California Fish and Game Commission

Marine Resources Committee

Meeting Binder

July 11, 2019

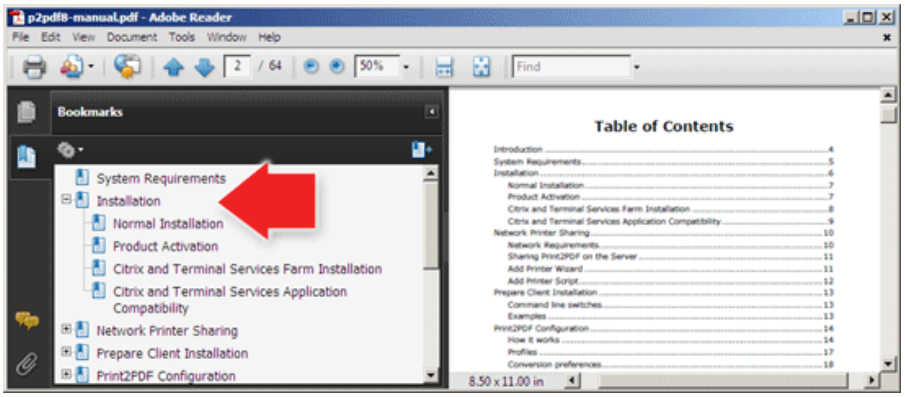
San Clemente

EASY GUIDE TO USING THE BINDER

1. Download and open the binder document using your Adobe Acrobat program/app.

2. If a bookmark panel does not automatically appear on either the top or left side of the screen, click/tap on the “bookmark symbol” located near the top left-hand corner.

3. To make adjustments to the view, use the Page Display option in the View tab. You should see something like:



4. We suggest leaving open the bookmark panel to help you move efficiently among the staff summaries and numerous supporting documents in the binder. It’s helpful to think of these bookmarks as a table of contents that allows you to go to specific points in the binder without having to scroll through hundreds of pages.

5. You can resize the two panels by placing your cursor in the dark, vertical line located between the panels and using a long click /tap to move in either direction. ↔

6. You may also adjust the sizing of the documents by adjusting the sizing preferences located on the Page Display icons found in the top toolbar or in the View tab.

7. Upon locating a staff summary for an agenda item, notice that you can obtain more information by clicking/tapping on any item underlined in blue.

8. Return to the staff summary by simply clicking/tapping on the item in the bookmark panel.

9. Do not hesitate to contact staff if you have any questions or would like assistance.

OVERVIEW OF FISH AND GAME COMMISSION COMMITTEE MEETING

- Welcome to this meeting of the _____ Committee. The Committee is comprised of up to two Commissioners who co-chair each meeting; members are assigned by the Commission annually.

- Our goal today is informed discussion to guide future decision making, and, we need your cooperation to ensure a lively and comprehensive dialogue.

- We are operating under Bagley-Keene Open Meeting Act, but it is important to note that the Committee chairs cannot take action independent of the full Commission; instead, the chairs make recommendations to the full Commission at regularly scheduled meetings.

- These proceedings may be recorded and posted to our website for reference and archival purposes.

- Items may be heard in any order pursuant to the determination of the Committee Co-Chairs.

- In the unlikely event of an emergency, please locate the nearest emergency exits.

- Restrooms are located _____.

- As a general rule, requests for regulatory change need to be redirected to the full Commission and submitted on the required petition form, FGC 1, titled "Petition to the California Fish and Game Commission for Regulation Change" (Section 662, Title 14, CCR). However, at the Committee's discretion, the Committee may request that staff follow up on items of potential interest to the Committee and possible recommendation to the Commission.

- Committee meetings operate informally and provide opportunity for everyone to provide comment on agenda items. If you wish to speak on an agenda item, please follow these guidelines:
    1. Raise your hand and wait to be recognized by the Committee.
    2. Provide your name, affiliation (if any), and the number of people you represent.
    3. Time is limited; please keep your comments precise to give others time to speak.
    4. If several speakers have the same concerns, please appoint a group spokesperson.
    5. If you would like to present handouts or written materials to the Committee, please provide five copies to the designated staff member just prior to speaking.
    6. If speaking during public comment, the subject matter you present should <u>not be related</u> to any item on the current agenda (public comment on agenda items will be taken at the time the Committee members discuss that item).

- **Warning!** Laser pointers may only be used by a speaker doing a presentation.

INTRODUCTIONS FOR FISH AND GAME COMMISSION MARINE RESOURCES COMMITTEE

FISH AND GAME COMMISSIONERS

Peter Silva	Co-Chair (Jamul)
Samantha Murray	Co-Chair (Del Mar)

COMMISSION STAFF

Susan Ashcraft	Acting Deputy Executive Director
Elizabeth Pope	Acting Marine Advisor
Sergey Kinchak	Staff Services Analyst

DEPARTMENT OF FISH AND WILDLIFE

Craig Shuman	Regional Manager, Marine Region
Bob Puccinelli	Captain, Law Enforcement Division

I would also like to acknowledge special guests who are present:
(i.e., key DFW staff, elected officials, tribal chairpersons, other special guests)

_____

_____

Commissioners
Eric Sklar, President
Saint Helena
Jacque Hostler-Carmesin, Vice President
McKinleyville
Russell E. Burns, Member
Napa
Peter S. Silva, Member
Jamul
Samantha Murray, Member
Del Mar

STATE OF CALIFORNIA
Gavin Newsom, Governor

Fish and Game Commission

Wildlife Heritage and Conservation
Since 1870

Melissa Miller-Henson
Acting Executive Director
P.O. Box 944209
Sacramento, CA 94244-2090
(916) 653-4899
fgc@fgc.ca.gov

www.fgc.ca.gov

MARINE RESOURCES COMMITTEE

Committee Co-chairs: Commissioner Murray and Commissioner Silva

Meeting Agenda
July 11, 2019, 9:30 a.m.

California Department of Parks and Recreation
Orange Coast District Office Training Room
3030 Avenida del Presidente
San Clemente, CA 92672

This meeting may be audio-recorded

NOTE: See important meeting procedures and information at the end of the agenda. Unless otherwise indicated, the California Department of Fish and Wildlife is identified as Department. All agenda items are informational and/or discussion only. The Committee develops recommendations to the Commission but does not have authority to make policy or regulatory decisions on behalf of the Commission.

Call to order

1. Approve agenda and order of items

2. General public comment for items not on the agenda
The Committee may not discuss or take action on any matter raised during this item, except to consider whether to recommend that the matter be added to the agenda of a future meeting. [Sections 11125, 11125.7(a), Government Code]

3. Staff and agency updates
Receive updates from staff and other agencies on items of note since the last Committee meeting.

(A) Ocean Protection Council
(B) Department
  I. Marine Region
  II. Law Enforcement Division
(C) Commission staff update

4. Red Abalone Fishery Management Plan (FMP)
Receive Department update on collaborative progress in completing the Red Abalone FMP.

5. Marine Life Management Act (MLMA) master plan implementation
Receive Department update on implementing the 2018 master plan for fisheries.

6. Kelp and algae commercial harvest regulations
Receive Department update on progress made for potential revisions to regulations for commercial kelp and algae harvest.

7. Coastal fishing communities project
Receive staff update on the Commission's coastal fishing communities project and staff report, and discuss next steps.

8. State recreational fisheries management authority
Receive stakeholder informational presentation on aspects of State recreational fisheries management not under Commission regulatory authority.

9. Whale and turtle protections in the Dungeness crab fisheries
Discuss management strategies to provide additional whale and turtle protections in the Dungeness crab fisheries, including possible provisions for the recreational fishery.

10. Future agenda items

(A) Review work plan agenda topics and timeline
(B) Potential new agenda topics for FGC consideration

Adjourn

CALIFORNIA FISH AND GAME COMMISSION
2019 MEETING SCHEDULE

Note: As meeting dates and locations can change, please visit www.fgc.ca.gov for the most current list of meeting dates and locations.

Meeting Date	Commission Meeting	Committee Meeting	Other Meetings
August 7-8	Natural Resources Building Auditorium, First Floor 1416 Ninth Street Sacramento, CA 95814		
September 5		**Wildlife Resources** Justice Joseph A. Rattigan State Building Conference Room 410, Fourth Floor 50 D Street Santa Rosa, CA 95404	
October 8		**Tribal** San Diego	
October 9-10	San Diego		
November 5		**Marine Resources** Natural Resources Building 12th Floor Conference Room 1416 Ninth Street, Room 1206 Sacramento, CA 95814	
December 11-12	Natural Resources Building Auditorium, First Floor 1416 Ninth Street Sacramento, CA 95814		

OTHER MEETINGS OF INTEREST

Association of Fish and Wildlife Agencies

- September 22-25, Saint Paul, MN

Pacific Fishery Management Council

- September 11-18, Boise, ID
- November 13-20, Costa Mesa, CA

Pacific Flyway Council

- August 23, TBD

Western Association of Fish and Wildlife Agencies

- July 11-16, Manhattan, KS

Wildlife Conservation Board

- August 28, Sacramento, CA
- November 21, Sacramento, CA

IMPORTANT COMMITTEE MEETING PROCEDURES INFORMATION

Welcome to a meeting of the California Fish and Game Commission's Marine Resources Committee. The Committee is chaired by up to two Commissioners; these assignments are made by the Commission.

The goal of the Committee is to allow greater time to investigate issues before the Commission than would otherwise be possible. Committee meetings are less formal in nature and provide for additional access to the Commission. The Committee follows the noticing requirements of the Bagley-Keene Open Meeting Act. It is important to note that the Committee chairs cannot take action independent of the full Commission; instead, the chairs make recommendations to the full Commission at regularly scheduled meetings.

The Commission's goal is the preservation of our heritage and conservation of our natural resources through informed decision making; Committee meetings are vital in developing recommendations to help the Commission achieve that goal. In that spirit, we provide the following information to be as effective and efficient toward that end. Welcome, and please let us know if you have any questions.

PERSONS WITH DISABILITIES

Persons with disabilities needing reasonable accommodation to participate in public meetings or other Commission activities are invited to contact the Reasonable Accommodation Coordinator at (916) 651-1214. Requests for facility and/or meeting accessibility should be received at least 10 working days prior to the meeting to ensure the request can be accommodated.

SUBMITTING WRITTEN MATERIALS

The public is encouraged to attend Committee meetings and engage in the discussion about items on the agenda; the public is also welcome to comment on agenda items in writing. You may submit your written comments by one of the following methods (only one is necessary): **Email** to fgc@fgc.ca.gov; **mail** to California Fish and Game Commission, P.O. Box 944209, Sacramento, CA 94244-2090; **deliver** to California Fish and Game Commission, 1416 Ninth Street, Room 1320, Sacramento, CA 95814; or **hand-deliver to a Committee meeting.**

COMMENT DEADLINES

The **Written Comment Deadline** for this meeting is **5:00 p.m. on June 27, 2019.** Written comments received at the Commission office by this deadline will be made available to Commissioners prior to the meeting.

The **Late Comment Deadline** for this meeting is **noon on July 8, 2019.** Comments received by this deadline will be marked "late" and made available to Commissioners at the meeting.

After these deadlines, written comments may be delivered in person to the meeting – please bring five (5) copies of written comments to the meeting.

The Committee **will not** consider comments regarding proposed changes to regulations that have been noticed by the Commission. If you wish to provide comment on a noticed item, please provide your comments during Commission business meetings, via email, or deliver to the commission office.

Note: Materials provided to the Committee may be made available to the general public.

REGULATION CHANGE PETITIONS
As a general rule, requests for regulatory change need to be redirected to the full Commission and submitted on the required petition form, FGC 1, titled "Petition to the California Fish and Game Commission for Regulation Change" (Section 662, Title 14, CCR). However, at the Committee's discretion, the Committee may request that staff follow up on items of potential interest to the Committee and possible recommendation to the Commission.

SPEAKING AT THE MEETING
Committee meetings operate informally and provide opportunity for everyone to comment on agenda items. If you wish to speak on an agenda item, please follow these guidelines:

1. Raise your hand and wait to be recognized by the Committee chair or co-chair(s).
2. Once recognized, please begin by giving your name and affiliation (if any) and the number of people you represent.
3. Time is limited; please keep your comments concise so that everyone has an opportunity to speak.
4. If you would like to present handouts or written materials to the Committee, please provide five copies to the designated staff member just prior to speaking.
5. If speaking during general public comment, the subject matter you present should not be related to any item on the current agenda (public comment on agenda items will be taken at the time the Committee members discuss that item). As a general rule, general public comment is an opportunity to bring matters to the attention of the Committee, but you may also do so via email or standard mail. At the discretion of the Committee, staff may be requested to follow up on the subject you raise.

VISUAL PRESENTATIONS/MATERIALS
All electronic presentations must be submitted by the **Late Comment Deadline** and approved by the Commission executive director before the meeting.

1. Electronic presentations must be provided by email by the written materials deadline.
2. All electronic formats must be Windows PC compatible.
3. It is recommended that a print copy of any electronic presentation be submitted in case of technical difficulties.
4. A data projector, laptop and presentation mouse will be available for use at the meeting.

LASER POINTERS may only be used by a speaker during a presentation.

2. PUBLIC COMMENT

Today's Item **Information** ☒ **Direction** ☐

Receive public comments for items not on the agenda.

Summary of Previous/Future Actions (N/A)

Background

The Committee generally receives two types of correspondence or comment under public forum: Requests for MRC to consider new topics, and informational items. As a general rule, requests for regulatory change need to be directed to FGC and submitted on the required petition form, FGC 1, *Petition to the California Fish and Game Commission for Regulation Change* (Section 662, Title 14, CCR). However, at the discretion of the Committee, staff may be requested to follow up on items of potential interest to the Committee and possible recommendation to FGC.

Significant Public Comments (N/A)

Recommendation

If the Committee wants to recommend any new future agenda items based on issues raised and within FGC's authority, staff recommends holding for discussion under today's Agenda Item 10, *Future Committee agenda topics*.

Exhibits (N/A)

Committee Direction/Recommendation (N/A)

COMMITTEE STAFF SUMMARY FOR JULY 11, 2019

3. STAFF AND AGENCY UPDATES

Today's Item **Information** ☒ **Direction** ☐

Receive updates from staff and other agencies, including the California Ocean Protection Council (OPC) and DFW.

Summary of Previous/Future Actions (N/A)

Background

This is a standing item for DFW and other government agencies to provide an update on marine-related activities of interest.

(A) ***OPC*:** Paige Berube, Fisheries Program Manager

(B) ***DFW*:**

I. *Marine Region*: Regional Manager Craig Shuman, who will include highlights of marine-related rulemakings developed under DFW authority

II. *Law Enforcement Division*: Captain Bob Puccinelli

(C) ***FGC staff:*** On Jun 28, 2019 Governor Newson reappointed Director Chuck Bonham as director of DFW and appointed Valerie Termini as chief deputy director for DFW. With the FGC executive director position now vacant, a recruitment process has begun and several staff will remain in their acting roles for FGC until the process is complete. Melissa Miller-Henson is acting executive director, Susan Ashcraft is acting deputy executive director, and Elizabeth Pope is acting marine advisor.

Significant Public Comments (N/A)

Recommendation (N/A)

Exhibits (N/A)

Committee Direction/Recommendation (N/A)

4. RED ABALONE FISHERY MANAGEMENT PLAN (FMP)

Today's Item **Information** ☒ **Action** ☐

Receive DFW update on collaborative progress to complete the red abalone FMP.

Summary of Previous/Future Actions

• FGC supported red abalone FMP development per MRC recommendation	Oct 8, 2014; Mt. Shasta
• DFW updates to MRC on FMP process	2015-2017; MRC meetings
• FGC discussions of FMP scope and content	Dec 2017-2018; various
• Received peer review results for draft FMP and re-referred to MRC	Oct 17, 2018; Fresno
• MRC discussion of revised FMP process	Nov 14, 2018; MRC, Sacramento
• DFW update to MRC on FMP process	Mar 20, 2019; MRC, Sacramento
• **Today's update**	**Jul 11, 2019; MRC San Clemente**

Background

A red abalone FMP has been under development by DFW since 2014, with regular updates to MRC and FGC. DFW staff has also reported unprecedented environmental conditions on California's north coast with significant biological impacts to abalone, and how those impacts are affecting the FMP process and its possible provisions.

Last year, two sets of proposed harvest control rules for the FMP—one proposed by DFW, and an alternate proposed by The Nature Conservancy (TNC) using stakeholder-developed metrics—underwent peer review. FGC supported a peer review recommendation to explore integrating aspects of both draft management strategies to be more robust against uncertainty under different fishery conditions and referred the exploration to MRC. For a more detailed background on the process, see exhibits 1 and 2.

At the Nov 2018 MRC meeting, DFW presented a draft approach for responding to peer review recommendations and revising the draft FMP. MRC recommended that FGC: (1) support integrating aspects of both draft management strategies based on a simulation modeling approach co-developed by DFW and the TNC-led stakeholder team, including engagement with abalone divers and other stakeholders; (2) revise FMP goals to allow for a *de minimis* fishery option; (3) develop triggers for the *de minimis* fishery option in consultation with stakeholders; and (4) request that DFW develop a proposed process and timeline which accounts for active public and MRC engagement. FGC approved the recommendations at its Dec 2019 meeting.

In Mar 2019, DFW introduced MRC to a collaborative structure designed to support management strategy integration and public involvement as requested by FGC. The structure includes three collaborative teams: an administrative team, a modeling team, and a project team (see Exhibit 3 for details). The first project team public meeting was held May 22, 2019 in Santa Rosa (Exhibit 4). A second meeting via webinar is scheduled for Jul 19, 2019.

Today, MRC will receive a presentation from DFW and TNC staff on FMP progress made in the collaborative team structure (Exhibit 5).

Significant Public Comments (N/A)

Recommendation (N/A)

Exhibits

1. Staff summary for FGC Agenda Item 11, Oct 17, 2018 (for background purposes only)
2. Staff summary for MRC Agenda Item 5, Nov 14, 2018 (for background purposes only)
3. DFW presentation provided at Mar 20 MRC meeting (for background purposes only)
4. Meeting materials for May 22, 2019 project team meeting, available at www.opc.ca.gov/2019/05/red-abalone-management-strategies-integration
5. DFW presentation

Committee Direction/Recommendation (N/A)

5. MARINE LIFE MANAGEMENT ACT MASTER PLAN

Today's Item **Information** ☒ **Direction** ☐

Receive DFW update on next steps for implementing the 2018 master plan for fisheries.

Summary of Previous/Future Actions

- FGC adopted 2018 master plan — Jun 20-21, 2018; Sacramento
- Most recent implementation update — Mar 20, 2019; MRC, Sacramento
- **Today's update on implementation — Jul 11, 2019; MRC, San Clemente**

Background

The Marine Life Management Act (MLMA) directs DFW to submit to FGC for approval a master plan that specifies the process and resources needed to prepare, adopt, and implement fishery management plans (FMPs) for sport and commercial marine fisheries managed by the State, with input from fisheries participants, marine conservationists, scientists, and other interested parties (Fish and Game Code Section 7073). Pursuant to the MLMA requirement, in 2001 FGC adopted *The Master Plan: A Guide for the Development of Fishery Management Plans* (Master Plan), developed by DFW with stakeholder input.

In Jun 2018, FGC adopted an updated plan, titled *2018 Master Plan for Fisheries: A Guide for Implementation of the Marine Life Management Act* (2018 Master Plan). FGC referred the topic to MRC as a standing agenda item to discuss and receive regular DFW updates on implementation steps, priorities, and opportunities.

Today is the fourth discussion of MLMA implementation efforts since the master plan's adoption. DFW staff will provide an update on tasks reflected in the MLMA implementation work plan, which was provided to FGC in Jun 2019 (Exhibit 1). DFW has provided enhanced status reports developed pursuant to MLMA for three species: Kellet's Whelk, Ridgeback Prawn and Hagfish (exhibits 2-4).

Significant Public Comments (N/A)

Recommendation (N/A)

Exhibits

1. *Marine Life Management Act Master Plan: Implementation Work Plan*, dated Jun 3, 2019
2. *Kellet's Whelk, Kelletia kelletii, Enhanced Status Report*, dated Jun 2019
3. *Ridgeback Prawn, Sicyonia ingentis, Enhanced Status Report*, dated Jun 2019
4. *Pacific Hagfish, Eptatretus stoutii, Enhanced Status Report*, dated Jun 2019

Committee Direction/Recommendation (N/A)

6. KELP AND ALGAE COMMERCIAL HARVEST REGULATIONS

Today's Item **Information** ☒ **Direction** ☐

Receive update from DFW on progress made for potential revisions to commercial kelp and algae harvest regulations.

Summary of Previous/Future Actions

- FGC approves 3-phase approach for kelp review — Jun 2012
- FGC adopts Phase 1 kelp regulations — Nov 2013
- MRC reviews approach to next regulation phases — Nov 4, 2015; MRC, Ventura
- FGC approves revised 3-phase approach — Dec 9, 2015; San Diego
- MRC update on regulation review (new Phase 2) — Nov 15, 2016; MRC, Los Alamitos
- Update on regulation review — Mar 6, 2018; MRC, Santa Rosa
- **Today's update on regulation review — Jul 11, 2019; MRC, San Clemente**

Background

Kelp, an important biogenic habitat, is managed through DFW's kelp management program. In Jun 2012, FGC and DFW agreed to a three-phase approach to revise antiquated commercial kelp regulations over several years, to improve management and enforceability (Exhibit 1). The approved approach was to commence with Phase 1, to modernize boundaries for administrative kelp plans, improve reporting requirements, and require kelp harvest plans; would be followed by a review of fees in Phase 2; and would conclude with a review of commercial kelp and algae harvest management and regulations in Phase 3.

Phase 1 was completed in 2013 and implemented in 2014. Following a DFW update and discussion with MRC in Nov 2015, FGC approved an MRC recommendation to reverse the order of the 2nd and 3rd phases, to evaluate commercial kelp and algae harvest regulations as Phase 2 before reviewing fees as Phase 3. The reversal was intended to ensure any potential increased costs to DFW resulting from changes in kelp management structure could be considered in setting fees. The revised order is:

Phase 1: Boundaries and improved guidelines (2013–2014)

Phase 2: Review regulations for commercial kelp and algae harvest (2016–current)

Phase 3: Fees (TBD)

As part of Phase 2, DFW has focused on both regulatory clean-up and broader management and regulation overhaul, recognizing that California Environmental Quality Act compliance could be a constraining factor for the timeline and cost.

Today, DFW staff will present an update on the review of commercial harvest and marine algae regulations since the last update in Mar 2018, a timeline moving forward, and next steps.

Significant Public Comments (N/A)

Recommendation (N/A)

Exhibits

1. DFW memo on three-phase approach, dated Jun 1, 2012 (for reference purposes)
2. DFW presentation

Committee Direction/Recommendation (N/A)

7. COASTAL FISHING COMMUNITIES PROJECT

Today's Item **Information** ☒ **Direction** ☐

Receive staff update on FGC's Coastal Fishing Communities Project, receive update on staff report revisions progress, and discuss next steps.

Summary of Previous/Future Actions

- FGC refers topic to MRC — Feb 11, 2015; Sacramento
- MRC discussions, planning, and public meetings — 2015 - 2017; various
- MRC received and discussed staff report — Jul 17, 2018; MRC, San Clemente
- Most recent MRC update — Mar 20, 2019; MRC, Sacramento
- **Today's update on progress** — **Jul 11, 2019; MRC, San Clemente**

Background

An MRC project under FGC direction, the Coastal Fishing Communities Project has been underway since 2015 (see Exhibit 1 for background). At the direction of MRC, staff held a series of eight stakeholder conversations (2016-2018) in coastal communities across the state, which were designed to inform MRC on the issues facing coastal fishing communities.

In Jul 2018, FGC staff completed a report intended to capture and summarize information provided during the coastal communities meetings, and to identify common themes and port-specific challenges. Staff provided the *Jul 2018 Staff Report on California Coastal Fishing Communities Meetings* and an overview presentation at the Jul 2018 MRC meeting, where MRC directed staff to open the report for public comment. Following a six-week public comment period, staff summarized 14 comment letters with over 75 unique comments.

At MRC's Nov 2018 meeting, stakeholders requested that the staff report be revised to integrate the public comments, and to add more detailed information and an analysis of options to provide greater context before MRC consider recommending any specific actions moving forward. MRC recommended, and at its Dec 2018 meeting FGC approved, that staff (a) revise the Jul 2018 staff report based on submitted public feedback; (b) develop a more comprehensive report in collaboration with interested stakeholders to provide more detailed background and an analysis of options for FGC action (overall and port-specific strategies); and (c) report back to MRC in Mar 2019 on progress (see Exhibit 2 for background).

At the Mar 2019 MRC meeting, staff provided an update highlighting efforts in four focal areas identified to help address MRC direction: (1) staff report revisions, (2) public outreach, (3) partner efforts, and (4) collaboration. Following the Mar MRC meeting, staff completed revisions to the Jul 2018 staff report, including integrating stakeholder comments and clarifying staff-recommended options for potential development (Exhibit 3), and continued efforts in project focal areas.

Today, staff delivers the final coastal fishing communities meetings staff synthesis report (Exhibit 3) and will report on progress made on all focal project areas.

Significant Public Comments (N/A)

Recommendation

Receive the *Final Staff Synthesis Report on California Coastal Fishing Communities Meetings* (Jul 2019) as complete. If supported by MRC, staff can begin working with partners to develop a more in-depth report on coastal fishing communities' resilience in California. Discuss prioritizing the recommendations outlined in the final staff report and provide input on where to focus staff efforts as a more in-depth analysis and reporting ensues.

Exhibits

1. Staff summary from Nov 4, 2015 MRC meeting, Agenda Item 8 (for background purposes only)
2. Staff summary from Nov 14, 2018 MRC meeting, Agenda Item 4 (for background purposes only)
3. Final staff synthesis report on coastal fishing communities meetings and summary of stakeholder comments, dated Jul 2019 *(to be provided at or before MRC meeting)*

Committee Direction/Recommendation (N/A)

COMMITTEE STAFF SUMMARY FOR JUL 11, 2019

8. STATE RECREATIONAL FISHERIES MANAGEMENT AUTHORITY

Today's Item **Information** ☒ **Action** ☐

Receive stakeholder informational presentation on aspects of State recreational fisheries management not under FGC authority

Summary of Previous/Future Actions

- MRC recommendation to refer topic — Mar 20, 2019; MRC, Sacramento
- FGC approves MRC recommendation — Apr 17, 2019; Santa Monica
- FGC modifies topic — Jun 12-13, 2019; Redding
- **Today receive stakeholder presentation** — **Jul 11, 2019; MRC, San Clemente**

Background

At its Mar 2019 meeting, MRC received a request from George Osborn, representing the California Sportfishing League, to provide an informational presentation on State recreational fisheries management not under FGC authority, to stimulate discussion about possibly shifting more authority to FGC. After some discussion and the request of MRC, the topic was broadened to include commercial fisheries with a request that Mr. Osborn reach out to commercial fishery representatives and invite their participation. MRC recommended, and at its Apr 2019 meeting FGC approved, to refer the topic to MRC for discussion at the Jul 2019 MRC meeting.

At the Jun 2019 FGC meeting, a representative of a commercial fishing organization commented that Mr. Osborn had reached out to him inviting commercial fishing interests' participation in the agenda topic; however, the representative requested to defer the commercial fisheries portion of the discussion until after the summer fishing season. FGC approved the request to limit the scope of the Jul stakeholder presentation to recreational fisheries, and to schedule the commercial fisheries part of the discussion for Nov when it would be more feasible for commercial fisheries participation.

For today's agenda item, Mr. Osborn has prepared an informational presentation and background paper (exhibits 1 and 2) that highlight differing authorities for sport fisheries in California as provided in statute, and as summarized in a general overview prepared by the Legislative Council Bureau (Exhibit 3).

Significant Public Comments (N/A)

Recommendation (N/A)

Exhibits

1. George Osborn informational presentation
2. Background paper from George Osborn, California Sportfishing League, dated Jul 11, 2019

3. Letter from Diane Boyer-Vine, Legislative Council Bureau, to the Honorable Sharon Quirk-Silva regarding Sport Fishing and Commercial Fishing - #1912858, dated May 31, 2019

Motion/Direction (N/A)

9. WHALE AND TURTLE PROTECTIONS – DUNGENESS CRAB FISHERIES

Today's Item **Information** ☒ **Direction** ☐

Receive informational presentations from DFW and discuss management strategies to provide additional whale and turtle protections in the Dungeness crab fisheries, including possible provisions for the recreational fishery.

Summary of Previous/Future Actions

- FGC discussion of entanglement settlement and referral to MRC — Apr 17, 2019; Santa Monica
- **Today's discussion** — **Jul 11, 2019; MRC, San Clemente**

Background

FGC has authority to regulate the recreational Dungeness crab fishery; however, authority over the commercial Dungeness crab fishery is held by DFW and the California State Legislature. In recent years, whale populations in California's waters have increased, leading to greater presence in Dungeness crab fishing grounds and an increased risk of entanglement in deployed fishing gear.

In 2017, following a significant increase in the number of whale entanglements off the West Coast, the Center for Biological Diversity sued DFW challenging DFW authorization of the crab fishery as a violation of Section 9 of the federal Endangered Species Act for take of blue and humpback whales and leatherback sea turtles. In Mar 2019 a settlement was reached that defines a series of interim measures to protect listed whales and turtles in the commercial Dungeness crab fishery while DFW pursues a habitat conservation plan (HCP) for federal government approval (exhibits 1-2). Additional industry perspective on the settlement is provided in exhibits 3-5, including a Jul 2019 article in National Fisherman.

At the Apr 2019 FGC meeting, a discussion was held to recap the provisions of the commercial fishery settlement agreement and explore its potential application to the recreational Dungeness crab fishery (Exhibit 6). Commenters at the meeting from the recreational fishery were not in support of applying the same restrictions to the recreational fishery, as it operates differently from the commercial fishery; they requested that the recreational fishery be considered independently. Based on differing public comment and multiple stakeholder requests, the topic was referred to the Jul MRC meeting for further discussion and to identify any possible provisions for the recreational fishery.

At this meeting, DFW will report on whale management strategies for the Dungeness crab fishery and provide MRC an opportunity to explore possible provisions for the recreational fishery in a timeframe consistent with DFW efforts to develop an HCP.

Significant Public Comments

A commercial fishermen requested that MRC discussion about minimizing risk of whale entanglements in the Dungeness crab fishery be held in central California, in proximity to the

fishing grounds, rather than in southern California, which is outside the fishery range and presents a barrier to fishermen participating due to travel costs and time.

Recommendation

Request that DFW explore possible provisions for the recreational fishery in a time frame consistent with DFW efforts to develop an HCP, and bring options for discussion to the Nov 2019 MRC meeting.

Exhibits

1. DFW News: *Entanglement Settlement Protects Whales, Sea Turtles and California's Crab Fishery*, dated Mar 26, 2019
2. Center for Biological Diversity v. Bonham (Defendant), and Pacific Coast Federation of Fishermen's Associations and Institute for Fisheries Resources (Intervenor-Defendants), stipulation and [proposed] order staying case, filed Mar 26, 2019
3. California Dungeness Crab Fishing Gear Working Group statement, dated Mar 29, 2019
4. California Dungeness Crab Fishing Gear Working Group Evaluation Team advisory, dated Mar 19, 2019
5. Feature article "Dungie Deal" by Nick Rahaim, National Fisherman, Jul 2019 issue
6. Staff summary for FGC Agenda Item 25, Apr 2019 (for background purposes only)

Committee Direction/Recommendation (N/A)

10. FUTURE AGENDA ITEMS

Today's Item **Information** ☐ **Direction** ☒

Review upcoming agenda items scheduled for the next and future MRC meetings, hear requests from DFW and interested stakeholders for future agenda items, and identify new items for consideration.

Summary of Previous/Future Actions

- FGC approved MRC agenda and work plan — Jun 12-13, 2019; Redding
- **Today's discussion** — **Jul 11, 2019; MRC, San Clemente**
- Next meeting — Nov 5, 2019; MRC, Sacramento

Background

Committee topics are referred by FGC and scheduled as appropriate. FGC-referred topics and their current schedule are shown in the MRC work plan, Exhibit 1. MRC agendas currently include several complex and time-intensive topics under development. The committee has placed emphasis on issues of imminent regulatory or management importance, and thus considering new topics will require planning relative to existing committee workload.

MRC Work Plan and Timeline

Draft agenda topics identified for the Nov 2019 MRC meeting:

1. Update on MLMA master plan for fisheries implementation
2. Update on red abalone fishery management plan development
3. Update and discussion on best management practices plan requirements for aquaculture leases
4. Update, discussion and potential recommendation on aquaculture programmatic environmental impact report
5. Stakeholder informational presentation on aspects of state commercial fisheries management not under FGC regulatory authority (deferred from Jul MRC meeting)
6. Update and discussion on FGC's California Coastal Fishing Communities Project

Discuss and Recommend New MRC Topics

Today provides an opportunity to identify any potential new agenda topics to recommend to FGC for referral to MRC.

Significant Public Comments (N/A)

Recommendation

FGC staff: No new topics are recommended for FGC referral to MRC.

Exhibits

1. MRC work plan, dated Jul 2, 2019
2. FGC perpetual timetable for regulatory actions, dated Jun 18, 2019

Committee Direction/Recommendation (N/A)

11. RED ABALONE FISHERY MANAGEMENT PLAN

Today's Item **Information** ☒ **Action** ☐

Receive peer review results for draft red abalone fishery management plan (FMP), discuss peer review results, and discuss next steps.

Summary of Previous/Future Actions

• FGC supports red abalone FMP development per MRC recommendation	Oct 8, 2014; Mt. Shasta
• DFW updates to MRC on FMP process and timeline	2015-2017; MRC meetings
• Received update on FMP process	Dec 6-7, 2017; San Diego
• Discussed FMP scope and content	Apr 18-19, 2018; Ventura
• Last update on FMP schedule	Aug 22-23, 2018; Fortuna
• **Today receive peer review results for draft FMP**	**Oct 17, 2018; Fresno**

Background

DFW is developing a red abalone FMP for adoption by FGC. Beginning in 2014, DFW provided updates at MRC meetings on the FMP process, progress, and stakeholder input. DFW abalone project staff have also kept FGC and MRC updated on the unprecedented environmental conditions on the north coast and subsequent biological impacts to abalone, and how those are affecting the FMP process and possible provisions.

At FGC's Dec 2017 meeting, DFW provided an overview of its proposed harvest control rule (HCR) for the FMP. In addition, an alternate HCR option was proposed by The Nature Conservancy using survey methods derived from engaging abalone fishermen in citizen science. FGC supported advancing the stakeholder-proposed HCR through a peer review process alongside the DFW-proposed HCR. In addition, FGC directed staff to schedule future FMP updates at FGC meetings rather than MRC meetings due to broad interest in the topic.

In Apr 2018, DFW provided a more detailed overview of the red abalone FMP components, including the management framework, new environmental and abalone condition factors, management responses, a reopening approach, and the DFW HCR-based management strategy. In Jun 2018, the California Ocean Science Trust (OST), with support from the California Ocean Protection Council, began coordinating an external, independent scientific peer review of the draft FMP and both the DFW-developed and The Nature Conservancy's stakeholder-developed HCR-based management strategies. At the Jun 2018 FGC meeting, DFW notified FGC that an extended timeline was necessary to provide time for adequate peer review of both strategies.

On Aug 20, 2018, OST hosted an initial public webinar with the peer review panel, DFW, and The Nature Conservancy. A second public webinar is scheduled to be held on Oct 12, 2018 following release of the peer review report (Exhibit 1).

Today, OST will present the peer review results on the draft red abalone FMP.

Significant Public Comments (N/A)

Recommendation

FGC staff: Request that DFW analyze the peer review results, consider possible pathways and timeline for completing the FMP, and schedule follow-up discussion for the Dec 12-13, 2018 FGC meeting.

Exhibits

1. OST red abalone FMP peer review report, dated Oct 2018

Motion/Direction (N/A)

COMMITTEE STAFF SUMMARY FOR NOVEMBER 14, 2018

5. RED ABALONE FISHERY MANAGEMENT PLAN (FMP)

Today's Item **Information** ☒ **Action** ☐

Discuss next steps in addressing peer review recommendations and completing the red abalone FMP.

Summary of Previous/Future Actions

• FGC supported red abalone FMP development per MRC recommendation	Oct 8, 2014; Mt. Shasta
• DFW updates to MRC on FMP process	2015-2017; MRC meetings
• Received update on FMP process	Dec 6-7, 2017; San Diego
• Discussed FMP scope and content	Apr 18-19, 2018; Ventura
• Last update on FMP schedule	Aug 22-23, 2018; Fortuna
• Received peer review results for draft FMP	Oct 17, 2018; Fresno
• **Today MRC discusses next steps**	**Nov 14, 2018; MRC, Sacramento**

Background

Since 2014, DFW has been developing a red abalone FMP for adoption by FGC, with regular updates to MRC and FGC on the process, progress, and stakeholder input. DFW abalone project staff have also kept FGC and MRC updated on the unprecedented environmental conditions on the north coast and subsequent biological impacts to abalone, and how those are affecting the FMP process and possible provisions. For a more detailed background on the process to date, see Exhibit 1.

This year, attention has focused on two proposed harvest control rules (HCRs) for the FMP: the DFW-recommended HCR, and an alternate HCR option proposed by The Nature Conservancy using stakeholder-developed metrics. FGC supported analysis of both HCRs through an external, independent scientific peer review convened by the California Ocean Science Trust (OST), with support from the California Ocean Protection Council.

At the Oct 2018 FGC meeting, OST presented results and recommendations from the peer review (Exhibit 2). In particular, the peer review panel highlighted that a management strategy employing a combination of aspects from each HCR may be more robust against uncertainty under different fishery conditions, and recommended an analysis to determine how to best integrate them. FGC referred to MRC for this meeting a discussion of next steps and possible pathways to respond to the peer review recommendations. DFW will provide an update.

Significant Public Comments (N/A)

Recommendation

FGC staff: Clarify DFW feedback on peer review recommendations, including alternative approaches to evaluating HCR integration, and schedule follow-up discussion for Dec FGC meeting.

Exhibits

1. Staff summary for Agenda Item 11, Oct 17, 2018 (for background purposes only)
2. OST red abalone FMP peer review report, dated Oct 2018

Committee Direction/Recommendation (N/A)

Red Abalone FMP
Management Strategy Integration
Project Update

Marine Resources Committee Meeting
March 2019

Recapping the 2018 FGC Recommendation

1. Support addressing peer review recommendations to **integrate aspects of both draft management strategies**, based on a simulation modeling approach co-developed by DFW and the TNC-led stakeholder team, including engagement with abalone divers and other stakeholders
2. Revise FMP goals to allow for a ***de minimis* fishery option**
3. **Develop triggers** for the *de minimis* fishery option in consultation with stakeholders
4. Request that DFW develop a **proposed process and timeline** which accounts for active public and MRC engagement

Approach to Ensuring Cross-Engagement

Administrative (Admin) Team

- **Purpose:** To ensure that the Red Abalone Harvest Control Rule (HCR) Integration process occurs in a collaborative, efficient, and timely manner and informs a revised management chapter for the recreational red abalone fishery management plan (FMP)

- **Membership:** Primary/ Alternate
  - Sonke Mastrup [Secretary]/Ian Taniguchi (CDFW)
  - Elizabeth Pope/Susan Ashcraft (FGC)
  - Paige Berube/Jenn Eckerle (OPC)
  - Alexis Jackson [Chair]/Kate Kauer (TNC)
  - Joshua Russo/ Jack Likins (Waterman's Alliance)

Administrative (Admin) Team

- Anticipated Activities:
  - Inform structure and charge of Project Team
  - Assess funding needs to convene Project Team, and secure necessary funding
  - Schedule regular check-in calls
  - Schedule Project Team meetings
  - Draft progress reports for MRC meetings on progress
  - Organize public webinars and periodically update CDFW Red Abalone website
  - Deliver final summary report for FGC and CDFW managers to inform revisions to FMP

Administrative (Admin) Team

- Consensus-based decision-making around outlining the process for HCR proposal integration

- Progress to Date:
  - Finalized charters for Admin and Project Teams
  - Identified funding source and drafted funding proposal
  - Outlined draft HCR integration process
  - Outlined public engagement strategy

Project Team

- **Purpose:** To review and provide feedback on all scientific analyses conducted by modelers and provide input on the *de minimis* fishery and integrated harvested control rule design

- **Membership:**
  - Open to all agency staff and stakeholders for participation
  - Modelling capacity to be provided by Dr. Bill Harford, in consultation with peer reviewers and science staff from CDFW and TNC

Project Team

- Anticipated Activities:
  - Consider all recommendations from the Final Recreational Red Abalone Peer Review Report
  - Review all scientific documents provided by modelers
  - Provide constructive feedback on science reported by modelers
  - Contribute to design of *de minimis* fishery
  - Propose candidate HCRs based on outcome of simulation modeling work

- Meetings will be under third-party facilitation to promote

Opportunities for Public Engagement

- There are several ways for a member of the general public to remain updated on FMP development process –
    - Follow Project Team Meetings
    - MRC and FGC Meetings
    - Webinars
    - CDFW Red Abalone Website
    - Engage with Admin Team Member(s)

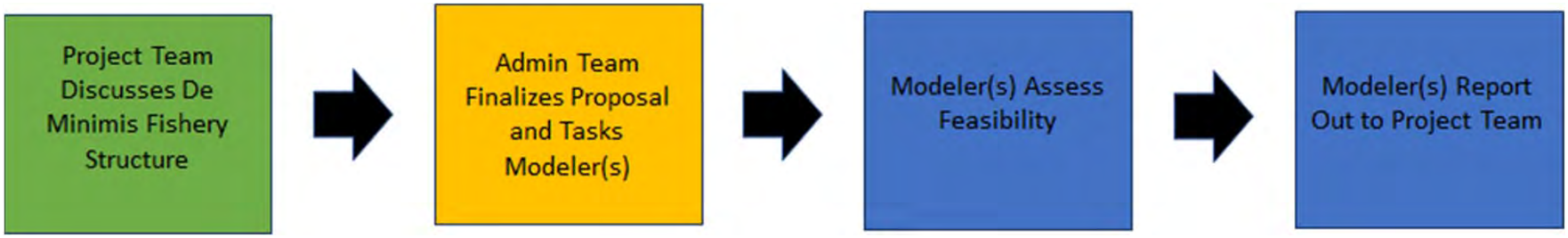
DRAFT HCR Integration Process

Step #1: Simulation modeling work

May repeat as feedback loop where modelers present revised model results to Project Team, Project Team provides additional input on model assumptions, and Admin Team reviews feedback from Project Team to inform any necessary tasks for modelers.

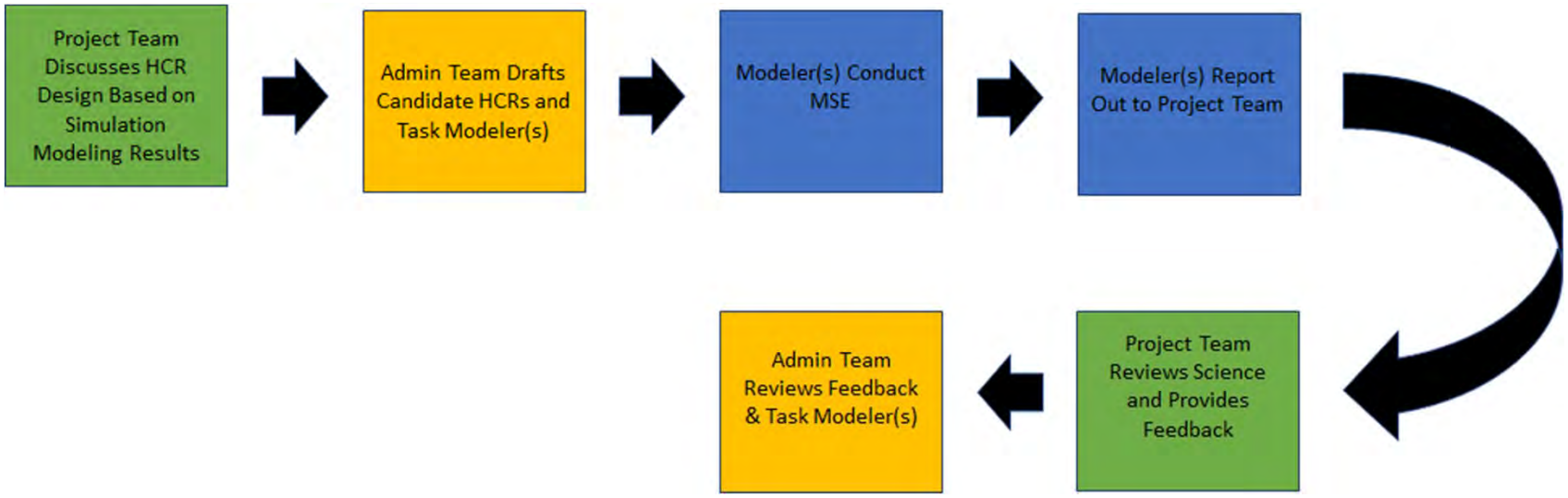
DRAFT HCR Integration Process (cont.)

Step #2: Design *De-Minimis* Fishery



DRAFT HCR Integration Process (cont.)

Step #3: Design integrated HCR



Upon seeing revised results from modelers, the Project Team may select or revise HCR based on MSE performance results and repeat process

DRAFT HCR Integration Process

Step #4: Develop Final Report to CDFW on Integration Process Outcomes for FMP

HCR Integration Timeline

- **First Project Team Meeting - Apr 2019**
- **Ongoing Modelling + Project Team Meetings - Apr to Dec 2019**
- **Complete HCR Integration Process - Dec 2019**
- **FMP Redrafting - Spring 2020**

Next Steps

- **Securing a third-party facilitator**
- **Scheduling the first Project Team meeting (April 2019)**
- **Finalizing an agenda for the first Project Team meeting**

Red Abalone FMP
Management Strategy Integration
Project Update

Marine Resources Committee Meeting
July 2019

Update Overview

- Admin Team
- Facilitation
- Project Team Update
- Next Steps in Process
- Management Strategy Integration Timeline

Administrative (Admin) Team

- **Purpose:** To ensure that the Red Abalone Management Strategy Integration process occurs in a collaborative, efficient, and timely manner and informs a revised management chapter for the recreational red abalone fishery management plan (FMP)

- **Membership:** Primary/ Alternate
  - Sonke Mastrup [Secretary]/Ian Taniguchi (CDFW)
  - Elizabeth Pope/Maggie McCann (FGC)
  - Paige Berube/Jenn Eckerle (OPC)
  - Alexis Jackson [Chair]/Kate Kauer (TNC)
  - Joshua Russo (Waterman's Alliance)/ Jack Likins (Recreational Diver)

Integration Process Facilitation

- Facilitation Support for Project Team (Strategic Earth Consulting)
  - Funded by the Ocean Protection Council
  - Provide third-party, neutral facilitation and meeting support for Project Team members
  - Work in close coordination with the Administrative Team

Project Team Update

- First meeting held May 22 in Santa Rosa, CA.
  - Approximately 40 participants representing multiple constituencies
  - Provided overview of integration process, Project Team role and purpose (team charter), and introduced Project Team work plan
  - Introduced modelers, provided background on management strategy evaluation, and guidance on next steps
  - Had brainstorm and discussion around a *de minimis* fishery
- Next Project Team meeting is July 18 (Webinar)

Next Steps

- Project Team
  - At next meeting (and beyond), discuss available data streams and continuing discussion and development of *de minimis* fishery options

- Modelers
  - Incorporate peer review recommendations to operating model
  - Develop a suite of proposed management strategies

- Administrative Team
  - Organize and prepare materials for Project Team meetings
  - Manage the integration and FMP development process
  - Update the MRC and FGC on progress

Management Strategy Integration Timeline

• Project Team meetings	July, Aug., Sept., Oct., Nov. 2019
• Ongoing modeling	July – Dec. 2019
• Complete integration process	Dec. 2019
• FMP redrafting	Spring 2020
• FMP adoption	Fall/Winter 2020

More Information

- OPC Recreational Red Abalone Management Strategy Integration webpage: http://www.opc.ca.gov/2019/05/red-abalone-management-strategies-integration/

- CDFW Red Abalone Fishery Management Plan webpage:

  https://wildlife.ca.gov/Conservation/Marine/Red-Abalone-FMP

- For questions or to be added to Project Team communications email:

  hello@strategicearth.com

California Department of Fish and Wildlife

Marine Life Management Act Master Plan: Implementation Work Plan

June 3, 2019

Background

The Marine Life Management Act Master Plan (2018 Master Plan) was adopted by the Fish and Game Commission (FGC) in June 2018. The 2018 Master Plan, which updates the original 2001 Master Plan, provides guidance and a toolbox for implementing the Marine Life Management Act (MLMA) goals and objectives. To help ensure that the 2018 Master Plan is implemented effectively, it specifies the development of an Implementation Work Plan (Work Plan).

Structure and Content

To aid in the successful implementation of the 2018 Master Plan, the Work Plan incorporates the following two characteristics:

1. The Work Plan must clearly capture the range of activities that are required to implement MLMA-based management over the next several years. These include fishery prioritization and scaling components from the 2018 Master Plan as well as routine ongoing activities and new statutory mandates.

2. The Work Plan must be adaptable to reflect change as specific tasks reach completion and others are initiated. In many cases, the results from completed tasks will inform the development of new tasks. For instance, the prioritization and scaling tasks within the MLMA-based management "Framework" will inform the decision (and resulting tasks) regarding which species currently need more focused management.

The Work Plan incorporates these two characteristics through seven key elements. The tasks listed under these elements within the Work Plan table below reflect current or soon-to-be implemented work. Partners supporting specific tasks are noted and an anticipated time frame is provided. Planned next steps, those that are expected to be addressed at some point within the next several years, are provided in Appendix 1.

Stakeholder engagement and peer review, as described in the 2018 Master Plan, are crucial to the successful implementation of the MLMA across most of the elements listed below. When specific stakeholder engagement and peer review activities are identified, they will be added as Work Plan subtasks.

Plan Updates

Following presentation of the draft Implementation Work Plan to the FGC Marine Resource Committee (MRC) in March 2019, the final Work Plan will be submitted to the FGC in June. It is anticipated that regular updates will be provided to the MRC and, as requested, to the FGC Tribal Committee and FGC at their scheduled 2019 and 2020 meetings.

