

# **2018 OCEAN SELECTIVE FISHERY SAMPLING REPORT**

SUBMITTED BY:

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## 1. INTRODUCTION

The Pacific Fishery Management Council (PFMC) adopted 2018 recreational and commercial troll fisheries for all salmon species in the area between Cape Falcon, Oregon and the U.S./Canada border. Recreational and commercial mark-selective fisheries (MSFs) for coho were included in all four Catch Record Card (CRC) areas of coastal Washington (Areas 1, 2, 3, and 4; **Fig 1**). Council-area fisheries were adopted based on assumptions regarding coho and Chinook abundance, distribution of stocks, Chinook age class distributions, coho mark rates, compliance with selective fishery regulations, and incidental mortality.

The PFMC adopted ocean coho MSFs in Marine Areas 1 through 4 for the twentieth consecutive year, following state-tribal agreement during the North of Falcon process. No Chinook MSFs were recommended by the Salmon Advisory Subpanel nor adopted by the PFMC in 2018.

The Washington Department of Fish and Wildlife's (WDFW) Ocean Sampling Program (OSP) continued its intensive monitoring program in all ocean ports during the season to collect data to estimate key parameters characterizing the fishery and its impacts on unmarked salmon. Sampling activities included on-water observation, a Voluntary Trip Report (VTR) system, and dockside creel sampling. Among other parameters, sampling activities emphasized data collection needs for the estimation of: *i*) the mark rate of the targeted coho population, *ii*) the total number of coho harvested by mark-status, including an estimate of angler compliance rate with coho MSF regulations, *iii*) the total number of coho released (by mark-status), *iv*) the coded-wire tag (CWT) stock composition of landed coho, and *v*) the total mortality of marked and unmarked coho.

## 2. SEASON DESCRIPTION

### 2.1 Ocean Recreational All-Species Fisheries (Coho Mark-Selective)

CRC Area 1: The ocean recreational fishery in CRC Area 1 was open for all salmon species seven days per week from June 23 through August 12 and September 2 and 3. A daily bag limit of two salmon, one of which could be a Chinook, was in effect June 23 through August 12; the bag limit was modified in-season to two salmon for September 2 and 3. All retained coho were required to have a healed adipose fin clip. The Columbia Control Zone was closed. A total of 53 fishing days were available in the area.

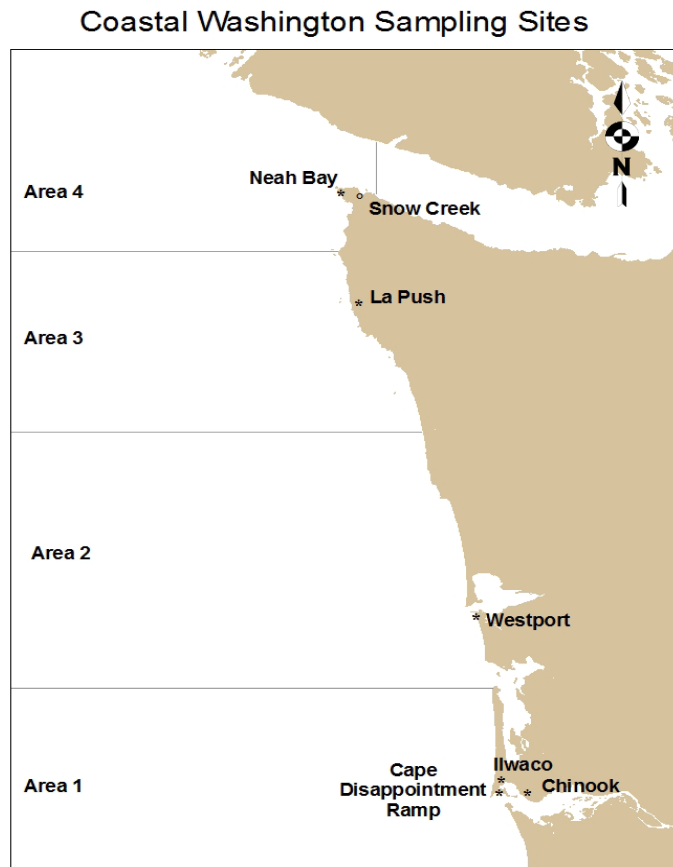
CRC Area 2: The ocean recreational fishery in CRC Area 2 was open for all salmon species five days per week (Sunday through Thursday) from July 1 through August 23; the fishing week was modified in-season to seven days per week from August 24 through September 3. A daily bag limit of two salmon, one of which could be a Chinook, was in effect July 1 through August 23; the bag limit was modified in-season to two salmon from August 24 through September 3. All retained coho were required to have a healed adipose fin clip. A total of 51 fishing days were available in the area.

CRC Area 3: The ocean recreational fishery in CRC Area 3 was open for all salmon species seven days per week from June 23 through September 3. A daily bag limit of two salmon was in

effect. All retained coho were required to have a healed adipose fin clip. A total of 73 fishing days were available in the area.

CRC Area 4: The ocean recreational fishery in CRC Area 4 was open for all salmon species seven days per week from June 23 through August 12. A daily bag limit of two salmon, one of which could be a Chinook, was in effect June 23 through July 13; the bag limit was modified in-season to two salmon from July 14 through August 12. All retained coho were required to have a healed adipose fin clip. A total of 51 fishing days were available in the area.

The all-species ocean recreational fishery operated under preseason quotas of 27,500 landed Chinook and 42,000 landed marked coho.



**Figure 1.** Map of coastal Washington showing the ocean catch record card areas (Areas 1 through 4) and major sampling sites.

