UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802-1668

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Concurrence

Pacific Kelp Felice Strait
Aquaculture Project
Ketchikan, Alaska

NMFS Consultation Number: AKRO-2025-00571

Action Agency: US Army Corps of Engineers

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Fin Whale (*Balaenoptera physalus)*	Endangered	No	N/A	N/A	N/A
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	No	No	N/A

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

Jonathan M. Kurland
Regional Administrator

Date: December 12, 2025

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TERMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADL	Alaska Division of Lands
ADNR	Alaska Department of Natural Resources
AKR PRD	Alaska Region Protected Resources Division
AS	Alaska Statute
BA	Biological Assessment
CFR	Code of Federal Regulations
dB	decibels
DMLW	Division of Mining, Land, and Water
DPS	Distinct Population Segment
DQA	Data Quality Act
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
FR	Federal Register
ft	feet
HDPE	High density polyethylene
Hz	Hertz
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
kg	kilogram
kHz	kilohertz
LAS	Land Administration System
lbf	Pound-force
m	Meter(s)
mi	Mile(s)
min	Minute(s)
mm	Millimeter(s)
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
OMAO	Office of Marine and Aviation Operations
ppm	Parts per million
PSO	Protected Species Observer
PTS	Permanent Threshold Shifts
PVC	Polyvinyl chloride
RPA	Reasonable and Prudent Alternative
SEL	Sound Exposure Level
SPL	Sound Pressure Level
SSL	Steller sea lion
SSV	Sound source verification
TTS	Temporary threshold shift
US	United States
USACE	US Army Corps of Engineers
USC	United States Code
USFWS	US Fish and Wildlife Service
WNP	Western North Pacific

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)(1)).

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.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 FR 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to NMFS's existing practice in implementing section 7(a)(2) of the Act (84 FR at 45015; 89 FR at 24268). We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this Biological Opinion and ITS would not have been any different under the 2019 regulations or pre-2019 regulations.

In this document, the action agency is the U.S. Army Corps of Engineers (USACE), which proposes to issue a Letter of Permission under the Rivers and Harbors Act Section 10 to authorize construction and five years of operations of a 22.3-acre in-water aquaculture facility designed to grow kelp in Felice Strait, near Ketchikan, Alaska. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's Biological Opinion and concurrence (Opinion) on the effects of this proposal on endangered and threatened species. No designated critical habitat is located within the action area.

The Opinion and ITS were prepared by the 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

The Opinion is based on information provided in the Biological Assessment provided to NMFS on March 3, 2025. Other sources of information include species stock assessment reports, clarifying emails, and targeted studies listed in the References section. A complete record of this consultation is on file at NMFS's Juneau, Alaska office.

The proposed action involves the construction, placement, and operation of a 22.3-acre kelp-focused aquaculture facility. The proposed project site is located in Felice Strait in Southeast Alaska, approximately 33 miles by boat southeast of Ketchikan (Figure 1). The Latitude/Longitude of the four corners of the facility array would be:

Northeast Corner	54.9783, -131.421
Southeast Corner	54.9753, -131.4188
Southwest Corner	54.9722, -131.4317
Northwest Corner	54.9752, -131.4339

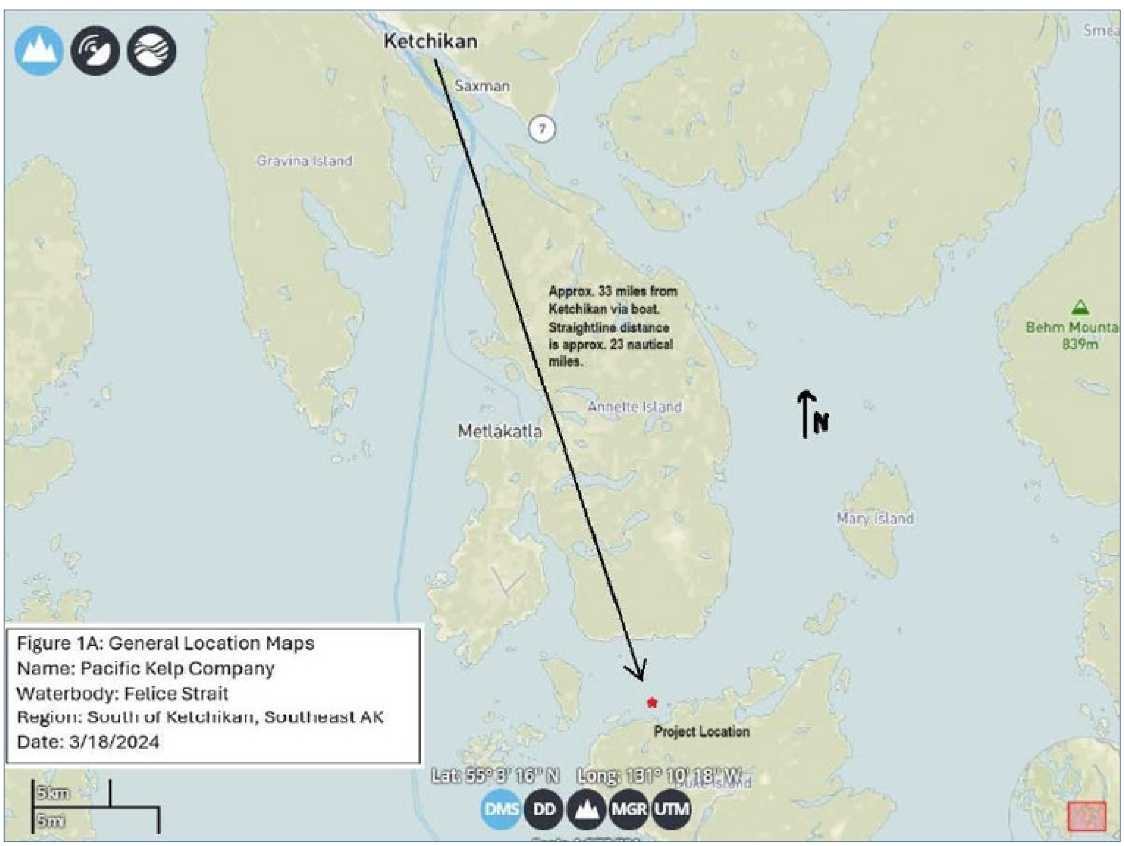


Figure 1. Map showing the location of the proposed aquaculture site (red star) at the north end of Duke Island, and distance (approximately 33 miles) from Ketchikan.

This Opinion considers the effects of aquaculture facility installation activities in addition to operational activities associated with the facility. These actions may affect and are likely to adversely affect the Mexico distinct population segment (DPS) of humpback whales (*Megaptera novaeangliae*) and also may affect but are not likely to adversely affect the fin whale (*Balaenoptera physalus*). No designated critical habitat is located within the action area.

1.2 Consultation History

Our communication with the USACE regarding this consultation is summarized as follows:

- **February 21, 2024:** USACE submitted to NMFS a request for informal consultation.
- **March 2024:** USACE/NMFS held telephone conversations regarding likely significant changes to aquaculture facility footprint.
- **April 2, 2024:** USACE submitted significant revisions to NMFS for the proposed action per the applicant's request.
- **April 9-May 22, 2024**: Frequent emails and calls between NMFS, USACE, and the applicant were held regarding additional changes to the action description, take calculations, and potential mitigation measures. Consultation was paused while applicant and USACE prepared revised project description.
- **November 25, 2024**: USACE submitted to NMFS a request for formal consultation. NMFS requested clarification and additional information.
- **December 12, 2024**: USACE and NMFS met to discuss the incomplete request for formal consultation.
- **December 23, 2024**: NMFS submitted to USACE a list of questions and requests for needed information in order to formally initiate consultation.
- **January 10, 2025:** USACE submitted to NMFS a revised draft Biological Assessment to better support a request for formal consultation.
- **January 15-February 19, 2025:** During this time period there were several back-and-forth discussions between USACE and NMFS via phone calls, emails, and one in-person meeting.
- **March 3, 2025:** USACE submitted to NMFS another revised request for formal consultation including an updated Biological Assessment. Consultation was initiated by NMFS.
- **March – August, 2025:** Email and phone exchanges were held between NMFS and USACE regarding clarifications in project description.

2 DESCRIPTIONS 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 and upon the high seas (50 CFR 402.02).

2.1.1 Proposed Activities

The purpose of the proposed action is to authorize the Pacific Kelp Company to establish an aquaculture (i.e., mariculture) facility in order to grow and sell kelp commercially. Pacific Kelp Company proposes to construct a kelp aquaculture farm in marine waters in order to commercially grow and harvest four species of kelp: giant kelp (*Macrocystis pyrifera*), sugar kelp (*Saccharina latissimi*), ribbon kelp (*Alaria marginata*), and bull kelp (*Nereocystis leutkeana*) for commercial use year-round.

The proposed project is located within Section 32 and the W1/2 of Section 33, township 79 S., Range 93 E., Copper River Meridian; center latitude 54.9759° N., longitude 131.4256° W.; east of Vegas Island and north of Duke Island (Figure 2), approximately 27 miles in a direct line southeast of Ketchikan, Alaska.

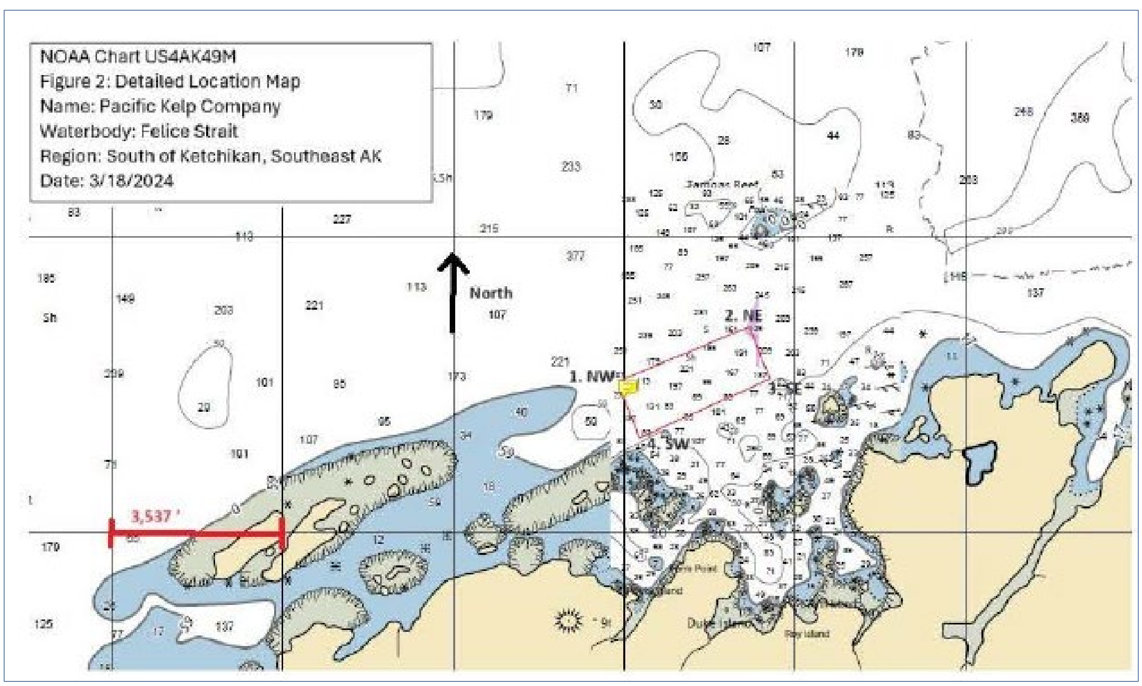


Figure 2. Chart showing the tidelands lease boundaries (pink lines) of the aquaculture site at the north end of Duke Island. The facility would be constructed within the lease area. The black arrow indicates North and the red line shows the width of the rectangular sections (3,537 feet).

The total size of the lease area is 79.9 acres (1,180 feet by 2,942 feet) with depth ranging from 90 to 150 feet deep. The parcel will contain one growing array (i.e., a system with multiple macroalgae longlines laid out in a grid pattern or attached together) measuring 22.3 acres of growing structures within the lease area. If the aquaculture facility and arrays are expanded beyond 22.3 acres within this 79.9-acre lease in the future, that would be a trigger for reinitiation of consultation. The arrays would be a catenary design. Catenary arrays are a type of grid/array system that use curved catenary lines or spreader bars made of high density polyethylene (HDPE) at either end of the structure to keep the entire system at a consistent tension to prevent line crossing and chafing[1] (Feldman et al. 2025). This can be accomplished due to the curved and flexible nature of the catenary line or bar. These features allow the catenary line or bar to connect the two outer headropes and allow for additional attachment points for the inner horizontal cultivation lines. Catenary lines use the same anchors and buoys as the headrope lines, thereby eliminating the need for additional anchors and buoys, while also increasing stability of the entire system. To remain at tension, the horizontal cultivation lines must differ in length and spacing, with the longer, and wider spaced lines on the outside closer to the backbones, and the shorter, more tightly spaced lines in the center of the system. As a result, a catenary system can typically use fewer anchors and buoys to moor it to the sea floor, and the mooring components allow the system to self-adjust in ever changing ocean conditions (Feldman et al. 2025).

The array would contain six (6) steel high scope drag embedment anchors, one at each corner of the array and an anchor on each side of the array (Figure 3). The anchors would be 5,000 kg each with the dimensions of 4.75 m by 2.70 m. Each anchor would be deployed with a boat, not to exceed 100 feet in length, with a crane hoist, that would position and then lower the anchors into place. The anchors would be connected to the arrays with 83-millimeter steel chain anchor and 96-millimeter fiber rope anchor lines. On average, more than 25 feet of anchor chain per anchor would be used. Given the tidal range of 15 feet at the farm site, it is expected that about 15 feet of the anchor chain would remain on the ocean floor at low tide. The anchor lines would be connected to 35-liter plastic tension floats to maintain tension in the lines. There would be a polyethylene foam corner float in each corner of the array. Anchor deployment would occur once at the start of the project and anchor removal would occur once the life of the project is completed.

[1] Goudey. (2019). United States Patent. Patent No.: US10, 257,990 B1. April, 16, 2019.

