

NOAA Technical Memorandum NMFS-NWFSC-107



West Coast Limited Entry Groundfish Trawl Cost Earnings Survey Protocols and Results for 2004

September 2010

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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This document should be referenced as follows:

Lian, C.E. 2010. West Coast limited entry groundfish trawl cost earnings survey protocols and results for 2004. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-107, 35 p.

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Executive Summary

This technical memorandum describes the fielding protocols and empirical results from an economic cost earnings survey of the limited entry trawl 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. The survey population was all owners of commercial fishing vessels holding a West Coast limited entry groundfish permit with a trawl endorsement. Only vessels with at least \$1,000 of West Coast landings during 2004 were included in the survey. The species composition of landings was not a factor used in selecting the survey population. The survey population included vessels that participate in the shoreside whiting (*Merluccius productus*) fishery, vessels that participate in the nonwhiting groundfish fishery, vessels that participate in both the nonwhiting groundfish fishery and the shoreside whiting fishery, and vessels that participated in neither the nonwhiting groundfish fishery nor the shoreside whiting fishery (but still held a limited entry trawl permit and had at least \$1,000 of West Coast landings during 2004).

The survey sample was a census of the 143 vessels in the survey population. Data for 2003 and 2004 were collected from each participating vessel owner through an in-person interview. Because the groundfish trawl buyback program took effect in December 2003 and removed 91 vessels and their associated permits from the limited entry groundfish trawl fishery, this document reports results from 2004 (which is expected to be more representative of future economic conditions in the fishery than 2003). Interviews were conducted with the owners of 99 of the 143 limited entry trawl vessels active during 2004. Of the 99 interviews conducted, 91 were deemed to provide acceptable quality data to be used for statistical inference and economic analysis. The 91 survey respondents represent 64% of the limited entry trawl vessels and accounted for 69% the West Coast landings revenue earned by limited entry trawl vessels during 2004.

These 91 responses were used for statistical inference of operating costs, revenue from sources other than West Coast landings, and vessel operating characteristics (such as crew size and fuel consumption). Data collected from the survey were combined with economic data available from other sources, such as the Pacific Fisheries Information Network, to provide harvester revenues and costs at the vessel level. This document presents the results of this statistical inference for both the entire limited entry trawl fleet and the primary vessel types within the trawl fleet. Primary vessel types within the fleet include large groundfish trawlers, whiting vessels that deliver to shoreside processors, and crabbers.

Tests for nonresponse bias indicated that there was no statistically significant difference between survey respondents and nonrespondents when examining results for vessel types such as crabbers, large groundfish trawlers, and vessels participating in the shoreside whiting fishery. However, results for the aggregate limited entry trawl fleet exhibited statistically significant nonresponse bias, with survey respondents having revenue from West Coast crab landings which

was significantly larger than that of nonrespondents. While the mean per vessel level of revenue from West Coast landings of all species for the entire limited entry trawl fleet was \$327,425, the mean per vessel level of revenue from West Coast landings for the 91 survey respondents was \$356,771.

For the limited entry trawl fleet, the average vessel had revenue from all sources of \$488,507 during 2004. West Coast landings accounted for \$356,771 and Alaska landings accounted for \$111,168 of the \$488,507 in revenue earned during 2004. While the mean level of revenue from Alaska landings was \$111,168, at the individual vessel level almost all survey respondents had either more than \$500,000 of Alaska landings revenue or no Alaska landings revenue. The mean level of costs collected by the survey for a limited entry trawl vessel was \$376,637. The largest cost categories reported by survey respondents were \$97,042 for repair, maintenance, and improvements, \$96,072 for crew, \$81,100 for the captain, and \$53,857 for fuel. As discussed in subsection 7.1 of this report, the cost figures reported here reflect expenditures during 2004, which in some cases differ from opportunity costs. A number of adjustments to the survey data should be made before calculating economic profits or quasi-rents.

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, Jim Hastie, Todd Lee, Jerry Leonard, and Mark Plummer, Northwest Fisheries Science Center (NWFSC); Dave Colpo, Pacific States Marine Fisheries Commission (PSMFC); Stephen Freese, NMFS Northwest Regional Office; Pete Leipzig, Fishermen's Marketing Association; Brad Pettinger, Oregon Trawl Commission; Cindy Thomson, Southwest Fisheries Science Center; Phil Watson, University of Idaho; and Quinn Weninger, Iowa State University. The NWFSC and the PSMFC are grateful to the Fishermen's Marketing Association and the Oregon Trawl Commission for endorsing the survey. The NWFSC and the PSMFC also thank all of the vessel owners who volunteered their time and data for the survey.

1. Introduction

This technical memorandum describes the survey design and fielding protocol for the cost earnings survey of the limited entry trawl fleet, which 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). Summary statistics computed with data collected through the survey are provided with accompanying discussion. The survey was fielded between May 2006 and September 2006 and collected data for 2003 and 2004. Since the limited entry trawl buyback program took effect in December 2003, responses for 2004 were viewed as more relevant to current conditions in the limited entry trawl fishery than responses for 2003.¹ As a result, this document focuses on reporting results for 2004.

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 discusses the issue of correcting for nonresponse bias. Section 7 presents empirical results obtained from analysis of the survey data. Section 8 provides concluding remarks.

¹ The buyback program allowed the holders of federal limited entry groundfish permits with a trawl endorsement to submit a bid to have their groundfish permit as well as any other associated permits purchased by the government. The buyback program purchased not only the limited entry groundfish trawl permit associated with the vessel, but also any other federal fishing permit as well as state crab and shrimp permits. The vessel with which these permits were associated was not purchased, but was prohibited from engaging in commercial fishing activities. Vessels whose permits were purchased through the buyback program ceased commercial fishing activities in December 2003.

2. Survey Design

The limited entry trawl fleet accounts for about two-thirds of groundfish landings on the West Coast (on a revenue basis). In addition, members of the limited entry trawl fleet participate in other fisheries such as crab and shrimp. The objective of this survey was to obtain the vessel-level information on earnings and expenditures that would support the calculation of economic performance measures (such as quasi-rents and efficiency) as well as regional economic impact analysis.

Because this survey was conducted on a voluntary basis and a survey of the limited entry trawl fleet conducted in 2000 had obtained a response rate of about 15%, survey design placed an emphasis on obtaining an adequate response rate. Discussions with industry participants indicated that vessel owners are more likely to respond to an in-person interviewer than a mail questionnaire, so all data collection was conducted through in-person interviews. Questionnaire length was limited to four pages (the questionnaire is provided in Appendix A). As discussed in this report, limiting questionnaire length imposed constraints on the number of cost categories and the collection of data on purchases of capital goods.

