

State of California
Natural Resources Agency
Department of Fish and Wildlife

Standardized Regulatory Impact Assessment

Proposed Addition of Section 132.8, Title 14, California Code of Regulations
for the
Risk Assessment Mitigation Program: Commercial Dungeness Crab Fishery

Prepared by
California Department of Fish and Wildlife
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OVERVIEW AND NEED FOR THE PROPOSED REGULATIONS

The number of confirmed marine life entanglements with crab traps and other gear off the U.S. West Coast has increased since 2015. The primary marine life species of concern reported as entangled in California waters are humpback whales, blue whales, and Pacific Leatherback sea turtles. The purpose of the proposed addition of Section 132.8 is to mitigate and reduce such entanglements.

As reported in the 2018 Whale Entanglement Forensic Review Workshop Summary Report (Forensic Report; Pacific States Marine Fisheries Commission (PSMFC) and National Oceanic and Atmospheric Administration (NOAA), 2018)), Dungeness crab is the largest trap fishery off the west coast with the highest number of participants and number of traps. While the majority of confirmed entanglements has involved gear of unknown origin, the commercial Dungeness crab fishery has the highest confirmed entanglement reports of any fishery.

The California Department of Fish and Wildlife (CDFW) has taken several steps to better understand the causes of, and to mitigate, marine life entanglements. CDFW has established “Whale Safe Fisheries” efforts and resources dedicated to working through issues for California commercial and other fisheries. A major force active in abating marine life entanglements is the California Dungeness Crab Fishing Gear Working Group (Working Group), convened in partnership with National Marine Fisheries Service (NMFS) and the California Ocean Protection Council (OPC). Established in September 2015, the Working Group is comprised of commercial and recreational fishermen, environmental organization representatives, members of the disentangling network, as well as state and federal agencies. The Working Group’s responsibilities include informing the legislature, state, and federal agencies about entanglements in Dungeness crab fishing gear; provide guidance and recommendations to the commercial industry about how to avoid/minimize whale entanglements, and proposing measures or experiments that can be developed or implemented by the fishery.

LEGISLATIVE AND STATUTORY ACTIONS

Senate Bill 1309 (SB 1309; Fisheries Omnibus Bill of 2018, McGuire), signed into law on September 30, 2018, amended and added several Fish and Game Code (FGC) sections to require adjustments to the commercial Dungeness crab fishery. The resultant implementing regulatory actions are completed, or underway, as follows:

Trap Gear Retrieval Program: CDFW established a Trap Gear Retrieval Program (Section 132.7, Title 14, California Code of Regulations) that incentivizes the removal of commercial Dungeness crab trap gear remaining in the ocean after the end of the fishing season to reduce entanglement risk, other threats to marine life, and navigational hazards. The regulations were effective September 20, 2019 in time for the 2020 gear removal season.

Standardized Commercial Trap Marking: CDFW established a standardized marking program for commercial trap fishing gear to better identify the fisheries involved in marine life entanglements. Identifying the trap gear involved in marine life entanglements would allow the State to direct resources to those fisheries with the greatest contribution to entanglement. Amendments to sections 122.1, 125, 126.1, 180.1, and 180.5, of Title 14, CCR were effective October 28, 2019, with a compliance date of May 1, 2020.

Risk Assessment Mitigation Program (RAMP): This program is the subject of this rulemaking. The addition of Section 8276.1 provides in part the framework for regulatory action to reduce the risk of marine life entanglement. FGC 8276.1 subsection (c)(1) provides that "Until the regulations adopted pursuant to subdivision (b) become effective or until November 1, 2020, whichever occurs first, if the Director, in consultation with the California Dungeness Crab Fishing Gear Working Group, determines that the California Dungeness crab fishery is being conducted in a manner that poses a significant risk of marine life entanglement, the Director may restrict the take of Dungeness crab in those areas where that risk has been determined to exist, including through time or area closures, or both." Additionally, FGC Section 8276.1 requires CDFW, in consultation with the Working Group and other stakeholders, to adopt regulations establishing criteria and protocols to evaluate and respond to potential risk of marine life entanglement. The RAMP regulation proposes to add Section 132.8 to Title 14, CCR and is required to be effective no later than November 1, 2020.

EXISTING STATUTE AND REGULATIONS

The commercial Dungeness crab fishery in California is regulated by FGC sections 8275 et seq and implemented by regulations in sections 132.1 through 132.7, Title 14, CCR. These statutes and regulations address fishing districts and season dates, season opening of the fishery after testing crab meat quality, and a tiered permitting structure and trap limit, among other things. Specifically, FGC Section 8276.2 authorizes CDFW to oversee a crab quality testing program and authorizes the Director of CDFW (Director) to delay the opening of the commercial fishery in Northern Management Area (Sonoma/Mendocino county line north to the California/Oregon border) if crabs are found to be soft-shelled

or otherwise low quality; this delay cannot extend beyond January 15th of the following calendar year.

Trap rules, physical characteristics, and specifications are contained in FGC sections 9000 et seq and the implementing regulations in sections 180, 180.2, and 180.5, Title 14, CCR. FGC Section 9003 and implementing regulation in Section 180.2, Title 14, CCR provide for trap destruction devices, and FGC Section 9011 and Section 180, Title 14, CCR specifies trap rules and dimensions. FGC Sections 9003, 9005, 9006, 9007 and 9011 govern the use of crab traps, including destruction devices, buoy marking, buoy ID and crab trap requirements.

Additionally, FGC Section 5523 authorizes the Director, upon a recommendation from the Director of Environmental Health Hazard Assessment, to restrict take of any species or subspecies that poses a human health risk from high levels of toxic substances (e.g., domoic acid for Dungeness crab).

These two environmental conditions (crab quality and human health risk from high levels of toxic substances) have the potential to drive the economic impact of this fishery every season, based on the time and area closures or delays of the Dungeness crab fishery implemented to protect human health, and/ or because of poor Dungeness crab meat quality.

LEGAL ACTIONS

In October 2017, the Center for Biological Diversity sued CDFW alleging violations of the federal Endangered Species Act for take of threatened and endangered humpback whales, endangered blue whales, and endangered Pacific Leatherback sea turtles in the commercial Dungeness crab fishery. The Pacific Coast Federation of Fishermen's Associations later intervened on behalf of the Dungeness crab industry. A settlement agreement between CDFW, Center for Biological Diversity, and the Pacific Coast Federation of Fishermen's Associations was announced on March 26, 2019.

The settlement outlines a comprehensive approach to the problem of whale entanglements. It expedites implementation of two of the aforementioned regulatory actions (including RAMP), ensures stakeholder input from the Working Group, and formalizes CDFW's commitment to pursue an application for an Incidental Take Permit (ITP) under Section 10 of the federal Endangered Species Act. The settlement also included an early closure for the 2018-19 Dungeness crab season and prescribes protective measures for future springtime fishing seasons, when the greatest number of whales are typically present off the California coast.

STATEMENT OF NEED FOR PROPOSED REGULATION

The RAMP program must be implemented per new FGC Section 8276.1. This regulation is necessary to reduce marine life entanglements in the California commercial Dungeness crab fishery. This regulation complements other recent regulatory actions to provide additional information on fishery of origin through a gear marking program, (Section 180.5 Trap Buoy Identification, i.e., the Standardized Trap Marking Program), and reducing entanglement and navigational hazards from lost or abandoned gear (Section 132.7 Lost or Abandoned Dungeness Crab Trap Gear Retrieval Program).

PROPOSED REGULATION SUMMARY

The RAMP establishes criteria and protocols to evaluate and respond to the potential risk of marine life entanglement. CDFW drafted the proposed regulations in consultation with the Working Group to include information to assess risk of entanglements, thresholds precipitating management action, and the set of actions that could be taken to mitigate the risk. The proposed regulations describe the framework by which entanglement risk will be minimized to the extent practicable. The proposed regulation will cover the following elements:

The proposed regulation will cover the following elements.

- Definitions pertaining to RAMP and its implementation, including:
 - The marine species targeted for risk assessment and mitigation, “Actionable Species:”
 - Blue Whales, Humpback Whales, and Pacific Leatherback Sea Turtles found in California crab fishing grounds.
 - Fishing Zones, which include a Northern Management Area (NMA, the California coast north of the Sonoma/Mendocino County line); a Central Management Area (CMA, the California coast south of the Sonoma/Mendocino County line); subzones within the CMA; and a Pacific Leatherback Sea Turtle Foraging Area.
- Schedule for conducting the risk assessment.
- Data sources CDFW will consider for evaluating entanglement risk, leading towards decisions on management actions.
- The suite of management actions the Director can take to reduce entanglement risk, and the numerical triggers for such actions. It is important to note that in the event one or more trigger(s) are attained for the same Fishing Zone(s), the more restrictive management action will apply. Management actions are implemented in response to information

available from data sources, and may include one or more of the following:

1. Delay start of the fishing season in 15-day increments
 2. Early season closure
 3. 50% reduction in gear
 4. Closure of one or more fishing zones
 5. Closure of the entire fishery
 6. Use of alternative gear
- The authority of the Director to restrict the commercial take of Dungeness crab through one of the above-listed management actions when a potential entanglement risk exists, and to lift certain restrictions when the risk has abated.
 - The use of alternative gears, the standards for alternative gear certification, and how a person or manufacturer can certify their alternative gear with CDFW.
 - Minimum notice requirement prior to implementing any management action regarding the take of Dungeness crab (48 hours), and the methods by which such management actions or changes in action will be disseminated to the affected public.

The RAMP will inform CDFW's draft Conservation Plan, which will be part of CDFW's application for an Incidental Take Permit (ITP) under Section 10 of the federal Endangered Species Act. The Conservation Plan will address ESA -listed species interactions in the Dungeness crab fishery and support CDFW's efforts to provide for a sustainable fishery while minimizing marine life entanglements.

