Establishing a Spatial and Economic Baseline and Assessing Initial Changes in the California North Central Coast CPFV Fisheries

Report to the California Sea Grant College Program

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The North Central Coast MPA Baseline Program

This study is a part of a larger baseline marine protected areas monitoring effort, entitled the North Central Coast (NCC) MPA Baseline Program, tasked with characterizing the ecological and socioeconomic conditions within the NCC region. Specifically, this study addresses the Baseline Program objectives by describing human use patterns across the study region and establishing initial data points for long-term tracking of conditions and trends in the North Central Coast. This study is also a part of a four-part study conducted by Ecotrust to provide baseline estimates of the quantity, spatial distribution, and economic value of human uses—specifically human use in four specific sectors: coastal recreational, commercial fishing, commercial passenger fishing vessels, and the recreational abalone fishery in the NCC region.

Ecotrust

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Acknowledgements

Conducting research in coastal communities is as challenging as it is rewarding. We have learned a tremendous amount from the CPFV fishermen who provided guidance and feedback during this study as well as the countless other community members, state agency staff, and observers of this project. We are deeply thankful to the CPFV operators/owners who participated in this project and for making time in their busy schedules, overcoming sometimes considerable reservations, and sharing their knowledge and experience with us.

1. INTRODUCTION

The waters off the North Central Coast of California have long supported fishing activities that are integral to the cultural and economic history of the area. Fisheries exemplify the interdependencies between the natural environment and coastal communities that have characterized California since well before statehood. On May 1, 2010, as part of the Marine Life Protection Act (MLPA) Initiative, the California Fish and Wildlife Commission (CFWC) designated 31 marine protected areas (MPAs) which include six special closures within the North Central Coast state waters of California. The North Central Coast Region of California stretches from Alder Creek in the north to Pigeon Point in the south (see Map 1 and 2).

As part of the baseline marine protected area monitoring effort to characterize the ecological and socioeconomic conditions and changes within the North Central Coast Region since MPA implementation, this report provides three sets of primary findings:

1. A baseline characterization of spatial fishing patterns and economic status of commercial passenger fishing vessel (CPFV) operators in the North Central Coast region;
2. An assessment of historical economic trends and initial economic changes following MPA implementation; and
3. A qualitative investigation into the impact of MPAs on CPFV operators and the specific MPAs impacting CPFV fisheries at the port and region scale.

Establishing a baseline characterization of the CPFV fleet of the California North Central Coast provides a better understanding of the current economic health of the North Central Coast fishing communities and provides a benchmark of economic conditions and spatial fishing patterns against which future MPA impacts and benefits can be measured. Furthermore, assessing historical trends along with initial changes in economic conditions and spatial fishing patterns that followed MPA implementation will help inform how MPAs and other driving factors may interplay to influence observed changes.

This project will directly inform the 5-year management review of the North Central Coast MPAs in which the California Department of Fish and Wildlife (CDFW) will make management recommendation to the California Fish and Wildlife Commission based on findings from the baseline MPA monitoring projects and other sources of information. This project was developed in close coordination with the MPA Monitoring Enterprise (Monitoring Enterprise), a program of the California Ocean Science Trust, in partnership the California Department of Fish and Wildlife, and supported by the California Sea Grant College Program and the California Ocean Protection Council (OPC).

The primary goal of this project was to collect up-to-date information on historical trends, current economic conditions, and the spatial distribution and relative economic value of fishing grounds of the commercial passenger fishing vessel (“party-boat”) fleet in the North Central Coast Region to inform future long-term monitoring efforts.

To accomplish this goal our research team conducted extensive community outreach in the region and developed and deployed an interactive, web browser-based interview instrument called Open OceanMap that was customized to the North Central Coast Region and project objectives. The survey instrument was utilized by field staff on laptop computers to collect geo-referenced information from CPFV fishermen about the extent and relative importance of California North Central Coast marine waters and related economic data. Data collection occurred during the summer and fall months of 2011 and 2012. The data were then compiled in aggregate form into spatial datasets (e.g., raster data layers, kernel density layers, pdf maps) and various excel workbooks and delivered to the California Sea Grant College Program and MPA Monitoring Enterprise. We would like to emphasize that no individual information was delivered only data in the aggregated form (with three or more fishermen in each data point) was delivered. This report details the approach and methods we used to collect, analyze, verify, and interpret the various data sets utilized in this project.

It should be noted that in the main body of this report we only report out on the first year of data collected (data collection conducted in 2011 inquiring about the post MPA 2010 fishing year). We chose to do this as the survey sample in the first year of data collection was significantly more robust and thus more

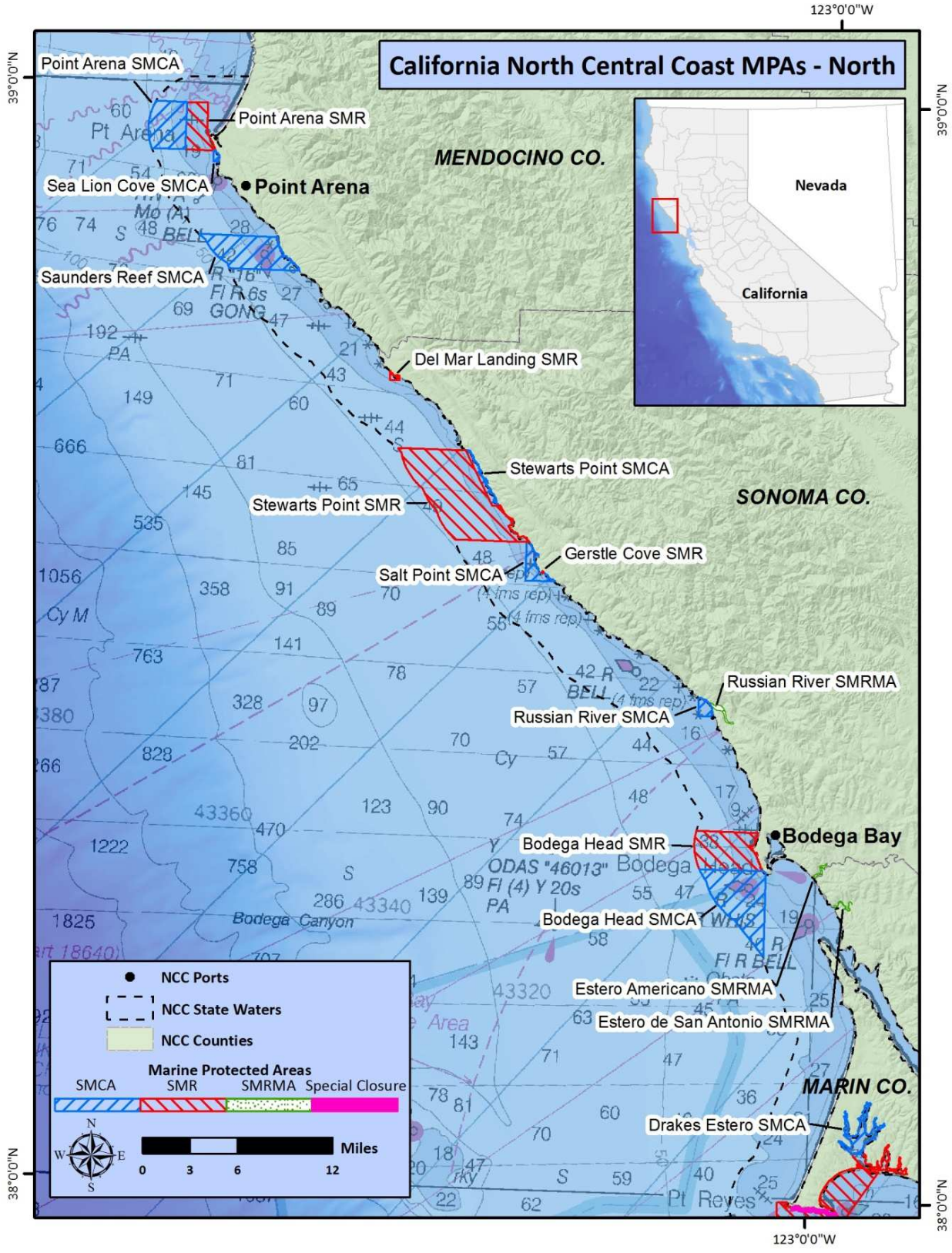
representative and reliable as a baseline characterization of the North Central Coast region CPFV fleet. The regional results of the second year of data collection are provided in an appendix of this report and the summarized port level data are available in the Microsoft excel workbooks delivered as part of this project. Furthermore, throughout this report we do add information to the report narrative that may be of interest from the second year of data collection.

The main body of this report consists of two main sections—1) a region-wide profile of the CPFV fleet and 2) profiles for each port. To help better facilitate the use of the data presented in this report in accordance with the Monitoring Enterprises' monitoring framework, each sub-section is further broken out into the MPA monitoring framework components of 'initial changes' and 'baseline characterization'. Furthermore, a specific spatial baseline section is provided in this report to organize all the spatial baseline data into one section rather than distributing them throughout the report.

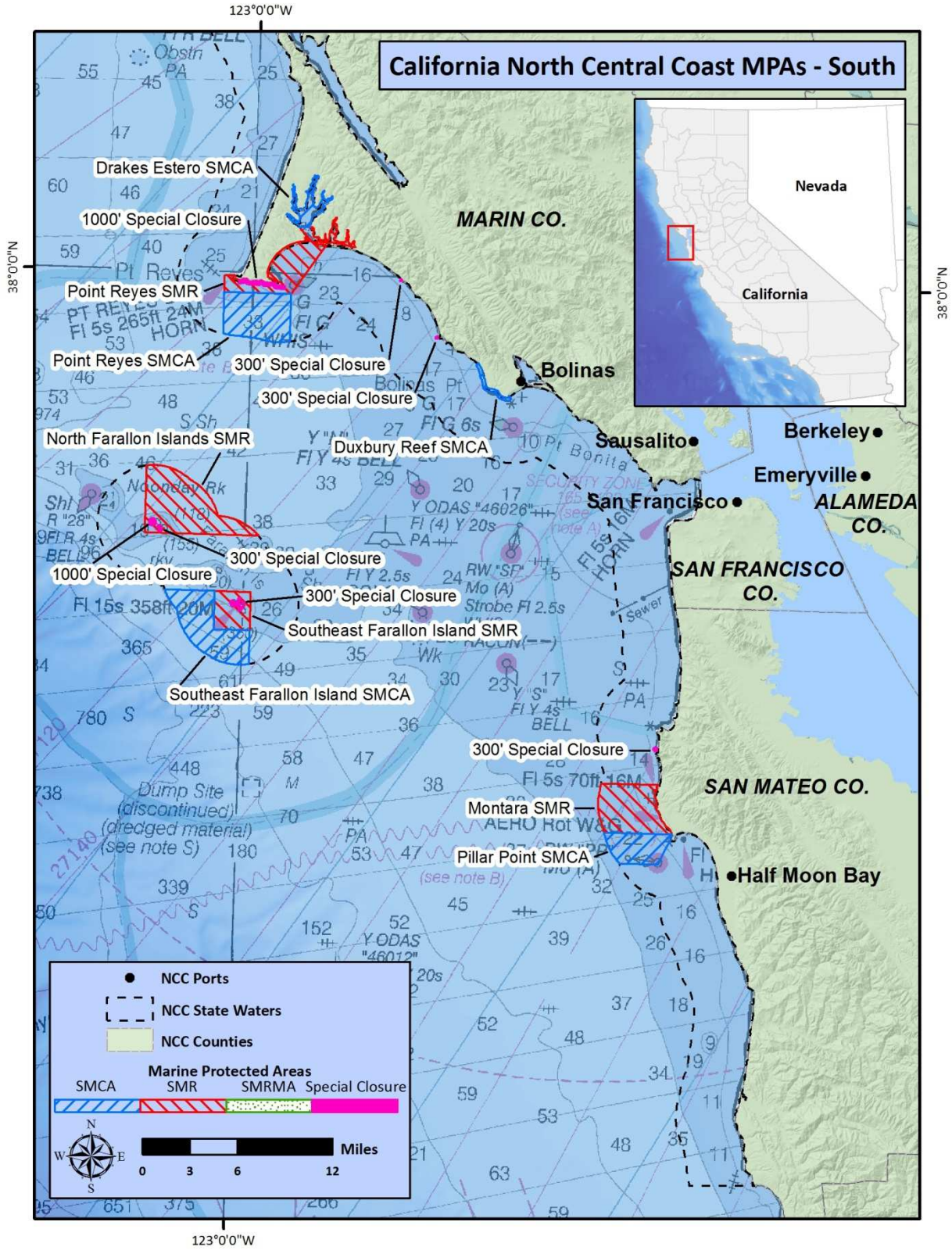
We would like to emphasize that the purpose of this report is not to measure or assess the economic impact of MPAs on the CPFV fleet in the region. To quantitatively measure the impact of MPAs requires robust long term economic data sets in both pre and post MPA periods that enable analyses to account or control for the complex interplay of regulatory, environmental, and economic factors that drive economic change in CPFV operations. Such a study was beyond the scope of this project but to provide insights into the possible impacts of MPAs we collected qualitative information from CPFV operators as to the ways in which MPAs are affecting their success as a CPFV operator. This information we have collected can be used to help better understand the complex system of CPFV operations and how MPAs may directly or indirectly be impacting a CPFV operator's success as well as inform future research efforts to possibly measure and quantify these impacts.

Conducting research in coastal communities is as challenging as it is rewarding. We have learned a tremendous amount from the CPFV fishermen who participated in this study as well as the countless other community members, agency staff, and observers of this project. We are deeply thankful to the CPFV operators/owners who participated in this project and for making time in their busy schedules, overcoming sometimes considerable reservations, and sharing their knowledge and experience with us.

Map 1. North Central Coast study region, ports, and marine protected areas – Northern portion



Map 2. North Central Coast study region, ports, and marine protected areas – Southern portion



2. SURVEY AND ANALYSIS METHODS

2.1. North Central Coast Region: Primary CPFV Fisheries and Ports of Interest

To focus efforts upon information which may be most useful and cost effective in informing a 5-year management review of the North Central Coast MPAs, this project identified the Commercial Passenger Fishing Vessel (CPFV) user group and associated fisheries in which to target our data collection and analysis efforts. For the CPFV sector, data were collected for the entire portfolio of activities conducted by CPFV operations—both consumptive and non-consumptive. According to California Department of Fish and Wildlife (CDFW) and CPFV operator interviews, the following are the primary fisheries and non-consumptive activities conducted in the North Central Coast Region from 2000 to 2011:

1. Albacore tuna – fishery
2. California halibut – fishery
3. Dungeness crab – fishery
4. Jumbo squid/Humboldt squid – fishery
5. Rockfish – fishery
6. Salmon – fishery
7. Sanddab and other flatfish – fishery
8. Striped bass – fishery
9. Funeral services - activity
10. Leisure cruises - activity
11. Whale watching – activity

The CPFV ports of interest for this project are listed below. These were identified by state agency partners and CPFV operators in the region as the primary CPFV ports in the region that fish in North Central Coast state waters (Map1 and Map 2):

1. Bodega Bay
2. Sausalito
3. Berkeley
4. Emeryville
5. San Francisco
6. Half Moon Bay

2.2. CDFW Logbook Data Analysis Methods

Under a non-disclosure agreement with the California Department of Fish and Wildlife (CDFW), the Commercial Passenger Fishing Vessel (CPFV) logbook data from 2000 to 2011 presented throughout this report was developed in collaboration with CDFW staff and was transmitted to Ecotrust in a summarized form in March 2013. CPFV logbook data is submitted by each CPFV vessel operator each year which documents the number of passengers, the number of fish caught, the block number they caught their fish, and other characteristics of each fishing trip they operate. It should be noted that the data provided in this report is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here. We chose to do this in order to present a more accurate understanding of the relationship between CPFV operators and the fisheries in the North Central Coast state waters.

Finally, following CDFW protocol we suppressed all data points with fewer than 3 CPFV operators—however, in the study period from 2000-2011 all data points for each port had 3 or more CPFV operators and thus we did not conduct any data suppression. We also strived to summarize the CPFV logbook data in the most compelling and visual formats. We have consistently color-coded fisheries and ports throughout the report and presented data in consistently formatted and scaled graphs in order to facilitate quick reference and comparison across ports. We avoid repetition whenever possible and recognize there are many more ways to query and analyze the data, however, throughout this report we aimed to present the most relevant and informative analyses possible.

2.3. Survey Data Collection and Analysis Methods

While the use of GIS technology and analysis in marine and fisheries management has expanded steadily over the past decade (Kruse et al. 2001; Breman 2002; Valavanis 2002; Fisher and Rahel 2004; Meaden 2009), its use for socioeconomic research is still somewhat limited. Nevertheless, a growing body of literature has examined GIS-enabled approaches to community-based MPA design and assessment (Aswani and Lauer 2006; Hall and Close 2006; St. Martin et al. 2007; Ban et al. 2009; Gleason et al. 2010) and there are several good examples to build on for improving the spatial specificity of the West Coast knowledge base and data landscape.

Some of the most pertinent applications of GIS technology to socioeconomic questions in marine fisheries concern the spatial extent and intensity of fishing effort (Caddy and Carocci 1999; Green and King 2003; Parnell et. al 2010; Lee et. al 2010) and the use of participatory methods similar to the ones employed here (Wedell et al. 2005; St. Martin 2004; 2005; 2006; Scholz et al. 2011a). We built on these approaches and adapted them for the California North Central Coast context, following best practices for the use of participatory GIS in natural resource management (Quan et al. 2001), as described in the remainder of this section.

Our project approach builds on methods developed in previous projects on the West Coast of the United States (Chen et al. 2012; Steinback et al. 2010; Scholz et al. 2004; 2005; 2006a; 2006b; 2008; 2010; 2011a; 2011b), which demonstrated novel approaches for collecting, compiling, and analyzing spatial fishing patterns and associated economic information at various geographic resolutions to aid the design and assessment of various marine spatial planning efforts (e.g., marine protected areas and wave energy siting). The successes and lessons learned in these projects were directly applied to the methods and tools deployed in this project. As Ecotrust continues to conduct MPA monitoring work in other regions in California we aim to help close existing coastal and marine use information gaps and provide a tested, consistent, and cost-effective method for long-term monitoring across California.

Specifically, Ecotrust's approach involved several steps that are designed to engage the fishing community throughout the project from project/survey design to the development of final products. These steps are generally categorized below:

1. Fishing community outreach/engagement;
2. Survey questions and survey tool design;
3. Data collection;
4. Data analysis;
5. Review and validation of data analysis results; and
6. Final reporting.

Ecotrust conducted a series of outreach meetings throughout the data collection period with key fishing community members and fishing organizations/associations prior to beginning interviews in the region and in each port. The objectives of these meetings were to provide a project overview, answer questions, develop relationships, gain insights into the current fishery issues/challenges, raise general awareness, and solicit potential interview participants. During these initial meetings Ecotrust also gathered feedback on its proposed project and survey design, such as on what types of information the fishing community felt were important to capture, and when possible the feedback received was incorporated into the data collection tool and data analysis plan.

2.3.1. Sampling Method

Ecotrust carried out two waves of field work in the summer and fall months of 2011 and 2012 to collected data on the 2010 post MPA fishing year and the entire 2011 fishing year. For the CPFV fleet, a comprehensive list of CPFV owner/captains was not available to Ecotrust and thus Ecotrust staff identified CPFV operators by networking in each port. Because of the need to advertise their services, CPFV operations are often highly visible in a harbor and widely known. Using this method, Ecotrust field staff compiled a list of CPFV operations in each port, and later confirmed and added to this list as it was

reviewed with each CPFV operator interviewed. Ecotrust interviewed both CPFV operation owners and CPFV captains of each vessel in a port as often owners were more knowledgeable of revenue and operating cost information and also to gain a broader perspective.

To compare our survey sample characteristics to the study population characteristics we examined CPFV logbook data provided by CDFW. We examined the number of CPFV captains interviewed compared the number of CPFV vessels who submitted logbooks in 2010 and the survey response of CPFV captains interviewed compared to averages calculated from CDFW logbooks for select survey questions (Table 1).

As mentioned previously, we networked through port communities to identify and interview CPFV operators. Using this method it is likely we sampled more visible full-time CPFV operations in each port. Upon examining Table 1 below, the remaining vessels we did not interview may have been difficult to identify for interviews as they are CPFV vessels that either: 1) operate on a part-time basis overall; 2) are vessels the primarily operate fishing trips in the San Francisco bay but occasionally fish in the North Central Coast state waters; or 3) are vessels that primarily run non-consumptive trips but may occasionally run a fishing trip to the North Central Coast state waters.

The potential that our sample does not adequately represent part-time CPFV operators or CPFV operators that only occasionally fish in North Central Coast state waters is supported by the comparison of data on average number of trips per vessel reported by interview respondents compared to CDFW CPFV logbook data. On average, the vessel captains we interviewed operate more trips per year (thus being more visible in the port) than the vessel captains we did not interview. Lastly, interview respondents at the regional level reported an average of 12 anglers per trip while CDFW CPFV logbook data reported an average of 15 anglers per trip—indicating that perhaps the CPFV operators we did not interview were not necessarily smaller passenger capacity vessels (such as six-pack vessels) but instead operate similar sized vessels yet significantly fish less frequently in the NCC state waters.

Table 1. Comparison of survey sample data with CPFV logbook data

			Average number of trips per vessel (2010)		Average number of anglers per trip (2010)	
Port	**Number of CPFV captains interviewed**	**Number of vessels in CDFG logbook data (2010)**	**Interview Data**	**CDFW Logbook Data**	**Interview Data**	**CDFW Logbook Data**
Bodega Bay	5	9	124	40	8	12
Sausalito	5	4	36	33	13	10
Berkeley	4	10	118	37	15	19
Emeryville	5	13	63	22	16	15
San Francisco	4	12	70	14	13	12
Half Moon Bay	7	10	63	46	9	15
North Central Coast	30	N/A	79	30	12	15

Source: Current study and CDFW CPFV logbook data

2.3.2. Interview Protocol

Field Staff Training
Building upon our experience conducting large scale human use data collection projects with fishing communities Ecotrust has established rigorous field staff training procedures and interview protocols to ensure that:

1. Field staff are able to effectively engage in conversations with fisherman about the goals/objectives of this project and the larger MPA monitoring/assessment effort this project will inform;
2. Sensitive fishermen contact information is kept secure and confidential;
3. Fishermen are properly informed of the research project goals and possible risk and agreements on data use before the fishermen engages in an interview;
4. Fisherman data remains confidential and is securely stored, transmitted, and analyzed;
5. Interviews are conducted professionally and consistently; and
6. High quality data is consistently collected across interviews.

To accomplish this, Ecotrust staff trained in human subjects research protocols conducted extensive training with Ecotrust field staff on proper research protocols and interview approach and procedures. This training includes providing background on Ecotrust's project history with fishing communities, the Marine Life Protection Act planning process, the MPA monitoring program, and possible reservations fisherman may have to participate in interviews in order for field staff to effectively engage in meaningful conversations with fishermen to solicit interviews. Furthermore, field staff were trained in being aware and respectful of the sensitivities of collecting fishing data and were provided with human subjects research protocols to ensure field staff are aware of proper ways of presenting the research goals and risks to fishermen and that proper informed consent is obtained before interviews begin.

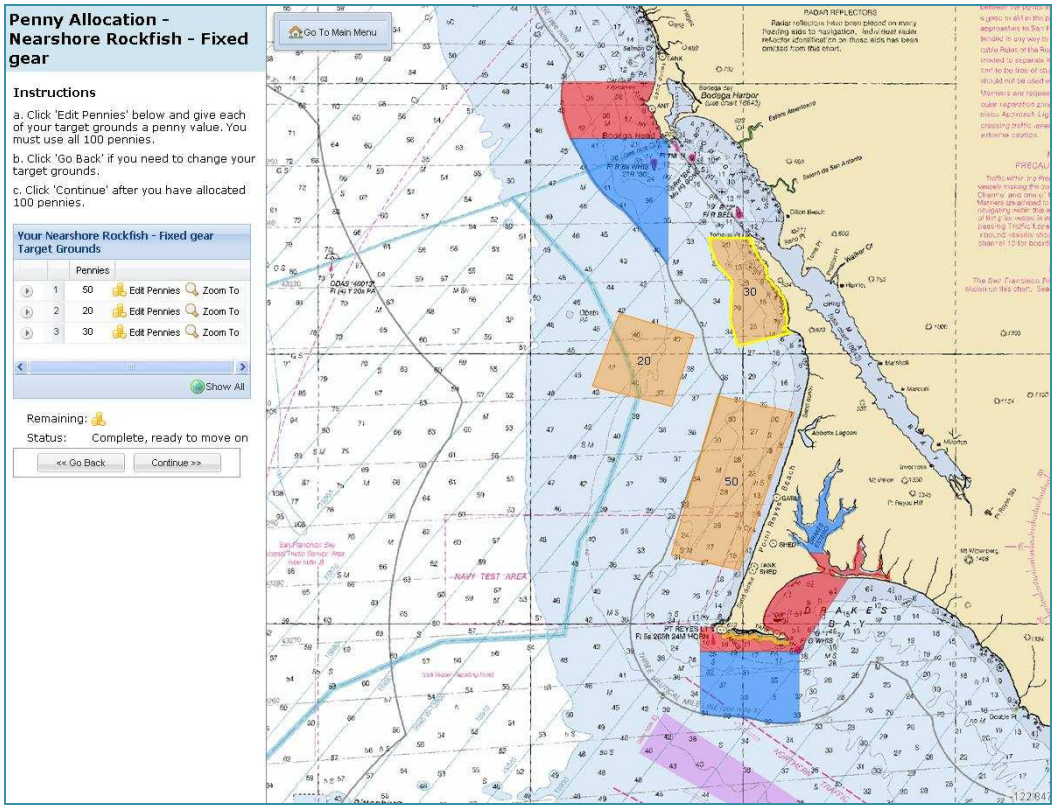
Strict procedures and mechanisms are put in place so that individual fisherman data is kept secure and confidential throughout the project from data collection, to transmission of the data, to data analysis, and subsequent storage of the data. Interviews were conducted under individual non-disclosure consent forms and all data were collected on password protected laptop computers. Data collection and analysis protocols were utilized which masks all names and identifying characteristics of an individual's fishing grounds.

Field staff are also fully trained in how to ask survey questions and capture responses in a consistent manner. The field staff coordinator initially conducted fisherman interviews with each field staff member to ensure the quality of interviews and periodically conducted fisherman interviews with field staff throughout the field season to ensure that interview quality was maintained. Survey data are checked as they are transmitted to the Ecotrust main office and reviewed by Ecotrust staff to ensure quality data are being captured consistently across field staff.

Interview Procedure
The data collection methods in this project were designed to complement existing data previously acquired from CPFV operations in the North Central Coast Region (see Scholz et al. 2008) before the MPA network was established. Interviews in this project were conducted in person using a one-on-one interview format. All interview data were entered directly into a spatially enabled, Open Source GIS survey tool developed by Ecotrust called Open OceanMap[1]. Field staff used Open OceanMap (Figure 1) to collect non-spatial survey data (e.g., demographics, basic operating information, descriptive fishing characteristics, impacts from MPAs and other factors, and associated qualitative questions) and to map areas representing a participant's fishing grounds. Open OceanMap's mapping component utilizes NOAA nautical charts which can be zoomed in and out to reveal more detailed nautical charts and moved directionally (similar to Google Maps) to allow fishermen to draw fishing areas in their natural sizes (polygons) rather than confining responses to a statistical grid or to political boundaries.

[1] For more information on Open OceanMap please see http://www.ecotrust.org/marineplanning/

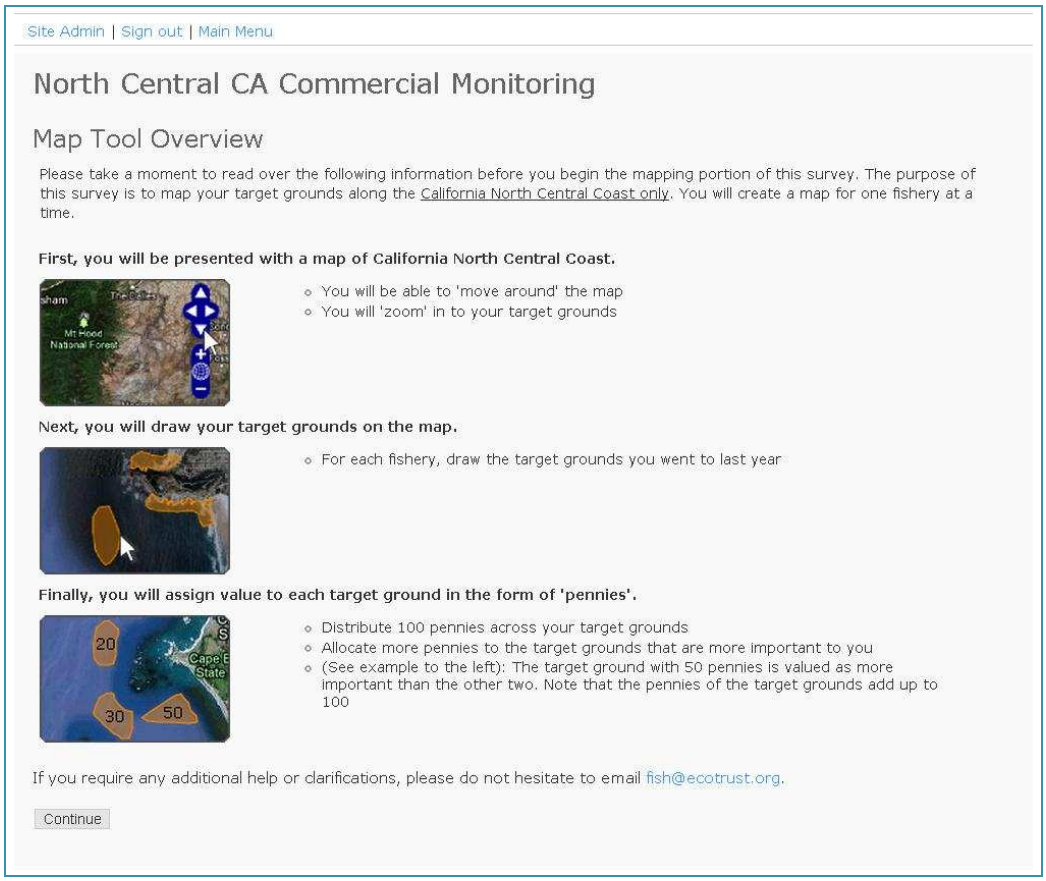
Figure 1. Screenshot of Open OceanMap mapping tool showing mock fishing ground



All interviews followed a shared protocol:

1. Interviews begin with an explanation of the project goals/objectives, the types of data collected, how data will be analyzed, possible risks of participating in the interview, and any other project information the fisherman would like to discuss.
2. The fisherman is presented an informed consent form agreement which allows Ecotrust to utilize interview data, however, the agreement legally binds Ecotrust to present data only in the aggregate form and to never release individual data or the identities of those interviewed.
3. Non-spatial survey data is collected on questions pertaining to individual fisherman characteristics and overall CPFV operations.
4. Non-spatial survey data is collected for each fishery/activity within a CPFV operator's portfolio.
5. Fishing grounds are mapped following these steps (see Figure 2). These steps are repeated to map each fishery separately:
    a. Establish a maximum extent: Using the electronic nautical charts embedded in Open OceanMap, fishermen were asked to identify the maximum extent north, south, east, and west they would target a fishery. This is done to orient the map to the full extent of their fishing area before fishermen were asked to identify/delineate specific fishing grounds.
    b. Map fishing grounds: Within this maximum extent, fishermen were then asked to delineate the area(s) they fish for a particular species/fishery last year. Under the guidance of the fisherman, field staff drew these fishing areas in the Open OceanMap survey tool and recorded associated boundary information for each area such as depth limits and geographic landmarks.
    c. Assign value: Fishermen were then asked to rank these fishing areas using a weighted percentage — in which they split and distribute 100 points or '100 pennies' over the various fishing areas based on their relative importance.

Figure 2. Screenshot of Open OceanMap mapping tool overview



We would like to note that for the first year of data collection (conducted in 2011 inquiring about 2010 fishing grounds) fishermen were asked to only map post-MPA fishing grounds in order to capture a post-MPA spatial baseline data. In the 2012 data collection wave we inquired about the full 2011 calendar fishing year but as mentioned before the 2010 data collected is from a much more robust sample than the 2011 data collected and therefore the 2010 data set is the focus of this report.

2.3.3. Data Review and Verification

There are several data review and verifications steps throughout this project. The following standard quality assurance and quality control (QAQC) steps were conducted:

1. Editing of spatial data by Ecotrust staff based on notes from interviews and when required to standardize the data (e.g. clipping a shape to the shoreline or specific depth);
2. Review by each participant of his/her individual maps and information; and
3. Review by fishing community, though group and individual meetings, to verify aggregated results.

The collection of spatial data has an inherent higher margin of error and thus several QAQC steps were implemented in our project to ensure the spatial data collected were of the highest quality possible. First, notes were taken on the boundaries of each fishing area drawn during an interview with a fisherman. Once spatial data are collected and transmitted to Ecotrust staff for analysis, each spatial dataset is checked against spatial data notes to ensure fishing areas are drawn to the indicated depth limits and spatial extent. If any spatial outliers are identified within a given fishery, individual fishermen are contacted to verify their spatial dataset is accurate. Second, each individual fisherman is mailed maps of his/her fishing grounds for each fishery they provided spatial information on to review/verify its accuracy. These individual maps are printed on security paper that cannot be photocopied and are mailed with a

return addressed and stamped envelope and contact information so fisherman may easily communicate any changes to their spatial data. Third, once all spatial fishing data are aggregated, these maps are reviewed by the fishing community with Ecotrust staff.

These review meetings with the fishing community are complimentary to the individual interviews and take a synergistic approach that is important in several ways. Review meetings are an opportunity to review and verify map products as well as share other data analysis results such as having the fishing community assist in interpreting logbook data analysis results, review drafts of the project report, discuss project next steps, build trust within the fishing community, and continue established relationships.

For review meetings, each individual who participated in interviews was contacted to participate in the project results review. During these individual or group review meetings, map products were reviewed for errors. It should be emphasized that spatial data sets are not augmented based on the where an individual who reviews the map(s) thinks areas of importance should be. Instead, the purpose of reviewing the map products are to ensure there are no large errors in the data sets made during the collecting, editing, and compiling of the data. Example of errors include fishing areas that extend beyond regulatory depth limits or geographic areas in which the fishery occurs (e.g., nearshore finfish grounds extending into rockfish conservation area boundaries) or areas in which no-fishing is allowed. Based on our experience, having the community review these map products helps ground-truth the data sets, produce data sets that are of higher quality, and help establish transparency and trust between researchers and the fishing community.

To the extent possible, Ecotrust validated data collected during this project with independent data sets provided by CDFW. Data validation with independent data sets is an important step in providing rigorous research methods as data collected in any survey are liable to the inconsistencies of memory, subjective judgment, and possible deliberate falsification. Validating data sets may also reveal possible sample biases which can inform interpretation of survey results. Much of the data Ecotrust collected in this project are novel and thus similar data sets to our knowledge do not exist or are not readily accessible to compare survey results, however, in Table 1 above we were able to compare our survey results to CPFV logbook data from CDFW to reveal a possible sample bias in which we may have under sampled CPFV operators who operate only part-time, CPFV operators who mainly fish in the San Francisco bay and occasionally fish in the NCC state waters, or operators who primarily run non-consumptive trips but may occasionally run fishing trips in the NCC state waters.

To verify the spatial fishing data sets, CPFV logbook data could have been used, however this data is confidential at the individual level and would take considerable resources to compile and analyze at the aggregate level. The spatial scale in which data are collected with logbooks (10 square mile blocks) are at a much larger scale than Ecotrust's data, making it difficult to compare data sets.

In light of the difficulties in obtaining and analyzing existing data sets to compare our results, Ecotrust thoroughly reviewed all data sets with the fishing community to ensure all data products submitted were verified and accepted by the fishing community and are of the best quality possible.

2.3.4. Spatial Data Analysis Methods

In this section we further detail how spatial data were analyzed in this project. Ecotrust's methodology to analyze spatial fishing data collected was developed and refined through collaboration with fishing communities across California during the MLPA process (Scholz et al. 2011a). The analysis of the fishing grounds information is broadly comprised of two components: determination of the fishing grounds and determination of relative (economic) importance. Below we present a detailed methodology for how spatial data were weighted, analyzed, and aggregated for the CPFV sector's spatial fishing data.

As stated above all fishermen were asked to map fishing grounds for each fishery separately. For CPFV operators, spatial fishing data were weighted based on self-reported gross economic revenue from 2010 (or 2011 in the second season of data collection conducted in 2012) from each specific fishery/activity. To calculate gross economic revenue from each fishery/activity, CPFV operators/owners were first asked to

approximate his/her gross economic revenue from CPFV operation for a given vessel (at times CPFV owners may own multiple CPFV vessels, however, in the NCC we did not interview any respondents who owned multiple vessels) and then were asked what percent of the vessel specific gross revenue was from each specific fishery/activity.

Spatial Analysis Methodology

The following is a detailed methodology of how we analyzed and aggregated individual spatial fishing data to create port and region level spatial data sets on the relative importance of fishing areas. We would like to emphasize that fishermen are asked to map each fishery separately and the spatial data analysis methodology detailed below is conducted for each fishery separately as well.

Step 1: Individual weighted fishing grounds

During the interview process, each fisherman was presented with a navigable nautical chart (e.g., interviewer could zoom in/out and move the map around) contained within the mapping portion of the Open OceanMap survey tool (Figure 1). Fishermen were then asked to direct field staff to draw polygons or areas that could be of any shape or size. To do this each fisherman was asked to identify his or her fishing grounds for a particular fishery when conducting CPFV fishing trips from their homeport in the North Central Coast region. This may include mapping areas outside the study region such as in the San Francisco bay or north or south of the study region. These fishing grounds could be one or more set of polygon/areas and together they comprise his or her total fishing grounds for a particular fishery.

Once the fishing area(s) were mapped, fishermen were then asked to allocate some portion of 100 pennies to each fishing area (or if there is only one fishing area all 100 pennies would be allocated to that area by default) such that the sum of the pennies allocated across his/her fishing areas for a particular fishery equals to 100. This is done to determine the relative important of fishing areas to each other.

Step 2: Standardize and apply economic value to individual fishing grounds

The second step is to apply economic value to the individual fishing areas and distribute that value spatially based on the proportion of pennies allocated to each fishing area. For CPFV operators we utilized the estimated gross economic revenue earned from a specific fishery and distributed that economic value across the fishing area(s) proportionally with the amount of pennies allocated to a specific fishing area. For example, if a CPFV operator's gross economic revenue from rockfish was $50,000 and one fishing area was assigned 50 pennies we would allocate $25,000 in economic value to that specific fishing area. This allocation of economic value is applied to each individual spatial fishing data set.

To standardize each data set for aggregation we then converted each fisherman's fishing ground data layer (polygon layer) for a particular fishery into a 100 x 100 meter cell size grid or raster layer. For fisheries where an individual mapped fishing grounds inside the San Francisco bay area we simply clipped those areas out of the analysis so that only fishing grounds outside the San Francisco bay were included. However, by using the above methodology the relative economic value of the fishing areas outside of the San Francisco bay remains intact.

Step 3: Aggregate individual fishing ground values to port level data set

To aggregate the individual fishing ground data layers (raster layers) we simply summarize the economic values in each cell across the individual raster data layers for all respondents in a given home port. The resulting data set is a 'heat map' depicting the relative value of fishing areas for a given fishery in a given port.

Step 4: Aggregate port level data sets to regional data sets

To create regional level data sets for a specific fishery each port data layer is further weighted by the port's total number fish caught for the specific fishery (for the given year of interest) which is provided by the California Department of Fish and Wildlife CPFV logbook data and then combined into a regional data layer. We apply the total number of fish caught to each port level data layer when combining data layers to control for any sample bias at the port level. For example, if we interviewed more CPFV operators in a given port it may not necessarily mean that the economic value of that port is greater than that of another port in which we interviewed less CPFV operators.

Applying this aggregation weight is done by distributing the total number of fish caught across the respective port level 'heat map' data layer proportionally by the value in each raster cell. Each of these port level raster data layers are then aggregated by summing the values in each raster cell across the port data layers in the region.

2.3.5. Non-spatial Data Analysis Methods

All non-spatial survey data were exported from Open OceanMap to an MS Access database and then imported into MS Excel files which were then summarized into tabular format primarily using pivot table queries. As emphasized above all data for ports or fisheries with fewer than three respondents have been withheld from publication to protect the confidentiality of the survey respondents. An asterisk, '*', can be found in the data tables in which data has been suppressed. A dash, '–', in the data tables indicates a zero or that data was not collected for a given port-fishery combination. Often if data were not collected in a given port-fishery combination the fishery does not occur or is not a significant fishery in a port (e.g., is not a target fishery).

The design of survey questions within this project was largely modeled from survey questions developed through the survey work Ecotrust conducted during the MLPA planning process (2005-20011). The survey was further refined through review with key informants within the North Central Coast fishing community to tailor the questions and select target fisheries specific to the North Central Coast Region. The survey questions were designed so that fishermen could easily provide answers/estimates from readily available knowledge commonly known by fishermen. For the instances in which fishermen were unable to provide answers using on-hand information, Ecotrust field staff later followed up with the individual to collect the information or the information was omitted when calculating averages.

3. NORTH CENTRAL COAST CPFV REGIONAL PROFILE

3.1. North Central Coast Region CPFV Historical Trends and Initial Changes

3.1.1. Introduction/Methods

Commercial Passenger Fishing Vessels (CPFV) are often called party-boats or charter fishing boats and make a business in taking members of the public to recreationally fish and, more recently, to enjoy non-consumptive types trips such as whale watching or leisure cruises. In a study conducted by Responsive Management in 2007, the majority of Californian's (84.0 percent) agree that CPFV opportunities are important to maintain as they provide opportunities for people to experience coastal resources who otherwise would not be able to as they cannot afford a boat of their own.

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses in this report. The following types of information listed below are generally the analyses presented in the historical trends and initial change sections found at the region and port level throughout the report:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel

4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery
6. Percent change in total number of vessels, trips, and anglers in pre and post MPA periods

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the target species of the trip, catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

For the CPFV logbook data presented here, data is provided only for fishing trips which fished from fishing blocks within the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here. Furthermore, the CPFV logbook data presented only includes data on fishing trips as logbook data does not include information on non-consumptive trips such as whale watching.

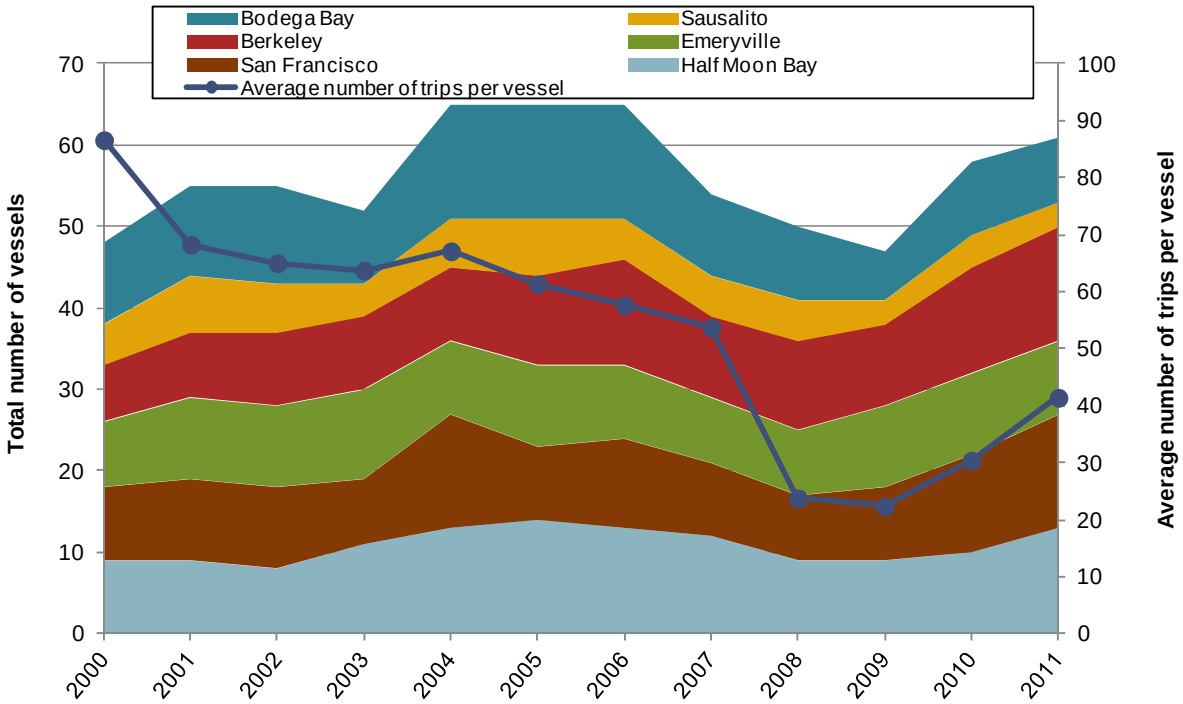
3.1.2. North Central Coast CPFV Historical Trends and Initial Changes

During the study period, 2000-2011, the ocean environment, the regulatory environment, and the socioeconomic environment experienced several changes. The California Current System at this time was transitioning from a warm to a cold water regime which affected the availability of certain kinds of fish targeted by anglers. Furthermore, a deep recession, which began in December 2007, and higher gas prices impacted people's livelihoods and discretionary monies. Major changes in regulations occurred for rockfish (season closures initiated in 2000 with the addition of depth closures starting in 2001) and salmon (in particular, closures in 2008 and 2009). In addition, the North Central Coast Marine Protected Areas (MPAs) were implemented in May, 2010. All of these factors affected fishing in the study area to various degrees; three of these factors (recession, salmon season closures, and the implementation of the MPAs) occurred together in a relatively short time period.

