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# **West Coast Limited Entry Groundfish Cost Earnings Survey**

## **Protocol and Results for 2008**

December 2012

**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
National Marine Fisheries Service  
Northwest Fisheries Science Center

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## **Protocol and Results for 2008**

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**National Oceanic and Atmospheric Administration**  
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# Executive Summary

This technical memorandum describes the fielding protocols and empirical results from an economic cost earnings survey of the West Coast (Washington, Oregon, and California) limited entry groundfish fleet. The survey was conducted by the Fishery Resource Analysis and Monitoring Division of the Northwest Fisheries Science Center in cooperation with the Pacific States Marine Fisheries Commission. Measuring the economic performance and impact of a fishery requires data on the costs incurred by harvesters. Since harvesting vessels operating with a limited entry groundfish permit account for more than 80% of the value of West Coast groundfish landings, economic data on the limited entry groundfish fleet is essential for evaluating the economic performance and impact of the West Coast groundfish fishery. The results published here are expected to be used in regional economic impact models, measures of economic performance, and a variety of analyses that arise regarding the management of groundfish off the West Coast.

The surveyed population was owners of active commercial fishing vessels that 1) landed at least \$1,000 of fish on the West Coast during 2008 and 2) had a limited entry groundfish permit. Because of the requirement for at least \$1,000 of West Coast landings during 2010, vessels that participated in the at sea whiting (*Merluccius productus*) fishery but did not participate in any shoreside West Coast fisheries were not surveyed. Any vessel that participated in the shoreside whiting fishery was included in the survey population. There were 255 vessels in the survey population.

This survey updates an earlier cost earnings survey of the limited entry fleet. In-person interviews were completed with the owners of 123 vessels, representing a 48% response rate. The response rate was higher for vessels in the limited entry groundfish trawl fleet (57%) than for vessels in the limited entry groundfish fixed gear fleet (39%).

These 123 responses were used for statistical inference of costs, revenues, and vessel operating characteristics (such as crew size and fuel consumption). This document presents the results of that statistical inference for both the trawl and fixed gear fleets, as well as for the primary vessel types in each fleet. Primary vessel types in the limited entry groundfish trawl fleet include large groundfish trawlers, shoreside whiting harvesters, Alaska vessels, crabbers, and shrimpers. Primary vessel types in the limited entry groundfish fixed gear fleet include sablefish (*Anoplopoma fimbria*) vessels, other groundfish vessels, Alaska vessels, and crabbers.

Tests for nonresponse bias indicated that differences between survey respondents and nonrespondents did not exhibit significant nonresponse bias when examined at the vessel type level. Results for the limited entry groundfish trawl fleet as a whole also did not exhibit significant nonresponse bias. In the limited entry groundfish fixed gear fleet, response rates varied considerably across vessel types, and as a result, nonresponse bias was significant for the fixed gear fleet as a whole. Results reported in this document for the entire limited entry groundfish fixed gear fleet incorporate weights for each response that offset nonresponse bias.

For the limited entry groundfish trawl survey respondents, the average vessel had revenue from all sources of \$585,041, reported costs of \$469,068, economic costs of \$507,660, and economic net revenue of \$77,381 during 2008. Since economic cost only includes costs incurred prior to the shoreside delivery of fish and does not include shoreside management and administration costs, it provides a measure of economic profit that is biased upward. Amounts such as revenue, cost, and net revenue reflect operations in all fisheries (West Coast and Alaska). Vessels that operated primarily in Alaska fisheries and the West Coast shoreside whiting fishery earned higher economic net revenue than vessels that operated primarily in the West Coast non-whiting groundfish trawl fishery. Vessels that operated primarily in the West Coast non-whiting groundfish trawl fishery earned positive but smaller economic net revenue, on average (\$16,562 in 2008).

For the limited entry groundfish fixed gear survey respondents, the average vessel had revenue from all sources of \$324,189, costs reported on the survey of \$247,003, economic costs of \$261,876, and economic net revenue of \$62,313 during 2008. As in the limited entry groundfish trawl fleet, the vessels earning the most net revenue were Alaska vessels, which earned per vessel economic net revenue of \$422,151. Economic net revenue was lower for vessels that operated primarily in the West Coast limited entry fixed gear fishery. Sablefish fixed gear vessels earned an average economic net revenue of \$36,410 in 2008 and other groundfish fixed gear vessels earned an average economic net revenue of \$8,641.

# Acknowledgments

The cost earnings survey described in this document was developed through collaboration and consultation with numerous individuals. The following individuals made important contributions to the survey design, fielding protocol, analysis of data, or reporting of data: Leif Anderson and Todd Lee, Northwest Fisheries Science Center; Dave Colpo, Pacific States Marine Fisheries Commission; and Stephen Freese, National Marine Fisheries Service's Northwest Regional Office. The Northwest Fisheries Science Center and the Pacific States Marine Fisheries Commission also thank all of the vessel owners who volunteered their time and data for the survey.



# 1. Introduction

This technical memorandum describes the fielding protocol and empirical results from an economic cost earnings survey of the U.S. West Coast (Washington, Oregon, and California) limited entry groundfish fleet. The survey was conducted by the Fishery Resource Analysis and Monitoring Division of the Northwest Fisheries Science Center (NWFSC) in cooperation with the Pacific States Marine Fisheries Commission (PSMFC). Measuring the economic performance and impact of a fishery requires data on the costs incurred by harvesters. Since harvesting vessels operating with a limited entry groundfish permit account for more than 80% of the value of West Coast groundfish landings, economic data on the limited entry fleet is essential for evaluating the economic performance and impact of the West Coast groundfish fishery. The results published here are expected to be used in regional economic impact models, measures of economic performance, and a variety of analyses that arise regarding the management of groundfish off the West Coast.

The survey was fielded between July 2009 and February 2010, and collected data for the 2007 and 2008 vessel fiscal years. It updates results from a previous cost earnings survey of the limited entry groundfish fleet that collected data for the 2003 and 2004 vessel fiscal years.

Section 2 discusses survey design and questionnaire development. Section 3 discusses survey fielding. Section 4 discusses response rates. Section 5 compares respondents and nonrespondents and summarizes the results of tests for nonresponse bias. Section 6 presents empirical results obtained from analysis of the survey data. Section 7 provides concluding remarks.

## **2. Survey Design**

This survey was designed to provide economic data on vessels that participate in the West Coast limited entry shoreside groundfish fishery. The objective was to obtain vessel-level information on earnings and expenditures needed to support the calculation of economic performance measures (such as net revenue and efficiency), as well as regional economic impact analysis.

### **2.1. Survey Population and Sample**

The population of interest for this survey was all vessels with at least one limited entry groundfish permit at the end of 2008 and at least \$1,000 of West Coast landings during 2008. There were 255 vessels in the survey population. Vessels with less than \$1,000 of West Coast landings were considered too small in revenue to justify the expense of data collection.

Due to the relatively small number of vessels in the limited entry fleet and the high level of landings per vessel, an attempt was made to collect cost earnings data from each member of the survey population. The survey sample is a census of the survey population.

Fielding a survey requires contact information on each member of the survey population. Contact information (vessel owner name, address, and telephone number) for each vessel in the survey population was obtained from vessel and limited entry permit registration data.

### **2.2. Questionnaire Development**

The survey questionnaire was an update of the questionnaire previously used to collect 2004 data from the West Coast limited entry groundfish fleet.<sup>1</sup> The updated questionnaire was developed initially by representatives of NWFSC, National Marine Fisheries Service's (NMFS) Northwest Regional Office, Southwest Fisheries Science Center, and PSMFC. After survey content was determined, a draft questionnaire was prepared and discussed with members of the limited entry fleet.

For this second economic cost earnings survey of the limited entry fleet, a few modifications were made to the questionnaire. Cost data were collected for three categories (moorage, enforcement, and dues) that did not appear on the initial questionnaire. In addition, an "other" cost category appeared, which provided the survey respondent a chance to report any expenses not covered by the listed categories.

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<sup>1</sup> For a description of questionnaire development for the previous limited entry survey, see Lian 2010.



### 2.3. Defining Revenues and Costs Directly Related to Commercial Fishing

The objective of this survey was to provide the economic data needed to evaluate the economic performance and economic impacts of the West Coast limited entry groundfish fishery. Evaluating performance and impacts requires data on the revenues earned by and costs incurred through the operation of commercial fishing vessels in the fishery. Since the same entity that owns a commercial fishing vessel may also be engaged in any number of other fishing-related or nonrelated activities, it is important to define which revenues and costs are included in the measurement of net revenue.

This survey focused on collecting revenue and cost information directly related to the operation of a commercial fishing vessel. Some expenses incurred by the owner of the vessel may not be directly related to the operation of a commercial fishing vessel. Expenses incurred after the fish have been landed are not directly related to the operation of the vessel. The vessel owner may also own a processing plant, but expenses related to operating the processing plant are not directly related to operation of the fishing vessel. Additionally, some expenses incurred before the point of landing may be difficult to separate into expenses that are directly related to operation of the vessel and expenses that are not. For example, expenses such as office space and a shore-based truck may be associated with the operation of a vessel, but are difficult to separate from other possible uses. Such expenses are therefore excluded from the costs collected in the survey. As a result, estimates of net revenue in this report should be considered “maximum estimates” due to the fact that some costs are not collected through the survey.

The survey collected annual revenue and cost data for the 2007 and 2008 fiscal years. Revenue sources collected by this survey include Alaska landings, Hawaii landings, at sea deliveries, the sale and leasing of permits, salmon disaster relief payments, and other activities directly related to the operation of the vessel (e.g., chartering as part of a NMFS research project). The survey did not collect information on West Coast landings because this information can be obtained from the Pacific Fisheries Information Network (PacFIN). Cost categories collected by the survey included captain, crew, fuel, food, ice, bait, insurance, interest, moorage, dues, enforcement, purchase of permits, leasing of permits, and RMI (repair, maintenance, and improvements). Since most vessels operate in multiple fisheries, much of the available cost data pertain to multiple fisheries. While some of the costs such as vessel repairs and maintenance are joint costs, other costs such as fuel are not necessarily joint costs but are not reported separately by fishery in the survey.<sup>2</sup>

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<sup>2</sup> Joint costs are production costs incurred by the firm when two or more outputs are jointly produced. Joint costs can occur when the cost of an input is a fixed cost and when that input is used to produce multiple outputs either concurrently or consecutively. In the case of concurrent outputs, a variable cost can be a joint cost. Repair and maintenance costs that prepare the vessel for use in all fisheries are joint costs. If a single trawl tow harvests both sablefish (*Anoplopoma fimbria*) and Dover sole (*Microstomus pacificus*), the fuel used to harvest the sablefish and Dover sole from the same tow is a joint cost.

## **3. Survey Fielding Protocol**

This section describes the protocol used to field the survey and collect data from respondents. Particular emphasis was placed on implementing a protocol that would maximize response rates. Steps taken to maximize response rates are discussed in subsection 3.2.

### **3.1. Fielding Schedule**

Survey fielding was divided into three stages, with each stage corresponding to one of the West Coast states. Fielding began in Washington, moved to Oregon, and finished in California. It moved southward over time so as to reduce the travel costs involved in conducting in-person interviews. Fielding began with each member of the survey sample receiving a package by mail containing an introductory letter describing the survey, a one-page description of reasons for conducting the survey, and a copy of the questionnaire (the latter supplied in Appendix A). About two weeks after the letter and questionnaire mailing, attempts began to contact each survey recipient by telephone and schedule an in-person interview. During the following three weeks, up to six additional attempts were made to contact each member of the survey population until an interview date was scheduled or the vessel owner declined to participate in the survey. Interviews were conducted at a location chosen by the respondent. The most frequent interview locations were the respondent's residence, vessel, or a restaurant.

Interviewers used the questionnaire during the in-person interviews, asking some additional follow-up questions when appropriate. The interviewer's questionnaire contained not only the questions for which responses were collected, but also examples of how responses to each question would be used by NWFSC staff to address fisheries management issues. For example, interviewers were prompted to ask questions about the nature of repair and maintenance expenses when survey respondents reported large repair and maintenance expenditures.

Survey fielding began in July 2009 and was completed in February 2010. The extended period of data collection reflects the fact that some members of the survey population travel to Alaska during part of the year, and obtaining their responses to the survey required waiting for their return. Data were collected through in-person interviews by Gilmore Research. To aid in preparation, survey respondents received a copy of the questionnaire in the mail prior to the in-person interview.

### **3.2. Maximizing Response Rates**

A number of methods were used to maximize survey response rates. First, the survey was short, four pages in written form. Data collection through in-person interviews usually took less than one hour. Second, respondents were asked only to provide information about major cost and earnings categories, thus avoiding what might seem to respondents like unnecessary

detail. Third, data were collected through in-person interviews, which typically have higher response rates than mail or telephone surveys. Fourth, there were extensive follow-up telephone calls and mailings after the initial letter and questionnaire mailing in order to schedule in-person interviews and obtain responses. These follow-up telephone calls were distributed among weekday/weekend and day/evening time periods to maximize the likelihood of reaching the contact person.

## 4. Survey Response Rates

Responses for this voluntary survey provided a representative sample of the vessels in each of the major vessel types in the limited entry trawl fleet and the limited entry fixed gear fleet. Because response rates varied considerably across vessel types in the limited entry fixed gear fleet, it is necessary to weight survey responses when developing summary statistics for the entire fixed gear fleet, even though weighting survey data is not necessary when examining summary statistics for each individual vessel type. Table 1 presents a summary of survey response rates. A complete survey form with data judged usable was received from 123 of the 255 survey population members, a 48% response rate.<sup>3</sup> Complete responses were received from 73 of 127 vessels in the trawl fleet, a 57% response rate. Complete responses were received from 50 of 128 vessels in the fixed gear fleet, a 39% response rate.

Response rates are reported by vessel type, state of home port, and revenue from West Coast landings. The vessel type definitions used in this report are taken from page 55 of Radtke and Davis (2000). The primary vessel types in the limited entry groundfish trawl fleet are large groundfish trawlers (at least \$100,000 annual revenue, of which at least 33% comes from trawl-caught groundfish), whiting (*Merluccius productus*) vessels (at least \$100,000 revenue, of which at least 33% comes from whiting), crabbers (at least \$15,000 revenue, of which at least 33% comes from crab), shrimpers (at least \$15,000 revenue, of which at least 33% comes from shrimp), and Alaska vessels (at least \$100,000 revenue, of which at least 50% comes from Alaska fisheries). Vessels that participate in the shoreside whiting fishery are typically classified as either whiting vessels or Alaska vessels, depending on whether or not they operated in Alaska. The primary vessel types in the limited entry fixed gear fleet are sablefish (*Anoplopoma fimbria*) fixed gear (at least \$15,000 revenue, of which at least 33% comes from sablefish caught with fixed gear), other groundfish fixed gear (at least \$15,000 revenue, of which at least 33% comes from groundfish caught with fixed gear), crabbers (already defined), and “other less than \$15,000” (vessels landing less than \$15,000 of fish during the year). While most vessels that participate in the primary sablefish fishery are classified as sablefish fixed gear vessels, there are some vessels (especially those with a single tier 3 sablefish permit) that are classified as crabbers or other groundfish fixed gear vessels.

In the limited entry trawl fleet, large groundfish trawlers accounted for 83 of the 127 vessels and provided a 63% response rate. Responses were received from 43% of the 14 Alaska vessels, 67% of the 12 whiting vessels, 33% of the 9 crab vessels, 75% of the 4 shrimp vessels, and 25% of the 4 vessels that were in other vessel types. In the limited entry fixed gear fleet, responses were received from 37% of the 59 sablefish fixed gear vessels, 24% of the 34 other

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<sup>3</sup> Some survey respondents completed only some of the survey questions and as a result did not provide complete data sources of costs and earnings. Other survey respondents provided data which were deemed suspect, such as having variable costs that exceeded revenue from landings. The response rate figures in this section only count complete responses that do not contain any suspicious responses.

groundfish fixed gear vessels, 53% of the 17 crab vessels, 75% of the 12 Alaska vessels, and 40% of the 5 vessels that were in other vessel types.

Table 1 presents response rates by geographic location and revenue class. In the limited entry groundfish trawl fleet, response rates were 61% for vessels with a home port in California, 58% for vessels with a home port in Oregon, and 42% for vessels with a home port in Washington. In the limited entry groundfish fixed gear fleet, response rates were 27% for vessels based in California, 49% for vessels based in Oregon, and 47% for vessels based in Washington. The low response rate in California reflects the low response rate among participants in the live thornyhead (*Sebastolobus* spp.) fishery.

