# Washington MRIP Consultant's Review Recommendation for Sampling of Minor Ports

FY 2012 Proposal

Wendy Beeghley
Created: 05/13/2015

# 1. Overview

## 1.1. Sponsor
Russell Porter

## 1.2. Focus Group
Survey Design and Evaluation

## 1.3. Background
Comprehensive and sound management of recreational finfish fisheries in Washington State requires information on catch, effort, and stock-specific fishery impacts necessary to meet established conservation and allocation mandates. These data are federally required to open and manage recreational fisheries, especially considering the need to limit and monitor impacts to threatened species. For the Washington ocean Marine Catch Areas (Areas 1-4), these critical fishery information needs are met through the Washington Department of Fish and Wildlife (WDFW) Ocean Sampling Program (OSP). To produce estimates of marine fish catch and effort in ocean Marine Catch Areas (for the “private boat” and “charter boat” modes), WDFW employs a procedure based on data collected by an access point intercept survey. The OSP survey is designed to provide both total effort and catch per unit effort (CPUE). These data are used to generate estimates of total catch and effort by Marine Catch Area, month, and fishing mode which are provided to the Recreational Fishery Information Network (RecFIN , www.recfin.org). Currently, ocean fishery sampling occurs in all major ocean access ports during “peak” effort months, May through September. Small coastal access sites are not sampled, and effort and catch are assumed to be insignificant; these sites include Nahcotta, Bay Center, South Bend, Smith Creek, and Tokeland in Willapa Bay and Ocean Shores, Johns River, and Hoquiam 28th Street launch in Grays Harbor. Boat effort from the Grays Harbor sites is included in the total effort count for Westport on all sampled days as boats launching from these sites must pass by the Westport exit count site. These vessels are included in the effort count, and target trip composition and catch per boat is assumed identical to sampled Westport vessels. These assumptions have never been tested, but in this way, catch and effort are estimated for these sites. Boat effort from the Willapa Bay sites is not included in the total effort count for any sampled sites, as they are not visible. Therefore, any ocean catch and effort originating from these sites is ignored and excluded from estimates of ocean catch and effort. This project proposes to sample all above-listed minor ports from July – September, 2012 with the objectives of:a) Confirming effort counts from Grays Harbor portsb) Comparing ocean target trip and catch composition from Grays Harbor minor ports to Westportc) Generating estimates of ocean effort and catch from Willapa Bay minor ports

## 1.4. Project Description
The proposed project implements one of the recommended actions resulting from the MRIP’s 2010 review of the WDFW OSP. During that review, the MRIP consultants (experts in sampling design, statistics, and estimation methods) recommended specific actions that OSP could implement to improve total ocean catch estimation. The major category of improvement recommended by the MRIP consultants was to address under-coverage issues. Our proposed project requests funds to continue implementing one of these recommendations, as detailed below.Work on this project would begin April 1, 2012, and cease on September 30, 2012, or later periods covering these months depending on funding date. A final report completed by June 30, 2013.

## 1.5. Public Description

## 1.6. Objectives
To sample in all minor ocean access sites during peak effort months, July – September. This study would address the question of whether minor access sites constitute significant effort or catch in the Washington ocean fisheries.

## 1.7. References
Evaluation of Washington ocean recreational catch and effort from minor ocean access sites near the Washington coast.

# 2. Methodology

## 2.1. Methodology
A pressure matrix for site selection will be developed starting April 1, 2012 similar to the matrix used for site selection in WDFW’s Puget Sound Sampling Program. Sites will be grouped geographically (Group 1: Nahcotta, Bay Center, and South Bend; Group 2: Tokeland and Smith Creek; Group 3: Ocean Shores, 28th Street launch, John’s River) and sites within each group will be selected for sampling using the pressure matrix within a calendar month. One sampler will be assigned to each group of sites and stationed in the location likely to result in the least amount of personal vehicle mileage. Sampling design will be identical to that currently used by the OSP in major coastal ports (documentation is available).

## 2.2. Region
Pacific

### 2.3. Geographic Coverage
Washington's minor ocean access points, Nahcotta, Bay Center, South Bend , Tokeland, Smith Creek, Oc

### 2.4. Temporal Coverage
April 2012 - December 2012 (sampling during July - September)

### 2.5. Frequency
See Sampling Methodology

### 2.6. Unit of Analysis
Vessel based survey (private and party/charter)

### 2.7. Collection Mode
Intercept Survey

## 3. Communication

### 3.1. Internal Communication
Internal communication will consist of a monthly email report distributed to the project team during the sampling period detailing number of boats sampled by general activity (fishing or non-fishing) and anglers encountered, and whether or not fish were observed. The internal project team will also receive a copy of the catch estimates provided externally as well as the final report (described below).

