

Establishing a Statewide Baseline and Long-Term MPA Monitoring Program for Commercial and Commercial Passenger Fishing Vessel Fisheries in the State of California

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Acknowledgements & Report Citation

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Executive Summary

California's coastal and marine resources support a variety of human uses for various social, economic, recreational, and cultural purposes. To understand human-environment interactions in the context of marine protected areas (MPAs), a comprehensive understanding of the historical and current use of marine resources in relation to MPA formation, perceptions of MPAs by resource users, and MPA linkages to the socioeconomic health and well-being of people and communities is required. This project was designed to inform the 10-year management review of California's MPA network, focusing on two specific forms of consumptive use: commercial fishing and Commercial Passenger Fishing Vessels (CPFV). This project set out to design, implement, and evaluate a scalable and replicable consumptive human use long-term monitoring program that could be applied statewide and in the long term.

Project methods were designed to address three core components:

1. Engagement with fishermen across 18 major California port groups, managers, researchers, and other invested parties;
2. Design and implementation of port-based and/or regional focus groups with members of California's commercial and CPFV fishing communities related to community well-being and outcomes from the MPA network; and
3. Spatial data modeling to explore spatial use of the ocean by commercial fisheries in relation to the MPA network.

To ensure the final research products would be useful, intended end-users—fishermen, managers, and researchers—were engaged at the onset of the project's initiation and at key stages throughout the project's duration to provide input on the design of project methods and final product deliverables. These 'Key Communicators' were invited to share their perspectives and feedback through informal interviews, small group meetings/webinars, 1-on-1 discussions, and written reviews. Following each conversation, the input shared was considered and integrated into the overall project design.

A core method of this research project involved conducting focus groups with members of commercial and CPFV fishing communities in order to assess their

knowledge, attitudes, and perceptions of the MPA network and the overall health and well-being of their fishing communities. Managers and scholars have increasingly recognized the importance of information about perceptions in informing environmental decision-making and adaptive management. In effect, gathering quantitative and qualitative perceptions data can play an important role in monitoring and evaluation of conservation projects such as marine protected areas.

When thinking about the human dimensions of MPAs, there has also been an increased focus by researchers on the well-being outcomes of communities and groups connected to and potentially affected by MPA networks. The concept of well-being encompasses the social, cultural, economic, and ecological conditions within fishing communities. A focus on well-being allows for a more holistic understanding of the conditions and context under which management decisions, such as the implementation and on-going management of MPAs, are experienced.

During focus group conversations, fishing community members were asked to answer questions related to their community well-being and outcomes from the MPA network (see Appendix A.9 for the question list). The focus group approach and questions list were developed through an assessment of experience with previous socioeconomic monitoring studies; an extensive review of the literature related to community well-being and human dimensions of MPAs; and outreach and engagement with key communicators including fishermen, agency staff, and academics. The focus group approach was designed to be cost-effective for collecting social data at a statewide scale and to capture both quantitative and qualitative information through first-hand accounts from fishermen themselves. The arrival of the COVID-19 pandemic at the beginning of our study effort made face-to-face interactions with fishermen untenable, causing the Project Team to pivot to a virtual approach. From July 2020 - May 2021, the Project Team held virtual focus group conversations in 18 of 19 major port groups for the commercial fishing sector and five of seven larger regions for the CPFV sector. During the focus groups, participants were led through a deliberative process to rate and discuss questions related to their perceptions of MPA outcomes and their fishing community's overall well-being. A total of 85 individuals participated in the commercial fishing focus groups and 20 participated in the CPFV focus groups.

California Commercial Fishing Ports and Regional CPFV Fishing Groups Invited to Participate in Focus Group Discussions

California commercial fishing ports:

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Crescent City 2. Trinidad 3. Eureka 4. Shelter Cove 5. Fort Bragg Area Ports 6. Point Arena 7. Bodega Bay Area Ports 8. San Francisco Area Ports 9. Princeton - Half Moon Bay 10. Santa Cruz | <ol style="list-style-type: none"> 11. Moss Landing 12. Monterey Bay* 13. Morro Bay - Avila / Port San Luis 14. Santa Barbara 15. Ventura / Channel Islands Area Ports 16. Los Angeles / Long Beach Area Ports 17. Orange County Area Ports 18. Oceanside 19. San Diego Ports |
|--|--|

CPFV regions:

1. North Coast: Crescent City, Trinidad, Eureka, Shelter Cove, Fort Bragg, Albion, Point Arena
2. Bodega Bay: Bodega Bay / Bolinas
3. San Francisco Area Ports: Princeton - Half Moon Bay
4. Santa Cruz, Moss Landing, Monterey*
5. Santa Barbara, Ventura, Port Hueneme - Oxnard
6. Los Angeles / Long Beach*
7. Orange County Area Ports, Dana Point, Oceanside, San Diego Area Ports

**Fishermen from these ports/port groups chose not to participate in a focus group conversation.*

The Project Team also developed a modeled spatial dataset to better understand fishing patterns in and around California state MPAs in the years 2005-2020. This modeling effort set the pre-MPA years as 2005-2009 and the post-MPA years as 2010-2020. This was done in an effort to simplify the model and set a MPA implementation point that tracked with the real world implementation. This methodology can be applied to other years but since this effort was focused on methods development and Ecotrust’s spatial data were collected within this timeframe, we determined these years were the most appropriate for modeling. This modeling utilized both CDFW landings data and Ecotrust spatial fishing data gathered through in-person interviews to support the MPA network design and monitoring process. In combining the strengths of both of these data sets, the Project Team conducted a refactor analysis and a resulting dataset that provides year-over-year spatial fishing effort data at a 1 nm² scale. In addition, spatial data sets were developed for nearshore finfish, urchin, and spiny lobster fisheries and analyzed to

conduct a baseline-and-change assessment between pre/post MPA periods and for changes in fishing effort inside/outside of MPAs.

Our key project findings are listed below. However, a full presentation of our key project findings and the data products/deliverables can be found on the [project website](#):

- 1. Commercial fishing perceptions of MPA outcomes:** Focus group responses indicated commercial fishermen across California were both dissatisfied with and had experienced negative effects from the MPA network (Figure 0.1). Overall perceptions of MPAs were low across the state, though the magnitude of views varied slightly between ports (Figure 0.2). A majority of participants' perceptions about MPA effects on marine resource health fell below positive, and across the board, focus group participants from California commercial fishing communities reported experiencing negative livelihood effects. Reported impacts tended to be more acute for ports in Central and Southern California compared to Northern California, where participants indicated that MPAs are located further from ports. Overall, participants expressed dissatisfaction with MPA management (including the MPA planning process), MPA monitoring, and MPA enforcement with many emphasizing this dissatisfaction related to a lack of communication from the state.

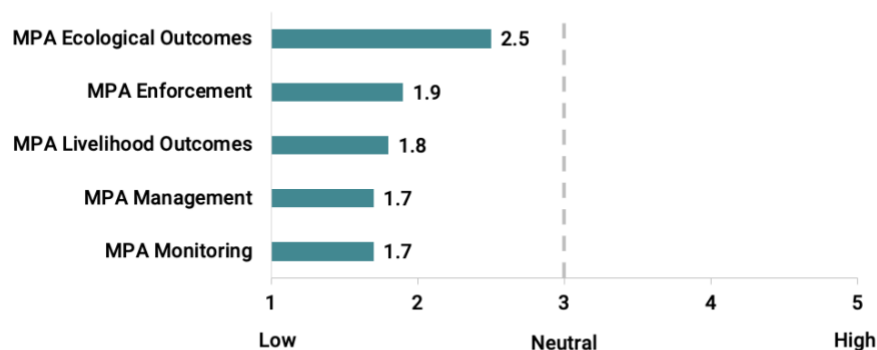


Figure 0.1 Bar chart showing statewide averages of commercial fishing focus group participants' perspectives about MPA outcomes, ordered from highest to lowest.

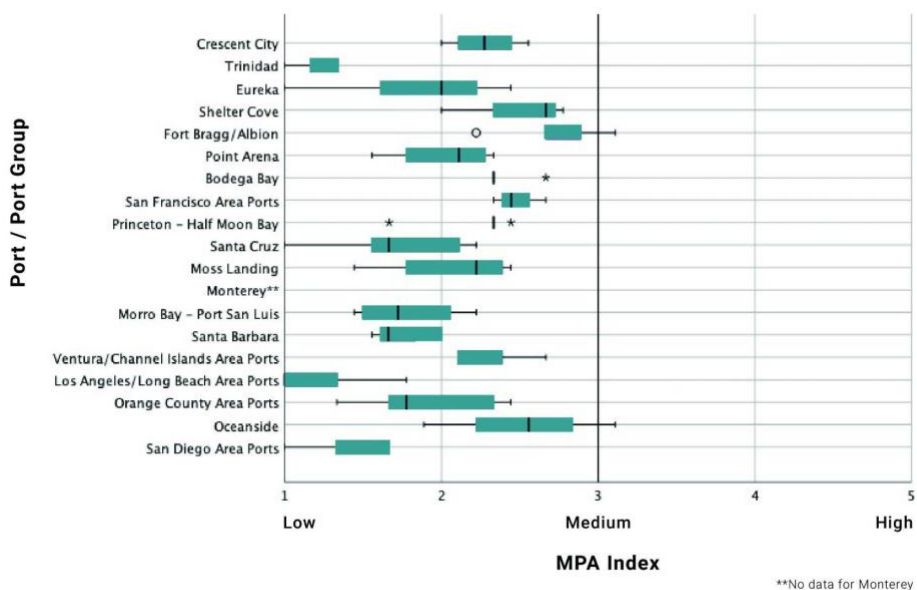


Figure 0.2 Boxplot of the MPA index score for each commercial fishing focus group, ordered geographically from north to south. An MPA index was developed for each port group by combining quantitative responses to 5 MPA questions and bundling them into three broad categories: MPA ecological outcomes, MPA livelihood outcomes, and MPA management.

- 2. Commercial fishing perceptions of fishing community well-being:** Focus group responses indicated ports across California experienced many challenges related to their well-being (Figure 0.3); however, there were some bright spots. Perceived well-being varied fairly extensively across the state, indicating that not all ports may be experiencing the same type or extent of challenges (Figure 0.4). Participants described the present health of marine resources as strong but also expressed concerns about the potential future health of the resources. The focus groups highlighted challenges related to their economic well-being with infrastructure, access to harvestable resources, income from fishing, and markets. In addition, participants reported strong internal relationships and high levels of job satisfaction. Still, they reported weaker relationships with external entities (e.g., government agencies, non-fishing nonprofit organizations) and challenges related to recruiting new captains and crew participants into the commercial fishing industry.

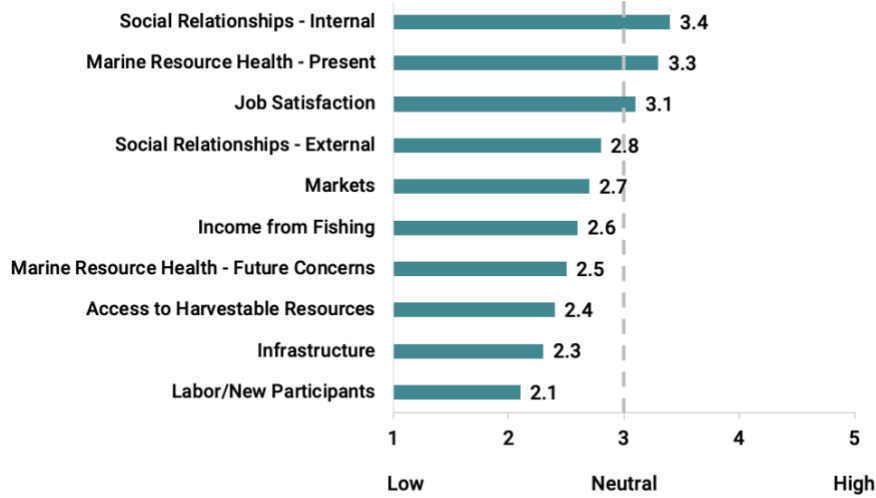


Figure 0.3 Bar chart showing statewide averages of commercial fishing focus group participants' perspectives about well-being outcomes, ordered from highest to lowest.

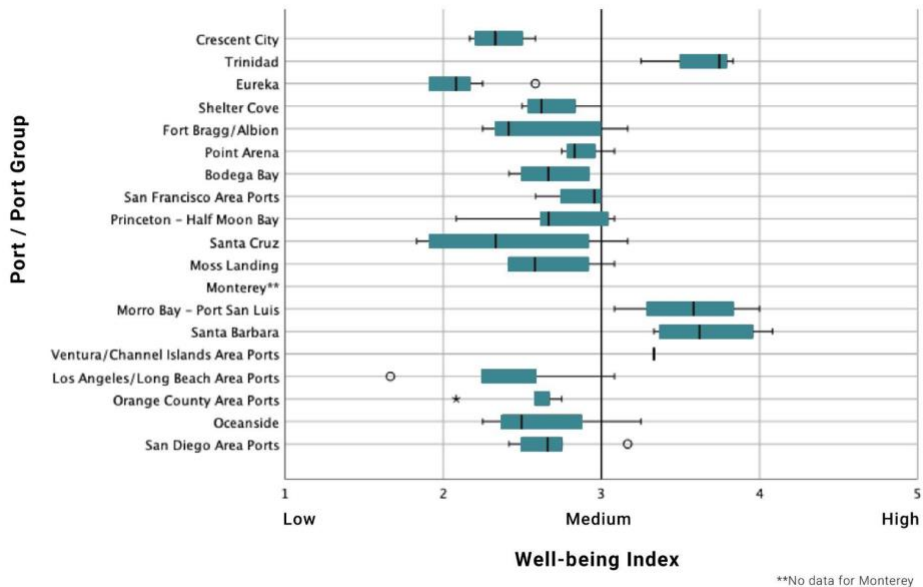


Figure 0.4 Boxplot of the well-being index score for each commercial fishing focus group, ordered geographically from north to south. A well-being index was developed for each port group by combining quantitative responses to 10 well-being questions and bundling them into three broad categories: environmental, economic, and social.

3. **Commercial fishing views on engagement and participation in fishery management:** Focus group participants expressed fear that information gathered by researchers from fishing communities would be used to restrict access to fisheries. Many participants were disillusioned with how decision-makers consider and value fishermen's knowledge and believed there was a lack of support politically for a thriving commercial fishing industry in California. Participants highlighted the disparity of available funding for researchers, managers, and planners relative to how fishermen are compensated for their time and expertise. Most participants were either satisfied or very satisfied with their experience participating in the virtual focus group. Over three-quarters of participants said they would be open to participating in a virtual meeting like the focus group in the future.
4. **Commercial fishing perceptions of COVID-19 impacts on fishing communities:** Focus group participants recounted experiencing negative impacts and disruptions in their fishing activities due to COVID-19, including challenges accessing the waterfront, temporary beach/waterfront closures, and disruptions selling their catch through traditional markets. Health concerns and crew challenges were reported in various ports across the state. Participants reported creative adaptation strategies to keep their businesses afloat through the challenging time.
5. **CPFV perspectives on MPAs, well-being, engagement, and impacts from COVID-19:** Focus group responses indicated that CPFV owner/operators share similar perspectives to commercial fishermen. While some participants felt MPAs were positively affecting ecological outcomes, the majority of participants expressed negative or neutral views on the impacts of MPAs on their fishing livelihoods, ecological outcomes, and businesses and fishing practices. Across the state, CPFV participants were dissatisfied with MPA management, monitoring, and enforcement, specifically highlighting their perceptions that managers did a poor job communicating about the MPA Program (Figure 0.5). Statewide, on average CPFV participants rated job satisfaction and social relationships among fishing community members and current marine resource health as positive. Statewide average ratings below neutral were reported for factors including income from fishing, relationships with external groups, allocation of resources, and future marine resource health (Figure 0.6). Many participants expressed frustration that their perspectives and expertise were not heard or accepted as valid sources of information by decision-makers to help inform fisheries management in

California. Eight-five percent of participants reported COVID-19 highly or very highly disrupted and changed the way CPFV businesses operate.

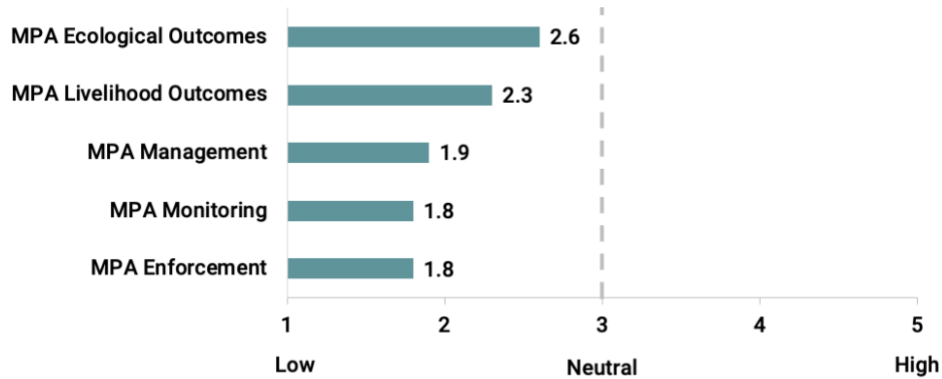


Figure 0.5 Bar chart showing statewide averages of CPFV focus group participants' perspectives about MPA outcomes, ordered from highest to lowest.



Figure 0.6 Bar chart showing statewide averages of CPFV focus group participants' perspectives about well-being outcomes, ordered from highest to lowest.

- Spatial and fisheries data analyses:** In assessing the outputs of our spatial modeling approach, the spatial modeling methodology was found to have successfully redistributed the CDFW landings data. While Ecotrust data is not

entirely coincident with CDFW data, results show a high level of fidelity between the total per year summarized to the 10nm² blocks and the output of the analysis. Additionally, the model shows changes in commercial fishing activity in micro-blocks immediately adjacent to the State Marine Reserves (SMR). For lobster, these micro-blocks averaged 10% of the catch in pre-MPA (2005-2009) years and increased to 13% in the post-implementation years (2010 - 2020). The same level of increase can be seen for sea urchin, averaging 19% in pre-MPA years (2005-2009) increasing to 22% in post-MPA years (2010 - 2020). For nearshore finfish (all species) the increase is greater: in pre-MPA years (2005-2009), the average catch in the adjacent areas was 7% but increased to 15% in the post-MPA years (2010 - 2020).

Our project directly informs California Ocean Protection Council's (OPC) [Scientific Guidance for Evaluating California's Marine Protected Area Network](#) – also known as the Decadal Evaluation Working Group's (DEWG) Report – specifically recommendations 3, 5, 10, 11, 13, and 14. Key recommendations for future ongoing MPA monitoring efforts include:

- Explicitly identify and provide sustained funding for a full spectrum of human dimensions research
- Establish methods and programs to gather fine-scale spatial and temporal scale human use data
- Initiate and integrate collaboration across the human and ecological dimensions
- Build communication channels that reflect the needs of the target audience
- Plan meeting experiences to maximize inclusivity, with a focus on participant convenience and comfort
- Be accountable and transparent about opportunities for adaptive management and potential expansion of MPAs
- Invest in California fishing community well-being

1.0 Introduction

People—as individuals and as members of larger communities—are an integral part of the California coastal ecosystem; as such, they stand to both impact and benefit from the state’s network of marine protected areas (MPAs). Understanding this human dimension has become widely recognized as a central component to understanding whether MPAs are maximizing their ecological, economic, and socio-cultural benefits while minimizing potentially negative socioeconomic impacts.

With this in mind, this project was designed to inform the 10-year management review of California’s MPA network, as well as to design, test, and evaluate a scalable and replicable consumptive human use long-term monitoring program. To understand human-environment interactions in the context of MPAs, a comprehensive understanding of the historical and current use of marine resources in relation to MPA formation, perceptions of MPAs by resource users, and MPA linkages to the socioeconomic health and well-being of people and communities is required. California’s oceans and marine resources support a variety of human uses for various social, economic, recreational, and cultural purposes. This study focuses on two specific forms of consumptive use: commercial and Commercial Passenger Fishing Vessel (CPFV). To gain a complete picture of the human dimensions in the 10-year management review, it was important to assess information about all human uses. Information about other uses may be found in additional reports or could be gained through engagement with representatives from those user groups.

For this project, we assembled a Project Team consisting of researchers and consultants from Ecotrust, Strategic Earth, and Humboldt State University with deep experience engaging California fishing communities, particularly in regards to MPA network planning and monitoring. This experience allowed us to quickly adapt our project as the COVID-19 pandemic unfolded and the in-person focus group meetings we originally proposed were not possible. We redesigned our project to engage fishermen in a virtual setting and leveraged our decades-long relationships with fishing community members to cultivate support and rally attendance for our online focus groups. More details on how we adapted our project in the light of COVID-19, as well as capturing how COVID-19 impacted fishing communities, can be found in the methods section.

For this study, we focused on key commercial and commercial fishing passenger vessel (CPFV) fisheries pursued in California state waters across all major ports.

Table 1 California Commercial Fishing Ports and Regional CPFV Fishing Groups Invited to Participate in Focus Group Discussions

California commercial fishing ports:	
<ol style="list-style-type: none"> 1. Crescent City 2. Trinidad 3. Eureka 4. Shelter Cove 5. Fort Bragg Area Ports 6. Point Arena 7. Bodega Bay Area Ports 8. San Francisco Area Ports 9. Princeton - Half Moon Bay 10. Santa Cruz 	<ol style="list-style-type: none"> 11. Moss Landing 12. Monterey Bay* 13. Morro Bay - Avila / Port San Luis 14. Santa Barbara 15. Ventura / Channel Islands Area Ports 16. Los Angeles / Long Beach Area Ports 17. Orange County Area Ports 18. Oceanside 19. San Diego Ports
CPFV regions:	
<ol style="list-style-type: none"> 1. North Coast: Crescent City, Trinidad, Eureka, Shelter Cove, Fort Bragg, Albion, Point Arena 2. Bodega Bay: Bodega Bay / Bolinas 3. San Francisco Area Ports: Princeton - Half Moon Bay 4. Santa Cruz, Moss Landing, Monterey* 5. Santa Barbara, Ventura, Port Hueneme - Oxnard 6. Los Angeles / Long Beach* 7. Orange County Area Ports, Dana Point, Oceanside, San Diego Area Ports 	

*Fishermen from these ports/port groups chose not to participate in a focus group conversation.

The socioeconomic status of California state fisheries is affected by a complex interplay of regulatory, environmental, and socioeconomic elements. MPAs are but one of a myriad of factors that impact spatial fishing patterns and the economic health and well-being of fishing communities. Given this complexity, this study aimed to take inventory of the overall status and well-being of port fishing communities but in ways that utilized and integrated temporal, spatial, and place-based approaches. Combined, these approaches produce a comprehensive understanding of economic and spatial changes over time, and consider how place-based factors (including MPA implementation) have played a role in driving these observed changes and the overall well-being of fishing communities.

A core method of this research project involved conducting focus groups in commercial and CPFV fishing communities in order to assess fisherman's knowledge, attitudes, and perceptions of the MPA network and the overall health and well-being of their fishing communities. Managers and scholars have increasingly recognized the importance of information about perceptions to inform environmental decision-making and adaptive management (for a review see: Bennett 2016). Bennett (2016, 1) claims that, "studies of the perceptions of local people can provide important insights into observations, understandings and interpretations of the social impacts, and ecological outcomes of conservation; the legitimacy of conservation governance; and the social acceptability of environmental management."

Gathering quantitative and qualitative perceptions data can play an important role in monitoring and evaluating conservation projects such as marine protected areas. There has been considerable research related to local perceptions of MPAs (e.g., Christie 2004; Leleu et al. 2012; Pita et al. 2011; Bennett and Dearden 2014a; McClanahan, Davies, & Maina 2005). These scholars have shown that perceptions data can help inform outreach strategies, the design of governance structures, assessment of ecological outcomes, and the development of management and enforcement strategies in MPAs in order to best position them for success. In short, perceptions data from ocean users can be a crucial piece of information to inform effective long-term management of MPAs, allowing for the maximizing of ecological benefits while reducing socioeconomic harm. Many recent guidelines related to the implementation and management of conventional MPAs recommend incorporating information about public and stakeholder views into the designation and long-term management processes of MPAs (e.g. Christie and White, 2007; IUCN World Commission on Protected Areas, 2008; Pomeroy et al. 2005).

When thinking about the human dimensions of MPAs, there has been an increasing focus by researchers on the well-being outcomes of communities and groups connected to and potentially affected by MPA networks (Ban et al. 2017; Ban et al. 2019; Brueckner-Irwin, Armitage, & Courtenay 2019; Gollan & Barclay 2020; Mascia, Claus, & Naidoo 2010; Mahajan & Daw 2016; Ngoc 2018; Rasheed 2020; Rees et al. 2014). The concept of human well-being in relation to environmental and ecosystems concerns has gained increased prominence in academic, development, and policy circles; notably with its foregrounding in the Millennium Ecosystem Assessment (MEA 2005) and inclusion as a United Nations Sustainable Development Goal (United Nations 2015). According to Rasheed (2020 p.1), "human well-being refers to a

holistic notion of the state and conditions of individuals and communities.” This holistic approach encompasses social, cultural, economic, and ecological conditions. Rasheed (2020 p 2) goes on to state that well-being assessments “include subjective measures which capture factors such as people’s perceptions of local environment quality; access to resources and economic opportunities; the quality of cooperation and cohesiveness of the community; and they also often aim to show how such factors affect the ‘quality of life’, ‘life satisfaction’ and/or ‘happiness’ of individuals and communities [. . .] This balanced and holistic systems perspective makes human well-being a strong and all-encompassing concept. As a result, well-being assessments are considered as a better measure of tracking human progress compared to former measures that were primarily focused on analyzing the economic productivity of individuals.” Given these considerations, we devised an approach that allows for the exploration of well-being outcomes connected to the MPA network, in addition to an analysis of California’s landings and log-book data that may provide quantitative information linked to “economic productivity.”

1.1 Project Goals and Objectives

For this project we developed four overarching goals to support the state of California in conducting long term monitoring and evaluation of its MPA network:

1. Engage representatives of commercial fishing communities across all major California ports so they can participate as partners in long-term socioeconomic monitoring efforts related to the MPA network;
2. Establish a statewide spatial and economic data sets that maybe used to assess changes in commercial and CPFV fisheries since MPA implementation;
3. Assess commercial and CPFV fishing community perceptions of the well-being of their port fishing communities and the outcomes from and management of MPAs including how fishermen have been affected by and/or adapted to MPA implementation over time; and
4. Produce recommendations as to how the state of California can most effectively design and implement a long-term program to monitor the socioeconomic health of commercial and CPFV fisheries.

To accomplish these goals, the objectives of this project were to:

- Collaborate with CDFW and Ocean Protection Council (OPC) to ensure our project was synergistic with the 10-year management review process, that CDFW commercial landings data was appropriately analyzed, and that

feedback and engagement of the overall fishing community was well communicated.

- Gain guidance and expertise from fishermen, researchers, and managers on core aspects of the project, including the design of the focus group assessment tool and final reporting products.
- Conduct a review of spatial and socioeconomic data products for accuracy and using best available data, develop statewide spatial and economic longitudinal data sets that may be used to assess changes in commercial and CPFV fisheries since MPA implementation.
- Conduct focus groups with commercial fishermen in each of California's major ports where fishermen can: A) provide quantitative and qualitative information about their perceptions of community well-being and impacts from, and adaptation to, California MPAs; B) Provide insights into the underlying causes of changes in socioeconomic or spatial patterns and trends; and C) provide feedback about what fishermen would prioritize to study in a long-term socioeconomic monitoring program related to MPAs.
- Inform future monitoring efforts by developing recommendations of key metrics and methods for long-term socioeconomic MPA monitoring.

2.0 Methods

In this section we detail the methods we designed and utilized in each of our project components. The project components include:

- Key Communicator Engagement
- Focus Groups
- Spatial Data Analysis

2.1 Key Communicator Engagement

To help ensure the key outcomes and deliverables of this monitoring study reflected the needs and priorities of end-users, we grounded the project design in the lived experiences of fishermen, managers, and academics (collectively 'Key Communicators'). This involved actively soliciting key communicator guidance about the study design and feedback on the presentation of results. Our team also provided key communicators with progress updates during the project period. An overview of Key Communicator touchpoints are in Table 2 and Figure 1.

At the very beginning of the project, prior to developing the research approach and methodology, we held preliminary informal scoping conversations with eight fishermen who play leadership roles within their fishing communities, two researchers, and select state agency staff (OPC, CDFW, FGC). These individuals were known to Project Team members through existing relationships before the project began. Scoping conversations focused on potential concerns, desired outcomes, and the potential utility of results to fishing communities. We also asked these individuals which type of socioeconomic information would be most valuable for us to collect (see Appendix A.1 for a list of initial scoping conversation questions). Feedback from these conversations informed the overall approach and focus of the study. The Project Team used this feedback to develop a draft methodology, protocol, and assessment tool for focus groups.