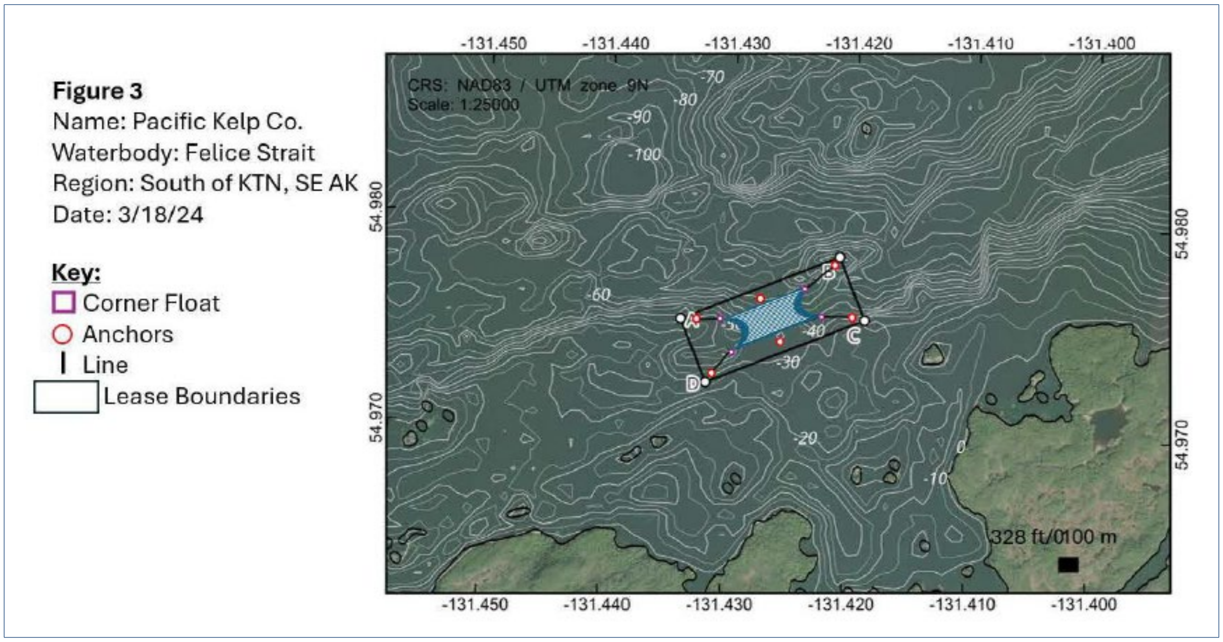


Figure 3. Chart showing the site plan. The lines associated with the array would occur towards the center of the 79.9-acre lease, with anchor lines tensioning the corners of the arrays, and buoys suspending the catenary lines. The black rectangle lines represent the lease boundaries (not to scale).

The array would contain 60 growlines, each measuring 984 feet to 1,640 feet in length. The total length of growlines for the array would measure 71,827 feet (Figure 4). The growlines would be suspended between the grid and anchor lines approximately 25 feet to 30 feet below the water surface. Each line would contain five concrete weights attached to the line and counteract the buoyancy of the kelp (Figure 6). The grid lines and growlines will be 36 mm (1.4") in diameter, with an estimated breaking strength of 24 tons (53,000 lbf). The growline tethers will be 10 mm (0.4") in diameter, with an estimated breaking strength of 3 tons (6,600 lbf). The mooring lines will be 96 mm (3.8") in diameter, with an estimated breaking strength of 500 tons (1,100,000 lbf). An example of line anticipated to be similar to the mooring lines in the proposed action can be seen in Figure 5.

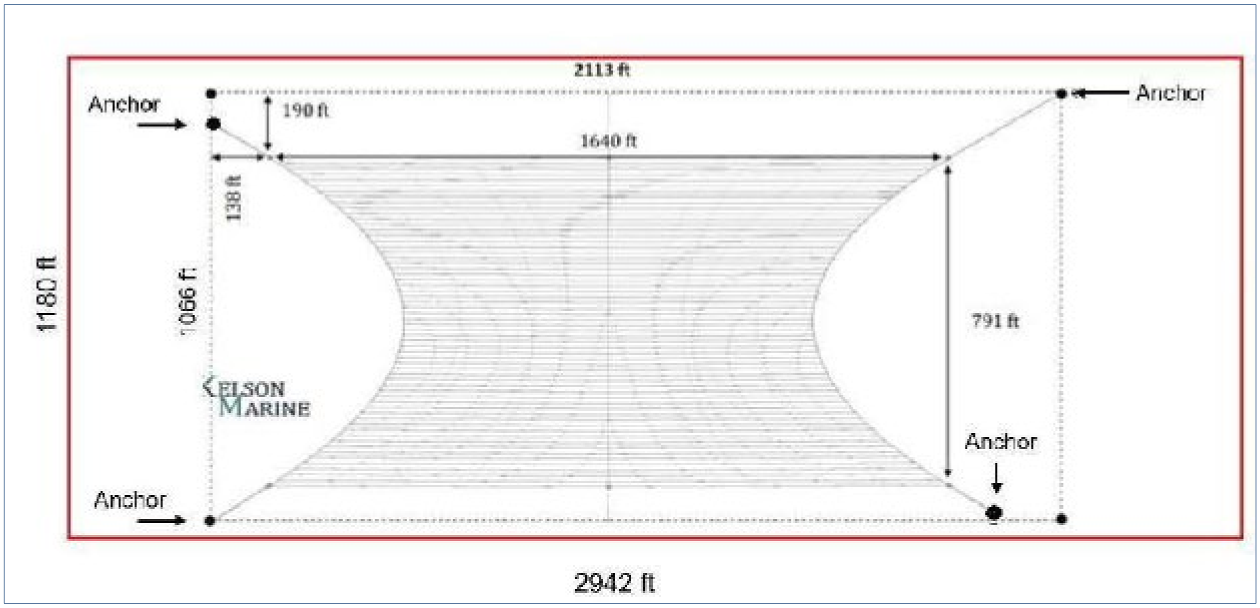


Figure 4. Schematic showing the dimensions of the aquatic farm area (black dotted lines) relative to the lease area (red outer lines). Note: diagram not to scale.

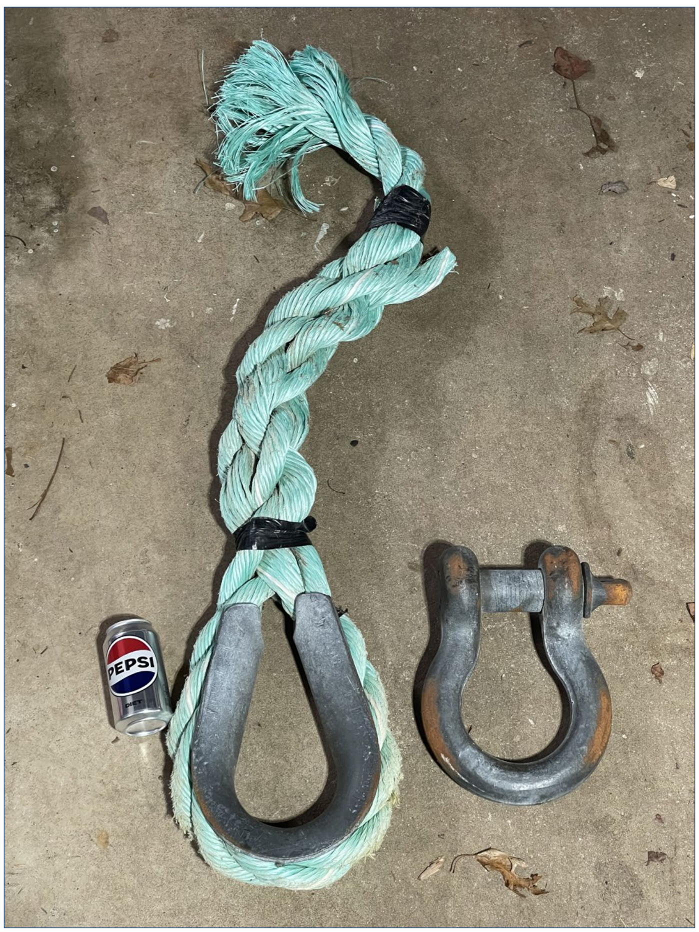
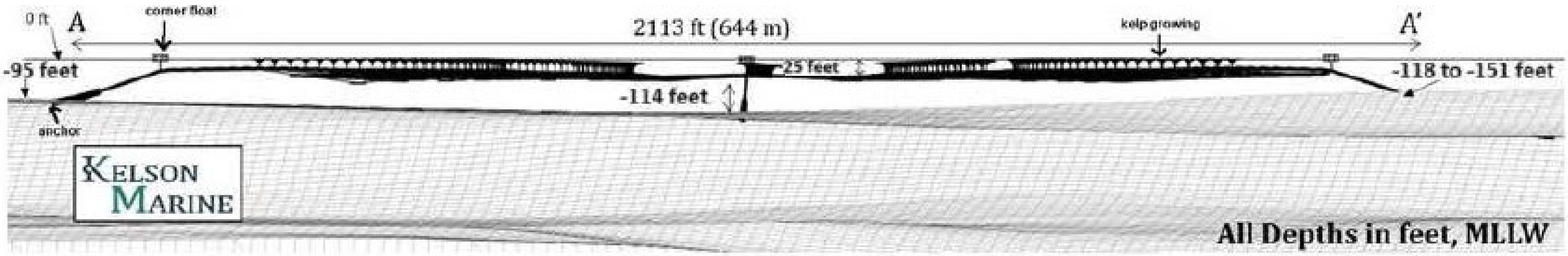


Figure 5. Photo of line anticipated to be similar to the mooring lines used in the proposed action. See soda can for size reference. Photo provided by NMFS.



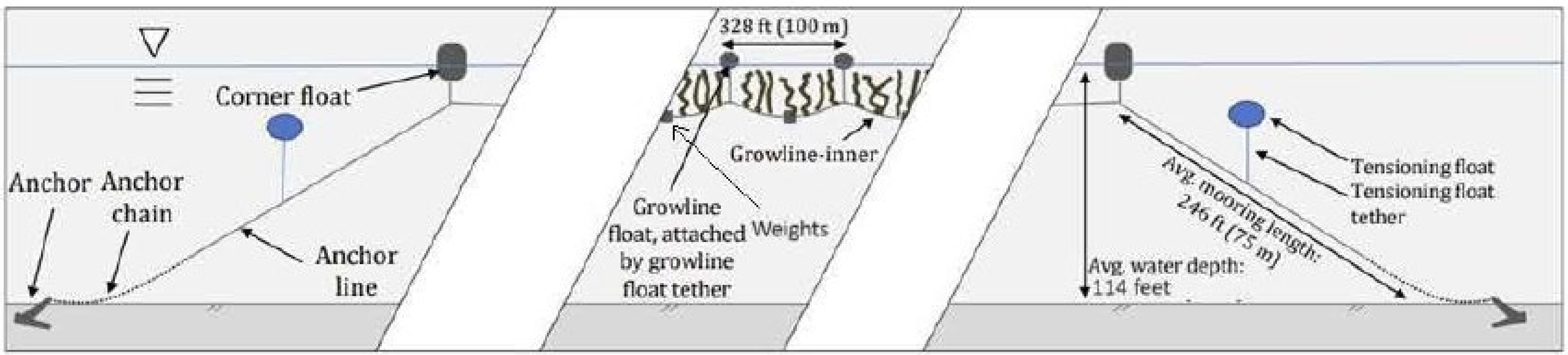


Figure 6. Two cross sectional schematics showing the anchors, anchor lines, anchor chains; grow lines; corner floats; and tensioning tethers and floats in more detail.

Giant kelp would be the primary species cultivated at this farm, but other species may be cultivated including sugar kelp, ribbon kelp, and bull kelp. Pacific Kelp Company would collect wild sorus tissue samples of the various kelp species to then provide to a certified hatchery. The hatchery would then propagate the sorus tissue. Kelp sporophytes would be planted by unwinding a seeded PVC pipe over the length of growlines. Pacific Kelp Company proposes to harvest multiple times per year (up to four times per year per individual kelp plant) by trimming the kelp canopy. Harvest would be completed by cutting the kelp with a knife and other cutting apparatus on a long pole to trim the kelp from the growout lines. Kelp would then be collected with a net or hook from the water surface and be placed into brailer bags which would be transported via tender boat or barge to Ketchikan for processing on private property. Tender boats would be local tenders, hired from Ketchikan, and the boats would not be longer than 100 feet. Wet weight yield would be measured to determine biomass growth rates on site. Gear would be cleaned of fouling organisms by washing or removal by hand.

The proposed kelp farm would be accessed via the Inside Passage by a 20-foot to 30-foot-long skiff, traveling from Ketchikan South Tongass Launch Ramp or a local area harbor. Traveling to and from the farm site to Ketchikan Harbor, the skiff would cruise as speeds around 30 miles per hour. Once at the farm site, the skiff would slowly circle the site at no more than 10 miles per hour and slowing down more or stopping when needed to complete monitoring or harvesting. Pacific Kelp Company plans to visit the site at least once per week to monitor the site, weather permitting. During the harvest, there would be one or two 20 to 30-foot skiffs and one tender boat or barge that would not exceed 100 feet in length.

Duration and Timing

Initial gear deployment to construct the facility/array would occur during the fall and winter of 2025/2026, with kelp out-planting, growing, and production anticipated to begin shortly after deployment. All gear and equipment would remain in the water year-round as giant kelp is a perennial species and can be harvested multiple times a year. If other species are cultivated, gear would remain in the water year-round and harvest would occur annually in the late winter/early spring. Harvesting would take approximately four to six hours per day and would not last more than four days per month. Harvesting would occur year-round with peak activity in summer months and minimal activity occurring in winter months. The Alaska Department of Natural Resources (ADNR) lease would be granted for 10 years. Operations under the ADNR lease may continue up to 10 years and would be reevaluated if operations are to be extended. The USACE permit will be reevaluated every five years. For purposes of this Opinion, NMFS assumes that operations will continue for the five-year period associated with the USACE permit. At this juncture, NMFS does not assume operations will continue past that period given that the success of the facility is unknown. If operations do continue after five years, a new USACE permit would be required, which would trigger reinitiation of consultation.

State Leasing Conditions

The proposed ADNR lease would be subject to the terms of the Department of Mining, Land, and Water's (DMLW) standard lease document and any additional stipulations based, in part, upon the following considerations. In accordance with AS 38.05.083[2] and 11 AAC 63.080,[3] Pacific Kelp Company would be required to submit a performance guaranty for the lease of the site.

- $8,000 Performance Bond: This bond would remain in place for the life of the proposed lease. The bond amount is based upon the level of development, amounts of hazardous waste/substances on site, and the perceived liability to the State. This bond would be used to ensure the applicant's compliance with the terms and conditions of the lease issued for their project. This bond amount will be subject to periodic adjustments and may be adjusted upon approval of any amendments, assignments, re-appraisals, changes in the development plan, changes in the activities conducted, changes in the performance of operations conducted on the authorized premises, or as a result of any violations to one or more of the authorizations associated with this project.
- Reclamation Bond: ADNR DMLW reserves the right to require a reclamation bond due to non-compliance issues during the term of the lease or near the end of the life of the project.