### 3.2. External Communication
Monthly reporting to the MRIP Operations Team will occur through the MRIP online reporting system reporting activity on the project and sampling results as described above. In addition, catch estimates will be included in the standard estimates provided monthly to the Pacific States Marine Fisheries Commission for incorporation into the RecFIN database; these estimates will be provided within 30 days of the end of each month (eg. by August 31, 2012, for July 2012). A final report on the project will be submitted to the Operations Team by December 31, 2012.

## 4. Assumptions/Constraints

### 4.1. New Data Collection
Y

### 4.2. Is funding needed for this project?

### 4.3. Funding Vehicle
Pacific RecFIN Grant

### 4.4. Data Resources
No data is required from NOAA. All data will be collected by OSP.

### 4.5. Other Resources
Additional samplers will be needed to be hired and trained. More time from existing staff will also be required for sampler supervision, data entry, error checking, data analysis, and report writing.

### 4.6. Regulations
No regulatory changes are required.

### 4.7. Other
We are assuming funding will be available in time to hire, train, and begin sampling in July 2012.We propose integrating funding for this proposal into the 2012-2013 WDFW RecFIN grant

## 5. Final Deliverables

### 5.1. Additional Reports

Intergration of the minor port catch and effort into the state major port sampling catch estimates

### 5.2. New Data Set(s)

New Data Sets for Minor Ports previously only sampled infrequently

### 5.3. New System(s)

## 6. Project Leadership

### 6.1. Project Leader and Members

| First Name | Last Name | Title | Role | Organization | Email | Phone 1 | Phone 2 |
|---|---|---|---|---|---|---|---|
| Scott | Barbour | Ocean Sampling Coordinator | Team Member | Washington Dept. Fish & Wildlife | Scott.Barbour@dfw.wa.gov | 360-249-1214 | |
| Wendy | Beeghley | Ocean Sampling Unit Supervisor | Team Leader | Washington Dept. Fish & Wildlife | Wendy.Beeghley@dfw.wa.gov | 360-249-1215 | |
| Doug | Milward | Ocean & Puget Sound Samp. Mgr. | Team Member | Washignton Dept. Fish & Wildlife | Douglas.Milward@dfw.wa.gov | 360-902-2739 | |
| Erica | Speidel | Ocean Sampling Catch Specialist | Team Member | Washington Dept. Fish & Wildlife | Erica/Speidel@dfw.wa.gov | 360-249-1236 | |

## 7. Project Estimates

### 7.1. Project Schedule

| Task # | Schedule Description | Prerequisite | Schedule Start Date | Schedule Finish Date | Milestone |
|---|---|---|---|---|---|
| 1 | Develop pressure based site selection matrix | | 06/01/2012 | 06/30/2012 | |
| 3 | Sample minor ocean access points | 1,2 | 07/01/2012 | 09/30/2012 | |
| 4 | Analysis and Final Report | 1,2, 3 | 11/01/2012 | 12/31/2012 | Y |
| 2 | Hire and train sampling staff | | 06/01/2012 | 06/30/2012 | |

### 7.2. Cost Estimates

| Cost Name | Cost Description | Cost Amount | Date Needed |
|---|---|---|---|
| Goods and Services | Supplies and materials for sampling | $200.00 | 07/01/2012 |
| Project duties for existing staff (matrix desing, site assgn, hiring, training, data mgt. | 4 staff months Scientific Technician 2, 1 staff month F & W Biologist | $23900.00 | 07/01/2012 |

| Cost Name | Cost Description | Cost Amount | Date Needed |
|---|---|---|---|
| Indirect Costs | Agency Indirect Cost (23.51%) | $17879.00 | 07/01/2012 |
| PSMFC Admin Fee for RecFIN GRant | 2.02% administrative fee for contract processing | $1897.00 | 07/01/2012 |
| Travel Costs | Travel to ports from Montesano, WA and between sites by samplers | $3000.00 | 07/01/2012 |
| Additional Sampling Staff | 9 staff months of sampling time (average $2,943/mo salary + $1,384/mo benefits) | $38950.00 | 07/01/2012 |
| Data Analysis and Report Writing | 1 month of data analysis from staff biometrician or consultants for analysis and final report | $10000.00 | 11/01/2012 |
| TOTAL COST | | $95826.00 | |

# 8. Risk

## 8.1. Project Risk

| Risk Description | Risk Impact | Risk Probability | Risk Mitigation Approach |
|---|---|---|---|
| Low number of sampling assignments at some sites could jeopardize accuracy of catch/effort estimates. | Catch or effort could be over- or under-estimated. | Medium | Data will be stratified by month rather than week to maximize sample days per stratum. |
| Vehicle or traffic/road problems could prevent sampler from getting to assigned sample site. | Scheduled sampled days may be unsampled road closures or vehicle problems prevent access to sampling sites | Low | We will pre-schedule alternative sampling days within each spatial/temporal stratum should scheduled primary sampling days be missed. |

