

**California Fish and Game  
Commission**

**Marine Resources Committee**

**Meeting Binder**



**November 17, 2022**

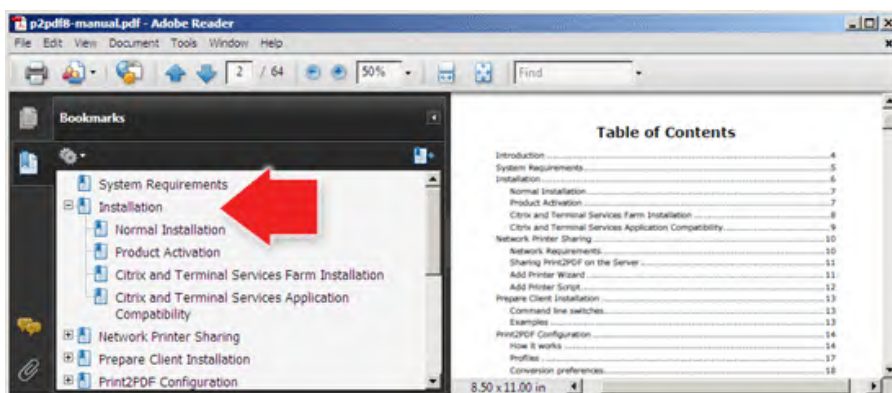
**San Diego, CA**


## **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

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- Welcome to this meeting of the Marine Resources 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 are being recorded for reference and archival purposes and are available upon request.
- Items may be heard in any order pursuant to the determination of the Committee Co-Chairs.
- 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 speaking during 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).

# INTRODUCTIONS FOR FISH AND GAME COMMISSION MARINE RESOURCES COMMITTEE

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## **FISH AND GAME COMMISSIONERS**

Samantha Murray	MRC Chair (La Jolla)
Eric Sklar	MRC Chair (Saint Helena)

## **COMMISSION STAFF**

Melissa Miller-Henson	Executive Director
Susan Ashcraft	Marine Advisor
Chuck Striplen	Tribal Advisor
Cynthia McKeith	Staff Services Analyst
David Haug	Regulatory Analyst
Kimberley Rogers	Sea Grant State Fellow

## **DEPARTMENT OF FISH AND WILDLIFE**

Eric Kord	Assistant Chief, Law Enforcement Division
Randy Lovell	Statewide Aquaculture Coordinator
Craig Shuman	Regional Manager, Marine Region
Joanna Grebel	Program Manager, Invertebrate Fisheries, Marine Region
Becky Ota	Program Manager, Marine Habitat Conservation, Marine Region
Kirsten Ramey	Program Manager, State Managed Finfish and Nearshore Ecosystem, Marine Region
Jason Kraus	Captain, Marine Law Enforcement Division
Julia Coates	Senior Environmental Scientist, Specialist

## **INVITED GUESTS**

Noah Ben-Adaret	Sustainable Fisheries and Aquaculture Program Manager, California Ocean Protection Council
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I would also like to acknowledge special guests who are present:  
(i.e., key DFW staff, elected officials, tribal chairpersons, other special guests)

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**Commissioners**  
**Samantha Murray**, President  
Del Mar  
**Erika Zavaleta**, Vice President  
Santa Cruz  
**Jacque Hostler-Carmesin**, Member  
McKinleyville  
**Eric Sklar**, Member  
Saint Helena  
**Anthony Williams**, Member  
Huntington Beach

STATE OF CALIFORNIA  
Gavin Newsom, Governor

**Melissa Miller-Henson**  
**Executive Director**  
P.O. Box 944209  
Sacramento, CA 94244-2090  
(916) 653-4899  
[fgc@fgc.ca.gov](mailto:fgc@fgc.ca.gov)  
[www.fgc.ca.gov](http://www.fgc.ca.gov)

## Fish and Game Commission



*Wildlife Heritage and Conservation  
Since 1870*

### MARINE RESOURCES COMMITTEE

Committee co-chairs: Commissioner Sklar and Commissioner Murray

**Meeting Agenda**  
**November 17, 2022; 8:30 a.m.**

**Handlery Hotel San Diego**  
**950 Hotel Circle North**  
**San Diego, CA 92108**

**and**

**Webinar and Teleconference**

**To participate in the meeting, you may join via Zoom or by telephone. [Click here](#) or go to <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=204684&inline> for instructions on how to join the meeting.**

**Note: Please 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 California Fish and Game 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 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. Aquaculture leasing in California – public interest determination**  
Receive update on public interest criteria development process and public input, including outcomes from September 30, 2022 public workshop. Discuss and provide committee direction on next steps for revising the draft criteria.

**4. Red abalone fishery management plan**

Receive Department update on 2022 survey results, harvest control rule development, and de minimis fishery concepts, and develop potential committee recommendation.

**5. Assessing and addressing bycatch in California fisheries**

(A) ***Overview of process for evaluating and addressing fishery bycatch***

Review the four-step process for limiting bycatch to acceptable types and amounts as outlined in the 2018 Marine Life Management Act (MLMA) master plan for fisheries.

(B) ***Evaluating bycatch in the California halibut fishery***

Receive Department update on analysis of bycatch data for the California halibut fishery to support fishery management review.

(C) ***Determining acceptable bycatch types and amounts***

Discuss potential approaches to completing inquiries for determining what bycatch is “acceptable” within a specific fishery, and develop potential committee recommendation.

**6. Coastal Fishing Communities Policy**

Receive Commission staff update on progress developing a draft policy on coastal fishing communities for potential Commission adoption, and discuss next steps.

**7. Staff and agency updates requested by the Committee**

Receive written updates from staff and other agencies.

*Note: To enhance meeting efficiency, the Committee intends to receive updates primarily in writing. The public will be given an opportunity to provide comment, although the level of in-meeting discussion will be at the discretion of the Committee.*

(A) ***California Ocean Protection Council***

(B) ***Department***

I. Law Enforcement Division

II. Marine Region

a. Marine protected areas network decadal management review

b. MLMA master plan implementation work plan update

(C) ***Commission staff***

**8. Future agenda items**

(A) ***Review work plan agenda topics, priorities, and timeline***

(B) ***Potential new agenda topics for Commission consideration***

(C) ***MRC meeting format***

Receive stakeholder input on format for future MRC meetings – hybrid versus in-person – and discuss potential modifications

Adjourn

## California Fish and Game Commission Meeting Schedule

**Note:** As meeting dates and locations can change, please visit [www.fgc.ca.gov](http://www.fgc.ca.gov) for the most current list of meeting dates and locations.

Meeting Date	Commission Meeting	Committee Meeting
December 13, 2022		<b>Tribal</b> Handlery Hotel San Diego 950 Hotel Circle North San Diego, CA 92108
December 14-15, 2022	Handlery Hotel San Diego (pending) 950 Hotel Circle North San Diego, CA 92108	
January 12, 2023		<b>Wildlife Resources</b> Los Angeles Area
February 8-9, 2023	Sacramento	
March 16, 2023		<b>Marine Resources</b> Monterey/Santa Cruz Area
April 18, 2023		<b>Tribal</b> Fresno/Bakersfield Area
May 17, 2023	Teleconference –Sacramento	
May 17, 2023		<b>Wildlife Resources</b> Monterey/Santa Cruz Area
June 14-15, 2023	Sacramento	
July 20, 2023		<b>Marine Resources</b> Sonoma/SF Bay Area
August 21, 2023		<b>Tribal</b> Smith River area/North Coast
September 21, 2023		<b>Wildlife Resources</b> Chico Area
October 11-12, 2023	San Jose Area	
November 16, 2023		<b>Marine Resources</b> San Diego Area
December 12, 2023		<b>Tribal</b> San Diego Area
December 13-14, 2023	San Diego Area	

## **Other Meetings of Interest**

### **Association of Fish and Wildlife Agencies**

- September 18-21, 2022 – Fort Worth, TX
- September 23-27; 2023 – Calgary, Alberta, Canada

### **Pacific Fishery Management Council**

- March 2023 – Seattle, WA
- April 2023 – Foster City, CA
- June 2023 – Vancouver, WA
- September 2023 – Spokane, WA
- November 2023 – Garden Grove, CA

### **Pacific Flyway Council**

- February 21, 2023 – St Louis, MO
- August 2023 – Location TBD

### **Western Association of Fish and Wildlife Agencies**

- Jan 4-10, 2023 – Santa Ana Pueblo, NM
- July 9-14, 2023 – Santa Fe, NM

### **Wildlife Conservation Board**

- November 15, 2022 – Sacramento, CA
- February 2023 – Sacramento, CA
- May 2023 – Sacramento, CA
- August 2023 – Sacramento, CA
- November 2023 – 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 composed of and chaired by up to two Commissioners; these assignments are made by the Commission each year.

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 preserving our outdoor heritage and conserving 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 Department's Equal Employment Opportunity (EEO) Office at (916) 653-9089 or [EEO@wildlife.ca.gov](mailto:EEO@wildlife.ca.gov). Accommodation requests for facility and/or meeting accessibility and requests for American Sign Language (ASL) Interpreters should be submitted at least two weeks prior to the event. Requests for Real-Time Captioners should be submitted at least four weeks prior to the event. These timeframes are to help ensure that the requested accommodation is met. If a request for an accommodation has been submitted but is no longer needed, please contact the EEO Office immediately.

### 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](mailto:fgc@fgc.ca.gov); **mail** to California Fish and Game Commission, P.O. Box 944209, Sacramento, CA 94244-2090; or **deliver** to California Fish and Game Commission, 715 P Street, 16<sup>th</sup> floor, 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 November 4, 2022**. Written comments received at the Commission office by this deadline will be made available to Commissioners prior to the meeting.

The **Supplemental Comment Deadline** for this meeting is **noon on November 14, 2022**. Comments received by this deadline will be made available to Commissioners at 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 must be redirected to the full Commission and submitted on the required petition form, FGC 1, *Petition to the California Fish and Game Commission for Regulation Change* (Section 662, Title 14, California Code of Regulations). 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. You will be given instructions during the meeting for how to be recognized by the Committee co-chair(s) to speak.
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 there are several speakers with the same concerns, please try to appoint a spokesperson and avoid repetitive comments.
5. If speaking during public comment for items not on the agenda (Agenda Item 2), 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, 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 **Written Comment Deadline** and approved by the Commission executive director before the meeting.

1. Electronic presentations must be provided by email to [fgc@fgc.ca.gov](mailto:fgc@fgc.ca.gov) or delivered to the Commission on a USB flash drive by the deadline.
2. All electronic formats must be Windows PC compatible.

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

**2. General public comment for items not on agenda****Today's Item****Information** ☒**Action** ☐

Receive public comment regarding topics that are not included on the agenda.

**Summary of Previous/Future Actions (N/A)****Background**

MRC receives two types of correspondence or comment under general public comment: requests for MRC to consider new topics and informational items. As a general rule, requests for regulatory change must be submitted to FGC on petition form FGC 1, Petition to the California Fish and Game Commission for Regulation Change (Section 662). However, MRC may, at its discretion, request that staff follow up on items of potential interest for possible recommendation to FGC.

**Significant Public Comments**

1. A member of the public discussed two concerns, one relating to salmon and another to crabbing season. First, they requested that MRC discuss the causes of declines of salmon populations in northern California, and asked why FGC and DFW do not have an ongoing dialogue on the numerous issues affecting salmon. Second, they expressed concern that since the 2021-22 season DFW did not clarify crabbing regulations as they pertain to the size that are caught and kept, and suggests that, if crabbers do not abide by the regulations, then more enforcement is necessary.
2. A member of the public shared an NPR article, dated Nov 2, 2022, highlighting marine scientist Enric Sala's National Geographic expeditions to the South Pacific before and after marine heatwaves. No additional comment by the commenter.

**Recommendation**

Staff recommends any new agenda items—based on issues raised and within FGC's authority—be held for discussion under Agenda Item 8, Future Agenda Items.

**Exhibits**

1. [Email from Phoebe Lenhart, received, Nov 2, 2022](#)
2. [Email from Paul Weakland, received, Nov 3, 2022](#)

**Committee Direction/Recommendation (N/A)**



## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

**3. AQUACULTURE LEASING IN CALIFORNIA - PUBLIC INTEREST DETERMINATION****Today's Item****Information** ☒**Action** ☐

Receive update on public interest criteria development process and public input, including outcomes from Sep 30, 2022 public workshop. Discuss and provide committee direction on next steps for revising the draft criteria.

**Summary of Previous/Future Actions**

- |  |   |
|--|---|
| • MRC recommended developing public interest criteria for new aquaculture leases                 | Mar 16, 2021; MRC, Webinar/Teleconference |
| • FGC approved MRC recommendation to develop public interest criteria for new lease applications | Apr 14, 2021; Webinar/Teleconference      |
| • MRC received DFW update on developing criteria   | Jul 21, 2021; MRC, Webinar/Teleconference |
| • MRC received DFW update on developing criteria   | Mar 24, 2022; MRC, Webinar/Teleconference |
| • Received and discussed initial draft criteria  | Jul 14, 2022; MRC, Santa Rosa             |
| • <b>Today's DFW update on draft criteria and guidance on next steps</b>                         | <b>Nov 17, 2022; MRC, San Diego</b>       |

**Background**

FGC has the authority to lease state water bottoms to any person for the purpose of conducting aquaculture in marine waters of the State, under terms agreed upon between FGC and the lessee (California Fish and Game Code sections 15400 and 15405). Prior to approving any lease, FGC must determine that the lease is in the public interest (Fish and Game Code Section 15400(a)). In Apr 2021, FGC approved an MRC recommendation to develop criteria for use in making a determination that an aquaculture lease applied for would be in the public interest, and referred the topic to MRC. DFW committed to take the lead in development. See Exhibit 1 for additional background.

In Jun 2022, DFW released initial draft criteria for review by government agencies, non-governmental organizations and stakeholders, hosted a public information session jointly with FGC staff, and received written feedback. DFW presented the initial draft criteria to MRC at its Jul 2022 meeting for discussion and additional public input.

*Update*

Following the Jul MRC meeting and public input, DFW prepared a revised draft version of the criteria. On Sep 30, DFW and FGC staff jointly hosted a public workshop on the revised criteria (Exhibit 2) and received public input. In addition, staff and DFW shared an overview of the effort and the current draft with the Offshore Aquaculture Interagency Working Group for

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

California, comprised of state and federal agencies of jurisdiction that coordinate on potential aquaculture development in federal waters. Agencies that are similarly tasked with making public interest determinations in permitting processes offered to serve as a resource for FGC's effort, based on their relevant experience.

Since the drafting process began (Jun 2022), over 50 sets of written comments have been submitted on the draft criteria; DFW and FGC staff have recently reviewed and summarized all comments received to date. A summary of key themes expressed in the comments is provided in Exhibit 3; individual comments, and staff's responses regarding how the comments are considered in the draft criteria, are summarized in Exhibit 4. The quality and detail within numerous letters reflect a significant investment of time and thought by stakeholders and organizations; in several cases, specific feedback and suggestions are many pages in length.

Comments received from environmental non-governmental organizations and industry representatives over the effort to date have varied widely and, in some cases, are conflicting, although all acknowledge concern for both protection and use of important resources. There have been especially diverse perspectives on the role of environmental considerations at the public interest determination stage in advance of the formal environmental review process under the California Environmental Quality Act (CEQA). DFW has previously clarified that its intent with the draft criteria is not to duplicate or supplant the State's required environmental review under CEQA, but to help highlight specific project concerns that warrant more thorough review and analysis.

In addition, comments have diverged in what role specific criteria should play in either supporting economic development through aquaculture or filtering out proposed aquaculture leases as not in the public interest before undergoing CEQA review. This type of discourse is not unfamiliar – it's been grappled with by other governmental organizations within the United States and in other countries tasked with making public interest determinations in permitting. As an example, the U.S. Army Corp of Engineers developed its own criteria through federal regulation, stating that "one specific factor (e.g., fish and wildlife values or economics) cannot by itself force a specific decision, but rather the decision represents the net effect of balancing all public interest factors, many of which are frequently in conflict" and noting that each project is different. Staff advises that the intent for FGC's criteria adhere to the same principle. However, guidance from MRC on how criteria should be applied will help provide clarity for advancing criteria development.

DFW and FGC staff believe that additional revisions to the draft criteria are needed based on the most recent feedback. Staff believes this effort would benefit from the experience and further insights of the governmental agencies that have offered support. Staff further envisions additional discussion with commenters who have provided thoughtful input.

**Significant Public Comments**

1. Two representatives of the aquaculture industry (exhibits 6 and 7) expressed concern that the public interest criteria process could be a redundant permitting exercise that may be duplicative of CEQA and permitting by other existing authorities. They also emphasized how very few people understand the permitting process and requested a new website to serve as a tool for applicants. Lastly, they expressed concern of

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

monopolization of the aquaculture industry by a handful of people who can afford the permitting process. One representative provided suggested revisions to the draft.

2. Sixteen environmental non-governmental organizations signed a joint letter (Exhibit 8), commenting that the second draft criteria weakened the initial draft criteria and were not ready for advancing to FGC. They want stronger environmental considerations, including explicit emphasis on the public trust doctrine, as a screen to filter lease applications before CEQA review. In addition to these comments, they proposed numerous revisions and additional considerations.
3. The San Diego Unified Port District—an agency that is a landlord, operator, regulator and environmental steward of state tidelands and submerged lands—shared a series of detailed general and specific comments (Exhibit 9). General comments included a request for greater clarification about how the criteria will be used, concern that certain criteria are duplicative of CEQA review, and a suggestion that criteria work in tandem with the environmental review process but are not binding. Specific comments include a suggestion to recognize different types of aquaculture and requested revisions to draft criteria language to clarify intent.

### Recommendation

**FGC staff:** Direct staff to engage governmental organizations and prepare a revised suite of draft criteria. Provide guidance on priorities for what to focus on in the next version, consistent with DFW's recommendation.

**DFW staff:** Direct staff to prepare a revised suite of draft criteria and provide guidance on priorities for what to focus on in the next version.

### Exhibits

1. [Background document: Staff summary from item 4, MRC meeting, Jul 14, 2022](#)
2. [Sep 30, 2022 workshop materials, including public interest criteria drafts](#)
3. [Key themes in public comments received on draft public interest criteria, DFW, received Nov 10, 2022](#)
4. [Summary of public comments on public interest criteria and staff responses, DFW, dated Nov 14, 2022 \(will be posted separately\)](#)
5. [DFW presentation](#)
6. [Letter from Nathan Churches, Chief Science Officer, Holdfast Aquaculture, LLC, received Oct 10, 2022](#)
7. [Letter from Terry Sawyer, Co-Founder and Vice President, Hog Island Oyster Company, received Nov 3, 2022](#)
8. [Joint letter from 16 NGOs, received Nov 3, 2022](#)
9. [Letter from Jason Giffen, Vice President for Planning & Environment, San Diego Unified Port District, received Nov 4, 2022](#)

### Committee Direction/Recommendation (N/A)

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

**4. RED ABALONE FISHERY MANAGEMENT PLAN****Today's Item****Information** ☐**Action** ☒

Receive Department update on 2022 abalone survey results, harvest control rule development, and *de minimis* fishery concepts, and develop potential committee recommendation.

**Summary of Previous/Future Actions**

- |  |   |
|--|---|
| • FGC supported development of recreational red abalone fishery management plan (FMP)            | Oct 8, 2014; Mt. Shasta                                       |
| • FGC received peer review results for draft FMP and re-referred to MRC                          | Oct 17, 2018; Fresno  |
| • FGC supported revised process per MRC recommendation   | Dec 12-13, 2018; Oceanside                                    |
| • MRC received administrative team report recommendations  | Mar 17 and Apr 29, 2020; MRC, Webinar/Teleconference          |
| • MRC recommended FGC support DFW to develop a draft FMP with administrative team report options | Jul 29, 2020; MRC, Webinar/Teleconference                     |
| • FGC approved MRC recommendation  | Aug 19-20, 2020; Webinar/Teleconference                       |
| • MRC received DFW updates on FMP progress   | Jul 16, Nov 21, and Nov 17, 2020; MRC, Webinar/Teleconference |
| • MRC received draft management chapter for FMP  | Mar 24, 2022; MRC, Webinar/Teleconference                     |
| • MRC discussed draft management strategy and provided input to DFW                              | Jul 14, 2022; MRC, Santa Rosa                                 |
| • <b>Today receive DFW update and potential MRC recommendation</b>                               | <b>Nov 17, 2022; MRC, San Diego</b>                           |

**Background**

An FMP for the north coast recreational red abalone fishery has been under development by DFW since 2014; DFW has provided regular progress updates to MRC.

Key milestones relevant to today's discussion are detailed in background materials from the Jul 2022 MRC meeting (Exhibit 1). In brief, recent milestones have culminated in:

- FGC endorsement of MRC recommendation for DFW to develop a draft FMP, using both spawning potential ratio (SPR) and density metrics in a harvest control rule (Aug 2020)
- DFW developing a draft FMP and giving general updates to MRC (late 2020-early 2022)
- DFW presenting a draft FMP management chapter to MRC and the public (Mar 2022). The chapter introduced:

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

- New “climate-ready” environmental and abalone indicators for fishery opening;
- a new harvest control rule approach called an “egg production-based indicator model” that merges the SPR and density data streams into a single model rather than separate metrics; and
- rationale for developing a hybrid model rather than separate data streams.
- MRC requests and DFW commitments (Mar 2022, Jul 2022):
  - Increase transparency and communication with key partners and the Recreational Abalone Advisory Committee (RAAC);
  - prepare a more in-depth and clear explanation of how DFW staff arrived at the current proposed management strategy;
  - discuss the proposed new management strategy and partner concerns in more depth;
  - seek to find common ground with partners among competing management strategies and find a workable management strategy solution;
  - provide more information about scale of a *de minimis*, or limited, fishery relative to a rebuilding stock size; and
  - perform summer field surveys to assess abalone stock status and provide updated data.

**Update**

Consistent with its commitments made in Jul 2022, DFW completed the summer abalone field surveys; conducted stakeholder outreach for more thorough discussion of management strategies; and prepared an in-depth report of rationale for its management strategy recommendation. In the report (Exhibit 2), DFW further expounds on its recommendation to use the density and egg production model by detailing:

- Background on the management approaches analyzed (i.e., density, SPR, and egg production);
- the management strategy evaluation it conducted; and
- the assessment of indicators (i.e., SPR and density performance for simulated red abalone data, and egg production performance).

For today’s meeting, DFW will present 2022 survey results, management strategy details, an analysis of abalone stock indicators (i.e., trade-offs of using density, SPR, density and SPR, or egg production), and future fishing opportunity considerations (Exhibit 4). The presentation will support discussion and a potential MRC recommendation related to a potential path forward with harvest control rule development, *de minimis* fishery concepts, surveys, or other next steps.

**Significant Public Comments**

An abalone historian makes a case for redirecting focus from harvest control rule development to helping abalone recover given the “perilous current condition of red abalone” and provides historic and current context to support the request. The commenter urges FGC and DFW to

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

shift focus to red abalone recovery efforts, such as developing new strategies to address the key threats that have emerged since the time of the Abalone Recovery and Management Plan (Exhibit 4).

### Recommendation

**FGC staff:** Provide guidance regarding project focus on abalone surveys, harvest control rule selection or further development, and *de minimis* fishery development as recommended by DFW. (2) Discuss whether DFW should place emphasis on developing a recovering plan (currently in preparation for FMP).

**DFW:** Provide guidance regarding additional abalone surveys, harvest control rule selection or further development, and *de minimis* fishery development.

### Exhibits

1. [Background document: Staff summary and exhibits from Jul 14, 2022 MRC meeting](#)
2. [DFW report: \*Analysis of red abalone stock indicators\*, Marine Region, dated Oct 2022](#)
3. [DFW presentation](#)
4. [Email from Ann Vileisis, dated Nov 4, 2022](#)

### Committee Direction/Recommendation

The Marine Resources Committee recommends that the Commission support DFW focusing on the following areas of red abalone fishery management plan development and/or recovery planning: \_\_\_\_\_ .

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

**5. ASSESSING AND ADDRESSING BYCATCH IN CALIFORNIA FISHERIES****Today's Item**Information ☐Action ☒

- (A) ***Overview of process for evaluating and addressing fishery bycatch***  
Review the four-step process for limiting bycatch to acceptable types and amounts as outlined in the 2018 Marine Life Management Act (MLMA) master plan for fisheries.
- (B) ***Evaluating bycatch in the California halibut fishery***  
Receive Department update on analysis of bycatch data for the California halibut fishery to support fishery management review.
- (C) ***Determining acceptable bycatch types and amounts***  
Discuss potential approaches to completing inquiries for determining what bycatch is “acceptable” within a specific fishery and develop potential committee recommendation.

**Summary of Previous/Future Actions**

- |  |   |
|--|---|
| • FGC referred California halibut management review to MRC   | Aug 19-20, 2020; Webinar/Teleconference   |
| • DFW update on California halibut stock assessment and management review                              | Mar 16, 2021; MRC, Webinar/Teleconference |
| • DFW update; MRC recommendation to schedule bycatch review discussion                                 | Nov 9, 2021; MRC, Webinar/Teleconference  |
| • FGC referred bycatch review to MRC   | Dec 15-16, 2021; Webinar/Teleconference   |
| • FGC received update on bycatch evaluation for California halibut management review                   | Mar 24, 2022; MRC, Webinar/Teleconference |
| • DFW written update on bycatch evaluation for California halibut                                      | Jul 14, 2022; MRC, Santa Rosa             |
| • <b>Today's update and discussion on bycatch evaluation for halibut; potential MRC recommendation</b> | <b>Nov 17, 2022; MRC, San Diego</b>       |

**Background**

The California halibut fishery is a multi-sector commercial and recreational fishery managed under FGC authority. In 2019, as part of the fisheries prioritization process required by the Marine Life Management Act (MLMA) and outlined in *2018 Master Plan for Fisheries, A Guide for Implementation of the Marine Life Management Act*, California halibut was prioritized for management review. In Aug 2020, DFW recommended that it initiate the management review process for California halibut; FGC concurred and referred the topic to MRC.

One key driver in halibut's high priority ranking included potential risks to bycatch species (including sub-legal-sized halibut) in commercial trawl and set gillnet fisheries. Bycatch, as defined by MLMA for state-managed fisheries, means “...fish or other marine life that are taken in a fishery but are not the target of the fishery. Bycatch includes discards” (California Fish and Game Code Section 90.5). MLMA requires that DFW manage every sport and commercial



## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

marine fishery in a way that *limits bycatch to acceptable types and amounts* (Fish and Game Code Section 7056(d)), and specifies information, analysis, and management measures required to accomplish this for each fishery (Fish and Game Code Section 7058).

The master plan established a bycatch evaluation framework in Chapter 6 (“Ecosystem-based objectives”) as guidance for achieving the requirements of Section 7058. The framework is detailed in a section titled “Limiting bycatch to acceptable types and amounts” (Exhibit 1). The section draws largely from the work of a group of diverse stakeholders, called the Bycatch Working Group, convened by FGC in 2015 to help inform review of bycatch management. The framework in the master plan is, in part, designed to help determine what constitutes “acceptable types and amounts” of bycatch for each fishery evaluated.

The California halibut fishery management review presents the first opportunity to utilize the master plan’s bycatch evaluation framework. In Dec 2021, FGC requested that MRC pursue the halibut bycatch evaluation as a separate work plan topic from the related fishery management review that the bycatch evaluation will inform, to ensure robust public engagement through this first evaluation process. In Mar 2022, DFW presented MRC with its approach to evaluating halibut fishery bycatch and, in Jul 2022, DFW provided a written update about its continued efforts and hurdles it is facing in analyzing halibut bycatch from the available data.

Today’s meeting is an opportunity to focus on the master plan guidance and discuss options for how to complete the steps in the process.

**(A) *Overview of process for evaluating and addressing fishery bycatch***

FGC staff will recap the four-step process laid out in the master plan framework to identify bycatch and consider its impacts (Exhibit 1):

- Step 1 – Collect information on the amount and type of catch
- Step 2 – Distinguish target, incidental, and bycatch species
- Step 3 – Determine “acceptable” types and amounts of bycatch
- Step 4 – Address unacceptable bycatch

Note that today’s meeting is focused on steps 1-3.

**(B) *Evaluating bycatch in the California halibut fishery (steps 1 and 2)***

Consistent with MRC discussion in Jul 2022, DFW has provided the recently-completed bycatch assessment report for the trawl and set gillnet California halibut fisheries that DFW developed in collaboration with an academic partner, which authored the final report (Exhibit 2). DFW believes that the report accomplishes the goals of steps 1 and 2 and is adequate to support the Step 3 analysis. DFW will present an overview of the complex assessment, methods and results—to help build a common understanding of the foundational data that can support the Step 3 evaluation of bycatch acceptability—and potential next steps for MRC consideration (Exhibit 3).

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**(C) *Determining acceptable bycatch types and amounts (Step 3)***

The master plan specifies that DFW will determine if the amount and type of bycatch is unacceptable for a particular fishery using four criteria mandated in MLMA (Fish and Game Code Section 7058):

1. Legality of take of bycatch species
2. Degree of threat to the sustainability of the bycatch species
3. Impacts on fisheries that target the bycatch species
4. Ecosystem impacts

The master plan bycatch evaluation framework (Exhibit 1) lays out a detailed series of inquiries and recommended actions for each criterion under Step 3 that would be applied to each species of bycatch. The inquiries provide a structural basis for managers to consistently assess each criterion to determine what is “acceptable” bycatch in the fishery and to articulate the findings. However, given the number of bycatch species and the detailed inquiries that would need to be applied to each, it is necessary to prioritize which species to include in the Step 3 assessment. It is possible that selecting a handful of representative species for the assessment would be sufficient, as the benefit of proposed management actions will likely have benefits across multiple species.

Today’s meeting provides an opportunity to explore how DFW might accomplish the bycatch inquiries for California halibut in a manner that is transparent, inclusive and timely. This discussion will inform MRC’s direction or potential recommendation regarding an approach.

**Significant Public Comments**

A joint comment from two environmental non-governmental organizations emphasizes the importance of FGC’s commitment to minimize fishery bycatch, with an initial focus on California halibut trawl and gill net gears, consistent with DFW’s ecological risk assessment and prioritization. The organizations have conducted their own bycatch assessments of trawl and set gillnet gear in California using federal observer data and request a collaborative approach to implementing the bycatch inquiry. They also request that MRC provide direction on what additional analyses are needed and to outline the public process and timeline MRC will follow to make a recommendation to FGC (Exhibit 4).

**Recommendation**

**FGC staff:** (1) Recommend FGC support DFW moving forward with Step 3 of the bycatch evaluation to determine bycatch acceptability, using the bycatch analysis report DFW provided today (Exhibit 2) and a DFW-led workgroup of key communicators representing various interests to provide a forum for discussing responses to the Step 3 inquiries prior to bringing recommendations to MRC. (2) Recommend using MRC as a forum for broader discussion and, ultimately, MRC recommendation to FGC on DFW’s findings. (3) Provide guidance on selection of bycatch species to begin Step 3.

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**DFW:** Move forward with Step 3 of the framework in the master plan analysis based on the information contained in the steps 1 and 2 bycatch analysis report (Exhibit 2), and provide guidance on options for public engagement in determining bycatch acceptability.

### Exhibits

1. [Chapter 6 – “Ecosystem-based objectives: Limiting bycatch to acceptable types and amounts”, extracted from 2018 Master Plan for Fisheries, A Guide to Implementation of the Marine Life Management Act, dated June 2018](#)
2. [Report by Christopher M. Frees, DFW contractor: Assessment of associated landed species and bycatch discards in the California halibut gill net and trawl fisheries, received Nov 4, 2022](#)
3. [DFW presentation](#)
4. [Letter from Geoff Shester, Oceana, and Scott Webb, Turtle Island Restoration Network, received Nov 3, 2022](#)

### Committee Direction/Recommendation

The Marine Resources Committee recommends that the Commission (1) support the Department moving forward with evaluation of bycatch acceptability based on the analysis report submitted by the Department at the committee’s November 2022 meeting; and (2) request that the Department pursue the following approach for completing the inquiries within the Step 3 evaluation framework and engaging stakeholders in the process: \_\_\_\_\_

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

**6. COASTAL FISHING COMMUNITIES POLICY**

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

Receive FGC staff update on progress developing a draft policy on coastal fishing communities for potential FGC adoption, and discuss next steps.

**Summary of Previous/Future Actions**

- MRC update and recommendation to begin policy development Mar 16, 2021; MRC, Webinar/Teleconference
- FGC approved MRC recommendation Apr 14, 2021; Webinar/Teleconference
- MRC update Jul 21, 2021; MRC, Webinar/Teleconference
- MRC update on the policy and discussion: presented policy goals and key concepts document Nov 9, 2021; MRC, Webinar/Teleconference
- Update on policy drafting workshop outcomes Mar 24, 2022; MRC, Sacramento
- MRC update Jul 14, 2022; MRC, Santa Rosa
- **Today's update on draft policy outline Nov 17, 2022; MRC, San Diego**

**Background**

The Coastal Fishing Communities Project is an FGC initiative to more directly recognize coastal fishing community needs and the impact that different options for achieving conservation and use goals in fisheries management decisions may have on those communities. As part of this initiative, FGC staff is in the process of developing a policy for coastal fishing communities for future FGC consideration. The initial draft policy was shared at a public workshop in Feb 2022 (materials available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=199387&inline>).

FGC staff appreciates the feedback received during and following the public workshop. In spring 2022, staff began to incorporate feedback received into a revised draft policy with the intention of sharing that revised draft in a second workshop at the beginning of summer. However, after integrating much of the feedback, the draft increased in length and specificity, causing concern that the policy had lost focus and would not be adaptable to different strategies to achieve its overall goal. Many of the details, however, would be appropriate for consideration within an implementation work plan that can be adapted over time as needs change. See Exhibit 2 for details on the process and considerations for streamlining a draft policy.

At today's meeting FGC staff will share an outline for a revised draft policy (Exhibit 3) for discussion. Staff seeks MRC feedback on the proposed outline, process, and whether to continue in this new direction.

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Following today's meeting, staff anticipates incorporating any feedback and reviewing the full revised draft policy with stakeholders and partners at a workshop on Dec 1, 2022.

**Significant Public Comments (N/A)****Recommendation**

Provide feedback on the proposed draft policy outline, policy development process, and whether to continue in this new direction.

**Exhibits**

1. [Background document: Staff summary from Item 8, Mar 24, 2022 MRC meeting](#)
2. [FGC staff update on policy development process, dated Nov 9, 2022](#)
3. [Outline, revised draft coastal fishing communities policy, dated Nov 9, 2022](#)

**Committee Direction/Recommendation (N/A)**

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

**7. STAFF AND AGENCY UPDATES REQUESTED BY THE COMMITTEE****Today's Item****Information** ☒**Action** ☐

Receive written updates from staff and other agencies.

(A) California Ocean Protection Council (OPC)

(B) DFW

I. Law Enforcement Division

II. Marine Region

a. Marine protected areas (MPA) network decadal management review

b. Marine Life Management Act (MLMA) master plan implementation work plan update

(C) FGC staff

**Summary of Previous/Future Actions (N/A)****Background**

This is a standing item for staff and agencies to provide an update on marine-related activities of interest. Updates related to current work plan topics are generally provided in writing. The public will have an opportunity to provide comment, although the level of in-meeting discussion will be at the discretion of MRC.

(A) **OPC**

OPC staff provided a written update (Exhibit 1) and will be presenting on several topics of interest to the committee.

(B) **DFW**

I. *Law Enforcement Division*

Marine law enforcement staff will provide a verbal update on marine enforcement topics of interest.

II. *Marine Region*

Marine Region has provided updates on two topics on the MRC work plan.

a. DFW staff will present an update on the MPA network decadal management review (Exhibit 2).

b. DFW has updated its MLMA master plan implementation work plan, which is provided as Exhibit 3.

(C) **FGC staff**

FGC has been matched with its 2023 Sea Grant Fellow. Kinsey Mathews is completing her master's degree from Moss Landing Marine Laboratories, California State University, and will start her tenure with FGC in Mar 2023. Kimi Rogers will remain in her fellowship position through Feb 2022.

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FGC's Tribal Advisor and Liaison Chuck Striplen has provided an overview of the Tribal Committee's tribal subsistence harvest project that is currently underway (Exhibit 4). Chuck will be available at the meeting to answer any questions about the project and its current status.

**Significant Public Comments (N/A)****Recommendation (N/A)****Exhibits**

1. [OPC written update](#)
2. [DFW presentation: MPA network decadal management review](#)
3. [Marine Life Management Act Master Plan: Implementation Work Plan, dated Nov 2022](#)
4. [Issue statement and background for the tribal subsistence definition workgroup, dated December 9, 2021 draft](#)

**Committee Direction/Recommendation (N/A)**



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**8. FUTURE AGENDA ITEMS**

<b>Today's Item</b>	<b>Information <input type="checkbox"/></b>	<b>Action <input checked="" type="checkbox"/></b>
(A) Review work plan agenda topics, priorities, and timeline		
(B) Potential new agenda topics for FGC consideration		
(C) MRC meeting format: Receive stakeholder input on format for future MRC meetings – hybrid versus in-person – and discuss potential modifications		

**Summary of Previous/Future Actions**

- |   |                                     |
|---|-------------------------------------|
| • FGC approved MRC agenda and work plan | Oct 12-13, 2022; Kings Beach        |
| • <b>Today's discussion</b>             | <b>Nov 17, 2022; MRC, San Diego</b> |
| • Next MRC meeting                      | Mar 16, 2023; MRC, Monterey         |

**Background**

Committee topics are referred by FGC and scheduled as appropriate. FGC-referred topics and their schedule are shown in the MRC work plan (Exhibit 1); currently several complex and time-intensive topics are under development. MRC has placed emphasis on issues of imminent regulatory or management importance; thus, scheduling current topics and considering new topics for MRC review requires planning relative to existing workload and timing considerations.

**(A) *MRC Work Plan and Timeline***

Topics anticipated to be proposed for the Mar 2023 MRC meeting are shown in the “Mar 2023” column of the work plan in Exhibit 1. Note that readiness considerations may lead to changes in proposed timing and type of anticipated action for FGC consideration at its Feb 2023 meeting. Staff welcomes guidance from MRC regarding scheduling any specific topics identified in the work plan.

**(B) *Discuss and Recommend New MRC Topics***

Today is an opportunity to identify any potential new agenda topics to recommend to FGC for referral to MRC. No new topics have been identified by staff for potential referral to MRC at this time.

**(C) *MRC meeting format***

MRC invites stakeholder input on the format for future MRC meetings – considering the benefits and challenges with the recent hybrid in-person/webinar format and those of the pre-pandemic in-person only format – and discuss potential modifications. Formats and staff reflections are summarized below to support discussion.

***In-person MRC meetings (2000-2019)***

Since MRC was established in 2000, meetings were held in-person among committee chair(s), FGC staff, DFW staff, stakeholders, and members of the public. The face-to-face format was intended to provide a more informal, problem-solving structure for discussions

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

outside of FGC meetings while complex marine resource management options were at a formative stage. The in-person format required travel to meeting locations in different regions of the state, generally along the coast, which presented limitations on stakeholder participation based on time constraints and financial cost. It was common for ocean-dependent stakeholders to only attend meetings scheduled near their home port or to travel at personal expense for pivotal discussions that would impact them. The most consistent participation typically came from organizations with paid staff.

### *Remote MRC meetings (2020-Mar 2022)*

Following the “stay at home” order issued in Mar 2020, with the onset of the COVID-19 pandemic, MRC adapted quickly to provide a virtual-only platform for conducting MRC meetings from remote locations. Remote meetings allowed for continued participation when in-person meetings were suspended. The format increased public access and participation without necessitating travel time and costs that otherwise might preclude engagement, which aligned with FGC’s vision for advancing justice, equity, diversity and inclusion; however, the format can be particularly challenging when participation and interest in sharing are high. The two-dimensional format, conducted primarily without video for stakeholders and members of the public, tended to change the meeting dynamics from the informal, organic discussions to a more formalized “public comment” form of engagement to accommodate the increased participation and technology. Without the direct, face-to-face format, there also tended to be less active listening to the dialogue by all participants.

### *Hybrid (in-person/webinar) MRC meetings (Jul 2022 – present)*

In Apr 2022, FGC for the first time began providing options for both in-person and remote participation and comment in all its meetings. Jul 2022 was MRC’s first time providing both an in-person and remote participation venue post-pandemic. The experience still allowed for broader stakeholder and public participation via Zoom, but exposed new challenges, such as technology supporting adequate sound volume, the inability to interject when a remote participant is speaking, a reduction in non-verbal communication, a similar tendency toward formality as the remote-only meetings, and limited in-person attendance outside of commissioners, FGC and DFW staff, and paid staff from other organizations. If the hybrid (in person and virtual) format is to be effective, additional work is necessary to support active dialogue and engagement and enhanced remote participation.

Today’s discussion, held at the request of FGC, is to receive public input on and discuss the format of future MRC meetings.

## **Significant Public Comments (N/A)**

## **Recommendation**

- (A) Review list of topics identified for the Mar 2023 MRC meeting and determine if topics should be revised or any additional topics on the work plan should be scheduled for that meeting.
- (B) Identify any potential new topics to recommend to FGC for referral to MRC.

## COMMITTEE STAFF SUMMARY FOR NOVEMBER 17, 2022 MRC

- (C) Learn from stakeholders about their preferences for meeting format and provide direction regarding potential changes to MRC's meeting format.

### Exhibits

1. [MRC work plan, updated Nov 1, 2022](#)

### Committee Direction/Recommendation

The Marine Resources Committee recommends that the Committee work plan be updated with the following changes: \_\_\_\_\_.

From: Phoebe Lenhart <[REDACTED]>  
Sent: Wednesday, November 2, 2022 3:30 PM  
To: FGC <FGC@fgc.ca.gov>  
Subject: November 17, 2022, Marine Resources Committee, (2) General public comment

Dear Commissioners,

There are two concerns that I wish to bring to your attention as I do not see either matter addressed on the agenda for the November 17, 2022 meeting.

First, I do not know if any of you read the tragic reports (dated October 10, 2022) regarding the deaths of 60,000 salmon returning to the Neekas River (British Columbia). The drought is responsible for the deaths of 70% of the salmon before they were able to reproduce due to unseasonably warm and dry weather.

The reason that I am bringing this to your attention is that the Neekas River could very easily be our Klamath River or Smith River. In these years of catastrophic climate change, not to see any agenda item (on the Marine Resources Committee) in reference to the spring and fall salmon along the CA coast is a concern. Why isn't there an ongoing dialogue between the DFW and the FGC on drought conditions in CA rivers? Issues regarding dams? Poor spawning conditions? Over fishing? Compliance to size limitations? Etc. There are many matters affecting our local salmon that I see are detrimental to the success of salmon spawning now and in the future years. I don't think the biological significance of salmon in our area is given enough importance and attention by government agencies.

Second, since the crabbing season of 2021-2022, I was under the impression that the DFW was going to clarify the regulations as they pertain to the size of crabs that are caught and kept (rather than released due to under size). Numerous crabbing vessels that returned to the Crescent City Harbor caught and kept undersized crabs during the 2021-2022 crabbing season. To date, I have not seen any revision to the crabbing regulations as the 2022-2023 crabbing season will begin soon. Where are the improved crabbing regulations? Unfortunately, it appears that if crabbers don't abide by the regulations; then, more enforcement is necessary.

Thank you very much in advance for considering my two concerns. I hope that both concerns will be delegated to the appropriate departments for improvements.

Sincerely,

Phoebe Lenhart  
[REDACTED]

Sent from my iPad

From: paul weakland <[REDACTED]>

Sent: Thursday, November 3, 2022 9:15 AM

To: FGC <FGC@fgc.ca.gov>

Subject: This coral reef resurrected itself — and showed scientists how to replicate it : NPR

<https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.npr.org%2F2022%2F11%2F02%2F1132950728%2Fcoral-reef-resurrected-climate-change-bleaching-protection-nat-geo&data=05%7C01%7CFG%40fgc.ca.gov%7Cafe3c48177be43dd49a808dabdb691fa%7C4b633c25efbf40069f1507442ba7aa0b%7C0%7C1%7C638030889087833790%7CUnknown%7CTWFpbGZsb3d8eyJWljoIMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IjEhaWwiLCJXVCi6Mn0%3D%7C2000%7C%7C&reserved=0>

Sent from my iPad

## COMMITTEE STAFF SUMMARY FOR JULY 14, 2022 MRC

*For background purposes only*

### 4. AQUACULTURE LEASING IN CALIFORNIA – PUBLIC INTEREST DETERMINATION

#### Today's Item

Information ☒

Action ☐

Receive and discuss initial draft public interest determination criteria for new aquaculture lease applications in state waters.

#### Summary of Previous/Future Actions

- |  |   |
|--|---|
| • MRC recommended developing public interest criteria for new aquaculture leases                 | Mar 16, 2021; MRC, Webinar/Teleconference |
| • FGC approved MRC recommendation to develop public interest criteria for new lease applications | Apr 14-15, 2021; Webinar/Teleconference   |
| • MRC received DFW update on developing criteria   | Jul 21, 2021; MRC, Webinar/Teleconference |
| • DFW update on developing criteria  | Mar 24, 2022; MRC, Webinar/Teleconference |
| • <b>Receive and discuss initial draft criteria</b>  | <b>Jul 14, 2022; MRC, Santa Rosa</b>      |

#### Background

FGC has the authority to lease state water bottoms to any person for the purpose of conducting aquaculture in marine waters of the State, under terms agreed upon between FGC and the lessee (California Fish and Game Code sections 15400 and 15405). Prior to approving any lease, FGC must determine that the lease is in the public interest (Fish and Game Code section 15400(a)).

In Apr 2021, MRC recommended, and FGC approved, initiating a process to define and formalize standards that must be met for a new proposed lease to be found in the public interest. DFW offered to take the lead in developing draft public interest criteria, under MRC's guidance. In Jul 2021, MRC provided feedback to DFW, suggesting the criteria be developed for consideration within a proposed FGC policy, followed by regulations if needed (see Exhibit 1 for additional background).

In Mar 2022, DFW outlined a process to develop draft criteria, including research, coordination amongst agencies, and stakeholder engagement. Following a discussion of potential categories of criteria, MRC requested that DFW develop preliminary draft criteria, circulate the draft to stakeholders, and bring it to MRC for discussion in Jul 2022. FGC staff also committed to supporting at least one public workshop before the Jul MRC meeting.

#### Update

Following the Mar 2022 MRC meeting, DFW developed an initial draft suite of criteria for agency, stakeholder, and MRC review (Exhibit 2). In Jun 2022, DFW shared the initial draft with FGC staff, other agencies of jurisdiction, current lease holders and applicants, and several non-governmental

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*For background purposes only*

organizations (NGOs) for initial feedback. On Jul 1, DFW published the draft on its webpage (<https://wildlife.ca.gov/Aquaculture>). A public webinar is being jointly hosted by DFW and FGC staff on July 12 (two days prior to today's meeting), for DFW to present a detailed overview of initial criteria and answer questions in advance of the MRC discussion (Exhibit 3).

At today's meeting, DFW will present MRC with an overview of the initial draft criteria and a summary of feedback received to date, including input submitted directly to DFW. DFW seeks MRC guidance regarding the current draft, a potential public workshop in late summer or early fall, and further development of a DFW-recommended draft for MRC discussion in Nov 2022.

### **Significant Public Comments**

Comments were received from two current lease holders, one new lease applicant, and jointly from five environmental NGOs.

- A current lessee and a lease applicant in Tomales Bay submitted comments following the Mar 2022 MRC meeting in support of developing public interest criteria and participating in the process (exhibits 4 and 5). They disagree with comments that FGC should pause consideration of current aquaculture lease applications while public interest criteria are developed; offer feedback about how to develop criteria; and emphasize concern over including environmental criteria that are already evaluated through existing processes, namely the California Environmental Quality Act (CEQA) (also noted in Exhibit 6).
- A current leaseholder offshore Santa Barbara emphasizes the potential for aquaculture to support California coastal fishing communities and improve access to seafood; they recommend criteria for lease issuance focus on offshore locations, small lease sizes, and qualifications and community participation of lease candidates (Exhibit 6).
- Representatives of five environmental NGOs submitted a joint letter to provide feedback and recommendations on initial draft criteria shared by DFW (as seen in Exhibit 2). They request clarification in a few areas and include a redlined version of DFW's initial draft for consideration (Exhibit 7).
- Additionally, commenters shared concerns about DFW's capacity to carry out additional tasks for different reasons:
  - staff focus on developing the public interest criteria will delay processing of existing and new aquaculture lease requests (Exhibit 4); or
  - issuing any new leases in addition to monitoring current lease compliance and enforcement may overburden staff (Exhibit 7).

### **Recommendation (N/A)**

### **Exhibits**

1. Background document: Staff summary from agenda item 10, MRC meeting on Mar 24, 2022
2. DFW document: Initial draft criteria for public interest determination, received Jun 28, 2022
3. FGC email notice of aquaculture public interest determination webinar, dated Jul 2, 2022

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4. Letter from John Finger, CEO/Co-Founder, Hog Island Oyster Company, received Mar 25, 2022
5. Letter from Joel Barnard and Bob Broadsky, San Andreas Shellfish, received Apr 8, 2022
6. Email and letter from Bernard Friedman, President, Santa Barbara Mariculture, received Jun 23, 2022
7. Email from Ashley Eagle-Gibbs, Legal and Policy Director, Environmental Action Committee of West Marin, transmitting joint letter from five non-governmental organizations, received Jun 30, 2022

**Committee Direction/Recommendation (N/A)**



**California Department of Fish and Wildlife**  
**Second Draft Criteria for Public Interest Determination**  
**by the California Fish and Game Commission for New State Water Bottom Leases**

California Fish and Game Code (FGC) Section [15400](#) requires the Fish and Game Commission (Commission) to determine that a lease is in the public interest prior to issuing an aquaculture state water bottom lease. The Commission's public interest determination is made during a public hearing conducted in a fair and transparent manner and is the first decision in a multi-decision process. Once that public interest determination is made, Section [15404](#) directs the Commission to notify the public that the lease is being considered. This determination also has the effect of triggering environmental review under the California Environmental Quality Act (CEQA) and compliance with the State Tribal Communication and Consultation policy. In accordance with State and Commission procedures, the lease may be approved at a subsequent public hearing held at least 90 days after the initial public notification was published<sup>1</sup>.

At its March 24, 2022, meeting, the Commission's Marine Resources Committee (MRC) discussed an approach to developing potential criteria to consider when making a public interest determination. Based on MRC guidance, the Department of Fish and Wildlife (Department) subsequently developed an initial draft of potential criteria to consider when making this "public interest" determination, based on existing statutory, regulatory, and policy requirements to guide sustainable marine aquaculture development in California. Initial draft criteria were presented for discussion with the MRC and public at the July 2022 MRC meeting. This second draft reflects revisions made based on public comments provided so far, and should inform continuing discussions, including a public workshop scheduled for September 30, 2022. These criteria apply ONLY to shellfish or seaweed aquaculture leases and do not apply to the culture of finfish within Pacific Ocean waters that are regulated by the state<sup>2</sup>.

The Commission's decision to issue a lease should consider potential environmental, cultural, and socio-economic impacts and benefits. However, the degree of impact and/or benefit may, in many cases, only be ascertained after in-depth study, evaluation, and consultation. The criteria that the Department (in its project evaluation and recommendations) and the Commission (in its decision-making) should consider is broad, necessarily influenced by existing mandates and varies by project. Mandates such as CEQA, State Tribal Communication and Consultation Policy, and the public hearing process provide mechanisms for more in-depth considerations.

Criteria listed below will help inform the public interest determination, project development, scoping of further analyses needed before a final leasing decision is made, and downstream agency permitting. The criteria are divided into two sections: 1) "Requirements", which limit or constrain lease locations or activities by statute and/or regulations, and 2) a broader list of factors that may be reasonably anticipated for consideration ("Considerations") during the planning, evaluation, and decision-making

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<sup>1</sup> CA Code of Regulations, Title 14, sec. [237\(b\)\(4\)](#).

<sup>2</sup> [FGC 15007](#).

process. The public interest determination requires careful weighing of the Considerations relevant to each lease proposal. Thus, one specific Consideration cannot by itself force a specific decision, but rather the determination represents the net effect of balancing all Considerations. Lease proposals will not be considered in the public interest where Requirements are not met and where in-depth study, evaluation and consultation would not likely resolve significant environmental, cultural, and socio-economic impacts.

### **Requirements or Constraints**

- 1 Lease is located in an area that is certified by the California State Lands Commission as unencumbered and available for aquaculture use<sup>3</sup>.
- 2 Lease area does not include areas used by the public for digging clams<sup>4</sup>.
- 3 Lease is not located within marine protected areas, marine managed areas, and special closures under state<sup>5</sup>, federal, or other jurisdictions<sup>6</sup> that prohibit aquaculture.
- 4 Lease area is not located within, over, or adjacent to any area likely to adversely impact previously identified Native American cultural resources, as identified by the Native American Heritage Commission.
- 5 Lease activities do not include culture of any species at any location where it has been determined, [based on best available science], it would be detrimental to adjacent native wildlife<sup>7</sup>.

### **Considerations**

#### **Potential impacts or concerns:**

- 1 Lease area is compatible with administrative kelp bed designations<sup>8</sup>.
- 2 Lease is sited in areas that would minimize risks to public health as determined through consultation with California Department of Public Health (including within or adjacent to recognized mooring areas).
- 3 Lease does not propose use of culture methods, chemicals, or materials known to cause environmental degradation.
- 4 Lease would not unreasonably impede public access to state waters for purpose of commercial and/or recreational fishing, navigation, commerce, or coastal recreation<sup>9</sup>; this should include

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<sup>3</sup> T14, CCR, Section [237\(b\)\(3\)](#).

<sup>4</sup> FGC Section [15401](#).

<sup>5</sup> State MPAs described in CCR Title 14, sec. [632](#).

<sup>6</sup> See applicable regulations for federal or other jurisdictions.

<sup>7</sup> FGC Section [15102](#).

<sup>8</sup> T14, CCR, Section [165.5](#).

<sup>9</sup> FGC Section [15411](#).

documented high-use vessel routes, shipping lanes, and navigation channels for recreational and commercial uses.

- 5 Lease would not unreasonably interfere with, or significantly impact, the ability of the site and surrounding areas to support ecologically significant flora and fauna and the ecosystem services they provide, including blue carbon sequestration and wetland migration as sea level rises.
- 6 Lease is sited to avoid areas within recognized sensitive habitats and avoid impacts to special-status species, including species with a threatened or endangered designation.
- 7 The proposed lease will include measures to:
  - prevent introduction, transmission, and/or spread of invasive species, pathogens, disease, and pests;
  - prevent, minimize, clean up, and monitor marine debris;
  - maintain regular inspections of infrastructure and culture activities, keep infrastructure in good repair, address any damaged or lost cultivation materials within specified timeframes, and report on gear and infrastructure conditions;
  - meet the minimum production and planting requirements per acre<sup>10</sup>.

**Potential benefits:**

- 1 Lease activities would benefit the state and surrounding community by providing employment and economic opportunity.
- 2 Lease activities would provide fresh, locally sourced product, benefiting local food security, and supplementing wild-harvested supplies.
- 3 Lease activities would contribute environmental benefits, such as habitat creation, nutrient uptake or filtration, species recovery, or other ecosystem services.
- 4 Lease activities would advance mitigation and/or adaptation strategies in response to climate change, including carbon sequestration.
- 5 Lease activities would help increase native fish stocks or enhance commercial and recreational fishing.
- 6 Consideration of prior leases are taken into account to encourage sustainable and equitable access to leases and to discourage monopolies.

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<sup>10</sup> T14, CCR, Section [237](#).

**California Department of Fish and Wildlife**  
**Initial Draft Criteria for Public Interest Determination**  
**by the California Fish and Game Commission for New State Water Bottom Leases**

California Fish and Game Code (FGC) Section 15400 requires the Fish and Game Commission (Commission) to determine that a lease is in the public interest prior to issuing an aquaculture state water bottom lease. At its March 24, 2022, meeting, the Commission's Marine Resources Committee (MRC) discussed an approach to developing potential criteria to consider when making a public interest determination. Based on MRC guidance, the Department of Fish and Wildlife (Department) subsequently developed an initial draft of potential criteria to consider when making this "public interest" determination, based on existing statutory, regulatory, and policy requirements to guide sustainable marine aquaculture development in California. Draft criteria will be presented for discussion with the MRC and public at the July 2022 MRC meeting.

Draft criteria outlined in this document are divided into two sections: 1) "Constraints", which are mandated requirements found in statute and/or regulations, and 2) "Considerations", which are factors that may be reasonably anticipated to consider during project development, permitting, and the California Environmental Quality Act (CEQA) process. Note that the public interest criteria are not intended to supplant or duplicate the type of analysis required for environmental review under CEQA, but rather to provide opportunity to flag significant concerns that either may prevent moving forward with the proposed project or may raise questions about alignment with the public interest, and/or help to bring line potentially significant environmental concerns that can be evaluated in depth through CEQA.

Constraints

- ☐ Lease is located in an area that is certified by the California State Lands Commission as unencumbered and available for aquaculture use (T14, CCR, Section 237(b)(3)).
- ☐ Lease area does not include areas used by the public for digging clams (FGC Section 15401).
- ☐ Lease is located outside of California's marine protected areas, marine managed areas, and special closures (T14, CCR, Section 632).
- ☐ Lease area is not located within, over, or adjacent to any area likely to adversely impact Native American cultural resources, as identified by the Native American Heritage Commission.
- ☐ Lease activities do not include culture of invasive species, as defined by U.S. Presidential Executive Order 13112 (Clinton 1999) as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."
- ☐ Lease activities within Pacific Ocean waters do not include culture of any species of finfish belonging to the family Salmonidae, transgenic fish species, or any exotic species of finfish (FGC Section 15007).
- ☐ Leases activities are consistent with established best management practices within the industry.

Considerations

- ☐ Lease would not unreasonably impede public access to state waters for purpose of commercial and/or recreational fishing, navigation, commerce, or coastal recreation (FGC Section 15411):
  - Lease area is located outside of important fishing grounds, including the California halibut trawl grounds (FGC Section 8495).
  - Lease area is located outside of high-use vessel routes, shipping lanes, and navigable channels.
  - Lease would not impede commercial or recreational boat navigation and safety.
- ☐ Lease area would not interfere with closed, lease only, or leased administrative kelp beds (T14, CCR, Section 165.5).
- ☐ Lease is sited in areas that would minimize risks to public health as determined through consultation with California Department of Public Health (including within recognized mooring areas)
- ☐ Lease would not unreasonably interfere with the ability of the site and surrounding areas to support ecologically significant flora and fauna and avoids areas within sensitive habitats, including seagrass, kelp, and rocky reef habitat.
- ☐ Lease is sited to avoid impacts to special-status species, including marine mammals, finfish, and birds.
- ☐ Leases do not propose culture methods or materials known to cause environmental degradation, such as dredging, in-bottom culture, use of mechanical harvesting devices, hydraulic pumps, pesticides or other chemicals, etc.
- ☐ If appropriate, lease proposal includes plans to:
  - prevent introduction and/or spread of invasive species, pathogens, disease, and pests;
  - minimize and monitor marine debris;
  - maintain regular inspections, keep infrastructure in good repair, address any damaged or lost cultivation materials within specified timeframes, and report on gear and infrastructure conditions;
  - meet the minimum production and planting requirements per acre (T14, CCR, Section 237); and
  - benefit local and state economies through various means, such as diversification of the local economy, promotion of employment opportunities, contributions to the tax base, etc.
- ☐ Lease activities do not include culture of any species where it is determined it would be detrimental to adjacent native wildlife (FGC Section 15102).

# **Key Themes Identified from Public Comments on Potential Public Interest Criteria for Shellfish and Seaweed Aquaculture Lease Applications**

Prepared for November 17, 2022 Marine Resources Committee meeting

California Department of Fish and Wildlife

November 10, 2022

The California Department of Fish and Wildlife (CDFW) developed and released two public drafts of potential criteria to determine whether an aquaculture lease applied for would be in the public interest (Criteria), pursuant to California Fish and Game Code Section 15400; the first draft (Draft 1) was released in June 2022 and the second draft (Draft 2) in September 2022. The California Fish and Game Commission (Commission) and CDFW hosted an informational webinar on July 12, 2022, to provide additional context and answer questions related to Draft 1 of the Criteria. On September 30, 2022, the Commission and CDFW hosted a public workshop to solicit feedback on Draft 2 of the Criteria.

Public comments were received throughout the year — both before and after draft Criteria were developed — including at the March 2022 and July 2022 Commission Marine Resources Committee meetings, at the September 2022 public workshop, and through written submissions.

Key themes that have emerged among the public comments are summarized below and grouped by the categories of process, environmental impacts and California Environmental Quality Act (CEQA), and socio-economics.

## **Process**

- Confusion about how the new Criteria would fit into the existing lease approval and permitting process, confusion over how the Considerations would be used to evaluate the public interest of a lease proposal, and confusion about why certain criteria were categorized as Considerations rather than Requirements.
- Identifying criteria that overlap CDFW and Commission jurisdiction with other agency's jurisdictions. Some commenters request to include criteria that are within other agency's jurisdiction (e.g., water quality), whereas other commenters noted that some criteria extend beyond CDFW/Commission jurisdiction (e.g., overlap with California Department of Public Health and U.S. Army Corps of Engineers).

- Request to more explicitly state that finfish aquaculture is a constraint in the Criteria.

## **Environmental impacts and CEQA**

- Concerns that the draft Criteria would duplicate the reviews and analyses already conducted under other regulatory requirements, such as environmental review under the California Environmental Quality Act (CEQA). Concern that this effort would add further confusion and lengthen the lease approval process through a lengthy new evaluation process.
- Desire to elevate specific environmental impacts from considerations to constraints.
- Request to add explicit consideration of impacts to specific flora and fauna, such as eelgrass, whales, waterfowl and shorebirds. Additionally, require that consideration of environmental impacts to be a required element of a lease proposal.

## **Socio-Economic**

- Criteria on public interest should also consider potential benefits added by the proposed lease, including potential socioeconomic and environmental benefits, rather than only focusing on preventing potential negative impacts of the proposed lease.
- Request that Considerations explicitly evaluate if new leases avoid conflicting with other coastal uses and coastal access, such as commercial and recreational fishing and fishing community needs.
- Requests criteria consider equitable access to obtaining new leases.
- Requests criteria reflect environmental justice principles applied to all affected communities.



# Public Interest Criteria for State Water Bottom Leases

*17 November 2022*

*Presented to:*

**Marine Resources Committee**

*Presented by:*

**Kirsten Ramey**

**Environmental Program Manager**

**Marine Region**





# Outline

- Background and timeline of events
- Development process
- Overview of draft criteria
- Comments received
- Recommendations and next steps

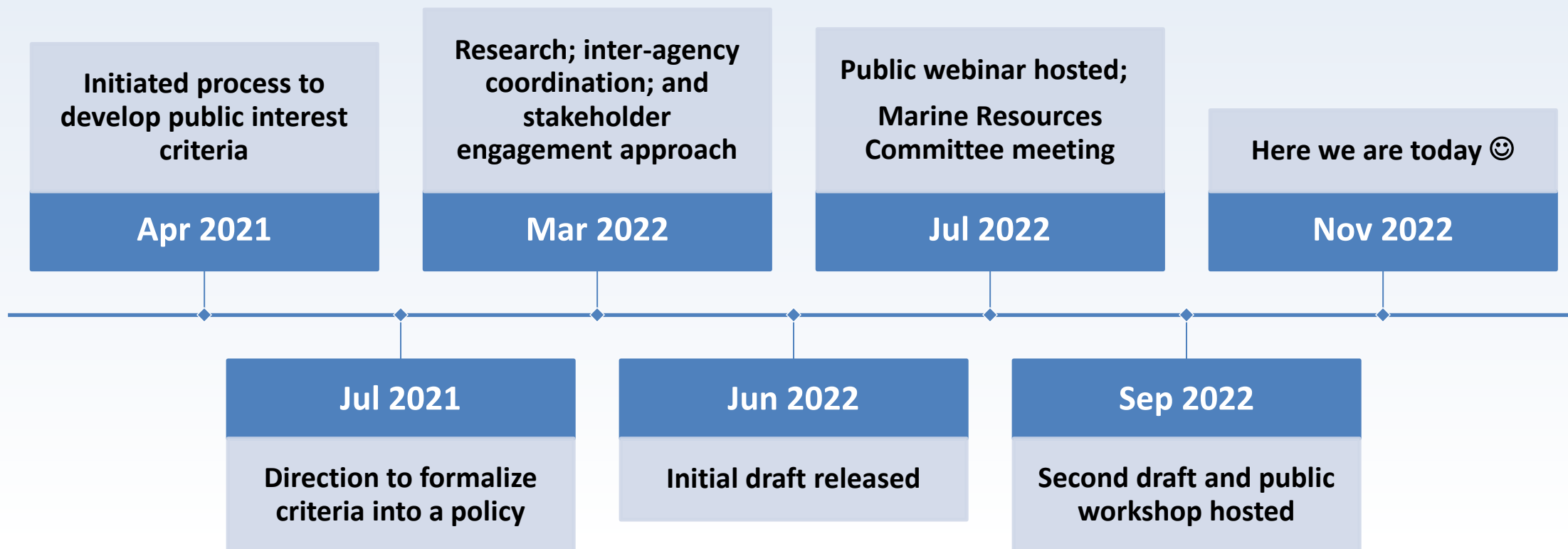


# Background

- Authority to lease for aquaculture: Fish and Game Code, Section 15400
- Public interest requirement: Fish and Game Code, Subdivision 15400(a)
- No defined criteria in law
- Commission intent to define criteria



# Timeline of Events





# Development Process

- Other state and country examples
- Aligned with code and regulations
- Inter-agency coordination
- Public engagement



Photo credit: CDFW

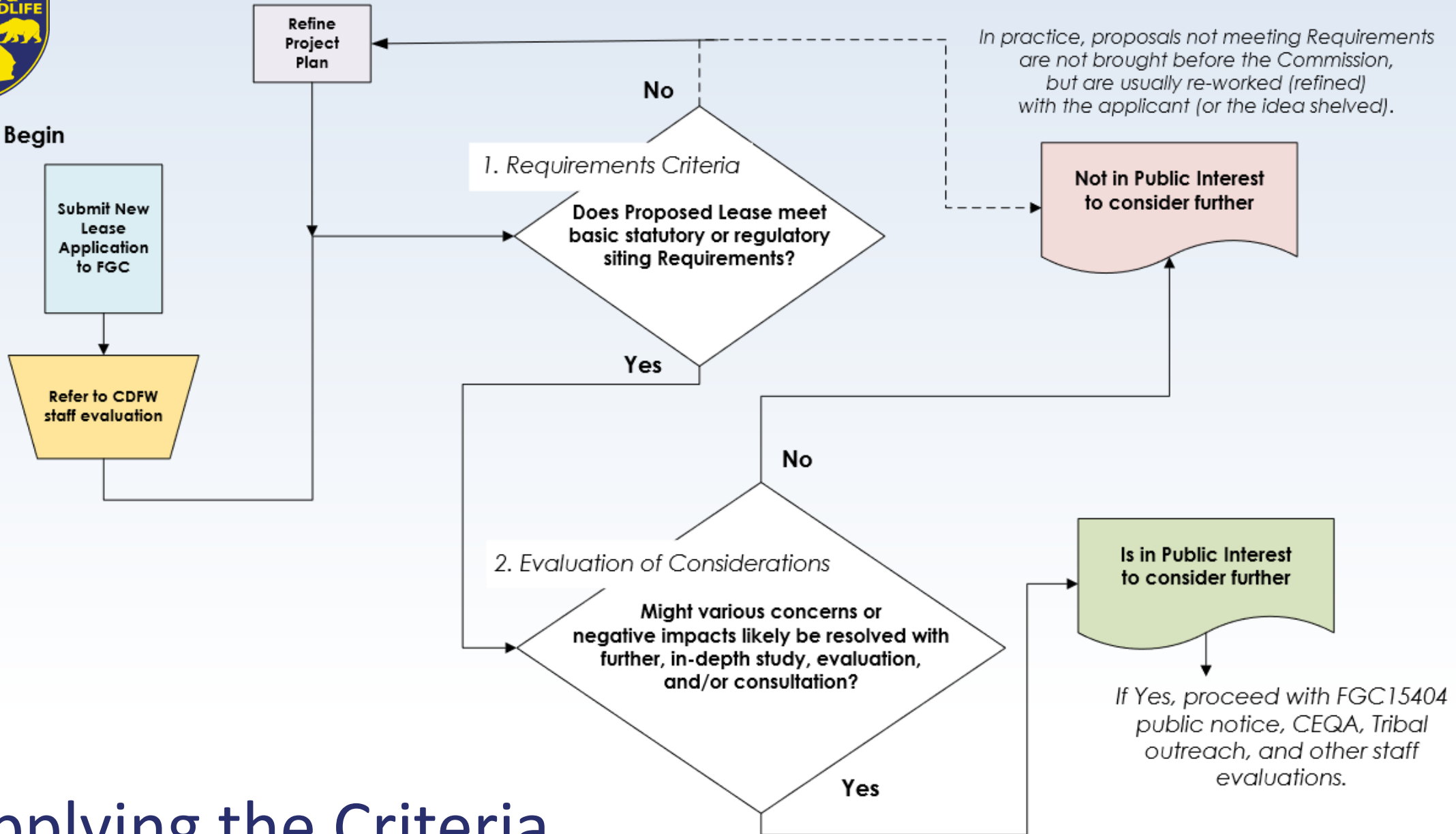


# Goal of Criteria

- *First step* in multi-decision process (i.e., preliminary screening)
- *Does not replace* environmental review or additional permitting processes
- *Goal* is guidance and transparency



Begin



# Applying the Criteria



# Draft Criterial for Public Interest Determination

- Requirements or Constraints
  - Based on law
  - **Must** be met, independently
- Considerations
  - Balance between potential impacts and potential benefits
  - Evaluated together







# Comments

- Approximately 50 sets of comments to date from:
  - Local, state and federal agency staff
  - Non-governmental organizations
  - Industry members
  - General public







# Reflections

- Support aquaculture development
- Compatible with State's environmental goals
- Consistent with State Aquaculture Principles
- Complement CEQA
- Support other public uses



# Recommendations and Next Steps

- Receive MRC guidance
- Balance viewpoints
- Develop next draft
- Future MRC and California Fish and Game Commission meetings



# Thank You

- Marine-specific Aquaculture Inquiries
  - [marineaquaculture@wildlife.ca.gov](mailto:marineaquaculture@wildlife.ca.gov)
- State Aquaculture Coordinator
  - [Aquaculturecoord@wildlife.ca.gov](mailto:Aquaculturecoord@wildlife.ca.gov)
- CDFW Aquaculture Program Website
  - <https://wildlife.ca.gov/Aquaculture>

10.10.2022



Dear colleagues at the CDFW and the FGC,

We appreciate the recent meeting regarding the draft for the Public Interest Criteria that the CDFW is generating, held on 9/30/22. We would like to start by thanking this committee for including language regarding monopolization that we had previously requested be included in the Public Interest Criteria (PIC).

This PIC process has the potential to have either a streamlining effect for new lease applicants, or a hindering effect, and we would like to ensure that the former is accomplished. In order for the PIC to become a catalyst for aquaculture, more assurances from the CDFW need to be made regarding direct dialogue, feedback, and the development of tools to help applicants. If the PIC is a pass/fail system, lacking decision transparency and tools regarding the improvement of the application, then this becomes a redundant permitting exercise and adds to the already prohibitively large burden of applying for aquaculture leases in the state of California.

I recently spoke at the California Seaweed Festival, where many of our industry's largest entities and thinkers were present, and was asked what I thought was the major hindrance to aquaculture in this state. I answered by calling the audience to raise their hand if they wanted to become an aquaculturist; about a third of the audience raised their hand. I then told them to keep their hands raised if they understood how to accomplish this, from a permitting perspective. Not a *single* hand remained raised. The room was full of Ph.Ds and entrepreneurs with a dedicated interest to this industry.

At a minimum, we suggest developing a new website in which each PIC criteria has further reading and reasoning, as well as linking to downstream regulatory agencies and appropriate contacts there, and a meeting scheduling tool with aquaculture coordinators at CDFW.

I bookend this letter by calling back to the issue of monopolization: if the only players that are able to navigate the permitting system are the ones with enough funding to support multiple full time permitting specialists, then we will eliminate the diversity, vitality, and regenerative interests that are currently intrinsic elements of this industry.

Thank you for your time and efforts,

Nathan Churches, Ph.D.  
Chief Science Officer  
Holdfast Aquaculture, LLC





MARSHALL  
SAN FRANCISCO  
NAPA  
HUMBOLDT  
LARKSPUR

November 1, 2022

**By E-mail**

California Fish and Game Commission  
Marine Resources Committee  
P.O. Box 944209  
Sacramento, CA 94244-2090

**Re: Agenda Item No. 3 - Aquaculture Leasing in California - Public Interest  
Determination**

Dear Marine Resources Committee:

We appreciate the Committee's efforts to develop guidelines to assist the Fish and Game Commission ("Commission") in evaluating whether proposed aquaculture leases are in the "public interest" pursuant to Fish & Game Code § 15400(a). We support the development of objective and balanced public interest criteria that would inform the Commission as to when to proceed with consideration of leasing State waters for aquaculture. These criteria should: (1) inform aquaculture applicants of statutory or regulatory provisions that would bar an application from moving forward for full consideration by the Commission; (2) identify potential benefits from aquaculture leases that should be considered by the Commission in assessing the public interest of the proposed lease; and (3) identify other considerations that should be evaluated, recognizing that the public interest determination is a preliminary determination that does not have the benefit of full environmental review under the California Environmental Quality Act ("CEQA") and other consultation and public engagement opportunities that will be available prior to final consideration of the proposed lease by the Commission. We provide the following suggested revisions to the September 20, 2022 draft criteria.