Work Plan

Time Frame: Annual, Ongoing, PC (Proposed Completion), TBD (To Be Determined)
Acronyms for partners provided below Element VII

I. MLMA Framework - Prioritization		
Tasks	**Partners**	**Time Frame**
Fisheries Set #1: Key finfish plus Bay Shrimp, CA Spiny Lobster, and Market Squid		
• Conduct Bycatch Ecological Risk Assessment (ERA) and Habitat ERA; conduct Target ERA and combine with Productivity & Susceptibility Analysis (PSA); combine bycatch, habitat, and target results		PC July 2019
• Present update on production of prioritized list for Fisheries Set #1 to MRC		July 2019
• Apply socioeconomic and climate considerations	CA Sea Grant	PC Aug 2019
• Engage stakeholders: ERA + PSA prioritization results; socioeconomic and climate considerations; next steps (scaling)	Engagement opportunity for CA Tribes and interested stakeholders	PC July - Sep 2019
• Present prioritized list for Fisheries Set #1 to FGC		Presentation at Oct FGC meeting; final approval at Dec FGC meeting
II. MLMA Framework - Scaling		
Tasks	**Partners**	**Time Frame**
High-Rank Fisheries (Set #1): conduct evaluation (degree of management change needed; fishery complexity) to determine appropriate management scale	Specific engagement opportunities for CA Tribes and interested stakeholders will be added to the Work Plan as they are identified	PC Feb 2020
III. Scaled Fishery Management Documents: Development		
Tasks	**Partners**	**Time Frame**
Develop 35 Enhanced Status Reports (ESRs) for 38 Species	Fathom Consulting, Strategic Earth, SeaChange Analytics, OPC	PC June 2019
Update ESRs with 2018 landings		PC Oct 2019
Generate Pacific Herring FMP	SeaChange Analytics, Pacific Herring FMP Steering Committee	Proposed Adoption by FGC: Oct 2019
Generate Red Abalone FMP	TNC, CA Tribes, Fishermen	Proposed Adoption by FGC: Summer 2020
Address target species of high-rank fisheries (Set #1) at appropriate scale identified in II	TBD	TBD

IV. Managing Fisheries		
Tasks	**Partners**	**Time Frame**
Monitoring/Research		
• Long-term fishery–dependent and –independent data collection	Various Partners; supplemental resources and/or partnerships could expand scope of this effort	Ongoing
• Key short-term collaborative fishery research projects		Ongoing
o Use Remote Operating Vehicle to assess habitat use by Warty Sea Cucumbers and MR dive survey effectiveness in monitoring populations of this species	Marine Applied Research and Exploration,	PC June 2019
o Examine climate change impacts on the sustainability of key fisheries of the CA Current System	SIO, SDSU, NOAA Fisheries	PC 2020
o Monitor experimental Box Crab fishery catches (part of the experimental Box Crab collaborative program)	Fishermen, FGC, PSMFC, OPC	PC for first year March 2020
Data Analysis and Stock Assessments		
• Conduct project-specific data analyses; efforts that have previously been highlighted to the MRC are provided in sub-tasks below		Ongoing
o Generate CA Halibut stock assessment		PC Fall 2019
o Conduct Management Strategy Evaluation (MSE) through the Data-Limited Methods (DLM) Toolkit on eight state-managed species/species groups (Barred Sand Bass, CA Halibut, Kelp Bass, Redtail Surfperch, CA Spiny Lobster, Red Sea Urchin, Rock Crab [3 species], Warty Sea Cucumber)	NRDC, UBC, SeaChange Analytics, OPC	PC Jan 2020
o For the red abalone management strategy integration process, use a simulation modeling approach to test management indicators to determine suite of indicators that provide best management strategies for reopening a fishery and for managing an open fishery	TNC, Dr. Bill Harford	PC 2020
Review Analytical Results and Develop Management Options		
• White Seabass and CA Spiny Lobster status as determined through process outlined in FMPs		Annual
• Market Squid status as determined through egg escapement evaluation		Dependent on sampling
• Cabezon, Greenlings, and CA Sheephead landings against TACs		Annual
• Kellet's Whelk and Sheep Crab landings against TACs		Annual

• Pacific Herring spawning biomass estimates		Annual
• Northern CA Red Abalone status	Various	Annual
• Dungeness Crab meat quality evaluation	Fishermen, PSMFC, CDPH, OEHHA	Annual
• Dungeness Crab, Rock Crab, and CA Spiny Lobster domoic acid level evaluation	Fishermen, CDPH, OEHHA	Ongoing
• Razor Clam domoic acid level evaluation	Fishermen, CDPH, OEHHA	Ongoing
Identification of Management Measures and Development of Regulations		
• Hagfish traps permitted on single vessel	FGC	Proposed Adoption by FGC: June 2019
• Commercial kelp and algae harvest management: phase 2	FGC, InterTribal Sinkyone Wilderness Council	In progress
V. Outreach		
Tasks	**Partners**	**Time Frame**
Implement CA Fisheries Portal		
• Design CA Fisheries Portal, includes layout for ESR text	Fathom Consulting, Strategic Earth, Waterview Consulting, OPC, CA Tribes, Stakeholders	PC June 2019
• Build website for CA Fisheries Portal and add ESR text	TBD	PC March 2020
Post final, updated ESRs onto Marine Region website until imported into CA Fisheries Portal		PC Nov 2019
Renovate MR website		TBD
Provide regular updates at FGC Marine Resource Committee and Tribal Committee meetings		Ongoing
Participate on formal and informal fishery task forces and workgroups	Various	Ongoing
Outreach to fishermen through port discussions		Ongoing
Build partnerships to support implementation	Academics, Non-government entities, Fishermen and member groups, CA Tribes, Other constituents	Ongoing
VI. Implementing New Programs		
Tasks	**Partners**	**Time Frame**
Implement Experimental Fishing Permit Program: California Fisheries Innovation Act of 2018 (AB 1573)		
• Develop program and design and implement regulations governing program	Fishermen, TNC, FGC	PC Dec 2019
Implement Risk Assessment and Mitigation Program (RAMP): SB 1309		
• Develop program and design and implement regulations governing program	Dungeness Crab Task Force, Dungeness Crab Fishing Gear Working Group, FGC	PC Oct 2019
Implement Gear Retrieval Program for Dungeness Crab Traps: SB 1309		

• Develop program and design and implement regulations governing program	Dungeness Crab Task Force, Dungeness Crab Fishing Gear Working Group, FGC	PC July 2019
Implement Standardized Gear Marking Program: SB 1309		
• Develop program and design and implement regulations governing program	Fishermen, FGC	PC Nov 2019
Implement Disaster Relief Programs		
• Dungeness and Rock Crab 2015-2016 fishery disaster: mitigation plan	PSMFC, NOAA Fisheries	PC Aug 2019
VII. Improving MLMA Fisheries (Ecological, Social, and Management Systems) Including Adaptive Capacity		
Tasks	**Partners**	**Time Frame**
Data modernization and review		
• Transition from paper commercial landing receipts to electronic receipts	PSMFC	PC July 2019
• Review and evaluate logbooks		TBD
Data collection methods		
• Evaluate use of remote operating vehicles for collecting sea cucumber data inside and outside of MPAs	Marine Applied Research and Exploration	PC June 2019
• Evaluate use of electronic monitoring for vessels participating in box crab experimental fishing program		TBD
Develop and/or review fishery management tools		
• Scope out types of analyses to support review of CA restricted access programs	Conservation Strategy Fund	Complete
• Develop criteria and protocols to evaluate and respond to potential risk of marine life entanglement (SB 1309)		PC 2020
Improving fisheries management responsiveness and fishing community adaptability	Supplemental resources and/or partnerships could expand scope of this effort	
• Investigate ways to increase management responsiveness and fishing communities' resilience to changing ocean conditions	FGC, OPC, OST, PFMC	Ongoing
• Support development of port profile descriptions	NOAA Fisheries, FGC, CA Sea Grant	PC Sept 2019

Partner Acronyms

CDPH: California Department of Public Health

NOAA Fisheries: National Oceanographic and Atmospheric Administration, National Marine Fisheries Service

NRDC: Natural Resources Defense Council

OEHHA: Office of Environmental Health Hazard Assessment

OPC: Ocean Protection Council

OST: California Ocean Science Trust

PFMC: Pacific Fishery Management Council

PSMFC: Pacific States Marine Fisheries Commission
SDSU: San Diego State University
SIO: Scripps Institution of Oceanography
TNC: The Nature Conservancy
UBC: University of British Columbia

Appendix 1: Planned Next Steps

A-I. MLMA Framework - Prioritization
Tasks
Conduct prioritization process for Fisheries Set #2: Remaining key invertebrate fisheries
Enhance future prioritization processes
• Develop socioeconomic assessment tool for use in prioritization process as noted in MLMA-based Management Framework
• Develop oceanographic and climate assessment tool to include in the prioritization process
A-II. MLMA Framework - Scaling
Tasks
High-Rank Fisheries (Set #2): conduct evaluation (degree of management change needed; fishery complexity) to determine appropriate management scale
A-III. Scaled Fishery Management Documents: Development
Tasks
Enhance sections of management documents for high-rank fisheries (Set #1) including socioeconomics and climate
Address target species of high-rank fisheries (Set #2) at appropriate scale identified in A-II
• Enhance sections of management documents including socioeconomic and climate
Update ESRs annually with latest fishery information (for example, latest catches, research and monitoring results – including socioeconomics and climate, and regulation changes)
A-IV. Managing Fisheries
Tasks
New Monitoring/Research
• Conduct research to address information gaps identified in ESRs
• Continue research to address the use of marine protected areas in MLMA-based management
• Conduct research to address socioeconomic information gaps
• Conduct research to address climate-related information gaps
o Conduct climate vulnerability assessment
• Identify emerging fisheries that might benefit from inclusion in an experimental gear program
New Data Analysis and Stock Assessments
• Conduct analyses for high-rank species to support scaled management identified in III and A-III; may include stock assessments, data-limited methods
Review New Analytical Results and Develop Management Options
• Identify management options for high-rank species to support scaled management identified in III and A-III
• Identify management options to address fisheries concerns (e.g., ecological and socioeconomic) highlighted through monitoring/research and assessments
o Identify options for non-high-rank species to address specific concerns highlighted through monitoring/research and assessments such as those outlined in I and A-I
o Using results from climate vulnerability assessments and other tools, identify options for addressing risks to fish stocks and fishing communities from climate change
Identification of New Management Measures and Development of Regulations
• Identify management measures for high-rank species to support scaled management identified in III and A-III

A-V. Outreach
Tasks
Renovate MLMA Website
Enhance CA Fisheries Portal (such as additional resource links)
A-VI. Implementing New Programs
Tasks
Implement any new marine fisheries programs as mandated through 2019 legislation
A-VII. Improving MLMA Fisheries (Ecological, Social, and Management Systems) Including Adaptive Capacity
Tasks
Data modernization and review
• Develop and implement public fisheries data query tool for the Marine Landings Data System
• Centralize fisheries independent data sets
Bycatch reduction methods
• Test methods for reducing bycatch
Improving management adaptive capacity
• Identify management approaches that increase adaptive capacity for responding to climate change

Kellet's Whelk, Kelletia kelletii
Enhanced Status Report

Kellet's Whelk, *Kelletia kelletii*. (Credit: Crow White).

California Department of Fish and Wildlife
Marine Region
June, 2019

Citation: California Department of Fish and Wildlife. 2019. Kellet's Whelk, *Kelletia kelletii*, Enhanced Status Report.

Contributors: Anthony Shiao (2019).

Special thanks to Dr. Crow White, Dr. Danielle Zacherl, and Dr. Steven Lonhart for providing their respective expert input.

Enhanced Status Reports

The Marine Life Management Act (MLMA) is California's primary fisheries law. It requires the Department of Fish and Wildlife (Department) to regularly report to the California Fish and Game Commission (Commission) on the status of fisheries managed by the state. The 2018 Master Plan for Fisheries expanded on this general requirement by providing an outline for Enhanced Status Reports (ESRs) that is based on the MLMA's required contents for Fishery Management Plans (FMPs). The goal of ESRs is to provide an overview of the species, fishery, current management and monitoring efforts, and future management needs, and provide transparency around data and information that is unavailable or unknown. ESRs can help to guide Department efforts and focus future partnerships and research efforts to address information gaps and needs to more directly inform management. It is also anticipated that some ESRs will be foundations for future FMPs by providing background information and focusing analyses and stakeholder discussions on the most relevant issues.

Table of Contents

Enhanced Status Reports i
Table of Contents ii
List of Acronyms iv
List of Figures iv
List of Tables v
Fishery-at-a-Glance: Kellet's Whelk vi
1 The Species 1-1
1.1 Natural History 1-1
1.1.1 Species Description 1-1
1.1.2 Range, Distribution, and Movement 1-1
1.1.3 Reproduction, Fecundity, and Spawning Season 1-3
1.1.4 Natural Mortality 1-4
1.1.5 Individual Growth 1-4
1.1.6 Size and Age at Maturity 1-5
1.2 Population Status and Dynamics 1-6
1.2.1 Abundance Estimates 1-6
1.2.2 Age Structure of the Population 1-9
1.3 Habitat 1-10
1.4 Ecosystem Role 1-10
1.4.1 Associated Species 1-11
1.4.2 Predator-prey Interactions 1-11
1.5 Effects of Changing Oceanic Conditions 1-12
2 The Fishery 2-1
2.1 Location of the Fishery 2-1
2.2 Fishing Effort 2-2
2.2.1 Number of Vessels and Participants Over Time 2-2
2.2.2 Type, Amount, and Selectivity of Gear 2-2
2.3 Landings in the Recreational and Commercial Sectors 2-3
2.3.1 Recreational 2-3
2.3.2 Commercial 2-3
2.4 Social and Economic Factors Related to the Fishery 2-4
3 Management 3-1
3.1 Past and Current Management Measures 3-1
3.1.1 Overview and Rationale for the Current Management Framework 3-1
3.1.1.1 Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild 3-1
3.1.1.2 Past and Current Stakeholder Involvement 3-2

3.1.2 Target Species 3-2
3.1.2.1 Limitations on Fishing for Target Species 3-2
3.1.2.1.1 Catch 3-2
3.1.2.1.2 Effort 3-2
3.1.2.1.3 Gear 3-3
3.1.2.1.4 Time 3-3
3.1.2.1.5 Sex 3-3
3.1.2.1.6 Size 3-3
3.1.2.1.7 Area 3-3
3.1.2.1.8 Marine Protected Areas 3-3
3.1.2.2 Description of and Rationale for Any Restricted Access Approach 3-4
3.1.3 Bycatch 3-4
3.1.3.1 Amount and Type of Bycatch (Including Discards) 3-4
3.1.3.2 Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch 3-5
Discard Mortality 3-5
Bycatch of Overfished, Threatened, or Endangered Species 3-5
Measures to Reduce Bycatch 3-5
3.1.4 Habitat 3-5
3.1.4.1 Description of Threats 3-5
3.1.4.2 Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing 3-6
3.2 Requirements for Person or Vessel Permits and Reasonable Fees 3-6
4 Monitoring and Essential Fishery Information 4-1
4.1 Description of Relevant Essential Fishery Information 4-1
Biological Information 4-1
Environmental and Fishery-dependent Indicators 4-1
4.2 Past and Ongoing Monitoring of the Fishery 4-1
4.2.1 Fishery-dependent Data Collection 4-1
4.2.2 Fishery-independent Data Collection 4-1
5 Future Management Needs and Directions 5-1
5.1 Identification of Information Gaps 5-1
5.2 Research and Monitoring 5-2
5.2.1 Potential Strategies to Fill Information Gaps 5-2
5.2.2 Opportunities for Collaborative Fisheries Research 5-2
5.3 Opportunities for Future Management Changes 5-3
5.4 Climate Readiness 5-3
Literature Cited viii

List of Acronyms

CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CFIS	Commercial Fisheries Information System
CPUE	Catch Per Unit Effort
ENSO	El Niño Southern Oscillation
ESR	Enhanced Status Report
FGC	Fish and Game Code
FMP	Fishery Management Plan
MLDS	Marine Landings Database System
MLMA	Marine Life Management Act
MPA	Marine Protected Area
PISCO	Partnership for the Interdisciplinary Studies of Coastal Oceans
TAC	Total Allowable Catch

List of Figures

Figure 1-1: Shell, foot, mantle, and operculum of a Kellet's Whelk.

Figure 1-2. Range of Kellet's Whelk; Monterey, California to Asuncion, Baja California.

Figure 1-3. Kellet's Whelk laying eggs capsules.

Figure 1-4. Proportion of Kellet's Whelk larger and smaller than known size at maturity, and the average length surveyed in the northern Channel Islands from 1985 to 2018.

Figure 1-5. Kellet's Whelk average annual density determined by SCUBA surveys across California from 2004 to 2015.

Figure 1-6. Kellet's Whelk average annual density determined by SCUBA surveys around northern Channel Islands from 1983 to 2018.

Figure 1-7. Kellet's Whelk size structure and average length as determined by SCUBA surveys around northern Channel Islands from 1983 to 2018.

Figure 1-8. Extended Prehensile Proboscis of feeding Kellet's Whelk.

Figure 1-9. Size distribution of Kellet's Whelk in California before and after the 1997 El Niño.

Figure 2-1. Kellet's Whelk landings by Department fishing block from 2008 to 2018.

Figure 2-2. Kellet's Whelk landings and number of individuals making landings from 1988 to 2018.

Figure 2-3. Kellet's Whelk landings and total ex-vessel value from 1988 to 2018.

Figure 2-4: Kellet's Whelk landings and average per-lb ex-vessel value from 1988 to 2018.

Figure 2-5. Kellet's Whelk percentage of total landings by port from 2008 to 2018.

Figure 3-1. Kellet's Whelk average annual density (individuals per 100 m^2) determined by SCUBA surveys across California from 2004 to 2015 inside and outside MPAs (PISCO).

List of Tables

Table 3-1. Permits and fees associated with Kellet's Whelk commercial and recreational fishery.

Table 5-1. Informational needs for Kellet's Whelk and their priority for management.

Fishery-at-a-Glance: Kellet's Whelk

Scientific Name: *Kelletia kelletii*

Range: Current range of Kellet's Whelk spans from Monterey, California to Isla Asuncion, Baja California.

Habitat: Kellet's Whelk inhabits rocky reefs and adjoining sandy habitats.

Size (length and weight): The shell length of a Kellet's Whelk can grow up to 6.9 inches (17.5 centimeters). The maximum weight of Kellet's Whelk is unknown.

Life span: The life span of Kellet's Whelk is unknown.

Reproduction: The mating season of Kellet's Whelk generally occurs from March to May, but extends into June north of Point Conception.

Prey: Kellet's Whelk feed on detritus, and dead and dying organisms; they also prey on live benthic animals such as tube worms, annelids, and other gastropods.

Predators: Predators of Kellet's Whelk include adult moon snails, sea stars, octopus, and sea otters. Kellet's whelk larvae are preyed upon by zooplankton and fin fishes.

Fishery: A commercial fishery exists for Kellet's Whelk. A small recreational fishery also exists, though no data have been collected in recent years. The commercial fishery is primarily an incidental fishery to Spiny Lobster, rock crab, sea urchin, and sea cucumber fisheries in southern California.

Area fished: Most Kellet's Whelk are harvested from Point Conception, California to the California-Mexico border, while minor component also exists in Morro Bay.

Fishing season: The Kellet's Whelk fishery is open from July 1 through the first Wednesday after March 15.

Fishing gear: Kellet's Whelk may be taken by hand, and in commercial Spiny Lobster and rock crab traps.

Market(s): Kellet's Whelk are harvested primarily for domestic consumption.

Current stock status: The stock status of Kellet's Whelks is unclear, with some information suggesting the stock is stable; landings have remained stable for the past 7 years since the implementation of a total allowable catch.

Management: The commercial fishery for Kellet's Whelk was mostly unregulated prior to 2012. In 2012, in response to rising level of take, regulations went into effect including gear restrictions allowing commercial take by hand or incidentally in rock crab and Spiny Lobster traps, a seasonal closure from the first Thursday after March 15 to

June 30, and annual total allowable commercial catch of 100,000 pounds. Commercial landings of Kellet's Whelk under a marine aquaria collector's permit has also been explicitly prohibited since 1996. Recreational take of Kellet's Whelk is also prohibited from the first Thursday after March 15 to June 30. Up to 35 Kellet's Whelk can be taken per person with a valid recreational fishing license per day. Whelks can be taken recreationally by hand while skin diving or from shore, and hook and line. Recreational take by hand while SCUBA diving is also allowed south of Yankee Point in Monterey County.

1 The Species

1.1 Natural History

1.1.1 Species Description

Kellet's Whelk (*Kelletia kelletii*) is the largest whelk found in southern California. The shell of the animal can reach 6.9 inches (in) (17.5 centimeters (cm)) in length (Morris et al. 1980). Kellet's Whelk can be identified by their unique shell that is both spiraled and knobbed. The natural color of the shell is white with brown spirals, which is apparent in young whelks and new shell on adult whelks. Older shells often have purple or green algae that cover and impregnate the shell, masking the natural coloration. The foot and mantle are yellow, with additional black stripes and white spots on the foot, and the proteinaceous operculum is light brown (Figure 1-1) (Morris et al. 1980; Gotshall 2005).

Figure 1-1: Shell, foot, mantle, and operculum of a Kellet's Whelk (Photo Credit: Derek Stein, CDFW).

1.1.2 Range, Distribution, and Movement

Kellet's Whelk is found in nearshore areas at depths ranging from 6 to 230 feet (ft) (2 to 70 meters (m)) (Rosenthal 1970). The species was historically understood to have resided between Point Conception and Isla Asuncion, Baja California, based on Paleontological record (Lonhart and Tupen 2001). In 1980, the first live Kellet's Whelk were observed at the Hopkins Marine Life Refuge in Monterey, California (Herrlinger

1981). This finding expanded the previously known range by more than 250 miles (mi) (400 kilometers (km)) (Figure 1-2).

Figure 1-2. Range of Kellet's Whelk; Monterey, California to Asuncion, Baja California.

The species' historical northern boundary at Point Conception was likely caused by access limitation (larvae prevented from dispersing north of Point Conception due to strong current (Zacherl et al. 2003)). The species exhibits a relatively long larval phase of 40 to 60 days (Romero et al. 2012), and larvae could potentially be spread over long distances depending on the oceanographic currents (Zahn et al. 2016). The central

California population was likely first carried into the region by El Niño conditions in the 1970s, and the population now likely experiences consistent recruitment. This group was originally thought to be an isolated sink population due to a lack of recruits, few juveniles, and many large adults (Lonhart and Lupen 2001). However, subsequent surveys conducted in the 2000s and 2010s following later El Niño events suggest that if El Niño conditions become more prevalent and extreme (Power et al. 2013), more individuals may recruit into this northern population (Zacherl et al. 2003; Rodriguez 2017).

Kellet's Whelk are relatively slow moving. There is little available information on their movement rates or home ranges, though Cumberland (1995) noted a great deal of immigration/emigration of Kellet's Whelk in a >200 square meters (m^2) area during a monthly tag-recapture study, despite the area being surrounded by sandy channels. Cumberland observed that Kellet's Whelk could move equally well on rocky reef substrate or on sand.

1.1.3 Reproduction, Fecundity, and Spawning Season

Sexes are separate, and whelks can form mating aggregations in spring, consisting of several to dozens of whelks. Kellet's Whelk show no sexual dimorphism, however during mating females are consistently the larger individual in a mating pair, and fertilization is internal. Males cling to the shell of the larger female and transfer a sperm packet with a prehensile, flattened penis that extends into the female's mantle cavity. After fertilization, egg deposition occurs in April and May (Cumberland 1995) in southern California, but is later in central California, occurring from May to July (Lonhart unpublished data). Egg-depositing aggregations can consist of 200 to 300 individuals observed within 215 square feet (ft^2) (20 m^2) area (Rosenthal 1970).

Oval shaped egg capsules are deposited in clusters on hard substrate (Figure 1-3), including reef, discarded mollusk shells or other Kellet's Whelk. Eggs may be laid over several days at several locations. Females lay an average of 66 egg capsules (Cumberland 1995) with each capsule generally containing between 400 and 1,200 eggs, with occasionally as many as 2,200 eggs (Rosenthal 1970). The number of eggs depends on the height of the capsule, which directly correlates to the size of the spawning female. Egg capsule height generally ranges between 0.2 to 0.4 in (6.0 to 9.0 millimeters (mm)) (Rosenthal 1970).

Figure 1-3. Kellet's Whelk laying eggs capsules (Photo Credit: Steve Lonhart).

Embryos begin development within the capsule and emerge into the water column as free-swimming larvae after 30 days (Rosenthal 1970). Larval size is inversely correlated to egg capsule size, with smaller capsules containing larger larvae. This larval phase lasts roughly 5.5 to 9.0 weeks (Romero et al. 2012).

1.1.4 Natural Mortality

Determining the natural mortality (M) of marine species is important for understanding the health and productivity of their stocks. Natural mortality results from all causes of death not attributable to fishing such as old age, disease, predation or environmental stress. Natural mortality is generally expressed as a rate that indicates the percentage of the population dying in a year. Animals with high natural mortality rates must replace themselves more often and thus tend to be more productive. Natural mortality along with fishing mortality result in the total mortality operating on the stock.

To date, no method has been developed to age Kellet's Whelk, and the lifespan and mortality of the species is unknown at this time. However, from their slow growth rates it is likely that they live for many years, possibly decades. In a tag-recapture study in La Jolla, California, Cumberland (1995) estimated a 97% annual survival rate.

1.1.5 Individual Growth

Individual growth of marine species can be quite variable, not only among different groups of species but also within the same species. Growth is often very rapid in young fish and invertebrates, but slows as adults approach their maximum size. The

von Bertalanffy Growth Model is most often used in fisheries management, but other growth functions may also be appropriate.

The growth rate of Kellet's Whelk is not well known, but is thought to be slow. Wilson (2017) determined that a larva grows about 0.1 mm (0.004 in) over a span of 7 weeks while gestating in an egg capsule. Juvenile growth was estimated to be 0.3 to 0.4 in (7.0 to 10.0 mm) per year until sexual maturity (Cumberland 1995). Once reaching sexual maturity, growth slows considerably. Cumberland (1995) observed a maximum growth of 5.0 mm (0.2 in) per year, and some snails exhibited no growth during that period, possibly due to shell erosion. In that study the Brody-Bertalanffy growth rate constant *k* was estimated to be 0.0548/yr, while the maximum asymptotic shell length L_∞ was estimated to be 92.3 mm (3.6 in). It is important to note that the maximum size of Kellet's Whelk observed in that study was 99.0 mm (3.9 in), which is smaller than whelks that have been collected in areas north of San Diego. For example, White et al. (2010) collected whelks between 60.0 and 150.0 mm (2.4 and 5.9 in) in shell length at sites in Santa Barbara and the Channel Islands. Furthermore, Cumberland was only able to observe the growth of three individuals that were smaller than 60.0 mm (2.4 in) in length.

1.1.6 Size and Age at Maturity

Female Kellet's Whelk are generally sexually mature between 2.6 and 2.8 in (65.0 and 70.0 mm). Males mature at slightly smaller sizes (Rosenthal 1970). White et al. (2010) observed Kellet's Whelks as small as 60.0 mm (2.4 in) that were reproductively mature (White et al. 2010), however, the age of these individuals was not determined. Available size data from the Channel Island National Park Kelp Forest Monitoring Program shows that from 1985 to 2018 most of the individual whelks measured at their survey sites in the northern Channel Islands are above size at sexual maturity (Figure 1-4). The data also suggests that a pulse of recruitment may have occurred in 2013, when a large cohort of juveniles began appearing in the survey data.

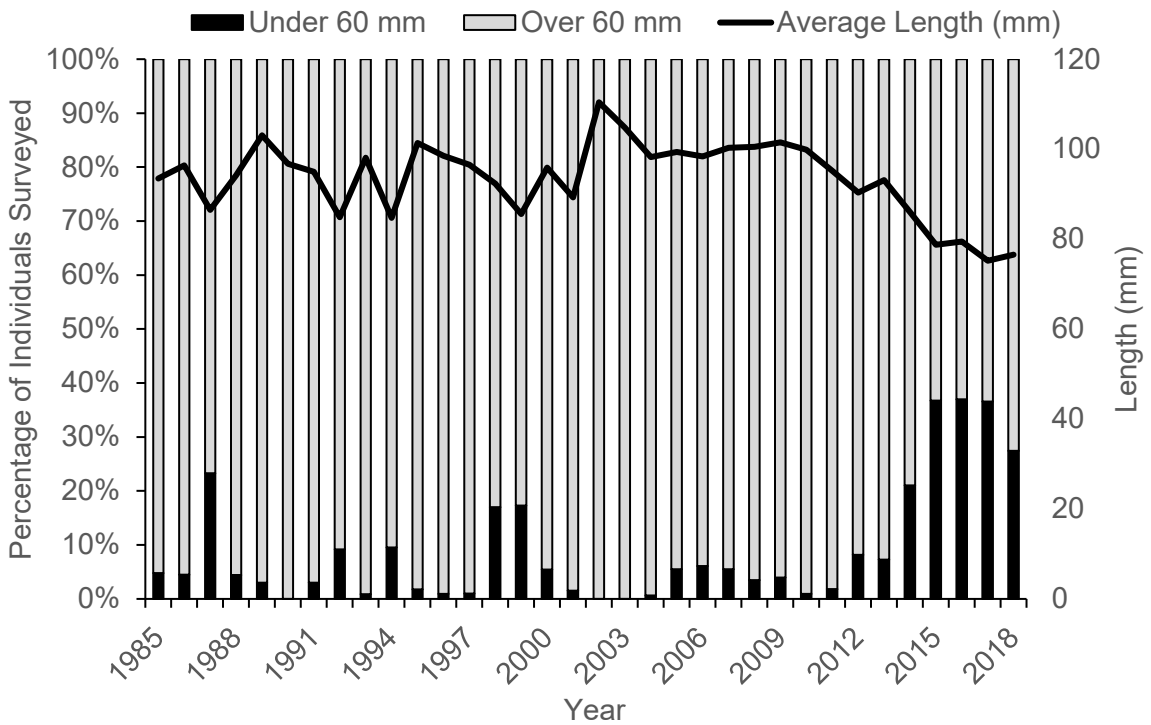


Figure 1-4. Proportion of Kellet's Whelk larger and smaller than known size at maturity, and the average length surveyed in the northern Channel Islands from 1985 to 2018 (National Park Service).

1.2 Population Status and Dynamics

The population status of the Kellet's Whelk population has been explored by targeted studies as well as long-term dive surveys conducted by various established research groups. No clear trend of the overall population increasing or decreasing can be established with current data. Size frequency data gathered from the northern Channel Islands suggest that recruitment into that area is likely sporadic.

1.2.1 Abundance Estimates

Little is known about the overall status of the Kellet's Whelk population. The Partnership for the Interdisciplinary Studies of Coastal Oceans (PISCO) coastal biodiversity survey, the National Park Service, and the Vantuna Research Group at Occidental College all conduct multi-year underwater surveys that include Kellet's Whelk within their survey designs.

Surveys done by Zacherl et al. in 1997, 1999, and 2000 north and south of Point Conception found the density of Kellet's Whelk to have ranged from 1 to 111 individuals per 100 m^2. However, the dataset does not extend beyond the 3 years (yr). Available PISCO data suggests that the species' density has fluctuated between 2.8 to 10.9 individuals per 100 m^2 north of Point Conception and 4.5 to 9.2 individuals per 100 m^2 south of Point Conception from 2004 to until 2012 (Figure 1-5a,b). Densities south of Point Conception began trending downward starting in 2011. Data from PISCO south of

Point Conception was sparse for 2016 and 2017 and cannot establish a clear trend of the population (Figure 1-5). Such a decline has not been observed in the data gathered between 2007 and 2015 by the Vantuna Research Group (Figure 1-5c). Data from those surveys are gathered from sites in the southern portion of the Southern California Bight (From Carpinteria in the north to Isla Coronado to the south) and do not overlap with the sites surveyed by PISCO.

PISCO data also show that the density north of Point Conception decreased sharply between 2014 and 2015. Density survey results have fluctuated significantly from year to year in the region (Figure 1-5), thus it is unclear whether there is a downward trend. Furthermore, the area is outside of where Kellet's Whelk are generally taken, and any decline is unlikely to be attributed to the take of adults in the area.

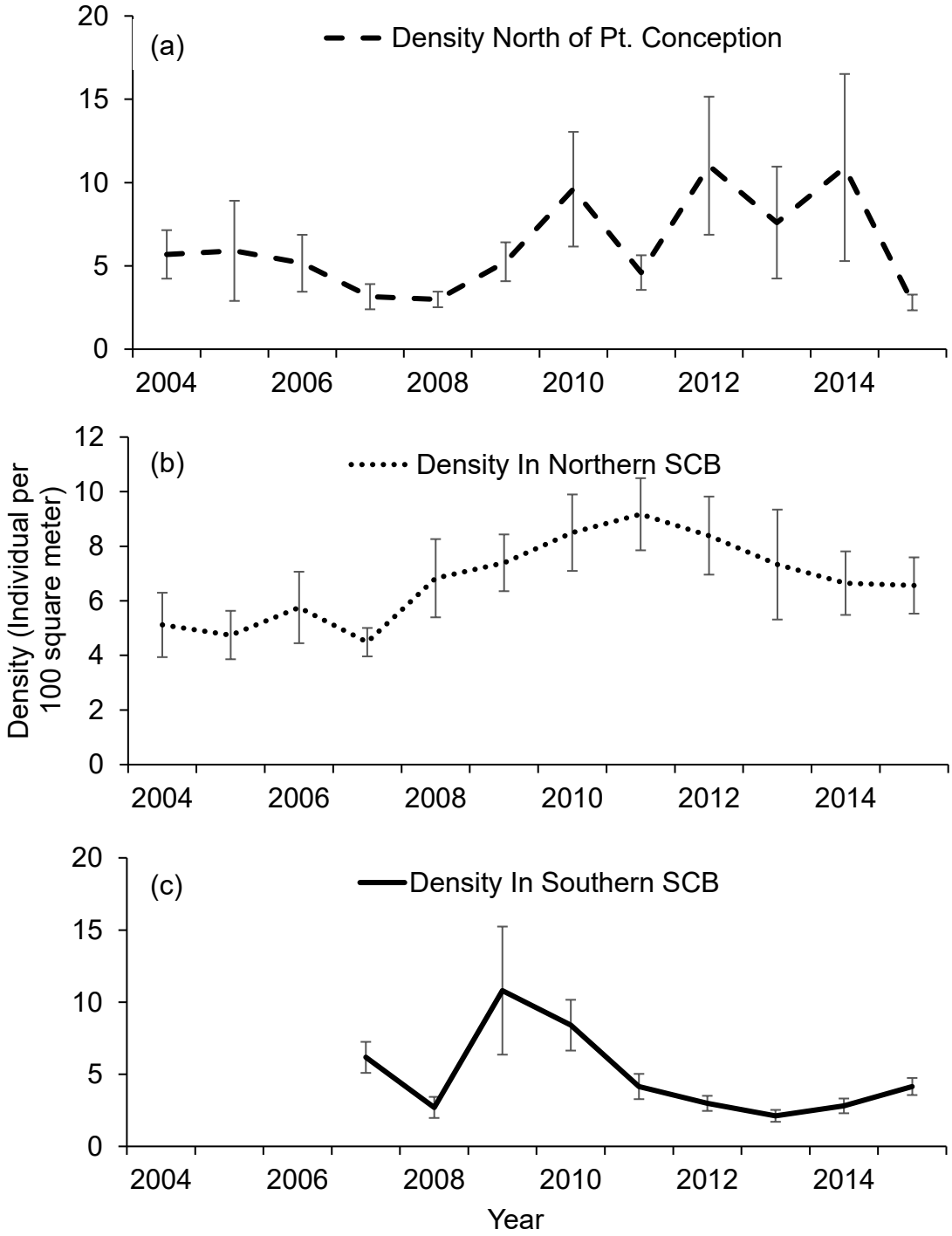


Figure 1-5. Kellet's Whelk average annual density observed (individuals per 100m^2) determined by SCUBA surveys across California from 2004 to 2015; bars represent standard error within each year between the averages of each site (Vantuna Research Group; PISCO).

The Channel Island National Park maintains one of the longest running datasets on Kellet's Whelk density. The Park Service's dataset focuses on the region around the

northern Channel Islands, and it shows that the density of Kellet's Whelk has fluctuated between 1.0 to 4.5 animals per 100 m^2 in the region until 2014. Starting in 2015, the density of the animal rose sharply, though the cause of this increase is unclear (Figure 1-6).

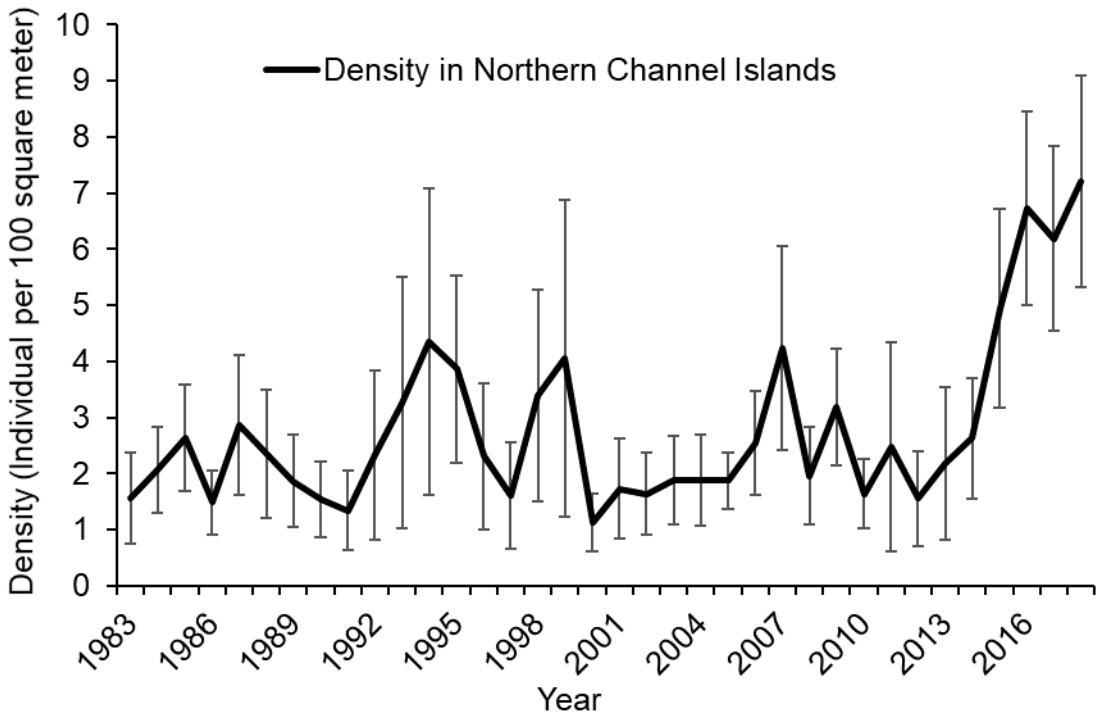


Figure 1-6. Kellet's Whelk average annual density (individuals per 100 m^2) determined by SCUBA surveys around northern Channel Islands from 1983 to 2018; bars represent standard error within each year between the averages of each site (National Park Service).

1.2.2 Age Structure of the Population

While there is currently no known method for directly aging Kellet's Whelk, size frequency data can be used to infer the age structure of the population. Size frequency data has been collected in the northern Channels Islands by the National Park Service since 1985. The survey data shows that most of the animals found in the area are larger than the size at sexual maturity, and the small percentage of individuals from the smallest class size for most years suggests that recruitment in this region may be sporadic (Figure 1-7).

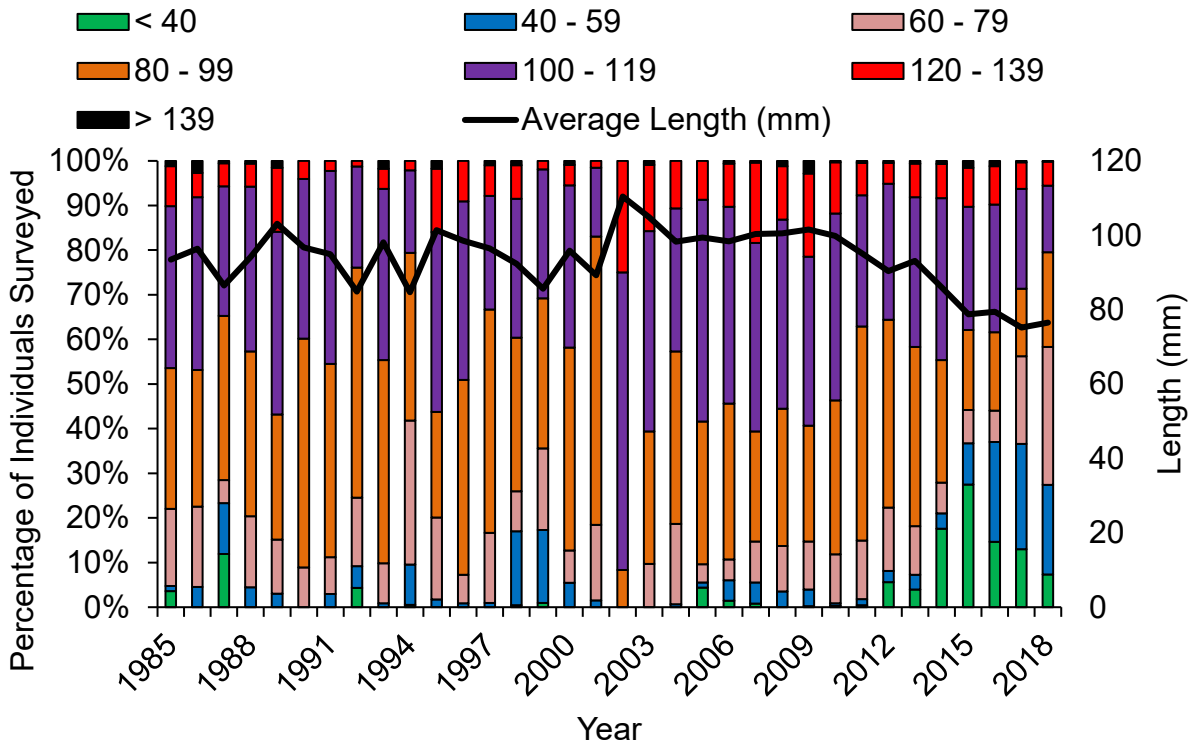


Figure 1-7. Kellet's Whelk size structure (in 20 mm bins) and average length as determined by SCUBA surveys around the northern Channel Islands from 1983 to 2018 (National Park Service).

1.3 Habitat

Kellet's Whelk is primarily found in kelp forests and temperate rocky reef habitat, but also occurs in rocky shores and protected sandy beach habitats from Monterey Bay southward to Isla Asuncion, Baja California, Mexico (Morris et al. 1980). Cumberland (1995) observed that Kellet's Whelks will occasionally bury themselves in sand to feed, and to protect themselves from predators. Such behavior has been observed and documented in sandy habitats off Santa Catalina Island (Lonhart unpublished data).

1.4 Ecosystem Role

The Kellet's Whelk is a generalist predator and scavenger, consuming living, dead, and dying organisms. As a scavenger that occurs at the transition zone between reef and sandy habitats, their presence likely impacts the surrounding substrate as they sift through the habitat for food. Directed research on the ecological role of Kellet's Whelk has been limited (Lonhart and Lupen 2001), but a study performed by Halpern et al. (2006) suggests that the species may play a crucial role in controlling the algae grazer population in the California kelp forest ecosystem.

1.4.1 Associated Species

Kellet's Whelk is known to host various species of parasitic worms (Hopper et al. 2014). The species is commonly caught with California Spiny Lobster (*Panulirus interruptus*) and rock crabs (*Cancer* spp.) in traps. The species is also taken by commercial divers targeting Red Sea Urchin (*Mesocentrotus franciscanus*) and Warty Sea Cucumber (*Parastichopus parvimensis*). The species presumably co-occur with other organisms inhabiting reef and near-reef habitats in the 6 to 230 ft (2 to 70 m) range, but is not known to be associated with other species other than as a predator, prey, or competitor.

1.4.2 Predator-prey Interactions

Kellet's Whelk is an opportunistic carnivore that feeds on dead or dying organisms and often feed in clusters. However, they will actively pursue prey including several species of turban snails, vermetid gastropods, and annelid worms.

Eating occurs through the scraping of the radula, a tongue-like structure bearing rows of teeth, and the muscular suction action of the prehensile proboscis, a tubular extension used for feeding, which can be extended up to three times the length of the shell (Figure 1-8). They are voracious eaters and often feed on bait and injured crustaceans in commercial crab and lobster traps.

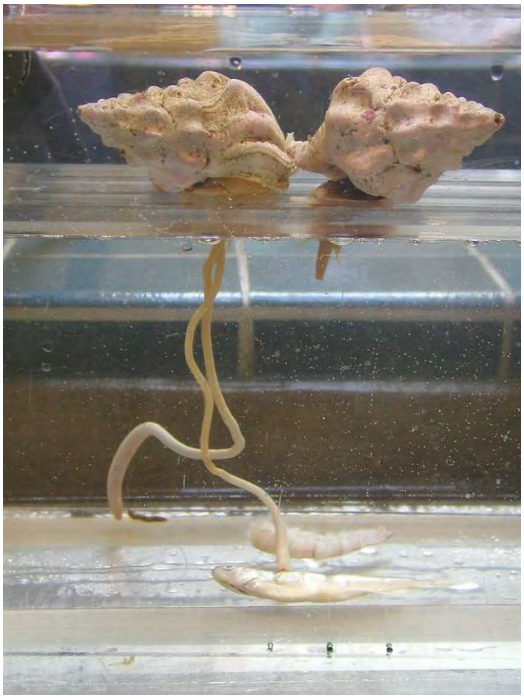


Figure 1-8. Extended prehensile proboscis of feeding Kellet's Whelk (Photo Credit: Steve Lonhart).

Predators of Kellet's Whelk include moon snails, sea stars, octopus, and Southern Sea Otters (*Enhydra lutris nereis*) in central California. Juvenile Kellet's Whelk

are eaten by a variety of fishes. Kellet's Whelk is often found feeding alongside its predator, the Giant-Spined Star (*Pisaster giganteus*).

1.5 Effects of Changing Oceanic Conditions

Point Conception has been a major northern biogeographic barrier for many marine species in the Southern California Bight (Doyle 1985). This collision point between two current systems likely serves as a physical barrier for Kellet's Whelk larvae but some evidence suggest that is not the case during El Niño Southern Oscillation (ENSO) events (Zacherl et al. 2003). Size-frequency surveys conducted in 1997, 1999, 2015, and 2016 suggests that the size structure of the species north of Point Conception may have shifted (Figure 1-9) (Zacherl et al. 2003; Rodriguez 2017). Based on data from 1997, it was observed that areas south of Point Conception tend to be occupied by individuals of different sizes. However, larger number of individuals at or smaller than the size of sexual maturity began to appear north of Point Conception after the 1997 El Niño event (Figure 1-9). As global climate conditions evolve, El Niño events could become more intense and frequent (Cai et al. 2015; Power et al. 2013). If that is the case, the species may have fully established itself north of Point Conception, and the age structure of Kellet's Whelk in this region may continue to mirror the age structure south of Point Conception.

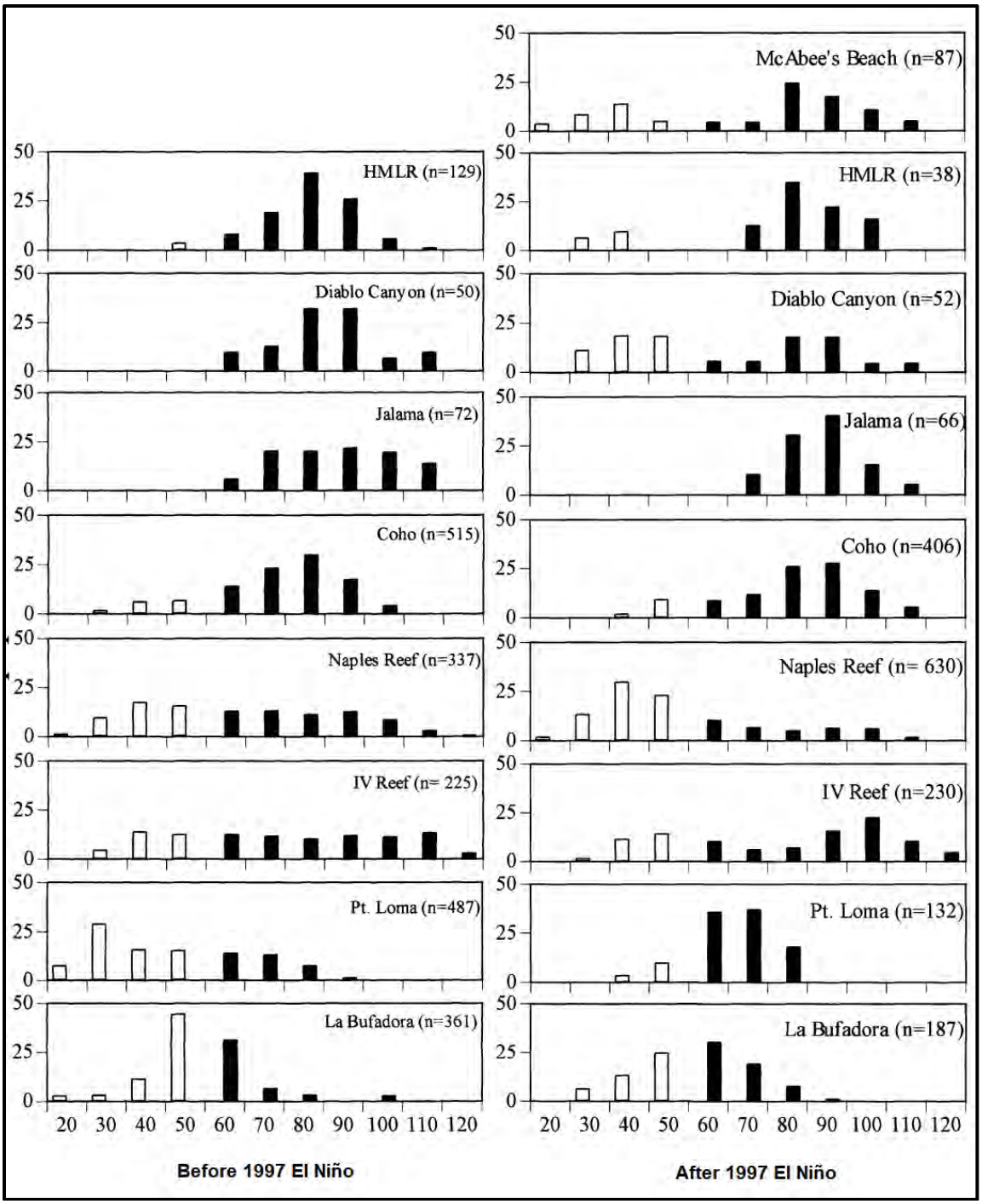


Figure 1-9. Size distribution (10 mm bins) of Kellet's Whelk in California before (1997) and after (1999) the 1997 El Niño. Jalama, Diablo Canyon, Hopkins Marine Life Refuge, and McAbee's Beach are north of Point Conception, while the rest are south of Point Conception (Note that La Bufadora is in Baja California; white bars represent juvenile classes; n = sample size (Zacherl et al. 2003).

As atmospheric carbon dioxide (CO_2) concentration increases, the temperature of the air increases, along with the temperature of the ocean (Solomon et al. 2007).

Marine animals may be particularly affected by the changing climate due to the ectothermic nature of most of their physiology (Sunday et al. 2012). Depending on whether the range for Kellet's Whelk shifts due to a warming ocean, and if so, by how much, the resilience of the population may increase or decrease accordingly.

Another effect of increased CO_2 concentration in the atmosphere is ocean acidification. As the concentration of CO_2 in the atmosphere increases, the molecules diffuse into the upper layer of the ocean and increase the acidity of ocean water, impacting various organisms that form hard shells (Gazeau et al. 2013). No study to date has looked specifically at the effects of climate-driven ocean acidification on Kellet's Whelk. However, past studies have shown detrimental effects towards other marine snails that form hard calcified shells (Nienhuis et al. 2010). Therefore, Kellet's Whelk larvae may be impacted from the effects of acidification as well.

2 The Fishery

2.1 Location of the Fishery

Kellet's Whelk is primarily an incidentally caught species in commercial lobster and crab trap fisheries. The commercial dive fishery in southern California, which primarily targets sea urchin and sea cucumber, marginally contributes to the overall landings of Kellet's Whelk as well. Between 2008 and 2018 approximately 1.18 million pounds (lb) of Kellet's Whelk were landed in California by the lobster and crab trap fisheries, and the dive fishery landed just over 20,000 lb. A commercial fishery also exists in Baja California, Mexico, but the level of take is unknown.

Due to the location of the species' historical range, coupled with the location of the lobster, crab, and dive fisheries, Kellet's Whelk landings occurred almost exclusively in the Southern California Bight. Based on landing receipt data from 2008 to 2018, a majority of the landings came from fishing blocks near ports in Santa Barbara and San Diego, followed by San Pedro (Figure 2-1).

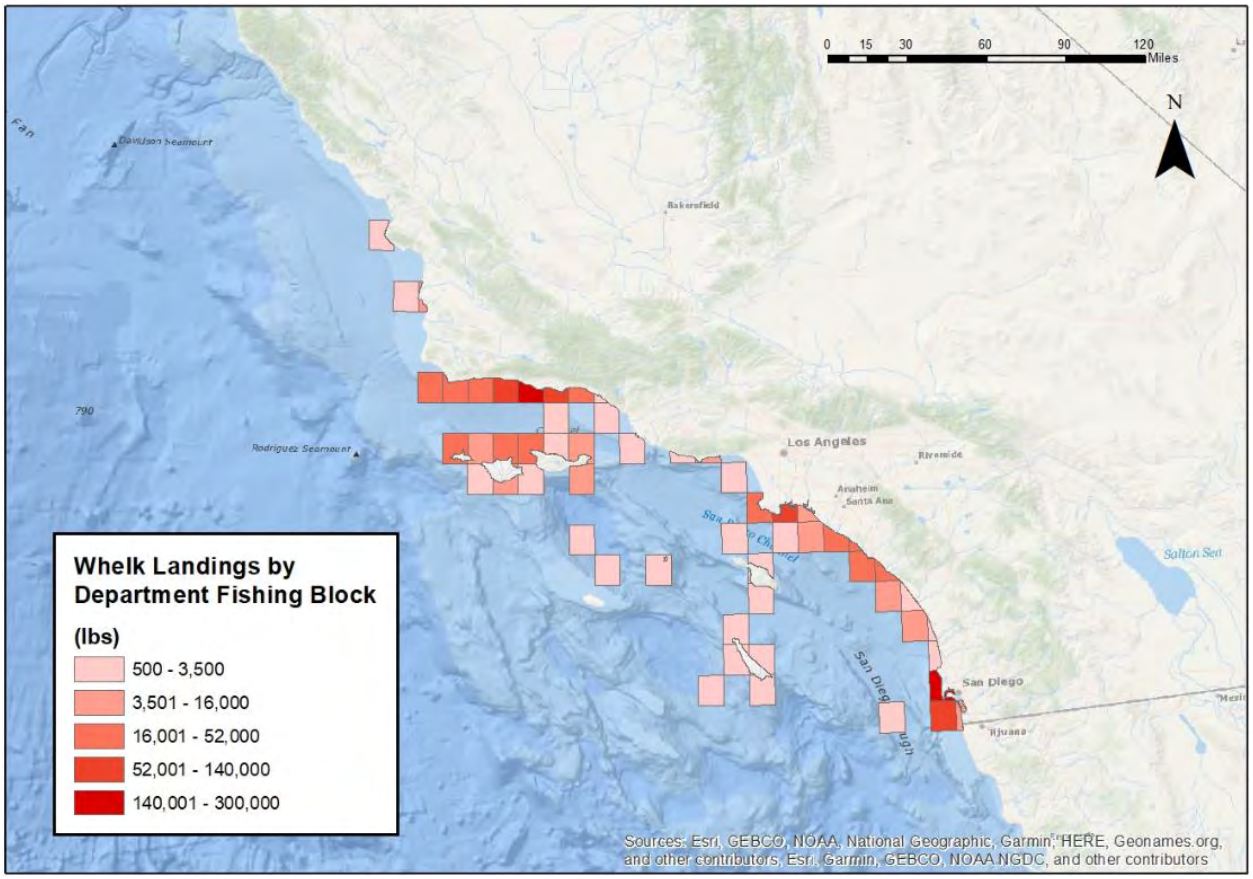


Figure 2-1. Reported origin of Kellet's Whelk landings by Department fishing block from 2008 to 2018 for blocks with more than 500 lb of cumulative landings (CDFW Marine Landings Database System (MLDS)).

2.2 Fishing Effort

2.2.1 Number of Vessels and Participants Over Time

There are 177 lobster operator permit holders, 117 southern rock crab trap permit holders, 274 sea urchin diver permit holders, and 80 sea cucumber dive permit holders in 2019. The fisheries overlap, with some individuals holding more than one of these permits. In total 482 individuals participate in fisheries that allow the take of Whelk in 2019.

While almost 500 individuals participate in fisheries that allow the take of Kellet's Whelk, the number of individuals landing Kellet's Whelk is much lower. The number of participants peaked at 77 in 2010, and then dropped to a low of 51 in 2014, 2 yr following the implementation of new management measures (i.e. a season and total allowable catch). The number has slowly risen to 75 in 2018 (Figure 2-2).

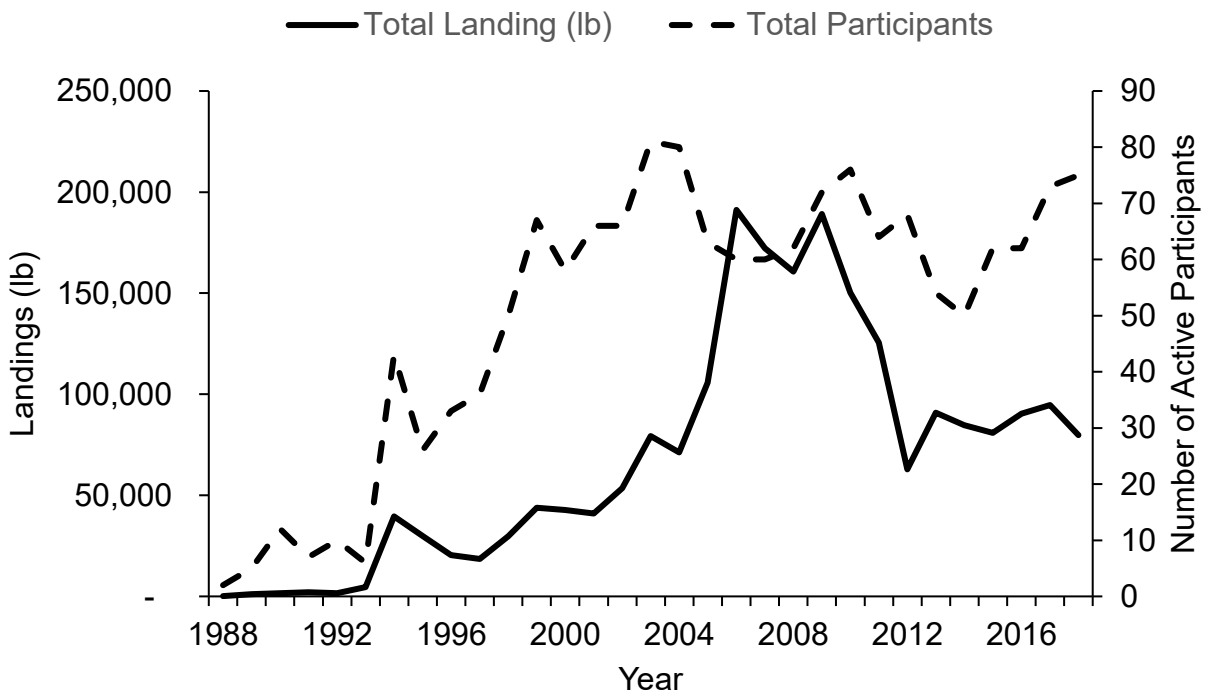


Figure 2-2. Kellet's Whelk landings and number of individuals making landings from 1988 to 2018 (CDFW Commercial Fisheries Information System (CFIS) 2019).

The Department does not possess any information suggesting significant recreational interest in Kellet's Whelk. Anecdotal information suggests that the species is being pursued by some divers.

2.2.2 Type, Amount, and Selectivity of Gear

Since 2008, 98% of all harvested Kellet's Whelk have been taken incidentally in lobster and crab traps, which they enter to prey on bait and injured crustaceans. Smaller

individuals can enter traps through the mesh of the wire traps, while larger individuals can only enter though the entrance funnels and escape ports that allow undersized crab and lobster to escape. Kellet's Whelk that are smaller than the mesh size likely fall out of the trap upon retrieval. The other method of take is hand take by divers. Kellet's Whelk of all sizes are vulnerable to this method of take.

Kellet's Whelk can be taken in the recreational sector by hand while skin or SCUBA diving south of Yankee Point, Monterey County, by hand from shore, or hook and line.