## 2.2 Non-Treaty Commercial Troll Fisheries (Coho Mark-Selective)

The non-Treaty troll fishery was open in May and June for all salmon except coho from Cape Falcon, Oregon to the U.S.-Canada border. All sub-areas were open during this time for 61 days. The fishery reopened for all salmon species (except no chum retention north of Cape Alava, WA in August) on July 1 for 81 available fishing days in all areas between Cape Falcon, Oregon and the U.S.-Canada border. All retained coho were required to have a healed adipose fin clip.

Specific open dates and regulations are available in the PFMC Review of 2018 Ocean Salmon Fisheries (<http://www.pcouncil.org/salmon/stock-assessment-and-fishery-evaluation-safe-documents/>).

### **3. METHODS**

WDFW's OSP implemented a comprehensive monitoring program in all ocean ports during the coho MSF seasons in Washington ocean CRC Areas 1-4. The OSP collected data to estimate key fishery parameters characterizing the ocean MSFs and associated impacts on unmarked salmon. Sampling activities included direct on-the-water observations of salmon encounters during charter ride-along trips, VTRs of completed trips provided by charter boat skippers and the angling public, dockside angler interviews (with catch sampling), and total boat counts via exit or entrance counts at each major coastal port.

#### **3.1 On-Board Observation**

WDFW samplers conducted direct on-water observation of salmon encounters aboard charter vessels during the recreational all-species coho MSF. For each hook-up, data collected included result of the hook-up (fish kept, released, or dropped off), species, mark status (marked or unmarked), and size class (legal or sublegal). These data were used to estimate the encounter rates of Chinook and coho by size class and mark group (legal-size and marked [LM], legal-size and unmarked [LU], sublegal-size and marked [SM], and sublegal-size and unmarked [SU]), as well as drop-offs.

Direct on-water observation of salmon encounters was primarily used in CRC Areas 1 and 2 where charter vessel salmon fishing trips are numerous. The VTR system (see Section 3.2 below) was also used to collect encounter data in these two areas.

In CRC Areas 3 and 4, where few charter vessels take salmon fishing trips, and those who do are very small, the VTR system was the primary method used to collect on-water encounter data; charter on-board observation was minimal in these areas.

#### **3.2 Voluntary Trip Reports**

Selective fishery encounter statistics were also acquired through VTRs that WDFW samplers distributed and collected from both charter boat skippers and the angling public in all ocean CRC Areas. The VTR form is designed to capture information identical to that collected by on-board observers. Anglers complete the information on the form as they fish, minimizing recall error.

Samplers distributed VTRs to private vessels on every sampled day in all sampled ports. Charter vessels agreeing to participate were given a binder with several forms to complete throughout the season. For private vessels, samplers approached anglers preparing to depart for fishing or after returning from fishing, explained the purpose of the VTR and how to complete it, and encouraged anglers to record all encounters while fishing and to return the form to a dockside sampler at the end of the fishing day. Anglers also had the option of mailing completed forms to the WDFW Region 6 office postage paid. Additionally, office staff contacted anglers who regularly complete VTRs prior to the season and provided blank VTRs.

### 3.3 Dockside Sampling

Dockside samplers were stationed in the four major landing ports for the ocean fisheries: Neah Bay, La Push, Westport, and Ilwaco (including the port of Chinook and the Columbia River North Jetty). The recreational fisheries in each port were sampled a minimum of 4 to 5 days per week, with weekend (Saturday, Sunday, and holidays) and weekday days (non-holiday Monday through Friday) stratified. Typically, all weekend days and 3 randomly-selected weekdays per week were sampled. Total fishery catch and effort estimates were generated by the OSP using three types of data obtained during dockside sampling: effort counts, interview data, and examination of catch. Each is described below.

#### *Effort Counts*

On each sample day, a total recreational boat count was obtained either by counting boats exiting the port or entering the port. A minimum of 20% of the boats returning to the port within each boat type (charter and private) was sampled. An exit count (a count of boats leaving the port) typically began at 4:00AM and continued through the end of the sampling day (exact time was port-specific). An entrance count (a count of boats entering the port) usually began near 8:00AM and continued through dusk. Whether OSP samplers conducted exit or entrance counts varied based on specific considerations for each port. Regardless of the method used, this effort count, taken on every sampled day, provided the total counts of charter and private boats to which sample data were expanded.

#### *Angler Interviews and Catch Sampling*

WDFW samplers stationed in coastal ports collected catch and effort information during dockside angler interviews from boats returning from fishing. Information collected during each sample included number of anglers, target species, area fished, landed catch by species, mark status of landed salmon, identification and recovery of (CWTs), and angler estimates of released salmon by species and mark status and of released groundfish by species. Additionally, dockside samplers collected DNA samples, lengths, and scale samples from landed Chinook as time allowed.

### 3.4 Estimating Catch and Effort

#### *3.4.i 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  $t$ ,  
 $S_t$  = 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 (see Thompson 1992, p. 129):

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

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

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

### 3.4.ii 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 sampled 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 (see Cochran 1977, p. 52):

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

The estimated total boat-trips is then obtained by:

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

with estimated variance:

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

Effort expressed in terms of angler-trips is the product of the average anglers per boat-trip and 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:

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

with variance:

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

Thus the estimated total number of angler-trips is:

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

with variance:

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

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:

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

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.

## **4. RESULTS IN THE ALL-SPECIES COHO MARK SELECTIVE RECREATIONAL FISHERY**

### **4.1 Dockside Sampling Results**

An estimated 55,520 angler trips (47,969 from Washington, 7,699 from Oregon) were completed by private and charter anglers during the 2018 coastwide all-species coho MSF. These anglers harvested a total of 10,598 Chinook coastwide (9,913 WA, 689 OR) and 41,819 coho (34,710 WA, 7,128 OR). **Table 1** shows effort and catch by month and area during the 2018 coho MSF.

WDFW dockside samplers interviewed an estimated 43% of all anglers fishing from WA coastwide during the coho MSF. A total of 43% of all Chinook and 43% of all coho harvested in WA were sampled; 658 CWTs were collected from sampled Chinook and 2,428 were collected from sampled coho in WA ports (**Table 2**).