**A. Introductory Paragraphs**

We appreciate the comments made during the September 30, 2022 presentation regarding the context of the Commission's public interest review as it relates to CEQA and other processes that occur after the initial public interest determination. It appears that some commenters would like the Commission to make determinations concerning certain environmental impacts, or impacts to habitat or species, as part of the public interest determination. We support the current description of how the criteria will be evaluated and recognition that many of the considerations are important, but are best analyzed *after* the public interest review upon completion of environmental review under CEQA. The types of environmental considerations listed in the "considerations" section are at the heart of CEQA, subject to regulatory protocols and well-established guidelines that govern how those impacts are

to be evaluated by a lead agency. Pre-determination of those effects during a public interest review process, without the benefit of full consideration, short-circuits that review and deprives the Commission, the applicant, and the general public from a full evaluation of environmental impacts. CEQA is intended to inform the public and provide the applicant and lead agency with the ability to evaluate the project and avoid and/or mitigate for environmental impacts. While some commenters claim that there are “easy cases” where environmental impacts are insurmountable, a number of agencies, including the Commission, California Coastal Commission, U.S. Army Corps of Engineers, National Marine Fisheries Service, and U.S. Fish & Wildlife Service, have recognized some of the ecological benefits of aquaculture and have approved projects after working to reduce environmental impacts. This is true even in areas where shellfish aquaculture has been proposed in eelgrass, bird habitats, or in certain Marine Protected Areas. The science concerning aquaculture impacts on the environment is complex and not one-sided, which warrants a full evaluation and consideration pursuant to CEQA prior to making a “one-size-fits-all” or predetermined judgment.

We suggest the following revisions to make the language clearer in a couple of sentences. As the introductory paragraphs provide the context for the requirements and considerations, we strongly encourage that they remain part of the criteria.

**Revision** (first paragraph): This determination also has the effect of triggering the commencement of environmental review under the California Environmental Quality Act (CEQA) and compliance with the State Tribal Communication and Consultation Policy.

**Reasoning:** When entities talk about “triggering” CEQA that sometimes means that CEQA must be completed prior to taking agency action. This clarifies the statement to be consistent with the way it was described during the workshop.

**Revision** (last paragraph): The public interest determination requires careful weighing of the Considerations relevant to each lease proposal. Thus, one specific Consideration cannot by itself force a specific decision, but rather the determination represents the net effect of balancing all Considerations. Lease proposals will not be considered in the public interest where Requirements are not met and where in-depth study, evaluation and consultation would not likely resolve significant environmental, cultural, and socio-economic impacts. Conversely, it is anticipated that many of the Considerations may be the subject of more in-depth evaluation and consultation after the Commission makes the public interest determination but prior to the Commission's final determination as to whether or not to issue the lease.

**Reasoning:** See above.



## B. Requirements or Constraints

**Revision** (Requirement 3): Lease is not located within ~~marine protected areas, marine managed areas, and special closures under state, federal, or other jurisdictions~~ that prohibit aquaculture.

**Reasoning:** The draft language can be read two ways: (1) that the lease is not located within marine protected areas, marine managed areas, etc. and “other jurisdictions that prohibit aquaculture” or (2) that the lease is not located in marine protected areas, marine managed areas, etc. that prohibit aquaculture. As noted in the workshop, some marine protected areas allow aquaculture. To avoid language that could be read to imply otherwise, we suggest simplifying the language as revised above to just read that the lease cannot be located in areas “that prohibit aquaculture.”

## C. Considerations

**Revision** (Consideration 2): Lease is sited in areas that would minimize risks to public health as determined through consultation with California Department of Public Health in compliance the National Shellfish Sanitation Program ~~(including within or adjacent to recognized mooring areas)~~.

**Reasoning:** The parenthetical language does not add anything to the consideration and is not accurate as some aquaculture projects may be approved by CDPH in mooring areas. The National Shellfish Sanitation Program allows some aquaculture in mooring areas. For example, seed grown in FLUPSYs or designated for depuration or relay can be grown in those areas. Additionally, shellfish that are intended for habitat remediation rather than human consumption can also be grown in those areas.

**Revision** (Consideration 4): Lease would not unreasonably impede public access to state waters for purpose of commercial and/or recreational fishing, navigation, commerce, or coastal recreation; ~~this should include documented high use vessel routes, shipping lanes, and navigation channels for recreational and commercial uses.~~

**Reasoning:** We believe that the last clause creates more confusion than clarity. We agree that any aquaculture lease should avoid shipping lanes, but it is unclear how the criteria define “high use vessel routes” and “navigation channels for recreational and commercial uses.” It would seem to elevate recreational uses above aquaculture uses in a manner that is not supported by the underlying regulation. Citation to the regulation would be sufficient to allow for case-by-case consideration without creating additional uncertainty.

**Revision** (Consideration 6): Lease is sited to avoid impacts to areas within recognized sensitive habitats and ~~avoid impacts to~~ special-status species, including species with a threatened or endangered designation.

**Reasoning:** A significant amount of scientific literature supports that aquaculture, if properly installed and operated, can coexist with many sensitive habitat areas. For example, we have worked with The Nature Conservancy to document that eelgrass has moved into its existing farms and that its cultivation has generally supported, not hindered, eelgrass growth. The Coastal Commission thoroughly evaluated these impacts when approving an updated permit for our Tomales Bay farm in 2019 and determined that after “extensive review of available information, Commission staff has found no evidence that contradicts HIOC’s statements that eelgrass beds appeared in these areas only after the cultivation structures and equipment had been installed and in use for a sustained period of time” and that eelgrass beds grew into our farm sites. This consideration, as well as Consideration 5, should be evaluated on a lease-by-lease basis and be properly informed by a thorough environmental review process pursuant to CEQA.

**Revision** (Potential Benefit Consideration 6): In the event that there are multiple potential applicants for a particular lease area, consideration of prior leases are taken into account to encourage sustainable and equitable access to leases and to discourage monopolies.

**Reasoning:** Hog Island Oyster Company, as well as most other existing California aquaculture companies, has strongly supported diversification of the industry and creating equitable access to leases. Indeed, it was one of the reasons that the industry supported the California Shellfish Initiative, which had that as one of its goals, and continued efforts to reduce the costs of permitting and entry, which are prohibitive for small companies that may be interested in aquaculture. As we have discussed previously with the Commission and others, it is the permitting process, monitoring requirements, and lengthy process to obtain a lease and permits that have prevented equitable access to leases. Many of these costs are exacerbated by the lack of programmatic evaluations and approvals common in other states. The costs to navigate the permitting process can be tens, if not hundreds, of thousands of dollars. It is these costs, not existing leaseholders, which are preventing new companies from acquiring aquaculture leases. However, these considerations may be relevant in the unique circumstance where there are competing applications from two or more qualified aquaculture applicants.

Thank you for your time and consideration. We look forward to the discussion at the next Committee meeting and continuing to work with the Committee and Commission in its development of objective and balanced public interest criteria for aquaculture leases.

Sincerely,

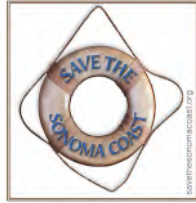
A handwritten signature in black ink, appearing to read "Terry Sawyer", written over a horizontal line.

Terry Sawyer  
Co-Founder/Vice President





Heal the Bay



DON'T CAGE  
OUR OCEANS



Resource Renewal Institute  
40 Years. Innovation for a Sustainable Future.



November 3, 2022

Wildlife Aquaculture Program  
California Department of Fish and Wildlife  
P.O. Box 944209  
Sacramento, CA 94244-2090  
*Via Electronic Mail: [aquaculturePrgm@wildlife.ca.gov](mailto:aquaculturePrgm@wildlife.ca.gov)*

Fish and Game Commission Marine Resources Committee  
California Fish and Game Commission  
P.O. Box 944209  
Sacramento, CA 94244-2090  
*Via Electronic Mail: [fgc@fgc.ca.gov](mailto:fgc@fgc.ca.gov)*

Dear Mr. Lovell, Department staff, and Commissioners,

Re. MRC Agenda Item 3: Aquaculture leasing in California – public interest determination

We, the undersigned organizations, have extensive experience in marine and aquaculture policy in the state of California. We have been supportive of the development of public interest aquaculture criteria before accepting any new leases. We want to make clear at the outset that while our organizations are opposed to marine finfish aquaculture, we are not *generally* opposed to low-trophic commercial or restorative aquaculture (including marine algae and shellfish) where appropriately sited and where impacts are addressed. Our opposition to marine finfish is consistent with the *Guiding Principles for Sustainable Marine Aquaculture in California*<sup>1</sup> and the Ocean Protection Council's Strategic Plan, Objective 4.2<sup>2</sup>. We are hopeful that the development of strong criteria will aid in appropriate siting and avoidance of harmful impacts, which can be associated with

<sup>1</sup> Guiding Principles for Sustainable Marine Aquaculture in California, 2021, [https://www.opc.ca.gov/webmaster/\\_media\\_library/2021/06/Aquaculture-Principles-Public-20210604.pdf](https://www.opc.ca.gov/webmaster/_media_library/2021/06/Aquaculture-Principles-Public-20210604.pdf).

<sup>2</sup> Ocean Protection Council, 2020-2025 Strategic Plan, [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20200226/OPC-2020-2025-Strategic-Plan-FINAL-20200228.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20200226/OPC-2020-2025-Strategic-Plan-FINAL-20200228.pdf).

aquaculture. Clear criteria and a thorough review, including through the California Environmental Quality Act (CEQA), are needed to exclude harmful proposals.

Our organizations have submitted oral and written comments, attended the previous public workshops in July and September and the July Fish and Game Commission (Commission) Marine Resources Committee (MRC) meeting, and have reviewed the latest September 2022 revisions to the draft aquaculture public interest criteria. We offer the following comments beginning with overarching comments and continuing with more specific comments on the constraints, considerations, and benefits.

### *Overarching Comments*

While we appreciate that some of our comments were included in the revisions, the September 2022 revisions do not adequately respond to or reflect the comments put forward by conservation organizations. Rather, we view the revisions as weakening the criteria. We do not believe the current draft is ready for adoption and urge a significant rewrite that addresses conservation concerns before being finalized by the MRC. As currently written, we are opposed to the draft criteria unless they are amended. However, we are hopeful that we can work with stakeholders to resolve these concerns before the criteria are finalized. These criteria will serve an important purpose of avoiding improper leasing and a costly CEQA process where it is unwarranted; it is critical that they are comprehensive. We understand that the Ocean Protection Council's Aquaculture Action Plan has been delayed, but it would also be good if the development of the criteria is coordinated with the development of the plan for statewide consistency.

As an additional overarching comment, which was also raised during the September 30th workshop, the relevance of the public trust doctrine in determining whether to issue a lease should be listed more explicitly in the criteria. While this is alluded to in some of the enumerated points, the doctrine should be clearly called out.

Several considerations imply that proposed leases can include measures that will adequately address concerns. For many potential aquaculture impacts, there are no proven mitigation measures. The criteria should be strengthened to read that the type/technology of aquaculture being proposed does not have a history of causing such problems, or that it includes proven solutions that guarantee that such impacts will not occur. The overarching goal should be that there is no net loss to habitat from the issuance of a new lease.

As the criteria are written now, the constraints only refer to language written in statute, however, the Commission has authority to, and should, include additional constraints and requirements beyond those specified in statute – several considerations should move to constraints. The criteria should explicitly state and include as a constraint that marine finfish aquaculture is not in the public interest, rather than stating this in the background or initial statement.

### *Better Recognizing Potential Adverse Aquaculture Impacts*

Several key potential aquaculture impacts are either missing or inadequately described in the criteria. Additional key marine aquaculture impacts must be added to the document, and any proposal that does *not* provide

evidence that these impacts will be avoided should not be found in the public interest. The responsibility should be on the applicant to demonstrate that the proposal will have a net benefit and avoid significant negative impacts to our already degraded bays and oceans. Below is a list of impacts which should be included as considerations at a minimum:

- Entanglements of wildlife – the proposal will not pose risks of entanglement.
- Entrainment of eggs and larvae – the proposal will not entrain egg or larval fish or invertebrates through saltwater intakes.
- Predator controls shall not include harmful measures to control, deter, or harass wildlife such as birds, sharks, or mammals.
- Disturbance of feeding, migration, or reproduction due to manmade structures, noise, construction, maintenance, vessel traffic, or other human activity.
- The cumulative impacts of existing and proposed aquaculture must be considered when considering new leases, so issues of scale are considered and addressed. If the cumulative impacts of proposed and existing aquaculture leases are excessive, the proposed leases shall not be in the public interest.
- Environmental impacts of any feeds used and any discharges.
- Escapes of cultured animals: non-native animals becoming established, or genetic impacts through interbreeding.
- Incubation and spread of diseases, parasites, and/or pathogens to wild populations.
- Displacement of commercial or recreational fishing activities.
- Impacts of non-filter feeders, e.g., abalone, requires large inputs of kelp as feed, creating demand for wild kelp harvesting in the vicinity, which directly removes habitat for wild fish, invertebrates, and wildlife.

We have listed additional specific substantive comments below:

*Overall & Comments Related to the Background*

- Identification of a single significant harmful impact **could** be enough to warrant a finding that a proposal is not in the public interest.
- In the background, the document now says, “Lease proposals will not be considered in the public interest where Requirements are not met and where in-depth study, evaluation and consultation would not likely resolve significant environmental, cultural, and socio-economic impacts.” However, it does not make clear how the Commission would know this at the outset. This conflicts with the statement that “The Commission’s decision to issue a lease should consider potential environmental, cultural, and socio-economic impacts and benefits. However, the degree of impact and/or benefit may, in many cases, only be ascertained after in-depth study, evaluation, and consultation.” We request the latter statement be removed, as the purpose of the public interest criteria is to serve as an initial screening to avoid unnecessary CEQA analyses for projects unlikely to be in the public interest.
- Using the heading “Requirements or Constraints” is confusing considering the Commission renamed the section “Requirements” in the introductory paragraph and defined it to **include** constraints.

*Requirements or Constraints*

- As stated above, there should be a constraint stating that no marine finfish aquaculture will be considered in the public interest.
- Constraint #3 should be broadened or another constraint should be added: Aquaculture operations shall not be sited in areas containing eelgrass or other federally designated habitat areas of particular concern (HAPC), as well as including the existing language around state marine protected areas (MPAs). Constraint #3 should include congressionally designated Marine Wilderness areas. In addition, not only should these important ecological areas be avoided, but negative impacts to adjacent areas should also be listed under Considerations.
- Regarding Constraint #5, the language should quote Fish and Game Code Section 15102: "...the culturing of any species at any location where it is determined it would be detrimental to adjacent native wildlife." While we tend to support the use of best available science, we are concerned that adding in "based on the best available science" to the language of Section 15102 might lead to ambiguity in this case, because such language does not appear in the statute. In addition, replacing the word "detrimental" with "harmful" would be more protective of wildlife.
- In what is now Requirement #4, "previously identified" has been added before "Native American cultural resources" but that is redundant. The Commission should have just added "previously" before "identified by the Native American Heritage Commission." The Commission's proposed change could potentially lead to confusion as to whether there are two standards. The language could also be broadened to include any "similar entity that provides oversight or guidance regarding cultural resources."
- A constraint should be added that discharges from lease activities do not exceed total maximum daily loads of impaired waters per Clean Water Act (CWA sections 303(d) and 305(b)).
- A constraint should be added related to no conflict with existing mooring areas or public health concerns.

*Considerations*

- Consideration #1 should be a constraint.
- Re. Consideration #3, take a more precautionary approach to chemical use: no antibiotics or chemicals may be used in aquaculture operations, regardless of whether they show harm.
  - Some non-exhaustive list of methods, materials, and chemicals that are known to cause environmental degradation should be reinserted as in the first draft.
- Consideration (Potential Impact or Concern) #4 regarding public access to state waters should be a requirement, not a consideration.
  - Broaden language to say, should not impede access to "state waters or shorelines."
- Upon reflection, regarding Considerations #4-5, it would be stronger to remove the word "unreasonably" and just say "would not impede" and "would not interfere with."
- Regarding Consideration #5, we appreciate the addition of this consideration. It could be strengthened by also addressing other potential climate change effects. For example, with changes in

currents and sea water temperatures, would refugia be important to preserve for species such as kelp?

- Re. Consideration #6 impacts to special status species should include without limitation all mammals, finfish, sea turtles, and birds, as it did in the first draft, as well as any Endangered Species Act listed species. It should also specify species protected under both state and federal listings. This should also be a requirement, not a consideration.
- Related to best management practices (BMPs) or Consideration (Potential Impact or Concern) #7, this should be a minimum list and there should be a reference to similar coastal development permit conditions, since the Commission's BMP rulemaking process is on hold. Also, this should be a constraint rather than a consideration.
  - Clean-ups should be quarterly at a minimum.
  - The measures should also address any concerns related to waste, discharge and/or water quality.
  - Leases should be clearly marked.
  - Also related to minimum criteria, each proposal should address in some way, how clean up costs will be addressed. While this might be outside the scope of the criteria comments, it is worth noting that before a lease is issued, there must be appropriate funds available for a potential clean up through an escrow account, financial surety, or other binding process.
- There should be considerations that lease activities do not unreasonably interfere with educational or tourism activities and opportunities.
- There should be a consideration that lease activities would not unfairly expose low-income or marginalized communities to harms associated with the lease activities.
- There should be a consideration whether evidence can be provided to show that the lessee is a good actor and will uphold the grounds of their lease agreement.

#### *Comments on Considerations of Aquaculture Benefits*

While the idea of splitting considerations into concerns and benefits makes sense, there is substantial overlap between those categories. In other words, benefits and impacts should not be separate, because there are instances where benefits are discussed without reference to impacts or concerns. For example, there is now a reference to potential benefits to surrounding communities in terms of employment and economic activity, but no reference to the potential impacts or concerns for them. Also, there is no reference of benefits or impacts to other communities (especially environmental justice communities that may not be surrounding the project but are affected). Also, regardless of community, there are no references to impacts aside from employment and economic activity, such as pollution or water quality.

The benefits read as a yes/no checklist, whereas it is critical to understand the likely extent or magnitude of such benefits in order to make a public interest determination. Consideration of each benefit should include the scale of such benefit, not just a presence/absence. For each benefit considered, the criteria should ask "the extent to which" each potential benefit is expected to occur.

There should be a consideration that lease activities would contribute to overall resiliency of the surrounding ecosystems through restorative practices. However, it is unclear whether the focus of these criteria are purely for commercial leases or whether they will also include restoration or conservation projects. “Conservation, regenerative, or restorative aquaculture” should be defined as limited to activities with the sole purpose of seeking to replenish endangered or depleted species. This definition explicitly excludes hatcheries with the purpose of augmenting capture fisheries. There should be a distinction made between conservation and commercial aquaculture in the public interest criteria, as these two types of aquaculture have different purposes. We are concerned that some of the benefits may be exaggerated and appear to be unsubstantiated in the scientific literature, while potentially underestimating the costs and impacts. For example, Benefit #2 “benefiting local food security” is a false benefit, or at best a subjective one, as it may be difficult to document that the specific product will be lower cost than other similar food sources and made widely available to underprivileged consumers or communities in close proximity to the project.

Regarding Benefit #4, the “blue carbon” sequestration benefits of commercial seaweed aquaculture are speculative and unlikely to be significant; it is premature to include those as a benefit. In raising this concern, we do want to make a distinction between commercial seaweed aquaculture and restoration projects, the latter which we support. We appreciate the good work that the state of California has begun around supporting blue carbon and wetland restoration projects. However, regarding commercial state water bottom leases, there is a potential for the commercial structures to damage natural ecosystems, wildlife, wild fish populations, or habitats, in which case the proposals may actually harm adaptation, rather than aiding in climate resilience.

Related to Benefit #5, commercial grow operations do not benefit native fish stocks or fisheries – in fact they are more likely to harm them - unless the explicit purpose is conservation aquaculture, in which products would not be sold. Such projects (e.g., hatcheries) should be considered separately and have their own set of criteria, for example the potential genetic impacts and the evidence of the extent to which they would enhance wild populations.

In the final consideration (Benefit #6), the language should be stronger, such as “prevent[ing] financial burden and monopolies.”

Thank you for the consideration of our comments and your substantial work on the criteria. This is an important opportunity for the Commission to ensure that as interest in aquaculture grows, there is clarity to stakeholders on the types of aquaculture that are in the public interest and that any projects that move forward are carefully and appropriately sited based on a review of the best available science and data. We look forward to continued public participation on this topic.

Sincerely,

Ashley Eagle-Gibbs, Esq., Legal & Policy Director  
Environmental Action Committee of West Marin

Geoff Shester, Ph.D., California Campaign Director &  
Senior Scientist  
Oceana

Comments re. MRC Agenda Item 3

Barak Kamelgard, Senior Attorney  
Los Angeles Waterkeeper

Nils Warnock, Ph.D., Director of Conservation Science  
Cypress Grove Research Center  
Audubon Canyon Ranch

Courtney S. Vail, Campaign Director  
Oceanic Preservation Society (OPS)

Scott Webb, Advocacy & Policy Director  
Turtle Island Restoration Network

Michael Stocker, Director  
Ocean Conservation Research

Chance Cutrano, Director of Programs  
Resource Renewal Institute

Erin Woolley, Policy Advocate  
Sierra Club California

Marcie Kever, Oceans & Vessels Program Director  
Friends of the Earth

Cea Higgins  
Save the Sonoma Coast

Benjamin Pitterle, Science and Policy Director  
Santa Barbara Channelkeeper

Emily Parker, Coastal & Marine Scientist  
Heal the Bay

James Mitchell, Legislative Director  
Don't Cage our Oceans

Liliana Griego, Sr. Coastal Program Manager  
Audubon CA

Laura Walsh, California Policy Manager  
Surfrider Foundation

cc: Susan Ashcraft, Senior Environmental Scientist and Marine Advisor, California Fish and Game Commission  
Sara Briley, Environmental Scientist, California Department of Fish and Wildlife  
Randy Lovell, State Aquaculture Coordinator, California Department of Fish and Wildlife  
Kirsten Ramey, Senior Environmental Scientist Supervisor, California Department of Fish and Wildlife  
Craig Shuman, Marine Region Manager, California Department of Fish and Wildlife



November 4, 2022

California Fish and Game Commission  
Marine Resources Committee  
P.O. Box 944209  
Sacramento, CA 94244-2090

**via email to: [fgc@fgc.ca.gov](mailto:fgc@fgc.ca.gov)**

**RE: *Aquaculture Leasing in California, Public Interest Determination, November 17, 2022 Agenda Item #3***

Dear Marine Resources Committee,

The San Diego Unified Port District (District) appreciates the opportunity to provide comments on the Fish and Game Commission's (Commission) "Second Draft Criteria for Public Interest Determination by the Commission for New State Water Bottom Leases" to establish criteria to evaluate whether proposed aquaculture leases are in the "public interest." We value our ongoing collaboration and coordination with the Commission on past and future aquaculture initiatives and submit these comments in that same spirit. The District is providing this letter based on our experience as a landlord, operator, regulator, and environmental steward of state tidelands and submerged lands.

The District is a public corporation and regional government entity created in 1962 through the California State Legislature's adoption of the San Diego Unified Port District Act (Port Act). Through the Port Act, the District was granted the state tidelands and submerged lands in and around San Diego Bay and is entrusted with managing and protecting the tidelands and diverse waterfront uses in a manner that is consistent with the Public Trust Doctrine, promoting and balancing navigation, commerce, fisheries, recreation, and environmental stewardship.

As a champion of the Blue Economy, the District is committed to innovative opportunities that advance our mission, create benefits for coastal communities, and support the growth of a sustainable and equitable Blue Economy. The District recognizes the multiple public benefits of California-based shellfish and seaweed aquaculture within the Blue Economy, as a way to help meet our nation's growing demand for locally sourced, fresh product; provide for local employment and economic development; support expanded opportunities for emerging businesses to participate in the market; and as an important tool to help respond to environmental and climate-related challenges. To this end, the Port established a Blue Economy Incubator (BEI) program to assist in the creation, development, and scaling of new business ventures focusing on aquaculture and blue technology. Currently, there are two aquaculture companies in the BEI – one growing seaweed and the other shellfish. For these two companies, and potential future operators, the District has a stakeholder interest in how public interest is determined for aquaculture leases.

The District strongly supports fair, timely, transparent, and balanced permitting processes for shellfish and seaweed aquaculture and appreciates the effort of Commission staff to add clarity to the review process for aquaculture. The District requests your consideration of the following comments on the proposed draft:



**RE:    *Aquaculture Leasing in California, Public Interest Determination, November 17, 2022 Agenda Item #3***

**General Comments**

1. The District requests that the criteria and its use be clarified, so that a layperson or an applicant can understand the criteria, what is mandatory to proceed in the process and when the provisions need to be satisfied. For example, are satisfaction of the “requirements” and “considerations” mandatory to find a proposed lease be in the public interest, when will each be examined in the process, will “considerations” be analyzed as part of the California Environmental Quality Act (CEQA) review process or prior thereto? What is needed to trigger the CEQA process – a determination that the proposed lease is in the public interest? The District, as a governmental agency that serves many roles and routinely drafts, considers, and interprets regulation and regulatory documents, identified some ambiguity on the intent and use of the criteria and believes clarification would be useful to future lease applicants.
2. The history of this proposed language indicates that there may be an interest in evaluating the merits of an aquaculture project prior to initiating environmental review pursuant the CEQA by focusing on whether a future aquaculture lease is in the public interest. The draft clearly states, *“Criteria listed...will help inform the public interest determination, project development, scoping of further analyses needed before a final leasing decision is made, and downstream agency permitting.”* Although, the draft also states, *“Lease proposals will not be considered in the public interest where Requirements are not met and where in-depth study, evaluation and consultation would not likely resolve significant environmental, cultural, and socioeconomic impacts.”* These two statements create unnecessary ambiguity on whether the criteria will be used as explained in the first sentence to *“help inform the public interest determination”* or as a mandatory screening process based on an assumption that future study or environmental review would not resolve significant environmental, cultural, and socioeconomic impacts. The intent and timing of how and when the criteria is to be applied by the Commission or Commission staff is important and the draft would benefit from further clarification.

Additionally, it is unclear whether both the following must be met for a proposed lease to be in the public interest: (1) satisfaction of the requirements and (2) in-depth study, evaluation and consultation likely resolve significant environmental, cultural, and socioeconomic impacts. CEQA is the regulatory process to determine whether environmental impacts exist or can be mitigated to less than significant, and it seems, although ambiguous, that CEQA is triggered after the Commission’s determination that a proposed lease is in the public interest. The District request this be clarified and suggests that the in-depth study, evaluation and consultation be conducted during the CEQA process.

Moreover, it is also unclear whether the criteria will serve as policy guidance or be used as a required standard of review for future projects pursuant to a Commission determination at a public hearing pursuant to California Fish and Game Code (FGC) Section 15400. For example, how will Commission staff precisely use the criteria? Will Commission staff use the criteria to guide their review of an aquaculture lease once an application has been accepted for processing or will staff use the criteria to determine whether an application will be accepted for processing in the first place. It does not seem like this is the intent, but as outlined above there is ambiguity in the draft. Commission

**RE: Aquaculture Leasing in California, Public Interest Determination, November 17, 2022 Agenda Item #3**

staff may be able to perform the former action, but not the latter action based on the fact only the Commission may make a public interest determination in a public hearing. Further explanation about how the criteria is intended to be used is essential, so stakeholders have a clear understanding of the process. We recommend adding more specificity on how the criteria will be used and whether it will serve as general policy guidance or as a broad standard of review that will apply to all future projects and leases.

3. The District understands that the “requirements” stem from codified FGC sections and requests that citations be added after each “requirement.” If the intention is to have the Commission use the “considerations” as a requirement and standard for implementing FGC Section 15400 (the requirements that must be met to establish a future public interest determination at a public hearing), those would be binding with broad applicability upon all applications for new water bottom leases in state waters, requiring compliance with the Administrative Procedures Act to avoid being an underground regulation.<sup>1</sup>
4. The act of making a formal public interest determination *“has the effect of triggering environmental review.”* The District has not found any authority for this sequence of triggering events and believes this needs to be clarified. Pursuant to the definition of a “project” (CEQA Guidelines Section 15378) making such a determination would require reliance upon a CEQA document. However, until there is more clarity on how, what part and when the Commission will be using the criteria as a part of their decision-making process, it remains unclear if the required CEQA document would be available at the time a public interest determination is made.

From the District’s viewpoint, existing processes can solve this conundrum. Existing processes, like CEQA, provide opportunity for holistic and objective analysis, disclosure, and public input, and these processes should not be prematurely foregone. Instead, any future process for making a public interest determination by the Commission could be created as a complementary and not a preemptory replacement. We encourage the Commission to avoid adopting criteria that may produce unintended consequences like possibly circumventing or duplicating existing regulatory processes designed to discover and address potential impacts; complicating the role of regulatory functions of other state agencies involved in evaluating proposed shellfish and seaweed aquaculture activities; or limiting shellfish and seaweed aquaculture - for both consumptive and non-consumptive uses - from occurring in California. Furthermore and in support of aquaculture as a public interest, California Public Resources Code, Chapter 4, Section 826 states: *“The Legislature finds and declares that it is in the interest of the people of the state that the practice of aquaculture be encouraged in order to augment food supplies, expand employment, promote economic activity, increase native fish stocks, enhance commercial and recreational fishing, and protect and better use the land and water resources of the state.”*

5. In addition to the questions and comments related to administrative authority and procedure outlined above, applying the criteria to projects without the benefit of in-depth analysis precludes aquaculture projects from being able to demonstrate how a project

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<sup>1</sup> See *Center for Biological Diversity v. Cal. Department of Fish and Game* (2015) 234 Cal.App.4th 214.

**RE: *Aquaculture Leasing in California, Public Interest Determination, November 17, 2022 Agenda Item #3***

may comply with the criteria. During the CEQA process, environmental impacts are analyzed, and feasible mitigation measures applied. Such mitigation measures may make a proposed lease and project compliant with the criteria when without the mitigation measures it may not be in compliance. Therefore, use of criteria may be premature as the lease and project would not move onto the CEQA analysis and precludes the benefit of detailed environmental review. This may also have the effect of discouraging aquaculture lease applicants from applying in the first place and present another barrier to equitable opportunity to apply for aquaculture leases. The science concerning interactions between shellfish and seaweed aquaculture and the environment is complex and proposed aquaculture projects would benefit from a full evaluation and consideration pursuant to CEQA. The determination of public interest should be complementary to the CEQA environmental review process, which are focused on objective analysis of unique project features, site characteristics, and geography; disclosure of impact and mitigation; and public review.

6. We support providing useful and balanced information to assist the Commission in their decision-making process for leasing state waters for aquaculture. Therefore, it seems appropriate that any criteria are not binding, but rather guidance, and should occur in tandem with the standard environmental review process, enabling a holistic and complete review of a project's benefits or impacts. Also, it would be useful for the draft to include a more detailed discussion on how it will be procedurally used by the Commission in its review of future aquaculture projects. It also would be helpful to understand if the Commission plans to update the criteria and, if so, how often.

**Specific Comments**

The following comments are specific to the requirements, considerations, and benefits sections of the draft and are intended to assist with the cogent development of criteria in consideration of other conditions, processes, and requirements, as well as the comments provided above:

7. Most times aquaculture is thought of for human consumption as food. However, there are multiple uses for aquaculture including a variety of nature-based solutions and sustainable non-consumptive end uses such as bioremediation, carbon sequestration, restoration and habitat enhancement, and sustainable ocean grown products. By not calling out the different types of aquaculture the proposed language inadvertently focuses on aquaculture for human consumption. The permitting pathway for non-consumptive and consumptive aquaculture is the same, yet a few of the considerations in the draft guidelines unintentionally preclude non-consumptive uses from occurring in locations where consumptive aquaculture is inappropriate. The proposed language could be strengthened by acknowledging the different types of aquaculture, and where appropriate, ensure that the conditions are reasonable to support both consumptive and non-consumptive aquaculture including but not limited to bioremediation, carbon sequestration, restoration, mitigation banking, habitat and ecosystem enhancement, and providing for other non-consumptive, sustainable ocean grown products.
8. The last paragraph in the introductory section should include language indicating that the Agency's determination of public interest is not an indicator of the acceptance or denial of the lease itself and that other criteria (i.e. analysis under the CEQA process) will be evaluated before making a final decision on the lease.

**RE: Aquaculture Leasing in California, Public Interest Determination, November 17, 2022 Agenda Item #3**

9. Requirements and Constraints: The third element in this section is problematic and without being clearly defined could result in an unintended ban on shellfish and seaweed aquaculture projects in most of the waters in California. The use of the term “*marine managed areas*” without a definition carries potentially broad exclusion and extends far beyond the public interest. We recommend the term “*marine managed areas*” be deleted or replaced with the following language: “*Lease is not located within areas that prohibit aquaculture.*” If the term is retained, a clear definition consistent with allowances for aquaculture in state waters should be included in the next draft and provide the public with an opportunity to review.
10. Considerations: The second consideration is specific to consumptive uses of shellfish. Non-consumptive aquaculture such as seaweed aquaculture projects that support sequestration, bioremediation, and other environmental enhancement uses would unnecessarily be excluded. The District requests the language to read “*Lease, for projects that support consumptive uses of shellfish, is sited in areas that would minimize risks to public health as determined through consultation with California Department of Public Health and in accordance with the National Shellfish Sanitation Program.*”

Additionally, there is no need to call out specific areas (moorings) that may pose a risk to public health. By simply calling out the consultation with California Department of Public Health (CDPH) and adherence to the rules under the National Shellfish Sanitation Program (NSSP), which is administered by CDPH is not only sufficient but allows for periodic changes to the laws, which in the future may include seaweed, based on best available science, public health trends and industry operations.

11. Considerations: The fourth consideration calls out certain types of public access – commercial and/or recreational fishing, navigation, commerce, or coastal recreation – and it is not clear where shellfish and seaweed aquaculture fit. The District requests that the guidance accommodates the wide range of public access including inclusive and equitable access to the use of submerged lands for uses such as shellfish and seaweed aquaculture, which is commerce. The District strongly supports marine spatial planning and any related types of marine siting tools which help reduce use conflicts. At a minimum the language in Consideration 4 should read “*Lease would not unreasonably impede public access to state waters for purposes of recreational and/or commercial fishing, navigation, commerce (including shellfish and seaweed aquaculture), or coastal recreation.*”
12. Considerations: The sixth consideration’s language lacks sufficient detail to indicate the intention of the condition. As written – without allowing for minimization or mitigation of impacts through the CEQA process – it does not allow applicants to demonstrate how a project may reduce impacts and could create a significant barrier for shellfish and seaweed aquaculture proposals by preempting proper review from agencies who have the authority to consider how aquaculture projects interact with sensitive areas and species. The District requests that this consideration be eliminated as written or revised as follows: “*Lease is sited and operations mitigated to lessen significant impacts to recognized sensitive habitats, special status species, including species with a threatened or endangered designation, to below a level of significance.*”

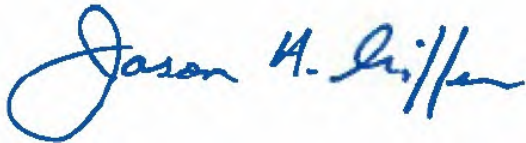
**RE: Aquaculture Leasing in California, Public Interest Determination, November 17, 2022 Agenda Item #3**

13. Potential Benefits: The District supports the considerations in this section and agrees that shellfish and seaweed aquaculture does create the many benefits within the list, with one exception, Benefit 6. The public interest considerations should support equitable access to opportunities and not limit access, as currently framed in Benefit 6. The District requests Benefit 6 be revised as follows: *"Encourage sustainable and equitable access to leases."*

The District appreciates the Commission's efforts to prepare the draft language to guide the public interest determination and efforts to obtain and incorporate public comment. Progress has been made with the second draft and we look forward to the next steps in developing useful direction that will support a fair and timely permitting pathway for shellfish and seaweed aquaculture throughout the state.

Thank you for the opportunity to provide feedback! If you have any questions, please do not hesitate to contact me at [jgiffen@portofsandiego.org](mailto:jgiffen@portofsandiego.org) or (619) 686-6473 or Paula Sylvia, Program Director, Aquaculture & Blue Technology at [psylvia@portofsandiego.org](mailto:psylvia@portofsandiego.org) or (619) 889-7686.

Sincerely,



Jason H. Giffen  
Vice President, Planning & Environment

## COMMITTEE STAFF SUMMARY FOR JULY 14, 2022 MRC

### *For Background Purposes Only*

### 3. RED ABALONE FISHERY MANAGEMENT PLAN (FMP)

#### Today's Item

Information ☐

Action ☒

Receive DFW update on FMP development, including draft chapter related to management, harvest control rule and *de minimis* fishery concepts, and develop potential committee recommendation.

#### Summary of Previous/Future Actions

- |  |   |
|--|---|
| • FGC supported development of recreational red abalone FMP                                      | Oct 8, 2014; Mt. Shasta                                       |
| • FGC received peer review results for draft FMP and re-referred to MRC                          | Oct 17, 2018; Fresno  |
| • FGC supported revised process per MRC recommendation   | Dec 12-13, 2018; Oceanside                                    |
| • MRC received administrative team report recommendations  | Mar 17 and Apr 29, 2020; MRC, Webinar/Teleconference          |
| • MRC recommended FGC support DFW to develop a draft FMP with administrative team report options | Jul 29, 2020; MRC, Webinar/Teleconference                     |
| • FGC approved MRC recommendation  | Aug 19-20, 2020; Webinar/Teleconference                       |
| • MRC received DFW updates on FMP progress   | Jul 16, Nov 21, and Nov 17, 2020; MRC, Webinar/Teleconference |
| • MRC received draft management chapter for FMP  | Mar 24, 2022; MRC, Webinar/Teleconference                     |
| • <b>Today's update and potential recommendation</b>   | <b>Jul 14, 2022; MRC, Santa Rosa</b>                          |

#### Background

An FMP for the north coast recreational red abalone fishery has been under development by DFW since 2014; DFW has provided regular updates to MRC.

Key milestones met in the process relevant to today's discussion include:

- Peer review of two proposed harvest control rules (Oct 2018)
- FGC approval of an MRC recommendation to support a collaborative stakeholder team process to integrate the two harvest control rules (Dec 2018)
- Report to MRC (Mar 2020) prepared by the collaborative stakeholder team (aka, the *red abalone FMP harvest control rule integration administrative team*, or administrative team), titled [Summary of the Management Strategy Integration Process for the North Coast Recreational Red Abalone Fishery Management Plan](#), including eight recommendations for integration of management strategies for development within a revised draft red abalone FMP (final Apr 2020)

## COMMITTEE STAFF SUMMARY FOR JULY 14, 2022 MRC

### *For Background Purposes Only*

- MRC recommendation (Jul 2020), based on discussions over several meetings, to:  
*Support DFW developing a draft FMP for further MRC and public review to include all eight FMP elements recommended in the harvest control rule integration administrative team report, with the following options selected:*
  - a. *Harvest control rule: Use both spawning potential ratio (SPR) and density metrics wherever possible.*
  - b. *Fishing zones: Establish two fishing management zones, with a framework in the FMP for data needed to establish a third zone.*
  - c. *Biological fishery: Include provision for biological fishery as a de minimis fishery option only, based on precaution and driven by scientific need.*
  - d. *Explore a tribal allocation.*
- FGC approval of the MRC recommendation (Aug 2020); support for DFW drafting
- DFW-developed draft FMP management chapter to MRC and public (Mar 2022)

All DFW work on the FMP since Aug 2020, has taken place under the guidance of FGC's direction in Aug 2020. MRC has received general updates from DFW on this work; Mar 2022 was the first meeting where specific FMP details were provided.

#### *March 2022 MRC recap*

For the Mar 2022 MRC meeting, DFW provided a draft red abalone FMP chapter titled "Abalone Management Chapter 3.0" related to the fishery management framework. DFW presented a series of detailed presentations to highlight key elements of the draft chapter for public and MRC discussion. See Exhibit 1 for background materials, the draft chapter, and presentations provided at the Mar 2022 MRC meeting.

DFW highlighted new developments related to the management framework and harvest control rule, including environmental and abalone indicators for fishery opening to support a climate-ready management framework. DFW also presented a new "egg production-based indicator" model developed to resolve concerns DFW identified with SPR as it further developed the management strategy. In lieu of utilizing SPR and density as metric streams, the DFW model employs a hybrid approach that integrates density, length frequency, weight frequency, and eggs-per-weight into an egg production model to determine a total allowable catch.

DFW requested MRC feedback on its proposed framework. Additionally, DFW requested MRC guidance on whether to have a *de minimis*, or limited, fishery as the stock rebuilds or to prevent fishing until the stock is fully rebuilt. MRC requested more information about how a *de minimis* level of take would compare to the whole abalone stock size (i.e., relative scale).

During public comment, The Nature Conservancy (chair of the administrative team and collaborator) expressed concerns regarding DFW's new approach, notably:

- DFW's departure from FGC's direction to move forward with both SPR and density metrics, as included in the administrative team's report;

## COMMITTEE STAFF SUMMARY FOR JULY 14, 2022 MRC

### *For Background Purposes Only*

- Continued reliance on density metric over citizen science-derived length and spawning potential ratio;
- A new model that does not provide clarity over which inputs drive results and decision-making; and
- Lack of transparency and communication between DFW and stakeholders during the management chapter development process.

In response to concerns raised and MRC input, DFW committed to take the following steps:

- Meet with their key partners, including The Nature Conservancy, to discuss the management framework, and Reef Check, to ensure data collection methodologies would be consistent.
- Discuss the draft management chapter at the Recreational Abalone Advisory Committee (RAAC) (scheduled Jul 11) to receive additional input.
- Provide MRC a sense of scale for a *de minimis* fishery allowance relative to stock size.
- Begin summer field surveys.

### *Update*

At today's meeting, DFW staff will present a recap of the key elements of its proposed management strategy; provide an update on discussions with The Nature Conservancy, Reef Check, and the RAAC; share plans for summer field surveys; and highlight potential next steps for MRC discussion (Exhibit 2).

While the agenda identifies the potential for developing a committee recommendation, staff anticipates that additional discussions, as highlighted in DFW's next steps, may provide a better understanding into the difference between the different recommended potential approaches for the management framework, including harvest control rule.

### **Significant Public Comments (N/A)**

### **Recommendation**

Consider information shared at today's meeting and determine next steps, including potential follow-up prior to the Nov MRC meeting.

### **Exhibits**

1. Background documents: Staff summary and exhibits from Mar 24, 2022 MRC meeting, available online at:  
<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=199371&inline>
2. [DFW presentation](#)

### **Committee Direction/Recommendation (N/A)**



## **Analysis of red abalone stock indicators**

Marine Region

October 2022

### CDFW Recommendation

After thorough investigation of multiple stock indicator options including a proposed dual indicator harvest control rule, the California Department of Fish and Wildlife (CDFW) Marine Region recommends the use of egg production as the preferred stock indicator for management. Staff do not recommend use of SPR as a sole indicator due to shortcomings in its ability to respond to environmental factors, unexplained variability, and potential to remain low during recovery. We recognize the importance of abalone size as an indicator of productivity. Therefore, we have worked to combine both density and size into an egg production indicator.

### Rationale

- Density and egg production indicators respond appropriately to changes in stock status from environmental factors, whereas the response of SPR occurs late or not at all.
- SPR is designed to detect the loss of large adults due to intense fishing but is incapable of detecting mortality events that affect all the size classes equally such as environmental impacts.
- In simulation, SPR shows a delayed response to stock impacts and longer fishery closures when stocks are in recovery.
- Historical empirical data shows that had the dual indicator harvest control rule been in place, management actions would have been driven by density while SPR would have been unnecessary.
- SPR estimates vary across years in ways that cannot be reconciled with historical information about fishery dynamics at given sites, e.g., unfished sites with low SPR and sites experiencing mass mortality with high SPR. The discrepancies can be associated with population changes resulting from environmental factors and create doubt on relying solely on SPR for management.
- Egg production can be cleanly tied to both fishery opening and closing recommendations by a limit threshold, and to total allowable catch. The proposed dual indicator harvest control rule with density and SPR was designed to trigger fishery opening and closing but gave no guidance on total allowable catch.
- Egg production, like SPR, represents reproductive potential incorporating size data. Unlike SPR, egg production makes use of abundance, length-weight, and fecundity information.

### Background on Red Abalone Management Approaches

Here we investigate the performance of a suite of red abalone stock indicators for use in management. We provide a summary of outcomes regarding indicators from the development of the red abalone fishery management plan (FMP), peer reviews and stakeholder processes. We then describe analyses performed by CDFW to examine the function and performance of a suite of potential indicators, their ability to accurately describe stock status, and to translate that information into management action via fishery opening and closing as well as guiding the annual total allowable catch at different stock levels. We will focus on three main indicators: density, spawning potential ratio (SPR), and egg production.

## *Density*

Density has historically been the primary management indicator used for red abalone within the Abalone Recovery and Management Plan (ARMP) that has guided management and recovery of abalone in California since its adoption by the Fish and Game Commission (FGC) in 2005. Density represents the numbers of abalone per unit area measured on transects by SCUBA surveys. Its primary purpose is to provide information on abalone abundance. The principle behind the use of this indicator has been that as the density of abalone increases the catch can also increase whereas, if density declines management would reduce catch. Density is important in abalone productivity since fertilization success is high when abalone are more densely packed together facilitating egg fertilization (Babcock and Keesing 1999).

Information on CDFW density methods for red abalone can be found in the ARMP (CDFW 2005). The history of the fishery indicates that density signaled when there were problems in the fishery such as when abalone in Sonoma County declined following a harmful algal bloom which killed abalone in 2011. We know that abalone density is dependent on depth and so density surveys are conducted within 4 depth strata from shallow to deep (60 feet). Sites within the principal fishing grounds (Sonoma and Mendocino Counties) are sampled using random transect locations within a site. A peer review of the density methodology highlighted that 1) when densities are high, density is highly variable due to the patchy distribution and CDFW should examine density confidence intervals through time and compare them to an a priori confidence in status relative to the management threshold, 2) density averages should not average across the entire site but be an average of the densities in each of the 4 depth strata, 3) the number of survey sites should be increased beyond the 8 that were monitored at that time, and 4) additional techniques to analyze and model the survey data should be explored, including analysis of SPR adjusted for nearest neighbor distance (OST 2014).

### *Changes Enacted in Response to Density Review*

In response to these recommendations we, 1) explored density confidence intervals over time and chose to use the 50% confidence interval<sup>i</sup> when comparing density measurements to the threshold, 2) adjusted the method for calculating the site averages to take advantage of the depth structure, 3) increased the number of index sites from 8 to 10, and 4) developed the egg production indicator which represents an additional modeling technique utilizing the survey data and the size of the abalone recognizing that a dense population of abalone that are all mature will be more productive than the same density of juvenile abalone. We remain open to discussion and feedback from stakeholders.

## *Spawning Potential Ratio*

SPR is an indicator using length samples to describe the size structure of the stock. SPR is designed to detect the loss of large adults from the size frequency distribution as occurs during intense fishing, particularly for fisheries subject to a size limit. It is used to express the proportion of the unfished reproductive potential left in a fished stock (Goodyear 1993) and is used typically for data-limited fisheries lacking age and abundance data. Values range from zero to one with one being the most pristine (unfished stock). The idea is that SPR can indicate when a stock has lost more of the large fecund individuals relative to medium and small individuals thereby impacting stock productivity. A limit reference point of 0.4 is a theoretical value commonly considered appropriate for long-lived finfish stocks (Mace 1994, Clark 2002, Punt and Ralston 2007). Invertebrates are thought to tolerate higher or lower SPR levels depending on life history. Abalone stocks in southern California collapsed even at an

SPR level of approximately 0.5 (Tegner et al. 1989) and therefore a higher limit is considered necessary for red abalone.<sup>ii</sup>

The use of SPR was proposed as an alternative management strategy for the recreational red abalone fishery in northern California due to its appealing features such as user engagement in size data collection, simplicity of calculation, and the potential to replace density as a less labor-intensive data stream (Hordyk et al. 2014). However, there needed to be an evaluation of how accurately SPR reflects the status of abalone populations for the recreational red abalone fishery in northern California. At the direction of the FGC, CDFW engaged with the Nature Conservancy (TNC) in a Management Strategy Integration Process to explore the possible integration of density and SPR in management with the use of a management strategy evaluation (MSE) model, described below.

### *Egg Production*

Egg production has a long history of being used as a direct status indicator for a variety of fisheries (Bernal et al. 2012) as well in egg per recruit models to determine appropriate size limits (Gabriel et al. 1989). Incorporating egg productivity in abalone fishery modeling can aid in establishing biological reference points and examining management strategies (Leaf et al. 2008). The red abalone egg production indicator presented in the draft FMP builds on the use of size as an important feature of abalone stocks. In this work, we construct an egg production metric using previously unavailable information on length, weight, and fecundity relationships. We generate this metric from modern as well as historical baseline values when the fishery was known to be robust. A similarly calculated reproductive potential metric was found by Rossetto et al. (2013) to correlate with local recruitment of pink and green abalone in Baja California Mexico. The concept of egg production monitoring is similar to SPR and egg per recruit in that it describes reproductive output. However, while SPR is based on a size frequency distribution only, egg production incorporates size, abundance, and fecundity information. Additionally, egg production is expressed as an amount and not as a ratio relative to a theoretical unfished condition.

### Management Strategy Evaluation

TNC hired Dr. Bill Harford to work with their scientists to develop an MSE of a multi-indicator decision tree using catch and SPR (Harford et al 2019). In the MSE model, undesirable stock sizes were avoided even while executing a fishery (Harford et al. 2019). The management strategy centered on catch and SPR was presented to the FGC by TNC as an alternative to the density-based FMP developed by CDFW in 2018. Following collapse of the stock due to the marine heat wave and subsequent fishery closure, catch would no longer be an available data stream. Dr. Harford and TNC supported a new MSE using density rather than catch as an abundance indicator in conjunction with SPR. We refer to results of the analysis of this new MSE throughout this document.

### Assessment of Indicators

Here we focus on the quantitative evaluation of the indicators, both during and after the Red Abalone FMP Management Strategy Integration Process.

### *SPR and density performance for historical red abalone data*

The exploration of density and SPR as indicators for red abalone management within the MSE described above involved assessing their performance for a simulated stock. Those simulations tested their functioning together within a dual indicator harvest control rule (Figure 1). Following that process, CDFW staff saw the need to examine the performance of density and SPR individually using historical red abalone data to better understand how they would have performed both jointly and individually if the fishery has been managed under this proposal. We calculated SPR using the methods described in Harford (2020) which included the use of the R software LB-SPR, length samples from legal-sized individuals only, and parameters ( $M/K=0.9$ , coefficient of variation of asymptotic length of 0.1 and fecundity exponent of 4.7). Table 1 is a matrix of SPR values at index sites where data are available between 1999 and 2018. Cells with SPR values of 0.5 or below are highlighted. We find that SPR has been above the limit for the majority of the monitoring history, reflecting a lack of fishery related impacts. In other words, the SPR indicator has not been triggered. Within this fishery's history, the most substantial declines in stock status have been brought on by environmental change rather than harvest impacts. Those events include a harmful algal bloom (HAB) that impacted sites in Sonoma County in 2011 and the marine heat wave that began in 2014. No sites dropped below  $SPR=0.5$  as a result of the HAB. Moreover, Fort Ross was the most heavily impacted site and SPR increased between monitoring events in 2009 and 2012 and remained high in 2015, contrary to observed stock declines. No sites dropped below the limit as a result of the marine heat wave until 2018, thus SPR was slow to reflect the changes to the abalone stock even during a mass mortality event which occurred in 2015-2016.

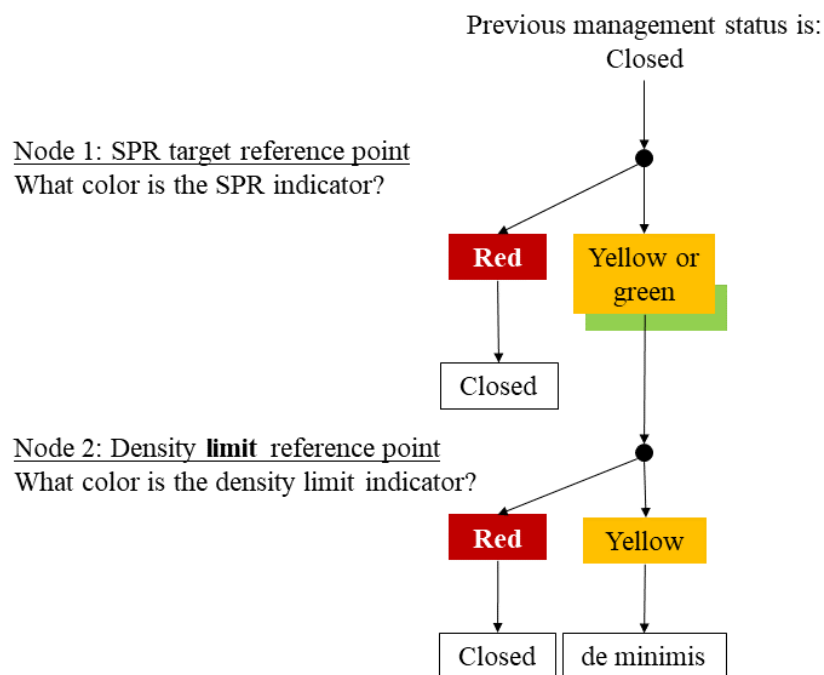


Figure 1. Proposed dual indicator harvest control rule decision tree beginning from closed fishery status. Reproduced from Harford (2020).

Table 1. Spawning potential ratio at CDFW index sites. Values of 0.5 or below are highlighted.

SPR	Sonoma					Mendocino				
	Fort Ross	Timber Cove	Ocean Cove	Salt Point	Sea Ranch	Point Arena	Van Damme	Russian Gulch	Caspar Cove	Todds Point
1999	0.56						0.51			
2000	0.61			0.52						
2003						0.64	0.58			
2004	0.75									
2005				0.55					0.56	
2006	0.54	0.67								0.52
2007			0.59			0.60	0.52			
2008				0.50					0.73	
2009	0.57	0.67								0.58
2010			0.61			0.58	0.57			
2011									0.57	
2012	0.70	0.68	0.56	0.66	0.72					
2013							0.58		0.75	0.75
2014						0.67		0.62		
2015	0.74	0.57								
2016			0.91	0.72			0.57			
2017	0.58	0.66	0.58	0.68	0.65	0.72	0.51	0.59	0.69	0.67
2018	0.54	0.66	0.43				0.48	0.42	0.50	0.68

There are two reasons that SPR has been slow to indicate changes in the red abalone stock. First and most importantly, the major events in the fishery history have been environmentally caused, rather than caused by fishing pressure. Those environmental events impacted abalone abundance but *did not impact size structure*. Figure 2 illustrates this by comparing the size structure before and after these events. The second reason relates to abalone age at maturity. Impacts to the stock from environmental change may ultimately be reflected in SPR as the fewer number of young abalone eventually lead to a reduced frequency of large abalone as they age. Red abalone take 10 to 12 years to reach legal size and therefore SPR impacts may be delayed for up to that amount of time.

Examining a matrix of density across index sites and years, we see that density dropped below the 0.25 abalone per square meter limit at three Sonoma County sites resulting from the 2011 HAB and all monitored sites were below the limit in 2017 and 2018 due to the marine heat wave with some in 2016 (Table 2). Therefore, density reflected the major stock declines known in the history of this fishery. The MSE-tested harvest control rule was designed such that each indicator must be above its limit for fishing to occur (Figure 1). Considering the unresponsiveness of SPR to the major events impacting the stock during its history, we conclude that this harvest control rule would have been driven by the density indicator had it been in use. The SPR indicator would not have been informative to management. Consistent declines in density at some sites did not occur in SPR, which remained stable or was variable (Figure 3).

To further explore this variability in both density and SPR, we examined the coefficient of variation of each within the same site and year. SPR estimates for a site/year discussed thus far have been made by

pooling all length measurements among all transects to generate one SPR estimate for that site/year. Alternatively, for density the lower 50% confidence interval around the mean among multiple transects is used. To compare multiple SPR estimates within a site/year to the multiple estimates derived for density, we calculated multiple SPR estimates for Van Damme 2003 from samples of the total available length measurements that were similar in size to the numbers of abalone counted per transect (and used for density estimation) for a total number of samples equal to the number of transects. The coefficient of variation (standard deviation/mean) of these SPR estimates is lower than the coefficient of variation of transect densities (0.10 vs. 0.77). Coefficient of variation can be compared across metrics on different scales. Therefore, the variability of SPR within site/year appears to be lower than density. Among year variability within a site is concerning as it could lead to erroneous management action. This is a concern for both the SPR and density indicators which are subject to variability due to sampling processes. This can be seen in the variability in SPR observed at Ocean Cove as well as in density at Van Damme in Figure 3. We conclude that while SPR appears to exhibit greater precision among length samples within a site and year, both indicators are subject to variability across years, and SPR did not show coincident signals of stock decline observed in density.

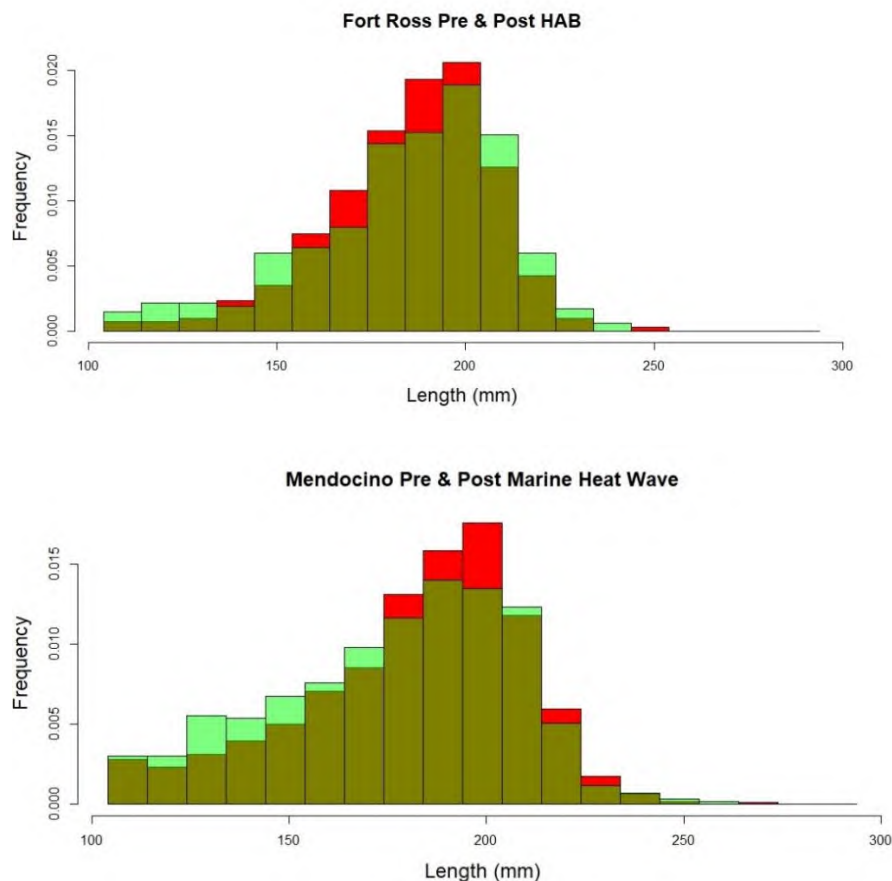


Figure 2. Red abalone size frequency distributions for A) before (red) and after (green) the harmful algal bloom at Fort Ross and B) before (red) and after (green) the marine heat wave across all index sites in Mendocino.

Table 2. Density (lower 50% confidence interval around the mean abalone/square meter) at CDFW index sites. Values below 0.25 are highlighted. Values for 2022 are shown using three significant digits due to low indicator status.

	Sonoma					Mendocino				
Year	Fort Ross	Timber Cove	Ocean Cove	Salt Point	Sea Ranch	Point Arena	Van Damme	Russian Gulch	Caspar Cove	Todds Point
1999	0.22						0.38			
2000				0.32						
2003						0.45	0.75			
2005				0.41					0.43	
2006	0.41	0.46								0.31
2007			0.59			0.47	0.39			
2008				0.29					0.30	
2009	0.23	0.32								0.40
2010			0.46			0.63	0.54			
2011									0.29	
2012	0.18	0.27	0.21	0.23	0.27					
2013							0.32		0.29	0.39
2014						0.51		0.46		
2015	0.33	0.25								
2016			0.28	0.23			0.22			
2017	0.17	0.07	0.10	0.04	0.17	0.17	0.14	0.04	0.03	0.11
2018	0.06	0.09	0.08				0.08	0.04	0.01	0.06
2022	0.001			0.003			0.026	0.020	0.007	0.003

We conducted a separate analysis of SPR for length measurements collected by citizen scientists as well as by CDFW staff prior to development of the monitoring protocols currently in use (pre-1999).

Measurements taken at Van Damme by Reef Check, a citizen scientist organization, allow us to assess the comparability of these data sources. Data collected by Reef Check in 2007, 2010 and 2013 result in SPR estimates of 1, 0.51 and 0.78, respectively. CDFW data collected at Van Damme result in SPR estimates of 0.52, 0.57 and 0.58. Reef Check SPR estimates are substantially higher in two out of the three years and show much greater variability between years. CDFW estimates of SPR at Van Damme in 1971 and at Point Cabrillo in 1986 are 0.47 and 0.43, respectively. We expected there would have been relatively little abalone harvesting by divers at Van Damme back in 1971 and no abalone harvesting in the long-time reserve at Point Cabrillo so these sites should have had high SPR values. Instead, the values were lower than actively fished sites and low enough to close the fishery. Again, this points to unexplained interannual variability that over long time scales may relate to ecosystem shifts and.

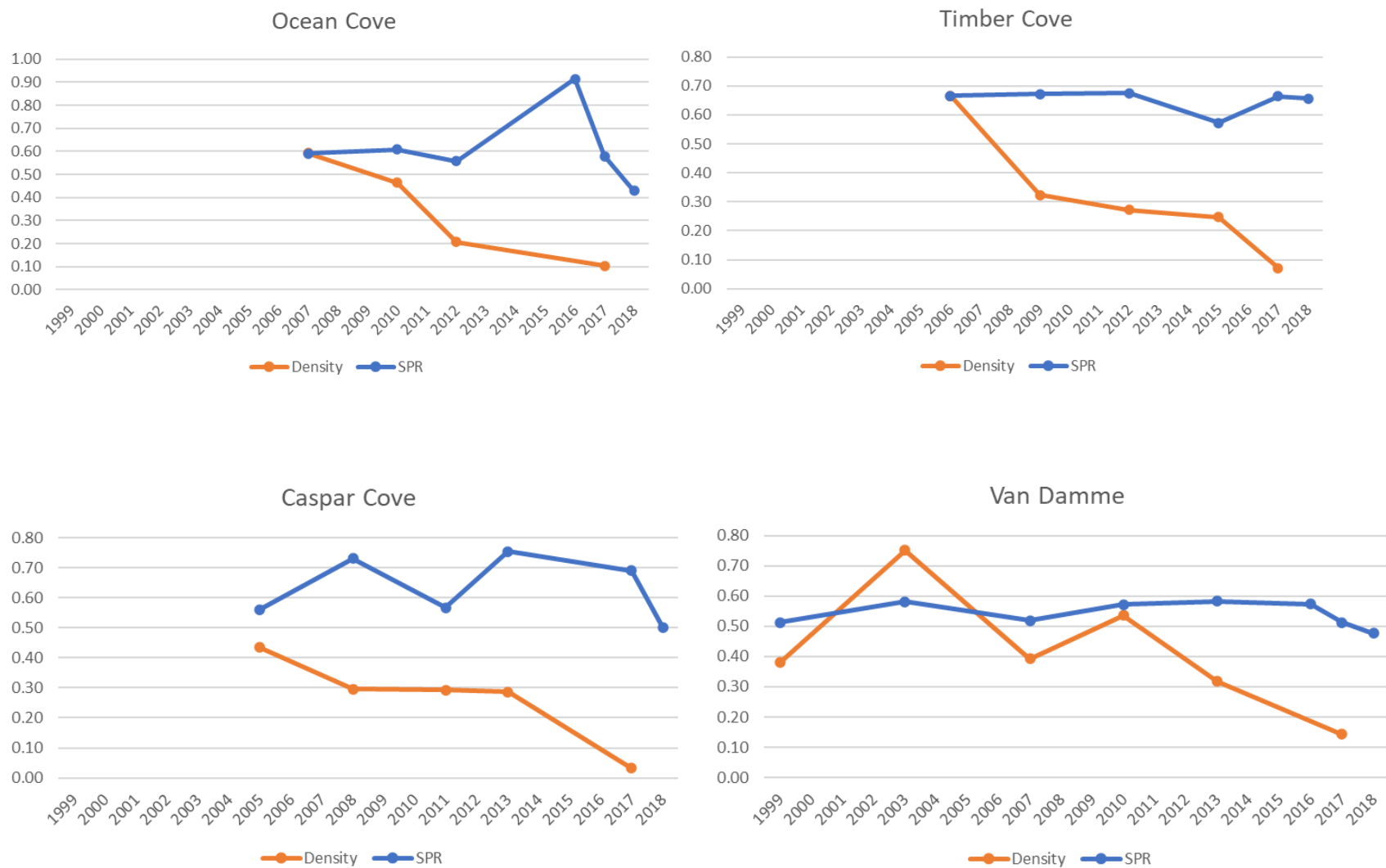


Figure 3. Density and spawning potential ratio trends over time at four index sites.



### *SPR and density performance for simulated red abalone data*

Given the current poor status of the red abalone stock, it is necessary to look at simulations to learn about indicator performance during a potential future stock recovery. We simulated recruitment of young abalone to the fishery using the actual length frequency data from Van Damme in 2003 and inflating the number of individuals in the two smaller legal size classes (175-180 mm, 180-185 mm) (Table 3). SPR decreased as the number of individuals in those classes was inflated by 10, 20, 30, and 40% while the number of individuals in the other size classes was unchanged. Therefore, as we simulated recovery SPR decreased falsely indicating the stock was doing more poorly. This is because SPR reflects relative frequencies in the size classes and is blind to abundance. When sites are at a fishable abundance, as reflected by density, they may have relatively higher numbers of small individuals following a recovery or strong recruitment pulse. This causes SPR to decline and may result in action to close the fishery even when the stock is doing better in recovery. This is an undesirable feature of the SPR indicator when stocks start to recover.

As sites recover, recruitment pulses will eventually be observed as increases in the number of individuals in the smallest legal size classes. This initially results in a decline in SPR as we have just shown. Eventually, as these smaller individuals grow to larger sizes, SPR will slowly start to increase. However, given the long lifespan of red abalone, this increase in SPR will take approximately a decade or more. This dynamic was observed by the MSE as shown in Figure 4 by the trajectory of indicators across a 120-year simulation. The indicator status of a simulated stock can be known with complete accuracy. This is represented by the orange lines. Within an MSE, we apply observation error to the simulated data so that it has similar statistical properties to real sample data. Indicators with observation error are represented by the blue lines. Panels A, C, and E of figure 4 show that at low densities, when management actions would be taken, variability in density is low and observed density tracks true density tightly. Variability in density is much greater as the true simulated density increases, thus density estimates track the true density with less precision but are centered around the mean. Panels B, D, and F show that as true SPR declines, observed SPR remains high and thus there is a delay in the indicator. As true SPR increases, observed SPR can remain low in some or all years for multiple decades, erroneously closing the fishery.

Table 3. SPR estimates for Van Damme in 2003 when the number of individuals in the two smallest legal size classes (175-180, 180-185 mm) is inflated to simulate recovery.

Percent Inflation of Small Sizes	SPR
0	0.58
10	0.57
20	0.562
30	0.555
40	0.547

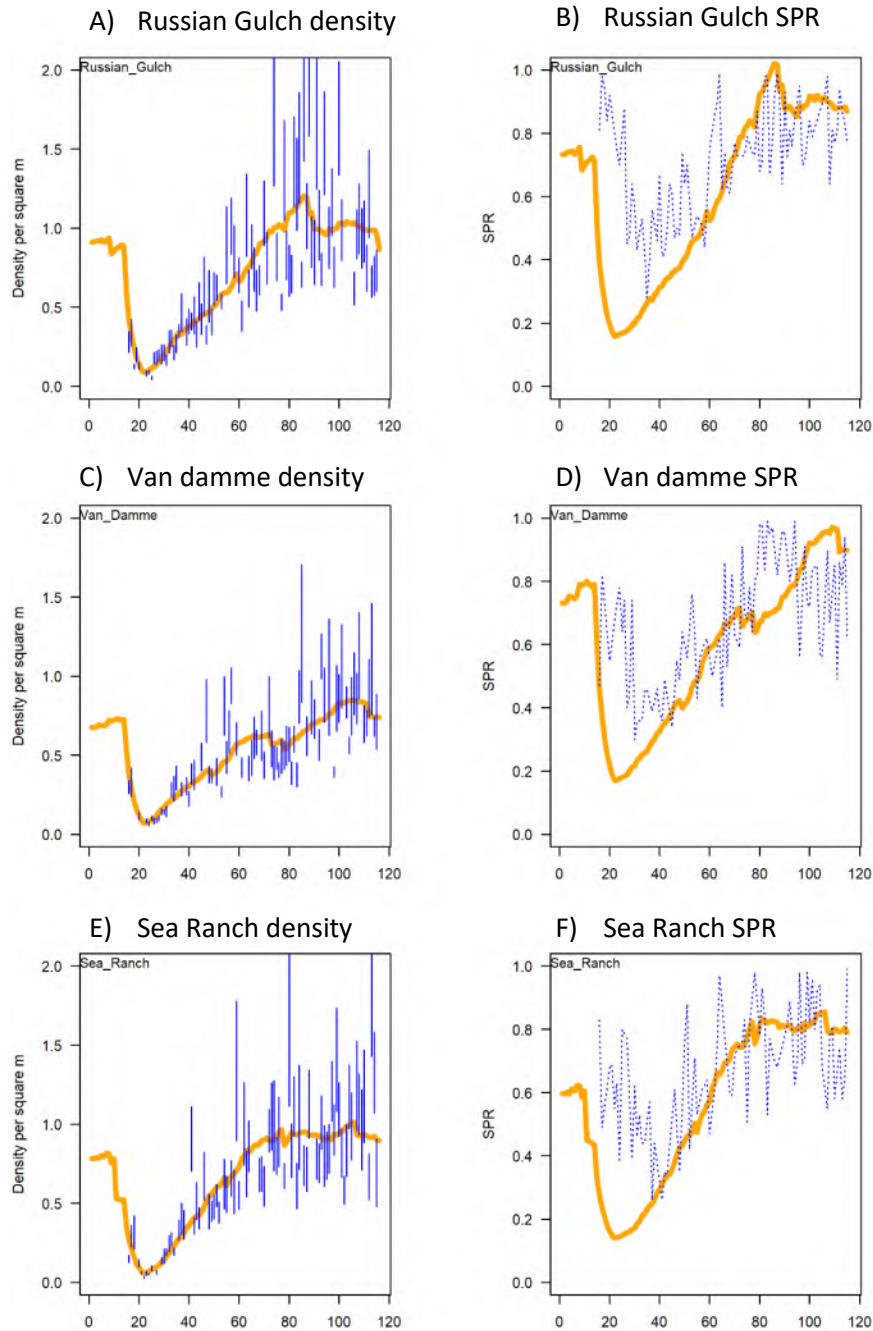


Figure 4. Illustration of propensity for observation error (blue lines) relative to true-simulated resource state (orange lines). Shown in the left column is a typical example from one simulation of observed densities, showing 50% confidence intervals (vertical lines) of those observed densities relative to corresponding true density trends. Shown in the right column are simulation of observed SPR point estimates plotted against corresponding true SPR. Examples are shown for three sampling sites (rows) using OM 2 (prolonged environmental decline). Reproduced from Harford (2020).

We performed an additional analysis of observation error related to sample size by subsampling real length data at three sites in years with many length samples. Figure 5 shows the change in SPR and confidence intervals when samples for estimation are made with replacement from the total available at a site. SPR was estimated based on 25, 50, 100, 200, 300, 400, and the total available at three sites. These plots suggest sample sizes greater than 3-400 may be necessary to achieve accurate SPR estimates. Given the current status of the stock, it will be difficult to achieve the necessary sample sizes.

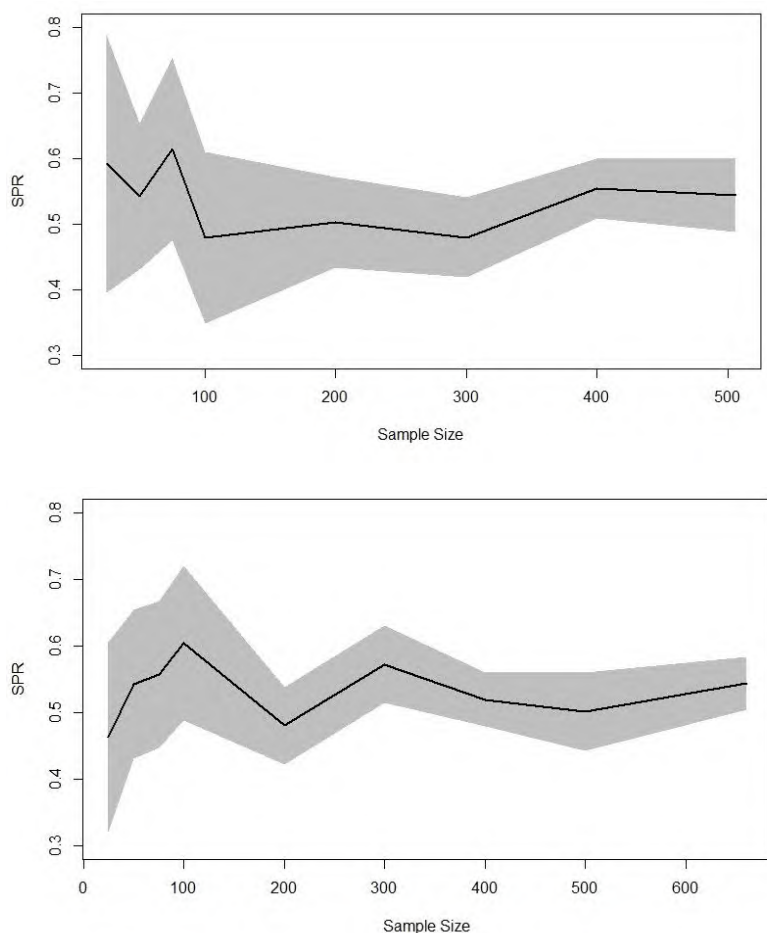


Figure 5. Spawning potential ratio estimates and 95% confidence intervals at varying sample sizes for length samples collected at A) Fort Ross in 2006 and B) Salt Point in 2005.