2.1. Survey Population and Sample

The population of interest for this survey is all active commercial fishing vessels holding a limited entry permit with a trawl endorsement. Active fishing vessels were defined as having at least \$1,000 of West Coast (Washington, Oregon, and California) landings during 2004. Vessels with less than \$1,000 landings were considered to have too low a level of activity to provide useful cost earnings data. Fish ticket data obtained through the Pacific Fisheries Information Network (PacFIN) system indicated that there were 143 vessels in the survey population.

While vessels were required to have at least \$1,000 of revenue from West Coast landings during 2004, no restrictions were placed on the species landed. While most of the vessels in the survey population obtained a majority of their revenue from whiting (*Merluccius productus*) and other groundfish species, some vessels obtained a majority of their revenue from crab or other nongroundfish species. Of the 143 vessels in the survey population, 12 had no revenue from West Coast groundfish landings during 2004 but did have a limited entry permit. These 12 vessels earned the majority of their revenue from crab and shrimp.

These vessels are included in the survey population, as the objective of the survey is to obtain a representative sample of the entire population of vessels that have an associated limited entry trawl permit. Applications of survey data focusing on groundfish management can choose

to omit responses from vessels with no groundfish landings if so desired.² Of course, survey objectives also include obtaining data on a representative sample of vessels engaging primarily in groundfish harvesting.

Because of the relatively small size of the survey population, this survey attempted to collect data from all members of the population. All 143 vessels in the survey population were in the sample population due to the use of this census approach.

2.2. Questionnaire Development

The survey questionnaire was developed initially by representatives of the NWFSC, National Marine Fisheries Service (NMFS) Northwest Regional Office, Southwest Fisheries Science Center, and PSMFC. After survey content was determined, a draft questionnaire was prepared. The draft was discussed with members of the limited entry trawl fleet by PSMFC personnel. In addition, NWFSC personnel provided presentations on survey content and timing to the Pacific Fishery Management Council (PFMC) Groundfish Advisory Panel and the PFMC Scientific and Statistical Committee. Comments received through these discussions and presentations improved questionnaire content and format.

² Of the 12 vessels in the survey population with no West Coast groundfish landings, 7 provided survey responses. Of these 7 respondents with no revenue from groundfish landings, 6 earned a majority of revenue from crab and one earned a majority of revenue from shrimp.

3. Survey Fielding Protocol

This section describes the protocol used to field the survey and collect data from respondents. Because of the low response rate to an earlier cost earnings survey of the limited entry trawl fleet conducted by mail, particular emphasis was placed on implementing protocol that would maximize response rates. Steps taken to maximize response rates are discussed in subsection 3.2.

3.1. Fielding Schedule

Fielding began with each member of the survey population 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 provided in Appendix A). Enclosing the questionnaire gave recipients an opportunity to see firsthand the data being collected by the survey and collect the requested data prior to the in-person interview. The cover letter noted that the survey had been endorsed by two industry associations, the Fishermen's Marketing Association and the Oregon Trawl Commission.

About two weeks after the letter and questionnaire mailing, attempts to contact each recipient by telephone began in order to schedule a time and location for the 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. Survey fielding moved across geographic areas over time, so as to reduce the travel costs involved in conducting in-person interviews. 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. 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.

The survey was fielded by the PSMFC and its subcontractors. Survey fielding began in October 2005 and was completed in September 2006. The unusually long time period for fielding resulted from administrative hurdles that prevented fielding between January 2006 and May 2006.

3.2. Maximizing Response Rates

A number of methods were used to maximize survey response rates.³ First, the questionnaire is short, consisting of only four pages in written form. Data collection through the

³ While data collection occurred through in-person interviews, many of the protocols used to maximize survey response were taken from Mail and internet surveys: The tailored design method (Dillman 1999).

in-person interview usually took less than one hour. Second, respondents were asked only to provide information about major cost and earnings categories, thus avoiding what may seem to respondents like unnecessary detail. Third, data was 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 weekend/weekday and day/evening time periods to maximize the likelihood of reaching the contact person. Finally, as noted in the cover letter, the survey carried the endorsements of the Fishermen's Marketing Association and the Oregon Trawl Commission.

4. Survey Response Rates

Responses were received from 99 of the 143 vessels in the survey population, a 69% response rate. However, some respondents failed to provide complete cost data or provided data that were deemed suspect.⁴ After removing 8 incomplete responses, there were 91 responses (63% response rate), which were used for empirical analysis.

Table 1 presents a summary of survey response rates by vessel type and geographic location. The vessel type classification scheme used in this report is described by Radtke and Davis (2000). Within the limited entry trawl fleet, most vessels have landing patterns that place them in the whiting, large groundfish trawler, or crabber vessel types. Whiting vessels are defined as having at least \$100,000 in annual revenue from West Coast landings and obtaining at least 33% of revenue from whiting. Large groundfish trawlers are defined as having at least \$100,000 in annual revenue from West Coast landings and obtaining at least 33% of revenue from groundfish. Crabbers are defined as having at least \$15,000 in annual revenue from West Coast landings and obtaining at least 33% of revenue from crab landings. Vessels were classified on the basis of their 2004 landings. Vessels that had more than \$100,000 in annual revenue from West Coast landings during 2004 and earned at least 33% of their revenue from whiting and at least 33% of their revenue from non-whiting groundfish were classified as whiting vessels.

The survey population includes all vessels operating on the West Coast that are classified as shoreside whiting vessels or large groundfish trawlers. The survey population also includes some vessels classified as crabbers (these vessels earn more revenue from crab landings than groundfish landings, even though they do have a limited entry trawl permit). Geographic classification is based on the home port of the vessel. While this survey provides representative data on the population of shoreside whiting vessels and large groundfish trawlers operating on the West Coast, it also provides representative data on a unique subset of West Coast crabbers.

The response rate for crabbers (74%) is higher than the response rate for either large groundfish trawlers (65%) or whiting vessels (63%). No responses were received from the five small groundfish trawlers in the survey population. The response rate was higher for vessel owners living in Oregon than owners living in Washington and California. A 76% response rate was obtained from limited entry trawl vessels in Oregon, while responses were obtained from 51% of the limited entry trawlers in California and 50% of the limited entry trawlers in Washington.

There are three possible reasons for the higher response rate in Oregon. First, the Oregon Trawl Commission provided a valuable endorsement of the survey. Second, the survey was

⁴ The most common response regarded as suspect had variable costs (captain, crew, fuel, food, bait, and ice) greatly exceeding revenue. Large changes in landings between 2003 and 2004 without a corresponding change in variable costs were also flagged during data analysis.

fielded first in Oregon, then lengthened with additional questions on insurance and interest expenditures before fielding in California and Washington. Finally, trawlers in Oregon have higher average earnings than those in Washington and California, and survey response rates tend to be higher as vessel revenues increase.

