UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
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Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Section 7(a)(4) Conference Report

Lutak Dock Replacement Project, Lutak Inlet, Haines, Alaska

NMFS Consultation Number: AKRO-2023-00031

Corps POA Number: POA-2023-00357

Agencies: National Marine Fisheries Service (NMFS), Office of Protected Resources, Permits and Conservation Division; U.S. Department of Transportation, Maritime Administration (MARAD), U.S. Army Corps of Engineers (USACE)

Affected Species and Determinations:

ESA-Listed Species	Status	Is the Action Likely to Adversely Affect Species?	Is the Action Likely to Adversely Affect Critical Habitat?	Is the Action Likely To Jeopardize the Species?	Is the Action Likely To Destroy or Adversely Modify Critical Habitat?
Steller Sea Lion, Western DPS (*Eumetopias jubatus)*	Endangered	Yes	No	No	No
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	No	No	No
Fin Whale (*Balaenoptera physalus*)	Endangered	No	N/A	No	N/A
North Pacific Right Whale (*Eubalaena japonica*)	Endangered	No	No	No	No
Sperm Whale (*Physeter macrocephalus*)	Endangered	No	N/A	No	N/A

ESA-Listed Species	Status	Is the Action Likely to Adversely Affect Species?	Is the Action Likely to Adversely Affect Critical Habitat?	Is the Action Likely To Jeopardize the Species?	Is the Action Likely To Destroy or Adversely Modify Critical Habitat?
Sunflower sea star (*Pycnopodia helianthoides*)	Proposed, Threatened	Yes	N/A	No	N/A

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

Jonathan M. Kurland
Regional Administrator

Date: February 6, 2024

Accessibility of this Document

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TERMS AND ABBREVIATIONS

µPa	Micro Pascal
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
AKR	Alaska Region
AMHS	Alaska Marine Highway System
AML	Alaska Marine Lines
AKR	Alaska Region
BA	Biological Assessment
BIA	Biologically Important Area
CI	Confidence Interval
CI	Confidence Interval
CO2	Carbon dioxide
CV	Coefficient of Variance
CWA	Clean Water Act
cy	Cubic yards
dB re 1µPa	Decibel referenced 1 microPascal
DDT	Dichlorodiphenyltrichloroethane
DPS	Distinct Population Segment
DTH	Down the hole
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
EVOS	Exxon Valdez Oil Spill
°F	Fahrenheit
FR	Federal Register
ft	Feet
HTL	High Tide Line
Hz	Hertz
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
kg	kilogram
kHz	Kilohertz
km	Kilometers
kts	Knots

m	Meter
MARAD	U.S. Department of Transportation Maritime Administration
MHW	Mean High Water
mi	Mile
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
nm	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRC	National Research Council
OC	Organochlorine
Opinion	Biological Opinion
Pa	Pascals
PAH	Polycyclic aromatic hydrocarbons
PBF	Physical and Biological Features
PCB	Polychlorinated biphenyls
PCE	Primary Constituent Element
POL	Petroleum, Oil, and Lubricants
ppm	Parts Per Million
PSO	Protected Species Observer
PTS	Permanent Threshold Shift
RMS	Root Mean Square
RoRo	Roll On, Roll Off
ROV	Remotely Operated Vehicle
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
s	Second
SEL	Sound Exposure Level
sf	Square Foot
SPLASH	Structure of Populations, Level of Abundance and Status of Humpback Whales
SST	Sea Surface Temperature
SSWS	Sea Star Wasting Syndrome
TMC	Turnagain Marine Construction
TTS	Temporary Threshold Shift

UME	Unusual Mortality Event
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Services

1 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. § 1536(a)(2)) requires each Federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a Federal agency's action "may affect" a protected species, that agency is required to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR § 402.14(a)). Federal agencies may fulfill this general requirement informally if they conclude that an action may affect, but "is not likely to adversely affect" endangered species, threatened species, or designated critical habitat, and NMFS or the USFWS concurs with that conclusion (50 CFR § 402.14(b)).

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary or appropriate to minimize such impact, and sets forth terms and conditions to implement those measures.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different. New proposed rules were published in the Federal Register on June 22, 2023 (88 FR 40753-64).

In this document, the action agencies are NMFS Office of Protected Resources, Permits and Conservation Division (hereafter referred to as "PR1" or "NMFS Permit Division"), the U.S. Army Corps of Engineers (hereafter referred to as USACE), and the U.S. Department of Transportation Maritime Administration (hereafter referred to as "MARAD"). MARAD is the lead action agency requesting consultation on effects to ESA-listed species from proposed project activities described herein. The NMFS Permits Division plans to issue an incidental harassment authorization (IHA) pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. § 1361 et seq.), to the Haines Borough for harassment of marine mammals incidental to the proposed action. The USACE plans to issue a Rivers and Harbors Act Section 10 and Clean Water Act section 404 (33 U.S.C. § 1344) permit for the proposed action (POA-2023-00357). Haines Borough, via contract with Turnagain Marine Construction (TMC), plans to construct a replacement of the Lutak Dock on the southern shore of Lutak Inlet, approximately 5.5 kilometers (km) northwest of downtown Haines. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's biological opinion (opinion) on the effects of this proposal on endangered and threatened species and designated critical habitat.

The opinion and ITS were prepared by NMFS Alaska Region in accordance with section 7(b) of the ESA (16 U.S.C. § 1536(b)), and implementing regulations at 50 CFR part 402.

The opinion and ITS are in compliance with the Data Quality Act (44 U.S.C. § 3504(d)(1)) and underwent pre-dissemination review.

1.1 Background

This opinion is based on information provided in the Incidental Harassment Authorization (IHA) application, the proposed IHA (88 FR 78330, Nov. 15, 2023), and subsequent revisions prepared and submitted by Solstice Alaska Consulting, Inc. (Solstice) and the Biological Assessment (BA) and subsequent revisions prepared and submitted by Solstice on behalf of MARAD. Other sources of information relied upon include sources of communications (emails and virtual meetings), recent consultations completed in the same region, previous monitoring reports in the region, scientific literature, and marine mammal surveys in Southeast Alaska. A complete record of this consultation is on file at NMFS's Anchorage, Alaska office.

The proposed action involves construction activities for the replacement of Lutak Dock, on the southern shore of Lutak Inlet, approximately 5.5 km northwest of downtown Haines, Alaska (Figure 1 and Figure 2).

Figure 1. Lutak Dock Replacement Project Location and Vicinity Map.

Figure 2. Lutak Dock Replacement Project Location.

This opinion considers the effects of pile driving activities, including vibratory and impact pile driving and down-the hole (DTH) drilling, the placement of fill material below the high-tide line (HTL), and vessel transit of materials and construction barges through habitat occupied by ESA-listed marine mammals. These actions have the potential to affect endangered fin whale (*Balaenoptera physalus*), threatened Mexico distinct population segment (DPS) humpback whale (*Megaptera novaeangliae*), endangered North Pacific right whale (*Eubalaena japonica*), endangered sperm whale (*Physeter macrocephalus*), endangered Western DPS Steller sea lion (*Eumetopias jubatus*), Steller sea lion critical habitat, and Mexico DPS humpback whale critical habitat. There is no critical habitat for North Pacific right whales in the action area. Critical habitat is not designated for fin whales or sperm whales.

In addition, the action agency requested a discretionary conference opinion for the proposed threatened Sunflower sea star (88 FR 16212, March 16, 2023); they requested concurrence with their determination that this action is likely to adversely affect, but not likely to jeopardize this species.

1.2 Consultation History

- January 17, 2023, NMFS AKR received a letter from MARAD designating Solstice as their non-federal representative and a request to initiate formal consultation

- June 14, 2023, NMFS AKR received the biological assessment (BA) from Solstice Consulting
- A revised BA was submitted to NMFS AKR on July 10, 2023, due to a change in the project that reduced the total number of pile driving days
- NMFS AKR received the Incidental Harassment Application (IHA) application from Solstice on July 10, 2023
- July 26, 2023, NMFS AKR met with PR1 and Solstice to discuss the proposed project, take estimates, and mitigation measures
- NMFS AKR sent comments on the BA to Solstice on August 4, 2023, with particular attention to the following issues: inclusion of additional listed species, sound source levels for pile driving activities and corresponding shutdown zones (which were conferred upon with PR1), revisions to/addition of mitigation measures, the reasoning for the infeasibility of a bubble curtain
- Solstice submitted a revised BA to NMFS AKR on August 16, 2023
- On August 22, 2023, NMFS AKR sent Solstice an email regarding concerns surrounding mining operations in the Haines area to confirm the replacement dock project was intended to support mining operations (which would change NMFS AKR's analysis of the proposed action); this topic, in addition to mitigation measures involving Sunflower sea stars, was also discussed via phone call on August 28, 2023; confirmation on mining operations was received via email on September 5, 2023
- An early review team meeting (ERT) was held with PR1 and NMFS AKR on September 19, 2023 to discuss the project
- NMFS AKR received a revised IHA application on October 11, 2023
- On October 16, 2023, PR1 determined the IHA application was adequate and complete
- Solstice submitted a revised BA to NMFS AKR on November 3, 2023
- Solstice submitted a revised Protected Species Monitoring Plan to NMFS AKR on November 7, 2023, and consultation was initiated
- On November 15, 2023, PR1 sent a request for consultation to NMFS AKR and the proposed IHA was published in the Federal Register.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. 50 C.F.R. § 402.02.

This opinion considers the effects of the construction of a dock facility on the southern shore of Lutak Inlet. The proposed project is located at latitude 59.282°N and longitude 135.467°W, approximately 5.5 km northwest of downtown Haines, Alaska. The proposed action will also include vessel transit of one materials barge to and from Seattle, Washington, and one construction barge to and from Cordova, Alaska. The Haines Borough proposes to construct a replacement of the existing Lutak Dock on the southern shore of Lutak Inlet. In-water pile installation and removal activities are expected to occur for a total of approximately 1,272 hours over 234 (not necessarily consecutive) days. All project activities are expected to take one year to complete. This project aims to maintain existing freight and cargo capacities at Lutak Dock to ensure the Haines area has reliable, safe, and economical barge service for the foreseeable future; expansion/increased capacity of the dock facility is not proposed at this time.

The following description of the proposed action derives primarily from the IHA application, the proposed IHA (88 FR 78330), and the BA.

2.1.1 Proposed Activities

2.1.1.1 Construction Activities

The proposed project involves construction of a new 705-foot-long combi wall to form a new bulkhead dock directly in front of the existing dock (Figure 3, Figure 4). The combi wall will be constructed of a series of interlocking steel pipe piles joined together by steel connectors using a ball-and-socket joint. The ball-and-socket joints will be welded directly onto the piles before installation and do not require a separate installation process. The combi wall will extend down the west side of the dock for 77 feet and along southeast side for 90 feet to completely enclose the existing dock, which will remain in place. Gravel fill will be placed in between the new combi wall and the existing dock, and gravel surface course will be overlain on top. New riprap shore protection will be added on the east and west ends of the combi wall to tie into existing shore protection. A concrete cap will be added to the top of the combi wall and new fenders and mooring bollards would be added to the front of the dock. The Alaska Marine Lines (AML) Roll-on/Roll-off (RoRo) ramp would be rotated 2.5 degrees to accommodate the extension to the front of the dock in order to continue receiving barge traffic safely without damage to structures or front fendering. Four mooring dolphins and one guide dolphin to the west of the dock will be removed. Pile driving activities will occur for approximately 1,272 hours over 234 days within the construction window (Table 1). Construction activities include both in-water and in-the-dry components and are detailed below.

In summary, the in-water construction activities include:

- Removal of 24 16-inch diameter steel piles associated with four existing mooring dolphins;
- Removal of one existing 24-inch diameter steel pile;
- Installation and removal of 42 36-inch diameter steel piles (template piles) to guide permanent piles into place;
- Installation of 180 42-inch diameter steel piles;
- Installation of 40 55.5-inch steel sheet piles as part of the combi wall; and
- Fill below high tide line (HTL): 53,310 square feet (sf) (1.2 acres).

In-the-dry construction activities include:

- Installation of 40 55.5-inch steel sheet piles to form the barge loading slip;
- Installation of 23 42-inch diameter steel batter piles;
- Installation of dock components such as fenders and bollards; and
- Fill above HTL: 112,155 sf (2.6 acres).

In-water construction of the combi wall would use the following sequence:

1. Vibrate in 2 to 3 temporary 36-inch diameter steel piles a minimum of 10 feet into overburden to support template frames.
2. Install the template frame with support on the existing dock structure and welded to the temporary pile. The template frame will be sized to hold approximately 10 piles to minimize the number of moves required to complete the work.
3. Within the frame, vibrate, impact, and DTH drill the permanent 42-inch diameter steel piles into place. Only one pile will be actively advanced at a time. However, up to 10 piles may be partially installed at a given time. To do this, the contractor will partially advance one individual pile into the substrate, then partially advance the next individual pile into the substrate, repeating this for each individual pile. This ensures that all piles remain vertical and in alignment through the installation process. In this way, the combi wall will be installed in "curtain-like" sections composed of interlocking pipe piles. The steel pipe piles will be joined together by steel connectors using a ball-and-socket joint that is installed on the pile prior to pile driving. The "curtain-like" installation process precludes the implementation of a bubble curtain, due to the elongated sections created by the interlocking of multiple piles.
4. Remove the template frame and temporary pile, and reinstall in the next location. This process will be repeated for installation of all permanent piles.
5. Vibrate and impact the 55.5-inch sheet piles to make up the new dock return walls.

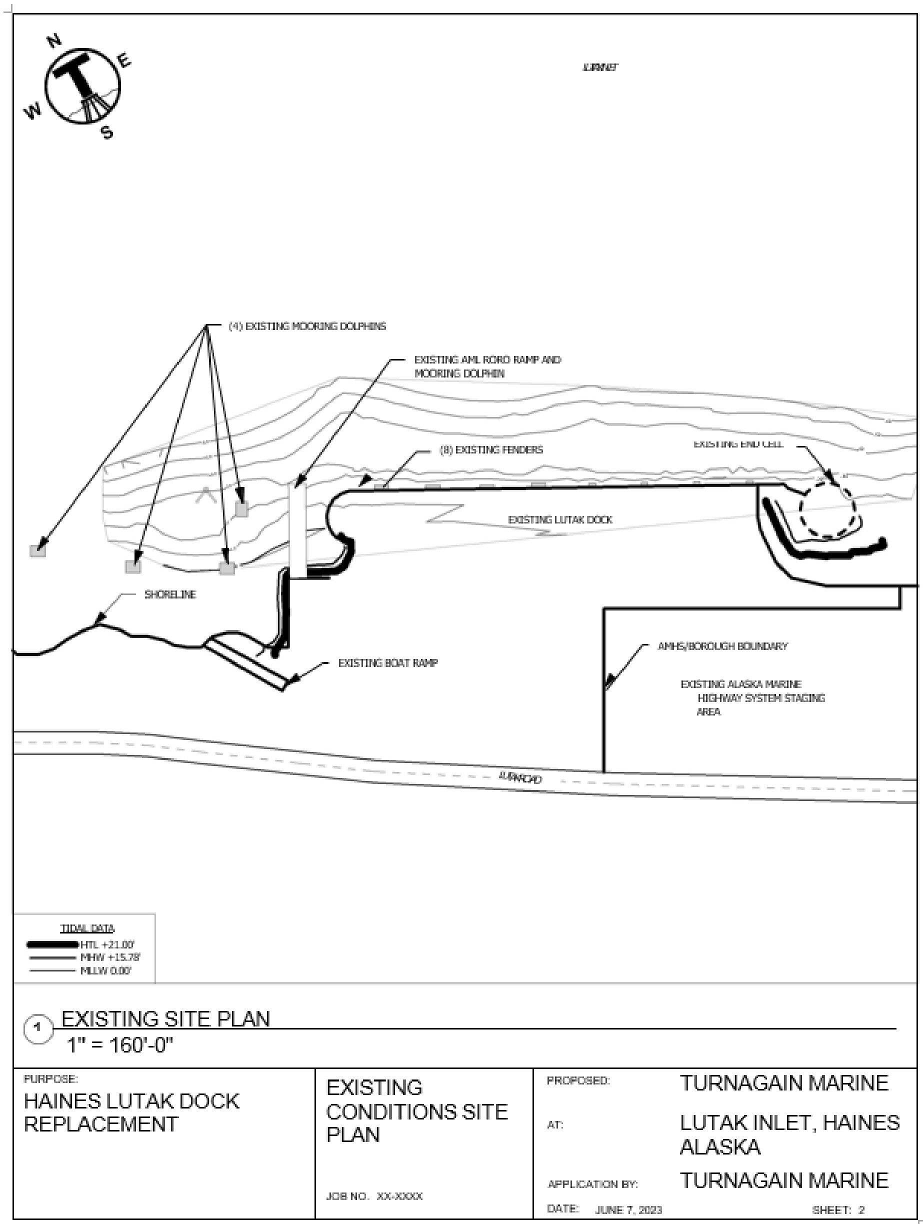


Figure 3. Existing Site Plan at Lutak Dock.

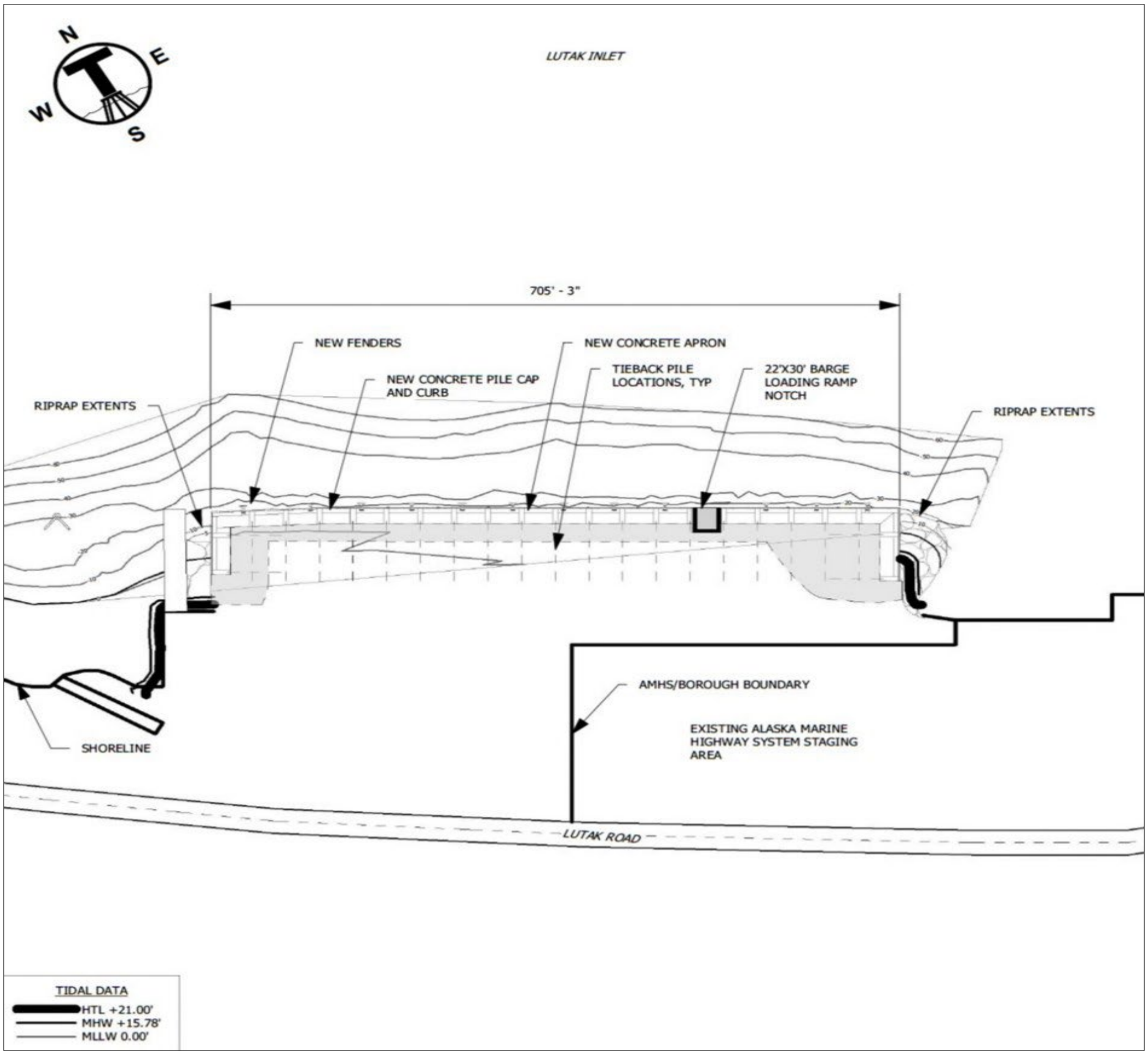


Figure 4. Lutak Dock Replacement Proposed Design.

Table 1. Lutak Dock Replacement Project Pile Installation and Removal Summary

	In-Water Work (Below HTL)						In-Air Work (Above HTL)	
	Guide Pile Removal	**Dolphin Removal**	**Temp. Pile Installation**	**Temp. Pile Removal**	**Perm. Pile Installation**	**Sheet Pile Installation**	**Sheet Pile Installation**	**Batter Pile Installation**
Diameter of Steel Pile (inches)	24	16	36	36	42	55.5	55.5	42
Number of Piles	1	24	42	42	180	40	40	23
Vibratory Pile Driving								
Total Quantity	1	24	42	42	180	40	40	23
Max # Piles Vibrated per Day	1	4	4	4	4	6	6	2
Vibratory Time per Pile (minutes)	45	45	15	15	45	30	30	60
Vibratory Time per Day (minutes)	45	180	60	60	180	180	180	120
Number of Days	1	6	11	11	45	7	7	12
Vibratory Time Total (hours)	1	18	11	11	135	20	20	23
Impact Pile Driving								
Total Quantity			42		180	40	40	23
Max # Piles Impacted per Day			4		4	6	6	2
Number of strikes per Pile			900		1,500	900	900	2,700
Impact Time per Pile (minutes)			30		45	30	30	90
Impact Time per Day (minutes)			120		180	180	180	180
Number of Days			11		45	7	7	12
Impact Time Total (hours)			21		135	20	20	35
Down-The-Hole Drilling								
Total Quantity					180			23
Max # Piles Installed per Day					2			1
# Strikes Per Pile					324,000			259,200
# Strikes Per Second					18			18
Drilling Time Per Pile (minutes)					300			240
Time per Day (minutes)					600			240
Number of Days					90			23
DTH Drilling Time Total (hours)					900			92

Pile installation equipment includes a vibratory hammer, two diesel impact hammers and a shaft drill (Table 2); the pile number, pile size, duration of installation, and installation method for each type of pile are summarized in Table 1, and are described in further detail below.

Table 2. Pile Installation Equipment

Driving mechanism	Pile driver	Properties
Vibratory pile driving	APE 200-6/bare hammer weight without clamp 18,900 pounds	6,600 inch-pounds eccentric moment 255 tons drive force
Impact pile driving	Diesel Delmag D46	Max energy per blow 122,435 feet-pounds Speed (blows per minute) 34-53
Impact pile driving	Diesel Delmag D80	Max energy per blow 212,420 feet-pounds Speed (blows per minute) 34-45
Drilled shaft	Holte Top Drive	Max energy 100,000 feet-pounds

The existing 16-inch diameter steel piles that comprise the four mooring dolphins and the existing 24-inch guide pile will be dead-pulled or removed using vibratory methods.

Template frames supported by a cantilever on the existing dock will be used to guide installation of permanent piles. However, if needed, temporary piles may be installed to support the template frames. Two or three temporary 36-inch diameter piles may be needed for each template. Most temporary piles will be driven into place with vibratory methods; however, up to four of these may need to be impact hammered in locations where the bedrock is shallow, although shallow bedrock conditions are not expected at the project site.

Using the templates as guides for positioning, 180 permanent piles will be installed using vibratory methods, and if required, impact hammered through to the bedrock to encapsulate the existing dock. Once the pile tips have reached bedrock, they will be socketed into the bedrock to 10 feet utilizing a DTH drill. For each permanent 42-inch diameter pile, approximately 5 cubic yards (cy) of drill cuttings will be produced. A sediment curtain will be used to capture drill cuttings and minimize turbidity effects at the site.

23 permanent 42-inch diameter tieback steel piles will be installed via vibratory methods or impact hammered as required through the soil layer to bedrock. A 28-inch diameter shaft will be drilled through the 42-inch diameter pile into the bedrock with the DTH drill and bit to socket the piles 24 feet into the bedrock. All tieback pile installation will occur above HTL within the existing dock.

40 55.5-inch sheet piles will be vibrated and then impacted to create the return walls along the east and west sides of the dock.

A barge loading slip will be constructed by creating an approximately 22-ft by 30-ft notch along the new face of the dock. After the installation of the combi wall and backfill, a maximum of 40 sheet piles will be installed behind the newly installed combi wall using a vibratory hammer and impact hammer. After the installation of all sheet piles, about eight of the newly installed steel pipe piles (forming the new combi wall) will be cut off using an oxy-acetylene cutting torch at a depth of about 10 feet and capped with a steel waler and a concrete curb to form the barge loading notch. The installation of the barge loading slip will occur above HTL within the existing dock.

Fill material

Following the installation of piles for the combi wall, type C fill will be placed between the combi wall and the existing dock, vibracompacted to ensure stability, and overlain with gravel surface course to match existing grade. Riprap shore protection will be placed along the southeast and northwest ends of the dock and tied in to the existing riprap. The riprap and fill will be placed using a dozer and loader, and fill above HTL will be compacted using a vibratory soil compactor.

Approximately 27,848 cy, covering 165,465 square feet (sf) of habitat, will be placed both inside the combi wall to encapsulate the existing closed cell sheet piles and construct the new dock, and along the sides of the dock as bank stabilization. Table 3 describes the specific quantities and types of fill to be placed below mean high water (MHW), in the intertidal zone between MHW and HTL, and above HTL.

Table 3. Lutak Dock Replacement Project Fill Summary.

	Surface Area (sf)	**Volume (cy)**	**Time (hours)**	**Days**
Fill above HTL				
Gravel	85,000	2,000	160	20
Type C Fill	17,500	4,055	327	11
Riprap Total	9,655	127	10	8
Total:	**112,155**	**6,182**	**497**	**39**
Fill in Intertidal Waters (Between MHW and HTL)				
Type C Fill	17,500	4,255	343	11
Riprap Total	9,655	275	22	3
Total:	**27,155**	**4,530**	**365**	**14**
Fill in Marine Waters (below MHW)				
Type C Fill	16,500	14,000	1,130	38
Riprap Total	9,655	3,136	248	31
Total:	**26,155**	**17,136**	**1,378**	**69**
Grand Total	**165,465**	**27,848**	**2,240**	**122**

2.1.1.2 Transport of Materials and Equipment

One materials transport barge (approximately 400 feet [ft] by 100 ft) will make a single round trip between Seattle, Washington, and Lutak Inlet, Alaska, and will be used onsite as a staging area during construction. One construction barge (*Brightwater* crane barge [280 ft by 76 ft by 16 ft]) will make a single round trip between Cordova, Alaska and Lutak Inlet, Alaska. This barge will be used onsite to support construction activities. One skiff (19-ft by

8-ft with a single 90-135 horsepower Honda outboard motor) will be transported to the project site on the crane barge to support construction and marine mammal monitoring activities. All barges will be towed at a speed around 8 knots (kts). Once at the project site, the construction barge will be secured in place by four mooring anchors. The materials barge will be tied to the construction barge, and materials will be moved from the staging barge to the construction barge and project site by a crane on the construction barge. Local barge moves to the next pile installation area (in approximately 100-foot increments) would occur at a speed of less than 2 kts.

2.1.2 General Mitigation Measures

1. The project proponent will inform NMFS of impending in-water activities a minimum of one week prior to the onset of those activities (email information to akr.section7@noaa.gov).

2. If construction activities will occur outside of the time window specified in this letter, the applicant will notify NMFS of the situation at least 60 days prior to the end of the specified time window to allow for reinitiation of consultation.

3. In-water work will be conducted at the lowest points of the tidal cycle when feasible.

4. Consistent with AS 46.06.080, trash will be disposed of in accordance with state law. The project proponent will ensure that all closed loops (e.g., packing straps, rings, bands, etc.) will be cut prior to disposal. In addition, the project proponent will secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter marine waters.

Protected Species Observer (PSO) Requirements

5. At least one PSO will have either prior experience as a PSO in Alaska or will have taken a NMFS-approved PSO or marine mammal observer training course.

6. PSO training will include:

    a. field identification of marine mammals and marine mammal behavior;

    b. ecological information on marine mammals and specifics on the ecology and management concerns of those marine mammals;

    c. ESA and Marine Mammal Protection Act (MMPA) regulations;

    d. proper equipment use;

    e. methodologies in marine mammal observation and data recording and property reporting protocols; and

    f. an overview of PSO roles and responsibilities.

7. PSOs will be individuals independent from the project proponent and must have no other

assigned tasks during monitoring periods.

8. The action agency or its designated non-federal representative will provide resumes or qualifications of PSO candidates to consultation biologist and akr.prd.section7@noaa.gov approval at least one week prior to in-water work. NMFS will provide a brief explanation of lack of approval in instances where an individual is not approved.

9. PSOs will:

    a. collectively be able to effectively observe the entirety of the shutdown zone;

    b. be able to identify marine mammals and accurately record the date, time, and species, of all observed marine mammals in accordance with project protocols;

    c. be able to identify listed marine mammals that may occur in the action area, at a distance equal to the outer edge of the applicable shutdown zone and determine marine mammal's location and distance from sound source;

    d. have the ability to effectively communicate orally, by radio or in person with project personnel to provide real-time information on listed marine mammals;

    e. possess a copy of mitigation measures; and

    f. possess data forms.

<u>PSO Procedures</u>

10. PSOs will not scan for marine mammals for more than four hours without at least a one hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.

11. PSOs will have the ability, authority, and obligation to order appropriate mitigation response, including shutdown, to avoid takes of listed marine mammals.

12. One or more PSOs will perform PSO duties onsite throughout the authorized activity.

13. Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated.

14. For each in-water activity, PSOs will monitor all marine waters within the indicated zone radius for that activity (Table 4, Table 5).

Table 4. Level A Shutdown Zones for Each Activity.

Pile-Driving Method	Pile Type/ Activity	Shutdown zone (m)	Hearing Group [1]
Vibratory Hammer	16-inch pile removal	10	OW
		15	LF
	24-inch pile removal	10	LF, OW
	36-inch temporary pile installation and removal	10	OW
		15	LF
	42-inch pile installation	10	OW
		60	LF
	55.5-inch sheet pile installation	10	OW
		20	LF
Impact Hammer	36-inch temporary pile installation	110	OW
		2,735	LF
	42-inch pile installation	150	OW
		3,845	LF
	55.5-inch sheet pile installation	80	OW
		1,940	LF
DTH Drill	42-inch pile installation	160	OW
		4,050	LF

[1]LF = low frequency cetaceans (humpback whales); OW = otariid pinnipeds (Steller sea lions)

Table 5. Level B Monitoring Zones for Each Activity.

Pile-Driving Method	Pile Type/ Activity	Monitoring Zone
Vibratory Hammer	Sheet pile and 42-inch batter pile in-air installation	25
	16-inch pile removal	5,425
	24-inch pile removal	5,425
	36-inch temporary pile installation and removal	7,000[1]
	42-inch pile installation	7,000[1]
	55.5-inch sheet pile installation	6,310
Impact Hammer	Sheet pile and 42-inch batter pile in-air installation	30
	36-inch temporary pile installation	1,500 (OW)
		2,735 (LF)[2]
	42-inch pile installation	1,500 (OW)
		3,845 (LF)[2]
	55.5-inch sheet pile installation	1,000 (OW)
		1,940 (LF)[2]
DTH Drill	42-inch pile installation	7,000[1]

[1] Land masses truncate the Level B zone for these pile activities; the distances shown here represents the extent of practical monitoring zones.

[2] Represents a Level A shutdown zone; in some instances, zones where Level A take could occur are larger than the Level B monitoring zones for humpback whales. For those activities, the Level A shutdown zone is shown on the Level B monitoring zone.

15. PSOs will be positioned such that they will collectively be able to monitor the entirety of each activity's shutdown or monitoring zone.

16. Prior to commencing any activity listed in Table 4 and Table 5, PSOs will scan waters within the appropriate shutdown zone and confirm no listed marine mammals are within the shutdown zone for at least 30 minutes immediately prior to initiation of the in-water activity. If one or more listed marine mammals are observed within the shutdown zone, the in-water activity will not begin until the listed marine mammals exit the shutdown zone of their own accord, or the shutdown zone has remained clear of listed marine mammals for 30 minutes immediately prior to the commencement of the activities listed in Table 4 and Table 5.

17. The on-duty PSOs will continuously monitor the shutdown zone and level B monitoring zone and adjacent waters during any of the activities listed in Table 4 and Table 5 for the presence of listed marine mammals.

18. Activities listed in Table 4 and Table 5 will only take place:

    a. between sunrise and sunset;

    b. during conditions with a Beaufort Sea State of 4 or less; and

    c. when the entire shutdown zone and adjacent waters are visible (e.g., monitoring effectiveness is not reduced due to rain, fog, snow, haze, or other environmental/atmospheric conditions).

19. If visibility degrades such that PSOs can no longer ensure that the shutdown zone remains devoid of listed marine mammals during any of the activities listed in Table 4 and Table 5 the crew will stop activities until the entire shutdown zone is visible and the PSOs has indicated that the zone remained devoid of listed marine mammals for 30 minutes.

20. The PSOs will order ongoing activities listed in Table 4 and Table 5 to immediately cease if one or more listed marine mammals has entered, or appears likely to enter, the shutdown zone.

21. If any of the activities listed in Table 4 or Table 5 are shut down for less than 30 minutes due to the presence of listed marine mammals in the shutdown zone, the activities may commence when the PSOs provides assurance that listed marine mammals were observed exiting the shutdown zone. Otherwise, the activities may only commence after the PSO provides assurance that listed marine mammals have not been seen in the shutdown zone for 30 minutes (for cetaceans) or 15 minutes (for pinnipeds).

22. If a listed marine mammals is observed within a shutdown zone or is otherwise harassed, harmed, injured, or disturbed, the PSO will immediately report that occurrence to NMFS using the contact information specified in Table 6.

23. Prior to commencing any activity listed in Table 4 or Table 5, or at changes in watch,

PSOs will establish a point of contact with the construction crew. The PSO will brief the point of contact as to the shutdown procedures if the PSO observes that listed marine mammals are likely to enter or enter the shutdown zone. If the point of contact goes "off shift" and delegates their duties, the point of contact must inform the PSO and brief the new point of contact.

Impact Pile Installation (pipe piles or H piles)

24. If no listed marine mammals are observed within the applicable shutdown zone (see Table 4, Table 5) for 30 minutes immediately prior to pile installation, soft-start procedures will be implemented immediately prior to activities. Soft-start procedures require contractors to provide an initial set of strikes at no more than half the operational power, followed by a 30-second waiting period, then two subsequent reduced-power-strike sets. A soft-start must be implemented:

    a. at the start of each day's impact pile installation;

    b. any time pile installation has been shut down or delayed due to the presence of a listed marine mammal;

    c. whenever pile installation has temporarily stopped (≤30 min) and PSO observation has also stopped; or

    d. whenever pile installation has temporarily stopped for more than 30 min and PSO observation has also stopped.

25. Following the soft-start procedure, operational impact pile installation may commence and continue provided listed marine mammals remain absent from the shutdown zone.

26. Following a lapse of impact pile installation activities of more than 30 minutes, the PSO will authorize resumption of impact pile installation only after the PSO provides assurance that listed species have not been present in the shutdown zone for at least 30 minutes immediately prior to resumption of operations.

Vibratory Pipe and Sheet Pile Removal and Installation

27. If no listed marine mammals are observed within the applicable shutdown zone (see Table 4, Table 5) for 30 minutes immediately prior to pile removal or installation, vibratory pile removal or installation may commence. This pre-pile removal or installation observation period will take place at the start of each day's vibratory pile removal or installation, each time pile removal or installation has been shut down or delayed due to the presence of a listed species, and following a cessation of pile driving for a period of 30 minutes or longer.

28. Following a lapse of vibratory pile removal or installation activities of more than 30 minutes, the PSO will authorize resumption of vibratory pile removal or installation only after the PSO provides assurance that listed marine mammals have not been present in the shutdown zone for at least 30 minutes immediately prior to resumption of operations.

Down the Hole (DTH) drilling

29. If no listed marine mammals are observed within the DTH pile driving shutdown zone (see Table 4, Table 5) for 30 minutes immediately prior to pile driving, soft-start procedures will be implemented immediately prior to activities. Soft start requires contractors to activate the drilling equipment at no more than half the operational power for several seconds, followed by a 30 second waiting period, then two subsequent reduced power start-ups. A soft start must be implemented at the start of each day's DTH pile driving, any time pile driving has been shutdown or delayed due the presence of a listed species, and following cessation of pile driving for a period of 30 minutes or longer.

30. Following this soft-start procedure, operational DTH pile driving may commence and continue provided listed marine mammals remain absent from the shutdown zone.

31. Following a lapse of DTH pile driving activities of more than 30 minutes, the PSO will authorize resumption of pile driving only after the PSO provides assurance that listed marine mammals have not been present in the shutdown zone for at least 30 minutes immediately prior to resumption of operations.

Intertidal Fill/Bank Stabilization and Maintenance

32. Fill material will consist of rock fill that is free of fine sediments to the extent practical, or will come from on-site dredged material.

33. Fill material will be obtained from local sources or will be free of non-native marine and terrestrial vegetation species.

34. A PSO must be present whenever sheet piles are installed and will follow mitigation measures for impact and vibratory pile driving listed above.

Project-Dedicated Vessels (vessel and crew safety should never be compromised)

35. Vessel operators will:

    a. maintain a watch for marine mammals at all times while underway;

    b. stay at least 91 meters (100 yards) away from listed marine mammals, except that they will remain at least 460 meters (500 yards) away from endangered North Pacific right whales;

    c. travel at less than 5 knots when within 274 meters (300 yards) of a whale;

    d. avoid changes in direction and speed within 274 meters (300 yards) of a whale, unless doing so is necessary for maritime safety;

    e. not position vessel(s) in the path of a whale, and will not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern);

f. reduce vessel speed to 10 knots or less when weather conditions reduce visibility to 1.6 kilometers (1 mile) or less; and

g. adhere to the Alaska Humpback Whale Approach Regulations when vessels are transiting to and from the project site: (see 50 CFR §§ 216.18, 223.214, and 224.103(b); these regulations apply to all humpback whales). Specifically, pilot and crew will not:

   i. approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 100 yards of any humpback whale;

   ii. cause a vessel or other object to approach within 100 yards of any humpback whale; or

   iii. disrupt the normal behavior or prior activity of a humpback whale by any other act or omission.

36. If a whale's course and speed are such that it will likely cross in front of a vessel that is underway, or approach within 91 meters (100 yards) of the vessel, and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel, except that vessels will remain 460 meters (500 yards) from North Pacific right whales.

37. Vessels will not allow lines to remain in the water unless both ends are under tension and affixed to vessels or gear.

38. Project-specific barges will travel at 10 knots or less.

<u>Vessel Transit, North Pacific Right Whales, and their Designated Critical Habitat</u>

39. Vessels will:

   a. remain at least 460 meters (500 yards) from North Pacific right whales.

<u>Vessel Transit, Western DPS Steller Sea Lions, and their Designated Critical Habitat</u>

40. Vessels will not approach within 5.5 kilometers (3 nautical miles[nm]) of rookery sites listed in 50 CFR § 224.103(d); and

41. Vessels will not approach within 914 meters (3,000 feet) of any Steller sea lion haulout or rookery.

<u>Sunflower Sea Star Mitigation Measures</u>

42. To prevent direct placement of a pile on a Sunflower sea star, a pre- construction survey

and biweekly (every other week) surveys of the seafloor near the project area will take place.

43. An initial Sunflower sea star survey will be conducted prior to, but no more than 24 hours prior to, in-water work in areas where fill will be placed on the sides of the dock and along the face of the dock.

44. If a Sunflower sea star is identified during the pre-construction or biweekly surveys, more frequent surveys prior to piling may be required.

45. The contractor, at their own discretion, may monitor the seafloor during the placement of every pile in lieu of a pre-construction or bi-weekly surveys.

46. If a Sunflower sea star is attached to a pile being removed from the water, the Sunflower sea star will be gently removed from the pile by the Lead PSO, or a crew delegate due to possible safety concerns, and immediately released into an intertidal location nearby.

47. Each day prior to fill operations below MHW along the sides of the dock, Sunflower sea star surveyors will systematically examine all intertidal and subtidal areas that may be impacted by fill operations during that day.

48. Survey transects will run roughly parallel to shore, with two-meter separation between each transect line, until the area that will be covered with fill that day is surveyed (see example transect diagrams, Appendix D). Surveys may be conducted on foot at low tide or by snorkelers in areas where the substrate is not visible by foot during low tide. During surveys, bathymetry must be sufficiently visible so that surveyors can accurately assess for the presence of Sunflower sea stars of all size classes. In areas that are not visible to snorkelers, surveys may be done by a diver or remotely operated vehicle equipped with a camera.

49. Sunflower sea stars that are found in fill areas will be gently moved into a container of water collected at the site, and immediately taken to a location at least 100 meters away from the project area and gently released onto the substrate; individuals will be held within a bucket of water for no more than 10 minutes. The number and approximate diameter of Sunflower sea stars moved will be recorded and reported to NMFS.

50. If it appears that a Sunflower sea star has sea star wasting syndrome or if any dead Sunflower sea stars are observed, pictures of the individuals will be taken and infected individuals will be counted. The infected Sunflower sea stars will not be touched or moved. All Sunflower sea star findings will be reported to NMFS, including latitude/longitude and transect line, at akr.section7@noaa.gov (see fact sheet, Appendix D).

51. Fill material will be obtained from local sources when available, avoiding the need to ship fill through protected species habitat and minimizing the risk of introducing non- native species.

Data Collection

PSOs have the following responsibilities for data collection:

52. PSOs will record observations on data forms or into electronic data sheets.

53. The project proponent will ensure that PSO data will be submitted electronically in a format that can be queried such as a spreadsheet or database (i.e., digital images of data sheets are not sufficient).

54. PSOs will record the following:

    a. Project name, date, shift start time, shift stop time, and PSO identifier;

    b. date and time of each reportable event (e.g., a listed marine mammal observation, operation shutdown, reason for operation shutdown, change in weather conditions);

    c. weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea state (https://www.weather.gov/mfl/beaufort);

    d. species, numbers, and, if possible, sex and age class of observed listed marine mammal;

    e. the predominant anthropogenic sound-producing activities occurring during each listed marine mammal observation;

    f. observations of listed marine mammal behaviors and reactions to anthropogenic sounds and presence;

    g. geographic coordinates of initial, closest, and last location of listed species, including distance from observer to the listed species, and minimum distance from the predominant sound-producing activity to listed species; and

    h. whether the presence of a listed species necessitated the implementation of mitigation measures to avoid acoustic impact (i.e., shutdown), and the duration of time that normal operations were affected by the presence of listed species.

Reporting

Unauthorized Take

55. If a listed marine mammal is determined by the PSO to have been disturbed, harassed, harmed, injured, or killed (e.g., a listed marine mammal is observed entering a shutdown zone before operations can be shut down, or is injured or killed as a direct or indirect result of the action), the PSO will report the incident to NMFS within one business day, with information submitted to akr.section7@noaa.gov. These PSO records will include:

a. digital, queryable documents containing PSO observations and records, and digital, queryable reports;

b. the date, time, and location of each event (provide geographic coordinates);

c. description of the event;

d. number of individuals of each listed marine mammal species affected;

e. the time the animal(s) was first observed or entered the shutdown zone, and, if known, the time the animal was last seen or exited the zone, and the fate of the animal;

f. mitigation measures implemented prior to and after the animal was taken;

g. if a vessel struck a listed marine mammal, the contact information for the PSO on duty on the vessel or the contact information for the individual piloting the vessel; and

h. photographs or video footage of the animal(s), if available.

Stranded, Injured, Sick or Dead Listed Species (not associated with the project)

56. If the PSO observes an injured, sick, or dead marine mammals (i.e., stranded), they will notify the Alaska Marine Mammal Stranding Hotline at 877-925-7773. The PSOs will submit photos and available data to aid NMFS in determining how to respond to the stranded animal. If possible, data submitted to NMFS in response to stranded marine mammals will include date/time, location of stranded marine mammal, species and number of stranded individuals, description of the stranded marine mammal's condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine mammals.

Illegal Activities

57. If the PSO observes listed marine mammals or other marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding or unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement (Table 6; 1-800-853-1964).

58. Data submitted to NMFS will include date/time, location, description of the event, and any photos or videos taken.

North Pacific Right Whales

59. All observations of North Pacific right whales will be reported to NMFS within 24 hours.

<u>Final Report</u>

60. A final report will be submitted to NMFS within 90 calendar days of the completion of the project summarizing the data recorded by emailing it to akr.section7@noaa.gov. The report will summarize all in-water activities associated with the proposed action, and results of PSO monitoring conducted during the in-water activities.

61. The final report for projects will include:

    a. summaries of monitoring efforts, including dates and times of construction, dates and times of monitoring, dates and times and duration of shutdowns due to listed marine mammal presence;

    b. dates and times of listed marine mammal observations, geographic coordinates of listed marine mammals at their closest approach to the project site, including date, water depth, species, age/size/gender (if determinable), and group sizes;

    c. number of listed marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);

    d. observed listed marine mammal behaviors and movement types versus project activity at the time of observation;

    e. numbers of marine mammal observations/individuals seen versus project activity at time of observation; and

    f. digital, queryable documents containing PSO observations and records, and digital, queryable reports.

Table 6. Summary of Agency Contact Information.

Reason for Contact	**Contact Information**
Consultation Questions & Unauthorized Take	akr.prd.section7@noaa.gov
Reports & Data Submittal	AKR.section7@noaa.gov
Stranded, Injured, or Dead Marine Mammals	Stranding Hotline (24/7 coverage) 1-877-925-7773
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802 and

Reason for Contact	Contact Information
	AKRNMFSSpillResponse@noaa.gov
Illegal Activities *(not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)*	NMFS Office of Law Enforcement (AK Hotline): 1-800-853-1964
In the event that this contact information becomes obsolete	NMFS Anchorage Main Office: 907-271-5006 or NMFS Juneau Main Office: 907-586-7236

2.2 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). For this reason, the action area is typically larger than the project area and extends out to a point where no measurable effects from the proposed action occur.

