Application for an Individual Incidental Take Permit Under the Endangered Species Act of 1973

Incidental Take Permit Application and Draft Conservation Plan for California's Commercial Dungeness Crab Fishery

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California Department of Fish and Wildlife
715 P Street, Sacramento, CA 95814
T: (916) 445-0411

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Acronym Glossary

Acronym	Definition
ARS	Area Restricted Search
BIA	Biologically Important Area
Cal. Code Regs.	California Code of Regulations
California APA	California Administrative Procedure Act
CCCA	California Coast Crab Association
CCIEA	California Current Integrated Ecosystem Assessment
CCS	California Current System
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CMA	Central Management Area
CNP	Central North Pacific
CP	Conservation Plan
CPFV	Commercial Passenger Fishing Vessel
DCTF	Dungeness Crab Task Force
DGN	Drift Gillnet
DPS	Distinct Population Segment
DTD	CDFW Data and Technology Division

Acronym	Definition
EEZ	Exclusive Economic Zone
EFP	Experimental Fishing Permit
ENP	Eastern North Pacific
ENSO	El Niño Southern Oscillation
ESA	Endangered Species Act
Federal APA	Federal Administrative Procedure Act
FGC	California Fish and Game Commission
Fish & G. Code	California Fish and Game Code
FR	Federal Register
HAB	Harmful Algal Bloom
ITP	Incidental Take Permit
LED	CDFW Law Enforcement Division
LLRP	Local Limit Reference Point
LMH	Large Marine Heatwave
M&SI	Mortality and Serious Injury
MLMA	Marine Life Management Act
MLPA	Marine Life Protection Act
MMPA	Marine Mammal Protection Act
MR	Marine Region

Acronym	Definition
NEPA	National Environmental Protection Act
NHPA	National Historic Preservation Act
NMA	Northern Management Area
NMFS	National Marine Fisheries Service
NPGO	North Pacific Gyre Oscillation
NPH	North Pacific High
OCEO	CDFW Office of Communications, Education, and Outreach
OGC	CDFW Office of General Counsel
OPC	Ocean Protection Council
PBR	Potential Biological Removal
PCFG	Pacific Coast Feeding Group
PDO	Pacific Decadal Oscillation
PRD	NMFS Protected Resources Division
PSMFC	Pacific States Marine Fisheries Commission
RAMP	Risk Assessment and Mitigation Program
RU	CDFW Regulations Unit
SCB	Southern California Bight
SDM	Species Distribution Models
SST	Sea Surface Temperature

Acronym	Definition
SWFSC	Southwest Fisheries Science Center
TNC	The Nature Conservancy
TSD	Temperature-Dependent Sex Determination
US	United States
VMS	Vessel Monitoring System
WCRO	West Coast Regional Office
Working Group	California Dungeness Crab Fishing Gear Working Group

Executive Summary

The California Department of Fish and Wildlife (CDFW) has prepared this draft application and Conservation Plan (CP) to support an Incidental Take Permit (ITP) request from the National Marine Fisheries Service (NMFS) under Section 10(a)(1)(B) of the federal Endangered Species Act (ESA). The ESA generally prohibits "take" of endangered or threatened species, which includes activities that "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect". However, Section 10 of the ESA allows NMFS to issue an ITP authorizing take of endangered or threatened species when incidental to otherwise lawful activities, such as commercial fishing. An ITP application must include:

- The type of application, either Individual ITP or General ITP
- The name, address, and telephone number of the applicant
- The affected species or stocks and a description of their status, distribution, seasonal distribution, habitat needs, feeding habits, and other biological requirements
- A detailed description of the proposed activity, including the anticipated dates, duration, and specific location. If the request is for a general ITP, an estimate of the total level of activity expected to be conducted
- A CP based on the best data available which specifies:
    - Anticipated impact of the proposed activity on the species or stocks and their habitat
    - Steps the applicant will take to monitor, minimize and mitigate such impacts, and available funding to implement the proposed measures
    - Alternative actions considered by the applicant and why the alternatives are not being used
    - A list of data sources used in the plan

The California commercial Dungeness crab fishery, which is managed by CDFW, is known to entangle endangered large whales and sea turtles. Entanglements are considered a form of "take" under the federal ESA and are generally prohibited without authorization under an ITP. The requested ITP would provide authorization for limited incidental take of the Covered Species (blue whales, humpback whales, and leatherback sea turtles) by the California commercial Dungeness crab fishery.

CDFW is seeking a 15-year ITP which would allow for continued operation of the California commercial Dungeness crab fishery ("Covered Activity") with the goal of supporting the recovery of humpback whale, blue whale, and leatherback sea turtle populations by reducing take to the maximum extent practicable. CDFW proposes continuing implementation of the Risk Assessment and Mitigation Program (RAMP) as an entanglement avoidance Conservation Measure. Increasing opportunities for derelict gear recovery and enhancing lost gear tracking will support minimizing the likelihood of Covered Species entanglements in lost or abandoned gear. CDFW also commits to supporting

entanglement reporting, education, and analysis which will aide in mitigation of entanglements should they occur.

Throughout the permit term, CDFW will conduct monitoring to quantify the number of entanglements occurring as a result of the Covered Activity, periodically review the effectiveness of the Conservation Measures, and implement needed changes through periodic progress reports. The proposed Conservation Measures would apply throughout the Plan Area, which is defined as the portion of the United States (US) Exclusive Economic Zone (EEZ) off California from the California/Oregon border to the US/Mexico border.

CHAPTER 1. INTRODUCTION AND BACKGROUND

1.1 Background

The California Department of Fish and Wildlife (CDFW) is a state agency within California's executive branch (specifically, the California Natural Resources Agency) and is the state trustee agency for fish and wildlife resources. CDFW has prepared this Conservation Plan (CP) and application for an Incidental Take Permit (ITP) under Section 10 of the federal Endangered Species Act (ESA). The ITP would provide authorization for limited incidental take of the Covered Species (blue whales, humpback whales, and leatherback sea turtles) by the California commercial Dungeness crab fishery within the Plan Area. The Plan Area encompasses state waters and the entirety of the US Exclusive Economic Zone (EEZ) waters off California. This application and CP describe a comprehensive strategy to avoid, minimize, and mitigate entanglements of ESA-listed whales and sea turtles in commercial Dungeness crab fishing gear off the coast of California.

The California Ocean Protection Council (OPC) also falls within the California Natural Resources Agency and has been charged by the California Legislature with coordinating agency activities related to the protection and conservation of coastal and ocean ecosystems, including those of CDFW (Public Resources Code § 35615). As such, OPC's policies and their corresponding strategic plan serve to inform the broader context of this CP. That vision, in turn, is to ultimately move towards zero annual mortality and serious injury (M&SI) from entanglement by all state managed fisheries, as described in Target 3.3.5 in OPC's 2020-2025 Strategic Plan (OPC 2020a). While meeting this target is not an explicit goal of this CP, it underpins many of the precautionary elements detailed in this document. Minimizing bycatch (entanglements) is also consistent with the Marine Life Management Act (AB1241, Keely, 1998) which guides management of all California fisheries.

Entanglements of large whales and human interactions with sea turtles are reported to the National Marine Fisheries Service (NMFS) through either the West Coast Regional Office (WCRO) or the Southwest Fisheries Science Center (SWFSC). WCRO receives and confirms reports of large whale entanglements and tracks a variety of metrics associated with each large whale entanglement including location, gear type, timing, and response efforts. SWFSC is responsible for receiving and confirming reports from the Marine Mammal and Sea Turtle Stranding Network. A subset of these reports relates to human interactions with sea turtles, including entanglements in fishing gear. CDFW considers these confirmed reports to be the best available information regarding historical large whale entanglements and sea turtle interactions, since unconfirmed reports may lead to double counting (i.e., multiple reports of the same whale) or may not in fact be entanglements (e.g., kelp or other debris which resemble fishing gear).

NMFS has confirmed 602 entanglements of large whales in fishing gear of various types off the US West Coast (West Coast, including the states of California, Oregon, and Washington) between 1982 and 2023 (NMFS WCRO Whale

Entanglement Response Database, as of January 8, 2024) and 73 sea turtle interactions with fishing gear between 1980 and 2023 (NMFS SWFSC Sea Turtle Stranding Database, as of June 13, 2024). As of the time of writing, 2023 is the most current full calendar year with verified data. Entanglements in West Coast fixed gear (i.e., trap and gillnet fisheries) have been confirmed for the following ESA-listed species and Distinct Population Segments (DPS):

- blue whales (*Balaenoptera musculus*)
- fin whales (*B. physalus*)
- humpback whales (*Megaptera novaeangliae*) – Central America DPS and Mexico DPS
- leatherback sea turtles (*Dermochelys coriacea*)
- sperm whales (*Physeter macrocephalus*)

Other types of fishery interactions have been documented for the following ESA-listed species:

- green turtles (*Chelonia mydas*)
- loggerhead turtles (*Caretta caretta*)
- hawksbill turtles (*Eretmochelys imbricata*)
- olive ridley turtles (*Lepidochelys olivacea*)

There have also been documented fixed gear entanglements for gray whales (*Eschrichtius robustus*) and killer whales (*Orcinus orca*). Both species have listed DPSs which occur in the North Pacific. However, these entanglements are not known to involve the endangered DPS units. Further details are provided in Sections 3.3.1 and 3.3.2.

The number of confirmed large whale entanglements off the West Coast (across all gear types) increased sharply in 2014, from an average of 8.2 per year from 1982–2013 to an average of 33.7 per year from 2014-2023 (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024; Figure 1-1). While the number of confirmed entanglements has decreased from the highs of 53 and 56 in 2015 and 2016, respectively, entanglements in recent years still remain above pre-2014 levels (2019, n = 25; 2020, n = 17; 2021, n = 28; 2022, n = 30; 2023, n = 27). The increased number of entanglements is likely due to a combination of factors, including changes in the abundance and distribution of whales and forage, shifting patterns of human activities, and increased public awareness and reporting.

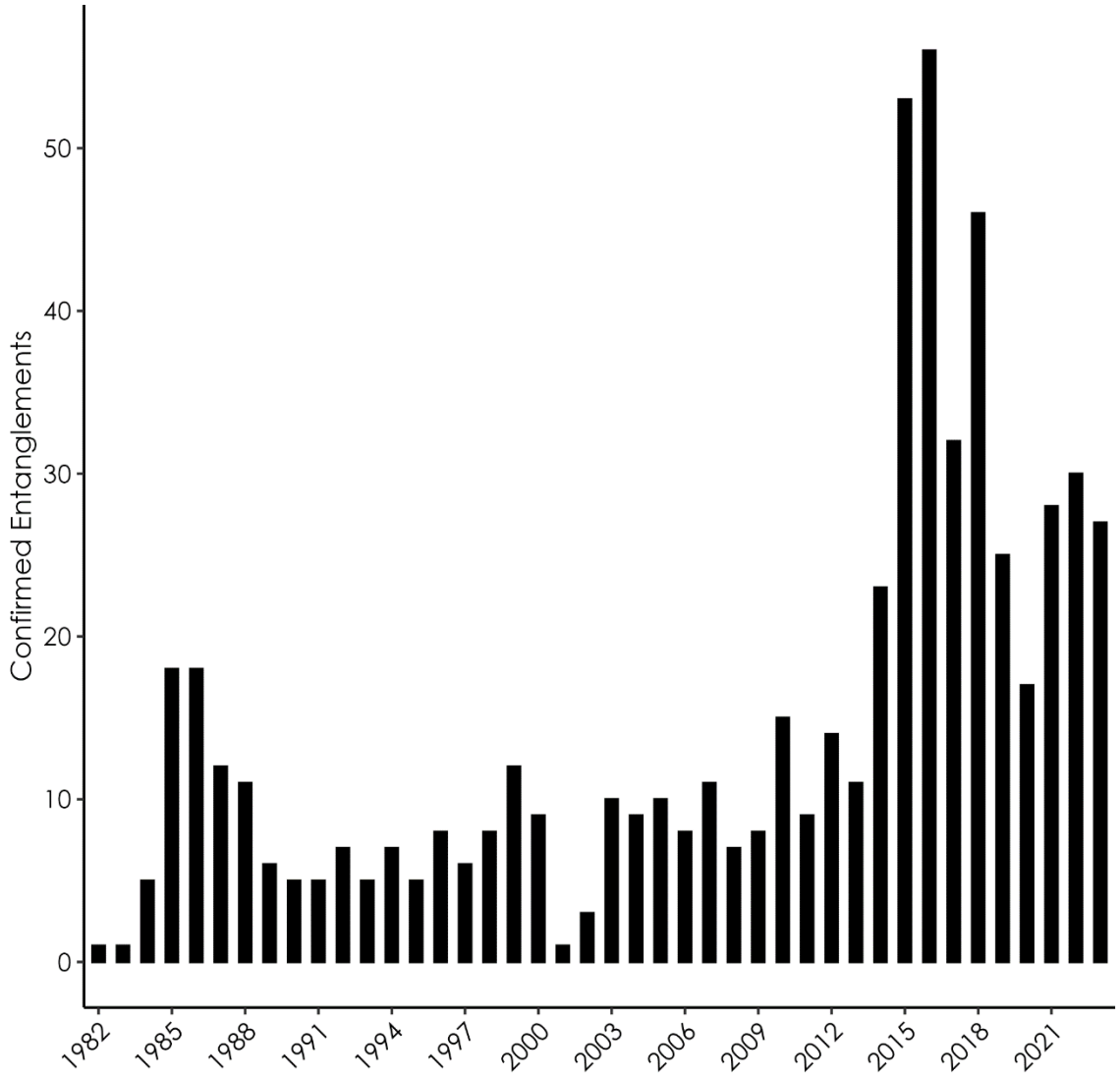

Figure 1-1. Annual number of confirmed large whale entanglement reports off the West Coast, 1982-2023. Created with NMFS WCRO Whale Entanglement Response Database (as of January 8, 2024).

Reports of sea turtle interactions with fishing gear also increased during this period (Figure 1-2). In addition to entanglements where the gear wraps around the animal, fishery interactions include hooks embedded into flippers and ingestion of hooks or monofilament line. Between 1980 and 2015, zero to three fishery interactions were reported each year. Reported interactions increased to eight in 2016, followed by seven in 2017 and eight in 2018. However, the cause of this increase is not well understood. Reports declined during 2019 (n = 3) but increased again in 2020 (n = 7), with no fishery interactions reported in 2021, two reported in 2022, and four reported in 2023.

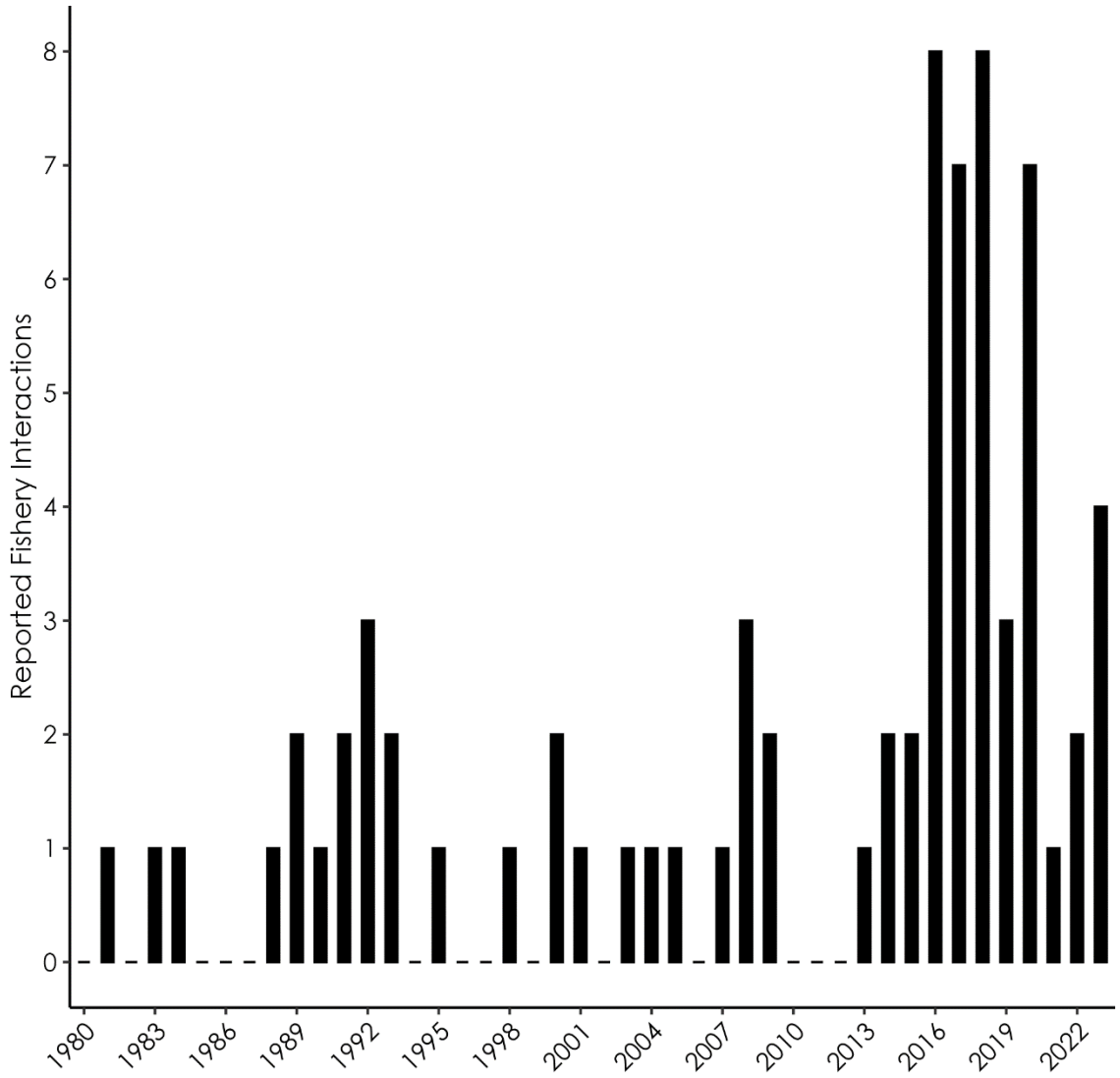

Figure 1-2. Annual number of reported fishery interactions with sea turtles off the West Coast, 1980-2023. Created with information from the NMFS SWFSC Sea Turtle Stranding Database (as of June 13, 2024).

Nearly half (n = 270, 45%) of confirmed West Coast large whale entanglements between 1982 and 2023 involved unidentified gear (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024). In terms of gear which can be identified to a specific fishery, commercial Dungeness crab gear was the most common (n = 122, 37%), of which 58% (n = 71) involved gear set in California.

Compared to large whales, available information regarding fishery attribution is much more limited for sea turtles. Of the 73 reported fishery interactions between 1980 and 2023, 64% (n = 47) involved line gear (e.g., monofilament, braided line, and hook and line), 14% (n = 10) involved pot/trap gear, 11% (n = 8) involved netting (including one instance of both line and netting), and 10% (n = 8) don't have enough information to specify the type of gear. Of the six sea turtle

interactions attributed to specific fisheries, four were leatherback sea turtles with one in California rock crab gear (deceased), one in groundfish pot/trap gear (deceased), and two in California commercial Dungeness crab gear (one released alive by the reporting fisherman, one deceased).

1.2 ITP Applicant

CDFW personnel and functions are spread amongst a variety of offices, branches, divisions, programs, and regions which report to the CDFW Director. Key units within CDFW whose scope of work includes state fishery management, including marine life entanglement issues, are briefly described below.

CDFW's Marine Region (MR) is responsible for protecting, maintaining, enhancing, and restoring California's marine ecosystems for their ecological values and their use and enjoyment by the public through good science and effective communication. Within the MR, the Invertebrate Management Program oversees development and implementation of scientific and regulatory programs to assess and manage fisheries targeting invertebrate species (including Dungeness crab) and their associated ecosystem impacts. The MR's Pelagic Fisheries and Ecosystem Program oversees management issues related to sea turtles, including listings under the California Endangered Species Act (CESA). Because of the direct link to the Dungeness crab fishery, overseeing implementation of the CP will be one of the Invertebrate Management Program's primary responsibilities.

CDFW's Law Enforcement Division (LED) enforces regulations adopted by CDFW or the California Fish and Game Commission (FGC), as well as statutory mandates from the California Legislature. The Office of General Counsel (OGC) advises and reports to the Director on legal matters and provides in-house legal services to CDFW divisions and regions for, among other things, a variety of resource management and conservation issues. The Regulations Unit (RU) assists staff throughout CDFW with developing new and amended regulations in support of broader program goals. The Data and Technology Division (DTD) maintains CDFW's webpages and electronic databases, oversees IT equipment and software acquisitions, and manages CDFW's biogeographic data resources. The License and Revenue Branch (LRB) issues licenses and permits for recreational and commercial fishing activities, aquaculture, and scientific collection in support of educational and research projects. The Office of Communications, Education, and Outreach (OCEO) prepares and distributes press releases and other official CDFW communications regarding important actions by CDFW, including those affecting operations of commercial fisheries. Furthermore, administrative staff within each CDFW unit provide strategic support for essential functions such as procurement, contracts, and personnel management.

1.3 Regulatory Framework

Even though ESA establishes the fundamental regulatory framework for this application and CP, additional state and federal laws are also relevant. These

laws include CESA, the Marine Mammal Protection Act (MMPA), the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), various provisions of the California Fish and Game Code (Fish & G. Code) and California Code of Regulations (Cal. Code Regs.), the Marine Life Management Act (MLMA), the California Administrative Procedure Act (California APA), the Federal Administrative Procedure Act (Federal APA), and the National Historic Preservation Act (NHPA).

1.3.1 Endangered Species Act (ESA)

ESA is the primary federal law that protects living resources at risk of extinction. The statute requires federal agencies to prevent additional declines in, and support recovery of, species that are listed under the act as either in danger of extinction throughout all or a significant portion of their range ("endangered") or as likely to become endangered in the foreseeable future ("threatened"). ESA defines species to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature" (Title 16, US Code (USC) §1532 subdivision (subd.) 16).

Under Section 4 of ESA, NMFS is responsible for listing and designating critical habitat for most marine species. NMFS is also responsible for monitoring and evaluating the status of listed species, as well as developing and implementing recovery plans for them. Section 9 includes a broad prohibition on take of listed species, which is defined to include activities which "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" a member of a species (16 USC § 1538).

For some species, such as blue whales, the entire species may be listed as endangered or threatened throughout its range under ESA. Other times, however, a subspecies or DPS of a species may be listed (16 USC § 1532 subd. 16), as is the case with humpback whale, where only certain DPS are listed as threatened or endangered. A DPS designation is guided by the distinctness and significance of a population, as well as whether the population's status warrants listing under the standards of the statute (61 Federal Register (FR) 4722). Once a DPS has been listed as endangered or threatened, it is afforded the same protection as other listed species.

Section 10 provides a process to permit take of listed species incidental to otherwise lawful activities, such as commercial fisheries (16 USC § 1539 subd. (a)(1)(B)). To issue such a permit, NMFS requires a Section 10(a)(1)(B) application and a CP for the impacted species (16 USC § 1539 subd. (a)(2)). Per 50 Code of Federal Regulations (CFR) § 222.307(b), an ITP application must discuss the following:

- The type of application, either Individual ITP or General ITP
- The name, address, and telephone number of the applicant

- The affected species or stocks and a description of their status, distribution, seasonal distribution, habitat needs, feeding habits, and other biological requirements
- A detailed description of the proposed activity, including the anticipated dates, duration, and specific location. If the request is for a general ITP, an estimate of the total level of activity expected to be conducted
- A CP based on the best data available which specifies:
  - Anticipated impact of the proposed activity on the species or stocks and their habitat
  - Steps the applicant will take to monitor, minimize and mitigate such impacts, and available funding to implement the proposed measures
  - Alternative actions considered by the applicant and why the alternatives are not being used
  - A list of data sources used in the plan

Before issuing an ITP under Section 10, NMFS must comply with the consultation requirements in Section 7 (16 USC § 1536 subds. (a) and (b)) to ensure permit issuance is not likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of any designated critical habitat. NMFS must make the application and CP available for public review and comment, and make the following findings in accordance with 16 USC §1539 subd. (a)(2)(B):

- The taking will be incidental
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking
- The applicant will ensure that adequate funding for the plan will be provided
- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild
- The measures, if any, required under subparagraph (A)(iv) will be met

In the case of marine mammals, the Secretary of Commerce must also make findings pursuant to the MMPA, including whether the taking is authorized under Section 101(a)(5) of the MMPA (16 USC § 1371 subd. (a)(5)) and identifying any measures necessary to ensure such compliance (16 USC § 1536 subd. (b)(4)(C)). Further details about the MMPA are provided in Section 1.3.3.

1.3.2 California Endangered Species Act (CESA)

CESA is the state of California counterpart to the federal ESA. CESA operates similarly to ESA by prohibiting the import, export, take, possession, purchase, and sale of species that are listed under the act as threatened or endangered (Fish & G. Code § 2080). CESA contains provisions that allow CDFW to permit incidental take of listed species if certain conditions are met (Fish & G. Code § 2081 subd. (b)), as well as take for scientific, educational, or management purposes (Fish & G. Code § 2081 subd. (a)). In October 2021, the FGC listed the leatherback sea

turtle, which forages in California state waters, as an endangered species under CESA.

1.3.3 Marine Mammal Protection Act (MMPA)

MMPA establishes a national policy of preventing marine mammal species and populations from diminishing, as a result of human activities, to the extent they cease to be significant functioning elements of their ecosystems. Under MMPA, NMFS is responsible for evaluating the status of marine mammal species and developing CPs for species or stocks designated as depleted (16 USC § 1383 subd. (b)), developing stock assessment reports to evaluate stock status (16 USC § 1386), coordinating responses to marine mammal strandings and entanglements (16 USC §§ 1421 and 1421 subd. (b)), assessing M&SI of incidental anthropogenic interactions with marine mammals arising from commercial fisheries (16 USC § 1387), and issuing permits and authorizations for take of marine mammals (16 USC §§ 1373 and 1374).

MMPA generally prohibits "take" of marine mammals in US waters, which is defined as activities which "harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 USC § 1362). The law also provides limited exemptions to the take prohibition by authorizing several types of take permits. Section 101(a)(5)(E) allows NMFS to permit incidental take of certain stocks listed under ESA by commercial fishing vessels (16 USC § 1371 subd. (a)(5)(E)). To issue such a permit, the Secretary of Commerce must find, among other things, that the incidental M&SI from the permitted commercial fishing activity will have a "negligible impact" on protected marine mammals (16 USC § 1371 subd. (a)(5)(E)). Guidelines for making such determinations are provided in NMFS Procedure 02-204-02.

1.3.4 National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA)

NEPA requires every federal agency to use all practicable means and measures to protect environmental values and makes environmental protection a part of its mandate (42 USC §§ 4321-4370 subd. (m-12)). The statute requires every federal agency to prepare a detailed statement for any major federal action significantly affecting the quality of the human environment that includes, among other things, the environmental impact of the proposed action (42 USC § 4332). Issuance of an ITP is a major federal action.

CEQA is the state of California counterpart to NEPA. CEQA generally requires state and local government agencies to inform decision makers and the public about the potential environmental impacts of proposed projects. CEQA also requires those agencies to reduce potentially significant impacts to a less than significant level, unless such mitigation or alternatives are infeasible (California Public Resources Code §§ 21000-21189.3). Information regarding the CEQA analysis for this CP will be made available on CDFW's Whale Safe Fisheries webpage.

1.3.5 California Fish and Game Code and California Code of Regulations

Primary management authority for the commercial Dungeness crab fishery rests with the California Legislature, which has enacted several statutes constraining allowable fishing activity. Certain statutes have expressly delegated authority over fishery management to CDFW, which has then adopted implementing regulations. Therefore, legislative statutes (codified in Fish & G. Code) and CDFW regulations (codified in Cal. Code Regs, Title 14 (Tit. 14)) jointly provide the management framework for this fishery.

The commercial Dungeness crab fishery in California is mainly regulated by Fish & G. Code §§ 8275 *et seq.* and implementing regulations in Cal. Code Regs., Tit. 14 §§ 132.1-132.8. These provisions address season dates, trap limits, delays of the fishery due to crab meat quality, and permitting structure. Some specific statutes and regulations that provide relevant authority to CDFW and important context for understanding the construction of this application and CP are:

- Fish & G. Code § 5523 authorizes CDFW to restrict the commercial take of Dungeness crab due to human health risks.
- Fish & G. Code § 8276.1 authorizes CDFW to restrict the commercial take of Dungeness crab due to the risk of marine life entanglement; with implementing regulations found in Cal. Code Regs., Tit. 14, § 132.8.
- Fish & G. Code § 8276.2 allows CDFW to delay the commercial Dungeness crab season in specified fishing districts when the quality of crab is poor.
- Fish & G. Code § 8276.5 prescribes the trap limits for commercial Dungeness crab vessel permit holders and allows for replacement of lost tags; with implementing regulations found in Cal. Code Regs., Tit. 14, §§ 132.1, 132.2 and 132.4.
- Fish & G. Code § 8279.1 prohibits commercial Dungeness crab fishery participants from fishing in areas where openings are delayed due to human health risks, poor crab meat quality, or entanglement risk for 30 days if these participants have already fished in other areas.
- Fish & G. Code § 9002.5 requires CDFW to develop a program that facilitates retrieval of lost or abandoned commercial Dungeness crab traps following the end of the fishing season; with implementing regulations found in Cal. Code Regs., Tit. 14, § 132.7.
- Fish & G. Code § 9004 describes gear servicing requirements, specifically that each trap shall be raised, cleaned, and serviced at intervals not to exceed 96 hours and that no trap shall be abandoned in the waters of the state.
- Fish & G. Code § 9005 requires every commercial fishing trap to be marked with a buoy.

1.3.6 California Marine Life Management Act (MLMA)

The MLMA establishes the importance of California's marine resources (Fish & G. Code §7050 subd. (a)) and ensures the conservation, sustainable use, and restoration of California's marine living resources (Fish & G. Code § 7050 subd.

(b)). The MLMA emphasizes the importance of fishery sustainability and the need for a comprehensive ecosystem-based approach (Fish & G. Code §7050 subd. (b((1)). To achieve these overarching goals, the MLMA outlines several basic tools including use of best available science, constituent involvement, creation of fishery management plans, and use of adaptive management. In addition, the MLMA also highlights the importance of recreational, sport, and commercial fisheries as a benefit to the citizens of California (Fish & G. Code § 7050 subd. (b)(3)-(4)). This includes ensuring the growth of commercial fisheries (Fish & G. Code § 7055 subd. (d)), supporting management for sport use (Fish & G. Code 7055 subd. (c)), and recognizing the importance of recreational ocean activities such as fishing (Fish & G. Code § 7050 subd. (b)(3)).

The MLMA requires that fishery management be adaptive and defines adaptive management as a "scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as tools for learning. Actions shall be designed so that even if they fail, they will provide useful information for future actions. Monitoring and evaluation shall be emphasized so that the interaction of different elements within the system can be better understood" (Fish & G. Code § 90.1). The MLMA stipulates that management systems should be proactive and respond quickly to changing environmental conditions (Fish & G. Code § 7056 subd. (l)).

Adaptive management is a continuous and flexible process that aids in decision making under uncertainty. It begins by defining the problem, identifying objectives and evaluation criteria, implementing a monitoring program, and finally adapting management actions or decisions based on findings (Figure 1-3). Several elements of this CP incorporate the principle of adaptive management, as described further in Section 5.6.

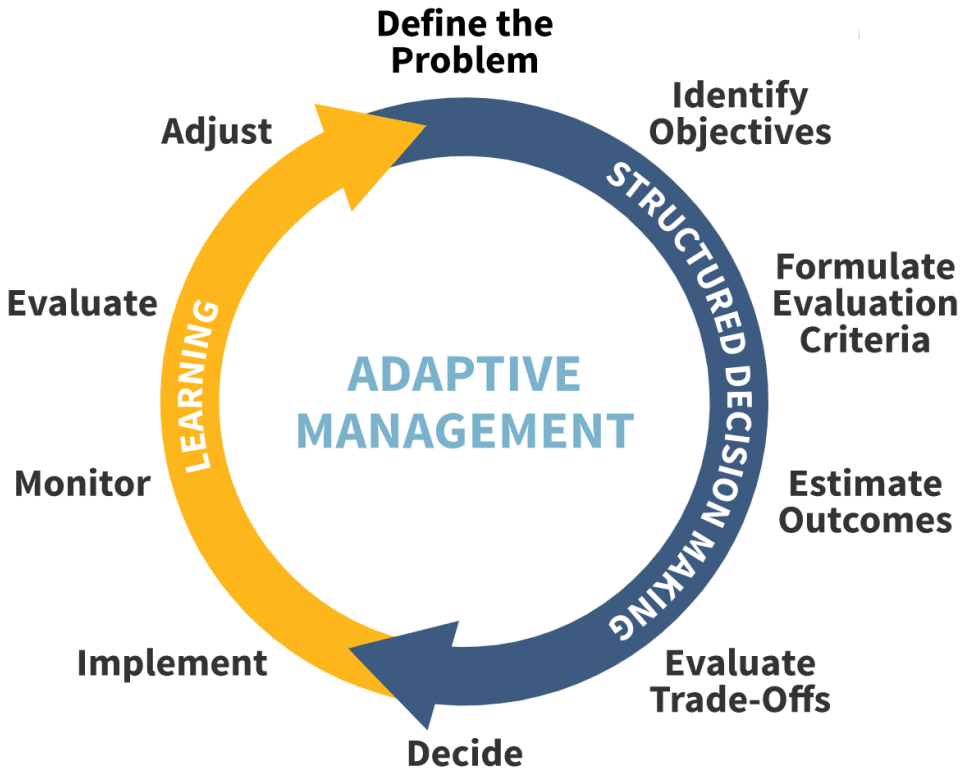

Figure 1-3. A generalized view of the adaptive management cycle. The blue arrow represents the systematic identification of the problem, objectives, and the associated decision-making. The yellow arrow represents the learning associated with implementation (adapted from Birgé et al. 2016).

1.3.7 California Administrative Procedure Act (APA) and Federal Administrative Procedure Act

The California APA (Government Code §§ 11340-11365) establishes rulemaking procedures and standards for California state agencies. Unless otherwise exempt, the adoption of every regulation must comply with the requirements of the California APA. The law is designed to provide the public with a meaningful opportunity to participate in the adoption of state regulations and to ensure that regulations are clear, necessary, and legally valid. State regulations must also be adopted in compliance with relevant regulations implementing the California APA (Cal. Code Regs., Tit. 1, §§ 1-280).

Federal agencies are also subject to statutorily prescribed administrative requirements through the Federal APA (5 USC §§ 500 *et seq.*). While most rulemaking and rule implementation described in this CP fall under state jurisdiction, and are thus managed pursuant to the California APA, the CP, ITP, and accompanying NEPA documents are subject to review and approval by NMFS. These approval decisions are in turn required to meet the decision-making standards described in the Federal APA and are subject to judicial review (see 5 USC §§ 701-706).

1.3.8 National Historic Preservation Act (NHPA)

The NHPA (54 USC §§ 300301 *et seq.*) was signed into law in 1966 to help preserve historic properties in the US. As part of issuing an ITP, NMFS is required to consult with state and Tribal stakeholders and to avoid, minimize, or mitigate any adverse effects on any historical property listed under the National Register of Historic Places (36 CFR §§ 800.3 *et seq.*). While there are properties registered under NHPA located within the proposed Permit Area for this CP (see Section 2.1), most notably the Farallon Islands (National Register # 77000332), the activities governed by this CP are not expected to impact the wildlife, Tribal artifacts, or historical buildings located on and around the Islands. The state of California is committed to continuously engaging with Tribal communities through both requirements under CEQA and CDFW's own Tribal Consultation Policy. CDFW will also provide a liaison or any information necessary for NMFS to satisfy NHPA consultation requirements.

1.4 California Native American Tribes

On December 23, 2019, CDFW provided formal notice to California Native American tribes regarding the development of this CP and associated regulations. CDFW requested preliminary input by February 1, 2020. CDFW staff also provided a brief update during the January 17, 2020 FGC Tribal Committee meeting in Los Alamitos, California.

CDFW provided a second formal notice to tribes on July 26, 2021, which included an update on preparation of the CP. The notice invited tribes to request consultation or to contact CDFW staff for questions related to CP development by September 1, 2021. Pursuant to CEQA, CDFW provided a third formal notice to tribes regarding preparation of the CP, associated regulations, and analyses on August 29, 2022. CDFW will provide an additional notice to tribes when submitting the ITP application to NMFS. In addition, NMFS will provide formal notice of CP publication in the Federal Register for public comment and engage with tribes to provide opportunities for public comment.

1.5 Stakeholder Involvement

1.5.1 California Dungeness Crab Fishing Gear Working Group

CDFW, OPC, and NMFS first convened the California Dungeness Crab Fishing Gear Working Group (Working Group) in 2015. The group's charge is to address marine life entanglements from the California Dungeness crab fishery and consists of a broad cross-section of key stakeholders, including fishermen, agencies, and environmental organizations. In dealing with a problem as uncertain and dynamic as marine life entanglements, the Working Group provides critical transparency and the input necessary for CDFW to establish and implement effective programs.

The Working Group has been instrumental in making recommendations to state management agencies regarding actions to reduce entanglement risk. Its most significant achievement to date has been testing and development of the Risk Assessment and Mitigation Program (RAMP; see Section 5.2 and Appendix E).

CDFW has provided routine updates to, and solicited feedback from, the Working Group during development of this application and CP and the associated regulations implementing the RAMP. The Working Group provided feedback on key aspects of this application and CP, including triggers for management action and the avoidance and minimization measures, prior to submission of a preliminary draft CP to NMFS in May 2020. CDFW conducted additional targeted outreach with this group prior to submission of the ITP application. The Working Group's role in implementing this CP is discussed further in Chapters 5-7.

1.5.2 Other Outreach

In March 2019, CDFW created a dedicated Whale Safe Fisheries webpage where updates about the ITP process are posted. CDFW also created a listserv where the interested public could sign up for updates regarding development of the application and CP, and a dedicated email account where individuals could send comments regarding CDFW's Whale Safe Fisheries efforts. As of November 22, 2024, 3,243 individuals are subscribed to this list.

CDFW notified commercial fishery participants of the ITP application and CP development and invited their comments in outreach newsletters mailed in October of 2019 – 2023. Updates were also provided at public meetings of the Dungeness Crab Task Force (DCTF) in October of 2019-2022 and November 2023, and the California Legislature's Joint Committee on Fisheries and Aquaculture in November 2019, March 2020, November 2021, and October 2022.

CDFW conducted a webinar meeting in March 2020 during which staff provided a pre-notice preview of the proposed RAMP regulations and provided updates regarding the overall ITP process. Invitations were broadly distributed to commercial and recreational Dungeness crab fishery participants, harbormasters, the Working Group, and environmental interest groups. Around 80 individuals attended, including several Working Group members.

CDFW made three public drafts of the CP available prior to submission of the ITP application in May 2020, December 2021, and January 2024. CDFW solicited comments from the Working Group and the public on the 2020 and 2021 drafts, and integrated the comments received as appropriate. CDFW held a public meeting on January 7, 2022, to provide further information about the December 2021 public draft and answer clarifying questions. CDFW also hosted a Q&A session with the Working Group on January 14, 2022.

CDFW will provide public notice via the Whale Safe Fisheries email listserv both when submitting the ITP application to NMFS and once formal notice of the publication is available on the Federal Register via NMFS for public comment.

CHAPTER 2. PROJECT DESCRIPTION AND ACTIVITIES COVERED BY THE PERMIT

This Chapter describes the Plan and Permit Area (Section 2.1), provides an overview of the Covered Activity (Section 2.2), and identifies CDFW's requested permit term (Section 2.3). Covered Activities are further described in Chapters 4 and 5.

2.1 Plan and Permit Area

Commercial Dungeness crab fishing depths are dependent on multiple factors, including fishing location, time of year, and vessel type. Fishing locations are dependent on the time of year, home port, and access to processing facilities. While a few vessels deploy traps in waters as deep as 750 feet (125 fathoms), average maximum fishing depths reported to CDFW over the past four fishing seasons (2020-21 to 2023-24) are between 180-240 feet (30-40 fathoms). Additionally, the fishery occurs almost exclusively north of Point Conception (CDFW 2020a). However, individual fishermen may decide to set gear in other areas, and gear could be moved by ocean currents, other vessels, or entangled marine life beyond the typical fishing grounds. CDFW jurisdiction over the fishery extends throughout the entire US Exclusive Economic Zone (EEZ) off California, including state waters (16 USC § 1856 note). Therefore, CDFW has defined the Plan and Permit Area as encompassing the entirety of the EEZ south of the California/Oregon border to the US/Mexico border (Figure 2-1).