### **4.2 On-water Observation and VTR Results**

**Tables 3 and 4** detail on-water data collected during on-board observation and from VTRs submitted by charter and private fishing vessels. OSP observer staff, combined with charter boat VTRs, provided on-water catch and encounter data from a total of 229 charter boat trips documenting a total of 554 legal sized Chinook, 572 sublegal sized Chinook, 4,221 legal sized coho, and 99 sublegal sized coho during the all-species coho MSF. Dockside samplers also collected 243 completed and useable VTRs from private vessels containing 239 legal sized Chinook encounters, 217 sublegal sized Chinook encounters, 1,372 legal sized coho encounters, and 93 sublegal sized coho encounters. Mark rates calculated from onboard observer and VTR data are shown in **Table 5** and compared to pre-season FRAM coho mark rate projections.

### **4.3 Overall Fishery Impacts**

#### *Estimated Total Coho Encounters and Mortalities*

FRAM pre-season projections of coho encounters (Washington and Oregon) in the 2018 ocean recreational all-species coho MSFs are compared with estimated encounters based on OSP data in **Table 6**. **Table 7** compares total coho mortality projected pre-season by FRAM (Washington and Oregon) with estimated coho mortality based on OSP data.

The overall impacts of the 2018 recreational coho MSF in ocean CRC Areas 1-4 are characterized in terms of grand-total estimates of coho encounters and mortalities and by using estimates specific to mark group (i.e., marked and unmarked). The method described in section 3.4 was used to generate total estimates of retained catch by mark group. To estimate coho salmon encounters and releases by mark group, we applied Conrad's (2012) alternative method for estimating coho encounters and release mortalities in ocean MSFs, which independently calculates charter and private vessel totals based on observer and VTR data. This method differs from that used prior to 2012.

Estimated marked and unmarked coho retention is calculated from dockside sampling data as described in Section 3.4; note that since catch estimates are stratified by week, monthly total

proportions of marked and unmarked estimated retained catch may vary slightly from monthly total proportions of marked and unmarked sampled coho. Encounters are calculated by boat type and CRC Area based on landed catch of legal sized marked coho, the proportion of observed encounters that were legal sized marked coho, and the proportion of observed encounters that were legal sized marked coho retained. Mortality was estimated for each mark group based on calculated encounters and the proportion of the legal sized coho of that mark status that were released multiplied by the PFMC ocean selective fishery mortality (*s<sub>fm</sub>*) rate of 14% (Conrad, 2012).

**Figure 2** compares the FRAM projected coho encounters and mortality by area with those estimated using OSP data in the all-species fishery. Observed estimates of both coho encounters and total mortality were higher than projected preseason in all CRC areas (1-4). This was caused primarily by lower observed coho mark rates than anticipated preseason and by an in-season transfer of coho (modeled to be impact-neutral on 2018 limiting stocks including Queets, Grays Harbor, LCN, Skagit, Snohomish and Stillaguamish coho) from the non-Treaty troll fishery quota to the recreational fishery quota. The transferred fish were harvested primarily in CRC Areas 1 and 2 in the recreational fishery, and resulted in greater than modeled coho catch and encounters in the recreational fishery and lower than modeled coho catch and encounters in the non-Treaty troll fishery.

#### *Compliance*

**Table 8** reports rates of compliance with mark-selective fishery regulations observed by dockside samplers for the recreational fisheries by area and month. Coastwide, compliance with selective fishery regulations averaged 99%, similar to previous seasons.

#### **4.4 DNA Data Collection**

A total of 852 DNA samples were collected from Chinook by Washington dockside samplers during the summer all-species recreational fishery. **Table 9** shows the numbers of samples collected by mark status and area.

**Table 1.** Estimates of total fishing effort and number of Chinook and coho retained during the 2018 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border.

|                                   | TOTAL ANGLER TRIPS |               |               |              |               | CHINOOK RETAINED |              |              |           |               | COHO RETAINED |               |               |            |               |
|-----------------------------------|--------------------|---------------|---------------|--------------|---------------|------------------|--------------|--------------|-----------|---------------|---------------|---------------|---------------|------------|---------------|
|                                   | June               | July          | Aug           | Sept         | TO TAL        | June             | July         | Aug          | Sept      | TO TAL        | June          | July          | Aug           | Sept       | TO TAL        |
| Area 4                            | 1,169              | 5,989         | 1,499         | 0            | <b>8,657</b>  | 352              | 2,269        | 420          | -         | <b>3,041</b>  | 548           | 3,170         | 1,221         | -          | <b>4,939</b>  |
| Area 3                            | 80                 | 400           | 1,408         | 20           | <b>1,908</b>  | 26               | 102          | 297          | 2         | <b>427</b>    | 25            | 94            | 814           | 21         | <b>954</b>    |
| Area 2                            | -                  | 8,019         | 14,110        | 390          | <b>22,519</b> | -                | 2,537        | 2,307        | 32        | <b>4,876</b>  | -             | 1,638         | 13,496        | 236        | <b>15,370</b> |
| Area 1                            | 1,195              | 5,098         | 7,979         | 613          | <b>14,885</b> | 455              | 507          | 586          | 21        | <b>1,569</b>  | 258           | 4,679         | 8,422         | 88         | <b>13,447</b> |
| <b>TOTAL WA</b>                   | <b>2,444</b>       | <b>19,506</b> | <b>24,996</b> | <b>1,023</b> | <b>47,969</b> | <b>833</b>       | <b>5,415</b> | <b>3,610</b> | <b>55</b> | <b>9,913</b>  | <b>831</b>    | <b>9,581</b>  | <b>23,953</b> | <b>345</b> | <b>34,710</b> |
| OREGON (Area 1)                   | 380                | 1,839         | 5,332         | 148          | <b>7,699</b>  | 120              | 150          | 415          | 4         | <b>689</b>    | 36            | 1,393         | 5,680         | 19         | <b>7,128</b>  |
| <b>TOTAL NOF</b>                  | <b>2,824</b>       | <b>21,345</b> | <b>30,328</b> | <b>1,023</b> | <b>55,520</b> | <b>953</b>       | <b>5,565</b> | <b>4,025</b> | <b>55</b> | <b>10,598</b> | <b>867</b>    | <b>10,974</b> | <b>29,633</b> | <b>345</b> | <b>41,819</b> |
| <b>WA Variance:</b> <sup>1/</sup> |                    |               |               |              | 519,739       |                  |              |              |           | 50,611        |               |               |               |            | 701,479       |
| <b>WA Standard Error:</b>         |                    |               |               |              | 721           |                  |              |              |           | 225           |               |               |               |            | 838           |
| <b>WA CV (%):</b>                 |                    |               |               |              | 2%            |                  |              |              |           | 2%            |               |               |               |            | 2%            |
| <b>WA 95% CI:</b>                 |                    |               |               |              | 46,556-49,382 |                  |              |              |           | 9,472-10,354  |               |               |               |            | 33,068-36,352 |

