



Economic Impact of the Commercial Fisheries on Local County Economies from Catch in the Monterey Bay National Marine Sanctuary 2010, 2011 and 2012

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
Office of National Marine Sanctuaries



January 2014

About the Marine Sanctuaries Conservation Series

The Office of National Marine Sanctuaries, part of the National Oceanic and Atmospheric Administration, serves as the trustee for a system of 14 marine protected areas encompassing more than 170,000 square miles of ocean and Great Lakes waters. The 13 national marine sanctuaries and one marine national monument within the National Marine Sanctuary System represent areas of America's ocean and Great Lakes environment that are of special national significance. Within their waters, giant humpback whales breed and calve their young, coral colonies flourish, and shipwrecks tell stories of our maritime history. Habitats include beautiful coral reefs, lush kelp forests, whale migrations corridors, spectacular deep-sea canyons, and underwater archaeological sites. These special places also provide homes to thousands of unique or endangered species and are important to America's cultural heritage. Sites range in size from one square mile to almost 140,000 square miles and serve as natural classrooms, cherished recreational spots, and are home to valuable commercial industries.

Because of considerable differences in settings, resources, and threats, each marine sanctuary has a tailored management plan. Conservation, education, research, monitoring and enforcement programs vary accordingly. The integration of these programs is fundamental to marine protected area management. The Marine Sanctuaries Conservation Series reflects and supports this integration by providing a forum for publication and discussion of the complex issues currently facing the sanctuary system. Topics of published reports vary substantially and may include descriptions of educational programs, discussions on resource management issues, and results of scientific research and monitoring projects. The series facilitates integration of natural sciences, socioeconomic and cultural sciences, education, and policy development to accomplish the diverse needs of NOAA's resource protection mandate. All publications are available on the Office of National Marine Sanctuaries Web site (<http://www.sanctuaries.noaa.gov>).

Economic Impact of the Commercial Fisheries on Local County Economies from Catch in the Monterey Bay National Marine Sanctuary 2010, 2011 and 2012

Vernon R. Leeworthy¹, Desiree Jerome², Kelsey Schueler³

1. NOAA, National Ocean Service, Office of National Marine Sanctuaries
2. Clark University, NOAA Summer Fellow
3. Monterey Institute, Center for the Blue Economy Summer Fellow



U.S. Department of Commerce
Penny Pritzker, Acting Secretary

National Oceanic and Atmospheric Administration
Kathryn Sullivan, Ph.D.
Acting Under Secretary of Commerce for Oceans and Atmosphere

National Ocean Service
Holly Bamford, Ph.D., Assistant Administrator

Silver Spring, Maryland
January 2014

Office of National Marine Sanctuaries
Daniel J. Basta, Director

Disclaimer

Report content does not necessarily reflect the views and policies of the Office of National Marine Sanctuaries or the National Oceanic and Atmospheric Administration, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Report Availability

Electronic copies of this report may be downloaded from the Office of National Marine Sanctuaries web site at <http://sanctuaries.noaa.gov>. Hard copies may be available from the following address:

National Oceanic and Atmospheric Administration
Office of National Marine Sanctuaries
SSMC4, N/ORM62
1305 East-West Highway
Silver Spring, MD 20910

Cover

Top Left: There are four major harbors along the shores of the Monterey Bay National Marine Sanctuary. They are; Pillar Point in Half Moon Bay, Santa Cruz Harbor, Moss Landing harbor, and Monterey Harbor.

Top Right: Jack Mackerel are one example of the many types of silver sided fish found in the Sanctuary.

Bottom Left: The Kelp rockfish is one of the most common rockfish found in the kelp forest of the Monterey Bay National Marine Sanctuary. It spends most of its time on or near the bottom where it blends in with its surroundings.

Bottom Right: There are many commercial fishing operations that take place in the Monterey Bay National Marine Sanctuary. Squid, shrimp, sardines, salmon, and other fish are just a few examples of the types of active fisheries.

Credit: Kip Evans

Suggested Citation

Leeworthy, V.R., Jerome, D. Schueler, K. 2014. Economic Impact of the Commercial Fisheries on Local County Economies from Catch in the Monterey Bay National Marine Sanctuary 2010, 2011 and 2012. Marine Sanctuaries Conservation Series ONMS-14-03. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. 46 pp.

Contact

Dr. Vernon R. (Bob) Leeworthy
Chief Economist
Office of National Marine Sanctuaries
1305 East West Highway, SSMC4, 11th floor
Silver Spring, MD 20910
Telephone: (301) 713-7261
Fax: (301) 713-0404
E-mail: Bob.Leeworthy@noaa.gov

Abstract

This report estimates the economic impact of commercial fishing within the Monterey Bay National Marine Sanctuary (MBNMS) according to the California Ocean Fish Harvester Economic Model. The methodology applies county multipliers to estimates of harvest revenue from the MBNMS in order to calculate output, income, value added and employment. This report also describes a profile of the commercial fish industry in the MBNMS. In addition, this report explores special issues related to trends in trawl catch. Special issues represent specific requests from sanctuary management for queries of the data.

This report estimates the economic impact of commercial fishing within the Monterey Bay National Marine Sanctuary (MBNMS) according to the California Ocean Fish Harvester Economic Model (COFHE). This report also describes a profile of the commercial fish industry in the MBNMS. In addition, this report explores special issues related to trends in trawl fishing. The three-year average for 2010 to 2012 finds that landings of catch from CBNMS generated \$25,962,774 in harvest revenue, \$42,028,137 in output, \$28,633,164 in value added, \$25,942,900 in total income and 843 full and part-time jobs across 12 counties. During the study period harvest revenue demonstrated an overall increase, ranging from \$24,299,169 in 2010 to \$29,644,153 in 2012. The top five species/species groups caught in MBNMS were *Market Squid*, *Dungeness crab*, *Salmon*, *Coastal Pelagics*, and *Spot Prawn*. These top five species/species groups accounted for over 91% of MBNMS landings in 2012. In 2012, the gear types associated with highest percent of total value include “Pots & Traps,” “Other Seine – Dip Net,” “Purse Seine,” and “Troll.” The top four ports where catch from MBNMS was landed are Princeton-Half Moon, Moss Landing, Monterey and Santa Cruz. All four ports were highly dependent on the sanctuary; each had over 90% of their total port landings value come from the sanctuary. Monterey and Santa Cruz each had over 95% of their port landings value from the sanctuary. Moss Landing was the least dependent, with 91.85% of its value coming from the sanctuary. Monterey was the most dependent, with 96.59% of its value coming from the sanctuary.

Key Words

Economic impact, income, jobs, California, commercial fishing, harvest revenue, trawl, output, multiplier, port dependence.

Table of Contents

<i>Topic</i>	<i>Page</i>
Abstract	ii
Key Words	ii
Table of Contents	iii
List of Figures and Tables.....	iv
Introduction.....	1
Chapter 1: Economic Impacts of Commercial Fishing Catch in the MBNMS	3
Operational Categories.....	5
Results.....	6
Chapter 2: Profiles of the Commercial Fisheries in the MBNMS.....	13
Catch by Species/Species Groups.....	13
Catch by Gear Type and Number of Vessels by Gear Type.....	15
Harvest Revenue Distribution by Number of Vessels	16
Vessel Dependence on the MBNMS for their Total California Fishing Revenues	18
Port Dependence on Catch from the MBNMS	19
Trends in Catch for the Top Five Species/Species Groups.....	22
El Niño	22
Market Squid.....	22
Dungeness Crab	24
Salmon	25
Coastal Pelagics	26
Spot Prawn.....	27
Chapter 3: Special Issues	28
Section 3.1: Economic Impacts of Commercial Trawling Catch in the MBNMS.....	30
Operational Categories.....	30
Results.....	31
Section 3.2. Profiles of the Trawling Commercial Fisheries in the MBNMS	33
Catch by Species/Species Groups.....	33
Catch by Gear Type and Number of Vessels by Gear Type.....	34
Harvest Revenue Distribution by Number of Vessels	34
Vessel Dependence on the MBNMS for their Total California Fishing Revenues ..	35
Trawl Catch from the MBNMS	36
Trends in Trawl Catch for the Top Species/Species Groups	38
El Niño.....	38
Dover-Sole-Thornyheads-Sablefish.....	39
CA Halibut.....	40
Other Flatfish.....	41
Shelf Rockfish.....	42
Grenadiers.....	43
Sanddab.....	44
References.....	45

List of Figures and Tables

<i>Figure/Table Number and Title</i>	<i>Page</i>
Figure 1.1 Definition of the MBNMS using CDFW-CFIS Blocks	3
Figure 2.1 Trends in Market Squid Caught in the MBNMS 2000 to 2012 (2013 \$).....	23
Figure 2.2 Trends in Dungeness Crab Caught in the MBNMS 2000 to 2012 (2013 \$) ...	24
Figure 2.3 Trends in Salmon Caught in the MBNMS 2000 to 2012 (2013 \$)	25
Figure 2.4 Trends in Coastal Pelagic Caught in the MBNMS 2000 to 2012 (2013 \$).....	26
Figure 2.5 Trends in Spot Prawn Caught in the MBNMS 2000 to 2012 (2013 \$)	27
Figure 3.1 Map of the condition of the MBNMS, including regulations and closures.....	29
Figure 3.2 Trawl Catch in the MBNMS 2000-2012 (2013 \$)	37
Figure 3.3 Trends in Dover-Sole-Thornyheads-Sablefish Trawl Caught in the MBNMS, 2000 to 2012 (2013 \$).....	39
Figure 3.4 Trends in CA Halibut Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	40
Figure 3.5 Trends in Other Flatfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	41
Figure 3.6 Trends in Shelf Rockfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	42
Figure 3.7 Trends in Grenadiers Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	43
Figure 3.8 Trends in Sanddab Caught by Trawl in the MBNMS 2000-2012 (2013 \$)	44
Table 1.1 Definition of the MBNMNS using CDFW-CFIS Blocks.....	4
Table 1.2 Operational Categories for the COFHE Model	5
Table 1.3 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 2010 (2013 \$).....	7
Table 1.4 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 2011 (2013 \$).....	8
Table 1.5 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 2012 (2013 \$).....	9
Table 1.6 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 3-year Average 2010, 2011 and 2012 (2013 \$)	10
Table 1.7 Local/Regional Dependence on the MBNMS Fishing Industry, 2010 and 2011	11
Table 1.8 Local/Regional Dependence on the MBNMS Fishing Industry, 2010 and 2011 (continued).....	12
Table 2.1 Pounds and Value of Landings from the MBNMS by Species/Species Groups 2012 (2013 \$).....	14
Table 2.2 Number of Vessels, Pounds and Value by Gear Type in the MBNMS, 2010 to 2012 (2013 \$).....	16
Table 2.3 Vessel Distribution of Harvest Revenue from the MBNMS, 2012 (2013 \$) ...	17
Table 2.4 Vessel Dependence on Harvest Revenue from the MBNMS, 2012 (2013 \$) ..	18
Table 2.5 Landings by Port and Species/Species Groups from Catch in the MBNMS, 2012 (2013 \$).....	20

Table 2.6 Landings by Port and Species/Species Groups from Catch in the MBNMS, 2012 (2013 \$) Continued	21
Table 2.7 Trends in Market Squid Caught in the MBNMS 2000 to 2012 (2013 \$)	23
Table 2.8 Trends in Dungeness Crab Caught in the MBNMS 2000 to 2012 (2013 \$).....	24
Table 2.9 Trends in Salmon Caught in the MBNMS 2000 to 2012 (2013 \$).....	25
Table 2.10 Trends in Coastal Pelagic Caught in the MBNMS 2000 to 2012 (2013 \$)	26
Table 2.11 Trends in Spot Prawn Caught in the MBNMS 2000 to 2012	27
Table 3.1 Operational Categories for COFHE Model	30
Table 3.2 Economic Impacts of Trawling from MBNMS Catch, 2010, 2011, 2012 and 3-year Average (2013 \$)	31
Table 3.3 Economic Impacts of Trawling from MBNMS Catch, 2010, 2011, 2012 and 3-year Average (2013 \$)	32
Table 3.4 Pounds and Value of Trawl Landings from the MBNMS by Species/Species Groups, 2012 (2013 \$)	33
Table 3.5 Vessel Distribution of Trawling Harvest Revenue from the MBNMS, 2012 (2013 \$).....	34
Table 3.6 Vessel Dependence on Trawling Harvest Revenue from the MBNMS, 2012 (2013 \$).....	35
Table 3.7 Trawl Catch in the MBNMS 2000 to 2012 (2013 \$).....	36
Table 3.8 Trends in Dover-Sole-Thornyheads-Sablefish Trawl Caught in the MBNMS, 2000 to 2012 (2013 \$).....	39
Table 3.9 Trends in CA Halibut Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	40
Table 3.10 Trends in Other Flatfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	41
Table 3.11 Trends in Shelf Rockfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	42
Table 3.12 Trends in Grenadiers Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)	43
Table 3.13 Trends in Sanddab Caught by Trawl in the MBNMS, 2000-2012 (2013 \$) ..	44

Introduction

This report is part of the Socioeconomic Research & Monitoring Program for the Monterey Bay National Marine Sanctuary (MBNMS). Socioeconomic priorities were established for all West Coast Region (WCR) sanctuaries in the “*Office of National Marine Sanctuaries West Coast Region Socioeconomic Plan FY2013 – FY2014* (Office of National Marine Sanctuaries, 2012)”. This report also supports a “*National*” Office of National Marine Sanctuaries (ONMS) priority to document the connection between the national marine sanctuary resource uses and local, regional and national economies.

This report addresses the commercial fisheries in the MBNMS. The data used to estimate how much of the commercial catch in California landed at California Ports comes from the California Fishery Information System (CFIS) from the California Department of Fish and Wildlife (CDFW). Data presented here is from years 2000 through 2012. For estimating economic impacts on local county economies, the California Ocean Fish Harvester Economic (COFHE) Model was used (Hackett et al. 2009).

Economic impact here is limited to the impacts of commercial fishing operations and the multiplier impacts from the spending in conducting their fishing operations. The estimates underestimate the total economic impact because the COFHE Model used here did not include the processing, wholesaling, retail and restaurant market channels and market markups of the fish landed in each county. Only the costs of production from commercial fishing operations was included and the associated indirect and induced economic impacts (i.e. the ripple or multiplier impacts) of this spending. Although information on market channels and market-markups are presented in Hackett et al (2009), the information was not available at the county level to include in the COFHE Model.