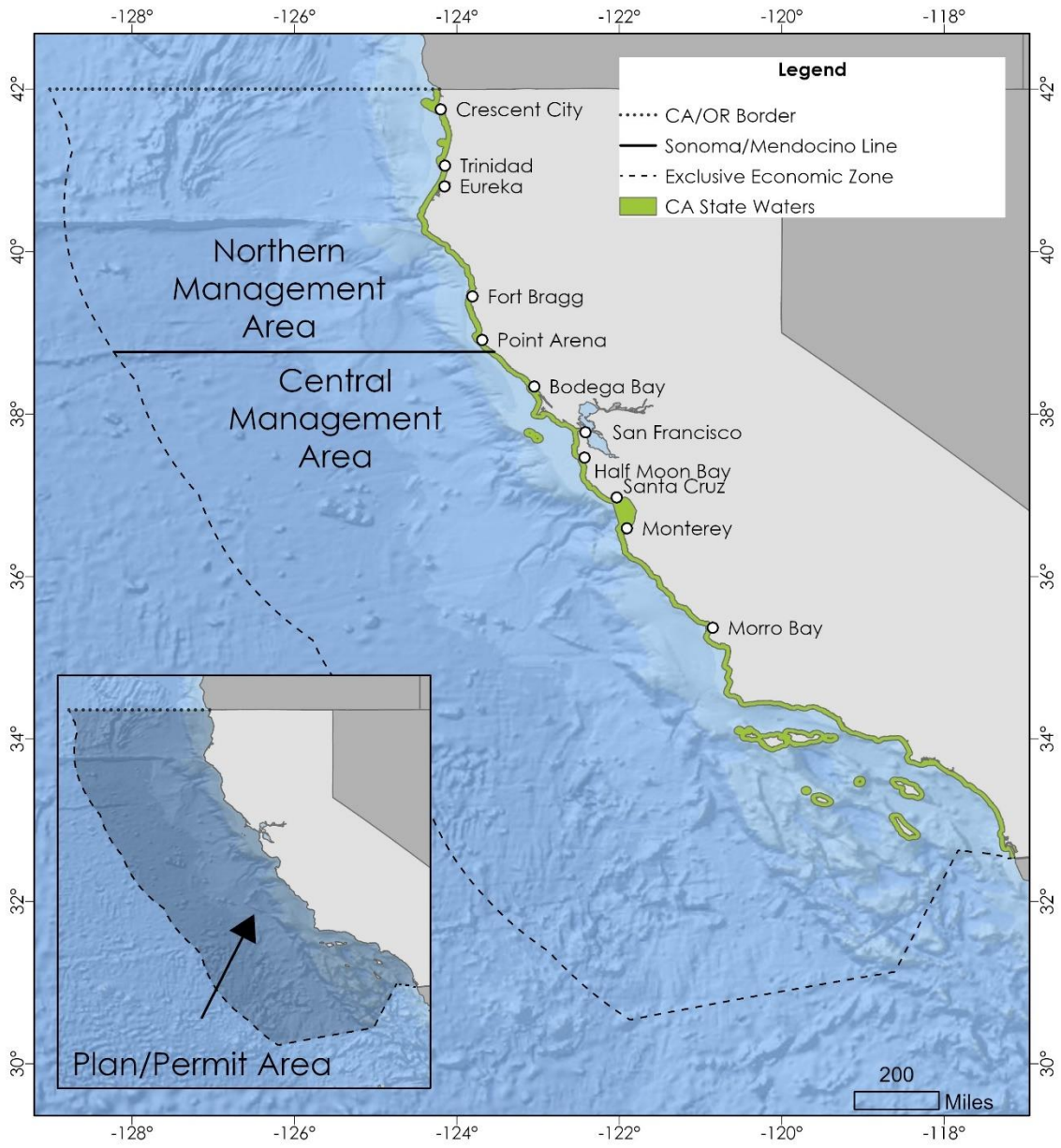

Figure 2-1. Northern and Central Management Areas within the Plan and Permit Area, along with key landmarks. California state waters, shown in green, generally extend to 3 nautical miles offshore but extend farther in some areas (e.g., Monterey Bay).

2.2 Covered Activities

The Covered Activity to which this application and CP applies is the operation of the California commercial Dungeness crab fishery. The California commercial Dungeness crab fishery began in the mid-1800s and over time has developed into one of the most valuable commercial fisheries in the state (Wild and Tasto 1983). Crab is the most important species group by both revenue and number of active vessels for Crescent City and Eureka and is among the highest contributors for other ports in northern and central California (Harvey et al. 2022).

While multiple crab species are harvested in California, Dungeness crab constitutes the highest percentage of both landings and ex-vessel value. Among ports in California, Bodega Bay is particularly reliant upon this fishery (Magel et al. 2020). Since 2010, the fishery has regularly exceeded $50 million in ex-vessel value each season (CDFW 2020a). Landings then enter the larger California seafood economy, which generated over $26 billion in sales and supported nearly 130,000 jobs in 2020 (NMFS 2023).

The following subsections provide additional details regarding the Covered Activity, including targeted species, gear configuration, permitting and associated trap limits, methods of monitoring fishing activity, and spatial and temporal patterns of fishing activity.

2.2.1 Targeted Species

Although they can be found in depths of at least 750 feet, adult Dungeness crab (*Metacarcinus magister*) prefer sandy to silty substrates and are primarily targeted in depths shallower than 300 feet (50 fathoms; CDFW 2020a), and fishing activity is concentrated within this habitat type. These highly productive crustaceans take about three to five years to reach the minimum legal size of 6.25 inches. Seasonal landings are dependent on crab production cycles with decadal variability, resulting in large fluctuations from year to year.

2.2.2 Gear Used

The fishery uses trap gear, which is generally composed of three elements: a weighted trap, surface gear (line and buoy(s)), and a vertical line connecting the trap to the surface gear. The trap is constructed from two circular iron frames, three to 3.5 feet in diameter, connected by spokes on the outer edges (Figure 2-2) and generally weighs between 40 and 50 pounds. The frame is wrapped with strips of rubber and the entire frame is covered with stainless steel wire mesh. When gear is deployed, the weighted trap sinks to the seafloor and generally remains in place until the trap is hauled, limiting the spatial footprint of the associated benthic disturbance. Gear is generally unattended while deployed. Traps must be hauled every 96 hours, weather conditions at sea permitting (Fish & G. Code § 9004).

Figure 2-2. Stacked commercial Dungeness crab gear. Photo by Morgan Ivens-Duran (CDFW).

The surface gear is composed of one or more buoyant buoys connected to the vertical line by a short length of rope and generally floats at the surface when the gear is deployed. Fish & G. Code § 9005 requires every trap or string of traps be marked with a buoy, and the operator of a Dungeness crab trap must also mark the buoy with their commercial fishing license number (Fish & G. Code § 9006). Additional trailer buoys may be used, depending on the participant's need for added buoyancy to facilitate recovering trap gear. Current regulatory requirements regarding allowable surface gear are described in Section 4.5 and Appendix F. Proposed regulations as of September 2024 will also require both the main buoy and trailer buoy to be marked with the identification letter "D".

Fish & G. Code § 9012 prohibits connecting multiple traps with a common line in Districts 6, 7, 8, and 9 (north of the Sonoma/Mendocino county line). Requiring each trap to be individually buoyed helps CDFW enforce its trap limit program. However, this requirement prevents the use of multi-trap "trawls" which are common in East Coast trap fisheries (Figure 2-3).

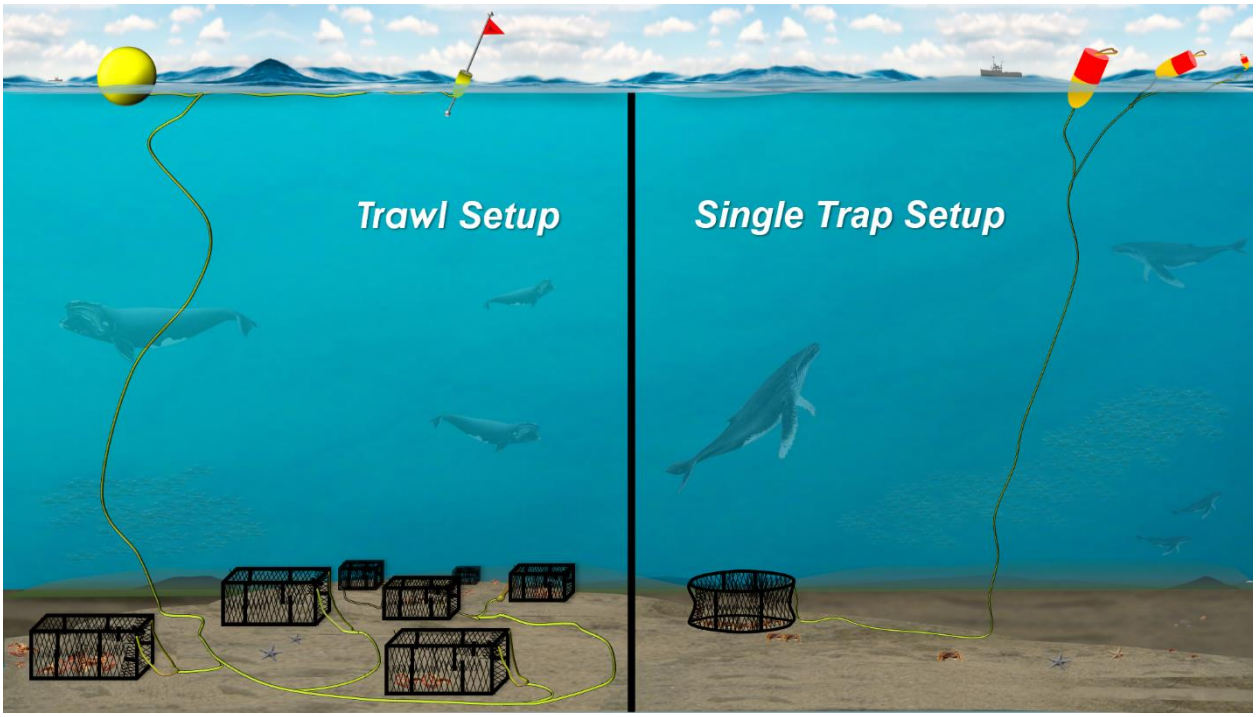

Figure 2-3. Side-by-side comparison of trawl and single trap set up. Whale images courtesy of NMFS.

The amount of vertical line which connects the trap and the surface gear is dictated by the depth where the trap will be deployed, with additional scope to compensate for tidal changes, swell, and currents. In the past, the fleet typically used blue steel-type line, also known as "floating line", but more recently participants have been switching to neutral buoyancy lines in an attempt to reduce the amount of line at the surface.

2.2.3 Fishing Vessel Permits and Trap Limits

The California Legislature first implemented a restricted access program in 1995, capping the fishery at 681 permits (AB 3337, Hauser, 1994). A trap limit program to further control effort was established in 2013 (SB 369, Evans, 2011). Dungeness crab vessel permitholders were divided into seven tiers based on their total California Dungeness crab landings from the 2003-04 through 2007-08 seasons. Those in the highest tier (Tier 1) were allotted 500 traps, and those in the lowest tier (Tier 7) were allotted 175 traps. Trap allotments are enforced with biennial buoy tags marked with the permit number. Originally implemented due to concerns about overcapacity and latent permits, the unique gear marking has allowed commercial Dungeness crab gear to be more easily identified when involved in a marine life entanglement. As of the 2023-24 fishing season, 532 permits were renewed across the seven tiers (Table 2-1). Of these, 350 vessels made at least one landing and an CDFW estimates a total of 82,950 traps were deployed (see Section 5.4 and Appendix G for further details).

Table 2-1. Number of Issued and Active Dungeness Crab Permits During the 2023-24 Fishing Season by Trap Tier (CDFW Automated License Data System and Marine Landings Data Systems, June 16, 2024). Active permits are those for which at least one landing was made.

Tier	Trap Number	Number of Issued Permits	Number of Active Permits
1	500	57	40
2	450	53	40
3	400	55	43
4	350	55	43
5	300	52	40
6	250	155	95
7	175	105	48
Total	NA	532	349

2.2.4 Monitoring Landings

All catch taken under a California commercial fishing license must be reported on a commercial landing receipt (commonly called a "fish ticket"; Fish & G. Code § 8043). These landing receipts include vessel and commercial fishing license information, pounds caught by species, unit price, catch location, port of landing, and fish business information. These documents are then submitted by the commercial fish business to CDFW via an electronic platform (eTix, maintained by the Pacific States Marine Fisheries Commission (PSMFC)) within three business days of the landing, allowing managers to have access to near-real time information on fishing activity.

2.2.4.1 Trap Estimates

Landing receipts require identification of the fishing vessel, which can be combined with permitting information from the state's Automated License Data System to identify the vessel's permit tier and trap allotment. However, the number of deployed traps is not reported on landing receipts. Historically, this has made it difficult for CDFW to quantify the amount of gear used in the fishery.

CDFW has three methods to quantify gear usage. The first method is to identify the total number of issued permits and sum the associated trap limits to estimate the maximum amount of gear that could be fished. The second method is to identify which vessels participated in the fishery (i.e., "active" vessels that made landings) and sum the associated trap limits to estimate the maximum amount of deployed gear. The third method relies on a requirement in RAMP for fishery participants to self-report trap usage (see Section 5.2) to estimate the number of deployed traps. Because not all vessels with active permits participate in the fishery, and participating vessels do not always fish their full trap allotment, the first two methods likely overestimate the amount of actual gear in the water. Because there is not yet full compliance with the RAMP reporting requirement, the third method likely underestimates the amount of deployed gear. However,

CDFW has developed a method to correct for non-compliance, as further described in Section 5.4.2.

2.2.4.2 Fishery Management Areas and Timing

Historically, the fishery has been divided into two areas at the Sonoma/Mendocino county line. The Northern Management Area (NMA) extends from the Sonoma/Mendocino county line to Oregon, and the Central Management Area (CMA) extends from the Sonoma/Mendocino county line to Mexico (Figure 2-1). The scheduled season start date is preceded in both management areas by a designated "pre-soak" period during which baited gear can be deployed but Dungeness crab cannot yet be harvested. Historically, there was a 64-hour pre-soak period for the NMA and an 18-hour pre-soak period for the CMA. SB 80 (McGuire, 2021) amended Fish & G. Code § 8283 to establish a uniform 64-hour pre-soak period for both management areas, which has been in effect since the 2021-22 season.

The scheduled season runs from December 1 to July 15 in the NMA, and from November 15 to June 30 in the CMA (Fish & G. Code § 8276). However, the Director of CDFW may delay the season opening for part or all of the NMA due to low crab meat quality (Fish & G. Code § 8276.2), close any area due to biotoxin risk (Fish & G. Code § 5523), and (more recently) restrict fishing activity in any area due to elevated marine life entanglement risk (Fish & G. Code § 8276.1 and Cal. Code Regs., Tit. 14 § 132.8). With the exception of low crab meat quality, the same actions may be implemented in the CMA. The interactions between these three provisions (quality, biotoxin risk, and entanglement risk) generate uncertainty regarding the timing and duration of the fishing season (Figure 2-4).

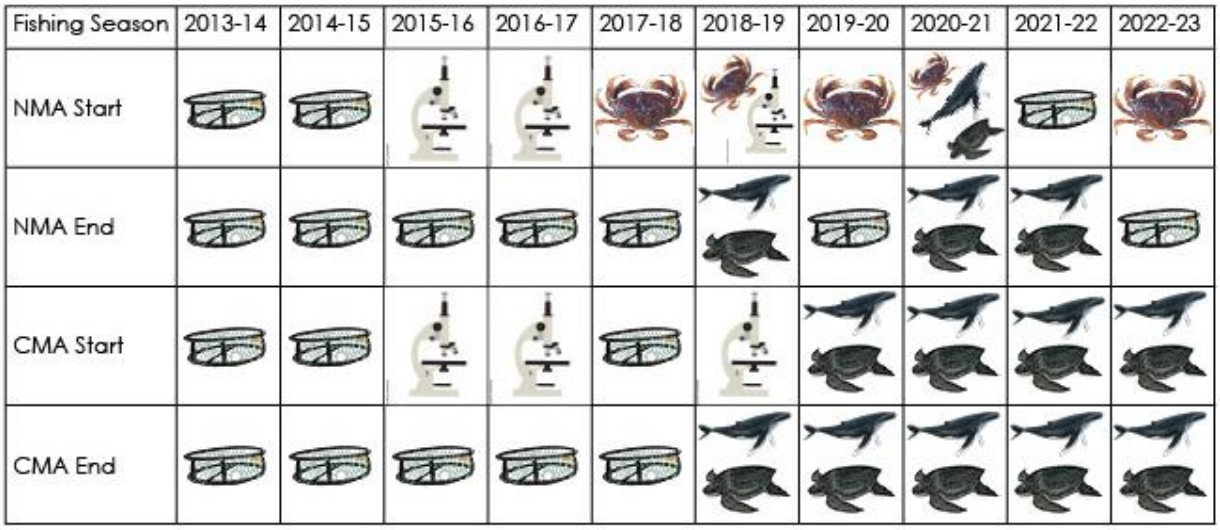

Figure 2-4. Summary of Dungeness crab season timing during the 2013-14 through 2022-23 fishing seasons. On time openings and closures are represented with a crab trap. Delays or early closures are represented with a humpback whale and leatherback sea turtle (marine life entanglement risk), Dungeness crab (low meat quality), or a microscope (elevated levels of domoic acid). Whale and sea turtle images courtesy of NMFS.

Regardless of the actual start date, a majority of statewide landings occur within the first two months of a given season (Figure 2-5).

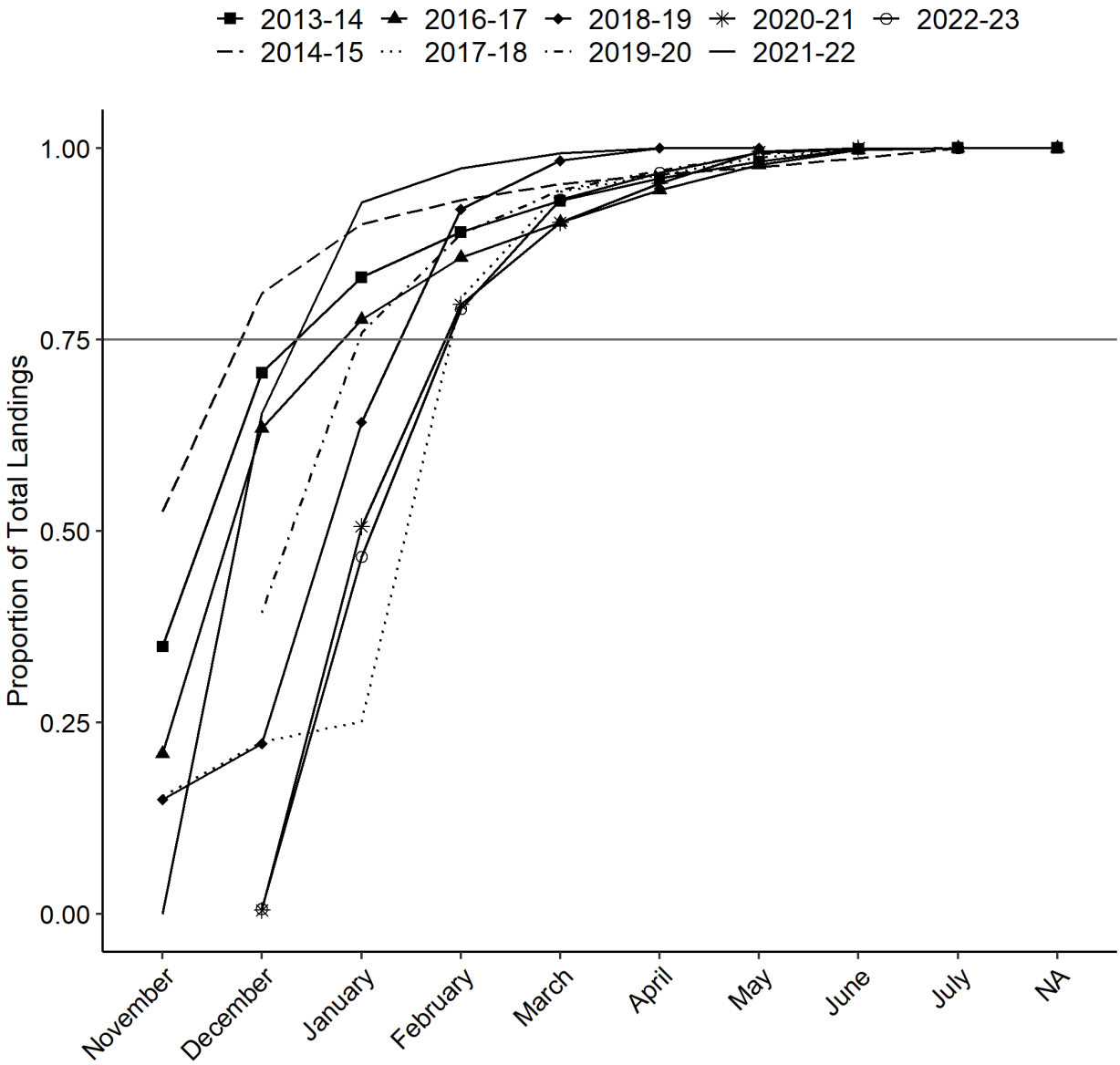

Figure 2-5. Proportion of cumulative pounds of Dungeness crab landed by month between 2013-14 and 2022-23 (not including the 2015-16 disaster season). Source: CDFW Marine Landings Data System.

Fish & G. Code § 8276 subd. (d) requires all Dungeness crab traps to be removed from the water by 11:59 pm on the last day of the Dungeness crab season, and neither Fish & G. Code nor Cal. Code Regs., Title 14 provide any post-season buffer period during which gear may remain at sea.

2.2.5 Spatial Trends in Fishing Activity

The relative importance of an individual port or management area during any given Dungeness crab fishing season is largely driven by the interannual

variability in crab production within nearby fishing grounds, although a small number of vessels will transit a substantial distance between the area where crab was harvested and the port of landing. Historical CDFW Dungeness crab landings data are available beginning with the 1915-16 fishing season. Since the mid-1940s, the bulk of Dungeness crab landings have been made at ports within the NMA, although during the last decade there has been an increase in the proportion of landings made into CMA ports (Figure 2-6), which may reflect the five-fold increase in pre-season Dungeness crab abundance before and after 2000 (Richerson et al. 2020).

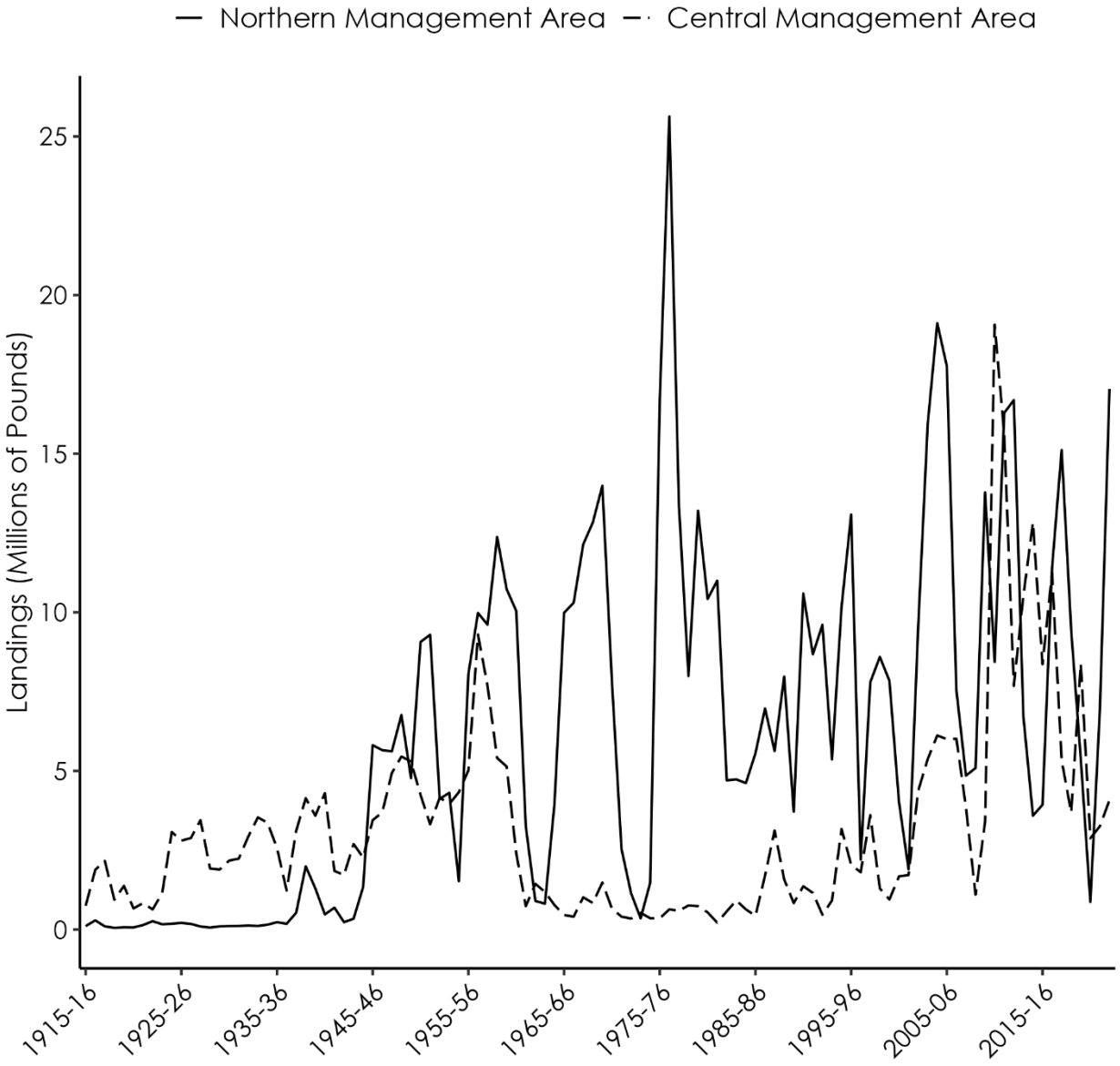

Figure 2-6. California Dungeness crab landings in millions of pounds from 1915-16 to the 2022-23 fishing seasons within the NMA (solid line) and CMA (dashed line).

In addition to crab landings volume, examining the number of permitted vessels which make landings into each port (active vessels) during January and

February and their associated trap limits provides another method for evaluating fishing activity. Focusing on January and February captures the period with the greatest vessel activity while reducing overlap of vessels which transit to more than one port area over the course of the fishing season.

The relative contribution of landings by port region to the total number of active vessels between the 2016-17 and 2022-23 fishing seasons is shown in Figure 2-7, with about a third to half of active vessels landing in the ports of Crescent City, Trinidad, and Eureka within the NMA, and a similar proportion landing in Bodega Bay, San Francisco and Half Moon Bay within the CMA. This is in contrast to ports in Mendocino County (e.g., Fort Bragg and Point Arena) and from Monterey Bay south that have a smaller proportion of active vessels (≤10%).

Figure 2-7 also displays the maximum number of traps those vessels may have deployed during each fishing season. While the trap estimates are based on port of landing rather than catch area, CDFW anticipates these traps would mostly be found near these ports and inside the 100-fathom depth contour.

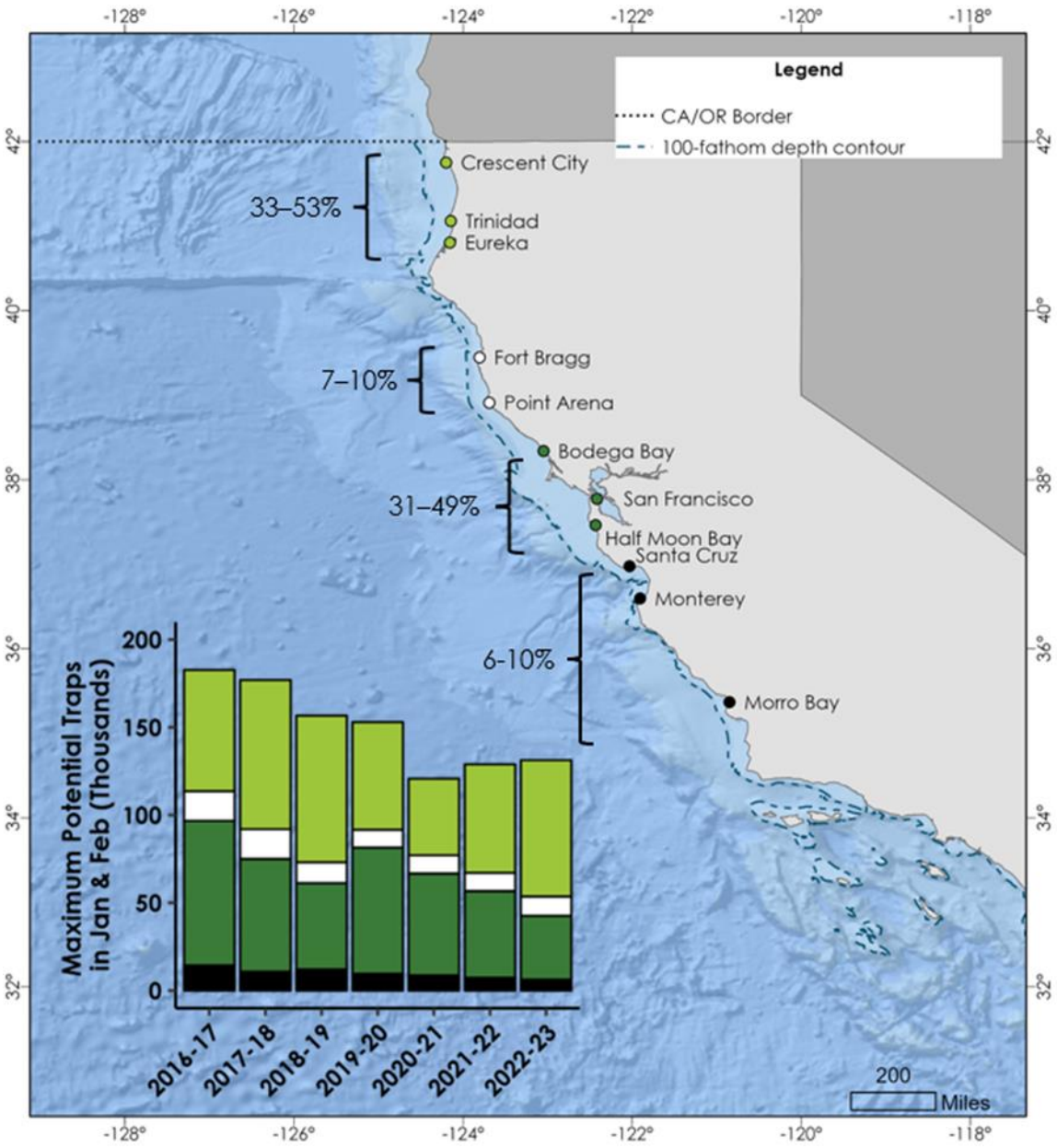

Figure 2-7. Map of California showing 100-fathom depth contour (black line) along port regions and vessel activity during the 2016-17 to 2022-23 fishing seasons. Numbers adjacent to each port region show the range in percent of the active fleet that made at least one landing in the port region during January and February over the past seven fishing seasons (2016-17 to 2022-23). The stacked bar graph in lower left shows the estimated maximum potential traps by fishing season that the active vessel permits represent during the same time period, color coded by port region (from top to bottom: Northern, North-Central, Central, and Southern).

2.3 Permit Duration

CDFW is requesting a 15-year renewable ITP. This permit term allows CDFW to reasonably assess the long-term effectiveness of the Conservation Program for the Covered Species across multiple generations of blue whales, humpback

whales, and leatherback sea turtles while acknowledging CDFW's dynamic management of the California Commercial Dungeness Crab fishery.

Importantly, the requested permit duration provides sufficient time to evaluate the performance of the conservation measures in relation to the generation times of the Covered Species, which range from five to over 20 years. While the permit must cover the entirety of the fishery's operations, the 15-year term sets a sufficient time period to detect and study intergenerational impacts resulting from the modified practices.

As the populations of the Covered Species fluctuate, both the potential for take and the associated impacts will also vary. To address these uncertainties and the inevitably changing conditions over the permit term, CDFW has implemented a comprehensive adaptive management program. This program is integrated into two key components of the CP: RAMP and the backstop measures outlined in Sections 4.8 and 5.2. These elements provide mechanisms for triggering protective actions when specific thresholds are met, thereby minimizing take and supporting the recovery of ESA-listed whale and sea turtle species.

Finally, a shorter permit term requiring the creation of a new or amended CP represents a substantial investment in staff time and resources. The requested permit term allows for sufficient analysis of the conservation measures as they are in effect and provides staff the necessary time to amend or augment the CP. Taken together, these factors support the requested permit term; further information about changes and amendments to the CP can be seen in Chapter 6.

CHAPTER 3. ENVIRONMENTAL SETTING AND BIOLOGICAL RESOURCES

This Chapter briefly summarizes information regarding the oceanographic and ecological conditions of waters off California (Section 3.1), information about blue whales (Section 3.2.1), humpback whales (Section 3.2.2), and leatherback sea turtles (Section 3.2.3), and species not proposed for coverage (Section 3.3).

3.1 Seasonal and Interannual Dynamics of the California Current System

The waters off California are part of the California Current System (CCS), a highly productive coastal ecosystem spanning the West Coast of North America from British Columbia to Baja California (Talley et al. 2011). The dynamics of the CCS have been described in detail by several sources (e.g., Huyer 1983; Lynn and Simpson 1987; Hickey 1979; Marchesiello et al. 2003; Checkley and Barth 2009) and are briefly summarized here.

The CCS is comprised of the California Current, the California Undercurrent, the Davidson Current, and the Southern California Countercurrent (Hickey 1979). Like other eastern boundary current systems, the CCS experiences significant, sustained upwelling events driven by large-scale wind and circulation patterns (Carr and Kearns 2003; Talley et al. 2011). Upwelling occurs when warmer surface water is pushed offshore and replaced by deeper, nutrient-rich water. This influx of nutrients into the euphotic zone fuels high levels of biological production, particularly in shelf and shelf-break habitats, supporting high densities of migratory seabirds and marine mammals as well as resident fish species including groundfish, salmon, sardine, and mackerel (Carr and Kearns 2003; Field et al. 2006).

The California Current Integrated Ecosystem Assessment (CCIEA) identifies three basin-scale oceanographic phenomena which influence dynamics of the CCS: El Niño Southern Oscillation (ENSO), Pacific Decadal Oscillation (PDO), and North Pacific Gyre Oscillation (NPGO; Harvey et al. 2023). ENSO has three states: neutral, El Niño, and La Niña. During ENSO neutral years, climate variables result in upwelling along the coast of South America. During El Niño, years climate variables result in reduced upwelling and productivity in the eastern Pacific. During La Niña, trade winds strengthen, intensifying upwelling in the eastern Pacific. The cycling between El Niño, La Niña, and ENSO-neutral conditions is variable in both periodicity and intensity, but typically recurs every two to 10 years.

The PDO also reflects anomalies in sea surface temperature (SST), with positive values (warmer temperatures) indicating lower productivity and lower values (colder temperatures) reflecting higher productivity conditions (Harvey et al. 2023). Cycling between the warm and cool phases of the PDO occurs on longer timescales than ENSO, typically on 20-30 year intervals (https://www.whoi.edu/know-your-ocean/ocean-topics/ocean-circulation/el-nio-other-oscillations/, accessed May 14, 2021).

The NPGO is an index of sea surface height, indicating basin-scale circulation patterns. Positive NPGO values are associated with higher flows of nutrient-rich subarctic waters towards the equator, supporting more productive coastal ecosystems, and negative NPGO values are associated with decreased contributions of subarctic waters and lower productivity (Harvey et al. 2023).

Skogsberg (1936) defined three distinct oceanographic periods in Monterey Bay: (1) a spring/summer "upwelling season", (2) a summer/fall "oceanic season", and (3) a winter "Davidson Current season", and suggested these trends apply to the CCS more broadly. Persistent, low-magnitude upwelling occurs nearly year-round below Point Conception, and the upwelling season shortens with increasing latitude. Between Point Conception and Cape Mendocino, relatively consistent upwelling of a moderate magnitude occurs from March to October. The highest magnitude upwelling is seen north of Cape Mendocino between April and October, with a peak in July. Complex coastal topography (e.g., capes, points, and peninsulas) and bathymetry (e.g., banks and canyons) can alter upwelling patterns and associated productivity (Huyer 1983; Marchesiello et al. 2003; Checkley and Barth, 2009). Specifically, El Niño events can result in dramatic declines in productivity, while La Niña events can result in nutrient-rich northern waters and increased productivity (Checkley and Barth 2009).

Variations in large-scale atmospheric forcing can also influence upwelling dynamics and ecosystem productivity in the CCS. The North Pacific High (NPH) is a semi-permanent area of high pressure (> 1020 Pascals) in the North Pacific Ocean, and variation in both the size and location of the NPH affects the timing and strength of coastal upwelling off California (Schroeder et al. 2013). Winter NPH values (January – February average) provide an early indication of likely upwelling conditions and resulting biological productivity during the following spring and summer.

Climate change may alter historical upwelling dynamics. Brady et al. (2017) anticipate that in the latter half of the 21st century, seasonal upwelling in the CCS will be characterized by a more intense spring transition (shift from downwelling to upwelling) and a reduction in total seasonal upwelling. These changes could lead to higher, rather than lower, productivity if more moderate levels of upwelling recalibrate the balance between advection and available nutrients.

Between 2014 and 2016, typical seasonal dynamics in the Northeast Pacific were disrupted by a Large Marine Heatwave (LMH) event colloquially known as "The Blob". Driven by changes in sea level pressure (Bond et al. 2015), this LMH event had profound impacts on ocean circulation patterns which cascaded throughout the ecosystems of the CCS. Upwelling in 2014 was dramatically delayed and was among the weakest and shortest since the 1990s (Peterson et al. 2015), decreasing primary productivity and impacting the abundance, species richness, and distribution of key prey species such as copepods and krill (reviewed by Cavole et al. 2016).

Warm SST caused by the LMH, northward transport of *Pseudo-nitzchia australis*, and the onset of seasonal upwelling in spring 2015 led to a Harmful Algal Bloom (HAB), a rapid proliferation of microalgae with detrimental effects (Guang et al. 2021). The HAB caused a large scale, unprecedented domoic acid event along the entire West Coast of North America (Cavole et al. 2016; McCabe et al. 2016). Fishery-dependent coastal communities in California, Oregon, and Washington experienced broad financial and socioeconomic impacts. The Dungeness crab, rock crab, anchovy, sardine, mussel, and razor clam fisheries all experienced closures which resulted in millions in lost revenue, mass reductions in fishery-related employment, and reduced sustenance and recreational fishing (Moore et al. 2019; Moore et al. 2020). The West Coast commercial Dungeness crab fishery experienced a $97.5 million loss in revenue (Moore et al. 2020) and $48.3 million was from California alone (NMFS 2016a). The federal Department of Commerce provided nearly $26 million in disaster assistance relief funds to California Dungeness crab fishermen.

Due to health risks from human consumption of domoic acid, the 2015-16 season opening of the California commercial Dungeness crab fishery was delayed until March 26, 2016 in the CMA, and the NMA did not fully open until May 26, 2016. As discussed in Section 2.2.4.2, in a typical fishing season the vast majority of Dungeness crab landings are made within the first eight weeks of the season opening, with declining landings thereafter. During the 2015-16 season, a majority of landings (presumably accompanied by the highest amount of deployed trap gear) did not occur until April, May, and June (Figure 3-1).