5. Comparing Respondents and Nonrespondents

A considerable amount of information is available about vessel characteristics and landings for each member of the survey population. This information can be used to compare respondents and nonrespondents and perform statistical tests to determine whether differences between them are statistically significant. This section compares vessel physical characteristics and revenue from landings for respondents and nonrespondents. Appendix B discusses the results of statistical tests aimed at determining whether the differences between respondents and nonrespondents are statistically significant. Subsection 5.3 provides a brief summary of the statistical tests discussed in Appendix B.

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) is 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. In addition, some information is available from the Alaska Fisheries Information Network (AKFIN) regarding landings in Alaska by population members. This information is used to compare the activities of respondents and nonrespondents in Alaskan waters. This information is important, as some members of the population are believed to earn considerable revenue in Alaskan waters. Available information on Alaska landings includes 1) whether each vessel had any landings in Alaska and 2) whether revenue from landings in Alaska was greater or smaller than revenue from landings in Washington, Oregon, and California.

5.2. Comparison Results

Vessel physical characteristics and landings revenue for survey respondents and nonrespondents are compared in Table 2 through Table 5. Table 2 provides a comparison for the entire limited entry trawl fleet of respondents, nonrespondents, and all limited entry trawl vessels with landings on the West Coast. Comparisons are provided for engine horsepower, vessel length, vessel revenue from crab, revenue from groundfish, and revenue from all species.

Table 2 shows that all 143 vessels in the survey population had average West Coast landings revenue of \$327,425. Respondents had average revenue of \$356,771 and nonrespondents had average revenue of \$276,069. Respondents earned greater revenue than nonrespondents from both groundfish and crab. Mean groundfish revenue during 2004 was \$214,341 for respondents and \$198,678 for nonrespondents. Crab landings exhibited a greater

proportional difference between respondents (\$109,499) and nonrespondents (\$55,940) during 2004. The difference in revenue from crab landings accounts for about two-thirds of the difference in revenue from all West Coast landings for respondents and nonrespondents. Respondents also had vessels with greater length (67 vs. 62 feet) and horsepower (431 vs. 373) than nonrespondents.

Table 3 through Table 5 present results for the three major vessel types within the limited entry trawl fleet. Crabbers, large groundfish trawlers, and whiting vessels account for 88 of the 91 survey respondents and 132 of the 143 vessels in the survey population. The results for the entire limited entry trawl fleet in Table 2 include not only the 88 respondents in these 3 vessel types, but also the 3 survey respondents in other vessel types.

Table 3 shows that while the mean West Coast landings revenue from all species was \$383,987 for all 30 crabbers in the survey population, it was \$391,463 for the 22 respondents and \$363,428 for the 8 nonrespondents. Respondents had higher levels of both crab and groundfish landings than nonrespondents, as well as larger vessels with more horsepower.

Among large groundfish trawlers in Table 4, respondents had higher mean revenue from all West Coast landings (\$325,719) than nonrespondents (\$267,063). Respondents and nonrespondents earned similar levels of revenue from groundfish landings (\$230,961 vs. \$234,005). However, respondents earned considerably more revenue from landings of crab and other nongroundfish species than nonrespondents. Respondents also had vessels with greater length (67 vs. 60 feet) and horsepower (401 vs. 339) than nonrespondents.

Table 5 shows that groundfish and crab account for almost all revenue from West Coast landings for members of the shoreside whiting fleet. While some members of the shoreside whiting fleet earn almost all of their West Coast revenue from whiting landings (and earn all other revenue in Alaska), other members remain on the West Coast outside of the whiting season and participate in other groundfish fisheries and crabbing. The 12 survey respondents had nearly identical revenue from groundfish (which includes whiting) landings as the 7 nonrespondents (\$420,924 vs. \$421,705). Revenue from crab landings was about twice as large for respondents as nonrespondents (\$74,021 vs. \$36,233). Respondents had smaller vessels (82 vs. 89 feet in length) with smaller engines (685 vs. 742 horsepower) than nonrespondents.

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. Detailed results from the two sample t-tests are presented in Appendix B. This subsection provides a summary of the results from the two sample t-tests.

The two sample t-tests indicate that for each of the three primary vessel types within the limited entry trawl fleet, the difference in revenue from West Coast landings between respondents and nonrespondents was not statistically significant. However, there is a statistically significant difference in revenue from all West Coast landings for survey respondents and nonrespondents when results are examined for the entire limited entry trawl fleet.

The combination of 1) larger though not statistically significant landings for respondents than nonrespondents in each of the three primary vessel types and 2) absence of small groundfish trawlers results in a statistically significant difference between revenue from all West Coast landings for respondents and nonrespondents for the entire limited entry trawl fleet. Thus the average survey respondent had \$356,771 of revenue while the average member of the survey population had \$327,425 of revenue; that is, respondents had average revenue which was \$29,346 (9.0%) larger than that of the average member of the population.

6. Correcting for Nonresponse Bias

Survey respondents have greater revenue from total West Coast landings than nonrespondents for each of the three primary vessel types within the limited entry trawl fleet, but these differences are not statistically significant at the 95% confidence level. For the entire limited entry trawl fleet, respondents have revenue from West Coast landings that is 9.0% larger than that of all limited entry trawl vessels. Since much of the statistically significant bias among the entire limited entry trawl fleet results in part from not having any survey responses from the five small groundfish trawlers, weighting responses would not be an effective way of reducing this bias. Since no responses were received from small groundfish trawlers, there is no data to weight. As a result, this report presents only unweighted results for both the major vessel types within the limited entry trawl fleet and the entire limited entry trawl fleet. Since respondents had greater revenue from West Coast landings than the survey population, estimates of variable costs (which depend on the level of fishing activity) derived from the data provided by respondents are biased upwards. All estimates of costs, revenues, and operating characteristics reported in Table 6 through Table 12 were calculated using PROC SURVEYMEANS in SAS.

7. Empirical Results

This section provides empirical results from the survey for the limited entry trawl fleet and the major vessel types within each fleet.

Before examining cost and earnings data from 2004, it is worthwhile to consider the health of the West Coast groundfish and crab fisheries during 2004. That year, total commercial and tribal groundfish landings (including whiting) for all gear types on the West Coast were 240,172 mt, slightly below the average of 251,488 mt observed from 2005 to 2009. Commercial and tribal groundfish landings for all gear types during 2004 included 213,478 mt of whiting and 38,010 mt of non-whiting groundfish. Both whiting and non-whiting groundfish landings were slightly lower during 2004 than the annual average over the 2005–2009 period.