2.3 Landings in the Recreational and Commercial Sectors

2.3.1 Recreational

There are currently no data on the recreational catch of Kellet's Whelk, but it is likely to be minor. Up to 35 Kellet's Whelk can be taken recreationally per person per day.

2.3.2 Commercial

Kellet's Whelk was subject to steadily increasing commercial landings. The earliest recorded commercial landing data specific to Kellet's Whelk are from 1979, but prior to this they may have been recorded as miscellaneous mollusks or sea snails. Landings data indicate an increase in take beginning in 1993 at 4,590 lb (2 metric tons (mt)), with highest landings in 2006 of 191,177 lb (87 mt) (Figure 2-3). An 81% increase in landings occurred between 2005 and 2006. Landings has remained relatively stable after a 100,000 lb Total Allowable Catch (TAC) was implemented in 2012, fluctuating between 67,000 lb and 96,000 lb from 2013 to 2018.

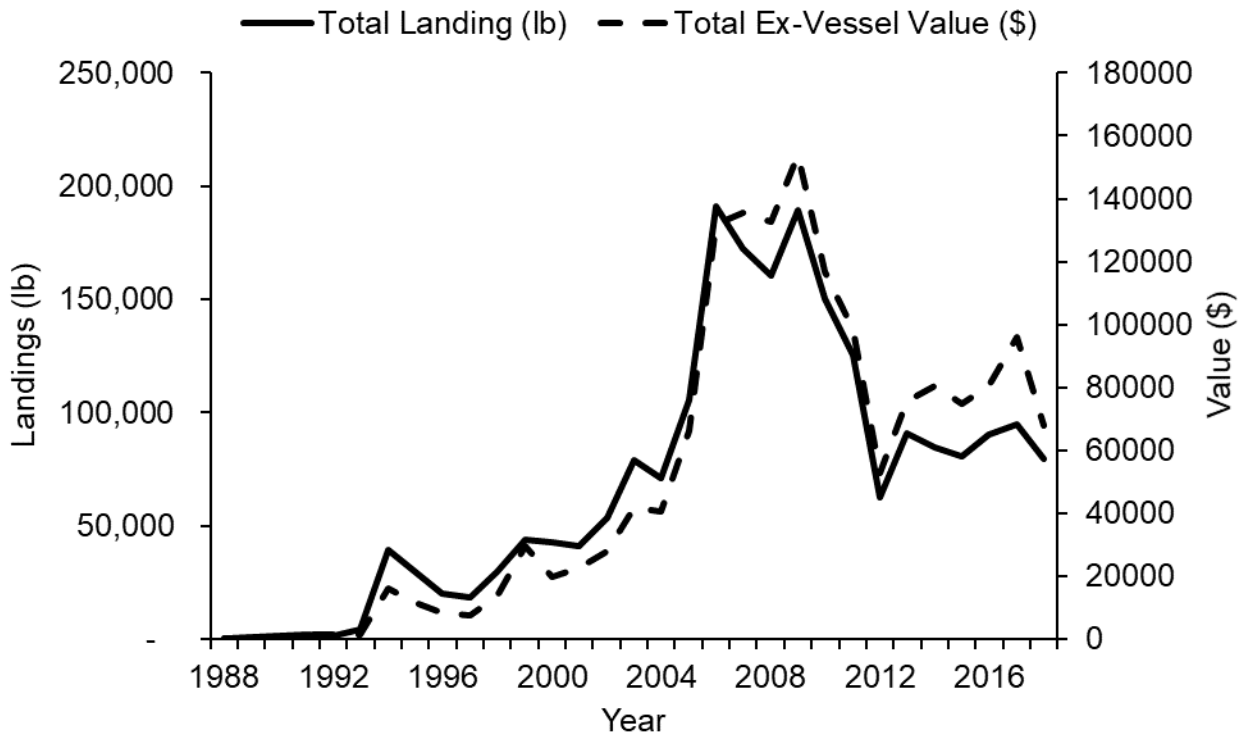


Figure 2-3. Kellet's Whelk landings (lb) and total ex-vessel value (dollar) from 1988 to 2018 (CDFW MLDS 2019).

2.4 Social and Economic Factors Related to the Fishery

Commercial ex-vessel value in 2018 was approximately $67,700 with an average price per pound of $0.85 ($1.87 per kilogram (kg)). Since 1979, the fishery's total ex-vessel value has ranged from $94 in 1988 to approximately $153,800 in 2009 (Figure 2-3), with the ex-vessel price per pound ranging from a low of $0.34 ($0.76 per kg) in 1993 to a high of $1.01 ($2.23 per kg) in 2017 (Figure 2-4). Overall the value of the species has steadily risen, but not to the extent observed in associated fisheries such as lobster or sea cucumber.

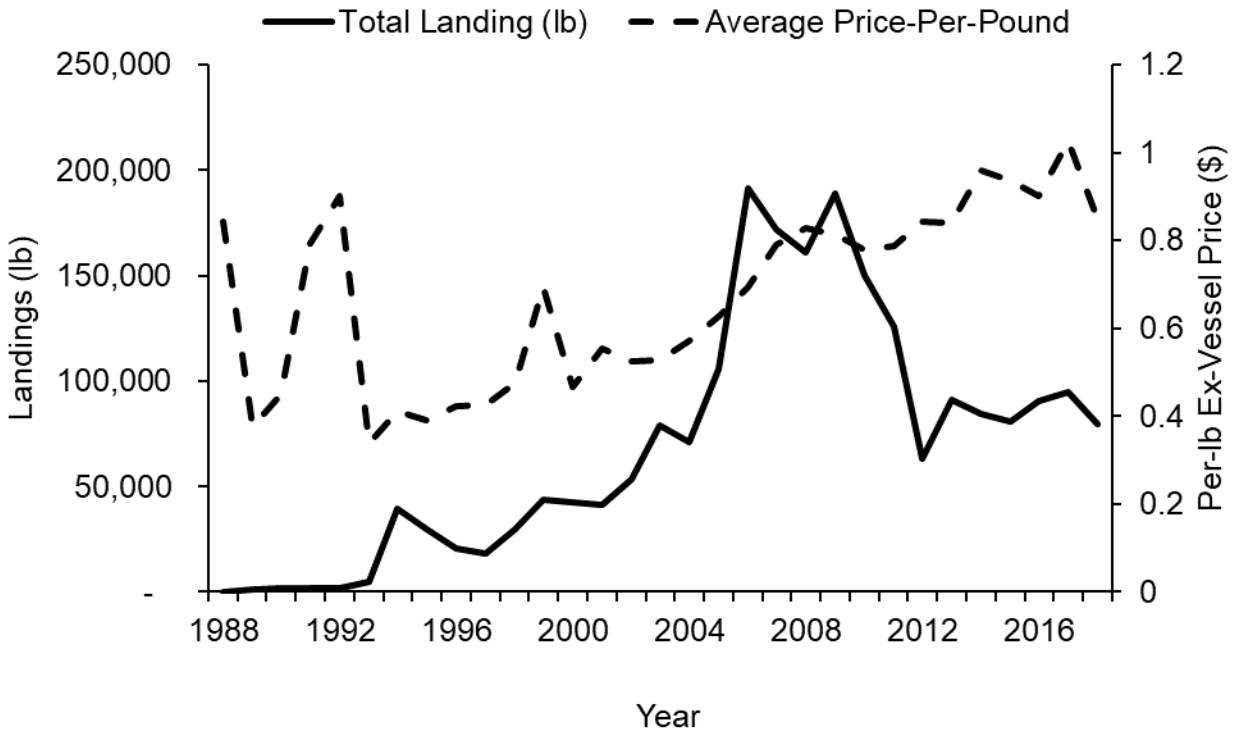


Figure 2-4: Kellet's Whelk landings (lb) and average per-lb ex-vessel value (dollar) from 1988 to 2018 (CDFW MLDS 2019).

Despite the rise in the species' per pound ex-vessel value, the value of Kellet's Whelk still trails the value of the targeted species it is associated with. As such, commercial trap fishermen and divers do not have a strong incentive to target Kellet's Whelk, except perhaps for when the price of rock crab is low. The species is known to be sold in local fishermen's market across southern California, such as the New Port Beach Dory Fleet market. However, it is unclear what proportions of the landings are packaged or sold to restaurants. It is unknown whether Kellet's Whelk has an international market. Export data from the National Oceanic and Atmospheric Administration shows that 26 mt of marine snails of all species were exported outside of the United States in 2017, but the data do not separate Kellet's Whelk out as a distinct species.

The distribution of landings over the last decade can potentially identify areas in California that are most likely to benefit from this fishery. Kellet's Whelk landings have been reported at 21 ports from 2008 to 2018, with 80% of landings occurring at four ports. Approximately 50% of the total reported landings over this period (586,447 lb (266 mt)), occurred at the Santa Barbara Harbor (Figure 2-5). The next three ports are San Diego, Terminal Island, and Dana Point, with cumulative landings of 175,269 lb (76 mt), 95,114 lb (43 mt) and 94,808 lb (43 mt), respectively.

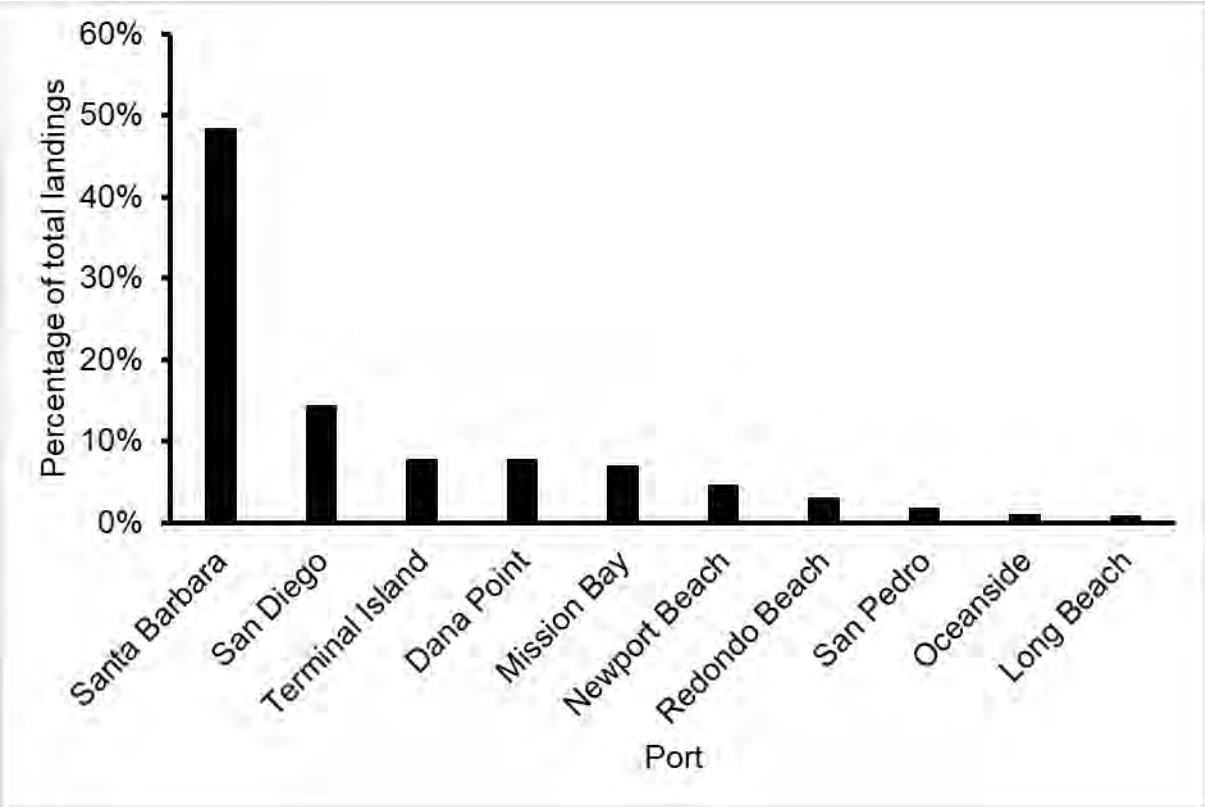


Figure 2-5. Kellet's Whelk percentage of total landings by port from 2008 to 2018 (CDFW MLDS 2019).

3 Management

3.1 Past and Current Management Measures

The current management measures for Kellet's Whelk went into effect in 2012, under California Code of Regulations Title 14 Section 127 (§127, Title 14, CCR). Kellet's Whelk can only be taken commercially by hand or incidentally in lobster or rock crab traps. Incidental take in rock crab traps is only allowed south of the Monterey-San Luis Obispo County line and incidental take in lobster traps is only allowed south of Yankee Point, Monterey County. Deployment of these traps are further prohibited in the front side of Santa Catalina Island, Santa Monica Bay, the Port of Los Angeles/ Long Beach, and San Diego Bay. The commercial fishery is closed from the first Thursday after March 15 to June 30 every year. The fishery is also subject to a TAC of 100,000 lb per season, a level yet to be reached since it was put in place.

Both the lobster and southern rock crab fisheries are limited entry fisheries with a limit on the number of permits specific to their fisheries. Rock crab fishermen must also hold a general trap permit, while a lobster operator permit holder is exempt from this requirement. Commercial divers are required to have a commercial fishing license and may only take Kellet's Whelk further than 1,000 ft (305 m) beyond the low tide mark, as the take of any snails is prohibited in the tidal invertebrate zone (§123, Title 14, CCR). Commercial take is further subject to prohibitions in State Marine Reserves and some State Marine Conservation Areas.

Recreational take of Kellet's Whelk by hand or hook and line is allowed (§29.10, Title 14, CCR) outside of the 1,000 ft (305 m) tidal invertebrate zone. Except where prohibited in state marine reserves and state marine conservation areas, the bag limit is 35 animals with take prohibited from the first Thursday after March 15 to June 30 each year.

3.1.1 Overview and Rationale for the Current Management Framework

The Kellet's Whelk fishery remained essentially unregulated until 2012. However, rising landings and participation in the 1990s and early 2000s drew the attention of fishery managers. Based on the advice and input from the Department, a recommendation from the Commission's Marine Resources Committee, as well as public testimony, the Kellet's Whelk fishery was designated as an emerging fishery in 2011 and the Commission directed staff to develop regulations to ensure the sustainability of the resource and fishery. In late 2011, new regulations were adopted by the Commission. The TAC was chosen based on a fixed fraction of historical landings. A closed season was put in place to avoid harvest during months when Kellet's Whelk aggregate to mate and that also coincides with the end of the commercial lobster season.

3.1.1.1 Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild

No objective overfished or overfishing benchmark has been designated due to the incidental nature of the Kellet's Whelk fishery and the relative stability of the

landings. However, landings, effort and value are monitored. Multiple years of the TAC being reached, a sudden drop in landings, or rise in effort or price may lead to an investigation by Department staff, and if warranted, the development of adaptive management recommendations.

3.1.1.2 Past and Current Stakeholder Involvement

The take of Kellet's Whelk came to the attention of fishery managers in the late 2000s due to rising landings. The question of whether to implement specific management measures for the species was first brought up in a public discussion at the June 2010 Commission meeting in Folsom, California. The issue was further discussed in front of the Marine Resources Committee of the Commission in October 2010 and again in February 2011. The full Commission further deliberated on the matter in its April 2011 meeting before the matter entered the rulemaking process. The rulemaking process involved three further Commission meetings (September 15, 2011; November 17, 2011; and December 15, 2011), during which the public was given further opportunities for input and comment.

Due to the incidental nature and the small scale of this fishery, there has been little periodic outreach to stakeholders outside those discussed above. However, any stakeholder may raise concerns or suggestions to the Commission at any of its regular scheduled meetings or by submitting a petition for regulatory change via email or mail.

3.1.2 Target Species

3.1.2.1 Limitations on Fishing for Target Species

3.1.2.1.1 Catch

The Kellet's Whelk fishery is currently managed under a TAC of 100,000 lb. The TAC resets after the end of each fishing season. Each year, Department scientists project the time at which the TAC would be reached based on the landing trends of that season. If the TAC is expected to be reached before the season ends, the Department will announce the fishery closure by providing a required 10-day notice to all individuals who have landed Kellet's Whelk commercially in the previous 5 years and all individuals who hold a lobster operator permit or Southern Rock Crab Permit. The Department will also publish a news release announcing the closure within the same timeframe (§127, Title 14, CCR).

3.1.2.1.2 Effort

Other than the seasonal closure, there is no direct restriction on fishing effort in the Kellet's Whelk dive fishery. The species is predominantly taken in the lobster and rock crab fisheries, both of which are limited-entry. As of 2019, there were 219 individuals that hold a lobster operator permit or a Southern Rock Crab Permit that may take Kellet's Whelk using traps. As of fall 2017, a limit of 300 traps per lobster operator permit was implemented for the lobster fishery.

3.1.2.1.3 *Gear*

Kellet's Whelk may only be commercially taken by hand or incidentally in lobster and rock crab traps. Both rock crab traps and lobster traps are subject to specific configuration requirements and pulling requirements, (§121-122.2, 125-125.1, Title 14, CCR; Fish and Game Code (FGC) §9000 *et seq.*) The species may be recreationally taken by hook and line or by hand while skin diving, and also while SCUBA diving south of Yankee Point in Monterey, California (§29.05 and 29.10, Title 14, CCR).

3.1.2.1.4 *Time*

Kellet's Whelk may be taken commercially and recreationally each year from July 1 to the first Wednesday after March 15 of the next year.

3.1.2.1.5 *Sex*

The sex of Kellet's Whelk cannot be differentiated visually, thus there is no sex restriction on the take of this species.

3.1.2.1.6 *Size*

There is no size restriction on the take of Kellet's Whelk.

3.1.2.1.7 *Area*

Kellet's Whelk may not be taken commercially or recreationally within 1,000 ft of the low tide mark.

3.1.2.1.8 *Marine Protected Areas*

Pursuant to the mandates of the Marine Life Protection Act (FGC §2850), the Department redesigned and expanded a network of regional Marine Protected Areas (MPAs) in state waters from 2004 to 2012. The resulting network increased total MPA coverage from 2.7% to 16.1% of state waters. Along with the MPAs created in 2002 for waters surrounding the Santa Barbara Channel Islands, California now has a statewide scientifically-based ecologically connected network of 124 MPAs. The MPAs contain a wide variety of habitats and depth ranges.

Although MPAs were not designed for fisheries management purposes, but they present related opportunities and considerations including the following:

1. They serve as long-term spatial closures to fishing if the species of interest is within their boundaries and is prohibited from harvest.
2. They can function as comparisons to fished areas for relative abundance and length or age/frequency of the targeted species.
3. They can serve as ecosystem indicators for species associated with the target species, as prey, predator, or competitor.
4. To varying degrees, they displace fishing effort when they were implemented.

Dive survey data from PISCO suggest that Kellet's Whelk may not derive notable conservation advantage from MPAs (Figure 3-1), but before any conclusions can be drawn more analyses are needed to investigate what may be driving the differences in density inside and outside MPAs.

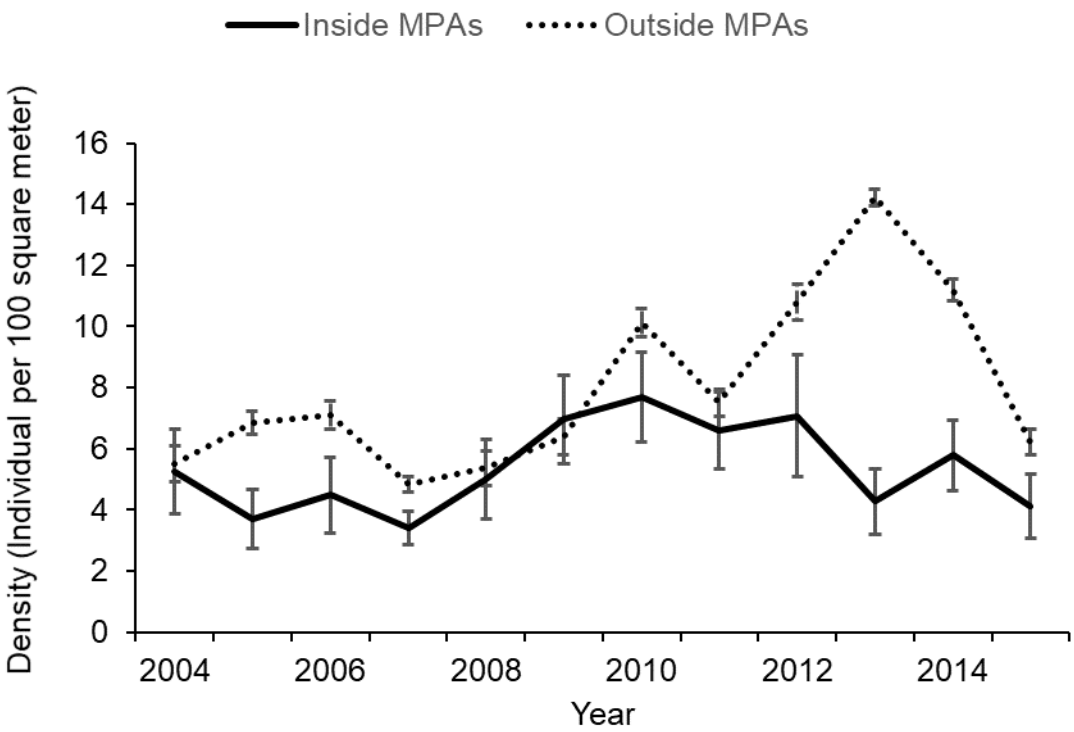


Figure 3-1. Kellet's Whelk average annual density (individuals per 100m^2) determined by SCUBA surveys across California from 2004 to 2015 inside and outside MPAs; bars represent standard error within each year between the average of all sites (PISCO).

3.1.2.2 <u>Description of and Rationale for Any Restricted Access Approach</u>

There is currently no restricted access program in place for Kellet's Whelk. However; both the lobster and southern rock crab fisheries that incidentally take Kellet's Whelk are limited access.

3.1.3 Bycatch

3.1.3.1 <u>Amount and Type of Bycatch (Including Discards)</u>

FGC §90.5 defines bycatch as "fish or other marine life that are taken in a fishery but which are not the target of the fishery." Bycatch includes "discards," defined as "fish that are taken in a fishery but are not retained because they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained" (FGC §91). The term "bycatch" may include fish that, while not the target species, and

are desirable and are thus retained as incidental catch, and does not always indicate a negative impact.

Kellet's Whelk is almost exclusively taken as an incidental species in other fisheries. As such, it is more accurate to characterize Kellet's Whelk as incidental marketable catch of other targeted species. In the lobster fishery where bycatch is well documented, Kellet's Whelk and lobster make up almost 90% of the individual animals caught by number, while sheep crab, rock crab, and sea star make up another 7.5% (CDFW 2016).

3.1.3.2 Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch

Discard Mortality

Bycatch is not an issue in dive fisheries generally since take is by hand and targeted. There is no data on discard mortality of Kellet's Whelk in the trap fisheries. Considering that Kellet's Whelks have some value and are relatively easy to store, discard level is probably low for marketable sized individuals. It is unknown whether discarded Kellet's Whelk tend to land in favorable habitats, but the animals are known to be resilient and likely sink to the bottom relatively quickly.

Bycatch of Overfished, Threatened, or Endangered Species

Because Kellet's Whelk are taken as incidental species in several fisheries, catch of other species associated with Kellet's Whelk are not characterized as bycatch of the Kellet's Whelk fishery. For bycatch of overfished, threatened, or endanger species in the rock crab and lobster fisheries, please consult the respective ESRs for those fisheries.

Measures to Reduce Bycatch

No measures to reduce bycatch are in place since there is no directed fishery for Kellet's Whelk. Both the lobster and the rock crab trap fisheries are subject to trap configuration restrictions that include minimum mesh size, escape ports to reduce bycatch, and destruction devises to minimize ghost fishing.

3.1.4 Habitat

3.1.4.1 Description of Threats

The targeted nature of a dive fishery means that no notable habitat disturbance occurs. Traps in general also do not create significant habitat disturbance, especially compared to other gear types such as trawls and gillnets (Eno et al. 2001). In 2017, a trap limit was implemented for the lobster fishery for the first time, reducing the number of lobster traps.

3.1.4.2 Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing

The dive fishery has no specific habitat disturbance to mitigate. Trap fisheries generally contribute little to habitat degradation. A trap limit was implemented for the Spiny Lobster fishery in 2017 to reduce the number of lobster traps. The Department is also tracking the number of lobster trap loss through a requirement for end of season trap loss reporting for all lobster operator permit holders as part of the trap limit program. As more information becomes available, improvements may be made to reduce trap loss.

3.2 Requirements for Person or Vessel Permits and Reasonable Fees

The particular license, permits, and fees associated with the commercial take of Kellet's Whelk depend on the specific method of take employed (See Table 3-1). All fees include a nonrefundable 3% application fee.

The requirements are as follows:

- All commercial fishermen must hold a valid commercial fishing license and they must operate from a registered commercial vessel:
    - Commercial Fishing License – All commercial fishermen must have a commercial fishing license. Commercial fishing licenses are $145.75 for residents and $431.00 for non-residents in 2019. Licenses are required for any resident 16 yr of age or older who uses or operates or assists in using or operating any boat, aircraft, net, trap, line, or other appliance to take fish for commercial purposes, or who contributes materially to the activities onboard a commercial fishing vessel.
    - Commercial Boat Registration – The commercial boat registration fee is required for any owner or operator for any vessel operated in public waters in connection with fishing operations for profit in the state and is $379.00 for residents and $1,122.00 for non-residents in 2019.
- Kellet's Whelk taken incidental to Southern Rock Crab fishery:
    - Southern Rock Crab Trap Permit – A commercial fisherman taking rock crabs using traps south of Lopez Point, Monterey County must hold a Southern Rock Crab Trap Permit. A Southern Rock Crab Trap Permit is limited-entry and must be transferred from an existing permit holder. A current Southern Rock Crab Trap Permit holder can renew the permit for $373.75 in 2019.
    - General Trap Permit – A commercial fisherman taking rock crabs using traps must also hold a general trap permit. A General Trap Permit could be purchased from the Department for $54.08 in 2019.
- Kellet's Whelk taken incidental to Spiny Lobster Fishery:
    - Lobster Operator Permit – A commercial fisherman taking lobsters using traps must hold a Lobster Operator Permit. A Lobster Operator Permit is limited-entry and must be obtained by having one transferred from an existing permit holder. A current Lobster Operator Permit holder can renew the permit for $820.50 in 2019.

The licensing requirement and associated fees for recreational take of Kellet's Whelk are as follow:

- Sport Fishing License – Individuals age 16 yr and older are required to have a California Sport Fishing License to fish recreationally in the state. A sport fishing license in 2019 costs $49.94 for California residents and $134.74 per year for non-residents.
- Ocean Enhancement Validation – Individuals fishing recreationally south of Point Arguello, Santa Barbara County, must obtain an Ocean Enhancement Validation at the cost of $5.56 in 2019.

Table 3-1. Permits and fees associated with Kellet's Whelk commercial and recreational fishery (Accessed June 6, 2019 https://www.wildlife.ca.gov/Licensing/Commercial/Descriptions; https://www.wildlife.ca.gov/Licensing/Fishing).

Permit	Fee (US dollars)
Commercial Fishery	
Commercial Fishing License residents	$145.75
Commercial Fishing License non-residents	$431.00
Commercial Boat Registration residents	$379.00
Commercial Boat Registration non-residents	$1,122.00
Incidental take in Rock Crab	
General Trap Permit	$54.08
Southern Rock Crab Trap Permit	$373.75
Incidental take in Lobster Fishery	
Lobster Operator Permit	$820.50
Recreational Fishery	
Sports Fishing License	$49.94
Ocean Enhancement Validation	$5.56

4 Monitoring and Essential Fishery Information

4.1 Description of Relevant Essential Fishery Information

Biological Information

Length-weight relationship, length-age relationship, and size at sexual maturity for the species are not well understood. Rosenthal (1970) estimated the age of sexual maturity to be between shell length of 2.6 and 2.8 in (65.0 and 70.0 mm). However, sexual maturity has been found in smaller individuals, and the relationship between age and size has never been established. In addition, more advanced information such as the species' trophic role, response to environmental factors, total biomass, and mortality rates have not been as well documented as some other species. Some information such as length-weight relationship and response to protected areas are being gathered by primary research institutions, and could become available by 2019 (White personal communication).

Environmental and Fishery-dependent Indicators

Currently, no biological or environmental indicators are tracked by the Department for use in management of this fishery. Instead, fishery-dependent indicators, such as landings, are used to evaluate the status of the fishery.

4.2 Past and Ongoing Monitoring of the Fishery

4.2.1 Fishery-dependent Data Collection

The Department's primary source of information on the fishery comes from landing receipt data. Data on the date, time, place, depth, effort and amount of take is captured on commercial dive logbooks, but the species is not recorded on lobster and rock crab trap logs where the majority of landings in California occur. Therefore, it is not possible to calculate Catch Per Unit Effort (CPUE) for the trap fisheries. Data collected on landing receipts include:

- fishermen and vessel information
- date the fish was landed
- port of landing
- commercial fishing block where the fish were harvested
- weight (in pound) landed by market category
- price paid to the fisherman by market category
- condition of the fish when sold
- type of gear used to harvest the fish

4.2.2 Fishery-independent Data Collection

The Department does not actively collect fishery-independent data on Kellet's Whelk. The density of Kellet's Whelk is monitored at a number of sites in southern

California by PISCO dive surveys and the Vantuna Research Group, which also collects size information. The National Park Service also similarly conducts dive surveys on a regular basis at the northern Channel Islands. Kellet's Whelk is also surveyed by Reef Check California in its dive surveys; the data from which has not been incorporated into this document, but could be in the future. The species is being actively studied by researchers at the California Polytechnic State University, California State University Fullerton, and Monterey Bay National Marine Sanctuary.

5 Future Management Needs and Directions

5.1 Identification of Information Gaps

Table 5-1. Informational needs for Kellet's Whelk and their priority for management.

Type of information	Priority for management	How essential fishery information would support future management
Fill data gaps and improve biological and life history information	High	Information obtained would include weight-length data, size at maturity, fecundity, adult sex ratio, natural mortality, and adult movement pattern. The information could be used to inform the development of management measures as well as help inform the future development of data poor fisheries models for assessing and projecting the status of the stock.
Capturing take of Kellet's Whelk on lobster and general trap logbooks and collecting size frequency of harvested individuals	Medium	Information would help the Department assess fishing effort, CPUE in the lobster fishery, and fishing mortality for the species
Assess species response to ocean acidification, temperature change, and climate-influenced ENSO events	Medium	Information would help the Department plan for long-term, multi-decadal management strategy. Ocean acidification may negatively impact the stock in the future, change in water temperature may shift the range of the species, while stronger and more frequent El Niño events may increase the recruitment rate of the population north of Point Conception
Assess larval movement and recruitment patterns	Medium	Parameter would help the Department assess recruitment dynamics
Fill data gaps in existing nearshore habitat maps.	Medium	Information could help refine population abundance estimates and would inform future management decisions that could impact the species' habitat.
Develop conversion factors to relate different dive survey methods and datasets used to estimate abundance	Low	Information is helpful to encompass as much data into abundance estimate as possible; data would also help detect population change by comparing densities inside and outside of MPAs, and measure the effectiveness of current management measures through additional fishery-independent datasets.
Assess stock in Baja California and inter-connectivity across national boundaries	Low	Information would help complete the assessment of the current population and projection of future trend for the portion of the population outside of U.S. jurisdiction

5.2 Research and Monitoring

5.2.1 Potential Strategies to Fill Information Gaps

Due to the relative stability of the Kellet's Whelk landings, future information gathering by the Department would likely be opportunistic. There are signs that the population's density has been decreasing across its range, but these data are not conclusive. The highest priority is to obtain all basic life history of the species to allow Department staff to more comprehensively assess the status of the stock. Information on weight-length relationship, reproduction, mortality, and adult movement are areas that are currently lacking. Information that can further complement management are better data on fishery take, larval movement, habitat, and effects of climate change. Lastly, information that help integrate all existing data sets on the species and information on the species' status in Baja California could help improve the overall integrity of the Department's understanding of the stock.

The bulk of future information gathering on Kellet's Whelk life history would likely be performed by academic institutions and in collaborative partnerships between the Department, researchers, and/or fishermen. Already, several researchers in California are conducting studies on Kellet's Whelk to collect information as a regular study subject. These institutions are not constrained by immediate management needs and policy consideration and they have the facilities to hold live animals and conduct these types of studies.

5.2.2 Opportunities for Collaborative Fisheries Research

The Department has collaborated in the past and will continue to work with outside entities such as academic organizations, non-governmental organizations, citizen scientists, and both commercial and recreational fishery participants to help fill information gaps related to the management of state fisheries. The Department will also reach out to outside persons and agencies when appropriate while conducting or seeking new fisheries research required for the management of each fishery

Currently, the Department does not have any active fishery-independent research planned for Kellet's Whelk. However, the Department provides vessel support for a number of Reef Check California and PISCO survey trips each year. Fishery-dependent information is collected regularly from fishery participants and buyers in the form of dive logs and landing receipts. Several laboratories, such as the Zacherl lab at California State University- Fullerton and the Center for Coastal Marine Science at California Polytechnic State University, conduct focused studies on Kellet's Whelk. The Department has and will continue to provide its fishery-dependent data and other support as appropriate to help aid these efforts.

In addition, research groups such as PISCO and the Vantuna Research Group conduct regular marine surveys in southern California that include Kellet's Whelk. However, different research groups have adopted different protocols and practices, and conversion factors may need to be developed before the datasets could be compared (Simmonds et al. 2014). The Department could help facilitate discussions between

these groups to develop and adopt data standardization practices to maximize the effectiveness of these survey datasets.

Should the need arise, the Department can further engage the members of the fishing industry. Information such as the end-use of Kellet's Whelks, market demand and dynamics, or individual participant's practice of capturing and retaining the species can be obtained through informal meetings, formal surveys, or other stakeholder engagement tools described in Appendix G of the 2018 MLMA Master Plan.

5.3 Opportunities for Future Management Changes

This section is intended to provide information on changes to the management of the fishery that may be appropriate but does not represent a formal commitment by the Department to address those recommendations. ESRs are one of several tools designed to assist the Department in prioritizing efforts and the need for management changes in each fishery will be assessed in light of the current management system, risk posed to the stock and ecosystem, needs of other fisheries, existing and emerging priorities, as well as the availability of capacity and resources.

No management changes for Kellet's Whelk have been identified or recommended since 2012. However, improvement to population estimates could allow the Department to adjust the TAC if necessary to improve sustainability. Further understanding population and recruitment trends relative to environmental factors and changes may lead to identifying and incorporating environmental indicators in monitoring efforts and management of the fishery and resource.

5.4 Climate Readiness

Some studies suggest that as the global climate changes, intense El Niño conditions would become more prevalent (Cai et al. 2015; Power et al. 2013), though such prediction is not dispositive (Collins et al. 2010). The species abundance north of Point Conception could thus continue to grow, potentially increasing its resilience.

Warmer ocean temperature may lead to a range shift of the species due to physiological limitations (Sunday et al. 2012). Depending on how the temperature change interacts with physical barriers and habitat suitability, the resilience of Kellet's Whelk may increase or decrease.

Ocean acidification may have a detrimental impact on Kellet's Whelk. As the ocean gradually acidifies (Feely et al. 2009), animals such as Kellet's Whelk that rely on calcified shells to protect themselves would generally become more fragile. Larvae may not develop properly into adults, and adults may need to expend more energy into maintaining their shells (Waldbusser et al. 2015).

None of the current management measures for Kellet's Whelk are directly designed to account for climate change, but the conservative TAC adopted by the Commission and the statewide network of MPAs may help buffer impacts of a changing climate. While the seasonal closure would continue to serve its purpose if the species' reproductive season remains the same, the dates and duration of the closure along with

the current TAC for the commercial fishery may require adjustment as ocean conditions change.

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Ridgeback Prawn, *Sicyonia ingentis*
Enhanced Status Report

Ridgeback Prawn, *Sicyonia ingentis.* (Photo Credit: David Ono, CDFW)

California Department of Fish and Wildlife
Marine Region
June 2019

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Enhanced Status Reports

The Marine Life Management Act (MLMA) is California's primary fisheries law. It requires the California Department of Fish and Wildlife (Department) to regularly report to the California Fish and Game Commission (Commission) on the status of fisheries managed by the state. The 2018 Master Plan for Fisheries expanded on this general requirement by providing an outline for Enhanced Status Reports (ESRs) that is based on the MLMA's required contents for Fishery Management Plans (FMPs). The goal of ESRs is to provide an overview of the species, fishery, current management and monitoring efforts, and future management needs, and provide transparency around data and information that is unavailable or unknown. ESRs can help to guide Department efforts and focus future partnerships and research efforts to address information gaps and needs to more directly inform management. It is also anticipated that some ESRs will be foundations for future FMPs by providing background information and focusing analyses and stakeholder discussions on the most relevant issues.

Table of Contents

Enhanced Status Reports i
Table of Contents ii
List of Acronyms iv
List of Figures v
List of Tables v
List of Appendices vi
Fishery-at-a-Glance: Ridgeback Prawn vii
1 The Species 1-1
1.1 Natural History 1-1
1.1.1 Species Description 1-1
1.1.2 Range, Distribution, and Movement 1-1
1.1.3 Reproduction, Fecundity, and Spawning Season 1-2
1.1.4 Natural Mortality 1-3
1.1.5 Individual Growth 1-3
1.1.6 Size and Age at Maturity 1-4
1.2 Population Status and Dynamics 1-4
1.2.1 Abundance Estimates 1-4
1.2.2 Age Structure of the Population 1-6
1.3 Habitat 1-6
1.4 Ecosystem Role 1-7
1.4.1 Associated Species 1-7
1.4.2 Predator-prey Interactions 1-7
1.5 Effects of Changing Oceanic Conditions 1-7
2 The Fishery 2-1
2.1 Location of the Fishery 2-1
2.2 Fishing Effort 2-2
2.2.1 Number of Vessels and Participants Over Time 2-2
2.2.2 Type, Amount, and Selectivity of Gear 2-3
2.3 Landings in the Recreational and Commercial Sectors 2-5
2.3.1 Recreational 2-5
2.3.2 Commercial 2-5
2.4 Social and Economic Factors Related to the Fishery 2-7
3 Management 3-1
3.1 Past and Current Management Measures 3-1
3.1.1 Overview and Rationale for the Current Management Framework 3-1
3.1.1.1 Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild 3-2

3.1.1.2 Past and Current Stakeholder Involvement 3-2
3.1.2 Target Species 3-3
3.1.2.1 Limitations on Fishing for Target Species 3-3
3.1.2.1.1 Catch 3-3
3.1.2.1.2 Effort 3-3
3.1.2.1.3 Gear 3-3
3.1.2.1.4 Time 3-3
3.1.2.1.5 Sex 3-3
3.1.2.1.6 Size 3-3
3.1.2.1.7 Area 3-3
3.1.2.1.8 Marine Protected Areas 3-3
3.1.2.2 Description of and Rationale for Any Restricted Access Approach 3-4
3.1.3 Bycatch 3-4
3.1.3.1 Amount and Type of Bycatch (Including Discards) 3-4
3.1.3.2 Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch 3-6
Discard Mortality 3-6
Impact on Fisheries that Target Bycatch Species 3-7
Bycatch of Overfished, Threatened, or Endangered Species 3-7
Bycatch of Sea Birds and Marine Mammals 3-8
Measures to Reduce Bycatch 3-8
3.1.4 Habitat 3-9
3.1.4.1 Description of Threats 3-9
3.1.4.2 Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing 3-9
3.2 Requirements for Person or Vessel Permits and Reasonable Fees 3-10
4 Monitoring and Essential Fishery Information 4-1
4.1 Description of Relevant Essential Fishery Information 4-1
4.2 Past and Ongoing Monitoring of the Fishery 4-1
4.2.1 Fishery-dependent Data Collection 4-1
4.2.2 Fishery-independent Data Collection 4-2
5 Future Management Needs and Directions 5-1
5.1 Identification of Information Gaps 5-1
5.2 Research and Monitoring 5-3
5.2.1 Potential Strategies to Fill Information Gaps 5-3
Biological Research 5-3
Update Fishery Data Collection Systems 5-3
5.2.2 Opportunities for Collaborative Fisheries Research 5-4
5.3 Opportunities for Management Changes 5-4

Bycatch Management *5-5*
Restricted Access Program *5-5*
Stakeholder Participation *5-5*
5.4 Climate Readiness 5-6
Literature Cited ix
A Estimated total (retained and discard) catch of non-target species (metric ton (mt)), discard weight (mt), and percent discarded in the Ridgeback Prawn fishery, 2017 ..... A-1

List of Acronyms

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
BRD	Bycatch Reduction Device
CCR	California Code of Regulations
CFIS	Commercial Fisheries Information System
CFR	Code of Federal Regulations
CDFW	California Department of Fish and Wildlife
CL	Carapace Length
CPUE	Catch Per Unit Effort
EFI	Essential Fishery Information
ENSO	El Niño Southern Oscillation
ESR	Enhanced Status Report
FGC	Fish and Game Code
FMP	Fishery Management Plan
IPCC	Intergovernmental Panel on Climate Change
LOF	List of Fisheries
M	Natural Mortality
MLMA	Marine Life Management Act
MLPA	Marine Life Protection Act
MPA	Marine Protected Area
MRC	Marine Resources Committee
NCCOS	National Centers for Coastal Ocean Science
NGO	Non-Governmental Organization
NRC	National Research Council
NMFS	National Marine Fisheries Service
NWFSC	Northwest Fisheries Science Center
NOAA	National Oceanic and Atmospheric Administration
PFMC	Pacific Fishery Management Council
SCB	Southern California Bight
TL	Total Length
SCCWRP	Southern California Water Research Project
WCGOP	West Coast Groundfish Observer Program

List of Figures

Figure 1-1. Ridgeback Prawn a) dorsal view showing the prominent ridge and b) lateral view.

Figure 1-2. Geographic range of Ridgeback Prawn.

Figure 1-3. Abundance of Ridgeback Prawn by depth stratum and Southern California Coastal Water Research Project Southern California Bight survey year, 1994 to 2013.

Figure 1-4. Ridgeback Prawn on soft bottom habitat.

Figure 2-1. Ridgeback Prawn trawl locations by CDFW fishing blocks and the percentage of total landing by fishing block from 1974 to 2017.

Figure 2-2. Commercial Ridgeback Prawn fishery number of active vessels and landings (million lb), 1974 to 2017.

Figure 2-3. Commercial Ridgeback Prawn fishery number of issued permits and usage status from 1991 to 2017.

Figure 2-4. Diagrams of a) a single-rigged vessel pulling one otter trawl, and b) a double-rigged vessel pulling two otter trawls both of which are used in the Ridgeback Prawn commercial fishery.

Figure 2-5. Diagram of a rigid-grate excluder approved for use in the Ridgeback Prawn fishery.

Figure 2-6. Ridgeback Prawn landings (million lb) and value (million dollars) from 1974 to 2017.

Figure 2-7. Seasonal CPUE for the Ridgeback Prawn fishery from 1983 to 2006.

Figure 2-8. Ridgeback Prawn percentage of total landings by county from 1974 to 2017.

List of Tables

Table 2-1. Landings (lb), ex-vessel value, and average price-per-pound for Ridgeback Prawn, 2000 to 2017.

Table 3-1. Estimated total catch of non-target species (metric ton), percent discarded, and bycatch ratios (non-target species: target species) by weight in the Ridgeback Prawn fishery, 2017.

Table 3-2. Estimated bycatch (metric ton) of overfished species in the Ridgeback Prawn fishery and their ABC and ACL as specified in federal regulations for 2017.

Table 3-3. Commercial fishing license fees for Ridgeback Prawn valid from April 1, 2019 to March 31, 2019.

Table 3-4. Annual recreational fishing license fees for Ridgeback Prawn from January 1 to December 31, 2019.

Table 4-1. Potential sources of additional information on Ridgeback Prawn.

Table 5-1. Informational needs for Ridgeback Prawn and their priority for management.

List of Appendices

Appendix A. Estimated total (retained and discard) catch of non-target species (metric ton (mt)), discard weight (mt), and percent discarded in the Ridgeback Prawn fishery, 2017.

Fishery-at-a-Glance: Ridgeback Prawn

Scientific Name: *Sicyonia ingentis*

Range: Ridgeback Prawn are found in Monterey Bay, California to Isla Maria Madre, Mexico, including the Gulf of California. They are abundant in the Santa Barbara Channel, Santa Monica Bay, and off Baja California, Mexico.

Habitat: Ridgeback Prawn occupy subtidal depths (16 to 1,007 feet or 5 and 307 meters), but are most commonly found between 148 and 531 feet (45 and 162 meters) occurring on sand, shell, and green mud substrate. Highly suitable Ridgeback Prawn habitat occurs at depths between 131 and 525 feet (40 and 160 meters) and south of Point Conception (below 35°N).

Size (length and weight): Female Ridgeback Prawns reach a maximum length of 1.8 inches (4.5 centimeters) carapace length and 7.1 inches (18.0 centimeters) total length. Males reach a maximum 1.5 inches (3.7 centimeters) carapace length and 6.2 inches (15.7 centimeters) total length. Length-weight relationships for both sexes are equivalent.

Life span: Ridgeback Prawn are short-lived with a life span of about 4 to 5 years.

Reproduction: Ridgeback Prawn are dioecious and thus have separate male and female sexes. They are broadcast spawners, and both sexes can spawn as early as the first year of growth, but most spawn upon reaching 1.2 inches (3.05 centimeters) carapace length in the second year of growth. Spawning season lasts from June through October. Females spawn multiple times during the spawning season and produce an average of 86,000 eggs a season.

Prey: Ridgeback Prawn feed on organic surface sediments, diatoms, infaunal polychaetes, gastropods, and crustaceans.

Predators: Several species of sea robins and groundfish prey on Ridgeback Prawn. Other likely predators include octopus, sharks, halibut, and bat rays.

Fishery: Ridgeback Prawn are commercially important. In 2017, more than 383,800 pounds (174 metric tons) were landed in California and generated about $923,400 in revenue. Average ex-vessel price has varied between $0.50 and $2.62 per pound since 1974, and was $2.39 in 2017.

Area fished: The Ridgeback Prawn fishery spans from Santa Barbara County to San Diego County, with most of the activity occurring in the Santa Barbara Channel. Ports within Santa Barbara and Ventura counties received the majority of the landings from year to year.

Fishing season: The Ridgeback Prawn fishery is closed during the peak spawning months from June 1 to September 30.

Fishing gear: Bottom trawl is used to fish for Ridgeback Prawn. Bottom trawling includes use of single-walled or double-walled nets equipped with a bycatch reduction device via single or double rigged trawl vessel. There is a minimum mesh size of 1.5 inch (2.54 centimeters) for single-walled cod ends or 3 inch (7.62 centimeters) for double-walled cod ends; net mesh may be no less than 1.375 inches (3.5 centimeters) measured inside the knot.

Market(s): Ridgeback Prawn are sought for domestic consumption, and either sold fresh or live to prevent “blackening” – a discoloration that forms after death that lowers consumer appeal.

Current stock status: No current estimates of Ridgeback Prawn population abundance in California exist. Recruitment appears to be influenced by oceanographic conditions, especially the El Niño Southern Oscillation. Warmer water years have generally resulted in greater biological productivity.

Management: Ridgeback Prawn is a state-managed fishery. Trawling for ridgeback is allowed in federal waters only. No quota or catch limits exist, and gear must contain a bycatch reduction device. Since April 2006, bottom trawlers targeting Ridgeback Prawn have been required to use a rigid-grate fish excluder device to minimize bycatch. Other management measures include seasonal and area closures, gear restrictions, logbook requirement, bycatch limits, and a federal observer program.

1 The Species

1.1 Natural History

1.1.1 Species Description

Ridgeback Prawn (*Sicyonia ingentis*) emerged as a commercially important species in California in the late 1970s. They have big bulbous eyes, a hard and stony exoskeleton, and a slender body consisting of two regions: the cephalothorax and abdomen. The carapace (hard protective shell over the cephalothorax) has a short slender rostrum (a horn-like projection) on the front edge that reaches over the tips of the eyes and bears two sets of feelers (antennules and antennae), mouthparts, and five pairs of pereiopods (walking legs) on the underside (Figure 1-1a). The abdomen consists of six segments: a pair of pleopods (swimming legs) are present on five of the anterior abdominal segments and the sixth segment bears a tail fan (uropod and telson) (Figure 1-1b). The carapace and dorsal part of the abdomen is reddish-brown in color and walking legs are white with some reddish patches (Hendrickx 1984). A prominent ridge along the upper (dorsal) midline portion of the abdomen distinguishes the Ridgeback Prawn from other species (U.S. Department of Commerce 2008).

a) b)

Figure 1-1. Ridgeback Prawn a) dorsal view showing the prominent ridge and b) lateral view (Reproduced from Lindholm et al. 2015a).

1.1.2 Range, Distribution, and Movement

Ridgeback Prawn range from Monterey Bay, California, to Isla Maria Madre, Mexico, at depths between 16 and 1,007 feet (ft) (5 and 307 meters (m)) (Perez Farfante 1985) (Figure 1-2). Major concentrations in southern California occur in the Santa Barbara Channel, Santa Monica Bay, and waters off Oceanside (Stull et al. 2001). This distribution of abundance also is reflected by the areas where they are fished commercially (See section 2.1). Other pockets of abundance are found off Baja California, Mexico. Ridgeback Prawns undertake a gradual offshore ontogenetic

migration until maturity, with larger individuals found in deeper depths (NMFS 1983). After settlement, movement of adult Ridgeback Prawn within their home range is believed to be relatively small; thus, it is assumed that there is little or no adult movement and intermixing between the main pockets of abundance in southern California (CDFG 2001).

Figure 1-2. Geographic range of Ridgeback Prawn. This species occurs from Monterey Bay, California, to Isla Maria Madre, Mexico, at depths between 16 and 1,007 ft (5 and 307 m).

1.1.3 Reproduction, Fecundity, and Spawning Season

Unlike many other shrimp species that are protandrous hermaphrodites that change from male to female during their life cycle and brood eggs, Ridgeback Prawn are dioecious (having separate male and female sexes) and are broadcast spawners. Females store packets of sperm deposited by the males and release both the eggs and sperm into the water column where fertilization and embryonic development occurs. Spawning can occur after the first year of growth, but it is assumed that all Ridgeback Prawns are mature at 1.2 inches (in) (3.1 centimeters (cm)) Carapace Length (CL) in their second year of growth (CDFG 2001; CDFG 2008).

The spawning season takes place from June through October. Individuals can spawn multiple times during this period, and females are known to produce an average of 86,000 eggs during the spawning season (Anderson et al.1985a). Observations of spawning events indicate that Ridgeback Prawn spawn in the water column at night during a new moon (CDFG 2001). Anderson et al. (1985a) observed that both sexes molt prior to and after the spawning season in the spring and late fall. A majority of

females display synchronous molting immediately following the spawning season, but molting patterns of males are less discernible throughout the year. Molting is rarely observed in either sex during the summer months (Anderson et al. 1985a).

1.1.4 Natural Mortality

Determining the natural mortality (M) of marine species is important for understanding the health and productivity of their stocks. Natural mortality results from all causes of death not attributable to fishing such as old age, disease, predation or environmental stress. Natural mortality is generally expressed as a rate that indicates the percentage of the population dying in a year. Fish with high natural mortality rates must replace themselves more often and thus tend to be more productive. Natural mortality along with fishing mortality result in the total mortality operating on the fish stock.

Little information on natural mortality exists for this species. It is estimated Ridgeback Prawn can live up to 4 or 5 years (yr) (Sunada 1984; Anderson et al. 1985b; CDFG 2001; CDFG 2008), which suggests a relatively high rate of natural mortality. Similar to other species of penaeid shrimps, predation is likely the primary source of mortality for juvenile Ridgeback Prawns. Individuals typically recruit into the fishery at age 1 yr, although the majority of the catch documented were composed of 2 and 3 yr old prawns (Sunada 1984; Anderson et al. 1985b; CDFG 2001). In the absence of fishing mortality, natural mortality factors include predation, disease, competition, senescence, and environmental stressors.

1.1.5 Individual Growth

Individual growth of marine species can be quite variable, not only among different groups of species but also within the same species. Growth is often very rapid in young fish and invertebrates, but slows as adults approach their maximum size. The von Bertalanffy Growth Model is most often used in fisheries management, but other growth functions may also be appropriate.

Published growth estimates for Ridgeback Prawn are scarce. During development, Ridgeback Prawn experience a pelagic larval period in the water column then gradually metamorphose to a post-larval stage and settle to the bottom. The duration of development from spawning to post larval settlement is unknown (Wolotira et al. 1990).

It is estimated that juveniles range in size from 0.04 to between 0.8 and 0.9 in (0.1 to between 2.0 and 2.3 cm) (Wolotira et al. 1990). They molt periodically throughout their life, growing larger with each molt (See sections 1.1.3 and 1.2.2). While very little is known about the duration of successive life history stages (i.e., molt increment and frequency) for this species, males and females appear to exhibit different growth rates. Males grow slightly slower than females and reach a smaller maximum size (Anderson et al. 1985b). Males reach a maximum size of 1.5 in (3.7 cm) CL and 6.2 in (15.7 cm) Total Length (TL) while females reach a maximum size of around 1.8 in (4.5 cm) CL and 7.1 in (18.0 cm) TL (Sunada 1984; Perez Farfante 1985). The length to weight ratios for both sexes are equivalent (CDFG 2008).

1.1.6 Size and Age at Maturity

Ridgeback Prawn mature at around 0.9 in (2.3 cm) CL (Wolotira et al. 1990). Growth is not well understood, but it is thought that they reach this size between 1 and 2 years of age. It is unknown whether males and females mature at different sizes or ages.

1.2 Population Status and Dynamics

Ridgeback Prawn is considered a “data-poor” species because insufficient resources and data exist for assessing stock status. To an extent, commercial fisheries data can be used to provide an indication of overall abundance, fishing pressure, and recruitment success. While no estimates of biomass or maximum sustainable yield exist for Ridgeback Prawn, the landings may provide insight on the species’ wide fluctuation in availability (See section 2.2.1). Catch Per Unit Effort (CPUE) data also suggest fluctuations in abundance in response to changing environmental conditions (See section 1.5).

1.2.1 Abundance Estimates

No formal studies to determine the population status of Ridgeback Prawn have been conducted. However, there have been bottom trawl surveys performed by several city and county water quality agencies within the Southern California Bight (SCB) that provide anecdotal information on population abundance (Hendrickx 1984; Allen and Moore 1997; Allen et al. 1999, 2002, 2007, 2011; Stull et al. 2001; NCCOS 2005). Results from surveys conducted from 1971 to 1985 showed that Ridgeback Prawn was the second most abundant invertebrate species in the northern and central regions of the SBC on the outer shelf and upper slope of the continental shelf from 148 to 1,033 ft (45 to 315 m) (CDFG 2008). The Southern California Coastal Water Research Project (SCCWRP) conducted another series of large-scale bottom trawl surveys in the SCB in 1994, 1998, 2003, 2008 and 2013. Figure 1-3 shows Ridgeback Prawn abundance by stratum classification of areas sampled for each of the SCCWRP survey years. In 1994 and 2003, Ridgeback Prawn was the second most abundant species on the middle shelf from 85 to 394 ft (26 to 120 m) and the third most abundant macro-invertebrate species caught in the outer shelf from 331 to 656 ft (101 to 200 m). In 2013, Ridgeback Prawn was found to be one of the top ten most frequently occurring species in the SCB, collected in 25% of all trawl samples, and were the second most abundant species in samples taken in bays and harbors from 13 to 98 ft (4 to 30 m) and third most abundant species on the middle shelf (Walther et al. 2017).