A project kickoff webinar was held on January 31, 2020 with 17 Key Communicators to inform study design from the ground up. Participants reviewed the draft methodology and assessment tool and provided feedback about focus group design, including focus group size, duration and timeline, and participant recruitment process. They also offered guidance on the questions to be asked in focus groups (see Appendix A.2 for a list of the feedback received through the webinar). Key Communicator feedback was then integrated into an updated project approach (see Appendix A.3 for a description of how our revised methodology integrated Key Communicator feedback). See Section 2.2.2 Methods: Focus Group Design, Recruitment, and Process on page 16 for focus group methods.

During the project period, key communicators were kept apprised of project progress and updates through email communications, and in several instances, informal phone calls with key communicators upon request. Key communicators were invited to track project progress through the [project website](#), where focus group summaries were posted as they were developed.

Throughout the project duration, principal investigators coordinated with agency staff from CDFW, OPC, CFGC in quarterly agency calls to discuss project milestones and topics related to the project as they arose.

After the project completed the focus group data collection, we held two additional webinars with key communicators to discuss preliminary findings and gain feedback

relevant to developing final research products that would be both accurate and relevant to end users. During Webinar #1 to Guide Final Reporting Product Development, (35 Key Communicators) participants had the opportunity to review and provide feedback about the design of the public facing website intended to share study results (see Table 2 for related materials and feedback from Key Communicators; see Appendix A.4 for Key Takeaways Summary #1). During Webinar #2 to Guide Final Reporting Product Development, (35 Key Communicators) participants had the opportunity to review and provide feedback about one draft key finding and two draft port profiles (see Table 2 for related materials and feedback from Key Communicators; see Appendix A.5 for Key Takeaways Summary #2). Key Communicator feedback was collected and integrated into later iterations of final deliverable products (see Appendix A.6 to review the project team’s approach to integrating Key Communicator feedback into final reporting products).

A final webinar to share final project reporting products was held with 37 participants, including both Key Communicators and the general public (see Table 2 for related materials).

Table 2 Engagement Process Overview Summary of engagement activities conducted throughout the duration of the project.

Stakeholder	Activity	Date	Resources
Agency Staff	Coordination Calls with Principal Investigators and Agency Staff Project Managers	Quarterly, starting August 2019	
Select Key Communicators	Informal Scoping Conversations	October-November 2019	
All Key Communicators	Key Communicators Webinar to <i>Guide the Design of a 'Port Community Well-being Assessment Tool'</i> and Focus Group Discussions	January 31, 2020	Webinar Agenda Webinar Slide Deck Webinar 'Presentation and Discussion Highlights Summary'
Regular Key Communicator Updates	Via email	Various dates	

Stakeholder	Activity	Date	Resources
All Key Communicators	Key Communicators Webinar #1 to Guide Final Reporting Product Development	May 27, 2021	Webinar Agenda Webinar Slide Deck Website User Stories and Design Inspiration Draft Site Map
All Key Communicators	Key Communicators Webinar #2 to Guide Final Reporting Product Development	August 27, 2021	Webinar Agenda Webinar Slide Deck Draft Key Finding and Port Profiles
All Key Communicators and General Public	Sharing Final Project Reporting Products Community Webinar	December 13, 2021	Webinar Agenda Additional materials available on project website

The following stakeholders (collectively referred to as 'Key Communicators') were included in our engagement process:

- Fishing Community Leaders: Commercial and CPFV fishermen who have historically engaged in research and management efforts, existing and new contacts of Project Team members
- Agency Staff and Project Managers: Staff from California Department of Fish and Wildlife, California Ocean Protection Council, Fish and Game Commission, California Sea Grant
- Fishing Industry Partners: Groups with direct connections to commercial and CPFV fishermen (i.e., Pacific Coast Federation of Fishermen's Association, Monterey Fisheries Trust, etc.)
- Academics/Researchers: Researchers employed by Sea Grant, universities, etc.
- Port Liaisons: Leaders within each of the 19 major California ports identified in this project, who were consulted for recommendations of potential focus group participants. In many cases, this term overlapped with fishing community leaders and fishing industry partners

- Focus Group Participants: Commercial nearshore fishermen and CPFV operators who were selected based on their ability to speak to perspectives of the port community as a whole, and who met recruitment selection criteria

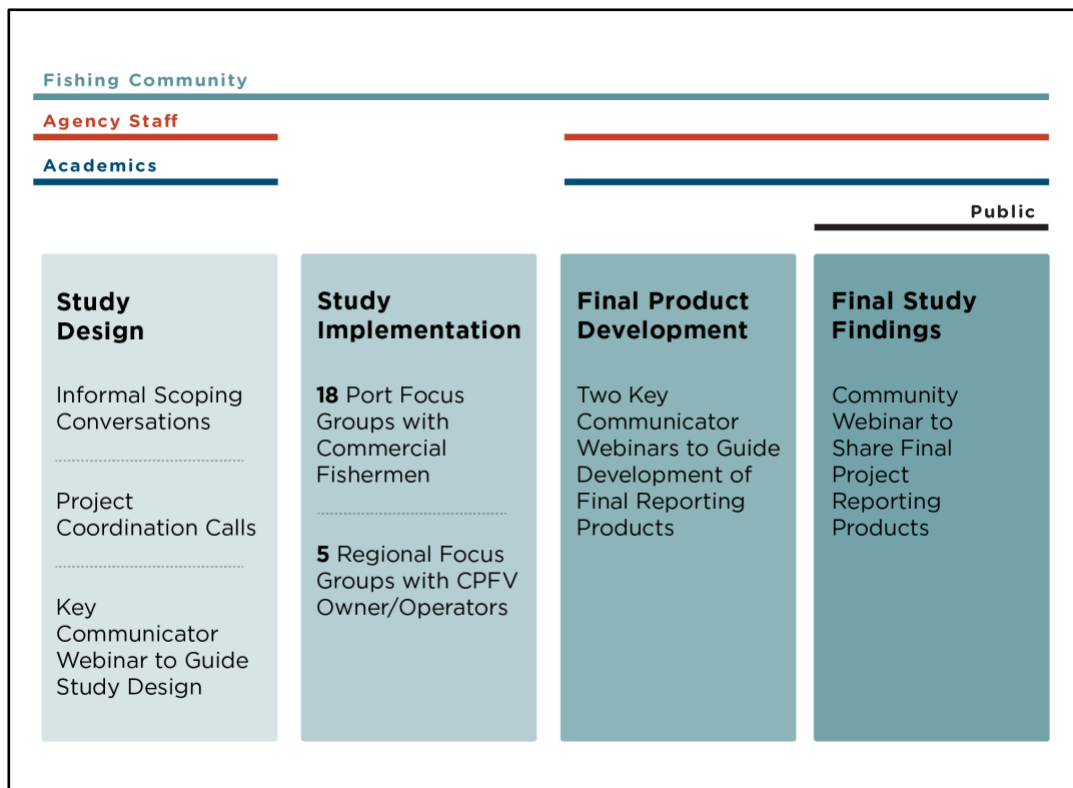


Figure 1 Overview of engagement process design that involved Key Communicator guidance at key phases of the project. Interested members of the public attended the Final Study Findings webinar.

2.2 Focus Groups

2.2.1 Considerations for the Focus Group Approach

The Project Team sought to develop a research approach to gather rich, rigorous, replicable, and comparable information about fishermen’s perceptions of the well-being of California’s commercial and CPFV fishing communities in the context of the formation and operation of the [state’s network of 124 MPAs](#). The well-being and MPA outcomes assessment process needed to overcome several challenges:

- (1) Surveys are overly burdensome for participants, expensive, and time-consuming: Previous baseline monitoring studies incorporated one-on-one surveys with a representative sample of commercial and CPFV fishermen

from every port (Chen et al. 2012; Chen et al. 2013; Chen et al. 2015; Hackett et al. 2017). This required teams of researchers to move up and down the coast, living in fishing communities for periods of time to track down fishermen to interview. Even with significant effort it was difficult to get statistically viable samples as fishermen didn't always have the time or interest to participate. Mail or email surveys of fishermen have been shown to be unreliable often with small sample sizes of returned surveys that could contribute to sample bias (Anderson et al. 2021). The team determined that it would not be realistic or cost-effective to conduct individual surveys as a part of this statewide monitoring effort. In addition, surveys lack the ability to capture rich, qualitative information about fishermen's views, experiences, and subjectivities.

- (2) Solely qualitative focus groups can be difficult for making comparisons over time and space: The California North Coast baseline study included qualitative focus groups among fishermen in each of the main ports in the region (Hackett et al. 2017). The focus groups provided rich context and specific information about fishermen's knowledge of and experiences of the MPAs. However, the data was meant to complement the survey findings. Qualitative findings from focus groups or interviews can be difficult to use to make comparisons between ports or over time, as should be incorporated into a long-term monitoring approach.
- (3) Fishermen are burned-out as participants in research studies: Fishermen are increasingly being asked to participate in a range of studies about fisheries and fishing communities. In addition, many fishermen need to keep up a schedule of attending policy meetings, technical working groups, and various other workshops. A goal was to design a research approach that limited the burden on fishermen, while making sure their voices and perspectives were effectively captured.
- (4) Secondary data analyses lack the ability to hear directly from fishing community members about their experiences: Many assessments of fishing community well-being outcomes from regulatory change focus solely on analysis of secondary data such as census data (Jepson and Colburn 2013), logbook or landings data, and other economics indicators (Ban et al. 2019; Breslow et al. 2016; Van Holt et al. 2016). While this information can provide a useful backdrop, it tells little about how individuals are experiencing changes reflected in the data. In addition, secondary can tell you the 'what,' but very

little about the 'why' – conversations with fishermen can in addition also provide insight about why certain patterns are occurring.

- (5) Grand scale of the state and the importance of hearing from small and large ports and all types of fishermen: California is a large state with at least 19 different major port groups and over 36 different fisheries. Each port and fishery has a unique context that may cause it to experience MPAs differently. Monitoring of human use needs to capture the experiences and views from fishermen up and down the coast, from the ports large and small, and from participants in the range of California's fisheries.
- (6) COVID-19 complications: The arrival of the COVID-19 pandemic at the beginning of our study effort made it so that face-to-face interactions with fishermen were untenable, requiring the team to develop a virtual research approach.

The Project Team worked with input from fishermen, managers, and prominent academics in the field of fisheries social science (see section 2.1 Key Communicator Engagement above for more details) to design an assessment protocol that overcame these challenges and would be able to provide managers, fishermen, and scholars alike with high-quality information about the human dimensions of the MPA network that will be useful and able to inform long-term management and decision-making.

2.2.2 Focus Group Design, Recruitment, & Process

The Project Team developed what we are calling a 'community-expert' approach that involved holding virtual focus groups with representatives of fishing communities who were able to reflect on the well-being of their port communities in the context of California's MPAs. The focus groups incorporated both quantitative and qualitative elements where participants would rate their fishing community, port, or region on a series of topics and then engage in a discussion about each topic. Focus group topics included concepts related to community well-being and MPAs.

The Project Team attempted to hold focus group conversations in 19 major port groups for commercial fishing and five larger regions for CPFV fishermen. The focus group method invites a dialogue between participants, but if the group gets too large it can be difficult to have a meaningful conversation (Krueger 2014). Therefore we sought to recruit 3-10 participants or 'community-experts' for each focus group to facilitate impactful dialogue. Community-experts were defined as individuals who

have a strong awareness of the state of the commercial and/or CPFV fishing community overall and can speak beyond their individual perspective.

We wanted to make sure that a broad range of perspectives in the port were represented and also invite those who would contribute to the deliberative process in a productive manner. We considered a variety of demographic factors during the participant recruitment phase such as age, fisheries of participation, vessel size, ex-vessel value, gender, and level of experience in the fishery. The Project Team developed demographic profiles for each port or region to compare with the invitee list to ensure that major fisheries or demographic groups were represented. Focus group participants were selected based on a combination of (1) reaching out to port leadership (at least two port leaders or liaisons contacted for each community) for nominations or suggestions, (2) drawing from existing contacts among members of the Project Team, and (3) reviewing CDFW landings data. Since this is a state project linked to nearshore MPAs, we limited participants to those who were connected to at least one state water fishery. Given that focus groups were held in a virtual format, we also considered access to and familiarity with remote meeting technology in our selection of participants. We also considered potential participants' ability to consider the state of their fishing community beyond their own individual experience. The goal of the conversation was to encourage fishermen to discuss the state of their port or fishing community as a whole. Community-expert participants included commercial and CPFV fishing captains, vessel owners, crew members, and occasionally individuals who did not currently fish themselves but were extremely connected to and knowledgeable about the fishing community through business activities, familial ties, and political engagement. The Project Team offered compensation to all focus group participants (see Appendix A.7 for the focus group recruitment process).

Outreach to potential focus group participants involved making contact with fishing community leaders and port liaisons (Key Terms) who were known to Project Team members prior to this project. We asked them to recommend individuals within their port communities who could speak to community perspectives broadly, and beyond their own experiences. These individuals were contacted via phone and/or email, and were presented with a preparation packet (available on [project website](#)) overviewing the project goals, objectives, and methodology, in addition to guiding questions to create discussion with other community members to gain their perspectives. Participants were also sent the entire list of focus group questions prior to the focus groups themselves. Individuals who agreed to participate in focus groups were

guided through an IRB-approved consent process (see consent forms in Appendix A.8) prior to focus groups, either via phone before the focus group date, or at the beginning of the focus group (details below). We also provided support to those who needed assistance with Zoom prior to the focus groups.

The focus groups were structured to lead participants through a deliberative process to rate and discuss 15 commercial fishing and 12 CPFV questions related to their perceptions of both MPA outcomes and overall well-being of their fishing community. Participants were also asked several open-ended questions (see Table 2 for a list of question topics and Appendix A.9 for full question prompts). Questions were developed through a review of the literature and consultation with fishermen, managers, and academics. First the Project Team conducted a thorough review of literature related to fishing community health, well-being, resilience, and vulnerability and used the review to develop a list of key environmental, social, and economic components of fishing community well-being. The community capitals framework (CCF) was used as a starting framework to develop a holistic set of questions that addressed all aspects of fishing community well-being. The CCF separates community well-being into seven interdependent capitals: social, human, cultural, political, financial, built, and natural (Emery & Flora 2006; Fey, Bregendahl, & Flora 2006; Flora 2018). We continued to review the literature and catalog various examples of well-being indicators related to fisheries and used this information to fill in areas not covered through the CCF. Next the team conducted a literature review related to both perceptions of and socioeconomic impacts from MPAs. The concept of 'outcomes' is a growing term in literature related to human dimensions of MPAs (Gruby et al. 2017). Socioeconomic outcomes from MPAs can encompass both positive and negative impacts and they can also include broader social change processes that emerge from MPA implementation processes such as increased political organizing by some groups. The literature pointed to the importance of assessing ecological and livelihood outcomes from MPAs as well as perceptions of management, monitoring, and enforcement processes.

In addition to assessing the literature, we called select fishermen and agency representatives before we designed the series of questions to ask what topics they would like to see incorporated into the focus group questions. We used the combination of this feedback and findings from the literature review to develop a draft list of questions for focus group participants. We then reviewed and refined this question list through a key communicator workshop. At the workshop, participants

expressed a need to revise the question list and approach to ensure that results are more comparable across ports and time. To address this suggestion, we developed a list of “topics to consider” after each question so that participants would answer the question with a common definition and set of expectations about the scope of the question. As an example, when we asked participants: “Overall, how would you rate the income that fishermen from your port earn from fishing in terms of supporting livelihoods?,” we asked them to consider the following factors: (a) Need to take on other jobs; (b) Costs compared to revenue; (c) Income earned compared to similar types of jobs. The depth and extent of the considerations was limited by the Zoom virtual video format which only allows 255 characters per question in a Zoom poll.

At the request of representatives of CDFW, the Project Team added a question related to COVID-19 impacts on their fishing community. This question was not added until after the fourth focus group so not all groups answered the question. Adding this question shows the utility of this approach for long-term monitoring where a similar set of questions can be asked overtime to assess change, while the tool can be revised to add additional questions relevant to current issues or conditions. Exact text of the questions and their considerations for all of the focus groups can be found in Appendix A.9. Table 3 shows a list of the broad question topics.

Table 3 A list of the commercial fishing and CPFV question topics included in the focus group assessment tool.

Focus group type	Question topic
Commercial fishing	Marine resource health - present
	Marine resource health - future concerns
	Access to harvestable resources
	Income from fishing
	Markets
	Infrastructure

Focus group type	Question topic
	COVID-19 impacts
	Labor/new participants
	Social relationships - internal
	Social relationships - external
	MPA ecological outcomes
	MPA livelihood outcomes
	MPA management
	MPA monitoring
	MPA enforcement
CPFV	Marine resources - present state
	Marine resources - future concerns
	Income from fishing
	Allocation of resources
	COVID-19 impacts
	Job satisfaction
	Social relationships - internal
	Social relationships - external
	MPA ecological outcomes
	MPA livelihood outcomes

Focus group type	Question topic
	MPA management
	MPA monitoring
	MPA enforcement

The focus groups were held using the virtual meeting software Zoom and were designed to engage participants in a structured deliberative process with quantitative and qualitative components. The focus groups began with facilitators leading the participants through a short Zoom training to make sure they were all aware of functions such as mute, video, the chat, and responding to polls so they would be able to successfully complete the activities. An overview about the study and the process followed the training, including a review of the IRB consent form and ensuring that all participants gave consent to participate in the study and have the conversation recorded. The consent forms for commercial fishing and CPFV focus groups are contained in Appendix A.8. Recordings were to be used for analysis purposes and it was communicated that neither recordings nor full transcriptions would be made available beyond the Project Team (see Appendix A.10 for the data sharing plan for this project).

After the training and introduction, the focus group conversation commenced. First, the facilitators posed a question and asked participants to rate their community using polling software built into Zoom’s software functionality. Importantly, participants were asked to consider the views and experiences across their community or port group, rather than simply ranking their individual perceptions. Individuals who dialed into the virtual call by phone or had difficulty with the polling software recounted their scores orally which were either input into Zoom by a member of the Project Team as a proxy, or recorded and compiled with the other scores after the focus group. In some cases, due to technical or logistical difficulties, the participants sent their responses over email after the conclusion of the focus group. After the participants rated each indicator, the facilitators encouraged respondents to engage in a qualitative discussion about why they chose their ratings. This conversation allowed for the capture of qualitative information in addition to the quantitative data collected in the ratings. To start the conversation, the facilitator showed the spread of the individual data and asked individuals to discuss their scores and the areas where

their individual ratings differed. At the end of the discussion, the facilitators asked participants to rate the indicator again to see if the conversation changed any individual ratings or moved the group towards a more consensus-based or collaborative rating. The scores did tend to change a bit after the conversation, sometimes because participants heard experiences from others that made them rethink their rating and sometimes because participants indicated that they had not fully understood the question when they rated it a first time. The statistics related to the individual ratings from the end of the discussion were taken as the final rating for that port's fishing community. In other words, the second, deliberative scores are the ones reported in the final graphs and data analyses in this report.

This deliberative, community-expert approach drew from methodologies being explored and refined in the literature. Many groups of researchers have utilized an "expert" approach to assessing aspects related to fishing and ocean policy. This work shows that if done through a structured approach, researchers can draw from the views of a carefully selected group of representative "experts" from a given community or topic to develop a rigorous assessment of impacts or outcomes occurring on the group. This approach is particularly favorable for rapid assessments, projects with more limited budgets, projects accounting for consolidations of a broad geographic area, and projects in areas with limited data. Examples that incorporate some aspects of expert assessment include the Environmental Defense Funds "Fishery Socioeconomic Outcomes Tool" (Smith et al. 2019), the interdisciplinary Ocean Health Index (Halpern et al. 2014; Halpern et al. 2015; Halpern 2020), the Fisheries Performance Index (Anderson et al. 2015), and the Social Wellbeing in Fisheries Tool (SWIFT) (Van Holt et al. 2016). Many of these assessment tools rely on more traditional definitions of experts such as scientists and agency professional staff, however, this project relies on the frame that fishing community members are themselves the greatest experts on the perceptions and experiences of fellow industry participants from their ports.

There has also been research in the field of environmental economics about the value of deliberative processes. Traditional economic valuation studies have relied on large-scale representative surveys of the population who rank their willingness to pay for certain environmental features or functions. Researchers have found that deliberative valuation processes that draw from a small number of diverse representatives from a given community can overcome the need to conduct large scale surveys. Through the deliberation the group is able to work out their differences

and come to a value that is broadly reflective of the community (Wilson & Howarth 2002). The focus group approach in this study draws from these principles by having participants rate each question after having a discussion with their fellow community members, so researchers can ensure that the scores from the second rating better accounts for the conditions in the community. The focus group approach in this study draws from respected and credible methodologies to overcome many of the challenges inherent in the study above. Given the deliberative and expert-based approach, there are some limitations for how the data can be used. For example the researchers could not go through the scores and separate the ratings just from those who participate in the Dungeness crab fishery to compare with those who fish in other fisheries. This is because the ratings from each individual do not reflect that individual's personal experience as for example a crab fisherman. They represent that individual's best estimate of the conditions in their entire fishing port.

2.2.3 Commercial Fishing Focus Groups

The Project Team identified 19 major port groups in California in which to hold commercial fishing focus groups. Through an extensive recruitment effort, the team was able to hold focus groups in 18 of those 19 ports (Table 4). Despite extensive outreach, we were unable to hold one commercial fishing focus group with individuals out of the port Monterey. Representatives from the port indicated that they did not believe participating in the study was worth their time and expressed doubt that the information would be meaningfully used by state managers. To develop and refine the process, we held a pilot focus group in Bodega Bay in July 2020 to receive feedback from participants and facilitators and used that feedback to develop a consistent focus group process for the remaining groups. In response to participant needs, the Project Team held one-on-one conversations with each Oceanside participant rather than conducting the conversation in a focus group format. The commercial fishing focus groups consisted of three to eight participants and were between two hours, forty minutes and four hours, twenty minutes in length, inclusive of a break in the middle (Table 4). A total of 85 individuals participated in the commercial fishing focus groups.

Table 4 Location, date, length, and number of participants in commercial fishing focus groups.

Port/port group	Date	Focus group length	Number of individuals contacted	Number of focus group participants
Crescent City [^]	August 6, 2020	3:30:32	9	4
Trinidad	October 27, 2020	3:37:01	5	3
Eureka	October 8, 2020	3:52:15	10	8
Shelter Cove	October 19, 2020	2:59:00	7	4
Fort Bragg/Albion	November 5, 2020	3:33:18	13	5
Point Arena	February 1, 2021	3:13:13	7	4
Bodega Bay ^{^*}	July 9, 2020	4:18:01	11	6
San Francisco Area Ports	October 26, 2020	3:15:35	5	4
Princeton - Half Moon Bay	November 19, 2020	3:15:57	11	7
Santa Cruz	December 8, 2020	3:46:01	11	5
Moss Landing	December 16, 2020	3:30:41	10	4
Monterey ^{**}	-	-	7	-
Morro Bay - Port San Luis	October 29, 2020	3:31:30	12	4
Santa Barbara [^]	August 31, 2020	3:43:04	11	4
Ventura/Channel Islands Area Ports	September 16, 2020	3:30:28	16	3
Los Angeles/Long Beach Area Ports [^]	September 4, 2020	3:24:10	11	6
Orange County Area Ports	September 9, 2020	3:47:53	9	6
Oceanside ⁺	April–May 2021	-	6	3
San Diego Area Ports	March 2, 2021	2:41:29	10	5
Total				85

Table 4 Symbols Key:

*Pilot focus group

^ Early focus groups that did not include the COVID-19 impacts question

**Fishermen from these ports/port groups chose not to participate in a focus group conversation

+ Due to participant preference, this was not held as a focus group but separate one-on-one conversations with three individuals; therefore the scores do not as clearly reflect the deliberative component

2.2.4 CPFV Focus Groups

CPFV focus groups were convened at a more regional level where CPFV owner/operators from multiple ports in a given region participated in a single focus group. We held five regional CPFV focus groups between September 2020 and March 2021 (Table 5). Due to logistics, impacts from COVID-19 and nearby wildfires, and/or lack of trust or interest in the project, we were not able to convene CPFV focus groups in two regions of California (Monterey Bay Region and Los Angeles-Long Beach Region). CPFV focus groups consisted of three to six participants per region and were between two hours, thirty minutes and three hours, fifty minutes in length, inclusive of a break in the middle (Table 5). A total of 20 individuals participated in the CPFV focus groups. The San Francisco area ports CPFV focus group acted as a pilot for the Project Team’s conversations with CPFV owner/operators. Initially the CPFV focus group assessment tool was only qualitative and did not include quantitative questions. After the pilot group and discussion the Project Team decided to add quantitative scoring to the CPFV focus group component. The Project Team followed up with the San Francisco area participants to ask them to quantitatively score questions related to their fishery. Those scores may not as clearly reflect the deliberative component, but participants did submit their scores after the focus group discussion so the scores may have incorporated the broader knowledge from the discussion. While all six participants provided ratings and discussed their responses during the well-being portion of the Orange County/San Diego CPFV focus group, one participant decided not to participate in the MPA session because they didn’t feel like they had enough knowledge about the MPAs to comment on them.

Table 5 Location, date, length, and number of participants in CPFV focus groups.

Regional CPFV port group	Date	Focus group length	Number of individuals contacted	Number of focus group participants
North Coast Area Ports	February 8, 2021	3:16:55	16	4

Regional CPFV port group	Date	Focus group length	Number of individuals contacted	Number of focus group participants
(Point Arena to Crescent City)				
Bodega Bay Area Ports	February 10, 2021	3:48:02	4	4
San Francisco Area Ports	September 10, 2020	2:30:23	10	3
Monterey Bay Area Ports**	-	-	9	-
Santa Barbara and Ventura/Channel Islands Area Ports	March 11, 2021	2:27:48	10	3
Los Angeles/Long Beach Area Ports**	-	-	14	-
Orange County/San Diego Area Ports	November 20, 2020	3:21:44	10	6
Total				20

**Fishermen from these ports/port groups chose not to participate in a focus group conversation.

2.2.5 Focus Group Data Analysis Methods

All focus group conversations were recorded using the remote video meeting software Zoom cloud recording function. Text transcripts were initially generated through Zoom, and were then edited and refined through the transcription service [Sonix.ai](https://sonix.ai) for clarity and understanding. Members of the Project Team then finalized the edited transcripts by reviewing the focus groups recordings parallel to the transcripts. The Project Team utilized standard qualitative analysis techniques (Punch 2009; Saldana 2016; Schutt 2018) to examine patterns and findings within the qualitative data from focus groups. We uploaded focus group transcripts to [Dedoose](https://dedoose.com) to code for key themes. Themes and codes were linked to the focus group question topics (Table 5). We used the coded transcript excerpts to develop detailed summaries of each focus group conversation. See Appendix B for all focus group

summary documents. Focus group summaries contain results from the quantitative ratings for each question along with a summary of participants' perceptions, insights, and perspectives related to each question and direct quotes from participants that help to illustrate sentiments in their own words.

The summaries also include the numerical final scores gathered via Zoom polls for questions asked within each theme. Figures in the focus group summaries display participant responses for questions that had a numerical/quantitative component. Focus group quantitative ratings data were compiled in Project Team shared Google Sheets using poll reports generated in Zoom. The data were processed in Microsoft Excel and edited in Microsoft PowerPoint to create figures containing the percent of participants in the focus group who selected each response for each question, the total number of focus group participants, the average rating for each question, and the standard deviation.

Completed focus group summaries were made available on the project website and shared with participants. On several occasions, participants requested summary content be changed. The Project Team updated the summaries accordingly, and reposted the new version to the project website and shared it with participants. There was one instance when we shared a draft section of a summary with focus group participants in response to questions that arose during the focus group with regard to how their contributions to the conversation would be interpreted/presented in the focus group summary output; their feedback was then incorporated into that section of the summary in the final document. At times, participants contacted a member of the Project Team with additional thoughts/comments following the focus group, which were considered for inclusion in the summary.