Pacific Kelp Company would be required to submit proof of liability insurance to DMLW, with the State of Alaska listed as a "NAMED" insured party. In accordance with AS 38.05.090(b), all lessees must restore their lease sites to a "good and marketable condition" within 120 days after termination of the lease. The USACE is not responsible for enforcing State of Alaska laws or regulations.

2.1.2 Mitigation Measures

For all reporting that results from implementation of these mitigation measures, NMFS will be contacted using the contact information specified in (Table 1). In all cases, notification will reference the NMFS consultation tracking number for this consultation (**NMFS Consultation Number: AKRO-2025-00571**).

General Mitigation Measures

1. The applicant will inform NMFS of impending in-water activities a minimum of one week prior to the onset of those activities (email information to akr.prd.records@noaa.gov and Sadie.Wright@noaa.gov).
2. If construction activities will occur entirely outside of the time window specified in this

[2] Alaska state law on Aquatic farming and hatchery site leases.
[3] Alaska state regulation for required security of aquatic farm site permits and leases.

Opinion, 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. If construction activities will not be completed within the time window specified in this Opinion, the applicant will notify NMFS as soon as the applicant is aware of the delays to allow NMFS sufficient time to consider whether reinitiation of consultation is necessary consistent with 50 CFR 402.16.

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 applicant will ensure that all closed loops (e.g., packing straps, rings, bands, etc.) will be cut prior to disposal. In addition, the applicant will secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter marine waters.

5. No hazardous materials or fuel will be stored at the proposed farm location.

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

6. Vessel operators for all project vessels will:

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

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

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

    d. 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);

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

    f. 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.

7. 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.

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

9. Project-specific tenders and barges will travel at 10 knots or less.

Reporting

Extralimital Sightings

10. All observations of ESA-listed marine mammal species not considered in this consultation will be reported to NMFS within 24 hours. Photographs and/or video should be taken if possible to aid in identification of individual animals. Reports will include all applicable information that would be included in an annual report.

Table 1. Summary of agency contact information.

Reason for Contact	Contact Information
Consultation Questions & Unauthorized Take	akr.prd.section7@noaa.gov and sadie.wright@noaa.gov
Reports & Data Submittal	akr.prd.section7@noaa.gov and sadie.wright@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 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: 901-206-4342

Aquatic Farms and Mariculture Operations

The applicant will implement the following mitigation measures to minimize the risk of adverse impacts to ESA-listed species from the aquatic farm:

Mariculture Infrastructure

11. The number of vertical lines employed in the design of the arrays will be minimized to avoid entanglement of listed species, while providing ample strength to secure each array.

12. Applicant will regularly maintain and monitor aquatic farm structures, keep lines secured, and keep lines tensioned under all tidal conditions.

13. Each buoy will be marked with the aquatic farm's ADL (lease) number (or LAS number if a temporary research site) using a method that will withstand the elements and remain legible while the buoy is deployed.

14. Each site will be inspected weekly during and outside of the growing season and following any major storm event (i.e., sustained surface winds or frequent gusts greater than or equal to 34 knots (39 miles/hour)) to ensure the integrity of the array.

15. Moorings and anchors will be inspected at least once per growing season and after each major storm event (i.e., sustained surface winds or frequent gusts greater than or equal to 34 knots (39 miles/hour)).

Marine Mammal Avoidance/Deterrence

16. Applicant and farm staff will not interact with or feed marine mammals.

Monitoring and Reporting

17. Applicant will submit an annual monitoring report each year by January 30, in electronic format, to akr.prd.records@noaa.gov and sadie.wright@noaa.gov. The report will contain the following information:

    a. A record of all visits to the aquatic farm site, including dates and times.

    b. Dates the gear was deployed and retrieved from marine waters.

    c. Reports of all ESA-listed species observed within 0.5 nm of the aquatic farm site. For each observation, the applicant and/or farm crew will record the date, number of individuals, approximate distance from the farm arrays, and any interactions between the animals and the vessels or array.

18. Applicant will immediately report any marine mammal observed entangled or otherwise directly interacting with the aquatic farm structures to the NMFS Alaska 24-hr. Stranding Hotline: 877-925-7773 (Table 1).

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 action area for this Opinion is defined by NMFS as the area within which project-related operations may occur. The action area includes the waters covered by the ADNR lease, the waters directly affected by the proposed structure, the waters immediately adjacent to the site, and the transit route to the project site. Vessels will transit the marine waters between Ketchikan and northern Duke Island to bring supplies to the site, conduct monitoring activities, harvest macroalgae, and transport product back to Ketchikan (Figure 7).

Figure 7. Satellite image showing the anticipated red track line that vessels will travel between Ketchikan and the proposed aquaculture facility site (as indicated by the yellow pins). The action area includes the area within which project-related activities will occur, including vessel transit 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).

We use the following approach to determine whether the proposed action described in Section 2 of this Opinion is likely to jeopardize the listed species listed above:

- Identify those aspects (or stressors) of the proposed action that are likely to have effects on listed species. As part of this step, we identify the action area – the spatial and temporal extent of these effects.
- Identify the rangewide status of the species likely to be adversely affected by the proposed action. This section describes the current status of each listed species relative to the conditions needed for recovery. Species status is 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 sex of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. 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. 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: appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution. This assessment is made in full consideration of the status of the species (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this Opinion.
- Reach jeopardy conclusion. Conclusions regarding jeopardy 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 (RPA) 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, NMFS must identify an RPA to the action.

4 RANGEWIDE STATUS OF THE SPECIES

This Opinion and concurrence consider the effects of the proposed action on the species specified below (Table 2).

The nearest critical habitat for the Mexico DPS humpback whale is over 600 miles from the action area. Critical habitat has not been designated for fin whales. Critical habitat will not be discussed further in this Opinion.

Table 2. Listing status for marine mammals considered in this Opinion and concurrence.

Species	Status	Listing	Critical Habitat
Fin Whale (*Balaenoptera physalus*)	Endangered	December 2, 1970, 35 CFR 18319	N/A
Humpback Whale, Mexico DPS (*M egaptera nov aeangliae*)	Threatened	September 8, 2016, 81 FR 62260	April 21, 2021, 86 FR 21082 (none in the action area)

4.1 Species Not Likely to be Adversely Affected by the Action

NMFS uses two criteria to identify those endangered or threatened species that are likely to be adversely affected by the agency action. The first criterion is exposure or some reasonable expectation of a co-occurrence between one or more potential stressors associated with the activities the USACE has proposed to authorize and a listed species. The second criterion is the probability of a response given exposure. If all potential stressors are extremely unlikely, insignificant, or beneficial in their effects to a listed species, the action is not likely to adversely affect that species.

We applied these criteria to the species listed above and determined that fin whales are not likely to be adversely affected by the proposed action.

4.1.1 Fin Whale

The fin whale was listed as an endangered species under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319) following large scale declines due to commercial whaling, and continued to be listed as endangered following passage of the ESA. Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, and are less common in the tropics. They occur year-round in a wide range of latitudes and longitudes, but the density of individuals in any one area changes seasonally. Critical habitat has not been designated for fin whales.

In the North Pacific Ocean, fin whales occur in summer foraging areas in the Chukchi Sea, the Sea of Okhotsk, around the Aleutian Islands, and the Gulf of Alaska (Gambell 1985, Muto et al. 2021). The stock of fin whales that occur in Alaska is the Northeast Pacific Stock. Visual surveys of fin whales conducted in the Gulf of Alaska in 2013 and 2015 recorded, respectively, 171 and 38 sightings of fin whales (Rone et al. 2017). These surveys provided fin whale abundance estimates of 3,168 fin whales (CV = 0.26) in 2013 and 916 (CV = 0.39) in 2015. The marked differences in these estimates can be partially explained by differences in sampling coverage across the two cruises (Rone et al. 2017).

In the North Pacific, the preferred prey of fin whales include euphausiids (mainly *Euphausia pacifica*, *Thysanoessa longipes*, *T. spinifera*, and *T. inermis*) and large copepods (mainly *Calanus cristatus*), followed by schooling fish such as Pacific herring (*Clupea pallasii*), walleye pollock (*Gadus chalcogrammus*), and capelin (*Mallotus villosus*) (Nemoto 1970).

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 2024). Estimates based on scans of a fin whale calf skull suggest that the best hearing for fin whale calves ranges from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015). Baleen whales have inner ears that appear to be specialized for low-frequency hearing. The morphology of the *mysticete* (baleen whale) auditory apparatus indicates they may have acute infrasonic hearing (Ketten 1997). Direct studies of fin whale hearing have not been conducted, but it is assumed that fin whales can hear the same frequencies that they produce (low) and are likely most sensitive to this frequency range (Richardson et al. 1995, Ketten 1997).

4.1.1.1 Fin whales in the action area

Fin whales occur in the action area, but in low numbers and typically in waters deeper than the proposed aquaculture site. All of the fin whales that occur in Alaska are from the North Pacific/North Atlantic subspecies (*B. p. physalus*), which occur throughout the North Pacific and North Atlantic Ocean basins, although the two populations rarely (if ever) mix (Young et al. 2024). 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 extremely unlikely that they would overlap or interact with this nearshore aquaculture facility.

4.1.2.1 Risk of entanglement

Fin whales are vulnerable to injury and death from entanglement in lines, nets, and other materials in the marine environment. Although entanglement deaths of fin whales have been documented in Alaska in gear similar to the lines being proposed for use in this Pacific Kelp facility, those events are rare, and have occurred in waters deeper than the proposed aquaculture site (NMFS Alaska Marine Mammal Stranding Network database, accessed July 29, 2025). Two confirmed fin whale entanglements were reported to the NMFS between 2000-2024. One incident occurred in 2012 when a fin whale became entangled in ¾" anchor cable associated with a vessel moored in 35 fathoms of water near Kodiak. The second incident occurred in 2019 when a fin whale became entangled in the lines associated with a pollock trawl net in the Bering Sea. Both incidents resulted in mortality to the whales (NMFS Alaska Marine Mammal Stranding Network database, accessed July 29, 2025). Given the location of this proposed aquaculture facility nearshore and fin whales' use of deeper water away from the immediate coast, we do not anticipate that any fin whales will interact with the lines or other in-water gear associated with this proposed aquaculture facility. In summary, we conclude that entanglement risk associated with the proposed action is extremely unlikely to occur.

4.1.2.2 Vessel traffic

Project specific vessels will transit at high speeds between Ketchikan and the aquaculture site in Felice Strait. Vessels will move at slower speeds during harvest operations near the site. Only two vessel strikes of fin whales have been documented in Alaska from 2000-2024, both in the Kodiak region. Both reported vessels were large (over 100 feet) and moving quickly (14 and 17 knots). At least one of the strikes resulted in the death of the fin whale (AKR PRD Vessel Strike database, 07.09.2025).

Mitigation measures (Section 2.1.2) will be implemented to minimize or avoid auditory and visual disturbance and potential vessel collisions with marine mammals, including fin whales, during project activities. Although some marine mammals could receive sound levels in exceedance of the acoustic threshold of 120 dB from the project vessels or be disturbed by the visual presence of vessels, disturbances rising to the level of harassment of fin whales are extremely unlikely to occur due to the temporary and transitory nature of the sound, the low anticipated density of fin whales in the region, and the anticipated application of mitigation measures. Because of the very low numbers of fin whales anticipated to occur in the action area and the implementation of mitigation measures, it is extremely unlikely that vessels will strike or elicit behavioral responses from, or have any adverse effects on fin whales. In summary, we conclude that effects from vessel traffic associated with the proposed action will be extremely unlikely to occur or insignificant.

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

4.2 Changing Environmental Conditions

There is a large and growing body of literature on past, present, and future impacts of global changing environmental conditions, exacerbated and accelerated by human activities. Effects of changing environmental conditions include sea level rise, increased frequency and magnitude of severe weather events, changes in air and water temperatures, changes in the quality and quantity of ice, changes in ocean acidification, and changes in precipitation patterns, all of which are likely to impact ESA species and habitat. NOAA's climate information portal provides basic background information on these and other measured or expected changing environmental condition effects (see https://www.climate.gov). We present an overview of the potential effects of changing environmental conditions on ESA-listed marine mammals and their habitat below.

A vast amount of literature is available on changing environmental conditions 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 Alaska specifically:

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

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

http://nsidc.org/arcticseaicenews/

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

Three facets of changing environmental conditions, increased air temperatures, increased ocean temperatures, and ocean acidification, are presented because they have the most direct impact on ESA-listed species and their prey.

Air temperature

Recording of global temperatures began in 1850, and the ten warmest years in the 175-year record have all occurred in the last decade (2015–2024)[4]. The yearly temperature for North America has increased at an average rate of 0.27° F per decade since 1910; however, the average rate of increase has more than doubled the century-scale rate since 1975 (0.59° F)[5].

The Arctic (latitudes between 60º N and 90º N) 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 8). Some of the most pronounced effects of changing environmental conditions in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014).

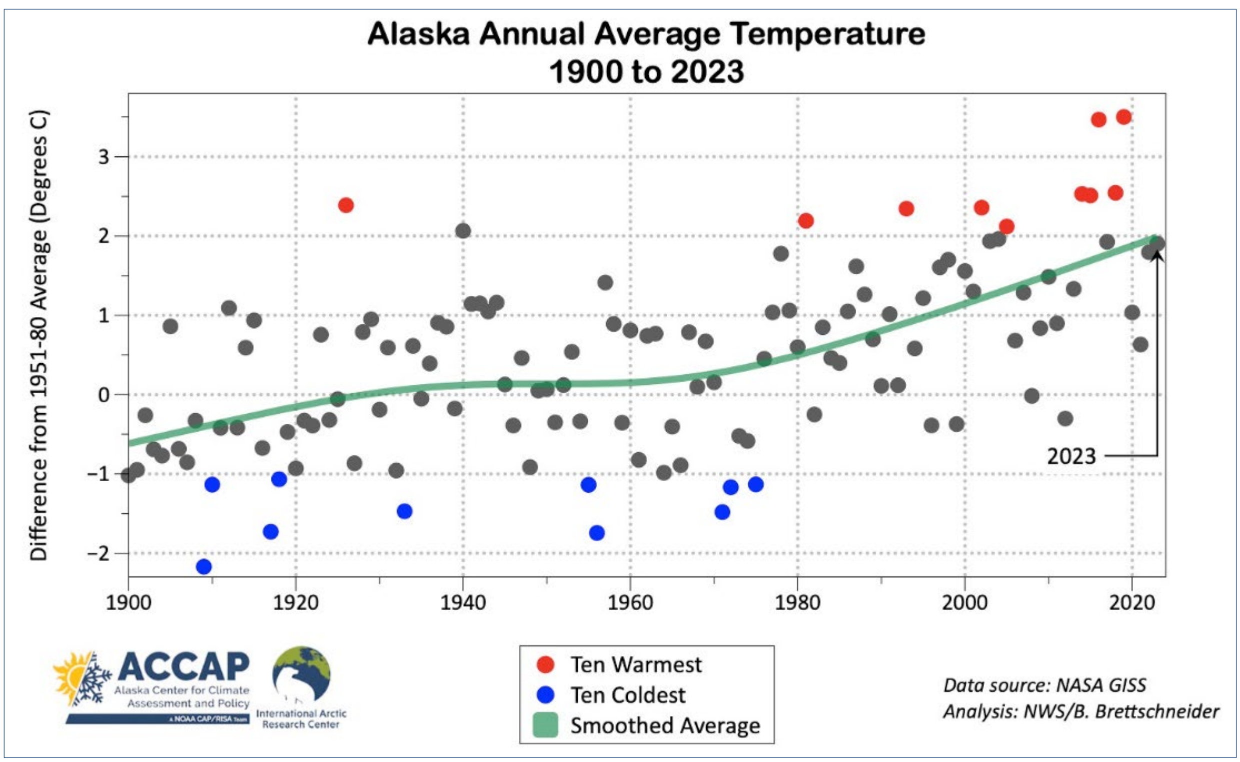


Figure 8. Alaska annual average air temperature, 1900 to 2023[6].