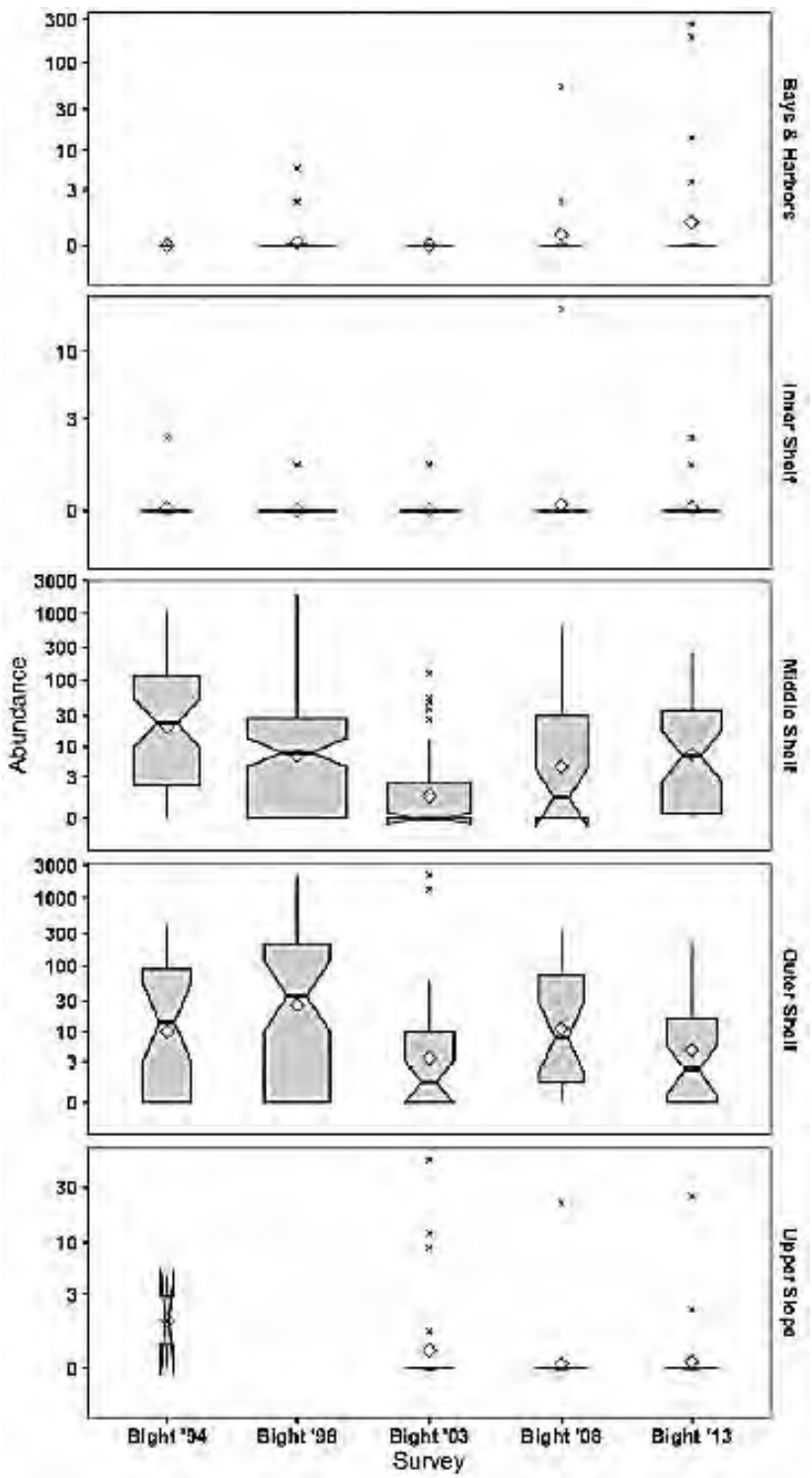

Figure 1-3. Abundance of Ridgeback Prawn by depth stratum and Southern California Coastal Water Research Project Southern California Bight survey year, 1994 to 2013. Abundance is measured as the number of individuals. Data are median, upper and lower quartiles, means (diamonds), 95% confidence intervals of the medial (notches), 1.5 times the interquartile range (whiskers), and outliers (“x”). Box width indicates relative sample size (Reproduced from Walther et al. 2017).

1.2.2 Age Structure of the Population

Age structure can be used to infer the magnitude of recruitment events as well as the total mortality experienced by the stock, and as a result can be a very informative indicator of population status. There has been a lack of age class monitoring for this species, but historic trawl surveys showed variations in size by depth, with adult Ridgeback Prawns found further offshore than juveniles. Anderson et al. (1985b) observed a narrow size range of 0.9 to 1.9 in (2.3 to 4.7 cm) CL offshore at a depth of 476 ft (145 m) and smaller size classes of less than 1 in (2.5 cm) CL at 197 ft (60 m). Shallower depths around 131 ft (40 m) yielded the smallest prawns ranging from 0.2 to 0.5 in (0.6 to 1.5 cm) CL, which were most likely newly settled juveniles (young-of-the-year) (Anderson et al. 1985b). Since adult Ridgeback Prawns collected in trawls at 476 ft (145 m) were as small as 0.9 in (2.3 cm), Anderson et al. (1985b) estimated newly settled individuals grow at a rate of 0.04 in (0.1 cm) per month, and enter the fishery 1 yr after settlement. They noted that while the youngest age of recruitment can be approximated, the variability in molt increment and molt frequency, as well as the ontogenetic movement into deeper waters as they age, makes it difficult to determine distinct age classes from the size distribution of Ridgeback Prawns. However, this study suggests that newly recruited cohorts can be determined, and the magnitude of recruits may be a useful population indicator in the future.

1.3 Habitat

Ridgeback Prawn occur primarily on soft bottom habitat composed of green mud, shell and sand (Figure 1-4), and can tolerate temperature and salinity gradients ranging from 39 to 86 degrees, Fahrenheit (ºF) (4 to 30 degrees, Celsius (ºC)) and 33 to 35 parts per thousand, respectively (Perez Farfante 1985). As noted in section 1.1.2, they are distributed between the inner to outer continental shelf between 16 and 1,007 ft (5 and 307 m), and most abundant at 180 to 269 ft (55 to 82 m) (Perez Farfante 1985).

Figure 1-4. Ridgeback Prawn on soft bottom habitat (Reproduced from Lindholm et al. 2015a).

Highly suitable habitat for Ridgeback Prawn occur over hard and soft substrates at depths between 131 and 525 ft (40 and 160 m) and south of Point Conception (below 35°N) (NCCOS 2005). A study of mid-depth rocky reef and soft-bottom ecosystems within marine protected areas across the SCB noted that they were most commonly observed at depths ranging from 459 to 656 ft (140 to 200 m) with bottom slopes of 10 to 20° (Lindholm et al. 2015a).

1.4 Ecosystem Role

As noted, Ridgeback Prawn is one of the most common benthic species in the SCB on the middle and outer shelf, and is ecologically important to the area, occupying a central position in the trophic structure. They are omnivorous bottom feeders that consume a wide variety of benthic organisms and are forage for a number of fish species (See section 1.4.2).

1.4.1 Associated Species

Bottom trawl surveys (Allen et al. 2011) of the SCB have found that Ridgeback Prawn commonly co-occur with English Sole (*Parophrys vetulus)* on the inner and outer shelf. On the middle and outer shelf, Ridgeback Prawn and Gray Sand Star (*Luidia foliolata*) were frequently found together, and were associated with California Sea Cucumber (*Parastichopus californicus*) and California Sea Slug (*Pleurobranchaea californica*) (Allen et al. 2011). Additionally, commercial landing receipt data provides information on associated species that are caught and landed with Ridgeback Prawn (i.e., incidentally caught species that are marketable and legal to retain in conjunction with Ridgeback Prawn). The composition of these species can vary from year to year, however, commercial landing records from 2013 to 2017 showed California Lizardfish (*Synodus lucioceps*), English Sole (*Parophrys vetulus*), White Croaker (*Genyonemus lineatus*), unspecified Rock Crab, and unspecified Sole were consistently in the top 10 species landed with Ridgeback Prawn. While these fish and invertebrate species were found to commonly co-occur with Ridgeback Prawn in trawl landings, potential interactions between these species and Ridgeback Prawn are not fully known.

1.4.2 Predator-prey Interactions

This species is a benthic omnivore that feeds on organic surface sediments, diatoms, infaunal polychaetes, gastropods, and crustaceans (CDFG 2008). In Baja California, several species of sea robins are known to prey on Ridgeback Prawn (CDFG 2001). In southern California, likely predators include rockfish, lingcod, sharks, rays and skates, halibut, and octopus (CDFG 2001; CDFG 2008).

1.5 Effects of Changing Oceanic Conditions

The reproduction and population structure of the Ridgeback Prawn appears to be strongly influenced by the El Niño Southern Oscillation (ENSO). ENSO is a naturally occurring climate cycle in which sea-surface temperatures in the equatorial Pacific Ocean fluctuate between a warming phase (El Niño) and a cooling phase (La Niña). El

Niño events occur once every 3 to 8 yr with varying intensity and last between 12 and 18 months (Chavez et al. 2017). An examination of both the commercial landing receipt and the trawl logbook data suggests a positive correlation between these oceanographic shifts in water temperature and catch success: biological productivity of Ridgeback Prawn is greatest during warm water phases and is depressed during the cooler water phases. After the two strongest ENSO events of the past 30 years, the 1982 to 1983 and the 1997 to 1998 events, Ridgeback Prawn landings along with CPUE dramatically increased 1 to 2 yr following these events (CDFG 2008). Since Ridgeback Prawn recruit into the fishery at around age 1 or 2 yr (Sunada 1984; Anderson el al. 1985b), warmer waters may positively influence reproductive success or juvenile survival.

Historically, these cool and warm water phases associated with ENSO have been consistent within the SCB. However, there has been unusual variability in recent years. From 2014 to 2016, the entire coast of California experienced a prolonged period of unusually warm sea surface temperatures that included a strong El Niño event in 2015 to 2016. Ridgeback Prawn landings increased steadily during this period of anomalously warm water conditions (See section 2.3.2).

2 The Fishery

2.1 Location of the Fishery

The Ridgeback Prawn commercial fishery occurs exclusively in California (Figure 2-1). The fishery operates primarily between depths of 50 and 660 ft (15 and 201 m), with an average depth of 489 ft (149 m). According to commercial trawl log data, 95% of trips fished within this depth range (California Department of Fish and Wildlife (CDFW) Marine Log System).

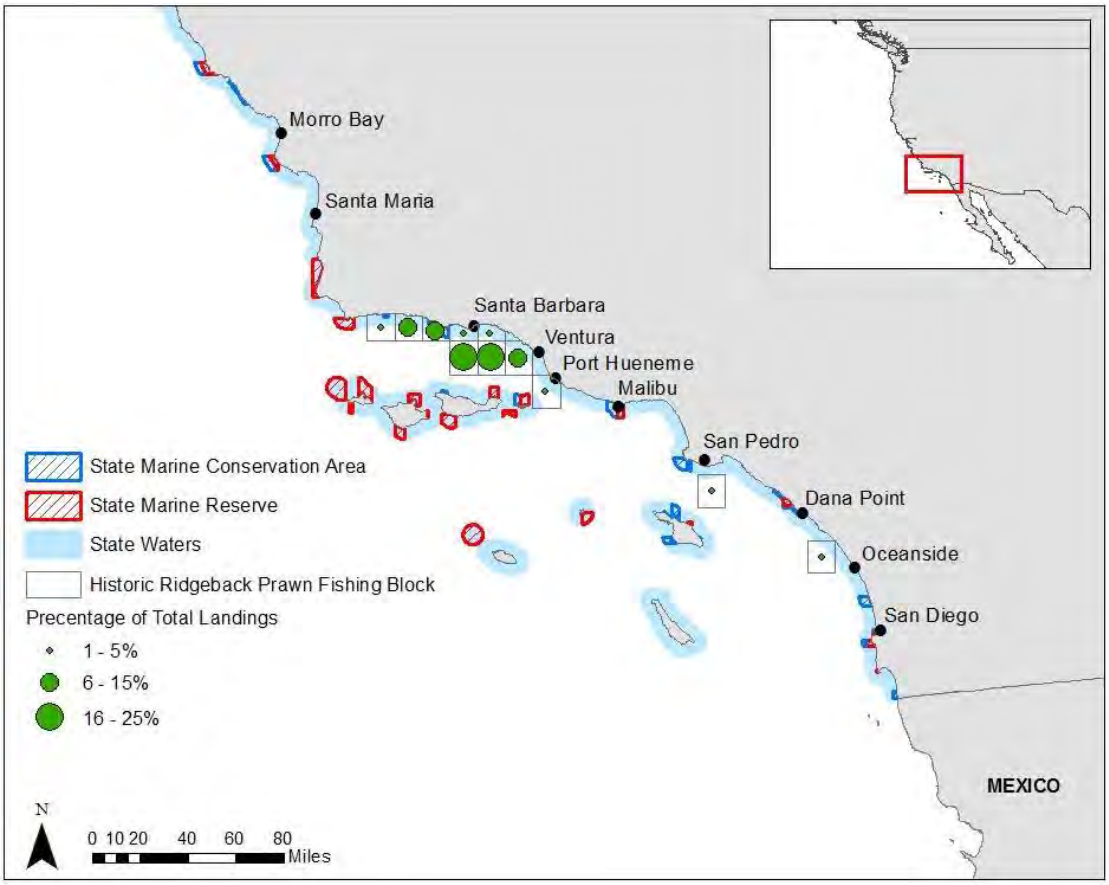

Figure 2-1. Ridgeback Prawn trawl locations by CDFW fishing blocks and the percentage of total landing by fishing block from 1974 to 2017 (CDFW Commercial Fisheries Information System (CFIS) 2018). Each fishing block is 10 by 10 nautical miles (18.52 kilometers (km) by 18.52 km).

The Santa Barbara Channel is considered the center of the fishery and ports within Ventura and Santa Barbara counties receive the majority of the Ridgeback Prawn landings from year to year (See section 2.4). In 1981, Morro Bay became the first port to record landings north of Santa Barbara. These vessels were most likely fishing in the Santa Barbara Channel and landing their catch in Morro Bay (CDFG 2008). By 1984, the fishery expanded south of Santa Barbara into waters adjacent to Los Angeles County and into San Diego County (CDFG 2008).

2.2 Fishing Effort

2.2.1 Number of Vessels and Participants Over Time

The commercial fishery for Ridgeback Prawn is currently open access with no limit on the number of permits issued. The Ridgeback Prawn trawl fishery began in the 1960s and was a minor fishery until 1978 due to market demand. The number of active vessels (vessels that made landings) trawling for Ridgeback Prawn increased between the late 1970s and mid-1980s, and peaked in 1988 at 58 vessels (Figure 2-2). After a drop in 1989, the number of active vessels fluctuated between 27 and 46 vessels until 2003. In 2007, participation declined to a low of ten active vessels. Since 2013, the number has remained relatively stable at around 16 to 18 vessels. More than one permit holder may operate from the same vessel. Figure 2-3 shows the number of trawl permits issued for Ridgeback Prawn, including active and inactive permits, over recent decades.

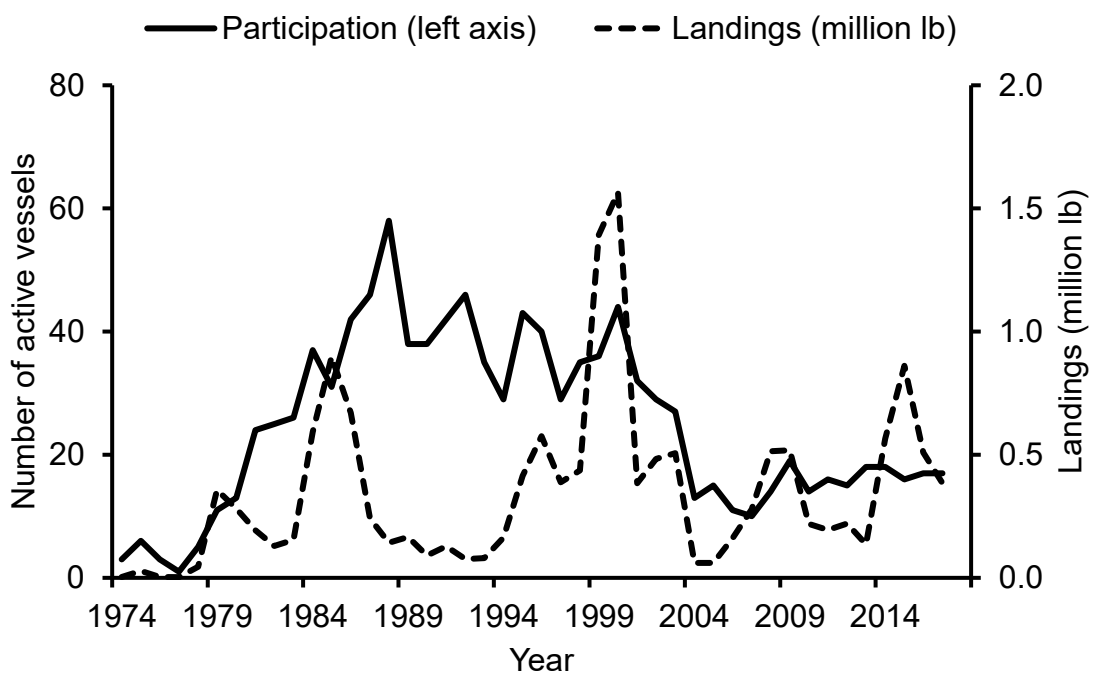

Figure 2-2. Commercial Ridgeback Prawn fishery number of active vessels and landings (million lb) from 1974 to 2017 (CDFW CFIS 2018).

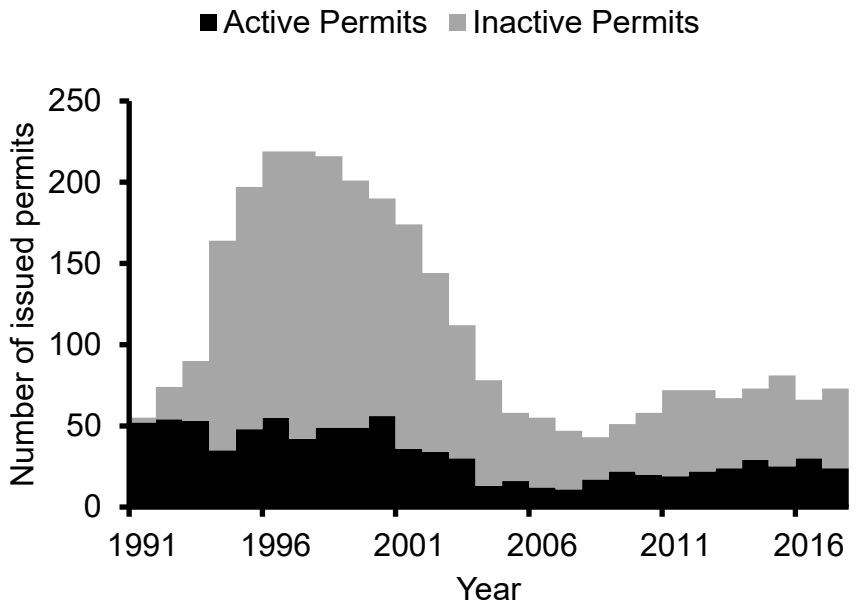

Figure 2-3. Commercial Ridgeback Prawn fishery number of issued permits and usage status from 1991 to 2017 (CDFW CFIS 2018).

Number of vessels in the fishery is a very simple measure of fishing effort (Nance 2004). Other measures of fishing effort include number of tows, fishing trips, and hours or days fished per season. Because the number of vessels fishing may vary from year to year in response to fluctuations in either abundance or price per pound, the number of tows, trips, or hours fished may be a more accurate and standardized way to measure fishing effort. Typically, the metrics used by the Department to determine the intensity of Ridgeback Prawn trawling efforts are tow hours and number of tows.

2.2.2 Type, Amount, and Selectivity of Gear

The average vessel length participating in the fishery between 2013 and 2017 is around 44 ft (13 m) with a range of 28 to 70 ft (8 to 21 m). The primary gear used in the fishery is a single-rig trawl (Figure 2-4a). Typically, mesh sizes for the single-rig trawl range from 1.75 to 2.25 in (4.5 to 5.7 cm) (CDFG 2008). Very few vessels in the fishery use double-rig gear (Figure 2-4b). While catch efficiency of a double-rigged vessel is as much as 60% higher than a single-rigged vessel, double-rigged gear is not preferred in this fishery due to higher operation costs when the harvestable biomass is not available in high concentration (CDFG 2008).

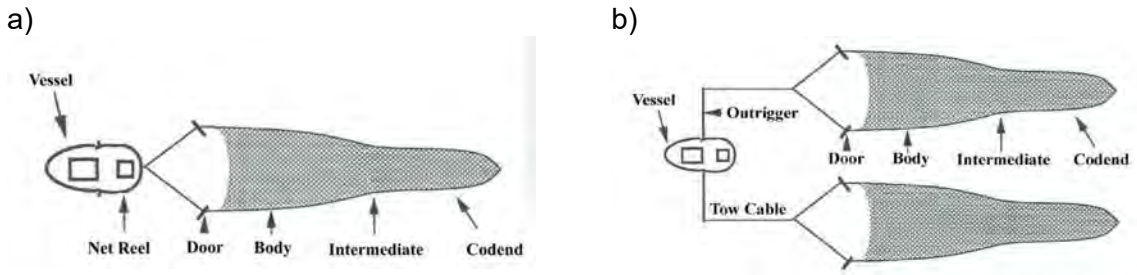

Figure 2-4. Diagrams of a) a single-rigged vessel pulling one otter trawl, and b) a double-rigged vessel pulling two otter trawls, both of which are used in the Ridgeback Prawn commercial fishery (Reproduced from Jones et al. 1996).

Since 2006, a Bycatch Reduction Device (BRD) is required for all trawl nets used in shrimp and prawn fisheries to minimize bycatch pursuant to Fish and Game Code (FGC) Section §8841. Currently, a rigid-grate fish excluder device is the approved type of BRD for the Ridgeback Prawn fishery (Figure 2-5). No other type of BRD has been approved for Ridgeback Prawn trawling at this time. The rigid-grate excluder however, is not the preferred BRD by fishery participants because it becomes damaged when wrapped on the net reel (CDFG 2008). A rigid-grate excluder with a hinge allowing the grate to fold or bend as the net is wrapped in the net reel alleviates this problem and meets the BRD requirement.

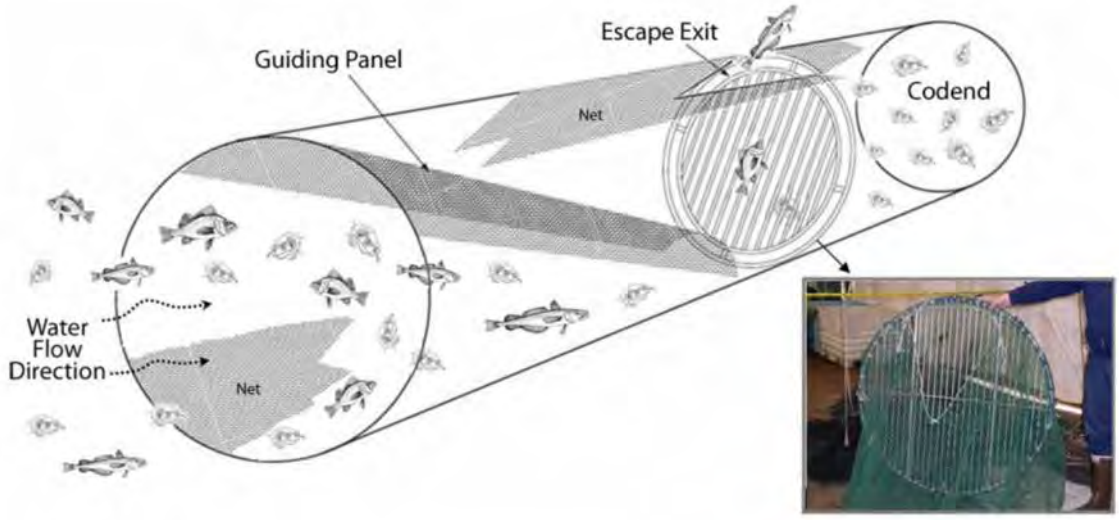

Figure 2-5. Diagram of a rigid-grate excluder approved for use in the Ridgeback Prawn fishery. The diagram depicts shrimp traveling through the BRD, and larger fish being deflected by the BRD and guided through the escape hatch (Photo Credit: Robert Hannah, ODFW).

2.3 Landings in the Recreational and Commercial Sectors

2.3.1 Recreational

This species may be taken for recreational purpose in a shrimp or prawn trap. South of Point Conception, trap openings may not exceed 0.5 in (1.27 centimeters (cm)) in any dimension. For traps fished north of Point Conception, trap openings are limited to five in in any dimension. The recreational limit is 35 per day, and there is no closed season or size limit for Ridgeback Prawn. Effort and catch are believed to be minimal, although recreational fishery surveys have not been conducted for this species.

2.3.2 Commercial

The fishery for Ridgeback Prawn originated in the early 1960s as incidental catch in trawls for groundfish species. It was a minor fishery until 1978, with annual landings below 5,000 lb (2,268.0 kilograms (kg)) from 1974 to 1977 (except for 1975 when landings exceeded 28,000.0 lb (12,700.6 kg)). Landings increased dramatically in 1979 to over 356,000.0 lb (161,478.8 kg) due to increased market demand. Since then, landings have fluctuated with two major peaks (Figure 2-6). Landings peaked at nearly 900,000.0 lb (408,232.8 kg) in 1985 and a reached a record high at about 1.6 million lb (725,747.2 kg) in 2000 with an ex-vessel value of about $473,000 and $1.8 million, respectively. Landings subsequently declined and reached a low of about 60,500.0 lb (27,442.3 kg) in 2004. Notably, only 17% of permits issued in 2004 fished that year, which constituted a 57% drop in the number of active participants from 2003. After a period of alternating highs and lows, Ridgeback Prawn landings reached a recent high of about 860,600.0 lb (390,361.3 kg) in 2015, valued at an all-time high of $2.1 million (ex-vessel value), but have since declined to about 384,000.0 lb (174,179.3 kg) in 2017 with an ex-vessel value of about $923,000.

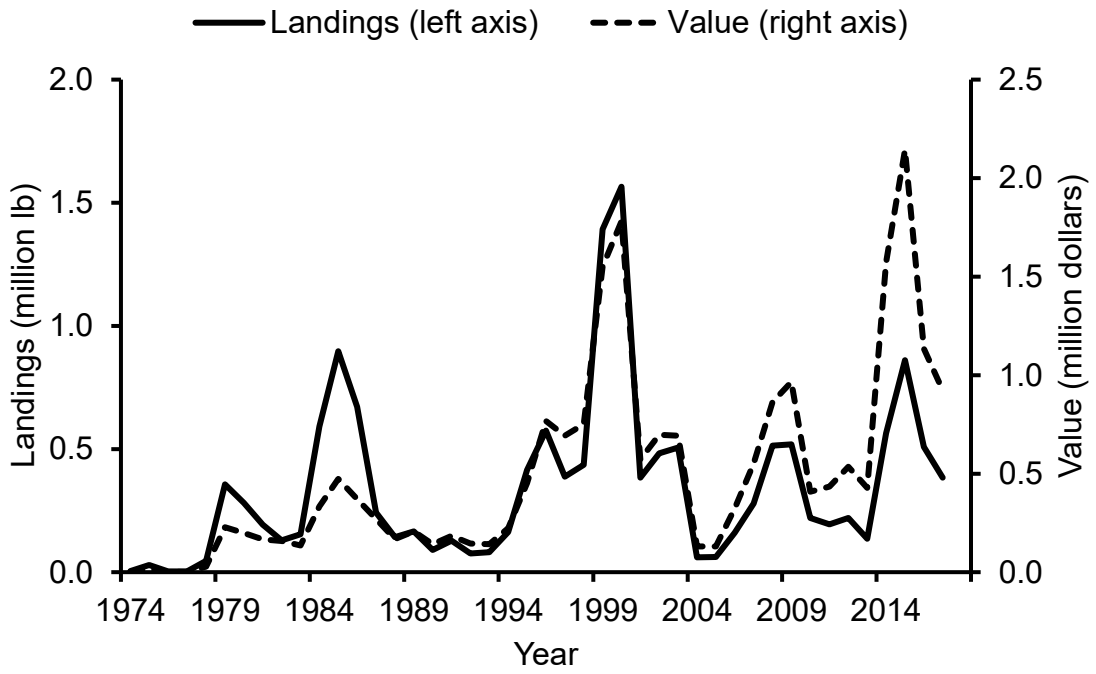

Figure 2-6. Ridgeback Prawn landings (million lb) and value (million dollars) from 1974 to 2017 (CDFW CFIS 2018).

Ridgeback Prawn trawl logs, required since 1986, show that the reported CPUE in pounds per tow hour varies from season to season with the abundance of prawn (Figure 2-7). During the 1984 to 1985 fishing season, CPUE peaked at 251.0 lb (113.9 kg) per hour then steadily declined to 33.0 lb (15 kg) per hour by the 1992 to 1993 season. Since the 1992 to 1993 season, CPUE has fluctuated with peaks in seasons 1994 to 1995 and 1999 to 2000 at 176 and 203.0 lb (80 and 92 kg) per hour, respectively. After reaching a 20 yr record low of 32.0 lb (14.5 kg) per hour during the 2004 to 2005 season, CPUE climbed to 104.0 lb (47.2 kg) per hour by the 2006 to 2007 season which is the most recent data available. Logbook data after the 2006 to 2007 season were entered as staffing allowed with data gaps for the 2007 to 2008 season and for the seasons between 2011 to 2014.

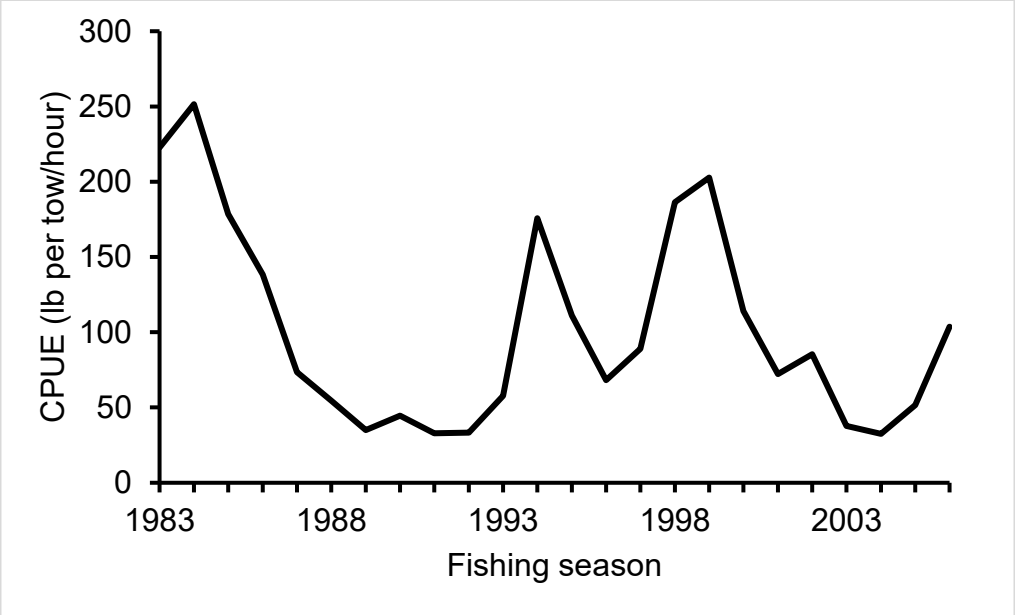

Figure 2-7. Seasonal CPUE for the Ridgeback Prawn fishery from 1983 to 2006 (CDFW Commercial Trawl Logbook 2018). The fishing season, denoted by the start year, runs from October 1 to May 31.

2.4 Social and Economic Factors Related to the Fishery

In the early years of the fishery, Ridgeback Prawn proved difficult to market. When Ridgeback Prawn die, enzymes in the prawn causes breakdown of the flesh that results in a “blackening” discoloration of the head and body of the prawn. This discoloration reduces visual appeal and marketable value of the product. Since the 1980s, new handling techniques were developed, such as keeping the prawn chilled or selling them live (Price et al. 1996). These improved handling techniques enabled the product to expand beyond the local landing ports to markets throughout southern California (CDFG 2008).

The economic importance of Ridgeback Prawn throughout its distribution is shown in Figure 2-8 by the percentage of landings (by weight) by county in California. Historically, the majority of the landings have come from landing ports in Santa Barbara County (56%), followed by Ventura County (35%). The remaining 10% of Ridgeback Prawn landings are from ports in Los Angeles, San Luis Obispo, and San Diego counties at 7%, 2%, and 1%, respectively. Since 2005, there has been a shift in the regional distribution of landing activity. With an exception in 2010, landings from Ventura County has exceeded Santa Barbara County by an average of 52% annually. Prior to 2005, the annual total of Ridgeback Prawn landed in ports in Ventura County was on average 67% less than Santa Barbara County.

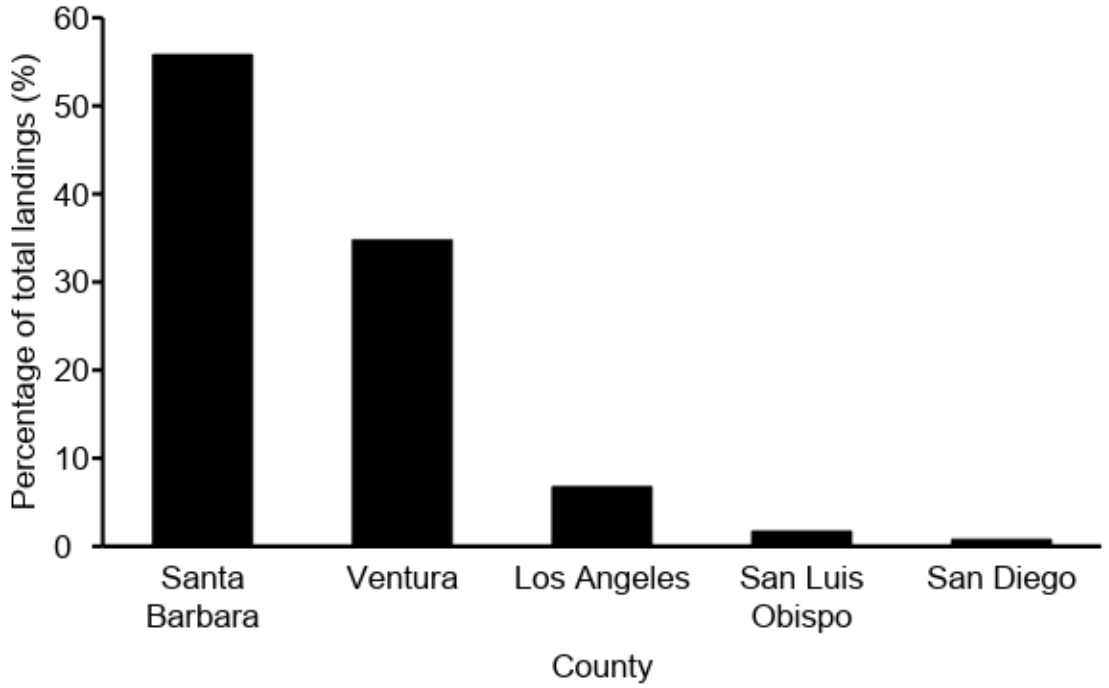

Figure 2-8. Ridgeback Prawn percentage of total landings by county from 1974 to 2017 (CDFW CFIS 2018).

Commercial Ridgeback Prawn catch volumes and economic values are reflected in the price per pound (Table 2-1). This fishery has relatively low volume, but high value when compared to the California fishery for Pacific Ocean Shrimp (*Pandalus jordani)* (CDFG 2008). The ex-vessel price-per-pound of Ridgeback Prawn has increased from an average of $0.59 per lb ($1.30 per kg) in the 1970s to an average of $2.32 per lb ($5.10 per kg) since 2010. In 2017, the ex-vessel price for all Ridgeback Prawn averaged $2.39 per lb ($5.25 per kg). Since the species does not freeze well, Ridgeback Prawn are primarily sold live or as fresh whole prawns. Live prawn accounted for 92% of the landings in 2017 and sold for an average ex-vessel price of $2.66 per lb ($5.85 per kg).

Table 2-1. Landings (lb), ex-vessel value and average price-per-pound for Ridgeback Prawn, 2000 to 2017 (CDFW CFIS 2018)

Year	Pounds	Ex-vessel value (US dollars)	Average price-per-pound (US dollars)
2000	1,565,009	$1,780,712	$1.09
2001	384,092	$572,128	$1.47
2002	482,405	$697,557	$1.39
2003	505,746	$692,006	$1.39
2004	60,548	$131,366	$1.96
2005	61,241	$130,849	$2.04
2006	160,870	$324,347	$2.02
2007	278,534	$550,575	$2.07

2008	514,291	$862,622	$1.90
2009	518,359	$965,300	$2.05
2010	219,609	$408,258	$2.02
2011	194,087	$433,989	$2.26
2012	220,353	$535,437	$2.20
2013	135,983	$427,474	$2.62
2014	564,544	$1,573,423	$2.55
2015	860,563	$2,143,520	$2.27
2016	508,936	$1,134,723	$2.26
2017	383,814	$923,435	$2.39

3 Management

3.1 Past and Current Management Measures

The commercial trawl fishery for Ridgeback Prawn is a state managed fishery. The Commission first established regulations for the fishery in 1965 to allow the take of prawns with trawl nets and by 1967, a directed fishery for Ridgeback Prawn operated under a prawn trawl permit regulated with area restrictions, gear specifications, and incidental catch limits for non-targeted species (CDFG 2001; CDFG 2008). Following a 1981 decline in landings, the Commission adopted a seasonal closure (June 1 through September 30) in 1983 to protect Ridgeback Prawn during their peak spawning months. That same year, a depth restriction was also implemented to prevent trawling in any waters less than 150 ft (CDFG 2008).

Since 1983, three changes to bottom trawling regulations have affected the Ridgeback Prawn fishery. In 2000, area and depth closures that were implemented to protect overfished groundfish stocks further restricted trawling effort for Ridgeback Prawn; however, these regulations were subsequently repealed in 2008 based on changes in management authorities. Federal groundfish regulations under the purview of the National Oceanic and Atmospheric Administration (NOAA) Fisheries and Pacific Fishery Management Council (PFMC) now prescribe closed areas, depth constraints, and bycatch limits for Ridgeback Prawn trawling activities in waters 3 to 200 nautical miles from shore. In 2004, the State Legislature approved Senate Bill 1459, adding FGC §8841 to statute, which granted the Commission management authority over all state-managed commercial bottom trawl fisheries not managed under a federal or state fishery management plan and prohibited bottom trawling in state waters beginning January 1, 2008, except in those waters specifically authorized in §120, Title 14, CCR and FGC §8842. In 2006, the use of a BRD became mandatory to fish commercially for prawn and shrimp. The configuration of the BRD and effects on bycatch levels are discussed in sections 2.2.2 and 3.1.3, respectively.

3.1.1 Overview and Rationale for the Current Management Framework

The Ridgeback Prawn fishery is currently managed under a suite of regulations to promote sustainability. These include:

1. Requirement of a fishery-specific commercial permit for Ridgeback Prawn (§120, 120.3, and 705, Title 14, CCR) for management of the resource.
2. Authorized fishing areas (§120, Title 14, CCR and FGC §8842) to protect sensitive seafloor habitats and minimize conflict with other users.
3. Logbook requirement (§§120 and 190, Title 14, CCR) to monitor catch location and effort information.
4. Seasonal closure from June 1 through September 30 (§120.3, Title 14, CCR) to protect spawning female and juvenile Ridgeback Prawns.
5. Possession limits for incidental catch (§120, Title 14, CCR and FGC §8842) to reduce bycatch impacts.

6. Minimum mesh size of 1.5-in for single-walled cod ends or 3-in for double-walled cod ends (§120.3, Title 14, CCR) to allow for escapement of small 0 and 1 year old prawn.
7. BRD requirement (FGC §8841) to minimize bycatch of rockfish and other groundfish.
8. Requirement to cooperate with the federal groundfish observer program (FGC §8841) to collect information on discarded catch and bycatch of groundfish species.

3.1.1.1 Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild

Currently, there is no direct reference point for determining whether the stock is "overfished" nor are there procedures in place specific to the Ridgeback Prawn fishery to halt overfishing when it is found to be occurring. However, yields per unit area (e.g., fishing block) and CPUE represent two indicators of exploitation. The yield of Ridgeback Prawn per unit area may reflect changes in the spatial distribution of fishing that can be indicative of trends in Ridgeback Prawn abundance. Moreover, long term increases or decreases in CPUE may provide an indication of whether or not populations of Ridgeback Prawn are being overfished. A decline in both yield per unit area and CPUE can reflect a state of over-exploitation, which may warrant additional investigation by the Department or management changes for the Ridgeback Prawn fishery.

3.1.1.2 Past and Current Stakeholder Involvement

Engaging the public in management, research, and decision-making is a central tenet of the MLMA. Often, stakeholder involvement occurs during regulation changes affecting the Ridgeback Prawn fleet. Stakeholders are consulted on the development or amendment of regulations, and public comments and input are taken into consideration at all stages of the Commission's regulatory process. Stakeholders may also recommend that a regulation be added, amended, or repealed by submitting a petition to the Commission. Stakeholders also are encouraged to participate in the Commission's Marine Resources Committee (MRC) meetings. The goal of the MRC is to allow greater time to investigate issues before they are brought up at full Commission meetings.

Currently, there are two stakeholder-identified issues for further consideration by the Commission concerning the Ridgeback Prawn resource. First, the Commission received a petition in August 2014 to reinstate an incidental take allowance (50.0 lb (26.7 kg) or 15% by weight) for Ridgeback Prawn in State trawl fisheries that was removed from §120.3, Title 14, CCR in 2008. This petition has been put on hold pending further review by Department and Commission staff (See section 5.2.2). Second, a concern was raised by some fishery participants about overfishing and the potential for overcapitalization in the Ridgeback Prawn fishery at ~~a~~an MRC meeting in July 2017, which may warrant further investigation by the Department (See section 5.2.2).

3.1.2 Target Species

3.1.2.1 Limitations on Fishing for Target Species

3.1.2.1.1 Catch

There is no quota currently in place for Ridgeback Prawn.

3.1.2.1.2 Effort

The fishery is currently open access with no cap on the number of permits that can be issued. Other than the closed season, there is no limit on tow hours.

3.1.2.1.3 Gear

Ridgeback Prawn may only be taken by otter trawl nets for commercial purposes. The minimum mesh size for trawl nets with single-walled bag or cod end is 1.5 in (3.81 cm) in length or 3.0 in (7.62 cm) in length for trawl nets with double-walled bag or cod end. The primary gear used in the fishery is a single-rig shrimp trawl with a single-walled net with mesh sizes ranging from 1.75 to 2.25 in (4.5 to 5.7 cm) (CDFG 2008). The net mesh may be no less than 1.375 in (3.49 cm) measured inside the knot. In addition, the net must be equipped with an approved BRD.

3.1.2.1.4 Time

The fishery is closed from June 1 to September 30 to protect Ridgeback Prawns during peak spawning months.

3.1.2.1.5 Sex

There is no restriction on the sex of Ridgeback Prawn that can be retained.

3.1.2.1.6 Size

There are no restrictions on the size of Ridgeback Prawn that can be retained.

3.1.2.1.7 Area

Trawling for Ridgeback Prawn is allowed only in waters that extend beyond three nautical miles off the coast of California.

3.1.2.1.8 Marine Protected Areas

Pursuant to the mandates of the Marine Life Protection Act (FGC §2850), the Department redesigned and expanded a network of regional MPAs in state waters from 2004 to 2012. The resulting network increased total MPA coverage from 2.7% to 16.1% of state waters. Along with the MPAs created in 2002 for waters surrounding the Santa Barbara Channel Islands, California now has a statewide scientifically-based

ecologically connected network of 124 MPAs. The MPAs contain a wide variety of habitats and depth ranges.

Marine Protected Areas (MPAs) created under the Marine Life Protection Act were not designed for fisheries management purposes however, they present related opportunities and considerations including the following:

1. They serve as long-term spatial closures to fishing if the species of interest is within their boundaries and is prohibited from harvest.
2. They can function as comparisons to fished areas for relative abundance and length or age/frequency of the targeted species.
3. They can serve as ecosystem indicators for species associated with the target species, either as prey, predator, or competitor.
4. To varying degrees, they displaced fishing effort when they were implemented.

Trawling for Ridgeback Prawn occurs outside of state waters (Figure 2-1); therefore, the MPAs in state waters are not a significant management consideration.

3.1.2.2 Description of and Rationale for Any Restricted Access Approach

The fishery is currently open access. If it should become necessary to limit the number of persons or vessels that may be engaged in the take of Ridgeback Prawn or limit the catch allocation for each fishery participant, a control date was established in regulations (§120.4, Title 14, CCR) for a restricted access Ridgeback Prawn trawl fishery. Specifically, §120.4, Title 14, CCR states: “A control date of January 1, 1999, is established for the purpose of developing a restricted access Spot, Ridgeback, and Golden Prawn trawl fishery. Only those vessels which have made at least one Spot, Ridgeback, or Golden Prawn landing with trawl gear before this date may be considered for inclusion in the restricted access trawl fishery.” The purpose of the control date is to inform all current and potential fishery participants that a restricted access program may be considered at a future date for this fishery, and that participation after the control date may not qualify for inclusion in the program. The restricted access approach is intended to balance the fishing capacity of the commercial fleet with the size of the resource in a way that results in an economically viable and sustainable fishery. The Commission has yet to institute a restricted access program for the Ridgeback Prawn trawl fishery and has the authority to revisit the control date for determining qualifications for a restricted access program.

3.1.3 Bycatch

3.1.3.1 Amount and Type of Bycatch (Including Discards)

The Fish and Game Code (FGC §90.5) defines bycatch as “fish or other marine life that are taken in a fishery but which are not the target of the fishery.” Bycatch includes “discards” (FGC §90.5), defined as “fish that are taken in a fishery but are not retained because they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained” (FGC §91). The term “Bycatch” may include

fish that, while not the target species, and are desirable and are thus retained as incidental catch, and does not always indicate a negative impact.

Until recently, data on the amount and type of bycatch, including discards, in the Ridgeback Prawn trawl fishery have been unknown due to limited observer coverage for at-sea monitoring of the Ridgeback Prawn fleet. In 2017, the Ridgeback Prawn trawl fishery was included in the West Coast Groundfish Observer Program (WCGOP) for the first time since 2005. The observed portion of total Ridgeback Prawn landings was 11% in 2017 (Somers et al. 2018b). The 2017 WCGOP estimates of landings and discard of observed species in the Ridgeback Prawn fishery are summarized in Appendix A.

Federal fishery observers have noted that bycatch includes various species of fish and invertebrates. For fish species, California Lizardfish (*Synodus lucioceps*) had the highest bycatch catch level, followed by Pacific Sanddab (*Citharichthys sordidus*), White Croaker (*Genyonemus lineatus*), English Sole (*Parophrys vetulus*), and Pacific Hake (also known as Pacific Whiting, *Merluccius productus*) (Appendix A). For invertebrate species, unidentified Squat Lobster had the largest level of bycatch, followed by unidentified urchin, unidentified sea star, Red Rock Crab (*Cancer productus*), and unidentified nudibranch (Appendix A). Similarly, the five most consistently captured species reported on commercial Ridgeback Prawn landing receipts from 2013 to 2017 were California Lizardfish (*Synodus lucioceps*), English Sole (*Parophrys vetulus*), White Croaker (*Genyonemus lineatus*), unspecified Rock Crab, and unspecified Sole (See section 1.4.1).

Table 3-1 provides the estimated total catch of non-target species and percent discarded in 2017 for the Ridgeback Prawn fishery as well as bycatch ratios (i.e., non-target species to target species) by species group by weight. The catch could be divided into four major components: Ridgeback Prawn (39.7 %), other invertebrates (7.9%), finfish (48.9%), and other (including egg cases and mixed unsampled catch, 3.6%). Non-target species comprised about 60% of the estimated total catch, of which only about 14% was retained and landed in 2017 (NWFSC 2018). The overall ratio of bycatch to Ridgeback Prawn is 1.52. The bycatch ratios produced for non-target invertebrates and finfish species are between 0.01 to 1 and 1.23 to 1 (Table 3-1).

Table 3-1. Estimated total catch of non-target species (metric ton), percent discarded, and bycatch ratios (non-target species: target species) by weight in the Ridgeback Prawn fishery, 2017 (NWFSC 2018). Zeros represent values rounded to zero.

	Total catch (metric ton)	**Percent of total catch**	**Percent discarded**	**Bycatch ratio**
TARGET SPECIES				
Ridgeback Prawn	185.61	39.66	13.43	--
NON-TARGET SPECIES				
Other Invertebrates	36.80	7.86	85.68	0.20:1
Finfish	228.76	48.88	92.89	1.23:1
Federally Managed Groundfish[a]	105.55	22.55	96.71	0.57:1
Flatfish	72.65	15.52	95.71	0.39:1
Rockfish	12.71	2.72	97.97	0.07:1
Roundfish	18.29	3.91	99.48	0.10:1
Sharks	0.42	0.09	100	0:1
Skates	1.48	0.32	99.39	0.01:1
All other fish (non-Federally managed groundfish)	123.21	26.33	89.63	0.66:1
Other[b]	16.84	3.60	0.01	0.09:1
Total	468.02	100	57.47	1.52

a. Federally Managed Groundfish constitute species and species group managed under the Federal Pacific Coast Groundfish Fishery Management Plan, including 60-plus rockfish (all genera and species from the family Scorpaenidae (*Sebastes, Scorpaena, Sebastolobus, and Scorpaenodes* occurring in waters off Washington, Oregon, and California), 12 flatfish species, 6 roundfish species, and some sharks and skates.

b. Other comprise of mixed unsampled catch and egg cases.

Over 90 species of marine finfish are managed or monitored under a Federal West Coast Groundfish Fishery Management Plan that is administered by the PFMC. Federally managed groundfish species comprised 22.6% of the total estimated catch, which is about 46% of the estimated finfish catch in the Ridgeback Prawn fishery in 2017. Flatfish had the highest bycatch ratio of 0.39 to 1 compared to other federally managed groundfish species with bycatch ratios of less than or equal to 0.10 to 1, but the lowest level of discard (Table 3-1).

3.1.3.2 Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch

Discard Mortality

Due to the average depth at which Ridgeback Prawn trawling occurs, it is assumed that the mortality of captured groundfish species with swim bladders, particularly rockfish, is 100% due to barotrauma. Discard mortality of other species is unknown.

Impact on Fisheries that Target Bycatch Species

While species with little to no commercial value are discarded, incidental take allowances in §120, Title 14, CCR and FGC §8842 permit Ridgeback Prawn vessel operators to retain and sell commercially valuable species. For marine invertebrates such as Spot Prawn (*Pandalus platyceros*) and Sea Cucumber, trawl loads of ridgeback prawn "shall not contain more than 50 lb without restriction or 15%, by weight, of Spot Prawns" (§120(e)(3), Title 14, CCR), and "any amount of Sea Cucumbers taken incidentally while prawn or shrimp trawling may be possessed if the owner or operator of the vessel possesses a permit to take Sea Cucumbers pursuant to §8405 of the FGC" (§120(e)(2), Title 14, CCR). Between 2010 and 2017, around 21% of Ridgeback Prawn permit holders also possess a Sea Cucumber Trawl Permit. However, less than 1% of the species retained and landed with Ridgeback Prawn were comprised of Sea Cucumber, except from 2011 to 2013, where on average, 4% of the associated catch on Ridgeback Prawn landing receipts were Sea Cucumber.

For finfish, "it is unlawful to possess in excess of 1,000 lb [(453.6 kg)] of incidentally taken fish per trip" when fishing for Ridgeback Prawn (FGC §8842(c)). Also, limits on incidental take of west coast groundfish species specified in federal regulations of Title 50 Code of Federal Regulations (CFR) Part 660 apply to state-managed trawl fisheries, including the Ridgeback Prawn fishery, pursuant to § 189, Title 14, CCR (§120(e)(1), Title 14, CCR). Currently, vessels participating in the Ridgeback Prawn fishery may land no more than 300 lb (136.1 kg) of groundfish per trip in accordance with 50 CFR Part 660, Subpart F. In addition, species specific limits apply and the amount of groundfish landed may not exceed the amount of Ridgeback Prawn landed, except for Spiny Dogfish. Spiny Dogfish are limited by the 300 lb/trip overall groundfish limit. The daily trip limits for Sablefish coastwide and Thornyheads south of Point Conception and the overall groundfish "per trip" limit may not be multiplied by the number of days of the trip. These measures are in place to minimize impacts to fisheries that target the bycatch species.

Bycatch of Overfished, Threatened, or Endangered Species

Certain bycatch species, such as those that are depleted, overfished, threatened, or endangered, require special consideration to ensure that the recovery and rebuilding efforts for those species are not undermined. Each year, the National Marine Fisheries Service (NMFS), in consultation with the PFMC, sets harvest limits for overfished species based on the respective stock assessments and rebuilding plans. Table 3-2 shows the bycatch levels for the Ridgeback Prawn fishery of overfished species that are rebuilding or have recently been rebuilt as well as each species' Acceptable Biological Catch (ABC) and Annual Catch Limit (ACL) specified in federal regulations (50 CFR Part 660, Subpart C) for 2017. As the estimated catch and retention levels from the Ridgeback Prawn fishery are well below the harvest specifications (i.e. ABC and ACL), the fishery is unlikely to impede the ability of overfished stocks to rebuild.

Table 3-2. Estimated bycatch (metric ton) of overfished species in the Ridgeback Prawn fishery and their ABC and ACL as specified in federal regulations (50 CFR Part 660, Subpart C) for 2017. Bycatch data adapted from NWFSC 2018.

Common name	Species	Status	Total bycatch (metric ton)	Percent of bycatch retained	Acceptable biological catch (metric ton)	Annual catch limit (metric ton)
Bocaccio Rockfish	*Sebastes paucispinis*	Rebuilt 2017	0.15	0.91	1,924	741
Canary Rockfish	*Sebastes pinniger*	Rebuilt 2015	0.01	0.00	1,526	1,526
Cowcod Rockfish	*Sebastes levis*	Rebuilding as of 2016	0.07	0.00	64	10
Darkblotched Rockfish	*Sebastes crameri*	Rebuilt 2017	0.01	0.00	653	653
Lingcod	*Ophiodon elongatus*	Rebuilt 2005	0.40	13.58	1,144	1,144
Petrale Sole	*Eopsetta jordani*	Rebuilt 2015	1.26	33.81	3,013	3,013

Bycatch of Sea Birds and Marine Mammals

The California shrimp trawl fishery, which includes Ridgeback Prawn, is classified as a Category III fishery (i.e., fisheries with a remote likelihood of marine mammal interaction or no known serious injuries or mortalities with marine mammals) by the NMFS on its List of Fisheries (LOF). The LOF reflects information on interactions between commercial fisheries and marine mammals. There were no recent documented interactions between marine mammals and the Ridgeback Prawn fishery (NOAA Fisheries 2018). Additionally, low rates of interactions resulting in mortalities rates with sea birds have been observed in bottom trawl fisheries; most interactions were birds feeding on catch and some boarding vessels (PFMC 2016).