The Lutak Dock and associated facilities will be constructed on the southern shore of Lutak Inlet approximately 5.5 km northwest of downtown Haines, Alaska. Lutak Inlet is approximately 9-km long and measures less than 2 km across from shore to shore at its widest point. It is about 360 feet deep at its entrance between Tanani Point and Taiya Point. Depths at the project area are shallower, approximately 25 to 100 feet deep. To the north of the project area, the Ferebee River empties into the Taiyasanka Harbor and then into Lutak Inlet; to the west of the project area, Chilkoot Lake empties into Lutak Inlet via the Chilkoot River.

NMFS defines the action area for this consultation to include the area within which project-related noise levels exceed 120 dB re 1 μPa root mean square (rms), and are expected to approach ambient noise levels (i.e., the point where no measurable effect from the project would occur).

To define the action area, we considered the maximum diameter and type of piles, the pile-driving methods, and empirical measurements of noise. In this case, the action area is where noise levels from DTH installation of 42-inch piles (the farthest-reaching noise associated with the project) are expected to decline to 120 dB re 1 μPa rms; received sound levels from this source are expected to decline to 120 dB re 1 μPa rms within 39.8 km from the source. However, the extent of ensonification is truncated where land masses obstruct underwater sound transmission; thus, the action area extends west 7 km into Lutak Inlet and east 4.5 km into the confluence of Chilkoot Inlet and Taiya Inlet and encompasses approximately 21 square km (Figure 5).

Due to the effects of vessel noise and disturbance on protected species, the expected transit routes of the materials and construction barges are also considered part of the action area. The materials barges will be towed from Seattle, Washington, to the project site (Figure 6). The construction barge will be towed from Cordova, Alaska, to the Lutak Inlet project site (Figure 7).

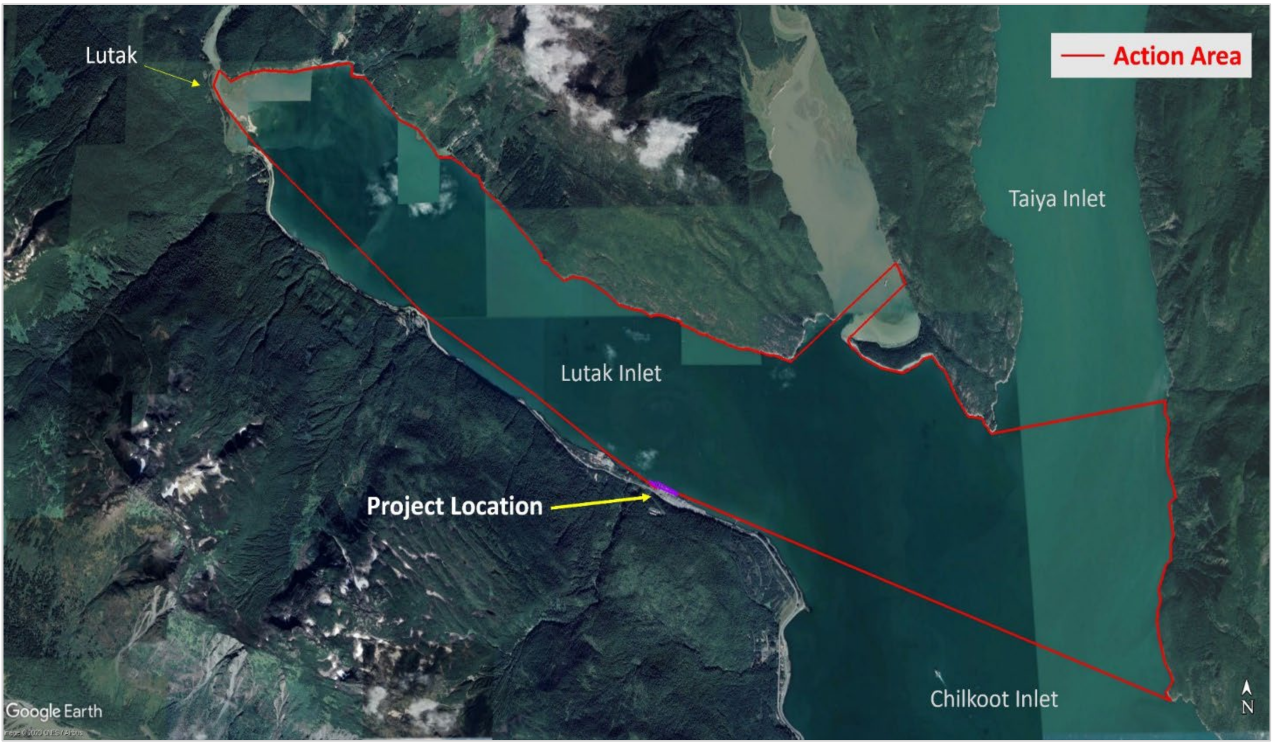


Figure 5. Lutak Dock Replacement Project Area showing the waters near the project site ensonified by activities occurring at the project location. The entire action area includes the project area and the ensonified swaths of marine waters along barge routes.

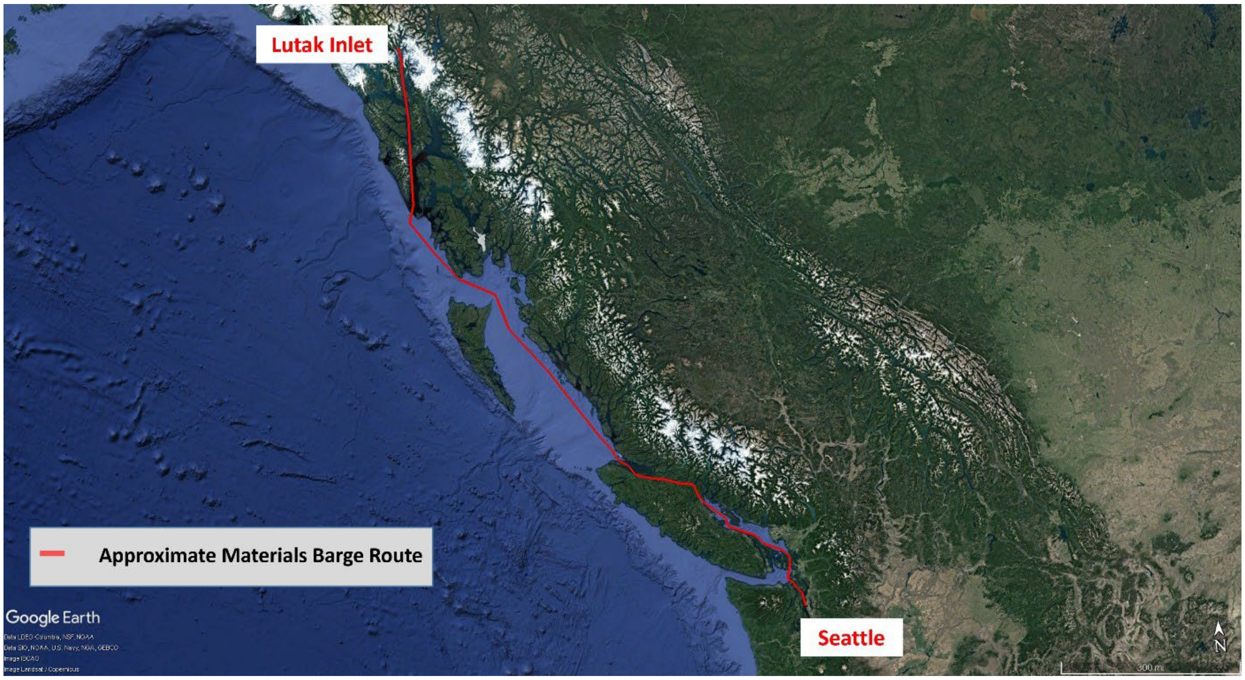


Figure 6. Lutak Dock Replacement Project Materials Barge Route. The entire action area includes the project area and the ensonified swaths of marine waters along barge routes.

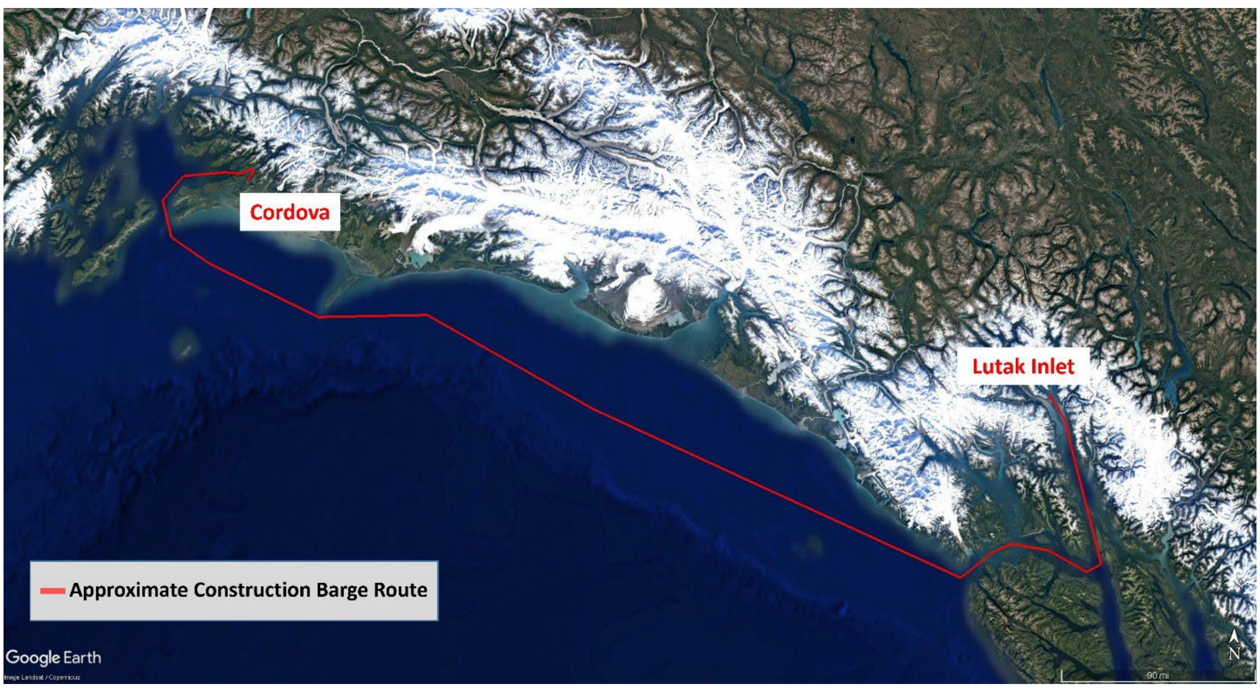


Figure 7. Lutak Dock Replacement Project Construction Barge Route. The entire action area includes the project area and the ensonified swaths of marine waters along barge routes.

3 APPROACH TO THE ASSESSMENT

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

To jeopardize the continued existence of a listed species means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02). As NMFS explained when it promulgated this definition, NMFS considers the likely impacts to a species' survival as well as likely impacts to its recovery. Further, it is possible that in certain, exceptional circumstances, injury to recovery alone may result in a jeopardy biological opinion (51 FR 19926, 19934; June 3, 1986).

Under NMFS's regulations, the destruction or adverse modification of critical habitat means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR § 402.02).

The designation(s) of critical habitat for Steller sea lions use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (81 FR 7414; February 11, 2016) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, our use of the term PBF also applies to Primary Constituent Elements and essential features.

We use the following approach to determine whether the proposed action described in Section 2 of this opinion is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the proposed action that are likely to have effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these effects.

- Identify the range-wide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this opinion.

- Describe the environmental baseline including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 5 of this opinion.

- Analyze the effects of the proposed action. Identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat PBFs. The effects of the action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.

- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.3 of this opinion.

- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR § 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 7 of this opinion.

- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this opinion.

- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8.

- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action.

4 RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

This opinion considers the effects of the proposed action on the species and designated critical habitats specified in Table 7. Although critical habitat has been designated for the North Pacific right whale, there is no critical habitat for this species within the action area.

Table 7. Listing status and critical habitat designation for species considered in this opinion.

Species	Status	Listing	Critical Habitat
North Pacific Right Whale *(Eubalaena japonica)*	Endangered	NMFS 2008, 73 FR 12024	NMFS 2008, 73 FR 19000
Humpback Whale, Mexico DPS *(Megaptera novaeangliae)*	Threatened	NMFS 2016, 81 FR 62260	NMFS 2021 86 FR 21082
Fin Whale (*Balaneoptera physalus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Sperm Whale (*Physeter macrocephalus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Steller Sea Lion, Western DPS *(Eumetopias jubatus)*	Endangered	NMFS 1997, 62 FR 24345	NMFS 1993, 58 FR 45269
Sunflower Sea Star (*Pycnopodia helianthoides*)	Proposed, Threatened	NMFS 2023, 88 FR 16212	Not proposed

4.1 Species and Critical Habitat Not Likely to be Adversely Affected by the Action

As described in the Approach to the Assessment section of this opinion, NMFS uses two criteria to identify those endangered or threatened species or critical habitats that are likely to be adversely affected. The first criterion is exposure or some reasonable expectation of a co-occurrence between one or more potential stressors associated with the proposed activities and a listed species or designated critical habitat.

The second criterion is the probability of a response given exposure. For endangered or threatened species, we consider the susceptibility of the species that may be exposed. For example, species exposed to vessel sound that are not likely to exhibit physical, physiological, or behavioral responses given that exposure (at the combination of sound pressure levels and distances associated with an exposure), are unlikely to be adversely affected by the exposure. We determine that an action would not likely adversely affect an animal if one could not meaningfully measure or detect the effects, or if the effects are extremely unlikely to occur.

In addition, if proposed activities are not likely to destroy or adversely modify critical habitat, further analysis is not required.

We applied these criteria to the species and critical habitats listed above and determined that the following species and designated critical habitats are not likely to be adversely affected by the proposed action: sperm whale, North Pacific right whale, fin whale, Mexico DPS humpback whale critical habitat, and Steller sea lion critical habitat. Below we discuss our rationale for those determinations.

4.1.1 Sperm Whale, North Pacific Right Whale, Fin Whale

Sperm whale

The sperm whale (*Physeter macrocephalus*) was listed as an endangered species under the Endangered Species Conservation Act (ESCA) in 1970 (35 FR 18319, December 2,1970), and continued to be listed as endangered following passage of the ESA. Critical habitat has not been designated for sperm whales.

Sperm whales are primarily found in deep waters, and sightings of sperm whales in water less than 300 m (984 ft) are uncommon. They are usually found far offshore, except in cases where the shelf break or submarine canyons occur close to land (Mizroch and Rice 2013). They feed primarily on medium-sized to large-sized squids but also take substantial quantities of large demersal and mesopelagic sharks, skates, and fishes (Rice 1989). The northern extent of their known range is 62°N, where Soviet catches of females occurred in Olyutorsky Bay (Muto et al. 2018). During summer, males are found in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands (Mizroch and Rice 2013). There are no recent and reliable estimates for population size or trend for sperm whales off Alaska (i.e., the North Pacific Stock). A minimum estimate of the total annual level of human-caused mortality and serious injury for North Pacific sperm whales in 2013-2017 is 4.9 whales in U.S. commercial fisheries (Muto et al. 2020).

Sperm whales produce a variety of vocalizations ranging from 0.1 to 20 kilohertz (kHz) (Weilgart and Whitehead 1993; Goold and Jones 1995; Møhl et al. 2003; Weir and Goold 2007). Sperm whales are odontocetes (toothed whales) and are considered mid-frequency cetaceans with an applied frequency range of 150 hertz (Hz) to 160 kHz (NMFS 2018c). The only direct measurement of hearing was from a young stranded individual from which auditory evoked potentials were recorded and indicated a hearing range of 2.5 to 60 kHz (Carder and Ridgway 1990).

Four of the most common threats cited for Southeast Alaska sperm whales are interactions with commercial fishing, whale watching, acoustic disturbance, and ship strikes (NMFS 2010). Neilson et al. (2012a) found that out of the 89 defined whale strikes documented from 1978-2011 only one of those was a sperm whale, and the fate of that whale is unknown. The level of effects on sperm whales from ship noise is not fully understood but effects are expected to be similar to those described for humpback whales (NMFS 2010). Between 2012 and 2021, four suspected human-related sperm whale mortalities were reported to the Alaska Region Stranding Program.

Results from acoustic surveys indicate that sperm whales are present in the Gulf of Alaska year-round where they are most common in the summer months along the continental shelf waters (Mellinger et al. 2004a; Straley et al. 2014; Diogou et al. 2019). Tagging studies primarily show sperm whales use the deep-water slope habitat extensively for foraging (Mathias et al. 2012).

Sperm whales have been documented interacting with demersal longline fisheries in the Gulf of Alaska since the 1970s (Straley et al. 2014; Wild et al. 2017; Hanselman et al. 2018), and interaction studies between sperm whales and the longline fishery have been focused along the continental slope of the eastern Gulf of Alaska in water depths between about 1,970 and 3,280 ft (600 and 1,000 m)(Straley et al. 2005; Straley et al. 2014). In July of 2021, a sperm whale became entangled in gear used by the Alaska Fisheries Science Center's Alaska Longline Survey. The interaction resulted in a live release; the whale swam away with no visible gear wrapped around it and is assumed to have survived with no major effects (Eco49 2022).

Sperm whales are widely distributed and thus may be present in waters of Southeast Alaska year-round (Muto et al. 2022), typically in deeper offshore waters. In 2019, a sperm whale carcass was found in Lynn Canal and the cause of death was determined to be trauma from a vessel strike (Freed et al. 2022).

Because sperm whales show preference for shelf-edge/slope waters of the Gulf of Alaska, it is highly unlikely that individual whales will overlap with the effects of project construction activities in the action area. However, project-specific barges traveling to Lutak Inlet from Seattle and Cordova may pass through habitat occupied by sperm whales, the effects of which are analyzed below (section 4.1.1.1).

Additional information on sperm whale biology and habitat is available at:

Sperm Whale Species Description

2015 Status Review

Marine Mammal Stock Assessment Reports: Cetaceans-Large Whales

North Pacific Right Whales

The right whale (*Eubalaena* spp.) was listed as an endangered species under the ESCA in 1970 (35 FR 8491, June 2, 1970 (baleen whales listing); 35 FR 18319, December 2, 1970 (right whales listing)), and continued to be listed as endangered following passage of the ESA. NMFS later divided northern right whales into two separate endangered species: North Pacific right whales (*E. japonica*) and North Atlantic right whales (*E. glacialis*; 73 FR 12024, March 6, 2008). There are likely fewer than 500 North Pacific right whales remaining. Only about 26 individuals are estimated to remain of the Eastern stock that visits Alaskan waters (Muto et al. 2022).

The North Pacific right whale is distributed from Baja California to the Bering Sea with the highest concentrations in the Bering Sea, Gulf of Alaska, Okhotsk Sea, Kuril Islands, and Kamchatka area. They are primarily found in coastal or shelf waters but sometimes travel into deeper waters. In spring through fall their distribution is dictated by the distribution of their prey. In the winter, pregnant females move to shallow waters in low latitudes to calve; the winter habitat of the rest of the population is unknown.

Analyses of the data from acoustic recorders deployed between October 2000, January 2006, May 2006, and April 2007 indicate that right whales remain in the southeastern Bering Sea from

May through December with peak call detection in September (Munger et al. 2008; Stafford and Mellinger 2009). Recorders deployed from 2012 to 2013 have not yet been fully analyzed, but indicate the presence of right whales in the southeastern Bering Sea almost year-round, with a peak in September and a sharp decline in detections in mid-November (Muto et al. 2018).

The North Pacific right whale is the first right whale species documented to produce song and it is hypothesized that these songs are reproductive displays (Crance et al. 2019). The singers whose sex could be determined were all males and it is unknown if females also sing. Four distinct song types were recorded at five distinct locations in the southeastern Bering Sea from 2009-2017. A study of right whale ear anatomy suggests a total possible hearing rage of 10 Hz to 22 kHz (Parks et al. 2007). NMFS categorizes right whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2018c).

Recent detections of right whales have been very rare in the Gulf of Alaska, even though large numbers of whales were caught there in the 1800s. From 2004 to 2006, four sightings occurred in the Barnabas Trough region on Albatross Bank, southeast of Kodiak Island. This area represents important habitat for the relic population of North Pacific right whales, and a portion of this area was included in the critical habitat designation (50 CFR 226.215). Acoustic monitoring from May 2000 to July 2001 at seven sites in the Gulf of Alaska detected right whale calls at only two: one off eastern Kodiak and the other in deep water south of the Alaska Peninsula (detection distance 10s of kilometers; Mellinger et al. 2004b). There have been a handful of sightings in more recent years with one spotted in the northeast Gulf of Alaska in 2018, two in Barnabas Trough and two in the Trinity Islands of western Kodiak Island in 2021, and two near Unimak Island in 2022.

Given their preference for coastal and continental shelf waters, the rarity of occurrence in the Gulf of Alaska overall, and their low population abundance, it is highly unlikely that individual right whales would overlap with the effects of project construction activities in the action area. Overlap with North Pacific right whale individuals and project activities may occur during the infrequent need for a project specific delivery of materials to a project site via barges traveling from Seattle and Cordova. Project barges will not transit through North Pacific right whale critical habitat, but it is possible that barges could pass through areas occupied by North Pacific right whales, the effects of which are analyzed below (section 4.1.1.1). However, the rarity of the whales and the expected rarity of project specific barge trips makes the likelihood of encounters extremely rare.

Information on biology and habitat of the North Pacific right whale is available at:

North Pacific Right Whale Species Description

2017 Status Review

Marine Mammal Stock Assessment Reports: Cetaceans-Large Whales

North Pacific Right Whale Critical Habitat

Fin Whales

The fin whale (*Balaenoptera physalus*) was decimated by commercial whaling in the 1800s and early 1900s. It was listed as an endangered species under the ESCA in 1970 (35 FR 8491, June 2, 1970 (baleen whales listing); 35 FR 18319, December 2, 1970 (fin whale listing)), and continued to be listed as endangered following passage of the ESA. Critical habitat has not been designated for fin whales. There are no reliable estimates for the entire Northeast Pacific stock of fin whales; however, the best provisional estimate is 3,168 whales (Muto et al. 2021).

Coastal and pelagic catch data from the first half of the twentieth century indicate that fin whales were not uncommon near Unalaska Bay and around Unalaska Island (Nishiwaki 1966; Reeves et al. 1985); however, fin whales have been documented infrequently around Unalaska Island since whaling ended (Stewart et al. 1987; Zerbini et al. 2006). High concentrations of fin whales are found around Kodiak Island, indicating the region's importance for foraging (Angliss and Outlaw 2007; Stafford et al. 2007; Ferguson et al. 2015; Rone et al. 2017; Brower et al. 2022). Five passive acoustic monitoring sites in the Gulf of Alaska recorded fin whales year-round with more calls at sites on or near the continental shelf compared to seamount sites in deeper water (Rice et al. 2021).

Fin whale sounds have increasingly been recorded during surveys in the eastern Chukchi Sea (67°–72°N, 157°–169°W) from July to October primarily over the continental shelf (Brower et al. 2018). During similar aerial surveys in 1982–1991, there was a complete lack of sightings of these whales (Brower et al. 2018). Fin whale sightings have been increasing during surveys conducted in the U.S. portion of the northern Chukchi Sea from July to October, and fin whale calls were recorded each year from 2007 to 2010 in August and September in the northeastern Chukchi Sea and August to October just north of the Bering Strait, suggesting they may be re-occupying habitat used prior to large-scale commercial whaling (Muto et al. 2020).

In 2012, a fin whale was recorded by a passive recorder located 50 km north of Utqiagvik, Alaska, which was approximately 280 and 365 km northeast of the previous closest acoustic detection, and confirmed visual sighting, of a fin whale, respectively (Crance et al. 2015). A passive recorder located in the southern Chukchi Sea from 2012 to 2015 documented fin whale songs from August to November (Furumaki et al. 2021).

Fin whales produce a variety of low-frequency sounds in the 10 Hz to 0.2 kHz range (Thompson et al. 1992; Rice et al. 2021). While there is no direct data on hearing in low-frequency cetaceans, the applied frequency range is expected to be between 7 Hz and 35 kHz (NMFS 2018c). Estimates based on scans of a fin whale calf skull indicate the range of best hearing for fin whale calves to range from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

Fin whale range overlaps with the action area, however, their occurrence in the inner waterways of Southeast Alaska appears to be extremely low. Cetacean abundance and distribution surveys conducted by the Alaska Fisheries Science Center (AFSC) between 1991 and 2007 documented a total of 7 fin whale sightings (38 different cruises, 484 total survey days representing Spring, Summer, and Fall seasons). The low numbers of sightings precluded evaluating seasonal trends overall, but all observations occurred during summer surveys (Dahlheim et al. 2009).

Additionally, all observations occurred in lower Clarence Strait and the southwestern tip of Prince of Wales Island, and the authors suggested that fin whale distribution may be restricted to areas exposed to the open ocean or channels that are in close proximity to the open ocean. Recent cetacean surveys in Behm Canal by AFSC in April 2023 documented 2 fin whale sightings (NMFS unpublished data). This may indicate that fin whales are increasing in Southeast Alaska in general, but the increase in sightings may also be attributed to differences in survey methods.

Overall, fin whales are typically found in deep water (Matsuoka et al. 2013; Rone et al. 2017) away from the immediate coast (Clarke et al. 2020); consequently it is unlikely that they would overlap with effects from coastally-based construction activities. However, project-dedicated barges traveling from Seattle and Cordova could pass through waters occupied by fin whales, the effects of which are analyzed below (section 4.1.1.1).

Additional information on fin whale biology and habitat is available at:

Fin Whale Species Description

Marine Mammal Stock Assessment Reports: Cetaceans-Large Whales

2019 Status Review

4.1.1.1 Vessel Transits

The routes proposed for the materials and construction barges overlap with the ranges of the sperm whale, North Pacific right whale, and fin whale, and therefore these species may be encountered during transit. For this project, one materials barge will make one round-trip from Seattle, Washington to the project site, and one construction barge will make one round-trip from Cordova, Alaska to the project site in Lutak Inlet, Alaska. Both barges will be towed at approximately eight knots. Potential effects from project vessel traffic on these ESA listed species includes auditory and visual disturbance, vessel collision, and exposure to small spills.

Project vessels will have a short-term presence in the Gulf of Alaska as they transit between Cordova, Alaska and Lutak Inlet. Project vessels will also have a short-term presence in the inner waterways of Southeast Alaska as they transit between Seattle, Washington and Lutak Inlet. NMFS is not able to quantify existing traffic conditions across these areas to provide full context for the maximum of two round trips from each location over the life of the project. However, Automatic Identification System (AIS) data suggest that planned project routes currently experience a high level of vessel traffic (Figure 8). Therefore, the total number of project vessel trips along the marine transit route represents an extremely small incremental increase in the existing level of vessel traffic in the action area.

Vessel operators will implement mitigation measures (Section 2.1.2) to minimize or avoid auditory and visual disturbance and the potential for vessel collision during tug and barge activities. These mitigation measures include, but are not limited to, maintaining a vigilant watch for listed whales and pinnipeds and avoiding potential interactions with whales by implementing a 5 knot (9 km/hour) speed restriction when within 300 yards (274 m) of observed whales. In addition, vessels will take reasonable steps to alert other vessels operating in the vicinity of

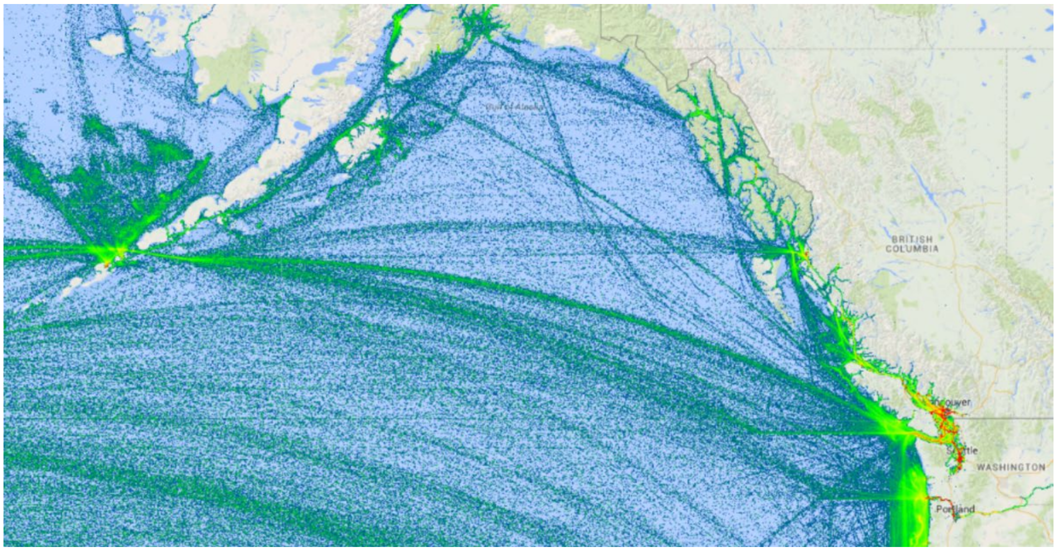


Figure 8. Shipping traffic density map based-off of live tracking AIS; project barges will follow established shipping routes. The red star indicates the approximate project site near Haines, Alaska.

whale(s), and will report any dead or injured listed whales. Vessels will not transit within designated North Pacific right whale critical habitat, thereby reducing the probability of an interaction with this rare species.

For this project, the tugs towing barges are expected to travel at approximately eight knots. The primary underwater noise associated with vessel operations due to this action is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. Tugs have higher speed engines and propellers than larger fueling vessels or barges. The smaller vessel noise spectra peak around 300 Hz with a source level ranging from 145-170 dB re 1 µPa depending on if the tug is pulling an empty or loaded barge. Continuous sounds for sea going barges have been measured at a peak sound source level of 170 dB re 1 µPa at 1 m (broadband), and emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles et al. 1987; Richardson et al. 1995); these frequencies overlap with the hearing ranges of sperm whales, North Pacific right whales, and fin whales.

The maximum source level measurement of 170 dB re 1 µPa at 1m associated with oceanic tug-boat noise will decline to 120 dB re 1 µPa within 2.2 km (1.4 miles) of the source. Therefore, sperm whales, North Pacific right whales, and fin whales may be exposed to sound from vessels in transit; the majority of acoustic energy they will be exposed to will be low-frequency, with much of the acoustic energy emitted by the vessels at frequencies below the most sensitive hearing range for sperm whales. While North Pacific right whale and fin whale hearing is more sensitive to frequencies produced by vessels, because vessels will be in transit, the duration of the exposure of these whales to vessel noise will be very brief. At eight knots, vessels with a sound source level of 170 dB will ensonify a given point in space along the vessel route center line to levels above 120 dB re 1µPa for approximately 17.8 minutes. Moreover, vessels in transit typically travel in a consistent and predictable direction and speed, essentially providing a gradually increasing signal of their approach. Therefore, a startle response is not expected. Rather, slight deflection and avoidance are expected to be common responses in those instances where there is any response at all. The implementation of mitigation measures, as specified in Section 2.1.2, is expected to further reduce the extent to which marine mammals react to transiting vessels. Any response of a North Pacific right whale, fin whale, or sperm whale to visual or acoustic disturbance of vessels will be too small to detect, therefore we conclude any adverse effects due to such disturbance are immeasurably small.

Vessels transiting the marine environment have the potential to collide with or strike marine mammals (Laist et al. 2001; Jensen and Silber 2004) resulting in serious injury or mortality to the animal. The probability of strike events depends on the frequency, speed, and route of the marine vessels, as well as distribution of marine mammals in the area. Laist et al. (2001) found that while all sizes and types of vessel can strike a whale, ships greater than 80 m and those going faster than 14 knots were most likely to cause severe or fatal injuries. Similarly, Vanderlaan and Taggart (2007) found that the chances of lethal injury to a large whale are greater than 50 percent at vessel speeds higher than 11.8 knots. For this project, barges are expected to travel at a maximum of 8 knots, thereby reducing the risk of collision with a whale.

Large whales, particularly humpback whales, are more likely to be struck than small cetaceans or pinnipeds. A total of 28 vessel strikes occurred in Alaskan waters between 2016 and 2020, the majority of which were humpback whales (n=18), followed by 3 fin whales, 3 unidentified whales, 2 sperm whales, 1 killer whale, and 1 Steller sea lion (Muto et al. 2022). Previous studies have also documented humpback whales as the most frequent subjects of vessel strike, accounting for 86 percent of reported collisions (Nielson et al. 2012).

While ship strike is one of the leading causes of North Atlantic right whale mortality[1], there have been no documented injuries to North Pacific right whales by ship strike in waters off Alaska. Given their low abundance estimate, it is highly unlikely that project barges will encounter a North Pacific Right whale. Moreover, project vessels are not expected to transit through North Pacific right whale critical habitat. In addition to avoidance of critical habitat areas completely, adherence to mitigation measures (i.e., vessels will maintain a watch for listed marine mammals at all times while underway; remaining at least 460 m (500 yards) from North Pacific right whales), will reduce the likelihood of vessel collision with North Pacific right whales.

With the low number of vessel trips, transitory nature of project-related vessel traffic, slow transit speeds, implementation of the mitigation measures, and the low occurrence of these whale species over the majority of the route, we conclude the probability of a project vessel striking a North Pacific right whale, fin whale, or sperm whale to be extremely low and any adverse effects due to vessel strikes are extremely unlikely to occur.

There is risk of an oil spill associated with the project barges during any of the proposed transits. The effects of oil are determined by its chemical properties, such as molecular weight and solubility. Some compounds (typically the lower molecular weight substances) are acutely toxic, yet exhibit rapid dissipation and removal from the environment. Other forms of oil, such as tar or weathered oil, are less toxic but persist in the environment (Neff 1990). Oil spills can affect marine mammals through various direct and indirect pathways. Direct pathways include inhalation, ingestion, and dermal contact/absorption, each of which can trigger a variety of

[1] https://www.fisheries.noaa.gov/species/north-atlantic-right-whale, accessed 11/9/2023

physiological responses with potential consequences for health and long-term survival and/or reproduction (Helm et al. 2015).

Several different petroleum products may be associated with a spill, such as hydraulic oil, engine lubricant, gasoline, or diesel fuel. Storage capacity varies across vessels, but ocean-going tugboats (90-150 ft) typically carry 90,000-190,000 gallons of fuel[2]. Since 1970, a total of 6,721 spills associated with vessels have occurred in Alaskan waters[3]; 441 (~6.6 percent) of these spills were attributed to barges. Quantities of substances released from barges ranged from 0-50,000 gallons, with 89 percent of spills releasing 100 gallons or less. Diesel fuel was the predominant substance released, followed by hydraulic oil, and gasoline. Collision, equipment failure, and grounding are the three main accident types associated with large spills (Dalton and Jin 2010). Out of the 441 spills associated with barges, 6 (~1.4 percent) were a result of collision, 30 (6.8 percent) were a result of equipment failure, and 30 (6.8 percent) were a result of grounding. With support from these data from over the last several decades, we consider it highly unlikely for an oil spill to occur during project-related barge transits. In the rare instance a spill does occur, it is highly unlikely to be a large spill. In the occurrence of a small spill, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products dissipate from the environment quickly via evaporation, therefore the timeframe during which exposure of these contaminants to marine mammals is very brief, and the exposure of marine mammals or their prey, should it occur, would be highly localized and transient. The probability of contamination occurring at harmful concentrations is very small, and thus we conclude adverse effects of small spills to sperm whales, North Pacific right whales, and fin whales are highly improbable.

In summary, NMFS concurs that the proposed action is not likely to adversely affect the North Pacific right whale, sperm whale, or fin whale. These species are not discussed further in this opinion.

4.1.2 Critical Habitat

The area of ensonification for pile driving activities is well outside of Mexico DPS humpback whale critical habitat (>500 km away). The nearest designated Steller sea lion haulout, Gran Point, is about 22 km away from the project site. The area of ensonification for pile driving activities that extends through Lutak Inlet and intersects with Chilkoot Inlet is about 16 km from Gran Point. Therefore, construction activities do not overlap with the critical habitat of Mexico DPS humpback whales nor Steller sea lions. However, the projected-related materials and construction barges will pass through critical habitat for the Mexico DPS humpback whale and Steller sea lion when traveling to and from Cordova, Alaska, and to and from Seattle, Washington.

Humpback Whale Critical Habitat

Critical habitat for the Mexico DPS humpback whale was designated April 20, 2021 (86 FR 21082; Figure 9). Critical habitat for the Mexico DPS includes those same areas plus the Prince

[2] https://response.restoration.noaa.gov/about/media/how-much-oil-ship.html, accessed 9/6/2023
[3] https://dec.alaska.gov/Applications/SPAR/PublicMVC/PERP/SpillSearch, accessed 9/6/2023

William Sound area.

For the Mexico DPS, the PBFs associated with critical habitat include: Prey species, primarily euphausiids (*Thysanoessa, Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic schooling fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea pallasii*), capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*), and Pacific sand lance (*Ammodytes personatus*) of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

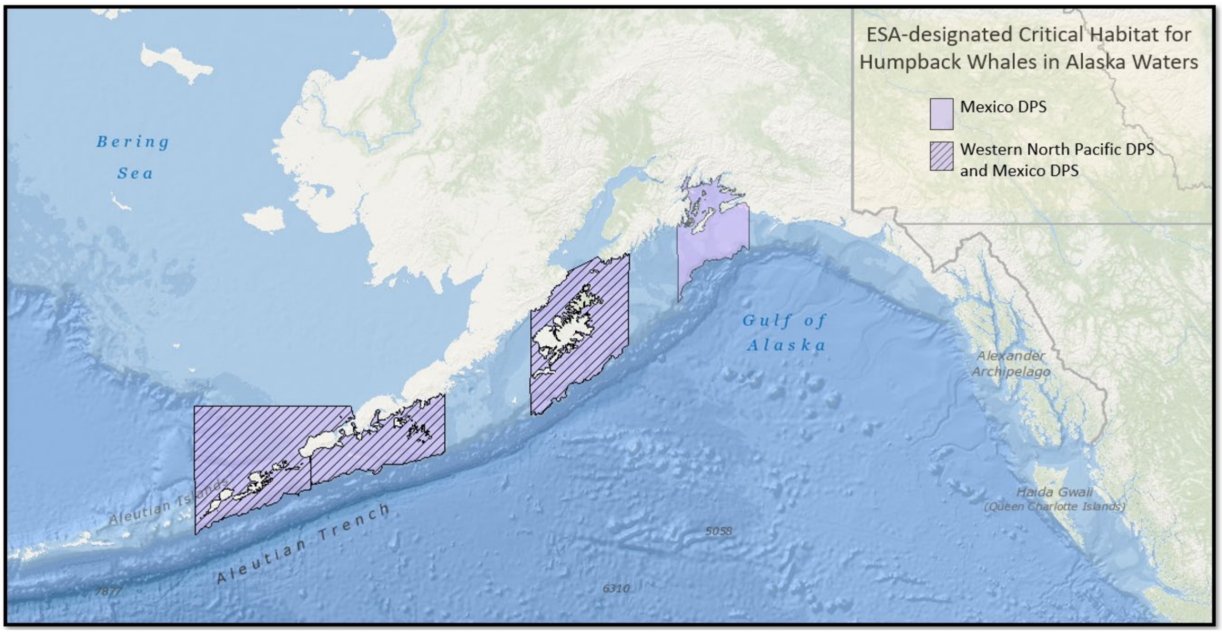


Figure 9. Designated humpback whale critical habitat in Alaska (includes Western North Pacific DPS humpback, which are not considered in this Opinion).

The physical presence and noise associated with vessel transit could cause dispersion or temporary displacement of primary prey from feeding areas. However, vessel disturbance will be very limited spatially and temporally. Although there may be some short-term disturbance to prey species, we do not expect vessel presence or noise to decrease the availability of prey or otherwise compromise their health or fitness. Moreover, temporary vessel disturbance is not expected to permanently displace primary prey such that they may not reoccupy this space once the vessel leaves, or modify feeding area habitat in a way that it can no longer support primary prey species. Effects related to vessel noise and vessel presence are very minor, therefore we conclude that that any adverse effects from vessel noise or vessel presence on PBFs will be immeasurably small.

Small spills associated with vessel transits may occur, which could affect humpback whale primary prey species. Zooplankton such as copepods and euphausiids readily assimilate hydrocarbons from food or directly from the water column, and some fractions of hydrocarbons may be retained for days or weeks in either metabolized or un-metabolized forms (Neff 1990). During this time period, hydrocarbons could be transferred to zooplankton consumers. Marine fish metabolize and excrete petroleum hydrocarbon quickly, therefore even in heavily oil-contaminated environments, most fish do not accumulate or retain high concentrations of petroleum hydrocarbons, and thus are not likely to transfer them to predators (Neff 1990). Refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products also dissipate from the environment quickly via evaporation. Oil droplets and fractions of hydrocarbons partitioned into the water column are expected to disperse with wind and tidal action (Neff 1990), which facilitates further dissipation of contamination over time. Because the probability of contamination occurring at harmful concentrations is very small, adverse effects to primary prey are highly unlikely. Therefore, we conclude that the adverse effects of small spills on PBFs of designated critical habitat for listed humpback whales in the action area are highly unlikely to occur.

Steller Sea Lion Critical Habitat

NMFS identified physical and biological features essential for conservation of Steller sea lions in the final rule to designate critical habitat (58 FR 45269; August 27, 1993, Figure 10, Figure 11), including terrestrial, air, and aquatic habitats (as described at 50 CFR § 226.202) that support reproduction, foraging, rest, and refuge:

1. Terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery in Alaska.

2. Air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.

3. Aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144° W longitude.

4. Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144° W longitude.

5. Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR § 226.202(c).

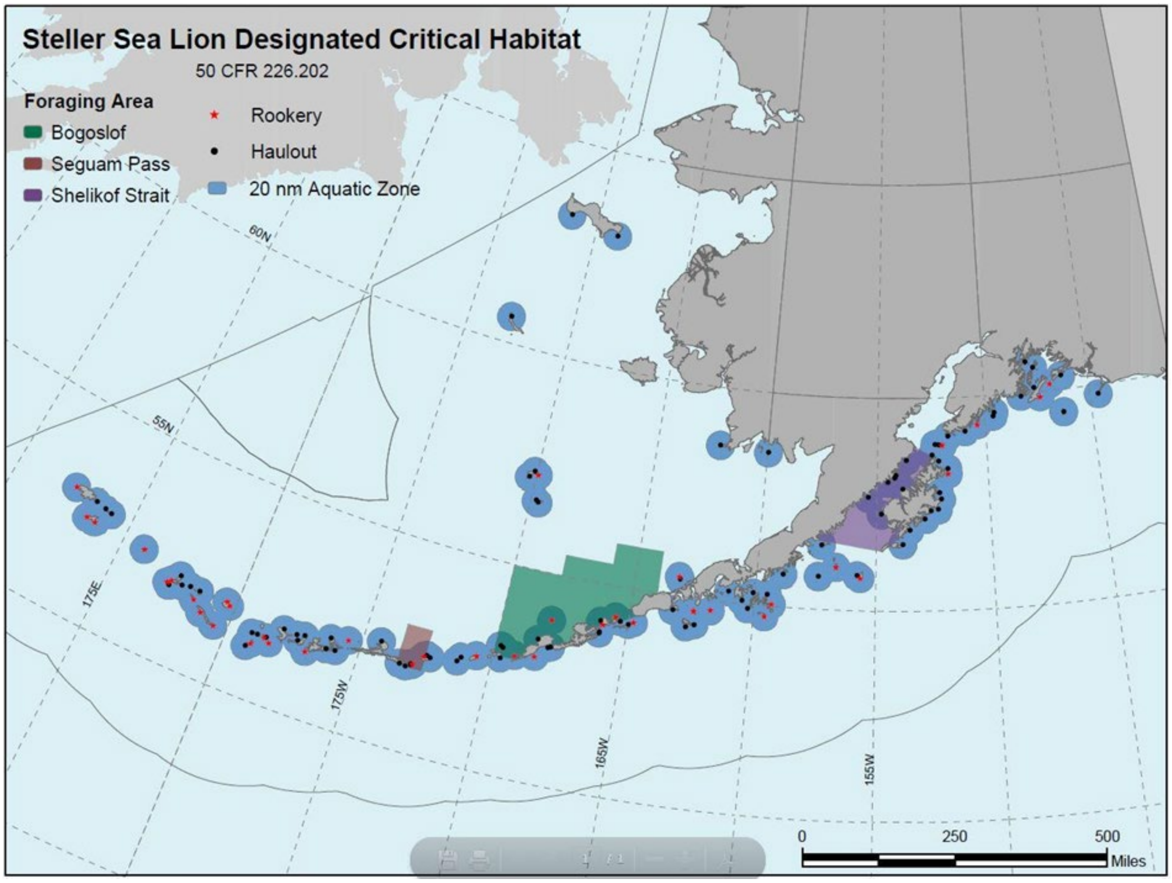


Figure 10. Designated Steller sea lion habitat in Alaska west of 144 ° W longitude.

Figure 11. Designated critical habitat for Steller sea lions in Southeast Alaska.

Vessel transit associated with the proposed project may affect Steller sea lion critical habitat by causing disturbance to rookeries and haul-outs, displacement from special aquatic foraging areas, and by introducing contaminants into critical habitat via small spill events. Mitigation measures are in place to protect Steller sea lion critical habitat, such as not approaching within 3 nautical miles of designated rookery sites or within 3,000 feet of any haul-out. We evaluate effects to each of the physical or biological features below.

1. Terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery in Alaska.

Many terrestrial zones occur along transit routes from both Seattle and Cordova and the project site in Lutak Inlet. Neither vessel presence nor vessel noise is expected to affect the terrestrial zone. A small spill associated with project vessels has the potential to foul the shoreline, thereby reducing the habitat quality of terrestrial zones. However, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products also dissipate from the environment quickly, therefore any adverse effects to the terrestrial zone will be highly localized and transient. The probability of contamination occurring at harmful concentrations is very small, and thus adverse effects to terrestrial zones are extremely unlikely to occur. Therefore, we conclude that the adverse effects from small spills to

PBF1 are highly unlikely.