Revenue from commercial and tribal West Coast groundfish landings (for all gear types) was \$68.1 million in 2004, well below the annual average of \$85.1 million observed during 2005–2009. Revenue from groundfish landings during 2004 included \$24.2 million from whiting landings and \$43.9 million from non-whiting groundfish landings. Both figures are below the annual average of \$33.8 million from whiting landings and \$51.3 from non-whiting groundfish landings recorded during the 2005–2009 period. Revenues from landings during 2004 are further below the 2005–2009 annual average than landings, reflecting the rise in whiting and sablefish (*Anoplopoma fimbria*) prices that occurred between 2004 and 2009.

The West Coast crab fishery had a high level of landings and revenue during 2004. That year, West Coast commercial and tribal crab landings (with all gear types) were 28,537 mt, the third largest annual harvest during the 1998–2009 period and higher than the average of 24,465 mt recorded during 2005–2009. Revenue from crab landings was also higher than normal during 2004. West Coast crab landings provided revenue of \$115.7 million during that year, well above the average of \$106.3 million recorded during 2005–2009.

7.1. Costs and Earnings Categories

Table 6 provides average expenditures and revenues for all survey respondents in the limited entry trawl fleet. Some respondents did not respond to all questions, so the number of observations varies across variables. Cost categories covered by the survey include payments to captain, payments to crew, fuel, food, ice, bait, repair, maintenance, and improvements (RMI), insurance, interest, permit purchases, and permit leases.

The mean limited entry trawl survey respondent earned \$356,771 from West Coast landings, \$111,168 from Alaska landings, \$11,319 from at sea deliveries, \$2,041 from the sale and leasing of permits, and \$7,209 from all other sources. As shown in Table 10, this results in total revenue of \$488,507 for the average limited entry trawl vessel.

The \$111,168 revenue from Alaska landings and the \$11,319 in at sea deliveries reported in Table 6 are averages that are rarely observed. Most Alaska landings were reported by vessels in the whiting vessel type. These vessels typically participate in the West Coast shoreside whiting fishery for a few months and spend most of the year fishing in Alaska. Among the 91 survey respondents, 12 reported revenue from Alaska during 2004 averaging \$843,024, and 79 reported no revenue from operations in Alaska. Similarly, only 5 of the 91 survey respondents reported at sea deliveries to motherships in the West Coast at sea whiting fishery during 2004. While the average revenue from at sea deliveries across all 91 respondents was \$11,319, the average revenue from at sea deliveries for the 5 vessels reporting non-zero at sea deliveries was \$206,000.

The largest variable cost categories for limited entry trawlers are crew expenditures (\$96,072), captain expenditures (\$81,100), and fuel expenditures (\$53,857). These three cost categories account for more than 60% of all costs. These three variable costs plus RMI account for about 85% of the costs reported on this survey.

In an effort to keep the questionnaire length short and boost response rates for this voluntary survey, data was collected on all expenditures for RMI. No distinction is made in Table 6 through Table 9 between purchases that are expensed and purchases that are capitalized and depreciated in future years. As a result, individual vessel level costs show considerable variation due to variation in purchases of capital goods that provide services over many years.

A more theoretically desirable way to have collected data on purchases of capital goods would have been to collect information on 1) purchases expensed during 2004, 2) purchases capitalized during 2004, and 3) depreciation taken during 2004 for capital goods purchased in previous years. However, this approach increases questionnaire length and complexity, and was rejected for use in this voluntary survey.

7.2. Calculating Profits and Quasi-rents from Survey Data

Using the survey data provided in Table 6 through Table 9 to calculate economic performance measures such as quasi-rents (the difference between total revenue and variable costs) and profit requires that a number of issues be considered and addressed. The first two issues discussed in this subsection affect the calculation of both quasi-rent and economic profit. The third issue affects the calculation of economic profit but not the calculation of quasi-rents, as it affects fixed costs that do not enter into the calculation of quasi-rent.

First, the survey does not cover all costs incurred by vessel owners. In an effort to limit survey length and boost response rates, the questionnaire (provided in Appendix A) did not collect data on costs such as moorage, unloading fish, and transporting fish to the buyer. Of course there is no way of knowing the exact magnitude of the cost categories not covered by the survey, but conversations with industry participants suggest it is in the range of 5% to 10% of total costs.

Second, calculating economic profit would require adjustment for the vessel owners who serve as captain and do not always pay themselves a salary as captain. Rather, these vessel owners derive their compensation for service as captain through their earnings as the recipient of

vessel profits. Since actual expenditures differ greatly from opportunity costs in such cases, it is necessary to develop another way of estimating captain costs for vessels where the captain receives no salary on some trips.

The third issue that must be addressed when using this survey data to derive a measure of economic profit is the opportunity cost of the money tied up in marketable capital goods such as the fishing vessel and equipment. The fishing vessel and onboard equipment represents an opportunity cost for the vessel owner. Were the vessel to be sold, the money received for the vessel could be invested and earn a positive rate of interest.

As a result of these three considerations, this document (whose function is to report survey results) does not attempt to perform and report the considerable additional work required to estimate economic profit.⁵ However, quasi-rents can be calculated without the fixed costs that are also included in the definition of profit, and can be calculated from the available survey data with fewer adjustments than economic profit. Since fewer and simpler adjustments are required to calculate quasi-rents, this document does report quasi-rents.

7.3. Costs, Earnings, and Quasi-rents

Table 10 reports revenues, variable costs, and quasi-rents calculated using the survey data with no adjustment for vessel owners who serve as captain without salary compensation on some groundfish trips. The table also reports adjusted variable costs and adjusted quasi-rent, which attempt to correct for the bias created by vessel owners taking their compensation for serving as captain through being the residual claimant. Based on an examination of captain expenditures reported for vessels where the owner does not serve as captain, this adjustment assumed that the vessel captain should earn at least \$80,000 annually. In cases where the reported captain expenditure is less than \$80,000, the reported captain expenditure is replaced with \$80,000.

Table 10 shows revenue (total revenue from West Coast landings and all other sources such as Alaska landings), total costs (the total of all expenditures shown in Table 6 through Table 9), variable costs (the total of expenditures for captain, crew, food, fuel, bait, and ice), and quasi-rents (total revenue minus variable costs). Costs in Table 10 are derived by summing the cost categories shown in Table 6 through Table 9. Table 10 also includes columns labeled adjusted variable costs and adjusted quasi-rent. Adjusted variable cost was obtained by making two adjustments to variable costs for each vessel. First, annual captain expenditures were assumed to be equal to a minimum of \$80,000 per vessel. Second, variable costs were increased by 10% to account for those expenditures not captured by the survey questionnaire.