The economic impacts estimated here relative to the “full” economic impacts will vary greatly by fishery and county of landings. For fisheries characterized by little processing, wholesaling, local retail sales and local restaurant sales, the differences will be small. In these cases, most of the landings are exported out of the county with little added value locally. Estimating the market channels and market mark-ups by county should be a high priority for the next version of the COFHE Model. In the peer review of this document, one of the authors in Hackett et al (2009) argued that the COFHE Model was designed to estimate the impacts of management strategies and regulations and the effects on processing, wholesaling, retail and restaurant markets would be minimal since these sectors can easily substitute lost catch from other places and therefore there would be little, if any, impacts on local economies. The reviewer also admitted that this might be less true for some processors.

In Leeworthy et al, 2005, the Fishery Economic Assessment Model (FEAM) developed by the Pacific Fishery Management Council (PFMC 1999) was used to estimate the potential economic impacts of the network of marine reserves (no-take areas) in the Channel Islands National Marine Sanctuary (CINMS). FEAM multipliers were very similar to the COFHE Model’s in that the IMPLAN input-output model was used to derive multipliers defined in terms of income to harvest revenues. The FEAM multipliers were only done for income in each county by

species/species groups instead of OCs as in the COFHE Model and the FEAM multipliers included all market channels (e.g. processing, wholesaling, retailing and restaurant sales). In 1998, the CINMS multipliers for income to harvest revenue (ratio of income generated at all market levels divided by harvest revenue) ranged from 1.2 for most *Finfish* to 4.5 for *Market Squid*, while for *Crab* it was 2.8. The overall average was about 3.1, which was heavily influenced by *Market Squid* which accounted for 59% of CINMS harvest revenue. In comparison, the COFHE Model income multipliers for CINMS averaged about 1.00 for years 2010 through 2012. So the total economic impact could be three times higher than was estimated here using the COFHE Model for the CINMS. We don't have the FEAM multipliers for the other ONMS sites in California, but given the dominance of *Market Squid* and *Dungeness Crab* in MBNMS, the total economic impact for MBNMS could also be about three times higher than estimated here. For CBNMS and GFNMS, which are more dominated by *Finfish* catch, the multipliers for total economic impact are likely lower, probably less than 2.0, so the estimates of total economic impact for these sanctuaries could be double that estimated here for total income generated.

Chapter 1 provides the results of applying the COFHE Model to landings from the MBNMS. Harvest revenue (what the fishermen receive when they land their catch at various California ports) is converted to estimates of total output, value added, income and employment (measured in number of full- and part-time jobs) using the multipliers in the COFHE Model for each county. Results are presented for years 2010, 2011, 2012 and the 3-year average. Details of the COFHE Model are presented in a separate technical appendix report (Leeworthy et al, 2013).

Chapter 2 provides a profile of the commercial fishery for MBNMS. Profile elements include: the distribution of catch (pounds and value or harvest revenue converted to 2013 dollars using the consumer price index) for year 2012 by species/species groups; trends in catch for the top five species/species groups for years 2000 through 2012; catch by gear type for years 2010, 2011, and 2012; dependence of ports on catch from MBNMS (i.e. the percent of total fishing harvested landings at the port from MBNMS); and the dependence of fishing vessels on their catch from the MBNMS (i.e. the percent of a vessels total fishing revenues from all of California from MBNMS).

Chapter 3 is devoted to "*Special Issues*". Sanctuary management submitted several requests for special views of the commercial fishing catch from the MBNMS to support management efforts. Here, MBNMS management requested special tabulations for trawling catch, including the economic impacts of trawling on the local county economies.

Chapter 1: Economic Impacts of Commercial Fishing Catch in the MBNMS

To obtain estimates of the commercial catch from the MBNMS the first step is to define the “best” spatial area from the CDFW-CFIS that “best” approximates the area within the MBNMS. CDFW-CFIS maintains commercial landings by where the fish is caught and where it is landed. For where the fish is caught, 10-minute by 10-minute blocks (100 nautical square mile cells) are used. The lines defining the blocks are latitude and longitude coordinates. Figure 1.1 shows the overlay of the MBNMS boundaries on the CDFW-CFIS blocks. Each block has a three digit database code. Table 1.1 shows the 64 blocks included in our definition of the MBNMS.



Figure 1.1 Definition of the MBNMS using CDFW-CFIS Blocks

Table 1.1 Definition of the MBNMNS using CDFW-CFIS Blocks

Full or Partial Blocks	Block Numbers
Full - 47 Blocks ¹	446, 464, 472, 473, 474, 475, 478, 479, 480, 481, 501, 502, 503, 507, 508, 509, 510, 511, 512, 516, 517, 518, 519, 520, 521, 525, 526, 527, 528, 529, 530, 532, 533, 534, 535, 538, 539, 540, 541, 547, 548, 549, 553, 554, 560, 561, 562
Partial - 17 Blocks ²	465, 476, 482, 504, 505, 513, 522, 531, 536, 542, 550, 551, 601, 602, 603, 604, 568

1. MBNMS boundary covers the full block.
 2. MBNMS boundary covers a significant portion of the block.
- Source: California Fishing Information System, California Department of Fish and Wildlife.

For where the catch is landed, catch is reported by port where landed. CDFW-CFIS also provides documentation for county location of each port, so landings can be summarized by port and county where landed. This is important for economic impact analysis since the multipliers in the COFHE Model are county multipliers.

Operational Categories.

The COFHE Model is based on organizing the fisheries into 20 operational categories (OCs). OCs are either based on gear types or a combination of gear types and species and each has different production functions (i.e. different combinations of inputs of productions such as gear, labor, fuel, bait, ice, etc.) and some such as the *Salmon & Dungeness crab* and *Dungeness crab* are differentiated by size of the vessel (vessel length). Table 1.2 lists the 20 OCs in the COFHE Model. Details on the harvest revenue by OC and the associated multipliers by county for translating harvest revenue into estimates of output, value added, income and employment by county are in the technical appendix report (Leeworthy et al 2013). Not all catch is included in the 20 OCs. Thus, economic impacts are slightly under estimated. In 2010, 0.23% was not included, while 0.15% was excluded in 2011, and 0.06% was excluded in 2012. In addition, small amounts of catch from MBNMS were landed at far distant ports and these amounts were also excluded from the analysis.

Table 1.2 Operational Categories for the COFHE Model

Number	Operational Category
1	Trawl - Northern California
2	Trawl - Southern California
3	CPS Seine
4	Herring Gillnet
5	Other Gillnet
6	Salmon
7	Salmon & Albacore
8	Salmon & Dungeness Crab - Small Vessels
9	Salmon & Dungeness Crab - Mid to Large Vessels
10	Dungeness Crab - Small Vessels
11	Dungeness Crab - Mid to Large Vessels
12	Longline
13	Harpoon - Spear
14	Hook & Line
15	Hook & Line - Live
16	Lobster & Crab
17	Nearshore & Groundfish Trap
18	Prawn Trap
19	Sea Urchin
20	Tuna - Other Seine

Source: Hackett et al, 2009.

Definitions of Terms (Adapted from Hackett et al. 2006)

Harvest Revenue: What fishermen receive when they land their catch at various CA ports.

Output: Total industry production, equal to shipments plus net additions to inventory.

Value Added: The value added during production to all purchased intermediate goods and services. This is equal to employee compensation plus proprietor's income plus other property income plus indirect business taxes.

Total Income: Sum of employee compensation, proprietor's income, corporate income, rental income, interest and corporate transfer payments.

Employment: Full- and part-time jobs.

Results.

The COFHE Model was used to estimate the economic impact by county of harvest revenue from the MBNMS for years 2010, 2011, and 2012 plus the three-year average. This was done due to volatility in influential fisheries, fluctuating greatly from year to year (see trends of top six species/species groups in Chapter 2).

Catch from MBNMS was landed at 62 ports in 17 counties in years 2010 to 2012. Due to insignificant landings at distant ports, we only included the landings in 12 counties (Tables 1.3, 1.4, 1.5 and 1.6). Harvest revenue, output, value added and total income showed variability within the three-year period. There was a slight decline in all four from 2010 to 2011. However, from 2011 to 2012, these economic indicators increased above 2010 levels. Employment has consistently increased over the study period.

In 2010, about \$24.3 million was harvested by the 20 OCs from MBNMS, which generated almost \$39.3 million in total output, just under \$27.7 million in value added, almost \$25.2 million in income and 650 full- and part-time jobs in the 12 counties (Table 1.3).

Table 1.3 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 2010 (2013 \$)

County	Harvest Revenue	Output	Value Added	Total Income	Employment ¹
Alameda	94,071	152,073	55,762	49,458	2.63
Marin	103,995	161,541	108,178	96,862	1.84
Mendocino	31,251	47,786	33,372	30,130	0.42
Monterey	14,409,802	23,283,109	17,561,994	16,153,832	369.93
San Francisco	1,805,368	2,923,840	1,929,014	1,729,737	31.07
San Luis Obispo	677,715	1,077,945	582,638	502,934	40.45
San Mateo	6,502,468	10,505,900	6,788,343	6,071,703	141.97
Santa Barbara	25,751	42,317	24,892	21,763	0.89
Santa Cruz	594,254	1,005,841	561,097	489,601	58.17
Solano	3,344	5,226	3,155	3,712	0.06
Sonoma	44,928	78,928	47,108	41,810	2.16
Ventura	6,222	9,791	3,807	3,096	0.68
<i>Total</i>	<i>24,299,169</i>	<i>39,294,298</i>	<i>27,699,361</i>	<i>25,194,638</i>	<i>650</i>

1. Number of full and part-time jobs.
2. \$54, 825 excluded or 0.225% of total harvest revenue. \$47,881 in Monterey and \$460 in San Mateo not included because the catch did not map into one of the 20 Operational Categories in the COFEH Model. In addition, \$733 in Contra Costa, \$379 in Orange and \$5,376 in San Diego not included because catch was not significant or too distant from study area of economic impact.

In 2011, just over \$23.9 million was harvested from the MBNMS, which generated \$38.8 million in output, almost \$26 million in value added, \$23.3 million in income and 864 full- and part-time jobs (Table 1.4).

Table 1.4 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 2011 (2013 \$)

County	Harvest Revenue	Output	Value Added	Total Income	Employment ¹
Alameda	137,639	217,162	30,087	26,722	0.62
Marin	20,876	32,146	17,198	14,794	1.70
Mendocino	98,202	150,155	103,403	93,245	1.37
Monterey	12,915,897	20,887,822	14,864,291	13,514,113	472.39
San Francisco	1,469,648	2,376,989	1,585,393	1,423,462	24.45
San Luis Obispo	886,652	1,407,034	767,403	660,486	50.81
San Mateo	7,167,284	11,573,829	7,409,969	6,616,919	163.78
Santa Barbara	14,915	24,537	14,191	12,425	0.56
Santa Cruz	1,079,615	1,837,582	994,727	861,067	140.74
Solano	9,245	15,153	9,733	11,738	0.16
Sonoma	143,688	250,415	145,346	128,148	6.87
Ventura	1,339	2,211	1,058	900	0.09
<i>Total²</i>	<i>23,945,000</i>	<i>38,775,034</i>	<i>25,942,799</i>	<i>23,364,018</i>	<i>864</i>

1. Number of full and part-time jobs.

2. \$35,407 or 0.148% excluded from harvest revenue. In Monterey \$24,791, San Mateo \$889, and Santa Cruz \$113 not included because catch did not map into one of the 20 Operational Categories in the COEFH Model. In addition, \$8,264 in Humboldt and \$1,350 in Orange not included because too distant from study area of economic impact.

In 2012, over \$29.6 million was harvested from the MBNMS, which generated more than \$48 million in output, almost \$32.3 million in value added, almost \$29.3 million in income and 1,016 full- and part-time jobs (Table 1.5).

Table 1.5 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 2012 (2013 \$)

County	Harvest Revenue	Output	Value Added	Total Income	Employment ¹
Alameda	152,992	246,206	59,625	53,123	1.21
Marin	13,309	20,485	10,777	9,285	1.54
Mendocino	18,128	27,709	16,751	14,924	0.33
Monterey	11,769,984	19,047,473	13,179,920	11,934,167	454.32
San Francisco	402,249	649,121	398,033	352,216	17.08
San Luis Obispo	649,440	966,102	549,837	475,952	30.33
San Mateo	14,528,007	23,473,364	16,128,407	14,776,885	279.79
Santa Barbara	13,190	21,321	9,976	8,342	1.53
Santa Cruz	2,033,826	3,455,393	1,840,608	1,589,431	223.62
Solano	2,280	3,809	1,682	1,464	0.25
Sonoma	43,332	75,434	40,709	35,344	5.52
Ventura	17,416	28,660	21,006	18,910	0.22
<i>Total</i> ²	<i>29,644,153</i>	<i>48,015,078</i>	<i>32,257,331</i>	<i>29,270,043</i>	<i>1,016</i>

1. Number of full and part-time jobs.

2. \$17,213 or 0.058% excluded from harvest revenue. Monterey \$9,030 and San Mateo \$3,757 not included because the catch did not map into one of the 20 Operational Categories in the COEFH Model. In addition, \$1,799 in Contra Costa, \$382 in Humboldt, and \$2,241 in Los Angeles not included because too distant from main study area for economic impact.

The three-year average was almost \$26 million in harvest revenue, over \$42 million in output, \$28.6 million in value added, \$25.9 million in income and 843 full- and part-time jobs (Table 1.6).

Table 1.6 Economic Impact on Local County Economies from Commercial Fishing in the MBNMS, 3-year Average 2010, 2011 and 2012 (2013 \$)

County	Harvest Revenue	Output	Value Added	Total Income	Employment ¹
Alameda	128,234	205,147	48,491	43,101	1.49
Marin	46,060	71,391	45,384	40,314	1.69
Mendocino	49,194	75,217	51,175	46,100	0.71
Monterey	13,031,894	21,072,801	15,202,069	13,867,370	432.21
San Francisco	1,225,755	1,680,870	1,304,146	1,168,471	24.20
San Luis Obispo	737,936	1,150,360	633,293	546,458	40.53
San Mateo	9,399,253	15,184,365	10,108,906	9,155,169	195.18
Santa Barbara	17,952	29,392	16,353	14,177	0.99
Santa Cruz	1,235,898	2,099,605	1,132,144	980,033	140.84
Solano	4,956	8,063	4,857	5,638	0.16
Sonoma	77,316	134,925	77,721	68,434	4.85
Ventura	8,326	13,554	8,624	7,636	0.33
<i>Total</i>	<i>25,962,774</i>	<i>42,028,137</i>	<i>28,633,164</i>	<i>25,942,900</i>	<i>843</i>

1. Number of full and part-time jobs.

Most of the economic impact was concentrated in Monterey and San Mateo counties. For the three-year average, Monterey County received over 50% of harvest revenue and output and 53% of value added and income. San Mateo received over 36% of harvest revenue and output and 35% of value added and income. Monterey County accounted for 51% of employment, while San Mateo accounted about 23% of employment (Table 1.6).