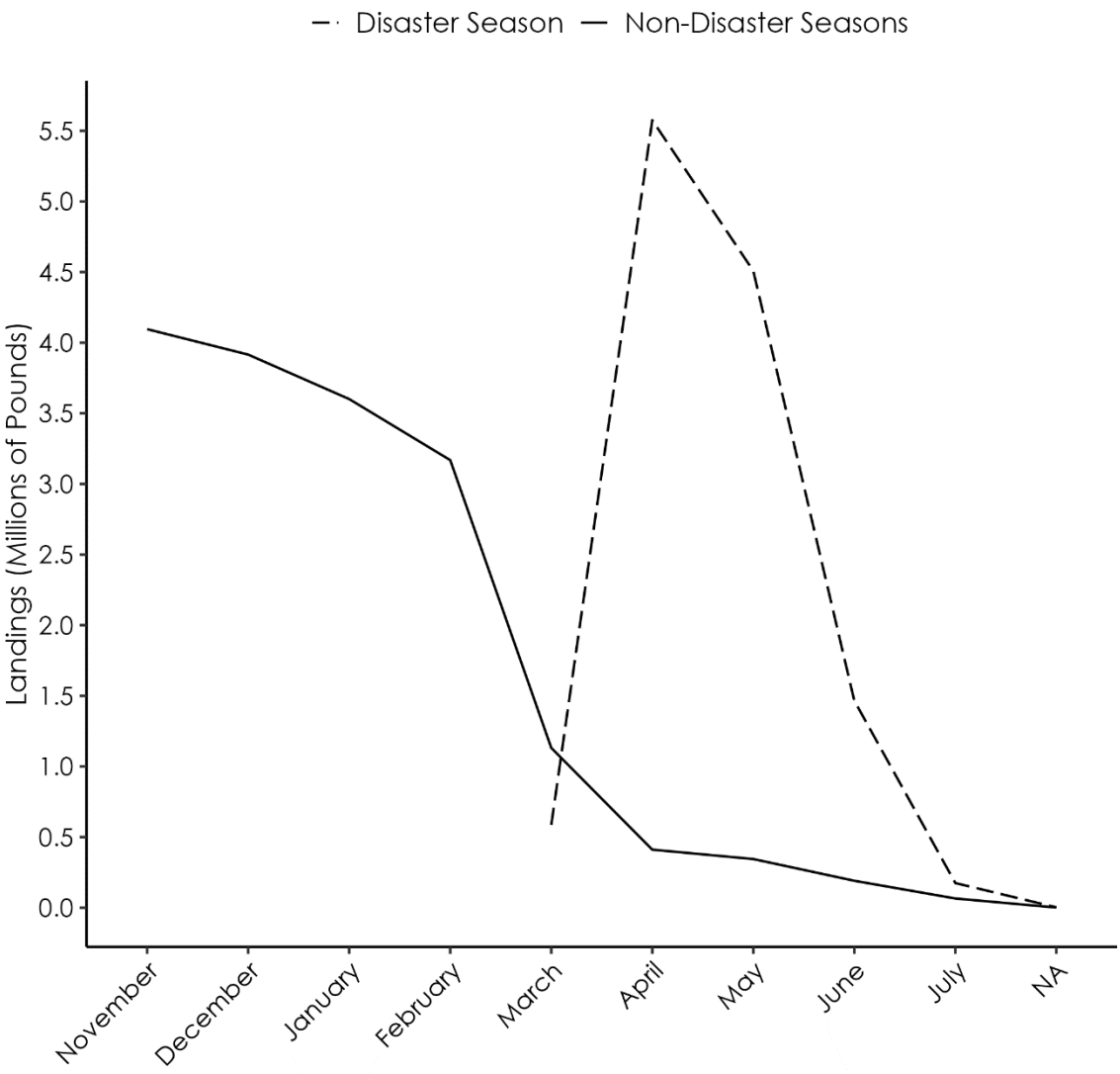

Figure 3-1. Monthly landings during the 2015-16 "Disaster Fishing Season" (dashed line) as compared to average monthly landings during the "Non-Disaster Fishing Seasons" of 2013-14 to 2014-15 and 2016-17 to 2022-23 (solid line).

Restricted upwelling in the 2015-16 period also compressed available forage into a relatively narrow band along the coast (Santora et al. 2020). When large whales arrived off the California coast, their distribution was similarly compressed into nearshore areas where active Dungeness crab fishing was occurring. The convergence of these factors likely contributed to the record number of confirmed large whale entanglements along the West Coast in 2016 (n = 56), 22 (39%) of which involved California commercial Dungeness crab gear.

Jacox et al. (2018) suggest that while the 2014-16 LMH was primarily driven by a confluence of complementary natural processes, these were exacerbated by long-term trends of anthropogenic warming. Guang et al. (2020), Oliver et al. (2018), and Moore et al. (2019) analyzed historical trends in LMHs and HABs and concluded both have increased in intensity and frequency. Several additional

heatwave events have followed the 2014-16 LMH in the CCS (Harvey et al. 2021, Harvey et al. 2022, Harvey et al. 2023). In addition, future projections from Brady et al. (2017), Guang et al. (2020), and Oliver et al. (2018) indicate that climate change will continue to increase LMHs, the intensity of upwelling in the CCS, and SST. Guang et al. (2020) anticipates HABs will increase along with these factors. While the geographic scale, intensity, and duration of the 2014-16 LMH was unprecedented, best available science suggests these types of warm water events will continue to occur, and should be considered as part of the environmental context for this CP.

3.2 Covered Species

CDFW requests take coverage for the following ESA-listed species in this ITP application (Covered Species):

- Blue whale
- Humpback whale – Central America DPS and Mexico DPS
- Leatherback sea turtle

Between 1982 and 2023, there were three blue whale, 84 humpback whale, and two leatherback sea turtle interactions with commercial Dungeness crab gear (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024 and NMFS SWFSC Sea Turtle Stranding Database, as of June 13, 2024).

The humpback whale was originally listed under ESA in June 1970, and in April 2015 NMFS proposed revising the listing status to designate 14 DPS units. On September 8, 2016, the Central America DPS and Mexico DPS, both of which are known to occur along the California coast were listed as endangered and threatened, respectively (81 FR 62260). Multiple interactions have also been documented with blue whales, which was listed as endangered on July 30, 1970 (35 FR 18319). The leatherback sea turtle was listed as endangered on June 2, 1970 (35 FR 8491).

3.2.1 Blue Whales

Blue whales are broadly distributed amongst the world's ocean and are listed at the species level under ESA. The Society for Marine Mammalogy currently recognizes five subspecies of blue whale: *B. m. musculus* in the North Atlantic and North Pacific Oceans; *B. m. intermedia* in the Antarctic; *B. m. brevica* in the sub-Antarctic southern Indian Ocean and southwestern Pacific Ocean; *B. m. indica* in the northern Indian Ocean; and an un-named subspecies in the southeastern Pacific Ocean (NMFS 2020a).

Blue whales undertake seasonal migrations between breeding and foraging grounds and are generally more abundant off California during the summer months (Reilly et al. 1990; Mate et al. 1999; Forney and Barlow 1998; Bailey et al. 2009; Abrahms et al. 2019a; NMFS 2020a). Models of blue whale presence (Hazen et al. 2016) and suitable habitat (Abrahms et al. 2019b) support this finding, with limited presence or suitable habitat during the winter and early spring, an

increase within the Southern California Bight (SCB) during April, May and June, and northwards expansion during the late summer and early fall before retracting southwards towards the SCB. Hazen et al. (2016) found the highest predicted blue whale densities in the SCB and between Monterey and Humboldt Bay within 300 km of shore, and Abrahms et al. (2019b) found hotspots of suitable habitat within the SCB, Monterey Bay, Gulf of the Farallones, Cape Mendocino, and Cape Blanco.

Blue whales depart summer foraging areas in December and follow the continental margin until they reach one of three wintering areas: the southern tip of Baja, the Gulf of California, or the area west of the Costa Rica Dome (Bailey et al. 2009). During the northward migration, which begins in March or April, blue whales make extended stops off Baja before arriving off California in June. Area Restricted Search (ARS) behaviors indicate the Gulf of the Farallones, SCB, northern Coast of Baja, and off the tip of Baja are key foraging areas. Palacios et al. (2019) also documented a key foraging area between Cape Mendocino and Cape Blanco, and that ARS behavior decreased within these foraging areas during warm phases of the PDO.

Even during years with lower productivity, blue whales still exhibit strong site fidelity (Palacios et al. 2019), consistent with recent findings indicating blue whale migration is driven by a combination of memory and environmental cues. Abrahms et al. (2019a) found that blue whale migratory movements in the Northeastern Pacific were significantly correlated with 10-year average values of peak chlorophyll-a, indicating blue whales target areas with predictably high-quality prey resources rather than those with the highest productivity. This memory-driven focus on long-term average trends in resource availability may be detrimental as climate change drives shifts in phenology, latitudinal range, and vertical distribution of prey species. Szesciorka et al. (2020) found a combination of ocean conditions and memory drove timing of blue whale movements between the winter breeding and summer foraging grounds. Blue whales arrived in the SCB earlier if conditions during the prior year were cooler and arrived later if conditions had been warmer than average.

Calambokidis et al. (2015) identified nine Biologically Important Areas (BIAs) off the West Coast where blue whale foraging is common (Figure 3-2). Together, the nine BIAs represent 2% of the waters off the West Coast while encompassing 87% of blue whale sightings between 1986 and 2011. All of these BIAs are located off California and six are located within the SCB, which underscores the importance of the Plan Area for this species. Three BIAs north of Point Conception (Monterey Bay to Pescadero, Gulf of the Farallones, Point Area to Fort Bragg) overlap with Dungeness crab fishing grounds. Based on available sightings information, Calambokidis et al. (2015) concluded blue whales generally arrive in these areas in July or August and depart in October or November. However, near-daily shore-based observations between 1993 and 2016 indicate a trend of earlier arrivals and increased residence time at the Farallon Islands (Ingman et al. 2021). The initial arrival of blue whales has shifted over time from early September in the early 1990's to mid-May as of 2016. While blue whales are also departing earlier

(in early rather than mid-October), the extended residency of blue whales overlaps to a greater extent with the commercial Dungeness crab season, contributing to increased entanglement risk.

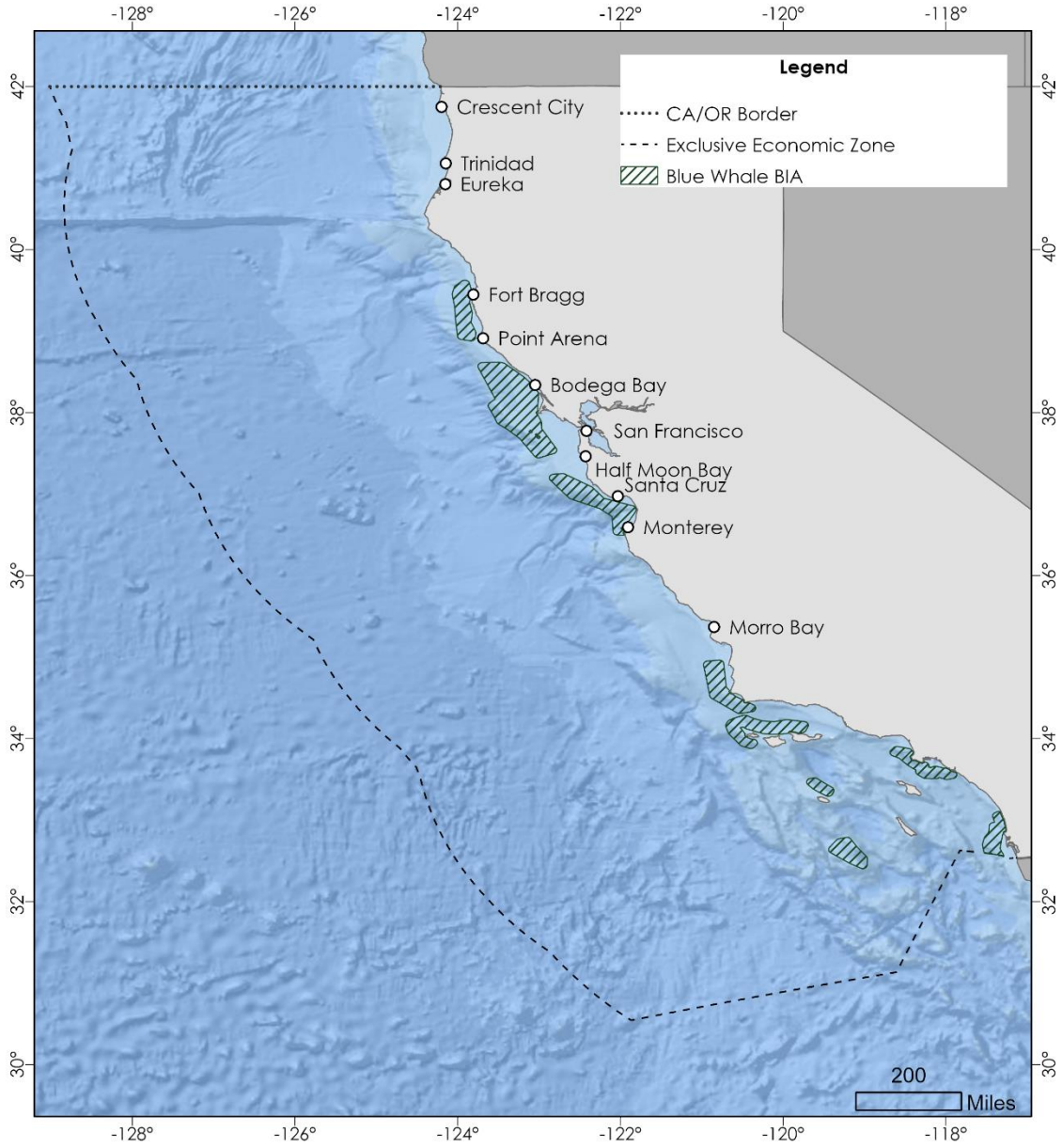

Figure 3-2. BIAs for blue whales off the West Coast, as described in Calambokidis et al. 2015 (downloaded from https://oceannoise.noaa.gov/biologically-important-areas, November 10, 2022).

Krill species are a foundational component of CCS trophic structure, with substantial interannual variation in abundance. Field et al. (2006) estimated that much of the energy flow between primary producers and tertiary consumers in the northern CCS is filtered through krill. This is certainly true for blue whales, which exclusively consume these small euphausiids. In particular, blue whales

forage selectively on high-density patches of large *Thysanoessa spinifera* and *Euphausia pacifica*, even when other size classes or species are more abundant (Croll et al. 2005).

Blue whales can conduct multiple feeding lunges at depths exceeding 200m before returning to the surface (Croll et al. 2001; Calambokidis et al. 2007). Blue whales shift from deeper foraging dives during daylight hours to shallower dives at night, tracking the vertical migration of their prey (Fiedler et al. 1998; Croll et al. 2001; Calambokidis et al. 2007). The stretch of coast between the California-Oregon border and Point Sur generally experiences the strongest upwelling within the CCS, as well as the most variability from year to year (Bograd et al. 2009). On average, the area south of Point Sur experiences less upwelling than the area immediately to the north, but upwelling tends to last longer and is more consistent (Bograd et al. 2009). As upwelling strength increases, nutrient availability and abundance of phytoplankton species upon which krill feed also increases (Croll et al. 2005). However, stronger upwelling also increases the likelihood of advection, with krill being transported away from favorable habitat. Santora et al. (2011) found hotspots of high krill abundance during May and June in areas of moderate upwelling, particularly between Point Reyes and Point Conception (Figure 3-3).

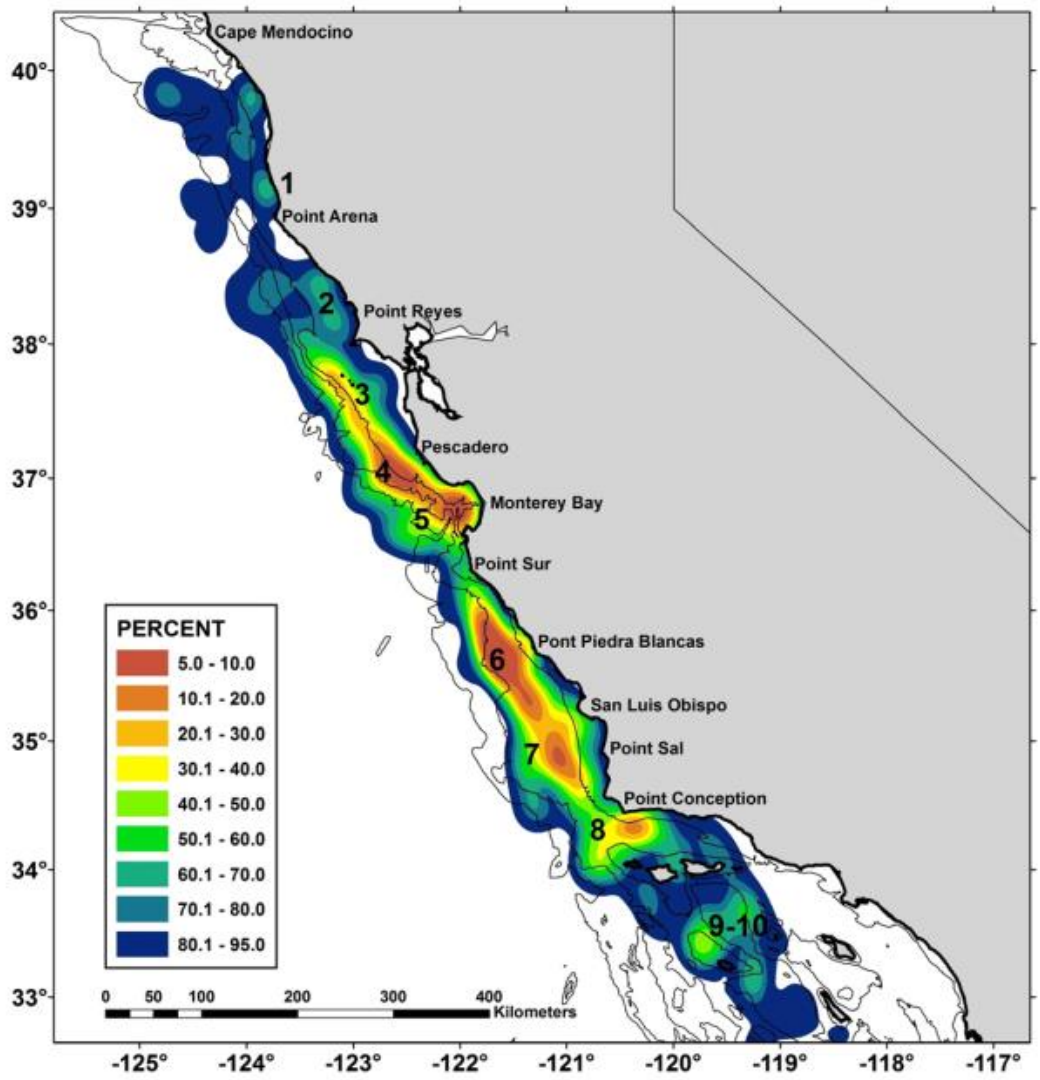

Figure 3-3. Krill hotspots along the California coast during May-June from 2004-2009, with depth contours denoting the 200m, 1000m, and 2000m isobaths. Percent value denotes the relative krill abundance of an area as a percentile within all sampled areas, with areas in the 5th to 20th percentiles considered "high," and areas in the 20th to 40th percentile considered "medium". From Santora et al. (2011).

More recently, Messié et al. (2022) identified three main krill hotspots off California. The southernmost hotspot (north of Point Conception, 34.5 to 36° N) is most productive between May and July. The central hotspot (which extends from Point Sur to Point Arena, 36.3 to 38.9° N) is most productive during June and July, and the northern hotspot (which extends from Cape Mendocino to Cape Blanco, 40.4 to 42.8° N) is most productive during July and August. Krill concentrations are consistently elevated within the central hotspot, with the southern and northern hotspots subject to greater interannual variability. On average, krill concentrations are highest between Point Conception and Point Arena, although hotspots appear to be shifting northward and occurring progressively earlier in the year. Near-real time mesoscale predictions of krill concentrations within the California Current are updated on a monthly basis and

available on a dedicated page hosted by the Monterey Bay Aquarium Research Institute, which can be used to support protected species management.

3.2.2 Humpback Whales

Humpback whales are broadly distributed amongst the world's oceans. Best available science from Jackson et al. (2014) identifies three subspecies (North Pacific, Atlantic, and Southern Hemisphere) based on restricted gene flow between the major ocean basins. The North Pacific subspecies is found throughout the Pacific Ocean Basin, with summering areas spanning the waters between Russia and California, and wintering areas in both the eastern and western portions of the North Pacific.

Of the four DPS known to occur within the North Pacific, only the Central America and Mexico DPS forage within the Plan Area (NMFS 2020b). These two DPS jointly constitute the Covered Species for the purposes of this CP. The Central America DPS feeds almost exclusively off California and Oregon and breeds along the Pacific coasts of Costa Rica, Panama, Guatemala, El Salvador, Honduras, and Nicaragua (81 FR 62260), although more recent data indicates the wintering area extends northwards into southern Mexico (Taylor et al. 2021). The Central America DPS is designated as a single stock under MMPA (Carretta et al. 2023). The Mexico DPS feeds along a broad swath of the Northeastern Pacific Ocean from Central California to the Aleutian Islands and breeds along the Pacific coast of mainland Mexico and the Revillagigedo Islands (81 FR 62260). Under MMPA, the Mexico DPS includes one stock comprised of individuals which forage within the Plan Area and a second "unit" whose stock structure has not yet been resolved (Carretta et al. 2023).

Using spatial capture-recapture methods and photographs collected between 2019 and 2021, Curtis et al. (2022) estimated the abundance of the Central America DPS as 1,494 individuals, with a minimum population estimate of 1,284 individuals. Carretta et al. (2023) relies upon the difference between the Calambokidis and Barlow (2020) abundance estimate for humpback whales off the West Coast (4,973 individuals) and the Curtis et al. (2022) estimate for the Central America DPS (1,494 individuals) to estimate abundance for the portion of the Mexico DPS which uses the Plan Area as 3,479 individuals, with a minimum population estimate of 3,185 individuals.

While these DPS differ in their breeding and foraging areas, CDFW is not aware of any evidence which suggests they differ with respect to habitat preferences, prey species, foraging behavior, or other aspects of their ecology. Therefore, the remainder of this section describes best available science regarding humpback whales in general.

Humpback whales rarely feed while on the breeding grounds and rely on seasonal foraging in temperate latitudes to replenish the energy stores needed to support migration and successful breeding (NMFS 2020b). Historical whaling

records from Monterey and Trinidad in the early 20th century indicate mean body condition was lowest in March, increased through the summer, and peaked in October (Clapham et al. 1997). Humpback whales require high-density prey patches to build sufficient energy reserves (Friedlander et al. 2009; Hazen et al. 2009). The high energetic costs of lunge feeding compared to swimming at constant speed drive humpback whale foraging behavior (Goldbogen et al. 2008). Humpback whales can complete multiple foraging lunges at depth during a single dive event, although as the number of lunges and dive duration increases, so does the subsequent surface interval (Kieckhefer 1992; Goldbogen et al. 2008). Humpback whales target the upper boundary of dense prey aggregations, possibly to minimize the energy costs from diving and searching at depth, and will alter their dive profiles to repeatedly sample high-quality prey patches before returning to the surface (Goldbogen et al. 2008).

Their main prey targets are krill (particularly *E. pacifica* and *T. spinifera*) and small pelagic fish such as northern anchovy, Pacific herring, and Pacific sardine (Kieckhefer 1992; Clapham et al. 1997; Fleming et al. 2016; NMFS 2020b). The distribution and abundance of both krill and small pelagic fish are impacted by basin-scale and local oceanographic conditions and vary from year to year (Chavez et al. 2003). Acoustic and trawl surveys conducted during the spring and summer in the CCS show both interannual and seasonal variability in the distribution and abundance of these fish species, although anchovy exhibited higher geographic affinity and were consistently caught close to shore off the Columbia River mouth and Monterey Bay (Zwolinski et al. 2012, 2016, 2017). Fluctuations in upwelling can also modulate fine-scale distribution of prey species, with smaller, more discrete aggregations of krill and anchovy found during strong upwelling and more diffuse distribution during relaxation of upwelling conditions (Benoit-Bird et al. 2019). Anchovy and sardine spawning habitat also varies between years, although in general anchovy eggs are found closer to shore and concentrated within the SCB while sardine eggs are more abundant offshore and north of Point Conception (Reiss et al. 2008).

Unlike blue whales, humpback whales are generalist predators, switching between prey species depending on their relative abundance and quality (Clapham et al. 1997; Fleming et al. 2016; Santora et al. 2020). Humpback whale diets are dominated by krill during years with low SST, positive NPGO, and high upwelling, which results in elevated nutrient levels and higher krill abundance. Conversely, anchovy and sardine are more prevalent during years with higher SST, negative NPGO, and delayed upwelling.

Humpback whales are most common in relatively cool waters over the continental shelf and slope, remaining largely nearshore during the summer and fall and extending farther offshore during the winter and spring (Becker et al. 2017). Calambokidis et al. (2015) identified seven BIAs where humpback whales are commonly seen feeding (Figure 3-4). Together, the seven BIAs represent 3% of EEZ waters off the West Coast, while encompassing 89% of the humpback whale sightings between 1986 and 2011. Four of the BIAs are located off California (Fort Bragg to Point Arena, Gulf of the Farallones to Monterey Bay,

Morro Bay to Point Sal, and the Santa Barbara Channel to San Miguel Island), underscoring the importance of the Plan Area for this species. There is also substantial overlap between these BIAs and traditional Dungeness crab fishing grounds.

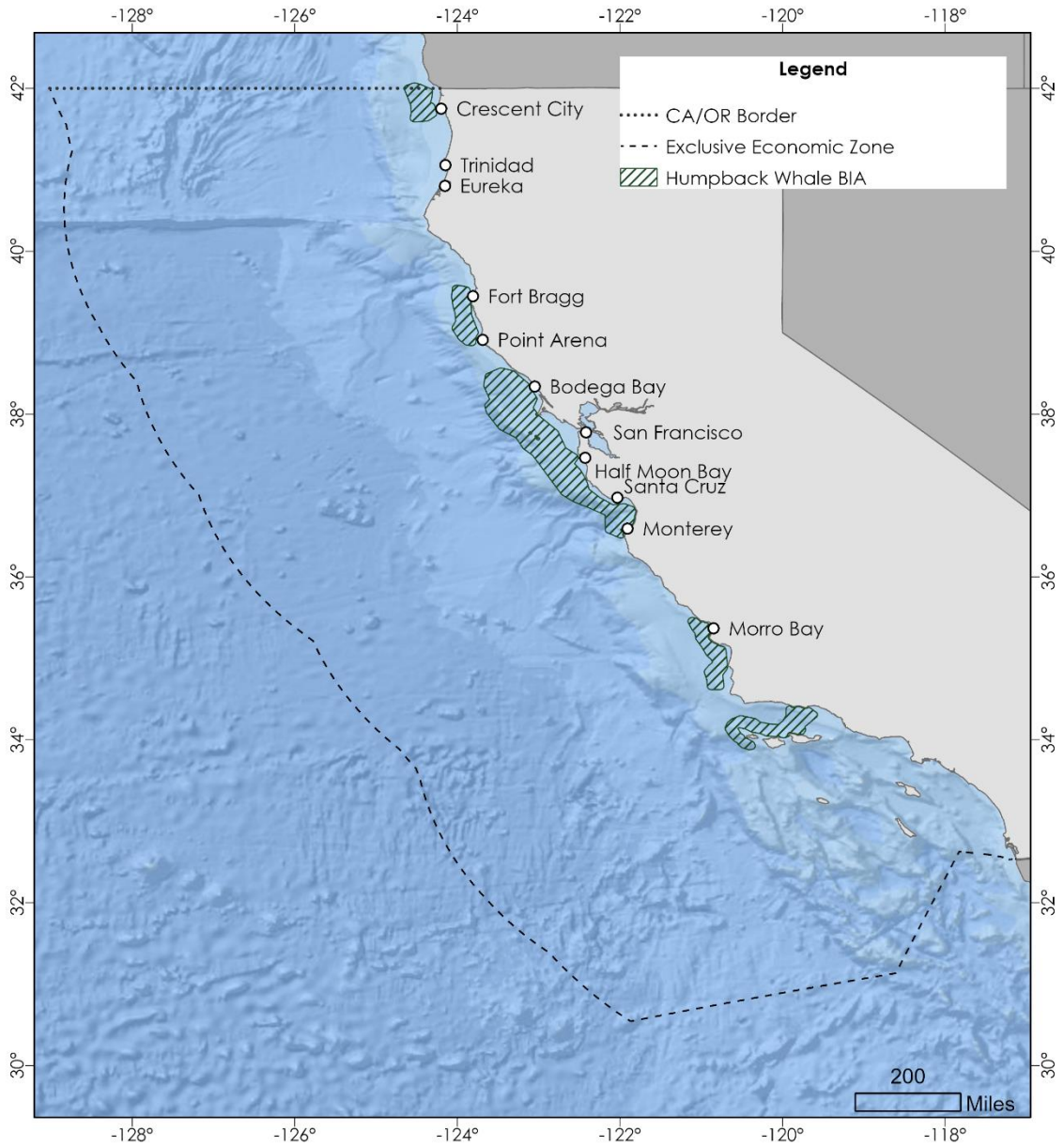

Figure 3-4. BIAs for humpback whales off the West Coast, as described in Calambokidis et al. 2015 (downloaded from https://oceannoise.noaa.gov/biologically-important-areas, 11/10/2022).

Based on available sightings information, Calambokidis et al. (2015) concluded humpback whales were most common from July to November between Fort Bragg and Monterey Bay, April to November between Morro Bay and Point Sal, and March to September from the Santa Barbara Channel to San Miguel Island.

These periods largely avoid the peak activity seen at the start of the commercial Dungeness crab season (see Section 2.2.4.2), instead overlapping with the late season (during which less gear is present) and the summer and fall statutory closure (during which only lost or abandoned gear is present). However, basin-scale oceanographic conditions may modify seasonal occurrence patterns. Daily observations at the Farallon Islands indicate humpback whales arrive earlier during years characterized by cool-phase PDO values and depart later during years with neutral or high NPGO values (Ingman et al. 2021). Additionally, similar to the trend for blue whales, Ingman et al. (2021) has documented a shift in the initial arrival of humpback whales from early October in 1993 to early June in 2016. The extended residency of humpback whales overlaps to a greater extent with the commercial Dungeness crab season, contributing to increased entanglement risk.

Beginning in 2020, there have been multiple studies focused specifically on evaluating humpback and/or blue whale entanglement risk in the California commercial Dungeness crab fishery. Santora et al. (2020) and Feist et al. (2021) found that the high number of humpback whale entanglements during the LMH resulted from a combination of humpback whales moving into areas used by the fishery (as a result of habitat compression driving altered forage availability) and the presence of gear within those areas later into the spring and summer (following an unprecedented delay of the 2015-16 Dungeness crab season). Samhouri et al. (2021) and Free et al. (2023) used retrospective analyses to evaluate the hypothetical impacts of particular management actions (both static and dynamic) on entanglement risk and fishery outcomes both during and following the LMH. Direct comparison of their findings is difficult due to differences in methodology, however both papers concluded management actions which displace, rather than reduce, gear presence can have counterproductive outcomes. Free et al. (2023) also found that static management actions generally outperform dynamic responses, largely due to shifts in the risk landscape prior to management action implementation. Taken together, these four studies indicate that management actions which directly constrain overlap of vertical lines with the Covered Species will provide the greatest reduction in entanglement risk and highlight the importance of incorporating proactive risk predictions (such as the near-real time forecasts of whale distributions described in Section 5.6.2.2).

3.2.3 Leatherback Sea Turtles

Leatherback sea turtles are the largest and most widely distributed sea turtle species in the world. Of the sea turtles found north of Mexico, they have the most northern distribution and are frequently sighted between Northern Baja and Oregon, with occasional sightings off Washington, Canada, and Alaska (Stinson 1984). A recent status review of the leatherback sea turtle identified seven potential DPS units (Northwest Atlantic, Southwest Atlantic, Southeast Atlantic, Southwest Indian, Northeast Indian, West Pacific, and East Pacific), although no DPS have been formally designated under ESA (NMFS and USFWS 2020b). Of the two populations within the Pacific Ocean Basin, only the West Pacific population

is known to forage within the CCS (Benson et al. 2011; Benson et al. 2020; NMFS and USFWS 2020b), and is the primary focus of this CP.

The West Pacific population primarily nests on beaches along the north coast of the Bird's Head Peninsula in Indonesia, although nesting has also been documented in Papua New Guinea, Vanuatu, and the Solomon Islands (Benson et al. 2011; NMFS and USFWS 2020b). The two main nesting beaches are Jamursba Medi and Wermon (Benson et al. 2011; Tapilatu et al. 2013). A large-scale satellite telemetry tagging effort by Benson et al. (2011) showed that while leatherback sea turtles utilize broad swaths of the Pacific Ocean Basin, only those turtles nesting during the summer at West Papua, Indonesia forage within the CCS. Of the leatherback sea turtles in the study, approximately 62% of the leatherback sea turtles nesting in West Papua moved towards the North Pacific after nesting, with 27% eventually reaching the CCS. Of the leatherback sea turtles tagged within CCS foraging grounds, 97% eventually moved towards the Eastern Equatorial Pacific, from which they either continued moving towards nesting beaches in the Western Pacific (28%) or returned to the CCS after a two-to-three-month overwintering period (72%).

Leatherback sea turtles first enter the CCS via the SCB in the spring, after which they travel through nearshore waters to foraging areas in central California (Benson et al. 2011). South of Point Conception, leatherback sea turtles first appear during May and June and are most common during the July – September "turtle season" (Stinson 1984). North of Point Conception, 87% of sightings are within this turtle season. Leatherback sea turtle abundance is positively correlated with Northern Oscillation Index values, and the timing of their arrival in California foraging areas is associated with upwelling (Benson et al. 2007; Eguchi et al. 2016). Leatherback sea turtle sightings are also associated with surface drifts of jellies, as well as concentrations of albacore and bluefin tuna (Stinson 1984). Individuals begin to depart the CCS in October and November when water temperature begins to drop and productivity decreases (Thomas and Strub 2001; Benson et al. 2011). Approximately two-thirds (67.5%) of the leatherback sea turtles which forage off California are female (Benson et al. 2007) and they exhibit strong fidelity to foraging sites, with individuals returning to the CCS in subsequent years (Benson et al. 2011).

Within the CCS the primary leatherback sea turtle foraging area lies between Monterey Bay and Point Arena (Benson et al. 2011; Benson et al. 2020; Figure 3-5), where they have been observed feeding on jellies (*Chrysaora fuscescens, C. colorata,* and *Aurelia sp.)* (Benson et al. 2007). This region is characterized by 14-16°C waters over the continental shelf (< 200m) with high levels of chlorophyll and low physical energy, supporting high concentrations of gelatinous prey within northern Monterey Bay, the Gulf of the Farallones, and Point Reyes (Lenarz et al. 1995; Graham et al. 2001; Benson et al. 2011).

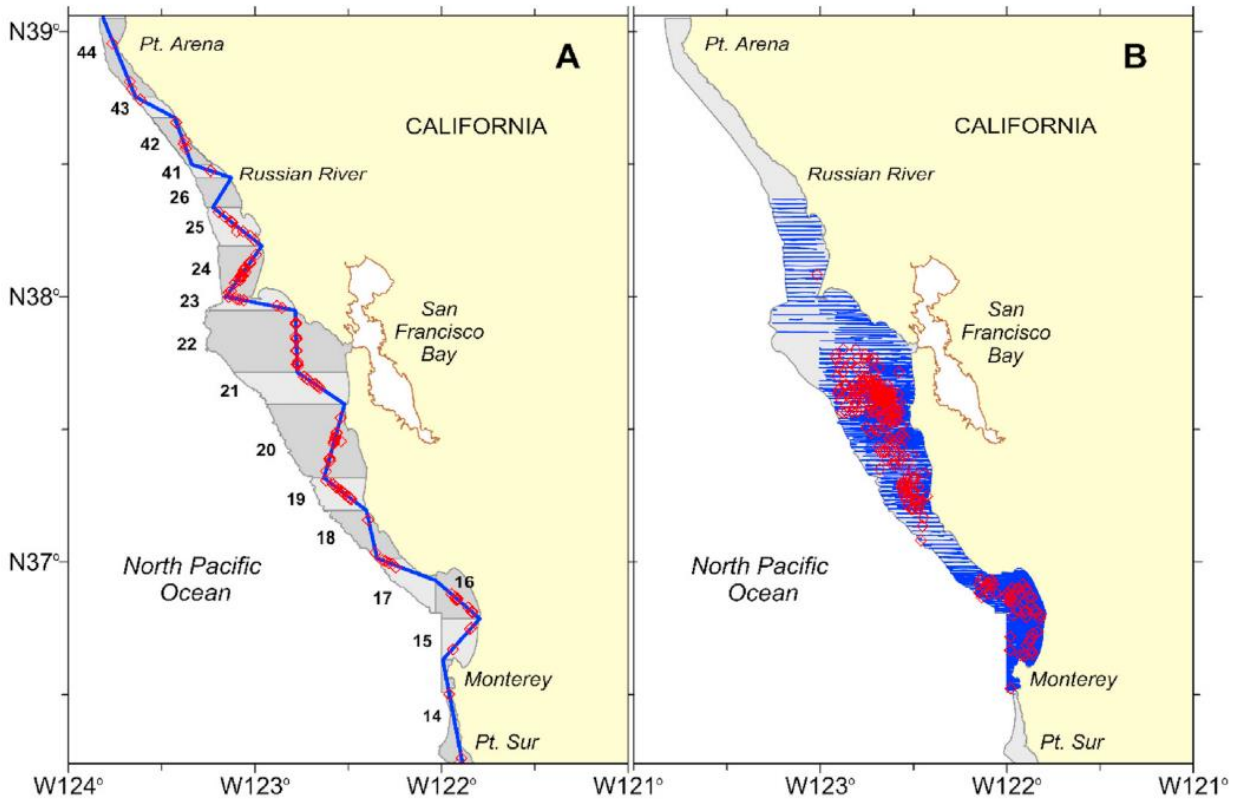

Figure 3-5. Aerial survey coverage (A) along harbor porpoise transects, 1990-2017 and (B) along adaptive fine-scale surveys that primarily covered waters from Monterey Bay to San Francisco, 2000-2017. Blue lines show transects; red diamonds show leatherback sea turtle sightings. Analysis strata are shown in alternating light and medium gray shading in panel (A), with stratum/transect numbers shown alongside. From Benson et al. (2020).

Studies of foraging leatherback sea turtles in the Atlantic Ocean indicate they are efficient and successful predators which consume 96 times their body weight in jellies each year, with higher proportions for juveniles and lower proportions for adults (Heaslip et al. 2012; Jones et al. 2012). Within Monterey Bay, between 1986 and 1991 the highest number of leatherback sea turtle sightings were during August and correlated with high SST (Starbird et al. 1993). While leatherback sea turtle sightings occur seasonally regardless of ocean temperatures, during warmer years they are reported in greater numbers and over a longer period north of Point Conception (Stinson 1984).

Within the CCS, leatherback sea turtle abundance has declined by 5.6% annually between 1990 and 2017, with a total decline of 80% over that period (Benson et al. 2020). Benson et al. (2020) found no evidence for declines in habitat quality or prey availability within the CCS, although this decline is closely correlated with declines observed at the Jamursba Medi and Wermon nesting beaches by Tapilatu et al. (2013). The most recent estimate of West Pacific nesting female abundance is 1,277 individuals; however, this estimate relies on surveys from a subset of nesting beaches and should be viewed as an index rather than the total abundance of nesting females (NMFS and USFWS 2020b).

3.3 Species Not Proposed for Coverage

The following species are known to occasionally co-occur spatially or temporally with the commercial Dungeness crab fishery and therefore may be susceptible to interactions. However, interactions are not reasonably certain to occur as the following species or DPS are not present in the Plan Area or are not expected to be exposed to the Covered Activity. Therefore, they are not proposed for coverage under this ITP, as detailed further in the following sections:

- Gray whale – Western North Pacific DPS
- Killer whale – Southern Resident DPS
- Fin whale
- North Pacific right whale
- Sei whale
- Sperm whale
- California sea otter
- Green sea turtle – East Pacific DPS
- Loggerhead turtle – North Pacific Ocean DPS
- Olive ridley turtle

3.3.1 Gray Whale

The gray whale was originally listed in December 1970, but in 1994 NMFS de-listed the Eastern North Pacific DPS (59 FR 31094). The Western North Pacific DPS, which occurs primarily off Russia and Japan, remains endangered. However, the likelihood of these individuals interacting with California commercial Dungeness crab gear is low. Over the 42-year period from 1982-2023, a total of 29 gray whales have been confirmed as entangled in commercial Dungeness crab gear, of which eleven were confirmed as California commercial Dungeness crab gear. On average, this translates to 0.26 gray whales entangled in California commercial Dungeness crab gear each year. The latest stock assessment in 2021 suggests that the Western North Pacific DPS has at most 290 individuals, which is much lower than the Eastern North Pacific DPS abundance estimate of 26,960 individuals (Carretta et al. 2023), although an updated abundance estimate from Eguchi et al. (2022) indicates a decline to 16,650 individuals in the Eastern North Pacific DPS due to recent unusual mortality events. Moore and Weller (2018) report that at least 37% of the Western North Pacific population migrates along the West Coast. Even with a conservative assumption that each member of the Western North Pacific DPS was present within the Eastern North Pacific at the time an entanglement occurred results in an estimate that 1.7% [290/(16,650+290)] of the gray whales encountered within the Plan Area would be Western North Pacific gray whales. Combining these two estimates (0.26 gray whales entangled in California commercial Dungeness crab gear each year and 1.7% of gray whales within the Plan Area originating from the Western North Pacific DPS) results in an annual take estimate of 0.004 Western North Pacific gray whales. Even over a 15-year permit term (see Section 2.3), this would result in take of less than 0.1 gray whales from the Western North Pacific DPS.

Given the low likelihood of interactions between the California commercial Dungeness crab fishery and the endangered Western North Pacific DPS or the Eastern North Pacific DPS PCFG, as well as the de-listed status of the Eastern North Pacific DPS, gray whales are not included as a Covered Species under this application and CP.

3.3.2 Killer Whale

Of the killer whale populations known to visit California waters, only a single DPS (Southern Resident) is listed under ESA (70 FR 69903). There have been two confirmed killer whale entanglements in California commercial Dungeness crab trap gear since 1982; one each in 2015 and 2016 (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024). However, there is no indication that these entanglements involved members of the Southern Resident population (Carretta et al. 2023). Furthermore, the minimum population estimate for the Southern Resident DPS (74 individuals) is much smaller than those for the two other populations known to visit California waters. The Southern Resident DPS are the rarest killer whales found off California. The 2023 stock assessment for the Southern Resident stock puts the known total M&SI for the stock at zero (Carretta et al. 2023). Because of the lack of evidence suggesting any entanglement of this ESA-listed DPS by the fishery, killer whales are not included as a Covered Species under this CP.