The Project Team reviewed and utilized the content from the focus group summaries to develop an assessment of high-level themes and patterns that emerged across focus groups. The Project Team identified themes through iterative coding of focus group responses. The Project Team utilized the second, deliberative quantitative ratings from the focus groups to develop state-wide visual displays. Displays show the statewide average rating for focus group and CPFV and the comparative rating for each focus group question across the state. In addition the Project Team used the rating from the commercial focus groups to develop two indices: one related to perceptions of well-being and the other to perceptions of MPAs. Commercial well-

being and MPA indices were created by combining responses to focus group questions that were relevant in content (Table 6). We created three sub-indices for well-being (environmental, economic, social) and three for MPA (MPA ecological outcomes, MPA livelihood outcomes, and MPA management). Before combining the items for each individual sub-index, we assessed their internal coherence using Cronbach’s alpha (Bennett et al. 2019, p.4), which were at or greater than 0.7 in all cases. These sub-indices were calculated by averaging participants’ responses to all questions within those categories. Individual participant averages were then averaged with others’ who were in the same focus group to produce a port/port group-level sub-index. We summed and normalized the environmental, economic, and social sub-indices to obtain the overall/composite well-being index, and the MPA ecological outcomes, MPA livelihood outcomes, and MPA management sub-indices to obtain the overall/composite MPA index. We averaged participant-level well-being sub-indices and MPA sub-indices, then averaged those with others who were in the same focus group. This resulted in one well-being index and one MPA index for the port/port group. Well-being and MPA index values were between 1 (low) and 5 (high).

Table 6 Commercial fishing focus group question topics and their relationship to sub-indices and indices developed to explore community well-being and MPA perceptions.

Commercial fishing focus group question topic	Sub-index	Index
Marine resource health - present	Environmental	Well-being
Marine resource health - future concerns		
Access to harvestable resources	Economic	
Income from fishing		
Markets		
Infrastructure		
Labor/new participants	Social	
Job satisfaction		
Social relationships - internal		

Commercial fishing focus group question topic	Sub-index	Index
Social relationships - external		
MPA ecological outcomes	MPA ecological outcomes	MPA
MPA livelihood outcomes	MPA livelihood outcomes	
MPA management	MPA management	
MPA monitoring		
MPA enforcement		

2.3 Spatial Data Analysis Methods

The goal of this modeling effort was to develop a methodology, which when applied to available spatial and tabular datasets provides a new way of looking at the fishing patterns in and around California state MPAs in the years 2005-2020. To be clear, models are a simplification of real world complexities. Renowned statistician George Box is quoted as saying “all models are wrong, some are useful”. The outputs presented here are no different. We developed this methodology utilizing the best available data but this is simply one possible approach and should be considered as such. However, we will show that our outputs are useful and provide insight about fishing patterns as they relate to California state MPAs.

To complete this spatial modeling we used two data sources, commercial fishing landings receipts from California Department of Fish and Wildlife (CDFW) and spatial layers of fishing areas developed by Ecotrust based on in-person interviews to support the MPA network development and implementation (Scholz et al. 2011). The data collection method mapped the areas that each fisherman identified as important. For each fishery a fisherman targeted, they were asked to distribute a hypothetical set of 100 pennies. The fishermen were asked to distribute the pennies among the areas they drew giving them a weighted importance. A fisherman could draw one 100-penny area or a hundred 1-penny areas. The areas and the weights were determined by the fishermen. In the post interview analysis, Ecotrust applied an economic value based on an average of the five most recent years of fishing. The data were then aggregated together and a single layer was produced showing the

relative importance of the fishing grounds by the fishery-port complex and for a fishery in a MLPA region (North Coast, North Central Coast, Central Coast, and South Coast).

The CDFW data is an excellent source of commercial fishing landings data. Housed in the CFIS database¹, these data provide a depth of information that can be used to better understand the economic activity associated with the seafood industry throughout California. Unfortunately, the spatial information associated with these data is too coarse to evaluate the performance of specific MPAs. Most of the fisheries landings data are summarized to 10 x 10 nautical mile blocks (Figure 2), which is a 100 square-nautical mile area. However, the CDFW landings data is gathered at each landing event or fishing trip offering a continuous longitudinal data set.



Figure 2 CDFW 10nm² blocks showing the Spiny lobster-trap fishery heat map of fishing harvest levels for 2005

The Ecotrust data (Figure 3, below) are more spatially discrete, drawn to the contours of precise fishing areas, providing a more real-world representation of fishing use patterns. However, the Ecotrust data are but a snapshot in time, gathered during in-person interviews inquiring about cumulative fishing patterns, and do not necessarily reflect changes in fishing effort year after year.

¹ For this study, Ecotrust obtained these data from CDFW in two exports. For the years 1992-2018 the data were queried and delivered in October 2019, and for the years 2019-2020 the data were queried and delivered in May 2021.

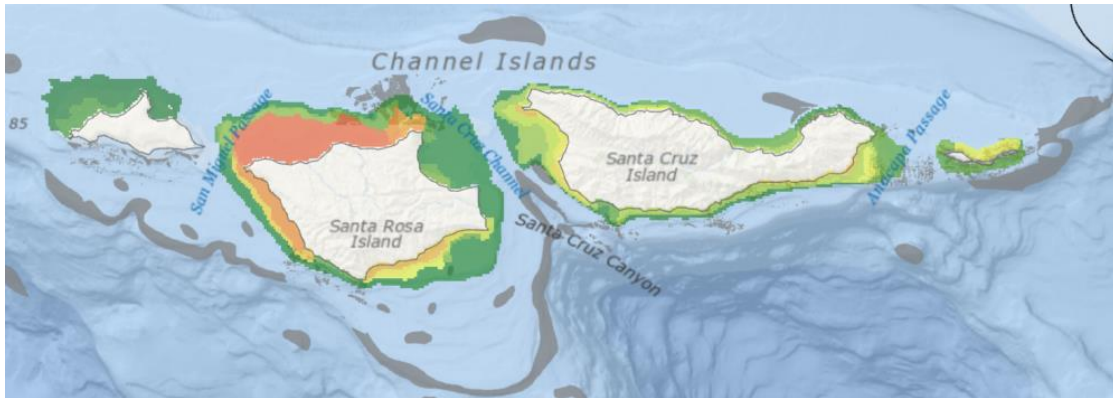


Figure 3 Heat map of fishing value/harvest levels for Spiny lobster-trap from pre-MPA Ecotrust mapping process shown with hard substrate data (in gray)

In combining the strengths of both these data sets, the project team conducted a refactor analysis and a resulting dataset that provides year on year spatial fishing effort data at a 1x1 nautical mile scale – a scale that is more appropriate for MPA evaluation studies (Figure 4). The resulting modeled spatial layers provide a reasonable proxy and best-available data for commercial fishing patterns based on preliminary review by fishermen and managers. The following provides detailed information about the methods, results, and discusses findings.



Figure 4 1x1 nm blocks showing Spiny lobster-trap summary heat map of fishing harvest levels for 2005

2.3.1 Data preparation

This analysis relied on data developed for the initial MPA design and implementation process under the Marine Life Protection Act Initiative (MLPA), which occurred between 2005 and 2010. For more detail about the spatial data products generated by Ecotrust for that process please review Scholz et al. 2011 listed in the works cited below. The process with which these layers were created aggregates data across multiple fishermen (representing the majority of the revenue in a fishery) based on

stated importance and economic value, which we use as a proxy for effort. The first step in preparing the data for this refactoring analysis was to identify the appropriate fisheries layers for this type of analysis. As we aimed to test this hypothesis on non-migratory species that were relevant to the other long-term MPA monitoring projects, we identified the nearshore finfish fisheries², urchin, and lobster as appropriate initial datasets. The nearshore finfish data set represent the combined fishing areas for 24 species including:

Black Rockfish, Black-Blue Group Rockfish, Black-Yellow Rockfish, Blue Rockfish, Bolina Group Rockfish, Brown Rockfish, Cabezon, Calico Rockfish, California Scorpionfish, California Sheephead, China Rockfish, Copper (Whitebelly) Rockfish, Copper Rockfish, Deep Nearshore Group Rockfish, Gopher Group Rockfish, Gopher Rockfish, Grass Rockfish, Kelp Greenling, Kelp Rockfish, Monkeyface Prickleback, Nearshore Group Rockfish, Olive Rockfish, Quillback Rockfish, Rock Greenling, Treefish Rockfish.

Additionally, the data were originally collected with a gear-type included. For this modeling, we combined across gear types to create a single layer for each region. Table 7 below enumerates the fisheries layers used for this analysis:

Table 7 Ecotrust fishery layers used in analysis.

Region	Fishery groups
North Coast (2009)	Deep Nearshore finfish - Hook and line; Deep Nearshore finfish - Longline; Nearshore finfish - Longline; urchin - dive
North Central Coast (2007)	Lingcod - all gears; Nearshore finfish - all gears; urchin - dive
Central Coast (2006)	Nearshore finfish - Hook and line; Nearshore finfish - trap
South Coast (2008)	Deep Nearshore Rockfish - hook and line; Nearshore Rockfish - hook and line; Nearshore Rockfish - trap; Lobster - trap; urchin - dive

2.3.2 Normalizing spatial data

To calculate the refactor value for the entire coast, we combined the fisheries layers at the regional level then built up to the statewide layer. We worked with the regional

² For the purposes of this analysis, a fishery refers to a grouping of multiple fish species and gear types, which were combined based on management practices and landing receipts.

layers because the data were originally collected in phases by region and port groupings, which resulted in slightly different configurations of fishery-gear combinations for each region. Our aim was to create layers that differentiated higher importance areas from lower importance areas and were comparable across regions. To produce these layers we performed a max normalization on the regional layers listed in Table 7 above. This was done for each layer by dividing all of the raster cells by the highest value cell using the raster calculator in ArcGIS. The output from this step were new layers with a value range of 0 to 1. We then set all null values to 0 and combined the regional layers into a single layer by adding the layers together using the raster calculator. Following that we performed another max normalization on the new regional layer. The interim product was a state-wide raster layer built from the region layers for each fishery with a value range of 0 to 1.

Max Normalization equation:

$$X_i = (X_y - X_{\min}) / (X_{\max} - X_{\min})$$

i = index value

y = grid cell value

Calculating refactor values

Next, we ran the Zonal Statistics as a Table tool in ArcGIS on the max normalized layers overlying the California Recreational Fisheries Survey (CRFS) micro-block layer as the feature zones. This calculated zonal statistics for each micro block (1 sq nautical mile) from our max normalized raster layers. The output of the zonal statistics tool was a table that included the summarized value of the relative importance within each micro block. These values were then used to perform several interim calculations before refactoring the pounds landed. The first calculation summarized the relative importance value at the 10' block level. Each micro-block nests within a 10 nautical mile block, so we aggregated the relative importance upto the larger block level. This summarized value was then divided by the micro-block values that nest within the 10 nautical mile block data. The result was a refactor value that identifies the spatial variance within a 10 nautical mile block by micro-block and provides a value to reapportion CDFW landings data. The landings summarized to the 10 nautical mile block were then multiplied by the quotient within each micro-block.

Refactoring equation

$$x = \left(\frac{m}{b}\right)p$$

$$r = \frac{m}{b}$$
$$x = rp$$

where

m = micro-block value

b = sum of m per 10' block value

r = refactor value

p = 10' block pounds total

Creating spatial layers

Using a series of crosstab queries we reallocated the pounds landed to the micro-blocks based on the stated relative importance provided by commercial fishermen. The data were then joined to the CRFS spatial layer in an ArcGIS geodatabase. A new layer was then created for each of the following species and fisheries:

Black Rockfish, Brown Rockfish, Blue Rockfish, Black-Yellow Rockfish, California Scorpionfish, Cabezon, China Rockfish, Copper Rockfish, California Sheephead, Gopher Rockfish, Grass Rockfish, Kelp Greenling, Kelp Rockfish, Lobster, Monkeyface Prickleback, Olive Rockfish, Quillback Rockfish, Treefish Rockfish, Red Sea Urchin, and Nearshore Finfish.

The following further explains assumptions and additional details of our modeled process and layers:

- This modeling effort set the pre-MPA years as 2005-2009 and the post-MPA years as 2010-2020. This was done in an effort to simplify the model and set a MPA implementation point that tracked with the real world implementation. This methodology can be applied to other years but since this effort was focused on methods development and Ecotrust's spatial data were collected within this timeframe, we determined these years were the most appropriate for modeling.
- We focused this modeling effort on non-migratory species for several reasons. We assume that fishing patterns are mostly consistent year-to-year, that fishing effort is focused on areas that yield the highest success, and that non-migratory species persist in generally the same locations year to year. Therefore, we assume effort is consistent in a specific location over time. Conversely, migratory species range over large areas, thus the locations of

fishing effort changes over time. So we assert that generally, non-migratory species are the best suited for this modeling approach.

- In our fishermen interviews for the MPA implementation phase, we collected spatial data in fishery groupings that align with CDFW fisheries management, though part of our goal for this modeling was to produce spatial layers that represent single species. We included the single species modeling to support the other long-term MPA monitoring projects that are part of this decadal review. After testing the model outputs, we feel confident this methodology can be applied to single species, assuming certain caveats. For example, the landings data for black rockfish is highly spatially coincident between CDFW and Ecotrust data and the species represents 27% of the total fishery. This resulted in an average redistribution of 92% over 16 years for black rockfish. In other words, Black rockfish was successfully redistributed because it represents a large portion of the fishery and the Ecotrust interview data included those fishers who target this species. It should be noted that there were two species where this methodology did not work well: California Scorpionfish and Quillback Rockfish, likely due to these species representing only 1% of the total nearshore finfish fishery, and likely due to a spatial mismatch between the Ecotrust data and the reported are in the CDFW data. We recommend that other investigators using this modeling method should verify model outputs of single species redistribution.
- This refactoring is not looking at the economic value of the fishery. Rather, we are attempting to reapportion the CDFW landings information into more appropriately scaled units. Therefore we max normalized the regional datasets to constrain the CDFW landings information to geographic areas that are spatially coincident between the CDFW 10 nm blocks, 1 nm microblocks, and Ecotrust's data. The Ecotrust data was apportioned to the microblocks using a zonal summary analysis. We are using the max normalization to identify the fishing areas in each region scaled by the relative importance of each fishery. These max normalized areas are then being used as a proxy to scale the fishing activity in the region. The estimations of pounds per microblock are calculated by apportioning the yearly pounds summary from the spatially coincident 10 nm blocks. The fishing data Ecotrust collected for the MPA network development and implementation process was asked with an economic framing. Ecotrust requested the fishermen draw the areas that were most important to them for their livelihood. The responses were then reported as some portion of 100, scaling the areas' importance as a

percentage of the fishermen's income from that fishery. For example, if an area was given 60 pennies by a fisherman targeting nearshore finfish then Ecotrust applied 60% of their gross landing receipts for that fishery to that area. The data were then aggregated with other fishermen to create a dataset that provides a representation of the relative importance of any particular area. Therefore, we assume that the more important areas also yield higher ranges of pounds of fish landed. Using this logic, we created a value to refactor the 10nm blocks to the 1nm microblocks. The spatial position of the blocks coupled with the time series data provides us with a methodology for modeling year-on-year shifts in fish caught represented by pounds per microblock.

3.0 Results

Below we detail the key findings from our analysis. These findings along with the presentation of data products such as spatial data layers, CDFW commercial landings/CPFV logbook data visualizations, port focus groups details, etc. can be found at the project website <http://www.mpahumanuses.com>. We utilized a website to present project results and products to promote wider accessibility and understanding on the well-being and status of port communities. An online format allows for the more dynamic presentation of materials and data products in ways that promotes both the visual and narrative exploration of California commercial and CPFV fishing communities.

Key findings in the report include:

1. Commercial fishing perceptions of MPA outcomes
2. Commercial fishing perceptions of fishing community well-being
3. Commercial fishing views on engagement and participation in fishery management
4. Commercial fishing perceptions of COVID-19 impacts
5. CPFV perspectives on MPAs, well-being, engagement, and impacts from COVID-19
6. Spatial and fisheries data analyses

3.1 Focus Groups Results

We held 18 commercial port focus group conversations and 5 CPFV regional focus group conversations. We developed detailed summaries of the findings from those

focus groups which include for each question a summary of the quantitative ratings, a summary of the key discussion points, and a list of relevant direct quotes from the conversation. These focus group summaries can be found in full in Appendix B; they included relevant and detailed port or region-specific information. The results section of this report focuses more heavily on the key findings, patterns, and themes that emerged across the focus groups and across the state. Data is presented to highlight statewide findings and to allow for the comparison of well-being and MPA perceptions between ports and across the state. We present a summary of statewide findings across five key themes or findings. Appendix C.1 contains figures depicting how focus group participants rated individual well-being and MPA questions across ports and regions. These charts will allow readers to make geographic comparisons between ports and regions.

3.1.1 Key Finding 1: Commercial fishing perceptions of MPA outcomes

There was much discussion about MPAs during the commercial fishing focus group conversations. Fishermen recounted their perceptions of impacts and outcomes from MPAs as well as related to the management of MPAs. This section presents key findings from commercial focus group conversations related to MPAs, with an aim to explore patterns and themes that emerged across the state. A presentation of CPFV fishing community participants' perceptions related to the outcomes of MPAs can be found in a separate CPFV key finding below. Note that detailed information about MPA outcomes by port can be found in the port-based focus group summaries (Appendix B). Key themes related to commercial fishing perceptions of MPA outcomes included:

- Statewide overview of commercial fishing MPA perceptions
- Commercial fishing perceptions of ecological outcomes from MPAs
- Commercial fishing perceptions of livelihood outcomes and/or impacts from MPAs
- Commercial fishing perceptions of the management of the MPA network

Summary of Key Finding 1: Commercial fishing perceptions of MPA outcomes

- Statewide overview of commercial fishing MPA perceptions
 - Focus group responses indicate commercial fishermen across California are both dissatisfied with and have experienced negative effects from the MPA network.

- All five MPA questions had a statewide average rating below neutral (3.0). Among them, perceptions of MPA management and MPA monitoring received the lowest ratings across the state.
- Only MPA ecological outcomes were rated above a 2.0.
- Overall perceptions of MPAs were low across the state, though the magnitude of views varied slightly between ports.
- Commercial fishing perceptions of ecological outcomes from MPAs
 - A majority of participants' perceptions about MPA effects on marine resource health fell below positive, with 43% reporting strongly negative or negative and 50% reporting no effect/neutral.
 - Only 7% of participants rated MPA effects on marine resource health as positive.
- Commercial fishing perceptions of livelihood outcomes and/or impacts from MPAs
 - Across the board, focus group participants from California commercial fishing communities reported experiencing negative livelihood effects from the MPA network.
 - Reported MPA livelihood outcomes included: loss of access to historically important/profitable fishing grounds; increased crowding and competition along/outside MPA boundaries; increased travel distance to fishing grounds, which led to increased safety risk and increased cost of doing business; and fishermen moving ports or leaving fisheries.
- Commercial fishing perceptions of the management of the MPA network
 - Overall, participants were dissatisfied with MPA management (including the MPA planning process), MPA monitoring, and MPA enforcement.

Statewide Overview of Commercial Fishing MPA Perceptions:

- As part of the focus group conversations, we had participants (n=84) rate their perceptions of MPAs on five different indicators or factors.
 - MPA perceptions included impacts or outcomes from the California MPA network on marine resource health and fishermen's livelihoods, in addition to fishermen's satisfaction with MPA management, monitoring, and enforcement; see page 9 in focus group materials

([here](#)) for a detailed description of the focus group approach and questions.

- Participants rated each question on a five-point scale from very low to very high, with a score of three being neutral.
 - Participants also provided oral commentary and description about their perceptions of MPAs.
- Focus group responses indicate fishermen across California are both dissatisfied with and have experienced negative effects from the MPA network (Figure 5).
 - All five MPA questions had a statewide average rating below neutral (3.0). Among them, perceptions of MPA management and MPA monitoring received the lowest ratings across the state.
 - Only MPA ecological outcomes were rated above a 2.0.

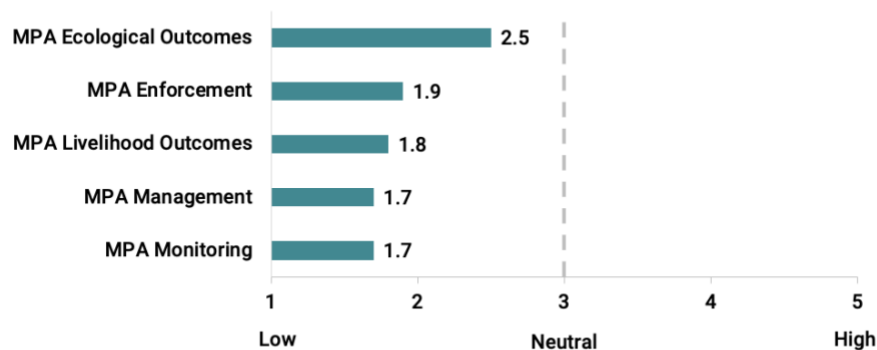


Figure 5 Bar chart showing statewide averages of commercial fishing focus group participants' perspectives about MPA outcomes, ordered from highest to lowest.

- Overall perceptions of MPAs were low across the state, though the magnitude of views varied slightly between ports (Figure 6).
 - When the responses to the MPA questions were combined into an overall index (see 2.2.5 Focus Group Data Analysis Methods for information about index creation), all 18 ports reported an MPA perceptions index score below neutral (3.0). Fort Bragg/Albion, Shelter Cove, and Oceanside had the highest MPA perceptions index, while

Los Angeles/Long Beach Area Ports, Trinidad, and San Diego Area Ports had the lowest.

- Some MPA questions had greater variability across the state than others. Perceptions of MPA impacts on marine resource health ranged from strongly negative to positive, and satisfaction with MPA enforcement varied from strongly negative to strongly positive. An overwhelming majority of participants reported negative MPA impacts on fishermen’s ability to earn a living from fishing, and dissatisfaction with MPA management and MPA monitoring.

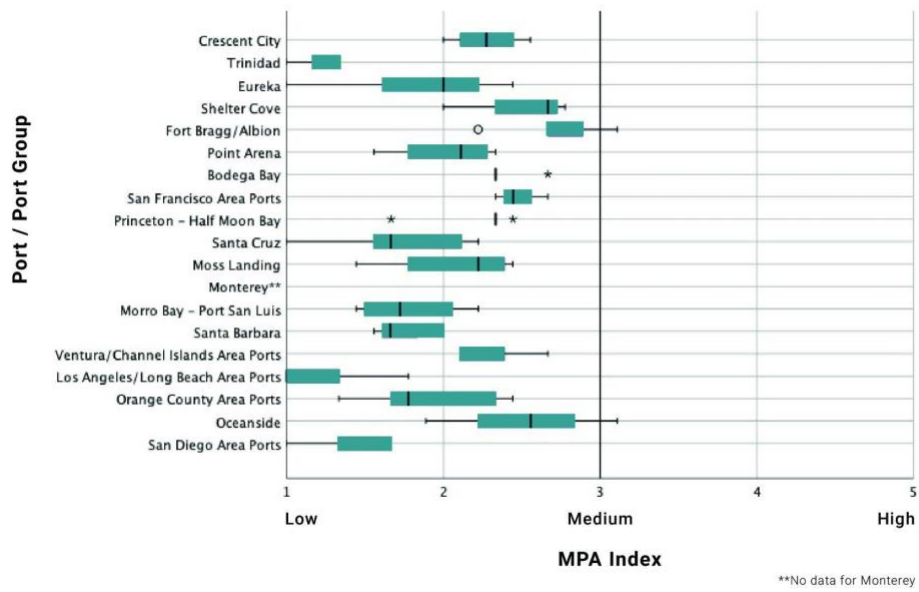


Figure 6 Boxplot showing MPA indices for each focus group, ordered geographically from north to south³.

³ The MPA index was created by combining responses to focus group questions related to three MPA sub-indices (MPA ecological outcomes, MPA livelihood outcomes, and MPA management). The Cronbach’s alpha for each individual sub-index was at or greater than 0.7, indicating internal coherence. Each box contains the values in the first quartile, median, and third quartile, with the bold line representing the median. The left whisker is the minimum value (excluding outliers), and the right whisker is the maximum value (excluding outliers). The circles represent outliers, and the asterisks represent extreme values.

Commercial fishing perceptions of the ecological outcomes from MPAs

- A majority of participants' perceptions about MPA effects on marine resource health fell below positive, with 43% reporting strongly negative or negative and 50% reporting no effect/neutral. Only 7% of participants rated MPA effects on marine resource health as positive.
 - **Perceptions of Negative Ecological Outcomes:** Participants described several ways in which they perceived MPAs to cause negative impacts on the health of marine resources near their ports. Several fishermen expressed concerns that the MPAs contributed to increased fishing pressure in non-protected waters, resulting in ecological harm and contributing to localized depletions. Several urchin divers expressed concerns that MPA closures, which prevent urchin harvesting, may have contributed to kelp decline as kelp-consuming urchin populations increased in those areas. Many were worried that certain MPAs could become urchin barrens, with populations of small, starved urchins and minimal ecological life overall.
 - **Perceptions of No Effect/Neutral Ecological Outcomes:** Several participants reported no noticeable change in species health near/along MPA boundaries. Some participants explained their reasoning for selecting "No Effect/Neutral" and stated they did not have enough information to assess the outcomes of the MPAs, either due to their inability to fish in the closures; lack of awareness of results from MPA monitoring studies; or difficulty parsing out MPA effects from other factors like RCAs, quotas, and natural ocean cycles. Others emphasized a belief that MPAs do not protect against impacts beyond fishing, including pollution and changing ocean conditions. In several instances, participants discussed not seeing a spillover effect from local MPAs, which helped inform their perspective that MPAs have neither positively or negatively contributed to marine resource health. Several participants shared the perspective that more mobile species are not protected by MPAs (i.e., fish swim inside and outside MPA boundaries).
 - **Perceptions of Positive Ecological Outcomes:** Some participants identified rockfish, lobster, and sea cucumber as species whose abundance and/or size may have benefited from MPAs.

- Representative quotes related to ecological outcomes:

"I think what ultimately ended up having to happen was that the few areas that were actually viable for fishermen to fish ended up sustaining a lot more pressure than they would have otherwise. And so you sort of are weighing these pros and cons between the existing effort with all the people that were fishing dispersed across the ocean with less fishermen fishing in more targeted areas. Now, the areas in the MPAs, yeah, I'm sure they're great and beautiful and pristine. And that's, I think, what a lot of folks are going for. But I think the externalities associated with fishing on the lines, having to heavily target a few areas that are viable, could result in some pretty negative impacts." -**Moss Landing commercial fisherman**

"I think it's hard to really assess for a number of reasons, and one is there's more than just MPAs. There's restricted quotas that [. . .] I think probably keep people from fishing any area more than it being an MPA. And then there's the RCAs. And so I think probably what will happen is that whoever decided this [the MPA network] is a good idea will take credit for it working, even though it probably isn't really possible to tell whether it really made any difference or not." -**San Francisco Area Ports commercial fisherman**

"I do think that MPAs are a good thing on a certain scale, like the science behind it and what we've seen, it's good to have little reserves to buffer the populations. For the sea cucumber fishery, I think that was really good, like those animals have to aggregate really densely to spawn and it's good to have some areas for them to do that [and] get no pressure whatsoever. So for that fishery, I would lean towards the neutral to positive." -**Santa Barbara commercial fisherman**

Commercial fishing perceptions of the Livelihood Outcomes or Impacts from MPAs

- Across the board, focus group participants from California commercial fishing communities reported experiencing negative livelihood effects from the MPA network and reported impacts tended to be more acute for ports in Central and Southern California compared to Northern California where MPAs are located further from ports.
 - Loss of access to historically important/profitable fishing grounds was a concern highlighted most often, with many participants reporting decreased income opportunities for the Dungeness crab, salmon, rockfish, and sea urchin fisheries. They emphasized the compounding effects of MPAs with other fishing restrictions, including season delays and early closures, depth restrictions (i.e., rockfish conservation areas (RCA)), and quotas for target species.
 - Many participants noted increased crowding and competition along/outside MPA boundaries due to lost access to fishing grounds. They explained this has made fishing more difficult and resulted in

compaction of fixed fishing gear (i.e., lobster/crab traps), lower catches, and emotional distress.