DETERMINATION OF MAJOR REGULATION

The proposed RAMP regulation is determined to be a major regulation because it is possible that within the first twelve months following full implementation (from November 2020 to November 2021) of Scenario 4(c) (delays in the start of the fishing season, combined with 50% gear reduction and April 1 closure date) and Scenario 5 (full fishery closure), the economic impact for California businesses and individuals may exceed \$50 million. The economic impact is estimated as a result of economic loss in revenue by the directly affected and supporting businesses and individuals.

AFFECTED BUSINESSES AND INDIVIDUALS

Dungeness crab permit holders/vessel operators and deckhands (harvesters) would be the businesses and individuals directly affected should

implementation of the proposed RAMP management actions limit fishing opportunity (Table 1). CDFW records show that there are 553 Dungeness crab vessel permits with about 450-470 of these actively used per Dungeness crab season. A crew consists of a skipper who captains the vessel and typically between 1 and 3 crewmembers who deploy the traps and the crab block to pick up traps and collect and sort legal crab from the catch. Permit holders are classified by tiers that allow for a certain number of traps per fisherman. When the trap limit program was established, the number of these permits between the two management areas was relatively equal, however the number of higher trap tier permits was higher in the NMA while the number of lower trap tier permits was higher in the CMA. A permit is valid to be used in any part of the state and a portion of the fleet is rather mobile between the two areas. Fishermen may move amongst the two management areas, but quality and domoic delays prevent vessels from fishing at the start of these season for 30 days if they have already participated in the fishery elsewhere prior to the delayed area opening. This is known as the fair start provision.

Table 1. Directly Affected and Supporting Businesses for the Commercial Dungeness Crab Fishery

Category	Estimated Individuals/ Businesses
Directly Affected	
Commercial Dungeness crab vessel permit holders and deckhands per vessel (harvesters)	553 Permits (2019 Permit Year), 450 – 470 active <ul style="list-style-type: none"> • Tier 1 w/500 traps – 58 permits • Tier 2 w/450 traps – 53 permits • Tier 3 w/400 traps – 57 permits • Tier 4 w/350 traps – 55 permits • Tier 5 w/300 traps – 55 permits • Tier 6 w/250 traps – 163 permits • Tier 7 w/175 traps – 112 permits
Indirectly Affected (Supporting Businesses)	
Fish Buyers: Processors (40%) Wholesaler/ Distributor (45%) Retailer (7%) Restaurant/ Food Service (2.5%) Grocery/ Retail (2.5%) Exports (0%) Final Consumers (5.5%) <i>Percentages shown are for product flow</i>	133 Fish Buyers (2018-19 season) 60% Business; 40% Individual <ul style="list-style-type: none"> • Of these 4.5% received >900k pounds, • 12.7% received 100k-899,999 pounds, • 82.7% received <100k pounds
Unknown Indirectly Affected (Supporting Businesses)	
Fuel docks run by private and public entities Bait and Tackle shops Commercial Ice Distributors Manufacturers and distributors of buoy, trap and line gear Dock Infrastructure run by private, municipal and tribal entities	Unknown numbers of businesses/ individuals

Sources: CDFW Automated License Data System (ALDS); Kirkley, James, NMFS (CFS I/O Model)

Fishermen can sell crab they land to themselves, for selling live crab off their vessel or to other businesses. Fish Buyers can be individuals, or small or large business that purchase one of CDFW's licenses (Receiver, Processors, Retailers,

Wholesaler and Multifunction) which allows them to directly purchase fish from fisherman and record landings on an electronic ticket receipt. Buyers generally further cook and/or process crab and can either sell directly to consumers or other distributors that are generally large businesses that will also sell directly to consumers (e.g. supermarkets) .The exercise of apportioning the indirect impact by business type is imprecise, however, some basic patterns are discernable.

Surveys show that expenditures differ by vessel size, by type of operation, and by the fishing strategies employed (single species or multiple species). Dungeness crab fishermen reportedly expend an average 33% of their gross revenue on operating expenses (Wilén and Abbot, 2006). That average 33% percent of gross revenue that is distributed to other supporting businesses, employees, and individuals is apportioned to various expenditure categories is shown in Table 2.

Table 2. Share of Fisherman Expenditure by Category

Expenditure Category	Share
Purchases of goods	12%
Fishing gear; Miscellaneous hardware & supplies; Electronics	
Repair and maintenance	10%
Gear maintenance; Vessel & engine; Electronics	
Trip expenses	18%
Groceries, food, supplies; Fuel & lubricants; Ice; Bait	
Fixed and General Expenses	23%
Moorage; Licenses, permits, dues, fees; Accounting & bank services, Insurance; Vehicle expenses; Capital costs, boats; Other expenses	
Income shares & taxes	37%
Crew & captain income shares; Taxes	
Total	100%

Source: Kirkley, James, NMFS (CFS I/O Model)

Other businesses that receive and distribute the harvest would be indirectly affected. Individuals who receive income from the above-mentioned business types would also be affected should their income from the fishery and supporting businesses be reduced.

OUTREACH TO AFFECTED PARTIES

CDFW has sought input from the Working Group on an ongoing basis as these regulations were developed. The Working Group has several project teams, including gear innovation, communication, aerial/vessel surveys, and electronic monitoring. The Working Group has created a Best Management Practices document for the commercial and recreational Dungeness crab fishery, with guidance on voluntary measures fishermen may take to help reduce the risk of

whale entanglement. The Working Group developed a pilot RAMP to assess circumstances where entanglement risk may be elevated and provide recommendations on appropriate management actions to the Director. The pilot RAMP program developed by the Working Group is the basis for the proposed regulations.

Public outreach efforts are listed in **Appendix A**, and include links to outcomes from the Working Group collaborations and meetings. Additionally, the Working Group and affected fleet was afforded early review opportunities of the straw proposal for the regulations in September 2019, as well as a draft of the proposed RAMP regulatory text in January 2020.

SOURCES OF ECONOMIC AND FISCAL IMPACT

The proposed RAMP regulations offer six management actions in response to changes in measures of entanglement risk. The management actions are proposed to be implemented solely or in combination, depending on the field of risk measures.

The proposed RAMP regulations could result in economic and fiscal impacts if the implementation of management actions result in reductions in the quantity of Dungeness crab commercially harvested. Management actions that could constrain harvest (temporally and spatially) include:

1. Delay start of the fishing season in 15-day increments
2. Early season closure
3. 50% reduction in gear
4. Closure of one or more fishing zone(s)
5. Closure of the entire fishery
6. Use of alternative gear

The **broad economic impacts** assessed are: changes in fishery ex-vessel value (the season's crab harvest volume multiplied by the market price - direct expenditure), along with the subsequent indirect, induced, and employment effects of any change in direct expenditure as multiplied through the affected sectors that are linked to the commercial Dungeness crab fishery.

The **fiscal impacts assessed** are: CDFW expenditures for program implementation and enforcement; revenue to the state from Dungeness crab landings fees; as well as fiscal impacts to local and state governments.

IMPACT ASSESSMENT METHODOLOGY

Baseline Information

This assessment evaluates the economic and fiscal impacts of the proposed RAMP regulation against commercial Dungeness crab landings data using the ex-vessel value - the total dollar amount received by fishermen for the amount of crab they harvest and then bring to the dock and sell to fish buyers (calculated as pounds of crab landed times the market price). The scheduled commercial Dungeness crab season is from November 15 to June 30 in the CMA and from December 1 to July 15 in the NMA. However, even absent the proposed RAMP regulation, two factors (quality and domoic acid) may delay the start of the Dungeness crab fishing season. This assessment incorporates the effect of those factors into the status quo (SQ) for the fishery; status quo determines the baseline for this economic assessment.

Quality Delays

The pre-season quality testing of Dungeness crab meat has been conducted for the northern portion of the fishery for many years in concert with testing in Washington and Oregon. Although procedures have been modified over the years, the scheduled delays are built into the current operations of the fishery. The fishery cannot be delayed due to quality issues past January 15, pursuant to FGC Section 8276.2, whereas with domoic acid, the season delays are unpredictable.

Domoic Acid Delays

Domoic acid is a neurotoxin produced by unicellular algal organisms that thrive in warm water. The domoic acid problem that caused the severe delay of the 2015-16 season was thought to be a direct effect of the anomalous (unusual) ocean warming that developed off the U.S. West Coast in 2014 and continued in to late-2015. As these anomalous warming ocean conditions persist, so does the problem of harmful algal blooms that cause domoic acid. This has become a top priority for discussion between industry, the Dungeness Crab Task Force and other affected fisheries and agencies.

The last five seasons of landings data since trap limits were implemented were used in establishing the baseline or SQ for the fishery used in the analysis: 2013-2014, 2014-2015 and 2016-2017, 2017-18, and 2018-19 (Table 3). The analyses excluded landings data from the severely delayed 2015-16 season because of the abbreviated time period when landings occurred four to five months after the scheduled season start date; this compression of landings data is not indicative of baseline conditions. This federally declared disaster year was due to high domoic acid levels that persisted beyond typical timeframes through

late winter and into early spring 2016. The analyses include the seasons between 2016-2019, which were characterized by much shorter season delays due to SQ quality testing and domoic acid delays.

Table 3. Five Season Ex-Vessel Value Total by Fishery Management Area (Between 2013-14 and 2018-19 Seasons, Excluding 2015-16).