<sup>1/</sup> Variance estimates are unavailable for Oregon statistics.

**Table 2.** WA dockside sampling statistics during the 2018 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border.

|                 | Anglers       | Sample     | Landed          | Sample     | Landed        | Sample     | Chinook    | Coho CWTs    |
|-----------------|---------------|------------|-----------------|------------|---------------|------------|------------|--------------|
|                 | Sampled       | Rate       | Chinook Sampled | Rate       | Coho Sampled  | Rate       | collected  | collected    |
| Area 4          | 2,894         | 33%        | 1,091           | 36%        | 1,729         | 35%        | 175        | 281          |
| Area 3          | 1,258         | 66%        | 280             | 66%        | 652           | 68%        | 37         | 83           |
| Area 2          | 9,084         | 40%        | 1,951           | 40%        | 5,828         | 38%        | 275        | 874          |
| Area 1          | 7,459         | 50%        | 911             | 58%        | 6,783         | 50%        | 171        | 1,190        |
| <b>TOTAL WA</b> | <b>20,695</b> | <b>43%</b> | <b>4,233</b>    | <b>43%</b> | <b>14,992</b> | <b>43%</b> | <b>658</b> | <b>2,428</b> |

**Table 3.** On-board and VTR Chinook encounters by size class and mark status in the 2018 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border.

|               |              | Charter Boats (On-board observation/VTRs) |             |            |          |                |            |           | Private boats (VTRs)    |             |           |          |                |           |          |
|---------------|--------------|---|-------------|------------|----------|----------------|------------|-----------|-------------------------|-------------|-----------|----------|----------------|-----------|----------|
|               |              | Total Observer<br>Trips/VTRs              | LEGAL-SIZED |            |          | SUBLEGAL-SIZED |            |           | Total VTRs<br>Collected | LEGAL-SIZED |           |          | SUBLEGAL-SIZED |           |          |
|               |              |   | Marked      | Unmarked   | Unknown  | Marked         | Unmarked   | Unknown   |                         | Marked      | Unmarked  | Unknown  | Marked         | Unmarked  | Unknown  |
| <b>Area 4</b> | June         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 6                       | 4           | 4         | 0        | 7              | 5         | 0        |
|               | July         | 7   | 33          | 13         | 0        | 3              | 2          | 0         | 25                      | 11          | 8         | 0        | 7              | 5         | 0        |
|               | Aug          | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 1                       | 0           | 0         | 0        | 2              | 1         | 0        |
|               | Sept         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>7</b>                                  | <b>33</b>   | <b>13</b>  | <b>0</b> | <b>3</b>       | <b>2</b>   | <b>0</b>  | <b>32</b>               | <b>15</b>   | <b>12</b> | <b>0</b> | <b>16</b>      | <b>11</b> | <b>0</b> |
| <b>Area 3</b> | June         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | July         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | Aug          | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | Sept         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>0</b>                                  | <b>0</b>    | <b>0</b>   | <b>0</b> | <b>0</b>       | <b>0</b>   | <b>0</b>  | <b>0</b>                | <b>0</b>    | <b>0</b>  | <b>0</b> | <b>0</b>       | <b>0</b>  | <b>0</b> |
| <b>Area 2</b> | June         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | July         | 68  | 190         | 90         | 0        | 134            | 115        | 13        | 50                      | 70          | 42        | 0        | 49             | 34        | 3        |
|               | Aug          | 69  | 78          | 50         | 0        | 51             | 32         | 0         | 61                      | 29          | 12        | 0        | 11             | 8         | 3        |
|               | Sept         | 6   | 0           | 3          | 0        | 3              | 1          | 0         | 3                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>143</b>                                | <b>268</b>  | <b>143</b> | <b>0</b> | <b>188</b>     | <b>148</b> | <b>13</b> | <b>114</b>              | <b>99</b>   | <b>54</b> | <b>0</b> | <b>60</b>      | <b>42</b> | <b>6</b> |
| <b>Area 1</b> | June         | 7   | 16          | 3          | 0        | 11             | 3          | 0         | 7                       | 10          | 3         | 0        | 2              | 1         | 0        |
|               | July         | 54  | 46          | 20         | 0        | 58             | 100        | 0         | 46                      | 18          | 14        | 0        | 10             | 15        | 1        |
|               | Aug          | 18  | 3           | 9          | 0        | 12             | 34         | 0         | 44                      | 7           | 7         | 0        | 32             | 21        | 0        |
|               | Sept         | 0   | 0           | 0          | 0        | 0              | 0          | 0         | 0                       | 0           | 0         | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>79</b>                                 | <b>65</b>   | <b>32</b>  | <b>0</b> | <b>81</b>      | <b>137</b> | <b>0</b>  | <b>97</b>               | <b>35</b>   | <b>24</b> | <b>0</b> | <b>44</b>      | <b>37</b> | <b>1</b> |