The total number of vessels working out of North Central California ports in 2011 was slightly higher than that in 2000 by approximately 21 percent (Figure 3). Decreases in vessels occurred between 2006 and 2009; increases then were observed at most ports between 2009 and 2011. Most ports experience an increase in the number of vessels operating between 2000 and 2011, except in the ports of Bodega Bay and Sausalito who each had two less vessels than reported in 2000. It should be noted that the number of vessels does not reveal the size of the vessel operation as this may range from small six-pack boats to larger vessel that can hold dozens of passengers.

The average number of trips per vessel has a steady decreasing trend between 2000 and 2007. However, in 2008 the average number of trips per vessel dropped significantly due to the closure of the salmon season and has only begun increasing starting in 2010 when the salmon season returned. However, the average number of trips per vessel has not returned to the same levels seen before 2008 (Figure 3).

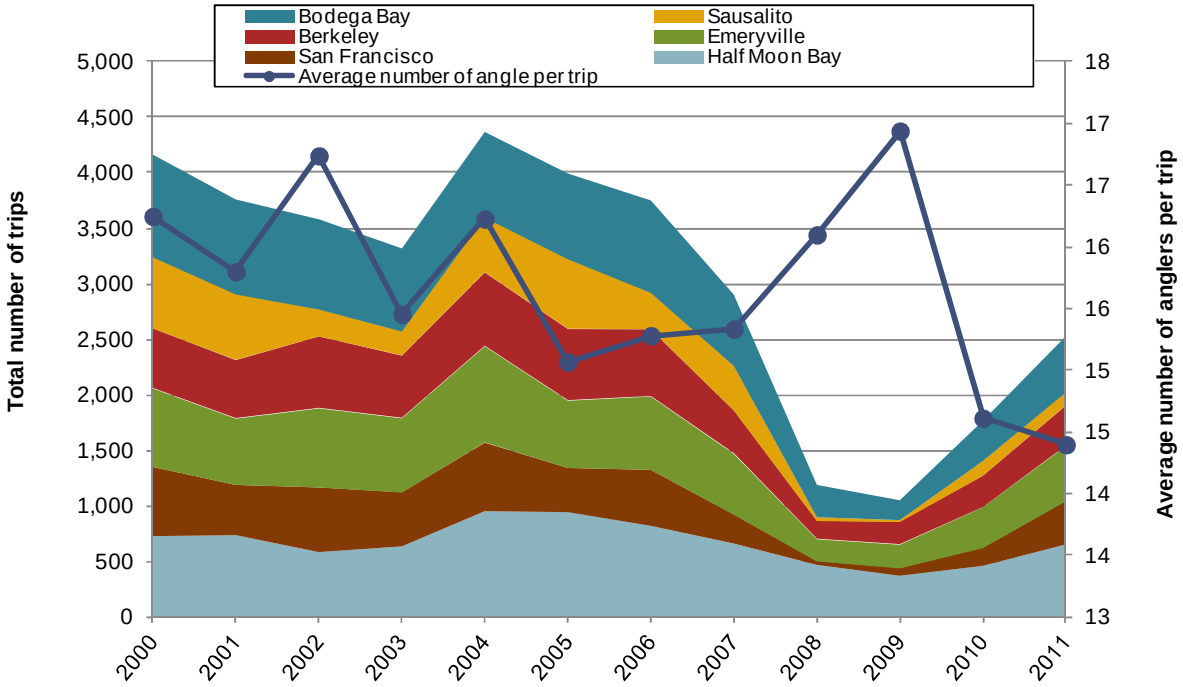
Figure 3. Total number of CPFV vessels and average number of trips per vessel, North Central Coast Region, 2000-2011



Source: CDFW CPFV logbook data

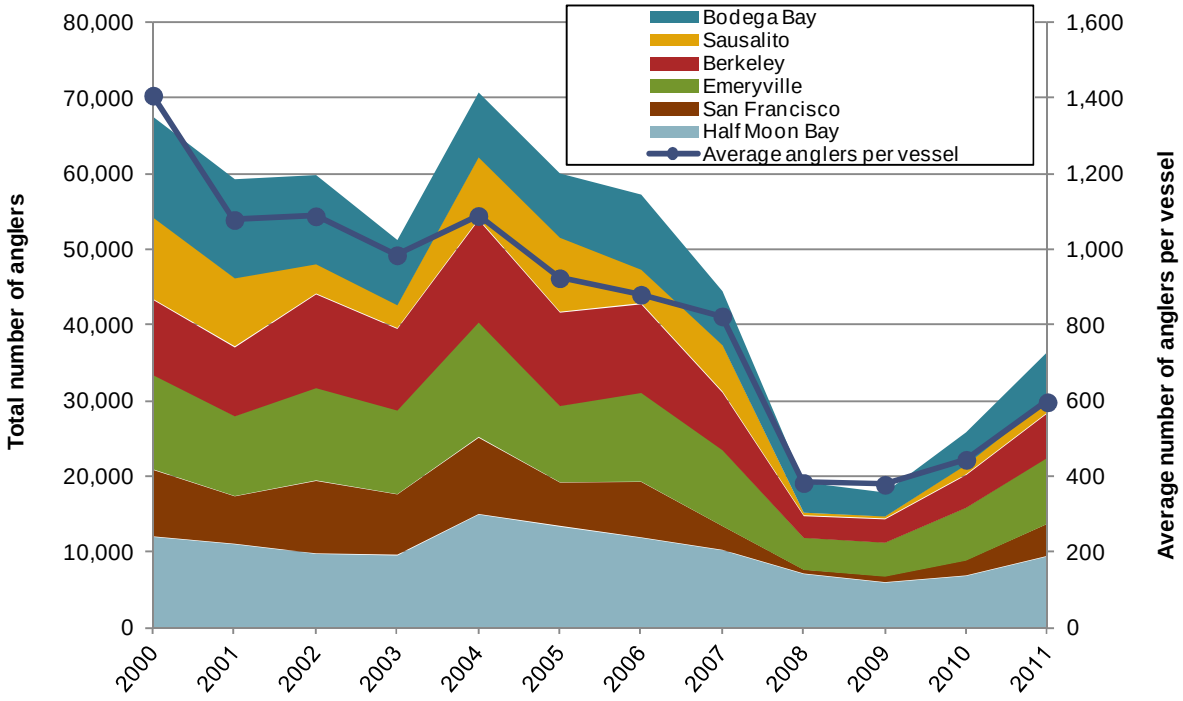
The total number of CPFV trips in the region has generally declined from 2000 to 2011 by about 39 percent (Figure 4) with the exception with a slight increase in 2004 which may have been due to a good salmon season (Figure 6). With the salmon season closed in 2008 and 2009 the total number of trips in the region declined sharply dropping by about 59 percent between 2007 and 2008. As we can observe below, during the salmon season closures the ports of San Francisco and Sausalito operated very few trips. In 2010 and 2011 the number of total trips began to rise again, however, they have not returned to levels seen before 2008. The total number of CPFV anglers also generally declined from 2000 to 2011 (Figure 5) and follows similar patterns to that of total number of CPFV trips (Figure 4). Of note is that in 2009 the average number of anglers per trip increased sharply—this may have been due to larger capacity vessels operating more frequently than smaller capacity vessels that often specialize in salmon fishing.

Figure 4. Total number of CPFV trips and average number of anglers per trip, North Central Coast Region, 2000-2011



Source: CDFW CPFV logbook data

Figure 5. Total number of CPFV anglers and average number of anglers per vessel, North Central Coast Region, 2000-2011

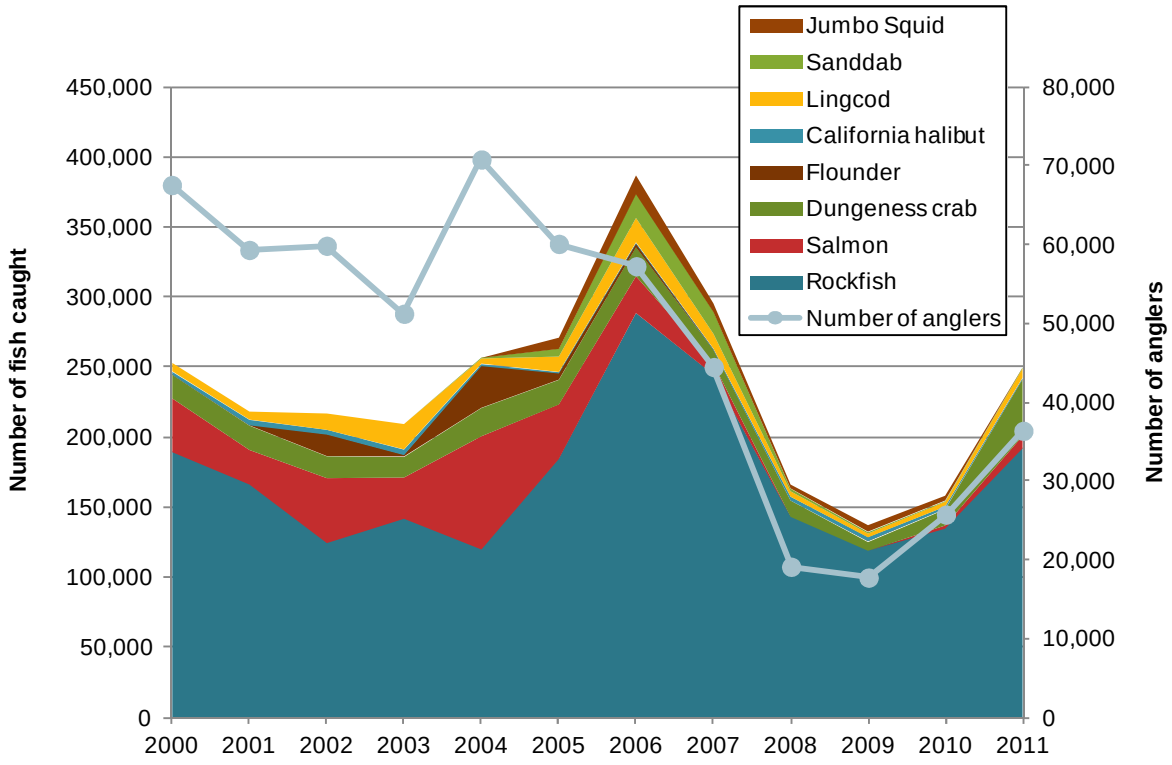


Source: CDFW CPFV logbook data

As seen in Figure 6 below, the majority of the number of fish caught in the region is rockfish (approximately 70.9 percent on average) followed by salmon (approximately 10.4 percent). The total number of fish caught was variable from 2000 to 2011, but peaked in 2006 with approximately 394,750 fish caught. This peak may be due to a shift in effort (number of trips) from the salmon fishery to the rockfish fishery (Figure 7) and also due to the larger bag limit of rockfish (in 2013 the limit was 10 rockfish) in comparison to salmon (in 2013 the limit was 2 salmon).

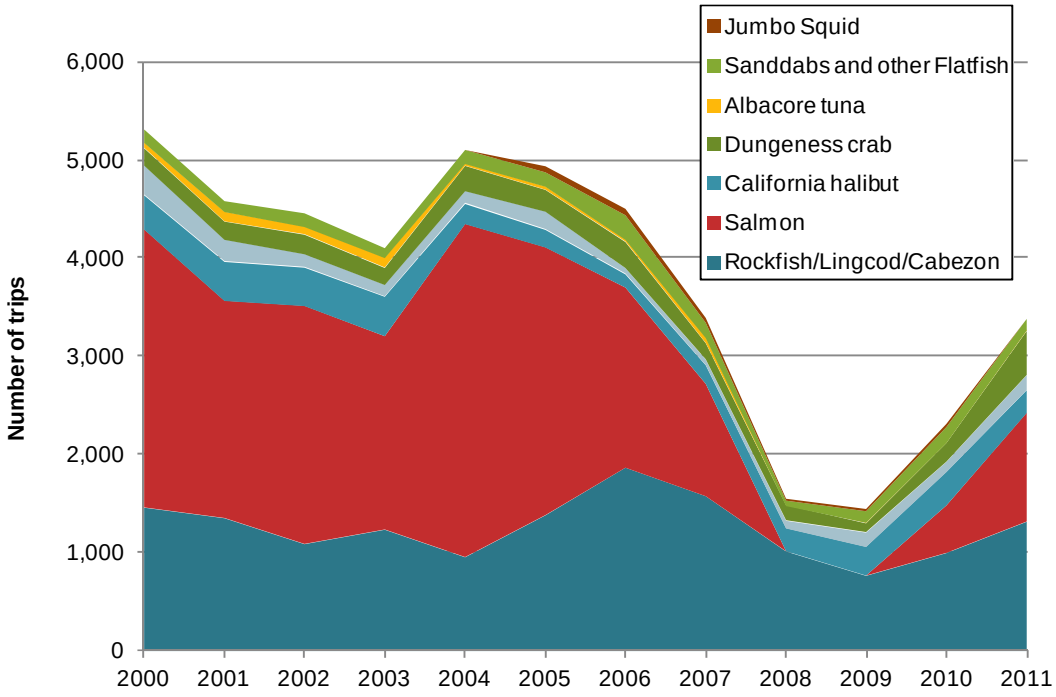
Even though the majority of the number of fish caught in the region is rockfish, from 2000 to 2011 approximate 45 percent of all CPFV trips primarily targeted salmon (despite the 2008 and 2009 season closures) and 33 percent of trips primarily targeted rockfish. Beginning in 2010 salmon trips resumed in the region, however, the number of salmon trips has not returned to level observed before the salmon closure in 2008.

Figure 6. CPFV total number of fish caught for each fishery, North Central Coast Region, 2000-2011



Source: CDFW CPFV logbook data

Figure 7. Total number of CPFV trips for each target fishery, North Central Coast Region, 2000-2011



Source: CDFW CPFV logbook data

Below we provide a table investigating average yearly change in the number of vessels, trips, and anglers over time. We separate time periods into two pre MPA time periods (2000 to 2005 and 2005 to 2010) and one post MPA time period (from 2010 to 2011). Since the MPAs went into effect in 2010 and we only have available 2011 data we were only able to assess change from 2010 to 2011 for the post MPA period.

As see in Table 2 below, the number of vessels across pre and post MPA years has remained relatively steady. However in pre MPA years (2005-2010) the number of trips and anglers sharply declined (-30 percent and -29 percent on average respectively) but have begun to slightly recover in the post MPA year of 2011. However, as seen in the above figures, the number of anglers and trips has not reached the same levels as observed before the 2008 and 2009 salmon season closures.

The ports of Sausalito and San Francisco have experienced the most change from 2000 to 2011. In particular the port of Sausalito which is largely a CPFV salmon port was hit hard by the salmon closures as seen in the average yearly percent change in trips and anglers (-222 percent and -349 percent respectively) from 2005 to 2010. Despite the return of the salmon season, Sausalito is still experiencing a decline in the number of vessel (-33 percent from 2010 to 2011) and number of trips (-12 percent from 2010 to 2011) and overall Sausalito has had an average yearly decline of -110 percent in the number of trips and an average yearly decline of -165 percent in the total number of anglers from 2000 to 2011.

We would like to note that these increases in the number of vessels, trips, and anglers in the post MPA period should not be interpreted as a direct impact of MPA establishment. As shown in the above figures, the increase in the post MPA period is attributed to return of the highly economically important salmon fishing season which was closed in 2008 and 2009 just before the MPA network was implemented in the North Central Coast region.

Table 2. Percent change in CPFV vessels, trips, and anglers per port and region wide, 2000-2011

Ports/Region		Average Yearly Change			
		Pre MPA (2000-2005)	Pre MPA (2005-2010)	Post MPA (2010-2011)	2000-2011
North Central Coast Study Region	Number of Vessels	5%	-3%	5%	1%
	Number of Trips	-2%	-30%	30%	-12%
	Number of Anglers	-4%	-29%	29%	-12%
Bodega Bay	Number of Vessels	4%	-14%	-13%	-5%
	Number of Trips	-4%	-31%	29%	-13%
	Number of Anglers	-10%	-21%	33%	-11%
Sausalito	Number of Vessels	2%	-16%	-33%	-10%
	Number of Trips	-17%	-222%	-12%	-110%
	Number of Anglers	-20%	-349%	21%	-165%
Berkeley	Number of Vessels	8%	2%	7%	5%
	Number of Trips	2%	-31%	22%	-11%
	Number of Anglers	3%	-38%	26%	-13%
Emeryville	Number of Vessels	3%	-1%	-11%	0%
	Number of Trips	-6%	-28%	26%	-13%
	Number of Anglers	-8%	-20%	20%	-11%
San Francisco	Number of Vessels	-6%	4%	14%	1%
	Number of Trips	-14%	-116%	58%	-54%
	Number of Anglers	-16%	-108%	53%	-52%
Half Moon Bay	Number of Vessels	7%	-8%	23%	2%
	Number of Trips	3%	-18%	30%	-4%
	Number of Anglers	0%	-16%	27%	-5%

Source: CDFW CPFV logbook data

3.2. North Central Coast Region CPFV Baseline Characterization

Establishing a baseline characterization of the North Central Coast Region CPFV fleet provides a benchmark of economic conditions and spatial fishing patterns in which future MPA impacts and benefits can be measured**.** In the CPFV baseline characterization sections found throughout this report we summarize the primary data collected from CPFV operator interviews carried out in the summer and fall of 2011. Data collected in 2012 is not discussed here but can be found at the regional level in the appendix at the end of this report. We chose not to include results from the second year of data collection in the main body of the report as we interviewed fewer respondents in 2012 but generally received similar responses both years.

In 2011 we interviewed 31 CPFV owners/operators as shown in Table 3**,** regarding their 2010 fishing year**.** One respondent was an owner only and 30 were either owner/operators or operators who knew enough about the business to answer all questions contained in the interview. There were no CPFV operations in Point Arena and the San Francisco bay area ports are split into the ports of Sausalito, Berkeley, Emeryville, and the city of San Francisco.

As shown in Table 4 the average individual we interviewed was 50.2 years old, has 19.7 years of experience owning a CPFV boat (if applicable) and 21.8 years of experience operating a CPFV vessel (if applicable). On average, respondents reported that 72.4 percent of their income came from operating and/or owning a CPFV vessel. Respondents were asked what other sources they had for additional income and 9 out of 16 respondents (56 percent) reported that they generated income from other fishing related work, such as commercial fishing or gear construction and sales. Additional sources of income are listed below in Table 5.

Table 3. Number of CPFV interviews completed, 2010 fishing year, North Central Coast Region

Port	Individuals interviewed
Bodega Bay	5
Sausalito	5
Berkeley	5
Emeryville	4
San Francisco	5*
Half Moon Bay	7
Grand Total	31

Source: Current study
** One individual interviewed in San Francisco is an owner only and provided revenue information for his operator.*

Table 4. CPFV survey response statistics, 2010, North Central Coast Region

	Response	Standard deviation	Number responding
Individuals interviewed	31	n/a	n/a
Owner only	1	n/a	n/a
Average age	50.2	12.4	30
Average number of years owning CPFV boat/s	19.7	10.3	29
Average number of years operating CPFV boat/s	21.8	10.9	28
Average percent income from CPFV operations in 2010	72.4%	32.9%	30

Source: Current study

Table 5. Sources of income in 2010 in addition to CPFV operation, North Central Coast Region

	Fishery					Activity				
Response	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^	All target fisheries/ activities (unique individuals)
Construction/Contractor	1	1	1	1	1	—	—	—	—	1
Harbor/City job	1	1	2	2	—	2	—	—	—	2
Other fishing/boating related work	4	2	7	6	4	1	2	2	2	9
Other specialized work	1	—	2	1	1	—	—	—	—	2
Property management	1	—	1	2	1	2	2	1	1	2
Retirement/Social Security/Investments	—	—	1	1	—	1	1	1	1	1
Skilled labor	—	—	1	—	—	1	1	1	—	1
Number of individuals responding	8	4	13	11	7	6	5	4	3	16

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in the North Central Coast reported earning a gross economic revenue (GER) of $105,423 in 2010. Additionally, respondents across the region reported they spent an average of 22.9 percent of their GER on fuel, 12.3 percent on crew, and 37.5 percent on other operational expenses. After costs, respondents in the region made an average net revenue of $28,708 in 2010.

Table 6. Average CPFV gross economic revenue (GER) to operating costs in 2010, North Central Coast Region

	Number responding	Average response	Standard deviation
Total GER 2011	26	$105,423	$77,444
% GER to fuel	26	22.9%	9.0%
% GER to crew	26	12.3%	12.2%
% GER to other operating costs	26	37.5%	22.6%

Source: Current study

All respondents operated consumptive trips in 2010, while 21 respondents operated non-consumptive trips (Table 7). On average, consumptive trips were conducted more frequently, were more expensive, had more crew, and had fewer passengers per trip than non-consumptive trips. As shown below in Table 8, rockfish was targeted by the largest number of respondents (28) and on average generated the largest percentage of gross economic revenue (35 percent) compared to other target fisheries and activities. The most commonly reported non consumptive trip type was funeral services, with ten respondents indicating they conducted funeral trips in 2010, followed by whale watching which eight respondents indicated they conducted. These trips generated an average of 9.1 percent and 12.9 percent of the average respondents' GER, respectively. CPFV captains also explained that non-consumptive trips are often priced by the boat load and not by the individual. Some respondents were able to estimate what the rate would be for the individual and others chose not to provide a response.

Table 7. CPFV trip statistics, 2010, North Central Coast Region

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	29	n/a	n/a	21	n/a
Average number of trips in 2010	26	78.9	46.5	18	35.4	54.1
Average number of passengers(per trip)	29	12.1	5.5	21	17.4	12.7
Average price per passenger (per trip)	29	$103	$28	13	$69	$44
Average number of crew (per trip)	27	1.2	0.8	17	1.0	0.6

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 8. Number of days targeting and percent of GER from fishery/activity in 2010, CPFV, North Central Coast Region

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	17	15	43.1	28.8	14	28.4%	21.1%
	Dungeness crab	9	9	37.0	28.3	9	15.4%	16.7%
	Rockfish	28	25	39.8	29.0	25	35.0%	22.2%
	Salmon	25	22	22.1	22.0	21	25.8%	27.7%
	Striped bass	12	10	37.2	33.1	9	17.4%	14.8%
Activity	Funeral services	10	8	27.1	50.0	8	9.1%	16.6%
	Leisure cruises	6	4	49.0	87.4	5	5.8%	5.8%
	Whale watching	8	7	10.0	11.4	7	12.9%	16.6%
	Other^	4	3	16.7	18.9	4	22.3%	22.2%

Source: Current study

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare their success in each of their target fisheries and non-consumptive activities in 2010 to that of the previous five years. As shown below in Table 9, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse. Respondents were then asked what factors they felt had contributed to change in success in their fishery/activity. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Dungeness crab was the most improved fishery, with 66.7 of respondents reporting that their success in the fishery was significantly better and no one reported that they were doing worse in this fishery. For all other fisheries the majority of respondents said they were less successful than in previous years. Most non consumptive activities were divided more evenly as shown in Table 9. Environmental and regulatory factors were mentioned most frequently across fisheries and activities throughout the study region. MPAs were indicated by 20 individuals as being one of the primary factors impacting their overall success in the rockfish fishery (Table 10). Nineteen salmon fishermen indicated that there were fewer salmon than there had been in previous years (not including 2008 and 2009 when the fishery was closed) (Table 11). Another primary factor individuals mentioned as impacting their success in the salmon fishery was the short length of the regulated season (Table 10). Additionally, some fishermen explained that economic factors, such as a generally poor economy, lack of customers, and high fuel costs had a large impact on their success (Table 12). Lastly, a few fishermen mentioned impacts that did not fit into any of the above categories and they are shown below in Table 13.

Table 9. Overall success in CPFV fishery/activity in 2010 compared to past five years, North Central Coast Region

			Percent responding				
		Number responding	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	California halibut	17	5.9%	5.9%	17.6%	47.1%	23.5%
	Dungeness crab	9	66.7%	11.1%	22.2%	—	—
	Rockfish	28	3.6%	3.6%	21.4%	35.7%	35.7%
	Salmon	24	8.3%	4.2%	—	16.7%	70.8%
	Striped bass	11	—	—	36.4%	54.5%	9.1%
Activity	Funeral services	9	11.1%	11.1%	66.7%	11.1%	—
	Leisure cruises	6	—	16.7%	33.3%	16.7%	33.3%
	Whale watching	8	25.0%	25.0%	12.5%	12.5%	25.0%
	Other ^	4	25.0%	25.0%	25.0%	—	25.0%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

Table 10. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, North Central Coast Region

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other ^
	Number responding	5	1	21	15	4	—	—	—	1
	Response	**Count of responses**								
Negative	Regulated season too short	—	—	—	11	—	—	—	—	—
	MPAs	3	1	20	2	2	—	—	—	1
	More pressure on fishery	4	—	—	—	4	—	—	—	—
	Rockfish Conservation Areas	—	—	2	—	—	—	—	—	—
Positive	Fishery closed in previous seasons	—	—	—	6	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: bird watching, recreational diving, and nature trips.

Table 11. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, North Central Coast Region

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	10	7	11	20	3	—	—	4	—
	Response	**Count of responses**								
Positive	Large quantity of fish	2	6	1	1	—	—	—	1	—
	Peak of natural cycle	—	1	—	—	—	—	—	—	—
	Good ocean conditions	—	1	—	—	—	—	—	2	—
Negative	Low quantity of fish	5	—	5	19	3	—	—	—	—
	Low of natural cycle	1	—	—	—	—	—	—	—	—
	Bad weather	—	—	—	—	—	—	—	2	—
	Poor ocean conditions	3	—	1	1	—	—	—	—	—
	More bait/feed in water - causing fish to bite less	—	—	1	—	—	—	—	—	—
	Loss of salmon spawning grounds	—	—	—	1	—	—	—	—	—
	Fish are smaller	—	—	4	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: bird watching, recreational diving, and nature trips.

Table 12. Economic changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, North Central Coast Region

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	5	1	—	2	2	2	1
	Response	**Count of responses**								
Positive	Good/new market opportunity	—	—	—	—	—	—	—	—	1
Negative	Lack of customers	—	—	3	1	—	3	—	—	—
	Bad economy	—	—	2	—	—	2	2	2	—
	Fuel costs	—	—	1	—	—	1	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: bird watching, recreational diving, and nature trips.

Table 13. Other changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, North Central Coast Region

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	3	—	3	1	—	2	2	2	2
	Response	**Count of responses**								
Positive	Diversifying portfolio of fisheries/activities	—	—	—	—	—	2	1	1	2
	Putting more effort into fishery/activity	—	—	—	1	—	—	—	—	—
Negative	Others are diversifying - adding competition to fishery/activity	—	—	—	—	—	—	1	—	—
	Putting less effort into fishery/activity	1	—	—	—	—	—	—	—	—
	Personal reasons	—	—	—	—	—	—	—	1	—
	Too many other boats/overcrowding	—	—	3	—	—	—	—	—	—
	Drag boats depleting resource	2	—	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: bird watching, recreational diving, and nature trips.

3.3. North Central Coast Region MPAs and CPFV Operations

Determining and measuring the impact of MPAs upon CPFV operators is challenging to quantify and unravel from the multitude of environmental, regulatory, and economic factors influencing systems of fishing. Despite this, we sought to capture information from fishermen as to how they perceive they have been impacted by MPAs and the specific MPAs which are impacting their fisheries/activities. This section provides information at the region and port levels and summarizes the response from the following three questions which were asked for each fishery during interviews:

1) Has your fishery/activity been directly impacted by the recently established MPAs?;
2) If so, how have you been impacted?; and,
3) What MPAs have impacted your specific fishery/activity?

Question one was posed as a simple yes or no response and questions two and three were open-ended questions in which responses were later coded and categorized into the tables below. Additionally, fishermen were given a map of the MPAs in the North Central Coast to aid in identifying and naming the MPAs impacting them. The questions above were asked for every fishery/activity an individual participated in. We'd like to note that the data provided here is only from fishermen who are currently still fishing or participating in a fishery/activity. Fishermen who dropped out of CPFV operation or who dropped out of a specific fishery/activity since MPA implementation are not captured here.

Rockfish was the most impacted CPFV fishery, with all 28 fishermen who targeted rockfish indicating that their fishery had been directly impacted and that they had lost traditional fishing grounds. Additionally, half of these fishermen responded that they were spending more time fishing or traveling for fishing than they had in the past. For some this meant that it took longer to catch fish while others indicated it meant that they were spending more time on the water traveling to fishing spots. California halibut was the second most impacted fishery with 41.2 percent of respondents indicating their fishery had been impacted by MPAs and 35.3 percent indicating they could no longer fish for California halibut in a traditional fishing area (Table 14). We would like to note that as 2010 had a limited salmon season that we likely did not capture the full extent of how and which MPAs are impacting this fishery.

Respondents indicated fewer types of impacts on non-consumptive activities, but did note that these activities had also been impacted. The other category, which included bird watching, nature trips, and recreational diving, was the most highly impacted (75 percent of respondents indicated impacts in this category). Most of these individuals indicated they could not approach an area that was popular for wildlife viewing due to special closures. Additionally, one responded explained that in the past he had conducted non-consumptive diving and fishing combination trips and it no longer made sense for him to travel to a particular area if he could not do both activities. More information can be found below in Table 14.

All respondents were asked to identify particular MPAs that had impacted them for each fishery and activity in which they participate in. Respondents were provided with a map of the MPAs in order to more easily identify them and in order to place the correct name with the proper MPA. Throughout the study region and across all fisheries/activities, there were 24 MPAs (out of 31 MPAs which include special closures in the North Central Coast study region) that respondents indicated impacted them in some way (Table 15). Many MPAs have an impact on only fishermen from a specific port in the region and so impacts on smaller ports may not be well represent in this region level table. Port specific tables found in this section should be referenced for this. However, when considering the region as a whole the MPAs surrounding the Farallon Islands had the largest impact on CPFV fishermen across all fisheries. More information can be found below in Table 15.

Table 14. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, North Central Coast Region

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	17	9	28	25	12	6	8	4	30
Percent indicating direct impacts from MPAs	41.2%	33.3%	100.0%	36.0%	16.7%	16.7%	25.0%	75.0%	93.3%
Response	**Percent responding**								
Loss of traditional fishing grounds	35.3%	33.3%	100.0%	36.0%	8.3%	—	—	25.0%	93.3%
Fishing at the borders of MPAs	11.8%	22.2%	60.7%	24.0%	—	—	—	—	60.0%
Spending more time fishing/traveling for fishing	5.9%	22.2%	50.0%	20.0%	—	—	—	—	46.7%
Fishing more in areas with worse/less predictable weather	11.8%	22.2%	35.7%	16.0%	—	—	—	—	40.0%
Increased fishing pressure/crowding in open areas	5.9%	—	39.3%	12.0%	—	—	—	—	36.7%
Shift of fishing effort into other fisheries	5.9%	—	14.3%	—	8.3%	—	—	—	16.7%
Loss of highly productive area	—	—	10.7%	8.0%	—	—	—	—	16.7%
Can't approach an area for viewing wildlife due to special closures	—	—	—	—	—	—	25.0%	50.0%	10.0%
Fishing less	—	—	10.7%	—	—	—	—	—	10.0%
Open areas less productive due to increased pressure	—	—	—	—	—	—	—	—	6.7%
Loss of revenue	—	—	3.6%	4.0%	—	—	—	—	6.7%
Increase in operating expenditures (fuel etc.)	—	—	3.6%	—	—	—	—	—	3.3%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

Table 15. MPAs impacting specific CPFV fisheries/activities in 2010, North Central Coast Region

MPA	Percent Responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	17	9	28	25	12	6	8	4	30
Bodega Head SMCA	—	—	14.3%	12.0%	—	—	—	—	16.7%
Bodega Head SMR	5.9%	—	14.3%	20.0%	—	—	—	—	16.7%
Del Mar Landing SMR	—	—		—	—	—	—	—	6.7%
Double Point/Stormy Stack SC	5.9%	11.1%	3.6%	—	—	—	—	—	3.3%
Drake's Estero SMCA	11.8%	11.1%	—	—	—	—	—	—	10.0%
Duxbury Reef SMCA	11.8%	11.1%	7.1%	—	—	—	—	—	13.3%
Gerstle Cove SMR	—	—	3.6%	—	—	—	—	—	3.3%
Montara SMR	5.9%	11.1%	32.1%	16.0%	—	—	—	—	30.0%
North Farallon Islands SC	—	11.1%	64.3%	4.0%	—	—	12.5%	25.0%	60.0%
North Farallon Islands SMR	—	11.1%	64.3%	4.0%	—	—	12.5%	25.0%	60.0%
Pillar Point SMCA	—	—	17.9%	4.0%	—	—	—	—	16.7%
Point Resistance Rock SC	5.9%	—	—	—	—	—	—	—	3.3%
Point Reyes Headlands SC	17.6%	—	17.9%	4.0%	—	—	—	—	23.3%
Point Reyes SMCA	17.6%	—	25.0%	4.0%	—	—	—	—	26.7%
Point Reyes SMR	11.8%	—	21.4%	4.0%	—	—	—	—	23.3%
Russian River SMCA	—	—	10.7%	12.0%	—	—	—	—	13.3%
Russian River SMRMA	—	—	3.6%	12.0%	—	—	—	—	10.0%
Salt Point SMCA	—	—	7.1%	4.0%	—	—	—	—	6.7%
Saunders Reef SMCA	—	—	3.6%	—	—	—	—	—	3.3%
Southeast Farallon Island SC	—	—	71.4%	4.0%	—	—	—	50.0%	66.7%
Southeast Farallon Island SMCA	—	—	75.0%	4.0%	—	—	—	25.0%	70.0%
Southeast Farallon Island SMR	—	—	71.4%	4.0%	—	—	—	50.0%	66.7%
Stewarts Point SMCA	—	—	14.3%	4.0%	—	—	—	—	13.3%
Stewarts Point SMR	—	—	17.9%	4.0%	—	—	—	—	16.7%
Number of MPAs impacting fishery	9	6	22	18	—	—	2	5	24

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

In Bodega Bay, all respondents indicated that MPAs were impacting their rockfish and salmon fishery and that they had lost traditional fishing grounds. When targeting salmon all fishermen indicated they were fishing at the borders of MPAs and 80 percent indicated they were doing so when targeting rockfish. Additionally 80 percent of fishermen targeting rockfish mentioned spending more time fishing, more time traveling to reach fishing spots, and increased pressure and crowding in fishing areas that remained open. Additional types of impacts are found below in Table 16.

Seventeen of the 31 MPAs in the North Central Coast impacted the CPFV fishermen we interviewed in Bodega Bay (Table 17). Bodega Head SMR and SMCA had the greatest impacts on local CPFV operations. Fishermen noted that both of these MPAs are right outside the Bodega Harbor and offer a close safe place for recreational fishing. Despite Bodega Head SMCA being open for salmon fishing, some fishermen were unaware of this and avoided the area regardless. Some fishermen noted that they were generally unsure what they could and could not fish for in different MPAs and instead chose to avoid them all.

Stewarts Point SMR and SMCA also had a large impact on the rockfish fishery, impacting 100 percent and 80 percent of individuals, respectively. Impacts were also reported at Stewarts Point by one salmon fisherman. The Russian River SMCA and SMRMA were also noted as impacting both rockfish and salmon fishing; although impacts were higher for the salmon fishery. It should be noted that the Russian River and Stewarts Point SMCAs, unlike the Bodega Bay SMCA, do not allow for the recreational take of salmon.

Table 16. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, Bodega Bay

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	3	4	5	5	1	—	—	—	5
Percent indicating direct impacts from MPAs	33.3%	—	100.0%	100.0%	—	—	—	—	100.0%
Response	**Percent responding**								
Loss of traditional fishing grounds	33.3%	—	100.0%	100.0%	—	—	—	—	100.0%
Fishing at the borders of MPAs	33.3%	—	80.0%	100.0%	—	—	—	—	100.0%
Spending more time fishing/traveling for fishing	—	—	80.0%	60.0%	—	—	—	—	80.0%
Fishing more in areas with worse/less predictable weather	—	—	40.0%	40.0%	—	—	—	—	60.0%
Increased fishing pressure/crowding in open areas	—	—	80.0%	40.0%	—	—	—	—	80.0%
Shift of fishing effort into other fisheries	—	—	—	—	—	—	—	—	—
Loss of highly productive area	—	—	—	40.0%	—	—	—	—	40.0%
Can't approach an area for viewing wildlife due to special closures	—	—	—	—	—	—	—	—	—
Fishing less	—	—	20.0%	—	—	—	—	—	20.0%
Open areas less productive due to increased pressure	—	—	—	—	—	—	—	—	20.0%
Loss of revenue	—	—	—	20.0%	—	—	—	—	20.0%
Increase in operating expenditures (fuel etc.)	—	—	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

Table 17. MPAs impacting specific CPFV fisheries/activities in 2010, Bodega Bay

MPA	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	3	4	5	5	1	—	—	—	5
Bodega Head SMCA	—	—	80.0%	60.0%	—	—	—	—	100.0%
Bodega Head SMR	33.3%	—	80.0%	100.0%	—	—	—	—	100.0%
Del Mar Landing SMR	—	—	40.0%	—	—	—	—	—	40.0%
Gerstle Cove SMR	—	—	20.0%	—	—	—	—	—	20.0%
North Farallon Islands SC	—	—	20.0%	—	—	—	—	—	20.0%
North Farallon Islands SMR	—	—	20.0%	—	—	—	—	—	20.0%
Point Reyes SMCA	—	—	20.0%	—	—	—	—	—	20.0%
Point Reyes SMR	—	—	20.0%	—	—	—	—	—	20.0%
Russian River SMCA	—	—	60.0%	60.0%	—	—	—	—	80.0%
Russian River SMRMA	—	—	20.0%	60.0%	—	—	—	—	60.0%
Salt Point SMCA	—	—	40.0%	20.0%	—	—	—	—	40.0%
Saunders Reef SMCA	—	—	20.0%	—	—	—	—	—	20.0%
Southeast Farallon Island SC	—	—	20.0%	—	—	—	—	—	20.0%
Southeast Farallon Island SMCA	—	—	40.0%	—	—	—	—	—	40.0%
Southeast Farallon Island SMR	—	—	20.0%	—	—	—	—	—	20.0%
Stewarts Point SMCA	—	—	80.0%	20.0%	—	—	—	—	80.0%
Stewarts Point SMR	—	—	100.0%	20.0%	—	—	—	—	100.0%
Number of MPAs impacting fishery	1	—	17	7	—	—	—	—	17

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

CPFV operators interviewed in Sausalito reported that MPAs were only impacting their rockfish grounds and 100 percent of those who fished for rockfish noted they had lost traditional grounds (Table 18). All three fishermen who we interviewed who targeted rockfish in 2010 reported that the five MPAs surrounding the Farallon Islands were the MPAs impacting them (Table 19).

Responses in Berkeley, which is just across the bay from Sausalito, were similar. All respondents in Berkeley indicated that rockfish had been impacted and that they had lost traditional fishing grounds. However, unlike Sausalito, in Berkeley one fisherman noted that his salmon grounds had been impacted (33 percent of those interviewed for this fishery in Berkeley) and two fishermen indicated that their California halibut grounds had also been impacted (50 percent of those interviewed for this fishery in Berkeley). One California halibut fishermen noted that because so many prime areas for fishing rockfish had been shut down, other fishermen were beginning to shift into the California halibut fishery (Table 20). Also similar to Sausalito fisherman, those in Berkeley reported that the MPAs surrounding the Farallon Islands had the largest impact on them when they were targeting rockfish. However, Berkeley respondents also indicated that Montara SMR near Half Moon Bay and the MPAs surrounding Point Reyes were also impacting their rockfish fishing. More information regarding which specific MPAs impacted fishermen from Berkeley can be found in Table 21.

Table 18. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, Sausalito

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	3	—	3	5	3	1	1	—	5
Percent indicating direct impacts from MPAs	—	—	100.0%	—	—	—	—	—	60.0%
Response	**Percent responding**								
Loss of traditional fishing grounds	—	—	100.0%	—	—	—	—	—	60.0%
Fishing at the borders of MPAs	—	—	33.3%	—	—	—	—	—	20.0%
Spending more time fishing/traveling for fishing	—	—	—	—	—	—	—	—	—
Fishing more in areas with worse/less predictable weather	—	—	33.3%	—	—	—	—	—	20.0%
Increased fishing pressure/crowding in open areas	—	—	—	—	—	—	—	—	—
Shift of fishing effort into other fisheries	—	—	33.3%	—	—	—	—	—	20.0%
Loss of highly productive area	—	—	—	—	—	—	—	—	—
Can't approach an area for viewing wildlife due to special closures	—	—	—	—	—	—	—	—	—
Fishing less	—	—	—	—	—	—	—	—	—
Open areas less productive due to increased pressure	—	—	—	—	—	—	—	—	—
Loss of revenue	—	—	—	—	—	—	—	—	—
Increase in operating expenditures (fuel etc.)	—	—	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

Table 19. MPAs impacting specific CPFV fisheries/activities in 2010, Sausalito

	Percent responding								
	Fishery					Activity			
MPA	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	3	—	3	5	3	1	1	—	5
North Farallon Islands SC	—	—	100.0%	—	—	—	—	—	60.0%
North Farallon Islands SMR	—	—	100.0%	—	—	—	—	—	60.0%
Southeast Farallon Island SC	—	—	100.0%	—	—	—	—	—	60.0%
Southeast Farallon Island SMCA	—	—	100.0%	—	—	—	—	—	60.0%
Southeast Farallon Island SMR	—	—	100.0%	—	—	—	—	—	60.0%
Number of MPAs impacting fishery	—	—	5	—	—	—	—	—	5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

Table 20. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, Berkeley

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	4	—	5	3	2	—	—	—	5
Percent indicating direct impacts from MPAs	50.0%	—	100.0%	33.3%	*	—	—	—	100.0%
Response	**Percent responding**								
Loss of traditional fishing grounds	25.0%	—	100.0%	33.3%	*	—	—	—	100.0%
Fishing at the borders of MPAs	—	—	60.0%	—	*	—	—	—	60.0%
Spending more time fishing/traveling for fishing	—	—	40.0%	33.3%	*	—	—	—	40.0%
Fishing more in areas with worse/less predictable weather	—	—	40.0%	33.3%	*	—	—	—	40.0%
Increased fishing pressure/crowding in open areas	—	—	20.0%	—	*	—	—	—	20.0%
Shift of fishing effort into other fisheries	25.0%	—	20.0%	—	*	—	—	—	40.0%
Loss of highly productive area	—	—	40.0%	—	*	—	—	—	40.0%
Can't approach an area for viewing wildlife due to special closures	—	—	—	—	*	—	—	—	—
Fishing less	—	—	—	—	*	—	—	—	—
Open areas less productive due to increased pressure	—	—	—	—	*	—	—	—	20.0%
Loss of revenue	—	—	—	—	*	—	—	—	—
Increase in operating expenditures (fuel etc.)	—	—	—	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 21. MPAs impacting specific CPFV fisheries/activities in 2010, Berkeley

MPA	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	4	—	5	3	2	—	—	—	5
Drake's Estero SMCA	25.0%	—	—	—	—	—	—	—	20.0%
Duxbury Reef SMCA	25.0%	—	—	—	—	—	—	—	20.0%
Montara SMR	—	—	20.0%	33.3%	—	—	—	—	20.0%
North Farallon Islands SC	—	—	80.0%	—	—	—	—	—	80.0%
North Farallon Islands SMR	—	—	80.0%	—	—	—	—	—	80.0%
Point Resistance Rock SC	25.0%	—	—	—	—	—	—	—	20.0%
Point Reyes Headlands SC	25.0%	—	20.0%	33.3%	—	—	—	—	40.0%
Point Reyes SMCA	25.0%	—	20.0%	33.3%	—	—	—	—	40.0%
Point Reyes SMR	25.0%	—	20.0%	33.3%	—	—	—	—	40.0%
Southeast Farallon Island SC	—	—	100.0%	—	—	—	—	—	100.0%
Southeast Farallon Island SMCA	—	—	100.0%	—	—	—	—	—	100.0%
Southeast Farallon Island SMR	—	—	100.0%	—	—	—	—	—	100.0%
Number of MPAs impacting fishery	6	—	9	4	—	—	—	—	12

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

In addition to impacts on the rockfish fishery (which were indicated by all fishermen who targeted the fishery), CPFV operators in Emeryville mentioned the California halibut and Dungeness crab fisheries were impacted by MPAs. Additionally, some respondents indicated that their non-consumptive activities had been negatively impacted. These impacts, like those for Dungeness crab cannot be shown below in Table 22, due to confidentiality constraints. All those targeting rockfish indicated they could not fish in traditional fishing grounds, 75 percent indicated they were fishing at the borders of MPAs, spending more time fishing/traveling to reach a fishing area, and fishing more frequently in areas with worse or less predictable weather. Additionally, 50 percent of individuals targeting rockfish in Emeryville mentioned they had experienced an increase in fishing pressure and overcrowding in areas that remained open to fishing. Those targeting the California halibut fishery indicated the same type of impacts as those targeting rockfish and the percentage indicating each type can be found below in Table 22.

Similar to Sausalito and Berkeley, CPFV operators in Emeryville reported the highest impacts from the MPAs surrounding the Farallon Islands. One respondent indicated that the areas just offshore of the Farallon Islands provided a safe and well protected fishing area and now they are forced to fish further out in open water. California halibut fishermen reported impacts from the MPAs near Point Reyes as well as Double Point, Duxbury Reef, and Montara. More information can be found in Table 23.