#### *Egg production performance*

The egg production indicator incorporates both abundance and size information about the abalone stock. As we have seen SPR has limited abilities to indicate problems with the stock or stock recovery. However, CDFW recognizes the value of abalone size as an important indicator of stock productivity and the ability to incorporate stakeholder-collected data. Therefore, we propose as the FGC has requested, that we integrate both abundance and size data into an indicator that can be sensitive to both fishing and environmental stressors. This is important as climate driven changes in the stock are occurring now and are predicted to occur in the future.

The proposed limit of 5 billion eggs is based on a healthy size frequency distribution and a low density of 0.25. Sites and past years that fell below that limit align with the sites and years that fell below the density limit (Table 4). We can see that in the year 2015-2016 we are already being warned of problems with the fishery falling below the 5 billion eggs lower limit. We therefore feel confident that this indicator can respond to both environmentally and fishery induced change.

Table 4. Egg production indicator values at CDFW index sites. Values below 5 are highlighted. Missing years and cells indicate that surveys were not conducted except for 2022 when surveys were conducted but length sample sizes were insufficient to calculate egg production.

	Sonoma					Mendocino				
Year	Fort Ross	Timber Cove	Ocean Cove	Salt Point	Sea Ranch	Point Arena	Van Damme	Russian Gulch	Caspar Cove	Todds Point
1999	4.73						8.15			
2000				8.11						
2003						9.36	14.06			
2005				8.92					8.22	
2006	8.37	9.63								7.04
2007			10.90			9.32	7.69			
2008				6.36					6.92	
2009	4.79	7.12								9.66
2010			9.11			12.60	10.20			
2011									5.56	
2012	3.73	5.38	4.14	4.65	6.50					
2013							6.18		5.53	8.01
2014						10.78		8.24		
2015	5.97	4.87								
2016			5.96	4.35			4.13			
2017	3.44	1.87	2.08	0.96	4.03	4.12	2.16	0.73	0.83	2.54
2018	0.95	2.36	1.10				1.29		0.13	1.86

We further evaluated the sensitivity of the egg production indicator to concurrent change in density and size frequency to determine if egg production can be responsive to both information sources. Four size frequency distributions were examined. First, a baseline distribution was based on a normal curve. Second and third, inflated the smallest and largest size classes by 200%, respectively. Inflating small size classes simulates strong recruitment. Inflating large size classes is likely biologically unrealistic but was explored as a learning exercise. The fourth distribution reduced all legal size classes by 60%, simulating strong harvest pressure. Egg production increases linearly with density for each of these size distributions (Figure 6). At a baseline size distribution, densities below 0.25 abalone/m<sup>2</sup> result in an egg production value below the limit. A size distribution with a high proportion of large individuals can remain above the egg production limit at some densities below 0.25 abalone/m<sup>2</sup>. Alternatively, size distributions with relatively fewer large individuals require higher densities. This reflects appropriate caution that may close sites at both low density and size distributions with few reproducing abalone. However, as observed in the dual indicator harvest control rule using SPR and density, egg production

may penalize recovering sites with size frequencies favoring small individuals. This seems to be an unavoidable feature of incorporating size into a red abalone harvest control rule but as illustrated in Figure 6, densities just slightly above 0.25 may be able to compensate for a left skewed size distribution and allow the egg production indicator to be above the limit.

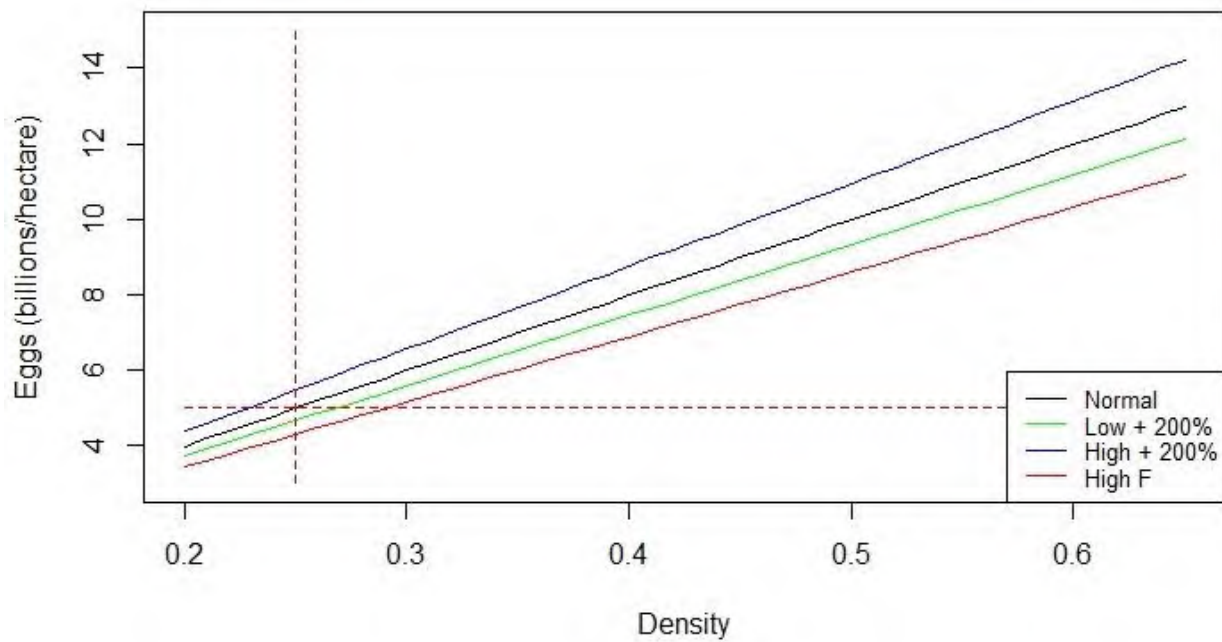


Figure 6. Simulated change in egg production with change in density for four size frequencies representing a normal distribution (black), a recruitment pulse (green), a high proportion of large abalone (blue), and high fishing pressure (red).

## References

- Babcock R. and Keesing J. 1999. Fertilization biology of the abalone *Haliotis laevis*: laboratory and field studies. *Canadian Journal of Fisheries and Aquatic Sciences*, 56(9), pp.1668-1678.
- Bernal M, Somarakis S, Witthames PR, van Damme CJG, Uriarte A, Lo NCH, Dickey-Collas M. 2012. Egg production methods in marine fisheries: An introduction. *Fisheries Research*. 177-188: 1-5.
- Breen PA, Smith ANH. 2008. The 2007 assessment for paua (*Haliotis iris*) stock PAU 5B (Stewart Island).
- Clark WGW. 2002. F35% revisited ten years later. *North American Journal of Fisheries Management*, 22: 251–257.
- Gabriel WL, Sissenwine MP, and Overholtz WJ. 1989. Analysis of spawning stock biomass per recruit: an example for Georges Bank haddock. *North American Journal of Fisheries Management* 9: 383-391.
- Harford WJ, Dowling NA, Prince JD, Hurd F, Bellquist L, Likins J, and Wilson JR. 2019. An indicator-based decision framework for the northern California red abalone fishery. *Ecosphere* 10( 1):e02533. [10.1002/ecs2.2533](https://doi.org/10.1002/ecs2.2533)
- Harford W. 2020. Management strategy evaluation: Recreational red abalone management strategy integration. Report prepared for the California Fish and Game Commission. January 6, 2020.
- Hordyk A, Ono K, Valencia S, Loneragan N, Prince J. A novel length-based empirical estimation method of spawning potential ratio (SPR), and tests of its performance, for small-scale, data-poor fisheries. *ICES Journal of Marine Science*. 72(1): 217-231.
- Leaf RT, Rogers-Bennett L, and Jiao Y. 2008. Exploring the use of a size-based egg-per-recruit model for the red abalone fishery in California. *North American Journal of Fisheries Management*, 28(5), pp.1638-1647.
- Mace PM. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. *Can J Fish Aquat Sci*. 51:110–122.
- Ocean Science Trust (OST). 2014. Final Report of the Science Advisory Committee – Scientific and Technical Review of the Survey Design and Methods Used by the California Department of Fish and Wildlife to Estimate Red Abalone (*Haliotis rufescens*) Density. June 2014.  
<https://www.oceansciencetrust.org/wp-content/uploads/2016/11/Abalone-Review-Final-Report-FINAL.pdf>
- PIRSA (Department of Primary Industries and Regions). 2021. Paper number 83: Management plan for the South Australian Commercial Abalone Fisheries (2021). Government of South Australia.
- Prince JD, Peeters H, Gorfine H, Day RW. 2008. The novel use of harvest policies and rapid visual assessment to manage spatially complex abalone resources (Genus *Haliotis*). *Fisheries Research*. 94(3): 330-338.
- Punt AE, and Ralston S. 2007. A Management Strategy Evaluation of Rebuilding Revision Rules for Overfished Rockfish Stocks. Page in J. Heifetz, J. DiCosimo, A. J. Gharrett, M. S. Love, V. M. O’Connell, and R. D. Stanley, editors. *Biology, Assessment, and Management of North Pacific Rockfishes*. Alaska Sea Grant College Program, Juneau, AL.

Rogers-Bennett L, Kashiwada, JV, Taniguchi IK, Kawana SK and Catton CA, 2019. Using density-based fishery management strategies to respond to mass mortality events. *Journal of Shellfish Research*, 38(2), pp.485-495.

Rogers-Bennett L, Klamt R and Catton CA, 2021. Survivors of climate driven abalone mass mortality exhibit declines in health and reproduction following kelp forest collapse. *Frontiers in Marine Science*, p.1071.

Rossetto M, De Leo GA, Greenley A, Vazquez L, Saenz-Arroyo A, Montes JAE, Micheli F. 2013. Reproductive potential can predict recruitment rates in abalone. *Journal of Shellfish Research*. 32(1): 161-169.

Strain LWS, Hesp SA, Fabris F and Hart AM. 2017. Demographic performance of Brownlip abalone: exploration of wild and cultured harvest potential. FRDC Project No. 2012/016. Fisheries Research Report No. 280, Department of Fisheries, Western Australia, 100pp.

Tegner MJ, Breen PA, and Lennert CE. 1989. Population biology of red abalones, *Haliotis rufescens*, in southern California and management of the red and pink, *H. corrugata*, abalone fisheries. U.S. National Marine Fisheries Service Fishery Bulletin 87:313-339

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<sup>i</sup> This value was chosen during the integration process and was the density reference point that was MSE tested. It represents 50% probability that the true value is between the upper and lower values. 95% confidence intervals were determined to be overly conservative.

<sup>ii</sup> SPR values of 0.4 and 0.5 were agreed upon during the integration process as appropriate for MSE testing. "Several studies have concluded that SPR targets greater than or equal to 0.4 should produce close to optimum harvest, especially for long-lived species (Mace 1994, Clark 2002, Punt and Ralston 2007, Harford et al. 2019b). And like other studies, maintaining SPR above such a target during an open fishery may be a reasonable means to buffer against environmentally-induced abundance fluctuations in the longer-term (Harford et al. 2018)." Harford (2020).



# Red Abalone Fishery Management Plan

*17 November 2022*

*Presented to:*

**Marine Resources Committee**

**Fish and Game Commission**

*Presented by:*

**Julia Coates**

**Senior Environmental Scientist  
Marine Region**





# Outline

- Background
- 2022 Survey Update
- Management Strategy Overview
- Analysis of Abalone Stock Indicators
- Future Fishing Opportunities
- Next Steps



# Background

- July 2022 MRC
  - Update on management strategy development and progression since Integration Process
  - Presentation of the draft management strategy, Total Allowable Catch (TAC), and potential allocations
- August - October
  - Refine, independent analysis of HCR drafted report summarizing our results and rationale
  - Stakeholder outreach
    - RAAC meeting (Nov. 1, 2022)



# Survey Update



# Mendocino Abalone Survey

Mendocino County Sites	2022 # Transect	2022 Red Abalone Counted	2022 Red Abalone Density (m <sup>-2</sup> )	2018 Red Abalone Density (m <sup>-2</sup> )
Van Damme	12	33	.0479	.1564
Caspar Cove	12	7	.0097	.0116
Todd's Point	12	5	.0069	.1327
Russian Gulch	12	24	.033	.0460
Mean			<b>0.024</b>	<b>0.087</b>



# Sonoma Abalone Surveys

Sonoma County Sites	2022 # Transect	2022 Red Abalone Counted	2022 Red Abalone Density (m <sup>-2</sup> )	2018 Red Abalone Density (m <sup>-2</sup> )
Fort Ross	12	3	.0042	.0891
Salt Point	12	5	.0069	No data
Mean			<b>0.0056</b>	



# Management Strategies



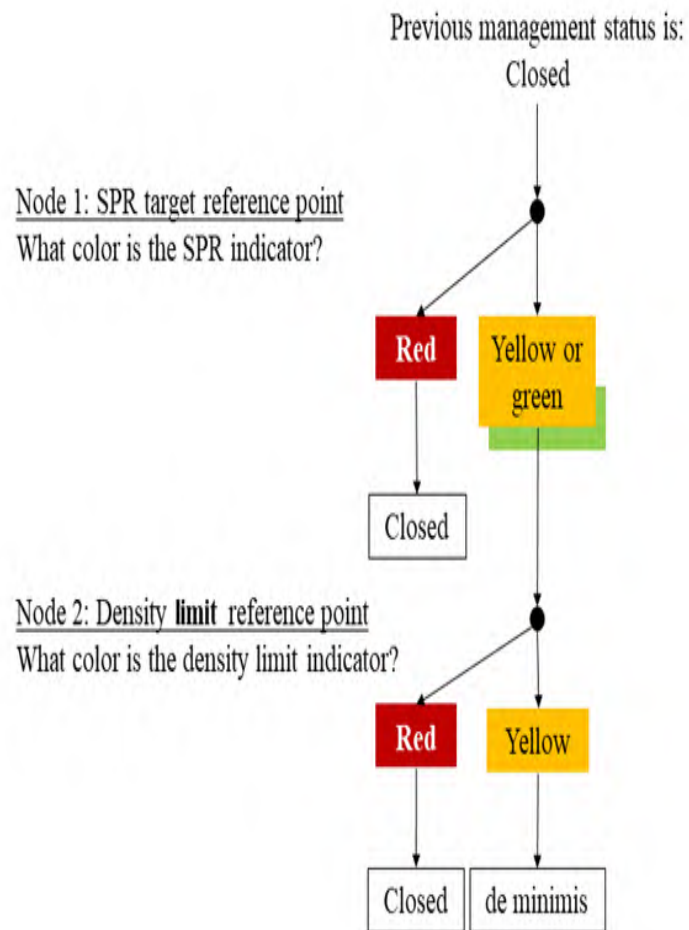
# Management Strategy Overview

- Harvest Control Rule
  - Evaluated independently for each fishing zone
  - Multilevel decision process using stop light approach
  - Indicators
    - Environment
    - Abalone condition
    - Egg production
- Total Allowable Catch (TAC)

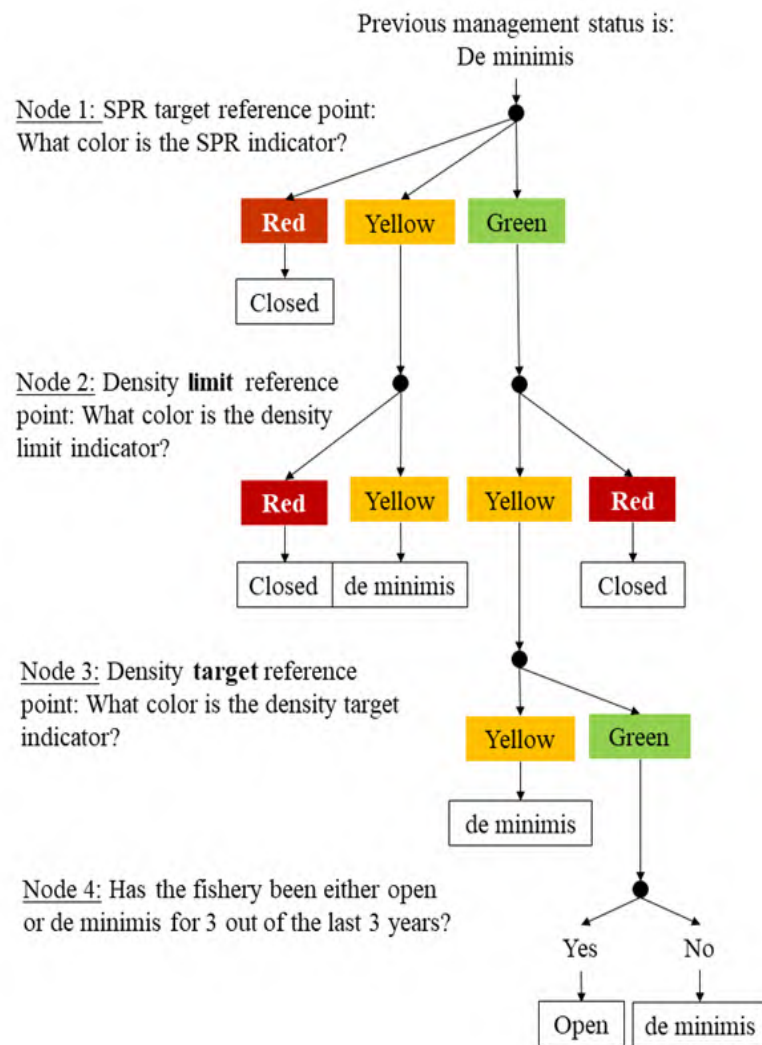


# Administrative Team HCR

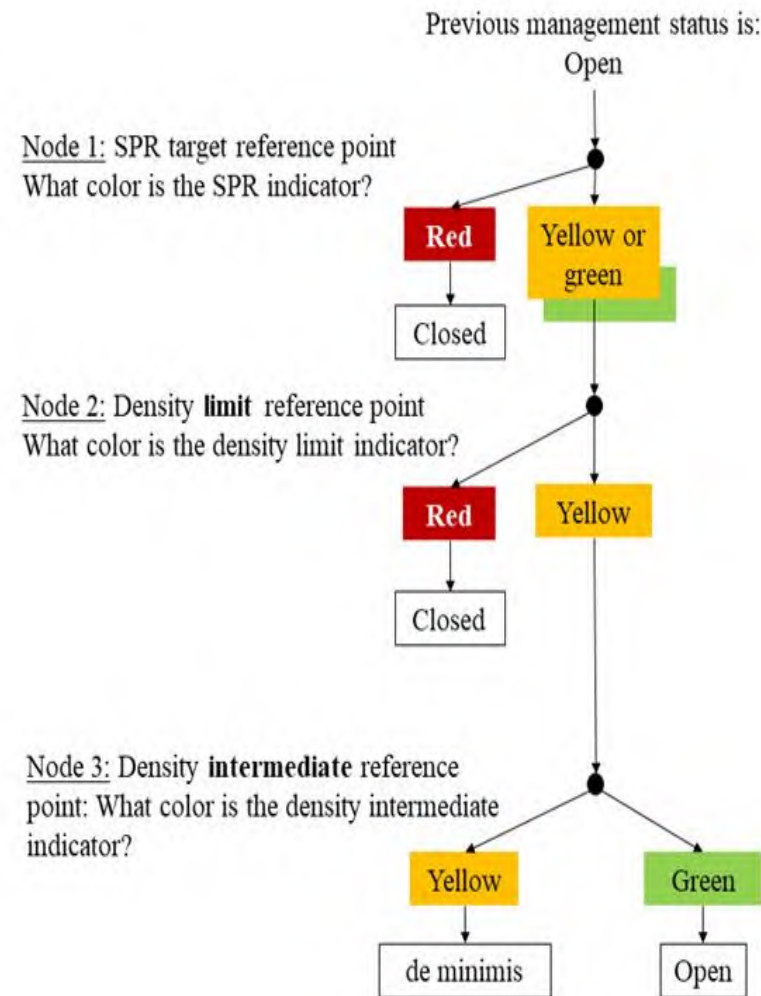
## CLOSED



## DE MINIMIS



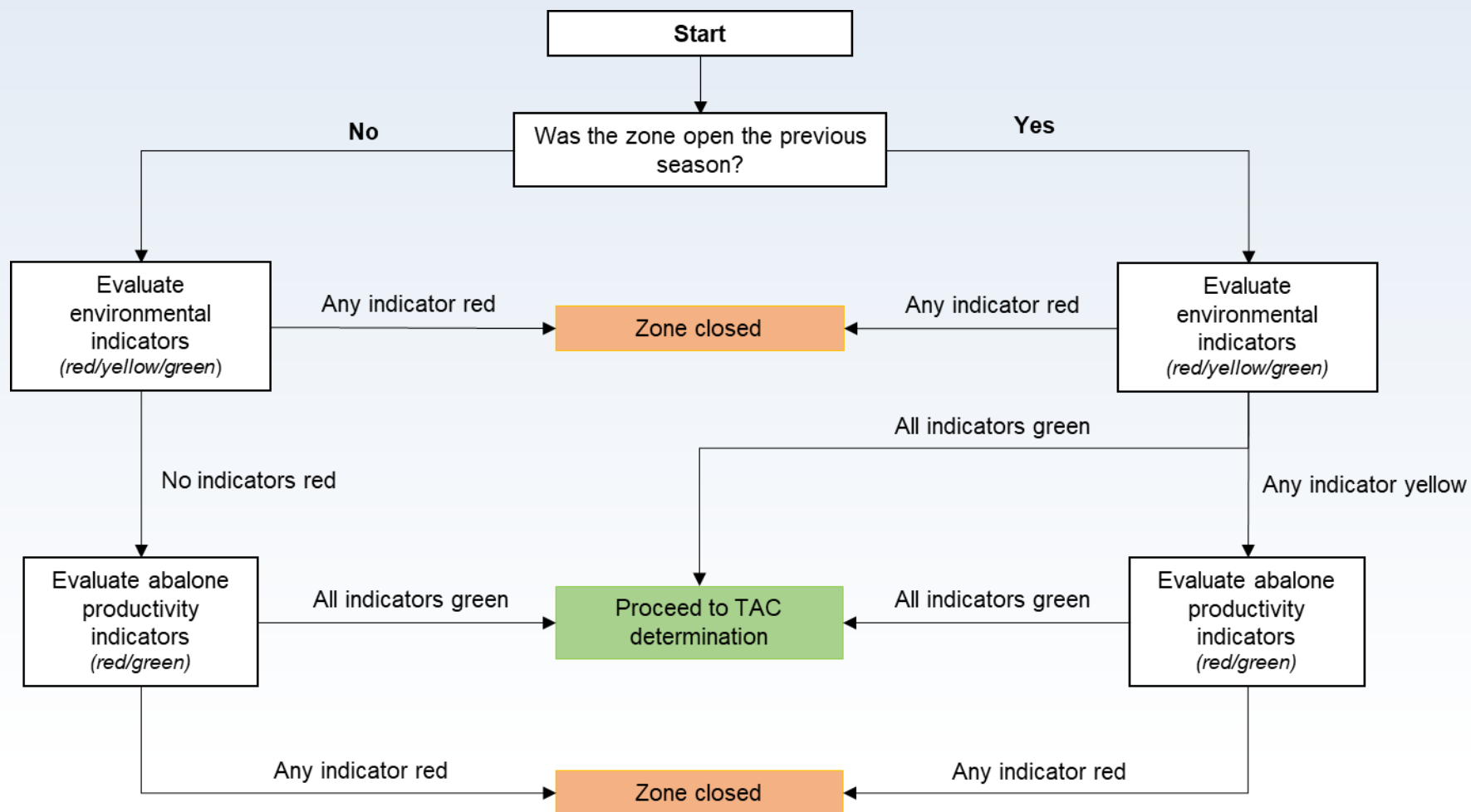
## OPEN







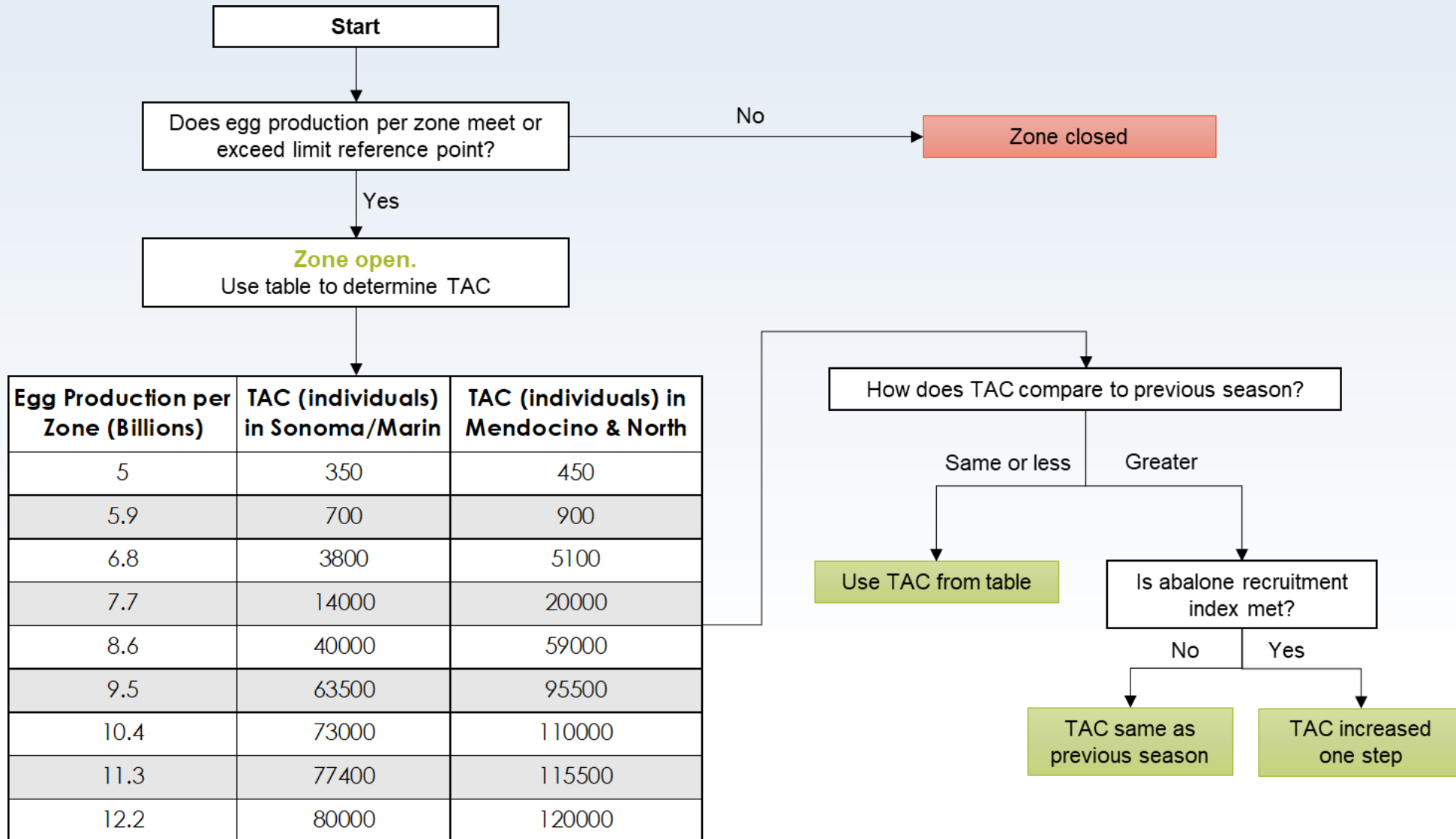
# CDFW Preferred HCR



*Note: Presence of oil spill, mass mortality, harmful algal bloom, or disease in a zone will cause immediate closure and investigation.*



# Total Allowable Catch (TAC)





# CDFW Analysis of Stock Indicators



# Stock Indicators

- Density (#/m<sup>2</sup>)
  - Primary indicator used in the Abalone Recovery & Management Plan (ARMP)
- Spawning potential ratio (SPR)
  - Size frequency distribution
  - Expression of reproductive potential
- Multi-indicator harvest control rule
  - FGC directed integration process
  - Management strategy evaluation
- Egg production
  - Combines density and size frequency in a single indicator
  - More data-rich expression of reproductive potential



# Density Indicates Stock Decline

## Density

Year	Fort Ross	Timber Cove	Ocean Cove	Salt Point	Sea Ranch	Point Arena	Van Damme	Russian Gulch	Caspar Cove	Todds Point
1999	0.22						0.38			
2000				0.32						
2003						0.45	0.75			
2005				0.41					0.43	
2006	0.41	0.46								0.31
2007			0.59			0.47	0.39			
2008				0.29					0.30	
2009	0.23	0.32								0.40
2010			0.46			0.63	0.54			
2011									0.29	
2012	0.18	0.27	0.21	0.23	0.27					
2013							0.32		0.29	0.39
2014						0.51		0.46		
2015	0.33	0.25								
2016			0.28	0.23			0.22			
2017	0.17	0.07	0.10	0.04	0.17	0.17	0.14	0.04	0.03	0.11
2018	0.06	0.09	0.08				0.08	0.04	0.01	0.06
2022	0.001			0.003			0.026	0.020	0.007	0.003

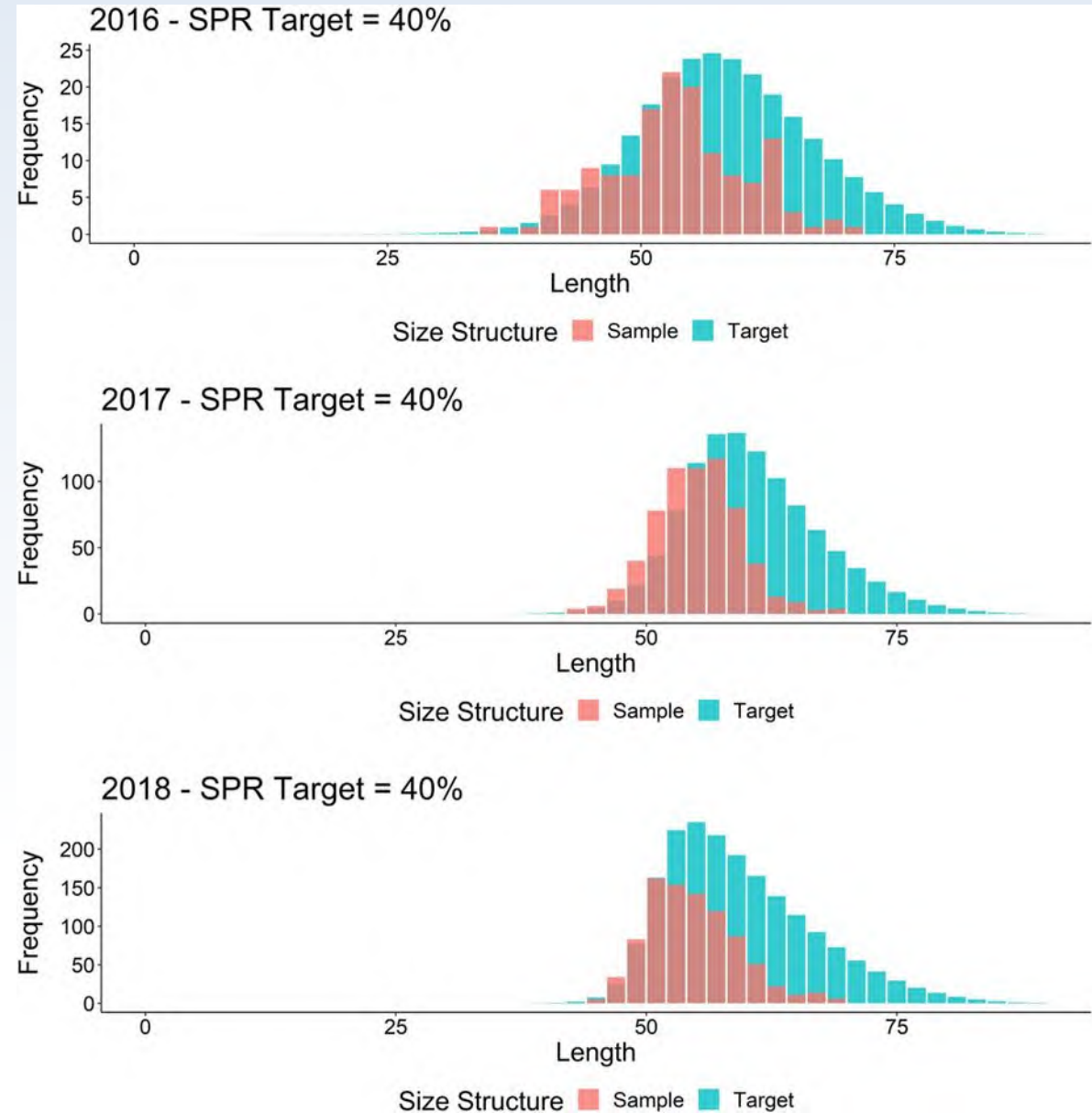
## SPR

Fort Ross	Timber Cove	Ocean Cove	Salt Point	Sea Ranch	Point Arena	Van Damme	Russian Gulch	Caspar Cove	Todds Point
0.56						0.51			
0.61			0.52						
					0.64	0.58			
0.75									
			0.55					0.56	
0.54	0.67								0.52
		0.59			0.60	0.52			
			0.50					0.73	
0.57	0.67								0.58
		0.61			0.58	0.57			
								0.57	
0.70	0.68	0.56	0.66	0.72					
						0.58		0.75	0.75
					0.67		0.62		
0.74	0.57								
		0.91	0.72			0.57			
0.58	0.66	0.58	0.68	0.65	0.72	0.51	0.59	0.69	0.67
0.54	0.66	0.43				0.48	0.42	0.50	0.68



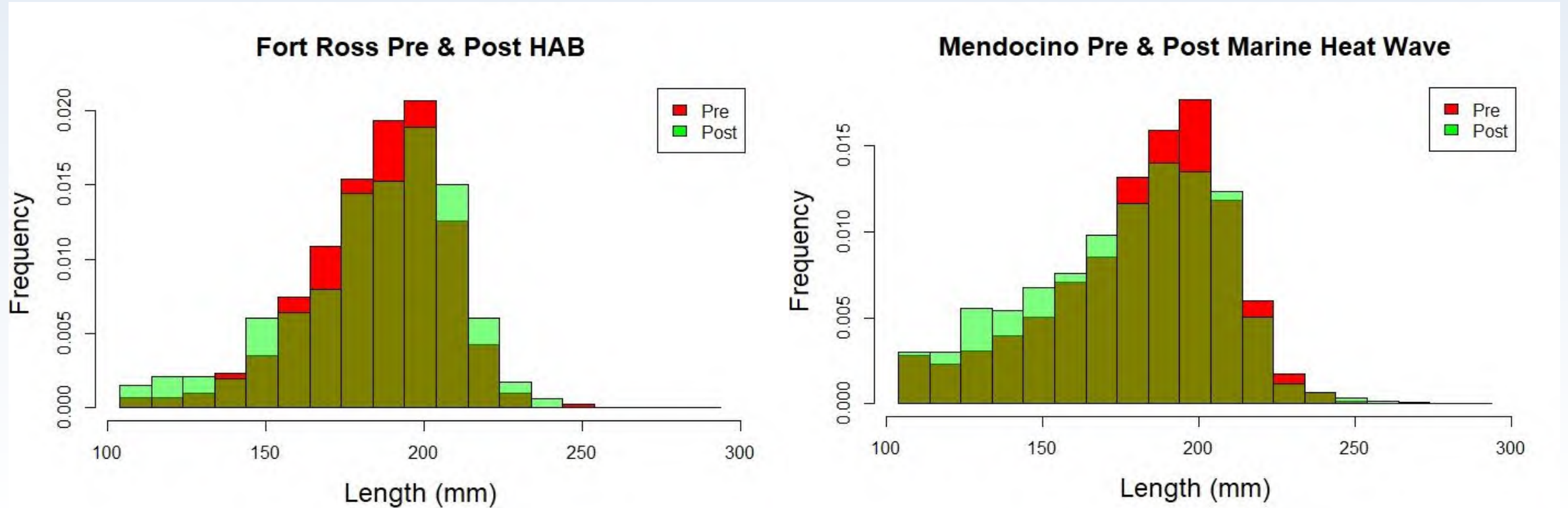
# Spawning Potential Ratio

- The proportion of the unfished reproductive potential left at any given level of fishing pressure
- Use same software and parameters used by Harford
- Use legal abalone survey sizes  $\geq 178\text{mm}$
- SPR limit = 0.5



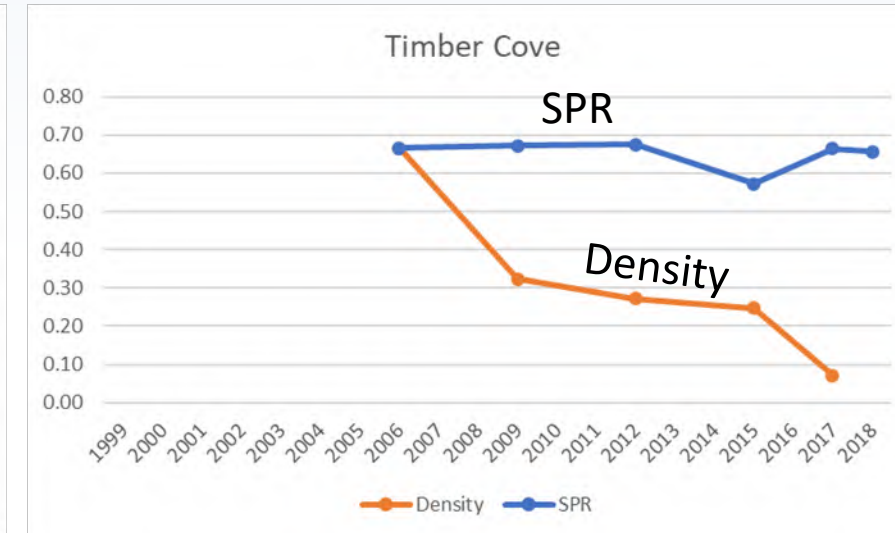
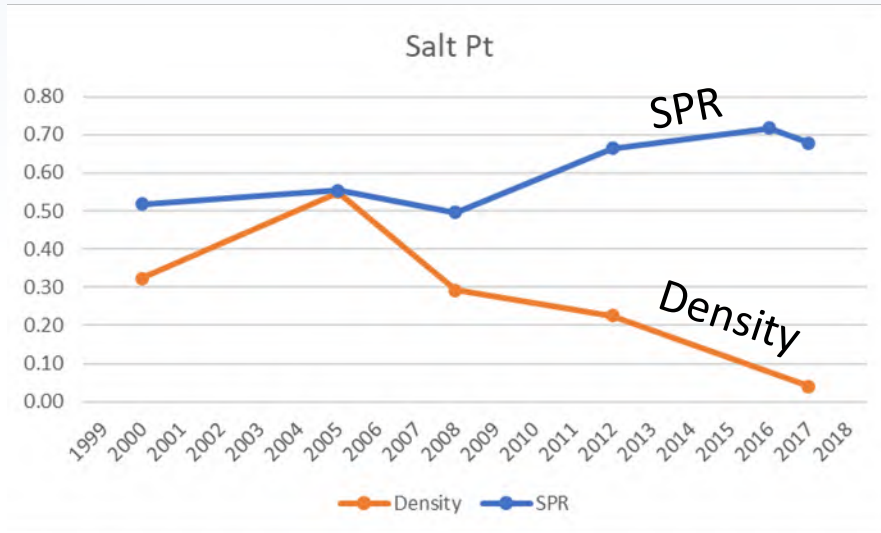
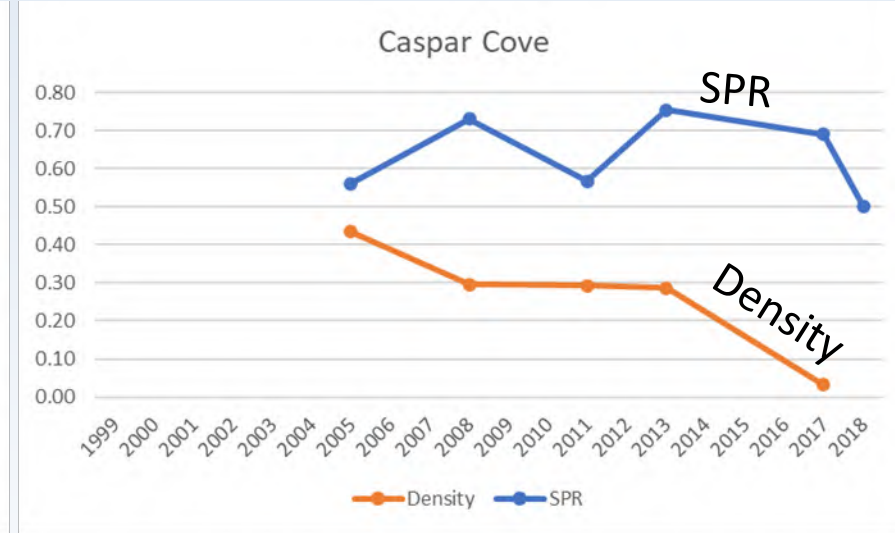
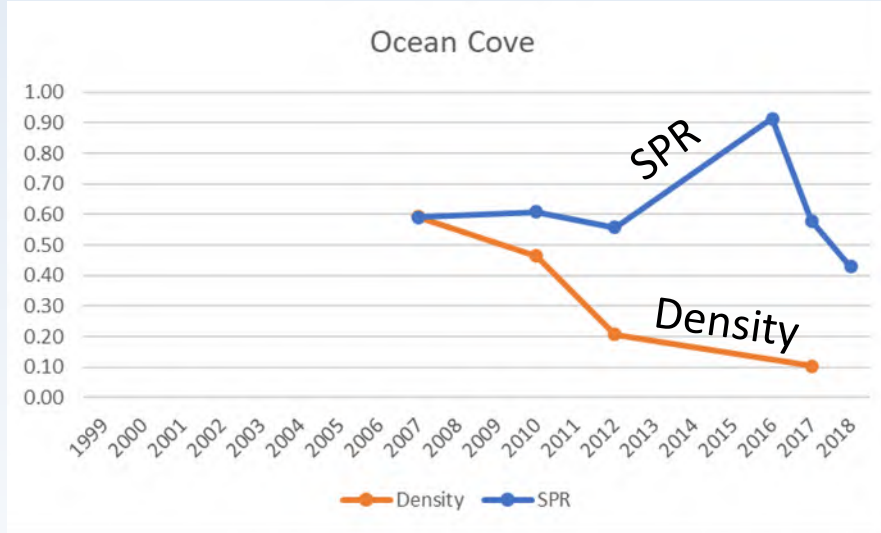


# SPR not affected by environmental impacts





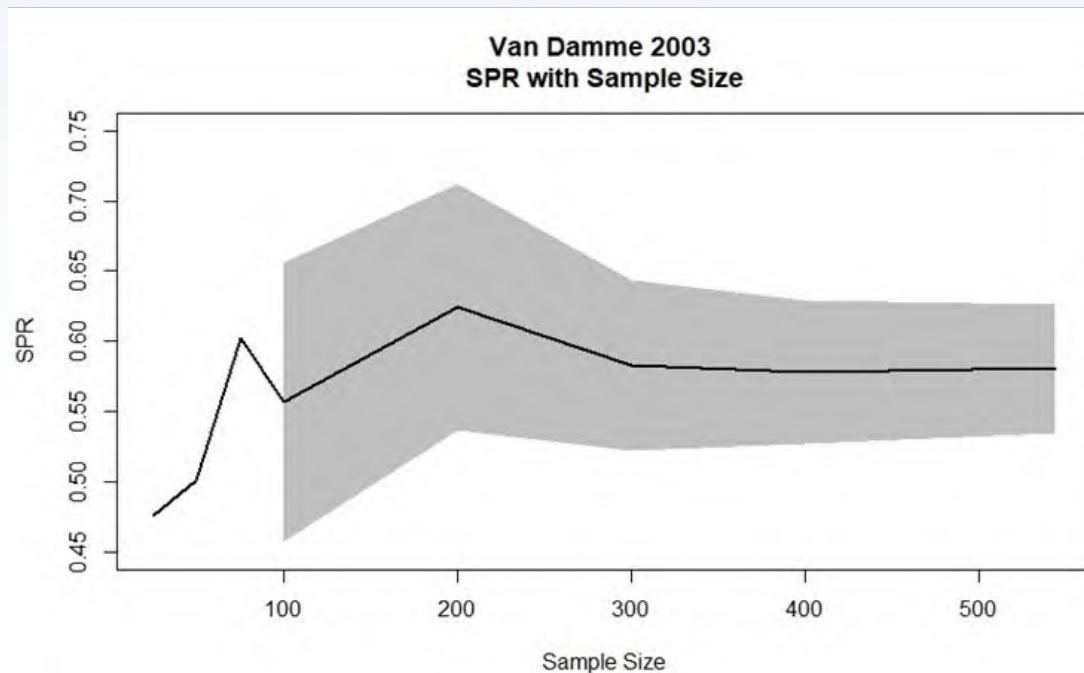
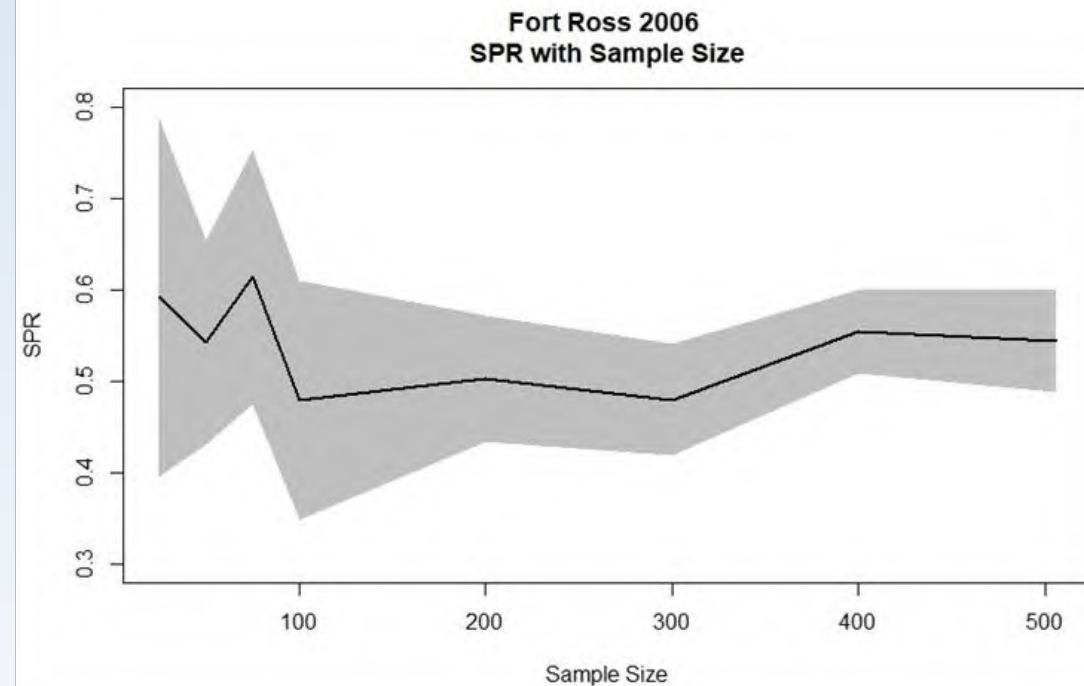
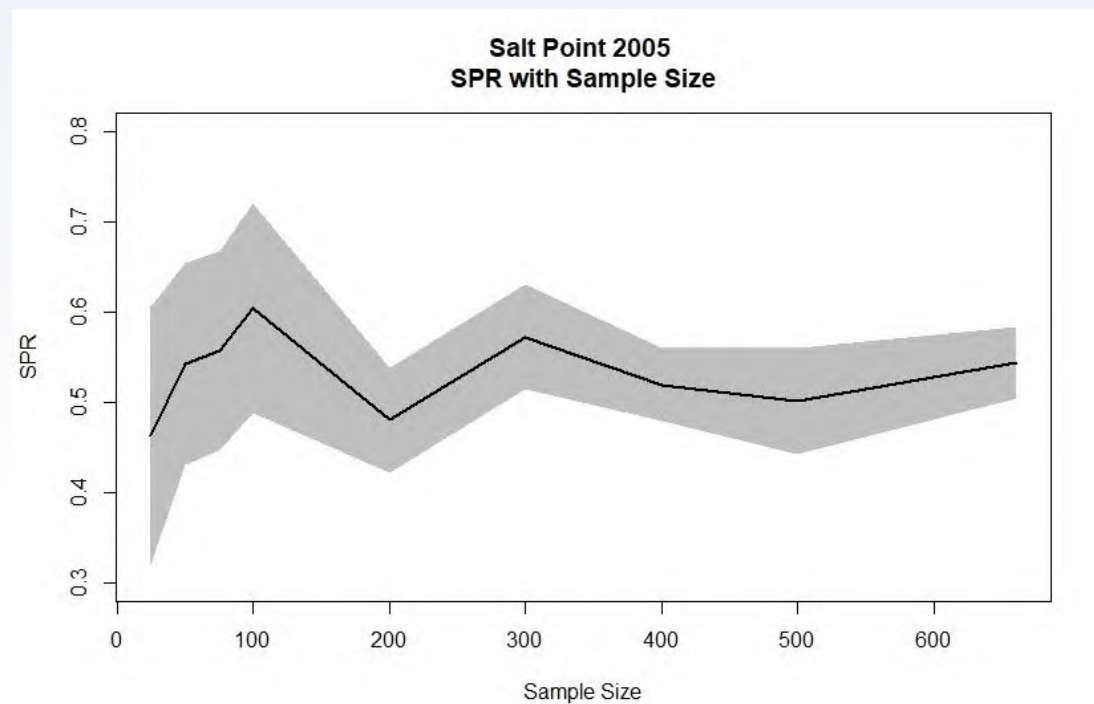
# Density declines not observed in SPR







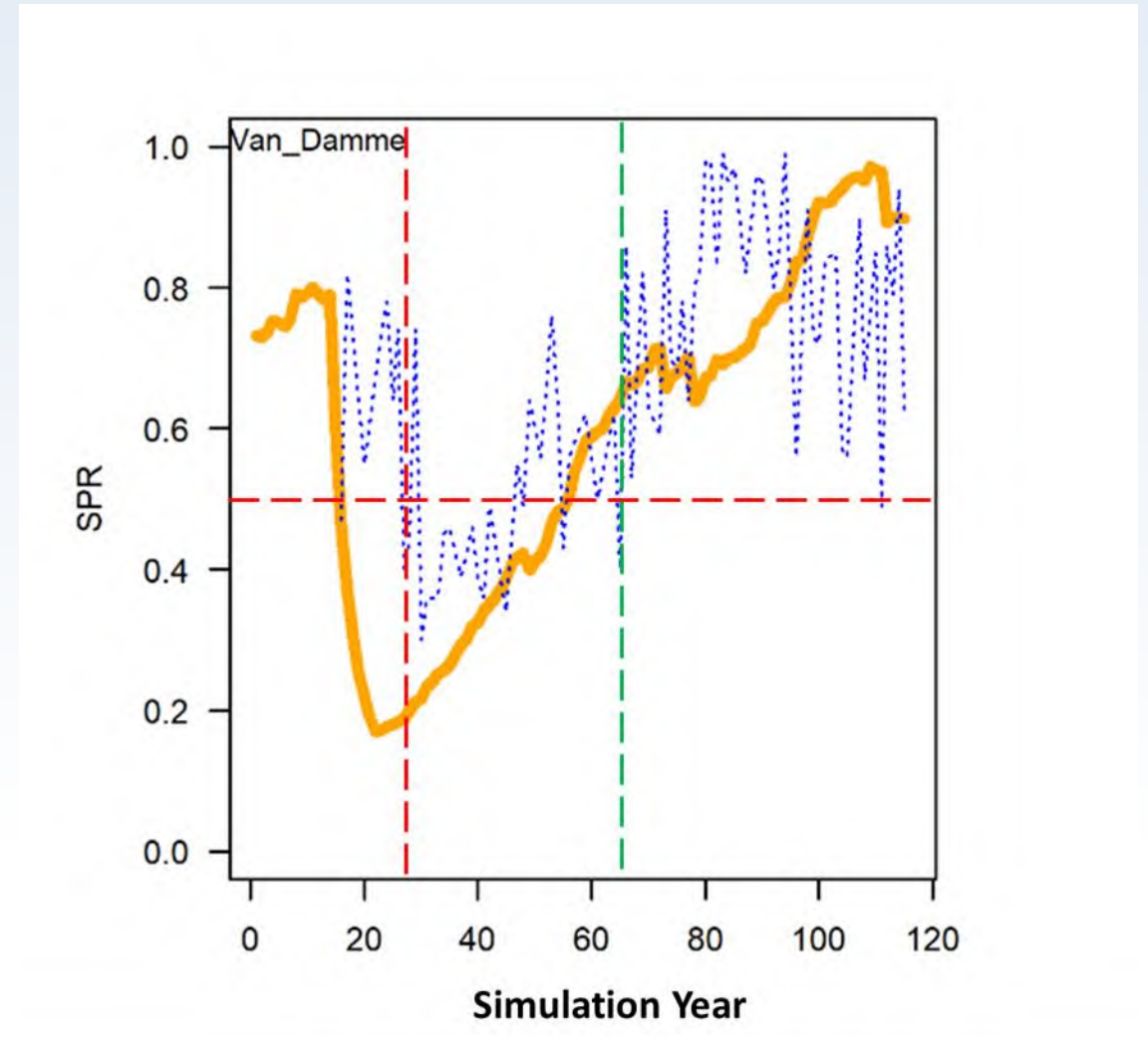
3-400 length samples  
required





# SPR remains low as sites recover

Percent Inflation of Small Sizes	SPR
0	0.58
10	0.57
20	0.562
30	0.555
40	0.547





# Indicator Comparison

## Density

- Indicates **abundance**
- Responds to fishing
- Responds to environmental impacts
- Subject to interannual variation
- **Little delay** between impact and indicator response
- **Higher** field work requirements

## SPR

- Indicates **size structure**
- Responds to fishing
- **No** response to environmental impacts
- Subject to interannual variation
- **Longer delay** between impact and indicator response
- **Lower** field work requirements



# Indicator Comparison

## Density & SPR

- Responds to fishing
- Responds to environmental impacts
- Delay between recovery and fishery opening
- Connection to TAC unclear

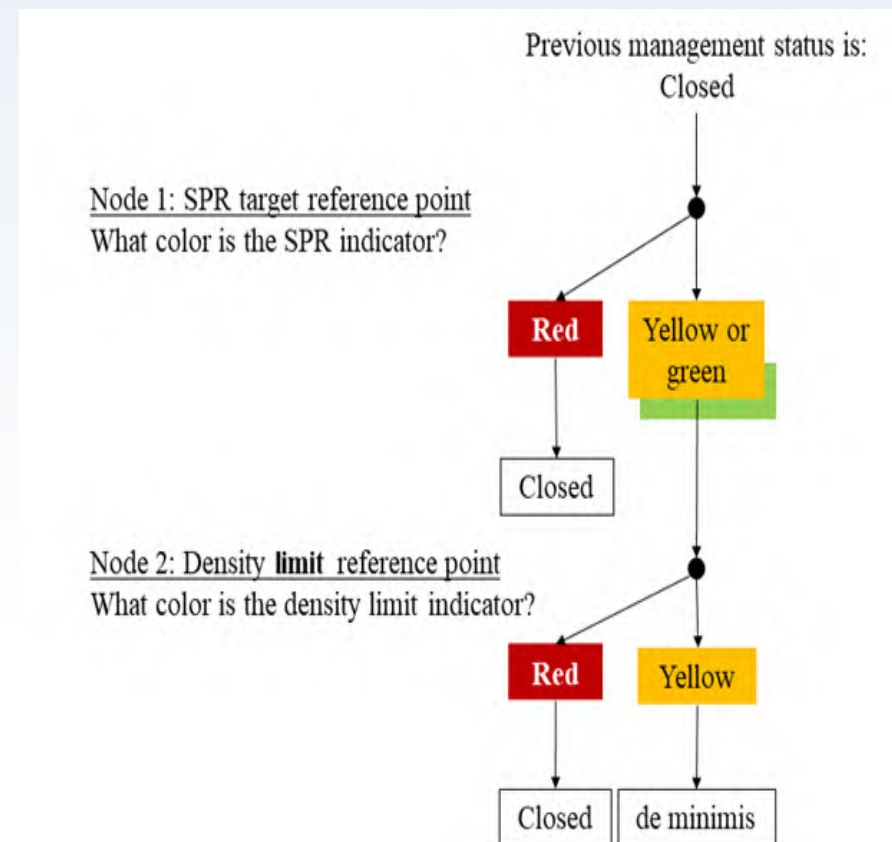
## Egg Production

- Responds to fishing
- Responds to environmental impacts
- **Minimal** delay between recovery and fishery opening
- Connection to TAC **clear**



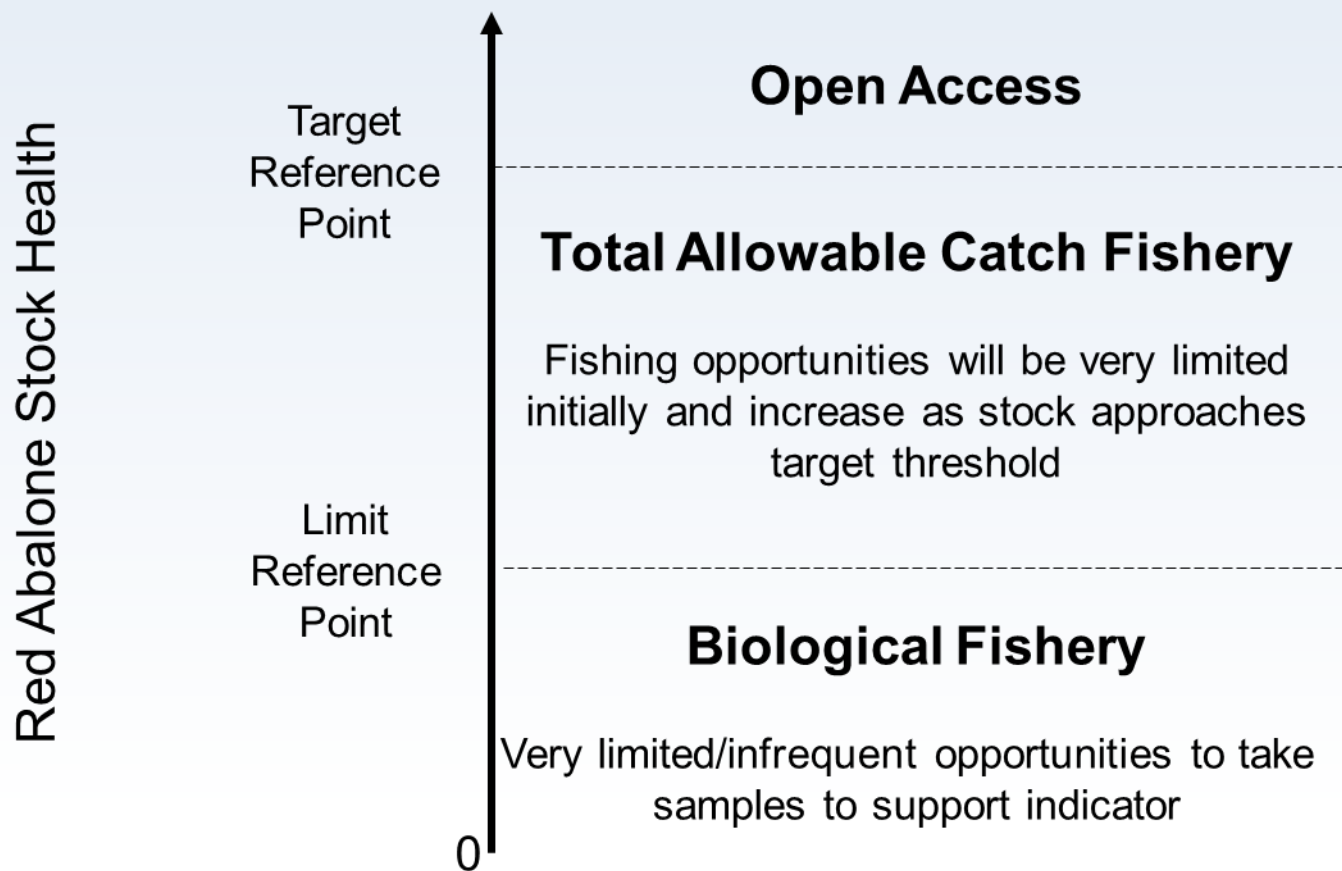
# Potential Pathway Forward with HCR

- Discussed potential modifications to framework developed through Integration process
  - Order of operations
  - "Turn off" SPR when density is high
- Still need to explore TAC





# Potential Fishing Opportunities





# Biological Fishery

- Lethal take historically used to inform abalone productivity indicators (gonad indices)
- Non-lethal methods now available to gather same productivity information
- Staff unable to quantify a level of take that would not have adverse impacts on stock



# Next Steps

- Harvest Control Rule
  - Integration Process, CDFW preferred, other?
  - Additional time to explore whether concerns can be addressed through modifications to framework identified in Integration Process
- Further develop biological/de minimis fishery concepts
- 2023 surveys – complete remaining sites



# Thank You



To: California Fish and Game Commission, Marine Resources Committee  
From: Ann Vileisis  
Date: Nov. 4, 2020

Dear Commissioners Sklar and Murray:

I am writing regarding Item #4 on your Nov. 17<sup>th</sup> meeting agenda, the Red Abalone Fisheries Management Plan (FMP). As a historian and the author of *Abalone, the remarkable history and uncertain future of California's iconic shellfish*, I have had the opportunity to study abalone in depth. I have also had the chance to talk to many Californians about abalone and to hear from many citizens—not only fishers—about their hope that these cherished shellfish will persist into the future. It is from this perspective that I urge you to consider a change of course for red abalone management.

The initial impetus for the Red Abalone FMP came about a decade ago when fishers were concerned that CDFW's management approach for red abalone was too precautionary. Because lack of sufficient data to inform fisheries management is one reason that fishery agencies take a precautionary approach, the fishers believed that with more abundance and length data from more locations—provided by users—the agency could rely on proposed modeling to more comfortably add fishing opportunity. In addition, some fishers were philosophically opposed to the idea of having an abalone plan that focused on “recovery” instead of on fishing opportunity since at that time red abalone on the North Coast provided for a fishery.

Since that time, with the “perfect storm” of marine heatwaves, sea star wasting disease, and exploding urchin numbers, the North Coast's once rich kelp forest ecosystems has fundamentally collapsed. Abalone populations, with no kelp to eat, have been decimated through starvation, and the once rich reefs have been overtaken by urchin barrens. The most recent, summer 2022 CDFW surveys of index sites in Mendocino and Sonoma counties indicate the lowest abundance and densities of red abalone ever recorded.

However, the project to develop an FMP has continued onward—with the ultimate irony that so much effort and resources continue to go toward a Harvest Control Rule—even as red abalone are faced with perilous conditions and everyone knows there will be no possibility for a recreational fishery for the foreseeable future. Although the benefit of completing the rulemaking on an FMP would be that there would be a fully-vetted and agreed-upon approach should the opportunity for a recreational red abalone fishery ever arise again, because conditions are continually evolving—and because there have already been several attempts to resolve disagreements related to the Harvest Control Rule—with several separate and costly public processes—and there is still no resolution, the Department is now in the position of having to complete what appears to be a zombie errand.

The perilous current condition of red abalone and the principles of adaptive management strongly point to the need for a new approach.

I urge the Commission to direct the Department to focus resources toward the more urgent project of red abalone conservation and recovery rather than toward completing the rulemaking on a Harvest Control Rule, at this time.

Red Abalone recovery efforts should identify the current key threats and limiting factors, which have changed markedly since the time of the Abalone Recovery and Management Plan (ARMP), and focus on new strategies that could address these threats.

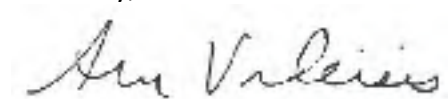
On the North Coast, red abalone that remain have moved into shallow areas, making the animals vulnerable to poaching, and with the lack of abundant kelp, there has also been a lack of robust reproduction –putting the long term persistence of existing populations at risk. Recent urchin removal projects have shown this approach might help to create and protect some small oases of biodiversity –including bull kelp, red abalone (as well as flat abalone, perhaps), sea stars, and other marine life that has also been imperiled by the collapse of bull kelp. Such pockets of life may be essential to recovery if and when conditions allow the bull kelp to return to larger areas.

The Commission has a responsibility to recover the red abalone, and even if there is not a fishery at this time, this important animal to California's culture and ecology needs greater attention and resources if it's to recover and survive into the future.

I urge you to you to direct resources toward the project of red abalone recovery at this time.

Thank you for considering my comments and for your public service.

Sincerely,

A handwritten signature in dark ink, appearing to read "Ann Vileisis". The signature is fluid and cursive, with the first name "Ann" and last name "Vileisis" clearly distinguishable.

Ann Vileisis  
[www.annvileisis.com](http://www.annvileisis.com)

## Chapter 6 – Ecosystem-based objectives

The MLMA seeks to preserve the health of fish stocks and the ecosystems that support them (§7050). When the law was passed, the concept of EBFM was relatively new, but has since become a common foundation of fisheries law and policy at the state, national, and international level. This chapter focuses on three specific objectives described in the MLMA: 1) limiting bycatch to acceptable types and amounts (§7056(d)); 2) maintaining habitat health (§7056(b)); and 3) conserving ecosystem health and diversity (§7050(b)(1)).

### *Limiting bycatch to acceptable types and amounts*

*NOTE: This section draws largely from the work of the **Bycatch Working Group (BWG)**, a group of stakeholders convened by the Commission in 2015. The BWG was created to help inform the MRC and Commission’s review of bycatch management, specifically through the Department’s effort to amend the Master Plan. The Department used as much of the consensus language from the review as possible in the development of the section on bycatch below.*

#### *Definition of bycatch*

During most fishing activity, fishing gear may catch other fish and marine species in addition to the species that is being targeted. For example, commercial and recreational fishermen using **hook-and-line** often cannot tell which species of fish they will catch. There are many terms used to describe this: bycatch, **discards**, non-target, **incidental catch**, and so forth. Sometimes these terms are used interchangeably, but their implications differ subtly.

The Department has historically considered the species or species complex managed by an FMP to be the target of that fishery. The definition of bycatch includes target species that are discarded because they are of undesirable size, sex, or quality, or prohibited due to size, season, catch limit, or sex restrictions, as well as non-target species that are either undesirable or required by law to be discarded (§90.5 and §91). The MLMA mandates that unacceptable amounts or types of bycatch be addressed through conservation and management measures.

This section of the Master Plan focuses on what may constitute unacceptable bycatch and how this bycatch may be addressed. To assist this discussion, the following are definitions of categories of catch and the standards to which they should be managed.

- A target species is defined as any species that is a primary target of the fishery and the principal focus of management efforts. Identification of target species is discussed in Step 2 below. These species are managed to the sustainability standard of the MLMA (see Chapter 5).
- Incidental catch is defined as fish caught incidentally during the pursuit of the primary target species, but legal and desirable to be sold or kept for consumption. Some may define these species as secondary targets or retained bycatch. For purposes of FMP development these species should be accounted for and must be managed either as target species under the sustainability standards outlined in Chapter 5, or as bycatch under the bycatch standard described below. In making this determination, the Department will consult with stakeholders and may consider the criteria associated with identifying emerging fisheries as discussed in detail in Chapter 9. The Department should articulate the basis for its determinations in the relevant FMPs. Identification of incidental species is discussed in Step 2 below.
- Bycatch, as defined by the MLMA, means “fish or other marine life that are taken in a fishery but are not the target of the fishery. Bycatch includes discards” (§90.5). The MLMA provides additional clarification that discard means fish that are taken in a fishery but not retained because

they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained (§91). This includes the following:

- Discretionary discards:
  - Fish that are legal but undesirable or unmarketable due to species, size, quality, condition, etc.
  - Legal fish that are less desirable than other fish by species or size (high grading), particularly when total take is limited in number or weight by species, species complex, or not retained due to limited storage capacity.
- **Regulatory discards:**
  - Fish that are required by law not to be retained.

As noted in Step 3 below, discarded catch may be returned to the sea alive, dead, or dying, and it is important to assess the mortality rate to evaluate impacts. While all discards are defined as bycatch (§90.5), the discard of live catch may not pose a risk to a bycatch species, and discarding can be an effective management strategy to protect some individuals (e.g., juveniles, sex-specific) in which survival is expected to be high.

#### *Assessing and addressing bycatch impacts*

To achieve the goal of minimizing unacceptable bycatch, the MLMA requires that the Department manage every sport and commercial marine fishery in a way that limits bycatch to acceptable types and amounts (§7056(d)).

Consistent with this objective, each FMP must include all the following:

- Information on the amount and type of bycatch (§7085(a)).
- An analysis of the amount and type of bycatch based on the following criteria (§7085(b)):
  - Legality of the bycatch under any relevant law;
  - Degree of threat to the sustainability of the bycatch species;
  - Impacts on fisheries that target the bycatch species; and
  - Ecosystem impacts.
- In the case of unacceptable amounts or types of bycatch, FMPs must include conservation and management measures with the first priority to minimize bycatch and the second priority to minimize mortality of discards that cannot be avoided (§7085(c)).

Section 7085 can be used as the basis for a four-step process to identify bycatch and consider its impacts, as follows:

#### Step 1. Collection of information on the amount and type of catch.

To determine how to minimize unacceptable bycatch, managers should first gather information on all the species caught in a fishery. Some fisheries require state or federal observers or **Electronic Monitoring (EM)** to record catch data, and some recreational fisheries participate in state observer programs. However, most recreational fisheries and many commercial fisheries operate without such monitoring. If observer data are not available, dockside sampling, **logbooks** and **landing receipts**, Federal Stock Assessment and Fishery Evaluation reports, recreational report cards, creel surveys, directed fishing surveys, or communications with participants can be used to identify the full suite of species caught and the amounts of bycatch.

If information is unavailable or insufficient to understand what is caught in a fishery, the Department can prioritize the collection of these data and clearly state this as a research need in ESRs and FMPs.

### Step 2. Distinguishing target, incidental, and bycatch species.

Once information about the type and amount of catch is identified, it is necessary to determine which species are the target of the fishery, which are incidental catch species, and which are bycatch species. In some situations, target or incidental catch species of the wrong size, sex, or condition may be discarded and become bycatch per the MLMA's definition. Differentiating target species from incidental catch and bycatch species is not always obvious (e.g., recreational "catch and release" species). Targets can change over time and vary among participants. Nevertheless, the development of FMPs present opportunities to engage with stakeholders and consider criteria for categorizing catch.

These criteria may include the following:

- The intended target(s) of participants as evidenced by landings data.
- The marketability of landed commercial species or the desirability of recreational species.
- Historical use patterns of the fishery.
- Whether the species is being managed as a target species under another FMP, or under other state or federal law or regulation.

While the MLMA creates a distinction between target species and bycatch, impacts to any species caught must be understood and addressed appropriately regardless of the categorization. In the case of target species, impacts need to be managed so that sustainability is maintained. In the case of bycatch, impacts need to be managed so that they are acceptable as discussed below. Incidental catch species need to be managed to either target or bycatch standards according to the needs of the fishery as determined by the Department. While the statutory language surrounding these two standards is different, their goals are similar and as a practical matter, achieving them may often involve the same strategies and management measures.

### Step 3. Determining "acceptable" types and amounts of bycatch (§7085(b)).

The MLMA assesses the acceptability of the amount and type of bycatch using four criteria: 1) legality of the take of bycatch species; 2) degree of threat to the sustainability of the bycatch species; 3) impacts on fisheries that target the bycatch species; and 4) ecosystem impacts (§7085(b)). These criteria have not been further defined in regulation, and it may not be possible to identify a uniform definition of "acceptable" that is appropriate across California's diverse suite of fisheries. However, structured, MLMA-specific inquiries may provide a practical means of conducting fishery-specific analysis of impacts and identifying means for minimizing unacceptable types of bycatch.

If after considering all four criteria the Department determines the amount and type of bycatch to be unacceptable, then further management action is required. The questions provided below for each of the four criteria (§7085(b)(1-4)) can be used to consistently assess what is "acceptable" bycatch within a particular fishery. Responses to these questions are not proposed to be used in a formulaic or prescriptive way, but rather are intended to provide a structured basis for managers to consider the issue and articulate the findings.

#### *(1) Legality of take of bycatch species*

This criterion includes any species that might be illegal to take or retain under any relevant state, federal, or international law.

*Inquiries:*

1. Is the species covered under the **Endangered Species Act (ESA)**, **Marine Mammal Protection Act (MMPA)**, **Migratory Bird Treaty Act (MBTA)**, **Billfish Conservation Act (BCA)**, **Magnuson-Stevens Fishery Conservation and Management Act (MSA)**, Fish and Game Code, Title 14 of the California Code of Regulations, Title 50 of the Code of Federal Regulations, or another FMP?
2. Are there prohibitions against the take of the bycatch species using a specific gear type employed in prosecuting the fishery?
3. Is the species a target species that requires discard of individuals based on size limits, seasons, or gear type restrictions?
4. Is the discard mortality rate known?
5. Are special permits required to retain or interact with the species (such as incidental take permits), does the fishery currently have such permits, and do the levels of bycatch comply with them?
6. Does the species have an incidental catch allowance, ACL, or other restrictions on the amount, size, or sex of catch allowed, and does the catch comply with them?