Season	Delays/ Closures	NMA Ex-Vessel value	CMA Ex-Vessel Value	Statewide Ex-Vessel Value Total
2013-14	No delays or early closures (NMA opened Dec. 1; CMA Nov. 15)	\$23,176,943	\$37,031,489	\$60,208,432
2014-15	No delays or early closures (NMA opened Dec. 1; CMA Nov. 15)	\$13,339,579	\$46,523,730	\$59,863,308
2015-16	Domoic delay (NMA had 2 areas open May 12 and May 26; CMA opened Mar. 26)	Excluded from analysis	Excluded from analysis	Excluded from analysis
2016-17	Domoic delay (NMA opened in parts Dec. 1 through mid- Jan.; CMA opened in parts Nov.15 through mid Dec.)	\$35,088,249	\$37,102,117	\$72,190,366
2017-18	Quality delay (NMA opened Jan. 15; CMA Nov. 15)	\$46,296,815	\$23,419,145	\$69,715,960
2018-19	Quality and Domoic delays (NMA had 2 areas open Jan. 15 and Jan. 25; CMA had 2 areas open Nov. 15 and Dec. 8)	\$31,616,086	\$15,531,139	\$47,147,225
	Five season ex-vessel value average	\$29,903,534	\$31,921,524	\$61,825,058 (SQ)

Source: CDFW Marine Landings Data System

The fishery is also characterized as a “derby-style” fishery where the majority of the landings occur by the first and second months that the fishery is open (Figure 1). In general, the overall effect of season delays on the fishery is to shift this

intense fishing effort to later than the scheduled season start date and contract the overall fishing season. In 2017-18 and 2018-19 seasons that both experienced quality delays until January 15, the majority landings (>75%) occurred in February, compared to the majority of landings that occurred earlier in December for the 2014-15 season that began on time (Figure 1).

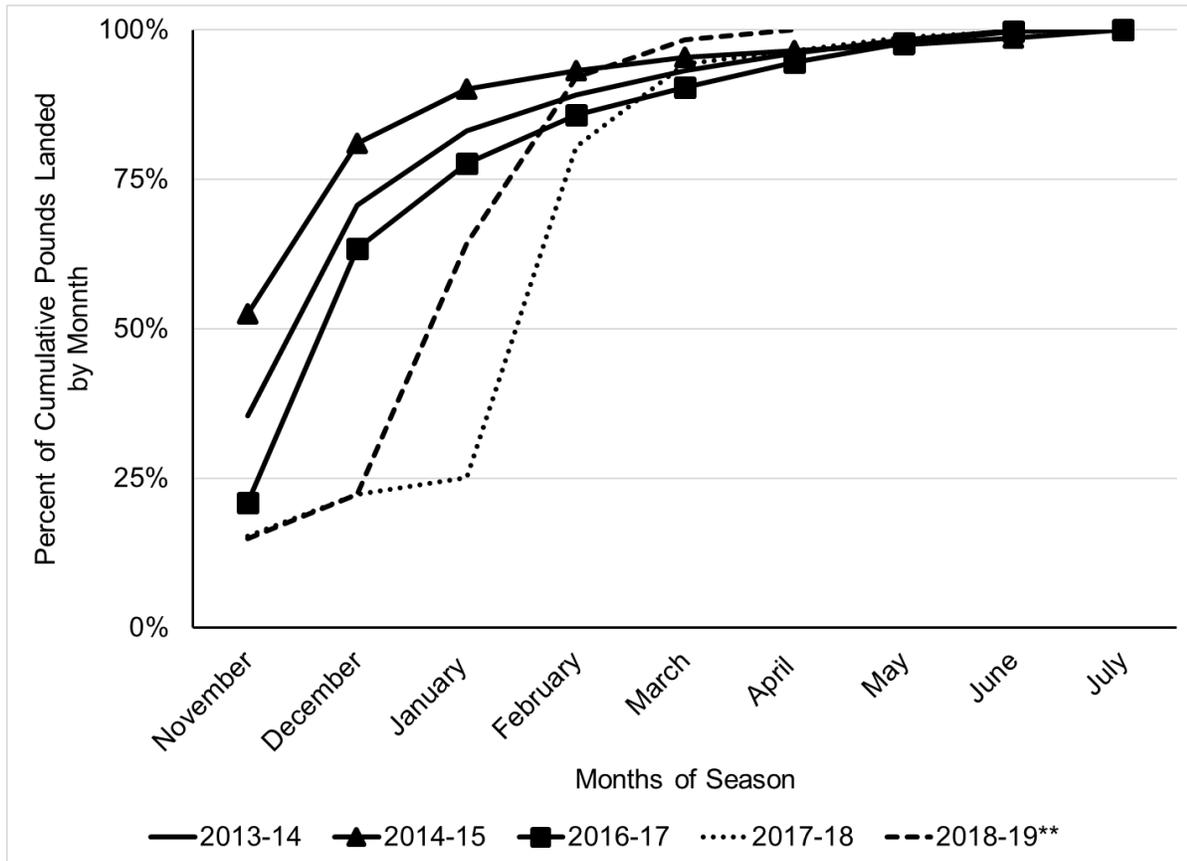


Figure 1. Percent of Cumulative Pounds of Dungeness Crab Landed by Month Between 2013-14 and 2018-19 (Not Including 2015-16 Disaster Season and **2018-19 Season Ending April 15)

Source: CDFW Marine Landings Data System.

Estimated Impact by Management Action

The variability of ex-vessel value within each management area from season to season is primarily due to the available population of legal-sized male crab that can be harvested since total pounds landed is highly correlative to ex-vessel value. Pounds landed have been characterized as occurring on decadal cycles and dramatic change in total pounds landed are observed from one season to the next.

The same five seasons that were used to establish the baseline were used in the analysis to estimate potential loss for season delays, early season closures and 50% gear reduction management measures due to the proposed RAMP regulations. Daily landings data by management areas (NMA and CMA) was used to determine each season's losses by comparing the difference in value to the total ex-vessel value earned that season, and these losses were then averaged over the five seasons.

In lieu of removing value earned at the start of the season to determine losses due to season delays, value of landings by the season start date were shifted to later in the season while removing the value earned towards the end of the season to reflect the contracted time period produced by the delay. This method better captured this traditional "derby-style" fishing effort, whereas for early season closures, value of landings that only occurred later in the season were removed. For proposed management actions that involved both of these measures that would further contract the season, a shifting of the landings to a later date and larger removal of value earned at the end of the season was assessed for each season compared to the season's totals to determine loss. For 50% gear reduction, value of landings during these contracted time periods was divided in half (see Management Action 3: Gear Reductions for more detail).

Although the proposed RAMP regulation includes subzones within the CMA and implementation could result in closures of subzones as opposed to the entire CMA, this analysis focuses on economic impacts of management measures implemented over the entirety of the CMA. CDFW data sources do not currently allow for an accurate analysis of how implementation of management measures on a subzonal scale would economically affect the fishery. Should the management measures for each scenario described below be implemented on individual subzone scale, it is likely that losses would be less than those presented here.

Using daily Dungeness crab landings data by management area, a suite of dates was examined. The average losses by management action were also used to determine the percent change from SQ in ex-vessel value, the 5-season average of total ex-vessel value, to quantify the potential economic loss to the overall Dungeness crab fishery and state economy by delay and early closure management actions, by duration, and by fishery management area. All analysis assumes that any management action is imposed due to implementation of the RAMP program alone, without any concurrent management action due to quality testing delays or domoic delays or closures.

Management Action 1: Season Start Delays

Season delays occur in scheduled 15-day increments only in the NMA that is subject to quality testing of crab. Under the proposed RAMP regulations, projected delays due to the outcome of the risk assessment are assumed similar to the dates used for quality delay openers in the NMA: Dec. 1, Dec. 16, and Dec. 31. Loss in terms of percent change from SQ for ex-vessel value are calculated for the NMA and CMA on those dates.

This analysis assumes that a delay implemented under the proposed RAMP regulation would have an equivalent effect on fishing effort as a quality delay. Because the CMA has an earlier opening date than the NMA, losses are anticipated to be greater in that management area. Additionally, because quality delays do not impact the CMA, the baseline value of the fishery in the CMA is higher compared to the NMA, where baseline value already incorporates quality delays that occurred in the seasons included to establish the baseline value of the fishery; therefore total losses in the CMA would be higher due to the differences in baseline value.

Losses for delays due to RAMP implementation with assumed openings around the Dec. 1, Dec 16, and Dec. 31 dates could range:

- In the NMA, between 0.0% and -0.7%.
- In the CMA, between -0.6% and -2.1%.

Management Action 2: Early Season Closures

Early season closure dates considered encompass a timeframe inclusive of the date for earlier than anticipated presence of Actionable Species along our coast until the date when these species were more likely to be present. Dates analyzed are: Mar. 15, Apr. 1, Apr. 15, and May 1.

Loss in terms of percent change from SQ for ex-vessel value were calculated for the NMA and CMA on these dates.

- Losses in the NMA could range between -2.4% and -5.6%
- Losses in the CMA were similar and could range between -3.1% and -6.7%.

Management Action 3: Fifty Percent Reduction in Gear

Under the proposed RAMP regulation, fishing effort could be reduced by fishing only 50% of trap gear in each of the seven tiers at the start of the fishing season. This projection assumed that all vessels had been fishing their maximum tier allotment, and that a proportional 50% reduction in landings would result if the fleet had been fishing half this maximum number of traps. If gear were to be

reduced for the entire scheduled season, an average loss of 50% in SQ is assumed.

Percent change from SQ for ex-vessel value for the NMA and CMA was examined using the same dates proposed for the season delay management action.

- Losses in the NMA could range between -3.7% and -6.6%.
- Losses in the CMA could range between -12.4% and -18.1%.

Management Action 4: Depth and Area Restrictions

In the proposed RAMP regulation, another management action is to consider a 50-fathom depth restriction on fishing activity when blue whales are present, and a 30-fathom depth restriction on fishing activity when Pacific Leatherback Sea Turtles are present. CDFW does not possess data on a fine enough scale to analyze potential impacts from a depth restriction. However, while these management actions would change fishing location and decrease overall fishing grounds, this change would likely not reduce fishing effort since the same number of traps could be utilized by the fleet (as opposed to a gear reduction action as analyzed above). A restriction on allowable depth ranges could result in either increased or decreased vessel fuel and crew costs depending on whether a vessel travels longer or shorter distances, respectively. Therefore, fishing activity could either be higher or lower, and it is anticipated that on average there would not be a change in ex-vessel value of the fishery.