3.3.3 Fin Whale

Eleven fin whale entanglements have been documented off the West Coast since 1982, and none of them have been confirmed as California commercial Dungeness crab gear (NMFS WCRO Whale Entanglement Response Database, shared January 6, 2023). Of these entanglements, one was confirmed Oregon Dungeness commercial crab gear, one was confirmed as drift gillnet (DGN) gear, and nine were categorized as unidentified gear. Due to the rarity of these entanglements, lack of documented entanglements with California commercial Dungeness crab gear, and low likelihood of interaction with California commercial Dungeness crab gear, fin whales are not included as a Covered Species under this CP.

3.3.4 North Pacific Right Whale

Although recent sightings of the North Pacific right whale are most common in the central North Pacific and Bering Sea (https://www.fisheries.noaa.gov/species/north-pacific-right-whale#overview, accessed February 27, 2023), the historical distribution of this stock does include the Plan Area (Young et al. 2023) and there was a confirmed sighting of a North Pacific right whale within Monterey Bay on March 5, 2023. While there is potential for overlap with the Covered Activity, there have been no confirmed entanglements of North Pacific right whales in any gear type since 1982 (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024). Given

the lack of documented entanglements, and its rarity within the Plan Area, North Pacific right whales are not included as a Covered Species under this CP.

3.3.5 Sei Whale

Sei whales are rare within the California Current Ecosystem, although occasional sightings have been documented within the offshore portions of the Plan Area (Carretta et al. 2023). While there is potential for overlap with the Covered Activity, there have been no confirmed entanglements of sei whales in any gear type since 1982 (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024). Given the lack of documented entanglements, sei whales are not included as a Covered Species under this CP.

3.3.6 Sperm Whale

Sperm whales are regularly observed within the Plan Area (Carretta et al. 2023), and there have been 15 entanglements since 1982; however, none of these entanglements have involved trap gear (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024). Given the lack of documented entanglements with trap gear, sperm whales are not included as a Covered Species under this CP.

3.3.7 California Sea Otter

California sea otters are listed as threatened under ESA. California sea otters are also fully protected under California state law (Fish & G. Code § 4700). M&SI due to interactions with trap gear is rare, with five mortalities known to have occurred in California since the mid-1970s (Hatfield et al. 2011, USFWS 2021). Of these mortalities, none were in Dungeness crab gear. There is no direct evidence of M&SI from the commercial Dungeness crab fishery; therefore, sea otters are not included as a Covered Species under this CP.

3.3.8 Threatened and Endangered Turtles Occurring Within the Plan Area Not Proposed for Coverage

Loggerhead sea turtles (*Caretta caretta*), olive ridley turtles (*Lepidochelys olivacea*), and green sea turtles were listed under the ESA on July 28, 1978 (43 FR 32800). Loggerhead sea turtles were initially listed as threatened, and the North Pacific Ocean DPS was listed as endangered in September 2011 (76 FR 58868). While no DPS are designated for olive ridley turtles, two categories of populations are identified, with breeding colony populations on the Pacific coast of Mexico listed as endangered, and all other populations listed as threatened. Similarly, green sea turtle breeding populations in Florida and along the Pacific coast of Mexico were originally listed as endangered, and all other populations listed as threatened. In May 2016, NMFS and USFWS revised the green sea turtle listing status to establish 11 DPS units, with the East Pacific DPS listed as threatened (81 FR 20057).

The range of the loggerhead sea turtle North Pacific DPS spans the entire North Pacific Ocean between 0 and 60°N and therefore includes the Plan Area. Olive ridley sea turtles are known to occur between Southern California and Northern Chile (https://www.fisheries.noaa.gov/species/olive-ridley-turtle#overview, accessed November 2, 2022), overlapping with the southern portion of the Plan Area. The range of the green sea turtle East Pacific DPS extends from 41°N southward along the Pacific Coast of the Americas to central Chile (40° S) and westward to 142° W (at the northern end) and 96° W (at the southern end), therefore overlapping with all but the very northern portion of the Plan Area. While both live sightings and strandings of these three species have occurred north of Point Conception, they are considered relatively rare, likely due to low tolerance of the cooler waters common north of Point Conception (personal communication, Jeffrey Seminoff, NMFS SWFSC, November 3, 2022).

More specifically, as of November 2022, unpublished NMFS data indicates there have been a total of 25 live hardshell turtle sightings (since 1974) and 259 hardshell turtle strandings (since 1981) north of Point Conception. This includes sightings in Oregon, Washington, and Alaska. In terms of live sightings off California (n = 15), the three species are observed in similar quantities (five olive ridley turtles, four green sea turtles, and four loggerhead sea turtles, as well as six unidentified sea turtles). In terms of stranded turtles reported in California (n = 100), olive ridley turtles are by far the most common (n = 56), followed by green sea turtles (n = 37) and loggerhead sea turtles (n = 6), with one unidentified hardshell turtle. On an annual basis, no more than 10 turtles total are reported stranded in California, and no more than four live turtles have been sighted off California.

There have been no documented interactions of loggerhead, olive ridley, or green sea turtles with pot/trap gear off the West Coast, and recent status reviews for these species have identified bycatch issues in the Eastern Pacific only with other gear types. Given the limited presence of these species in the portion of the Plan Area north of Point Conception (where the Covered Activity take place) and the absence of documented interactions between these species and pot/trap gear, CDFW considers take of these species by the commercial Dungeness crab fishery to be unlikely. Therefore loggerhead, olive ridley, and green sea turtles are not included as Covered Species under this CP.

CHAPTER 4. ANALYSIS OF IMPACTS AND TAKE ASSESSMENT

This Chapter discusses defining and apportioning take (Section 4.1), existing take levels within the California commercial Dungeness crab fishery (Section 4.2), and anticipated take levels (Section 4.3). This Chapter also identifies the take amounts that CDFW is requesting pursuant to an ITP (Section 4.4), monitoring activities to account for take (Section 4.5), anticipated impacts of take (Section 4.6), cumulative effects and impacts of anthropogenic take (Section 4.7), and actions to avoid exceedance of take (Section 4.8).

4.1 Defining and Apportioning Take

This application and CP address take of Covered Species which results from entanglements in commercial Dungeness crab trap gear deployed within the Plan Area. While entanglements are only one activity that would be considered take under the definitions in ESA and MMPA (see Chapter 1), this application and CP focus on the impact of Covered Activity on Covered Species resulting from entanglements in commercial Dungeness crab trap gear. Not all entanglements result in removal of the entangled individual animal from the population. Therefore, this application and CP use the term "take" when discussing entanglements and "removal" when discussing entanglements which are known or expected to result in M&SI.

As described in Section 3.2.2, humpback whales in the Plan Area may originate from either the Central America DPS or the Mexico DPS. Identifying individuals and their source DPS is rarely possible in real time during an entanglement response or during post-hoc forensic review (personal communication, Pieter Folkens, May 1, 2020). Genetic tissue sample collection is not always possible due to the hazard of approaching an entangled whale and safety considerations for the response team. Furthermore, very few individuals on the West Coast are currently authorized through the West Coast Large Whale Entanglement Response Program to collect tissue samples allowing for genetic analysis. High-quality photographs of the flukes or dorsal fins can be compared to identification databases but can be difficult to acquire with available equipment or if the entanglement configuration restricts movement. Due to these difficulties, Carretta et al. (2023) determines DPS-specific take by applying proration factors based on movement probabilities between summer and wintering areas from Wade (2021). Specifically, a single humpback whale take constitutes 0.423 humpback whales from the Central America DPS and 0.577 humpback whales from the Mexico DPS. CDFW uses these proration factors to apportion take to the Central America and Mexico DPS in the following subsections, as well as developing backstop measures to avoid exceedance of permitted take levels (Section 4.8).

4.2 Existing Take Levels

Unlike a development project, in which a new source of take is proposed, this CP and associated ITP application seeks coverage for the ongoing Covered Activity with a documented history of Covered Species take. Therefore, there is no clear

starting point for evaluating take from the Covered Activity. Additionally, recent changes in entanglement reporting specificity, variable ecosystem conditions, and modifications and improvements to management approaches prior to submission of the ITP application (Figure 4-1) make it unlikely that prior take levels properly reflect the anticipated future take by the fishery, as further detailed below.

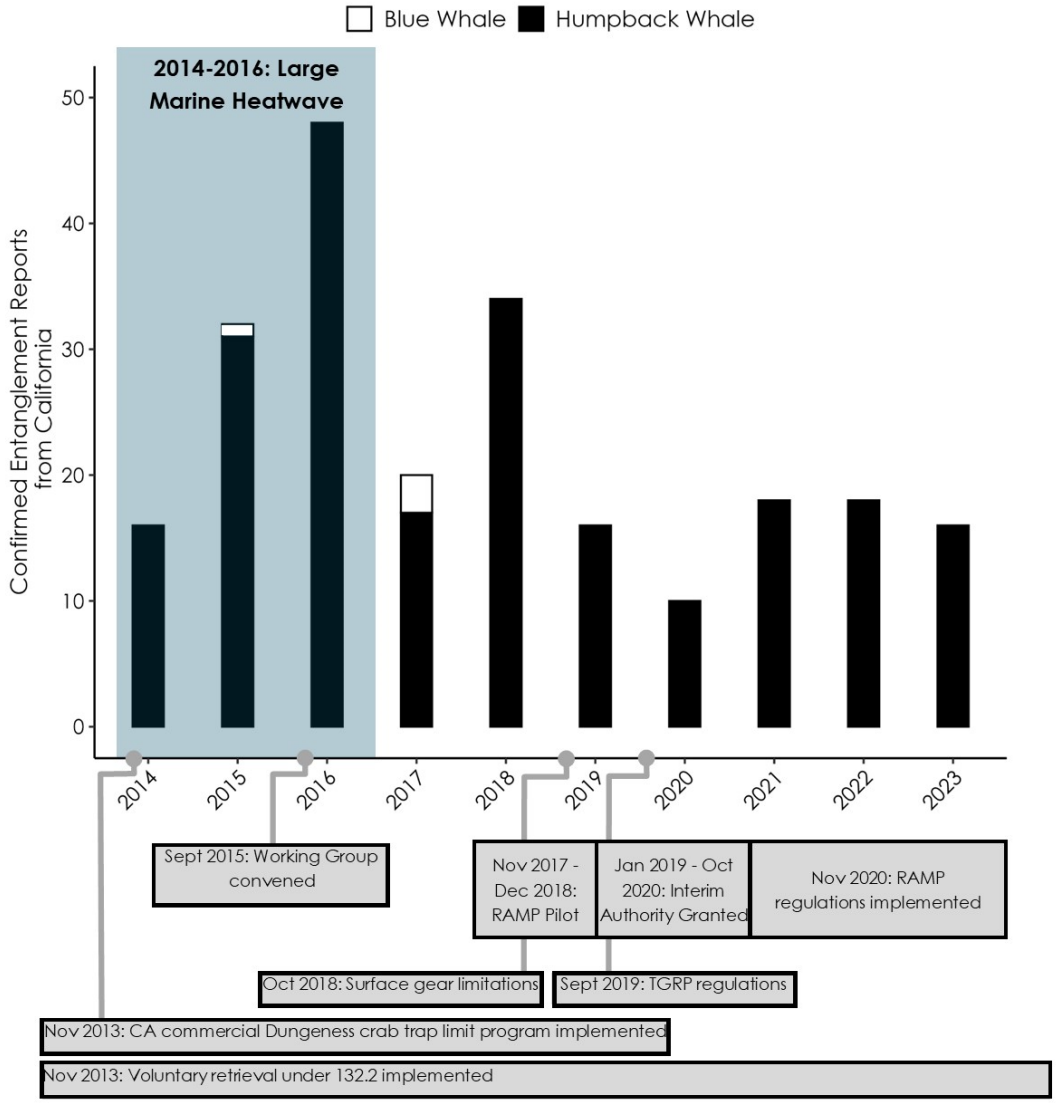

Figure 4-1. Annual confirmed entanglements of blue and humpback whales reported off California, all gear types, 2014-2023; with notes regarding ecosystem conditions, gear detectability, and key changes in Dungeness crab fishery management.

CDFW considered multiple factors to identify the period that best captures existing take levels. While sea turtle stranding records are available from 1981 on, and large whale entanglement records are available from 1982 on, NMFS has characterized 2013 as the beginning of the "modern era of entanglements"

based on increased availability and quality of documentation for entanglement reports (Saez et al. 2021). Sea turtle stranding data began receiving additional scrutiny in 2015, with an increased focus on attributing leatherback sea turtle entanglements to specific fisheries, as is done for large whales (personal communication, Dan Lawson, NMFS WCRO, June 4, 2021). Additionally, requirements to mark California commercial Dungeness crab gear with a unique buoy tag went into effect beginning with the 2013-14 season. When the main buoy is visible, or the gear can be retrieved by an entanglement response team, this unique tag makes it easier to attribute an entanglement to the commercial Dungeness crab fishery. Each state uses different colors and shapes for their fishery's tags (Figure 4-2), allowing managers to attribute commercial Dungeness crab entanglements to either the California, Oregon, or Washington fishery. To account for the increased detectability of California commercial Dungeness crab gear involved in entanglements, CDFW uses the 2014 calendar year as the starting point to assess existing take levels. Additionally, CDFW has relied on the NMFS entanglement record which represents the best available information regarding take of the Covered Species for the analysis presented in this Chapter.

Figure 4-2. From left to right: Examples of California, Oregon, and Washington commercial Dungeness crab buoy tags (tier specific and replacements). Color (for all three states) and shapes (for Washington) vary between seasons. Photos provided by Lauren Saez, NMFS WCRO.

4.2.1 Take of Covered Species in the California Commercial Dungeness Crab Fishery

Between 2014 and 2023, there were three blue whale, 52 known humpback whale, and two leatherback sea turtle entanglements that originated within the Plan Area in California commercial Dungeness crab gear (Table 4-1).

Table 4-1. Confirmed entanglements in California commercial Dungeness crab gear by year for each Covered Species, 2014-2023. Created with NMFS WCRO Whal Entanglement Response Database (as of January 8, 2024) and NMFS SWFSC Sea Turtle Stranding Database (shared June 13, 2024).

Year	Blue Whale	Humpback Whale	Leatherback Sea Turtle
2014	0	2	0
2015	0	7	0
2016	2	19	1
2017	1	3	0
2018	0	7	0
2019	0	3	0
2020	0	1	0
2021	0	1	0
2022	0	4	0
2023	0	5	1
Grand Total	3	52	2
Annual Average	0.3	5.2	0.2

While there has been documented take of all three Covered Species in California commercial Dungeness crab gear, by far the highest number of entanglements have been of humpback whales. Of the 52 humpback whale entanglements in California commercial Dungeness crab gear, 28 (54%) occurred during the 2014-16 LMH. As noted in Chapter 3, this unprecedented LMH event led to an extended delay in the 2015-16 fishing season. Santora et al. (2020) directly connects the heatwave's impacts on fishery operations and Covered Species distributions with the dramatic increase in large whale entanglements documented off California in 2015 and 2016 (Figure 4-3). While the annual number of entanglements has since declined, the entanglements documented during this LMH were the impetus for CDFW's increasingly active management of the Dungeness crab fishery and request for an ITP.

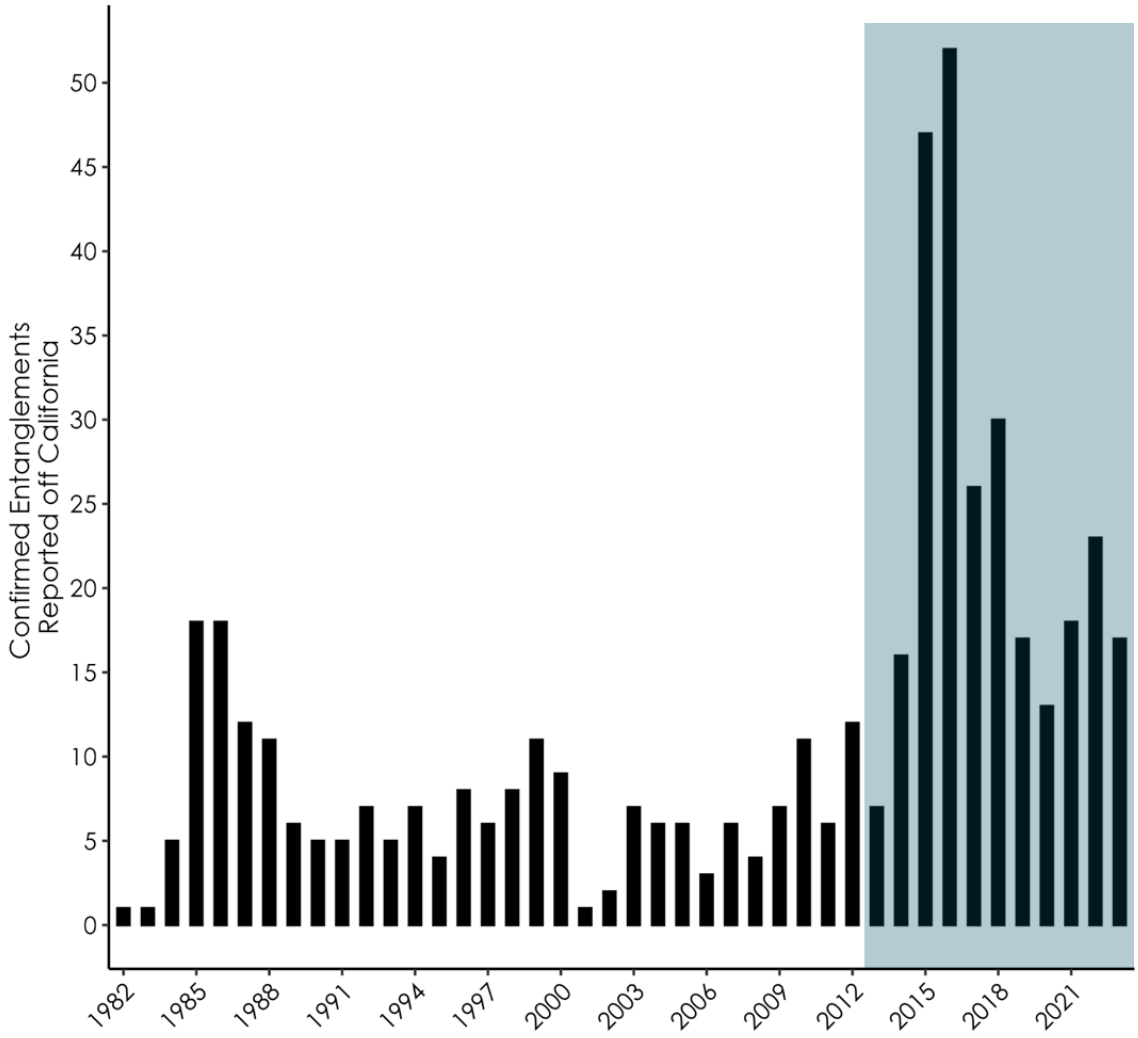

Figure 4-3. Confirmed large whale entanglements reported off California, all species and gear types, 1982 – 2023. Blue shading represents the modern era of entanglements, which began in 2013.

4.2.2 Take of Covered Species in Unidentified Pot/Trap Gear

Between 2014 and 2023, there were four known blue whale, 85 known humpback whales, and one known leatherback sea turtle entanglements in unidentified gear (Table 4-2). Additionally, during this period 11 known entanglements occurred with unidentified gear but were reported outside of the Plan Area in Oregon or Washington. CDFW considers reports from the Plan Area to generally reflect take occurring within the Plan Area.

The "unidentified gear" category excludes entanglements which are confirmed in netting, and those which are attributed to non-fishery sources. Generally, entanglements in "unidentified gear" can be considered entanglements in "unidentified pot/trap gear" (personal communication, Lauren Saez, NMFS WCRO, July 26, 2022). Therefore, the summaries in this Section consider "unidentified gear" to be equivalent to "unidentified pot/trap gear".

Table 4-2. Confirmed entanglements in unidentified pot/trap gear by year for each Covered Species within the Plan Area, 2014-2023.

Year	Blue Whale	Humpback Whale	Leatherback Sea Turtle
2014	0	4	0
2015	1	16	1
2016	1	22	0
2017	2	7	0
2018	0	12	0
2019	0	7	0
2020	0	3	0
2021	0	4	0
2022	0	9	0
2023	0	5	0
Grand Total	4	89	1
Annual Average	0.4	8.9	0.1

4.3 Anticipated Take

CDFW began active in-season management to reduce marine life entanglements in the commercial Dungeness crab fishery in January 2019. The management measures implemented during the 2019-2023 period are similar to those described in this Chapter, and allow CDFW to forecast anticipated take under a fully implemented CP.

As highlighted in Section 4.2.2, entanglements in unidentified pot/trap gear comprise approximately 50% of confirmed large whale entanglements. CDFW expects the enhanced gear marking requirements described in Sections 4.5.1 and 4.5.2, as well as those implemented in Oregon and Washington, will reduce the proportion of entanglements in unidentified pot/trap gear during the permit term and increase the number of entanglements identified to specific fisheries, including California commercial Dungeness crab. While it is impossible to confirm with certainty which fisheries were involved in past unidentified pot/trap gear entanglement events, CDFW has chosen to assume a proportion involved California commercial Dungeness crab gear. Therefore, CDFW anticipates future take levels under a fully implemented CP requires consideration of entanglements in confirmed in California commercial Dungeness crab gear and entanglements in unidentified pot/trap gear.

To better understand the percentage of unidentified gear entanglements that may have resulted from the Covered Activity, CDFW staff reviewed available information regarding active participants, number of fishable days, number of deployed traps, and gear configuration to estimate the vertical line day contributions of pot/trap fisheries operating within the Plan Area for the 2014-2022 period. As further described in Appendix C, the vertical line days metric reflects cumulative entanglement risk during a given calendar year. Analysis included the following fisheries: commercial Dungeness crab, recreational Dungeness crab (commercial passenger fishing vessel (CPFV) sector),

commercial California spiny lobster, commercial rock crab, commercial coonstripe shrimp, commercial hagfish, and commercial spot prawn. Based on available information, CDFW has determined gear deployed in the California commercial Dungeness crab fishery comprised an average of 56.9% of vertical line days from 2014-2022.

The above proportion overestimates the contributions of the California commercial Dungeness crab fishery, as CDFW was unable to obtain sufficient information to include contributions from several other pot/trap fisheries operating within the Plan Area (see Appendix C for further details).

CDFW has selected a conservative apportionment level of 57%, which reflects the contribution of the Covered Activity to total vertical line days during the implementation period. CDFW has applied this apportionment to confirmed entanglements in unidentified pot/trap gear reported within the Plan Area only, rather than coastwide reports.

As described further in Section 5.2 and Chapter 5, RAMP was codified in regulation November 2020 and is a major component of the conservation measures put forth in the CP. CDFW has therefore based the anticipated take analysis on years when RAMP is in effect, from the 2019-20 fishing season through the 2022-23 fishing season.

Applying this 57% apportionment to the recent take levels in unidentified pot/trap gear described in Section 4.2.2 results in 16 additional humpback whale entanglements attributable to the California commercial Dungeness crab fishery between 2019 and 2023. Combined with the 14 confirmed humpback whale entanglements in California commercial Dungeness crab gear during the same period (see Section 4.2.1), this results in an average annual total of 6 humpback whale takes. After applying the proration factors described in Carretta et al. (2023), whereby each take of a humpback whale constitutes take of 0.423 humpback whales from the Central America DPS (and the Central America/Southern Mexico – CA/OR/WA stock) and 0.577 humpback whales from the Mexico DPS (specifically the Mainland Mexico – CA/OR/WA stock), CDFW anticipates take of 38 humpback whales from the Central America DPS and 51.9 humpback whales from the Mexico DPS over the requested 15-year permit term (2.53 Central America DPS humpback whales and 3.46 Mexico DPS humpback whales annually multiplied by 15 years).

Over the 2014-2023 period, there were four blue whale entanglements reported within the Plan Area in unidentified pot/trap gear, for a pro-rated average annual take of 0.23 blue whales (4 blue whales multiplied by 57% apportionment / 10 years). Combined with the average annual take in California commercial Dungeness crab gear (3 blue whales / 10 years = 0.30 blue whales), this results in a total annual average take of 0.53. CDFW anticipates take of 7.95 blue whales over the requested 15-year permit term.

Over the 2014-2023 period, there was one leatherback sea turtle entanglement reported within the Plan Area in unidentified pot/trap gear, for a pro-rated average annual take of 0.06 (1 leatherback turtle multiplied by 57% apportionment / 10 years). Over the 2014-2023 period there were two confirmed leatherback sea turtle entanglements in California commercial Dungeness crab gear. Combined with the average annual take in California commercial Dungeness crab gear (2 leatherback sea turtle / 10 years = 0.2 leatherback sea turtles), this results in a total annual average take of 0.26. CDFW anticipates take of 3.9 leatherback sea turtles over the requested 15-year permit term.

As described further in Sections 4.5 and Appendix F, updated and expanded gear marking for both the commercial Dungeness crab fishery and other state-managed pot and trap fisheries operating within the Plan Area are expected to improve the ability of CDFW and NMFS to attribute entanglements to their fisheries of origin. This will not only increase certainty regarding the actual amount of incidental take by the Covered Activity, but also the severity of those takes. With an increasing proportion of confirmed entanglements attributed to a given fishery, CDFW may discover the impacts of the Covered Activity are either higher or lower than currently anticipated.

4.4 Requested Allowable Take of Covered Species

CDFW is requesting the following allowable take levels of Covered Species by the California commercial Dungeness crab fishery over the permit term:

- six blue whales
- 25 humpback whales from the Mexico DPS
- 10 humpback whales from the Central America DPS
- two leatherback sea turtles

CDFW assessed what proportion of the requested take would result in population removals by applying the average M&SI rates in NMFS 2020d. For blue whales entangled in Dungeness crab gear, the average M&SI rate was 0.92. For humpback whales entangled in California commercial Dungeness crab gear, the average M&SI rate was 0.76. Based on these rates, the requested take of six blue whales would result in the removal of 5.52 whales. Similarly, the requested take would result in 7.6 humpback whales from the Central America DPS and 19 from the Mexico DPS, with the remaining entanglements likely resulting in non-serious injuries. MS&I rates are not available for leatherback sea turtles, so CDFW anticipates that each take would result in a removal. Additional details about anticipated removals are in Section 4.6.

As described in Sections 5.2 and 5.3, the Conservation Measures implemented in recent years (2019-2023) have substantially reduced take of the Covered Species. Full implementation of the Conservation Program may further reduce the amount of take from the Covered Activity. To further inform a take request, CDFW requested researchers at the NOAA Climate, Ecosystems, and Fisheries Initiative West Coast Decision Support Team conduct an analysis to quantify the

impact of RAMP on blue and humpback whale entanglement risk in the California commercial Dungeness crab fishery. The resulting analysis recognizes inherent caveats such as reliance on Vessel Monitoring System (VMS) data and species distribution models (SDM). The report also notes that estimated entanglement risk to blue and humpback whales following the RAMP's implementation in 2019 is highly uncertain. However, results concluded that blue whale estimated risk was found to have decreased by 71% and humpback whale estimated risk decreased by 35% when comparing the 2014-2019 period (pre-RAMP implementation) with 2019-2023 period (post RAMP implementation). These findings rely on a simulated status quo of what risk might have been if the RAMP had not been implemented, and do not address how the change in risk to the whales varied month-to-month or between regions. These results provide compelling evidence that RAMP can lead to decreased entanglement risk. See Appendix E for further information.

However, there remains the unavoidable uncertainty regarding the amount of take currently classified as unidentified pot/trap gear which is actually a result of the Covered Activity and the amount of take from the Covered Activity that is not reported (or able to be confirmed). The restrictions described in this CP represent the maximum effort CDFW can practicably implement to avoid take of the Covered Species while minimizing the impacts of that taking. More stringent limitations, such as shortening the statutorily set fishing season, are either outside the scope of CDFW's authority or would excessively impede the viability of the California commercial Dungeness crab fishery.

For purposes of determining whether these take thresholds have been reached, CDFW will consider each confirmed entanglement of a blue whale or leatherback sea turtle in California commercial Dungeness crab gear to constitute take of an individual. In alignment with NMFS Directive 02-204-01, when evaluating take of humpback whales relative to take limits for the Central America and Mexico DPS, CDFW will apply a two-phase approach. If sufficient documentation exists to definitively identify a source DPS for the entangled humpback whale, CDFW will assign that take to the appropriate DPS. If there is insufficient information to make a DPS determination, CDFW will use the proration factors from Caretta et al. (2023) unless improvements in best available science indicate alternative proration factors are warranted. Further details regarding assignment of humpback whale takes to the relevant DPS are provided in Section 4.1. Confirmed entanglements of Covered Species in California commercial Dungeness crab gear will be considered take regardless of the reporting location (i.e., inside or outside of the Plan Area) or time of year (i.e., whether the fishery is currently open or closed).

4.5 Monitoring Take Under an Issued ITP

As described in Section 2.2.2, typical fishing practices involve fishermen setting and periodically returning to check gear (typically every 96 hours). Entanglement events are generally presumed to occur while gear is unattended. Unattended gear is of particular concern for cetaceans because the entangled animal is

likely to swim away with the gear. This is a key distinction between the Dungeness crab fishery and other fisheries where fishermen or independent observers can more fully account for take of protected species. This includes fisheries where gear is actively tended and take can be documented in real time (e.g., Hawaii shallow set longline fishery), and fisheries where the gear remains in place and take can be documented when gear is retrieved (e.g., North Carolina gillnet fishery).

Therefore, during the permit term there will necessarily be some degree of uncertainty regarding the amount of take which results from the Covered Activity. However, pursuant to 50 CFR § 222.307 subd. (b)(5)(iii), CDFW must specify steps to monitor impact to the Covered Species, and 50 CFR § 222.301 subd. (i) allows NMFS to require ITP permitholders provide complete and accurate records of taking Covered Species. In addition, CDFW has developed a monitoring program which will improve the reporting and documentation of entanglements and improve the ability of NMFS and CDFW to identify the origins of reported entanglements in the California commercial Dungeness crab fishery.

4.5.1 Buoy marking

As of the time of writing, CDFW has proposed new buoy marking requirements that will move forward in addition to a line marking strategy. The buoy marking requirements, like the line marking strategy, will move forward regardless of the date of permit issuance, demonstrating CDFW's commitment to monitoring entanglements. Additionally, there are already regulations in place requiring buoy marking of commercial fishing gear in the spiny lobster, rock crab, tanner crab, spot prawn, coonstripe shrimp, and nearshore finfish fisheries (Appendix F).

The proposed regulations would require each main buoy, as well as any trailer buoys, to be marked with the identification letter "D". Each main buoy must also be marked with the commercial fishing license number of the gear operator. The numbers must be at least 1.5 inches in height and marked with a line no less than 0.25 inch thick. The letters must be at least 3 inches in height and marked with a line no less than 0.25 inch thick. Buoys that are 4 inches in diameter or greater must have the letter on four opposing sides, while buoys that are smaller must have the letters on two opposing sides. The numbers and letters must be distinctly marked, visible, and legible at all times. These improved buoy markings will help identify and monitor Dungeness crab gear in the case of an entanglement.

4.5.2 Line marking

Historically, CDFW has relied on NMFS to attribute confirmed entanglements to specific fisheries (e.g., California commercial Dungeness crab) or gear types (e.g., other trap gear). While the availability and quality of documentation has improved since 2013 (Saez et al. 2021), NMFS is unable to identify a responsible fishery or gear type for approximately 50% of confirmed entanglements reported off the West Coast. The trap limit program implemented by CDFW in 2013 has made California commercial Dungeness crab gear more readily identifiable by requiring the use of buoy tags (see Sections 2.2.2 and 4.2.1). Additionally,

proposed regulations as of November 2024 will amend current buoy marking requirements for commercial Dungeness crab in alignment with those implemented for other state-managed commercial fisheries (see Appendix F).

Establishing a line marking strategy will further improve the ability of CDFW and NMFS to identify a fishery of origin for marine life entanglements. Between 2013 and 2020, approximately 47% of confirmed entanglements of unknown origin had high quality imagery which could have allowed for the detection of line marks (NMFS 2022). CDFW has worked in coordination with the Oregon and Washington Departments of Fish and Wildlife to develop and implement line marking for each state's commercial Dungeness crab fishery and provide a unified approach for line marking on the West Coast.

As of the time of writing, CDFW has proposed a line marking strategy as part of the RAMP rulemaking process which will move forward regardless of date of permit issuance. Starting November 1, 2025, every Dungeness crab permit holder must mark all their surface lines with a continuous mark of alternating colors of black and purple, with surface lines defined as the length of line between any two buoys (Figure 4-4). Starting November 1, 2026, both the surface and vertical line will have a requirement to be marked. The top 15 fathoms of vertical line connecting the crab trap to the main buoy must be continuously marked, with an exception for the bottom five fathoms of line closest to the crap trap. Beginning in 2025 permit holders will be required to mark surface gear (Figure 4-4). By November 2026 permit holders will be required to mark 25% of their deployed gear; by November 2027, they will be required to mark 50% of their deployed gear; and by November 2028, all lines on deployed Dungeness crab fishing gear shall be marked (Figure 4-5).

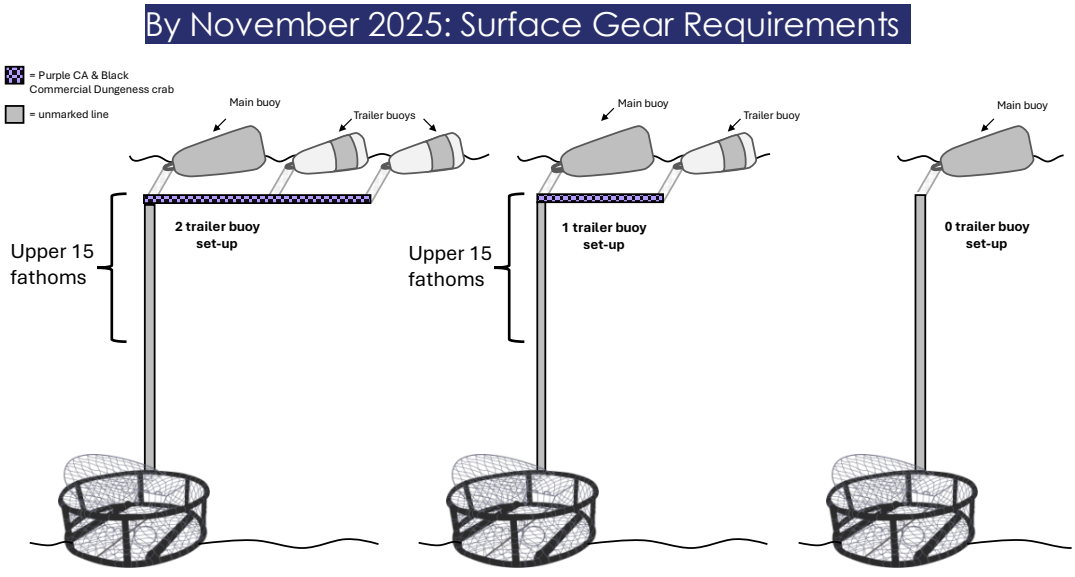

Figure 4-4. Line marking requirements to be implemented by November 1, 2025, for the California commercial Dungeness crab fishery.

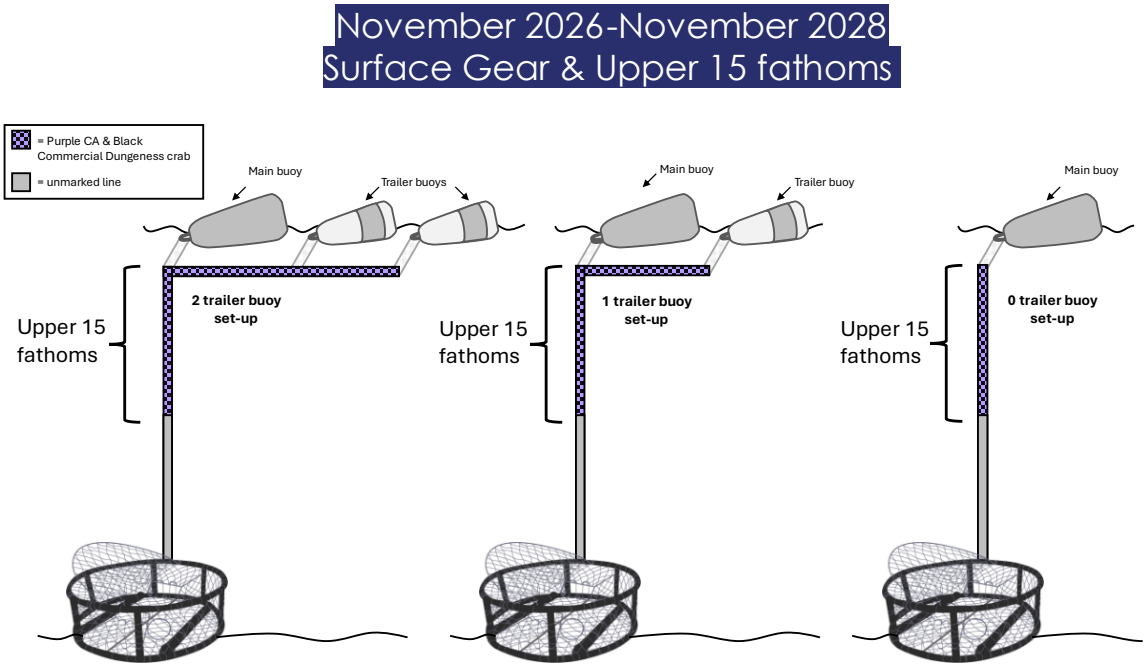

Figure 4-5. Line marking requirements for the California commercial Dungeness crab fishery. Starting in November 2026, 25% of deployed gear must have the vertical line marked in addition to surface gear line marking requirements. By November 2028, 100% of deployed gear must be fully marked.

The dual purple and black coloring serves to distinguish California Dungeness crab gear from Oregon commercial Dungeness crab gear, for which the state of Oregon is adopting a yellow and black pattern and Washington commercial Dungeness crab gear, which has adopted red as its state color (Figure 4-6; Washington Administrative Code 220-340-430). Specifying a unique line marking requirement for the Dungeness crab fishery will enhance CDFW's ability to better identify entanglements which occur in gear from the fishery. Lines with the requisite purple and black pattern can be identified as Dungeness crab gear, while lines without the pattern can be ruled out as Dungeness crab gear. A positive identification of Dungeness crab gear can further help CDFW identify the likely origin of the gear, how it was lost, and how similar situations can be prevented in the future.

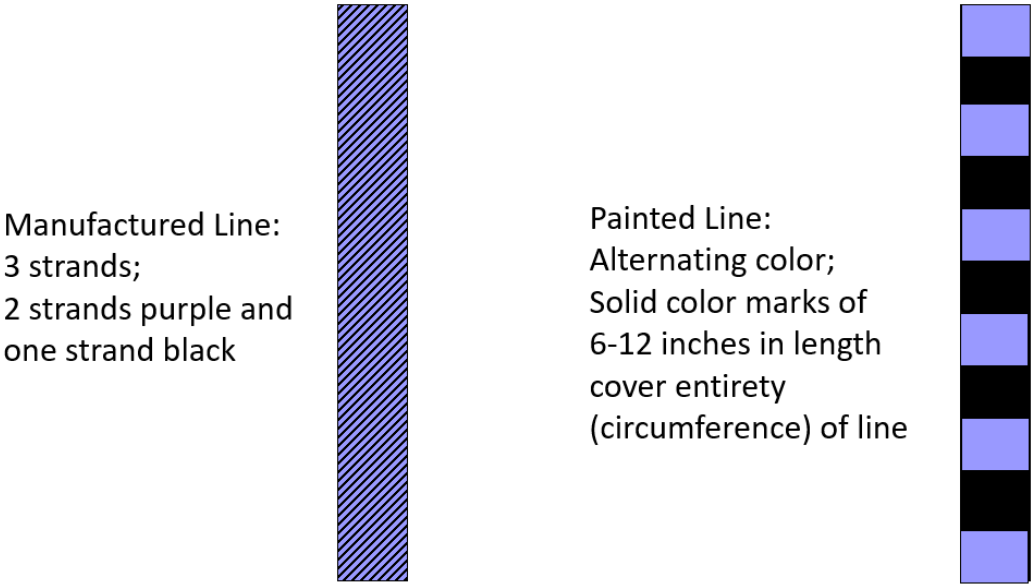

Figure 4-6. Figure showing proposed line color and configuration for both manufactured line and painted line for the California commercial Dungeness crab fishery.

Over time, CDFW anticipates these expanded marking requirements will increase the proportion of confirmed entanglements which can be attributed to a given fishery, supporting CDFW and NMFS' abilities to attribute take of the Covered Species to the appropriate fisheries.