The commercial fisheries directly (and indirectly through the multiplier process) accounted for 0.009% of the total income by place of work and 0.007% of the total income by place of residence in the 12-county study area in 2011. The commercial fisheries accounted for 0.028% of all jobs in the 12-county study area in 2011 (Tables 1.7 and 1.8).

Table 1.7 Local/Regional Dependence on the MBNMS Fishing Industry, 2010 and 2011

County	Commercial Fishing		Income by Place of Residence (\$000)	Income by Place of Work (\$000)	Total Employment
	Income	Employment			
2010					
Alameda	\$49,458	2.63	\$72,024,822	\$55,762,084	854,126
%			0.000069%	0.000089%	0.000308%
Marin	\$96,862	1.84	\$20,854,466	\$9,895,696	470,495
%			0.000464%	0.00098%	0.00039%
Mendocino	\$30,130	0.42	\$3,049,993	\$1,644,157	177,066
%			0.000988%	0.001833%	0.000238%
Monterey	\$16,153,832	369.93	\$16,677,674	\$11,640,804	221,952
%			0.096859%	0.13877%	0.166669%
San Francisco	\$1,729,737	31.07	\$55,850,894	\$62,256,151	88,421
%			0.003097%	0.002778%	0.03514%
San Luis Obispo	\$502,934	40.45	\$10,436,017	\$6,346,739	20,464
%			0.00481921%	0.007924%	0.197647%
San Mateo	\$6,071,703	141.97	\$47,946,507	\$35,037,442	719,646
%			0.012663%	0.017329%	0.019728%
Santa Barbara	\$21,763	0.89	\$18,309,874	\$12,507,607	147,720
%			0.000119%	0.000174%	0.000600%
Santa Cruz	\$489,601	58.17	\$12,246,607	\$6,276,809	460,901
%			0.003998%	0.007800%	0.012622%
Solano	\$3,712	0.06	\$15,293,223	\$9,080,662	1,111,764
%			0.000024%	0.000041%	0.000005%
Sonoma	\$41,810	2.16	\$20,975,353	\$12,387,049	138,386
%			0.000199%	0.000338%	0.001563%
Ventura	\$3,096	0.68	\$36,506,222	\$22,313,520	168,062
%			0.000008%	0.000014%	0.000404%
<i>Total</i>	<i>\$24,634,656</i>	<i>588</i>	<i>\$330,171,652</i>	<i>\$245,148,720</i>	<i>2,552,170</i>
<i>% of Total from Commercial Fishing</i>			<i>0.0075%</i>	<i>0.0100%</i>	<i>0.0231%</i>

Source: U.S. Department of Commerce, Bureau of Economic Analysis (BEA) and
U.S. Department of Labor, Bureau of Labor Statistics (BLS).

Table 1.8 Local/Regional Dependence on the MBNMS Fishing Industry, 2010 and 2011 (continued)

County	Commercial Fishing		Income by Place of Residence (\$000)	Income by Place of Work (\$000)	Total Employment
	Income	Employment			
2011					
Alameda	\$26,722	0.62	\$75,908,145	\$57,401,672	676,047
%			0.000035%	0.00005%	0.000091%
Marin	\$14,794	1.70	\$21,871,623	\$10,249,177	122,558
%			0.000068%	0.000144%	0.00139%
Mendocino	\$93,245	1.37	\$3,170,419	\$1,686,462	38,461
%			0.00294%	0.00553%	0.003573%
Monterey	\$13,514,113	472.39	\$17,355,940	\$11,904,437	193,111
%			0.0779%	0.1135%	0.2446%
San Francisco	\$1,423,462	24.45	\$60,432,766	\$67,017,958	413,291
%			0.002355%	0.002124%	0.005916%
San Luis Obispo	\$660,486	50.81	\$10,966,438	\$6,610,972	124,611
%			0.006023%	0.009991%	0.040774%
San Mateo	\$6,616,919	163.78	\$50,596,839	\$36,930,765	342,370
%			0.013078%	0.017917%	0.047836%
Santa Barbara	\$12,425	0.56	\$19,303,120	\$13,065,357	201,724
%			0.000064%	0.000095%	0.000278%
Santa Cruz	\$861,067	140.74	\$12,919,550	\$6,496,062	131,123
%			0.006665%	0.013255%	0.107335%
Solano	\$11,738	0.16	\$15,858,521	\$9,226,093	188,959
%			0.000074%	0.000127%	0.000087%
Sonoma	\$128,148	6.87	\$22,126,957	\$12,840,293	229,466
%			0.000579%	0.000998%	0.002992%
Ventura	\$900	0.09	\$38,141,164	\$23,091,225	388,147
%			0.000002%	0.000004%	0.000024%
<i>Total</i>	<i>\$23,364,018</i>	<i>864</i>	<i>\$348,651,482</i>	<i>\$256,520,473</i>	<i>3,049,868</i>
<i>% of Total from Commercial Fishing</i>			<i>0.00670%</i>	<i>0.00911%</i>	<i>0.02831%</i>

Source: U.S. Department of Commerce, Bureau of Economic Analysis (BEA) and
U.S. Department of Labor, Bureau of Labor Statistics (BLS).

Chapter 2: Profiles of the Commercial Fisheries in the MBNMS

In addition to where catch is caught and landed, CDFW-CFIS database includes vessel and fisherman identification codes for who caught the fish and gear types for how the catch was made.

Catch by Species/Species Groups

Species are identified by three-digit codes. We have combined species into species/species groups. For MBNMS, we originally defined 24 species/species groups, including an *All Other* group. After processing the data, we discovered that some predetermined groups were not significant and placed them in the *All Other* group and pulled some species/species groups that were originally in the *All Other* group and broke them out separately. A \$1,000 revenue cut-off was chosen to determine what was broken out for the *All Other* group. We ended up with 35 species/species groups, including the *All Other* group for 2012. The *All Other* group accounted for only 0.02% of all landings from MBNMS in 2012 (Table 2.1).

Market squid was the number one ranked fishery in MBNMS in 2012 on the basis of both pounds and value accounting for over \$10.8 million or 36.5% of all harvest value from MBNMS. This was followed by *Dungeness crab* at almost \$9.5 million (31.9%), *Salmon* at \$4.1 million (13.8%), *Coastal Pelagic species* at \$1.36 million, and *Spot Prawn* at almost \$1.3 million (4.6%). These top five species/species groups accounted for more than 91% of the 2012 harvest value from MBNMS.

Table 2.1 Pounds and Value of Landings from the MBNMS by Species/Species Groups 2012 (2013 \$)

Species/Species Groups	Pounds	Value	Percent of Total Value
Market Squid	35,552,550	\$10,818,161	36.47%
Dungeness Crab	2,878,609	\$9,458,902	31.89%
Salmon	751,283	\$4,105,247	13.84%
Coastal Pelagic	14,582,629	\$1,365,589	4.60%
Spot Prawn	103,638	\$1,298,754	4.38%
Sablefish Non-Trawl	306,156	\$656,265	2.21%
Dover-Sole-Thornyheads-Sablefish Trawl	739,101	\$401,771	1.35%
White Seabass ²	80,399	\$377,095	1.27%
CA Halibut	74,657	\$355,133	1.20%
Tuna	103,223	\$172,034	0.58%
Shelf Rockfish	140,790	\$132,968	0.45%
Shallow Nearshore Rockfish	17,894	\$123,251	0.42%
Other Flatfish	102,270	\$113,910	0.38%
Thornyheads Non-Trawl ²	12,891	\$49,122	0.17%
Sandabs	76,417	\$43,728	0.15%
Rock Crab ²	14,745	\$36,747	0.12%
Deeper Nearshore Rockfish	7,538	\$36,156	0.12%
Lingcod	10,398	\$33,793	0.11%
Grenadier ²	90,539	\$20,956	0.07%
Greenling, kelp ²	2,594	\$17,386	0.06%
Sharks-Rays not White Shark or Big Skate	36,289	\$9,896	0.03%
Zebraperch ²	1,032	\$6,540	0.02%
Pacific Herring - roe on kelp ²	988	\$3,756	0.01%
Jumbo Squid ²	4,553	\$3,740	0.01%
Smelts	4,897	\$3,587	0.01%
Hagfish	2,031	\$1,750	0.01%
Shrimp, unspecified ²	409	\$1,659	0.01%
Octopus, unspecified ²	838	\$1,609	0.01%
Crustacean, unspecified ²	385	\$1,366	0.005%
Sea Cucumber, warty ²	243	\$1,183	0.004%
Bolina Rockfish ²	138	\$1,105	0.004%
CA Spiny Lobster ²	104	\$1,059	0.004%
Red Rock Crab ²	1,362	\$1,029	0.003%
Red Urchin	1,899	\$1,007	0.003%
All Other	5,547	\$5,103	0.02%
Total	55,709,035	29,661,358	100.0%

Source: California Fishing Information System, California Department of Fish and Wildlife

1. Species Groups "Surfperch" and "Dover Sole Non-trawl" were added to the "All Other" category because they had a value less than \$1,000.
2. Species Groups that were originally in the "All Other" category that were broken out because their value exceeded \$1,000.

Catch by Gear Type and Number of Vessels by Gear Type

The CDFW-CFIS database contains 65 different gear codes. We combined gears into 12 gear types, plus an “All Other” category. If gear code was missing (not recorded) we classified this as “Unspecified”. For 2010 to 2012, very few landings were recoded as “All Other” or “Unspecified” (Table 2.2). Most of the catch from the MBNMS was caught with “Pots & Traps”, “Purse Seine” and “Other Seine-Dip Nets;” “Pots & Traps” for Dungeness crab, and “Purse Seine” and “Other Seine-Dip Nets” for *Market Squid*. Trawling accounted for between 2.4% to 4.3% of the value of catch from MBNMS over the 2010 to 2012 period. Longlines accounted for between 1.5% and 3.1% and has steadily declined over the 2010 to 2012 period. “Hooka-diving,” “Set gill nets”, “Drift gill nets” and “Harpoon/spear” gears recorded little to no catch in the MBNMS over the 2010 to 2012 period.

There number of vessels operating in the MBNMS steadily increased from 374 in 2010 to 601 in 2012. The number of “Troll” vessels increased markedly from 71 in 2010 to 365 in 2012. The number of “Hook and Line” vessels also increased from 139 to 214. The number of “Pots & Traps,” “Trawl,” “Purse Seine” and “Other Seine – Dip Net” remained relatively constant. Although “Pots & Traps” were the gear type associated with the most landings, more vessels used the gear types “Purse Seine” and “Other Seine-Dip Net” than used “Troll” and “Hook-and-line” gears (Table 2.2).

Table 2.2 Number of Vessels, Pounds and Value by Gear Type in the MBNMS, 2010 to 2012 (2013 \$)

Gear Type	Pounds	Value	Percent of Total Value
2010			
Troll	18,455	\$90,514	0.37%
Pots and Traps	4,533,945	\$9,541,976	39.18%
Longlines	376,134	\$761,789	3.13%
Hook and Line	168,255	\$630,904	2.59%
Hooka - Diving	16,383	\$4,373	0.02%
Set Gill Nets	87	\$186	0.00%
Trawl	1,043,170	\$974,194	4.00%
Purse Seine	24,980,605	\$5,832,231	23.95%
Other Seine - Dip Net	28,677,882	\$6,480,309	26.61%
Drift Gill Net	14,688	\$37,516	0.15%
Harpoon / Spear	0	\$0	0.00%
All Other	0	\$0	0.00%
Unspecified	0	\$0	0.00%
<i>Total</i>	<i>59,829,604</i>	<i>\$24,353,992</i>	<i>100%</i>
2011			
Troll	128,735	\$850,514	3.55%
Pots and Traps	3,773,317	\$10,838,754	45.20%
Longlines	270,944	\$689,333	2.87%
Hook and Line	199,620	\$825,712	3.44%
Hooka - Diving	2,097	\$1,533	0.01%
Set Gill Nets	0	\$0	0.00%
Trawl	1,007,592	\$1,032,070	4.30%
Purse Seine	28,131,933	\$4,744,786	19.79%
Other Seine - Dip Net	26,481,656	\$4,997,569	20.84%
Drift Gill Net	0	\$0	0.00%
Harpoon / Spear	0	\$0	0.00%
All Other	0	\$0	0.00%
Unspecified	31	\$136	0.001%
<i>Total</i>	<i>59,995,925</i>	<i>\$23,980,407</i>	<i>100%</i>
2012			
Troll	826,429	\$4,231,772	14.27%
Pots and Traps	3,159,230	\$11,193,118	37.74%
Longlines	235,161	\$442,805	1.49%
Hook and Line	240,201	\$783,310	2.64%
Hooka - Diving	2,574	\$4,927	0.02%
Set Gill Nets	87	\$335	0.00%
Trawl	979,886	\$724,325	2.44%
Purse Seine	27,197,709	\$6,012,445	20.27%
Other Seine - Dip Net	23,067,348	\$6,267,892	21.13%
Drift Gill Net	350	\$177	0.0006%
Harpoon / Spear	0	\$0	0.00%
All Other	26	\$133	0.0004%
Unspecified	33	\$117	0.0004%
<i>Total</i>	<i>55,709,035</i>	<i>\$29,661,358</i>	<i>100%</i>

Source: California Fishing Information System, California Department of Fish and Wildlife.

Harvest Revenue Distribution by Number of Vessels

In the commercial fisheries, it is often maintained that 20% of the fishermen catch 80% of the fish i.e. the “20-80” rule. For 2012, we developed a summary view of the distribution of total harvest revenue. In MBNMS, 98 of the 601 vessels, or 16.4%, accounted for 82.4% of the total value of catch, which is pretty close to the “20-80” rule.

There is a skewed distribution of harvest revenue by vessels. Five vessels (0.8%) accounted for 27.7% of value. Each of these five vessels received over \$1 million for their catch from the MBNMS. Further, 17 vessels (2.8%) accounted for 47.3% of value, and each of these vessels received at least \$300,000 for their catch from the MBNMS. On the lower end of the revenue distribution, 311 vessels (51.6%) accounted for only 3.3% of the value, and each of these vessels landed less than \$10,000 (Table 2.3).