2. Air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.

Airborne sounds from vessels can contribute significantly to the airborne ambient noise that Steller sea lions and other marine mammals may be exposed to when they are hauled out or at the surface (Richardson et al. 1995). Project-dedicated vessels may temporarily ensonify air zones above the terrestrial zone when transiting past designated major haulouts or rookeries to and from Seattle or Cordova to Lutak Inlet. A sea-going tug towing a barge is expected to produce an in-water source level of 170 dB re 1 µPa at 1m. If we apply recommendations by Richardson et al. (1995) and subtract 26 dB to provide an in-air source level, we get a source level of 144 dBA re 20 µPa. This sound is expected to decline to the 100 dB threshold for otariid pinnipeds within 158 m. Project dedicated barges are expected to travel offshore to avoid navigational hazards and maintain depth for operational safety, as well as adhere to mitigation measures which are in place to protect Steller sea lion critical habitat (e.g., not approach within 3 nautical miles of designated rookery sites or within 3,000 feet of any haul-out). Therefore, it is highly unlikely air zones will be ensonified. We conclude that adverse effects from vessel noise to PBF 2 are highly unlikely.

3. Aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144° W longitude.

Vessel transits to and from Seattle will travel past several sites designated as major haulouts and major rookeries, and thus may transit through several aquatic zones associated with those haulout and rookery sites. The physical presence and noise associated with vessel transit could temporarily reduce the habitat quality of portions of the aquatic zones that the vessels travel through. However, vessel disturbance will be very limited spatially and temporally. Although the vessels may temporarily ensonify or occupy portions of aquatic zones, we do not expect transient vessel noise or physical presence to permanently modify aquatic zones such that Steller sea lions cannot reoccupy these areas or access associated major haulout or major rookery sites once the vessel leaves. Effects related to vessel noise and vessel presence will be very minor, therefore we conclude that these effects on PBF 4 will be immeasurably small.

Small spills associated with vessel transits may occur, thereby reducing the habitat quality of aquatic zones. However, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products also dissipate from the environment quickly, therefore adverse any effects to the aquatic zone will be highly localized and transient. The probability of contamination occurring at harmful concentrations is very small, and thus we conclude adverse effects from small spills to PBF 3 are extremely unlikely to occur.

4. Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144° W longitude.

Vessel transits to and from Cordova will travel past several sites designated as major haulouts and major rookeries, and thus may transit through several aquatic zones associated with those haulout and rookery sites. The physical presence and noise associated with vessel transit may temporarily reduce the habitat quality of portions of the aquatic zones that the vessels travel through. However, vessel disturbance will be very limited spatially and temporally. Although the vessels may temporarily ensonify or occupy portions of aquatic zones, we do not expect transient vessel noise or physical presence to permanently modify aquatic zones such that Steller sea lions cannot reoccupy these areas or access associated major haulout and major rookery sites once the vessel leaves. Effects related to vessel noise and vessel presence are very minor, therefore we conclude that these effects on PBF 4 will be immeasurably small.

Small spills associated with vessel transits may occur, thereby reducing the habitat quality of aquatic zones. However, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products also dissipate from the environment quickly, therefore adverse any effects to the aquatic zone will be highly localized and transient. The probability of contamination occurring at harmful concentrations is very small, and thus we conclude adverse effects from small spills to PBF 4 are extremely unlikely to occur.

5. Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR § 226.202(c).

Vessel transits to and from Seattle and Cordova will not travel through any special aquatic foraging areas. Therefore, project vessels will not affect special aquatic foraging areas.

In summary, NMFS concurs that the proposed action is not likely to adversely affect designated critical habitat for Mexico DPS humpback whales or Western DPS Steller sea lions. These species' critical habitats are not discussed further in this opinion.

4.2 Climate Change

One threat common to all the species we discuss in this opinion is global climate change. Because of this commonality, we present an overview here rather than in each of the species-specific narratives that follow. A vast amount of literature is available on climate change and for more detailed information we refer the reader to these websites which provide the latest data and links to the current state of knowledge on the topic in general, and in the Arctic specifically:

https://www.ipcc.ch/reports/

https://climate.nasa.gov/evidence/

http://nsidc.org/arcticseaicenews/

https://arctic.noaa.gov/Report-Card

Three facets of climate change, increased air temperatures, increased ocean temperatures, and ocean acidification, are presented here because they have the most direct impact on marine mammals and their prey.

Air temperature

Recording of global temperatures began in 1880, and the last nine years (2014–2022) have ranked as the nine warmest years on record[4]. The yearly temperature for North America has increased at an average rate of 0.23°F since 1910; however, the average rate of increase has doubled since 1981 (0.49°F)[5].

The Arctic (latitudes between 60ºN and 90ºN) has been warming at more than two times the rate of lower latitudes since 2000. This is due to "Arctic amplification", a characteristic of the global climate system influenced by changes in sea ice extent, albedo, atmospheric and oceanic heat transports, cloud cover, black carbon, and many other factors (Serreze and Barry 2011; Richter-Menge et al. 2017; Richter-Menge 2019). The average annual temperature is now 3-4°F warmer than during the early and mid-century (Figure 12). The average annual temperature for Alaska in 2023 was 28.4°F, 2.4°F above the long-term average, ranking 17th warmest in the 99-year record for the state[6]. Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014).

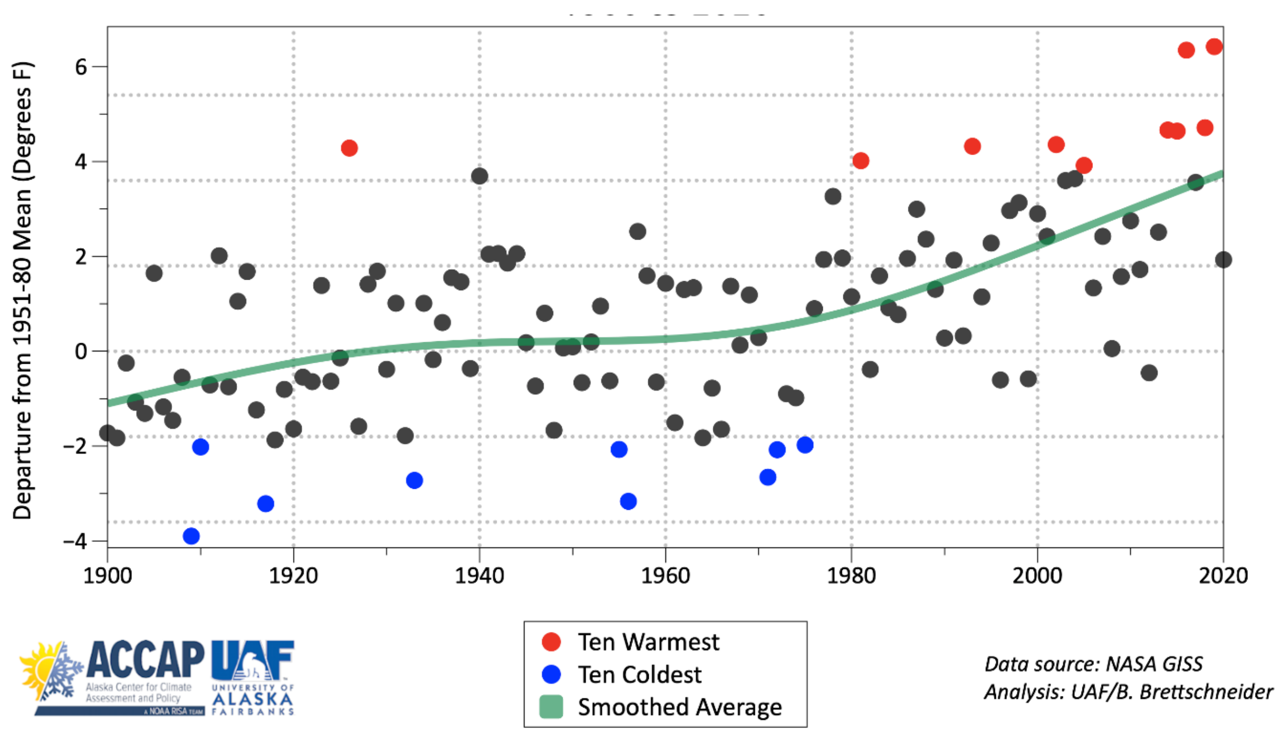


Figure 12. Alaska Annual Temperature 1900 to 2020.

Marine water temperature

Higher air temperatures have led to higher ocean temperatures. More than 90 percent of the

[4] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202307 viewed 8/15/2023.
[5] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202307 viewed 8/15/2023.
[6] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/202307 viewed 1/123/2024.

excess heat created by global climate change is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019; Cheng et al. 2020). The four highest annual global ocean heat content (OHC), which measures the amount of heat stored in the upper 2000 m (6,561 ft) of the ocean, have all occurred in the last four years (2019–2022), and regions of the North Pacific, North Atlantic, Mediterranean, and southern oceans recorded their highest OHC since the 1950s[7].

The seas surrounding Alaska have been unusually warm in recent years, with unprecedented warmth in some cases (Thoman and Walsh 2019). This effect has been observed throughout the Alaska region, including the Bering, Chukchi, and Beaufort seas (Figure 13). Warmer ocean water affects sea ice formation and melt. In the first decade of the 21st century, Arctic sea ice thickness and annual minimum sea ice extent (i.e., September sea ice extent) began declining at an accelerated rate and continues to decline at a rate of approximately -2.7 percent per decade (Stroeve et al. 2007; Stroeve and Notz 2018).

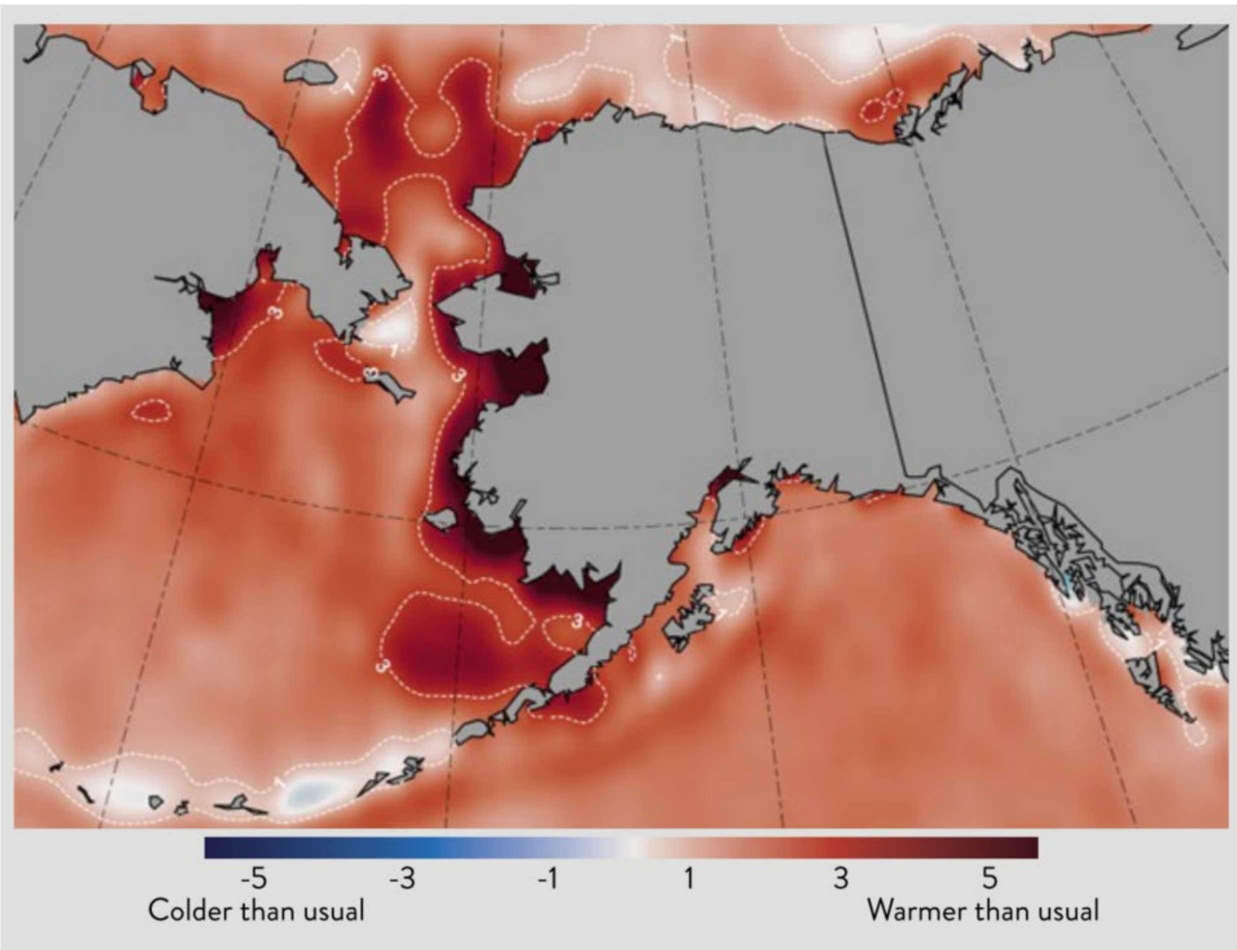


Figure 13. Summer Sea Surface Temperatures 2014-2018 (Thoman and Walsh 2019).

In the Pacific Arctic, with the reduction in the cold-water pool in the northern Bering Sea, large scale northward movements of commercial stocks are underway as previously cold-dominated

[7] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202307 viewed 8/15/2023.

ecosystems warm, and fish move northward to higher latitudes (Grebmeier et al. 2006; Eisner et al. 2020). Not only fish, but plankton, crabs, and, ultimately, sessile invertebrates like clams are affected by these changes in water temperature (Grebmeier et al. 2006; Fedewa et al. 2020).

Another ocean water anomaly is the marine heat wave, defined as a coherent area of extreme warm temperature at the sea surface that persists (Frölicher et al. 2018). Marine heatwaves are a key ecosystem driver and nearly 70 percent of global oceans experienced strong or severe heatwaves in 2016, compared to 30 percent in 2012 (Suryan et al. 2021). The largest recorded marine heat wave occurred in the northeast Pacific Ocean, appearing off the coast of Alaska in the winter of 2013-2014 and extending south to Baja California by the end of 2015 (Frölicher et al. 2018). The Pacific marine heatwave began to dissipate in mid-2016, but warming re-intensified in late-2018 and persisted into Fall 2019 (Suryan et al. 2021). Consequences of this event included an unprecedented harmful algal bloom that extended from the Aleutian Islands to southern California, mass strandings of marine mammals, shifts in the distribution of invertebrates and fish, and shifts in abundance of several fish species (Cavole et al. 2016). Cetaceans, forage fish (capelin and herring), Steller sea lions, adult cod, chinook and sockeye salmon in the Gulf of Alaska were all impacted by the Pacific marine heatwave (Bond et al. 2015; Peterson et al. 2016; Sweeney et al. 2018b).

The 2018 Pacific cod stock assessment[8] estimated that the female spawning biomass of Pacific cod (an important prey species for Steller sea lions) was at its lowest point in the 41-year time series, following three years of poor recruitment and increased natural mortality as a result of the Pacific marine heatwave. The spawning stock biomass dropped below 20 percent of the unfished spawning biomass in 2020; 20 percent is a minimum spawning stock size threshold instituted to help ensure adequate prey availability for the endangered Western DPS of Steller sea lions. The federal Pacific cod fishery in the Gulf of Alaska was closed by regulation to directed Pacific cod fishing in 2020 as a result (Barbeaux et al. 2020). As of 2022, Pacific cod has not recovered from the decline during the 2014-2016 marine heatwave[9].

Ocean Acidification

For 650,000 years or more, the average global atmospheric carbon dioxide (CO2) concentration varied between 180 and 300 parts per million (ppm), but since the beginning of the industrial revolution in the late 1700s, atmospheric CO2 concentrations have been increasing rapidly, primarily due to anthropogenic inputs (Fabry et al. 2008; Lüthi et al. 2008). The world's oceans have absorbed approximately one-third of the anthropogenic CO2 released, which has buffered the increase in atmospheric CO2 concentrations (Feely et al. 2004; Feely et al. 2009). Despite the oceans' role as large carbon sinks, the CO2 level continues to rise and is currently at 422 ppm[10].

As the oceans absorb CO2, the buffering capacity and pH of seawater are reduced. This process is referred to as ocean acidification. Ocean acidification reduces the saturation states of certain biologically important calcium carbonate minerals like aragonite and calcite that many organisms use to form and maintain shells or skeletons (Bates et al. 2009; Reisdorph and Mathis

[8] https://www.fisheries.noaa.gov/alaska/population-assessments/2018-north-pacific-groundfish-stock-assessments accessed 8/15/23.
[9] https://apps-afsc.fisheries.noaa.gov/REFM/docs/2022/GOA-ESR-Brief.pdf accessed 8/15/23.
[10] https://gml.noaa.gov/ccgg/trends/ accessed 8/16/23.

2014). When seawater is supersaturated with these minerals, calcification (growth) of shells is favored. Likewise, when the seawater becomes undersaturated, dissolution is favored (Feely et al. 2009).

High latitude oceans have naturally lower saturation states of calcium carbonate minerals than more temperate or tropical waters, making Alaska's oceans more susceptible to the effects of ocean acidification (Fabry et al. 2009; Jiang et al. 2015). Model projections indicated that aragonite undersaturation would start to occur by about 2020 in the Arctic Ocean and by 2050, all of the Arctic will be undersaturated with respect to aragonite (Feely et al. 2009; Qi et al. 2017). Large inputs of low-alkalinity freshwater from glacial runoff and melting sea ice contribute to the problem by reducing the buffering capacity of seawater to changes in pH (Reisdorph and Mathis 2014). As a result, seasonal undersaturation of aragonite was already detected in the Bering Sea at sampling stations near the outflows of the Yukon and Kuskokwim Rivers, and the Chukchi Sea (Fabry et al. 2009). Models and observations indicate that rapid sea ice loss will increase the uptake of CO2 and exacerbate the problem of aragonite undersaturation in the Arctic (Yamamoto et al. 2012; DeGrandpre et al. 2020).

Ocean acidification is considered a major threat to calcifying organisms, such as corals, bivalves, crustaceans, echinoderms (e.g., sea stars) and many forms of zooplankton such as copepods and pteropods. Other sensitive organisms include the free-living larval stages produced by most benthic marine species (DuPont et al. 2010). Consequently, ocean acidification may disrupt Arctic food webs (Fabry et al. 2008; Bates et al. 2009). Pteropods, which are often considered indicator species for ecosystem health, are prey for many species of carnivorous zooplankton, fishes including salmon, mackerel, herring, and cod, and baleen whales (Orr et al. 2005). Because of their thin shells and dependence on aragonite, under increasingly acidic conditions, pteropods may not be able to grow and maintain shells (Lischka and Riebesell 2012). It is uncertain if these species, which play a large role in supporting many levels of the Alaskan marine food web, will be able to adapt to changing ocean conditions (Fabry et al. 2008; Lischka and Riebesell 2012).

Warming ocean temperatures, extreme fluctuations in ocean temperature, harmful algal blooms, ocean acidification, and low dissolved oxygen events, all byproducts of anthropogenic climate change, could impose direct and indirect stress on Sunflower sea stars (Lowry et al. 2022). In general, echinoderms are one of the taxa considered most at risk to effects of ocean acidification. In sea stars, negative effects such as decreased growth and feeding rates, mortality, developmental abnormalities, and immune suppression have been documented (Hernroth et al. 2011; Byrne et al. 2013; Craig 2016; Hu et al. 2018). However, response to this stressor seems to vary among species; some studies have even found increased growth rates in response to increased CO2 concentrations (Gooding et al. 2009; Dupont et al. 2010). Other studies suggest that ocean warming is the greatest threat to sea stars, rather than ocean acidification (Nguyen et al. 2012). Heat stress has been hypothesized to increase echinoderm susceptibility to disease, and increased prevalence of sea star wasting disease (SSWD) in recent years has been strongly associated with warmer temperatures in both laboratory and field experiments (Craig 2016; Lowry et al. 2022). However, while environmental factors such as temperature likely contributed to the pandemic, and continue to interact with the disease process to suppress recovery, studies have failed to document conclusive linkages that apply broadly. Overall, complex interactions among stressors, some of which may be exacerbated by climate change, affect both the persistence of individuals and local populations of Sunflower sea stars (Lowry et al. 2022).

Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Hinzman et al. 2005; Burek et al. 2008; Doney et al. 2012; Huntington et al. 2020). The physical effects on the environment described above have impacted, are impacting, and will continue to impact marine species in a variety of ways (IPCC 2014), including shifting abundances, changes in distribution, changes in timing of migration, and changes in periodic life cycles of species. The potential impacts of climate and oceanographic change on whales will likely affect habitat availability and food availability. Site selection for whale migration, feeding, and breeding may be influenced by factors such as ocean currents and water temperature. For example, there is some evidence from Pacific equatorial waters that sperm whale feeding success and, in turn, calf production rates are negatively affected by increases in sea surface temperature (Smith and Whitehead 1993). Additionally, cetaceans with restricted distributions linked to water temperature may be particularly susceptible to range restriction (Learmonth et al. 2006; Isaac 2009). Of greatest concern are cetaceans with ranges limited to non-tropical waters, and preferences for shelf habitats (Macleod 2009). For pinnipeds, climate change will affect habitat where they rest and give birth to young, and at sea where they forage. On land, sea level rise and larger, more frequent storms may reduce or eliminate resting and birthing areas. Changes in ocean currents, ocean acidification, and other alterations in climate cycles such as changes in the frequency of El Nino events are likely to alter ocean food webs and affect the abundance and diversity of prey items. These changes may also affect susceptibility to diseases. For marine mammals in general, range size, location, and whether or not specific range areas are used for different life history activities (e.g. feeding, breeding) are likely to affect how each species responds to climate change (Learmonth et al. 2006).

4.3 Status of Listed Species Likely to be Adversely Affected by the Action

This opinion examines the status of each species and critical habitat that is likely to be adversely affected by the proposed action. Species status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR § 402.02. The opinion also examines the condition of critical habitat throughout the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

For each species, we present a summary of information on the population structure and distribution of the species to provide a foundation for the exposure analyses that appear later in this opinion. Then we summarize information on the threats to the species and the species' status given those threats to provide points of reference for the jeopardy determinations we make later in this opinion. That is, we rely on a species' status and trend to determine whether an action's effects are likely to increase the species' probability of becoming extinct.

4.3.1 Western DPS Steller Sea Lions

More detailed background information on the status of Western DPS Steller sea lions can be found in the latest stock assessment report (Muto et al. 2020) and the recovery plan for Steller sea lions (NMFS 2008a).

Additional information on Steller sea lions can be found at https://www.fisheries.noaa.gov/species/steller-sea-lion,

in the Steller Sea Lion Recovery Plan at https://www.fisheries.noaa.gov/resource/document/recovery-plan-steller-sea-lion-revision-eastern-and-western-distinct-population,

and in the most recent stock assessment report at https://repository.library.noaa.gov/view/noaa/20606.

Distribution

Steller sea lions are distributed along the rim of the North Pacific Ocean from San Miguel Island (Channel Islands) off Southern California to northern Hokkaido, Japan (Loughlin et al. 1984). Their centers of abundance and distribution are in the Gulf of Alaska and the Aleutian Islands (NMFS 1992). Their distribution also extends northward from the western end of the Aleutian chain to sites along the eastern shore of the Kamchatka Peninsula.

Population Structure and Status

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs based on genetic studies and other information (62 FR 24345; May 5, 1997). At that time, the Eastern DPS (which includes animals from east of Cape Suckling, Alaska, at 144°W longitude) was listed as threatened and the Western DPS (which includes animals from west of Cape Suckling, at 144°W longitude) was listed as endangered. On November 4, 2013, the Eastern DPS was removed from the endangered species list (78 FR 66140). Information on Steller sea lion biology, threats, and habitat (including critical habitat) is available in the revised Steller Sea Lion Recovery Plan (NMFS 2008).

As summarized most recently by Muto et al. (2020), the Western DPS of Steller sea lions decreased by an estimated 220,000 to 265,000 animals in the late 1970s to less than 50,000 in 2000. Factors that may have contributed to this decline include incidental take in fisheries, competition with fisheries for sea lion prey, legal and illegal shooting, predation, exposure to contaminants, disease, and ocean regime shift climate change (NMFS 2008b).

The most recent population surveys (survey regions shown in Figure 14), conducted in 2022 by Sweeney et al. (2023) reported an increase in non-pups by 1.05 percent per year (95 percent CI 0.46-1.69 percent per year) (Figure 15) between 2007 and 2022 for an abundance estimate of 37,333 (95 percent CI 34,274-40,245). Pups increased by 0.50 percent per year (95 percent CI 0.04-0.96 percent per year) (Figure 16) between 2007 and 2022, for an abundance estimate of 11,987 (95 percent CI 11,291-12,703). However, while the surveys reported an overall positive trend in abundance from 2007 to 2022, trends were highly variable across regions and age classes (Figure 17, Figure 18). Notably, pup production nearly plateaued in the early 2010s, resulting in a subsequent plateau in non-pups around 2015. Between 2019 and 2022, non-pups in the Western DPS declined by approximately 6 percent. All regions west of Samalga Pass (~170°W longitude) have demonstrated little to no signs of recovery since their initial decline. Moreover, in the last 15 years, regions east of Samalga Pass, which historically showed positive abundance trends, have either experienced a plateau or decline in pup counts with a subsequent plateau or decline (or both) in non-pups (Sweeney et al. 2023).

The population trends in the Gulf of Alaska were observed to be increasing until 2015 (Sweeney et al. 2018a); however, in 2017, NMFS surveys observed anomalously low pup counts in these areas which may be related to low availability of prey associated with anomalously warm ocean temperatures in the Gulf of Alaska during 2014-2016. The 2020 Pacific cod stock assessment indicated a continued low biomass level, and NMFS closed the Gulf of Alaska Pacific cod directed fishery for the 2020 season (50 CFR 679.20(d)(4)).

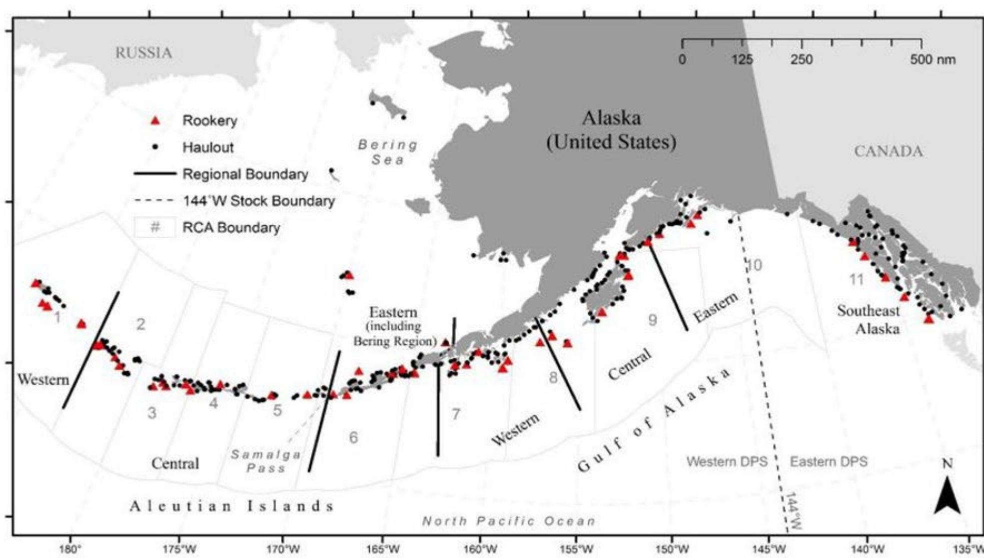


Figure 14. Map of Alaska showing the NMFS Steller sea lion survey regions, rookery, and haulout locations in Alaska, with line at 144°W depicting separation of the eDPS and wDPS (Fritz et al. 2016).

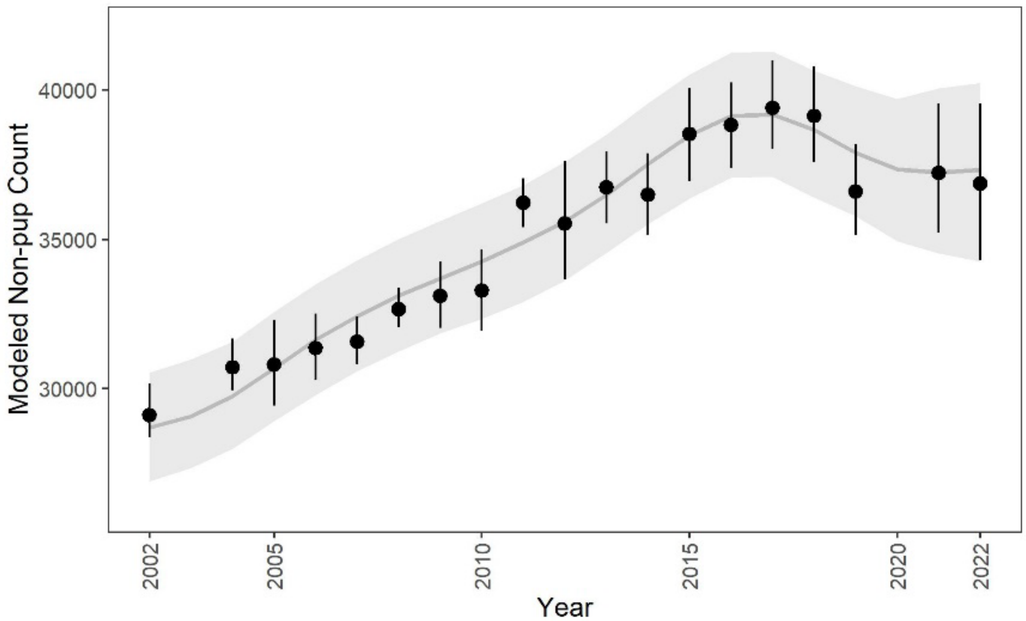


Figure 15. Realized and predicted Steller sea lion non-pup counts in the total western distinct population segment in Alaska, 2002–2022. Realized counts are represented by points and vertical lines (±95percent credible intervals). Predicted counts are represented by the black line and gray shaded area (±95percent credible intervals) (Sweeney et al. 2023).

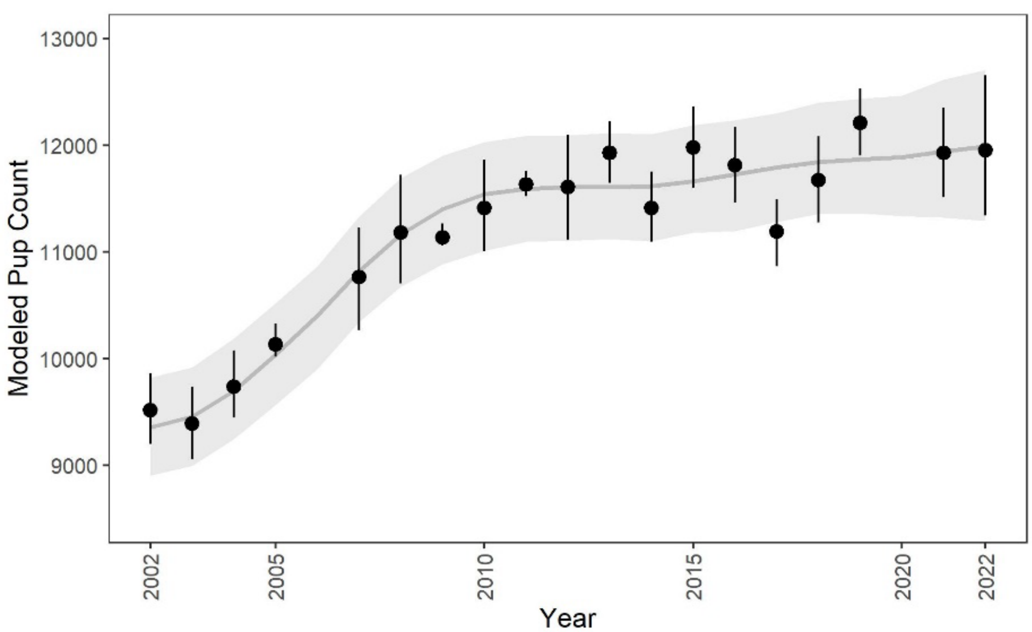


Figure 16. Realized and predicted Steller sea lion pup counts in the total western distinct population segment in Alaska, 2002–2022. Realized counts are represented by points and vertical lines (±95percent credible intervals). Predicted counts are represented by the black line and gray shaded area (±95percent credible intervals) (Sweeney et al. 2023).

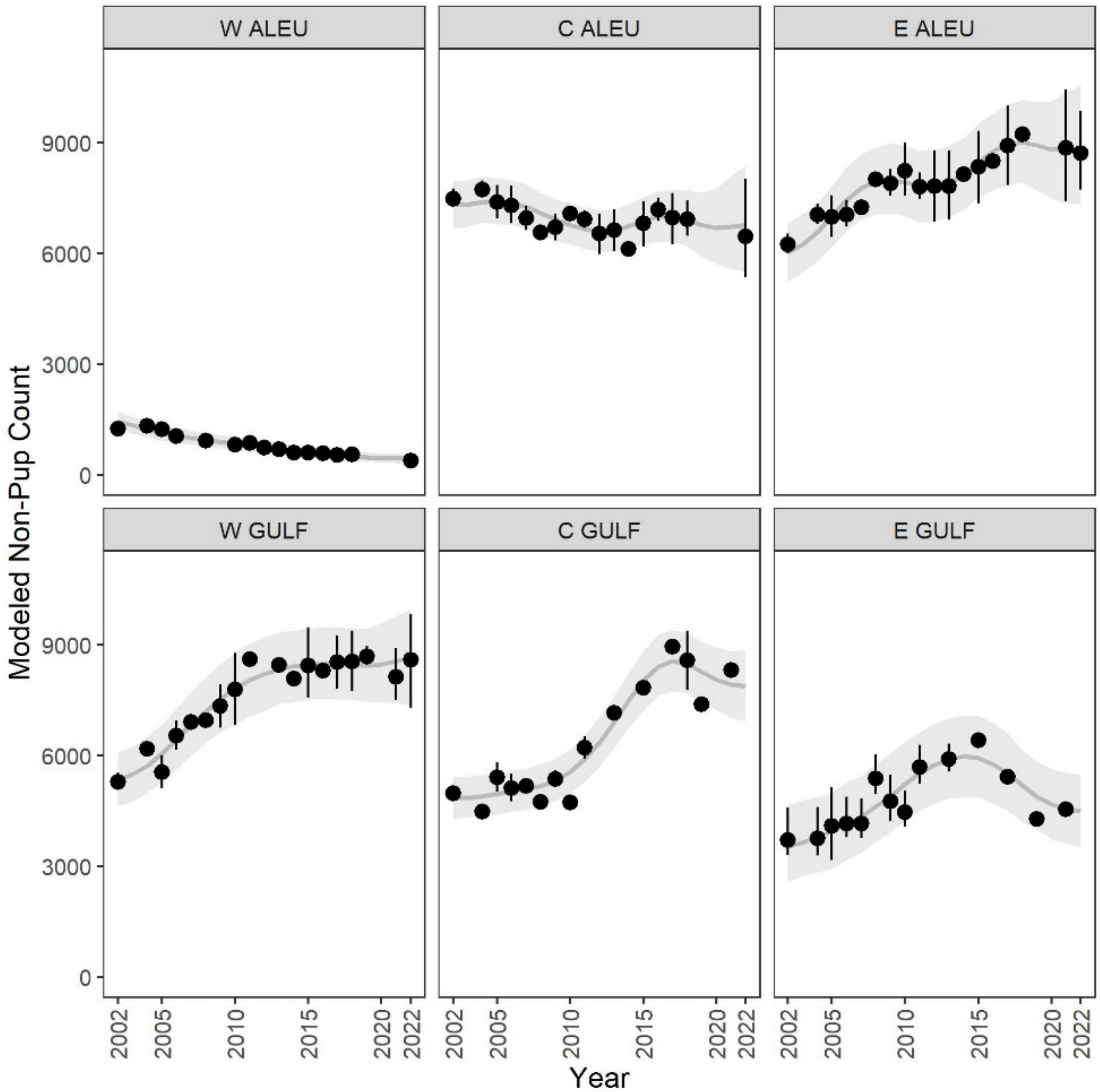


Figure 17. Realized and predicted Steller sea lion non-pup counts in the western (W), central (C), and eastern (E) Aleutian Island (ALEU) and Gulf of Alaska (GULF), regions, 2002–2022. Realized counts are represented by points and vertical lines (±95percent credible intervals). Predicted counts are represented by the black line and gray shaded area (±95percent credible intervals) (Sweeney et al. 2023).

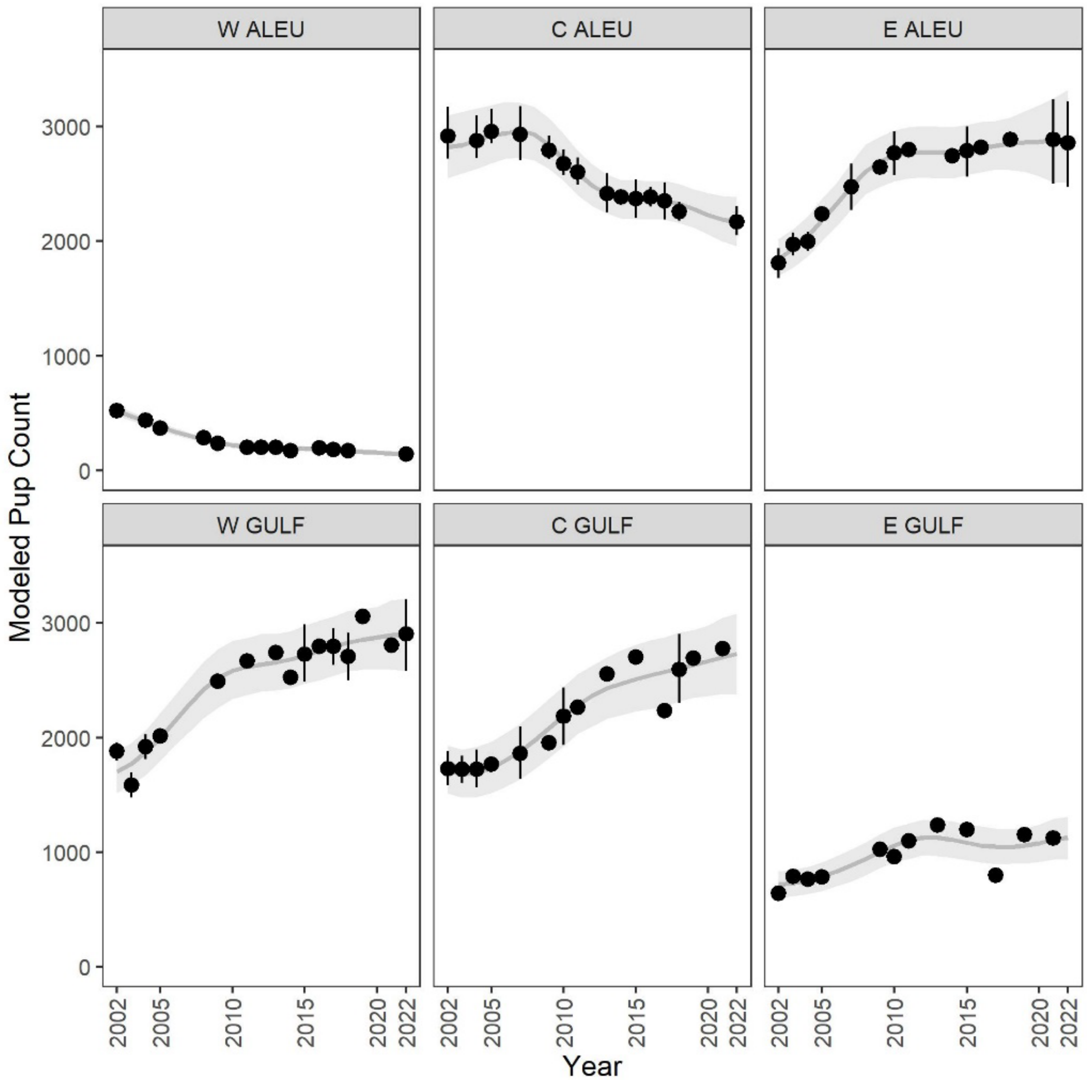


Figure 18. Realized and predicted Steller sea lion pup counts in the western (W), central (C), and eastern (E) Aleutian Island (ALEU) and Gulf of Alaska (GULF), regions, 2002–2022. Realized counts are represented by points and vertical lines (±95percent credible intervals). Predicted counts are represented by the black line and gray shaded area (±95percent credible intervals) (Sweeney et al. 2023).

Occurrence in the Action Area

Marine transit routes

Given the wide dispersal of individuals and the numerous designated haul-outs and rookeries that occur throughout Alaska, both the endangered Western DPS and delisted Eastern DPS of Steller sea lions will likely be encountered along the transit routes. An area of high Steller sea lion occurrence extends from the shore to water depths of 500 m. The construction barge traveling from Cordova to Lutak Inlet will transit through Steller sea lion critical habitat, including through critical habitat areas where Western DPS Steller sea lions predominate. The materials barge traveling from Seattle, Washington will transit in proximity to Steller sea lion critical habitat throughout Southeast Alaska; in Southeast Alaska, Eastern DPS Steller sea lions predominate, but distinct mixing zones with Western DPS individuals occur throughout the region (Hastings et al. 2020).

Lutak Inlet

Steller sea lions seasonally follow dense aggregations of pre-spawning and spawning prey species throughout Lynn Canal and seasonally pass through the action area. In winter, Steller sea lions target herring in the lower portions of the Lynn Canal, followed by a gradual but predictable movement north towards and into Lutak Inlet, through the action area, to the mouths of the Chilkoot River during spring as they follow dense aggregations of eulachon. In early summer through fall, they follow multiple runs of salmon south throughout the Lynn Canal, prior to the return of adult herring aggregations in late fall through winter. Salmon increase in importance as prey for sea lions from late-October through December in the Chilkat River (NMFS 2020b).

There are no Steller sea lion haulouts or rookeries associated with critical habitat that occur within Lutak Inlet. The nearest year-round Steller sea lion haulout associated with critical habitat is located at Gran Point, which is 21.2 km south of the project area. However, there is a seasonal haulout at Taiya Point (approximately 3.8 km from the project site, within the area of ensonification), with documented high use during the spring eulachon run from mid-March through May (Womble et al. 2005). In the monitoring report from the White Pass and Yukon Route Railroad Dock Dolphin Installation project (greater than 20 km from the current project) in Taiya Inlet, a total of 165 Steller sea lion sightings were documented from March to May 2019; 6 sightings occurred in March, 93 sightings occurred in April, and 66 sightings occurred in May (WP&YR 2019). These sightings are outside of the action area for the Lutak Dock Replacement project, but it is reasonable to assume that sea lions moved through the current action area to Taiya Inlet. The monitoring report from the Lutak Dock RoRo Modification Project (Tom Mortensen Associates 2021) only reported two Steller sea lions during in-water work in November 2020. Local charter companies that operate in the area from May through September report that Steller sea lions are observed primarily at Gran Point haul-out and are not frequently seen in Lutak Inlet (Solstice 2023).

Over a decade of research on seasonal foraging behavior of Steller sea lions shows that they move into the Gran Point area to forage during the spring fish runs, resulting in local seasonal increases in abundance (Womble et al. 2005; Womble and Sigler 2006; Womble et al. 2009). Gran Point is used most heavily from mid-April through mid-June, with counts significantly decreasing from mid-July throughout mid-October, as well as periods of one to five weeks in mid-summer where sea lions were absent from the haulout during surveys. Abundance at Gran Point gradually increases by early fall, with more than a hundred animals present by mid-October. Numbers from December through March are generally lower when individuals move further south in Lynn Canal to forage on over-wintering herring. The highest abundance of Steller sea lions at Gran Point occurs in June (average abundance in June across all years surveyed is 674.4 animals (Eco49 2019)).

Within the project area in Lutak Inlet, Steller sea lions are expected to be predominantly from the Eastern DPS, but a small number of Western DPS Steller sea lions may occur. Based upon genetic analyses, Hastings et al. (2020) indicates that 1.4 percent of all non-pup Steller sea lions found in the Lynn Canal region (which encompasses the action area) had mitochondrial DNA haplotypes suggesting they were born in the Western DPS region. Therefore, for the purposes of this opinion, we conclude that 1.4 percent of the total Steller sea lions in the project area within Lutak Inlet are from the endangered Western DPS and the remaining 98.6 percent are from the delisted Eastern DPS.

Reproduction and Growth

Female Steller sea lions reach sexual maturity and first breed between three and eight years of age, and the average age of reproducing females (generation time) is about 10 years (Pitcher and Calkins 1981; Calkins and Pitcher 1982a; York 1994). They give birth to a single pup from May through July and then breed about 11 days after giving birth.

Land sites used by Steller sea lions are referred to as rookeries and haulouts (Figure 10, Figure 11). Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season. Haulouts are used by all age classes of both sexes but are generally not where sea lions reproduce. At the end of the reproductive season, some females may move with their pups to other haulout sites and males may migrate to distant foraging locations (Spalding 1964; Pitcher and Calkins 1981). Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley et al. 1997; Burkanov and Loughlin 2005). Round trip migrations of greater than 6,500 km by individual Steller sea lions have been documented (Jemison et al. 2013). Most adult Steller sea lions occupy rookeries during the pupping and breeding season (Pitcher and Calkins 1981; Gisiner 1985), and exhibit high site fidelity (Sandegren 1970). During the breeding season some juveniles and non-breeding adults occur at or near the rookeries, but most are on haulouts (Rice 1998; Ban 2005; Call and Loughlin 2005).

Feeding and Prey Selection

Steller sea lions are generalist predators that consume a variety of demersal, semi-demersal, and pelagic prey, indicating a potentially broad spectrum of foraging styles, probably based primarily on availability. Diet is likely strongly influenced by local and temporal changes in prey distribution and abundance (McKenzie and Wynne 2008; Sigler et al. 2009). Within the action area for this project, aggregates of prey that are most likely to be exploited by sea lions include eulachon, salmon, and herring.