4.5.3 Ongoing Monitoring

In addition to gear marking, CDFW plans to utilize existing aerial surveys and vessel operations to opportunistically monitor for entanglements. Since 2020, CDFW and RAMP data contributors have conducted aerial and vessel surveys to assess concentrations of marine life which inform management actions under RAMP. CDFW's aerial surveys are conducted monthly from October through the end of the fishing season from Point Conception to the California/Oregon border. The surveys assess the presence of marine mammals, sea turtles, fishing gear, and prey species, but also present an opportunity to monitor for entanglements. Additional details on CDFW aerial survey can be found in Section 5.3.1.1 and CDFWs aerial survey protocol can be found in Appendix E.

CDFW may also occasionally provide observers for surveys conducted by RAMP data contributors. NOAA and Upwell regularly conduct aerial surveys in central California while the California Coast Crab Association (CCCA) and The Nature Conservancy (TNC) conduct vessel surveys in northern California and central California. Additionally, NMFS SWFSC Marine Turtle Ecology and Assessment Program conducts aerial and vessel-based tagging operations in central California. Full details of these surveys can be found in Section 5.3. When CDFW staff are present, they will monitor for potential entanglements and deviate from planned routes when necessary to verify such occurrences.

Lastly, CDFW staff may observe quality testing onboard vessels departing from Crescent City, Trinidad, and Eureka in November and December each year. The frequency of trips depends on testing results but generally consists of at least two consecutive days of observation at each port, with the possibility of multiple rounds. These surveys also present an additional opportunity to observe and report potential entanglements.

4.5.4 Entanglements Which Are Not Considered Take by the Covered Activity

There are several categories of entanglements which CDFW does not consider take attributable to the Covered Activity. These include unconfirmed entanglements, confirmed entanglements of unidentified species, confirmed entanglements in gear from other fisheries, confirmed entanglements in unidentified gear, and unreported entanglements. Unconfirmed entanglements are not considered for reasons described in Chapter 1 (i.e., to avoid double counting when multiple reports are received for the same entanglement, and to ensure the entanglement involves fishing gear rather than kelp or other marine debris).

Confirmed entanglements with unidentified large whale species are relatively rare occurrences, representing just 3% (n = 21) of the 602 total confirmed entanglements between 1982 and 2022 (NMFS WCRO Whale Entanglement Response Database, as of January 8, 2024). Only two of those entanglements were confirmed in commercial Dungeness crab gear, one in 2007 and one in 2008. At this time, CDFW considers the available data too speculative to include confirmed entanglements of unidentified species when evaluating take of Covered Species. However, as with other changes to the proposed Conservation Program, should new information indicate such triggers are warranted, CDFW will consider updating this element of the CP through the amendment process described in Chapter 6.

Confirmed entanglements in gear from other fisheries do not reflect take from the Covered Activity, and are outside the scope of this CP. This includes confirmed entanglements reported within the Plan Area which are attributed to other state's commercial Dungeness crab fishery and confirmed entanglements reported within the Plan Area which are attributed to any other fishery (even if the gear originated within the Plan Area).

While CDFW considered confirmed entanglements in unidentified pot/trap gear when selecting requested take levels (see Sections 4.3 and 4.4), CDFW will not implement restrictions for the California commercial Dungeness crab fishery in response to confirmed entanglements which are categorized as unidentified pot/trap gear. While CDFW does consider it likely that a portion of the unidentified pot/trap gear entanglements which occurred originated from the Covered Activity, pre-consultation discussions with NMFS indicate that the expanded gear marking which will be in place prior to permit issuance is sufficient to enable reliable identification of confirmed entanglements which occur in California commercial Dungeness crab gear. Furthermore, as observed

in recent analyses for the West Coast sablefish pot fishery, NMFS practice is to limit evaluation of fishery-specific take to instances where the fishery is specifically identified (86 FR 69627). Assigning a portion of the residual take in unidentified pot/trap gear to the Covered Activity would therefore be inconsistent with past practice, and is not proposed for this CP.

Regarding unreported entanglements, the entanglement reports received by NMFS represent an unknown subset of the total number of entanglements which occur. CDFW will undertake efforts to improve reporting, as described in Section 5.5.2.

4.6 Anticipated Impacts of Taking

Pursuant to ESA, an ITP can only be issued if the proposed activities will not jeopardize the continued existence of any listed species (16 USC § 1536 subd. (a)(2)), among other requirements. Jeopardy exists when an agency action reasonably would be expected, directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild (50 CFR § 402.02). For humpback and blue whales, the requested take must also satisfy requirements of the MMPA.

In the following sections, CDFW describes anticipated impacts of the requested take on each Covered Species, including effects on their designated critical habitat.

4.6.1 Anticipated Impacts of Taking Blue and Humpback Whales

Large whale entanglements in pot/trap fishing gear, including commercial Dungeness crab, can have a variety of outcomes ranging from little or no impact to mortality. NMFS (2012) highlights this fact and describes the process for evaluating fishery impacts for the purpose of evaluations under the MMPA, which involves categorizing a given entanglement as resulting in either non-serious injury, serious injury, or mortality. Injuries in the latter categories are often grouped together and referred to as M&SI.

As described in NMFS (2012), entanglements involving constricting wraps (L2) can cause lacerations, partial or complete fin amputation, organ damage, or muscle damage and interfere with mobility, feeding, and breathing. In addition, constricting wraps trigger a stress response, and elevated cortisol levels could tax the immune system and make the whale susceptible to infection. L2 entanglements are therefore considered a serious injury. Entanglements which consist of a lose wrap (L3) can result in tissue damage but do not elicit the same immune response, and are considered a non-serious injury.

Even for L3 entanglements, or L2 entanglements with successful self-release or human intervention which enables removal of some or all of the gear, it is reasonable to conclude the whale has suffered some degree of harm. While there is limited information focused on humpback or blue whales, the question of sublethal impacts from entanglements has been well studied in the North

Atlantic right whale. Given plausible differences in morphology, physiology (including immune response), locomotion, and other biological aspects, it is imprudent to assume humpback and blue whales respond to stressors in an identical manner as North Atlantic right whales. However, this well-studied species is the closest proxy available, and the general principles deducted from this research likely apply to other large whales.

The most severe outcome from a given entanglement event is mortality. Cassoff et al. (2011) conducted an extensive review of mortality reports for four baleen whale species, including both North Atlantic right whales and humpback whales. Among stranded carcasses with evidence of entanglement, causes of death included asphyxia, starvation, systemic infection, hemorrhage, and debilitating tissue damage. Cassoff et al. (2011) concluded asphyxia is more likely in smaller whales (e.g. juveniles), but is possible in whales of any body size if the extent, weight, and strength of entangling gear are sufficient. Drowning is more likely for complex entanglements, where gear is affixed to multiple body parts. Starvation can occur either as a result of impaired locomotion or the direct disruption of feeding mechanics when gear is present in or around the mouth. Systemic infection can be caused by the loss of epithelial protection or chronic stress levels which weaken the immune system. Gear induced wounds may be up to 20 cm deep, cutting through blubber, tissue, and even into bone.

For entanglements which do not result in mortality, the outcomes are more variable. From a biomechanical perspective, sublethal entanglements subject whales to additional drag forces, increasing the amount of energy required to propel an individual through the water (van der Hoop et al. 2017). Over time, overcoming these increased drag forces can consume the same amount of energy as is needed to complete seasonal migrations, and (for females) nearly as much as is required to gestate and wean a calf. The specific health impacts of a given entanglement are affected by the timing relative to available energy reserves. Van der Hoop et al. (2017) also found that the duration of an entanglement, more than the amount of drag imposed by the entanglement configuration, had stronger health effects and was a better predictor of post-entanglement survival; i.e., more rapid human intervention or self-release led to higher survival. These increased energetic costs can also result in thermal stress associated with blubber loss (Lysiak et al. 2018).

Increased energetic demands associated with entanglements can also impair reproduction. With increasing entanglement severity, whales spend a greater proportion of time with body condition below that required for calving, and have an increasing likelihood of mortality (i.e., lower survivorship). Knowlton et al. (2022) also found that for a given level of injury severity, females had lower survival than males. Entanglement in fishing gear is associated with decreased body length of both entangled individuals and (if present) their dependent calves (Stewart et al. 2021). Because shorter whales also display decreased reproductive output (Stewart et al. 2022), the impact of a given entanglement can cascade across generations.

As detailed in Table 4-3, these anticipated removals resulting from the requested take represent a marginal proportion of the minimum population estimates. However, as detailed above, even instances of entanglement deemed to be a non-serious injury can trigger stress responses and potentially impact growth and reproduction of not only the entangled individual but, for entangled females, any subsequent offspring. Therefore, a full accounting of the impacts of the taking for these species must consider not only entanglements which result in MS&I but also those which result in non-serious injuries.

Table 4-3. Anticipated impacts of the requested take for blue and humpback whales. Nmin reflects the minimum population estimates from Carretta et al. (2023). For the Mexico DPS of humpback whales, Nmin is for the portion of the DPS known to occur with within the Plan Area. Requested Take is as described in Section 4.4. To calculate Anticipated Removals, CDFW multiplied Requested Take by the average MS&I values described in Section 4.4. Proportional Impact of Anticipated Removals is calculated by dividing Anticipated Removals by Nmin.

Species – DPS	N_{min}	Requested Take	Anticipated Removals	Proportional Impact of Anticipated Removals
Blue whale	1,767	6	5.52	0.31%
Humpback whale - Central America DPS	1,284	10	7.6	0.59%
Humpback whale – Mexico DPS	3,185	25	19	0.60%

4.6.2 Anticipated Impacts of Taking Leatherback Sea Turtles

As described in Section 4.4, CDFW's requested take level is two individuals over the 15-year permit term, and CDFW anticipates that each sea turtle interaction will result in removal from the population. CDFW evaluated the impact of the removal of two individuals by examining what percentage of the estimated female and adult nesting population of leatherback sea turtles the individuals represented. CDFW used recent population estimates from NMFS and USFWS (2020b) and the annual decline in Martin et al. (2020a) to estimate the total and adult nesting populations, then divided the requested take by the predicted populations to determine what percentage it represented.

CDFW chose to examine the impact of take on the female and adult nesting populations of West Pacific leatherback sea turtles based on past surveys of the Plan Area and life history knowledge. Aerial and vessel surveys of the CCS, conducted since the 1990s, have never recorded juveniles (personal communication, Scott Benson, NMFS SWFSC, March 21, 2023; Benson et al. 2020). Thus, any leatherback sea turtles taken in the Plan Area will likely be adults or sub-adults. Male West Pacific leatherback sea turtles are capable of fertilizing multiple clutches of eggs and females can have multiple clutches per season (NMFS and USFWS 2020b). West Pacific leatherback sea turtles also exhibit female skewed temperature-dependent sex determination (TSD). Tomillo and Spotila (2020) suggests that TSD developed as an adaptation to increase future fecundity (by producing more females) and species resilience in warming

climates. Therefore, best available science suggests female West Pacific leatherback sea turtles are the limiting factor in reproduction.

NMFS and USFWS (2020b) recently estimated an adult nesting female population of 1,277 from Jamursba-Medi and Wermon, Papua Barat, Indonesia, based on nesting surveys and long-term modeling. In contrast, Martin et al. (2020a) estimated a smaller adult female population of 666 to 942 (95% CI) based on the same nesting surveys and Bayesian state-space model analyses. Unlike NMFS and USFWS (2020b), Martin et al. (2020a) calculated estimates for months with no surveys through predictive modeling, and CDFW determined the Martin et al. (2020a) estimates represent best available science for the purposes of this analysis. Jamursba-Medi and Wermon are the main two beaches utilized by nesting adults (Benson et al. 2011), and estimates suggest that they host 50-75% of the West Pacific DPS (NMFS and USFWS 2020b; Tapilatu et al. 2013). CDFW applied this proportion to the most conservative female nesting population estimate from Martin et al. (2020a), 666, resulting in a total West Pacific female nesting population between 888 and 1,332. Benson et al. (2011) and the IUCN (Tapilatu and Tiwari 2007) tagged nesting individuals and conducted mark-recapture studies, concluding that the population sampled showed a 3:1 female-to-male ratio. Adults and sub-adults foraging in the temperate waters off the West Coast of North America were recorded to have the same 3:1 female-to-male ratio (Benson et al. 2011). CDFW applied this ratio to nesting female abundance to estimate an adult male population between 296 and 444 individuals. Combining these estimates results in a total population of adult nesting West Pacific leatherback sea turtles of 1,184 to 1,776 individuals for 2020. (Table 4-4).

Table 4-4. West Pacific leatherback sea turtle population estimates for 2020.

Year	Female leatherback sea turtle estimated population size range (median)	Total adult leatherback sea turtle estimated population size range (median)
2020	888-1332 (1104)	1,184-1,776 (1,480)

With regard to the current population trajectory, NMFS conducted a Population Viability Analysis (PVA) for West Pacific leatherback sea turtles which simulated the annual rate of decline of nesting adults for a 100-year projection with or without fishery related take from the Hawaii shallow-set longline, Hawaii deep-set longline, and American Samoa longline fisheries (Martin et al. 2020a, 2020b). The PVA indicated that in 2020 the population of adult nesting leatherback sea turtles was declining at a rate of 6.1% per year (95% CI: - 23.8% to 12.2%). Tapilatu et al. (2013) and Benson et al. (2020) had similar results, estimating an annual decline at the two Indonesian beaches of 5.9% and 5.6%. The NMFS PVA also indicated a shift in population trajectories before and after 46 years (95% CI: 13 to 95), Before this threshold, there was no significant difference in population trajectories between models which included fishery-related take and those which did not include fishery-related take. CDFW therefore considers it unlikely

that the requested take will exacerbate the current trajectory of population decline, and that the 6.1% population decline can be reasonably used to estimate expected declines over the permit term.

CDFW applied the 6.1% decline rate to the current adult nesting and female nesting population estimates to calculate future population estimates in 2026 (anticipated timing for permit issuance) and 2041 (anticipated end of the permit term; Table 4-5).

Table 4-5. West Pacific leatherback sea turtle population estimates for 2026 (anticipated permit issuance) and 2041 (anticipated end of the permit term).

Year	Female leatherback sea turtle estimated population size range (median)	Total adult leatherback sea turtle estimated population size range (median)
2026	609-913 (757)	812-1217(1,015)
2041	237-355 (294)	316-474 (395)

Even when considering the lowest population estimates, the removal of two individual leatherback sea turtles would represent less than 0.9% of the adult and female nesting West Pacific leatherback sea turtle population (Table 4-6). CDFW's requested take of two animals represents a negligible percentage; given this, the current status of the species, and the cumulative impacts described in Section 4.7.2, the requested take will not significantly alter the recovery or survival of the species.

Table 4-6. The estimated percentage of the adult and female nesting populations that the proposed take of two leatherback sea turtles represents.

Year	Percentage of Female Nesting Population	Percentage of Adult Nesting Population
2026	0.22% - 0.33% (0.26%)	0.15% - 0.23% (0.19%)
2041	0.56% - 0.85% (0.68%)	0.42%- 0.63% (0.51%)

CDFW considered and rejected an alternative approach that utilized Local Limit Reference Points (LLRPs), which are analogous to Potential Biological Removal (PBR) for marine mammals to evaluate impact. While PBR is only calculated for marine mammals to determine the highest number of animals that can be removed from a stock, Curtis et al. (2015) adapted the PBR concept to leatherback sea turtles by calculating LLRPs. The LLRP approach estimates the maximum amount of anthropogenic mortality along the West Coast which would still allow for recovery of this species. LLRPs were calculated for three distinct conservation outcomes: (1) allowing the population to rebuild to the maximum net productivity level, (2) limiting delay of, or expediting, population rebuilding, and (3) preventing further population decline. At that time, Curtis et al. (2015) noted estimated abundance was approximately 10% the size prior to

anthropogenic impact. While more recent publications do not provide a directly comparable value, there is evidence of continued decline in nesting females (NMFS and USFWS 2020b) as well as animals foraging off California (Benson et al. 2020).

While Curtis et al. (2015) provides specific thresholds against which CDFW could evaluate requested take, NMFS has not yet adopted any of these values or provided guidance on their applicability to analyzing impacts under ESA. The Curtis et al. (2015) LLRPs apply to take from all sources (similar to PBR) rather than to take from a given activity (as is typical for ITPs). Furthermore, both Curtis et al. (2015) and more recent USFWS and NMFS documents acknowledge the outsized influence of anthropogenic pressures occurring outside of the Plan Area (particularly those affecting nesting beaches) on the continued decline of this species (NMFS and USFWS 2020b; NMFS 2021a). Even if all take within the EEZ were kept below these LLRP values, without substantive actions at the international level to promote recovery, Benson et al. (2020) and the recent ESA status review (NMFS and USFWS 2020b) forecast declines in this population. CDFW has therefore decided against directly evaluating requested take of leatherback sea turtles against the Curtis et al. (2015) LLRP values when considering potential impacts.

4.6.3 Effects on Covered Species Habitat

Specific areas of particular importance for each Covered Species are reviewed in Section 3.2. Additionally, critical habitat has been designated for humpback whales (see Section 4.6.3.2) and leatherback sea turtles (see Section 4.6.3.3).

4.6.3.1 Blue Whales

The Covered Activity is not anticipated to impact blue whale habitat. Use of the gear may damage the benthic environment (see Section 2.2.2), however blue whale habitat is generally considered to include the pelagic portions of the water column. Trap gear is not as a means of harvesting blue whale prey species, and is not deployed at densities which would prevent movement through the Plan Area.

NMFS has neither proposed nor adopted critical habitat designations for blue whales, and CDFW is unable to assess the impact of the Covered Activity on blue whale critical habitat. However, the current recovery plan (NMFS 2020c) highlights the importance of additional research to document important habitat through satellite tagging, surveys, and environmental modeling.

4.6.3.2 Humpback Whales – Central America DPS and Mexico DPS

NMFS designated critical habitat for three DPS units of humpback whales (Western North Pacific, Mexico, Central America) on April 21, 2021 (86 FR 21082). Critical habitat for the Mexico and Central America DPS includes most waters off California, with nearshore boundaries defined by the 15, 30, or 50-meter isobath and the offshore boundaries defined by the 2,000, 3,000, or 3,700-meter isobath (Figure 4-7). Presence of key prey species within known humpback whale

feeding areas of sufficient quality, abundance, and accessibility to support feeding and population growth is an essential feature of this designation. CDFW is unaware of any direct evidence that the Covered Activity will affect the quality, density, or accessibility of humpback whale prey. Therefore, CDFW concludes the Dungeness crab fishery is unlikely to negatively impact critical habitat for humpback whales.

The Covered Activity is not anticipated to impact other aspects of humpback whale habitat. Use of the gear may disturb the benthic environment (see Section 2.2.2), however humpback whale habitat is generally considered to include the pelagic portions of the water column. Trap gear is not deployed at densities which would prevent movement through the Plan Area.

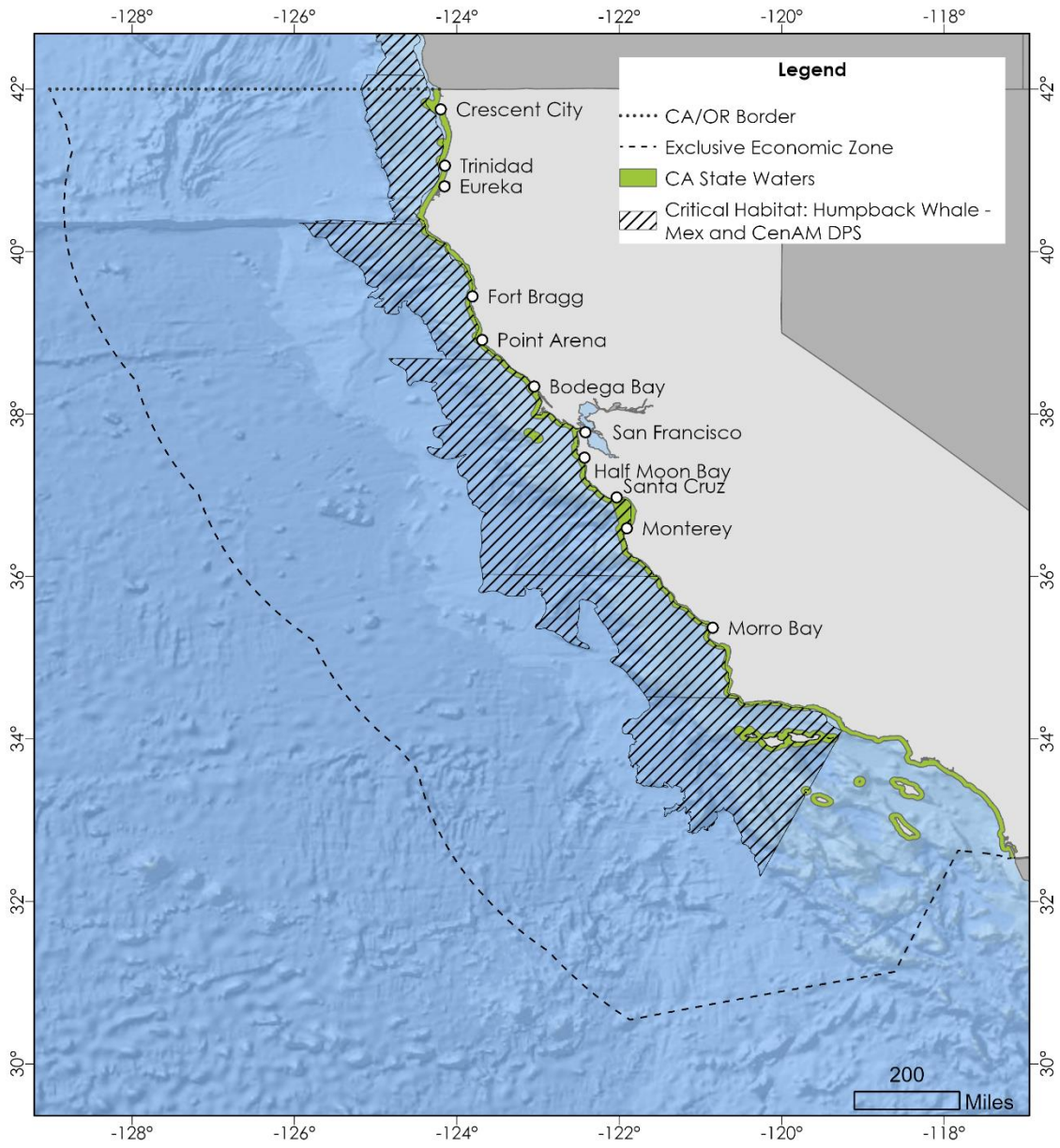

Figure 4-7. Designated critical habitat for the Mexico DPS and Central America DPS of humpback whales off California.

4.6.3.3 Leatherback Sea Turtles

Leatherback sea turtle critical habitat (Figure 4-8) was most recently revised on January 26, 2012 (77 FR 4169). The portion off California includes ocean waters east of the 3,000-meter depth contour from Point Arena to Point Arguello. Critical habitat has also been designated off Oregon and Washington. Oceanographic features which provide consistent foraging areas with sufficient density of preferred prey (brown sea nettles) were the primary driver of this designation. CDFW is unaware of any direct evidence that the Covered Activity will affect the

quality or density of leatherback sea turtle prey. Therefore, CDFW concludes the Dungeness crab fishery is unlikely to negatively impact critical habitat for leatherback sea turtles.

The Covered Activity is not anticipated to impact other aspects of leatherback sea turtle habitat. Use of the gear may disturb the benthic environment (see Section 2.2.2), however leatherback sea turtle habitat is generally considered to include the pelagic portions of the water column. Trap gear is not deployed at densities which would prevent movement through the Plan Area.

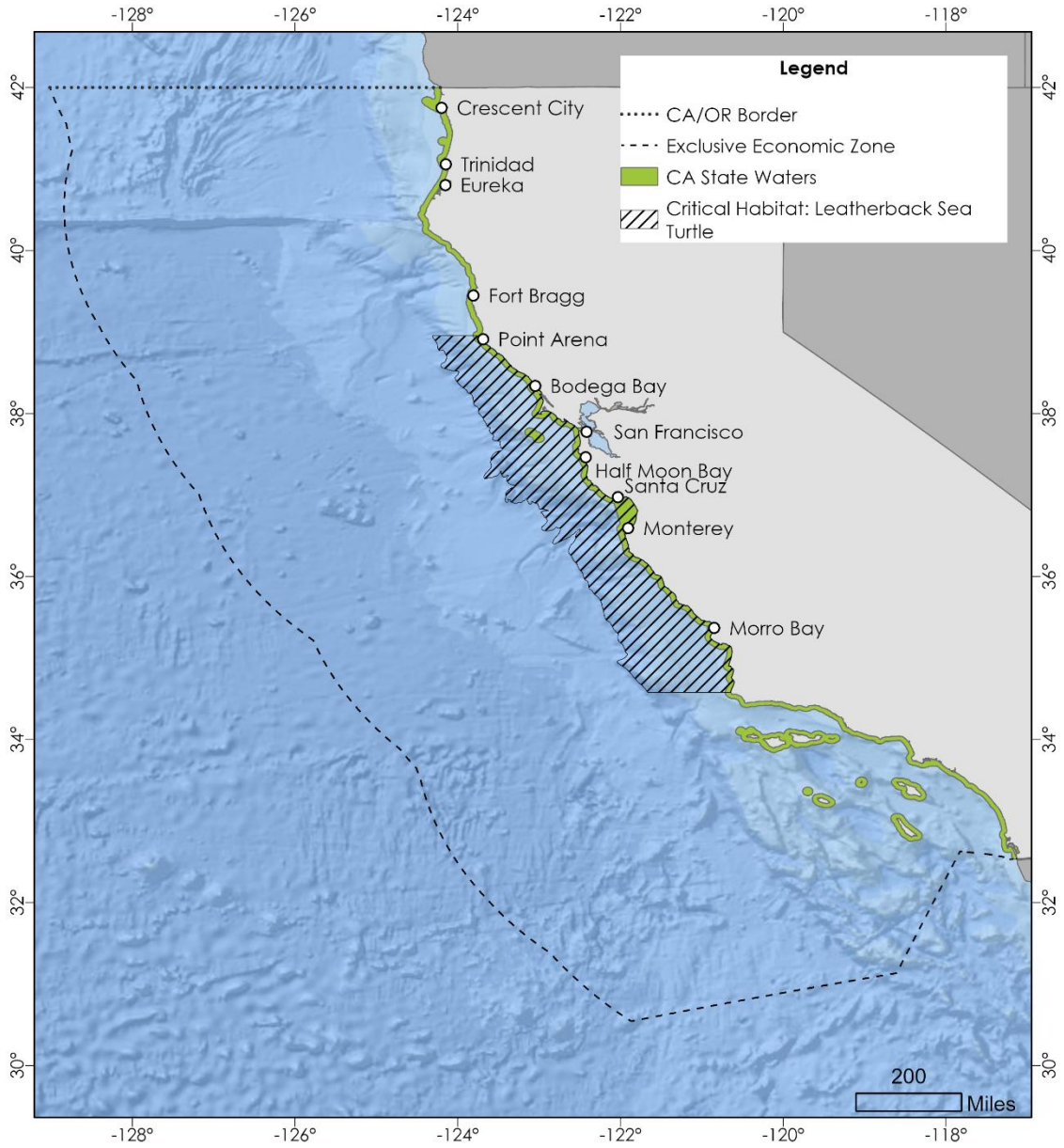

Figure 4-8. Designated critical habitat for leatherback sea turtles off California.

4.7 Cumulative Effects and Impacts

Under Section 7 of ESA, NMFS is required to consider cumulative effects of future, non-federal activities which are reasonably certain to occur within the action area of the Federal action (i.e., issuance of the requested permit) subject to consultation (50 CFR 402.02 and 402.17 subd. (a)). This is distinct from the NEPA requirement to consider cumulative impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future federal and non-federal actions (40 CFR 1508.7). Analyses of cumulative impacts (under ESA) and cumulative effects (under NEPA) fall within the purview of NMFS and are not required elements of a CP developed pursuant to Section 10(a)(1)(B) of ESA. Below, CDFW briefly reviews anticipated future activities within the Plan Area which NMFS may incorporate into their analyses of cumulative impacts or cumulative effects.

CDFW anticipates both new and ongoing activities will contribute to climate change effects within the Plan Area. However, differentiating between impacts caused by baseline global climate change and those which result from specific future actions is not feasible. Therefore, CDFW has included an overview of potential climate change impacts on Covered Species within the Plan Area in Chapter 3, and on the goals and objectives for this CP in Section 5.1.

4.7.1 Cumulative Effects and Impacts on Blue and Humpback Whales

Pursuant to MMPA, NMFS routinely prepares stock assessment reports for marine mammals under their jurisdiction, including large whales. These reports reflect the best available information regarding past and present anthropogenic impacts within US waters that are known to cause M&SI to members of a given stock. Carretta et al. (2023) identifies vessel strikes and entanglements in fishing gear as sources of M&SI for blue and humpback whales, with minimum estimates of known M&SI provided (Table 4-7). On average, minimum known annual M&SI is estimated as 13 for blue whales, 13.4 for Central America DPS humpback whales, and 22.1 for Mexico DPS humpback whales.

Table 4-7. Known sources of anthropogenic mortality for blue and humpback whales between 2016 and 2020, adapted from the 2022 U.S. Pacific Marine Mammal Stock Assessments (Carretta et al. 2023) and Carretta et al. (2022). Commercial pot/trap fisheries include Dungeness crab, sablefish, and spot prawn. Recreational trap/pot includes Dungeness crab and spot prawn. Unidentified fisheries include unidentified pot/trap fisheries. Mean annual M&SI numbers may differ slightly from those presented in Carretta et al. (2023) due to rounding.

Sector	Total (Mean Annual) M&SI: Blue Whales	Total (Mean Annual) M&SI: Humpback Whales – CenAm DPS	Total (Mean Annual) M&SI: Humpback Whales – Mex DPS
Commercial Pot/Trap Fisheries	3 (0.6)	22.3 (4.5)	37.1 (7.4)
Commercial Gillnet Fisheries	0 (0)	2.5 (0.5)	4.2 (0.8)
Hook & Line Fishery	0 (0)	0.4 (0.1)	0.7 (0.1)
Non-Fishery Entanglement	0 (0)	0.4 (0.1)	0.7 (0.1)
Recreational Pot/Trap	0 (0)	1.3 (0.3)	2.1 (0.4)
Unidentified Fishery	6 (1.2)	29.8 (6)	49.7 (9.9)
Ship Strikes	4 (0.8)	5.9 (1.2)	9.8 (2)
Unidentified whales, pro-rated	Unknown	2 (0.4)	3.3 (0.7)
Total	13 (2.6)	64.6 (12.8)	107.6 (21.4)

Carretta et al. (2023) notes that the M&SI values above likely underestimate total impacts from both ship strikes and fishery interactions due to incomplete detection. Rockwood et al. (2017) used an encounter theory model to estimate annual ship strike mortality as 18 blue whales and 22 humpbacks. Applying the DPS pro-ration factors results in an annual M&SI estimate of 9.2 Central America DPS humpback whales and 15.4 Mexico DPS humpback whales, far higher than the estimates in Table 4-7. Although standardized observer programs allow for more precise estimates in certain fisheries (e.g., sablefish pot, drift gillnet), in general estimates of M&SI from fishery interactions rely upon opportunistic reports. There is no method currently available to correct for this negative bias (Carretta et al. 2023). Therefore, the totals in Table 4-7 should be considered minimum values.

Unidentified whales represent approximately 15% of West Coast entanglement cases (Carretta 2018). If excluded from further consideration, this can also negatively bias estimates of species-specific entanglement rates and associated M&SI. Carretta et. al (2023) uses a cross-validated species identification model to estimate additional M&SI of two Central America DPS humpback whales and 3.3 Mexico DPS humpback whales during the 2016-2020 period. CDFW has included these values in Table 4-7. The most recent values available for blue whales (0.04 mean annual M&SI) are from the 2021 U.S. Pacific Marine Mammal Stock Assessments and reflects entanglements from 2015-2019. Since comparable

values for the 2016-2020 period are not available, CDFW has not included additional M&SI of unidentified whales which were likely blue whales in Table 4-7.

Carretta et al. (2023) also notes increasing levels of anthropogenic sound as an additional impact to blue and humpback whales. Low- and mid-frequency sounds, including those produced by shipping traffic and used in active sonar military exercises, can cause harm by impacting communication between individuals and can cause lethal or sublethal injuries to individuals. Noise-related injuries are not included in injury determinations due to the challenges of detecting them in live animals (NMFS 2012).

Additional activities which may occur within the Plan Area and affect blue and humpback whales include aquaculture projects, offshore energy development (e.g., wind farms), changes to vessel traffic separation schemes, and modifications of National Marine Sanctuary or state Marine Protected Area boundaries. These types of changes in ocean use policies are highly uncertain and subject to change as available resources and state and federal priorities shift. Given the federal nexus of these activities, while they could be considered under NEPA as contributing to cumulative impacts, they would not be considered under ESA as a component of cumulative effects, which are limited to non-federal actions.

4.7.2 Cumulative Effects and Impacts on Leatherback Sea Turtles

While anthropogenic impacts on leatherback sea turtles are not quantified in the same way as for marine mammals (i.e., through Stock Assessment Reports), there are multiple known threats to this species that are responsible for the population's decline. Internationally, threats include bycatch in fisheries, direct harvest of eggs and adults, destruction of nesting habitat, and climate change (NMFS and USWFS 2020b; NMFS 2021a).

International fisheries bycatch remains a threat to West Pacific leatherback sea turtle populations. The foraging range and migratory routes of the population overlap with the coastal and pelagic fisheries of many nations, including the US, Japan, Philippines, Malaysia, Korea, China, and Taiwan (Benson et al. 2011). A study by Lewison et al. in 2004 estimated 1,000 to 3,200 leatherback sea turtle mortalities occurred in the Pacific Ocean in 2000 as a result of pelagic longlining. A revised estimate by Beverly and Chapman (2007), which incorporated additional bycatch data, calculated approximately 200 to 640 annual leatherback sea turtle mortalities in the Pacific. However, it is important to note that few studies accurately quantify mortality from international fishery interactions due to inconsistent reporting and lack of information on small scale coastal fisheries. Annual interaction and mortality rates of leatherback sea turtles are only reliably available for US fisheries, where regulations regarding leatherback sea turtle interactions are adequately enforced (NMFS and USFWS 2020b).

The harvest of adult leatherback sea turtles and eggs continues to be a significant threat to the population. While the number of leatherback sea turtles removed from the population via harvest is unquantified, there is significant evidence that legal and illegal take occurs in all four nations where the West Pacific populations nests, despite regulatory protections (NMFS and USFWS 2020b). In Indonesia, poaching at Jamursba-Medi and Wermon has largely been eliminated since the enactment of a beach monitoring program in 1993, though recent surveys show leatherback sea turtles and eggs are still harvested from other beaches (NMFS and USFWS 2020b). Approximately three to five adults are killed at Buru Island, Indonesia and up to 100 adults at the Kei Islands, annually (NMFS and USFWS 2020b; Kinan 2005). In Vangunu Island, Solomon Islands, an estimated 10-20 nesting females are taken annually (Jino et al. 2018). Similar reports of harvest have been documented in Papua New Guinea and Vanuatu (NMFS and USFWS 2020b). The illegal poaching and legal harvest of leatherback sea turtles and eggs, combined with predation of eggs by local fauna, is unsustainable and considered a major threat to the population (NMFS and USFWS 2020b).

The destruction of nesting habitat is another threat to the West Pacific leatherback sea turtle population and difficult to quantify. Nesting beaches of this population are subject to beach erosion and ocean inundation (NMFS and USFWS 2020b). In West Papua, Indonesia, where leatherback sea turtles foraging in the CCS primarily nest, beach erosion and ocean inundation destroyed 80% and 23% of nests at Jamursba-Medi during the 2003-04 nesting season and at Wermon during the 2004-05 nesting season, respectively (NMFS and USFWS 2020b). While the West Pacific leatherback sea turtle population can sustain natural (but unquantified) loss of nests, the increased frequency and severity of storms and other high energy events, perhaps due to climate change, may lead to an unsustainable loss of nests (NMFS and USFWS 2020b).

In addition to the destruction of nesting habitat, climate change is also likely to impact hatching success and hatchling sex ratios. Studies have documented decreased hatching success and a female skewed sex ratio at warmer nesting sites (NMFS and USFWS 2020b; Tapilatu and Tiwari 2007). Increased global temperatures can increase sand temperatures, potentially creating lethal incubation temperatures or changes in hatchling sex ratios as sea turtles exhibit TSD (NMFS and USFWS 2020b). The majority of the threats described above, particularly those affecting nesting beaches in the Western Pacific, occur in areas outside of US jurisdiction. Within US waters, incidental take in fisheries, particularly those using longline and gillnet, remains a threat to the West Pacific leatherback sea turtle population and is described in further detail below.

Longline fishing is prohibited within the Plan Area, and not considered further. The best available bycatch rates for the California DGN fishery are computed by the SWFSC using Bayesian regression trees (PFMC 2017). Estimates are produced with a two-year lag; the most recent estimates available when this CP was prepared were through 2021. Leatherback sea turtle bycatch rates dropped significantly after 2001 upon implementation of the Pacific Leatherback Conservation Area

(Eguchi et al. 2016). Estimated annual M&SI values from 2014 to 2021 ranged from 0.1 to 0.899, with a total of 1.829 over this period (Carretta 2022). Neither observer data nor logbook data for state-managed gillnet fisheries indicates historical take of leatherback sea turtles.

CDFW also considered potential impacts from the Deep-Set Buoy Gear (which, like DGN, targets swordfish) and West Coast groundfish fisheries. There have been no reported interactions with leatherback sea turtles during the experimental phase of the Deep-Set Buoy Gear Fishery (2015-2020; NMFS 2021b). Between 2002 and 2019, there was a single observed leatherback sea turtle mortality in the groundfish fishery, however no take has been observed since 2008 (PFMC 2021).

An additional source of information regarding anthropogenic take of leatherback sea turtles is the SWFSC stranding database. Of the 11 leatherback sea turtle takes documented between 2014 and 2023, four were of unknown origin and one involved handling only (to remove kelp wrapped around the animal). Of the other six takes associated with human interactions, four involved fishing gear (one in rock crab gear, two in California commercial Dungeness crab gear, one in unspecified fishing gear), one involved ingested plastic, and one was due to unspecified trauma.

Based on available information, there appears to be limited anthropogenic take of leatherback sea turtles within the Plan Area and waters off the West Coast. Additional activities which may occur within the Plan Area and affect leatherback sea turtles include aquaculture projects, offshore energy development (e.g., wind farms), changes to vessel traffic separation schemes, and modifications of National Marine Sanctuary or state Marine Protected Area boundaries. These types of changes in ocean use policies are highly uncertain and subject to change as available resources and state and federal priorities shift. Given the federal nexus of these activities, while they could be considered under NEPA as contributing to cumulative impacts, they would not be considered under ESA as a component of cumulative effects, which are limited to non-federal actions.

4.8 Actions to Avoid Exceedance of Permitted Take Thresholds

Under RAMP regulations, CDFW must take a management action informed by the best available science following a single confirmed entanglement of a humpback whale, blue whale, or leatherback sea turtle in California commercial Dungeness crab gear (reported from any location). The Conservation Measures described in Chapter 5 (particularly RAMP) are intended to avoid take resulting from co-occurrence between Covered Species and the Covered Activity. Therefore, when an entanglement does occur, CDFW will implement a management action designed to further restrict the presence of actively fished vertical lines and prevent additional entanglements.

The default management action in this instance is a Fishing Zone closure. The specific Fishing Zone(s) closed will depend on whether available information is limited to the reporting location, or also includes the location where the entanglement occurred. Regardless, the Director retains discretion to select an alternative management action after review of the most current information related to the management considerations identified in Section 5.2. CDFW discretion is needed due to the potential for distinct risk profiles for each Covered Species and the dynamic nature of both the Covered Species and Covered Activity. For example, even when entanglements are ultimately traced to the point of origin, this may occur weeks or months later, at which point a predetermined management response may be ineffective. Alternatively, if closing particular areas in response to a humpback whale entanglement would concentrate gear in areas suitable for blue whales or leatherback sea turtles, this action could increase opportunities for take of the other Covered Species.

Furthermore, a recent analysis by Saez et al. (2022) indicates that for the 53 confirmed humpback whale entanglements reported within the Plan Area in commercial Dungeness crab gear between 2014 and 2022, 30% (n = 16) were with gear set within the same Fishing Zone as where the entanglement was reported and 34% were with gear set within either a different Fishing Zone or different state. Nearly a third of the entanglements (30%, n = 16) were known to have occurred within the Plan Area but a specific Fishing Zone could not be identified. When only the entanglement reporting location is known, there is a reasonable probability that closing the Fishing Zone where the report originated may not meaningfully address entanglement risk in the Fishing Zone where that entanglement occurred. By working through the RAMP process, CDFW can consider the full suite of available information and select an action which is appropriately informed by these complexities.

However, pre-determined management responses are necessary when the current trajectory of take indicates permitted take levels would be exceeded. Exceedance of permitted take levels could lead to NMFS addressing permit noncompliance by initiating an action to suspend or revoke CDFW's ITP pursuant to 50 CFR § 222.306 subd. (e). CDFW has therefore identified species-specific backstop measures which will apply to traditional trap gear with persistent vertical lines, as further detailed below.