Response rates were positively correlated with revenue from West Coast landings during 2008. Among limited entry trawl vessels, the response rate was 65% for vessels with more than \$500,000 of West Coast landings revenue, 57% for vessels with between \$100,000 and \$500,000 of West Coast landings, and 30% for vessels having West Coast landings under \$100,000. Among limited entry groundfish fixed gear vessels, the response rate was 43% for vessels with more than \$500,000 of West Coast landings, 51% for vessels with between \$100,000 and \$500,000 of West Coast landings, and 27% for vessels with under \$100,000 of West Coast landings.

## **5. Comparing Respondents and Nonrespondents**

A considerable amount of information about vessel characteristics and landings for each member of the survey population is available from federal and state vessel registration records and PacFIN landings data. That information can be used to compare respondents and nonrespondents and perform tests to determine whether differences between them are statistically significant. This section compares vessel physical characteristics and revenue from West Coast landings for respondents and nonrespondents.

### **5.1. Data Used to Test for Nonresponse Bias**

Data on vessel physical characteristics, West Coast landings (by species, gear type, and port), and revenue from West Coast landings (also by species, gear type, and port) are available for all members of the survey population. Available information on vessel characteristics includes vessel length and horsepower. PacFIN provides vessel-level information on West Coast (Washington, Oregon, and California) landings by date, species, gear type, and port for all vessels in the survey population. As a result, it is possible to compare respondents and nonrespondents with regard to seasonal patterns, species landed, and location of landings.

### **5.2. Comparison Results**

Vessel physical characteristics and landings revenue for survey respondents and nonrespondents are compared in Table 2 through Table 13. Table 2 through Table 7 report results for the limited entry groundfish trawl fleet and Table 8 through Table 13 report results for the limited entry groundfish fixed gear fleet. These tables compare vessel physical characteristics and revenue from West Coast landings for the survey population, survey respondents, and survey nonrespondents. While this section compares respondents and nonrespondents (providing the magnitude of differences between them), subsection 5.3 and Table 14 and Table 15 provide tests of statistical significance for the differences between respondents and nonrespondents.

Table 2 compares respondents and nonrespondents for the entire limited entry groundfish trawl fleet during 2008. The mean engine horsepower for survey respondents (436) was slightly lower than the mean engine horsepower for nonrespondents (446). Both respondents and nonrespondents had a mean vessel length of 66 feet. Mean revenue from West Coast landings was greater for respondents (\$451,877) than nonrespondents (\$413,832). Respondents earned greater revenue than nonrespondents from groundfish (\$339,504 vs. \$306,926) and crab (\$48,909 vs. \$40,304) landings.

Table 3 through Table 7 compare respondents and nonrespondents for the primary vessel types in the limited entry groundfish trawl fleet. Table 3 compares respondents and

nonrespondents for the Alaska trawl fleet. Survey respondents had vessels with smaller engine horsepower than nonrespondents (a mean of 650 vs. 801) and nearly identical length (a mean of 88 feet for respondents vs. 89 feet for nonrespondents). The revenue from West Coast landings earned by vessels classified as Alaska vessels comes primarily from whiting, and was lower for survey respondents than nonrespondents (\$416,584 vs. \$466,737).

Table 4 compares respondents and nonrespondents for vessels in the limited entry groundfish trawl fleet classified as crabbers.<sup>4</sup> Responses were received from three of the nine vessels. Respondents had vessels with greater mean length (46 feet) than nonrespondents (41 feet) and more powerful engines (horsepower of 298 vs. 193). Revenue from West Coast landings was also greater for respondents than nonrespondents (a mean of \$259,718 vs. \$114,117). Respondents not only had greater revenue from crab landings than nonrespondents, but also averaged \$53,367 in revenue from groundfish landings, while the six nonrespondents did not earn any revenue from groundfish landings.

Table 5 compares respondents and nonrespondents for vessels in the limited entry groundfish trawl fleet classified as large groundfish trawlers. This type accounts for almost two-thirds of the vessels in the limited entry groundfish trawl fleet, and consists of vessels that earn more than \$100,000 revenue from West Coast landings annually with at least one-third of the revenue coming from groundfish caught with trawl gear. Physical characteristics for respondents and nonrespondents show almost no difference. Respondents had vessels with mean engine horsepower of 385 while nonrespondents had vessels with mean engine horsepower of 384. Similarly, respondents had a mean vessel length of 63 feet while nonrespondents had a mean vessel length of 62 feet. While revenue from groundfish and crab landings was very similar for respondents and nonrespondents, revenue from all West Coast landings was smaller for respondents (\$414,266) than nonrespondents (\$440,575). This difference reflects the greater shrimp landings recorded by nonrespondents than respondents during 2008.

Table 6 indicates that whiting vessels had smaller engines (mean horsepower of 663 for respondents vs. 758 for nonrespondents) and shorter length (77 vs. 85 feet). While respondents landed less groundfish on the West Coast than nonrespondents, survey respondents landed more crab on the West Coast than nonrespondents. Revenue from landings of all species on the West Coast was \$813,966 for respondents and \$776,175 for nonrespondents.

The limited entry groundfish trawl survey population also included four vessels that were classified as shrimpers during 2008. As shown in Table 7, three of these four vessels responded to the survey. Since confidentiality restrictions prevent publication of data based on fewer than three responses, it is not possible to publish data in Table 7 for nonrespondents that would allow a comparison of respondents and nonrespondents. Table 7 does supply information from survey respondents on how the physical characteristics and revenue from West Coast landings of shrimpers compare with other vessel types.

Table 8 compares respondents and nonrespondents for the entire limited entry groundfish fixed gear fleet during 2008. Survey respondents had vessels with greater engine horsepower

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<sup>4</sup> The statistical significance of the differences between respondents and nonrespondents in Table 4 through Table 13 is shown in Table 14 and Table 15.

than nonrespondents (a mean of 292 vs. 226) and greater vessel length (a mean of 46 feet vs. 37 feet). While survey respondents and nonrespondents had similar revenue from West Coast groundfish landings (a mean of \$90,673 for respondents vs. \$88,862 for nonrespondents), survey respondents earned more than twice as much revenue from crab landings as nonrespondents (a mean of \$91,287 vs. \$45,590). As a result of their greater revenue from crab landings, the mean revenue from all West Coast landings for survey respondents was \$202,637 while the mean revenue from all West Coast landings for nonrespondents was \$147,296.

Table 9 compares survey respondents and nonrespondents that were classified as Alaska vessels in the limited entry groundfish fixed gear fleet. While the mean vessel length for respondents was 66 feet, the mean vessel length for nonrespondents was 58 feet. While respondents had higher revenue from crab landings on the West Coast than nonrespondents (a mean of \$94,065 vs. \$48,068), respondents had lower revenue from West Coast groundfish landings than nonrespondents (a mean of \$110,062 vs. \$167,464). As a result, respondents had slightly lower revenue from all West Coast landings than nonrespondents (\$212,304 vs. \$226,147).

Table 10 compares survey respondents and nonrespondents in the limited entry fixed gear fleet classified as crabbers. Respondents had vessels with a shorter length than nonrespondents (a mean of 47 feet vs. 51 feet) and smaller engine (a mean horsepower of 341 vs. 515). Respondents earned greater revenue from West Coast crab landings than nonrespondents (a mean of \$231,156 vs. \$209,649), but respondents earned less from groundfish landings than nonrespondents (a mean of \$59,500 vs. \$128,085). As a result of their lower revenue from groundfish landings, survey respondents had lower revenue from all West Coast landings than nonrespondents (a mean of \$325,812 vs. \$387,268).

Table 11 compares survey respondents and nonrespondents for those members of the limited entry fixed gear fleet classified as other groundfish fixed gear vessels (other groundfish meaning other than sablefish). While responses were received from only 8 of the 34 vessels in this vessel type, the physical characteristics of survey respondents and nonrespondents were similar. Survey respondents had vessels with slightly smaller engines than survey nonrespondents (a mean horsepower of 214 vs. 225), and vessel length was nearly identical (a mean of 29 feet for respondents vs. 28 feet for nonrespondents). The short length of vessels in the other groundfish fixed gear vessel type reflects the fact that many of these vessels participate primarily in the southern California live thornyhead fishery. Survey respondents earned more revenue from West Coast crab landings than nonrespondents (a mean of \$29,039 vs. \$7,986), but earned less revenue from West Coast groundfish landings (a mean of \$62,210 vs. \$77,069). When all West Coast landings are considered, survey respondents earned slightly more revenue than nonrespondents (a mean of \$89,420 vs. \$73,269).

All vessels in the limited entry fixed gear fleet with under \$15,000 of landings on the West Coast are placed in the under \$15,000 vessel type. The survey population contained five vessels of this type during 2008. Of them, two responded to the survey and three were nonrespondents. Since confidentiality restrictions prohibit reporting results based on fewer than three independent observations, it is not possible to report results for the two respondents. It is also not possible to report results for the five vessels in the survey population and the three nonrespondents, as it would then be possible to easily calculate the values omitted for the two



respondents. As a result, Table 12 only reports results for the survey population of five vessels. The vessels had a mean length of 41 feet and mean engine horsepower of 160. They consisted primarily of small-scale harvesters of crab and groundfish. The mean vessel had West Coast landings of \$5,998.

Table 13 compares the survey population, respondents, and nonrespondents in the limited entry groundfish fixed gear fleet classified as sablefish fixed gear vessels. In terms of number of vessels, this is the largest vessel type in the limited entry groundfish fixed gear fleet. All of the vessels in this type have at least one limited entry groundfish fixed gear permit with a sablefish endorsement. Survey respondents had vessels with greater mean horsepower than nonrespondents (a mean of 246 vs. 180) and greater length (a mean of 42 feet vs. 39 feet). Respondents had greater revenue from West Coast crab landings (a mean of \$63,532 vs. \$41,183) and West Coast groundfish landings (a mean of \$117,271 vs. \$102,095) than nonrespondents during 2008. As a result, survey respondents had greater revenue from West Coast landings of all species than nonrespondents (a mean of \$207,120 vs. \$154,292).

### **5.3. Statistical Tests for Nonresponse Bias**

A two sample t-test was used to determine whether the differences observed between survey respondents and nonrespondents were statistically significant. The two sample t-test is based on a null hypothesis that the mean value of the variable being tested is the same for respondents and nonrespondents.<sup>5</sup> Two sample t-tests were performed using data on vessel length, engine horsepower, value of West Coast crab landings, value of West Coast groundfish landings, and value of all West Coast landings.

Two sample t-tests for the limited entry groundfish trawl fleet are reported in Table 14. Test results are reported for the entire limited entry groundfish trawl fleet as well as the primary vessel types in the fleet. A total of 5 two sample t-tests were performed for the entire survey population and 20 two sample t-tests were performed at the vessel-type level. In some cases, the limited number of observations prevents reporting results due to confidentiality considerations.<sup>6</sup>

Table 14 shows that for the entire limited entry trawl fleet as well as the primary vessel types in the fleet, none of the two sample t-tests demonstrated a statistically significant difference between survey respondents and nonrespondents at even the 90% confidence level. While the difference in revenue from West Coast landings of all species for respondent and nonrespondent crab vessels appears large (respondents had more than twice as much revenue as nonrespondents from West Coast landings of all species during 2008), the difference is not statistically significant at the 90% confidence level because of the small number of observations and the large variance in revenue among the few observations.

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<sup>5</sup> In addition to testing for statistically significant differences between survey respondents and nonrespondents using a two sample t-test, survey respondents and nonrespondents were compared using permutation tests, which do not require any assumption about the distribution of the variable being used to compare respondents and nonrespondents. Since the outcome of the permutation tests was similar to the outcome of the t-tests and the intent of this document is to summarize survey responses, results from the permutation tests are not provided. For an outline of the permutation testing methodology, see Goode 2006.

<sup>6</sup> In order to protect the confidentiality of survey respondents, responses from at least three separate business entities are required in order to report values for survey means and standard deviations.

Table 15 indicates that the difference in revenue from crab landings earned by respondents and nonrespondents for the entire limited entry fixed gear fleet was statistically significant at the 95% confidence level. However, the difference in revenue from all West Coast landings earned by respondents and nonrespondents was not significant at even the 90% confidence level.

Revenue from landings (for crab, groundfish, or all species) and physical characteristics did not show a statistically significant difference at the 95% level for any of the vessel types in the limited entry groundfish fixed gear fleet. Only engine horsepower in Alaska vessels displayed a statistically significant difference between respondents and nonrespondents at the 90% level. Differences between respondents and nonrespondents are more frequently significant for the entire limited entry groundfish fixed gear fleet than for the vessel types in the fleet, because the different survey response rates across vessel types create distortions in the inferences for the entire limited entry groundfish fixed gear fleet that are not present in the inferences for the individual vessel types.

#### **5.4. Correcting for Nonresponse Bias**

Subsection 5.2 and subsection 5.3 indicate that statistically significant differences do not exist at the vessel-type level between survey respondents and nonrespondents. A comparison of respondents and nonrespondents for the limited entry groundfish trawl fleet also does not show a consistent pattern of differences that are statistically significant. As a result, there is no reason to adjust survey data at the vessel-type level or for the entire limited entry groundfish trawl fleet for nonresponse bias.

While the response rate for Alaska vessels in the limited entry groundfish fixed gear fleet was 75%, the response rate for vessels in the other groundfish fixed gear vessel type was only 24%. The different response rates create bias when data from the survey is aggregated without weighting. While the survey population has 12 Alaska vessels and 32 other groundfish fixed gear vessels, the survey respondents include 9 Alaska vessels and 8 other groundfish fixed gear vessels. Aggregating the survey respondents without adjusting for the different response rates would result in the Alaska vessels accounting for too large a share of the limited entry groundfish fixed gear fleet, and would cause results reported for the limited entry groundfish fixed gear fleet to be biased upward, as Alaska vessels are much larger scale operations than other groundfish fixed gear vessels. This is the reason unweighted survey respondents have mean West Coast landings of \$202,637 while unweighted survey nonrespondents have unweighted West Coast landings of \$147,296 in Table 8.

In order to weight the survey responses for calculation of revenue and cost figures for the entire limited entry groundfish fixed gear fleet, a survey weight is calculated for responses from each vessel type in the fleet. The weight for each vessel type is equal to the number of vessels in the survey population divided by the number of respondents. For example, in the limited entry groundfish fixed gear fleet, there were 12 Alaska vessels in the survey population and responses were obtained from 9 of these vessels. The weight for Alaska vessels is  $12 / 9 = 1.33$ . There were 34 other groundfish fixed gear vessels in the survey population and responses were obtained from 8 vessels, so the survey weight for other groundfish fixed gear vessels is  $34 / 8 = 4.25$ . Statistics reported for the entire limited entry groundfish fixed gear fleet in section 6 are

calculated using these weights with SAS PROC SURVEYMEANS.<sup>7</sup> All other results reported in section 6 for individual vessel types and for the entire limited entry groundfish trawl fleet are calculated using unweighted data from survey respondents.

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<sup>7</sup> For a description of the weighting procedure used by PROC SURVEYMEANS, see the documentation online at [http://support.sas.com/documentation/cdl/en/statug/63347/HTML/default/viewer.htm#statug\\_surveymeans\\_sect007.htm](http://support.sas.com/documentation/cdl/en/statug/63347/HTML/default/viewer.htm#statug_surveymeans_sect007.htm)

## **6. Empirical Results**

Before examining cost and earnings data from 2008, it is worthwhile to consider the health of the West Coast groundfish and crab fisheries during 2008. Total commercial groundfish landings (including whiting) for all gear types on the West Coast were 97,858 mt during 2008. This is the sixth largest annual groundfish landings total on the West Coast during the 10 year period between 2001 and 2010. Total commercial crab landings for all gear types on the West Coast were 20,487 mt during 2008. The 2008 value is the seventh highest annual landings total during the 10 year period between 2001 and 2010, and the lowest annual landings total since 2003.

Revenue from commercial West Coast groundfish landings in 2008 was \$70,029,024. This is the highest annual revenue from groundfish landings during the 2001–2010 period on both a nominal and an inflation-adjusted basis. The historically high revenue from groundfish landings reflects the high prices for whiting and sablefish that prevailed during 2008. Ex vessel whiting prices averaged \$0.10 per pound during 2008, the highest annual average (on both a nominal and an inflation-adjusted basis) during the 2001–2010 period. Ex vessel sablefish prices averaged \$2.10 a pound during 2008, higher than annual average prices observed during 2001–2007, but below annual average prices observed during 2009 and 2010.

