

**Pacific Salmon Commission  
Joint Chinook Technical Committee Report**

**Pacific Salmon Commission Chinook Model  
Base Period Re-Calibration  
Volume I: Fisheries**

**REPORT TCCHINOOK (21)-02**

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## LIST OF ACRONYMS AND ABBREVIATIONS

<b>AABM</b>	Aggregate Abundance Based Management	<b>NBC</b>	Northern BC Dixon Entrance to Kitimat including Haida Gwaii
<b>ADF&amp;G</b>	Alaska Department of Fish & Game	<b>NMFS</b>	National Marine Fisheries Service
<b>AI</b>	Abundance Index	<b>NOC</b>	North Oregon Coast
<b>AWG</b>	Analytical Working Group	<b>NWIFC</b>	Northwest Indian Fisheries Commission
<b>B.C.</b>	British Columbia	<b>ODFW</b>	Oregon Department of Fish & Wildlife
<b>BPC</b>	Base Period Calibration	<b>OOB</b>	Out of Base
<b>BSE</b>	Base period file	<b>PFMA</b>	Pacific Fishery Management Area
<b>BY</b>	Brood Year	<b>PFMC</b>	Pacific Fishery Management Council
<b>BYER</b>	Brood Year Exploitation Rate	<b>PNV</b>	Proportion Non-Vulnerable
<b>CBC</b>	Central British Columbia	<b>PSC</b>	Pacific Salmon Commission
<b>CEI</b>	Ceiling file	<b>PST</b>	Pacific Salmon Treaty
<b>CNR</b>	Chinook Nonretention	<b>QIN</b>	Quinault Nation
<b>CRITFC</b>	Columbia River Intertribal Fish Commission	<b>RM</b>	River Mile
<b>CTC</b>	Chinook Technical Committee	<b>RMIS</b>	Regional Mark Information System
<b>CWT</b>	Coded Wire Tag	<b>SEAK</b>	Southeast Alaska Cape Suckling to Dixon Entrance
<b>DFO</b>	Department of Fisheries and Oceans Canada	<b>STK</b>	Stock file
<b>EIS</b>	Escapement Indicator Stock	<b>TAC</b>	Total Allowable Catch
<b>EO</b>	Economic Opportunity Fishery	<b>TAC</b>	<i>U.S. v Oregon</i> Technical Advisory Committee
<b>ER</b>	Exploitation Rate	<b>U.S.</b>	United States
<b>ERA</b>	Exploitation Rate Analysis	<b>UAF</b>	University of Alaska Fairbanks
<b>ERIS</b>	Exploitation Rate Indicator Stock	<b>URB</b>	Upriver Brights
<b>FNC</b>	First Nations Caucus	<b>USFWS</b>	US Fish & Wildlife Service
<b>FP</b>	Fishery Policy	<b>WA/OR</b>	Ocean areas off Washington and Oregon North of Cape Falcon
<b>FRE</b>	Fraser Early stock component	<b>WCVI</b>	West Coast Vancouver Island excluding Area 20
<b>FRL</b>	Fraser Late stock component	<b>WDFW</b>	Washington Department of Fish and Wildlife
<b>IM</b>	Incidental Mortality		
<b>ISBM</b>	Individual Stock Based Management		
<b>ITE</b>	Individual Transferrable Effort		
<b>ITQ</b>	Individual Transferrable Quota		
<b>MDL</b>	Model file		
<b>MOC</b>	Mid-Oregon Coast		
<b>MRP</b>	Mark Recovery Program		
<b>MSF</b>	Mark-Selective Fishery		

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# 1 Introduction

The Pacific Salmon Treaty (PST) requires the Chinook Technical Committee (CTC) to report annually on catches, harvest rate indices, estimates of incidental mortality (IM), and exploitation rates for Chinook salmon fisheries and stocks harvested from Oregon north to Southeast Alaska including British Columbia. To fulfill this obligation, the CTC uses a model, the Pacific Salmon Commission's (PSC) Chinook Model, to generate key outputs of relevance to PSC annual fishery management cycle. The Model is calibrated each year, incorporating preseason stock-specific abundance forecasts with the latest information on catches, exploitation rates generated through cohort analysis, terminal runs, and escapements. The Parties rely upon the Model to generate annual estimates of abundance for aggregate abundance-based management (AABM) fisheries and evaluation for individual stock-based management (ISBM) fisheries.

The PSC Chinook Model was originally constructed in the 1980s. At its inception, computational power was a bottleneck to the complexity, development, and maintenance of the PSC Chinook Model's code, its inputs, and algorithms. These limitations as well as limited ability to verify data in an accepted data exchange format and source allowed for modelling of only a few stocks and fisheries to represent the operation of inter-jurisdictional fisheries.

As computing power increased and stock and fishery assessment programs developed, additional stocks and fisheries were added for greater representation and relevance to Chinook fisheries management under the PST. This increased model stratification and better representation of AABM and ISBM fishery impacts. This enables estimation of fishery impacts north and south of Cape Falcon (Southern U.S.), permits finer stock resolution of fishery impacts, and eventually will allow estimation of differential impacts on marked and unmarked stock components as a result of mark-selective fisheries (MSFs).

The Model is calibrated to agreed base period years (1979–1982) to determine initial exploitation rates (ERs) and starting parameters (e.g., cohort size) in which Model stocks of the PSC Chinook Model are reconstructed and updated to present time. Each year, the Model is calibrated using updated stock and fishery data and abundance forecasts. During this process, the Model reconstructs stocks and fisheries and produces projections of Abundance Indices (AIs) relative to the base period for the upcoming season. The previous calibration for the base period was accomplished in 1998 (referred to as 9806) and was used through 2019. A Base Period Calibration (BPC) is a critical component of the Chinook chapter of the PST, as AABM fishery limits in the 1999, 2009, and 2019 PST Agreements are based on the Model AIs that scale current conditions to the base period.

Periodic BPCs are necessary to reflect changes in available data to represent stocks and fisheries, and this is an intensive process of data collection, analyses and comparisons, and review. In general, previous attempts to reconstruct the base period were hampered by conflicting priorities of the CTC in fulfilling its normal duties and assignments to support PST Agreement renewal negotiations, and the overall complexity and enormity of the task. An

attempt at updating the BPC began in 2013 for use in renegotiating the PST. This effort, which received both agency and PSC prioritization and financial support, culminated in 2019 with a successful new BPC. The BPC results formed the underpinnings for the PSC Chinook Model (Phase II), which also underwent significant revisions during this process. The PSC Chinook Model (Phase II) was formally adopted by the PSC for use in October 2019 and is now calibrated annually and documented in CTC Exploitation Rate Analysis (ERA) and Model Calibration reports.

The update to the BPC was accomplished in two phases: Phase I focused on increasing and improving stock stratifications and Phase II focused on increasing and improving the modelled fisheries stratifications. The first iteration of the PSC Chinook Model improvement (Phase I) resulted in finer stock resolution by adding stock groups that were not previously represented, splitting some stocks to better represent life histories and ocean distributions, or improving the representation by the coded-wire tag (CWT) hatchery indicator stocks. These changes increased the resolution from 30 modelled stocks to 41. Phase I also updated escapement and terminal run estimates for multiple stocks, reviewed and revised the CWT codes used for modelled stocks, and updated the Ricker  $\alpha$  productivity parameter for multiple stocks. In the revised stratification of Phase II, several larger fisheries were split in the Model, especially terminal area fisheries. These changes increased the resolution of fisheries from 25 to 48.

The intent of this report is to document the recent BPC that led to the PSC Chinook Model (Phase II). Future improvements that have been identified are described in the “recommendations” section. This report is intended as final documentation of the Phase II BPC, however, the recommendations section will be maintained as a living document that details subsequent recommendations and changes to the PSC Chinook Model.

This report is separated into three volumes. Volume One, this document, compares base period ERs with the observed catches in the previous BPC (9806) and the catches in Phase II BPC fisheries. Volume Two contrasts base period CWT recoveries, base period cohort sizes, maturation rates and adult equivalents, and base period ERs with the model stocks from the previous BPC (9806) and the Phase II BPC. Volume Three contrasts model parameters and programs from the 9806 BPC with those of the Phase II BPC. The following naming convention is used for the section headings:

9806 stock name (acronym): Phase II stock name(s) (acronym)

The following statements apply where appropriate:

1. Base CWT recoveries across multiple stocks were summed,
2. ERs across multiple fisheries were summed,
3. ERs across multiple stocks were averaged, and
4. Escapement and terminal run across multiple model stocks were summed.