Table 10 indicates that the average limited entry trawler earns adjusted quasi-rents of \$216,761. These quasi-rents are equal to 44% of total revenue. The average crabber earned adjusted quasi-rents of \$234,204, which equals 49% of total revenue. The average large groundfish trawler earned adjusted quasi-rents of \$131,134, which equals 38% of revenue. While large groundfish trawlers earn \$133,950 less revenue than crabbers, their adjusted variable

⁵ See Lian et al. (2010) for an example of how these adjustments to the survey data can be made to derive an estimate of economic profit. That journal article adjusts the survey data to account for 1) costs which were not reported on the survey questionnaire, 2) vessel owners who served as captain and did not pay themselves a salary, and 3) the opportunity cost of capital (vessel and onboard equipment) used in harvesting groundfish.

costs are only \$30,880 lower. As a result, a large groundfish trawler on average earns less than 60% of the quasi-rents earned by a crabber in the limited entry trawl fleet. Whiting vessels, which not only earn the most revenue on the West Coast of any vessel type but also earn the most revenue in Alaska, earned adjusted quasi-rents of \$551,188 per vessel. Quasi-rents for whiting vessels averaged 50% of total revenue. While crabbers and whiting vessels earned nearly identical adjusted quasi-rents as a percentage of revenue, large groundfish trawlers earned considerably lower adjusted quasi-rents as a percentage of revenue. In other words, adjusted variable costs consume a greater share of total revenue for large groundfish trawlers than for crabbers or whiting vessels.

Since quasi-rents represent the difference between total revenue and variable costs, they do not consider the fixed costs (such as insurance, interest, permits, and RMI) that a vessel owner incurs.⁶

The data in Table 10 cannot be used to directly calculate a measure of accounting profit or economic profit. Accounting profit measures the difference in a given time period between revenue and cost, where cost includes items that are being expensed in the current period as well as depreciation from capital goods purchased in earlier time periods. Measuring accounting profit would require adjusting the survey data for 1) adjustment for those minor cost categories not collected by the survey and 2) knowledge of how much of the current expenditure on capital goods is depreciated and how much is expensed, as well as knowledge of how much depreciation for capital goods purchased in earlier years is being taken in the current year. Economic profit measures the difference between revenue and the opportunity costs incurred during a given time period. Calculating a measure of economic profit that accounts for all opportunity costs incurred by the vessel owner would require adjusting the survey data for 1) vessel owners who serve as captain without an explicit payment for their provision of captain services, 2) the interest income lost by having capital tied up in the vessel rather than an interest earnings asset, and 3) cost categories not collected by the survey.

7.4. Crew Size, Fuel Use, and Vessel Speed

Table 11 provides crew size, fuel use (gallons per hour), and vessel speed (knots per hour) for the limited entry trawl fleet and major vessel types. Crew size exhibited little variation across fisheries. For all limited entry trawl vessels, the average crew size (not including the captain) was 1.9 for groundfish trawl, 2.0 for shrimping, and 2.1 for crabbing. When crew size is examined by vessel type, whiting vessels and large groundfish trawlers report similar crew sizes, and crabbers report smaller crew sizes by activity than whiting vessels or large groundfish trawlers.

Fuel use showed considerable variation across fisheries, ranging from 19.1 for groundfish trawling to 8.2 for crabbing. While the average member of the limited entry trawl fleet uses 19.1

⁶ The 2004 data used in these calculations come from a period before implementation of the buyback program landing taxes. In December 2003, NMFS required all accepted bidders to permanently cease fishing with the fishing vessels and permits whose privileges had been relinquished in exchange for buyback program reduction payments. Landings taxes on groundfish, crab, and shrimp are used as a source of funding for the buyback program. Collection of these taxes began in September 2005, so the 2004 data reported herein does not reflect the impact of buyback landings taxes.

gallons of fuel per hour when trawling, this figure ranges considerably across vessels and vessel types. Vessels targeting whiting are typically larger than vessels in the large groundfish trawler and crabber vessel classifications, and hence have higher fuel use. Because of the small number of whiting vessels engaged in shrimping, confidentiality considerations prohibit providing fuel use or speed for whiting vessels engaged in shrimping.

7.5. Crew Share System and Owner as Captain

Table 12 reports the share of revenue on groundfish trips paid to the captain, crew, and vessel owner. For the limited entry trawl fleet, the vessel owner served as captain for 82% of trips targeting groundfish. On trips where the vessel owner served as captain, landings revenue minus deductions was allocated at 21% to the captain, 22% to the crew, and 57% to the vessel. These percentages are nearly identical for trips where the vessel owner is not the vessel captain. While the captain receives a 20% share when he is not the owner, the captain receives a 21% share when he is the vessel owner.

Results for the major vessel types indicate that whiting vessels are less frequently captained by the vessel owner than crabbers or large groundfish trawlers. The vessel owner served as captain on 60% of the trips targeting groundfish made by whiting vessels, but 85% of the trips made targeting groundfish by crabbers and 86% of the trips made targeting groundfish by large groundfish trawlers.

The allocation of landings revenue minus deductions also varies across vessel types. Whiting vessels pay the captain a somewhat lower percentage of revenues after deductions than crabbers or large groundfish trawlers. It should be remembered that whiting vessels typically have higher revenue from landings than crabbers or large groundfish trawlers.

Table 12 shows that whiting vessels had a similar allocation of landings revenue after deductions when the owner served as captain and when the owner did not serve as captain. On the 60% of trips where the owner served as captain, landings revenue after deductions was allocated at 15% to the captain, 25% to the crew, and 61% to the vessel (numbers do not add to 100% due to rounding).

For large groundfish trawlers on the 86% of groundfish trips where the owner served as captain, landings revenue after deductions was allocated at 23% to the captain, 22% to the crew, and 55% to the vessel. On trips where the owner did not serve as captain, landings revenue after deductions was allocated at 20% to the captain, 20% to the crew, and 60% to the vessel. On trips where the owner is not on board, a larger percentage of landings revenue is allocated to the vessel and a smaller percentage to the captain and the crew.

Crabbers were captained by the vessel owner on 85% of trips targeting groundfish, almost identical to the 86% figure obtained for large groundfish trawlers. On trips where the vessel owner served as captain, the allocation of landings revenue after deductions by crabbers was 22% to the captain, 21% to the crew, and 57% to the vessel. The allocation changes slightly when the vessel owner did not serve as captain, with 26% to the captain, 19% to the crew, and 55% to the vessel.

8. Concluding Comments

The NWFSC and PSMFC thank all of the vessel owners who participated in this voluntary survey. The NWFSC and PSMFC also are grateful for the survey endorsement provided by the Fishermen's Marketing Association and the Oregon Trawl Commission. The quality of data and summary statistics provided in this report depends on the willingness of commercial fishermen to provide their time and confidential data.

While this report provides 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 the NWFSC or PSMFC.

The NWFSC and PSMFC intend to conduct cost earnings surveys of the limited entry trawl fleet on a regular basis. This will allow for the development of a time series database that will support evaluation of the economic performance of the limited entry trawl fleet.