Table 2.3 Vessel Distribution of Harvest Revenue from the MBNMS, 2012 (2013 \$)

Distribution Range	Number of Vessels	Percent of Vessels	Percent of Harvest Revenue
Greater than \$0	601	100.00%	100.00%
Greater than \$1,000,000	5	0.83%	27.75%
Greater than \$300,000	17	2.84%	47.29%
Greater than \$200,000	31	5.18%	58.85%
Greater than \$100,000	62	10.35%	73.96%
Greater than \$50,000	98	16.36%	82.37%
Greater than \$30,000	142	23.71%	88.15%
Greater than \$10,000	290	48.41%	96.72%
Less than \$10,000	311	51.59%	3.28%
Less than \$5,000	240	39.73%	1.55%
Less than \$1,000	81	13.52%	0.12%
Less than \$100	7	1.17%	0.001%

Mean=\$49,512; Median=\$8,967; Minimum=\$13; Maximum=\$2,951,493; sum=\$29,661,358

Source: California Fishing Information System, California Department of Fish and Wildlife

Vessel Dependence on the MBNMS for their Total California Fishing Revenues

Another way of looking at the distribution of harvest revenue is to look at how dependent vessels are on the MBNMS for their total fishing revenues. We calculated the percent of a vessel's harvest revenue from their MBNMS catch as a percent of all of their catch from all of California. Table 2.4 shows the distribution for year 2012. Together, all 601 vessels that fished in the MBNMS in 2012 caught over \$29.66 million from MBNMS, equal to 43% of all their fishing revenues from fishing in all of California. The five vessels with harvest revenue greater than \$1,000,000 were highly dependent on their catch from MBNMS, it accounted for 96.25% of all their fishing revenue from fishing in all of California. Thirty-one vessels or 5%, that accounted for almost 59% of the total value of catch from the MBNMS depended on MBNMS for over 80% of their total fishing revenues from all of California. On the lower end of the distribution, 309 vessels, equal to over 51% of vessels that fished in the MBNMS, accounted for only 3.3% of the value of MBNMS catch and depended for only 9.2% of their total fishing revenues from MBNMS.

Table 2.4 Vessel Dependence on Harvest Revenue from the MBNMS, 2012 (2013 \$)

Number of Vessels	Percent of Vessels	Revenue from MBNMS	Percent Distribution of MBNMS Revenue	Total Harvest Revenue from All of CA	Percent of All CA Revenue From MBNMS
601	100.00%	\$29,661,358	100.00%	\$68,813,970	43.10%
5	0.83%	\$8,228,436	27.74%	\$8,548,897	96.25%
17	2.83%	\$14,024,728	47.28%	\$16,930,197	82.84%
31	5.16%	\$17,454,073	58.84%	\$21,742,033	80.28%
62	10.32%	\$21,935,891	73.95%	\$35,912,859	61.08%
98	16.31%	\$24,428,544	82.36%	\$42,674,365	57.24%
142	23.63%	\$26,142,633	88.14%	\$47,011,729	55.61%
290	48.25%	\$28,684,742	96.71%	\$58,267,288	49.23%
309	51.41%	\$972,987	3.28%	\$10,546,682	9.23%
238	39.60%	\$459,155	1.55%	\$6,591,395	6.97%
81	13.48%	\$36,862	0.12%	\$1,460,412	2.52%
7	1.16%	\$355	0.00%	\$97,582	0.36%

1. Due to missing vessel ID , dependence is not calculated for 2 vessels with \$3628.26 of revenue

Source: California Fishing Information System, California Department of Fish and Wildlife

Port Dependence on Catch from the MBNMS

Another way of looking at economic dependence is port dependence measured as the percent of total port landings from MBNMS. We calculated the percent of pounds and value by species/species groups for the top four ports where catch from the MBNMS was landed: Princeton-Half Moon, Moss Landing, Monterey, and Santa Cruz. These four ports accounted for 95.4 percent of the total value of landings from MBNMS in 2012.

All four ports were highly dependent on MBNMS in 2012. Princeton-Half Moon depended on MBNMS for 92.8% of the total value of landings, Moss Landing 91.9%, Monterey 96.6%, and Santa Cruz 95.6%. For many species/species groups, 100% of port landings were from MBNMS (Table 2.5 and 2.6).

Table 2.5 Landings by Port and Species/Species Groups from Catch in the MBNMS, 2012 (2013 \$)

Port/Species/Species Group	Catch from MBNMS		Total Port Landings		Percent of Total Port Landings from MBNMS	
	Pounds	Value	Pounds	Value	Pounds	Value
Princeton-Half Moon						
Coastal Pelagic	1,634	\$1,483	1,634	\$1,483	100.00%	100.00%
Dover Sole-Thorneyheads-Sablefish Trawl	209	\$42	209	\$42	100.00%	100.00%
Rock Crab	7,956	18,102	7,956	\$18,102	100.00%	100.00%
Smelts	199	\$64	199	\$64	100.00%	100.00%
Spot Prawn	36,492	\$459,289	36,492	\$459,289	100.00%	100.00%
Surfperch	2	\$2	2	\$2	100.00%	100.00%
Market Squid	16,279,009	\$4,956,617	16,709,087	\$5,086,410	97.43%	97.45%
CA Halibut	45,287	\$219,274	47,291	\$229,355	95.76%	95.60%
Sanddabs	52,345	26,672	55,277	\$28,159	94.70%	94.72%
Dungeness Crab	2,186,516	\$7,115,607	2,341,359	\$7,615,840	93.39%	93.43%
White Seabass	1,159	\$6,535	1,253	7,107	92.50%	91.95%
Salmon	246,817	\$1,484,202	282,011	\$1,704,353	87.52%	87.08%
Other Flatfish	59,403	\$57,651	73,741	\$73,985	80.56%	77.92%
Sharks-Rays not White Shark or Big Skate	8,452	\$2,239	10,982	\$2,948	76.96%	75.96%
Lingcod	3,708	\$15,200	6,275	\$20,932	59.10%	72.62%
Shelf Rockfish	71,120	\$47,826	92,084	\$65,898	77.23%	72.58%
Deeper Nearshore Rockfish	4,083	\$22,790	6,167	\$35,058	66.22%	65.00%
Shallow Nearshore Rockfish	333	\$2,519	665	\$5,131	50.02%	49.09%
Dover Sole Non-Trawl	118	\$43	268	\$112	44.03%	38.69%
Sablefish Non-Trawl	29,361	\$51,866	90,295	\$142,485	32.52%	36.40%
Tuna	15,487	\$24,321	54,699	\$129,041	28.31%	18.85%
Thornyheads Non-Trawl	105	\$158	2,759	\$3,793	3.81%	4.17%
Hagfish	0	\$0	12	\$117	0.00%	0.00%
All Other	3,888	\$12,812	4,653	\$15,299	83.55%	83.75%
<i>Total</i>	<i>19,053,681</i>	<i>\$14,525,315</i>	<i>19,825,368</i>	<i>\$15,645,005</i>	<i>96.11%</i>	<i>92.84%</i>
Moss Landing						
CA Halibut	9,479	\$35,273	9,479	\$35,273	100.00%	100.00%
Coastal Pelagic	12,417,001	\$1,116,771	12,417,001	\$1,116,771	100.00%	100.00%
Deeper Nearshore Rockfish	9	\$60	9	\$60	100.00%	100.00%
Dover Sole-Thorneyheads-Sablefish Trawl	413,431	\$282,398	413,431	\$282,398	100.00%	100.00%
Other Flatfish	27,865	\$43,522	27,865	\$43,522	100.00%	100.00%
Sanddabs	333	\$1,070	333	\$1,070	100.00%	100.00%
Surfperch	16	\$27	16	\$27	100.00%	100.00%
White Seabass	7,450	\$33,811	7,450	\$33,811	100.00%	100.00%
Dover Sole Non-Trawl	188	\$24	190	\$25	98.95%	99.17%
Dungeness Crab	272,730	\$882,412	275,190	\$890,511	99.11%	99.09%
Shelf Rockfish	45,470	\$50,381	46,001	\$51,006	98.85%	98.77%
Market Squid	15,067,017	\$4,582,935	15,281,145	\$4,648,066	98.60%	98.60%
Shallow Nearshore Rockfish	7,795	\$44,688	7,927	\$45,516	98.33%	98.18%
Rock Crab	1,654	\$2,124	1,733	\$2,204	95.46%	96.38%
Lingcod	2,075	\$6,259	2,273	\$6,750	91.27%	92.71%
Sharks-Rays not White Shark or Big Skate	19,652	\$5,685	20,114	\$6,270	97.70%	90.66%
Salmon	215,090	\$1,109,745	256,386	\$1,314,716	83.89%	84.41%
Grenadiers	87,525	\$20,137	113,881	\$26,817	76.86%	75.09%
Sablefish Non-Trawl	178,172	\$344,961	274,309	\$574,884	64.95%	60.01%
Thornyheads Non-Trawl	9,834	\$36,183	18,290	\$67,499	53.77%	53.61%
Tuna	15,530	\$31,212	153,209	\$235,743	10.14%	13.24%
Swordfish	0	\$0	2,596	\$12,559	0.00%	0.00%
All Other	5,373	\$15,828	6,248	\$16,697	86.00%	94.80%
<i>Total</i>	<i>28,803,689</i>	<i>\$8,645,506</i>	<i>29,335,076</i>	<i>\$9,412,196</i>	<i>98.19%</i>	<i>91.85%</i>

Source: California Fishing Information System, California Department of Fish and Wildlife.

Table 2.6 Landings by Port and Species/Species Groups from Catch in the MBNMS, 2012 (2013 \$) Continued

Port/Species/Species Group	Catch from MBNMS		Total Port Landings		Percent of Total Port Landings from MBNMS	
	Pounds	Value	Pounds	Value	Pounds	Value
Monterey						
Coastal Pelagic	2,160,824	\$246,266	2,160,824	\$246,266	100.00%	100.00%
Deeper Nearshore Rockfish	647	\$3,004	647	\$3,004	100.00%	100.00%
Dover Sole Non-Trawl	28	\$7	28	\$7	100.00%	100.00%
Dover Sole-Thorneyheads-Sablefish Trawl	325,461	\$119,331	325,461	\$119,331	100.00%	100.00%
Grenadiers	92	\$40	92	\$40	100.00%	100.00%
Lingcod	975	\$2,664	975	\$2,664	100.00%	100.00%
Market Squid	4,019,765	\$1,221,505	4,019,765	\$1,221,505	100.00%	100.00%
Other Flatfish	13,399	\$10,816	13,399	\$10,816	100.00%	100.00%
Shallow Nearshore Rockfish	3,181	\$26,451	3,181	\$26,451	100.00%	100.00%
Sharks-Rays not White Shark or Big Skate	7,191	\$1,556	7,191	\$1,556	100.00%	100.00%
Spot Prawn	43,513	\$540,787	43,513	\$540,787	100.00%	100.00%
Thornyheads Non-Trawl	19	\$15	19	\$15	100.00%	100.00%
Tuna	42,125	\$56,199	42,125	\$56,199	100.00%	100.00%
Sablefish Non-Trawl	15,914	\$40,645	15,956	\$40,688	99.74%	99.90%
White Seabass	17,614	\$88,497	17,674	\$88,771	99.66%	99.69%
Sanddabs	20,681	\$11,960	20,702	\$12,003	99.90%	99.65%
CA Halibut	4,118	\$17,252	4,135	\$17,338	99.59%	99.50%
Salmon	119,405	\$603,078	120,182	\$607,914	99.35%	99.20%
Shelf Rockfish	18,543	\$19,041	19,036	\$19,440	97.41%	97.95%
Rock Crab	230	\$933	300	\$1,199	76.67%	77.80%
Dungeness Crab	27,374	\$82,655	55,220	\$182,962	49.57%	45.18%
All Other	6,053	\$8,540	6,971	\$11,854	86.83%	72.04%
<i>Total</i>	<i>6,847,153</i>	<i>\$3,101,243</i>	<i>6,877,396</i>	<i>\$3,210,811</i>	<i>99.56%</i>	<i>96.59%</i>
Santa Cruz						
Coastal Pelagic	3,170	\$1,068	3,170	\$1,068	100.00%	100.00%
Deeper Nearshore Rockfish	523	\$1,309	523	\$1,309	100.00%	100.00%
Market Squid	218	\$365	218	\$365	100.00%	100.00%
Other Flatfish	154	\$473	154	\$473	100.00%	100.00%
Rock Crab	1,133	\$3,544	1,133	\$3,544	100.00%	100.00%
Sanddabs	1,154	\$3,060	1,154	\$3,060	100.00%	100.00%
Shallow Nearshore Rockfish	24	\$122	24	\$122	100.00%	100.00%
Shelf Rockfish	1,503	\$3,489	1,503	\$3,489	100.00%	100.00%
Smelts	4,674	\$3,462	4,674	\$3,462	100.00%	100.00%
Surfperch	53	\$105	53	\$105	100.00%	100.00%
CA Halibut	14,628	\$74,704	14,681	\$74,933	99.64%	99.69%
Dungeness Crab	275,572	\$976,863	279,176	\$990,567	98.71%	98.62%
White Seabass	52,812	\$241,794	53,635	\$245,678	98.46%	98.42%
Lingcod	1,220	\$3,578	1,255	\$3,649	97.19%	98.04%
Salmon	122,586	\$654,303	130,538	\$701,057	93.91%	93.33%
Tuna	21,796	\$43,647	26,650	\$50,538	81.79%	86.36%
Sablefish Non-Trawl	6,342	\$20,277	7,091	\$23,525	89.43%	86.19%
Sharks-Rays not White Shark or Big Skate	383	\$277	981	\$883	39.06%	31.35%
Swordfish	0	\$0	3,922	\$16,900	0.00%	0.00%
All Other	1,026	\$1,387	1,706	\$2,391	60.15%	58.03%
<i>Total</i>	<i>508,969</i>	<i>\$2,033,826</i>	<i>532,241</i>	<i>\$2,127,117</i>	<i>95.63%</i>	<i>95.61%</i>

Source: California Fishing Information System, California Department of Fish and Wildlife.

Trends in Catch for the Top Five Species/Species Groups

In MBNMS, the top five species/species groups in terms of value of landings were *Market Squid*, *Dungeness crab*, *Salmon*, *Coastal Pelagics*, and *Spot Prawn*.

Many of these trends display dips and spikes for which the reason is not immediately obvious. Each spotlighted species will include possible explanations, if available, including ecological events that coincide in time with some of the extremes of the data. This report does not claim any of these to causal, only time-associated events that may offer some explanation.

El Niño. El Niño is oscillation of the ocean-atmosphere system in the tropical Pacific. El Niño is characterized by unusually warm ocean temperatures in the Equatorial Pacific, while La Niña is characterized by unusually cold temperatures. El Niño causes changes in weather around the globe.