## **2 Changes to the Model**

### **2.1 Fishery Stratification**

The Phase II BPC stratifies several fisheries and adds fisheries that were previously not incorporated (Table 1). The Washington/Oregon (WA/OR) troll and sport fisheries were divided into north and south of Cape Falcon. The North/Central British Columbia (B.C.) sport fishery was stratified into North and Central areas, and the northern sport fishery was divided into AABM and ISBM components. The ISBM component of West Coast Vancouver Island (WCVI) sport fishery was newly incorporated. The Strait of Georgia sport fishery was geographically divided into Strait of Georgia and Juan de Fuca sport fisheries.

Previously, the “C files” that contained tag recoveries for each tag code had one generic terminal net fishery (“TERMINAL NET”) and one generic terminal sport fishery (“TERMINAL SPORT”), but these files did not represent the more specific geographical areas of CWT recoveries. To facilitate a uniform database structure for all recoveries, these generic fishery strata were replaced by geographically defined terminal fishery areas (Table 1).

Table 1—9806 vs. Phase II arranged by old fishery number and gear. Strata that changed are in white.

9806			Phase II		
#	Acronym	Fishery Name	#	Acronym	Fishery Name
<b>TROLL</b>					
1	ALASKA T	Alaska Troll	1	ALASKA T	Alaska Troll
2	NORTH T	North B.C. Troll	3	NORTH T	North B.C. Troll
3	CENTR T	Central B.C. Troll	4	CENTRAL T	Central B.C. Troll
4	WCVI T	West Coast Vancouver Island Troll	5	WCVI T	West Coast Vancouver Island Troll
5	WA/OR T	Washington/Oregon Troll	6	N FALCON T	North of Falcon Troll
	<i>Catches for these fisheries were not previously included in base period</i>		7	S FALCON T	South of Falcon Troll
6	GEO ST T	Georgia Strait Troll	8	GEO ST T	Georgia Strait Troll <sup>1</sup>
<b>NET</b>					
7	ALASKA N	Alaska Net	9	ALASKA N	Alaska Net
	<i>Catches for these fisheries were not previously included in base period</i>		2	TAK YAK N	Alaska Yakutat Terminal Net
			18	TAK TBR N	Alaska Transboundary River Terminal Net
8	NORTH N	North B.C. Net	10	NORTH N	North B.C. Net
9	CENTR N	Central B.C. Net	11	CENTRAL N	Central B.C. Net
10	WCVI N	West Coast Vancouver Island Net	12	WCVI N	West Coast Vancouver Island Net
11	J DE F N	Juan De Fuca Net	13	J DE F N	Juan de Fuca Net
12	PGTNTH N	Puget Sound North Net	14	PGSDN N	Puget Sound North Net
13	PGTSTH N	Puget Sound Other Net	15	PGSDO N	Puget Sound Other Net
14	WASH CST N	Washington Coast Net	16	WASH CST N	Washington Coast Net
15	TERMINAL NET	Terminal Net	17	TCOL R N	Columbia River Net
			23	TPS FN	Puget Sound Freshwater Net
			24	TWAC FN	Washington Coast Freshwater Net
	<i>Catches for these fisheries were not previously included in base period</i>		19	TBC TBR FN	Canada Transboundary River Freshwater Net
			20	TCENTRAL FN	Central B.C. Freshwater Net
			21	TGEO ST FN	Georgia Strait Freshwater Net <sup>1</sup>
			22	TFRAS FN	Fraser Freshwater Net
			37	TYK YAK FN	Canada Yakutat Freshwater Net <sup>2</sup>
16	JOHN ST N	Johnstone Strait Net	25	JNST N	Johnstone Strait Net
17	FRASER N	Fraser Net	26	FRASER N	Fraser Net

-continued-

Table 1 – Page 2 of 2.

9806			Phase II		
#	Acronym	Fishery Name	#	Acronym	Fishery Name
<b>SPORT</b>					
18	ALASKA S	Alaska Sport	27	ALASKA S	Alaska Sport
19	NOR/CEN S	North/Central B.C. Sport	28	CBC S	Central B.C. Sport
20	WCVI S	West Coast Vancouver Island Sport	29	NBC AABM S	North B.C. AABM Sport
	<i>Catches for these fisheries were not previously included in base period</i>		30	NBC ISBM S	North B.C. ISBM Sport
21	WASH OCN S	Washington Coast Sport	31	WCVI AABM S	West Coast Vancouver Island AABM Sport
	<i>Catches for these fisheries were not previously included in base period</i>		32	WCVI ISBM S	West Coast Vancouver Island ISBM Sport
22	PGTNTH S	Puget Sound North Sport	33	N FALCON S	North of Falcon Sport
23	PGTSTH S	Puget Sound Other Sport	34	S FALCON S	South of Falcon Sport
24	GEO ST S	Georgia Strait Sport	35	PGSDN S	Puget Sound North Sport
25	TERMINAL SPORT	Terminal Sport	36	PGSDO S	Puget Sound Other Sport
	<i>Catches for these fisheries were not previously included in base period</i>		38	GEO ST S	Georgia Strait Sport <sup>1</sup>
			39	BC JF S	B.C. Juan de Fuca Sport
			40	TCOL R S	Columbia River Sport
			41	TAK TBR S	Alaska Transboundary River Terminal Sport
			42	TNORTH FS	North B.C. Freshwater Sport
			43	TCENTRAL FS	Central B.C. Freshwater Sport
			44	TWCVI FS	West Coast Vancouver Island Freshwater Sport
			45	TFRASER FS	Fraser River Freshwater Sport
			46	TGS FS	Georgia Strait Freshwater Sport <sup>1</sup>
			47	TPS FS	Puget Sound Freshwater Sport
			48	TSF FS	South of Falcon Freshwater Sport

<sup>1</sup> Strait of Georgia fisheries are designated in the table as “Georgia Strait” but referenced throughout the rest of the document as Strait of Georgia to bring the naming convention in line with Fisheries and Oceans Canada naming structures.

<sup>2</sup> Canada Yakutat Freshwater Net encompasses Alsek River Chinook caught using angling gear in the Canadian portion of the river.



### 2.1.1 Changes in Base Period Calibration Parameters

Several parameters used in the BPC are contained within \*.BSE files. These include incidental mortality and drop-off mortality rates by fishery, as well as proportion non-vulnerable (PNV) factors by age and fishery. Proportion non-vulnerable is the proportion of each age class in a fishery which is not vulnerable to the gear. There were no changes in incidental and drop-off mortality rates, shown in \*.BSE Table 2.

*Table 2—Incidental and drop off mortality rates for legal and sublegal sized fish in the base period by fishery (CTC 2004).*

<b>Fisheries</b>	<b>Sublegal</b>	<b>Legal</b>	<b>Drop-off</b>
Alaska Troll	0.255	0.211	0.008
Other Troll	0.255	0.211	0.017
Net	0.900	0.900	0.000
Alaska & North Central British Columba Sport	0.123	0.123	0.036
Puget Sound Sport	0.123	0.123	0.145
Strait of Georgia & Juan de Fuca Sport	0.322	0.322	0.069
Other Sport	0.123	0.123	0.069

The changes in age-specific PNV factors are shown in Table 3 and Table 4 for pre-terminal and terminal fisheries, respectively.