## 9. Supporting Documents

"Final Report", page 1

# MARINE RECREATIONAL INFORMATION PROGRAM

**Addressing Recommendations from the MRIP Sponsored Review of Monitoring of Washington's Ocean Sampling Program: Evaluation of recreational catch and effort from minor access sites on Washington's coast**

**Washington Department of Fish and Wildlife**

**April 1, 2015**

### INTRODUCTION

Comprehensive and sound management of recreational finfish fisheries in Washington State requires information on catch, effort, and stock-specific fishery impacts necessary to meet established conservation and allocation mandates. These data are federally required to open and manage recreational fisheries, especially considering the need to limit and monitor impacts to threatened species. For the Washington ocean Marine Catch Areas (Areas 1-4), these critical fishery information needs are met through the Washington Department of Fish and Wildlife (WDFW) Ocean Sampling Program (OSP).

To generate estimates of marine fish catch and effort in ocean Marine Catch Areas (for the "private boat" and "charter boat" modes), WDFW employs a procedure based on data collected by an access point intercept survey. The OSP survey is designed to provide both total effort and catch per unit effort (CPUE). These data are used to generate estimates of total catch and effort by Marine Catch Area, month, and fishing mode which are provided to the Recreational Fishery Information Network (RecFIN, www.recfin.org).

Currently, ocean fishery sampling occurs in all major ocean access ports during "peak" effort months, May through September. Some access sites are also sampled at a lower rate during March, April, and/or October. These major access sites include Neah Bay (and adjacent Snow Creek launching site), La Push, Westport, and Ilwaco (including the ports of Ilwaco and Chinook, the Cape Disappointment launching ramp, and the land-based fishery from the Columbia River North Jetty).

There are also minor access sites located along Willapa Bay and Grays Harbor that have the potential for ocean fishing effort. Effort has been estimated during the months of July-September each year for Ocean Shores from visual counts made by the Westport exit counter and added to the overall effort count for Westport; none of the sites have been sampled for ocean fishery effort or catch. Ocean fishery effort and catch have been assumed to be insignificant in all of these non-sampled sites.

The objective of this project was to test the assumption that ocean fishing effort and catch are indeed insignificant from the minor access sites. This was a recommendation resulting from the Marine Recreational Information Program's (MRIP) recent review of the WDFW OSP. Work on this project began July 1, 2012, and ceased on September 30, 2012.

## METHODS

One field sampler was stationed to sample each minor Washington coastal access complex: southern Willapa Bay (Nahcotta, Bay Center, and South Bend), northern Willapa Bay (South Bend, Smith Creek, and Tokeland), and Grays Harbor (Ocean Shores, 28th Street launch in Hoquiam, and John's River) (see Figure 1). One Scientific Technician and one Biologist worked to coordinate sampling, collect and keypunch data, and generate estimates of catch and effort. One Biometrician analyzed the resulting catch data, comparing minor ports to adjacent normally sampled major access sites (the Ilwaco/Chinook complex and Westport) and will complete analysis once final catch estimates are available.

A pressure index was developed by permanent OSP staff to assign a probability matrix to the minor ports. This matrix was used to randomly select sample sites for each minor port complex for each month. Sites were selected for sampling between 2 and 14 days per month.

The OSP mainly uses a two-stage design for each port, with days constituting the primary sampling units (PSU) and boats within each sampled day as the secondary sampling units (SSU). Selection of days follows simple random procedures. Although sampling of boats is approximately systematic (e.g., every $k^{th}$ boat), the selection procedure is not exact and this stage is treated as simple random for estimation purposes. Daily estimates are expanded over days within strata to produce weekly, monthly and annual estimates.

Effort is measured in units of boat-trips and angler-trips, and on sampled days, is measured throughout the entire period of boat activity, i.e., from the time when the first boat enters a port until the last boat returns. On a given sampling day, the total number of boats that left a port is counted. Boat effort was measured during this project through an entrance count: a count of all boats entering that marina.

The catch per boat is sampled through intercept surveys. Returning boats are systematically sampled at a minimum target rate of 20% within each boat type (charter and private). Every $k^{th}$ boat to enter the harbor is included in the sample regardless of size, mooring location, trip type, or other attributes.. The size of the sample (leading to the calculation of $m$) depends on the projected effort and the number of available samplers. Overall, the sampling rate during normally sampled timeframes in each major Washington coastal port in a year averages over 50% for charter boats and over 40% for private boats. For this project, the sampling goal was 100% of the vessels entering the port on each sampled day in sites with anticipated low effort. Where effort was higher, the desired sampling rate was adjusted inversely proportional to effort.

Data collected from each sampled boat trip include target species, area fished, number of anglers,

landed catch by species, released salmon by species, releases of all marine fish by species, depth at which the majority of rockfish in the catch were hooked, and other biological data.

