

# **2019 OCEAN SELECTIVE FISHERY SAMPLING REPORT**

SUBMITTED BY:

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE  
FISH MANAGEMENT PROGRAM  
600 CAPITOL WAY NORTH  
OLYMPIA, WASHINGTON 98501-1091

PERIOD COVERED:

May 1, 2019 through September 30, 2019

**D R A F T**

**Date of Draft: 10/2/2020**

## TABLE OF CONTENTS

TABLE OF CONTENTS.....	1
LIST OF TABLES .....	1
LIST OF FIGURES .....	2
1. INTRODUCTION .....	3
2. SEASON DESCRIPTION .....	3
2.1 Ocean Recreational All-Species Fisheries (Coho Mark-Selective) .....	3
2.2 Non-Treaty Commercial Troll Fisheries (Coho Mark-Selective).....	4
3. METHODS .....	5
3.1 On-Board Observation .....	5
3.2 Voluntary Trip Reports .....	5
3.3 Dockside Sampling .....	6
Effort Counts.....	6
Angler Interviews and Catch Sampling .....	6
3.4 Estimating Catch and Effort.....	6
3.4.i Estimated Stratum Totals (Primary Stage) .....	6
3.4.ii Daily Catch and Effort Estimation (Secondary Stage).....	8
4. RESULTS IN THE ALL-SPECIES COHO MARK SELECTIVE RECREATIONAL FISHERY .....	10
4.1 Dockside Sampling Results .....	10
4.2 On-water Observation and VTR Results .....	10
4.3 Overall Fishery Impacts .....	10
Estimated Total Coho Encounters and Mortalities .....	10
Compliance .....	11
4.4 DNA Data Collection.....	11
5. RESULTS IN THE ALL-SPECIES COHO MARK SELECTIVE NON-TREATY COMMERCIAL TROLL FISHERY .....	21
REFERENCES .....	22

## LIST OF TABLES

Table 1. Estimates of total fishing effort and number of Chinook and coho retained during the 2017 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border. ....	12
Table 2. WA dockside sampling statistics during the 2017 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border. ....	12
Table 3. On-board and VTR Chinook encounters by size class and mark status in the 2017 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border. ....	13
Table 4. On-board and VTR coho encounters by size class and mark status in the 2017 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border. ....	14

Table 5. Estimated Chinook and coho mark rates during the 2017 all-species recreational fishery (coho MSF) by boat type and size class using onboard observer and VTR encounters. .... 15

Table 6. Comparison of modeled (FRAM model run #1731) and estimated total coho encounters in the 2017 ocean coho MSF. .... 16

Table 7. Comparison of modeled (FRAM model run #1731) and estimated total coho mortalities in the 2017 ocean coho MSF. .... 17

Table 8. Compliance with coho selective fishery regulations observed during dockside sampling interviews in the 2017 ocean coho MSF between Cape Falcon, Oregon and the U.S.-Canada border. .... 19

Table 9. Number of Chinook DNA samples collected by dockside samplers from the 2017 ocean recreational all-species fishery by area, month, and mark status. .... 20

Table 10. Total Chinook and coho retained during the 2017 all-species non-Treaty commercial troll fishery (coho mark-selective) between Cape Falcon, Oregon and the U.S.-Canada border. 21

Table 11. Chinook and coho sampled in WA during the 2017 all-species non-Treaty commercial troll fishery (coho mark-selective) between Cape Falcon, Oregon and the U.S.-Canada border. 21

**LIST OF FIGURES**

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

Figure 2. Comparison of modeled (FRAM model run #1731) and estimated total coho encounters and mortality in the 2017 ocean coho MSF. .... 18

## 1. INTRODUCTION

The Pacific Fishery Management Council (PFMC) adopted 2019 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 twenty-first consecutive year, following state-tribal agreement during the North of Falcon process. No Chinook MSFs were recommended by the Council's Salmon Advisory Subpanel nor adopted by the PFMC in 2019.

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 22 through September 30. A daily bag limit of two salmon, one of which could be a Chinook, was in effect. All retained coho were required to have a healed adipose fin clip. The Columbia Control Zone was closed. A total of 101 fishing days were available in the area.