*Table 3—Age-specific proportion non-vulnerable factors in pre-terminal fisheries. Strata that changed between the 9806 calibration and Phase II calibration are in white.*

Pre-terminal Fisheries											
9806						Phase II					
#	Acronym	Age 2	Age 3	Age 4	Age 5	#	Acronym	Age 2	Age 3	Age 4	Age 5
1	ALASKA T	0.5968	0.0691	0.0326	0.0086	1	ALASKA T	0.5968	0.0691	0.0326	0.0086
2	NORTH T	0.5938	0.6561	0.1036	0.0159	3	NORTH T	0.5938	0.6561	0.1036	0.0159
3	CENTR T	0.5981	0.6188	0.1154	0.0222	4	CENTRAL T	0.5981	0.6188	0.1154	0.0222
4	WCVI T	0.5974	0.6072	0.2139	0.0807	5	WCVI T	0.5974	0.6072	0.2139	0.0807
5	WA/OR T	0.5864	0.5010	0.1444	0.0633	6	N FALCON T	0.5864	0.5010	0.1444	0.0633
						7	S FALCON T	0.5864	0.5010	0.1444	0.0633
6	GEO ST T	0.4407	0.0222	0.0014	0.0102	8	GEO ST T	0.4407	0.0222	0.0014	0.0102
7	ALASKA N	0.1788	0.0478	0.0018	0.0000	9	ALASKA N	0.1788	0.0478	0.0018	0.0000
8	NORTH N	0.1932	0.0239	0.0013	0.0000	10	NORTH N	0.1932	0.0239	0.0013	0.0000
9	CENTR N	0.1886	0.0352	0.0039	0.0055	11	CENTRAL N	0.1886	0.0352	0.0039	0.0055
10	WCVI N	0.1603	0.0087	0.0018	0.0067	12	WCVI N	0.1603	0.0087	0.0018	0.0067
11	J DE F N	0.1603	0.0087	0.0018	0.0067	13	J DE F N	0.1603	0.0087	0.0018	0.0067
12	PGTNTH N	0.5322	0.0824	0.0149	0.0049	14	PGSDN N	0.5322	0.0824	0.0149	0.0049
13	PGTSTH N	0.5322	0.0824	0.0149	0.0049	15	PGSDO N	0.5322	0.0824	0.0149	0.0049
14	WASH CST N	0.5322	0.0824	0.0149	0.0049	16	WASH CST N	0.5322	0.0824	0.0149	0.0049
16	JOHN ST N	0.1469	0.0222	0.0014	0.0102	25	JNST N	0.1469	0.0222	0.0014	0.0102
17	FRASER N	0.1710	0.0567	0.0027	0.0102	26	FRASER N	0.1710	0.0567	0.0027	0.0102
18	ALASKA S	0.9947	0.6911	0.0326	0.0086	27	ALASKA S	0.5968	0.6911	0.0326	0.0086
19	NOR/CEN S	0.8828	0.0078	0.0006	0.0000	28	CBC S	0.8828	0.0078	0.0006	0.0000
						29	NBC AABM S	0.8828	0.0078	0.0006	0.0000
						30	NBC ISBM S	0.8828	0.0078	0.0006	0.0000
20	WCVI S	0.5690	0.0030	0.0008	0.0022	31	WCVI AABM S	0.5690	0.0030	0.0008	0.0022
						32	WCVI ISBM S	0.5690	0.0030	0.0008	0.0022
21	WASH OCN S	0.5322	0.0824	0.0149	0.0049	33	N FALCON S	0.5322	0.0824	0.0149	0.0049
						34	S FALCON S	0.5322	0.0824	0.0149	0.0049
22	PGTNTH S	0.8101	0.0098	0.0027	0.0014	35	PGSDN S	0.8101	0.0098	0.0027	0.0014
23	PGTSTH S	0.8101	0.0098	0.0027	0.0014	36	PGSDO S	0.8101	0.0098	0.0027	0.0014
24	GEO ST S	0.1008	0.0051	0.0014	0.0000	38	GEO ST S	0.1008	0.0051	0.0014	0.0000
						39	BC JF S	0.1008	0.0051	0.0014	0.0000

Table 4—Age-specific proportion non-vulnerable factors in terminal fisheries. Strata that changed between the 9806 calibration and Phase II calibration are in white.

Terminal Fisheries											
9806						Phase II					
#	Acronym	Age 2	Age 3	Age 4	Age 5	#	Acronym	Age 2	Age 3	Age 4	Age 5
15	TERMINAL NET	0.1064	0.0824	0.0149	0.0049	2	TAK YAK N	0.1064	0.0824	0.0149	0.0049
						17	TCOL R N	0.1064	0.0824	0.0149	0.0049
						18	TAK TBR N	0.1064	0.0824	0.0149	0.0049
						19	TBC TBR FN	0.1064	0.0824	0.0149	0.0049
						20	TCENTRAL FN	0.1064	0.0824	0.0149	0.0049
						21	TGEO ST FN	0.1064	0.0824	0.0149	0.0049
						22	TFRAS FN	0.1064	0.0824	0.0149	0.0049
						23	TPS FN	0.1064	0.0824	0.0149	0.0049
						24	TWAC FN	0.1064	0.0824	0.0149	0.0049
						37	TYK YAK FN	0.1064	0.0824	0.0149	0.0049
25	TERMINAL SPORT	0.9901	0.0051	0.0014	0.0000	40	TCOL R S	0.9901	0.0051	0.0000	0.0000
						41	TAK TBR S	0.1139	0.0013	0.0000	0.0000
						42	TNORTH FS	0.1139	0.0013	0.0000	0.0000
						43	TCENTRAL FS	0.1139	0.0013	0.0000	0.0000
						44	TWCVI FS	0.1139	0.0013	0.0000	0.0000
						45	TFRASER FS	0.1139	0.0013	0.0000	0.0000
						46	TGS FS	0.1139	0.0013	0.0000	0.0000
						47	TPS FS	0.1139	0.0013	0.0000	0.0000
						48	TSF FS	0.1139	0.0013	0.0000	0.0000

## 2.1.2 Terminal Fishery Designations

The \*.BSE file contains many of the parameters used in the Model, including a flag designating terminal fisheries for each stock and age combination. Table 5 represents a visualization of the terminal fisheries for each stock and age combination used in the 9806 BPC. Table 6 and Table 7 represent the Phase II combinations. The Phase II stock composition shown in Table 6 and Table 7 varies from those stocks shown in the 9806 calibration due to increased stock strata (see TCCHINOOK (21)-02 V2 for details).

Table 5—Presence of terminal fisheries for stock and age combinations in the 9806 calibration (green highlighted cells).

Stock/Fishery/Age Combinations with AEQ=1 (Terminal) (from Clb0401.bse)															
	Troll	Net											Sport		
9806 Fishery #	1-6	7	8	9	10	11	12	13	14	15	16	17	18-24	25	
9806 Fishery		ALASKA N	NORTH N	CENTR N	WCVI N	J DE F N	PGTNTH N	PGTSTH N	WA CST N	TERMINAL NET	JOHN ST N	FRASER N		TERMINA SPORT	
Age 4&5 Terminal															
Stock	Terminal Fishery for all ages of stock														
Alaska South SE															
North/Centr															
Fraser Early															
Fraser Late															
WCVI Hatchery															
WCVI Natural															
Georgia St. Upper															
Georgia St. Lwr Nat															
Georgia St. Lwr Hat															
Nooksack Fall															
Pgt Sd Fing															
Pgt Sd NatF															
Pgt Sd Year															
Nooksack Spring															
Skagit Wild															
Stillaguamish Wild															
Snohomish Wild															
WA Coastal Hat															
UpRiver Brights															
Spring Creek Hat															
Lwr Bonneville Hat															
Fall Cowlitz Hat															
Lewis R Wild															
Willamette R															
Spr Cowlitz Hat															
Col R Summer															
Oregon Coast															
WA Coastal Wild															
Lyons Ferry															
Mid Col R Brights															

Table 6—Presence of terminal fisheries for stock and age combinations found in the Phase II calibration of troll, sport, and freshwater sport fisheries (green highlighted cells).

Note: stock strata have been updated to reflect the Phase II stocks (see TCCHINOOK (21)-02 V2 for more information).

Stock/Fishery/Age Combinations with AEQ=1 (Terminal) -- fisheries ordered as in Table 3, from .BSE file for V1.28.												
	Troll		Sport			Freshwater Sport						
Phase II Fishery #	1,3-8		27-39	40	41	42	43	44	45	46	47	48
Phase II Fishery				TCOL R S	TAK TBR S	TNORTH FS	TCENTRAL FS	TWCVI FS	TFRASER FS	TGS FS	TPS FS	TSF FS
Age 4&5 Terminal												
Stock	Terminal Fishery for all ages of stock											
Southern SE AK												
Northern SE AK												
Alsek												
Taku and Stikine												
Northern BC												
Central BC												
Fraser Spring 1.2												
Fraser Spring 1.3												
Fraser Summer Ocean-type 0.3												
Fraser Summer Stream-type 1.3												
Fraser Harrison Fall												
Fraser Chilliwack Fall Hatchery												
WCVI Hatchery												
WCVI Natural												
Upper Georgia Strait												
Puntledge Summers												
Lower Georgia Strait												
Middle Georgia Strait												
Nooksack Fall												
Pgt Sd Fing												
Pgt Sd NatF												
Pgt Sd Year												
Nooksack Spring												
Skagit Wild												
Stillaguamish Wild												
Snohomish Wild												
WA Coastal Hat												
WA Coastal Wild												
Willamette R												
Spr Cowlitz Hat												
Col R Summer												
UpRiver Brights												
Spring Creek Hat												
Lwr Bonneville Hat												
Fall Cowlitz Hat												
Lewis R Wild												
Lyons Ferry												
Mid Col R Brights												
North Oregon Coast												
Mid-Oregon Coast												
Yakutat Forelands												

Table 7—Presence of terminal fisheries for stock and age combinations found in the Phase II calibration of net and freshwater net fisheries (green highlighted cells).