*Recommended actions:*

1. If legality is not assessed, this should be conducted.
2. If legality has been assessed and the take is found to be illegal, it may be considered unacceptable and Department action or consultation with responsible state or federal agencies may be necessary.
3. If legally-sanctioned rates of mortality exist, the Department should evaluate if the rate of injury and mortality is being exceeded, potentially through consultations with other responsible state and federal agencies.
  - a. If the rate is within legally-sanctioned injury or mortality rates, then bycatch is likely acceptable in relation to this criterion.
  - b. If the rate exceeds legally-sanctioned injury or mortality rates, the bycatch may be unacceptable and management action may be necessary.

*(2) Degree of threat to the sustainability of the bycatch species*

This criterion considers the impact of the relative level of bycatch within the fishery on the biological health of a particular bycatch species for which the bycatch is considered to be significant: that is, if the type or amount of bycatch compromises the ability of the population of the bycatch species to maintain a sustainable level. If the particular bycatch species is the target of another managed fishery, it may be possible to refer to a state or federal stock assessment or management plan to understand how the current level of additional catch is likely to impact that species. If there is little information about the status of the stock, the Department should identify a pathway and timeline for determining the fishery's impacts. An initial step could be to conduct a PSA, which may provide insight on the degree of threat to the sustainability of the bycatch species. Understanding the impacts to species that are identified as relatively vulnerable through a PSA could be identified as a research need. A level of take that compromises the sustainability of the population would be unacceptable under the standards of the MLMA.

*Inquiries:*

1. Has a peer-reviewed risk assessment of the vulnerability of the particular bycatch species to overfishing been conducted (e.g., PSA)?

2. Does a population status estimate or stock assessment exist for this species, and is there confidence in the underlying data such that a reasonable determination can be made if the stock is considered healthy, overfished, or depleted?
3. Are there any existing state and/or federal management measures, and are they effective in ensuring sustainability?
4. Is the bycatch the product of recreational catch-and-release practices?
5. What is the estimated discard mortality rate given the characteristics of the fishery and gear type?
6. Do any post-release studies exist to verify the estimated mortality rate?
7. What is the probability of mortality exceeding levels that have been scientifically determined to be necessary for the continued viability of the species?

*Recommended actions:*

1. If the level of risk to a state-managed species for which bycatch is significant has not been assessed, the Department should identify this as a research need in the ESR or FMP of the target species.
2. If a risk assessment has been conducted:
  - a. If risk is low, bycatch of the species is likely acceptable for this criterion.
  - b. If risk is high, bycatch of the species may be unacceptable and the Department should consider additional management measures.

*(3) Impacts on fisheries that target the bycatch species*

This criterion considers whether the current level of bycatch within the fishery negatively impacts the management of another fishery or the fishermen that target the fishery resource. This is particularly an issue for fisheries which may only land the primary target species (e.g., Spot Prawn). Factors to consider may include increasing competition between fleets that target certain species by capturing species managed under federal rebuilding plans or by increasing mortality of juveniles targeted by another fishery.

*Inquiries:*

1. Does a directed fishery exist for the bycatch species?
2. Has the bycatch and associated discard mortality been accounted for?
3. Is bycatch affecting the directed fishery management strategy (i.e., restrictions on size, sex, or season)?
4. Are the impacts of bycatch considered and made explicit in an ESR or FMP?
5. Is the species constrained under a federal rebuilding plan and will bycatch compete with fleets that target the species?
6. Is there a management allowance for percent of catch or a prohibition on retention?
7. If there is a directed fishery for the species, have there been:
  - Reductions in opportunities or income for participants in fisheries that target the bycatch species?
  - Reductions in fishery quotas or opportunities (e.g., time and area closures) based on bycatch issues?
  - Early closures of a fishery based on higher-than-expected bycatch?
  - Changes in fishing, processing, disposal, and marketing costs due to bycatch?
  - Changes in the social or cultural value of fishing activities due to bycatch?
  - Negative socioeconomic impacts from bycatch on fisheries and/or fishing communities which target or need incidental catch of this species?



- Negative impacts to juveniles of a species targeted by another fishery?

*Recommended actions:*

1. If socioeconomic impacts of bycatch have not been considered, this should be identified as a research need and integrated into future updates of ESRs or subsequent FMPs.
2. If any impacts under Inquiry 7 above are identified, the Department should consult with fishery participants and others regarding these potential impacts. Depending on the presence and severity of impacts, the Department may find bycatch to be unacceptable, and management measures may be necessary.

*(4) Ecosystem impacts*

This criterion explores whether the current level of bycatch within the fishery impedes the ability of the bycatch species to fulfill its functional role within the ecosystem. This is difficult to assess for most species, but tools such as ERA may help provide useful guidance and qualitative information, even in data-poor circumstances.

*Inquiries:*

1. What is the ecosystem role of the bycatch species?
2. Does scientific evidence show the amount of bycatch mortality significantly increases the risk that a bycatch species will be unable to serve its ecosystem role?

*Recommended actions:*

1. If this information is not available, its collection should be identified as a research need in ESRs and FMPs. Managers should consider collaborations with external marine ecologists and other researchers to collect this information.
2. If species ecosystem function is unlikely to be impeded, then bycatch is likely acceptable under this criterion.
3. If species ecosystem function is likely to be impeded, then bycatch may be unacceptable per this criterion and management measures may be necessary.

Step 4. Addressing unacceptable bycatch (§7085(c)).

If the current type or amount of bycatch is deemed to be unacceptable based on the four criteria above, conservation and management measures are required that minimize the bycatch, and in cases where discards are unavoidable, the mortality of the discards (§7085(c)).

*Inquiries:*

1. Are measures in place to minimize the impact of the fishery on bycatch species and ensure the fishery does not overfish or hinder the recovery of bycatch species?
2. Are bycatch management measures likely to decrease unintended, non-retainable, and/or dead catch of non-target species?
3. Are bycatch management measures being implemented successfully?
4. Have bycatch management measures been shown to be effective at reducing bycatch and/or bycatch mortality in similar fisheries?
5. What is the economic impact of implementing management measures to reduce bycatch and bycatch mortality to those participating in the fishery in which the bycatch occurs?

There are a number of frequently used strategies for reducing bycatch and discard mortality. These measures and considerations associated with their use are detailed in Appendix M. They include minimum mesh size requirements, escape ports, descending devices, closed areas, depth restrictions,

acoustic pingers, **Light Emitting Device (LED)** lights, and incidental take caps to name a few. However, understanding and implementing the most effective means of reducing bycatch while maintaining economic viability typically requires input from all stakeholders and close collaboration with the fishing industry.

### ***Maintaining habitat health***

The MLMA emphasizes the importance of habitat protection as a means of preserving healthy and productive marine resources (§7056(b)). While there are factors external to fishery management that may negatively impact habitat (e.g., storms, climate change, habitat loss due to development, pollution, etc.), protecting habitat from potential fishery impacts is essential to help maintain healthy fisheries, ecosystems, and communities in California. Healthy habitats provide space for the various life history functions of species that are necessary to create sustainable marine populations, including spawning, growth, feeding, and reproduction. Marine habitats are often utilized in different ways by an array of species, so impacts from fishing activities may have cascading effects on the ability of other species of ecological or economic significance to sustain themselves. To achieve the goal of protecting habitats the MLMA requires the Department to:

- Manage every sport and commercial marine fishery with the objective that the health of the fishery habitat is maintained, restored, and where appropriate, enhanced (§7056(b)).
- Include information about the habitat and known threats to the habitat in FMPs (§7080(c)).
- Include measures in FMPs that, to the extent practicable, minimize adverse effects on habitat caused by fishing (§7084(a)).

The following describes steps for assessing and addressing impacts to habitat:

#### Step 1. Describe the habitat utilized by the target species at each life stage.

ESRs and FMPs should summarize the readily available information regarding the habitats of the target stock (§7080(c)). While ocean waters and their associated salinities, temperature, and nutrients are an important part of marine habitats, most marine habitat management focuses on **benthic** habitats, including habitat-forming plants and invertebrates. Benthic habitats are usually classified by three general types of **substrate**: hard, mixed, and soft. In addition to substrate types, habitats are frequently classified by depth, which influences the amount of light available to the species that live there. Benthic marine communities are often grouped by depth categories such as coastal, continental shelf, continental slope, and abyssal.

ESRs and FMPs should focus on habitats that are particularly sensitive. These include estuaries, sea grass beds, intertidal areas, rocky reef habitats, and kelp forests, which have been found to support a high diversity of species at critical life stages. In addition, these areas are often home to structural or biogenic organisms, which are those species that create habitats for other species. These include some plants, such as Giant Kelp and sea grass, as well as animals such as corals, gorgonians, and sponges.

Marine species may use multiple habitat types during different life stages or for different activities. It is important for managers to describe the habitats utilized for all activities that are crucial to survival and reproduction. If there are some life stages or activities where a species' habitat association is unknown, collecting this information should be identified as an area for future study. ESRs and FMPs should also identify where additional understanding of habitat characteristics, functions, and fluctuations would improve management. See Appendix N for more information on habitat types and their characteristics and sensitivities.

# Assessment of associated landed species and bycatch discards in the California halibut gill net and trawl fisheries

Christopher M. Free<sup>1,2\*</sup>

<sup>1</sup> Bren School of Environmental Science and Management, University of California, Santa Barbara, Santa Barbara, CA, 93106, USA

<sup>2</sup> Marine Science Institute, University of California, Santa Barbara, Santa Barbara, CA, 93106, USA

\* **Corresponding author:** Bren School of Environmental Science and Management, University of California, Santa Barbara, 2400 Bren Hall, Santa Barbara, CA 93106-5131; 610-999-4732; cfree14@gmail.com

## Abstract

California halibut (*Paralichthys californicus*) supports California's tenth largest commercial fishery in terms of revenues and contributes to the catch of over 400 commercial hook-and-line, gill net, and trawl fishing vessels. The relatively low selectivity of trawl and gill net gears means that they are used in multi-species fisheries where halibut is one of many species legal to be targeted and sold. In such fisheries, the definition of bycatch or incidental catch is fluid and dependent on seasons, markets, and fisher preferences. In its Enhanced Status Report for California halibut, the California Department of Fish and Wildlife identifies the characterization of bycatch in the fishery and identification of strategies for reducing bycatch as a high priority management need in this economically important fishery. This is in part due to relatively high discard mortality in trawl and gill net gears and due to a recognition of the need to describe and quantify the community of species landed with halibut. In this report, we take a California halibut-centric view of these gears and analyze only gear sets and/or trips where halibut was caught. We refer to "bycatch" as discarded catch that may either be undersized halibut or non-halibut species. We leverage observer data, logbook data, and landing receipts to assess all the types of catch associated with commercial California halibut landings from gill net and trawl gears. This information may identify opportunities for reducing discarded catch through gear modifications, depth restrictions, spatial management measures, or season adjustments. When possible, we assess three categories of catch: (1) retained (landed) catch of non-halibut species; (2) discards (live/dead) of non-halibut species; and (3) discards (live/dead) of sub-legal-sized halibut. We calculate ratios of these categories to legal-sized halibut catch and examine patterns by gear type, location, depth, and day of year to identify opportunities for maximizing halibut catch while minimizing discarded catch in the fishery.

**Keywords:** California halibut, *Paralichthys californicus*, bycatch, gill net fisheries, trawl fisheries

## Terms of Reference

### **A. Assemble datasets**

- a. California landing receipts**
- b. Publicly available groundfish multi-year mortality (GEMM) data**
- c. Confidential federal observer data from halibut trawl vessels**
- d. Confidential federal observer data from halibut gill net vessels**

Appendix A describes the assembled datasets and how they were cleaned for analysis (i.e., how they were formatted from their original forms).

The four datasets named above are described in the following sections: CDFW landing receipts (3.1.2), GEMM data (3.4.1), WCGOP (federal) trawl observer data (3.3.2), SWFSC (federal) gill net observer data (3.3.1).

In addition to the four datasets named above, we assembled and cleaned the following four datasets: CDFW permit data (3.1.1), CDFW gill net logbook data (3.2.1), CDFW trawl logbook data (3.2.2), CDFW gill net observer data (3.3.1).

### **B. Analysis of landing receipt data on incidental (landed) bycatch**

- a. Calculate ratios of incidental catch (sublegal halibut, other species, and both) to landed target catch**
  - i. For trawl gear types:**
    - 1. Exclude federal groundfish trawlers as much as possible by excluding offshore blocks in >40 fm depth and/or by vessel permit information**
    - 2. Separate analyses N and S of Point Arguello**
  - ii. For gill net gear types:**
    - 1. Separate analyses N and S of Point Arguello**
    - 2. Separate analyses for large and small mesh**
- b. Use generalized linear models to explore predictors of bycatch amount (vessel, year, season, port, number of trips, pre/post regulation changes)**

The analysis of the landings receipt data is described in Section 3.1.2. The results of this analysis are described in Sections 4.1.1 and 4.2.1.

We excluded federal trawlers using permit records and separated the trawl analysis north and south of Point Arguello. In consultation with CDFW, we focused the gillnet analysis on the southern large-mesh gillnet fishery, because targeting halibut with small-mesh is illegal and targeting halibut north of Point Arguello is rare.

We note that the bycatch of sublegal halibut catch cannot be analyzed using this dataset, because this dataset only describes legal landings.

### **C. Analysis of GEMM data**

- a. Calculate the bycatch ratios including landed and discarded using the same data separations as above**
- b. If possible, analyze data separately for discarded, retained, and combined**

The analysis of the GEMM data is described in Section 3.4.1. The results of this analysis are described in Section 4.2.3. We note the GEMM data does not include information on the gill net fishery and that it does not include the geographic information necessary to split the trawl fishery analysis into its northern and southern portions.

#### ***D. Confidential federal observer data for trawl and gill net gears***

- a. Work with CDFW to explore the data and determine appropriate analyses**

The analysis of the federal (WCGOP) observer data for trawl fisheries is described in Section 3.3.2. The results of this analysis are described in Section 4.2.3.

The analysis of the federal (SWFSC) observer data for gill net fisheries is described in Section 3.3.2. The results of this analysis are described in Section 4.1.3.

#### ***E. Make comparisons among datasets where appropriate***

Comparisons among datasets are described in Section 5.

#### ***F. Place bycatch ratios in context with other similar fisheries in the literature***

Figures 62 and 63 place the bycatch ratios described here in the context of other West Coast fisheries generally targeting a single species.

#### ***G. Produce maps of key findings***

A number of maps are used to illustrate key findings.

#### ***H. Produce draft report, solicit input from CDFW staff, and revise***

This report has undergone revisions in response to several rounds of review from CDFW.

#### ***I. Share data and code***

All of the project code is available on GitHub here: [https://github.com/cfree14/halibut\\_bycatch](https://github.com/cfree14/halibut_bycatch). The data are not included in the GitHub repository to protect the confidentiality of the analyzed datasets. All data will be shared securely with CDFW upon request.

# 1. Introduction

The purpose of this report is to evaluate the magnitude and composition of catch in two gear types (trawl and gill net) associated with permits to target California halibut (*Paralichthys californicus*) in California. Halibut is among many targets and/or marketable species selected by these gears. Therefore, the catch may include legal-sized halibut, sublegal halibut, and other species both retained and discarded. The term “bycatch” is often used to mean unwanted or wasted catch. While much of the catch associated with halibut does not meet this definition, some does, and we will use the term “bycatch” to refer to discarded catch of both sublegal halibut and other species. Additionally, while most of the other species landed in association with halibut are subject to single-species state or federal management plans, we recognize a need to better understand the community of species caught by these gears. The California Department of Fish and Wildlife (CDFW) intends to use the analyses presented here to assess whether there is a need for changes in selectivity of these gears in collaboration with stakeholders and recommend potential regulatory changes as a part of its California halibut management review.

Reducing the bycatch of non-target species is a global fisheries and conservation challenge. The bycatch of protected species such as seabirds, sea turtles, and marine mammals represents a threat to these vulnerable species and in some places, risks fishery closures if not successfully prevented. The catch of “weak stocks”, fish and invertebrate stocks that are either less productive or more exploited than other targets in a multi-species fishery, can also risk overexploitation and fishery closures. Furthermore, the bycatch, and subsequent discarding and mortality, of sublegal individuals of the target species can reduce the productivity of the target species and the long-term profitability of its fishery. In general, handling bycatch can reduce the economic efficiency of fishing operations or disqualify fishing operations from environmental certifications (e.g., Marine Stewardship Council certification) that can add value. Thus, reducing bycatch in fisheries is central to both the conservation of marine life and the maintenance of economically efficient, predictable, and profitable fisheries globally.

There are several pathways for reducing bycatch in fisheries. First, physical modifications to gear or behavioral changes in gear deployment can alter gear selectivity and reduce bycatch without significant losses in target species catch. For example, the introduction of Turtle Excluder Devices (TEDs), a grid of bars placed at the mouth of trawl nets that allow the catch of target fish or invertebrates but eject the catch of larger turtles and sharks, has reduced leatherback sea turtle mortality by 97% in U.S. trawl fisheries (Finkbeiner et al., 2011). Second, bycatch can be reduced by only allowing fishing with certain locations, depth ranges, times of day, or times of year. These static management strategies, which are not varied in response to real-time information, depend on the identification of predictable relationships in the co-occurrence of target and bycatch species (Jannot and Holland, 2013). For example, (Melvin et al., 1999) found that bycatch of seabirds in the salmon drift gill net fishery was highest at dusk and dawn, and that time-of-day restrictions could contribute to a 70-75% reduction in seabird bycatch without significant losses in salmon catches. Third, bycatch can be reduced through dynamic management strategies that alter the location, timing, or method of fishing based on near-real time information on likely bycatch and target species co-occurrence (Dunn et al.,

2016). This can be achieved through real-time information sharing among fishers that allows for fishers to “move-on” from bycatch hotspots (Little et al., 2015) or through dynamic closures identified based on oceanographic conditions (Howell et al., 2008) or modeled predictions of bycatch risk (Hazen et al., 2018).

Identifying which methods or combinations of methods are likely to reduce bycatch without onerous impacts on fisher livelihoods depends on good data for informing a detailed understanding of bycatch dynamics (Lewison et al., 2015, 2011). CDFW has access to several data sources of varying completeness and relevance. Data from fisheries observers, professionally trained biological technicians placed on commercial fishing vessels to independently monitor catch and discards at sea, are the gold standard for developing such an understanding. These data are independently collected, cover both retained and discarded catch, and include detailed information on fishing gear, effort, location, and oceanography. These data can be used to explore how bycatch ratios, the ratio of bycatch to target catch (which can be calculated in terms of weight, count, or a mixture depending on how the data are collected), vary by gear type, depth, location, time of day or year, or environmental conditions, and can be used to direct fishing effort towards times or locations with favorable bycatch ratios (e.g., (Jannot and Holland, 2013)). However, observer programs are expensive and therefore have not been available continuously for California trawl and gill net fleets. Fisheries logbooks provide self-reported information on the identity, amount, and location of landed catch and fishing effort. Finally, landing receipts (a.k.a., “fish tickets”), provide an accurate account of retained catch, but can be difficult to interpret because loads may be split across multiple buyers. While logs and receipts may not document discarded bycatch, they provide information on the community of catch in multi-species fisheries and can be used for scaling bycatch observations representing a subsample of fishing effort to overall fishing effort through statistical models (e.g., (Somers et al., 2021)).

In 2018, the California Department of Fish and Wildlife (CDFW) rewrote its “Master Plan for Fisheries” (CDFW, 2018) and identified the California halibut fishery as a high priority for management attention given its economic importance, potential risks to discarded bycatch species (including sub-legal-sized halibut), and vulnerability to climate change. Since 2010, California halibut have supported the tenth largest commercial fishery in the state in terms of revenues (Free et al., 2022) and in 2019, contributed to the catch of 377 hook-and-line, 29 gill net, and 27 trawl commercial fishing vessels (CDFW, 2022). Furthermore, since 2010, California halibut have supported the sixth largest recreational fishery in the state in terms of landed weight (Free et al., 2022) and recreational landings often outweigh commercial landings of halibut (CDFW, 2022). In general, the relatively low selectivity and high discard mortality of trawl and gill net gear types make the halibut trawl and gill net sectors vulnerable to bycatch of non-halibut species (Somers et al., 2021). Furthermore, due to the cross-fishery minimum size limit (22 inches), there is bycatch of sub-legal-size halibut. In its “Enhanced Status Report” for California halibut (CDFW, 2022), CDFW identifies the characterization of bycatch in the fishery and identification of strategies for reducing bycatch as a high priority management need for this high priority fishery.

In this study, we leverage California’s rich history of fishery monitoring data to assess catch associated with California halibut in the trawl and gill net fisheries with the intention of

informing managers and stakeholders of opportunities to reduce unwanted or harmful bycatch through management measures such as gear modifications, depth restrictions, spatial management measures, and/or season adjustments. We assess three categories of catch: (1) retained catch of non-halibut species; (2) discards (live/dead) of non-halibut species; and (3) discards (live/dead) of sub-legal-sized halibut. We calculate ratios of each category to legal-sized halibut catch, and examine patterns by location, depth, and day of year to identify opportunities for maximizing halibut catch while minimizing bycatch in the fishery.

## 2. The California halibut fishery

The commercial California halibut fishery has been operating since CDFW's inception in 1870 but landings from the fishery were not monitored until 1916. Landings peaked in 1919 at 4.7 million pounds and have generally declined since, with smaller builds and peaks in landings in the mid-1940s (2.5 million pounds) and mid-1960s (1.3 million pounds) (**Figure 1**). Landings stabilized around 1.0 million pounds annually from 1980-2005 then declined and stabilized around 0.5 million pounds annually from 2006-2020 (**Figure 1**). The location of landings has varied through time as a result of both environmental variability and changes in management regulations that have affected where the fishery can operate and with what gear. Catches from the recreational sector are substantial and have outweighed commercial landings in some years. They occur primarily from Commercial Passenger Fishing Vessels (CPFVs) and private hook-and-line vessels though a small amount of recreational catch comes from shore-based fishing and spearfishing.

The directed commercial California halibut fishery is divided into three sub-fisheries: (1) the limited-entry state gill net fishery; (2) the limited-entry state trawl fishery; and (3) the open-access state hook-and-line fishery (**Figure 2**). A limited amount of incidental catch may also be landed in the federal groundfish trawl fishery. The gill net fishery dominated participation (number of vessels) and landings into the 1980s (**Figure 3**) but declined after the introduction of gill net permits in 1980 capped participation and the Alternative Gear Development Program (AGDP), initiated in 1985, found that trawl gear was more efficient at catching halibut while avoiding seabird and marine mammal bycatch (CDFW, 2022). In 1994, the use of gill nets was moved outside of state waters in accordance with the Marine Resources Protection Act of 1990 (FGC 8610.2-8610.3). Then, in 2000, the use of gill and trammel nets were prohibited between Point Reyes and Point Conception (central California) in waters less than 60 fathoms. The central California set gill net fishery was greatly reduced by this restriction, as waters greater than 60 fathoms are not ideal for setting gill net gear on the seafloor and halibut are generally not found in great abundance at these depths. The trawl fishery briefly overtook the gill net fishery in terms of participation and landings but was ultimately overtaken by the open-access hook-and-line fishery in the 1990s (**Figure 2&3**). Permits were introduced to the trawl fishery in 2007 and participation continued to steadily decline. A small amount of commercial California halibut catch is caught incidentally by groundfish trawlers, which may land up to 150 pounds of halibut per trip without a halibut trawl permit (CDFW, 2022).

California halibut fisheries are managed using a mixture of spatial management, gear restrictions, size limits, and other regulations (**Figures 4&5**). The limited entry gill net fishery



may only operate south of Point Arguello, Santa Barbara County and must occur outside of state waters (in general, state waters occur within 3 nautical miles of shore, though there are exceptions, e.g., around the Channel Islands and in Monterey Bay). Furthermore, California halibut cannot be targeted with small-mesh (<8.5 in) gill nets. The limited entry trawl fishery may operate outside of state waters coastwide and is also allowed to operate seasonally within specially designated California Halibut Trawl Grounds (CHTG) located inside state waters in southern California (CDFW, 2022). Both the commercial and recreational hook-and-line fisheries may operate in both state and federal waters, though both generally occur within state waters. A minimum legal size limit of 22 inches (55.9 cm) total length applies to all commercial and recreational fisheries (with a slight variance in the measurement method allowed in the commercial fishery), which contributes to large discards of sublegal fish in fisheries in both sectors. Recreational fisheries have a 3-fish bag and possession limit north of Point Sur (36.3°N) and a 5-fish bag and possession limit south of Point Sur. Gear restrictions apply in all halibut fisheries and fishing is prohibited within specially designated marine protected areas (CDFW, 2022).

### 3. Methods

We used diverse datasets (**Table 1**) to assess bycatch in California halibut fisheries and to identify opportunities for reducing bycatch through management measures such as gear modifications, depth restrictions, season adjustments, and/or spatial management. We examined patterns using four types of information – (1) landing receipts; (2) logbook data; (3) observer data; and (4) modeled estimates of bycatch – which have different advantages and disadvantages. Landing receipts cover the entire commercial fleet and provide useful context surrounding fleet dynamics; however, they have low and self-reported spatial resolution, they do not provide information about discards, and do not provide set- or tow-specific information (which means they cannot be used to calculate set-specific bycatch ratios). Logbook data provides higher spatial resolution, sometimes includes information on discards (i.e., the gill net logbooks analyzed here occasionally include discard information), and is set-specific, but accuracy varies due to self-reporting and only covers a sub-sample of the fleet and catch due to non-compliance. Observer data is independently collected, includes highly resolved information on location, effort, and discards, and is set-specific, but also only covers a sub-sample of the fleet and catch. Modeled estimates of bycatch use observer data to scale sampled information to the whole fleet. Thus, they provide useful insights into the fleetwide bycatch patterns, but do not offer insights into the set-level bycatch patterns that are required for tactical management.

#### 3.1 Permits and landings data

##### 3.1.1 CDFW permits

We received permit records from 2000 to 2021 for all vessels and permit types. These records describe the permits held by vessels, the date these permits were issued, the offices from which these permits were issued, and information on the vessel including its size (i.e., length, beam, horsepower, and tonnage) and home port. These data were used to exclude

federal trawl vessels from consideration in the analysis. Specifically, for analysis of the trawl fishery, we only considered vessels with active state halibut trawl permits on the day of fishing (**Figure 6**). We cleaned these data based on the procedures described in **Table S1**. The vessel id is the best unique identifier of vessel identity; vessel names change through time, may be shared among vessels, and/or are inconsistently transcribed when purchasing permits.

### 3.1.2 CDFW landing receipts

We received landing receipts (a.k.a., “fish tickets”) from 2000 to 2021 for all vessels and species. These records are collected and submitted by fish buyers and processors and describe who caught the landings, who purchased the landings, what species were purchased, how much fish was purchased and for what price, the date and location of the original catch, the gear used to make the original catch, and the condition and use of the purchased landings. We cleaned these data based on the procedures described in **Table S2**. Because these data only describe landed catch (i.e., they do not describe catch discarded at sea) and because they are not necessarily specific to individual gear deployments (e.g., individual gill net sets or trawl tows) or trips, they are imperfect for calculating informative catch ratios. However, they provide useful context about the commercial halibut fishery, which operates using different permits, gears, and ports. Thus, we used these data to document the fishery dynamics described in Section 2 above.

Although catches sold on the same landings receipt were not necessarily caught on the same tow, set, or trip, catches sold on the same landings receipt and procured using the same gear and in the same location present a potentially useful unit of fishing effort for assessing ratios of non-halibut landings to halibut landings. Thus, we developed a proxy for individual gear deployments that we defined based on the receipt id, date, gear type, and block id and built a unique identifier for assessing catch across these “vessel trips” (i.e., ReceiptID-YYYY-MM-DD-GearType-BlockID). We identified vessel trips in which California halibut were caught in either trawl or large-mesh set gill net (gear codes 63 and 67) gears and examined catch ratios north and south of Point Arguello (34.6°N) due to difference in management in those regions. We excluded trawl trips conducted by vessels without active state halibut trawl permits. Ratios were calculated in terms of weight (lbs).

## 3.2 Logbook data

### 3.2.1 CDFW gill net logbooks

We received logbook data from the commercial gill net fishery from 2000 to 2021 for all vessels fishing with gill nets. These data describe where (block id), when (date), and how long (hours) a vessel fished, what fish it was targeting during this effort, what permit (and thus permit type) it was operating under, what type of gear it used (drift gill net or set net) and characteristics of this gear (length, mesh size, buoy line depth), what species it caught, and the amount (number and/or weight) and fate of this catch (kept, released, or lost, including the identify of predators preying on released fish). We cleaned this data based on the procedures described in **Table S3**. We defined individual gill net sets based on the logbook id, vessel id,

date, block id, set type, target species, depth, net characteristics, and soak time. We examined gill net sets in which California halibut were named as one of the target species (i.e., targets are frequently multispecies) and were actually landed (i.e., a catch ratio cannot be calculated if no halibut were landed). We focused on the southern large-mesh ( $\geq 8.5$  in) set gill net fishery because landings are low and rare in the northern fishery and are illegal with small-mesh ( $<8.5$  in) gill nets. Although landings are reported using small-mesh gill nets, they are small and rare and may represent reporting errors. Although the gill net logbooks occasionally report discarded and lost catch, this is not required and has been relatively rare. As a result, we calculated catch ratios based on landed catch. Furthermore, we calculated catch ratios in terms of the number of landed organisms, because this value is more frequently reported than the weight (lb) of the landed catch. We examined ratios of non-halibut to halibut landings as a function of bottom depth (fathoms), location, and day of year for the 20 species most commonly caught as bycatch.

### 3.2.2 CDFW trawl logbook data

We received logbook data from the commercial trawl fishery from 2000 to 2021 for all vessels fishing with trawl gear. These data describe where (region, block id, set lat/long, haul lat/long), when (date and set/haul time), and how long (hours) a vessel fished as well as what fish it was targeting during this effort, what permit (and thus permit type) it was operating under, what type of trawl net it was using, what species it landed, and amount and value of the landings. We cleaned this data based on the procedures described in **Table S4**. We defined individual trawl tows based on the logbook id, date, tow number, and set time. We examined trawl tows in which California halibut was listed as the target species and were actually landed (i.e., a catch ratio cannot be calculated if no halibut were landed). By only examining trawl tows in which California halibut was the target species, we were able to exclude federal groundfish trawlers, which are not allowed to target California halibut. We examined ratios of non-halibut landings to halibut landings, calculated in terms of weight (lbs), as a function of bottom depth (fathoms), location, and day of year for the 20 species most commonly landed in association with halibut.

## 3.3 Observer data

### 3.3.1 SWFSC gill net observer data

We received federal observer data for the commercial gill net fishery from 1990 to 2017 for gill net vessels operating in southern California. Over this 27-year time period, the observer program was active in 15 years: 1990-1994, 1999, 2000, 2006, 2007, 2009-2013, and 2017. Observers collected information on the amount and fate of catch (**Table S8**), the length composition of a sample of this catch (**Table S9**), and information on the location, gear, and time of the catch (**Table S10**). We cleaned this data based on the procedures described in **Tables S8-S10**. We defined individual gill net sets based on the observer trip number and the set number and built a unique identifier to link set-level information across datasets (i.e., TripID-Set#). We examined gill net trips occurring in which California halibut was the target species and were actually landed (i.e., a catch ratio cannot be calculated if no halibut were landed). Furthermore, we only considered gill net trips after 1994, when new regulations pushed gillnet

fishing further offshore. We examined ratios of landings, discards, and dead discards to halibut landings, calculated in terms of the number of caught organisms, as a function of year, bottom depth (fathoms), and day of year for the 20 most frequently caught species most commonly caught. We could not evaluate ratios by location given the low rate of GPS coordinate reporting. We focused our analysis on the southern large-mesh set gill net fishery. Because gill net mesh sizes and set coordinates were only provided for 7.0% and 8.5% of trips, respectively, we were unable to discriminate sets in the large-/small-mesh and north/south fisheries reliably. However, by focusing on sets in which California halibut were named as the target species, we should be focused on the large-mesh fishery (since the small-mesh fishery is not allowed to target halibut) and by eliminating trips in which both the ports of departure and return were north of Point Arguello, we should be limiting our analysis to the southern fishery.

### 3.3.2 WCGOP trawl observer data

We received a version of the observer data for the federal commercial groundfish fishery from 2002 to 2020 that was randomized to maintain confidentiality (i.e., the author of this report is not authorized to see the confidential raw data). While the results from the analysis of this data cannot be interpreted due to its randomization, we set up the data cleaning and formatting procedure for CDFW to independently complete this analysis. The data describe set-level landings (transcribed from vessel logbooks; i.e., not independently collected) and discards from selected groundfish vessels and includes information on when (date, set/haul time), where (set/haul lat/long), and how long (hours) fishing occurred; what permit type and gear was used (bottom trawl, shrimp trawl, fixed gears, hook and line) to land the catch; what species were caught and discarded. We cleaned this data based on the procedures described in **Tables S11**. We focused our analysis on the federally-defined “Open Access California Halibut Fishery”, which actually refers to the state limited entry trawl fishery. The federal government uses the “open-access” term because the vast majority of vessels in the state limited entry trawl fishery do not have a federal groundfish permit. We defined individual gear sets based on the trip id, haul id, gear type, set time, and haul time. We wrote code to perform this analysis on the randomized dataset and CDFW applied this code to the confidential data.

## 3.4 Modeled estimates of bycatch

### 3.4.1 GEMM data

We accessed modeled estimates of bycatch in federal commercial groundfish fisheries from the Groundfish Expanded Mortality Multiyear (GEMM) dataset (Somers et al., 2020). The GEMM dataset provides estimates of landings and discards for 924 taxonomic groups across 36 fisheries sectors based on analysis of federal observer data (Somers et al., 2021). In general, these estimates are prepared using the ratio estimation method, which assumes that the ratio of discards to landings on observed trips is the same as on unobserved trips. Thus, this ratio can be used to extrapolate fleetwide discards from fleetwide landings. We analyzed these data by examining: (1) the amount of California halibut discards (dead and live) by fishery sector; and (2) the bycatch ratios of species within the open-access (OA) California halibut fishery, which contributes the most dead discards currently. Bycatch ratios were calculated in terms of weight.

The GEMM mortality estimates are not regionally disaggregated so we could not separate results for the southern and northern fishery.

## 4. Results

### 4.1 Commercial gill net fishery

#### 4.1.1 Gill net landing receipts data

The five most common species caught in association with halibut and landed in the southern large-mesh set gill net fishery based on landing receipts data were: Pacific angel shark, thresher shark, white seabass, leopard shark, and fantail sole (**Figure 7**). The non-halibut to halibut ratios were generally lower than one (more halibut catch than non-halibut catch landed). Ratios have been generally stable through time (**Figure 8**). Ratios vary spatially (**Figure 9**) and vary by day of year for species such as soupfin shark, bat ray, and yellowtail (**Figure 10**). Of the sensitive species in **Table 2**, only giant sea bass have ever been reported in the gill net landing receipt data (**Figure 11**). Bycatch of giant sea bass has fluctuated through time and is much lower than one. It peaks in September and in certain spatial areas (**Figure 11**).

#### 4.1.2 Gill net logbook data

The five most common species caught in association with halibut and landed in commercial gill net fishing gear based on gill net logbooks were: Pacific angel shark, white seabass, leopard shark, thresher shark, and soupfin shark (**Figure 12**). The ratios were generally lower than one (more halibut catch than non-halibut landings). Among the top five species, the ratios for all but white sea bass have generally increased through time; ratios of white sea bass have been stable through time (**Figure 13**). Ratios vary spatially (**Figure 14**) but are not strongly determined by depth (**Figure 15**) or day of year (**Figure 16**). Of the sensitive species in **Table 2**, only giant sea bass have ever been reported in the gill net logbook data (**Figure 11**). Bycatch of giant sea bass has fluctuated through time and is much lower than one. It is not strongly determined by depth or day of year but occurs in some spatial areas more than others (**Figure 17**).

#### 4.1.3 Gill net observer data

The five most common species caught in association with halibut and landed in the gill net fishery based on the SWFSC observer data were: spider crab, Pacific angel shark, shovelnose guitarfish, Pacific mackerel, and brown smoothhound shark (**Figure 18**). The ratios were generally lower than one (more halibut catch than incidental catch). Ratios have fluctuated through time (**Figure 19**) and are not strongly determined by depth (**Figure 20**) or day of year (**Figure 21**).

The five most common bycatch species incidentally caught and discarded (live and dead) in the gill net fishery based on the SWFSC observer data were: rock crab, spider crab,

bat ray, California skate, and California halibut (**Figure 22**). The bycatch ratios were generally lower than one (more landed halibut than discarded catch). Bycatch ratios have fluctuated through time (**Figure 23**). Bycatch ratios are not strongly determined by depth (**Figure 24**) or day of year (**Figure 25**).

The five most common bycatch species incidentally caught and discarded dead in the gill net fishery based on the SWFSC observer data were: spider crab, Pacific mackerel, rock crab, California halibut, and brown smoothhound shark (**Figure 26**). Bycatch ratios were generally lower than one (more landed halibut than discarded catch). Bycatch ratios have fluctuated through time (**Figure 27**) and are not strongly determined by depth (**Figure 28**) or day of year (**Figure 29**).

The catch of sensitive species in **Table 2** has occurred in the southern large-mesh set gill net fishery (**Figure 30**). The most commonly caught sensitive species are California sea lions (n=152) and harbor seals (n=31).

Observer coverage is not complete, and numbers of incidentally caught and discarded species are likely an underestimate for the gill net fishery.

## 4.2 Commercial trawl fishery

### 4.2.1 Trawl landing receipts data

The five most common species caught in association with halibut and landed in the northern trawl fishery based on landings receipt data were: starry flounder, sand sole, petrale sole, white seabass, and turbot (**Figure 31**). The ratios were generally lower than one (more halibut catch than incidental catch). The ratios of the top nine most commonly landed species have generally declined through time (**Figure 32**). Ratios vary spatially (**Figure 33**) and vary by day of year for species such as sanddab and sablefish (**Figure 34**). Some deep-water species, such as sablefish, occur in the dataset despite the removal of landings from vessels without a valid California halibut trawl permit. This is due to the possession by some vessels of both state and federal trawl permits that may fish within both deeper waters and the California halibut trawl grounds within the same trip. Landings of these species should not be considered to be associated with the state California halibut trawl fishery.

The five most common species caught in association with halibut and landed in the southern trawl fishery based on landings receipt data were: unspecified sole, Pacific angel shark, California scorpionfish, ridgeback prawn, and unspecified skate (**Figure 35**). The ratios were generally lower than one (more halibut catch than incidental catch) and have fluctuated through time (**Figure 36**). Ratios vary spatially (**Figure 357** but are determined by day of year for species like white croaker and California lizardfish (**Figure 38**).

The sensitive species in **Table 2** have almost never been reported in landings from either the northern or southern trawl fisheries. 12 lbs of giant sea bass were caught in one trip in the southern trawl fishery and 16.6 lbs were caught in one trip in the northern trawl fishery.

#### 4.2.2 Trawl logbook data

The five most common species caught in association with halibut and landed in the northern trawl fishery based on trawl logbooks were: starry flounder, sand sole, petrale sole, curlfin turbot, and unspecified sole (**Figure 39**). The ratios were generally much lower than one (more halibut catch than non-halibut catch). The ratios for the top five species have generally declined through time (**Figure 40**). The ratios for the next most common species have generally been stable through time. The ratio for white seabass has gone up through time. Ratios vary spatially (**Figure 41**) but are not strongly determined by depth (**Figure 42**) or day of year (**Figure 43**).

The five most common species caught in association with halibut and landed in the southern trawl fishery based on trawl logbooks were: unspecified trawl fish, unspecified sole, unspecified skate, English sole, and rock sole (**Figure 44**). The ratios were generally much lower than one (more halibut catch than non-halibut catch). The ratios have fluctuated through time (**Figure 45**). Ratios vary spatially (**Figure 46**) but are not strongly determined by depth (**Figure 47**) or day of year (**Figure 48**).

None of the sensitive species in **Table 2** have ever been reported in the logbooks of vessels in either the northern or southern trawl fisheries. This includes giant sea bass, which was reported in the landings one trawl trip in each fishery in the landing receipts data.

#### 4.2.3 WCGOP trawl observer data

The five most common species incidentally caught and discarded in the northern trawl fishery based on WCGOP trawl observer data were: Dungeness crab, big skate, California halibut, California skate, and English sole (**Figure 49**). The ratios were generally much lower than one (more halibut catch than non-halibut catch), except for Dungeness crab. The ratios have fluctuated through time (**Figure 50**). Ratios are not strongly determined by depth (**Figure 51**) or day of year (**Figure 52**).

The five most common species incidentally caught and discarded in the southern trawl fishery based on WCGOP trawl observer data were: California halibut, California skate, hornyhead turbot, longspine combfish, and fantail sole (**Figure 53**). The ratios were generally much lower than one (more halibut catch than non-halibut catch). The ratios have fluctuated through time, with some increases in recent years (**Figure 54**). Ratios are not strongly determined by depth (**Figure 55**) or day of year (**Figure 56**).

#### 4.2.4 GEMM bycatch estimates

The California recreational halibut fishery contributes the greatest amount of California halibut discards (**Figure 57**), however, the majority of these discards are likely returned alive (Somers et al., 2021). Bycatch ratios in the commercial halibut fisheries have been relatively stable through time and have always been less than one (**Figure 58**). The top five bycatch species in the open-access halibut fishery are Dungeness crab, California halibut, big skate, bat ray, and jellyfish. In this dataset, which is based on federal observer data, the “open-access” fishery actually refers to the limited entry state trawl fishery, because the vast majority of these vessels do not have federal groundfish permits. Only Dungeness crab regularly exhibit a

bycatch ratio greater than one (**Figures 59 & 60**). Of the sensitive species in **Table 2**, only giant sea bass have been reported in the GEMM bycatch estimates for the OA fishery, and the volumes of giant sea bass have been extremely low (**Figure 61**).

## 5. Discussion

### 5.1 Caveats

The results of this analysis may be affected by a few data limitations. First, most of these fisheries-dependent datasets are self-reported by fishers and inaccuracies are known to exist. Our analysis is likely to be more sensitive to misreporting of location (block) and depth than to day of the year, which is likely to be reported more accurately. Because we examine bycatch ratios, we avoid the need to consider effort (soak time), which may also be subject to inaccuracies. We suspect that species, amount, and value of landed catch are sufficiently accurate for these analyses. We note that even the independent observer data is subject to inaccuracies as observers record the block, depth, and soak time (though not used in our analysis) from self-reported information in the vessel's logbook. Although observers have independently recorded GPS coordinates in recent years, we used the reported block throughout our analysis. Second, the calculation of bycatch ratios may be sensitive to our assumptions regarding the attributes that define unique gill net sets or trawl tows. Because discrete fishing events are not uniquely identified in all of the data sources, we attempted to uniquely identify discrete fishing events by combining several data attributes (e.g., logbook id, vessel id, date, block id, set type, target species, depth, net characteristics, and soak time). This method is likely imperfect and may result in bycatch ratios being calculated across a few fishing events rather than a single one. This is likely to be especially common in the analysis of the landings receipts, where multiple fishing events may occur per trip. While averaging across multiple trips is likely to smooth the results, the average pattern is likely to remain the same.

### 5.2 Connections between datasets

The observer data offers the best insights into bycatch in the California halibut fishery. Maintaining support for the observer program is thus important for characterizing bycatch, understanding its ecological and economic impacts, and designing strategies for minimizing bycatch in the fishery. While the gill net landing receipts and logbooks are in general agreement about the species frequently caught in association with California halibut (i.e., Pacific angel shark, white seabass, leopard shark, thresher shark, and soupfin shark), these results differ from the observer data. This is likely due to the fact that the observer data reports catch in numbers while the landing receipts and logbook both report catch in weight. In terms of numbers, the gill net observer data identifies spider crabs, shovelnose guitarfish, Pacific mackerel, brown smoothhound shark, and rock crab as species commonly landed in association with California halibut (it agrees with the receipt and logbook data that Pacific angel shark are commonly landed in the gill net fishery). Future studies should convert numbers to weight estimates to ease comparison between datasets. While sensitive species such as green sturgeon, silver salmon, and yelloweye rockfish were rarely to never caught in the gill net



fishery, giant sea bass were occasionally captured, and California sea lions and harbor seals were even more commonly captured. Future studies may want to focus on understanding the fleetwide capture of these two marine mammals in the gillnet fishery. The trawl fishery has had extremely low rates of sensitive species bycatch. While it does have high bycatch of Dungeness crab, this resource remains highly productive (Richerson et al., 2020). As a result of the high rates of Dungeness crab discards, the open-access (OA) halibut trawl fishery has the highest rate of bycatch among any of the other single species fisheries on the U.S. West Coast (**Figure 62 & 63**). Understanding the proportion returned dead and impact of this mortality on sustainability is an important next step for understanding bycatch in the fishery. The methods for conducting such analyses are discussed in the next section.

### 5.3 Estimating fleetwide discards

An important next step in assessing bycatch in the California halibut fishery is to estimate fleetwide bycatch amounts and to consider the impact of this bycatch on populations.

The simplest approach, and the one taken to produce the GEMM dataset, is to assume that the fleetwide ratio of discarded catch to retained catch is the same as in the observer data. This assumption is acceptable when the fleet is appropriately stratified into meaningful sectors (i.e., sectors that may have different bycatch ratios) and when the observer program is successful at randomly sampling fishing trips (i.e., no bias in observed vs. unobserved trips). When these criteria are met, the equation for estimating fleetwide discards is straightforward:

$$D_{f,s} = \frac{\sum_t^{ntows} d_{t,s}}{\sum_t^{ntows} r_t} \times R$$

Where the fleetwide discards ( $D_i$ ) of species  $s$  is calculated by multiplying the fleetwide landings of the target species ( $R$ ) by the ratio of sum of discards of species  $s$  in observed tows ( $t$ ) to the sum of the landings of the target species in observed tows ( $r_t$ ). The fleetwide landings of the target species can be determined from the landing receipts. In this way, time series of discards can be generated by multiplying the observer-wide discards ratio by time series of landings of the retained species. If there is evidence that bycatch ratios vary annually or between time periods or other meaningful strata, then the observer data would have to be subdivided to reflect these strata.

For fisheries with 100% logbook coverage and set-level (or tow-level) catch information, a more sophisticated approach for estimating fleetwide discards could be used. In these cases, a model could be developed to predict the set-level discards based on properties of the set such as depth, distance from shore, latitude, time of day, gear type, and/or soak time, among many other properties. The model would be trained on the discard ratios observed in the observer data and then used to predict discard ratios for sets in the logbook data. Such models have been developed using generalized linear models (Luck et al., 2020), generalized additive models (Stock et al., 2020, 2019), and random forests (Stock et al., 2020, 2019), and many other modeling techniques could be considered (Rezende et al., 2019; Sims et al., 2008; Yan et al., 2022). The best model could be identified through testing on an independent test dataset or through other model selection approaches. This approach is more complex and has higher data requirements (i.e., logbooks with accurately reported meta-data) but avoids simple, and

potentially inaccurate, assumptions that bycatch ratios are, on average, the same across all sets.

These approaches could be used to estimate fleetwide discards in the California halibut fishery to more directly assess whether discards levels are of management concern. If discard mortality studies are available to inform the proportion of discards that die after capture, then these methods could be used to estimate the mortality contribution of the California halibut fishery. Ideally, these studies should be conducted using acoustic telemetry arrays. However, observer data on the status of returned fish can also be helpful. For species with stock assessments or other forms of population models, this data stream can be incorporated to assess and manage the impacts of this source of mortality on sustainability goals. For species without quantitative population models, the consequences of this source of mortality can be assessed and managed through other, more data-limited, approaches.

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## References

- CDFW, 2022. California Halibut Enhanced Status Report 2022 [WWW Document]. CDFW Mar. Species Portal. URL <https://marinespecies.wildlife.ca.gov/california-halibut/true/#table-of-contents> (accessed 5.12.22).
- CDFW, 2018. 2018 Master Plan for Fisheries A Guide for Implementation of the Marine Life Management Act.
- Dunn, D.C., Maxwell, S.M., Boustany, A.M., Halpin, P.N., 2016. Dynamic ocean management increases the efficiency and efficacy of fisheries management. *Proc. Natl. Acad. Sci.* 113, 668–673. <https://doi.org/10.1073/pnas.1513626113>
- Finkbeiner, E.M., Wallace, B.P., Moore, J.E., Lewison, R.L., Crowder, L.B., Read, A.J., 2011. Cumulative estimates of sea turtle bycatch and mortality in USA fisheries between 1990 and 2007. *Biol. Conserv.* 144, 2719–2727. <https://doi.org/10.1016/j.biocon.2011.07.033>
- Free, C.M., Vargas Poulsen, C., Bellquist, L.F., Wassermann, S.N., Oken, K.L., 2022. The CALFISH database: A century of California's non-confidential fisheries landings and participation data. *Ecol. Inform.* 69, 101599. <https://doi.org/10.1016/j.ecoinf.2022.101599>
- Hazen, E.L., Scales, K.L., Maxwell, S.M., Briscoe, D.K., Welch, H., Bograd, S.J., Bailey, H., Benson, S.R., Eguchi, T., Dewar, H., Kohin, S., Costa, D.P., Crowder, L.B., Lewison, R.L., 2018. A dynamic ocean management tool to reduce bycatch and support sustainable fisheries. *Sci. Adv.* 4, eaar3001. <https://doi.org/10.1126/sciadv.aar3001>
- Howell, E., Kobayashi, D., Parker, D., Balazs, G., Polovina, aJJ, 2008. TurtleWatch: a tool to aid in the bycatch reduction of loggerhead turtles *Caretta caretta* in the Hawaii-based pelagic longline fishery. *Endanger. Species Res.* 5, 267–278. <https://doi.org/10.3354/esr00096>
- Jannot, J.E., Holland, D.S., 2013. Identifying ecological and fishing drivers of bycatch in a U.S. groundfish fishery. *Ecol. Appl.* 23, 1645–1658. <https://doi.org/10.1890/12-2225.1>
- Lewison, R., Hobday, A.J., Maxwell, S., Hazen, E., Hartog, J.R., Dunn, D.C., Briscoe, D., Fossette, S., O'Keefe, C.E., Barnes, M., Abecassis, M., Bograd, S., Bethoney, N.D., Bailey, H., Wiley, D., Andrews, S., Hazen, L., Crowder, L.B., 2015. Dynamic Ocean

- Management: Identifying the Critical Ingredients of Dynamic Approaches to Ocean Resource Management. *BioScience* 65, 486–498. <https://doi.org/10.1093/biosci/biv018>
- Lewison, R., Soykan, C., Cox, T., Peckham, H., Pilcher, N., LeBoeuf, N., McDonald, S., Moore, J., Safina, C., Crowder, L., 2011. Ingredients for Addressing the Challenges of Fisheries Bycatch. *Bull. Mar. Sci.* 87, 235–250. <https://doi.org/10.5343/bms.2010.1062>
- Little, A.S., Needle, C.L., Hilborn, R., Holland, D.S., Marshall, C.T., 2015. Real-time spatial management approaches to reduce bycatch and discards: experiences from Europe and the United States. *Fish Fish.* 16, 576–602. <https://doi.org/10.1111/faf.12080>
- Luck, C., Jessopp, M., Tully, O., Cosgrove, R., Rogan, E., Cronin, M., 2020. Estimating protected species bycatch from limited observer coverage: A case study of seal bycatch in static net fisheries. *Glob. Ecol. Conserv.* 24, e01213. <https://doi.org/10.1016/j.gecco.2020.e01213>
- Melvin, E.F., Parrish, J.K., Conquest, L.L., 1999. Novel Tools to Reduce Seabird Bycatch in Coastal Gillnet Fisheries. *Conserv. Biol.* 13, 1386–1397. <https://doi.org/10.1046/j.1523-1739.1999.98426.x>
- Rezende, G.A., Rufener, M.-C., Ortega, I., Ruas, V.M., Dumont, L.F.C., 2019. Modelling the spatio-temporal bycatch dynamics in an estuarine small-scale shrimp trawl fishery. *Fish. Res.* 219, 105336. <https://doi.org/10.1016/j.fishres.2019.105336>
- Sims, M., Cox, T., Lewison, R., 2008. Modeling spatial patterns in fisheries bycatch: improving bycatch maps to aid fisheries management. *Ecol. Appl.* 18, 649–661. <https://doi.org/10.1890/07-0685.1>
- Somers, K.A., Jannot, J.E., Richerson, K.E., Tuttle, V.J., 2021. Estimated Discard and Catch of Groundfish Species in the 2020 U.S. West Coast Fisheries.
- Somers, K.A., Jannot, J.E., Tuttle, V., Richerson, K., Riley, N., McVeigh, J.T., 2020. Groundfish Expanded Mortality Multiyear (GEMM), 2002-18 (NOAA Data Report No. NMFS-NWFSC-DR-2020-01). U.S. Department of Commerce.
- Stock, B.C., Ward, E.J., Eguchi, T., Jannot, J.E., Thorson, J.T., Feist, B.E., Semmens, B.X., 2020. Comparing predictions of fisheries bycatch using multiple spatiotemporal species distribution model frameworks. *Can. J. Fish. Aquat. Sci.* 77, 146–163. <https://doi.org/10.1139/cjfas-2018-0281>
- Stock, B.C., Ward, E.J., Thorson, J.T., Jannot, J.E., Semmens, B.X., 2019. The utility of spatial model-based estimators of unobserved bycatch. *ICES J. Mar. Sci.* 76, 255–267. <https://doi.org/10.1093/icesjms/fsy153>
- Yan, Y., Cantoni, E., Field, C., Treble, M., Flemming, J.M., 2022. Spatiotemporal modeling of bycatch data: methods and a practical guide through a case study in a Canadian Arctic fishery. *Can. J. Fish. Aquat. Sci.* 79, 148–158. <https://doi.org/10.1139/cjfas-2020-0267>

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Figure 49. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2003-2020 based on WCGOP trawl observer data.

Figure 50. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2003-2020 based on WCGOP trawl observer data.

Figure 51. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery as a function of depth from 2003-2020 based on WCGOP trawl observer data.

Figure 52. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery as a function of the day of year from 2003-2020 based on WCGOP trawl observer data.

Figure 53. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2003-2020 based on WCGOP trawl observer data.

Figure 54. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2003-2020 based on WCGOP trawl observer data.

Figure 55. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery as a function of depth from 2003-2020 based on WCGOP trawl observer data.

Figure 56. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery as a function of the day of year from 2003-2020 based on WCGOP trawl observer data.

Figure 57. Average annual landings and discards of California halibut in West Coast groundfish fisheries from 2002-2020 based on GEMM data.

Figure 58. Annual landings and discards of California halibut in directed halibut fisheries from 2002-2020 based on GEMM data.

Figure 59. Distribution of bycatch ratios in the open-access (OA) halibut fishery for the top-50 most commonly caught bycatch species from 2002-2020 based on GEMM data.

Figure 60. Bycatch ratios of the top-20 most commonly caught bycatch species in the open-access (OA) halibut fishery from 2002-2020 based on GEMM data.

Figure 61. Bycatch ratios of giant sea bass in the open-access (OA) halibut trawl fishery from 2002-2020 based on GEMM data.

Figure 62. Proportion of target species and non-target species catch that is landed or discarded in West Coast fisheries sectors based on the GEMM mortality estimates.



Figure 63. Bycatch ratios in West Coast fisheries sectors based on the GEMM mortality estimates.

## Tables & Figures

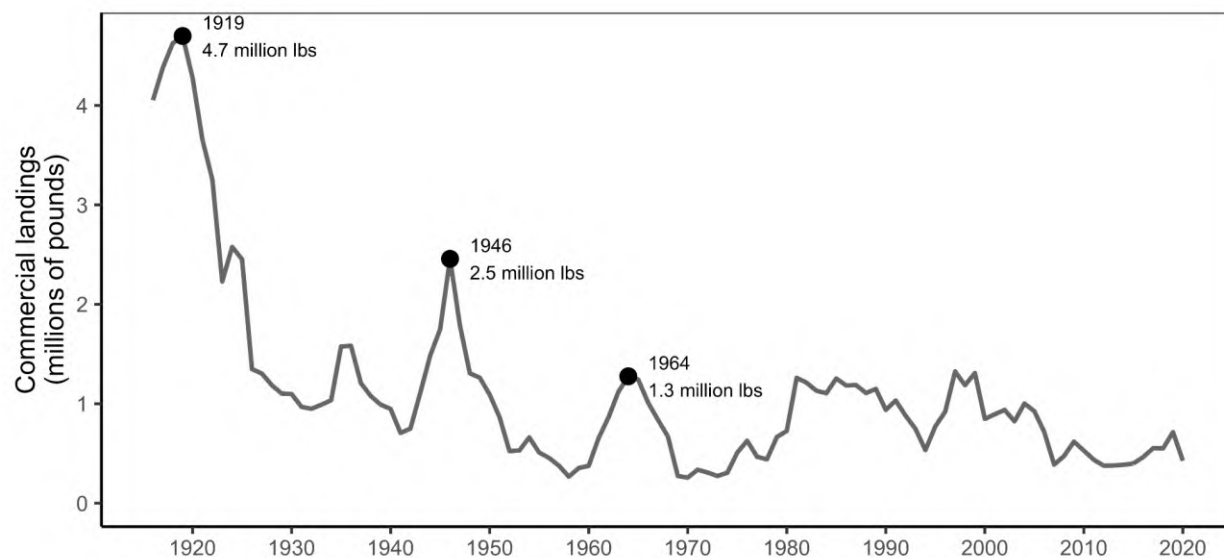
### Contextual figures

**Table 1.** Datasets with information on California halibut landings and discards.

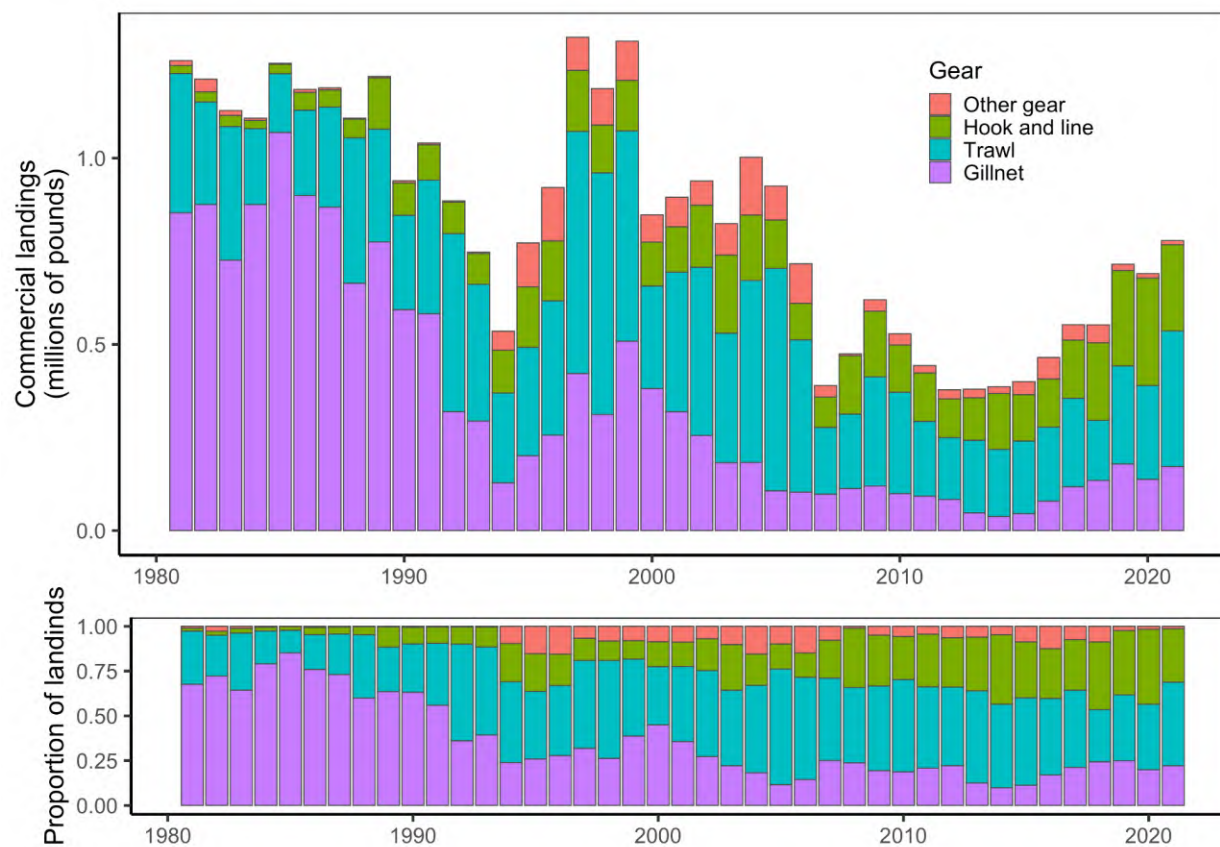
<b>Dataset</b>	<b>Years</b>	<b>Catch type</b>
CDFW landing receipts	2000-2020	Landings (lbs)
CDFW gill net logbooks	2000-2021	Landings and discards (lbs/count)
CDFW trawl logbooks	2000-2021	Landings (lbs)
CDFW gill net observer data	1983-1989	Landings and discards (alive/dead) (count)
SWFSC gill net observer data	1990-2017	Landings and discards (alive/dead) (count)
WCGOP trawl observer data	2002-2020	Landings and discards (lbs/count)
GEMM	2002-2020	Landings and discards (alive/dead)

**Table 2.** Sensitive species.

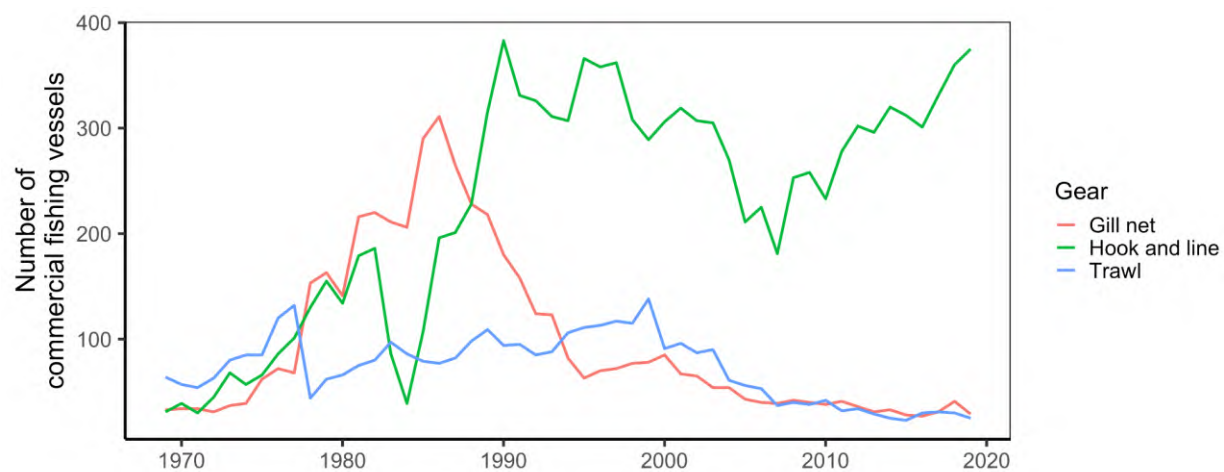
Species
Green sturgeon ( <i>Acipenser medirostris</i> )
Silver (coho) salmon ( <i>Oncorhynchus kisutch</i> )
Giant sea bass ( <i>Stereolepis gigas</i> )
Overfished or rebuilding rockfish: Yelloweye rockfish ( <i>Sebastes ruberrimus</i> )
Seabirds, sea turtles, and marine mammals



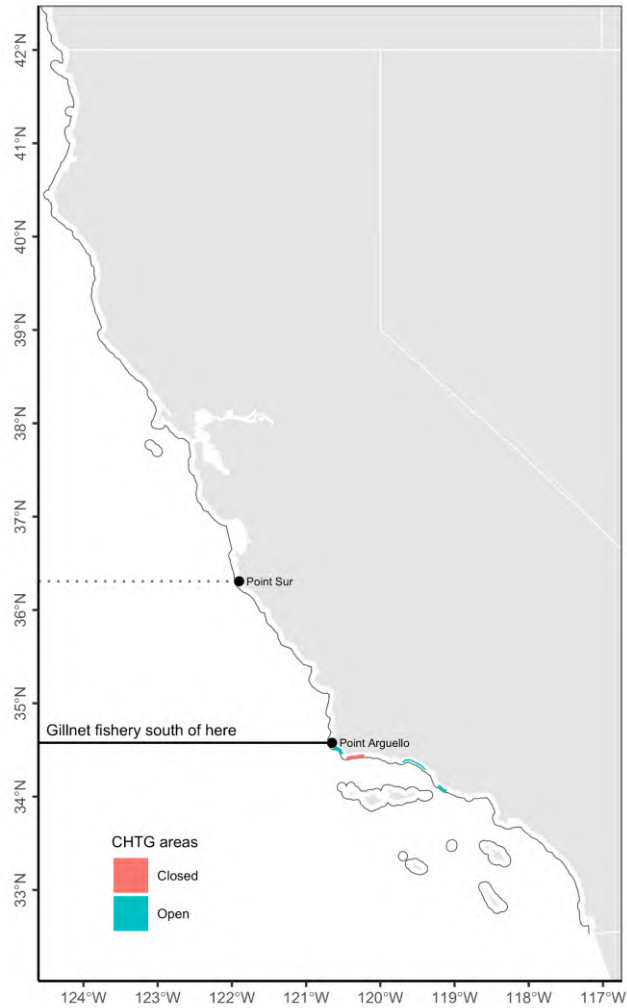
**Figure 1. Commercial landings of California halibut from 1916 to 2020.** Landings data are from Barksy (1990) for 1916-1980 and from PacFIN from 1981-2020.



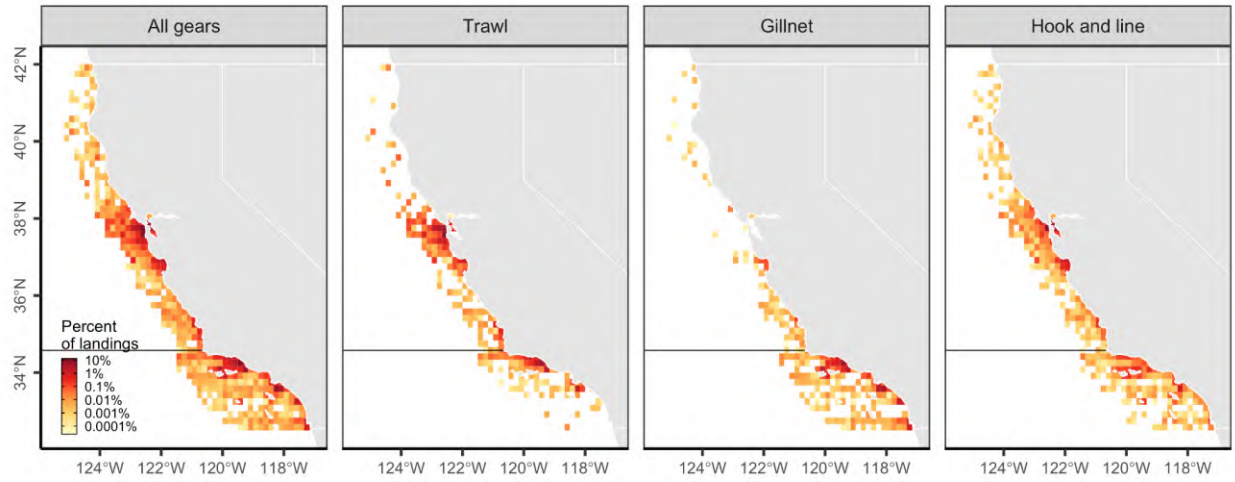
**Figure 2. Commercial California halibut landings by gear type from 1980 to 2021 based on the CDFW landings receipt data.**



**Figure 3. Number of commercial fishing vessels reported halibut landings from 1969 to 2019 based on data from the Enhanced Status Report for California halibut.**

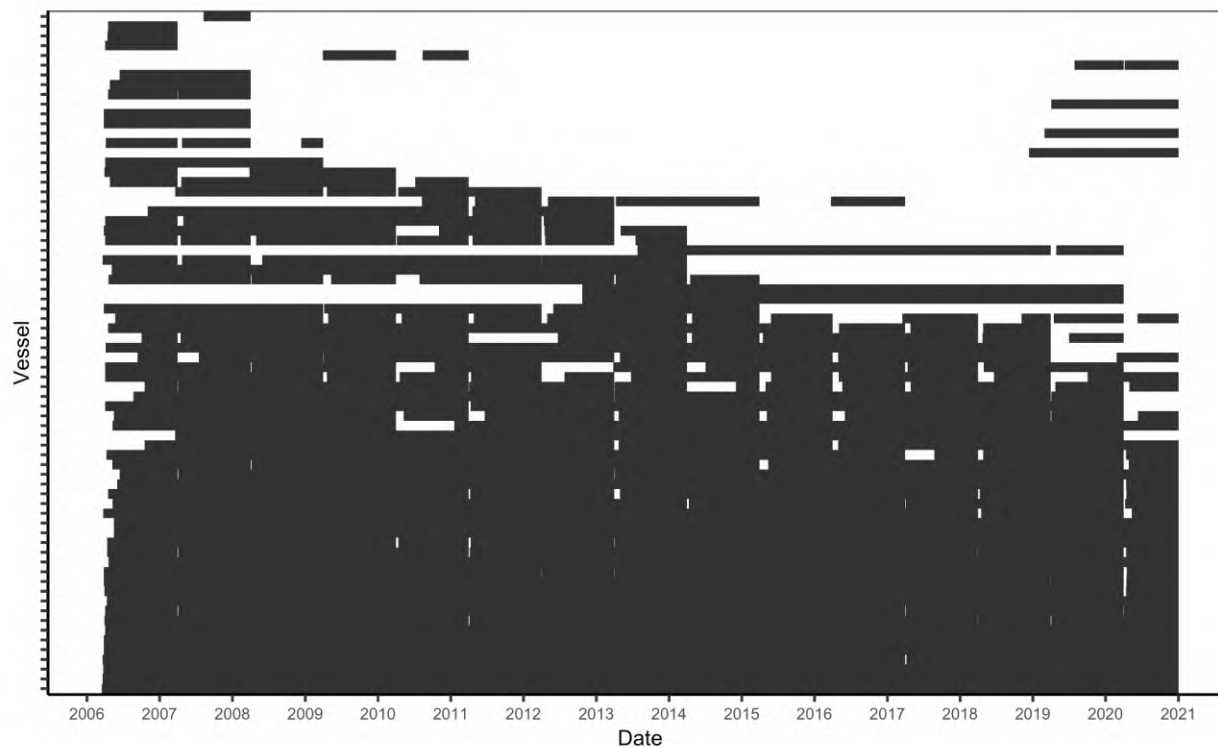


**Figure 4. Map of the spatial management for California halibut.** The limited entry gill net fishery largely operates south of Point Arguello (34.6°N) and must occur outside of state waters (thin line buffering the coast and islands). The limited entry trawl fishery may operate outside of statewaters coastwide and is also allowed to operate seasonally within specially designated California Halibut Trawl Grounds (CHTG) located inside state waters in southern California. Recreational fisheries have a 3-fish bag and possession limit north of Point Sur (36.3°N) and a 5-fish bag and possession limit south of Point Sur.