- Participants stated the MPAs have increased travel distance to fishing grounds, which has led to increased safety risk associated with fishing (inclement weather, restrictions on anchoring in MPAs) and increased cost of doing business (fuel, need for multi-day trips).
 - Several participants discussed fishermen moving ports or leaving fisheries as a result of the MPAs.
 - Participants expressed their concerns and experiences with specific MPAs in the network; the results of those discussions—organized by MPA—can be found on the [project website](#).
- Representative quotes related to Livelihood Outcomes:

“As a fisherman, I go and I’ll fish in an area and then when that shifts and I see my production level go down or the actual product quality change, then I’ll move just to protect my resource. And then move into another area and get better product and contact a bit more resource and let that area come back and then I’ll go back to another area. Now I’ve confined it to one little spot. So I actually wind up overfishing it to the point where the quality won’t be there or the quantity won’t be there, and therefore I have to just fold it up, move on, go do something different. [. . .] You can only farm the same plot of land with the same thing for so long and then you don’t have anything there.” -Moss Landing commercial fisherman

“Crowding? Of course! There is more competition in open areas, and then we had the [lobster] trap reduction on top of it. I’ve lost a third of my area and my potential to fulfill markets. One or two guys left the industry because of MPAs.” - Oceanside commercial fisherman

“Well, I think the guys are still able to fill their quota. It takes longer. More fuel to burn, more time on the ocean... You’re still able to do it if you fish hard. These guys fish every day. The nearshore guys that go every day. So they’re still making a living, but of course, they’re spending a lot more going. So it just takes longer, and they are fishing the areas harder than they would if the areas were still open where we saw fish.” -Morro Bay - Port San Luis commercial fisherman

Commercial fishing perceptions of the Management of the MPA Network:

- Overall, participants were dissatisfied with MPA management (including the MPA planning process), MPA monitoring, and MPA enforcement.
 - **Perceptions of MPA Implementation:** Participants reported strong feelings of betrayal during the MPA implementation process, and

believed opportunities for fishing community input were hollow gestures and that fishermen's needs and interests were not genuinely considered/heard. Several participants recalled the "pennies" exercise in which fishermen were asked to disclose their priority fishing grounds, which were then used to inform MPA placement. They expressed a belief that data from the exercise had been used against them to place MPAs in important fishing grounds.

- **Perceptions of Current MPA Management:** Many participants shared they were unaware about how the MPA network is managed due to poor communication by managers, which led them to believe MPA management is not occurring. Many participants expressed frustration that commitments for adaptive management of the MPA network have not been fulfilled. They also spoke about poor communication of the goals of the MPA network, including how MPAs are evaluated. Some participants highlighted the need for meaningful recognition and inclusion of fishermen's knowledge and expertise in both MPA management and MPA monitoring, which they believe is currently not the case.
- **Perceptions of MPA Monitoring:** A majority of participants were unaware about how or whether the MPA network is monitored. They reported not seeing monitoring efforts occurring in local MPAs, and a lack of communication of MPA monitoring studies and results with members of California fishing communities. Participants desired greater collaboration with the fishing fleet in both the design and implementation of MPA monitoring studies.
- **Perceptions of MPA Enforcement:** Participants perceived a lack of MPA enforcement and shared that they continue to see illegal fishing activity occurring in the MPAs, often among the sport fishing fleet, which they attributed to lack of funding and limited capacity of CDFW wardens. Several participants reported that fishermen enforce the MPAs themselves by informing each other of MPA rules and regulations. There was dissatisfaction with the methods used for MPA enforcement, including poor MPA boundary markers, issuance of citations for first-time offenders, and penalties for gear that unintentionally drifts into MPAs.

- Representative quotes related to MPA Management:

"I can remember the penny thing, where we put pennies in [. . .] important areas and it seemed like we all lost our money. You know, that's kind of our feeling, you know, we never felt like it was beneficial. In fact, where we put the penny seemed to be where the MPAs ended [. . .] so that was kind of a defeating feeling." -**Bodega Bay commercial fisherman**

"The one thing that I think is extremely negative is that when they originally set up the plan, they asked fishermen where the areas were they didn't want the MPAs, and that's right where they put them, in some really prime turf [. . .] they took some really, really productive turf. So that, I mean, they targeted areas that we told them we wanted to keep." -**Santa Barbara commercial fisherman**

"I just think there's a lot of confusion about what the MPA's goal was, like, what they are trying to achieve. And they haven't put it in a measurable form for us, so fishermen have a hard time with that. Like, if you can say, hey, well, we're intending to increase rockfish stocks by this much or we're expecting the kelp to regrow this much or, you know, we're expecting to save the bottom by not letting people drag in there. Something that we can measure would be good for us to understand the goal of an MPA process. And I just haven't seen that to this point." -**Eureka commercial fisherman**

"It would have been so easy, if they have done any monitoring or anything, to just send an email and say 'here's a link to what we've been doing' to all the fishermen that are licensed that might have been impacted [by the MPAs]. So I am not happy with that." -**Los Angeles/Long Beach Area Ports commercial fisherman**

"I think the reality is that there's no enforcement. There's a ton of sport fishermen fishing in those areas. And the thing is, we [commercial fishermen] have more to lose. If they take our permits away, that's our livelihood. Whereas these guys are like 'oh, I might get a ticket. I'm going to go fish in the MPAs and there's no enforcement.' But like, would we ever roll the dice? No, we have more to lose. So that's where the whole enforcement component of it doesn't make any sense." -**San Diego Area Ports commercial fisherman**

3.1.2 Key Finding 2: Commercial fishing perceptions of fishing community well-being

This section presents the findings from the focus group conversation related to commercial fishing community well-being. In focus groups, commercial participants were asked to assess and discuss the well-being of the port community on a variety of factors. This finding highlights patterns in commercial fishing participants' perceived well-being across the state, focusing on four key themes:

- Statewide overview of commercial fishing perceptions of well-being
- Commercial fishing perceptions of environmental well-being

- Commercial fishing perceptions of economic well-being
- Commercial fishing perceptions of social well-being

Summary of Key Finding 2: Commercial fishing perceptions of fishing community well-being

- Statewide overview of commercial fishing perceptions of well-being
 - Focus group responses indicate ports across California are experiencing many challenges related to their well-being; however, there were some bright spots.
 - Perceived well-being varied fairly extensively across the state, indicating that not all ports may be experiencing the same type or extent of challenges.
- Commercial fishing perceptions of environmental well-being
 - Overall, focus group participants described the present health of marine resources as strong while also indicating concerns about the potential future health of the resources.
- Commercial fishing perceptions of economic well-being
 - Results indicate ports across California are experiencing challenges related to their economic well-being, with infrastructure, access to harvestable resources, income from fishing, and markets all rated low.
- Commercial fishing perceptions of social well-being
 - Overall, commercial fishing focus group participants reported strong internal relationships and high levels of job satisfaction, but they reported weaker relationships with external entities and challenges related to recruiting new participants—both captains and crew—into the commercial fishing industry.

Statewide overview of commercial fishing perceptions of well-being

- As part of the commercial focus group conversations, we had participants (n=84) rate the well-being of their fishing communities on ten different indicators or factors.
 - Well-being included environmental, economic, and social conditions in the port (see 2.2.2 Focus Group Design, Recruitment, & Process for a detailed description of the focus group approach and questions).

- Participants rated each question on a five-point scale from very low to very high, with a score of three being neutral.
- Participants also provided oral commentary and description about the various aspects of their community's well-being.
- Focus group responses indicated that ports across California are experiencing many challenges related to their well-being; however, there were some bright spots (Figure 7).
 - Seven of the ten well-being questions had an average rating below neutral (3.0). Among them, access to harvestable resources, infrastructure, and ability to recruit labor or new participants into the fishing industry were rated the lowest across the state.
 - Three well-being indicators were rated positively (average rating above 3.0) across the state: job satisfaction, the present state of marine resource health, and internal social relationships.

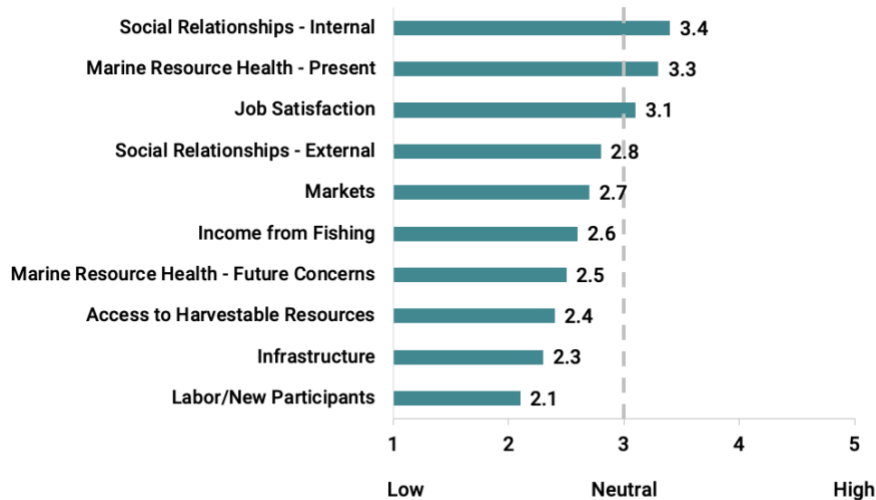


Figure 7 Bar chart showing statewide averages of commercial fishing focus group participants' perspectives about well-being outcomes, ordered from highest to lowest.

- Perceived well-being varied fairly extensively across the state, indicating that not all ports may be experiencing the same type or extent of challenges (Figure 8).

- When the responses to the well-being questions were combined into an overall index, four ports reported an overall well-being above neutral (3.0) - Ventura/Channel Islands Area Ports, Morro Bay - Port San Luis, Trinidad, Santa Barbara - and 14 ports reported an overall well-being lower than neutral, with Los Angeles/Long Beach Area Ports, Santa Cruz, Crescent City, and Eureka rating themselves the lowest.
- The answers to several individual well-being questions varied across the state; notably, ports had highly variable ratings for the quality of infrastructure and markets in their ports, indicating that access to sufficient infrastructure and markets vary extensively throughout the state.

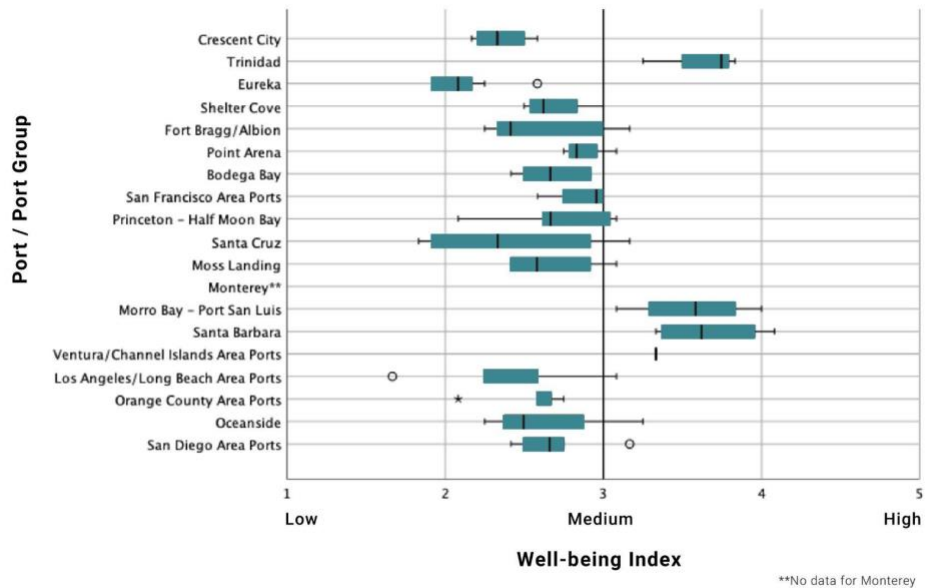


Figure 8 Boxplot showing well-being indices for each focus group, ordered geographically from north to south⁴.

⁴ The well-being index was created by combining responses to focus group questions related to three well-being sub-indices (environmental, economic, social). The Cronbach's alpha for each individual sub-index was at or greater than 0.7, indicating internal coherence. Each box contains the values in the first quartile, median, and third quartile, with the bold line representing the median. The left whisker is the minimum value (excluding outliers), and the right whisker is the maximum value (excluding outliers). The circles represent outliers, and the asterisks represent extreme values.

Commercial fishing perceptions of environmental well-being

- Overall, focus group participants described the present health of marine resources as strong while also indicating concerns about the potential future health of the resources.
 - Participants highlighted several species they believe are currently healthy, including rockfish, Dungeness crab, lingcod, prawn/shrimp, halibut, rock crab, and California sheephead. Many commented on the cyclical nature of the marine environment and believed even species that are in a down cycle will come back up again, though there were overarching concerns about salmon and sea urchin populations and kelp forest declines.
 - When discussing the future health of marine resources, participants identified worries about the effects of climate change, habitat loss, water pollution and the politics of water management, and the effectiveness of fisheries management.

- Representative quotes related to environmental well-being:

"The salmon are in trouble in their riverine and estuarine habitat, and the whole effort to put a whole lot of money into MPAs just doesn't deal with the salmon problem, and the state has allowed [salmon] to go down. [The state was] supposed to double the salmon populations by 2000; they crashed instead. There's a lack of will for enforcement of water law in the rivers." -**Eureka commercial fisherman**

"The red urchin industry up here is in complete disaster. Our 2019 harvest for the Fort Bragg area was one percent of what it was in 2014, so that has been a pretty steady decline. So far this year, we're almost to two percent of 2014, so we're doing a little bit better. But that is no comparison to how well things were before this [urchin] disaster." -**Fort Bragg/Albion commercial fisherman**

"The pressures aren't on the actual fishery or on the species. It's more on the regulations surrounding fishing - species like [Dungeness] crab, for instance, the pressure is on whale entanglement, domoic acid, fair starts, and regional disputes. [. . .] There's pressures everywhere else, but the actual crabs are doing pretty well. So that particular fishery is an example of how I think we all feel, and salmon is the same way. It was actually a pretty good salmon season, but there is the worry of water and [. . .] the politics around water, which is a huge issue." -**San Francisco Area Ports commercial fisherman**

"The ebbs and flows of everything is just something that we've grown accustomed to and have expected. I think the question becomes: are there factors, whether it's climate or anthropogenic forces, that are making it more dramatic?" -**Moss Landing commercial fisherman**

"The ocean looks healthy to me. I mean, the RCA has been closed for so long now, [there's an] abundance of rockfish in the shallows that never used to be there." -Morro Bay - Port San Luis commercial fisherman

"The urchin stock, especially the little on the Los Angeles coast area, has been hit really hard for reasons of closed areas; they took away part of our fishing areas and then other possible [areas] that have caused other boats to migrate south from Santa Barbara and up - coming down and work in our areas and decimating some of the areas that I don't think will come back. So that's a big worry and concern." -Los Angeles/Long Beach Area Ports commercial fisherman

"It's hard to separate the resource worries with the management worries [and] regulations coming down on fishermen. [...] I know fishermen are worried about the industry overall [...] I don't think the resources are going away [...] but I do worry about how we're going to get regulated out of business - that's a concern. So I don't know how you separate the two when you're worried about the industry. But as far as a resource, I think it's gonna be fine, but I know fishermen are worried." -Crescent City commercial fisherman

"The kelp serves as a nursery for a lot of fisheries. So even though some fisheries may still be doing well, I think that if in the long-term the kelp doesn't come back, it'll have more widespread effects." -Fort Bragg/Albion commercial fisherman

"Ocean conditions are the main thing that are causing our worry because domoic acid's caused delays in our crab season for years and quality keeps the crabs too light to start and our seasons get shorter every year, so that's a main worry. And then we all saw the starfish die off, so how fragile is life in this ocean? Could the crabs be next? We don't know, so you'd be a fool not to be worried, being a fisherman." -Point Arena commercial fisherman

"I think people are worried [about] water issues; we aren't getting the water that we need for the juvenile crabs and salmon. So there's a lot of worry about policy, politics, and regulation, and I think that goes hand in hand with the populations of the species right now." -San Francisco Area Ports commercial fisherman

"I do have some concerns for the future that we may reach some type of tipping point when it comes to ocean acidification and stuff like that. I think we've all noticed that the world has been a changing place. I don't know how that's going to relate back over to the species that we rely on." -Santa Cruz commercial fisherman

Commercial fishing perceptions of economic well-being

- Results indicated that ports across California are experiencing challenges related to their economic well-being, with infrastructure, access to harvestable resources, income from fishing, and markets all rated low.

- Availability of sufficient and well-maintained infrastructure was a concern highlighted across California, with many ports reporting a lack of at least some crucial pieces of infrastructure such as ice, fuel, haul-out facilities, processors, hoists, piers, and gear storage. Even ports with self-reported available and reliable infrastructure expressed a desire for more funding and support for infrastructure development and maintenance.
 - Sixty-six percent of participants rated the state of infrastructure and services that support commercial fishing in their ports as poor or very poor, 19% as neutral/acceptable, and 15% as good or very good.
 - Participants reported interlinked challenges with sufficient access to marine resources to support the fishing fleet due to regulatory factors such as permits, seasons, and area/depth closures, and availability of consistent, diverse, and local markets, making it difficult for many to earn a living from fishing.
 - Many participants across California stated they needed to pursue an additional source of income or rely on income and/or health benefits from a partner in order to support their livelihoods.
- Representative quotes related to economic well-being:

*“The infrastructure - definitely, there's room for improvement. I don't know any port that there isn't right now, and it used to be - it wasn't too long ago - any port you went into, there was always the infrastructure to keep you going. And it's pretty much fallen apart up and down the whole coast. Like I say, I travel up and down the coast. There's only a couple of ports that I could see on the whole West Coast that could actually handle it and even then, you could be put in line to wait, but you'll eventually get what you need so you could keep going. But some of these ports, California being the worst, can't keep up with any influx of vessels coming into any one spot.” -**Moss Landing commercial fisherman***

*“The infrastructure is problematic because without the infrastructure, you can't have the fishing. And if you don't have the fishing, you can't have the [funding to support] infrastructure.” - **Eureka commercial fisherman***

*“It's extremely hard [to participate in multiple fisheries]. I would say if you are a person that just wanted to get off and start fishing, that would be near to impossible. [...] Live fish permits are a lot of money, everything's a lot of money. So just to go for it and then not be successful [is a risk]. Crab didn't open for four months because of the domoic acid [and] we went four years ago in May, so if that's someone's only fishery, you're kind of screwed.” -**Point Arena commercial fisherman***

"The permitted system is very constraining. It really sort of keeps fishermen from moving from one fishery to the next in a way [that] was essential as a fisherman to always be changing and to always be varying the species that you're targeting to follow that curve of those upswings and downswings. [...] These permit structures are very rigid and it's not to say that they've been a bad thing; I think it's obviously been a good thing in terms of recovering a lot of the resource and bringing back a lot of our overfished species. But it's sort of left a scar in our fishing communities in terms of the flexibility that fishermen really need to make a living." -**Moss Landing commercial fisherman**

"I don't think a rockfish should be worth twenty five cents. We can get paid a heck of a lot more than that, but trying to find those markets is hard to do. And the same comes to crab as well [...] We have a lot of crab that comes into this port [...] and the vast majority also has to succumb to what the bigger processors are willing to pay. And generally that is, you know, lower than what we possibly could get. So market availability is, I guess, there, but for a good, reasonable market? No, not really there." -**Eureka commercial fisherman**

"I have dabbled in it [direct sales]. Typically, I would love to just come in, load to the market, and be done with it and go fishing the next day. But you have to take the time to sell the product. So that cuts into your fishing time. I don't want to do it. I would much rather go with the buyers. But if the buyers are loaded and you're stuck with trying to make a living and having to take and sell to the public and maybe spend that extra time, the price that you sell to the public is substantial." -**San Francisco Area Ports commercial fisherman**

"I started out full-time fishing and then I took on another job. So I do get about half my income from fishing and the other half from the other job. I see some guys that are full time that I'm friends with and, yeah, you can definitely make a living full-time, but everybody has a different standard of living. Guys have different work ethics and different financial means and for some guys, it seems like they really struggle to make ends meet and there's some that do really well." -**Ventura/Channel Islands Area Ports commercial fisherman**

Commercial fishing perceptions of social well-being

- Overall, commercial fishing focus group participants reported strong internal relationships and high levels of job satisfaction, but they reported weaker relationships with external entities and challenges related to recruiting new participants—both captains and crew—into the commercial fishing industry.
 - Participants tended to describe a sense of camaraderie and support among their peers in the industry, though low levels of trust and leadership were identified in some ports. Many participants discussed feeling a lack of support from external groups, including agencies,

environmental non-governmental organizations (NGO), and the general public.

- Fifty percent of focus group participants reported relationships between fishermen within their port were either strong or very strong, while only 23% reported relationships with external groups were either strong or very strong.
- On average, participants reported neutral (35%) to high (39% satisfied or very satisfied) levels of satisfaction with their jobs in the fishing industry. Many described a sense of fulfillment having been able to turn their love for fishing into a career. They identified the independence of the job and ability to work closely with nature as key highlights. At the same time, participants discussed regulatory burdens and financial stress/difficulty making a living as challenges.
- Across California ports, the ability to recruit new captains and crew to the commercial fishing industry and retain current participants was cited as a key challenge. It was the lowest rated well-being question across focus groups, with 69% of participants characterizing recruitment and retention as poor or very poor, 29% as neutral/acceptable, and only 2% as good.
 - Participants stated high start-up costs, including prohibitively expensive limited entry permits, have created hurdles for young people to enter and survive in the industry. They noted it is very difficult to enter the industry without financial inheritance or other form of financial support.
 - While participants noted some bright spots of younger fishermen entering and making it in the industry, many expressed concerns about the so-called “graying of the fleet.” They indicated regulatory and other financial burdens which prevent new fishermen from entering represent an existential threat to the future of young people entering the commercial fishing industry.
 - Many participants discussed the challenge of finding and maintaining quality crew members to support their fishing operations. They stated there is a small, skilled labor pool that is willing and/or able to work around the uncertainties of management, accept wages that are often insufficient to earn a

living, and handle the nature of the job. Only rarely did participants report having maintained a steady crew.

- Representative quotes related to social well-being:

"We're still brothers with each other. And if somebody needs help with their boat, you're going to go to help them. That takes precedence over you making money for that day or whatever you were going to do." -**Shelter Cove commercial fisherman**

"There's some strong relationships within the fishery, like a real bond there. Being a younger guy, I've definitely had a handful of older fishermen [who are] like mentors that took me under their wing at the beginning, so I'd describe those relationships as strong. And I think that's really important for passing the fishing heritage on, especially for me because I don't come from a fishing family. So if I hadn't landed in the lap of a few of these guys who really showed me the ropes, I wouldn't be where I'm at." -**Ventura/Channel Islands Area Ports commercial fisherman**

"In terms of the agencies, it's very hard to educate them about how important the commercial fishery is. I think they hear a lot of stuff from NGOs that don't like us and don't want to see us fishing, or want us to fish in the manner that they approve of which would mean that we would all go out of business, so that's all problematic." -**San Francisco Area Ports commercial fisherman**

"I always thought that people should know more about the wharf and the fishermen there and the culture there. I think it used to be like that, they used to have parades and just a lot of community involvement down there, which has kind of gone away. So I'd like to see more of that to counter the disinformation that the public is getting from the NGOs and the media. That's kind of our biggest problem." -**San Francisco Area Ports commercial fisherman**

"I think there's a wide range, everywhere from people who are making a decent living like me and who feel like they have a great life. So I would say I'm very satisfied, even though it's a struggle and my stress is through the freakin' roof. I'm still satisfied with my job because I have a lot of fulfillment and purpose and I do have a secure job: no one is going to fire me... stress is high, but other than that, it's a good job." -**Moss Landing commercial fisherman**

"There's three or four boats that are going to retire this year because of old age. They're done doing it [. . .]. To be honest, you got to be almost crazy to get into this industry right now. It's financially irresponsible. I mean, I've made good money, and really, this is all I can do. This is what I do. And so when [the season] gets shut[down early], [it's] devastating to my family, devastating... I can't even explain to you. So for somebody to get into this industry right now, you would have to be crazy or [at least] know what the possibilities are. You can make good money, but there's a possibility that you're going to be spending a lot of money and not making nothing and be left high and dry without anything. You're gambling, big time." -**Trinidad commercial fisherman**

"I think the fishermen are more endangered now than the resource itself. And I think we could actually largely say that as an industry, as a whole, we're in a critical moment right now where all these other forces, including the regulatory management aspects, the gentrification of our ports, the markets that are driving the economies of our fishing industries... those are all things that I think are putting fishermen out of work and keeping new fishermen from coming into the industry. [...] And the permitting of all of our fisheries becomes a really significant barrier to entry." **-Moss Landing commercial fisherman**

"The problem is the younger guys don't have the money to buy into the fishery right now. If you're going to do it right, you need a couple hundred thousand dollars to buy a permit, a good boat, and good gear to maybe be competitive, and that's as the old guys get out because of maybe their age and their limitations. You don't have the younger guys moving in behind them because they don't have the resources." **-Orange County Area Ports commercial fisherman**

"I think it's hard [for] crew members. The seasonality of the job is brutal. [During] lobster [season], you're rich. The next three months now, keeping a crew member, he's going to make nothing. So you work 12 to 15 hours a day for two months and then [it's] 'I need you to take three months off and not make any money and then come back and start lifting heavy stuff.' It's hard to retain crew." **-San Diego Area Ports commercial fisherman**

3.1.3 Key Finding 3. Commercial fishing views on engagement and participation in fishery management

A long history informs commercial fishing participants' engagement and participation perspectives in fisheries management and policy. Participants referenced their countless experiences attending community meetings and town halls, acting as advisors to address specific fisheries issues, and having direct conversations with CDFW managers. The following themes capture engagement and participation attitudes conveyed during the focus group conversations:

- Reluctance to participate in management and research processes
- Limited capacity and resources to effectively engage
- Willingness to participate in virtual focus groups in the future

Summary of Key Finding 3: Commercial fishing views on engagement and participation in fishery management

- Commercial fishing focus group participants expressed reluctance to participate in management and research processes due to:

- Fear that information gathered from fishing communities will be used to restrict access to fisheries.
- Disillusionment with how decision-makers consider and value fishermen's participation and knowledge.
- Consternation there is not a future for commercial fishing in California.
- Commercial fishing focus group participants expressed that they have limited capacity and resources to effectively engage because:
 - Volunteer time limits fishermen's ability to successfully take part in management and policy processes.
 - There is a disparity in funding made available to researchers, managers, planners, and others relative to how fishermen are compensated to participate in management processes.
- Commercial fishing focus group participants expressed their willingness to participate in virtual focus groups in the future, and conveyed the following sentiments:
 - Support for virtual focus groups and satisfaction with the focus group experience.
 - Appreciation for Zoom meeting orientation/training to ensure effective participation.
 - Appreciation for introduction/guided tour of public websites (i.e., this project's website) and interim products (i.e., focus group summaries).
 - Technology limitations and time constraints can be barriers to participation.
 - Virtual experience facilitated trust-building and supported open lines of communication.
 - Neutral facilitation improved focus group experience.
 - In-person meetings, where possible, are preferred.

Reluctance to Participate in Management and Research Processes

- *Fear that information gathered from fishing communities will be used to restrict access to fisheries.* Based on their past experiences with management processes like MPA implementation, many participants expressed a reluctance to participate in current and future management and monitoring processes and related research for fear that information shared will be used to restrict their participation in and access to commercial fishing in California.

- This legacy of mistrust affected this project, resulting in one commercial fishing port [and two CPFV regional port groups] deciding not to participate due to fears about how the information gathered would be used to limit commercial fishing.
- *Disillusionment with how decision-makers consider and value fishermen's participation and knowledge.* Many participants expressed frustration that their perspectives and expertise were not heard or accepted as valid sources of information by decision-makers to help inform fisheries management in California.
 - Participants expressed skepticism that decision-makers will seriously consider their needs and priorities in such processes as the [Governor's 30x30 Executive Order](#), the [Risk Assessment and Mitigation Program \(RAMP\)](#), and proposed regulation changes to the Rockfish Conservation Area.
- *Consternation there is not a future for commercial fishing in California.* Concerns the state is not interested in supporting—or investing in—a thriving commercial fishing industry in California were expressed multiple times by participants statewide.
- Representative quotes related to reluctance to participate in management and research processes:

"It always feels good to vent, but on the other hand, is this really going to do us any good? It was a pleasant experience talking to everybody tonight, but I've seen this [same thing] happen in my 40 plus years of experience. None of this ever comes to much. [. . .] I just can't ever see anything happening [because of what we shared]. [With] the DCTF, we actually do implement some stuff, but we're not going to be implementing anything here. [. . .] You took the sting out of it by paying us. [. . .] We're being railroaded by the powers that be... [they're putting] us through this dog and pony show to dot the I's and cross the T's." -
Trinidad commercial fisherman

"The experience would be great if we can see something happen from it. It'd be worth it to do it every year, but I guess we'll have to wait and see." -
Point Arena commercial fisherman

"They [decision-makers] can say [...] they don't have intentions of doing [anything that will negatively affect fishermen]. That's [what] they told us in the very beginning [of the MPA planning process]. [...] You know, we're going to participate in these conference calls because, if you're not in the room, you're on the menu. But I mean, we've heard this before. [...] We gave them all the information [fishing activity that informed MPA locations]. The minute you said Ecotrust, the only reason I didn't hang up is because you're [Project Team

member, name redacted, was] on the other end of this call and I trust you. But they screwed us. [From] the very beginning, they did. We all did the interviews. [...] It's hard not to be pissed off." -Morro Bay - **Port San Luis commercial fisherman**

"It's hard as a fisherman not to be distrustful of the process. It just feels like all we do now is suffer. And as fishermen, I think we all feel like the ocean's generally healthy. And just every day, there's a new heavy-handed thing coming down on us year after year after year, and it just gets to be less and less satisfying to deal with." -Princeton - **Half Moon Bay commercial fisherman**

Limited Capacity and Resources to Effectively Engage

- *Volunteer time limits fishermen’s ability to successfully take part in management and policy processes.* Many participants described their limited capacity to participate in stakeholder engagement processes, which often depend on fishermen volunteering their time and expertise. They expressed that management restrictions already decrease their ability to earn income, and participating in management processes is too much of an additional burden for many.
 - During the recruitment for this project, fishermen expressed reluctance to participate based on their need to prioritize fishing and making an income. While appreciated, the nominal stipend made available did not compensate for a day off the water.