In summary, the West Coast groundfish fishery in 2008 can be characterized by average harvest levels and strong prices for key species such as whiting and sablefish. As a result, the revenue earned from landings of groundfish on the West Coast was unusually high. In contrast, the crab fishery during 2008 experienced its lowest level of ex vessel landings revenue since 2003.

### **6.1. Calculated Costs**

The tables discussed in subsection 6.2 present the costs and revenues associated with operation of a commercial fishing vessel. While information on revenue from West Coast landings was taken from PacFIN data, information on all other sources of revenue was taken from survey responses. Although most of the cost categories report information collected by the survey, there are four cost categories that were calculated using PacFIN and cost earnings survey data. The cost of landings taxes and buyback fees was calculated from PacFIN data and published tax rates, while the opportunity cost of capital and adjusted captain costs were calculated based on survey responses and PacFIN data. Combining all of this information on revenue sources and costs permits calculation of the net revenue earned through operation of commercial fishing vessels.

#### **6.1.1. Landings Taxes**

Calculating the landing taxes paid by the owner of a commercial fishing vessel requires consideration of not only the tax rates charged by each state, but also the incidence of the tax

between the fish seller (vessel owner) and fish buyer. Calculating landings taxes is straightforward, as PacFIN provides information on the location of landings (landings taxes vary by state), species landed (as tax rates differ by species in some cases), landed weight (for California taxes charged on a per pound basis), and revenue from landings (for Washington and Oregon taxes, which are calculated as a percentage of revenue).

Determining the incidence of the landings tax between the harvester and the first receiver is more difficult. Neither the Oregon tax code nor the California tax code include any provision to shift some of the tax back to harvesters. As discussed in Leonard and Watson (2011), the ex vessel price of fish reported in PacFIN is believed to be the price net of taxes, so no adjustment to revenue reported in PacFIN for taxes is required in California and Oregon for fish sold to a first receiver. In California and Oregon, the only landings taxes assumed in this analysis to be paid by the vessel owner from the revenue reflected on the fish ticket are incurred on fish sold directly to the final consumer. In contrast to California and Oregon, the Washington tax code states that first receivers can shift half of the landings tax back to the fish seller. As a result, this analysis assumes that the vessel owner incurs half of the 2.3% landings tax levied in Washington when fish are sold to a first receiver. In California and Oregon, the first receiver cannot shift any portion of the landings tax back to the fish seller.

### **6.1.2. Trawl Buyback Fees**

PacFIN data is also used as the basis for calculating the fees paid by vessels owners to repay the buyback program that removed 91 permits from the groundfish trawl fishery in 2003, along with their associated crab and shrimp permits. Buyback fees are charged on trawl-caught groundfish, crab, and shrimp. The fees on crab and shrimp landings are paid by all vessels making landings of crab and shrimp, regardless of whether they have a limited entry groundfish permit. Trawl groundfish landings in all states are subject to a 5% tax. Crab landings are taxed at a 1.24% rate in California, 0.55% in Oregon, and 0.16% in Washington. Shrimp landings are taxed at a 5.0% rate in California, 3.75% in Oregon, and 1.50% in Washington. The incidence of buyback taxes is assumed to fall entirely on the vessel owner. Buyback fees are legally placed on the fish harvesters who sell the fish, but fish buyers are directed to collect the fee and deduct it from the net trip proceeds that fish buyers pay to the fish sellers.

### **6.1.3. Adjusted Captain Costs**

Calculating economic net revenue requires adjustment for vessel owners who serve as captain and do not pay themselves a salary for the provision of captain services. Even though some vessel owners do not receive a payment for captain services, they are forgoing other employment opportunities to serve as captain. These vessel owners derive their compensation for service as captain through their earnings as the recipient of vessel net revenue. Since actual expenditures on captain services differ greatly from the opportunity cost of providing captain services in such cases, it is necessary to estimate the opportunity cost of serving as the vessel captain.<sup>8</sup>

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<sup>8</sup> Responses to the cost earnings survey indicate that the vessel owner serves as captain on 36% of trips targeting groundfish. Vessel owners rarely serve as captain on the larger vessels that operate in the West Coast whiting fishery.

The estimate of opportunity cost of serving as captain is based on the payment to captains of vessels where the owner does not serve as captain.<sup>9</sup> Examination of survey responses from vessels where the owner did not serve as captain indicated that the expenditures for captain as a share of vessel revenue decline as vessel revenue increases, and generally remain above 15% for vessels with under \$750,000 of annual revenue. Given that almost all vessels in the survey population that exceed \$750,000 of annual revenue operate in both the West Coast and Alaska, a minimum expenditure for captain services of 15% of vessel revenue was imposed on all vessels not categorized as Alaska vessels. No adjustment was made to the captain expenditures of vessels that participate in the shoreside whiting fishery, as these vessels rarely have an owner serving as captain and typically operate on a much larger scale where captain costs are below 15% of revenue.

#### **6.1.4. Opportunity Cost of Capital**

Vessel owners have a substantial capital investment in their vessel, gear, and fishing permits. If the vessel owner were to quit fishing, these assets could be sold and the proceeds could be used to purchase an asset providing a stream of future interest payments. Considering the opportunity cost of capital is important because it is an economic cost incurred by the vessel owner. Terry et al. (1996) note that conventional practice in fisheries economics has been to estimate the opportunity cost of capital as  $P(i+d)$  where  $P$  is the market value of capital,  $i$  is the interest rate, and  $d$  is the depreciation rate. They suggest a Moody's Baa rated corporate bond as providing an interest rate that incorporates some of the economic risk inherent in fishing and straight-line depreciation as a viable approach. After examining interest rates on corporate bonds with a Baa rating, a 5% interest rate was chosen for calculation of the opportunity cost of capital.<sup>10</sup>

## **6.2. Costs and Earnings during 2008**

Table 16 through Table 22 provide average costs (expenses) and revenues for the limited entry groundfish trawl fleet and the primary vessel types in the fleet. Each table was constructed by taking the relevant survey responses and calculating the mean and standard error of each cost and revenue category. For those survey respondents who reported having a fiscal year that did not match the calendar year (i.e., they use a fiscal year that does not begin on January 1), the revenue and cost values used were for that vessel's fiscal year. This procedure insures that the revenues and costs used for each vessel are measured over the same time period, but does result in some difference across vessels as to the time period included in their 2008 data. While a vessel that uses a fiscal year identical to a calendar year reports 2008 expenditures from January 2008 to December 2008, a vessel with a fiscal year starting in October reports cost and revenue figures for 2008 measured from October 2007 to September 2008.<sup>11</sup>

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<sup>9</sup> The limited entry and open access cost earnings survey questionnaires collected information on the percentage of trips where the vessel owner served as captain, so it was possible to identify a subset of survey respondents for which the vessel owner did not serve as captain on any trips and the payments to captain reflect expenditures for captain services when an explicit payment is made to the captain on each trip.

<sup>10</sup> The interest rate on a Moody's Baa corporate bond during November 2010 was 5.18%. This information was online at <http://research.stlouisfed.org/fred2/series/BAA>.

<sup>11</sup> Fiscal year differed from calendar year for 9 of the 73 limited entry groundfish trawl survey respondents and 4 of the 50 limited entry groundfish fixed gear survey respondents.

Table 16 provides average costs (expenditures) and revenues for all survey respondents in the limited entry groundfish trawl fleet. Some respondents did not respond to all questions, so the number of observations varies across cost and revenue categories. Cost categories reported in Table 16 include payments to captain, adjusted payments to captain, crew, fuel, food, ice, bait, insurance, interest, moorage, dues, enforcement, leasing permits, purchasing permits, RMI, opportunity cost of capital, other costs, landings taxes paid by the vessel owner, and buyback fees paid by the vessel owner. The cost of captain, crew, fuel, food, ice, bait, insurance, interest, moorage, dues, enforcement, leasing permits, purchasing permits, RMI, and other expenses were taken directly from survey responses. As described in subsection 6.1, the cost of landings taxes and buyback fees was calculated using PacFIN data. Adjusted captain cost and the opportunity cost of capital were calculated following the methodology described in subsection 6.1. Table 16 indicates that the largest cost categories for the average limited entry groundfish trawler are crew expenses (\$117,552), adjusted captain expenses (\$96,788), fuel (\$91,741), RMI (\$71,885), the opportunity cost of capital (\$34,496), insurance (\$25,481), and buyback fees (\$19,367). Each other cost category involved less than \$10,000 of expenditure during 2008. Figure 1, a pie chart constructed from the data in Table 16, shows the share of costs accounted for by each cost category. Figure 1 aggregates all of the cost categories with average expenditures under \$10,000 into “other costs,” as the relatively small expenditures on these cost categories are not clearly visible on a pie chart.

The primary sources of revenue for the average limited entry groundfish trawler were West Coast groundfish landings (\$339,504), Alaska landings (\$85,648), West Coast shrimp landings (\$53,332), West Coast crab landings (\$48,909), at sea deliveries (\$26,788), and other sources (\$16,843, a category that includes activities such as working on NMFS groundfish stock surveys). Each other revenue source on Table 16 provided average revenue below \$10,000 during 2008. It should be noted that since the figures reported in Table 16 are averages, the figure may be at a level rarely observed for an individual vessel. For example, the average vessel earned \$85,648 in revenue from Alaska landings, but individual vessels typically have Alaska earnings more than \$500,000 or equal to \$0. Similarly, the average vessel had at sea deliveries of \$26,788, while individual vessels either had more than \$250,000 of at sea deliveries or \$0 of at sea deliveries. Table 17 through Table 21 report average earnings and costs by individual vessel type (Alaska, crab, large groundfish trawler, shrimp, and whiting) in the limited entry groundfish trawl fleet during 2008. When examining the data in those tables, it is important to remember that about two-thirds of the revenue earned by Alaska vessels came from fisheries outside the West Coast, and that the results reported for both crabbers and shrimpers are based on three respondents.

Table 22 provides cost and earnings data for the average limited entry groundfish fixed gear vessel. As discussed in subsection 5.4, the values reported in Table 22 are calculated by weighting survey responses to account for the different response rates across vessel types in the limited entry groundfish fixed gear fleet. Table 16 indicates that the largest cost categories for the average limited entry groundfish trawler were crew expenses (\$72,051), adjusted captain expenses (\$51,234), RMI (\$31,892), fuel (\$24,874), the opportunity cost of capital (\$14,281), bait (\$11,597), and insurance (\$10,388). Each of the other cost categories involves less than \$10,000 of expenditure during 2008. Figure 2, a pie chart constructed from the data in Table 22, shows the share of costs accounted for by each cost category. Figure 2 aggregates all of the cost categories with average expenditures under \$10,000 into “other costs,” as the relatively small

expenditures on these cost categories are not clearly visible on a pie chart. The primary sources of revenue for the average limited entry groundfish fixed gear vessel were Alaska landings (\$119,664), West Coast groundfish landings (\$87,053), and West Coast crab landings (\$77,264). Each other revenue source in Table 22 provided average revenue below \$10,000 during 2008. Table 23 through Table 27 report average costs and earnings by individual vessel type (Alaska, crab, other groundfish fixed gear, other < \$15,000, and sablefish fixed gear) for the limited entry groundfish fixed gear fleet. Note that while Alaska vessels in the fixed gear fleet earned an average of \$1,266,444 from Alaska landings, they earned \$212,304 from West Coast landings. Revenue from operations in West Coast fisheries accounts for less than 20% of the total revenue earned by these vessels.

### **6.3. Profitability during 2008**

This document presents two measures of profitability, accounting net revenue and economic net revenue. Accounting net revenue seeks to construct a measure of accounting profit, while economic net revenue seeks to measure economic profit (which considers opportunity costs incurred by operating a commercial fishing vessel that are not considered by accounting profit). While accounting net revenue is an appropriate measure to use if trying to determine whether the vessel owner's financial statement will show a profit, economic net revenue provides a measure of economic profit that considers the opportunity costs that do not appear in a vessel owner's financial records but are a foregone opportunity.

Both net revenue measures use revenue from West Coast landings, Alaska landings, at sea deliveries, the sale and leasing of permits, salmon disaster relief payments, and other activities directly related to operation of the commercial fishing vessel (e.g., chartering as part of a NMFS research project). Costs included in the calculation of accounting net revenue include costs reported for captain, crew, fuel, food, ice, bait, insurance, interest, moorage, dues, enforcement, purchase of permits, leasing of permits, RMI, unloading, trucking to the fish buyer, and freight supplies.<sup>12</sup> Costs calculated for landings taxes and trawl buyback fees are also included in the calculation of accounting net revenue. Economic net revenue replaces reported captain costs with adjusted captain costs and considers the opportunity cost of capital.

While the cost earnings surveys seek to collect information on all revenues and costs directly related to the operation of a commercial fishing vessel, it is known that the list of costs omits some costs. Because a small share of costs are not considered in these calculations, accounting net revenue is greater than accounting profit and economic net revenue is greater than economic profit.

Since most vessels operate in multiple fisheries, much of the available cost data pertains to multiple fisheries. While it is not necessary to disaggregate costs in order to analyze net revenue for all vessel operations, it is necessary in order to analyze net revenue at the fishery level.

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<sup>12</sup> Costs for unloading, trucking to the buyer, and freight supplies were collected by the open access groundfish survey, but not the earlier limited entry groundfish survey. These three costs added 1.2% to the total costs reported by vessel owners.



Table 28 reports limited entry groundfish trawl fleet results for total revenue from all sources, reported costs, accounting net revenue, economic costs, and economic net revenue. Accounting net revenue and economic net revenue are reported for both the entire limited entry groundfish trawl fleet and the primary vessel types in the fleet. All revenues, costs, and net revenue figures are calculated over all operations of the vessel (in all fisheries in all geographic areas). Figure 3 is a bar chart summarizing sources of revenue for the average limited entry groundfish trawl vessel, Figure 4 is a bar chart summarizing costs incurred by the average trawl vessel, and Figure 5 is a bar chart depicting economic net revenue earned by the average trawl vessel.

For the entire limited entry groundfish trawl fleet, average accounting net revenue was \$115,983 and economic net revenue was \$77,381 over all fisheries during 2008. Economic net revenue equaled 13.2% of total revenue. The amount of accounting net revenue and economic net revenue earned per vessel varied considerably across vessel types. The different levels of economic net revenue reflect not only different scales of operation, but also different rates of profitability. Alaska vessels in the groundfish trawl fleet earned mean economic net revenue of \$493,915, which represents 28.3% of revenue from all sources. Whiting vessels earned mean economic net revenue of \$167,457, which represents 19.2% of revenue from all sources. Shrimpers earned mean economic net revenue of \$131,160 per vessel, which represents 25.4% of revenue from all sources. Crabbers earned mean economic net revenue of \$33,577 per vessel, which represents 11.8% of revenue from all sources.<sup>13</sup> Large groundfish trawlers accounted for about two-thirds of the vessels in the limited entry trawl fleet and earned average economic net revenue of \$16,562 per vessel, which represents 3.7% of revenue from all sources.

Table 29 shows that for the entire limited entry groundfish fixed gear fleet, average accounting net revenue was \$77,185 and economic net revenue was \$52,313 across all fisheries during 2008. Economic net revenue equaled 16.1% of total revenue. The amount of accounting net revenue and economic net revenue earned per vessel varies greatly across vessel types. Alaska vessels in the fixed gear fleet earned economic net revenue of \$422,151 per vessel, which equals 28.5% of revenue from all sources. Among the other vessel types (which include vessels earning less than 50% of their total revenue in Alaska), the highest level per vessel was earned by sablefish vessels; they earned per vessel economic net revenue of \$36,410, which equals 15.3% of total revenue. Other groundfish fixed gear vessels earned per vessel economic net revenue of \$8,851, which equals 9.7% of total revenue. Figure 6 is a bar chart summarizing sources of revenue for the average limited entry groundfish fixed gear vessel, Figure 7 is a bar chart summarizing costs incurred by the average fixed gear vessel, and Figure 8 is a bar chart depicting economic net revenue earned by the average fixed gear vessel.