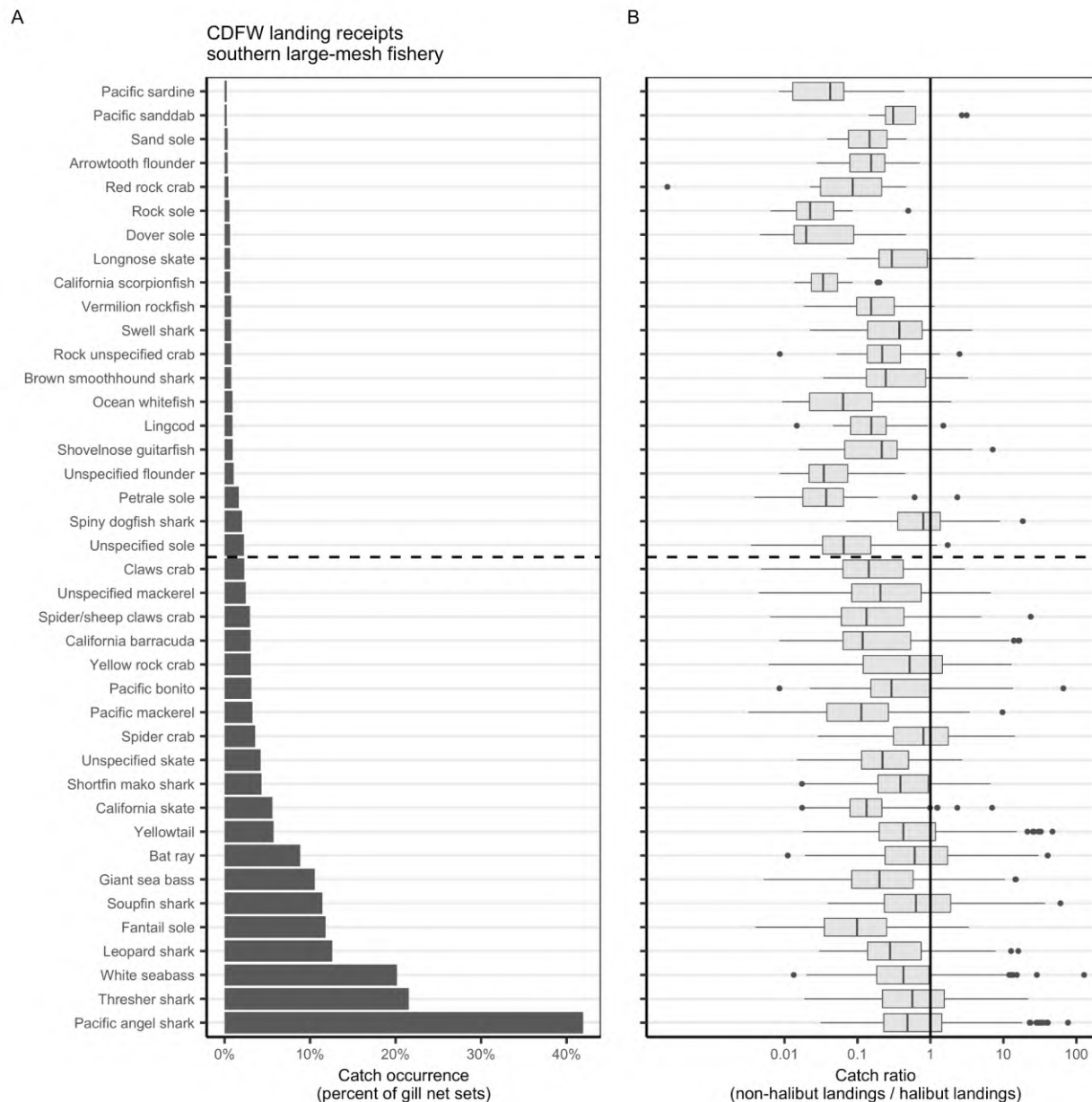
**Figure 5. Location of commercial California halibut landings by gear type from 2000 to 2021 based on the CDFW landings receipt data.**



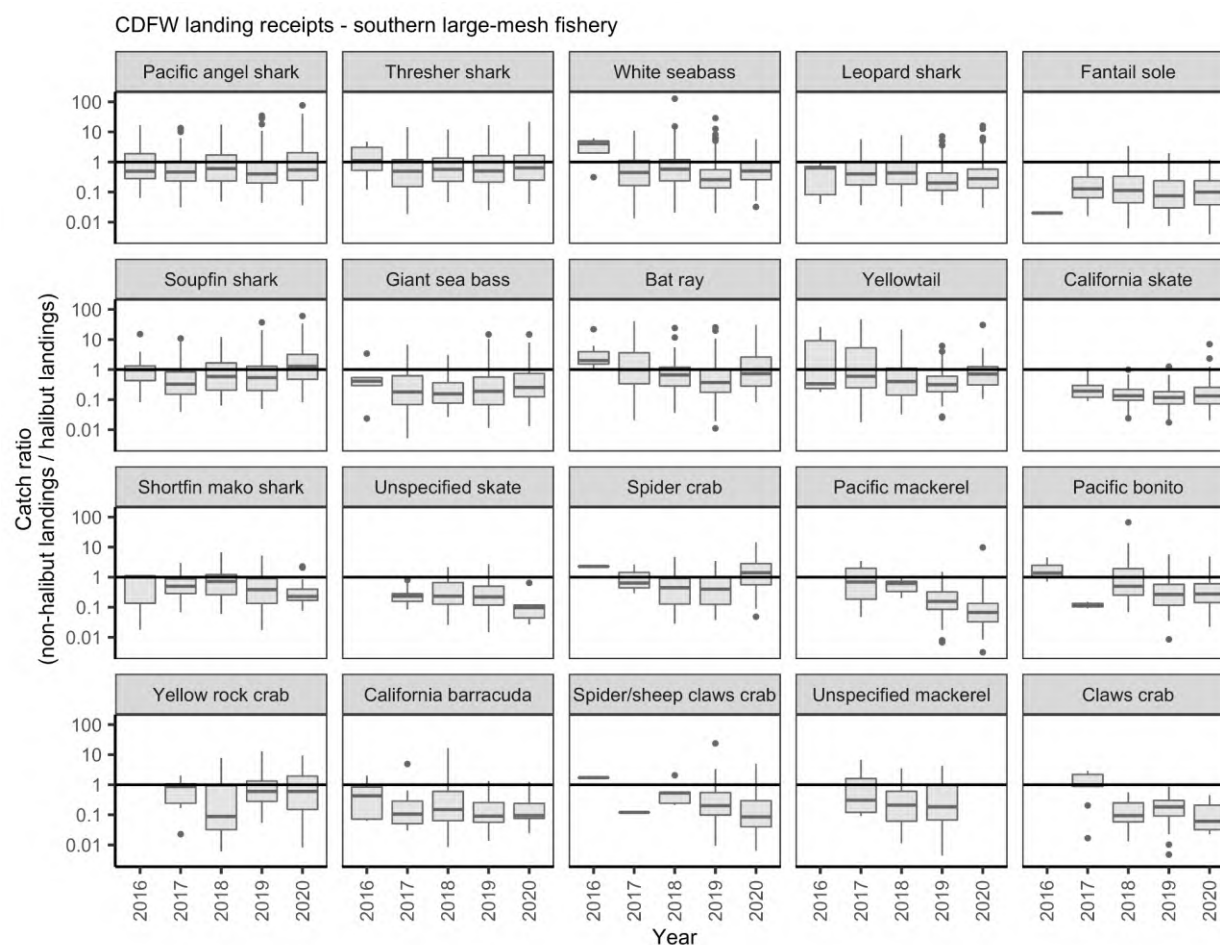


**Figure 6. Vessels holding state halibut trawl permits and the dates on which those permits were active.** Vessel id is suppressed to maintain confidentiality.

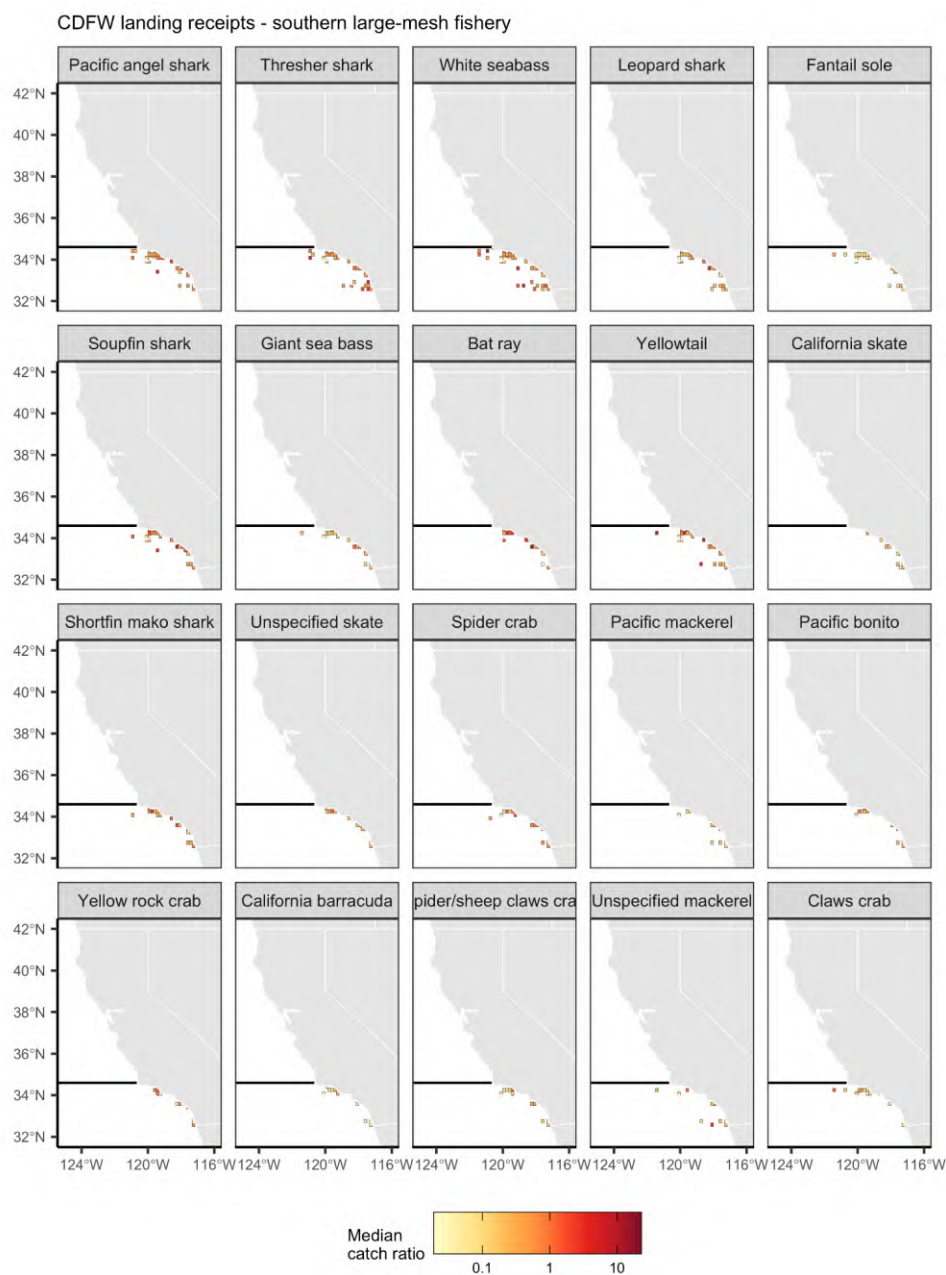
## Receipts - SLM gill net



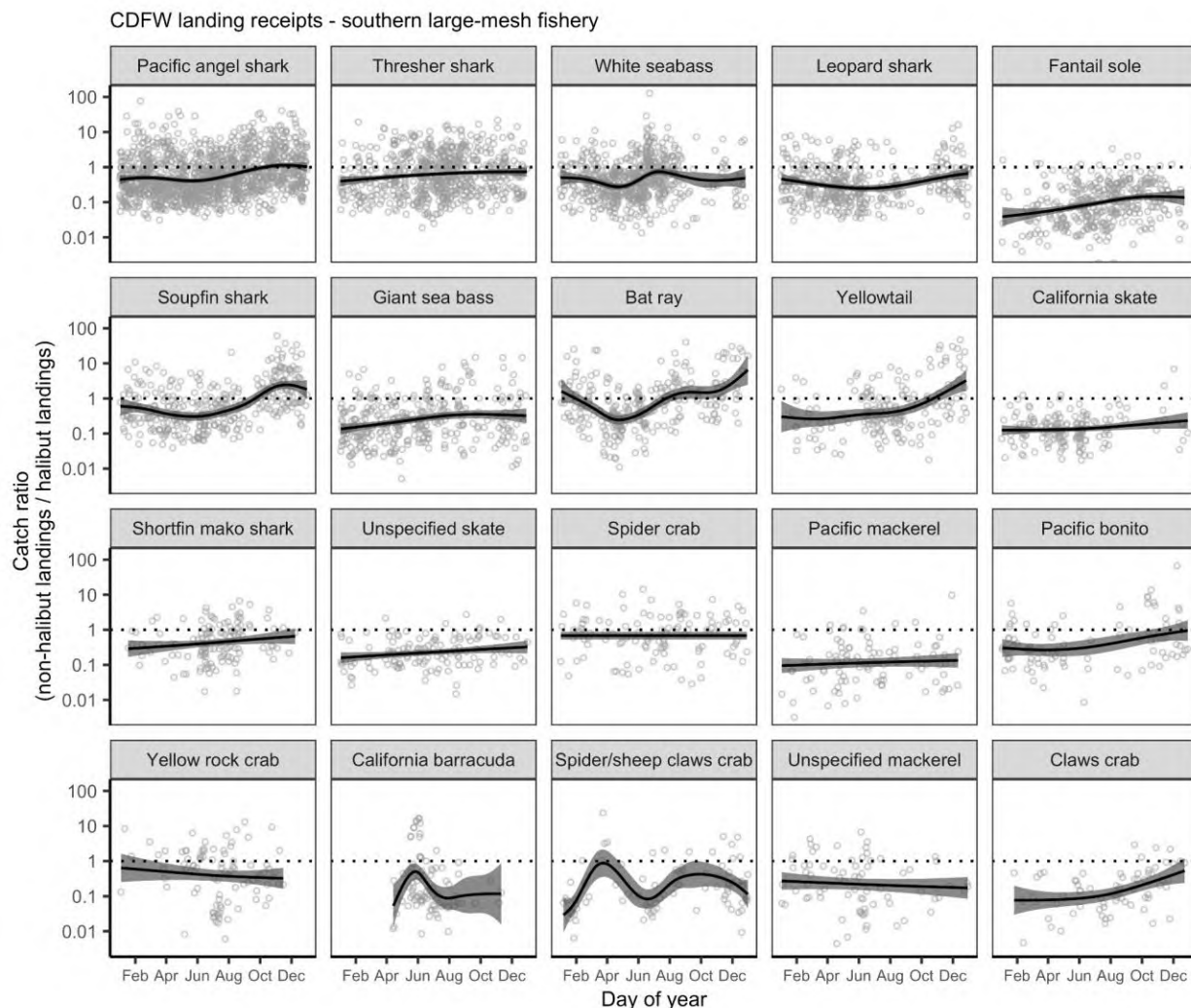
**Figure 7. Retained catch associated with California halibut landings in the southern large-mesh set gill net fishery from 2016-2020 based on CDFW landing receipts.** Panel A shows how frequently a species occurred in gill net trips. Panel B shows the ratio of non-halibut landings to halibut landings in gill net trips. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).



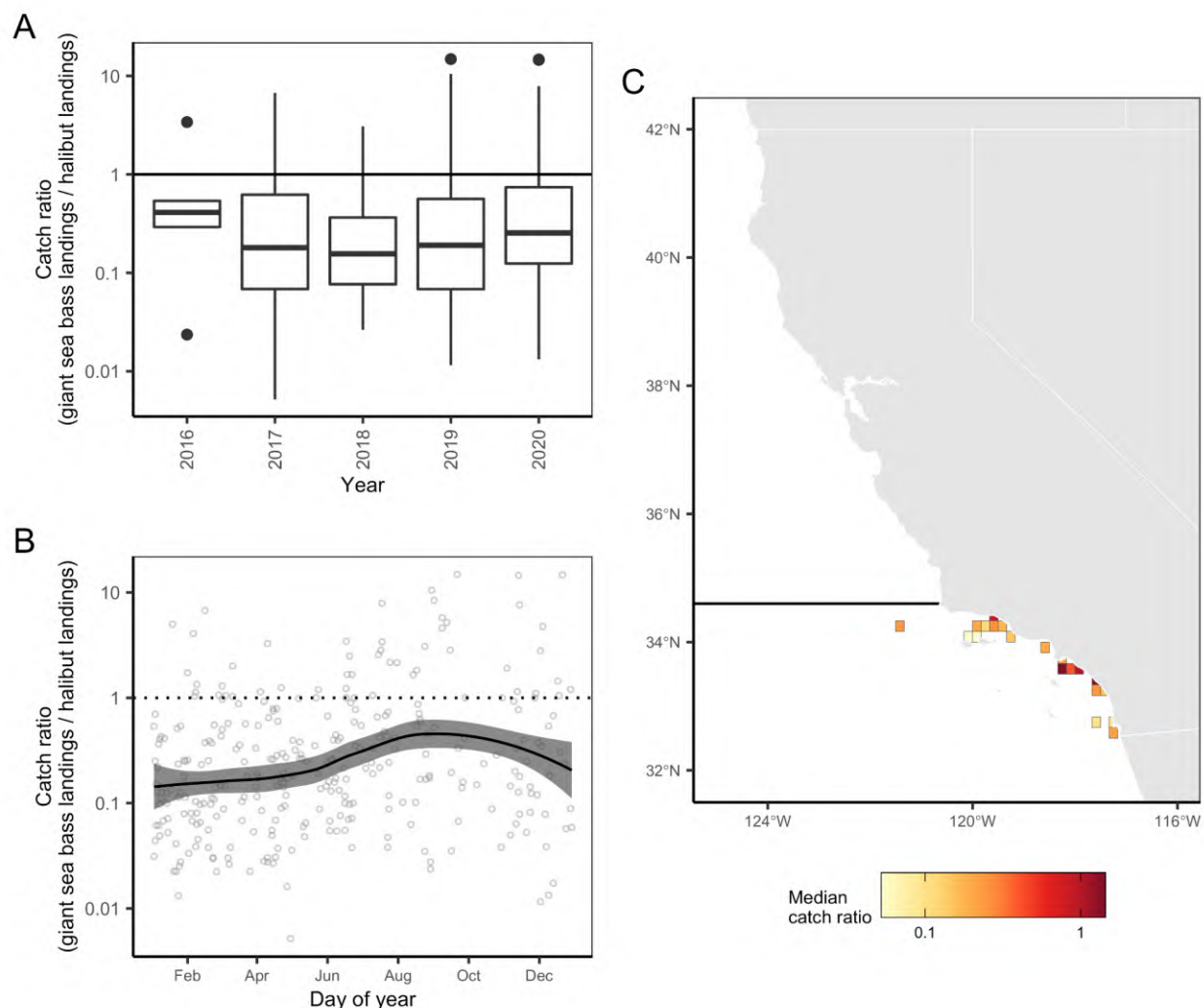
**Figure 8. Retained catch associated with California halibut landings in the southern large-mesh set gill net fishery from 2016-2020 based on CDFW landing receipts.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.



**Figure 9. Retained catch associated with California halibut landings in the southern large-mesh set gill net fishery from 2016-2020 based on CDFW landing receipts.** Color indicates the median catch ratio (non-halibut landings / halibut landings) of all gill net trips occurring in a block; note the log-scale in the color bar. The horizontal line indicates Point Arguello. The top-20 most frequently landed species are shown in order of decreasing frequency.

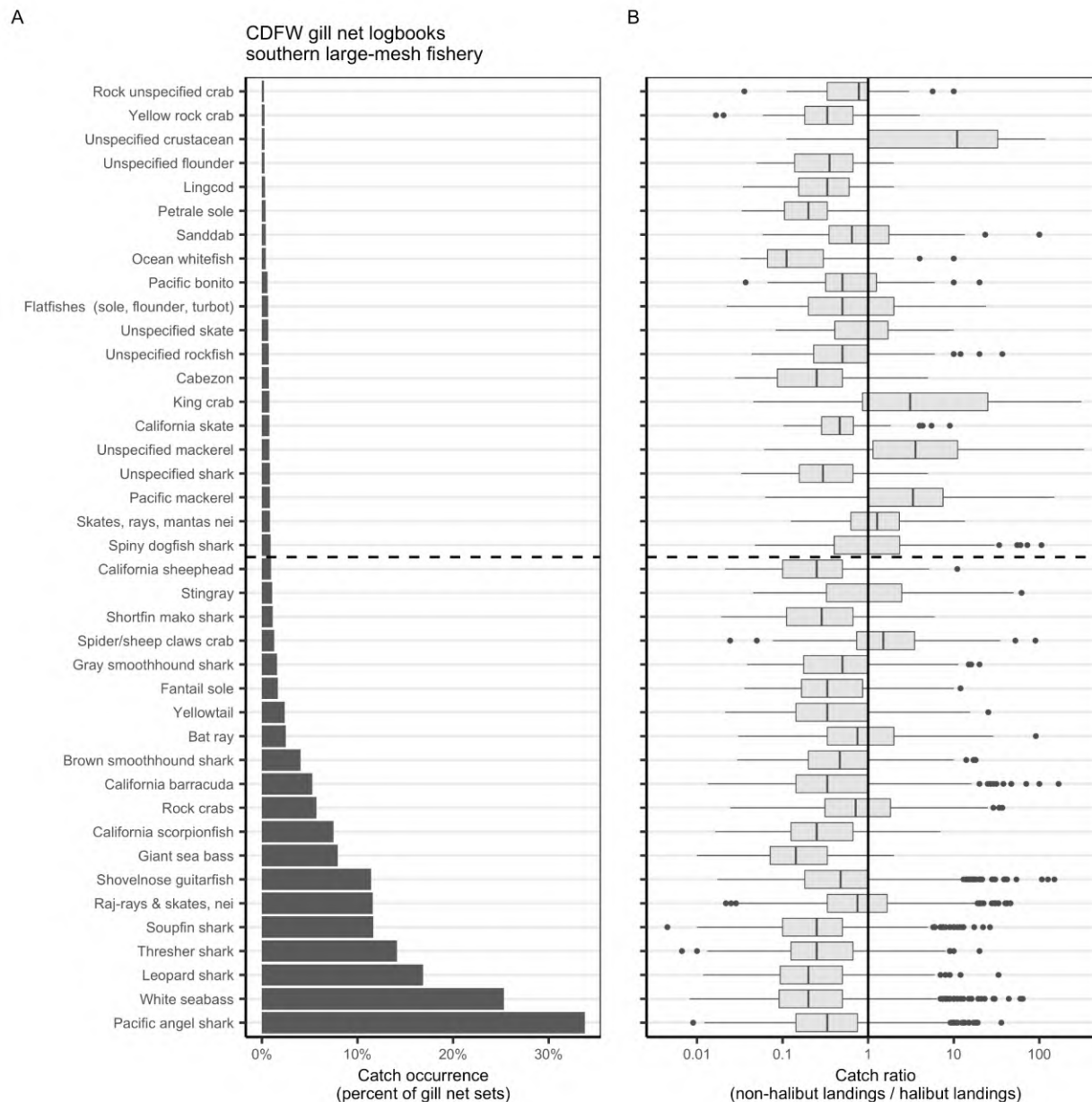


**Figure 10. Retained catch associated with California halibut landings in the southern large-mesh set gill net fishery from 2016-2020 based on CDFW landing receipts.** Points indicate individual gill net trips. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

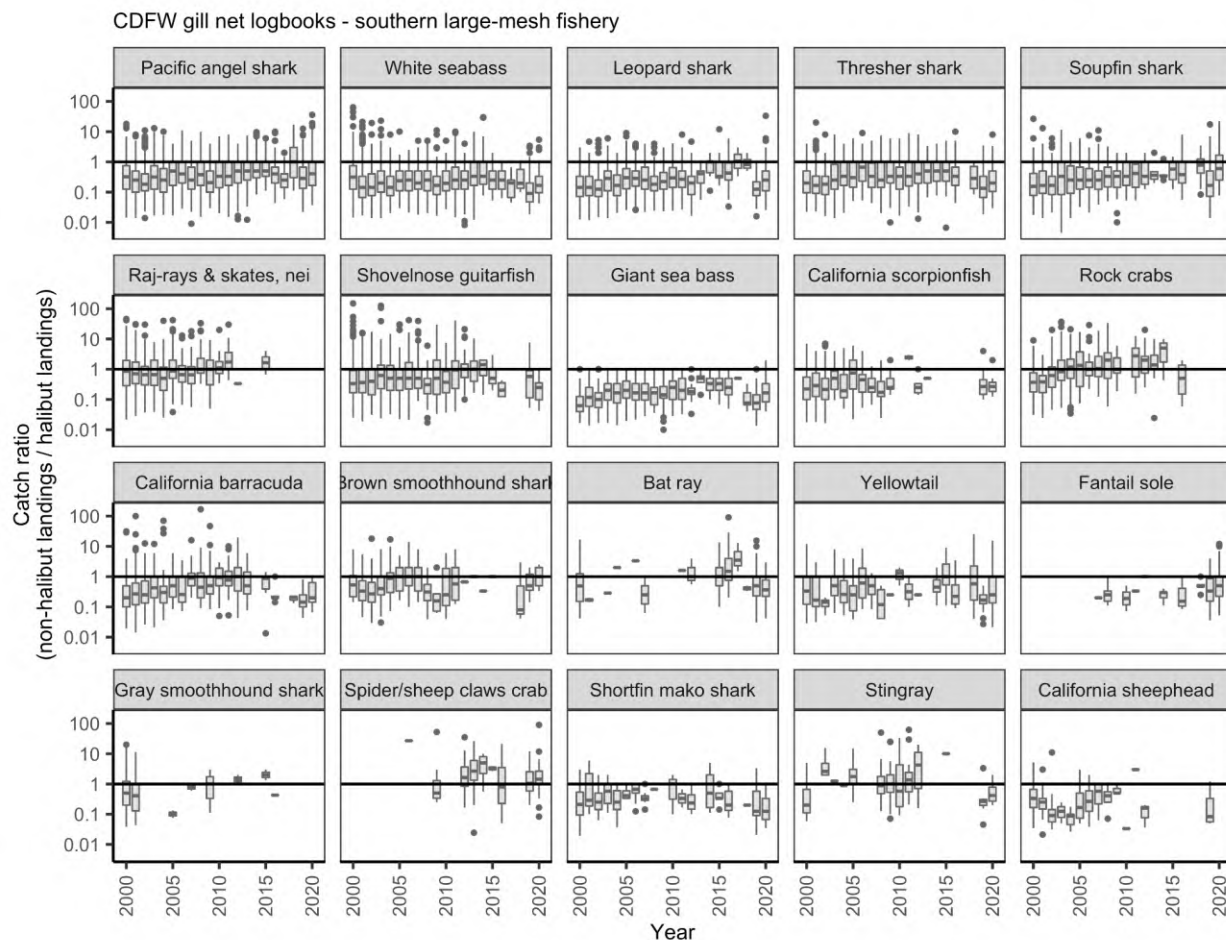


**Figure 11. Retained catch of giant sea bass associated with California halibut landings in the southern large-mesh set gill net fishery from 2016-2020 based on CDFW landing receipts.** In (A), the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers. In (B), points indicate individual gill net trips. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. In (C), color indicates the median catch ratio (non-halibut landings / halibut landings) of all gill net trips occurring in a block. In all plots, note the log-scale.

## Logbooks - SLM gill net

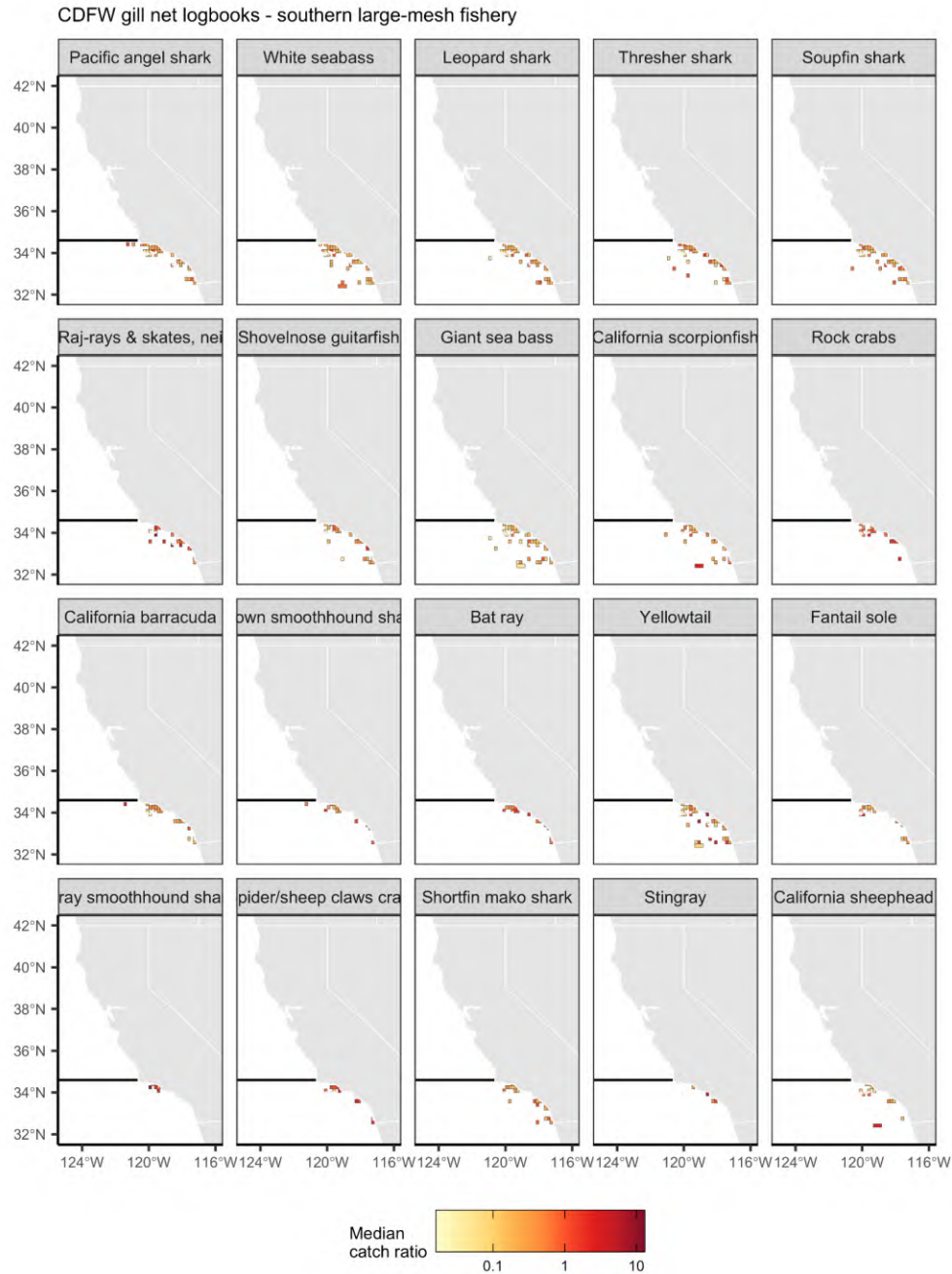


**Figure 12. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh set gill net fishery from 2000-2021 based on CDFW gill net logbook data.** Panel A shows how frequently a species occurred in gill net sets. Panel B shows the ratio of non-halibut landings to halibut landings in gill net sets. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).

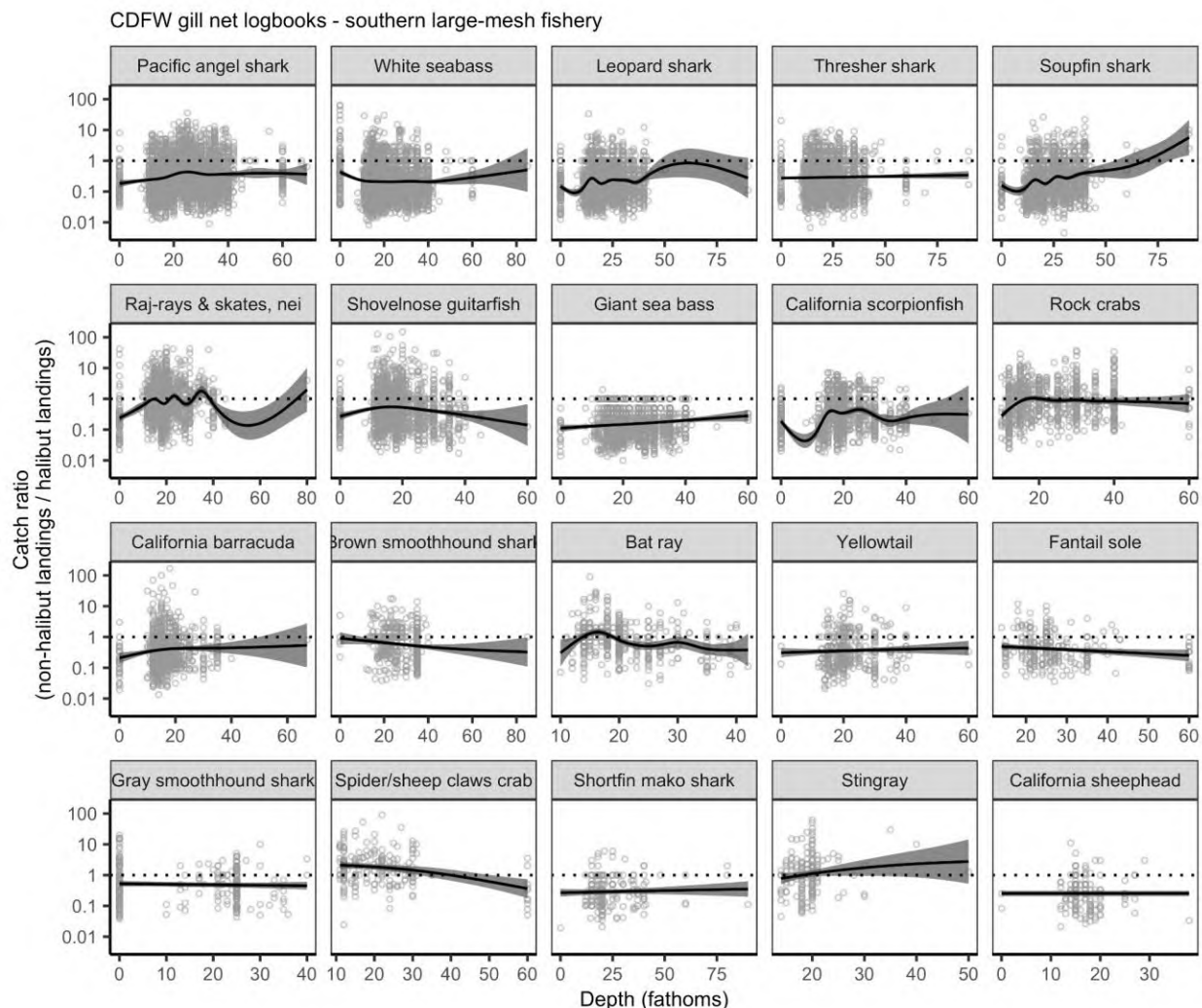


**Figure 13. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh set gill net fishery from 2000-2021 based on CDFW gill net logbook data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.

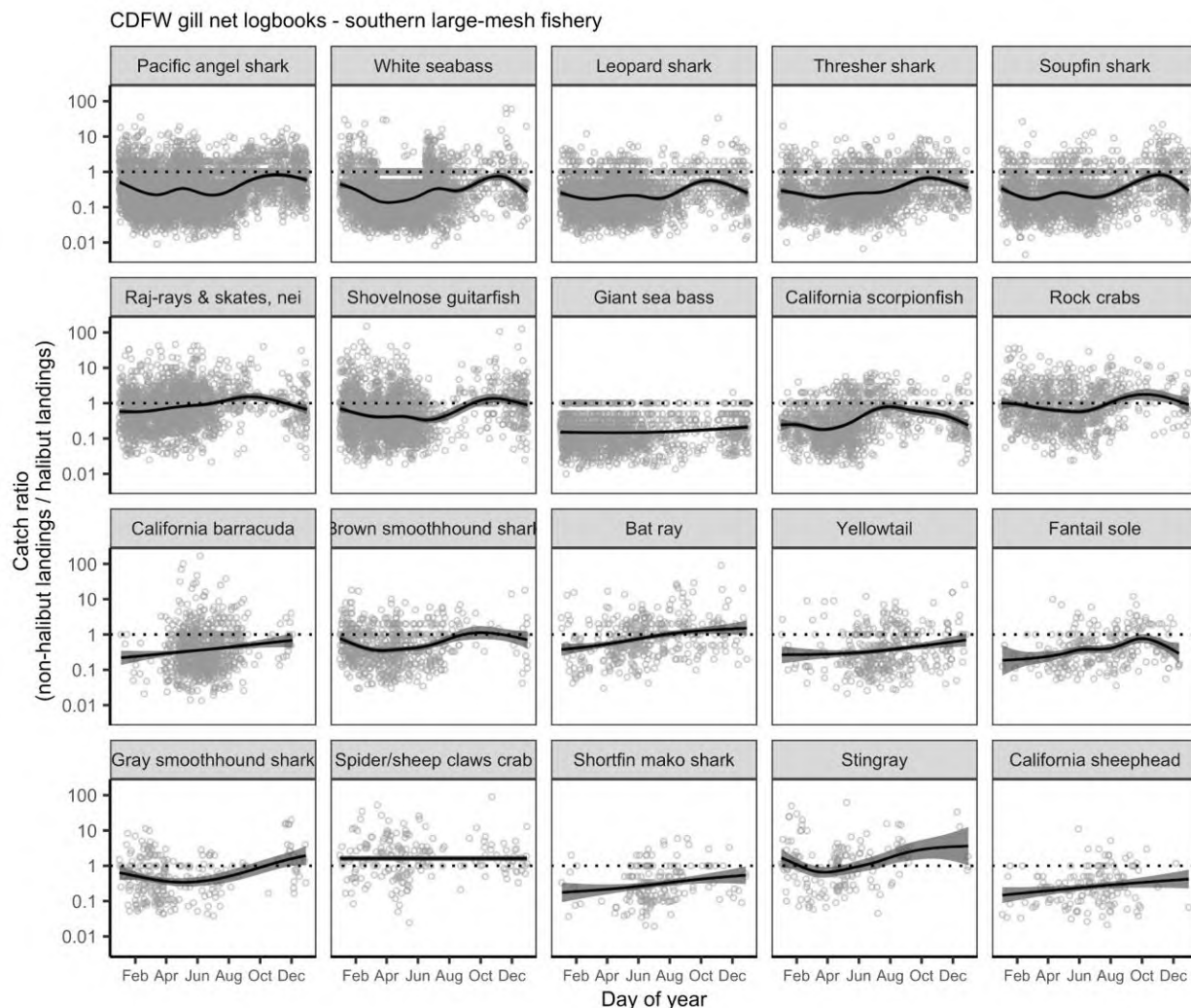




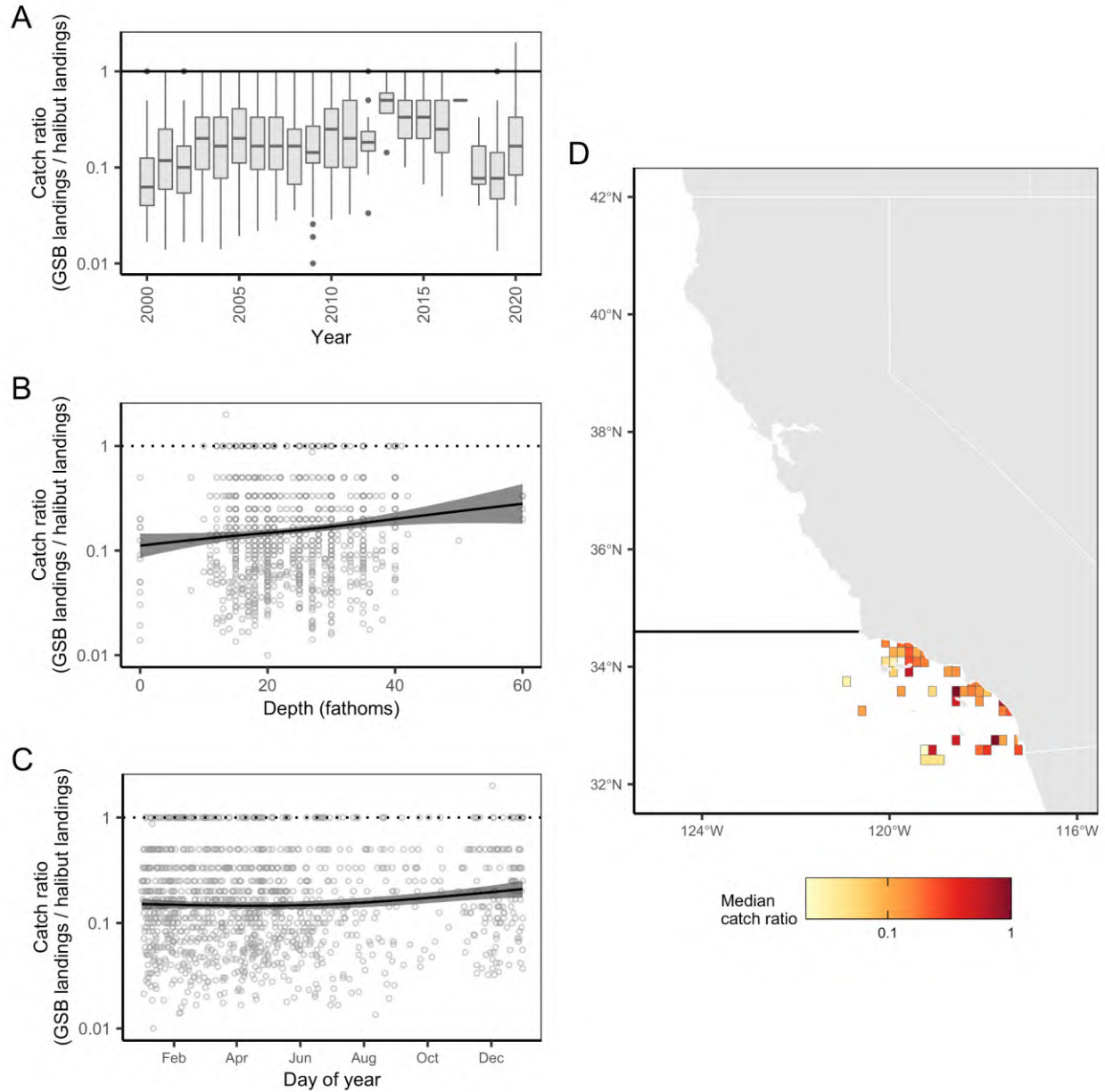
**Figure 14. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh set gill net fishery by commercial fishing block from 2000-2021 based on CDFW gill net logbook data.** Color indicates the median catch ratio (non-halibut landings / halibut landings) of all gill net sets occurring in the block; note the log-scale in the color bar. The horizontal line indicates Point Arguello. The top-20 most frequently landed species are shown in order of decreasing frequency.



**Figure 15. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh set gill net fishery as a function of depth from 2000-2021 based on CDFW gill net logbook data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

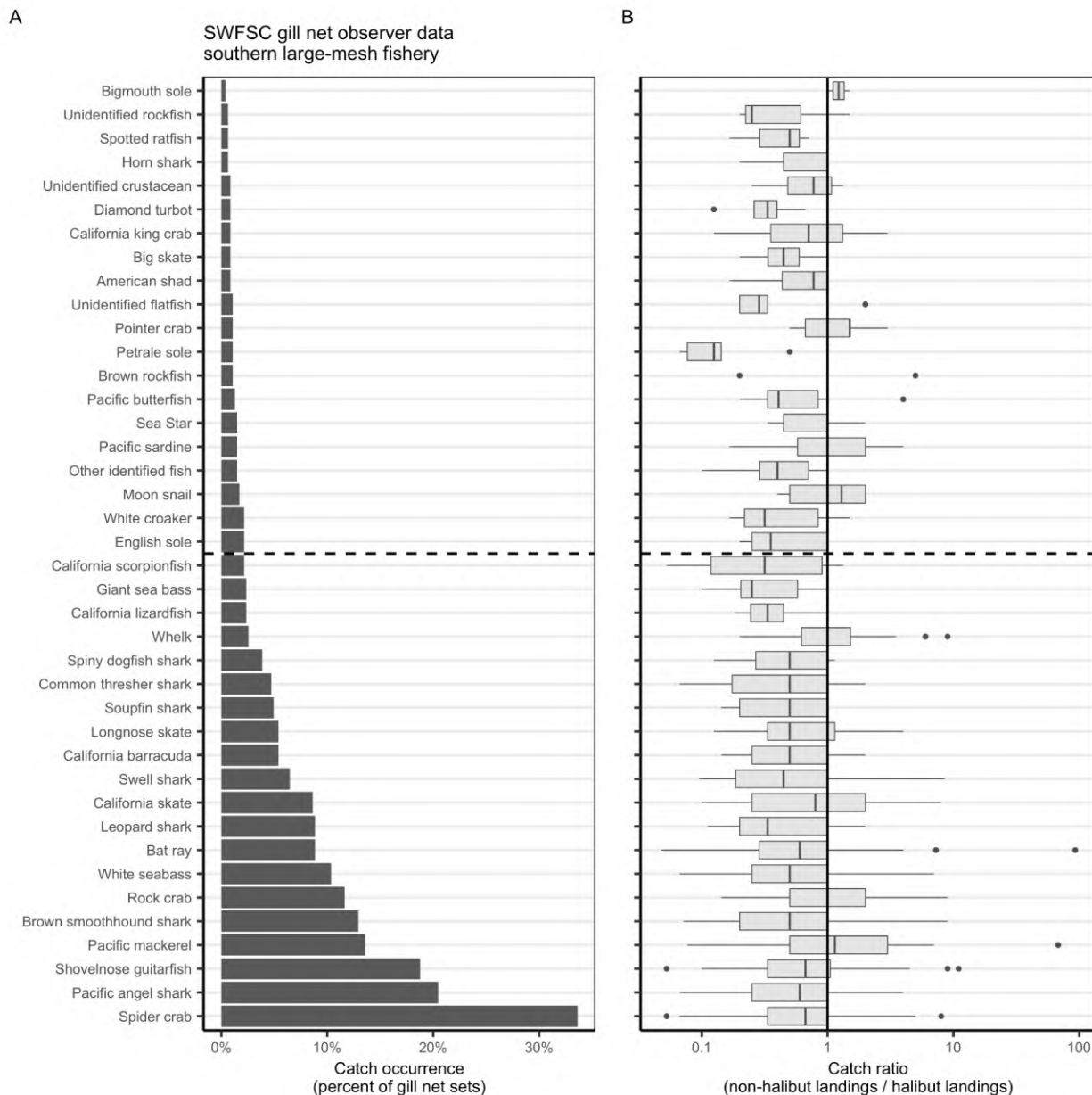


**Figure 16. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh set gill net fishery as a function of the day of year from 2000-2021 based on CDFW gill net logbook data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

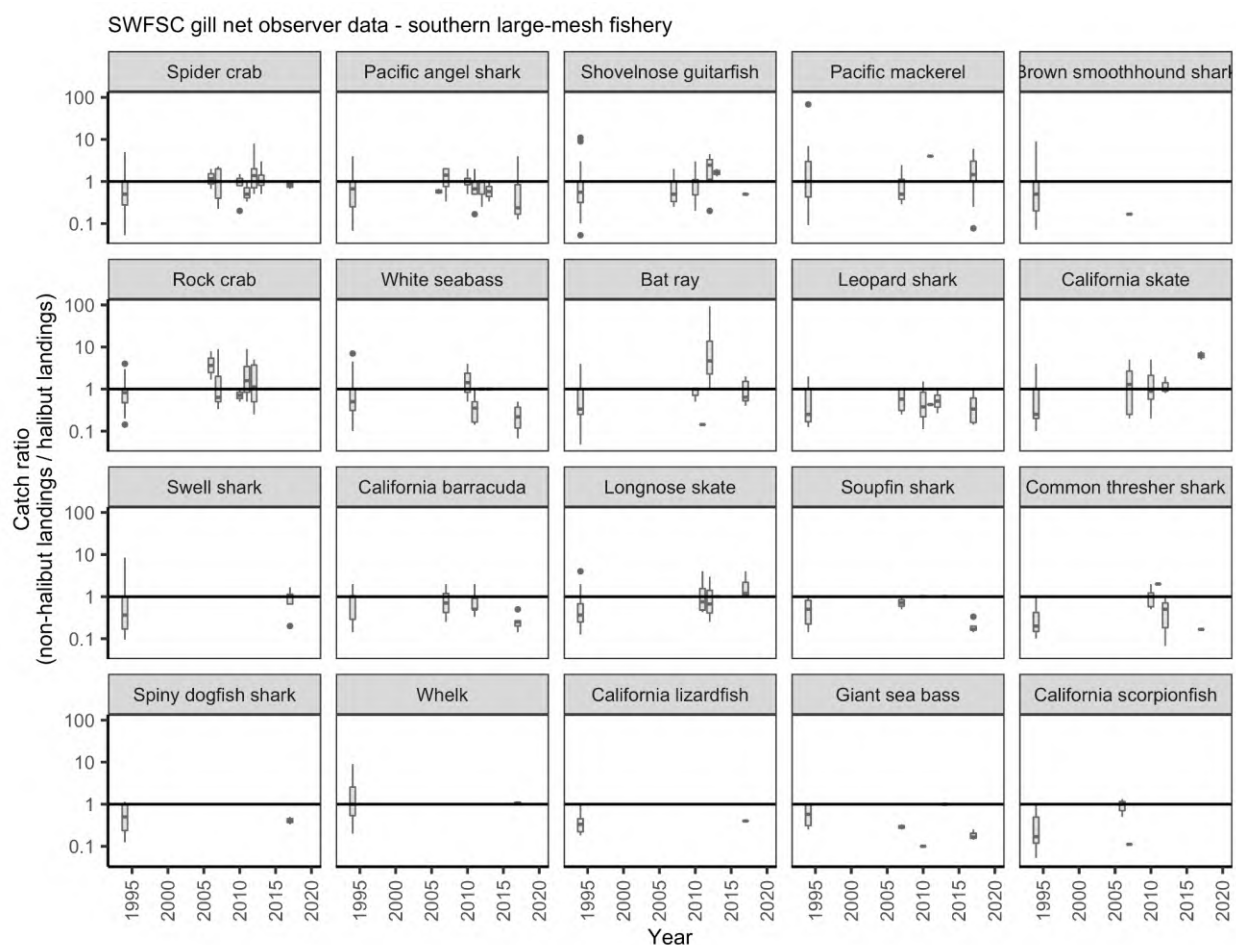


**Figure 17. Retained catch of giant sea bass associated with California halibut landings in the southern large-mesh set gill net fishery from 2000-2020 based on CDFW gill net logbook data.** In (A), the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers. In (B) and (C), points indicate individual gill net trips. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. In (D), color indicates the median catch ratio (non-halibut landings / halibut landings) of all gill net trips occurring in a block. In all plots, note the log-scale.

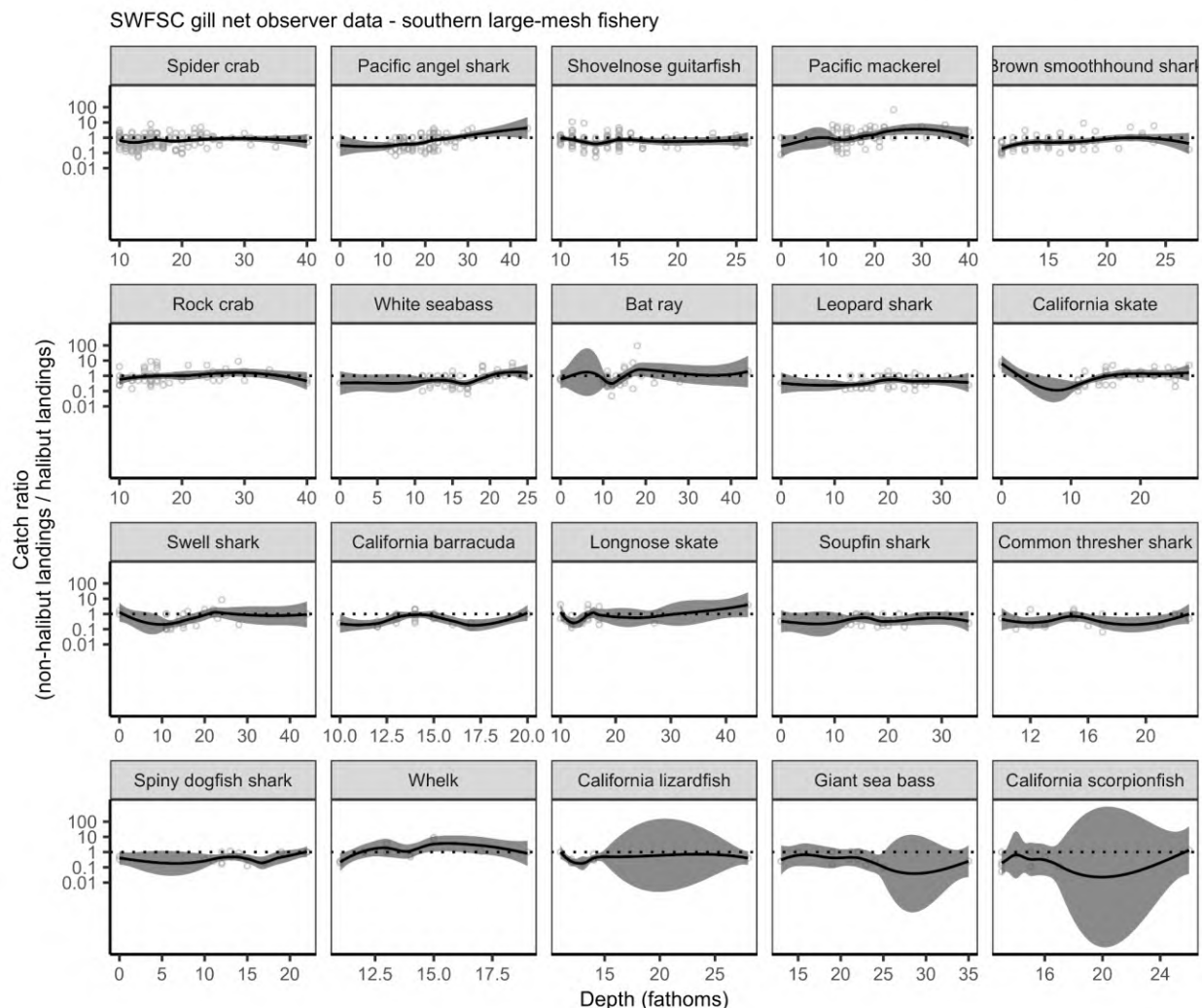
## Observers - SLMGN landings



**Figure 18. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 based on SWFSC gill net observer data.** Panel A shows how frequently a species occurred in gill net sets. Panel B shows the ratio of non-halibut landings to halibut landings in gill net sets. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).

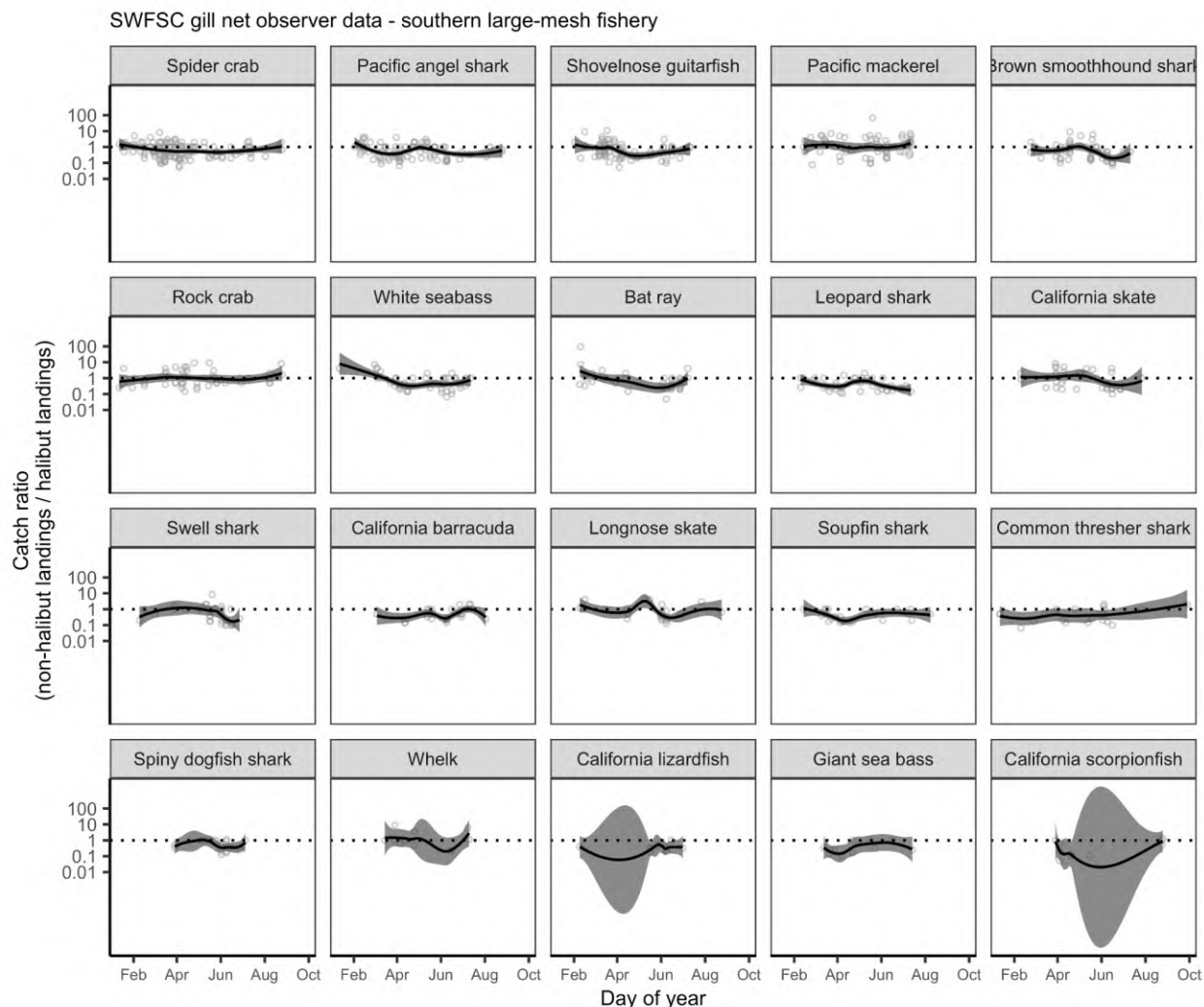


**Figure 19. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 based on SWFSC gill net observer data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency. The observer program was only active in 1994, 1999, 2000, 2006, 2007, 2009-2013, and 2017.



**Figure 20. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery as a function of depth from 1994-2017 based on SWFSC gill net observer data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

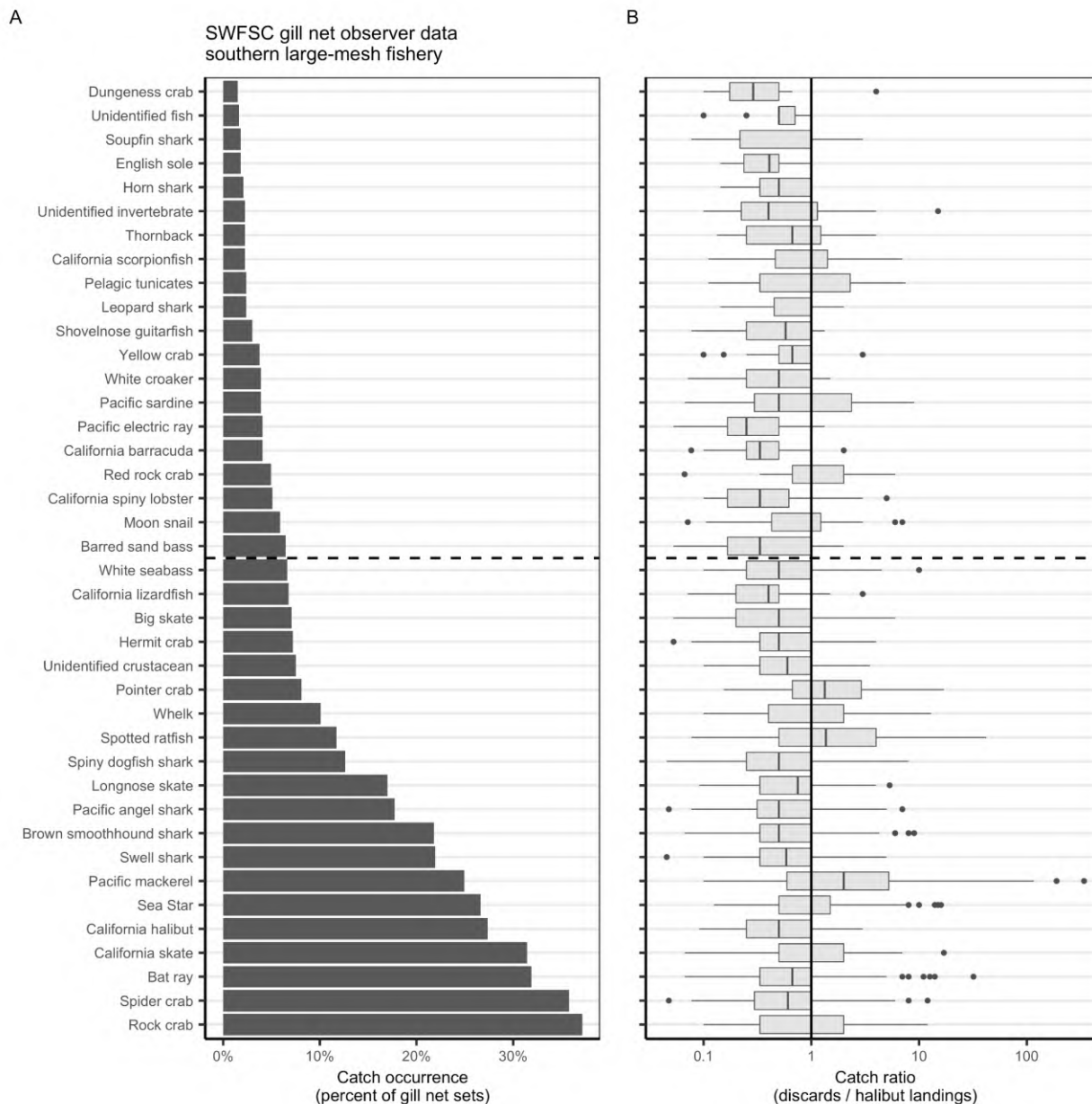




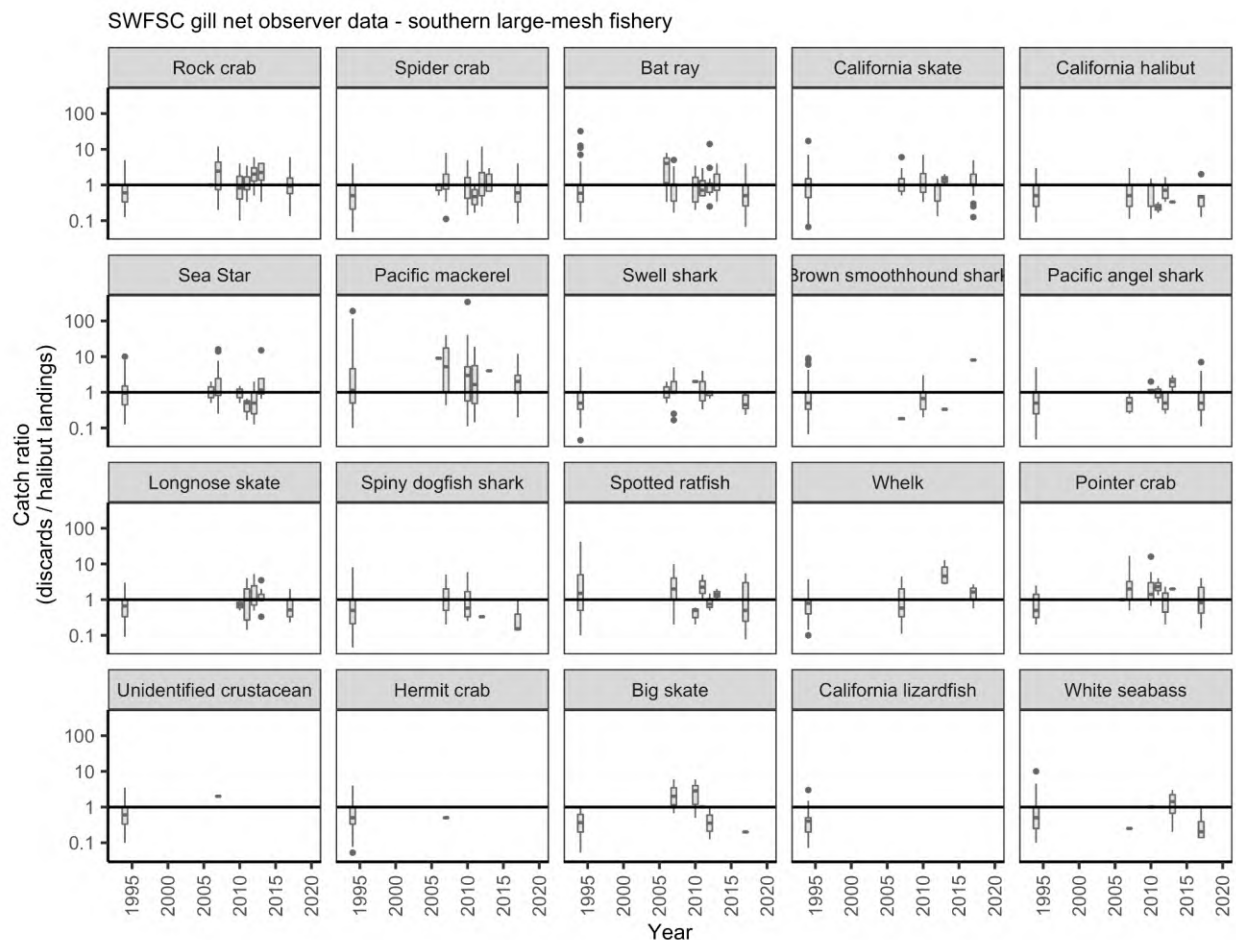
**Figure 21. Retained catch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery as a function of the day of year from 1994-2017 based on SWFSC gill net observer data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.



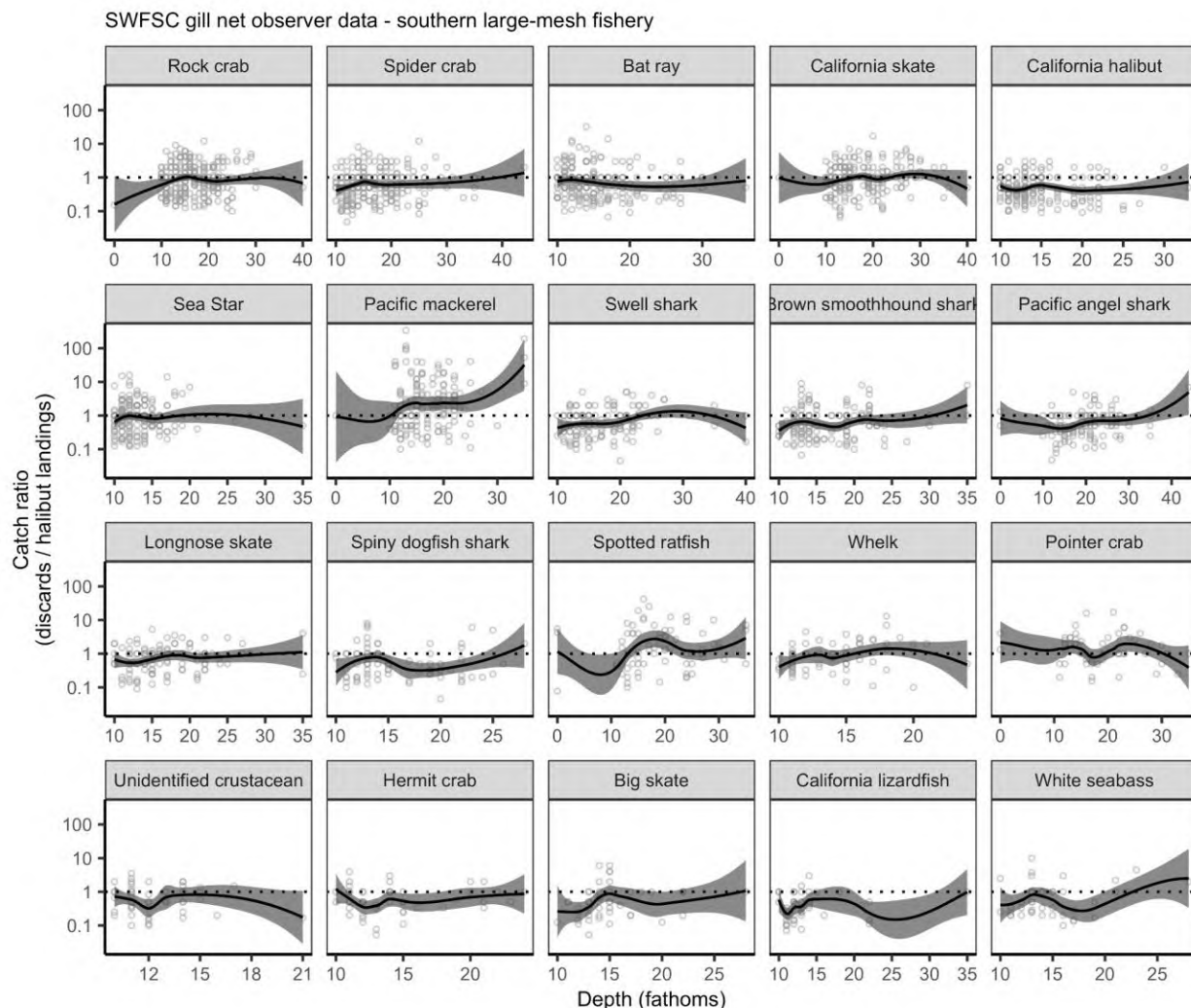
## Observers - SLMGN discards



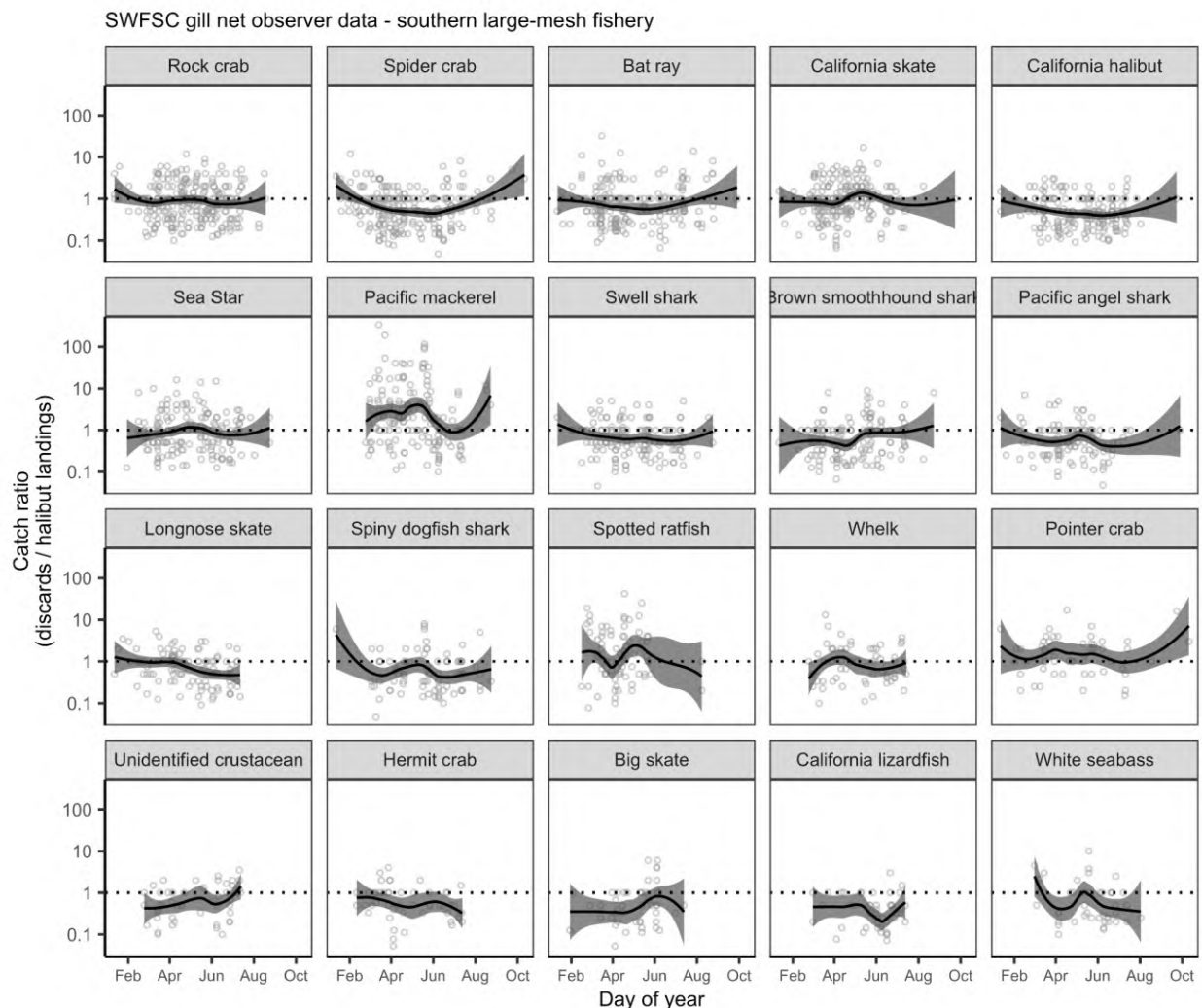
**Figure 22. Discarded bycatch (live and dead) in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 based on SWFSC gill net observer data.** Panel A shows how frequently a species occurred in gill net sets. Panel B shows the ratio of discarded bycatch to halibut landings in gill net sets. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).



**Figure 23. Discarded bycatch (live and dead) in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 based on SWFSC gill net observer data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency. The observer program was only active in 1994, 1999, 2000, 2006, 2007, 2009-2013, and 2017.