Economic losses due to season delays and closures within the entire Pacific Leatherback Sea Turtle Foraging Area that encompass the fishery from Point Arena south were also calculated using the same projected season delay and early closure dates proposed above under Management Actions 1 and 2. The analysis looked at data for all ports of landing within the Pacific Leatherback Sea Turtle Foraging Area to calculate possible losses.

- Losses for a season delay in this area could range between -0.6% and -2.1%.
- Losses for early closures in this area ranged between -3.1% and -6.8%.

Management Action 5: Full closure

A scenario in which the fishing season does not open at all could occur due to implementation of the proposed RAMP regulation. For example, ocean conditions impacting availability of forage species could lead to circumstances where Actionable Species remain in the Fishing Grounds for the entirety of the

Fishing Season. This scenario could result in the 100% loss of the Dungeness crab fishery SQ ex-vessel value that averages \$61.8 million.

Management Action 6: Alternative Gear

The final management action is the implementation of alternative trap gear that is configured to reduce the potential of entangling marine life. Current gear configuration stipulates that each trap be attached to a main buoy by a vertical line that is always present in the water column. Alternative gear types range in styles and may include, longlining (linked gear), time release mechanisms, acoustic release devices, hoop nets and/or other “pop-up or ropeless gear” technologies. The overall effect is to reduce the number of vertical lines employed in the fishery. The RAMP rulemaking provides criteria for approval of new methods and/or gear types required to be certified for use in the commercial fishery during certain fishery closures. Once these gear types are allowed, each permitted vessel owner may choose to invest in them as a way to extend their fishing season during high risk closure periods when the traditional fishing season has ended because a RAMP trigger was reached. At this time, there is no way to gauge any changes to fishing effort with using these gear types compared to current gear in order to determine a change in overall landings for the fishery. Several of these gear types are still in development and the estimated costs range up to \$3,000 dollars per unit. Given the uncertainty in costs and application it is not possible to provide an economic assessment at this time.

Projected Scenarios

Given the multifarious possible triggers and management actions, five potential scenarios for RAMP implementation were identified by considering the history of the fishery of season delays and early closures, along with information on Actionable Species presence along the California coast. Scenarios 2-5 projects potential impacts from both an April 1 and a May 1 closure due to presence in the spring of Actionable Species.

Actual future scenarios are difficult to predict given the uncertainty on what triggers will precipitate which management actions. It is also impossible to predict future movement and occurrence of the Actionable Species within management areas during critical times, and thus only a rough estimate of economic impacts can be provided.

Scenario 1 considers a season when triggers in the proposed RAMP regulation are never reached, and no management actions are implemented. The season would open as usual without delay by Nov 15 in the CMA and Dec. 1 in the NMA, and close June 30 in the CMA and July 15 in the NMA.

- This would mean commercial Dungeness crab fishermen have the longest potential season (7.5 months), aside from any potential delay due to domoic or meat quality.

Scenario 2 considers a season that is not delayed (opener Nov. 15 for the CMA/ Dec. 1 for NMA) paired with a closure date that is likely due from the increased concentration of Actionable Species that return to California in the spring over the course of their yearly migrations.

- Generally, Actionable Species' migration returns to California occur in the spring months, but it is unknown when the population has returned in numbers that warrant an early closure.
- Entanglement triggers could cause an early closure date of April 1 [Scenario 2(b)] or May 1 [Scenario 2(a)], for a season of 4-5.5 months.

Scenario 3 would be a season delay until Dec. 16 due to the continued presence of Actionable Species along the California coast, paired with a closure date of April 1 or May 1, similar to Scenario 2.

- Actionable Species have increasingly been shown to remain along the California Coast from their spring and summer presence, until the month of December; it is likely that this trend will continue.
- Similar to Scenario 2, the Actionable Species' migration returns to California occur in the spring months, but it is unknown when the population has returned in numbers that warrant an early closure.
- Entanglement triggers could also cause an early closure date of April 1 [Scenario 3(b)] or May 1 [Scenario 3(a)], for a season of 3.5-4.5 months.

Scenario 4 would be a season delay until Dec. 31, along with an early closure date of April 1 or May 1, and the former date paired with a 50% gear reduction that occurs throughout the season.

- Actionable Species have increasingly been shown to remain along California until the month of December, and it is likely that this trend will continue. Presence of Actionable Species may extend into late December.
- Similar to Scenario 2, the Actionable Species' migration returns to California occur in the spring months, but it is unknown when the population has returned in numbers that warrant an early closure.
- Additionally, a 50% gear reduction throughout the season may be employed due to the number of confirmed entanglements that occur at or near the start of the season.

- Entanglement triggers could also cause an early closure date of April 1 [Scenario 4(b)] or May 1 [Scenario 4(a)] and a 50% gear reduction throughout the season until April 1 [Scenario 4(c)].

Scenario 5 would be a full season closure.

- Delays in the fall, paired with confirmed entanglements, or continued whale presence in the Fishing Grounds could lead to a full season closure.

Multiplier Analysis

All costs to the economy due to the proposed regulatory change are calculated on an annual basis through a full fishery season (7 to 7.5 months potentially open and 4.5 to 5 months off-season) up to a full 12-month period after the proposed regulation is fully implemented. With the baseline of the state's Dungeness crab fishery ex-vessel value specified, the projected changes in harvest ex-vessel value (which represents direct expenditures) are then utilized to estimate the total economic and fiscal impacts with multipliers derived with IMPLAN social accounting matrices (Minnesota IMPLAN Group).

The ex-vessel value (the season's crab harvest volume multiplied by the market price) comprise the direct expenditures that ripples through the economy, as receiving supporting businesses buy intermediate goods from suppliers that then spend that revenue again. Business spending on wages is received by workers who then spend that income, some of which goes to local businesses. Commercial fishery harvest value thus multiplies throughout the economy with the indirect and induced effects of the initial direct expenditure.

Generally smaller study areas such as a single less economically diversified county has significantly smaller multipliers, because spending "leaks out" as fewer products and services are available in the immediate locale. This assessment utilized multipliers for the state of California study area.

Notably, the Dungeness crab fishery is differentiated by vessel size: small vessels and medium to large vessels. For the state of California, about 60% of active permits are in the medium and large category (36-99 feet in length) with the remaining 40% less than 36 feet (per recent CDFW 2013-14 and 2014-15 permitting and landings data).

Table 4. California Ocean Fish Harvester Economic (COFHE) Model

Dungeness Crab Output Multipliers	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Small Vessels (~40%)	1.00	0.41	0.56	1.98
Medium and Large Vessels (~60%)	1.00	0.19	0.75	1.93
Employment Effects (per \$ M of Sector Output)				
Small Vessels (~40%)	43.29	2.72	4.15	50.16
Medium and Large Vessels (~60%)	8.42	1.16	5.49	15.07
Indirect Business Taxes				
Small Vessels (~40%)	0.08	0.03	0.03	0.14
Medium and Large Vessels (~60%)	0.07	0.01	0.04	0.12
State & Local Taxes				
Small Vessels (~40%)	0.041	0.014	0.041	0.096
Medium and Large Vessels (~60%)	0.033	0.007	0.054	0.083

Source: Minnesota IMPLAN Group, Inc., and the *California Ocean Fish Harvester Economic (COFHE) Model*.

Medium and large vessels land about ~78% of Dungeness crab landings for the same two seasons while small vessels brought in ~22% of the landings. This pattern is reflected in the multipliers where small vessels appear to be generally more labor-intensive, with a much higher employment multiplier and larger indirect and induced effects, as their operations are generally not as vertically integrated as larger vessels. Our economic assessment attempted to fairly apportion the broader economic consequences of the proposed management actions in accordance with the range of vessel sizes.

ECONOMIC IMPACT OF THE PROPOSED REGULATION

COMPLIANCE COSTS FOR AFFECTED PARTIES: DUNGENESS CRAB FISHERY PARTICIPANTS

The proposed regulation will not impose new compliance costs directly, however if a reduction in gear is implemented for a certain location over a limited period of time the fuel marginal costs may be increased per unit catch. Depth restrictions may result in increases or decreases in marginal fuel costs depending on the specific areas specified. The new requirement for two-color tags are available at no extra cost as previous seasonal tags.

IMPACT ESTIMATES

Table 5 shows the range of potential loss by area in ex-vessel value by scenario.

Table 5. Potential Dungeness Crab Fishery Ex-Vessel Losses by Area and Scenario (\$2019)

Scenario	Season Opener	Season Closure	Ex-Vessel Loss for NMA & CMA	Ex-Vessel Loss for PLSTFA
1	Nov 15 CMA/ Dec 1 NMA	June 30/ July 15	\$ (0)	\$ (0)
2(a)	Nov 15/ Dec 1	May 1	\$ (3,395,824)	\$ (1,933,520)
2(b)	Nov 15/ Dec 1	Apr 1	\$ (5,844,192)	\$ (3,383,503)
3(a)	Dec 16 Delay	May 1	\$ (5,098,157)	\$ (3,424,569)
3(b)	Dec 16 Delay	Apr 1	\$ (7,718,055)	\$ (5,070,407)
4(a)	Dec 31 Delay	May 1	\$ (6,058,629)	\$ (4,127,163)
4(b)	Dec 31 Delay	Apr 1	\$ (9,081,668)	\$ (6,023,837)
4(c)	Dec 31 Delay + 50% Gear Reduction (entire season)	Apr 1	\$ (35,453,363)	n/a
5	Full closure due to RAMP		\$ (61,825,058)	n/a

Notes: Pacific Leatherback Sea Turtle Foraging Area (PLSTA) overlaps into both the NMA and CMA. The management actions evaluated here would only impact that sub-area and are shown in a separate column.

Source: CDFW Marine Landings Data System

Table 6 shows an array of potential economic impacts including employment and the total economic impact for the two or three variants of each scenario (i.e. different possible early closure dates of April 1 and May 1). Note that in two scenarios the total economic impacts over a 12-month period of full implementation could exceed the \$50 million threshold for a major regulation (Scenario 4 with \$68.5 M and Scenario 5 with \$119.6 M in total impacts).