Measures to Reduce Bycatch

As noted in sections 2.2.2 and 3.1.1, the use of a BRD has been required for the fishery since 2006 to reduce the number and volume of bycatch species. However, the degree of regulatory compliance with respect to the use of BRDs by Ridgeback Prawn trawlers is currently unknown. The use of BRDs in Pacific Ocean Shrimp (*Pandalus jordani*) trawl fishery have resulted in a large reduction of finfish bycatch of between 66 and 85% from historical (pre-BRD) levels (Hannah and Jones 2007). Hannah and Jones (2007) found that mandatory BRD use has also changed the species composition of the bycatch, shifting from mostly large-bodied fishes, some of which are commercially valuable, to mostly juveniles and smaller-bodied species of little to no commercial value. As such, it is important to verify and enforce the use of BRDs in the Ridgeback Prawn fishery to ensure the fleet is implementing sustainable fishing practices (See section 5.2.2). Ridgeback Prawn vessels are also subject to federal restrictions on daily and trip limits for incidental catches of federally managed groundfish as well as area closures in

the form of Rockfish Conservation Areas to protect rockfish and other overfished species from potential for interaction with trawl gear.

3.1.4 Habitat

3.1.4.1 Description of Threats

The impacts from bottom trawling on benthic, or seafloor, habitats and sensitive species are complex. It is widely believed that bottom trawling causes a loss or alteration of important habitats by scouring, crushing, burying, or exposing marine flora and fauna and greatly reducing the complexity and diversity of the seafloor. However, a recent study by Lindholm et al. (2015b) found trawling impacts are context dependent, depending on the type of gear used, the types of habitats trawled, and how often trawling occurs. Furthermore, recovery after disturbance varies with habitat characteristics, frequency and intensity of disturbance, and species composition (NRC 2002). Relatively stable habitats, such as hard bottom and dense mud, experience the greatest changes and have the slowest recovery rates compared to less consolidated coarse sediments in areas of high natural disturbance (NRC 2002). Soft bottom habitats, such as those where Ridgeback Prawn are fished, are relatively resilient to trawl gear (NRC 2002). The NMFS indicates that impacts by bottom trawl gear in soft bottom habitat areas where Ridgeback Prawn trawling occurs (i.e., soft bottom habitat) have the lowest sensitivity classification for impacts to seafloor habitat, and the recovery time after perturbation is estimated to be less than 1 yr (NMFS 2005). In addition, Lindholm and others (2015b) suggest negligible effects to certain soft bottom habitats (primarily mud and sand) when small footrope trawl gear with a footrope diameter of less than or equal to 8 in (20 cm) are used, as required by federal bottom trawling regulations and consequently used in the Ridgeback Prawn fishery (J. Vestre, personal communication, October 17, 2018).

3.1.4.2 Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing

The MLMA emphasizes the importance of habitat protection as a means of preserving healthy and productive marine resources. To achieve the habitat conservation goal of the MLMA, Ridgeback Prawn management in California should contain “measures that, to the extent practicable, minimize adverse effects on habitat caused by fishing” (CDFW 2008). Current management measures described in section 3.1.1, such as gear limitations, seasonal closures, and area restrictions are intended to reduce potential impacts on habitat and other ecosystem effects of Ridgeback Prawn trawling activities. For example, gear limitations as discussed in section 3.1.4.1 generally mitigate the effects of fishing gear contact on seafloor habitats. Moreover, seasonal closures which protect spawning female and juvenile Ridgeback Prawns also provide temporary protection from fishing gear disturbances and allow for potential recovery of the habitat. Fishing area restrictions provide more permanent protection for sensitive habitats, in which some or all biological resources are protected from removal or disturbance.

3.2 Requirements for Person or Vessel Permits and Reasonable Fees

Requirements and fees for persons or vessels fishing for Ridgeback Prawn are described in the FGC and Title 14 of the CCR. Fishermen are required to have the appropriate licenses to fish either commercially or recreationally in California waters. Each license is categorized based on the fishermen's residency status (i.e., a resident is any person who has resided continuously in the State of California for six months or more immediately prior to the date of their application for a license or permit, any person on active military duty with the Armed Forces of the United States or auxiliary branch thereof, or any person enrolled in the Job Corps). Table 3-3 provides the description of the license types, boat registration types, and permit required to fish commercially for Ridgeback Prawn and the associated fees (all fees include a nonrefundable 3% application fee, not to exceed $7.50 per item (§700.4, Title 14, CCR)). Table 3-4 provides the description of the license types and validation required to fish recreationally for Ridgeback Prawn and the associated fees (fees include 5% license agent handling fee and 3% nonrefundable application fee).

Table 3-3. Commercial fishing license fees for Ridgeback Prawn valid from April 1, 2019 to March 31, 2020. (Accessed June 17, 2019. https://www.wildlife.ca.gov/Licensing/Commercial/Descriptions).

License	Fee	Description
Resident Commercial Fishing License	$145.75	Required for any resident 16 yr of age or older who uses or operates or assists in using or operating any boat, aircraft, net, trap, line, or other appliance to take fish for commercial purposes, or who contributes materially to the activities on board a commercial fishing vessel.
Non-Resident Commercial Fishing License	$431.00	Required for any nonresident 16 yr of age or older who uses or operates or assists in using or operating any boat, aircraft, net, trap, line, or other appliance to take fish for commercial purposes, or who contributes materially to the activities on board a commercial fishing vessel.
Commercial Boat Registration (Resident)	$379.00	Required for any resident owner or operator for any vessel operated in public waters in connection with fishing operations for profit in this State; or which, for profit, permits persons to sport fish.
Commercial Boat Registration (Non-resident)	$1,122.00	Required for any nonresident owner or operator for any vessel operated in public waters in connection with fishing operations for profit in this State; or which, for profit, permits persons to sport fish.
Golden Prawn and Ridgeback Prawn Permit	$45.84	Required for the operator of a vessel to use or possess trawl nets to take golden or ridgeback prawns in ocean waters.

Table 3-4. Annual recreational fishing license fees for Ridgeback Prawn from January 1 to December 31, 2019. (Accessed June 17, 2019. https://www.wildlife.ca.gov/Licensing/Fishing).

License	Fee	Description
Resident Sport Fishing	$49.94	Required for any resident 16 yr of age or older to fish.
Non-resident Sport Fishing	$134.74	Required for any non-resident 16 yr of age or older to fish.
Ocean Enhancement Validation	$5.66	Required to fish in ocean waters south of Point Arguello (Santa Barbara County). An Ocean Enhancement Validation is not required when fishing under the authority of a One or Two-Day Sport Fishing License.

4 Monitoring and Essential Fishery Information

4.1 Description of Relevant Essential Fishery Information

The biology of Ridgeback Prawn is not well documented. Little biological information exists for this species, making determination of sustainable harvest levels difficult. Currently, no biological or environmental indicators are tracked for use in management of this fishery in California. Instead, fishery-dependent indicators are used to evaluate the sustainability and environmental impacts of the Ridgeback Prawn fishery (See section 4.2.1) and determine whether additional management actions are necessary.

4.2 Past and Ongoing Monitoring of the Fishery

4.2.1 Fishery-dependent Data Collection

The Department's primary source of information on the fishery comes from monitoring commercial effort and catch data from Ridgeback Prawn trawl logs and landing receipts. All commercial trawl operators targeting Ridgeback Prawn are required to record the date, start and end location, time, depth, and duration of trawl tows, total catch by species market category, gear used, and other pertinent fishing information. Fishery managers and enforcement officers use state-issued landing receipts, referred to as fish tickets, to monitor fishery landings. Data collected by fish tickets include:

- fishermen and vessel information
- date the fish was landed
- port of landing
- commercial fishing block where the fish were harvested
- weight (in pounds) landed by market category
- price paid to the fisherman by market category
- condition of the fish when sold
- type of gear used to harvest the fish

Fishery-dependent indicators such as CPUE (e.g., catch per tow hour) is considered a reasonable proxy of overall Ridgeback Prawn abundance, and the spatial extent of fishing activities provides information about the patterns of exploitation.

The fishery has also been subject to observation under a federal at-sea program that collects fisheries data for the management of groundfish. The WCGOP monitors effort and landings, including the species makeup of both retained and discarded species, allowing for close monitoring of bycatch levels to ensure that they remain within acceptable levels, especially with regard to sensitive species such as rebuilding rockfish populations. The WCGOP had provided observer coverage for this fishery from 2001 to 2005; however, observer coverage was redirected to other higher priority fisheries in subsequent years (NWFSC 2017). In 2017, a pilot study was initiated to estimate incidental groundfish catch in the Ridgeback Prawn fishery. As noted in section 3.1.3.1, WGCOP coverage of the Ridgeback Prawn fleet was 11% in 2017 (Somers et al. 2018b).

4.2.2 Fishery-independent Data Collection

A Department program to collect fishery-independent data does not exist for the Ridgeback Prawn fishery at this time. However, some potentially useful sources of additional information on Ridgeback Prawn is provided in Table 4-1. These sources could help fill information gaps in the Department's understanding of Ridgeback Prawn which would be helpful for designing future studies.

Table 4-1. Potential sources of additional information on Ridgeback Prawn.

Data source	**Organization**	**Program**	**Summary of research/monitoring activity**
Abundance and distribution data associated with environmental quality monitoring in the Southern California Bight (SBC)	Southern California Coastal Water Research Project (SCCWRP)	SCB Regional Monitoring Program	Bottom trawl surveys were first conducted by SCCWRP in 1994 and reprised approximately every 5 years to provide a comprehensive regional characterization of the trawl-caught finfish and megabenthic invertebrate communities in the SCB.
Discard and bycatch data associated with federal groundfish monitoring	Pacific States Marine Fisheries Commission (PSMFC)/ National Marine Fisheries Service (NMFS)	West Coast Groundfish Observer Program (WCGOP)	The WCGOP observed the California prawn fishery from 2002 to 2005, covering vessels targeting Coonstripe, Ridgeback, and Spotted Prawn, but this data has not been used in discard estimations. In 2017, the WCGOP observed the Ridgeback Prawn portion of the prawn fishery as a pilot study, and fleet-wide discard estimates were derived from at-sea observations and landing receipt data (Somer et al. 2018a).

There are likely other sources of information on Ridgeback Prawn that were not discovered or included in Table 4-1. The Department would welcome information from local agencies, federal agencies, and academic institutions to identify and track general trends relevant to Ridgeback Prawn management.

5 Future Management Needs and Directions

5.1 Identification of Information Gaps

According to the MLMA, management of marine resources is to be based upon the best available scientific information and other relevant information. Presently, there is very little information available on the biology, ecology, and population status of Ridgeback Prawn to estimate appropriate reference points for management of the fishery in California. Fishery-dependent data, such as landings, alone do not provide reliable indicators of resource condition and status because many factors influence fishing effort and subsequent landings (Culver et al. 2010). Acquiring Essential Fishery Information (EFI) (e.g., biology of fish, population status and trends, fishing effort, catch levels, and impacts of fishing) that is currently not available or is incomplete for the Ridgeback Prawn fishery is important to determine if the current levels of fishing effort and harvest are sustainable and whether the stocks are robust enough to support the fishery over the long term. Information needs for the fishery, along with their priority for management is summarized in Table 5-1.

Table 5-1. Informational needs for Ridgeback Prawn and their priority for management.

Type of information	Priority for management	How essential fishery information would support future management
Multi-year Ridgeback Prawn trawl bycatch (catch retained and discarded)	High	Provides information for management of bycatch, including the proportion and composition of species retained and discarded, which could be used to improve fishing practices (i.e., use of or modification of bycatch reduction devices to reduce discards) and development of incidental catch quotas. Adequate evaluation of bycatch will require multi-year data sets.
BRD research and development	High	Research on the differences and efficiency of a variety of BRD types and configurations will better inform management measures to reduce bycatch and promote compliance with the mandatory use of these devices in the Ridgeback Prawn fishery.
CPUE	High	Provides information on long-term increases or decreases in the catch rate. If catch decreases but effort stays the same, it suggests a change in the productivity of the stock. The decline in catch rate with increasing effort can also indicate overcapitalization in the fishery. Commercial logbooks have been used by the Department to provide estimates of CPUE. However, effective monitoring of CPUE will require more complete time series data of logbook records.
Ecological interactions	Medium to High	Provides information on ecosystem structure and dynamics to track changes in interactions over time between Ridgeback Prawn and their environment, habitat, and other organisms. Changes in spatial distribution with time can provide information on environmental drivers of abundance.
Age, size, and sex composition of catch	Medium	New, improved information needed to understand recruitment, growth, survival, and selectivity of fishing gear. Specifically: • The age composition of the catch was believed to be primarily 2 and 3 year old (Sunada 1984; Anderson et al. 1985b), it may be important to determine if that is still the case. • Monitoring the number of 1 year old Ridgeback Prawns can provide the Department with an index of recruitment and indicate when recruitment may be especially low or especially high in the coming year. This could help identify environmental factors that contribute to recruitment success or failure. These environmental indicators may then be used for management. • Additional sex-specific information on the size/age at maturity and sex ratio of catch to determine whether females, which grow faster than males, are more vulnerable to the fishing gear.
Effects of fishing on habitats	Medium	Impacts abundance and diversity of fish and invertebrate species. Builds upon current understanding of habitat sensitivity and vulnerability in terms of their resilience to disturbances from fishing activities.
Abundance	Medium	Analyze the SCCWRP trawl surveys described in section 1.2.1 as fishery-independent index of abundance.

5.2 Research and Monitoring

5.2.1 Potential Strategies to Fill Information Gaps

Biological Research

Despite its commercial value, little research on the biology and ecology of Ridgeback Prawn has been conducted since the 1980s. Additional research is important to help obtain and refine the EFI for future population assessments and management. For instance, sampling the size/sex composition at sea or dockside would provide opportunities to collect information on recruitment and growth rates. Additional fishery independent sampling of inshore locations during late/early winter could be helpful to understand the distribution of juveniles, which may not be reflected in the catch due to mesh sizes and fishing locations. This type of sampling may be valuable to develop a recruitment index that can be used to derive biological thresholds to inform fishery management. Analysis of spatial distribution and environmental correlates of abundance is also needed to anticipate impacts of environmental change to the stock. In addition to current Ridgeback Prawn fishery indicators which are primarily based on commercial landings (i.e., effort and catch) data, developing other potential indicators related to climate, environmental, and oceanographic conditions are likely to be useful in monitoring variability and changes in Ridgeback Prawn resource that may affect the fishery. Research on bycatch composition, importance of Ridgeback Prawns as a food source to other species in the community, and habitat impacts of trawling are also needed to assess the need for effort controls.

Update Fishery Data Collection Systems

Long-term, consistent at-sea monitoring of Ridgeback Prawn is essential to collect reliable and robust scientific data needed for management. Information collected by fisheries observer programs can be used to understand fishing activities, patterns, and gear use. This information can also help verify regulatory compliance, as well as monitor the amount and disposition of catch and bycatch. While a 100% observer coverage of the fleet may be infeasible due to associated costs and other capacity constraints, the use of electronic monitoring technologies like gear sensors and video technology to capture information on fishing location, effort, catch, and discards, can help supplement the work of fishery observers/at-sea monitors, automate data to reduce observer costs, and provide for more comprehensive at-sea monitoring in the future.

The Department has also embarked on a comprehensive series of projects to develop electronic reporting for commercial marine fisheries, including Shrimp/Prawn Trawl Log (form DFW 120) for Ridgeback Prawn. When completed, the projects will include web-based user interfaces that offer commercial fishermen the option to submit electronic fishing activity records instead of paper logs. The use of electronic logs will likely result in more accurate fisheries data, provide for ease of information storage, and improve the availability of data for research and management.

5.2.2 Opportunities for Collaborative Fisheries Research

The Department has collaborated in the past and will continue to work with outside entities such as academic organizations, non-governmental organizations (NGO), citizen scientists, and both commercial and recreational fishery participants to help fill information gaps related to the management of state fisheries. The Department will also reach out to outside persons and agencies when appropriate while conducting or seeking new fisheries research required for the management of each fishery.

The Department is interested in developing collaborative programs with fishermen and scientists from other agencies, academic institutions, and NGOs to increase the quantity and quality of data being used to make management decisions. Experimental research and monitoring are areas for potential collaboration to collect EFI. Collaborative monitoring and information sharing can be used to correlate fluctuations in the fishery that may occur with changes in environmental conditions or fishing-related impacts.

Collaborative fishery research can also be used to evaluate the efficiency of various management alternatives or test specific management-related technology innovations. These can include, but are not limited to, gear innovations, monitoring tools, and other technological advances. For example, further outreach and research is needed to verify and ensure that required BRDs are used and are effective at reducing bycatch in the Ridgeback Prawn fishery. As noted in section 2.2.2., the approved rigid grate is not the best type of BRD for use on trawl vessels with net reels due to damage when wrapped on the net reel. A rigid grate excluder that incorporates a hinge (hinged rigid grate) allowing it to fold as it is wrapped on the reel, meets the current BRD requirement and is likely a better option for the ridgeback fishery. Partnership with fishery participants via experimental fishing permits can facilitate testing of alternative BRDs in order to demonstrate the most effective BRD for Ridgeback Prawn trawl vessels, which can improve fishing practices and increase regulatory compliance to minimize the bycatch of sensitive species. Additionally, fishery partnerships and collaborations with fishermen, NGOs, academic, and the technology sector can help develop and test new data collection approaches or technologies for real-time, electronic monitoring of the fishery (See section 5.2.1). If successful, the Department can implement these data collection approaches or technologies to effectively support fishery management efforts.

5.3 Opportunities for Management Changes

This section is intended to provide information on changes to the management of the fishery that may be appropriate, but does not represent a formal commitment by the Department to address those recommendations. ESRs are one of several tools designed to assist the Department in prioritizing efforts and the need for management changes in each fishery will be assessed in light of the current management system, risk posed to the stock and ecosystem, needs of other fisheries, existing and emerging priorities, as well as the availability of capacity and resources.

Bycatch Management

The MLMA requires that the Department manage commercial fisheries in a way that "limits bycatch to acceptable types and amounts, as determined for each fishery" (FGC §7056(d)). If the type or amount of bycatch is deemed unacceptable, management measures may be required to minimize the bycatch and discard mortality. Bycatch management measures may include:

- modifying gear design, materials, and configurations;
- placing limits on the number of individuals or weight of bycatch (catch limits can include zero quotas and required release);
- placing spatial and temporal restrictions on fishing and certain gear types at a time of year and/or in a geographic location when bycatch is expected;
- implementing incentives or disincentives related to bycatch to encourage fishermen to innovate their practices to avoid bycatch; and/or
- improving monitoring and enforcement (CDFW 2018).

Additionally, research and testing of new gear technology and methods may result in new information that could further bycatch reductions and promote greater BRD compliance in the Ridgeback Prawn fishery (See section 5.2.2). The use of new methods, technologies, and BRDs that are equally, if not more, effective as the current approved rigid-grate excluder should be considered for future management of the fishery.

Restricted Access Program

As discussed in section 3.1.2.2, the Ridgeback Prawn trawl fishery is currently open access, with no cap on the number of permits issued. In 2000, the Commission adopted regulations that set a control date of January 1, 1999, for entry into a restricted access program for the fishery. Should a restricted access program be necessary in the future, the Commission has the authority to revisit the control date for determining eligibility for participating in a restricted access fishery for Ridgeback Prawn.

Stakeholder Participation

Stakeholder engagement and participation in fishery management is key to helping both the Department and Commission identify areas in the fishery that need management attention and/or action. As noted in section 3.1.1.2, the Department intends to investigate concerns that some fishery participants have regarding overcapitalization of the fishery and the need to limit fishing effort, including placing a time limit on the time of day that trawling can occur (i.e.; from sunrise to sunset) or a limit on the amount of time (e.g., trips or days) that can be spent at sea by the fleet. The Department may make recommendations regarding whether effort restrictions are needed and the most appropriate methods for effort control.

Other Ridgeback Prawn resource related petitions received from stakeholders includes a request in 2014 to reinstate an incidental take allowance for Ridgeback Prawn in the State trawl fisheries (See section 3.1.1.2). This petition has been put on

hold by the Commission due to a Department concern regarding take of Ridgeback Prawn from fishing grounds prohibited in FGC §8842. Based upon interpretation of the FGC, there may be a need for clarification of the Ridgeback Prawn trawling regulations to address incidental take of Ridgeback Prawn in other State trawl fisheries.

5.4 Climate Readiness

Climate change is a shift in global climate pattern characterized by increasing global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC 2007). These physical changes may in turn effect ecosystem productivity and function, species abundances and distributions, habitat use and availability, and cues that some species rely on that indicate changes in the season (CDFW 2018). This possibility underscores the need for more research to understand how normal climatic fluctuations have affected Ridgeback Prawn stocks in the past in order to help managers prepare for and respond to climate change.

Currently, the Department collects information on commercial Ridgeback Prawn fishing effort and landings that can potentially be used to determine if any trend in abundance and distribution of the resource could be attributable to shifts in climate rather than annual fluctuations in the environment. However, our current understanding of Ridgeback Prawn fishing effort is restricted by limited time series data (See section 2.3.2). As such, a critical first step in readying the Ridgeback Prawn fishery for climate change is to improve the availability of logbook data to adequately calculate CPUE and effectively detect trends in the fishery on relevant timescales. The move toward electronic logbooks (See section 5.2.1) will improve the timeliness of that data and the ability by the Department to manage the fishery. Additionally, a consistent fishery monitoring and sampling program for the Ridgeback Prawn fishery will be important for detecting impacts due to climate change and designing potential new management approaches to facilitate adaptation and resilience in the fishery under changing climate conditions.

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Appendices

A Estimated total (retained and discard) catch of non-target species (metric ton (mt)), discard weight (mt), and percent discarded in the Ridgeback Prawn fishery, 2017 (NWFSC 2018). Zeroes represent values rounded to zero.

Common name	Scientific name	Total catch (metric ton)	Discard weight (metric ton)	Percent discarded
Invertebrates				
Anemone Unid	*Actiniaria*	0.10	0.10	100
Armed Box Crab	*Platymera gaudichaudii*	0.77	0.77	100
Bivalves Unid	*Bivalvia*	0.39	0	0.80
Black Coral	*Antipatheria*	0.01	0.01	100
Bobtail Squid	*Sepiolida*	0.05	0.05	100
Brittle/Basket Star Unid	*Ophiuroidea*	0.26	0.26	100
Brown Box Crab	*Lopholithodes foraminatus*	1.41	1.41	100
California King Crab	*Paralithodes californiensis*	0.78	0.78	100
California Sea Cucumber	*Parastichopus californicus*	0.95	0.95	100
Crab Unid	*Brachyura/Anomura*	0.33	0.07	20.48
Decorator/Spider Crab Unid	*Majidae*	0.01	0.01	100
Hermit Crab Unid	*Paguridae*	0	0	100
Horny Gorgonians	*Holaxonia*	0	0	100
Invertebrate Unid	*Animalia*	1.74	1.74	100
Irregular Echinoids	*Echinoidea*	0.41	0.41	100
Isopod Unid	*Isopoda*	0.04	0.04	100
Jellyfish Unid	*Scyphozoa*	0.07	0.07	100
King Crab Unid	*N/A*	0.03	0	0
Mantis Shrimp	*Stomatopoda*	0	0	100
Market Squid	*Loligo opalescens*	1.32	0	0
Mollusk Unid	*Mollusca*	0.01	0.01	100
Nudibranch Unid	*Nudibranchia*	2.68	2.68	100
Octopus Unid	*Octopoda*	0.16	0.11	68.04
Orange Sea Pen	*Ptilosarcus gurneyi*	0.01	0.01	100
Pacific Rock Crab	*Cancer antennarius*	0.01	0.01	100
Red Rock Crab	*Cancer productus*	2.84	0.02	0.62
Salp Unid	*Taliacea*	0.87	0.87	100
Sea Cucumber Unid	*Holothuroidea*	1.27	1.22	96.01
Sea Pens	*Pennatulacea*	0.04	0.04	100
Sea Snail Unid	*Gastropoda*	0.48	0.48	100

Common name	Scientific name	Total catch (metric ton)	Discard weight (metric ton)	Percent discarded
Sea Star Unid	*Asteroidea*	3.09	3.09	100
Shrimp Unid	*Caridea*	0.51	0.34	67.98
Spiny Lithode Crab	*Acantholithodes hispidus*	0.02	0.02	100
Spot Prawn	*Pandalus platyceros*	0.21	0.03	12.55
Squat Lobster Unid	*Galatheidae*	9.41	9.41	100
Tunicate Unid	*Tunicata*	2.05	2.05	100
Urchin Unid	*Echinoidea*	4.01	4.01	99.97
Worm Unid	*Sipuncula*	0.02	0.02	100
Yellow Rock Crab	*Cancer anthonyi*	0.44	0.44	100
Finfish				
Bat Ray	*Myliobatis californica*	1.59	1.54	97.06
Bigmouth Sole	*Hippoglossina stomata*	1.08	1.08	99.72
Brown Smoothhound Shark	*Mustelus henlei*	0.01	0.01	100
California Halibut	*Paralichthys californicus*	2.09	0.05	2.33
California Lizardfish	*Synodus lucioceps*	36.34	36.34	100
California Tonguefish	*Symphurus atricauda*	0.01	0.01	100
Combfish Unid	*Zaniolepis*	0.01	0.01	100
Croaker Unid	*Sciaenidae*	0.02	0	0
Cusk-eel Unid	*Ophidiidae*	0.17	0.17	100
Eelpout Unid	*Zoarcidae*	5.17	5.17	100
Fantail Sole	*Xystreurys liolepis*	0.46	0.31	66.88
Hagfish Unid	*Myxinidae*	0.02	0.02	100
Hornyhead Turbot	*Pleuronichthys verticalis*	1.73	1.73	100
Longfin Sanddab	*Citharichthys xanthostigma*	1.78	1.78	100
Longspine Combfish	*Zaniolepis latipinnis*	14.80	14.80	100
Mackerel Unid	*Scombridae*	0.01	0	0
Midshipman (Toadfish) Unid	*Batrachoididae*	10.40	10.40	100
Non-Eulachon Smelt Unid	*Non-Eulachon Osmeriformes*	0.03	0.03	100
Non-Humboldt Squid Unid	*Teuthida*	0.36	0.36	100
Northern Anchovy	*Engraulis mordax*	0.36	0.34	92.79
Pacific Angel Shark	*Squatina californica*	7.09	6.73	94.96
Pacific Argentine	*Argentina sialis*	0.02	0.02	100
Pacific Butterfish	*Peprilus simillimus*	0.56	0.56	100
Pacific Electric Ray	*Torpedo californica*	2.60	2.60	100
Pacific Hagfish	*Eptatretus stouti*	0.01	0.01	100
Pacific Sardine	*Sardinops sagax*	0.01	0	10.56

Common name	Scientific name	Total catch (metric ton)	Discard weight (metric ton)	Percent discarded
Pink Surfperch	*Zalembius rosaceus*	0.83	0.83	100
Plainfin Midshipman	*Porichthys notatus*	6.95	6.95	100
Poacher Unid	*Agonidae*	0.27	0.27	100
Queenfish	*Seriphus politus*	0.01	0	0
Redtail Surfperch	*Amphistichus rhodoterus*	0.01	0.01	100
Sculpin Unid	*Cottidae*	0.10	0.08	78.71
Shark Unid	*Squaliformes*	0.07	0	0
Shiner Surfperch	*Cymatogaster aggregata*	0	0	100
Shortspine Combfish	*Zaniolepis frenata*	0.75	0.75	100
Skate Unid	*Rajidae*	1.03	0.02	2.08
Slender Sole	*Lyopsetta exilis*	2.49	2.49	100
Smooth Stargazer	*Kathetostoma averruncus*	0.14	0.14	100
Specklefin Midshipman	*Porichthys myriaster*	0.62	0.62	100
Splitnose Searobin	*Bellator xenisma*	0	0	100
Spotted Cusk-eel	*Chilara taylori*	0.06	0.06	100
Surfperch Unid	*Embiotocidae*	0.03	0.03	100
Swell Shark	*Cephaloscyllium ventriosum*	0.04	0.04	100
Triggerfish Unid	*Balistidae*	0	0	100
White Croaker	*Genyonemus lineatus*	23.08	14.08	60.99
Federally Managed Groundfish[a]				
Arrowtooth Flounder	*Atheresthes stomias*	0.01	0.01	100
Aurora Rockfish	*Sebastes aurora*	0.06	0.06	100
Bank Rockfish	*Sebastes rufus*	0	0	100
Big Skate	*Raja binoculata*	0	0	100
Black Rockfish	*Sebastes melanops*	0	0	0
Bocaccio Rockfish	*Sebastes paucispinis*	0.15	0.15	99.09
Brown Rockfish	*Sebastes auriculatus*	0.02	0.01	72.95
Cabezon	*Scorpaenichthys marmoratus*	0.02	0.01	79.65
Calico Rockfish	*Sebastes dalli*	0.10	0.10	100
California Scorpionfish	*Scorpaena guttata*	0.92	0.77	84.51
California Skate	*Raja inornata*	1.09	1.09	100
Canary Rockfish	*Sebastes pinniger*	0.01	0.01	100
Chilipepper Rockfish	*Sebastes goodei*	0.65	0.65	100
Copper Rockfish	*Sebastes caurinus*	0.02	0.02	100
Cowcod Rockfish	*Sebastes levis*	0.07	0.07	100
Curlfin Sole	*Pleuronichthys decurrens*	0.07	0.06	95.85
Darkblotched Rockfish	*Sebastes crameri*	0.01	0.01	100
Dover Sole	*Microstomus pacifcus*	10.52	10.52	99.94

Common name	Scientific name	Total catch (metric ton)	Discard weight (metric ton)	Percent discarded
English Sole	*Parophrys vetulus*	22.80	22.00	96.47
Flag Rockfish	*Sebastes rubrivinctus*	0.01	0.01	100
Flatfish Unid	*Pleuronectiformes*	2.92	1.88	64.47
Freckled Rockfish	*Sebastes lentiginosus*	0.02	0.02	100
Greenblotched Rockfish	*Sebastes rosenblatti*	0.08	0.08	100
Greenspotted Rockfish	*Sebastes chlorostictus*	0.02	0.02	100
Greenstriped Rockfish	*Sebastes elongatus*	0.05	0.05	100
Halfbanded Rockfish	*Sebastes semicinctus*	4.14	4.14	100
Kelp Rockfish	*Sebastes atrovirens*	0	0	100
Lingcod	*Ophiodon elongatus*	0.40	0.35	86.42
Longnose Skate	*Raja rhina*	0.39	0.38	97.67
Mexican Rockfish	*Sebastes macdonaldi*	0.02	0.02	100
Pacific Hake	*Merluccius productus*	17.09	17.05	99.79
Pacific Sanddab	*Citharichthys sordidus*	33.75	33.66	99.73
Petrale Sole	*Eopsetta jordani*	1.26	0.83	66.19
Redstripe Rockfish	*Sebastes proriger*	0.01	0.01	100
Rex Sole	*Glyptocephalus zachirus*	0.57	0.57	100
Rock Sole	*Lepidopsetta*	0.11	0	0
Rosy Rockfish	*Sebastes rosaceus*	0	0	100
Sablefish	*Anoplopoma fmbria*	0.05	0.05	95.70
Sanddab Unid	*Citharichthys*	0.63	0	0
Shelf Rockfish Unid	*N/A*	0.67	0.63	93.91
Shortbelly Rockfish	*Sebastes jordani*	0.03	0.03	100
Shortspine/Longspine Thornyhead	*Sebastolobus*	0.01	0	0
Slope Rockfish Unid	*N/A*	0.05	0.01	17.35
Soupfin Shark	Soupfn Shark	0.04	0.04	100
Speckled Rockfish	*Sebastes ovalis*	0	0	100
Spiny Dogfish Shark	*N/A*	0.38	0.38	100
Splitnose Rockfish	*Sebastes diploproa*	0.02	0.02	100
Spotted Ratfish	*Hydrolagus colliei*	0.73	0.73	100
Squarespot Rockfish	*Sebastes hopkinsi*	0.05	0.05	100
Stripetail Rockfish	*Sebastes saxicola*	4.96	4.96	100
Swordspine Rockfish	*Sebastes ensifer*	0	0	100
Vermilion Rockfish	*Sebastes miniatus*	0.57	0.56	97.94
Other				
Egg Case Unid	*N/A*	0	0	100
Unidentified Mixed Species	*N/A*	16.84	0	0

a. Federally Managed Groundfish constitute species and species group managed under the Federal Pacific Coast Groundfish Fishery Management Plan.

Pacific Hagfish, *Eptatretus stoutii*
Enhanced Status Report

Pacific Hagfish, *Eptatretus stoutii*. (Photo Credit: CDFW/MARE).

California Department of Fish and Wildlife
Marine Region
May 2019

Citation: California Department of Fish and Wildlife. 2019. Pacific Hagfish, *Eptatretus stoutii,* Enhanced Status Report.

Contributors: Travis Tanaka and Kathryn Meyer (2019).

Enhanced Status Reports

The Marine Life Management Act (MLMA) is California's primary fisheries law. It requires the California Department of Fish and Wildlife (Department) to regularly report to the California Fish and Game Commission (Commission) on the status of fisheries managed by the state. The 2018 Master Plan for Fisheries expanded on this general requirement by providing an outline for Enhanced Status Reports (ESRs) that is based on the MLMA's required contents for Fishery Management Plans (FMPs). The goal of ESRs is to provide an overview of the species, fishery, current management and monitoring efforts, and future management needs, and provide transparency around data and information that is unavailable or unknown. ESRs can help to guide Department efforts and focus future partnerships and research efforts to address information gaps and needs to more directly inform management. It is also anticipated that some ESRs will be foundations for future FMPs by providing background information and focusing analyses and stakeholder discussions on the most relevant issues.

Table of Contents

Enhanced Status Reports i
Table of Contents ii
List of Acronyms iv
List of Figures iv
List of Tables v
Fishery-at-a-Glance: Pacific Hagfish vi
1 The Species 1-1
1.1 Natural History 1-1
1.1.1 Species Description 1-1
1.1.2 Range, Distribution, and Movement 1-2
1.1.3 Reproduction, Fecundity, and Spawning Season 1-2
1.1.4 Natural Mortality 1-3
1.1.5 Individual Growth 1-3
1.1.6 Size and Age at Maturity 1-5
1.2 Population Status and Dynamics 1-5
1.2.1 Abundance Estimates 1-5
1.2.2 Age Structure of the Population 1-5
1.3 Habitat 1-6
1.4 Ecosystem Role 1-6
1.4.1 Associated Species 1-7
1.4.2 Predator-prey Interactions 1-7
1.5 Effects of Changing Oceanic Conditions 1-8
2 The Fishery 2-1
2.1 Location of the Fishery 2-1
2.2 Fishing Effort 2-1
2.2.1 Number of Vessels and Participants Over Time 2-1
2.2.2 Type, Amount, and Selectivity of Gear 2-2
2.3 Landings in the Recreational and Commercial Sectors 2-4
2.3.1 Recreational 2-4
2.3.2 Commercial 2-4
2.4 Social and Economic Factors Related to the Fishery 2-5
3 Management 3-1
3.1 Past and Current Management Measures 3-1
3.1.1 Overview and Rationale for the Current Management Framework 3-2
3.1.1.1 Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild 3-2
3.1.1.2 Past and Current Stakeholder Involvement 3-3

3.1.2 Target Species 3-3
3.1.2.1 Limitations on Fishing for Target Species 3-3
3.1.2.1.1 Catch 3-3
3.1.2.1.2 Effort 3-3
3.1.2.1.3 Gear 3-3
3.1.2.1.4 Time 3-4
3.1.2.1.5 Sex 3-4
3.1.2.1.6 Size 3-4
3.1.2.1.7 Area 3-4
3.1.2.1.8 Marine Protected Areas 3-4
3.1.2.2 Description of and Rationale for Any Restricted Access Approach 3-6
3.1.3 Bycatch 3-6
3.1.3.1 Amount and Type of Bycatch (Including Discards) 3-6
3.1.3.2 Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch 3-7
Discard Mortality 3-8
3.1.4 Habitat 3-8
3.1.4.1 Description of Threats 3-8
3.1.4.2 Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing 3-8
3.2 Requirements for Person or Vessel Permits and Reasonable Fees 3-9
4 Monitoring and Essential Fishery Information 4-1
4.1 Description of Relevant Essential Fishery Information 4-1
4.2 Past and Ongoing Monitoring of the Fishery 4-1
4.2.1 Fishery-dependent Data Collection 4-1
4.2.2 Fishery-independent Data Collection 4-4
5 Future Management Needs and Directions 5-1
5.1 Identification of Information Gaps 5-1
5.2 Research and Monitoring 5-1
5.2.1 Potential Strategies to Fill Information Gaps 5-1
Stock Distribution 5-2
Stock Composition 5-2
Recruitment 5-2
Reproduction 5-3
Indices of Abundance 5-3
Age and Growth 5-3
Target and Limit Development 5-3
Movement Patterns 5-4

Mortality *5-4*
Ecological Interactions *5-4*
Habitat Coverage *5-4*
5.2.2 Opportunities for Collaborative Fisheries Research 5-5
5.3 Opportunities for Future Management Changes 5-5
5.4 Climate Readiness 5-5
Literature Cited viii

List of Acronyms

CCR	California Code of Regulations
CPP	Count Per Pound
CPUE	Catch Per Unit Effort
EFI	Essential Fishery Information
ESR	Enhanced Status Report
F	Fishing Mortality
FGC	Fish and Game Code
FMP	Fishery Management Plan
MLMA	Marine Life Management Act
MLPA	Marine Life Protection Act
MPA	Marine Protected Area
NOAA	National Oceanic and Atmospheric Administration
SST	Sea Surface Temperature
TL	Total Length

List of Figures

Figure 1-1. Dorsal view of a Pacific Hagfish.

Figure 1-2. Ventral view of a Pacific Hagfish.

Figure 1-3. Age-at-length relationships for Pacific Hagfish captured off the central California coast using three datasets as described by Nakamura (1994).

Figure 1-4. Hagfish in their natural habitat.

Figure 2-1. Hagfish fishermen count by year.

Figure 2-2. Sample length frequency relative to trap hole diameter.

Figure 2-3. Five-gallon bucket Hagfish trap, cylindrical Korean trap, and barrel trap.

Figure 2-4. Graphic of a groundline equipped with Hagfish bucket traps.

Figure 2-5. Total annual landing weight of Hagfish and value by year.

Figure 3-1. Trap retention of immature Hagfish as related to trap hole diameter.

Figure 4-1. Average annual CPP by port area.

Figure 4-2. Average annual female Hagfish total length by port area based on Department sampling.

Figure 4-3. Results from a trap hole diameter study suggests holes 14.3 mm (0.56 in) in diameter are a compromise between retained catch and escape of immature female Hagfish.

List of Tables

Table 2-1. 2017 Pounds and total value by port complex.

Table 3-1. Addition or amendments to Hagfish fishing statutes and regulations in California by year.

Table 3-2. Total square miles of soft bottom habitat in depths of 100 to 3,000 m within State waters off California.

Table 3-3. Total square miles of soft bottom habitat in depths of 100 to 3,000 m within California marine protected areas by region.

Table 3-4. List of commercial license and permit fees related to the Hagfish fishery 01 April 2017 to 31 March 2018.

Table 4-1. Female Hagfish spawning status criteria.

Table 5-1. Informational needs for Hagfish and their priority for management.

Fishery-at-a-Glance: Pacific Hagfish

Scientific Name: *Eptatretus stoutii*

Range: Hagfish are distributed coast-wide from southern Alaska to central Baja California, Mexico.

Habitat: Hagfish live on the sea floor in soft bottom (mud) habitat and are found at depths of 30 to 2,400 feet (9 to 732 meters).

Size (length and weight): Hagfish are long and skinny, achieving lengths up to 20 inches (508 millimeters) or more. Depending upon sex, weight may exceed 8 ounces (230 grams). Individual fish weight-at-length is highly variable.

Life span: Hagfish are slow growing. Their maximum age is unknown, but evidence suggests that Hagfish can live to be 25 to 50 years old.

Reproduction: There is no specific spawning season and female Hagfish may have viable eggs at any time. Hagfish mature at 7 to 12 years of age and have low fecundity, with females producing up to 30 eggs at a time. It is unknown how often Hagfish spawn.

Prey: Hagfish are primarily scavengers of carrion, but also prey on small benthic invertebrates.

Predators: Spiny Dogfish, Harbor Seals, Harbor Porpoises, and Elephant Seals prey on Hagfish.

Fishery: Fishermen deploy baited traps to attract Hagfish. After many years of very low landings, landings increased in 2007 due to increased demand. In 2017, 44 fishermen landed 2.1 million pounds statewide.

Area fished: Hagfish fishing is allowed in all depths within state and federal waters off California except in marine protected areas.

Fishing season: Hagfish can be taken year-round.

Fishing gear: Hagfish are taken with baited traps attached to weighted groundlines, usually with floats on each end. Traps must have holes of a certain diameter to allow small Hagfish to escape.

Market(s): Landed Hagfish are exported live for human food in South Korea.

Current stock status: The status of the Hagfish stock is unknown currently. However, available information suggests that Hagfish are relatively long lived and have low fecundity, making them likely susceptible to fishery depletion.

Management: The open-access Hagfish fishery is managed via restrictions on the amount and type of gear allowed. The fishery has no reporting requirement, other than a landing receipt. There is no minimum size limit, landing quota, or seasonal closure. There are no daily, seasonal, or annual catch limits. The fishery is assessed by dockside sampling using a mean count-per-pound metric, and samples are taken for life history studies. During the past eight years this metric has been highly variable and has shown no trend.

1 The Species

1.1 Natural History

1.1.1 Species Description

Pacific Hagfish (Hagfish) (*Eptatretus stoutii*) are a member of the Myxinidae (Hagfishes) family. Hagfish are cartilaginous fish that lack eyes, jaws, scales, and paired fins (Figures 1-1, 1-2). Hagfish have eye spots, a single nostril, and a mouth that contains two parallel rows of pointed, keratinous teeth. These teeth are secured to rasping dental plates. The oral/nasal cavity is surrounded by eight barbels. Lacking an operculum, Hagfish have from 11 to 13 gill pores or slits (Worthington 1905). They are brown in color and may have dark mottling. Members of the Hagfish family also have mucous producing “slime” glands along each side of the fish’s body. When agitated, Hagfish will produce a protein-based mucous that, when mixed with water, produces a thick, viscous slime. This characteristic is the reason Hagfish are called “slime eels”.

Figure 1-1. Dorsal view of a Pacific Hagfish. Notice the eye spots (Photo Credit: Andrew Clark, University of California, Irvine).

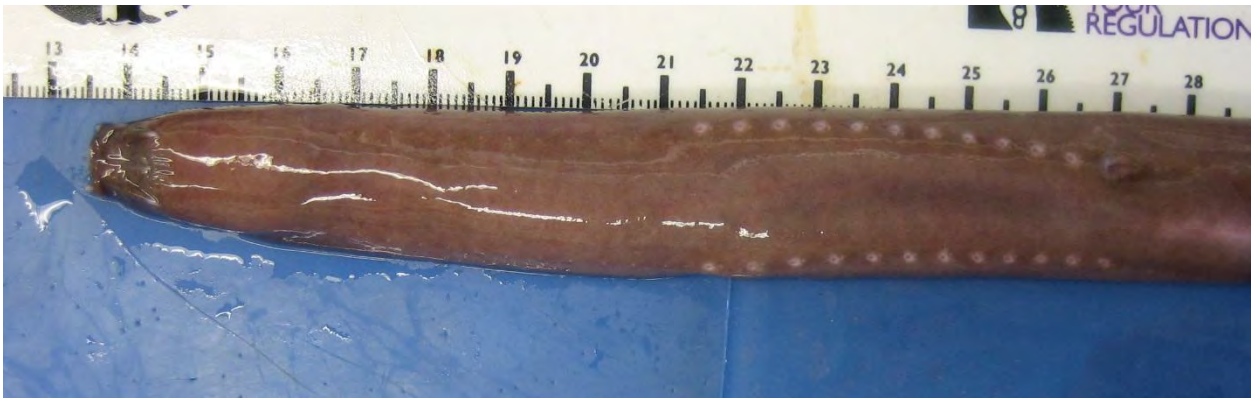

Figure 1-2. Ventral view of a Pacific Hagfish. Notice this individual has 11 gill pores on one side and 12 on the other (Photo Credit: Andrew Clark, University of California, Irvine).

Hagfish are osmoconformers, meaning that a Hagfish’s blood osmolality is isosmotic with the environment (Hastey 2011). Because Hagfish are unable to regulate sodium and chloride ions, they are sensitive to changes in salinity, especially decreases.

Considered scavengers and benthic predators, Hagfish will feed upon carrion or live invertebrates. They identify food sources through their excellent sense of smell and touch. Hagfish will protract/retract their plates until the food source is secured and consumption begins by entering an existing hole or making one by using their dental plates. The Hagfish will then enter its food item, if possible, consuming it from the inside. Hagfish were once thought of as parasites due to this behavior.

A related species, the Black Hagfish (*Eptatretus deani*), occurs in deeper waters than Pacific Hagfish although their distributions overlap. Landings are sometimes mixed, but those of Black Hagfish are rare. Black Hagfish are found over soft mud habitat at depths from 1,560 to 3,500 feet (ft) (476 to 732 meters (m)) (Miller and Lea 1972). Black Hagfish are uniform purple/black in color. Gill pores are closer to the head than in Pacific Hagfish

1.1.2 Range, Distribution, and Movement

Hagfish are distributed coast-wide from southern Alaska to central Baja California, Mexico. Preferring deep, soft mud habitat, Hagfish are found at depths of 30 to 2,400 ft (9 to 732 m) (Miller and Lea 1972) but are more common in depths less than 1,200 ft (366 m) (Love 1996). In California they are usually caught in depths less than 1,800 ft (549 m).

Knowledge about Hagfish movement is limited. Based on fishing activity as reported via voluntary logbooks, Hagfish may exhibit limited migration, and respond to the presence of food. The introduction of food sources, such as from fishing discards, may result in a localized increase of Hagfish (Martini 1998).
Changes in oceanic conditions or habitat may force Hagfish to migrate to more favorable depths or locations. Hagfish are sensitive to salinity decreases, significant increases in water temperature, or substrate alterations (Hastey 2011).

1.1.3 Reproduction, Fecundity, and Spawning Season

As protogynous hermaphrodites, Pacific Hagfish exhibit relatively unique reproductive characteristics among fish species. As protogynous hermaphrodites, all fish initially develop female oocytes, but hermaphroditism can occur as a temporary “juvenile” event (Gorbman 1990). Females begin gonadal maturation before males. Laboratory research has shown that female differentiation occurs gradually in early life stages until reaching 8 inches (in) (203 millimeters (mm)) Total Length (TL). Eggs begin developing after 8 in (203 mm) TL, and females are sexually identifiable at this size. Male Hagfish show a temporary version of juvenile hermaphroditism (Gorbman 1990). The anterior section of the testis develops through stages of oogenesis for Hagfish less than 8 in (203 mm). For fish larger than 8 in (203 mm), the testes begin development of testicular follicles resulting in the production of spermatocytes. During testicular development, the part of the gonad that underwent oogenesis begins to degrade (Gorbman 1990). Males are sexually identifiable internally without magnification at 11 in (279 mm) TL.

Fecundity is low with females going through cycles of spawning maturity. Viable female Hagfish will contain eggs of various stages of maturity. Immature female Hagfish can produce up to 200 eggs however, at peak maturity, the number of eggs that reach

maturity is significantly lower. Reid (1990) found an average of 23 mature eggs per female, while Fleury (2016) estimated as few as 20. In 4 years (yr) of sampling, Barss (1993) found females to average up to 28 eggs per spawn cycle with only one set of eggs maturing at a time. The number of eggs a female will carry to term may be dependent upon length with longer females carrying a greater number of mature eggs (Nakamura 1991).

There is no specific spawning season and female Hagfish may have viable eggs at any time. Once mature, the female will carry eggs of various stages, including spent eggs, year-round as observed in Department sampling efforts. While viable eggs have been observed more frequently in Department-sampled Hagfish during fall and winter months, Hagfish most likely spawn throughout the year. The peak of the spawn may be during the summer (Barss 1993).

Sex ratio may be skewed toward female or male; however, a sex ratio approaching or near 1:1 is expected prior to spawning. Nakamura (1991) found that males were more prominent throughout the year based on quarterly sampling, but the number of males and females were closest during the summer. Other studies found that females were more dominant in the population. Reid (1990), after sampling all four seasons, found a male: female ratio of 1.0:1.5. Additionally, Department sampling indicated a bias toward female Hagfish with a sex ratio of 1.0:1.3 (CDFW Hagfish Sample Data 2017).

1.1.4 Natural Mortality

Determining the natural mortality (M) of marine species is important for understanding the health and productivity of their stocks. Natural mortality results from all causes of death not attributable to fishing such as old age, disease, predation or environmental stress. Natural mortality is generally expressed as a rate that indicates the percentage of the population dying in a year. Fish with high natural mortality rates must replace themselves more often and thus tend to be more productive. Natural mortality along with fishing mortality result in the total mortality operating on the fish stock.

Natural mortality has not been directly estimated for Hagfish. However, it is thought to be very low based on empirically derived life history relationships that link maximum age to natural mortality rate for many fish species. Nakamura (1994) suggested that a maximum age of more than 50 years was possible, making natural mortality less than 0.1 using Hoenig's (1983) method

1.1.5 Individual Growth

Individual growth of marine species can be quite variable, not only among different groups of species but also within the same species. Growth is often very rapid in young fish and invertebrates but slows as adults approach their maximum size. The von Bertalanffy Growth Model is most often used in fisheries management, but other growth functions may also be appropriate.

Hagfish growth has proved difficult to characterize as a result of difficulties with determining age-at-length since, as a cartilaginous fish, they lack any of the bony structures that are typically used to estimate age. Nakamura (1994) attempted an age

and growth study, both by analyzing limited mark-recapture data and by evaluating growth rates observed in Hagfish reared in the laboratory. The resulting data showed a wide range of possible age-length relationships and additionally documented fish that experienced zero or even negative growth in both natural and laboratory settings. Growth models were constructed using three categories of observation data; laboratory-reared fish excluding negative growth observations (Lab +), wild fish excluding the negative/zero observations (Wild +), and wild fish including negative/zero observations (Wild +/-). Although negative growth is a phenomenon that occurs in other cartilaginous fishes (e.g. Lamprey), it may also be exacerbated by handling, tag, and/or lab stress and was consequently excluded in two of the models. The laboratory-reared fish grew significantly more slowly than those observed in the wild, creating a likely unrealistic characterization of Hagfish growth. Including or excluding negative growth observations had a large consequence on the resulting age-length relationship in the wild population data, which is an uncertainty that should be taken into consideration when characterizing Hagfish growth in future work. The three age-length relationships are provided in Figure 1-3.

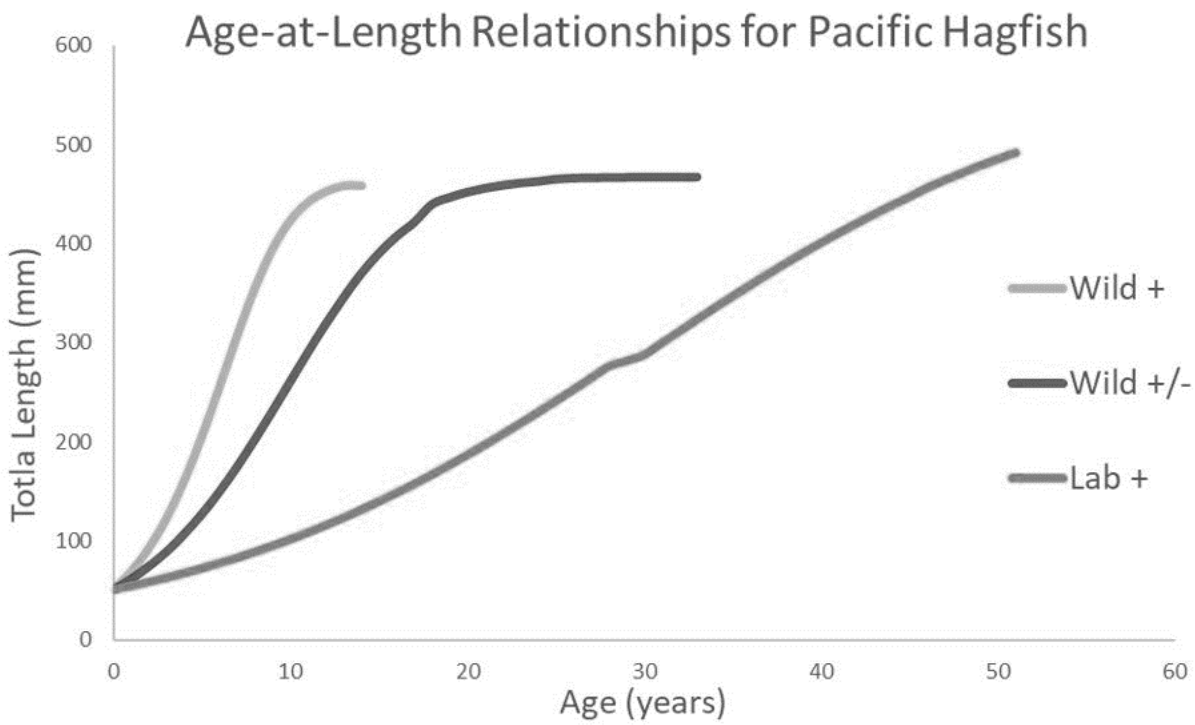

Figure 1-3. Age-at-length relationships for Pacific Hagfish captured off the central California coast using three datasets: Wild + - includes mark-recapture data with only positive growth observations, Wild +/- uses mark-recapture data that includes negative/zero growth observations, and Lab + uses only fish held captive in laboratory conditions (Reproduced from Nakamura 1994).

1.1.6 Size and Age at Maturity

Research indicates that Hagfish begin sexual differentiation around 8 in (203 mm) and are mature at 12.8 in (338.0 mm). Nakamura (1994) estimated that female Hagfish off California mature around 12.8 in (325.0 mm) TL when they are between 7 and 8 yr old. Based on Department sample data, Tanaka and Crane (2014) found that female Hagfish were mature at 13.3 in (338.0 mm).

Barss (1993) found that male Hagfish off Oregon and Washington were 50% mature at 13.8 in (351.0 mm) and 100% mature at 16.5 in (419.0 mm). Females were 50% mature at 16.5 in (419.0 mm) and 100% mature at 20 in (508 mm). This same study found the smallest mature male was 10.2 in (259.0 mm) and the smallest female was 11.8 in (300.0 mm)

1.2 Population Status and Dynamics

Current and historical stock status is unknown. There is limited knowledge of Hagfish life history with which to model the population dynamics for this species. However, available information suggests that Hagfish are relatively long lived and have low fecundity, making them likely susceptible to fishery depletion. While there is a catch record for this species, there is unfortunately no standardized measure of associated fishing effort, precluding the development of an index of relative abundance. Currently, staff are working on applying data-limited methods to Hagfish data to elucidate population status.

1.2.1 Abundance Estimates

Nakamura (1991) estimated population abundance off the central coast of California using a series of tagging surveys. During this study, more than 5,000 Hagfish were caught, tagged, and released, and 39 were recaptured. Based on this, the estimated density of Hagfish was 1.15 million per square mile (mi^2) (2.59 square kilometers (km^2)). Other studies observing Black Hagfish, saw average densities of 840,000 per mi^2 (2,175,590 km^2) off the coast of California, with maximum densities ranging up to 1.5 million per mi^2 (3,884,982 km^2), but considered these estimates low due to burrowing Hagfish, which could not be sampled by trawl gear (Wakefield 1990). Observations of Hagfishes (*Eptatretus* spp.) off Oregon's coast also show that they are more active at night, causing lower abundances to be observed during the day due to burrowing behavior (Hart et al. 2010).