Table 22. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, Emeryville

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	3	2	4	4	3	1	2	1	4
Percent indicating direct impacts from MPAs	66.7%	*	100.0%	—	—	—	*	*	100.0%
Response	**Percent responding**								
Loss of traditional fishing grounds	66.7%	*	100.0%	—	—	—	*	*	100.0%
Fishing at the borders of MPAs	33.3%	*	75.0%	—	—	—	*	*	75.0%
Spending more time fishing/traveling for fishing	33.3%	*	75.0%	—	—	—	*	*	75.0%
Fishing more in areas with worse/less predictable weather	66.7%	*	75.0%	—	—	—	*	*	75.0%
Increased fishing pressure/crowding in open areas	33.3%	*	50.0%	—	—	—	*	*	50.0%
Shift of fishing effort into other fisheries	—	*	—	—	—	—	*	*	—
Loss of highly productive area	—	*	—	—	—	—	*	*	—
Can't approach an area for viewing wildlife due to special closures	—	*	—	—	—	—	*	*	25.0%
Fishing less	—	*	—	—	—	—	*	*	—
Open areas less productive due to increased pressure	—	*	—	—	—	—	*	*	—
Loss of revenue	—	*	—	—	—	—	*	*	—
Increase in operating expenditures (fuel etc.)	—	*	—	—	—	—	*	*	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 23. MPAs impacting specific CPFV fisheries/activities in 2010, Emeryville

	Percent responding								
	Fishery					Activity			
MPA	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	3	2	4	4	3	1	2	1	4
Double Point/Stormy Stack SC	33.3%	*	25.0%	—	—	*	*	*	25.0%
Drake's Estero SMCA	—	*	—	—	—	*	*	*	25.0%
Duxbury Reef SMCA	33.3%	*	—	—	—	*	*	*	25.0%
Montara SMR	33.3%	*	25.0%	—	—	*	*	*	25.0%
North Farallon Islands SC	—	*	100.0%	—	—	*	*	*	100.0%
North Farallon Islands SMR	—	*	100.0%	—	—	*	*	*	100.0%
Point Reyes Headlands SC	66.7%	*	50.0%	—	—	*	*	*	75.0%
Point Reyes SMCA	66.7%	*	75.0%	—	—	*	*	*	75.0%
Point Reyes SMR	33.3%	*	50.0%	—	—	*	*	*	50.0%
Southeast Farallon Island SC	—	*	75.0%	—	—	*	*	*	75.0%
Southeast Farallon Island SMCA	—	*	75.0%	—	—	*	*	*	75.0%
Southeast Farallon Island SMR	—	*	75.0%	—	—	*	*	*	75.0%
Number of MPAs impacting fishery	6	5	10	—	—	—	2	5	12

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

In San Francisco, just across the bay from Emeryville, all respondents reported that their rockfish fishery had been impacted by MPAs, 50 percent of respondents indicated their California halibut fishery had been impacted, and 33.3 percent of striped bass fisherman indicated impacts from MPAs. Like most others in the North Central Coast study region, all fishermen indicating impacts reported not being able to fish in traditional fishing grounds. Additionally, 50 percent of the operators who targeted rockfish in 2010 reported that due to the MPAs they rarely, if ever, target rockfish anymore and have shifted effort into other fisheries. Lastly one respondent indicated fishing rockfish at the borders of MPAs and one indicated experiencing increased fishing pressure and overcrowding in areas that remained open to rockfish fishing.

Like the rest of the Bay Area ports, most fishermen (75 percent) in San Francisco reported impacts on rockfish from the MPAs surrounding the Farallon Islands. They also mentioned the MPAs near Point Reyes and Duxbury Reef. Additionally, one California halibut fishermen reported impacts from Drake's Estero SMCA. Additional information is found below in Table 25.

Table 24. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, San Francisco

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	4	—	4	2	3	1	1	—	4
Percent indicating direct impacts from MPAs	50.0%	—	100.0%	—	33.3%	*	—	—	100.0%
Response	**Percent responding**								
Loss of traditional fishing grounds	50.0%	—	100.0%	—	33.3%	*	—	—	100.0%
Fishing at the borders of MPAs	—	—	25.0%	—	—	*	—	—	25.0%
Spending more time fishing/traveling for fishing	—	—	—	—	—	*	—	—	—
Fishing more in areas with worse/less predictable weather	—	—	—	—	—	*	—	—	—
Increased fishing pressure/crowding in open areas	—	—	25.0%	—	—	*	—	—	25.0%
Shift of fishing effort into other fisheries	—	—	50.0%	—	—	*	—	—	50.0%
Loss of highly productive area	—	—	—	—	—	*	—	—	—
Can't approach an area for viewing wildlife due to special closures	—	—	—	—	—	*	—	—	—
Fishing less	—	—	50.0%	—	—	*	—	—	50.0%
Open areas less productive due to increased pressure	—	—	—	—	—	*	—	—	—
Loss of revenue	—	—	—	—	—	*	—	—	—
Increase in operating expenditures (fuel etc.)	—	—	—	—	—	*	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 25. MPAs impacting specific CPFV fisheries/activities in 2010, San Francisco

MPA	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	4	—	4	2	3	1	1	—	4
Drake's Estero SMCA	25.0%	—	—	—	—	—	—	—	25.0%
Duxbury Reef SMCA	—	—	50.0%	—	—	—	—	—	50.0%
North Farallon Islands SC	—	—	75.0%	—	—	—	—	—	75.0%
North Farallon Islands SMR	—	—	75.0%	—	—	—	—	—	75.0%
Point Reyes Headlands SC	—	—	50.0%	—	—	—	—	—	50.0%
Point Reyes SMCA	—	—	50.0%	—	—	—	—	—	50.0%
Point Reyes SMR	—	—	50.0%	—	—	—	—	—	50.0%
Southeast Farallon Island SC	—	—	75.0%	—	—	—	—	—	75.0%
Southeast Farallon Island SMCA	—	—	75.0%	—	—	—	—	—	75.0%
Southeast Farallon Island SMR	—	—	75.0%	—	—	—	—	—	75.0%
Number of MPAs impacting fishery	1	—	9	—	—	—	—	—	10

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All respondents in Half Moon Bay indicated they targeted rockfish in 2010 and all of them indicated they had been directly impacted by MPAs. All of these fishermen reported they had lost traditional fishing grounds, 71.4 percent indicated they were fishing at the borders of the MPAs and were spending more time fishing or having to travel further distances to reach fishing areas, and 42.9 percent indicated that there was an increase in fishing pressure and overcrowding in fishing areas that remained open to rockfish fishing. Additionally, 66.7 percent of respondents who targeted Dungeness crab in 2010 indicated it had been impacted by MPAs and 50 percent of respondents indicated their salmon fishery had been impacted. CPFV fishermen from Half Moon Bay also indicated that some of their non-consumptive activities had been negatively impacted by MPAs. Specifically, 28.6 percent of respondents mentioned they could not approach an area that was popular for wildlife viewing due to special closures. Additional information regarding the percentage of respondents indicating they were impacted by MPAs for each fishery and activity, as well as the different types of impacts they experienced can be found below in Table 26.

All fishermen we interviewed in Half Moon Bay indicated they had been impacted by Montara SMR, which is located just outside of the Half Moon Bay Harbor and is closed to all commercial and recreational fishing. Montara SMR had the largest impact on the rockfish fishery although some respondents indicated it had also impacted the Dungeness crab and salmon fisheries. Pillar Point SMCA, which is located just south of Montara SMR, impacted 71.4 percent of respondents. Despite this area being open to the recreational take of salmon by trolling; one individual indicated his salmon fishing had been impacted. In general, some fishermen were unaware of regulations for specific MPAs and chose to avoid all areas designated as a protection area.

Aside from the areas right outside of their harbor, fishermen from Half Moon Bay indicated the MPAs surrounding the Farallon Islands also impacted their fishing. Again, these impacts were primarily on the rockfish fishery, although one fisherman indicated his salmon fishing grounds had also been impacted. The MPAs surrounding the South Farallon Island impacted a larger percentage of fishermen (71.4) than those surrounding the North Farallon Island (42.9). Additional information regarding the specific MPAs that impacted each of the CPFV fisheries and activities can be found below in Table 27.

Table 26. Percent of CPFV operators indicating direct impacts from MPAs for each fishery/activity, 2010, Half Moon Bay

	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	—	3	7	6	—	3	4	3	7
Percent indicating direct impacts from MPAs	—	66.7%	100.0%	50.0%	—	—	25.0%	66.7%	100.0%
Response	**Percent responding**								
Loss of traditional fishing grounds	—	66.7%	100.0%	50.0%	—	—	—	—	100.0%
Fishing at the borders of MPAs	—	33.3%	71.4%	16.7%	—	—	—	—	71.4%
Spending more time fishing/traveling for fishing	—	33.3%	71.4%	16.7%	—	—	—	—	71.4%
Fishing more in areas with worse/less predictable weather	—	33.3%	28.6%	16.7%	—	—	—	—	42.9%
Increased fishing pressure/crowding in open areas	—	—	42.9%	16.7%	—	—	—	—	42.9%
Shift of fishing effort into other fisheries	—	—	—	—	—	—	—	—	—
Loss of highly productive area	—	—	14.3%	—	—	—	—	—	14.3%
Can't approach an area for viewing wildlife due to special closures	—	—	—	—	—	—	25.0%	66.7%	28.6%
Fishing less	—	—	—	—	—	—	—	—	—
Open areas less productive due to increased pressure	—	—	—	—	—	—	—	—	—
Loss of revenue	—	—	14.3%	—	—	—	—	—	14.3%
Increase in operating expenditures (fuel etc.)	—	—	14.3%	—	—	—	—	—	14.3%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 27. MPAs impacting specific CPFV fisheries/activities in 2010, Half Moon Bay

MPA	Percent responding								
	Fishery					Activity			
	California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Leisure cruises	Whale watching	Other^	Unique individuals
Number responding	—	3	7	6	—	3	4	3	32
Montara SMR	—	33.3%	100.0%	50.0%	—	—	—	—	100.0%
North Farallon Islands SC	—	—	42.9%	16.7%	—	—	—	—	42.9%
North Farallon Islands SMR	—	—	42.9%	16.7%	—	—	—	—	42.9%
Pillar Point SMCA	—	—	71.4%	16.7%	—	—	—	—	71.4%
Southeast Farallon Island SC	—	—	71.4%	16.7%	—	—	—	33.3%	71.4%
Southeast Farallon Island SMCA	—	—	71.4%	16.7%	—	—	—	—	71.4%
Southeast Farallon Island SMR	—	—	71.4%	16.7%	—	—	—	33.3%	71.4%
Number of MPAs impacting fishery	0	1	7	7	0	0	0	2	7

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

4. NORTH CENTRAL COAST CPFV PORT PROFILES

4.1. Bodega Bay

The port of Bodega Bay is located in Northern California's Sonoma County and is 67 miles north of San Francisco on California Highway 1. Bodega Bay was inhabited by the Pomo and Miwok Indian Tribes when the first Euro-American settlers (Russian fur traders from Alaska) arrived in 1812. (Norman et al, 2007). The population of Bodega Bay was recorded during the 2010 U.S. Census as 1,077 people, which was a decline from 2000 U.S. Census reports. The estimated per capita income (2007-2011) was $52,512 with a mean household income of $96,668 (US Census Bureau 2010). In the mid nineteenth century Bodega Bay became a thriving commercial fishing port and in the 1870's a railroad line allowed the port to enter into the San Francisco market (Norman et al. 2007). The fishing industry in Bodega Bay, which was primarily focused on salmon continued to grow until the early 1990s when salmon landings rapidly declined after peaking in the 1980s. Anthropogenic changes to the landscape and the subsequent loss of salmon spawning habitat are thought to have contributed significantly to this decline. Another threat to fishing in Bodega Bay has been the silting of the bay floor which has decreased the channel size that vessels must transit through to reach the port. It was originally dredged in 1943 and again in 2004-2005 after some parts of the channel reached a depth of only five feet. The tourism industry began to boom in Bodega Bay during the 1980s and today the primary employment sector is 'arts, entertainment, recreation, accommodation and food service' which includes CPFV operations (US Census Bureau 2010).

Targeted species on CPFV trips vary and can include various rockfish, lingcod, salmon, Dungeness crab, and albacore tuna amongst others. In Bodega Bay, a range of vessels (40-65 ft) can accommodate a range of customers (18-40 persons) and take reservations for large groups or individuals. Prices can range from $50 per passenger for whale watching, to $85 for nearshore rockfish trips, and up to $275 for the 30-40 miles offshore albacore tuna trips (USA Sport Fishing 2013 and Bodega Bay Charters 2013).

4.1.1. Bodega Bay CPFV Fisheries Historical Trends and Initial Changes

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

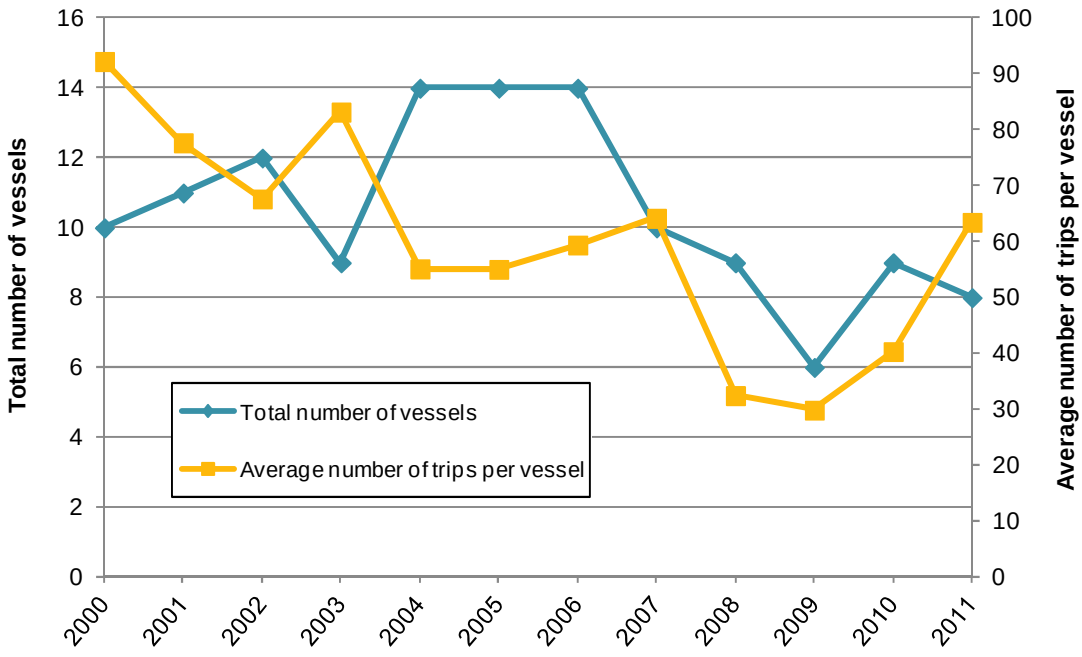
As noted in our methods sections, the data provided here is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here.

The number of vessels operating out of Bodega Bay has been variable from 2000 to 2011 with a max of 14 vessels operating in the region (2004 to 2006) to a low of 6 vessels (2009). In 2011 there were 8 vessels operating in the port a 20 percent decline from the number of vessels in 2000 (Figure 8). The average number of trips per vessel has also been variable but started at a peak in 2000 of an average of 92 trips per vessel to a low of 30 trips per vessel in 2009 during the salmon season closure and increasing to an average of 64 trips per vessel in 2011. The average of 64 trips per vessel in 2011 is higher than the study region average of 41 trips per vessel.

The total number of CPFV fishing trips from Bodega Bay was relatively steady from 2000 to 2006 but from 2006 to 2008 decreased dramatically by approximately 78.4 percent. Since the salmon season was opened again in 2010 the number of trips has begun to increase again, but not to level seen before the salmon closures (Figure 9). However, the average number of anglers per trip has been relatively steady from 2000 to 2011 with a slight increase in 2008 and 2009 during the salmon closures. This increase in 2008 and 2009 may be due to the fact that remaining vessels operating in the port during those years were on average higher capacity vessels.

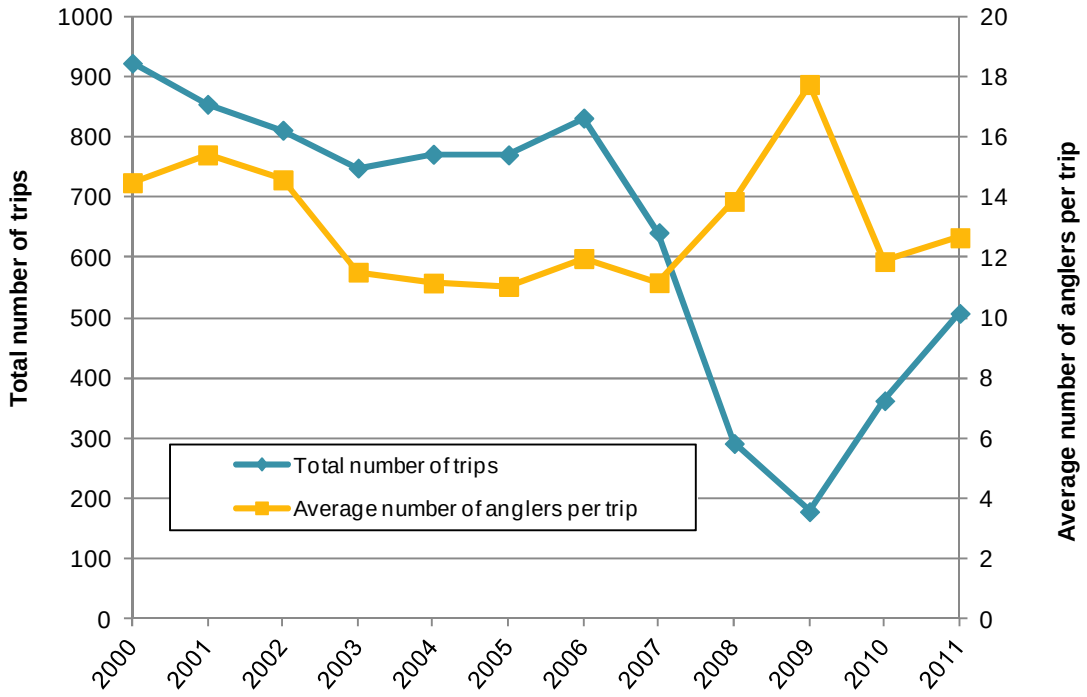
The total number of CPFV anglers in Bodega Bay as well as the average number of anglers per vessel followed similar generally decreasing trends from 2000 to 2011. The total number of anglers was at its highest point in the study period in 2000 (13,378 anglers) and at its lowest in 2009 (3,178 anglers). Since salmon has reopened the total number of angler has been increasing but has not returned to level seen before 2008 (Figure 10).

Figure 8. Total number of CPFV vessels and average number of trips per vessel, Bodega Bay, 2000-2011



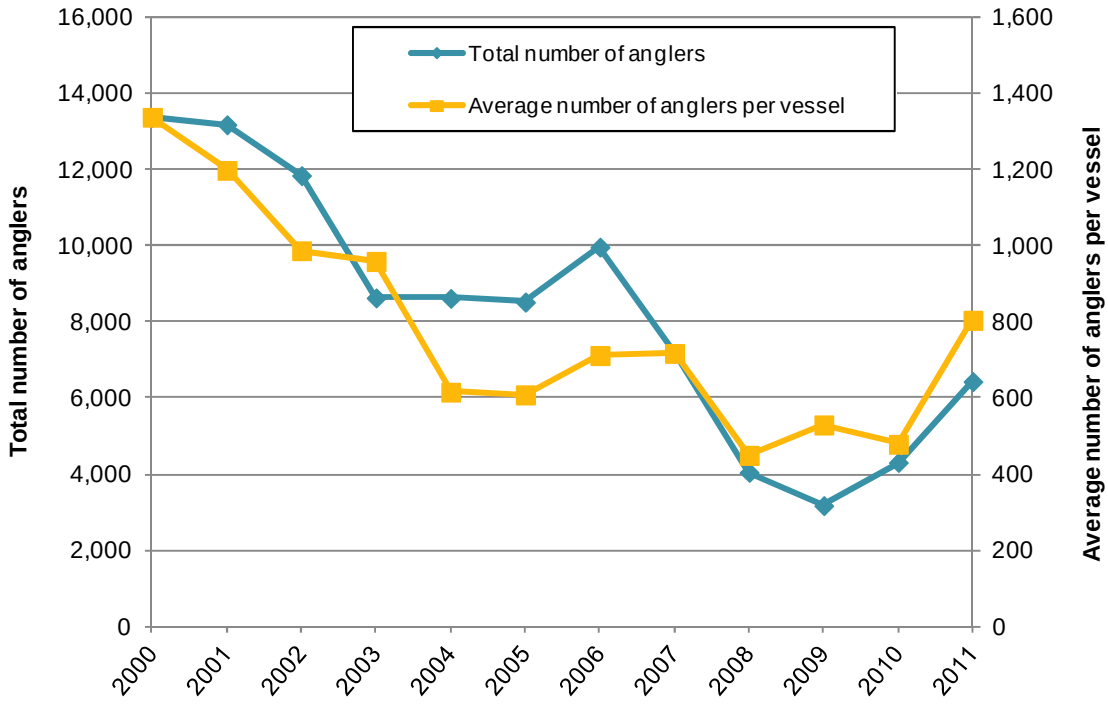
Source: CDFW CPFV logbook data

Figure 9. Total number of CPFV trips and average number of anglers per trip, Bodega Bay, 2000-2011



Source: CDFW CPFV logbook data

Figure 10. Total number of CPFV anglers and average number of anglers per vessel, Bodega Bay, 2000-2011

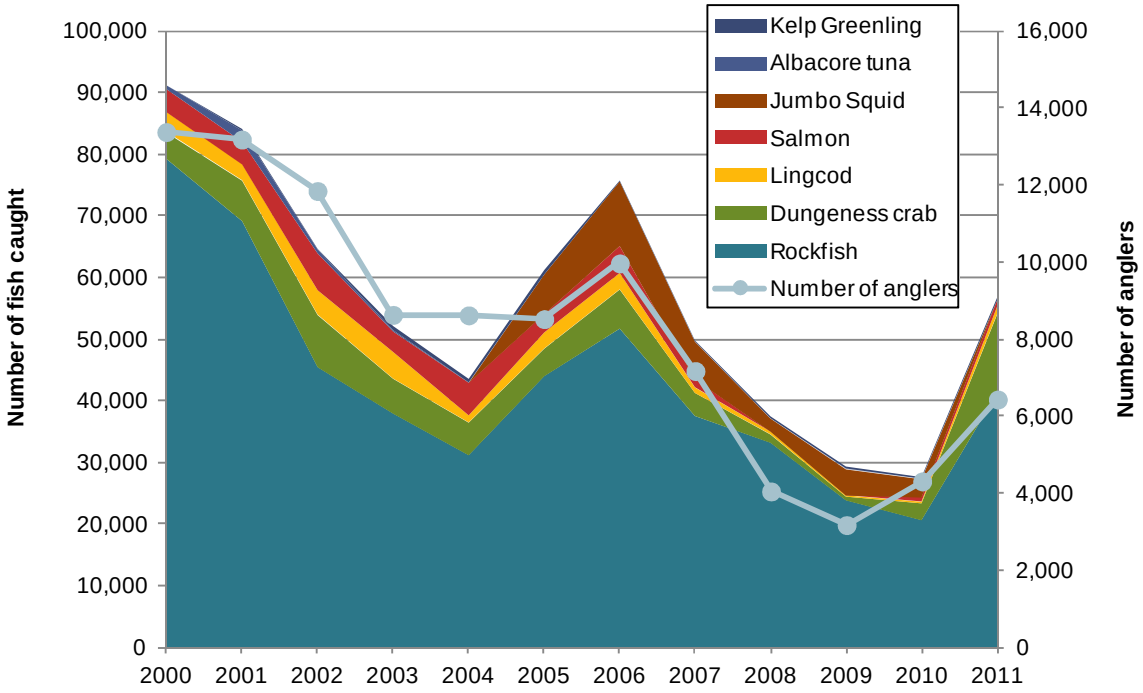


Source: CDFW CPFV logbook data

As seen in Figure 11 the vast majority of the total number of fish caught in Bodega Bay are rockfish (approximately 75.9 percent of total fish caught from 2000 to 2011) followed by Dungeness crab (9.2 percent of total fish caught from 2000 to 2011), salmon (4.9 percent), and Jumbo squid/Humboldt squid (4.9 percent) . The total number of fish caught has been generally decreasing from its peak in 2000 with 92,714 number of fish caught to a secondary peak in 2006 with 77,123 fish caught to approximately 56,755 fish caught in 2011.

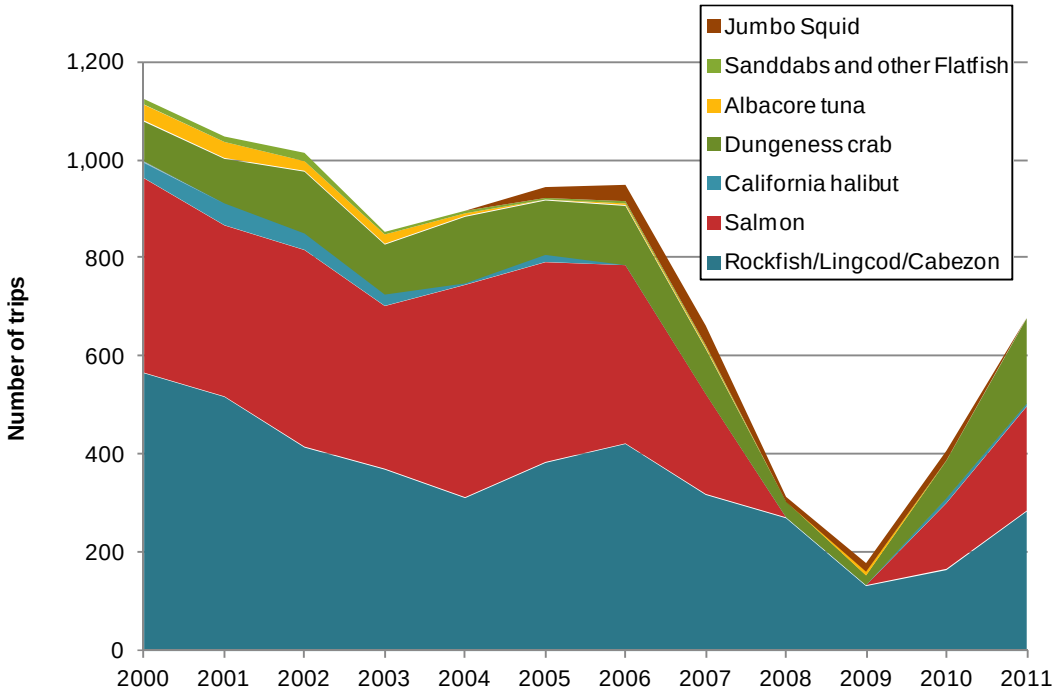
Despite rockfish's dominance in the total number of fish caught, approximately 36 percent of CPFV trips primarily target salmon while 46 percent of trips primarily target rockfish. As with most other trends in this port, the total number of CPFV trips has been declining from 2000 to 2011, starting with a peak in 2000 and a major decline in 2008 and 2009. In 2010 and 2011 salmon trips begin to be operated again and the number of salmon trips in 2011 was slightly above those in 2007. We'd like to note that during the years of a closed salmon season the port also had a decline in the number of rockfish trips as well—demonstrating the impact regulations on a single fishery may have on overall CPFV operations and economics.

Figure 11. CPFV total number of fish caught for each fishery, Bodega Bay, 2000-2011



Source: CDFW CPFV logbook data

Figure 12. Total number of CPFV trips for each target fishery, Bodega Bay, 2000-2011



Source: CDFW CPFV logbook data

4.1.2. Bodega Bay CPFV Fisheries Baseline Characterization

As shown in Table 28 the average individual we interviewed was 52.8 years old, has 16 years of experience owning a CPFV vessel (if applicable) and 21.8 years of experience operating a CPFV vessel. On average, respondents reported that 89 percent of their income came from operating and/or owning a CPFV vessel, which is higher than the regional average of 72.4 percent. Only two CPFV operators indicated they had an additional source of income besides their CPFV operation. One indicated he had a job with the harbor and another mentioned construction work (Table 29).

Table 28. CPFV survey response statistics, 2010, Bodega Bay

	Response	Standard deviation	Number responding
Individuals interviewed	5	n/a	n/a
Owner only	—	n/a	n/a
Average age	52.8	8.4	5
Average number of years owning CPFV boat/s	16.0	10.9	5
Average number of years operating CPFV boat/s	21.8	12.7	4
Average percent income from CPFV operations in 2010	89.0%	16.0%	5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

.

Table 29. Sources of income in 2010 in addition to CPFV operation, Bodega Bay

	Fishery					Activity				
Response	**California halibut**	**Dungeness crab**	**Rockfish**	**Salmon**	**Striped bass**	**Funeral services**	**Leisure cruises**	**Whale watching**	**Other^**	**All target fisheries/ activities (unique individuals)**
Construction/Contractor	1	1	1	1	*	—	—	—	—	1
Harbor/City job	1	1	1	1	*	1	—	—	—	1
Other fishing/boating related work	—	—	—	—	*	—	—	—	—	—
Other specialized work	—	—	—	—	*	—	—	—	—	—
Property management	—	—	—	—	*	—	—	—	—	—
Retirement/Social Security/Investments	—	—	—	—	*	—	—	—	—	—
Skilled labor	—	—	—	—	*	—	—	—	—	—
Number of individuals responding	2	2	2	2	*	1	—	—	—	2

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in Bodega Bay reported earning a gross economic revenue (GER) of $91,800 in 2010, lower than the regional average of $105,423. Additionally, respondents in Bodega Bay reported they spent an average of 19.3 GER on fuel, 1.5 percent on crew, and 50.8 percent on all other operating costs. Expenses for fuel and crew in Bodega Bay were lower than the study region as a whole (22.9 percent and 12.3 percent, respectively, across the region) but higher for other operating costs (37.5 for the entire study region). After costs, respondents in Bodega Bay made an average of $26,163 in 2010.

Table 30. Average CPFV gross economic revenue (GER) to operating costs in 2010, Bodega Bay

	Number responding	Average response	Standard deviation
Total GER 2011	5	$91,800	$63,216
% GER to fuel	4	19.3%	8.6%
% GER to crew	4	1.5%	3.0%
% GER to other operating costs	4	50.8%	29.8%

Source: Current study

All five respondents conducted consumptive fishing trips in 2010 but only four conducted non-consumptive trips. The average fishing trip out of Bodega Bay was $127 and had 8.4 passengers on board while the average non-consumptive trip was $53 per passenger and had 11.8 passengers on board. Additional information regarding consumptive and non-consumptive trips can be found below in Table 31.

Table 31. CPFV trip statistics, 2010, Bodega Bay

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	5	n/a	n/a	4	n/a
Average number of trips in 2010	5	124.0	32.9	3	8.7	3.1
Average number of passengers(per trip)	5	8.4	6.5	4	11.8	12.2
Average price per passenger (per trip)	5	$127	$23	2	$53	$4
Average number of crew (per trip)	5	0.6	0.9	2	0.5	0.7

Source: Current study

For each fishery and activity they targeted in 2010, CPFV fishermen were asked how many days they spent targeting that fishery/activity and what percent of their GER they earned from that fishery/activity (Table 32). The highest percentage of GER attributed to a single fishery in Bodega Bay was 34.8 percent, which came from rockfish. Respondents indicated targeting salmon 52.5 days out of the year, which generated the second highest percent of GER (32 percent) attributed to a single fishery in Bodega Bay. The only non-consumptive activity reported in Bodega Bay was funeral services and on average respondents reported conducting trips 8.7 days per year for an average of 3 percent of their GER.

Table 32. Number of days targeting and percent of GER from fishery/activity in 2010, CPFV, Bodega Bay

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	3	3	26.7	20.8	3	14.3%	22.2%
	Dungeness crab	4	4	33.3	22.7	4	13.5%	8.1%
	Rockfish	5	4	43.8	18.9	5	34.8%	17.1%
	Salmon	5	4	52.5	28.7	5	32.0%	17.9%
	Striped bass	1	1	*	*	1	*	*
Activity	Funeral services	3	3	8.7	3.1	3	3.0%	2.0%
	Leisure cruises	—	—	—	—	—	—	—
	Whale watching	—	—	—	—	—	—	—
	Other^	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare the success in each of their target fisheries and non-consumptive activities in 2010 to the previous five years. As shown below in Table 33, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse. Respondents were then asked what factors they felt had contributed to the change in success in their fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

In general, trends in Bodega Bay were similar to average trends across the study region (see Table 33). Most fishermen indicated that their success in the rockfish fishery was either significantly worse (40 percent of respondents) or somewhat worse (20 percent of respondents) and the remaining individuals noted it was the same (40 percent of respondents). All those who targeted salmon in 2010 expressed that their success in the fishery was either significantly worse (40 percent) or somewhat worse (20 percent) except for one fisherman who indicated it was significantly better. This fisherman explained that he was making more revenue on salmon trips than he had in previous years, but also mentioned that he was putting more effort into the fishery than he had before the 2008 and 2009 closures (Table 37). Fishermen indicated that the overall success in both the salmon and rockfish fishery had been impacted by the MPAs (Table 34). Additional reasons that fishermen cited as impacting the overall success in their different fisheries can be found in Table 34 through Table 37.

Table 33. Overall success in CPFV fishery/activity in 2010 compared to past five years, Bodega Bay

Fisheries		Number responding	Percent responding: Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	California halibut	3	—	33.3%	—	33.3%	33.3%
	Dungeness crab	4	50.0%	25.0%	25.0%	—	—
	Rockfish	5	—	—	40.0%	20.0%	40.0%
	Salmon	5	20.0%	—	—	20.0%	60.0%
	Striped bass	1	*	*	*	*	*
Activity	Funeral services	3	—	—	100.0%	—	—
	Leisure cruises	—	—	—	—	—	—
	Whale watching	—	—	—	—	—	—
	Other ^	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 34. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Bodega Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	1	—	2	3	*	—	—	—	—
	Response	**Count of responses**								
Negative	Regulated season too short	—	—	—	1	*	—	—	—	—
	MPAs	1	—	2	2	*	—	—	—	—
	More pressure on fishery	—	—	—	—	*	—	—	—	—
	Rockfish Conservation Areas	—	—	—	—	*	—	—	—	—
Positive	Fishery closed in previous seasons	—	—	—	1	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 35. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Bodega Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	2	3	2	4	*	—	—	—	—
	Response	**Count of responses**								
Positive	Large quantity of fish	1	2	—	1	*	—	—	—	—
	Peak of natural cycle	—	1	—	—	*	—	—	—	—
	Good ocean conditions	—	—	—	—	*	—	—	—	—
Negative	Low quantity of fish	1	—	—	3	*	—	—	—	—
	Low of natural cycle	—	—	—	—	*	—	—	—	—
	Bad weather	—	—	—	—	*	—	—	—	—
	Poor ocean conditions	—	—	—	—	*	—	—	—	—
	More bait/feed in water - causing fish to bite less	—	—	—	—	*	—	—	—	—
	Loss of salmon spawning grounds	—	—	—	—	*	—	—	—	—
	Fish are smaller	—	—	2	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 36. Economic changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Bodega Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	2	—	*	—	—	—	—
	Response	**Number responding**								
Positive	Good/new market opportunity	—	—	—	—	*	—	—	—	—
Negative	Lack of customers	—	—	1	—	*	—	—	—	—
	Bad economy	—	—	—	—	*	—	—	—	—
	Fuel costs	—	—	1	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 37. Other changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Bodega Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	—	1	*	—	—	—	—
	Response	**Number responding**								
Positive	Diversifying portfolio of fisheries/activities	—	—	—	—	*	—	—	—	—
	Putting more effort into fishery/activity	—	—	—	1	*	—	—	—	—
Negative	Others are diversifying - adding competition to fishery/activity	—	—	—	—	*	—	—	—	—
	Putting less effort into fishery/activity	—	—	—	—	*	—	—	—	—
	Personal reasons	—	—	—	—	*	—	—	—	—
	Too many other boats/overcrowding	—	—	—	—	*	—	—	—	—
	Drag boats are depleting resource	—	—	—	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

4.2. Sausalito

Sausalito, in Marin County, is directly north of San Francisco across from the Golden Gate Bridge. The area was originally inhabited by the Coastal Miwok. In the late 1700s Spanish explorers arrived and later Sausalito was resettled in 1838 through a Mexican land grant (City of Sausalito, 2013; Sausalito Historical Society, 2010). According to the 2010 US Census, Sausalito had 7,061 residents, and the estimated per capita income was $84,618 (2007-2011) with a mean household income of $147,374 (US Census Bureau, 2010). Following the end of World War II, many of the city's docks and industrial areas were repurposed as marinas and harbors. Today there are several of these facilities and CPFV operators run out of various marinas and offer fishing trips, leisure cruises, and other activities both inside the San Francisco Bay and in the open ocean (City of Sausalito, 2013).

Sausalito CPFV operators mainly target the recreational salmon fishery; however CPFV operators also target various other species including rockfish, lingcod, striped sea bass, and albacore tuna. The vessels operating out of Sausalito generally range from 43 to 56 feet and can accommodate a range of customers (up to 32 persons) and take reservations for large groups or individuals. Fishing rods and tackle can be rented on most vessels, but customers are expected to bring state issued recreational fishing licenses and appropriate stamps (San Francisco Sport Fishing, 2013).

4.2.1. Sausalito CPFV Fisheries Historical Trends and Initial Changes

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

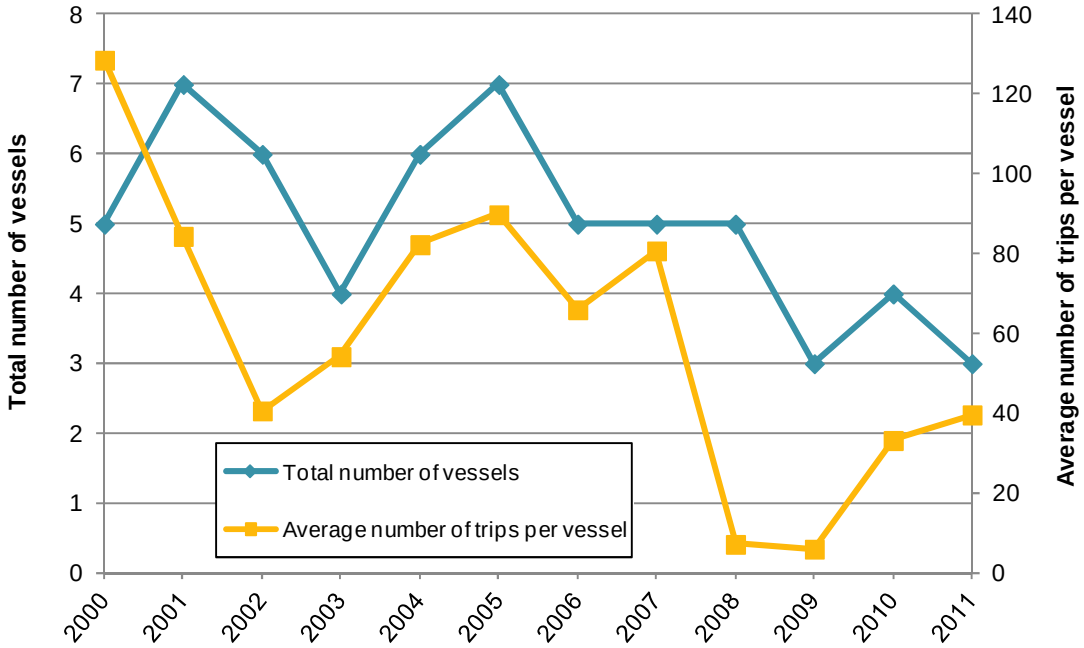
As noted in our methods sections, the data provided here is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here.

The number of vessels operating out of Sausalito has been variable from 2000 to 2011 with a max of 7 vessels operating in the region (in 2001 and 2005) to a low of 3 vessels (in 2009 and 2011). In 2011 there were 3 vessels operating in the port a 40 percent decline from the number of vessels in 2000 (Figure 13). The average number of trips per vessel has also been variable but has significantly declined across the study period. The average number of trips per vessel started at a peak in 2000 of an average of 129 trips per vessel to a low of 6 trips per vessel in 2009 during the salmon season closure and increasing to an average of 40 trips per vessel in 2011 which is on par with the study region average of 41 trips per vessel.

As the Sausalito port is largely a CPFV salmon port its economic health is closely tied to that of the health of the salmon populations. The total number of CPFV fishing trips from Sausalito was highly variable from 2000 to 2011 and decreased dramatically in 2002-2003 and again in 2008 and 2009. Overall, the number of CPFV fishing trips has declined approximately 81.4 percent from 2000 to 2011. Since the salmon season was opened again in 2010 the number of trips has begun to increase since its low of 18 trips in 2008, but not to level seen before the salmon closures (Figure 14). However, the average number of anglers per trip has been relatively steady from 2000 to 2011.

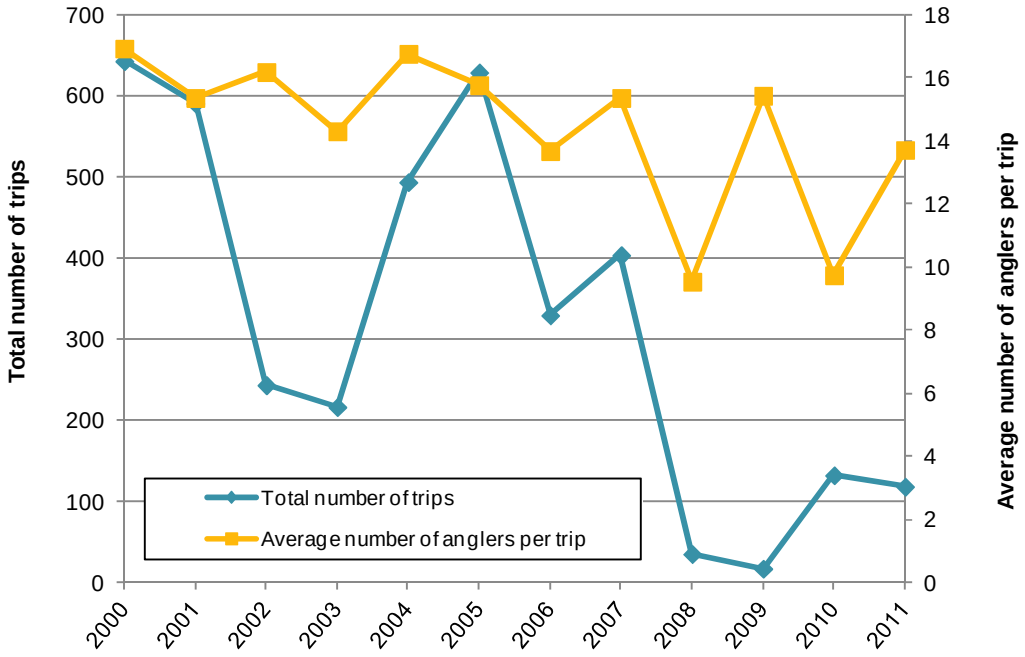
The total number of CPFV anglers in Sausalito as well as the average number of anglers per vessel followed similar variable but sharply decreasing trends from 2000 to 2011. The total number of anglers was at its highest point in the beginning of the study period in 2000 (10,889 anglers) and at its lowest in 2009 (278 anglers). Since salmon has reopened the total number of anglers has been increasing but not to the numbers seen before 2008. In 2011 the number of anglers was approximately 73.7 percent less than the number of anglers in 2007 (Figure 15).