Figure 19 depicts a likely seasonal foraging strategy for Steller sea lions in Southeast Alaska. These results suggest that seasonally aggregated high-energy prey species, such as eulachon and herring in late spring and salmon in summer and fall, influence the seasonal distribution of Steller sea lions. Similarly, the Status Review of Southeast Alaska Pacific Herring (NMFS 2014b) generalizes that sea lions forage on herring aggregations in winter, on spawning herring and eulachon in spring, and on various other species throughout the year. Herring fishery managers use the presence of sea lions on the spring spawning grounds as an indicator that spawning is imminent, even though herring have been in deeper adjacent waters for weeks prior to sea lion arrival (Kruse 2000).

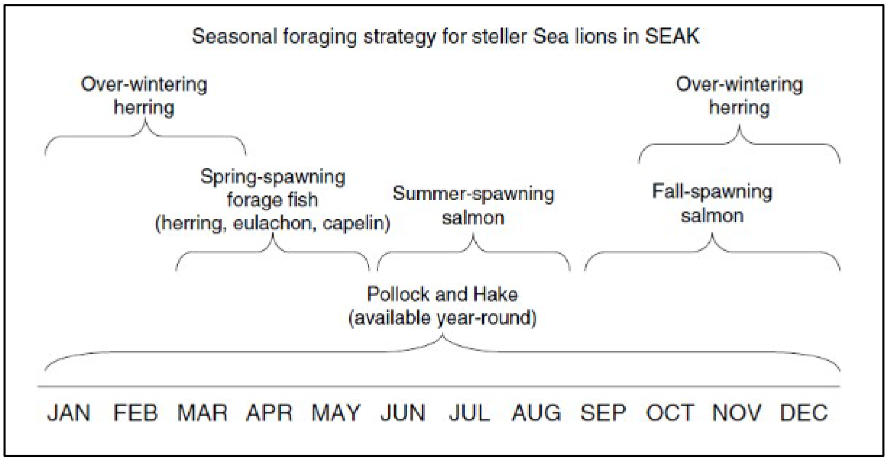


Figure 19. Seasonal foraging ecology of Steller sea lions (Womble et al. 2009).

Diving and Social Behavior

The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries and the seasonal presence of many prey species. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Pitcher and Calkins 1981; Calkins and Goodwin 1988; NMFS 2008a), and occasionally other marine mammals and birds (Pitcher and Fay 1982; NMFS 2008a).

During summer, Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 20 nm of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites.

Steller sea lions tend to make shallow dives of less than 250 m, but are capable of deeper dives (NMFS 2008a). Female foraging trips during winter tend to be longer in duration, farther from shore, and with deeper dives. Summer foraging dives, on the other hand, tend to be closer to shore and are shallower (Merrick and Loughlin 1997). Adult females begin a regular routine of alternating foraging trips at sea with nursing their pups on land a few days after birth.

Steller sea lions are gregarious animals that often travel in large groups of up to 45 individuals (Keple 2002), and rafts of several hundred Steller sea lions are often seen adjacent to haulouts. Individual rookeries and haulouts may be comprised of hundreds of animals. At sea, groups usually consist of females and subadult males; adult males are usually solitary (Loughlin 2002).

Vocalization, Hearing, and Other Sensory Capabilities

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz in water (NMFS 2018a). Studies of Steller sea lion auditory sensitivities have found that this species detects sounds underwater between 1 and 25 kHz (Kastelein et al. 2005), and in air between 250 Hz and 30 kHz (Mulsow and Reichmuth 2010).

Threats to the Species

Brief descriptions of potential threats to Steller sea lions are presented in the following sections. Table 8 identifies the threats to Western DPS Steller sea lions and their assessed impact on the species' recovery. More detailed information can be found in the 2008 Steller Sea Lion Recovery Plan (available at: https://www.fisheries.noaa.gov/resource/document/recovery-plan-steller-sea-lion- revision-eastern-and-western-distinct-population), the 2022 Alaska Stock Assessment Reports (available at: https://repository.library.noaa.gov/view/noaa/52074) and the Alaska Groundfish Biological Opinion (NMFS 2014a).

Table 8. Potential threats and impacts to western DPS Steller sea lion recovery (Muto et al. 2019).

Threat	Impact on Recovery	Level of Uncertainty	Reference Examples
Environmental variability	Potentially high	High	Trites and Donnelly 2003, Fritz and Hinckley 2005
Competition with fisheries	Potentially high	High	Fritz and Ferrero 1998, Hennen 2004, Fritz and Brown 2005, Dillingham et al. 2006
Predation by killer whales	Potentially high	High	Springer et al. 2003, Williams et al. 2004, DeMaster et al. 2006, Trites et al. 2007
Toxic substances	Medium	High	Calkins et al. 1994, Lee et al. 1996, Albers and Loughlin 2003, Rea et al. 2013
Incidental take by fisheries	Low	High	Wynne et al. 1992, Nikulin and Burkanov 2000, Perez 2006
Subsistence harvest	Low	Low	Haynes and Mishler 1991, Loughlin and York 2000, Wolfe et al. 2005
Illegal shooting	Low	Medium	Loughlin and York 2000, NMFS 2001
Entanglement in marine debris	Low	Medium	Calkins 1985
Disease and parasitism	Low	Medium	Burek et al. 2005
Disturbance from vessel traffic and tourism	Low	Medium	Kucey and Trites 2006
Disturbance or mortality due to research activities	Low	Low	Calkins and Pitcher 1982, Loughlin and York 2000, Kucey 2005, Kucey and Trites 2006, Atkinson et al. 2008, Wilson et al. 2012

Natural Threats

Environmental Variability

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the western DPS (NMFS 2008). The Bering Sea and Gulf of Alaska are subjected to large-scale forcing mechanisms that can lead to basin-wide shifts in the marine ecosystem, resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, and sea ice extent and amount. Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels.

Predation

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked predation by killer whales as a potentially high threat to the recovery of the western DPS. Springer et al. (2003) suggested killer whale predation caused the decline of Steller sea lions and other pinnipeds in the North Pacific as a long-term consequence of commercial whaling that led killer whales to prey switch, although this hypothesis has been challenged. Numerous studies do indicate, however, that Steller sea lions are important prey for killer whales ((NMFS 2014a). Maniscalco et al. (2007) estimated that 11 percent of the Steller sea lion pups born from 2000-2005 at the Chiswell Island rookery (in the Kenai Fjords area) were preyed upon by killer whales. Horning and Mellish (2012) estimated that over half of juvenile Steller sea lions in the Kenai Fjords/Prince William Sound region are consumed by predators before age 4 years. Steller sea lions may also be attacked by sharks (Horning and Mellish 2012), though little evidence exists to indicate that sharks prey on Steller sea lions. The Steller Sea Lion Recovery Plan did not rank shark predation as a threat to the recovery of the Western DPS.

Disease and Parasites

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked diseases and parasites as a low threat to the recovery of the WPDS. Steller sea lions have tested positive for several pathogens (Burek et al. 2005), but disease levels are unknown. Similarly, parasites in this species are common, but mortality resulting from infestation is unknown. Significant negative effects of these factors may occur in combination with stress, which may compromise the immune system. If other factors, such as disturbance, injury, or difficulty feeding occur, it is more likely that disease and parasitism can play a greater role in population reduction.

Anthropogenic Threats

Competition with Fisheries and Fishery Interactions

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked competition with fisheries for prey as a potentially high threat to the recovery of the Western DPS. Substantial scientific debate surrounds the question about the impact of potential competition between fisheries and Steller sea lions. It is generally well accepted that commercial fisheries target several important Steller sea lion prey species including salmon species, Pacific cod, Atka mackerel, pollock, and others. These fisheries could be reducing sea lion prey biomass and quality at regional and/or local spatial and temporal scales such that sea lion survival and reproduction are reduced. Limitations on fishing grounds, duration of fishing season, and monitoring have been established to prevent Steller sea lion nutritional deficiencies as a result of inadequate prey availability. Incidental take by fisheries is considered a low threat, albeit with a high degree of uncertainty. Of note, between 2016 and 2020 human-caused mortality and injury of the Western DPS Steller sea lions (n = 148) was primarily caused by entanglement in fishing gear, in particular, commercial trawl gear (n=113; Freed et al. 2022)

Toxic Substances and Pollutants

The Steller Sea Lion Recovery Plan ranked the threat of toxic substances as medium, but contaminants leading to Steller sea lion mortality have not been identified (NMFS 2008). Steller sea lion tissues have been documented to contain polycyclic aromatic hydrocarbon (PAH) contaminants such as organochlorines, including polychlorinated bi-phenyls (PCBs) and the pesticide DDT (and their metabolites) (Barron et al. 2003; Hoshino et al. 2006), heavy metals, including mercury, zinc, and copper, metallothionien, and butyltin (Kim et al. 1996; Beckmen et al. 2002; NMFS 2008a). Metal and contaminant exposure remains a focus of ongoing investigation. Total mercury concentrations measured in hair samples collected from pups in the western-central Aleutian Islands were detected at levels that cause neurological and reproductive effects in other species (Rea et al. 2013).

Sea lions which died as a result of the *Exxon Valdez* oil spill contained particularly high levels of PAH contaminants, and subsequently, premature birth rates increased and pup survival decreased (Calkins et al. 1994; Loughlin et al. 1996). Wang et al. (2011) found PCB levels in the kidneys of some adult males high enough that reproductive and immune function may have been compromised. Lefebvre et al. (2016) reports both saxitoxin and domoic acid have been documented in Steller sea lion tissues in Alaska, however, population level effects from these biotoxins is unknown.

Illegal Shooting

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked illegal shooting as a low threat. In recent years, illegal shooting seems to have become more prevalent, especially in the Copper River Delta region, notably beginning in 2015 (Wright 2016). There were no cases of illegal shooting successfully prosecuted between 1998 and 2017. However, in 2018, a Cordova-based fishing boat captain and one crewmember were convicted of illegal take of marine mammals, and admitted to shooting and killing multiple Steller sea lions in 2015. From 2000-2016, the NMFS Alaska Stranding Response Program documented 60 Steller sea lions statewide with suspected or confirmed firearm injures, and in 2019, there were 11 reports of confirmed or suspected firearm injuries to Steller sea lions.

Other

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked five other anthropogenic threats as having low impact to the recovery of western DPS Steller sea lions. These include subsistence harvests by Alaska Natives (seen as relatively low threat due to low levels of subsistence harvest compared to historic levels); entanglements in fishing gear and marine debris; disturbance from vessel traffic and tourism; and disturbance or mortality due to research activities. More information about the other low threats is available in the Steller Sea Lion Recovery Plan (NMFS 2008), the most recent Stock Assessment Reports (Young et al. 2023), and the references provided in Table 8.

Recovery Goals

In the 2008 recovery plan, NMFS outlined a strategy to meet its goal of promoting the recovery of the Western DPS and its ecosystem to a level that would warrant delisting (NMFS 2008). The highest priority goal set by NMFS is to continue to improve estimates of population abundance, trends, distribution, health, and essential habitat characteristics through monitoring and research and to identify key threats to the population. In addition to identifying individual threats, research needs to expand our understanding of how multiple interrelated threats combine to create long-term cumulative impacts on the Western DPS.

4.3.2 Mexico DPS Humpback Whales

Distribution

Humpback whales are found in all oceans of the world with a broad geographical range from tropical to temperate waters in the Northern Hemisphere and from tropical to near-ice-edge waters in the Southern Hemisphere. Humpback whales generally undertake seasonal migrations from their tropical calving and breeding grounds in winter to their high-latitude feeding grounds in summer, although some individuals may remain in Alaska waters year-round. Most humpbacks that feed in Alaska winter in temperate or tropical waters near Mexico, Hawaii, or in the western Pacific near Japan. In the spring, those animals migrate back to Alaska, where food is abundant. They tend to concentrate in several areas, including Southeast Alaska, Prince William Sound, Kodiak, the mouth of Cook Inlet, and along the Aleutian Islands (Ferguson et al. 2015). Large numbers of humpbacks have also been reported in waters over the continental shelf, extending up to 100 nm offshore in the western Gulf of Alaska (Wade 2021).

Additional information on humpback whale biology and natural history is available at:

https://www.fisheries.noaa.gov/species/humpback-whale

http://alaskafisheries.noaa.gov/pr/humpback

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

Status and Population Structure

In 1970, the humpback whale was listed as endangered worldwide, under the ESCA of 1969 (35 FR 18319; December 2, 1970), primarily due to overharvest by commercial whalers. Congress replaced the ESCA with the ESA in 1973; humpback whales remain listed as endangered under the ESA and are considered “depleted” under the MMPA. NMFS conducted a global status review that led to changing the status of humpback whales under the ESA and dividing the species into 14 distinct population segments (DPS) (81 FR 62260, September 8, 2016). Of these 14 DPSs, NMFS listed four as endangered, one as threatened, and delisted the remaining nine. Three DPSs occur in waters of Alaska. The Western North Pacific DPS is listed as endangered; the Mexico DPS is listed as threatened; and the Hawaii DPS is not listed (81 FR 62260, September 8, 2016).

The Hawaii DPS population is estimated to be 11,540 animals (CV=0.04) with an annual growth rate between 5.5 and 6.0 percent. The Mexico DPS is comprised of approximately 2,913 animals (CV=0.7; Wade 2021) with an unknown, but likely declining, population trend (81 FR 62260; September 8, 2016). Approximately, 1,084 animals (CV=0.09) comprise the Western North Pacific DPS (Wade 2021). Humpback whales in the Western North Pacific remain rare in some parts of their former range, such as the coastal waters of Korea, and have shown little sign of recovery in those locations.

Based on an analysis of migration between winter mating/calving areas and summer feeding areas using photo-identification, Wade (2021) concluded that whales feeding in Alaskan waters belong primarily to the Hawaii DPS (recovered), with small numbers from the Western North Pacific DPS (endangered) and Mexico DPS (threatened) individuals. In Southeast Alaska, (which is considered part of the Southeast Alaska and Norther British Columbia summer feeding area), we consider Hawaii DPS individuals to comprise 98 percent of the humpback whales present, Mexico DPS individuals to comprise 2 percent. Individuals from the Western North Pacific DPS are not expected to occur in coastal waters of Southeast Alaska.

Whales from these three DPSs overlap on feeding grounds off Alaska and are visually indistinguishable unless individuals have been photo-identified on breeding grounds and again on feeding grounds. All waters off the coast of Alaska may contain ESA-listed humpbacks.

Critical habitat was designated for the Western North Pacific and Mexico DPSs on April 21, 2021 (86 FR 21082). Only one essential feature of their critical habitat was identified: adequate prey resources. Although humpback whales are generalist predators and prey availability can vary seasonally and spatially, data indicate that their diet is consistently dominated by euphausiid species and small pelagic fishes such as northern anchovy, Pacific herring, Pacific sardine, and capelin (86 FR 21082.

Occurrence in the Action Area

Marine Transit Routes

The summer feeding range of humpback whales in the North Pacific includes coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk and north of the Bering Strait (Muto et al. 2021). Humpback whales are also found in deep waters south of the continental shelf from the eastern Aleutians through the Gulf of Alaska. Relatively high densities of humpback whales occur throughout much of Southeast Alaska and northern British Columbia. Southeast Alaska has been identified as a biologically important area (BIA) for seasonal feeding due to the high density of animals from March-November (Ferguson et al. 2015).

Both the materials and construction barge will travel through the Southeast Alaska BIA. The construction barge traveling from Codova, Alaska will transit through Mexico DPS humpback whale critical habitat. Therefore, Mexico DPS humpback whales may be encountered along transit routes.

Lutak Inlet

Systematic whale surveys are not undertaken in the Lynn Canal area; the most reliable seasonal data in the action area are from charter boat vessels and near-daily passages of the Lynn Canal between Juneau and Haines/Skagway by the Alaska Marine Highway System (AMHS) ferries. Recent reports state that humpback whales are observed daily in southern Lynn Canal during late-spring through summer, with less frequent sightings further north into upper Lynn Canal (NMFS 2020b), suggesting a more favorable food source elsewhere (NMFS 2020a). Observations of humpback whales have also been reported by local operators in Chilkoot Inlet and, less frequently, near the mouth of Lutak Inlet during the spring eulachon and herring runs.

The whales typically leave the area by July to feed on aggregations of herring in lower Lynn Canal, but a few individuals are observed on and off throughout the summer in northern Lynn Canal (Anchor QEA 2023), inside or near the action area. In the monitoring report from the White Pass and Yukon Route Railroad Dock Dolphin Installation project, which occurred from March to May 2019, two humpback whales were documented in nearby Taiya Inlet in March (WP&YR 2019).

Given their widespread range and their opportunistic foraging strategies, humpback whales may be in the project vicinity during the proposed project activities. As previously mentioned, humpback whales in Southeast Alaska are 98 percent comprised of the Hawaii DPS (not listed) and 2 percent of the Mexico DPS (Wade et al. 2021). Therefore, we use 2 percent in this analysis to approximate the percentage of humpbacks observed in the action area that are from the Mexico DPS.

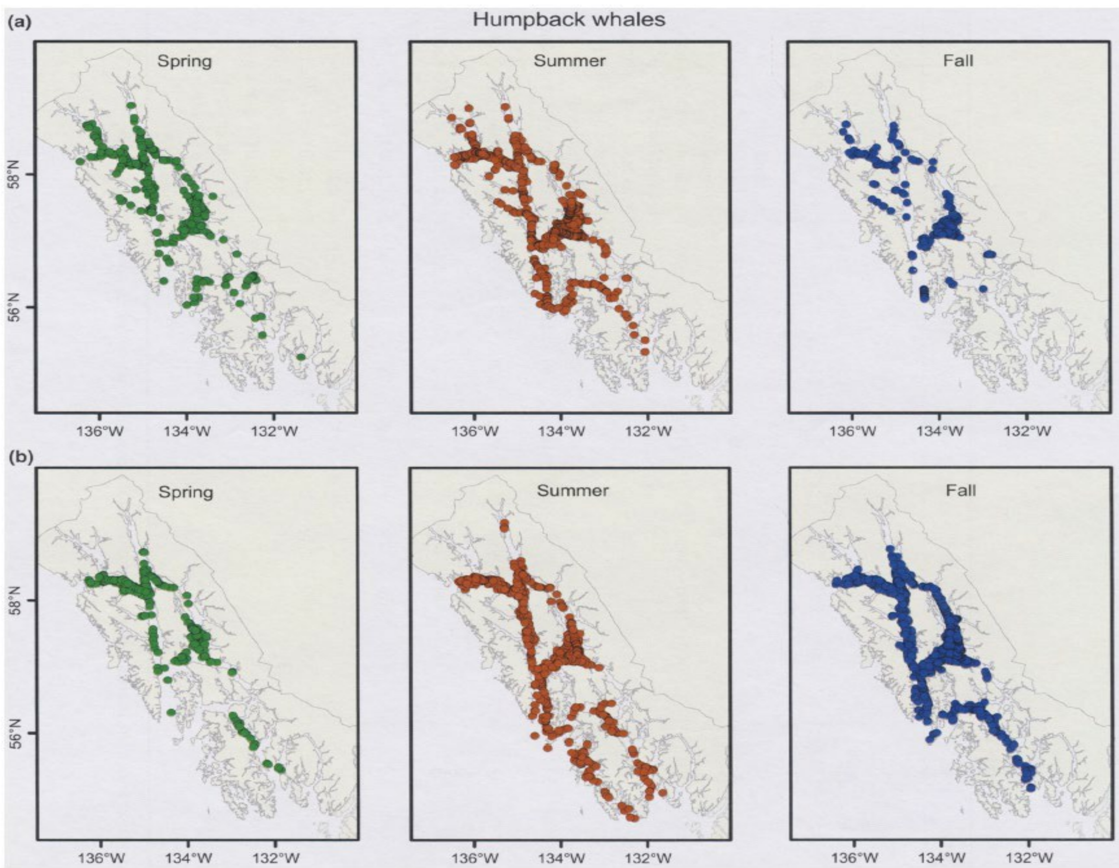


Figure 20. Seasonal distribution of humpback whales in Southeast Alaska, with each dot indicating a group sighting/encounter. (a) 1991, 1992, 1993, 2006 and 2007, representing five spring, five summer, and four fall surveys; (b) 1994-2005, representing four spring, nine summer, and eleven fall surveys (from Dalheim et al. 2009).

Reproduction and Growth

Humpbacks give birth and presumably mate on low-latitude wintering grounds in January to March in the Northern Hemisphere. Females attain sexual maturity at five years in some populations and exhibit a mean calving interval of approximately two years (Clapham 1992; Barlow and Clapham 1997). Gestation is about 12 months, and calves are typically weaned by the end of their first year (Perry et al. 1999).

Feeding and Prey Selection

Humpback whales exhibit flexible feeding strategies, sometimes foraging alone and sometimes cooperatively (Clapham 1993). Humpback whales are ‘gulp’ or ‘lunge’ feeders, capturing large mouthfuls of prey during feeding rather than continuously filtering food, as may be observed in some other large baleen whales (Goldbogen et al. 2008; Simon et al. 2012). When lunge feeding, whales advance on prey with their mouths wide open, then close their mouths around the prey and trap them by forcing engulfed water out past the baleen plates.

Compared to some other baleen whales, humpbacks are relatively generalized in their prey selection. In the Northern Hemisphere, known prey includes: euphausiids (krill); copepods; juvenile salmonids; herring; Arctic cod; walleye pollock; pteropods; and cephalopods (Johnson and Wolman 1984; Perry et al. 1999; Straley et al. 2018). In Lynn Canal, humpbacks primarily feed on herring, but have also been observed feeding on euphasiids and capelin (Straley et al. 2018; NMFS 2020a).

Vocalization and Hearing

NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with a generalized hearing range between 7 Hz and 35 kHz (NMFS 2018c). Baleen whales have inner ears that appear to be specialized for low-frequency hearing. In a study of the morphology of the mysticete auditory apparatus, Ketten (1997) hypothesized that large mysticetes have acute infrasonic hearing.

Humpback whales produce a wide variety of sounds ranging from 20 Hz to 10 kHz. During the breeding season males sing long, complex songs, with frequencies in the 20-5,000 Hz range and intensities as high as 181 dB (Payne 1970; Winn et al. 1970; Thompson et al. 1986). Source levels average 155 dB and range from 144 to 174 dB (Thompson et al. 1979). The songs appear to have an effective range of approximately 10 to 20 km. Animals in mating groups produce a variety of sounds (Tyack 1981; Silber 1986).

Social sounds associated with aggressive behavior by male humpback whales in breeding areas are very different than songs and extend from 50 Hz to 10 kHz (or higher), with most energy in components below 3 kHz (Tyack and Whitehead 1983; Silber 1986). These sounds appear to have an effective range of up to 9 km (Tyack and Whitehead 1983).

Humpback whales produce sounds less frequently in their summer feeding areas. Feeding groups produce distinctive sounds ranging from 20 Hz to 2 kHz, with median durations of 0.2-0.8 seconds and source levels of 175-192 dB (Thompson et al. 1986). These sounds are attractive and appear to rally animals to the feeding activity (D'Vincent et al. 1985; Sharpe and Dill 1997).

Threats to the Species

Brief descriptions of natural and anthropogenic threats to humpback whales follow. More detailed information can be found in:

the Humpback Whale Recovery Plan (NMFS 1991; https://www.fisheries.noaa.gov/resource/document/final-recovery-plan-humpback-whale-megaptera-novaeangliae),

NMFS Stock Assessment Reports (https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock- assessment-reports-species-stock#cetaceans---large-whales),

Global Status Review (Fleming and Jackson 2011; https://repository.library.noaa.gov/view/noaa/4489),

and the ESA Status Review (Bettridge et al. 2015; https://repository.library.noaa.gov/view/noaa/4883).

Natural Threats

Predation

Natural sources and rates of mortality of humpback whales are not well known. The most common predator of humpback whales is the killer whale (Jefferson et al. 1991). Most observations of humpback whales under attack from killer whales reported vigorous defensive behavior and tight grouping where more than one humpback whale was present (Ford and Reeves 2008). Calves remain protected near mothers or within a group and lone calves have been known to be protected by presumably unrelated adults when confronted with attack (Ford and Reeves 2008). There is also evidence of shark predation on calves and entangled whales (Mazzuca et al. 1998). Shark bite marks on stranded whales may often represent post-mortem feeding rather than predation, i.e., scavenging on carcasses (Long and Jones 1996).

Disease, Parasites, and Biotoxins

Humpback whales can carry the giant nematode *Crassicauda boopis*, which appears to increase the potential for kidney failure in humpback whales and may be preventing some populations from recovering (Lambertsen 1992). Parasites and biotoxins from red-tide blooms are other potential causes of mortality (Perry et al. 1999). Out of 13 marine mammal species examined in Alaska, domoic acid was detected in all species examined with humpback whale showing 38 percent prevalence. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50 percent) (Lefebvre et al. 2016)

Anthropogenic Threats

Vessel Strikes

Vessel strikes are listed as one of the main threats and sources of anthropogenic impacts to humpback whales in Alaska. Neilson et al. (2012a) summarized 108 large whale ship-strike events in Alaska from 1978 to 2011; 86 percent involved humpback whales. Eighteen humpbacks were struck by vessels between 2016 and 2020 (Freed et al. 2022). Most ship strikes of humpback whales are reported in Southeast Alaska (Helker et al. 2019), where high vessel traffic overlaps with whale presence.

Fishery Interactions including Entanglements

Fishing gear entanglement is another major threat to humpback whales. Entanglement may result in only minor injury or may potentially significantly affect individual health, reproduction, or survival. Every year humpback whales are reported entangled in fishing gear in Alaska, particularly pot gear and gill net gear. The minimum mean annual mortality and serious injury rate due to interactions with all fisheries between 2014 and 2018 is 19 humpbacks for the Central North Pacific stock[11] and 1.7 whales for the Western North Pacific stock[12] (Muto et al. 2021). Between 2016 and 2020, entanglement of humpback whales (n = 47) was the most frequent human-caused source of mortality and injury of large whales (Freed et al. 2022).

Subsistence, Illegal Whaling, or Resumed Legal Whaling

Historically, commercial whaling represented the greatest threat to every population of humpback whales and was ultimately responsible for listing humpback whales as an endangered species. In 1965, the International Whaling Commission banned commercial hunting of humpback whales in the Pacific Ocean, and as a result this threat has largely been curtailed. No whaling occurs within the range of Mexico DPS humpbacks, but some commercial bycatch whaling has been documented in both Japan and South Korea (Bettridge et al. 2015). Alaskan subsistence hunters are not authorized to take humpback whales.

Pollution

Humpback whales can accumulate lipophilic compounds (e.g., halogenated hydrocarbons) and pesticides (e.g. DDT) in their blubber as a result either of feeding on contaminated prey (bioaccumulation), or inhalation in areas of high contaminant concentrations (e.g. regions of atmospheric deposition) (Barrie et al. 1992; Wania and Mackay 1993). Organochlorines, including PCB and DDT, have been identified from humpback whale blubber (Gauthier et al. 1997). Overall levels of PCB concentrations in North Pacific humpback whales are on par with other baleen whales, which are generally lower than odontocete cetaceans (Elfes et al. 2010). Although the health effects of different doses of contaminants are currently unknown for humpback whales, available information does not suggest contaminant levels in humpback whales have population-level effects.

Acoustic Disturbance

Low-frequency sound comprises a significant portion of ocean noise and stems from a variety of sources including shipping, research, naval activities, and oil and gas exploration (Weilgart 2007b). Bettridge et al. (2015) identified underwater noise from human activity as a threat and suggested that exposure is likely chronic and at relatively high levels, caveating that overall

[11] This stock comprises individuals with Mexico and Hawaii wintering grounds and North Pacific feeding grounds that include southeast Alaska.

[12] This stock comprises individuals with eastern Asia and Hawaii wintering grounds and North Pacific feeding grounds that include southeast Alaska.

population-level effects of exposure to underwater noise are not well-established. It does not appear that humpback whales are often involved in strandings related to noise events. There is one record of two humpback whales found dead with extensive damage to the temporal bones near the site of a 5,000-kg explosion, which likely produced shock waves that were responsible for the injuries (Ketten 1995). Other detrimental effects of anthropogenic noise include masking and temporary threshold shifts (TTS).

4.3.3 Sunflower Sea Stars

Status and population structure

On August 18, 2021, the Center for Biological Diversity petitioned NMFS to list the Sunflower sea star (*Pycnopodia helianthoides*) under the ESA. NMFS determined that the proposed action may be warranted (86 FR 73230, December 27, 2021) and began a full status review to evaluate overall extinction risk for the species. NMFS determined that the Sunflower sea star is likely to become an endangered species within the foreseeable future throughout its range and on March 16, 2023, published a proposed rule to list the Sunflower sea star as a threatened species (88 FR 16212). NMFS did not propose to designate critical habitat at that time. No specific populations of Sunflower sea stars have been delineated and they are assumed to be genetically homogenous throughout their range (Lowry et al. 2022).

Distribution and Habitat Use

The Sunflower sea star is a large (up to 1 m in diameter), fast-moving (up to 160 cm/minute), many-armed (up to 24) echinoderm native to the west coast of North America (Lowry et al. 2022). It occupies waters from the intertidal to at least 435 m deep, but is most common at depths less than 25 m and rare in waters deeper than 120 m (Lambert 2000; Hemery et al. 2016; Gravem et al. 2021). Sunflower sea stars occur over a broad array of soft-, mixed-, and hard-bottom habitats from the Aleutian Islands to Baja California, Mexico, but are most abundant in waters off eastern Alaska and British Columbia (Gravem et al. 2021).

Abundance

Prior to 2013, the global abundance of Sunflower sea star was estimated at several billion animals, but from 2013–2017 sea star wasting syndrome (SSWS) reached pandemic levels, killing an estimated 90 percent or more of the population (Lowry et al. 2022). Declines in the northern portion of its range were less pronounced than in the southern portion, but still exceeded 60 percent. Species-level impacts from SSWS, both during the pandemic and on an ongoing basis, have been identified as the major threat affecting the long-term persistence of the Sunflower sea star (Lowry et al. 2022).

Occurrence in the action area

Sunflower sea stars are distributed throughout Southeast Alaska and as habitat generalists, occupy a diverse range of substrate types and depths. Depths in the area immediately adjacent to the Lutak Dock average around 25 to 100 feet, and Lutak Inlet has a maximum depth of around 360 feet, which fall within the depth ranges for Sunflower sea star occurrence. Sunflower sea stars have been observed throughout Southeast Alaska by research divers[13]. While there currently are no density estimates for the action area, Sunflower sea stars have been observed in the waters around Haines, although documented sightings near the action area are uncommon (Solstice 2023). Other diver-based monitoring sources report the closest observations of Sunflower sea stars to occur near Juneau and further south[14], but it is unclear whether Sunflower sea stars don't occur near the action area or that there is simply an absence of monitoring in the action area and the upper Lynn Canal region in general. Based on this limited information, we expect Sunflower sea star overlap with construction activities to be rare, with the caveat that there is a high degree of uncertainty given the paucity of data on this species in Southeast Alaska. Therefore, we will implement a conservative approach to Sunflower sea star presence in our analysis forward.

Reproduction and Growth

The species has separate sexes and is a broadcast spawner with a planktonic larval stage (Lundquist and Botsford 2011). Females can release a million eggs or more (Strathmann 1987; Chia and Walker 1991; Byrne 2013). Reproduction also occurs via larval cloning, enhancing potential reproductive output beyond female fecundity (Bosch et al. 1989; Balser 2004). Sea stars also have the ability to regenerate lost rays/arms and parts of the central disc (Chia and Walker 1991). Rays may detach when a sea star is injured or as a defense reaction when attacked by a predator. The longevity of *P. helianthoides* in the wild is unknown, as is the age at first reproduction and the period over which a mature individual is capable of reproducing (Lowry et al. 2022). While generally solitary, they are also known to seasonally aggregate, perhaps for spawning purposes.

Feeding and Prey Selection

The Sunflower sea star hunts a range of bivalves, gastropods, crustaceans, and other invertebrates using chemosensory stimuli and will dig for preferred prey in soft sediment (Mauzey et al. 1968; Paul and Feder 1975; Herrlinger 1983). It preys on sea urchins and plays an important role in controlling sea urchin numbers in kelp forests (Lowry et al. 2022). Sunflower sea stars are also scavengers, consuming dead or damaged prey such as fish, sea birds, and octopus (Lowry et al. 2022).

Threats to the Species

Sea Star Wasting Syndrome

SSWS is the primary threat identified to the Sunflower sea star in the proposed threatened listing rule (88 FR 16212). SSWS occurs in a variety of sea star species of the class *Asteroidea*. It is marked by characteristic white skin lesions, limb autotomy, loss of body wall integrity, and, in some cases, complete disintegration and mortality of the animal (Hewson et al. 2018). While

[13] https://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=1041, accessed on 10/4

[14] https://www.inaturalist.org/taxa/47673-Pycnopodia-helianthoides, accessed 10/4.

outbreaks are observed in sea stars periodically throughout the globe, the most recent SSWS epizootic event caused one of the largest marine die offs ever recorded on the west coast of North America, killing billions of sea stars across a broad spatial and depth range of affected populations (Oulhen et al. 2022). Although some studies suggest a possible interaction between a pathogen and environmental stressors, the etiology of disease and the mechanism of its progression remain unknown (Oulhen et al. 2022). Hewson et al. (2018) speculates that SSWS may have different etiologies across species and locations. There is some evidence that SSWS is exacerbated by environmental perturbations, such anomalously warm sea surface temperatures (SSTs), like those during the 2014-2016 marine heat wave (Harvell et al. 2019). However, recent studies found no consistent patterns associated with water temperatures, or other environmental conditions, across the entire range of SSWS (Hewson et al. 2018). Therefore, the onset and progression of SSWS is likely a result of many complex interactions amongst multiple environmental variables.

Bycatch/Overexploitation

Sunflower sea stars are not the object of targeted commercial fisheries historically or currently. Bycatch mortality from trawl and bottom-contact trap/pot fisheries pose a low-level risk now and potentially a higher level of future risk, especially in areas where populations are declining or already at very low levels (Lowry 2022). Recreational harvest of *P. helianthoides* is permitted in British Columbia, Alaska, and California, and is unrestricted in Mexico, but estimates of recreational harvest are not available (Lowry 2022). Evidence does not exist for regular human consumption of the species, so all collection is assumed to be for private exhibition, use, or curiosity.

Pollution/Discharge

The Status Review Team was concerned about the impacts that pollutants and contaminants might have on the ecosystems upon which *P. helianthoides* depend, in particular the food that they eat (Lowry 2022). Pollutants could potentially weaken the microbiome or immune response of the Sunflower sea star, leading to mortality (Aquino et al. 2021; McCracken et al. 2023). However, evidence for direct impacts of pollutants and environmental contaminants on Sunflower sea stars are lacking. The team concurred that impacts due to pollutants and environmental contaminants are either unknown or are low enough such that they are unlikely to contribute to the species’ risk of extinction now or in the foreseeable future (Lowry et al. 2022).

Coastal Development

Impacts to the benthic environment from coastal development activities such as dredging, pile driving, use of heavy equipment, and runoff of pollutants into the marine environment are a potential threat to Sunflower sea stars. Sedimentation, erosion, and sea level rise have the potential to produce more widespread impacts, especially in coastal environments near urban development (Lowry 2022). Log booms could create localized habitat destruction as water-soaked bark rains down a river into coastal waters, creating anoxic areas (Gravem et al. 2021; Lowry et al. 2022).

More information on the Sunflower sea star can be found at:

Proposed Rule to List Sunflower Sea Stars as Threatened Under the ESA

Sunflower Sea Star Status Review

5 ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action areas that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR § 402.02).

A number of human activities have contributed to the current status of populations of ESA-listed species in the action area. The factors that have likely had the greatest impact are discussed in the sections below. For more information on all factors affecting the ESA-listed species considered in depth in this opinion, please refer to the following documents:

- 2022 Alaska Marine Mammal Stock Assessments (Young et al. 2023), available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region,
- Recovery Plan for the Steller Sea Lion, Eastern and Western Distinct Population Segments (*Eumetopias jubatus*) (NMFS 2008), available at https://www.fisheries.noaa.gov/resource/document/recovery-plan-steller-sea-lion-revision-eastern-and-western-distinct-population, and
- Status Review of the Humpback Whale (*Megaptera novaeangliae*) (Bettridge *et al.* 2015), available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.

The project vicinity is an area of moderately high human use and some habitat alteration. The primary ongoing human activities in the action area likely to impact ESA-listed species include climate change, coastal zone development, pollution, marine vessel activity, and noise (e.g., vessel, pile-driving, equipment, etc.).

5.1 Recent Biological Opinions in the Action Area

NMFS AKR has issued two recent biological opinions for projects located in Lutak Inlet. These include the Haines Ferry Terminal Modification Project (this project never went forward) and

Alaska Marine Line's Lutak Dock RoRo Modification Project. The Lutak Dock RoRo Modification Project involved the demolition of the existing RoRo on Lutak Dock and construction of a new RoRo. This project introduced stressors into Lutak Inlet including vessel sound, vessel strike, habitat alteration, and impulsive and non-impulsive sound from pile installation and removal activities. Two Western DPS Steller sea lions were reported to be exposed to level B acoustic harassment; no animals were reported to be exposed to level A acoustic harassment. No vessel strike or injury to listed species were reported. In- water construction was brief and intermittent, occurring for 12 days in November 2020. Therefore, any exposure to project stressors were brief, and listed species' responses were likely short-term behavioral modifications. It is unlikely the RoRo Modification Project shifted the Environmental Baseline in a measurable way. By comparison to existing coastal development in the Lutak Inlet, the replacement of the RoRo ramp is considered minor.

These biological opinions can be found here:

https://media.fisheries.noaa.gov/dam-migration/akdot_haines_2017_biop_opr1.pdf

https://www.fisheries.noaa.gov/resource/document/biological-opinion-alaska-marine-lines-lutak-dock-roro-modification-project-lutak

5.2 Climate and Environmental Change

Since the 1950s the atmosphere and oceans have warmed, snow and sea ice have diminished, sea levels have risen, and concentrations of greenhouse gases have increased (IPCC 2014). There is little doubt that human influence has been the dominant cause of the observed warming since the mid-20th century (IPCC 2014). The impacts of climate change are especially pronounced at high latitudes and in polar regions. Average temperatures have increased across Alaska at more than twice the rate of the rest of the United States[15].

In the past 60 years, average air temperatures across Alaska have increased by approximately 3°F, and winter temperatures have increased by 6°F (Chapin et al. 2014). Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014). Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Houghton 2001; McCarthy et al. 2001). The impacts of these changes and their interactions on listed species in Alaska are hard to predict.

Indirect threats associated with climate change include increased human activity as a result of regional warming. Less ice could mean increased vessel activity or construction activities with an associated increase in sound, pollution, and risk of ship strike. Human fishing pressure could change the abundance, seasonality, or composition of prey species. Fisheries in Alaska are managed with the goal of sustainability; however, not all fish stocks are assessed, and it is unknown whether management of fisheries for optimal returns provides sufficient densities in feeding areas for efficient foraging by ESA-listed marine mammal species.

[15] https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-alaska_.html accessed 8/17/23.

An Unusual Mortality Event (UME) of large cetaceans occurred in Alaskan waters in 2015-2016. Reports of dead whales included 22 dead humpback, 12 fin, 2 gray, 1 sperm, and 6 unidentified whales. The fin whales were observed stranded within a 27-day period around Kodiak Island. This was concurrent with an unusually large number of dead whales found in British Columbia. The strandings were concurrent with the arrival of the Pacific marine heatwave, one of the strongest El Nino weather patterns on record, decreasing ice extent in the Bering Sea, and one of the warmest years on record in Alaska in terms of air temperature.

Recent studies and observations have shown changes in distribution (Brower et al. 2018), body condition (Neilson and Gabriele 2020), and migratory patterns of humpback whales, likely in response to climate change. The indirect effects of climate change on Mexico DPS humpback whales over time would likely include changes in the distribution of ocean temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

The Pacific marine heatwave is also likely responsible for poor growth and survival of Pacific cod, an important prey species for Steller sea lions. The 2018 Pacific cod stock assessment estimated that the female spawning biomass of Pacific cod was at its lowest point in the 41-year time series considered. This assessment was conducted following three years of poor recruitment and increased natural mortality during the Gulf of Alaska marine heat wave from 2014 to 2016 (NMFS 2018b).

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the Western DPS (NMFS 2008a). The Bering Sea and Gulf of Alaska are subjected to large-scale forcing mechanisms that can lead to basin-wide shifts in the marine ecosystem resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, and sea ice extent and amount.

Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels. Warmer waters could favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008a). Populations of Steller sea lions in the Gulf of Alaska and Bering Sea have experienced large fluctuations due to environmental and anthropogenic forcing (Mueter et al. 2009).

Climate change is expected to lead to warming ocean temperatures, more extreme fluctuations in ocean temperatures, and more storm events. These characteristics may exacerbate SSWS events in Sunflower sea stars, or result in marine habitat or ecological shifts that negatively affect the species (Lowry et al. 2022). Warming ocean temperatures, extreme fluctuations in ocean temperature, harmful algal blooms, ocean acidification, and low dissolved oxygen events, all byproducts of anthropogenic climate change, could impose direct and indirect stress on Sunflower sea stars and increase their vulnerability over the coming decades. There is uncertainty regarding causal links between climate change and impacts to Sunflower sea stars and the scale over which these potential impacts are taking place. For example, local temperature-related stress, low dissolved oxygen events, and harmful algal blooms may be buffered by the refuge that a broad geographic and depth range provides to this species.

5.3 Coastal Development

Coastal development can result in the loss and alteration of nearshore marine mammal habitat and changes in habitat quality. Increased development may prevent marine mammals from reaching or using important feeding, breeding, and resting areas, or may affect the quality of the habitat for marine mammal prey species. The Lutak Dock is a multiuse, deep-water port originally constructed in 1953. Modifications, repairs and partial replacements to the dock have been incrementally occurring since 2003 in order to maintain the dock's working condition. Lutak Dock is also located between two other highly modified areas, the Chilkoot Lumber Dock and the Haines Ferry Terminal. As such, the shoreline in the immediate project area is highly modified, while most other coastline within the action area and along transit routes has not been altered by human development.

5.4 Vessel Activity

Marine vessels that use the action area include recreational vessels, charter and commercial fishing vessels, shipping vessels such as barges and cargo vessels, whale-watching tour boats, cruise ships, and AMHS passenger ferries. The action area experiences moderately high levels of marine vessel traffic year-round with the highest volumes occurring April through October. Freight barges, cruise ships, and ferries are the largest vessels that routinely transit through the action area. Alaska Marine Lines operates a twice-weekly barge to Haines year-round[16]. Alaska Marine Highway System ferries stop in Haines year-round, with as many as ten sailings a week during the spring and summer months with the most sailings scheduled from May through September[17]. Delta Western has fuel barge deliveries 12 times per year (roughly one barge per month). Medium to large cruise ships stop at Haines' Port Chilkoot Dock near downtown up to eight times per week during the peak season[18] (June and July) and in Skagway around three to four times a day during peak season[19]. Additionally, barge transit routes from Cordova and from Seattle experience high levels of vessel traffic (Figure 8); project-related vessels will use established shipping lanes. All of these sources of vessel traffic increase underwater noise and contribute to the risk of collision with marine mammals on barge transit routes and near the construction site.

Ship strikes and other interactions with vessels unrelated to fisheries occur frequently with humpback whales. Neilson et al. (2012) summarized 108 large whale ship-strike events in Alaska from 1978 to 2011, 25 of which are known to have resulted in the whale's death. Eighty-six percent of these reports involved humpback whales. Most vessel collisions with humpbacks are reported from Southeast Alaska (Freed et al. 2022). Between 2000-2022, 91 vessel strikes of live humpback whales and 20 confirmed vessel strike humpback whale carcasses occurred in Southeast Alaska (NMFS AKR unpublished stranding data 2023).

Neilson et al. (2012a) also reported the following summary statements about humpback whale and

[16] https://www.lynden.com/aml/resources/sailing-schedules/ , accessed 8/13/23
[17] https://dot.alaska.gov/amhs/schedules.shtml, accessed 08/13/23
[18] https://claalaska.com/wp-content/uploads/2023/08/HNS-Haines-2023.pdf, accessed 8/13/23
[19] https://claalaska.com/wp-content/uploads/2023/08/SKG-Skagway-2023.pdf, accessed 8/13/23

vessel collisions in Southeast Alaska, and used previous locations of whale strikes to produce a kernel density estimate for high risk areas (Figure 21), which are also popular whale watching destinations.

- Most vessels that strike whales are less than 49 ft long
- Most collisions occur at speeds over 13 knots
- Most collisions occur between May and September
- Calves and juveniles appear to be at higher risk of collisions than adult whales

Between 2000-2022, there are four documented occurrences of Steller sea lions being struck by vessels in Southeast Alaska; three were near Sitka and one was near Juneau (NMFS AKR unpublished stranding data). Vessel strike of Steller sea lions not been documented in the action area and is not considered a major threat to Steller sea lions.

Information about regulations, guidelines, and programs related to vessel interactions with marine mammals is available at: https://www.fisheries.noaa.gov/alaska/marine-life-viewing- guidelines/alaska-marine-mammal-viewing-guidelines-and-regulations.