Table 8 Summary of the number of commercial fishermen contacted to participate in focus group conversations and number of individuals who participated across ports.

Commercial Fishing: Participation Data

Port	Number of Participants Contacted	Number of Participants Who Participated
Bodega Bay	11	6
Crescent City	9	4
Santa Barbara	11	4
Los Angeles/Long Beach	11	6
Orange County Area	9	6

Channel Island/Ventura	16	4
Eureka	10	8
Shelter Cove	7	4
San Francisco Area	5	4
Trinidad	5	3
Fort Bragg / Albion	13	5
Morro Bay / Avila / Port San Luis	12	4
Princeton - Half Moon Bay	11	7
Santa Cruz	11	5
Moss Landing	10	4
Point Arena	7	4
Monterey/Big Sur	7	0
San Diego Area	10	5
Oceanside	6	3

- *There is a disparity in funding made available to researchers, managers, planners, and others relative to how fishermen are compensated to participate in management processes.* Participants recognized the imbalance of how researchers, agency staff, and others are paid to attend meetings while fishermen are asked to volunteer their time.
 - This dynamic affected our project, with multiple occasions where fishermen confirmed their participation in a focus group but had to cancel at the last minute due to pressing business priorities.

- Representative quotes related to limited capacity and resources to effectively engage:

“Over the last 20 years, we’ve adapted our operations to satisfy [decision-makers]. It’s cost us thousands of hours and thousands of dollars to rerig gear, to change things, to do things, to be accepted. For everything that’s been taken away from us, not one thing has ever been given back. So for us to keep coming to the table and trying [to participate in these discussions], it’s getting harder and harder.” -Morro Bay - Port San Luis commercial fisherman

“This time of year, our time is very budgeted and this timing was pretty horrible, but I thank these guys for coming. [It would] have been nicer to have done this in a sooner time fashion.” -Orange County area ports commercial fisherman

"You [have to] understand that we have to furnish everything: we have to furnish our boats, we have to furnish our own crab pots, we have to furnish bait, we have to furnish our own hired crew, we have to furnish our own leased out spots to put the crab gear, we have to furnish storage units for rope and line. We have to furnish all those expenses. That's before we furnish our trucks and our trailers and our semi-trucks that go up and down [the coast] because maybe we fish south or north, and then sometimes we got to fly boats and crew back and forth. That's before we get started fishing. That's before we've made any money. And so it's different than a politician or a lawyer - they might have to rent an office building and buy a ream of paper... we're not like that." -Trinidad commercial fisherman

Willingness to Participate in Virtual Focus Groups in the Future

- *Support for virtual focus groups and satisfaction with the focus group experience.* As time allowed, participants were asked about their experience with the focus group process. A majority of participants were either satisfied or very satisfied with their experience participating in the virtual focus group (Figure 9), and over three-quarters of participants said they would be open to participating in a virtual meeting like the focus group in the future (Figure 10).
 - For some, the financial compensation that the Project Team provided helped make their participation feel less burdensome.
- *Appreciation for Zoom meeting orientation to ensure effective participation.* Several participants reported the online meeting software/Zoom training and orientation at the start of the focus group helped them feel comfortable navigating the technology throughout the meeting, even among those who had not used Zoom before or were not as familiar with the virtual meeting platform.
- *Appreciation for introduction to public websites and interim products.* Several participants expressed appreciation for the facilitation team walking through the public facing website and highlighting the location of interim products (i.e., focus group summaries), which gave them confidence to find and review these products on their own time.
- *Technology limitations and time constraints can be barriers to participation.* Technology needs (i.e., having access to a device compatible with Zoom functionality) and the time commitment required of participants were identified as potential barriers to virtual participation across focus groups.
 - Participants also suggested the focus group be shorter (i.e., less than four hours in length) and, in some instances, earlier in the day; several

focus groups ended between eight and nine in the evening to accommodate fishing schedules in the morning and afternoon.

- *Virtual experience facilitated trust-building and supported open lines of communication.* Participants also stated the virtual environment made it easier for them to open up about their experiences because they were joining the meeting from a place where they felt comfortable like their homes. Additionally, holding the focus group in a virtual setting made it possible for some participants to join who otherwise would not have been able if the meeting was in person.
- *Neutral facilitation improved focus group experience.* Participants commented on the facilitation of the focus group and elaborated that the facilitators were professional, transparent, and attentive to their needs and concerns regarding their participation in this project. Several participants suggested that their participation was dependent upon the layer of confidentiality and impartiality provided by a neutral third party.
- *In-person meetings, where possible, are preferred.* Many participants expressed a preference for in-person meetings, which afford participants opportunities to make more meaningful face-to-face personal connections. Participants also expressed their distaste for the amount of time they must spend on the computer for regulatory and business purposes, and generally prefer to limit their time using computers.

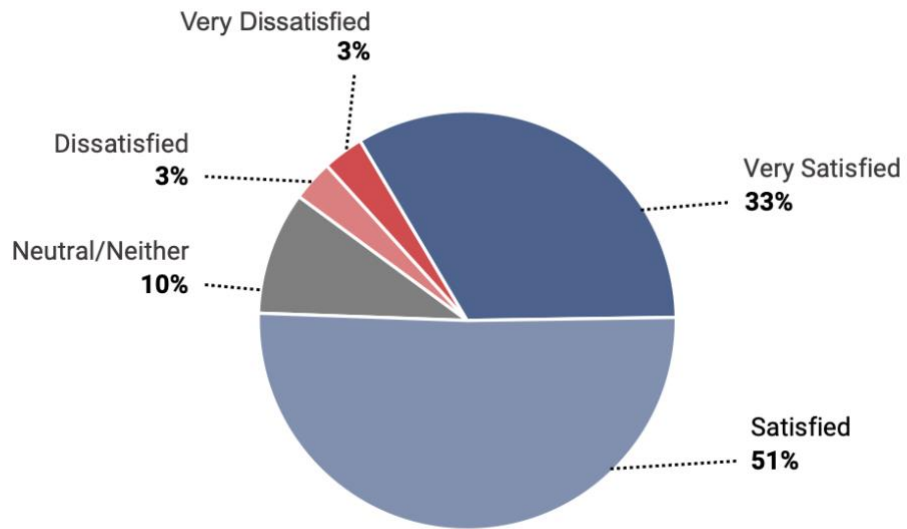


Figure 9 Pie chart showing commercial fishing focus group participants' satisfaction with the virtual process (n=63).

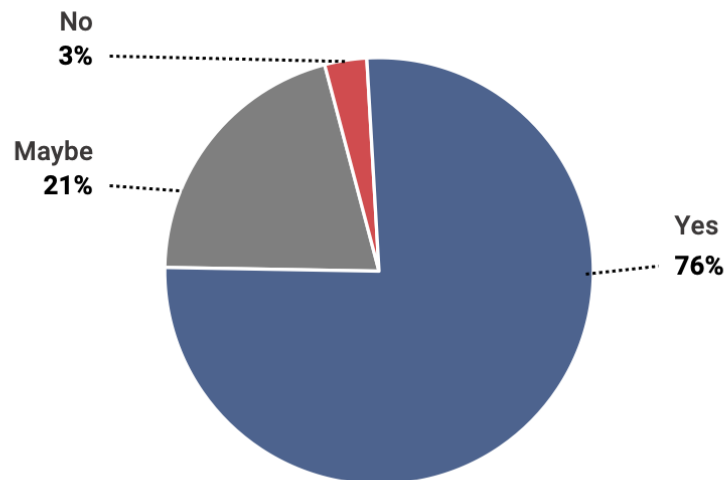


Figure 10 Pie chart showing commercial fishing focus group participants' willingness to participate in a virtual process in the future (n=63).

- Representative quotes related to willingness to participate in virtual focus groups in the future:

"I was very satisfied. Thank you very much for putting this all together and giving us [this space to share] input. Communication, as I keep stressing, is most important. And you have the ear of certain people that are going to be able to listen to you. Yes, I definitely appreciate what you guys have done, opening up potential avenues of communication. We'll see what happens. You can count on me to be here whenever I can." -**San Francisco Area Ports commercial fisherman**

"I think this has been a very good way of being able to gather several people in different geographic areas in an area where we feel comfortable, like, for example, I'm at home [...] I just feel that if you're in your zone, your comfort zone, we're going to actually say more and remember more. Just seeing everybody else, it looks like everybody is kind of in their comfort zone." -**Bodega Bay commercial fisherman**

"I like [it when] everybody sits around a table, and this isn't a venue where we're going to disagree necessarily. Right? I mean, we're all like-minded for the most part as it relates to commercial fisheries. I just prefer to do it in person. That's it. I'm not a fan of technology, regardless of what I'm doing right now but I'd rather we sat as a group together." -**Los Angeles/Long Beach Area Ports commercial fisherman**

"I think it's really great that we have an opportunity to look at it [the MPA network] ten years later and are able to give our input." -**Point Arena commercial fisherman**

3.1.4 Key Finding 4. Commercial fishing perceptions of COVID-19 impacts and adaptations

The COVID-19 pandemic emerged in the middle of our project period and all focus groups were conducted as the pandemic was occurring within the state of California. As a result, COVID-19 was a discussion item that came up several times during focus group conversations. In addition, the state requested that we add a question related to COVID-19 to our focus group assessment tool, so most of the ports explicitly assessed and discussed the impacts and adaptations from the COVID-19 pandemic. The following themes capture commercial fishing perceptions of COVID-19 impacts and adaptations conveyed during the focus group conversations:

- Statewide overview of commercial fishing perceptions of COVID-19 impacts
- Waterfront access challenges from COVID-19
- Disruptions to markets from COVID-19
- Health related challenges for commercial fishing from COVID-19
- Commercial fishing adaptation strategies in the face of COVID-19

Summary of Key Finding 4: Commercial fishing perceptions of COVID-19 impacts and adaptations

- Statewide overview of commercial fishing perceptions of COVID-19 impacts
 - Commercial fishing focus groups participants recounted experiencing negative impacts and disruptions in their fishing activities due to COVID-19.
 - 64% of focus group participants reported high or very high disruption to their normal business operations as a result of COVID-19.
- Waterfront access challenges from COVID-19
 - Commercial fishermen in several parts of the state reported challenges accessing the waterfront and their businesses due to COVID-19 restrictions and beach/waterfront closures in the first three months of the pandemic.
- Disruptions to markets from COVID-19
 - Commercial fishermen up and down the coast reported experiencing challenges and disruptions with selling their catch through traditional markets.
- Health related challenges for commercial fishing from COVID-19
 - Health concerns and crew challenges related to COVID-19 were reported in various ports across the state.
- Commercial fishing adaptation strategies in the face of COVID-19
 - Commercial fishermen reported creative adaptation strategies to keep their businesses afloat, including new and/or expanded efforts in direct marketing.

Statewide overview of commercial fishing perceptions of COVID-19 impacts

- Commercial fishing focus groups participants recounted experiencing negative impacts and disruptions in their fishing activities due to COVID-19.
 - 64% of focus group participants reported high or very high disruption, 28% reported medium disruption, and 8% reported low or very low levels of disruption (Figure 11).

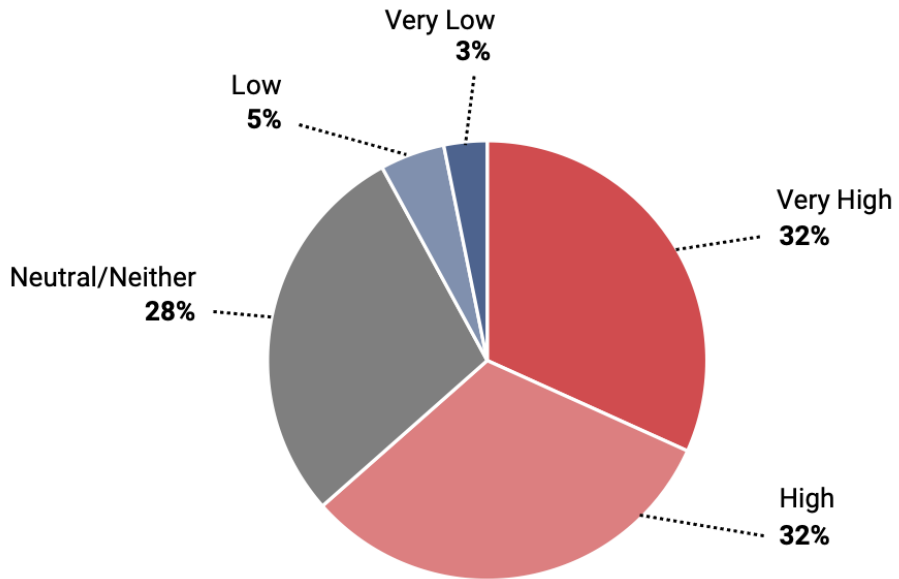


Figure 11 Pie chart showing commercial fishing focus group participants' perceived disruption of COVID-19 to their port's fishing operations (n=63).

- Fishermen from southern and central ports reported higher levels of disruption when compared to those from ports in northern California (Figure 12).

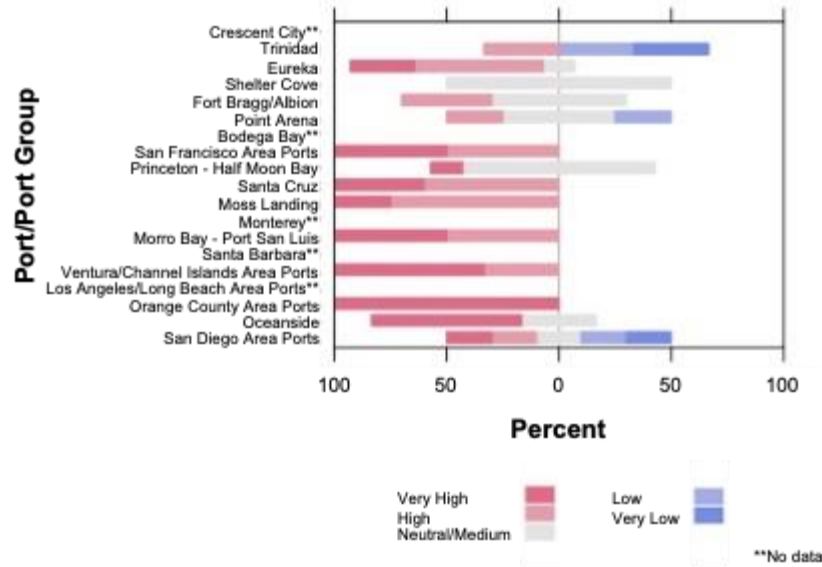


Figure 12 Diverging stacked bar chart showing commercial fishing focus group participants' perceived disruption of COVID-19 to their port's fishing operations, ordered geographically from north to south.

- Representative quote related to statewide overview of commercial fishing perceptions of COVID-19 impacts:

“COVID definitely affected the crab fishery. And it got to a point where the buyers didn't even want your crabs and they just told you just to bring your gear in and find somebody else to sell them to. The price was, I don't remember, three bucks or something - should have been like six.” -Bodega Bay commercial fisherman

Waterfront access challenges from COVID-19

- Commercial fishermen in several parts of the state reported challenges accessing the waterfront and their businesses due to COVID-19 restrictions and beach/waterfront closures in the first three months of the pandemic.
- Representative quote related to waterfront access challenges from COVID-19:

“As a trailer boat commercial fisherman, during COVID, in the beginning, I had to threaten these lawsuits to get access to the boat ramps in Mission Bay. The city was willing to listen and then they gave us access, they gave commercial fishermen access. San Diego Bay didn't until they were faced with having to go before the news to discuss it, and then they finally opened their boat ramps. There was two months where I wasn't able to fish because the boat ramps were closed.” -San Diego area commercial fisherman

Disruptions to markets and fishing from COVID-19

- Commercial fishermen up and down the coast reported experiencing challenges and disruptions with selling their catch through traditional markets.
 - COVID-19 affected overseas and export markets, restaurant sales, and the trucking operations for buyers.
 - These disruptions resulted in very low prices and in some cases the inability to sell catch.
 - Some fishermen decided not to fish at this time due to low prices and health concerns.
 - Other fishermen decided to fish harder in order to produce higher catches to offset the lower costs.
 - Some participants reported that markets for certain fisheries, such as salmon, in certain locations were either not affected or even improved. Particularly for fisheries that allowed for direct sales.
- Representative quotes related to disruptions to markets and fishing from COVID-19:

"But for my personal experience this past year, I've done things that I never envisioned that I would have to do just to survive the COVID thing. We fished to when the truck was available, not to when the weather was good. And we had buyers that wanted, on one particular day of the week, they only wanted small fish [...] So we were throwing fish over the side that normally would have been marketable to not bring stuff to the dock that we couldn't sell. [...] If we couldn't make it work for the day that the truck was going to be there, we didn't get to go fishing. So we managed to make a year out of it, but it wasn't easy. [...] Those of us that are on this call have figured out how to survive, and that's why we're still here." -**Morro Bay/Port San Luis commercial fisherman**

"The stress level with our crew members and everybody else is huge, man. I mean, it really sucks: are we going to get shut down any minute? What's going to happen? And we did get shut down. Then we got opened back up again. There are threats of shutting down again. I mean, that really wears on everybody for sure." -**Santa Barbara/Ventura/CI CPFV owner/operator**

"In my particular case, what I found last summer with COVID around was that the demand for the salmon increased, not decreased. And I even had people say, 'oh my gosh, we've got more people up here in the area around Gualala and Point Arena and Sea Ranch. We have more people here now than we've ever had before; they're trying to get out of the Bay Area. You should be charging more for your salmon and not less.' And so I didn't see any particular problem with COVID and found that the markets were pretty good for the way that I sell the fish. I

usually catch less and try to sell them to individuals as much as possible to get more per fish.” -Point Arena commercial fisherman

“When rock cod season opened up, people weren't going into town or going to grocery stores. They wanted to stay home. All I had to do was text a few people, and we would have our orders before we even went fishing.” -Shelter Cove commercial fisherman

Health related challenges for commercial fishing from COVID-19

- Health concerns and crew challenges were reported in various ports across the state.
 - Some operations decided to reduce crew sizes due to health concerns.
 - Other operations struggled to maintain crew during the pandemic due to the availability of high unemployment benefits and health concerns.

- Representative quote related to health-related challenges for commercial fishing from COVID-19:

“And it's also been hard to negotiate the whole thing with your deckhand on the boat, without having the social distancing all the time and the impact of that with your family [and being able to] work that all out, it's just made it a lot more difficult.” -Point Arena commercial fisherman

Commercial fishing adaptation strategies in the face of COVID-19

- Commercial fishermen reported creative adaptation strategies to keep their businesses afloat.
 - Some fishermen reported growing existing direct marketing businesses during the pandemic.
 - Others developed new strategies including using social media and other websites to sell their catch direct to consumers, restaurants, or food banks.
 - Fishermen expressed an interest to maintain or expand their direct marketing efforts since many of these ventures were lucrative during the pandemic.

- Representative quotes related to commercial fishing adaptation strategies in the face of COVID-19:

"I have an Instagram page, and I don't like people or social media. Now I'm trying to sell direct-to-consumer. We adapted – we're fishermen, you have to or you go out of business." **-San Diego area commercial fisherman**

"I'm new to the whole off the dock sales thing...other fishermen in this port have many years worth of experience more than I do...I think that maybe the demand has always been there for getting your seafood off the dock and directly from the source [and] maybe COVID-19 has helped push that demand a little bit further and increased that demand maybe slightly." **-Eureka commercial fisherman**

"We did an online store and added a bunch of product that we were getting from other fishermen, which was around the same time that the supermarkets were emptying out and people didn't want to go shopping. So the option to pull up and have a box full of seafood handed to them was super appealing." **-Santa Barbara commercial fisherman**

"The reason we pivoted to e-commerce and more direct-to-consumer sales [was] because restaurants shut down due to COVID. But I mean, yeah, sure, I dreamt of doing like an online sale thing prior to that, but I feel like I got kicked in the butt a little bit and didn't have much of a choice because we had no other outlet for a catch. [. . .] We're right on the cusp of that revolution or movement. So I hope things get better for fishermen and there's more outlets and the markets strengthen a bit here. I think the consumers definitely want it. It's just logistics of getting it to them." **-San Diego area commercial fisherman**

3.1.5 Key Finding 5. CPFV perspectives on MPAs, well-being, engagement, and impacts from COVID-19

To round out the snapshot provided by this study about California's health and well-being of California's fishing communities in relation to MPAs, Commercial Passenger Fishing Vessel (CPFV), or charter, operators from across California weighed in with their perspectives about MPA outcomes and about the overall well-being of their communities. The following themes capture CPFV operators' perspectives conveyed during the CPFV focus group conversations:

- CPFV perceptions of MPA outcomes
- CPFV perceptions of fishing community well-being
- CPFV views on engagement and participation in fishery management
- CPFV perceptions of COVID-19 impacts

Summary of Key Finding 5: CPFV perspectives on MPAs, well-being, engagement, and impacts from COVID-19

- CPFV perceptions of MPA outcomes

- On average, CPFV participants across California rated the outcomes of the MPA network poorly; all five questions were rated below a neutral score of 3.0.
- MPA Ecological Outcomes was rated the highest of the MPA outcomes questions, but with a score of 2.6, still well below neutral.
- Regarding MPA livelihood outcomes, CPFV participants expressed either negative or neutral views about the impacts of MPAs on their fishing livelihoods.
- Regarding MPA management outcomes, all three of the questions related to MPA management were rated very poor with average scores below 2.0.
- CPFV perceptions of fishing community well-being
 - Statewide, on average CPFV participants rated job satisfaction, social relationships among fishing community members, and present marine resource health as positive.
 - Statewide average ratings below neutral were reported for income from fishing, relationships with external groups, allocation of resources, and future marine resource health.
- CPFV views on engagement and participation in fishery management
 - Many participants expressed frustration that their perspectives and expertise were not heard or accepted as valid sources of information by decision-makers to help inform fisheries management in California.
- CPFV perceptions of COVID-19 impacts
 - CPFV focus group participants reported COVID-19 was disruptive and changed the way CPFV businesses operate.
 - 85% of focus group participants reported high or very high disruption from COVID-19.

CPFV Focus Group Approach

- The Project Team conducted five regional focus group conversations with 20 members of California’s CPFV fleet. See Section 1.0 Introduction, Table 1 for list of CPFV regions.
 - Focus group participants were asked to rate a series of questions about the well-being of their CPFV fishing communities and about

outcomes from the MPA network on a five-point scale from very low to very high, with a score of three being neutral.

- Participants also provided oral commentary and description about the MPA network and various aspects of their community's well-being.

CPFV perceptions of MPA outcomes

- Participants across the state rated the MPA network based on ecological outcomes, livelihood outcomes, and various aspects of MPA management and provided commentary about the reasons for their answers.
 - On average, CPFV participants across California rated the outcomes of the MPA network poorly (Figure 13). All five questions were rated below a neutral score of 3.0; all three of the questions related to MPA Management were rated very poor with average scores below 2.0; MPA Ecological Outcomes was rated the highest, but with a score of 2.6, well below neutral.

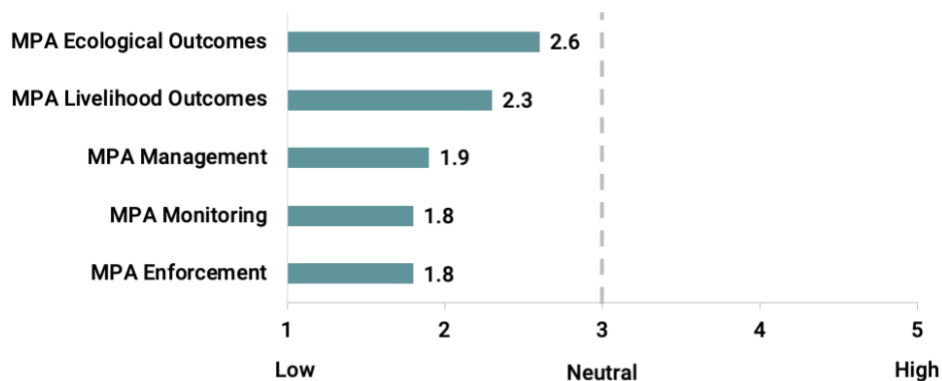


Figure 13 Bar chart showing statewide averages of CPFV focus group participants' perspectives about MPA outcomes, ordered from highest to lowest.

CPFV perceptions of ecological outcomes from MPAs

- The majority of participants expressed negative or neutral views of the ecological outcomes while a few participants did mention potential positive effects. Several participants believed a few specific species were benefiting due to MPAs.

- Many participants expressed a concern that MPAs could negatively affect marine resource health due to compaction of fishing effort in areas that remain open.
 - Many participants expressed a desire to see monitoring results in order to better understand the ecological outcomes from MPAs.
 - Participants did note some positive to semi-positive outcomes for species such as rockfish and lingcod and protection of juvenile nursery habitat, but still had doubts about whether these impacts can be attributed to the MPA network or have a positive effect on the quantity and quality of harvestable resources.
- Representative quotes related to CPFV perceptions of ecological outcomes from MPAs:

“Since I've been fishing there for a long time and stuff near the MPAs, we kind of knew going in with the whole MLPA [Marine Life Protection Act] that in well-managed fisheries, MPAs are not as strong as they are in areas with poor management - they don't have as much effect. And that's kind of what we're seeing really: that the fisheries management has had more effect on our fisheries than the MPAs. We fish fairly near one MPA, but we don't really see [...] that the fishing is any different along the edge of the MPA as it is, you know, several miles away from it - it's actually fairly similar. So I would say that there hasn't been a noticeable effect either way.” -CPFV owner/operator from North Coast Region

“The MPAs have devastated the commercial urchin fishery. When the MPAs went into place - they're basically nearshore, which is exactly where the urchins are at - that's one of the reasons that [urchin populations] have exploded so much and have eaten the kelp forest and had a negative impact on the ecosystem and the abalone. That's not the only reason the abalone are in trouble, but it was a huge reason maybe no one thought about, that if they [close] the best urchin diving spot on the North Coast, a series of spots, not just one spot, almost all of them, then you're going to kill the industry. [And that will] enable the urchin to have less pressure and maybe upset the balance that was found before. I'm not saying that's the only reason at all why we're struggling with kelp forest and abalone, but it could be one reason. The kelp forest is part of the ecosystem that our nearshore rockfish thrive in, which [charter operators] depend on.” -CPFV owner/operator from Bodega Bay area ports

“I think [MPAs] have had a positive effect on the fisheries in that it gives them a nursery and a rookery for fish species here... the negative aspect of this is that it has limited our geographical areas where we can fish. And the limiting of geographical areas we fish has had a negative impact, because we're having to fish in a smaller area... we end up having to go back to the same spots as opposed to going to new areas all the time... but the positive aspect is that it has

been a good rookery. It's an area where fish populations have been able to grow and those juveniles and subadults are moving to other areas. And so I see it as an overall positive thing because of the increase in the populations.” -CPFV owner/operator from San Francisco area ports

CPFV perceptions of livelihood outcomes and/or impacts from MPAs

- CPFV participants expressed either negative or neutral views about the impacts of MPAs on their fishing livelihoods (Figure 14). The data reveals some regional trends, where more southern California based CPFV operators appeared to rate the livelihood impacts as worse than those from Northern parts of the state. Commentary indicates that this could be linked to the comparative placement of MPAs in the different regions, where participants described that MPAs in the North Coast region were less likely to have been placed in important fishing grounds compared to those in southern parts of the state.
 - Participants described several impacts from the MPA network that they believed affected their businesses and decreased their overall profits including a decrease in accessible fishing grounds. This included a need to travel longer distances to avoid fishing in MPAs, which lead to increased safety concerns, fuel costs, and trip times; reductions in either the length of fishing time or in total trips offered per day; compaction of CPFV operations in smaller areas; and adding an overall sense of uncertainty and worry to the CPFV business model. Participants believed at least one CPFV operator left the industry due to the implementation of MPAs.
 - Participants highlighted the cumulative effects when the protected areas from the MPA network were combined with other restrictions and closures such as the RCAs and Cowcod Conservation Areas (CCAs).
 - Some participants cited CPFV operators’ resilience in finding workarounds to maintain business viability, despite negative livelihood effects from MPAs.
 - Participants expressed their concerns and experiences with specific MPAs in the network; the results of those discussions—organized by MPA—can be found on the [project website](#).