Tables 1–12

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

	Survey population	Complete responses	Response rate (%)
Limited entry trawlers	143	91	64
Trawl vessel type			
Crabber	30	22	73
Large groundfish trawler	83	54	65
Other	6	3	50
Small groundfish trawler	5	0	0
Whiting	19	12	63
Trawl by state			
California	49	25	51
Oregon	76	57	75
Washington	18	9	50
Trawlers by annual WOC landings revenue			
<\$200,000	51	27	53
\$200,000 to \$400,000	52	34	65
>\$400,000	40	30	75

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

Variable	Response status	Number of observations	Mean	Standard error
Engine horsepower	All	135	410	19
	Respondents	85	431	26
	Nonrespondents	50	373	29
Vessel length (feet)	All	135	65	1
	Respondents	85	67	1
	Nonrespondents	50	62	2
Revenue from crab (US\$)	All	143	89,961	11,848
	Respondents	91	109,402	16,363
	Nonrespondents	52	55,940	14,572
Revenue from groundfish (US\$)	All	143	208,645	14,228
	Respondents	91	214,341	17,177
	Nonrespondents	52	198,678	25,217
Revenue from all species (US\$)	All	143	327,425	17,127
	Respondents	91	356,771	21,314
	Nonrespondents	52	276,069	27,599

Table 3. Comparison of vessel physical characteristics and revenue sources for the crabber fleet respondents and nonrespondents.

Variable	Response status	Number of observations	Mean	Standard error
Engine horsepower	All	30	351	39
	Respondents	22	376	52
	Nonrespondents	8	281	31
Vessel length (feet)	All	30	56	3
	Respondents	22	57	3
	Nonrespondents	8	53	4
Revenue from crab (US\$)	All	30	265,796	30,397
	Respondents	22	276,134	37,734
	Nonrespondents	8	237,367	49,500
Revenue from groundfish (US\$)	All	30	75,573	19,305
	Respondents	22	85,603	24,846
	Nonrespondents	8	47,990	23,424
Revenue from all species (US\$)	All	30	383,987	46,026
	Respondents	22	391,463	56,270
	Nonrespondents	8	363,428	81,892

Table 4. Comparison of vessel physical characteristics and revenue sources for the large groundfish trawler respondents and nonrespondents.

Variable	Response status	Number of observations	Mean	Standard error
Engine horsepower	All	76	378	18
	Respondents	48	401	22
	Nonrespondents	28	339	32
Vessel length (feet)	All	76	65	1
	Respondents	48	67	2
	Nonrespondents	28	60	2
Revenue from crab (US\$)	All	83	44,776	9,520
	Respondents	54	55,414	13,564
	Nonrespondents	29	24,967	9,470
Revenue from groundfish (US\$)	All	83	232,024	15,339
	Respondents	54	230,961	17,228
	Nonrespondents	29	234,005	30,425
Revenue from all species (US\$)	All	83	305,225	17,366
	Respondents	54	325,719	20,777
	Nonrespondents	29	267,063	30,435

Table 5. Comparison of vessel physical characteristics and revenue sources for the whiting fleet respondents and nonrespondents.

Variable	Response status	Number of observations	Mean	Standard error
Engine horsepower	All	18	704	74
	Respondents	12	685	104
	Nonrespondents	6	742	90
Vessel length (feet)	All	18	84	2
	Respondents	12	82	1
	Nonrespondents	6	89	4
Revenue from crab (US\$)	All	19	60,099	26,030
	Respondents	12	74,021	37,794
	Nonrespondents	7	36,233	29,622
Revenue from groundfish (US\$)	All	19	421,212	33,546
	Respondents	12	420,924	46,833
	Nonrespondents	7	421,705	47,642
Revenue from all species (US\$)	All	19	487,931	43,456
	Respondents	12	501,557	58,991
	Nonrespondents	7	464,571	65,771

Table 6. Cost and earnings by category for the entire limited entry trawl fleet.

Variable	Number of observations	Mean (US\$)	Standard error (US\$)
Cost of:			
Captain	89	81,100	3,656
Crew	89	96,072	4,958
Food	88	5,257	591
Fuel	90	53,857	3,687
Bait	91	5,697	592
Ice	91	4,711	372
Insurance	33	18,893	1,846
Interest payments	33	5,210	1,369
Leasing permits	91	2,444	700
Purchasing permits	91	12,052	3,552
RMI ^a	91	97,042	8,704
Revenue from:			
Alaska	91	111,168	19,620
Hawaii	91	0	0
Other sources	91	7,209	2,616
At sea deliveries	91	11,319	3,157
Sale/leasing of permits	91	2,041	692
All species ^b	91	356,771	12,692
Groundfish	91	214,341	10,229
Crab	91	109,402	9,744
Shrimp	91	17,976	3,065
Salmon	91	3,614	825
Pelagic	91	322	64
HMS ^c	91	3,563	722
Halibut	91	7,386	2,245

^a RMI = repair, maintenance, and improvements.

^b 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.

^c HMS = highly migratory species.

Table 7. Cost and earnings by category for the crabber fleet.

Variable	Number of observations	Mean (US\$)	Standard error (US\$)
Cost of:			
Captain	22	76,764	12,105
Crew	22	91,370	15,084
Food	20	2,689	763
Fuel	22	34,621	10,438
Bait	22	11,005	2,448
Ice	22	2,963	855
Insurance	7	7,286	2,395
Interest payments	7	286	169
Leasing permits	22	0	0
Purchasing permits	22	6,591	4,754
RMI ^a	22	83,041	14,721
Revenue from:			
Alaska	22	54,545	50,110
Hawaii	22	0	0
Other sources	22	28,682	16,235
At sea deliveries	22	0	0
Sale/leasing of permits	22	2,955	2,714
All species ^b	22	391,463	51,694
Groundfish	22	85,603	22,825
Crab	22	276,134	34,665
Shrimp	22	8,037	7,383
Salmon	22	11,674	4,885
Pelagic	22	158	69
HMS ^c	22	7,953	3,447
Halibut	22	1,894	1,055

^a RMI = repair, maintenance, and improvements.

^b 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.

^c HMS = highly migratory species.

Table 8. Cost and earnings by category for the large groundfish trawlers.

Variable	Number of observations	Mean (US\$)	Standard error (US\$)
Cost of:			
Captain	52	64,794	3,256
Crew	52	71,841	4,442
Food	53	3,368	434
Fuel	53	42,535	2,979
Bait	54	4,261	824
Ice	54	6,282	715
Insurance	25	19,582	2,223
Interest payments	25	5,805	2,272
Leasing permits	54	4,119	1,535
Purchasing permits	54	6,050	2,260
RMI ^a	54	62,467	6,746
Revenue from:			
Alaska	54	12,037	9,455
Hawaii	54	0	0
Other sources	54	370	291
At sea deliveries	54	5,556	4,364
Sale/leasing of permits	54	13	10
All species ^b	54	325,719	16,320
Groundfish	54	230,961	13,533
Crab	54	55,414	10,655
Shrimp	54	24,283	5,899
Salmon	54	572	373
Pelagic	54	34	18
HMS ^c	54	2,676	1,026
Halibut	54	11,635	4,944

^a RMI = repair, maintenance, and improvements.