Figure 13. Total number of CPFV vessels and average number of trips per vessel, Sausalito, 2000-2011



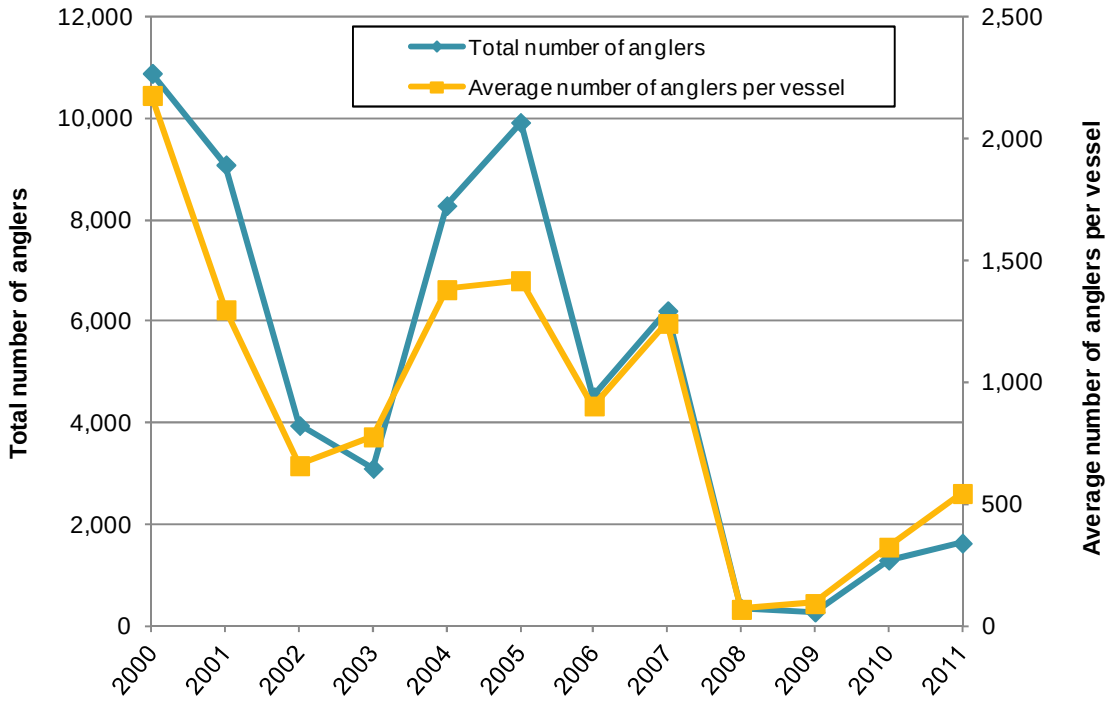
Source: CDFW CPFV logbook data

Figure 14. Total number of CPFV trips and average number of anglers per trip, Sausalito, 2000-2011



Source: CDFW CPFV logbook data

Figure 15. Total number of CPFV anglers and average number of anglers per vessel, Sausalito, 2000-2011

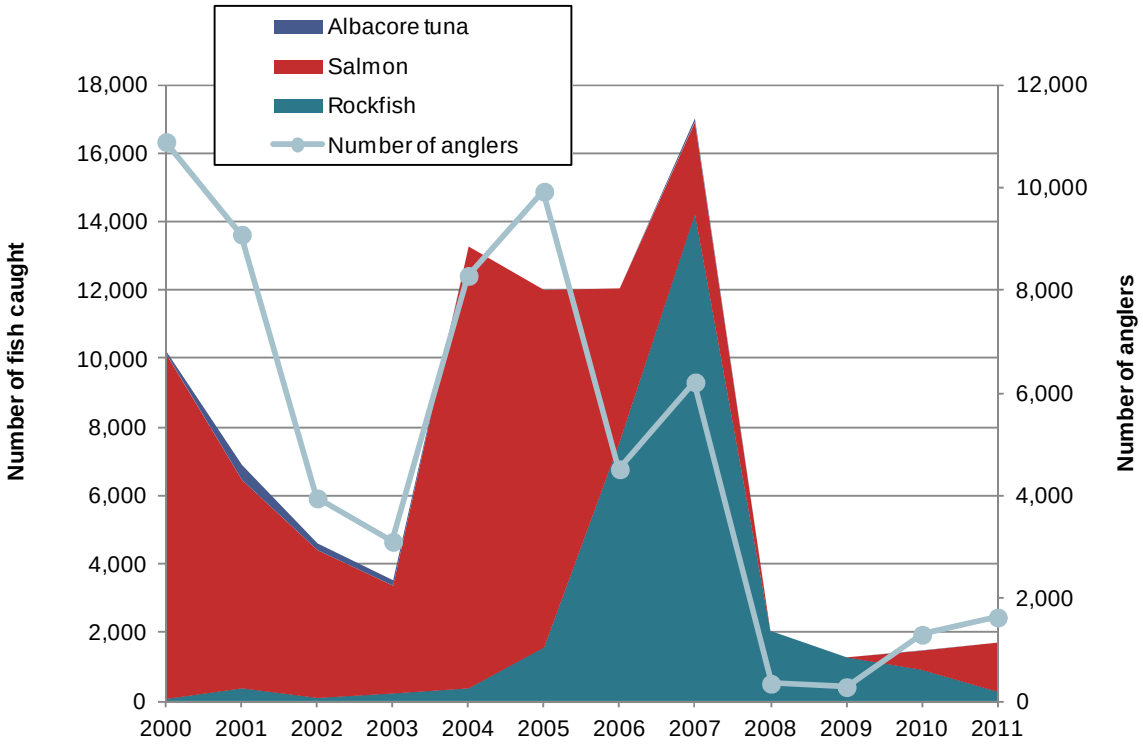


Source: CDFW CPFV logbook data

As seen in Figure 16 the vast majority of the total number of fish caught in Sausalito is salmon (approximately 62.9 percent of total fish caught from 2000 to 2011) followed by Rockfish (32.5 percent of total fish caught from 2000 to 2011. The total number of fish caught has decreased from 2000 to 2011 by approximately 82.8 percent but has been variable during this time with peaks in catch from 2003 to 2007—with a peak in 2007 with 17,468 fish caught. Although Sausalito is primarily a salmon CPFV port during the peak in 2007 approximately 81.4 of the catch was rockfish and 15.4 percent was salmon.

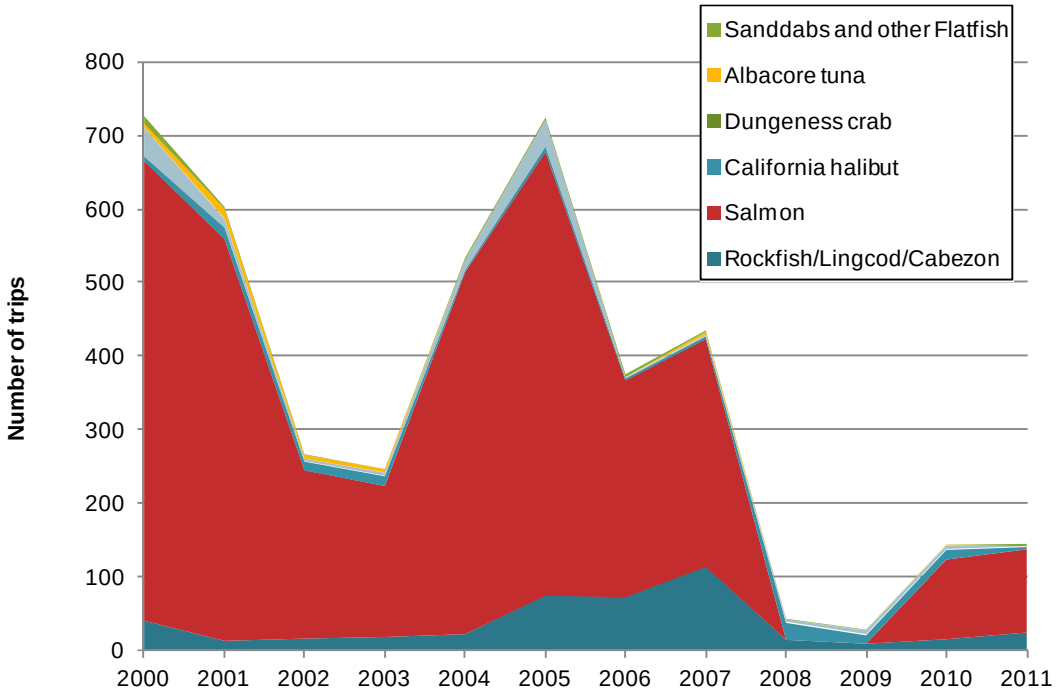
Despite the abundance of rockfish caught in 2006 and 2007 approximately 83% of all CPFV trips from 2000 to 2011 in Sausalito are trips that primarily target salmon. As with most trends in this port, the total number of CPFV trips has been declining from 2000 to 2011 by approximately 80.1 percent, starting with a peak in 2000 with 730 trips and a major decline in 2002 and 2003 with significant increases in 2004 to 2005 but then declining drastically in 2008 and 2009. In 2010 and 2011 salmon trips begin to be operated again but not to levels seen before 2008.

Figure 16. CPFV total number of fish caught for each fishery, Sausalito, 2000-2011



Source: CDFW CPFV logbook data

Figure 17. Total number of CPFV trips for each target fishery, Sausalito, 2000-2011



Source: CDFW CPFV logbook data

4.2.2. Sausalito CPFV Fisheries Baseline Characterization

We interviewed five owner/operators in Sausalito who reported making an average of 60 percent of their income from CPFV operations, which was less than the regional average of 72.4 percent. On average respondents in Sausalito were 55.8 years old in 2010 at the time of interview, had owned CPFV boats for 25.8 years and operated them for 26.4 years (Table 38). Three individuals from Sausalito indicated they had other sources of income (Table 39), two of whom said the income came from another fishing related job, such as commercial fishing or gear sales, and one indicated he worked in property management.

Table 38. CPFV survey response statistics, 2010, Sausalito

	Response	Standard deviation	Number responding
Individuals interviewed	5	n/a	n/a
Owner only	—	n/a	n/a
Average age	55.8	15.3	5
Average number of years owning CPFV boat/s	25.8	12.6	5
Average number of years operating CPFV boat/s	26.4	13.2	5
Average percent income from CPFV operations in 2010	60.0%	41.8%	5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 39. Sources of income in 2010 in addition to CPFV operation, Sausalito

	Fishery					Activity				
Response	**California halibut**	**Dungeness crab**	**Rockfish**	**Salmon**	**Striped bass**	**Funeral services**	**Leisure cruises**	**Whale watching**	**Other^**	**All target fisheries/ activities (unique individuals)**
Construction/Contractor	—	—	—	—	—	*	*	*	—	—
Harbor/City job	—	—	—	—	—	*	*	*	—	—
Other fishing/boating related work	1	—	1	2	1	*	*	*	—	2
Other specialized work	—	—	—	—	—	*	*	*	—	—
Property management	1	—	—	1	1	*	*	*	—	1
Retirement/Social Security/Investments	—	—	—	—	—	*	*	*	—	—
Skilled labor	—	—	—	—	—	*	*	*	—	—
Number of individuals responding	2	—	1	3	2	*	*	*	—	3

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in Sausalito reported earning a gross economic revenue (GER) of $87,000 in 2010, which is lower than the regional average of $105,423. Additionally, respondents in Sausalito reported they spent an average of 17.4 percent of their gross GER on fuel, 14 percent on crew, and 48 percent on other operational expenses. Expenses for fuel were lower in Sausalito than the study region as a whole (22.9 percent for the region) and higher for crew and other operating costs (12.3 and 37.5 percent, respectively). After costs, respondents in Sausalito made an average net revenue of $17,922 in 2010.

Table 40. Average CPFV gross economic revenue (GER) to operating costs in 2010, Sausalito

	Number responding	Average response	Standard deviation
Total GER 2011	5	$87,000	$24,393
% GER to fuel	5	17.4%	8.0%
% GER to crew	5	14.0%	12.0%
% GER to other operating costs	5	48.0%	29.5%

Source: Current study

The five Sausalito operator/owners interviewed all operated fishing trips in 2010 and two of them operated non-consumptive trips. On average respondents from Sausalito conducted fewer consumptive trips than the rest of the study region (36.2 compared to 78.9 for the region), but slightly more non-consumptive trips (37.3 compared to 35.4 for the region). Fishing trips from Sausalito averaged $99 per trip per person and had 12.1 passengers while non-consumptive trips were an average of $90 per trip per person but had an average of 19.5 passengers on board. Additional information can be found below in Table 41.

Table 41. CPFV trip statistics, 2010, Sausalito

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	5	n/a	n/a	4	n/a
Average number of trips in 2010	5	36.2	14.7	4	37.3	25.8
Average number of passengers(per trip)	5	13.4	2.3	4	19.5	12.8
Average price per passenger (per trip)	5	$99	$3	2	$90	$14
Average number of crew (per trip)	5	1.2	0.4	3	1.0	1.0

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Respondents in Sausalito reported that nearly two thirds of their GER came from salmon trips in 2010 (64.3 percent) and that they targeted salmon an average of 32 days per year. Additionally, they reported only generating 2.7 percent of their GER from rockfish, targeting it only 3 days per year. This is different than the region as a whole, which reported 22.1 days salmon fishing for 25.8 percent of GER and 39.8 days fishing for rockfish, generating 35 percent of the average respondents GER. Additional information regarding the number of days targeting a specific fishery and the percent of gross economic revenue generated from each fishery in Sausalito can be found below in Table 42.

Table 42. Number of days targeting and percent of GER from fishery/activity in 2010, CPFV, Sausalito

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	3	2	6.5	2.1	2	2.5%	0.7%
	Dungeness crab	—	—	—	—	—	—	—
	Rockfish	3	3	3.0	2.0	3	2.7%	2.1%
	Salmon	5	4	32.0	15.6	4	64.3%	38.5%
	Striped bass	3	2	6.5	2.1	2	1.5%	0.7%
Activity	Funeral services	1	—	—	—	—	—	—
	Leisure cruises	1	—	—	—	—	—	—
	Whale watching	1	1	*	*	1	*	*
	Other	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare the success in each of their target fisheries and non-consumptive activities in 2010 to the previous five years. As shown below in Table 43, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse. Respondents were then asked what factors they felt had contributed to the change in success in their fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Sausalito indicated that their level of success was either worse or the same across all fisheries they participated in (Table 43). Four out of five respondents indicated that the salmon fishery was significantly worse and the fifth salmon operator did not respond to the question. For the salmon fishery they indicated that the season was short and there was a low quantity of fish, while for rockfish they mentioned poor oceanic conditions and regulations such as MPAs and the Rockfish Conservation Areas (Table 44 and Table 45).

Table 43. Overall success in CPFV fishery/activity in 2010 compared to past five years, Sausalito

Fisheries		Number responding	Percent responding: Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	California halibut	3	—	—	33.3%	33.3%	33.3%
	Dungeness crab	—	—	—	—	—	—
	Rockfish	3	—	—	—	33.3%	66.7%
	Salmon	4	—	—	—	—	100.0%
	Striped bass	3	—	—	33.3%	33.3%	33.3%
Activity	Funeral services	1	*	*	*	*	*
	Leisure cruises	1	*	*	*	*	*
	Whale watching	1	*	*	*	*	*
	Other ^	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 44. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Sausalito

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	2	2	—	*	*	*	—
	Response	**Count of responses**								
Negative	Regulated season too short	—	—	—	2	—	*	*	*	—
	MPAs	—	—	1	—	—	*	*	*	—
	More pressure on fishery	—	—	—	—	—	*	*	*	—
	Rockfish Conservation Areas	—	—	1	—	—	*	*	*	—
Positive	Fishery closed in previous seasons	—	—	—	—	—	*	*	*	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 45. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Sausalito

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	2	—	2	4	1	*	*	*	—
	Response	**Count of responses**								
Positive	Large quantity of fish	—	—	—	—	—	*	*	*	—
	Peak of natural cycle	—	—	—	—	—	*	*	*	—
	Good ocean conditions	—	—	—	—	—	*	*	*	—
Negative	Low quantity of fish	2	—	—	4	1	*	*	*	—
	Low of natural cycle	—	—	—	—	—	*	*	*	—
	Bad weather	—	—	—	—	—	*	*	*	—
	Poor ocean conditions	—	—	1	—	—	*	*	*	—
	More bait/feed in water - causing fish to bite less	—	—	1	—	—	*	*	*	—
	Loss of salmon spawning grounds	—	—	—	—	—	*	*	*	—
	Fish are smaller	—	—	—	—	—	*	*	*	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: Bird watching, recreational diving, and nature trips.

4.3. Berkeley

Berkeley, in northern Alameda County, was originally inhabited by an indigenous group, now called the Ohlone. The first Europeans came to the San Francisco Bay area in the late 1700s from Spain (Wollenberg, 2002). According to the 2010 US Census, Berkeley had 112,580 residents, and the estimated per capita income (2007-2011) was $38,887 with a mean household income of $93,550 (US Census Bureau, 2010). In 1926, the city wharf was built out and became Berkeley Pier which originally extended 3.5 miles into San Francisco Bay leading to a ferry dock. When the Bay Bridge was built the ferry was discontinued and the pier became a popular recreational fishing spot (Todd 2010). The Berkeley Harbor now offers over 1,000 berths up to 110 feet long and a number of recreational facilities including a number of CPFV operations (City of Berkeley 2013).

Berkeley CPFV operators target various species including rockfish, lingcod, salmon, Dungeness crab, and albacore tuna. The CPFV operators out of Berkeley also offer 'potluck' fishing at a fixed rate, which is fishing for whatever the season and day's conditions dictate. A fleet of vessels (43-56 feet) can accommodate a range of customers (up to 49 persons) and take reservations for large groups or individuals. Prices can vary on the type and length of trip. Fishing rods and tackle can be rented on most vessels, but customers are expected to bring state issued recreational fishing licenses and appropriate stamps (Berkeley Marina Sportfishing 2013).

4.3.1. Berkeley CPFV Fisheries Historical Trends and Initial Changes

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

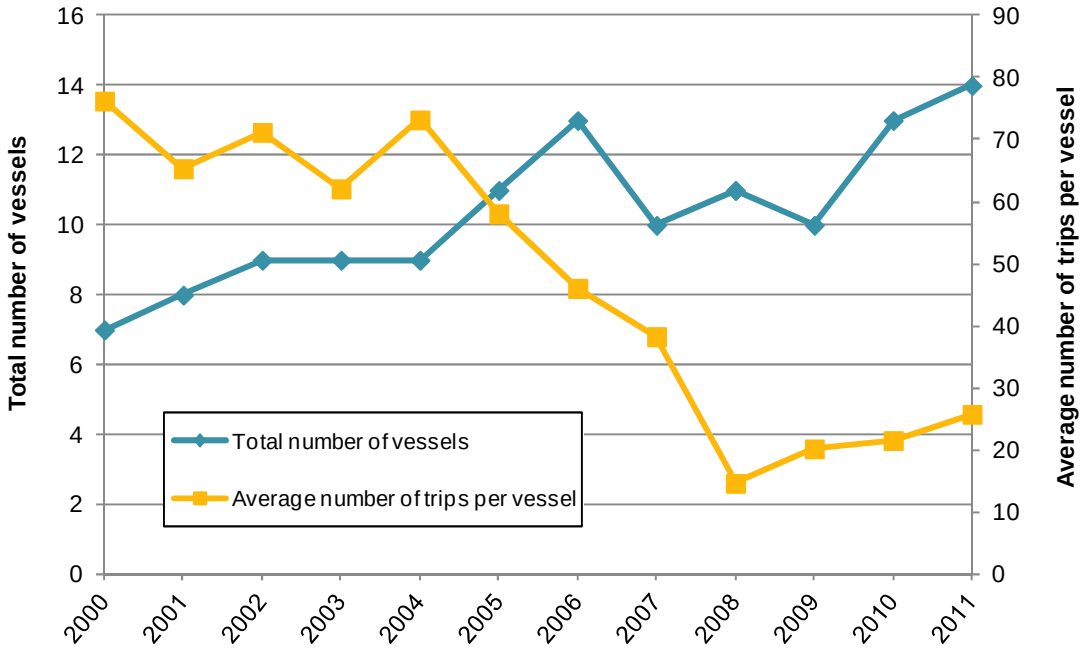
As noted in our methods sections, the data provided here is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here.

The number of vessels operating out of Berkeley has been increasing from 2000 to 2011 starting from its lowest of 7 vessels in 2000 to a peak of 14 vessels in 2011 (Figure 18). The average number of trips per vessel however, saw a significant decline starting in 2004 and reached its lowest point in 2008 an average of 15 trips per vessel—an 80 percent decline from averages in 2004. Although the number of vessels increased over time, vessels may have been operating less due to several reasons such as economic decline and increasing fishery regulations. Since 2007 the average number of trips per vessel has increased slightly to approximately 26 trips per vessel—however this is significantly lower than the study region average in 2011 of 41 trips per vessel.

Indeed, the total number of trips follows similar trends to that of the average number of trips per vessel in that the number of trips was relatively steady from 2000 to 2006 (with a peak in 2004 of 659 trips) until a significant decline in 2007 and 2008 (Figure 19). In 2008 the total number of trips reached its lowest point in the study period with 161 total trips. The total number of trips has increased since its low in 2008 however has not recovered to the number of trips seen before 2008.

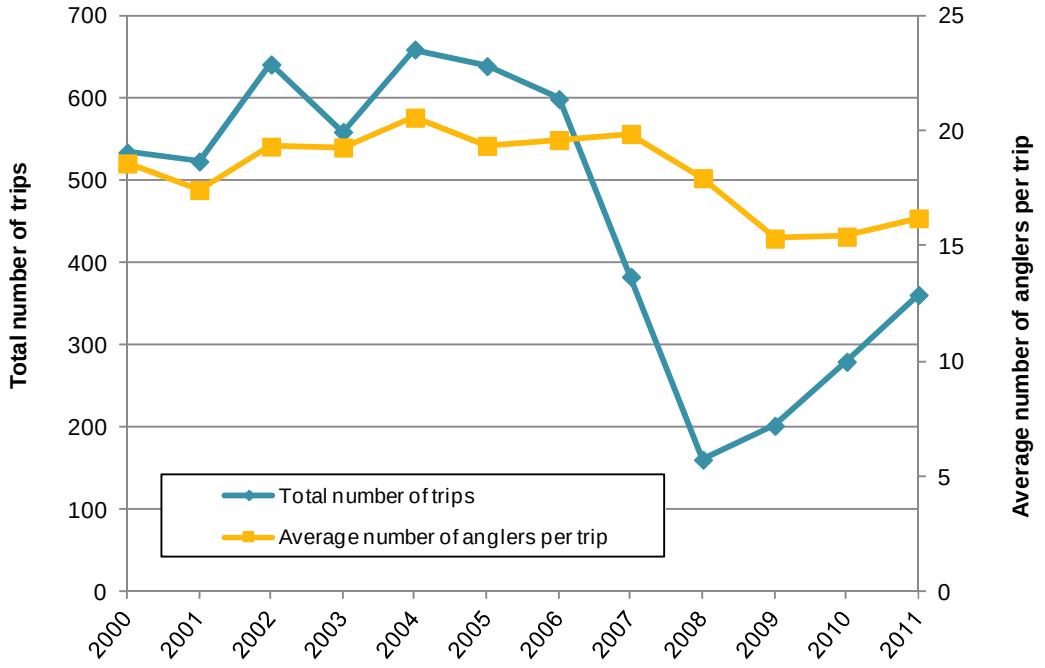
The total number of CPFV anglers in Berkeley as well as the average number of anglers per vessel followed similar generally decreasing trends from 2000 to 2011. The total number of anglers was at its highest point in the study period in 2004 (13,562 anglers) and at its lowest in 2008 (2,891 anglers). Since salmon has reopened the total number of angler has been increasing but has not returned to level seen before 2008 (Figure 20).

Figure 18. Total number of CPFV vessels and average number of trips per vessel, Berkeley, 2000-2011



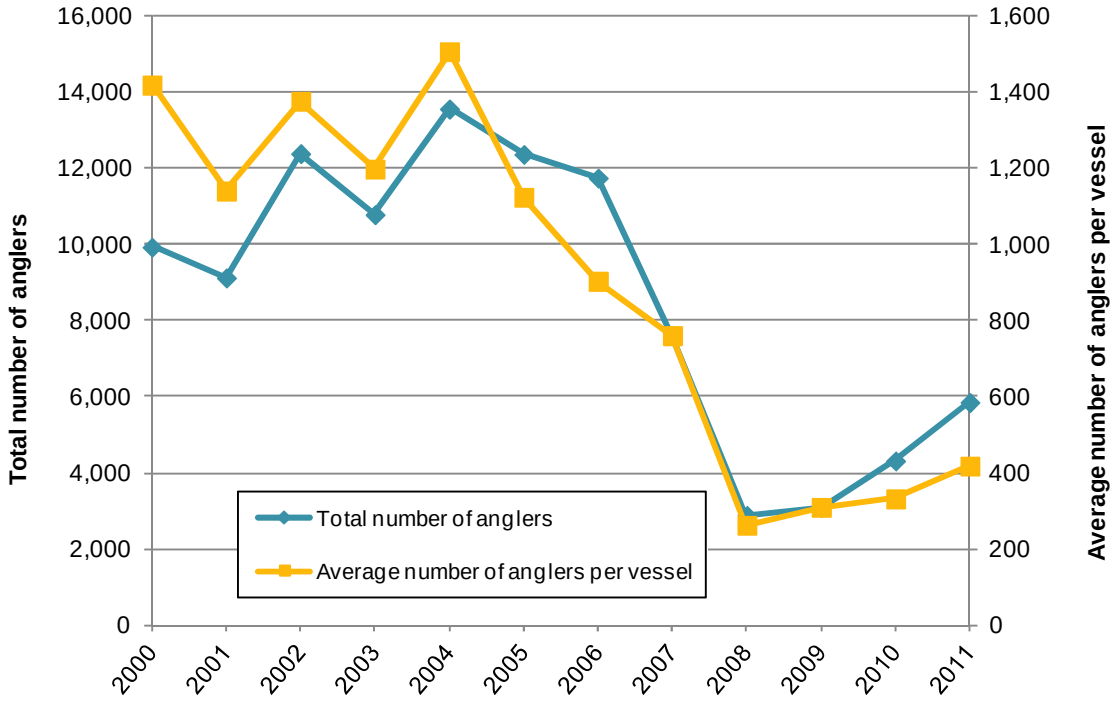
Source: CDFW CPFV logbook data

Figure 19. Total number of CPFV trips and average number of anglers per trip, Berkeley, 2000-2011



Source: CDFW CPFV logbook data

Figure 20. Total number of CPFV anglers and average number of anglers per vessel, Berkeley, 2000-2011



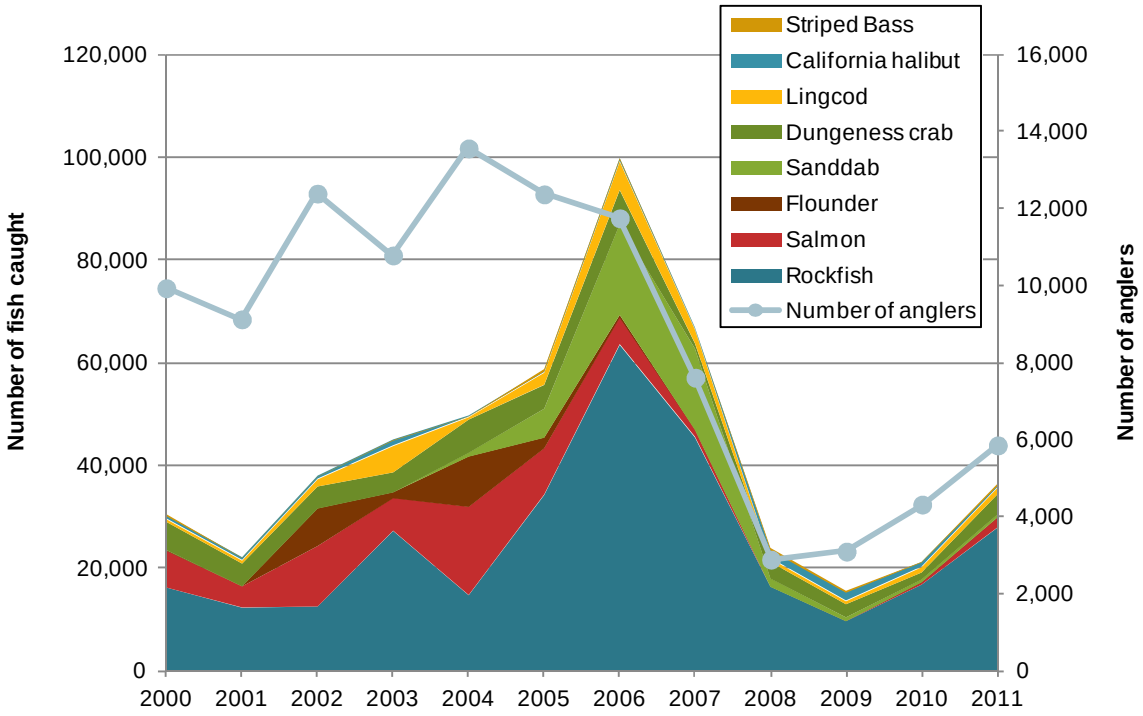
Source: CDFW CPFV logbook data

As seen in Figure 21 the vast majority of the total number of fish caught in Berkeley are rockfish (approximately 61.6 percent of total fish caught from 2000 to 2011) followed by salmon (13.4 percent of total fish caught from 2000 to 2011), and Dungeness crab (10 percent). The total number of fish caught has been highly variable with a peak in 2006 with approximately 87,482 fish caught.

It is interesting to examine Figure 21 alongside Figure 22 as one can observe the large gap between the number of anglers and the total number of fish caught from 2000 to 2005. However, when examining Figure 22 one can see that most trips targeted the salmon fishery which corroborates the results seen in Figure 21 as the salmon fishery has significantly lower bag/catch limits than the rockfish fishery.

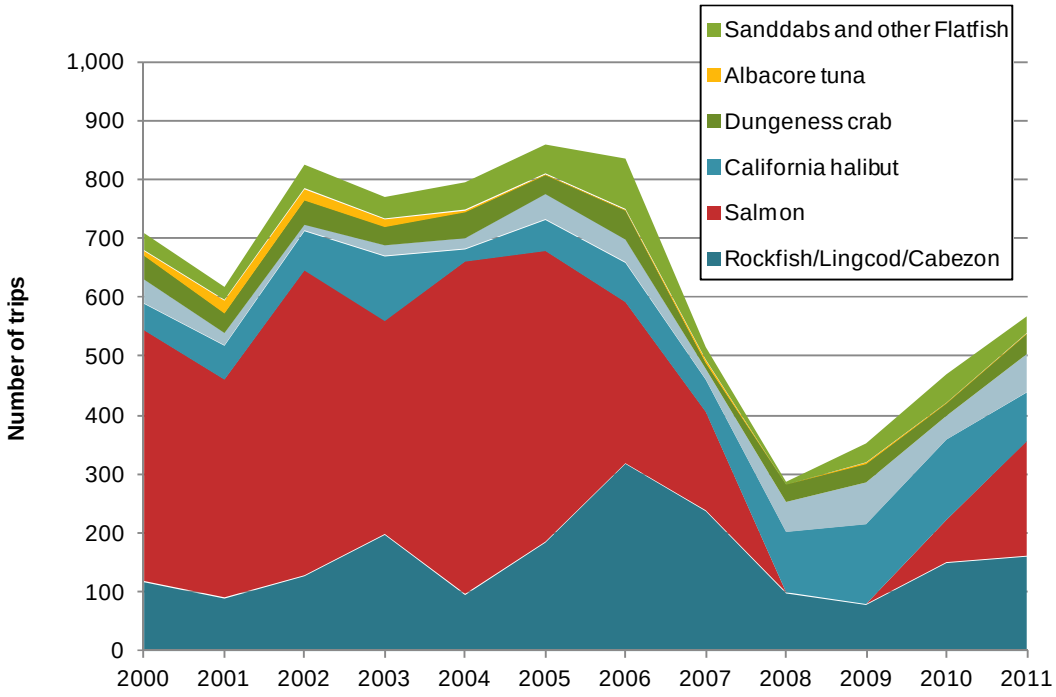
As see in Figure 22, the port of Berkeley conducted a large number of trips targeting the salmon fishery consisting of approximately 45.4 percent of all trips from 2000 to 20011, the rockfish fishery was the second most popular trip with 24.3 percent of all trips, and California halibut trips consisted of 12.3 percent of all trips. Trends in the number of CPFV trips follow those similar to the total number of anglers with a steady number of trips from 2000 to 2006 until a significant decline in 2008 to 2009 during the salmon fishery closures. Since then the total number of trips have begun to recover, with notably relatively more California halibut trips operated.

Figure 21. CPFV total number of fish caught for each fishery, Berkeley, 2000-2011



Source: CDFW CPFV logbook data

Figure 22. Total number of CPFV trips for each target fishery, Berkeley, 2000-2011



Source: CDFW CPFV logbook data

4.3.2. Berkeley CPFV Fisheries Baseline Characterization

We interviewed five CPFV owner/operators in Berkeley and they reported making an average of 94 percent of their total personal income from CPFV fishing. This was higher than the regional average of 72.4 percent and the highest percent of any port in the region. Additionally, as shown in Table 46, the average CPFV operator from Berkeley is 52.3 years old, has 23.4 years of experience owning a CPFV vessel and has 24.2 years of experience operating a CPFV vessel. Only one person we spoke to indicated they had an additional source of income in addition to CPFV operations and that was another type of fishing related work (Table 47).

Table 46. CPFV survey response statistics, 2010, Berkeley

	Response	Standard deviation	Number responding
Individuals interviewed	5	n/a	n/a
Owner only	—	n/a	n/a
Average age	52.3	11.5	4
Average number of years owning CPFV boat/s	23.4	9.2	5
Average number of years operating CPFV boat/s	24.2	8.9	5
Average percent income from CPFV operations in 2010	94.0%	13.4%	5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 47. Sources of income in 2010 in addition to CPFV operation, Berkeley

	Fishery					Activity				
Response	**California halibut**	**Dungeness crab**	**Rockfish**	**Salmon**	**Striped bass**	**Funeral services**	**Leisure cruises**	**Whale watching**	**Other^**	**All target fisheries/ activities (unique individuals)**
Construction/Contractor	—	—	—	—	*	—	—	—	—	—
Harbor/City job	—	—	—	—	*	—	—	—	—	—
Other fishing/boating related work	1	—	1	—	*	—	—	—	—	1
Other specialized work	—	—	—	—	*	—	—	—	—	—
Property management	—	—	—	—	*	—	—	—	—	—
Retirement/Social Security/Investments	—	—	—	—	*	—	—	—	—	—
Skilled labor	—	—	—	—	*	—	—	—	—	—
Number of individuals responding	1	—	1	—	*	—	—	—	—	1

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in Berkeley reported earning a gross economic revenue (GER) of $169,000 in 2010, higher than the regional average of $105,423 (and the highest of any port). Additionally, respondents in Berkeley reported they spent an average of 27.3 percent of their GER on fuel, 13 percent on crew, and 20.5 percent on other operational expenses. Expenses for fuel were lower in Berkeley than the study region as a whole (22.9 percent for the region) but higher for crew and other operating costs (12.3 percent and 37.5 respectively for the region). After costs, respondents in Berkeley made an average net revenue of $66,332 in 2010

Table 48. Average CPFV gross economic revenue (GER) to operating costs in 2010, Berkeley

	Number responding	Average response	Standard deviation
Total GER 2011	3	$169,000	$107,764
% GER to fuel	4	27.3%	6.8%
% GER to crew	4	13.0%	4.8%
% GER to other operating costs	4	20.5%	4.2%

Source: Current study

As shown below in Table 49, in 2010 all respondents from Berkeley conducted consumptive trips and two reported non consumptive trips. The average fishing trip from Berkeley was $95, which was less than the regional average of $103. However, fishing trips were more frequent (118.9 trips per year compared the regional average of 78.9), had more passengers (15.4 per trip compared to the regional average of 12.1), and had more crew (1.8 crew members per trip compared to the regional average of 1.2). Non-consumptive trips were less frequent than the regional average, occurring in Berkeley 4.5 times during the year compared to 35.4 trips per year on average across the study region.

Table 49. CPFV trip statistics, 2010, Berkeley

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	5	n/a	n/a	2	n/a
Average number of trips in 2010	4	118.8	53.0	2	4.5	0.7
Average number of passengers(per trip)	5	15.4	4.2	2	15.0	7.1
Average price per passenger (per trip)	5	$95	$5	2	$70	$42
Average number of crew (per trip)	5	1.8	0.4	2	1.0	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

As show in Table 50, California halibut and rockfish were the most frequently targeted CPFV fisheries in Berkeley (63.8 and 41.6 days, respectively) and similarly generated the highest percent of gross economic revenue (41.3 percent and 32.5 percent, respectively).

Table 50. Number of days and percent GER targeting fishery/activity in 2010, CPFV, Berkeley

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	4	4	63.8	22.9	4	41.3%	14.4%
	Dungeness crab	—	—	—	—	—	—	—
	Rockfish	5	5	41.6	29.6	4	32.5%	10.4%
	Salmon	3	3	20.7	9.3	2	15.0%	7.1%
	Striped bass	2	2	65.0	35.4	2	30.0%	—
Activity	Funeral services	—	—	—	—	—	—	—
	Leisure cruises	—	—	—	—	—	—	—
	Whale watching	—	—	—	—	—	—	—
	Other^	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare their success in each of their target fisheries and non-consumptive activities in 2010 to that of the previous five years. As shown below in Table 33, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse. Respondents were then asked what factors they felt had contributed to the change in success in their fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

In Berkeley, no one indicated in any fishery that they were doing better than in the previous five years. One individual indicated that their success in the California halibut was the same, and all other individuals indicated that their success in specific fisheries was somewhat or significantly worse than the previous five years (Table 51). Similarly to other CPFV ports in the region respondents from Berkeley mentioned mostly regulatory (Table 52) and environmental (Table 53) factors for the decrease in success. All five respondents indicated that MPAs were one of the largest factors impacting their overall success in the rockfish fishery. A few additional economic and other factors are also shown below in Table 54 and Table 55.

Table 51. Overall success in CPFV fishery/activity in 2010 compared to past five years, Berkeley

Fisheries		Number responding	Percent responding: Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	California halibut	4	—	—	25.0%	50.0%	25.0%
	Dungeness crab	—	—	—	—	—	—
	Rockfish	5	—	—	—	40.0%	60.0%
	Salmon	3	—	—	—	—	100.0%
	Striped bass	1	*	*	*	*	*
Activity	Funeral services	—	—	—	—	—	—
	Leisure cruises	—	—	—	—	—	—
	Whale watching	—	—	—	—	—	—
	Other ^	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 52. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Berkeley

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	2	—	5	1	*	—	—	—	—
	Response	**Count of responses**								
Negative	Regulated season too short	—	—	—	1	*	—	—	—	—
	MPAs	1	—	5	—	*	—	—	—	—
	More pressure on fishery	2	—	—	—	*	—	—	—	—
	Rockfish Conservation Areas	—	—	—	—	*	—	—	—	—
Positive	Fishery closed in previous seasons	—	—	—	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 53. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Berkeley

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	3	—	1	3	*	—	—	—	—
	Response	**Count of responses**								
Positive	Large quantity of fish	—	—	—	—	*	—	—	—	—
	Peak of natural cycle	—	—	—	—	*	—	—	—	—
	Good ocean conditions	—	—	—	—	*	—	—	—	—
Negative	Low quantity of fish	1	—	—	3	*	—	—	—	—
	Low of natural cycle	—	—	—	—	*	—	—	—	—
	Bad weather	—	—	—	—	*	—	—	—	—
	Poor ocean conditions	2	—	—	—	*	—	—	—	—
	More bait/feed in water - causing fish to bite less	—	—	—	—	*	—	—	—	—
	Loss of salmon spawning grounds	—	—	—	—	*	—	—	—	—
	Fish are smaller	—	—	1	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 54. Economic changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Berkeley

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	1	1	*	—	—	—	—
	Response	**Number responding**								
Positive	Good/new market opportunity	—	—	—	—	*	—	—	—	—
Negative	Lack of customers	—	—	1	1	*	—	—	—	—
	Bad economy	—	—	—	—	*	—	—	—	—
	Fuel costs	—	—	—	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 55. Other changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Berkeley

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	1	—	—	—	*	—	—	—	—
	Response	**Number responding**								
Positive	Diversifying portfolio of fisheries/activities	—	—	—	—	*	—	—	—	—
	Putting more effort into fishery/activity	—	—	—	—	*	—	—	—	—
Negative	Others are diversifying - adding competition to fishery/activity	—	—	—	—	*	—	—	—	—
	Putting less effort into fishery/activity	—	—	—	—	*	—	—	—	—
	Personal reasons	—	—	—	—	*	—	—	—	—
	Too many other boats/overcrowding	—	—	—	—	*	—	—	—	—
	Drag boats are depleting resource	1	—	—	—	*	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

4.4. Emeryville

Emeryville, in Alameda County, lies adjacent to the Bay Bridge between the cities of Oakland and Berkeley. The area was originally inhabited by an indigenous group, now called the Ohlone. The first Europeans came to the San Francisco Bay area in 1769 from Spain and in 1859 an American, Joseph Emery, purchased large land tracts and began to develop the city of Emeryville. Emeryville began as an industrial town, for shipping, meat packing, paint, and ironworks, but these industries have been replaced in present day by software and biotech companies (City of Emeryville 2013). The 2010 US Census reports Emeryville's population as 10,080 residents, and the estimated per capita income was $52,258 (2007-2011) with a mean household income of $89,385 (US Census Bureau 2010). In the 1970s, the city began building what is now Marina Park, which is home to two marinas, one public and one private. The marina features a public ramp, fuel dock, and is near vessel haul out and maintenance services. Several CPFV operators run out of this marina and offer trips both in and outside the bay.

Emeryville CPFV operators target various species including rockfish, lingcod, salmon, Dungeness crab, sturgeon, Jumbo/Humboldt squid, and albacore tuna. Additionally, they also offer 'potluck' fishing at a fixed rate, which is fishing for whatever the season and day's conditions dictate. The fleet of vessels (30-57 feet) can accommodate a range of customers (up to 35 persons) and take reservations for large groups or individuals. Prices can vary on the type and length of trip, but generally range from $85 to $350 per person. Fishing rods and tackle can be rented on most vessels, but customers are expected to bring state issued recreational fishing licenses and appropriate stamps (Emeryville Sport Fishing 2013).

4.4.1. Emeryville CPFV Fisheries Historical Trends and Initial Changes

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. A limited number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

As noted in our methods sections, the data provided here is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here.

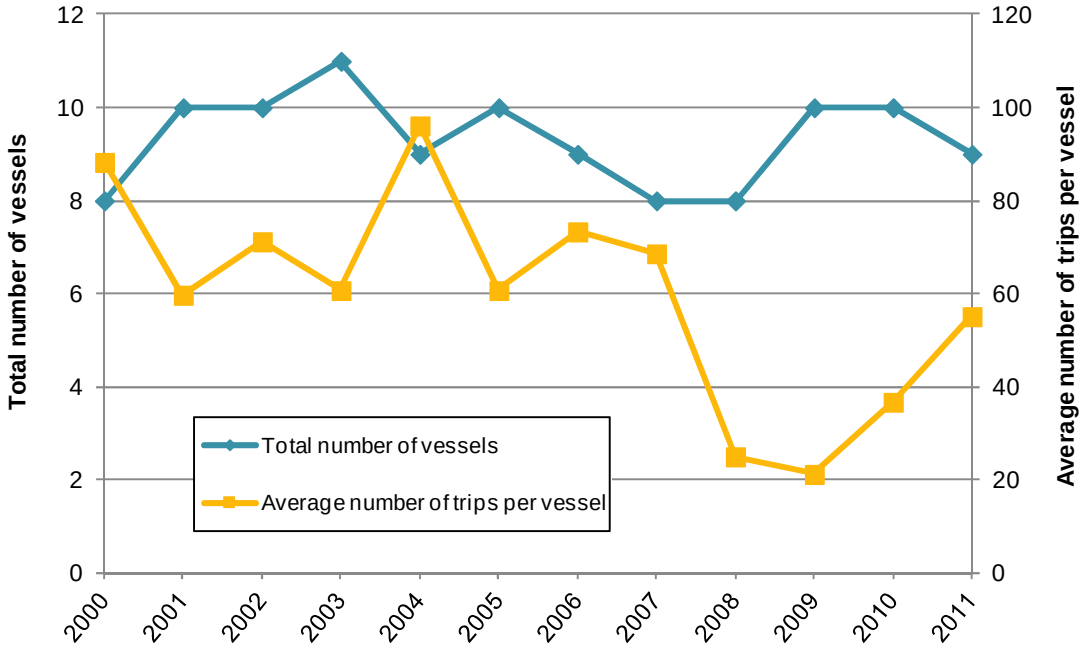
The number of vessels operating out of Emeryville has been relatively steady from 2000 to 2011 starting from one of its lowest of 8 vessels in 2000 to a peak of 11 vessels in 2003 to 9 vessels in 2011 (Figure 23). The average number of trips per vessel however has been highly variable with a peak in 2004 of an average of 96 trips per vessel to a low of 21 trips per vessel in 2009 due to the salmon closures. The average number of trips per vessel has begun to recover again in 2010 but as of 2011 the average number of trips per vessel has not returned to level seen before the salmon closures of 2008 and 2009.

However, in 2011 the average vessel in Emeryville conducts 55 trips, while the regional average is 41 trips.

Indeed, the total number of trips follows similar trends to that of the average number of trips per vessel in that the number of trips was relatively steady from 2000 to 2007 (with a peak in 2004 of 865 trips) until a significant decline in 2008 and 2009 (Figure 24). In 2008, the total number of trips reached its lowest point in the study period with 200 trips total. The total number of trips has increased since its low in 2008 however has not recovered to the number of trips seen before 2008.

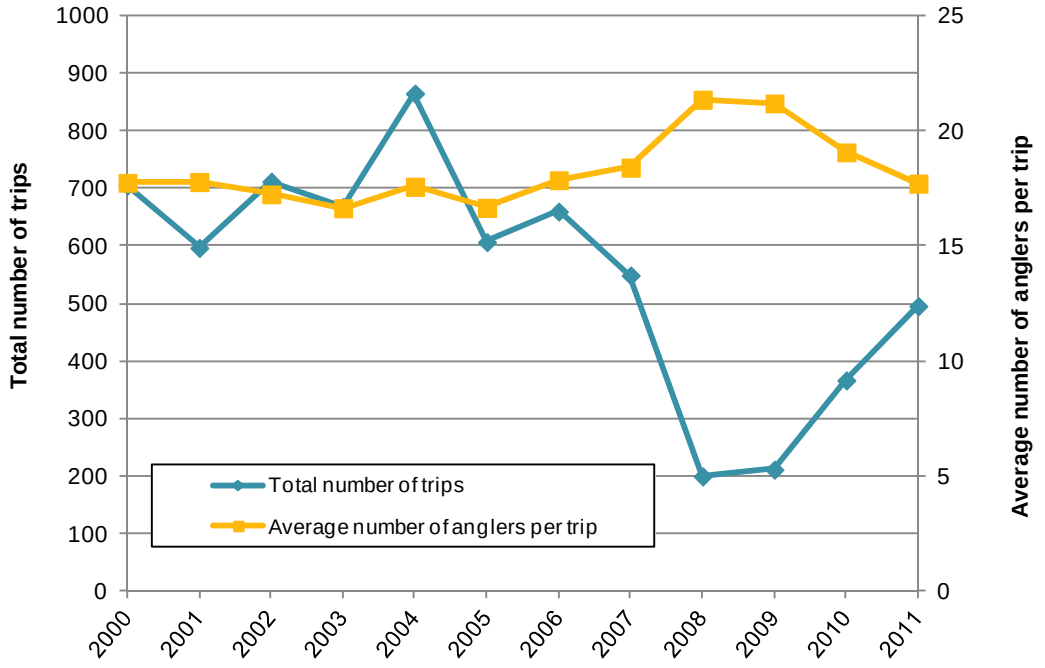
The total number of CPFV anglers in Emeryville as well as the average number of anglers per vessel followed similar variable but generally decreasing trends from 2000 to 2011. The total number of anglers was at its highest point in the study period in 2004 (15,204 anglers) and at its lowest in 2008 (4,271 anglers). Since salmon has reopened the total number of angler has been increasing but has not returned to level seen before 2008 (Figure 25).