1.2.2 Age Structure of the Population

Age information is limited due to the lack of reliable aging structures such as otoliths or other bony structures in Hagfish. However, Nakamura's (1994) work gives estimated age at length. Nakamura results suggest that a 7.1 in (180.0 mm) long Hagfish is 4 to 8 yr old, and a 17.7 in (450.0 mm) long Hagfish is 15 to 25 yr old. Applying Nakamura's estimate to Department sample data from 2015 to 2017 (2015 is the effective year of the 0.56 in (14.0 mm minimum trap hole diameter regulation), the fishery retains minimal female Hagfish under 12.8 in to 13.3 in (325.0 to 338.0 mm) or 7

to 8 yr of age. Based on Department sampling, 96 to 98% of sampled Hagfish are longer than 13.3 in (338.0 mm). Due to the minimum trap hole diameter, the number of potentially available Hagfish under 8 yr is unknown. Since the fishery retains nearly 100% of Hagfish captured, 81 to 87% of retained Hagfish could be 8 to 15 yr of age. The percentage of older, larger fish may be declining in the catch. In 2015, 12.4% of sampled females were 17.7 in (450.0 mm) (15+ yr) or longer. This percentage decreased again in 2016. In 2017, samples had 3.9% of females 17.7 in (450.0 mm) or longer. This is an indication that the fishery has removed a great majority of the older, larger females from fished areas.

1.3 Habitat

Hagfish prefer deep water (between 30 to 2,400 ft (9 to 732 m)), soft bottom (mud) habitat, which is the predominant marine habitat type off California. Still, Hagfish can be found over mixed substrate (mud, sand, gravel) or in areas with larger boulder formations (Cailliet et al. 1991) (Figure 1-4). Hagfish are sensitive to salinity decreases, significant increases in water temperature, or substrate alterations (Hastey 2011). A significant increase in temperature or prolonged decrease in salinity can have lethal effects (Martini 1998).

Figure 1-4. Hagfish in their natural habitat (Photo Credit: http://ocean.si.edu/ocean-photos/pacific-hagfish, NOAA).

1.4 Ecosystem Role

As scavengers, Hagfish play a significant ecosystem role by assisting in the rapid recycling of nutrients in deep water, soft bottom, benthic habitat. Hagfish are also benthic predators of invertebrates, particularly polychaete worms (Johnson 1994).

In addition, at increased densities, Hagfish facilitate benthic turnover through burrowing. Martini (1998) suggested several adaptations to a burrowing lifestyle:

- smooth skin with elongate body shape
- degenerative eyes
- reduction of the lateral line system
- gill ventilation by a velar pump system
- low basal metabolic rate

1.4.1 Associated Species

Fishermen are not allowed to land incidentally caught finfish, and logbooks are not required for reporting catch, so there is little information on associated species. Limited information on observed associated species is based upon observation trips aboard Hagfish vessels and Department studies. There are known species that inhabit deep, soft-bottom habitat, including: Pacific Sanddab (*Citharichthys sordidus*), Sablefish (*Anoplopoma fimbria*), Spotted Cusk Eel (*Chilara taylori*), Octopus (*Octopus* (spp.), Dungeness Crab (*Metacarcinus magister)*, and Shrimp (species unknown). Other species likely to co-occur with Hagfish on deep, soft-bottom habitat include: Spiny Dogfish (*Squalus acanthias*), Dover Sole (*Microstomus pacificus*), English Sole (*Pleuronectes vetulus*), Big Skate (*Raja binoculata*), California Skate (*Raja inornata*), California Tonguefish (*Symphurus atricauda*), Spotted Ratfish (*Hydrolagus colliei*), Petrale Sole (*Eopsetta jordani*), and benthic invertebrates, such as polychaetes, sea stars, and crustaceans.

1.4.2 Predator-prey Interactions

Despite having a slime-producing mechanism for defense, Hagfish are preyed upon at all life stages. In California waters, Hagfish face predation from Spiny Dogfish, Harbor Seals (*Phoca vitulina*) Harbor Porpoises (*Phocoena phocoena*), and Elephant Seals (*Mirounga angustirostris*) (Martini 1998). A scat analysis of Harbor Seals showed that Hagfish occurred as a prey item 27.5% of the time on an annual basis (Hanson 1993). Hagfish eggs are preyed upon by some invertebrates (Martini 1998). Deep-water fishes such as Sablefish are also known to eat Hagfish.

Hagfish are primarily scavengers and have been observed feeding on the muscles and viscera of large fishes such as cod, Spiny Dogfish, Sablefish, Lingcod (*Ophiodon elongatus*), perches, flounders, and salmon (*Onchorhynchus* spp.) (Hart 1973). In areas subject to extensive fishing pressure, Hagfish may feed on fishing discards (Martini 1998). Hagfish are also benthic predators of cephalopods, polychaetes, sergestid shrimp, euphausiids, and small fishes (Johnson 1994). Johnson (1994) also found that many of the Hagfish sampled had empty stomachs and inferred that Hagfish spend little time searching for food. Being burrowers, Hagfish most likely lie in wait for a scent trail to follow.

A significant, long-term reduction in Hagfish density could have the effect of a buildup of carrion falls or a disruption in nutrient recycling. It is unknown what potential ecosystem effects could occur due to a reduction of Hagfish density (Martini 1998).

1.5 Effects of Changing Oceanic Conditions

Hagfish are sensitive to significant temperature changes and are susceptible to thermal stress. Thermal stress through heating influences biochemical reactions and can double or triple the metabolic rate of Hagfish for every 10 degrees Celsius (˚C) (50 degrees Fahrenheit (°F)) increase and may disrupt the osmotic balance of Hagfish (Hastey 2011). As an osmoconformer, any disruption to osmotic balance leads to additional stress. Prolonged or significant oceanic temperature changes due to events such as El Niño or La Niña may have a temperature affect as deep as 300 m (984 ft) (Norton and McLain 1994). However, due to the greater depths that Hagfish inhabit, the effect of changes to temperature at depth may not be significant enough to force Hagfish migration (J. Norton personal communication). The potential stress to Hagfish caused by increased temperature is apparent after the fish are caught and are subject to ambient Sea Surface Temperature (SST) during transit to the buyer and after being placed in dockside receivers. During significant warm water months, some buyers will stop all market orders, particularly in southern California, due to loss associated with the stress of increased water temperature. Landing trends do not reflect the market-imposed limits placed on southern California vessels. Some Hagfish exporters can keep their fish alive using water chillers, but at greater expense.

2 The Fishery

2.1 Location of the Fishery

Within California, Pacific Hagfish have been fished over soft bottom in waters from 180 to 1200 ft (55 to 366 m) but are more commonly targeted in water depths ranging from 180 to 600 ft (55 to 183 m). Hagfish are landed statewide, from Eureka (Humboldt County) to Oceanside (San Diego County). There are a greater number of landings off central California due to a larger number of participants, but pounds of fish per landing are smaller by comparison. Fewer, but larger landings occur off the north coast.

2.2 Fishing Effort

2.2.1 Number of Vessels and Participants Over Time

When the fishery began in 1982, four vessels participated. Due to demand, the number of participants quickly increased and by 1990, a total of 56 vessels participated in the fishery. However, the market collapsed shortly thereafter, resulting in a decline in the number of participants and very little fishing effort until 2005 (Figure 2-1).

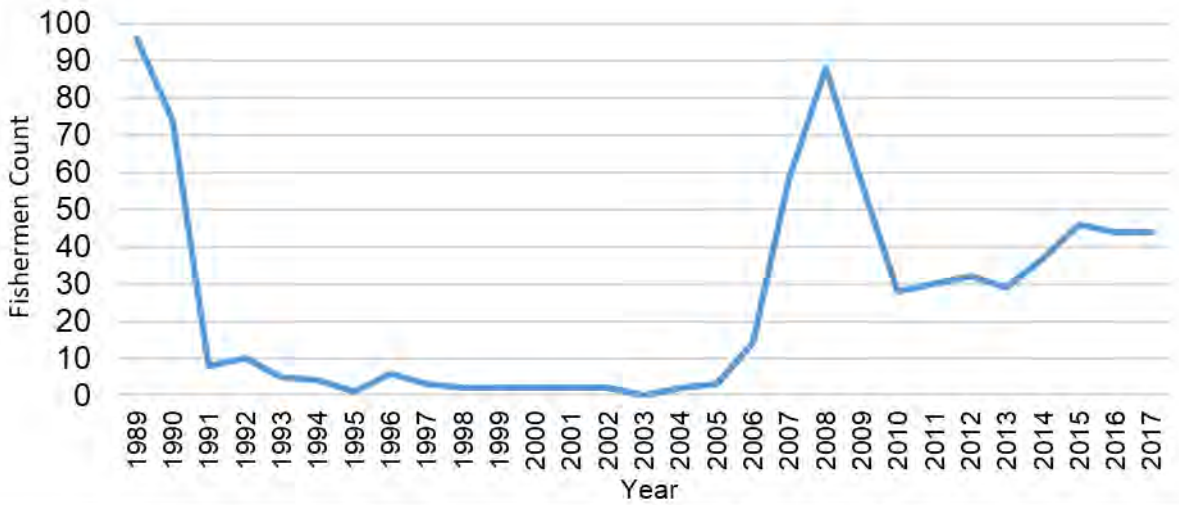

Figure 2-1. Hagfish fishermen count by year. Note the closure of the commercial salmon fishery during 2008 to 2009 (CDFW Commercial Fisheries Information System 2018).

Fishing effort rebounded significantly beginning in 2007 due to renewed interest in California-caught Hagfish. In 2008, effort increased due to interest from displaced fishermen, either from fisheries that had seasonal reductions, emergency closures, or those seeking additional income (Figure 2-1). The Hagfish fishery is open access, and fishermen tend to enter and leave the fishery depending on market volatility or involvement in other fisheries. Since the resurgence of the fishery in 2005, fishing effort, (mostly market driven) has increased to a relatively consistent level in recent years. In 2017, 43 vessels, operated by 44 fishermen, participated in the Hagfish fishery. This contributed to a statewide landing total of 2.1 million pounds (lb) (952,543.2 kilograms

(kg)), valued at $1.80 million (CDFW Commercial Fisheries Information System (CFIS)). The 10 yr average of participating fishermen who made at least one landing is 36,000 lb (16,329.3 kg) (range: 20,500.0 to 47,700.0 lb (9.298.6 to 21,636.3 kg)).

Fishing effort is dictated by market order, which is dependent upon Korean import demand. Hagfish are stored dockside for several days prior to shipping. Fishermen are often told when to deliver to allow time for stored fish to purge their gut contents prior to packing. During Dungeness Crab or Chinook Salmon (*Oncorhynchus tshawytscha*) seasons, fishermen may not take part in the Hagfish fishery for several months in order to participate in these more profitable fisheries. Typically, Hagfish vessels are operated by one captain and one or two deckhands, but a few fishermen work independently.

2.2.2 Type, Amount, and Selectivity of Gear

When the California fishery began in 1982, fishermen were free to utilize any trap type with no restrictions on trap capacity, escapement opening, or total trap number. The only general regulations applicable for traps used for Hagfish were the use of a destruct device, regular trap servicing, and marking the float with the fisherman's license number.

Hagfish are harvested using 5 gallon buckets or Korean traps and in 2016, barrel traps were included as another authorized gear type (Figure 2-3). All traps are attached to weighted groundlines (Figure 2-4), usually with floats on each end. Based on fisherman preference, groundlines may be any length, but 1,000 ft (305 m) or longer is common. In 2015, the Department implemented new regulations that required all holes, except for the entrance, to be at least 0.56 in (14 mm) in diameter. Holes of 0.56 in (14 mm) or greater have shown to minimize trap retention of immature Hagfish (Tanaka and Crane 2014). Tanaka and Crane's (2014) study showed that increasing trap hole diameter from 0.50 to 0.56 in (12 to 14 mm) resulted in a 10.5% reduction of immature fish retained by the trap. Traps with smaller hole diameters retained Hagfish of all lengths, including a greater number of smaller fish (Figure 2-2). For more information on gear types, see section 3.1.2.1.3.

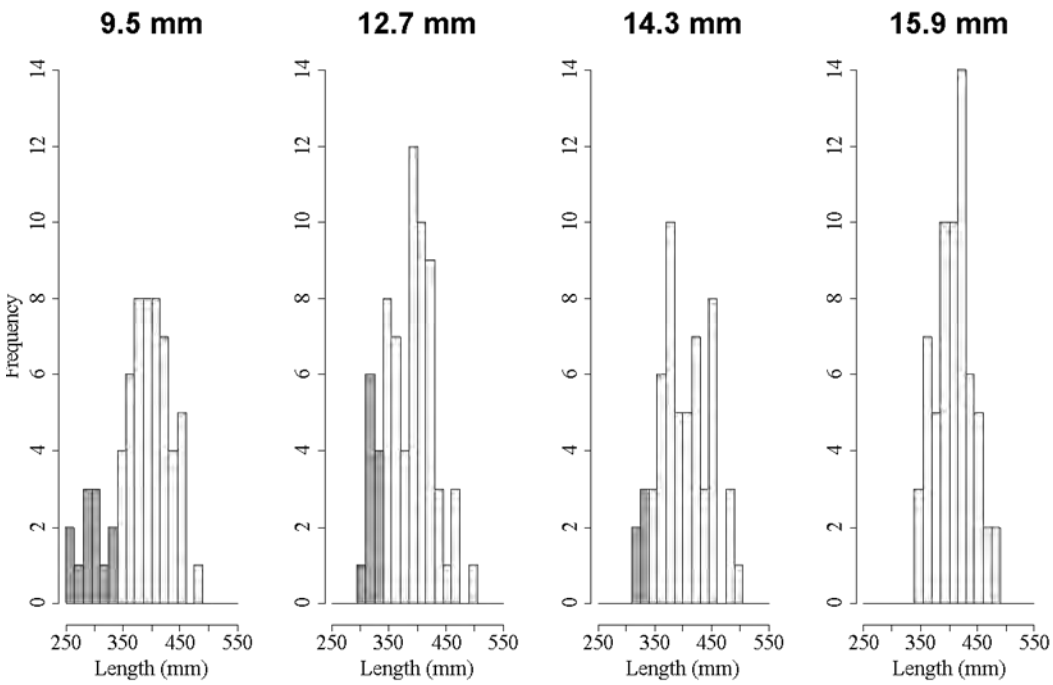

Figure 2-2. Sample length frequency relative to trap hole diameter from Tanaka and Crane (2014).

Figure 2-3. Five gallon bucket Hagfish trap, cylindrical Korean trap, and barrel trap (Photo Credit: Travis Tanaka, CDFW).

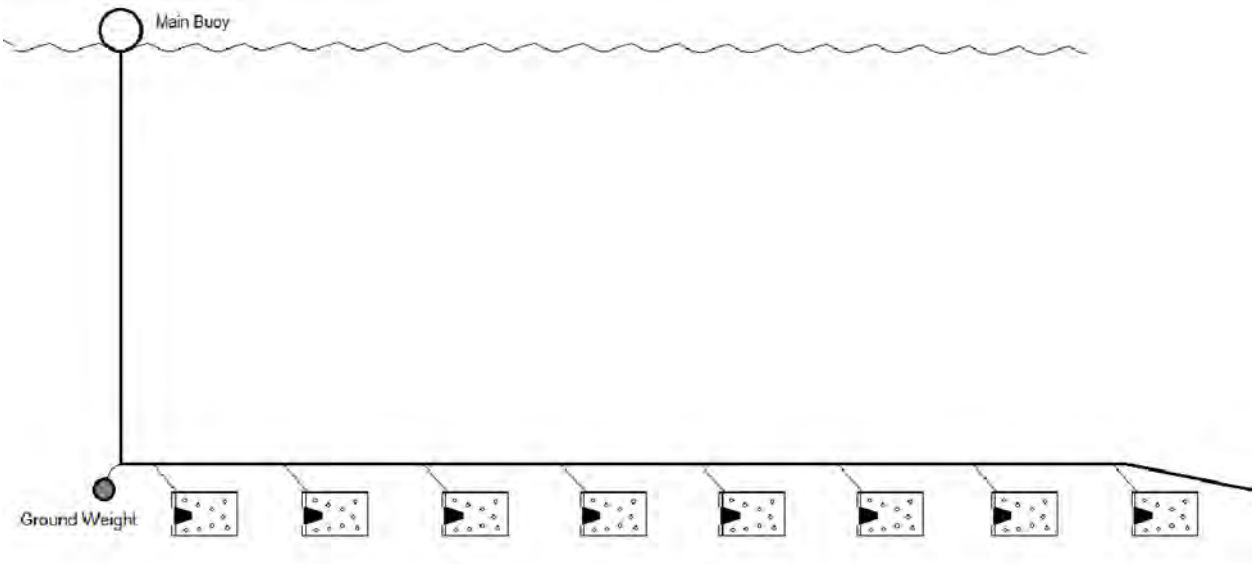

Figure 2-4. Graphic of a groundline equipped with Hagfish bucket traps Graphic (Illustration Credit: Ashok Sadrozinski, CDFW).

2.3 Landings in the Recreational and Commercial Sectors

2.3.1 Recreational

There is currently no recreational fishery for Hagfish.

2.3.2 Commercial

The Hagfish fishery in California began in response to demand from South Korean buyers. Minor landings occurred from 1982 to 1984. In late 1987, Korean processors solicited California fishermen, mostly from San Francisco and Monterey, to target Hagfish. These fishermen began fishing the following year. In 1988, eight vessels landed 690,000.0 lb (312,978.5 kg). Between 1988 and 1991, effort and landings peaked at 4.9 million lb (2.22 million kg), caught by 56 vessels (Figure 2-5). Korean interest in California-caught Hagfish decreased during the 1990 season, leading to a market driven collapse in 1991. Several fishermen and receivers who participated in the early fishery claim that Korean importers left the fishery to avoid paying their debts, but there is not documentation of this. Between 1991 and 2006, annual landings ranged from near zero to 406,000.0 lb (184,158.4 kg) with an average of 82,000.0 lb (37,194.5 kg).

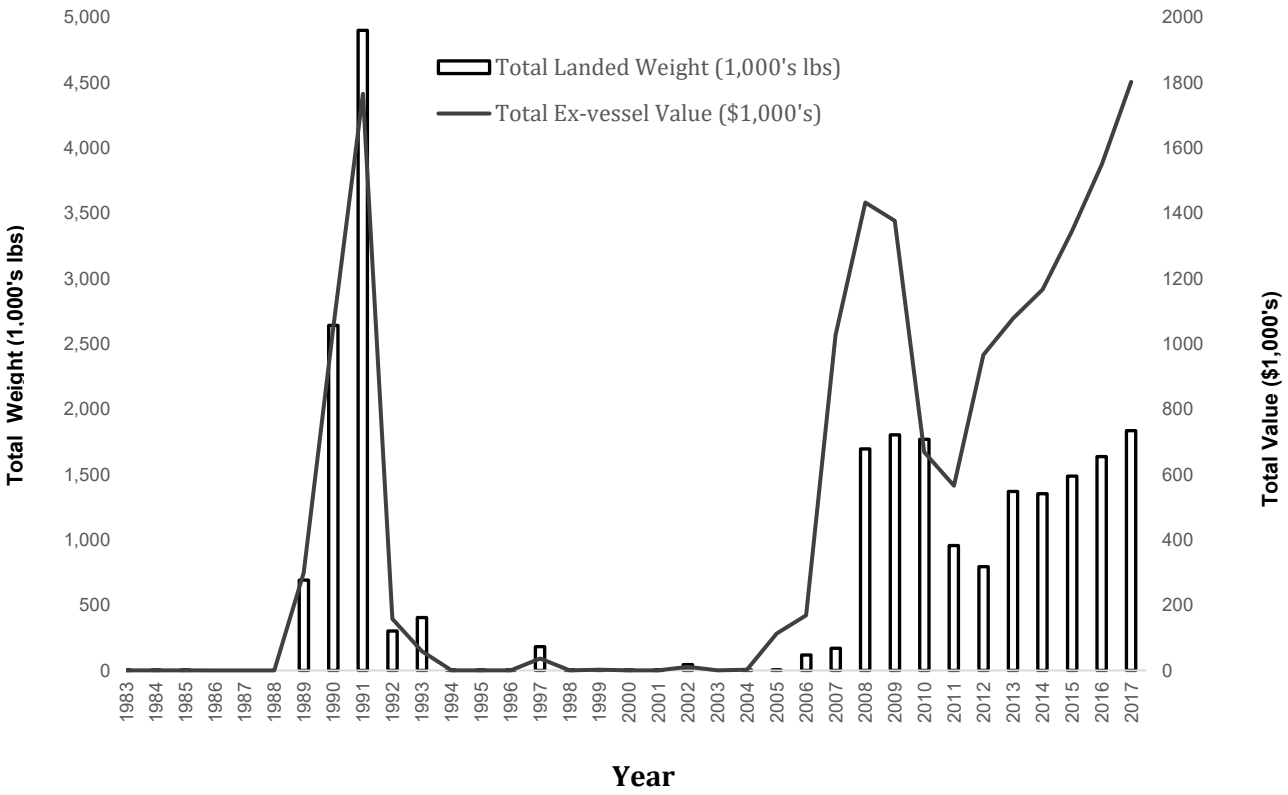

Figure 2-5. Total annual landing weight of Hagfish and value by year (CDFW CFIS).

Due to renewed interest in California-caught Hagfish, fishing effort and landings rebounded significantly beginning in 2007 with total landings reaching 1.69 million lb (766,570.5 kg), valued at $1.03 million (CDFW CFIS). Fishermen, especially those who did not have other fishery options, began targeting Hagfish to satisfy Korean demand.

Annual landings reflect fluctuations in Korean demand, with seasonal declines occurring during the late spring followed by significant increases in demand. In 2017, the fishery supported 44 fishermen who landed 2.10 million lb (952,543.2 kg) statewide.

2.4 Social and Economic Factors Related to the Fishery

The California Hagfish fishery began as a result of foreign fishery depletion. In 1983, Korean “eel skin” leather products gained popularity and the fishing effort increased in the waters off Korea and Japan to accommodate the need for Hagfish skins. In South Korea, from 1983 to 1985, 400 vessels contributed to landing totals up to 6 million lb (2,721,552 kg) per year. Between 1986 and 1987, there were approximately 600 vessels and 35 Korean processors in the South Korean port of Pusan. Due to severe fishery depletion, Korean processors began to look for outside sources of Hagfish, and this spurred the development of the California Hagfish fishery in 1989 (Kato 1990).

Being an export-only fishery, fishermen and fish receivers are affected by changes in South Korea’s economy, policies, and customs. From 1988 to 1992, the average ex-vessel price was $0.37 per lb ($0.81 per kg) to satisfy the need for “eel skin”

leather goods. California fish receivers sold locally caught Hagfish to Korean importers. However, Korean interest in California-caught Hagfish decreased in the 1990 season, leading to a market driven collapse in 1991. Demand declined during the early 1990s due to skin quality defects (unexplained holes) found on California-caught Hagfish causing Korean importers to seek other sources for Hagfish (Melvin and Osborn 1992).

After robust landings for several years, most Hagfish fishing in California ceased after 1992. Landings were made at a minor level until 2006 when South Korean demand for California-caught Hagfish once again increased. Korean buyers also helped build interest by offering trap components or equipment to those who would sell Hagfish to them. Between 2007 and 2017, the total average annual landing value was $1.18 million with an average price per lb of $0.78 ($1.72 per kg). In 2016, the average price per lb was $0.99 ($2.18 per kg).

In addition to the ex-vessel price, exporters must also factor in the fees and costs to ship live Hagfish overseas. According to one Hagfish exporter, the cost to ship one box is approximately $60. This includes the costs of packaging, labor, and airfreight. This does not include the costs to store and maintain Hagfish prior to shipment. (C. Thomsson pers. comm.).

During the peak fishery of 1990, 24 fish receivers purchased California-caught Hagfish. Based on Department records, 11 of those receivers were backed or owned by Korean interests. Of the 24 receivers, only two have remained in business. In 2016, nine fish receivers purchased Hagfish. Market conditions continue to support these fish receivers, even during periods of poor fishing or demand collapse. Two of the nine receivers are fishermen who catch, pack, and export their own catch.

Hagfish fishermen face their own economic constraints. In addition to costs associated with maintaining a vessel and fishing gear, fishermen have costs and the burden of acquiring/storing bait, especially during bait shortage or a management closure of the bait species and paying crew during periods of irregular fishing activity due to weather or market changes. Depending on the type of trap used (bucket or barrel) the quantity of bait varies and is based on fisherman preference. Bait (sardines) is currently $0.40 per lb ($0.88 per kg) (2018 price). Some fishermen can acquire fish carcasses. Bucket fishermen may use up to 800.0 lb (362.9 kg) of bait per set. Barrel fishermen from the same port may use up to 400.0 lb (181.4 kg) per set. During periods of bait shortage, fishermen fish fewer days to maximize soak time on their traps and to minimize bait purchased per fishing week (H. Juarez pers. comm.). Some barrel fishermen use up to 125.0 lb (56.7 kg) of bait per set, but utilize bait containers to extend bait life and to limit consumption by small fish and invertebrates (C. Thomsson pers. comm.)

The Hagfish fishery has provided a needed boost for fishery-based economies of several fishing communities. Displaced fishermen rely on Hagfish as a source of income during fishery closures or between fishing seasons for other targeted species. For example, the City of Morro Bay cited the Hagfish fisheries role in “contributing to the diversity of species, scale of operation, and export market opportunities” (Lisa Wise Consulting 2015). During the period examined by Wise Consulting, Hagfish contributed over $2.4 million to the Morro Bay area from 2006 to 2014. Even though Hagfish are exported, Morro Bay fish receivers must employ staff, usually local fishermen, to care for the retained Hagfish prior to shipment. Money is spent on packaging materials, dock

rental, and transportation. Fish receivers and exports pay taxes/fees for exportation and landing taxes on Hagfish purchased from fishermen. In 2017, Hagfish landings significantly contributed to the fishing economies of eight California port complexes (Table 2-1). Of the eight port complexes, Eureka and Morro Bay complexes contributed to over 63% of state-wide landings.

Table 2-1. 2017 Pounds and total value by port complex (CDFW CFIS).

Port Complex	Pounds Landed	Total Value (U.S dollars)
Eureka	651,411	386,999
Fort Bragg	145,464	130,599
Bodega Bay	267,882	200,912
Monterey	64,651	58,186
Morro Bay	663,888	721,569
Santa Barbara	38,074	39,983
Los Angeles	244,971	234,700
San Diego	22,533	30,544

Based on Department commercial fishery records, as of 2017 most participating fishermen in the Hagfish fishery were those without special permits, either vessel or individual. In 2017, of the 44 participating fishermen, 27 did not hold additional permits to other fisheries. The remaining fished Hagfish while in between seasons or in the case of salmon, closure of their fishery. Of the 43 vessels used in the 2017 season, 22 did not have any vessel-based permits. Nineteen participating vessels were permitted as salmon or Dungeness Crab vessels. Due to the variability or lack of other fishing opportunities, in any given month participation was approximately 20 fishermen.

3 Management

3.1 Past and Current Management Measures

The Hagfish fishery began with no regulations or management oversight. A series of regulations were enacted in Fish and Game Code (Table 3-1) after the market-induced collapse in 1991. Additional management measures were enacted ten years after the last amendment to Hagfish regulations in Fish and Game Code.

Table 3-1. Additions or amendments to Hagfish fishing statutes and regulations in California by year.

Year	Fish and Game Code or Title 14	Addition or amendment	Result
1995	FGC	Addition §9001.6	Established a Finfish Trap Permit; no popups for buoy lines; destruct device that conforms to current devices adopted by the Commission required for finfish traps.
1996	FGC	Amendment §9001.6	Allowed take of Hagfish in Korean and bucket traps; when in possession of Korean or bucket traps, no finfish other than Hagfish shall be taken or possessed.
1997	FGC	Amendment §9001.6	Established dimensions of Korean and bucket traps; establishes 2003 as sunset year.
1998	FGC	Amendment §9001.6	Established trap limits of 500 for Korean traps and 200 for bucket traps.
2001	FGC	Amendment §9001.6	Established requirement of General Trap Permit for take of Hagfish; extend sunset year to 2006.
2004	FGC	Amendment §9001.6	Clean up of Section 9001.6.
2014	Title 14	Addition §180.6	Required a minimum hole diameter of 0.56 in (14 mm) for all holes except the entrance.
2015	Title 14	Amendment §180.6	Allowed for take of Hagfish in 40 gallon (151.4 liter) barrel traps; If barrel traps are used, may be attached to no more than three ground lines.
2016	Title 14	Amendment §180.6	Replaced 40 gallon (151.4 liter) requirement with maximum allowable dimensions (40 in long x 25 in outside (1016 mm long x 635 mm outside) diameter).

3.1.1 Overview and Rationale for the Current Management Framework

The Hagfish fishery is an open access, state-managed commercial fishery. The fishery was initially managed through legislation with management measures found in Section 9001.6 of the Fish and Game Code (FGC). However, beginning in 2014, the Commission implemented regulatory measures, located in Title 14 of the California Code of Regulations (CCR). Statutes and regulations relevant to the Hagfish fishery are summarized in Table 3-1. The fishery began with minor landings occurring during the period 1982 to 1984, with significant landings from 1988 to 1992. However, legislation to manage the fishery was not enacted until 1995.

The fishery is managed via restrictions on the amount and type of gear allowed. The rationale behind these early regulations that limited the number of traps each participant may deploy was to help prevent overfishing and limit gear abandonment. Additional regulations enacted in 2014 require that all trap holes be at least 0.56 in (14.0 mm) in diameter to minimize trap retention of immature Hagfish (Tanaka and Crane 2014). The authorization of barrel traps for Hagfish take gives fishermen an option that reduces loss due to crowding, minimizes gear conflicts, and, depending on the number of fishermen that switch to barrels, would limit the number of traps in contact with the bottom. There is no reporting requirement, other than a landing receipt, for this fishery. Currently, there is no minimum size limit, landing quota, or seasonal closure. Hagfish fishing is allowed in all depths within state and federal waters off California except in Marine Protected Areas (MPAs). There are no daily, seasonal, or annual catch limits.

3.1.1.1 Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild

MLMA defines "overfishing" as a rate or level of take that the best available scientific information, and other relevant information, indicates is not sustainable or that jeopardizes the capacity of a marine fishery to produce the maximum sustainable yield on a continuing basis.

The Department has not yet established any biological reference points or other criteria which could be used to classify the Hagfish fishery as overfished or to determine when overfishing occurs. However, the Department monitors the average Count Per Pound (CPP) in the catch, which is a proxy for the average size of Hagfish landed by the fishery (see Section 4). The time series of CPP data is intended as a means of detecting truncation of the underlying population size structure, which can be indicative of a decline in population abundance. A sustained increase in CPP would indicate that the average fish size in the population was reduced and would consequently trigger a more thorough investigation of other possible indicators of stock status. Department staff are currently developing a method for determining a CPP threshold which approximates an overfishing limit, but no specific management action is prescribed if such a threshold is surpassed.

3.1.1.2 Past and Current Stakeholder Involvement

Department staff have working relationships with some Hagfish fishermen, buyers, and processors, primarily in central and northern California. This facilitates valuable exchanges of information, an understanding of the market-related factors driving the fishery, and an opportunity to sample landed Hagfish for life history information. In the recent past, Department staff have worked on an ad-hoc basis with fishermen to develop and implement regulations for a minimum hole diameter in Hagfish traps, which became effective in 2015. Department staff also worked with fishermen to develop and implement the use of barrel traps in the fishery, which were not permitted prior to 2015; this included onboard observations during the experimental phase of gear testing.

3.1.2 Target Species

3.1.2.1 Limitations on Fishing for Target Species

3.1.2.1.1 Catch

There are no limits on the amount of Hagfish that can be landed. The Hagfish fishery is currently a single species fishery. Black Hagfish is a related species present and available in deeper waters but are not currently desirable in the export market and thus not targeted by the California fishing fleet. Fishermen are prohibited from retaining other species of finfish when targeting Hagfish or in possession of Hagfish.

3.1.2.1.2 Effort

The Hagfish fishery is open access. Fishermen are required to obtain a General Trap Permit to participate in the fishery. Although the Hagfish fishery is open access, fishing capacity per vessel is limited through trap limits (see Section *3.1.2.1.3*).

3.1.2.1.3 Gear

Under the authorization of FGC and CCR Title 14, Hagfish may be taken in bucket, Korean, or barrel traps. No other method of take is allowed. Following the fishery of 1988 to 1991, Korean and 5.0 gallon (18.9 liter) bucket traps were the only methods authorized. Korean traps are approximately 21 in (533 mm) long with a diameter of 5 in (127 mm). Fishermen can fish 500 Korean or 200 5.0 gallon (18.9 liter) bucket traps, but not both.

After receiving a petition for an experimental gear permit to use 40.0 gallon (151.4 liter) barrel traps in 2014, the Department evaluated this potential gear with the cooperation of commercial fishermen. Barrel traps, which are larger, improve the landing condition of captured Hagfish and may result in less dead loss due to crowding. Subsequently, in 2015 the Department recommended to the Commission that 40.0 gallon (151.4 liter) barrel traps be approved as a method of take for Hagfish, with a maximum of 25 traps per vessel. In a later rulemaking, the volumetric requirement of 40.0 gallon (151.4 liter) was replaced with a maximum dimensional requirement. This allowed flexibility in selecting barrels for trap construction.

Regardless of the trap fished, all Hagfish traps are fished in a string on weighted groundlines (Figure 2-3). Fishing on a groundline is efficient and reduces the amount of gear compared to fishing traps with individual vertical lines and floats. Fishermen using barrel traps may spread out their barrels over no more than three groundlines. There is no groundline requirement for bucket or Korean traps. Commercial trap fishermen must service their gear every 96 hours (hr).

Hagfish traps have multiple holes drilled in the trap. This allows water flow and can act as a means of escapement for small Hagfish. After a Department study (Tanaka and Crane 2014) showed a direct relationship between escapement of small Hagfish and trap hole diameter, the Commission adopted a regulation for a minimum hole diameter of 0.56 in (14.0 mm), except for the trap entrance. It is possible to circumvent this added protection by what is known as short-soaking the traps. Small Hagfish are known to leave traps once the bait is completely consumed. Pulling traps before this occurs will not allow small Hagfish to escape.

3.1.2.1.4 Time

The Hagfish fishery is open year-round.

3.1.2.1.5 Sex

There are no restrictions on the take of Hagfish by sex; it is impossible to determine Hagfish sex externally.

3.1.2.1.6 Size

Hagfish are often sold live and are difficult to measure. Consequently, there is no minimum legal size for Hagfish since it would be difficult if not impossible to implement and enforce. As an alternative, the Commission established a minimum hole diameter of 0.56 in (14.0 mm) for Hagfish traps which reduces the number of small Hagfish retained (Tanaka and Crane 2014). To some extent, the market also influences the size of Hagfish targeted and retained by the fishery. During the eel-skin fishery of 1988 to 1991, the industry preferred Hagfish 14.2 in (361.0 mm) or longer (Tanaka and Crane 2014). Since the fishery has switched to landing in live condition for human consumption, weight is more important than length and live Hagfish are difficult to measure. The export market will use Hagfish of all sizes, but potential buyers could decline shipments with large numbers of immature Hagfish.

3.1.2.1.7 Area

There are no specific area restrictions for the Hagfish fishery, other than those discussed below.

3.1.2.1.8 Marine Protected Areas

Pursuant to the mandates of the Marine Life Protection Act (Marine Life Protection Act) (FGC §2850), the Department redesigned and expanded a network of regional MPAs in state waters from 2004 to 2012. The resulting network increased total

MPA coverage from 2.7% to 16.1% of state waters. Along with the MPAs created in 2002 for waters surrounding the Santa Barbara Channel Islands, California now has a statewide scientifically-based ecologically connected network of 124 MPAs. The MPAs contain a wide variety of habitats and depth ranges.

Even though the use of MPAs as a fishery management tool was not one of the primary goals of the MLPA, they function as one for the following reasons:

1. They serve as adaptive spatial closures to fishing if the species of interest is within their boundaries and is prohibited from harvest. Under the MLPA, the Department has the authority to evaluate the effectiveness of the closure, possibly resulting in changes in allowance for extractive practices.
2. They function as comparisons to fished areas for relative abundance and length or age/frequency of the targeted species.
3. They serve as ecosystem indicators for species associated with the target species, either as prey, predator, or competitor.
4. Many of the MPAs served to displace fishing effort when they were implemented.

Although the network of MPAs was not designed specifically to protect populations of Hagfish, some MPAs have significant amounts of soft bottom in depths exceeding 318 ft (100 m), which Hagfish prefer. Within state waters along the California mainland and island coasts there are 669.9 mi^2 (1,735.0 km^2) of soft bottom habitat in depths of 318 to 9,840 ft (100 to 3,000 m) (Table 3-2). The state's network of MPAs shelter 139.6 mi^2 (361.6 km^2) or 20.83% of available soft bottom habitat between 318 and 9,840 ft (100 and 3,000 m) (Table 3-3). While a significant proportion of Hagfish habitat, as well as the fishery, occurs outside state waters, the network of protected soft bottom habitat within state waters may have direct benefits by protecting a segment of the population that could contribute to rebuilding the populations around the MPAs should fishery depletion occur.

Table 3-2. Total square miles of soft bottom habitat in depths of 100 to 3,000 m within State waters off California (California Seafloor and Coastal Mapping Project 2017).

Depth (meters)	North Coast	North-Central Coast	Central Coast	South Coast	Total
100 to 200	62.8	5.5	73.3	158.4	300.0
201 to 3,000	7.7	0.0	127.9	234.3	369.9
Total	70.5	5.5	201.2	392.7	669.9

Table 3-3. Total square miles of soft bottom habitat in depths of 100 to 3,000 m within California MPAs by region (California Seafloor and Coastal Mapping Project 2017).

Depth (meters)	North Coast	North-Central Coast	Central Coast	South Coast	Total
100 to 200	10.2	3.8	17.0	41.2	72.2
201 to 3,000	2.2	0.0	26.7	38.5	67.4
Total	12.4	3.8	43.7	79.7	139.6

3.1.2.2 Description of and Rationale for Any Restricted Access Approach

There is currently no restricted access program for Hagfish. The fishery is open access, and anyone with a General Trap Permit can participate in the fishery.

3.1.3 Bycatch

3.1.3.1 Amount and Type of Bycatch (Including Discards)

The Fish and Game Code (FGC §90.5) defines bycatch as “fish or other marine life that are taken in a fishery, but which are not the target of the fishery.” Bycatch includes “discards,” defined as “fish that are taken in a fishery but are not retained because they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained” (FGC §91). The term “Bycatch” may include fish that, while not the target species, and are desirable and are thus retained as incidental catch and does not always indicate a negative impact.

Information regarding bycatch in this fishery is minimal. There is no method in place to monitor bycatch routinely in the Hagfish fishery. Retention of finfish bycatch is prohibited, so these species are discarded at sea. Based on Department observations, the Hagfish trap fishery is a relatively “clean” fishery with little to no bycatch.

The Department conducted two studies on Hagfish trapping. Over four days of trapping, using 96 5 gallon (18.9 liter) bucket traps, 7,595 (1,818 lb) (824.6 kg) Hagfish were caught, and one live octopus and one live Pacific Sanddab were observed as bycatch (Tanaka and Crane 2014). In the second study, barrel traps were evaluated through onboard observation and fishermen logbooks. Department observers documented the entire contents of 74 barrel traps with no observed bycatch (Tanaka 2015). In addition, voluntary fishermen logbooks reported no bycatch on trips without Department observers on board. Related to the barrel trap study, the Department sought to test the rate of dead loss in bucket traps (Tanaka 2015) by setting two strings of 20 baited bucket traps. Prior to setting the traps, video of a baited bucket trap was taken to verify that the area held Hagfish. The footage revealed that Pacific Sanddabs, Sablefish and Dungeness Crabs showed interest in the trap, but none entered. Upon retrieval, one live octopus and one live juvenile Sablefish were the only observed bycatch. A total of 2,781 Hagfish were released alive and 68 were dead after an overnight soak.

The Hagfish fishery is a deep-water trap fishery, thus there are no interactions with birds and small marine mammals such as otters. There are no documented instances of entanglement with large marine mammals. The likelihood of entanglement is reduced by the fact that Hagfish traps are fished on a single groundline, as opposed to single traps attached to individual buoys. National Oceanic and Atmospheric Administration (NOAA) Fisheries-Office of Protected Resources classifies California Hagfish trap fishery as Category III with no known marine mammal interactions (NOAA Fisheries 2016).

To be proactive in reducing the chance of entanglement, the Commission approved the Department's request to authorize barrel trap gear with no more than three groundlines for Hagfish take in 2015. There are no regulations for the number of groundlines for bucket or Korean trap gear.

3.1.3.2 Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch

As described above, the Hagfish trap fishery is relatively clean with minimal bycatch of other species. Immature Hagfish are the only significant bycatch in the Hagfish trap fishery. The use of 0.56 in (14.0 mm) holes is the only restriction in place to minimize trap retention of small Hagfish. Prior to the 0.56 in (14.0 mm) requirement, California fishermen were using hole diameters from 0.38 to 0.56 in (10.0 to 14.0 mm). By requiring a 0.56 in (14.0 mm) minimum hole diameter, the potential for retention of immature Hagfish (Figure 3-1) is reduced as shown in Tanaka and Crane (2014). The study showed 0.56 in (14.0 mm) diameter holes provide a trade-off between minimizing retention of immature Hagfish and maintaining the viability of the fishery. In the figure below, maturity was compared to results from Gorbman and Dickhoff (1978) and Barss (1993).

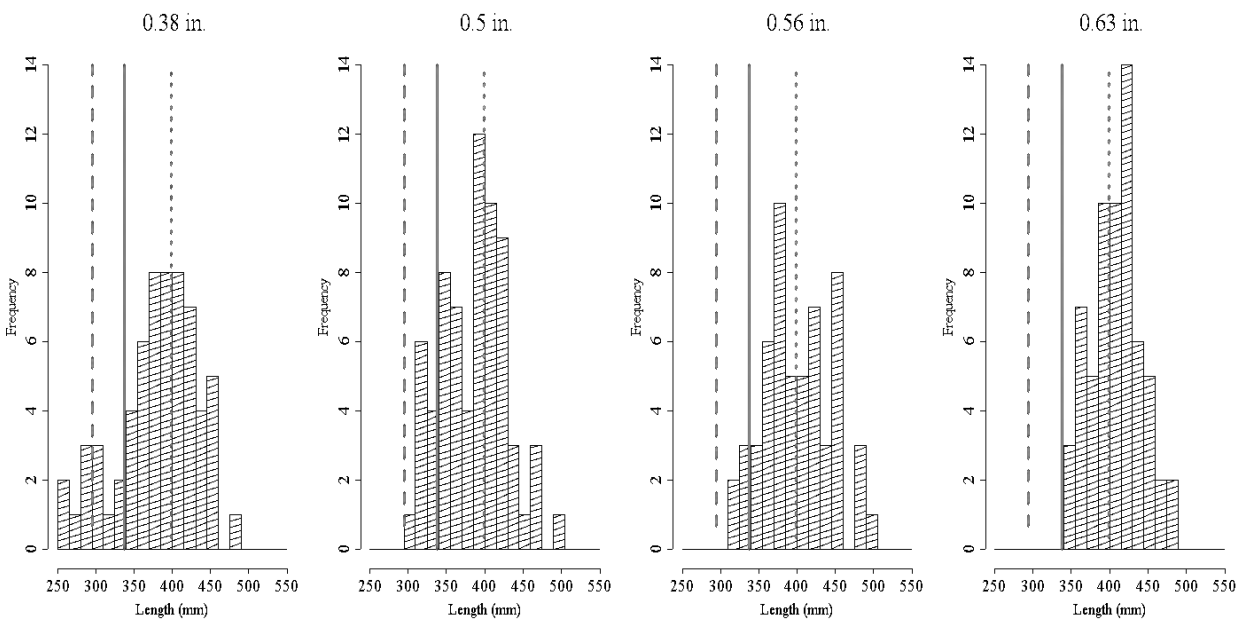

Figure 3-1. Trap retention of immature Hagfish is related to trap hole diameter, as studied by Tanaka and Crane (2014) Sampled female Hagfish results (solid line) from Tanaka and Crane (2014) as compared to Reid (1990) (dashed line) and Gorbman and Dickhoff (1978) (dotted line). First observed maturity, for the purposes of this study is considered Condition 2 as described by Barss (1993).

Discard Mortality

There is no discard mortality estimate for this fishery, except for dead-loss due to crowding. Typically, all live Hagfish are retained regardless of length. Sorting of live Hagfish at sea is labor intensive and not practical. Some fishermen do report doing minimal sorting, with smaller, live Hagfish getting released overboard. There is no information on the survival of these Hagfish upon release.

Over the course of dockside sampling, fishermen have reported dead loss due to crowding in bucket traps. Fishermen report that when there are dead Hagfish, usually the entire bucket is dead due to crowding. This dead loss is discarded at sea. To estimate dead loss, the Department conducted its own dead loss study. A total of 61 dead Hagfish and 2,781 live Hagfish (2.1%) were counted for 32 traps (Tanaka, unpublished Cruise report 2014). No dead loss was reported while evaluating barrel traps.

Commercial trap fishermen must service their gear every 96 hr. Regular servicing lessens mortality of captured species and reduces the potential for lost gear due to traps filling with mud or sand. All traps must have a destruct device to prevent “ghost fishing” and to release captured fish should the trap become lost.

Pursuant to a regulation effective in 2014, all holes, except for the entrance must be at least 0.56 in (14.0 mm) or greater in diameter. When fished on longer soaks and the correct amount of bait for the trap used, 0.56 in (14.0 mm) holes allow for escapement of smaller, immature Hagfish, thus reducing discards as well as minimizing discard mortality.

The Hagfish trap fishery has no documentation of impacts to threatened, endangered, or overfished species. Department sampling, both onboard and dockside, has not documented the retention of any such species. Federally, the Hagfish trap fishery is considered a Category III with no documented interactions with marine mammals. Category III fisheries have a remote likelihood of or no known interactions with marine mammals.

3.1.4 Habitat

3.1.4.1 Description of Threats

The Hagfish trap fishery has minimal impact to the seafloor. Hagfish are targeted over deep water, soft mud bottom habitat. Traps, lines, and anchors are deployed and retrieved by lowering to and lifting from the seafloor. This method and gear have less overall contact when compared to gears that drag.

Hagfish habitat may be subject to trawling from groundfish fisheries. Benthic trawls, including those that are considered “light touch” can temporarily disturb, but not significantly alter, soft bottom habitat (Wick T, Tanaka T, Pradham N, Enriquez L. pers. comm.).

3.1.4.2 Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing

In addition to improving the landing condition of captured Hagfish, barrel traps potentially have less effect on the substrate than bucket traps due to fewer traps

deployed and less line/weights to fish this gear. Fishermen that choose barrel traps are required to use three ground lines or less for their 25 traps. Based on Department interviews, fisherman use three to five ground lines to fish 200 bucket traps (Tanaka, pers. comm.).

3.2 Requirements for Person or Vessel Permits and Reasonable Fees

The Hagfish fishery is open access and participation does not require any fishery-specific permits. Participants do need a commercial fishing license, vessel registration, and a general trap permit. The fees associated with each of these are shown in Table 3-4. Additionally, Hagfish receivers also require a license; the type of license depends on the activities of that business (Table 3-4).

Table 3-4. List of commercial license and permit fees related to the Hagfish fishery 1 April 2018 to 31 March 2019. Note that fees associated with fish business licensing are based on a calendar year, January to December. (CDFW License and Revenue Branch 2018).

Commercial License	Permit Fee (US dollars)	Description
Resident Commercial Fishing License	$141.11	Required for any resident 16 yr or older who uses or operates or assists in using or operating any boat, aircraft, net, trap, line, or other appliance to take fish for commercial purposes, or who contributes materially to the activities on board a commercial fishing vessel.
Nonresident Commercial Fishing License	$417.75	Required for any nonresident 16 yr or older who uses or operates or assists in using or operating any boat, aircraft, net, trap, line, or other appliance to take fish for commercial purposes, or who contributes materially to the activities on board a commercial fishing vessel.
Commercial Boat Registration (Resident)	$367.25	Required for any resident owner or operator for any vessel operated in public waters in connection with fishing operations for profit in this state; or which, for profit, permits persons to sport fish.
Commercial Boat Registration (Nonresident)	$1,807.00	Required for any nonresident owner or operator for any vessel operated in public waters in connection with fishing operations for profit in this state; or which, for profit, permits persons to sport fish.
Trap Permit	$52.27	Required for any person who uses traps to take finfish, mollusks, or crustaceans for profit except Spiny Lobster and Dungeness Crab, as defined in FGC §9001. Dungeness Crab can only be taken on vessels with a valid Dungeness Crab vessel permit. Commercial fishermen can only take Spiny Lobster under the authority of a Spiny lobster operator permit. Spot Prawn can only be taken on vessels with a valid Spot Prawn Trap Vessel Permit.

Fish Receiver's License	$798.25	Any person who purchases or receives fish for commercial purposes from a commercial fisherman not licensed as a fish receiver must obtain a Fish Receiver's License.

Some of the costs associated with management of the fishery by the Department are borne by the fishermen, fish receivers, and processors. In addition to licensing fees, fish businesses in California must pay a landing fee for all fish purchased. The landing fee rate is set in FGC §8051. The rate for Hagfish is $0.0067. In 2017, California fish businesses collectively paid $2,727 in landing fees for Hagfish.

4 Monitoring and Essential Fishery Information

4.1 Description of Relevant Essential Fishery Information

FGC §93 defines Essential Fishery Information (EFI) as “information about fish life history and habitat requirements; the status and trends of fish populations, fishing effort, and catch levels; fishery effects on age structure and on other marine living resources and users, and any other information related to the biology of a fish species or to taking in the fishery that is necessary to permit fisheries to be managed according to the requirements of this code”. Some Hagfish life history parameters have not been determined (see Section 5), age and growth, reproductive potential, movement and migration, and natural mortality. Since Hagfish are impossible to measure in live condition, the Department uses CPP to evaluate the average size of the fish in the landing. All other practical life history parameters that are feasible to determine are done in the lab, including individual fish length, weight, sex, and spawning status. Other EFI parameters are examined through long-term monitoring of the fishery, as discussed in Section 4.2.

4.2 Past and Ongoing Monitoring of the Fishery

4.2.1 Fishery-dependent Data Collection

The Department’s (Marine Region) Northern and Central California Finfish Research and Management Project monitor the Hagfish fishery through use of landing receipts and opportunistic dockside sampling. Fishery-dependent collection of Hagfish data began in 2008 with samples taken from Monterey area vessels. Other than tracking landings, the Department did not collect fishery-dependent data from the 1988 to 1991 Hagfish fishery. Logbooks are not required for this fishery. The Department has received limited voluntary logbook data from a small number of fishermen.

All fish taken (species and weight) under a commercial fishing license are documented on a landing receipt provided by the Department. Landing receipts record date of fish purchase, fisherman information (name, license number), vessel name and number, species, weight, price, block location of catch and gear type. In many fisheries, landing receipts are the primary means of monitoring, and particularly for those fisheries like Hagfish that have no catch quota or closed seasons. When coupled with sample data and a comprehensive understanding of the dynamics of the fishery, landing receipts could be reasonable indicators of the status of the fishery. While not often used, condition and use of fish categories are available. Fish businesses making the purchase must provide the business name and license number. Both the fisherman and business receiving the fish must sign the document signifying that the information provided is true and correct. Upon submission to the Department, staff edit each receipt for correctness and clarity of information provided. If errors are suspected, staff will contact the fisherman or fish business to verify.

In addition to landing totals, the Hagfish fishery is monitored opportunistically dockside by full-time staff or volunteers as schedules and office location allow. Not all ports of landing are sampled. Basic sampling protocol is as follows:

1. Using a 5.0 gallon (18.9 liter) bucket, a sample of fish is taken, preferably mixing the fish in the container while scooping because larger Hagfish typically force the smaller Hagfish to the surface. Water can drain, and slime or other debris is removed.
2. The bucket and fish are weighed.
3. Fish are counted into a separate container, allowing the sampler to continue to sample the tote.
4. The remaining slime and bucket are weighed, which becomes the tare weight for the bucket sample.
5. The CPP is calculated by dividing the counted number of Hagfish by the weight.

A lower CPP indicates a larger average size of Hagfish and vice versa. The export market prefers a minimum CPP of 3.60 to 4.00 (Tanaka and Crane 2014); in this size range, most Hagfish are mature. However, recent market sampling and discussions with Hagfish buyers indicate that the desired CPP is only a target.

Department staff may opportunistically take a sample of fish to process as a fresh laboratory sample as time permits. Freezing Hagfish for later processing is not practical and not useful for sample purposes. Sex and spawning status are difficult to determine in thawed Hagfish because often the gonads are in poor condition due to freezing. Lab samples are processed for individual fish length, weight, sex, and spawning status as described by Barss (1993) (Table 4-1). While spawn status is recorded for both sexes, female condition status is the most important.

Table 4-1: Female Hagfish spawning status criteria (Barss 1993).

Stage	Condition	Criteria
1	Immature	All round eggs
2	Maturing, but not mature	Some oblong eggs; >1 and <5.0 mm (0.04 to 0.2 in) in length; no empty ovarian capsules present
3	Mature, ova developing	Oblong eggs >5.0 mm (0.2 in) without hooks present
4	Mature, developed	Large eggs ≥20.0 mm (0.79 in) with hooks present
5	Mature, spent	Large, empty ovarian capsules present

Average CPP and laboratory data are used to document and track the status of the fishery. It is important to note that average CPP may depend upon fishery practices, such as short soaking traps or using excessive bait. Both would result in increased retention of smaller Hagfish. Shorter soak time does not allow enough time for smaller Hagfish to escape, especially if the bait is not exhausted. Using excessive bait promotes retention because the fish do not have a reason to try to escape. These fishing practices would result in an increase in CPP (smaller Hagfish). Department studies indicate that Hagfish 13.3 in (338.0 mm) or shorter are immature (Tanaka and Crane 2014). Hagfish of this length, depending upon weight, translate to a CPP greater than six. If the CPP suggests that fishermen are taking significant numbers of immature

Hagfish or market demand changes to wanting smaller fish, additional management measures may be necessary. Some fishermen commented that fishing depth may influence how many small Hagfish are trapped. Nakamura (1991) found that the average length decreased from 15.7 in (398.0 mm) at 300 ft (91 m) to 12.2 in (310.0 mm) at 900 ft (274 m).

A summary of Department Hagfish sampling data since 2008 shows relatively high variability in average CPP, both among ports and within a port among years (Figure 4-1). An increasing trend indicates a decreasing average size of Hagfish, however there is no established threshold that could trigger management action. After the 0.56 in (14.0 mm) minimum hole diameter requirement went into effect in 2014, average CPP was generally lower in the Morro Bay and Eureka areas. However, the longest continuous database from Eureka shows no consistent trend over an 8 yr span. Fishermen in Eureka reported that they were using 0.56 in (14.0 mm) diameter holes prior to the regulation change.