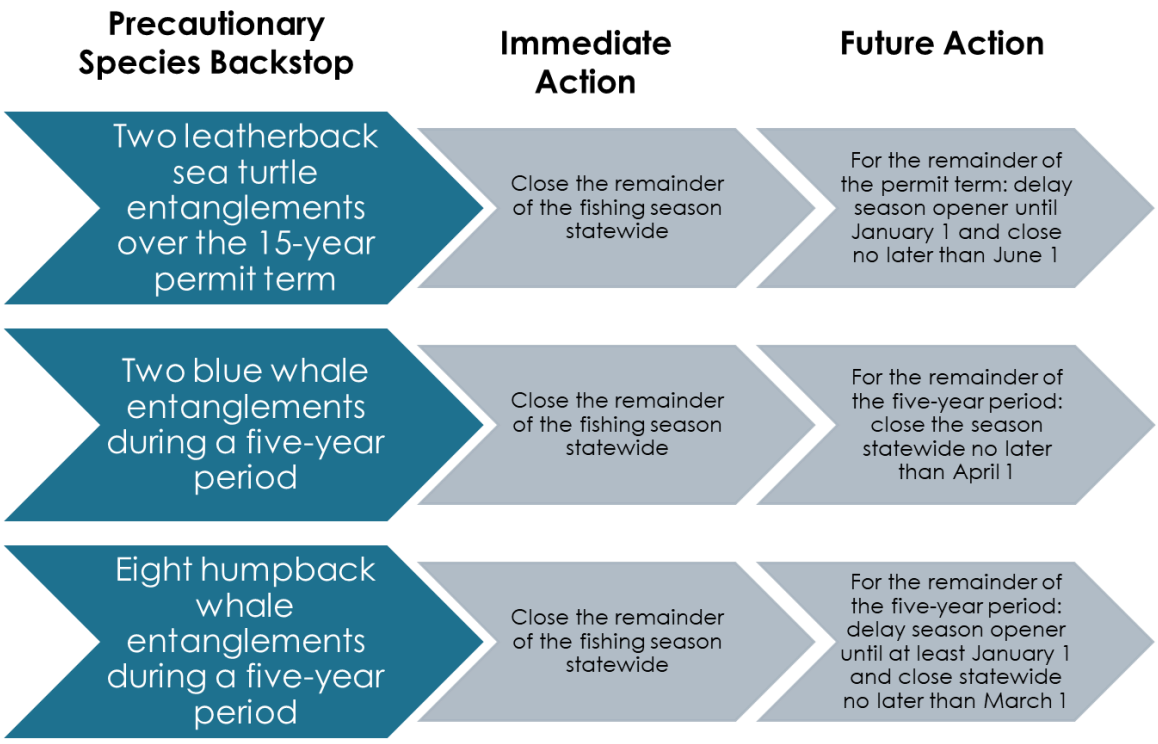

Figure 4-9. Figure depicting CDFW's actions to avoid exceedance of permitted take levels for the Covered Species. Each species has different backstop trigger numbers and future actions to prevent take from accumulating.

The interval over which the backstop measures would apply differs between leatherback sea turtles and large whales. For leatherback sea turtles, the requested take limit (two) is so low that measures would need to be in place over the remainder of the permit term. CDFW is requesting higher take limits for blue and humpback whales, and measures would be in place over the remainder of a given five-year period. For these species, the backstop measures prevent take from accumulating too rapidly. Should a backstop be met before the assigned time interval, CDFW would review management actions and undertake an ITP progress report of the Conservation Program to identify appropriate changes to status quo management which should be implemented prior to the start of the next five-year period (Section 6.1 and 6.3).

Following a cumulative total of two leatherback sea turtle entanglements confirmed in California commercial Dungeness crab gear (reported from any location) during the permit term, CDFW would close the remainder of the season statewide. For the remainder of the permit term, CDFW would delay the season opener until January 1 and close the season no later than June 1 within Fishing Zones 3 and 4. As described in Section 3.2.3, leatherback sea turtles are most common within the Plan Area during the spring, summer, and early fall. Based on these migratory patterns, CDFW considers take in actively fished vertical lines could occur at both the beginning and the end of the statutory fishing season.

Restricting the Covered Activity to a period during which leatherback sea turtles are rarely, if ever, present within this area (January 1 – May 31) should therefore prevent overlap between leatherback sea turtles and actively fished vertical lines. By selecting a closure date of June 1, CDFW has created a buffer period during which gear recovery efforts can remove lost or abandoned gear, further reducing the potential for additional take to occur during the remainder of the permit term.

Following a cumulative total of two blue whale entanglements confirmed in California commercial Dungeness crab gear (reported from any location) during a given five-year period of the permit term, CDFW would close the remainder of the season statewide. For the remainder of the five-year period (i.e., Years 1-5, Years 6-10, or Years 11-15), CDFW would close the season statewide no later than April 1. As described in Section 3.2.1, while historical patterns suggest blue whales begin utilizing BIAs within the Plan Area in July and depart in October or November, recent research indicates blue whales have begun arriving at the Farallon Islands (Fishing Zone 3) in mid-May and departing in early October. Blue whales were infrequently observed on CDFW aerial surveys conducted during the 2020-21 through 2022-23 seasons (n = 19), with nearly all sightings (n = 15) during the months of October and June. Based on these migratory patterns, CDFW considers take in actively fished vertical lines to be unlikely at the beginning of the fishing season, and would not mandate actions to restrict their presence during that period. Take is more likely at the end of the fishing season during the spring and early summer. Closing the season prior to their expected arrival in the Plan Area should therefore prevent overlap between blue whales and actively fished vertical lines. By selecting a closure date of April 1, CDFW has created a buffer period during which gear recovery efforts can remove lost or abandoned gear, further reducing the potential for additional take to occur. At the beginning of the next five-year period of the permit term, the Covered Activity would again be managed as described in Chapter 5.

The presence of two humpback whale DPS units within the Plan Area complicates actions to prevent exceedance of permitted take thresholds. Section 4.1 describes the approach by which CDFW will work with NMFS to assign takes to the appropriate DPS, but as described in Section 4.1 such assignments are unlikely to be done in real time. Using the area movement probabilities from Wade (2021) a single humpback whale take constitutes 0.423 humpback whales from the Central America DPS and 0.577 humpback whales from the Mexico DPS. CDFW used these probabilities to calculate appropriate backstop measures. In instances where the appropriate DPS is known, the entanglement will be assigned to that population. However, if the entanglement cannot be attributed to a DPS population, CDFW will assume the proration factors above until the backstop has been met.

Following a cumulative total of eight humpback whale entanglements confirmed in California commercial Dungeness crab gear (reported from any location) during a given five-year period of the permit term, CDFW would close the remainder of the season statewide. For the remainder of the five-year period,

CDFW would delay the season opener until at least January 1 in each Fishing Zone and close statewide on March 1. As described in Section 3.2.1, historical patterns suggest humpback whales begin utilizing BIAs within the Plan Area in March and depart in November. Humpback whales were frequently observed on CDFW aerial surveys conducted during the 2020-21 through 2022-23 seasons (n = 547), with the vast majority observed during October and November (n = 405, 74%), and more limited numbers in December (n = 42, 8%). Delaying the season opener to January 1 should therefore prevent most overlap between humpback whales and actively fished vertical lines from the Covered Activity during the fall period. CDFW aerial survey coverage has been more limited during the spring period, however humpback whale BIA usage suggests they are commonly observed within the Fishing Grounds (Fishing Zones 1-5) beginning in April. Closing the season prior to their expected arrival in the Plan Area should therefore prevent overlap between humpback whales and actively fished vertical lines. By selecting a closure date of March 1, CDFW has created a buffer period during which gear recovery efforts can remove lost or abandoned gear, further reducing the potential for additional take to occur. At the beginning of the next five-year period of the permit term, the Covered Activity would again be managed as described in Chapter 5 and Appendix E.

In all instances, the season delays and early closures would apply to traditional trap gear which is fished with persistent vertical lines. CDFW anticipates certain types of Alternative Gear could be fished in a manner which poses little to no risk of entanglements. For such gear types, the conditional authorization would specify the manner in which the gear could be fished while a backstop measure is in place.

These backstop measures ensure CDFW will be responsive to entanglements which are reported or confirmed after the close of the season by constraining the Covered Activity to lower risk times and areas during future fishing seasons. This is particularly important given the potential for days, weeks, or even months to pass between when an entanglement occurs and when it is reported and confirmed. As described in Section 5.4.1, the vast majority of confirmed large whale entanglements are presumed to occur in actively fished gear. Therefore, CDFW presumes that in general, entanglements which are reported after the end of the season occurred in actively fished gear with a lag between entanglement occurrence and reporting.

These backstop measures are not codified in regulation. However, Cal. Code Regs., Tit. 14 § 132.8 subd. (c)(1)(B) specifies CDFW will take action following each confirmed entanglement of a Covered Species and Cal. Code Regs., Tit. 14 § 132.8 subd. (d)(9) specifies CDFW will consider the magnitude and accumulation trend for confirmed entanglements when selecting an appropriate management action. Taken together, these two provisions grant CDFW the management authority necessary to implement the backstop measures described above.

CHAPTER 5. CONSERVATION PROGRAM

Note: State regulations will be revised prior to permit issuance consistent with the final content of this Chapter. Proposed changes can be reviewed on the 2024 RAMP Revisions webpage.

This Chapter describes the biological goal and objectives for the Covered Species (Section 5.1) and the Conservation Program CDFW will implement to achieve them. Section 5.2 and Section 5.3 outlines how CDFW will aim to avoid take and minimize impacts to the Covered Species. Section 5.4 outlines the mitigation CDFW will undertake for unavoidable take and impacts. Section 5.5 describes CDFW's adaptive management program which allows for improvements and alterations based on observations and changing conditions.

5.1 Biological Goals and Objectives

The biological goal states a desired future condition for the Covered Species that is the overall intention of the Conservation Program. CDFW created this Conservation plan to promote the restoration of the ESA-listed whales and sea turtles while still maintaining a viable and sustainable commercial Dungeness crab fishery. CDFW's ideal future outcome is typified by following goal:

Support recovery of humpback whale, blue whale, and leatherback sea turtle populations by reducing take of these ESA-listed species in commercial Dungeness crab trap gear to the maximum extent practicable.

CDFW has developed three objectives in support of this goal, which can be categorized as avoidance, minimization, or mitigation (Figure 5-1). These objectives will be supported by Conservation Measures that are the specific actions CDFW will undertake to meet the objectives. For the purpose of implementing the below objectives, CDFW will not differentiate between humpback whales belonging to the Central America or Mexico DPS.

Objective 1: Reduce the co-occurrence of humpback whales, blue whales, and leatherback sea turtles with California commercial Dungeness crab fishing activity by implementing fishery management measures that reduce entanglement risk.

Objective 2: Minimize the likelihood of Covered Species entanglement in lost or abandoned California commercial Dungeness crab gear by increasing opportunities for derelict gear recovery and enhancing lost gear tracking and reduction measures.

Objective 3: Mitigate the impacts of entanglements on Covered Species by supporting entanglement reporting, education, and analysis to reduce the likelihood of serious or fatal injuries.

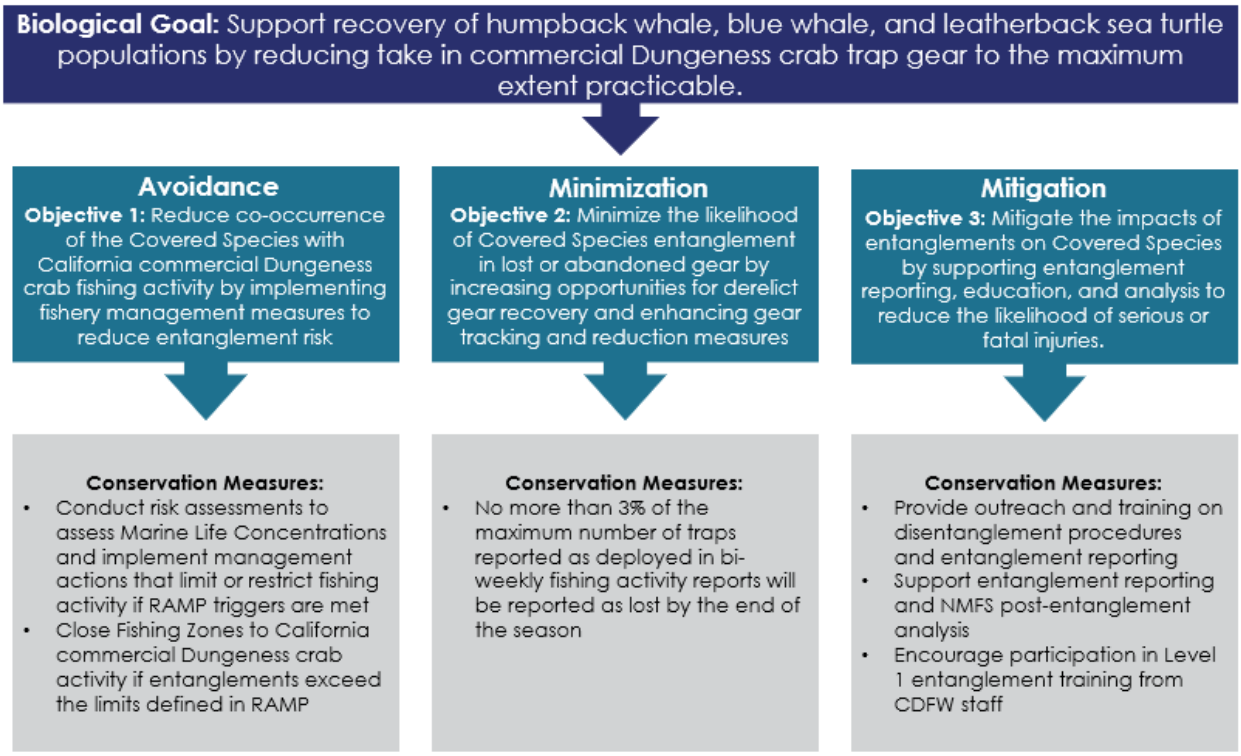

Figure 5-1. Summarized version of the Biological Goal, supporting Objectives, and associated Conservation Measures of the proposed Conservation Program.

In developing these goals and objectives, CDFW reviewed and considered the 1991 Humpback Whale Recovery Plan (particularly Objective 2; NMFS 1991), the 2020 Blue Whale Recovery Plan (particularly Recovery Action 5.4; NMFS 2020c), and the 1998 Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (particularly Recovery Actions 2.1.3.3 and 2.1.4.2; NMFS and USFWS 1998).

The Humpback Whale Recovery Plan states that the main method for increasing population growth is to optimize natural fecundity by providing adequate feeding opportunities and by reducing death or injury caused by human activities. CDFW has therefore chosen to focus this CP on reducing death or injury caused by the Covered Activity. This is also consistent with the Blue Whale Recovery Plan, which identifies managing or eliminating significant anthropogenic threats as the main method by which to increase blue whale resiliency which focuses on addressing significant anthropogenic threats to achieve sufficient and viable populations in all ocean basins.

The 1998 Recovery Plan for Pacific Populations of the Leatherback Turtle reviews a broad suite of both on-land and in-water threats, and states that the primary threat within waters off the West Coast is incidental take in fisheries. More recently, the 2020 ESA Status Review (NMFS and USFWS 2020b) and Species in the Spotlight 2021-2025 Priority Actions for the Pacific Leatherback Sea Turtle (NMFS 2021a) identifies bycatch in foraging areas, migratory corridors, and off nesting beaches as the most significant threat to leatherback sea turtles. NMFS (2021a)

predicts further declines in the West Pacific population without "intensive international conservation efforts". Since terrestrial and many of the in-water threats occur outside the Plan Area, CDFW has focused its goal on actions which fall within the agency's authority to manage the commercial Dungeness crab fishery across the Plan Area.

While the specific timing, location, and magnitude of impacts are impossible to predict, climate change will likely affect the Covered Species and Covered Activity. These changes may include effects on the environment such as increased water temperature, ocean productivity, and abundance or distribution of forage species such as anchovy, krill, and brown sea nettles. In addition, changing environmental factors may impact aspects of crab biology such as molting and reproduction. Given the uncertainty regarding future co-occurrence dynamics, CDFW will continue to conduct routine assessments of marine life entanglement risk based on robust, real-time information rather than relying on static closures based on historical patterns.

5.2 Risk Assessment and Mitigation Program (RAMP)

RAMP is a major component of the conservation measures put forth in this draft application and CP. This section reviews the main concepts underlying RAMP process and history. Further details can be found in Section 5.3 and Appendix E.

RAMP was piloted by the Working Group (Section 1.5.1) and codified into regulation on November 1, 2020. These regulations began governing fishing operations at the start of the 2020-21 fishing season, providing CDFW broad authority to implement the take avoidance measures that are a key element of this CP. Figure 5-2 provides an overview of the RAMP process, as further described in the remainder of Section 5.2 and 5.3.

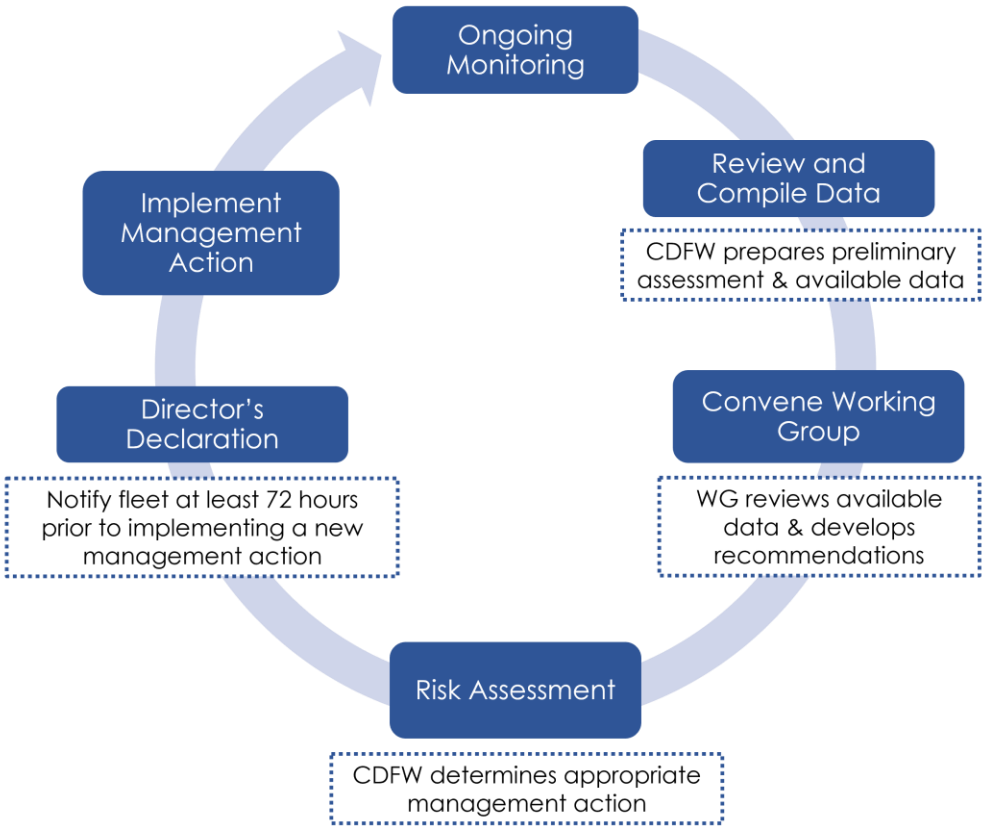

Figure 5-2. Phases of RAMP cycle: Ongoing Monitoring, Review and Compile Data, Convene Working Group, Risk Assessment, Director's Declaration, and Implement Management Actions.

RAMP establishes quantitative thresholds for determining if entanglement risk is elevated, specifies potential management actions, and requires consideration of the best available science and outreach to stakeholders when determining appropriate management actions (Figure 5-2).

Specifically, subsections (a) – (f) of the RAMP regulations (Cal. Code Regs., Tit. 14 § 132.8) define key terms, specify the frequency and process for conducting risk assessments and receiving input from the Working Group, specify triggers for management actions, specify potential management actions (see Section 5.3.2) and the considerations which guide selection of an appropriate management action (see Appendix E), and describe the process by which CDFW will notify fishery participants of management actions taken pursuant to these regulations. This portion of the RAMP regulations also establishes Fishing Zones with the following latitudinal boundaries (Figure 5-3):

- Zone 1: From the California/Oregon border (42° N. latitude) to Cape Mendocino (40° 10' N. latitude).
- Zone 2: From Cape Mendocino to the Sonoma/Mendocino county line (38° 46.125' N. latitude).

- Zone 3: From Sonoma/Mendocino county line to Pigeon Point (37° 11' N. latitude)
- Zone 4: From Pigeon Point to Lopez Point (36° N. latitude)
- Zone 5: From Lopez Point to Point Conception (34° 27' N. latitude)

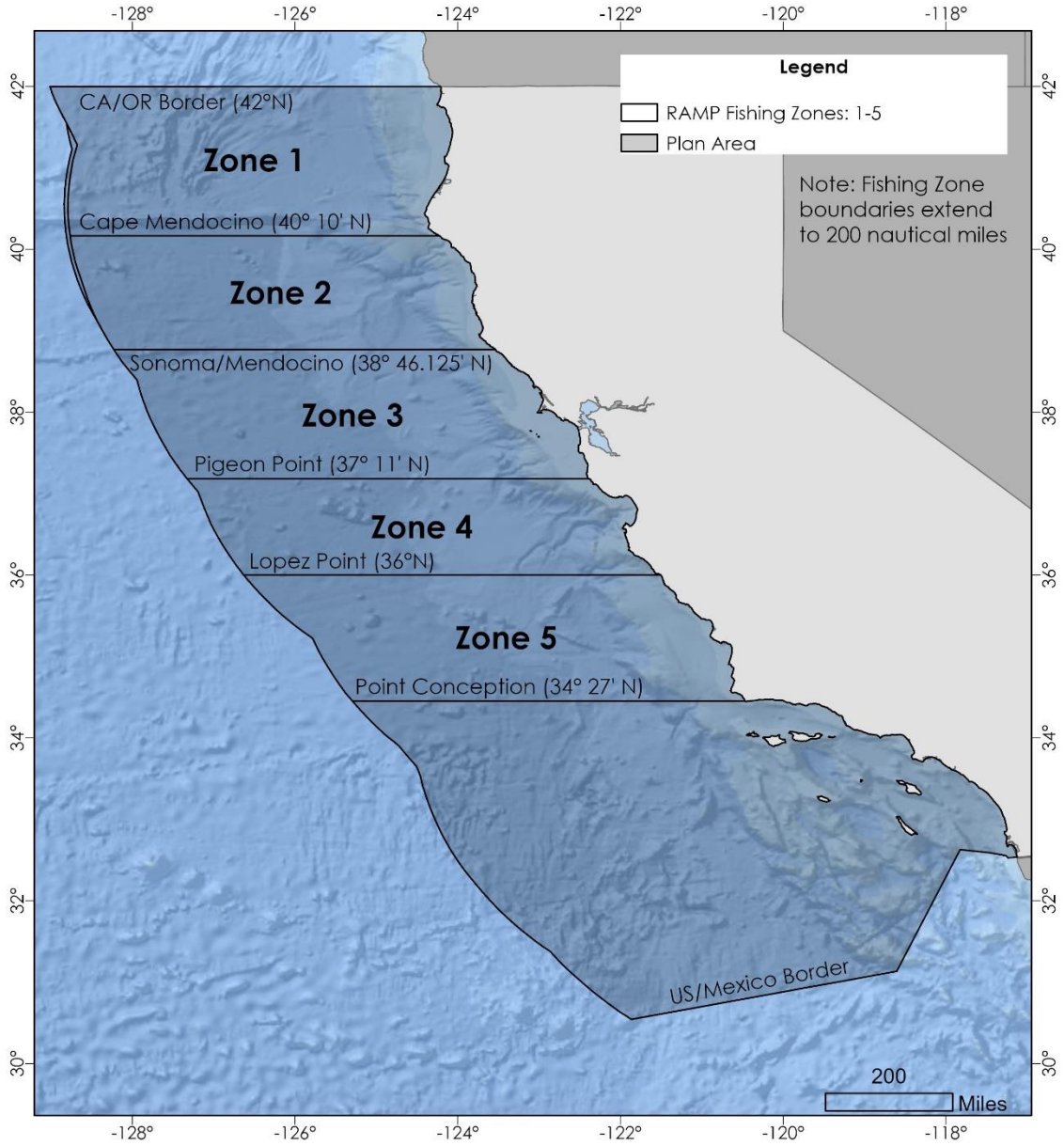

Figure 5-3. RAMP Fishing Zone boundaries and Plan Area. Created by CDFW MR.

Beginning in late fall, CDFW evaluates marine life entanglement risk and any needed modifications to the scheduled opener of the commercial fishery in each Fishing Zone (See Appendix E). In general, four risk assessments are conducted between October and December at approximately two-to-three-week intervals. Once a given Fishing Zone is open, the timing of each

subsequent risk assessment is guided by available data but conducted at least monthly until the closure of that Fishing Zone.

As part of RAMP regulations (Cal. Code Regs., Tit. 14 § 132.8), all fishery participants are required to submit bi-weekly reports to CDFW. These reports include vessel permit number, Fishing Zone, the Fishing Zone where gear is currently deployed, and the number and depth range of currently deployed traps. Submitting these reports every two weeks allows CDFW to consider recent information during the risk assessment process. While data are self-reported, these reports nevertheless greatly improve CDFW's ability to quantify near real-time fishing effort and gear deployment. The bi-weekly reports are also the only way to identify vessels which are harvesting crab from (and therefore have gear deployed in) the Plan Area but are making landings into other states, allowing CDFW to more accurately quantify maximum potential trap deployments.

Once risk is determined to be elevated as described in Sections 5.3.1, including when current data regarding Marine Life Concentrations are not available, the Director implements a management action to reduce marine life entanglement risk. Management responses are limited to issuance of a depth constraint, vertical line/gear reduction, Fishing Zone delay/closure, and authorizing deployment of Alternative Gear (Cal. Code Regs., Tit. 14 § 132.8 subd. (e)). Should the best available science be insufficient to support alternative management responses, the default of a partial or statewide closure of the fishing grounds ensures protective actions to minimize entanglement risk.

Several of the Conservation Measures which comprise the proposed Conservation Plan in this Chapter were at least partially implemented beginning the 2019-2020 fishing season. Therefore the 2020-21 through the 2023-24 seasons can be treated as a case study for how the Conservation Program will function during the permit term. Further details regarding RAMP and Conservation Plan implementation and risk assessment outcomes are available in the Appendix E.

5.3 Avoidance Measures

In support of the biological goal, CDFW has created the following objective that is characterized as "avoidance". Avoidance measures include the actions taken in support of Objective 1 and are designed to decrease the take of the Covered Species to the maximum extent practicable by reducing the prevalence of actively fished vertical lines which could entangle Covered Species within the Plan Area during times when Covered Species are known, or likely, to be present.

To reduce co-occurrence of Covered Species and the Covered Activity, CDFW will implement the dynamic RAMP management framework in support of Objective 1. While the RAMP program as a whole supports Objective 1, the following sections will provide more detail on how RAMP evaluates risk (Section 5.3.1) and potential management actions to address elevated risk (Section 5.3.2). Taken together these aspects of RAMP aim to reduce co-occurrence of the Covered Species and the Covered Activity.

Objective 1: Reduce the co-occurrence of humpback whales, blue whales, and leatherback sea turtles with California commercial Dungeness crab fishing activity by implementing fishery management measures that reduce entanglement risk.

CDFW will achieve Objective 1 by meeting the following measures:

- Conduct risk assessments to evaluate the presence of Covered Species and implement management actions that limit or restrict fishing activity if marine life concentrations exceed the limits defined in RAMP.
- Close Fishing Zones to California commercial Dungeness crab activity if entanglements exceed the limits defined in RAMP.

5.3.1 Evaluating Risk: Presence, Distribution, and Abundance of Covered Species

CDFW evaluates entanglement risk, and the need for management action, based on separate abundance thresholds for each Covered Species and for two periods, fall (November 1 – December 31) and spring (March 1 until fishery closure). Two distinct time periods are identified because information collected during these periods has different implications for management based on anticipated presence of Covered Species and their respective historical migration patterns. Covered Species migration status (whether they are anticipated to be moving into or out of the fishing grounds) in conjunction with the status of the fishing season (open or closed) and associated overlap between Covered Species and Covered Activity warrants identification of distinct triggers and management actions for each period due to differences in potential co-occurrence. Additionally, these pre-determined thresholds and triggers provide structured decision making under an adaptive management approach.

During the fall risk evaluation period, CDFW does not open the season in each Fishing Zone until sufficient data are available to inform the risk assessment process. This precautionary approach reflects that the absence of current information on Covered Species presence does not mean there is no entanglement risk. If data are available and numerical triggers as defined in RAMP are exceeded, the Director must implement a management action to restrict the Covered Activity.

During January and February (i.e., the interval between the fall and spring risk evaluation periods), CDFW scales back data collection efforts. Low abundance of Covered Species within the Plan Area during this interim period (see Section 3.2) is associated with low marine life entanglement risk, making intensive data collection efforts less vital. CDFW still conducts risk assessments to: (a) further increase understanding of entanglement risk dynamics and seasonality and (b) ensure actions can be taken if typical fishing season dynamics deviate from historical norms.

The spring risk evaluation period begins on March 1 and continues through June 30 (or the end of the fishing season). If data are unavailable for a given Fishing Zone by March 15, the Director must implement a management action to restrict Covered Activity. As during the fall, the absence of current information does not mean there is no entanglement risk. Therefore, if data are available and the numerical triggers as defined in RAMP are exceeded, the Director will implement a management action.

The threshold values established in regulation for humpback and blue whales are based on trends observed for Fishing Zone 4 in a long-term data series collected by Monterey Bay Whale Watch and standardized by NMFS SWFSC. The values are used as robust indicators of seasonal humpback and blue whale migration status within the Monterey Bay region. In the fall, abundances below these values indicate migration out of the Monterey Bay region is largely complete. Conversely, abundances above these values in the spring indicate migration into the Monterey Bay region is underway. In the absence of robust alternatives, CDFW uses the Monterey Bay Whale Watch values as indicators of relative entanglement risk for humpback and blue whales in all Fishing Zones because it provides a long-term data set to compare historical arrivals and departures.

Given the population status of leatherback sea turtles, avoiding any interactions with the Covered Activity is critical. Therefore, management actions must be implemented if surveys or satellite telemetry information indicate one or more leatherback sea turtles are present within a given Fishing Zone. This is essential because leatherback sea turtles are cryptic and there is a likelihood that more turtles are within the Plan Area than can be observed.

5.3.1.1 Aerial Surveys

Aerial surveys provide high-resolution information regarding distribution of Covered Species, forage (e.g., bait balls, *Chrysaora* patches), and observed trap gear. Beginning with the 2019-20 season, CDFW has placed an increased emphasis on conducting reconnaissance flights. Beginning with the 2020-21 fishing season, the US Coast Guard has also conducted focused surveys in support of their Living Marine Resources mandates and opportunistically recorded information during other types of flight operations.

During the permit term, CDFW will conduct aerial surveys and/or vessel surveys between shore and 100 fathoms in Fishing Zones 1-5 to evaluate the abundance and distribution of Covered Species. Surveys will be conducted at least monthly from October until the end of the Fishing Season, and during the summer and early fall as resources allow. Surveys involve three to six hours of active search time, depending on the survey design and conditions. Since the fall of 2020, CDFW has conducted 79 Marine Life Concentration surveys, which attempt to cover at least three Fishing Zones per survey day. CDFW's goal is to cover all Fishing Zones but prioritizes Fishing Zones based on historical migration patterns of Covered Species and status of the fishing season in each Fishing Zone. CDFW

anticipates maintaining a similar level of survey effort throughout the permit term. CDFW will also continue working closely with NMFS SWFSC scientists to develop data collection tools and resources which would allow CDFW reconnaissance flights to more closely replicate the systematic (distance sampling) line transect surveys conducted by NMFS. See Appendix E for aerial survey protocol.

Weather or mechanical issues may occasionally prevent CDFW from conducting these surveys. In such instances, CDFW will review and consider sources of current information regarding Marine Life Concentrations, including aerial or vessel surveys conducted by other partners as described in Appendix E. When conducting surveys, or considering information contributed by outside partners, CDFW will separately evaluate whether the survey covered a sufficient latitudinal and depth range of each Fishing Zone as to be a useful and reliable indicator of Covered Species presence, whether the survey used design-based transects or followed one or more depth contours, and the spacing between each transect. CDFW will also consider whether standardized methods were used, platform type, the number and placement of observers (including distance above the sea surface), observer experience level, observer affiliation (i.e., whether they are independent or whether sightings were recorded by fishery participants), transit speed, and weather conditions (e.g., swell, wind, and fog) which may have limited detection. If sufficient information is not available, CDFW will implement management actions to restrict the presence of vertical lines, as described further in Section 5.3.2.

5.3.1.2 Vessel Surveys

Vessel-based surveys are another option for collecting fine-scale information on the presence, distribution, and abundance of Covered Species. Unlike aerial surveys, vessel-based surveys cover much less area per unit time, and an individual survey is unable to provide a snapshot of conditions over a large area. However, vessel-based surveys place observers in closer proximity to observed individuals, enabling collection of genetic samples and high-resolution photographs (enabling assignment of individuals to specific DPS units, see Section 3.2.2), attachment of satellite tags (see Section 5.3.1.3), and other supplemental research activities.

CDFW has historically relied upon external partners to conduct these surveys, although surveys can also be conducted during routine vessel-based enforcement patrols by LED. NMFS has several ongoing vessel-based research and monitoring efforts that collect information on the distribution and abundance of marine species off California either as their primary mission or as ancillary data. Examples include the Rockfish Recruitment and Ecosystem Assessment Survey, Applied California Current Ecosystem Studies, and Coastal Pelagic Species surveys. Location and timing vary between surveys and years; however, data are often collected during the spring and summer months when Covered Species are abundant off California.

Cascadia Research Collective Vessel Surveys

Beginning in summer 2019, Cascadia Research Collective has conducted vessel surveys to support the assessment of real-time large whale distributions. In June 2020 and June 2021, OPC awarded funding to continue this work through the 2022-23 season, then extended through the 2024-25 season. Transects typically follow both a shallow (e.g., 70m) and deep (e.g., 200m) depth contour to assess the spatial distribution of large whales across multiple depths. All sightings of humpback and blue whales are recorded, as well as sightings of unidentified whales and other species of interest. In addition to sightings information, researchers document prey species when animals are observed foraging at the surface. Photographs are taken to allow for identification of individual humpback whales and assignment to a specific DPS. Photographs also support estimates of minimum and overall abundance by allowing researchers to document sighting histories for a given individual. Satellite telemetry tags are opportunistically deployed, allowing tracking of individual animal movements and inference of foraging behavior.

California Coast Crab Association (CCCA)and The Nature Conservancy (TNC)

The CCCA and TNC have collaborated to develop an industry-led vessel survey that utilizes commercial fishing vessels and crews to document the presence of Covered Species. This project was initiated based on guidance from the Dungeness Crab Task Force and the priorities set by the Working Group, in order to provide an additional data source to RAMP. The vessel surveys aim to collect information on the presence, absence, and depth distribution of humpback and blue whales within commercial Dungeness crab fishing grounds during the fishing season. By leveraging industry expertise and resources, the surveys are intended to inform near real-time management of the fishery. The program also seeks to test and demonstrate a scalable data collection protocol, enabling fishermen and potentially other ocean stakeholders to contribute scientifically credible data, collected in a standardized manner across Fishing Zones. In collaboration with Working Group Advisors, surveys began in Fall 2020 to assess the feasibility and protocols for fishing vessel-based surveys of Covered Species. The developed protocols prioritize surveys in Fishing Zones 1 and 5, areas where survey data can be limited due to weather constraints. During the 2023-24 season, TNC and CCCA began collaborating with the Marine Mammal Education and Research Program at Cal Poly Humboldt. Surveys have been conducted opportunistically to inform fall and spring risk assessments from 2020 to 2024.

The protocol uses independent observers as data recorders when available and industry vessel operators and crew in other circumstances. Surveys are typically conducted by eight boats, with two operating out of each of the ports of Eureka, Crescent City, Morro Bay, and Port San Luis. Each port has two survey lines, one north and one south, that alternate between the 30- and 200-fathom depth contours to provide comprehensive Fishing Zone coverage and inshore/offshore distribution. Whether all eight survey lines are conducted

depends on vessel and observer availability, as well as the Fishing Zone's priority for RAMP Marine Life Concentration estimates. The protocol prioritizes counts by species and vessel location, with the option to estimate animal location and specify other information like animal behavior or forage. Data collectors are also instructed to track environmental conditions at every way point and in the case of significant shifts in conditions (e.g., swell, visibility).

All aspects of the program were designed to maximize accessibility and flexibility for both fishermen and independent observers to participate in data collection. From the pilot survey to the conclusion of the 2023-24 fishing season, 52 surveys were conducted in Fishing Zones 1 and 5 to inform Risk Assessments under RAMP, led by 19 participating fishing vessel captains. Survey protocols, data sheets and way points are being revised to increase efficiency, improve the ease of use, and increase consistency. Initial findings show promise, however further work is needed to further refine a workflow to ensure reliable data collection (particularly of survey track lines) and data transmission to CDFW.

Monterey Bay Whale Watch

Monterey Bay Whale Watch conducts routine whale watching and natural history tours within Monterey Bay, and reports sightings of Covered Species on a publicly accessible website. NOAA SWFSC scientists compile new postings into a database which contains reported sightings from 2003 to present. Sightings information from trips (which vary in length) is then standardized as half-day trips. While data collected on these trips is not generated by formal surveys, observations are made by trained naturalists and are conducted on a near-daily basis, providing a long running, high-resolution time series of Covered Species abundance within a key foraging area.

5.3.1.3 Tagging

Ongoing satellite tagging programs targeting blue whales and leatherback sea turtles provide information regarding their presence and distribution. Unlike aerial or vessel surveys, which quantify presence within a given area and time, tagging data provide long-term tracks of individual animal movements. For species with known migratory patterns, these index individuals provide a general understanding of when populations begin to arrive in or depart from the Plan Area. Deployment of satellite tags requires scientists to locate and then closely approach an individual animal; for cryptic species which spend limited time at the surface (e.g., blue whales) and are difficult to observe even when on the surface (e.g., leatherback sea turtles), this often results in small sample sizes. Additionally, due to limited battery life, tag loss, or individual mortality, satellite tags generally report for weeks to months after deployment. Therefore, understanding multi-year trends requires routine tagging operations.

Funding permitting, researchers with the NMFS SWFSC Marine Turtle Ecology and Assessment Program conduct routine leatherback tagging operations within the Plan Area during the late summer and early fall. Successful deployment of satellite transmitters is dependent on available aerial and vessel platforms, the

presence of sufficient leatherback sea turtles, calm sea conditions (Beaufort 0-2), and relatively clear sky conditions. As of June 2023, a total of 39 days of at-sea effort has been conducted within the Plan Area, as well as 53 days of aerial survey effort (27 of which were dedicated to transect surveys and 26 of which directly supported capture and tagging operations). A total of 31 turtles were observed off California during this period, with 10 successful satellite tag deployments. No operations were conducted in 2020 due to the COVID-19 pandemic.

5.3.2 Management Actions

Once risk is determined to be elevated through a risk assessment, the Director implements a management action to reduce marine life entanglement risk. The default action when a trigger is reached is closure of one or more Fishing Zones to traditional Dungeness crab trap gear. In most cases, however, the Director selects from several alternatives based on the best available science related to the management considerations and triggers for management action described in Appendix E. This provides the greatest flexibility and is supported by the best available science (within varying degrees of risk and uncertainty) highlight RAMP's adaptive management approach.

The amount of time which elapses between confirming a trigger has been reached and fully effectuating a management action will depend on the time of year and which action is being implemented. First, CDFW must gather and evaluate available data and provide at least 24-hours notice to the Working Group and public (Cal. Code Regs., Tit. 14 § 132.8 subd. (b)(2)). Following review of the Working Group's recommendation (Cal. Code Regs., Tit. 14 § 132.8 subd. (d)(1)), the Director must then issue a determination and provide at least 72-hours notice to the fleet before requiring adherence to the management action (Cal. Code Regs., Tit. 14 § 132.8 subd. (f)(2)). Consultation with the Working Group and other stakeholders indicated 72-hours was a reasonable time period for fishery participants to understand and respond to management changes. This interval is also consistent with notification requirements for public health advisories (Fish & G. Code § 5523). However, in practice, once gear is in the water, CDFW has generally given at least one to two week's notice for compliance and full gear removal, and generally two weeks when heavy weather (storms and large swell) prevents the fleet from accessing the fishing grounds.