The profitability data in Table 28 and Table 29 indicate that members of the limited entry groundfish fleet (both trawl and fixed gear) that participate in Alaska fisheries earn higher accounting net revenue and economic net revenue than members of the fleet that only operate in West Coast fisheries. Net revenues are higher for vessels operating in Alaska in both absolute terms and as a percentage of revenue. Vessels in the limited entry groundfish trawl fleet that participate in the West Coast shoreside whiting fishery yet do not participate in Alaska fisheries

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<sup>13</sup> One should recall that this information on the profitability of crabbers and the profitability of shrimpers is based on only three observations for each vessel type.

also earn substantial accounting net revenue and economic net revenue, but less than vessels participating in Alaska fisheries. Accounting net revenue and economic net revenue among vessels operating primarily in the West Coast non-whiting groundfish fishery was much smaller, although still positive when examined at the vessel-type level. On average, sablefish fixed gear vessels earned a higher rate of economic net revenue than other groundfish fixed gear vessels.

#### **6.4. Crew Size, Fuel Use, and Speed**

Table 30 has a summary of survey responses on crew size (not including the captain), fuel use, and vessel speed for limited entry groundfish trawl fleet respondents and major vessel types in the fleet. For the entire trawl fleet, crew size exhibits some variation by activity, with a larger crew size reported for crabbing (2.8 members) than groundfish trawling (2.0 members) or shrimp trawling (2.0 members). Except for a few cases where the number of observations is low, crew size does not vary greatly across vessel types; fishing activity is a greater determinant of crew size than vessel type. For all vessels in the trawl fleet, fuel use was greater when groundfish trawling (17.1 gallons per hour) than shrimp trawling (11.7 gallons per hour) or crabbing (8.3 gallons per hour). Vessel speed was greater when crabbing (2.7 knots per hour) than groundfish trawling (2.6 knots per hour) or shrimp trawling (2.2 knots per hour). Like crew size, fuel use and speed are determined more by fishing activity than vessel type.

Table 31 has a summary of survey responses on crew size, fuel use, and vessel speed for the limited entry groundfish fixed gear fleet and the primary vessel types in the fleet. Crew size is similar for crabbing (2.4 members) and longlining (2.5 members) and smaller for salmon trolling (1.2 members). One should consider that 2008 was a year of very little harvesting activity in the salmon troll fishery. Fuel use was greater when longlining (5.9 gallons per hour) than crabbing (4.8 gallons per hour) or trolling (3.6 gallons per hour). Higher fuel use by trawl vessels than fixed gear vessels reflects both the different gear used when targeting groundfish and the larger engine size typically observed in trawl vessels. Fixed gear fleet vessel speed was greater when longlining (4.7 knots per hour) and crabbing (4.6 knots per hour) than when salmon trolling (3.8 knots per hour).

#### **6.5. Owner as Captain**

Table 32 reports the percentage of trips on which the vessel owner served as captain for members of the limited entry groundfish trawl fleet. For the entire fleet, the owner served as captain on 35.5% of trips. This percentage varied considerably by vessel type. Owners of vessels classified as crabbers served as captain on 66.7% of trips, while owners of vessels classified as large groundfish trawlers served as captain on 39.5% of trips. The result for crab vessels is based on only three survey responses. Large groundfish trawlers show a lower likelihood of being captained by the vessel owner as vessel length increases. Alaska vessels were captained by the vessel owner on 33.3% of trips. Whiting vessels and shrimp vessels were captained by the vessel owner on less than 5% of trips. The result for shrimp vessels, like that for crab vessels, is based on only three survey responses.

For the entire limited entry groundfish trawl fleet on trips where the owner does not serve as captain, the average allocation of revenue after deductions is 18.1% to the captain, 22.5% to the crew, and 59.5% to the vessel. On trips where the vessel owner serves as captain, the

allocation of revenue after deductions is 8.1% to the captain, 25.7% to the crew, and 66.2% to the vessel. Placing the vessel owner on the ship as captain reduces the revenue share paid to the captain and increases the revenue share paid to the vessel, reflecting the choice of some vessel owners to not explicitly pay themselves for captain services.

Table 33 has survey results regarding percentage of trips with the vessel owner serving as captain and the distribution of revenue after deductions for the limited entry groundfish fixed gear fleet. For the entire fixed gear fleet, 76.8% of trips were made with the owner serving as captain. This is nearly double the 39.5% owner on board figure obtained for the trawl fleet and reflects the smaller scale of operation of vessels in the fixed gear fleet, as well as the owner on board requirement for vessels operating in the limited entry fixed gear primary sablefish fishery. The percentage of trips with the owner serving as captain was 62.3% for Alaska vessels, 99.1% for crabbers, 57.5% for other groundfish fixed gear vessels, and 84.9% for sablefish fixed gear vessels.

For the entire limited entry groundfish fixed gear fleet on trips where the owner does not serve as captain, the average allocation of revenue after deductions is 19.0% to the captain, 28.1% to the crew, and 52.3% to the vessel. On trips where the vessel owner serves as captain, the allocation of revenue after deductions is 16.0% to the captain, 30.7% to the crew, and 61.4% to the vessel. As in the limited entry groundfish trawl fleet, placing the vessel owner on the ship as captain reduces the revenue share paid to the captain and increases the revenue share paid to the vessel, reflecting the choice of some vessel owners to not explicitly pay themselves for captain services.

## **6.6. Market Value of Vessels**

The survey asked vessel owners to provide the market value of their vessel. This information is a key input in estimating the opportunity cost of capital for the vessel owner. Table 34 indicates that the average value of a vessel in the limited entry groundfish trawl fleet was \$589,926. Vessels used in Alaska fisheries and the West Coast whiting fishery have a much higher market value (and are much larger) than crabbers and large groundfish trawlers. Table 35 indicates that the average market value of a limited entry fixed gear vessel was \$246,449. In the limited entry groundfish fixed gear fleet, Alaska vessels have a reported market value nearly double that of crabbers and more than twice that of sablefish fixed gear or other groundfish fixed gear vessels. While the reported market value of a vessel does not affect accounting net revenue, higher reported market value for a vessel does increase the opportunity cost of capital and reduce economic net revenue.

## **6.7 Comparison of 2004 and 2008 Survey Results**

During 2004 the average vessel in the West Coast limited entry groundfish trawl fleet earned revenue of \$488,507. As shown in Figure 3, the primary sources of revenue were West Coast groundfish landings (\$214,341), Alaska landings (\$111,168), West Coast crab landings (\$109,402), West Coast shrimp landings (\$17,976), and at sea deliveries (\$11,319). Revenue earned from all sources by the average limited entry groundfish trawl vessel increased to \$585,041 in 2008 as revenues from West Coast groundfish landings increased to \$339,503 and revenue from shrimp landings increased to \$53,331. Revenue earned per vessel from West Coast

crab landings (\$48,909), Alaska operations (\$85,648), and at sea deliveries declined in 2008 relative to 2004. The increase in revenues from West Coast groundfish landings from \$214,341 in 2004 to \$339,503 reflects the rise in whiting and sablefish prices between 2004 and 2008.

Economic costs incurred by the average limited entry groundfish trawl vessel related to operations in all fisheries rose from \$458,392 in 2004 to \$507,660 in 2008. Figure 4 shows per vessel costs during 2004 and 2008 for the major cost categories. Higher costs in 2008 were the result of higher fuel prices in 2008 (fuel expenses rose from \$53,857 during 2004 to \$91,741 in 2008) and fees to pay for the groundfish trawl buyback program. While the buyback program removed 91 vessels from West Coast fisheries in December 2003, collection of fees to pay off the buyback program did not begin until 2005. During 2008 the average vessel in the limited entry groundfish trawl fleet paid \$19,367 in buyback fees. As shown in Figure 5, economic net revenue earned by the average limited entry groundfish trawl vessel in all fisheries rose from \$30,114 in 2004 to \$77,381 in 2008.

During 2004 the average vessel in the West Coast limited entry groundfish fixed gear fleet earned revenue of \$327,916. Figure 6 shows that the primary sources of revenue during 2004 were Alaska operations (\$130,997 per vessel), West Coast crab landings (\$93,721 per vessel), and West Coast groundfish (primarily sablefish) landings (\$74,654 per vessel). Revenue earned from all sources by the average fixed gear vessel declined slightly to \$324,189 during 2008. While the increase in sablefish prices caused revenue earned from West Coast groundfish landings to rise to \$87,053, revenue earned from Alaska operations (\$119,664) and West Coast crab landings (\$77,264) declined in 2008 relative to 2004. While crab prices were higher during 2008 than 2004, the West Coast crab harvest declined by more than one-third from 31,232 mt during 2004 to 20,487 mt in 2008. The decline in crab harvest affected the limited entry groundfish fixed gear fleet more than the limited entry groundfish trawl fleet, as the fixed gear fleet typically derives a greater percentage of its revenue from the West Coast crab fishery.

Economic costs incurred by the average limited entry groundfish fixed gear vessel related to operations in all fisheries rose slightly from \$268,517 to \$271,876. Because fixed gear vessels use less fuel than trawlers, their fuel costs rose less than fuel costs for limited entry groundfish trawl vessels. As shown in Figure 7, average expenditure on fuel for a fixed gear vessel rose from \$13,634 during 2004 to \$24,874 during 2008. While members of the fixed gear fleet pay buyback fees on West Coast crab and shrimp landings, they do not pay buyback fees on groundfish landed with fixed gear. As a result, the implementation of fees to pay for the trawl buyback program in 2005 imposed costs of \$850 on the average member of the limited entry groundfish fixed gear fleet during 2008. Figure 8 shows that the average economic net revenue earned from operations in all fisheries by the average member of the fixed gear fleet declined from \$84,653 during 2004 to \$62,313 during 2008. Despite the rise in sablefish prices, higher fuel costs and a smaller crab harvest resulted in slightly lower economic net revenue for the average member of the limited entry groundfish fixed gear fleet during 2008 than during 2004.

## **7. Concluding Comments**

The NWFSC and PSMFC thank all of the vessel owners who participated in this voluntary survey. The quality of data and summary statistics in this report depend on the willingness of commercial fishermen to provide their time and confidential data. While this report supplies a considerable amount of information taken from the survey responses, it does not provide all possible summary statistics that could be derived from the survey responses. Individuals interested in further information about the survey should contact either NWFSC or PSMFC.

The NWFSC and PSMFC will continue to conduct voluntary cost earnings surveys of the limited entry groundfish fixed gear fleet. With implementation of the catch shares management regime in the limited entry groundfish trawl fishery, submission of economic data is mandatory for catcher vessels participating in the groundfish trawl fishery (as well as for catcher processors, motherships, and first receivers/shoreside processors). Economic data will continue to be collected from the limited entry groundfish fixed gear fleet on a voluntary basis.

## Figures 1–8

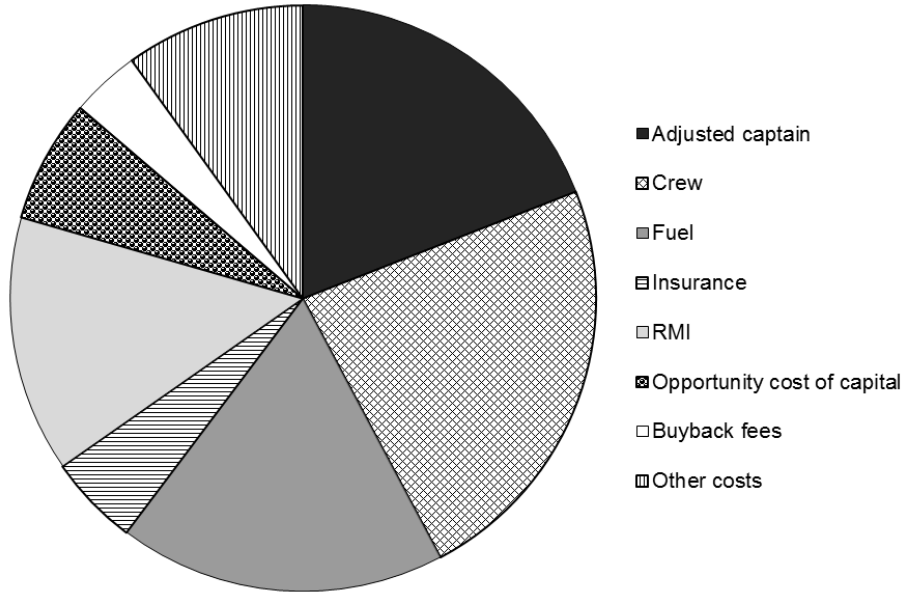


Figure 1. Economic costs in 2008 for the trawl fleet. RMI = repair, maintenance, and improvements. “Other costs” include bait, ice, interest, moorage, dues, enforcement, permit leasing, permit purchasing, landings taxes, and food.

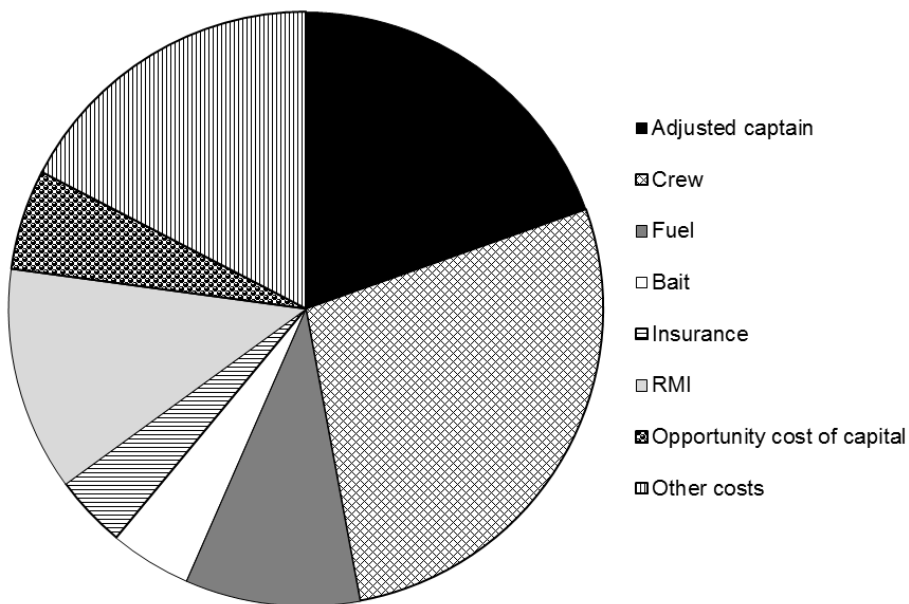


Figure 2. Economic costs in 2008 for the fixed gear fleet. RMI = repair, maintenance, and improvements. “Other costs” include ice, interest, moorage, dues, enforcement, permit leasing, permit purchasing, landings taxes, buyback fees, and food.

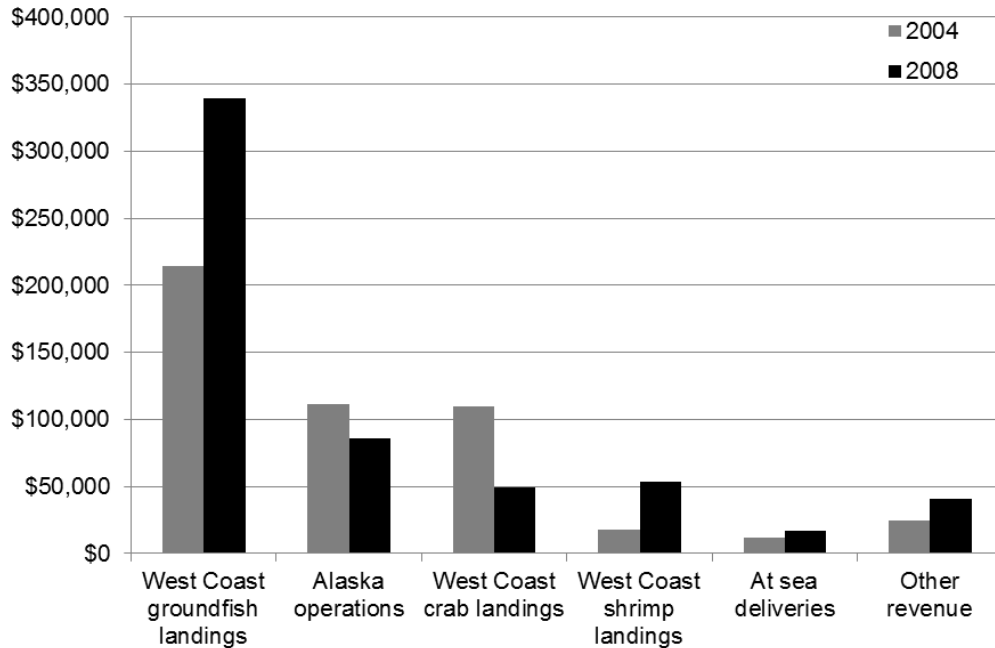


Figure 3. Revenue per vessel in 2004 and 2008 for the trawl fleet.