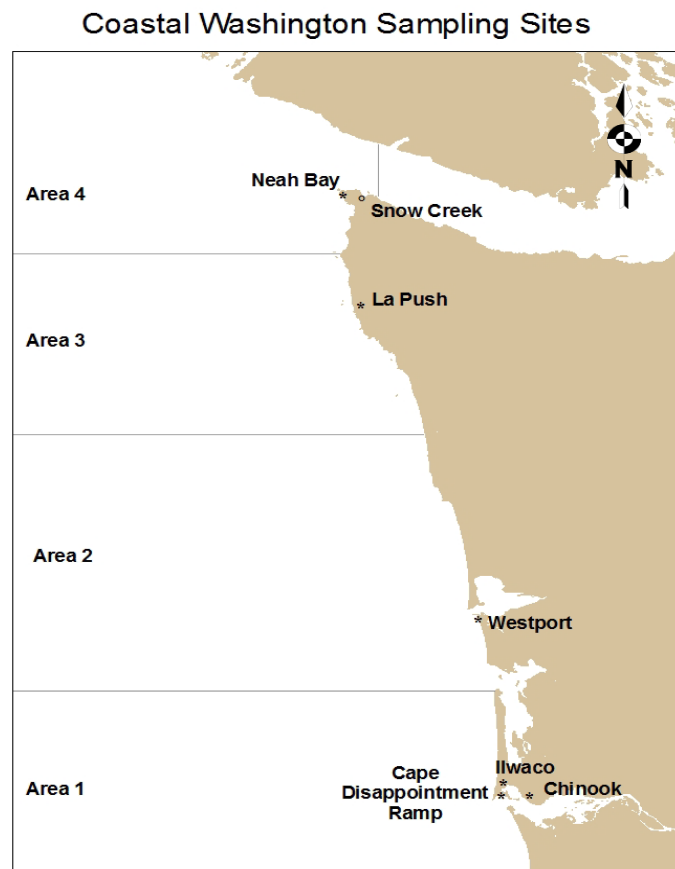
CRC Area 2: The ocean recreational fishery in CRC Area 2 was open for all salmon species seven days per week from June 22 through September 30. A daily bag limit of two salmon, one of which could be a Chinook, was in effect June 22 – August 9; the bag limit was modified in-season to two salmon from August 10 – September 30. All retained coho were required to have a healed adipose fin clip. A total of 101 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 22 through September 30. A daily bag limit of two salmon was in effect through July 14, after which the daily bag limit was modified in-season to include only one Chinook. All retained coho were required to have a healed adipose fin clip. The portion of

Area 3 restricted to north of 47°50'00" north latitude and south of 48°00'00" north latitude was open for all salmon species from October 1 through 13 with a daily bag limit of two salmon; all retained coho were required to have a healed adipose fin clip. A total of 114 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 22 through September 30. A daily bag limit of two salmon was in effect June 22 – July 7; the bag limit was modified in-season to include only one Chinook from July 8 – July 13. Beginning July 14, Chinook retention was not allowed. All retained coho were required to have a healed adipose fin clip. A total of 101 fishing days were available in the area.

The all-species fishery operated under preseason quotas of 26,250 landed Chinook and 159,600 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. Ocean Areas 1 and 2 were open during this time for

54 days, while Areas 3 and 4 were open for 45 days. The fishery reopened for all salmon species (except no chum retention north of Cape Alava, WA in August) on July 1 in all areas between Cape Falcon, Oregon and the U.S.-Canada border. The fishery closed as scheduled on September 30 allowing a total of 92 available fishing days. All retained coho were required to have a healed adipose fin clip. Specific open dates and regulations are available in the PFMC Review of 2019 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 to 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 could also mail these forms to the WDFW Region 6 office postage-paid. Additionally, office staff contacted anglers by phone or mail who regularly complete VTRs prior to the season and provided blank VTRs and binders. Forms are also available on the WDFW website, where the angler has the opportunity to print it and complete it on the water as well.