- Representative quotes related to CPFV perceptions of livelihood outcomes and/or impacts from MPAs:

“You definitely have to use a lot more fuel to move around more because you've got to drive around the [MPAs] so that you can fish. So that's why I wrote negative. I mean, [clients] don't like the ride to be that long, a shorter ride is better, more preferable. And then [more] fuel, you know, [means] less profit. I have to burn more fuel per day per trip.” -CPFV owner/operator from Bodega Bay Region

“In North County San Diego and in Mission Bay, we have watched the fishing business evolve away from the half-day fishing trips. Now there's only one half-day boat out of those two areas because of the removal of fishable habitat [from MPAs]. I mean, it has a direct correlation with it. There were 7:00am to 4:00pm boats that fished every day in La Jolla, [...] and all of a sudden all these boats, [...] we had to go to Mexico. We had to take those trips and make them longer and go to Mexico [...] in order to make a viable living. Now we're playing on a 50 yard field in that area; they cut the fields right in half.” -CPFV owner/operator from Orange County/San Diego Region

“One thing that you also need to understand is that the RCAs have also had a tremendous effect and impact on our industry [in addition to the MPAs], and that's not being addressed here at all. [The combination of the MPA network and the RCAs have] pushed us into a much, much smaller box.” -CPFV owner/operator from San Francisco Region

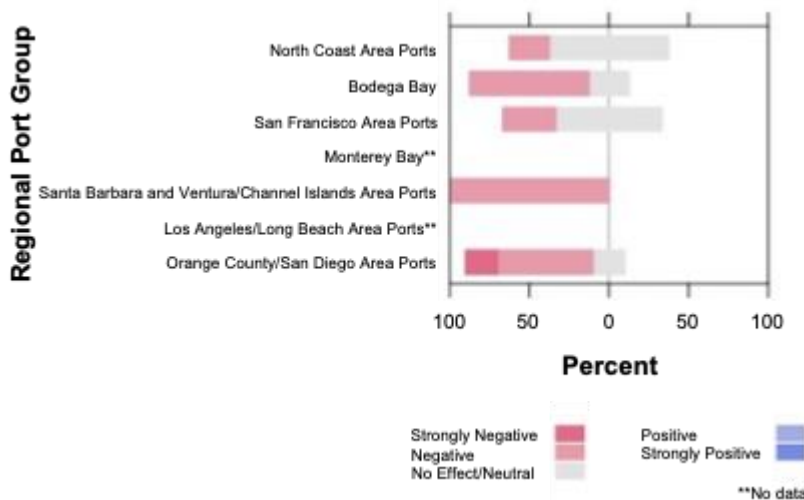


Figure 14 Diverging stacked bar chart showing CPFV focus group participants' perceived MPA livelihood impacts, ordered geographically from north to south.

CPFV perceptions of the management of the MPA network

- Across the state, CPFV participants were dissatisfied with MPA management, monitoring, and enforcement. Many participants felt that managers did not effectively communicate information about MPA management goals/indicators of success during MPA implementation and beyond, and felt the implementation process and ongoing management efforts lack meaningful consideration of CPFV industry conditions and input by CPFV operators. Several participants described frustration about managers' poor communication about how information from MPA monitoring studies would inform management decisions. Many participants expressed frustration about enforcement efforts, which they believe are insufficient.
 - Perspectives on MPA Implementation: Many participants expressed a continuing sense of resentment and betrayal related to the MPA implementation process, which they believed lacked meaningful consideration of local fishing community input. Several expressed a belief that the good faith information they shared with managers about their priority fishing grounds had been used against them as many MPAs were designated in important fishing grounds. Some participants felt that the MPA implementation process did not include sufficient consideration of fishing community socioeconomic information or sufficient consideration of the cumulative impacts of other management restrictions already in place.
 - Perspectives on Current MPA Management: Participants said they were unaware of ongoing MPA management efforts and frustrated by a perceived lack of opportunities for meaningful involvement of fishing community input in ongoing management efforts. Many participants expressed a desire for an updated management approach to MPAs using rotational closures.
 - Perspectives on MPA Monitoring: Participants expressed concerns related to a perceived lack of clear monitoring goals and a perceived failure to communicate results from past monitoring studies with CPFV participants. Many expressed that they were not even aware of ongoing monitoring efforts and findings. Participants expressed dissatisfaction with a perceived lack of opportunities for CPFV owner/operators to participate in monitoring study design and implementation. Some participants suggested that monitoring should

occur more than once a year to capture the monthly and seasonal changes on the water.

- Perspectives on MPA Enforcement: Many participants discussed seeing very little on-the-water enforcement presence, despite seeing substantial illegal fishing activity in MPAs, specifically by private recreational fishing boats. Participants recalled that reports of this illegal activity to CDFW wardens often went unaddressed; some participants acknowledged CDFW's limited capacity for enforcement. Some participants reported inconsistent enforcement efforts for CPFV vessels versus private recreational vessels, with CPFV operators being more targeted by enforcement. Many participants across the state said that CPFV operators have had to act as de facto enforcement by confronting offending vessels and informing them about MPA boundaries/regulations and maintaining a culture of self-policing and peer pressure among CPFV owner/operators.
- Representative quotes related to CPFV perceptions of the management of the MPA network:

"When they came to put in the MPAs, [...] they asked 'well, where do you like to fish,' where it would be closed down and all that stuff. And overwhelmingly, one of the answers was 'well, one of the very best places to fish at Bodega Bay is Bodega Head.' And one of the very first things that happened is they closed that exact spot. That didn't create really good will. And so it has taken 20 years before groups like yours are able to come along and start up that dialogue again, because a lot of fishermen felt betrayed for lack of a better word." -**CPFV owner/operator from Bodega Bay Region**

"There's been no communication, there's been no information that's been put out on what has been going on with the MPAs. There's been no fishermen involvement that I have seen in the management of what's going on in the MPAs. Yes, we were involved with setting up the MPAs originally, but after that, there's been nothing." -**CPFV owner/operator from San Francisco Region**

"There's been no communication [of MPA monitoring studies/results], right? There was no baseline study of what was there prior to the MPAs taking place. So you have nowhere to know, obviously. And then opportunities for involvement? Obviously, there's some because the guys do some research with it; I know the other guys do, but what goals? There's never been anything put out to us CPFV guys [about] what the goals of these are. So the only goal we know is to keep us out." -**CPFV owner/operator from Santa Barbara/Ventura Region**

"I don't know about anybody else, but I have not seen any MPA enforcement, I have seen [the California Department of] Fish and Wildlife a couple of times down in the area where we do rock fishing and stuff. But I don't think I've ever seen them where they need to approach a boat or anything. [...] And personally, I like to see the enforcement. If you're going to have an [MPA], then you might as well make it the best it can be and enforce it and keep people out of there." - CPFV owner/operator from North Coast Region

Statewide overview of CPFV perceptions of well-being

- Participants across the state rated and discussed the well-being of their CPFV community related to environmental, social, and economic factors. Statewide, on average CPFV participants rated job satisfaction, social relationships among fishing community members, and present marine resource health as positive. Statewide average ratings below neutral were reported for income from fishing, relationships with external groups, allocation of resources, and future marine resource health (Figure 15).



Figure 15 Bar chart showing statewide averages of CPFV focus group participants' perspectives about well-being outcomes, ordered from highest to lowest.

CPFV perceptions of social well-being

- CPFV participants across the state reported high levels of job satisfaction and relatively strong internal social relationships. However, on average, they indicated that social relationships with external entities such as government, managers, NGOs and other fishing sectors could use improvement.

- *Perspectives on Job Satisfaction:* On average, job satisfaction was the highest rated well-being question and CPFV participants across the state reported a strong sense of fulfillment from working on the ocean, having autonomy over their businesses and schedules, and working with clientele. Most participants indicated that these positives of the job outweigh many of the stressors and challenges.
- *Perspectives on Internal Relationships:* Some participants identified strong relationships and collaboration within their ports, while others said CPFV owner/operators in their port do not work well together.
 - Those participants who reported strong internal relationships in their local CPFV fleets elaborated that CPFV owner/operators work toward common goals, have good communication among the fleet regarding upcoming issues that may affect them, are responsive and supportive to requests for help by other CPFV owner operators, and engage in healthy competition.
 - Of those participants who identified internal relationships as weak, some explained that CPFV operators are their own bosses who are not used to working collaboratively and cooperatively.
- *Perspectives on External Relationships:* Participants' perspectives regarding relationships between CPFV owner/operators and external groups were wide ranging, from very weak to strong, though on average participants reported the strength of relationships with external groups as below neutral or somewhat weak.
 - Participants from multiple ports discussed challenges with low engagement and representation in policy processes by the CPFV industry broadly. Several participants lamented that the CPFV industry generally does not have a voice in the management of their fishery and believed they could better inform management and industry decisions if they were more organized.
 - Participants highlighted strengths in relationships with external groups, describing some areas of productive engagement with managers, eNGOs, and their local communities.

- Several participants elaborated on the strength of local CPFV fleets' relationships with a variety of external groups, including managers and decision makers (i.e., CDFW, FGC), environmental non-governmental organizations (eNGOs), commercial fishermen, and local communities. One participant noted that the advocacy work of the Sportfishing Association of California (SAC) was a high point in terms of helping to advance the industry's priorities.
- Representative quotes related to CPFV perceptions of social well-being:

"I think everyone is satisfied. And if people weren't satisfied, certainly they wouldn't be here [working in the CPFV industry]. I think there are some questions with job security, possibly, right? I mean, who knows where we're going to be in 20 years? [...] It's stressful, that's part of the job, we understand it, we deal with it, we make do with it. But I think, certainly, the positives outweigh the negatives. I think everyone's satisfied, we wouldn't be doing this if there wasn't some sort of satisfaction out of it, that's for sure. I mean, we're not doing it because we're looking to get rich, right?" -CPFV owner/operator from Orange County/San Diego Region

"Everybody seems to get along really well, although, you know, we all compete amongst ourselves. I believe that it's healthy competition and everybody works together and we all share common interests. There's competition on a daily basis, but it's all friendly. And we've got a bunch of great guys that get along well. So we're lucky in that respect." -CPFV owner/operator from Bodega Bay Region

"I'm in a lot of different organizations through one of my other jobs working for the [redacted]. And I'm active in that job in a lot of those scenes, and I see no other charter captains in those scenes with NGOs and other groups, including even the local Fish and Game Commission - I'm a Fish and Game Commission appointee by my Board of Supervisors members. I've never seen another charter person there for ocean fishing. [...] I just don't see the presence of the charter community in outside groups, whether it be the Coastal Commission meetings, whether it be Fish and Game Commission meetings, local or state. I just don't see them. We're a 'non-group' is what I would call us." -CPFV owner/operator from North Coast Region

CPFV perceptions of economic well-being

- Overall, fishermen reported challenges related to the economics of their CPFV fisheries. Both income from fishing and allocation of resources were ranked

low, with participants expressing challenges making a living from CPFV fishing operations.

- *Perspectives on Income from Fishing:* On average, CPFV participants across California rated income from fishing at 2.85 or somewhat below neutral. Of participants who reported insufficient income from fishing, many discussed the need for additional sources of income to support their livelihoods.
 - Several participants expressed that it is easier for CPFV operators close to urban or wealthier areas to make a living CPFV fishing due to access to more potential clients.
 - Several participants reported increasing costs of business while revenue was staying the same. Some participants also mentioned challenges associated with high costs of living.
 - Participants communicated that seasonal closures for target fisheries and the declining health of the salmon populations were negatively affecting their ability to earn a living.
- *Perspectives on Allocation of Resources:* Across the state, CPFV focus group participants reported that allocation of resources for the CPFV industry was between insufficient and neutral, with the average response landing closer to insufficient.
 - Participants discussed tension between CPFV owner/operators and commercial fishermen due to competition for resource allocation and how this directly impacts their economic well-being. Many CPFV participants believed resources and habitats are more negatively impacted by some commercial sectors when compared to CPFV operations. They felt that resource allocation (e.g., bag limits, access with MPAs and RCAs) are too restrictive relative to the CPFV fleet's limited impact on the health of the resource.
 - Participants noted Dungeness crab, rockfish, and lingcod as specific species where sufficient allocations are lacking.
- Representative quotes related to CPFV perceptions of economic well-being:

"I have to work side jobs and do other stuff. As much as I love charter boats and I've dedicated my life to it, it doesn't earn me enough income to live in this area. You spend the winter getting things ready for the summer, but even then it's just difficult. My goal is to be financially able to do this as a career [which means I

need] the ability to have more days on the water. Once the season's over, we're closed by regulation for three months at least, and the regulations certainly make it difficult for other ones besides those three months as well. It's not really a viable option for charter boats in those three months, most years." -CPFV owner/operator from Bodega Bay Region

"I think there are quite a few of us [CPFV owner/operators] that participate in other [commercial] fisheries as well, which I think could be considered another job. But it's got to be something that can be very flexible, because sometimes the seasons are different. I think up and down the state, there's quite a few guys that are both involved in a CPFV fleet as well as some type of commercial fishery. There's a lot of guys that fish squid when they're around, or lobsters or various other things. They're still fishing all the time, but they might not solely rely only on their CPFV revenue." -CPFV owner/operator from Orange County/San Diego Region

"[Resource allocation for us is] insufficient. You take MPAs, rockfish closures, or bag limits into consideration. I mean, the bottom line is the more restrictive [CDFW regulations are],... the harder it is to do our job, the harder it is to make a profit from it and the more pressure [is] put in smaller areas." -CPFV owner/operator from Ventura/Santa Barbara Region

CPFV perceptions of environmental well-being

- On average, CPFV operators rated the present health of marine resources as somewhat above neutral. Participants highlighted some bright spots such as the recovery of rockfish populations; however participants were more wary about the future state of marine resources due to concerns about long-term management, changing ocean conditions, and future drought conditions.
 - Several participants believed rockfish populations have rebounded from historic low abundance, which they attributed to RCAs.
 - Participants from northern California ports reported vastly reduced salmon abundance and expressed concerns that riverine habitat loss, drought, and water law were all negatively affecting present salmon population health. Some participants expressed concerns about declining kelp forests, which they highlighted as important nursery habitat for target species.
 - Several participants attributed fluctuations in marine resource health to natural ocean cycles.
 - When focusing on future marine resource health, many participants reported they were primarily concerned about ineffective fisheries management, though they also discussed worries about other

contributing factors that might negatively affect future marine resource health, including changing ocean conditions and river flows.

- Representative quotes related to CPFV perceptions of environmental well-being:

[For present marine resource health] I chose 'Neutral' [...] based on natural fluctuations because of what we've seen over the last ten years with sea bass, yellowtail, [and] groundfish opportunities. But it's all based on natural fluctuations." -**CPFV owner/operator from Ventura/Santa Barbara Region**

"When you look at things like decreasing kelp forests, increasing pressure on some species [...] like, look at salmon. Salmon is somewhat doomed, it's a hard word, but they're having a really hard time in California. And we are likely, in my opinion, to have a restricted or heavily restricted season this year based on numbers of returning fish, but not necessarily reflecting what we're seeing as far as fisheries in the ocean. [...] It matters what species we're talking about. But in general, I think we're looking at decreasing and changing habitats with increasing pressure, which in my opinion, is lower sustainability and is a worry for me." -**CPFV owner/operator from Bodega Bay Region**

"[It's a] combo of worry about management and future ocean change. I'm always worried that CDFW [California Department of Fish and Wildlife], NMFS [National Marine Fisheries Service], NOAA [National Oceanic and Atmospheric Administration], PFMC [Pacific Fisheries Management Council] are going to screw up management measures." -**CPFV owner/operator from San Francisco Bay Area Region**

CPFV views on engagement and participation in fishery management

- Many participants expressed frustration that their perspectives and expertise were not heard or accepted as valid sources of information by decision-makers to help inform fisheries management in California.
- While some participants believed that the CPFV industry is well represented in management processes by industry groups (e.g., Sportfishing Association of California), others believed there was room for improvement in the level of organization and engagement across California's CPFV industry. Many participants discussed their experiences attempting to participate in management and/or monitoring discussions and processes as individuals, which yielded frustrating results. Some participants discussed low levels of engagement by the CPFV fleet, and explained operators had limited time to engage due to business priorities and busy fishing schedules.

- A majority of CPFV participants were either satisfied or very satisfied with their experience participating in the virtual focus group, and 100% of participants said they would be open to participating in a virtual meeting like the focus group in the future (Figures 16 and 17).
- Representative quotes related to CPFV views on engagement and participation in fishery management:

"We very much care about the management of the resources. The bitterness is because we disagree with the management and we're not included in it." -**CPFV owner/operator from Bodega Bay Region**

"State, local agencies: the agencies need to listen; they just need to listen to us. And I'm not saying they don't listen to us verbatim, but there needs to be more cooperation and understanding..." -**CPFV owner/operator from Ventura/Santa Barbara Region**

"When people call me, always my first thought is I'm skeptic[al] and I usually get a hold of the sport fishing [association - SAC]... I'll say 'hey, this is what the people are asking [the CPFV fleet to participate in].' I'm not sure if we want to go down this road because, like we said, [these types of discussions] always come back and bite us." -**CPFV owner/operator from Ventura/Santa Barbara Region**

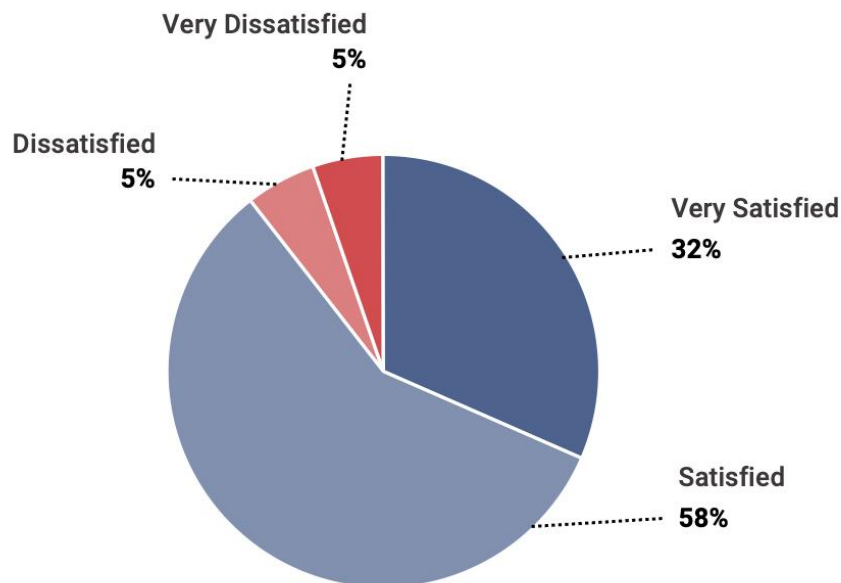


Figure 16 Pie chart showing CPFV focus group participants' satisfaction with the virtual process (n=19).

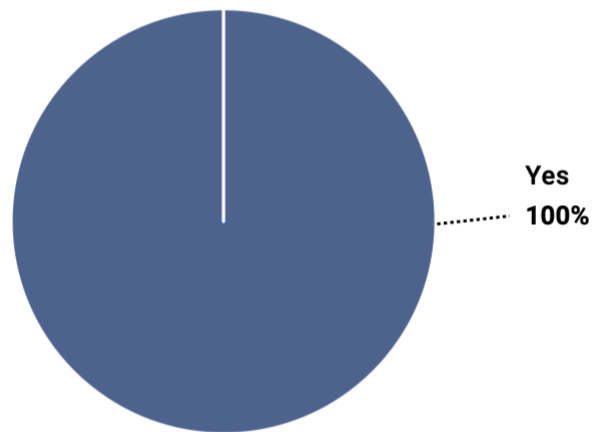


Figure 17 Pie chart showing CPFV focus group participants' willingness to participate in a virtual process in the future (n=19).

CPFV perceptions of COVID-19 impacts

- CPFV focus group participants reported COVID-19 was disruptive and changed the way CPFV businesses operate.
 - Eighty-five percent of focus group participants reported high or very high disruption, ten percent reported neutral/medium disruption, and five percent reported low levels of disruption (Figure 18)

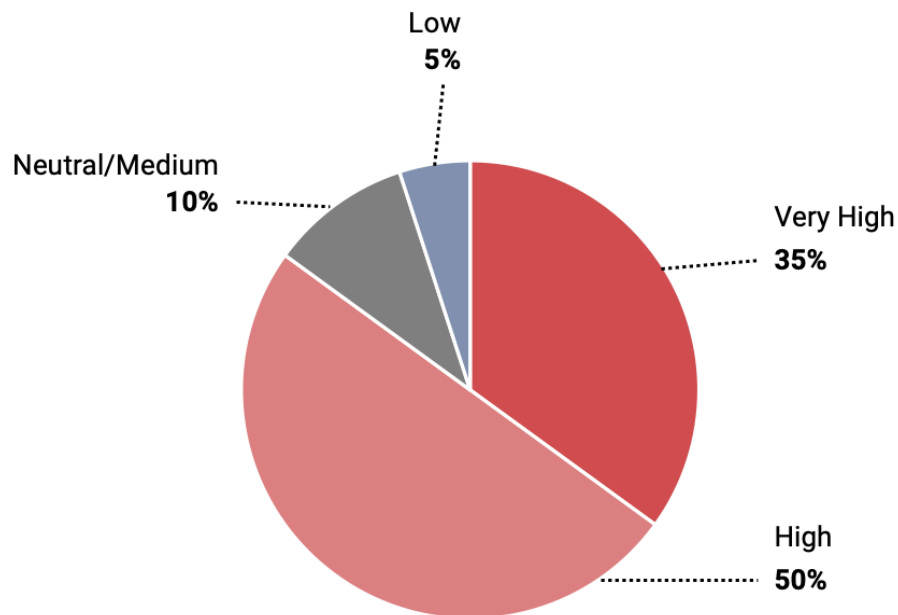


Figure 18 Pie chart showing CPFV focus group participants' perceived disruption of COVID-19 to their region's fishing operations (n=20).

- Participants across focus groups recounted several-month long CPFV business closures early on in the pandemic as a result of state- and county-imposed COVID-19 restrictions. They explained how delays in operations led to a loss of revenue for CPFV businesses.
- Participants recalled CPFV operations resuming at reduced capacity when COVID-19 protocols were lifted to allow space for physical distancing. They identified a shift in passenger composition from tourists to locals and different booking processes such as requiring passengers to reserve an entire boat with others in their 'bubble' rather than individual fishing trips.
- Participants discussed implementing safety measures in an effort to reduce the spread of COVID-19 on their boats, including regular sanitizing and investment in personal protective equipment (PPE) like gloves and masks.
- Some participants highlighted difficulties accessing waterfront spaces and maintaining crew members during the pandemic.
- Representative quotes related to CPFV perceptions of COVID-19 impacts:

"We raised the price a little bit. Ran lighter loads. It didn't compensate for the full normal year deal. And then for the family groups, we did a regular deal, but people were scared at the beginning. A lot of people were scared. We didn't get going until middle of June almost, usually we start in April, so there's three months right there. We all felt it." -**CPFV owner/operator from Ventura/Santa Barbara Area Region**

"We had a fair amount of cancellations from out of the area, and we filled in a lot of it with local business. And after that, [...] we pretty much mostly took regulars or people we know - we didn't take people from LA or San Diego if they wanted to come up and fish, but we did take people from Redding and Anderson and Chico and stuff if we knew a little bit of their health history." -**CPFV owner/operator from North Coast Region**

"I bought foggers, I got gallons of sanicide, I got gloves, boxes and boxes, which are really hard to find, and they ain't cheap anymore. Lots of masks. I mean, you name it, we got it, you know. I got a shed full of stuff. And we use that stuff daily, hourly, minute-ly sometimes. That stuff costs a fortune. You know, I can't tell you how many thousands of dollars [were] spent..." -**CPFV owner/operator from Ventura/Santa Barbara Region**

"[COVID-19 has been] highly disruptive. When we were shut down, people had to find other jobs to pay bills. Maybe they found something that paid them better or not. But [we had] crew issues, people not coming back either because they didn't want to come back or they were fearful to come back or whatever. It was disruptive as far as finding crew to work. And I think that was across the board with everybody. Crew issues were difficult [up and down the California] coast. And people maybe made more money, and didn't want to come back, like the extra \$600 a week in unemployment. So it was disruptive." -**CPFV owner/operator from Orange County/San Diego Area Region**

3.2 Key Finding 6. Commercial Fisheries Spatial Analysis

In assessing the outputs of our spatial modeling approach, we aimed to answer two primary questions - how well did this approach work in redistributing the pounds landed from the 10nm² blocks to the 1nm² micro-blocks, and what does this tell us about fishing patterns in and around California MPAs. We also examined alternatives to spatial modeling.

Summary of Key Finding 6: Commercial Fisheries Spatial Analysis:

The following are the key findings from our spatial analysis:

- The spatial modeling methodology successfully redistributed the CDFW landings data
- The model shows changes in commercial fishing activity in and around MPAs

3.2.1 Success of spatial modeling methodology:

When assessing the outputs of this spatial modeling approach, we aimed to answer two primary questions - how well did this approach work in redistributing the pounds landed from the 10nm² blocks to the 1nm² micro-blocks, and what does this tell us about fishing patterns in and around California MPAs.

To evaluate how well the refactoring worked, we compared the total landings summarized by 10nm² blocks to the total redistributed to 1nm² micro-blocks. Since our approach focused on spatially coincident areas, we knew that some of the pounds landed in any given year would not be captured in the refactoring. This is due to either errors in the landing receipts or because the Ecotrust spatial data did not capture all fishing areas. In other words, the Ecotrust data is not entirely coincident with CDFW data, so some landings were not captured in our analysis. Our results, however, show a high-level of fidelity between the total per year summarized to the 10nm² blocks and the output of our analysis. The average percentage of pounds refactored for lobster, urchin, and nearshore finfish (all species) is 97%, 98%, and 87% respectively. We view this as a successful transformation of the data because it shows both a spatial match and the capacity to redistribute the pounds within the fishing areas. Table 9 below shows the percentage of pounds refactored to the 1nm² micro-blocks per year.

Table 9 Percentage of pounds redistributed to 1nm² micro-blocks.

Species Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Spiny Lobster	98%	98%	98%	98%	96%	97%	97%	95%	97%	98%	97%	97%	98%	97%	97%	95%	97%
Red Sea Urchin	99%	98%	99%	99%	99%	98%	99%	99%	98%	98%	96%	98%	98%	97%	98%	98%	98%
Nearshore Finfish	91%	92%	94%	95%	94%	85%	86%	86%	82%	81%	85%	87%	87%	85%	83%	80%	87%
Black Rockfish	97%	96%	98%	98%	96%	95%	89%	94%	92%	90%	92%	94%	98%	90%	86%	67%	92%
Brown Rockfish	87%	89%	87%	88%	93%	91%	90%	88%	81%	77%	82%	83%	69%	71%	77%	77%	83%
Blue Rockfish	61%	66%	47%	32%	60%	71%	88%	90%	65%	66%	61%	57%	65%	58%	64%	74%	64%
Black-Yellow Rockfish	72%	89%	88%	87%	95%	88%	87%	91%	85%	80%	77%	81%	75%	72%	68%	84%	83%
California Scorpionfish	20%	34%	48%	35%	58%	3%	2%	2%	4%	10%	3%	4%	2%	5%	7%	2%	15%
Cabazon	65%	73%	77%	81%	83%	78%	82%	84%	82%	79%	79%	79%	75%	74%	61%	75%	77%
China Rockfish	69%	57%	45%	46%	69%	79%	74%	61%	63%	74%	77%	72%	55%	68%	44%	61%	63%
Copper Rockfish	56%	51%	44%	50%	87%	68%	79%	63%	77%	75%	78%	81%	58%	47%	49%	62%	64%
California Sheephead	88%	92%	92%	94%	87%	71%	78%	75%	73%	72%	74%	78%	73%	85%	79%	67%	80%

Species Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Gopher Rockfish	79%	83%	86%	84%	91%	87%	91%	92%	86%	73%	75%	78%	77%	70%	72%	80%	82%
Grass Rockfish	70%	82%	90%	91%	93%	68%	72%	71%	72%	81%	89%	89%	85%	67%	72%	82%	80%
Kelp Greenling	70%	69%	71%	69%	70%	75%	83%	82%	71%	77%	68%	75%	61%	59%	63%	70%	71%
Kelp Rockfish	92%	95%	94%	97%	99%	86%	81%	89%	83%	80%	55%	80%	68%	59%	69%	83%	82%
Monkeyface Prickleback	98%	93%	96%	51%	94%	100%	93%	67%	43%	56%	54%	25%	11%	11%	25%	23%	59%
Olive Rockfish	92%	91%	75%	94%	97%	25%	50%	49%	52%	76%	65%	33%	64%	56%	63%	72%	66%
Quillback Rockfish	6%	13%	10%	9%	31%	23%	17%	17%	34%	52%	23%	49%	12%	11%	12%	32%	22%
Treefish Rockfish	83%	94%	96%	86%	92%	95%	95%	94%	95%	88%	90%	92%	85%	90%	85%	83%	90%

The individual nearshore finfish species also refactored with moderate to high fidelity to the original landings data. Out of 17 species modeled, 15 captured an average 60% or higher of pounds landed; and 10 out of those 15 had 70% or higher average. This level of fidelity for individual species and fishery groups provides reasonable confidence that our methods are a useful approach for modeling fishing patterns.