Of relevance to this study, El Niño causes a reduction in coastal upwelling, which is essential for providing nutrients to many fish. This reduction has an adverse effect on commercial fisheries. The impacts of La Niña tend to be opposite those of El Niño. (CPC, 2013)

La Nina & El Nino	
Began	Ended
Jun-1998	Apr-2001
Apr-2002	Mar-2003
Jun-2004	Feb-2005
Oct-2005	Apr-2006
Aug-2006	Feb-2007
Jul-2007	Jul-2008
Dec-2008	Apr-2009
Jun-2009	May-2010
Jun-2010	May-2011
Aug-2011	Apr-2012

Source: NOAA Climate Prediction Center

Market Squid. California market squid are extremely sensitive to the warm water trends of El Niño. Overall catch decreases in the warm-water phases, and then rebound in the cooler La Niña phases which bring increased upwelling. In the southern fishery, *Market Squid* landings are minimal in El Niño years. Landings in the northern fishery often increase, then decrease for several years after El Niño. During these warm water events with nutrient poor water, landings can disappear entirely in some areas. (CDFW 2006, 1-2)

The Market Squid Fishery Management Plan was instituted by CDFW in 2005. Under this plan, commercial fishing for *Market Squid* is limited by fishery control rules. These rules include requiring permits to land or possess over 1.8 tons, an annual catch limit, time and spatial closures, and lighting restrictions. (Sweetnam 2011, 18)

In 2012, *Market Squid* was number one in terms of value of catch, but catch of *Market Squid* was very volatile over the 2000 to 2012 time period, ranging from a low of 186 pounds with a value of \$95 in 2008 to a high of 42.7 million pounds and \$11.35 million in 2010. The biggest dip in the fishery was from 2005-2009, reaching its low in 2008. In terms of pounds of catch, the high catch was in 2002 at over 56.3 million pounds with harvest revenue of \$9.1 million in 2013 dollars (Table 2.7 and Figure 2.1).

Table 2.7 Trends in Market Squid Caught in the MBNMS 2000 to 2012 (2013 \$)

Year	Pounds	Value
2000	14,093,604	\$2,295,190
2001	16,002,302	\$2,174,492
2002	56,325,572	\$9,109,269
2003	32,010,412	\$10,469,218
2004	13,522,651	\$3,882,547
2005	4,251,760	\$1,183,014
2006	1,134,853	\$297,183
2007	55,741	\$18,247
2008	186	\$95
2009	2,714,293	\$1,008,954
2010	42,708,345	\$11,351,509
2011	28,374,070	\$7,276,105
2012	35,552,550	\$10,818,161

Source: California Fishing Information System,
California Department of Fish and Wildlife

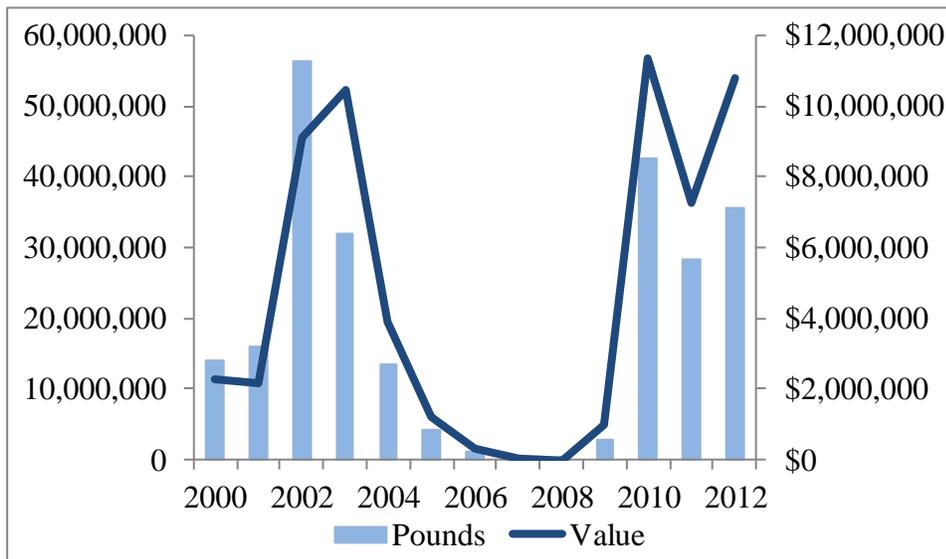


Figure 2.1 Trends in Market Squid Caught in the MBNMS 2000 to 2012 (2013 \$)

Dungeness crab. In 2012, *Dungeness crab* was second in terms of value of catch, with almost \$9.5 million in harvest revenue. Catch has increased significantly since 2000 with periodic ups and downs. In 2010, catch reached a high of over 4.3 million pounds and although poundage was significantly lower in 2012 than 2010, the total value of catch reached a high in 2012 of almost \$9.5 million (Table 2.8 and Figure 2.2).

Dungeness crab larval abundance has been correlated with lower water temperatures; on average, larvae will enter the commercial fishery within three years. The wide fluctuations in catch appear to be directly related to crab abundance which in turn seems to be a function of ocean conditions (CDFW 2013, 2-8).

Table 2.8 Trends in Dungeness Crab Caught in the MBNMS 2000 to 2012 (2013 \$)

Year	Pounds	Value
2000	167,097	\$607,960
2001	287,629	\$1,077,149
2002	691,585	\$1,927,657
2003	1,292,744	\$2,967,224
2004	1,263,081	\$2,887,761
2005	901,353	\$2,106,058
2006	1,607,834	\$4,066,299
2007	1,032,814	\$3,301,480
2008	773,347	\$2,768,015
2009	887,810	\$2,469,083
2010	4,238,324	\$8,549,479
2011	3,378,252	\$8,865,532
2012	2,878,609	\$9,458,902

Source: California Fishing Information System,
California Department of Fish and Wildlife

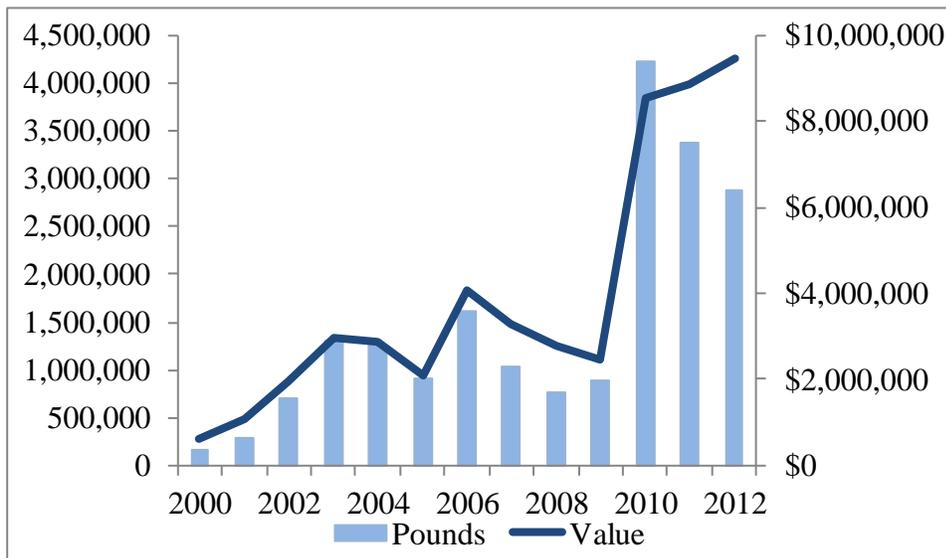


Figure 2.2 Trends in Dungeness Crab Caught in the MBNMS 2000 to 2012 (2013 \$)

Salmon. In 2012, *Salmon* was number three in terms of value of catch, but catch of *Salmon* has been very volatile over the 2000 to 2012 time period ranging from a low of zero in 2008 and 2009 to a high of 1.4 million pounds and \$5.1 million in value in 2004. *Salmon* catch has been increasing since 2010 and value was \$4.1 million (Table 2.9 and Figure 2.3).

Prior to 1990, the industry enjoyed relatively high and consistent salmon landings, averaging about 7.5 million pounds annually. During the last two decades, *Salmon* landings have been much more variable and lower overall, averaging 3.5 million pounds a year. Although oceanic and river conditions play a major role in annual *Salmon* catches, variation among years can also be attributed to changes in fishery regulations and fishing effort. (CDFW 2011, 5-3) In 2010, the commercial ocean salmon fishery was opened for the first time since 2007 (Sweetnam 2009, 19).

Table 2.9 Trends in Salmon Caught in the MBNMS 2000 to 2012 (2013 \$)

Year	Pounds	Value
2000	923,764	\$2,521,521
2001	316,693	\$874,115
2002	683,730	\$1,390,168
2003	460,202	\$1,128,044
2004	1,417,020	\$5,103,163
2005	1,231,249	\$4,479,016
2006	94,887	\$689,620
2007	363,541	\$2,340,837
2008	0	\$0
2009	0	\$0
2010	15,787	\$80,630
2011	122,532	\$835,114
2012	751,283	\$4,105,247

Source: California Fishing Information System,
California Department of Fish and Wildlife

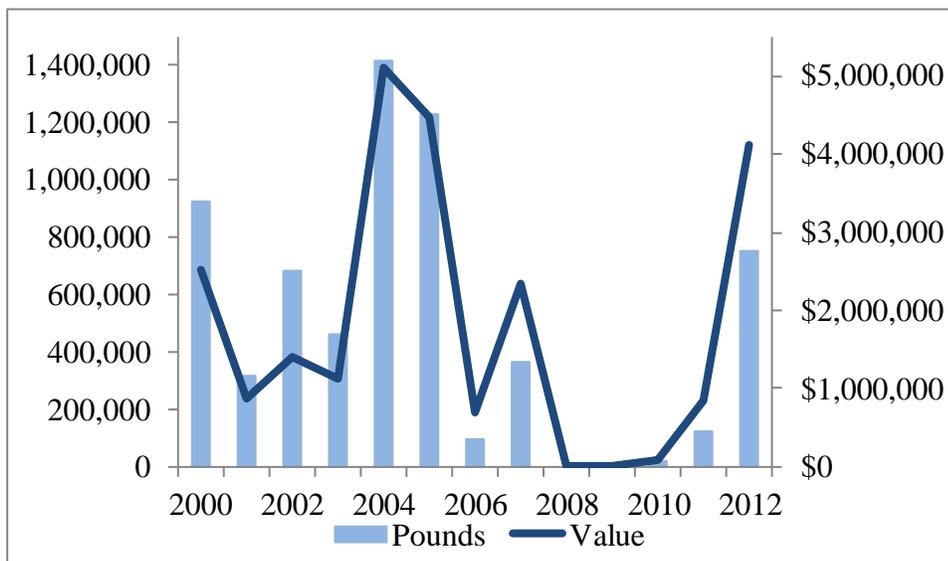


Figure 2.3 Trends in Salmon Caught in the MBNMS 2000 to 2012 (2013 \$)

Coastal Pelagics. In 2012, *Coastal Pelagics species group* was fourth in terms of value of catch. Catch increased significantly from 2000 to 2007, and then began to decline. In 2007, catch reached a high in terms of pounds landed of over 94 million with a value of about \$4.8 million. Although catch in terms of pounds declined from 2007 to 2008, the value of catch increased to a high of almost \$5.8 million in 2008. In 2012, catch had declined to a little over 14.5 million pounds with a value of almost \$1.4 million (Table 2.10 and Figure 2.4).

Table 2.10 Trends in Coastal Pelagic Caught in the MBNMS 2000 to 2012 (2013 \$)

Year	Pounds	Value
2000	16,870,647	\$1,474,072
2001	17,899,998	\$1,833,288
2002	32,399,250	\$2,525,819
2003	18,486,008	\$923,010
2004	42,619,742	\$1,865,989
2005	32,412,079	\$1,520,704
2006	56,503,339	\$2,601,945
2007	94,295,168	\$4,793,807
2008	84,623,877	\$5,754,079
2009	54,810,324	\$5,091,545
2010	10,983,264	\$960,785
2011	26,102,267	\$2,372,185
2012	14,582,629	\$1,365,589

Source: California Fishing Information System,
California Department of Fish and Wildlife

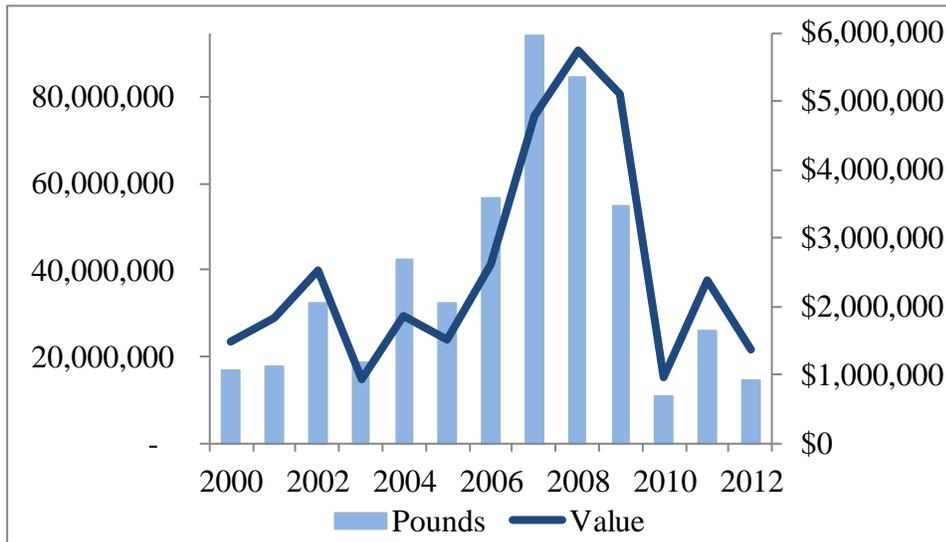


Figure 2.4 Trends in Coastal Pelagic Caught in the MBNMS 2000 to 2012 (2013 \$)

Spot Prawn. In 2012, *Spot Prawn* was fifth in terms of value of catch at almost \$1.3 million. From 2000 to 2012, catch had significant ups and downs with a general downward trend from 2000 to 2009 and an upward trend from 2009 to 2012. Although poundage reached a high in 2002 of over 106,000, the value of catch reached a high in 2012 of almost \$1.3 million, with a catch about 3,000 pounds less than in 2002 (Table 2.11 and Figure 2.5).