### **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 Cape Disappointment launch ramp). 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 4:30AM 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 recollection 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):

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

where

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

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 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:

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

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 80,362 angler trips (65,667 from Washington, 14,695 from Oregon) were completed by private and charter anglers during the 2019 coastwide all-species coho MSF. These anglers harvested a total of 10,878 Chinook coastwide (9,583 WA, 1,295 OR) and 81,649 coho (64,425 WA, 17,224 OR). **Table 1** shows effort and catch by month and area during the 2019 coho MSF.

WDFW dockside samplers interviewed an estimated 44% of all anglers fishing from WA coastwide during the coho MSF. A total of 42% of all Chinook and 45% of all coho harvested in WA were sampled; 455 CWTs were collected from sampled Chinook and 5,011 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 267 charter boat trips documenting a total of 335 legal sized Chinook, 261 sublegal sized Chinook, 7,604 legal sized coho, and 125 sublegal sized coho during the all-species coho MSF. Dockside samplers also collected 338 completed and useable VTRs from private vessels containing 208 legal sized Chinook encounters, 212 sublegal sized Chinook encounters, 2,175 legal sized coho encounters, and 99 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 2019 ocean recreational all-species coho MSFs are compared with estimated encounters based on Washington and Oregon sample data in **Table 6**. **Table 7** compares total coho mortality projected pre-season by FRAM (Washington and Oregon) with estimated coho mortality based on Washington and Oregon sample data.

The overall impacts of the 2019 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 PFMCO ocean selective fishery mortality (*sfm*) rate of 14% (Conrad, 2012).

Observed estimates of total coho encounters were lower than projected preseason in all CRC areas, although encounters of unmarked coho were higher than projected preseason in most areas. Total mortality estimates were lower than projected preseason in all CRC Areas, but estimated unmarked mortality was higher than projected preseason in most areas. Estimated landed catch (both marked and unmarked) was much lower in all CRC areas than projected preseason. Observed coho mark rates were lower than anticipated preseason in all areas.

**Figure 2** compares the FRAM projected coho encounters and mortality by area with those estimated using Washington and Oregon sample data in the all-species 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 938 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 2019 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	TOTAL	June	July	Aug	Sept	TOTAL	June	July	Aug	Sept	TOTAL
Area 4	2,527	5,150	1,987	400	<b>10,064</b>	1,474	2,385	-	-	<b>3,859</b>	754	3,344	1,764	318	<b>6,179</b>
Area 3 <sup>1/</sup>	124	530	1,114	534	<b>2,301</b>	10	216	190	197	<b>613</b>	2	336	1,095	334	<b>1,768</b>
Area 2	1,604	9,823	10,178	1,788	<b>23,393</b>	126	1,163	959	121	<b>2,368</b>	341	7,878	10,930	1,077	<b>20,227</b>
Area 1	2,396	10,576	15,602	1,335	<b>29,909</b>	237	1,533	888	84	<b>2,743</b>	3,507	14,386	16,997	1,361	<b>36,251</b>
<b>TOTAL WA</b>	<b>6,651</b>	<b>26,079</b>	<b>28,881</b>	<b>4,056</b>	<b>65,667</b>	<b>1,847</b>	<b>5,297</b>	<b>2,037</b>	<b>402</b>	<b>9,583</b>	<b>4,603</b>	<b>25,944</b>	<b>30,786</b>	<b>3,091</b>	<b>64,425</b>
OREGON (Area 1)	1,334	5,066	7,930	365	<b>14,695</b>	104	668	485	38	<b>1,295</b>	1,852	6,548	8,543	281	<b>17,224</b>
<b>TOTAL NOF</b>	<b>7,985</b>	<b>31,145</b>	<b>36,811</b>	<b>4,421</b>	<b>80,362</b>	<b>1,951</b>	<b>5,965</b>	<b>2,522</b>	<b>440</b>	<b>10,878</b>	<b>6,455</b>	<b>32,492</b>	<b>39,329</b>	<b>3,372</b>	<b>81,649</b>
<b>WA Variance:</b> <sup>2/</sup>					777,368					91,850					1,401,665
<b>WA Standard Error:</b>					882					303					1,184
<b>WA CV (%):</b>					1%					3%					2%
<b>WA 95% CI:</b>					63,939-67,395					8,989-10,177					62,104-66,745

<sup>1/</sup> Area 3 September effort and catch includes effort and catch from October restricted-area fishery.

