## I. INTRODUCTION

The purpose of this report is to summarize and analyze secondary survey data recently gathered in California and Oregon from commercial salmon fishery participants. The overall goal is to use the survey data to improved information on vessel operating costs and revenues. The resulting study, summarized in report form, will provide a current picture of the salmon troll fleet characteristics.

This subcontract was supported by funds provided by the National Marine Fisheries Service (NMFS, or NOAA Fisheries Service). These funds were provided to support the regulatory efforts of the Oregon Department of Fish and Wildlife (ODFW) and California Department of Fish and Game (CDFG). The analysis in this report was conducted using secondary data that was originally gathered by Hackett and Hansen (2008) and by Lian and others at NOAA Fisheries Service. No funds from Subcontract 8404-S-004 were used to support survey research. California survey data were gathered with funding under a separate contract from CDFG, while Oregon survey data were gathered by the NOAA Fisheries Service under a separate contract.

Cost and revenue summary data were prepared in consultation with representatives of CDFG and ODFW. Each agency utilizes its own methods for economic analysis, and the summary data in this report reflect the specific data requirements of these state agencies. State and federal regulatory agencies can use the cost and revenue information in this report to conduct economic impact and other assessment, and ultimately to facilitate resource management decisions: (1) by determining least cost (to fishermen) management alternatives, (2) estimating relationships to and impacts on other fisheries (other fishery alternatives), (3) giving consideration to the social costs and benefits of management actions, (4) estimating economic impacts on coastal communities in terms of sales, personal income, and employment, and (5) forecasting likely future outcomes associated with different resource abundances and regulatory frameworks.

The first part of this report briefly describes the resource and regulatory context for this report. We then turn to a brief description of the survey data and methods. This section also includes a description of cost categories, operational configurations (California), and FEAM (Fishery Economic Assessment Model) vessel classes (Oregon). The last section of this report contains the cost and revenue tables that form the core of this report.

## II. RESOURCE AND REGULATORY CONTEXT

This report is focused on the costs and revenues associated with the commercial salmon fisheries in California and Oregon. Commercial salmon fishermen may target various non-salmon species, and in order to understand fishing costs one must include a complex of species. In consultation with California and Oregon fisheries experts, characteristic species groups targeted by salmon fishermen are addressed in this report. Key target species or species groups addressed in this report include Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch)*, albacore tuna (*Thunnus alalunga*), Dungeness crab (*Cancer magister*), sablefish (*Anoplopoma fimbria*), ocean shrimp (*Pandalus jordani*), and various groundfish and highly migratory species (HMS).

No single agency is responsible for all Pacific salmon management because salmon cross many geographical and political boundaries, which makes their management complex. The state commissions governing the California Department of Fish and Game and the Oregon Department of Fish and Wildlife set salmon seasons in their respective state waters, including coastal waters extending three miles offshore. The NMFS sets all seasons in the Exclusive Economic Zone beyond the three-mile limit out to 200 miles. California and Oregon are members of the Pacific Fisheries Management Council (PFMC),

and present data and information for review during the season-setting process. Each year the PFMC develops management measures that establish fishing areas, seasons, quotas, legal gear, possession and landing restrictions, and minimum lengths for salmon taken in federal waters off Washington, Oregon, and California (Boydstun et al. 2001). These measures are designed to prevent overfishing and to allocate the ocean harvest equitably among ocean commercial and recreational fisheries. The measures must meet the goals of the Fishery Management Plan, which addresses spawning escapement needs and allows for freshwater fisheries. The needs of salmon species listed under the federal Endangered Species Act must also be met as part of the process (Boydstun et al. 2001).

The PFMC makes annual recommendations to NMFS for ocean salmon seasons. Once the federal season setting process is completed the respective state fishing commissions normally adopt a similar set of regulations for state waters. Moreover, American Indian tribes play a key co-management role in managing salmon fisheries and in conserving salmon populations through harvest management, tribal hatchery programs, habitat protection, and restoration and biological studies.