Note: stock strata have been updated to reflect the Phase II stocks (see TCCHINOOK (21)-02 V2 for more information).

Stock/Fishery/Age Combinations with AEQ=1 (Terminal) -- fisheries ordered as in Table 3, from .BSE file for V1.28.																				
	Net													Freshwater Net						
Phase II Fishery #	9	2	18	10	11	12	13	14	15	16	17	25	26	23	24	19	20	21	22	37
Phase II Fishery	ALASKA N	TAK YAK N	TAK TBR N	NORTH N	CENTRAL N	WCVI N	J DE F N	PGSDN N	PGSDO N	WASH CST N	TCOL N	JNST N	FRASER N	TPS FN	TWAC FN	TBC TBR FN	TCENTRAL FN	TGEO ST FN	TFRAS FN	TYK YAK FN
Age 4&5 Terminal																				
Stock	Terminal Fishery for all ages of stock																			
Southern SE AK																				
Northern SE AK																				
Alsek																				
Taku and Stikine																				
Northern BC																				
Central BC																				
Fraser Spring 1.2																				
Fraser Spring 1.3																				
Fraser Summer Ocean-type 0.3																				
Fraser Summer Stream-type 1.3																				
Fraser Harrison Fall																				
Fraser Chilliwack Fall Hatchery																				
WCVI Hatchery																				
WCVI Natural																				
Upper Georgia Strait																				
Puntledge Summers																				
Lower Georgia Strait																				
Middle Georgia Strait																				
Nooksack Fall																				
Pgt Sd Fing																				
Pgt Sd NatF																				
Pgt Sd Year																				
Nooksack Spring																				
Skagit Wild																				
Stillaguamish Wild																				
Snohomish Wild																				
WA Coastal Hat																				
WA Coastal Wild																				
Willamette R																				
Spr Cowlitz Hat																				
Col R Summer																				
UpRiver Brights																				
Spring Creek Hat																				
Lwr Bonneville Hat																				
Fall Cowlitz Hat																				
Lewis R Wild																				
Lyons Ferry																				
Mid Col R Brights																				
North Oregon Coast																				
Mid-Oregon Coast																				
Yakutat Forelands																				

### 2.1.3 Fishery Policy Methods

In addition to the \*.BSE file, each model fishery's exploitation rates and catch quotas or ceilings are controlled using the fishery policy (\*.FP) and ceiling strategy (\*.CEI) files, respectively. Table 8 represents \*.CEI file and \*.FP file details for Phase II for troll and net fisheries, and Table 9 represents details from the sport fisheries in Phase II. In the \*.FP file, stock and year specific scale factors for ERs are specified for each fishery. FP scalars adjust the base period harvest rates to account of changes in time and area openings and size limits when legal harvest is calculated. The \*.CEI file contains observed catch for fisheries modeled as ceiling or catch quota fisheries (Table 10). In the fishery descriptions throughout the document, reported catch figures are created from the \*.CEI files.

*Table 8— \*.CEI and \*.FP files detail for the Phase II calibration for troll and net fisheries. Dark green cells indicate fishery is controlled with a \*.CEI file. Color coding in the “Years” column indicate the same years present in the \*.FP files.*

#	Phase II Fishery	Ceiling File	Years	Control Method	Stock Specific FPs <sup>1</sup> (Stock #)	FP Source
<b>Troll</b>						
1	ALASKA T		83 on	Both	All but 3, 33, 34, by age	SPFI-to-FPA program
3	NORTH T		83-84, 99 on	Both	9,13,14, 32,39,40	HRJ-to-FPA program
4	CENTRAL T		83-84	Both		HRJ-to-FPA program
5	WCVI T		83-84, 92-93, 00-on	Both	13-14, 19-26, 29-40	HRJ-to-FPA program
6	N FALCON T		83-84	Both		HRJ-to-FPA program
7	S FALCON T		83-84	Both		HRJ-to-FPA program
8	GEO ST T		83-84	Both		HRJ-to-FPA program
<b>Net</b>						
9	ALASKA N		83-84	Both		HRJ-to-FPA program
2	TAK YAK N		83 on	FP	3,41	External
18	TAK TBR N		83 on	FP		External
10	NORTH N		83 on	Both	5	External
11	CENTRAL N		83 on	Both	6	External
12	WCVI N		83 on	Both	13,14	External
13	J DE F N		83-84	Both		HRJ-to-FPA program
14	PGSDN N		83 on	Both	19-22,24-26	External
15	PGSDO N		83 on	FP	19-22,24-26	External
16	WASH CST N		All years	Base		All 1.00
17	TCOL R N		83 on	Ext FP	29-38	External Adjusted FP
23	TPS FN		All years	Base		All 1.00
24	TWAC FN		83 on	FP	27,28	All 1.00
19	TBC TBR FN		83 on	FP		External
20	TCENTRAL FN		All years	Base		All 1.00
21	TGEO ST FN		83 on	FP	17	External
22	TFRAS FN		All years	Base		All 1.00
37	TYK YAK FN		83 on	Ext FP		External
25	JNST N		83-84	Both		HRJ-to-FPA program
26	FRASER N		83 on	FP	7-12	Hybrid

<sup>1</sup> Stock specific fishery policy (FP).

Table 9—\*.CEI and \*.FP files detail for the Phase II calibration for sport fisheries. Dark green cells indicate fishery is controlled with a \*.CEI file. Color coding in the “Years” column indicate the same years present in the \*.FP files.

#	Phase II Fishery	Ceiling File	Years	Control Method	Stock Specific FPs <sup>1</sup> (Stock #)	FP Source
<b>Sport</b>						
27	ALASKA S		83-84	Both		HRJ-to-FPA program
28	CBC S		All years	Ceiling		All 1.00
29	NBC AABM S		All years	Ceiling		All 1.00
30	NBC ISBM S		All years	Base		All 1.00
31	WCVI AABM S		All years	Ceiling		All 1.00
32	WCVI ISBM S		83-84	Both		HRJ-to-FPA program
33	N FALCON S		83-84	Both		HRJ-to-FPA program
34	S FALCON S		All years	Ceiling		All 1.00
35	PGSDN S		83-84	Both		HRJ-to-FPA program
36	PGSDO S		83-84	Both		HRJ-to-FPA program
38	GEO ST S		83-84	Both		External
39	BC JF S		83-84	Both		HRJ-to-FPA program
40	TCOL R S		83 on	Ext FP	29-38	HRJ-to-FPA program
41	TAK TBR S		83 on	Ext FP		External Adjusted FP
42	TNORTH FS		All years	Base		External
43	TCENTRAL FS		All years	Base		All 1.00
44	TWCVI FS		All years	Base		All 1.00
45	TFRASER FS		83 on	FP	7-12	All 1.00
46	TGS FS		All years	Base		All 1.00
47	TPS FS		All years	Base		All 1.00
48	TSF FS		83-17	FP	39,40	External

<sup>1</sup> Stock specific fishery policy (FP).



Table 10—Ceiling catches found in Phase II \*.CEI files from 1979-2018.

Colors distinguish different gear types. Each colored block is shaded on a proportion of the total catch for that gear type, where full color (blue) of a troll fishery block is 540,000 fish, full color (green) of a net fishery block is 78,000 fish, and full color (yellow) of a sport fishery block is 370,000 fish.