[4] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202413 viewed 3/27/2025.
[5] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202413 viewed 3/27/2025.
[6] https://www.flickr.com/photos/alaskaclimategraphics/albums/72177720310047711/ viewed 3/27/2025.

Marine water temperature

Higher air temperatures have led to higher ocean temperatures. More than 90 percent of the excess heat created by global changing environmental conditions is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019, Cheng et al. 2020). The annual global ocean heat content for 2024 in the upper 700 m and upper 2000 m was record high, passing the previous records set in 2023. The five highest years of global ocean heat content in the upper 700 m have all occurred since 2019, and the five highest years of global heat content in the upper 2000 m have all occurred in the past five years (2020-2024)[7].

Alaska oceans have been unusually warm in recent years, with unprecedented warmth in some cases (Thoman and Walsh 2019). This effect is observed throughout the Alaska region, including the Bering, Chukchi, and Beaufort seas (Figure 9). Annual average temperatures have increased by 1.8° C across the contiguous U.S. since the beginning of the 20th century with Alaska warming faster than any other state and twice as fast as the global average since the mid-20th century (Jay et al. 2018). 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).

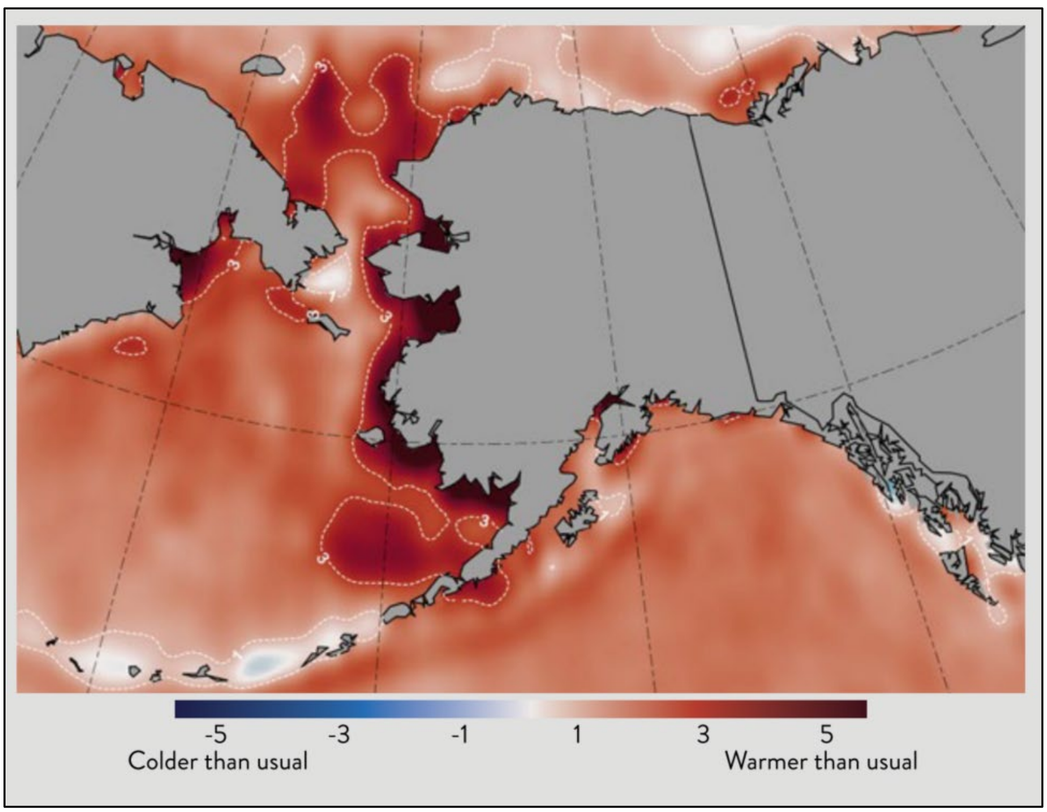


Figure 9. Alaska summer sea surface temperatures, 2014-2018 (Thoman and Walsh 2019).

[7] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202413#ohc viewed 3/27/2025.

In the Pacific Arctic, with the reduction in the cold-water pool in the northern Bering Sea, largescale northward movements of commercial stocks are underway as previously cold-dominated 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 heatwave, a coherent area of extreme warm temperature at the sea surface that persists (Frölicher et al. 2018). Global warming has led to more frequent heatwaves in most land regions and an increase in the frequency and duration of marine heatwaves (IPCC 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 heatwave 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). Humpback whales in Southeast Alaska were significantly impacted by the Pacific marine heatwave with documented declines in calf and adult survival (Gabriele et al. 2022).

Cetaceans, forage fish (capelin and herring), Steller sea lions, adult cod, king salmon, 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. 2018). The northeast Pacific marine heatwave is negatively correlated with humpback whale reproduction in Hawaii (Cartwright et al. 2019). Humpback whales are thought to be particularly susceptible to impacts from changing environmental conditions due to their high site fidelity and habitat temperature preferences (von Hammerstein et al. 2022).

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 increased 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 carbon sinks, the CO2 level continues to rise and in April 2025 was 429.64 ppm[8].

[8] https://gml.noaa.gov/ccgg/trends/ accessed 5/21/25.

As the oceans absorb CO_2, 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 (Bates et al. 2009, Reisdorph and Mathis 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 CO_2 and exacerbate the problem of aragonite undersaturation in the Arctic (Yamamoto et al. 2012, DeGrandpre et al. 2020). Undersaturated waters are potentially highly corrosive to any calcifying organism, such as corals, bivalves, crustaceans, echinoderms (including sea stars), and many forms of zooplankton such as copepods and pteropods, and, consequently, may affect 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 Alaska marine food web, will be able to adapt to changing ocean conditions (Fabry et al. 2008, Lischka and Riebesell 2012).

Changing environmental conditions are 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 2014b), including shifting abundances, changes in distribution, changes in timing of migration, and changes in periodic life cycles of species. For example, cetaceans with restricted distributions linked to water temperature may be particularly susceptible to range restriction (Learmonth et al. 2006, Isaac 2009). Macleod (2009) estimated that, based on expected shifts in water temperature, 88 percent of cetaceans will be affected by changing environmental conditions, 47 percent will be negatively affected, and 21 percent will be put at risk of extinction. Of greatest concern for cetaceans are populations with ranges limited to non-tropical waters, and preferences for shelf habitats (Macleod 2009).

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

This Opinion examines the status of each species 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 the definition of "jeopardy" under 50 CFR 402.02.

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 Mexico DPS Humpback Whales

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.

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

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

Humpback Whale 2015 Status Review

Humpback Whale 2022 Recovery Outline

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

4.3.1.1 Population Structure and Status

Commercial whaling severely reduced humpback whale numbers from historical levels. The humpback whale was listed as endangered under the ESCA on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered, and are also considered "depleted" under the Marine Mammal Protection Act (MMPA). NMFS conducted a global status review and in 2016 changed the status of humpback whales under the ESA. The globally listed species was divided into 14 DPSs, four of which are endangered, one is threatened, and the remaining nine are not listed under the ESA (81 FR 62260; September 8, 2016).

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 (WNP) DPS (endangered) and Mexico DPS (threatened). 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.

There are approximately 1,084 animals in the WNP DPS and 2,913 animals in the Mexico DPS (Wade 2021). The population trend is unknown for both DPSs. The Hawaii DPS is estimated at 11,540 animals, and the annual growth rate is between 5.5 and 6.0 percent (Wade 2021). Humpback whales in Southeast Alaska are comprised of approximately 98 percent Hawaii DPS individuals and two percent Mexico DPS individuals (Table 3). Central America DPS humpback whales do not occur in Alaska waters.

Table 3. Estimated proportion of humpback whales from each DPS in the North Pacific Ocean in various feeding areas. Adapted from Wade (2021).

Summer Feeding Areas	**North Pacific Distinct Population Segments**			
	Western North Pacific DPS (endangered)	**Hawaii DPS (not listed)**	**Mexico DPS (threatened)**	**Central America DPS (endangered)**
Kamchatka	91%	9%	0%	0%
Aleutian Islands / Bering / Chukchi / Beaufort	2%	91%	7%	0%
Gulf of Alaska	1%	89%	11%	0%
Southeast Alaska / Northern BC	0%	98%	2%	0%
Southern BC / WA	0%	69%	25%	6%
OR / CA	0%	0%	58%	42%

The abundance of humpback whales has increased in Southeast Alaska, and the most recent abundance estimate of humpback whales summering in Southeast Alaska and northern British Columbia is 5,890 (CV = 0.075) (Wade 2021, Young et al. 2024). That estimate includes humpback whales from the Hawaii and Mexico DPSs.

4.3.1.2 Distribution

Humpback whales migrate seasonally between warmer, tropical or sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate or sub-Arctic waters in summer months (where they feed). In their summer foraging areas and winter calving areas, humpback whales tend to occupy shallower, coastal waters; during their seasonal migration however, humpback whales disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

Humpback whale populations in Southeast Alaska have been steadily increasing in recent decades. Humpback whale abundance has increased by at least an estimated annually 6.8 percent in the North Pacific in the 39 years following the cessation of commercial whaling in the United States (Calambokidis et al. 2008). The annual rate of increase of humpback whale abundance in Southeast Alaska was estimated to be 10.6 percent from 1991-2007 (Dahlheim et al. 2009). As previously mentioned, an estimated 98 percent of humpback whales in Southeast Alaska are from the Hawaii DPS (not listed) and two percent from the Mexico DPS (threatened) (Wade 2021). We use 2 percent in this analysis to estimate the percentage of observed humpbacks that are from the Mexico DPS. WNP DPS humpback whales are not expected to occur in Southeast Alaska (Table 3).

Humpback whales are present in Southeast Alaska, including the action area, year-round. Most Southeast Alaska humpback whales winter in low latitudes, but there is significant overlap in migratory departures and returns, and documentation of individuals overwintering in Southeast Alaska (Baker et al. 1985, Straley 1990, Moran et al. 2018). Humpback whales forage on fish and euphausiids throughout the summer in Southeast Alaska (Krieger and Wing 1984). Late fall and winter whale habitat in Southeast Alaska appears to correlate with areas that have over-wintering herring (Baker et al. 1985, Straley 1990). In Southeast Alaska, peak densities of whales occur in early Fall in preparation for schooling herring (Straley et al. 2018). Schools of euphausiids, herring, and other fish in the action area may provide foraging opportunities for whales. Nearly all Southeast Alaska waters, including the entirety of the action area, are considered biologically important feeding areas for humpback whales (Wild et al. 2023). Southeast Alaska is not a breeding area for humpback whales (Young et al. 2024).

4.3.1.3 Threats to the Species

Algal toxins

Harmful algal blooms are a potential stressor for humpback whales. Out of 13 stranded marine mammal species sampled in Alaska, domoic acid was detected in all species examined with humpback whales showing 38 percent prevalence. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50 percent) and bowhead whales (32 percent) (Lefebvre et al. 2016). Domoic acid has caused marine mammal illness and mortality on the West Coast of the United States, and saxitoxin is a known cause of human illness and mortality in Alaska. Both are expected to increase in association with current climate trends (i.e., increasing water temperatures) (Lefebvre et al. 2016).

Entanglement

Humpback whales can be killed or injured in interactions with commercial fishing gear and other entangling materials, including aquaculture gear (Bath et al. 2023, Storlund et al. 2024, Young et al. 2024). A photo analysis study of humpback whales in Southeast Alaska in 2003 and 2004 found at least 53 percent of individuals showed scarring from past entanglements (Neilson 2006). The total minimum estimate of the mean annual mortality of all humpback whales incidental to U.S. commercial fisheries in Alaska (which includes whales from the Hawaii DPS, Mexico DPS, and Western North Pacific DPS) from 2016-2020 is 5.9 (CV = 0.93) humpback whales. This estimate is based on observer data from Alaska (0.4 annually in federal fisheries + 5.5 annually in the state-managed Southeast Alaska salmon drift gillnet fishery) (Young et al. 2024). During the same time period (2016-2020), Marine Mammal Authorization Program fishermen self-reports (from which the commercial fishery has been confirmed by NMFS) combined with reports to the NMFS Alaska Region stranding network documented an additional mean annual humpback whale mortality rate of 3.35 due to entanglements in recreational fishing gear, subsistence fishing gear, unknown fishing gear, marine debris, and other gear (e.g., mooring lines) (Young et al. 2024). These estimates are based on confirmed reports and are certainly a minimum number of humpback whale mortality and serious injury in Alaska due to entanglement (Young et al. 2024). Between 2016 and 2020, entanglement of humpback whales (n = 47) was the most frequent human-caused source of mortality and injury in Alaska (Freed et al. 2022).

Ship Strike

Ship strikes and other interactions with vessels occur frequently with humpback whales in Alaska. Neilson et al. (2012) summarized 108 large whale ship strikes 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. Eighteen humpbacks were confirmed to be struck by vessels in Alaska from 2016 to 2022 (Freed et al. 2022). Most ship strikes of humpback whales in Alaska are reported from Southeast Alaska (Freed et al. 2022).

In 2017, there were eight reported vessel strikes to large whales in Alaska; six confirmed humpback whales, one unknown large whale, and one sperm whale. In 2018, there were nine reported vessel strikes to large whales in Alaska; seven humpback whales, one gray whale, and one fin whale (AKR PRD Stranding Program Vessel Strike database; accessed on June 4, 2020). These reports are a minimum number of whale vessel strikes in Alaska, however, these incidents account for a very small fraction of the total humpback whale range (Laist et al. 2001). From 2016-2020, an estimated 1.93 humpback whales in Alaska suffered mortality or serious injury annual due to vessel strike and other interactions not related to fisheries, with most of these interactions occurring in Southeast Alaska (1.75 humpback whales) (Young et al. 2024).