Table 2.11 Trends in Spot Prawn Caught in the MBNMS 2000 to 2012

Year	Pounds	Value
2000	68,600	\$822,192
2001	65,880	\$825,546
2002	106,707	\$1,288,560
2003	62,216	\$799,656
2004	57,912	\$778,969
2005	59,046	\$819,924
2006	72,266	\$1,052,836
2007	48,539	\$689,420
2008	39,793	\$536,602
2009	31,945	\$419,587
2010	39,291	\$509,043
2011	83,523	\$1,054,129
2012	103,638	\$1,298,754

Source: California Fishing Information System,
California Department of Fish and Wildlife

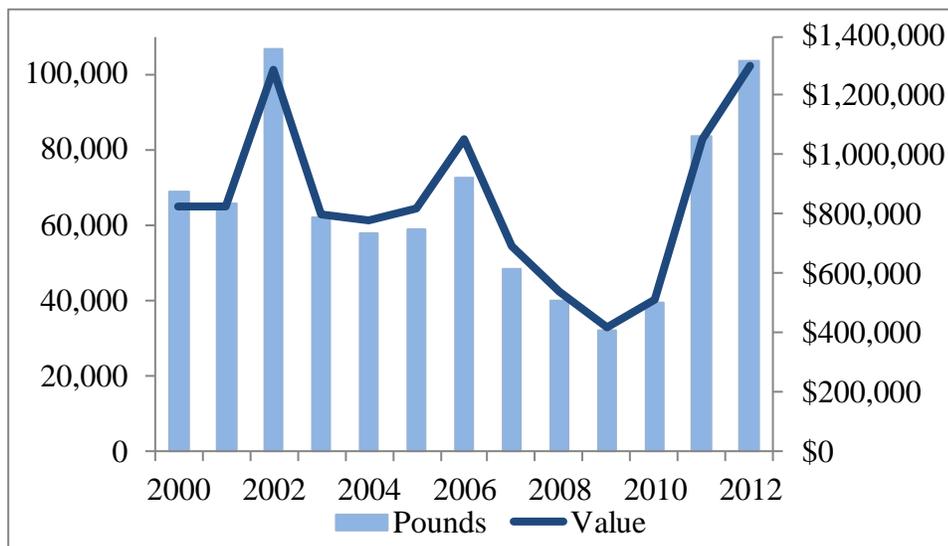


Figure 2.5 Trends in Spot Prawn Caught in the MBNMS 2000 to 2012 (2013 \$)

Chapter 3: Special Issues

In this chapter, we address special request made by MBNMS management for special queries of the data. The first major request was for the “trawling” fishery. Here all the topics addressed in Chapters 1 and 2 are addressed for trawling.

Trawling Overview.

The trawl fishery began in 1876 with the introduction of the paranzella net in the San Francisco Bay area. This early trawl net was towed by two sail boats. Eventually wind-powered vessels were replaced by steam, then combustion engines. The two-vessel method of towing a net remained until the 1940s, when single vessels began towing and hauling their own nets (CDFW 2011, 16-2).

Various restrictions on bottom trawling in state waters have been in effect since 1915. Over time, these restrictions have become more detailed and expanded. Some examples of these are illustrated in Figure 3.1.

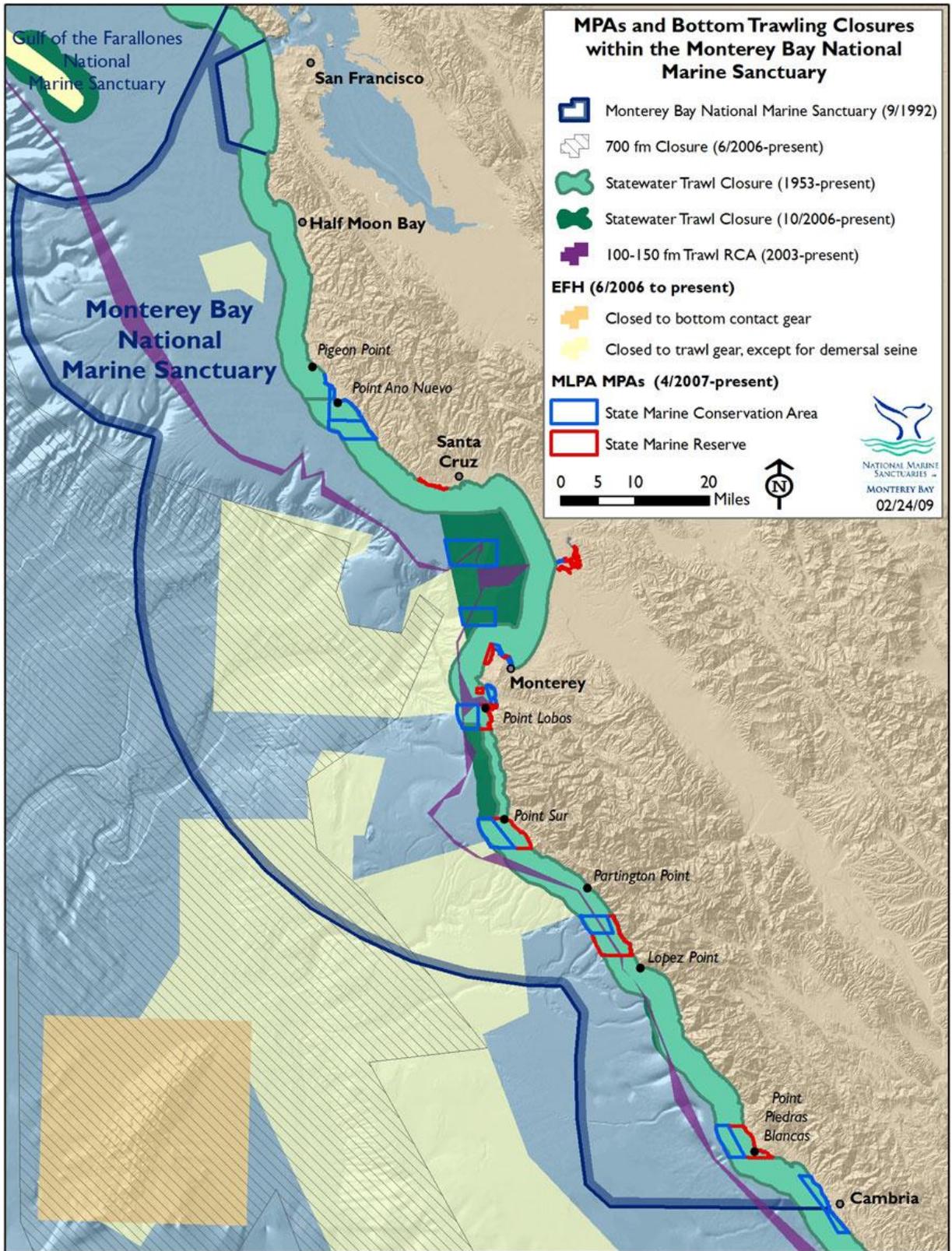


Figure 3.1 Map of the condition of the MBNMS, including regulations and closures

Section 3.1: Economic Impacts of Commercial Trawling Catch in the MBNMS

Operational Categories. The COFHE Model is based on organizing the fisheries into 20 operational categories (OCs). OCs are either based on gear types or a combination of gear types and species and each has different production functions (i.e. different combinations of inputs of productions such as gear, labor, fuel, bait, ice, etc.) and some such as the *Salmon & Dungeness crab* and *Dungeness crab* are differentiated by size of the vessel (vessel length). Table 3.1 lists the 20 OCs in the COEFH Model. Details on the harvest revenue by OC and the associated multipliers by county for translating harvest revenue into estimates of output, value added, income and employment by county are in the technical appendix report (Leeworthy et al 2013).

Table 3.1 Operational Categories for COFHE Model

Number	Operational Category
1	Trawl - Northern California
2	Trawl - Southern California
3	CPS Seine
4	Herring Gillnet
5	Other Gillnet
6	Salmon
7	Salmon & Albacore
8	Salmon & Dungeness Crab - Small Vessels
9	Salmon & Dungeness Crab - Mid to Large Vessels
10	Dungeness Crab - Small Vessels
11	Dungeness Crab - Mid to Large Vessels
12	Longline
13	Harpoon - Spear
14	Hook & Line
15	Hook & Line - Live
16	Lobster & Crab
17	Nearshore & Groundfish Trap
18	Prawn Trap
19	Sea Urchin
20	Tuna - Other Seine

Source: Hackett et al, 2009.

Results

Table 3.2 Economic Impacts of Trawling from MBNMS Catch, 2010, 2011, 2012 and 3-year Average (2013 \$)

Year/County	Harvest Revenue	Output	Value Added	Total Income	Employment ¹
2012					
Monterey	\$508,693	\$806,468	\$581,981	\$530,307	6.9552
San Francisco	\$636	\$1,011	\$729	\$666	0.00808
San Mateo	\$214,721	\$339,793	\$243,992	\$222,772	2.7424
Santa Barbara	\$141	\$232	\$165	\$151	0.002
Sonoma	\$13	\$22	\$16	\$14	0.00019
Ventura	\$121	\$197	\$140	\$128	0.000168
<i>Total</i>	<i>\$724,325</i>	<i>\$1,147,723</i>	<i>\$827,023</i>	<i>\$754,038</i>	<i>10</i>
2011					
Monterey	\$673,511	\$1,067,765	\$770,545	\$702,128	9.2087
San Francisco	\$77,609	\$123,343	\$88,992	\$81,326	0.9855
San Luis Obispo	\$22,363	\$36,834	\$25,685	\$23,439	0.3238
San Mateo	\$256,192	\$405,421	\$291,116	\$265,798	3.2721
Santa Barbara	\$443	\$728	\$518	\$473	0.0063
Solano	\$1,952	\$3,155	\$2,216	\$2,755	0.0273
<i>Total</i>	<i>\$1,032,070</i>	<i>\$1,637,246</i>	<i>\$1,179,072</i>	<i>\$1,075,919</i>	<i>14</i>
2010					
Monterey	\$573,461	\$909,149	\$656,081	\$597,827	7.8408
San Francisco	\$117,199	\$186,263	\$134,388	\$122,812	1.4883
San Mateo	\$283,534	\$448,689	\$322,185	\$294,165	3.6213
<i>Total</i>	<i>\$974,194</i>	<i>\$1,544,101</i>	<i>\$1,112,654</i>	<i>\$1,014,804</i>	<i>13</i>
3-year Average					
Monterey	\$585,222	\$927,794	\$669,536	\$610,087	8.0016
San Francisco	\$65,148	\$103,539	\$74,703	\$68,268	0.8273
San Luis Obispo	\$7,454	\$12,278	\$8,562	\$7,813	0.1079
San Mateo	\$251,482	\$397,968	\$285,764	\$260,912	3.2119
Santa Barbara	\$195	\$320	\$228	\$208	0.0028
Solano	\$651	\$1,052	\$739	\$918	0.0091
Sonoma	\$4	\$7	\$5	\$5	0.0001
Ventura	\$40	\$66	\$47	\$43	0.0001
<i>Total</i>	<i>\$910,196</i>	<i>\$1,443,023</i>	<i>\$1,039,583</i>	<i>\$948,254</i>	<i>12</i>

1. Number of full- and part-time jobs.

Source: California Fishing Information System, California Department of Fish and Wildlife and the California Ocean Fish Harvesting Model.

Table 3.3 Economic Impacts of Trawling from MBNMS Catch, 2010, 2011, 2012 and 3-year Average (2013 \$)

Year	Harvest Revenue	Output	Value Added	Total Income	Employment ¹
2010	\$974,194	\$1,544,101	\$1,112,654	\$1,014,804	13
2011	\$1,032,070	\$1,637,246	\$1,179,072	\$1,075,919	14
2012	\$724,325	\$1,147,723	\$827,023	\$754,038	10
3-year Average	\$910,196	\$1,443,023	\$1,039,583	\$948,254	12

1. Number of full- and part-time jobs.

Source: California Fishing Information System, California Department of Fish and Wildlife and the California Ocean Fish Harvesting Model

Section 3.2. Profiles of the Trawling Commercial Fisheries in the MBNMS

In addition to where catch is caught and landed, CDFW-CFIS database includes vessel and fisherman identification codes for who caught the fish and gear types for how the catch was made. Here, we examine specifically the data associated with Trawl gear types.

Catch by Species/Species Groups

Species are identified by three-digit codes. We have combined species into species/species groups. When the MBNMS data was controlled for the gear type *Trawl*, we ended up with 10 species/species groups, including an *All Other* group. The *All Other* group accounted for only 0.2% of all landings from MBNMS trawling in 2012 (Table 3.4).

Table 3.4 Pounds and Value of Trawl Landings from the MBNMS by Species/Species Groups, 2012 (2013 \$)

Species/Species Groups	Pounds	Value	Percent of Total Value
Dover Sole-Thornyheads-Sablefish Trawl	739,101	\$401,771	55.5%
CA Halibut	42,296	\$199,759	27.6%
Other Flatfish	55,365	\$66,521	9.2%
Shelf Rockfish	43,338	\$24,386	3.4%
Grenadier	57,418	\$12,264	1.7%
Sanddab	19,613	\$10,432	1.4%
Sharks-Rays not White Shark or Big Skate	16,970	\$4,359	0.6%
Jumbo Squid	4,007	\$2,601	0.4%
Dungeness Crab	209	\$636	0.1%
All Other	1,569	\$1,596	0.2%
<i>Total</i>	<i>979,886</i>	<i>\$724,325</i>	<i>100.0%</i>

Source: California Fishing Information System, California Department of Fish and Wildlife.

Dover Sole-Thornyheads-Sablefish Trawl was the number one ranked trawl fishery in MBNMS in 2012 on the basis of both pounds and value accounting for over \$400,000 or 55.5% of all trawl harvest value from MBNMS. This was followed by *CA Halibut* at almost \$200 thousand (27.6%), *Other Flatfish* \$66.5 thousand (9.2%), *Shelf Rockfish* \$43 thousand, *Grenadier* \$12 thousand, and *Sanddab* at \$10 thousand (1.4%). These top six species/species groups accounted for more than 98% of the 2012 trawling harvest value from MBNMS.

Catch by Gear Type and Number of Vessels by Gear Type

Trawling accounted for between 2.4% to 4.3% of the value of catch from MBNMS over the 2010 to 2012 period.

Harvest Revenue Distribution by Number of Vessels

In the commercial fisheries, it is often maintained that 20% of the fishermen catch 80% of the fish i.e. the “20-80” rule. For 2012, we developed a summary view of the distribution of total harvest revenue. For trawling in MBNMS, 3 of the 12 vessels or 25% accounted for 91.2% of the total value of catch, which approximates the “20-80” rule.

There is a skewed distribution of harvest revenue by vessels. Three vessels (25%) accounted for 91.2% of value. Each of these three vessels received over \$150,000 for their trawl catch from the MBNMS. Further, five vessels (42%) accounted for 99.6% of value, and each of these vessels received at least \$9,000 for their catch from the MBNMS. On the lower end of the revenue distribution, six vessels (50%) accounted for only 0.2% of the value, and each of these vessels landed less than \$1,000 (Table 3.5).