5.3.2.1 Depth Constraint

A depth constraint may be implemented to limit co-occurrence of Covered Species and the Covered Activity. Depth constraints have particular value when paired with a vertical line/gear reduction, in order to avoid increasing entanglement risk due to effort displacement into the areas which remain open (Samhouri et al. 2021). Depth constraints are based on waypoints as defined in federal regulation (50 CFR §§ 660.71-660.73). The use of waypoints to define depth contours is routine in the federal groundfish fishery and is familiar to Dungeness crab fishermen because many individuals participate in both

fisheries. As discussed in Chapter 3, available forage for Covered Species is in part tied to the depth contour off the coast. If the best available scientific information indicates that certain depths carry a higher risk of entanglement, the Director could implement a depth constraint over the fishing grounds or within specific Fishing Zones. Given the flexible foraging strategies of humpback whales (see Section 3.2.2) and the potential for humpback whales to rapidly shift across a range of depths in pursuit of prey, CDFW will consider the use of depth constraints on a case-by-case basis. This management action may be used more routinely when the species of concern are blue whales or leatherback sea turtles. Prohibiting take of Dungeness crab seaward of the 50-fathom line could reduce interactions with blue whales, which are primarily found in deeper depths over the continental shelf. Prohibiting take of Dungeness crab inshore of the 45-fathom line could protect leatherback sea turtles by excluding gear from their primary foraging area (personal communication, Scott Benson, NMFS SWFSC, June 17, 2023) as long as displaced traps didn't impede leatherbacks from entering or exiting the foraging grounds. CDFW will consider the best available science when determining appropriate depth-based closures.

5.3.2.2 Vertical Line/Gear Reduction

If survey data indicate Covered Species (or their prey) are widely distributed across a broad range of depths, reducing the number of vertical lines in the water is another method to reduce entanglement risk. Given the current requirements for each Dungeness crab trap to be individually marked with a buoy (see Section 2.2.2), vertical line reductions are implemented as gear reductions. Based on the availability of Marine Life Concentrations data, CDFW could implement a vertical line reduction to lower the overall risk of entanglement within a given Fishing Zone. For example, if data collected prior to the season opening indicated the southward migration of Covered Species had begun but was not yet complete, a vertical line reduction during the early weeks of the fishing season would allow the fishery to commence while reducing entanglement risk for the Covered Species. Alternatively, if data collected in the early spring indicated the northward migration of Covered Species had begun, but abundances only marginally exceed the thresholds defined in RAMP, allowing remaining participants to continue fishing with a reduced amount of gear would allow for continued fishing opportunity while still reducing marine life entanglement risk. Furthermore, by requiring removal of a portion of the gear, fishery participants would need less time to comply with subsequent management actions (e.g., additional vertical line reductions or fishery closure).

RAMP regulations specify trap reductions are effectuated through requiring excess tags to be present onboard the vessel, rather than affixed to traps. Any deployed gear without the required buoy tags would be non-compliant.

5.3.2.3 Closures

Spatiotemporal closures are a key management measure in the spring months when historical migration patterns, surveys, and/or models indicate that Covered Species have begun to arrive in the fishing grounds, and during the fall if

Covered Species have not begun their migration out of California waters. In these instances, the scheduled season opening can be delayed, or the scheduled season closure advanced. When real-time information on Marine Life Concentrations, trap gear, and co-occurrence is available, spatiotemporal closures can also be used to selectively close areas with elevated entanglement risk. Cal. Code Regs., Tit. 14 § 132.8 specifies that closures can occur by Fishing Zone or statewide. Once a closure is in effect, LED can take appropriate enforcement action against owners of Dungeness crab traps found inside closed Fishing Zones.

5.3.2.4 Alternative Gear

As noted above, spatiotemporal closures are an effective tool for reducing co-occurrence between Covered Species and the Covered Activity, and therefore reducing associated take. However, such closures will have economic impacts on some fishery participants. Developing innovative gear types which pose lower entanglement risk could ameliorate those impacts and is an area of substantial interest for CDFW.

Since 2019, CDFW has been engaging with gear manufacturers and other stakeholders to better understand the current limitations of, and potential solutions for, design and adoption of innovative gear types in the Dungeness crab fishery. Both the Working Group and CDFW have produced guidance for gear developers regarding design considerations and options for testing. A current version of CDFW's guidance is available on CDFW's Whale Safe Fisheries webpage, and copies of each CDFW and Working Group version are included as Appendix A.

Several types of gear innovations are being explored by gear developers, fishermen, and some members of the Working Group. These include but are not limited to "pop-up" gear (sometimes referred to as "ropeless gear"). There are two main categories of pop-up gear: on-demand and timed release. In general, on-demand gear involves a coil of rope, acoustic receiver, and buoy attached to the trap. An acoustic signal is sent from the fishing vessel to the receiver, triggering the release of the rope and buoys. Once the buoy "pops up" to the surface of the water, the fisherman can retrieve the gear using the same methods as they would for traditional gear. Other companies have entirely replaced the rope and buoys, the acoustic release instead triggers compressed gas canisters to fill large lift bags which bring the entire trap to the surface for retrieval. In contrast, timed-release gear relies on a chemical reaction (for galvanic releases) or elapsed time (for electronic releases) to release the rope and buoys. All of these approaches share the common element of minimizing the amount of time vertical lines are present in the water column and gear is at the surface, thereby decreasing entanglement risk.

Preliminary testing of pop-up gear off California had highlighted economic and reliability concerns from fishery participants and CDFW concerns regarding gear conflict, gear loss, and enforceability of trap limits, gear configuration, Marine

Protected Areas, and other regulations. Recognizing ongoing development efforts in this area, RAMP establishes a process for CDFW certification of innovative gear types as Alternative Gear. This process includes performance standards such as being detectable by CDFW, having a reliable means of retrieval, being easily identifiable, and providing a tangible benefit by reducing entanglement risk or severity. Given the heightened potential for gear conflict during the fall and winter (when the majority of fishing activity occurs; see Section 2.2.4.2) use of Alternative Gear is limited to the time period of the traditional fishery has closed. This limitation may however be adjusted in the future as part of the ITP Progress Report process.

CDFW notes this certification process is distinct from, and serves a different role than, issuance of Experimental Fishing Permits (EFPs) by the FGC pursuant to Cal. Code Regs., Tit. 14 § 91. EFPs are ultimately approved by the Fish and Game Commission and are a mechanism for testing of innovative gear. This information (testing results) can then in turn be provided to request CDFW certification as Alternative Gear. Upon certification, Alternative Gear would become legal commercial fishing gear and could be used by all participants (not just those who were operating under an EFP).

EFPs have been an area of active research and participation in recent years. As of the time of writing, there are three active EFPs related to the Dungeness crab fishery which are testing new and innovative gear types. Many of the EFPs show promise to reduce the presence of vertical lines, thereby decreasing entanglement risk. These preliminary EFP results are also valuable when considering enforceability, gear conflict, and gear loss. Additionally, EFPs have proven to be informative in the long term when developing Alternative Gear authorization. For more information about the EFP program please see CDFW's EFP webpage.

5.4 Minimization Measures

Despite best efforts, CDFW anticipates that some level of take will occur as a result of the Covered Activity. When take cannot be avoided, CDFW will support its biological goal by minimizing the impacts to the Covered Species to the maximum extent practicable. CDFW designed Objective 2 and the associated conservation measures to minimize entanglement risk from lost or abandoned gear through enhanced removal efforts and decreased loss or abandonment. Section 5.4.1 details the measures to decrease gear loss, and Section 5.4.2 discusses how CDFW will estimate gear loss and enhance retrieval opportunities.

Objective 2: Minimize the likelihood of Covered Species entanglement in lost or abandoned California commercial Dungeness crab gear by increasing opportunities for derelict gear recovery and enhancing lost gear tracking and reduction measures.

CDFW will achieve Objective 2 by meeting the following measure:

- No more than 3% of the maximum number of traps reported as deployed in bi-weekly Fishing Activity Reports will be reported as lost by the end of the season.

5.4.1 Reducing Gear Loss

To minimize entanglement risk from lost or abandoned gear, CDFW has included a distinct target within Objective 2; that no more than 3% of the maximum number of traps reported as deployed on bi-weekly Fishing Activity Reports will be reported as lost at the end of the season.

The target focuses on reducing the amount of gear lost or abandoned at sea. CDFW will implement a broad array of actions to achieve this target including continued education, continued enforcement of gear tending requirements, improved best practices, support for gear innovation, and electronic monitoring.

CDFW will continue to regularly communicate with fishery participants regarding the importance of reducing gear loss and avoiding gear abandonment. Current communication efforts include an annual pre-season newsletter mailed to all Dungeness crab vessel permitholders, as well as distributed electronically through CDFW's Marine Management News blog and posted on CDFW's Whale Safe Fisheries webpage. CDFW will also emphasize this during public meetings held prior to the start of each fishing season and in press releases and other public-facing communication efforts. Since implementation of RAMP CDFW has noted a substantial increase in awareness regarding marine life entanglement issues amongst the fleet, media, and members of the public. CDFW believes continued education regarding the role of lost or abandoned gear in marine life entanglements is one method for making progress on this target.

As described in Section 1.3.5, Fish & G. Code § 9004 requires each trap to be raised, cleaned, and serviced at intervals not to exceed 96 hours (weather conditions at sea permitting) and that no trap shall be abandoned in the waters of the state. As with all regulations pertaining to the Covered Activity, this requirement is actively enforced by LED. CDFW will maintain current levels of enforcement throughout the permit term to ensure compliance with gear tending requirements.

Adoption of pop-up gear should reduce gear loss. Because the vertical line is contained near the trap for some (or all) of the time the trap is deployed at sea, currents are less likely to move the gear away from its deployment location, increasing the likelihood that fishery participants will be able to locate the gear when they return. Use of multi-trap trawls is anticipated to have a similar effect, since the heavier gear is less mobile. Certain methods of virtual gear marking, such as self-localization or use of GPS-enabled buoys, would also decrease gear loss by allowing fishers to locate their gear even if it does move from the deployment location.

Fleet-wide use of electronic vessel position monitoring (see Sections 5.6.2.1) will improve the ability of fishery participants to account for their gear during the course of the season, and will also support the target by allowing CDFW, Trap Gear Retrieval Program participants, and others to conduct targeted removal efforts.

CDFW will determine whether the target has been met based on bi-weekly Fishing Activity Reports, logbooks submitted under the Trap Gear Retrieval Program, voluntary submission of documentation regarding retrieval under Cal. Code Regs., Tit. 14 § 132.2, and any documentation provided regarding retrieval activities conducted under other authorities (e.g., salvage permits issued by the NOAA Office of National Marine Sanctuaries).

Following the 2020-21 season, CDFW received documentation substantiating retrieval of 250 lost or abandoned commercial Dungeness crab traps. This represents 14% of the corrected total number of lost traps in Appendix G (n = 1,772). 799 traps were retrieved following the 2021-22 season, which represents 20% of the corrected total number of lost traps in Appendix G (n = 3,923). 111 traps were retrieved following the 2022-23 season, which represents (3.2%) of the corrected total number of lost traps in Appendix G (n = 3,438).

The numeric values selected for each target are based on what CDFW has been able to achieve during the 2020-21 through 2022-23 seasons. CDFW does not anticipate being able to substantially improve upon the gear loss or gear recovery percentages presented above and in Appendix G. Given the extent of the Plan Area, and limited capacity for on-the-water retrieval operations, CDFW is largely dependent on actions taken by external parties with respect to gear tending and recovery. Selecting targets which exceed what CDFW has been able to accomplish during the past two seasons would therefore jeopardize CDFW's ability to achieve this objective.

CDFW considered, but rejected, eliminating tag replacements as an additional measure to reduce gear loss. Cal. Code Regs., Tit. 14 § 132.4 establishes three options for requesting tag replacements: in-season, between-season, and catastrophic loss. Starting 30 days after the season opener, Dungeness crab permitholders may request replacement of up to 10% of their tier allotment at a cost of $1 per tag by submitting an In-Season Replacement Dungeness Crab Buoy Tag Affidavit (FG1303) to LRB. In-season replacement tags must be returned to CDFW prior to the start of the next fishing season. Dungeness crab permitholders can request replacement of any number of tags (up to their full tier allotment) through submission of a Between-season Replacement Dungeness Crab Buoy Tag Affidavit (FG1302) to LRB at a cost of $1 per tag. In instances of catastrophic loss, CDFW can issue replacement of any number of tags at no cost to the Dungeness crab permitholder.

Presumably, eliminating issuance of replacement tags could incentivize fishery participants to oversee deployed gear more closely and disincentivize gear abandonment. CDFW is aware fishery managers in Oregon and Washington

have included this measure into their draft CPs. However, this is not a practicable option for CDFW. While these procedures and costs are specified through implementing regulations in Cal. Code Regs., Tit. 14 and could be amended through CDFW rulemaking actions, the ability of Dungeness crab permitholders to replace lost tags in some form is provided by statute (F. & G. Code § 8276.5 subd. (a)(7)). Entirely eliminating tag replacements is therefore outside the scope of CDFW's authority at this time.

5.4.2 Measuring Gear Loss

The best available information regarding causes of gear loss is from the between-season requests for replacement buoy tags which are processed by LRB. The DFW 1302 form (Rev 05/25/2022) requires Dungeness crab vessel permitholders to "describe the factual circumstances surrounding the loss of the buoy tags". Based on the descriptions provided on the between-season request affidavits submitted in 2014, 2016, and 2018, gear loss was most frequently caused by other boats, weather, and kelp, followed by wear and tear, debris, the operator's boat, or silt. Nearly half (48%) of gear loss incidents did not include sufficient details to assign a cause of gear loss.

Entanglement reports, including information collected during a response effort, rarely include sufficient details to evaluate whether the entanglement occurred in lost (rather than actively fished) gear. Of the 246 confirmed large whale entanglements between 2013 and 2020, only three are known to have occurred in lost or abandoned gear, and another 11 had "indications" of lost gear but could not be confirmed as such (personal communication, Lauren Saez, NMFS WCRO, August 29, 2022). Despite this, CDFW considers lost or abandoned gear as a substantial source of marine life entanglement risk. As the abundance of Covered Species within an area increases the likelihood of an interaction with a given vertical line also increases. Vertical lines which persist in the Plan Area during the spring, summer, and early fall months when Covered Species are foraging within the Plan Area therefore pose a disproportionate risk of entanglement. Given the actions of the RAMP program described in Section 5.2, the gear most likely to be present at those times would be lost or abandoned, rather than actively fished. CDFW has therefore taken actions to both reduce the amount of gear which becomes lost or abandoned and to remove lost or abandoned gear, further minimizing entanglement risk from the Covered Activity.

Beginning with the 2020-21 fishing season, the bi-weekly Fishing Activity Reports under Cal. Code Regs., Tit. 14 § 132.8 subd. (g)(1) require fishery participants to annually report the number of lost traps. These self-reported gear loss values can be compared to gear deployments from those same reports as an alternative method for calculating gear loss. As discussed in Section 2.2.4.1, due to compliance issues with this new reporting requirement, CDFW considers the number of reported lost traps and reported deployed traps to be a lower bound, although it's unclear whether this would also negatively bias the associated gear loss percentage. To correct for vessels which harvested Dungeness crab from the

Plan Area but did not provide bi-weekly reports, and vessels whose bi-weekly reports did not include the number of lost traps, CDFW relied on the following assumptions when correcting reported totals:

- Total lost traps are calculated by summing the lost traps documented on bi-weekly reports. For those vessels which harvested crab in California but did not provide a lost trap total, trap loss was estimated by calculating tier-specific averages for those vessels which did submit lost trap totals (rounded to the nearest whole number).
- Total deployed traps are calculated by summing each permit's maximum reported trap number. For those vessels which harvested crab in California but did not provide bi-weekly reports, the permit was assumed to have deployed their full trap allotment.

Bi-weekly reports also allow for a more holistic evaluation of the maximum potential traps deployed within the Plan Area, as described in Section 5.2.

Despite the compliance issues, bi-weekly reports remedy many of the limitations associated with relying on tag replacement request affidavits, and with continued implementation of RAMP (including higher compliance with the reporting requirement), CDFW will be able to phase out use of correction factors and more accurately quantify annual gear loss.

CDFW adopted regulations (Cal. Code Regs., Tit. 14 § 132.7) in September 2019 implementing a formal lost or abandoned commercial Dungeness crab trap gear retrieval program (Trap Gear Retrieval Program). Under the terms of the program, qualified entities (sport or commercial fishing associations with a board and/or charter, non-profits, and local government agencies or harbor districts) work with commercial trap fishermen to conduct on-the-water retrieval operations from two weeks after the scheduled season closure (Fish & G. Code § 8276) to September 30. The Director can authorize retrieval to begin sooner as part of a closure under RAMP. All retrieved traps are documented on a logbook, which is submitted to CDFW each year. Compensation for retrieval activities is provided either by the Dungeness crab vessel permitholder, in exchange for the retrieved trap, or by CDFW. The guaranteed compensation is one key difference between the formal program and the informal retrieval activities conducted under Cal. Code Regs., Tit. 14 § 132.2. CDFW has conducted extensive outreach to potential Retrieval Permittees to encourage their participation, as well as notifying commercial fishery participants of the program's implications. Further information about tag loss information is available in Appendix G.

5.5 Mitigation Measures

Even with the avoidance and mitigation measures outlined in Sections 5.4 and 5.3, CDFW anticipates that there will be some impact from the Covered Activity. In response, CDFW has created mitigation measures to offset the impact to the Covered Species. Objective 3 aims to mitigate entanglement severity through improved entanglement response efforts. CDFW has committed to mitigating the effects of entanglements on Covered Species by disseminating best practices to

prevent entanglement (Section 5.5.1), improving entanglement documentation and reporting efforts (Section 5.5.2), and coordinating with key partners (Section 5.5.3) in support of Objective 3.

Objective 3: Mitigate the impacts of entanglements on Covered Species by supporting entanglement reporting, education, and analysis to reduce the likelihood of serious or fatal injuries.

CDFW will achieve Objective 3 by meeting the following measures:

- Provide outreach materials and training opportunities on proper disentanglement procedures and entanglement reporting to fishery participants and the public.
- Support entanglement reporting and NFMS post-entanglement analysis and documentation via post entanglement interviews, license and permitting records
- MR and LED staff who are conducting activities within the Plan Area will strive to aid in entanglement reporting and obtain Level 1 entanglement training. EFP participants will obtain Level 1 entanglement training.

Having reporting parties promptly report entanglements, document pertinent information regarding the entanglement, and monitor the entanglement until a Large Whale Entanglement Response Network team can arrive on site makes it more likely responders will be able to re-locate the entangled animal and mount a successful response. Unlike on the East Coast, where a designated Sea Turtle Stranding and Salvage Network responds to sea turtle entanglements, in California members of the Large Whale Entanglement Response Network handle response efforts for both large whales and sea turtles.

Documentation collected by the initial reporting party or during an entanglement response can also support forensic reviews, which can identify best practices and improve the general state of knowledge regarding gear configuration, environmental conditions, and other circumstances which could result in entanglements. Contacting fishers whose gear is involved in entanglements therefore provides a crucial source of information for both CDFW and NMFS. CDFW will continue the follow-up actions described in Section Appendix F (i.e., searching license and permitting records and conducting interviews with fishermen) for the duration of the permit.

The State of California has previously provided direct financial support to the Large Whale Entanglement Response Network. The 2015-16 and 2016-17 state budgets each included $100,000 grants to California Whale Rescue/Oceanic Society administered through the UC Davis Wildlife Health Center. In 2020, OPC appropriated $110,000 to The Marine Mammal Center. Between May 2020 and December 2022, this funding was used to reimburse vessel expenses from 48 response efforts, repair or replace specialized equipment, purchase personal protective equipment for responders, and reimburse travel costs for responders assisting with entanglement response efforts outside their home area. In February

2020, OPC granted $59,101 to the National Marine Sanctuary Foundation to host Large Whale Entanglement Response trainings. While initially scheduled for summer 2020, the trainings were delayed due to the COVID-19 pandemic. In late 2022, the OPC funding was used to support trainings at both the Channel Islands and Monterey Bay National Marine Sanctuaries, with 42 and 35 participants respectively. The trainings included hands-on skill improvement for Level 2-4 responders; refreshers regarding safety protocols, operations and roles, and risk assessment; and development and discussion of Incident Action Plans. In February 2024, OPC granted an additional $200,000 to the National Marine Sanctuary Foundation to further support large whale entanglement response through spring 2026. Funds will be used to host two annual trainings and reimburse vessel-related expenses. CDFW provided a formal letter of support for the most recent OPC grant (OPC 2024). While CDFW is unlikely to directly provide funding, throughout the permit term CDFW will work with OPC and the California Legislature to identify opportunities to support operations of the Large Whale Entanglement Response Network.

5.5.1 Outreach and Best Practices

CDFW engages in a number of outreach activities including various types of outreach products and forums. In particular, a Best Practices Guide was first developed in fall 2015 by the Working Group, with input and support from OPC, NMFS, and CDFW. This guide provides guidance for commercial and recreational crab trap fisheries to minimize the occurrence of entanglements. As of the 2021-22 fishing season, the Best Practices Guide is updated on an as-needed basis to incorporate new recommendations from the Working Group, Working Group Advisors, and agencies. Copies are given to Working Group members for distribution, posted online, and shared through various listservs. The Best Practices Guide is made available at CDFW license counters that fall within the range of the Dungeness crab fishery and is also distributed by CDFW staff during recreational fishery sampling and at outreach events.

Additionally, CDFW prepares and distributes an annual pre-season newsletter which includes updates regarding development and implementation of Conservation Measures to address marine life entanglements and any new regulatory requirements for the commercial fishery. The newsletter is mailed to all California Dungeness crab vessel permitholders.

CDFW also generates press releases, sends updates via a dedicated listserv, and regularly updates the Whale Safe Fisheries webpage with new developments related to the Conservation Measures described in this CP. These outreach efforts are an important aspect of adaptive management, which aims to incorporate and facilitate effective stakeholder engagement.

5.5.2 Improving Reporting and Documentation

CDFW plans to increase awareness of proper entanglement response procedures with on-the-water users who might provide opportunistic

entanglement reporting. NMFS has developed a free online Level 1 U.S. Whale Entanglement Response training, which takes approximately one hour to complete and covers the essential elements of how to report and document marine life entanglements. CDFW will work with four groups of on-the-water users to improve reporting and documentation: CDFW staff, individuals seeking EFPs from the FGC, commercial Dungeness crab fishery participants, and other commercial or recreational ocean users.

CDFW routinely conducts at-sea research and enforcement operations throughout the Plan Area, with over 2,000 on-the-water hours each year. Additionally, since the fall of 2020, CDFW has conducted aerial surveys as detailed in Section 5.3 and 4.5.3. Staff will use these surveys to evaluate observed whales for potential signs of entanglements and will deviate from planned transects as needed to confirm. Prior to permit issuance, CDFW will ensure that all MR and LED staff who are conducting vessel or aerial-based research and enforcement activities within the Plan Area have taken the Level 1 entanglement response training and immediately report any observed entanglement. Furthermore, unless it interferes with mission critical functions or poses substantial risks to human safety, CDFW vessels will strive to stand by an observed entanglement until additional trained personnel from the Large Whale Entanglement Response Network arrive on site and can initiate an entanglement response effort.

MR staff conduct technical reviews of applications for EFPs (see Section 5.3.2.4). While the FGC ultimately determines the terms and conditions which are attached to these permits, for any applications which seek to use trap gear MR staff will recommend including a requirement to take the Level 1 entanglement response training prior to commencing EFP activities. Unlike MR and LED personnel and assets, which are under the direct control of CDFW, EFP recipients are independent entities, and the FGC cannot direct the use of EFP participant's vessels and time by requiring they standby observed entanglements. However, while they are operating under the auspices of an EFP, and receiving a privilege not afforded to other members of the fishing community, it is appropriate and reasonable to ensure they have the necessary information to effectively contribute to entanglement reporting and documentation efforts within the Plan Area.

On an annual basis, CDFW will provide all commercial Dungeness crab fishery participants with information regarding proper entanglement reporting procedures via the annual crab newsletter. Dissemination of outreach materials, and increasing the proportion of the fleet who are Level 1 responders, will ensure individuals engaged in the Covered Activity can take swift and effective actions when entanglements are observed. However, requiring fishery participants to take the Level 1 training is currently outside the scope of CDFW's delegated authority to manage the fishery.

As a public agency, CDFW oversees a broad array of communications to various commercial and recreational ocean user groups. While CDFW cannot compel

action, incorporating reminders regarding proper entanglement reporting and documentation procedures into these communications will increase awareness amongst a broad swath of the ocean-going public. CDFW will work in close collaboration with NMFS WCR and PRD to develop appropriate content for inclusion in both print and electronic mailings (Table 5-1).

Table 5-1. Inventory of routine electronic and print communications distributed by CDFW to commercial and recreational ocean users.

Name	Communication Type	Description	Audience/Reach	Frequency
Commercial Fishing Digest	PDF (Posted online)	Regulations for commercial fishing in California	The commercial fishing industry and general public (CDFW sold approximately 5,600 commercial fishing licenses in 2023)	Once annually (April 1st)
Ocean Sport Fishing Regulations	PDF (Posted online)	Regulations for recreational ocean fishing in California	Recreational fishermen and general public (CDFW sold 1.7 million sport fishing licenses in 2023)	Once annually (March 1st)
Recreational Angler Update	Email	Informational email sent from CDFW that contains various fishing topics, seasons, regulatory changes, etc.	All recreational fishing license holders in California who provide their email address to CDFW (as of 8/21/2023, approximately 785,000 individuals)	Monthly
Marine Management News	Blogsite/email	A blogsite that contains a collection of marine fisheries-related blog posts, written by CDFW staff	"Blog Update" emails with links to the latest blog posts are sent to all interested parties who have signed up for the CDFW MR News Service (as of 8/16/2023, approximately 4,900 individuals)	Intermittent, as the need arises

5.5.3 Outreach, Coordination and Key Partners

Outreach to fishery participants is a crucial component of this CP. CDFW will continue routinely engaging key stakeholders on the Working Group and DCTF,

as well as encouraging them to share information with the constituents they represent.

CDFW will annually distribute a pre-season newsletter which includes updates regarding implementation of this CP and any new regulatory requirements for the commercial fishery. The most recent Best Practices Guide will also be included. The newsletter will be mailed to all Dungeness crab vessel permitholders. The newsletter will also be distributed electronically through CDFW's Marine Management News blog and posted on CDFW's Whale Safe Fisheries webpage.

CDFW will also generate press releases, send updates via a dedicated listserv, and regularly update the Whale Safe Fisheries webpage with new developments related to implementation of the CP.

Specific efforts to coordinate with key partners are further described below.

5.5.3.1 NMFS

Successful implementation of this CP will require continued coordination and collaboration between CDFW and NMFS staff within the WCRO, PRD, and the Fisheries Science Centers. CDFW will continue relying on NMFS to review and confirm reported entanglements and to provide any available information regarding the appropriate attribution of those entanglements (i.e., which gear type was involved). CDFW will consider any information provided to support the in-season risk assessment and management action selection process under RAMP, including real-time marine life concentrations information from surveys or satellite tagging operations (see Sections 5.3.1.2 and 5.3.1.3), analysis of historical patterns, and insights regarding ocean conditions and forage availability (see Appendix E.

CDFW will also engage NMFS when conducting ITP progress reports of the Conservation Plan, and when considering potential amendments to this CP and associated regulations, as described in Sections 6.1 and 6.3.

5.5.3.2 California Native American Tribes

CDFW is committed to engaging and consulting with tribes about the potential impact of activities on tribal interests and providing meaningful opportunities to participate in decision-making processes regarding those activities. Throughout the term of the permit, CDFW will conduct outreach and is available for consultation with tribes in accordance with the CDFW Tribal Communication and Consultation Policy.

5.5.3.3 California Ocean Protection Council

As described in Section 1.1, as the lead agency for California ocean policy, OPC strategic plans and policies provide crucial guidance for the ocean conservation activities of state agencies. Of particular relevance to this CP are elements of the current OPC Strategic Plan (OPC 2020a) which discuss

sustainable fisheries and anthropogenic impacts on marine life, including entanglements. OPC's goal of zero annual M&SI provides overarching context for the design and implementation of this CP. OPC also provides financial resources (from bond funds and legislative appropriations) to state agencies and external parties that enhance the quality and quantity of scientific information upon which state management decisions are made. Further details are provided in Chapter 6.

Along with CDFW and NMFS, OPC was instrumental in organizing the initial public meeting on marine life entanglements in August 2015 and convening the Working Group in September 2015. Since the Working Group's inception, OPC has provided financial support for Working Group operations, strategic guidance regarding Working Group activities, and staff resources to organize meetings and document outcomes of Working Group discussions. CDFW intends to continue this collaborative relationship with OPC when implementing this CP.

5.5.3.4 Tri-State

Washington and Oregon are also developing Conservation Plans and intend to submit applications for ITPs providing coverage for their commercial Dungeness crab fisheries. While differences in each state's regulatory environment and fishery operations will be reflected in their respective CPs, California will continue routine coordination and information and data-sharing with the other two states, particularly with regard to forensic review of entanglements, gear marking and innovations, and emerging science. California will also continue participating in the Tri-State Agreement overseen by PSMFC, through which the three states routinely discuss and coordinate management actions regarding domoic acid and Dungeness crab quality as well as marine life entanglement efforts undertaken by each state's Working Group, industry, and management agency.

5.5.3.5 State Advisory Bodies

The expertise of Working Group members and Advisors is crucial to gathering and reviewing available information and making management recommendations to the Director under RAMP (Section 5.2). The Working Group also provides a forum for conducting and evaluating trials of innovative gear that may reduce entanglement risk, which may be authorized as Alternative Gear (Sections 5.3.2.4) or incorporated into baseline fishing practices. A substantial amount of the Working Group's value is vested in its composition. At the time this CP was prepared, Working Group members included commercial and recreational fishermen and industry representatives, environmental organization representatives, members of the Large Whale Entanglement Response Network, and agency staff. Working Group members are appointed by the MR manager, and CDFW will undertake reasonable efforts to ensure continued representation across a diverse range of interests throughout the permit term.

While not exclusively focused on entanglement issues, the DCTF is charged with making recommendations to the California Legislature, FGC, CDFW, and other

state institutions regarding the need for changes in management of the Dungeness crab fishery. As such, CDFW will keep the DCTF informed regarding implementation of this CP and may request DCTF review of adaptive management measures under consideration.

5.5.3.6 Fishing and Port Associations

As described earlier in this Chapter, CDFW recognizes implementation of the Conservation Measures described in this Chapter may have short-term economic impacts on the commercial Dungeness crab fishery, related industries, and coastal communities throughout central and northern California. Input from fishing and port associations on proposed regulations, the draft CP, and the in-season RAMP process has provided crucial insights into industry perspectives. CDFW will continue collaborating with fishing and port associations through, and in parallel to, the cross-interest Working Group process. In particular, CDFW will work with fishing and port associations to develop more detailed metrics and approaches for assessing economic impact of management actions implemented under RAMP (Appendix E); design and implementation of industry-led surveys for detecting entanglements and documenting presence, abundance, and distribution of Covered Species (Section 5.3.1.2); developing innovative gear and evaluating best practices (Sections 5.3.2.4 and 5.5.1); and promoting recovery and reporting of lost or abandoned gear through the Trap Gear Retrieval Program and other regulatory provisions (Sections 5.4).

Additionally, CDFW will welcome continued strategic investments and other support provided by fishing and port associations to bolster implementation of the various Conservation Measures described in this Chapter, as well as broader updates to the Conservation Program through the progress report process described in Section 6.1.

5.5.3.7 Environmental Organizations

During the early years of the Working Group and initial development of the various Conservation Measures described in this Chapter, conservation-oriented environmental organizations have provided valuable input. CDFW will continue collaborating with environmental organizations through, and in parallel to, the cross-interest Working Group process. In particular, CDFW anticipates environmental organizations will continue to support the development and testing of gear innovations (Section 5.3.2.4); evaluating best practices (Sections 5.5.1); highlighting advances in the best available science to inform RAMP (Section 5.2 and Appendix E); and promoting recovery and reporting of lost or abandoned gear through the Trap Gear Retrieval Program and other regulatory provisions (Section 5.4).

Additionally, CDFW will welcome continued strategic investments and other support provided by environmental organizations to bolster implementation of the various Conservation Measures described in this Chapter, as well as broader updates to the Conservation Program through the progress report process described in Section 6.1.

5.5.3.8 External Researchers

As highlighted throughout this CP, and particularly in this Chapter, CDFW is committed to relying upon the best available science when implementing and evaluating the Conservation Measures which comprise this Conservation Program. CDFW will undertake targeted research efforts as resources allow, but to a large extent will rely on findings from studies conducted and funded by other parties. CDFW will encourage interested researchers to focus their efforts on implementation of RAMP (Section 5.2) and developing actionable approaches to the alternative management strategies described in Chapter 8. CDFW will also highlight critical information gaps in external-focused documents such as the Science Action Strategy, which was in development at the time this CP was prepared.

CDFW has established robust working relationships with researchers at the NMFS Fisheries Science Centers and outside organizations such as Point Blue Conservation Science and Cascadia Research Collective, who serve as Working Group members and Advisors. Throughout the permit term, CDFW will build on existing relationships and explore opportunities to establish new relationships with other individual, institutional, and agency researchers focused on marine life entanglement issues in both East and West Coast contexts.

5.6 Adaptive Management

This section reviews the existing adaptive management components of the Conservation Program and planned adaptive management improvements. (Figure 5-4). As mentioned in Section 1.3.6, the MLMA requires management actions to follow the principle of adaptive management. Adaptive management is a continuous and flexible process that aids in decision-making due to uncertainty.

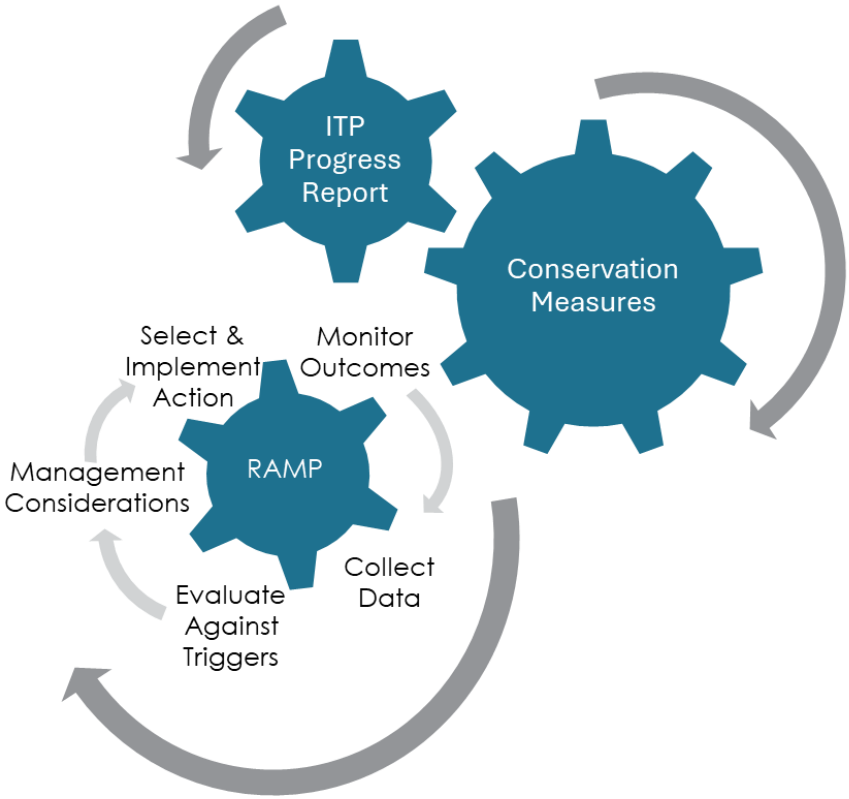

Figure 5-4. Overview of CDFW's adaptive management approach. Ongoing implementation of the inherently adaptive RAMP process feeds into five-year ITP progress reports and additional conservation measures.

5.6.1 Existing Adaptive Management Actions

Adaptive management is present in two main aspects of the Conservation Plan, the RAMP process and the built-in backstop measures when approaching take limits.

The structure of RAMP incorporates several elements of the adaptive management cycle, described in Section 1.3.6, by providing a structured way to respond to changing conditions within and outside the Plan Area. Some examples of how RAMP represents an adaptive management process are:

- As described in Section 1.1, an increase in the number of entanglements led to the establishment of RAMP which aims to reduce entanglement risk in the Dungeness crab fishery by limiting deployment of gear when Covered Species are present. This process of defining the problem and outlining objectives represents the first step in an adaptive management approach.
- RAMP establishes quantitative thresholds to determine if entanglement risk is elevated. This represents the second step in many adaptive

management processes, formulating evaluation criterion with which to make informed decisions.
- RAMP takes into account various management considerations, including input from the Working Group when evaluating potential management actions (Section 5.2 and Appendix E). This represents a phase of adaptive management where tradeoffs are evaluated, and management actions are selected based on the tradeoff analysis.
- Once a management action is selected, CDFW continues to monitor and evaluate the fishery based on a set schedule to determine if a management adjustment is needed (Section 5.2 and Appendix E). This ensures that management is proactive and can respond to changing conditions.

In addition to RAMP, CDFW has instituted backstop measures to avoid exceedance of permitted take, as further described in Section 4.8. These backstop measures will ensure that CDFW is responsive to entanglements and provide built-in check points to evaluate take levels and appropriate management actions. This process is adaptive in that it identifies predetermined time frames to incorporate new information, evaluate current progress, and potentially change management actions to address conservation goals.

5.6.2 Planned Adaptive Management Improvements

Both the RAMP and backstop measures rely on CDFW's current understanding of Marine Life Concentrations, existing monitoring practices, and regulatory authority. Currently, CDFW management actions consider overlap between the Covered Activity and Covered Species, but do not explicitly calculate or use metrics of co-occurrence. However, in the future, CDFW anticipates incorporating more real time information based on co-occurrence to evaluate risk from the Covered Activity. This will improve both in-season management and the ability to conduct post-hoc evaluations of effectiveness.

To effectively utilize co-occurrence modeling, CDFW needs detailed data on both species' distribution and gear location. With the incorporation of vessel data from electronic monitoring and updated SDM, CDFW will be able to calculate co-occurrence values for discrete spatiotemporal units to inform management decisions. Additionally, as technology and data inputs improve CDFW will be able to quantify and evaluate areas with historically high co-occurrence, which will provide a stronger basis for management actions.

5.6.2.1 Electronic Monitoring

Electronic vessel position monitoring was required for all participants in the California commercial Dungeness crab fishery as of the 2023-24 fishing season. This requirement will provide near real-time information on fleet dynamics and allow CDFW to track fleet-wide trends, identify hot spots of gear usage and vessel activity, observe individual vessel trajectories, and verify harvest location by matching vessel tracks to landing receipts. This comprehensive, fine-scale information will be an essential input into spatiotemporal analyses of co-

occurrence, supporting both real-time decision making and retrospective evaluations of management effectiveness. At this time, electronic monitoring will be limited to vessel position information, however CDFW will consider the value of additional equipment such as hydraulic or rotational sensors, allowing a more precise estimate of the number of pots hauled and evaluation of when fishing activity begins and ends.

Electronic monitoring data could also be paired with an electronic logbook where GPS data are automatically collected and matched to landing receipts, bi-weekly Fishing Activity Reports, or other documentation regarding vessel activity.

As described in Section 5.2, all vessels participating in the California commercial Dungeness crab fishery are required to submit a bi-weekly Fishing Activity Report via text or email to WhaleSafeFisheries@wildlife.ca.gov. Submission of the reports can be burdensome for fishery participants, and the workload for CDFW staff to review and enter the Fishing Activity Report is substantial. Collection of electronic vessel position monitoring data could allow automatic generation and submission of the Fishing Activity Reports, ensuring compliance and providing more robust data to inform CDFW's analyses of fleet dynamics, efforts to quantify co-occurrence, and the management decision process.

CDFW will continue coast-wide coordination efforts with the Washington and Oregon Departments of Fish and Wildlife and PSMFC on both technical and operational aspects of electronic monitoring. When paired with SDM (see Section 5.6.2.2), information gathered from electronic vessel monitoring may support CDFW's eventual transition to evaluating risk based on explicit measures of co-occurrence.

5.6.2.2 Marine Life Concentration Thresholds and Data Sources

As described in Section 5.2 and 5.3.1, RAMP relies on routine evaluation of information regarding the distribution and abundance of Covered Species. Currently, CDFW relies on a long-term data series collected by Monterey Bay Whale Watch and processed by NMFS scientists when evaluating entanglement risk in all Fishing Zones and across a suite of aerial and vessel-based surveys. During the permit term, CDFW will consider refining the Marine Life Concentration thresholds currently specified in regulation when information is available to meaningfully inform the thresholds. Potential improvements are described further below and include SDMs; predicted arrival dates based on environmental factors and lagged responses to abundance trends in other areas; and incorporating Effective Strip Widths for aerial and vessel surveys to calculate density rather than straight counts. CDFW will also specify distinct trigger values for each Fishing Zone.

A blue whale SDM and a similar model currently under development for humpback whales provide near real-time predictions of habitat suitability and presence, respectively, throughout the Plan Area. Outputs from these models will be particularly valuable when environmental conditions or available resources

constrain the ability of CDFW and partners to conduct routine surveys. The outputs from these SDMs are either density or probability of suitable habitat and cannot be evaluated against the survey-style triggers used currently. Once final versions of both models are available, CDFW will work with model developers, Working Group Advisors, and NMFS to incorporate the data into the RAMP process as a potential data source.