Figure 23. Total number of CPFV vessels and average number of trips per vessel, Emeryville, 2000-2011



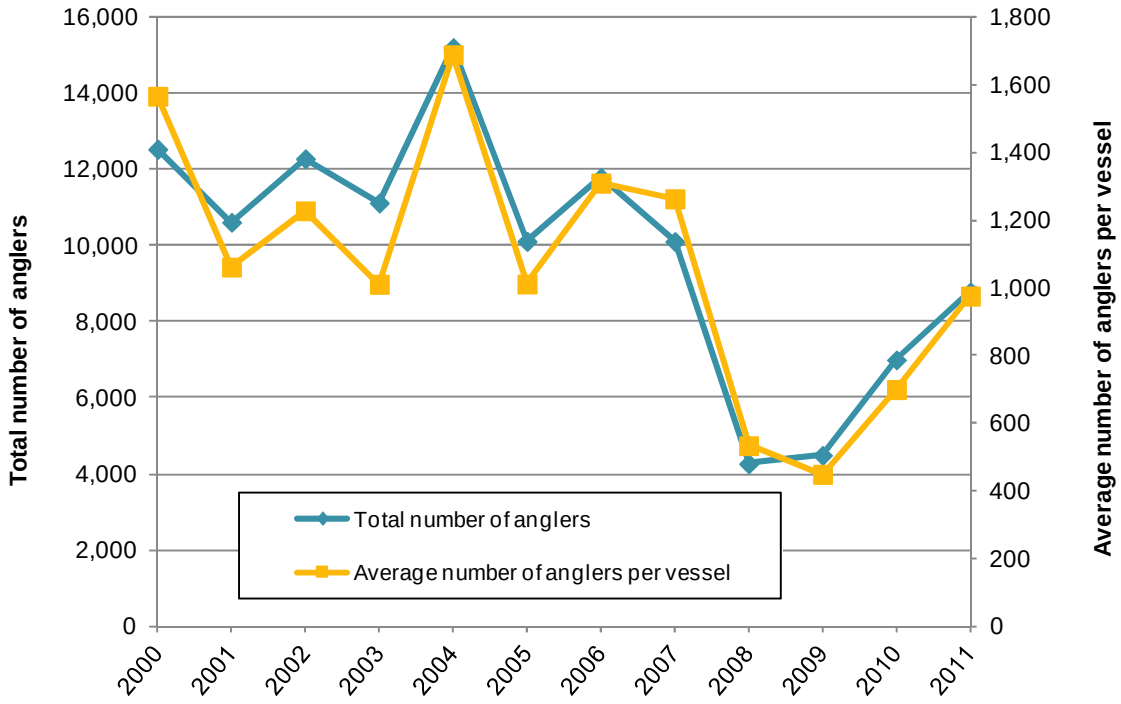
Source: CDFW CPFV logbook data

Figure 24. Total number of CPFV trips and average number of anglers per trip, Emeryville, 2000-2011



Source: CDFW CPFV logbook data

Figure 25. Total number of CPFV anglers and average number of anglers per vessel, Emeryville, 2000-2011

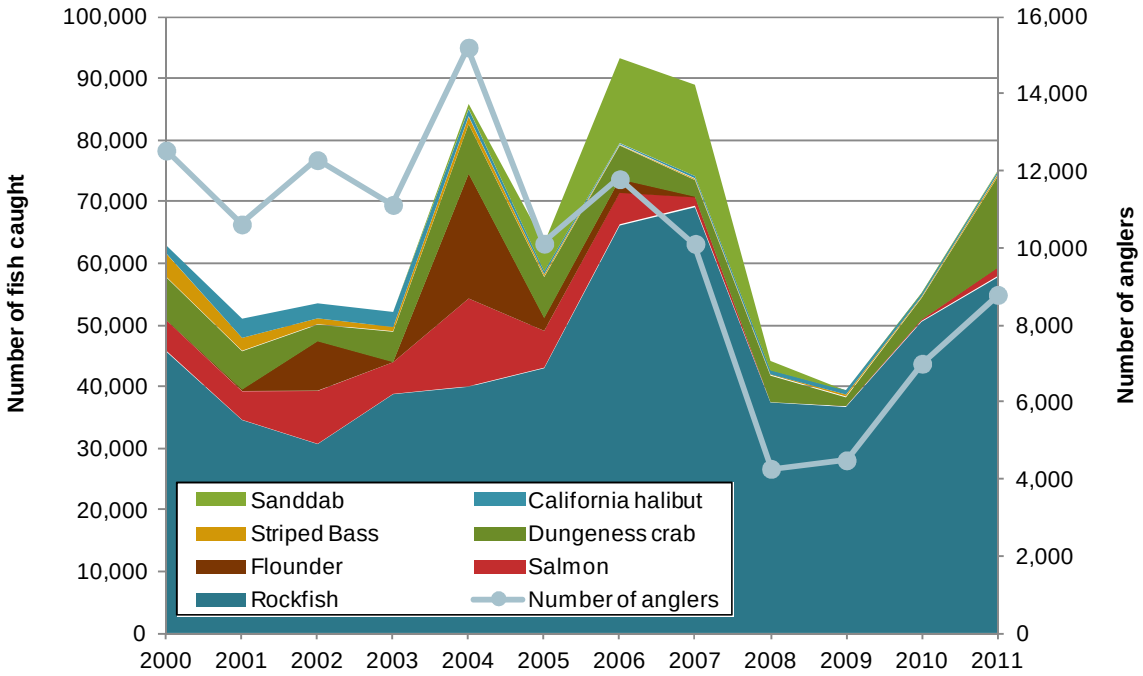


Source: CDFW CPFV logbook data

As seen in Figure 26 the vast majority of the total number of fish caught in Emeryville are rockfish (approximately 67.7 percent of total fish caught from 2000 to 2011) followed by Dungeness crab (8.34 percent of total fish caught from 2000 to 2011), and salmon (6.33 percent. The total number of fish caught has been highly variable but not as variable as other ports as Emeryville perhaps due to its relatively more diversified fisheries portfolio. The total number of fish caught peaked in 2005 with 102,859 fish caught and a low of 40,602 fish caught in 2009.

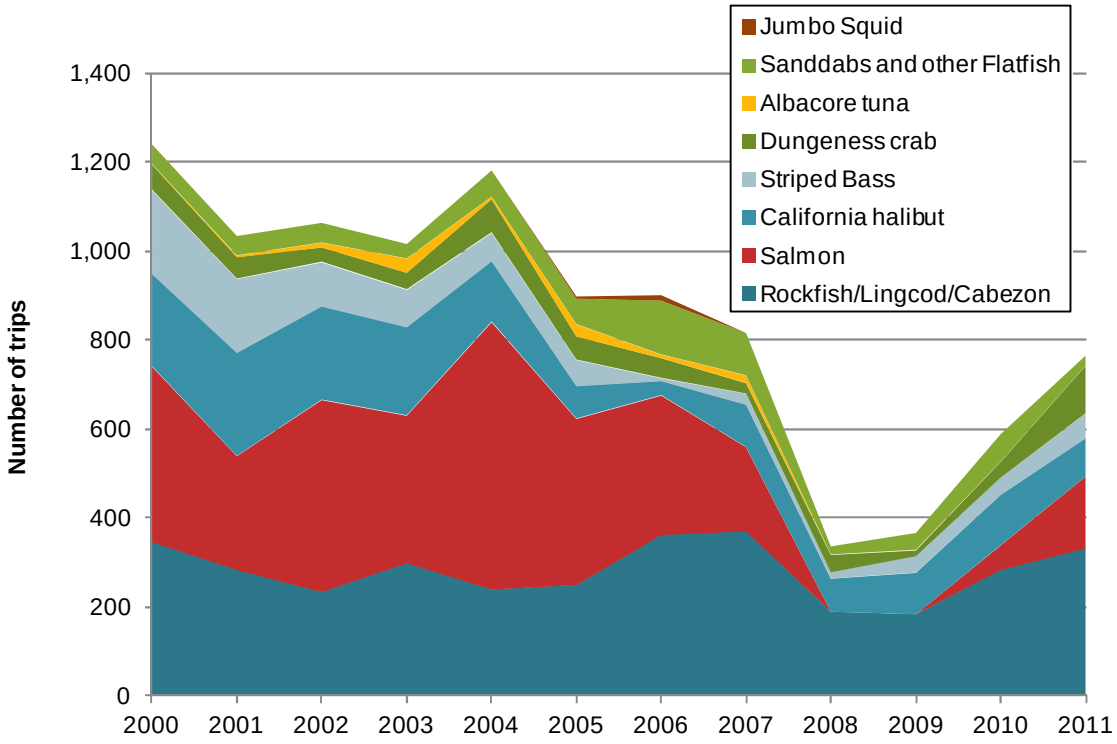
Despite rockfish's dominance in the total number of fish caught, approximately 33 percent of CPFV trips primarily target rockfish while 30.5 percent of trips primarily target salmon, 15.2 percent of trips targeted California halibut, and 8.2 percent of trips targeted striped bass. As with most other trends in the region, the total number of CPFV trips has been declining from 2000 to 2011, starting with a peak in 2000 (1,242 trips) with a major decline in 2008 (334 trips) and 2009 (365 trips) and moderate increases to approximately 764 trips in 2011.

Figure 26. CPFV total number of fish caught for each fishery, Emeryville, 2000-2011



Source: CDFW CPFV logbook data

Figure 27. Total number of CPFV trips for each target fishery, Emeryville, 2000-2011



Source: CDFW CPFV logbook data

4.4.2. Emeryville CPFV Fisheries Baseline Characterization

We interviewed four owner/operators from Emeryville who were, on average 49.5 years old. On average, they indicated they had 17.7 years of experience owning and 19.8 years of experience operating a CPFV vessel. They reported, on average, making 78.8 percent of their personal income from CPFV operations, slightly more than the regional average of 72.4 percent (Table 56). Only two respondents indicated they had sources of income other than CPFV operation and that these jobs were related in some way to the fishing industry (Table 57).

Table 56. CPFV survey response statistics, 2010, Emeryville

	Response	Standard deviation	Number responding
Individuals interviewed	4	n/a	n/a
Owner only	—	n/a	n/a
Average age	49.5	3.1	4
Average number of years owning CPFV boat/s	17.7	6.1	3
Average number of years operating CPFV boat/s	19.8	6.5	4
Average percent income from CPFV operations in 2010	78.8%	25.3%	4

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 57. Sources of income in 2010 in addition to CPFV operation, Emeryville

	Fishery					Activity				
Response	**California halibut**	**Dungeness crab**	**Rockfish**	**Salmon**	**Striped bass**	**Funeral services**	**Leisure cruises**	**Whale watching**	**Other^**	**All target fisheries/ activities (unique individuals)**
Construction/Contractor	—	*	—	—	—	—	*	*	*	—
Harbor/City job	—	*	—	—	—	—	*	*	*	—
Other fishing/boating related work	1	*	2	2	1	—	*	*	*	2
Other specialized work	—	*	—	—	—	—	*	*	*	—
Property management	—	*	—	—	—	—	*	*	*	—
Retirement/Social Security/Investments	—	*	—	—	—	—	*	*	*	—
Skilled labor	—	*	—	—	—	—	*	*	*	—
Number of individuals responding	1	*	2	2	1	—	*	*	*	2

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in Emeryville reported earning a gross economic revenue (GER) of $126,667 in 2010 (Table 58), which is higher than the regional average of $105,423. Additionally, respondents in Emeryville reported they spent an average of 24.3 percent of their GER on fuel, 11 percent on crew, and 23.7 percent on other operational expenses. All of the expenses listed above were lower than the study region as a whole (22.9 percent, 12.3 percent, and 37.5 respectively for the region). After costs, respondents in Emeryville made an average net revenue of $51,933 in 2010

Table 58. Average CPFV gross economic revenue (GER) to operating costs in 2010, Emeryville

	Number responding	Average response	Standard deviation
Total GER 2011	3	$126,667	$64,291
% GER to fuel	3	24.3%	7.5%
% GER to crew	3	11.0%	4.6%
% GER to other operating costs	3	23.7%	5.5%

Source: Current study

Three of the four respondents who reported fishing trips in Emeryville also reported operating non-consumptive trips in 2012. Fewer fishing trips were reported in 2010 in Emeryville than on average elsewhere in the region (63.3 trips per year compared to the regional average of 78.9) but they averaged a higher number of passengers (16.3 passengers per trip compared to the regional average of 12.1).

Table 59. CPFV trip statistics, 2010, Emeryville

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	4	n/a	n/a	3	n/a
Average number of trips in 2010	3	63.3	41.6	2	25.0	28.3
Average number of passengers(per trip)	4	16.3	7.5	3	16.0	13.5
Average price per passenger (per trip)	4	$104	$38	1	$150	n/a
Average number of crew (per trip)	4	0.8	0.5	3	0.7	0.6

Source: Current study

Similar to Berkeley, California halibut accounted for the largest percent of the average Emeryville respondents' CPFV related gross economic revenue (51.5 percent) and was also the most frequently targeted fishery (53 days per year). This is the highest percent of GER attributed to California halibut of all ports across the study region. Additionally, salmon was only targeted an average of 6.8 days per year in Emeryville and generated only 3.7 percent of the average individuals' gross economic revenue. This is less than the regional average of 22.1 days per year and 25.8 percent of the average individuals' gross economic revenue. More information can be found below in Table 60.

Table 60. Number of days and percent GER targeting fishery/activity in 2010, CPFV, Emeryville

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	3	3	53.0	19.9	2	51.5%	16.3%
	Dungeness crab	2	2	*	*	2	*	*
	Rockfish	4	4	44.3	20.6	3	29.0%	3.6%
	Salmon	4	4	6.8	5.5	3	3.7%	2.3%
	Striped bass	3	3	36.3	25.1	2	11.0%	12.7%
Activity	Funeral services	—	—	—	—	—	—	—
	Leisure cruises	1	1	*	*	1	*	*
	Whale watching	2	2	4.0	2.8	2	5.0%	4.2%
	Other^	1	1	*	*	1	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare their success in each of their target fisheries and non-consumptive activities in 2010 to the previous five years. As shown below in Table 61, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse. Respondents were then asked what factors they felt had contributed to the change in success in their fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

One Emeryville respondent explained that he felt his success in the 2010 salmon fishery was somewhat better but noted that 2007 was a poor salmon year and that the fishery was closed all together in 2008 and 2009. Others said that 2010 was generally worse than the previous five years even though they were allowed a limited season (Table 62). All respondents indicated their success in the striped bass, rockfish, and California halibut fisheries were worse or the same. Three fishermen noted that MPAs were one of the primary factors impacting their overall success in the rockfish fishery (Table 62) and one mentioned there was a low quantity of rockfish available (Table 63).

Table 61. Overall success in CPFV fishery/activity in 2010 compared to past five years, Emeryville

			Percent responding				
		Number responding	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	California halibut	3	—	—	—	100.0%	—
	Dungeness crab	2	*	*	*	*	*
	Rockfish	4	—	—	50.0%	25.0%	25.0%
	Salmon	4	—	25.0%	—	50.0%	25.0%
	Striped bass	3	—	—	33.3%	66.7%	—
Activity	Funeral services	—	—	—	—	—	—
	Leisure cruises	1	*	*	*	*	*
	Whale watching	2	*	*	*	*	*
	Other ^	1	*	*	*	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 62. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Emeryville

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	*	3	3	—	—	*	*	*
	Response	**Count of responses**								
Negative	Regulated season too short	—	*	—	2	—	—	*	*	*
	MPAs	—	*	3	—	—	—	*	*	*
	More pressure on fishery	—	*	—	—	—	—	*	*	*
	Rockfish Conservation Areas	—	*	—	—	—	—	*	*	*
Positive	Fishery closed in previous seasons	—	*	—	2	—	—	*	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 63. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Emeryville

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	2	*	1	2	2	—	*	*	*
	Response	**Count of responses**								
Positive	Large quantity of fish	—	*	—	—	—	—	*	*	*
	Peak of natural cycle	—	*	—	—	—	—	*	*	*
	Good ocean conditions	—	*	—	—	—	—	*	*	*
Negative	Low quantity of fish	1	*	1	2	2	—	*	*	*
	Low of natural cycle	1	*	—	—	—	—	*	*	*
	Bad weather	—	*	—	—	—	—	*	*	*
	Poor ocean conditions	1	*	—	—	—	—	*	*	*
	More bait/feed in water - causing fish to bite less	—	*	—	—	—	—	*	*	*
	Loss of salmon spawning grounds	—	*	—	1	—	—	*	*	*
	Fish are smaller	—	*	—	—	—	—	*	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 64. Economic changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Emeryville

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	*	1	—	—	—	*	*	*
	Response	**Number responding**								
Positive	Good/new market opportunity	—	*	—	—	—	—	*	*	*
Negative	Lack of customers	—	—	—	—	—	—	*	*	*
	Bad economy	—	—	1	—	—	—	*	*	*
	Fuel costs	—	—	—	—	—	—	*	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 65. Other changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Emeryville

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	1	*	—	—	—	—	*	*	*
	Response	**Number responding**								
Positive	Diversifying portfolio of fisheries/activities	—	*	—	—	—	—	*	*	*
	Putting more effort into fishery/activity	—	*	—	—	—	—	*	*	*
Negative	Others are diversifying - adding competition to fishery/activity	—	*	—	—	—	—	*	*	*
	Putting less effort into fishery/activity	1	*	—	—	—	—	*	*	*
	Personal reasons	—	*	—	—	—	—	*	*	*
	Too many other boats/overcrowding	—	*	—	—	—	—	*	*	*
	Drag boats are depleting resource	—	*	—	—	—	—	*	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

4.5. San Francisco

San Francisco, in San Francisco County, is the largest city in the North Central Coast study region, with 805,235 residents, as of the 2010 US Census. The estimated per capita income (2007-2011) was $46,777 with a mean household income of $105,753 (US Census Bureau 2010). The first European settlers arrived in the San Francisco Bay area in 1769 from Spain. Prior to European settlement some 40 different tribal groups inhabited the San Francisco Bay area. The city of San Francisco was built up significantly during the California gold rush and as the gold rush slowed in the late 1840s people started to turn to commercial fishing (Norman et al 2007). Some of the first commercial fishermen in San Francisco were Chinese fishermen in the mid-1850s, followed by Italians in the 1860s (Norman et al, 2007). By 1892, 93% of California's commercial fisheries were centered in San Francisco (Love, 2006). In the early 1900's pollution of the San Francisco Bay and the advancement of fishing gear and vessels led to a shift from nearshore fisheries to offshore fisheries. The sardine fishery peaked in the 1930s and with it came the building of canneries through the region (Norman et al, 2007). Originally, Fisherman's Wharf was the center of commercial fishing in San Francisco and has been expanded several times as the fishing fleet has been built out, and new fisheries exploited. More recently, Fisherman's Wharf has turned into more of a tourist destination, but does still serve several commercial fishermen, with full-service repair shop, dry docks, fuel, ice and other supplies. Pier 45 has become the hub of commercial fishing activity, home to the West coast's largest concentration of commercial fish processors and distributors (Norman et al, 2007).

Many CPFV operators are currently located at Fisherman's Wharf and this serves as the departure point for fishing trips and non-consumptive activities both in the bay and the open ocean. Several CPFV operators line the main street adjacent to Fisherman's Wharf and offer passing tourists opportunities to join 1 to 2 hour leisure cruises. CPFV operators in San Francisco thus largely run non-consumptive trips and the less frequently conduct fishing trips. CPFV operators often have to wait many years for boat slips in this area of Fisherman's Wharf to open up as non-consumptive trips offer a steadier and more reliable revenue stream than fishing trips.

San Francisco CPFV operators largely target the recreational salmon fishery but also target various other species including rockfish, lingcod, Dungeness crab, Jumbo/Humboldt squid, and albacore tuna. Additionally, they also offer 'potluck' fishing at a fixed rate, which is fishing for whatever the season and day's conditions dictate. From Fisherman's Wharf, a fleet of vessels (30-65 feet) can accommodate a range of customers (up to 40 persons) and take reservations for large groups or individuals. Prices can vary on the type and length of trip. Fishing rods and tackle can be rented on most vessels, but customers are expected to bring state issued recreational fishing licenses and appropriate stamps (San Francisco Sport Fishing 2013).

4.5.1. San Francisco CPFV Fisheries Historical Trends and Initial Changes

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or

combine species into a group species category such as “Unidentified Rockfish.” Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

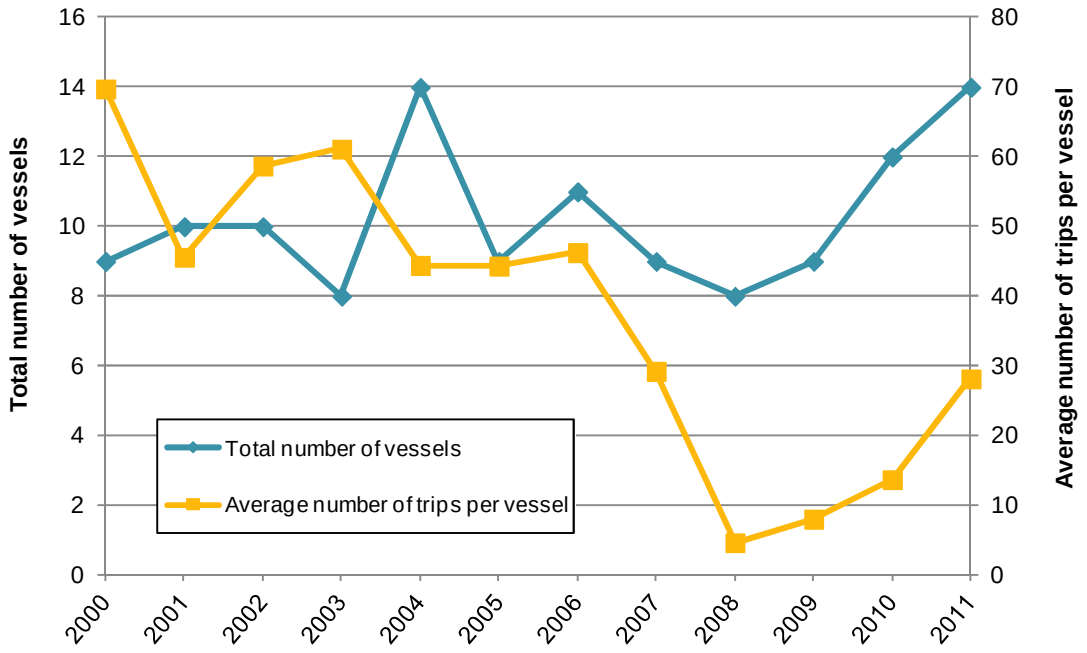
As noted in our methods sections, the data provided here is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here.

The number of vessels operating out of San Francisco has been variably increasing from 2000 to 2011 starting with 9 vessels operating in the port to a peak of 14 vessels in 2011 (Figure 28). The average number of trips per vessel however has been significantly decreasing with its peak in 2000 of an average of 70 trips per vessel to a low in 2008 of 5 trips per vessel increasing to approximately 28 trips per vessel in 2011. The average number of trips per vessel in 2011 for San Francisco is significantly lower than the regional average of 41 trips per vessel. This may be due to the fact that CPFV operators in San Francisco may also conduct a significant amount of non-consumptive trips to accommodate San Francisco tourists.

The total number of trips follows similar trends to that of the average number of trips per vessel in that the number of trips was variably steady from 2000 to 2007 (with a peak in 2004 of 622 trips) until a significant decline in 2008 and 2009 (Figure 29). In 2008, the total number of trips reached its lowest point in the study period with 37 trips total. The total number of trips has increased since its low in 2008 however has not recovered to the number of trips seen before 2008.

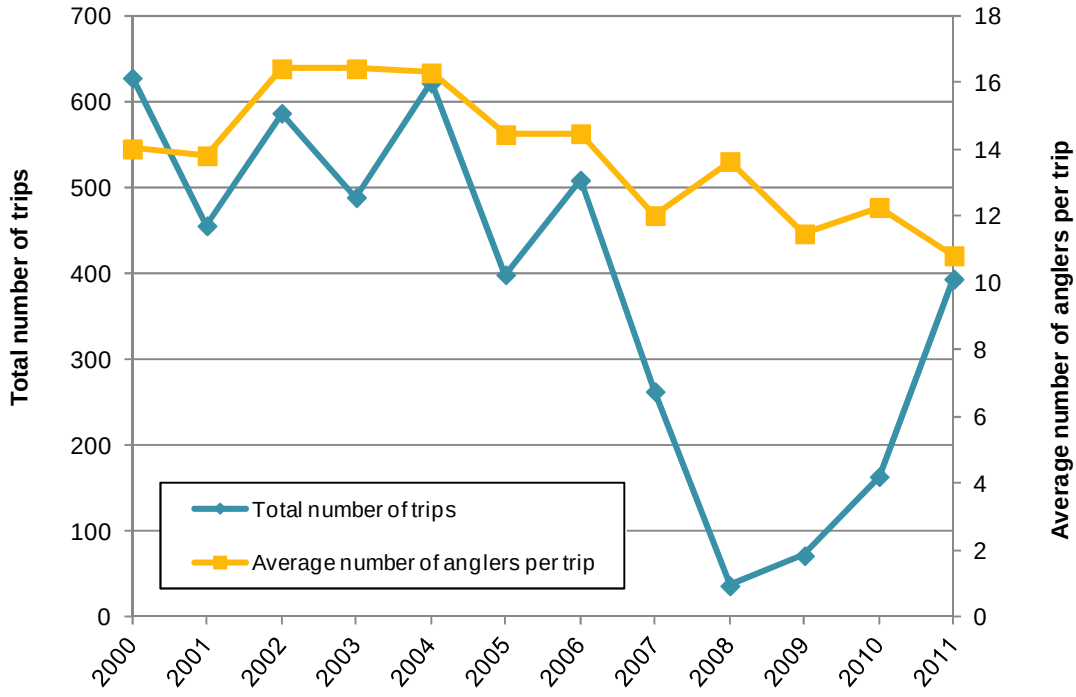
The total number of CPFV anglers in San Francisco as well as the average number of anglers per vessel followed similar variable but generally decreasing trends from 2000 to 2011. The total number of anglers was at its highest point in the study period in 2004 (10,149 anglers) and at its lowest in 2008 (505 anglers). Since salmon has reopened the total number of angler has been increasing but has not returned to levels seen before 2008 (Figure 30).

Figure 28. Total number of CPFV vessels and average number of trips per vessel, San Francisco, 2000-2011



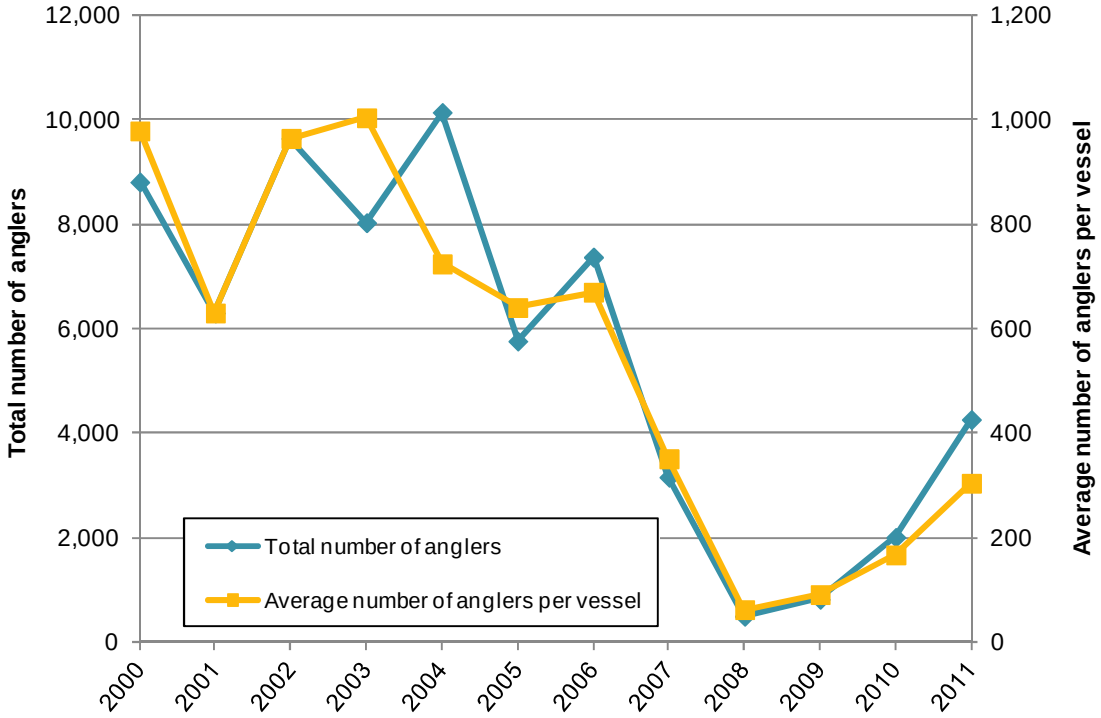
Source: CDFW CPFV logbook data

Figure 29. Total number of CPFV trips and average number of anglers per trip, San Francisco, 2000-2011



Source: CDFW CPFV logbook data

Figure 30. Total number of CPFV anglers and average number of anglers per vessel, San Francisco, 2000-2011

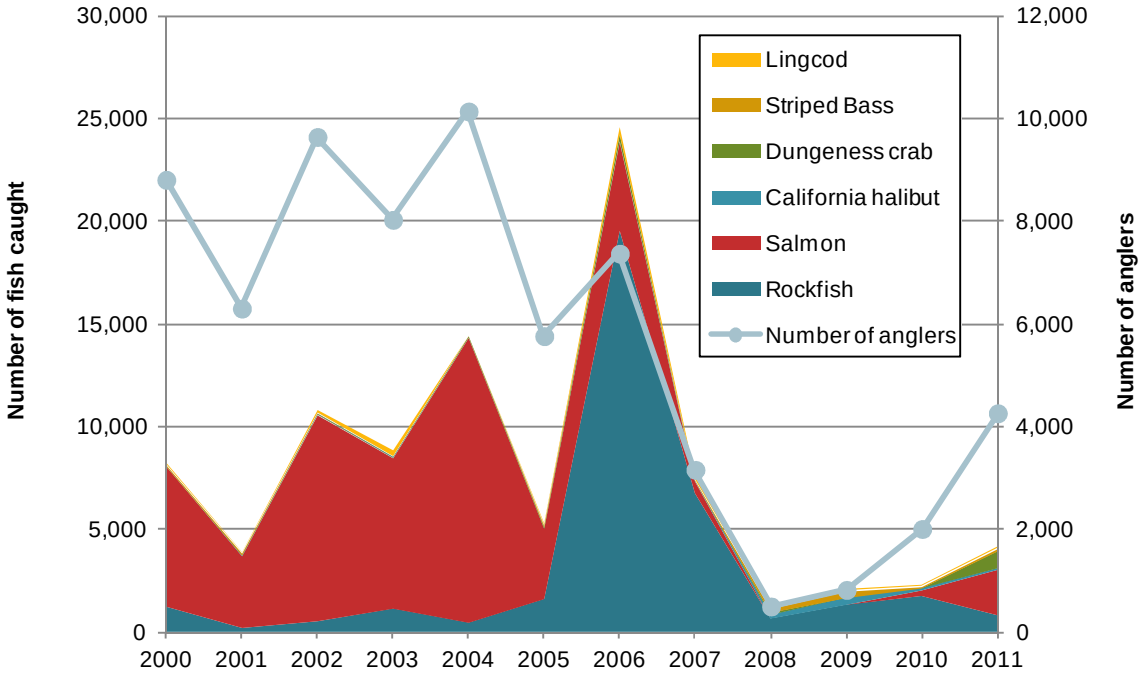


Source: CDFW CPFV logbook data

As seen in Figure 31 the two major fish caught by CPFV anglers in San Francisco are salmon (55.1 percent of catch) and rockfish (37.8 percent of catch). The CPFV port of San Francisco and Sausalito are similar in that both these ports rely heavily on the salmon fishery. The total number of fish caught has been variable with a peak of 25,036 fish caught in 2006 and a low of 1,294 fish caught in 2008. Since the salmon closures in 2008 and 2009 the number of fish caught has remained at levels generally lower than those observed before 2008 (with the exception of 2001).

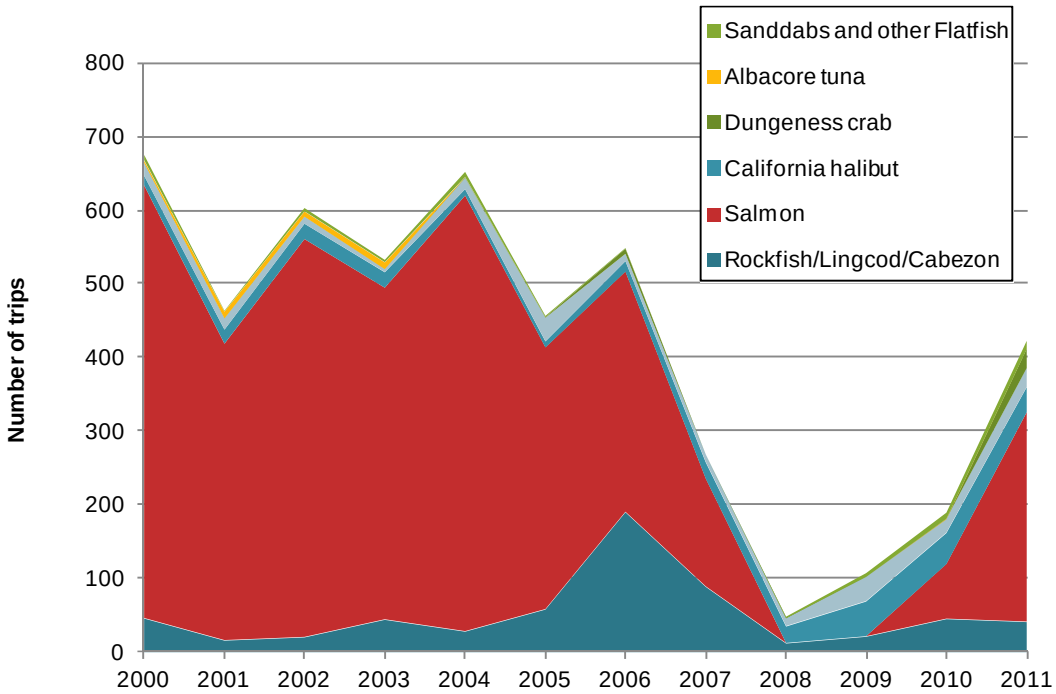
From Figure 32 is clear that the majority of trips (75.6 percent of trips from 2000 to 2011) operated from San Francisco are targeting the salmon fishery. The total number of trips in 2000 peaked with 674 total trips declined drastically in 2008 to 49 total trips. Since the salmon closures in 2008 and 2009 the total number of trips has increased with 423 total trips in 2011.

Figure 31. CPFV total number of fish caught for each fishery, San Francisco, 2000-2011



Source: CDFW CPFV logbook data

Figure 32. Total number of CPFV trips for each target fishery, San Francisco, 2000-2011



Source: CDFW CPFV logbook data

4.5.2. San Francisco CPFV Fisheries Baseline Characterization

We interviewed five individuals in San Francisco, three of which were owner/operators, one of whom was an owner only, and lastly, one operator that worked for the owner. Table 66 and Table 67 include responses from both the owner and operator as well as the owner/operators, however the rest of the tables in this section include responses from the three owner/operators and *either* the owner or the operator of the remaining operation.

The average CPFV respondent in San Francisco was 39.2 years old in 2010 which is younger than the average respondent across the study region (50.2 years). Respondents from San Francisco indicated that an average of 57.5 percent of their total personal income came from CPFV fishing in 2010. This was the lowest average of any port in the study region. More information can be found below in Table 66.

Table 66. CPFV survey response statistics, 2010, San Francisco

	Response	Standard deviation	Number responding
Individuals interviewed	5	n/a	n/a
Owner only	1	n/a	n/a
Average age	39.2	16.0	5
Average number of years owning CPFV boat/s	20.3	4.5	4
Average number of years operating CPFV boat/s	14.0	12.5	3
Average percent income from CPFV operations in 2010	57.5%	29.9%	4

Source: Current study

As shown below in Table 67, three of the five respondents indicated they had other sources of income aside from CPFV operations. Two indicated this additional source was related in some way to the fishing industry and the other mentioned specialized work (we defined this as something that requires a special degree or license).

Table 67. Sources of income in 2010 in addition to CPFV operation, San Francisco

	Fishery					Activity				
Response	**California halibut**	**Dungeness crab**	**Rockfish**	**Salmon**	**Striped bass**	**Funeral services**	**Leisure cruises**	**Whale watching**	**Other^**	**All target fisheries/ activities (unique individuals)**
Construction/Contractor	—	—	—	*	—	—	*	*	—	—
Harbor/City job	—	—	—	*	—	—	*	*	—	—
Other fishing/boating related work	1	—	1	*	1	—	*	*	—	2
Other specialized work	1	—	1	*	1	—	*	*	—	1
Property management	—	—	—	*	—	—	*	*	—	—
Retirement/Social Security/Investments	—	—	—	*	—	—	*	*	—	—
Skilled labor	—	—	—	*	—	—	*	*	—	—
Number of individuals responding	2	—	2	*	2	—	*	*	—	3

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in San Francisco reported earning a gross economic revenue (GER) of $75,000 in 2010, which is lower than the regional average of $105,423. Additionally, respondents in San Francisco reported they spent an average of 16.7 percent of their GER on fuel, 18.3 percent on crew, and 30.7 percent on other operational expenses. Expenses for crew in San Francisco were higher than the study region as a whole (12.3 percent for the region) but lower for fuel and other operating costs (22.9 percent and 37.5 percent for the entire study region). After costs, respondents in San Francisco made an average net revenue of $25,750 in 2010.

Table 68. Average CPFV gross economic revenue (GER) to operating costs in 2010, San Francisco

	Number responding	Average response	Standard deviation
Total GER 2011	3	$75,000	$35,000
% GER to fuel	3	16.7%	4.2%
% GER to crew	3	18.3%	20.2%
% GER to other operating costs	3	30.7%	16.2%

Source: Current study

The average respondent operated 70 fishing trips with 12.7 passengers at a price of $115 per passenger and had two crew members on board. Additional information is shown below in Table 69. The two respondents who indicated they operated non-consumptive trips reported an average of 91.5 trips per year, much higher than the regional average of 35.4 trips. However, these trips averaged only $28 per passenger per trip, which is much lower than the regional average of $69. Lastly, in San Francisco, the average non-consumptive trip has 42 passengers on board while the regional average was only 17.4 passengers. Additional information is found below in Table 69.

Table 69. CPFV trip statistics, 2010, San Francisco

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	3	n/a	n/a	2	n/a
Average number of trips in 2010	3	70.0	35.0	2	91.5	125.2
Average number of passengers(per trip)	3	12.7	5.9	2	42.0	9.9
Average price per passenger (per trip)	3	$115	$52	2	$28	$18
Average number of crew (per trip)	2	2.0	—	2	2.0	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

San Francisco was the only port in the region where striped bass was the mostly frequently targeted fishery (57 days) and generated the largest proportion of revenue (33.5 percent) compared to other fisheries. When considering the entire study region striped bass was only targeted 37.2 days per year and generated 17.4 percent of gross economic revenue (the second least of all fisheries at the regional level). Additionally, in San Francisco, rockfish was targeted 24.7 days and generated the least amount of gross economic revenue (22 percent). Conversely, across the entire North Central Coast study region rockfish was the second most frequently targeted fishery (39.8 days per year) and generated the largest proportion of gross economic revenue (35 percent). For more information regarding the number of days respondents spent targeting each fishery and the percent of gross economic revenue attributed to each fishery, see Table 70 below.

Table 70. Number of days and percent GER targeting fishery/activity in 2010, CPFV, San Francisco

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	4	3	46.3	37.8	3	27.3%	10.8%
	Dungeness crab	—	—	—	—	—	—	—
	Rockfish	4	3	24.7	30.7	3	22.0%	2.6%
	Salmon	2	2	16.5	12.0	1	*	*
	Striped bass	3	2	57.0	46.7	2	33.5%	2.1%
Activity	Funeral services	—	—	—	—	—	—	—
	Leisure cruises	1	1	*	*	1	*	*
	Whale watching	1	1	*	*	—	—	—
	Other^	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare their success in each of their target fisheries and non-consumptive activities in 2010 to that of the previous five years. As shown below in Table 71, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. Respondents were then asked what factors they felt had contributed to the change in success in their fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Aside from one respondent who indicated that his success in the California halibut fishery was significantly better, all respondents in San Francisco indicated that their success in specific fisheries were either the same or worse (Table 71). The individual who expressed that their success in the California halibut fishery was better specified that there was a large quantity of fish present in 2010 (Table 73). Those who indicated their success was worse mentioned that there was more pressure on the California halibut fishery due to salmon closures and that the MPAs had impacted their overall success (Table 72). The two fishermen who indicated they felt their success in the striped bass fishery was somewhat worse than in the previous five years mentioned MPAs and that they felt more people were targeting the fishery in 2010 (Table 72).

Table 71. Overall success in CPFV fishery/activity in 2010 compared to past five years, San Francisco

			Percent responding				
Fisheries		**Number responding**	**Significantly better**	**Somewhat better**	**The same**	**Somewhat worse**	**Significantly worse**
Fishery	California halibut	4	25.0%	—	25.0%	25.0%	25.0%
	Dungeness crab	—	—	—	—	—	—
	Rockfish	4	—	—	25.0%	25.0%	50.0%
	Salmon	2	*	*	*	*	*
	Striped bass	3	—	—	33.3%	66.7%	—
Activity	Funeral services	—	—	—	—	—	—
	Leisure cruises	1	*	*	*	*	*
	Whale watching	1	*	*	*	*	*
	Other ^	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 72. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, San Francisco

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	2	—	4	1	2	—	*	*	—
	Response	**Count of responses**								
Negative	Regulated season too short	—	—	—	—	—	—	*	*	—
	MPAs	1	—	4	—	1	—	*	*	—
	More pressure on fishery	2	—	—	—	2	—	*	*	—
	Rockfish Conservation Areas	—	—	—	—	—	—	*	*	—
Positive	Fishery closed in previous seasons	—	—	—	1	—	—	*	*	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 73. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, San Francisco

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	1	—	1	*	—	—	*	*	—
	Response	**Count of responses`**								
Positive	Large quantity of fish	1	—	—	*	—	—	*	*	—
	Peak of natural cycle	—	—	—	*	—	—	*	*	—
	Good ocean conditions	—	—	—	*	—	—	*	*	—
Negative	Low quantity of fish	—	—	1	*	—	—	*	*	—
	Low of natural cycle	—	—	—	*	—	—	*	*	—
	Bad weather	—	—	—	*	—	—	*	*	—
	Poor ocean conditions	—	—	—	*	—	—	*	*	—
	More bait/feed in water - causing fish to bite less	—	—	—	*	—	—	*	*	—
	Loss of salmon spawning grounds	—	—	—	*	—	—	*	*	—
	Fish are smaller	—	—	—	*	—	—	*	*	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 74. Other changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, San Francisco

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	1	*	—	—	—	—	*	*	*
	Response	**Number responding**								
Positive	Diversifying portfolio of fisheries/activities	—	*	—	—	—	—	*	*	*
	Putting more effort into fishery/activity	—	*	—	—	—	—	*	*	*
Negative	Others are diversifying - adding competition to fishery/activity	—	*	—	—	—	—	*	*	*
	Putting less effort into fishery/activity	1	*	—	—	—	—	*	*	*
	Personal reasons	—	*	—	—	—	—	*	*	*
	Too many other boats/overcrowding	—	*	—	—	—	—	*	*	*
	Drag boats are depleting resource	—	*	—	—	—	—	*	*	*

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

4.6. Half Moon Bay

Half Moon Bay, in San Mateo County, is 30 miles south of San Francisco, on the Pacific coast of the San Francisco peninsula. According to the 2010 US Census, the population of Half Moon Bay was 11,324 residents, and the estimated per capita income (2007-2011) was $47,909 with a mean household income of $124,970 (US Census Bureau 2010), and the sector with the highest employment in 2006 was 'educational, health and social services' (CDFG 2007). Like much of the surrounding region, the first European settlers arrived in 1769 from Spain. Prior to European settlement some 40 different tribal groups inhabited the San Francisco Bay area. Originally settled as a ranch during Mexican rule, the town of Half Moon Bay is the oldest in San Mateo County (Norman et al, 2007). The Pillar Point Harbor at the north end of Half Moon Bay is officially in a smaller town called Princeton and serves both commercial fishermen and CPFV operators. Additionally, a popular feature of the Harbor is that the public can buy fresh fish directly from fishermen selling from their boats. Located at this port is a boat ramp and 2000 pound hoist mainly for dinghies (Norman et al. 2007, California Coastal Commission 2003).