**Table 4.** On-board and VTR coho encounters by size class and mark status in the 2018 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border.

|               |              | Charter Boats (On-board observation/VTRs) |              |              |          |                |           |          | Private boats (VTRs)    |             |            |          |                |           |          |
|---------------|--------------|---|--------------|--------------|----------|----------------|-----------|----------|-------------------------|-------------|------------|----------|----------------|-----------|----------|
|               |              | Total Observer<br>Trips/VTRs              | LEGAL-SIZED  |              |          | SUBLEGAL-SIZED |           |          | Total VTRs<br>Collected | LEGAL-SIZED |            |          | SUBLEGAL-SIZED |           |          |
|               |              |   | Marked       | Unmarked     | Unknown  | Marked         | Unmarked  | Unknown  |                         | Marked      | Unmarked   | Unknown  | Marked         | Unmarked  | Unknown  |
| <b>Area 4</b> | June         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 6                       | 8           | 8          | 0        | 0              | 1         | 0        |
|               | July         | 7   | 48           | 29           | 0        | 0              | 0         | 0        | 25                      | 22          | 25         | 0        | 3              | 2         | 0        |
|               | Aug          | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 1                       | 5           | 2          | 0        | 1              | 0         | 0        |
|               | Sept         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>7</b>                                  | <b>48</b>    | <b>29</b>    | <b>0</b> | <b>0</b>       | <b>0</b>  | <b>0</b> | <b>32</b>               | <b>35</b>   | <b>35</b>  | <b>0</b> | <b>4</b>       | <b>3</b>  | <b>0</b> |
| <b>Area 3</b> | June         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | July         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | Aug          | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | Sept         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>0</b>                                  | <b>0</b>     | <b>0</b>     | <b>0</b> | <b>0</b>       | <b>0</b>  | <b>0</b> | <b>0</b>                | <b>0</b>    | <b>0</b>   | <b>0</b> | <b>0</b>       | <b>0</b>  | <b>0</b> |
| <b>Area 2</b> | June         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | July         | 68  | 244          | 300          | 0        | 8              | 9         | 0        | 50                      | 60          | 92         | 0        | 14             | 11        | 0        |
|               | Aug          | 69  | 919          | 1036         | 0        | 3              | 16        | 0        | 61                      | 212         | 264        | 0        | 5              | 6         | 1        |
|               | Sept         | 6   | 44           | 56           | 0        | 0              | 0         | 0        | 3                       | 7           | 7          | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>143</b>                                | <b>1,207</b> | <b>1,392</b> | <b>0</b> | <b>11</b>      | <b>25</b> | <b>0</b> | <b>114</b>              | <b>279</b>  | <b>363</b> | <b>0</b> | <b>19</b>      | <b>17</b> | <b>1</b> |
| <b>Area 1</b> | June         | 7   | 15           | 14           | 0        | 3              | 4         | 0        | 7                       | 0           | 7          | 0        | 0              | 0         | 0        |
|               | July         | 54  | 592          | 404          | 0        | 13             | 5         | 0        | 46                      | 153         | 120        | 0        | 3              | 5         | 0        |
|               | Aug          | 18  | 256          | 264          | 0        | 16             | 22        | 0        | 44                      | 167         | 220        | 0        | 21             | 18        | 2        |
|               | Sept         | 0   | 0            | 0            | 0        | 0              | 0         | 0        | 0                       | 0           | 0          | 0        | 0              | 0         | 0        |
|               | <b>TOTAL</b> | <b>79</b>                                 | <b>863</b>   | <b>682</b>   | <b>0</b> | <b>32</b>      | <b>31</b> | <b>0</b> | <b>97</b>               | <b>320</b>  | <b>340</b> | <b>0</b> | <b>24</b>      | <b>23</b> | <b>2</b> |

**Table 5.** Estimated Chinook and coho mark rates during the 2018 all-species recreational fishery (coho MSF) by boat type and size class using onboard observer and VTR encounters.