Year	Troll (0-540,000)							Net (0-78,000)							Sport (0-370,000)											
	AK	NORTH	CENTRL	WCVI	N FALCON	S FALCON	GEO ST	AK	NORTH	CENTRL	WCVI	J DE F	PGSDN	JNST	AK	CBC	NBC AABM	WCVI AABM	WCVI ISBM	N FALCON	S FALCON	PGSDN	PGSDO	GEO ST	BC JF	
Year	1	3	4	5	6	7	8	9	10	11	12	13	14	25	27	28	29	31	32	33	34	35	36	38	39	
1979																										
1980																										
1981																										
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### 3 Pre-terminal Model Fisheries

#### 3.1 Alaska Troll (ALASKA T): Alaska Troll (ALASKA T)

##### 3.1.1 Description of Fishery and Changes

The Southeast Alaska (SEAK) troll fishery operates from Cape Suckling north of Yakutat to Dixon Entrance south of Ketchikan. Power troll vessels make up the majority of the fleet, however, hand troll vessels also participate in the fishery. The fishery operates on an accounting year that runs from October 1 through September 30. The fishery mainly targets Chinook and coho but there is a small component of the fleet that target chum and other salmon species as well.

##### 3.1.2 Base Period Exploitation Rate by Age

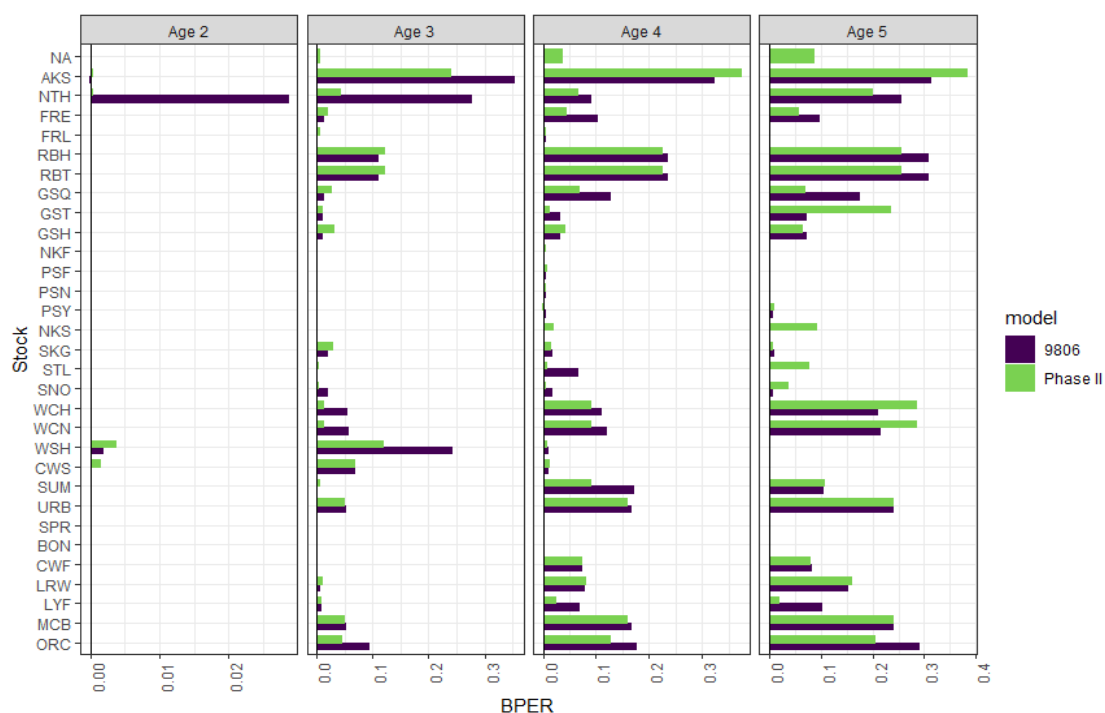


Figure 1—Base period exploitation rate by age for Alaska Troll.

### 3.1.3 Reported Catch

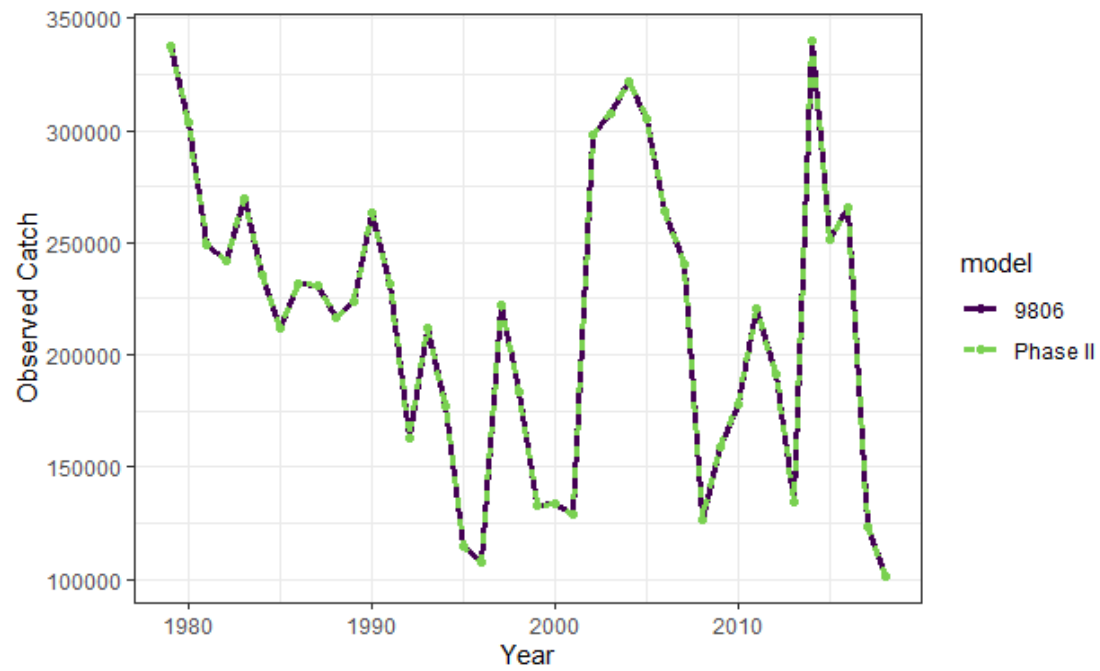


Figure 2—Reported catch for Alaska Troll.

## 3.2 North B.C. Troll (NORTH T): North B.C. Troll (NORTH T)

### 3.2.1 Description of Fishery and Changes

The North British Columbia (NBC) troll fishery operates from the U.S.-Canada border on the north edge of Dixon Entrance south to Queen Charlotte Sound. The area surrounds Haida Gwaii and its eastern boundary is the mainland north of Banks Island and the center of Hecate Strait South of Banks Island. The fleet is made up of power troll vessels with a number of effort limiting requirements including area licensing and vessel length restrictions. The NBC and Central B.C. (CBC) troll fishing areas are combined under a single area license (Area F). The Area F Chinook fishery has operated under an individual transferrable quota since 2005. The fishery operates on an accounting year that runs from October 1 through September 30. The fishery mainly targets Chinook and coho salmon but a small component of the fleet targets pink and coho salmon in the A-B line fishery along the U.S.-Canada border.

### 3.2.2 Base Period Exploitation Rate by Age

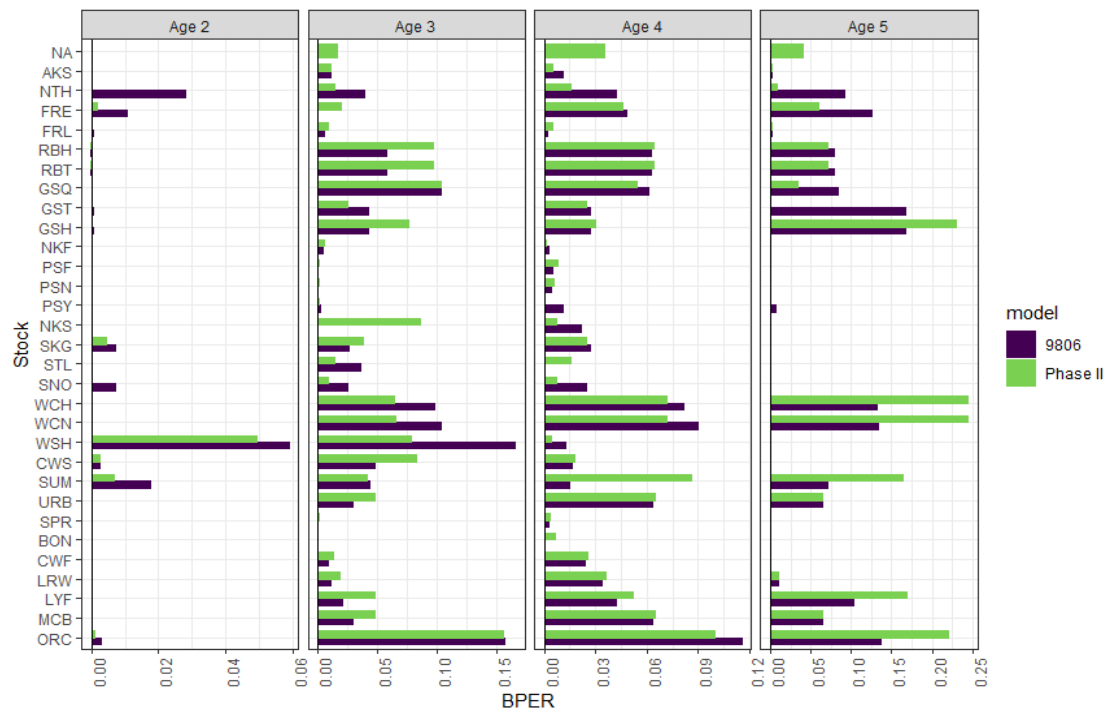


Figure 3—Base period exploitation rate by age for North Troll.