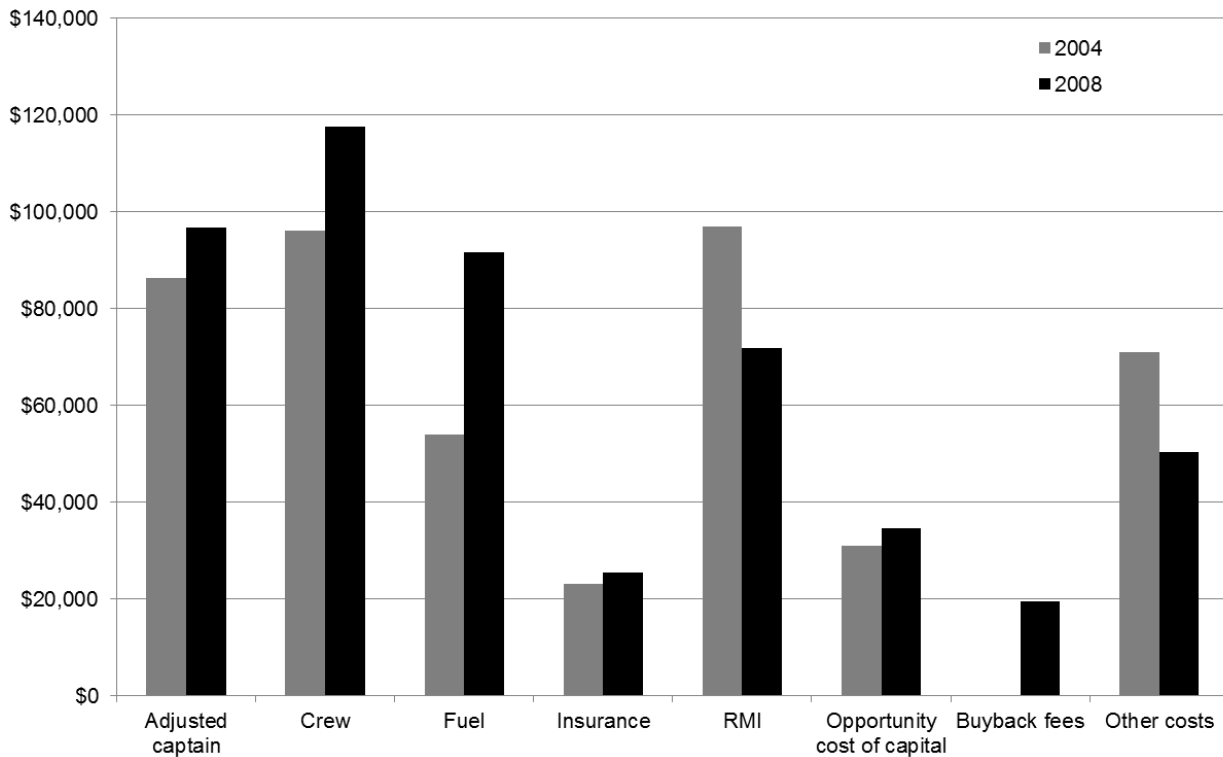


Figure 4. Economic costs per vessel in 2004 and 2008 for the trawl fleet. Economic costs are shown on a per vessel basis. RMI = repair, maintenance, and improvements. “Other costs” include bait, ice, interest, moorage, dues, enforcement, permit leasing, permit purchasing, landings taxes, and food.

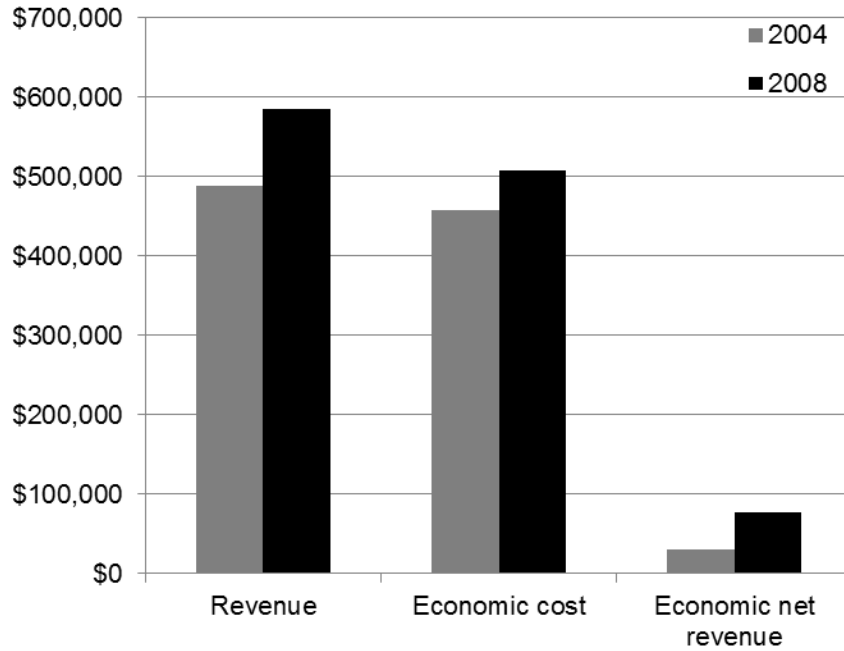


Figure 5. Economic net revenue per vessel in 2004 and 2008 for the trawl fleet.

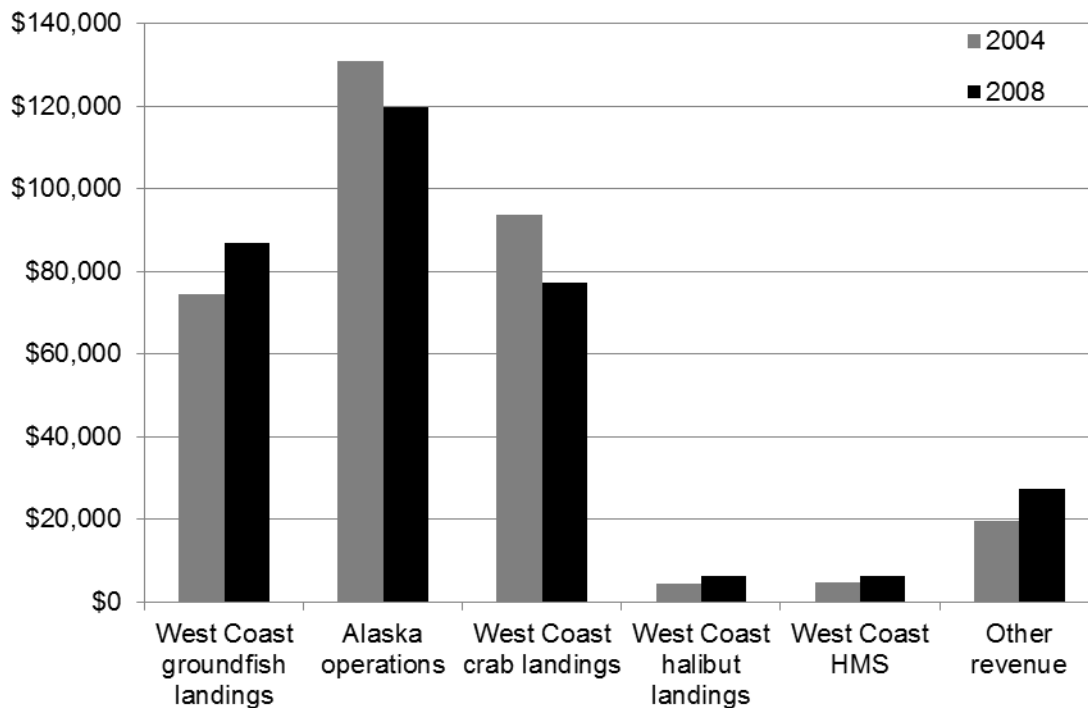


Figure 6. Revenue per vessel in 2004 and 2008 for the fixed gear fleet.



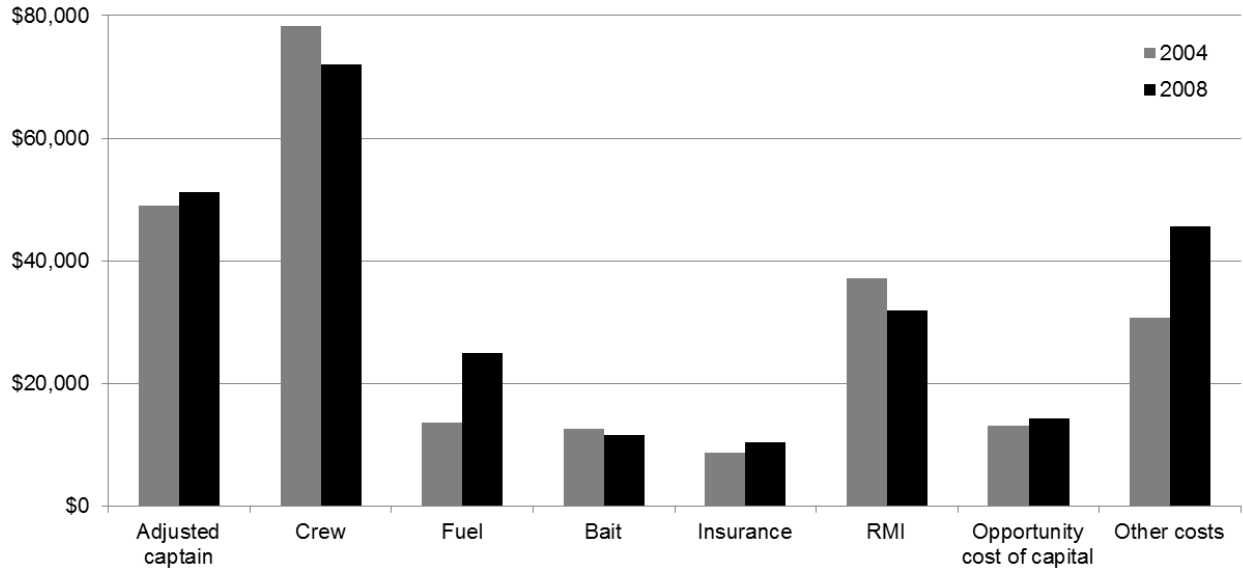


Figure 7. Economic costs per vessel in 2004 and 2008 for the fixed gear fleet. Economic costs are shown on a per vessel basis. RMI = repair, maintenance, and improvements. “Other costs” include ice, interest, moorage, dues, enforcement, permit leasing, permit purchasing, landings taxes, buyback fees, and food.

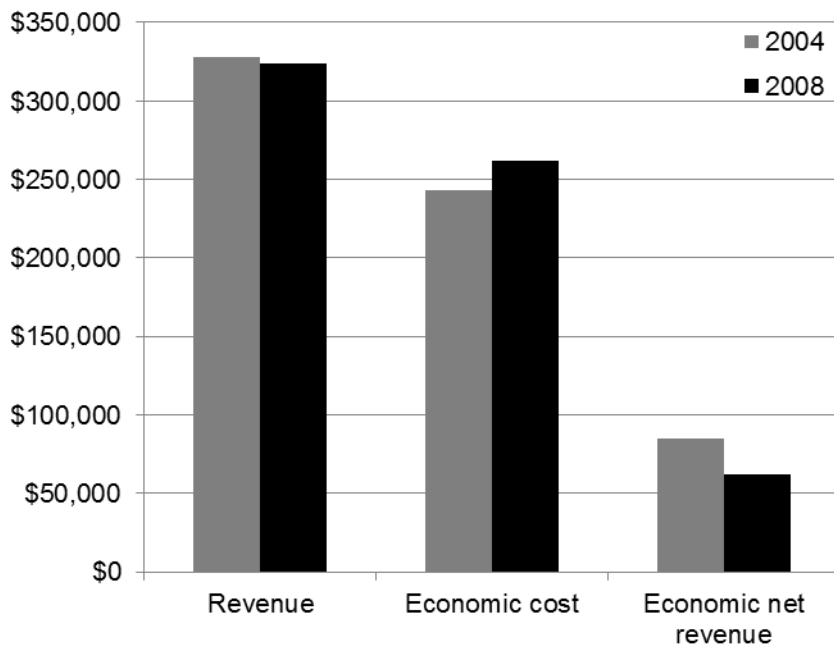


Figure 8. Economic net revenue per vessel in 2004 and 2008 for the fixed gear fleet.

## Tables 1–35

Table 1. Summary of survey response by vessel type, state, and revenue.

	Survey population	Complete responses	Response rate (%)
<b>Total survey</b>	255	123	48
Limited entry trawlers	127	73	57
Limited entry fixed gear	128	50	39
<b>Trawl vessel type</b>			
Alaska	14	6	43
Crabber	9	3	33
Large groundfish trawler	83	52	63
Shrimper	4	3	75
Whiting	12	8	67
Other	5	1	20
<b>Fixed gear vessel type</b>			
Alaska	12	9	75
Crabber	17	9	53
Other groundfish fixed gear	34	8	24
Other < \$15,000	5	2	40
Sablefish fixed gear	59	22	37
Other	1	0	0
<b>Trawl by state</b>			
California	36	22	61
Oregon	79	46	58
Washington	12	5	42
<b>Fixed gear by state</b>			
California	61	18	30
Oregon	37	18	49
Washington	30	14	47
<b>Trawler by annual WOC landings revenue</b>			
<\$100,000	10	3	30
\$100,000 to \$500,000	69	39	57
>\$500,000	48	31	65
<b>Fixed gear by annual WOC landings revenue</b>			
<\$100,000	62	17	27
\$100,000 to \$500,000	59	30	51
>\$500,000	7	3	43

Table 2. Comparison of vessel physical characteristics and revenue sources for all trawler respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	116	439	23
	Respondents	72	436	23
	Nonrespondents	44	445	46
Vessel length (feet)	All	127	66	1
	Respondents	73	66	2
	Nonrespondents	54	66	2
Revenue from crab (US\$)	All	127	45,250	7,728
	Respondents	73	48,909	11,973
	Nonrespondents	54	40,304	8,356
Revenue from groundfish (US\$)	All	127	325,652	20,773
	Respondents	73	339,504	25,365
	Nonrespondents	54	306,926	34,922
Revenue from all species (US\$)	All	127	435,700	24,837
	Respondents	73	451,877	31,567
	Nonrespondents	54	413,832	40,042

Table 3. Comparison of vessel physical characteristics and revenue sources for Alaska trawler respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	12	725	120
	Respondents	6	650	117
	Nonrespondents	6	801	218
Vessel length (feet)	All	14	88	2
	Respondents	6	88	3
	Nonrespondents	8	89	3
Revenue from crab (US\$)	All	14	17,779	12,144
	Respondents	6	18,733	18,733
	Nonrespondents	8	17,063	17,063
Revenue from groundfish (US\$)	All	14	419,761	74,953
	Respondents	6	396,230	87,049
	Nonrespondents	8	437,410	118,723
Revenue from all species (US\$)	All	14	439,529	82,756
	Respondents	6	416,584	89,016
	Nonrespondents	8	456,737	133,843

Table 4. Comparison of vessel physical characteristics and revenue sources for trawl crabber fleet respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	9	228	26
	Respondents	3	298	51
	Nonrespondents	6	193	21
Vessel length (feet)	All	9	43	2
	Respondents	3	46	5
	Nonrespondents	6	41	3
Revenue from crab (US\$)	All	9	126,841	25,134
	Respondents	3	155,636	56,502
	Nonrespondents	6	112,444	27,445
Revenue from groundfish (US\$)	All	9	17,789	14,697
	Respondents	3	53,367	40,530
	Nonrespondents	6	0	0
Revenue from all species (US\$)	All	9	162,651	47,713
	Respondents	3	259,718	126,801
	Nonrespondents	6	114,117	28,889

Table 5. Comparison of vessel physical characteristics and revenue sources for large groundfish trawler respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	77	385	18
	Respondents	52	385	22
	Nonrespondents	25	384	30
Vessel length (feet)	All	83	63	1
	Respondents	52	63	1
	Nonrespondents	31	62	2
Revenue from crab (US\$)	All	83	36,107	7,072
	Respondents	52	35,596	9,401
	Nonrespondents	31	36,964	10,676
Revenue from groundfish (US\$)	All	83	317,738	17,207
	Respondents	52	318,879	23,757
	Nonrespondents	31	315,824	23,603
Revenue from all species (US\$)	All	83	424,719	22,626
	Respondents	52	415,266	29,467
	Nonrespondents	31	440,575	35,458