|               |              | LEGAL-SIZED CHINOOK |            |            | SUBLEGAL-SIZED CHINOOK |            |            | LEGAL-SIZED COHO |            |            | FRAM Projected Coho |
|---------------|--------------|---------------------|------------|------------|------------------------|------------|------------|------------------|------------|------------|---------------------|
|               |              | Charter             | Private    | Combined   | Charter                | Private    | Combined   | Charter          | Private    | Combined   | Mark Rate           |
| <b>Area 4</b> | June         | -                   | 50%        | 50%        | -                      | 58%        | 58%        | -                | 50%        | 50%        | <b>55%</b>          |
|               | July         | 72%                 | 58%        | 68%        | 60%                    | 58%        | 59%        | 62%              | 47%        | 56%        |                     |
|               | August       | -                   | -          | -          | -                      | 67%        | 67%        | -                | 71%        | 71%        |                     |
|               | September    | -                   | -          | -          | -                      | -          | -          | -                | -          | -          |                     |
|               | <b>TOTAL</b> | <b>72%</b>          | <b>56%</b> | <b>66%</b> | <b>60%</b>             | <b>59%</b> | <b>59%</b> | <b>62%</b>       | <b>50%</b> | <b>56%</b> |                     |
| <b>Area 3</b> | June         | -                   | -          | -          | -                      | -          | -          | -                | -          | -          | <b>61%</b>          |
|               | July         | -                   | -          | -          | -                      | -          | -          | -                | -          | -          |                     |
|               | August       | -                   | -          | -          | -                      | -          | -          | -                | -          | -          |                     |
|               | September    | -                   | -          | -          | -                      | -          | -          | -                | -          | -          |                     |
|               | <b>TOTAL</b> | -                   | -          | -          | -                      | -          | -          | -                | -          | -          |                     |
| <b>Area 2</b> | June         | -                   | -          | -          | -                      | -          | -          | -                | -          | -          | <b>66%</b>          |
|               | July         | 68%                 | 63%        | 66%        | 54%                    | 59%        | 55%        | 45%              | 39%        | 44%        |                     |
|               | August       | 61%                 | 71%        | 63%        | 61%                    | 58%        | 61%        | 47%              | 45%        | 47%        |                     |
|               | September    | 0%                  | -          | 0%         | 75%                    | -          | 75%        | 44%              | 50%        | 45%        |                     |
|               | <b>TOTAL</b> | <b>65%</b>          | <b>65%</b> | <b>65%</b> | <b>56%</b>             | <b>59%</b> | <b>57%</b> | <b>46%</b>       | <b>43%</b> | <b>46%</b> |                     |
| <b>Area 1</b> | June         | 84%                 | 77%        | 81%        | 79%                    | 67%        | 76%        | 52%              | 0%         | 42%        | <b>73%</b>          |
|               | July         | 70%                 | 56%        | 65%        | 37%                    | 40%        | 37%        | 59%              | 56%        | 59%        |                     |
|               | August       | 25%                 | 50%        | 38%        | 26%                    | 60%        | 44%        | 49%              | 43%        | 47%        |                     |
|               | September    | -                   | -          | -          | -                      | -          | -          | -                | -          | -          |                     |
|               | <b>TOTAL</b> | <b>67%</b>          | <b>59%</b> | <b>64%</b> | <b>37%</b>             | <b>54%</b> | <b>42%</b> | <b>56%</b>       | <b>48%</b> | <b>54%</b> |                     |



**Table 6.** Comparison of modeled (FRAM model run #1830) and estimated total coho encounters in the 2018 ocean coho MSF.

| Data Source                   | Area         | Marked        | Unmarked      | Total Encounters | Landed Catch  |
|-------------------------------|--------------|---------------|---------------|------------------|---------------|
| FRAM                          | Area 4       | 4,559         | 3,657         | 8,216            | 4,369         |
|                               | Area 3       | 1,140         | 721           | 1,861            | 1,090         |
|                               | Area 2       | 16,298        | 8,286         | 24,584           | 15,540        |
|                               | Area 1       | 22,071        | 8,146         | 30,217           | 21,000        |
|                               | <b>TOTAL</b> | <b>44,068</b> | <b>20,810</b> | <b>64,878</b>    | <b>41,999</b> |
| Estimated Actual Encounters   | Area 4       | 5,284         | 5,231         | 10,516           | 4,939         |
|                               | Area 3       | 958           | 1,837         | 2,795            | 954           |
|                               | Area 2       | 15,485        | 19,201        | 34,686           | 15,370        |
|                               | Area 1       | 20,921        | 21,136        | 42,057           | 20,575        |
|                               | <b>TOTAL</b> | <b>42,648</b> | <b>47,406</b> | <b>90,054</b>    | <b>41,838</b> |
| <b>Variance<sup>1/</sup>:</b> |              | 1,372,054     | 1,838,743     | 6,365,177        | 701,479       |
| <b>Standard Error:</b>        |              | 1,171         | 1,356         | 2,523            | 838           |
| <b>CV (%):</b>                |              | 3%            | 3%            | 3%               | 2%            |
| <b>95% CI:</b>                |              | 40,353-44,944 | 44,748-50,064 | 85,109-94,999    | 40,196-43,480 |

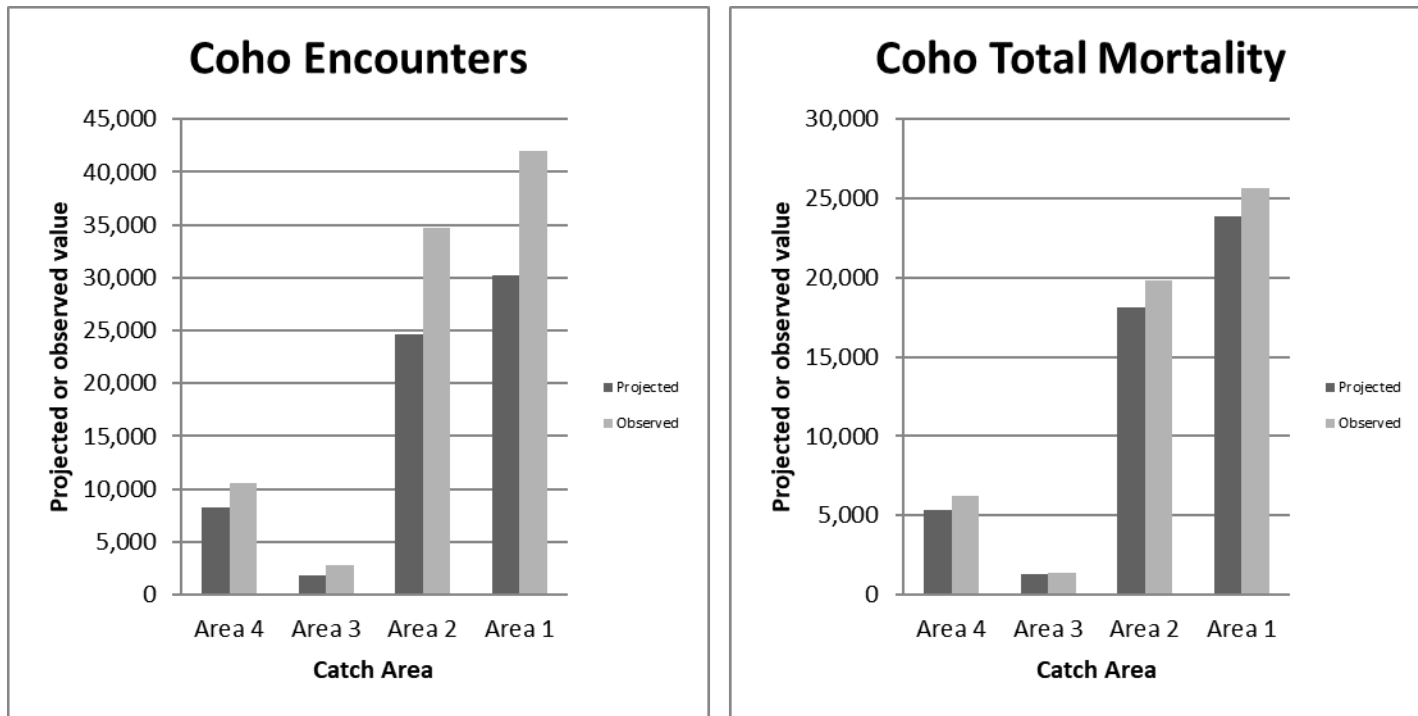
<sup>1/</sup> Variance estimates are unavailable for Oregon statistics.