Vessel collisions with humpback whales remain a significant management concern, given the increasing abundance of humpback whales foraging in Alaska, as well as the growing presence of marine traffic in Alaska's coastal waters. Based on these factors, injury and mortality of humpback whales as a result of vessel strike will continue into the future.

Anthropogenic Sound

Elevated sound from anthropogenic sources (e.g., shipping, military sonars, coastal development) is a potential concern for humpback whales in the North Pacific, as it can reduce acoustic space used for communication (Clark et al. 2009, Young et al. 2024). Lost communication opportunities due to anthropogenic sound effectively leads to loss of habitat (Williams et al. 2014). Abandonment or loss of preferred habitats could lead to decreases in fitness if the whales do not have access to food or resting areas.

4.3.1.4 Reproduction and Growth

Humpback whales in the Northern Hemisphere give birth and mate on low-latitude wintering grounds in January to March. Average sexual maturity of humpback whales in the Northern Hemisphere is between 5-11 years old, and varies between and within populations (Clapham 1992, Robbins 2007, Bettridge et al. 2015). Calving rates are between one and five years in humpback whales in the Northern Hemisphere, although two or three years is most common (Steiger and Calambokidis 2000, Bettridge et al. 2015). Gestation is about 12 months, and calves are likely weaned by the end of their first year (Perry et al. 1999).

4.3.1.5 Feeding and Prey Selection

Humpback whales tend to feed on summer grounds and not on winter grounds. However, some opportunistic winter feeding has been observed at low latitudes (Perry et al. 1999). Humpback whales engulf large volumes of water and then filter small crustaceans and fish through their fringed baleen plates. 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.

Humpback whales are relatively generalized in their feeding compared to some other baleen whales. In the Northern Hemisphere, known humpback whale prey includes: euphausiids; copepods; juvenile salmonids; Arctic cod; sardines; capelin; anchovy; herring; walleye pollock; pteropods; and cephalopods (Perry et al. 1999, Bettridge et al. 2015, Moran et al. 2018). Feeding by humpback whales is observed most of the year in Lynn Canal, including in the action area.

4.3.1.6 Diving and Social Behavior

In Hawaiian waters, humpback whales remain almost exclusively within the 1800 m isobath and usually within water depths less than 182 meters. Maximum diving depths are approximately 170 m (558 ft) (but usually <60 m [197 ft]), with a very deep dive (240 m [787 ft]) recorded off Bermuda (Hamilton et al. 1997). Diving behavior varies by season, and average dive times are less than five minutes during the summer, and between 10-15 minutes (and sometimes more than 30 minutes) in winter months (Clapham and Mead 1999). Because most humpback whale prey is likely found above 300 m, most humpback dives are probably relatively shallow.

Humpback whales appear to form small, unstable social groups during the breeding season (Clapham 1996). During the feeding season they form small groups that occasionally aggregate on concentrations of food. Feeding groups are sometimes stable for long periods of time. There is strong evidence of some territoriality in feeding (Clapham 1994, 1996) and calving areas (Tyack 1981).

4.3.1.7 Vocalization and Hearing

Mysticetes, including humpback whales, are likely most sensitive to sound from an estimated tens of hertz to approximately ten kilohertz (Southall et al. 2007). Evidence suggests that humpbacks can hear sounds as low as 7 Hz up to 24 kHz, and possibly as high as 30 kHz (Ketten 1997, Au et al. 2006). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with a generalized hearing range between 7 Hz to 35 kHz (NMFS 2024). Researchers studying mysticete auditory apparatus morphology hypothesized that large mysticetes have acute infrasonic hearing (Ketten 1997). 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 variety of vocalizations ranging from 20 Hz to 24 kHz (Thompson et al. 1986, Au et al. 2006). On wintering grounds, males sing complex songs that can last up to 20 minutes and may be heard up to 20 miles away (Clapham and Mattila 1990, Cato 1991). Source levels average 155 dB and range from 144 to 174 dB (Thompson et al. 1979).

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).

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 area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in 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).

This section focuses on existing anthropogenic and natural activities within the action area and their influences on the listed species that may be adversely affected by the proposed action. Although some of the activities discussed below occur outside of the action area, they may still impact listed species in the action area. Marine mammals may be affected by multiple threats concurrently, compounding the impacts of individual threats. Anthropogenic risk factors are discussed individually below.

5.1 Recent Consultations in the Action Area

Since May 1, 2019, there have not been any consultations near Duke Island. The closest projects that received ESA section 7 consultations since May 1, 2019, were in Metlakatla (approximately 20 boat miles northwest of the proposed aquaculture facility), southern Prince of Wales Island (more than 24 miles west), and Ketchikan (approximately 30-45 boat miles northwest).

Both ESA section 7 consultations in Metlakatla were for dock construction or refurbishment projects. One was a formal consultation for the Metlakatla Sea Plane dock, and the second was a Letter of Concurrence issued by NMFS for a smaller scale dock construction project. Both projects involved pile driving, resulting in sound source levels that temporarily exceeded NMFS’s acoustic thresholds of concern.

Three Letters of Concurrence were issued for projects on southern Prince of Wales Island, due west of the proposed facility site, across Dixon Entrance. One project was for salmon net pens, and the other two were for vessel activity associated with mine exploration projects. These are ongoing projects that will involve some level of vessel traffic, docks, and seasonal salmon net pens in the foreseeable future.

There were several Letters of Concurrence for informal consultations and four Biological Opinions for formal consultations issued by NMFS since May 1, 2019, in the Ketchikan area. Ketchikan is centered approximately 40 miles northwest of the proposed aquaculture site in Felice Strait, and would be the closest hub community from which vessel operations for the proposed action would be based. Most of the section 7 consultations since 2019 have been completed and most were for pile driving associated with dock construction and maintenance. Sixteen Letters of Concurrence were issued since May 1, 2019, by NMFS for dock construction, modification, maintenance, or removal activities in Ketchikan. Six Letters of Concurrence were issued during that same time period for seawall, walkway, or highway construction; and harbor dredging. One Letter of Concurrence was issued for wastewater treatment, and another for power cable replacement.

Two of the formal section 7 consultations in Ketchikan issued since May 1, 2019, have been completed and were related to large dock construction projects, including a NOAA OMAO Port Facility and the City of Ketchikan's Berth III dolphin construction. A third formal section 7 consultation was for Gravina Access improvements, much of which has been completed. A couple of components of the action will be completed in 2026, which will involve pile driving and vessel activity near the center of the city of Ketchikan. A fourth formal section 7 consultation was recently issued for SeaLink fiber optic cable placement in the region. This work will likely be ongoing in 2025 and will involve large, slow-moving vessels operating in the proposed action area.

5.2 Marine Vessel Activity

Vessel-based recreational activities, commercial and charter fishing, shipping, whale-watching, and general transportation, including Alaska State ferry boats and cruise ships, occur within the action area regularly. All of these activities increase ambient in-air and underwater sound and pose risk of vessel collisions with marine mammals. Vessel sound can change the behavior of marine mammals and mask their ability to communicate (Erbe et al. 2019). All of the sources of vessel traffic listed above increase underwater sound and contribute to the risk of vessel-whale collisions.

Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects from anthropogenic sounds such as shipping traffic. Baleen whales may also exhibit behavioral changes in response to vessel noise. Marine mammals that have been disturbed by anthropogenic noise 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 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). Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is uncertain (Schuler et al. 2019).

NMFS provides a voluntary code of conduct framework for vessel operators to reduce marine mammal interactions including:

- remain at least 100 yards from marine mammals; and
- time spent observing individual(s) should be limited to 30 minutes.

These guidelines can be viewed at: https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines.

Vessel strikes are a leading cause of mortality in large whales. Neilson et al. (2012) reported the following summary statements about humpback whale and vessel collisions in Southeast Alaska:

- Most vessels that strike whales are less than 49 feet long
- Most lethal collisions occur at speeds over 12 knots
- Most collisions occur between May and September
- Calves and juveniles appear to be at higher risk of collisions than adult whales

Further, the authors used previous locations of whale strikes to produce a kernel density estimation. The high risk areas shown in red in Figure 10 are also popular whale-watching destinations (Neilson et al. 2012). A number of the risk factors listed above occur in the proposed action area.

During the same time period (2000-2024), 108 vessel strikes of humpback whales were documented in Alaska by the NMFS Alaska Region Stranding Program. Eight of those were thought to not contain sufficient information, and another seven were unconfirmed, leaving 93 reports. Most of the vessels involved were engaged in fast transit activities when the strikes occurred (defined here as greater than 12 knots), although some vessels were moving slower, and a couple were even at rest or anchored. Most of these reports occurred in Southeast Alaska (AKR PRD Vessel Strike database, July 9, 2025), an area with high overlap of humpback whales and vessels, particularly during the summer months.

Although Tongass Narrows, which runs through Ketchikan, is identified as a high-risk area for vessel traffic in Southeast Alaska, the rest of the transit route between Ketchikan and the proposed farm site is not (Miller et al. 2019). Much of the transit route between the farm site and Ketchikan is a well-defined and frequently used route (Figure 11).

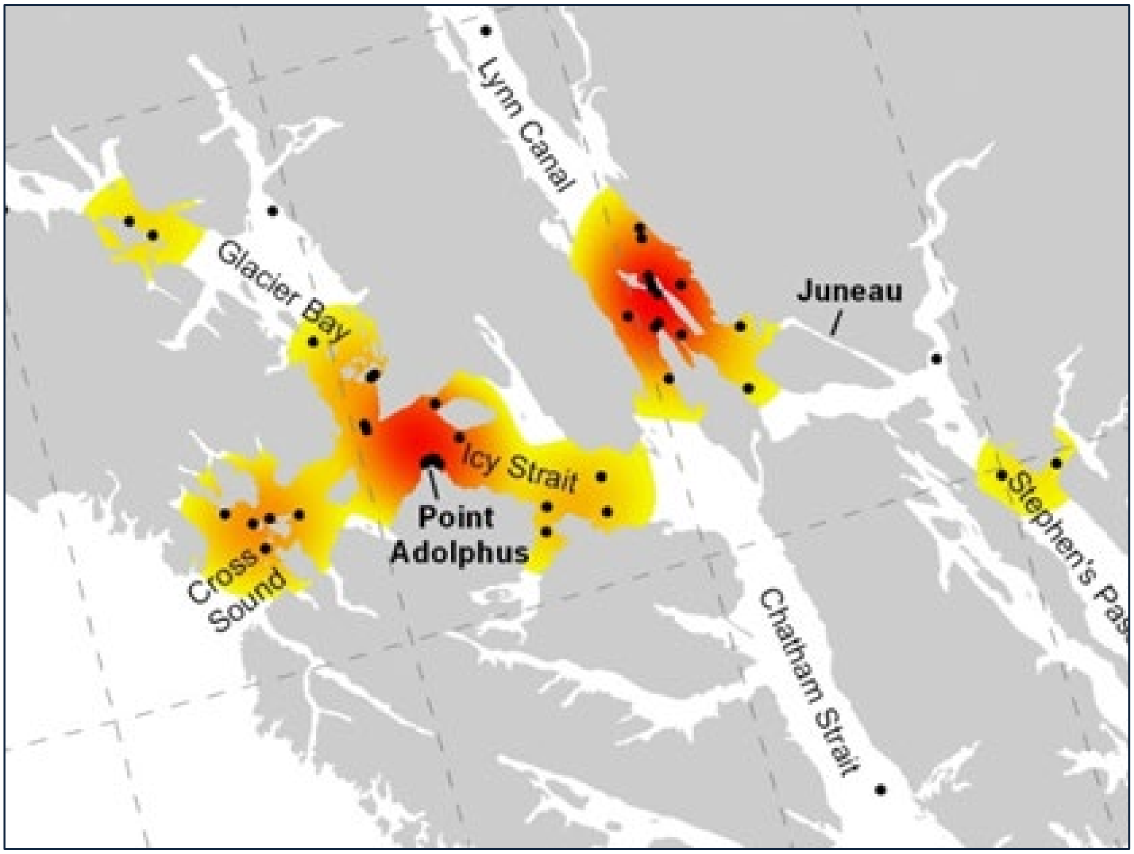


Figure 10. High risk areas for vessel strike of humpback whales in northern Southeast Alaska (Neilson et al. 2012). Many of the same risk factors that lead to the high-risk categorization in this map are similar near Ketchikan.

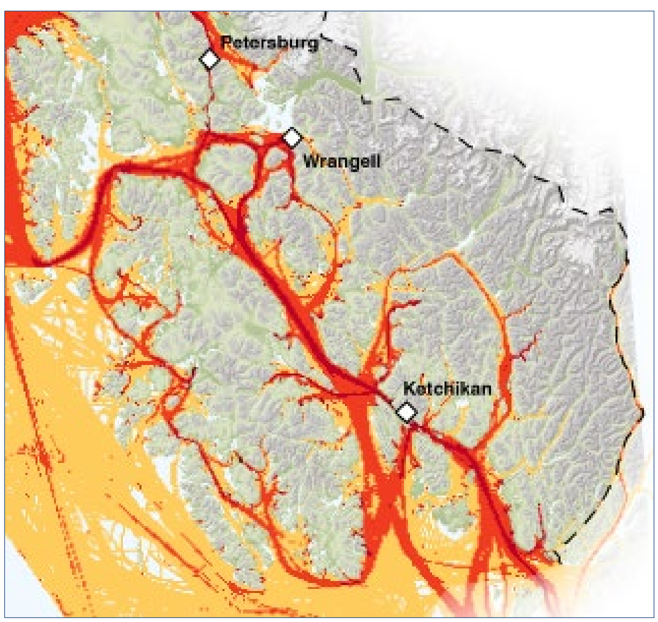


Figure 11. Heat map showing vessel traffic patterns in Southeast Alaska, including the waters between Ketchikan and the proposed farm site on the north side of Duke Island (modified from a figure in Miller et al. (2019)).

NMFS implemented regulations to minimize harmful interactions between ships and humpback whales in Alaska (see 50 CFR 216.18, 223.214, and 224.103(b)). These regulations require that all vessels:

a. not approach within 100 yards of a humpback whale, or cause a vessel or other object to approach within 100 yards of a humpback whale;

b. not place vessel in the path of oncoming humpback whales causing them to surface within 100 yards of vessel;

c. not disrupt the normal behavior or prior activity of a whale; and

d. operate vessel at a slow, safe speed when near a humpback whale. Safe speed is defined in regulation (see 33 CFR 83.06).