Table 6. Estimated Season-Long Total Economic Impact by Case Scenario (\$2019)

Scenario	Direct	Indirect	Induced	Employment	Total Economic Output
1	(\$0)	(\$0)	(\$0)	(0)	(\$0)
2(a)	(\$3,395,824)	(\$636,085)	(\$2,535,085)	(51)	(\$6,566,991)
2(b)	(\$5,844,192)	(\$1,094,699)	(\$4,362,865)	(88)	(\$11,301,751)
3(a)	(\$5,098,157)	(\$954,956)	(\$3,805,927)	(77)	(\$9,859,036)
3(b)	(\$7,718,055)	(\$1,445,700)	(\$5,761,760)	(116)	(\$14,925,506)
4(a)	(\$6,058,629)	(\$1,134,866)	(\$4,522,948)	(91)	(\$11,716,436)
4(b)	(\$9,081,668)	(\$1,701,123)	(\$6,779,737)	(137)	(\$17,562,519)
4(c)	(\$35,453,363)	(\$6,640,911)	(\$26,466,999)	(534)	(\$68,561,238)
5	(\$61,825,058)	(\$11,580,699)	(\$46,154,261)	(932)	(\$119,559,956)

Source: CDFW Marine Landings Data System, COFHE multipliers (See Table 4)

RESULTS OF THE ECONOMIC IMPACT OF THE REGULATION

CREATION OR ELIMINATION OF JOBS WITHIN THE STATE

CDFW anticipates the potential for some seasonal impacts on the creation or elimination of jobs due to direct, indirect and induced impacts, some jobs (from 50 to 900) may be eliminated during a potential full closure period, but any fishery closures are to be minimized in duration and extent, and expeditiously lifted when the risk has been abated.

CREATION OF NEW BUSINESSES OR THE ELIMINATION OF EXISTING BUSINESSES WITHIN THE STATE

CDFW does not anticipate substantial impacts on the creation of new businesses or the elimination of existing businesses within the state because any fishery closures would be minimized in duration and extent, and because it's expected that businesses are diversified and are fishing other species commercially to offset the unpredictability of the Dungeness crab fishery.

EXPANSION OF BUSINESSES CURRENTLY DOING BUSINESS WITHIN THE STATE

CDFW does not anticipate substantial impacts on the expansion of businesses currently doing business within the state because any fishery closures are to be minimized in duration and extent, and expeditiously lifted when the risk has been abated. However, there is the potential that some existing businesses could expand to develop and manufacture alternative gear types that could be approved for use.

SIGNIFICANT STATEWIDE ADVERSE ECONOMIC IMPACT DIRECTLY AFFECTING BUSINESSES, INCLUDING THE ABILITY OF CALIFORNIA BUSINESSES TO COMPETE WITH BUSINESSES IN OTHER STATES

The proposed action will not have a significant statewide adverse economic impact directly affecting business, including the ability of California businesses to compete with businesses in other states because west coast states in the Dungeness crab fishery are developing or have similar mitigation programs in effect.

As reported by NOAA, in 2018, Working Groups in Oregon and Washington (both initially formed in 2017) continued meeting to evaluate whale entanglements, develop Best Practices Guides applicable to their respective state fisheries, and discuss potential measures to avoid entanglements with Dungeness crab and other gear in their state. Potential measures that have been discussed by the Working Groups and industry at large include: limitations on gear during the later portion of the fishing season, implementing summer buoy tags to better distinguish when entanglements may be occurring, and promoting research to determine if there are particular whale “hot spot” areas that could be avoided by fishermen during certain times.

INCREASE/ DECREASE IN INVESTMENT AND INCENTIVES

It is difficult to measure the change in investment that this regulation could induce; however, generally new requirements may induce compliance investment.

Since the environmental consequences of marine life bycatch have precipitated public and legislative action, now new government regulations may act as critical triggers to prompt investment. Fishing gear designers and manufacturers are anticipated to be compelled to invest in the development new gear protocols that comply with developing alternative gear standards. The spread of new technologies may eventually bring costs down and externalities as well.

INCENTIVES FOR INNOVATION IN PRODUCTS, MATERIALS, OR PROCESSES

Innovation typically involves research and development expenditures and prototype development at less than cost-effective scales of production. Moreover, firms that invest in innovation often have difficulty retaining all of the benefits of their expenditures because their new technologies may be copied by competing firms. In this instance the proposed regulations will spur incentives to innovate in a larger variety of crab trap gear types than are currently available. Over time competition among manufacturers is expected to promote

innovation in performance and to reduce production costs that may be passed onto consumers.

FISCAL IMPACT OF THE PROPOSED REGULATION

The fiscal impact of the proposed regulations during the Dungeness crab fishery season was assessed using COFHE multipliers developed specifically for California commercial fisheries (see Table 4).

FISHERY AND ASSOCIATED BUSINESSES TAX REVENUE

The underlying basis for the state and local, and business tax projections is that the Dungeness crab fishermen and associated businesses utilize goods and services of other industry sectors when conducting their fishing: boat fuel, food, bait, ice, insurance, rental storage, and other various operational needs. In purchasing these goods and services from other industry sectors, local taxes are paid on the transactions. As expenditures originating with the Dungeness crab fishery ripple through the economy there is an additive effect on the economy; these are the culmination of the direct, indirect, and induced effects and are captured in the multiplier coefficients.

The impact on business tax revenue is projected for the estimated loss in ex-vessel value by Scenario (Table 7).

Table 7. Projected by Scenario: Business Tax Revenue (\$2019)

Scenario	Direct	Indirect	Induced	Total Effect
1	(\$0)	(\$0)	(\$0)	(\$0)
2(a)	(\$229,741)	(\$2,959)	(\$10,088)	(\$28,590)
2(b)	(\$395,383)	(\$5,093)	(\$17,361)	(\$49,203)
3(a)	(\$344,911)	(\$4,443)	(\$15,145)	(\$42,922)
3(b)	(\$522,157)	(\$6,726)	(\$22,927)	(\$64,979)
4(a)	(\$409,890)	(\$5,280)	(\$17,998)	(\$51,008)
4(b)	(\$614,411)	(\$7,914)	(\$26,978)	(\$76,459)
4(c)	(\$2,398,562)	(\$30,896)	(\$105,318)	(\$298,484)
5	(\$4,182,713)	(\$53,878)	(\$183,659)	(\$520,509)

Source: CDFW Marine Landings Data System, COFHE multipliers (see Table 4)

STATE AND LOCAL TAX

The impact on state and local tax revenue is projected for each defined scenario based on the COFHE multipliers for the Dungeness crab fishery (Table 8).

Table 8. Projected by Scenario: State and Local Tax (\$2019)

Scenario	Direct	Indirect	Induced	Total Effect
1	(\$0)	(\$0)	(\$0)	(\$0)
2(a)	(\$113,543)	(\$739)	(\$6,086)	(\$9,369)
2(b)	(\$195,407)	(\$1,273)	(\$10,475)	(\$16,124)
3(a)	(\$170,463)	(\$1,110)	(\$9,137)	(\$14,065)
3(b)	(\$258,062)	(\$1,681)	(\$13,833)	(\$21,293)
4(a)	(\$202,577)	(\$1,319)	(\$10,859)	(\$16,715)
4(b)	(\$303,656)	(\$1,978)	(\$16,277)	(\$25,055)
4(c)	(\$1,185,422)	(\$7,720)	(\$63,543)	(\$97,813)
5	(\$2,067,189)	(\$13,463)	(\$110,810)	(\$170,570)

Source: CDFW Marine Landings Data System, COFHE multipliers (see Table 4)

CDFW Costs

CDFW is projected to spend roughly \$95,000 in regulation development (including preparation of the SRIA) and outreach in the year preceding the promulgation of the proposed regulations in 2020. Thereafter additional expenditures and revenue losses are foreseen for CDFW for the first year of implementation and in the following two+ years.

CDFW Landings Fee Revenue Losses

Pursuant to FGC Section 8051, the landing fee for Dungeness crab is \$0.0333 per pound. The impact on CDFW landings fee revenue is projected with the estimated losses in ex-vessel value per case scenario (Table 9). CDFW could expect to lose between zero dollars for Scenario 1 to a maximum of \$2,057,628 for Scenario 5 per fiscal year of full implementation.

Table 9. Projected CDFW Landings Fee Revenue Impact by Scenario (\$2019)

Scenario	Ex-Vessel Loss	Landings Fee Loss FY1	Landings Fee Loss FY2	Landings Fee Loss FY3
1	(\$0)	(\$0)	(\$0)	(\$0)
2(a)	(\$3,395,824)	(\$113,081)	(\$113,081)	(\$113,081)
2(b)	(\$5,844,192)	(\$194,612)	(\$194,612)	(\$194,612)
3(a)	(\$5,098,157)	(\$169,769)	(\$169,769)	(\$169,769)
3(b)	(\$7,718,055)	(\$257,011)	(\$257,011)	(\$257,011)
4(a)	(\$6,058,629)	(\$201,752)	(\$201,752)	(\$201,752)
4(b)	(\$9,081,668)	(\$302,420)	(\$302,420)	(\$302,420)
4(c)	(\$35,453,363)	(\$1,180,597)	(\$1,180,597)	(\$1,180,597)
5	(\$61,825,058)	(\$2,058,774)	(\$2,057,628)	(\$2,057,628)

Source: CDFW Marine Landings Data System

Existing Whale Safe Program Costs

In response to increasing numbers of whale entanglements since 2015, a FY2018-2019 Budget Change Proposal (3600-016-BCP-2018-GB) included the request for \$500,000 to create two new PYs to initiate a program that would evaluate entanglement risk in real-time, and coordinate as needed with the Dungeness crab fleet, NMFS, NGOs and others on the appropriate response options. The request was approved for FY2019 and two Marine Region staff were hired to form the Whale Safe Fisheries project. Responsibilities include coordination of the Dungeness Crab Fishing Gear Working Group as well as implementation of the RAMP pursuant to FGC Section 8276.1.