Table 3.5 Vessel Distribution of Trawling Harvest Revenue from the MBNMS, 2012 (2013 \$)

Distribution Range	Number of Vessels	Percent of Vessels	Percent of Harvest Revenue
Greater than \$0	12	100.00%	100.00%
Greater than \$150,000	3	25.00%	91.20%
Greater than \$50,000	4	33.30%	98.20%
Greater than \$9,000	5	41.70%	99.60%
Greater than or Equal to \$1,000	6	50.00%	99.80%
Less than \$1,000	6	50.00%	0.20%
Less than \$500	5	41.70%	0.001%

Mean=\$60,360; Median=\$1,104; Minimum=\$13; Maximum=\$355,010; sum=\$724,325

Source: California Fishing Information System, California Department of Fish and Wildlife

Vessel Dependence on the MBNMS for their Total California Fishing Revenues

Another way of looking at the distribution of harvest revenue is to look at how dependent trawling vessels are on the MBNMS for their total fishing revenues. We calculated the percent of a vessel's harvest revenue from their MBNMS trawl catch as a percent of all of their trawl catch from all of California. Table 3.6 shows the distribution for year 2012. For all 12 vessels that trawled in the MBNMS in 2012, harvest revenue from the MBNMS was over \$724,000 or 42.5% of all their fishing revenues from fishing in all of California. The top three vessels that represented 25% of the vessels that trawl in MBNMS were highly dependent on their catch from MBNMS as their MBNMS catch accounted for 99.28% of all their fishing revenue from fishing in all of California. On the lower end of the distribution, six vessels (50% of all vessels that fished in the MBNMS) accounted for only 0.02% of the value of MBNMS catch and depended for only 0.19% of their total fishing revenues from MBNMS.

Table 3.6 Vessel Dependence on Trawling Harvest Revenue from the MBNMS, 2012 (2013 \$)

Number of Vessels	Percent of Vessels	Revenue from MBNMS	Percent Distribution of MBNMS Revenue	Total Harvest Revenue from All of CA	Percent of All CA Revenue From MBNMS
3	25%	\$660,361	91.17%	\$665,173	99.28%
3	25%	\$62,504	8.63%	\$263,456	23.72%
6	50%	\$1,460	0.20%	\$777,626	0.19%
12	100%	\$724,325	100.00%	\$1,706,255	42.45%

Source: California Fishing Information System, California Department of Fish and Wildlife

Trawl Catch from the MBNMS

Trawl Catch in MBNMS has declined over time, in both volume and value. Volume was at its highest in 2003, at 2.4 million pounds. Value was highest in 2000, at nearly \$1.9 million. Both measures reached a low in 2012, with pounds coming in just under 980 thousand, and value at only \$724 thousand. From 2000-2012 the catch seems to have approximately stabilized, hovering around 1 million pounds, and just below \$1 million in value. (Table 3.7 and Figure 3.2)

Table 3.7 Trawl Catch in the MBNMS 2000 to 2012 (2013 \$)

Year	Pounds	Value
2000	2,096,145	\$1,877,493
2001	1,765,325	\$1,617,436
2002	1,401,995	\$1,572,013
2003	2,423,629	\$1,699,801
2004	1,621,033	\$1,626,426
2005	1,024,271	\$1,459,660
2006	1,260,526	\$1,408,511
2007	1,485,194	\$1,444,484
2008	1,351,324	\$1,278,598
2009	1,074,667	\$1,098,190
2010	1,043,170	\$974,194
2011	1,007,592	\$1,032,070
2012	979,886	\$724,325

Source: California Fishing Information System,
California Department of Fish and Wildlife.

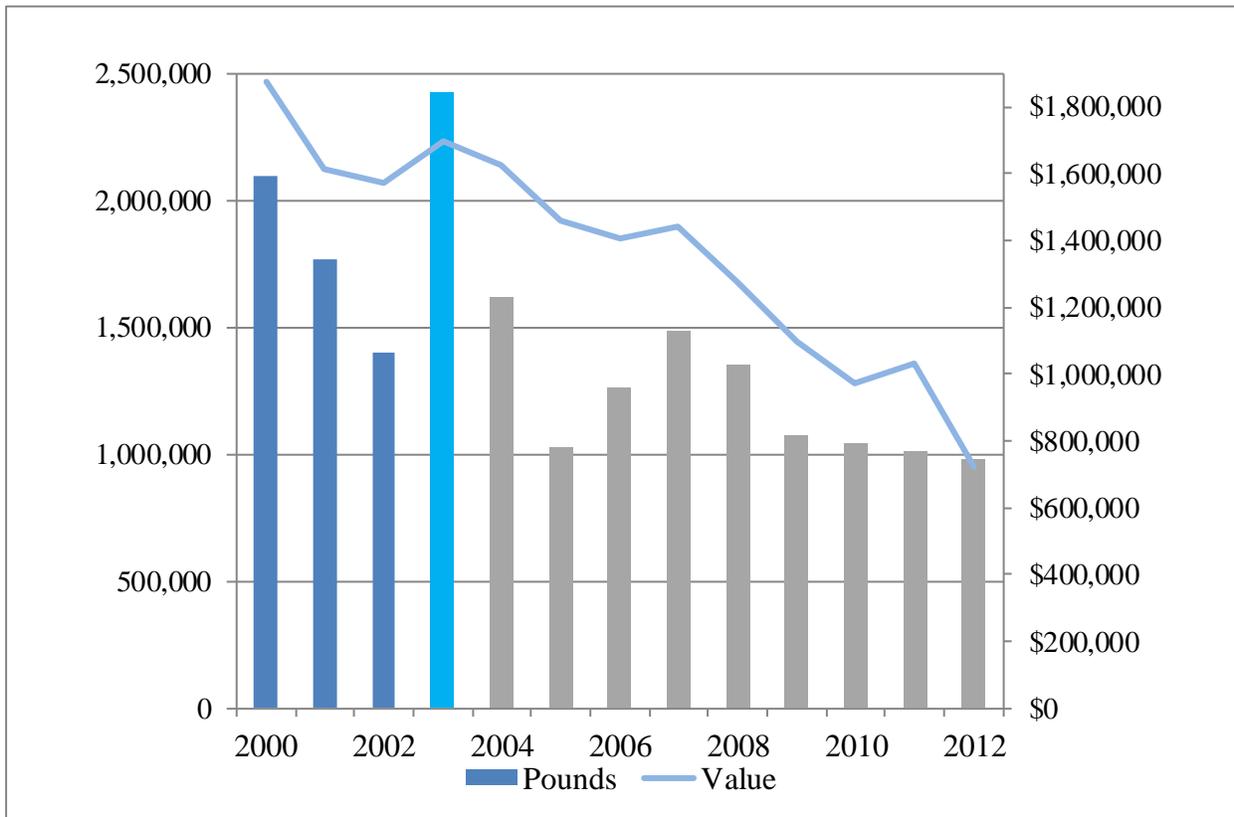


Figure 3.2 Trawl Catch in the MBNMS 2000-2012 (2013 \$)

In 2003, Congress authorized the Pacific Coast Groundfish Buyback program. This program permanently removed 91 vessels and 239 fishing permits for \$45,662,471 from the Groundfish trawl fishery and associated corollary fisheries of *Dungeness crab* and *Pink shrimp* off the California, Oregon and Washington coast (National Marine Fisheries Service). The inception of the program is illustrated in Figure 3.2 by a bright blue bar, followed by gray bars which reflect the post-buyback catch.

Trends in Trawl Catch for the Top Species/Species Groups

In the MBNMS, the top trawling species/species groups in terms of value of landings was *Dover-Sole-Thornyheads-Sablefish*, *CA Halibut*, *Other Flatfish*, *Shelf Rockfish*, *Grenadiers*, and *Sanddab*.

Many of these trends display dips and spikes for which the reason is not immediately obvious. Each spotlighted species will include possible explanations, if available, which will contain ecological events that coincide in time with some of the extremes of the data. This report does not claim any of these to be casual, only time-associated events that may offer some explanation.

El Niño. El Niño is oscillation of the ocean-atmosphere system in the tropical Pacific. El Niño is characterized by unusually warm ocean temperatures in the Equatorial Pacific, while La Niña is characterized by unusually cold temperatures. El Niño causes changes in weather around the globe.

Of relevance to this study, El Niño causes a reduction in coastal upwelling, which is essential for providing nutrients to many fish. This reduction has an adverse effect on commercial fisheries. The impacts of La Niña tend to be opposite those of El Niño (CPC, 2013).

La Nina & El Nino	
Began	Ended
Jun-1998	Apr-2001
Apr-2002	Mar-2003
Jun-2004	Feb-2005
Oct-2005	Apr-2006
Aug-2006	Feb-2007
Jul-2007	Jul-2008
Dec-2008	Apr-2009
Jun-2009	May-2010
Jun-2010	May-2011
Aug-2011	Apr-2012

Source: NOAA Climate
Prediction Center

Dover-Sole-Thornyheads-Sablefish. In 2012, *Dover-Sole-Thornyheads-Sablefish* was number one in terms of value of catch for trawl species. Catch of *Dover-Sole-Thornyheads-Sablefish* presented an apparently cyclical pattern over the 2000 to 2012 time period; from low to high in periods of approximately 3-4 years. Catch ranged from a low of 250,852 pounds with a value of \$232,130 in 2005 to a high of 1.25 million pounds with a value of \$810,173 in 2003. In terms of pounds of catch, value per pound ranged only from \$0.97 per pound in 2009 to \$0.54 in 2012 (Table 3.8 and Figure 3.3).

Table 3.8 Trends in Dover-Sole-Thornyheads-Sablefish Trawl Caught in the MBNMS, 2000 to 2012 (2013 \$)

Year	Pounds	Value
2000	673,960	\$461,761
2001	592,682	\$381,918
2002	914,028	\$648,962
2003	1,251,384	\$810,173
2004	682,811	\$531,394
2005	250,082	\$232,130
2006	474,060	\$370,989
2007	732,991	\$605,220
2008	716,166	\$616,929
2009	396,070	\$383,175
2010	524,791	\$412,756
2011	711,603	\$631,681
2012	739,101	\$401,771

Source: California Fishing Information System, California Department of Fish and Wildlife.

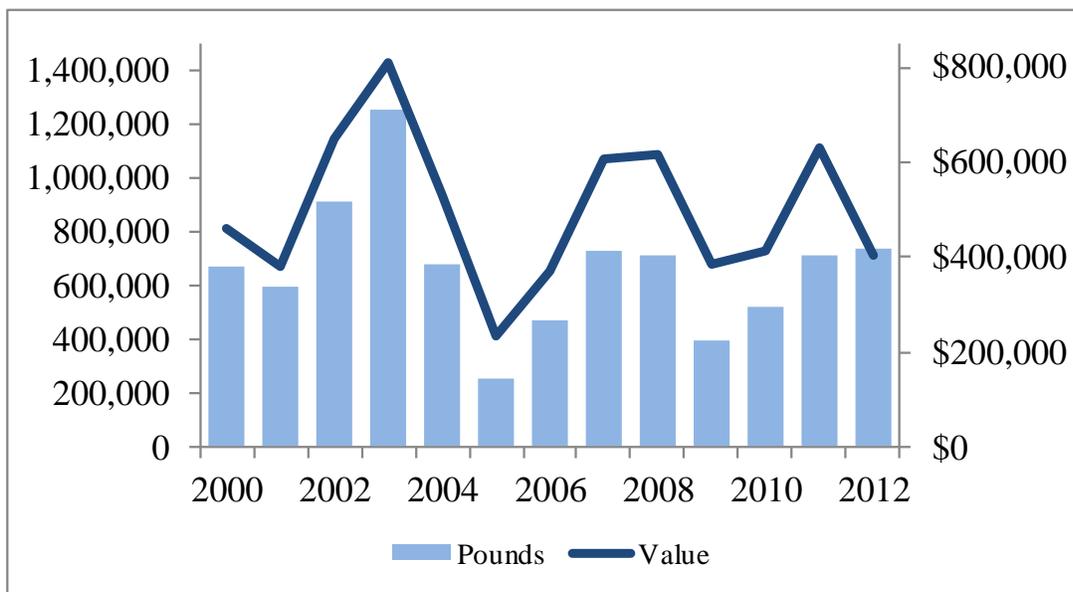


Figure 3.3 Trends in Dover-Sole-Thornyheads-Sablefish Trawl Caught in the MBNMS, 2000 to 2012 (2013 \$)

CA Halibut. In 2012, *CA Halibut* was second in terms of value of catch of trawl species. Catch of *CA Halibut* experienced a spike from 2004-2006. Highest catch was in 2005, at 206,972 pounds, with a value of \$708,813. Lowest catch was in 2012, for only 42,296 pounds with a value of \$199,759. Value per pound was highest in 2012, at \$4.72 per pound, and lowest in 2002 at \$3.32 per pound (Table 3.9 and Figure 3.4).

The spike in catch in 2005 coincides with the drop in *Dover-Sole-Thornyheads-Sablefish* catch that same year.

Table 3.9 Trends in CA Halibut Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Year	Pounds	Value
2000	53,237	\$194,986
2001	53,263	\$186,642
2002	72,128	\$239,356
2003	90,252	\$296,590
2004	143,406	\$477,499
2005	206,972	\$708,813
2006	143,157	\$520,195
2007	54,148	\$203,972
2008	56,518	\$221,573
2009	71,359	\$290,024
2010	63,480	\$246,279
2011	53,099	\$236,244
2012	42,296	\$199,759

Source: California Fishing Information System, California Department of Fish and Wildlife.