**Catch and Effort Estimation**

The OSP generates preliminary estimates of catch and effort in-season to meet the demands of ocean fishery management. Catch estimates for quota fisheries (currently salmon and halibut) are generated weekly; catch estimates for all other species are generated monthly and provided to the RecFin database by the end of the following month. Final post-season catch and effort estimates for all species are generated by February 1 each year; these post-season estimates replace any existing in-season estimates. For this project, final estimates of effort and catch were generated monthly and provided to the RecFin database by the end of the following month

***OSP Estimated Stratum Totals (Primary Stage)***

Combined (total) catch estimates are typically stratified by weekend/holiday and weekday. In some strata, every day is sampled. In those strata the combined estimates are simply sums of the daily catches. In other strata, where some days are not sampled, the average catch per day over all sampled days is multiplied by the number of days in the stratum to estimate the total catch.

Let:

| | | |
|---|---|---|
| $a$ | = | the marine catch area, |
| $i$ | = | trip type, |
| $t$ | = | Weekend/holiday or Weekday stratum, |
| $N_t$ | = | the number of days in stratum $t$, |
| $T_t$ | = | collection of all days in stratum $t$, |
| $n_t$ | = | the number of days sampled in stratum $t$, (rather than the number of boats sampled as above), |
| $S_t$ | = | collection of sampled days in stratum $t$ (when $S$=$T$, $n$=$N$), |
| $Y_{taik}$ | = | estimated catch (or effort) on day $k$ for stratum $t$ in area $a$ from trip type $i$, |
| $C_{tai}$ | = | catch for stratum $t$ in area $a$ from trip type $i$, |

Then

$$\hat{C}_{tai} = N_t \frac{\sum_{k \in S_t} \hat{Y}_{taik}}{n_t}$$

with estimated variance (Thompson 1992, p. 129):

$$\hat{V}\left(\hat{C}_{tai}\right)=\frac{N_t(N_t-n_t)}{n_t}\frac{\sum_{k\in S_t}\left(\hat{Y}_{taik}-\hat{\bar{Y}}_{tai}\right)^2}{n_t-1}+\frac{N_t}{n_t}\sum_{k\in S_t}\hat{V}\left(\hat{Y}_{taik}\right)$$

where

$$\hat{\bar{Y}}_{tai}=\frac{\sum_{k\in S_t}\hat{Y}_{taik}}{n_t}.$$

For strata with all days sampled, $n_t = N_t$ , and the catch and variance estimators reduce to:

$$\hat{C}_{tai}=\sum_{k\in T_t}\hat{Y}_{taik}$$

and

$$\hat{V}\left(\hat{C}_{tai}\right)=\sum_{k\in T_t}\hat{V}\left(\hat{Y}_{taik}\right).$$

***OSP Daily Catch and Effort Estimation (Secondary Stage)***

Both catch and effort are post-stratified by trip-type and area fished. Effort in terms of boat-trips is simply the sample number of boats for each trip-type and area expanded by the appropriate boat-type (charter or private) exit/entrance count. Effort in terms of angler-trips is calculated as the mean number of anglers per boat (indexed by trip-type and area) expanded by the counted total population of boats.

The total catch for a given species on a sampled day is the product of the population of boats and the estimated catch per boat, again post-stratified by trip-type and area fished. Key assumptions in the current estimation procedures are that:

1) All boats exiting/entering a port are included in the exit/entrance count
2) Exit/entrance counts are made without error
3) The approximate systematic sample of boats can be treated as a simple random sample
4) Anglers answer questions accurately and do not conceal fish

In the following discussion, subscripts referring to port and boat-type are suppressed. Let:

$M_t$ = total exit or entrance count for a given port on day *t* (assumed known without error),

$m_t$ = total boats sampled on day *t*,

$m_{tai}$ = number of boats sampled of trip type *i* fishing in area *a* on day *t*,

$a_{taij}$ = number of anglers on the *j*th boat from trip type *i* fishing in area *a* on day *t*,

$y_{taij}$ = number of species specific fish caught on the *j*th boat from trip type *i* in area *a* on day *t*, and

$Y_{tai}$ = total catch of specific species caught from trip type *i* in area *a* on day *t*.

