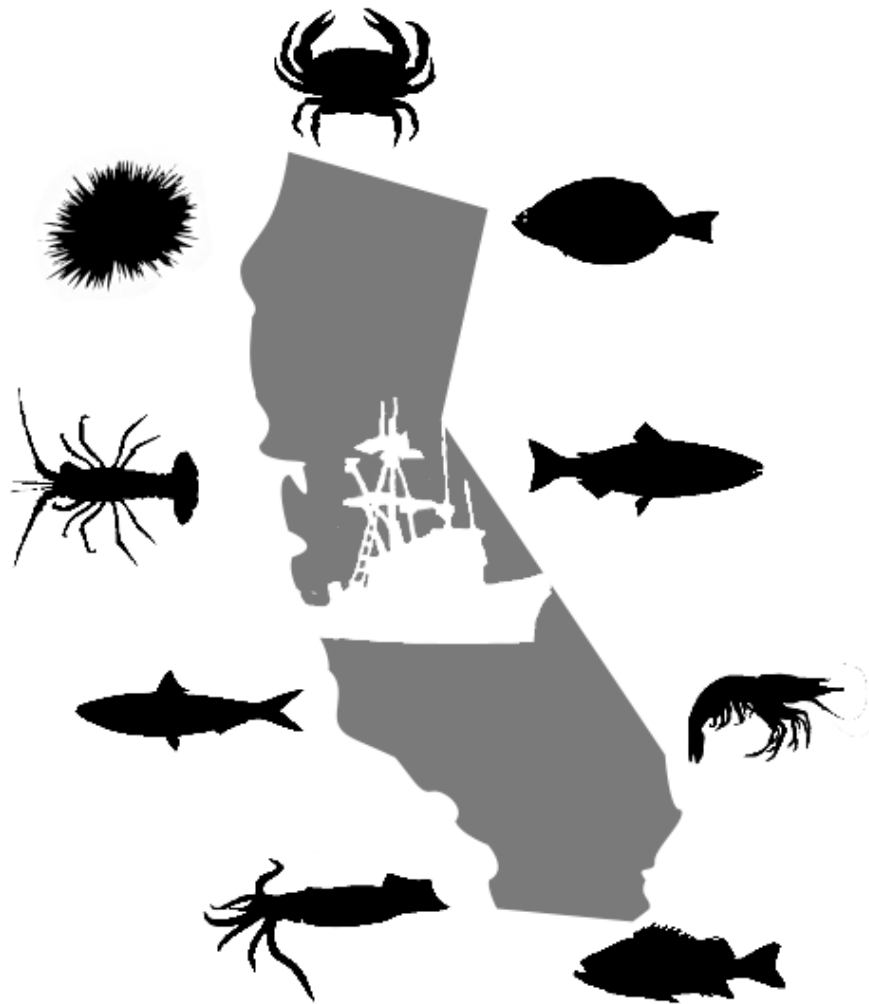


The Economic Structure of California's Commercial Fisheries



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ABSTRACT

California commercial fishermen generate millions of dollars of ex-vessel revenues annually. However, the economic impacts made by California's commercial fishermen on local and state economies are elusive due to the lack of economic cost data. This project provides fisheries managers, researchers, and stakeholders with the specialized economic modeling tools needed to examine the contribution of commercial fishermen to the economy of California and its coastal regions. To initiate this process, a survey of all California commercial fishermen participating in marine capture fisheries in 2006 was done to collect vessel and fishing-related costs, vessel and participant information, market channel data, and summary opinions on fishery conditions. Survey data were then merged with California Department of Fish and Game's landing receipt and license datasets, which provided additional information required to estimate unit and item non-responses for all 2006 fishery participants. These comprehensive fleet-wide cost data were then aggregated into 20 operational configurations that together span all of the state's commercial marine fisheries. Summary data on costs and other survey results are provided in the report. One of the main reasons for the survey research, however, was to support the development of a new economic tool for assessing the contribution of California's marine fisheries to coastal communities, multi-county regions, and the overall state. Consequently, the aggregated cost data were used to develop a set of input-output coefficients for each operational configuration, and for county, region, and state-wide spatial groupings. The result of this work is the California Ocean Fish Harvester Economic (COFHE) model, a customized impact assessment model built on the IMPLAN impact assessment system. Supplementing this report are the COFHE models (in IMPLAN format) and Excel-based "look-up" tables that can be used by non-IMPLAN experts to estimate economic impacts related to California's commercial fisheries. Both sets of supplemental materials are available from the Marine Region of the California Department of Fish and Game.

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I. INTRODUCTION

Fisheries managers in California must consider the economic effects of management changes and plans on individuals, businesses, fishing communities, and local economies. Currently there is a gap in our understanding of the economic characteristics of California's commercial fishing fleet. This stems from a lack of current information that can be used to assess the economic impact of proposed management measures. From the standpoint of economic impact assessment, the last authoritative and comprehensive analysis of California's commercial fishing fleets occurred in the early 1980's (King and Flagg 1982), and is now outdated.

The California Department of Fish and Game (CDFG) requested this research and provided the funds to implement it. The project has two distinct elements. The first was a statewide survey of all the marine capture fisheries in California, conducted by Hackett and Hansen. These data were then merged with landings receipt and license datasets, which allowed for comprehensive estimation of both unit and item non-responses. The result was a dataset that includes estimated costs, revenues, and other descriptive statistics for each of the state's marine capture fisheries. Data were then aggregated by operational configuration (OC) and by location (county, region, and state overall). A description of the data sources, methods of analysis, and operational configurations is given in section II below. Summary cost, revenue, and other descriptive statistics are provided in tabular form in section III below.

The second element of this project was the creation of customized IMPLAN input/output models, multipliers, and economic impact assessments for California's marine capture fisheries (Minnesota IMPLAN Group 2008). This component of the project was supervised by King and Associates. Cost data from the survey, and revenue data from CDFG landings receipts, were used to identify input/output coefficients that were then used to create the customized IMPLAN models for each OC. The impact models are also differentiated by location (county, region, and state overall). The resulting California Ocean Fish Harvester Economic (COFHE) Model, which updates and expands the commercial fishing sector for California's economic impact modeling system, is introduced in section IV below. Supplementing this report are the COFHE models (in IMPLAN format) and Excel-based "look-up" tables that can be used by non-IMPLAN experts to estimate economic impacts related to California's commercial fisheries. Both sets of supplemental materials are available from CDFG.

II. BACKGROUND INFORMATION

This portion of this report is divided into four subsections – data sources and methods of analysis, a description of the operational configurations, a list of cost categories, and a discussion of ex-vessel revenue.

II.1 Data Sources and Methods of Analysis

The analysis presented in this report derives from data gathered from a California commercial fisherman mail survey (the survey instrument and a detailed discussion of survey methods are available in the appendix). Pre-survey meetings were held in various fishing ports in California, and project endorsements were received from the Pacific Coast Federation of Fishermen's Associations (PCFFA), the California Sea Urchin Commission, and the California Wetfish Producers Association. Survey questions were pre-

tested with fisheries leaders identified from the pre-survey port meetings. All fishermen who made landings in 2006 in California received a survey requesting economic and demographic data. The total research design method (Dillman 1978) was used to encourage fishermen to complete and return the survey. This included a pre-survey letter, the survey, a follow up postcard, and a second survey with a new cover letter and an additional letter provided by the Pacific Coast Federation of Fishermen's Association. Surveys were sent to all fishermen on August 20, 2007. A second mail out was sent on September 26, 2007 to those fishermen who had not yet responded. December first was chosen as the cutoff date for receiving surveys. By following this method, 1,946 commercial fishermen received a survey and 405 viable surveys were received, amounting to a 20.8 % response rate.

Quality assurance and quality control methods helped limit potential errors in responses and data tabulation. This included a random check of 30 % of tabulated surveys that were compared with the paper survey responses. "Ground truthing" the data was then implemented with assistance from thirteen commercial fishermen spanning the major fisheries in California. This process involved identifying a number of commercial fishermen having substantial experience among the state's various fisheries and who were also willing to assist the research project. These volunteers were provided with anonymous summary data showing mean, maximum, and minimum reported survey responses by cost category for each specific fishery, and by each vessel size class. Other data they reviewed included the reported range of days fished, and a list of other fisheries that respondents reported to have participated in during 2006. The "ground truthing" fishermen reviewed the information and provided information on likely ranges of costs by category. This information was then used to either confirm survey results or to identify unusual responses that may require adjustment. Data outliers were deleted if no supporting information was provided, modified if a mean value could be applied from survey responses of fishermen of similar characteristics, or left alone if other information provided on the questionnaire appeared to support the outlier value.

Mean survey response values by vessel size category were used to estimate unit and item non-responses for some fixed costs categories, including slip fees, interest costs, and certain vessel-related costs (hull, engine, electronic gear, and other gear). CDFG 2006 fees (boat registration, permit fees, commercial license fees) were calculated for each fisherman active in 2006 based on fishing activity recorded on fish landing receipts. CDFG fish landing receipts were also used to estimate landing taxes for all fishermen by applying 2006 tax rates for type of and amount of fish landed. Commodity board assessments for all salmon and urchin fishermen were applied using CDFG landing receipts as well.

The disaggregated survey data were then merged with license and landings receipt datasets provided by CDFG. These additional data provided observations on all active fishermen, and could thus be used to infer both unit and item non-responses. Regression models were used to estimate some fixed and variable costs for unit and item non-respondents based on the merged dataset. Regression estimates for fixed and variable operating costs include insurance, membership fees, state and federal taxes, fuel and lube, harbor fees, transportation costs, ice, bait, food, and crew wages. By combining the survey respondent cost data with the cost estimates addressing unit and item non-responses, and with CDFG's ex-vessel revenue dataset, a complete dataset was created that represents estimated costs and revenues for all 1,946 California commercial fishermen active in 2006.

As noted above, costs were estimated for each fisherman based on observable characteristics from the merged database. These characteristics include 2006 home port and landing port locations, 2006 OC participation, individual 2006 landings by OC, and vessel size and gear type circa 2006. After each category of cost was estimated (or tabulated from the survey) for each fisherman, these cost totals by category for each fisherman were then aggregated by OC. In the great majority (67%) of cases, fishermen only participate in one OC, in which case their costs are simply aggregated into that OC. In the minority of cases where fishermen participate in more than one OC, the aggregation process worked as follows. If, for example, a fisherman made 40 % of his total 2006 fishing trips in OC 1, and 60 % of his fishing trips in OC 2, then the estimated totals for each cost category for this fisherman were allocated 40 % to OC 1 and 60 % to OC 2. Moreover, costs were further aggregated by county in order to facilitate spatial economic impact modeling and assessment. In particular, fixed costs were attributed to a fisherman's home port county, and variable costs were assigned to a fisherman's landing port county.

The method of cost estimation and aggregation by OC implies a small amount of cost blending across OC, due to the minority of cases (33%) of fishermen who participate in more than one OC. Blending raises some issues for some potentially large cost categories, such as bait and ice, which are not incurred in all OCs. Bait and ice costs are tabulated from (survey respondents) or estimated for (non-respondents) a fisherman due to their activity in an OC in which these fishing inputs are used. But for the minority of cases in which that fisherman also participates in an OC where bait and ice are not used, nevertheless a share of his bait and ice costs are allocated to that OC where they are not used. The OC that do not require bait include CPS, Gillnet, Harpoon/Spear, Herring, Sea Urchin, Tuna/Other Seiner, and Trawlers. Likewise ice is not used in the Dungeness Crab, Lobster & Crab, and Sea Urchin OCs.

To remedy the bait and ice cost issue, two assessments were made. First, if the total estimated bait or ice costs for an OC that does not use these inputs appeared relatively high, those costs were zeroed out. While this policy results in a small underestimate of total bait and ice costs across all the OCs, it is likely to provide a more accurate portrayal of these costs in the OCs that do not use these inputs. In the remainder of cases, bait or ice costs were deemed to be relatively small, and these costs were retained. Thus when bait or ice costs are seen in the tables that follow in this report for some OC that clearly do not utilize these inputs, these costs will tend to be relatively small, and can be attributed to modest levels of activity in OCs that utilize these inputs. Other cost categories that are not common to all OCs (such as association membership fees) are also blended to a minor degree, but these costs are generally much smaller and were not modified. The bait and ice costs that were removed from OCs that do not use these inputs were added back to the statewide totals in Table 5 below.

II.2 Operational Configurations

Commercial fishermen are categorized into distinct **operational configurations (OCs)** that were constructed in collaboration with Terry Tillman of CDFG. Commercial fishermen are grouped into 20 OCs depending on species landed, size of vessel, and gear type used to land the targeted species. The result of this process is illustrated in Table 1 and in the following summaries.

Table 1: California's Operational Configurations

Operational Configuration	Vessel Size	Gear Types
Coastal Pelagic Species (CPS) Seine (includes Squid)	Any	Seine, Brail/Dip Net, Lampara Net
Dungeness Crab– Medium and Large Vessels	26' and Larger	Crab Trap
Dungeness Crab - Small Vessels	< 26'	Crab Trap
Harpoon/Spear	Any	Harpoon, Spear
Herring Gillnet	Any	Gillnet - set or drift
Hook & Line	Any	Hook and Line
Hook & Line Live	Any	Hook and Line
Lobster & Crab	Any	Crab or Lobster Trap
Longline	Any	Longline
Nearshore & Groundfish Trap	Any	Fish Trap, Crab Trap
Other Gillnet	Any	Gillnet Set and Drift
Prawn Trap	Any	Prawn Trap, Fish Trap
Salmon	Any	Salmon Troll, Hook and Line
Salmon & Albacore	Any	Salmon and Albacore Troll, Hook and Line, Jig
Salmon & Dungeness Crab – Medium and Large Vessels	26' and Larger	Salmon Troll, Hook and Line, Crab Trap
Salmon & Dungeness Crab – Small Vessels	< 26'	Salmon Troll, Hook and Line, Crab Trap
Sea Urchin	Any	Dive/Hook
Trawl - Northern California (north of Santa Barbara)	Any	Trawl
Trawl - Southern California (south of Santa Barbara)	Any	Trawl
Tuna/Other Seine	Any	Purse and Danish/Scottish Seine

Coastal Pelagic Species (CPS) Seine

A majority of “CPS Seine” fishermen are associated with very large vessels (> 40’) and are active primarily in southern California. Additionally, the fishery operates in central California, but in a lesser extent. The gear associated with the CPS fishery includes: purse seine, Danish/Scottish seine, lampara nets, and brail and dip nets. The target species include anchovies, sardines, smelt, mackerel, and market squid. These species are fished nearshore or in the open ocean; as far as 600 miles from shore (Hill and Klingbeil 2001). Trips range between one to five days. Volume of landings for the majority of the bigger vessels are generally very large (80,000 lbs. or greater). The CPS fishery is a limited entry fishery.

Dungeness Crab

Of the vessels operating in the Dungeness crab fishery, medium and large vessels dominate (>26'). These larger vessels are better able to accommodate the space needed for transporting the 3.5-foot diameter crab trap gear (Hankin 2001). However, there is a small contingent fishing with vessels less than 26'. The fishery is active in central and northern California. The Dungeness crab season begins in the late fall and continues into the early summer of the following year. Trips for medium and large vessels range from one to four days, while small vessels tend to stay out for only one day. The Dungeness crab fishery is a vessel based restricted access fishery.

Harpoon/Spear

Most "Harpoon/Spear" fishermen fish from large vessels (> 36'). The harpoon/spear is handheld and is propelled towards its target specie, swordfish, from the fishing vessel (Holts 2001). As swordfish reside in warmer waters, the fishery operates in southern California. "Harpoon/Spear" fishermen fish from May to December. Trips range upwards to seven days. This very selective fishery is being displaced by the drift net fishery. In 2006, less than 30 fishermen made landings using harpoon/spear gear.

Herring Gillnet

Medium and large vessels ($\geq 26'$) predominate in the "Herring Gillnet" OC. These larger vessels are required to accommodate the gillnet gear and the high volume of catch (generally between 1,000 to 6,000 lbs.). The fishery operates in California's four largest herring spawning areas: San Francisco Bay, Tomales Bay, Humboldt Bay, and Crescent City Harbor. Duration of a single trip can last between one and five days. Pacific herring is the targeted species; however, the fish sac-roë (ovary) is the product sought after and is mainly supplied to the Japanese market (Watters, Oda, and Mello 2001). The herring gillnet is a highly competitive fishery due to the small fishing area and short season (January and February). The sac-roë fishery is a limited entry fishery and is managed by a catch quota system.

Hook & Line

Over 500 fishermen made landings using hook and line gear. These fishermen primarily fish from small to medium sized vessels ($\leq 36'$). "Hook & Line" gear consists of: rod and reel, and vertical and horizontal set lines. "Hook & Line" fishermen target lingcod, rockfish, flounder, sole, tuna, shark, sablefish, California halibut, seabass, croaker, and surfperch. A majority of trips lasts from one and two days but can span up to four. This fishery primarily operates in central and northern California.

Hook & Line Live

In the late 1980s the live fishery for the restaurant market began taking shape in southern California and extended to northern California in the 1990s, and is now a common fishery in central California (McKee-Lewis 1996). The live/ premium fish fishery targets smaller "plate size" fish which concern fisheries managers, as these fish are likely juveniles and have not reach reproductive age (Cailliet 2000). As with the "Hook & Line" OC, these fishermen predominately fish from small and medium sized vessels ($\leq 36'$). However, the "Hook & Line Live" fishermen primarily use rod and reel gear. In 2000, 70 % of live fish landings were made by hook and line gear (Schultze 2001). The primary variety of fish landed live include: sheephead, lingcod, California halibut, and rockfish. Nearshore fishery species are regulated through a restricted access program. The groundfish fishery is generally managed as an open access fishery although restrictions apply to specific species.

Lobster & Crab

All size classes of vessels operate in the “Lobster & Crab” OC. The fishery relies on crab and lobster traps. Fishermen operating medium and larger vessels can have between 100 to 300 set traps at one time. The fishery mainly fishes in the shallow rocky areas of southern California (Barsky 2001). It is considered a highly lucrative fishery where ex-vessel prices for lobster hovered around \$10/lbs. in 2006. “Lobster & Crab” fishermen target the California spiny lobster, rock crab, and spider crab. Trips range between one and three days. The season runs from fall to spring of the following year. It is a restricted access fishery.

Longline

“Longline” fishermen fish from a variety of vessel lengths and are active along the entire coast of California. Longline gear consists of baited hooks attached to a long main line (miles long) that can either be buoyed or laid on the ocean floor (Leet et al 2001). Due to the structure of longline gear, multiple species of fish are caught such as: tuna, mackerel, shark, sablefish, sole, rockfish, croaker, and swordfish. As “Longline” fishermen can target an assortment of species, they operate throughout the year. The pelagic longline fishery (tuna, mackerel, and shark) is a restricted access fishery and the groundfish longline fishery is a limited entry fishery.

Nearshore & Groundfish Trap

“Nearshore and Groundfish Trap” fishermen mainly fish from medium and large vessels ($\geq 26'$). The gear associated with the fishery includes fish and crab traps. These fishermen also a participant in the live fish fishery, as a majority of their catch is landed live (Schulteze 2001). The trap fishery targets nearshore and groundfish species which includes: sheephead, sablefish, scorpionfish, and Cabazon. Fishermen in this OC are mainly active in central and southern California. Two to three day trips are common. The groundfish and the nearshore trap fisheries are both limited entry fisheries.

Prawn Trap

Medium and large vessels ($\geq 26'$) are the common vessel sizes used in the “Prawn Trap” OC. The prawn fishery operates throughout the year and is located in southern and central California. The primary harvested species is the spot prawn and coonstriped shrimp, however, crayfish fishermen are also included in this OC as they use prawn traps as well. Prawn traps targeting spot prawns are deployed as deep as 600 to 1,000 feet along submarine canyons or shelf breaks. The trap gear allows for a majority of spot prawn catches to be landed live, which is principally sold to the local Asian and overseas markets (Larson, 2001). Fishermen fish for two to three days. The spot prawn trap fishery is a restricted access fishery.

Other Gillnet

The “Other Gillnet” OC incorporates both set and drift net gear types. Medium and large vessels ($\geq 26'$) are the predominate vessel sizes using gillnet gear. The fishery mainly operates in southern California, but a small fishery exists in central California. Drift gillnet gear generally targets tuna, swordfish, shark, seabass, and opah. Set gillnets largely catches barracuda, shark, California halibut, and seabass. Trip duration ranges between one and six days. The general gillnet fishery is a restricted access fishery.

Salmon

The “Salmon” OC employs a variety of vessel sizes, however medium and small vessels are the most numerous ($\leq 36'$). Gear types include: salmon troll and hook and line. The salmon season generally spans from early summer to fall. The fishery is concentrated in central and northern California. Fishermen can spend up to four days at sea on a single trip. The salmon fishery is a restricted access fishery. It should be noted that NOAA Fisheries Service closed the commercial 2006 salmon season north of Pt. Arena in California, and much of the rest of California saw an abbreviated season (NOAA Fisheries Service 2006). The closure and restricted season likely affects the cost and revenue data for the salmon OCs presented in this report.

Salmon & Albacore

Fishermen who fall under this OC usually fish with large vessels. “Salmon & Albacore” fishermen use hook and line, and salmon and/or albacore troll gear types. The season runs from early summer to early fall. Fishing activity occurs in northern California and off the coast of Oregon; however fishermen primarily make their landings in central and northern California. Fishing trips range between one and 20 days. It should be noted that within the “Salmon & Albacore” OC, a large number of the fishermen only landed albacore in 2006, though many used salmon troll gear. In collaboration with Terry Tillman it was determined that the albacore-only fishermen should fall under the “Salmon & Albacore” OC since albacore and salmon gear types are similar, and many salmon fishermen target albacore as well.