Projected RAMP Implementation Costs

Implementation of the proposed RAMP regulations will trigger additional program costs to the existing Whale Safe Program and other CDFW programs. It is anticipated that this funding will remain in place during FY2020-21 to continue supporting the PY's assigned to the Whale Safe Fisheries project. A breakdown of anticipated staff costs is displayed in Table 10.

Responsibilities include:

- Conducting aerial surveys commencing October 1 until the season opens statewide to provide information on the number and distribution of whales remaining in Dungeness crab Fishing Grounds as they migrate south to their winter breeding grounds. Based on historical migratory patterns, species expected to depart California waters in late fall, so the surveys would trail off at that point, and resume in the spring (as noted above).
- Performing risk assessment starting November 1 so that a first evaluation

may be completed in time to inform the risk level of a traditional season opener on November 15 as well as any necessary management action based on that evaluation.

- Continuing risk assessments at the minimum monthly frequency throughout the season. Additional work and coordination amongst the possibility of domoic acid or meat quality concerns means that the season could open in any month within the Fishing Season. The requirement to evaluate risk only lasts through July 15 or as long as the season is open because evaluation of risk is not critical when the fishery is closed; without fishing gear in the water the risk of entanglement is only from lost or abandoned gear, which are not addressed through this program. However, the Director may choose to perform a risk analysis at any time.
- Convening the Working Group to conduct the risk assessment, evaluate next steps, and if warranted, propose recommendations for Director's management actions.
- Management actions set in motion require notification to the affected fishermen, and the public pursuant to the notification section in the regulations.

Table 10. Estimated Staffing Costs for FY2020-2021 for Implementation of RAMP Regulations

Classification	PY	Benefits ¹	Monthly Salary ²	Annual	% Time	Projected
Env. Prog. Mgr I	0.20	\$6,673	\$12,655	\$231,933	20%	\$46,387
Env. Sci (Range B)	1.00	\$2,765	\$5,244	\$96,103	100%	\$96,103
Env. Sci (Range B)	0.20	\$2,765	\$5,244	\$96,103	20%	\$19,221
Sr. Env. Sci (Spec)	1.00	\$4,033	\$7,648	\$140,164	100%	\$140,164
Sr. Env. Sci (Sup)	0.10	\$5,423	\$10,395	\$190,520	10%	\$19,052
Sum	2.5				<i>subtotal</i>	\$320,927
		Overhead ³	24.32%			\$78,049
					Total	\$398,976

¹ Staff Benefit rate FY 2018-2019 is 52.734% (Dept. Budget Memo dated 9/18/2018)

² Staff Payscale (CalHR 01/08/2020)

³ Staff Overhead rate FY 2019-2020 is 24.32% Non-federal (Dept. Budget Memo 6/26/2019)

Aerial Surveys

CDFW will support and work closely with NOAA staff to build staff capacity and training tools to support aerial survey work for RAMP. Annual costs will include aircraft time, pilot and additional observer costs (Table 11).

Table 11. Estimated Staffing Costs for FY2020-2021 for Aerial Surveys

Item	Description	Unit	Quantity	Rate	Projected Cost
Aircraft contract	Airtime	hour	100	\$650	\$65,000
Pilot Expenses	Travel, tie-down etc.	person-days	10	\$350	\$3,500
Observer Travel	Travel, data collection	person-days	30	\$200	\$6,000
Observer Cost	Day rate	person-days	30	\$400	\$12,000
Supply Purchases	Data recording	variable	1	\$5,000	\$5,000
				Total	\$91,500

Source: Marine Region information

Enforcement costs

In addition to Whale Safe Program costs with implementation of the RAMP regulations, CDFW would incur patrol costs for law enforcement of management actions implemented by the Director (Table 12). This involves CDFW resources including large patrol vessels, crews, aircraft patrol, lieutenants and wildlife officers. These patrol costs are estimated separately as they would only be needed for management actions put into place once the Dungeness crab fishery is already open, the frequency of which those actions are required is unknown for purposes of this analysis.

Table 12. Law Enforcement Patrol Costs per Management Action Implemented (2-day aerial patrols, 3-day large vessel patrols)

F & G Classification	Activity	Benefits¹	Monthly Salary²	Hourly Rate	Patrol Unit (hours)	Projected
Captain	Supervision	\$5,768	\$9,463	\$92.49	4	\$370
Lieutenant Supervisor	Supervision	\$5,031	\$8,254	\$80.68	16	\$1,291
<i>Large Patrol</i>	<i>Vessel</i>			\$202	24	\$4,848
Lieutenant Specialist	Patrol	\$4,543	\$7,452	\$72.84	24	\$1,748
Warden	Patrol	\$3,781	\$6,202	\$60.62	24	\$1,455
Warden	Patrol	\$3,781	\$6,202	\$60.62	24	\$1,455
<i>Aircraft Patrol</i>				\$116	16	\$1,856
Warden Pilot	Patrol	\$5,070	\$8,317	\$81.29	16	\$1,301
Warden	Patrol	\$3,781	\$6,202	\$60.62	16	\$970
					<i>subtotal</i>	\$14,924
		Overhead ³	24.32%			\$3,629
F&G= Fish and Game				Total		\$18,553

¹ Peace Officer Staff Benefit rate FY 2018-2019 is 60.960% (Dept. Budget Memo dated 9/18/2018)

² Staff Payscales (CalHR 01/08/2020)

³ Staff Overhead rate FY 2019-2020 is 24.32% Non-federal (Dept. Budget Memo 6/26/2019)

There are many unknown variables associated with patrols and enforcement costs. In general, the estimates provided above for a two-day aerial patrol and a three-day large vessel patrol would capture the time spent in enforcement of a single management action, particularly actions taken after the season is already underway to ensure that no further take of Dungeness crab is occurring. These patrols would be utilized for enforcement of management actions 2-5, described as part of the regulatory proposal, including management area closures, 50% reduction in gear, depth or area restrictions, and full closure. The estimates provided above in Table 11 are to enforce each management action implemented, and may include separate units of enforcement officers should separate actions be required in the NMA or CMA.

It is particularly difficult to estimate enforcement costs for management action 6 (alternative gear) because of several unknowns, including the types of gears CDFW will certify through its process listed in the last subsection of the proposed regulations. After the certification process is implemented and requests are received and approved, CDFW law enforcement will have a better sense of the

gear approved, how it operates, whether additional training or equipment is needed, and if there are variations in what may be needed to ensure compliance.

BENEFITS OF THE REGULATIONS

REDUCED MARINE LIFE ENTANGLEMENTS

The proposed regulatory RAMP program is structured to assess and mitigate the risk of marine life entanglements with commercial Dungeness crab gear. For the purposes of this analysis, the Department evaluated the benefits from a 50%, 75% and 100% reduction in whale entanglements in commercial Dungeness crab gear.

VALUING AN ENVIRONMENTAL GOOD

Calculating a dollar value for a resource such as a whale or sea turtle, which is not commercially harvested, and thus does not have a recognized ex-vessel dollar value and is not recreationally harvested with known angler expenditures per day, requires the use of other valuation methods. These methods may be used singularly or in combination in the exercise of assigning a monetary value to the preservation of whales, turtles, and other marine life threatened by Dungeness crab gear.

Figure 2 below summarizes some commonly utilized methods to assess the value of non-market traded environmental goods.

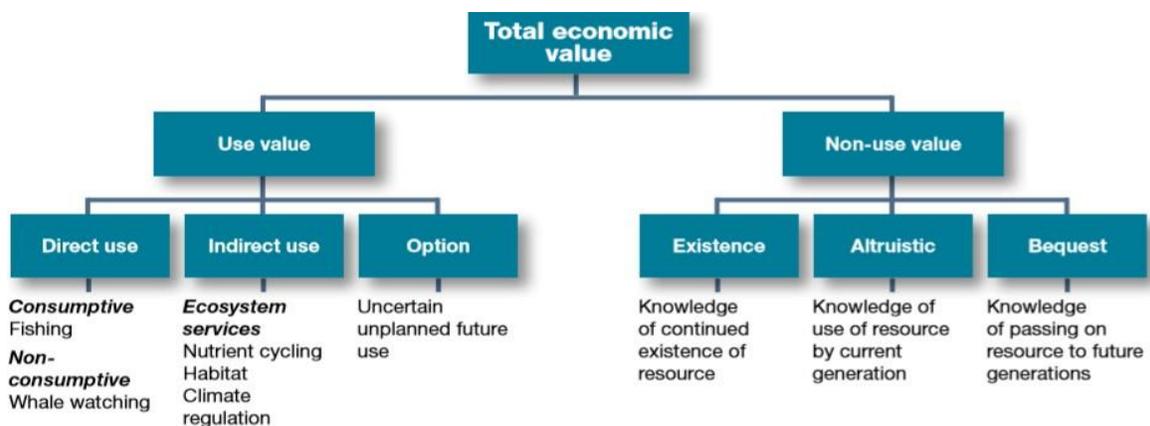


Figure 2. Total Economic Value Framework, conceptual. Source: Tinch & Mathieu, 2011. This image describes “Use” and “Non-Use” values that make up total economic value. Under “Use,” are consumptive (e.g., fishing), non-consumptive (e.g., whale watching), ecosystem services, and options for future use. Under “Non-Use,” “Existence,” “Altruistic” and “Bequest” show knowledge of continued existence of resource, knowledge of resource by current generation, and

knowledge of passing on resource to future generations.

While any anticipated ecosystem services benefits, aesthetic benefits and other non-use values are difficult to monetize, it is worth recognizing that especially for rare and charismatic wildlife, non-use values are likely to be quite substantial for residents in and out of California. Many people value and express a willingness to pay to protect whales, even if they do not expect to ever see them. This type of value, “existence value” is on the right-side of Figure 2 above, along with “altruistic” and “bequest” values. These non-use values could be very important - but given that they would require more extensive and careful surveying of public sentiments than time permitted, this analysis concentrates on the less-disputable expenditure research.