Various factors have contributed to declining salmon stocks, including the destruction of spawning habitat, pollution, fishing pressure, and fluctuating ocean conditions (Boydstun et al. 2001). Conditions in the Klamath River basin system have been of particular concern. Chinook salmon represents the primary commercial salmon species in this area, and stocks in the Oregon and California interface were so depressed in the early 1980s that a recovery plan was adopted in 1986, leading to the creation of the Klamath Management Zone (KMZ). The KMZ extends from Port Orford in southern Oregon to Point Arena in northern California. The KMZ restricts salmon landings for commercial and recreational fisheries to allow for escapement back to spawning areas (PFMC 2008b).

In recent years the Chinook salmon fisheries in California and Oregon have been in crisis. In 2006 the PFMC recommended closures and other restrictions for commercial and recreational fishermen for California and Oregon, and the NOAA Fisheries Service adopted those recommendations, sharply reducing ocean salmon fishing in 2006 (Schwarzenegger 2006). NOAA Fisheries Service closed the commercial salmon season in southern Oregon and north of Pt. Arena in California, and much of the rest of California saw an abbreviated season (NOAA Fisheries Service 2006). California and Oregon salmon landings in 2006 were down 83 percent from 2005, and 87 percent from 2004 (National Marine Fisheries Service SW Office 2008). The impending closure and restrictions prompted disaster relief fund petition letters to the federal government from both the Oregon and California governors four days before the NOAA announcement (Schwarzenegger 2006; Kulongoski 2006).

With the severe reduction in the supply of salmon, the average West Coast ex-vessel price in 2006 was the second highest received since 1979 (PFMC 2007). Although fishermen benefited from these high ex-vessel prices, average ex-vessel revenue per vessel dropped by over 50 percent in Oregon and by 41 percent in California (PFMC 2007). In 2006, 489 California commercial fishermen landed 1.04 million pounds (dressed) of salmon on 477 vessels. This California fleet total represents the lowest number of commercial fishing vessels that targeted salmon since the beginning of PFMC's database in 1960 (PFMC 2001). By comparison, 680 commercial vessels targeted salmon in California in 2005. The value of California commercial salmon landings in 2006 totaled $5.3 million (in 2007 $), down from $12.9 million in 2005 (in 2007 $) (PFMC 2007). Oregon's 2006 salmon season saw its second lowest number of participating commercial vessels since the beginning of PFMC's Oregon database in 1974. Three hundred and fifty-seven vessels landed 499,000 pounds (dressed) salmon valued $2.7 million (in 2007 $). By way of comparison, 565 vessels landed 2.7 million pounds (dressed) of salmon worth $8.5 million in 2005 (in 2007 $) (PFMC 2007).

In 2008 the PFMC recommended a complete closure of commercial and sport Chinook fisheries off

California and most of Oregon, and allowed only a 9,000 fish catch for hatchery coho salmon off Central and southern Oregon (PFMC 2008a). The closures were aimed at conserving Sacramento River fall-run Chinook salmon. On April 10th 2008 Governors Schwarzenegger and Kulongoski issued executive orders declaring a state of emergency in their respective states due to low numbers of Chinook salmon returns (Schwarzenegger 2008; Kulongoski 2008). On May 1st 2008 the NOAA Fisheries Service closed the federal ocean salmon fishery south of Cape Falcon, Oregon, and Secretary of Commerce Gutierrez (2008) declared a commercial fishery failure for the West Coast salmon fishery due to historically low salmon returns. Once again the impending salmon season closures and restrictions prompted disaster relief petitions to the federal government from both the California and Oregon Governors.

Following each of the salmon fishery crises described above, federal legislation provided disaster aid for all affected west coast states. The total dollar amount of the disaster payments to the states ($60.4 million in 2006 and $170 million in 2008) was ultimately derived from a negotiated political process involving consultations and meetings between industry representatives, elected government officials, and government agencies. The bulk of the aid packages focused on assisting commercial salmon fishermen. For 2006, all current salmon permit holders in California were given $1,000. In addition to the permit allowance, a catch payment for California permit holders was determined based on a selected best season's landings from the previous three years multiplied by a price per pound figure (approximately 60 percent of the previous year's nominal average ex-vessel price). For 2008, California fishermen would receive the greater of a minimum payment of $5,000 or a catch payment (similar to 2006) not exceeding a $225,000 cap (California Salmon Council 2007 and 2008). Oregon's 2006 and 2008 disasters payments went to all qualifying fishermen who were reimbursed for at least 50 percent of their ex-vessel value for a selected previous year's landings up to a $75,000 cap (Oregon Salmon Commission 2007 and Pacific States Fisheries Marine Commission 2008).