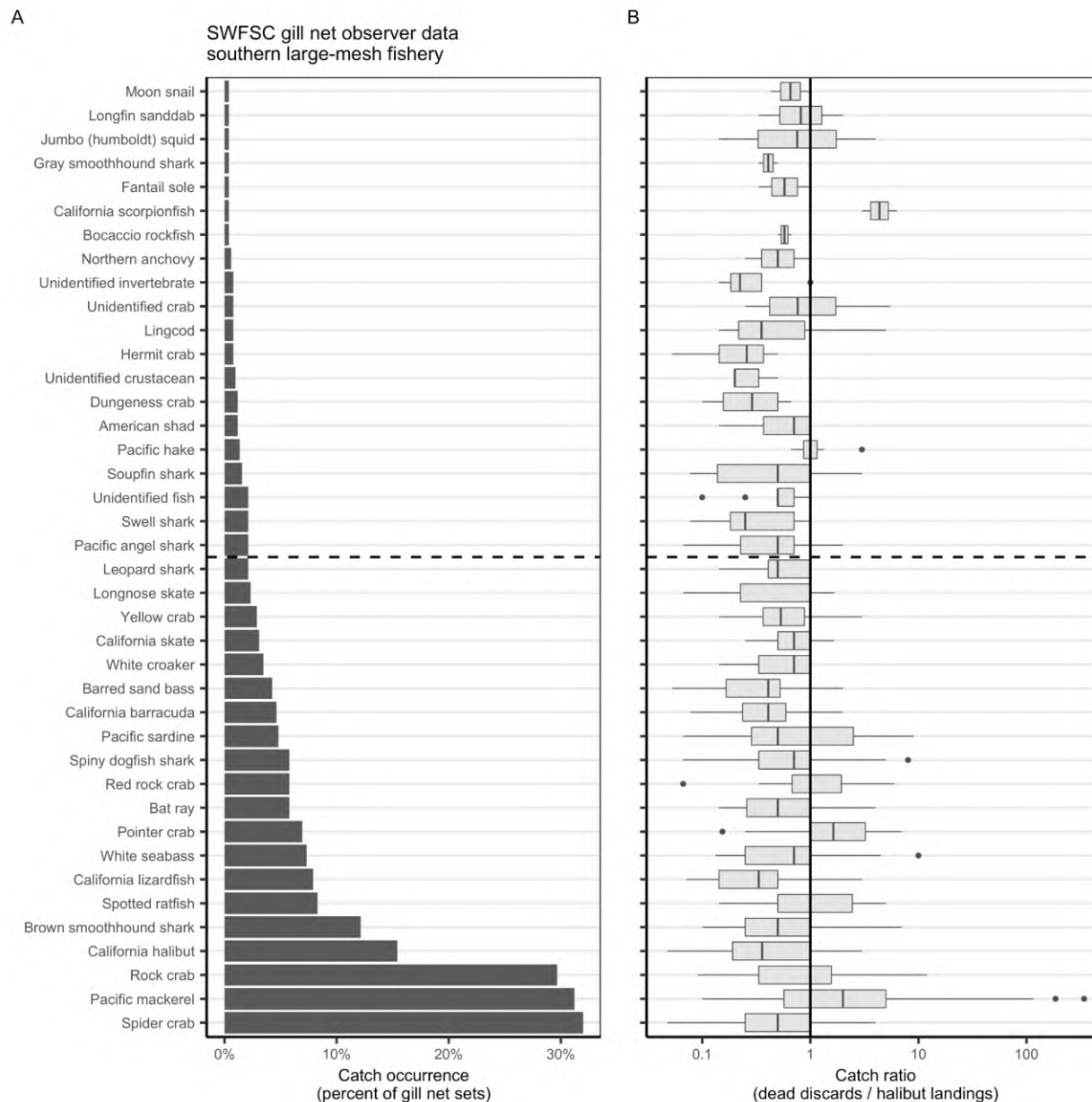


**Figure 24. Discarded bycatch (live and dead) in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery as a function of depth from 1994-2017 based on SWFSC gill net observer data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

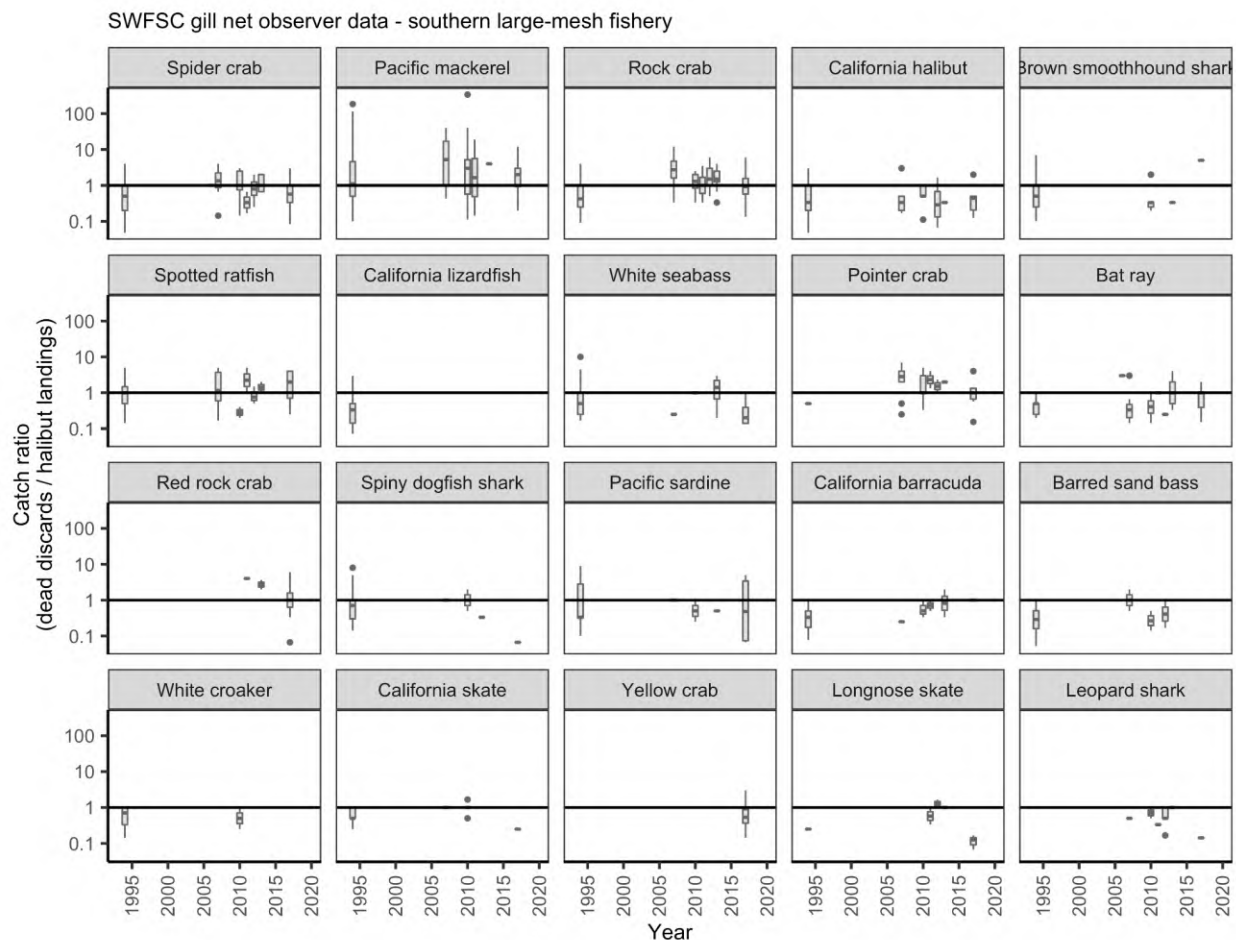


**Figure 25. Discarded bycatch (live and dead) in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery as a function of the day of year from 1994-2017 based on SWFSC gill net observer data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

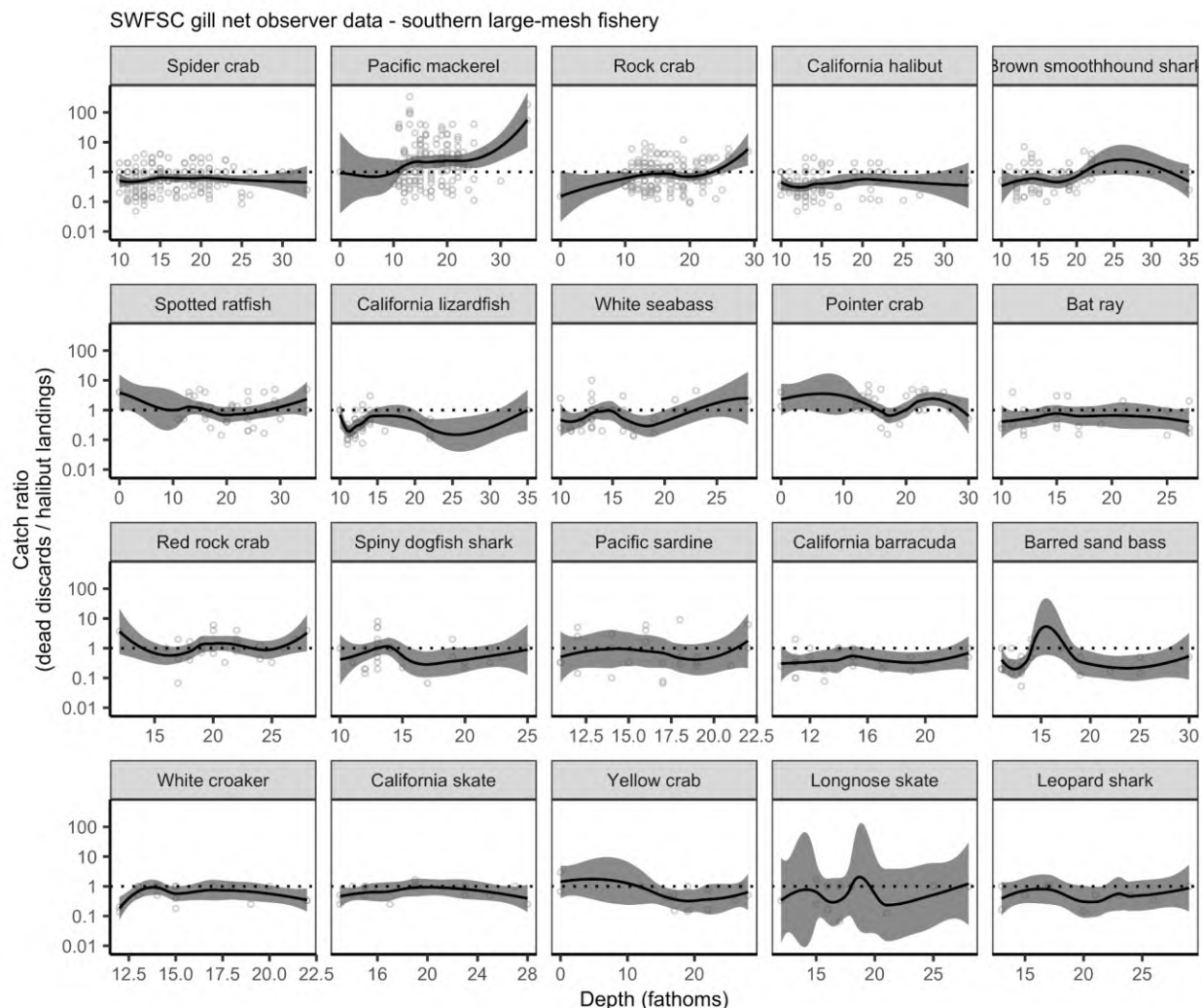
## Observers - SLMGN dead discards



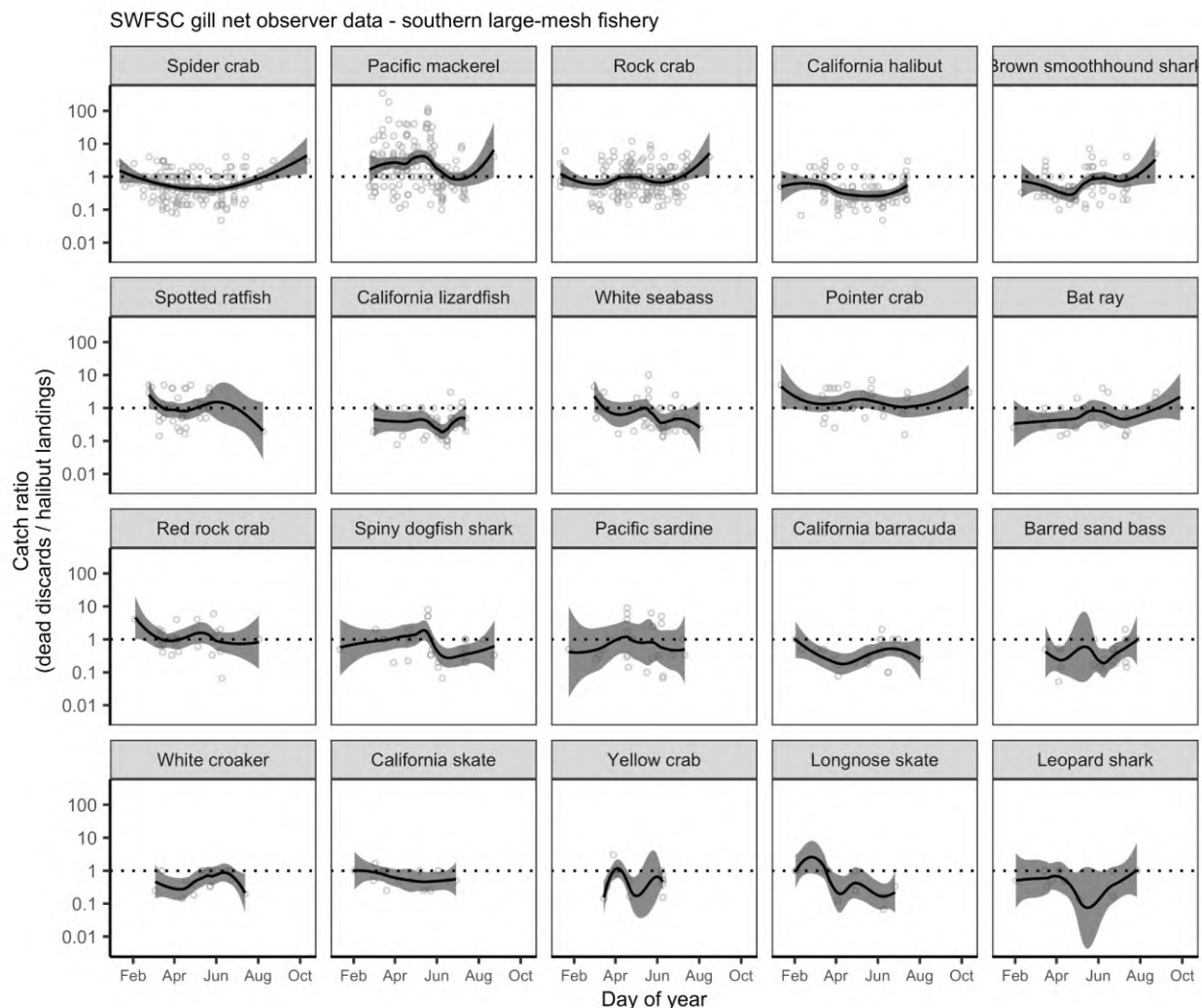
**Figure 26. Dead discarded bycatch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 based on SWFSC gill net observer data.** Panel A shows how frequently a species occurred in gill net sets. Panel B shows the ratio of dead discards to halibut landings in gill net sets. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).



**Figure 27. Dead discarded bycatch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 over time based on SWFSC gill net observer data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency. The observer program was only active in 1994, 1999, 2000, 2006, 2007, 2009-2013, and 2017.



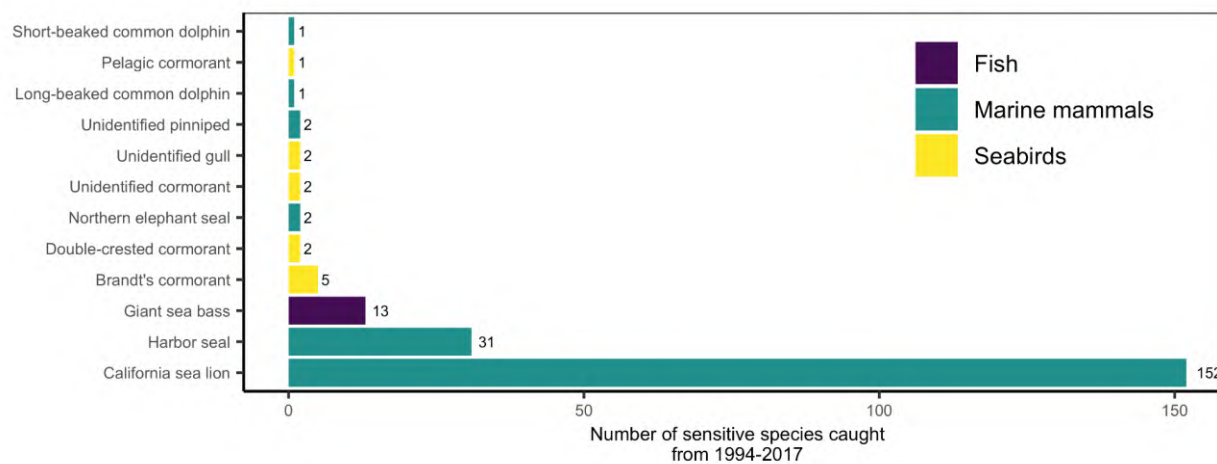
**Figure 28. Dead discarded bycatch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 as a function of depth based on SWFSC gill net observer data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.



**Figure 29. Dead discarded bycatch in commercial gill net sets targeting California halibut in the southern large-mesh gillnet fishery from 1994-2017 as a function of the day of year based on SWFSC gill net observer data.** Points indicate individual gill net sets. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

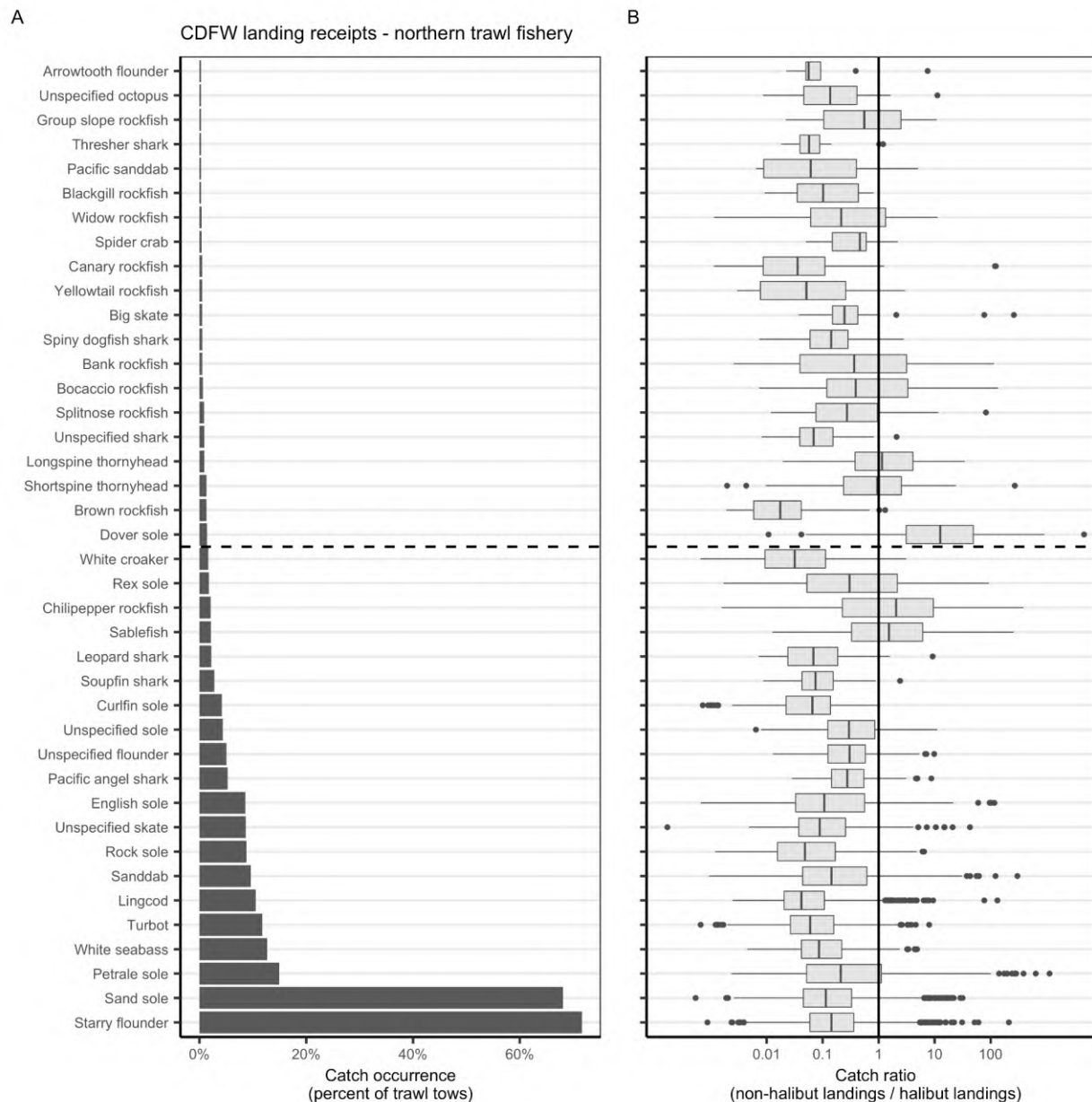


## Observers - SLMGN sensitive species

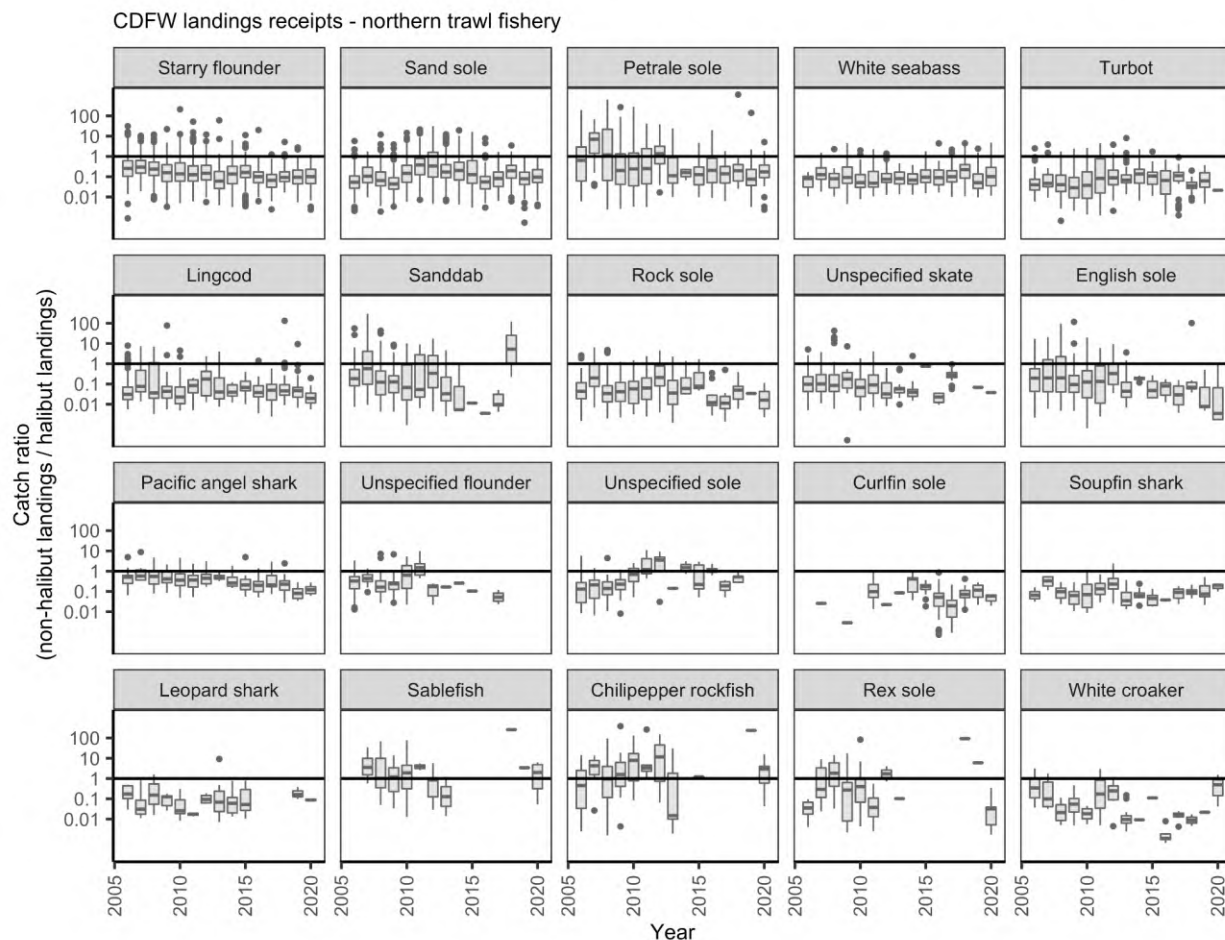


**Figure 30. The observed number of sensitive species caught in commercial gill net sets targeting California halibut in the southern large-mesh set gill net fishery from 1994-2017 based on SWFSC gill net observer data.** Note: this is the observed number of sensitive species in trips with observers, not an estimate of the total number caught.

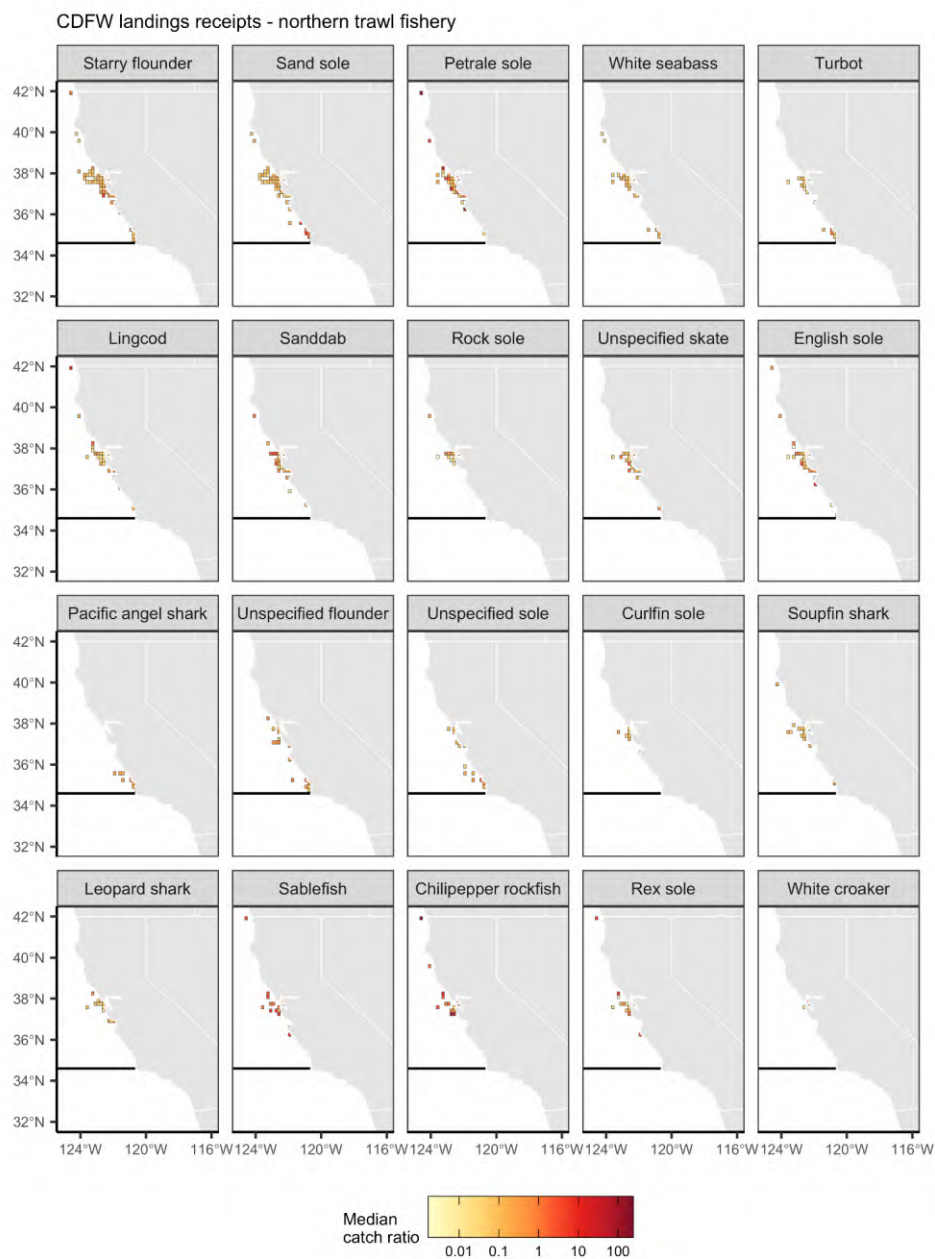
## Receipts - northern trawl



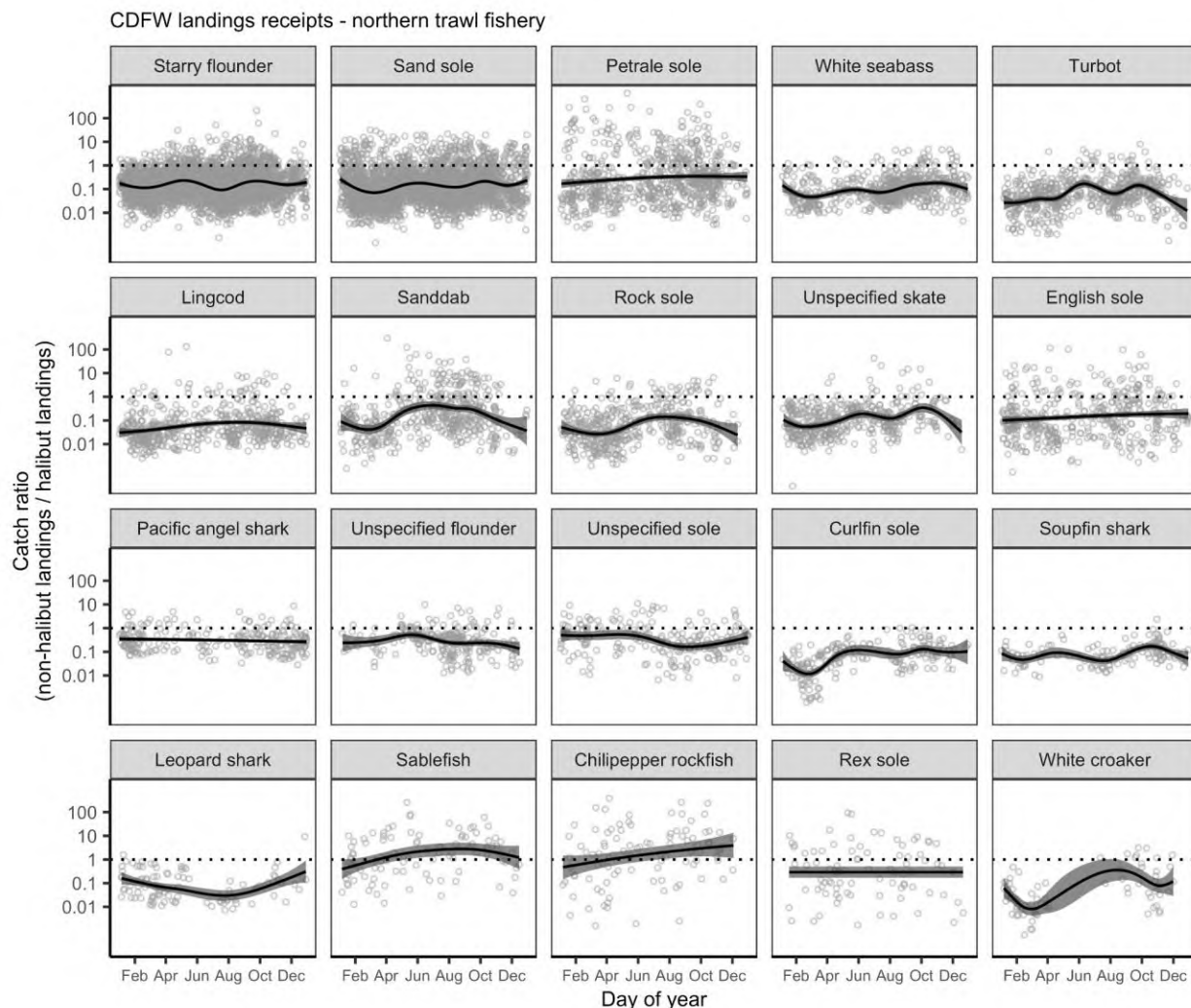
**Figure 31. Retained catch associated with California halibut landings in the northern trawl fishery from 2000-2021 based on CDFW landing receipts.** Panel A shows how frequently a species occurred in trawl trips. Panel B shows the ratio of retained bycatch to retained halibut catch in trawl trips. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).



**Figure 32. Retained catch associated with California halibut landings in the northern trawl fishery from 2000-2021 based on CDFW landing receipts.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.

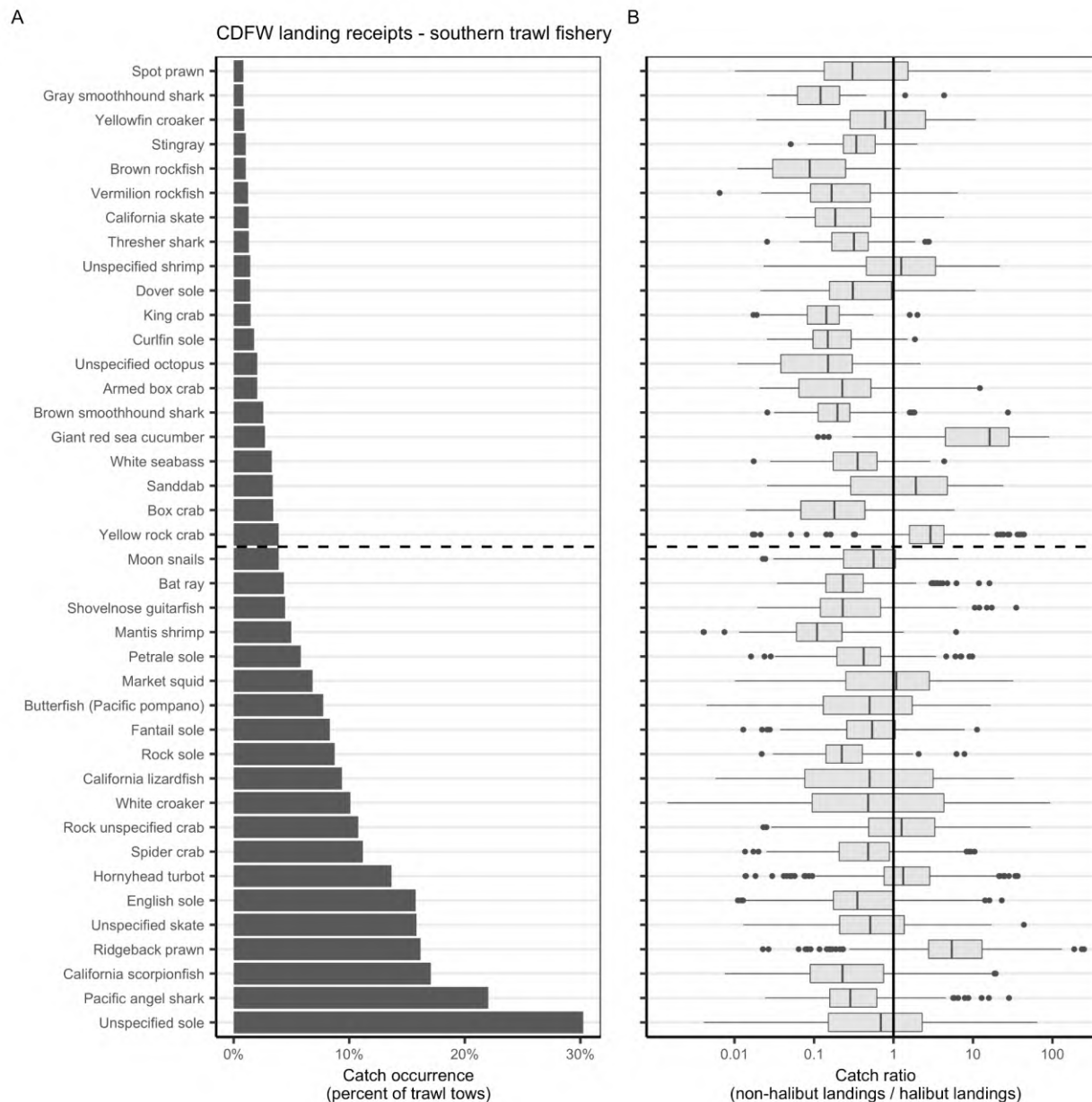


**Figure 33. Retained catch associated with California halibut landings in the northern trawl fishery by fishing block from 2000-2021 based on CDFW landing receipts.** Color indicates the median catch ratio (non-halibut landings / halibut landings) of all trawl trips occurring in a block; note the log-scale in the color bar. The horizontal line indicates Point Arguello. The top-20 most frequently landed species are shown in order of decreasing frequency.

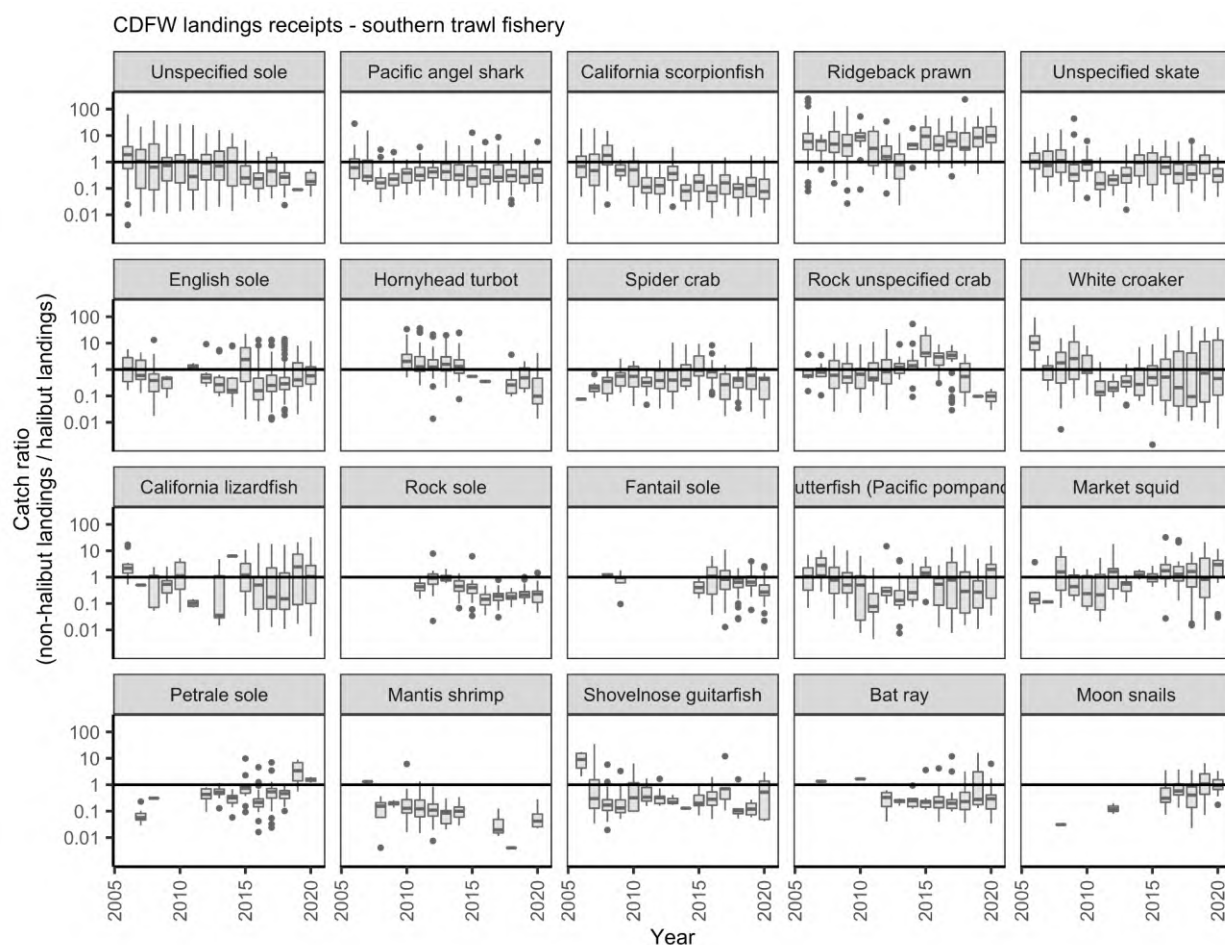


**Figure 34. Retained catch associated with California halibut landings in the northern trawl fishery as a function of the day of year from 2000-2021 based on CDFW landing receipts.** Points indicate individual trawl trips. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

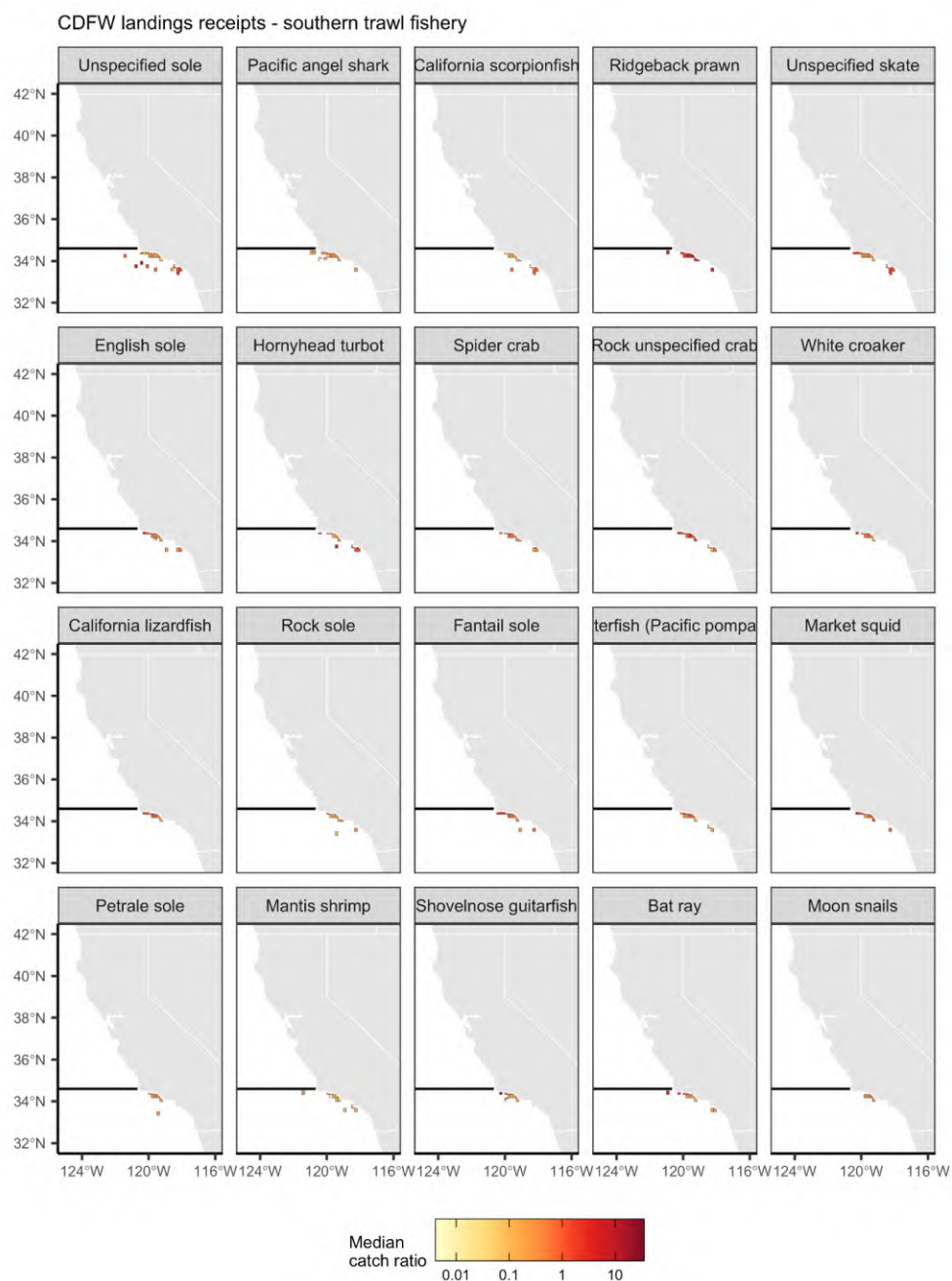
## Receipts - southern trawl



**Figure 35. Retained catch associated with California halibut landings in the southern trawl fishery from 2000-2021 based on CDFW landing receipts.** Panel A shows how frequently a species occurred in trawl trips. Panel B shows the ratio of retained bycatch to retained halibut catch in trawl trips. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).

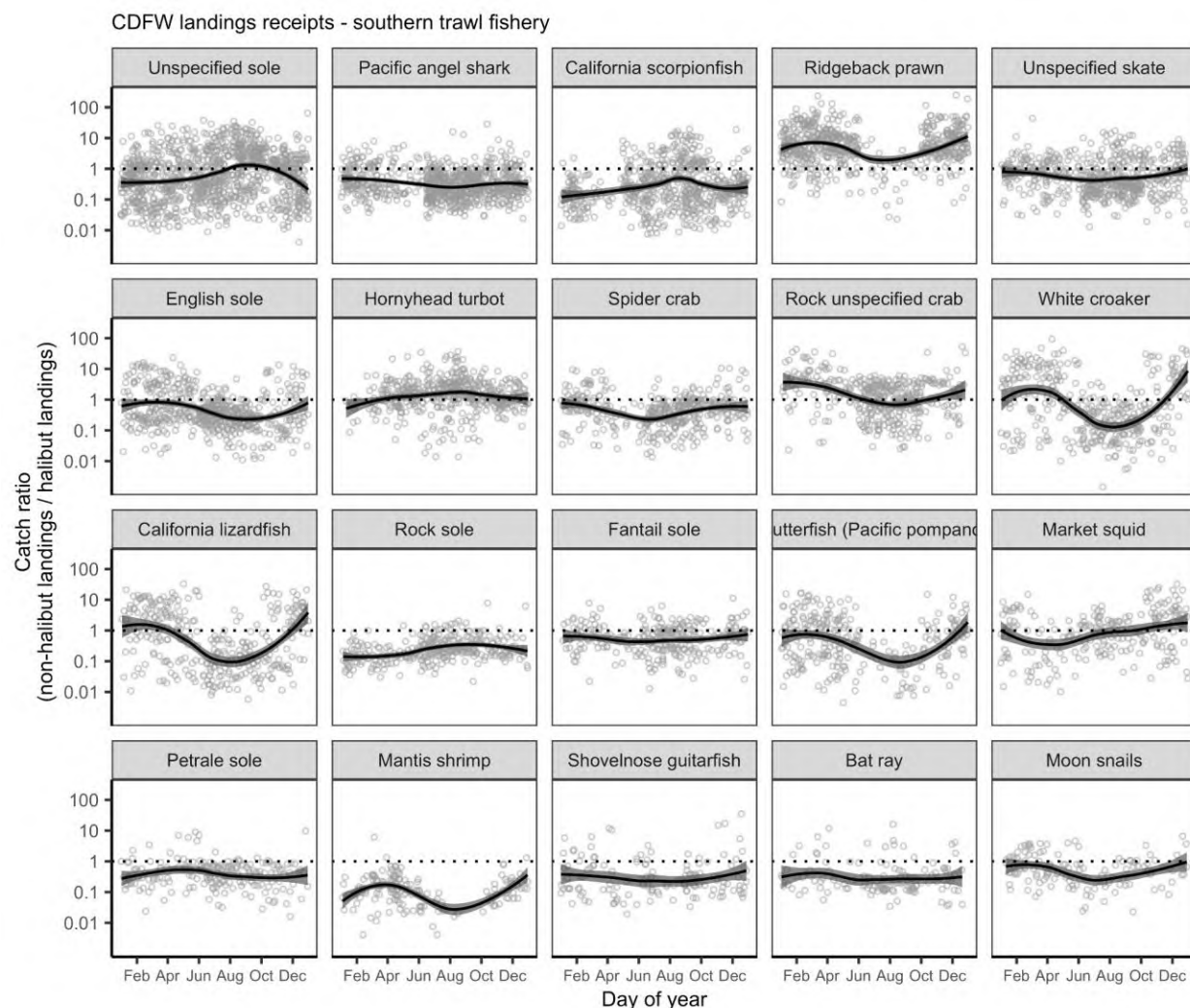


**Figure 36. Retained catch associated with California halibut landings in the southern trawl fishery from 2000-2021 based on CDFW landing receipts.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.



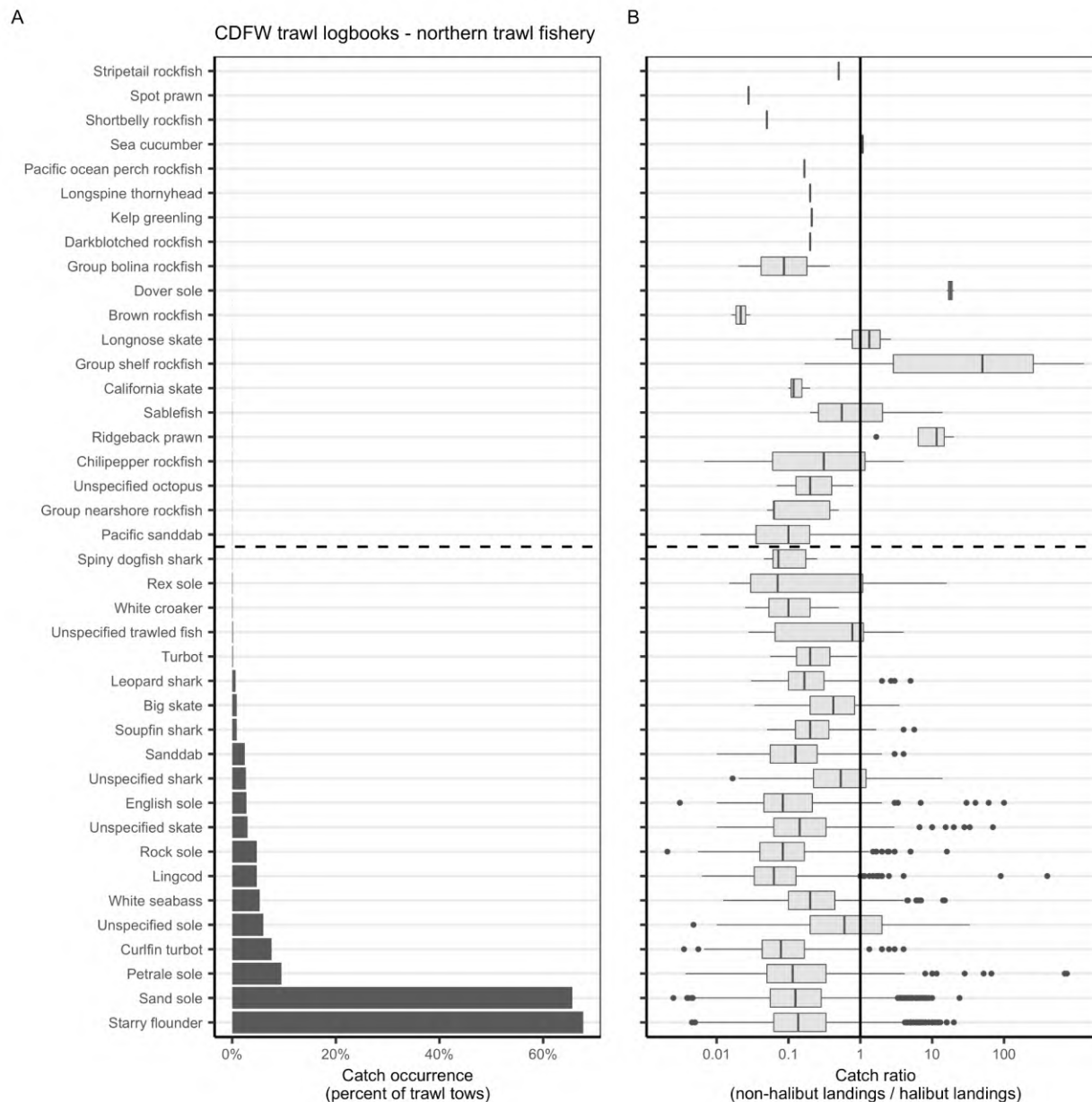
**Figure 37. Retained catch associated with California halibut landings in the southern trawl fishery by fishing block from 2000-2021 based on CDFW landing receipts.** Color indicates the median catch ratio (non-halibut landings / halibut landings) of all trawl trips occurring in a block; note the log-scale in the color bar. The horizontal line indicates Point Arguello. The top-20 most frequently landed species are shown in order of decreasing frequency.



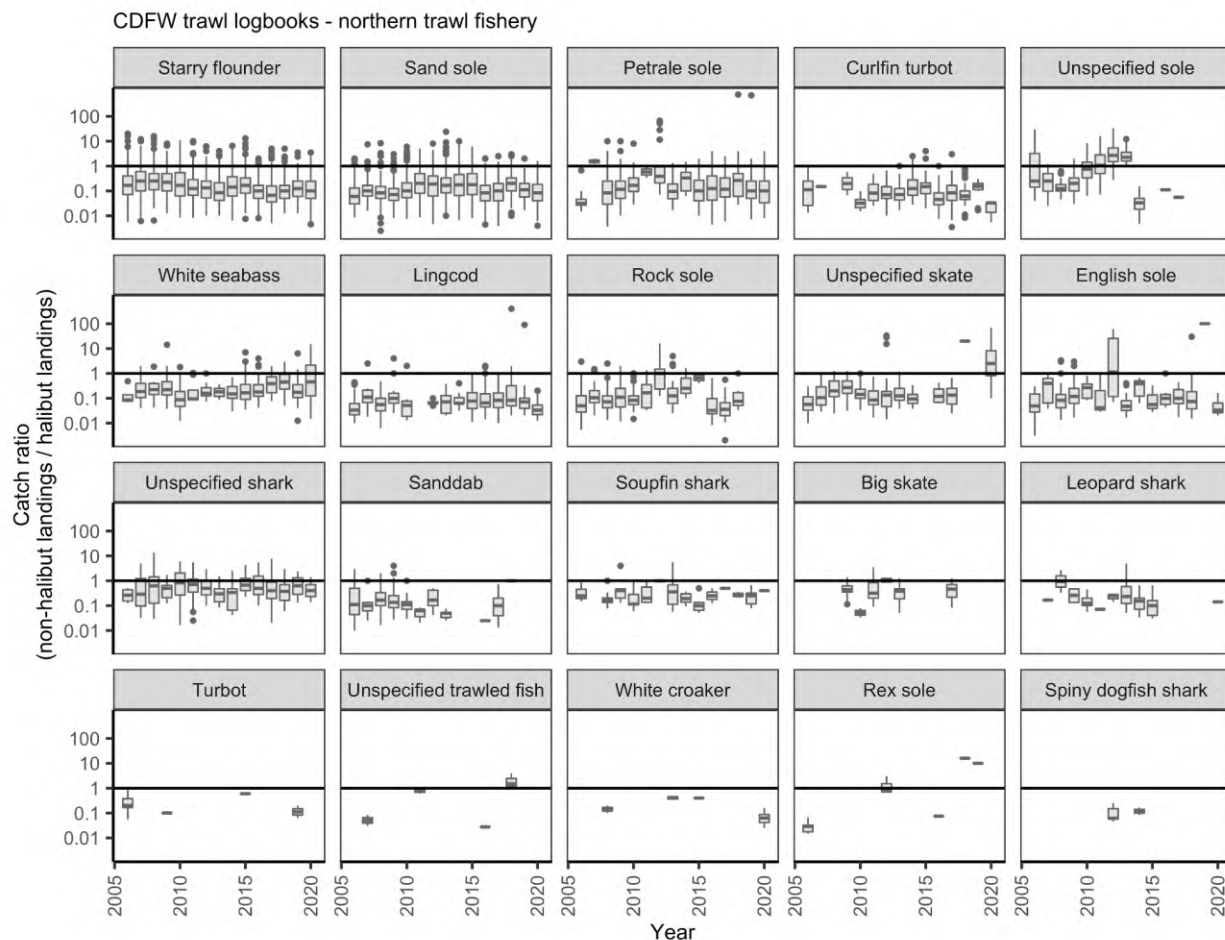


**Figure 38. Retained catch associated with California halibut landings in the southern trawl fishery as a function of the day of year from 2000-2021 based on CDFW landing receipts.** Points indicate individual trawl trips. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

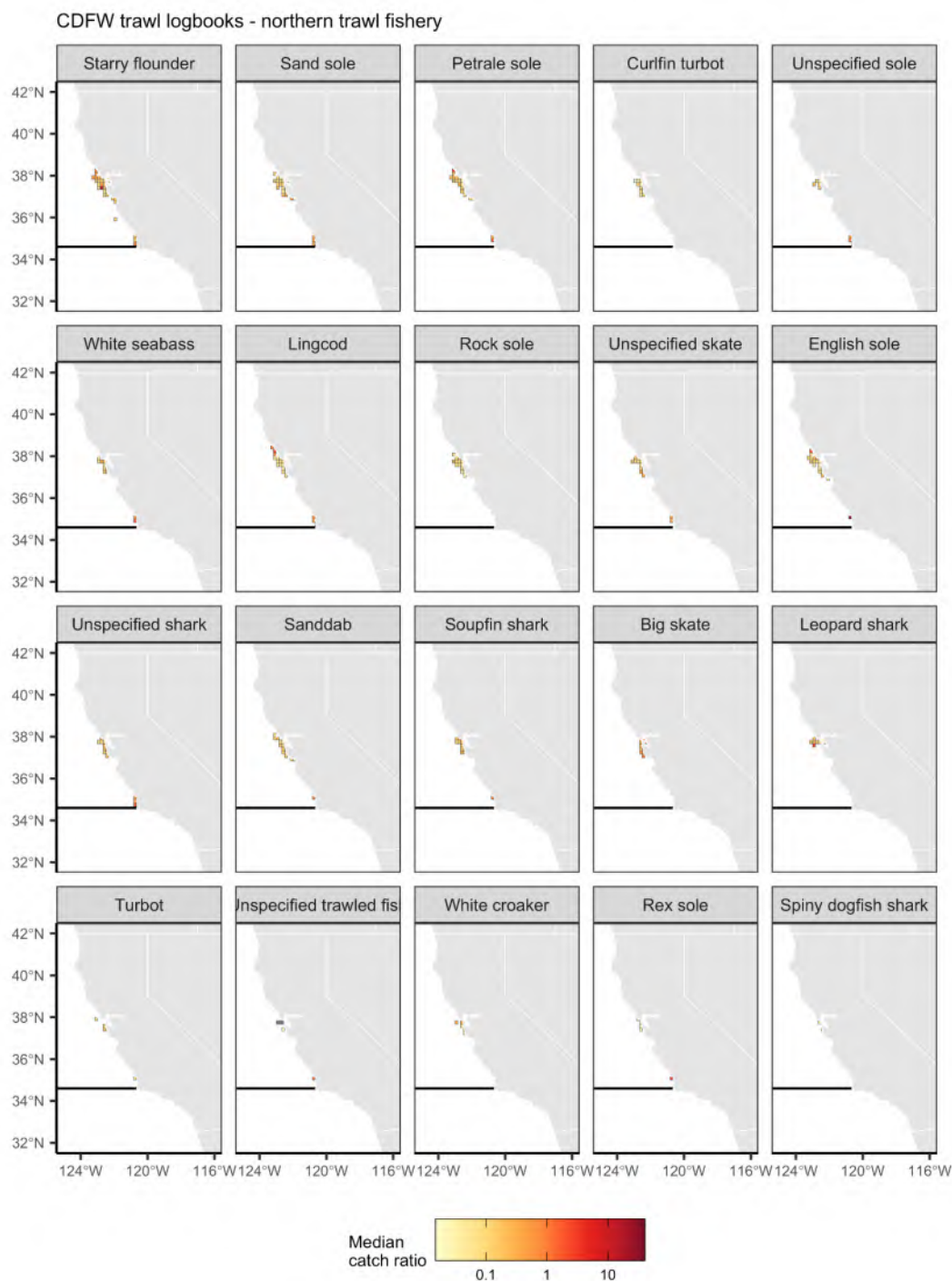
## Logbooks - northern trawl



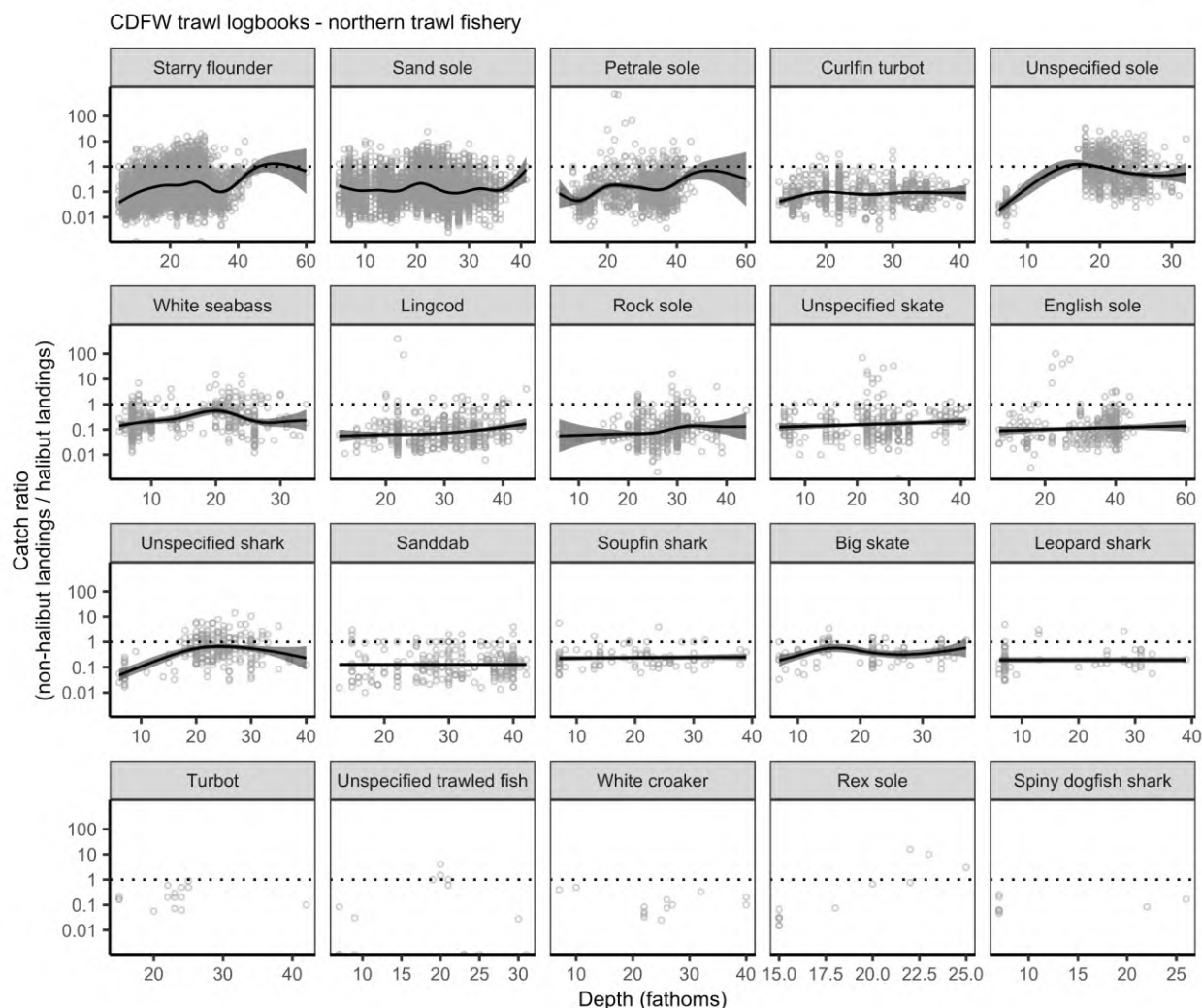
**Figure 39. Retained catch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2000-2021 based on CDFW trawl logbook data.** Panel A shows how frequently a species occurred in trawl tows. Panel B shows the ratio of non-halibut landings to halibut landings in trawl tows. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).



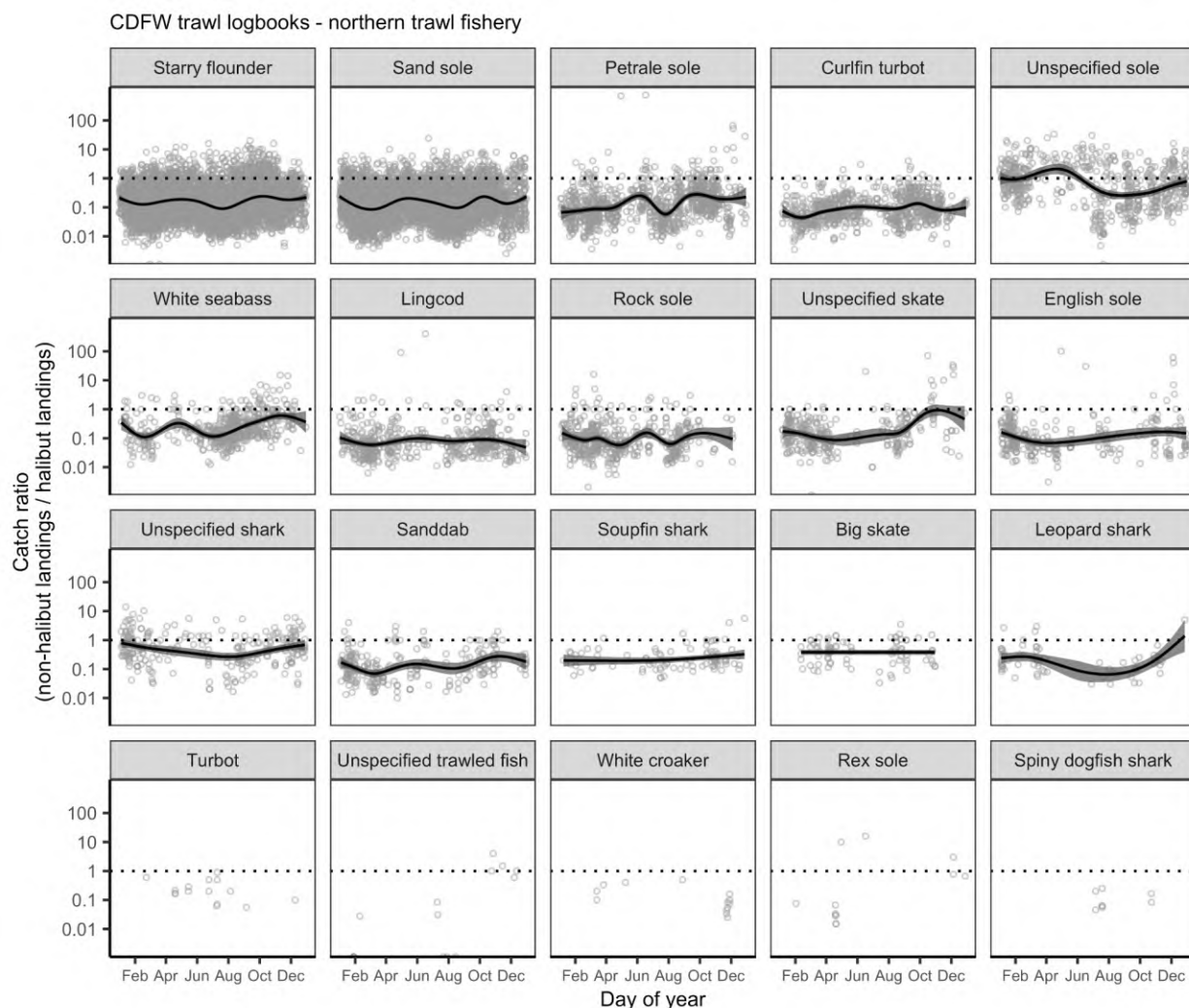
**Figure 40. Retained catch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2000-2021 based on CDFW trawl logbook data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.



**Figure 41. Retained catch in commercial trawl tows targeting California halibut in the northern trawl fishery by commercial fishing block from 2000-2021 based on CDFW trawl logbook data.** Color indicates the median catch ratio (non-halibut landings / halibut landings) of all trawl tows occurring in the block; note the log-scale in the color bar. The horizontal line indicates Point Arguello. The top-20 most frequently landed species are shown in order of decreasing frequency.

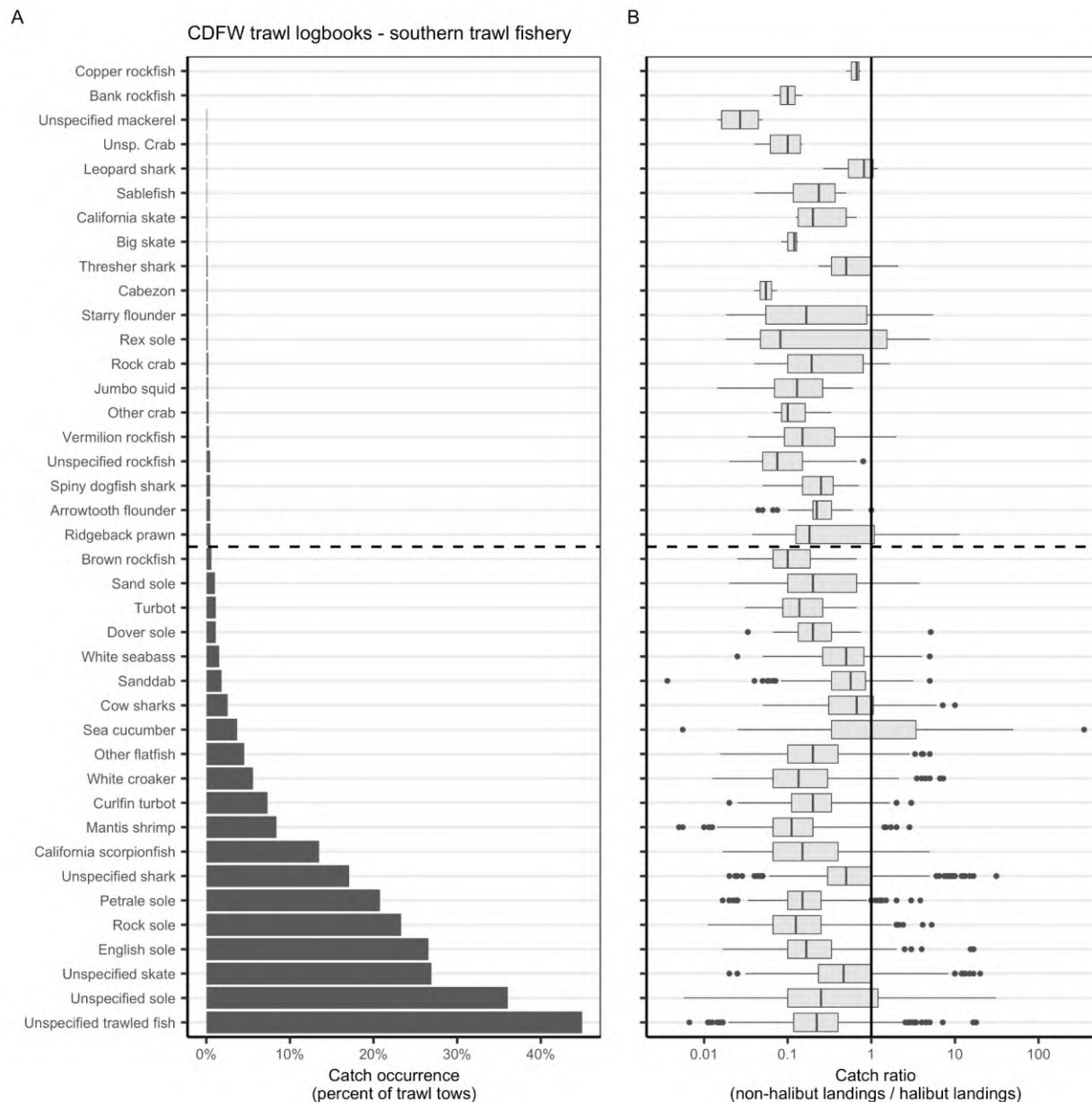


**Figure 42. Retained catch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2000-2021 as a function of depth based on CDFW trawl logbook data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

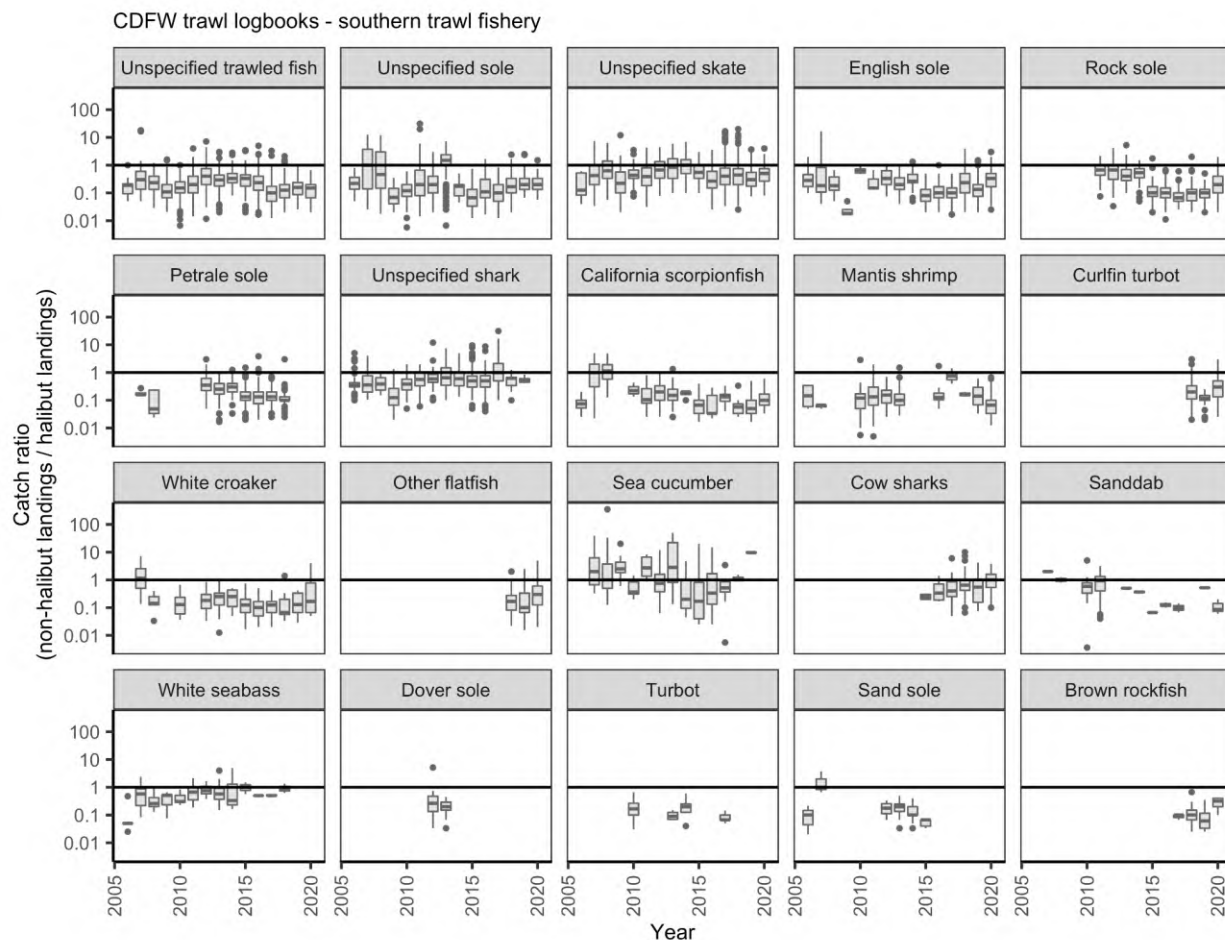


**Figure 43. Retained catch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2000-2021 as a function of the day of year based on CDFW trawl logbook data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

## Logbooks - southern trawl

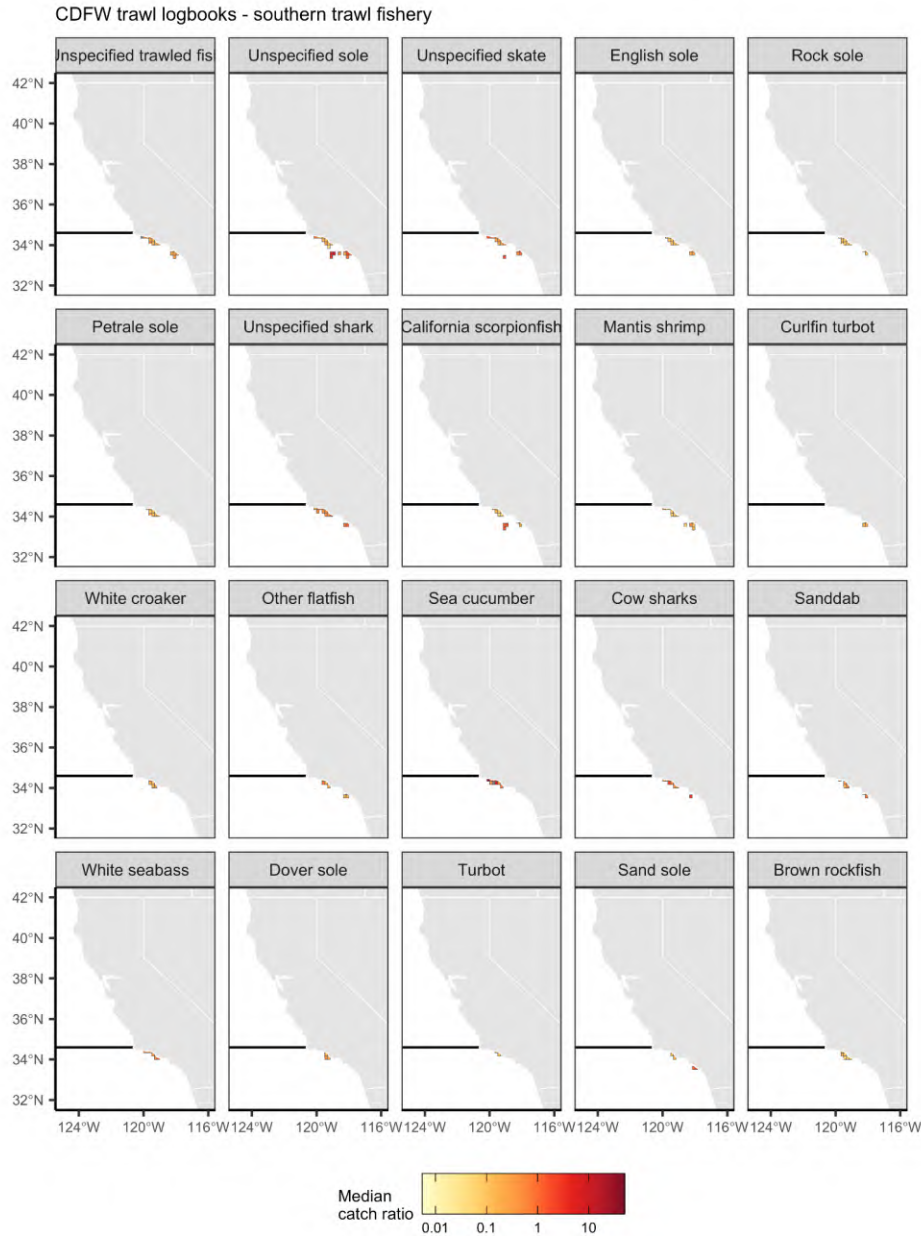


**Figure 44. Retained catch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2000-2021 based on CDFW trawl logbook data.** Panel A shows how frequently a species occurred in trawl tows. Panel B shows the ratio of non-halibut landings to halibut landings in trawl tows. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).