Since 2011, cruise lines, pilots, NMFS, and National Park Service (NPS) biologists have worked together to produce weekly whale sightings maps to improve situational awareness for cruise ships and state ferries in Southeast Alaska. In 2016, NMFS and NPS launched Whale Alert, a voluntary program that receives and shares real-time whale sightings with controlled access to reduce the risk of ship strike and contribute to whale avoidance.

In addition to these voluntary marine mammal viewing guidelines, many marine mammal viewing tour boats voluntarily subscribe to even stricter approach guidelines by participating in the Whale SENSE program. NMFS implemented Whale SENSE Alaska in 2015, which is a voluntary program developed in collaboration with the whale-watching industry that recognizes companies who commit to responsible practices. More information is available at https://whalesense.org/.

Marine vessel speed limits of 10 knots or less have shown reduced mortality of endangered North Atlantic right whales (NOAA 2020) and is used in the mitigation measures for this proposed action.

These regulations and guidelines all apply within the proposed action area.

5.3 Entanglement

Entanglement of pinnipeds and cetaceans in fishing gear and other human-made material is a major threat to their survival worldwide. Other materials also pose entanglement risks including marine debris, mooring lines, anchor lines, and underwater cables. While in many instances marine mammals may be able to disentangle themselves (Jensen et al. 2009), other entanglements result in lethal and sublethal trauma to marine mammals including drowning/asphyxiation, injury, reduced foraging, reduced fitness, and increased energy expenditure (van der Hoop et al. 2017).

Entangled marine mammals may drown/asphyxiate or starve due to being restricted by gear, suffer physical trauma and systemic infections, or be struck by vessels due to an inability to avoid them. Entanglement can include many different gear interaction scenarios, but the following have occurred with humpback whales:

- Gear loosely wrapped around the marine mammal's body that moves or shifts freely with the marine mammal's movement and does not indent the skin can result in disfigurement.
- Gear that encircles any body part and has sufficient tension to either indent the skin or to not shift with marine mammal's movement causes lacerations, partial or complete fin amputation, organ damage, or muscle damage, and interferes with mobility, feeding, and breathing. Chronic tissue damage from lines under pressure can compromise a whale's physiology. Fecal samples from entangled whales had extremely high levels of cortisol, an immune system stress hormone (Rolland et al. 2005). Extended periods of pituitary release of cortisol can exhaust the immune system, making a whale susceptible to disease and infection.

The NMFS Alaska Marine Mammal Stranding Network database has documented 276 humpback whale entanglement reports from 2000-2024. Eight of those whales were confirmed to be not entangled (e.g., kelp) and 14 reports were not confirmed due to lack of photo quality or other information. Therefore, 254 confirmed humpback whale entanglements exist in the NMFS Alaska Marine Mammal Stranding Network database from 2000-2024 (accessed on July 15, 2025). Most of the documented humpback whale entanglement reports in Alaska during that time period (70.6 percent) occurred in Southeast Alaska. This is likely due to a high level of overlap between whales and anthropogenic materials in the water, combined with a relatively high number of people on the water who provide the initial reports (e.g., whale watching vessels, fishers, recreational boaters, researchers).

In some areas in Southeast Alaska where there is higher than average observer effort (e.g., near communities with many recreational boaters, whale watch companies, commercial fishing, etc.), there are instances where humpback whales are observed entangled annually. For example, in and around a boat moorage zone near the Gustavus public dock and ferry terminal, four large whales have been confirmed entangled since 2021; three humpback whales and a minke whale. Three of the whales were entangled in boat moorings, and the fourth in suspected pot fishing gear. The minke whale died as a result of the entanglement, two of the humpbacks self-released from the gear after dragging the boats some distance, and the outcome of the fourth entanglement is unknown. Four additional humpback whales were confirmed entangled within a few miles of that boat moorage zone since 2021; two in fishing gear, one in a boat anchor line, and fourth in lines of unknown origin (NMFS Alaska Marine Mammal Stranding Network database, accessed July 29, 2025). The Gustavus area is fairly small and has eight known entangled baleen whales since 2021 (seven humpback whales). It is possible that whales were attracted to the Gustavus moorage area by plentiful forage fish and kelp habitat.

Humpbacks have been reported as entangled in or near the proposed action area in recent years. Humpback whales are relatively strong and can often fight free of entangling materials, or when line breaking strength is too high, humpback whales can drag or suspend gear for days to months, enabling time for a human-led response effort if the whale is spotted with an entanglement and reported. Sometimes trained responders are able to cut away the entangling materials, and other times whales may succumb to the entanglement and asphyxiate or die from entanglement-related injuries.

5.4 Pollution

A number of intentional and accidental discharges of contaminants pollute the marine waters of Alaska annually. Intentional sources of pollution, including domestic, municipal, and industrial wastewater discharges, are managed and permitted by the Alaska Department of Environmental Conservation. Pollution may also occur from unintentional discharges and spills.

Marine water quality in the proposed action area can be affected by discharges from treated sewer system outflows, vessels operating in marine waters, and sediment runoff from paved surfaces and disturbed areas, but this would be more likely in the urban Ketchikan area. Large fuel spills are also possible from large vessel groundings, particularly high fuel capacity ships or barges transporting fuel. Direct exposure of marine mammals to oil or other contaminants spilled into the marine environment could have significant health consequences (Ziccardi et al. 2015, Schwacke et al. 2017, Wright et al. 2022). These events are likely uncommon, and no large-scale federalized oil spill responses have occurred near Duke Island in at least the past decade.

5.5 Changing Environmental Conditions

As described in detail in Section 4.2, changing environmental conditions have the potential to impact species abundance, geographic distribution, migration patterns, timing of seasonal activities (IPCC 2014a), and species viability into the future. Changing environmental conditions are also expected to result in the expansion of low oxygen zones in the marine environment (Gilly et al. 2013). Though predicting the precise consequences of changing environmental conditions on highly mobile marine species, including humpback whales, is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring. The northeast Pacific marine heatwave is negatively correlated with humpback whale reproduction in Hawaii (Cartwright et al. 2019).

The indirect effects of changing environmental conditions include changes in the distribution and abundance of prey and the distribution and abundance of competitors or predators. For example, variations in the localized recruitment of herring in or near the action area caused by changing environmental conditions could change the distribution and localized abundance of humpback whales. Warmer waters favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of humpback whales is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years (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 in or near the action area. As we strive to understand how these mechanisms affect various trophic levels in the marine ecosystem, we must consider the additional effects of changing environmental conditions, which are expected to be most significant at northern latitudes (Mueter et al. 2009, IPCC 2013).

5.6 Competition for Prey

Competition for prey between humans fishing commercially or recreationally and humpback whales may exist in some areas in Alaska. In the action area, humans recreationally fish for species that are also prey for humpback whales, including herring. Fisheries in the Tongass Narrows have varying likelihoods of competing with marine mammals for fish, depending on gear type, species fished, timing, and fisheries location and intensity. Some species may experience reduced prey availability and/or habitat displacement due to commercial and recreational fishing activity.

The Tongass Narrows is part of the Southern Southeast Alaska Biologically Important foraging area (BIA) for humpback whales (Wild et al. 2023).

5.7 Coastal Development

Although coastal development is minimal on the north side of Duke Island, project-associated vessels will launch from Ketchikan, a community with significant ongoing coastal development. While the majority of the shoreline on the east side of the Tongass Narrows, including near Ketchikan is developed, the west shore is largely undeveloped except for the airport, immediately across the narrows from Ketchikan. Ketchikan has numerous port facilities as well. Marine vessel activity is described in Section 5.2 above.

Significant coastal construction projects undergo ESA section 7 consultations and implement mitigation measures such as vessel speed limits and shut down zones to minimize impacts to humpback whales.

5.8 Aquaculture Development

There are existing aquaculture operations near the action area consisting of subtidal geoduck operations, seaweed farm, and two hatcheries (Figure 12). The closest seaweed farm to the proposed project site is in George Inlet approximately 31 miles from Duke Island (ADFG Aquatic Farming Operations Mapper, accessed August 26, 2025).

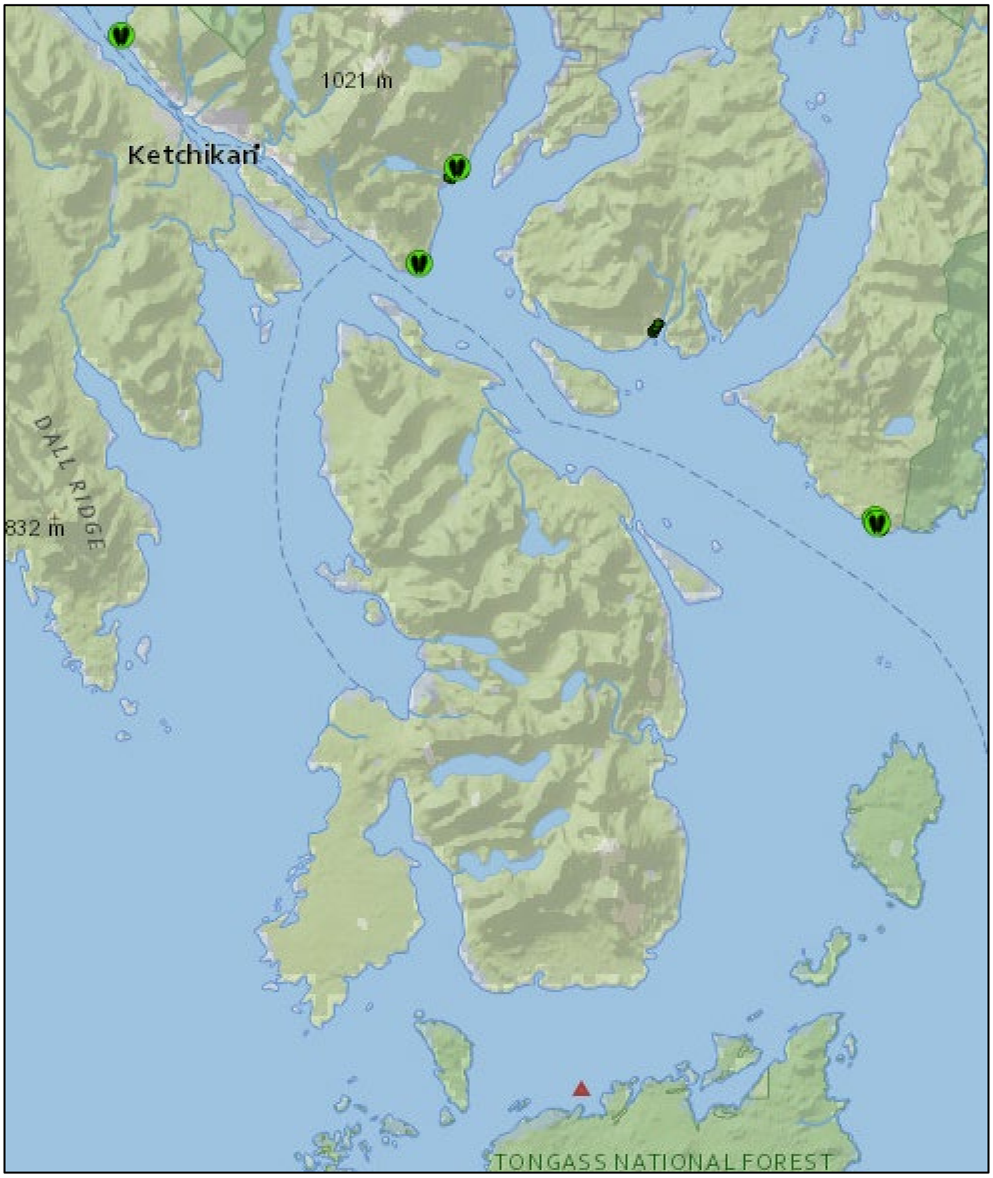


Figure 12. Active aquatic farming operation (green circles) that occur near the project site (red triangle) in Southeast Alaska state waters (ADFG Aquatic Farming Operations Mapper, accessed August 26, 2025).

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 Opinion relies on the best scientific and commercial information available. We try to note areas of uncertainty, or situations where data are not available. In analyzing the effects of the action, NMFS aims to minimize the likelihood of false negative conclusions (i.e., 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.

6.1 Project Stressors

Stressors are any physical, chemical, or biological phenomenon 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 Biological Assessment; personal communications with the USACE, the applicant, and others; and other available literature as referenced in this Opinion, our analysis recognizes that the Pacific Kelp Felice Strait aquaculture facility construction and operation action may cause these primary stressors:

1. risk of entanglement;
2. risks from pollutants and contaminants, including trash and debris;
3. disturbance from in-water activity, including farm operations and noise from anchor placement;
4. vessel sound and strike risk;
5. prey impacts; and
6. seafloor disturbance and increased water turbidity due to anchor or equipment placement.

Most of the analysis and discussion of effects to Mexico DPS humpback whales from this action will focus on risk of entanglement in facility structure lines and exposure to in-water sound sources because these stressors will likely have the most direct and far-reaching impacts on that listed species.

6.1.1 Minor Stressors to ESA-listed Species

Based on a review of available information, we determined the following stressors may occur, but are likely to have improbable or minimal effects on ESA-listed species.

6.1.1.1 Risks from pollutants, contaminants, trash, and debris

Increased vessel activity in the action area will increase the risk of accidental fuel and lubricant spills. Mitigation measures to reduce the risk of accidental spills include that no hazardous materials or fuel will be stored at the farm location. Debris that may be contaminated with used motor oil, solvents, or other chemicals would be classified as a hazardous substance and removed from the site and managed and disposed of in accordance with state and federal regulations. Vessels are not anticipated to operate in extreme weather conditions, so the likelihood of a spill occurring in association with the proposed action is extremely low.

Frequent visits and operational activities at the farm site will release additional air pollutants and increase the likelihood of trash or other debris being accidentally released into the marine environment. Air pollutants are anticipated to be temporary and would not accumulate enough to decrease the air quality in the action area. Project trash and debris could be released into the marine environment, posing a risk to marine mammals. The applicant will comply with all applicable regulations, and the amount of project-generated trash and debris is expected to be minimal. Mitigation measures require the applicant to properly and legally dispose of all trash and cut all debris loops in order to reduce ingestion and entanglement risk. Due to implementation of the mitigation measures, the risk of significant pollution and trash/debris is reduced below measurable levels.

6.1.1.2 Disturbance from in-water activity, including farm operations and noise from anchor placement

As discussed in Section 2, *Description of the Proposed Action*, USACE intends to authorize aquaculture construction and operations activities that would introduce acoustic disturbance, including vessel traffic and anchor placement. Some sound associated with this proposed action (i.e., vessels, in-water facility construction) will be within the hearing range of humpback whales (Table 4) but as described below will not result in exposure at levels that would cause take or that would otherwise result in harassment.

Table 4. Underwater marine mammal hearing groups (NMFS 2024).