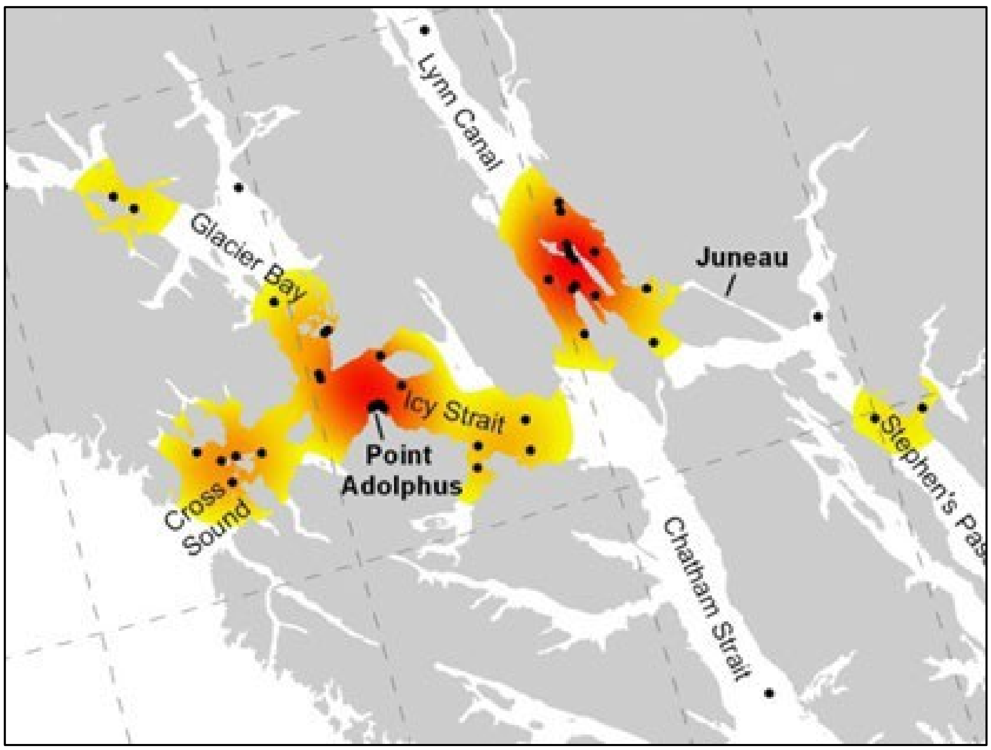


Figure 21. High risk areas (in red) for vessel strike in northern southeast Alaska (Nielson et al. 2012).

5.5 Fisheries Interactions

Commercial, recreational, sport, and subsistence fishing occurs in the action area. Commercial fisheries pose a threat to recovering marine mammal stocks in the Gulf of Alaska. Entanglement may result in minor injury or may significantly affect individual health, reproduction, or survival.

Additionally, reductions in seasonal availability and distribution of fish can cause cumulative effects on many species that depend on reliable sources of prey for survival.

Bettridge et al. (2015) report that fishing gear entanglements may moderately reduce the population size or the growth rate of ESA-listed whales. Humpback whales have been killed and injured during interactions with commercial fishing gear; however, the frequency of these interactions does not appear to have a significant adverse consequence for humpback whale populations. Most entanglements occur between early June and early September, when humpbacks are foraging in nearshore Alaska waters. A photographic study of humpback whales in southeastern Alaska found at least 53 percent of individuals showed some kind of scarring from fishing gear entanglement (Neilson et al. 2005).

Fishing gear involved in humpback entanglements between 1990 and 2016 included gillnet gear (37 percent), pot gear (29 percent), and longline gear (1-2 percent). The minimum mean annual mortality and serious injury rate due to interactions with all fisheries between 2014 and 2018 is 19 humpbacks for the Central North Pacific stock[20] and 1.7 whales for the Western North Pacific stock[21] (Muto et al. 2021). Between 2016 and 2020, entanglement of humpback whales (n = 47) was the most frequent human-caused source of mortality and injury of large whales (Freed et al. 2022). In Southeast Alaska, there were 163 humpback whale entanglements from 2003-2022, five of which occurred near Haines (NMFS AKR unpublished cetacean entanglement data).

Among Steller sea lions, the minimum estimated mean annual mortality and serious injury rate in U.S. commercial fisheries between 2014 and 2018 was 38 individuals (Muto et al. 2021). This is likely an underestimate as it is an actual count of verified human-caused deaths and serious injuries, and not all entangled animals strand nor are all stranded animals found, reported, or have the cause of death determined. Between 2016 and 2020 human-caused mortality and injury of the Western DPS Steller sea lions (n = 148) was primarily caused by entanglement in fishing gear, particularly commercial trawl gear (n=113; Freed et al. 2022). In Southeast Alaska, 152 Steller sea lion entanglements occurred between 2000 and 2022, one of which occurred near Haines (NMFS AKR unpublished pinniped entanglement data).

Commercial fisheries may indirectly affect marine mammals by reducing the amount of available prey or affecting prey species composition. Competition could exist between listed species and commercial fishing for prey species as certain fisheries target key Steller sea lion and humpback whale prey, including Pacific cod, salmon, and herring. Prey-switching may also occur; for example, Steller sea lions in the Gulf of Alaska have shifted their diet away from herring to pollock in recent years, although the role of commercial herring fisheries in this diet shift is unclear. Fishery management measures have reduced this potential for competition in some regions (e.g., no trawl zones and gear restrictions on various fisheries in southeast Alaska). In other parts of the action area, the broad distribution of prey and seasonal fisheries that differ from listed species presence in the area may minimize competition as well.

Southeast Alaska is one of four major commercial fishery regions identified by the state of

[20] This stock comprises individuals with Mexico and Hawaii wintering grounds and North Pacific feeding grounds that include southeast Alaska.
[21] This stock comprises individuals with eastern Asia and Hawaii wintering grounds and North Pacific feeding grounds that include southeast Alaska.

Alaska; the Southeast Region includes commercial fisheries for salmon, herring, groundfish including pollock, sablefish, and rockfish, shellfish including shrimp and king, tanner, and dungeness crabs, and dive fisheries including geoduck clams, urchins, and sea cucumbers. Commercial harvest of salmon is increasing state-wide; in 2022 all-species salmon harvest totaled 163.2 million fish, and 2023 forecasts a total harvest of 189.4 million fish[22]. Salmon, a primary food source for Steller sea lions, are harvested with purse seine and drift gillnets as well as with hand troll and power troll gear[23]. Herring, a primary food source for humpback whales that migrate to southeast Alaska for feeding, are harvested with purse seines and gillnets. However, herring have not been commercially harvested in the Lynn Canal area since 1982 due to low herring abundance[24].

Sunflower sea stars are likely caught in small numbers as bycatch in pot gear in the action area, however this data is not currently collected and/or reported. Most of these are likely returned to the marine environment without serious injury, however, the effects of handling stress have not been quantified.

5.6 Pollution

Previous development and discharges in portions of the action area are the source of multiple pollutants that may be bioavailable (i.e., may be taken up and absorbed by animals) to ESA-listed species or their prey items. As a port facility, there is the potential for accidental discharges or spills, permitted discharges, and storm-water runoff of terrestrial contaminants. Intentional sources of pollution including domestic, municipal, and industrial wastewater discharges are managed and permitted by the Alaska Department of Environmental Conservation (ADEC).

Lutak Inlet is not listed as an impaired water body on the 2022 *Final Integrated Water Quality and Assessment Report* by ADEC to the Environmental Protection Agency (EPA). However, the Lutak Dock is located between two ADEC listed Contaminated Sites under Active status; the Haines Sawmill, located approximately 790 m northwest of the project site and less than 100 m from the shoreline, and the U.S. Army Haines Petroleum, Oil and Lubricants (POL) Terminal, located approximately 855 m southeast of the project site and approximately 400 m from the shoreline[25]. Haines Sawmill is a large industrial site that still contains thousands of tons of waste materials, and derelict buildings and equipment; hazardous materials such as waste oils, lubricants, paints, antifreeze and water treatment chemicals are stored in insecure areas[26]. The U.S. Army Haines POL Terminal contains contaminated soil and groundwater from tank farm operations and sludge burial disposal practices[27]. These sources may potentially expose ESA listed species or their prey to contaminants or pollutants, which can migrate through ground or surface water, tidal currents, or wind currents. Adjacent to the proposed project, Delta Western's bulk facility and the Haines Ferry Terminal both have active stormwater discharge multi-sector general permits[28]. Haines Packing Company also currently has an active permit for seafood

[22] https://www.adfg.alaska.gov/FedAidPDFs/SP23-10.pdf, accessed 8/29/23.
[23] https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareasoutheast.main, accessed 8/29/23.
[24] https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1476418894.pdf, accessed 8/29/23.
[25] https://www.arcgis.com/apps/mapviewer/index.html?webmap=315240bfbaf84aa0b8272ad1cef3cad3, accessed 8/24/23
[26] https://dec.alaska.gov/water/water-quality/integrated-report/, accessed 8/17/23
[27] https://dec.alaska.gov/Applications/SPAR/PublicMVC/CSP/SiteReport/591, accessed 8/24/23
[28] https://dec.alaska.gov/Applications/Water/EDMS/nsite/map/results, accessed 11/13/23.

processing[29], which may introduce excess fish waste into the environment. Along the marine transit route, the most likely sources of pollution and contaminants are ballast water discharge and accidental spills of oil, fuel, and other materials from traversing vessels. Ships can potentially release pollutants and non-indigenous organisms through the discharge of ballast water. Marine organisms picked up in ship ballast water and released into non-native habitats are responsible for significant ecological and economic perturbations costing billions of dollars; this is a recognized worldwide problem. Discharges of wastes from vessels are regulated by the United States Coast Guard and, by law, no discharges of any kind are allowed within three miles of land. The Alaska Department of Fish and Game (ADFG) developed an Aquatic Nuisance Species Management Plan (Fay 2002) in order to protect Alaska's waters. The effects of discharged ballast water and the possible introduction of invasive species on humpback whales and Steller sea lions are unknown, but may include indirect ecosystem perturbations

Pollution into the marine environment from runoff, spills, or outfall pipes may compromise the microbiome of Sunflower sea stars leading to death, or making them vulnerable to other stressors (Aquino et al. 2021; McCracken et al. 2023)). Relative to SSWS, this is a minor threat that is limited in spatial and temporal scope. There is no direct evidence that this stressor is directly impacting Sunflower sea stars in the action area.

Increased vessel activity in the action area will temporarily increase the risk of accidental fuel and lubricant spills. Accidental spills may occur from a vessel leak or if the vessel runs aground. From 1995 to 2012, approximately 400 spills (100 to 300,000 gallons) occurred in Alaska's marine waters. Most were in nearshore and shallow coastal waters and were primarily diesel (BLM 2019).

5.7 Sea Star Wasting Syndrome

SSWS is the primary threat to Sunflower sea stars across their range. SSWS is thought to be exacerbated by warming ocean temperatures and other climate change related characteristics. A SSWS pandemic occurred across the range of the Sunflower sea star from 2013-2017. SSWS is known to occur in Sunflower sea stars and other species at smaller geographic and temporal scales, and is expected to occur in the future. The magnitude of future outbreaks is unknown. The pathogen that caused the 2013-2017 is also unknown. As stated previously, the draft 2022 Status Review Report for this species identified SSWS as the factor of greatest concern for the species throughout its range, including in the action area.

5.8 Overexploitation

Handling stress in sea stars is not well understood, but is not likely to be significantly impacting the species in the action area. Some individuals may be collected for curiosity by the public in the action area, but these numbers are expected to be small.

[29] https://dec.alaska.gov/eh/fss/active-permits/, accessed 11/13/23.

6 EFFECTS OF THE ACTION

"Effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR § 402.02).

This biological opinion relies on the best scientific and commercial information available. We try to note areas of uncertainty, or situations where data is not available. In analyzing the effects of the action, NMFS aims to minimize the likelihood of false negative conclusions (concluding that adverse effects are not likely when such effects are, in fact, likely to occur).

We organize our effects analysis using a stressor identification – exposure – response – risk assessment framework for the proposed activities.

We conclude this section with an *Integration and Synthesis of Effects* that integrates information presented in the *Status of the Species* and *Environmental Baseline* sections of this opinion with the results of our exposure and response analyses to estimate the probable risks the proposed action poses to endangered and threatened species.

NMFS identified and addressed all potential stressors; and considered all consequences of the proposed action, individually and cumulatively, in developing the analysis and conclusions in this opinion regarding the effects of the proposed action on ESA-listed species and designated critical habitat.

6.1 Project Stressors

Stressors are any physical, chemical or biological phenomena that can induce an adverse response. The effects section starts with identification of the stressors produced by the constituent parts of the proposed action.

Based on our review of the information available, the proposed dock replacement activities may cause these primary stressors:

1. Sound fields produced by impulsive and non-impulsive sound sources such as pile driving activities (vibratory pile driving, impact pile driving, and down-the-hole drilling), and produced by support vessels;
2. Risk of vessels striking marine mammals;
3. Seafloor disturbance and habitat alteration from pile installation or removal activities and fill placement;
4. Pollution from unauthorized spills; and
5. Direct contact to Sunflower sea stars: pile placement, handling/relocation, and smothering of Sunflower sea stars from fill placement.

6.1.1 Minor Stressors on ESA-Listed Species

Based on a review of available information, we determined the following stressors are minor stressors and are unlikely to result in take of Mexico DPS humpback whales, Western DPS Steller sea lions, and Sunflower sea stars.

6.1.1.1 Vessel Sound

As discussed in the Environmental Baseline section, Lutak Inlet experiences moderate levels of vessel traffic year-round, with a seasonal summer increase. Vessel traffic is primarily from recreation and transportation/freight vessels, including cruise ships, passenger ferries, charter and commercial fishing vessels, recreational vessels, tour boats, barges, and freight vessels. Lutak Dock is connected by the road system to many other areas of Alaska and Canada, which makes it an important hub for shipping goods and transporting passengers.

There may be a temporary, localized, and small increase in vessel traffic during construction. Two barges, one construction barge and one for materials, will be present during the in-water work. The construction barges will be secured in place by four mooring anchors and the material barges will be tied to the construction barges. Local barge movements to the next pile installation area will occur at a speed of less than two knots in approximately 100-ft increments. One 19-ft skiff will transport workers short distance from the shore to the barge work platform. The tugs transporting the barges from Seattle and Cordova to the project area will travel at slow speeds (maximum of eight knots) and follow well-established, frequently utilized navigation lanes. Vessel traffic is not expected to increase upon completion of Lutak Dock; the purpose of the project is to maintain existing facilities rather than expand facilities at the dock.

Vessel sound and presence can impact whales by causing behavioral disturbances, auditory interference, or non-auditory physical and physiological effects (e.g., vessel strike, stress). Based on a suite of studies of cetacean behavior due to vessel approaches, variables that determine whether marine mammals are likely to be disturbed by surface vessels include: the number of vessels, distance between the animal and the vessel, vessel speed and vector, and behavioral state of the animal (Au and Perryman 1982; Hewitt 1985; Bauer and Herman 1986; Corkeron 1995; Bejder et al. 1999; Au et al. 2000; Nowacek et al. 2001; David 2002; Magalhaes et al. 2002; Ng and Leung 2003; Goodwin and Cotton 2004; Bain et al. 2006; Bejder et al. 2006; Lusseau 2006; Richter et al. 2006; Lusseau and Bejder 2007).

Free-ranging marine mammals may habituate to, tolerate, or avoid surface vessels moving toward them (Wartzok et al. 2003). Animals have been observed reducing their visibility at the water's surface and moving horizontally away from the source of disturbance or adopting erratic swimming strategies (Williams et al. 2002; Lusseau 2003; Lusseau 2006). Animals' dive times increase, vocalizations and jumping decrease (with the exception of beaked whales), individuals in groups move closer together, and swimming speeds increase in response to vessels (Kruse 1991; Evans et al. 1994). Most animals in confined spaces, such as shallow bays, tend to move towards more open, deeper waters when vessels approach. This movement likely provides more opportunities to avoid or evade vessels as conditions dictate. It is unclear if these responses are caused by the physical presence of the vessel, the underwater sound generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004; Lusseau 2006). However, several authors suggest that the vessel sound is probably an important factor (Evans et al. 1992; Blane and Jaakson 1994; Evans et al. 1994).

Baleen whales vocalize at low frequencies over long distances, and masking is a concern as their communication frequencies overlap with anthropogenic sounds such as shipping traffic. Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects. For example, fin whales have reduced their calling rate in response to boat noise (Watkins 1986) and right whales have been observed changing vocal behavior due to shipping sound that caused an increase in overall background noise (Parks et al. 2011). Noises from ships and other anthropogenic activities in Cook Inlet area may cause a decrease or cessation of beluga vocalizations, or mask their vocalizations (Castellote et al. 2015). Beluga whale responses to vessel noise include changes in behavioral states (Richardson et al. 1995), changes in vocalizations (Lesage et al. 1999; Scheifele et al. 2005; Gervaise et al. 2012) and avoidance (Blane and Jaakson 1994; Erbe and Farmer 2000). Acoustic studies by Azzara et al. (2013) indicate that sperm whales reduce the number of clicks in response to approaching vessels. Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is unknown (Bauer and Herman 1986). Some studies have shown that humpback cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached, as compared to undisturbed whales (Morete et al. 2007).

Baleen whales may also exhibit behavioral changes in response to vessel sound. Marine mammals that have been disturbed by anthropogenic sound and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, suggesting an energetic cost to the affected animal. Humpback whales are especially responsive to fast moving vessels (Richardson et al. 1995), exhibiting aerial behaviors such as breaching or tail/flipper slapping (Jurasz and Jurasz 1979). In Hawaii, humpbacks responded to vessels at distances of 2 to 4 km (Baker et al. 1983); however, feeding humpbacks showed no reaction at distances beyond 800 m (Watkins 1981; Kreiger and Wing 1986). Despite the presence of vessels, temporarily disturbed whales often remain in the area (Baker et al. 1988; Baker et al. 1992).

Watkins (1981) found that fin whales appeared startled and increased their swimming speed to avoid approaching vessels. Responses were observed at distances of about 1 km (Edds and Macfarlane 1987). Fin whales stopped feeding and swam away when closely approached by inflatable vessels (Jahoda et al. 2003). These animals also had increases in blow rates and spent less time at the surface, suggesting increases in metabolic rates (Jahoda et al. 2003). All of these responses can manifest as a stress response in which the animal undergoes physiological changes with exposure to one or more stressors. Therefore, in addition to experiencing stress responses, behavioral and physiological events may be interrupted, and the animals' activity-time budget may be affected (Sapolsky 2000; Frid and Dill. 2002).

Potential impacts of vessel disturbance on Steller sea lions have not been well studied, and the responses will likely depend on the season and stage in the reproductive cycle (NMFS 2008a). The presence and movements of ships can cause disturbance to normal pinniped behaviors (Calkins and Pitcher 1982b; Kucey 2005; Jansen et al. 2006), and Steller sea lions could potentially abandon their preferred breeding habitats (also referred to as rookeries) in areas with high traffic (Kenyon and Rice 1961). Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles (NMFS 2008a). Pups are the age-class most vulnerable to disturbance from vessel traffic (NMFS 2008a). The effects of vessel presence on sea lions in open water is likely to be temporary and transient in nature as the vessel approaches and passes sea lions. Increases in ambient noise, however temporary, has the potential to mask communication between sea lions, and affect their ability to detect predators (Richardson and Malme 1993; Weilgart 2007a).

Project activity will temporarily increase vessel sound in Lutak Inlet and along barge transit routes during the duration of the proposed action. As is evident from past studies described above, humpback whale and Steller sea lion responses to vessel sound may include changes in behavioral states, changes in vocalizations, and/or temporary displacement from an area. Vessels in transit typically travel in a consistent and predictable direction and speed, essentially providing a gradually increasing signal of their approach. Consequently, we would not expect a startle response from any individual marine mammal. Individuals may exhibit deflection from the noise source, engage in low-level avoidance behavior, exhibit short-term vigilance behavior, or experience and respond to short-term acoustic masking behavior. These behaviors are expected to be very short in duration and not likely to result in significant disruption of normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering, resting or migrating.

Project barges will use established marine transit routes, and thus vessel noise is not a novel disturbance to marine mammals that occur along this route. The adherence to mitigation measures, such as maintaining watch for marine mammals while underway, reducing vessel speed in the vicinity of marine mammals, maintaining a defined distance from Steller sea lion haul-outs and rookeries, and avoiding direct approach to marine mammals, are expected to further reduce the potential for humpback whales and sea lions to react discernibly to transiting project-specific barges. While marine mammals are likely to be exposed to project vessel sound, the effects are expected to be too small to detect. Therefore, NMFS concludes that the effects of project-related vessel noise on Mexico DPS humpback whales and Western DPS Steller sea lions in the action area will be immeasurably small.

6.1.1.2 Vessel Strike

Vessels transiting the marine environment have the potential to collide with or strike marine mammals (Laist et al. 2001; Jensen and Silber 2004), resulting in serious injury or mortality to the animal. The probability of strike events depends on the frequency, speed, and route of the marine vessels, as well as distribution of marine mammals in the area. Laist et al. (2001) found that while all sizes and types of vessels can strike a whale, ships greater than 80 m and those going faster than 14 knots were most likely to cause severe or fatal injuries. Similarly, Vanderlaan and Taggart (2007) found that the chances of lethal injury to a large whale are greater than 50 percent at vessel speeds higher than 11.8 knots.

The project-related barges in this action have the potential to strike a marine mammal along any transit route. As stated in section 5, large whales, particularly humpback whales, are more likely to be struck than small cetaceans or pinnipeds. Between 1978 and 2011, there were 108 reports of whale-vessel collisions in Alaska waters (Neilson et al. 2012b). Among larger whales, humpback whales were the most frequent victims of ship strikes in Alaska, accounting for 86 percent of all reported collisions. Between 2000 and 2022, 88 vessel strikes (77 live strike, 11 carcasses) of humpback whales in Southeast Alaska were reported to the NMFS Alaska Regional Office Stranding Program (NMFS AKR unpublished data). Seven of the live strikes were reported in Lynn Canal, but there were no live strikes or vessel-struck carcasses documented in the project action area. Of the known vessels involved in the live strikes, the majority (42 percent) were classified as commercial/recreational (such as whale watching vessels or tour boats); the next most common vessels involved in a strike (27 percent) were classified as personal sport/recreational. Other vessels involved in vessel strikes of humpback whales included military (i.e., USCG cutters), commercial fishing, cruise ship, and State ferries.

The minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska for humpback whales between 2014 and 2018 was 2.9 whales (Muto et al. 2021). Most vessel collisions with humpbacks are reported from Southeast Alaska; however, there are also reports from the southcentral, Kodiak Island, and Prince William Sound areas of Alaska (Young et al. 2020). A humpback whale was discovered on the bulbous bow of a 710 ft container ship as it docked in the Port of Anchorage in 2001, and it is unknown where the vessel may have collided with the whale (NMFS Alaska Regional Office Unpublished Stranding data). The difference in ship strike rates between Southeast Alaska and other portions of the humpback whale range in Alaska may be due to differences in reporting, amount of vessel traffic, densities of animals, and/or other factors (Muto et al. 2021). Vessel strikes in Alaska account for a very small fraction of the humpback whale population within Alaska waters.

In Alaska, our data indicates that cetaceans are more frequently involved in vessel strikes than are pinnipeds, and this is consistent with data from other regions of high sea lion abundance (Barcenas-De La Cruz et al. 2018). There are two reported live vessel strikes of Steller sea lions between 2000-2022; one vessel involved in the strike was a fishing vessel traveling greater than 12 knots in Tracy Arm south of Juneau, and the other was an unclassified vessel in Sitka Sound (NMFS AKR unpublished vessel strike data). Additionally, two Steller sea lion carcasses confirmed as vessel strikes were reported in Sitka Sound in this same timeframe.

Although risk of vessel strike has not been identified as a significant concern for Steller sea lions, the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts) (NMFS 2008b). Numerous haul-outs and rookeries occur along proposed transit routes, and a seasonal haulout occurs at Taiya Point in the action area. Sea lions encountering vessels may be able to avoid vessel interactions due to their relatively small size and high degree of maneuverability.

The temporary increase in vessel traffic during the proposed action is considered minor in comparison to the routine vessel traffic currently present in the action area. Moreover, most of the vessel use will be localized to Lutak Inlet. In addition to the slow operational speeds of project vessels (8 knots or less), the mitigation measures in place to minimize exposure of marine mammals to vessel activities (speed restrictions, timing restrictions, and approach restrictions) further minimize harmful interactions between vessels and humpback whales and Steller sea lions in Alaska. Therefore, we consider vessel strike of Mexico DPS humpback whales or Western DPS Steller sea lions highly improbable.

6.1.1.3 Project-generated sound on Sunflower sea stars

Overall, there are significant data gaps regarding the effects of anthropogenic sound, such as vessel noise or pile driving noise, on aquatic invertebrates. Therefore, there is not existing criteria to assess adverse impacts of anthropogenic sound on Sunflower sea stars (Hawkins et al. 2015). However, sound appears to be important for some invertebrate species. The spatial dynamics of soundscapes in aquatic habitats can influence the spatial patterns of larval recruitment based on how some species navigate by acoustic cues within the environment (Hawkins 2015). For example, there is evidence that underwater sound is used by some pelagic larval invertebrates to orient themselves towards suitable settlement habitat, and some invertebrate species have been documented to show preference for habitats emanating specific frequency bands (Radford et al. 2010). For these species, anthropogenic noise may potentially mask biologically important acoustic features of the soundscape.

Invertebrate species that are most susceptible to anthropogenic sounds have yet to be identified; the most likely species are those that potentially detect the kinetic elements (particle motion) of sound, rather than sound pressure (Hawkins and Popper 2014). There are very few data on sound detection in aquatic invertebrates, but it is possible that several species are able to detect particle motion. A suite of studies reviewed in Hawkins and Popper (2017) indicate that many aquatic invertebrates use some type of hydrodynamic receptor to detect, localize, and identify prey, predators, or conspecifics. Sunflower sea stars, like other members of the class Asteroidea, rely on chemosensation throughout their life history (Motti et al. 2018). Through their chemosensory capabilities, they detect and hunt prey, deter predators, form spawning aggregations, synchronize gamete release, and identify suitable habitat for larval settlement (Motti et al. 2018). Therefore, because life history as well as physiological and behavioral processes in Sunflower sea stars are mediated by chemical stimuli, project-generated sound is not expected to impact Sunflower sea stars in any measurable way.

6.1.1.4 Disturbance to seafloor and alteration of habitat

Habitat disturbance

A temporary and localized increase in turbidity near the seafloor will occur in the immediate area surrounding the dock during the placement of in-water fill and during in-water pile installation activities. The project also involves the placement of a small amount of riprap fill to protect the shoreline alongside the dock, which will induce temporary increases in turbidity near the shoreline work area. A portion of the in-water work will involve DTH drilling which will also release drill cuttings (seafloor) into the marine environment from the top of the piles and increase turbidity in the immediate area during pile driving. Turbidity impacts will be minimized during DTH drilling through use of a sediment curtain to trap released drill cuttings and contain them in the immediate area to prevent dispersal. Furthermore, turbidity plumes during pile installation and removal will be localized around the pile; turbidity associated with pile installation is localized to about a 7.6 m radius around the pile (Everitt et al. 1980). In addition, while an increase in turbidity may temporarily reduce the water quality of the habitat, the area near Lutak Dock is already turbid due to glacial sediment outfall from Chilkoot Lake and Ferebee River (Solstice 2023). Taking these factors into consideration, we do not expect any adverse effects to habitat as a result of project-related turbidity to be detectable. Humpback whales are not expected to be close enough to the pile driving areas to experience the effects of turbidity, and Steller sea lions can easily avoid localized areas of turbidity at no measurable cost to them. Local currents are expected to disperse any additional suspended sediments produced by project activities at moderate to rapid rates depending on tidal stage. Due to temporary, localized, and low levels of turbidity increases, we expect any effects from turbidity to the Mexico DPS humpback whale or the Western DPS Steller sea lion to be minor or undetectable.

The proposed activities may permanently alter or destroy habitat, but project activities are not expected to modify the habitat in such a way that marine mammals cannot reoccupy the area upon project completion. The project purpose is to replace an existing dock, and the new dock will have a minor increase in overall footprint due to a new combi-wall system that will encapsulate the existing structure, as well as added shoreline rip-rap extents that will modify the current shoreline. However, these minor habitat alterations are not expected to affect Mexico DPS humpback whales or Western DPS Steller sea lions in any discernible way. The footprint of the replacement dock is relatively small compared to the available habitat in Lutak Inlet. The dock replacement footprint does not include any biologically important areas or other habitat of known importance. Furthermore, the project footprint does not obstruct movements or migration of any marine mammals. Therefore, we conclude that project-related effects to marine mammal habitat will be immeasurably small.

Construction activities may increase turbidity in some areas that overlap with Sunflower sea stars, particularly in shallow regions. Sedimentation can disrupt feeding and respiration in some invertebrates, although glacial-associated sea star species appear to tolerate it (Newcombe and MacDonald 1991). Sunflower sea stars live in naturally harsh and sometimes turbid environments, including areas with high sedimentation and stratification such as shallow coastal waters and near glacial outfall streams. Konar et al. (2019) found the highest abundance of Sunflower sea stars in regions with tidewater glaciers compared to other sites, and past studies have documented a positive correlation with Sunflower sea star size and wave exposure (fetch), with many animals residing in exposed areas (Shivji et al. 1983). Because any turbidity caused by the proposed action will be minimal and short-lived relative to natural habitat conditions experienced by Sunflower sea stars, any effects from construction-related turbidity on Sunflower sea stars is expected to be immeasurably small.

Disturbance to prey resources

Prey species may be affected by noise from in-water work. Construction activities will produce non-impulsive (i.e., vibratory pile installation and removal and DTH drilling) and impulsive (i.e., impact pile driving and DTH drilling) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies related to large, multiyear bridge construction projects (Scholik and Yan 2001; Scholik and Yan 2002; Popper and Hastings 2009). Impulsive sounds at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson et al. 1992; Skalski et al. 1992). SPLs of sufficient strength may cause injury to fish or fish mortality (CalTrans 2020).

The most likely impact to fish from pile driving and drilling activities at the project area will be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving ceases is unknown, but a rapid return to normal recruitment, distribution, and behavior is expected. In general, impacts to marine mammal prey species are expected to be minor and temporary given the small area of pile driving relative to known feeding areas of listed marine mammals. We expect fish will be capable of moving away from project activities to avoid exposure to noise. We expect the area in which stress, injury, TTS, or changes in balance of prey species may occur will be limited to a few meters directly around the pile driving and DTH drilling operations. We consider potential adverse impacts to prey resources from construction activities in the action area to be immeasurably small.

6.1.1.5 Pollution from Small Spills

Effects on cetaceans and pinnipeds

There is risk of small spills associated with the project barges during any of the proposed transits and while at the construction site. The effects of oil are determined by its chemical properties, such as molecular weight and solubility. Some compounds (typically the lower molecular weight substances) are acutely toxic, yet exhibit rapid dissipation and removal from the environment. Other forms of oil, such as tar or weathered oil, are less toxic but persist in the environment (Neff 1990). It is also possible for some fractions of oil, such as aromatic hydrocarbons, to interact synergistically (Rice et al. 1983).

Oil spills can affect marine mammals through various direct and indirect pathways. Direct pathways include inhalation, ingestion, and dermal contact/absorption, each of which can trigger a variety of physiological responses with potential consequences for health and long-term survival and/or reproduction (Helm et al. 2015). Inhalation of volatile, highly toxic aromatic compounds of oil poses the greatest acute health threat due to severe damage to the respiratory system. Ingestion of oil through grooming or consumption of contaminated prey has been documented to damage internal organs and organ systems (Engelhardt 1983; Helm et al. 2015). Contact exposure can cause temporary damage of the mucous membranes, eyes, or epidermis (Hansen 1985; Geraci 1990; St. Aubin 1990), and other external soft tissue areas (Helm et al. 2015). External oiling may interfere with thermoregulation for species that rely on fur for insulation, which can lead to life-threatening hypothermia (Helm et al. 2015, Engelhardt 1983). Indirect pathways are effects associated with contamination that results in alterations in marine food webs, which may result in reductions in prey availability, injury to prey, or increases in predation (Helm et al. 2015).

In a review of the effects of oil spills on marine mammals, Helm et al. (2015) stated that for pinnipeds that rely primarily on blubber for insulation, such as Steller sea lions, external oiling does not significantly disrupt their ability to maintain core body temperature. Similarly, St Aubin (1990) stated that pinnipeds other than fur seals are less threatened by the thermal effects of oil-fouled fur, if they are thermally affected at all. This is supported by Kooyman et al. (1976) who showed that oil has no effect on the relatively poor insulative capacity of the pelts of sea lions, bearded seals, and ringed seals. However, heavy oiling may result in death by smothering or interfere with an animal's capability to swim, resulting in drowning (St. Aubin 1990). Other studies on the toxicological effects of oil on pinnipeds described in St. Aubin (1990) demonstrated changes in respiratory epithelium consistent with inhalation of toxic fumes. In addition to respiratory surfaces, the eyes, oral cavity, and anal and urogenital orifices were found to be especially sensitive to prolonged contact with oil. Studies in which phocid seals were fed small doses of oil showed pathological changes in liver and kidney function after oil ingestion, however it was concluded that phocid seals can tolerate small quantities of ingested oil overall. Behavioral studies indicated that while pinnipeds are able to detect oil through vision and/or sense of smell, they do not show a strong avoidance response (St. Aubin 1990). Furthermore, animals may show irritation, annoyance, or distress from oil, but an animal's need to remain in an area for food, shelter, or other biological requirements overrides any avoidance behaviors to oil (Vos et al. 2003). Therefore, pinnipeds are likely to come into contact with oil if it enters their habitat, and they may be at an increased risk should an oil spill occur near a breeding colony, haul-out, or important foraging area.

Cetaceans can be exposed to oil through direct contact with the skin, eyes, mouth, and blowhole, inhalation of volatile fumes at the surface of the water, or ingestion of contaminated prey or water during feeding events. Unlike furbearing seals and sea lions, cetaceans are not at risk of uncontrolled heat loss through oiled-skin. They lack hair or fur and are constantly sloughing skin cells; oil does not readily adhere to cetacean bodies and thus does not compromise insulation (Helm et al. 2015). Additionally, studies detailed in Geraci et al. (1990) showed that cetacean skin is nearly impermeable to oil owing to tight intercellular bridges and the unusual thickness of their epidermis, even when the skin is compromised by an injury such as an open wound. Several studies referenced in a review by Helm et al. (2015) suggest that the inhalation of volatile toxic fractions at the air-water interface is the most concerning threat to cetaceans, rather than exposure through ingestion or absorption through the skin. Inhalation of toxic vapors may lead to inflammation of mucous membranes, lung congestion, and ultimately pneumonia (Hansen 1985)(Hansen et al. 1985). Toxicants that are inhaled can accumulate in blood and other tissues, leading to liver damage and other physiological malfunctions (Geraci et al. 1990). Evidence for adverse health effects of oil exposure is supported by comparison health assessments between dolphins affected by the Deepwater Horizon oil spill to dolphins from non-oiled sites; dolphins in oil-affected areas had low hormone and blood sugar levels, were underweight, and showed signs of liver and/or lung damage (Schwacke et al. 2014).

When oil is released at the surface, it spreads out horizontally creating a slick. Larger droplets have the potential to coalesce and concentrate at the surface. While all marine mammals spend considerable time at the surface for feeding, breathing, swimming, or resting, baleen whales may be particularly at risk to oil exposure via ingestion due to their feeding strategies. They display a variety of surface feeding patterns, such as bubble net feeding and lunge feeding by humpback whales, that have a greater potential for ingesting oil when filtering large quantities of water (Helm et al. 2015). Heavy oil fouling of baleen plates may also interfere with feeding efficiency (Geraci 1990). A variety of cetacean species can visually detect oil, and toothed whales have been documented to avoid it visually and through echolocation capabilities. There is also some evidence to suggest that both toothed and baleen whales may be able to detect oil via cutaneous signals and therefore avoid it (Helm et al. 2015, Geraci 1990). However, species with restricted ranges or specific habitat requirements may experience prolonged exposure to oil if they are not able to shift their ranges to avoid a spill. Similarly, cetaceans with limited diets or that take advantage of seasonally abundant or geographically restricted prey resources (such as humpback whales) may be disproportionately affected by an overlapping oil spill. Thus, critical habitat that represents important feeding areas or other biologically important areas are of greater concern for oil spill.

Effects on Sunflower sea stars

Despite comprising the majority of marine organisms, little information exists regarding the impact of oil spills on invertebrate species, including Sunflower sea stars. Sensitivity to oil depends on numerous biological and environmental variables (e.g., salinity, temperature), and there can be pronounced differences in sensitivity between different life stages of a single species (Rice et al. 1983). Additionally, it is possible to have a dual response of toxicity and organic enrichment in benthic invertebrate communities, where some species consistently show patterns of depression (e.g., amphipods), while other species that are more stress-tolerant and opportunistic show patterns of enhancement (e.g., polychaetes) (Jewett et al. 1999). Some studies have documented lethal and sub-lethal effects such as physiological and behavioral changes, as well as reduced immunity and overall health in some species (Yuewen and Adzigbli 2018). For sea stars, laboratory studies on *Evasterias troschelli*, for example, showed that daily feeding rates decreased with increasing concentrations of water soluble fractions of Cook Inlet crude oil, and animals exposed to concentrations ≥ 0.20 ppm had significantly slower growth rates than control groups (Rice et al. 1983).

Heavier fractions of oil sink and eventually deposit in sediments on the benthos where they can persist for extended periods of time (Neff 1990). Additionally, benthic invertebrates, particularly bivalves, accumulate and retain higher concentrations of petroleum hydrocarbons than other taxa (Neff 1990). Therefore, Sunflower sea stars may be exposed to spilled petroleum products by direct contact/coating of body surfaces or through the ingestion of contaminated prey. Because they have well-developed chemosensory capabilities, Sunflower sea stars may be able to detect and avoid areas of contamination through chemical stimuli. Additionally, as habitat generalists known to occupy a variety of depths and substrate types, Sunflower sea stars may be able move out of a spill site to higher quality habitat, depending on the magnitude and type of spill.

Based on post-EVOS studies by Edds-Walton (1997); Lee and Page (1997), dilution and weathering prevents highly toxic fractions of oil to enter the subtidal environment, biological effects of oil in subtidal regions following a large spill are short in duration and recovery back to normal conditions is expected to be rapid. Therefore, subtidal regions where Sunflower sea stars are most commonly found are not expected to remain in contaminated conditions in the long-term.

Small Spill Conclusions

While large oil spills have the potential to be high-impact events with severe consequences, we consider it highly unlikely for an oil spill to occur during project-related vessel transits and while at the construction site. Based on data from ADEC and the expected type and volume of petroleum products to occur on project barges (previously discussed in section 4.1.1), we conclude that in the unlikely event that a spill does occur, it is highly improbable to be a large spill. In the occurrence of a small spill, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products dissipate from the environment quickly via evaporation to unharmful concentrations, therefore

Mexico DPS humpback whales, Western DPS Steller sea lions, and Sunflower sea stars are not expected to experience prolonged exposure to toxic fumes, and/or ingest large amounts of oil, and thus we do not expect injury or mortality as a result. The probability of contamination occurring due to project activities is very low, and resulting effects are expected to be immeasurably small. We therefore conclude effects of small spills to Sunflower sea stars, humpback whales, and Steller sea lions are both improbable and minor.

6.1.2 Major Stressors on ESA-Listed Species

The following sections analyze the stressors likely to adversely affect ESA listed species. The major stressor likely to adversely affect Mexico DPS humpback whales and Western DPS Steller sea lions is underwater anthropogenic sound. The major stressors likely to adversely affect Sunflower sea stars are direct contact (i.e., pile placement and handling for the purpose of relocation) and smothering via fill placement.

6.1.2.1 Underwater Sound

Construction activities will produce non-impulsive (i.e., vibratory pile installation and removal and DTH drilling) and impulsive (i.e., impact pile driving and DTH drilling) sounds into the environment. Below, we provide a brief explanation of the sound measurements and acoustic thresholds used in the discussions of acoustic effects in this opinion.

6.1.2.2 Acoustic Thresholds

As discussed in Section 2, Description of the Proposed Action, TMC plans to use impact, vibratory, and DTH pile removal/installation methods for the replacement of Lutak dock. Pile driving activities could create sounds loud enough to cause disturbance and acoustic injury to Mexico DPS humpback whales and Western DPS Steller sea lions.

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater and in-air sounds that might result in impacts to marine mammals (70 FR 1871, 1872; January 11, 2005). NMFS has developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary thresholds shifts (PTS and TTS) (83 FR 28824; June 21, 2018; 81 FR 51693; August 4, 2016). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels,[30] expressed in root mean square[31] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA) (16 U.S.C § 1362(18)(A)(ii)):

- impulsive sound: 160 dB_{rms} re 1 µPa

[30] Sound pressure is the sound force per unit micropascals (µPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 µPa, and the units for underwater sound pressure levels are decibels (dB) re 1 µPa.
[31] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

- non-impulsive sound: 120 dB_{rms} re 1µPa

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds (Table 10) for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (16 U.S.C § 1362(18)(A)(i)) (NMFS 2018). Different thresholds and auditory weighting functions are provided for different marine mammal hearing groups, which are defined in the Technical Guidance (NMFS 2018). The generalized hearing range for each hearing group is in Table 9.

Table 9. Hearing groups of listed marine mammals expected in the project area (NMFS 2018).

Hearing Group	ESA-listed Marine Mammals In the Project Area	Generalized Hearing Range[1]
Low-frequency (LF) cetaceans *(Baleen whales)*	Humpback whales	7 Hz to 35 kHz
Otariid pinnipeds (OW) *(sea lions and fur seals)*	Steller sea lions	60 Hz to 39 kHz

[1]Respresents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 db threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds and L_E for non-impulsive sounds.

Level A harassment radii can be calculated using the optional user spreadsheet[32] associated with NMFS Acoustic Guidance, or through modeling.

[32] The Optional User Spreadsheet can be downloaded from the following website: http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm

Table 10. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2018).

Hearing Group	PTS Onset Acoustic Thresholds[1] (Received Level)	
	Impulsive	**Non-impulsive**
Low-Frequency (LF) Cetaceans	$L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

[1] Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa^2s. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]" (16 U.S.C. § 1362(18)(A)).

While the ESA does not define "harass," NMFS issued guidance interpreting the term "harass" under the ESA as to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). Exposure to sound capable of causing Level A or Level B harassment under the MMPA often, but not always constitutes take under the ESA. For the purposes of this consultation, we have determined pile driving activities have sound source levels capable of causing take under the MMPA and ESA.

6.1.2.3 Direct contact to Sunflower sea stars: pile placement, handling/relocation, and smothering of Sunflower sea stars from fill placement

New permanent and temporary pilings will come in contact with the benthic environment. Additionally, marine invertebrates, such as mussels and barnacles, have likely settled and grown on the pilings that will be removed as part of the action description. These are prey items for Sunflower sea stars, and it is possible that a few individual Sunflower sea stars will be attached onto the pilings prior to pile removal activities, and direct contact may occur in order to remove them from pilings brought out of the water.

Pile driving may interact with Sunflower sea stars on the sea floor. Pilings could potentially come in contact with sea stars during pile placement, causing injury to Sunflower sea stars.

Sunflower sea stars could also be affected by fill activities associated with this project. Approximately 27,848 cubic yards (covering 165,465 square feet of habitat) will be placed both inside the combi wall to encapsulate the existing closed cell sheet piles and construct the new dock, and along the sides of the dock as bank stabilization. Sunflower sea stars may be moved/handled prior to placement of fill, or they may be inadvertently smothered by fill. Fill activities have the potential to directly impact (e.g., harm, wound, kill, collect) Sunflower sea stars, as well as disturb Sunflower sea star habitat.

6.2 Exposure Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and sex of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent.

As discussed in Section 2.1.2 above, MARAD proposed mitigation measures that should avoid or minimize exposure of Mexico DPS humpback whales, Western DPS Steller sea lions, and Sunflower sea stars to one or more stressors from the proposed action.

NMFS expects that Mexico DPS humpback whales and WDPS Steller sea lions will be exposed to underwater sound from pile installation and removal activities.

6.2.1 Ensonified Area

This section describes the operational and environmental parameters of each construction activity that allow NMFS to estimate the area ensonified above the acoustic thresholds, based on only a single construction activity occurring at a time, as proposed by TMC.

The sound field in the action area is the existing background noise plus additional construction noise from the proposed project. Marine mammals may be affected via sound generated by the primary components of the project (i.e., vibratory pile installation and removal, impact pile driving, and DTH drilling). NMFS used acoustic monitoring data from other locations to develop the source levels used to calculate distances to the Level A and Level B harassment thresholds for different sizes of piles and installation/removal methods. The values used and the source from which they were derived are summarized in Table 11.

NMFS developed a spreadsheet tool[33] to help implement the 2018 Technical Guidance (NMFS 2018c) that incorporates the duration of an activity into the estimation of a distance to the Level A isopleth. This estimation can then be used in conjunction with marine mammal density or occurrence to help predict exposures. NMFS notes that because of some of the assumptions included in the methods used for these tools, the isopleths estimated may be overestimates, and the resulting estimate of Level A harassment almost certainly overestimates the number of marine mammals that actually experience PTS if they should cross the Level A isopleth for fairly brief amounts of time. However, these tools offer the best available way to conservatively predict appropriate isopleths until more sophisticated modeling methods are widely available. NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as impact driving, vibratory driving, and DTH drilling, the NMFS User Spreadsheet predicts the distance at which a marine mammal would incur PTS if it remained at that distance for the duration of the activity.