^b 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.

^c HMS = highly migratory species.

Table 9. Cost and earnings by category for the whiting fleet.

Variable	Number of observations	Mean (US\$)	Standard error (US\$)
Cost of:			
Captain	12	155,819	24,158
Crew	12	200,793	33,111
Food	12	15,280	5,398
Fuel	12	130,844	27,847
Bait	12	3,850	2,357
Ice	12	1,500	617
Insurance	1	— ^a	—
Interest payments	1	—	—
Leasing permits	12	0	0
Purchasing permits	12	10,417	9,964
RMI ^b	12	216,726	72,238
Revenue from:			
Alaska	12	538,040	142,046
Hawaii	12	0	0
Other sources	12	417	399
At sea deliveries	12	60,833	27,295
Sale/leasing of permits	12	5,000	4,783
All species ^c	12	501,557	56,425
Groundfish	12	420,924	44,796
Crab	12	74,021	36,150
Shrimp	12	0	0
Salmon	12	3,429	604
Pelagic	12	2,000	590
HMS ^d	12	395	373
Halibut	12	179	65

^a An em dash (—) is placed to maintain confidentiality when fewer than three respondents.

^b RMI = repair, maintenance, and improvements.

^c 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.

^d HMS = highly migratory species.

Table 10. Limited entry trawl fleet costs, revenues, and quasi-rents (in US\$).

Fleet	Total cost	Variable cost	Adjusted variable cost	Total revenue	Quasi-rent	Adjusted quasi-rent
All trawlers	376,637	240,996	271,746	488,507	247,511	216,761
Crabber	305,610	208,407	243,441	477,645	269,238	234,204
Large groundfish trawler	286,842	188,819	212,561	343,695	154,876	131,134
Whiting	839,093	504,236	554,660	1,105,848	601,611	551,188

Table 11. Limited entry trawl fleet crew size, fuel use (gallons per hour), and speed (knots per hour).

Fleet	Variable	Number of observations	Mean	Standard error
All trawlers	Crew size for crabbing	19	2.1	0.1
	Crew size for shrimp trawling	12	2.0	0.0
	Crew size for groundfish trawling	33	1.9	0.1
	Crew size for salmon trolling	12	4.3	0.3
	Fuel use for crabbing	46	8.2	0.5
	Fuel use for shrimp trawling	44	13.5	0.5
	Fuel use for groundfish trawling	86	19.1	1.1
	Speed when crabbing	42	3.5	0.2
	Speed when shrimp trawling	43	2.1	0.0
	Speed when groundfish trawling	86	3.0	0.1
Crabber	Crew size for crabbing	6	1.8	0.3
	Crew size for shrimp trawling	2	—	—
	Crew size for groundfish trawling	7	1.3	0.2
	Crew size for salmon trolling	3	3.0	0.5
	Fuel use for crabbing	20	8.4	1.1
	Fuel use for shrimp trawling	13	15.1	1.9
	Fuel use for groundfish trawling	21	14.7	2.6
	Speed when crabbing	20	3.8	0.3
	Speed when shrimp trawling	13	2.2	0.1
	Speed when groundfish trawling	21	2.4	0.1
Lg. groundfish trawler	Crew size for crabbing	10	2.2	0.2
	Crew size for shrimp trawling	7	2.0	0.0
	Crew size for groundfish trawling	22	2.1	0.1
	Crew size for salmon trolling	7	5.4	0.3
	Fuel use for crabbing	23	6.6	0.4
	Fuel use for shrimp trawling	29	13.1	0.6
	Fuel use for groundfish trawling	51	14.9	1.0
	Speed when crabbing	19	3.4	0.3
	Speed when shrimp trawling	28	2.1	0.0
	Speed when groundfish trawling	51	3.1	0.2
Whiting	Crew size for crabbing	3	2.3	0.3
	Crew size for shrimp trawling	2	—	—
	Crew size for groundfish trawling	3	2.0	0.0
	Crew size for salmon trolling	2	2.0	0.0
	Fuel use for crabbing	3	18.3	5.7
	Fuel use for shrimp trawling	1	—	—
	Fuel use for groundfish trawling	11	44.6	7.2
	Speed when crabbing	3	3.0	1.1
	Speed when shrimp trawling	1	—	—
	Speed when groundfish trawling	11	3.7	0.1

Table 12. Limited entry trawl fleet share for captain, crew, and vessel.

Fleet	Variable	Number of observations	Mean (%)	Standard error
All trawlers	Captain share without owner as captain	74	20.1	0.7
	Crew share without owner as captain	74	20.6	0.5
	Vessel share without owner as captain	74	59.4	0.7
	Captain share with owner as captain	44	21.3	1.3
	Crew share with owner as captain	44	22.0	0.6
	Vessel share with owner as captain	44	56.6	1.4
	Percent of trips with owner as captain	44	82.3	2.6
Crabber	Captain share without owner as captain	16	26.1	3.8
	Crew share without owner as captain	16	18.6	2.0
	Vessel share without owner as captain	16	55.3	3.7
	Captain share with owner as captain	16	21.7	3.9
	Crew share with owner as captain	16	20.9	1.7
	Vessel share with owner as captain	16	57.4	4.2
	Percent of trips with owner as captain	16	85.3	5.7
Lg. groundfish trawler	Captain share without owner as captain	43	19.7	0.9
	Crew share without owner as captain	43	20.1	0.9
	Vessel share without owner as captain	43	60.1	1.0
	Captain share with owner as captain	24	22.8	2.1
	Crew share with owner as captain	24	22.4	1.2
	Vessel share with owner as captain	24	54.8	2.3
	Percent of trips with owner as captain	24	86.0	4.6
Whiting	Captain share without owner as captain	12	14.1	1.2
	Crew share without owner as captain	12	24.5	1.4
	Vessel share without owner as captain	12	61.4	1.4
	Captain share with owner as captain	3	14.7	0.6
	Crew share with owner as captain	3	24.7	1.1
	Vessel share with owner as captain	3	60.7	1.1
	Percent of trips with owner as captain	3	60.0	9.6

References

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Appendix A: Limited Entry Survey Questionnaire

OMB No. 0648-0369

Expiration date: 7/31/09

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 1st Street, Waldport, OR 97005</i>	
c. USCG vessel ID	<i>33221843</i>	
d. State vessel ID	<i>OR33214</i>	
e. Home port	<i>Newport, OR</i>	
f. Length (feet)	<i>75</i>	
g. Fuel capacity	<i>300</i>	
h. Engine make and model	<i>No information on record</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

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 2004. 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 2003 and 2004.