Salmon & Dungeness

Since the salmon and Dungeness crab seasons follow and overlap each other, a number of fishermen fish both fisheries throughout the year. Most “Salmon & Dungeness” fishermen operate medium and large ($\geq 26'$) vessels, though a minority group fish from small vessels ($< 26'$). “Salmon & Dungeness” gear types include: hook and line, salmon troll, and crab trap. Fishermen fish central and northern California waters. Fishermen who fall under this OC are able to fish from winter to the following fall. Small vessel fishermen generally fish for a single day, and medium and large vessel fishermen can stay out up to four days. The salmon and Dungeness crab fishery are both restricted access fisheries.

Sea Urchin

Sea urchin fishermen tend to fish from medium sized vessels (26' to 36'), but all size classes participate in the fishery. Many fishermen who are deemed “unclassified” as a vessel size class category (section III) are most likely walk-on-divers and have their own individual landings recorded. The fishery is split into two localities – southern and northern California (Mendocino being the most northern county). Sea urchin fishermen gear consists of an air compressor, dive suit, and hand rakes. Target species include red sea urchin and sea cucumber (warty sea cucumber in the south and giant red sea cucumber in the north). Fishing trips range from one to three days. The sea urchin fishery is a restricted access fishery.

Trawl – Northern California

Northern California trawler fishermen are fishermen who landed a majority of their catch north of Santa Barbara County. Northern California trawlers are chiefly large vessels (>36'). The gear implemented in this OC spans the trawling gear selection – general, mid water, bottom, less than and greater than 8' footrope, and selective flat fish trawl. The species landed consists of: ocean shrimp, shark, skate, sablefish, lingcod, sole, California halibut, flounder, rockfish and whiting. Northern California trawlers are active in central and northern California and fish throughout the year. Trips range from one to three days.

Trawl – Southern California

Southern California trawler fishermen land a majority of their catch south of Santa Barbara County. Southern California trawlers fish with medium and large sized vessels ($\geq 26'$). Gear for this OC mainly includes single rigged and bottom trawls. Fishermen target shark, skate, sole, California halibut, giant red sea cucumber, and ridgeback prawn. Fishermen can operate throughout the year.

Tuna/Other Seine

Very large vessels (> 45') make up the "Other Seine" OC fleet. Fishermen participating in this OC use purse and Danish/Scottish seine gear types. Purse seine fishermen fish in southern California and target Pacific bonito, yellowfin tuna, and skipjack tuna. Danish/Scottish seiners land lingcod, croaker, sole, rockfish, and sanddab primarily in central California. Both seiners make multiple day trips. Tuna purse seiners can land up to 200,000 lbs from a single trip. Purse seiners operate from summer to fall. Danish/Scottish seiners fish from spring to fall.

II.3 Costs

All cost data are in nominal 2006 dollars. Cost data are divided into fixed and variable (operating) cost categories, as shown in Tables 2 and 3. Nearly half of the fixed costs concern elective purchases and maintenance of the vessel's hull, engine, electronic gear, and fishing gear. These particular costs are broken down in such a way as to conform to IMPLAN modeling requirements.

Table 2: California Fixed Cost Categories

Fixed Cost Categories	Description
Engine Repair	Annual Expenditures on engine repairs
Engine Purchase	Annual Expenditures on engine purchases
Electrical Gear Repair	Annual Expenditures on electronic repairs
Electrical Gear Purchase	Annual Expenditures on electronic purchases
Hull Repair	Annual Expenditures on hull repairs
Hull Purchase	Annual Expenditures on hull purchases
Other Gear Repair	Annual Expenditures on gear repairs
Other Gear Purchase	Annual Expenditures on gear purchases
Vessel Insurance	Annual Insurance costs
Storage	Annual Storage costs
Interest	Annual Interest paid
Federal Taxes	Federal Taxes paid in 2006
State Taxes	State Taxes paid in 2006
Boat Registration Fees	Annual Boat Registration Fees
Permit Fees	Annual Permit Fees
Commercial License	Annual Commercial Fishing License Fee
Slip	Annual Home Slip costs
Other Slip	Annual Slip Costs other than home slip costs

Table 3: California Variable Cost Categories

Variable Cost Categories	Description
Bait	Annual Bait Costs
Wage	Annual expenditures on Crew Wages
Food	Annual Food Costs
Fuel	Annual Fuel Costs
Harbor	Annual Harbor Fees
Ice	Annual Ice Costs
Transportation	Annual Transportation Costs related to fishing
Membership	Annual Fishing Membership Fees
Landing Taxes	Annual Landing Taxes paid

All costs in this report represent explicit expenditures. Not included in the 27 fixed and variable costs categories listed in Tables 2 and 3 are capital depreciation (e.g. vessel and gear depreciation) and fishermen’s opportunity costs. To arrive at net economic benefits both explicit and implicit costs need to be addressed. The survey instrument did ask fishermen to estimate capital depreciation. In consultation with IMPLAN experts it was concluded that although depreciation generates economic activity, this economic activity is picked up within IMPLAN as an inter-industry purchase/sale when the depreciated amount is spent on replacement equipment or gear. Therefore depreciation was not used in this analysis. The survey did not ask for, nor does this study include, the opportunity cost of fishermen’s time. While this implicit cost has a role in deriving economic profit, it is not an explicit expenditure that can be used in IMPLAN-based impact assessment.

Fishermen’s costs are also categorized into 4 different vessel size classes. The breakdown follows: vessels under 26’; vessels between 26’ and 36’; vessels over 36’; and “unclassified”. The “unclassified” category refers to costs associated with fishermen who did not make landings in vessels that they either owned or that were “business owned” (based on CDFG vessel registration records). These unclassified cases represent fishermen who shared, borrowed, or leased the use of vessels owned by others. An additional instance concerning unclassified fishermen is when multiple fishermen make landings from a single vessel, and the receiver fills out a landing receipt for each fisherman’s landings, often called a “split ticket”. These split tickets comprise 10 to 20 % of recorded landings (Leos 2008). Oftentimes at least one of these split-ticket fishermen is not a registered owner of the vessel from which they made the landings, and so cannot be placed into a specific vessel size class.

II.4 Revenue

California (ex-vessel) revenue data were obtained through CDFG landings receipt records, which are usually completed when fish are off-loaded from vessels by receiver/processors. While the survey requested revenue data, ultimately it was decided that the CDFG landings receipt dataset would be a better and more complete source of revenue information.

There are several data reporting issues that can distort landings and revenue data at the individual fisherman level. In some cases, fishermen borrow or lease each other's vessels, and the license number of the registered vessel owner may be recorded on the landing receipt rather than the landing fisherman's license number. Moreover, as landing receipts are designed to only record one license number per landing, if several licensed commercial fishermen contribute to a single landing, the participation of all but one of these "phantom" fishermen is lost to the empirical record (Leos 2008). While these reporting practices may result in an incorrect count of active commercial fishermen and a distorted measure of average revenue, total revenue measures should be less affected.

III. SUMMARY COST AND REVENUE DATA

This section of the report presents costs estimates and revenue data in two informative ways. Firstly, costs are structured to reveal how fishermen's expenditures within each OC are distributed across different regions of California. Secondly, costs, revenues, net revenues and descriptive statistics are arranged in a table format for each OC.

For the purpose of this report, California is divided into four distinct coastal regions – northern, north - central, central, and southern. Table 4 lists the California counties that represent each region. Table 5 presents commercial fishermen's estimated fixed and variable costs by OC which are further aggregated into the four California regions. The OCs in Table 5 are listed in descending order based on total cost.

A component of Table 5 lists costs that could not be attributed to a coastal region. There are a number of reasons why costs could not be attributed to a specific location. Note that fixed and variable costs are assigned to home and landing ports, respectively. CDFG records included a number of instances in which no port was recorded for fishermen. Moreover, in other cases ports outside of California were recorded. These costs could not be assigned to a specific location in California. Fixed costs are largely affected by the unknown or outside California home port locations. Conversely, CDFG landing records that list landing ports were much more complete, thus variable costs were minimally affected.

Aggregate ex-vessel revenues for each OC are presented in Table 6. Ex-vessel revenue is further apportioned by coastal region and county (refer to Table 4). These revenues are derived from CDFG landing receipt records and are assigned to the counties where fishermen landed and received payment for their catch. Ex-vessel revenue for fishermen who's landing county was unknown, were not included in the analysis.

Tables 7 through 26 provide a detailed analysis of costs, revenue, net revenue, and descriptive statistics for each of the 20 OCs. Each table gives the number of fishermen that participated in each OC, and the number of those fishermen who participated in each size class. For several of the OCs, fishermen are

aggregated into broader vessel size class categories. These broader size class categories allowed for combining fishermen together if costs between the size classes did not appear to be significantly different. Values are presented as estimated total and average costs (average costs are calculated on a “per-fisherman” basis; not per vessel) by fixed and variable costs categories in 2006 dollars. Costs by category were summed to arrive at grand totals for total and average cost. Revenue is partitioned into the relevant vessel size classes and expressed as total and average values. Total and average net revenues are provided for each OC as well.

The descriptive statistics portion of the 20 OC tables is derived from the survey data. Average values are given for the number of years fishermen participated in the OC, age of vessel, and the number of days fished to complete a single trip. An analysis of market channels (i.e. where, or to whom, fishermen sell their catch) shows the average percentage of surveyed fishermen by OC who reported sales activity in one of the downstream market channels (direct to consumer, direct to restaurant, to a processor, or outside of California). The percentage of fishermen in an OC who sold into the various downstream market channels can sum to greater than 100 %. This is because fishermen can participate in more than one market channel. Moreover, the percentage of fishermen in an OC who sold into the various downstream market channels can also sum to less than 100 %, as some fishermen did not provide information on sales activity for any market channel. For those fishermen who reported some level of sales into a given market channel, the average percentage of their total landings that was sold in that market channel is also provided. The descriptive statistics also include an average rating of the 2006 fishing year for each OC. The rating is calculated based on each fisherman’s responses to a Likert scale of one to five, where “1” represents “worst” and “5” represents “best.” Recurrent themes in open-ended comments and concerns written by fishermen on the returned surveys are summarized as well. The final descriptive statistic shows the three most important landing counties in California, determined by the number of trips made and by the value of catch.

Table 4. California Regions by County

CA Coastal Regions	Counties
Northern	Del Norte, Humboldt, Mendocino
North- Central	Alameda, Contra Costa, Napa, Marin, Sacramento, San Francisco, San Joaquin San Mateo, Santa Clara, Solano, Sonoma, Yolo
Central	Monterey, San Luis Obispo, Santa Barbara, Santa Cruz
Southern	Los Angeles, Orange, San Diego, Ventura

Table 5. Total Annual Costs by CA Coastal Region and Operational Configuration (in 2006 \$)***Northern California**

OC	Fixed Costs	Variable Costs	Total Costs
Dungeness Crab - Medium and Large Vessels	5,798,289	5,590,307	11,388,596
Trawl - Northern	701,997	2,087,711	2,789,708
Salmon & Dungeness Crab - Medium and Large Vessels	1,236,866	855,733	2,092,599
Salmon	648,720	356,049	1,004,770
Nearshore & Groundfish Trap	466,918	371,906	838,824
Dungeness Crab - Small Vessels	164,043	512,210	676,253
Longline	345,868	181,424	527,293
Sea Urchin	300,923	202,887	503,811
Hook & Line Live	295,453	198,612	494,064
Hook & Line	208,089	169,596	377,685
Salmon & Albacore	145,021	94,886	239,907
Prawn Trap	79,819	36,372	116,191
All Other	47,938	67,028	114,966
Total	10,439,945	10,724,723	21,164,668

North - Central California

OC	Fixed Costs	Variable Costs	Total Costs
Salmon & Dungeness Crab - Medium and Large Vessels	2,127,023	1,408,561	3,535,584
Dungeness Crab - Medium and Large Vessels	1,992,074	1,304,048	3,296,122
Salmon	1,836,119	1,216,466	3,052,585
Hook & Line	780,750	717,425	1,498,175
Trawl - Northern	717,896	499,665	1,217,561
Herring Gillnet	424,164	381,831	805,996
Dungeness Crab - Small Vessels	143,631	114,394	258,025
Salmon & Dungeness Crab - Small Vessels	118,175	113,399	231,574
Longline	116,918	68,222	185,139
Hook and Line Live	100,447	45,420	145,868
Salmon & Albacore	108,630	35,137	143,767
CPS	64,126	67,243	131,369
Nearshore & Groundfish Trap	105,379	10,383	115,762
Sea Urchin	102,793	5,727	108,521
All Other	135,670	63,714	199,384
Total	8,873,796	6,051,635	14,925,431

Table 5 continued. Total Annual Costs by CA Coastal Region and Operational Configuration (in 2006 \$)*

Central California				
	OC	Fixed Costs	Variable Costs	Total Costs
Sea Urchin		1,503,651	861,965	2,365,616
Salmon		1,595,941	554,847	2,150,788
Lobster & Crab		1,078,661	731,252	1,809,912
Hook & Line		876,838	701,212	1,578,050
Hook and Line Live		546,141	565,268	1,111,409
Salmon & Dungeness Crab - Medium and Large Vessels		719,894	340,593	1,060,486
Trawl - Southern		205,358	708,042	913,400
CPS		746,406	120,079	866,484
Trawl - Northern		530,546	288,874	819,420
Other Gillnet		365,083	330,219	695,303
Nearshore & Groundfish Trap		347,356	310,658	658,014
Dungeness Crab - Medium and Large Vessels		502,611	121,467	624,078
Prawn Trap		320,570	278,410	598,980
Longline		328,390	220,118	548,508
Salmon & Albacore		365,388	156,829	522,217
All Other		107,879	12,891	120,770
	Total	10,140,712	6,302,723	16,443,435
Southern California				
	OC	Fixed Costs	Variable Costs	Total Costs
CPS		2,844,939	4,390,690	7,235,630
Lobster & Crab		2,513,354	2,702,400	5,215,754
Other Gillnet		1,331,682	2,023,858	3,355,540
Sea Urchin		1,165,256	1,081,178	2,246,434
Longline		579,380	1,616,718	2,196,098
Hook & Line		705,560	940,108	1,645,667
Hook and Line Live		457,936	641,673	1,099,609
Prawn Trap		390,632	483,124	873,755
Nearshore & Groundfish Trap		387,541	403,011	790,552
Harpoon/Spear		494,725	237,421	732,146
Salmon & Albacore		173,246	70,499	243,745
Tuna/Other Seine		92,597	142,792	235,389
Trawl - Southern		135,678	98,770	234,448
Salmon		118,573	223	118,796
All Other		194,668	32,535	227,202
	Total	11,585,767	14,864,999	26,450,766

Table 5 continued. Total Annual Costs by CA Coastal Region and Operational Configuration (in 2006 \$)*

Costs Not Attributed to a Specific California Region**

OC	Fixed Costs***	Variable Costs****	Total Costs
CPS	2,753,259	5,169	2,758,428
Dungeness Crab - Medium and Large Vessels	1,851,123	α	1,851,123
Salmon	1,262,961	α	1,262,961
Trawl - Northern	1,053,068	α	1,053,068
Hook & Line	1,004,350	α	1,004,350
Sea Urchin	995,118	α	995,118
Lobster & Crab	858,421	α	858,421
Herring Gillnet	683,114	α	683,114
Hook and Line Live	528,305	α	528,305
Longline	508,069	α	508,069
Other Gillnet	447,185	α	447,185
Nearshore & Groundfish Trap	312,490	α	312,490
Salmon & Dungeness Crab - Medium and Large Vessels	309,335	α	309,335
Prawn Trap	306,189	α	306,189
Trawl - Southern	115,704	α	115,704
All Other	166,369	2,242,282	2,408,651
Total	13,155,062	2,247,451	15,402,513

α = variable costs attributed to known California regions

Table 5 continued. Total Annual Costs by CA Coastal Region and Operational Configuration (in 2006 \$)*

Total California	OC	Fixed Costs	Variable Costs	Total Costs
Dungeness Crab - Medium and Large Vessels		10,228,013	7,017,185	17,245,198
CPS		6,408,730	4,589,152	10,997,882
Lobster & Crab		4,472,560	3,466,393	7,938,953
Salmon		5,462,315	2,127,585	7,589,901
Salmon & Dungeness Crab - Medium and Lg. Vessels		4,428,336	2,604,887	7,033,223
Sea Urchin		4,067,742	2,151,758	6,219,500
Hook & Line		3,575,586	2,528,340	6,103,927
Trawl - Northern		3,003,507	2,901,733	5,905,240
Other Gillnet		2,186,744	2,360,749	4,547,493
Longline		1,878,625	2,086,482	3,965,107
Hook and Line Live		1,928,282	1,450,973	3,379,255
Nearshore & Groundfish Trap		1,619,684	1,095,958	2,715,642
Prawn Trap		1,097,210	813,229	1,910,439
Herring Gillnet		1,210,582	381,831	1,592,413
Trawl - Southern		456,740	808,494	1,265,235
Salmon & Albacore		846,113	357,352	1,203,465
Dungeness Crab - Small Vessels		322,150	631,257	953,406
Harpoon/Spear		582,121	246,109	828,230
Tuna/Other Seine		198,152	150,755	348,906
Salmon & Dungeness - Small Vessels		172,883	149,914	322,797
All Other		49,207	2,271,394	2,320,601
	Total	54,195,282	40,191,531	94,386,813

*Source: Estimates derived from merged survey, landings receipt, and license data

**Costs of fishermen whose home port or landing ports are unknown, inland, or outside California

***Fishermen with home ports outside of California contribute \$2.66 million to fixed costs

****The \$2.24 million "all other" variable cost is the value of bait and ice costs removed from OCs that do not use those inputs

Table 6: Ex-Vessel Revenue by Operational Configuration, California Coastal Region, and County (in 2006 \$)*

Region and County	CPS	Dungness & Large Crab - Medium	Dungness Crab - Small	Harpoon/Spear	Herring Gillnet	Hook & Line	Hook & Line Live	Lobster & Crab	Longline	Nearshore & Groundfish Trap
North Coast Region	22,613	29,462,089	310,829	0	0	138,624	445,085	12,630	893,195	777,125
Del Norte	0	19,728,497	63,448	0	0	36,142	271,793	2,964	234,242	248,654
Humboldt	22,613	9,013,091	240,715	0	0	48,671	5,599	9,666	505,850	14,585
Mendocino	0	720,501	6,666	0	0	53,811	167,693	0	153,103	513,886
North - Central Coast Region	67,874	5,457,020	174,271	0	427,225	445,240	83,240	127,236	238,024	10,705
Alameda	0	16,305	47,035	0	10,977	65,363	741	0	1,127	0
Contra Costa	660	861	0	0	0	0	0	0	307	0
Marin	0	676,490	74,203	0	0	17,823	27,784	662	15,401	1,122
Sacramento	1,525	0	0	0	0	0	0	116,858	0	0
San Francisco	50,005	0	0	0	0	0	0	0	0	0
San Joaquin	0	0	0	0	0	0	0	1,475	0	0
San Mateo	0	53,914	0	0	0	36,011	2,089	61	0	0
Santa Clara	0	0	0	0	0	11,124	0	0	893	0
Solano	2,374	0	0	0	0	0	0	0	0	0
Sonoma	0	3,297,580	32,775	0	416,248	200,592	37,175	1,425	191,586	6,786
Yolo	13,310	1,411,870	20,258	0	0	114,327	15,451	6,755	28,710	2,797
Central Coast Region	2,523,945	343,192	0	3,472	0	344,458	1,029,001	2,728,277	818,607	468,941
Monterey	2,489,231	81,184	0	0	0	124,360	66,820	0	648,115	48,867
San Luis Obispo	0	244,864	0	0	0	107,894	726,249	88,102	118,958	345,119
Santa Barbara	0	0	0	3,472	0	59,990	233,958	2,639,617	43,888	68,726
Santa Cruz	34,714	17,144	0	0	0	52,214	1,974	558	7,646	6,229
South Coast Region	31,781,214	443	0	665,373	0	246,164	186,379	6,910,111	1,869,519	586,688
Los Angeles	24,645,354	0	0	324,415	0	91,152	93,288	1,229,913	390,642	87,219
Orange	37,266	0	0	162,856	0	4,250	3,838	1,445,852	208,075	49,241
San Diego	26,013	0	0	159,331	0	53,629	3,116	2,994,855	610,001	283,971
Ventura	7,072,581	443	0	18,771	0	97,133	86,137	1,239,491	660,801	166,257
California OC Total	34,395,646	35,262,744	485,100	668,845	427,225	1,174,486	1,743,705	9,778,254	3,819,345	1,843,459

Table 6 continued: Ex-Vessel Revenue by Operational Configuration, California Coastal Region, and County (in 2006 \$)*

Region and County	Other Gillnet	Prawn Trap	Salmon	Salmon & Albacore	Salmon - Medium & Large	Salmon - Dungeness Crab	Sea Urchin	California - Northern	California - Southern	Tuna/Other Seine	Region & County Total
North Coast Region	4,419	137,880	613,583	238,172	3,918,576	88,017	412,199	6,448,470	704	0	43,924,210
Del Norte	4,419	137,880	0	105,674	1,029,188	0	0	875,268	0	0	22,738,169
Humboldt	0	0	4,110	104,708	1,438,215	0	0	4,008,740	0	0	15,416,563
Mendocino	0	0	609,473	27,790	1,451,173	88,017	412,199	1,564,462	704	0	5,769,478
North - Central Coast Region	11,470	38,043	1,825,476	104,191	6,494,637	232,967	9,402	2,126,517	93,569	141,391	18,108,498
Alameda	0	0	26,575	0	84,382	121,040	0	19,527	0	0	135,265
Contra Costa	0	37,237	0	0	3,089	0	0	90,489	0	0	13,030
Marin	152	0	1,329,321	47,570	3,111,082	64,341	7,226	96,737	0	0	393,072
Sacramento	0	300	0	0	0	0	0	0	0	0	118,683
San Francisco	0	506	0	0	0	0	0	0	0	0	6,970,775
San Joaquin	0	0	0	0	0	0	0	0	0	0	50,511
San Mateo	0	0	15,120	657	14,974	9,476	0	2,963	0	0	4,782,077
Santa Clara	0	0	1,013	0	0	0	0	0	0	0	41,053
Solano	0	0	0	0	0	0	0	38,679	0	0	132,643
Sonoma	11,318	0	244,344	5,818	1,281,880	9,215	2,176	1,181,067	50,790	0	5,469,914
Yolo	0	0	209,103	50,146	1,999,230	28,895	0	697,055	42,779	141,391	1,475
Central Coast Region	701,331	1,248,468	362,105	133,546	771,570	955	2,657,736	1,234,425	432,348	0	15,802,377
Monterey	132,270	781,365	200,620	39,634	98,433	0	0	1,014,091	50,336	0	5,775,326
San Luis Obispo	338,127	335,005	63,284	23,496	379,408	436	327	158,576	2,936	0	2,932,781
Santa Barbara	230,635	132,098	1,868	81	2,591	0	2,657,409	34,075	375,249	0	6,483,657
Santa Cruz	299	0	96,333	70,335	291,138	519	0	27,683	3,827	0	610,613
South Coast Region	3,170,682	2,248,548	753	74,273	0	0	2,489,344	34,249	541,119	1,614,970	52,420,784
Los Angeles	853,665	539,266	753	48,508	0	0	769,264	10,790	51,817	1,455,200	30,591,246
Orange	14,600	367,518	0	664	0	0	11,463	0	0	0	2,305,623
San Diego	1,775,304	648,233	0	10,941	0	0	501,719	0	0	0	7,067,113
Ventura	527,113	693,531	0	14,160	0	0	1,206,898	23,459	489,302	159,770	12,456,802
California OC Total	3,887,902	3,672,939	2,801,917	550,182	11,184,783	321,939	5,568,681	9,843,661	1,067,740	1,756,361	130,255,869