The estimate of the number of boat-trips of trip-type *i* and area *a* follows the procedure outlined in Lai et. al. (1991) where the proportion of boats in each category is estimated by:

$$\hat{p}_{tai} = \frac{m_{tai}}{m_t}$$

with estimated variance (Cochran 1977, p. 52):

$$V(\hat{p}_{tai}) = \frac{\hat{p}_{tai} \cdot (1 - \hat{p}_{tai})}{(m_t - 1)} \cdot (\frac{M_t - m_t}{M_t})$$

The estimated total boat-trips is then obtained by:

$$\hat{M}_{tai} = M_t \cdot \hat{p}_{tai}$$

with estimated variance:

$$\hat{V}(\hat{M}_{tai}) = M^2{}_t \cdot \hat{V}(\hat{p}_{tai})$$

Effort expressed in terms of angler-trips is the product of the average anglers per boat-trip times the total number of boat-trips. The mean number of anglers per boat-trip (for trip-type *i* and fishing area *a*) is estimated as:

$$\hat{\bar{a}}_{tai} = \frac{\sum_j a_{taij}}{m_t}$$

with variance:

$$\hat{V}(\hat{\bar{a}}_{tai}) = \frac{\sum_j (a_{taij} - \hat{\bar{a}}_{tai})^2}{m_t(m_t - 1)} \cdot (\frac{M_t - m_t}{M_t})$$

Thus the estimated total number of angler-trips is

$$\hat{a}_{tai} = M_t \cdot \hat{\bar{a}}_{tai}$$

with variance

"Final Report", page 6

$$\hat{V}(\hat{a}_{tai}) = M_t^2 \cdot \hat{V}(\hat{\bar{a}}_{tai})$$

The catch (or number released) for a specific species on sampled day *t* in area *a* from trip type *i* is similarly estimated by

$$\hat{Y}_{tai} = \frac{\sum_j y_{taij}}{m_t} M_t$$

with estimated variance

$$\hat{V}\left(\hat{Y}_{tai}\right) = \frac{\sum_j \left(y_{taij} - \hat{\bar{y}}_{tai}\right)^2}{m_t\left(m_t - 1\right)} M_t\left(M_t - m_t\right).$$

This estimate and its variance differs somewhat from that described in Lai et al. (1991) since the total count, $M_t$ (assumed to be a known quantity), is used to expand the estimated CPUE (calculated over all sampled boats) rather than the estimated boat-trips by trip-type and area fished.

***Comparing catch estimates between exclusion and inclusion of minor ports***

One metric used to evaluate estimators is through comparing the mean squared error (MSE) which takes into account both bias and variance and is

$$MSE\left(\hat{C}\right) = Bias^2\left(\hat{C}\right) + Variance\left(\hat{C}\right).$$

Often the most desirable estimator is one with the smallest MSE. However, a zero bias does not always equate to a smaller MSE. At times, additional sampling to reduce or eliminate bias can increase the variance of an estimator, particularly if additional parameters are required to obtain an unbiased estimate of the target quantity. Alternatively, the cost of additional sampling may not decrease an MSE sufficiently to justify the use of additional resources.

If the total, unbiased catch in a year is the sum of the current OSP estimate plus the catch from minor ports, then

$$Bias\left(\hat{C}\right) = \hat{C}_{OSP} - \left(\hat{C}_M + \hat{C}_{OSP}\right),$$
$$Bias\left(\hat{C}\right) = -\hat{C}_M$$

where $\hat{C}_{OSP}$ = catch as estimated by the current OSP program,

$\hat{C}_M$ = catch from the minor ports,

$\hat{C}$ = the total catch for the year.

Total catch is underestimated by the amount of harvest in minor ports.

"Final Report", page 7

Under the assumption that minor port harvest is small or non-existent and $\hat{C}_{OSP}$ is used for total harvest, the MSE is

$$MSE\left(\hat{C}\right) = \left(\hat{C}_M\right)^2 + Variance\left(\hat{C}_{OSP}\right).$$

The MSE of total harvest calculated by sampling all ports, major and minor, is

$$MSE\left(\hat{C}\right) = Variance\left(\hat{C}_{OSP} + \hat{C}_M\right),$$
$$MSE\left(\hat{C}\right) = Variance\left(\hat{C}_{OSP}\right) + Variance\left(\hat{C}_M\right)$$

because the bias is zero and all ports are sampled independently.

Current OSP catch estimates can be corrected for negative bias using a the following bias correction,

$$\hat{C}_{corr} = \frac{\hat{C}_{OSP}}{BiasCorr}$$

where $BiasCorr = \frac{\hat{C}_{OSP}}{\hat{C}_{OSP} + \hat{C}_M}$. The corrected catch estimate $\hat{C}_{corr}$ is unbiased to the first term of a Taylor series expansion,

$$E\left(\hat{C}_{corr}\right) \doteq \frac{E\left(\hat{C}_{OSP}\right)}{\frac{E\left(\hat{C}_{OSP}\right)}{E\left(\hat{C}_{OSP} + \hat{C}_M\right)}},$$
$$E\left(\hat{C}_{corr}\right) \doteq E\left(C_{OSP} + C_M\right)$$
$$E\left(\hat{C}_{corr}\right) \doteq C$$