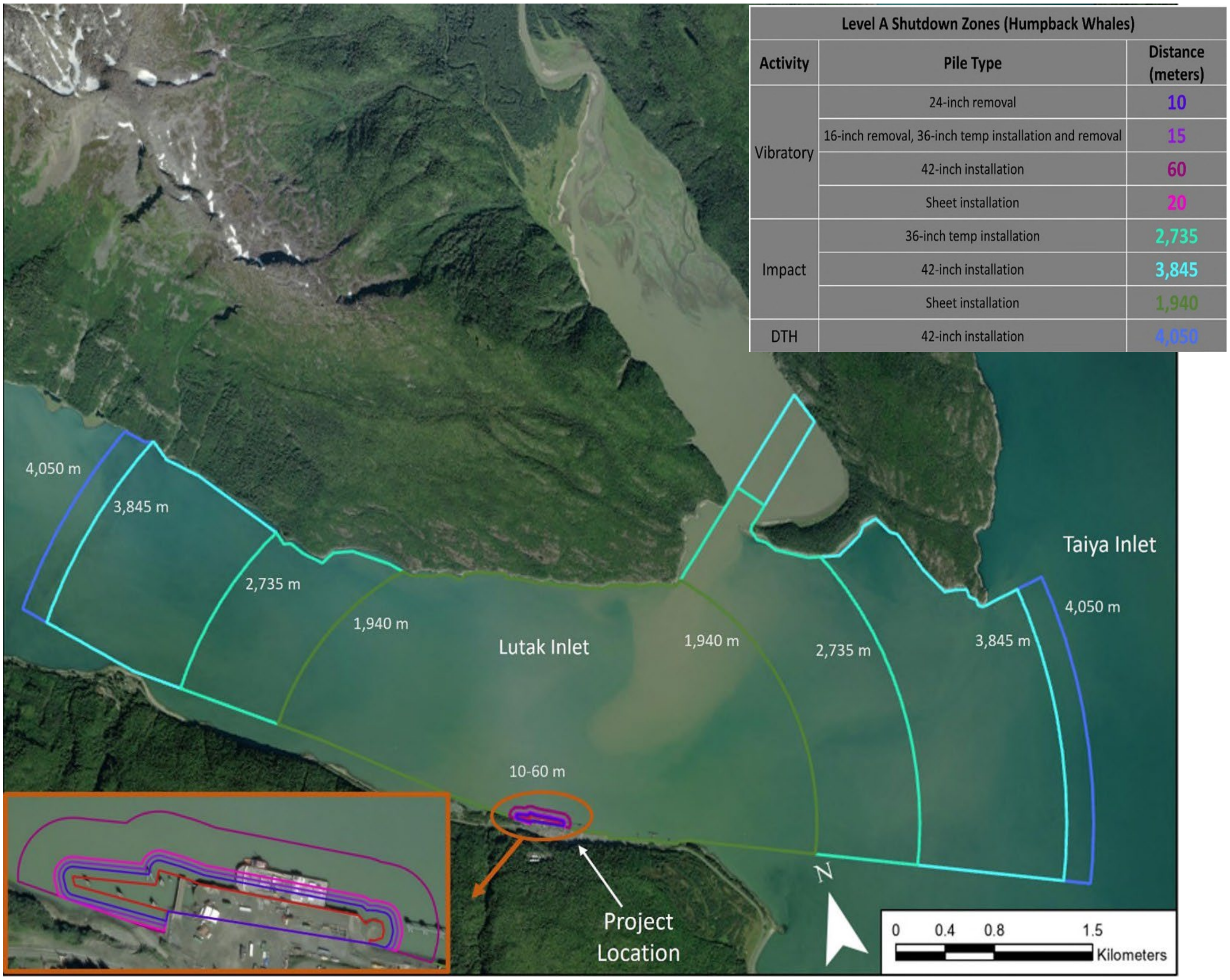
Inputs used in the User Spreadsheet are shown in Table 9 and Table 10, and the resulting Level A isopleths are shown in Table 4 (section 2.1.2); proposed corresponding shutdown zones are shown in Figure 22 and Figure 23. Level A harassment thresholds for impulsive sound sources are defined for both cumulative sound exposure levels (SELcum) and peak sound pressure level (SPLpk), with the threshold that results in the largest modeled isopleth for each marine mammal hearing group used to establish the Level A harassment isopleth.

[33] NMFS User Spreadsheet Tool, version 2.2 (updated December 2020), available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance, accessed February 25, 2023.

Table 11. Sound source levels for each proposed activity.

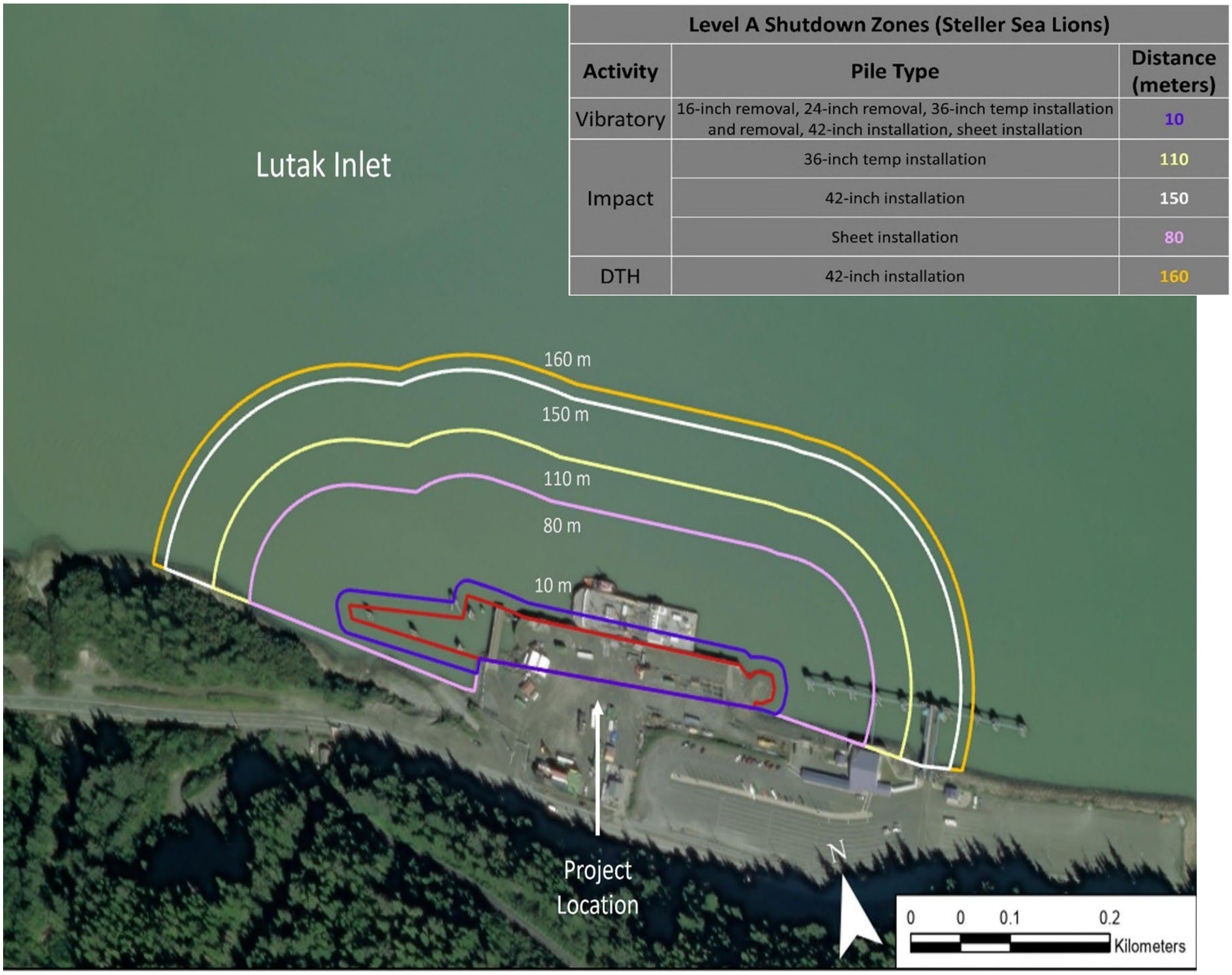
Method and Pile Type	Sound Source Level at 10 meters			Literature Source
Vibratory Hammer	**dB rms**			
16-inch steel piles	161			NAVFAC 2015
24-inch steel pile	161			NAVFAC 2015
36-inch steel piles	166			NAVFAC 2015
42-inch steel piles	170			NAVFAC 2015, Reyff and Heyvaert 2019
55.5-inch steel sheet piles	162			Caltrans 2020
Down-The-Hole Drill	**dB rms**	**dB SEL**	**dB peak**	
42-inch steel piles	174	164	194	NMFS 2022[34]
Impact Hammer	**dB rms**	**dB SEL**	**dB peak**	
36-inch steel piles	192	184	211	NAVFAC 2015
42-inch steel piles	192	184	211	NAVFAC 2015
55.5-inch steel sheet piles	190	180	205	NMFS 2023[35]

[34,31] Per discussion with PR1.



Level A Shutdown Zones (Humpback Whales)		
Activity	Pile Type	Distance (meters)
Vibratory	24-inch removal	10
	16-inch removal, 36-inch temp installation and removal	15
	42-inch installation	60
	Sheet installation	20
Impact	36-inch temp installation	2,735
	42-inch installation	3,845
	Sheet installation	1,940
DTH	42-inch installation	4,050

Figure 22. Proposed level A shutdown zones for humpback whales.



Level A Shutdown Zones (Steller Sea Lions)		
Activity	Pile Type	Distance (meters)
Vibratory	16-inch removal, 24-inch removal, 36-inch temp installation and removal, 42-inch installation, sheet installation	10
Impact	36-inch temp installation	110
	42-inch installation	150
	Sheet installation	80
DTH	42-inch installation	160

Figure 23. Proposed level A shutdown zones for Steller sea lions.

NMFS recommends treating DTH systems as both impulsive and continuous, non-impulsive sound source types simultaneously. Thus, impulsive thresholds are used to evaluate Level A harassment, and continuous thresholds are used to evaluate Level B harassment. With regards to DTH mono-hammers, NMFS recommends proxy levels for Level A harassment based on available data regarding DTH systems of similar sized piles and holes (Denes et al. 2019; Reyff and Heyvaert 2019; Guan and Miner 2020; Reyff et al. 2020; Heyvaert and Reyff 2021).

Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic sound exposure is also informed to varying degrees by other factors related to the source (e.g., frequency, predictability, duty cycle), the environment (e.g., bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall et al. 2007; Ellison et al. 2012). Based on the available science and the practical need to use a threshold that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic sound above received levels of 120 dB re 1 μPa rms for non-impulsive sources (e.g., vibratory pile-driving) and above 160 dB re 1 μPa rms for non-explosive impulsive (e.g., impact pile-driving) or intermittent sources.

The proposed construction activity for the Lutak Dock Replacement project includes the use of non-impulsive and impulsive sources, and therefore the 120 and 160 dB re 1 μPa rms thresholds for Level B behavioral harassment are applicable.

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$$TL = B * \text{Log10}\ (R1/R2), \text{ where}$$

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement

When site-specific transmission loss measurements are not available, the recommended TL coefficient for most nearshore environments is the default practical spreading loss coefficient of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for the proposed activities.

Using the practical spreading model, the underwater sound was determined to fall below the Level B threshold of 120 dB rms for marine mammals at a maximum radial distance of 39,811 m for DTH drilling of 42-inch piles. The geography of Lutak Inlet, however, obstructs underwater sound transmission and the maximum Level B harassment zone for the project is truncated to 7,000 m (Figure 5). Sound will also not reach the full distance of the Level B harassment isopleth for vibratory pile installation of 36-inch and 42-inch piles due to the land mass structure of Lutak Inlet. Other pile driving activities, (i.e., impact pile driving and vibratory pile installation and removal of all smaller piles plus 55-inch sheet piles), have smaller Level B harassment zones. In some instances, level A isopleths are larger than level B isopleths for low frequency cetaceans (i.e., humpback whales). For those activities, the level A shutdown isopleth is shown for level B monitoring zones (Figure 24). All Level B harassment monitoring zones are reported in Table 5 (section 2.1.2).

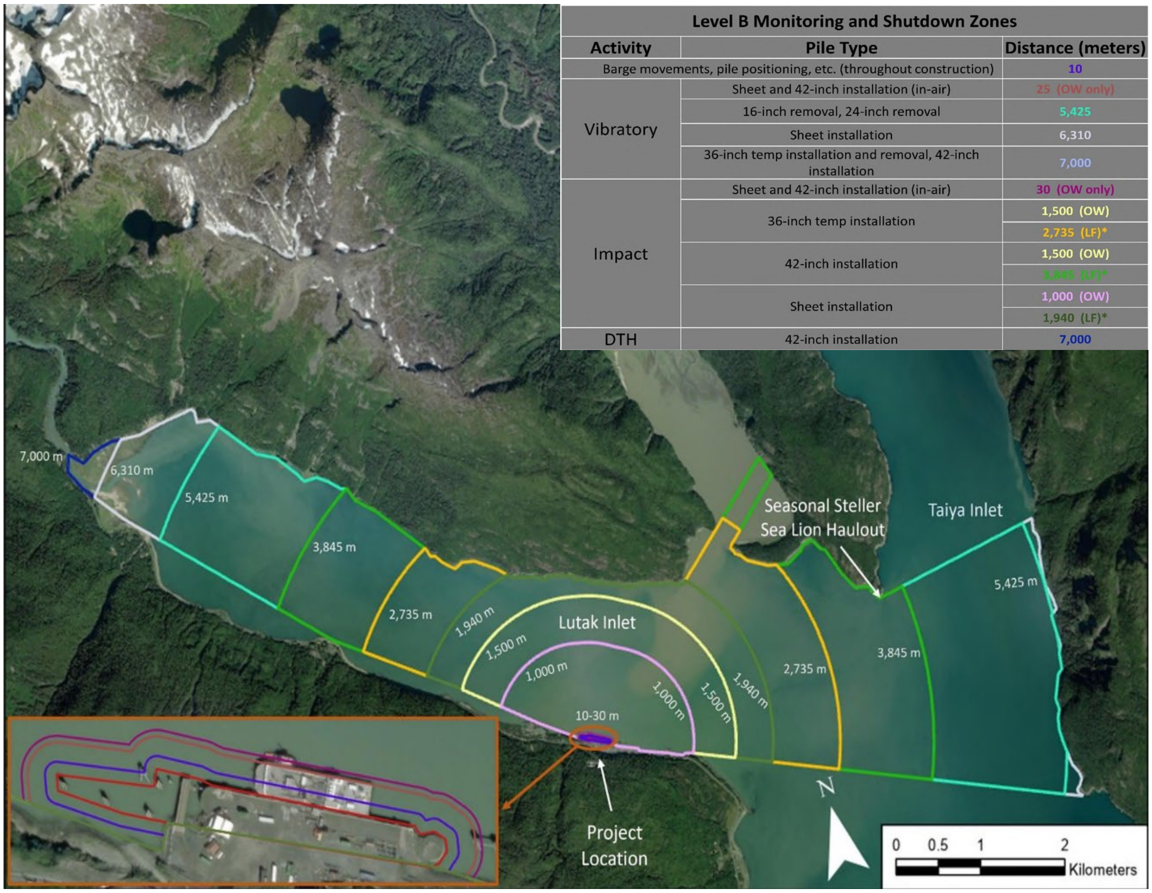


Figure 24. Proposed level B monitoring zones. Some level A isopleths are larger than level B isopleths for low frequency cetaceans (i.e., humpback whales). For those activities, the level A shutdown isopleth is shown for level B monitoring zones and marked with an asterisk. LF = low frequency cetaceans (humpback whales); OW = otariid pinnipeds (Steller sea lions).

6.2.2 Marine Mammal Occurrence and Exposure Estimates

Western DPS Steller sea lions

Steller sea lions occur year-round and are distributed throughout Southeast Alaska, with patterns correlated to seasonally pulsed resources, such as aggregations of spawning and migrating prey species (Sinclair and Zeppelin 2002; Sinclair et al. 2013). Therefore, seasonal variation in prey species will influence Steller sea lion occurrence in Lutak Inlet and thus exposure to the action.

Steller sea lions target high forage value areas such as those with access to anadromous streams. Lutak Inlet has several anadromous streams that support salmon species[36], as well as several eulachon spawning sites (Womble et al. 2005). In Southeast Alaska, eulachon spawn from mid-march to May. Salmon species that return to spawning rivers and streams via Lutak Inlet occur from June through October. Generally, in the summer months haul-outs and rookeries are heavily occupied, with hundreds of individuals documented (Sweeney et al. 2017). Pacific

[36] https://adfg.maps.arcgis.com/apps/MapSeries/index.html?appid=a05883caa7ef4f7ba17c99274f2c198f, accessed 11/13/23

herring are also a primary prey species for Steller sea lions. Proximity to herring spawning sites does not significantly drive Steller sea lion distribution in Southeast Alaska to the extent spring eulachon spawning does, and it is suggested that herring is a more important prey item in the fall and winter seasons (Womble et al. 2005). Herring spawning aggregations occur primarily in lower Lynn Canal and Southern Southeast Alaska, and therefore Steller sea lions may be less common in Lutak Inlet during these months.

Based on reports from a local charter company that operates from May through September in the Haines area, Steller sea lions are seen primarily at Gran Point haul-out and not often in Lutak Inlet (SolsticeAK 2023); there are no haul-outs or rookeries associated with critical habitat in Lutak Inlet. During monthly surveys of Steller sea lion haul-outs and rookeries between March 2001 through December 2002, Gran Point was determined to be a year-round haul-out with peak haul-out numbers in spring of both years. Counts in Lutak Inlet reached a maximum of 506 sea lions in April 2002 in association with spring eulachon spawning (Womble et al. 2005). Additionally, recent monitoring efforts estimate 25 to 40 Steller sea lions use Taiya Point (approximately 3.8 km northeast of the project site) as a seasonal haul-out during the spring eulachon run (Eco49 2019), during which they frequent Lutak Inlet. Womble et al. (2005) also stated that sea lions frequently rest in large rafts in the water near eulachon spawning sites. This is consistent with other monitoring activities in nearby Taiya Inlet (Steller sea lions have to transit through the action area to get to Taiya Inlet); marine mammal monitoring during in-water dolphin installation at the WP&YR Railroad Dock in Skagway reported 165 individual Steller sea lions during work from March-May (WP&YR 2019). During in-water work for construction of the AML RoRo ramp in November 2020, a total of 2 individual Steller sea lions were observed (Tom Mortensen Associates 2021).

Mexico DPS humpback whales

In Lynn Canal and Lutak Inlet, humpback whales are traditionally observed during seasons of high prey concentration, May through September (Witteveen et al. 2011). Feeding humpback whale presence in Southeast Alaska has also been correlated closely with peak herring abundance, which occurs in the late fall and early winter. Many areas in Southeast Alaska, including most of Lynn Canal, are identified as a biologically important area for humpback whales[37]. Some whales remain longer in northern waters, presumably to maximize food consumption prior to migrating south to relatively unproductive breeding grounds in the winter, and a few may skip migration altogether (Straley et al. 2018). Therefore, humpbacks may be present year-round in Lutak Inlet, but are less common during the late winter and early spring. Variable group size is expected depending on season; based on communication with a local charter captain, a group size of two (1-2 individuals sighted 4-6 times per week during the summer) is typical from May to September, and a group size of one is typical during the rest of the year. Humpback whales are observed less frequently from October to April near Lutak Inlet, and group sizes during this time in the Lynn Canal area can range from 1-2 individuals (Solstice 2023). No humpback whales were observed in Lutak Inlet during monitoring for the Lutak Dock RoRo Modification Project in November 2020 (Tom Mortensen Associates, LLC 2021). Two humpback whales were observed in Taiya Inlet during in-water dolphin installation at the WP&YR Railroad Dock in Skagway March through May 2019 (humpback whales have to transit

[37] https://cetsound.noaa.gov/biologically-important-area-map, accessed 10/13/23.

through the proposed action area to get to Taiya Inlet)(WP&YR 2019).

As described below, we anticipate that exposures to listed marine mammals from sound associated with the proposed action may result in disturbance (Level B harassment) and potential injury. However, with the addition of mitigation measures, no mortalities or permanent impairment to hearing are anticipated.
Exposure estimates were calculated using the acoustic harassment thresholds, ensonified area, and marine mammal density information provided above.

Level A and level B exposure calculations

Exposure estimates for each species considers the following:

1) acoustic thresholds above which NMFS believes marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment;
2) the size of the action area (the area of water that will be ensonified above acoustic thresholds in a day);
3) the density or occurrence of marine mammals in the action area; and
4) the number of days of pile driving and removal activity.

Consultation with a local tour company, IHAs from previous marine construction projects in the Lutak Inlet area, and available scientific literature and reports were used to estimate the occurrence of marine mammals in the action area. Incidental take may occur for each listed species that occurs in the action area.

Occurrence estimates are based on historic data of occurrence, seasonality, and group size in the Lynn Canal region. For total take estimate, the daily occurrence probability for a species was multiplied by the estimated group size and by the number of days of each type of pile driving activity. Group size is based on the best available published research and local knowledge for these species and their presence in this area. Estimates for Steller sea lions factor in larger group sizes during pile driving activities that produce sound that would reach the Taiya Point seasonal haulout during approximately 2.5 months (mid-March through May); estimates for humpback whales factor in different group sizes and occurrence based on available information about seasonal abundance in the region.

Using the daily occurrence estimates for a species, we multiplied by the estimated group size and by the number of days of each type of pile driving activity for total exposure estimate (Table 12, Table 13, and Table 14).

Estimated Exposure = Group size x groups per day x days of pile driving activity

Table 12. Level A exposure estimates for Western and Eastern DPS Steller sea lions.

Steller Sea Lion	Common	Year-round	Level A threshold does not include seasonal haulout	2	1 group per day	Impact (36-inch)	11	110	2 individuals X 1 group per day X 11 days = 22	**292**
						Impact (42-inch)	45	150	2 individuals X 1 group per day X 45 days = 90	
						DTH (42-inch)	90	160	2 individuals X 1 group per day X 90 days = 180	

Table 13. Level B harassment exposure estimates for Mexico DPS and Hawaii DPS humpback whales.

Species	Frequency	Seasonality	Abundance Notes	Group Size	Expected No. of Groups	Pile Driving Method	Total # days[1]	Distance (m)	Exposure Calculation	Total Exposure
Humpback Whale	Infrequent	Year-round	Mid-July – September during feeding in Lynn Canal area	2	1 group every 10 days	Vibratory (all)	17	5,425 - 7,000	2 individuals X 1 group every 10 days X 17 days = 4	**26**
			October – April during migration to southern waters	1	1 group every 10 days	Vibratory (all)	48	5,425 - 7,000	1 individual X 1 group every 10 days X 48 days = 5	
			May – mid-July when they are more frequently seen	2	1 group every 2 days	Vibratory (all)	17	5,425 - 7,000	2 individuals X 1 group every 2 days X 17 days = 17	

[1]The number of days for each pile driving method were rounded up to the nearest whole number.

Table 14. Level B harassment exposure estimates for Western and Eastern DPS Steller sea lions.

Species	Frequency	Seasonality	Abundance Notes	Group Size	Expected No. of Groups	Pile Driving Method	Total # days[1]	Distance (m)	Exposure Calculation	Total Exposure
Steller Sea Lion	Common	Year-round	Includes haulout (mid-March -May)	40	1 group per day	Vibratory (all)	25	5,425 - 7,000	40 individuals X 1 group per day X 25 days = 1,000	**2,352**
						DTH (42-inch)	25	7,000	40 individuals X 1 group per day X 25 days = 1,000	
			Does not include haulout (June – mid-March)	2	1 group per day	Vibratory (all)	55	5,425 - 7,000	viduals X 1 group per day X 55 days = 110	
						Impact (36-inch)	11	1,500	2 individuals X 1 group per day X 11 days = 22	
						Impact (42-inch)	45	1,500	2 individuals X 1 group per day X 45 days = 90	
						DTH (42-inch)	65	7,000	2 individuals X 1 group per day X 65 days = 130	

[1]The number of days for each pile driving method were rounded up to the nearest whole number.

For humpback whales, only pile driving with the largest resulting isopleths (DTH and vibratory driving) were used to calculate exposure estimates. Impact pile driving was excluded from these analyses because the Level A harassment isopleth was larger than the Level B harassment isopleth, and construction would be shut down before a whale could approach the Level B harassment zone. NMFS estimates that 26 humpback whales could be exposed to Level B harassment. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment. Wade (2021) reports that 2 percent of the individual humpback whales in this area are expected to be from the Mexico DPS. Therefore, NMFS expects that 0.52 individuals, rounded up to one individual, from the Mexico DPS may be exposed to Level B harassment during the proposed action.

No exposure to Level A harassment of humpback whales is proposed for authorization or expected to occur due to their large size and ability to be visibly detected in the project area if an animal should approach the Level A harassment zone.

NMFS expects that it is likely that up to 2,352 Steller sea lions may be exposed to Level B harassment and up to 292 Steller sea lions may be exposed to Level A harassment. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment. Based on the best available scientific information regarding Steller sea lion movement data, mark-recapture data, and genetic analyses (O'Corry-Crowe et al. 2006; Jemison et al. 2013; O'Corry-Crowe et al. 2014; Jemison et al. 2018; Hastings et al. 2020), we expect Western DPS Steller sea lions to occur in specific proportions in various regions of Southeast Alaska; in the Lynn Canal region, the proportion of Western DPS Steller sea lions is 1.4 percent. Therefore, NMFS expects that up to 33 individuals from the Western DPS may be exposed to Level B harassment, and up to four individuals from the Western DPS may be exposed to Level A harassment.

A summary of exposure estimates for Western DPS and Mexico DPS humpback whales is provided in Table 15.

Table 15. Exposure estimates for ESA-listed marine mammal species from Lutak Dock pile installation and removal activities.

Species	Level A	Level B
Mexico DPS humpback whale	0	1
Western DPS Steller sea lion	4	33

6.2.3 Sunflower Sea Star Occurrence and Exposure Analysis

Prior to the SSWS pandemic, Sunflower sea star abundance varied geographically in Alaska. They were reported as infrequent in Kachemak Bay (<0.005 m^2); fairly common in the Kenai Fjords National Park (~0.075/m^2); and quite common in western Prince William Sound (average 0.233/m^2) (Konar et al. 2019). Post-pandemic densities are much lower, and range from 0 to 0.04/m^2 at the sites that once had the highest density (e.g., western Prince William Sound)

(Traiger et al. 2022). We do not have specific density estimates for the action area, including any pre-pandemic estimates to use as a baseline. If we assume the action area had high densities pre-pandemic, we consider $0.04/m^2$ to be a conservative estimate of expected post-pandemic density in the action area.

The total surface area of fill below the high tide line (HTL) is 53,310 square feet (see Table 3), (4,952.66 m^2). Applying a density of 0.04 Sunflower sea stars per m^2 to the fill area yields 198 Sunflower stars exposed, with perhaps a fractional increase due to pile driving activities. Type of exposure may be direct mortality via smothering by fill material or pile placement, or harassment resulting from physical relocation by project staff out of harm's way.

6.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, response analyses determine how listed species/critical habitats are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. Our assessments try to detect the probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals.

Loud underwater sound can result in physical effects on the marine environment that can affect marine organisms. Possible responses by Mexico DPS humpback whales and Western DPS Steller sea lions to the impulsive and continuous sound produced by pile installation and removal activities are:

- Physical Response
  - Auditory threshold shifts (or hearing loss)
  - Non-auditory physiological effects
- Behavioral responses
  - Auditory interference (masking)
  - Tolerance, habituation, or sensitization
  - Change in dive, respiration, or feeding behavior
  - Change in vocalizations
  - Avoidance or displacement
  - Vigilance
  - Startle response

6.3.1 Responses to major sound sources (Pile Driving/Removal Activities)

As described in the *Exposure Analysis*, Mexico DPS humpback whales and Western DPS Steller sea lions are anticipated to occur in the action areas and are anticipated to overlap with sound associated with in-water construction activities. We assume that some individuals are likely to be exposed and respond to these impulsive and continuous sound sources.

With proper implementation of the mitigation measures and shutdown procedures described in Section 2.1.2, we do not expect that any listed marine mammals will be exposed to sound levels loud enough, long enough, or at distances close enough for the proposed action to cause Level A harassment. Across the life of the 12-month project, we expect no more than one exposure of Mexico DPS humpback whales and 33 exposures of Western DPS Steller sea lions to sound levels sufficient to cause Level B harassment, as described in Section 6.2.2. All Level B instances of take are expected to occur at received levels greater than 120 dB and 160 dB for non-impulsive and impulsive sound sources, respectively.

The introduction of anthropogenic sound into the aquatic environment from pile driving activities are the primary means by which marine mammals may be harassed from project activities covered in this opinion. In general, animals exposed to natural or anthropogenic sound may experience physical and physiological effects, ranging in magnitude from none to severe (Southall et al. 2007a). Exposure to anthropogenic sound can also lead to non-observable physiological responses such as an increase in stress hormones. Additional sound in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection.

Exposure to pile driving/removal sound has the potential to result in auditory threshold shifts and behavioral reactions (e.g., avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). The effects of pile driving/removal sound on marine mammals are dependent on several factors, including, but not limited to, sound type (e.g., impulsive vs. non-impulsive), the species, age and sex class (e.g., adult male vs. cow with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok et al. 2003, Southall et al. 2007a). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects.

6.3.1.1 Threshold Shifts

NMFS defines a sound -induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018b). In other words, a threshold shift is a hearing impairment, and may be temporary (such as ringing in your ears after a loud rock concert) or permanent (such as the loss of the ability to hear certain frequencies or partial or complete deafness). There are numerous factors to consider when examining the consequence of TS, including: the signal’s temporal pattern (e.g., impulsive or non-impulsive); likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS; the magnitude of the TS; time to recovery; the frequency range of the exposure (i.e., spectral content); the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (i.e., how an animal uses sound within the frequency band of the signal; (Kastelein et al. 2014); and the overlap between the animal and the sound (e.g., spatial, temporal, and spectral; (NMFS 2018b)). The amount of threshold shift is customarily expressed in dB.

Temporary Threshold Shift

Temporary threshold shift (TTS) is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter 1970). While experiencing TTS, the hearing threshold rises, and a sound must be stronger in order to be heard. In terrestrial mammals, TTS can last from minutes to days (in cases of strong TTS). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals recovers rapidly after exposure to the sound ends. Few data exist on the sound levels and durations necessary to elicit mild TTS in marine mammals, and none of the published data describe TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in Southall et al. (2007a).

Although some Level B exposures may occur during the course of the proposed action, not all instances of Level B take will result in TTS because the estimated sound thresholds for the onset of TTS are conservative. If TTS does occur, it is expected to be mild and temporary and not likely to affect the long-term fitness of the affected individuals.

Permanent Threshold Shift

When permanent threshold shift (PTS) occurs, there is physical damage to the sound receptors in the ear. The animal will have an impaired ability to hear sounds in specific frequency ranges, and there can be total or partial deafness in severe cases (Kryter 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals will incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing the onset of TTS might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based on anatomical similarities. PTS might occur at a received sound level at least several decibels above that which induces mild TTS, if the animal were exposed to strong sound pulses with rapid rise time. For non-impulsive exposures (i.e., vibratory pile driving), a variety of terrestrial and marine mammal data sources indicate that threshold shift up to 40 to 50 dB may be induced without PTS, and that 40 dB is a conservative upper limit for threshold shift to prevent PTS. An exposure causing 40 dB of TTS is, therefore, considered equivalent to PTS onset (NMFS 2018b).

For the proposed action, no exposures are expected at levels resulting in PTS due to estimates of Level A isopleths and mitigation measures to shut down pile driving activities if a humpback or Steller sea lion approaches a Level A zone.

6.3.1.2 Non-auditory Physiological effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, internal bubble formation, resonance effects, and other types of organ or tissue damage (Cox et al. 2006, Southall et al. 2007a). Studies examining such effects are limited. In general, little is known about the potential for pile driving activities to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period of time. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall et al. 2007a) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving are especially unlikely to incur auditory impairment or non-auditory physical effects.

An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (Moberg 2000). In many cases, an animal's first, and sometimes most economical (in terms of energetic costs), response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (Jessop et al. 2003, Lankford et al. 2005, Crespi et al. 2013). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000, Romano et al. 2002) and, more rarely, studied in wild populations (Romano et al. 2002). For example, sound reduction from reduced ship traffic in the Bay of Fundy following September 11, 2001 was linked to a significant decline in fecal stress hormones in North Atlantic right whales, suggesting that chronic exposure to increased sound levels, although not acutely injurious, can produce stress (Rolland et al. 2012). These stress hormones returned to their previous level within 24 hours after the resumption of shipping traffic. Exposure to loud sound can also adversely affect reproductive and metabolic physiology (Kight and Swaddle 2011). In a variety of factors, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress". In addition, any animal experiencing TTS would likely also experience stress responses (NRC 2003).

Pile driving is episodic over the life of the project, relatively short-term, and there are mitigation measures in place including shutdown zones to reduce or prevent exposure to acoustic stressors, thus limiting the potential for chronic stress. Humpback whales or Steller sea lions that show behavioral avoidance of pile driving are especially unlikely to incur auditory impairment or non-auditory physical effects because they will be limiting the duration of their exposure.

6.3.1.3 Behavioral Responses

Behavioral responses are influenced by an animal's assessment of whether a potential stressor poses a threat or risk. Behavioral responses may include: changing durations of surfacing and dives, number of blows per surfacing, or changing direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or, flight responses.

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral responses to sound are highly variable and context-specific, and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Southall et al. 2007a).

Tolerance of a stressor can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Behavioral state may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995, NRC 2003, Wartzok et al. 2003).

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997, Finneran, Carder and Ridgway 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes, suggesting discomfort (Morton and Symonds 2002, Wartzok et al. 2003, Thorson and Reyff 2006, Nowacek et al. 2007). Responses to non-impulsive sound, such as vibratory pile installation, have not been documented as fully as responses to pulsed sounds.

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be biologically significant if the change affects growth, survival, or fitness. Significant behavioral modifications that could potentially lead to effects on growth, survival, or fitness include:

- Drastic changes in diving/surfacing patterns;
- Longer-term habitat abandonment due to loss of desirable acoustic environment;
- Longer-term cessation of feeding or social interaction; and,
- Cow/calf separation.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography), and is difficult to predict (Southall et al. 2007a). Humpback whales and Steller sea lions are expected to exhibit some of these behavioral responses to the proposed action.

6.3.1.4 Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance or fitness in survival and reproduction. If the coincident (masking) sound were anthropogenic, it could be potentially harassing if it disrupted hearing-related behavior. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs only during the sound exposure. Because masking (without resulting in threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

Masking occurs at the frequency band the animals utilize, so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. Anthropogenic sounds may also affect communication signals when both occur in the same sound band and thus reduce the communication space of animals (Clark et al. 2009), and cause increased stress levels (Foote, Osborne and Hoelzel 2004, Holt et al. 2009).

Masking has the potential to affect species at the population or community levels as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Recent research suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than a three-fold increase in terms of SPL) in the world's ocean from pre-industrial periods, and that most of these increases are from distant shipping (Hildebrand 2009). All anthropogenic sound sources, such as those from vessel traffic, pile driving, and dredging activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Sound from pile driving activities is relatively short-term. It is possible that pile driving sounds from this proposed action may mask acoustic signals important to Mexico DPS humpback and and Western DPS Steller sea lions. However, the limited affected area and infrequent occurrence of humpback whales in the construction area would result in insignificant impacts from masking.

Masking is likely less of a concern for Steller sea lions, which vocalize both in air and water and do not echolocate or communicate with complex underwater "songs". Any masking event that could possibly rise to MMPA Level B harassment of sea lions would occur concurrently within the zones of behavioral harassment already estimated for pile driving activities, which have already been taken into account in the Exposure Analysis.

6.3.1.5 Change in dive, respiration, vocalizations, or feeding behavior

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (Lusseau and Bejder 2007). This highlights the importance of assessing the context of the acoustic effects alongside the estimated received levels. Severity of effects from a response to acoustic stimuli can likely vary based on the context in which the stimuli were received, particularly if it occurred during a biologically sensitive temporal or spatial point in the life history of the animal. There are broad categories of potential responses, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely, and may consist of increased or decreased dive times and surface intervals, as well as changes in the rates of ascent and descent during a dive (Frankel and Clark 2000). Variations in dive behavior may reflect interruptions in biologically significant activities (e.g., foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (e.g., bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral responses, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (Croll et al. 2001a). A determination of whether foraging disruptions incur fitness consequences would require information or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Rates of respiration naturally vary with different behaviors, and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may indicate annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater sound when determining the potential for impacts resulting from anthropogenic sound exposure (Kastelein et al. 2001).

Based on this analysis, we expect Mexico DPS humpback whales and Western DPS Steller sea lions to continue foraging in the face of moderate levels of disturbance. For example, humpback whales, which only feed during part of the year and must satisfy their annual energetic needs during the foraging season, may continue foraging in the face of disturbance in the action areas.

Similarly, a humpback cow accompanied by her calf is less likely to flee or abandon an area at the cost of her calf's survival. We also expect that these animals could resume foraging close by if the in-water sound associated with the proposed action causes them to avoid the action area. The proposed action is not expected to result in Western DPS Steller sea lions moving to a different haulout, but could cause them to temporarily move to different foraging areas near the action area. It is likely some change in dive, respiration, or feeding behavior of Mexico DPS humpback whales Western DPS Steller sea lions may occur in the action area, but we do not expect much change in these behaviors. Any change in behavior that could rise to Level B harassment under the MMPA is included within the zones of behavioral harassment, and have been taken into account in the exposure analysis.

6.3.2 Sunflower Sea Star Response to Direct Contact

While Sunflower sea stars are tolerant of extreme and diverse conditions, responses to direct contact and/or handling may include changes to immunochemistry indicative of an acute stress response, temporary respiratory disruption, temporary metabolic depression, or changes in coelomic fluid constituents. Handling stress in Sunflower sea stars is not well understood, and we do not expect to be able to detect these responses. Sunflower sea stars can be delicate when taken out of the water; if their bodies are full of water, they may become heavy and prone to tearing.

Sunflower sea stars may be buried entirely by fill material, resulting in an acute stress response or mortality of the animal. Non-crushing debris accumulating on them may interfere with their gas exchange and elicit physiological responses with cascading effects. However, Sunflower sea stars are quite mobile, so they may move away from a disturbed area if the volume of fill is small.

7 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area (50 CFR § 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the Environmental Baseline (Section 5).

We searched for information on ono-Federal actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline section and those summarized below. Reasonably foreseeable future state, local, or private actions are hard to predict, but the main actions include activities related to vessel traffic and fishing.

7.1 Vessel Traffic

Marine vessels that use the action area include recreational vessels, charter and commercial fishing vessels, shipping vessels such as barges and cargo vessels, whale-watching tour boats, cruise ships, and AMHS passenger ferries. The action area experiences moderately high levels of marine vessel traffic year-round with the highest volumes occurring April through October. Freight barges, cruise ships, and ferries are the largest vessels that routinely transit through the action area. Alaska Marine Lines operates a twice-weekly barge to Haines year-round. Alaska Marine Highway System ferries stop in Haines year-round, with as many as ten sailings a week during the spring and summer months with the most sailings scheduled from May through September. Delta Western has fuel barge deliveries 12 times per year (roughly one barge per month). Medium to large cruise ships stop at Haines' Port Chilkoot Dock near downtown up to eight times per week during the peak season (June and July) and in Skagway around three to four times a day during peak season. Additionally, small vessel trips, including fishing charters, scenic and wildlife tours, and passenger ferries increase during the cruise ship season to accommodate the influx of tourists.

The proposed action will not increase vessel traffic or the birthing capacity at Lutak Dock. However, vessel traffic is expected to continue in Lutak Inlet. It is unknown whether overall vessel traffic will increase in the future, as this depends largely on economics, tourism, and other factors, but it is unlikely to decrease significantly. As a result, there will be continued risk to marine mammals of vessel strike, exposure to vessel noise and presence, and small spills. Sunflower sea stars will also be at risk of exposure to small spills with continued vessel traffic.

7.2 Fishing

Southeast Alaska is one of four major commercial fishery regions identified by the state of Alaska. Seafood harvest is a primary industry in Haines. In the most recent economic baseline report for Haines, 103 residents held 160 limited entry permits and owned 86 commercial fishing vessels in 2016, generating $6 million in gross income, with similarly high or higher earnings reported in the previous decade[38]. Therefore, fishing is expected to continue in Lutak Inlet. As a result, there will be continued risk to marine mammals in the form of prey competition, vessel strikes, harassment, and entanglement in fishing gear. NMFS assumes that ADFG will continue to manage fish stocks and monitor and regulate fishing under their jurisdiction to maintain sustainable stocks. It remains unknown whether, and to what extent, marine mammal prey may be less available due to commercial, subsistence, personal use, and sport fishing. In addition, we do not know the full extent of the effects of fishing vessel traffic on availability of prey to listed species.

8 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS's assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to formulate the agency's biological opinion as to whether the

[38] https://www.alaska.edu/ualand/haines/files/Economic-Baseline.pdf, accessed 11/2/23.

proposed action is likely to: (1) result in appreciable reductions in the likelihood of both the survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) result in the adverse modification or destruction of critical habitat as measured through direct or indirect alterations that appreciably diminish the value of designated critical habitat as a whole for the conservation of the species. These assessments are made in full consideration of the status of the species (Section 4).

As we discussed in the *Approach to the Assessment* section of this opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

As part of our risk analyses, we identified and addressed all potential stressors and considered all consequences of exposing listed species to all the stressors associated with the proposed action, individually and cumulatively, given that the individuals in the action area for this consultation are also exposed to other stressors in the action area and elsewhere in their geographic range.

8.1 Humpback Whale Risk Analysis

Mexico DPS humpback whales in the project area have been and will continue to be affected by the following:

- Climate change
    - Increased exposure to biotoxins (harmful algal blooms)
    - Exposure or increased susceptibility to new diseases
    - Changes in distribution of important prey
- Direct mortality
    - Vessel strike
    - Entanglement and capture in fishing gear
    - Predation
- Exposure to pollutants and contaminants

Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels. Climate change resulting in effects to the ocean temperature and chemistry may affect humpback whales, primarily through effects on their prey. Warmer temperatures may cause changes in availability of prey; anomalously warm ocean temperatures in the Gulf of Alaska during 2014-2016 marine heatwave resulted reductions in biomass and shifts in the distribution of numerous forage fish species that humpback whales target. Additionally, ocean acidification may lead to water that is highly corrosive to calcifying forms of zooplankton such as copepods and pteropods, which are also primary prey species for humpback whales. Therefore, changes in the survival, quality, or availability of zooplankton and forage fish could have a direct effect on humpback whale fitness and survival.

A climate-induced decrease in availability and redistribution of prey species will also likely affect interactions with commercial fisheries. Entanglement in fishing gear is a primary threat to humpback whales, especially in Southeast Alaska where high densities of humpbacks overlap with commercial fishing operations, particularly in the summer months when humpbacks are feeding. If commercial fisheries follow fish to other areas, there may be a lessening of serious injury and mortality of humpback whales from interactions with commercial fishing gear and potentially a reduction of competition for fish in some areas, but there also is potential for an increase in these risks in areas where overlap between fisheries and humpback whales have not occurred previously. Any geographic and temporal overlap between humpback whales and commercial fisheries will increase the risk of adverse effects resulting from entanglement in active and derelict fishing gear. Effects to these species due to changes in the commercial fisheries will be subject to future section 7 consultations as Fishery Management Plans are developed or amended. Changing distribution of fish may also result in humpback whales having less fish available in their feeding areas, including in BIAs or in critical habitat, which is defined by availability of important prey species.

In addition to effects on prey species, consistently warming water temperatures have also increased the incidence and prevalence of harmful algal blooms (HABs). The recent marine heatwave caused an unprecedented HAB that extended from the Aleutian Islands to southern California resulting in mass strandings of marine mammals and other marine species. Testing for biotoxins in marine mammals show that HAB toxins are present throughout Alaska waters at levels high enough to be detected in humpback whales; these toxins are known to adversely affect marine mammal health and survival. Additionally, exposure to new diseases or greater vulnerability to disease as a consequence of stress may occur as a consequence of climate change. Moreover, novel pathogens and/or vector species are expected to expand their range into Alaskan waters as temperatures increase, potentially exacerbating existing health risks.

The Lutak Dock Replacement Project is not expected to interact with climate change related stressors. Due to its limited geographic scale and scope, it will not have effects that result in changes in the broad-scale distribution of primary prey species, nor will it influence Mexico DPS humpback whale exposure to HABs or disease agents.

Vessel traffic is expected to increase throughout Alaskan waters as sea ice declines. We expect this will lead to more noise in the ocean and greater potential for vessel strikes. As we have noted, vessel strike is a primary source of injury and mortality for humpback whales, particularly in Southeast Alaska. Additionally, as shipping increases, the ocean will become increasingly noisy, which will likely have masking effects on humpback whales.

Predation pressure or stress from evasion from killer whales may increase as sea ice decreases, prey distribution changes, and other environmental drivers alter trophic webs, predator-prey dynamics, and spatio-temporal overlap of marine species. The proposed project will neither increase or decrease predation risk.

Heavy metal and organic pollutants have been shown to bioaccumulate in humpback whale blubber. With increased regulation around the use of synthetic organic contaminants we expect contaminate levels will decline. However, contaminates related to microplastics may emerge as a more serious and difficult problem for these filter feeding whales. Contaminated sites occur near the project location in Lutak Inlet. The temporary suspension of sediment from the proposed project is not expected to increase the rate at which prey species uptake and/or accumulate toxicants, and transfer to humpback whale predators is not expected to increase from existing levels.

Minor stressors that we identified as a consequence of project activities are seafloor disturbance, pollution via small spills, vessel strike, and vessel noise. These stressors will have an immeasurably small effect, or because of the mitigation measures, will minimally overlap spatially or temporally with humpback whales.

When considering the risk to these species, we must put into context how the proposed activities in Lutak Inlet may affect the population. The Mexico DPS humpback whale population is estimated to be approximately 2,913 individuals (section 4.3.2). Several decades of data suggest that the Mexico-North Pacific stock of humpback whales is increasing (Young et al. 2023)(as of 2022, the North Pacific humpback whale stocks were redesignated[39]; the Mexico-North Pacific stock is comprised of individuals from the Mexico DPS that winter in mainland Mexico and have high latitude feeding areas in Alaska and Russia[40]). The Mexico-North Pacific stock of humpback whales has an estimated annual rate of increase of at least 6.6 percent (Young et al. 2023). However, recent surveys in Alaska have reported a reduction in the encounter rate of humpback whales and a decline in the number of calves in some areas after the recent marine heatwave, and the population trajectory for Mexico DPS humpback whales is currently unknown. Mexico DPS individuals are widely dispersed across Alaska and are not common in Southeast Alaska. Southeast Alaska is an important feeding ground for humpback whales in general, where many come to forage on spawning herring in the summer months, but most individuals are from the recovered Hawaii DPS; we only expect 2 percent of humpback whales that occur here to be from the Mexico DPS.

The humpback whales that use Lutak Inlet may experience acoustic harassment that induces a stress response or elicits behavioral disturbance reactions such as changes in activity, changes in call production, avoidance of the area, acoustic displacement from habitat, or changes to foraging and dive behavior. Individual and cumulative energy costs of the responses we have discussed are not likely to measurably affect the energy budgets of humpback whales. As a result, the humpback whales' probable responses (i.e., avoidance, short-term masking, and short-term changes to diving and surfacing patterns) to pile driving activities are not likely to reduce their current or expected future reproductive success or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the population those individuals represent.