<sup>2/</sup> Variance estimates are unavailable for Oregon statistics.

**Table 2.** WA dockside sampling statistics during the 2019 all-species recreational fishery (coho MSF) between Cape Falcon, Oregon and the U.S.-Canada border.

	Anglers Sampled	Sample Rate	Landed		Landed		Chinook CWTs collected	Coho CWTs collected
			Chinook Sampled	Sample Rate	Coho Sampled	Sample Rate		
Area 4	3,861	38%	1,220	32%	2,665	43%	129	347
Area 3	1,712	74%	422	69%	1,287	73%	23	185
Area 2	11,183	48%	1,146	48%	9,366	46%	134	1,443
Area 1	12,236	41%	1,258	46%	15,580	43%	169	3,036
<b>TOTAL WA</b>	<b>28,992</b>	<b>44%</b>	<b>4,046</b>	<b>42%</b>	<b>28,898</b>	<b>45%</b>	<b>455</b>	<b>5,011</b>

**Table 3.** On-board and VTR Chinook encounters by size class and mark status in the 2019 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	LEGAL-SIZED			SUBLEGAL-SIZED			Total VTRs	LEGAL-SIZED			SUBLEGAL-SIZED		
		Observer	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown	Collected	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown
<b>Area 4</b>	June	1	1	5	0	0	0	0	11	3	6	0	1	0	0
	July	10	15	31	0	11	10	0	27	12	21	0	8	12	0
	Aug	11	6	5	0	0	5	0	3	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>22</b>	<b>22</b>	<b>41</b>	<b>0</b>	<b>11</b>	<b>15</b>	<b>0</b>	<b>41</b>	<b>15</b>	<b>27</b>	<b>0</b>	<b>9</b>	<b>12</b>	<b>0</b>
<b>Area 3</b>	June	0	0	0	0	0	0	0	1	0	1	0	0	1	0
	July	10	3	15	0	2	0	0	7	4	6	0	3	1	0
	Aug	0	0	0	0	0	0	0	9	6	5	2	1	7	0
	Sept	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	<b>TOTAL</b>	<b>10</b>	<b>3</b>	<b>15</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>10</b>	<b>12</b>	<b>2</b>	<b>4</b>	<b>9</b>	<b>0</b>
<b>Area 2</b>	June	4	3	3	0	3	2	0	7	3	5	0	0	0	0
	July	45	14	19	0	16	6	0	70	22	14	0	12	10	0
	Aug	43	16	19	0	5	0	0	34	11	8	0	1	5	0
	Sept	15	0	3	0	2	1	0	2	0	0	0	0	0	0
	<b>TOTAL</b>	<b>107</b>	<b>33</b>	<b>44</b>	<b>0</b>	<b>26</b>	<b>9</b>	<b>0</b>	<b>113</b>	<b>36</b>	<b>27</b>	<b>0</b>	<b>13</b>	<b>15</b>	<b>0</b>
<b>Area 1</b>	June	10	4	7	0	7	7	0	13	0	4	0	1	5	0
	July	69	80	63	0	117	45	2	98	43	19	1	89	50	1
	Aug	42	8	9	0	14	4	1	48	4	5	0	1	2	0
	Sept	7	1	5	0	0	1	0	8	1	2	0	1	0	0
	<b>TOTAL</b>	<b>128</b>	<b>93</b>	<b>84</b>	<b>0</b>	<b>138</b>	<b>57</b>	<b>3</b>	<b>167</b>	<b>48</b>	<b>30</b>	<b>1</b>	<b>92</b>	<b>57</b>	<b>1</b>