Half Moon Bay CPFV operators target various species including rockfish, lingcod, salmon, Dungeness crab, Jumbo/Humboldt squid, and Albacore tuna. From Pillar Point Harbor, a fleet of vessels (30-65 feet) can accommodate a range of customers (up to 40 persons) and take reservations for large groups or individuals. Prices can vary depending on the type and length of trip. Fishing rods and tackle can be rented on most vessels, and some vessels can provide fishing licenses on board (San Francisco Sport fishing 2013 and Huli Cat 2013).

4.6.1. Half Moon Bay CPFV Fisheries Historical Trends and Initial Changes

This section provides a summary and analysis of California Department of Fish and Wildlife (CDFW) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the North Central Coast region by CPFV operators from ports outside the North Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each target species/fishery

CPFV operators are required to complete and submit a log to the CDFW for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Wildlife Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

As noted in our methods sections, the data provided here is only for fishing trips which fished in the North Central Coast region which does not include the San Francisco Bay. Thus, fishing trips which wholly fished from the San Francisco bay are not included in the CFPV logbook data results provided here.

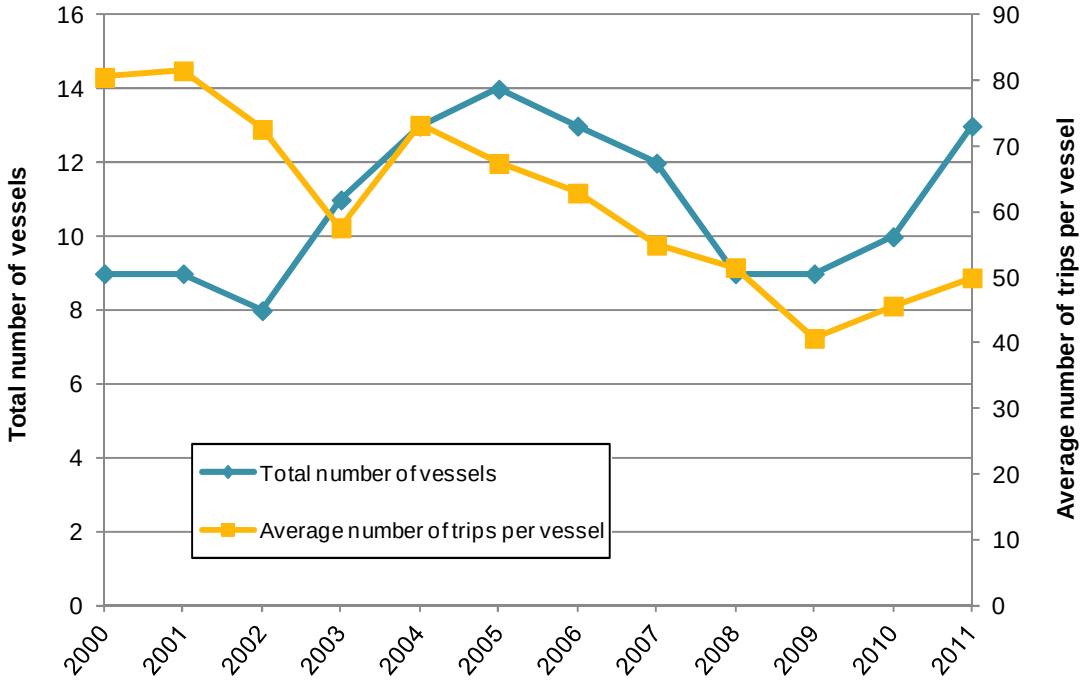
The number of vessels operating out of Half Moon Bay has been variably increasing from 2000 to 2011 starting with 9 vessels operating in the port to a peak of 14 vessels in 2005 and in 2011 with 13 vessels in operation (Figure 33). The average number of trips per vessel however has been decreasing with its peak in 2001 of an average of 82 trips per vessel to a low in 2009 of 41 trips per vessel increasing to approximately 50 trips per vessel in 2011. It is interesting to note that in 2009 (during the second salmon season closure in the study period) that the regional average number of trips per vessel was 22 trips as compared to the Half Moon Bay average of 41 trips. As see in Figure 37 below, Half Moon Bay CPFV

operators were able to operate CPFV well above the regional average during the salmon season closures as they also operate a large amount of rockfish fishing trips as well.

The total number of trips in Half Moon Bay is variable from 2000 to 2011 with a peak in 2004 with 952 trips to a low in 2009 with 367 trips. Since the salmon fishery closures the number of trips have increased to 650 trips in 2011 (Figure 34). The average number of anglers per trip has been highly variable oscillating between average of between 14 and 17 anglers per trip from 2000 to 2011.

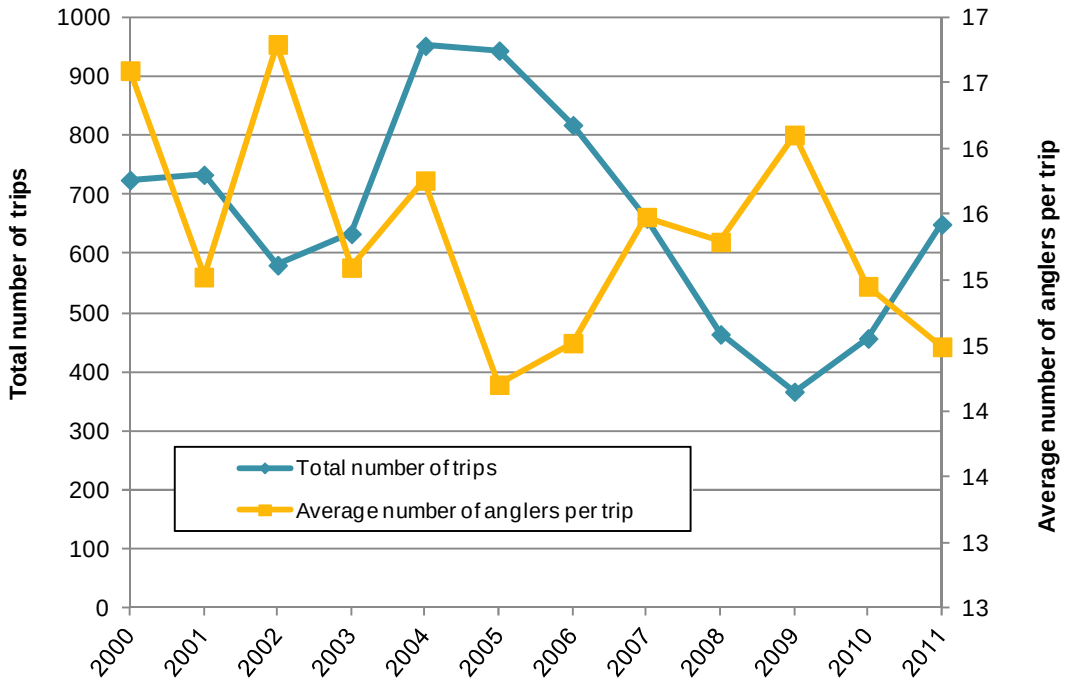
The total number of CPFV anglers in Half Moon Bay follows a variable but generally decreasing trend in which the total number of anglers peaked in 2004 with 15,002 anglers and reached is lowest in 2009 with 5,911 anglers and increased slightly to 9,421 anglers in 2011. The total number of anglers is increasing since the salmon closures of 2008 and 2009; however, it has not returned to levels seen before 2008. The average number of anglers per vessel also follows a generally decreasing trend with a peak of 1,337 anglers per vessel in 2000 to a low of 657 anglers per vessel in 2009, with a slight increase since to 723 anglers per vessel in 2011 (Figure 35).

Figure 33. Total number of CPFV vessels and average number of trips per vessel, Half Moon Bay, 2000-2011



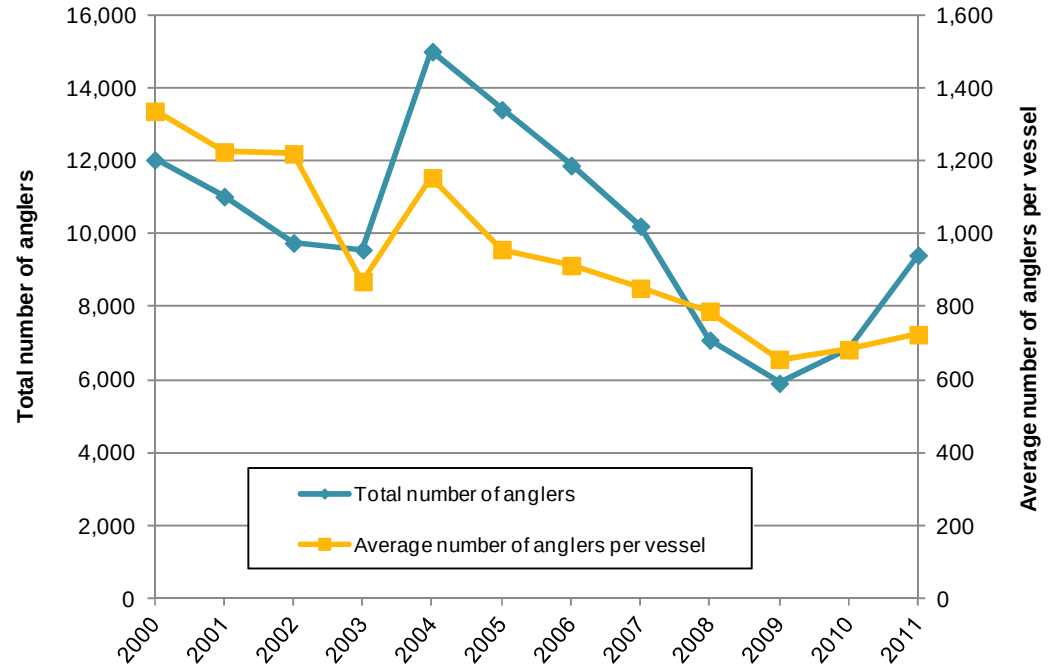
Source: CDFW CPFV logbook data

Figure 34. Total number of CPFV trips and average number of anglers per trip, Half Moon Bay, 2000-2011



Source: CDFW CPFV logbook data

Figure 35. Total number of CPFV anglers and average number of anglers per vessel, Half Moon Bay, 2000-2011

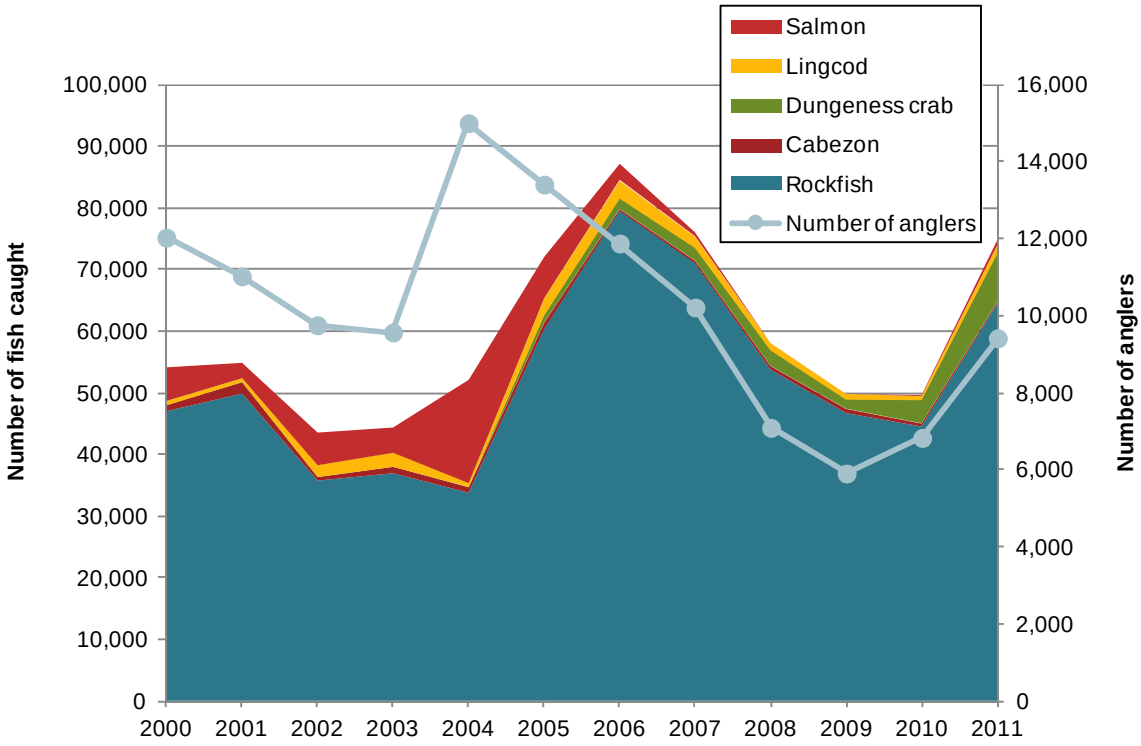


Source: CDFW CPFV logbook data

As seen in Figure 31 the two major fish caught by CPFV anglers in Half Moon Bay are rockfish (84.8 percent of fish caught) and salmon (6.13 percent of fish caught). The total number of fish caught has been variable with a peak of 89,411 fish caught in 2006 and a low of 44,323 fish caught in 2002. This is the only CPFV port in the region in which 2008 or 2009 (salmon fishery closure years) were not the lowest years of total fish caught in the study period.

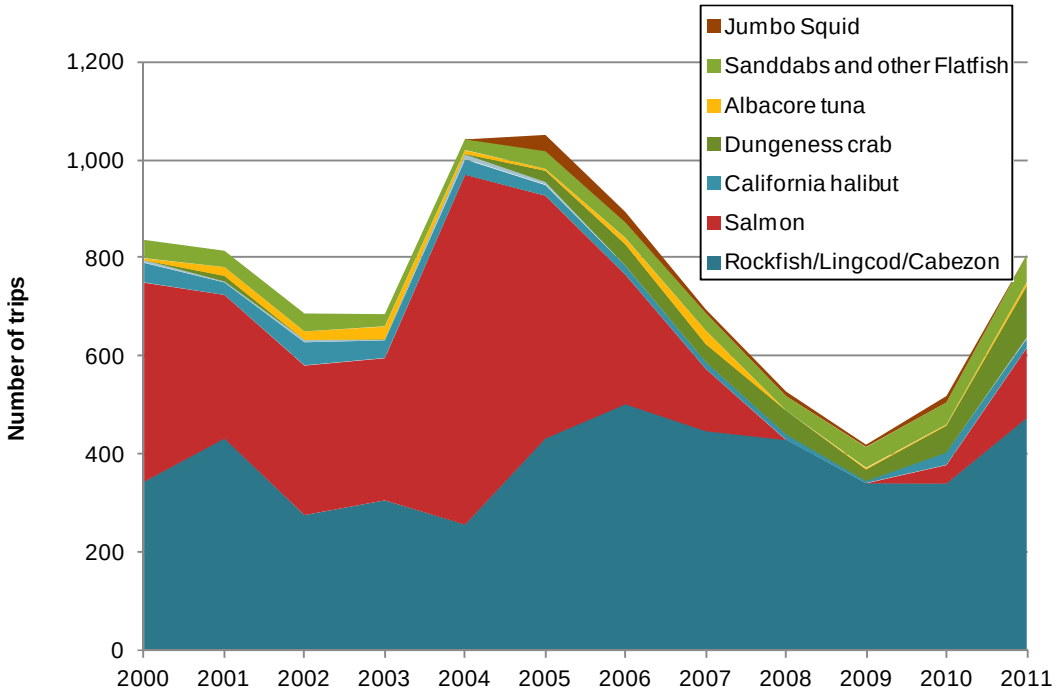
From Figure 37 we can see a more balanced mix of CPFV trips targeting either rockfish (50.9 percent of trips from 2000 to 2011) or salmon (34.2 percent of trips). The total number of trips peaked in 2005 with 1,052 total trips and reached a low in 2009 with 420 trips and has increased significantly to 810 trips total in 2011.

Figure 36. CPFV total number of fish caught for each fishery, Half Moon Bay, 2000-2011



Source: CDFW CPFV logbook data

Figure 37. Total number of CPFV trips for each target fishery, Half Moon Bay, 2000-2011



Source: CDFW CPFV logbook data

4.6.2. Half Moon Bay CPFV Fisheries Baseline Characterization

Seven CPFV operator/owners were interviewed in Half Moon Bay, who, on average, were 51.4 years old and made 58.7 percent of their total personal income from CPFV operations. This was lower than the regional average of 72.4 percent income from CPFV operations. Additionally, as shown below in Table 75, in 2010 CPFV operators we interviewed in Half Moon Bay had an average of 16 years of experience owning CPFV boats and 21.3 years of experience operating CPFV boats.

Five of the seven respondents from Half Moon Bay indicated that they had another source of income besides CPFV fishing in 2010 and some of them indicated they had more than one additional source of income. The only source of income that more than one individual reported was another type of fishing related work, such as commercial fishing. Additional responses are shown in Table 76.

Table 75. CPFV survey response statistics, 2010, Half Moon Bay

	Response	Standard deviation	Number responding
Individuals interviewed	7	n/a	n/a
Owner only	—	n/a	n/a
Average age	51.4	12.5	7
Average number of years owning CPFV boat/s	16.0	12.8	7
Average number of years operating CPFV boat/s	21.3	12.7	7
Average percent income from CPFV operations in 2010	58.7%	43.2%	7

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 76. Sources of income in 2010 in addition to CPFV operation, Half Moon Bay

	Fishery					Activity				
Response	**California halibut**	**Dungeness crab**	**Rockfish**	**Salmon**	**Striped bass**	**Funeral services**	**Leisure cruises**	**Whale watching**	**Other^**	**All target fisheries/ activities (unique individuals)**
Construction/Contractor	—	—	—	—	—	—	—	—	—	—
Harbor/City job	—	—	1	1	—	1	—	—	—	1
Other fishing/boating related work	—	1	2	2	—	1	—	1	1	2
Other specialized work	—	—	1	1	—	—	—	—	—	1
Property management	—	—	1	1	—	1	1	1	1	1
Retirement/Social Security/Investments	—	—	1	1	—	1	1	1	1	1
Skilled labor	—	—	1	—	—	1	1	1	—	1
Number of individuals responding	—	1	5	4	—	4	2	3	2	5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

^ includes bird watching, nature trips, and diving.

The average CPFV owner/operator in Half Moon Bay reported earning an average gross economic revenue (GER) of $105,000 in 2010, only slightly lower than the regional average of $105,423. Additionally, respondents in Half Moon Bay reported they spent an average of 28.4 percent of their GER on fuel, 15 percent on crew, and 41.1 percent on all other operational expenses. All of the expenses reported above were higher in Half Moon Bay than across the study region as a whole (22.9 percent, 12.3 percent, and 37.5 percent, respectively). After costs, respondents in Half Moon Bay made an average of $16,170 in net revenue. It should be noted that three respondents reported that 100 percent of their GER went back into their operating costs in 2010.

Table 77. Average CPFV gross economic revenue (GER) to operating costs in 2010, Half Moon Bay

	Number responding	Average response	Standard deviation
Total GER 2011	7	$105,000	$114,564
% GER to fuel	7	28.4%	10.5%
% GER to crew	7	15.0%	16.1%
% GER to other operating costs	7	41.1%	21.4%

Source: Current study

All but one of the CPFV fishermen in Half Moon Bay reported conducting non-consumptive trips in addition to consumptive fishing trips in 2010. The average fishing trip cost $89 per passenger and had nine passengers aboard and the average non-consumptive trip cost $68 and had 13.2 passengers aboard. More information regarding these trips is found below in Table 78.

Table 78. CPFV trip statistics, 2010, Half Moon Bay

	Consumptive trips			Non consumptive trips		
	Number responding	Response	Standard deviation	Number responding	Response	Standard deviation
Number of people reporting trips	n/a	7	n/a	n/a	6	n/a
Average number of trips in 2010	6	62.5	35.6	5	44.2	71.2
Average number of passengers(per trip)	7	9.0	3.7	6	13.2	7.7
Average price per passenger (per trip)	7	$89	$31	4	$68	$57
Average number of crew (per trip)	6	1.3	0.8	5	1.0	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Rockfish was the most frequently targeted fishery in Half Moon Bay (58.8 days in 2010) and generated the most revenue (58.6 percent of GER). This is the second largest proportion of revenue generated by any single fishery throughout the study region (fishermen in Half Moon Bay attributed 64.3 percent of their GER to salmon). Salmon trips and funeral services generated similar percentages of GER (10.7 and 12.8 percent respectively), but salmon was only targeted an average of 5.4 days as compared to funeral services which were operated an average of 38.2 days in 2010. More information regarding this information is found below in Table 79.

Table 79. Number of days and percent GER targeting fishery/activity in 2010, CPFV, Half Moon Bay

			Number of days targeting species (2010)			Percent of GER from fishery/activity (2010)		
	Fishery/activity	Number interviewed	Number responding	Average	Standard deviation	Number responding	Average	Standard deviation
Fishery	California halibut	—	—	—	—	—	—	—
	Dungeness crab	3	3	45.0	39.1	3	25.3%	27.0%
	Rockfish	7	6	58.8	32.8	7	58.6%	21.0%
	Salmon	6	5	5.4	3.0	6	10.7%	7.8%
	Striped bass	—	—	—	—	—	—	—
Activity	Funeral services	6	5	38.2	62.9	5	12.8%	20.9%
	Leisure cruises	3	2	5.5	4.9	3	3.0%	3.5%
	Whale watching	4	3	8.0	6.2	4	7.5%	2.9%
	Other^	3	2	6.0	5.7	3	14.0%	18.2%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

All CPFV operators were asked to compare their success in each of their target fisheries and non-consumptive activities in 2010 to that of the previous five years. As shown below in Table 80, individuals were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. Respondents were then asked what factors they felt had contributed to the change in success in their fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the Table 81 through Table 84 below.

The fishermen who felt that their success in the rockfish fishery was somewhat better specified that there was a large quantity of fish (Table 82), but that this was only the case near Half Moon Bay. Additionally, the individual who felt their success in the salmon fishery was better noted that although the 2010 season what shortened the 2008 and 2009 season had been closed completely.

Table 80. Overall success in CPFV fishery/activity in 2010 compared to past five years, Half Moon Bay

			Percent responding				
		Number responding	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	California halibut	—	—	—	—	—	—
	Dungeness crab	3	100.0%	—	—	—	—
	Rockfish	7	—	14.3%	14.3%	57.1%	14.3%
	Salmon	6	16.7%	—	—	16.7%	66.7%
	Striped bass	—	—	—	—	—	—
Activity	Funeral services	5	20.0%	—	60.0%	20.0%	—
	Leisure cruises	3	—	—	33.3%	—	66.7%
	Whale watching	4	25.0%	25.0%	—	—	50.0%
	Other ^	3	33.3%	33.3%	—	—	33.3%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ includes bird watching, nature trips, and diving.

Table 81. Regulatory changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Half Moon Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	1	5	5	—	—	—	—	1
	Response	**Count of responses**								
Negative	Regulated season too short	—	—	—	5	—	—	—	—	—
	MPAs	—	1	5	—	—	—	—	—	1
	More pressure on fishery	—	—	—	—	—	—	—	—	—
	Rockfish Conservation Areas	—	—	1	—	—	—	—	—	—
Positive	Fishery closed in previous seasons	—	—	—	2	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 82. Environmental changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Half Moon Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	3	4	5	—	—	—	3	—
	Response	**Count of responses**								
Positive	Large quantity of fish	—	3	1	—	—	—	—	—	—
	Peak of natural cycle	—	—	—	—	—	—	—	—	—
	Good ocean conditions	—	1	—	—	—	—	—	1	—
Negative	Low quantity of fish	—	—	3	5	—	—	—	—	—
	Low of natural cycle	—	—	—	—	—	—	—	—	—
	Bad weather	—	—	—	—	—	—	—	2	—
	Poor ocean conditions	—	—	—	1	—	—	—	—	—
	More bait/feed in water - causing fish to bite less	—	—	—	—	—	—	—	—	—
	Loss of salmon spawning grounds	—	—	—	—	—	—	—	—	—
	Fish are smaller	—	—	1	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 83. Economic changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Half Moon Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	1	—	—	2	2	2	1
	Response	**Number responding**								
Positive	Good/new market opportunity	—	—	—	—	—	1	—	—	1
Negative	Lack of customers	—	—	1	—	—	—	—	—	—
	Bad economy	—	—	1	—	—	1	2	2	—
	Fuel costs	—	—	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

Table 84. Other changes/factors influencing success in specific CPFV fishery/activity in 2010 compared to previous five years, Half Moon Bay

		Fishery					Activity			
		California halibut	Dungeness crab	Rockfish	Salmon	Striped bass	Funeral services	Leisure cruises	Whale watching	Other^
	Number responding	—	—	3	—	—	1	—	—	2
	Response	**Number responding**								
Positive	Diversifying portfolio of fisheries/activities	—	—	—	—	—	1	—	—	2
	Putting more effort into fishery/activity	—	—	—	—	—	—	—	—	—
Negative	Others are diversifying - adding competition to fishery/activity	—	—	—	—	—	—	—	—	—
	Putting less effort into fishery/activity	—	—	—	—	—	—	—	—	—
	Personal reasons	—	—	—	—	—	—	—	—	—
	Too many other boats/overcrowding	—	—	3	—	—	—	—	—	—
	Drag boats are depleting resource	—	—	—	—	—	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

** indicates data were collected but cannot be shown due to confidentiality constraints*

^ Other includes: bird watching, recreational diving, and nature trips.

5. NORTH CENTRAL COAST CPFV SPATIAL BASELINE

In the following section we provide maps of baseline data depicting the spatial fishing patterns of specific CPFV fisheries at the port and region level. The full detailed methodology of how these data were collected, analyzed, and reviewed can be found in Section 2 of this report. The GIS data layers with associated metadata of these spatial data sets are also available and were included in the deliverables package of this project which can be found on the OceanSpaces website: (http://oceanspaces.org). The following map products and spatial data sets for the North Central Coast region CPFV fleet for the post-MPA 2010 season are provided in Table 85 below. Only maps with 3 or more fishermen are available for use due to confidentiality protocols as indicated in the table below. We would like to note that due to the very limited salmon season in 2010 the 2011 data set (see appendix) is likely a more representative post-MPA spatial baseline.

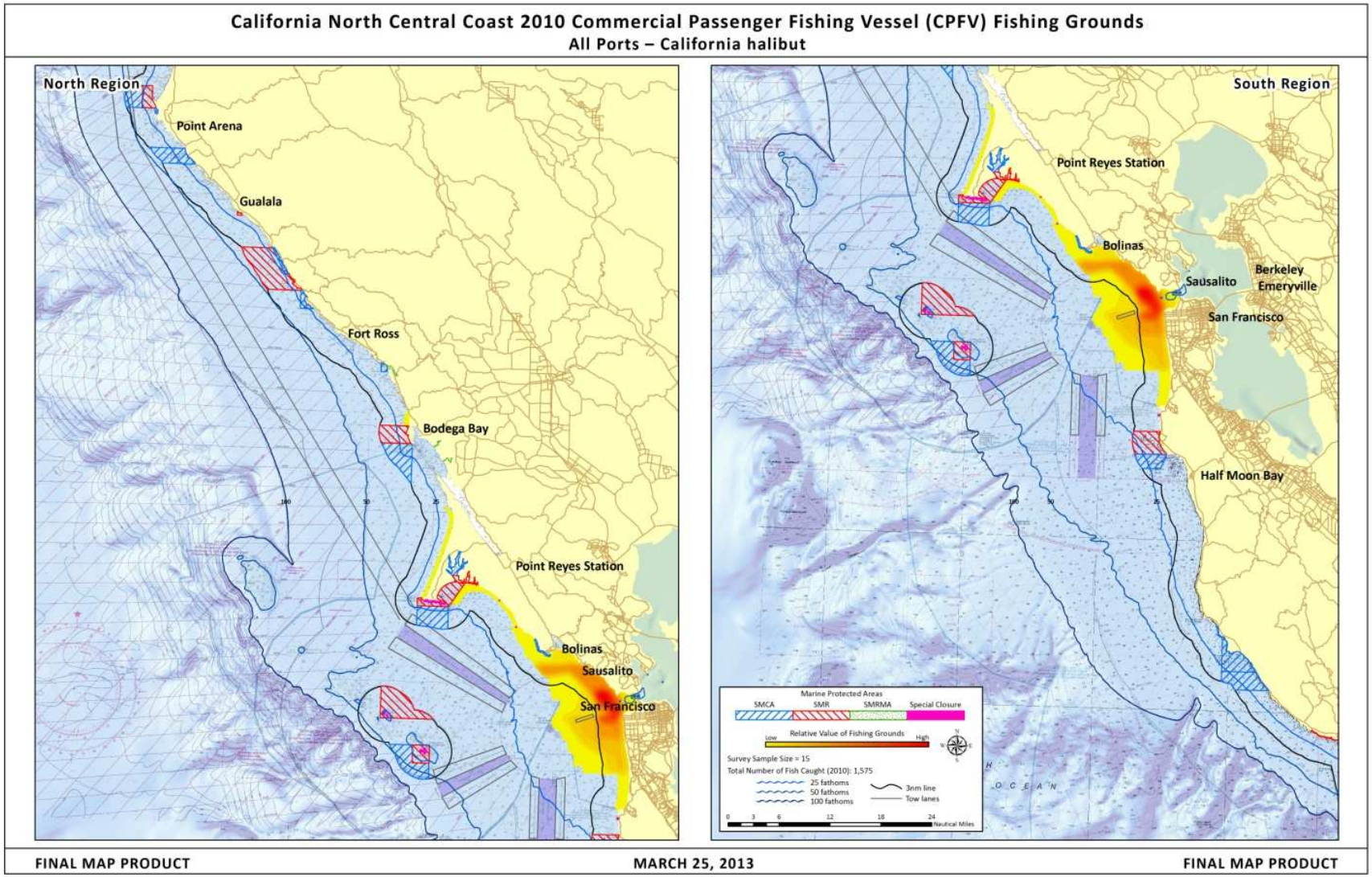
Table 85. 2010 Map products and spatial data sets developed and available

Port/Region	Fishery	Number of fish caught by CPFV operations	Number of fishermen who mapped	Map available
North Central Coast	California halibut	1,575	15	YES
North Central Coast	Dungeness crab	10,078	8	YES
North Central Coast	Rockfish	135,049	28	YES
North Central Coast	Salmon	2,277	25	YES
North Central Coast	Striped bass	356	10	YES
Bodega Bay	California halibut	46	3	YES
Bodega Bay	Dungeness crab	2,757	3	YES
Bodega Bay	Rockfish	20,648	5	YES
Bodega Bay	Salmon	695	5	YES
Bodega Bay	Striped bass	—	—	—
Sausalito	California halibut	16	2	NO
Sausalito	Dungeness crab	—	—	—
Sausalito	Rockfish	908	3	YES
Sausalito	Salmon	565	5	YES
Sausalito	Striped bass	8	2	NO
Berkeley	California halibut	898	4	YES
Berkeley	Dungeness crab	—	—	—
Berkeley	Rockfish	16,689	5	YES
Berkeley	Salmon	396	3	YES
Berkeley	Striped bass	122	2	NO
Emeryville	California halibut	482	3	YES
Emeryville	Dungeness crab	3,490	2	NO
Emeryville	Rockfish	50,566	4	YES
Emeryville	Salmon	178	4	YES
Emeryville	Striped bass	168	3	YES
San Francisco	California halibut	133	4	YES
San Francisco	Dungeness crab	—	—	—
San Francisco	Rockfish	1,752	4	YES
San Francisco	Salmon	273	2	NO
San Francisco	Striped bass	58	3	YES
Half Moon Bay	California halibut	—	—	—
Half Moon Bay	Dungeness crab	3,831	3	YES
Half Moon Bay	Rockfish	44,486	7	YES
Half Moon Bay	Salmon	170	6	YES
Half Moon Bay	Striped bass	—	—	—

Source: California Department of Fish and Wildlife, Current study

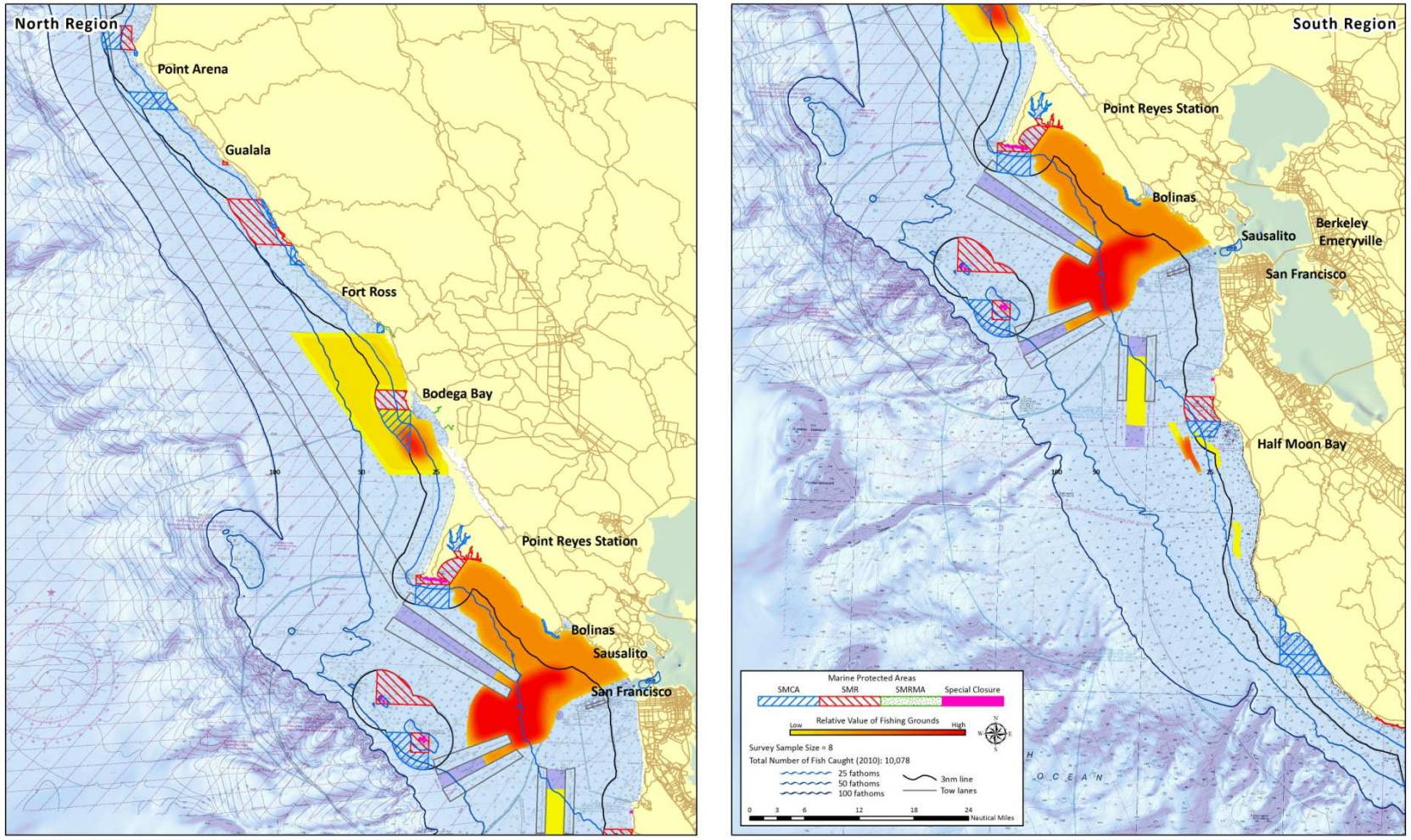
— indicates that the port/fishery was not sampled or a zero value data point

5.1. North Central Coast Region CPFV Spatial Baseline



California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

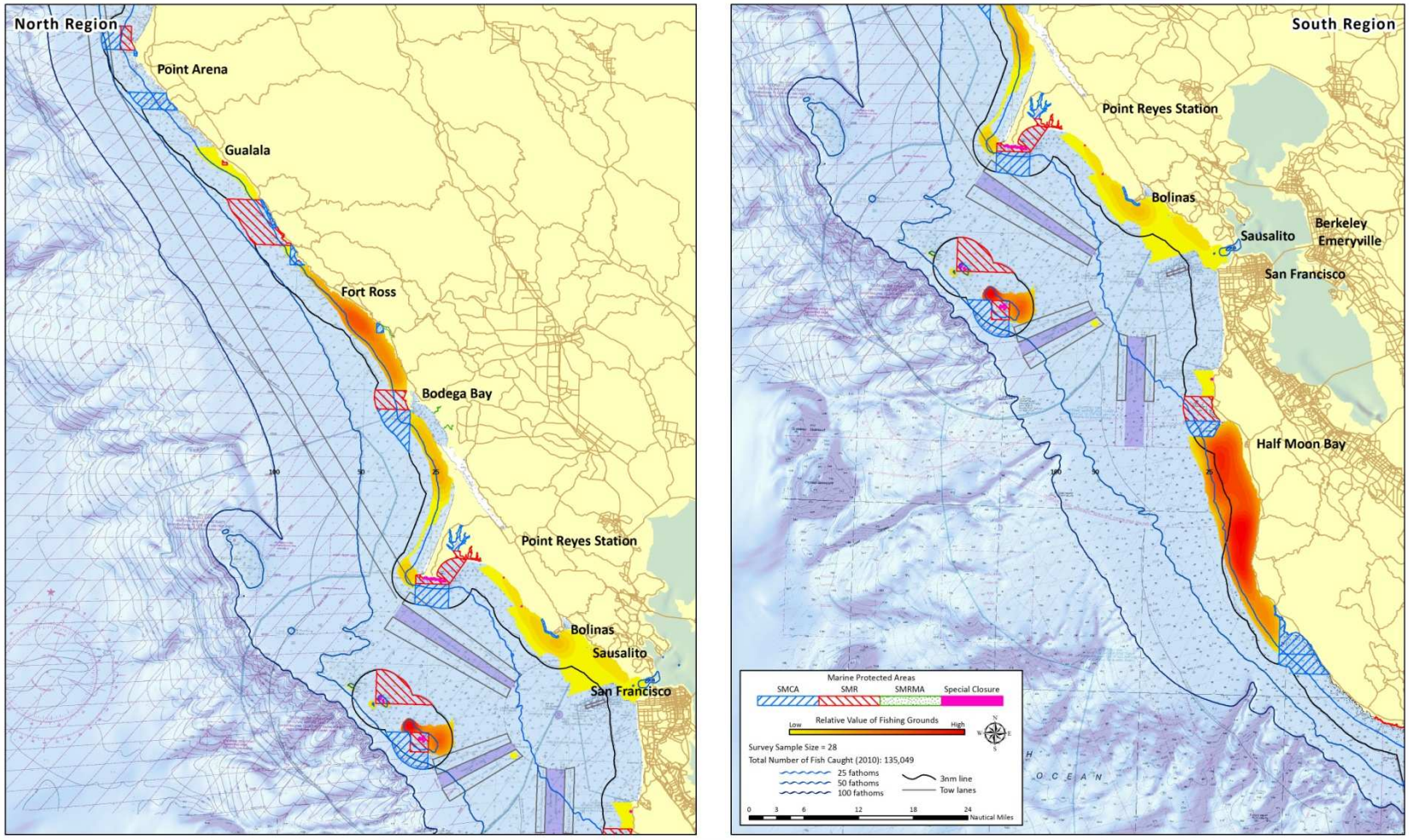
All Ports – Dungeness crab



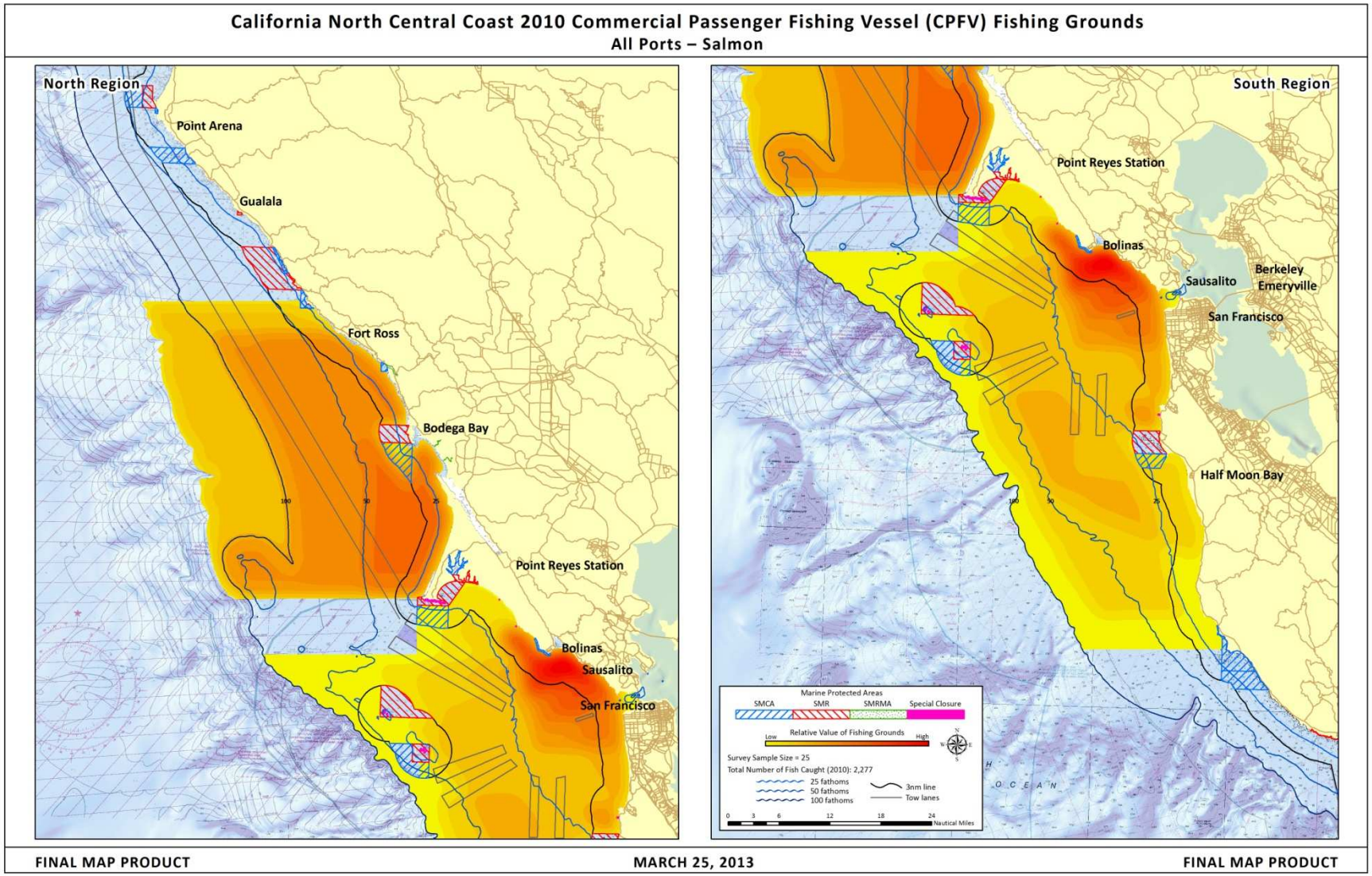
FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

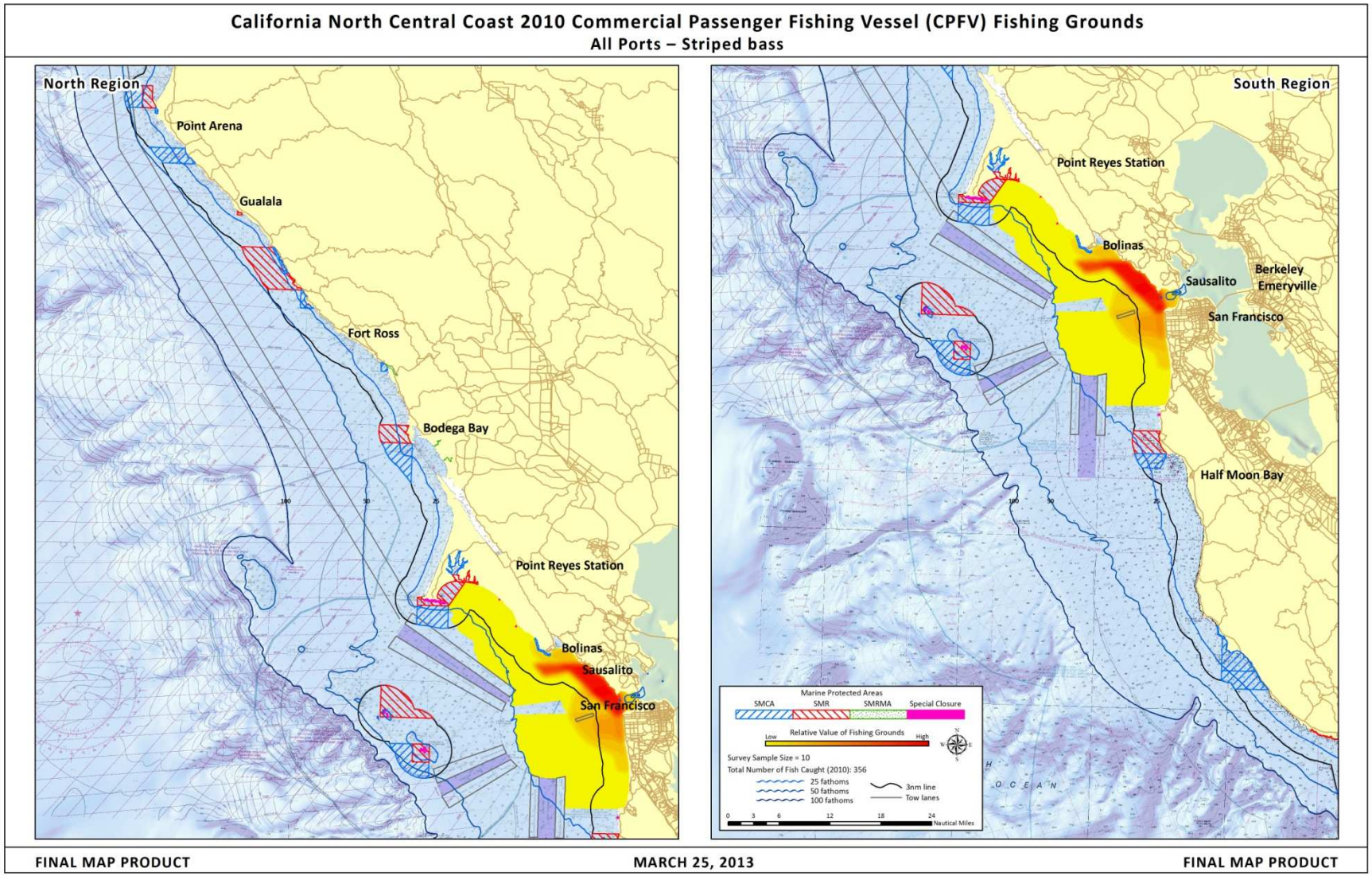
California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