The total number of Mexico DPS humpback whales that may experience effects from the proposed project activities is expected to be extremely low and these individuals would represent a very small percentage of the total population, and we do not expect acoustic disturbance to affect vital functions.

Based on the results of the exposure analysis (see Section 6), we expect humpback whales will be exposed to underwater sound from pile installation and removal activities. Although exposure

[39] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock, accessed 11/7/23.
[40] https://www.fisheries.noaa.gov/s3/2023-08/Humpback-Whale-Mainland-Mexico-2022.pdf, accessed 11/7/23.

will be minimized through mitigation measures, one Mexico DPS humpback whale may be exposed to sound that is likely to result in Level B harassment; zero Mexico DPS humpback whales are expected to be exposed to Level A harassment.

The low probability of Mexico DPS humpback whale occurrence (2 percent) in Lutak Inlet, combined with the implementation of the mitigation measures to reduce exposure of the individuals that may be in the area to harmful levels of sound, leads us to conclude that there will not be a population level effect to Mexico DPS humpback whales due to the Lutak Dock Replacement project.

As we discussed in the Approach to the Assessment section of this opinion, an action that is not likely to reduce the fitness of one Mexico DPS humpback whale is thus not likely to reduce the viability of the populations those individuals represent (that is, we would not expect reductions in the reproduction, numbers, or distribution of such populations). For the same reasons, an action that is not likely to reduce the viability of those populations is not likely to increase the extinction probability of the species those populations comprise; in this case, Mexico DPS humpback whales. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of Mexico DPS humpback whales.

8.2 Western DPS Steller Sea Lion Risk Analysis

As described in the Environmental Baseline (section 5), the following stressors affect Western DPS Steller sea lions:

- Climate change
  - Increased exposure to biotoxins (harmful algal blooms)
  - Exposure or increased susceptibility to new diseases
  - Changes in distribution of important prey
- Direct mortality
  - Subsistence hunting
  - Entanglement and capture in fishing gear
  - Predation
- Exposure to pollutants and contaminants
- Vessel traffic

Climate change is expected to continue to be a primary threat to Western DPS Steller sea lions. Across their range in the Bering Sea and Gulf of Alaska, large-scale forcing mechanisms have lead to basin-wide shifts in the marine ecosystem, resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, and sea ice extent and amount. Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels. As described in section 4.3.1, Western DPS Steller sea lions have exhibited an overall positive trend in abundance from 2007 to 2022, but trends were highly variable across regions and age classes, with many survey regions in more recent survey years showing declines or plateaus in both pup counts and non-pup counts. These low pup counts are likely related to low availability of prey associated with anomalously warm ocean temperatures in the Gulf of Alaska during 2014-2016 marine heatwave, which reduced the overall biomass and changed the distribution of important fish prey.

A climate-induced decrease in availability and redistribution of prey species will also likely affect interactions with commercial fisheries. A shift in commercial fishing to other areas may lead to a lessening of serious injury and mortality of Steller sea lions from interactions with commercial fishing gear and potentially a reduction of competition for fish in some areas, and it may increase these risks in other areas they have not yet occurred due to lack of previous overlap between Steller sea lions and fisheries. The changing distribution of fish may also result in Steller sea lions having less fish in their feeding areas, including areas that are currently defined as Steller sea lion special aquatic foraging areas.

Consistently warming water temperatures have also increased the incidence and prevalence of HABs. The recent marine heatwave caused an unprecedented HAB that extended from the Aleutian Islands to southern California resulting in mass strandings of marine mammals including Steller sea lions. Testing for biotoxins in marine mammals show that HAB toxins are present throughout Alaska waters at levels high enough to be detected in Steller sea lions; these toxins are known to adversely affect marine mammal health and survival. Additionally, exposure to new diseases or greater vulnerability to disease as a consequence of stress may occur as a consequence of climate change. Moreover, novel pathogens and/or vector species are expected to expand their range into Alaskan waters as temperatures increase, potentially exacerbating disease risk.

The Lutak Dock Replacement Project is not expected to interact with climate change related stressors. Due to its limited geographic scale and scope, it will not have effects that result in changes in the broad-scale distribution of primary prey species, nor will it influence Steller sea lion exposure to HABs or disease agents.

Vessel traffic is expected to increase throughout Alaskan waters as sea ice declines. We expect this will lead to more noise in the ocean and greater potential for vessel strikes. However, as we have noted, vessel strikes of Steller sea lions are rare. As shipping increases, the ocean will become increasingly noisy, and some masking of Steller sea lion communication may occur.

Exposure to non-biodegradable marine debris, specifically to debris that can cause entanglement, remains an unquantifiable risk, but associated effects from this project are expected to be minimal. Best practices regarding waste management (cutting loops prior to disposal) will further reduce the impact of debris on Steller sea lions. Based on the localized nature of small oil spills from the decks of vessels or machinery, the rapid weathering expected, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of the proposed action causing a small oil spill and exposing Steller sea lions is extremely small, and thus the effects are considered highly unlikely to occur.

Steller sea lions have been an important food and cultural resource to Alaska Natives, although the number taken is currently small compared to historical levels. Steller sea lions are a component of transient killer whales' diet. This project is not expected to have an effect on predation risk.

Heavy metal and organic pollutants have been documented in Steller sea lions, with high levels of mercury in particular detected in animals in the Aleutian Islands, which may be limiting population recovery in those regions. Contaminated sites occur near the project location in Lutak Inlet. The temporary suspension of sediment from the proposed project is not expected to increase the rate at which prey species uptake and/or accumulate toxicants, and transfer to Steller sea lion predators is not expected to increase from existing levels.

Minor stressors that we identified as a consequence of project activities are seafloor disturbance, pollution via small spills, vessel strike, and vessel noise. These stressors will have an immeasurably small effect, are highly unlikely, or because of the mitigation measures, will minimally overlap spatially or temporally with Steller sea lions.

When considering the risk to the Western DPS Steller sea lion, we must put into context how the proposed activities in Lutak Inlet may affect the population. The population estimate for the Western DPS is approximately 49,320 (pups and non-pups) (Section 4.3.1). Individuals in this population are widely dispersed across the Gulf of Alaska, the Aleutian Islands, and the Bering Sea. However, they are most common and abundant around the Aleutian Islands, Kodiak, and eastern Gulf of Alaska; they are far less common in Southeast Alaska. Steller sea lions aggregate in large numbers at specific rookeries and haulouts. No rookeries, have been identified near the project site, but a seasonal haulout occurs at Taiya Point. Eulachon spawning may attract Steller sea lions to this haulout in the spring, and spawning salmon may attract Steller sea lions to this haulout in the summer. The animals that use Lutak Inlet to target these seasonal fish runs may experience acoustic harassment that induces a stress response or elicits behavioral disturbance reactions such as changes in activity and vocalizations, avoidance, or displacement. Individual and cumulative energy costs of the responses we have discussed are not likely to measurably affect the energy budgets of Steller sea lions. As a result, the Steller sea lions' probable responses (i.e., tolerance, avoidance, short-term masking, and short-term vigilance behavior) to pile driving activities are not likely to reduce their current or expected future reproductive success or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the population those individuals represent.

The total number of Western DPS Steller sea lions that may experience effects from the proposed project activities is expected to be low and these individuals would represent a very small percentage of the total population, and we do not expect acoustic disturbance to affect vital functions.

Based on the results of the exposure analysis (see Section 6), we expect Steller sea lions will be exposed to underwater sound from pile installation and removal activities. Although exposure will be minimized through mitigation measures, 33 Western DPS Steller sea lions may be exposed to sound that is likely to result in Level B harassment, and up to four Western DPS Steller sea lions may be exposed to Level A harassment.

The low probability of Western DPS Steller sea lion occurrence (1.4 percent) in Lutak Inlet, combined with the implementation of the mitigation measures to reduce exposure of the individuals that may be in the area to harmful levels of sound, leads us to conclude that there will not be a population level effect to Western DPS Steller sea lions due to the Lutak Dock Replacement project.

As we discussed in the Approach to the Assessment section of this opinion, an action that is not likely to reduce the fitness of an individual Steller sea lion is not likely to reduce the viability of the populations those individuals represent (that is, we would not expect reductions in the reproduction, numbers, or distribution of such populations). For the same reasons, an action that is not likely to reduce the viability of those populations is not likely to increase the extinction probability of the species those populations comprise; in this case, Western DPS Steller sea lions. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of Western DPS Steller sea lions.

8.3 Sunflower Sea Star Risk Analysis

Our consideration of probable exposures and responses of proposed threatened Sunflower sea stars to construction activities associated with the proposed action is designed to help us assess whether those activities are likely to increase the extinction risk or jeopardize the continued existence of the species.

Effects from exposure to pile driving noise and vessel use are likely negligible due to the lack of expected responses from sea stars to these potential stressors; sea stars are not known to perceive or react to sound waves. They may be affected by disturbances to the benthic environment when piles are installed and removed, but this will be limited to within a few meters of the source. Sunflower sea stars are benthic organisms that cannot interact with vessels in such a way that they are at risk of vessel strike. The greatest project-related risk to Sunflower sea stars is the placement of fill, which has the potential to smother and thereby harm or kill Sunflower sea stars. Handling of Sunflower sea stars to move them out of the project area may induce temporary stress responses with potential for physiological perturbations. Mitigation measures are in place to prevent injury and mortality of Sunflower sea stars as a result of pile placement or fill placement, as well as to ensure proper handling techniques.

There are sources of contamination located near the project site in Lutak Inlet that may reach the benthic environment via run-off or through authorized discharges. The temporary suspension of sediment from the proposed project is not expected to increase the rate at which benthic species uptake and/or accumulate toxicants that have settled on the benthos. Small spills are a potential risk from this project. Small spills are considered high impact, yet low probability events, and we consider any effects of oil spills to Sunflower sea stars to be highly unlikely to occur as a result of this project.

Climate change is expected to be an ongoing threat to Sunflower sea stars, particularly due to effects resulting from ocean acidification and warming temperatures (see section 4.2). The primary threat to Sunflower sea stars identified in the draft Status Review Report (Lowry et al. 2022) and proposed rule to list the Sunflower sea star as threatened (88 FR 16212; March 16, 2023), is SSWS, which may be exacerbated by climate change. Based on our analysis of the action, no aspect of the proposed action is expected to increase the incidence or prevalence of SSWS in Sunflower sea stars.

The geographic scope of this project is small relative to the entire range of Sunflower sea stars. The effects from the proposed action on Sunflower sea stars are not likely to reduce the reproduction rates or growth rates of Sunflower sea stars. Due to the limited geographic and temporal scope of the project, we do not expect significant increases in vulnerability to a SSWS pandemic as a result of the proposed action. The number of individuals that will be affected is very small relative to the estimated population of Sunflower sea stars (over 600 million) (Lowry 2022). Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of Sunflower sea stars.

9 CONCLUSION

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mexico DPS humpback whale, Western DPS Steller sea lion, or Sunflower sea star.

NMFS also concludes that the proposed action is not likely to adversely affect the fin whale, North Pacific right whale, or sperm whale or to destroy or adversely modify designated critical habitat for the Mexico DPS humpback whale or Steller sea lion.

10 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. § 1532(19)). "Incidental take" is defined as take that results from, but is not the purpose of, the carrying out of an otherwise lawful activity conducted by the action agency or applicant (50 CFR § 402.02). Based on NMFS guidance, the term "harass" under the ESA means to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (16 U.S.C. § 1362(18)(A)(i) and (ii)). For this consultation, MARAD and PR1 expect take will be by Level A and Level B harassment.

The ESA does not prohibit the take of threatened species unless special regulations have been promulgated, pursuant to ESA section 4(d), to promote the conservation of the species. Federal regulations promulgated pursuant to section 4(d) of the ESA extend the section 9 prohibitions to the take of Mexico DPS humpback whales (50 C.F.R. § 223.213). ESA section 4(d) rules are not being proposed for Sunflower sea stars at this time, therefore, ESA section 9 take prohibitions do not apply to this species. This ITS includes numeric limits on the take of Sunflower sea stars because specific amounts of take were analyzed in our jeopardy analysis. These numeric limits provide guidance to the action agency on its requirement to re-initiate consultation if the amount of take estimated in the jeopardy analysis of this biological opinion is exceeded. This ITS includes reasonable and prudent measures and terms and conditions designed to minimize and monitor take of this proposed-threatened species.

Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement (ITS).

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by section 101(a)(5) of the MMPA. Accordingly, **the terms of this incidental take statement and the exemption from section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine mammals identified here.** Absent such authorization, this incidental take statement is inoperative.

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. MARAD, USACE, and PR1 have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, MARAD, USACE, and PR1 must monitor and report on the progress of the action and its impact on the species as specified in the ITS (50 CFR § 402.14(i)(3)). If MARAD, USACE, and PR1(1) fail to require the permit holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

10.1 Amount or Extent of Take

Section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or utilize a surrogate (e.g., other species, habitat, or ecological conditions) if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14(i)(1); see also 80 FR 26832; May 11, 2015).

The taking of Mexico DPS humpback whales will be by incidental acoustic harassment, and Western DPS Steller sea lions will be by incidental acoustic harm and harassment. The taking by serious injury or death is prohibited and will result in the modification, suspension, or revocation of the ITS. Table 14 lists the amount and timing of authorized take (incidental take by harassment) for this action. The method for estimating the number of listed species exposed to sound levels expected to result in Level B harassment and Level A harassment is described in Section 6.2.2. NMFS expects that 26 instances of Level B harassment of all humpback whale DPSs may occur. While we are only authorizing take of one Mexico DPS humpback whale under the ESA, we will consider the ESA-authorized take limit to be exceeded when the MMPA-authorized limit on Level B take of humpback whales is exceeded, as it is impossible to distinguish between DPSs in the field. NMFS expects that 33 instances of Level B harassment and 4 instances of Level A harassment of Western DPS Steller sea lions may occur.

Based on the estimated density of Sunflower sea stars in the action area and surface area of fill operations that will come into contact with the sea floor, we estimate up to 198 Sunflower sea stars may be harassed or harmed (Section 6.2.3.1).

Table 16. Summary of instances of exposure associated with the proposed activities resulting in incidental take of ESA-listed species.

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes	Proposed Takes (non-mammals)
Mexico DPS humpback whale	0	1	0
Western DPS Steller sea lion	4	33	0
Sunflower sea star	0	0	198

10.2 Effect of the Take

The takes authorized for ESA-listed marine mammals during the proposed action are takes by acoustic harassment, and for Steller sea lions, 4 instances of acoustic harm. No serious injuries or mortalities of marine mammals are expected or authorized as part of this proposed action. This consultation has assumed that exposure to major noise sources might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these whales and/or pinnipeds to major noise sources and any associated disruptions are not expected to affect the reproduction, survival, or recovery of these species.

Up to198 Sunflower sea stars may be harassed or injured as a result of the proposed action. The current range-wide (i.e., global) population estimate for the Sunflower sea star is nearly 600 million individuals, based on a compilation of the best available science and information (Gravem et al. 2021). This is 0.00000033percent of the population. Take prohibitions have not been proposed for this species at this time.

In Section 9 of this opinion, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

10.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take." (50 CFR 402.02). Failure to comply with RPMs (and the terms and conditions that implement them) may invalidate the take exemption and result in unauthorized take.

RPMs are distinct from the mitigation measures that are included in the proposed action (described in Section 2.1. We presume that the mitigation measures will be implemented as described in this opinion. The failure to do so will constitute a change to the action that may

require reinitiation of consultation pursuant to 50 CFR § 402.16.
The RPMs included below, along with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. NMFS concludes that the following RPMs are necessary and appropriate to minimize or to monitor the incidental take of Mexico DPS humpback whales, Western DPS Steller sea lions or Sunflower sea stars resulting from the proposed action.

1. The NMFS Permits Division, MARAD, and USACE will require TMC to conduct operations in a manner that will minimize impacts to Mexico DPS humpback whales and Western DPS Steller sea lions that occur within or in the vicinity of the project action area.

2. The NMFS Permits Division, MARAD, and USACE will require TMC to implement a comprehensive monitoring program to ensure that Mexico and WNP DPS humpback whales and Western DPS Steller sea lions are not taken in numbers or in a manner not anticipated by this opinion, and to submit a final report to NMFS AKR evaluating the mitigation measures and the results of the monitoring program.

10.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. These terms and conditions are in addition to the mitigation measures included in the proposed action, as set forth in Section 2.1.2 of this opinion. MARAD, USACE, PR1, or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR § 402.14(i)(3))).

Any taking that is in compliance with these terms and conditions is not prohibited under the ESA (50 CFR § 402.14(i)(5)). As such, partial compliance with these terms and conditions may invalidate this take exemption and result in unauthorized, prohibited take under the ESA. If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the action may lapse.

These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPM #1, MARAD, USACE, and PR1 must undertake (or require their lessees or permittees to undertake) the following:

1.1 Implement all mitigation measures, including observation and shut down zones and other requirements, as described in the final IHA and the marine mammal monitoring and mitigation plan.

1.2 The NMFS Permits Division will monitor for take (authorized and unauthorized) and the effects of their action on listed marine mammals and monitor and report the effectiveness of mitigation measures. In addition, they must submit a report to NMFS AKR that evaluates the mitigation measures and reports the results of the monitoring program.

To carry out RPM #2, NMFS Permits Division, MARAD, and USACE must undertake (or require their lessees or permittees to undertake) the following:

2.1 Adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA as reflected in the marine mammal monitoring and mitigation plan.

2.2 Submit a project specific report within 90 days of the conclusion of in-water work associated with this project. The report must analyze and summarize marine mammal interactions during this project. The report must be emailed to NMFS AKR at akr.section7@noaa.gov. This report must also contain information described in the mitigation measures of this opinion.

2.3 In the event that the proposed action causes serious injury or mortality of a marine mammal (e.g. ship strike, stranding, and/or entanglement), the incident will be immediately reported to NMFS AKR (akr.section7@noaa.gov), Caroline Cummings (caroline.cummings@noaa.gov), and the Marine Mammal Stranding Hotline at 877-925-7773.

2.4 Following a prohibited take, the NMFS Permits Division, MARAD, and USACE will be required to reinitiate consultation under 50 CFR § 402.16, and any subsequent activities causing incidental take will not be exempt from the take prohibitions of ESA section 9. NMFS AKR will work with the NMFS Permits Division, MARAD, and USACE to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance.

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR § 402.02).

For this proposed action, NMFS suggest the following conservation recommendations:

1. Project vessel crews should participate in the WhaleAlert program to report real-time sightings of whales while transiting in the waters of Southeast Alaska and to minimize the risk of vessel strikes. More information is available at https://www.fisheries.noaa.gov/resource/tool-app/whale-alert.

2. Without approaching whales or sea lions, project vessel crews should attempt to photograph humpback whale flukes and record GPS coordinates of the sightings during transit. These data should be included in the final report submitted to NMFS AKR.

3. Without approaching whales or sea lions, project vessel crews should attempt to photograph and/or video North Pacific right whales and record

GPS coordinates of the sightings during transit. These data should be submitted to NMFS AKR as soon as possible.

4. Without approaching whales or sea lions, project vessel crews should attempt to photograph Steller sea lions when brand numbers are visible and record GPS coordinates of the sightings during transit. These data should be included in the final report submitted to NMFS AKR.
5. Without disturbing whales or sea lions, project crews should attempt to conduct additional Sunflower sea star surveys anywhere in Lutak Inlet by any method (on-foot, dive/snorkel, ROV). These data should be included in the final report submitted to NMFS AKR.

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS Permits Division, MARAD, and USACE should notify NMFS of any conservation recommendations they implement in their final action.

12 REINITIATION OF CONSULTATION

As provided in 50 CFR § 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount of incidental take is exceeded, section 7 consultation must be reinitiated immediately (50 CFR § 402.14(i)(4)).

13 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act (DQA)) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to MARAD, USACE, PR1, and the general public. These consultations help to fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

This consultation will be posted on the NMFS Alaska Region website http://alaskafisheries.noaa.gov/pr/biological-opinions/. The format and name adhere to conventional standards for style.

13.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

13.3 Objectivity

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA Regulations, 50 CFR § 402.01 et seq.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Alaska Region ESA quality control and assurance processes.

14 REFERENCES

Anchor QEA. 2023. Request for an incidental harassment authorization for the Skagway Ore Terminal Redevelopment Project. Prepared by Anchor QEA, LLC for the Municipality of Skagway, Bellingham, WA, April 2023.

Angliss, R. P., and R. B. Outlaw. 2007. Alaska marine mammal stock assessments, 2006. U.S. Dept. of Comemrce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, January 2007. NOAA Technical Memorandum NMFS-AFSC-168, 244 p.

Aquino, C. A., R. M. Besemer, C. M. DeRito, J. Kocian, I. R. Porter, P. T. Raimondi, J. E. Rede, L. M. Schiebelhut, J. P. Sparks, J. P. Wares, and I. Hewson. 2021. Evidence that microorganisms at the animal-water interface drive sea star wasting disease. Frontiers in

Microbiology 11:610009.

Au, D., and W. Perryman. 1982. Movement and speed of dolphin schools responding to an approaching ship. Fishery Bulletin 80(2):371-379.

Au, W. W. L., A. N. Popper, and R. R. Fay. 2000. Hearing by whales and dolphins. Springer-Verlag, New York, NY.

Azzara, A. J., W. M. von Zharen, and J. J. Newcomb. 2013. Mixed-methods analytic approach for determining potential impacts of vessel noise on sperm whale click behavior. The Journal of the Acoustical Society of America 134(6):4566-4574.

Bain, D. E., J. C. Smith, R. Williams, and D. Lusseau. 2006. Effects of vessels on behavior of Southern Resident killer whales (*Orcinus* spp.), NMFS Contract Report No. AB133F-03-SE-0959 and AB133F-04-CN-00040, March 4, 2006, 62 p.

Baker, C. S. 1985. The population structure and social organization of humpback whales (*Megaptera novaeangliae*) in the central and eastern North Pacific. PhD dissertation. University of Hawaii, Honolulu, HI.

Baker, C. S., L. M. Herman, B. G. Bays, and G. B. Bauer. 1983. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season, Report prepared for the NOAA, NMFS, Alaska Fisheries Science Center, National Marine Mammal Laboratory, 84 p.

Baker, C. S., A. Perry, and G. Vequist. 1988. Humpback whales of Glacier Bay, Alaska. Whalewatcher 22:13-17.

Baker, C. S., J. M. Straley, and A. Perry. 1992. Population characteristics of individually identified humpback whales in southeastern Alaska: summer and fall 1986. Fishery Bulletin 90:429-437.

Balser, E. J. 2004. And then there were more: cloning by larvae of echinoderms. Pages 3–9 *in* T. Heinzeller, and J. H. Nebelsick, editors. Echinoderms: München. A. A. Balkema Publishers, Leiden, London, New York, Philadelphia, Singapore.

Ban, S. S. 2005. Modelling and characterization of Steller sea lion haulouts and rookeries using oceanographic and shoreline type data. University of British Columbia, Vancouver, BC, 103 p.

Barbeaux, S. J., K. Holsman, and S. Zador. 2020. Marine heatwave stress test of ecosystem-based fisheries management in the Gulf of Alaska Pacific Cod Fishery. Frontiers in Marine Science 7:703.

Barcenas-De La Cruz, D., E. DeRango, S. P. Johnson, and C. A. Simeone. 2018. Evidence of anthropogenic trauma in marine mammals stranded along the central California coast, 2003-2015. Marine Mammal Science 34(2):330-346.

Barlow, J., and P. J. Clapham. 1997. A new birth-interval approach to estimating demographic parameters of humpback whales. Ecology 78(2):535-546.

Barrie, L. A., D. Gregor, B. Hargrave, R. Lake, D. Muir, R. Shearer, B. Tracy, and T. Bidleman. 1992. Arctic contaminants: sources, occurrence and pathways. The Science of the Total Environment 122:1-74.

Barron, M. G., R. Heintz, and M. M. Krahn. 2003. Contaminant exposure and effects in pinnipeds: implications for Steller sea lion declines in Alaska. Science of The Total Environment 311(1-3):111-133.

Bates, N. R., J. T. Mathis, and L. W. Cooper. 2009. Ocean acidification and biologically induced seasonality of carbonate mineral saturation states in the western Arctic Ocean. Journal of Geophysical Research 114(C11007).

Bauer, G. B., and L. M. Herman. 1986. Effects of vessel traffic on the behavior of humpback whales in Hawaii. University of Hawaii, Kewalo Basin Marine Mammal Laboratory, Final report to the National Marine Fisheries Service, Honolulu, Hawaii, February 14, 1986, 151 p.

Beckmen, K. B., L. K. Duffy, X. M. Zhang, and K. W. Pitcher. 2002. Mercury concentrations in the fur of Steller sea lions and northern fur seals from Alaska. Marine Pollution Bulletin 44(10):1130-1135.

Bejder, L., S. M. Dawson, and J. A. Harraway. 1999. Responses by Hector's dolphins to boats and swimmers in Porpoise Bay, New Zealand. Marine Mammal Science 15(3):738-750.

Bejder, L., A. Samuels, H. Whitehead, N. Gales, J. Mann, R. Connor, M. Heithaus, J. Watson-Capps, C. Flaherty, and M. Krutzen. 2006. Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance. Conservation Biology 20(6):1791-1798.

Bettridge, S., C. S. Baker, J. Barlow, P. Clapham, M. Ford, D. Gouveia, D. Mattila, R. Pace, P. E. Rosel, G. K. Silber, and P. Wade. 2015. Status review of the humpback whale (*Megaptera novaeangliae*) under the Endangered Species Act. U.S. Dept. Commer., NOAA, NMFS, SWFSC, March 2015. NOAA Technical Memorandum NMFS-SWFSC-540, 263 p.

Blane, J. M., and R. Jaakson. 1994. The impact of ecotourism boats on the St Lawrence beluga whales. Environmental Conservation 21(3):267-269.

BLM. 2019. Biological Evaluation for the Implementation of the Oil and Gas Lease Sales for the Arctic Wildlife Refuge Coastal Plain. Submitted to NMFS Alaska Region, Anchorage, AK, May 10, 2019.

Bond, N. A., M. F. Cronin, H. Freeland, and N. Mantua. 2015. Causes and impacts of the 2014 warm anomaly in the NE Pacific. Geophysical Research Letters 42(9):3414-3420.

Bosch, I., R. B. Rivkin, and S. P. Alexander. 1989. Asexual reproduction by oceanic planktotrophic echinoderm larvae. Nature 337:169–170.

Brower, A., A. Willoughby, and M. Ferguson. 2022. Distribution and relative abundance of bowhead whales and other marine mammals in the western Beaufort Sea, 2020. U.S. Dept. of Commerce, National Oceanic and Oceanic Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, July 2022. NOAA Technical Memorandum NMFS-AFSC-439, 155 p.

Brower, A. A., J. T. Clarke, and M. C. Ferguson. 2018. Increased sightings of subArctic cetaceans in the eastern Chukchi Sea, 2008–2016: population recovery, response to climate change, or increased survey effort? Polar Biology 41(5):1033-1039.

Burek, K. A., F. Gulland, and T. M. O'Hara. 2008. Effects of climate change on Arctic marine mammal health. Ecological Applications 18(2):S126-S134.

Burek, K. A., F. M. Gulland, G. Sheffield, K. B. Beckmen, E. Keyes, T. R. Spraker, A. W. Smith, D. E. Skilling, J. F. Evermann, J. L. Stott, J. T. Saliki, and A. W. Trites. 2005. Infectious disease and the decline of Steller sea lions (*Eumetopias jubatus*) in Alaska, USA: insights from serologic data. Journal of Wildlife Diseases 41(3):512-24.

Burkanov, V. N., and T. R. Loughlin. 2005. Distribution and abundance of Steller sea lions, *Eumetopias jubatus*, on the Asian coast, 1720's-2005. Marine Fisheries Review 67(2):1-62.

Byrne, M. 2013. Chapter 5: Asteroid evolutionary developmental biology and ecology. Pages 51-58 *in* J. M. Lawrence, editor. Starfish: biology and ecology of the Asteroidea. The Johns Hopkins University Press, Baltimore, MD.

Byrne, M., M. Gonzalez-Bernat, S. Doo, S. Foo, N. Soars, and M. Lamare. 2013. Effects of ocean warming and acidifcation on embryos and non-calcifying larvae of the invasive sea star *Patiriella regularis*. Marine Ecology Progress Series 473:235-246.

Calkins, D., E. Becker, T. Spraker, and T. Loughlin. 1994. Impacts on the distribution and abundance of Steller sea lions in Prince William Sound and the Gulf of Alaska. T. Loughlin, editor. Marine Mammals and the Exxon Valdez.

Calkins, D. G., and E. Goodwin. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Alaska Dept. of Fish and Game, Anchorage, AK, August 1988, 76 p.

Calkins, D. G., and K. W. Pitcher. 1982a. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Pages 447-546 *in* Environmental assessment of the Alaska continental shelf. Prepared by the Alaska Department of Fish and Game for the Outer Continental Shelf Environmental Assessment Program, Final Report: Research Unit 243, ACE 8094521, Anchorage, AK.

Calkins, D. G., and K. W. Pitcher. 1982b. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Outer Continental Shelf Environmental Assessment Program, U. S. Department of the Interior, 140.

Call, K. A., and T. R. Loughlin. 2005. An ecological classification of Alaskan Steller sea lion (*Eumetopias jubatus*) rookeries: A tool for conservation/management. Fisheries Oceanography 14(Supplement 1):212-222.

CalTrans. 2020. Technical guidance for the assessment of hydroacoustic effects of pile driving on fish: Appendix I – Compendium of pile driving sound data. Division of Environmental Analysis, California Department of Transportation, Report Number: CTHWANP-RT-20-365.01.04, Sacramento, CA, October 2020.

Carder, D. A., and S. H. Ridgway. 1990. Auditory brainstem response in a neonatal sperm whale, *Physeter spp.* The Journal of the Acoustical Society of America 88(S4 (1990)).

Castellote, M., R. J. Small, J. Mondragon, J. Jenniges, and J. Skinner. 2015. Seasonal distribution and foraging behavior of Cook Inlet belugas based on acoustic monitoring. ADFG Final Report to Department of Defense.

Cavole, L. M., A. M. Demko, R. E. Diner, A. Giddings, I. Koester, C. M. Pagniello, M.-L. Paulsen, A. Ramirez-Valdez, S. M. Schwenck, and N. K. Yen. 2016. Biological impacts of the 2013–2015 warm-water anomaly in the Northeast Pacific: winners, losers, and the future. Oceanography 29(2):273-285.

Chapin, F. S., III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze. 2014. Ch. 22: Alaska. Pages 514-536 *in* J. M. Melillo, T. C. Richmond, and G. W. Yohe, editors. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program.

Cheng, L., J. Abraham, J. Zhu, K. E. Trenberth, J. Fasullo, T. Boyer, R. Locarnini, B. Zhang, F. Yu, L. Wan, X. Chen, X. Song, Y. Liu, and M. E. Mann. 2020. Record-setting ocean warmth continued in 2019. Advances in Atmospheric Sciences 37(2):137-142.

Chia, F. S., and C. W. Walker. 1991. Ch. 5. Echinodermata: Asteroidea. Pages pp. 301–353 *in* A. C. Giese, J. S. Pearse, and V. B. Pearse, editors. Reproduction of Marine Invertebrates Vol. VI-Echinoderms and Lophophorates. Boxwood Press.

Chumbley, K., J. Sease, M. Strick, and R. Towell. 1997. Field studies of Steller sea lions (*Eumetopias jubatus*) at Marmot Island, Alaska 1979 through 1994. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, Seattle, WA, August 1997. NOAA Technical Memorandum NMFS-AFSC-77, 99 p.

Clapham, P. J. 1992. Age at attainment of sexual maturity in humpback whales, *Megaptera novaeangliae*. Canadian Journal of Zoology 70(7):1470-1472.

Clapham, P. J. 1993. Social organization of humpback whales on a North Atlantic feeding ground. Pages 131-145 *in*.

Clarke, J., A. Brower, M. Ferguson, A. Willoughby, and A. Rotrock. 2020. Distribution and relative abundance of marine mammals in the eastern Chukchi Sea, eastern and western Beaufort Sea, and Amundsen Gulf, 2019 annual report. U.S. Dept. of Interior, Bureau of

Ocean Energy Management (BOEM), Alaska OCS Region, Anchorage, AK, June 2020. OCS Study BOEM 2020-027 prepared under Interagency Agreement M17PG00031 by the NOAA, Alaska Fisheries Science Center, Marine Mammal Laboratory.

Corkeron, P. J. 1995. Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland: behaviour and responses to whale-watching vessels. Canadian Journal of Zoology 73(7):1290-1299.

Craig, K. 2016. Immune system impacts of global climate change and ocean acidification conditions in two ecologically critical echinoderms: a laboratory study. Explorations: The UC Davis Undergraduate Research Journal 18.

Crance, J. L., C. L. Berchok, J. Bonnel, and A. M. Thode. 2015. Northeasternmost record of a North Pacific fin whale (*Balaenoptera physalus*) in the Alaskan Chukchi Sea. Polar Biology 38(10):1767-1773.

Crance, J. L., C. L. Berchok, D. L. Wright, A. M. Brewer, and D. F. Woodrich. 2019. Song production by the North Pacific right whale, *Eubalaena japonica*. Journal of the Acoustical Society of America 145(6):3467-3479.

Cranford, T. W., and P. Krysl. 2015. Fin whale sound reception mechanisms: skull vibration enables low-frequency hearing. PLOS ONE 10(1):e0116222.

D'Vincent, C. G., R. M. Nilson, and R. E. Hanna. 1985. Vocalization and coordinated feeding behavior of the humpback whale in southeastern Alaska. Scientific Reports of the Whales Research Institute 36:41–47.

Dahlheim, M. E., P. A. White, and J. M. Waite. 2009. Cetaceans of southeast Alaska: distribution and seasonal occurrence. Journal of Biogeography 36:410-426.

Dalton, T., and D. Jin. 2010. Extent and frequency of vessel oil spills in US marine protected areas. Marine Pollution Bulletin 60(11):1939-1945.

David, L. 2002. Disturbance to Mediterranean cetaceans caused by vessel traffic. G. Notarbartolo de Sciara, editor. Cetaceans of the Mediterranean and Black Seas: State of Knowledge and Conservation Strategies. ACCOBAMS Secretariat, Monaco.

DeGrandpre, M., W. Evans, M.-L. Timmermans, R. Krishfield, B. Williams, and M. Steele. 2020. Changes in the Arctic Ocean carbon cycle with diminishing ice cover. Geophysical Research Letters 47(12):e2020GL088051.

Denes, S. L., J. Vallarta, and D. G. Zeddies. 2019. Sound source characterization of down-the-hole hammering, Thimble Shoal, Virginia. Technical report by JASCO Applied Sciences for Chesapeake Tunnel Joint Venture, Document 00188, Version 1.0, 10 September 2019.

Diogou, N., D. M. Palacios, J. A. Nystuen, E. Papathanassiou, S. Katsanevakis, and H. Klinck. 2019. Sperm whale (*Physeter macrocephalus*) acoustic ecology at Ocean Station PAPA in the Gulf of Alaska–Part 2: oceanographic drivers of interannual variability. Deep Sea Research Part I: Oceanographic Research Papers 150:103044.

Doney, S. C., M. Ruckelshaus, J. E. Duffy, J. P. Barry, F. Chan, C. A. English, H. M. Galindo, J. M. Grebmeier, A. B. Hollowed, N. Knowlton, J. Polovina, N. N. Rabalais, W. J. Sydeman, and L. D. Talley. 2012. Climate change impacts on marine ecosystems. Annual Reviews in Marine Science 4:11-37.

Dupont, S., O. Ortega-Martinez, and M. Thorndyke. 2010. Impact of near-future ocean acidification on echinoderms. Ecotoxicology 19:449-462.

Eco49. 2019. Request for incidental harassment authorization for the Lutak Dock Project, Haines, AK. Prepared by Eco49 for Alaska Marine Lines and submitted to NMFS Office of Protected Resources, NMFS consultation number AKRO-2019-01875, Anchorage, AK, October 2019.

Eco49. 2022. ESA Section 7 Biological Assessment for fisheries research conducted and funded by the Alaska Fisheries Science Center and the International Halibut Commission. Eco49 Consulting, Contract analysis prepared for the National Marine Fisheries Service, Bend, OR, June 2022, 127 p.

Edds-Walton, P. L. 1997. Acoustic communication signals of mysticete whales. Bioacoustics 8:47-60.

Edds, P., and J. Macfarlane. 1987. Occurrence and general behavior of balaenopterid cetaceans summering in the St. Lawrence Estuary, Canada. Canadian Journal of Zoology 65(6):1363-1376.

Eisner, L. B., Y. I. Zuenko, E. O. Basyuk, L. L. Britt, J. T. Duffy-Anderson, S. Kotwicki, C. Ladd, and W. Cheng. 2020. Environmental impacts on walleye pollock (*Gadus chalcogrammus*) distribution across the Bering Sea shelf. Deep Sea Research Part II: Topical Studies in Oceanography 181-182:104881.

Elfes, C. T., G. R. VanBlaricom, D. Boyd, J. Calambokidis, P. J. Clapham, R. W. Pearce, J. Robbins, J. C. Salinas, J. M. Straley, P. R. Wade, and M. M. Krahn. 2010. Geographic variation of persistent organic pollutant levels in humpback whale (*Megaptera novaeangliae*) feeding areas of the North Pacific and North Atlantic. Environmental Toxicology and Chemistry 29(4):824-834.

Ellison, W., B. Southall, C. Clark, and A. Frankel. 2012. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology 26(1):21-28.

Engelhardt, F. R. 1983. Petroleum effects on marine mammals. Aquatic Toxicology 4(3):199-217.

Erbe, C., and D. M. Farmer. 2000. Zones of impact around icebreakers affecting beluga whales in the Beaufort Sea. The Journal of the Acoustical Society of America 108(3 Pt 1):1332-

40.

Evans, P. G. H., P. J. Canwell, and E. Lewis. 1992. An experimental study of the effects of pleasure craft noise upon bottle-nosed dolphins in Cardigan Bay, West Wales. Pages 43-46 *in* Proceedings of the Sixth Annual Conference of the European Cetacean Society, 20-22 February 1992, San Remo, Italy.

Evans, P. G. H., Q. Carson, P. Fisher, W. Jordan, R. Limer, and I. Rees. 1994. A study of the reactions of harbour porpoises to various boats in the coastal waters of southeast Shetland. European Research on Cetaceans 8:60-64.

Everitt, R. D., C. H. Fiscus, and R. L. DeLong. 1980. Northern Puget Sound marine mammals. U.S. Dept. of Commerce and U.S. Environmental Protection Agency, Interagency energy/environment R&D Program Report No. EPA 600/7-80-139 prepared by the NOAA NMFS National Marine Mammal Laboratory for the Marine Ecosytems Analysis Puget Sound Project, Washington, D.C., February 1980.

Fabry, V. J., J. B. McClintock, J. T. Mathis, and J. M. Grebmeier. 2009. Ocean acidification at high latitudes: the Bellweather. Oceanography 22(4):160-171.

Fabry, V. J., B. A. Seibel, R. A. Feely, and J. C. Orr. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Science 65:414-432.

Fay, V. 2002. Alaska Aquatic Nuisance Species Management Plan. Alaska Department of Fish and Game Publication. Juneau, AK.

Fedewa, E. J., T. M. Jackson, J. I. Richar, J. L. Gardner, and M. A. Litzow. 2020. Recent shifts in northern Bering Sea snow crab (*Chionoecetes opilio*) size structure and the potential role of climate-mediated range contraction. Deep Sea Research Part II: Topical Studies in Oceanography:104878.

Feely, R. A., S. C. Doney, and S. R. Cooley. 2009. Ocean acidification: present conditions and future changes in a high-CO_2 world. Oceanography 22(4):37-47.

Feely, R. A., C. L. Sabine, K. Lee, W. Berelson, J. Kleypas, V. J. Fabry, and F. J. Millero. 2004. Impact of anthropogenic CO2 on the CaCO3 system in the oceans. Science 305(5682):362-366.

Ferguson, M. C., C. Curtice, and J. Harrison. 2015. 6. Biologically Important Areas for Cetaceans Within U.S. Waters – Gulf of Alaska Region. Aquatic Mammals 41(1):65-78.

Ford, J. K. B., and R. R. Reeves. 2008. Fight or flight: antipredator strategies of baleen whales. Mammal Review 38(1):50-86.

Freed, J. C., N. C. Young, B. J. Delean, V. T. Helker, M. M. Muto, K. M. Savage, S. S. Teerlink, L. A. Jemison, K. M. Wilkinson, and J. E. Jannot. 2022. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2016-2020. U. S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine

Fisheries Service, Alaska Fisheries Science Center, Seattle, WA. NOAA Tech. Memo. NMFS-AFSC-442, 116 p.

Frid, A., and L. M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology 6(1):11.

Frölicher, T. L., E. M. Fischer, and N. Gruber. 2018. Marine heatwaves under global warming. Nature 560(7718):360-364.

Furumaki, S., K. Tsujii, and Y. Mitani. 2021. Fin whale (*Balaenoptera physalus*) song pattern in the southern Chukchi Sea. Polar Biology 44(5):1021-1027.

Gauthier, J. M., C. D. Metcalfe, and R. Sears. 1997. Chlorinated organic contaminants in blubber biopsies from northwestern Atlantic balaenopterid whales summering in the Gulf of St Lawrence. Marine Environmental Research 44(2):201-223.

Geraci, J. R. 1990. Physiologic and toxic effects on cetaceans. Pages 167-197 *in* J. R. Geraci, and D. J. St. Aubin, editors. Sea mammals and oil: confronting the risks. Academic Press, Inc., San Diego, CA.

Gervaise, C., Y. Simard, N. Roy, B. Kinda, and N. Menard. 2012. Shipping noise in whale habitat: Characteristics, sources, budget, and impact on belugas in Saguenay–St. Lawrence Marine Park hub. Journal of the Acoustical Society of America 132:76-89.

Gisiner, R. C. 1985. Male territorial and reproductive behavior in the Steller sea lion, *Eumetopias jubatus*. Ph.D. dissertation. University of California, Santa Cruz, CA, 145 p.

Goldbogen, J. A., J. Calambokidis, D. A. Croll, J. T. Harvey, K. M. Newton, E. M. Oleson, G. Schorr, and R. E. Shadwick. 2008. Foraging behavior of humpback whales: kinematic and respiratory patterns suggest a high cost for a lunge. Journal of Experimental Biology 211(23):3712-3719.

Gooding, R. A., C. D. G. Harley, and E. Tang. 2009. Elevated water temperature and carbon dioxide concentration increase the growth of a keystone echinoderm. Proceedings of the National Acadamy of Sciences 106(23):9316-9321.

Goodwin, L., and P. A. Cotton. 2004. Effects of boat traffic on the behaviour of bottlenose dolphins (*Tursiops truncatus*). Aquatic Mammals 30(2):279-283.

Goold, J. C., and S. E. Jones. 1995. Time and frequency domain characteristics of sperm whale clicks. Journal of the Acoustical Society of America 98(3):1279-91.

Gravem, S. A., W. N. Heady, V. R. Saccomanno, K. F. Alvstad, A. L. M. Gehman, T. N. Frierson, and S. L. Hamilton. 2021. *Pycnopodia helianthoides*. IUCN Red List of Threatened Species 2021:43 p.

Grebmeier, J. M., J. E. Overland, S. E. Moore, E. V. Farley, E. C. Carmack, L. W. Cooper, K. E. Frey, J. H. Helle, F. A. McLaughlin, and S. L. McNutt. 2006. A major ecosystem shift in the northern Bering Sea. Science 311(5766):1461-1464.

Guan, S., and R. Miner. 2020. Underwater noise characterization of down-the-hole pile driving activities off Biorka Island, Alaska. Marine Pollution Bulletin 160:111664.

Hanselman, D. H., B. J. Pyper, and M. J. Peterson. 2018. Sperm whale depredation on longline surveys and implications for the assessment of Alaska sablefish. Fisheries Research 200:75-83.

Hansen, D. J. 1985. The Potential Effects of Oil Spills and Other Chemical Pollutants on Marine Mammals Occurring in Alaskan Waters. USDOI, MMS, Alaska OCS Region, Anchorage, AK, 22.

Harvell, C. D., D. Montecino-Latorre, J. M. Caldwell, J. M. Burt, K. Bosley, A. Keller, S. F. Heron, A. K. Salomon, L. Lee, O. Pontier, C. Pattengill-Semmens, and J. K. Gaydos. 2019. Disease epidemic and a marine heat wave are associated with the continental-scale collapse of a pivotal predator (*Pycnopodia helianthoides*). Science Advances 5:eaau7042.

Hastings, K. K., M. J. Rehberg, G. M. O'Corry-Crowe, G. W. Pendleton, L. A. Jemison, and T. S. Gelatt. 2020. Demographic consequences and characteristics of recent population mixing and colonization in Steller sea lions, *Eumetopias jubatus*. Journal of Mammalogy 101(1):107-120.

Hastings, M. C., and A. N. Popper. 2005. Effects of sound on fish. Report prepared by Jones and Stokes under contract with California Department of Transportation, No. 43A0139, Sacramento, CA, January 28, 2005.

Hawkins, A. D., A. E. Pembroke, and A. N. Popper. 2015. Information gaps in understanding the effects of noise on fishes and invertebrates. Reviews in Fish Biology and Fisheries 25:39-64.

Hawkins, A. D., and A. N. Popper. 2014. Assessing the impacts of underwater sounds on fishes and other forms of marine life. Acoustics Today 10(2):30-41.

Hawkins, A. D., and A. N. Popper. 2017. A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates. ICES Journal of Marine Science 74(3):635-651.

Helker, V. T., M. M. Muto, K. Savage, S. Teerlink, L. A. Jemison, K. Wilkinson, and J. Jannot. 2019. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2012-2016. U. S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, Seattle, WA, May 2019. NOAA Tech. Memo. NMFS-AFSC-392, 71 p.

Helm, R. C., D. P. Costa, T. D. DeBruyn, T. J. O'Shea, R. S. Wells, and T. M. Williams. 2015. Chapter 18: Overview of effects of oil spills on marine mammals. Pages 455-475 *in* M. Fingas, editor. Handbook of oil spill science and technology, First edition. John Wiley and Sons, Inc., Hoboken, NJ.