**Table 4.** On-board and VTR coho encounters by size class and mark status in the 2019 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	LEGAL-SIZED			SUBLEGAL-SIZED			Total VTRs	LEGAL-SIZED			SUBLEGAL-SIZED		
		Observer	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown	Collected	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown
<b>Area 4</b>	June	1	6	2	0	0	0	0	11	16	12	0	2	0	0
	July	10	64	76	0	7	7	0	27	44	80	0	5	11	0
	Aug	11	105	216	0	9	5	0	3	13	29	0	1	1	0
	Sept	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	<b>TOTAL</b>	<b>22</b>	<b>175</b>	<b>294</b>	<b>0</b>	<b>16</b>	<b>12</b>	<b>0</b>	<b>41</b>	<b>73</b>	<b>121</b>	<b>0</b>	<b>8</b>	<b>12</b>	<b>0</b>
<b>Area 3</b>	June	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	July	10	71	85	0	1	0	0	7	15	28	0	2	3	0
	Aug	0	0	0	0	0	0	0	9	4	18	0	0	0	0
	Sept	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	<b>TOTAL</b>	<b>10</b>	<b>71</b>	<b>85</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>19</b>	<b>46</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>0</b>
<b>Area 2</b>	June	4	17	7	0	1	0	0	7	3	4	0	0	0	0
	July	45	671	688	0	9	6	0	70	215	167	0	1	1	0
	Aug	43	963	1233	0	11	11	0	34	104	149	0	7	5	0
	Sept	15	113	117	0	3	2	0	2	3	2	0	0	0	0
	<b>TOTAL</b>	<b>107</b>	<b>1,764</b>	<b>2,045</b>	<b>0</b>	<b>24</b>	<b>19</b>	<b>0</b>	<b>113</b>	<b>325</b>	<b>322</b>	<b>0</b>	<b>8</b>	<b>6</b>	<b>0</b>
<b>Area 1</b>	June	10	196	135	0	0	0	0	13	63	52	0	2	2	0
	July	69	941	671	0	3	6	1	98	430	264	0	13	10	0
	Aug	42	572	524	0	29	14	1	48	215	181	0	22	11	0
	Sept	7	82	49	0	0	1	0	8	34	30	0	0	0	0
	<b>TOTAL</b>	<b>128</b>	<b>1,791</b>	<b>1,379</b>	<b>0</b>	<b>32</b>	<b>21</b>	<b>2</b>	<b>167</b>	<b>742</b>	<b>527</b>	<b>0</b>	<b>37</b>	<b>23</b>	<b>0</b>

**Table 5.** Estimated Chinook and coho mark rates during the 2019 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	17%	33%	27%	-	100%	100%	75%	57%	61%	<b>57%</b>
	July	33%	36%	34%	52%	40%	46%	46%	35%	41%	
	August	55%	-	55%	0%	-	0%	33%	31%	33%	
	September	-	-	-	-	-	-	-	-	-	
	<b>TOTAL</b>	<b>35%</b>	<b>36%</b>	<b>35%</b>	<b>42%</b>	<b>43%</b>	<b>43%</b>	<b>37%</b>	<b>38%</b>	<b>37%</b>	
<b>Area 3</b>	June	-	0%	0%	-	0%	0%	-	-	-	<b>66%</b>
	July	17%	40%	25%	100%	75%	83%	46%	35%	43%	
	August	-	55%	55%	-	13%	13%	-	18%	18%	
	September	-	-	-	-	-	-	-	-	-	
	<b>TOTAL</b>	<b>17%</b>	<b>45%</b>	<b>33%</b>	<b>100%</b>	<b>31%</b>	<b>40%</b>	<b>46%</b>	<b>29%</b>	<b>41%</b>	
<b>Area 2</b>	June	50%	38%	43%	60%	-	60%	71%	43%	65%	<b>67%</b>
	July	42%	61%	52%	73%	55%	64%	49%	56%	51%	
	August	46%	58%	50%	100%	17%	55%	44%	41%	44%	
	September	0%	-	0%	67%	-	67%	49%	60%	49%	
	<b>TOTAL</b>	<b>43%</b>	<b>57%</b>	<b>49%</b>	<b>74%</b>	<b>46%</b>	<b>62%</b>	<b>46%</b>	<b>50%</b>	<b>47%</b>	
<b>Area 1</b>	June	36%	0%	27%	50%	17%	40%	59%	55%	58%	<b>74%</b>
	July	56%	69%	60%	72%	64%	68%	58%	62%	59%	
	August	47%	44%	46%	78%	33%	71%	52%	54%	53%	
	September	17%	33%	22%	0%	100%	50%	63%	53%	59%	
	<b>TOTAL</b>	<b>53%</b>	<b>62%</b>	<b>55%</b>	<b>71%</b>	<b>62%</b>	<b>67%</b>	<b>56%</b>	<b>58%</b>	<b>57%</b>	



**Table 6.** Comparison of modeled (FRAM model run #1925) and estimated total coho encounters in the 2019 ocean coho MSF.