The core estimate of the benefits of marine life entanglement avoidance focuses more narrowly on the monetized market-traded direct uses, such as expenditures in the whale-watching industry, supplemented with monetized travel costs research. Whale-watching and the associated travel costs are considered non-consumptive direct use values (see graphic above). Whale-watching is an industry that draws value from an abundance of whales that will attract more whale-watchers. Whale-watchers derive value from the sighting of whales and in theory the ticket price along with the travel costs of getting to the shore equal the “price” of seeing whales. Therefore, for the purposes of this analysis, the value of the whale-watching industry is evaluated as a proxy for the value of an abundance of whales. The number of whales off the California coast at risk of entanglement in Dungeness crab gear is the other key factor in assigning a value for an individual whale.

A literature survey¹ of the economic contribution of the whale watching industry in California yielded an estimated \$44,614,500 to \$59,902,500 in direct expenditures annually. The multipliers for whale-watching tourism expand the initial direct expenditure to a range of \$127,819,900 to \$171,720,500 in total economic value for the whale-watching industry, that supports 79 jobs per \$1 million in direct expenditures. With a total economic value of the industry the next steps taken to arrive at the monetary value of an individual whale are shown below.

Total Economic Value of Whale-Watching Tourism
[Range = \$127,894,900 to \$171,720,050]

¹ Erich Hoyt and E.C.M.Parsons (2014); Knowles, T., Campbell, R. (2011); Linwood Pendleton, (2006).

The travel cost research that traces the additional real costs of travel (e.g. gas and time) to estimate the consumer surplus of whale-watching beyond the direct ticket costs was also surveyed. Consumer surplus is the benefit that consumers reap, beyond what is paid for the experience.

Travel Cost as a Measure of Consumer Surplus
 [Average total = \$52,400,00]

The average total travel costs values were added to the total economic impact of direct expenditures in the state. That sum was then divided by the number of whales of the species traveling in the water depths and areas that could be most likely vulnerable to entanglement with Dungeness crab gear lines. This provides a measure of the total economic value of the whale watching industry and travel cost consumer surplus per whale.

$(\$127,894,900 + \$52,400,00) / 2,442 \text{ whales} = \$52,400 \text{ per whale}$
 $(\$171,720,050 + \$52,400,00) / 2,442 \text{ whales} = \$70,348 \text{ per whale}$

Records on whale entanglement off the California coast show that approximately 0.05% of the whale population have been entangled over recent years. The range of benefits are represented by presuming that 50 to 100 percent of the historical average number of whale entanglements can be avoided with the proposed RAMP regulation. The benefits of preventing the entanglement of 50%, 75% and 100% of the average number of recorded entanglements, constitute an estimated \$1,323,100 to \$3,552,590 in readily monetized value. This estimated \$1.3 to \$3.6 million in avoided bycatch of whales can be characterized as the dollar benefit for RAMP (Table 13).

Table 13. Value of Reduced Whale Entanglements (\$2019)

Range	\$ Value per whale	50% saved	75% saved	100% saved
low-end	\$52,400	\$1,323,100	\$1,984,650	\$2,646,200
high-end	\$70,348	\$1,776,295	\$2,664,442	\$3,552,590
Average in the range	\$61,374	\$1,549,697	\$2,324,546	\$3,099,395

Sources: CDFW Analysis; with data from: NOAA Whale Entanglement Reports 2015-2019; Jay Barlow and Karin A. Forney. 2007; Erich Hoyt and E.C.M. Parsons (2014); Knowles, T., Campbell, R. (2011); Linwood Pendleton, (2006).

NON-USE VALUE OF REDUCED WHALE ENTANGLEMENTS

As stated, to avoid any potential controversy over “non-use” value estimates, this assessment focused more narrowly on revealed preferences of dollar

expenditures. The approach traced the actual dollar expenditures in the state involved in the distinct industry that depends on flourishing whale populations. Published studies over three decades on whale watching expenditures per person, growth rates in participation, industry gross revenue over three decades, and industry linkages for total economic impact were surveyed. Annual direct expenditure figures were used from the most recent studies that covered all of California (not just Channel Islands for instance). The average of those, were inflation-adjusted to 2019 dollars, and multiplied out to derive the total economic impact.

Additionally, the benefits could be much higher if the more difficult to monetize, yet substantial, ecosystem services indirect uses values and the non-use values of existence, altruistic, and bequest values had been included. To provide some measure of the potential additional value of “non-use” values an encapsulation of the some of the core logic involved in recognizing non-use values is provided below.

Ecosystem Services

Marine life entanglements affect not only marine mammal populations, as broad-ranging impacts can be identified on the entire marine ecosystem and its components (including target species) through the reduction of nutrients that are provided by marine mammals. Recent analysis has estimated the ecosystem service benefits of a live whale to be \$2 million per whale (Chami et al., 2019).

Bycatch Externalities

Bycatch is characterized by economists as an unpriced or underpriced negative externality, which in this case is an unintended adverse impact of fishing. The term “bycatch” includes interactions that cause injuries to marine mammals that have temporary, long-term, or lethal impacts. The “costs” of bycatch in terms of impacts on the marine ecosystem and on marine mammals are not factored into the costs of fishing. The externality has not been internalized as part of the individual operator's decision-making. Seafood from fisheries with marine mammal bycatch is consequently overproduced and underpriced. In that sense, regulatory measures that require operators to incorporate these higher costs of fishing that incentivize changes in producer and consumer behavior help to better capture the true costs in price signals. Moreover, over time it is hoped that dynamic incentives induce technological change to further reduce marine mammal bycatch while enabling a thriving fishery.

PERSONAL INCOME

The direct and indirect impacts of projected changes to the contributions of Dungeness Crab ex-vessel value is not expected to register any difference to

the state's aggregate level of personal income, which was \$2,514,129 million in 2018 (Bureau of Economic Analysis data series as posted by the California Department of Finance).

GROSS STATE PRODUCT

Gross State Product (\$ 2,968,118 million in 2018, California Department of Finance) is not expected to register much overall change as a result of the implementation of the proposed regulations.

Benefits of the regulation to the health and welfare of California residents

CDFW anticipates benefits to the health and welfare of California residents from better protection of the State's natural resources and through the better management of valuable state fisheries that benefit fishing communities and consumers, among other residents of the state.

Benefits of the regulation to worker safety

CDFW does not anticipate any benefits to worker safety because this regulatory action will not impact working conditions or worker safety.

Benefits of the regulation to the State's environment and quality of life

CDFW anticipates benefits to the environment through the better protection of the State's natural resources better management of sustainable fisheries.

DESCRIPTION OF REASONABLE ALTERNATIVES TO REGULATORY ACTION

A number of alternative management strategies were considered for inclusion in the RAMP regulations that were not ultimately selected. The rationale for rejecting the strategies and relative costs and anticipated benefits of each are described below.

INCLUDE OTHER FISHERIES

CDFW considered whether to expand the scope of this rulemaking to include other commercial and recreational fishing sectors that pose an entanglement risk to marine life. Senate Bill 1309, which grants CDFW authority to implement this program, is only applicable to commercial Dungeness crab and did not contemplate other fishery sectors. While including other fisheries could provide the benefit of reduced marine life entanglement, the economic impact of the management actions on the additional fisheries would result in much higher economic impacts than would occur under the RAMP program as proposed.

INCLUDE OTHER ACTIONABLE SPECIES

In considering which Actionable Species to include within the RAMP, CDFW examined confirmed entanglements in California commercial Dungeness crab fishing gear. Although grey whales have been entangled in California commercial Dungeness crab fishing gear, they were not included as part of this rulemaking because the Eastern North Pacific population, once listed as endangered under the Endangered Species Act (ESA), has successfully recovered and was delisted in 1994. All Actionable Species are still listed under the ESA, indicating the populations are at a higher risk and may be more impacted on a population scale by entanglements. Additionally, the proposed RAMP regulations are intended inform CDFW draft Conservation Plan which will be part of CDFW's application for an Incidental Take Permit (ITP) under Section 10 of the federal Endangered Species Act. Furthermore, work done by the Working Group in developing a pilot RAMP did not include grey whales. Including a broader list of actionable Species would potentially lead to more closures of the fishery and thus the economic impacts could be much higher than the RAMP program as proposed. Any measures implemented to reduce the risk of entanglement will provide similar protections for other marine life not specifically included in this rulemaking.

HIGHER ENTANGLEMENT TRIGGERS

In developing triggers for entanglements, CDFW considered guidance from NOAA and other applicable federal laws governing species of concern (Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA)). Because this rulemaking will form an integral part of the Department's application for an Incidental Take Permit (ITP), triggers must be set at a level that are not likely to cause jeopardy to the identified species. Setting higher triggers could result in a jeopardy determination by NOAA and preclude CDFW from receiving an ITP. A jeopardy determination by NOAA could also lead to a full closure of the fishery, which would entail similar economic impacts as Scenario 5.

ADDITIONAL DATA SOURCES TO INFORM MARINE LIFE CONCENTRATIONS

In collaboration with the Working Group and its advisors, CDFW evaluated several data sources to determine their suitability for assessing marine life concentrations in California waters. While many data sources showed promise, CDFW determined that some were not appropriate for inclusion in this rulemaking due to limited spatiotemporal scope, lack of standardized data collection methodologies, lags between data collection and availability for management, and/or lack of a direct connection between information and entanglement risk. Use of additional data sources, if deemed appropriate, could provide a clearer picture of risk of entanglement and possibly reduce the need for season closures, reducing economic impacts to the fishery. However, relying on data sources that are not suitable due to limited scope and applicability

could also result in underestimation of the entanglement risk, which would potentially lead to increased entanglements that could result in a closure of the fishery.