Hemery, L. G., S. R. Marion, C. G. Romsos, A. L. Kurapov, and S. K. Henkel. 2016. Ecological niche and species distribution modelling of sea stars along the Pacific Northwest continental shelf. Diversity and Distributions 22(12):1314-1327.

Hernroth, B., S. Baden, M. Throrndyke, and S. Dupont. 2011. Immune suppression of the echinoderm *Asterias rubens* (L.) following long-term ocean acidification. Aquatic Toxicology 103(2011):222-224.

Herrlinger, T. J. 1983. The diet and predator-prey relationships of the sea star *Pycnopodia helianthoides* (Brandt) from a central California kelp forest. Master's thesis. San Jose State University, Moss Landing Marine Laboratories, San Jose, CA, 57 p.

Hewitt, R. P. 1985. Reaction of dolphins to a survey vessel: effects on census data. Fishery Bulletin 83(2):187-193.

Hewson, I., K. S. Bistolas, E. M. Quijano Carde, J. B. Button, P. J. Foster, J. M. Flanzenbaum, J. Kocian, and L. K. Chaunte. 2018. Investigating the complex association between viral ecology, environment, and Northeast Pacific sea star wasting. Frontiers in Marine Science 5:77.

Heyvaert, C., and J. Reyff. 2021. Tenakee ferry terminal improvements project: Pile driving and drilling sound source verification, Report prepared by Illingworth and Rodkin for the Alaska Department of Transportation and Public Facilities, Cotati, CA, January 2021, 217 p.

Hinzman, L. D., N. D. Bettez, W. R. Bolton, F. S. Chapin, M. B. Dyurgerov, C. L. Fastie, B. Griffith, R. D. Hollister, A. Hope, H. P. Huntington, A. M. Jensen, G. J. Jia, T. Jorgenson, D. L. Kane, D. R. Klein, G. Kofinas, A. H. Lynch, A. H. Lloyd, A. D. McGuire, F. E. Nelson, W. C. Oechel, T. E. Osterkamp, C. H. Racine, V. E. Romanovsky, R. S. Stone, D. A. Stow, M. Sturm, C. E. Tweedie, G. L. Vourlitis, M. D. Walker, D. A. Walker, P. J. Webber, J. M. Welker, K. S. Winker, and K. Yoshikawa. 2005. Evidence and implications of recent climate change in northern Alaska and other Arctic regions. Climatic Change 72(3):251-298.

Horning, M., and J. A. Mellish. 2012. Predation on an upper trophic marine predator, the Steller sea lion: evaluating high juvenile mortality in a density dependent conceptual framework. PLOS ONE 7(1):e30173.

Hoshino, H., S. Fujita, Y. Goto, T. Isono, T. Ishinazaka, V. N. Burkanov, and Y. Sakurai. 2006. Organochlorines in steller sea lions (*Eumetopias jubatus*) from the western north pacific.

Houghton, J. 2001. The science of global warming. Interdisciplinary Science Reviews 26(4):247-257.

Hu, M. Y., E. Lein, M. Bleich, F. Melzner, and M. Stumpp. 2018. Trans-life cycle acclimation to experimental ocean acidification affects gastric pH homeostasis and larval recruitment in the sea star *Asterias rubens*. Acta Physiologica 224:e13075.

Huntington, H. P., S. L. Danielson, F. K. Wiese, M. Baker, P. Boveng, J. J. Citta, A. De Robertis, D. M. Dickson, E. Farley, and J. C. George. 2020. Evidence suggests potential transformation of the Pacific Arctic ecosystem is underway. Nature Climate Change 10(4):342-348.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland, 151 p.

IPCC. 2019. Summary for Policymakers. Pages 1-36 *in* H.-O. Pörtner, and coeditors, editors. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate. Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, NY.

Isaac, J. L. 2009. Effects of climate change on life history: implications for extinction risk in mammals. Endangered Species Research 7(2):115-123.

Jahoda, M., C. L. Lafortuna, N. Biassoni, C. Almirante, A. Azzellino, S. Panigada, M. Zanardelli, and G. N. Di Sciara. 2003. Mediterranean fin whale's (*Balaenoptera physalus*) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration. Marine Mammal Science 19(1):96-110.

Jansen, J., J. Bengtson, P. Boveng, S. Dahle, and J. Ver Hoef. 2006. Disturbance of harbor seals by cruise ships in Disenchantment Bay, Alaska: an investigation at three spatial and temporal scales. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, National Marine Mammal Laboratory, Seattle, WA, February 2006. AFSC Processed Report 2006-02.

Jefferson, T. A., P. J. Stacey, and R. W. Baird. 1991. A review of Killer Whale interactions with other marine mammals: predation to co-existence. Mammal Review 21(4):151-180.

Jemison, L. A., G. W. Pendleton, L. W. Fritz, K. K. Hastings, J. M. Maniscalco, A. W. Trites, and T. S. Gelatt. 2013. Inter-population movements of Steller sea lions in Alaska with implications for population separation. PLOS ONE 8(8):e70167.

Jemison, L. A., G. W. Pendleton, K. K. Hastings, J. M. Maniscalco, and L. W. Fritz. 2018. Spatial distribution, movements, and geographic range of Steller sea lions (Eumetopias jubatus) in Alaska. PLOS ONE 13(12):e0208093.

Jensen, A. S., and G. K. Silber. 2004. Large whale ship strike database. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD, January 2004. NOAA Technical Memorandum NMFS-OPR-25, 37 p.

Jewett, S. C., T. A. Dean, R. O. Smith, and A. Blanchard. 1999. 'Exxon Valdez' oil spill: impacts and recovery in the soft-bottom benthic community in and adjacent to eelgrass beds. Marine Ecology Progress Series 185:59-83.

Jiang, L., R. A. Feely, B. R. Carter, D. J. Greeley, D. K. Gledhill, and K. M. Arzayus. 2015. Climatological distribution of aragonite saturation state in the global oceans. Global Biogeochemical Cycles 29:1656-1673.

Johnson, J. H., and A. A. Wolman. 1984. The Humpback Whale, *Megaptera novaeangliae*. Marine Fisheries Review 46(4):300-337.

Jurasz, C. M., and V. P. Jurasz. 1979. Feeding modes of the humpback whale, *Megaptera novaeangliae*, in Southeast Alaska. Scientific Reports of the Whales Research Institute 31:69-83.

Kastelein, R. A., R. van Schie, W. C. Verboom, and D. de Haan. 2005. Underwater hearing sensitivity of a male and a female Steller sea lion (*Eumetopias jubatus*). Journal of the Acoustical Society of America 118(3):1820-1829.

Kenyon, K. W., and D. W. Rice. 1961. Abundance and distribution of the Steller sea lion. Journal of Mammalogy 42(2):223-234.

Keple, A. R. 2002. Seasonal abundance and distribution of marine mammals in the southern Strait of Georgia, British Columbia. University of British Columbia.

Ketten, D. R. 1995. Estimates of blast injury and acoustic trauma zones for marine mammals from underwater explosions. Pages 391-407 *in* R. A. Kastelein, J. A. Thomas, and P. E. Nachtigall, editors. Sensory systems of aquatic mammals. De Spil Publishers, Woerden, The Netherlands.

Ketten, D. R. 1997. Structure and function in whale ears. Bioacoustics 8:103-135.

Kim, G. B., S. Tanabe, R. Tatsukawa, T. R. Loughlin, and K. Shimazaki. 1996. Characteristics of butyltin accumulation and its biomagnification in Steller sea lion (*Eumetopias jubatus*). Environmental Toxicology and Chemistry 15(11):2043-2048.

Konar, B., T. J. Mitchell, K. Iken, H. Coletti, T. Dean, D. Esler, M. Lindeberg, B. Pister, and B. Weitzman. 2019. Wasting disease and static environmental variables drive sea star assemblages in the Northern Gulf of Alaska. Journal of Experimental Marine Biology and Ecology 520:151209.

Kooyman, G. L., R. L. Gentry, and W. B. McAlister. 1976. Physiological impact of oil on pinnipeds. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Marine Mammal Division, Seattle, WA, December 1976. NAFC Processed Report 1976-24.

Kreiger, K., and B. L. Wing. 1986. Hydroacoustic monitoring of prey to determine humpback whale movements, 62.

Kruse, G., F Funk, H Geiger, K Mabry, H Savikko, S Siddeek. 2000. Overview of State-managed Marine Fisheries in the Central and Western Gulf of Alaska, Aleutian Islands, and Southeastern Bering Sea, with reference to Steller sea lions, Junueau, AK. Regional

Information Report 5J00-10.

Kruse, S. 1991. The interactions between killer whales and boats in Johnstone Strait, B.C. K. Pryor, and K. Norris, editors. Dolphin Societies - Discoveries and Puzzles. University of California Press, Berkeley, California.

Kucey, L. 2005. Human disturbance and the hauling out behaviour of Steller sea lions (*Eumetopias jubatus*). University of British Columbia, Vancouver, B.C., 75 p.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1):35-75.

Lambert, P. 2000. Sea stars of British Columbia, Southeast Alaska and Puget Sound. UBC Press, Vancouver.

Lambertsen, R. H. 1992. Crassicaudosis: a parasitic disease threatening the health and population recovery of large baleen whales. Rev. Sci. Technol., Off. Int. Epizoot. 11(4):1131-1141.

Learmonth, J. A., C. D. Macleod, M. B. Santos, G. J. Pierce, H. Q. P. Crick, and R. A. Robinson. 2006. Potential effects of climate change on marine mammals. Oceanography and Marine Biology: An Annual Review 44:431-464.

Lee, R. F., and D. S. Page. 1997. Petroleum hydrocarbons and their effects in subtidal regions after major oil spills. Marine Pollution Bulletin 34(11):928-940.

Lefebvre, K. A., L. Quakenbush, E. Frame, K. B. Huntington, G. Sheffield, R. Stimmelmayr, A. Bryan, P. Kendrick, H. Ziel, T. Goldstein, J. A. Snyder, T. Gelatt, F. Gulland, B. Dickerson, and V. Gill. 2016. Prevalence of algal toxins in Alaskan marine mammals foraging in a changing arctic and subarctic environment. Harmful Algae 55:13-24.

Lesage, V., C. Barrette, M. C. S. Kingsley, and B. Sjare. 1999. The effect of vessel noise on the vocal behavior of belugas in the St. Lawrence River Estuary, Canada. Marine Mammal Science 15(1):65-84.

Liddle, J. B. 2015. Population dynamics of Pacific herring and humpback whales, Sitka Sound, Alaska 1981-2011. Ph.D. dissertation. University of Alaska Fairbanks, Fairbanks, AK.

Lischka, S., and U. Riebesell. 2012. Synergistic effects of ocean acidification and warming on overwintering pteropods in the Arctic. Global change biology 18(12):3517-3528.

Long, D. J., and R. E. Jones. 1996. Chapter 27: White shark predation and scavenging on cetaceans in the eastern North Pacfic Ocean. Pages 293-307 *in* A. P. Klimley, and D. G. Ainley, editors. Great white sharks: the biology of *Carcharodon carcharias*. Academic Press.

Loughlin, T. R. 2002. Steller's sea lion *Eumetopias jubatus*. Pages 1181-1185 *in* W. F. Perrin, B. Würsig, and J. G. M. Thewissen, editors. Encyclopedia of marine mammals. Academic Press, San Diego, CA.

Loughlin, T. R., B. E. Ballachey, and B. A. Wright. 1996. Overview of studies to determine injury caused by the *Exxon Valdez* oil spill to marine mammals. American Fisheries Society Symposium 18:798-808.

Loughlin, T. R., D. J. Rugh, and C. H. Fiscus. 1984. Northern sea lion distribution and abundance: 1956-80. Journal of Wildlife Management 48(3):729-740.

Lowry, D., S. Wright, M. Neuman, D. Stevenson, J. Hyde, M. R. Lindeberg, N. Tolimieri, S. Lonhart, S. B. Traiger, and R. G. Gustafson. 2022. Draft Endangered Species Act status review report: sunflower sea star (*Pycnopodia helianthoides*). U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA, October 2022. Report to NMFS Office of Protected Resources, 89 p. + appendices.

Lundquist, C. J., and L. W. Botsford. 2011. Estimating larval production of a broadcast spawner: the influence of density, aggregation, and the fertilization Allee effect. Canadian Journal of Fisheries and Aquatic Sciences 68:30-42.

Lusseau, D. 2003. Effects of tour boats on the behavior of bottlenose dolphins: Using Markov chains to model anthropogenic impacts. Conservation Biology 17(6):1785-1793.

Lusseau, D. 2006. The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand. Marine Mammal Science 22(4):802-818.

Lusseau, D., and L. Bejder. 2007. The long-term consequences of short-term responses to disturbance: experiences from whalewatching impact assessment. International Journal of Comparative Psychology 20(2):228-236.

Lüthi, D., M. Le Floch, B. Bereiter, T. Blunier, J.-M. Barnola, U. Siegenthaler, D. Raynaud, J. Jouzel, H. Fischer, K. Kawamura, and T. F. Stocker. 2008. High-resolution carbon dioxide concentration record 650,000–800,000 years before present. Nature 453(7193):379-382.

Macleod, C. D. 2009. Global climate change, range changes and potential implications for the conservation of marine cetaceans: A review and synthesis. Endangered Species Research 7(2):125-136.

Magalhaes, S., R. Prieto, M. A. Silva, J. Goncalves, M. Afonso-Dias, and R. S. Santos. 2002. Short-term reactions of sperm whales (*Physeter macrocephalus*) to whale-watching vessels in the Azores. Aquatic Mammals 28(3):267-274.

Maniscalco, J. M., C. O. Matkin, D. Maldini, D. G. Calkins, and S. Atkinson. 2007. Assessing killer whale predation on Steller sea lions from field observations in Kenai Fjords, Alaska. Marine Mammal Science 23(2):306-321.

Matsuoka, K., S. A. Mizroch, and H. Komiya. 2013. Cruise report of the 2012 IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER). International Whaling Commission, Cambridge, 43 p.

Mauzey, K. P., C. Birkeland, and P. K. Dayton. 1968. Feeding behavior of asteroids and escape responses of their prey in the Puget Sound region. Ecology 49(4):603-619.

Mazzuca, L., S. Atkinson, and E. Nitta. 1998. Deaths and entanglements of humpback whales, *Megaptera novaeangliae*, in the main Hawaiian islands, 1972-1996. Pacific Science 52(1):1-13.

McCarthy, J. J., O. Canziani, N. A. Leary, D. J. Dokken, and K. S. White. 2001. Climate change 2001: Impacts, adaptation, and vulnerability. Contribution of working group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom.

McCracken, A. R., B. M. Christensen, D. Munteanu, B. K. M. Case, M. Lloyd, K. P. Herbert, and M. H. Pespeni. 2023. Microbial dysbiosis precedes signs of sea star wasting disease in wild populations of *Pycnopodia helianthoides*. Frontiers in Marine Science 10:1130912.

McKenzie, J., and K. M. Wynne. 2008. Spatial and temporal variation in the diet of Steller sea lions in the Kodiak Archipelago, 1999 to 2005. Marine Ecology Progress Series 360:265-283.

Mellinger, D. K., K. M. Stafford, and C. G. Fox. 2004a. Seasonal occurrence of sperm whale (*Physeter macrocephalus*) sounds in the Gulf of Alaska, 1999–2001. Marine Mammal Science 20(1):48-62.

Mellinger, D. K., K. M. Stafford, S. E. Moore, U. Munger, and C. G. Fox. 2004b. Detection of North Pacific right whale (*Eubalaena japonica*) calls in the Gulf of Alaska. Marine Mammal Science 20(4):872-879.

Merrick, R. L., and T. R. Loughlin. 1997. Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters. Canadian Journal of Zoology 75(5):776-786.

Miles, P. R., C. I. Malme, and W. J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea. U.S. Departmemt of Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Anchorage, AK.

Mizroch, S., and D. Rice. 2013. Ocean nomads: Distribution and movements of sperm whales in the North Pacific shown by whaling data and Discovery marks. Marine Mammal Science 29:E136-E165.

Møhl, B., M. Wahlberg, P. T. Madsen, A. Heerfordt, and A. Lund. 2003. The monopulsed nature of sperm whale clicks. The Journal of the Acoustical Society of America 114(2):1143-1154.

Morete, M. E., T. L. Bisi, and S. Rosso. 2007. Mother and calf humpback whale responses to vessels around the Abrolhos Archipelago, Bahia, Brazil. Journal of Cetacean Research and Management 9(3):241-248.

Motti, C. A., U. Bose, R. E. Roberts, C. McDougall, M. K. Smith, M. R. Hall, and S. F. Cummins. 2018. Chemical ecology of chemosensation in Asteroidea: insights towards management strategies of pest species. Journal of chemical ecology 44:147-177.

Mueter, F. J., C. Broms, K. F. Drinkwater, K. D. Friedland, J. A. Hare, G. L. Hunt Jr, W. Melle, and M. Taylor. 2009. Ecosystem responses to recent oceanographic variability in high-latitude Northern Hemisphere ecosystems. 81:18.

Mulsow, J., and C. Reichmuth. 2010. Psychophysical and electrophysiological aerial audiograms of a Steller sea lion (Eumetopias jubatus). The Journal of the Acoustical Society of America 127(4):2692-2701.

Munger, L. M., S. M. Wiggins, S. E. Moore, and J. A. Hildebrand. 2008. North Pacific right whale (*Eubalaena japonica*) seasonal and diel calling patterns from long-term acoustic recordings in the southeastern Bering Sea, 2000–2006. Marine Mammal Science 24(4):795-814.

Muto, M. M., V. T. Helker, R. P. Angliss, B. A. Allen, P. L. Boveng, J. M. Breiwick, M. F. Cameron, P. J. Clapham, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2018. Alaska marine mammal stock assessments, 2017. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, June 2018. NOAA Technical Memorandum NMFS-AFSC-378, 382 p.

Muto, M. M., V. T. Helker, B. J. Delean, R. P. Angliss, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, R. C. Hobbs, Y. V. Ivaschenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2020. Alaska marine mammal stock assessments, 2019. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, July 2020. NOAA Technical Memorandum NMFS-AFSC-404, 395 p.

Muto, M. M., V. T. Helker, B. J. Delean, N. C. Young, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, J. L. Crance, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, K. T. Goetz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2021. Alaska marine mammal stock assessments, 2020. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, July 2021. NOAA Technical Memorandum NMFS-AFSC-421, 398 p.

Muto, M. M., V. T. Helker, B. J. Delean, N. C. Young, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, J. L. Crance,

S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, K. T. Goetz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2022. Alaska marine mammal stock assessments, 2021. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, August 2022. NOAA Technical Memorandum NMFS-AFSC-441, 398 p.

Neff, J. M. 1990. Composition and Fate of Petroleum and Spill-Treating Agents in the Marine Environment. Pages 1-33 *in* J. R. Geraci, and D. J. St. Aubin, editors. Sea Mammals and Oil: Confronting the Risks. Academic Press, New York, NY.

Neilson, J., C. Gabriele, J. Straley, S. Hills, and J. Robbins. 2005. Humpback whale entanglement rates in southeast Alaska. Pages 203-204 *in* Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, California.

Neilson, J. L., and C. Gabriele. 2020. Glacier Bay and Icy Strait humpback whale population monitoring: 2019 update. National Park Service Resource Brief, Gustavus, AK.

Neilson, J. L., C. M. Gabriele, A. S. Jensen, K. Jackson, and J. M. Straley. 2012a. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology 2012:106282.

Neilson, J. L., C. M. Gabriele, A. S. Jensen, K. Jackson, and J. M. Straley. 2012b. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology:106282.

Newcombe, C. P., and D. D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fisheries Management 11(1):72-82.

Ng, S. L., and S. Leung. 2003. Behavioral response of Indo-Pacific humpback dolphin (*Sousa chinensis*) to vessel traffic. Marine Environmental Research 56(5):555-567.

Nguyen, H. D., S. Doo, N. Soars, and M. Byrne. 2012. Noncalcifying larvae in a changing: warming, not acidification/hypercapnia, is the dominant stressor on development of the sea star *Meridiastra calcar*. Global change biology 18:2466-2476.

Nishiwaki, M. 1966. Distribution and migration of the larger cetaceans in the North Pacific as shown by Japanese whaling results. Pages 171-191 *in* K. S. Norris, editor. Whales, dolphins, and porpoises. University of California Press, Berkeley, CA.

NMFS. 1992. Final recovery plan for Steller sea lions (*Eumetopias jubatus*). Prepared by the Steller Sea Lion Recovery Team for the Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Silver Spring, MD, December 1992, 92 p.

NMFS. 2008a. Recovery plan for the Steller sea lion (*Eumetopias jubatus*). Eastern and Western Distinct Population Segments (*Eumetopias jubatus*). Revision. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, MD, March 2008, 325 p.

NMFS. 2008b. Recovery plan for the Steller sea lion (Eumetopias jubatus). Revision., Silver Spring, Maryland.

NMFS. 2010. Final recovery plan for the sperm whale (*Physeter macrocephalus*). U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD, December 2010, 165 p.

NMFS. 2014a. Final Environmental Impact Statement: Steller sea lion protection measures for groundfish fisheries in the Bering Sea and Aleutian Islands Management Area. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Region, Juneau, AK, May 2014.

NMFS. 2014b. Status review of Southeast Alaska herring (*Clupea pallasi*): threats evaluation and extinction risk analysis. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Region, Juneau, AK, March 2014. Report prepared by NMFS Alaska Region for NMFS Office of Protected Resources, 183 p.

NMFS. 2018a. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59.

NMFS. 2018b. Assessment of the Pacific cod stock in the Gulf of Alaska. Alaska Fisheries Science Center, Seattle, WA.

NMFS. 2018c. Revision to technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0): underwater acoustic thresholds for onset of permanent and temporary threshold shifts. U.S. Dept. of Commerce, National Oceanic and Atmospherica Administraiton, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. NOAA Tech. Memo. NMFS-OPR-55, 178 p.

NMFS. 2020a. 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*). U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD, July 2020.

NMFS. 2020b. Endangered Species Act (ESA) Section 7(a)(2) biological opinion for Alaska Marine Lines' Lutak Dock RoRo modification project, Lutak Inlet, AK (POA-2019-00108). U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Regional, Protected Resources Division, Juneau, AK, April 13, 2020. NMFS Consultation Number AKRO-2019-01875.

Nowacek, S. M., R. S. Wells, and A. R. Solow. 2001. Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. Marine Mammal Science 17(4):673-688.

O'Corry-Crowe, G., T. Gelatt, L. Rea, C. Bonin, and M. Rehberg. 2014. Crossing to safety: dispersal, colonization and mate choice in evolutionarily distinct populations of Steller sea lions, *Eumetopias jubatus*. Mol Ecol 23(22):5415-34.

O'Corry-Crowe, G., B. L. Taylor, T. Gelatt, T. R. Loughlin, J. Bickham, M. Basterretche, K. W. Pitcher, and D. P. DeMaster. 2006. Demographic independence along ecosystem boundaries in Steller sea lions revealed by mtDNA analysis: implications for management of an endangered species. Canadian Journal of Zoology 84(12):1796-1809.

Orr, J. C., V. J. Fabry, O. Aumont, L. Bopp, S. C. Doney, R. A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R. M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R. G. Najjar, G.-K. Plattner, K. B. Rodgers, C. L. Sabine, J. L. Sarmiento, R. Schlitzer, R. D. Slater, I. J. Totterdell, M.-F. Weirig, Y. Yamanaka, and A. Yool. 2005. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. Nature 437:681-686.

Oulhen, N., M. Byrne, P. Duffin, M. Gomez-Chiarri, I. Hewson, J. Hodin, B. Konar, B. G. Miner, A. Newton, L. M. Schiebelhut, R. Smolowitz, S. J. Wahltinez, G. M. Wessel, T. M. Work, H. A. Zaki, and J. P. Wares. 2022. A review of Asteroid biology in the context of sea star wasting: possible causes and consequences. The Biological Bulletin 243(1):50-75.

Parks, S. E., D. R. Ketten, J. T. O'Malley, and J. Arruda. 2007. Anatomical predictions of hearing in the North Atlantic right whale. The Anatomical Record: Advances in Integrative Anatomy and Evolutionary Biology 290(6):734-744.

Paul, A. J., and H. M. Feder. 1975. The food of the sea star *Pycnopodia helianthoides* (Brandt) in Prince William Sound, Alaska. Ophelia 14:15-22.

Payne, R. S. 1970. Songs of the humpback whale. Capitol Records, Hollywood, CA.

Pearson, W. H., J. R. Skalski, and C. I. Malme. 1992. Effects of sounds from a geophysical survey device on behavior of captive rockfish (Sebastes spp.). Canadian Journal of Fisheries and Aquatic Sciences 49(7):1343-1356.

Perry, S. L., D. P. DeMaster, and G. K. Silber. 1999. The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973: a special issue of the Marine Fisheries Review. Marine Fisheries Review 61(1):1-74.

Peterson, W., N. Bond, and M. Robert. 2016. The blob (part three): Going, going, gone? PICES Press 24(1):46.

Pitcher, K. W., and D. G. Calkins. 1981. Reproductive biology of Steller sea lions in the Gulf of Alaska. Journal of Mammalogy 62(3):599-605.

Pitcher, K. W., and F. H. Fay. 1982. Feeding by Steller sea lions on harbor seals. The Murrelet:70-71.

Popper, A. N., and M. C. Hastings. 2009. The effects of anthropogenic sources of sound on fishes. Journal of Fish Biology 75(3):455-489.

Qi, D., L. Chen, B. Chen, Z. Gao, W. Zhong, Richard A. Feely, Leif G. Anderson, H. Sun, J. Chen, M. Chen, L. Zhan, Y. Zhang, and W.-J. Cai. 2017. Increase in acidifying water in the western Arctic Ocean. Nature Climate Change 7(3):195-199.

Radford, C. A., J. A. Stanley, C. T. Tindle, J. C. Montgomery, and A. G. Jeffs. 2010. Localised coastal habitats have distinct underwater sound signatures. Marine Ecology Progress Series 401:21-29.

Rea, L. D., J. M. Castellini, L. Correa, B. S. Fadely, and T. M. O'Hara. 2013. Maternal Steller sea lion diets elevate fetal mercury concentrations in an area of population decline. Science of The Total Environment 454-455:277-282.

Reeves, R. R., S. Leatherwood, S. A. Karl, and E. R. Yohe. 1985. Whaling results at Akutan (1912-39) and Port Hobron (1926-37). Report of the International Whaling Commission 35:441-457.

Reisdorph, S. C., and J. T. Mathis. 2014. The dynamic controls on carbonate mineral saturation states and ocean acidification in a glacially dominated estuary. Estuarine, Coastal and Shelf Science 144:8-18.

Reyff, J., and C. Heyvaert. 2019. White Pass and Yukon Railroad mooring dolphin installation: pile driving and drilling sound source verification, Skagway, AK, Prepared by Illingworth and Rodkin, Inc. for PND Engineers, Inc., Job No 18-221.

Reyff, J., C. Janello, and C. Heyvaert. 2020. Port of Alaska Modernization Program petroleum and cement terminal hydroacoustic monitoring report. Prepared by Illingworth and Rodkin for the Port of Alaska, Cotati, CA, October 2020.

Rice, A. C., A. Širović, J. S. Trickey, A. J. Debich, R. S. Gottlieb, S. M. Wiggins, J. A. Hildebrand, and S. Baumann-Pickering. 2021. Cetacean occurrence in the Gulf of Alaska from long-term passive acoustic monitoring. Marine Biology 168:72.

Rice, D. W. 1989. Sperm whale *Physeter macrocephalus* Linnaeus, 1758. Pages 177-233 *in* S. Ridgway, and R. Harrison, editors. Handbook of marine mammals, volume 4. Academic Press, New York, New York.

Rice, D. W. 1998. Marine mammals of the world: systematics and distribution. Society for Marine Mammology, Lawrence, KS.

Rice, S. D., D. A. Moles, J. F. Karinen, S. Kern, M. G. Caris, C. C. Broderson, J. A. Gharrett, and M. M. Babcock. 1983. Effects of petroleum hydrocarbons on Alaskan aquatic organisms: a comprehensive review of all oil-effects research on Alaskan fish and invertebrates conducted by the Auke Bay Laboratory, 1970-81. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Auke Bay Laboratory, Auke Bay, AK, April 1, 1983 (Revised November 1984). Final report for the Outer Continental Shelf Environmental Assessment Program, Research Unit 72.

Richardson, W. J., C. R. Greene Jr, C. I. Malme, and D. H. Thomson. 1995. Marine mammals and noise. Academic Press, Inc., San Diego, CA.

Richardson, W. J., and C. I. Malme. 1993. Man-made noise and behavioral responses. Pages 631-700 *in* J. J. Burns, J. J. Montague, and C. J. Cowles, editors. The Bowhead Whale, volume Society for Marine Mammology Special Publication Number 2. Allen Press, Inc., Lawrence, KS.

Richter-Menge, J., M. L. Druckenmiller, and M. Jeffries, editors,. 2019. Arctic Report Card 2019, http://www.arctic.noaa.gov/Report-Card.

Richter-Menge, J., J. E. Overland, J. T. Mathis, E. Osborne, and Eds.;. 2017. Arctic Report Card 2017, http://www.arctic.noaa.gov/Report-Card.

Richter, C., S. Dawson, and E. Slooten. 2006. Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. Marine Mammal Science 22(1):46-63.

Rone, B. K., A. N. Zerbini, A. B. Douglas, D. W. Weller, and P. J. Clapham. 2017. Abundance and distribution of cetaceans in the Gulf of Alaska. Marine Biology 164:23.

Sandegren, F. E. 1970. Breeding and maternal behavior of the Steller sea lion (*Eumetopias jubata*) in Alaska. University of Alaska, Fairbanks, AK, 138.

Sapolsky, R. M. 2000. Stress Hormones: Good and Bad. Neurobiology of Disease 7(5):540-542.

Scheifele, P. M., S. Andrew, R. A. Cooper, M. Darre, F. E. Musiek, and L. Max. 2005. Indication of a Lombard vocal response in the St. Lawrence River beluga. The Journal of the Acoustical Society of America 117(3):1486-1492.

Scholik, A. R., and H. Y. Yan. 2001. The effects of underwater noise on auditory sensitivity of fish. Proceedings of the Institute of Acoustics 23:27-36.

Scholik, A. R., and H. Y. Yan. 2002. The effects of noise on the auditory sensitivity of the bluegill sunfish, Lepomis macrochirus. Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology 133(1):43-52.

Schwacke, L. H., C. R. Smith, F. I. Townsend, R. S. Wells, L. B. Hart, B. C. Balmer, T. K. Collier, S. De Guise, M. M. Fry, L. J. Guillette, Jr., S. V. Lamb, S. M. Lane, W. E. McFee, N. J. Place, M. C. Tumlin, G. M. Ylitalo, E. S. Zolman, and T. K. Rowles. 2014. Health of common bottlenose dolphins (*Tursiops truncatus*) in Barataria Bay, Louisiana, following the Deepwater Horizon oil spill. Environmental Science and Technology 48(1):93-103.

Serreze, M. C., and R. G. Barry. 2011. Processes and impacts of Arctic amplification: a research synthesis. Global and Planetary Change 77(1):85-96.

Sharpe, F. A., and L. M. Dill. 1997. The behavior of Pacific herring schools in response to artificial humpback whale bubbles. Canadian Journal of Zoology-Revue Canadienne De Zoologie 75(5):725-730.

Shivji, M., D. Parker, B. Hartwick, M. Smith, and N. Sloan. 1983. Feeding and distribution study of the sunflower sea star *Pycnopodia helianthoides* (Brandt, 1835). Pacific Science 37(2):133-140.

Sigler, M. F., D. J. Tollit, J. J. Vollenweider, J. F. Thedinga, D. J. Csepp, J. N. Womble, M. A. Wong, M. J. Rehberg, and A. W. Trites. 2009. Steller sea lion foraging response to seasonal changes in prey availability. Marine Ecology Progress Series 388:243-261.

Silber, G. K. 1986. The relationship of social vocalizations to surface behavior and aggression in the Hawaiian humpback whale (*Megaptera novaeangliae*). Canadian Journal of Zoology 64(10):2075-2080.

Simon, M., M. Johnson, and P. T. Madsen. 2012. Keeping momentum with a mouthful of water: behavior and kinematics of humpback whale lunge feeding. Journal of Experimental Biology 215(21):3786-3798.

Sinclair, E., D. S. Johnson, T. K. Zeppelin, and T. S. Gelatt. 2013. Decadal variation in the diet of Western Stock Steller sea lions (*Eumetopias jubatus*). NMFS-AFSC-248.

Sinclair, E. H., and T. K. Zeppelin. 2002. Seasonal and spatial differences in diet in the western stock of Steller sea lions (*Eumetopias jubatus*). Journal of Mammalogy 83(4):973-990.

Skalski, J. R., W. H. Pearson, and C. I. Malme. 1992. Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (Sebastes spp.). Canadian Journal of Fisheries and Aquatic Sciences 49(7):1357-1365.

Smith, S. C., and H. Whitehead. 1993. Variations in the feeding success and behaviour of galapagos sperm whales (*Physeter macrocephalus*) as they relate to oceanographic conditions. Canadian Journal of Zoology 71(10):1991-1996.

Solstice. 2023. Endangered Species Act Section 7 biological assessment for listed species under the jurisdiction of the National Marine Fisheries Service for the Haines Borough Lutak Dock Replacement Project, Lutak Inlet, Haines, Alaska. Prepared by Solstice Alaska Consulting for the U.S. Department of Transportation Maritime Administration and submitted to NMFS, NMFS consultation number AKRO-2023-00031, Anchorage, AK, November 2023.

Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C. R. Greene Jr., D. Kastak, D. R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas, and P. L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33(4):411-521.

Spalding, D. J. 1964. Comparative feeding habits of the fur seal, sea lion and harbour seal on the British Columbia coast. Bulletin of the Fisheries Research Board of Canada No. 146, Ottawa, Ontario, 52 p.

Springer, A. M., J. Estes, G. B. Van Vliet, T. Williams, D. Doak, E. Danner, K. Forney, and B. Pfister. 2003. Sequential megafaunal collapse in the North Pacific Ocean: An ongoing legacy of industrial whaling? Proceedings of the National Academy of Sciences 100(21):12223-12228.

St. Aubin, D. J. 1990. Physiologic and toxic effects on pinnipeds. Pages 103-127 *in* J. R. Geraci, and D. J. St. Aubin, editors. Sea mammals and oil, confronting the risks. Academic Press, San Diego, CA.

Stafford, K. M., and D. K. Mellinger. 2009. Analysis of acoustic and oceanographic data from the Bering Sea, May 2006 – April 2007. Final report to the North Pacific Research Board, NPRB Project No. 719, Seattle, WA, 24 p.

Stafford, K. M., D. K. Mellinger, S. E. Moore, and C. G. Fox. 2007. Seasonal variability and detection range modeling of baleen whale calls in the Gulf of Alaska, 1999-2002. Journal of the Acoustical Society of America 122(6):3378-3390.

Stewart, B. S., S. A. Karl, P. K. Yochem, S. Leatherwood, and J. L. Laake. 1987. Aerial surveys for cetaceans in the former Akutan, Alaska, whaling grounds. Arctic 40(1):33-42.

Straley, J., T. O'Connell, S. Mesnick, L. Behnken, and J. Liddle. 2005. Sperm whale and longline fisheries interactions in the Gulf of Alaska, Final report for North Pacific Research Board Project R0309, Sitka, AK, December 2005.

Straley, J. M. 1990. Fall and winter occurrence of humpback whales (*Megaptera novaeangliae*) in southeastern Alaska. Report of the International Whaling Commission Special Issue 12:319-323.

Straley, J. M., J. R. Moran, K. M. Boswell, J. J. Vollenweider, R. A. Heintz, T. J. Quinn Ii, B. H. Witteveen, and S. D. Rice. 2018. Seasonal presence and potential influence of humpback whales on wintering Pacific herring populations in the Gulf of Alaska. Deep Sea Research Part II: Topical Studies in Oceanography 147:173-186.

Straley, J. M., G. Schorr, A. Thode, J. Calambokidis, C. Lunsford, E. M. Chenoweth, V. O. Connell, and R. Andrews. 2014. Depredating sperm whales in the Gulf of Alaska: local habitat use and long distance movements across putative population boundaries. Endangered Species Research 24(2):125-135.

Strathmann, M. F. 1987. Chapter 26. Phylum Echinodermata. Class Asteroidea. Pages 535-555 *in* M. F. Strathmann, editor. Reproduction and development of marine invertebrates of the northern Pacific Coast. Univ. of Washington Press, Seattle, WA.

Stroeve, J., M. M. Holland, W. Meier, T. Scambos, and M. Serreze. 2007. Arctic sea ice decline: Faster than forecast. Geophysical Research Letters 34(9).

Stroeve, J., and D. Notz. 2018. Changing state of Arctic sea ice across all seasons. Environmental Research Letters 13(10):103001.

Suryan, R. M., M. L. Arimitsu, H. A. Coletti, R. R. Hopcroft, M. R. Lindeberg, S. J. Barbeaux, S. D. Batten, W. J. Burt, M. A. Bishop, J. L. Bodkin, R. Brenner, R. W. Campbell, D. A. Cushing, S. L. Danielson, M. W. Dorn, B. Drummond, D. Esler, T. Gelatt, D. H. Hanselman, S. A. Hatch, S. Haught, K. Holderied, K. Iken, D. B. Irons, A. B. Kettle, D. G. Kimmel, B. Konar, K. J. Kuletz, B. J. Laurel, J. M. Maniscalco, C. Matkin, C. A. E. McKinstry, D. H. Monson, J. R. Moran, D. Olsen, W. A. Palsson, W. S. Pegau, J. F. Piatt, L. A. Rogers, N. A. Rojek, A. Schaefer, I. B. Spies, J. M. Straley, S. L. Strom, K. L. Sweeney, M. Szymkowiak, B. P. Weitzman, E. M. Yasumiishi, and S. G. Zador. 2021. Ecosystem response persists after a prolonged marine heatwave. Scientific Reports 11(1):6235.

Sweeney, K., B. Birkemeier, K. Luxa, and T. Gelatt. 2023. Results of the Steller sea lion surveys in Alaska, June-July 2022. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA. AFSC Processed Report 2023-02, 32 p.

Sweeney, K., L. Fritz, R. Towell, and T. Gelatt. 2017. Results of Steller sea lion surveys in Alaska, June-July 2017. Memorandum to the Record, December 5, 2017.

Sweeney, K., R. Towell, and T. Gelatt. 2018a. Results of Steller Sea Lion Surveys in Alaska, June-July 2018, Seattle, WA.

Sweeney, K., R. Towell, and T. Gelatt. 2018b. Results of Steller sea lion surveys in Alaska, June-July 2018: Memorandum to The Record. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, Marine Mammal Laboratory, Seattle, WA, December 2018.

Thoman, R., and J. Walsh. 2019. Alaska's Changing Environment: documenting Alaska's physical and biological changes through observations. International Arctic Research Center, University of Alaska Fairbanks.

Thompson, P. O., W. C. Cummings, and S. J. Ha. 1986. Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska. Journal of the Acoustical Society of America 80(3):735-740.

Thompson, P. O., L. T. Findley, and O. Vidal. 1992. 20-Hz pulses and other vocalizations of fin whales, *Balaenoptera physalus*, in the Gulf of California, Mexico. The Journal of the Acoustical Society of America 92(6):3051-3057.

Thompson, T. J., H. E. Winn, and P. J. Perkins. 1979. Mysticete sounds. Pages 403-431 *in* H. E. Winn, and B. L. Olla, editors. Behavior of Marine Animals: Current Perspectives in Research Vol. 3: Cetaceans. Plenum Press, New York, NY.

Tom Mortensen Associates. 2021. Final monitoring report for Incidental Harassment Authorization (IHA) issued to Alaska Marine Lines, for the Lutak Dock RoRo

Modification Project, Lutak Inlet, Alaska. Tom Mortensen Associates, LLC Environmental Permitting and Management, Report submitted to NMFS Office of Protected Resources for consultation number AKRO-2019-01875, Department of the Army permit POA-2019-00108, Anchorage, AK, August 25, 2021, 7 p.

Traiger, S. B., J. L. Bodkin, H. A. Coletti, B. Ballachey, T. Dean, D. Esler, K. Iken, B. Konar, M. R. Lindeberg, and D. Monson. 2022. Evidence of increased mussel abundance related to the Pacific marine heatwave and sea star wasting. Marine Ecology 43(4):e12715.

Tyack, P., and H. Whitehead. 1983. Male competition in large groups of wintering humpback whales. Behaviour 83(1/2):132-154.

Tyack, P. L. 1981. Interactions between singing Hawaiian humpback whales and conspecifics nearby. Behavioral Ecology and Sociobiology 8:105-116.

Vanderlaan, A. S. M., and C. T. Taggart. 2007. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23(1):144-156.

Vos, J. G., G. Bossart, M. Fournier, and T. O'Shea. 2003. Toxicology of Marine Mammals. Volume III. CRC Press.

Wade, P. R. 2021. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA. Paper submitted to the International Whaling Commission SC/68C/IA/03.

Wang, J., K. Hulck, S. M. Hong, S. Atkinson, and Q. X. Li. 2011. Accumulation and maternal transfer of polychlorinated biphenyls in Steller Sea Lions (*Eumetopias jubatus*) from Prince William Sound and the Bering Sea, Alaska. Environmental Pollution 159(1):71-77.

Wania, F., and D. Mackay. 1993. Global fractionation and cold condensation of low volatility organochlorine compounds in polar regions. AMBIO 22(1):10-18.

Watkins, W. A. 1981. Activities and underwater sounds of fin whales. Scientific Reports of the Whales Research Institute 33:83-117.

Watkins, W. A. 1986. Whale reactions to human activities in Cape Cod waters. Marine Mammal Science 2(4):251-262.

Weilgart, L., and H. Whitehead. 1993. Coda communication by sperm whales (*Physeter macrocephalus*) off the Galapagos Islands. Canadian Journal of Zoology 71(4):744-752.

Weilgart, L. S. 2007a. A brief review of known effects of noise on marine mammals. International Journal of Comparative Psychology 20(2):159-168.

Weilgart, L. S. 2007b. The impacts of anthropogenic ocean noise on cetaceans and implications for management. Canadian Journal of Zoology 85(11):1091-1116.

Weir, C. R., and J. C. Goold. 2007. The burst-pulse nature of 'squeal' sounds emitted by sperm whales (*Physeter macrocephalus*). Marine Biological Association of the United Kingdom. Journal of the Marine Biological Association of the United Kingdom 87(1):39.

Wild, L., A. Thode, J. Straley, S. Rhoads, D. Falvey, and J. Liddle. 2017. Field trials of an acoustic decoy to attract sperm whales away from commercial longline fishing vessels in western Gulf of Alaska. Fisheries Research 196:141-150.

Williams, R., D. E. Bain, J. K. B. Ford, and A. W. Trites. 2002. Behavioural responses of male killer whales to a 'leapfrogging' vessel. Journal of Cetacean Research and Management 4(3):305-310.

Winn, H. E., P. J. Perkins, and T. C. Poulter. 1970. Sounds of the humpback whale. Pages 39-52 *in* 7th Annual Conference on Biological Sonar and Diving Mammals, Stanford Research Institute, Menlo Park.

Witteveen, B. H., J. M. Straley, E. Chenoweth, C. S. Baker, J. Barlow, C. Matkin, C. M. Gabriele, J. Neilson, D. Steel, and O. von Ziegesar. 2011. Using movements, genetics and trophic ecology to differentiate inshore from offshore aggregations of humpback whales in the Gulf of Alaska. Endangered Species Research 14(3):217-225.

Womble, J. N., and M. F. Sigler. 2006. Seasonal availability of abundant, energy-rich prey influences the abundance and diet of a marine predator, the Steller sea lion *Eumetopias jubatus*. Marine Ecology Progress Series 325:281-293.

Womble, J. N., M. F. Sigler, and M. F. Willson. 2009. Linking seasonal distribution patterns with prey availability in a central-place forager, the Steller sea lion. Journal of Biogeography 36(3):439-451.

Womble, J. N., M. F. Willson, M. F. Sigler, B. P. Kelley, and G. R. VanBlaricom. 2005. Distribution of Steller sea lion *Eumetopias jubatus* in relation to spring-spawning fish in SE Alaska. Marine Ecology Progress Series 294:271-282.

WP&YR. 2019. White Pass & Yukon Route Railroad dock dolphin installation: protected species final report, Monitoring report for NMFS Alaska Region Protected Resources Division for compliance with ESA Section 7 consultation AKR0-2018-00261, August 19, 2019, 44 p.

Wright, S. 2016. 2016 Copper River Delta Carcass Surveys, Annual Report. National Marine Fisheries Service, Alaska Region Protected Resources Division, Juneau, AK.

Yamamoto, A., M. Kawamiya, A. Ishida, Y. Yamanaka, and S. Watanabe. 2012. Impact of rapid sea-ice reduction in the Arctic Ocean on the rate of ocean acidification. Biogeosciences 9(6):2365-2375.

York, A. E. 1994. The population dynamics of northern sea lions, 1975-1985. Marine Mammal Science 10(1):38-51.

Young, N. C., B. J. Delean, V. T. Helker, J. C. Freed, M. M. Muto, K. Savage, S. Teerlink, L. A. Jemison, K. Wilkinson, and J. E. Jannot. 2020. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2014-2018. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, December 2020. NOAA Technical Memorandum NMFS-AFSC-413, 142 p.

Young, N. C., M. M. Muto, V. T. Helker, B. J. Delean, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, J. L. Crance, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, K. T. Goetz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2023. Alaska marine mammal stock assessments, 2022. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA, July 2023. NOAA Technical Memorandum NMFS-AFSC-474, 316 p.

Yuewen, D., and L. Adzigbli. 2018. Assessing the impact of oil spills on marine organisms. Journal of Oceanography and Marine Research 6:179.

Zerbini, A. N., J. M. Waite, J. L. Laake, and P. R. Wade. 2006. Abundance, trends and distribution of baleen whales off Western Alaska and the central Aleutian Islands. Deep Sea Research Part I-Oceanographic Research Papers 53(11):1772-1790.