### 3.2.3 Reported Catch

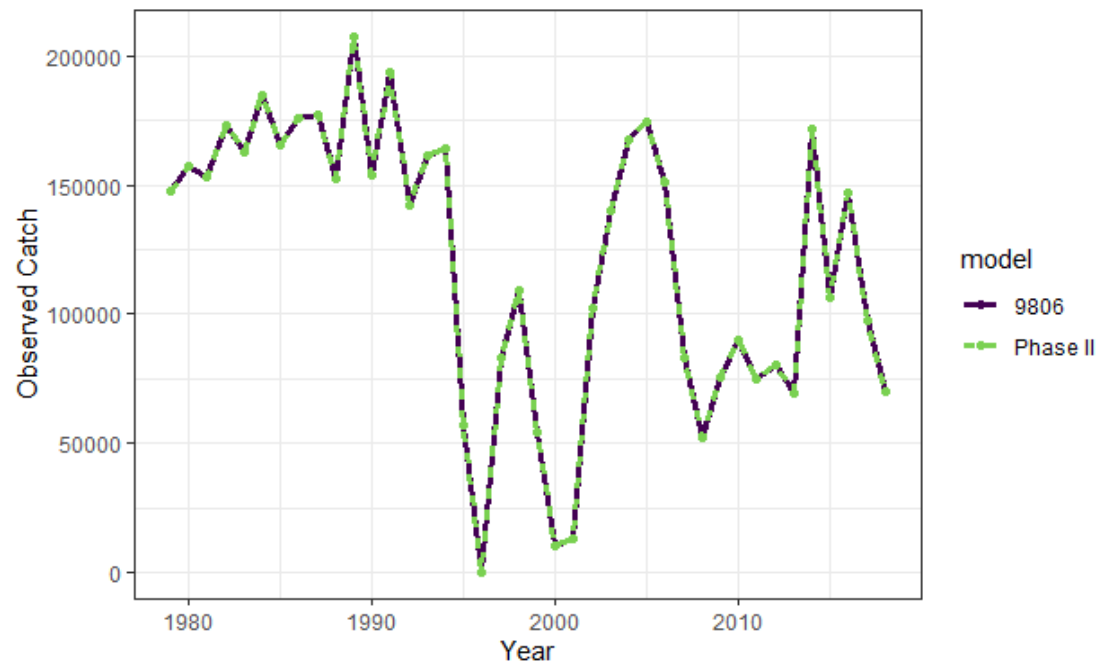


Figure 4—Reported catch for North Troll.

### 3.3 Central B.C. Troll (CENTR T): Central B.C. Troll (CENTRAL T)

#### 3.3.1 Description of Fishery and Changes

The CBC troll fishery operates from southeastern Hecate Strait to Cape Caution. The eastern boundary of the area is the mainland south of Banks Island. The northern half of the CBC area is bounded by the NBC area to the west. The fleet is made up of power troll vessels with a number of effort limiting requirements including area licensing and vessel length restrictions. The NBC and CBC troll fishing areas are combined under a single area license (Area F). The Area F Chinook fishery has operated under an individual transferrable quota since 2005. The fishery operates on an accounting year that runs from October 1 through September 30. The fishery mainly targets Chinook and coho salmon but has been limited since 2000 to protect stocks of concern.

#### 3.3.2 Base Period Exploitation Rate by Age

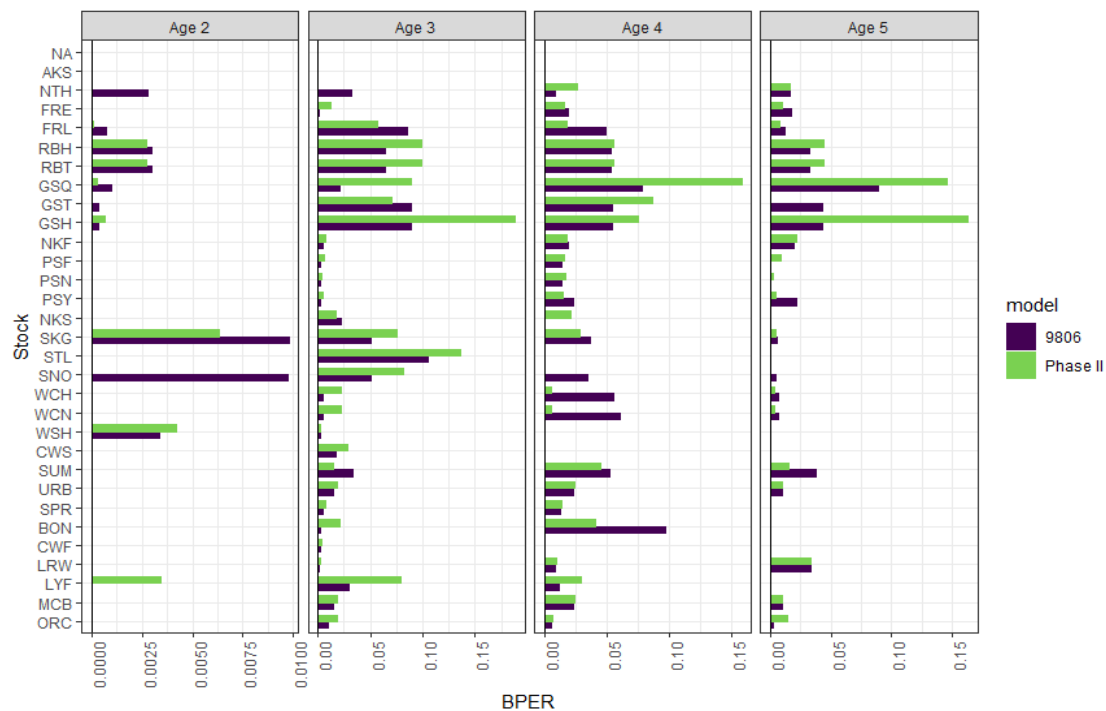


Figure 5—Base period exploitation rate by age for Central Troll.

### 3.3.3 Reported Catch



Figure 6—Reported catch for Central Troll.

### 3.4 West Coast Vancouver Island Troll (WCVI T): West Coast Vancouver Island Troll (WCVI T)

#### 3.4.1 Description of Fishery and Changes

The West Coast of Vancouver Island (WCVI) troll fishery is conducted between Pachena Point and northern Vancouver Island, in an area equivalent to the Canadian Pacific Fishery Management Areas (PFMA) 21, 23-27, and Areas 121, 123-127. The PST Chinook accounting year begins October 1 and ends September 30 which covers two domestic management planning years which run June 1 to May 31 annually. The fishery targets Chinook salmon and the retention of incidentally caught chum and pink salmon is generally permitted.