Hearing Group	ESA-listed Marine Mammals In the Project Area	Generalized Hearing Range[1]
Low-frequency (LF) cetaceans *(baleen whales)*	Mexico DPS humpback whales	7 Hz to 35 kHz

[1]Represents 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).

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).

Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and other factors. The potential effects of underwater sound from sound sources can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson et al. 1995, Nowacek et al. 2007, Southall et al. 2007). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high-level sounds can cause hearing loss, as can longer exposures to lower-level sounds. Temporary or permanent loss of hearing will occur almost exclusively for sound within an animal's hearing range.

We do not anticipate any significant physical or behavioral responses by whales to the noise created from aquaculture facility installation or operations. We anticipate minimal low-level exposure of short-term duration to listed humpback whales from vessel sound and anchor placement related to this action. A crane will be used the lower the anchors into place, therefore the loudest sound source associated with anchor placement will be marine vessel operations. If whales are exposed and do respond, they may exhibit slight deflection from the sound source and engage in short-duration avoidance behavior, short-term vigilance behavior, or experience short-term masking of communication, but these behaviors are not likely to result in adverse consequences.

Humpback whale prey (i.e., fish) may be exposed to sound source levels that illicit a short-term response. 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. However, the sounds associated with this proposed action are short in duration, and do not rise to a harmful level.

In addition to noise, we considered the potential for disturbance from in-water activities. The operations of this facility will include growing kelp on longlines/growlines in a grid pattern. It is not entirely predictable how the benthic and pelagic biodiversity could shift with the commercial growth and harvest of the kelp species proposed by Pacific Kelp, and it is possible that the kelp growth could attract fish and other organisms to the area (Forbes et al. 2022). Increases in marine mammal prey items could act as an attractant for megafauna species, increasing the likelihood of disturbance (as well as marine mammal interactions with gear as also addressed below in the major stressor section). Other human activities, such as vessel operations, may deter marine mammals from the area temporarily. While it is not entirely certain how the kelp growth and human interactions could impact marine mammal behavior, we do not anticipate significant beneficial or negative impacts beyond what is also considered in the major stressor section below. The observations and reports submitted to NMFS as part of the proposed action will provide useful baseline information for the future.

In summary, any disturbance of humpback whales from in-water activities (including noise) is not expected to significantly disrupt normal behavioral patterns for humpback whales. Any effects from this stressor are instead expected to be insignificant because the likely effects could not be meaningfully measured or detected.

6.1.1.3 Vessel sound and strike risk

The possibility of vessel strike associated directly with the proposed action is unlikely. While project-specific vessels will transit the waters between Ketchikan and the farm site fairly regularly at relative fast speeds (greater than 12 knots) and are similar to vessels that have stuck humpback whales in Southeast Alaska, other factors make strike from this project less likely. Given the low number of total strikes in the past relative to total transits and low proportion of ESA-listed humpback whales in Southeast Alaska (2%) (Wade 2021), the likelihood of a vessel strike of an ESA-listed humpback whale is extremely unlikely. Vessel activity is expected to increase very slightly as a result of the proposed action. Vessels transiting to and from the farm site and Ketchikan will add to the overall vessel traffic in the area (see Environmental Baseline), but this will be minor. Once vessels are at the project site, such vessel operational activities will occur at slow speeds (less than 10 knots).

Vessel noise associated with the proposed action will include construction and operational activities. Vessels may be used to deliver materials to the project site, and the applicants will use a small skiff for farm operations and harvesting.

Smaller vessels like those associated with the proposed action have higher speed engines and propellers than larger vessels or barges. Richardson et al. (1995) estimated the noise produced by a 12-m fishing vessel (similar to the proposed project vessels) traveling at 7 knots to be at a level of 151 dB re 1 μPa at 1 m from the vessel. Vessel noise would decrease below the temporary threshold shift level of 120 db at approximately 117 m from the source. This noise is expected to attenuate quickly due to reduced low frequency propagation in shallow water.

Humpback whale reactions to approaching boats are variable, including changes in speed, direction, and breath intervals (Schuler et al. 2019). Whales can sometimes tolerate slow-moving vessels within several hundred meters, especially when the vessel is not directed toward the animal and when there are no sudden changes in direction or engine speed (Richardson et al. 1995, Wartzok et al. 2003). Any responses of humpback whales to vessel noise are not expected to significantly disrupt normal behavioral patterns.

Vessels associated with the proposed action will have a transitory and short-term presence within the action area; the potential overlap with listed marine mammals is relatively small. During peak occurrence in the summer and early fall seasons, the farm site will be operational. Humpback whales routinely encounter vessels and may be somewhat habituated to associated noise in the area. We do not expect that the effects from vessel noise could be meaningfully measured or detected, and therefore we consider such effects to be insignificant.

NMFS's regulations for approaching humpback whales require that vessels not approach within 100 yards. The applicant will also employ the mitigation measures and guidelines listed above, including limiting vessel speeds below 10 knots in some conditions, which will further reduce vessel sound and the risk of ship strike during operations or when vessels are transiting the waters between Ketchikan and the farm site. All of these factors limit the risk of strike of marine mammals. We conclude the probability of strike occurring is extremely unlikely and therefore effects are highly improbable.

6.1.1.4 Prey impacts

As described in the *In-water activity* section above, humpback whale prey, including forage fish, will be subjected to some in-water noise that could cause a temporary response in behavior. The area likely impacted by the project is relatively small compared to the available habitat in southern Southeast Alaska. Avoidance by fish of the immediate area due to the temporary loss of this foraging habitat is possible. The duration of fish avoidance of this area after anchor installation stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is expected after construction is complete. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity in Felice Strait.

The proposed activities at the project area would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources, such as forage fish and marine invertebrates, and may affect acoustic habitat. Humpback whales occur in the action area year-round depending on food availability. While humpback whales feed in the action area, this is a small portion of their overall feeding area. The small portion of the area affected by the construction, construction sound, and increased turbidity from anchor placement, in conjunction with the short temporal scale of construction activity, make it unlikely the effects of the construction will significantly alter the foraging habitat of humpback whales in Southeast Alaska.

We do not anticipate any changes in behavior to be long-lasting. In addition, it is possible that commercial kelp growth during operations could attract fish and other organisms into the area. However, we do not anticipate significant beneficial or negative impacts from the changes to benthic and pelagic abundance beyond what we describe in this Opinion.

6.1.1.5 Seafloor disturbance and increased water turbidity due to anchor or equipment placement

During aquaculture facility installation, a temporary and localized increase in turbidity and sedimentation near the seafloor is possible in the immediate area surrounding each anchor. Anchor placement will generate some sedimentation and turbidity, particularly if they are dragged into position.

Local currents and tidal action will minimize sediments in the water column. Any potential water quality exceedances would likely be temporary and highly localized. The local tides and currents are expected to disperse suspended sediments from facility installation to near background levels in a few hours. Impacts on zooplankton, fish, and marine mammals are expected to be brief, intermittent, and minor, if impacts occur at all. Therefore, the impact from increased turbidity levels would be negligible to humpback whales, and would not cause a noticeable disruption of behavioral patterns. Therefore, we conclude that the effects from sedimentation are so small that they are not measurable.

6.1.2 Major Stressors on ESA-listed Species

The following stressors are likely to adversely affect Mexico DPS humpback whales: entanglement in facility lines/gear.

6.1.2.1 Risk of entanglement of humpback whales

This proposed facility is composed of miles of parallel and perpendicular grid lines, anchor/mooring lines, growlines, and kelp growline tethers, much of which is similar diameter to lines that have entangled whales in Alaska and other parts of the world. A key feature and mitigation measure that will likely reduce the risk of lethal whale entanglements is that the main structural supporting lines (e.g., grid lines and anchor/mooring lines) will be kept under tension through all tide cycles. In addition, the diameter of the main anchor/mooring lines is big (3.8”) and we anticipate that relatively large diameter line will be less likely to embed into a humpback whale's skin or tissue.

It is likely that, due to the size and location of this year-round facility in the high use feeding range of humpback whales, interactions will occur between whales and facility lines. In some areas in Southeast Alaska where there is higher than average observer effort (e.g., near communities with many recreational boaters, whale watch companies, commercial fishing, etc.), there are instances where humpback whales are observed entangled annually (see Gustavus example in Section 5.3 above). It could be that whales are attracted into areas by plentiful kelp beds and forage fish, increasing the risk of gear interactions.

Humpback whales' relatively poor eyesight and Alaska's low visibility waters make it difficult for whales to navigate visually in the water and may not be able to see lines obscured by kelp or other marine life attracted to the kelp. Humpback whales are attracted to schooling fish, their primary prey in some areas, and may be drawn into lunge feeding amongst the lines of the aquaculture facility. Over 10 humpback whales are confirmed entangled in Alaska annually, with most of those reports coming from Southeast Alaska. This number is an underestimate of the actual number of entanglements that occur in Alaska every year, based on published scar analyses of humpback whales. Most entanglements likely result in non-lethal interactions with the whale being able to self-release from the entangling materials. However, these interactions can still be harmful or injurious.

In addition to keeping lines under tension, the applicant has reduced the number of vertical lines where possible to minimize the risk of entanglement. For example, separate corner buoy marker lines will not be used, rather buoy (i.e., float) markers have been integrated into the support structure. This will eliminate the loose lines associated with separate corner buoy markers, and will shorten the length of line connecting the buoy markers to the structure; both characteristics will reduce the risk of whale entanglement.

The various lines have different breaking strengths: Grid lines and growlines will be 36 mm (1.4") in diameter, with an estimated breaking strength of 24 tons (53,000 lbf). The growline tethers will be 10 mm (0.4") in diameter, with an estimated breaking strength of 3 tons (6,600 lbf). The mooring lines will be 96 mm (3.8") in diameter, with an estimated breaking strength of 500 tons (1,100,000 lbf). When humpbacks interact with lines in the water, they may twist, thrash, or roll in an effort to release themselves from the binding materials. These actions can sometimes break the lines, but most of the lines associated with the proposed action exceed the breaking strength for humpback whales. The applicant has stated that weak link or weak line technology (similar to that used in lobster and other fisheries in the United States to reduce lethal whale entanglements) will not be feasible in this aquaculture structure because break away gear (e.g., lines or inserted devices that break at less than 1,700-pound breaking strength) would compromise the integrity of the structure and lessen the tension that can be applied to structural lines. Growline tethers do not appear to be essential to the integrity of the structure. It is not clear how much of a risk of entanglement the growline tethers will be. The tethers will be weighted, so that should theoretically reduce the risk of entanglement. In addition, the tethers will be covered in growing kelp, which may reduce the likelihood that a whale would lunge feed directly into those lines.

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, if the information is available, 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, the USACE and applicant have proposed mitigation measures as part of the proposed action that should avoid or minimize exposure of Mexico DPS humpback whales to one or more stressors from the proposed action.

6.2.1 Exposure to entangling materials

Mexico DPS humpback whales will likely be present within the waters of the action area during the time that the in-water operations occur and will be exposed to a number of horizontal and vertical lines in the water column at the aquatic farm site, which is within their feeding habitat.

Whales are ubiquitous in Southeast Alaska and often show a preference for feeding in calm and shallow bays, the same physical qualities that are helpful in locating macroalgae aquaculture and other fixed gear. In addition to the overlap in time and space, whales may actually be attracted to schools of fish that are likely to be attracted to kelp habitat, and whales are often observed rolling in kelp, including giant kelp, bull kelp, and dragon kelp (*Eualaria fistulosa*) in Southeast Alaska (Glacier Bay NPS Humpback Whale Monitoring Program, unpub. data). Kelp forests cultivated by the applicant are likely to attract whales to the kelp itself and to schooling fish that use the kelp forests as habitat. This attraction will increase the risk of humpback whales interacting with the facility lines and potentially becoming temporarily or severely entangled.

However, most of the structural lines associated with the facility will be under significant tension and the likelihood of a whale wrapping and twisting itself in the line is extremely low. In addition to keeping lines under tension, the applicant has reduced the number and length of vertical lines where possible to minimize the risk of entanglement. For much of the year, the growlines will be covered in kelp, which we anticipate will reduce the likelihood of a whale lunge feeding through the lines and having a loose line in its mouth. Finally, while aquaculture facilities of the magnitude of this proposed action are new to Alaska, in other areas of the world substantial numbers of entanglements of large baleen whales in aquaculture facilities have not been reported. These factors inform our estimate of the potential exposure to entangling materials and the number of humpback whales that may become entangled.

6.2.2 Estimating species occurrence

Information about the presence, density, or group dynamics of marine mammals informs our analysis on species occurrence and response. Reliable, consistent densities are not available for the marine waters in Tongass Narrows and north of Duke Island in Felice Strait. Generalized densities for the North Pacific would not be applicable given the high variability in occurrence and density at specific inlets and harbors. Therefore, we used information about presence, group size, and feeding and kelp rolling behavior to inform our analysis of species occurrence and response, if any.

Humpback whale group size in Southeast Alaska generally ranges from one to four individuals, with an average group size of two whales (Dahlheim et al. 2009). Based on this information, and historical occurrence data in monitoring reports from previous consultations in the region, we estimate humpback whale group occurrence near the proposed farm site will be twice a week, on average, year-round (NMFS 2025). Some of these whales will likely explore the farm site and in some cases, individuals will likely be attracted to the kelp grown on the farm and the forage fish that will be attracted to the kelp. As we have seen in well-observed areas in Southeast Alaska (see Gustavus example provided above), while most whales will successfully navigate and avoid the lines of the aquaculture structure, it is possible that whales could still become entangled in the lines of the facility. Based on the number and presence of humpback whales in the area and the size of the facility, we anticipate that, on average, one humpback whale will interact with the lines in a way that results in a significant, but non-lethal entanglement within each calendar year. Therefore, during the five-year period of the USACE permit, up to five humpback whales will be exposed to entanglements that will result in harm or harassment, but not death (detailed further in the Response Analysis). The proportion of these exposures that are expected to be incurred by threatened Mexico DPS humpback whales is two percent (Table 3) (Wade 2021). Therefore, there is a two percent chance that a whale exposed to entanglement will be from the ESA-listed Mexico DPS (Table 3), or a 10 percent chance that one of the five anticipated humpback whale interactions over the five years will involve an ESA-listed animal. If aquaculture operations continue after the five-year period associated with the USACE permit, reinitiation of consultation will be required and we will reassess our estimate of entanglement based on the information available then.

6.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this Opinion, response analyses determine how listed species 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 (particularly stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

Because we do not anticipate any entanglement of an ESA-listed species, we do not analyze the potential responses of the listed species. This section is presented as a general assessment of the potential response of humpback whales if they were to become entangled.