All Ports – Rockfish

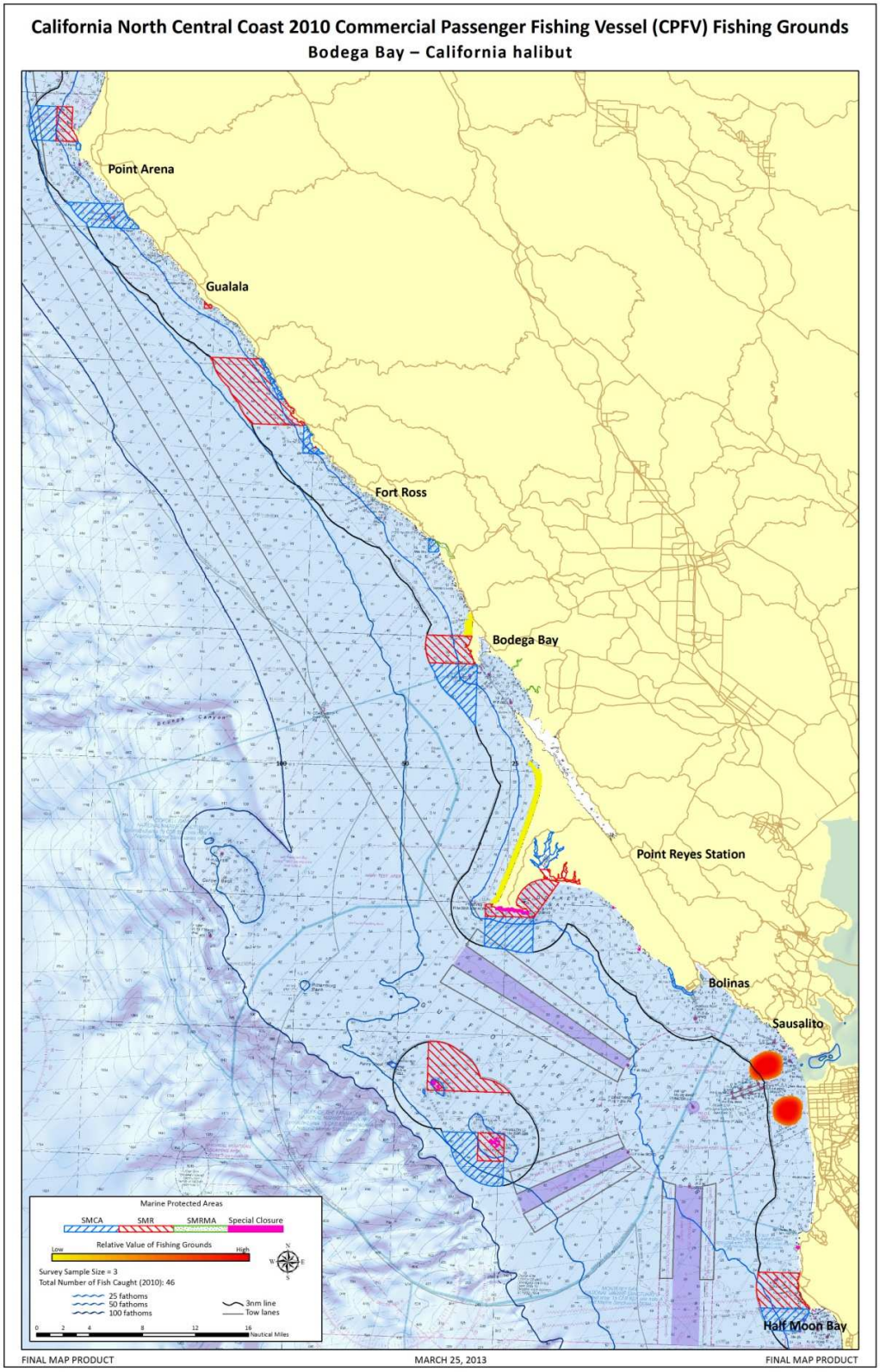


FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT


California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
All Ports – Salmon
North Region
Point Arena
Gualala
Fort Ross
Bodega Bay
Point Reyes Station
Bolinas
Sausalito
San Francisco
South Region
Point Reyes Station
Bolinas
Sausalito
Berkeley
Emeryville
San Francisco
Half Moon Bay
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Low
Relative Value of Fishing Grounds
High
Survey Sample Size = 25
Total Number of Fish Caught (2010): 2,277
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
0 3 6 12 18 24
Nautical Miles
O C E A N
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

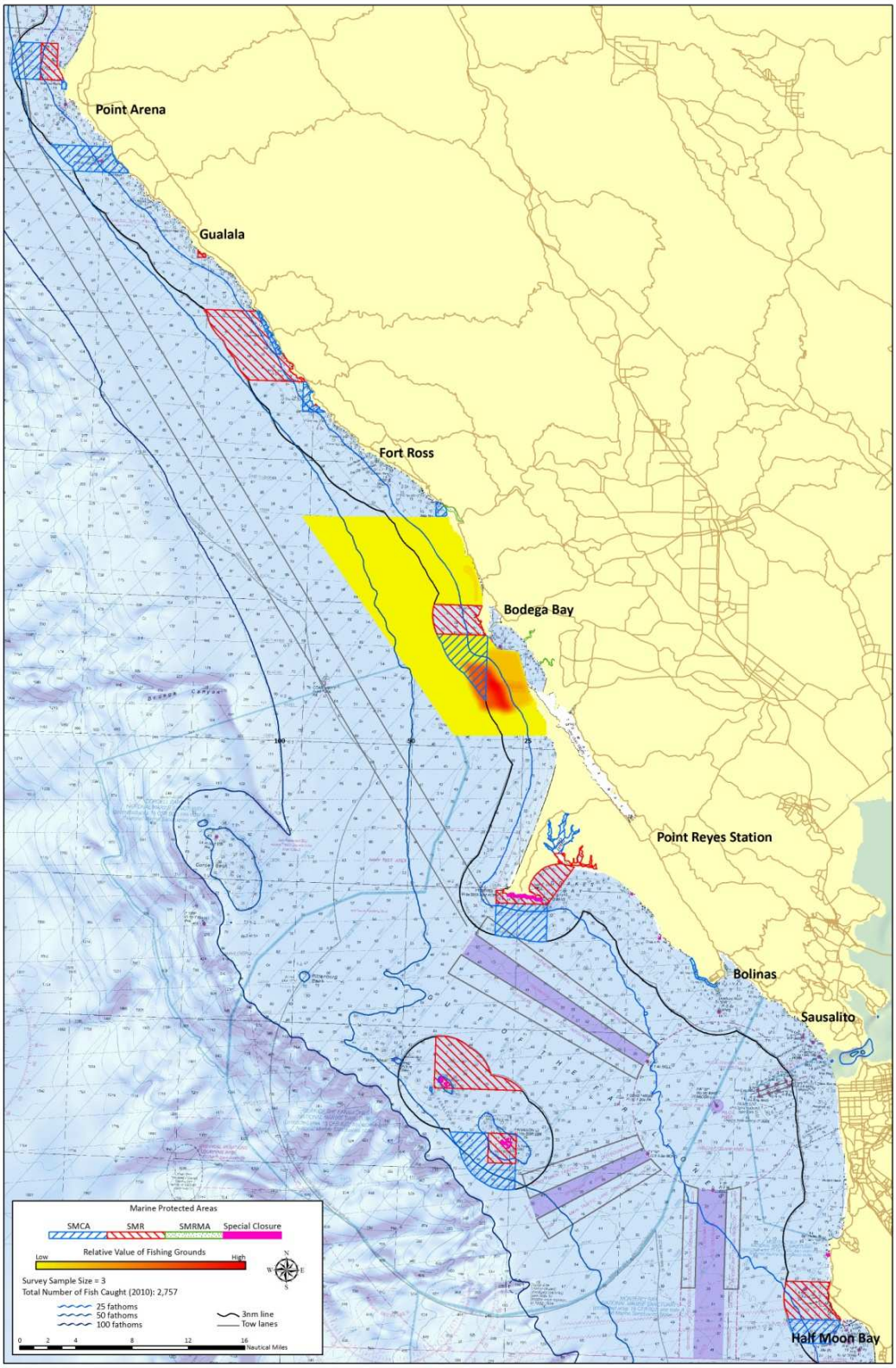

California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
All Ports – Striped bass
North Region
Point Arena
Gualala
Fort Ross
Bodega Bay
Point Reyes Station
Bolinas
Sausalito
San Francisco
South Region
Point Reyes Station
Bolinas
Sausalito
Berkeley
Emeryville
San Francisco
Half Moon Bay
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Low
Relative Value of Fishing Grounds
High
Survey Sample Size = 10
Total Number of Fish Caught (2010): 356
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
0 3 6 12 18 24
Nautical Miles
O C E A N
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

5.2. Bodega Bay CPFV Spatial Baseline



California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

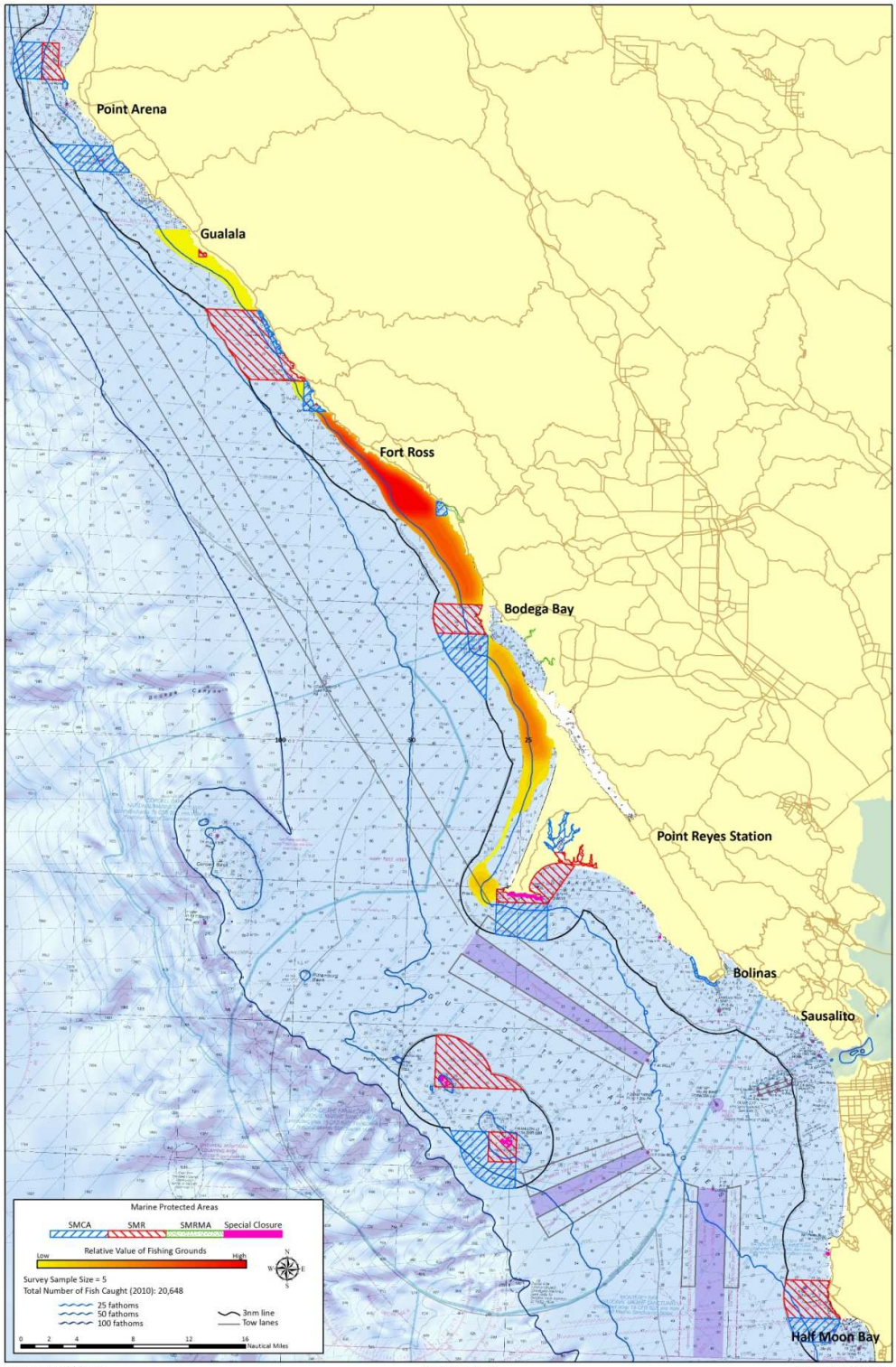
Bodega Bay – Dungeness crab



FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

Bodega Bay – Rockfish



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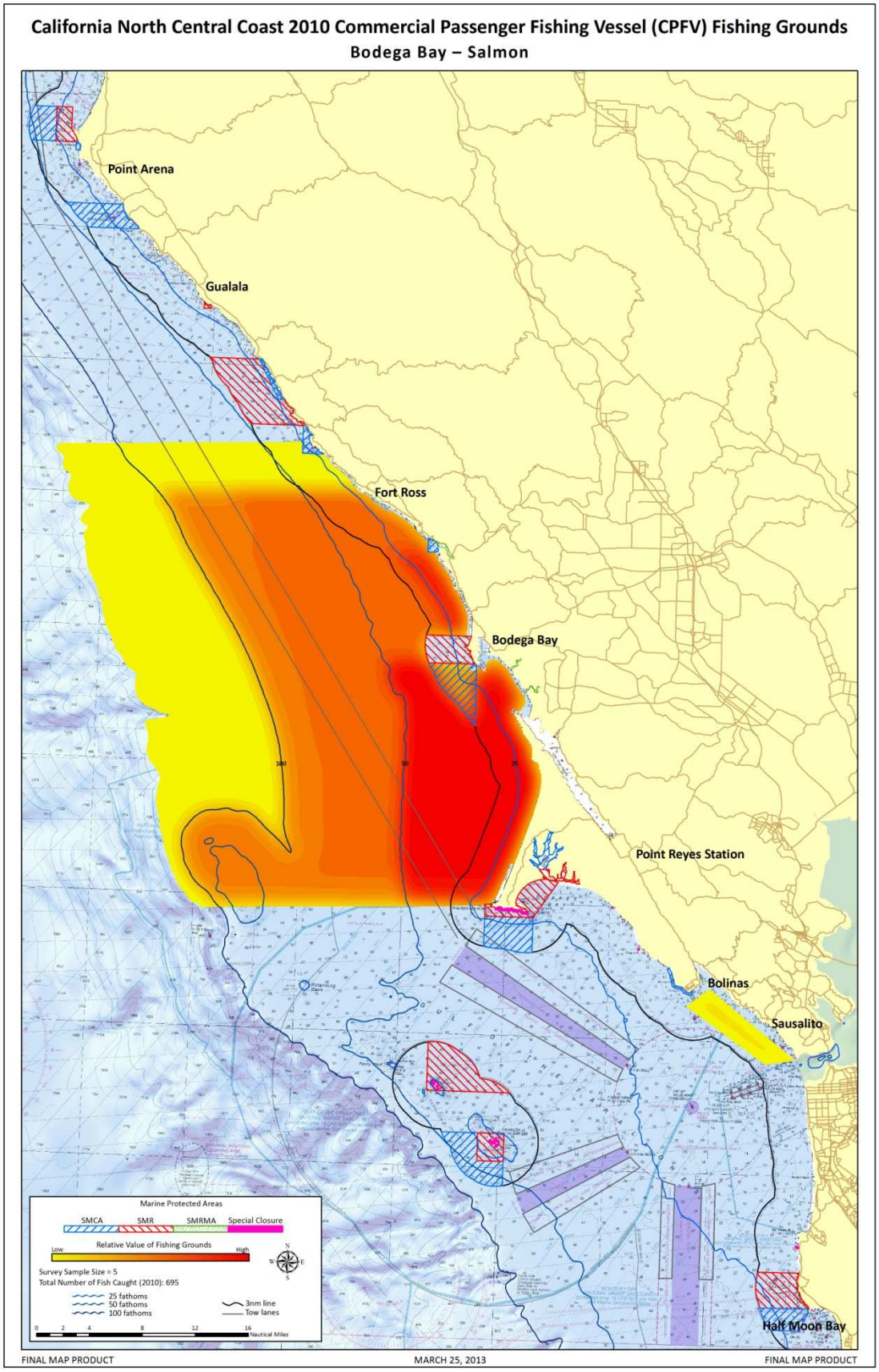
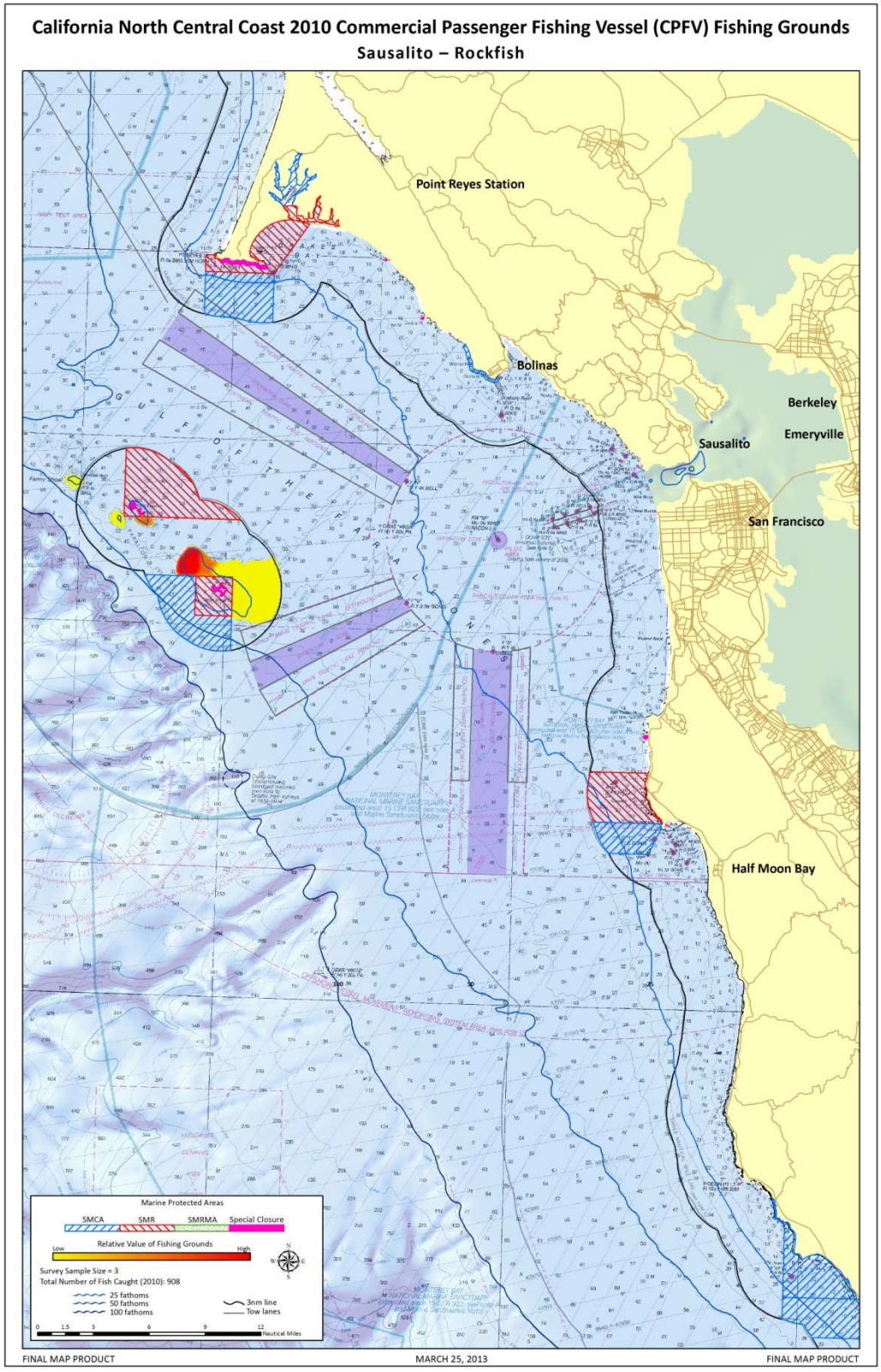
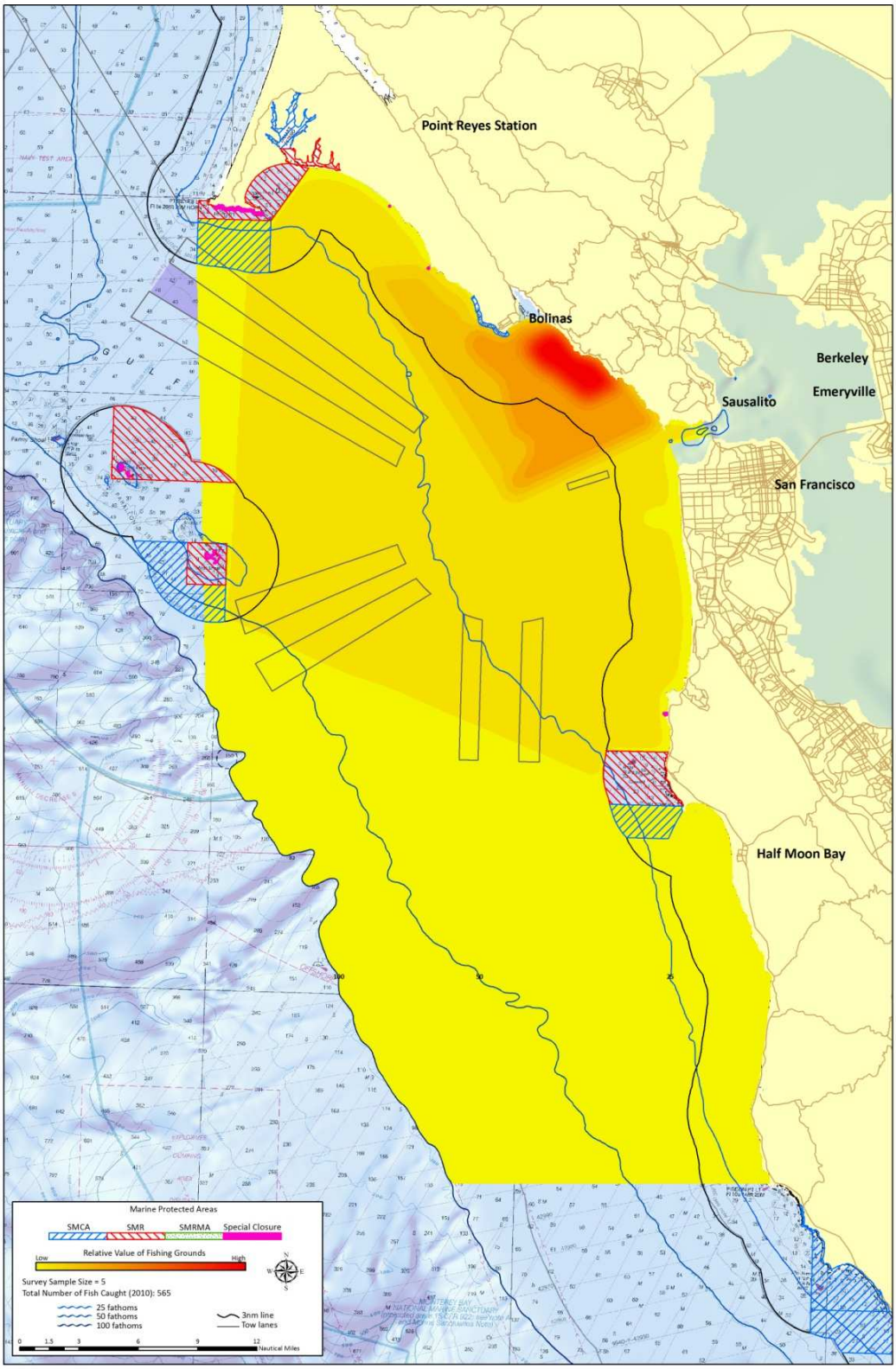

California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
Bodega Bay – Salmon
Point Arena
Gualala
Fort Ross
Bodega Bay
Point Reyes Station
Bolinas
Sausalito
Half Moon Bay
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Relative Value of Fishing Grounds
Low
High
Survey Sample Size = 5
Total Number of Fish Caught (2010): 695
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
Nautical Miles
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

5.3. Sausalito CPFV Spatial Baseline



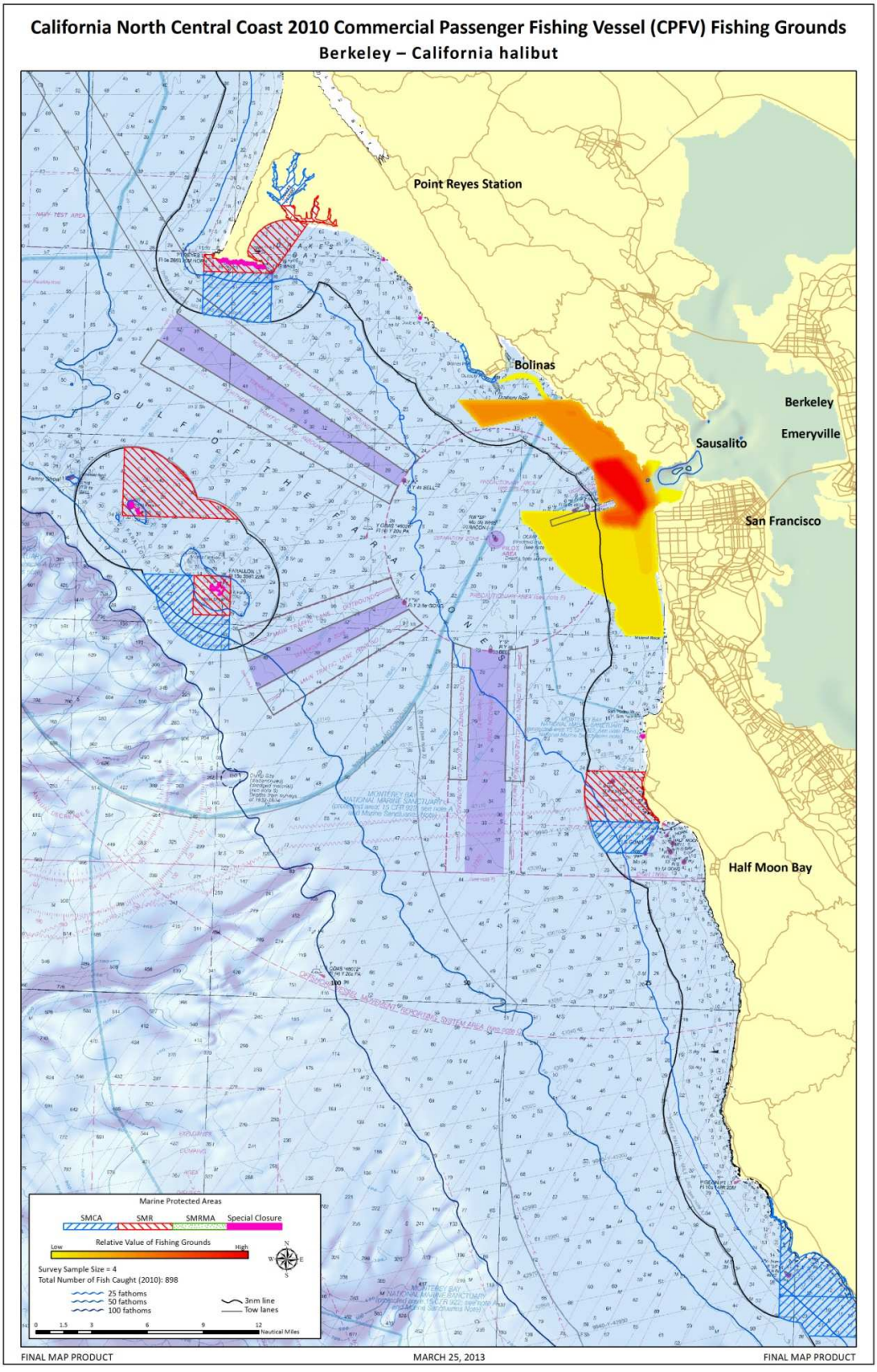
California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

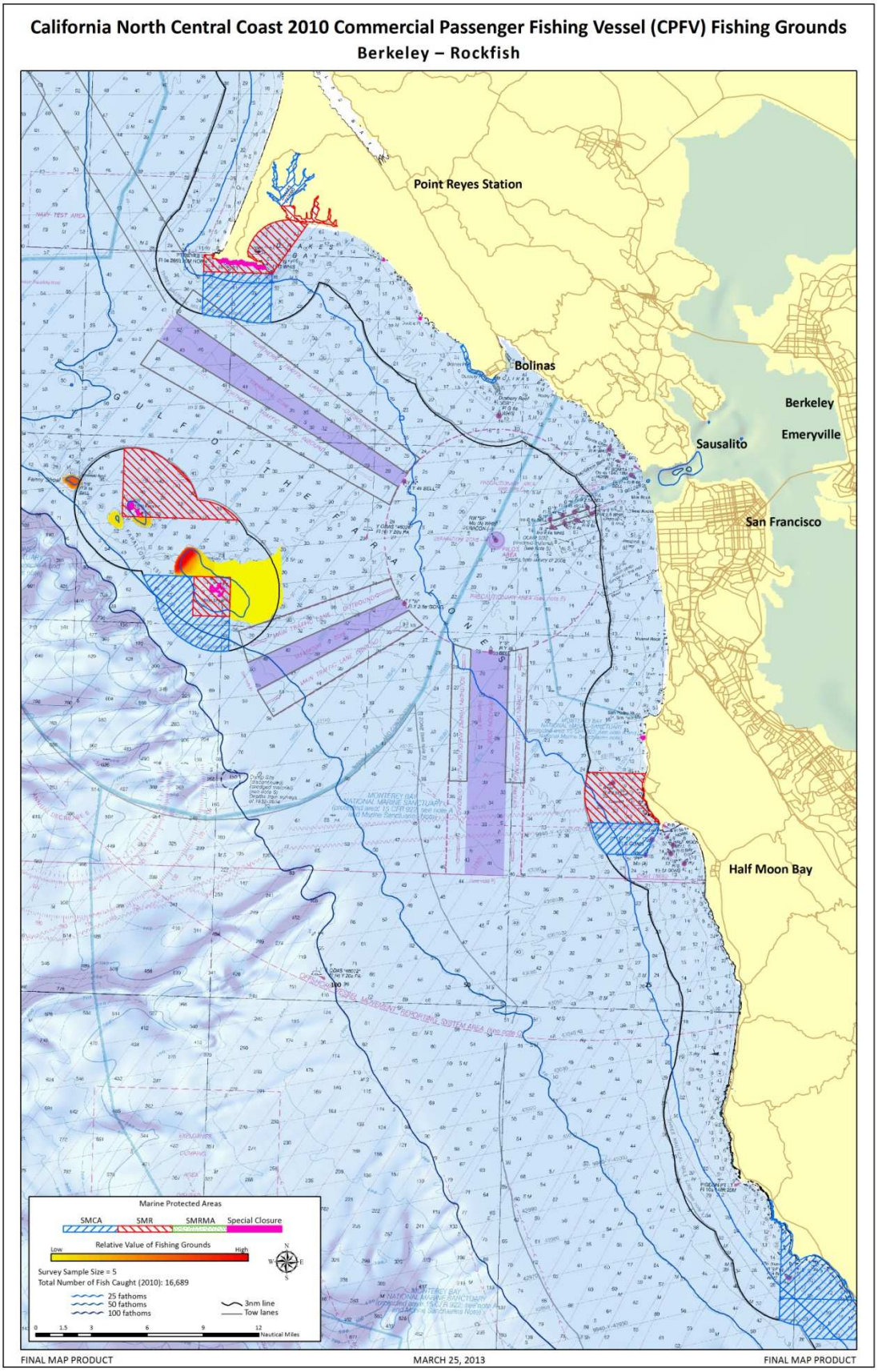
Sausalito – Salmon

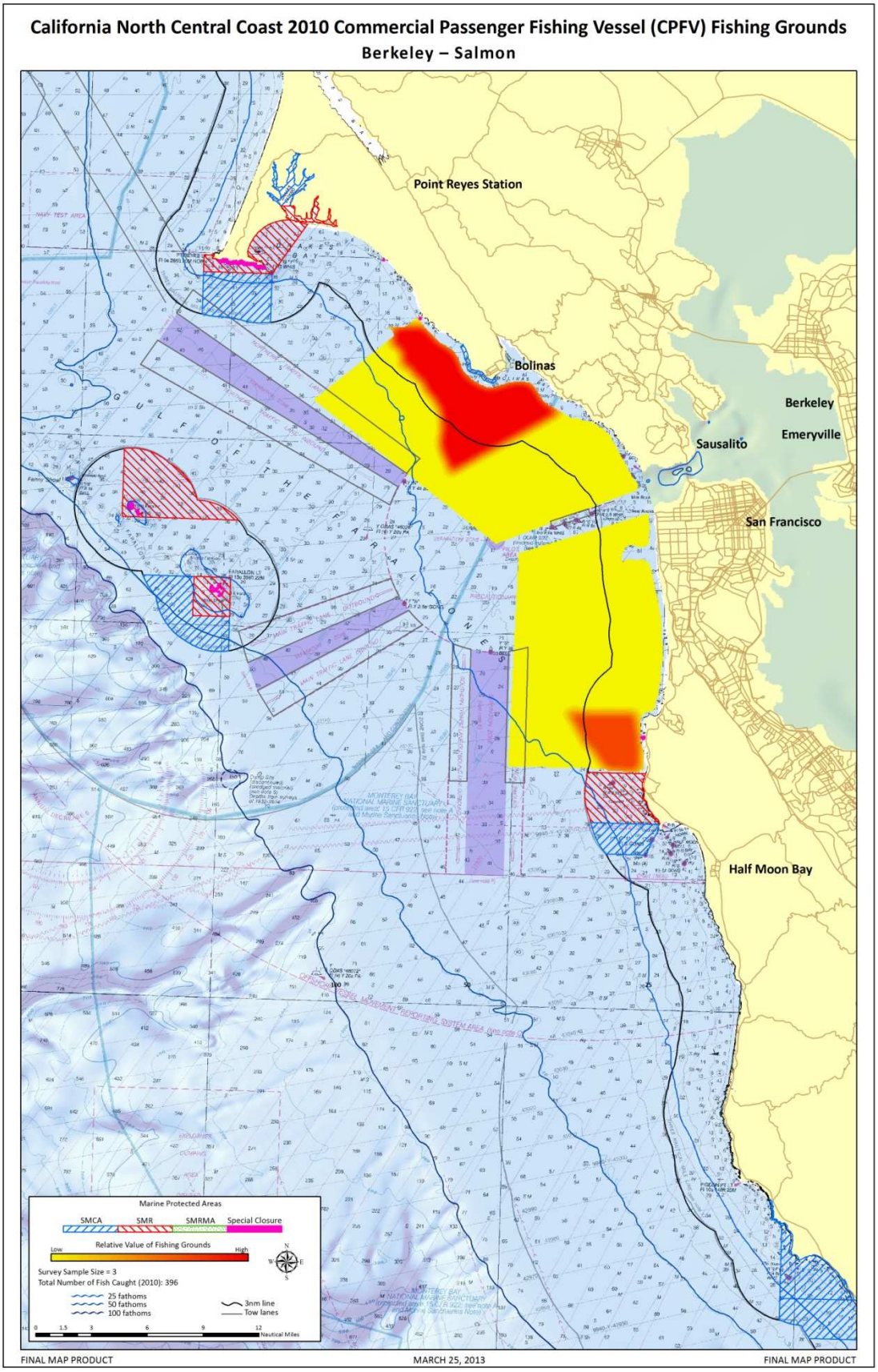


FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

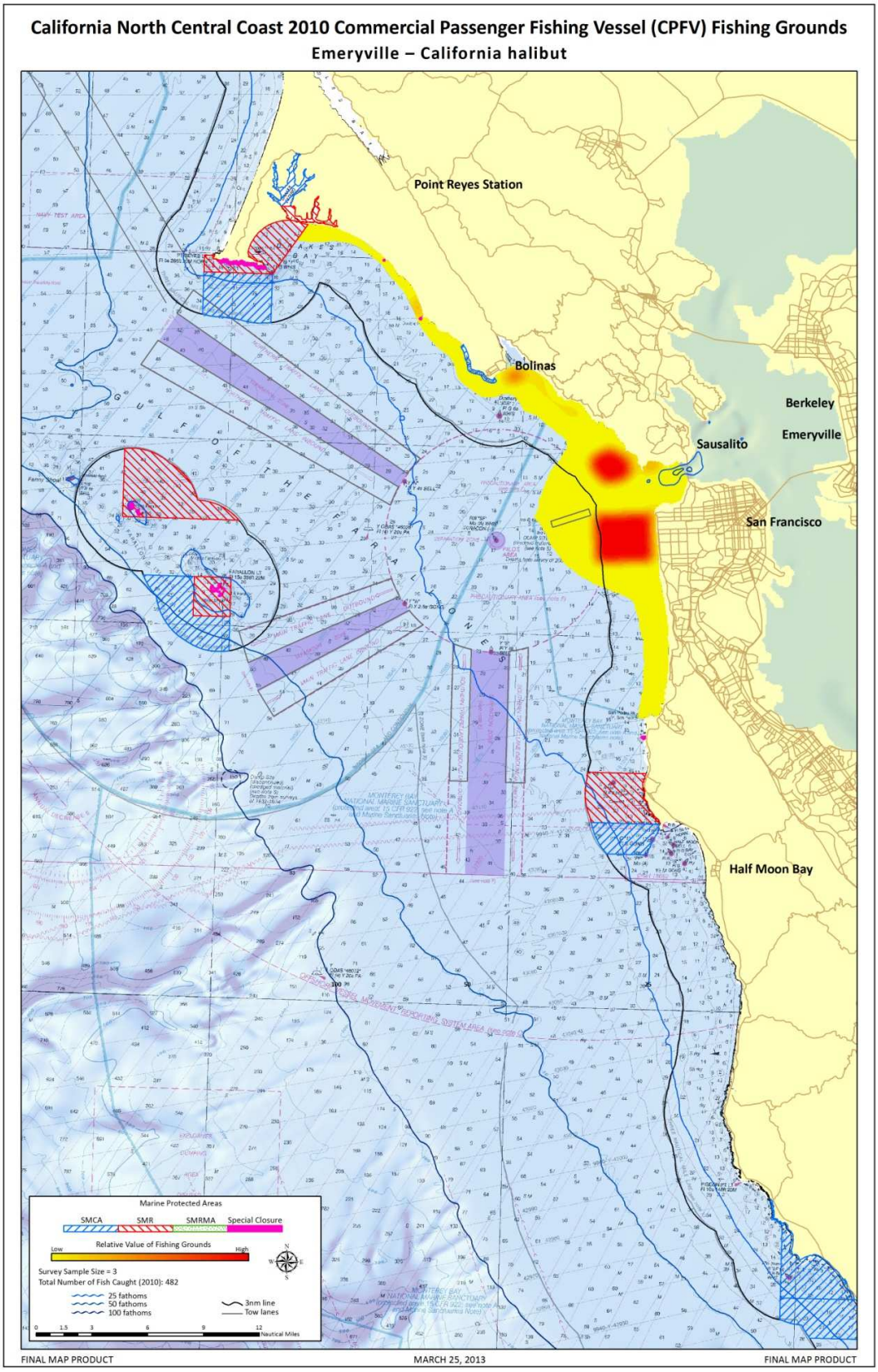
5.4. Berkeley CPFV Spatial Baseline




California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
Berkeley – Rockfish
Point Reyes Station
Bolinas
Berkeley
Emeryville
Sausalito
San Francisco
Half Moon Bay
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Relative Value of Fishing Grounds
Low
High
Survey Sample Size = 5
Total Number of Fish Caught (2010): 16,689
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
Nautical Miles
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

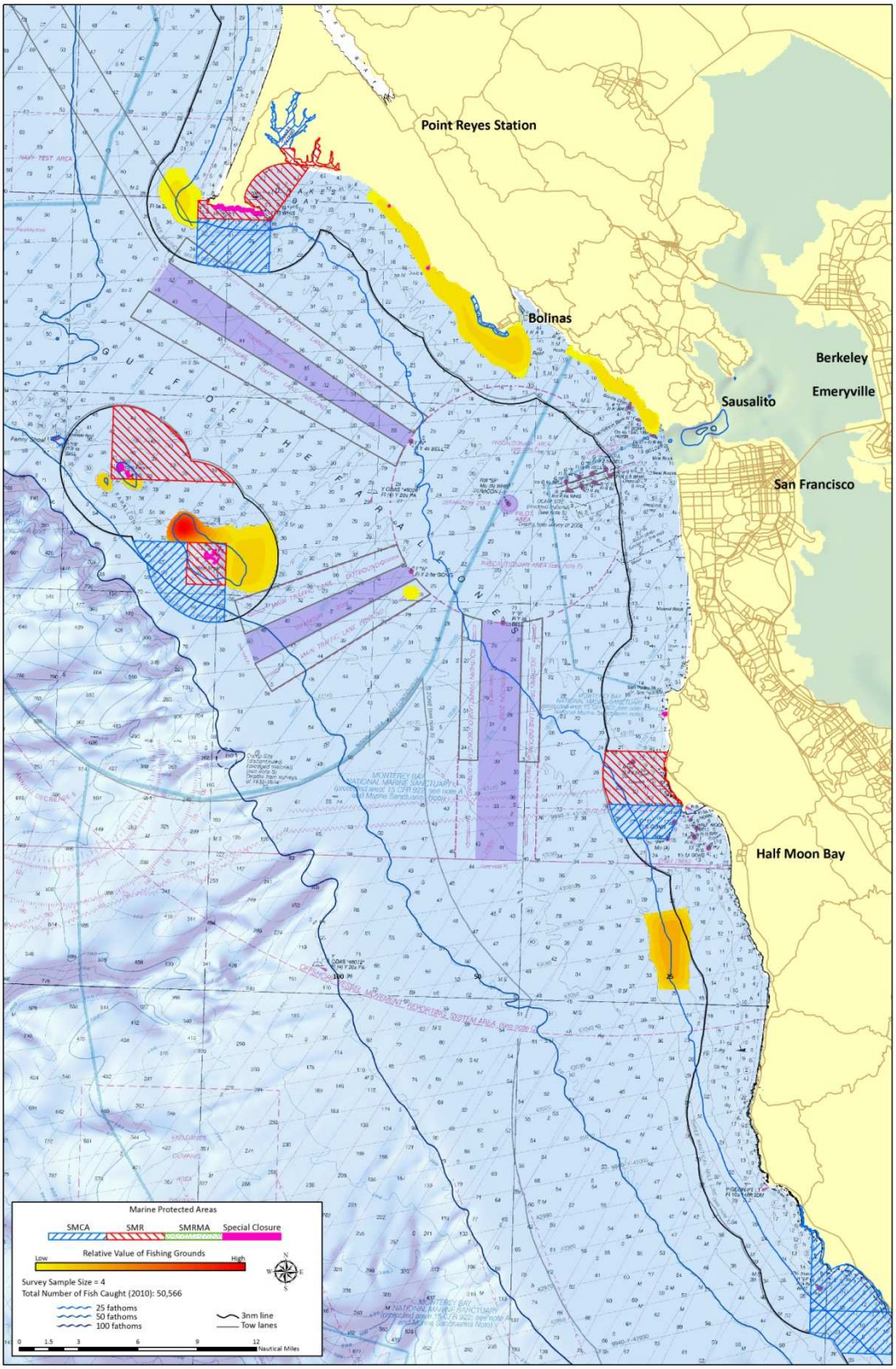

California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
Berkeley – Salmon
Point Reyes Station
Bolinas
Berkeley
Emeryville
Sausalito
San Francisco
Half Moon Bay
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Relative Value of Fishing Grounds
Low
High
Survey Sample Size = 3
Total Number of Fish Caught (2010): 396
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
Nautical Miles
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