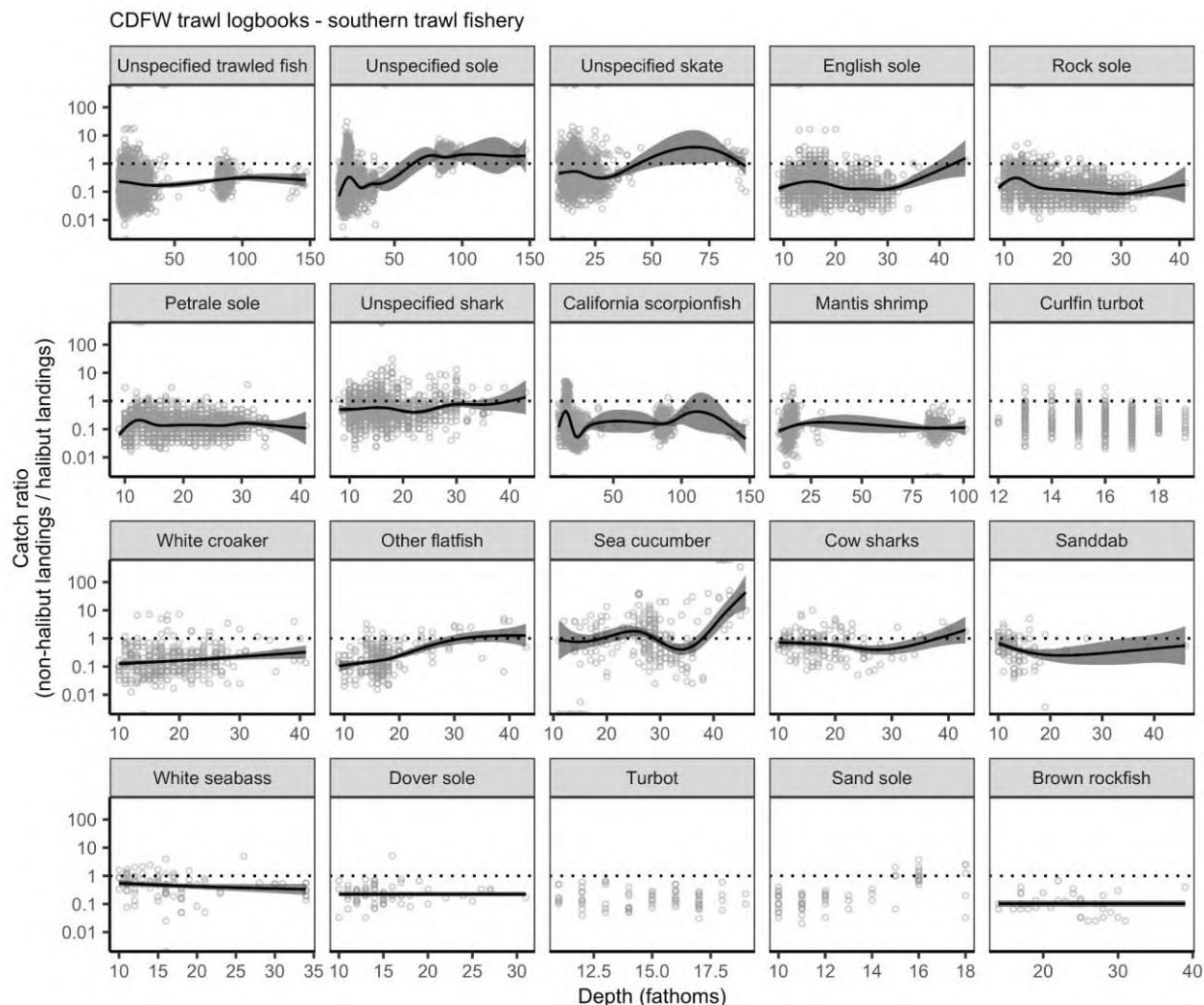


**Figure 45. Retained catch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2000-2021 based on CDFW trawl logbook data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.

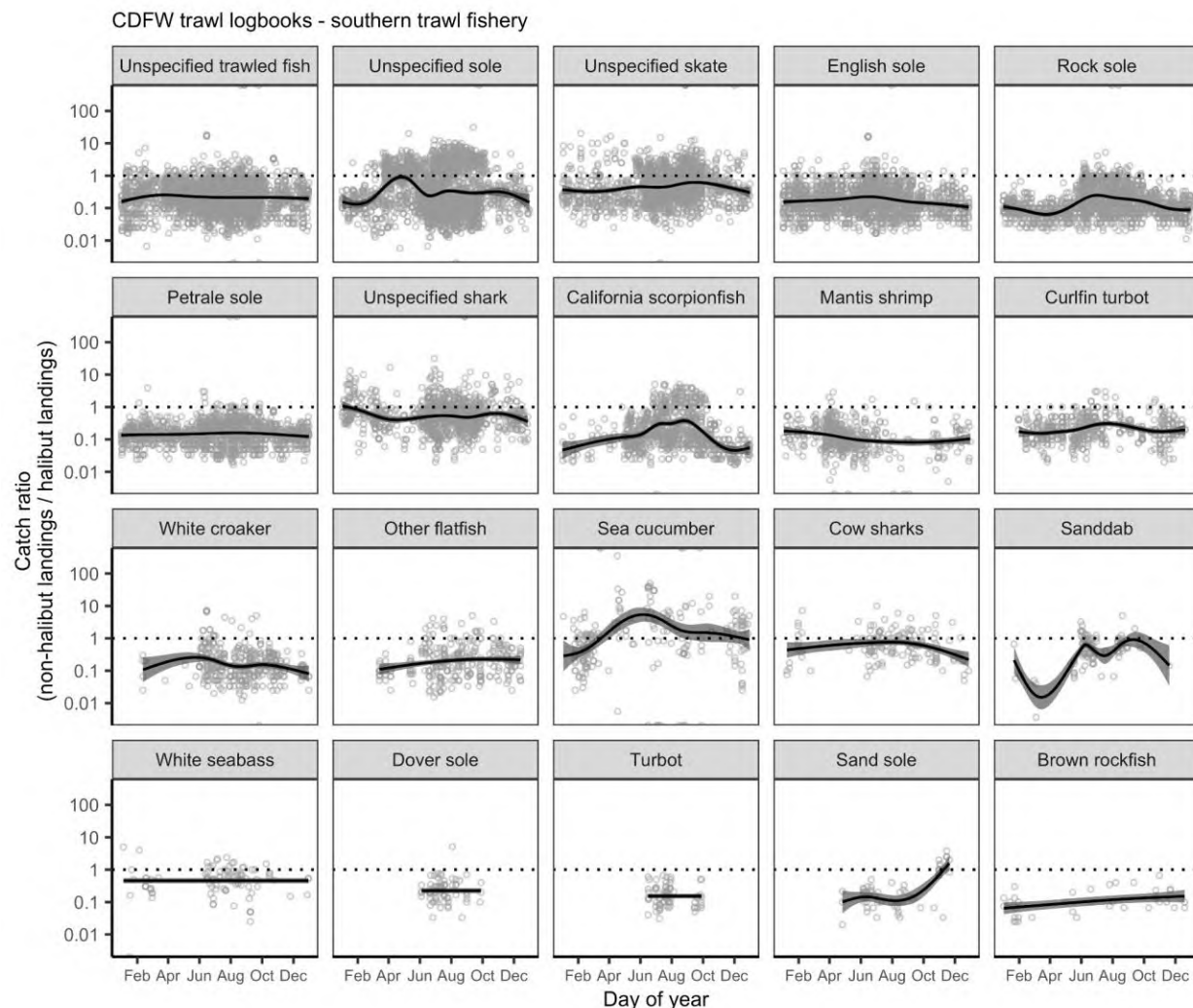




**Figure 46. Retained catch in commercial trawl tows targeting California halibut in the southern trawl fishery by commercial fishing block from 2000-2021 based on CDFW trawl logbook data.** Color indicates the median catch ratio (non-halibut landings / halibut landings) of all trawl tows occurring in the block; note the log-scale in the color bar. The horizontal line indicates Point Arguello. The top-20 most frequently landed species are shown in order of decreasing frequency.

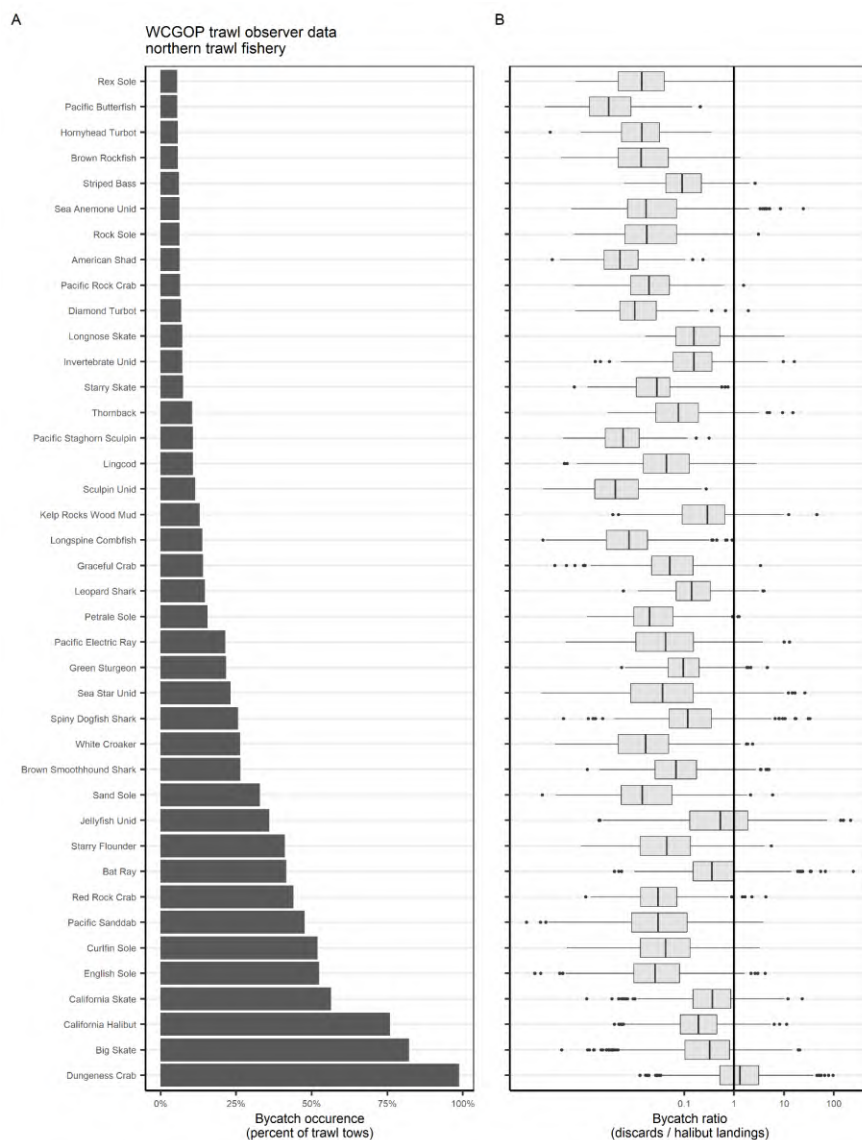


**Figure 47. Retained catch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2000-2021 as a function of depth based on CDFW trawl logbook data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

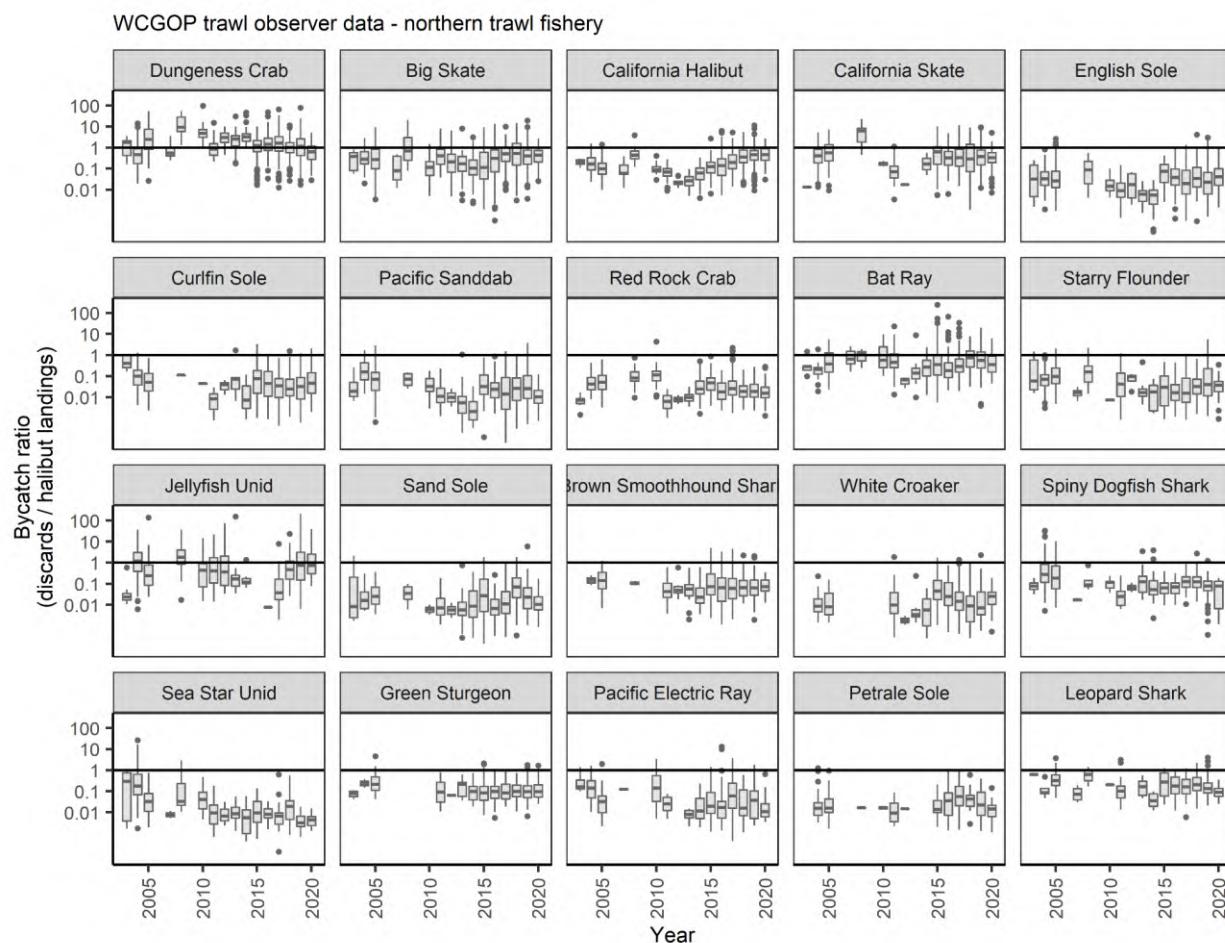


**Figure 48. Retained catch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2000-2021 as a function of the day of year based on CDFW trawl logbook data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

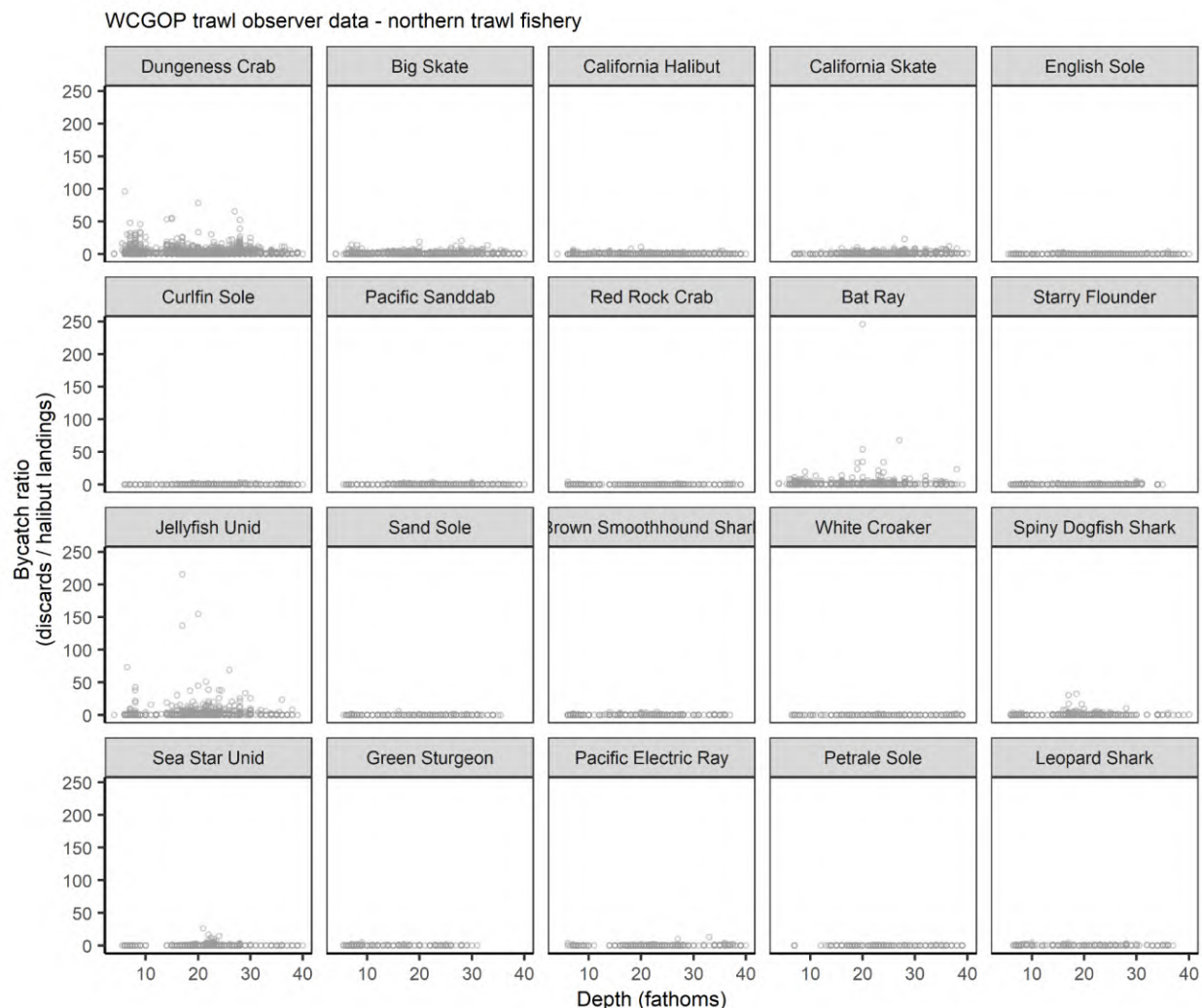
## Observers - northern trawl



**Figure 49. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2003-2020 based on WCGOP trawl observer data.** Panel A shows how frequently a species occurred in trawl tows. Panel B shows the ratio of discarded bycatch to halibut landings in trawl tows. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).

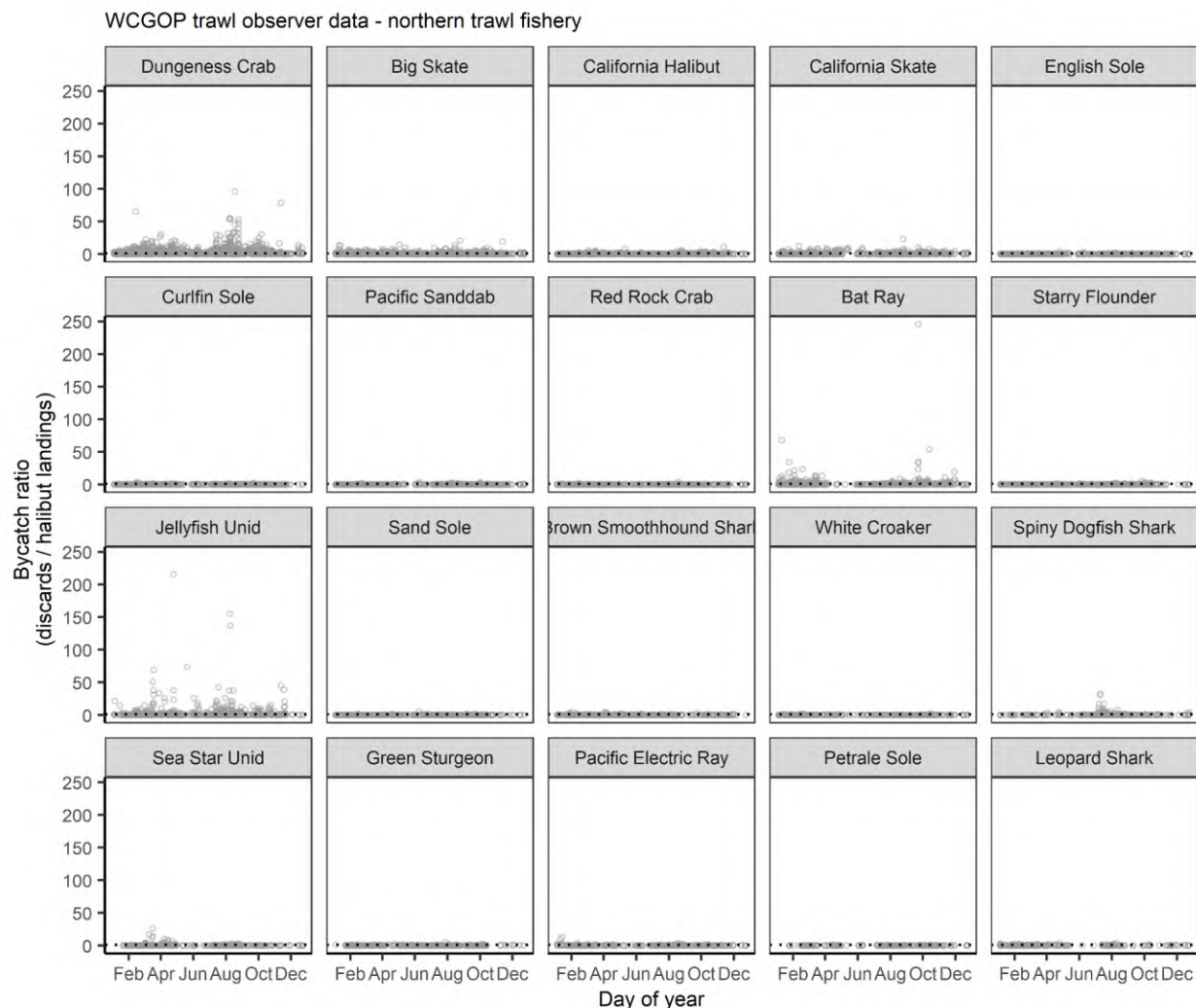


**Figure 50. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery from 2003-2020 based on WCGOP trawl observer data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.



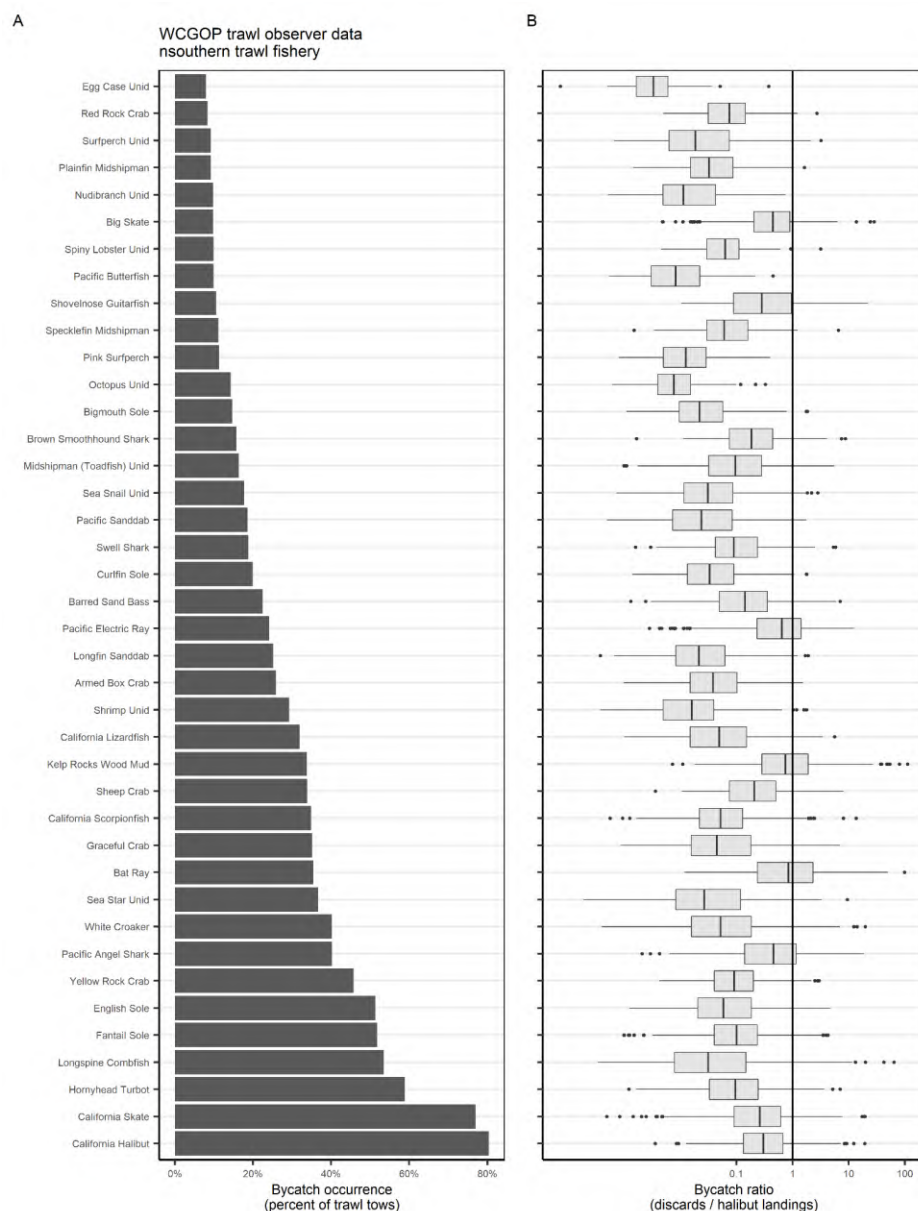
**Figure 51. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery as a function of depth from 2003-2020 based on WCGOP trawl observer data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.





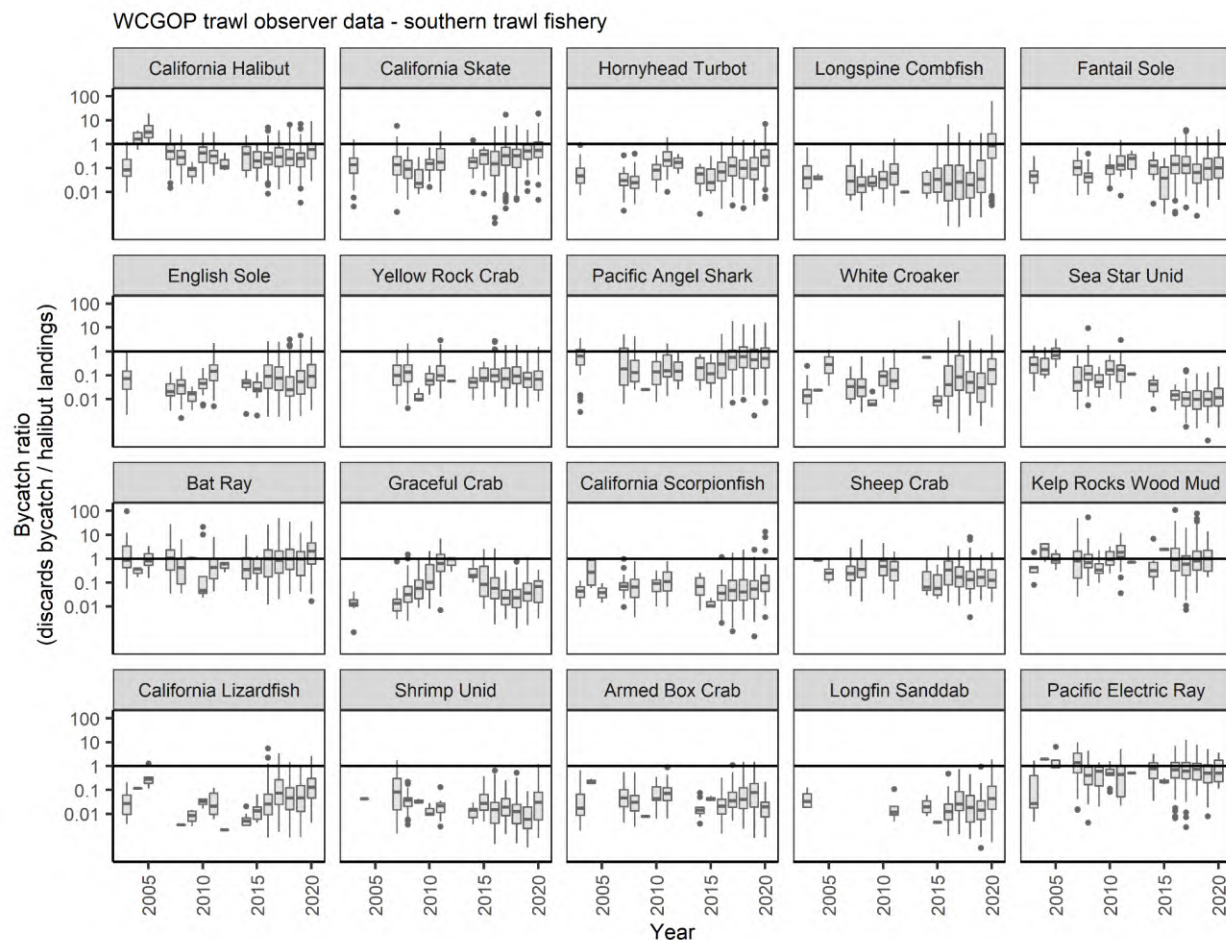
**Figure 52. Discarded bycatch in commercial trawl tows targeting California halibut in the northern trawl fishery as a function of the day of year from 2003-2020 based on WCGOP trawl observer data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

## Observers - southern trawl

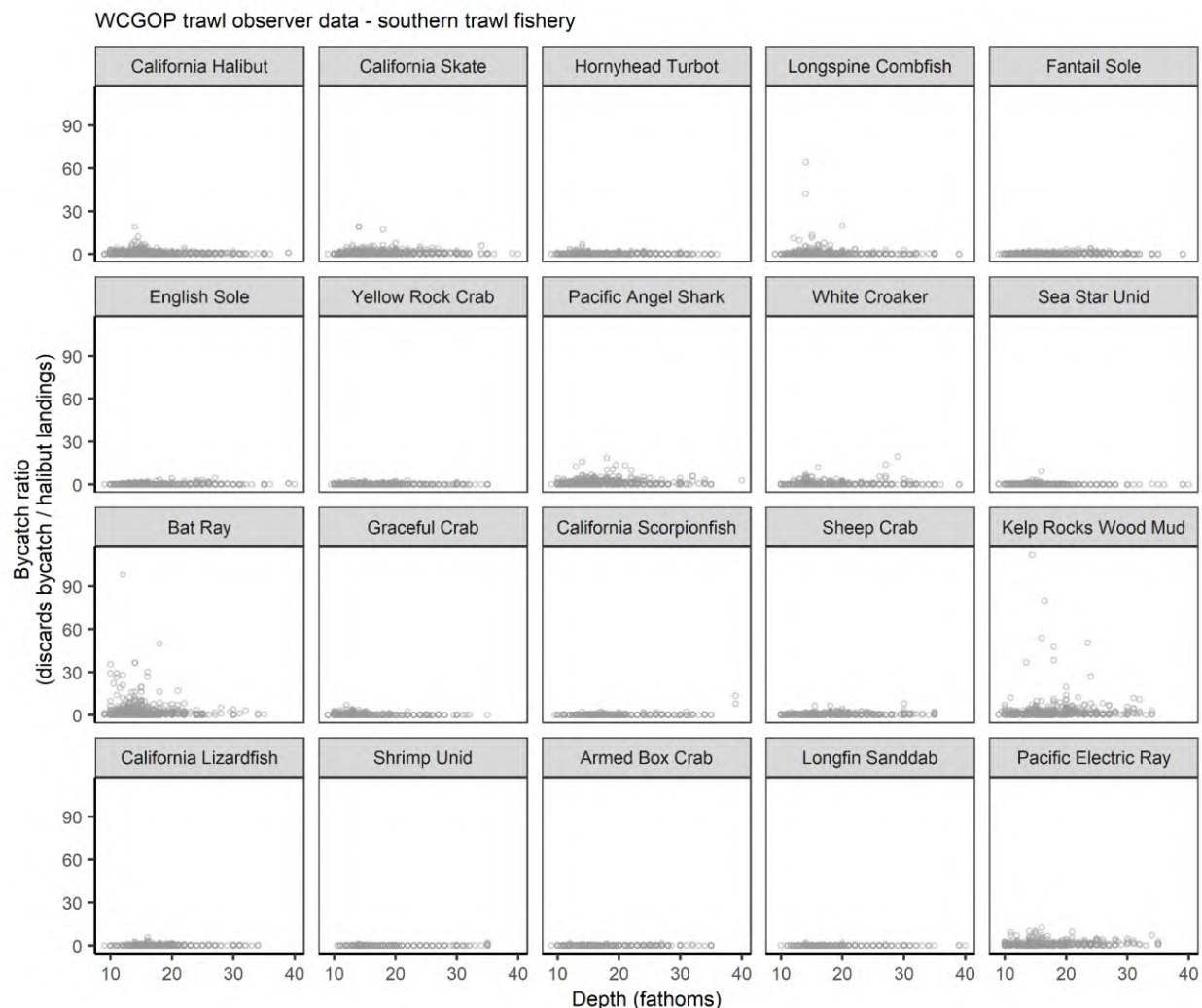


**Figure 53. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2003-2020 based on WCGOP trawl observer data.** Panel A shows how frequently a species occurred in trawl tows. Panel B shows the ratio of discarded bycatch to halibut landings in trawl tows. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. Only the top-40 most frequently landed species are shown. The remaining analysis of this dataset focuses on the top-20 most frequently landed species (marked by the dashed horizontal line).

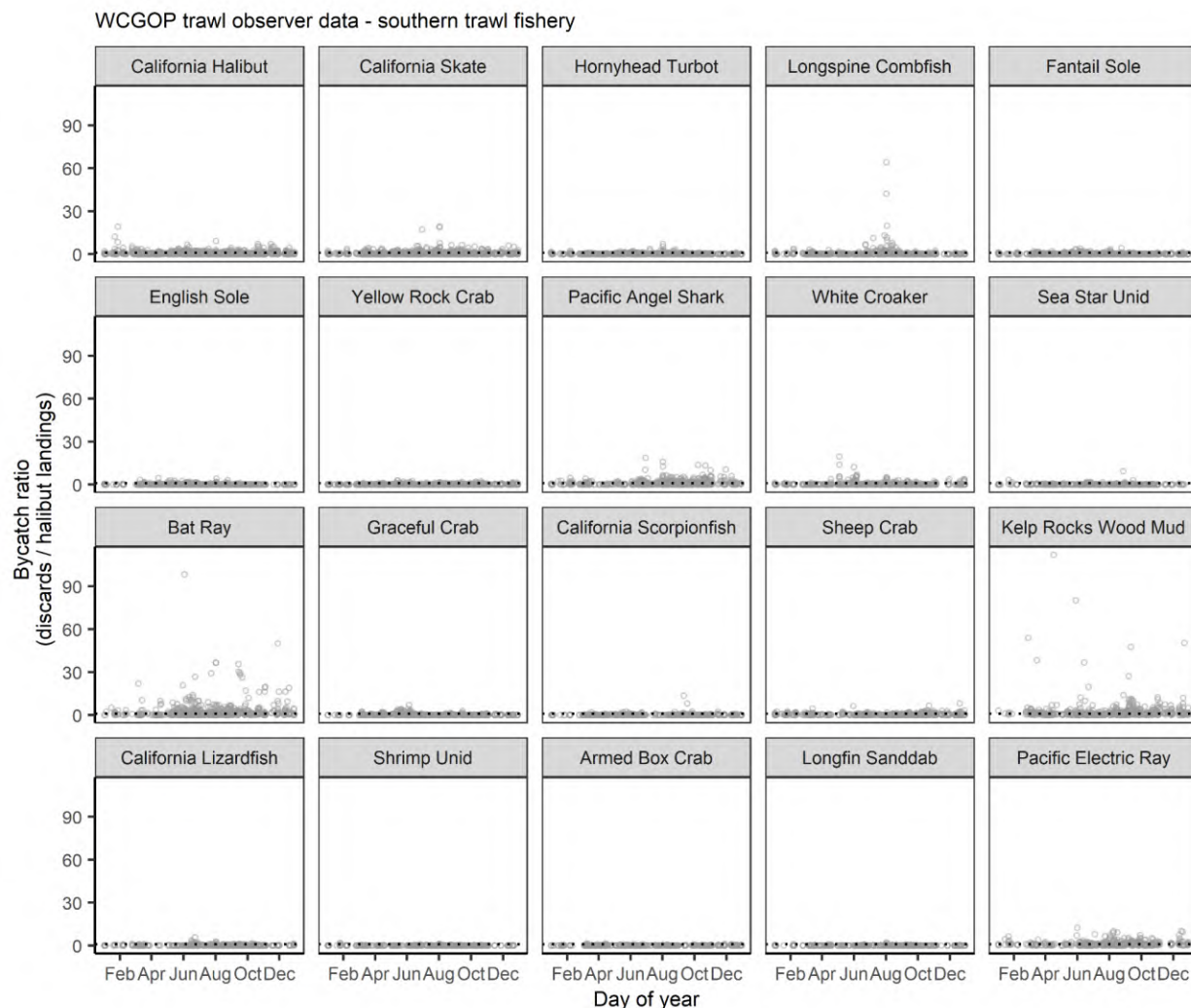




**Figure 54. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery from 2003-2020 based on WCGOP trawl observer data.** In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale. The top-20 most frequently landed species are shown in order of decreasing frequency.

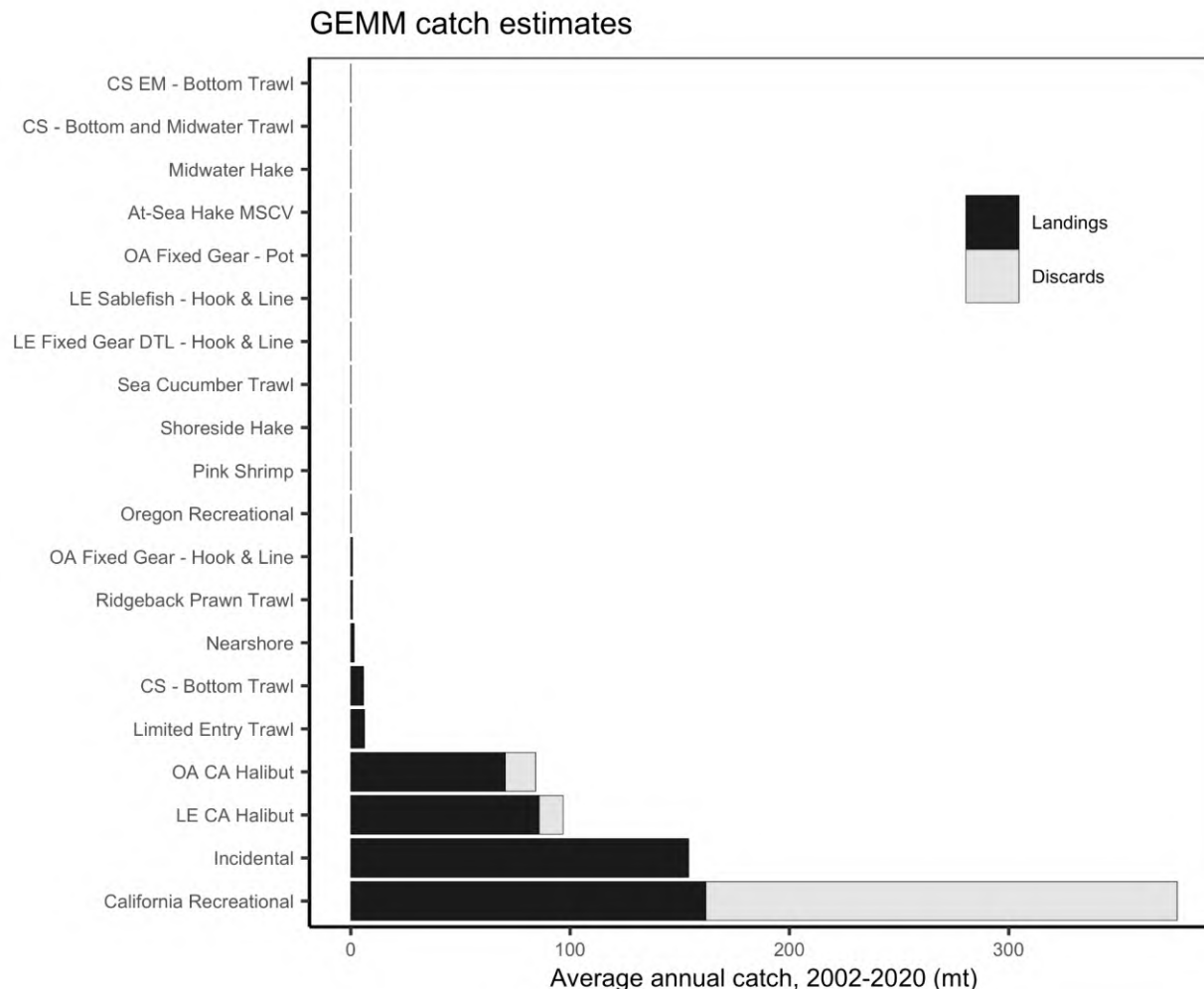


**Figure 55. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery as a function of depth from 2003-2020 based on WCGOP trawl observer data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

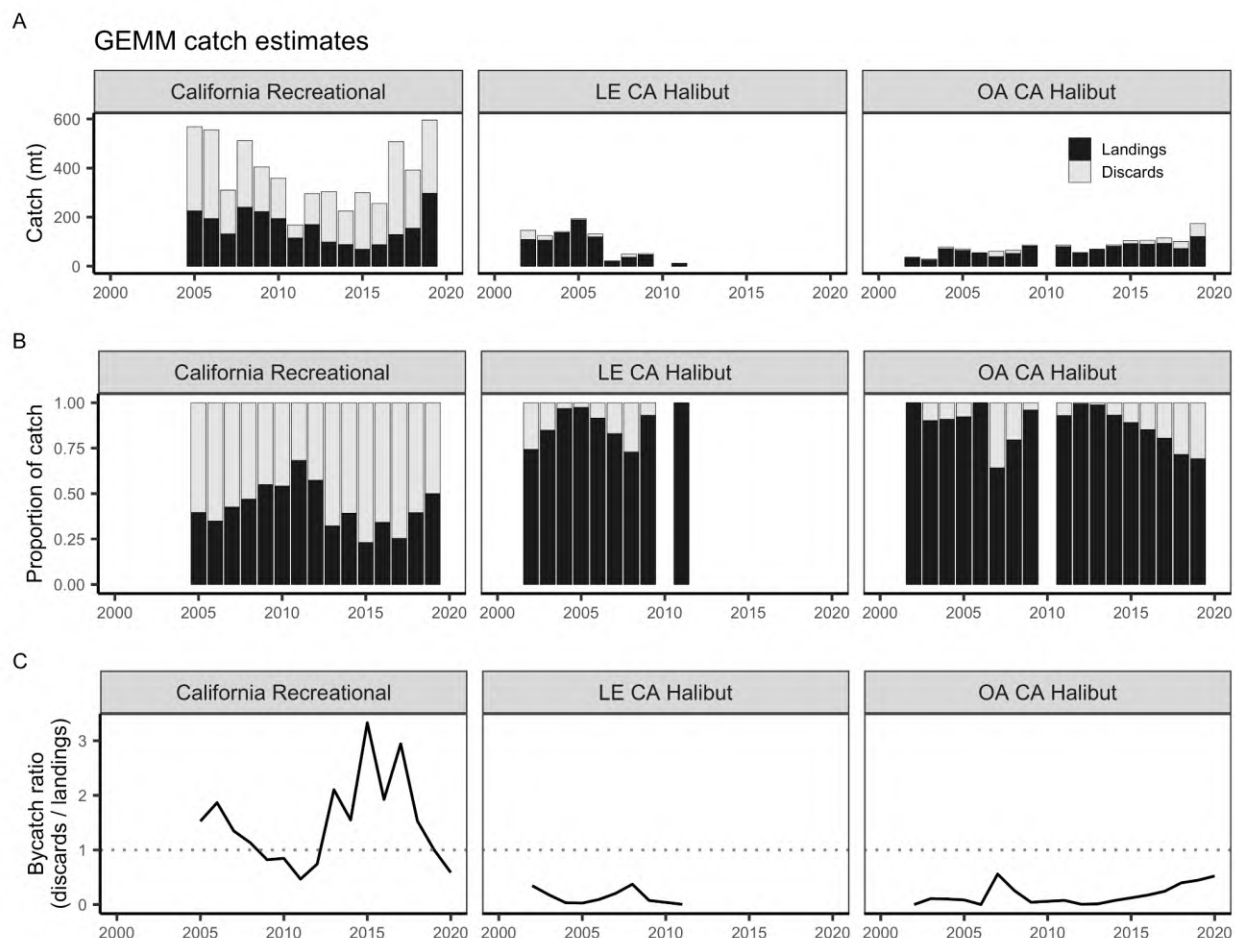


**Figure 56. Discarded bycatch in commercial trawl tows targeting California halibut in the southern trawl fishery as a function of the day of year from 2003-2020 based on WCGOP trawl observer data.** Points indicate individual trawl tows. The dark line indicates a Generalized Additive Model (GAM) fit to the data and the gray shading indicates the 95% confidence interval of the GAM fit. The top-20 most frequently landed species are shown in order of decreasing frequency.

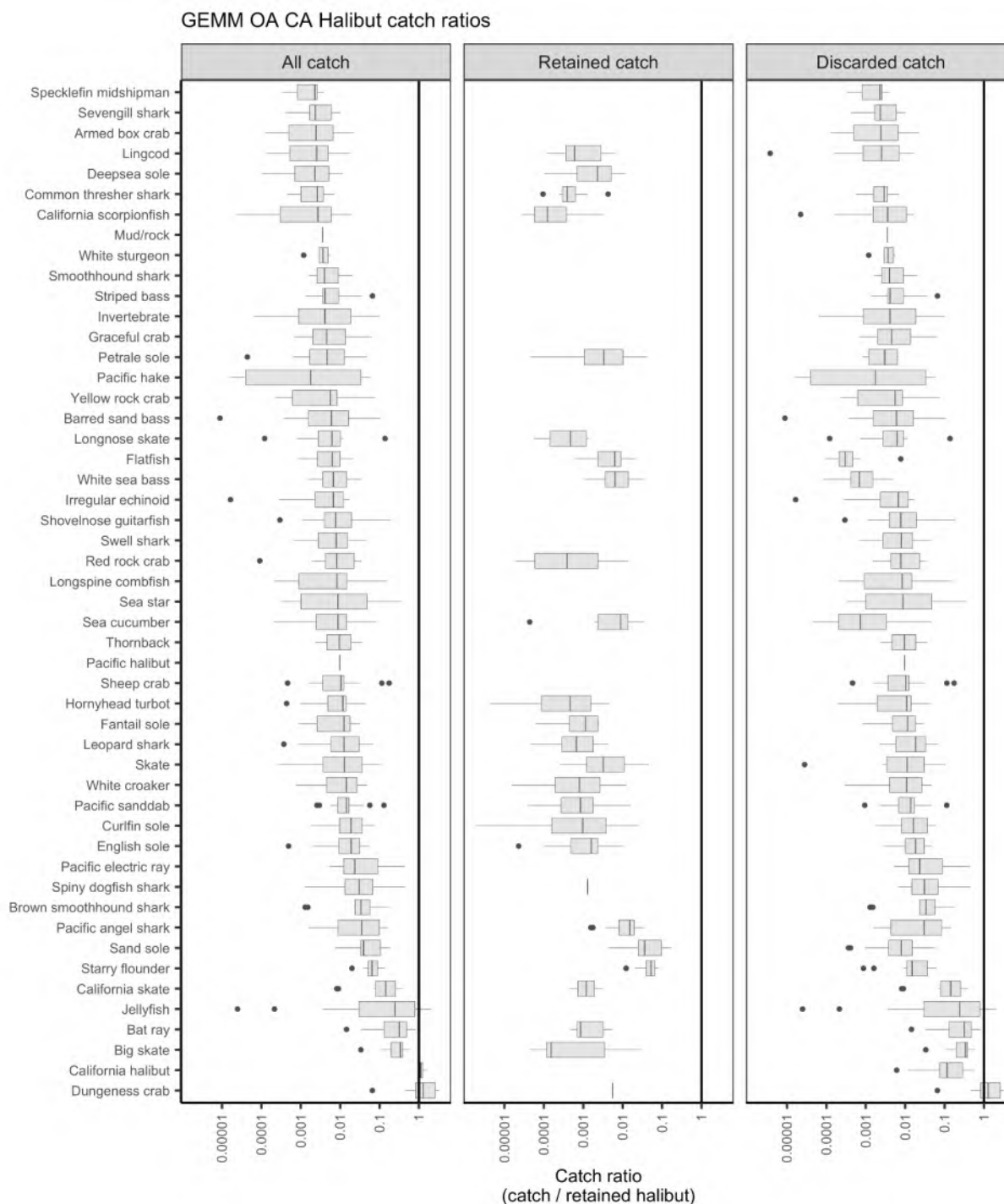
## GEMM data figures



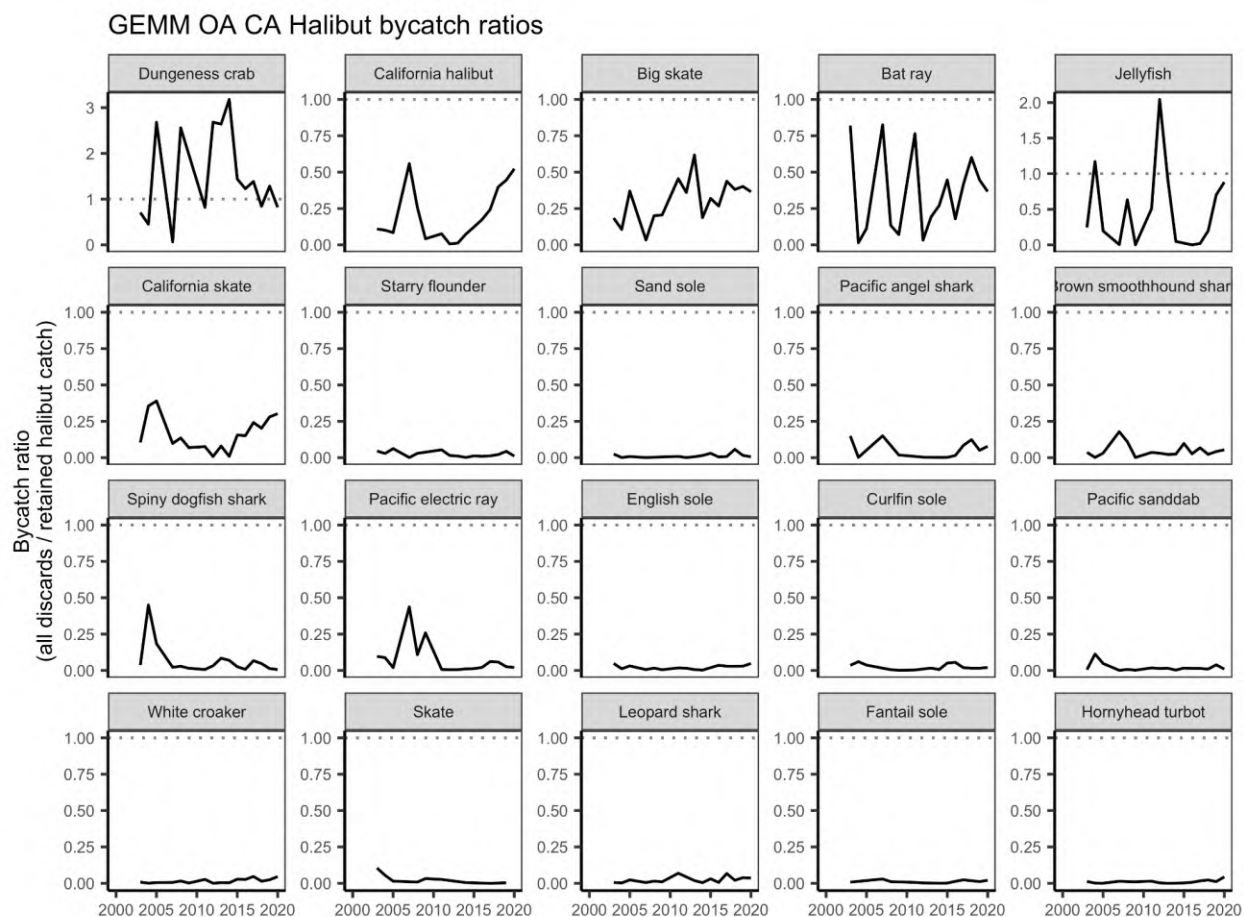
**Figure 57. Average annual landings and discards of California halibut in West Coast groundfish fisheries from 2002-2020 based on GEMM data.** The federal government refers to California's limited entry state trawl fishery as the "Open Access California Halibut" fishery because vessels in this fishery do not have federal groundfish permits. Vessels with both state trawl fishery permits and federal groundfish permits are included in the "Limited Entry California Halibut"; however, fewer than three vessels have met this criterion since 2011, so the results presented here represent the pre-2012 fishery. Incidental fisheries are other non-groundfish fisheries in which groundfish are captured incidentally; the GEMM report does not provide any examples of these fisheries. LE=limited entry, OA=open access, CS=catch share, EM=electronic monitoring, MSCV=mothership-catcher vessel, DTL=daily trip limit.



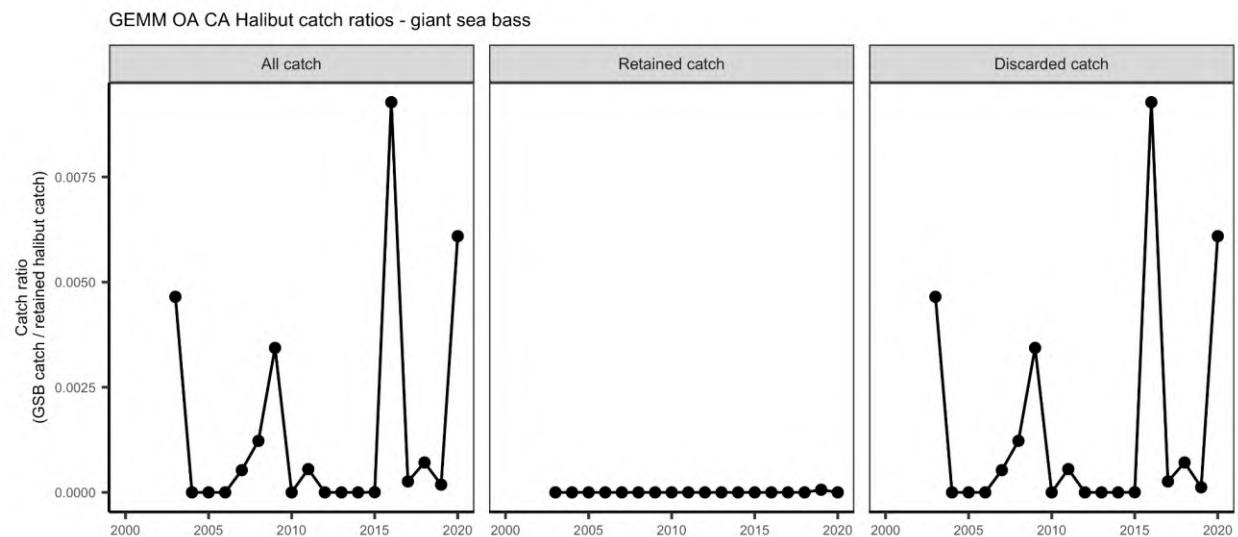
**Figure 58. Annual landings and discards of California halibut in directed halibut fisheries from 2002-2020 based on GEMM data.** Panel A shows the nominal catch, Panel B shows the proportional catch, and Panel C shows the ratio of discards to landings. Bycatch ratios greater than 1 indicate years in which discards exceed landings. The federal government refers to California's limited entry state trawl fishery as the "Open Access California Halibut" fishery because vessels in this fishery do not have federal groundfish permits. Vessels with both state trawl fishery permits and federal groundfish permits are included in the "Limited Entry California Halibut"; however, fewer than three vessels have met this criterion since 2011, so the results presented here represent the pre-2012 fishery. LE=limited entry, OA=open access.



**Figure 59. Distribution of catch ratios in the open-access (OA) halibut fishery for the top-50 most commonly caught species from 2002-2020 based on GEMM data.** Ratios greater than 1 indicate years in which catch exceeded retained halibut catch. In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25<sup>th</sup> & 75<sup>th</sup> percentiles), the whiskers indicate 1.5x the IQR, and the points beyond the whiskers indicate outliers; note the log-scale.

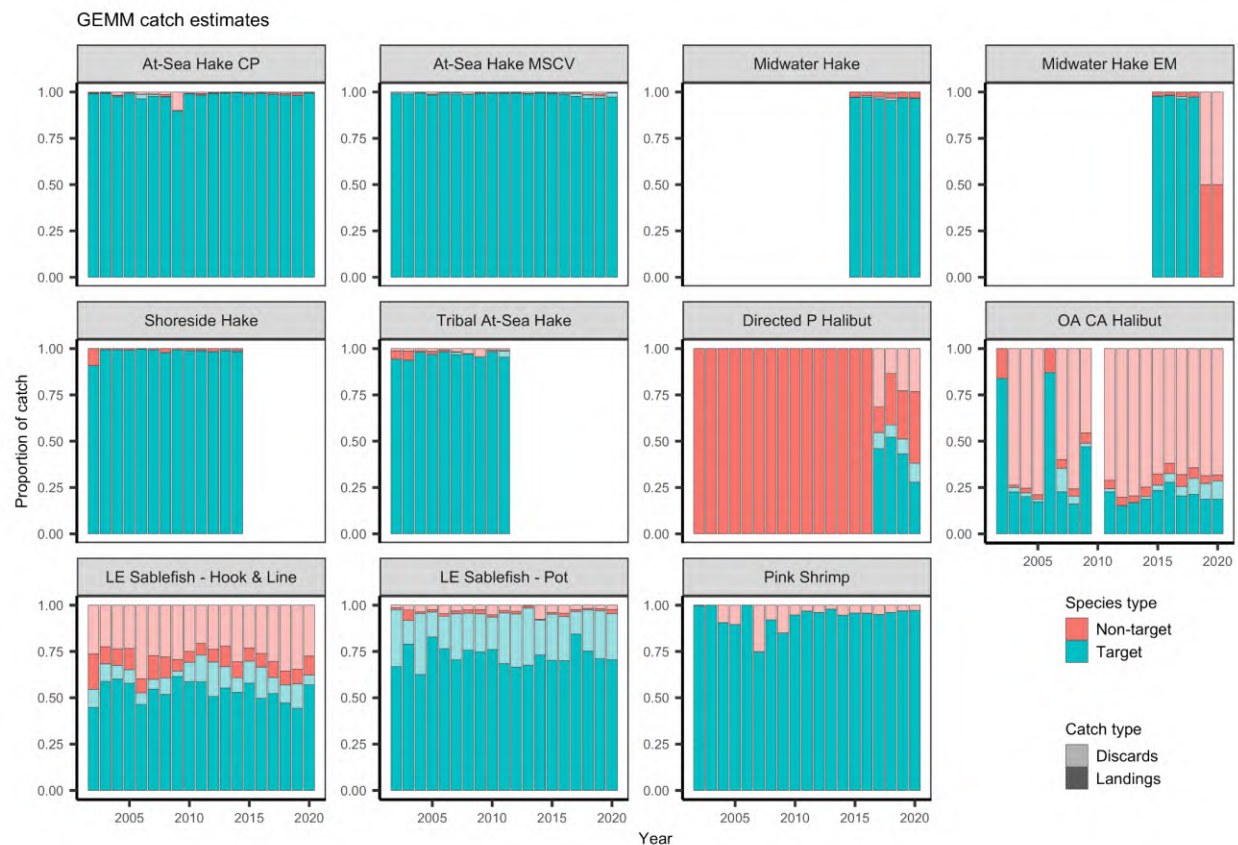


**Figure 60. Discarded bycatch (live and dead) of the top-20 most commonly caught bycatch species in the open-access (OA) halibut fishery from 2002-2020 based on GEMM data. Bycatch ratios greater than 1 indicate years in which bycatch exceeded retained halibut catch.**

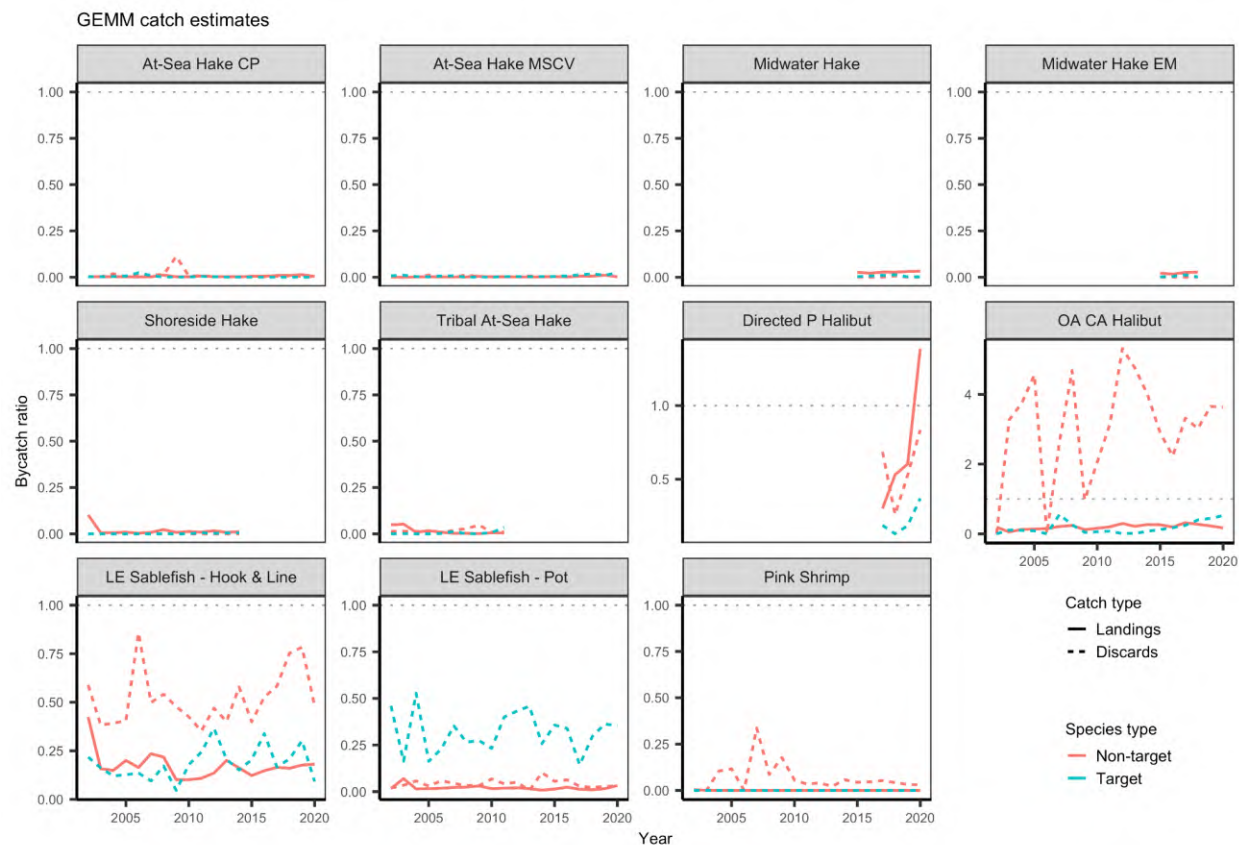


**Figure 61. Catch ratios of giant sea bass in the open-access (OA) halibut trawl fishery from 2002-2020 based on GEMM data.**





**Figure 62. Proportion of target species and non-target species catch that is landed or discarded in West Coast fisheries sectors based on the GEMM mortality estimates.** Data from the ridgeback prawn trawl and sea cucumber trawl fisheries are excluded because of limited observer coverage for informing discard estimates (CDFW, personal communication).



**Figure 63. Bycatch ratios in West Coast fisheries sectors based on the GEMM mortality estimates.** Bycatch ratios are calculated by dividing the bycatch by the retained catch of the target species. Data from the ridgeback prawn trawl and sea cucumber trawl fisheries are excluded because of limited observer coverage for informing discard estimates (CDFW, personal communication).

## Appendix A: Data cleaning

### CDFW permit data

**Table S1.** Meta-data and formatting procedures for the CDFW permit data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
VesselID	Vessel id	
CF/Doc	CA registration or CG documentation number	
VesselName	Vessel name	
Passengers	Number of passengers	
YearBuilt	Year built	
Length	Length (ft)	
Beam	Beam (ft)	
HorsePower	Engine horsepower	
Tonnage	Tonnage	
HomePort	Home port code	Added the home port name
PortCounty	County of home port	
VesselPermit	Permit number	
PermitIssueDate	Date permit was issued	
PermitIssueOffice	Office where permit was issued	
RegIssueDate	Date registration was issued	
RegIssueOffice	Office where registration was issued	
VesselYear	Year of registration (Apr 1 - Mar 31)	
EffectiveDate	Date the permit/license active	

\* Vessel id is the best unique identifier; vessel names change through time

\*\* Home port changes through time but size characteristics remain constant for all vessels.