*Source: CDFG Landings Receipt Data

Table 7. 2006 Economic Summary for the CA COASTAL PELAGIC SPECIES (Includes SQUID) Operational Configuration

Number of Participating Fishermen = 145

Number of Participating Fishermen in Size Class:

Unclassified = 31

ALL Vessel Sizes = 114

Fixed Cost Category	Vessel Size Class		Estimated Total Costs		Estimated Average Costs		St. Deviation of Costs	
	Unclassified	ALL Vessel Sizes	ALL Fishermen	Unclassified	ALL Vessel Sizes	Unclassified	ALL Vessel Sizes	
Engine Repair	53,710	275,130	328,840	1,733	2,413	3,564	1,356	
Engine Purchase	43,419	164,670	208,090	1,401	1,444	3,460	961	
Electrical Gear Repair	44,456	161,495	205,951	1,434	1,417	3,024	811	
Electrical Gear Purchase	11,355	70,191	81,547	366	616	766	328	
Hull Repair	110,348	780,189	890,538	3,560	6,844	7,769	5,254	
Hull Purchase	32,945	147,555	180,501	1,063	1,294	2,916	800	
Other Gear Repair	108,967	315,875	424,841	3,515	2,771	6,477	1,318	
Other Gear Purchase	57,177	532,331	589,507	1,844	4,670	3,307	2,549	
Vessel Insurance	163,651	166,831	330,482	5,279	1,463	12,424	4,507	
Storage	31,374	69,627	101,000	1,012	611	2,417	241	
Interest	92,472	488,175	580,647	2,983	4,282	9,030	3,520	
Federal Taxes	291,683	1,286,075	1,577,758	9,409	11,281	14,498	15,022	
State Taxes	78,520	269,556	348,076	2,533	2,365	3,462	3,224	
Boat Reg Fees	0	190,870	190,870	0	1,674	0	1,016	
Permit Fees	3,237	28,091	31,328	104	246	315	413	
Commercial License	2,727	9,741	12,468	88	85	25	32	
Slip	33,894	271,159	305,052	1,093	2,379	2,268	1,146	
Other Slip	16,633	131	16,764	537	1	2,086	11	

Table 7 continued. 2006 Economic Summary for the CA COASTAL PELAGIC SPECIES (Includes SQUID) Operational Configuration

Variable Cost Category	Vessel Size Class		Estimated Total Costs		Estimated Average Costs		St. Deviation of Costs	
	Unclassified	ALL Vessel Sizes	ALL Fishermen	Unclassified	ALL Vessel Sizes	Unclassified	ALL Vessel Sizes	
Bait	0	0	0	0	0	0	0	
Wage	1,869,225	1,083,121	2,952,346	60,298	9,501	196,370	79,715	
Food	60,538	100,234	160,771	1,953	879	4,285	2,435	
Fuel	180,514	367,180	547,694	5,823	3,221	14,132	12,481	
Harbor	27,192	96,105	123,297	877	843	1,935	3,360	
Ice	13,082	70,113	83,195	422	615	640	478	
Transportation	80,238	160,641	240,879	2,588	1,409	4,620	1,889	
Membership	17,631	45,178	62,809	569	396	1,093	413	
Landing Taxes	82,215	335,946	418,161	2,652	2,947	6,470	5,241	
		TOTAL		AVERAGE				
GRAND TOTAL COSTS	3,507,203	7,486,208	10,993,412	113,136	65,668	n/a	n/a	
EX-VESSEL REVENUE	5,541,466	28,854,180	34,395,646	178,757	246,617	n/a	n/a	
EX-VESSEL NET REVENUE	2,034,263	21,367,972	23,402,234	65,621	180,948	n/a	n/a	

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Coastal Pelagic Species (Including Squid) OC

Respondent's average years in the industry¹: 29

Average age of fishing vessel¹: 32

Average number of days per trip¹: 1.9

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	20	16
Restaurant	0	n/a
Processor	70	95
Outside CA	5	52

Likert scale rating of 2006 fishing year¹: Between “worse than normal” and “normal” (2.6)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of regulations/restrictions. Season length, fees, and resource/habitat problems are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Los Angeles	Los Angeles
Ventura	Ventura
Monterey	Monterey

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 8. 2006 Economic Summary for the CA DUNGENESE CRAB – MEDIUM AND LARGE VESSELS Operational Configuration

Number of Participating Fishermen = 294

Number of Participating Fishermen in Size Class:

Unclassified = 53

≥ 26' = 241

Fixed Cost Category	Vessel Size Class		Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	≥ 26'	Unclassified	≥ 26'		Unclassified	≥ 26'	Unclassified	≥ 26'
Engine Repair	92,232	493,087	585,319	1,647	2,055	4,036	1,022		
Engine Purchase	45,012	424,339	469,351	804	1,768	1,821	1,412		
Electrical Gear Repair	48,617	280,557	329,173	868	1,169	2,438	636		
Electrical Gear Purchase	25,140	199,188	224,328	449	830	851	982		
Hull Repair	208,835	1,084,748	1,293,584	3,729	4,520	8,992	3,808		
Hull Purchase	63,896	254,774	318,670	1,141	1,062	3,008	785		
Other Gear Repair	164,537	795,949	960,486	2,938	3,310	6,985	3,613		
Other Gear Purchase	142,482	963,799	1,106,282	2,544	4,016	4,464	2,034		
Vessel Insurance	180,827	440,351	621,178	3,229	1,835	6,130	3,167		
Storage	51,552	158,552	210,104	921	661	2,133	476		
Interest	59,389	739,131	798,520	1,061	3,080	1,623	2,205		
Federal Taxes	333,051	1,829,901	2,162,952	5,947	7,625	9,231	9,832		
State Taxes	91,293	361,805	453,098	1,630	1,508	2,861	2,057		
Boat Reg Fees	0	50,455	61,373	0	210	0	263		
Permit Fees	2,524	16,839	16,839	45	70	101	128		
Commercial License	4,886	20,598	25,485	87	86	25	26		
Slip	63,501	564,754	628,255	1,134	2,353	1,668	973		
Other Slip	3,910	3,313	7,223	70	14	235	117		

Table 8 continued. 2006 Economic Summary for the CA DUNGENESS CRAB – MEDIUM AND LARGE VESSELS Operational Configuration

Variable Cost Category	Vessel Size Class	Estimated Total Costs		Estimated Average Costs		St. Deviation of Costs		
		Unclassified	≥ 26'	ALL Fishermen	Unclassified	≥ 26'	Unclassified	≥ 26'
Bait		169,988	621,151	773,242	3,148	2,524	3,912	7,402
Wage		823,856	3,929,059	4,355,908	15,257	14,778	32,911	38,053
Food		49,469	182,453	229,815	916	755	1,672	945
Fuel		261,427	612,975	861,118	4,841	2,509	8,478	3,733
Harbor		23,685	83,922	107,446	439	350	1,831	2,710
Ice		27,911	139,817	164,997	517	574	616	775
Transportation		81,039	302,654	378,675	1,501	1,245	1,950	1,655
Membership		14,327	43,555	57,525	265	181	397	149
Landing Taxes		32,897	61,296	88,459	609	232	1,015	529
			TOTAL		AVERAGE			
GRAND TOTAL COSTS		3,074,675	14,659,021	17,733,696	55,887	60,867	n/a	n/a
TOTAL or AVE REVENUE		4,821,037	30,441,707	35,262,744	90,963	120,800	n/a	n/a
TOTAL or AVE NET REVENUE		1,746,362	15,782,686	17,529,048	35,076	59,934	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Dungeness Crab– Medium and Large Vessels OC

Respondents average years in the industry¹: 25
 Average age of fishing vessel¹: 40
 Average number of days per trip¹: 1.6

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	19	23
Restaurant	3	5
Processor	81	95
Outside CA	3	65

Likert scale rating of 2006 fishing year¹: Between “worse than normal” and “normal” (2.6)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of regulations and restrictions. The price of catch is also a top concern.

3 Most important landing countries²

By Number of Trips	By Value of Catch
Del Norte	Del Norte
Humboldt	Humboldt
San Mateo	San Francisco

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 9. 2006 Economic Summary for the CA DUNGENESS CRAB – SMALL VESSEL Operational Configuration

Number of Participating Fishermen = 24

Fixed Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Engine Repair	20,232	963	770
Engine Purchase	61,679	2,937	5,967
Electrical Gear Repair	5,621	268	305
Electrical Gear Purchase	7,621	363	273
Hull Repair	18,713	891	1,209
Hull Purchase	8,086	385	320
Other Gear Repair	23,007	1,096	930
Other Gear Purchase	31,245	1,488	2,950
Vessel Insurance	14,674	699	834
Storage	14,220	677	890
Interest	7,790	371	748
Federal Taxes	33,881	1,613	2,432
State Taxes	9,276	442	1,009
Boat Reg Fees	3,850	183	232
Permit Fees	1,956	93	157
Commercial License	1,282	61	39
Slip	22,351	1,064	1,041
Other Slip	0	0	0

Table 9 continued. 2006 Economic Summary for the CA DUNGENESS CRAB – SMALL VESSEL Operational Configuration

Variable Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Bait	16,458	716	838
Wage	86,402	3,757	6,230
Food	8,443	367	444
Fuel	22,225	966	1,265
Harbor	11,553	502	1,650
Ice	3,259	142	119
Transportation	24,758	1,076	1,586
Membership	3,539	154	166
Landing Taxes	2,392	104	308
GRAND TOTAL COSTS	TOTAL 464,515	AVERAGE 21,378	n/a
EX-VESSEL REVENUE	485,100	20,213	n/a
EX-VESSEL NET REVENUE	20,585	-1,166	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Dungeness Crab – Small Vessel OC

Respondent's average years in the industry¹: 21

Average age of fishing vessel¹: 23

Average number of days per trip¹: 1.0

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	0	n/a
Restaurant	20	10
Processor	80	98
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: Between “normal” and “better than normal” (3.3)

Comments and concerns¹: Regulations and restrictions, market problems, and more fish buyers were equally important concerns of surveyed fishermen.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Humboldt	Humboldt
Marin	Sonoma
Del Norte	Del Norte

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 10. 2006 Economic Summary for the CA HARPOON/SPEAR Operational Configuration

Number of Participating Fishermen = 27

Fixed Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Engine Repair	36,993	1,370	1,137
Engine Purchase	26,373	977	1,105
Electrical Gear Repair	28,417	1,052	824
Electrical Gear Purchase	18,739	694	516
Hull Repair	105,981	3,925	4,667
Hull Purchase	20,624	764	607
Other Gear Repair	59,390	2,200	1,488
Other Gear Purchase	81,833	3,031	2,332
Vessel Insurance	16,237	601	732
Storage	11,110	411	323
Interest	62,973	2,332	2,508
Federal Taxes	41,240	1,527	1,349
State Taxes	8,378	310	254
Boat Reg Fees	3,006	111	127
Permit Fees	5,774	214	167
Commercial License	2,206	82	35
Slip	52,615	1,949	1,534
Other Slip	233	9	32

Table 10 continued. 2006 Economic Summary for the CA HARPOON/SPEAR Operational Configuration

Variable Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Bait	21,076	781	922
Wage	64,539	2,390	2,048
Food	31,880	1,181	2,163
Fuel	82,612	3,060	3,989
Harbor	3,168	117	139
Ice	10,073	373	369
Transportation	28,177	1,044	818
Membership	3,209	119	94
Landing Taxes	1,374	51	74
GRAND TOTAL COSTS	TOTAL 828,230	AVERAGE 30,675	n/a
EX-VESSEL REVENUE	668,845	24,772	n/a
EX-VESSEL NET REVENUE	-159,385	-5,903	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Harpoon/Spear OC

Respondent's average years in the industry¹: 27

Average age of fishing vessel¹: 33

Average number of days per trip¹: 5.2

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	0	n/a
Restaurant	29	83
Processor	86	73
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: Between “worse than normal” and “normal” (2.7)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of regulations/restrictions. Gear topics are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Los Angeles	Los Angeles
San Diego	Orange
Orange	San Diego

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 11. 2006 Economic Summary for the CA HERRING GILLNET Operational Configuration

Number of Participating Fishermen = 91

Number of Participating Fishermen in Size Class:

Unclassified = 49 $\geq 26 = 43$

Expense Category	Vessel Size Class		Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	≥ 26	Unclassified	≥ 26		Unclassified	≥ 26	Unclassified	≥ 26
Engine Repair	8,097	74,581	82,678	165	1,734	570	817		
Engine Purchase	7,225	114,697	121,922	147	2,667	573	1,498		
Electrical Gear Repair	5,225	27,973	33,197	107	651	370	421		
Electrical Gear Purchase	3,082	30,450	33,532	63	708	179	410		
Hull Repair	8,815	97,064	105,879	180	2,257	532	1,120		
Hull Purchase	7,313	34,398	41,711	149	800	570	332		
Other Gear Repair	28,555	104,934	133,490	583	2,440	503	2,316		
Other Gear Purchase	16,691	124,908	141,599	341	2,905	854	1,335		
Vessel Insurance	8,902	50,800	59,702	182	1,181	569	954		
Storage	4,986	32,466	37,451	102	755	285	622		
Interest	20,205	98,499	118,704	412	2,291	1,239	1,233		
Federal Taxes	65,090	48,854	113,944	1,328	1,136	613	397		
State Taxes	12,375	8,864	21,240	253	206	149	71		
Boat Reg Fees	0	10,541	10,541	0	245	0	185		
Permit Fees	28,096	20,989	49,085	573	488	144	217		
Commercial License	4,720	3,679	8,399	96	86	18	32		
Slip	9,305	86,115	95,420	190	2,003	549	926		
Other Slip	1,426	425	1,851	29	10	144	60		

Table 11 continued. 2006 Economic Summary for the CA HERRING GILLNET Operational Configuration

Variable Cost Category	Vessel Size Class		Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	≥ 26	Unclassified	≥ 26		Unclassified	≥ 26	Unclassified	≥ 26
Bait	0	0	0	0	0	0	0	0	0
Wage	15,778	102,926	118,703	322	118,703	2,394	1,027	1,890	1,890
Food	16,841	32,999	49,840	344	49,840	767	413	651	651
Fuel	32,813	81,605	114,418	670	114,418	1,898	901	1,659	1,659
Harbor	1,525	8,469	9,994	31	9,994	197	85	147	147
Ice	12,035	9,641	21,676	246	21,676	224	50	90	90
Transportation	18,653	21,837	40,490	381	40,490	508	547	317	317
Membership	6,604	4,348	10,952	135	10,952	101	145	37	37
Landing Taxes	7,417	8,342	15,759	151	15,759	194	128	200	200
		TOTAL				AVERAGE			
GRAND TOTAL COSTS	351,775	1,240,401	1,592,176	7,179	1,592,176	28,847	n/a	n/a	n/a
EX-VESSEL REVENUE	203,065	224,160	427,225	4,144	427,225	5,213	n/a	n/a	n/a
EX-VESSEL NET REVENUE	-148,710	-1,016,241	-1,164,951	-3,035	-1,164,951	-23,634	n/a	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Herring Gillnet OC

Respondents' average years in the industry¹: 32

Average age of fishing vessel¹: 29

Average number of days per trip¹: 2.4

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	0	n/a
Restaurant	0	n/a
Processor	58	100
Outside CA	8	100

Likert scale rating of 2006 fishing year¹: Between “worst” and “worse than normal” (1.5)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of fees. Other concerns include fuel costs, resource problems/habitat, the poor 2006 season, and low price of catch.

3 Most important landing counties²

By Number of Trips	By Value of Catch
San Francisco	San Francisco
Marin	Marin
n/a	n/a

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 12. 2006 Economic Summary for the CA HOOK & LINE Operational Configuration

Number of Participating Fishermen = 508

Number of Participating Fishermen in Size Class:

Unclassified = 138
 < 26' = 207

26' - 36' = 108
 > 36' = 74

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	26' - 36'		> 36'	Unclassified	< 26'	26' - 36'	> 36'	Unclassified	< 26'	26' - 36'	> 36'
Fixed Cost Category													
Engine Repair	31,360	162,252	74,163	41,426	309,201	226	803	687	567	1,292	1,153	789	799
Engine Purchase	28,835	188,684	170,415	21,151	409,085	207	934	1,578	290	574	835	3,991	419
Electrical Gear Repair	31,754	32,807	26,437	29,848	120,846	228	162	245	409	2,121	177	393	545
Electrical Gear Purchase	16,612	59,857	40,378	18,237	135,084	120	296	374	250	483	322	1,266	302
Hull Repair	39,011	87,916	83,709	104,419	315,056	281	435	775	1,430	2,134	678	945	2,424
Hull Purchase	11,686	61,859	35,105	22,118	130,769	84	306	325	303	240	232	354	432
Other Gear Repair	59,314	170,566	76,790	72,390	379,060	427	844	711	992	606	701	761	1,200
Other Gear Purchase	42,186	120,134	102,950	98,573	363,844	303	595	953	1,350	781	536	1,041	1,662
Vessel Insurance	39,616	86,333	38,638	34,293	198,880	285	427	358	470	2,125	505	809	1,539
Storage	16,774	89,088	26,336	15,646	147,844	121	441	244	214	260	325	274	270
Interest	29,487	50,640	53,814	62,958	196,900	212	251	498	862	688	536	788	1,397
Federal Taxes	96,133	155,815	68,539	41,867	362,354	692	771	635	574	536	531	1,076	696
State Taxes	19,462	28,382	20,047	7,101	74,991	140	141	186	97	128	96	834	96
Boat Reg Fees	0	29,154	8,606	8,492	46,252	0	144	80	116	0	131	152	312
Permit Fees	9,123	20,470	5,545	4,836	39,975	66	101	51	66	135	167	108	137
Commercial License	6,832	11,873	3,447	1,864	24,016	49	59	32	26	41	39	36	31
Slip	24,269	154,676	81,530	55,902	316,376	175	766	755	766	491	679	878	962
Other Slip	3,381	1,232	80	361	5,054	24	6	1	5	255	46	5	27

Table 12 continued. 2006 Economic Summary for the CA HOOK & LINE Operational Configuration

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs				
	Unclassified	< 26'	> 36'		Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'		
Variable Cost Category												
Bait	42,060	151,100	70,007	307,198	307	733	642	603	605	2,713	2,758	1,904
Wage	137,374	360,281	84,576	618,764	1,003	1,749	776	500	6,275	2,513	1,281	898
Food	26,095	71,584	29,370	157,741	190	347	269	420	268	399	464	1,444
Fuel	69,995	189,872	84,289	455,707	511	922	773	1,528	926	1,065	2,121	7,095
Harbor	9,463	419,207	38,916	476,823	69	2,035	357	127	271	20,201	1,106	772
Ice	14,017	30,617	14,553	71,486	102	149	134	168	177	633	558	384
Transportation	74,115	211,354	48,932	370,782	541	1,026	449	498	784	1,509	537	1,053
Membership	12,857	36,094	10,656	64,641	94	175	98	69	160	619	180	210
Landing Taxes	1,363	1,495	1,209	5,199	10	7	11	16	34	16	41	23
			TOTAL			AVERAGE						
GRAND TOTAL COSTS	893,176	2,983,340	1,299,037	6,103,927	6,466	14,628	11,996	12,717	n/a	n/a	n/a	n/a
EX-VESSEL REVENUE	298,435	525,663	134,299	1,174,486	2,163	2,336	1,188	2,806	n/a	n/a	n/a	n/a
EX-VESSEL NET REVENUE	-594,741	-2,457,677	-1,164,738	-4,929,441	-4,304	-12,291	-10,807	-9,911	n/a	n/a	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Hook & Line OC

Respondents' average years in the industry¹: 23

Average age of fishing vessel¹: 29

Average number of days per trip¹: 1.7

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	12	43
Restaurant	10	48
Processor	47	91
Outside CA	1	70

Likert scale rating of 2006 fishing year¹: Between "worse than normal" and "normal" (2.2)

Comments and concerns¹: Regulations and restrictions is the greatest concern of surveyed fishermen. Marine Protected Areas/area closures and DFG, California, and Federal issues are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
San Luis Obispo	San Francisco
Monterey	Monterey
San Francisco	San Mateo

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 13. 2006 Economic Summary for the CA HOOK & LINE LIVE Operational Configuration

Number of Participating Fishermen = 265

Number of Participating Fishermen in Size Class:

Unclassified = 74 26' - 36' = 72
 < 26' = 108 > 36' = 39

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	26' - 36' > 36'		Unclassified	< 26'	26' - 36' > 36'	Unclassified	< 26'	26' - 36' > 36'			
Fixed Cost Category													
Engine Repair	10,335	78,523	56,438	20,732	166,028	150	755	784	518	373	672	773	745
Engine Purchase	10,717	103,262	97,245	10,823	222,047	155	993	1,351	271	313	1,040	1,258	343
Electrical Gear Repair	8,396	17,068	16,077	15,809	57,350	122	164	223	395	724	187	200	563
Electrical Gear Purchase	3,995	29,325	19,444	11,089	63,852	58	282	270	277	115	249	242	357
Hull Repair	6,892	45,948	57,761	50,517	161,118	100	442	802	1,263	285	526	726	2,122
Hull Purchase	7,811	33,674	24,935	11,588	78,007	113	324	346	290	385	294	307	405
Other Gear Repair	28,442	89,320	56,990	39,537	214,289	412	859	792	988	947	802	712	1,319
Other Gear Purchase	22,683	66,707	71,734	52,422	213,545	329	641	996	1,311	1,099	659	903	1,689
Vessel Insurance	8,915	46,779	20,811	26,653	103,158	129	450	289	666	305	652	471	1,628
Storage	5,140	47,703	19,582	8,584	81,010	74	459	272	215	154	412	250	246
Interest	18,071	26,006	40,888	30,497	115,462	262	250	568	762	1,144	432	774	1,006
Federal Taxes	39,345	78,068	42,806	23,353	183,573	570	751	595	584	455	540	447	569
State Taxes	7,686	13,898	7,456	4,029	33,069	111	134	104	101	90	82	83	99
Boat Reg Fees	0	14,290	4,836	5,117	24,243	0	137	67	128	0	155	99	408
Permit Fees	7,141	18,489	5,605	3,761	34,996	103	178	78	94	130	175	90	177
Commercial License	2,573	5,236	2,372	1,059	11,240	37	50	33	26	33	31	32	35
Slip	8,219	74,815	54,179	27,456	164,669	119	719	752	686	237	685	692	851
Other Slip	413	112	0	101	625	6	1	0	3	36	9	0	9

Table 13 continued. 2006 Economic Summary for the CA HOOK & LINE Live Operational Configuration

Variable Cost Category	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	26' - 36'		> 36'	Unclassified	< 26'	26' - 36'	> 36'	Unclassified	< 26'	26' - 36'	> 36'
Bait	110,245	116,851	74,759	95,644	397,498	1,490	1,102	1,038	2,452	8,273	4,879	6,216	10,350
Wage	28,946	178,809	60,049	38,890	306,693	391	1,687	834	997	787	2,036	1,360	1,506
Food	15,267	38,835	24,435	16,462	94,998	206	366	339	422	422	431	912	1,255
Fuel	39,454	103,554	44,110	65,312	252,429	533	977	613	1,675	1,251	1,219	1,031	5,907
Harbor	3,735	55,436	59,607	4,896	123,675	50	523	828	126	141	1,496	3,992	403
Ice	8,840	9,829	13,165	3,683	35,517	119	93	183	94	285	90	702	136
Transportation	43,850	107,880	35,107	25,422	212,259	593	1,018	488	652	1,259	1,051	550	1,169
Membership	2,865	13,107	7,666	1,577	25,215	39	124	106	40	56	291	213	43
Landing Taxes	580	795	817	497	2,689	8	7	11	13	19	18	14	19
			TOTAL				AVERAGE						
GRAND TOTAL COSTS	450,556	1,414,318	918,872	595,509	3,379,255	6,281	13,486	12,762	15,050	n/a	n/a	n/a	n/a
EX-VESSEL REVENUE	353,566	915,061	358,269	116,809	1,743,705	4,778	7,320	4,714	2,849	n/a	n/a	n/a	n/a
EX-VESSEL NET REVENUE	-96,990	-499,257	-560,603	-478,700	-1,635,550	-1,503	-6,165	-8,048	-12,201	n/a	n/a	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Hook & Line Live OC

Respondents' average years in the industry¹: 21

Average age of fishing vessel¹: 29

Average number of days per trip¹: 1.6

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	20	53
Restaurant	13	37
Processor	87	93
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: Between "worse than normal" and "normal" (2.5)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of regulations/restrictions. Marine Protected Areas/ area closures and DFG/California State/Federal issues were also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
San Luis Obispo	San Luis Obispo
Mendocino	Del Norte
Del Norte	Santa Barbara

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 14. 2006 Economic Summary for the CA LOBSTER & CRAB Operational Configuration

Number of Participating Fishermen = 211

Number of Participating Fishermen in Size Class:

Unclassified = 34 26' - 36' = 85
 < 26' = 74 > 36' = 36

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	26' - 36' > 36'		Unclassified	< 26'	26' - 36' > 36'	Unclassified	< 26'	26' - 36' > 36'			
Fixed Cost Category													
Engine Repair	57,904	71,442	152,323	60,800	342,468	1,703	1,006	1,771	1,643	5,082	568	2,697	2,196
Engine Purchase	52,584	121,933	332,638	37,051	544,206	1,547	1,717	3,868	1,001	3,443	3,500	7,483	1,519
Electrical Gear Repair	12,014	15,423	48,746	42,535	118,718	353	217	567	1,150	782	247	1,273	1,626
Electrical Gear Purchase	17,646	27,839	47,515	23,840	116,840	519	392	552	644	1,596	193	368	439
Hull Repair	35,965	43,787	198,931	99,654	378,337	1,058	617	2,313	2,693	2,745	523	6,365	2,698
Hull Purchase	32,079	88,844	62,914	25,103	208,941	944	1,251	732	678	3,913	6,496	549	730
Other Gear Repair	124,685	87,925	160,864	122,473	495,947	3,667	1,238	1,871	3,310	10,000	855	1,646	4,615
Other Gear Purchase	39,346	86,521	245,862	194,926	566,654	1,157	1,219	2,859	5,268	1,322	1,407	3,723	12,512
Vessel Insurance	22,654	52,676	81,421	62,268	219,019	666	742	947	1,683	982	678	1,020	2,163
Storage	19,525	43,083	58,383	22,308	143,298	574	607	679	603	1,019	310	620	622
Interest	23,725	22,531	101,480	67,449	215,185	698	317	1,180	1,823	1,250	412	1,125	1,609
Federal Taxes	48,170	157,079	243,590	128,777	577,617	1,417	2,212	2,832	3,480	1,378	1,737	4,373	4,387
State Taxes	15,992	30,706	46,624	29,713	123,035	470	432	542	803	896	446	888	1,475
Boat Reg Fees	0	12,820	15,115	5,602	33,536	0	181	176	151	0	131	232	143
Permit Fees	3,985	11,383	16,767	8,637	40,771	117	160	195	233	159	246	254	254
Commercial License	2,391	5,934	5,965	1,930	16,219	70	84	69	52	39	31	38	38
Slip	29,403	95,012	138,389	66,614	329,418	865	1,338	1,609	1,800	1,120	739	1,039	1,666
Other Slip	350	0	1,628	373	2,351	10	0	19	10	60	0	120	61

Table 14 continued. 2006 Economic Summary for the CA LOBSTER & CRAB Operational Configuration

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	26' - 36'		> 36'	Unclassified	< 26'	26' - 36'	> 36'	Unclassified	< 26'	26' - 36'	> 36'
Variable Cost Category													
Bait	64,893	280,475	287,541	191,331	824,240	1,966	3,790	3,383	5,171	2,189	9,042	9,067	7,795
Wage	85,446	214,735	288,550	162,689	751,420	2,589	2,902	3,395	4,397	3,834	2,723	4,896	6,298
Food	19,844	38,606	72,415	42,069	172,933	601	522	852	1,137	877	511	1,252	1,620
Fuel	69,600	120,208	183,521	120,547	493,876	2,109	1,624	2,159	3,258	3,370	1,784	3,602	4,725
Harbor	5,294	510,852	292,004	30,589	838,739	160	6,903	3,435	827	496	57,349	26,357	3,011
Ice	0	0	0	0	0	0	0	0	0	0	0	0	0
Transportation	25,787	89,202	96,201	81,073	292,263	781	1,205	1,132	2,191	707	947	1,064	5,365
Membership	9,916	25,845	25,164	10,021	70,946	300	349	296	271	489	1,620	620	340
Landing Taxes	2,983	5,682	9,048	4,262	21,976	90	77	106	115	224	159	212	208
GRAND TOTAL COSTS	822,182	2,260,543	3,213,597	1,642,631	7,938,953	24,435	31,105	37,539	44,395	n/a	n/a	n/a	n/a
EX-VESSEL REVENUE	1,004,911	2,911,454	3,886,708	1,975,181	9,778,254	29,556	38,819	44,167	50,646	n/a	n/a	n/a	n/a
EX-VESSEL NET REVENUE	182,729	650,911	673,111	332,550	1,839,301	5,121	7,715	6,628	6,250	n/a	n/a	n/a	n/a

AVERAGE

TOTAL

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Lobster & Crab OC

Respondent's average years in the industry¹: 26

Average age of fishing vessel¹: 22

Average number of days per trip¹: 1.6

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	22	41
Restaurant	12	10
Processor	76	97
Outside CA	5	30

Likert scale rating of 2006 fishing year¹: Between "normal" and "better than normal" (3.3)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of Marine Protected Areas. Regulations/restrictions and DFG, California State, and Federal issues are also top concerns.

³ Most important landing counties²

By Number of Trips	By Value of Catch
San Diego	San Diego
Santa Barbara	Santa Barbara
Los Angeles	Orange

Sources: ¹ – Survey. ² – 2006 CDFG landings receipt data.

Table 15. 2006 Economic Summary for the CA LONGLINE Operational Configuration

Number of Participating Fishermen = 147

Number of Participating Fishermen in Size Class:

Unclassified = 44 26' - 36' = 30
 < 26' = 34 > 36' = 48

Vessel Size Class	Estimated Total Costs			Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'			
Fixed Cost Category	ALL Fishermen											
Engine Repair	32,099	21,014	38,319	128,263	746	600	1,270	815	2,742	730	1,748	979
Engine Purchase	24,955	27,539	27,570	138,676	580	787	2,021	587	2,002	1,076	2,859	940
Electrical Gear Repair	23,784	4,337	24,602	64,386	553	124	402	523	2,369	170	602	583
Electrical Gear Purchase	8,348	7,619	15,803	44,981	194	218	456	336	741	263	638	335
Hull Repair	84,068	13,605	115,287	253,596	1,955	389	1,401	2,453	7,383	585	2,005	3,784
Hull Purchase	13,628	8,793	20,760	59,721	317	251	570	442	1,258	314	785	525
Other Gear Repair	55,011	22,848	64,225	183,128	1,279	653	1,415	1,366	4,071	823	2,026	1,341
Other Gear Purchase	50,979	18,941	91,148	212,396	1,186	541	1,770	1,939	4,539	779	2,448	2,067
Vessel Insurance	37,129	7,942	38,235	98,773	863	227	533	814	4,076	458	829	1,600
Storage	9,539	12,171	16,145	51,892	222	348	484	344	717	429	705	543
Interest	55,348	6,712	74,986	157,739	1,287	192	714	1,595	6,509	378	1,004	2,422
Federal Taxes	79,403	28,256	88,052	256,402	1,847	807	2,093	1,873	2,709	1,507	4,025	3,050
State Taxes	19,150	5,311	14,033	50,306	445	152	407	299	1,140	292	794	461
Boat Reg Fees	0	3,075	7,666	14,620	0	88	134	163	0	129	206	416
Permit Fees	3,105	4,673	4,966	14,266	72	134	52	106	157	177	77	205
Commercial License	2,493	1,209	1,545	6,186	58	35	32	33	46	36	34	30
Slip	30,022	23,298	53,371	141,823	698	666	1,211	1,136	2,753	822	1,552	1,221
Other Slip	81	0	1,389	1,470	2	0	0	30	12	0	0	144

Table 15 continued. 2006 Economic Summary for the CA LONGLINE Operational Configuration

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs				
	Unclassified	< 26'	26' - 36'		> 36'	Unclassified	< 26'	26' - 36'	> 36'	Unclassified	< 26'	26' - 36'
Variable Cost Category												
Bait	108,759	10,986	14,779	170,712	2,472	314	477	787	8,583	503	600	1,380
Wage	1,113,689	62,062	80,350	1,347,028	25,311	1,773	2,592	1,977	163,606	4,722	4,615	6,388
Food	27,190	7,667	14,241	77,697	618	219	459	622	1,654	280	674	1,260
Fuel	129,214	24,987	40,371	272,523	2,937	714	1,302	1,695	14,113	1,043	1,975	3,291
Harbor	4,767	8,150	4,232	22,606	108	233	137	119	414	828	235	340
Ice	12,145	2,783	4,077	38,779	276	80	132	430	930	146	174	1,139
Transportation	60,817	24,886	23,473	138,510	1,382	711	757	638	4,908	850	1,042	775
Membership	5,178	2,223	2,270	13,142	118	64	73	75	213	170	114	130
Landing Taxes	1,710	168	836	5,487	39	5	27	60	69	9	38	110
			TOTAL									
GRAND TOTAL COSTS	1,992,610	361,256	618,666	3,965,107	45,566	10,322	20,923	21,255	n/a	n/a	n/a	n/a
EX-VESSEL REVENUE	1,271,669	294,162	1,059,648	3,819,345	28,902	8,171	26,491	22,959	n/a	n/a	n/a	n/a
EX-VESSEL NET REVENUE	-720,941	-67,094	440,982	-145,762	-16,665	-2,150	5,569	1,704	n/a	n/a	n/a	n/a

TOTAL

AVERAGE

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Longline OC

Respondents' average years in the industry¹: 33

Average age of fishing vessel¹: 19

Average number of days per trip¹: 2

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	0	n/a
Restaurant	33	100
Processor	0	n/a
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: "normal" (3.0)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of permit allocation.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Monterey	Ventura
San Diego	Monterey
Orange	San Diego

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 16. 2006 Economic Summary for the CA NEARSHORE & GROUND FISH TRAP Operational Configuration

Number of Participating Fishermen = 151

Number of Participating Fishermen in Size Class:

Unclassified = 36

ALL Vessel Sizes= 123

Fixed Cost Category	Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	ALL Vessel Sizes		Unclassified	ALL Vessel Sizes	Unclassified	ALL Vessel Sizes
Engine Repair	9,458	95,923	105,381	256	793	580	1,045
Engine Purchase	15,715	98,674	114,389	425	815	1,553	1,250
Electrical Gear Repair	7,681	49,759	57,440	208	411	596	593
Electrical Gear Purchase	10,840	40,785	51,625	293	337	784	476
Hull Repair	36,378	162,835	199,213	983	1,346	3,301	2,153
Hull Purchase	8,891	45,735	54,626	240	378	701	507
Other Gear Repair	38,771	140,371	179,142	1,048	1,160	2,724	1,502
Other Gear Purchase	38,048	168,268	206,316	1,028	1,391	2,857	1,924
Vessel Insurance	7,792	72,455	80,246	211	599	440	1,402
Storage	7,483	36,015	43,499	202	298	446	349
Interest	10,623	124,945	135,568	287	1,033	603	1,762
Federal Taxes	36,733	141,971	178,705	993	1,173	994	1,602
State Taxes	8,702	28,793	37,495	235	238	312	344
Boat Reg Fees	0	18,461	18,461	0	153	0	353
Permit Fees	2,791	13,679	16,470	75	113	155	172
Commercial License	1,648	3,898	5,546	45	32	41	32
Slip	20,864	113,921	134,785	564	941	2,049	1,239
Other Slip	497	279	777	13	2	64	18

Table 16 continued. 2006 Economic Summary for the CA NEARSHORE & GROUND FISH TRAP Operational Configuration

Variable Cost Category	Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	ALL Vessel Sizes		Unclassified	All Vessel Sizes	Unclassified	All Vessel Sizes
Bait	66,612	273,063	339,675	1,850	2,238	3,888	8,045
Wage	57,798	223,696	281,494	1,605	1,834	5,237	4,267
Food	9,994	55,205	65,199	278	453	510	815
Fuel	39,704	149,025	188,728	1,103	1,222	1,651	2,587
Harbor	13,211	40,993	54,204	367	336	2,060	1,301
Ice	6,985	20,426	27,411	194	167	296	453
Transportation	16,271	93,730	110,001	452	768	496	1,786
Membership	5,002	17,138	22,140	139	140	274	235
Landing Taxes	1,296	5,810	7,106	36	48	61	78
		<u>TOTAL</u>		<u>AVERAGE</u>			
GRAND TOTAL COSTS	479,789	2,235,853	2,715,642	13,130	18,419	n/a	n/a
EX-VESSEL REVENUE	346,423	1,497,036	1,843,459	9,623	10,770	n/a	n/a
EX-VESSEL NET REVENUE	-133,366	-738,817	-872,183	-3,507	-7,649	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Nearshore & Groundfish Trap OC

Respondent's average years in the industry¹: 23

Average age of fishing vessel¹: 30

Average number of days per trip¹: 1.5

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	3	100
Restaurant	7	100
Processor	37	100
Outside CA	3	100

Likert scale rating of 2006 fishing year¹: Between "worse than normal" and "normal" (2.5)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of Marine Protected Areas and area closures. The poor 2006 season, regulations/restrictions, and DFG/California State/Federal issues are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
San Luis Obispo	Mendocino
Mendocino	San Luis Obispo
San Diego	San Diego

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 17. 2006 Economic Summary for the CA OTHER GILLNET Operational Configuration

Number of Participating Fishermen = 92

Number of Participating Fishermen in Size Class:

Unclassified = 19 26' - 36' = 27
 < 26' = 4 > 36' = 43

Vessel Size Class	Estimated Total Costs			Estimated Average Costs			St. Deviation of Costs						
	Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'				
Fixed Cost Category													
Engine Repair	11,686	117	43,454	80,143	135,400	615	29	1,609	1,864	1,111	21	893	1,378
Engine Purchase	4,764	140	94,919	42,343	142,166	251	35	3,516	985	415	28	4,556	983
Electrical Gear Repair	7,533	21	28,963	57,831	94,349	396	5	1,073	1,345	870	4	3,193	806
Electrical Gear Purchase	4,100	48	13,855	30,142	48,145	216	12	513	701	384	7	327	442
Hull Repair	12,767	57	68,580	221,378	302,782	672	14	2,540	5,148	1,154	12	4,582	4,454
Hull Purchase	5,062	49	19,483	44,579	69,173	266	12	722	1,037	409	9	399	780
Other Gear Repair	28,989	132	71,220	137,049	237,389	1,526	33	2,638	3,187	2,311	24	5,541	2,061
Other Gear Purchase	26,044	110	61,245	179,794	267,193	1,371	28	2,268	4,181	1,994	11	1,357	2,607
Vessel Insurance	19,460	116	23,699	107,946	151,222	1,024	29	878	2,510	1,787	29	858	3,589
Storage	7,455	73	14,326	26,602	48,457	392	18	531	619	975	13	291	395
Interest	10,325	36	40,828	166,926	218,115	543	9	1,512	3,882	976	7	1,471	3,491
Federal Taxes	38,121	171	69,069	103,109	210,471	2,006	43	2,558	2,398	2,235	19	4,001	2,403
State Taxes	6,912	32	13,429	18,639	39,012	364	8	497	433	357	3	784	474
Boat Reg Fees	0	27	7,818	6,426	14,272	0	7	290	149	0	5	537	164
Permit Fees	7,446	46	15,068	22,414	44,973	392	11	558	521	306	8	497	367
Commercial License	1,333	10	1,897	3,230	6,471	70	3	70	75	40	2	38	36
Slip	11,989	170	45,452	93,177	150,788	631	43	1,683	2,167	1,197	27	1,020	1,411
Other Slip	2,723	0	700	2,941	6,364	143	0	26	68	362	0	135	259

Table 17 continued. 2006 Economic Summary for the CA OTHER GILLNET Operational Configuration

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs		
	Unclassified	< 26'	> 36'		Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'
Variable Cost Category										
Bait	0	0	0	0	0	0	0	0	0	0
Wage	32,618	314	126,706	433,209	1,717	78	4,693	6,362	2,850	7,671
Food	25,299	162	35,665	109,192	1,332	41	1,321	1,118	2,512	2,215
Fuel	47,242	416	58,650	260,338	2,486	104	2,172	3,582	4,469	3,466
Harbor	964	5,375	826,766	1,155,273	51	1,344	30,621	7,492	109	98,988
Ice	25,396	34	55,715	218,070	1,337	9	2,064	3,184	2,312	2,882
Transportation	36,755	434	28,959	121,607	1,934	108	1,073	1,290	5,558	1,271
Membership	10,886	253	25,493	49,193	573	63	944	292	954	1,598
Landing Taxes	2,626	4	4,329	13,867	138	1	160	161	209	264
			TOTAL							
GRAND TOTAL COSTS	388,497	8,348	1,796,288	4,547,493	20,447	2,087	66,529	54,753	n/a	n/a
EX-VESSEL REVENUE	704,121	1,153	1,136,941	3,887,902	37,059	288	40,605	46,493	n/a	n/a
EX-VESSEL NET REVENUE	315,624	-7,195	-659,347	-659,591	16,612	-1,799	-25,924	-8,260	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Other Gillnet OC

Respondent's average years in the industry¹: 30

Average age of fishing vessel¹: 36

Average number of days per trip¹: 3.6

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	5	53
Restaurant	5	55
Processor	56	99
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: "normal" (2.9)

Comments and concerns¹: The greatest two concerns of surveyed fishermen are the issues of Marine Protected Areas and problems caused by sea lions. Regulations/restrictions and high fuel prices are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Los Angeles	San Diego
San Diego	Los Angeles
Ventura	Ventura

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 18. 2006 Economic Summary for the CA PRAWN TRAP Operational Configuration