Data Source	Area	Marked	Unmarked	Total Encounters	Landed Catch
FRAM	Area 4	17,319	12,891	30,210	16,601
	Area 3	4,342	2,275	6,617	4,151
	Area 2	61,884	30,995	92,879	59,051
	Area 1	83,848	29,934	113,782	79,800
	<b>TOTAL</b>	<b>167,393</b>	<b>76,095</b>	<b>243,488</b>	<b>159,603</b>
Estimated Actual Encounters	Area 4	8,738	14,503	23,240	6,179
	Area 3	2,022	3,857	5,879	1,768
	Area 2	20,759	22,605	43,363	20,227
	Area 1	55,084	39,729	94,813	53,475
	<b>TOTAL</b>	<b>86,601</b>	<b>80,693</b>	<b>167,295</b>	<b>81,649</b>
<b>Variance<sup>1/</sup>:</b>		4,075,049	5,500,709	18,337,296	1,401,665
<b>Standard Error:</b>		2,019	2,345	4,282	1,184
<b>CV (%):</b>		2%	3%	3%	1%
<b>95% CI:</b>		82,645-90,558	76,097-85,290	158,902-175,688	79,328-83,969

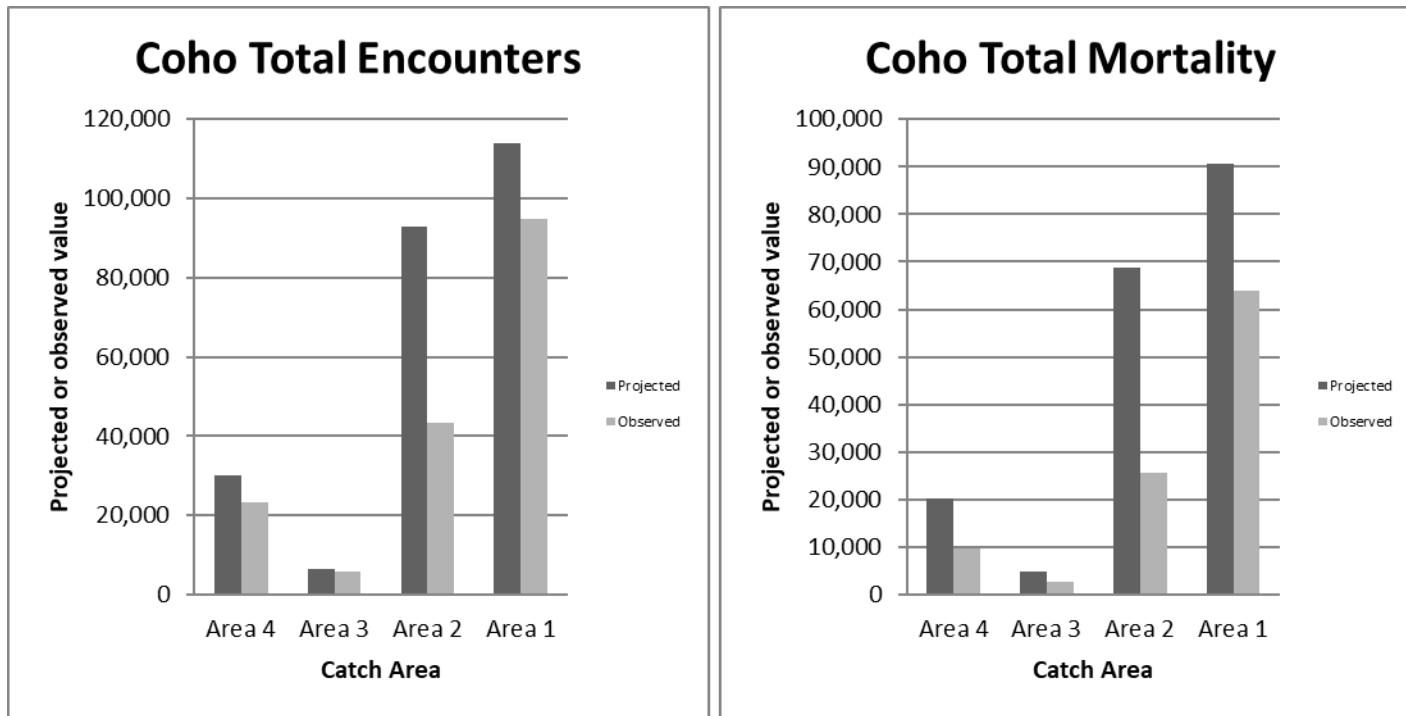
<sup>1/</sup> Variance estimates are unavailable for Oregon statistics.