5.5. Emeryville CPFV Spatial Baseline



California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

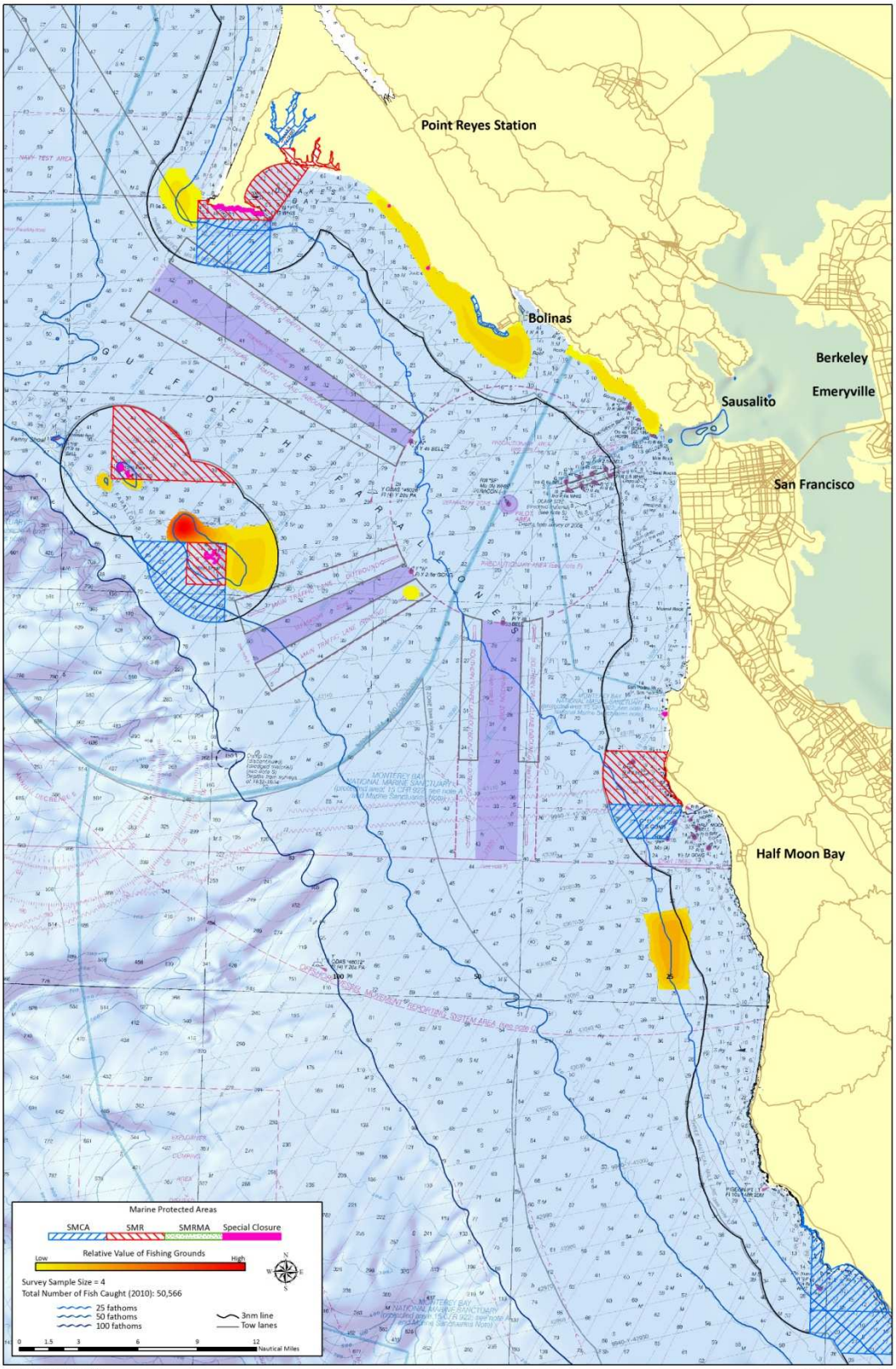
Emeryville – Rockfish



FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

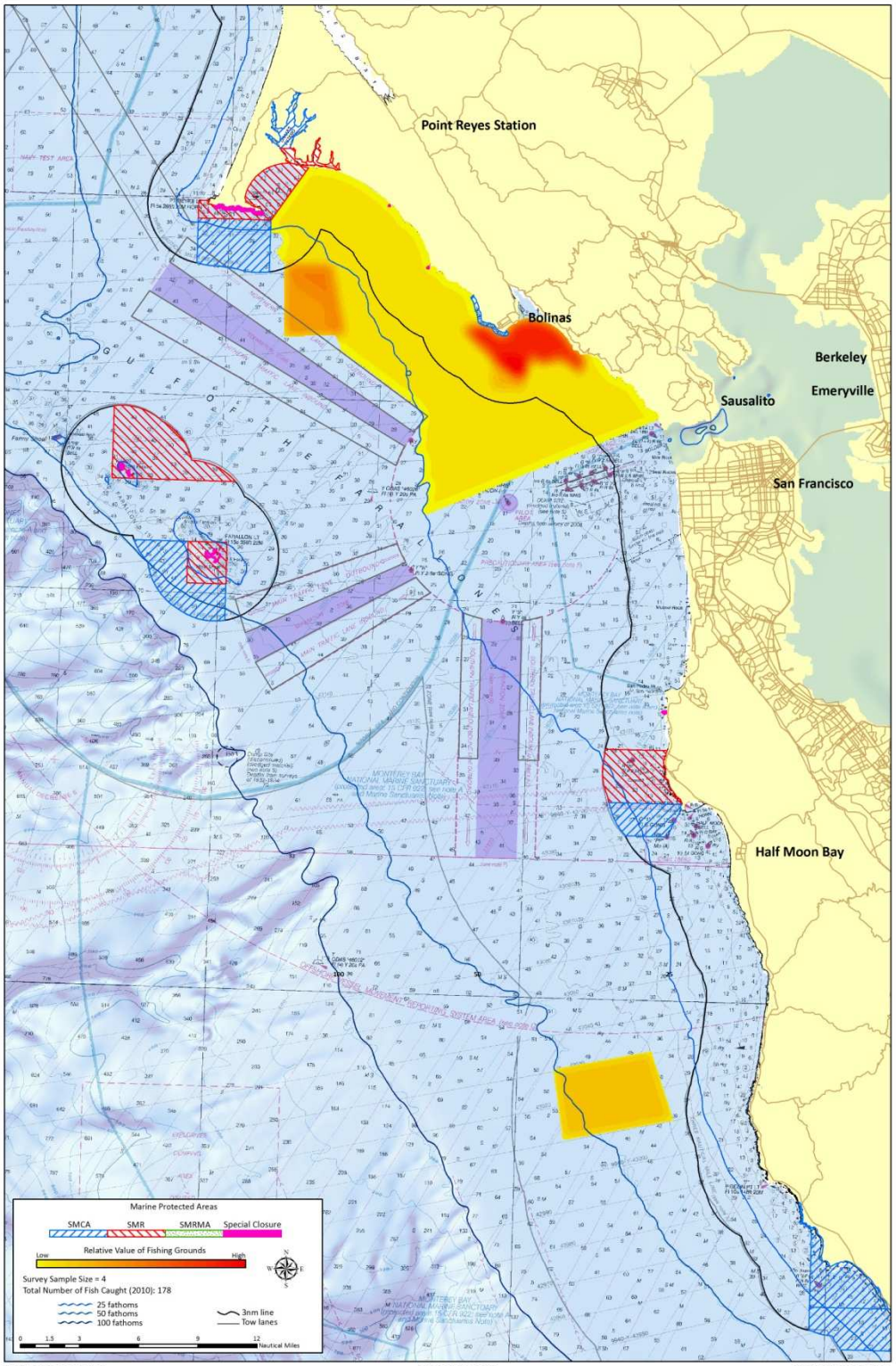
Emeryville – Rockfish



FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

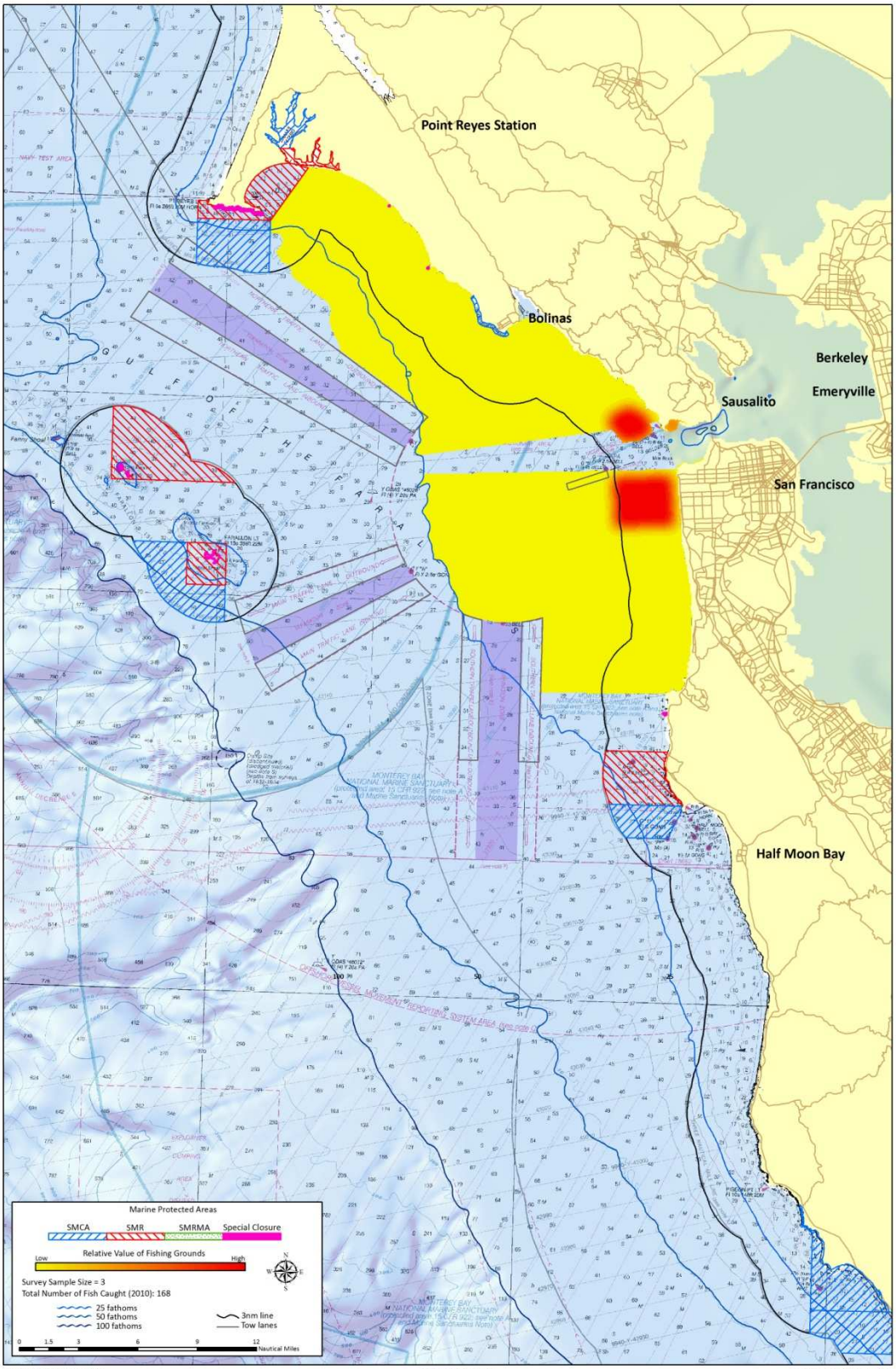
Emeryville – Salmon



FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

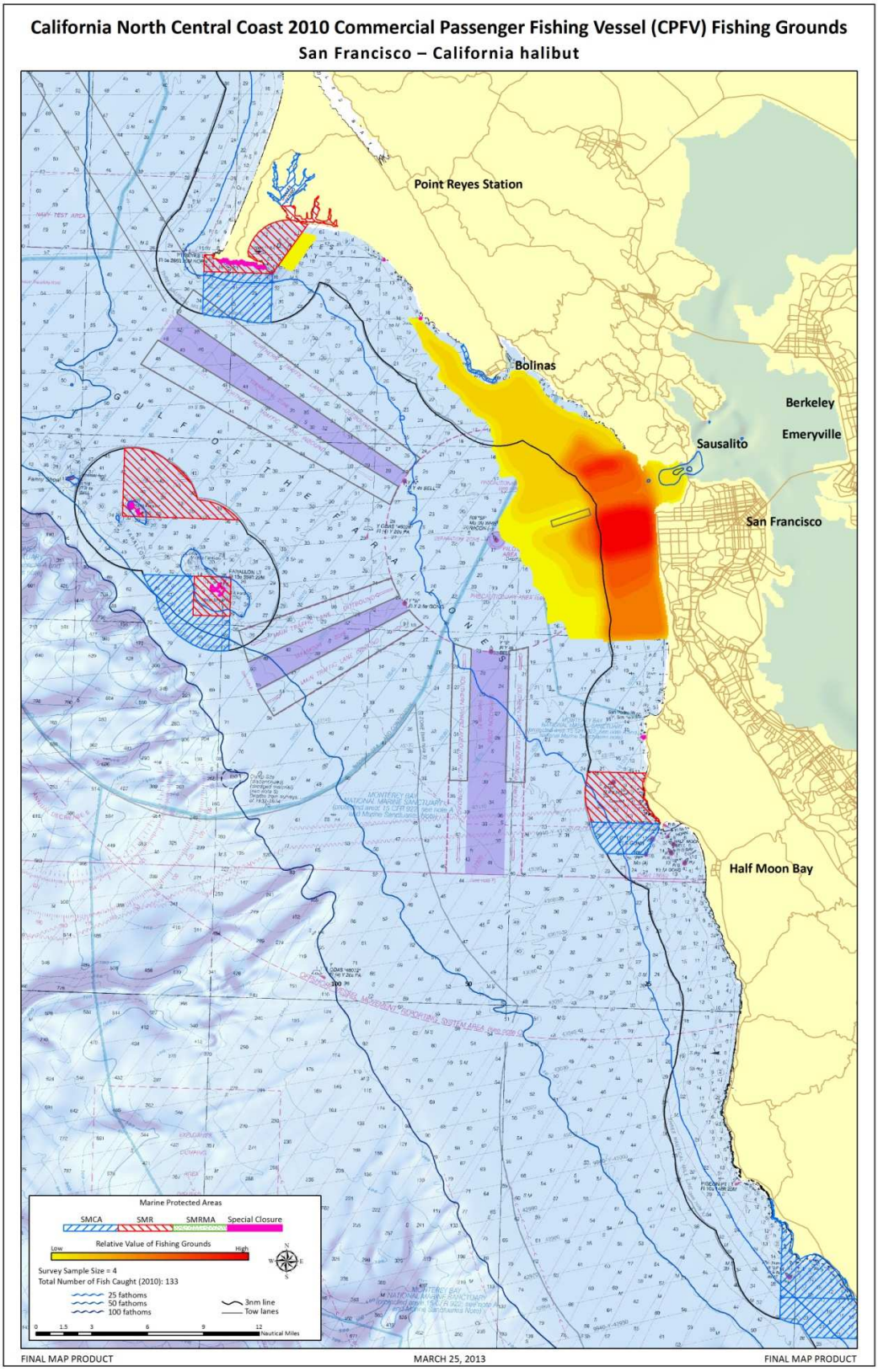
California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

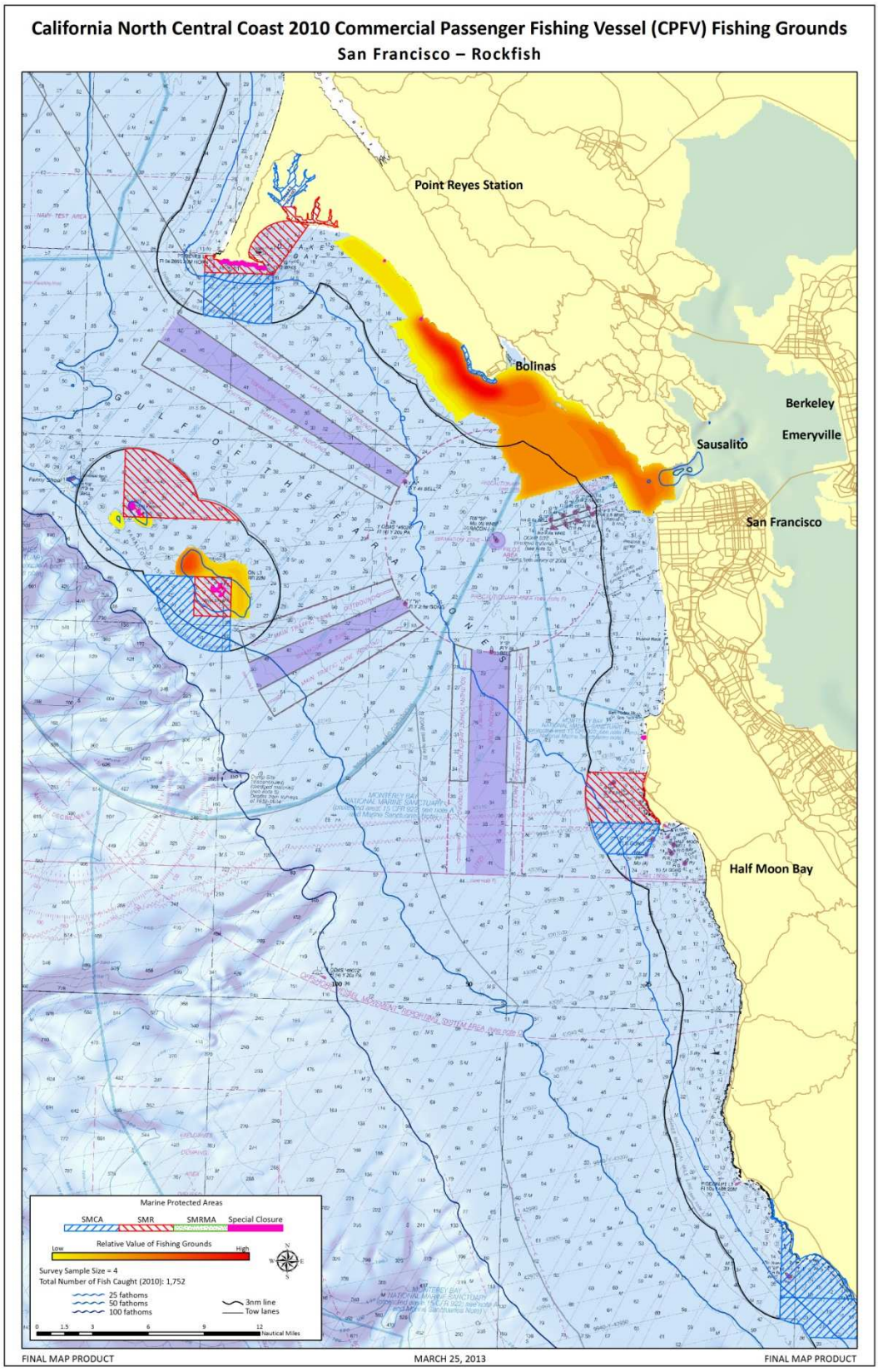
Emeryville – Striped bass



FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

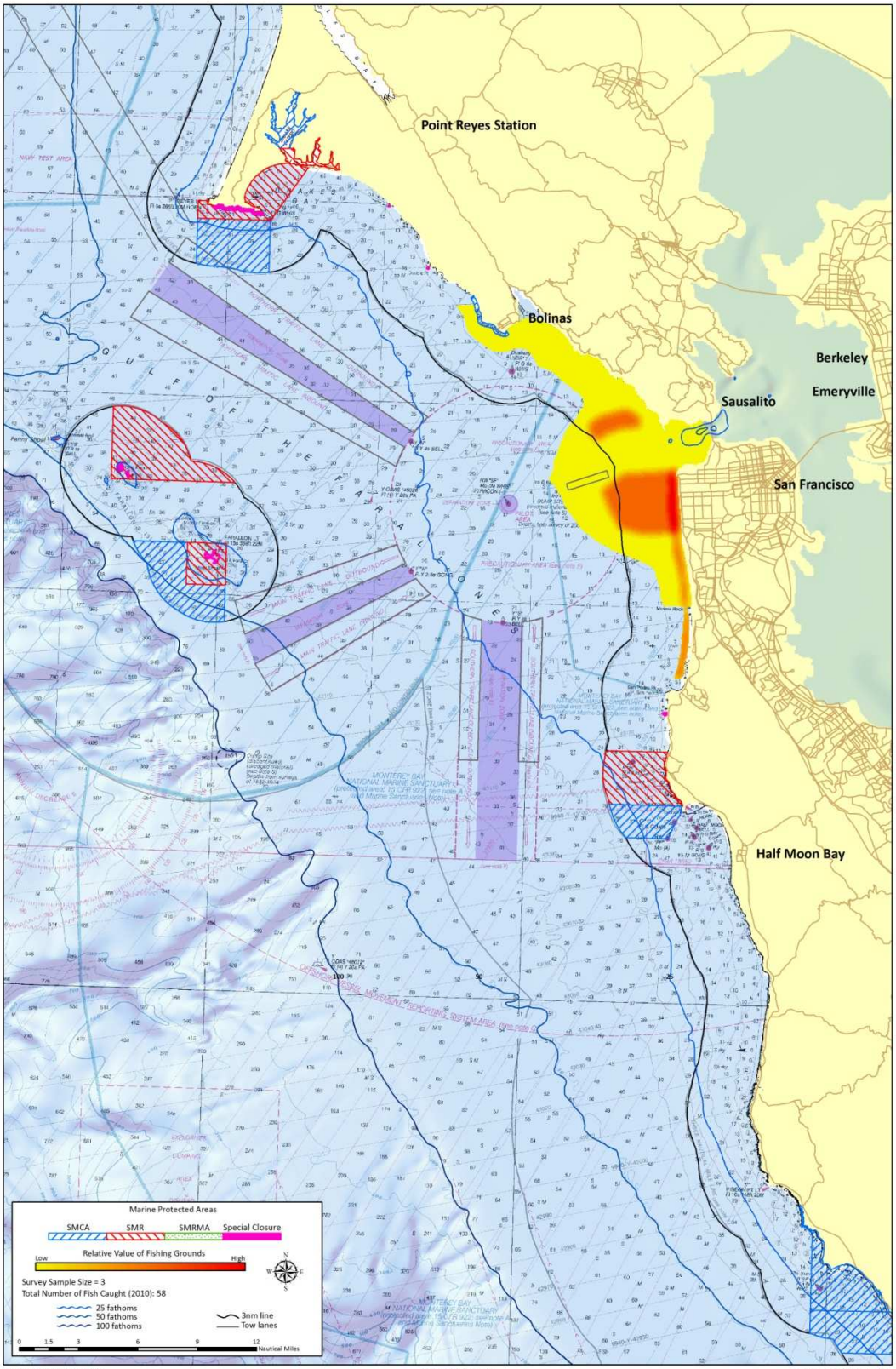
5.6. San Francisco CPFV Spatial Baseline




California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
San Francisco – Rockfish
Point Reyes Station
Bolinas
Berkeley
Emeryville
Sausalito
San Francisco
Half Moon Bay
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Relative Value of Fishing Grounds
Low
High
Survey Sample Size = 4
Total Number of Fish Caught (2010): 1,752
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
Nautical Miles
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

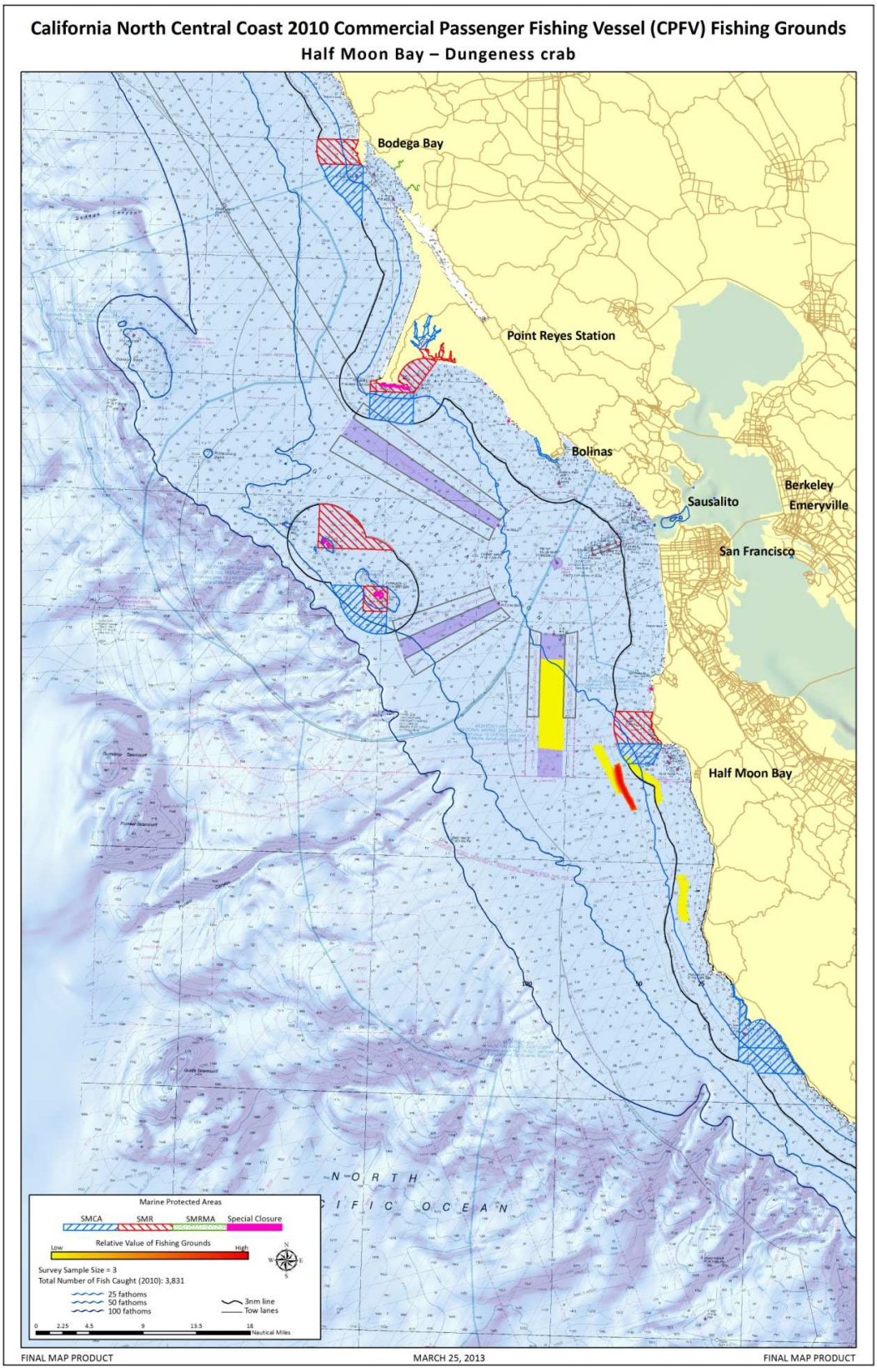
California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

San Francisco – Striped bass



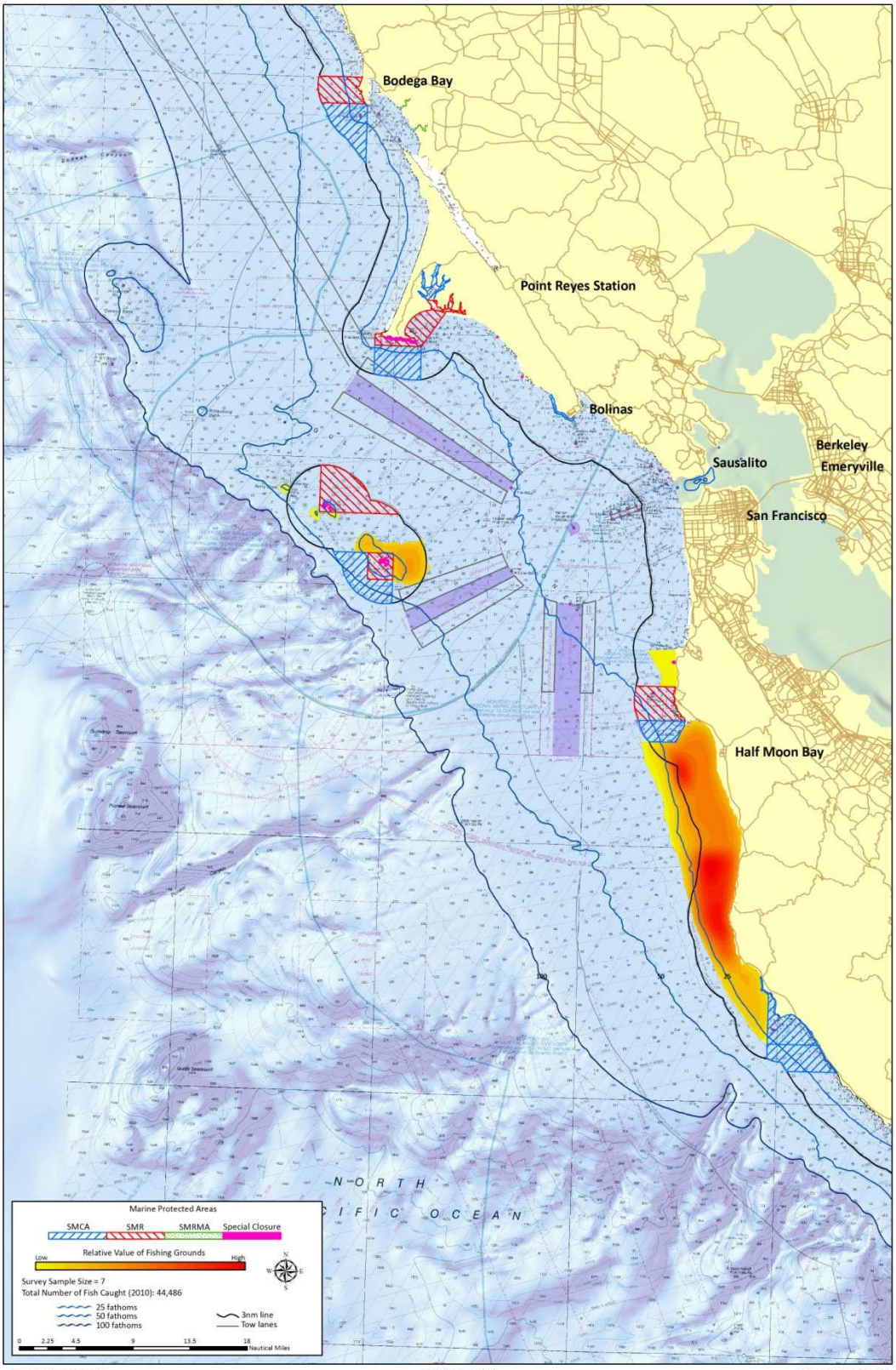
FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT

5.7. Half Moon Bay CPFV Spatial Baseline

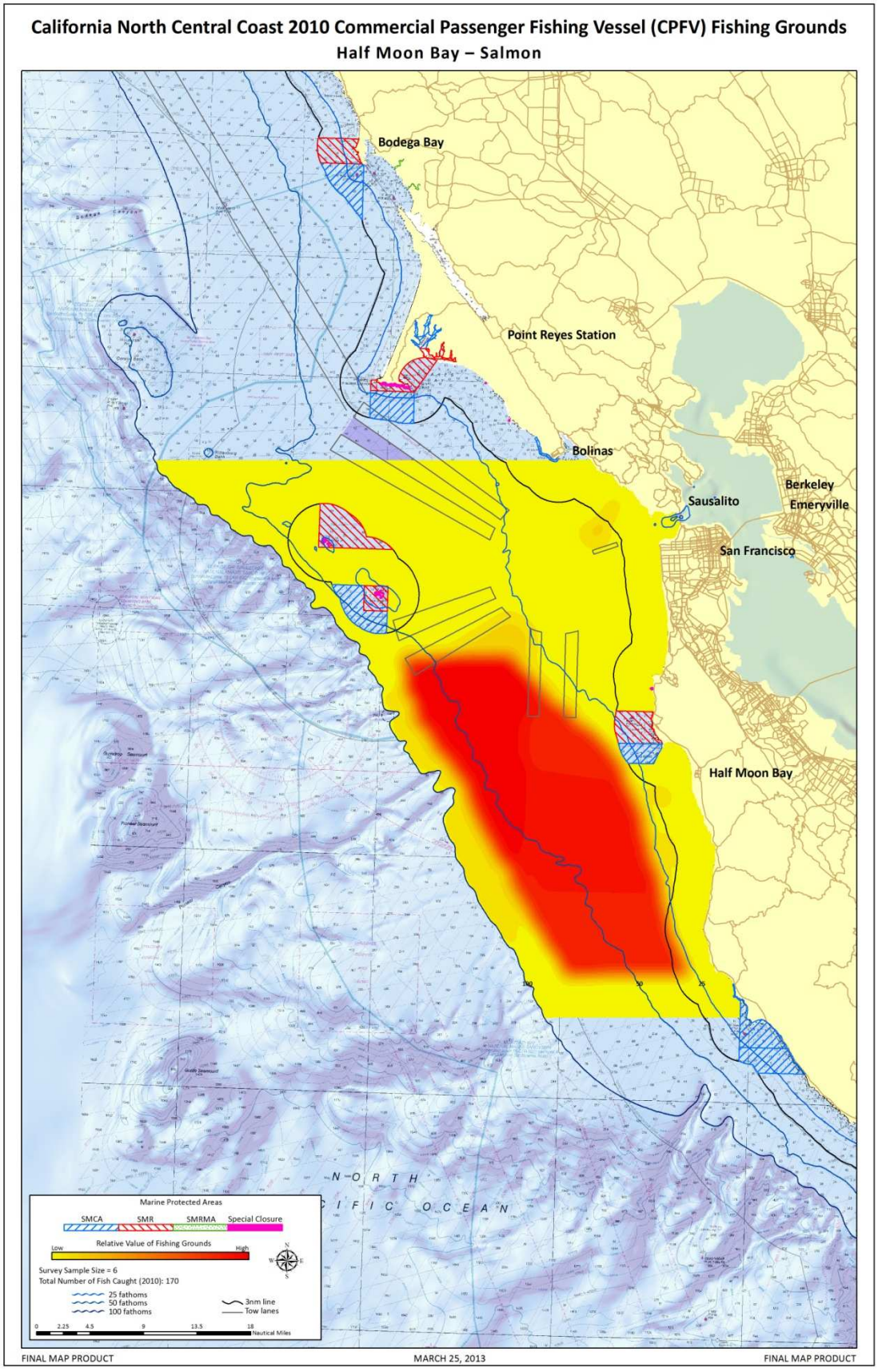


California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds

Half Moon Bay – Rockfish



FINAL MAP PRODUCT MARCH 25, 2013 FINAL MAP PRODUCT


California North Central Coast 2010 Commercial Passenger Fishing Vessel (CPFV) Fishing Grounds
Half Moon Bay – Salmon
Bodega Bay
Point Reyes Station
Bolinas
Sausalito
Berkeley
Emeryville
San Francisco
Half Moon Bay
N O R T H
C I F I C O C E A N
Marine Protected Areas
SMCA
SMR
SMRMA
Special Closure
Relative Value of Fishing Grounds
Low
High
Survey Sample Size = 6
Total Number of Fish Caught (2010): 170
25 fathoms
50 fathoms
100 fathoms
3nm line
Tow lanes
0
2.25
4.5
9
13.5
18
Nautical Miles
FINAL MAP PRODUCT
MARCH 25, 2013
FINAL MAP PRODUCT

6. LESSONS LEARNED AND FUTURE RECOMMENDATIONS

This section reflects on several methodological and overall project lessons learned and recommendations to inform future long-term MPA monitoring efforts.

6.1. Lessons Learned/Future Recommendations

Community Engagement
Outreach efforts to port communities were initiated at the project's inception and continued throughout the project. Building trust and collaborating with fishing communities were important measures of success for our project; however, due to several factors such as: distrust in how information will be used; dissatisfaction with the MPA network planning process and its outcome; and unclear benefits and outcomes of participating in the project, we found that a significant number of fishermen were reticent to participate in the project.

This reticence to participate directly affects the survey sample size and thus the representativeness of the data collected. It also affects our ability to provide comprehensive interpretation of data analysis results. A wide base of community feedback and input to interpret project results is critical to add context, meaning, and identify possible drivers of change in the data we present. A good example of this is the interpretation of CPFV logbook data on historical or current trends on the number of vessels, anglers, and trips. Without the intimate knowledge of the fishing community we would only be able to provide a description of the data trends without insights of possible factors influencing observed changes which are important to understand the full landscape of factors (including MPAs) that affect change in the CPFV fleet.

During the first year of data collection, we received a fairly reasonably representative sample as fishermen were largely interested in providing their information on how MPAs have impacted them. However, in the second year of data collection we experienced considerably more resistance to participating with interviews. Many fishermen noted that they felt that they provided all the information needed in the first year's interview (e.g., mapping of fishing grounds and information on how the fisherman has been impacted by MPAs) and that the information provided has not changed since last year's interview—questioning the utility of participating in an additional interview. Furthermore, when contacted to participate in the second year of interviews we experienced an increased level of overall frustration in the lack of understanding of how spatial fishing data will be used and a belief that the data collected will somehow be used to harm fishermen or further restrict their fishing.

This presented a difficult challenge to the project, and the nature of these concerns listed above was difficult to address in a limited timeline and the limited scope of Ecotrust's role in the larger landscape of MPA management and monitoring. Despite this, Ecotrust networked within the fishing community and attended fishermen meetings to disseminate information and answer questions as to the intentions of the project, and to the extent possible explain how data will be used to inform the 5-year management review of the North Central Coast MPA network. Furthermore, Ecotrust made an intense effort to keep the fishing community informed of project progress to develop transparency in the work and maintaining relationships in the North Central Coast Region. We hope to continue and maintain these relationships into the future.

In future projects, these issues of trust, project intentions, incentives to participate, and how data will be used may be better be addressed up front with strategic joint outreach efforts with state agencies responsible for MPA management and monitoring. Implementing efforts to engage fishermen early on, acknowledging and addressing to the extent possible their concerns, and incorporating fishermen in the overall MPA monitoring process is important in key to building the fishing community relationships necessary to conduct long-term socioeconomic studies. This can be done by meaningfully incorporating fishermen into MPA monitoring efforts such as project design, data review/analysis, and data dissemination which are important to build trust and transparency and foster a sense of ownership and legitimacy over the data, information, and process which may potentially impact their livelihood.

A promising model of engaging the fishing community is currently being carried out in the North Coast region of California in which community engagement from citizens to county board of supervisors began early on and frequently with the agencies involved in both managing the MPA network as well as the MPA monitoring effort. This developed interest and support in MPA monitoring efforts as the community was engaged in shaping the MPA monitoring effort from the ground up and there was clear opportunity to develop community-based projects. This community-wide investment in MPA monitoring efforts from the beginning, even before the request for MPA monitoring proposals is developed is critical to garnering the community investment and support needed to carry out effective MPA monitoring—especially socioeconomic MPA monitoring efforts.

Collect Data on Personal and Community Well-Being

The socioeconomic well-being of fishermen and fishing communities is a multi-dimensional concept that requires both quantitative and qualitative data to fully assess and track over time. This project collected primarily economic data, however, a future recommendation would be to also collect information and quantitative data on the personal and community well-being of fishing communities. It is important to understand that economic revenue levels do not translate as a measure of personal or community well-being. A key example of this we have observed with fishermen in the North Central Coast region are scenarios in which fishermen are earning the same gross economic revenue but are spending more hours working, fishing, or travelling to fish—reducing his/her overall quality of life. This type of impact is not captured quantitatively in this project but rather only qualitatively in our survey questions where we asked generally how fishermen have been impacted by MPAs. However, well established personal well-being/quality of life measures and other measures such as sense of job satisfaction and job security can be applied to quantitatively measure these important aspects of socioeconomic health.

In addition to questions pertaining to personal well-being it is important to collect data on community well-being. This may initially include qualitatively exploring possible impacts to the fishing community as a whole, making sure to include people such as crew members, fish buyers/processors, port infrastructure staff, and port managers amongst others, to begin to explore and track any change in the complex relationships that make up the larger system of fishing beyond just fishermen. Qualitatively exploring community well-being helps to conceptualize the interconnections that make up the system that make fishing possible and thus what one must consider when quantitatively examining community impacts or impacts beyond fishermen.

Conduct More Analyses at the Individual Fisherman Level

In this report we largely utilize individual fisherman data in aggregation for port and region level analyses to establish a baseline data set. However, a future recommendation is to conduct more advanced analyses using individual fisherman data to explore typologies of fishermen or specific attributes of fishermen and how these types of fishermen are experiencing and coping with change over time. Specifically, some questions to explore with individual fisherman data include:

1. What type of fishermen are doing better or worse over time?
2. What attributes do these fishermen that are doing better or worse have in common—what do they fish for, how much do they fish, and what port are they from?
3. What type of fishermen have dropped out of commercial fishing or specific fisheries over time and why?

We know that the impacts of economic change do not unfold evenly across fishermen—some fishermen are more or less able to cope with change depending on their adaptive capacity. The questions above help explore fisherman attributes that may help us better understand what types of fishermen are successfully coping with change and why they are successful. Understanding this can lead to identifying target areas in which to focus policy efforts that help fishermen cope with economic change, such as the change that follows MPA establishment, in order to better maintain viable livelihoods.

Obtain Comprehensive Listing of CPFV Operators
An additional lesson learned is to access a comprehensive list of CPFV operators so that part-time CPFV operators that may not be as visible in a port community may be interviewed as well. Using the sampling methodology implemented in this project, full-time CPFV operations were found, however, to ensure all CPFV operators are given the opportunity to participate in monitoring efforts a list of operators and contact information could potentially be obtained through the CDFW.

6.2. Recommendations on Key CPFV Monitoring Metrics

Below are Ecotrust's recommendations of key metrics for long-term monitoring within the CPFV sector. To inform the existing monitoring plan structure we included the key monitoring metrics recommended for consumptive uses detailed in the North Central Coast and South Coast MPA monitoring plans and added additional metrics with an associated rationale.

Table 86. Recommendations for key monitoring metrics in the CPFV sector

Metric	Purpose	Source
Landings (number of fish caught)	This metric is to monitor how many fish are being caught in key CPFV fisheries. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CPFV logbook data
Average annual gross revenue from CPFV operations	This metric is to monitor how gross economic revenue levels may be changing over time	Survey data
Average percent of revenue from key fisheries/activities	This metric is to monitor changes in the average proportion of CPFV operator gross economic revenue relies upon a specific fishery/activity.	Survey data
Operating costs (average yearly percentages)	This metric is to monitor how operating costs may be changing over time. This may be increases/decreases in fuel costs, equipment costs, maintenance costs, crew costs, etc. From this information changes in net revenue for individual CPFV operators may be calculated. These operating cost percentages may also be used to help estimate secondary economic impacts upon CPFV support industries.	Survey data
Total number of CPFV vessels operating	This metric is to monitor how many vessels are operating, each year. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CPFV logbook data
Total number of CPFV fishing trips	This metric is to monitor changes in the number of CPFV fishing trips that are being conducted each year as this is an indicator of economic conditions. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CPFV logbook data
Total number of anglers	This metric is to monitor how many anglers are taking CPFV trips each year as this is an indicator of economic conditions. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CPFV logbook data
Catch per unit effort (CPUE)	This metric is to monitor the average amount of fish caught per unit of effort. This metric is useful in helping determine changes in fish abundance or the success of fishing trips which is related to customer satisfaction. This metric may be calculated by dividing the number of fish caught (landings) by the number of trips or the number of anglers.	CPFV logbook data
Number of anglers per trip	This metric is to monitor the average number of anglers participating in each CPFV fishing trip as this is an indicator of economic conditions. This metric may be calculated by dividing the total number of anglers by the total number of trips. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CPFV logbook data
Spatial value of fishing area	This metric is to monitor changes in how coastal/ocean areas are being utilized and valued by CPFV operators. Data may be analyzed with previous spatial data sets to determine spatial shifts in the value of fishing areas for key fisheries	Survey data
Attitudes and perceptions	This information is to monitor and collect contextual information that may help identify key CPFV issues and factors driving the change observed in the metrics listed above.	Survey data/focus groups
Job satisfaction/ Well-being/ Quality of life	These social metrics are important to monitor as economic metrics may not reveal changes in personal well-being. For example, a fisherman may be making the same amount of revenue from one year to the next, but his/her quality of life may decline in increased work hours or travel time in order to do so.	Survey data/focus groups

7. CONCLUSION

The intention of this report was to provide a baseline characterization and description of initial changes since MPA implementation of key target fisheries and ports of the CPFV sectors in the California North Central Coast Region. It should be noted that in this report we do not account for the secondary economic effects of changes in fishing revenue and how that may affect support industries such as fish processors/buyers, port workers, crew, and the tourism economy which benefits and may rely on the business of CPFV passengers. Indeed, these industries are vital to the success and health of fishing communities and are important to account for in future monitoring efforts.

It is difficult to discern the effects of MPAs on fishing communities as they are confounded by a multitude of factors such as other regulatory constraints (e.g., area based closures, quota limits, and limited entry fisheries) and general economic downturn, environmental variability/change, market variability, and increasing competition for marine space. However, advancing our understanding of how humans utilize, value, and rely upon marine space will be critical to unraveling these interconnections as well as monitor how MPAs are benefitting or impacting fishing communities into the future. This information may then be used in adaptive management measures to improve the performance of MPAs towards meeting ecological and socioeconomic goals. Similarly, it is our hope that the data collected/compiled and lessons learned through this project will be applied to future MPA monitoring efforts to build a time series data set on how human uses and the socioeconomic health of fishing communities are changing over time. Such a robust and longitudinal dataset that provides both socioeconomic characterization and spatial fishing patterns on consumptive human uses could be used for a wide array of marine spatial planning application including the monitoring of MPAs.

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