## CDFW landing receipts data

**Table S2.** Meta-data and formatting procedures for the CDFW landings receipt data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
LandingReceiptNum	Landing receipt number	
LandingDate	Landing date	Extracted year and month
FisherID	Fisher id	
VesselID	Vessel id	
StatePermitNumber	State permit number	
GFPermitNum	Groundfish permit number	
PortID	Port id	Standardized unknown (0) and invalid (-1) ports
PortName	Port name	Added port complex
CDFWBlockID	Block id	Identified and marked invalid block ids
BusinessID	Business id	
PrimaryGearID	Primary gear id	Changed "NA" to "0" (unknown) and "75" to "-1" (invalid)
PrimaryGearName	Primary gear type	Changed "NA" to "0" (unknown) and "75" to "-1" (invalid)
SpeciesID	Species id	
SpeciesName	Species	
Pounds	Catch (lbs)	
UnitPrice	Price (USD/lb)	
TotalPrice	Value (USD)	
GearID	Gear id	Changed "NA" to "0" (unknown)
GearName	Gear name	Added gear category
FishConditionID	Condition id	
FishConditionName	Condition	
UseID	Use id	Added 0 code for unknown uses
UseName	Use	Added 0 code for unknown uses

## CDFW gill net logbook data

**Table S3.** Meta-data and formatting procedures for the CDFW 2000-2018 gill net logbook data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
SET_ID	Set id	
FISHING_DATE	Date of fishing	Standardized to YYYY-MM-DD; added year
CURRENT_NAME	Vessel name	
CDFW_VESSEL_ID	Vessel id	
VESSEL_NUM	Boat id	
CFL	Commercial fishing license	
SKIPPER_NAME	Skipper name	
TARSPC	Target species	Harmonized to consistent names
DRIFT_SET	Set type (drift or set)	Harmonized to "drift" and "set"
FG_BLOCKS	Block id	Identified invalid blocks
DEPTHS	Depth (fathoms)	
NET_LENGTH	Net length (feet)	
MESH_SIZE	Mesh size (inches)	
BOUY_LINE_DEPTH	Buoy line depth (fathoms)	
HOURS_NET_SOAKED	Soak duration (hours)	
COMMON_NAME	Name of species caught	Formatted to match CDFW key; added species code
STATUS	Status of catch (kept, released, lost)	
NOCATCH	Number of caught fish	
WEIGHTS	Weight (lbs) of caught fish	
PREDATOR	Observed predator of released fish	Harmonized to consistent names

**Table S4.** Meta-data and formatting procedures for the CDFW 2017-2020 gill net logbook data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
SN	Logbook id	
Fish & Game Receipt No.	Landing receipt number	
VESSEL_NAME	Vessel name	
BOATNO	Boat id	Removed; no data in this column
VESSEL_ID	Vessel id	
PERMIT	Permit number	
SKIPPER_NAME	Skipper name	
FISHING_DATE	Date of fishing	Standardized to YYYY-MM-DD
Year	Year of fishing	
TARSPC	Target species, version 1	Harmonized to consistent names
Final Target Species	Target species, version 2	Removed; no data in this column
DRIFT_SET	Set type (drift or set), version 1	Combined and harmonized columns
Final Net Type (Set, Drift)	Set type (drift or set), version 2	Combined and harmonized columns
FG_BLOCKS	Block id	Identified invalid blocks
DEPTHS	Depth (fathoms)	
NET_LENGTH	Net length (feet)	
MESH_SIZE	Mesh size (inches)	
BOUY_LINE_DEPTH	Buoy line depth (fathoms)	
HOURS_NET_SOAKED	Soak duration (hours)	
COMMON_NAME	Name of species caught, v1	Removed; added name based on species code
FinalMLDS_Common_Name	Name of species caught, v2	Removed; added name based on species code
MLDS_Species_Code	Code of species caught	Corrected two typos: 1520 and 154/158
STATUS	Status of catch (kept, released, lost)	
NUM_CATCH	Number of caught fish	
WEIGHTS	Weight (lbs) of caught fish	Removed "Sea Lion" from on entry
PREDATOR	Observed predator of released fish	Harmonized to consistent names
Crew Member 1	Name of crew member 1	Removed; not critical
Fishing License No. 1	Fishing license of crew member 1	Removed; not critical
Crew Member 2	Name of crew member 2	Removed; not critical
Fishing License No. 2	Fishing license of crew member 2	Removed; not critical
Crew Member 3	Name of crew member 3	Removed; not critical

<b>COLUMN</b>	<b>DESCRIPTION</b>	<b>HOW WE FORMATTED THE DATA</b>
Fishing License No. 3	Fishing license of crew member 3	Removed; not critical
Crew Member 4	Name of crew member 4	Removed; not critical
Fishing License No. 4	Fishing license of crew member 4	Removed; not critical
Date Received Los Al	Date received	Removed; not critical
QA/QC	Date of QA/QC and initials of analyst	Removed; not critical
QA/QC Comment	Comment from QA/QC analyst	Removed; not critical
Handwriting	Additional comments	Removed; not critical
Comments	Additional comments	Removed; not critical

## CDFW trawl logbook data

**Table S5.** Meta-data and formatting procedures for the CDFW trawl logbook data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
SerialNumber	Logbook id	
VesselID	Vessel id	
FederalDocNumber	Federal document number	
VesselName	Vessel name	
CrewSize	Crew size	
DepartureDate	Departure date	Standardized to YYYY-MM-DD
DepartureTime	Departure time	
ReturnDateString	Return date	Standardized to YYYY-MM-DD
ReturnTime	Return time	
DeparturePortCode	Departure port code	
ReturnPortCode	Return port code	
TowMonth	Month of tow	Combined YMD into YYYY-MM-DD
TowDay	Day of tow	Combined YMD into YYYY-MM-DD
TowYear	Year of tow	Combined YMD into YYYY-MM-DD
TowNumber	Tow number	
TowHours	Duration of tow (hours)	
SetTime	Set time	
SetLatitude	Set latitude	Added block id for set location
SetLongitude	Set longitude	Added negative sign
UpTime	Haul time	
UpLatitude	Haul latitude	Added block id for haul location
UpLongitude	Haul longitude	Added negative sign
AverageDepth	Average depth (fathoms)	
NetType	Net type code <sup>1</sup>	Added net type name
TargetStrategy	Target species code (PACFIN)	Added target species name
Pounds	Catch (lbs)	
ConvertedPounds	Catch (lbs, converted)	
SpeciesCode	Landed species code (CDFW)	Added landed species name
PacFINSpeciesCode	Landed species code (PACFIN)	Added landed species name
Revenue	Revenue (USD)	
Region	Region code <sup>2</sup>	Added region name
Block	Block id	



COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
IsEFPTrip	Is this an EFP trip? (Y/N)	
IsObservedTrip	Is this an observed trip? (Y/N)	
LandingReceipt	Landing receipt number	
LandingDate	Landing date	Standardized to YYYY-MM-DD
Comments	Comments	

<sup>1</sup> B=bottom; D=Danish or Scottish seine; F=selective flatfish; L=large footrope; M=midwater; S=small footrope

<sup>2</sup> N=North (above 40°10'N), NC=North Central (36°-40°10'N), C=Central (34°27'-36°N), S=Southern (below 34°27'N)

## CDFW gill net observer data

**Table S6.** Meta-data and formatting procedures for the CDFW gill net observer catch data.

COLUMN NAME	DESCRIPTION	HOW WE FORMATTED THE DATA
DATE	Date	Standardized to YYYY-MM-DD
FGNO	Fish & Game number	
SETNO	Set number	
SPECIES	Species code	Added species name
TCAT	Number of fish caught	
DDEAD	Number of fish discarded dead	
DLIVE	Number of fish discarded alive	Note: "M" appears sometimes
NODAM	Number of fish damaged	Note: "M" and "S" appear sometimes
NOKEPT	Number of legal fish kept	Note: "S" and blanks appear sometimes
NOKEPTSL	Number of sublegal fish kept	
NOSOLD	Number of fish sold	
M file link	Unknown	
S file link	Unknown	

**Table S7.** Meta-data and formatting procedures for the CDFW gill net observer length composition data.

COLUMN NAME	DESCRIPTION	HOW WE FORMATTED THE DATA
DATE	Date	Standardized to YYYY-MM-DD <sup>1</sup>
FGNO	Fish & Game number (vessel id)	
SETNO	Set number	
SPECIES	Species code	Added species name <sup>2</sup>
LENGTH	Fork length (mm)	
ALTLEN	Alternative length (mm) for sharks; dorsal fin to tail	
SEX	Sex (0=unknown, 1=male, 2=female)	Replaced codes with names
MAT	Maturity (0, 2, 3, 4, 6, 9)	Meaning of codes are unknown
DISP	Disposition (1, 2, 3, 4, 5, 6, 7)	Meaning of codes are unknown

<sup>1</sup> unable to correct one incorrectly formatted date: 87/01263

<sup>2</sup> unable to find species name for: 3, 305, 40, 408, 51, 55, 870, LO

**Table S8.** Meta-data and formatting procedures for the CDFW gill net observer set data.

COLUMN NAME	DESCRIPTION	HOW WE FORMATTED THE DATA
DATE	Date	Standardized to YYYY-MM-DD
FGNO	Fish and Game Number (vessel id)	
SETNO	Set number	
COMPLETE	Complete catch observed? (1=yes, 0=no)	Replaced codes with names
OTYPE	Observation type <sup>1</sup>	Replaced codes with names
DPORT	Port of departure code	Added name of departure port
LPORT	Port of landing code	Added name of landing port
TSPEC	Target species code	Added name of target species
LAT	Latitude (3340.9=33°40.9')	Standardized to decimal degrees
LONG	Longitude (11805.8 =118°5.8')	Standardized to decimal degrees
DFS	Unknown (potentially "distance from shore")	
AREA	Unknown	
NORIENT	Net orientation <sup>2</sup>	Replaced codes with names
ENVIRON	Environment <sup>3</sup>	Replaced codes with names
BDEPTH	Bottom depth (fathoms)	
PTIME	Time of pull (HH:MM)	Standardized to HH:MM on a 24-hour clock
SETDUR	Set duration (HH:MM)	Standardized to HH:MM
NTYPE	Net type <sup>4</sup>	Replaced codes with names
NMAT	Net material <sup>5</sup>	Replaced codes with names
NLEN	Net length (fathoms)	
NDEPTH	Net depth (number of meshes)	
MSIZE1	Mesh size (inches)	
MSIZE2	Mesh size (inches)	
HLENGTH	Hanging length (inches)	
HRATIO	Meshes/hanging ratio	
SLENGTH	Suspender length (ft)	
ELENGTH	Extender length (ft)	
SAMPLER	Initials of sampler	Standardized to FML (first-middle-last)

<sup>1</sup> 1=prearranged, 2=opportune on board, 3=opportune not on board, 4=opportune at sea, 5=prearranged at sea

<sup>2</sup> 1=parallel, 2=perpendicular, 3=diagonal, 4=other, 5=???

<sup>3</sup> 1=inshore of kelp, 2=in kelp, 3=outside of kelp, 4=no kelp

<sup>4</sup> 1=set, 2=drift, 3=float, 4=trammel 1 panel, 5=trammel 2 panel, 6=trammel 3 panel

<sup>5</sup> 1=monofilament, 2=multifilament, 3=combination, 4=twisted mono

## SWFSC observer data

**Table S9.** Meta-data and formatting procedures for the SWFSC gill net observer catch data.

COLUMN	DESCRIPTION
OBSERVER_TRIP_NUMBER	Observer trip number
SET_NUMBER	Set number
CATCH_SPECIES_CODE	Species code
SPECIES_COMMON_NAME	Species name
TOTAL_CATCH_COUNT	Number caught (kept+returned)
TOTAL_KEPT_COUNT	Number kept
RETURNED_ALIVE_COUNT	Number returned alive
RETURNED_DEAD_COUNT	Number returned dead
RETURNED_UNKNOWN_COUNT	Number returned unknown
WAS_DAMAGED_BY_MARINE_MAMMALS	Marine mammal damage? (no/yes)
DAMAGE_BY_MARINE_MAMMALS_COUNT	Number damaged by marine mammals
DAMAGE_TOTAL_COUNT	Number damaged (by marine mammals and more)
CONDITION_CODE	Condition code*
CONDITION_DESCRIPTION	Condition description*
SEX	Sex (male/female/unknown)*
WAS_TAG_PRESENT	Was a tag present? (no/yes)*

\* only for bird/mammal bycatch

**Table S10.** Meta-data and formatting procedures for the SWFSC gill net observer length composition data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
OBSERVER_TRIP_NUMBER	Observer trip number	
SET_NUMBER	Set number	
CATCH_SPECIES_CODE	Species code	
SPECIES_COMMON_NAME	Species common name	
DISPOSITION	Disposition (kept, returned, etc.)	
CONDITION	Condition	Deleted because always blank
MEASUREMENT	Length (cm)	Assumed that all lengths are in "cm"
MEASUREMENT_UNITS	Measurement units	Deleted because either blank or "cm"

**Table S11.** Meta-data and formatting procedures for the SWFSC gill net observer set data.

<b>COLUMN</b>	<b>DESCRIPTION</b>
SEASON	Season
OBSERVER_TRIP_NUMBER	Trip id
VESSEL_NAMES	Vessel name
VESSEL_PLATES	Vessel plate
VESSEL_PERMITS	Vessel permit
DEPARTURE_PORT_NAME	Departure port
RETURN_PORT_NAME	Return port
HAUL_DATE	Date of haul
SET_NUMBER	Set id
SOAK_TIME_HRS	Soak duration (hours)
EST_SOAK_TIME	Soak duration (hours) - estimated
PERCENT_OBSERVED	Percent observed
PRIMARY_TARGET_SPECIES_CODE	Primary target species code
PRIMARY_TARGET_SPECIES_NAME	Primary target species common name
SECONDARY_TARGET_SPECIES_CODE	Secondary target species code
SECONDARY_TARGET_SPECIES_NAME	Secondary target species common name
BEGIN_HAUL_DATE_TIME	Date of haul
BEGIN_HAUL_TEMP_DEVICE	Device used for temperature on haul
BEGIN_HAUL_POSITION_CODE	Position code for haul
BEGIN_HAUL_LATITUDE	Latitude for haul (°N)
BEGIN_HAUL_LONGITUDE	Longitude of haul (°W)
BEGIN_HAUL_DEPTH	Depth of haul (fathoms)
BEGIN_HAUL_SURFACE_TEMP	Temperature of haul (°F)
BEGIN_HAUL_BEaufort_NUMBER	Beaufort scale of haul
SET_NET_PERCENT_DESCRIBED	Set net - Percent described
SET_NET_HANGING_LENGTH_INCHES	Set net - Hanging length (in)
SET_NET_MESH_SIZE_INCHES	Set net - Mesh size (in)
SET_NET_SUSPENDER_LENGTH_INCHES	Set net - Suspender length (in)
SET_NET_EXTENDER_LENGTH_FEET	Set net - Extender length (ft)
SET_NET_PERCENT_SLACK	Set net - Percent slack
SET_NET_NUMBER_OF_MESHES_HANGING	Set net - Number of meshes hanging
SET_NET_MATERIAL_STRENGTH_LBS	Set net - Material strength (lbs)
SET_NET_MESH_PANEL_LENGTH_FATHOMS	Set net - Mesh panel length (fathoms)

COLUMN	DESCRIPTION
SET_NET_NET_DEPTH_IN_MESH_NUMBER	Set net - Net depth in mesh number
SET_NET_NET_COLOR_CODE	Set net - Net color code
SET_NET_NET_HANGING_LINE_MAT_CODE	Set net - Hanging line material code
SET_NET_NET_MATERIAL_CODE	Set net - Material code
SET_NET_NET_MAT_STRENGTH_UNIT_CODE	Set net - Net material strength unit code
FLOAT_NET_PERCENT_DESCRIBED	Float net - Percent described
FLOAT_NET_HANGING_LENGTH_INCHES	Float net - Mesh size (in)
FLOAT_NET_MESH_SIZE_INCHES	Float net - Mesh size (in)
FLOAT_NET_SUSPENDER_LENGTH_INCHES	Float net - Suspender length (in)
FLOAT_NET_EXTENDER_LENGTH_FEET	Float net - Extender length (ft)
FLOAT_NET_PERCENT_SLACK	Float net - Percent slack
FLOAT_NET_NUMBER_OF_MESHES_HANGING	Float net - Number of meshes hanging
FLOAT_NET_MATERIAL_STRENGTH_LBS	Float net - Material strength (lbs)
FLOAT_NET_MESH_PANEL_LENGTH_FATHOMS	Float net - Mesh panel length (fathoms)
FLOAT_NET_NET_DEPTH_IN_MESH_NUMBER	Float net - Net depth in mesh number
FLOAT_NET_NET_COLOR_CODE	Float net - Net color code
FLOAT_NET_NET_HANGING_LINE_MAT_CODE	Float net - Net hanging line material code
FLOAT_NET_NET_MATERIAL_CODE	Float net - Net Material code
FLOAT_NET_NET_MAT_STRENGTH_UNIT_CODE	Float net - Net strength unit code



## WCGOP trawl observer data

**Table S12.** Meta-data and formatting procedures for the WCGOP trawl observer catch data.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
YEAR	Year of return	
sector	Fishery sector (LE CA halibut, LE trawl, etc.)	
TRIP_ID	Trip id	
D_DATE	Date/time of departure	Added columns for date and time
D_PORT	Port of departure	
D_STATE	State of departure	
R_DATE	Date/time of return	Added columns for date and time
R_PORT	Port of return	
R_STATE	State of return	
HAUL_ID	Deployment/retrieval id	
gear	Gear type (bottom trawl, fixed gears, etc.)	
SET_DATE	Date of gear deployment	Added merged date/time
SET_TIME	Time of gear deployment	Added merged date/time
SET_DEPTH	Depth of gear deployment (fathoms)	
SET_DEPTH_UM	Depth units of gear deployment	Deleted because only in fathoms
SET_LAT	Latitude of gear deployment	
SET_LONG	Longitude of gear deployment	
UP_DATE	Date of gear retrieval	Added merged date/time
UP_TIME	Time of gear retrieval	Added merged date/time
UP_DEPTH	Depth of gear retrieval (fathoms)	
UP_DEPTH_UM	Unit of measure of gear retrieval	Deleted because only in fathoms
UP_LAT	Latitude of gear retrieval	
UP_LONG	Longitude of gear retrieval	
AVG_SOAK_TIME	Soak time (hrs), estimate from observer, for fixed gears	Converted ranges to averages
HAUL_DURATION	Soak time (hrs), computed from data, for trawl gears	
HAUL_DUR_UM	Unit of computed soak time - for trawl gears	Deleted because is only in hours
species	Common name	
SPID_EQV	PACFIN species code	
scientific_name	Scientific name	
CATCH_DISPOSITION	Disposition of catch (retained, discarded, unknown)	

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
EXP_SP_CT	Number of individuals in catch, for extrapolation	
EXP_SP_WT	Weight of catch (lbs), for extrapolation	
EXP_SPWT_UM	Units for weight of catch for extrapolation	Deleted because is only in pounds
RET_MT	Retained weight (mt)	
DIS_MT	Discarded weight (mt)	

## GEMM bycatch estimates

**Table S13.** Meta-data and formatting procedures for the GEMM bycatch estimates.

COLUMN	DESCRIPTION	HOW WE FORMATTED THE DATA
sector	Fishery sector	Added sector type*
grouping	Management group	
type	In Groundfish FMP? (yes/no)	
species	Common name	
year	Year	
cv	CV of the discards estimate	
total_landings_mt	Landings (mt)	
total_discard_mt	Discards (mt)	
total_discard_and_landings_mt	Catch (mt)	
total_discard_with_mort_rates_applied_mt	Discards (mt), adj. for mortality	
total_discard_with_mort_rates_applied_and_landings_mt	Catch (mt), adj. for mortality	

\* Sector types: Commercial, recreation, tribal, research

## Appendix B: Data tables

**Table B1.** Landings of halibut and non-halibut from 2016-2020 in the southern large mesh gill net fishery based on the landing receipts data. Data are only available from 2016 because this is the year in which the small- and large-mesh gear codes were first utilized.

<b>LANDINGS</b>		
<b>Year</b>	<b>Halibut (lb)</b>	<b>Non-halibut (lb)</b>
2016	18,337	8,407
2017	102,705	46,859
2018	117,518	88,680
2019	166,053	87,977
2020	119,707	85,880

**Table B2.** Landings of halibut and non-halibut from 2006-2020 in the northern trawl fishery based on the landing receipts data.

<b>LANDINGS</b>		
<b>Year</b>	<b>Halibut (lb)</b>	<b>Non-halibut (lb)</b>
2006	225,505	84,669
2007	98,026	346,427
2008	115,771	431,811
2009	216,595	277,919
2010	190,629	274,990
2011	150,649	106,299
2012	138,480	143,943
2013	161,402	107,225
2014	160,430	51,350
2015	181,241	50,692
2016	171,766	34,926
2017	206,040	43,461
2018	139,207	80,515
2019	220,137	62,508
2020	154,275	62,531

**Table B3.** Landings of halibut and non-halibut from 2006-2020 in the southern trawl fishery based on the landing receipts data.

<b>LANDINGS</b>		
<b>Year</b>	<b>Halibut (lb)</b>	<b>Non-halibut (lb)</b>
2006	47,280	32,365
2007	83,526	32,205
2008	86,056	32,505
2009	103,567	28,665
2010	99,481	30,166
2011	66,553	18,474
2012	44,921	24,186
2013	50,580	26,894
2014	37,843	19,123
2015	54,848	36,567
2016	80,410	43,832
2017	68,985	66,311
2018	63,307	54,141
2019	54,485	49,436
2020	48,764	37,259

**Table B4.** Landings and discards of halibut and non-halibut from 2000-2020 in the southern large-mesh set gill net fishery based on the gill net logbooks. We count both “Released” and “Lost” fish as discards. Note: operators are not required to record discards in the gill net logbooks.

Year	LANDINGS		DISCARDS	
	Halibut (#)	Non-halibut (#)	Halibut (#)	Non-halibut (#)
2000	30,527	16,105		
2001	25,186	13,938		
2002	26,491	13,314	118	30
2003	16,103	8,529	359	349
2004	14,627	5,591	1,864	39
2005	7,663	6,529	561	163
2006	6,660	4,263	395	47
2007	6,627	3,699	534	163
2008	8,405	4,282	490	93
2009	9,737	4,197	688	95
2010	6,734	2,491	326	83
2011	6,082	3,408	216	84
2012	4,940	2,883	259	45
2013	2,091	1,132	116	26
2014	1,468	3,003	95	312
2015	2,254	2,164	203	209
2016	4,318	5,978	258	607
2017	459	116	38	0
2018	484	1,102	34	160
2019	15,469	16,932	273	1,872
2020	8,746	8,099	126	1,169

**Table B6.** Landings of halibut and non-halibut from 2006-2020 in the northern trawl fishery based on the trawl logbooks.

<b>LANDINGS</b>		
<b>Year</b>	<b>Halibut (lb)</b>	<b>Non-halibut (lb)</b>
2006	129,655	30,992
2007	62,044	24,106
2008	88,513	24,687
2009	134,449	43,430
2010	154,518	43,459
2011	131,547	35,068
2012	117,468	53,524
2013	134,839	33,981
2014	143,639	40,274
2015	163,316	32,494
2016	159,346	27,711
2017	161,968	29,963
2018	98,096	36,850
2019	105,268	42,548
2020	156,295	24,818



**Table B6.** Landings of halibut and non-halibut from 2006-2020 in the southern trawl fishery based on the trawl logbooks.

<b>LANDINGS</b>		
<b>Year</b>	<b>Halibut (lb)</b>	<b>Non-halibut (lb)</b>
2006	20,141	1,364
2007	46,621	12,784
2008	29,097	11,376
2009	60,535	3,979
2010	58,007	4,713
2011	48,237	13,363
2012	24,810	12,749
2013	25,831	18,830
2014	14,551	11,974
2015	28,850	11,887
2016	44,034	20,398
2017	31,818	27,157
2018	29,317	20,022
2019	13,115	4,787
2020	22,358	8,297

**Table B7.** Landings and discards of halibut and non-halibut in the southern large-mesh set gill net fishery based on the SWFSC gill net observer data. All numbers are counts of observed fish and do not represent extrapolations of observations to the total fishery effort.

Year	Landings		Discards		Dead discards		Live discards		Unknown discards	
	Halibut	Non-halibut	Halibut	Non-halibut	Halibut	Non-halibut	Halibut	Non-halibut	Halibut	Non-halibut
1994	1,265	1,496	269	6,833	164	3,409	100	3,304	5	120
2006	7	38	0	59	0	48	0	10	0	1
2007	155	183	32	1,124	25	634	7	430	0	60
2010	105	127	14	1,467	7	299	7	1,168	0	0
2011	65	79	3	183	2	47	1	132	0	4
2012	100	351	21	413	8	257	13	155	0	1
2013	42	52	5	341	2	145	3	196	0	0
2017	488	451	20	1,282	5	458	15	813	0	11

**Table B8.** Landings and discards of halibut and non-halibut in the northern and southern trawl fishery based on the GEMM mortality estimates. The federal government refers to this as the “Open Access Halibut Fishery”. All numbers are weights of observed fish and do not represent extrapolations of observations to the total fishery effort.

Year	LANDINGS (MT)		DISCARDS (MT)	
	Halibut	Non-halibut	Halibut	Non-halibut
2002	36.14	6.93	0.00	0.00
2003	25.71	1.36	2.81	84.10
2004	70.78	8.93	7.13	265.24
2005	64.51	8.80	5.43	294.08
2006	54.83	8.17	0.00	0.00
2007	39.17	8.28	21.87	103.54
2008	51.82	12.44	13.31	242.80
2009	82.34	9.71	3.45	79.87
2011	79.89	16.03	6.08	251.04
2012	55.30	16.39	0.34	293.92
2013	68.98	14.80	0.83	327.97
2014	80.95	21.59	5.97	322.90
2015	91.98	23.88	11.27	266.55
2016	89.55	17.34	15.57	199.90
2017	92.80	29.51	22.49	308.01
2018	72.37	19.71	28.79	218.44
2019	120.65	27.43	53.70	440.79
2020	91.67	15.37	47.95	333.13

# Evaluation of Bycatch in the California Halibut Fishery

Marine Resources Committee

November 17, 2022

Kirsten Ramey

California Department of Fish and  
Wildlife



Photo Credit: CDFW





# Outline

- Background
- Bycatch Assessment
- Methods
- Results of study
- Potential Next steps
- Recommendations





# Background

- 2018 Master Plan for Fisheries, A Guide for Implementation of the Marine Life Management Act
- Bycatch defined (Fish and Game Code 90.5)
- California halibut = high priority
- Bycatch assessment
  - Phase 1, 2020-2022
  - Phase 2, 2022-2023



Photo Credit: CDFW

# Bycatch Assessment

- Gear types for California halibut
  - Large-mesh set gill net
  - Trawl
- Magnitude
- Composition



Photo Credit: CDFW







# Methods

- Best available data
  - Federal GEMM data
  - Federal observer data
  - CDFW permit data
  - CDFW logbook data
  - CDFW landing receipts
  - CDFW observer data
- Patterns
  - Gear type
  - Location
  - Depth
  - Day of year





# Results – Gill net fishery – Landings, Logbooks, and Observer Data



- Incidentally Caught and Landed
  - Pacific angel shark
  - White seabass
  - Leopard shark
  - Thresher shark
  - Soupfin shark
  - Fantail sole
- Incidentally Caught and Discarded (live/dead)
  - Rock crab
  - Spider crab
  - Bat ray
  - California skate
  - California halibut
  - Pacific mackerel
  - Brown Smoothhound shark
- Sensitive Species and Marine Mammals
  - Giant sea bass
  - California sea lions
  - Harbor seals



# Results – Trawl Fishery – Landings and Logbooks

## Incidentally Caught and Landed

### Northern fishery

- Starry flounder
- Sand sole
- Petrale sole
- White seabass
- Curlfin turbot
- Unspecific sole
- Turbot

### Southern fishery

- Unspecified trawl fish
- Unspecified sole
- Pacific angel shark
- California scorpionfish
- Ridgeback prawn
- Unspecified skate
- English sole
- Rock sole



Photo Credit: CDFW



# Results – Trawl Fishery - Observer Data

## Incidentally Caught and Discarded

### Northern fishery

- Dungeness crab
- Big skate
- California halibut
- California skate
- English sole

### Southern fishery

- California halibut
- California skate
- Hornyhead turbot
- Longspine combfish
- Fantail sole

### Sensitive Species

- Green sturgeon



Photo Credit: CDFW



# Insights and Potential Next Steps

- Observer data offers best insights into bycatch
- Future work
  - Numbers to weight
  - Estimating fleetwide discards
  - Mortality rates

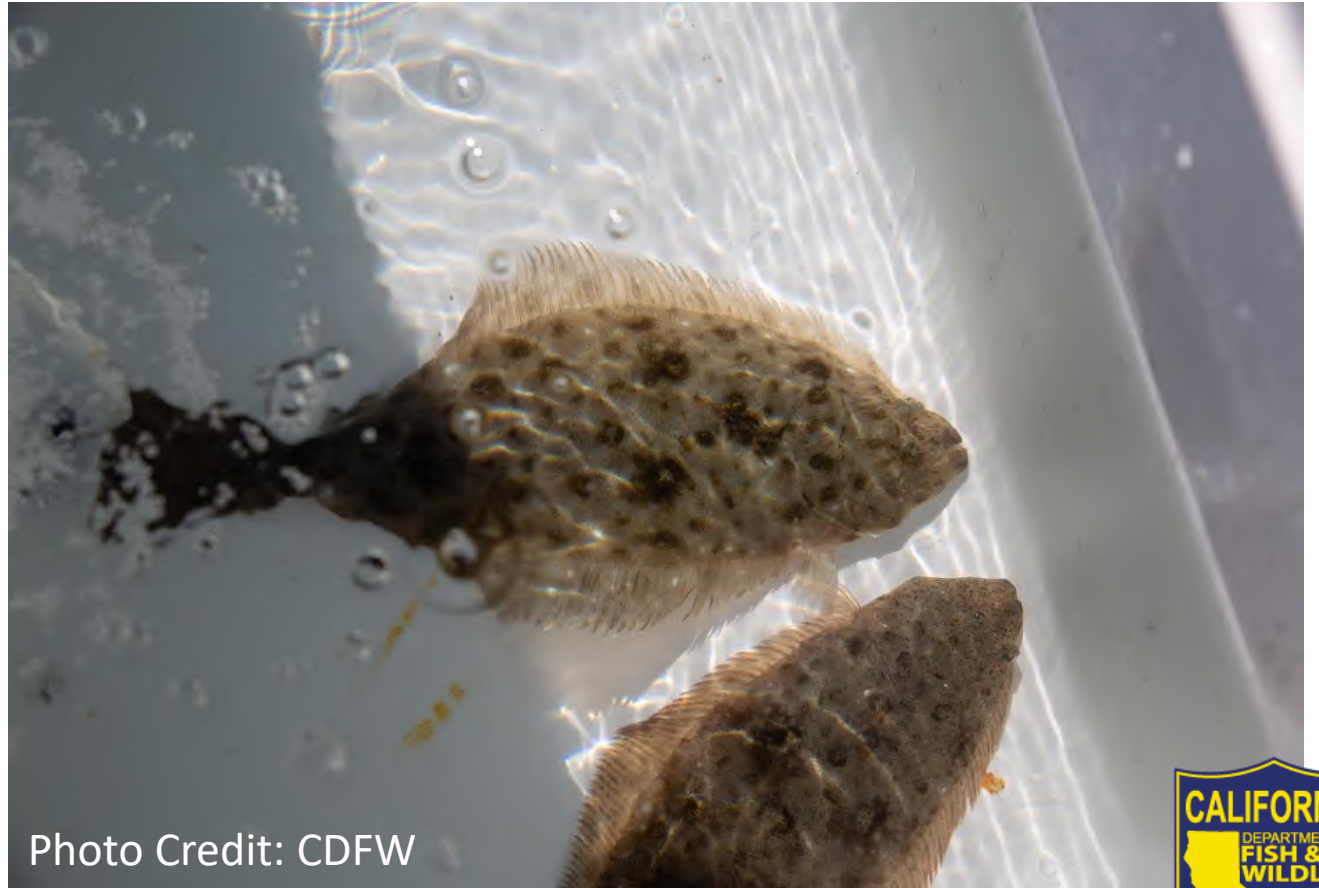


Photo Credit: CDFW





# Recommendations

## Assessing and Addressing Bycatch Issues per the MLMA

- Step 1: collection of data - DONE
- Step 2: Distinguish target - DONE
- Step 3: Determining acceptability - NEXT
- Step 4: Address unacceptable bycatch - TBD





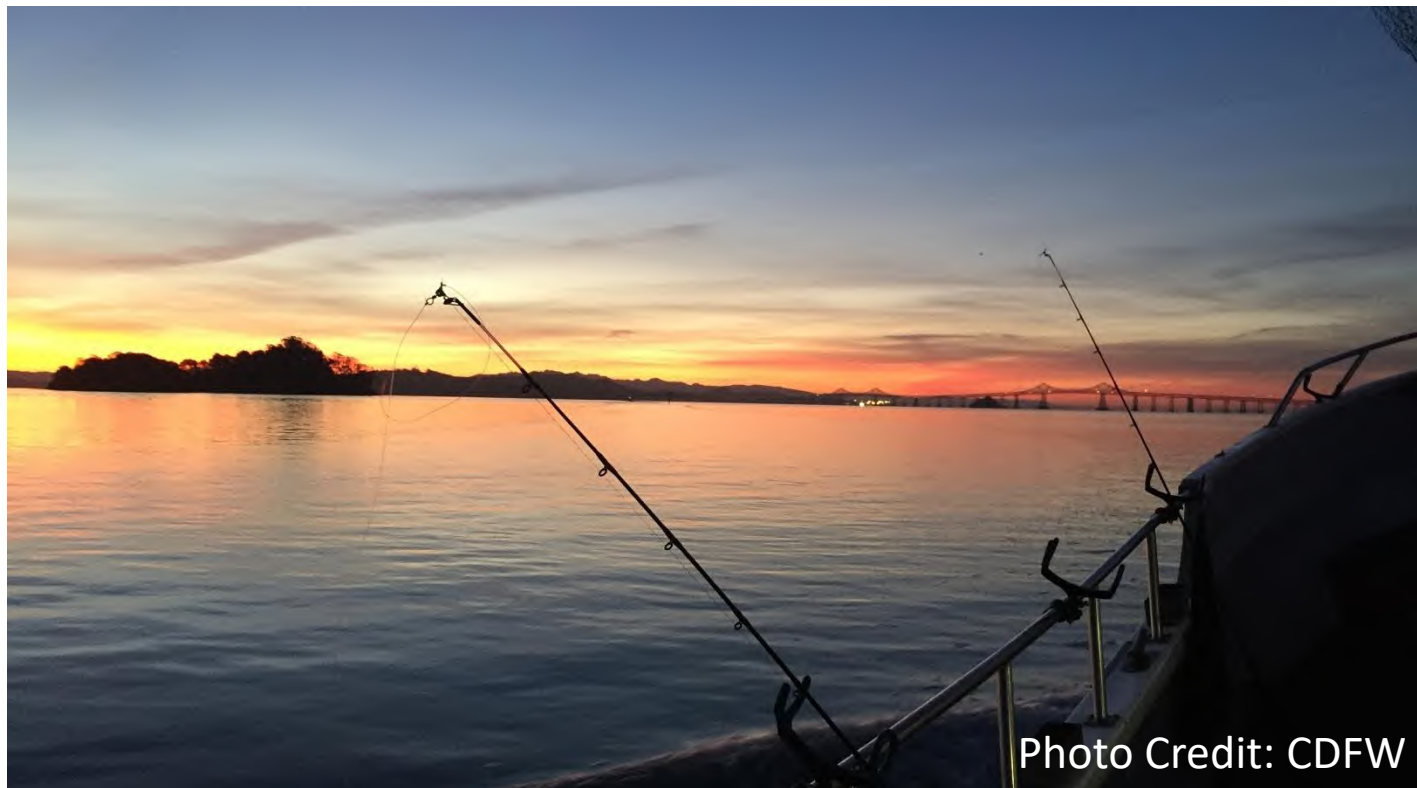
# Determining Acceptability

## Options

1. Stakeholder workshop
2. Key Communicators
3. Department expertise
4. ???



Photo Credit: CDFW



Thank you





November 4, 2022

Ms. Samantha Murray, President  
Mr. Eric Sklar, Commissioner  
California Fish and Game Commission, Marine Resource Committee  
P.O. Box 944209  
Sacramento, CA 94244-2090

**RE: MRC Agenda Item 5: Assessing and Addressing Bycatch in California fisheries - Set Gillnets & Bottom Trawls**

Dear President Murray and Commissioner Sklar,

Thank you for the opportunity to discuss bycatch in California fisheries at the upcoming November 17th Marine Resource Committee (MRC) meeting. In the wake of the current biodiversity crisis, it is imperative that the Commission uphold California's commitment to minimizing bycatch. California fishery management has generally served as a model on how to effectively manage clean, sustainable fisheries while simultaneously maintaining the economic viability of the state's historic industry. However, assessment of the California halibut fishery provides an opportunity to improve fishery management under the Marine Life Management Act (MLMA). This is consistent with the Department's Ecological Risk Assessments and fishery prioritization exercise, which ranked commercial bottom trawl and set gillnets targeting California halibut as top priorities due to their high ecological risk.

Over the last year, Oceana and Turtle Island Restoration Network thoroughly analyzed publicly available data from federal observer programs and other sources to better understand the complex issues associated with bycatch in California set gillnets and bottom trawls. We are grateful to members of both the California Department of Fish & Wildlife (CDFW) as well as California Fish & Game Commission for their guidance in navigating the myriad of data constraints associated with this fishery and for the collaborative approach in implementing the Bycatch Inquiry from the Marine Life Management Act. We look forward to seeing CDFW's analysis in the briefing materials for this meeting.

At the upcoming meeting, we hope to see the MRC have a robust discussion on how to complete steps 1 to 3 of the bycatch inquiry as outlined in the Master Plan for Fisheries to determine bycatch acceptability under MLMA criteria. We ask the MRC to provide clear direction on what additional analyses are needed and outline the public process and timeline the MRC will follow to make a recommendation to the full Commission on bycatch acceptability in bottom trawls and set gillnets. For example, it could be useful to host a dedicated public hearing outside a regular MRC meeting where CDFW presents their analysis, and stakeholders provide additional information and perspectives. This could inform a subsequent MRC meeting in which the MRC develops a final recommendation on bycatch acceptability.

We look forward to continuing to build a collaborative path forward as the Commission begins determining bycatch acceptability in this fishery. Thank you for your dedication to addressing the complicated issue of bycatch in California's fisheries.

Sincerely,

Geoffrey Shester, Ph.D.  
Oceana

Scott Webb  
Turtle Island Restoration Network



## COMMITTEE STAFF SUMMARY FOR MARCH 24, 2022 MRC

### *For Background Purposes Only*

## 8. COASTAL FISHING COMMUNITIES POLICY

### Today's Item

Information ☒

Action ☐

Receive FGC staff presentation of outcomes from the public Coastal Fishing Communities Policy Drafting Workshop, and discuss next steps in refining a potential draft policy for FGC consideration.

### Summary of Previous/Future Actions

- |   |  |
|---|--|
| • MRC update and recommendation to begin policy development                                 | Mar 16, 2021; MRC, Webinar/Teleconference        |
| • FGC approved MRC recommendation for policy development                                    | Apr 14, 2021; Webinar/Teleconference             |
| • MRC update  | Jul 21, 2021; MRC, Webinar/Teleconference        |
| • MRC update on the policy and discussion: presented policy goals and key concepts document | Nov 9, 2021; MRC, Webinar/Teleconference         |
| • <b>Today's update on policy drafting workshop outcomes</b>                                | <b>Mar 24, 2022; MRC, Webinar/Teleconference</b> |

### Background

The Coastal Fishing Communities Project is an FGC initiative to more directly recognize coastal fishing community goals, and the impact that different options for pursuing conservation and utilization goals in fisheries management decisions may have on those communities.

### ***Implementation of Staff Recommendation 1 – Policy***

In 2018, as part of the development of the Coastal Fishing Communities Project, Commission released a report titled *Staff Synthesis Report on California Coastal Fishing Communities Meetings, 2016-2018*. The report included 10 staff recommendations. Staff recommendation 1 is for FGC to “develop and adopt a policy and definition for coastal fishing communities,” FGC directed staff to peruse this recommendation.

In 2019, MRC adopted a working definition for *coastal fishing communities*, which was developed collaboratively among stakeholders and staff and serves as a foundation for developing a new policy for potential FGC adoption. In Mar 2021, MRC recommended FGC move forward with policy development and direct staff to engage stakeholders and initiate drafting a policy for coastal fishing communities; FGC approved the recommendation in Apr 2021.

At the Nov 2021 MRC meeting, staff shared outcomes from six regional roundtable meetings held in Aug and Sep 2021 with regional fishing community leaders and harbor representatives. Staff presented stakeholder-informed draft potential goals and key elements for consideration in an FGC policy on coastal fishing communities (within Exhibit 1). MRC gave input on the draft

## COMMITTEE STAFF SUMMARY FOR MARCH 24, 2022 MRC

### *For Background Purposes Only*

goals and directed staff to use the draft goals to shape the process for developing a potential coastal fishing communities policy during future policy drafting workshops.

#### *Update*

On Feb 23, 2022 FGC hosted a public policy-drafting workshop. Materials included background materials (Exhibit 1) to orient prospective new participants, and in-meeting materials (Exhibit 2) outlining the policy development process, previous stakeholder input, and an initial draft policy (see Exhibit 2). Workshop materials are posted on the FGC meetings page and on the Coastal Fishing Communities Project web page (at <https://fgc.ca.gov/Committees/Marine/Coastal-Fishing-Communities-Project>), which will serve as a single source for project materials previously shared with MRC.

Approximately 45 members of the public participated in the workshop, representing a range of fishing community interests. Commissioner Sklar attended to provide welcoming remarks and observe. The initial draft policy developed by staff served as a starting point for workshop discussions. A summary of the workshop is provided as Exhibit 4.

Today, staff will share the outcomes of the workshop, including key feedback from stakeholders (Exhibit 5), and initial work integrating feedback into a revised draft policy. Staff has identified a second public workshop as a potential next step. Staff seeks MRC input on incorporating stakeholders' feedback and exploring issues raised during the workshop for consideration in the next iteration of the draft policy.

#### **Significant Public Comments (N/A)**

#### **Recommendation**

Receive public input on the current draft, and consider and discuss issues raised during the public workshop. Provide direction on next steps for refining the draft policy for additional stakeholder input and MRC discussion in Jul 2022.

#### **Exhibits**

1. Workshop background materials combined, dated Feb 7, 2022
2. Workshop in-meeting materials, including staff initial draft policy, dated Feb 23, 2022
3. Staff presentation provided at workshop, dated Feb 23, 2022
4. Summary of public workshop held Feb 23, 2022
5. Table summarizing stakeholder comments received during workshop (to be posted separately)

#### **Committee Direction/Recommendation (N/A)**

# **California Fish and Game Commission**

## **Staff Update on Coastal Fishing Communities Policy Development**

*November 9, 2022*

This document has been prepared by California Fish and Game Commission (Commission) staff as an update on the effort to develop a coastal fishing communities policy, in support of Agenda Item 7(C) of the Commission Marine Resources Committee's November 17, 2022 meeting.

### **Background**

The Coastal Fishing Communities Project is a Commission initiative to more directly recognize coastal fishing community goals and the impact that different options for achieving conservation and use goals in fisheries management decisions may have on those communities. As part of this initiative, the Commission may consider adopting a policy for coastal fishing communities.

An initial draft policy was developed and shared at a virtual public workshop in February 2022 (materials available at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=199387&inline>). Commission staff appreciated the feedback received during and following the public workshop. In spring 2022, staff began incorporating the feedback into a revised draft with the intention of sharing the next iteration in a second workshop at the beginning of summer.

### **Feedback on Initial Draft and Process Shift**

Key concerns regarding the initial drafts of the policy included that:

- it lacked a clear overarching policy statement;
- it needed more emphasis on the challenges coastal fishing communities are facing, especially climate change and fisheries emergencies;
- it was too conservative and reflective of actions that were already occurring;
- there was confusion as to how the policy would enact change in the California Department of Fish and Wildlife (Department);
- there was too much reliance on the Department to carry out new actions identified within the policy and not enough emphasis on the role of other partners to achieve goals;
- some components felt repetitive; and
- the flow needed improvement.

After integrating much of the feedback received, staff concluded that the revised draft was lengthy and overly-specific; while the draft better reflected specific input from fishing community stakeholders, the level of detail would be more appropriate for an implementation plan that could be tailored over time as needs changed. This caused concern that the policy had lost focus and would not be adaptable over time as specific needs change or as different strategies emerge that might better achieve the overarching policy goal. Based on the concerns, Commission staff regrouped, postponed a second workshop, and changed course with the next draft.

Staff initiated internal discussions with the Department and other partners to re-envision the detailed policy and to develop a higher-level policy for considering coastal fishing communities' needs, while keeping in mind stakeholders' initial input on a potential policy and feedback on the first draft. As part of the re-drafting, staff separated out aspects of the initial draft policy and some feedback into the beginnings of a potential draft implementation plan. Several iterations of a draft policy were internally developed in concert with the Department and other partners with the ultimate goal of drafting a policy expressing foundational concepts and outcomes that reflect broader public values and will underlie specific actions to be taken on the public's behalf.

## **Revisions to Draft Policy**

There are several major changes in the revised draft policy.

1. Restructured to make the intent of the policy clearer and to improve readability:
  - Removed recognition statements. Instead, used an introduction section to better articulate why a Commission policy for coastal fishing communities is needed.
  - Added a "policy statement" section to highlight the overarching purpose of the policy.
  - The goals the Commission approved in Nov 2021 are integrated throughout new "policy strategies."
2. Used broader and less prescriptive language than the February 2022 draft to enable greater adaptability in specific actions for achieving the overall policy goal.
3. Reduced the number of directives and, rather, put a larger emphasis on harnessing the strengths of partners, stakeholders, and other agencies to accomplish the policy goal.

## **Next Steps**

For today's MRC meeting, Commission staff has prepared an outline for a revised draft policy for discussion (see Exhibit 3, this agenda item) and MRC feedback on whether to continue in this new direction. Following the MRC meeting, staff will incorporate feedback into the revised draft policy and make it available to the public. A public workshop is scheduled for December 1, where staff will review and discuss the revised draft with stakeholders and partners. Additionally, Commission staff are capturing specific actions recommended by stakeholders for consideration in a draft implementation plan.

Commission staff appreciates the engagement and feedback received from stakeholders, non-governmental organizations, academics, and agencies over the past couple of years to help develop a draft policy that uplifts coastal fishing communities' needs in fisheries management decision-making and in areas of importance to those communities.

# **California Fish and Game Commission Coastal Fishing Communities Project**

## **Outline of Revised Draft Coastal Fishing Communities Policy**

*November 8, 2022*

This document has been prepared by California Fish and Game Commission (Commission) staff in support of Agenda Item 7(C) of the Commission Marine Resources Committee's November 17, 2022 meeting. Staff developed this outline of a revised draft coastal fishing communities policy after internal discussions with the California Department of Fish and Wildlife and other partners to re-envision what was a much more detailed policy and to develop a higher-level policy for considering coastal fishing communities' needs, while keeping in mind stakeholders' initial input on a potential policy and feedback on the first draft policy.

### **I. Introduction**

- Highlight the importance of coastal fishing communities in California. Coastal fishing communities have social, cultural and economic value and are interdependent with healthy marine species and ecosystems.
- Coastal fishing communities are dynamic systems composed of many parts, each influencing the others.
- Coastal fishing communities face many dynamic challenges that strain and disrupt coastal fishing communities socially and economically; such challenges include economic viability, lack of adequate port infrastructure, climate change, shifting stocks, "greying" of the fleet, harmful algal blooms, whale entanglement risk and uncertain season length, increased competition for shoreside uses and ocean space, and more.
- The goal of the coastal fishing community project and this policy is to help address and, just as importantly, avoid exacerbating the numerous challenges.

### **II. Definition**

- For purposes of this policy, Coastal Fishing Community is defined as... [MRC's working definition]

### **III. Policy Setting**

- Marine Life Management Act
- California Coastal Act, sections 30234, 32034.5 and 30703
- Commission Restricted Access Commercial Fisheries Policy
- Federal policies (i.e., Magnuson-Stevens Fisheries Conservation and Management Act)
- Why a coastal fishing communities policy is still needed: There is a need for holistic management that accounts for fisheries as dynamic social-ecological systems. There are many interdependencies between communities and fisheries (as well as within and among fisheries) and implications for place-based communities need to be explicitly integrated into the management context.

## **IV. Policy Statement and Strategies**

### ***A. Policy Statement***

It is the policy and practice of the California Fish and Game Commission to consider the perspectives of and implications for coastal fishing communities socially and economically when pursuing robust and long-lasting fisheries management and conservation. The Commission will pursue this policy through a holistic strategy that includes meaningful coastal fishing community engagement, ensuring coastal fishing community interests are considered during Commission decision-making, and supporting efforts to facilitate capacity-building and adaptation in coastal fishing communities. A number of strategies will be pursued to address the challenges coastal fishing communities face and ensure their perspectives and interests are appropriately integrated into fisheries management and Commission actions.

### ***B. Understand issues and identify solutions through meaningful coastal fishing community engagement.***

- Promote direct and consistent engagement with coastal fishing communities, such as through a dedicated annual process
- Facilitate collaboration with coastal fishing communities on problem-solving and identifying solutions
- Consider a mechanism for regular, ongoing engagement and follow-up/follow-through

### ***C. Commission action: Ensure coastal fishing community interests are reflected in Commission decision-making***

- Advance collaborative approaches identified with coastal fishing communities through decision-making and regulatory processes as appropriate
- Support management options and plans that contribute to the social and economic sustainability of coastal fishing communities, while maintaining the sustainability of fisheries
- Develop a system(s) to anticipate and respond quickly to emerging needs or disruptive changes
- Review and adjust policies and regulations through the lens of supporting coastal fishing communities' adaptation

### ***D. Support capacity-building in coastal fishing communities via external efforts***

- Facilitate coordination efforts between agencies and partners aimed at supporting coastal fishing communities
- Support organizational and operational capacities of coastal fishing communities
- Uplift coastal fishing community interests in the face of emerging issues or threats

- Help build and leverage partnerships to collect essential information
- Support efforts to foster a new generation of fishermen
- Support efforts, such as the collection of socioeconomic data, that can inform decision-making and be a resource to stakeholders

## **FGC – MRC meeting (November 17<sup>th</sup>): Ocean Protection Council update**

### **30x30**

OPC is leading implementation of 30x30 in California's coastal waters, in close collaboration with California Native American tribes, state and federal agency partners, and key stakeholder groups. As detailed in the state's [Pathways to 30x30](#) document, the state currently considers 16% of state waters conserved. This is the area covered by the state's marine protected area (MPA) network, but MPAs are not the only way to achieve conservation of coastal and marine ecosystems. Strategies and opportunities for conserving an additional half a million acres of coastal waters by 2030 will include:

- Adaptively managing California's MPAs to ensure they continue to provide strong protections for coastal and marine biodiversity, especially in the face of climate change.
- Working with federal partners to strengthen biodiversity protections in California's National Marine Sanctuaries.
- Partnering with California Native American tribes to establish Indigenous Marine Stewardship Areas, focused on supporting and enhancing tribal stewardship of coastal and marine ecosystems.
- Collaborating with scientists and fishermen to better understand the role of complementary conservation measures, such as areas in which human activity is restricted for fisheries management purposes, in protecting coastal and ocean biodiversity.

OPC looks forward to working with environmental justice organizations, conservation groups, fishermen, and others as the state moves forward with its 30x30 initiative. As a first step, on November 30 from 12-1pm, OPC will host a virtual public workshop to share more detail about the approach for coastal waters and opportunities for members of the public to participate. OPC will also lead tribal consultations, listening sessions, and other engagement opportunities to ensure that the voices of California Native American tribes are elevated and prioritized in 30x30 implementation.

### **Statewide Restoration and Mitigation Policy**

OPC has developed a draft policy for restoration and mitigation in coastal and ocean habitats. Although habitat restoration and mitigation activities have been occurring for years in California, the state currently lacks a comprehensive policy for such activities within marine waters, resulting in a piecemeal and inconsistent approach. This new policy will promote consistency in agency decision-making, provide clarity to stakeholders and the public on appropriate activities, and help to conserve ocean and coastal biodiversity in a changing climate. It is intended to provide a standardized foundation for evaluation and approval of restoration and mitigation activities and will include specific guidance regarding MPAs, artificial reefs, invasive species management, and living shorelines.

The draft policy has been reviewed and revised by an expert science panel that includes Dr. Sean Anderson (CSU Channel Islands), Dr. Richard Ambrose (UCLA), Dr. Marissa Baskett (UC Davis), Dr. Peter Raimondi (UC Santa Cruz), and Whelan Gilkerson



(Merkel & Associates). In the coming weeks, OPC will share the revised policy with partner agencies for input and anticipates finalizing and publicly releasing the policy in early 2023.

### **United Nations Biodiversity Conference (COP 15)**

OPC continues to work closely with California Natural Resources Agency leadership to support California's participation in the United Nations biodiversity conference (COP 15), which will take place December 7-19 in Montreal, Canada. California representation at COP 15 will include Secretary for Natural Resources Wade Crowfoot, Deputy Secretary for Biodiversity and Habitat Dr. Jennifer Norris, Acting Deputy Secretary for Oceans and Coastal Policy and Acting OPC Executive Director Jenn Eckerle, OPC Senior Biodiversity Program Manager and Tribal Liaison Mike Esagro, California Department of Fish and Wildlife (CDFW) Director Chuck Bonham, and CDFW Chief Deputy Director Valerie Termini. Several legislative members have been invited to attend as well. OPC has identified key opportunities for engagement at COP, including: participation in negotiations around a new global agreement for biodiversity conservation; a leading role for California at a subnational government summit; a roundtable discussion on biodiversity conservation with NGO partners and legislative members, and attendance at key side events on issues such as 30x30, tribal/indigenous community engagement, and protected area management. These opportunities will allow California to showcase its global leadership on biodiversity and initiate knowledge exchange to benefit current initiatives in the state.

### **Marine Protected Areas (MPAs)**

In summer 2022, OPC issued a request for proposals to help resource managers better understand the role that California's MPA network plays in promoting climate resilience. Selected projects will address three solicitation priorities, which are based on major findings from a recent [OPC Science Advisory Working Group report on MPAs and Climate Resilience](#): 1) Characterize vulnerability of MPAs across multiple stressors to evaluate the potential ecological resilience through climate refugia; 2) Model habitat and species distribution in current and future conditions to inform risk assessments; and 3) Assess social values and outcomes relating to MPAs and climate resilience in California. \$2,000,000 in Proposition 68 funding is available through this solicitation and projects will be supported for up to two years.

OPC received 33 Letters of Intent through this solicitation and OPC and CDFW staff are currently reviewing 12 full proposals. Selected applicants will be notified by mid-December and projects will be presented at the January 24, 2023 OPC Meeting for consideration and possible approval.

OPC is also supporting CDFW in finalizing the Decadal Management Review of the MPA network. The final report will be released in January 2023 and OPC is leading planning efforts for a public symposium in March 2023 that will celebrate the MPA network's first ten years, highlight critical information gaps and next steps for adaptive management, and elevate the critical role of MPA partners across the state.

### **Aquaculture Action Plan**

OPC and the Aquaculture Leadership Team are bringing authorship of this document back to the state and are refining the scope to: 1) focus on improving the current system and management of existing operations (what is happening now and how can we improve); and 2) set the framework for future development to potentially expand aquaculture in California. OPC has convened a working group of the Leadership Team that will take the lead in identifying priorities and policy recommendations and will collaboratively develop a draft Action Plan that meets state needs, reflects state priorities, and leads to meaningful change and progress for sustainable aquaculture development in California. OPC aims to schedule the first meeting of this working group in late November/early December.

### **Climate-Resilient Fisheries**

OPC is currently outlining its vision for making California fisheries as resilient as possible in the face of climate change. The goal is to identify priorities for OPC to partner with, and support, the Commission and CDFW to modernize data collection, manage fisheries adaptively, maintain or enhance ecological resiliency, and build socio-economic resiliency within coastal fishing communities. This work is key priority for OPC and staff plans to share these priorities with the Commission and CDFW for input and feedback in late 2022/early 2023.

### **OPC/California Sea Grant Microplastics Request for Proposals (RFP)**

OPC and California Sea Grant are in the process of developing and releasing a microplastics RFP related to the fate, transport, source attribution, and assessment of environmentally significant microplastic concentrations, and to evaluate the microplastic removal efficacy of low impact development (LID) structural stormwater management approaches. OPC staff anticipates bringing the RFP to the Council for consideration and possible approval at the January 24, 2023 OPC Meeting.

### **Federal Marine Debris Proposal Submissions**

OPC partnered with California Sea Grant this late-summer/early-fall to submit three total proposals to leverage & pursue federal funds from the [National Sea Grant Marine Debris Challenge and Community Action Coalition solicitations](#) to: (1) conduct a community needs assessment in the Los Angeles region to mitigate plastic pollution; (2) pilot a statewide Macro- and Microplastics Monitoring Network; and (3) support research related to the use of green infrastructure (low impact development) as an effective approach to intervene with land-based microplastics (to expand the scope and scale of OPC and California Sea Grant's forthcoming RFP).



# MPA Network – 2022 Decadal Review Update



17 November 2022

*Presented to:*

**Marine Resources Committee**

**In-person/virtual meeting**

*Presented by:*

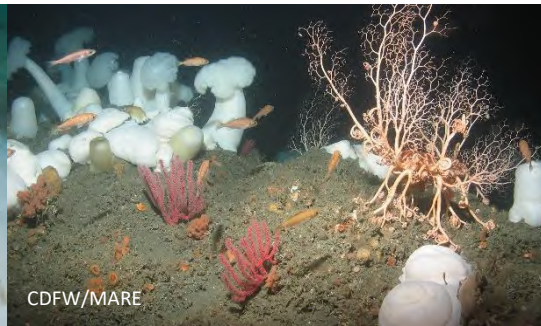
**Becky Ota**

**Program Manager  
Marine Region**



# MPA Decadal Management Review Purpose

- Informative Report with Technical Components
  - Progress towards meeting the goals of the MLPA
  - Information and knowledge gaps
  - Recommendations for adaptive management
    - MPA Network
    - MPA Management Program
- Provide recommendations to Fish and Game Commission to help inform adaptive management decisions moving forward







# Decadal Management Review Report

## Structure of the Report

### Executive Summary

- I. Setting the Scene
- II. Approach to the Review
- III. MPA Governance and Partnerships
- IV. MPA Management Program
  - I. Four pillars of management
- V. MPA Network Performance: Connecting Habitats and Domains
- VI. Discussion
- VII. Recommendations
- VIII. Conclusion
- IX. Appendices





# MPA Network Performance Sources

- Tribal perspectives on MPA Management
- Law enforcement data
- MPA Management Program partner reports
- Stakeholder input
- Science guidance
  - Baseline data (2007-2018)
  - Long-term data (2016-present)
  - MPA Decadal Evaluation Working Group Report
  - MPAs and Climate Resilience Report
  - National Center for Ecological Analysis and Synthesis
- Recommendations and associated action items







# Public Discussions

- Fish and Game Commission, February 8-9 - Sacramento
- Symposium, March 15, 2024 – Monterey
  - Panels on four Pillars of Management
  - Data sharing and networking
- Marine Resources Committee, March 16, 2023 – Monterey
- Tribal Committee, April 18, Fresno/Bakersfield
- Fish and Game Commission, April 19-20, Fresno/Bakersfield





# Decadal Management Report Timeline

## Develop DMR:

- Partner reports
- Tribal content
- Technical reports
- Stakeholder input
- Fishing industry input

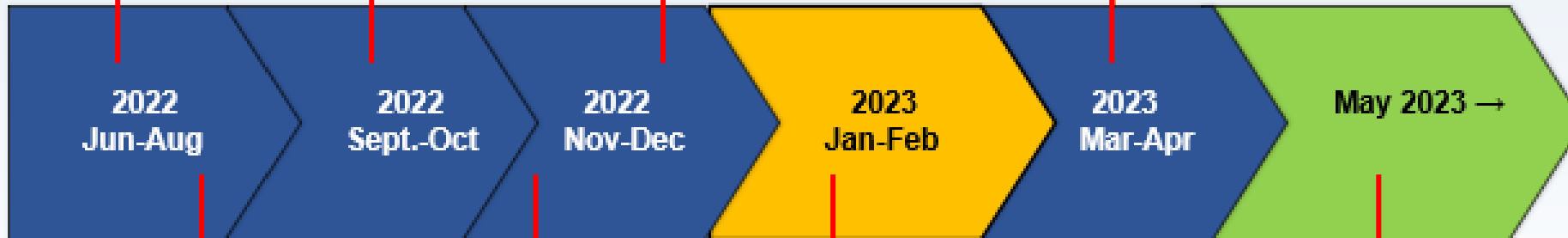
## Continued DMR Development:

- Tribal review of draft

## Public Meetings:

- Public Symposium- **March**
- Marine Resources Committee mtg – **March**
- FGC Tribal Committee mtg- **April**
- FGC meeting - **April**

## DMR Completed!



- **Continued:**
- National Center for Ecological Analysis and Synthesis (NCEAS) submissions
- Internal review

## Final Report Development

- **FINAL Report** publicly available in January
- **FINAL Report** to Fish and Game Commission (FGC) in February

## Continued discussion and decision making:

- Implementation of recommendations





# Thank you

[Becky.Ota@wildlife.ca.gov](mailto:Becky.Ota@wildlife.ca.gov)

<http://wildlife.ca.gov/Conservation/Marine/MPA>



**Becky Ota, Manager**  
San Carlos



**Stephen Wertz, Sr. ES**  
Los Alamitos



**Michael Prall, ES**  
Eureka



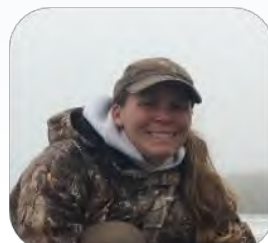
**Sara Worden, ES**  
San Carlos



**Chenchen Shen, ES**  
San Carlos



**Lara Slatoff, ES**  
Monterey



**Tammy Heitzenrater, AGPA**  
Monterey



**Amanda Van Diggelen, ES**  
Los Alamitos



**Kara Gonzales, ES**  
Los Alamitos

**Marine Life Management Act Master Plan: Implementation Work Plan**

November 2022

**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).

**Work Plan**

Time Frame: Annual, Ongoing, EC (Estimated Completion), In Progress (no estimated completion date), TBD (To Be Determined), or as specifically described.

**I. Scaled Fishery Management: Enhanced Status Reports**

Topic	Tasks	Time Frame
Completed ESRs	Update completed ESRs with landings and catch, research and monitoring results, and regulation changes	Ongoing
New ESRs	Develop additional ESRs (Spotfin Croaker, Bay Shrimp, Pacific Herring, and Gaper Clam)	EC – May 2023; Gaper Clam – TBD

**II. Scaled Fishery Management: Key Actions for Priority Species without an FMP**

Topic	Tasks	Time Frame
CA Halibut	Continue review of management needs (scaling) by completion of CA Halibut stock assessment model improvements for the southern stock, determining bycatch acceptability, conducting a trawl ground evaluation and Management Strategy Evaluation (MSE)	EC 2023
Kelp	Coordinate with Ocean Protection Council (OPC) to develop the Statewide Kelp Restoration and Management Plan, including development of a suite of priority projects for kelp recovery and restoration through partnerships	Ongoing
Red Abalone Fishery Management Plan (FMP)	Further develop the management strategy and harvest control rules developed during the management strategy integration process for Red Abalone to complete the draft FMP	EC 2023
Marine Algae	Develop Sea Palm commercial regulations	In progress

Topic	Tasks	Time Frame
Marine Algae	Develop other marine algae commercial regulations	TBD
Barred Sand Bass	Develop stock assessment, evaluate immediate management needs through MSE toolkit	TBD
Kelp Bass	Develop stock assessment and incorporate MSE toolkit	TBD
Barred Surfperch	Conduct MSE using toolkit and evaluate management needs	TBD
CA Barracuda	Conduct MSE using toolkit and evaluate bycatch in commercial fishery	TBD
Bay Shrimp	Evaluate bycatch in commercial fishery	TBD
Pacific Angel Shark	Evaluate bycatch in commercial fishery and monitor stock status as outlined in the ESR	Ongoing
Brown Smoothhound Shark	Monitor stock status as outlined in the ESR	Ongoing
Dungeness Crab	Update Risk Assessment and Mitigation Program (RAMP)	Ongoing
Ridgeback Prawn	Conduct fleet gear survey, work with federal observers to collect additional essential fisheries information, begin bycatch evaluation.	Fleet survey completed May 2022, Ongoing
Warty Sea Cucumber	Collaborative research with CA Sea Cucumber Dive Association on catch size frequency, continue to explore feasibility of minimum size limit and/or catch limit	Completed Aug 2022, In progress.
Rock Crab	Monitor entanglements (now possible with new buoy marking requirement)	Ongoing
Spot Prawn	Monitor entanglements (now possible with new buoy marking requirement)	Ongoing
Gaper Clam	Track results of hydraulic pump rulemaking	Ongoing

### III. Scaled Fishery Management: Key Actions for Priority Species with an FMP

Topic	Tasks	Time Frame
White Seabass	Evaluate bycatch in commercial fishery, complete biological research, and initiate review of FMP	TBD

Topic	Tasks	Time Frame
Ocean Pink Shrimp	MSC Certification	EC 2023
Pacific Herring	Amend commercial Herring regulations to allow limited use of small scale lampara nets in Humboldt Bay	EC Aug 2023
CA Sheephead	Regulatory amendment to decouple CA Sheephead from Groundfish and reduce take to stay within TAC	EC Jan 2023
Market Squid	Convene Fishery Advisory Committee and evaluate need for regulatory changes	EC 2024
CA Spiny Lobster	Regulatory cleanup package, monitor entanglements	EC April 2023, Ongoing

**IV. Managing Fisheries and New Programs\*\***

Topic	Tasks	Time Frame
Track TACs and Catch Limits	CA Sheephead, Kellet's Whelk, Sheep Crab, Market Squid, Pacific Herring, and Bull Kelp	Annual
HABs and Domoic Acid	Implement Evisceration Program for Dungeness and Rock Crab Fisheries under SB 80 – Expand surveillance testing to Southern California	Ongoing
Experimental Fisheries	Implement EFP Program	Ongoing
Fisheries Disaster Relief Programs	Implement as needed	Ongoing

\*\*In addition to tasks already covered in Sections II and III

**V. Outreach**

Topic	Tasks	Time Frame
CA Marine Species Portal	Addition of other non-ESR species	Ongoing
CA Marine Species Portal Phase 3 – Data Modernization	Implement Marine Fisheries Data Explorer	EC 2023
Marine Region Website	Improve website	Ongoing
FGC Updates	Provide regular updates at FGC Marine Resource Committee and Tribal Committee meetings	Ongoing

<b>Topic</b>	<b>Tasks</b>	<b>Time Frame</b>
Partnerships and Stakeholder Engagement	Participate on formal and informal fishery taskforces and workgroups	Ongoing
Partnerships and Stakeholder Engagement	Outreach to fishermen and stakeholders through formal and informal discussions	Ongoing
Partnerships and Stakeholder Engagement	Outreach to Tribes per guidance provided in the 2014 CDFW Tribal Communication and Consultation Policy	Ongoing
Partnerships and Stakeholder Engagement	Incorporate Justice, Equity, Diversity, and Inclusion principles into outreach documents and activities	Ongoing

## **VI. Improving MLMA Fisheries (Ecological, Social, and Management Systems)**

<b>Topic</b>	<b>Tasks</b>	<b>Time Frame</b>
Data Modernization and Review	Review and evaluate logbooks and potential use of E-logs	In progress
New Data Collection Methods	Evaluate use of electronic monitoring	Ongoing
Fisheries Adaptive Capacity	Support the investigation of other ways for improving fisheries management responsiveness and fishing communities' resilience to changing ocean conditions	Ongoing
Fisheries Adaptive Capacity	Support development of 13 port profile descriptions	EC Feb 2023
Fisheries Adaptive Capacity	Develop guidance for analyzing Department commercial fisheries data to address key socioeconomic questions	Ongoing

**Scaled Fishery Management**

Scaled Fishery Management along a continuum from Enhanced Status Report (ESR) to a complex Fishery Management Plan (FMP)[Adapted from the 2018 MLMA Master Plan, Figure 2]

### What scale of management is appropriate?

FGC §7056(a-m)

**Enhanced Status Report (ESR) → ESR & Rulemaking → ESR & Streamlined FMP → ESR & Standard FMP**  
Level also determined by fishery complexity and available information and resources

#### ESR

Spotfin Croaker  
Bay Shrimp  
Gaper Clam  
Pacific Herring

#### ESR & Data/Scoping

Barred Sand Bass  
Kelp Bass  
White Seabass  
Barred Surfperch  
Redtail Surfperch  
California Barracuda  
California Sheephead  
Ocean Whitefish  
Bay Shrimp  
Pacific Angel Shark  
Brown Smoothhound Shark  
Ridgeback Prawn  
Giant Red Sea Cucumber  
Warty Sea Cucumber  
Red Sea Urchin  
Spot Prawn  
Rock Crab

#### ESR & Rulemaking

Marine Algae  
Dungeness Crab  
Pacific Herring

#### ESR & Basic/Complex FMP

California Halibut\*  
Red Abalone  
Kelp

#### FMP Implementation or Review

Ocean Pink Shrimp  
Pacific Herring  
white Seabass  
Spiny Lobster  
Market Squid

\*Scale of management under review

**California Fish and Game Commission Tribal Committee**  
**Definition of “Tribal Subsistence Harvest”**  
**and Related Management Mechanisms Project**  
*December 9, 2021 Draft*

**Issue Statement**

California Native American tribes have long expressed concerns about the ability of their citizens under California law to access, harvest, hold, consume, and otherwise manage an array of species, natural resources, and marine and terrestrial areas within their respective historic territories, in manners consistent their traditional cultures and lifeways. Tribes have expressed their concerns verbally and in writing to the California Fish and Game Commission (Commission), the California Department of Fish and Wildlife (Department), the California Natural Resources Agency (CNRA), and other state entities via government-to-government consultations, during Commission, and other public meetings, and in field contexts. Identifying and implementing a solution to these concerns, in whole or in part, may be within the authority of the Commission.

**Goal**

Identify opportunities to develop in state statute and/or regulation an actionable definition of California Native American subsistence activities that is distinct from “commercial” or “recreational”.

**Background**

California regulates human interactions with fish and wildlife species, natural areas, and other public resources primarily under the auspices of the terms “commercial” and “non-commercial,” with the latter including uses referred to as “recreational,” “sport,” “scientific,” “educational,” etc. The term “commercial,” in reference to natural resources, is referenced in statute and regulation in over 1,350 instances, including in the California Food and Agricultural Code, the California Fish and Game Code, and Title 14 of the California Code of Regulations. In order to begin to provide the Tribal Committee with a foundational understanding of the issue, this background provides an initial, brief survey of how some of these terms are defined or referenced in California laws and regulations.

***Food and Agricultural Code***

*Section 23.5. Commercial production of aquatic life*

The commercial production of aquatic plants and animals propagated and raised by a registered aquaculturist pursuant to Section 15101 of the Fish and Game Code in the state is a growing industry and provides a healthful and nutritious food product, and, as a commercial operation, utilizes management, land, water, and feed as do other agricultural enterprises. Therefore, the commercial production of that aquatic life shall be considered a branch of the agricultural industry of the state for the purpose of any law that provides for the benefit or

protection of the agricultural industry of the state except those laws relating to plant quarantine or pest control.

### ***Fish and Game Code***

#### *Section 7600. Taking and possession of fish for commercial purposes*

The provisions of this part apply to the taking and possession of fish for any commercial purpose.

#### *Section 7709. Regulations for taking for educational and scientific purposes*

The commission may establish rules and regulations for the commercial taking of fish for educational and scientific purposes.

#### *Sections 8031, 8040. Definitions*

“Commercial fisherman” means a person who has a valid, unrevoked commercial fishing license issued pursuant to *Section 7850*.

#### *Section 16518. “Commercial fishing”*

“Commercial fishing” means the taking of fish by qualified Indian tribal members of the Klamath River Indian Tribes, for sale or to be offered for sale within California.

For the terms “recreational” and “sport” it appears that there are currently no formal statutory or regulatory definitions in California. As such, pursuant to the State’s recognition that jurisdiction over the protection and development of wildlife resources is of great importance to both it and California Indian tribes (California Fish and Game Code, *Section 16000*), the state has committed to strengthening and sustaining effective relationships between it and tribes by working to develop partnerships (Executive Order B-10-11 and N-15-19). The Commission and the Department maintain authority and responsibility for administering the public trust for wildlife resources within the state of California (California Fish and Game Code, *Sections 711.7, 1802*).

### ***Relationship with Tribal Co-management***

Relating these terms to future possible implementation actions or activities, and an eventual definition related to tribal subsistence harvest, recent policies and actions related to tribal co-management could also be considered in this process. In its October 2014 Tribal Communication and Consultation Policy, the Department encourages collaborative relationships with California tribes and recognizes the potential need for memoranda of agreement to establish cooperative relationships with tribes. In October 2018, the Commission adopted a co-management vision statement:

*The vision of tribes, the California Fish and Game Commission, and the California Department of Fish and Wildlife is to engage in a collaborative effort between sovereigns to jointly achieve and implement mutually agreed upon and compatible governance and management objectives to ensure the health and sustainable use of fish and wildlife.*

And in February 2020, the Commission defined “co-management” as:



*A collaborative effort established through an agreement in which two or more sovereigns mutually negotiate, define, and allocate amongst themselves the sharing of management functions and responsibilities for a given territory, area or set of natural resources.*

Most recently, in September 2020, Governor Gavin Newsom adopted the “Native American Ancestral Lands” policy, with the stated purpose:

*“To partner with California tribes to facilitate tribal access, use, and co-management of State-owned or controlled natural lands and to work cooperatively with California tribes that are interested in acquiring natural lands in excess of State needs.”*

The ancestral lands policy reflects not only new opportunities for tribal nations related to natural lands and potential harvest activities under existing governance structures, but also a positively evolving relationship with the State that creates a stronger foundation for pursuing a potential definition for tribal subsistence harvest.

### **California Code of Regulations**

The Commission has on at least one occasion created a regulatory definition for “tribal take” in the context of marine protected areas (MPA), offering one example of a successful strategy that may be applicable in other contexts to consider when evaluating various options for defining tribal subsistence harvest.

#### *Title 14, Subsection (a)(11) of Section 632. Tribal Take*

For purposes of this regulation, “federally recognized tribe” means any tribe on the *List of Indian Entities Recognized and Eligible to Receive Services from the United States Bureau of Indian Affairs*, published annually in the Federal Register. Any member of a federally recognized tribe authorized to take living marine resources from an area with area-specific take restrictions in subsection 632(b), when engaging in take within an authorized area shall possess on his person, in his immediate possession, or where otherwise specifically required by law to be kept, any valid license, report card, tag, stamp, validation, permit, or any other entitlement that is required in the Fish and Game Code, or required by other state, federal, or local entities, in order to take living marine resources. Members shall possess a valid photo identification card issued by a federally recognized tribe that contains expiration date, tribal name, tribal member number, name, signature, date of birth, height, color of eyes, color of hair, weight, and sex; and display any of the items listed above upon demand to any peace officer. Members taking living marine resources under this provision are subject to current seasonal, bag, possession, gear and size limits in existing Fish and Game Code statutes and regulations of the commission, except as otherwise provided for in subsection 632(b). No member, while taking living marine resources pursuant to this section, may be assisted by any person who does not possess a valid tribal identification card and is not properly licensed to take living marine resources. Nothing in the regulation is intended to conflict with, or supersede, any state or federal law regarding the take of protected, threatened or endangered species.

### **Proposed Work Plan**

Under development – update will be provided at the April 2022 Tribal Committee meeting.

# California Fish and Game Commission Marine Resources Committee (MRC) Work Plan

November 1, 2022

TOPICS	CATEGORY	Jul 2022	Nov 2022	Mar 2023
<b>Planning Documents &amp; Fishery Management Plans (FMPs)</b>				
MLMA Master Plan for Fisheries – Implementation Updates	Plan Implementation			
Red Abalone FMP / Abalone Recovery Management Plan Update	FMP	X/R	X/R	
California Halibut Fishery Management Review	Management Review			
California Halibut Bycatch Evaluation for Fishery Management Review	Management Review	X*	X	X
Market Squid Fishery Management and FMP Review	Management/ FMP Review	X*		
Kelp Recovery and Management Plan development	Management Plan			
Marine Protected Area Network 2022 Decadal Management Review	Management Review		X*	X/R
<b>Regulations</b>				
California Halibut Trawl Grounds Review	Commercial Take	X*		
Kelp and Algae Commercial Harvest – Sea Palm ( <i>Postelsia</i> )	Commercial Take			
California Spiny Lobster FMP Implementing Regulations Review	Implementing Regulations	X/R		
Implementation of 365-Day Sport Fishing License	Recreational Take	X		
<b>Marine Aquaculture</b>				
Aquaculture Program Planning (State Aquaculture Action Plan)	Planning Document			X
Aquaculture State Water Bottom Leases: Existing & Future Lease Considerations	Current Leases / Planning			
<i>Public Interest Determination Criteria</i> for New State Water Bottom Aquaculture Lease Applications	FGC Policy – New Leases	X	X/R	
Aquaculture Lease Best Management Practices Plans (Hold, TBD)	Regulatory			
<b>Emerging Management Issues</b>				
Kelp Restoration and Recovery Tracking	Kelp			X
Invasive Non-native Kelp and Algae Species	Kelp / Invasive Species			
<b>Special Projects</b>				
California's Coastal Fishing Communities Project	MRC Special Project			
Coastal Fishing Communities Policy	FGC Policy	X*	X	X/R
Box Crab Experimental Fishing Permit (EFP) Research Project	EFP			

**Key:** X = Discussion scheduled X/R = Recommendation may be developed and may move to Commission  
\* = Written agency update