The variance of the bias corrected estimate, $\hat{C}_{corr}$, is as follows,

$$Var\left(\hat{C}_{corr}\right) \doteq \hat{C}_{corr}^2 \left( \frac{Var\left(\hat{C}_{OSP}\right)}{\hat{C}_{OSP}^2} + \frac{Var\left(BiasCorr\right)}{BiasCorr^2} \right)$$

where $Var\left(BiasCorr\right)$ is a function of the $\hat{C}_{OSP}$, $\hat{C}_W$, and their associated variances,

$$Var\left(BiasCorr\right) \doteq \left( \frac{\hat{C}_M}{\hat{C}_{OSP} + \hat{C}_M} \right)^2 \left( \frac{Var\left(\hat{C}_{OSP}\right)}{\hat{C}_{OSP}^2} + \frac{Var\left(\hat{C}_M\right)}{\left(\hat{C}_{OSP} + \hat{C}_M\right)^2} \right).$$

Note that the above variance equation is derived under the assumption that a bias correction would be independently estimated. Because $\hat{C}_{corr}$ is unbiased, the MSE is equal to the variance.

"Final Report", page 8

## RESULTS

Preliminary results on total boat effort per day indicate that the average number of recreational vessels leaving all minor ports is small compared with the adjacent major ports (Westport and the Ilwaco/Chinook complex) (Table 1). July, prior to the opening of recreational fisheries inside Willapa Bay and Grays Harbor, showed the largest difference in total effort (Table 2).

The majority of sampled boat trips in minor ports were either engaged in non-fishing activities (crabbing, oyster gathering, siteseeing) or participating in inside fisheries (mainly Willapa Bay or Grays Harbor salmon fisheries). The one minor port with a significant portion of its effort occurring in the ocean was Ocean Shores. All minor ports had a higher proportion of non-fishing boat trips than the adjacent major ports. Table 3 shows the contribution of each target trip type to total effort by port and the proportion of total effort that participated in ocean fishing.

Average ocean salmon catch per angler trip by port is shown in Table 4; Table 5 shows ocean bottomfish catch per angler trip for the most common bottomfish species. Ocean salmon fishing trips were sampled in four of the eight minor ports, and catch per angler trip does not appear to differ significantly from the nearest major port, Westport. Of the minor ports, only Ocean Shores had ocean bottomfishing effort, and again, catch per angler does not appear to differ significantly from nearby Westport.

Since Ocean Shores appears to be the only minor port with significant ocean fishing effort, we compared catch estimates for Westport using two methods – our "conventional" method and a "stratified" method.

Conventional Westport area catch estimates generated by the OSP include an effort estimator from Ocean Shores. The Westport exit count site is located directly across a narrow portion of Grays Harbor from Ocean Shores. During visual morning exit counts, boats seen departing from Ocean Shores are tallied independently on the Westport exit count form, and are added to the total Westport exit count to which sample data are expanded. Heavy rain or fog can impede visibility; in those cases, an estimated number of boats from Ocean Shores is added proportionally based on observed days. Catch sample data from Westport is applied to the combined exit count data to generate estimates of fishing effort and catch. We refer to this catch estimation method as the "conventional" method.

With the data collected from Ocean Shores in 2012, we were able to apply Ocean Shores specific sample data to effort counts taken from Ocean Shores. We independently estimated ocean fishing effort and catch from Westport and Ocean Shores and added the two estimates together for a total Westport area catch (the "stratified" method).

The two methods of estimating ocean fishing effort and catch produced very similar results with similar variance levels. We compare effort and catch estimates for common species during the July – September time period using the two estimation methods in Table 6.

"Final Report", page 9

## DISCUSSION

Among the minor launching sites in Willapa Bay, only Tokeland had any ocean fishing effort during our study period. Tokeland's ocean effort was limited to salmon and was minimal. In Grays Harbor, the 28th Street launch and John's River each had minor ocean salmon fishing effort while Ocean Shores ocean fishing effort was more significant and included salmon, bottomfish, and albacore tuna directed trips. Note that Washington inside (estuary) salmon effort and catch is estimated using angler catch record cards rather than from sampling data, so this report is concerned only with ocean fishing effort and catch.

Given the very small and inconsistent nature of ocean fishing effort seen in all minor ports other than Ocean Shores, WDFW believes that the cost of sampling those ports at this time far outweighs the benefit in terms of more accurate catch and effort estimates. The Agency does not feel that an "adjustment factor" to current ocean catch estimates for these small launch sites is warranted or appropriate. Periodic checks of those launching sites during times when inside fisheries are not open are recommended to monitor any change in use patterns.