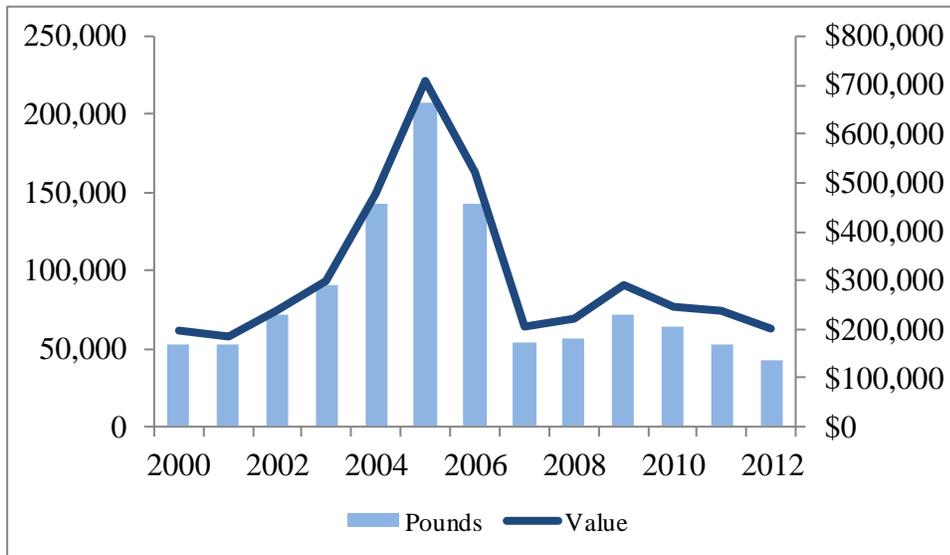


Figure 3.4 Trends in CA Halibut Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Other Flatfish. In 2012 *Other Flatfish* was third in terms of value of catch of trawl species. *Other Flatfish* experienced a temporary dip in 2002, then began to decline after 2007. Highest catch and value were in 2007, with over 340,000 pounds, with a value of over \$400,000. Lowest catch and value were in 2012, at 55,365 pounds with a value of \$66,521. Price has hovered pretty steadily around \$1 per pound, with a low in 2002 of \$0.82 and a high in 2001 at \$1.23. (Table 3.10 and Figure 3.5)

Table 3.10 Trends in Other Flatfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Year	Pounds	Value
2000	217,673	\$206,793
2001	230,713	\$245,318
2002	104,034	\$85,718
2003	194,187	\$185,705
2004	268,596	\$303,139
2005	288,982	\$336,710
2006	295,737	\$346,938
2007	343,826	\$408,582
2008	198,293	\$206,053
2009	172,980	\$164,989
2010	120,191	\$131,406
2011	63,701	\$78,396
2012	55,365	\$66,521

Source: California Fishing Information System, California Department of Fish and Wildlife.

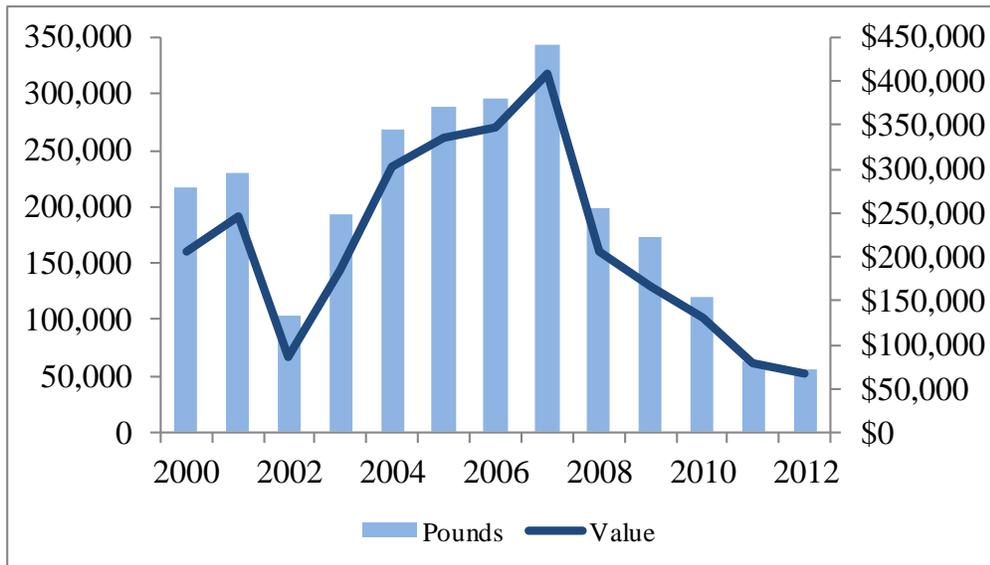


Figure 3.5 Trends in Other Flatfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Shelf Rockfish. In 2012 *Shelf Rockfish* was fourth in terms of value of catch of trawl species. *Shelf Rockfish* has fluctuated in the 2000-2012 time period, dropping below 100,000 pounds and value during 2002, 2005, and most recently, 2011 and 2012. 2012 was the worst year since 2000, with only 43,338 pounds of catch, with a value of only \$24,386. The highest catch was in 2009, with 283,637 pounds of catch, with a value of \$195,975.

Table 3.11 Trends in Shelf Rockfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Year	Pounds	Value
2000	237,938	\$180,957
2001	160,930	\$117,660
2002	80,748	\$51,580
2003	167,973	\$73,782
2004	147,798	\$107,684
2005	88,159	\$55,934
2006	254,608	\$121,837
2007	175,326	\$134,221
2008	241,853	\$157,990
2009	283,637	\$195,975
2010	205,738	\$124,558
2011	59,288	\$42,427
2012	43,338	\$24,386

Source: California Fishing Information System, California Department of Fish and Wildlife.

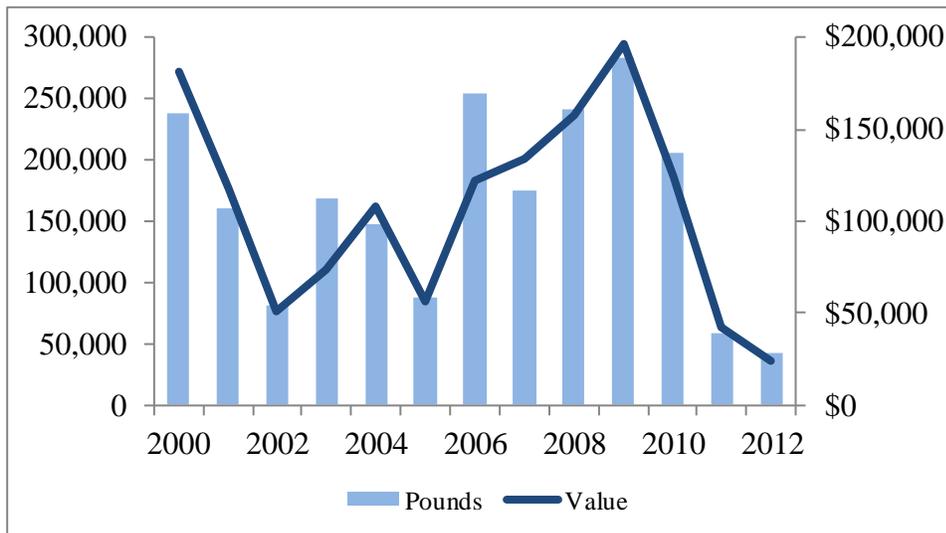


Figure 3.6 Trends in Shelf Rockfish Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Grenadiers. Grenadiers were ranked fifth in trawling in 2012 in terms of value of catch. From 2000 to 2012, Grenadiers have shown a general decline. The maximum catch value and volume were in 2000, at 500,000 pounds of catch, with a value of a little over \$125,000. The lowest catch was in 2009, at 155,156 pounds with a value of only \$31,610.

Table 3.12 Trends in Grenadiers Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Year	Pounds	Value
2000	496,270	\$125,210
2001	470,170	\$95,454
2002	416,344	\$84,133
2003	364,007	\$92,569
2004	305,375	\$64,526
2005	293,666	\$62,323
2006	177,783	\$33,775
2007	231,523	\$46,336
2008	200,178	\$47,218
2009	155,156	\$31,610
2010	206,864	\$46,830
2011	181,344	\$41,247
2012	209,248	\$51,094

Source: California Fishing Information System, California Department of Fish and Wildlife.

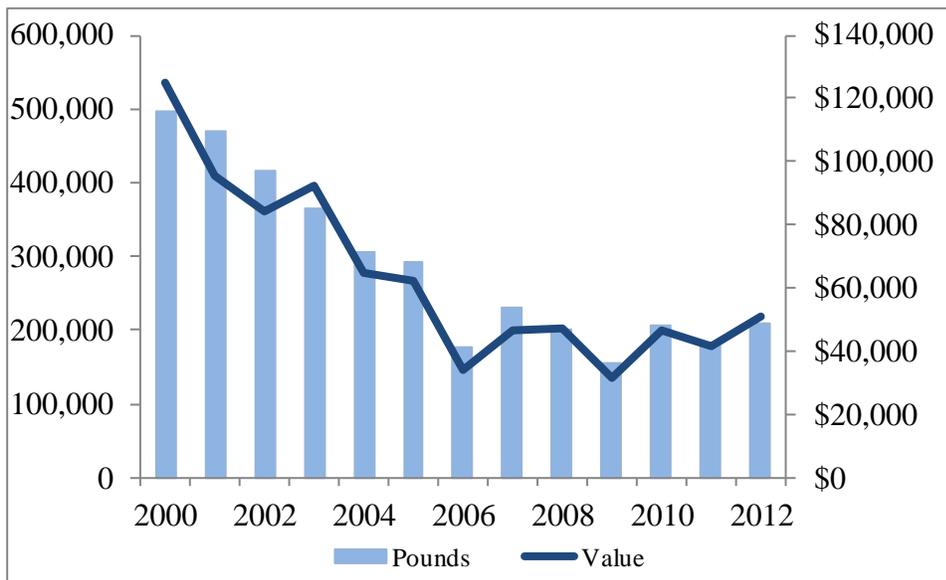


Figure 3.7 Trends in Grenadiers Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Sanddab. *Sanddab* was the sixth-ranked trawling species in 2012 in terms of value of catch. From 2000 to 2012, *Sanddab* catch has plummeted. Value was highest in 2001, at \$373,386, while poundage was highest in 2000 at 687,350 pounds. Value and poundage were both low in 2012, with only 19,613 pounds caught, with a value of only \$10,432.

Table 3.13 Trends in Sanddab Caught by Trawl in the MBNMS, 2000-2012 (2013 \$)

Year	Pounds	Value
2000	687,350	\$307,198
2001	601,156	\$373,386
2002	157,930	\$108,727
2003	631,925	\$273,346
2004	258,645	\$144,631
2005	134,006	\$97,704
2006	23,446	\$18,541
2007	77,798	\$54,117
2008	51,570	\$40,710
2009	33,692	\$24,504
2010	40,247	\$28,005
2011	40,596	\$24,077
2012	19,613	\$10,432

Source: California Fishing Information System, California Department of Fish and Wildlife.

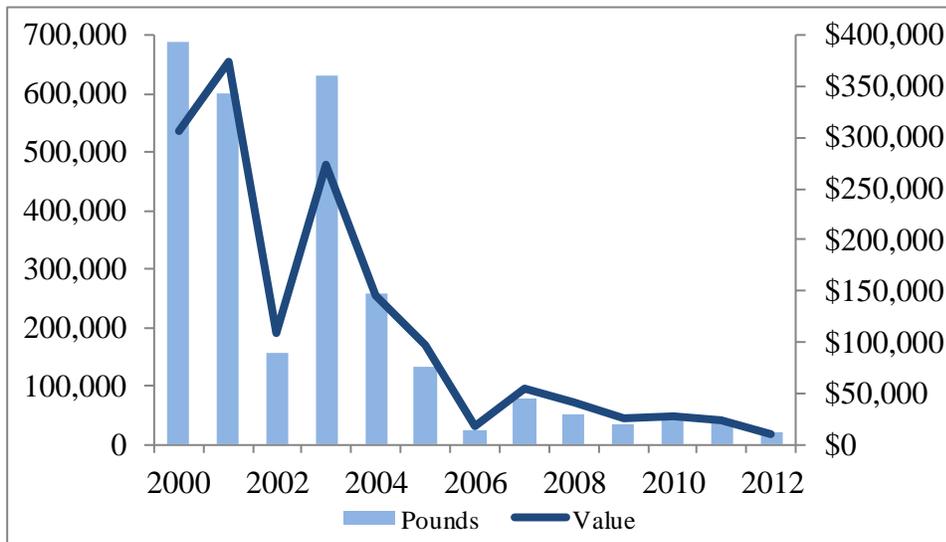


Figure 3.8 Trends in Sanddab Caught by Trawl in the MBNMS 2000-2012 (2013 \$)

References

- California Department of Fish and Wildlife (CDFW), Marine Region. 2013. Status of the Fisheries Report an Update through 2011. 227 pp.
- California Department of Fish and Wildlife (CDFW), Marine Region. 2006. Status of the Fisheries Report an Update through 2006. 153 pp.
- California Department of Fish and Wildlife, California Fishing Information System (CDFW-CFIS) 2013. Commercial fishing landings database for years 2000 to 2012. Terry Tillman, personal communications.
- Climate Prediction Center (CPC). 2013. ENSO Cycle: Recent Evolution, Current Status and Predictions. National Oceanic and Atmospheric Administration, National Weather Service, National Centers for Environmental Prediction, College Park, MD.
- Hackett, S., King, D. Hansen, D.M., Price, E. The Economic Structure of California's Commercial Fisheries. 2009. 91 pp.
- Leeworthy, Vernon R., Peter C. Wiley and Edward A. Stone. 2005. Socioeconomic Impact Analysis of Marine Reserve Alternatives for the Channel Islands National Marine Sanctuary. National Oceanic and Atmospheric Administration, National Ocean Service, Special Projects, Silver Spring, MD, October 7, 2005. Available at http://sanctuaries.noaa.gov/science/socioeconomic/channelislands/pdfs/2005_analysis.pdf
- Leeworthy, Vernon R., Desiree Jerome, and Kelsey Schueler. 2013. Technical Appendix: Economic Impact of Commercial Fisheries on Local County Economies from Catch in California National Marine Sanctuaries 2010, 2011 and 2012. National Oceanic and Atmospheric Administration, National Ocean Service, Office of National Marine Sanctuaries, Silver Spring, MD
- National Marine Fisheries Service. Pacific Coast Groundfish Buyback. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, MD. <http://www.nmfs.noaa.gov/mb/financial_services/pacific_coast_groundfish_buyback.html>
- Office of National Marine Sanctuaries. 2009. Monterey Bay National Marine Sanctuary Condition Report 2009. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. 128 pp
- Pacific Fisheries Management Council (PFMC). 1999. Community Description Booklet, Appendix B, Port Revenue and Income Impact Tables.

Sweetnam, D. (Ed.). 2011. Review of Selected California Fisheries for 2010: Coastal Pelagic Finfish, Market Squid, Ocean Salmon, Groundfish, Highly Migratory Species, Dungeness Crab, Spiny Lobster, Spot Prawn, Kellet's Whelk and White Seabass. California Cooperative Oceanic Fisheries Investigations Reports 52: 13-35

United States Department of Commerce, Bureau of Economic Analysis (BEA)
<<http://www.bea.gov/regional/index.htm>>

United States Department of Labor. Bureau of Labor Statistics (BLS)
<<http://www.bls.gov/data/>>