Table 6. Comparison of vessel physical characteristics and revenue sources for trawl shoreside whiting vessel respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	12	695	61
	Respondents	8	663	34
	Nonrespondents	4	758	184
Vessel length (feet)	All	12	80	3
	Respondents	8	77	2
	Nonrespondents	4	85	7
Revenue from crab (US\$)	All	12	90,185	55,832
	Respondents	8	122,564	82,219
	Nonrespondents	4	25,429	25,426
Revenue from groundfish (US\$)	All	12	680,087	74,921
	Respondents	8	655,110	75,998
	Nonrespondents	4	730,040	183,151
Revenue from all species (US\$)	All	12	801,368	107,555
	Respondents	8	813,965	142,417
	Nonrespondents	4	776,175	179,666

Table 7. Comparison of vessel physical characteristics and revenue sources for trawl shrimp fleet respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	2	†*	†
	Respondents	2	†	†
	Nonrespondents	0	—	—
Vessel length (feet)	All	4	†	†
	Respondents	3	69	9
	Nonrespondents	1	†	—
Revenue from crab (US\$)	All	4	†	†
	Respondents	3	52,330	52,330
	Nonrespondents	1	†	—
Revenue from groundfish (US\$)	All	4	†	†
	Respondents	3	135,869	43,184
	Nonrespondents	1	†	—
Revenue from all species (US\$)	All	4	†	†
	Respondents	3	516,955	95,996
	Nonrespondents	1	†	—

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 8. Comparison of vessel physical characteristics and revenue sources for fixed gear vessel respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	105	256	18
	Respondents	48	292	24
	Nonrespondents	57	226	26
Vessel length (feet)	All	128	40	1
	Respondents	50	45	2
	Nonrespondents	78	37	1
Revenue from crab (US\$)	All	128	63,440	10,250
	Respondents	50	91,287	18,360
	Nonrespondents	78	45,590	11,674
Revenue from groundfish (US\$)	All	128	89,569	6,399
	Respondents	50	90,673	10,515
	Nonrespondents	78	88,862	8,106
Revenue from all species (US\$)	All	128	168,914	16,656
	Respondents	50	202,637	29,084
	Nonrespondents	78	147,296	19,756

Table 9. Comparison of vessel physical characteristics and revenue sources for fixed gear Alaska vessel respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	12	407	57
	Respondents	9	444	72
	Nonrespondents	3	297	32
Vessel length (feet)	All	12	64	4
	Respondents	9	66	5
	Nonrespondents	3	58	3
Revenue from crab (US\$)	All	12	82,566	36,735
	Respondents	9	94,065	47,067
	Nonrespondents	3	48,068	48,068
Revenue from groundfish (US\$)	All	12	124,412	21,049
	Respondents	9	110,062	18,744
	Nonrespondents	3	167,464	65,538
Revenue from all species (US\$)	All	12	215,765	48,316
	Respondents	9	212,304	57,591
	Nonrespondents	3	226,147	107,168

Table 10. Comparison of vessel physical characteristics and revenue sources for fixed gear crabber fleet respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	12	399	94
	Respondents	8	341	65
	Nonrespondents	4	515	266
Vessel length (feet)	All	17	49	3
	Respondents	9	47	3
	Nonrespondents	8	51	5
Revenue from crab (US\$)	All	17	221,035	40,223
	Respondents	9	231,156	58,087
	Nonrespondents	8	209,649	59,037
Revenue from groundfish (US\$)	All	17	91,775	28,951
	Respondents	9	59,500	19,266
	Nonrespondents	8	128,085	56,905
Revenue from all species (US\$)	All	17	354,732	72,369
	Respondents	9	325,812	86,925
	Nonrespondents	8	387,268	124,249

Table 11. Comparison of vessel physical characteristics and revenue sources for fixed gear other groundfish fleet respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	32	222	12
	Respondents	8	214	34
	Nonrespondents	24	225	12
Vessel length (feet)	All	34	28	1
	Respondents	8	29	4
	Nonrespondents	26	28	1
Revenue from crab (US\$)	All	34	12,940	5,618
	Respondents	8	29,039	17,888
	Nonrespondents	26	7,986	4,768
Revenue from groundfish (US\$)	All	34	59,932	3,644
	Respondents	8	52,531	10,277
	Nonrespondents	26	62,210	3,597
Revenue from all species (US\$)	All	34	77,069	7,691
	Respondents	8	89,420	24,845
	Nonrespondents	26	73,269	6,816

Table 12. Comparison of vessel physical characteristics and revenue sources for fixed gear “other less than \$15,000” vessel respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	4	160	54
	Respondents	2	†*	†
	Nonrespondents	2	†	†
Vessel length (feet)	All	5	41	3
	Respondents	2	†	†
	Nonrespondents	3	†	†
Revenue from crab (US\$)	All	5	2,108	1,448
	Respondents	2	†	†
	Nonrespondents	3	†	†
Revenue from groundfish (US\$)	All	5	2,173	1,469
	Respondents	2	†	†
	Nonrespondents	3	†	†
Revenue from all species (US\$)	All	5	5,998	2,308
	Respondents	2	†	†
	Nonrespondents	3	†	†

\*The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 13. Comparison of vessel physical characteristics and revenue sources for fixed gear sablefish fleet respondents and nonrespondents.

<b>Variable</b>	<b>Response status</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Engine horsepower	All	45	211	24
	Respondents	21	246	27
	Nonrespondents	24	180	37
Vessel length (feet)	All	59	40	1
	Respondents	22	42	2
	Nonrespondents	37	39	2
Revenue from crab (US\$)	All	59	49,516	12,170
	Respondents	22	63,532	18,958
	Nonrespondents	37	41,183	15,832
Revenue from groundfish (US\$)	All	59	107,754	8,633
	Respondents	22	117,271	18,520
	Nonrespondents	37	102,095	8,372
Revenue from all species (US\$)	All	59	173,991	22,086
	Respondents	22	207,120	45,084
	Nonrespondents	37	154,292	22,788



Table 14. Two sample t-tests for statistical significance of differences between trawl fleet respondents and nonrespondents in five variables.

<b>Fleet</b>	<b>Variable</b>	<b>T-statistic</b>	<b>Degrees of freedom</b>	<b>Probability &gt; T if H0 true</b>
Alaska	Vessel length	-0.26	12	0.80
	Engine horsepower	-0.61	8	0.56
	Revenue from groundfish	-0.28	12	0.78
	Revenue from crab	0.07	11	0.95
	Revenue from all species	-0.25	11	0.81
All trawlers	Vessel length	0.21	91	0.84
	Engine horsepower	-0.16	64	0.87
	Revenue from groundfish	0.75	103	0.45
	Revenue from crab	0.59	120	0.56
	Revenue from all species	0.75	109	0.46
Crabber	Vessel length	0.93	3	0.42
	Engine horsepower	1.91	3	0.16
	Revenue from groundfish	1.32	2	0.32
	Revenue from crab	0.69	3	0.54
	Revenue from all species	1.12	2	0.37
Lg. groundfish trawler	Vessel length	0.72	59	0.47
	Engine horsepower	0.00	50	1.00
	Revenue from groundfish	0.09	76	0.93
	Revenue from crab	-0.10	70	0.92
	Revenue from all species	-0.55	67	0.58
Shrimp	Vessel length	—	0	—
	Engine horsepower	—	0	—
	Revenue from groundfish	—	0	—
	Revenue from crab	—	0	—
	Revenue from all species	—	0	—
Whiting	Vessel length	-1.09	4	0.34
	Engine horsepower	-0.51	3	0.65
	Revenue from groundfish	-0.38	4	0.72
	Revenue from crab	1.13	8	0.29
	Revenue from all species	0.16	7	0.87

Table 15. Two sample t-tests for statistical significance of differences between fixed gear fleet respondents and nonrespondents in five variables.

<b>Fleet</b>	<b>Variable</b>	<b>T-statistic</b>	<b>Degrees of freedom</b>	<b>Probability &gt; T if H0 true</b>
Alaska	Vessel length	1.58	10	0.15
	Engine horsepower	1.88	10	0.09
	Revenue from groundfish	-0.84	2	0.48
	Revenue from crab	0.68	6	0.52
	Revenue from all species	-0.11	3	0.92
All fixed gear	Vessel length	2.87	88	0.01
	Engine horsepower	1.89	103	0.06
	Revenue from groundfish	0.14	102	0.89
	Revenue from crab	2.10	88	0.04
	Revenue from all species	1.57	92	0.12
Crabber	Vessel length	-0.79	11	0.45
	Engine horsepower	-0.64	3	0.56
	Revenue from groundfish	-1.14	9	0.28
	Revenue from crab	0.26	15	0.80
	Revenue from all species	-0.41	13	0.69
Other < \$15,000	Vessel length	†*	1	0.41
	Engine horsepower	†	1	0.44
	Revenue from groundfish	†	1	0.61
	Revenue from crab	†	1	0.61
	Revenue from all species	†	1	0.64
Other groundfish	Vessel length	†	9	0.92
	Engine horsepower	†	9	0.78
	Revenue from groundfish	†	9	0.40
	Revenue from crab	†	8	0.29
	Revenue from all species	†	8	0.55
Sablefish	Vessel length	1.09	43	0.28
	Engine horsepower	1.43	41	0.16
	Revenue from groundfish	0.75	30	0.46
	Revenue from crab	0.90	47	0.37
	Revenue from all species	1.05	32	0.30

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 16. Costs and earnings by category for trawl vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	70	92,682	5,472
Captain adjusted	73	96,788	5,204
Crew	73	117,552	6,915
Food	73	8,114	707
Fuel	72	91,741	6,464
Bait	69	4,361	762
Ice	72	5,405	403
Insurance	70	25,481	1,528
Interest payments	71	5,338	706
Moorage	70	4,122	340
Dues	67	3,022	552
Enforcement	70	3,649	439
Leasing permits	71	1,439	367
Purchasing permits	71	1,704	764
RMI <sup>a</sup>	70	71,885	5,180
Capital (imputed)	68	34,496	2,375
Other	69	11,970	1,907
Landings tax	73	1,225	184
Buyback tax	73	19,367	852
Revenue from:			
Alaska	72	85,648	23,636
Hawaii	73	0	0
Other sources	73	16,843	4,513
At sea deliveries	73	26,788	7,933
Salmon disaster fund	73	3,349	1,418
Sale/leasing of permits	73	534	341
All species <sup>b</sup>	73	451,877	20,692
Groundfish	73	339,504	16,627
Crab	73	48,909	7,848
Shrimp	73	53,332	8,741
Salmon	73	145	50
Pelagic	73	2,203	858
HMS <sup>c</sup>	73	593	207
Halibut	73	1,069	396

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 17. Costs and earnings by category for trawl Alaska vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	6	234,164	43,887
Captain adjusted	6	234,164	43,887
Crew	6	318,546	38,350
Food	6	21,372	7,688
Fuel	6	296,221	46,203
Bait	6	1,667	1,627
Ice	6	290	283
Insurance	6	60,909	7,526
Interest payments	6	833	814
Moorage	6	12,258	3,887
Dues	6	1,783	1,163
Enforcement	6	13,244	2,356
Leasing permits	6	0	0
Purchasing permits	6	0	0
RMI <sup>a</sup>	6	164,853	32,426
Capital (imputed)	6	78,333	12,646
Other	6	25,833	24,257
Buyback tax	6	19,915	4,249
Landings tax	6	657	137
Revenue from:			
Alaska	6	1,027,782	163,022
Hawaii	6	0	0
Other sources	6	36,667	35,797
At sea deliveries	6	263,761	91,874
Salmon disaster fund	6	0	0
Sale/leasing of permits	6	0	0
All species <sup>b</sup>	6	416,584	86,905
Groundfish	6	396,230	84,984
Crab	6	18,733	18,288
Shrimp	6	0	0
Salmon	6	275	205
Pelagic	6	883	388
HMS <sup>c</sup>	6	0	0
Halibut	6	59	57

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 18. Costs and earnings by category for trawl crabbers.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	3	75,117	40,812
Captain adjusted	3	75,628	40,430
Crew	3	81,622	38,558
Food	3	1,647	1,038
Fuel	3	27,188	12,438
Bait	3	13,753	8,406
Ice	3	3,667	3,142
Insurance	3	3,333	3,294
Interest payments	3	1,817	1,578
Moorage	3	3,672	1,670
Dues	3	33	33
Enforcement	3	160	79
Leasing permits	3	0	0
Purchasing permits	3	0	0
RMI <sup>a</sup>	3	16,277	4,446
Capital (imputed)	3	16,667	6,588
Other	3	1,226	1,212
Buyback tax	3	6,452	4,931
Landings tax	3	374	198
Revenue from:			
Alaska	3	0	0
Hawaii	3	0	0
Other sources	3	9,707	9,593
At sea deliveries	3	0	0
Salmon disaster fund	3	17,667	16,480
Sale/leasing of permits	3	0	0
All species <sup>b</sup>	3	259,718	125,306
Groundfish	3	53,367	40,052
Crab	3	155,636	55,836
Shrimp	3	46,126	45,582
Salmon	3	0	0
Pelagic	3	552	546
HMS <sup>c</sup>	3	1,663	1,643
Halibut	3	2,294	1,317

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 19. Costs and earnings by category for large groundfish trawlers.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	51	75,706	5,298
Captain adjusted	52	83,137	5,196
Crew	52	93,443	6,107
Food	52	6,316	441
Fuel	51	72,775	5,169
Bait	48	3,357	722
Ice	51	6,121	526
Insurance	49	20,062	1,367
Interest payments	50	4,920	681
Moorage	49	2,932	178
Dues	46	3,755	909
Enforcement	49	1,795	379
Leasing permits	50	2,043	603
Purchasing permits	50	2,308	1,271
RMI <sup>a</sup>	49	61,768	5,486
Capital (imputed)	48	23,917	1,129
Other	48	12,166	2,066
Buyback tax	52	18,267	1,018
Landings tax	52	929	96
Revenue from:			
Alaska	51	0	0
Hawaii	52	0	0
Other sources	52	16,912	6,689
At sea deliveries	52	0	0
Salmon disaster fund	52	3,644	2,226
Sale/leasing of permits	52	750	563
All species <sup>b</sup>	52	415,266	22,706
Groundfish	52	318,879	18,306
Crab	52	35,596	7,244
Shrimp	52	50,683	11,633
Salmon	52	27	20
Pelagic	52	1,875	1,357
HMS <sup>c</sup>	52	736	333
Halibut	52	719	435

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 20. Costs and earnings by category for trawl shoreside whiting vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	8	106,929	9,666
Captain adjusted	8	106,929	9,666
Crew	8	154,574	32,121
Food	8	14,280	5,202
Fuel	8	111,448	16,234
Bait	8	8,750	7,189
Ice	8	6,788	2,637
Insurance	8	46,901	5,067
Interest payments	8	14,693	6,913
Moorage	8	6,338	1,588
Dues	8	2,370	1,336
Enforcement	8	9,421	2,375
Leasing permits	8	0	0
Purchasing permits	8	695	673
RMI <sup>a</sup>	8	97,933	30,123
Capital (imputed)	8	73,438	17,207
Other	8	9,759	7,043
Buyback tax	8	33,369	3,785
Landings tax	8	4,197	2,209
Revenue from:			
Alaska	8	0	0
Hawaii	8	0	0
Other sources	8	8,750	8,472
At sea deliveries	8	46,624	45,143
Salmon disaster fund	8	0	0
Sale/leasing of permits	8	0	0
All species <sup>b</sup>	8	813,965	137,895
Groundfish	8	655,110	73,584
Crab	8	122,564	79,608
Shrimp	8	19,830	13,501
Salmon	8	943	599
Pelagic	8	7,047	3,017
HMS <sup>c</sup>	8	5	4
Halibut	8	30	19

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 21. Costs and earnings by category for trawl shrimpers.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	3	70,497	25,196
Captain adjusted	3	80,888	15,521
Crew	3	104,515	22,280
Food	3	5,024	2,501
Fuel	3	42,726	10,137
Bait	3	6,000	5,929
Ice	3	3,333	1,647
Insurance	3	16,667	8,715
Interest payments	3	1,667	1,647
Moorage	3	1,800	1,195
Dues	3	0	0
Enforcement	3	3,973	2,981
Leasing permits	3	0	0
Purchasing permits	3	0	0
RMI <sup>a</sup>	3	55,804	23,531
Capital (imputed)	3	42,500	22,235
Other	3	1,003	991
Buyback tax	3	19,091	5,530
Landings tax	3	814	149
Revenue from:			
Alaska	3	0	0
Hawaii	3	0	0
Other sources	3	0	0
At sea deliveries	3	0	0
Salmon disaster fund	3	0	0
Sale/leasing of permits	3	0	0
All species <sup>b</sup>	3	516,955	94,865
Groundfish	3	135,869	42,675
Crab	3	52,330	51,713
Shrimp	3	320,246	101,578
Salmon	3	0	0
Pelagic	3	0	0
HMS <sup>c</sup>	3	0	0
Halibut	3	0	0

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.