The net revenue estimates provided in section IV of this report provide insight into the economic distress confronting participants in the California and Oregon salmon fisheries in 2006. As was described above, however, the disaster payments were based on the more robust economic conditions in these fisheries in prior years and not on estimated losses in 2006. Moreover, the net revenue estimates in this report are entirely based on income from commercial fishing, and do not include the disaster payments. The recent and repeated failure of the west coast salmon fisheries underscores the importance of understanding the underlying economic conditions in these fisheries.

## III. DATA SOURCES AND METHODS OF ANALYSIS

This section of the report is divided into two subsections – one for California and one for Oregon. Each provides a brief description of the surveys from which this report draws summary cost and revenue data. Each subsection also includes a description of the cost categories, operational configurations (California), and FEAM vessel classes (Oregon). Note that aggregated cost and revenue data for salmon fisheries in California and Oregon are also provided in supplementary Excel files accompanying this report.

### III.A. California

The analysis presented in this section of the report derives from secondary data gathered from a California commercial fisherman survey that was conducted in 2007 by Hackett and Hansen (2008), funded by CDFG. All salmon fishermen who made landings in 2006 in California received a survey requesting economic and demographic data. The total research design method (Dillman 1978) was followed. Quality assurance and quality control methods helped limit potential errors in response interpretation and data tabulation.

Hackett and Hansen merged the disaggregated survey data with license and landings receipt datasets provided by CDFG. These additional data were then used to infer both unit and item non-responses and create a complete dataset for estimated costs and revenues for 550 California commercial fishermen targeting salmon or albacore during the 2006 salmon season. This dataset can be used by CDFG to evaluate aggregated cost, revenue, and profit conditions for California's commercial salmon fishermen, as well as to conduct economic impact analyses of management and other discrete events affecting fishing activity and landings in California's commercial fisheries (e.g., see Minnesota IMPLAN Group 2008).

For the purpose of describing California's salmon fishing activity, commercial fishermen (rather than vessels) were categorized into distinct operational configurations (OCs) constructed in collaboration with Terry Tillman of CDFG. The 550 fishermen are grouped into four salmon OCs depending on species landed, size of vessel, and gear type used to land the targeted species. The result of this process is illustrated in Table 1. It should be noted that within the "Salmon & Albacore" OC, a large number of the fishermen only landed albacore in 2006, though many used salmon troll gear and were active in the salmon fishery in previous years. In collaboration with Terry Tillman it was determined that the albacore-only fishermen should be categorized in the "Salmon & Albacore" OC since albacore and salmon gear types are similar, and many salmon fishermen target albacore as well.

**Table 1: California's Salmon Operational Configurations***

| Operational Configuration | Vessel Size | Gear Types | Fishing Seasons |
|---|---|---|---|
| Salmon | Any | Salmon Troll, Hook and Line | Summer to Fall |
| Salmon & Albacore** | Any | Salmon and Albacore Troll, Hook and Line | Early Summer to Fall |
| Salmon & Dungeness – Small Vessels | < 26' | Salmon Troll, Hook and Line, Crab Trap | Winter to Fall |
| Salmon & Dungeness – Medium and Large Vessels | 26' and Larger | Salmon Troll, Hook and Line, Crab Trap | Winter to Fall |

* Source: Hackett and Hansen (2008)

** Data for this OC includes costs and revenue from some fishermen who fish albacore but not salmon.

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

**Table 2: California Fixed Cost Categories***

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

* Source: Hackett and Hansen (2008)

**Table 3: California Variable Cost Categories***

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

* Source: Hackett and Hansen (2008)

Fishermen's costs are also categorized into four different vessel size classes: vessels under 26'; vessels between 26' and 36'; vessels over 36'; and "unclassified". The "unclassified" category refers to costs associated with fishermen who did not make landings in vessels that they either owned or that were "business owned" (based on CDFG vessel registration records). These unclassified cases represent fishermen who shared or leased the use of vessels owned by others. An additional instance concerning unclassified fishermen is when multiple fishermen land in a single vessel and the fish dealer fills out a landing receipt for each fisherman's landings, often called a "split ticket". These split tickets comprise 10 to 20 percent of recorded landings (Leos 2008). Therefore, one or more of these fishermen land in a vessel they are not registered to own, and so cannot be placed into a specific vessel size class.