#### 3.4.2 Base Period Exploitation Rate by Age

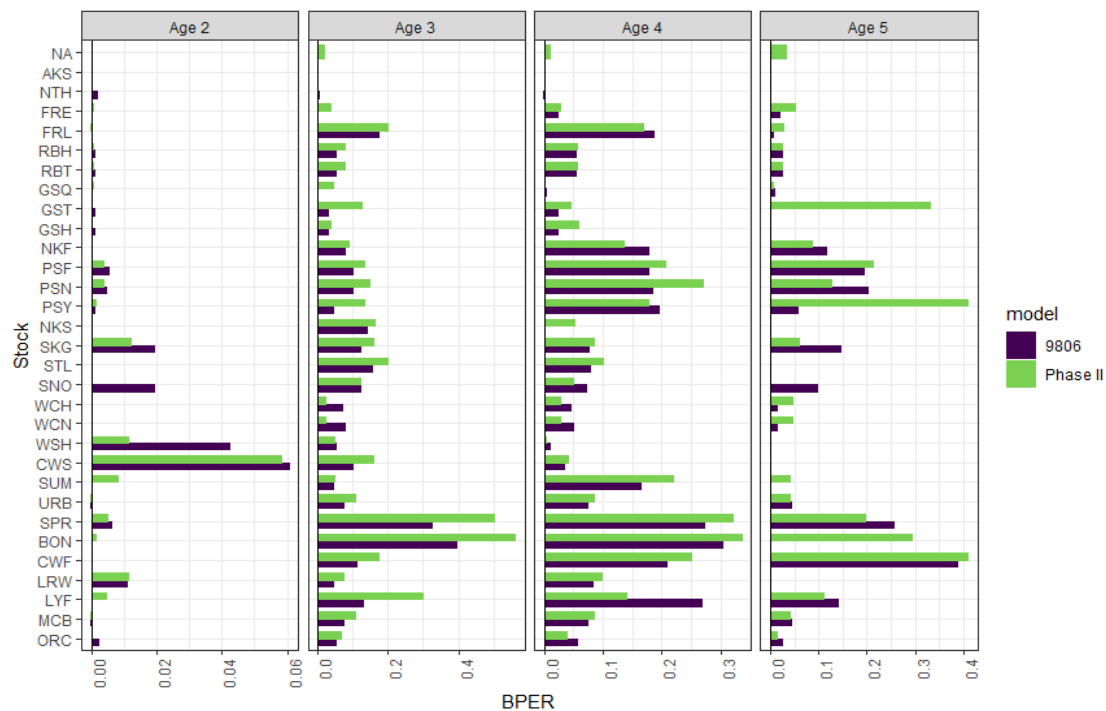


Figure 7—Base period exploitation rate by age for West Coast Vancouver Island Troll.



### 3.4.3 Reported Catch

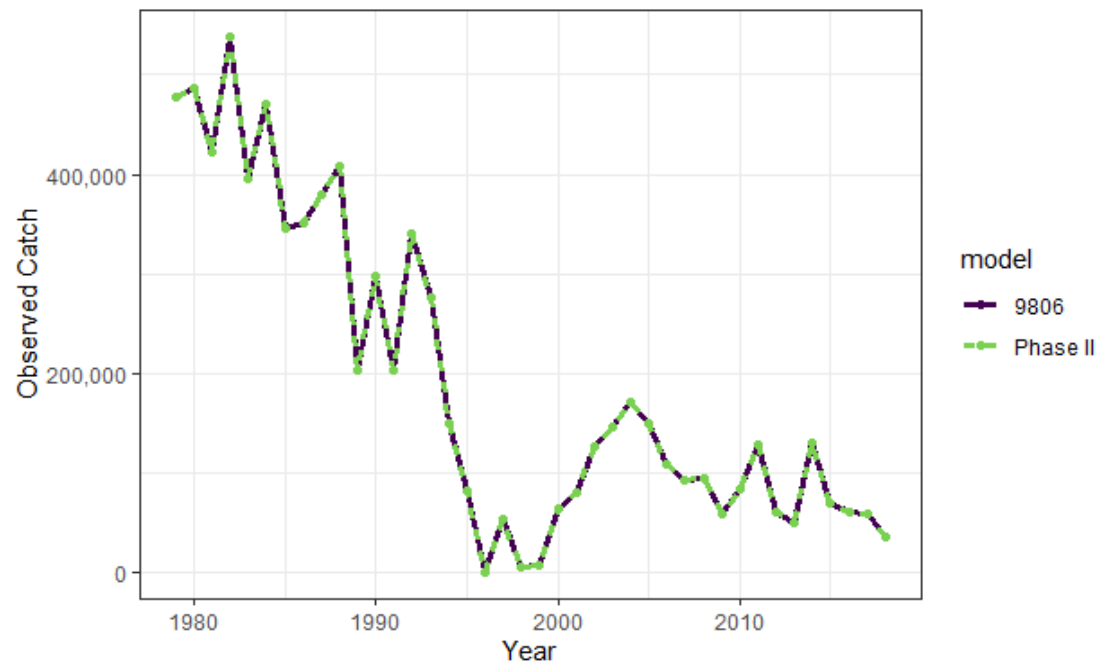


Figure 8—Reported catch for West Coast Vancouver Island Troll.

### 3.5 Washington/Oregon Troll (WA/OR T): North of Falcon Troll (N FALCON T) and South of Falcon Troll (S FALCON T)

#### 3.5.1 Description of Fishery and Changes

Ocean salmon troll fisheries off the coasts of Washington, Oregon, and California are managed by the Pacific Fishery Management Council (PFMC) and divided into two main areas, delineated by Cape Falcon, Oregon, located just south of the mouth of the Columbia River. The North of Cape Falcon area is comprised of four sub-areas and includes all waters off the Washington coast and approximately 50 miles of the northernmost Oregon coast. The remaining waters off the Oregon coast and those off the coast of California are managed as part of the South of Cape Falcon area, which is also broken down into multiple sub-areas. The “Washington/Oregon Troll” fishery of the 9806 Model included only fisheries that occurred in the North of Cape Falcon Area. In the Phase II Model, what was the “Washington/Oregon Troll” fishery is now the “North of Falcon Troll” fishery, and a new fishery, the “South of Falcon Troll” fishery, has been added, which represents the ocean troll fishery catch that occurs between Cape Falcon and Humbug Mountain on the southern Oregon coast. Troll fisheries that occur south of Humbug Mountain primarily catch Chinook stocks that are not included under the PST, thus catches in these fisheries are not included in the PST Chinook Model.



*Figure 9—The areas off of the Washington and Oregon coasts that are governed through PFMC fisheries management known as North of Falcon and South of Falcon management areas. Each is broken into smaller sub-areas for purposes of fine-scale management by tribal and state agencies, but those contiguous areas above (North) and below (South) of Cape Falcon are now consistently delineated in both PST and PFMC fisheries management.*

Ocean troll fisheries in the North of Falcon area that are managed by the PFMC occur primarily between May and September each year and include both treaty Indian and non-Indian fisheries. These fisheries have consistently been under non-selective regulations and are quota managed, with quotas determined annually each spring as part of the PFMC's salmon season setting process. Quotas vary annually based on forecasted abundances of Chinook stocks and are shaped to meet conservation objectives associated with Endangered Species Act (ESA)-listed stocks and the PFMC's Salmon Fishery Management Plan, as well as the Pacific Salmon Treaty. In recent years, the stocks most often responsible for limiting ocean troll quotas were ESA-listed Puget Sound and Lower Columbia River Fall tle Chinook. In addition to catch in PFMC managed fisheries, the North of Falcon troll model fishery also includes Chinook catch from smaller winter and summer treaty Indian troll fisheries that occur inside the Strait of Juan de Fuca.

South of Falcon troll fisheries between Cape Falcon and Humbug Mountain have occurred between March and November, however the majority of landings occur between May and September. These fisheries are managed as a season (no quota limits), as determined annually each spring as part of the PFMC's salmon season setting process. Season structure varies annually based on abundances of both Sacramento River Fall Chinook and Klamath River Fall Chinook populations and can be limited by ESA impacts to California Coastal, Lower Columbia tle, and Snake River wild Fall Chinook stocks as well as a few local coho stocks.

### 3.5.2 Base Period Exploitation Rate by Age



Figure 10—Base period exploitation rate by age for Washington/Oregon Troll (9806) and North of Falcon Troll (Phase II).