Table 22. Costs and earnings by category for fixed gear vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	50	50,643	6,426
Captain adjusted	50	51,234	6,423
Crew	50	72,051	10,105
Food	50	5,720	808
Fuel	50	24,874	3,694
Bait	50	11,597	1,426
Ice	50	1,258	260
Insurance	50	10,388	1,458
Interest payments	50	6,207	1,362
Moorage	50	2,697	171
Dues	50	776	209
Enforcement	50	995	170
Leasing permits	50	8,662	3,098
Purchasing permits	50	13,894	6,180
RMI <sup>a</sup>	50	31,892	3,934
Capital (imputed)	50	14,281	1,544
Other	50	3,979	871
Landings tax	50	538	96
Buyback tax	50	850	197
Revenue from:			
Alaska	50	119,664	35,250
Hawaii	50	206	161
Other sources	50	4,788	1,723
At sea deliveries	50	0	0
Salmon disaster fund	50	14,697	3,530
Sale/leasing of permits	50	670	380
All species <sup>b</sup>	50	184,164	21,659
Groundfish	50	87,053	8,384
Crab	50	77,264	12,210
Shrimp	50	5,605	3,558
Salmon	50	555	234
Pelagic	50	322	246
HMS <sup>c</sup>	50	6,415	2,209
Halibut	50	6,461	1,735

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 23. Costs and earnings by category for fixed gear Alaska vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	9	215,111	30,487
Captain adjusted	9	241,069	31,116
Crew	9	317,000	66,894
Food	9	24,611	5,777
Fuel	9	114,444	22,627
Bait	9	35,944	3,173
Ice	9	2,900	1,624
Insurance	9	35,633	6,190
Interest payments	9	10,873	3,342
Moorage	9	5,478	978
Dues	9	2,411	1,269
Enforcement	9	2,591	879
Leasing permits	9	32,444	20,702
Purchasing permits	9	91,667	62,498
RMI <sup>a</sup>	9	97,129	16,718
Capital (imputed)	9	36,389	9,792
Other	9	4,467	2,328
Landings tax	9	1,030	197
Buyback tax	9	517	250
Revenue from:			
Alaska	9	1,266,444	212,455
Hawaii	9	0	0
Other sources	9	0	0
At sea deliveries	9	0	0
Salmon disaster fund	9	0	0
Sale/leasing of permits	9	0	0
All species <sup>b</sup>	9	212,304	55,529
Groundfish	9	110,062	18,073
Crab	9	94,065	45,382
Shrimp	9	0	0
Salmon	9	0	0
Pelagic	9	0	0
HMS <sup>c</sup>	9	0	0
Halibut	9	4,866	1,694

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 24. Costs and earnings by category for fixed gear crabbers.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	9	58,222	13,713
Captain adjusted	9	59,547	13,736
Crew	9	88,758	28,779
Food	9	5,741	1,202
Fuel	9	32,834	9,177
Bait	9	12,190	3,542
Ice	9	1,928	949
Insurance	9	17,801	3,510
Interest payments	9	5,383	4,223
Moorage	9	2,389	376
Dues	9	264	255
Enforcement	9	2,117	1,048
Leasing permits	9	1,326	1,278
Purchasing permits	9	33,333	32,140
RMI <sup>a</sup>	9	54,578	17,195
Capital (imputed)	9	20,750	7,338
Other	9	13,127	6,170
Landings tax	9	831	538
Buyback tax	9	2,161	791
Revenue from:			
Alaska	9	0	0
Hawaii	9	0	0
Other sources	9	6,667	6,428
At sea deliveries	9	0	0
Salmon disaster fund	9	28,111	12,655
Sale/leasing of permits	9	3,111	3,000
All species <sup>b</sup>	9	325,812	83,814
Groundfish	9	59,500	18,576
Crab	9	231,156	56,007
Shrimp	9	948	914
Salmon	9	0	0
Pelagic	9	0	0
HMS <sup>c</sup>	9	30,894	15,968
Halibut	9	3,226	1,619

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 25. Costs and earnings by category for other groundfish fixed gear vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	8	13,725	2,531
Captain adjusted	8	14,845	3,406
Crew	8	22,375	4,349
Food	8	1,988	666
Fuel	8	7,162	1,673
Bait	8	6,347	2,024
Ice	8	625	205
Insurance	8	1,875	610
Interest payments	8	3,307	1,885
Moorage	8	1,875	282
Dues	8	63	31
Enforcement	8	498	206
Leasing permits	8	750	726
Purchasing permits	8	0	0
RMI <sup>a</sup>	8	11,890	5,274
Capital (imputed)	8	7,319	612
Other	8	1,363	824
Landings tax	8	93	45
Buyback tax	8	197	105
Revenue from:			
Alaska	8	0	0
Hawaii	8	0	0
Other sources	8	0	0
At sea deliveries	8	0	0
Salmon disaster fund	8	2,000	1,936
Sale/leasing of permits	8	0	0
All species <sup>b</sup>	8	89,420	24,056
Groundfish	8	52,531	9,951
Crab	8	29,039	17,320
Shrimp	8	0	0
Salmon	8	63	61
Pelagic	8	1,194	1,155
HMS <sup>c</sup>	8	3,880	3,757
Halibut	8	2,562	1,367

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 26. Costs and earnings by category for fixed gear “other less than \$15,000” vessels.

Variable	Number of observations	Mean (US\$)	Standard error (US\$)
Cost of:			
Captain	2	† <sup>a</sup>	†
Captain adjusted	2	†	†
Crew	2	†	†
Food	2	†	†
Fuel	2	†	†
Bait	2	†	†
Ice	2	†	†
Insurance	2	†	†
Interest payments	2	†	†
Moorage	2	†	†
Dues	2	†	†
Enforcement	2	†	†
Leasing permits	2	†	†
Purchasing permits	2	†	†
RMI <sup>b</sup>	2	†	†
Capital (imputed)	2	†	†
Other	2	†	†
Landings tax	2	†	†
Buyback tax	2	†	†
Revenue from:			
Alaska	2	†	†
Hawaii	2	†	†
Other sources	2	†	†
At sea deliveries	2	†	†
Salmon disaster fund	2	†	†
Sale/leasing of permits	2	†	†
All species <sup>c</sup>	2	†	†
Groundfish	2	†	†
Crab	2	†	†
Shrimp	2	†	†
Salmon	2	†	†
Pelagic	2	†	†
HMS <sup>d</sup>	2	†	†
Halibut	2	†	†

<sup>a</sup> The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

<sup>b</sup> RMI = repair, maintenance, and improvements.

<sup>c</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>d</sup> HMS = highly migratory species.

Table 27. Costs and earnings by category for fixed gear sablefish vessels.

<b>Variable</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Cost of:			
Captain	22	40,464	7,162
Captain adjusted	22	40,690	7,158
Crew	22	52,024	9,099
Food	22	4,482	883
Fuel	22	16,605	3,978
Bait	22	10,444	2,653
Ice	22	1,189	490
Insurance	22	8,785	2,353
Interest payments	22	7,641	2,974
Moorage	22	2,694	261
Dues	22	1,051	433
Enforcement	22	697	200
Leasing permits	22	11,232	6,453
Purchasing permits	22	1,659	1,047
RMI <sup>a</sup>	22	25,953	4,830
Capital (imputed)	22	12,357	1,927
Other	22	2,986	966
Landings tax	22	654	164
Buyback tax	22	987	414
Revenue from:			
Alaska	22	0	0
Hawaii	22	443	403
Other sources	22	8,259	3,857
At sea deliveries	22	0	0
Salmon disaster fund	22	22,173	7,597
Sale/leasing of permits	22	545	496
All species <sup>b</sup>	22	207,120	41,027
Groundfish	22	117,271	16,854
Crab	22	63,532	17,252
Shrimp	22	11,791	8,873
Salmon	22	1,072	571
Pelagic	22	5	4
HMS <sup>c</sup>	22	2,672	2,077
Halibut	22	10,513	4,153

<sup>a</sup> RMI = repair, maintenance, and improvements.

<sup>b</sup> Groundfish, crab, shrimp, salmon, pelagic, HMS, and halibut do not represent 100% of species landed; as a result, the sum of revenue for these species is less than revenue reported for all species.

<sup>c</sup> HMS = highly migratory species.

Table 28. Revenue, costs, and net revenue (in US\$) for the trawl fleet.<sup>a</sup>

<b>Fleet</b>	<b>Revenue all sources</b>	<b>Reported cost</b>	<b>Accounting net revenue</b>	<b>Economic cost</b>	<b>Economic net revenue</b>
Alaska	1,744,793	1,172,545	572,248	1,250,878	493,915
All	585,041	469,058	115,983	507,660	77,381
Crab	287,092	236,338	50,754	253,515	33,577
Lg. groundfish trawler	436,572	388,663	47,909	420,010	16,562
Shrimp	516,955	332,913	184,042	385,804	131,150
Whiting	869,338	628,444	240,895	701,881	167,457

Table 29. Revenue, costs, and net revenue (in US\$) for the fixed gear fleet.<sup>a</sup>

<b>Fleet</b>	<b>Revenue all sources</b>	<b>Reported cost</b>	<b>Accounting net revenue</b>	<b>Economic cost</b>	<b>Economic net revenue</b>
Alaska	1,478,749	994,251	484,498	1,056,598	422,151
All	324,189	247,003	77,185	271,876	52,313
Crab	363,700	332,985	30,716	355,059	8,641
Other < \$15,000	† <sup>b</sup>	†	†	†	†
Other groundfish	91,420	74,129	17,290	82,568	8,851
Sablefish	238,540	189,547	48,993	202,130	36,410

<sup>a</sup> For Table 28 and Table 29, values are rounded to the nearest dollar. Revenue all sources includes landings, at sea deliveries, sale and leasing of permits, salmon disaster payments, and any other sources. Reported cost provides the total of all cost categories as collected by the survey. Accounting net revenue is the difference between Revenue all sources and Reported cost. Economic cost makes three adjustments to the Reported cost figure to get closer to a measure of economic opportunity cost: 1) a minimum captain payment equal to 15% of revenue from landings and at sea deliveries is imposed to compensate for some vessels not making an explicit salary payment to the owner-captain for his or her provision of captains services, 2) capital costs are estimated to equal 5% of the reported market value of the vessel, and 3) costs are increased by 5% to account for those costs that were not included in the cost categories collected by the survey instrument. Economic net revenue equals Revenue all sources minus Economic cost.

<sup>b</sup> The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 30. Trawl fleet crew size, fuel use (gallons per hour), and speed (knots per hour).

<b>Fleet</b>	<b>Variable</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Alaska	Crew size for crabbing	1	†*	—
	Crew size for shrimp trawling	0	—	—
	Crew size for groundfish trawling	6	2.7	0.2
	Fuel use for crabbing	1	†	—
	Fuel use for shrimp trawling	0	—	—
	Fuel use for groundfish trawling	6	44.3	1.9
	Fuel use for steaming full	6	34.5	2.2
	Fuel use for steaming empty	6	29.5	3.9
	Speed when crabbing	1	†	†
	Speed when shrimp trawling	0	—	—
	Speed when groundfish trawling	6	3.5	0.1
All trawlers	Crew size for crabbing	31	2.8	0.1
	Crew size for shrimp trawling	36	2.0	0.0
	Crew size for groundfish trawling	72	2.0	0.0
	Fuel use for crabbing	28	8.3	0.5
	Fuel use for shrimp trawling	38	11.7	0.9
	Fuel use for groundfish trawling	68	17.1	1.0
	Fuel use for steaming full	65	14.6	0.8
	Fuel use for steaming empty	63	13.7	0.7
	Speed when crabbing	28	2.7	0.1
	Speed when shrimp trawling	36	2.2	0.1
	Speed when groundfish trawling	71	2.6	0.1
Crabber	Crew size for crabbing	3	2.3	0.3
	Crew size for shrimp trawling	2	†	†
	Crew size for groundfish trawling	3	1.3	0.3
	Fuel use for crabbing	2	†	†
	Fuel use for shrimp trawling	2	†	†
	Fuel use for groundfish trawling	2	†	†
	Fuel use for steaming full	2	†	†
	Fuel use for steaming empty	2	†	†
	Speed when crabbing	2	†	†
	Speed when shrimp trawling	2	†	†
	Speed when groundfish trawling	3	2.3	0.1
Speed when trolling	2	†	†	
Lg. groundfish trawler	Crew size for crabbing	23	2.7	0.1
	Crew size for shrimp trawling	29	2.0	0.0
	Crew size for groundfish trawling	52	1.9	0.0
	Crew size for salmon trolling	13	1.5	0.1
	Fuel use for crabbing	20	7.7	0.5
	Fuel use for shrimp trawling	28	10.7	0.7
	Fuel use for groundfish trawling	48	12.1	0.7
	Fuel use for steaming full	45	11.2	0.6
	Fuel use for steaming empty	43	10.5	0.5
Speed when crabbing	20	2.7	0.2	



Table 30 continued. Trawl fleet crew size, fuel use (gallons per hour), and speed (knots per hour).

<b>Fleet</b>	<b>Variable</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Lg. groundfish trawler (continued)	Speed when shrimp trawling	29	2.3	0.2
	Speed when groundfish trawling	50	2.5	0.1
	Speed when trolling	13	4.1	0.5
Shrimp	Crew size for crabbing	1	†	—
	Crew size for shrimp trawling	3	2.3	0.3
	Crew size for groundfish trawling	3	2.3	0.3
	Crew size for salmon trolling	1	†	—
	Fuel use for crabbing	1	†	—
	Fuel use for shrimp trawling	3	17.0	3.8
	Fuel use for groundfish trawling	3	18.3	4.4
	Fuel use for steaming full	3	14.0	3.0
	Fuel use for steaming empty	3	14.0	3.0
	Speed when crabbing	1	2.0	—
	Speed when shrimp trawling	3	1.9	0.1
	Speed when groundfish trawling	3	2.2	0.1
	Speed when trolling	1	†	—
Whiting	Crew size for crabbing	3	3.7	0.3
	Crew size for shrimp trawling	2	†	†
	Crew size for groundfish trawling	8	2.3	0.2
	Crew size for salmon trolling	0	†	—
	Fuel use for crabbing	3	13.0	2.1
	Fuel use for shrimp trawling	2	†	—
	Fuel use for groundfish trawling	8	30.6	5.9
	Fuel use for steaming full	8	22.4	3.5
	Fuel use for steaming empty	8	21.6	3.7
	Speed when crabbing	3	2.0	0.6
	Speed when shrimp trawling	2	†	†
Speed when groundfish trawling	8	2.9	0.3	
Speed when trolling	0	—	—	

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 31. Fixed gear fleet crew size, fuel use (gallons per hour), and speed (knots per hour).