**Table 7.** Comparison of modeled (FRAM model run #1830) and estimated total coho mortalities in the 2018 ocean coho MSF.

| Data Source                   | Area         | Release Mortality |              | Drop Off Mortality <sup>1/</sup> |              | Landed Catch  |            | Total Mortality |
|-------------------------------|--------------|-------------------|--------------|----------------------------------|--------------|---------------|------------|-----------------|
|                               |              | Marked            | Unmarked     | Marked                           | Unmarked     | Marked        | Unmarked   |                 |
| FRAM                          | Area 4       | 38                | 512          | 229                              | 187          | 4,294         | 75         | 5,335           |
|                               | Area 3       | 10                | 102          | 56                               | 37           | 1,075         | 15         | 1,295           |
|                               | Area 2       | 137               | 1,180        | 817                              | 430          | 15,367        | 173        | 18,104          |
|                               | Area 1       | 187               | 1,183        | 1,108                            | 432          | 20,828        | 172        | 23,910          |
|                               | <b>TOTAL</b> | <b>372</b>        | <b>2,977</b> | <b>2,210</b>                     | <b>1,086</b> | <b>41,564</b> | <b>435</b> | <b>48,644</b>   |
| Estimated Actual Mortality    | Area 4       | 62                | 720          | 264                              | 262          | 4,844         | 95         | 6,247           |
|                               | Area 3       | 2                 | 256          | 48                               | 92           | 945           | 9          | 1,352           |
|                               | Area 2       | 24                | 2,688        | 774                              | 960          | 15,311        | 59         | 19,817          |
|                               | Area 1       | 55                | 2,959        | 1,046                            | 1,057        | 20,530        | 45         | 25,692          |
|                               | <b>TOTAL</b> | <b>143</b>        | <b>6,624</b> | <b>2,132</b>                     | <b>2,370</b> | <b>41,630</b> | <b>208</b> | <b>53,107</b>   |
| <b>Variance<sup>2/</sup>:</b> |              | 523               | 48,037       | 3,430                            | 4,597        | 696,783       | 397        | -               |
| <b>Standard Error:</b>        |              | 23                | 219          | 59                               | 68           | 835           | 20         | -               |
| <b>CV (%):</b>                |              | 16%               | 3%           | 3%                               | 3%           | 2%            | 10%        | -               |
| <b>95% CI:</b>                |              | 98-187            | 6,194-7,053  | 2,018-2,247                      | 2,237-2,503  | 39,994-43,266 | 169-247    | -               |

<sup>1/</sup> Estimated drop off mortality calculated as 5% of estimated encounters.

<sup>2/</sup> Variance estimates for landed catch are unavailable for Oregon



**Figure 2.** Comparison of modeled (FRAM model run #1830) and estimated total coho encounters and mortality in the 2018 ocean coho MSF.

**Table 8.** Compliance with coho selective fishery regulations observed during dockside sampling interviews in the 2018 ocean coho MSF between Cape Falcon, Oregon and the U.S.-Canada border.

|               |              | Total Coho<br>Sampled | Marked Coho<br>Sampled | Unmarked Coho<br>Sampled | % Sampled<br>Coho Marked |
|---------------|--------------|-----------------------|------------------------|--------------------------|--------------------------|
| <b>Area 4</b> | June         | 162                   | 153                    | 9                        | 94.4%                    |
|               | July         | 1,181                 | 1,159                  | 22                       | 98.1%                    |
|               | August       | 570                   | 567                    | 3                        | 99.5%                    |
|               | September    | -                     | -                      | -                        | -                        |
|               | <b>Total</b> | <b>1,913</b>          | <b>1,879</b>           | <b>34</b>                | <b>98.2%</b>             |
| <b>Area 3</b> | June         | 1                     | 1                      | 0                        | 100.0%                   |
|               | July         | 38                    | 38                     | 0                        | 100.0%                   |
|               | August       | 394                   | 389                    | 5                        | 98.7%                    |
|               | September    | 95                    | 95                     | 0                        | 100.0%                   |
|               | <b>Total</b> | <b>528</b>            | <b>523</b>             | <b>5</b>                 | <b>99.1%</b>             |
| <b>Area 2</b> | June         | -                     | -                      | -                        | -                        |
|               | July         | 872                   | 867                    | 5                        | 99.4%                    |
|               | August       | 4,388                 | 4,376                  | 12                       | 99.7%                    |
|               | September    | 537                   | 535                    | 2                        | 99.6%                    |
|               | <b>Total</b> | <b>5,797</b>          | <b>5,778</b>           | <b>19</b>                | <b>99.7%</b>             |
| <b>Area 1</b> | June         | 117                   | 115                    | 2                        | 98.3%                    |
|               | July         | 3,551                 | 3,542                  | 9                        | 99.7%                    |
|               | August       | 3,089                 | 3,087                  | 2                        | 99.9%                    |
|               | September    | 58                    | 57                     | 1                        | 98.3%                    |
|               | <b>Total</b> | <b>6,815</b>          | <b>6,801</b>           | <b>14</b>                | <b>99.8%</b>             |