When we compared estimates of ocean catch and fishery effort in the Westport ocean area using our "conventional" estimation method (described above) and the "stratified" method - combining independently generated estimates for Westport and Ocean Shores -, the differences were minimal and demonstrated no bias toward over- or under-estimation. The differences in estimates of both commonly retained species (Chinook and coho salmon, black rockfish, and lingcod) and species of concern (canary and yelloweye rockfish) fell well within normal confidence intervals associated with OSP ocean catch estimates. Weighing the increased costs of collecting sampling data at Ocean Shores against the potential associated catch estimate accuracy benefits, we believe that the conventional method of accounting for Ocean Shores effort using visual counts from Westport and applying Westport sampling data to that effort is desirable. We further recommend that as funding allows, periodic sampling of Ocean Shores be conducted and comparisons of catch and effort estimates using the conventional and stratified methods be performed.

"Final Report", page 10

**Figure 1: Locations of major and minor ocean access sites.**

"Final Report", page 11

**Table 1: Comparison of average number of boat trips per day, minor ports and adjacent major ports, July – September.**

| Port | Total Days Sampled | Total Boat Effort on Sampled Days | Average Boats per Day |
|---|---|---|---|
| Ocean Shores | 35 | 403 | 12 |
| 28th St, Hoquiam | 17 | 638 | 38 |
| Johns River | 15 | 332 | 22 |
| Tokeland | 38 | 1,093 | 29 |
| Smith Creek | 7 | 36 | 5 |
| South Bend | 26 | 441 | 17 |
| Bay Center | 10 | 2 | 0 |
| Nahcotta | 29 | 53 | 2 |
| **WESTPORT** | **69** | **6,756** | **98** |
| **ILWACO and CHINOOK** | **132** | **11,815** | **90** |

**Table 2: Average number of boat trips per day by month, minor ports and adjacent major ports.**

| | Ocean Shores | 28th St, Hoquiam | Johns River | Tokeland | Smith Creek | South Bend | Bay Center | Nahcotta | **WESTPORT** | **ILWACO and CHINOOK** |
|---|---|---|---|---|---|---|---|---|---|---|
| July | 9 | 0 | 3 | 6 | 3 | 3 | 1 | 2 | 76 | 54 |
| August | 12 | 3 | 1 | 62 | 6 | 28 | 0 | 1 | 124 | 163 |
| September | 14 | 57 | 40 | 18 | 6 | 14 | 0 | 2 | 97 | 51 |

"Final Report", page 12

**Table 3: Percent contribution of each target trip type to total effort and proportion of effort in ocean in minor ports and adjacent major ports, 2012.**

| Port | Month | NON-FISHING | Tuna | | Bottomfish | | Salmon | | Sturgeon | | Halibut | | % OCEAN EFFORT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ocean | Inside | Ocean | Inside | Ocean | Inside | Ocean | Inside | Ocean | Inside | |
| **Ocean Shores** | July | 49% | 2% | 0% | 14% | 3% | 32% | 0% | 0% | 0% | 0% | 0% | **49%** |
| | August | 54% | 1% | 0% | 6% | 1% | 37% | 0% | 0% | 0% | 0% | 0% | **45%** |
| | Sept | 29% | 0% | 0% | 4% | 1% | 33% | 34% | 0% | 0% | 0% | 0% | **36%** |
| **John's River** | July | 75% | 0% | 0% | 0% | 0% | 25% | 0% | 0% | 0% | 0% | 0% | **25%** |
| | August | 90% | 0% | 0% | 0% | 10% | 0% | 0% | 0% | 0% | 0% | 0% | **0%** |
| | Sept | 2% | 0% | 0% | 0% | 0% | 0% | 98% | 0% | 0% | 0% | 0% | **0%** |
| **28th St** | July | - | - | - | - | - | - | - | - | - | - | - | - |
| | August | 70% | 0% | 0% | 0% | 0% | 30% | 0% | 0% | 0% | 0% | 0% | **30%** |
| | Sept | 1% | 0% | 0% | 0% | 0% | 0% | 99% | 0% | 0% | 0% | 0% | **0%** |
| **Tokeland** | July | 31% | 0% | 0% | 0% | 0% | 3% | 65% | 0% | 0% | 0% | 0% | **3%** |
| | August | 3% | 0% | 0% | 0% | 0% | 1% | 96% | 0% | 0% | 0% | 0% | **1%** |
| | Sept | 3% | 0% | 0% | 0% | 0% | 2% | 95% | 0% | 0% | 0% | 0% | **2%** |
| **Smith Creek** | July | 25% | 0% | 0% | 0% | 0% | 0% | 75% | 0% | 0% | 0% | 0% | **0%** |
| | August | 6% | 0% | 0% | 0% | 0% | 0% | 94% | 0% | 0% | 0% | 0% | **0%** |
| | Sept | 27% | 0% | 0% | 0% | 0% | 0% | 73% | 0% | 0% | 0% | 0% | **0%** |
| **South Bend** | July | 65% | 0% | 0% | 0% | 12% | 0% | 12% | 0% | 12% | 0% | 0% | **0%** |
| | August | 4% | 0% | 0% | 0% | 0% | 0% | 96% | 0% | 0% | 0% | 0% | **0%** |
| | Sept | 4% | 0% | 0% | 0% | 0% | 0% | 96% | 0% | 0% | 0% | 0% | **0%** |
| **Bay Center** | July | 100% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | **0%** |