<b>Fleet</b>	<b>Variable</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Alaska	Crew size for crabbing	3	4.0	0.6
	Crew size when longlining	9	4.2	0.4
	Crew size for salmon trolling	1	†*	—
	Fuel use for crabbing	1	†	—
	Fuel use when longlining	6	18.7	9.9
	Fuel use for salmon trolling	1	†	—
	Fuel use for steaming full	5	10.0	2.1
	Fuel use for steaming empty	5	9.8	2.1
	Speed when crabbing	3	2.8	0.9
	Speed when longlining	7	3.6	1.1
	Speed when salmon trolling	1	†	—
All fixed gear	Crew size for crabbing	28	2.4	0.2
	Crew size when longlining	44	2.5	0.2
	Crew size for salmon trolling	23	1.2	0.1
	Fuel use for crabbing	25	4.8	0.5
	Fuel use when longlining	43	5.9	1.2
	Fuel use for salmon trolling	25	3.6	0.4
	Fuel use for steaming full	42	7.8	0.7
	Fuel use for steaming empty	42	7.0	0.6
	Speed when crabbing	28	4.6	0.4
	Speed when longlining	44	4.7	0.5
	Speed when salmon trolling	26	3.8	0.3
Crabber	Crew size for crabbing	9	2.4	0.4
	Crew size when longlining	9	2.3	0.3
	Crew size for salmon trolling	5	1.4	0.2
	Fuel use for crabbing	8	6.2	1.4
	Fuel use when longlining	8	6.2	1.4
	Fuel use for salmon trolling	4	5.5	2.5
	Fuel use for steaming full	8	8.4	2.2
	Fuel use for steaming empty	8	8.2	1.9
	Speed when crabbing	8	4.8	0.7
	Speed when longlining	7	4.6	1.2
	Speed when salmon trolling	4	4.0	1.0
Other < \$15,000	Crew size for crabbing	1	†	—
	Crew size when longlining	1	†	—
	Crew size for salmon trolling	1	†	—
	Fuel use for crabbing	1	†	—
	Fuel use when longlining	1	†	—
	Fuel use for salmon trolling	1	†	—
	Fuel use for steaming full	2	†	0.5
	Fuel use for steaming empty	2	†	0.5
	Speed when crabbing	1	†	—
	Speed when longlining	1	†	—
	Speed when salmon trolling	1	†	—

Table 31 continued. Fixed gear crew size, fuel use (gallons per hour), and speed (knots per hour).

<b>Fleet</b>	<b>Variable</b>	<b>Number of observations</b>	<b>Mean</b>	<b>Standard error</b>
Other groundfish	Crew size for crabbing	3	2.3	0.3
	Crew size when longlining	6	2.5	1.1
	Crew size for salmon trolling	3	1.7	0.3
	Fuel use for crabbing	2	†	0.4
	Fuel use when longlining	6	2.2	0.4
	Fuel use for salmon trolling	2	†	1.5
	Fuel use for steaming full	6	11.0	3.0
	Fuel use for steaming empty	6	10.6	3.2
	Speed when crabbing	3	2.2	0.7
	Speed when longlining	7	4.6	1.2
	Speed when salmon trolling	3	4.6	0.9
	Sablefish	Crew size for crabbing	12	2.0
Crew size when longlining		19	1.7	0.2
Crew size for salmon trolling		13	1.0	0.0
Fuel use for crabbing		13	4.2	0.7
Fuel use when longlining		22	3.5	0.5
Fuel use for salmon trolling		17	3.1	0.5
Fuel use for steaming full		21	6.5	1.1
Fuel use for steaming empty		21	5.1	0.7
Speed when crabbing		13	5.7	0.6
Speed when longlining		22	5.2	1.0
Speed when salmon trolling		17	3.5	0.3

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 32. Trawl fleet share for captain, crew, and vessel.

<b>Fleet</b>	<b>Variable</b>	<b>Number of observations</b>	<b>Mean (%)</b>	<b>Standard error</b>
Alaska	Captain share without owner as captain	6	19.3	3.7
	Crew share without owner as captain	5	23.2	0.6
	Vessel share without owner as captain	6	61.3	0.8
	Captain share with owner as captain	3	15.7	0.9
	Crew share with owner as captain	4	27.0	3.6
	Vessel share with owner as captain	4	61.3	1.1
	Percent of trips with owner as captain	6	33.3	10.3
All trawlers	Captain share without owner as captain	51	19.1	0.7
	Crew share without owner as captain	51	22.5	0.7
	Vessel share without owner as captain	51	59.5	0.5
	Captain share with owner as captain	35	8.1	1.2
	Crew share with owner as captain	35	25.7	0.9
	Vessel share with owner as captain	35	66.2	1.1
	Percent of trips with owner as captain	73	35.5	3.4
Crabber	Captain share without owner as captain	0	—	—
	Crew share without owner as captain	1	†*	—
	Vessel share without owner as captain	1	†	—
	Captain share with owner as captain	2	†	†
	Crew share with owner as captain	2	†	†
	Vessel share with owner as captain	2	†	†
	Percent of trips with owner as captain	3	66.7	32.9
Lg. groundfish trawler	Captain share without owner as captain	33	19.5	1.0
	Crew share without owner as captain	32	23.4	1.0
	Vessel share without owner as captain	34	59.1	0.8
	Captain share with owner as captain	19	10.7	1.7
	Crew share with owner as captain	28	25.5	1.2
	Vessel share with owner as captain	28	67.3	1.6
	Percent of trips with owner as captain	52	39.7	4.9
Shrimp	Captain share without owner as captain	2	†	†
	Crew share without owner as captain	2	†	†
	Vessel share without owner as captain	2	†	†
	Captain share with owner as captain	0	—	—
	Crew share with owner as captain	0	—	—
	Vessel share with owner as captain	0	—	—
	Percent of trips with owner as captain	3	3.3	3.3
Whiting	Captain share without owner as captain	7	18.6	1.7
	Crew share without owner as captain	8	23.5	1.9
	Vessel share without owner as captain	8	60.3	2.0
	Captain share with owner as captain	1	†	—
	Crew share with owner as captain	1	†	—
	Vessel share with owner as captain	1	†	—
	Percent of trips with owner as captain	8	2.0	1.9

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 33. Fixed gear fleet share for captain, crew, and vessel.

<b>Fleet</b>	<b>Variable</b>	<b>Number of observations</b>	<b>Mean (%)</b>	<b>Standard error</b>
Alaska	Captain share without owner as captain	6	11.5	1.0
	Crew share without owner as captain	6	44.5	6.8
	Vessel share without owner as captain	6	44.0	6.3
	Captain share with owner as captain	6	13.2	7.9
	Crew share with owner as captain	7	48.9	10.6
	Vessel share with owner as captain	7	39.9	7.8
	Percent of trips with owner as captain	9	62.3	13.0
All fixed gear	Captain share without owner as captain	18	19.0	1.4
	Crew share without owner as captain	18	28.7	3.1
	Vessel share without owner as captain	18	52.3	2.4
	Captain share with owner as captain	23	16.0	2.8
	Crew share with owner as captain	37	30.7	2.3
	Vessel share with owner as captain	39	61.4	2.7
	Percent of trips with owner as captain	49	76.8	4.3
Crabber	Captain share without owner as captain	2	†*	†
	Crew share without owner as captain	2	†	†
	Vessel share without owner as captain	2	†	†
	Captain share with owner as captain	4	20.0	10.3
	Crew share with owner as captain	8	28.1	3.1
	Vessel share with owner as captain	8	61.9	7.3
	Percent of trips with owner as captain	8	99.1	0.6
Other < \$15,000	Captain share without owner as captain	2	†	†
	Crew share without owner as captain	2	†	†
	Vessel share without owner as captain	2	†	†
	Captain share with owner as captain	1	†	—
	Crew share with owner as captain	1	†	—
	Vessel share with owner as captain	1	†	—
	Percent of trips with owner as captain	2	†	†
Other groundfish	Captain share without owner as captain	3	25.0	0.0
	Crew share without owner as captain	3	12.0	0.0
	Vessel share without owner as captain	3	63.0	0.0
	Captain share with owner as captain	3	23.3	1.6
	Crew share with owner as captain	3	24.0	8.1
	Vessel share with owner as captain	4	64.5	12.4
	Percent of trips with owner as captain	8	57.5	16.9
Sablefish	Captain share without owner as captain	5	24.4	3.6
	Crew share without owner as captain	5	19.0	3.3
	Vessel share without owner as captain	5	56.6	4.4
	Captain share with owner as captain	9	13.3	5.6
	Crew share with owner as captain	18	25.3	2.7
	Vessel share with owner as captain	19	69.7	3.4
	Percent of trips with owner as captain	22	84.9	6.7

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

Table 34. Trawl fleet market value of vessel.

<b>Fleet</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Alaska	6	1,466,667	252,914
All trawler	68	589,926	47,502
Crab	3	233,333	131,762
Lg. groundfish trawler	48	378,333	22,579
Shrimp	3	750,000	444,695
Whiting	8	1,368,750	344,148

Table 35. Fixed gear fleet market value of vessel.

<b>Fleet</b>	<b>Number of observations</b>	<b>Mean (US\$)</b>	<b>Standard error (US\$)</b>
Alaska	9	627,778	195,849
All fixed gear	49	246,449	43,624
Crab	9	315,000	146,757
Other < \$15,000	2	†*	†
Other groundfish	8	46,375	12,238
Sablefish	21	147,143	38,538

\* The dagger (†) indicates value not provided because of confidentiality restrictions when fewer than three respondents.

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# Appendix A: Limited Entry Survey Questionnaire

Conducted by the National Marine Fisheries Service's Northwest Fisheries Science Center  
and the Pacific States Marine Fisheries Commission

## CONTACT INFORMATION FOR SURVEY RESPONDENT

1. Name: \_\_\_\_\_ 2. E-mail: \_\_\_\_\_  
 3. Date (month/day/year): \_\_\_\_\_ 4. Telephone: (\_\_\_\_) \_\_\_\_\_  
 5. Mailing address (street, city, state, and zip code):  
 \_\_\_\_\_

## VESSEL OWNERSHIP AND CHARACTERISTICS

6. Please verify the following information on record about your vessel's characteristics. If the information on record is correct, please place a check mark in the Corrections column. If the information on record is incorrect or there is no information on record, please provide the correct information in the Corrections column.

Item	Information on record	Corrections
a. Owner's name	<i>Charles Smith</i>	
b. Owner's address	<i>333 1<sup>st</sup> Street, Waldport, OR 97005</i>	
c. Vessel name	<i>FV Smith</i>	
d. USCG or state vessel ID	<i>33221843 or OR33214</i>	
e. Home port	<i>Newport, OR</i>	
f. Length (feet)	<i>75</i>	
g. Fuel capacity (gallons)	<i>300</i>	
h. Engine make and model	<i>No information on record</i>	
i. Engine horsepower	<i>380</i>	

7. What is the approximate market value of your vessel (not including associated permits) in dollars?  
 \$ \_\_\_\_\_

8. Please provide your vessel's fuel consumption, speed, and crew size (not including captain) when engaged in each of the following activities. If this vessel does not engage in an activity, please write "NA" in the appropriate columns.

Activity	Fuel consumption (gallons per hour)	Speed (knots per hour)	Crew size (not including captain)
a. Trawling (while towing)			
b. Longlining			
c. Shrimping (while towing)			
d. Crabbing			
e. Trolling			
f. Steaming (fully loaded)			Not applicable
g. Steaming (empty)			Not applicable

### ANNUAL COSTS AND EARNINGS

Questions 9 through 11 collect information about this vessel's costs and earnings **while operating in all fisheries** (groundfish, crab, shrimp, salmon, etc.). This survey's primary objective is to collect data on costs and earnings for 2008. However, we recognize that conditions in the fishery change from year to year and that two years of data can provide a more complete picture than a one-year snapshot. If possible, we would appreciate receiving your cost and earnings data for both 2007 and 2008.

9. In what month does your vessel's fiscal year begin? \_\_\_\_\_

10. For each of the earnings (income) sources listed below, please indicate the income earned during your fiscal year 2007 and fiscal year 2008. If no income was earned from a particular source during a particular year, please write "NA" in the appropriate box.

Earnings (income) source	2007 (\$)	2008 (\$)
a. Landings in Alaska		
b. Landings outside the West Coast (Washington, Oregon, and California) and Alaska. Please do not include at sea deliveries, which are covered in part c of this question.		
c. West Coast at sea deliveries		
d. Sale and leasing of permits associated with this vessel		
e. Salmon disaster relief payments		
f. Other (please specify) _____		

11. For each cost category below, please provide total annual expenditures during your fiscal year 2007 and fiscal year 2008. If you do not have separate data on expenditures for captain (part a) and crew (part b), please write combined expenditures in part a and write "NA" in part b. If no expenditures were incurred in a particular category during a particular year, please write "NA" in the appropriate box. For location of expenditures, please indicate the location of expenditures as a percentage in the following location categories: HP = home port, HS = home state but not home port city, WC = West Coast (WA, OR, or CA) state but not home state, AK = Alaska, and US = United States outside of West Coast and Alaska. For crew expenditures please indicate the percent of crew that reside in each location category.

Cost (expenditure) category	2007 (\$)	2008 (\$)	Location of expenditures (percent of total)				
			HP	HS	WC	AK	US
a. Captain (include share payments, bonuses, other forms of compensation, and payroll taxes)							
b. Crew (include share payments, bonuses, other forms of compensation, and payroll taxes)							
c. Fuel and lube							
d. Food and crew provisions							
e. Ice							
f. Bait							
g. Repair, maintenance, and improvements for vessel, gear, and equipment							
h. Insurance							
i. Interest and financial services							
j. Enforcement and monitoring (include cost of observers and electronics such as cameras)							
k. Commission dues							
l. Moorage							
m. Purchase of permits for this vessel			Not applicable				
n. Leasing of permits for this vessel			Not applicable				
o. All other expenses for this vessel			Not applicable				

## CREW COMPENSATION AND FUEL USE WHILE TARGETING GROUND FISH

Questions 12 through 17 collect information about labor and fuel costs when this vessel is participating in the West Coast (Washington, Oregon, and California) **groundfish fisheries**.

12. Does this vessel use a crew share system to pay its crew when operating in West Coast **groundfish fisheries**?

- a. Yes (proceed to question 13).
- b. No (proceed to question 17).

13. Which of the following expenses were deducted from total revenue before calculating the crew share when this vessel operated in West Coast **groundfish fisheries**?

- |                                    |     |    |
|------------------------------------|-----|----|
| a. Fuel and lube                   | Yes | No |
| b. Food and other crew provisions. | Yes | No |
| c. Landing taxes                   | Yes | No |
| d. Unloading expenses              | Yes | No |
| e. Trucking expenses               | Yes | No |
| f. Other. Please specify _____     | Yes | No |

14. On what percent of fishing trips does the vessel owner serve as captain? \_\_\_\_\_%

15. On trips when the vessel owner serves as captain, please indicate the share of net revenue (revenue minus the deductions listed in question 13) going to the vessel, captain, and crew. If the vessel owner does not serve as captain on any trips, please circle NA.

Vessel share \_\_\_\_\_%      Captain share \_\_\_\_\_%      Crew share \_\_\_\_\_%      NA

16. On trips when the vessel owner does not serve as captain, please indicate the share of net revenue (revenue minus the deductions listed in question 13) going to the vessel, captain, and crew. If the vessel owner always serves as captain, please circle NA.

Vessel share \_\_\_\_\_%      Captain share \_\_\_\_\_%      Crew share \_\_\_\_\_%      NA

17. In order to understand how regulatory changes affect your vessel's per trip operating costs, we need to collect data on your fuel costs as well as your labor costs. For trips where this vessel targets flatfish, roundfish, and rockfish, please indicate the typical daily fuel use in gallons. If this vessel did not make any trips targeting a particular type of fish, please write "NA" in the appropriate space.

Rockfish \_\_\_\_\_      Roundfish \_\_\_\_\_      Flatfish \_\_\_\_\_

### ***Survey Conclusion and Paperwork Reduction Act Statement***

Thank you for participating in this survey. The information you have provided will improve studies of the economic performance and economic impact of the West Coast limited entry fisheries. The public reporting burden for this information collection, including time for gathering data needed and completing the survey with an interviewer, is estimated to average **one hour** per respondent. Any questions about this survey may be directed to either Carl Lian of the Northwest Fisheries Science Center (206-302-2414) or Dave Colpo of the Pacific States Marine Fisheries Commission (503-595-3100). This survey is conducted under OMB No. 0648-0369, which expires on April 30, 2010.

# Recent NOAA Technical Memorandums

published by the  
Northwest Fisheries Science Center

## NOAA Technical Memorandum NMFS-NWFSC-

- 120 Pollock, M.M., J.M. Wheaton, N. Bouwes, C. Volk, N. Weber, and C.E. Jordan. 2012.** Working with beaver to restore salmon habitat in the Bridge Creek intensively monitored watershed: Design rationale and hypotheses. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-120, 47 p. NTIS number PB2013-101722.
- 119 Waples, R.S., K. Hindar, and J.J. Hard. 2012.** Genetic risks associated with marine aquaculture. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-119, 149 p. NTIS number PB2013-101344.
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