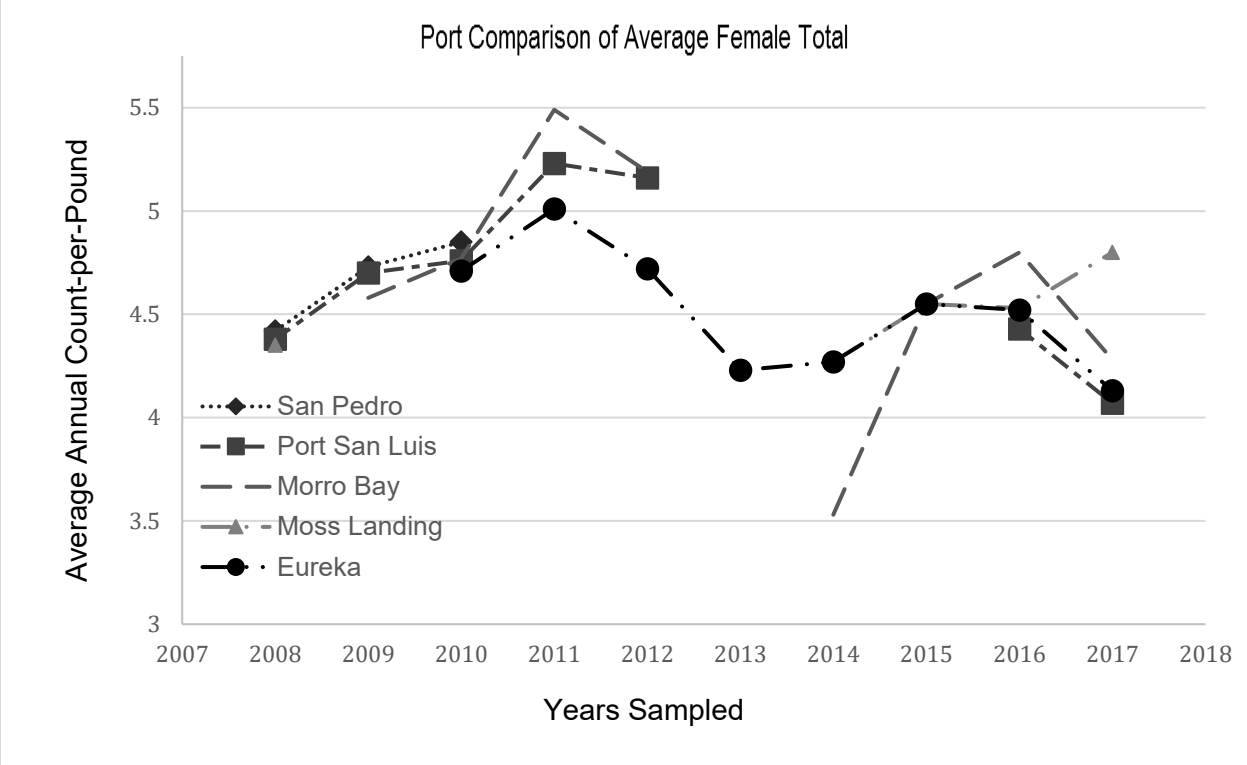

Figure 4-1. Average annual CPP by port area. In 2014, the requirement for a 0.56 in (14.0 mm) minimum hole diameter became effective (CDFW Hagfish Sample Data 2017).

Like the CPP data, the annual average female Hagfish TL has varied both within and among ports. This is particularly true in San Pedro and Morro Bay, but with a slight increasing trend (Figure 4-2). Reasons for this change could be related to the mandatory hole diameter regulation and longer soak times on gear. Lengths in Eureka were consistent and then increased in 2016, and again in 2017. Fishing practice in Eureka has not changed; the reason for the increase in length is unknown.

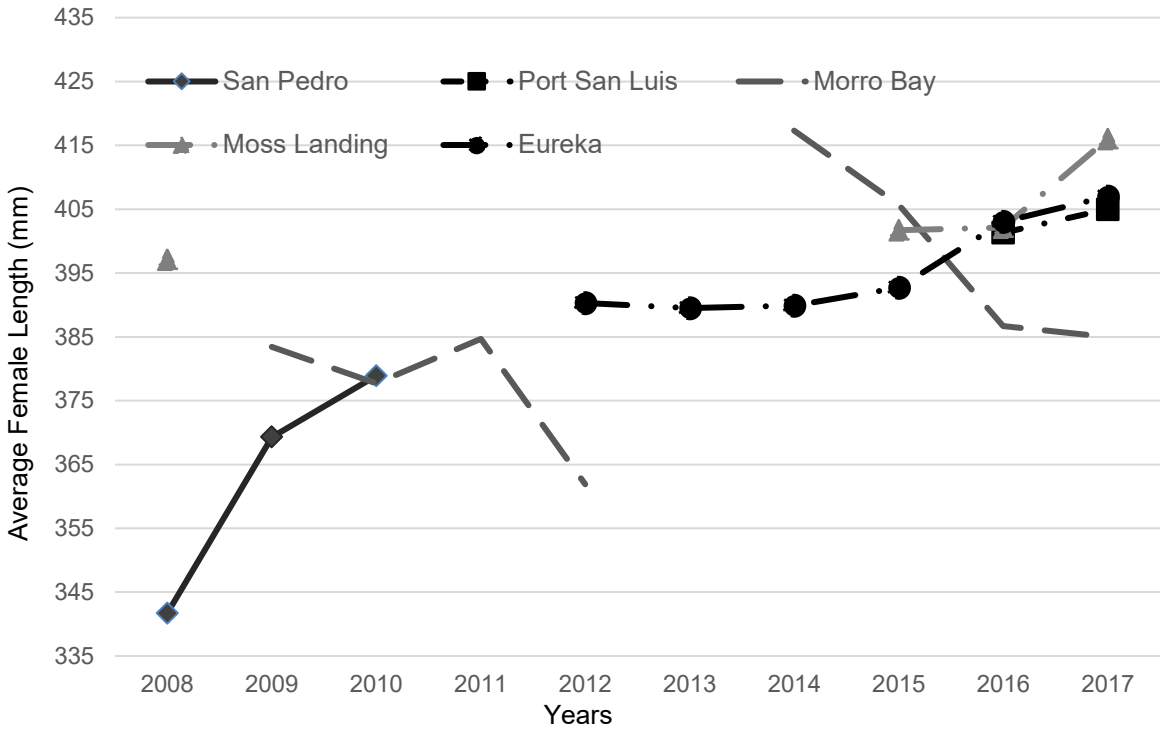

Figure 4-2. Average annual female Hagfish total length by port area based on Department sampling (CDFW Hagfish Sample Data 2017).

4.2.2 Fishery-independent Data Collection

There is no on-going fishery-independent monitoring of this fishery, but fishery-independent studies have been conducted to answer specific research questions. In March 2013, Department staff conducted a fishery independent study to test the influence of trap hole diameter on the average size of retained Hagfish. As part of the survey design, fishermen were interviewed to determine what hole diameters, number of traps, preferred bait, and typical soak duration were used by the fleet. Staff tested four hole diameters ranging from 0.38 to 0.63 in (10.0 to 16.0 mm). Bait type and amount were standardized. Retained fish were evaluated using the count per kg method (kg instead of lb) and a sample was retained for laboratory analysis to document length, weight, sex ratio, and spawning maturity per hole diameter. This study found that increasing hole diameter resulted in reduced catch with the benefit of decreased retention of immature females and retention of larger fish (Figure 4-3) (Tanaka and Crane 2014). Minimal bycatch was observed.

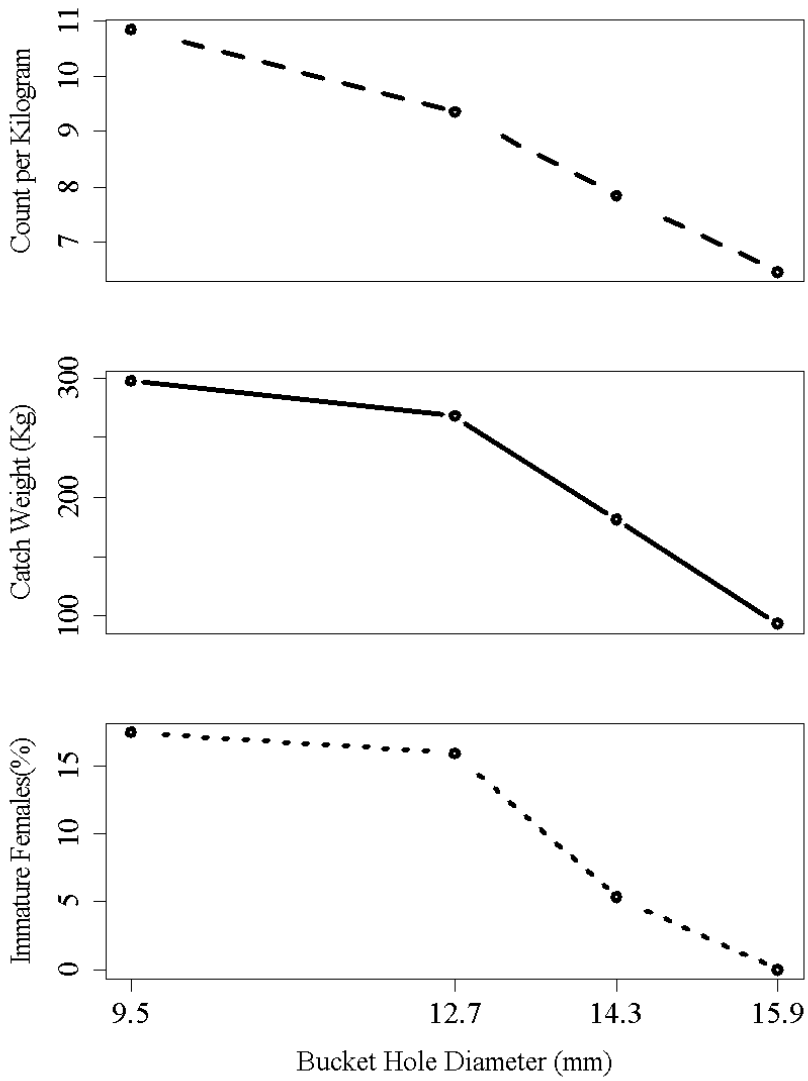

Figure 4-3. Results from a trap hole diameter study suggests holes 14.3 mm (0.56 in) in diameter are a compromise between retained catch and escape of immature female Hagfish (Reproduced from Tanaka and Crane 2014).

As a follow-up to this study, and to answer questions regarding the rate of dead loss in bucket traps, Department staff deployed and retrieved two strings of 20 traps after an overnight (>24 hr) soak. Traps were baited using quantities like those in the commercial fishery (Tanaka, unpublished Cruise Report). One live octopus and one live juvenile Sablefish were the only observed bycatch. A total of 2,781 Hagfish were released alive and 68 were dead. Most of the dead loss came from a single trap that was filled.

5 Future Management Needs and Directions

5.1 Identification of Information Gaps

Considered a data poor species, many Hagfish life history parameters have not been determined, age and growth, reproductive potential, movement and migration, and natural mortality (Table 5-1).

Table 5-1. Informational needs for Hagfish and their priority for management.

Type of information	Priority for management	How essential fishery information would support future management
Population age structure	High	Key component to recruitment estimate
Number of spawning waves and seasonal maturity	High	Used to determine temporal trends and changes in spawning patterns and sex ratio. Could be compared to effort periods in the fishery and potential impacts
Age and growth	High	Information is required to estimate recruitment, mortality, and year class distribution.
Stock distribution	Medium	Could be used to track distribution shifts due to environmental changes

These and others are discussed below.

5.2 Research and Monitoring

5.2.1 Potential Strategies to Fill Information Gaps

EFI is gathered by the Department from a variety of sources, including voluntary logbooks, landing receipts, onboard observations, dockside sampling, and laboratory work. The MLMA states that EFI is important and required for sustainable fisheries management. While the Department monitors the Hagfish fishery through landings and dockside sampling, many EFI are lacking, most notably the subjects discussed below (listed in order of priority). Some of these topics would be well suited to graduate students independently conducting research for their theses or dissertations. Others would be better suited for collaborative research with fishermen and the Department. Some EFI parameters have been previously studied, but further research is still needed.

Stock Distribution

It is unknown if the population (by sex and size class) is distributed by depth, has sub-populations, or is generally a mixed population across all strata. A standardized trap study stratified by habitat and depth in unfished areas could provide enough data to address the question of distribution on a broad scale.

Stock Composition

Stock composition collectively refers to the length frequency distribution, abundance, and sex ratio of a stock. Data about stock composition, especially by depth strata, would be important in the event of any management action needed due to an issue in the fishery. Length frequency is typically used to determine growth rate. However, length frequency from commercial catch will not reflect the length frequency of the unfished population due to the selectivity of the fishing gear, which is unlikely to retain small individuals. An extensive trap survey using trap gear with no escapement holes is required to sample the entire available size range of a population. The catch should be representative of the size frequency of the population above the size of 100% selectivity, and therefore still provides information on the composition of most of the stock.

Based on Department sampling data, the percentage of older, larger female Hagfish may be declining in the catch. In 2015, 12.4% of sampled females were 17.7 in (450.0 mm) (15+ yr) or longer. This percentage decreased in 2016. In 2017, samples had 3.9% of females 17.7 in (450.0 mm) or longer. This is an indication that the fishery has removed a great majority of the older, larger females from fished areas.

Recruitment

Larval recruitment and relative abundance data could indicate future availability of the fishery. However, very little is known about Hagfish spawning and larval recruitment. The Department does limited monitoring of recruitment into the fishery by documenting the presence of immature Hagfish in the catch through dockside sampling. However, the market prefers larger Hagfish and gear restrictions are in place to reduce the take of immature fish.

Hagfish have a low fecundity rate and it is unknown how often a female will go through a spawn cycle. It is also unknown how the densities of Hagfish impact their ability to reproduce. A specialized trap survey, like protocols used by Nakamura (1991) could be used to collect data on immature Hagfish smaller than 13.3 in (338.0 mm). Nakamura's survey captured immature fish, but not those that could be less than 1 yr old. Traps would need small diameter holes to retain Hagfish of all lengths. Sampling would occur across several isobaths to target multiple segments of the population should Hagfish segregate seasonally by sex or length. This trapping would have to occur several times a year in the same location to document changes in length composition, sex ratio, and spawning maturity.

Reproduction

More work is required to determine the periodicity of spawn cycles and maturation. By determining the seasonality of spawn, if any, could be used to correlate fishery closures to minimize take during the spawn season. Estimating sex ratio by season could also determine spawning periodicity. Nakamura (1991) suggested that a sex approaching 1 could indicate spawning activity.

Increased seasonal sampling and documenting the sex ratio could help identify seasonal shifts in spawning. The increased presence of spent females would indicate the end of the spawn cycle.

Indices of Abundance

A continuous time series of catch data for Hagfish is available, but a reliable measure of effort is needed to calculate a Catch Per Unit Effort (CPUE) based index of abundance with those data. Although logbooks containing effort information do exist for this fishery, they are currently voluntary, incomplete, and not representative of the activities of the fleet. In order to use CPUE as an index of abundance, it would be necessary to collect consistent logbook data that included appropriate measures of effort such as trap type, number of traps deployed, and total soak time. Fishermen using logbooks could report this information, thus the Department could make logbooks mandatory to capture this information.

Age and Growth

Nakamura (1994) conducted a Hagfish age and growth study utilizing fish marked and recaptured off San Luis Obispo County. Hagfish were also captured and held in an aquarium for comparison. Growth rates and age were estimated using positive growth (observed increase in length), negative growth (fish shrunk), and zero growth (no growth change). To better refine estimates, Nakamura (1994) suggested more work on Hagfish age and growth. Suggestions included work on population length-frequency distributions using a more sophisticated mathematical approach and exploring the possible use of statoliths to age Hagfish. Statoliths are hard, crystalline receptors in a sack-like structure and are used to maintain equilibrium. They are also found in gastropods and other invertebrates.

Target and Limit Development

Currently CPP is monitored, but there are no targets, limits, or other thresholds to help managers interpret CPP or link the CPP to the current health of the stock. If these reference points were developed it might be possible to use CPP to determine when management changes are necessary. A simulation model is currently in development which will provide insight into the relationship between observed CPP data obtained through sampling and the underlying Spawning Potential Ratio of the population. Results from the modeling effort should assist managers in defining target and limit

reference values for CPP and will also provide a measure of uncertainty associated with using CPP data as a population metric.

Movement Patterns

Hagfish do not exhibit long-range migration patterns but are known to move small distances. Based on logbook data, fishermen will fish an area until the area becomes unproductive and then move to new grounds, ultimately returning to the original area after significant time has passed. Areas previously depleted due to fishing tend to repopulate over time if left unfished. Understanding movement patterns would help managers understand fishing impacts and the benefits of unfished areas, such as MPAs. Tagging studies, especially in MPAs with soft bottom habitat, would be helpful in determining the rate of movement or replenishment of a fished area.

Mortality

Determining natural mortality of Hagfish in the environment is problematic, mostly due to the scope of work required. One method of estimating natural mortality is doing a tag-recapture study. Nakamura (1991) tagged and recaptured Hagfish as part of a population/biomass survey. Nakamura found that internal wire tags were the only tags feasible for use with Hagfish.

Fishing Mortality (F) is an estimate of the rate at which fish are caught and removed from the system. The most common methods for estimating F are either to estimate the total mortality via a catch curve analysis, or to have an estimate of the population size as well as amount landed each year. There are no estimates for F for Hagfish. Typically, all Hagfish retained by Hagfish traps are landed, although it has been reported that fishermen are asked by buyers to cull small Hagfish at sea. The rate of at-sea culling, as well as the survival of discarded individuals, is unknown. If management were to assume that all Hagfish caught by the fishery were retained, F may be overestimated. To accurately estimate F, a fleet-wide inventory of fishermen that cull and the amounts released is required. This can be accomplished with the use of logbooks to document discards.

Ecological Interactions

Hagfish serve as nutrient recyclers and facilitate substrate turnover through burrowing. However, in California more attention traditionally has been given to other habitat types that are closer to shore or have significant structure. Research and monitoring of deep mud habitat and associated species are desirable.

Habitat Coverage

An accurate estimate of area composed of soft mud bottom, both inside and outside MPAs, would be useful to extrapolate estimated density to total abundance. The Department has mapping data for soft bottom habitat within the State's three-mile jurisdiction, but the resolution does not exist to distinguish mud and sand habitats.

There is also a significant area outside of three miles within the depth-range of Black and Pacific Hagfish that has not been mapped, although much of it is likely soft bottom.

5.2.2 Opportunities for Collaborative Fisheries Research

The Department has collaborated in the past and will continue to work with outside entities such as academic organizations, non-governmental organizations, citizen scientists, and both commercial and recreational fishery participants to help fill information gaps related to the management of state fisheries. The Department will also reach out to outside persons and agencies when appropriate while conducting or seeking new fisheries research required for the management of each fishery.

Specifically, the Department has collaborated with fishermen and fishery-independent vessel contractors to obtain some valuable data sets used for management of the Hagfish fishery. These include the following: analysis of trap hole diameter in relation to Hagfish CPUE and sexual maturity of retained Hagfish; relative abundance of Hagfish in unfished areas; CPUE and bycatch using experimental barrel traps. The Department has also received limited voluntary logbook data from a small number of fishermen. Among the topics discussed in Section 5.2.1, stock distribution, indices of abundance, movement patterns, recruitment, and stock composition work would be particularly amenable to collaborative surveys with fishermen and independent contractors.

5.3 Opportunities for Future Management Changes

This section is intended to provide information on changes to the management of the fishery that may be appropriate but does not represent a formal commitment by the Department to address those recommendations. ESRs are one of several tools designed to assist the Department in prioritizing efforts and the need for management changes in each fishery will be assessed considering the current management system, risk posed to the stock and ecosystem, needs of other fisheries, existing and emerging priorities, as well as the availability of capacity and resources.

The Department's monitoring indicates that no management changes or action is required at this time. However, if the standard CPP metric used by the Department suggests that fishermen are taking significant numbers of immature Hagfish meaning that the average CPP shows the catch is primarily immature Hagfish, increased sampling and investigation would be required to verify that the catch reflects what is available in the population before considering management intervention.

To document information such as catch per set, catch location, soak duration, and environmental factors such as current speed, logbooks would become necessary

5.4 Climate Readiness

It is unknown whether cartilaginous, deep water species would experience enough temperature increase or change of pH at depth to alter behavior or survival.

Hagfish prefer deep soft bottom habitat due to stability of temperature and salinity. Even with an increase in SST, temperature change at depth may not increase enough to force migration (Norton 1994). pH is a function of depth and CO_2 in that pH decreases with depth due to increase in CO_2 produced by decay. At 500 to 1,000 m (1,640 to 3,280 ft), well within the depth range for Hagfish, pH is at its lowest (National Research Council 2010). The effect on Hagfish is unknown since acidification has the greatest impact on calcifying organisms. However, decrease in pH may negatively affect the invertebrates that Hagfish may feed.

Hagfish processors and fishermen may also experience negative impacts from climate change, which may necessitate some adaptation or innovation on their part. Since Hagfish are kept alive in tanks prior to sale, the processors need to circulate seawater that is typically pumped directly from the surface. During exceptionally warm water periods, Hagfish mortality is increased at port while they await shipment. Hagfish also experience high levels of mortality during dockside storage during low salinity that result from high levels of rainfall in nearshore environments. The industry may incur greater operating costs by circulating seawater through a chiller to reduce stress on stored Hagfish. Some operations may seasonally close during warming events.

There is a possibility that fishing pressure for Hagfish could increase in the future as a result of displaced effort from other fisheries which are more vulnerable to the impacts of climate change. For example, poor ocean conditions resulted in a closure of the commercial ocean salmon season in both 2008 and 2009, which resulted in increased participation in the Hagfish fishery. This increase in participation was short lived, and once salmon reopened the fishermen left the Hagfish fishery. Long-term participation increases may not be possible due to the infrastructure requirements to store and ship Hagfish.

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State of California
Department of Fish and Game

Flex your POWER

Memorandum

Date: ~~May 15~~ June 1, 2012

To: Sonke Mastrup
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: Agenda Item for June 20-21, 2012, Fish and Game Commission Meeting Re: Recommendation to Amend Regulations for the Commercial Take of Kelp and Other Aquatic Plants (Sections 165 and 165.5, Title 14, CCR)

On February 2, 2012, the Fish and Game Commission (Commission) directed the Department of Fish and Game (Department) to provide an approach and time line to revise antiquated kelp and other aquatic plant regulations (Sections 165 and 165.5, Title 14, CCR). The purpose of this informational item is to begin a formal discussion to improve management of marine algae. The Department recommends a three-phase reconstruction approach over several years to improve management and enforceability of the regulations.

Phase 1. Boundaries and Improved Guidelines

Request notice authorization at the Commission's October 3-4, 2012 meeting to consider these amendments to the existing regulations:

- Enhance descriptions of Administrative Kelp Bed (Kelp Bed) boundaries with spatially explicit latitude and longitude coordinates.
- Improve management of the mechanical harvest of giant kelp (*Macrocystis pyrifera*) by requiring a Commission-approved kelp harvest plan for all kelp beds.
- Improve spatial reporting requirements for kelp harvest.

Phase 2. Fees

Conduct public scoping meetings in 2012-2013, with assistance from the Commission, to explore options for increasing existing commercial license fees and royalty rates for harvesting giant kelp and bull kelp (*Nereocystis luetkeana*), edible seaweed, and agarweed to cover the long-term costs of managing these algae. By October 2013, the Department intends to have collected the necessary information to have had detailed discussions with the Commission's Marine Resources Committee.

After discussion in the Commission venue late in 2013, the Department will be prepared to ask the Commission to authorize notice of its intent to amend existing regulations concerning commercial license fees and royalty rates for the aforementioned resources.

Phase 3. Kelp Management and Harvest

Over the next three years (2013-2016), conduct a full review and potential rewrite of existing regulations to address management and harvest concerns identified by the Commission, kelp harvesters, and the public. This phase would include the following elements:

- Identify management and harvest issues and challenges by consulting and collaborating with kelp harvesters, the scientific community, and the public.
- Conduct public scoping meetings on a proposed project.
- Provide options for the Commission to consider revising the regulations.
- Draft an Initial Statement of Reasons for kelp regulations.
- Draft an Environmental Impact Report.

The Department looks forward to receiving input and guidance on this concept and to providing more detail and opportunity for discussion at future Commission and Marine Resource Committee meetings.

If you have questions or need additional information, please contact Ms. Marija Vojkovich, Regional Manager in the Department's Marine Region, by telephone at (805) 568-1246.

ec: Marija Vojkovich, Regional Manager
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Update on the Review of Commercial Harvest of Marine Algae Regulations

Marine Resources Committee Meeting
July 11, 2019

Rebecca Flores Miller
California Department of Fish and Wildlife

Photo Credit: R. Flores Miller

Outline

- Background
- Potential Regulatory Changes
- Timeline and Next Steps

Photo Credit: R. Flores Miller

Background

Phase One: *Kelp, Adopted in 2014*

Phase Two: *Edible seaweed, agar-bearing, and kelp*

- Broad overhaul
- Management strategies

Phase Three: *Edible seaweed, agar-bearing, and kelp*

- License fees and royalty rates

Photo Credit: Daniel Gotshall

Potential Regulatory Changes and Challenges

1. **Regulatory language cleanup and consistency**

2. **Revise the Commercial Kelp Harvest License**

3. **Consider harvest methods, limits, and seasons**

Challenges:

- Staff resources and capacity
- Recent kelp loss and recovery efforts

Timeline and Next Steps

- **March 2018:** Marine Resources Committee (MRC)
- **April, June, Dec 2018:** InterTribal Sinkyone Wilderness Council
- **Feb, June 2019:** Tribal Resources Committee (TRC)
- **~ July 2019:** Commercial permittee survey
- **Summer/Fall 2019:** Outreach activities
- **Oct 2019:** TRC Update
- **Nov 2019:** MRC Update
- **Dec 2019:** Commission Notice Hearing

Thank You ◈ Questions?

Rebecca Flores Miller
Environmental Scientist
Marine Region
831-649-2835

8. FISHING COMMUNITIES

Today's Item **Information** ☒ **Action** ☐

Explore the developing concerns about the sustainability and vitality of California's fishing communities and ports and what, if any, role FGC has in this issue.

Summary of Previous/Future Actions

- MRC initial discussion — Mar 4, 2015; Marina
- **Today's scoping** — **Nov 4, 2015; Ventura**

Background

Eleven public ports and numerous harbors dot the coast and waterways of California. Adjacent coastal communities that are reliant on certain fisheries and the fish harvesting industry are often referred to as "fishing communities," at various scales. Fishing communities depend on a number of conditions and players to sustain their vitality.

Over the past 15-plus years, many fishing communities have been confronted by challenges associated with changes in fishing or economic opportunity. Examples of challenges include fisheries management changes (e.g., management responses to address overfishing, overcapitalization and excess capacity in fisheries; loss of fish habitat, and fishery/area closures for species listed under the Endangered Species Act or federal rebuilding plans); environmental fluctuations in diversity, abundance, and distribution in fish assemblages, including those associated with climate change; and economic challenges related to increased competition in the global marketplace, and the recent economic downturn in general. The destabilizing effect of these challenges, and fishing/coastal community vitality and resilience, is a topic of active conversation along the Pacific coast, and nationwide (see exhibits 1-4).

FGC referred this agenda topic to MRC in 2014 following a petition from three northern California fishermen for new permits to fish for a more southerly species that had shown up in unusually high numbers due to warm water conditions. The petitioners, as well as supporters from northern California fish businesses and city representatives, made their case in support of the petitions based on the economic needs of local coastal communities reliant on fishing. While the specific request could not be granted without a lengthy regulatory and stakeholder process, FGC asked MRC to explore the issue of coastal community needs and the highlighted concerns.

Originally scheduled for discussion at the March 2015 MRC meeting, time constraints only allowed for an initial and very limited discussion. Today, staff will initiate further conversation with an overview of "fishing communities," guiding principles from the MLMA, and a report on current initiatives underway in California at the federal and local levels. One of the goals today is to hear from community members themselves, who are vital to clarifying the scope of the issues relevant to California fishing communities (see exhibits 5 and 6 for some perspectives originally submitted for the March 2015 MRC meeting).

Significant Public Comments

1. Assemblyman Jim Wood has expressed concerns about the needs of northern California coastal communities (Exhibit 5)
2. The California Wetfish Producers Association (CWPA) supports discussing the big big-picture issue of sustainable harbor communities (Exhibit 6)

Recommendation

Solicit public input on the scope of issues of concern regarding California's fishing community vitality and resilience, and evaluate if there are areas where FGC can play a role. What types of views, values, and concerns do different stakeholders, including coastal fishery participants, currently hold, and what can contribute to resilient fishing communities? What is the role that fishermen and local communities can play, that FGC and its policies can play, and how can stakeholders effectively engage and represent the concerns of their communities to help create more efficient and effective management?

Exhibits

1. California Sea Grant Extension Program webpage on fishing communities (https://caseagrant.ucsd.edu/project/discover-california-commercial-fisheries/fishing-communities), accessed Feb 26, 2015
2. Ocean Protection Council webpage on preserving California's fisheries (http://www.opc.ca.gov/2010/01/preserving-californias-fisheries/), accessed Oct 28, 2015
3. Maine Sea Grant, Best Practices for Working Waterfront Preservation: Lessons Learned from the Field, Mar 2013
4. National Working Waterfront Network webpage for Trinidad Harbor case study (http://www.wateraccessus.com/case_print.cfm?ID=31), accessed Oct 28, 2015
5. Letter from Assembly Member Jim Wood, received Jan 26, 2015
6. Email from Diane Pleschner-Steele, CWPA, received Feb 12, 2015

Committee Direction

Provide guidance on next steps to consider fishing community needs.

4. COASTAL FISHING COMMUNITIES PROJECT

Today's Item **Information** ☐ **Direction** ☒

Receive staff update and public comments on coastal fishing communities project staff report, and discuss next steps and possible recommendations.

Summary of Previous/Future Actions

• FGC refers topic to MRC	Feb 11, 2015; Sacramento
• MRC discussions, planning, and public meetings	2015 - 2017; various
• Most recent MRC update	Jul 17, 2018; MRC, San Clemente
• **Today's update and next steps**	**Nov 14, 2018; MRC, Sacramento**

Background

In early 2015, at the direction of FGC, an MRC discussion regarding fishing communities was initiated following a public request for new fishery access opportunities (see Exhibit 1 for background). Following exploratory discussions with MRC and the public in 2015 and 2016 regarding challenges and needs within California's coastal fishing communities, FGC approved an MRC recommendation to broaden the conversation coastwide through a series of locally-focused coastal fishing community meetings along the California coast.

A total of seven community meetings were held in 2017 and 2018 from Crescent City to San Diego. The meetings offered a venue to more thoroughly explore, from the perspective of specific fishing-dependent coastal communities, current conditions and changes being experienced in ports, constraints on adaptation, and needs for creating future resilience.

At the Jul 2018 MRC meeting, staff presented a staff report that summarized input from the various meetings to identify common themes, port-specific issues, and ideas. The staff report also identified a range of options for potential FGC focus and action in response to community concerns.

Update

Based on MRC recommendation, the staff report was opened for the public's feedback on the report and initial concepts from July 17 to September 24, 2018. There were 14 comment emails and letters with over 75 unique comments received during the public comment period (see "significant public comments" below).

In addition to written comments, staff has engaged in multiple conversations with fishing organizations, environmental non-governmental organizations, state and federal agencies, and academics, which are emerging as potential collaborators to support both the goals of FGC as well as those of fishing communities. Today, staff will provide an update on these project activities and opportunities, and discuss options for possible next steps.

Significant Public Comments

- Fourteen written comments on the staff report were received, providing over 75 individual comments. The comments provide valuable feedback on both the content of the report, by suggesting edits and additions, and the potential recommendations within the report. Comments are summarized in Exhibit 3 and linked to the individual comments.
- Several organizations have offered to support staff in an effort to help enhance and strengthen the report contents, through developing a more thorough report. Recommendations to strengthen content include providing an analysis of potential actions, assess which entites are appropriate to fill the action, identify what other organizations are already doing, and evaluate/recommend those actions in which FGC could invest its limited resources.
- A joint comment letter from five fishery associations and representatives urged MRC to hold off discussing "next steps and possible recommendations" until the Mar 2019 MRC meeting. The goal is to ensure that the extensive public comment, and additional input derived from ongoing discussion with FGC staff members, can progress and be integrated into a more detailed report that will help refine the next steps and possible recommendations (Exhibit 4).

Recommendation

FGC staff: Direct staff to: (1) continue to broaden conversations with state and federal agencies, non-governmental organizations, and fishing organizations, in a broader effort to explore how to best support fishing communities; (2) integrate input from public comments into a more in-depth report, including analysis of options and potential partnerships; and (3) schedule a discussion of the report, next steps and possible recommendations for the Mar 2019 MRC meeting.

Exhibits

1. Staff summary from Nov 4, 2015 MRC meeting (for background purposes only)
2. Staff report on 2017-2018 California coastal community meetings, dated Jul 2018
3. Public comments received on staff report, dated Nov 8, 2018
4. Joint letter from Pacific Coast Federation of Fishermens Associations, California Wetfish Producers Association, West Coast Fisheries Consultants, Alliance of Communities for Sustainable Fisheries, and Commercial Fishermen of Santa Barbara, received Oct 31, 2018

Committee Direction/Recommendation

The Marine Resources Committee recommends that staff take the following next steps based on outcomes and ideas generated through fishing community meetings and public comments on the staff report: _____.

INFORMATIONAL PRESENTATION ON SPORT FISHING NOT UNDER COMMISSION AUTHORITY

George Osborn
California Sportfishing League

July 11, 2019

California Fish and Game Commission

- A constitutionally created agency with general regulatory powers over the taking or possession of birds, mammals, fish, amphibia, and reptiles.

California Department of Fish and Wildlife (DFW)

- DFW, in contrast, is a statutorily created agency whose director is responsible to the Commission in enforcing the policies and provisions of the Fish and Game Code

Fish and Game Code

- Some sections of the Fish and Game Code do not deal with either sport or commercial fishing but deal with other take of marine life or other issues entirely.
- One such example is Section 5521.6: “Notwithstanding Sections 5521 and 5521.5, a registered aquaculturist may collect abalone for broodstock, in accordance with subdivision (b) of Section 15301.” Such sections of the Code are not included in this analysis.

Fish and Game Code Analysis

- Please note that this analysis is organized by sections of the California Fish and Game Code as referenced in the Report by the Legislative Counsel Bureau letter to Assemblymember Sharon Quirk-Silva dated May 31, 2019, RN # 1912858. Section numbers cited herein refer to the Code unless otherwise noted.

- The description following the Code section is a synopsis. Please refer to the Code for the actual and complete Code language.

Department of Fish and Wildlife Authority

- §702 – This Code shall be administered and enforced through regulations adopted only by the Department except where the Commission is required to adopt regulations.

Fish and Game Code Sections: Fees

- §713 – Implicit Price Deflator for State and Local Government Purchase of Goods and Services required as the index
- §713(g) - Department and the Commission, at least every five years, shall analyze all fees for licenses, stamps, permits, tags, and other entitlements issued by it to ensure the appropriate fee amount is charged

Fish and Game Code: Permits

- §5500 – No explosives in waters with fish except with permit
- §5501 – Department targets undue predators with Commission permit
- §5511 – No aquaculture above hatchery water source

Fish and Game Code: Access

- §5516 – Where artificial bait required, DFW posts
- §7115(a) – DFW identifies properties for disabled
- §7149.7 – Director - 2 free sport fishing days

Fish and Game Code: Fees Received

- §7361(a) et seq – Requires separate account for Bay-Delta stamp fees. Some interesting fish noted in statute for long term benefit from these fees, including striped bass, black bass, halibut, salmon, surf perch, steelhead trout, and American Shad.

Fish and Game Code: Protections

- §5514 – snagging prohibited, chinook, coho, kokanee
- §5515(a)(1) – No fully protected fish taken/possessed
- §5515(a)(3)(b) – listing of fully protected fish
- §5517 – No take of White Shark
- §5521 – Abalone moratorium

Fish and Game Code: Licenses

- §7145(a) – requires sport license 16 or older
- §7147 – CPFV operator must ensure all anglers have license
- §7149.05 to 7149.5 – sets sport license prices/structure

DFW Licenses

- Subject of the R3 Licensing Subcommittee
- Resident, nonresident, nonresident 10-day, 2-day, 1-day, validations
- All issued through the Automated License Data System
- License fees adjusted annually pursuant to §713
- This section highlights the importance of §713(g) discussed previously

Fish and Game Code: License Requirements and Conditions

- §7149.8(a) – license/report card required for abalone
- §7150 – reduced fee sport licenses
- §7151 – free sport licenses
- §7153 – no license for pier fishing/defined by Commission
- §7155 – Klamath River subsistence take by Yurok
- §7180.1 – Colorado river special use validation
- §7230 – smoking/canning fish by processor
- §7232 – sport fish offal use by processor

Specific Species Governed by Statute

- §7256 – Spiny lobster sport take method, hoop net or hand
- §7260-7261 – Legislative findings for, and also defines “native trout”
- §7290 – Pismo Clam possession for consumption
- §7332 – Clam digging instruments, possession
- §7350 – Giant Seabass, method of take only by hook and line

Commercial Passenger Fishing Vessels (CPFV)

- §7920 - The owner of any boat or vessel who, for profit, permits any person to take fish, shall procure a commercial passenger fishing boat license.
- This article applies only to a boat or vessel whose owner or his or her employee or other representative is with it when it is used for fishing.
- §7921 through §7925 addresses various aspects governing CPFVs.

R3 Recommendation

Because of the importance of license structure and fees, a Licensing Subcommittee was established in the R3 Project to make recommendations for change. One of those DRAFT recommendations is to "**Shift Authority to F&G commission for setting structure and price.**"

Next Steps

- We urge the Commission to take all possible steps to increase sport fishing participation while recognizing that fishery management decisions are not made in a vacuum.
- The MLMA requires fishery management plans for California's sport and commercial fisheries (§7072(a)) and that those plans are based on the best available science (§7072(b)) and that increases in participation affect stocks and that fishery management plans shall allocate take fairly among recreational and commercial sectors participating in the fishery (§7072(c)).

Thank You

George Osborn
California Sportfishing League

INFORMATIONAL PRESENTATION ON SPORT FISHING NOT UNDER COMMISSION AUTHORITY

George Osborn
California Sportfishing League
July 11, 2019

Background paper supporting the PP presentation to the MRC

Note: This report does not address for-profit commercial fishing or hunting or other matters in the Fish and Game Code.

Some sections indicate shared responsibility such as when the Commission must determine the form of a license or permit but the Department is required to issue the license or permit.

The California Fish and Game Commission is a constitutionally created agency with general regulatory powers over the taking or possession of birds, mammals, fish, amphibia, and reptiles.

The Department, in contrast, is a statutorily created agency whose director is responsible to the Commission in enforcing the policies and provisions of the Fish and Game Code ("Code").

Some sections of the Fish and Game Code do not deal with either sport or commercial fishing but deal with other take of marine life. One such example is Section 5521.6: "Notwithstanding Sections 5521 and 5521.5, a registered aquaculturist may collect abalone for broodstock, in accordance with subdivision (b) of Section 15301." Such sections of the Code are not included in this analysis.

Please note that this analysis is organized by sections of the California Fish and Game Code as referenced in the Report by the Legislative Counsel Bureau letter to Assemblymember Sharon Quirk-Silva dated May 31, 2019, RN # 1912858. Section numbers cited herein refer to the Code unless otherwise noted.

The description following the Code section is a synopsis. Please refer to the Code for the actual and complete Code language.

FISH AND GAME COMMISSION AUTHORITY

§205 – Establish seasons, bag, possession and size limits and manner of take.

§500 – Adopts guideline for penalties for violations for unlawful taking or possession of fish or wildlife.

§703 – The Commission formulates general policies for the conduct of the Department, which shall be guided by those policies and shall be responsible to the Commission for the administration of the Department in accordance with those policies.

§713 – The Legislature established the Implicit Price Deflator for State and Local Government Purchase of Goods and Services as the index to determine the annual rate of increase or decrease in fees for licenses, stamps, permits, tags, or other entitlements issued by the Department. (Included under COMMISSION AUTHORITY because of the requirement of §713(g) below.)

§713(g) – The Department and the Commission, at least every five years, shall analyze all fees for licenses, stamps, permits, tags, and other entitlements issued by it to ensure the appropriate fee amount is charged. Where appropriate, the Department shall recommend to the Legislature or the Commission that fees established by the Commission or the Legislature be adjusted to ensure that those fees are appropriate.

§1022 – The Commission may authorize experimental fishing permits to be issued by the Department for sport or commercial marine fishing activity.

§1050 – 1110 - General License Provisions
§1050(b) - The Commission shall determine the form of all licenses, permits, tags, reservations, and other entitlements and the method of carrying and displaying all licenses, and may require and prescribe the form of applications therefor and the form of any contrivance to be used in connection therewith, except for those programs where the Department has fee-setting authority, in which case the Department shall retain that authority.

§1050(d) – Except for fees set by the Department pursuant to subdivision (e), whenever this Code does not specify whether a fee is to be collected, or does not specify the amount of the fee to be collected, or does not expressly prohibit the adjustment of statutorily imposed fees by the Commission by reference to this section for the issuance of any license, tag, permit, application, reservation, or other entitlement, the Commission may establish a fee or the amount thereof by regulation. The Commission may also provide for the change in the amount of the fee in accordance with Section 713. Fees established by the Commission shall be in an amount sufficient to recover all reasonable administrative and implementation costs of the Department and Commission relating to the program with regard to which the fee is paid. The Commission may establish a fee structure that provides for the phasing in of new fees leading up to full cost recovery for the Department and Commission, provided that full cost recovery is achieved within five years of the establishment of the fee.

§2860(a) – The Commission may regulate commercial and sport fishing in MPAs.

§5500 - It is unlawful to use explosives in the waters of this state inhabited by fish, except under a permit first obtained by the user from the Department consistent with terms and conditions set by the Commission, or except in case of emergency, to remove

an accidental obstruction to the flow of water. Any person may appeal the Department's decision to grant or deny a permit to the Commission.

§5501 - The Department may take any fish which, in its opinion, is unduly preying upon any bird, mammal, or fish. The Commission may prescribe the terms of a permit to take any fish which, in the opinion of the Department, is harmful to other species of fish and which should be reduced in numbers.

§5508 – The Commission may regulate which fish other than whole fish may be brought ashore.

§5510 – The Commission may adopt regulations to prevent waste of fish and disposal of offal.

§7110 – The Commission may adopt regulations to automatically conform to federal regulations.

§7120 – The Commission may adopt regulations allowing possession of more than a daily bag limit.

§7149.8(c) – The Commission may set fees for the Abalone Report Card.

§7153 - (a) Per Legislative Authority, no sport fishing license is required to take fish by any legal means, for any purpose other than profit, from a public pier, **as defined by the Commission**, in the ocean waters of the state, or while angling at a registered aquaculture facility site.

Commercial Passenger Fishing Vessel
§8026(a) – The Commission may require the owner and operator of a [commercial fishing vessel, the holder of a commercial fishing license or permit and] the owner and license holder of a commercial passenger fishing boat to keep and submit complete and accurate record of fishing activities and may suspend the license for failure to keep and submit records.

DEPARTMENT OF FISH AND WILDLIFE AUTHORITY

§702 – This Code shall be administered and enforced through regulations adopted only by the Department except where the Commission is required to adopt regulations.

§713 – The Legislature established the Implicit Price Deflator for State and Local Government Purchase of Goods and Services as the index to determine the annual rate of increase or decrease in fees for licenses, stamps, permits, tags, or other entitlements issued by the Department. (Included also under Commission and Department Authority because of reporting and calculation requirements of 713(g))

§713(g) – The Department and the Commission, at least every five years, shall analyze all fees for licenses, stamps, permits, tags, and other entitlements issued by it to ensure the appropriate fee amount is charged. Where appropriate, the Department shall recommend to the Legislature or the Commission that fees established by the Commission or the Legislature be adjusted to ensure that those fees are appropriate.

§1050(a) – Licenses, permits, tags, reservations, and other entitlements authorized by this Code shall be prepared and issued by the Department.

§1050(b) - The Commission shall determine the form of all licenses, permits, tags, reservations, and other entitlements and the method of carrying and displaying all licenses, and may require and prescribe the form of applications therefor and the form of any contrivance to be used in connection therewith, except for those programs where the Department has fee-setting authority, in which case the Department shall retain that authority.

§1050(d) – Except for fees set by the Department pursuant to subdivision (e), whenever this Code does not specify whether a fee is to be collected, or does not specify the amount of the fee to be collected, or does not expressly prohibit the adjustment of statutorily imposed fees by the Commission by reference to this section for the issuance of any license, tag, permit, application, reservation, or other entitlement, the Commission may establish a fee or the amount thereof by regulation. The Commission may also provide for the change in the amount of the fee in accordance with Section 713. Fees established by the Commission shall be in an amount sufficient to recover all reasonable administrative and implementation costs of the Department and Commission relating to the program with regard to which the fee is paid. The Commission may establish a fee structure that provides for the phasing in of new fees leading up to full cost recovery for the Department and Commission, provided that full cost recovery is achieved within five years of the establishment of the fee.

§5500 - It is unlawful to use explosives in the waters of this state inhabited by fish, except under a permit first obtained by the user from the Department consistent with terms and conditions set by the Commission, or except in case of emergency, to remove an accidental obstruction to the flow of water. Any person may appeal the Department's decision to grant or deny a permit to the Commission.

§5501 - The Department may take any fish which, in its opinion, is unduly preying upon any bird, mammal, or fish. The Commission may prescribe the terms of a permit to take any fish which, in the opinion of the Department, is harmful to other species of fish and which should be reduced in numbers.

§5511 - Except under permit of the Department, it is unlawful to carry on any fish cultural operations on any stream above the point where water is diverted for the use and operation of a state fish hatchery.

§5516 - Any river, stream, lake, or other body of water restricted by the Commission to the use of artificial flies or artificial lures only for fishing shall be posted by the Department at logical places of entry so as to inform persons fishing in such waters as to the nature of the restrictions.

§7115(a) – The Department shall identify property it owns or manages that includes areas for sport fishing accessible to people with disabilities.

§7149.7 – The director may designate not more than two days as free sportfishing days.

§7155 – Under certain conditions, members of the Yurok Indian Tribe may take fish for subsistence from the Klamath River upon receipt of a permit issued by the Department.

§7361(a) et seq – Fees received by the Department from the sale of the Bay-Delta Sport Fishing Enhancement stamp shall be deposited in a separate account in the Fish and Game Preservation Fund and shall expend the funds for the long-term, sustainable benefit of the primary Bay-Delta sport fisheries, including striped bass, black bass, halibut, salmon, surf perch, steelhead trout, and American Shad and other matters regarding the Bay-Delta Sport Fishing Enhancement Stamp.

AUTHORITY RETAINED IN THE LEGISLATURE

§713 – Established the Implicit Price Deflator for State and Local Government Purchase of Goods and Services as the index to determine the annual rate of increase or decrease in fees for licenses, stamps, permits, tags, or other entitlements issued by the Department. (Included under Commission and Department Authority)

§5514 – It is unlawful to snag any chinook, coho, or kokanee salmon or any steelhead in inland waters.

§5515(a)(1) – Except as provided for scientific research, no fully protected fish shall be taken or possessed at any time.

§5515(a)(3)(b) – Lists fully protected fish.

§5517 – Prohibits take of white shark.

§5521 – Imposes moratorium on taking, possessing or landing abalone for commercial or recreational purposes south of the middle of the mouth of San Francisco Bay.

§7145(a) – Requires a sport fishing license for all persons 16 years of age or older to take any fish, reptile or amphibian for any purpose other than profit.

§7147 – Owner or operator of a CPFV must ensure than all anglers have in their possession a valid fishing license.

§7149.05 to 7149.5 - Sets terms and conditions, including prices and license structure, for sport fishing licenses.

§7149.7 – Enrollees in the Job Corps shall be deemed California residents for the purpose of obtaining a California sport fishing license.

§7149.8(a) – Requires sportfishing license and Abalone report card to take Abalone.

§7150 – Sets conditions for reduced fee sport fishing licenses.

§7151 – Sets conditions for free sport fishing licenses.

§7153 - (a) No sport fishing license is required to take fish by any legal means, for any purpose other than profit, from a public pier, as defined by the Commission, in the ocean waters of the state, or while angling at a registered aquaculture facility site.
(b) For purposes of this section, "ocean waters" include, but are not limited to, the open waters adjacent to the ocean and any island; the waters of any open or enclosed bay contiguous to the ocean; the San Francisco and San Pablo Bays, with any tidal bay belonging thereto; and any slough or estuary, if found between the Golden Gate Bridge and the Benicia-Martinez Bridge.

§7155 - Notwithstanding any other provision of this code, California Indians who are bona fide registered members of the Yurok Indian Tribe may take fish, for subsistence purposes only, from the Klamath River between the mouth of that river and the junction of Tectah Creek with it, exclusive of tributaries, without regard to seasons, under certain conditions.

§7180.1 – Sets terms for Colorado River special use validation.

§7230 – Sets terms for when fish lawfully taken under a sport fishing license may be canned or smoked by a fish cannery or processor.

§7232 – Sets terms for use of sport fish offal by fish canner or processor.

The following Code sections specify treatment of one species, as indicated, and are governed by statute:

§7256 – Spiny lobster sport take method, hoop net or hand
§7260-7261 – Legislative findings for, and defines "native trout"
§7290 – Pismo Clam possession for consumption
§7332 – Clam digging instruments, possession
§7350 – Giant Seabass, method of take only by hook and line

<u>Specific to Commercial Passenger Fishing Vessels:</u>

§7920 - The owner of any boat or vessel who, for profit, permits any person to take fish, shall procure a commercial passenger fishing boat license.

This article applies only to a boat or vessel whose owner or his or her employee or other representative is with it when it is used for fishing.
A person operating a guide boat, as defined in Section 46, is not required to obtain a commercial passenger fishing boat license.

§7921 - The base fee for a commercial passenger fishing boat license is two hundred fifty dollars ($250) in the 2004 license year, which shall be adjusted annually thereafter pursuant to Section 713. The commercial passenger fishing vessel license shall be issued to the holder of a commercial boat registration issued pursuant to Section 7881.

§7923 - The holder of a license shall keep a true record in the English language of all fish taken, and shall comply with such regulations as the Commission may prescribe. Such a record and the information contained in it shall be confidential, and the record shall not be a public record.

§7924 - Licenses issued under this article are subject to forfeiture, suspension, or revocation for a violation of Section 7121 and for any offense for which a commercial fishing license may be forfeited, suspended, or revoked.

§7925 - (a) If a vessel is licensed under this article and is used to take salmon or has salmon aboard in ocean waters north of Point Arguello, there shall be on board that vessel, a total number of commercial fishing salmon stamps sufficient to have at least one for the operator and one for each crewmember required by United States Coast Guard regulations, excepting an operator or a crewmember who is exempt from the requirement under subdivision (b) of Section 7860. The commercial fishing salmon stamps shall be affixed to either the commercial fishing licenses of the operator and the crewmembers or, pursuant to subdivision (b), to the commercial passenger fishing license. No person shall operate, or cause to be operated, any vessel licensed under this article in violation of this subdivision. Vessels permitted as commercial salmon fishing vessels pursuant to Section 8234 are exempt from the requirements of this subdivision.

(b) Notwithstanding Section 1053, the Department may issue to the owner or operator of a vessel licensed pursuant to this article, upon application and payment of the fees prescribed in subdivision (c) of Section 7860, one commercial fishing salmon stamp for the operator and not more than one additional commercial salmon stamp for each crewmember required by the United States Coast Guard regulations. The commercial fishing salmon stamps issued under this subdivision shall be affixed to the vessel's commercial passenger fishing boat license issued pursuant to this article.

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May 31, 2019

Honorable Sharon Quirk-Silva
Room 6012, State Capitol

SPORT FISHING AND COMMERCIAL FISHING - #1912858

Dear Ms. Quirk-Silva:

You have asked us for a general overview of the state statutory and constitutional provisions that govern sport fishing and commercial fishing.

We note as an initial matter that article IV, section 20 of the California Constitution authorizes the Legislature to provide for the division of the state into fish and game districts and to protect fish and game in districts or parts of districts. The Legislature has enacted a comprehensive statutory scheme to this effect, primarily in the Fish and Game Code. We discuss in general terms these provisions as they relate to your inquiry.

1. General provisions of the Fish and Game Code relating to the taking of fish

Provisions governing the taking of fish are generally administered by the Fish and Game Commission (hereafter commission) (Fish & G. Code, § 30)[1] and the Department of Fish and Wildlife (hereafter department) (§ 37). The commission is a constitutionally created agency with general regulatory powers over the taking or possession of birds, mammals, fish, amphibia, and reptiles. (Cal. Const., art. IV, § 20; Fish & G. Code, §§ 101, 200.) The department, in contrast, is a statutorily created agency whose director is responsible to the commission in enforcing the policies and provisions of the Fish and Game Code. (§§ 700-703.) (See *Wildlife Alive v. Chickering* (1976) 18 Cal.3d 190, 205.)

Sections 101-110 set forth the composition of the commission and rules relating to its governance. Sections 200-317 set forth the commission's various regulatory powers. Specifically, section 200 delegates to the commission the power to regulate the taking or

[1] All further section references are to the Fish and Game Code unless otherwise specified.

possession of fish, except for commercial purposes. (§ 200.) Under section 205, the commission may, by regulation, establish open seasons, closed seasons, bag limits, possession limits, and size limits, and prescribe the manner and means of taking.

The commission is required to adopt regulatory guidelines to assist the director and the department in ascertaining the amount of civil penalties to be imposed for the unlawful taking or possession of fish or wildlife. (§ 500.)

The commission may authorize an experimental fishing permit to be issued by the department that authorizes commercial or recreational marine fishing activity otherwise prohibited by the code or applicable regulations. (§ 1022.)

We turn now to general provisions relating to the department. The department is required to administer and enforce the Fish and Game Code through regulations adopted by the department, except as otherwise specifically provided or where the code requires the commission to adopt regulations. (§ 702.) General policies for the conduct of the department are required to be formulated by the commission. (§ 703.) The director must be guided by those policies and is responsible to the commission for the administration of the department in accordance with those policies. (§ 703.) Section 712.1 sets forth the department's mission and core programs. Sections 850-860 set forth requirements relating to employees of the department.

Sections 1050-1069 set forth general requirements relating to licenses, which are generally administered by the department. Specifically, all licenses, permits, tags, reservations, and other entitlements must be prepared and issued by the department. (§ 1050.) Under section 1050, both the commission and the department are required to comply with various requirements relating to issuing licenses and other entitlements. (§ 1050.)

Sections 2000-2022 contain general provisions regulating the taking, possessing, or selling of fish or wildlife. Specifically, it is unlawful to take any bird, mammal, fish, reptile, or amphibian except as provided in the code or applicable regulations. (§ 2000.) Also, it is unlawful to take mammals, birds, fish, reptiles, and amphibians outside of established seasons or to exceed specified possession limits. (§ 2001.)

Division 3, chapter 10.5 (§ 2850 et seq.) establishes the Marine Life Protection Act. Under this act, the department and commission share duties relating to regulating marine protected areas. (See, for example, §§ 2855 & 2856.)

Division 6, part 1 (§ 5500 et seq.) sets forth provisions governing the taking of fish. Under this division, the department and commission are both granted certain authority regarding the taking of fish. For example, section 5501 authorizes the department to take any fish that, in its opinion, is unduly preying upon any bird, mammal, or fish, and the commission is authorized to prescribe the terms of a permit to take any fish that, in the opinion of the department, is harmful to other species of fish.

There are numerous provisions of law in this division that govern the taking of specific types of fish. (See, for example, §§ 5514 [which makes it unlawful to kill or retain in possession any chinook, coho, or kokanee salmon or any steelhead that has not taken the bait or lure in its mouth, in inland waters] & 5521.5 [which makes it unlawful to take abalone for commercial purposes in certain districts].)

Chapter 8 of this part (§ 6900 et seq.) establishes the Salmon, Steelhead Trout, and Anadromous Fisheries Program Act for purposes of increasing the natural production of salmon and steelhead trout. Under this act, the department is required to prepare and maintain a detailed and comprehensive program for the protection and increase of salmon, steelhead trout, and anadromous fisheries. (§ 6920.)

Division 6, part 1.7 (§ 7050 et seq.) establishes requirements relating to fishery management plans. Under this part, the department is charged with various duties, including the preparation of fishery management plans. (See, for example, §§ 7075 & 7076.) The commission is generally charged with regulating marine fisheries, including approving the fishery management plans prepared by the department, in order to assure the long-term economic, recreational, ecological, cultural, and social benefits of those fisheries and the marine habitats on which they depend. (See §§ 7055, 7056, 7058, 7078.)