Number of Participating Fishermen in Size Class = 34

Fixed Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Engine Repair	63,110	1,856	2,556
Engine Purchase	43,984	1,294	1,239
Electrical Gear Repair	39,438	1,160	1,730
Electrical Gear Purchase	22,814	671	729
Hull Repair	116,526	3,427	4,418
Hull Purchase	25,549	751	611
Other Gear Repair	92,731	2,727	2,929
Other Gear Purchase	107,675	3,167	2,554
Vessel Insurance	68,815	2,024	4,219
Storage	24,483	720	918
Interest	79,389	2,335	2,503
Federal Taxes	279,823	8,230	12,300
State Taxes	56,466	1,661	2,375
Boat Reg Fees	7,441	219	193
Permit Fees	4,114	121	175
Commercial License	2,299	68	36
Slip	61,926	1,821	1,264
Other Slip	361	11	62

Table 18 continued. 2006 Economic Summary for the CA PRAWN TRAP Operational Configuration

Variable Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Bait	300,541	8,839	17,534
Wage	275,457	8,102	14,019
Food	30,522	898	1,406
Fuel	111,072	3,267	4,920
Harbor	5,728	168	311
Ice	30,760	905	1,814
Transportation	47,342	1,392	1,275
Membership	8,121	239	372
Landing Taxes	3,688	108	112
	<u>TOTAL</u>	<u>AVERAGE</u>	
GRAND TOTAL COSTS	1,910,173	56,182	n/a
EX-VESSEL REVENUE	3,672,939	102,026	n/a
EX-VESSEL NET REVENUE	1,762,766	45,845	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Prawn Trap OC

Respondent's average years in the industry¹: 24

Average age of fishing vessel¹: 21

Average number of days per trip¹: 2.8

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	17	5
Restaurant	17	4
Processor	100	99
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: Between "normal" and "better than normal" (3.3)

Comments and concerns¹: The price of catch, fees, MPA's/area closures, and the poor 2006 season were equally important concerns of surveyed fishermen.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Monterey	Monterey
Ventura	Ventura
Orange	San Diego

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 19. 2006 Economic Summary for the CA SALMON Operational Configuration

Number of Participating Fishermen = 341

Number of Participating Fishermen in Size Class:

Unclassified = 73 26' - 36' = 124
 < 26' = 84 > 36' = 60

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs				
	Unclassified	< 26'	26' - 36' > 36'		Unclassified	< 26'	26' - 36' > 36'	Unclassified	< 26'	26' - 36' > 36'		
Fixed Cost Category												
Engine Repair	77,041	88,151	215,164	465,052	1,014	1,075	1,778	1,460	3,276	1,195	731	890
Engine Purchase	75,136	110,301	369,602	603,897	989	1,345	3,055	842	1,772	1,775	1,214	847
Electrical Gear Repair	25,562	17,219	73,749	182,299	336	210	609	1,134	639	219	430	684
Electrical Gear Purchase	70,150	34,403	85,003	232,369	923	420	703	738	3,792	429	263	410
Hull Repair	71,366	42,485	227,017	530,467	939	518	1,876	3,269	1,943	430	791	2,731
Hull Purchase	43,999	35,208	103,989	227,273	579	429	859	760	1,331	388	378	473
Other Gear Repair	69,581	82,780	230,539	551,170	916	1,010	1,905	2,901	1,161	477	721	1,584
Other Gear Purchase	141,401	61,983	315,079	712,220	1,861	756	2,604	3,341	3,917	489	1,114	1,924
Vessel Insurance	43,005	40,484	81,823	218,461	566	494	676	916	1,288	483	794	1,141
Storage	23,746	50,224	76,809	183,792	312	612	635	569	363	272	274	420
Interest	51,325	21,826	213,110	419,123	675	266	1,761	2,291	1,419	201	1,337	1,737
Federal Taxes	81,062	84,451	154,154	393,449	1,067	1,030	1,274	1,272	599	431	457	935
State Taxes	15,665	16,352	27,059	72,160	206	199	224	226	168	184	81	157
Boat Reg Fees	0	19,951	30,655	63,244	0	243	253	218	0	172	187	190
Permit Fees	1,889	1,272	2,938	9,039	25	16	24	51	81	67	101	129
Commercial License	5,892	6,779	11,110	28,032	78	83	92	73	36	33	24	37
Slip	94,018	100,182	246,842	557,071	1,237	1,222	2,040	2,000	1,668	654	768	1,073
Other Slip	8,191	2,621	2,138	13,199	108	32	18	4	289	152	89	23

Table 19 continued. 2006 Economic Summary for the CA SALMON Operational Configuration

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs		
	Unclassified	< 26'	> 36'		Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'
Variable Cost Category										
Bait	25,967	26,262	65,374	210,240	333	316	536	469	806	1,255
Wage	95,011	123,307	216,460	550,201	1,218	1,486	1,774	1,826	1,656	1,831
Food	45,676	56,768	125,012	307,050	586	684	1,025	715	629	985
Fuel	115,117	84,630	167,464	508,291	1,476	1,020	1,373	2,343	975	1,143
Harbor	11,067	19,341	28,550	70,808	142	233	234	213	278	437
Ice	15,331	9,938	24,982	72,132	197	120	205	236	63	108
Transportation	72,225	70,451	134,886	343,403	926	849	1,106	961	1,002	703
Membership	13,031	8,000	14,927	41,956	167	96	122	343	65	120
Landing Taxes	5,287	2,010	9,669	23,505	68	24	79	96	34	94
			TOTAL							
GRAND TOTAL COSTS	1,297,740	1,217,376	3,254,106	7,589,901	16,941	14,787	26,840	n/a	n/a	n/a
EX-VESSEL REVENUE	658,962	261,617	1,103,370	2,801,917	9,027	3,078	8,898	n/a	n/a	n/a
EX-VESSEL NET REVENUE	-638,778	-955,759	-2,150,736	-4,787,984	-7,914	-11,709	-17,942	n/a	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Salmon OC

Respondent's average years in the industry¹: 26

Average age of fishing vessel¹: 37

Average number of days per trip¹: 2.1

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	19	42
Restaurant	6	68
Processor	74	89
Outside CA	2	47

Likert scale rating of 2006 fishing year¹: Between "worst" and "worse than normal" (1.5)

Comments and concerns¹: The greatest concern of surveyed fishermen is the poor 2006 season. Restrictions/regulations and resource/habitat problems are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Sonoma	Sonoma
Monterey	Mendocino
Mendocino	San Francisco

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 20. 2006 Economic Summary for the CA SALMON & ALBACORE Operational Configuration

Number of Participating Fishermen = 62

Number of Participating Fishermen in Size Class:

Unclassified = 10 26' - 36' = 8
 < 26' = 6 > 36' = 38

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs					
	Unclassified	< 26'	26' - 36'		> 36'	Unclassified	< 26'	26' - 36'	> 36'	Unclassified	< 26'	26' - 36'	> 36'
Fixed Cost Category													
Engine Repair	10,541	2,246	3,200	39,560	55,547	1,054	449	400	1,014	1,380	435	725	1,022
Engine Purchase	11,618	3,433	5,397	15,761	36,208	1,162	687	675	404	1,882	822	1,231	432
Electrical Gear Repair	3,049	1,366	1,041	29,485	34,941	305	273	130	756	372	487	205	691
Electrical Gear Purchase	2,167	659	1,224	16,965	21,015	217	132	153	435	274	100	247	414
Hull Repair	30,148	852	3,378	98,437	132,816	3,015	170	422	2,524	7,743	121	764	2,919
Hull Purchase	13,874	730	1,516	19,604	35,724	1,387	146	189	503	3,060	111	321	517
Other Gear Repair	9,463	2,990	3,230	67,331	83,014	946	598	404	1,726	1,461	659	737	1,608
Other Gear Purchase	21,151	1,696	4,501	84,396	111,743	2,115	339	563	2,164	3,834	171	965	2,027
Vessel Insurance	28,388	2,140	1,997	31,080	63,605	2,839	428	250	797	6,146	467	463	1,175
Storage	3,168	762	1,039	12,718	17,687	317	152	130	326	303	134	239	283
Interest	22,894	1,027	3,685	61,840	89,446	2,289	205	461	1,586	4,620	277	1,033	1,778
Federal Taxes	18,534	1,989	2,480	51,636	74,639	1,853	398	310	1,324	2,952	290	500	1,416
State Taxes	4,160	513	453	9,801	14,927	416	103	57	251	596	110	91	289
Boat Reg Fees	0	411	532	3,835	4,779	0	82	67	98	0	61	155	140
Permit Fees	177	103	98	658	1,036	18	21	12	17	56	46	12	43
Commercial License	588	155	150	1,698	2,592	59	31	19	44	47	24	34	39
Slip	13,016	1,545	3,536	46,679	64,776	1,302	309	442	1,197	1,745	325	875	1,134
Other Slip	1,096	57	14	452	1,618	110	11	2	12	284	26	5	52

Table 20 continued. 2006 Economic Summary for the CA SALMON & ALBACORE Operational Configuration

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs				
	Unclassified	< 26'	> 36'		Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'		
Variable Cost Category												
Bait	1,916	11,273	1,274	35,056	192	2,255	159	528	127	4,763	165	1,266
Wage	24,463	9,027	4,666	96,696	2,446	1,805	583	1,501	4,410	1,757	1,437	2,151
Food	6,936	1,049	1,262	35,676	694	210	158	678	858	173	345	1,118
Fuel	30,976	6,040	3,693	103,320	3,098	1,208	462	1,605	6,040	1,209	1,023	2,399
Harbor	5,083	6,784	381	15,972	508	1,357	48	96	1,373	2,122	106	149
Ice	5,260	1,999	326	16,341	526	400	41	225	1,155	627	88	228
Transportation	9,635	4,156	2,133	44,740	963	831	267	739	953	883	564	897
Membership	962	1,171	329	7,649	96	234	41	133	98	249	80	174
Landing Taxes	483	14	111	1,900	48	3	14	33	35	2	31	40
			TOTAL									
GRAND TOTAL COSTS	279,744	64,188	51,644	807,888	27,974	12,838	6,456	20,715	n/a	n/a	n/a	n/a
EX-VESSEL REVENUE	82,476	13,565	16,292	437,849	8,248	2,261	2,037	11,522	n/a	n/a	n/a	n/a
EX-VESSEL NET REVENUE	-197,268	-50,623	-35,352	-370,039	-19,727	-10,577	-4,419	-9,193	n/a	n/a	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Salmon & Albacore OC

Respondent's average years in the industry¹: 26

Average age of fishing vessel¹: 34

Average number of days per trip¹: 5.6

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	19	57
Restaurant	6	70
Processor	53	79
Outside CA	30	84

Likert scale rating of 2006 fishing year¹: Between "worse than normal" and "normal" (2.2)

Comments and concerns¹: The greatest concerns of surveyed fishermen are regulations/restrictions and sport fishing. The poor 2006 season and fuel costs are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Humboldt	Del Norte
Santa Cruz	Humboldt
Mendocino	Santa Cruz

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 21. 2006 Economic Summary for the CA SALMON & DUNGENESS CRAB – MEDIUM AND LARGE VESSELS Operational Configuration

Number of Participating Fishermen = 148

Number of Participating Fishermen in Size Class:

Unclassified = 27 $\geq 26'$ = 123

Fixed Cost Category	Vessel Size Class		Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	$\geq 26'$	Unclassified	$\geq 26'$		Unclassified	$\geq 26'$	Unclassified	$\geq 26'$
Engine Repair	37,054	227,713	264,767	1,372	1,851	1,229	900		
Engine Purchase	46,265	226,620	272,885	1,714	1,842	3,319	1,542		
Electrical Gear Repair	19,288	154,234	173,522	714	1,254	909	1,203		
Electrical Gear Purchase	30,382	113,603	143,986	1,125	924	2,970	475		
Hull Repair	79,491	434,841	514,332	2,944	3,535	3,383	2,534		
Hull Purchase	30,195	130,631	160,826	1,118	1,062	1,982	1,340		
Other Gear Repair	85,154	412,567	497,722	3,154	3,354	3,438	2,589		
Other Gear Purchase	130,483	479,770	610,253	4,833	3,901	5,950	1,977		
Vessel Insurance	72,004	140,374	212,378	2,667	1,141	3,306	1,540		
Storage	23,000	90,741	113,742	852	738	1,098	380		
Interest	37,054	329,987	367,041	1,372	2,683	1,472	2,243		
Federal Taxes	101,124	450,213	551,337	3,745	3,660	4,125	3,624		
State Taxes	23,462	82,111	105,573	869	668	1,035	797		
Boat Reg Fees	0	44,296	44,296	0	360	0	284		
Permit Fees	419	9,721	10,140	16	79	50	135		
Commercial License	2,365	11,171	13,536	88	91	27	20		
Slip	51,347	308,748	360,095	1,902	2,510	1,477	973		
Other Slip	5,383	6,522	11,905	199	53	336	253		

Table 21 continued. 2006 Economic Summary for the CA SALMON & DUNGENESS CRAB – MEDIUM AND LARGE VESSELS Operational Configuration

Variable Cost Category	Vessel Size Class		Estimated Total Costs		Estimated Average Costs		St. Deviation of Costs	
	Unclassified	≥ 26'	ALL Fishermen	Unclassified	≥ 26'	Unclassified	≥ 26'	
Bait	136,084	220,019	356,103	5,040	1,774	13,539	5,003	
Wage	361,986	800,341	1,162,326	13,407	6,454	15,216	8,761	
Food	45,245	182,572	227,817	1,676	1,472	1,752	1,782	
Fuel	127,708	348,241	475,949	4,730	2,808	4,370	3,123	
Harbor	5,004	38,124	43,129	185	307	164	939	
Ice	11	70	80	0	1	2	5	
Transportation	63,020	182,283	245,302	2,334	1,470	2,063	1,184	
Membership	9,308	30,576	39,885	345	247	606	482	
Landing Taxes	19,411	34,884	54,296	719	281	732	314	
		TOTAL		AVERAGE				
GRAND TOTAL COSTS	1,542,248	5,490,975	7,033,223	57,120	44,522	n/a	n/a	
EX-VESSEL REVENUE	2,137,792	9,068,083	11,205,875	79,177	71,402	n/a	n/a	
EX-VESSEL NET REVENUE	595,544	3,577,108	4,172,652	22,057	26,881	n/a	n/a	

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Salmon & Dungeness CRAB – Medium and Large Vessels OC

Respondent's average years in the industry¹: 24

Average age of fishing vessel¹: 41

Average number of days per trip¹: 2.2

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	13	51
Restaurant	4	18
Processor	78	93
Outside CA	3	67

Likert scale rating of 2006 fishing year¹: Between “worst” and “worse than normal” (1.8)

Comments and concerns¹: The greatest two concerns of surveyed fishermen are the issues of regulations/restrictions and DFG/California State/Federal issues. The poor 2006 season and season length are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
San Mateo	Sonoma
Sonoma	San Mateo
Mendocino	Mendocino

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 22. 2006 Economic Summary for the CA SALMON & DUNGENESE CRAB – SMALL VESSELS Operational Configuration

Number of Participating Fishermen = 13

Fixed Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Engine Repair	11,870	913	569
Engine Purchase	30,684	2,360	2,603
Electrical Gear Repair	3,436	264	211
Electrical Gear Purchase	7,930	610	756
Hull Repair	11,092	853	910
Hull Purchase	11,047	850	1,279
Other Gear Repair	17,858	1,374	771
Other Gear Purchase	15,965	1,228	1,034
Vessel Insurance	7,796	600	607
Storage	8,145	627	497
Interest	2,299	177	172
Federal Taxes	18,013	1,386	1,294
State Taxes	3,520	271	171
Boat Reg Fees	3,257	251	265
Permit Fees	1,468	113	174
Commercial License	1,034	80	34
Slip	17,468	1,344	826
Other Slip	0	0	0

Table 22 continued. 2006 Economic Summary for the CA SALMON & DUNGENESE CRAB – SMALL VESSELS Operational Configuration

Variable Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Bait	10,147	781	946
Wage	61,077	4,698	5,055
Food	6,527	502	321
Fuel	41,014	3,155	4,487
Harbor	4,751	365	541
Ice	0	0	0
Transportation	22,751	1,750	1,986
Membership	1,365	105	80
Landing Taxes	2,283	176	242
GRAND TOTAL COSTS	TOTAL 322,797	AVERAGE 24,831	n/a
EX-VESSEL REVENUE	300,847	23,142	n/a
EX-VESSEL NET REVENUE	-21,950	-1,688	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Salmon & Dungeness Crab – Small Vessels OC

Respondent's average years in the industry¹: 30
 Average age of fishing vessel¹: 29
 Average number of days per trip¹: 1.0
 Average shares of activity by market channel category¹:

Likert Scale Rating of 2006 Fishing Year¹: Between “worst” and “worse than normal” (1.8)
 Comments and concerns¹: Regulations and restrictions, transferability issues, fees and resource/habitat problems were equally important concerns of surveyed fishermen.

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	56	19
Restaurant	33	28
Processor	78	74
Outside CA	0	n/a

3 Most important landing counties²
 By Number of Trips
 Marin
 Sonoma
 Mendocino
 By Value of Catch
 Marin
 Mendocino
 Sonoma

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 23. 2006 Economic Summary for the CA SEA URCHIN Operational Configuration

Number of Participating Fishermen = 212

Number of Participating Fishermen in Size Class:

Unclassified = 104 26' - 36' = 95
 < 26' = 28 > 36' = 14

Vessel Size Class	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs				
	Unclassified	< 26'	> 36'		Unclassified	< 26'	> 36'	Unclassified	< 26'	> 36'		
Fixed Cost Category												
Engine Repair	63,570	33,513	252,520	368,332	611	1,156	2,658	1,441	1,599	1,348	3,950	1,005
Engine Purchase	115,874	52,594	472,729	650,226	1,114	1,814	4,976	694	4,087	4,374	8,172	813
Electrical Gear Repair	24,168	8,222	57,929	101,495	232	284	610	860	743	529	355	697
Electrical Gear Purchase	40,117	13,903	71,278	133,810	386	479	750	655	1,362	544	408	594
Hull Repair	79,149	16,176	219,639	339,557	761	558	2,312	1,892	2,466	599	1,296	1,818
Hull Purchase	26,568	13,532	93,908	141,003	255	467	989	538	588	506	537	397
Other Gear Repair	85,561	27,845	210,745	351,539	823	960	2,218	2,107	1,060	611	1,174	1,712
Other Gear Purchase	84,884	25,720	269,211	412,552	816	887	2,834	2,518	1,601	907	1,723	1,931
Vessel Insurance	38,289	24,929	124,995	213,001	368	860	1,316	1,907	753	748	1,627	2,094
Storage	25,945	16,036	75,066	125,338	249	553	790	638	353	457	552	789
Interest	50,893	6,624	156,489	233,307	489	228	1,647	1,485	1,422	165	1,924	1,308
Federal Taxes	195,443	43,370	216,355	480,854	1,879	1,496	2,277	1,976	2,090	1,595	2,367	2,161
State Taxes	31,280	11,170	42,874	90,191	301	385	451	374	299	758	749	423
Boat Reg Fees	0	5,193	17,487	24,640	0	179	184	151	0	123	141	132
Permit Fees	35,210	7,880	37,163	85,175	339	272	391	379	189	163	193	391
Commercial License	8,733	2,083	8,446	19,950	84	72	89	53	35	41	26	42
Slip	47,213	29,625	194,808	290,347	454	1,022	2,051	1,438	946	834	1,202	1,381
Other Slip	1,504	1,488	2,737	6,426	14	51	29	54	91	203	164	140

Table 23 continued. 2006 Economic Summary for the CA SEA URCHIN Operational Configuration

Vessel Size Class Variable Cost Category	Estimated Total Costs			ALL Fishermen	Estimated Average Costs			St. Deviation of Costs				
	Unclassified	< 26'	26' - 36'		> 36'	Unclassified	< 26'	26' - 36'	> 36'	Unclassified	< 26'	26' - 36'
Bait	0	0	0	0	0	0	0	0	0	0	0	0
Wage	117,054	80,494	384,439	657,662	1,126	2,875	3,963	6,306	2,013	2,642	3,776	8,260
Food	59,807	18,016	104,723	201,164	575	643	1,080	1,552	843	810	1,244	1,735
Fuel	140,648	49,067	359,769	635,952	1,352	1,752	3,709	7,206	2,215	2,356	5,382	16,455
Harbor	18,001	5,118	169,740	195,126	173	183	1,750	189	574	152	12,810	154
Ice	0	0	0	0	0	0	0	0	0	0	0	0
Transportation	150,442	33,673	195,322	398,608	1,447	1,203	2,014	1,598	2,362	1,041	2,192	1,339
Membership	17,551	2,914	26,926	48,897	169	104	278	125	300	77	471	111
Landing Taxes	5,998	899	6,654	14,348	58	32	69	66	63	35	56	85
			TOTAL						AVERAGE			
GRAND TOTAL COSTS	1,463,905	530,085	3,771,951	453,559	14,076	18,513	39,434	36,200	n/a	n/a	n/a	n/a
EX-VESSEL REVENUE	2,044,484	358,148	2,784,775	381,274	19,659	12,791	26,271	29,329	n/a	n/a	n/a	n/a
EX-VESSEL NET REVENUE	633,160	-169,293	-879,042	-37,090	8,736	-4,302	-5,605	-1,914	n/a	n/a	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Sea Urchin OC

Respondent's average years in the industry¹: 26

Average age of fishing vessel¹: 28

Average number of days per trip¹: 1.6

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	6	21
Restaurant	6	33
Processor	77	96
Outside CA	6	36

Likert Scale rating of 2006 fishing year¹: Between "worse than normal" and "normal" (2.6)

Comments and concerns¹: The greatest concern of surveyed fishermen is the issue of catch limits between Northern and Southern fishermen. Marine Protected Areas and Gear topics are also top concerns.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Santa Barbara	Santa Barbara
Ventura	Ventura
San Diego	Los Angeles

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 24. 2006 Economic Summary for the CA TRAWL - NORTHERN Operational Configuration

Number of Participating Fishermen = 86

Number of Participating Fishermen in Size Class:

Unclassified = 23

All Vessel Sizes= 63

Fixed Cost Category	Vessel Size Class		Estimated Total Costs		Estimated Average Costs		St. Deviation of Costs	
	Unclassified	ALL Vessel Sizes	ALL Fishermen	Unclassified	ALL Vessel Sizes	Unclassified	ALL Vessel Sizes	
Engine Repair	14,703	165,410	180,113	639	2,626	1,181	1,206	
Engine Purchase	16,386	96,665	113,052	712	1,534	1,336	972	
Electrical Gear Repair	9,041	94,856	103,897	393	1,506	942	661	
Electrical Gear Purchase	5,098	35,452	40,550	222	563	404	264	
Hull Repair	34,033	493,401	527,434	1,480	7,832	3,251	4,656	
Hull Purchase	20,380	90,139	110,519	886	1,431	2,854	711	
Other Gear Repair	25,323	171,266	196,589	1,101	2,719	1,344	1,002	
Other Gear Purchase	31,497	315,416	346,913	1,369	5,007	2,345	2,149	
Vessel Insurance	39,729	58,914	98,643	1,727	935	4,308	2,525	
Storage	4,577	37,504	42,082	199	595	451	202	
Interest	24,759	311,613	336,372	1,076	4,946	3,266	3,358	
Federal Taxes	172,918	424,951	597,869	7,518	6,745	8,983	8,689	
State Taxes	40,134	84,313	124,447	1,745	1,338	2,313	1,797	
Boat Reg Fees	0	5,823	5,823	0	92	0	151	
Permit Fees	680	1,779	2,459	30	28	125	84	
Commercial License	1,956	5,268	7,225	85	84	32	28	
Slip	16,779	150,551	167,330	730	2,390	1,351	843	
Other Slip	1,657	0	1,657	72	0	346	0	

Table 24 continued. 2006 Economic Summary for the CA TRAWL – NORTHERN Operational Configuration

Variable Cost Category	Vessel Size Class		Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	ALL Vessel Sizes	ALL Vessel Sizes	Unclassified		ALL Vessel Sizes	Unclassified	ALL Vessel Sizes	
Bait	0	0	0	0	0	0	0	0	0
Wage	1,823,246	291,938	2,115,184	79,272	2,115,184	4,634	286,286	18,938	
Food	18,925	44,699	63,623	823	63,623	710	1,217	1,360	
Fuel	155,134	155,327	310,461	6,745	310,461	2,466	14,227	4,216	
Harbor	1,685	17,697	19,382	73	19,382	281	125	1,330	
Ice	64,191	182,409	246,600	2,791	246,600	2,895	3,573	3,519	
Transportation	35,919	47,172	83,091	1,562	83,091	749	2,448	995	
Membership	3,672	22,315	25,987	160	25,987	354	198	1,422	
Landing Taxes	7,516	29,889	37,405	327	37,405	474	316	1,151	
		TOTAL				AVERAGE			
GRAND TOTAL COSTS	2,569,941	3,334,766	5,904,707	111,737	5,904,707	52,933	n/a	n/a	
EX-VESSEL REVENUE	3,008,522	6,835,139	9,843,661	130,805	9,843,661	106,799	n/a	n/a	
EX-VESSEL NET REVENUE	438,581	3,500,373	3,938,954	19,069	3,938,954	53,866	n/a	n/a	

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Trawl – Northern OC

Respondent's average years in the industry¹: 24

Average age of fishing vessel¹: 48

Average number of days per trip¹: 1.8

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	0	n/a
Restaurant	0	n/a
Processor	60	100
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: Between “worse than normal” and “normal” (2.7)

Comments and concerns¹: There were no concerns or comments from the survey respondents.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Humboldt	Humboldt
Monterey	Mendocino
San Mateo	San Francisco

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

Table 25. 2006 Economic Summary for the CA TRAWL - SOUTHERN Operational Configuration

Number of Participating Fishermen = 32

Number of Participating Fishermen in Size Class:

Unclassified = 11

≥ 26' = 23

Fixed Cost Category	Size Class		Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	≥ 26'	Unclassified	≥ 26'		Unclassified	≥ 26'	Unclassified	≥ 26'
Engine Repair	2,041	26,636	28,677			170	1,211	576	1,033
Engine Purchase	749	26,421	27,170			62	1,201	206	1,371
Electrical Gear Repair	528	18,917	19,445			44	860	144	895
Electrical Gear Purchase	1,117	14,265	15,382			93	648	316	728
Hull Repair	4,434	53,370	57,804			369	2,426	1,256	2,808
Hull Purchase	952	15,335	16,287			79	697	269	708
Other Gear Repair	3,933	44,065	47,998			328	2,003	244	1,715
Other Gear Purchase	5,216	56,240	61,456			435	2,556	1,307	2,150
Vessel Insurance	1,665	14,562	16,227			139	662	459	1,327
Storage	859	10,431	11,290			72	474	239	420
Interest	2,479	31,995	34,474			207	1,454	591	1,419
Federal Taxes	16,828	39,489	56,316			1,402	1,795	1,532	2,783
State Taxes	3,161	7,395	10,556			263	336	282	533
Boat Reg Fees	0	8,844	8,844			0	402	0	843
Permit Fees	3,487	4,514	8,002			291	205	307	256
Commercial License	784	1,315	2,099			65	60	46	46
Slip	718	33,715	34,433			60	1,533	189	1,240
Other Slip	0	280	280			0	13	0	60

Table 25 continued. 2006 Economic Summary for the CA TRAWL - SOUTHERN Operational Configuration

Variable Cost Category	Estimated Total Costs		ALL Fishermen	Estimated Average Costs		St. Deviation of Costs	
	Unclassified	≥ 26'		Unclassified	≥ 26'	Unclassified	≥ 26'
Bait	0	0	0	0	0	0	0
Wage	5,920	254,995	260,915	493	11,591	1,304	30,101
Food	1,092	13,962	15,054	91	635	106	1,309
Fuel	11,456	55,829	67,284	955	2,538	2,470	4,483
Harbor	1,815	362,286	364,101	151	16,468	349	47,612
Ice	2,830	38,748	41,579	236	1,761	215	3,899
Transportation	6,059	31,009	37,068	505	1,409	493	2,102
Membership	2,663	17,170	19,833	222	780	369	1,888
Landing Taxes	864	1,797	2,661	72	82	106	149
		TOTAL		AVERAGE			
GRAND TOTAL COSTS	81,648	1,183,586	1,265,235	6,804	53,799	n/a	n/a
EX-VESSEL REVENUE	332,672	735,068	1,067,740	30,243	31,959	n/a	n/a
EX-VESSEL NET REVENUE	251,024	-448,518	-197,495	23,439	-21,840	n/a	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Trawl - Southern OC

Respondent's average years in the industry¹: 33

Average age of fishing vessel¹: 53

Average number of days per trip¹: 1.0

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	0	n/a
Restaurant	0	n/a
Processor	20	98
Outside CA	0	n/a

Likert scale rating of 2006 fishing year¹: Between "worst" and "worse than normal" (1.7)

Comments and concerns¹: Regulations and restrictions, sea lions, fuel costs, MPA's/area closures, and the poor 2006 season were equally important concerns of surveyed fishermen.

3 Most important landing counties²

By Number of Trips	By Value of Catch
Ventura	Ventura
Santa Barbara	Santa Barbara
Los Angeles	Los Angeles

Sources: 1 - Survey. 2 - 2006 CDFG landings receipt data.

Table 26. 2006 Economic Summary for the CA TUNA/OTHER SEINE Operational Configuration

Number of Participating Fishermen = 15

Fixed Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Engine Repair	12,817	915	1,334
Engine Purchase	6,053	432	654
Electrical Gear Repair	7,119	508	742
Electrical Gear Purchase	1,741	124	183
Hull Repair	41,797	2,985	4,452
Hull Purchase	7,025	502	758
Other Gear Repair	12,803	915	1,206
Other Gear Purchase	23,270	1,662	2,502
Vessel Insurance	7,658	547	1,396
Storage	2,696	193	257
Interest	21,205	1,515	2,476
Federal Taxes	34,558	2,468	3,620
State Taxes	7,291	521	730
Boat Reg Fees	1,363	97	142
Permit Fees	50	4	7
Commercial License	340	24	36
Slip	9,836	703	1,077
Other Slip	530	38	142

Table 26 continued. 2006 Economic Summary for the CA TUNA/OTHER SEINE Operational Configuration

Variable Cost Category	Estimated Total Costs	Estimated Average Costs	St. Deviation of Costs
Bait	0	0	0
Wage	106,575	7,105	21,338
Food	5,616	374	706
Fuel	20,745	1,383	3,151
Harbor	26	2	7
Ice	4,113	274	428
Transportation	2,970	198	296
Membership	910	61	69
Landing Taxes	9,799	653	683
	TOTAL	AVERAGE	
GRAND TOTAL COSTS	348,906	24,204	n/a
EX-VESSEL REVENUE	1,756,361	117,091	n/a
EX-VESSEL NET REVENUE	1,407,455	92,887	n/a

Source: Costs: Estimates derived from survey -- in nominal 2006 dollars. Revenue: 2006 nominal CDFG landings receipt data.

Descriptive Statistics for the CA Tuna/Other Seine OC

Respondent's average years in the industry¹: n/a

Average age of fishing vessel¹: n/a

Average number of days per trip¹: n/a

Average shares of activity by market channel category¹:

Market Channel Category	% Resp. Active in Category	Average % Sales in Category for Those Active
Consumer	n/a	n/a
Restaurant	n/a	n/a
Processor	n/a	n/a
Outside CA	n/a	n/a

Likert scale rating of 2006 fishing year¹: n/a

Comments and concerns¹: n/a

3 Most important landing counties²

By Number of Trips	By Value of Catch
San Mateo	Los Angeles
Los Angeles	Ventura
Ventura	San Mateo

Sources: 1 – Survey. 2 – 2006 CDFG landings receipt data.

IV. THE CALIFORNIA OCEAN FISH HARVESTER ECONOMIC (COFHE) MODEL

For the second part of this project the economic data collected in part one was used by King and Associates, Incorporated to develop customized input-output models of the California economy, and for coastal regions and counties within California. These models show how each commercial fishing OC is linked with other industries and with households. The models were then used to develop economic “multipliers” that show the “ripple” effects of changes in fisheries and fisheries management decisions on the California economy.

Cost and earnings data from the survey and CDFG landings and revenue data generated during part one of the study were used to develop input-output models with 20 detailed fishery sectors for the state of California, four coastal regions within California, and 22 individual counties that make up those coastal regions. These 27 models, collectively called the California Ocean Fish Harvester Economic (COFHE) Model, were developed by King and Associates, Inc. from a widely used and respected regional economic modeling tool called the IMPLAN (IMPact Analysis for PLANning) system (IMPLAN Group, 2008).

Sections IV.1 to IV.4 below describe how the COFHE model was developed and how it works, provide some representative statistical results, and present several illustrations that demonstrate how model results can be used to assess the direct, indirect, and induced economic impacts of changes in fisheries and fisheries management.

Section **IV.1** includes a brief overview of economic input-output models in general and fishery-related input-output models in particular. This overview will be useful to COFHE Model users who are interested primarily in results (e.g., using multiplier effects or estimating economic impacts of policy options), and need only a general understanding of the type of economic analysis that generated them. This section also provides references to some widely used text books and websites related to input-output models and recent articles that summarize how they have been used in fisheries.

Section **IV.2** describes the development of the COFHE model, defines some terms that are used to present model results (e.g., indirect vs. induced impacts, value added multipliers, etc.), explains what assumptions are imbedded in the model, and provides some guidance regarding the interpretation and use of COFHE model results.

Section **IV.3** presents “look-up” tables of statewide economic multipliers that were generated for each OC using the COFHE model, and describes what various types of multipliers mean and how they should be interpreted. Multiplier tables similar to those presented here for the state are available for each coastal region and each county within these regions. Regional results can be interpreted in the same way as the state results presented in this section. Users of the COFHE model can use the multipliers presented in these tables to assess the economic impacts of many types of fishery management decisions at the state, regional or county scale without the need to work directly with the COFHE model itself.

Section **IV.4** provides illustrations of how to use the economic multipliers generated by the COFHE model to assess the economic impacts of alternative fishery management strategies. However, as fishery management objectives have shifted from conserving fish stocks to restoring depleted fish stocks, it is more likely that users may sometimes want to examine the potential economic impacts of structural

changes in a fishery that will change input-output relationships and economic multipliers associated with some OCs. Increasing near-term restrictions on fishing, for example, may result in a predictable short-term decline in earnings in the fishery, and related multiplier impacts associated with some OCs that can be assessed using the "look-up" multiplier tables. However, if such efforts to rebuild fish abundance are successful they will eventually increase fish abundance and, therefore, catch per unit effort, and change associated input-output relationships for some OCs in ways that will eventually increase earnings and result in favorable multiplier impacts.

For this reason, this section provides guidance and illustrations for two distinct types of COFHE model applications, including:

- Typical application where users can use “look-up” tables of economic multipliers to assess and compare relatively short-term economic impacts of changes in fish markets and fishery management without referring directly to underlying COFHE model itself, and
- More complex applications where the sources of the economic impacts under investigation involve long-term structural changes in input-output relationships, for example changes in fish abundance and catch-effort and associated input-output relationships.

The above distinction is important for two reasons. First, multipliers generated by the COFHE model, like the multipliers from all input-output models, are reliable primarily when input-output relationships are relatively stable. In fisheries this means when fish stock abundance, as reflected by catch/effort relationships, is relatively stable so that changes in input purchases (effort) are roughly proportional to changes in output (catch). However, the purpose of fishery management is often to rebuild rather than merely conserve fish stocks. In this case, users of the COFHE model may be interested in the potential long-term economic payoff of expected increases in catch per unit effort (i.e., output per unit input), and how they are expected to result in "non-linear" increases in fishermen’s income and related economic impacts. In these situations, it will be necessary for users to employ the COFHE model directly rather than refer only to "look-up" tables. Users will need to adjust the input-output relationships specified in the COFHE model to reflect expected changes (fewer direct input purchases and more direct household income per unit output) and use the adjusted model to generate new multipliers. In other words, they will need to look at the dynamic aspects of fishery economic impacts by comparing the results of static runs of the COFHE model with current and expected future input/output relationships.

IV.1 The Basics of Input - Output (I/O) Analysis

General Overview of I/O Analysis

Firms in every industry are linked through their purchases and sales with firms in other industries and with households. Inter-industry linkages and the impact of activities in one industry on overall household income, employment, business sales, tax revenues, and other economic conditions are important but not always apparent by examining direct industry statistics. The purpose of an input-output model is to display direct, indirect, and induced economic linkages, and to measure impacts of changes or proposed changes in industrial activity or in government policies that are expected to change industrial activity.

Direct impacts are associated with the direct purchases of inputs (e.g., labor and intermediate inputs) by an industry to support an increase in industry output. **Indirect impacts** are associated with additional “rounds” of inter-industry purchases and sales that are generated as a result of direct impacts. **Induced**

impacts are from increases in household expenditures that result from increases in household income associated with direct and indirect impacts. The COFHE model is designed to show the economic linkages and impacts of California’s commercial fish harvesting industries and how they are affected by changes in fishing regulations.

The theoretical foundation for input-output analysis rests with eighteenth century French economists, but the technique was developed and refined during the 1950’s by a Harvard University economist, Wassily Leontief, who won the 1962 Nobel Prize for his work on I/O analysis (summarized in Leontief, 1986). Since then, I/O models that describe economic linkages in national economic systems have been developed routinely by industrialized and developing countries, and are used regularly by government agencies and affected industries to assess the impacts of economic policies and to identify “bottlenecks” in industrial development plans. Special-purpose state and regional I/O models, like the one described here for California fisheries, are also common. These versions are usually designed to show the economic impact of specific industries on specific regional economies, and are used by policy analysts to evaluate economic trade-offs, and to prepare for economic change.

All I/O models are fundamentally the same, but the intended use of the model determines which industrial activities and economic linkages are emphasized. The basic approach is to collect as much purchase and sales information as possible from each industry, describe where each industry buys inputs and sells outputs, and evaluate how changes in one industry or changes in the final demand for the output of one industry will work their way through the economic system. The best way to understand I/O analysis is to consider the inter-industry linkages in a very simple economy.

Illustration of I/O Analysis

Consider a simple regional economy with only three industrial activities which are called Sector A, Sector B, and Sector C. Table 27 describes such an economy by showing the dollar value of transactions among the three industries, and between each of them and households in the region.

Table 27. Illustrative Input-Output Transactions Table (in Millions of Dollars)

	Producing Sector			Consuming Sector		Total Sales
	Industry A	Industry B	Industry C	Exports	Households	
Producing Sector						
Industry A	10	5	3	1	12	31
Industry B	3	9	8	1	4	25
Industry C	8	4	6	3	3	24
Primary Inputs						
Households	4	5	6	0	4	19
Imports	6	2	1	0	4	13
Total Inputs	31	25	24	5	27	112

Reading down the column for each sector shows the value of goods and services purchased by the sector listed above the columns from each of the sectors listed along the rows. Reading across the row for each sector shows the value of goods and services sold by the sector listed along the row to each of the sectors listed above the columns. Imports, exports, and transactions with households are also shown in the I/O model.

The shaded row shows that during the period under consideration, Sector B sold \$3 million to firms in Sector A, \$9 million to other firms in Sector B, and \$8 million to Sector C. It also shows that Sector B sold \$4 million to households and exported \$1 million; total sales by Sector B were \$25 million.

The shaded column for Sector B shows firms in that sector purchased \$5 million from firms in Sector A, \$9 million from other firms in Sector B, and \$4 million from firms in Sector C. Sector B also purchased \$2 million from outside the region (imports) and \$5 million from households. In this model some of the \$5 million paid to households is in the form of profits (payments to the households that own businesses in the sector) as well as in the form of wages, rents, etc. As a result, the total purchases for Sector B, including purchases from households, are shown here to equal total sales.

Table 27 is referred to as a **Transactions Table** and is the foundation of I/O analysis. It is also a useful starting point for many types of production and marketing studies since it identifies where industries buy and sell and where economic activities are “leaking” outside the region because of imports.

Starting with the Transactions Table, it is simple to develop what is called a **Technical Coefficients Table** which shows the direct dollar purchases which are required from each row sector to support each dollar sales by each column sector.¹ Table 28 shows the technical coefficients derived from Table 27. The numbers in Table 28 show that for each \$1 of sales, Sector B purchases \$0.20 from Sector A, \$0.36 from Sector B, and \$0.16 from Sector C. Based on the assumption that an X% increase in the output by a given sector requires an X% increase in the purchase of inputs by that sector, the technical coefficients allows the determination of direct input-output requirements.

Table 28. Illustrative Inter-industry Technical Coefficients Table*

	Industry A	Industry B	Industry C
Industry A	0.32	0.20	0.13
Industry B	0.10	0.36	0.33
Industry C	0.26	0.16	0.25

* Dollars of direct input purchases from each producing sector listed in the rows by the producing sector listed in the column per dollar of output by the sector listed in the column.

The third table shown, Table 29, is called an **Interdependency Coefficients Table**. It shows the amount of sales generated directly and indirectly in each row sector by each dollar of sales by the column sector. Note from the above illustration that the purchase of \$0.16 by Sector B would also call for additional production of \$0.04 (.16 x .25) by Sector C as well as \$0.05 (.16 x .33) by Sector B, and so on. There are many additional rounds of indirect economic impacts and these are what are reflected in the numbers

¹ In the Technical Coefficients table, the column for each sector represents a linear cost function for that sector, but the columns are often referred to as production functions.

shown in Table 29. The end result of a \$1 increase in sales by Sector B is not just a \$0.16 increase in sales by Sector C, as shown in Table 28, but a \$0.69 increase. Given the input-output relationships in the illustrative economy, Table 29 shows that each \$1 of sales by Sector A, B, and C respectively increases total regional economic production by \$3.29, \$3.45, and \$3.42.

Table 29. Illustrative Total Inter-industry Requirements Table*

	Industry A	Industry B	Industry C
Industry A	1.82	0.73	0.64
Industry B	0.69	2.03	1.01
Industry C	0.78	0.69	1.77
Total	3.29	3.45	3.42

* Total local production required by each producing sector listed in the rows to satisfy each dollar of new demand from each producing sector listed in the columns. For purposes of this study, however, we developed interindustry requirement estimates per dollar of direct industry output, not per dollar of new final demand. (See Footnote 2 below)

It is not always necessary to refer directly to the I/O analysis to assess or compare economic impacts because the direct, indirect, and induced economic impacts of changes in industrial activity can be expressed most simply using **Multipliers**. Output Multipliers and Income Multipliers can be developed directly from the Interdependency Coefficients presented in Table 29, and additional employment statistics can be used to estimate Employment Multipliers. In each case, two types of multipliers can be developed: Type I Multipliers show the impact of inter-industry transactions only; Type II Multipliers include those impacts and the effects of transactions on household income and related changes in household spending. Because Type II Multipliers include additional “rounds” of spending by households, they are larger than Type I output, income and employment multipliers. Both types of multipliers are normally presented with the results of an I/O analysis. Because they are simpler to understand and facilitate most useful types of impact assessments, economic multiplier impacts, whether they involve jobs, household income, value added, taxes, or other measures, are often expressed per dollar (or per million dollars) of new final demand, or per dollar (or per million dollars) of direct output.² The multipliers developed through the COFHE model are presented per million dollars of direct sector output.

A description of how input-output multipliers can be used and abused is beyond the scope of this paper. However, details are provided in most introductory economic texts and at many university websites (e.g., Raa, 2006). A website at www.math.louisville.edu contains a step-by-step tutorial about input-output analysis and the development and use of regional multipliers.

² Because of certain income and production linkages, a \$1 increase in the final demand for a sector's output can result in more than a \$1 increase in that sector's output. This can affect the estimation of multipliers. In California commercial fisheries, however, this is not the case; changes in output (landings) are usually a result of changes in fishing conditions or fishery policies, and do not influence and are not influenced by changes in consumer demand. The models developed here will also be used most often to examine changes in fishing conditions and policies that constrain fishing sector output. For these reasons, the multipliers estimated in this study are based on changes in sector output, not changes in final demand.