**Table 9.** Number of Chinook DNA samples collected by dockside samplers from the 2018 ocean recreational all-species fishery by area, month, and mark status.

|               |              | Marked     | Unmarked   | Unknown  | Total Number of<br>DNA Samples |
|---------------|--------------|------------|------------|----------|--------------------------------|
| <b>Area 4</b> | June         | 8          | 6          | 0        | 14                             |
|               | July         | 112        | 53         | 1        | 166                            |
|               | Aug          | 32         | 14         | 0        | 46                             |
|               | Sept         | -          | -          | -        | 0                              |
|               | <b>Total</b> | <b>152</b> | <b>73</b>  | <b>1</b> | <b>226</b>                     |
| <b>Area 3</b> | June         | 9          | 5          | 0        | 14                             |
|               | July         | 40         | 52         | 0        | 92                             |
|               | Aug          | 3          | 11         | 0        | 14                             |
|               | Sept         | 0          | 0          | 1        | 1                              |
|               | <b>Total</b> | <b>52</b>  | <b>68</b>  | <b>1</b> | <b>121</b>                     |
| <b>Area 2</b> | June         | -          | -          | -        | 0                              |
|               | July         | 189        | 79         | 0        | 268                            |
|               | Aug          | 103        | 44         | 1        | 148                            |
|               | Sept         | 0          | 1          | 0        | 1                              |
|               | <b>Total</b> | <b>292</b> | <b>124</b> | <b>1</b> | <b>417</b>                     |
| <b>Area 1</b> | June         | 20         | 3          | 0        | 23                             |
|               | July         | 22         | 12         | 1        | 35                             |
|               | Aug          | 14         | 15         | 1        | 30                             |
|               | Sept         | -          | -          | -        | 0                              |
|               | <b>Total</b> | <b>56</b>  | <b>30</b>  | <b>2</b> | <b>88</b>                      |

## 5. RESULTS IN THE ALL-SPECIES COHO MARK SELECTIVE NON-TREATY COMMERCIAL TROLL FISHERY

The non-Treaty commercial troll fishery harvested a total of 7,921 Chinook (7,873 WA, 48 OR) and 1,384 coho (1,292 WA, 92 OR) during the 2018 coastwide all-species coho MSF operating July 1 through September 19. Estimates of coho catch in the commercial troll fishery were lower than preseason projections. This was caused primarily by an in-season transfer of coho (modeled to be impact-neutral on 2018 limiting stocks including Queets, Grays Harbor, LCN, Skagit, Snohomish and Stillaguamish coho) from the non-Treaty troll fishery quota to the recreational fishery quota. The transferred fish were harvested primarily in CRC Areas 1 and 2 in the recreational fishery. **Table 10** shows commercial troll catch by month and area.

WDFW dockside samplers examined a total of 49% of all Chinook and 34% of all coho harvested and landed in WA during the all-species non-Treaty commercial troll fishery. CWT collections totaled 524 from Chinook and 50 from coho in Washington ports (**Table 11**).

**Table 10.** Total Chinook and coho retained during the 2018 all-species non-Treaty commercial troll fishery (coho mark-selective) between Cape Falcon, Oregon and the U.S.-Canada border.

|                  | Chinook      |              |            |              | Coho       |            |            |              |
|------------------|--------------|--------------|------------|--------------|------------|------------|------------|--------------|
|                  | July         | August       | September  | TOTAL        | July       | August     | September  | TOTAL        |
| Area 4           | 2,684        | 283          | 182        | 3,149        | 249        | 50         | 106        | 405          |
| Area 3           | 297          | 1,119        | 524        | 1,940        | 41         | 181        | 266        | 488          |
| Area 2           | 2,457        | 281          | 3          | 2,741        | 125        | 225        | 16         | 366          |
| Area 1           | 20           | 19           | 4          | 43           | 32         | 1          | -          | 33           |
| <b>TOTAL WA</b>  | <b>5,458</b> | <b>1,702</b> | <b>713</b> | <b>7,873</b> | <b>447</b> | <b>457</b> | <b>388</b> | <b>1,292</b> |
| OREGON (Area 1)  | 10           | 38           | 0          | 48           | 8          | 84         | 0          | 92           |
| <b>TOTAL NOF</b> | <b>5,468</b> | <b>1,740</b> | <b>713</b> | <b>7,921</b> | <b>455</b> | <b>541</b> | <b>388</b> | <b>1,384</b> |

**Table 11.** Chinook and coho sampled in WA during the 2018 all-species non-Treaty commercial troll fishery (coho mark-selective) between Cape Falcon, Oregon and the U.S.-Canada border.

|                 | Chinook       |             |                | Coho          |             |                |
|-----------------|---------------|-------------|----------------|---------------|-------------|----------------|
|                 | Total Sampled | Sample Rate | CWTs Collected | Total Sampled | Sample Rate | CWTs Collected |
| Area 4          | 1,184         | 38%         | 206            | 125           | 31%         | 13             |
| Area 3          | 1,075         | 55%         | 88             | 225           | 46%         | 24             |
| Area 2          | 1,571         | 57%         | 228            | 79            | 22%         | 13             |
| Area 1          | 12            | 28%         | 2              | 7             | 21%         | 0              |
| <b>TOTAL WA</b> | <b>3,842</b>  | <b>49%</b>  | <b>524</b>     | <b>436</b>    | <b>34%</b>  | <b>50</b>      |

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