2. Regulation of sport fishing in the Fish and Game Code

Division 6, part 2 (§ 7100 et seq.) (hereafter part 2) sets forth provisions governing sport fishing, which is defined to mean the taking and possession of fish for any purpose other than commercial (see § 7100). Part 2, chapter 1 includes the following provisions:

- Section 7110 authorizes the commission to establish by regulation an automatic process to conform its sport fishing regulations to federal regulations adopted under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.) and requires the department to provide public notice of such a conforming action.
- Section 7115 requires the department to identify property it owns or manages that includes areas for sport fishing accessible to persons with disabilities.
- Section 7120 provides that it is unlawful for any person to possess more than one daily bag limit of any fish taken under a license issued pursuant to article 3 (§ 7145 et seq.) unless authorized by regulations adopted by the commission.
- Article 3 (§ 7145 et seq.) sets forth requirements governing sport fishing licenses. Specifically, section 7145 requires every person 16 years of age or older who takes any fish, reptile, or amphibian for any purpose other than profit to first obtain a valid license for that purpose. Certain persons, including disabled veterans and persons over 65 years of age who meet certain income requirements, are authorized to apply to the department for reduced or free sport fishing licenses. (§§ 7150 & 7151.)
- Article 4 (§ 7180.1 et seq.) governs reciprocal sport fishing licenses with the State of Arizona.
- Article 5 (§§ 7230 & 7232) governs the processing and preserving of fish taken under a sport fishing license.

Part 2, chapter 2 (§ 7256 et seq.) governs the taking of particular varieties of fish. For example, section 7290 prohibits the possession of pismo clam not in the shell, except when it is being prepared for immediate consumption. Also within this chapter, article 4 (§ 7361) provides for the deposit and use of fees from the sale of Bay-Delta Sport Fishing Enhancement Stamp or validation.

3. Regulation of commercial fishing in the Fish and Game Code

Division 6, part 3 (7600 et seq.) (hereafter part 3) governs the taking and possessing of fish for any commercial purpose. Part 3, chapter 1 contains the following provisions:

- Article 1.5 (§ 7650 et seq.) sets forth provisions relating to the federal Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.) and authorizes the director to conform state law or regulations of the commission to a fishery management plan developed under that act.
- Article 2 (§ 7700 et seq.) provides for various requirements relating to commercial fishing and packing. Under these provisions, the commission may regulate and control fishing boats, commercial fishermen, plants where fish products are manufactured, and dealers in fish products. (§ 7701.) The department may enter and examine any canning, packing, preserving, or reduction plant or place of business, or board any fishing boat and ascertain the amount of fish received or kind and amount of fishery products packed or manufactured. (§ 7702.) The commission is authorized to establish grades for different varieties of fish or fishery products. (§ 7703.) The commission is also authorized to adopt and enforce regulations to carry out the provisions of this article. (§ 7700 et seq.)
- Article 3 (§ 7850 et seq.) governs commercial fishing licenses. Specifically, section 7850 requires all persons engaging in commercial fishing, except for persons otherwise exempted, to obtain a commercial fishing license issued by the department. The commission is authorized to suspend or revoke the commercial fishing license of any licensee who operates a vessel within the territorial jurisdiction of the state and approaches government vessels within a certain distance. (§ 7853.) Section 7857 sets forth conditions that apply to each commercial fishing license, permit, or other entitlement issued to take, possess aboard a boat, or land fish for commercial purposes.
- Article 3.5 (§ 7860 et seq.) sets forth requirements specific to taking salmon for commercial purposes.
- Article 4 (§ 7880 et seq.) specifies requirements, generally administered by the department, relating to registering vessels used in connection with commercial fishing.
- Article 5 (§ 7920 et seq.) requires the owner of any boat or vessel who, for profit, permits any person to take fish, to procure a commercial passenger fishing boat license (§ 7920).

- Article 6 (§ 8010 et seq.) requires the department to gather and prepare data relating to commercial fisheries. Under this article, the commission is authorized to require the owner of a commercial fishing vessel, the holder of a commercial fishing license or permit, and the owner of a commercial passenger fishing boat to keep and submit a record of fishing activities in a form prescribed by the department. (§ 8026.)
- Article 7 (§ 8030 et seq.) governs commercial fish business licenses and generally requires any person who engages in any business for profit involving fish to be licensed pursuant to the provisions specified in this article (§ 8030). Section 8032 specifies provisions relating to fees for such a license and requires the commission to adjust the fee as necessary to fully recover all reasonable administrative and implementation costs of the department and the commission relating to these licenses.
- Article 7.5 (§ 8040 et seq.) imposes "landing fees," which are fees imposed on a fish receiver or processor (§ 8040). The article governs the persons subject to these fees (§ 8041) and the manner in which the fees are imposed (§ 8042), and requires certain commercial fishermen to make a landing receipt record on a form to be furnished by the department (§ 8043).
- Article 8 (§ 8075 et seq.) authorizes the commission to grant a permit to take and use a fish by a reduction or extraction process (§ 8075).
- Article 9 (§ 8100 et seq.) sets forth provisions governing limited entry fisheries, which are fisheries in which the number of persons who may participate or the number of vessels that may be used in taking a specified species of fish is limited by statute or regulation (§ 8100).
- Article 10 (§ 8110 et seq.) regulates commercial fishing in far offshore fisheries, which are fisheries that lie outside the United States 200-mile exclusive economic zone, as defined (see § 8111).
- Article 11 (§ 8120 et seq.) governs the unauthorized taking of salmon for commercial purposes outside the United States 200-mile fishery conservation zone.
- Article 12 (§§ 8125 & 8126) establishes the Commercial Fisheries Capacity Reduction Program and authorizes the commission to establish a fee on the taking of certain species of fish and shellfish.

Part 3, chapter 2 (§ 8140 et seq.) sets forth restrictions and various requirements relating to taking certain fish for commercial purposes, including sardines (art. 2, § 8150.5 et

seq.), anchovies (art. 3, § 8180 et seq.), salmon (art. 4, § 8210.2 et seq.),[2] lobster (art. 5, § 8250 et seq.), crab (art. 6, § 8275 et seq.), clams and other mollusks (art. 8, § 8340 et seq.), salt-water and anadromous fish (art. 9, § 8370 et seq.), sea cucumbers (art. 9.1, § 8405 et seq.), pacific mackerel (art. 9.5, § 8411 et seq.), market squid (art. 9.7, § 8420 et seq.), fresh-water fish (art. 10, § 8430 et seq.), fresh-water fish for bait (art. 11, § 8460 et seq.), crayfish (art. 12, § 8490 et seq.), halibut (art. 13, § 8494 et seq.) tidal invertebrates (art. 14, § 8500), krill (art. 14.5, § 8510), herring (art. 15, § 8550 et seq.), shark and swordfish (art. 16, § 8561 et seq.), nearshore fish stock (art. 17, § 8585 et seq.), prawns and shrimp (art. 18, § 8590 et seq.), marine aquaria pets (art. 19, § 8596 et seq.), and white sharks and basking sharks (art. 20, § 8599 et seq.).

Part 3, chapter 3 (§ 8601 et seq.) sets forth requirements relating to fishing nets used for commercial fishing, including requirements relating to gill and trammel nets (see art. 5, § 8680 et seq.), round haul nets (art. 7, § 8750 et seq.), bait nets (art. 8, § 8780 et seq.), beach nets (art. 9, § 8800 et seq.), trawl nets (art. 10, § 8830 et seq.), and dip nets (art. 11, § 8870).

Part 3, chapter 4 governs other means of taking fish, including traps (art. 1, § 9000 et seq.), fishing lines (art. 2, § 9025.1 et seq.), and other appliances (art. 3, § 9050 et seq.).

Division 6.5 (§ 10000 et seq.) sets forth requirements relating to sturgeon egg processors, including licensing requirements (§§ 10000-10004) and provisions regarding violations of the licensing requirements (§ 10005).

Division 9 (§ 12000 et seq.) provides for fines and penalties for violations of the Fish and Game Code. Certain provisions govern violations as a general matter. For example, section 12000 provides that except as otherwise provided, any violation of the code is a misdemeanor. Other statutes provide for specific penalties. For instance, section 12002.4 provides that a commercial boat registration may be revoked or suspended by the commission, when requested by the department, for a period not to exceed one year, upon conviction of the registrant for a violation of certain provisions relating to sport fishing.

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[2] Chapter 2, article 4.5 (§ 8230 et seq.) sets forth provisions relating to commercial salmon vessel permits and prohibits the taking or possession of salmon for commercial purposes on a vessel unless the owner of the vessel obtains such a permit (§ 8232). These provisions are generally administered by the department. (See, for example, §§ 8234, 8236, 8239.2.) Additionally, the commission and the department are authorized to make and enforce regulations that may be necessary or convenient for carrying out any power, authority, or jurisdiction delegated to it under this article. (§ 8246.8.) Section 8247 establishes within the department a commercial salmon fishing review board, which is required, among other things, to consider and make recommendations to the department on requests for permit transfers, and consult with and advise the commission as required by certain provisions. (§ 8247.8.)

Additionally, section 12012.5 provides specific penalties for commercial fishing license holders who unlawfully take fish within a marine protected area.

We turn now to provisions of law related to sport fishing and commercial fishing located in the California Constitution and in codes other than the Fish and Game Code.

4. Other provisions relating to sport fishing and commercial fishing

The Marine Resources Protection Act of 1990, which was added at the November 6, 1990, General Election, sets forth provisions[3] governing the use of gill nets and trammel nets. (Cal. Const., art. X B, §§ 1-12.)

Certain provisions in the Food and Agricultural Code (§§ 78401-78588) establish the California Seafood Council for the purpose of, among other things, developing, maintaining, and expanding the state, nationwide, and foreign markets for seafood products that are harvested, processed, manufactured, sold, or distributed in California (Food & Agr. Code, § 78427).

Other provisions in this code govern the state's sea urchin commercial fishing industry. (Food & Agr. Code, §§ 79000-79145.) Specifically, the California Sea Urchin Commission (Food & Agr. Code, § 79062) is authorized to administer and enforce provisions of law governing the production of sea urchins for domestic consumption and export.

Additionally, the California Spiny Lobster Commission is authorized to administer and enforce relevant provisions of law to promote and maintain the spiny lobster commercial fishing industry. (Food & Agr. Code, § 79170.5.)

Other provisions in the Food and Agricultural Code govern salmon. (Food & Agr. Code, §§ 76501-76981.) In this regard, the California Salmon Council is established to enable the salmon fishery, with the aid of the state, to develop, maintain, and expand the state, nationwide, and foreign markets for salmon and salmon products harvested, processed, manufactured, sold, or distributed in the state for human consumption, and the use and consumption of salmon and salmon products in those markets. (Food & Agr. Code, §§ 76700-76719.)

Certain provisions outside of the Fish and Game Code and the Food and Agricultural Code also affect commercial fishing. For instance, Public Resources Code section 30234 requires that facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. And Government Code

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[3] Statutory provisions implementing this act are in Fish and Game Code sections 8610.1-8610.16.

section 12807.6 requires the Natural Resources Agency to establish a revolving low-interest loan program and a grant program for commercial fishing vessel owners, operators, and crew members whose primary source of income for each of the last five years has been derived from commercial fishing.

Very truly yours,

Diane F. Boyer-Vine
Legislative Counsel

By Amy Schweitzer
Amy E. Schweitzer
Deputy Legislative Counsel

AES:blt

CDFW News

CONSERVATION EDUCATION, CRAB, ENDANGERED SPECIES, ENVIRONMENTAL SCIENCE, FISHERIES, FISHING (COMMERCIAL), HABITAT CONSERVATION, MARINE, WILDLIFE PROTECTION

Entanglement Settlement Protects Whales, Sea Turtles and California's Crab Fishery

MARCH 26, 2019 | KMACINTY

SAN FRANCISCO — Californians will be pleased to know that Dungeness crab will be caught off the coast with greater care for endangered wildlife under a settlement announced by the Center for Biological Diversity, the California Department of Fish and Wildlife (CDFW) and the Pacific Coast Federation of Fishermen's Associations (PCFFA).

The legal settlement protects whales and sea turtles from entanglement in commercial Dungeness crab gear. The Center for Biological Diversity sued CDFW in October 2017 after a drastic increase in the number of whale entanglements off the West Coast.

"As I've said many times, no one wants whale entanglements to happen," said CDFW Director Charlton H. Bonham. "This agreement represents hours of intense negotiation to help ensure they don't happen while supporting the resiliency of the crab fishery in the long run. I am thankful for the leadership of the Center for Biological Diversity and the Pacific Coast Federation of Fishermen's Associations who realized something needed to be done together."

"This is great news for whales and sea turtles fighting extinction off California's coast," said Kristen Monsell, a Center for Biological Diversity attorney. "The settlement will reduce serious threats from crab gear to these beautiful and highly endangered animals. This agreement is a turning point that gets us closer to zero entanglements and a healthy ocean."

The lawsuit was brought by the Center for Biological Diversity against CDFW (*Center for Biological Diversity v. Bonham*) in federal court in San Francisco. The Pacific Coast Federation of Fishermen's Associations, which represents crabbers, intervened in the lawsuit.

The settlement, subject to court approval, creates a comprehensive approach to the problem of whale entanglements. It expedites state regulation, ensures stakeholder input from the Dungeness crab Fishing Gear Working Group and formalizes a first-ever commitment by CDFW to pursue a federal permit for protecting endangered species. While these steps are executed, the settlement calls for this year's crab season to end three months early and prescribes protective measures for future springtime fishing seasons, when the greatest number of whales are present off the California coast.

In November 2018, CDFW announced (https://www.sfchronicle.com/opinion/openforum/article/California-seeks-plan-to-protect-whales-and-13426429.php) it would seek a federal permit under the Endangered Species Act to address protected species interactions with the crab fishery. Obtaining a permit and developing a conservation plan as part of that process can take years, so the settlement spells out interim protections.

"This settlement represents the path back to normality for California's crab fishery with built-in protections for whales and crab fishing operations under the Endangered Species Act," said Noah Oppenheim, executive director of PCFFA. "The past several years have been extraordinarily challenging for fishing families, and the actions we're taking here are no exception. But in the end, we're going to emerge together with a resilient, prosperous, and protective fishery that will continue to feed California and the nation."

Details of the settlement can be found at http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=166146 (http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=166146).

The mission of the California Department of Fish and Wildlife is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

The Center for Biological Diversity is a national, nonprofit conservation organization with more than 1.4 million members and online activists dedicated to the protection of endangered species and wild places.

The Pacific Coast Federation of Fishermen's Associations is the largest commercial fishermen's organization on the West Coast, representing 17 local and regional associations from Santa Barbara to Southeast Alaska. As a major commercial fishing industry trade association, PCFFA represents the interests of commercial fishing families who make their living harvesting and delivering high-quality seafood to America's tables.

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CRAB **DUNGENESS** **ENDANGERED SPECIES ACT** **ENTANGLEMENT** **SEA TURTLES** **WHALES**

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IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

CENTER FOR BIOLOGICAL DIVERSITY, Plaintiff, **v.** **CHARLTON H. BONHAM, in his official capacity as Director of the California Department of Fish and Wildlife,** Defendant, and **PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS and INSTITUTE FOR FISHERIES RESOURCES,** Intervenor-Defendants.	Case No. 3:17-cv-05685-MMC **STIPULATION AND [PROPOSED] ORDER STAYING CASE** Judge: Hon. Maxine Chesney Trial Date: None scheduled Action Filed: October 3, 2017

Pursuant to Northern District Local Rule 6-2, Plaintiff Center for Biological Diversity, Defendant Charlton H. Bonham, in his official capacity as Director for the California Department of Fish and Wildlife, and Intervenor-Defendants Pacific Coast Federation of Fisherman's Associations and the Institute for Fisheries Resources (collectively, the "Parties") submit this stipulation and proposed order staying the case.

RECITALS

1. Plaintiff filed a complaint on October 3, 2017, alleging that Defendant has caused and is causing the "illegal 'take' of threatened and endangered humpback whales, endangered blue whales, and endangered Pacific leatherback sea turtles." (Dkt. No. 1.) Plaintiff's complaint challenges Defendant's "authorization, permitting, licensing, overseeing, and management of the California commercial Dungeness crab fishery," which Plaintiff alleges "is killing, injuring, harming, capturing, and otherwise causing 'take' of humpback whales, blue whales, and leatherback sea turtles in violation of" Section 9 of the Endangered Species Act. *Id.*; 16 U.S.C. § 1538.

2. Defendant filed an answer to Plaintiff's complaint on November 17, 2017, admitting and denying certain of Plaintiff's allegations. (Dkt. No. 15.)

3. After successfully intervening, Intervenor-Defendants filed an answer to Plaintiff's complaint on April 16, 2018, incorporating Defendant's responses in its answer, and admitting and denying certain of Plaintiff's allegations. (Dkt. No. 41.)

4. The Parties filed cross-motions for summary judgment in this case and appeared for oral argument on the motions on February 22, 2019. After the matter was deemed submitted, Defendant requested that the Court hold off on a ruling pending further settlement discussions. The Court agreed and ordered a joint status report to be filed by the Parties by March 15, 2019. (Dkt. No. 66.) On March 15, 2019, the Parties requested an additional week for continuing negotiations, which the Court granted. (Dkt. Nos. 67, 68.)

5. The Parties are happy to report that they have reached an agreement on a series of interim measures that will be protective of the threatened and endangered species at issue in this

lawsuit, which will be effective until Defendant receives an incidental take permit from the federal government. A true and correct copy of these agreed-upon terms is attached as Exhibit A.

6. Because these interim measures are incomplete in some respects, requiring further scientific analysis, development of the process by which threat levels will be evaluated and responded to, and implementation of rulemaking to provide the necessary regulatory framework for the program, the Parties have agreed that the appropriate procedural mechanism for resolving this litigation while protecting the Parties' respective interests is to stay the case.

7. A case stay would allow any party to reopen the case if another party acts in contravention of the attached terms, thus providing sufficient reassurance to the Parties that a continuing avenue for more immediate relief exists.

STIPULATION

THEREFORE, IT IS HEREBY STIPULATED among the Parties, through their respective counsel and subject to this court's approval, as follows:

1. All further proceedings in this matter, including the submitted cross-motions for summary judgment, should be stayed until the issuance of the final rulemaking described in Exhibit A as the RAMP rule. The case should be administratively closed during that time, subject to reopening on motion by any party. Within 14 days after the publication of the final rulemaking, the Parties will file a status report with the Court.

2. The Parties are willing to provide additional status reports to the Court every six months, or at whatever frequency would satisfy the Court that matters are proceeding.

IT IS SO STIPULATED.

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Dated: March 26, 2019

Respectfully submitted,

/s/ *Sara D. Van Loh*
Sara D. Van Loh
Deputy Attorney General
OFFICE OF THE ATTORNEY GENERAL

Attorneys for Defendant Charlton H. Bonham

/s/ *Kristen Monsell*
Catherine Kilduff
Kristen Monsell

Attorneys for Plaintiff
Center for Biological Diversity

/s/ *Glen Spain*
Glen Spain

Attorney for Intervenors Pacific Coast Federation of Fishermen's Association and Institute for Fisheries Resources

ATTESTATION

I, Sara D. Van Loh, am the ECF user whose identification and password are being used to file this STIPULATION AND [PROPOSED] ORDER STAYING CASE. In compliance with L.R. 5-1(i), I attest that the other signatories have concurred in this filing.

DATED: March 26, 2019

/s/ *Sara D. Van Loh*

[PROPOSED] ORDER

PURSUANT TO STIPULATION OF THE PARTIES, IT IS HEREBY ORDERED that:

1. All further proceedings in this matter, including the submitted cross-motions for summary judgment, are stayed until the issuance of the final rulemaking described in Exhibit A as the RAMP rule.

2. The court clerk is instructed to administratively close the case, subject to reopening on motion by any party.

3. Within 14 days after publication of the final rulemaking, the Parties will file a status

report with the Court.

4. The Parties will further submit a brief joint status update every six months from the date of this order until issuance of the RAMP rule.

DATED: _____

_____
HON. MAXINE M. CHESNEY
United States District Judge

Exhibit A

Exhibit A - Terms of Agreement

In the context of agreeing to support a stay of the case in advance of a ruling on the motion for summary judgment, the parties agree to the following measures:

I. The parties agree to the following:

a. The 2019 season will close statewide on April 15.

b. For the 2020 season and until submission of the draft HCP, the final state RAMP rule, or November 1, 2020, whichever is later, the season will close April 1 consistent with the approach described below.

c. Until the ITP issues, the following additional commitments will apply:

i. In consultation with the Working Group, the Director determines risk and management action on these dates: November 1, December 15, January 15, February 15, March 15, April 1, April 15, May 1, May 15, June 1, June 15, July 1.

ii. Prior to those dates, the Working Group will provide any RAMP risk assessment and management recommendation to the Director and settlement parties.

iii. The following also apply:

1. One or more confirmed entangled ESA listed species in CA Dungeness gear or two or more ESA-listed species confirmed in unknown gear prompts a district-wide closure, or other management action that the Director demonstrates protects listed species based on best available science after consultation with the Working Group and settlement parties.

2. Presence of 20 or more ESA-listed whales in a NOAA survey or a running average of 5 or more ESA-listed whales over a one-week period prompts a district-wide closure, or other management action that the Director demonstrates protects listed species based on best available science after consultation with the Working Group and settlement parties.

3. The April, 2020 season will close April 1 for Districts 10, 17, and south. That closure can be lifted by the Director after consultation with the Working Group and the settlement

parties, only if the risk is low as defined in the March 15, 2020 Working Group RAMP risk assessment and management recommendation and remains low for each successive reporting date during the 2020 season.

4. Beginning April 1, 2021, and each season on April 1 thereafter until the ITP issues, Districts 10, 17, and south are only open to ropeless fishing gear by default. This spring closure can be lifted at the next scheduled Director's risk determination, after consultation with the Working Group, only if the risk is low on all RAMP criteria.

II. The parties agree the provisions contained in Appendix A will be submitted to the Working Group, and the Department will advocate that the Working Group consider them for incorporation into the RAMP rule unless the Working Group demonstrates a different approach protects listed species based on the best available science.

III. The parties further agree:

a. The Department will:

i. Submit a comprehensive draft HCP to NOAA consistent with Section 10 of the ESA, 16 USC § 1539, for commercial Dungeness crab by May 15, 2020.

1. Involve the Center for Biological Diversity and PCFFA in the development process through quarterly consultations/check-ins.

ii. Prohibit crab gear spatially and temporally or take other measures as recommended by NOAA until ITP is issued.

iii. Complete the following rulemakings:

1. Gear retrieval, to be effective by November 15, 2019.
2. RAMP rulemaking – this shall incorporate the elements discussed below – to be effective by November 1, 2020.
3. Marking for fixed gear fisheries, to be effective by November 15, 2019.

iv. Pursue funding for an appropriate stipend for representatives to the Working Group.

v. Support the Working Group efforts to increase public access to meetings and Working Group members' participation via remote access.

vi. Commit to a regular frequency of RAMP workshops (i.e. webinar or public presentations) to provide accountability and public engagement regarding model design, model iteration, and other steps to increase trust and transparency in the RAMP and Working Group processes.

vii. Submit the criteria in Appendix A to the Working Group and advocate that the Working Group consider them for incorporation into RAMP rule unless Working Group demonstrates a different approach protects listed species based on the best available science.

b. Sea Turtle Evaluation Process - The Department will:
   i. Request and advocate for six months' funding (about $130,000) from OPC during 2020 or before for NOAA to adapt the EcoCast model to the Dungeness crab fishery and incorporate recent years' data into the model, and
   ii. Pursue funding in collaboration with NOAA scientists for Endangered Species Act Section 6 funding, 16 USC § 1535, to monitor sea turtle presence off central and northern California.

c. Whale presence modelling – the Department will continue to support development of humpback and blue whale distribution models that consider forage information, including automation of the model to apply to the ocean conditions risk factor.
   i. The Forney/Santora model, with results of hindcasting testing will be presented to the Working Group in March/April 2019.
   ii. The WhaleWatch model that predicts habitat suitability for blue whales will be refined to enable real-time predictions at the scale of 10 km.
   iii. The Department will work with OPC to finalize contracting for development of automated humpback and blue whale distribution models before November 1, 2020.
   iv. If NOAA completes internal review of the models outlined in (a) – (c) above and indicates they are ready for use in fisheries management, they can be used to inform the ocean conditions risk factor.

d. Monitoring/Solar Loggers –
   i. PCFFA commits to supporting this process by recruiting volunteers to fill the 40 available OPC funding spots for the 2019-2020 season. PCFFA will work to ensure volunteers provide a range of fishermen representing different tiers, levels of fishing effort, and fishing location.
   ii. If the 40 available OPC funding spots are not filled by volunteers during the 2019-2020 season, the parties agree to reconvene in June 2020 to discuss appropriate steps to further development of electronic monitoring.
   iii. As other applicable monitoring practices are developed (for example, self-reporting or aerial surveys), information can be incorporated as appropriate.

e. Ropeless Gear – the Department will continue to support development of ropeless gear technology, or any other alternative gear, and explicitly allow for its testing and use in the RAMP regulation.
   i. Authorized use of ropeless gear will include annual reporting requirements on the outcomes of use, and recommendations for further development.
   ii. The Department will amend existing regulations or finalize new regulations by November 1, 2020, that allow alternate gear, including ropeless gear, that meets the enforcement criteria to be used in any area closed to commercial Dungeness crab fishing to protect whales or sea turtles.

f. The parties will support this settlement publicly and coordinate any joint or separate press releases announcing the settlement to ensure they are consistent and appropriate in characterizations of this settlement and each party's intent.

g. The parties will file a stipulation and proposed order to stay the case pending issuance of the final RAMP rule.

Appendix A

The following provisions will be submitted to the Working Group, and the Department will advocate that the Working Group consider them for incorporation into the RAMP rule unless the Working Group demonstrates a different approach protects listed species based on the best available science.

The following risk factors will be used to evaluate entanglement risk, and the need for a responsive management action.

1. Predictive or projection factors, which in combination with a second factor would trigger action
    a. Fleet Dynamics, meaning behavior or potential behavior of the fleet due to changes in the fishery. Until satisfactory data is otherwise available (for example solar loggers or other electronic monitoring of the fleet), ***Trigger for elevated risk shall be*** (1) the first two weeks of any season opener; (2) any season that opens after Feb. 1.
    b. Ocean Conditions, meaning prediction or other indication of ocean or forage conditions for whales, including but not limited to low krill abundance and high nearshore anchovy abundance. Until models currently under development are finalized in consultation with the Center for Biological Diversity, ***Trigger for elevated risk is poor forage***. To assess forage conditions, the Director will consider stock assessments for various forage species (particularly anchovy and sardine), research cruises (e.g. the NOAA Rockfish Recruitment and Ecosystem Assessment midwater trawl surveys, acoustic trawl surveys for Coastal Pelagic Species), and oceanographic indicators (e.g. ENSO conditions and trends). The Director will also consider the prior analyses Dr. Jarrod Santora, Associate Researcher in the Department of Applied Mathematics, University of California at Santa Cruz, has completed (for calendar years 2013 – 2016) and compare current observations to those from prior years to make informed predictions about forage conditions. Data streams described above will be evaluated in light of the following correlations:
        i. Forage is considered poor and triggers elevated risk when at least two of the following are true:
            A. Upwelling is or is predicted to be below average. Specifically, upwelling is assumed to be below average when, according to data developed by NOAA offices which monitor El Niño events such as NOAA's Climate Prediction Center and the West Coast Office of NOAA's Coast Watch program, an El Niño is forecasted or occurring or sea surface temperatures are above average off California in the month prior to the evaluation.
            B. There is a low krill and high anchovy abundance according to NOAA stock assessments and surveys. In the absence of recent available data, this is considered true.

c. Regardless of abundance, whales are concentrated near shore based on NOAA aerial or shipboard observations. In the absence of recent available data, this is considered true.

2. Factors reflecting current, real-time conditions that would individually trigger action
   a. Presence of species of concern. ***Trigger for elevated risk*** shall be 20 or more whales detected on any one NOAA survey in California waters, or a running average of 5 or more whales over a one-week period.
      i. Once elevated risk is triggered, elevated risk shall last as follows:
         1. If based on fall aerial survey data, risk shall be elevated through December 15;
         2. If based on spring rock-fish data, risk shall be elevated through the remainder of the season.
      ii. NOAA survey shall mean the fall whale aerial survey and the spring rockfish survey. Other data streams, such as whale watch data, may also be considered in addition to the NOAA surveys.
      iii. If NOAA surveys for the current year are not available, historical data detailing whale presence shall be used.
      iv. Seasonal whale distribution information since 2012 will be used as an indicator for humpback whales' seasonal migration and anticipated arrival to California feeding grounds. The 7-day composite running average of NOAA survey whale sightings in the southern Monterey Bay will be used as indicator of whale concentrations. Reports from breeding grounds in Mexico and Central America will be used as an indicator of whale migration to predict when whales are expected to start arriving in greater numbers offshore California.

   b. Number of confirmed ESA-listed entanglements. ***Trigger for elevated risk*** shall be 1 or more entanglements of ESA-listed species in the current fishing season, calculated as follows
      i. A confirmed entanglement attributable to the CA commercial Dungeness crab fishery shall count as 1 entanglement.
      ii. A confirmed entanglement of a whale in an unknown gear type or a whale of unknown species shall count as 0.5 entanglement.
         1. The Department shall determine an entanglement is confirmed based on the following factors, consistent with NOAA classification:
            - Confirmed photo or video of the gear on the whale
            - Department or NOAA staff has direct visual observation
            - Report came from a trusted source (trained or professional observer)

- An experienced response entanglement network member or a NMFS expert interviewed the reporting party. The information provided is detailed and specific enough to confirm entanglement
- Corroborated, independent, and multiple sources providing reports with detailed descriptions of the animal and the entanglement.

iii. A reported or unconfirmed entanglement will be investigated by the Department within 48 hours to determine if the criteria that would classify that entanglement as confirmed apply.

3. Leatherback Sea Turtles – Trigger for elevated risk shall be NOAA tagging data that indicates a leatherback sea turtle is present in a fishing district or one or more-ESA listed turtles are confirmed entangled in CA commercial Dungeness crab gear or two or more confirmed in unknown crab gear.

4. The RAMP rule should include that in response to an elevated risk, the Director shall take appropriate management action. The Director shall also use this approach during an interim period until an ITP is issued.
   a. Management action will be commensurate with the risk of entanglement.
   b. Management action will be based on the best available science.
   c. Management actions will be forward-looking and spatially explicit, but still allow for response to real-time data.
   d. Management action will be consistent with Fish & Game Code 8276.1(c)(3).

5. A rubric adopted in the RAMP rule should outline a scoring system for each risk factor, and associated categories of management actions depending on overall risk score.
   a. The rubric will allow for Working Group input on practical implementation of the management action.
   b. Categories of management actions will include at least one the below:
      i. Modification of fishing seasons and allowable fishing areas;
      ii. Specifying total or per-vessel numbers of traps allowed in any given fishing area;
      iii. Requiring use of specialized gear designed to reduce risk of entanglement in specified areas or periods, for example no fishing unless with ropeless gear, or;
      iv. No action.
   c. Additional data collection and reporting may also be requirements, including but not limited to the use of solar loggers or other monitoring requirements.

Once risk factors no longer indicate to the Director an elevated entanglement risk, or if the Director determines that the management actions are not appropriate or protective of marine life, the Director, with consultation with the Working Group, shall remove any management restriction.

CERTIFICATE OF SERVICE

Case Name: ***Center for Biological Diversity v. Charlton H. Bonham*** Case No. **3:17-cv-05685-MMC**

I hereby certify that on March 26, 2019, I electronically filed the following document with the Clerk of the Court by using the CM/ECF system:

STIPULATION AND [PROPOSED] ORDER STAYING CASE

I certify that **all** participants in the case are registered CM/ECF users and that service will be accomplished by the CM/ECF system.

I declare under penalty of perjury under the laws of the State of California the foregoing is true and correct and that this declaration was executed on March 26, 2019, at San Francisco, California.

FE M. DOMINGO	/s/ Fe M. Domingo
Declarant	Signature

SF2017203894
21398053.doc.

CALIFORNIA DUNGENESS CRAB FISHING GEAR WORKING GROUP

March 29, 2019

The California Dungeness Crab Fishing Gear Working Group (Working Group) is a diverse, multi-stakeholder collaboration united by a shared goal to support thriving whale populations along the West Coast and a thriving and profitable Dungeness crab fishery. Established in September 2015, the Working Group is a unique coalition of commercial and recreational fishermen, environmental organization representatives, members of the whale entanglement response network, and state and federal agencies committed to identifying solutions that reduce the risk of whale entanglements in Dungeness crab fishing gear.

On March 26, the California Department of Fish and Wildlife, together with the Center of Biological Diversity and the Pacific Coast Federation of Fishermen's Associations, announced a settlement to protect whales and sea turtles from entanglement in commercial Dungeness crab gear. The Working Group was not a party in this litigation or the settlement terms. Moving forward, the Working Group understands they will have a role in advising the state in the evaluation of entanglement risk using the Risk Assessment and Mitigation Program (RAMP), which is a core foundational component of the settlement agreement.

On March 19, 2019, the California Department of Fish and Wildlife, in partnership with the National Marine Fisheries Service and the Ocean Protection Council, convened the Working Group's Evaluation Team to proactively discuss and assess the relative risk of entanglements following reports of increased humpback whale concentrations (a risk evaluation summary is available here). In light of changing events based on the settlement agreement, the Working Group will pause on recommending any additional management action for the commercial fishery during the 2018-19 season.

The Working Group encourages recreational Dungeness crab fishermen and commercial and recreational fishermen engaged in other fixed gear fisheries to review the March 19 risk assessment and consider fishing as minimal gear as possible to reduce vertical lines in the water. It is also strongly advised to avoid fishing in areas where there are groups of feeding or migrating whales, schools of anchovy, and/or swarms of krill during the spring and summer months.

The Working Group remains committed to continuing to address this pressing and complex issue through further developing the RAMP and working collaboratively with the state and its federal partners throughout the Incidental Take Permit/Habitat Conservation Plan development process. The Working Group will continue to track the RAMP and conduct future risk evaluations to inform recommendations to the Director in advance of and during the 2019-20 California Dungeness crab fishing season.

A request for nominations for new Working Group participants is expected to be available in April. Fishermen and whale watch operators are encouraged to participate in a pilot project testing solar loggers as a tool to help gather enhanced fishing dynamics and whale concentration information. Fishermen are also welcome to participate in gear innovation testing that is underway. To learn more about these opportunities, or to be added to the Working Group's public email list, please contact info@cawhalegroup.com.

Information about the Working Group's efforts, including opportunities to provide feedback and contribute expertise to the issue of whale entanglements: www.opc.ca.gov/whale-entanglement-working-group & www.opc.ca.gov/risk-assessment-and-mitgation-program-ramp.

CALIFORNIA DUNGENESS CRAB FISHING GEAR WORKING GROUP

March 19, 2019 Convenings

Evaluation Team Advisory
2018-19 Whale Entanglement Risk Assessment & Mitigation Program (RAMP)

On March 19, 2019, the California Department of Fish and Wildlife, in partnership with the National Marine Fisheries Service and the Ocean Protection Council, convened the California Dungeness Crab Fishing Gear Working Group (Working Group)'s Evaluation Team to proactively discuss and assess the relative risk of entanglements following reports of increased humpback whale concentrations. The Working Group identified the following risk levels for humpback whales:

Humpback Whales		
Risk Factors	**Current Entanglement Risk Assessment (March 19, 2019)**	**Entanglement Risk Assessment Outlook (April/May 2019)**
Entanglements	LOW	MODERATE TO HIGH
Forage/ocean conditions	MODERATE	MODERATE TO HIGH
Whale concentrations	LOW	LOW TO HIGH*
Fishing dynamics	LOW TO MODERATE	LOW TO HIGH*

*Outlook considers regional variability and considers spatial differences of where whales may be congregated.

More information and rationale for the scoring of each factor is available here (also see "Summary" section below for additional details). The Working Group anticipates changes in the distribution and concentrations of whales in the coming weeks and all risk factors will continue to be monitored closely and responded to as needed.

The Working Group encourages recreational Dungeness crab fishermen and other commercial and recreational fishermen engaged in fixed gear fisheries to fish as minimal gear as possible and remove any gear that cannot be serviced within required timeframes. When possible, fishermen should consider reducing the number of traps that are being actively fished to reduce vertical lines in the water and avoid fishing in areas where there are groups of feeding or migrating whales, schools of anchovy, and/or swarms of krill.

This update will be shared via the DCTF email list, the Working Group webpage, and CDFW's crab webpage. The Working Group welcomes your feedback and insights about the Working Group's efforts and the 2018-19 RAMP. Please visit http://www.opc.ca.gov/whale-entanglement-working-group or contact the Working Group at info@cawhalegroup.com.

Summary
The Evaluation Team was convened in response to a report of increased whale activity by members of the whale watch community received on March 15, 2019. Due to optimal weather conditions, on March 15 and 16, 2019 two aerial surveys were coordinated from Pt Lobos north to Gualala (here) where information on whales,

forage/prey, and Dungeness crab trap distribution was collected. Additional information related to whale concentrations (here), ocean conditions (here), fishing dynamics (via fishermen's on-the-water observations), and entanglements (here) was also gathered in advance of the March 19 Evaluation Team call.

The Evaluation Team determined that humpback whales are beginning to arrive in Dungeness crab fishing grounds. Although humpback and blue whales have not yet arrived in their traditional feeding grounds in moderate or high numbers, humpbacks are expected to arrive in greater numbers the next 2-3 week and blues in April/May. Grey whales are continuing to migrate north and appear to be at minimal risk for entanglement, primarily due to the speed they are traveling (i.e., not remaining in one place for an extended period of time). 1,767 crab traps were observed during the aerial survey in concentrations of up to 12 traps per transect, with fishermen reporting that gear is continually being brought to the dock. The March 14 El Niño Southern Oscillation (ENSO) report indicates a mild El Niño this spring (~80%) and summer (~60%) which has implications for forage and whale distributions. Additionally, based on the aerial survey, fishermen's observations, and previous forage reports, it is anticipated that this spring we will see strong abundance of both krill and anchovies.

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Lines drawn

California's Dungeness crab fleet feels fleeced by whale settlement

Sonar stars

New models see more with a smaller footprint

In Progress

Rogue wave recovery turns into sponson job

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DUNGIE DEAL

In a settlement over whale entanglement, California's Dungeness crab fishermen lose the spring season

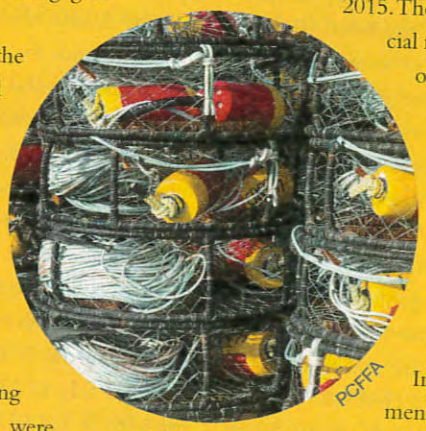
By Nick Rahaim

The worst-case scenario has been averted — no multiyear closure of California's Dungeness crab fishery. But fishermen will feel the sting for years to come after a settlement in a lawsuit over whale and sea turtle entanglements has closed spring crabbing in the state for the foreseeable future. And the fishermen are not happy.

"The settlement is going to be extremely painful and extremely difficult to deal with," said Noah Oppenheim, executive director of the Pacific Coast Federation of Fishermen's Associations, noting that millions of dollars in product will be left in the water this year. "But this was the best possible deal that was acceptable to all parties."

At issue is a 2017 lawsuit in federal court by the Oakland, Calif.-based Center for Biological Diversity that argued the state of California was in violation of the Endangered Species Act after a three-year spike in whale entanglements in Dungeness crab fishing gear from 2014 to 2017.

The lawsuit sought to force the state of California to obtain a federal incidental take permit for whales and turtles — a process that takes around three years to implement. It would have been possible for the fishery to remain closed during the intervening years, although the CBD says it never sought an indefinite closure through litigation.



In 2015, 50 whales, including humpback, gray and blue whales, were confirmed to have become entangled in fishing gear, up from an average of less than 10 annual entanglements in the 15 years prior. In 2016, the number of entanglements remained high at 48 confirmed whale entanglements. Numbers in 2017 were down, but still above historical norms, with 31 confirmed entanglements on the West Coast.

A preliminary report for 2018 from NOAA stated there were 45 confirmed whale entanglements. Seven of the 2018 entanglements were tied to California Dungeness crab gear.

Many Dungeness crab fishermen are quick to point out that, while a problem they are working hard to resolve, the majority of confirmed entanglements do not involve crab gear.

"Dungeness crab fishermen have been singled out," said Benjamin Platt, 57, a fisherman out of Crescent City and Bodega Bay. "The shipping industry kills more than a dozen whales a year by their own admission, but where's the outrage there?"

When whale entanglements first spiked, a group of diverse stakeholders convened to create the California Dungeness Crab Fishing Gear Working Group in September 2015. The working group consists of commercial fishermen, the California Department of Fish and Wildlife, state and federal agencies, and environmental groups, including the Center for Biological Diversity.

The original goal was to find solutions to mitigate whale entanglements in the fishery and keep varied interests working together rather than fighting in court. In a battle for narrative, both fishermen and the CBD have laid claim to initiating the working group.

After two years, the CBD postulated that not enough was being done to stop entanglements and filed suit in federal court, said Steve Jones, a spokesman for the environmental organization.

"We participated cooperatively but finally sued

Billy Igo, Brent Thiebout and Ben Platt (skipper) of the F/V Seastar on opening night of the northern California Dungeness season in 2018.

PCFFA

because nothing was being done to change conditions on the water," Jones said. "Remember, in June 2016 there was about one entanglement a day."

The settlement between the state of California, the Pacific Coast federation and the Center for Biological Diversity will require a federal incidental take permit, but will allow for fishing to continue in months where whale migration and crab gear don't overlap. In the settlement, the state of California and representatives of fishermen agreed to an April 15 closure this year and an April 1 closure of the fishery south of Mendocino in following years until the permit is issued by the federal government.

Fishermen helped free this humpback whale about two miles off Crescent City, Calif., in 2017.

NMFS

Fishermen using new ropeless gear will be exempt from the early closure. But that gear is expensive — about $15,000, compared to $200 for a traditional crab pot — and still has technical hurdles to overcome.

Fishermen had wanted a better deal, but in March a U.S. District Court judge in northern California said if she had to make a decision she would rule in favor of the Center for Biological Diversity, holding the state of California liable for whale entanglement. (The original suit did not name the Pacific Coast federation as a defendant; the organization filed a motion to intervene to ensure fishermen's interests were legally represented through the litigation.)

Early closures are a hit to the fleet, which faced months-long delays in three of the last four years. Domoic acid levels were too high in the winter months when the fishery typically opens — the 2015-16 season was delayed until late March 2016 because of the toxin. Those delays resulted in an increase in spring fishing, which is believed to have led to an increase in whale entanglements with crab gear.

While the spring months aren't typically

Continued on page 40

Cover Story
Continued from page 23

the highest volume time of year for Dungeness crab fishermen in years that trend to normal — a growing rarity in California — the market price tends to be high with a strong demand for live-market crab. Small-boat crabbers also face less competition from larger boats in the fishery.

For Oppenheim, who made the state's fishermen a party to the lawsuit, the federation was not negotiating from a position of power: The state of California wanted a settlement, the judge appeared to be leaning in favor of the plaintiff, and the Center for Biological Diversity was not backing down.

"With that chess game set up, we were in the weakest position possible," Oppenheim said. "If we weren't at the table, we would have been completely screwed — far worse than it would have been now. It's an awful deal; it could have been far worse."

Much of the fleet, however, feels they were not fairly represented.

"There are zero fishermen in the California crab fleet that are happy with the settlement agreement," said Platt. "We all wanted this to be settled, but I don't think anyone thought the settlement would be this bad."

The object of the lawsuit, according to Jones, was never a multiseason closure and to put fishermen out of work, but to force the state of California to adhere to federal law, the Endangered Species Act, and to limit entanglements by keeping gear out of the water when whales are migrating.

"Saying we wanted to shut down the fishery is simply not true. We want this fishery to be more sustainable, and it's pretty good in most respects," Jones said, noting Dungeness crab is one of his favorite foods. "But the whale entanglement issue is a big black mark and needs to be resolved."

With the settlement, the California Dungeness Crab Fishing Gear Working Group is not going away and will continue to be responsible for assessing risk and mitigating entanglements.

The California Legislature passed a law last year, in part to stave off court actions by the CBD, that gave the director of state Fish and Wildlife Department the ability to shut down the crab fishery, in coordination with assessments by the working group, when risks of whale entanglement were high.

Under the terms of the settlement, that provision is still in effect. And fishermen, scientists and environmentalists will continue to develop models through the state-managed working group, looking at patterns in whale migration, location of forage fish like krill and anchovies and fishing activity. When the risks for entanglement are too high in specific areas, the working group and Fish and Wildlife would move to close the fishery.

What's different now is that the CBD is an unofficial partner in the management of the Dungeness crab fishery, according to the terms of the settlement. Fishermen like Platt are deeply disappointed in that outcome.

"We now have a radical NGO dictating a state-managed fishery," Platt says. "The state abdicated their responsibility to manage this fishery."

While CBD has no official capacity in managing the fishery, the details of the settlement with the NGO require very strict management of the fishery, giving little leeway for fishing in the presence of whales.

For other Dungeness crab fishermen like Calder Deyerle, 31, a member of the working group, who's based in the Monterey Bay, the settlement is not catastrophic. He'll be sorry to lose the opportunity to fish for crab in the spring and summer months, but said the closures agreed to in the settlement might not be that different from closures required by the working group's risk assessments.

"We have to remember 2016 — that was an absolute disaster," Deyerle said of the time when whale migrants and large-scale fishing efforts overlapped in a delayed season. "We have to be extra careful the next few years; there are a lot of eyes on us."

PCFFA

The Seastar is locked and loaded for spring crabbing in sunny Morro Bay, Calif. The spring season, a live-market boon to many local fishermen, is threatened by litigation.

Nick Rahaim is a writer and former commercial fisherman based in the San Francisco Bay Area. Check out his blog www.outside-in.org or on Twitter @nrahaim.

25. WHALE AND TURTLE PROTECTION – DUNGENESS CRAB FISHERY

Today's Item **Information** ☐ **Action** ☒

Receive update on legal settlement agreement to protect whales and sea turtles from entanglement in commercial Dungeness crab gear, and consider potential application to the recreational Dungeness crab fishery.

Summary of Previous/Future Actions (N/A)

Background

FGC has authority to regulate the recreational Dungeness crab fishery; however, authority over the commercial Dungeness crab fishery is held by DFW and the California State Legislature. The commercial Dungeness crab fishery operates by using round baited traps covered with netting, which are then set in deeper water and tied to floating buoys. In recent years, whale populations in California's waters have increased, leading to greater presence in Dungeness crab fishing grounds and an increased risk of entanglement in deployed fishing gear.

In 2015, DFW, in partnership with the National Marine Fisheries Service (NMFS) and California Ocean Protection Council (OPC), convened the Dungeness Crab Fishing Gear Working Group to "tackle the challenge of reducing the risk of whale entanglements in the California Dungeness crab fishery". In 2017 , following a drastic increase in the number of whale entanglements off the West Coast, the Center for Biological Diversity sued DFW, challenging DFW authorization of the crab fishery as a violation of Section 9 of the federal Endangered Species Act for take of blue and humpback whales and leatherback sea turtles.

On Mar 26, 2019, DFW, together with the Center for Biological Diversity and the Pacific Coast Federation of Fishermen's Associations (as intervenor-defendant), announced they had reached a settlement and filed stipulation to stay the case (Exhibit 1); the settlement includes a series of interim measures to protect listed whales and turtles in the commercial Dungeness crab fishery, using the best available science, until DFW receives an incidental take permit from the federal government. The settlement (Exhibit 2) includes an "Exhibit A – Terms of Agreement" that defines specific measures to be taken.

In a Mar 29, 2019 statement (Exhibit 3), the Dungeness Crab Fishing Gear Working Group provided background, context, and risk assessment strategies for both commercial and recreational crab fisheries, which built on an advisory released by the group's Evaluation Team; the team had just convened on Mar 19 to proactively discuss and assess relative risk of entanglements following reports of increased humpback whale concentrations (Exhibit 4). Specifically, the Dungeness Crab Fishing Gear Working Group encouraged recreational Dungeness crab fishermen, as well as other fisheries using fixed gear, to review the risk assessment and consider fishing as minimal gear as possible to reduce vertical lines, and to avoid fishing in higher risk areas during spring and summer months (Exhibit 3).

This meeting provides FGC an opportunity to discuss the potential implications of the terms of the agreement for the recreational Dungeness crab fishery.

Significant Public Comments (N/A)

Recommendation

FGC staff: Discuss the potential implications of the terms of the agreement for the recreational Dungeness crab fishery; if FGC wishes to discuss further, consider referring to MRC for review and recommendation.

Exhibits

1. DFW News: *Entanglement Settlement Protects Whales, Sea Turtles and California's Crab Fishery*, dated Mar 26, 2019
2. Center for Biological Diversity v. Bonham (Defendant), and Pacific Coast Federation of Fishermen's Associations and Institute for Fisheries Resources (Intervenor-Defendants), stipulation and [proposed] order staying case, filed Mar 26, 2019
3. Dungeness Crab Fishing Gear Working Group statement, dated Mar 29, 2019
4. California Dungeness Crab Fishing Gear Working Group Evaluation Team advisory, dated Mar 19, 2019

Motion/Direction (N/A)

Marine Resources Committee (MRC) 2019 Work Plan
Scheduled Topics and Timeline for
Items Referred to MRC from California Fish and Game Commission
Updated July 2, 2019

Topic	Category	2019		
		MAR	JUL	NOV
		Sacramento	San Clemente	Sacramento
Planning Documents				
MLMA Master Plan for Fisheries - Implementation Updates	Master Plan Implementation	X	X	X
Abalone FMP / ARMP Update	FMP	X	X	X
Aquaculture Programmatic Environmental Impact Report (PEIR)	Programmatic Plan	X/R		X
Regulations				
Sport Fishing	Annual Rulemaking	X		
Aquaculture Lease Best Management Practices (BMP) Plan Requirements	DFW-FGC Project/ Rulemaking	X/R		X
Kelp & Algae Commercial Harvest	DFW Project/ Rulemaking		X	
Emerging/Developing Management Issues				
Aquaculture State Water Bottom Leases: Existing and future lease considerations	Lease Management Review			X
Special Projects				
California's Coastal Fishing Communities	MRC project	X/R	X	X
Informational / External Topics of Interest				
Whale and Turtle Protections in the Management of the Dungeness Crab Fisheries			X	X
Stakeholder informational presentation on aspects of State recreational fisheries management not under FGC regulatory authority			X	
Stakeholder informational presentation on aspects of State commercial fisheries management not under FGC regulatory authority				X

KEY: X Discussion scheduled X/R Recommendation developed and moved to FGC

California Fish and Game Commission – Perpetual Timetable for Anticipated Regulatory Actions

(dates shown reflect the date intended for the subject regulatory action)

6/18/2019

	For FGC Staff Use						2019										2020						
							JUN	JUN	JUL	AUG	SEP	OCT	OCT	NOV	DEC	JAN	FEB	FEB	MAR	APR	MAY	MAY
							11	12 13	11	7 8	10	8	9 10	5	11 12	TBD	TBD	TBD	TBD	TBD TBD	TBD	TBD
	QUARTERLY EFFECTIVE	DFW RU ANALYST	FGC ANALYST	LEAD	REGULATORY CHANGE CATEGORY	ACTION DATE, TYPE AND LOCATION	TC REDDING	FGC REDDING	MRC SAN CLEMENTE	FGC SACRAMENTO	WRC SANTA ROSA	TC SAN DIEGO	FGC SAN DIEGO	MRC SACRAMENTO	FGC SACRAMENTO	WRC TBD	TC	FGC	MRC	FGC	TELECONFERENCE	WRC
						File Notice w/OAL by		04/16/19		06/11/19			08/13/19		10/15/19			TBD		TBD		
						Notice Published		04/26/19		06/21/19			08/23/19		10/25/19			TBD		TBD		
						Title 14 Section(s)																
✱		MR	ST	MR	Commercial Logbooks	107, 174 and 176			E 7/1													
		MR	JS	WLB	Mammal Hunting, including deer/elk tag validation	362, 364, 364.1, 708.6			E 7/1		R											
		MR	JS	LED	Archery Equipment and Crossbow	354			E 7/1													
		MR	JS	WLB	Waterfowl (Annual)	502, 509			E 7/1		R											
		OA	SF	FB	Klamath River Basin 2084 (Emergency) (First 180 days)	7.50(b)(91.2)			E 7/1													
✱		OA	CC	MR	Hagfish Traps	180.6		D/A				E 10/1										
✱		MR	ST	MR	Recreational and Commercial Pacific Herring (Fishery Management Plan Implementation)	26.50, 28.50, 28.60, 28.62, 55.00, 55.01, 55.02, 163, 163.1, 163.5, 164 and 705		N		D			A			E 1/1						
✱		MR	CC	MR	Experimental Fishing Permit (EFP) Program (Phase I)	90 and 704			V	N			D/A			E 1/1						
✱		MR	JS	WLB	Possession of Nongame Animals (Nutria)	473				N			D		A					E 4/1		
		MR	ST	WLB	Wildlife Areas/Public Lands and Ecological Reserves	550, 550.5, 551, 552 and 630							N		D			A		E 4/1		
		OA	SF/CC	FB	Central Valley Salmon Sport Fishing (Annual)	7.50(b)(5), (68), (124), (156.5)					R				N			D		A		
		MR	JS	WLB	Mammal Hunting	360, 361, 362, 363, 364, 364.1					R				N			D		~~A~~		
		MR	JS	WLB	Waterfowl (Annual)	502					R				N			D		A		
		OA	SF/CC	FB	Klamath River Basin Sport Fishing (Annual)	7.50(b)(91.1)			E 7/1		R				N			D		A		
		MR	JS	WLB	Upland Game Bird	300					R							N		**D**		

RULEMAKING SCHEDULE TO BE DETERMINED

	OA	JS	FB	Simplification of Statewide Inland Fishing Regulations	5.00, 7.00, 7.50, 8.10																	
	OA	SF	FB	Klamath River Basin 2084 (Emergency) (90 day Extension - Phase I)	7.50(b)(91.2)																	
	OA	SF	FB	Klamath River Basin 2084 (Emergency) (90 day Extension - Phase II)	7.50(b)(91.2)																	
	OA	SF	FB	Klamath River Basin 2084 (Implementing Certificate of Compliance)	7.50(b)(91.2)																	
✱		CC	MR	Experimental Fishing Permit (EFP) Program (Phase II)	TBD																	
✱			MR	Commercial Kelp and Algae Harvest Management	165, 165.5, 704			V											V			
✱				Possess Game / Process Into Food	TBD																	
✱			OGC	American Zoological Association / Zoo and Aquarium Association	671.1																	
				Night Hunting in Gray Wolf Range	474																	
				Shellfish Aquaculture Best Management Practices	TBD	R											V		R			
✱				Ban of Neonicotinoid Pesticides on Department Lands	TBD																	
✱			MR	Commercial Pink Shrimp Trawl	120, 120.1, 120.2																	
✱			MR	Ridgeback Prawn Incidental Take Allowance	120(e)																	

EM = Emergency, EE = Emergency Expires, E = Anticipated Effective Date (RED "X" = expedited OAL review), N = Notice Hearing, D = Discussion Hearing, A = Adoption Hearing, V =Vetting, R = Committee Recommendation, WRC = Wildlife Resources Committee, MRC = Marine Resources Committee, TC = Tribal Committee