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 2003 and fiscal year 2004. If no income was earned from a particular source during a particular year, please write NA in the appropriate box.

Earnings (income) source	2003 (\$)	2004 (\$)
a. Landings in Alaska		
b. Landings in Hawaii		
c. Landings outside of the United States		
d. West Coast at sea deliveries		
e. Sale and leasing of permits associated with this vessel		
f. Other (please specify) _____		

11. For each cost category below, please provide total annual expenditures during your fiscal year 2003 and fiscal year 2004. 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 in either dollars or percentages 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, us = United States outside of West Coast and Alaska, ot = outside the United States. For crew expenditures please indicate the percent of crew that reside in each location category.

Cost (expenditure) category	2003 (\$)	2004 (\$)	Location of expenditures	
			hp:	ak:
a. Captain (including share payments, bonuses, other forms of compensation, and payroll taxes)			hs: wc:	us: ot:
b. Crew (including share payments, bonuses other forms of compensation, and payroll taxes)			hp: hs: wc:	ak: us: ot:
c. Fuel and lube			hp: hs: wc:	ak: us: ot:
d. Food and crew provisions			hp: hs: wc:	ak: us: ot:
e. Ice			hp: hs: wc:	ak: us: ot:
f. Bait			hp: hs: wc:	ak: us: ot:
g. Repair, maintenance, and improvements for vessel, gear, and equipment			hp: hs: wc:	ak: us: ot:
h. Insurance			hp: hs: wc:	ak: us: ot:
i. Interest and financial services			hp: hs: wc:	ak: us: ot:
j. Purchase of permits used with this vessel			NA	NA
k. Leasing of permits used with this vessel			NA	NA

CREW COMPENSATION

Questions 12 through 16 collect information about crew payments 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**?

	Deducted before calculating crew share?	
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 percentage 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

VESSEL EARNINGS AND HOUSEHOLD INCOME

17. Approximately what percentage of your annual household income comes from earnings associated with this vessel?

- a. less than 20%
- b. 20% to 40%
- c. 40% to 60%
- d. 60% to 80%
- e. greater than 80%

Appendix B: Testing for Nonresponse Bias

This appendix presents the numerical results of the two sample t-tests, which were used to determine whether the differences observed between survey respondents and nonrespondents are statistically significant. Results from these tests were summarized in subsection 5.3. This appendix provides the actual numerical results of the test as well as interpretation of whether the test results indicate the presence of nonresponse bias that requires corrective measures.

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. The form of the tests reported in Table B-1 assumes that respondents and nonrespondents do not have equal variances.

Table B-1 indicates that for each of the three primary vessel types within the limited entry trawl fleet, the difference in revenue from West Coast landings between respondents and

Table B-1. Two sample t-tests for statistical significance of differences between respondents and nonrespondents in five variables.

Fleet	Variable	T-statistic	Degrees of freedom	Probability > T if H0 true
All trawlers	Engine horsepower	1.52	115	0.13
	Vessel length	2.05	99	0.04
	Revenue from crab	2.44	137	0.02
	Revenue from groundfish	0.51	97	0.61
	Revenue from all species	2.31	108	0.02
Crabber	Engine horsepower	1.57	28	0.13
	Vessel length	0.78	20	0.45
	Revenue from crab	0.62	16	0.54
	Revenue from groundfish	1.10	22	0.28
	Revenue from all species	0.28	14	0.78
Lg. groundfish trawler	Engine horsepower	1.62	52	0.11
	Vessel length	2.88	54	0.01
	Revenue from crab	1.84	81	0.07
	Revenue from groundfish	-0.09	46	0.93
	Revenue from all species	1.59	54	0.12
Whiting	Engine horsepower	-0.42	15	0.68
	Vessel length	-1.44	6	0.20
	Revenue from crab	0.79	17	0.44
	Revenue from groundfish	-0.01	15	0.99
	Revenue from all species	0.42	14	0.68

nonrespondents was not statistically significant. When respondents and nonrespondents are compared at the vessel type level, the only statistically significant difference is in the length of large groundfish trawlers. Table 4 indicates that among large groundfish trawlers, respondents had a mean length of 67 feet and nonrespondents had a mean length of 60 feet, producing a t-statistic of 2.88.

Because respondents and nonrespondents at the vessel type level were not statistically different for revenue from groundfish landings, revenue from crab landings, and most physical characteristics, there is no need to weight survey responses at the vessel type level. The unweighted survey responses provide a representative picture of revenues and costs earned by each of the three major vessel types operating in the limited entry trawl fishery. There is no need to correct the vessel type level data for nonresponse bias, and consequently, all results presented in this document at the vessel type level are unweighted.

For the entire limited entry trawl fleet, respondents had values for vessel length, crab landings, and total West Coast landings that were significantly higher than those of nonrespondents. The difference between respondents and nonrespondents was not only statistically significant, but also of large magnitude. Survey respondents had mean revenue from crab landings of \$109,402 while nonrespondents had mean revenue from crab landings of only \$55,940.

Respondents also had higher groundfish landings than nonrespondents, but the difference was not statistically significant. As shown in Table 2, revenue from all landings had a mean value of \$356,771 for respondents and \$276,069 for nonrespondents.

While it may at first appear paradoxical that there is no statistically significant difference between revenue from West Coast landings for respondents and nonrespondents in any of the three primary vessel types when there is a statistically significant difference for the limited entry trawl fleet as a whole, it should be remembered that the three primary vessel types only include 132 of the 143 vessels in the limited entry trawl fleet. The other 11 vessels tend to have relatively small levels of revenue from landings. In particular, 5 of the 11 vessels are small groundfish trawlers, for which no survey responses were received. As a result, the average respondent had \$356,771 of revenue from landings while the average member of the survey population had \$327,425 of revenue from landings.

It should be noted that the three primary vessel types within the limited entry trawl fleet include 132 of the 143 limited entry trawl vessels. The other 11 vessels fall into three other vessel types. Since no responses were received from the five small groundfish trawlers, they are not represented in the survey results for the entire limited entry trawl fleet. The combination of 1) larger though not statistically significant landings for respondents than nonrespondents in each of the three primary vessel types and 2) absence of small groundfish trawlers results in a statistically significant difference between revenue from all West Coast landings for respondents and nonrespondents for the entire limited entry trawl fleet.

While nonresponse bias is statistically significant and of sufficient magnitude to make calculation of weighted survey results desirable, the lack of data on vessel types such as small groundfish trawlers makes the calculations of weighted survey results to correct for nonresponse

bias impossible. It is not possible to weight responses in strata with lower response rates more heavily when there are no respondents in that strata. As a result, only the unweighted results are provided in this document for the entire limited entry trawl fleet.

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