**Table 7.** Comparison of modeled (FRAM model run #1925) and estimated total coho mortalities in the 2019 ocean coho MSF.

Data Source	Area	Release Mortality		Drop Off Mortality <sup>1/</sup>		Landed Catch		Total
		Marked	Unmarked	Marked	Unmarked	Marked	Unmarked	Mortality
FRAM	Area 4	146	1,829	868	666	16,336	265	20,110
	Area 3	37	327	219	119	4,104	47	4,853
	Area 2	522	4,473	3,106	1,629	58,398	653	68,781
	Area 1	708	4,380	4,210	1,596	79,161	639	90,694
	<b>TOTAL</b>	<b>1,413</b>	<b>11,009</b>	<b>8,403</b>	<b>4,010</b>	<b>157,999</b>	<b>1,604</b>	<b>184,438</b>
Estimated Actual Mortality	Area 4	380	2,030	437	725	6,027	152	9,751
	Area 3	37	540	101	193	1,760	7	2,638
	Area 2	91	3,165	1,038	1,130	20,112	115	25,650
	Area 1	247	5,562	2,754	1,986	53,316	159	64,025
	<b>TOTAL</b>	<b>754</b>	<b>11,297</b>	<b>4,330</b>	<b>4,035</b>	<b>81,215</b>	<b>433</b>	<b>102,064</b>
<b>Variance<sup>2/</sup>:</b>		10,159	144,835	10,188	13,752	1,390,130	1,793	-
<b>Standard Error:</b>		101	381	101	117	1,179	42	-
<b>CV (%):</b>		13%	3%	2%	3%	1%	10%	-
<b>95% CI:</b>		557-952	10,551-12,043	4,132-4,528	3,805-4,265	78,904-83,526	350-516	-

<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 #1925) and estimated total coho encounters and mortality in the 2019 ocean coho MSF.

**Table 8.** Compliance with coho selective fishery regulations observed during dockside sampling interviews in the 2019 ocean coho MSF between Cape Falcon, Oregon and the U.S.-Canada border.

		Total Coho Sampled	Marked Coho Sampled	Unmarked Coho Sampled	% Sampled Coho Marked
<b>Area 4</b>	June	198	183	15	92.4%
	July	1,308	1,287	21	98.4%
	August	913	901	12	98.7%
	September	246	242	4	98.4%
	<b>Total</b>	<b>2,665</b>	<b>2,613</b>	<b>52</b>	<b>98.0%</b>
<b>Area 3</b>	June	2	2	0	100.0%
	July	287	284	3	99.0%
	August	711	708	3	99.6%
	September <sup>1/</sup>	287	287	0	100.0%
	<b>Total</b>	<b>1,287</b>	<b>1,281</b>	<b>6</b>	<b>99.5%</b>
<b>Area 2</b>	June	156	154	2	-
	July	4,278	4,236	42	99.0%
	August	4,367	4,345	22	99.5%
	September	565	558	7	98.8%
	<b>Total</b>	<b>9,366</b>	<b>9,293</b>	<b>73</b>	<b>99.2%</b>
<b>Area 1</b>	June	2,126	2,116	10	99.5%
	July	7,486	7,467	19	99.7%
	August	5,220	5,203	17	99.7%
	September	748	747	1	99.9%
	<b>Total</b>	<b>15,580</b>	<b>15,533</b>	<b>47</b>	<b>99.7%</b>

1/ Area 3 September data include October restricted-area fishery.