In examining the results of this spatial model, we determined that the refactoring methodology is useful and appropriate for redistributing CDFW fisheries landing summaries from 10nm² blocks to 1nm² micro-blocks. The output datasets have a high level of fidelity to the annual totals of pounds landed per 10nm² blocks. This level of fidelity gives us a high degree of confidence in two aspects of the input data. First, the landing receipts from 2005-2020 are generally accurate in terms of spatial locations. In other words, the 10nm² block may be an inappropriate spatial scale for comparative analysis but the areas listed by fishermen and processors are generally accurate. We are confident in concluding this because our methodology relied on the spatial coincidence between the 10nm² blocks and the Ecotrust spatial data. The Ecotrust spatial data were reviewed and edited based on a robust individual and group feedback process from commercial fishermen in the data development process. This review focused specifically on the accuracy of the fishing areas as well as the relative importance of those fishing areas. Therefore, we felt confident in the positional accuracy of the CDFW data due to the spatial coincidence coupled with the high level of fidelity between the landings totals. The second determination we were able to make about our input data is that the Ecotrust data can be successfully used to refine fishing activity from a very coarse level to a more appropriate level for comparative analysis with habitat research. Further, we feel this methodology would

be appropriate for modeling other information summarized to 10nm² blocks within the CDFW landings data.

3.2.2 Changes in Commercial Fishing Activity

To answer our second question regarding what else this modeling effort tells us about fishing patterns in and around California MPAs, we conducted an analysis summarizing the percentage of pounds landed inside and outside of MPAs between the years 2005-2020. To complete this analysis we added a column to our 1nm² micro-blocks layer indicating if the micro-block is inside or outside an MPA, and if it is within an MPA the field indicates the type of MPA (SMCA limited take, SMCA No-Take, SMP, SMR, SMRMA, Special Closure). We also identified the micro-blocks immediately adjacent to a State Marine Reserves (SMR), which have the highest level of fishing restrictions.

Below are Tables 10, 11, and 12 which show the percent breakdown of landings inside and outside of MPAs per year for Spiny Lobster, Red Sea Urchin, and nearshore finfish (all species). We set the year 2010 as the implementation year for this analysis so, 2005-2009 are pre-MPA years and 2010-2020 are post-MPA years. Looking at the table, we can see that the percent of landings within a SMR ranged between 11% to 17% for each fishery in the pre-MPA years, but dropped to 0% in implementation years.

Table 10 Percent of lobster catch taken in and outside of MPAs per year based on refactor model outputs.

Year	Outside of MPA	SMCA (limited take)	SMCA (No-Take)	SMP	SMR	SMR Adjacent ⁵	SMRMA	Special Closure
2005	72%	7%	2%	0%	11%	9%	0%	0%
2006	69%	8%	1%	0%	12%	10%	0%	0%
2007	71%	6%	1%	0%	12%	10%	0%	0%
2008	69%	8%	1%	0%	11%	11%	0%	0%
2009	70%	7%	1%	0%	11%	11%	0%	0%
2010	81%	6%	0%	0%	0%	12%	0%	0%
2011	82%	5%	0%	0%	0%	12%	0%	0%
2012	85%	5%	0%	0%	0%	10%	0%	0%
2013	86%	4%	0%	0%	0%	10%	0%	0%
2014	84%	4%	0%	0%	0%	11%	0%	0%
2015	81%	5%	0%	0%	0%	14%	0%	0%
2016	82%	4%	0%	0%	0%	14%	0%	0%

⁵ Denotes micro-blocks immediately adjacent to the border of State Marine Reserves (SMR)

Year	Outside of MPA	SMCA (limited take)	SMCA (No-Take)	SMP	SMR	SMR Adjacent ⁵	SMRMA	Special Closure
2017	82%	4%	0%	0%	0%	13%	0%	0%
2018	82%	5%	0%	0%	0%	13%	0%	0%
2019	82%	5%	1%	0%	0%	13%	0%	0%
2020	80%	4%	1%	0%	0%	15%	0%	0%

Table 11 Percent of urchin catch taken in and outside of MPAs per year based on refactor model outputs.

Year	Outside of MPA	SMCA (limited take)	SMCA (No-Take)	SMP	SMR	SMR Adjacent	SMRMA	Special Closure
2005	66%	2%	0%	0%	14%	18%	0%	0%
2006	63%	1%	0%	0%	16%	20%	0%	0%
2007	67%	2%	0%	0%	14%	17%	0%	0%
2008	63%	4%	0%	0%	14%	19%	0%	0%
2009	61%	3%	0%	0%	16%	20%	0%	0%
2010	79%	2%	0%	0%	0%	19%	0%	0%
2011	79%	2%	0%	0%	0%	18%	0%	0%
2012	79%	2%	0%	0%	0%	18%	0%	0%
2013	81%	2%	0%	0%	0%	16%	0%	0%
2014	75%	3%	0%	0%	0%	22%	0%	0%
2015	71%	3%	0%	0%	0%	26%	0%	0%
2016	68%	1%	0%	0%	0%	30%	0%	0%
2017	72%	2%	0%	0%	0%	26%	0%	0%
2018	76%	2%	0%	0%	0%	22%	0%	0%
2019	79%	1%	0%	0%	0%	20%	0%	0%
2020	70%	2%	0%	0%	0%	28%	0%	0%

Table 12 Percent of nearshore finfish catch taken in and outside of MPAs per year based on refactor model outputs.

Year	Outside of MPA	SMCA (limited take)	SMCA (No-Take)	SMP	SMR	SMR Adjacent	SMRMA	Special Closure
2005	77%	3%	0%	0%	11%	7%	0%	2%
2006	74%	3%	0%	0%	12%	8%	0%	2%
2007	77%	4%	0%	0%	10%	7%	0%	2%
2008	78%	3%	0%	0%	10%	7%	0%	2%
2009	77%	3%	0%	0%	10%	7%	0%	2%
2010	82%	2%	0%	0%	0%	14%	0%	2%
2011	80%	2%	0%	0%	0%	17%	0%	1%
2012	81%	2%	0%	0%	0%	16%	0%	1%
2013	83%	2%	0%	0%	0%	14%	0%	1%
2014	80%	1%	0%	0%	0%	17%	0%	1%
2015	85%	1%	0%	0%	0%	12%	0%	2%
2016	83%	1%	0%	0%	0%	13%	0%	3%
2017	83%	1%	0%	0%	0%	13%	0%	2%
2018	83%	1%	0%	0%	0%	14%	0%	2%

Year	Outside of MPA	SMCA (limited take)	SMCA (No-Take)	SMP	SMR	SMR Adjacent	SMRMA	Special Closure
2019	83%	1%	0%	0%	0%	14%	0%	2%
2020	81%	1%	0%	0%	0%	17%	0%	1%

Our model also shows an increase in the percentage of pounds taken in the micro-blocks immediately adjacent to the State Marine Reserves. For lobster, these micro-blocks averaged 10% of catch in pre-MPA years and increased to 13% in the post implementation years. The same level of increase can be seen for urchin, averaging 19% in pre-MPA years increasing to 22% in post-MPA years. But for nearshore finfish (all species) the increase is greater. In pre-MPA years the average catch in the adjacent areas was 7% but increased to 15% in the post-MPA years.

Other observations we can make from this analysis is that a small percent (1%-10%) of pounds are landed from within a State Marine Conservation Area (SMCA) with limited take. All other types of MPAs have either minimal or no pounds landed within them, and the vast majority of pounds landed throughout all years occurs outside of MPAs.

In examining the model results for what it tells us about commercial fishing activity in and around MPAs, we observe an increase in fishing effort just adjacent to MPAs. This could be due to two factors: 1) the spillover effect of larger sized species moving out of MPAs and into fishable waters and 2) that MPAs are located in and cover a portion of rocky reef areas that are target habitat for specific fisheries. Taken together though, this novel dataset developed provides the fine-scale spatial and temporal resolution needed to integrate fishing effort data into MPA performance and evaluation studies examining the status of biological marine resources. Being able to account for the ongoing changes in fishing pressure inside and outside of MPAs is essential for researchers to both understand how MPAs are benefitting and impacting fishing communities but also fishing communities are impacting marine resources in the context of MPAs.

This modeling effort created a method to combine the strengths of available datasets to develop a best-available spatial data set on commercial fishing effort. There are ways to collect more spatially accurate data that would benefit the fishing community, marine habitat research, and fisheries managers. Recommendations in

our report and made in the Appendix D of the California State MPA Action Plan should be considered and improvements should be made to the types and sources of data used for tracking commercial fishing activities.

4.0 Discussion

The 10-year review of California’s MPA Network is a considerable undertaking, as exemplified in both the state’s [long-term MPA monitoring action plan](#) and the Decadal Evaluation Working Group’s (DEWG) report [scientific guidelines to evaluate MPA performance](#). Both guidance documents underscore that the “most successful MPAs are designed and managed with human as well as ecological considerations, with benefits for both” (Hall-Arber et al. 2021). The human dimension of MPAs is complex, vast, and inextricably intertwined with the ecological dimensions of our coastal and ocean environment. This project serves as an entry point into understanding how both place-based port community and on-the-water fishing patterns have changed and unfolded unevenly across the state since MPA implementation.

4.1 Major Findings and Comparison with Baseline Monitoring Results

4.1.1 Summary of Major Study Findings:

1. **Commercial fishing perceptions of MPA outcomes:** Focus group responses indicated that commercial fishermen across California were both dissatisfied with and had experienced negative effects from the MPA network. A majority of participants’ perceptions about MPA effects on marine resource health fell below positive, and across the board, focus group participants from California commercial fishing communities reported experiencing negative livelihood effects. Reported impacts tended to be more acute for ports in Central and Southern California compared to Northern California, where participants indicated that MPAs are located further from ports. Overall, participants expressed dissatisfaction with MPA management (including the MPA planning process), MPA monitoring, and MPA enforcement with many

emphasizing this dissatisfaction related to a lack of communication from the state.

2. **Commercial fishing perceptions of fishing community well-being:** Focus group responses indicate ports across California are experiencing many challenges related to their well-being; however, there were some bright spots. Participants described the present health of marine resources as strong but also expressed concerns about the potential future health of the resources. The focus groups highlighted challenges related to their economic well-being with infrastructure, access to harvestable resources, income from fishing, and markets. In addition, participants reported strong internal relationships and high levels of job satisfaction. Still, they reported weaker relationships with external entities (e.g., government agencies, non-fishing nonprofit organizations) and challenges related to recruiting new captains and crew participants into the commercial fishing industry. Perceived well-being varied considerably throughout the state and did not adhere to a specific geographic pattern; results suggest that context-specific considerations in each port were driving well-being scores.

3. **Commercial fishing views on engagement and participation in fishery management:** Focus group participants expressed fear that information gathered by researchers from fishing communities would be used to restrict access to fisheries. Many participants were disillusioned with how decision-makers consider and value fishermen's knowledge and believed there was a lack of support politically for a thriving commercial fishing industry in California. Participants highlighted the disparity of available funding for researchers, managers, and planners relative to how fishermen are compensated for their time and expertise. Most participants were either satisfied or very satisfied with their experience participating in the virtual focus group. Over three-quarters of participants said they would be open to participating in a virtual meeting like the focus group in the future.

4. **Commercial fishing perceptions of COVID-19 impacts on fishing communities:** Focus group participants recounted experiencing negative impacts and disruptions in their fishing activities due to COVID-19, including challenges accessing the waterfront, temporary beach/waterfront closures,

and disruptions selling their catch through traditional markets. Health concerns and crew challenges were reported in various ports across the state. Participants reported creative adaptation strategies to keep their businesses afloat through the challenging time.

5. **CPFV perspectives on MPAs, well-being, engagement, and impacts from COVID-19:** Focus group responses indicate CPFV owner/operators share similar perspectives to commercial fishermen. While some participants felt MPAs were positively affecting ecological outcomes, the majority of participants expressed negative or neutral views on the impacts of MPAs on their fishing livelihoods, ecological outcomes, and businesses and fishing practices. Across the state, CPFV participants were dissatisfied with MPA management, monitoring, and enforcement, specifically highlighting their perceptions that managers did a poor job communicating about the MPA Program. Statewide, on average CPFV participants rated job satisfaction and social relationships among fishing community members and current marine resource health as positive. Statewide average ratings below neutral were reported for factors including income from fishing, relationships with external groups, allocation of resources, and future marine resource health. Many participants expressed frustration that their perspectives and expertise were not heard or accepted as valid sources of information by decision-makers to help inform fisheries management in California. Eight-five percent of participants reported COVID-19 highly or very highly disrupted and changed the way CPFV businesses operate.

6. **Spatial and fisheries data analyses:** In assessing the outputs of our spatial modeling approach, the spatial modeling methodology was found to have successfully redistributed the CDFW landings data. While Ecotrust data is not entirely coincident with CDFW data, results show a high level of fidelity between the total per year summarized to the 10nm² blocks and the output of the analysis. Additionally, the model shows changes in commercial fishing activity in micro-blocks immediately adjacent to the State Marine Reserves (SMR). For lobster, these micro-blocks averaged 10% of the catch in pre-MPA years and increased to 13% in the post-implementation years. The same level of increase can be seen for sea urchin, averaging 19% in pre-MPA years increasing to 22% in post-MPA years. For nearshore finfish (all species) the

increase is greater: in pre-MPA years, the average catch in the adjacent areas was 7% but increased to 15% in the post-MPA years.

4.1.2 Comparison with Baseline Monitoring Results

The state of California funded a series of baseline monitoring studies related to the socioeconomic conditions of California's commercial and CPFV fisheries between 2010 and 2017 and years. Those studies were conducted on a region-by-region basis, starting in the Central Coast and ending in the North Coast (Chen et. al 2012, Chen et. al 2013, Chen et. al 2015; Hackett et al, 2017). Those studies all involved developing a baseline characterization of spatial fishing patterns and socioeconomic status of commercial and CPFV fishermen in each region through one-on-one surveys with fishermen to capture information about their demographics and spatial use patterns related to key near shore fisheries and analysis of landings and logbook data.

Spatial data findings from those studies have been incorporated into the spatial analysis in this long-term monitoring study to highlight spatial changes in fishing patterns overtime and develop use datasets. Specifically, we used the data sets gathered in both the pre MPA and post MPA baseline studies and integrated them with CDFW spatial fisheries landings data to create hybrid spatial data sets for select nearshore fisheries that produce 1 x 1 natural mile fine scale data on fishing harvest levels, improving upon CDFW's spatial fisheries landing data which is captured at the 10 x 10 nautical mile scale.

The baseline monitoring studies did not involve the use of the same focus group protocol and instrument from this study, so it is difficult to make comparisons. However, the project team connected to the North Coast monitoring study did add questions related to fishermen's perceptions of MPAs and the marine ecosystem to the survey instrument (see: Hackett et. al 2017 and Ordoñez-Gauger et al. 2018). The North Coast region included ports from Albion in the south to the Oregon border. In addition, the North Coast region conducted a series of port-based qualitative focus groups to gain information about the socioeconomic conditions in those ports and perceptions of MPAs. While direct numerical comparisons may not be possible we can explore broad similarities and differences between findings from the North Coast Baseline study and this long-term monitoring study.

Survey and focus groups conducted in the North Coast region in 2014 revealed overall negative perceptions of the MPA network. Figures 19 and 20 below show survey results from questions related to the implementation of the MPA network. Results indicated satisfaction with the overall process to implement the MPA network was low. A total of 82% of respondents indicated they were dissatisfied, very dissatisfied, or neutral with the process (Figure 19). Respondents were more likely to be strongly dissatisfied (21.4%) than strongly satisfied (1.3%) with the MPA process. However responses were more mixed related to questions about the location of the MPA network and the inclusion of local input. When fishermen were asked about potential outcomes or benefits of MPAs (Figure 20), views of the network were fairly negative, with respondents overwhelmingly indicating that they did not believe the MPA network would improve overall ocean health or improve their income from fishing. A majority of respondents indicated that they believed enough protections were in place prior to the implementation of the MPA network. The survey also asked participants about their level of trust in different entities. The results indicated overall low trust - on average all but two of the entities (scientific researchers and other fishermen) were ranked below neutral. Fishermen indicated low or very low trust in OPC, MLPAI, CDFW, PFMC, and PSMC.

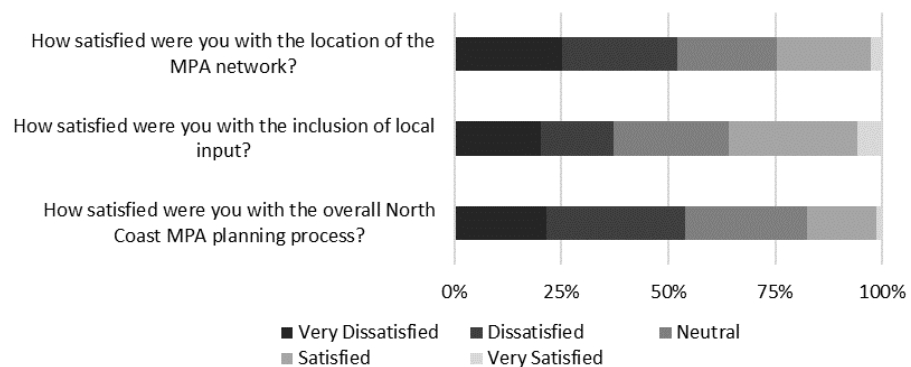


Figure 19 Responses to questions gauging participant levels of satisfaction with various aspects of the MPA network and process from surveys of fishermen from the California North Coast region conducted in 2014 as part of MPA baseline monitoring. From: Ordoñez-Gauger et al. 2018

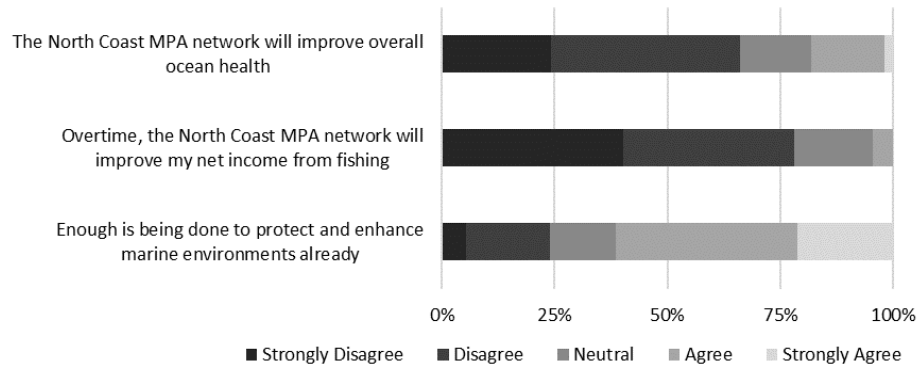


Figure 20 Responses to questions gauging participant levels of agreement with statements related to the outcomes or effects of the MPA network From: Ordoñez-Gauger et al. 2018

The findings from the North Coast baseline study were echoed in the focus group responses from this long-term monitoring study. Common findings:

Importance of Fishing Community Context when Considering MPAs:

In the 2014 focus groups fishermen commented on the importance for managers to understand the context of fishing communities at the time the MPA network was being implemented. At the time many of the communities were experiencing challenges including declining participation, loss of infrastructure, and loss of access to sufficient resources to harvest. In 2014 focus groups fishermen hinted at many of the well-being challenges discussed in focus groups across the state in 2020-2021. For example a participant in the Crescent City focus group expressed concerns about the so-called 'graying of the fleet' and trouble recruiting new members to the industry saying: "What is going to happen in 15 years when some of us aren't going to be able or won't be on a boat? Or 10 years, whatever it is. How do we move our business into someone else's hands? How do we, as I've said earlier, transmit our body of knowledge?" In 2014, a Eureka fisherman expressed concerns about lack of access to enough fish resources to make a living -- which was a similar theme expressed in Eureka and beyond in 2020, this participant said, "all of our eggs are in one basket now. And I used to have multiple things that I could do - all those things are off the table now. And some of the stuff we talked about you know when everybody started in the 70's, you can't do any of those things anymore, you know. They're not available to you. I couldn't even go out with a ring net and get crabs. There's nothing that you could do if you don't already have the permits in place that's gonna make you survive" (Hackett et al. 2017). These comparisons suggest that many of the fishing well-being

challenges discussed in California fishing ports in the 2020-2021 long-term monitoring study have been persistent in communities for quite some time.

Skepticism Around Potential Benefits and Concerns about Impacts from MPAs:

In surveys and focus groups in the North Coast region in 2014, fishermen expressed great skepticism about potential benefits from the MPA network with few believing it would improve their resource or increase their income. In the survey North Coast fishermen were asked about the potential for MPAs to affect the health of fish populations on a fishery by fishery basis. Summary results can be found in Table 13. The results show that fishermen’s perceptions of the potential ecological benefits varied by fishery, with the nearshore finfish fishery having the highest number of participants (31%) rank potential positive effects from the MPA network and the urchin fishery had the highest number of participants (44%) rank potential negative impacts. Across fisheries, the most common response was neutral or no response from MPAs and participants expressed concerns about potential negative impacts from MPAs such as crowding fishing in other areas and the potential to create ‘urchin barrens’ in MPAs in kelp habitats where not harvest was allowed. In the 2020-21 Long-term monitoring focus groups, fishermen across the state expressed similar skepticism about potential ecological benefits from the MPA network. On average focus group participants across the state ranked MPA ecological outcomes 2.5, which is slightly below neutral or three. Many participants reported no noticeable change in species health, while some participants expressed concerns around potential negative effects – even expressing concerns about the potential for urchin barrens as was expressed in the baseline monitoring study.

Table 13 Summary of North Coast fisherman responses to a question about the potential effects of the MPA network on various nearshore fisheries in 2014. Collated from the North Coast MPA Baseline report: Hackett et al. 2017.

Fishery	N	Neutral	Positive	Negative	Don't Know
Crab	123	70%	12%	11%	8%
Salmon	73	83%	8%	3%	6%
Nearshore Finfish	38	42%	31%	19%	8%
Urchin	18	50%	6%	44%	

In the North Coast Baseline monitoring study, fishermen overwhelmingly disagreed with the statement that MPAs would improve their net income from fishing. In 2014, North Coast fishermen expressed some concerns about negative impacts to their livelihood from MPAs, but also agreed that impacts were not as severe as they could have been due to the placement of MPAs farther from ports in the North Coast region. One Crescent City fisherman said, “I mean, we got what we had and to me, I know it hurts a few people but it could have been a lot worse.” The Long Term Monitoring study revealed widespread concern about livelihood impacts from the MPA network with an average ranking across the state of 1.8 between low (2) and very low (1). Data revealed that livelihood concerns may have been even higher in more southern ports when compared to those in the North Coast region.

Concerns Around Process of Implementation and Management of MPAs:

In the baseline focus groups in 2014, North Coast fishermen expressed many concerns about the implementation process for the MPA networks. The summary report presented concerns including: “Fishermen did not feel that MPA process organizers sufficiently took into account the historical and cumulative regulatory context in which fishing communities on the North Coast operate [. . .] [and] Some fishermen believed that MPA process organizers came to the region with their minds made up about what would happen, and that efforts to include stakeholders in the process were not genuine.” In 2020-2021 long-term monitoring focus groups, participants expressed similar concerns about the implementation and management of MPAs. Many fishermen expressed concerns that the state never clearly expressed their goals for the MPA network or how they might benefit fishermen. Fishermen were also concerned that their perspectives have been dismissed in management. On average participants across the state rated both MPA Management and Monitoring very low - an average score of 1.7. These findings suggest that initial concerns by fishermen about the MPA implementation process have persisted and fishermen remain concerned about the management framework for the MPAs and its ability to reflect fishermen perspectives and concerns.

Commonalities in findings between the North Coast Baseline Study suggest:

- (1) Concerns about the implementation of the MPA network, low levels of trust, and skepticism about benefits from MPAs expressed in North Coast Baseline research in 2014, likely were shared among fishermen in other regions, and

these concerns may have been worse in regions in more Southern parts of the state where MPAs were placed closer to important fishing grounds. Results from the 2020-2021 focus groups show that fishermen from more southern regions in California had higher concerns about potential impacts and when describing MPA-specific impacts fishermen from these ports tended to provide more commentary and concern.

- (2) Concerns around MPA implementation and concerns related to the context and well-being of ports expressed in the 2014 study in the north coast region do not seem to have lessened in the six years since that study. Trust appears to remain low in ports of the North Coast region and concerns around the impacts, goals, and management of the MPAs remain high. These findings may highlight the importance of developing and communicating inclusive goals for the MPA network and for finding avenues to include fishermen in the management process. Fishermen's bitterness over aspects of the implementation process appears to have persisted many years following implementation and may also have affected fishermen's perceptions of and willingness to participate in long-term management.

4.2 Alignment with DEWG recommendations and questions

It's important to understand specifically how our project informs the state's overarching MPA monitoring and evaluation plan. Highlighting the plan also allows for managers and policy-makers to understand where gaps in data, knowledge, and analyses still exist. Our project directly informs the following key recommendations and questions for MPA monitoring and evaluation put forth in the above referenced scientific guidelines DEWG report commissioned by the state:

4.2.1 DEWG Recommendation 3

Improve estimates of fishing effort and other anthropogenic influences such as visitation, pollution, and infrastructure at MPA scales.

3a: Continue to incorporate into ecological and human study designs, data analyses, and interpretations of MPA performance the best available data to estimate fishing effort and frequency in MPAs and reference sites pre- and post-MPA implementation.

3b: Continue work to identify where existing data are inadequate and focus efforts to improve fishing data in those areas.

As reported above in our results, we developed novel fishing effort data sets that integrate the strengths of the spatial data from CDFW's fish landing block data and Ecotrust's fisheries mapping data gathered pre and post MPA implementation. Using this approach along with fine-scale ocean substrate data we are able to produce data layers that fill this data gap and address this recommendation and can be used to examine how fishing patterns changed inside and outside MPAs and reference sites over pre and post MPA periods. This is an experimental method but creates the best available data we have on specific species/fisheries to the 1 nautical mile scale (recommendation 3a). Through this analysis we have also contributed in further understanding the utility and limitations of this approach and recommendations to improve fishing data temporal and spatial resolution into the future (recommendation 3b).

4.2.2 DEWG Recommendation 5

Improve understanding of the factors that influence human responses to MPAs.

5a: Use the best available data and support new research to assess the influence of social factors (e.g., value orientations, levels and types of knowledge) on people's responses to MPAs. Decadal Review & Long-Term Critical.

5b: Use the best available data and support new research to assess the influence of socio-economic and fisheries factors (e.g., the diversity of alternative fishery targets or non-fishing employment opportunities in a coastal community) on people's responses to MPAs. Decadal Review & Long-Term High.

5c: Use the best available data and support new research to assess the direct and indirect effects of environmental factors, including climate change, on human uses, attitudes, perceptions and aspects of well-being related to MPAs.

To address and answer this recommendation, we conducted port community focus groups that evaluated commercial and CPFV users as a distinct social group on their perceptions of MPAs and related issues (recommendation 5a). Furthermore, given we held focus groups across the state in port groupings we were able to assess the differences in responses to MPAs overall and to specific MPAs across various socioeconomic and fishery factors (recommendation 5b). Additionally, we gathered

data on the perception of environmental factors regarding overall well-being and perception of impact from MPAs (recommendation 5c).

4.2.3 DEWG Recommendation 10

Improve understanding of how human well-being is affected by MPAs, including economic, social, and cultural well-being.

10a: Continue to use the best available socio-economic data to assess the impacts of MPAs on fishing and engage fishing communities in validating these assessments and improving data collection, metrics, and analyses.

10b: Continue to use the best available data to conduct economic assessments of the impacts of MPAs that go beyond the proximal impacts to the fishing community and include broader assessments of the economic health of coastal communities.

10c: Continue to use a fully participatory process to identify relevant dimensions of social and cultural well-being and a set of valid indicators/metrics that capture the outcomes of the MPA Network for stakeholders and communities.