Description of IMPLAN

The particular regional input-output modeling system used to develop the COFHE model is called the IMPLAN system (Minnesota IMPLAN Group, 2008). This system includes state and county I/O models that separate economic activity into 509 industrial sectors, and a set of primary or non-industrial sectors to reflect payments to households, taxes, and so on. IMPLAN was developed during the 1970s by the U.S. Forest Service, but was privatized in 1993 and is now maintained and updated routinely by the Minnesota IMPLAN Group. Customized IMPLAN models are used extensively by federal and state government agencies and industry and trade groups to evaluate all sorts of economic impacts. The Minnesota IMPLAN Group maintains a website and online IMPLAN users forum with an enormous amount of information about I/O models in general, and about IMPLAN in particular (www.IMPLAN.com).

Fishery-related I/O Analysis

I/O models of fisheries can be divided into three categories: those that address commercial fishing, those that address recreational fishing, and those that address both. The COFHE model addresses only commercial fishing.

An extensive review of all fishery-oriented I/O models was prepared in 1986 (Andrews and Rossi, 1986) and a review of all fishery-oriented economic impact models, which included mostly I/O models and some lesser used types of economic impact models, was prepared in 2006 (Seung and Waters, 2006). The following section describes the options for developing regional fishery-oriented I/O models and how King and Associates decided to develop the COFHE model. In general, the approach was to develop the COFHE model in the simplest way possible so that users who have only a basic understanding of I/O analysis will know how economic impacts were generated, and how to modify impact estimates to take account of changes in I/O relationships.

IV.2 Development of the COFHE Model

General Approach

Standard IMPLAN models that include 509 industrial sectors based on the North American Industrial Classification System (NAICS), including one fish harvesting sector (IMPLAN Sector 16), are available for each U.S. state and county.³ The input-output relationships specified for Sector 16 within the IMPLAN model are based on national average revenues and costs for all vessel and gear types across all types of U.S. fisheries. This is too highly aggregated to reflect input-output relationships associated with the varied and relatively unique types of commercial fishing that takes place in California.

There are two ways to customize IMPLAN applications to estimate economic impacts related to specific regional fisheries. The first and most direct method is to replace Sector 16 with a number of more specific regional fishing sectors (i.e. the 20 OCs). The second method is more complex, less transparent, and involves leaving the IMPLAN model intact, developing sets of final demand changes that reflect the allocation of input purchases by an individual OC, and using the economic impacts generated by those assumed changes in final demand to reflect the economic impact of changes in intermediate input

³ NAICS replaced the Standard Industrial Classification (SIC) system in 1997. NAICS is the standard system used by federal agencies in classifying business establishments for the purposes of collecting data related to the US economy. This system was developed in cooperation with Canada and Mexico to allow business statistics to be comparable between countries (<http://www.census.gov/eos/www/naics/>).

purchases by that particular OC. If the production functions used to reflect the allocation of input purchases per dollar of output using the first method are the same as the entries used to reflect the allocation of "final demand" purchases using the second method, then both approaches, with one simple adjustment to prevent double counting direct industry output, should yield more or less the same results.

Considering the wide range of potential users and uses of the COFHE model, King and Associates decided to keep the specification of the model simple and chose the first approach. The COFHE model was developed, therefore, by replacing Sector 16 of IMPLAN with 20 new sectors that correspond to the 20 OCs described in Part 1.

Once the decision was made to include OCs directly in the inter-industry matrix, there was an additional important choice to be made. One could eliminate Sector 16 and add 20 new fishing sectors to the remaining set of 508 IMPLAN sectors, or one could eliminate Sector 16 and replace it and 19 other existing IMPLAN sectors that are either unimportant in California and/or have no direct, indirect, or induced economic relationship with California fisheries.

For a variety of reasons, including previous experience and advice from IMPLAN staff and other IMPLAN users, the decision was made to replace rather than add IMPLAN sectors. King and Associates simulated a \$1 million increase in output in the existing fishing sector (Sector 16) in the state of California IMPLAN model, and selected existing IMPLAN sectors to replace that showed no resulting direct, indirect, or induced economic impacts (e.g., IMPLAN Sector 7, Tobacco Farming); there were 16 sectors in this category. Three other IMPLAN sectors that had very low (\leq \$6) total output impacts resulting from a \$1 million simulated increase in fishing output (Sector 16) were also replaced; and the final sector replaced was the existing commercial fishing sector itself (IMPLAN Sector 16). Replacing these twenty IMPLAN sectors which have no link with California fisheries with the 20 new OCs representing fishing sectors will not result in any significant loss of direct, indirect, or induced "rounds" of economic impacts associated with fishing activity. A list of OCs and the IMPLAN sectors they replace is included as Table 30.

Table 30. IMPLAN Sectors Replaced with California Operational Configurations (OCs).

IMPLAN Sector	Sector Description	OC Code	Operational Configuration Name
1	Oilseed farming	1	Trawl - Northern California
7	Tobacco Farming	2	Trawl - Southern California
15	Forest nurseries, forest products, and timber tracts	3	CPS Seine
16	Fishing	4	Herring Gillnet
20	Coal mining	5	Other Gillnet
21	Iron ore mining	6	Salmon
22	Copper, nickel, lead, and zinc mining	7	Salmon & Albacore
24	Stone mining and quarrying	8	Salmon & Dungeness Crab – Small Vessels
29	Support activities for other mining	9	Salmon & Dungeness Crab – Medium and Large Vessels
33	New residential 1-unit structures, non-farm	10	Dungeness Crab - Small Vessels
34	New multifamily housing structures, non-farm	11	Dungeness Crab– Medium and Large Vessels
35	New residential additions and alterations, non-farm	12	Longline
36	New farm housing units, additions, and alterations	13	Harpoon/Spear
37	Manufacturing and industrial buildings	14	Hook & Line
38	Commercial and institutional buildings	15	Hook & Line Live
39	Highway, street, bridge, and tunnel construction	16	Lobster & Crab
40	Water, sewer, and pipeline construction	17	Nearshore & Groundfish Trap
41	Other new construction	18	Prawn Trap
44	Maintenance and repair of highways, streets, and bridges	19	Sea Urchin
52	Soybean processing	20	Tuna/Other Seine

Replacing IMPLAN sectors

The procedure for replacing a sector in IMPLAN is described in the IMPLAN manual and on the IMPLAN website, but essentially involves accessing the IMPLAN model, changing the sector name, editing the study area data to reflect the characteristics of the new sector, and then replacing the production function for the original sector with a new production function based on the new sector.⁴

Calculating production functions for the new OC sectors involved two steps. First, convert the OC expenditure data generated by the survey research described in Part 1 of this report (\$ spending by expense category) into input purchase data (\$ purchases from specific IMPLAN industrial and value added sectors). Second, for each OC, divide the estimated dollar purchases from each IMPLAN sector by the total value of output (landings value) for that OC.

One adjustment to survey results was necessary to develop the production functions for the OC sectors. Initially, the survey data related to output (landings), costs, and earnings for each fisherman in each OC were combined in the following basic equation:

Net earnings (profits) = total value of landings (output) - input purchases from all industrial sectors within CA - all purchases outside CA - wages, salaries and other payments to labor - taxes.

However, some fishing operations had such negative profits that the total net earnings for some OCs were negative during 2006. Because I/O models are linear models, leaving negative net earnings for an OC would result in impact estimates showing that an increase in landings by that OC would result in a decrease in net earnings and in related economic impacts. Eliminating those fishermen with negative net revenues on the assumption that they are not representative of long-term operators would have solved the problem, but would have prevented the utilization of a great deal of otherwise useful cost data provided by those fishermen. After considering and testing that option and others, and consulting with other researchers who have experienced similar survey results that reflect temporary economic losses in fisheries, the decision was made to substitute \$1 in net earnings for each survey respondent with negative net earnings in a given OC.⁵ This resulted in positive net earnings for all OCs and preserved useful cost data obtained from fishermen with negative net revenues without significantly biasing analytical results. However, it did result in fleet-wide output for some OCs in the models being somewhat higher than reported output for those OCs based on CDFG data.

⁴ Within the context of input-output models a set of gross absorption coefficients that show the input purchases from various row sectors per dollar of output by a column sector represents a cost function. Because COFHE models are regional, however, "regional absorption coefficients" are used which show purchases within the region from various row sectors per dollar of output by a column sector; and purchases from outside the region from any sector are lumped together in a separate row sector called "imports." The technical coefficients in these regional models, therefore, reflect only regional purchases of inputs per \$1 of sector output and do not represent "cost functions."

⁵ The other option considered here involved discarding survey results from fishermen reporting negative income. NOAA economists constructing similar models encountered similar problems. The authors agreed with their conclusion that the survey data regarding the distribution of input costs from these fishermen are valid and important and should not be discarded. The approach used, which makes use of these cost data, was preferable to ignoring these survey results. Trial model runs comparing multiplier and impact estimates using survey results that include and exclude responses from fishermen reporting negative earnings showed minimal differences in estimated economic impacts.

Replacing negative earnings with \$1 in positive earnings resulted in somewhat higher overall earnings for some OCs, and required that the control totals (landings values) for those OCs be increased by a comparable amount so that the technical coefficients used to describe the allocation of input purchases summed to one. However, in order to keep the total output statistics in the COFHE model consistent with the CDFG statistics, King and Associates used the production functions developed using the adjusted survey results with the CDFG control totals for each OC to develop a revised transactions table.⁶

Generating Study Area Data

Study area data consist of output, value added and employment.⁷ The output and employment data for each OC in each study area were derived directly from CDFG landings data. Statewide value added was calculated by multiplying the coefficient of each value added component by the statewide landings value (output) for each OC.⁸

Output for each OC in each region and county had already been derived during Part 1 (Table 6) from CDFG landings data. Value added information for each county was calculated by multiplying the statewide value added coefficients by county-specific OC output. Jobs/output was calculated on a statewide basis for each OC and then multiplied by the county-specific OC output to estimate the number of jobs per OC in each county. To generate study area data for the regional versions of the COFHE model, output, employment, and value added information were summed for each county within the region.

COFHE Model Construction

Once the background study area data calculations were complete, King and Associates created new IMPLAN models for the state and each county and region that included the 20 new sectors representing the 20 OCs. The assumption was made that each OC in each county and region in the state has the same production and cost functions (input-output relationships) but may have very different regional spending patterns. Prior to any model construction, the production functions for all OCs were saved to the "production function library" within IMPLAN. Then, models for each of the 27 study areas (22 California counties, four California regions, and the state) were constructed using the following steps:

1. A new model was created for each study area.
2. The Access version of the model was opened, and the "Industry/Commodity Codes" and "Type Codes" tables were replaced with tables that contained the names of the new sectors substituted for the original IMPLAN sectors.
3. The study area data (value added, employment and output) for each new sector/OC was manually entered, overwriting existing data for the sector being replaced. When an OC did not exist in a given study area, existing values in the sector being replaced were zeroed out.
4. Social accounts were created.

⁶ The coefficients and multiplier impacts per dollar change in OC output are the same regardless of the OC control total. This adjustment was made only to make the numbers in various tables match and avoid confusion.

⁷ In IMPLAN, employment refers to the total number of jobs (full and part-time), not full-time equivalents. Many California fishermen work part-time in multiple fisheries. Therefore, the sum of employment (full and part time jobs) across fisheries in California is greater than the number of fishermen participating in California fisheries.

⁸ The four components of value added are employee compensation, proprietor's income, other property income, and indirect business tax.

5. Using the “edit production function” tool, the production functions were retrieved for each OC from the library, and the “Balance Value Added” option was selected.
6. Social accounts were then rerun.
7. Using the “edit byproducts” tool, byproducts were edited because a number of the sectors that were replaced produce multiple commodities.⁹ Byproducts were manually edited so that each of the new fishing sectors only produced one commodity (i.e., the target of the OC).
8. Social accounts were rerun a final time, and the final model was constructed with Type II multipliers.

IV.3 Results from the COFHE Model

Statewide COFHE Multipliers

This section contains tables of economic impact coefficients and multipliers generated for the state of California using the COFHE model. Table 31 through Table 37 show the statewide direct, indirect, induced and total economic impacts of a \$1 change in output (landings) in each OC on the following: Output (Table 31), Value Added (Table 32), Labor Income (Table 33), Employee Compensation (Table 34), Proprietor’s Income (Table 35), Other Property Income (Table 36), and Indirect Business Taxes (Table 37). Table 38 shows Employment impacts of a \$1 million dollar change in output for each OC. Table 39 defines the terms that are used to describe various types of economic impacts in these tables. As discussed elsewhere, these multiplier impacts are estimated per dollar of direct output for each OC, and not per dollar of new final demand for the output of each OC. Further explanations are provided in the following sections.

Regional and County COFHE Multipliers

Sets of multipliers with the same definitions and characteristics as the statewide multipliers shown in Tables 31 through 38 are available for each of the four regions and 22 counties that are included in the COFHE model. These are available electronically at the CDFG website (<http://www.dfg.ca.gov/marine/>) and can be used as described above to determine the impacts of federal, state, regional, and county fishery management policies on regional or county economies. Economic impacts estimated at various scales are "nested" in the sense that statewide impacts are distributed among regions, and regional impacts are distributed among counties within each region. Differences between impacts in the state and in any particular region accrue to other regions as reflected in the tables for those regions. Those impacts that do not accrue to any of the four coastal regions, but are shown to accrue in the state, impact "the rest of the state".

Use of COFHE Multipliers

In general, using these multipliers to estimate statewide economic impacts of changes in fishery management policies involves three steps. First, estimate how the policy change is expected to affect the landings of each OC. Second, multiply those direct changes in the value of OC landings by the appropriate multipliers from these tables to estimate the economic impacts of policy changes related to each OC. Third, add the economic impacts associated with all OCs in the study area of interest (e.g., the

⁹ For example, the industry Soybean Processing (sector 52) was replaced with Tuna Seiners (OC 20). Soybean Processing produces commodities in soybean processing (88.5%), flour milling (1.2%), and fats and oils refining and blending (10.3%). Editing the byproducts meant deleting the latter two byproducts described above so that everything produced by the “new” industry is in sector 52.

state or San Diego County) to determine the overall economic impacts of the policy changes in that study area.

Background Data and Documentation

The Transactions, Technical Coefficients (production functions), and Inter-industry Interdependence Tables that form the basis of the 27 I/O models that make up the COFHE model include well over 500 rows and 500 columns each. Since these will be of little interest to the general user of the COFHE model and would take up many pages, they are not included here. Interested readers can contact CDFG to obtain electronic copies of these underlying Input-Output tables.

Special Case Applications

The look-up tables described and illustrated below (Tables 31 through 38) are used in the most typical situation where economic impacts are being assessed under conditions where fish stock abundance is relatively stable, and a change in landed value is associated with a proportional change in fishing effort and associated input purchases. This "typical" situation is described more fully in the following section as part of Illustration 1.

In some situations, however, landing values for an OC may change as a result of changes in fish abundance, for example as a result of a successful fish stock rebuilding program, with no corresponding change in fishing effort or associated fishing costs. Economic impacts in this case are associated with changes in fishermen income (proprietor's income), not changes in fishing input purchases. Because changes in fish abundance do not necessarily change the level of fishing effort or associated input purchases, in other words, their impacts, somewhat surprisingly, can be estimated without ever referring to the economic multipliers developed for any particular OC. Assessing economic impacts of changes in fish abundance when there is no associated change in fishing effort requires information only about how the change in fish abundance affects fishermen's income and the indirect and induced economic impacts of changes in fishermen's income.

Table 31. Direct, Indirect, and Induced Output Multipliers for the State of California

**California State Model
Output Effects (per \$1 of Sector Output)**

Sector #	Industry	Output			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	1.000000	0.157398	0.761073	1.918471
7	Trawl - Southern California	1.000000	0.478548	0.621735	2.100284
15	CPS Seine	1.000000	0.104635	0.839207	1.943841
16	Herring Gillnet	1.000000	0.501883	0.272540	1.774423
20	Other Gillnet	1.000000	0.560064	0.516185	2.076249
21	Salmon	1.000000	0.647435	0.346116	1.993551
22	Salmon & Albacore	1.000000	0.595575	0.360100	1.955675
24	Salmon & Dungeness Crab – Small Vessels	1.000000	0.557012	0.481445	2.038457
29	Salmon & Dungeness Crab – Medium and Large Vessels	1.000000	0.344622	0.650989	1.995611
33	Dungeness Crab - Small Vessels	1.000000	0.413674	0.564044	1.977718
34	Dungeness Crab– Medium and Large Vessels	1.000000	0.187314	0.746530	1.933843
35	Longline	1.000000	0.308046	0.665408	1.973454
36	Harpoon/Spear	1.000000	0.460222	0.526523	1.986745
37	Hook & Line	1.000000	0.669752	0.357249	2.027002
38	Hook & Line Live	1.000000	0.605724	0.409830	2.015554
39	Lobster & Crab	1.000000	0.446213	0.566867	2.013080
40	Nearshore & Groundfish Trap	1.000000	0.548300	0.414999	1.963299
41	Prawn Trap	1.000000	0.261228	0.682268	1.943496
44	Sea Urchin	1.000000	0.504400	0.478604	1.983003
52	Tuna/Other Seine	1.000000	0.070415	0.914868	1.985283

Table 32. Direct, Indirect, and Induced Value Added Multipliers for the State of California

California State Model

Total Value Added Effects (per \$1 of Sector Output)

Sector #	Industry	Total Value Added		
		Direct Effects	Indirect Effects	Induced Effects
1	Trawl - Northern California	0.764204	0.084599	0.451283
7	Trawl - Southern California	0.510777	0.267401	0.368662
15	CPS Seine	0.860317	0.056494	0.497613
16	Herring Gillnet	0.249737	0.269352	0.161605
20	Other Gillnet	0.402773	0.312742	0.306075
21	Salmon	0.251005	0.342667	0.205232
22	Salmon & Albacore	0.299564	0.317323	0.213523
24	Salmon & Dungeness Crab – Small Vessels	0.383775	0.282440	0.285476
29	Salmon & Dungeness Crab – Medium and Large Vessels	0.611761	0.182054	0.386008
33	Dungeness Crab - Small Vessels	0.509415	0.218209	0.334454
34	Dungeness Crab– Medium and Large Vessels	0.748767	0.098030	0.442660
35	Longline	0.631739	0.160222	0.394558
36	Harpoon/Spear	0.466397	0.244188	0.312205
37	Hook & Line	0.250079	0.351421	0.211833
38	Hook & Line Live	0.311459	0.311089	0.243011
39	Lobster & Crab	0.489494	0.235907	0.336127
40	Nearshore & Groundfish Trap	0.348464	0.281544	0.246076
41	Prawn Trap	0.689703	0.131223	0.404555
44	Sea Urchin	0.422830	0.264557	0.283791
52	Tuna/Other Seine	0.904620	0.038471	0.542477

Table 33. Direct, Indirect, and Induced Labor Income Multipliers for the State of California

California State Model

Labor Income Effects (per \$1 of Sector Output)

Sector #	Industry	Labor Income			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	0.685245	0.051253	0.248637	0.985135
7	Trawl - Southern California	0.440568	0.161092	0.203116	0.804776
15	CPS Seine	0.777720	0.034389	0.274162	1.086271
16	Herring Gillnet	0.099689	0.164051	0.089037	0.352777
20	Other Gillnet	0.310947	0.188571	0.168634	0.668152
21	Salmon	0.125703	0.209237	0.113073	0.448014
22	Salmon & Albacore	0.155229	0.193243	0.117642	0.466114
24	Salmon & Dungeness Crab – Small Vessels	0.296861	0.169038	0.157284	0.623183
29	Salmon & Dungeness Crab – Medium and Large Vessels	0.518544	0.111424	0.212673	0.842641
33	Dungeness Crab - Small Vessels	0.413527	0.132304	0.184269	0.730100
34	Dungeness Crab– Medium and Large Vessels	0.662628	0.059797	0.243885	0.966310
35	Longline	0.546699	0.097223	0.217384	0.861306
36	Harpoon/Spear	0.361229	0.148292	0.172011	0.681532
37	Hook & Line	0.131537	0.214177	0.116711	0.462424
38	Hook & Line Live	0.206153	0.190443	0.133888	0.530484
39	Lobster & Crab	0.404686	0.143877	0.185191	0.733754
40	Nearshore & Groundfish Trap	0.228287	0.173312	0.135577	0.537176
41	Prawn Trap	0.579095	0.081142	0.222892	0.883129
44	Sea Urchin	0.303328	0.159822	0.156356	0.619506
52	Tuna/Other Seine	0.862077	0.023249	0.298880	1.184207

Table 34. Direct, Indirect, and Induced Employee Compensation Multipliers for the State of California

California State Model

Employee Compensation Effects (per \$1 of Sector Output)

Sector #	Industry	Employee Compensation			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	0.175501	0.043792	0.213403	0.432695
7	Trawl - Southern California	0.144826	0.141886	0.174333	0.461045
15	CPS Seine	0.081214	0.029457	0.235311	0.345982
16	Herring Gillnet	0.072453	0.140931	0.076420	0.289804
20	Other Gillnet	0.072527	0.165243	0.144737	0.382507
21	Salmon	0.068214	0.180553	0.097050	0.345817
22	Salmon & Albacore	0.073728	0.165847	0.100971	0.340546
24	Salmon & Dungeness Crab – Small Vessels	0.161357	0.143923	0.134996	0.440275
29	Salmon & Dungeness Crab – Medium and Large Vessels	0.094073	0.095666	0.182536	0.372275
33	Dungeness Crab - Small Vessels	0.141552	0.114774	0.158157	0.414483
34	Dungeness Crab– Medium and Large Vessels	0.125116	0.051320	0.209325	0.385761
35	Longline	0.232770	0.083050	0.186579	0.502399
36	Harpoon/Spear	0.053918	0.126580	0.147636	0.328133
37	Hook & Line	0.097877	0.185017	0.100172	0.383066
38	Hook & Line Live	0.079168	0.164052	0.114915	0.358135
39	Lobster & Crab	0.062198	0.125286	0.158948	0.346432
40	Nearshore & Groundfish Trap	0.089179	0.149368	0.116365	0.354912
41	Prawn Trap	0.070849	0.069940	0.191306	0.332095
44	Sea Urchin	0.082279	0.137109	0.134199	0.353587
52	Tuna/Other Seine	0.060606	0.019900	0.256527	0.337033