INCORPORATING PREDICTIVE/ FORECASTING MODELS

In collaboration with the Working Group and NOAA scientists, CDFW has explored the use of various predictive models to predict species distribution and associated entanglement risk in specified times and/or areas. Better modeling data, could provide a clearer picture of risk of entanglement and possibly reduce the need for season closures, reducing economic impacts to the fishery. However, these models are still under development and were not available for consideration at the time of this rulemaking. Once model development and testing has been completed, CDFW will consider their inclusion through a future rulemaking.

ADDITIONAL MANAGEMENT ACTIONS

Static Season Structure

The season structure in the proposed regulations, including potential delays and/or closures, was developed to allow for adaptive in-season management based on demonstrated entanglement risk. CDFW discussed whether to utilize a more static approach where allowable fishing periods were defined prior to the season opening, with no in-season adjustments made. Performance of the fishery relative to entanglement risk would then be assessed at the end of the season, and any changes deemed necessary applied to the following season.

While a static management approach would provide certainty to the fleet, it could result in a fishing season that is unnecessarily restrictive and punitive, which would have negative economic consequences without necessarily reducing entanglement risk. Conversely, the absence of in-season management measures may not provide the necessary protections for species of concern by allowing fishery operations that result in excessive entanglements to continue. Given that this fishery is highly influenced by changing environmental conditions, CDFW determined in-season management provided a balanced approach between providing for economic stability of coastal communities and environmental protections.

Confirming Gear Reduction

Requiring individuals to double tag their buoys (use two tags instead of one) during the 50% gear reduction management action was an option discussed to confirm gear reduction compliance, since fisherman would need to take half of their 500-tag allotment and affix them to a maximum of 250 buoys. While it could

confirm that fisherman had reduced the amount of gear in the water, it would dramatically increase enforcement costs for CDFW since the current requirement is for them to keep the 250 unused tags in a location on their vessel, which can quickly be verified versus checking hundreds of unique buoys

CONCLUSION

After evaluating the available information from a wide array of sources, this CDFW assessment supports the possibility of a decline in Dungeness crab landings and associated ex-vessel value that will exceed the \$50 million threshold for a major regulation, depending on a number of interacting environmental factors and responsive management actions taken to reduce marine life entanglement.

Given the substantial uncertainty about triggers, likelihood of identifying which fishery gear was linked to an entanglement, and the combination of management actions that may be implemented at various times and areas, the true costs are difficult to project. However, this CDFW assessment discloses the potential economic impacts of RAMP regulations to the best degree possible given existing data and uncertainties.

References

Barlow, J. and K.A. Forney. 2007. Abundance and population density of cetaceans in the California Current ecosystem. *Fishery Bulletin*. 105(4): 509-526.

California Department of Fish and Wildlife, Commercial Fisheries Landings Data. Detailed Marine Region source data available upon request, also online at: <https://wildlife.ca.gov/Fishing/Commercial/Landings>
<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=136632&inline>

Chami, R., Cosimano, T., Fullenkamp, C. and S. Oztoşun. 2019. Nature's Solution To Climate Change: A strategy to protect whales can limit greenhouse gases and global warming, *Finance & Development*, December 2019

Erich Hoyt and E.C.M.Parsons, 2014. The Whale Watching Industry: Historical Development. *In*: Editors: J. Higham, L. Bjeder & R. Williams, Eds. *Whale-watching, Sustainable Tourism and Ecological Management*, Chapter: 5, Cambridge University Press.

Kirkley, J. 2009. National Marine Fisheries Service (NMFS) Commercial Fishing and Seafood Industry Input/Output Model (CFS I/O Model), Virginia Institute of Marine Science. Available from: <https://www.st.nmfs.noaa.gov/documents/Commercial%20Fishing%20I%20O%20Model.pdf> date last accessed January 27, 2020.

Knowles, T., Campbell, R., 2011. *What's a Whale worth? Valuing whales for National Whale Day*, a report for the International Fund for Animal Welfare (IFAW), prepared by Economists at Large, Melbourne, Australia.

Minnesota IMPLAN Group, Inc., 2014 with California Ocean Fish Harvester Economic (COFHE) Model multipliers. Available from: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=30738&inline> date last accessed January 27, 2020.

Pendleton, L. 2006. Understanding the Potential Economic Impact of Marine Wildlife Viewing and Whale Watching in California: Using the Literature to Support Decision-Making for the Marine Life Protection Act., University of California Los Angeles.

NOAA, 2018 West Coast Entanglement Summary, May 2019. Available from: <https://www.fisheries.noaa.gov/resource/document/2018-west-coast-whale-entanglement-summary> date last accessed January 27, 2020.

Pacific States Marine Fisheries Commission and National Oceanic and Atmospheric Administration (2018). Forensic Review Workshop Report Reviewing Gear Involved in West Coast Whale Entanglement. Available from: <http://habitat.psmfc.org/wp-content/uploads/2018/10/Forensic-ReviewWorkshop-Report.pdf>. date last accessed January 27, 2020.

Senate Bill 1309, 2018, McGuire:

https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1309

State of California, Department of Finance, Report P-1 (County): State and County Total Population Projections, 2010-2060. Sacramento, California, January 2013.

State of California, Department of Finance, Economic Research Unit:

California Economic Forecast — Annual & Quarterly

California Gross State Product and Personal Income

http://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/index.html

Tinch, R. and L. Mathieu. 2011. Marine and coastal ecosystem services: Valuation methods and their application, The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Biodiversity Series (2011) No. 33.

James Wilen and Joshua Abbott. Estimates of the Maximum Potential Economic Impacts of Marine Protected Area Networks in the Central California Coast, Final report submitted to the California Marine Life Protection Act Initiative, 2006.

Appendix A - Public Outreach Input

The commercial Dungeness crab fishery maintains an active role in actions taken by CDFW and is an engaged constituency. Overall through the preparation of the draft proposed RAMP regulations, the California Dungeness Crab Fishing Gear Working Group has been involved with Risk Assessment and Recommendations, and other actions pertaining to RAMP. General outreach efforts to this group, the Dungeness Crab Task Force, and the overall public are accessible from the CDFW webpage: <https://www.wildlife.ca.gov/Conservation/Marine/Whale-Safe-Fisheries> and from the Ocean Protection Council webpage: <http://www.opc.ca.gov/2009/04/dungeness-crab-task-force/>

INPUT OPPORTUNITY

January 7-January 17, 2020. Input opportunity by the California Dungeness Crab Fishing Gear Working Group and other stakeholders on the proposed draft regulations.

MEETINGS AND MEETING MINUTES

California Dungeness Crab Fishing Gear Working Group, Recommendations Memo, November 12 2019:
http://www.opc.ca.gov/webmaster/_media_library/2019/11/CAWhaleWorkingGroup_HighlightsRecommendationsMemo_SeptOct2019_FINAL.pdf

California Dungeness Crab Fishing Gear Working Group, Teleconference Call Summary, September 26 2019:
http://www.opc.ca.gov/webmaster/_media_library/2019/10/CAWorkingGroup_WebinarSummary_Sept262019.pdf

California Dungeness Crab Fishing Gear Working Group, Summary of Key Themes, September 4-5 2019:
http://www.opc.ca.gov/webmaster/_media_library/2019/10/CAWorkingGroup_KeyThemesSummary_FINAL_Sept4-52019.pdf

California Dungeness Crab Fishing Gear Working Group, Summary of Key Themes, March 26 2019:
http://www.opc.ca.gov/webmaster/_media_library/2019/04/CAWhaleWorkingGroup_KeyThemesSummary_26March2019Meeting_FINAL.pdf

California Dungeness Crab Fishing Gear Working Group, Guidelines for Research and Development Projects, Focus on Ropeless Gear Innovations, Feb 2019:

http://www.opc.ca.gov/webmaster/_media_library/2019/02/Whales-Gear-Innovations-R-and-D-Guidelines-February-2019.pdf

California Dungeness Crab Fishing Gear Working Group, Recommendations Memo, October 15 2018:

http://www.opc.ca.gov/webmaster/_media_library/2018/10/Whales_Working_GroupRecommendationsMemo_October2018_FINAL.pdf

California Dungeness Crab Fishing Gear Working Group, Summary of Key Themes, Santa Rosa, August 1-2, 2018:

http://www.opc.ca.gov/webmaster/_media_library/2018/09/CAWorkingGroup_KeyThemesSummaryAugust2018Meeting_FINAL.pdf

California Dungeness Crab Fishing Gear Working Group, Summary of Key Themes, Santa Rosa, April 23-24, 2018:

http://www.opc.ca.gov/webmaster/_media_library/2018/05/CAWorkingGroup_KeyThemesSummaryApril2018Meeting_FINAL.pdf

Other meetings listed here: <https://wildlife.ca.gov/Conservation/Marine/Whale-Safe-Fisheries#542162301-past-meetings>

PUBLIC DISCUSSIONS OF PROPOSED REGULATIONS PRIOR TO NOTICE PUBLICATION:

Dungeness Crab Task Force meetings where the proposed regulations were discussed:

October 16-18, 2017, teleconference (meeting summary:

http://www.opc.ca.gov/webmaster/_media_library/2009/04/DCTF_LegReportDec2017_FINAL.docx.pdf)

June 5-6, 2018, Ukiah, CA (meeting summary:

http://www.opc.ca.gov/webmaster/_media_library/2009/04/DCTF_MeetingSummary_June2018_FINAL.pdf)

October 16-17, 2019, Santa Rosa, CA (Meeting summary:

http://www.opc.ca.gov/webmaster/_media_library/2009/04/DCTF_Oct2017_FinalMeetingSummary.pdf)

TRIBAL COMMUNICATION & OUTREACH

In the event that tribal members participate in the commercial Dungeness crab fishery, CDFW sent a notification letter on December 23, 2019 to all California Federally recognized tribes of the upcoming regulatory proposal related to the RAMP and Conservation Plan currently under development. Marine staff also

provided a brief update during the January Tribal Committee meeting in Los Alamitos.