10d: Using appropriate frameworks, develop approaches for collecting data and evaluating changes across multiple dimensions of human well-being with input from social science experts.

Our study as a whole addresses and answers Recommendation 10 through engaging the fishing community and specifically our focus group approach answers the question of well-being (recommendation 10a). We furthermore have analyzed approximately 30 years of CDFW commercial landings economic data to assess changes in the economic health, diversity, scale, and livelihood pattern of commercial fishermen over time (recommendation 10b). Through consultation with academic experts, state agency staff, and industry stakeholders, we developed focus group survey instruments and recruitment strategies to test and pilot a well-being and MPA impact framework/assessment tool with a set of metrics/indicators (recommendation 10c). The piloting of this methodology led us to recommendations that can be used to scale, provide cost efficiencies, and broaden engagement capacity of future studies (recommendation 10d).

4.2.4 DEWG Recommendation 11

Improve understanding of changes in attitudes, perceptions, and knowledge related to MPAs and how these factors influence one another.

11a: Continue to use the best available data and support new research to determine the attitudes toward and perceptions of MPAs by different stakeholder groups, and how and why they change over time.

11b: Continue to use the best available data and support new research to determine knowledge of MPAs, expectations of MPA performance, and how these factors influence behaviors, attitudes, and perceptions by different stakeholder groups, and how and why these change over time.

To answer this recommendation, our port community focus groups specifically capture data on attitudes and perception of MPAs overall and specific MPAs and related issues (recommendation 11a). Furthermore, these focus groups can serve as a model moving forward and provide a longitudinal data set on attitudes and perception surrounding MPAs as the network and its management evolves (recommendation 11b).

4.2.5 DEWG Recommendation 13

Advance integration of MPAs and fisheries management.

13a: Use the best available qualitative and quantitative data and support new research to examine changes in the distribution and magnitude of fishing effort and yield inside and outside of MPAs.

13b: Use the best available data and support new research to examine the associated impacts of changes in fishing effort and yield inside and outside MPAs on behavior and well-being for fishermen, fishing families, and fishing communities.

As referenced in how we addressed recommendation 3, we developed a novel integrated spatial fishing effort data layer that resulted in the best available data on spatial fishing patterns both in distribution but also magnitude of fishing down. This data is a year on year time series data set with spatial resolution to the 1 nautical mile scale and so can be used to answer this state recommendation and assess fishing patterns inside and outside MPA during pre and post-MPA periods (recommendation 13a). Along with our focus group data on attitudes/perception and well-being we have made data available that can be analyzed to better understand the

relationship between changes in fishing effort and overall port community well-being (recommendation 13b).

4.2.6 DEWG Recommendation 14

Work to establish a framework for adaptive management decision-making that incorporates information from ecological, human, and governance domains.

14a: Identify targets, trajectories, or reference points that indicate achievement (or not) of MPA goals across domains.

Our project establishes a human dimension baseline - specifically in spatial fishing patterns and attitudes and perceptions of well-being and MPA impacts. These essentially create a reference point in which to assess achievement towards MPA goals in the decadal review and beyond (recommendation 14a).

4.2.7 DEWG Question N1, N2, and N4

N1: Which stakeholder groups are accessing MPAs and adjacent non-MPA reference sites?

N2: Has use of MPAs and reference sites changed over time, and why?

N4: Are there groups that disproportionately access or don't access MPAs and reference sites, and why?

Our project developed spatial fishing data layers that are provided in our data product package and results discussed in section 3.2 that display harvest patterns for select nearshore fisheries. This data can be used to determine which fisheries from which ports access and consistently rely upon certain MPAs and non-MPAs reference sites during pre-MPA and post-MPA periods. Furthermore, during our focus group, we surveyed participants as to which MPAs they were most impacted by. The results of which MPAs most affected each port can be found in our [focus group summaries](#).

4.2.8 DEWG Questions N5, N6, 18a, 18b, 18c, and N12

N5: What stakeholders engage with CDFW and the MPA management program, how do they engage and why?

N6: How does CDFW communicate with stakeholders about MPAs, which stakeholders do they reach and is the communication effective?

18a: Have attitudes towards and perceptions of individual MPAs and the MPA network as a whole by stakeholders changed over time and why?

18b: Has knowledge of MPAs by stakeholders changed over time and why?

18c: How does stakeholder knowledge of MPAs influence attitudes towards and perceptions of MPAs?

N12: How do outreach and education activities influence knowledge, attitudes, and perceptions of MPAs by stakeholders?

Our project solicited several questions pertaining to perceptions of MPA themselves as well as the management and monitoring of MPAs during our port community focus group. The findings of our study can be utilized to understand the presence or effectiveness of engagement of and communication efforts with fishermen in regards to MPA management and how they lead to certain attitudes and perceptions of MPAs overall. As reported in our results section in 3.1.1 (for commercial) and 3.1.5 (for CPFV) we have quantitative results that measure fishermen perceptions of MPAs around ecological outcomes, enforcement, livelihood outcomes, management, and monitoring. Overall we qualitatively summary our findings below:

Many participants shared they were unaware about how the MPA network is managed due to poor communication by managers, which led them to believe MPA management is not occurring. Many participants expressed frustration that commitments for adaptive management of the MPA network have not been fulfilled. They also spoke about poor communication of the goals of the MPA network, including how MPAs are evaluated. Some participants highlighted the need for meaningful recognition and inclusion of fishermen's knowledge and expertise in both MPA management and MPA monitoring, which they believe is currently not the case.

Furthermore, A majority of participants were unaware about how or whether the MPA network is monitored. They reported not seeing monitoring efforts occurring in local MPAs, and a lack of communication of MPA monitoring studies and results with members of California fishing communities. Participants desired greater collaboration with the fishing fleet in both the design and implementation of MPA monitoring studies.

Participants also perceived a lack of MPA enforcement and shared that they continue to see illegal fishing activity occurring in the MPAs, often among the sport fishing fleet, which they attributed to lack of funding and limited capacity of CDFW wardens. Several participants reported that fishermen enforce the MPAs themselves by informing each other of MPA rules and regulations. There was dissatisfaction with the methods used for MPA enforcement, including poor MPA boundary markers, issuance of citations for first-time offenders, and penalties for gear that unintentionally drifts into MPAs.

4.2.9 State Question N8

N8: How has MPAs affected dimensions of social and cultural wellbeing for relevant stakeholders and coastal communities?

Evaluating the well-being of commercial and CPFV port communities was a key component of this project and provides critical data to support answering this DEWG question. Well-being included environmental, economic, and social conditions. The overall summary of perceptions of well-being can be found in the results section 3.1.2 for commercial and 3.1.5 for CPFV and for each port community in these [focus group summaries](#).

4.2.19 State Question 6a, 9a, and 8a

6a: How does spatial variability in fishing effort and fishing mortality rates prior to and after MPA implementation affect the abundance and/or size/age structure of harvested species in MPAs?

9a: Do differences in fishing distribution, magnitude, and mortality rates prior to MPA implementation affect changes in the abundance and/or size/age structure of populations of focal species within MPAs relative to reference

8a: What is the relationship between MPAs and the displacement, compaction, and concentration of nearshore fishing efforts? Did overall fishing effort/mortality rates and yield change since MPA implementation?

A key component of this project was developing fine scale 1x1 nautical mile spatial data layers displaying harvest level for key state water fisheries during pre-MPA and post-MPA years allowing for a robust longitudinal analysis of spatial change in fishing distribution and magnitude. These data help to answer these DEWG questions and determine how MPAs have influenced changes in fishing patterns as well as impacted marine resource populations as a result. The spatial data layers can be found in our project's data package and is also presented in the results, Section 3.2 with a specific discussion on changes in commercial fishing activity, in Section 3.2.2.

4.3 Project Team Recommendations Based on Study Findings

Below we detail our Project Team's key recommendations for future ongoing MPA monitoring efforts based on the findings and experiences with this study. We list our recommendations and indicate the specific recommendation it aligns to in the DEWG's Scientific Guidelines to Evaluate MPA Performance report. Unless otherwise noted, our recommendations are intended to relate to both commercial and CPFV fishing communities. In each of the focus group conversations we included an open-ended question asking participants if they had any thoughts, concerns or suggestions that they would like to communicate to managers. Many of the recommendations below relate to the feedback we received on this question. For a full list of these focus group participant recommendations please see Appendix C.2.

4.3.1 Explicitly identify and provide sustained funding for full spectrum of human dimensions research (aligns with DEWG Recommendations 3, 5, 10, 11, and 13)

Our project represents only a portion of the human dimensions surrounding MPAs, and in fact was the only human dimensions project funded as part of the statewide baseline monitoring program. **In order for MPA science to move forward and recognize MPAs as integrated socio-ecological systems, the spatial and temporal robustness of human dimensions research must match that of complementary ecological/biological research on MPAs.** The knowledge and data gap between the two in the context of California can be glaring at times and preclude our ability to understand the human-environmental dynamics and impacts of our ocean and coastal systems as a whole. **It is vital that we both understand how human uses are affecting marine/coastal resources as well as how the status of those resources are impacting the economic, social, and cultural health and well-being of the myriad of communities that rely upon and benefit from California's marine/coastal resources.**

Our project strives to represent the perspective of the commercial fishing sector but the human dimensions include a vast array of stakeholders spanning cultural, economic, social, and environmental perspectives. This includes tribal nations, recreational fishing, non-consumptive recreation/tourism, subsistence fishing, shoreside economies, ecosystem service valuation, and port infrastructure, etc. Without these communities and perspectives represented we miss out on understanding and capturing the benefits that MPAs are providing, as well as how MPAs could be adapted to mitigate undue negative impacts to coastal communities.

Furthermore, **funding for human dimension studies should be sustained and strategic**. Many of the human dimensions research surrounding California MPAs are often one-off studies that are a single snapshot in time. This lack of a continuous longitudinal human use data sets greatly limits our ability to identify and understand the factors influencing observed trends/patterns. Capturing human use data at appropriate temporal and spatial scales will improve integration with biological/ecological datasets and enable the holistic yet focused evaluation of specific MPA performance.

We encourage the state agencies responsible for managing and funding ongoing long-term MPA monitoring efforts to **identify and prioritize resourcing a full-spectrum strategic sets of human dimensions research** as both an opportunity to holistically evaluate MPA performance but to also **engage the diversity of coastal communities who have a vested interest in the sustained health of California's marine resources**. Our project demonstrates a cost effective approach to long-term monitoring which could be implemented every 5 years to develop and maintain an up-to-date, robust knowledge base of human dimensions data. As discussed in earlier sections of this report, core questions can remain central to focus group conversations, and new/timely questions can be added seamlessly into the process, as needs/current events arise (i.e., addition of COVID-19 question in response to pandemic).

4.3.2 Establish methods and programs to gather fine-scale spatial and temporal scale human use data (aligns with DEWG Recommendation 3)

For us to meaningfully understand human-environmental dynamics as it relates to MPAs, **we must have data parity - particularly data that is comparable at spatial and**

temporal scales. However, human uses data and more specifically data on fishing use patterns is largely limited to CDFW landings data that is attributed to 10nm² spatial scales that are too large for MPA evaluation.

Biological/ecological studies under California's MPA monitoring efforts are often gathered at very fine spatial scales - such exact GPS locations or transects inside and outside MPAs. There is a great need to develop equally consistent and spatially comparable data sets across human use sectors so that they may be explored alongside biological and ecological data sets. **The lack of comparable fine scale data on human uses have prevented robust integration and thus understanding of the interplay of human-environmental dynamics that affect and determine MPA performance.**

The modernizing of fisheries data collection such as electronic reporting is being piloted and implemented across the world. Indeed, **addressing long-standing data gaps allows managers and policy makers to more effectively implement adaptive management and build trust with fishing communities through transparent data informed decision-making.** For example, digital logbooks that can log the exact location of fishing effort during each fishing event would provide researchers and managers the robust data needed to understand the continual changes happening in ocean and coastal areas. Rolling out digital logbooks would not be a small undertaking, but it could be a long term investment in the health and resilience of California marine resources and coastal communities.

4.3.3 Initiate and integrate collaboration across the human and ecological dimensions (aligns with DEWG Recommendation 13)

To fully understand how MPAs are benefitting and affecting coastal communities, **we must understand the interplay between the health of both marine resources and coastal communities.** Much of California's MPA monitoring efforts and resources to date have focused upon data collection, yet that data collection is not always informed by an understanding of the types and scale of data that are needed to best inform integrated socio-ecological analyses.

In the past, integrated analyses have been constrained by available and comparable data (spatially/temporally), time and resources to explore what is possible, and proactive or pre-RFP collaborations to design our studies around integration efforts.

Our Project Team recommends that state agencies take the lead on initiating and supporting communication, collaboration, and supported experiments between ecological and social science researchers, and fishermen. It is important that these efforts are inclusive beyond the state funded MPA monitoring projects as these limit the pool of collaborators needed to represent the full spectrum of perspectives needed. This type of concerted dialogue and applied collaboration will help researchers – both in the traditional sense of the word, and more broadly, fishermen researchers – overall understand each other's needs and develop recommendations and methods to advance integrated analyses. These recommendations can then inform how the State can best spend its resources to support focused MPA monitoring efforts that will advance specific key research questions and provide a more integrated and whole systems understanding of MPAs.

4.3.4 Build communication channels that are reflective of the needs of target audience (aligns with DEWG Recommendation 10c)

Focus group conversations highlighted participants' reluctance to participate in management and research processes. Many participants attributed this resistance to their mistrust of managers due to perceptions of poor relationships between managers and fishermen as well as poor communication by the state about MPA management goals, metrics for determining success, and interim updates about management and monitoring processes. Participants also described their limited capacity and resources to effectively engage in these processes, which require fishermen to volunteer and spend time away from their primary businesses. As such, our Project Team encourages state agencies to consider the following recommendations to improve effective communication, promote relationship building, and create equitable participation opportunities to develop constructive and trust-centered long-term relationships. Examples of tools to improve communications channels are in the subsections below.

4.3.4.1 Meet target audiences where they are by adapting to what they understand, feel, and think

Though information about MPA monitoring goals and progress exists on agency websites, many participants were unaware of these resources. This disconnect represents an area of opportunity for managers to **more clearly communicate where these resources can be found, and to proactively share updates with target audiences.** Participants specified their desire that agencies send updates (i.e., about

monitoring study results, changes in funding for monitoring efforts, information about recent enforcement activity, clear and easily accessible information, etc.) directly to the email addresses associated with their license/permit information, rather than assume fishermen regularly track agency website updates.

Our Project Team recommends state agencies **establish regular communications schedules to provide updates and information to license/permit holders.**

Consistently timed and informative communications can build trust and demonstrate agency accountability and transparency by establishing consistent expectations around information sharing and then meeting them.

We also encourage state agencies to **use target audiences' existing networks to share information.** Learning about where fishermen go to find MPA and fisheries management information can help to fine-tune (or update) existing channels to more effectively reach target audiences. In addition to sending emails directly to license/permit holders, it may be helpful to share updates with fishing associations, as well as recognized community leaders (i.e., individuals who frequently represent their ports in management discussions). Agency representatives are encouraged to ask community leaders to convey this information to their networks via informal conversations and to share where more information is available (i.e., in their email inboxes, on agency websites, etc.).

4.3.4.2 Commit to two-way information exchange as an investment in long-term relationship building

During focus group conversations, participants expressed frustration about the mismatch in the amount of information coming out of management agencies and the amount of information fishermen share out (i.e., through landings receipts, management processes seeking stakeholder engagement, research efforts, etc.). Fishermen feel like they waste their valuable time sharing their perspectives with managers only to see those perspectives not reflected in decision-making in a meaningful way.

Our Project Team recommends that **state agencies regularly engage with fishermen and consider convening a workshop/series focused on building capacity within fishing communities to constructively participate in management/policy and fisheries science** (i.e., similar to Pacific Fisheries Management Council's Marine

Resource Education Program (MREP)). Such a venue could be an effective place to introduce contacts and channels for communication with key contacts at CDFW/OPC/FGC, to build and strengthen relationships between fishing communities and agency staff, and to encourage two-way information exchange. We recommend that agencies consider sponsoring fishermen's participation in this type of training (see regarding participant inequity and burnout).

Similar to the training workshop/series outlined above, we encourage state agencies to consider **convening an annual, regional information exchange for both commercial and CPFV fisheries**. We envision that a productive format could include agency report-outs about key findings from annual monitoring work, updates about enforcement activities, and updates about management and policy. Within this **multi-directional approach to exchanging information and ideas**, we recommend there be time allocated for participants to report-out about factors affecting their fishing communities, as desired, and for solutions-oriented discussions to address these factors, as needed.

4.3.4.3 Co-create processes and products with Key Communicators and provide meaningful opportunities for feedback to increase transparency and gain buy-in on end products and results

Our approach for designing this project was rooted in **early and frequent engagement with the envisioned end-users of the information** we planned to collect. Our Project Team consulted with community-identified leaders in the fishing community, in addition to researchers and agency staff to seek their guidance on our project approach and design. As we integrated the feedback from this group we shared our updated project design, paired with the feedback that informed these updates, via our public website. We kept these Key Communicators, plus a broader target audience (e.g., focus group participants), informed of project progress through regular email updates and by sharing interim products via our website as they were developed. We also invited Key Communicators to guide the development of final reporting products via webinars as we began to develop final reporting products.

Similarly, our Project Team recommends that **state agencies consider co-creating processes/products with Key Communicators** as described above. This could include ground-truthing initial process/product approaches, building in time for feedback and integration of suggestions, and creating ongoing meaningful opportunities for

guidance by envisioned end-users. Through this approach, concerns and disagreements can emerge early and be addressed collaboratively. It is our experience that efficient, inclusive processes are both nimble and responsive.

4.3.5 Plan meeting experiences to maximize inclusivity, with a focus on participant convenience and comfort (Aligns with DEWG Recommendation 10c)

Focus group conversations highlighted fishing participants' limited capacity and resources to effectively engage in management processes broadly, and MPA implementation and ongoing management processes specifically. As such, the following outlines our recommendations for developing meeting experiences that maximize equitable, convenient, and comfortable engagement experiences for participants.

4.3.5.1 Address inequity and burnout by acknowledging target audiences' capacity and providing fair compensation for contributions

Many participants described their limited capacity to participate in fisheries management processes, which often depend on fishermen volunteering their time and expertise. They expressed that management restrictions already decrease their ability to earn an income, and participating in management processes is an additional burden for many. They also highlighted the imbalance of how researchers, agency staff, and others are paid to attend meetings while fishermen are asked to volunteer their time. To address this imbalance, our Project Team recommends that **budgets for engagement processes and related work include allocations for equitable engagement** (i.e., stipends). Fair compensation will take into consideration the compensation that other stakeholders (i.e., agency staff, researchers, etc.) receive for their participation; stipends should be allocated commensurately.

Additionally, findings from this project demonstrated disparities in the level of organization across California ports. These imbalances have implications for a given fishing community's ability to meaningfully participate in management processes that affect their livelihoods and well-being. To ensure all California ports have equal opportunity to engage in management processes should they desire, our Project Team recommends that **state agencies, in partnership with philanthropic foundations, NGOs and others, consider investing in public-private partnerships to build organizational capacity of fishing communities across the state.** This could

involve investing in existing fishing organizations or the establishment of new fishing groups to help **build capacity, improve communications, and centralize engagement.**

4.3.5.2 Provide meeting facilitation by neutral third party

Our Project Team included team members with existing professional relationships with many members of California's commercial and CPFV fishing communities. When asked about their experience during the focus group process, many participants expressed the facilitator team was professional, transparent, and attentive to participants' needs and concerns (see engagement key finding on page 44 for more information). Several participants suggested their participation was dependent on the involvement of an impartial third party neutral. This approach allowed them to speak openly without fear that would be targeted by enforcement or state managers.

As natural resources management processes are often complex, including the potential impacts to livelihoods, **meeting facilitation by a neutral, third party can be beneficial in planning and conducting productive meetings. This is particularly true when the facilitation team has built trust through existing relationships with all parties.** As such, our Project Team recommends involving a facilitator or facilitation team in management processes to have dedicated attention placed on designing an equitable and inclusive process.

4.3.5.3 Ask target audiences about their preferences for meeting format

Seeking guidance from target audiences about their preferences for meeting format and style can help to build investment in a process at the early stages of planning. In some scenarios, participants may prefer in-person meetings which can allow for more personal connections particularly between official meeting activities. In other cases, participants may feel more comfortable participating in meetings virtually from home which can be comforting and lead to more transparent information sharing.

We recommend **asking participants to guide the meeting planning process by sharing their preferences during initial project planning phases** (see recommendation about co-creating processes/products). Importantly, we also recommend asking target audiences about their preferences for scheduling meetings during convenient times of day (i.e., after/before working hours). For example, during

this study, participants generally preferred meeting in the evenings to allow for fishing activities in daylight hours. Weather windows were also tracked, with efforts made to schedule focus groups during poor fishing conditions.

When designing the meeting, we recommend state agencies **consider the goal of the conversation or information exchange to determine the appropriate size of the meeting and number of participants**. Due to the large volume of questions and need for detailed responses, focus group conversations were designed to be small groups (i.e., 3-10 participants) in geographically distinct port groupings to ensure all participants had the ability to fully share their perspectives on a given theme. This small group allowed for a conversational setting which enabled participants to effectively build upon each others' sentiments, or describe where and why their perspectives differed.

4.3.6 Be accountable and transparent about opportunities for adaptive management and potential expansion of protected areas (Aligns with DEWG Recommendation 14)

The most frequently shared frustrations and concerns during focus group conversations were focused on a lack of understanding about the goals of the MPA network and how it is being adaptively managed, and related fears about the relationship between the MPA Program and the Governor's 30x30 Executive Order. The crux of fishing participants' concerns regarding both topics lay in perceptions of inconsistent messaging both within state agencies and between state agencies and state leadership. As such, our Project Team encourages state agencies and state leadership to consider the following recommendations related to providing consistent messaging across fisheries and ecosystem-based management programs and processes.

4.3.6.1 Deliver consistent and timely messaging throughout project duration, from project-to-project, and within and across agencies

During focus group conversations across the state, we heard frustration from participants that during the MPA implementation process, agency staff made commitments about adaptive MPA management, **yet in the time since MPAs went into effect, participants had not heard from managers about adaptive management**, and the messaging around adaptive management was not consistent with what was identified during implementation.

We also heard fishing participants' distress when discussing the Governor's 30x30 Executive Order, and concerns that additional marine protected areas could be implemented. As a first step, our Project Team recommends that **state agencies and state leadership coordinate their messaging and provide clear updates regarding the vision for both adaptive management and plans for implementing the Governor's 30x30 Executive Order.** Additionally, **any changes or updates to the current vision and evolution of that vision should be conveyed early and often.** This will help clarify early messaging inconsistencies, provide important information for fishing business planning, and demonstrate accountability to build trust between fishing communities and managers/decision makers.

4.3.6.2 Establish a fishermen state-supported advisory body

Participants expressed disillusionment with how decision-makers consider and value fishermen's participation and knowledge. In focus group conversations across the state, many participants expressed frustration because they felt that their perspectives and expertise were not heard or accepted as valid sources of information by decision-makers to help inform MPA and fisheries management in California, despite their near-constant 'eyes-on-the-water.'

Our Project Team recommends that state agencies **consider establishing a fishermen's advisory body analogous to, and integrated with advisory bodies operating in capacities similar to the Ocean Protection Council Science Advisory Team, and PFMC advisory subpanels.** Such a system could promote equitable management processes. It could also serve as a record of how fishermen's guidance, recommendations, ideas were considered and/or put into practice, and if not, why. **This record could serve as a valuable resource to share with new agency staff as part of onboarding processes, which would also benefit fishermen** by reducing the number of times they repeat stories and suggestions to different resource managers due to staff turnover, which was another frustration we heard.

Importantly, beyond the specific examples of adaptive management and 30x30, we recommend that **state agencies prioritize consistent messaging and connections across policies and management practices** (i.e., in messaging regarding areas of overlap between the Marine Life Protection Act (MLPA) and the Marine Life Management Act (MLMA)).

4.3.7 Invest in California fishing community well-being

Findings from commercial and CPFV fishing focus groups indicate that fishing communities up and down the coast are experiencing challenges. In statewide averages, only three of ten commercial fishing well-being factors and only three of seven CPFV factors were rated above neutral. MPAs have not been the sole cause of these well-being challenges, many of which have arisen from long-term structural challenges in the state's fisheries. However, the focus group data shows that MPAs have interacted with and in many cases compounded these existing well-being challenges – and, according to fishermen accounts, have made it more difficult and stressful for California fishermen to earn a living and thrive in their careers. The state could **consider making long-term investments in strategies to help improve fishing community well-being**, perhaps even as a component of long-term MPA management.

As one example, infrastructure was highlighted as a key challenge across the state. In this area, the state could consider developing funds or partnerships to help make key investments in the state's commercial and CPFV fishing infrastructure. One fisherman participant in a webinar mentioned that the OPC could consider earmarking some of the funds for the "blue economy" towards investment in fishing infrastructure. The state **could consider developing partnerships and strategies towards addressing other well-being challenges such as access to sufficient resources (particularly for nearshore and small scale fishermen), markets, and ability to recruit new participants into the fishery**. Focus groups highlighted external relationships and fishing community relationships with state agencies such as CDFW, CFGC, and OPC as areas for improvement – some of the engagement strategies described above could work towards addressing these challenges. The state could potentially **work as partners with the fishing industries to develop a strategic plan for investment in fishing community well-being, modeled after (as a scaled up version) the Fishing Community Sustainability Plans that many individual California ports have developed** (Lisa Wise Consulting, 2013, 14; Lisa Wise Consulting & Humboldt State University, 2019a, b; Noyo Harbor District 2019).

Active investment by the state in fishing community well-being could serve many productive purposes including: (1) helping to offset the negative impacts incurred from the implementation of MPAs; (2) working to create sustainable, thriving local

fisheries and food systems in California; and (3) providing an opportunity for the state to work productively with fishermen on an issue that isn't about their regulation or restriction. In the focus group conversations numerous fishermen stated that they did not believe that the state actually cared about their commercial or CPFV fishing industries. Some believed that it was an end goal of state management to eliminate California's commercial and CPFV fisheries entirely. Several fishermen negatively compared California's fisheries management environment with that in states such as Oregon and Alaska where they saw state officials valuing local fishing industries and working more closely with fishermen to develop regulations that provided for sustainability while limiting negative social and economic impacts. Working together with fishermen on improvement in their well-being could help improve these negative perceptions and set the stage for a more effective partnership between fishermen and the state to address the many marine challenges that are likely to arise in the future, particularly with the onset of climate and ocean change.

4.3.8. Designing and implementing long term socioeconomic monitoring program for California commercial and CPFV fisheries

Our recommendations for a long term socioeconomic monitoring program for commercial and CPFV fisheries are grouped into three main components. First, **are capturing spatial fishing patterns (at fine spatial and temporal scales as recommended above) to help us understand how fisher harvest levels, fishing effort, and the importance of fishing areas to maintaining viable livelihoods are changing over time.** Our recommendation 4.2.2 above offers pathways to gathering this important data into the long-term and the novel data sets we developed as part of this project that combines Ecotrust and CDFW spatial fishing data also provides a 'best-available' data set to establish a baseline.

Second, are **capturing how the economics of fishing are changing over time,** such as revenue, operating costs (fixed and variable costs), market opportunities/conditions/price, fishery portfolios, and livelihood portfolios. Because there can be so much variability in this data across port, fisheries, and scale of operations this is best done by directly surveying a representative sample of commercial and CPFV fishermen. This could be done through in-person interview or mail in/online/phone surveys every 2-3 years. It is important to incentivize and compensate fishermen for their participation in these studies either through a one-time survey or by serving as a long-term participant that provides data year on year.

Third, is **capturing overall well-being, attitudes, and perception of port fishing communities and assessing how those are changing over time**. A key goal of our project was to test a cost-effective yet participatory approach to gathering this data stream through focus groups. Based on feedback from the fishing community, as seen in our results section, the focus group methodology was a success that can be replicated by groups that will carry forth monitoring efforts into the future. We recommend conducting port community focus groups every 3-5 years to gather this important data and assess how it changes over time as a way to evaluate MPA performance but also the overall well-being of fishing communities against various factors and conditions.

Focus group responses indicated that **commercial fishermen and CPFV owner/operators wished to be meaningfully involved in monitoring study design and implementation, and wished to receive targeted communications about monitoring study results**.

Overall the **information captured from these data streams should then be assessed against factors that include but also go beyond MPAs**, such as fishing regulations, increase/decline in marine resources, economic changes, port infrastructure changes, etc in order to determine how a myriad of factors cumulatively and collectively impact fishermen and fishing communities.

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