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

### III.B. Oregon

With the cooperation of the Pacific States marine Fisheries Commission, personnel from the NMFS Northwest Fisheries Science Center conducted coast-wide economic surveys in 2007 (NOAA NMFS 2008). In-person interviews were used to collect 2005 and 2006 costs from commercial open access groundfish vessels in California, Oregon, and Washington (CA/OR/WA), as well as various types of vessels targeting salmon and other species groups. The survey population criteria required that all commercial fishing vessels "(1) did not have a federal limited entry permit during 2005-06, (2) earned at least $2,000 from West Coast groundfish and salmon landings during 2005-06, and (3) earned at least five percent of their West Coast landed revenue from groundfish and salmon (this five percent rule was designed to exclude vessels that target HMS or coastal pelagic species but have a small amount of groundfish or salmon bycatch, and would not be receptive to a groundfish/salmon survey)" (Lian 2007).

All cost data in this section are derived from the NMFS survey, while revenue data are sourced from the PacFin database. Cost categories are grouped into the following fixed and variable costs categories (Tables 4 and 5).

**Table 4: Oregon and CA/OR/WA Fixed Cost Categories***

| Fixed Cost Categories | Description |
|---|---|
| Repair, Maintenance, and Improvements | Mean annual expenditures on repair, maintenance, and improvements for vessel, gear, and equipment |
| Insurance | Mean Annual Expenditures on vessel insurance |
| Interest | Mean Annual Expenditures on Interest |
| Permit Lease | Mean Annual Expenditures on permit leasing |
| Permit Purchase | Mean Annual Expenditures on permit purchases |

* Source: NOAA NMFS (2008)

**Table 5: Oregon and CA/OR/WA Variable Cost Categories***

| Variable Cost Categories | Description |
|---|---|
| Bait | Mean Annual Bait Costs |
| Captain Wage | Mean Annual expenditures on Captain Wages |
| Crew Wage | Mean Annual expenditures on Crew Wages |
| Food | Mean Annual Food Costs |
| Fuel | Mean Annual Fuel Costs |
| Ice | Mean Annual Ice Costs |

* Source: NOAA NMFS (2008)

The specific cost and revenue data requirements for the Oregon portion of this study were developed in close consultation with Chris Carter and Christine Broniak at ODFW, as constrained by the nature of the NMFS survey from which the data are drawn. ODFW utilizes the FEAM (Fisheries Economic Assessment Model) vessel-level framework in its economic analysis of commercial fisheries, which conforms to the vessel-level focus of the NMFS survey. Table 6 describes the relevant FEAM vessel categories used in this analysis.

**Table 6: Oregon Vessel Categories***

| Vessel Type | Description |
|---|---|
| Sablefish Fixed Gear | Sablefish revenue from fixed gear is greater than 33% of that vessel's total revenue, and total revenue is greater than $15,000 |
| Other Groundfish Fixed Gear | Groundfish (including halibut and California halibut), other than sablefish, revenue from fixed gear is greater than 33% of that vessel's total revenue, and total revenue is greater than $15,000 |
| Pelagic Netter | Pelagic species revenue is greater than 33% of that vessel's total revenue, and total revenue is greater than $15,000 |
| Migratory Netter | Highly migratory species revenue from gear other than troll or line gear is greater than 33% of that vessel's total revenue, and total revenue is greater than $15,000 |
| Shrimper | Shrimp revenue is greater than 33% of that vessel's total revenue, and total revenue is greater than $15,000 |
| Crabber | Crab revenue is greater than 33% of that vessel's total revenue, and total revenue is greater than $15,000 |
| Salmon Troller | Salmon revenue from troll gear is greater than 33% of that vessel's total revenue, and total revenue is greater than $5,000 |
| Other > $15,000 | All other vessels not listed in FEAM vessel categories 1 to 17 with total revenue greater than $15,000 |
| Other ≤ $15,000 | All other vessels not listed in FEAM vessel categories 1 to 17 with total revenue less than or equal to $15,000 |

* Source: Research Group (2006)