**Table 9.** Number of Chinook DNA samples collected by dockside samplers from the 2019 ocean recreational all-species fishery by area, month, and mark status.

		Marked	Unmarked	Unknown	Total Number of DNA Samples
<b>Area 4</b>	June	19	29	0	48
	July	46	59	0	105
	Aug	-	-	-	0
	Sept	-	-	-	0
	<b>Total</b>	<b>65</b>	<b>88</b>	<b>0</b>	<b>153</b>
<b>Area 3</b>	June	2	2	0	4
	July	18	71	0	89
	Aug	30	35	0	65
	Sept	3	23	0	26
	<b>Total</b>	<b>53</b>	<b>131</b>	<b>0</b>	<b>184</b>
<b>Area 2</b>	June	19	23	-	42
	July	94	57	0	151
	Aug	65	60	0	125
	Sept	7	12	0	19
	<b>Total</b>	<b>185</b>	<b>152</b>	<b>0</b>	<b>337</b>
<b>Area 1</b>	June	17	19	0	36
	July	100	70	2	172
	Aug	30	16	0	46
	Sept	3	7	0	10
	<b>Total</b>	<b>150</b>	<b>112</b>	<b>2</b>	<b>264</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 16,336 Chinook (15,831 WA, 505 OR) and 5,406 coho (3,997 WA, 1,409 OR) during the 2019 coastwide all-species coho MSF operating July 1 through September 30. Estimates of coho catch in the commercial troll fishery were well below preseason projections. **Table 10** shows commercial troll catch by month and area.

WDFW dockside samplers examined a total of 56% of all Chinook and 46% of all coho harvested and landed in WA. CWT collections totaled 549 from Chinook and 240 from coho in Washington ports (**Table 11**).

**Table 10.** Total Chinook and coho retained during the 2019 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	9,491	219	67	9,777	938	59	120	1,117
Area 3	1,838	2,373	1,584	5,795	313	633	344	1,290
Area 2	65	49	81	195	226	368	737	1,331
Area 1	36	28	0	64	161	98	0	259
<b>TOTAL WA</b>	<b>11,430</b>	<b>2,669</b>	<b>1,732</b>	<b>15,831</b>	<b>1,638</b>	<b>1,158</b>	<b>1,201</b>	<b>3,997</b>
OREGON (Area 1)	384	93	28	505	1,026	302	81	1,409
<b>TOTAL NOF</b>	<b>11,814</b>	<b>2,762</b>	<b>1,760</b>	<b>16,336</b>	<b>2,664</b>	<b>1,460</b>	<b>1,282</b>	<b>5,406</b>

**Table 11.** Chinook and coho sampled in WA during the 2019 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	5,248	54%	335	358	32%	37
Area 3	3,458	60%	190	678	53%	91
Area 2	138	71%	23	778	58%	106
Area 1	11	17%	1	33	13%	6
<b>TOTAL WA</b>	<b>8,855</b>	<b>56%</b>	<b>549</b>	<b>1,847</b>	<b>46%</b>	<b>240</b>

## REFERENCES

- Cochran, W. G. 1977. Sampling techniques. 3<sup>rd</sup> ed. John Wiley. 428 pp.
- Conrad, R. 2012. Comparison of Two Methods for Estimating Coho Salmon Encounters and Release Mortalities in the Ocean Mark-Selective Fishery. PFMC Salmon Methodology Review, October, 2012. <http://www.pcouncil.org/resources/archives/briefing-books/november-2012-briefing-book/#salmonNov2012> Agenda Item C.3.a, Attachment 4
- Lai, H-L., R. Moore, and J. Tagart. 1991. Methodologies for estimating catch and effort statistics of ocean sport fishery off the Washington Coast with users guide for the program 'OSFP.FOR'. Prog. Report No. 289. Wash. Dept. of Fisheries, Olympia, WA. 35 pp.
- Pacific Fishery Management Council. 2020. Review of 2019 Ocean Salmon Fisheries: Stock Assessment and Fishery Evaluation Document for the Pacific Coast Fishery Management Plan. February 2020. Pacific Fishery Management Council. Portland, Oregon.
- Thompson, S.K. 1992. Sampling. John Wiley. 343 pp.