"Final Report", page 13

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | August | - | - | - | - | - | - | - | - | - | - | - | - |
| | Sept | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nahcotta** | July | 95% | 0% | 0% | 0% | 0% | 0% | 5% | 0% | 0% | 0% | 0% | **0%** |
| | August | 77% | 0% | 0% | 0% | 0% | 0% | 23% | 0% | 0% | 0% | 0% | **0%** |
| | Sept | 94% | 0% | 0% | 0% | 6% | 0% | 0% | 0% | 0% | 0% | 0% | **0%** |
| **Ilwaco/ Chinook** | July | 19% | 8% | 0% | 6% | 0% | 58% | 0% | 0% | 9% | 0% | 0% | **72%** |
| | August | 7% | 4% | 0% | 1% | 0% | 24% | 65% | 0% | 0% | 0% | 0% | **29%** |
| | Sept | 20% | 7% | 0% | 3% | 1% | 23% | 46% | 0% | 0% | 0% | 0% | **33%** |
| **Westport** | July | 10% | 6% | 0% | 7% | 1% | 76% | 0% | 0% | 0% | 0% | 0% | **89%** |
| | August | 5% | 12% | 0% | 3% | 1% | 79% | 0% | 0% | 0% | 0% | 0% | **94%** |
| | Sept | 3% | 10% | 0% | 2% | 1% | 58% | 27% | 0% | 0% | 0% | 0% | **70%** |

**Table 4: Ocean salmon angler trips sampled and catch per angler by port.**

| Port | Total Days Sampled | Number Anglers Sampled | Chinook per Angler Trip | Coho per Angler Trip |
|---|---|---|---|---|
| Ocean Shores | 35 | 325 | 0.32 | 0.27 |
| 28th St | 17 | 10 | 0.60 | 0.20 |
| Johns River | 15 | 1 | 1.00 | 1.00 |
| Tokeland | 38 | 21 | 0.33 | 0.29 |
| Smith Creek | 7 | 0 | - | - |
| South Bend | 26 | 0 | - | - |
| Bay Center | 10 | 0 | - | - |
| Nahcotta | 29 | 0 | - | - |
| **Westport** | **69** | **7,377** | **0.53** | **0.30** |
| **Ilwaco/Chinook** | **132** | **5,594** | **0.36** | **0.34** |

"Final Report", page 14

"Final Report", page 15

**Table 5: Ocean bottomfish angler trips sampled and catch per angler by port.**

| Port | Total Days Sampled | Number Anglers Sampled | Black Rockfish per Angler Trip | Ling cod per Angler Trip |
|---|---|---|---|---|
| Ocean Shores | 35 | 80 | 2.00 | 0.56 |
| 28th St | 17 | 0 | - | - |
| Johns River | 15 | 0 | - | - |
| Tokeland | 38 | 0 | - | - |
| Smith Creek | 7 | 0 | - | - |
| South Bend | 26 | 0 | - | - |
| Bay Center | 10 | 0 | - | - |
| Nahcotta | 29 | 0 | - | - |
| **Westport** | **69** | **748** | **2.80** | **0.67** |
| **Ilwaco/Chinook** | **132** | **576** | **2.28** | **0.51** |

"Final Report", page 16

**Table 6: Comparison of estimated Westport area ocean salmon and bottomfish angler trips and catch of common species in July-September using conventional and stratified estimation methods.**

| | CONVENTIONAL ESTIMATION METHOD | | STRATIFIED ESTIMATION METHOD | | | |
|---|---|---|---|---|---|---|
| Variable Estimated | Estimated total | Variance | Estimated total | Variance | Difference in Estimates | % Difference |
| Black rockfish | 78,076 | 10,232,973 | 79,336 | 10,355,817 | (1,260) | -2% |
| Canary rockfish (retained) | 2 | 2 | 2 | 2 | - | 0% |
| Canary rockfish (released) | 91 | 304 | 90 | 296 | 1 | 1% |
| Chinook | 11,912 | 140,627 | 12,142 | 132,068 | (230) | -2% |
| Coho | 11,740 | 174,842 | 11,453 | 160,469 | 287 | 2% |
| Lingcod | 6,841 | 123,601 | 7,009 | 124,390 | (169) | -2% |
| Yelloweye rockfish (released) | 44 | 104 | 43 | 98 | 1 | 3% |
| Ocean bottomfish angler trips | 6,062 | 83,019 | 6,218 | 83,066 | (155) | -3% |
| Ocean salmon angler trips | 31,011 | 287,007 | 31,042 | 267,117 | (30) | 0% |