Table 35. Direct, Indirect, and Induced Proprietor's Income Multipliers for the State of California

California State Model

Proprietor's Income Effects (per \$1 of Sector Output)

Sector #	Industry	Proprietor's Income			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	0.509744	0.007461	0.035234	0.552439
7	Trawl - Southern California	0.295741	0.019206	0.028783	0.343730
15	CPS Seine	0.696506	0.004932	0.038851	0.740289
16	Herring Gillnet	0.027237	0.023119	0.012617	0.062973
20	Other Gillnet	0.238421	0.023328	0.023897	0.285645
21	Salmon	0.057489	0.028684	0.016023	0.102197
22	Salmon & Albacore	0.081501	0.027396	0.016671	0.125568
24	Salmon & Dungeness Crab – Small Vessels	0.135504	0.025115	0.022288	0.182908
29	Salmon & Dungeness Crab – Medium and Large Vessels	0.424472	0.015758	0.030137	0.470367
33	Dungeness Crab - Small Vessels	0.271975	0.017530	0.026112	0.315617
34	Dungeness Crab– Medium and Large Vessels	0.537512	0.008477	0.034560	0.580549
35	Longline	0.313929	0.014173	0.030805	0.358907
36	Harpoon/Spear	0.307311	0.021712	0.024375	0.353399
37	Hook & Line	0.033660	0.029160	0.016539	0.079359
38	Hook & Line Live	0.126985	0.026391	0.018973	0.172349
39	Lobster & Crab	0.342487	0.018591	0.026243	0.387322
40	Nearshore & Groundfish Trap	0.139108	0.023944	0.019212	0.182264
41	Prawn Trap	0.508246	0.011202	0.031585	0.551034
44	Sea Urchin	0.221049	0.022713	0.022157	0.265919
52	Tuna/Other Seine	0.801471	0.003349	0.042354	0.847174

Table 36. Direct, Indirect, and Induced Other Property Income Multipliers for the State of California

California State Model

Other Property Type Income Effects (per \$1 of Sector Output)

Sector #	Industry	Other Property Type Income			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	0.022077	0.021635	0.157882	0.201594
7	Trawl - Southern California	0.019136	0.073057	0.128977	0.221170
15	CPS Seine	0.014140	0.014571	0.174091	0.202802
16	Herring Gillnet	0.054317	0.069800	0.056538	0.180655
20	Other Gillnet	0.036513	0.085147	0.107081	0.228741
21	Salmon	0.051219	0.088314	0.071801	0.211334
22	Salmon & Albacore	0.067683	0.081709	0.074702	0.224093
24	Salmon & Dungeness Crab – Small Vessels	0.006076	0.075644	0.099874	0.181594
29	Salmon & Dungeness Crab – Medium and Large Vessels	0.029530	0.046292	0.135046	0.210868
33	Dungeness Crab - Small Vessels	0.012119	0.058215	0.117009	0.187344
34	Dungeness Crab– Medium and Large Vessels	0.018486	0.025351	0.154866	0.198703
35	Longline	0.025421	0.041411	0.138037	0.204869
36	Harpoon/Spear	0.052609	0.062383	0.109226	0.224218
37	Hook & Line	0.030699	0.092297	0.074110	0.197107
38	Hook & Line Live	0.029802	0.079893	0.085018	0.194713
39	Lobster & Crab	0.017751	0.061836	0.117595	0.197182
40	Nearshore & Groundfish Trap	0.039265	0.070962	0.086090	0.196318
41	Prawn Trap	0.019636	0.032755	0.141534	0.193925
44	Sea Urchin	0.029189	0.069926	0.099285	0.198399
52	Tuna/Other Seine	0.012059	0.009901	0.189787	0.211747

Table 37. Direct, Indirect, and Induced Indirect Business Taxes Multipliers for the State of California

California State Model

Indirect Business Taxes Effects (per \$1 of Sector Output)

Sector #	Industry	Indirect Business Taxes			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	0.056882	0.011711	0.044764	0.113357
7	Trawl - Southern California	0.051073	0.033252	0.036569	0.120894
15	CPS Seine	0.068457	0.007534	0.049360	0.125351
16	Herring Gillnet	0.095731	0.035501	0.016030	0.147262
20	Other Gillnet	0.055313	0.039025	0.030360	0.124699
21	Salmon	0.074083	0.045116	0.020358	0.139557
22	Salmon & Albacore	0.076653	0.042372	0.021180	0.140204
24	Salmon & Dungeness Crab – Small Vessels	0.080838	0.037758	0.028317	0.146913
29	Salmon & Dungeness Crab – Medium and Large Vessels	0.063687	0.024338	0.038289	0.126314
33	Dungeness Crab - Small Vessels	0.083768	0.027689	0.033175	0.144633
34	Dungeness Crab– Medium and Large Vessels	0.067654	0.012881	0.043909	0.124443
35	Longline	0.059619	0.021587	0.039137	0.120344
36	Harpoon/Spear	0.052559	0.033512	0.030968	0.117040
37	Hook & Line	0.087843	0.044947	0.021012	0.153802
38	Hook & Line Live	0.075504	0.040754	0.024105	0.140362
39	Lobster & Crab	0.067057	0.030193	0.033341	0.130592
40	Nearshore & Groundfish Trap	0.080912	0.037270	0.024409	0.142591
41	Prawn Trap	0.090972	0.017326	0.040129	0.148427
44	Sea Urchin	0.090314	0.034809	0.028150	0.153273
52	Tuna/Other Seine	0.030483	0.005320	0.053810	0.089614

Table 38. Direct, Indirect, and Induced Employment Multipliers for the State of California

California State Model

Employment Effects (per \$million of Sector Output)

Sector #	Industry	Employment			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
1	Trawl - Northern California	8.736587	0.996073	5.598445	15.331105
7	Trawl - Southern California	29.969845	4.020573	4.573479	38.563897
15	CPS Seine	4.215650	0.681394	6.173195	11.070240
16	Herring Gillnet	213.002518	3.315430	2.004805	218.322752
20	Other Gillnet	23.663147	4.527082	3.797056	31.987285
21	Salmon	120.899811	4.272575	2.546027	127.718413
22	Salmon & Albacore	110.634270	3.787865	2.648888	117.071023
24	Salmon & Dungeness Crab – Small Vessels	43.211334	3.387939	3.541502	50.140776
29	Salmon & Dungeness Crab – Medium and Large Vessels	13.202336	2.210238	4.788669	20.201242
33	Dungeness Crab - Small Vessels	43.290043	2.724747	4.149105	50.163895
34	Dungeness Crab– Medium and Large Vessels	8.422259	1.159816	5.491467	15.073542
35	Longline	38.488274	1.914074	4.894737	45.297085
36	Harpoon/Spear	40.368099	2.938477	3.873095	47.179671
37	Hook & Line	432.529633	4.592621	2.627923	439.750176
38	Hook & Line Live	151.975250	3.903198	3.014702	158.893151
39	Lobster & Crab	21.578495	3.105995	4.169867	28.854357
40	Nearshore & Groundfish Trap	81.911232	3.455154	3.052729	88.419115
41	Prawn Trap	9.256892	1.550592	5.018754	15.826239
44	Sea Urchin	38.070057	3.253822	3.520605	44.844484
52	Tuna/Other Seine	8.540385	0.445111	6.729758	15.715254

Table 39. Definitions of Terms Included in Tables 31 through 38*

IMPLAN Term	Definition
Direct Effects	The impacts associated with the direct purchases of inputs (e.g., labor and intermediate inputs) by an industry to support a \$ 1 increase in industry output.
Indirect Effects	The impacts associated with additional “rounds” of inter-industry purchases and sales that are generated as a result of direct impacts. Indirect impacts include the direct impacts of purchases of inputs (e.g., labor and intermediate inputs) by industries that sell to the industry responsible for the direct impacts, and by the industries that sell to those industries, and so on.
Induced Effects	The impacts associated with increases in household expenditures that result from increases in household income associated with direct and indirect impacts. The inclusion of induced impacts based on “income effects” is what distinguishes Type II multiplier Effects from Type I multiplier effects.
Total Effects	The total of all direct, indirect, induced impacts.
Industry Output	Total industry production, equal to shipments plus net additions to inventory.
Employment	Annual average number of full and part-time jobs, including self-employed individuals.
Employee Compensation	Total payroll costs, including wages and salaries plus benefits.
Indirect Business Tax	Sales, excise fees, licenses and other taxes paid during normal operation. This includes all payments to the government except for taxes based on income.
Labor Income	Sum of Employee Compensation and Proprietor’s Income
Other Property Income	Includes corporate income, rental income, interest and corporate transfer payments.
Proprietor Income	Income from self-employment.
Total 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.

*Source: Adapted from IMPLAN User Guide, Version 2.0

IV.4 Illustrations of the Use of Economic Multipliers

Background

The COFHE model will be used most often to assess and compare state, regional, or county-level economic impacts of changes in fishing regulations. In most cases this can be accomplished using the multiplier tables developed from the COFHE model without using the COFHE model directly, as described in section IV.3. However, there are occasions where new fishing restrictions are expected to result in negative short term economic impacts; but to result, eventually, in long term improvements in fishing conditions, higher fishermen earnings, and positive long term economic impacts. There may be occasions, in other words, when it will be useful to compare the negative short-term economic impacts that must be endured to achieve fish stock rebuilding targets with the potential positive economic impacts of achieving them.

This section provides three illustrations of how the COFHE model can be used to examine the costs and benefits of fishery management strategies. In each case, the illustrations are limited to showing expected changes in annual economic impacts associated with a hypothetical OC with no accounting for time (e.g., how many years a restriction might be in place or how many years it might take for stocks to rebuild) or risk (e.g., the likelihood that fishing restrictions may adversely affect markets or that stock rebuilding will not succeed.)

The use of the COFHE model becomes increasingly complicated as the types of changes in the fishery that are being addressed become sophisticated. The following three illustrations show progressively more complex applications. Illustration 1 is the most simple and most typical application where the model is used to show the near-term costs and adverse economic impacts of new fishing regulations that restrict the allowable harvest or limit fishing effort.

Illustration 2 is more complicated and shows how the model might be used to measure future benefits and positive economic impacts of fishing restrictions if they succeed at increasing stock abundance resulting in more revenues and fishermen earnings per unit fishing effort. Illustration 3 is the most complicated and shows how the model might be used to estimate future benefits and positive economic impacts of current fishing restrictions if they both increase stock abundance and result in a greater allowable harvest.

Attempting the types of analysis shown in Illustrations 2 and 3 will require more advanced understanding of both input-output modeling and fishery economics than the simple application shown in Illustration 1. Illustrations 2 and 3 are therefore written for analysts with more advanced training in IMPLAN modeling.

Illustration 1: Near-term economic impacts of changes in fishery regulations

Based on legal mandates and the advice of scientists to restore fish stocks, suppose that fishery managers decide they need to reduce the allowable annual commercial harvest of a particular OC by 500,000 pounds. Fishery managers reduce days-at-sea limits for the OC to levels they expect will reduce OC landing by 500,000 pounds. The planner for San Diego County is interested in determining what impact this is likely to have on the county's economy to determine if the county should take any action to mitigate local economic hardships or apply for federal assistance.

Using the COFHE Model (for illustration purposes only)

Using the results of the COFHE model to assess near-term economic impacts of changes in a fishing restriction, which reduces an OC’s output by limiting days at sea or the allowable harvest, involves a three step process:

1. Determine how the change is expected to increase or decrease the expected value of landings by one or more of the 20 OCs.
2. Identify the study area of interest. Within the COFHE model, this can be specified as the state of California, one or more of four regions within the state, one or more counties within those regions, or any combination.
3. Find the multipliers of interest for each OC identified in Step 1 in the COFHE multiplier tables that correspond with the study area of interest identified in Step 2, and multiply the expected direct change in landed value by each OC identified in Step 1 by the appropriate impact effect coefficients from the appropriate look-up tables.

The San Diego County planner in this illustration would thus take the following steps:

Step 1

Assuming 2006 ex-vessel fish prices of \$1.50/pound, the 500,000 pound reduction in landings will reduce the statewide landed value (output) of the OC by \$750,000.

Step 2

San Diego County includes home ports for roughly 50% of vessels in the OC, and landings in the county usually account for 50% of statewide landings by the OC. Based on the results of Step 1 the county planner estimates that output (landings) by this OC in the county will go down by \$375,000 (50% of \$750,000).

Step 3

The planner refers to the multiplier tables from the San Diego County version of the COFHE model (Table 40) and multiplies the "effects coefficients" that represent the direct, indirect, induced, and total effects per \$1 in landed value for the OC in that county by the expected \$375,000 decline in OC landings in the county.

The results of Step 3 show the total (direct, indirect, and induced) economic impacts of this change in fishing regulations on the San Diego County economy, as illustrated in Table 41.

Table 40. Direct, Indirect, Induced, and Total effects per \$1 output (For Illustration # 1)

Impact Type	Direct	Indirect	Induced	Total
Output (per \$1 direct output)	1.000000	0.308046	0.665408	1.973454
Value Added (per \$1 direct output)	0.631739	0.160222	0.394558	1.186519

Table 41. Economic Impacts of Proposed Reductions in Allowable Days at Sea Limits for an OC (For Illustration # 1)

Impact Type	Direct	Indirect	Induced	Total
Output	-\$375,000	-\$115,517	-\$249,528	-\$740,045
Value Added	-\$236,902	-\$60,083	-\$147,959	-\$444,945

Illustration 2: Potential Year 5 Economic Benefits of current Catch or Effort Restrictions

Proposed gear restrictions that are expected to reduce the harvest of a particular OC are being challenged by some state political leaders because of the negative short term economic impacts they will have on fishing industries. Fishery managers argue that accepting these fishing restrictions now will result in a 10% increase in fish stock abundance within five years, and increase fishermen incomes enough to justify the near-term sacrifice. To support their position they are interested in an analysis that provides numerical estimates of the economic impacts of increasing stock abundance by 10%.

Fishing effort is a commonly used index of the amount of input used in fishing, and catch per unit effort (CPUE) is a commonly used index of fish abundance. For purposes of this analysis, therefore, 10% higher stock abundance corresponds with a 10% increase in CPUE. If fishing effort and costs are assumed to be constant the only direct effect of a 10% increase in CPUE is a 10% increase in the value of landings by this OC which will all contribute directly to fishermen earnings (proprietor’s income).

Using the COFHE Model (for illustration purposes only)

For the sake of illustration, assume a constant fish price of \$1.50 per pound, and that the OC operates exclusively in the fishery being regulated and lands fish worth \$500,000 per year in the year when the fishing restrictions will take place. Within the COFHE model a 10% increase in fish abundance and CPUE can be reflected as a \$50,000 increase (10% increase) in landed value with no increase in fishing effort. This means the full \$50,000 increase in revenue associated with the increase in fish abundance generates new fishermen's income. The economic impact of fishing activity does not change because fishing effort and related purchases of fishing inputs do not change.

If the change in CPUE is expected to be permanent it might be worth putting in the effort to adjust input coefficients in the COFHE model to reflect the fact that fewer inputs are purchased and more proprietor’s income is generated per dollar of landing by this OC (as shown in Illustration 3 below). However, if fishing effort is expected to remain constant, it is easier to simply estimate the impact of a \$50,000 increase in proprietor’s income in the appropriate study area by multiplying the impact multipliers per \$10,000 of proprietor’s income in Table 42 by 5. As long as effort is expected to remain constant, in other words, the direct effect of a change in catch per unit effort is associated only with a change in proprietor’s income, and the impacts of such a change can be estimated without using COFHE multipliers for any particular OC. Impacts of changes in proprietor's income are the same for all OCs.

Table 42. Economic Impact of \$10,000 Change in Proprietor’s Income (For Illustration # 2)

Type of Impact	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Output	\$10,000	\$1,892	\$2,438	\$14,330
Total Value Added	\$3,281	\$1,019	\$1,446	\$5,746
Labor Income	\$1,713	\$647	\$797	\$3,156
Employee Compensation	\$1,484	\$543	\$684	\$2,710
Proprietor’s Income	\$229	\$104	\$113	\$446
Other Property Type Income	\$1,220	\$294	\$506	\$2,020
Indirect Business Taxes	\$348	\$79	\$143	\$570
Employment	0.0	0.0	0.0	0.1

* These effects on proprietor's income do not include the initial \$10,000 change in proprietor's income that caused the effects.

Illustration 3: Potential Year 10 Economic Benefits of an Increase in CPUE and an Increase in the Allowable Annual Harvest

The same fishing restrictions described in Illustration #2 are being proposed here, and are expected to temporarily reduce the allowable annual harvest by a particular OC by 100,000 pounds, from 500,000 to 400,000 pounds. Here again, fishery managers argue that accepting these fishing restrictions will result in future economic benefits. In this case, however, they believe that they will result in a 10% increase in fish stock abundance in ten years and allow the annual harvest limit to increase at that time from 400,000 pounds to 600,000 pounds. The short-term adverse economic impacts of these fishing restrictions have been assessed using the approach described in Illustration 1 above. Fishery managers are interested in examining their potential beneficial economic impacts starting in year 10.

In this illustration there are two sources of expected economic benefits from stock rebuilding in year 10. First, the 10% increase in fish abundance will reduce effort and costs per unit output and increase fishermen earnings per dollar of output (landed value) as described in Illustration 2. Second, the stock rebuilding is expected to increase allowable annual harvest from the current level of 500,000 pounds to 600,000 pounds.

Here again, assume a constant fish price of \$1.50 per pound and that the OC operates exclusively in the fishery being regulated. The value of annual landings by the OC, therefore, is \$750,000 now (@ 500,000 pounds allowable harvest), will be \$600,000 in the short term with the proposed restriction (@400,000 pounds allowable harvest), and is predicted to be \$900,000 in year 10 (@ 600,000 pounds allowable harvest). One direct economic impact during year 10, therefore, will be a \$150,000 increase in landed value of the harvest. However, a second direct impact is associated with the 10% increase in abundance and associated CPUE which means that the \$900,000 in allowable harvest in year 10 would be taken with less fishing effort resulting in an increase in fishermen income per dollar of output.

Using the COFHE Model (for illustration purposes only)

Assume that in the current version of the COFHE model, the technical coefficients in the production function for the affected OC show that each \$1 in output (landed value) is associated with \$0.80 in direct

input purchases from various IMPLAN sectors, \$0.15 in direct labor payments (employee compensation) and \$0.05 in proprietor's income (fishermen earnings). After a 10% increase in CPUE, the same purchases of inputs and labor payments associated with the same level of fishing effort would generate \$1.10 in revenues. Since the increase of \$0.10 in revenues is generated using the same level of effort and input costs it would all contribute to proprietor's income (fishermen earnings) which would increase from \$0.05 to \$0.15. If fisheries managers were only interested in this direct effect one could use the approach used in Illustration 2. In this illustration, however, fisheries managers are interested in the economic impacts of: a) the reduction in inputs purchased per dollar of output for this OC, b) the corresponding increase in fishermen income per dollar of output for this OC, and c) the 100,000 pound increase in the output (allowable harvest) by this OC.

Since technical coefficients in the COFHE model, like all I/O models, are expressed per \$1 in output, accounting for this change would require re-estimating technical coefficients for this OC before estimating economic impacts by dividing the new lower input purchases and labor payments, and higher proprietor's income by \$1.10 to get the new technical coefficients showing the allocation of input and primary sector payments per \$1.00 of output. This results in: 1) all technical coefficients associated with input use and labor purchases being reduced by 9.1% (from \$0.80 to \$0.727 in direct input purchases per dollar of output and from \$0.15 to \$0.136 in direct labor payments per dollar of output), and 2) a 272% increase in the technical coefficient associated with proprietor's income, from \$0.05 to \$0.136. (Note: the \$0.10 increase in proprietor's income from \$0.05 to \$0.15 is associated with a landed value of \$1.10, so the new technical coefficient representing proprietor's income as a portion of \$1 in landed value is $\$0.15/\1.10 or \$0.136.)

In summary, then, the economic impacts of stock rebuilding in year 10 include:

- A 20% increase in annual landed value of the OC, from \$750,000 to \$900,000.
- A 9.1% decrease in input purchases and payments to labor per dollar output for the OC (overall, from 0.80 to 0.727).
- A 326% increase in proprietor's income in the OC from \$37,500 ($\$750,000 \times \0.05) to \$122,400 ($\$900,000 \times \0.136).

Using the COFHE model to assess the indirect and induced statewide economic impacts in year 10 of a fish stock rebuilding program that is expected to increase the allowable harvest by this OC by \$150,000, and increase fish abundance and corresponding CPUE for the OC by 10% involves the following five steps:

1. Estimate current economic impacts of the OC using the current California state version of the COFHE model and current annual output (landed value) of \$750,000 using the method shown in Illustration 1.
2. Modify the state COFHE model by reducing all value added and input use coefficients by 9.1% (to reflect a decline from 0.95 to 0.864 in fishermen costs per dollar of output), and increase proprietor's income per dollar of OC output by 272% (to reflect an increase from 0.05 to 0.136 in earnings per dollar of output). To obtain the COFHE IMPLAN models for modification purposes, please contact CDFG.
3. Generate revised COFHE multipliers for the OC based on the new COFHE model.

4. Compute the economic impacts generated by the new annual harvest (\$900,000) using the new COFHE multipliers.
5. Subtract the results of Step 4 from the results of Step 1 to estimate the combined economic impacts in year 10 of a 10% increase in fish abundance and a 100,000 pound increase in the allowable annual harvest.

Note: A complete economic analysis to compare the economic impacts of short-term costs (Illustration 1) with long-term gains (Illustrations 2 and 3) may require economic analysis that cannot be performed using the COFHE model by itself. Although not discussed here, such an analysis may need to account for time (e.g., present value analysis), risks of fishery and market changes, and economic costs to fishermen during stock rebuilding, as well as potential effects of changes in near-term supply of fish on markets, consumer preferences, import substitution, etc.

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