Survey speed, altitude, and arrangement of observers can all affect detection of the Covered Species during aerial and vessel surveys. Collecting and reporting this metadata, as well as the linear distance surveyed, would allow for calculation of an Effective Strip Width and relative density for each survey. CDFW could then adjust the Marine Life Concentration triggers from straight counts to relative density values, allowing for meaningful comparisons of findings from surveys with different protocols.

OPC-funded research (Nur et al. 2022) has recently produced models which forecast the arrival and departure of humpback and blue whales from key areas in Fishing Zones 3, 4, and 6 and identified lagged relationships in monthly abundances between these areas. These models may allow CDFW to take precautionary actions based on predicted arrival dates, however additional evaluation is needed to validate these findings and operationalize the models within the RAMP process.

CDFW relied upon best available science, including input from Working Group Advisors, when developing the current Marine Life Concentration thresholds. CDFW determined that lower thresholds would excessively limit fishing activity, while higher thresholds would be insufficiently protective of Covered Species. However, as improvements in best available science indicate that revised values are warranted, CDFW will undertake the needed amendment processes described in Section 6.3.

CHAPTER 6: IMPLEMENTATION OF CONSERVATION PLAN

This chapter describes the ITP performance review process (Section 6.1); the potential for fleet adopted fishing practices (Section 6.2); amendments to the Conservation Plan (Section 6.3); the renewal, suspension/revocation, and cancellation process (Section 6.4); changes in Conservation Plan circumstances (Section 6.5); and unforeseen circumstances (Section 6.6).

In developing this CP, CDFW was guided by the goal of supporting the recovery of humpback whale, blue whale, and leatherback sea turtle populations by reducing take in commercial Dungeness crab trap gear to the maximum extent practicable.

6.1 ITP Progress Report

To ensure that CDFW is fulfilling the commitments outlined in this CP, CDFW will submit an ITP progress report to NMFS every five years following permit issuance. Additionally, if backstop measures are required before the five-year period has concluded, CDFW will conduct an ITP progress report during the interval when the backstop measures are in place. The primary purpose of these reports is to document CDFW's ongoing implementation of the Conservation Program, support adaptive management approaches, and to meet CDFW's obligations under 50 CFR 222.301 subd. (h); i.e., to support compliance monitoring. The ITP progress report will also provide an opportunity to reflect, evaluate the CP as a whole, and potentially introduce changes as needed.

Each progress report will summarize actions and accomplishments related to the four objectives outlined in Chapter 5. At a minimum, each report will include the following:

Objective 1. Reduce co-occurrence of Covered Species by implementing fishery management measures that reduce entanglement risk:

- Summary of how RAMP functioned including a summary of CDFW and partner surveys for Covered Species and the dates each Fishing Zone opened and closed.
- Any improvements in best available science regarding RAMP management considerations.
- Updates regarding certification of innovative gear types as Alternative Gear and testing of EFPs.

Objective 2. Minimize the likelihood of Covered Species entanglement in lost or abandoned gear by increasing opportunities for derelict gear recovery and enhancing lost gear tracking and reduction measures:

- Summary of CDFW's work to minimize gear loss through enforcement of gear tending requirements, education and communication with fishery participants, and electronic monitoring.

- Summary of lost or abandoned Dungeness crab gear retrieval efforts during the prior calendar year from the Trap Gear Retrieval Program, voluntary efforts under Cal. Code Regs., Tit. 14 §132.2, and salvage efforts.

Objective 3. Mitigate the impacts of entanglements on Covered Species by supporting entanglement reporting, education, and analysis to reduce the likelihood of serious or fatal injuries.

- Summary of the collaborative efforts of the California, Oregon, and Washington Departments of Fish and Wildlife to minimize unidentified gear through new gear marking requirements (including new gear marking regulations, data sharing, forensic review of entanglements, gear innovations, and emerging science).
- Number and associated records of any entanglements and disentanglement efforts observed or reported by CDFW.
- Summary of participation of fleet participants, EFP participants, and CDFW staff that have taken the Level 1 Entanglement Response Training.

The ITP progress report may include additional information regarding the number of entanglements, trends in entanglement severity, updates on co-occurrence models, and new available science. While preparing the ITP progress report, CDFW will consider engaging in collaborative conversations in the form of discussions, workshops, or meetings with Working Group members, NMFS, and other stakeholders.

The ITP progress report will also provide CDFW with an opportunity to address unforeseen changes over the duration of the permit term. Some of these changes may include, but are not limited to, addressing new legislation or regulations, environmental changes or significant climatic events, or potential technological improvements. During this review period, CDFW may also consider use of decision support tools, which could provide greater consistency, structure, and analytical sophistication for the progress report process.

CDFW will make these reports available to the public on CDFW's Whale Safe Fisheries webpage for a period of five years and provide access to archived documents for the duration of the permit. The same public accessibility protocols will be applied to any information on entanglements, Marine Life Concentrations, and any other non-confidential information relied upon by the Director during decision-making, including risk assessment and management recommendation memos produced by the Working Group and CDFW staff recommendations transmitted to the Director. All information will be provided and archived in accordance with CDFW's Scientific Integrity Policy (CDFW 2017).

6.1.1 Decision Support Tools

During preparation of this CP, CDFW consulted with the developers for two specific decision support tools. One of the tools takes a hindcasting approach to anticipate tradeoffs (Samhouri et al. 2021). The other uses a management

strategy evaluation to create a simulation of the entire fishery, guided by historical data, to weigh tradeoffs among alterative management strategies in relation to pre-defined performance metrics (Free et al. 2023). Both tools rely on a similar conceptual model that evaluates co-occurrence of Covered Species and Covered Activity by relating habitat suitability models developed for large whales (e.g., Abrahms et al. 2019b) and fishery-dependent data from landing receipts and VMS. However, the tools then use different methodologies to translate this co-occurrence into entanglement risk. CDFW will continue to engage with decision support tool developers to assess utility of such approaches.

6.1.2 Five Year Cycle

The adaptive management framework is centered around a five-year review cycle. The five-year timeframe is designed to give CDFW sufficient opportunity to assess program effectiveness prior to making management or regulatory changes, while ensuring routine review of the Conservation Program. While some changes could be administrative in nature, many will likely involve formal rulemaking action by CDFW and/or formal amendment of the CP. As this will require a substantial investment of staff resources, conducting a focused effort once every five years will align with CDFW and NMFS staff resources and availability. In addition, a shorter timeframe is unlikely to provide sufficient time to conduct meaningful analyses due to the relative rarity of entanglements. The five-year timeframe additionally provides some certainty for industry, whose livelihoods may be directly impacted by any substantive changes to the Conservation Program.

The five-year review cycle mimics the backstop measures that CDFW has implemented for large whales (see Section 4.8). If backstop measures are implemented before the five-year period has concluded, CDFW will conduct an ITP progress report during the interval when the backstop measures are in place. This will allow CDFW and NMFS, in consultation with other partners, to determine whether changes are needed prior to resuming status quo management.

6.2 Fleet Adoption of Alternatives

While developing the Conservation Program described in Chapters 5 and 6, CDFW considered multiple potential Conservation Measures. CDFW identified two potential Conservation Measures which are not currently practicable: fixed season dates and active tending. Should the fleet (likely in collaboration with the DCTF and California Legislature) show interest in advancing these options, CDFW would work to incorporate these measures into the CP.

6.2.1 Shortened Season Dates

The management program described in Chapters 5 and 6 creates uncertainty for fishery participants. Restricting fishery operations to periods of extremely low entanglement risk, as defined by historical migration patterns, would require significantly fewer resources for CDFW to implement and enforce, reduce

CDFW's reliance on data collection efforts by outside partners, and may provide greater market stability. Modifying the season to a historically low-risk period (e.g., January through March) is however outside the statutory authority of CDFW. Additional analysis is needed to better understand the potential socioeconomic costs of this alternative to the fleet and fishing communities before considering such a change in season dates.

It should be noted that California fishery operations would also no longer be aligned with Oregon and Washington, as prescribed under the Tri-State Agreement.

Given the uncertainty regarding the degree of protection offered to Covered Species, as well as the potential for substantial economic impacts on certain sectors of the fishery, CDFW decided against pursuing shorted season dates at this time.

6.2.2 Active Tending Requirement

CDFW has considered transitioning to a more actively tended approach which requires fishermen to remain in close proximity to the trap gear and tend it more regularly. Close monitoring of deployed gear could provide benefits for both take minimization and entanglement reporting. However, shortening this interval would require a modification of current fishing practices.

The current statute restricting the trap service interval (Fish & G. Code § 9004) includes the condition "weather conditions at sea permitting," allowing for longer service intervals based an individual vessel's ability to safely service traps under prevailing weather and ocean conditions. Mandating a shorter service interval may increase risks to human health and safety. Furthermore, even in ideal conditions, fishermen report minimum pot handling times of 60-90 seconds. For a Tier 1 permitted vessel, this equates to up to 12.5 hours of handling time when fishing their full trap allotment. Combined with transit to and from the Fishing Grounds, as well as transit between deployed gear, it would be impossible to service their full set of gear on time frames shorter than 24 hours.

However, shorter service intervals would be more feasible if participants were using a smaller portion of their allocated traps. Further exploration of active tending may identify its suitability for incorporation into baseline fishing practices. CDFW would then engage in further discussion with the Working Group, DCTF, and Legislature to discuss modifications to Fish & G. Code § 9004 or other statutory requirements, as appropriate.

6.3 Amendments

The following sections describe the process by which CDFW will amend the CP and promulgate new or amended state regulations, should the ITP progress report process described above identify needed changes to the Conservation Program.

6.3.1 Minor Amendments to the CP/ITP

Minor amendments may be made by mutual agreement between CDFW and NMFS without any prior public notice or comment period, provided NMFS determines they otherwise satisfy the requirements of applicable federal statutes and regulations, do not result in an increase in levels of incidental take, and the activity does not change in ways that were not analyzed in applicable analyses under NEPA and ESA Section 7. The following changes are considered minor amendments, unless they change the intended purpose of the amended text:

- Correction of typographical, grammatical, and similar editing errors
- Correction of maps, numbers, and similar substantive errors that deviate from the references they are pulled from
- Minor changes to survey, monitoring, reporting, or analytical protocols

For every minor amendment, the proposing agency shall provide a written statement describing its effect on the Covered Species, rationale for the amendment, and its effect on CP implementation. Amendments must be approved in writing by both parties, and both parties will endeavor to reach agreement within 45 days of the proposed amendment's initial transmittal. Following this agreement, the amended document(s) will be posted on CDFW's Whale Safe Fisheries webpage.

6.3.2 Major Amendments to the CP/ITP

An amendment is considered a major amendment if it is not a minor amendment. In general, any amendment which affects the take level of a Covered Species, modifies the scope of this CP, or otherwise changes the Conservation Program in a way not analyzed by this CP or associated environmental review documents (e.g., NEPA) will be considered a major amendment. These amendments must also satisfy federal statutory and regulatory requirements.

As with minor amendments, either CDFW or NMFS may initiate a major amendment to the CP or the ITP. The proposing agency will provide a written statement describing the amendment's effect on Covered Species, the rationale for the amendment, and its effect on CP implementation. CDFW shall provide notice of any major amendment under consideration on its Whale Safe Fisheries webpage with a 45-day public comment period. Both CDFW and NMFS shall review and consider all public comments prior to taking final action on the proposed amendment. The proposed amendment will be adopted following written approval from both CDFW and NMFS, after which CDFW will post the amended document(s) on the Whale Safe Fisheries webpage.

6.3.3 Amendments to State Regulations

Fish & G. Code § 8276.1 provides CDFW with the authority to develop and amend regulations implementing RAMP and other necessary measures to reduce marine life entanglement risk. The amendment process for any of the

regulations underlying the Conservation Program described in Chapter 5 will adhere to the California APA (see Section 1.3.7). At a minimum, this requires CDFW to provide a notice to the public through the California Notice Register that includes the amended text of the regulations and a statement of reasons providing rationale for the proposed changes. The public must be afforded at least 45 calendar days to provide comments before the amendment can be adopted.

Given public interest in marine life entanglement issues, CDFW has historically conducted additional outreach with key stakeholders prior to commencing the formal rulemaking process, including adoption of regulations establishing the Trap Gear Retrieval Program, RAMP, and standardized gear marking requirements. CDFW will continue to proactively engage with stakeholders throughout the term of the ITP when contemplating changes to these and other regulations relevant to this CP.

6.4 Renewal, Suspension/Revocation, and Cancellation

As noted in Section 2.3, CDFW requests NMFS issue a renewable ITP. CDFW will submit its renewal request at least one year before the permit's expiration. ITP renewal shall follow the terms of federal regulation (50 CFR 222.304).

NMFS may suspend or revoke the permit if CDFW fails to implement the CP in accordance with the terms and conditions of the permit or if suspension or revocation is otherwise required by federal law. Suspension or revocation of a Section 10(a)(1)(B) permit, in whole or in part, must be in accordance with the process provided in federal statutes and regulations.

If the Conservation Measures prescribed by this CP are no longer required due to improved stock status or decreased risk of entanglement from the Covered Activity, CDFW will request a cancellation of the ITP. Cancellation will follow the terms of federal regulation (50 CFR 222.306).

6.5 Changed Circumstances

As part of this CP, CDFW must contemplate changed circumstances affecting the Covered Species that may necessitate additional conservation and mitigation measures and can be reasonably anticipated (50 CFR 222.307 subd. (g)). Changed circumstances include relatively predictable, but unplanned, events. NMFS will not require CDFW to implement measures beyond the Conservation Program described in Chapter 5 unless the changed circumstance is provided for in the following sections.

6.5.1 Covered Activity Take of Newly Listed Species

In the event a new species that may be affected by the Covered Activity is listed under ESA during the permit term, NMFS will determine whether current Conservation Measures in the CP are sufficient to avoid take of the newly listed species. If not, NMFS will work with CDFW to identify appropriate measures.

6.5.2 De-listing of Covered Species

In the event a Covered Species is delisted during the permit term, CDFW will continue to include assessments of take and removals in the annual report to NMFS for the duration of the permit. CDFW will also evaluate whether changes to the Conservation Program are appropriate and consider initiating a major amendment process and associated updates to state regulations.

6.5.3 Change in Covered Species Status Under ESA

In the event ESA classification of a Covered Species (endangered vs threatened) changes during the permit term, during the next ITP progress report CDFW will consider whether changes to the Conservation Program are appropriate.

6.5.4 Designation or Revision of Critical Habitat; Changes to Stock Abundance, Distribution, or DPS structure

As described in Section 4.6.3, CDFW does not anticipate trap gear will significantly impact currently designated critical habitat for humpback whales or leatherback sea turtles. Should additional or revised critical habitat be designated for Covered Species, CDFW will evaluate whether a major or minor amendment and associated changes to state regulations are warranted.

CDFW anticipates changes in the abundance, distribution, and DPS/stock structure of Covered Species over the term of the permit. As part of the ITP progress report process, and more often as warranted, CDFW will consider the best available science and determine whether amendments to the CP and associated state regulations are warranted.

6.6 Unforeseen Circumstances

Unforeseen circumstances are changes in circumstances affecting the Covered Species that could not reasonably have been anticipated by CDFW and NMFS at the time of the CP's development, and that result in a substantial and adverse change in the status of the Covered Species (50 CFR 222.102). Such events by their very nature cannot be reasonably predicted and considered in the proposed Conservation Program. Under terms of federal regulation (50 CFR 222.307 subd. (g)(3)), NMFS may require additional management measures from CDFW, provided that they are within the current scope of this CP. NMFS bears the burden of demonstrating that unforeseen circumstances exist, and it will not require additional measures and resource commitment from CDFW without CDFW's consent. Should unforeseen circumstances arise, CDFW will work with NMFS to redirect existing resources and evaluate additional actions as appropriate.

CHAPTER 7. FUNDING ASSURANCES

CDFW is responsible for implementation of this CP and ongoing management and monitoring during the permit term. Section 10(a)(2)(A)(ii) of the ESA and NMFS implementing regulations at 50 CFR § 222.307 subd. (b)(5) require ITP applicants to demonstrate sufficient funding is available to implement the measures described in their CP, including changed circumstances and any future CP amendments.

This following chapter describes the state resources that will support implementation of the CP (Section 7.1), anticipated participation from various non-state entities (Section 7.2), and the role of grant funding (Section 7.3).

7.1 State Funding

CDFW is primarily funded through an annual budget cycle (July 1 – June 30) and is subject to state agency funding rules and processes. Funding sources include general funds from California income taxes, permit and licensing fees, dedicated accounts funded by other assessments, and federal grants. The California Legislature appropriates and allocates funding to all state agencies, including CDFW. Typically, CDFW receives funding to cover staffing and operating expenses for existing programs. In addition, either the Executive Branch or the Legislature can propose budget changes to cover costs for new or expanded programs. During the 2022-23 fiscal year, CDFW had over 3,000 employees and a budget of $1.321 billion (Table 7-1).

Table 7-1. CDFW budget for the 2013-14 through 2023-24 fiscal years in millions of dollars.

Fiscal Year	CDFW Budget
13-14	$456
14-15	$550
15-16	$563
16-17	$576
17-18	$601
18-19	$620
19-20	$636
20-21	$641
21-22	$1,040
22-23	$1,321
23-24	$1,241

CDFW cannot guarantee the amount of funding that will be available over the permit term because of the annual budgeting process and the prioritization that occurs based on available state funding. However, CDFW will work to ensure staffing and operating resources are sufficient to fully implement the CP. Budget allocations over the last 10 years (Table 7-1), policy statements by the California Legislature (e.g., AB 1241, Keeley, 1998; SB 1309, McGuire, 2018), OPC (e.g., OPC 2020a), and other potential funding partners indicate reducing marine life entanglements is a priority for the State of California. Given this, CDFW does not expect any reduction in funding that would impact its ability to fulfill obligations

under an issued permit. If such circumstances arise, CDFW will notify NMFS and work with NMFS to prioritize CP obligations to maximize benefits to Covered Species during any period of reduced resources. Such changes to CP operations may be considered a major amendment and would then follow the process described in Section 6.3.2.

Both CDFW and OPC began allocating staff time and resources to marine life entanglement issues in fall 2015. Initially, these efforts were absorbed as part of general management for the commercial Dungeness crab fishery. Recognizing the importance of, and increased workload associated with, addressing marine life entanglements, the Budget Act of 2018 included dedicated staffing and funding for CDFW. The Budget Act of 2018 also included a one-time general fund allocation of $7.5 million to the OPC to address marine life entanglement risk. Of this, $1 million was directed to support sea lion stranding response and $1 million was directed to the Drift Gillnet Transition Program mandated by Fish & G. Code § 8583.

At the November 13, 2019, OPC meeting, OPC approved an investment strategy to guide investment of the remaining funds, which must be spent by July 1, 2025 (OPC 2019). This funding is available to support a variety of projects, including development of predictive models to inform real-time assessment of entanglement risk and testing of gear innovations. As of February 2024, OPC has provided nearly $6 million to fund projects consistent with the 2019 investment strategy to advance entanglement science and reduce the risk of whale and sea turtle entanglement in fishing gear. Of these, the largest allocation was $3.8 million to PSMFC to support projects that improve data streams that inform entanglement risk, the development of a ropeless fishing management portal, expansion of a ropeless gear library, and fishing line procurement for the commercial Dungeness crab fleet.

In total, OPC has approved 14 projects that support the strategy's goals of advancing collaborative partnerships, improving the best available science, promoting gear innovation, enhancing entanglement response, and improving outreach. Through a combination of OPC funding and general fund allocations, the State of California has provided nearly $770,000 to the Large Whale Entanglement Response Network (see Section 5.5 for further details) since 2015. The Budget Act of 2022 also included additional staffing and funding for CDFW, including approximately $100,000 which was used to purchase electronic monitoring equipment. CDFW worked closely with PSMFC to secure additional funding so that the entire active commercial Dungeness crab fleet could be outfitted with required electronic vessel position monitoring equipment.

As described in Section 1.2, primary responsibility for implementation of the CP falls within the MR, whose budget has steadily increased since the 2013-14 fiscal year (Table 7-2). The Budget Act of 2018 included funding for two full time MR staff within the Invertebrate Management Program dedicated to marine life entanglement issues. Staff capacity was further augmented through the Budget Act of 2022, which included funding for three additional dedicated MR staff.

Upon issuance of the ITP, their primary duties will include implementation of the CP, including the underlying RAMP regulations. Within the Invertebrate Management Program, additional staff who actively manage the Dungeness crab fishery will support CP implementation. Outreach and education staff, administrative staff, and managers within MR will also provide support.

Table 7-2. MR budget for the 2012-13 through 2023-24 fiscal years in millions of dollars.

Fiscal Year	MR Budget
13-14	$18.9
14-15	$19.0
15-16	$19.8
16-17	$20.7
17-18	$20.5
18-19	$25.3
19-20	$26.2
20-21	$25.7
21-22	$29.2
22-23	$31.1
23-24	$30.4

Specifically, MR staff duties will include:

- Participation in, and oversight of, constituent groups (e.g., Working Group, DCTF)
- Routine monitoring of available data streams
- Research and development to improve RAMP performance
- Compilation and synthesis of available data to inform RAMP risk assessments
- Administering the Trap Gear Retrieval Program and supporting other lost gear recovery efforts
- Supporting entanglement response activities
- Supporting NMFS forensic reviews, including conducting interviews with California fishermen whose gear was involved in an entanglement
- Coordination with Oregon and Washington regarding entanglement avoidance, minimization, and monitoring efforts
- Oversight and coordination of Alternative Gear development and testing
- Outreach to Dungeness crab fishery participants and other trap fisheries

CDFW has numerous staff and operational resources from several other functions, including LED, OGC, DTD, OCEO, RU, LRB, and Executive who will assist with CP implementation. Table 7-3 provides an overview of which function areas will be involved in each of the CP commitments.

Table 7-3. Summary of CDFW commitments and involved function areas.

CDFW Commitment	Function Area
RAMP risk assessments and management measures	MR, LED, OGC, OCEO, Executive
Procedural improvements to RAMP	MR, LED, OGC, RU, Executive
Management measure compliance	MR, LED
Electronic vessel location monitoring	MR, LED, DTD, LRB
Authorization of Alternative Gear	MR, LED, OGC
Lost or abandoned gear retrieval	MR, LED, LRB
Improvements to baseline fishing practices	MR, LED
Entanglement response and gear identification	MR, LED
Outreach to fleet	MR, OCEO, LRB
Progress report of Conservation Program	MR, LED, OGC, Executive
Implementation of needed regulatory changes, preparing minor or major CP amendments	MR, LED, OGC, RU, Executive

LED staff and equipment (e.g., vessels, aircraft) will support the surveys to assess Covered Species presence. If available information triggers management action under the RAMP, LED will help select appropriate management measures and inform implementation timelines. LED will also evaluate fleet compliance with implemented management measures as well as reporting requirements and take appropriate enforcement actions when violations occur. LED will provide input regarding the design and function of electronic vessel location monitoring systems, as well as review available information from those systems. LED will work with MR staff to review available documentation from confirmed entanglements and identify those which occurred in California commercial Dungeness crab gear. LED will also work with MR staff to review requests for authorization of innovative gear types as Alternative Gear. LED will conduct inspections of gear retrieval operations, including those of the Trap Gear Retrieval Program, on an as-needed basis. LED will also participate in research and development to improve RAMP performance, 5-year reviews of the Conservation Program, developing new or amended state regulations, and preparing CP amendments.

OGC will be instrumental in reviewing available information to ensure CDFW selects management actions which align with RAMP regulations and obligations arising out of prior litigation, as well as preparing management action declarations. OGC will also participate in research and development to support improvements to RAMP performance, 5-year reviews of the Conservation Program, developing new or amended state regulations and preparing CP amendments.

DTD maintains CDFW webpages and electronic databases, as well as biogeographic data resources and software applications. DTD will provide technical support to LED and MR staff for technological aspects of authorized Alternative Gear and electronic vessel location monitoring data. OCEO will support the development of press releases and other external communications regarding RAMP risk assessments and management measures. The RU will

oversee internal and public-facing processes for promulgation of new or amended state regulations, as required throughout the term of the permit. LRB will issue Trap Gear Retrieval Permits and collect associated fees. LRB is also responsible for issuing commercial fishing licenses, commercial Dungeness crab permits, and vessel registrations, and therefore routinely engages with fishery participants. LRB will work with MR to identify and distribute appropriate outreach materials to fishery participants.

Executive staff, specifically the Director, hold decision-making authority regarding implementation of Conservation Measures, including actions taken under RAMP. As such, Executive staff will provide high-level policy guidance regarding CDFW actions and priorities throughout the term of the permit. Executive staff will also develop requests for any needed budget and staffing augmentations and redirect existing staff to support CP implementation, as appropriate.

Taken together, direct allocations to both OPC and CDFW's MR, as well as dedicated staffing within the Invertebrate Management Program, reflect a portion of the state funding available to support CP implementation over the requested permit term (Table 7-4). However, these values substantially underestimate CDFW's anticipated investment, as they do not reflect all operating expenses or CDFW staff time directly tasked with supporting CP implementation, specifically the activities of other CDFW functions discussed above as well as other staff within MR. Existing funding for other functions mentioned above is expected to continue throughout the permit term and adequately support CDFW's obligations under the CP.

Table 7-4. Minimum amount of state funding available to support CP implementation. MR staff costs include salary, benefits, and operating expenses for three Range C Environmental Scientists, one Range A Senior Environmental Scientist Specialist, and one Range A Senior Environmental Scientist Supervisor. Amounts are as currently allocated, and not adjusted for inflation.

Category	Annual Cost	Over 15-Year Permit Term
OPC General Fund Allocation	NA	$5,400,000
Dedicated MR Staff	$972,000	$14,580,000
Total	$972,000	$19,980,000

In addition, enabling legislation for the Trap Gear Retrieval Program described in Sections 5.4 (Fish & G. Code § 9002.5) includes a requirement for CDFW to fully recover reasonable costs of administering and implementing the program. As other methods of gear recovery will be conducted entirely by external parties, CDFW anticipates this program will be cost-neutral over the term of the permit.

7.2 Anticipated Non-State CP Implementation Partners

While CDFW anticipates the available state funding discussed above will be sufficient to fulfill state obligations under the CP, CDFW also recognizes the importance of working with outside entities in CP implementation. There are

several non-state entities which have been involved in funding recent projects or activities related to reducing the risk of marine life entanglements, and who may be reasonably expected to continue doing so throughout the permit term.

As highlighted in Sections 1.5.1 and Appendix E, the Working Group has been an essential partner in developing key elements of this CP. Between September 2015 and October 2023, the Working Group held over 145 meetings. While many of these meetings were virtual, others were held in-person in Santa Rosa, and required travel from as far away as San Luis Obispo and Crescent City. CDFW anticipates the Working Group will participate in at least 10 meetings a year throughout the term of the permit. CDFW anticipates the Working Group will remain engaged throughout the permit term and considers their time and travel expenses to be an in-kind contribution towards CP implementation.

Implementation of the Conservation Measures described in Chapters 5 and 6 will create additional operating costs for individuals participating in the Covered Activity. As described in Section 5.6.2.1, while electronic vessel position monitoring equipment is being provided at no cost to active fishery participants, ongoing service and data transmission costs will be borne by industry. Conducting surveys to evaluate marine life concentrations are particularly costly, yet also critical to implementation of the CP. While CDFW anticipates state resources will support some level of survey activity, it will also facilitate participation of commercial fishing vessels. Previously commercial vessel participation in surveys provided data to inform RAMP (see Section 5.3.1.2). Given past participation and the importance to the fleet of maximizing fishing opportunity, CDFW anticipates continued industry involvement in these surveys.

PSMFC is an interstate compact agency that promotes and supports policies and actions to conserve, develop, and manage fishery resources in a five-state member region (California, Oregon, Washington, Idaho and Alaska). Through this forum, CDFW works with other resource agencies and the fishing industry to determine how both federal and non-federal funds can be directed to address regional needs, including marine life entanglements in the commercial Dungeness crab fishery. Since 2017, PSMFC has helped convene three regional workshops to facilitate information sharing, improve collective knowledge about whale entanglements, review forensic data provided by gear removed from entangled whales, and develop recommendations for gear innovations and other options to reduce entanglement risk. PSMFC staff are also active participants in the Working Group. Furthermore, PSMFC has a stated policy resolution to continue to work on marine life entanglements issues (PSMFC 2019). Based on these commitments and examples of past funding and participation on this issue, CDFW reasonably expects to continue to work with and/or pursue funding from PSMFC to support activities related to CP implementation over the term of the permit.

7.3 Grants

As a state wildlife management agency, CDFW is eligible to apply for federal, state, and non-governmental organization funds to support CP tasks. CDFW will

evaluate future grant opportunities and consider applying for funding, however implementation of this CP is not dependent upon external grant funds. This, however, does not preclude future grant applications if the situation warrants it.

CHAPTER 8. ALTERNATIVES

Issuance of an ITP requires the applicant to avoid, minimize, and mitigate take of the Covered Species to the maximum extent practicable. CDFW did not select the alternatives described in this Chapter due to the lack of necessary management authority, limited information regarding their effectiveness in reducing take of Covered Species, and/or anticipated economic impacts on the Covered Activity; rendering the following options impracticable.

8.1 Require Use of Multi-Trap Trawls

Under the Conservation Program detailed in Chapters 5 and 6, a transition from single traps to multi-trap trawls is one potential method of achieving vertical line reductions and could be authorized as Alternative Gear (see Section 5.3.2.4). In addition to the safety issues and potential for gear conflict noted in Sections 5.3.2.4 and Appendix E, CDFW ultimately does not have the necessary management authority to allow the use of multi-trap trawls. Per (Fish & G. Code § 9012 subds. (b)), no trap shall be used to take Dungeness crab if the trap is attached to another trap by a common line in Districts 6, 7, 8, and 9 (north of the Sonoma/Mendocino county line). There is also uncertainty regarding the benefit to Covered Species, as multi-trap trawls would reduce encounter rates but any entanglements which did occur would involve heavier gear because of the multi-trap configuration. Fishing with multi-trap trawls may also pose safety concerns for smaller vessels, which have less available deck space and capacity to handle the gear. Only requiring vertical lines on a subset of fished traps also poses concerns regarding CDFW's ability to enforce trap limits and closed areas.

Given the lack of necessary management authority, potential increased complexity of entanglements, and vessel safety concerns, CDFW could not require multi-trap trawls at the time this draft application and CP were prepared.

8.2 Require Use of Pop-Up ("Ropeless") Gear

As described in Sections 5.3.2.4, there is increasing interest in replacing standard trap configurations (which include persistent vertical lines) with pop-up gear. CDFW received numerous public comments regarding use of pop-up gear during the rulemaking process to adopt Cal. Code Regs., Tit. 14 § 132.8. CDFW considered requiring the use of pop-up gear throughout the fishing season, rather than limiting its use to certain closures after April 1. Ultimately, CDFW decided against this alternative due to concerns about gear conflict, enforceability, implementation costs, and compatibility with fishery operations.

As described in Appendix A of the Final Statement of Reasons (CDFW 2020c) and Section 5.3.2.4, CDFW chose to prohibit the use of pop-up gear in an open Fishing Zone due to concerns about gear conflicts with traditional Dungeness crab trap gear, other trap fisheries, and commercial trawl fisheries. Furthermore, the greatest need for Alternative Gear is during spring closures, when entanglement risk is expected to continue increasing through the end of the fishing season as Covered Species return to the Fishing Grounds. Allowing the use

of pop-up gear in these situations allows for continued harvest of Dungeness crab in a manner that poses a lower risk of entanglement, mitigating economic impacts of such closures. Since traditional commercial Dungeness crab gear will not be deployed in those areas for the remainder of the fishing season, the potential for within-fishery gear conflict is reduced. During the fall and winter months, when Covered Species are either absent from or present in low numbers within the fishing grounds, the additional protective benefit from the use of pop-up gear is outweighed by concerns regarding gear conflict.

Should CDFW require the entire fishery to transition to pop-up gear, each vertical line would need to be replaced with a pop-up unit and (for on-demand releases) each vessel would also need an on-deck or hull-mounted unit to locate the gear and transmit the release signal. Calculating the cost for each participant to purchase, install, and operate the required gear is difficult, as it depends on whether a single pop-up unit would be attached to each trap or whether they could be deployed onto multi-trap trawls (see Figure 2-3). Additionally, given the number of traps used in the fishery, this sort of fleet-wide transition to pop-up gear could drive down production costs. However, 2021 equipment acquisition costs for a National Marine Sanctuary Foundation gear innovations testing project provide some insight into potential costs. Galvanic timed-release devices were by far the lowest cost option ($225/unit), although one component would need to be replaced at a cost of $1 each time the trap was re-deployed. Electronic timed-release devices were slightly more expensive ($300/unit). Of the four acoustic-triggered release devices, per-unit costs ranged from $1,700 - $11,000. In contrast, a traditional Dungeness crab trap, rope, and buoys typically costs $275. It is unclear at this time how the additional costs of transitioning to pop-up gear would impact economic viability of the fishery.

After consideration of the potential harm from gear conflicts and the anticipated economic impacts on the fishery, CDFW found this to be an impracticable alternative at this time.

8.3 GPS Use to Monitor for Entanglements

CDFW considered, but ultimately rejected, an alternative method relying on GPS gear tracking.

Broad scale deployment of GPS trackers on commercial Dungeness crab trap gear would provide specific, real-time information on trap location. Through a combination of machine-learning algorithms and manual (human) review, CDFW could detect gear movement patterns consistent with gear being carried by a large whale. These probable detections could then be verified with deployment of CDFW aerial or vessel assets, or an entanglement response team. In addition to providing greater certainty regarding the amount of take resulting from the Covered Activity, this approach would also have benefits for entanglement response efforts.

Each large whale entanglement response is dictated by environmental conditions, available equipment and personnel, behavior of the entangled

whale, and nature of the entanglement (personal communication, Justin Greenman, NMFS WCRO, August 2, 2021). One common element of successful responses is the response team's ability to locate and track the whale's movements. This can be done either through ongoing monitoring of the entangled whale from vessel or aerial platforms, or through deployment of a GPS tracker on the entangling gear. Continuous observation from vessel or aerial platforms is resource intensive, can be hindered by weather and sea conditions, and is very difficult at night. Deployment of a GPS tracker is often a preferrable method; however, this is a delicate operation that can only be done by trained members of the Large Whale Entanglement Response Network. In some cases, by the time the response team arrives on site, the whale is no longer visible, precluding any further actions. In other instances, the response team may lose sight of the animal due to weather or sea conditions, or the specific gear configuration or behavior of the whale may preclude attachment of a telemetry buoy. Of the 316 confirmed large whale entanglements off the West Coast between 2014 and 2023 where the whale was alive at the time of initial reporting, 263 (83%) either had no response or a response that resulted in only partial removal of the gear. In these instances, if the entangling gear already had a GPS tracker, response teams would be far more likely to locate the whale and mount a successful response.

However, to reliably monitor for potential entanglements, each individual trap (or string of traps) would need to be outfitted with a GPS gear tracker. This would entail one-time hardware costs as well as recurring data subscription fees. Preliminary scoping with one manufacturer has indicated fleetwide costs would depend on whether gear was fished as single buoys or trawls (and therefore the total number of buoys required), as well as the spacing between each buoy (which determines the ratio of lower-cost radio buoys to higher-cost satellite buoys). CDFW will continue to track developments in this space and may later identify a feasible path forward for implementation.

8.4 Permanent Capacity Reduction

As described in Section 5.1, the Conservation Program in this CP is primarily focused on reducing co-occurrence between Covered Species and the Covered Activity. As a result, CDFW considered multiple methods for implementing permanent reductions in fishery capacity (i.e., amount of fished gear) to further limit entanglement risk due to co-occurrence. Capacity reductions can be targeted at decreasing the number of participating vessels in the fishery, the amount of gear being fished by those vessels, or both. To be meaningful, the reduction must apply to active rather than latent effort. Three common methods of achieving capacity reductions within a limited entry fishery are a permit buy-back, permit stacking, and reduced gear (e.g., trap) allotments.

Based on the considerations detailed below for each of these methods, CDFW did not seek a permanent capacity reduction for the fishery. However, acknowledging the importance of reduced capacity as a tool to manage

entanglement risk, CDFW has included temporary vertical line reductions as a potential management action under RAMP (Sections 5.3.2.2), which can achieve a similar result on an as-needed basis when implemented by the Director.

8.4.1 Permit Buy-Back

Implementing a successful permit buy-back program can be costly, must remove a meaningful portion of active effort from the fishery, and is ultimately driven by the interest of fishery participants. CDFW recently implemented a buy-back program for the DGN fishery pursuant to SB 1017 (Allen, 2018), which offered active permitholders $110,000 and inactive permitholders $10,000 for surrendering their permit and nets. Currently, a total of $3.3 million has been invested in the buy-back program, of which $2.3 million is from state funding, and CDFW anticipates buying back 44 permits. During 2018, the last year before the buyout program began, there were 69 total DGN permits of which 28 (41%) were active. In contrast, as described in Chapter 2, the California commercial Dungeness crab fishery has approximately 550 permitted vessels; on average, 80% were active during the 2017-18 through 2019-20 seasons. Additionally, mean Ex-Vessel Value during the 2017-18 through 2019-20 seasons for a given Dungeness crab permit ($120,000) was substantially higher than that for a DGN permit ($34,357) during calendar year 2018. Both the percentage of active vessels and mean per-permit Ex-Vessel Value make it likely that substantially greater funding would be needed to implement a similar degree of capacity reduction in the commercial Dungeness crab fishery. Without a direct appropriation from the California Legislature, or commitments from outside entities, CDFW lacks both the necessary funding and statutory authority to implement a permit buy-back program.

CDFW would need to develop meaningful targets for the buy-back program that correspond to a sufficient decrease in entanglement risk. Furthermore, given the derby nature of this fishery, any reduction in the amount of gear may alter typical fishing season dynamics. If it takes longer for the fleet to harvest the same amount of crab, remaining vessels may fish their full trap allocation for a longer period. This could have the unintended effect of increasing the amount of trap gear present during the spring or summer months, when Covered Species are likely to be returning to the Fishing Grounds. Recent discussions by the DCTF highlighted a variety of industry concerns around cost, equity, harm to local communities, and other unintended side effects of a permit buy-back program (DCTF 2020).

At this time, CDFW does not anticipate gaining authority to establish a buy-back program without broad support from the DCTF and other partners.

8.4.2 Permit Stacking

Dungeness crab permits are assigned to specific vessels, and each vessel may only fish a single permit (Fish & G. Code 8280.2 subds. (b) and (d)). Permit

stacking would allow multiple Dungeness crab permits, and therefore more gear, to be fished by a given vessel. If paired with a stacked permit trap reduction, whereby the vessel could fish the full trap tier for the first permit but only a portion of the trap tier (e.g., 50%) for subsequent permits, permit stacking would reduce the maximum amount of gear that could be deployed in the fishery. However, as highlighted in Section 2.2.4.1, the maximum amount of gear that could be fished does not necessarily reflect the amount of trap gear that is actually deployed at any given time. Furthermore, if permits that are not currently being fished are stacked onto a vessel that does participate in the fishery, permit stacking could actually result in re-activation of latent effort and increase the amount of trap gear being fished, which would be contrary to the intent. CDFW anticipates permit stacking would differentially impact the diverse business models currently employed by fishery participants and could fundamentally change the nature of the Covered Activity, resulting in fishery consolidation. Finally, authorization for permit stacking would require a legislative change.

Due to the lack of appropriate targets, the potential for increased rather than decreased fishing effort, potential impacts on the economic viability of the fishery, and lack of authority, CDFW did not select this alternative for inclusion in the CP.

8.4.3 Reduce Gear Allotments

As described in Section 2.2.3, the number of traps a given vessel can deploy is specified by the tier level of the Dungeness crab vessel permit. The existing tiers were established following extensive negotiation with the fleet. Modifying the trap tiers could reduce the maximum amount of gear that could be deployed in the fishery. While some of the limitations from Section 8.4.2 apply, the conservation benefit would be more predictable as this method would implement a reduction across the entire fleet, rather than phasing in reductions through permit stacking as individual operators decide to purchase additional permits. This could be done by a proportional reduction across all tiers, or by some differential reduction. For example, all tiers could be limited to 75% of their current trap allotment, or a set number of traps (e.g., 25) could be subtracted from each tier's current allotment.

Prior to implementation of RAMP regulations, CDFW had limited available information regarding the number of deployed traps on either a fishery-wide or per-permit basis. Without this information, it is not possible to calculate the appropriate reduction in the number of permitted traps that would translate to a reduction from baseline levels of fishing activity. It is also unclear what impact adjusting the permit tiers would have on the economic viability of the fishery. Furthermore, Fish & G. Code § 8276.5 subd. (d) requires that any changes to the existing permit tiers be supported by the DCTF, so CDFW cannot unilaterally implement modifications.

Given the potential for adverse economic impacts on the fishery, CDFW decided against implementing this alternative.

List of Contributors:

CDFW would like to recognize the following individuals that made substantial contributions to this ITP application and Conservation Plan.

Ryan Bartling

Joanna Grebel

Morgan Ivens-Duran

Christy Juhasz

Allegra La Ferr

Mary Loum

Sonke Mastrup

Allison Mitchell

Anthony Shiao

Craig Shuman

Garrett Wheeler

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