6.3.1 Responses to entanglement

Probable response to entanglement and interactions with lines associated with the proposed aquaculture facility includes short-term behavioral reactions and minor injury. Behavioral responses to line interactions and entanglement can range from as little as a directional change by the whale to extreme twisting, thrashing, rolling, and contorting of the whale's body in an effort to release itself from the binding materials. These actions can sometimes break the lines, but most of the lines associated with the proposed action exceed breaking strength for humpback whales. Entanglement can also cause severe bodily injury and/or mortality, but we do not anticipate either associated with this facility. As described below, entanglements will likely result in significant but non-lethal interactions with the whale being able to self-release from the entangling materials.

The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through injury and increased stress response. Depending on how long the whale remains entangled, or how much energy it expends to free itself, the whale's energy budget could be impacted as well. Large whales such as humpbacks have the ability to store substantial amounts of energy, which enables them to survive for months on stored energy during migration and while in their wintering areas, and their feeding strategy allows them to acquire energy at high rates. The individual and cumulative energy costs of the behavioral responses discussed are not likely to reduce the energy budgets of humpback whales, and their probable temporary exposure to entanglement will likely not reduce their fitness significantly due to the short duration of any entanglements.

Most of the structural lines associated with the facility will be under tension and the likelihood of a whale wrapping and twisting itself in the line is extremely low. In addition to keeping lines under tension, the applicant has reduced the number and length of vertical lines where possible to minimize the risk of entanglement. There is less certainty about a whale's ability to wrap itself in the growline tethers, which will not be under much tension. The Alaska Large Whale Entanglement Response Program has observed and responded to humpback whales entangled in pot gear, anchor lines, or mooring lines that ran through the animal's mouth and became embedded in the corners of the mouth. It is thought this occurs when a whale is lunge feeding on schooling fish and does not see lines in the water. This could also occur with the growlines or other lines associated with an aquaculture facility. However, for much of the year, the growlines will be covered in kelp, which we anticipate will reduce the likelihood of a whale lunge feeding through the lines and having a loose line in its mouth. The kelp growth may act as a buffer to reduce the likelihood of the line becoming embedded. In addition, some of the lines (the main anchor lines) are big, and we anticipate that the relatively large diameter line will be less likely to embed into a humpback whale's skin or tissue. Most entanglements likely result in non-lethal interactions with the whale being able to self-release from the entangling materials. Therefore, we anticipate that significant interactions with the lines could result in a whale becoming briefly entangled, but will fight free or be released from the gear, and cause only short-term behavioral reactions and relatively minor injury.

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.

Changing environmental conditions, as well as some continuing and future non-Federal activities expected to contribute to changing environmental conditions, are reasonably certain to occur within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global changing environmental conditions 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 Status of the Species (Section 4) and Environmental Baseline (Section 5).

Commercial boat-based whale watching is typically a private activity that occurs in the action area during the late-Spring to early-Fall months. The overlap of whale watching vessels with the installation and operations of this aquaculture facility may be minimal due to timing. In future years, we anticipate that commercial boat-based whale watching activity will continue to occur, and even increase, in the action area. Peak numbers of whale watching boats does not appear to limit humpback whale recovery.

There are currently no other known or expected state or private activities reasonably certain to occur in the action area that may affect listed species and are not subject to section 7 consultation. We searched for information on non-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 5 of this Opinion), and we expect those activities discussed to be on-going with similar intensity. For example, we expect fisheries, sound, pollutants and discharges, and marine vessel activity will continue into the future. While the proposed project is expected to have vessel traffic associated with monitoring the site and harvest, it is not expected to result in a major increase in marine traffic in the action area.

8 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS's assessment of the risk posed to species 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 proposed action is likely to: 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. This assessment is made in full consideration of the Status of the Species (Section 4).

As we discussed in the Approach to the Assessment (Section 3) in 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 Mexico DPS Humpback Whale Risk Analysis

Our consideration of probable exposures and responses of ESA-listed whales to installation and operations 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 Mexico DPS humpback whales.

Effects from exposure to in-water sound, vessel sound from transit, disturbance to the seafloor, pollution and exposure to trash and debris, and potential for vessel strike are likely to be negligible due to the small marginal increase in such stressors relative to the environmental baseline, mitigation measures in place to reduce risks of effects from potential stressors, and the transitory and short-term nature of vessels and construction activities. Sound from the proposed action could discourage Mexico DPS whales from feeding in the action area during some construction activities, but any such effects would be brief and the affected whales would likely find other comparable foraging opportunities in the vicinity. Adverse effects from vessel strike are very unlikely because only a few additional vessels will be introduced for the proposed action, the vessels will be operating at slow speeds or will be stationary, and therefore interactions are expected to be infrequent.

As discussed in the *Description of the Action* and *Status of the Species* sections, this action does not overlap in space or time with humpback whale breeding. Some Mexico DPS humpback whales feed in Southeast Alaska and migrate to Mexico waters for breeding and calving in winter months. As a result, the probable responses to the proposed action are not likely to reduce the current or expected future reproductive success of Mexico DPS humpback whales or reduce the rates at which they grow, mature, or become reproductively active. Despite exposure to parallel and vertical lines in the water throughout their habitat in Alaska, not many lethal entanglements of humpback whales are documented. Scar studies show us that humpback whales are often able to self-release from entangling materials. Aquaculture facilities of the magnitude of this proposed action are new to Alaska. In other areas of the world, substantial numbers of entanglements of large baleen whales in aquaculture facilities have not been reported. Some lethal entanglements have occurred in British Columbia, as a result of humpback whales interacting with predator fencing, not the structural lines or growline tethers (Storlund et al. 2024). Most of the structural lines associated with this project will be under significant tension, which reduces the likelihood of a whale wrapping and twisting itself in the line. In addition, the applicant has reduced the number and length of vertical lines where possible to minimize the risk of entanglement. There is less certainty about a whale's ability to wrap itself in the growline tethers, which will not be under as much tension; however, for much of the year the growlines will be covered in kelp, reducing the likelihood of a whale lunge feeding through the lines and having a loose line in its mouth.

Even with these project modifications and mitigation measures, we estimate that one whale per year, or five whales total over a five-year period, will become entangled in gear associated with this project.

If an entanglement of a humpback whale were to occur, the whales' probable response to interactions with lines associated with the proposed aquaculture facility includes short-term behavioral reactions and relatively minor injury. These reactions are expected to subside quickly when the exposures cease. Injuries resulting from entanglements will not result in serious injury or mortality. Any entanglement is likely to result in behavioral changes as the whale struggles to free itself from the gear. Behavioral responses can range from as little as a directional change by the whale to an extreme twisting, thrashing, rolling, and contorting of the whale's body in an effort to release itself since most entanglements likely result in non-lethal interactions with the whale being able to self-release. We anticipate that whales will be able to free themselves from the gear. We do not anticipate any gear will become embedded, and we anticipate non-lethal injuries only. The applicant can work with the NMFS Alaska Region Large Whale Entanglement Response Program to prepare and respond, should an entanglement occur.

If there are entanglements, the proportion of these whales that are expected to be from the listed population (threatened Mexico DPS) is only two percent (Table 5) (Wade 2021). Since there is such a small chance a Mexico DPS humpback whale might be entangled during the five-year permit period, zero takes are authorized for this ESA-listed DPS. Because there are no takes from entanglement of the listed species, we anticipate that entanglement exposures and responses are not likely to reduce the abundance, reproduction rates, or growth rates (or significantly increase variance in one or more of these rates) of the populations those individuals represent.

Although changing environmental conditions have impacted humpback whales through reduced prey abundance or availability, the stabilization of humpback whale numbers in Southeast Alaska following the most recent Gulf of Alaska marine heatwave suggests that changing climate conditions are not continuing to drive numbers down. Levels of vessel traffic throughout Southeast Alaska associated with fishing, tourism (cruise ships and whale-watching), and recreation do not appear to be limiting humpback whale recovery. Cumulative effects of future state or private activities in the action area are likely to affect humpback whales at a level comparable to present.

In this risk analysis, we considered the possible effects of the proposed action, including entanglement; vessel strike; in-water noise and disturbance from in-water activities; disturbance to the seafloor and increased water turbidity; risk of pollution, contaminants, trash, and debris; and effects to prey; along with stressors described in the environmental baseline, including changing environmental conditions, coastal development, cumulative effects from future state or private activities, and other existing stressors. As a result of all the above factors, this project is not likely to appreciably reduce Mexico DPS humpback whales' likelihood of both surviving or recovering in the wild because it is not likely to reduce the reproduction, numbers, or distribution of the Mexico DPS humpback whale.

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 (*Megaptera novaeangliae*).

We also concur with the action agency's determination that the proposed action is not likely to adversely affect the fin whale (*Balaenoptera physalus*).

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, carrying out an otherwise lawful activity (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 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 CFR 223.213).

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 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 an incidental take statement and the exemption from section 9 of the ESA become effective only upon the issuance of any necessary MMPA authorization to take the marine mammals. This ITS authorizes 0 take of ESA-listed marine mammal species.

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. The USACE has a continuing duty to regulate the activities covered by this ITS. In order to monitor incidental take should it occur, the USACE must monitor and report the progress of the action and its impact on the species as specified in the ITS (50 CFR 402.14(i)(4)). If the USACE (1) fails to require the authorization 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 use 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).

10.1.1 Mexico DPS Humpback Whales

Based on the estimate of marine mammal occurrence calculated in Section 6.2.2 of the *Exposure Analysis* for the proposed activities, we expect a maximum of five humpback whales may be significantly entangled in the lines of the aquaculture facility over the five-year period of the USACE permit.[9]

[9] If aquaculture operations continue after the five-year period associated with the USACE permit, reinitiation of consultation will be required and we will reassess our estimate of the amount and extent of take based on the information available then.

We are reasonably certain that up to five takes of humpback whales will occur during the five years of this project; however, the proportion of these whales that are expected to be from the threatened Mexico DPS is only two percent (Table 5) (Wade 2021). Thus, there is a 10 percent chance that one of the entanglement interactions over the five-year permit period will involve a Mexico DPS humpback whale. Since there is such a small chance a Mexico DPS humpback whale might be entangled during the five-year permit period, zero takes are authorized for this ESA-listed DPS.

10.2 Effect of the Take

No take of an ESA-listed species is expected or exempted as part of this proposed action.

In Section 9 of this Opinion, NMFS determined that the level of expected take, coupled with other effects of the proposed action, is not likely to result in jeopardy to Mexico DPS humpback whales.

10.3 Reasonable and Prudent Measures (RPMs)

"Reasonable and prudent measures" are those actions necessary or appropriate to minimize the impacts of the amount or extent of incidental take. (50 CFR 402.02). Failure to comply with the 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 2.1.2). 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 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 any incidental take.

1. The USACE must implement a monitoring program that includes all items described in the mitigation measures section of this Opinion (Section 2.1.2) and allows NMFS AKR to evaluate the exposure estimates contained in this Opinion and that underlie this ITS.

2. The USACE must submit annual reports and a final report to NMFS AKR that evaluates the mitigation measures and the results of the monitoring program.

3. The authorization holder must contact NMFS AKR immediately (Sadie Wright at 907-957-8147 and the Stranding Hotline 877-925-7773) to report any evidence of entanglement, particularly if the event is ongoing.

10.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the USACE must comply with the following terms and conditions, which implement the RPMs described above and the mitigation measures set forth in Section 2.1.2 of this Opinion. The USACE has a continuing duty to monitor 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)(4)).

Any taking that is in compliance with these terms and conditions is not prohibited under the ESA (50 CFR § 402.14(i)(6)). As such, partial compliance with these terms and conditions may invalidate this take exemption and result in 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, USACE, or their authorization holder, must undertake the following:

1. The action area must be fully observed during all in-water work, vessel transits, and surveys of the farm site in order to document incidents of harassment and entanglement as described in the mitigation measures associated with this action.

2. If take of a humpback whale occurs, the USACE will notify NMFS by email at akr.prd.section7@noaa.gov and at Sadie.Wright@noaa.gov (Table 1) and discuss the need for reinitiation of consultation.

To carry out RPM #2, the USACE or their authorization holder must undertake the following:

1. Adhere to all monitoring and reporting requirements as detailed in this Biological Opinion.

    a. This report(s) must contain the following information:

        i. date and time that monitored activity begins or ends;
        ii. activities occurring during each observation period;
        iii. weather parameters (e.g., percent cover, visibility);
        iv. water conditions (e.g., sea state, tide state);
        v. species, numbers, and, if possible, sex and age class of marine mammals;
        vi. description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from activity;

vii. distance from activities to marine mammals and distance from the marine mammals to the observation point; and

viii. locations of all observed marine mammals.

To carry out RPM #3, the USACE or their authorization holder must undertake the following:

1. Contact the Alaska Region Stranding Program and Large Whale Entanglement Response Program immediately to report an active entanglement, or report evidence of a past entanglement within one week.

    a. Photograph and video the entangled whale from a safe distance and provide the documentation to Sadie.Wright@noaa.gov and akr.prd.section7@noaa.gov as soon as possible. In particular, photograph the dorsal fin from a perpendicular direction, and/or the underside of the flukes (i.e., tail).

    b. Contact should be made to Sadie Wright at Sadie.Wright@noaa.gov and akr.prd.section7@noaa.gov or (907) 957-8147, and the Stranding Network hotline at (877) 925-7773.

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 the 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 project, NMFS AKR recommends:

1. That the USACE encourage Pacific Kelp to consider how to integrate weak link or weak insert technology in lines at intervals of every 40 feet to reduce the risk of lethal whale entanglements. Other materials that could be tested for efficacy that are likely to reduce lethal entanglement risk that should be considered for use include fiberglass rods and HDPE tubing.

2. That the USACE encourage Pacific Kelp to use distinct/marked lines throughout their facility in order to track where their gear travels should it break free from the facility in a storm, due to normal wear and tear, or is dragged away by a whale. This action will enable other potential aquaculture farmers and NMFS to better understand the likelihood and pathway of lost gear and the distance such lost gear may travel in the marine environment.

3. That the USACE encourage Pacific Kelp, where appropriate, to provide outreach at their

facilities informing the public about Alaskan wildlife including marine mammals. NMFS's Alaska Region Protected Resources Division (AKR PRD) can contribute information and suggestions.

4. That the USACE encourage Pacific Kelp to have all project vessel crews participate in the Whale Alert 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.

5. That the USACE encourage Pacific Kelp that all lines should be removed from the water whenever not in use. Most of the facility is intended to be in use year-round to support kelp species that are on a year-round natural cycle. However, if some portions of the structure are not in use for some part of the year, any associated lines should be removed from the marine environment during that time in order to reduce entanglement risk.

In order to keep NMFS's PRD informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the USACE and Pacific Kelp should notify NMFS of any conservation recommendations they implement in the final action, or if they have thoughts on other potential conservation measures that could be implemented.

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)(5)).

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 NMFS, the USACE, 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: https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region.

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 *References* 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.

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