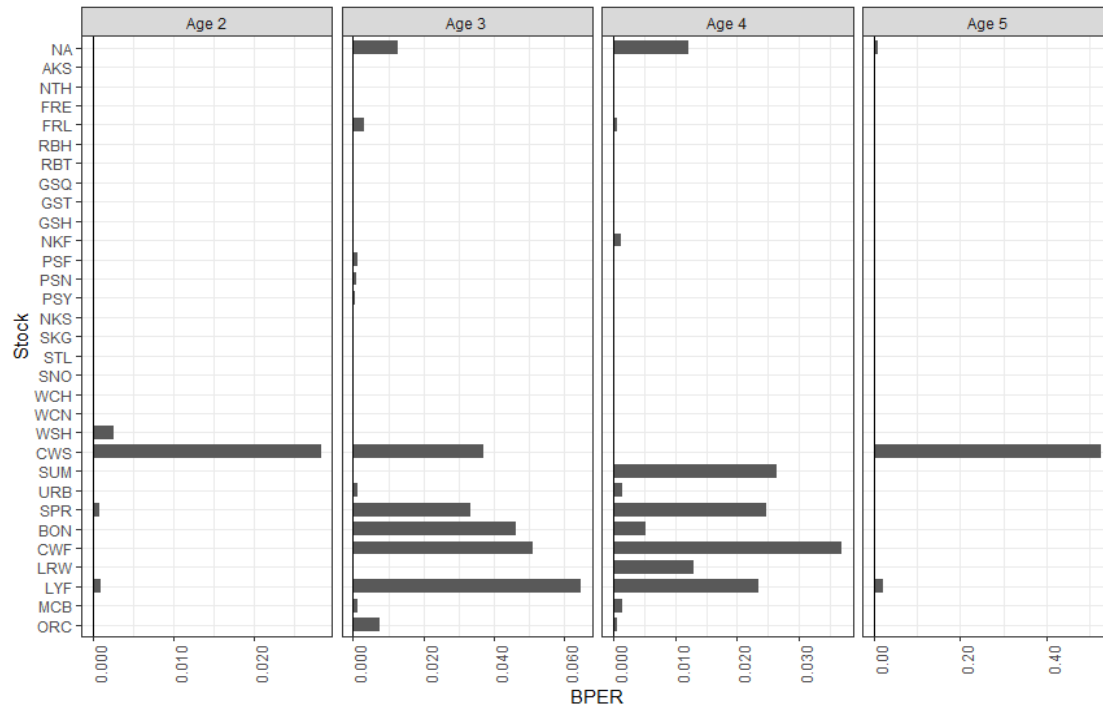


Figure 11—Base period exploitation rate by age for South of Falcon Troll (Phase II only).

### 3.5.3 Reported Catch

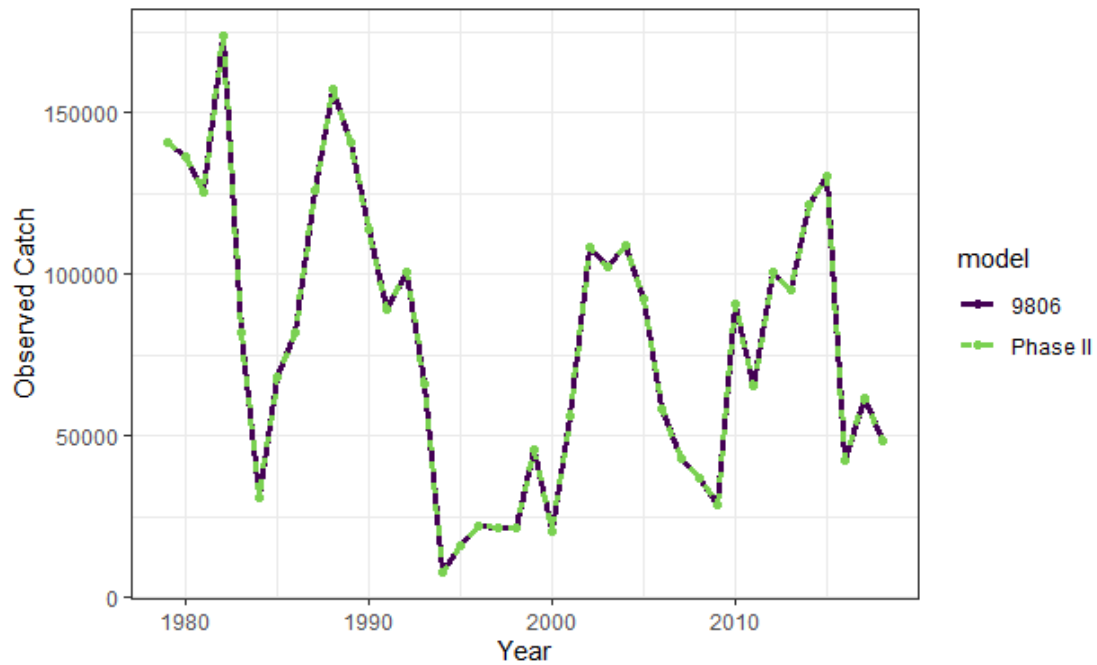


Figure 12—Reported catch for Washington/Oregon Troll (9806) and North of Falcon Troll (Phase II).

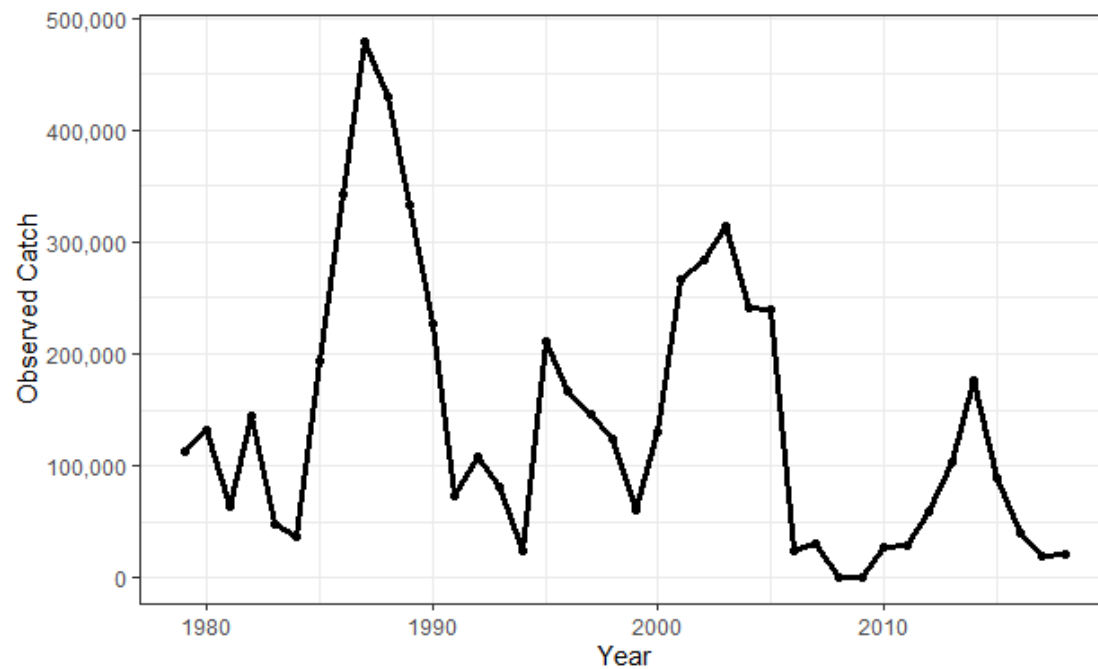


Figure 13—Reported catch for South of Falcon Troll (Phase II only).

## 3.6 Georgia Strait Troll (GEO ST T): Strait of Georgia Troll (GEO ST T)

### 3.6.1 Description of Fishery and Changes

The Strait of Georgia troll fishery operates in British Columbia in waters off the eastern shores of Vancouver Island from Cape Caution through to Victoria, B.C. The primary fishing areas include Johnstone Strait (portions of Pacific Fishery Management Areas [PFMA] 12 and 13) as well as the approach to the Fraser River (portions of PFMA 18 and 29). The fleet is made up of power troll vessels with a number of effort limiting requirements including area licensing, vessel length and gear restrictions. This is a single troll license area (Area H). The commercial troll fishery actively targeted Chinook and coho until 1995 when drastic declines in marine survival forced a complete closure. The fishery now only targets chum, sockeye and pink salmon; the retention of coho and Chinook is not permitted. The sockeye and pink salmon fishery is an individual transferrable quota (ITQ) fishery and takes place in July and August in Johnstone Strait and the approach to the Fraser River. The chum salmon fishery is an individual transferrable effort (ITE) fishery and takes place in Johnstone Strait from mid-October to early November.

### 3.6.2 Base Period Exploitation Rate by Age

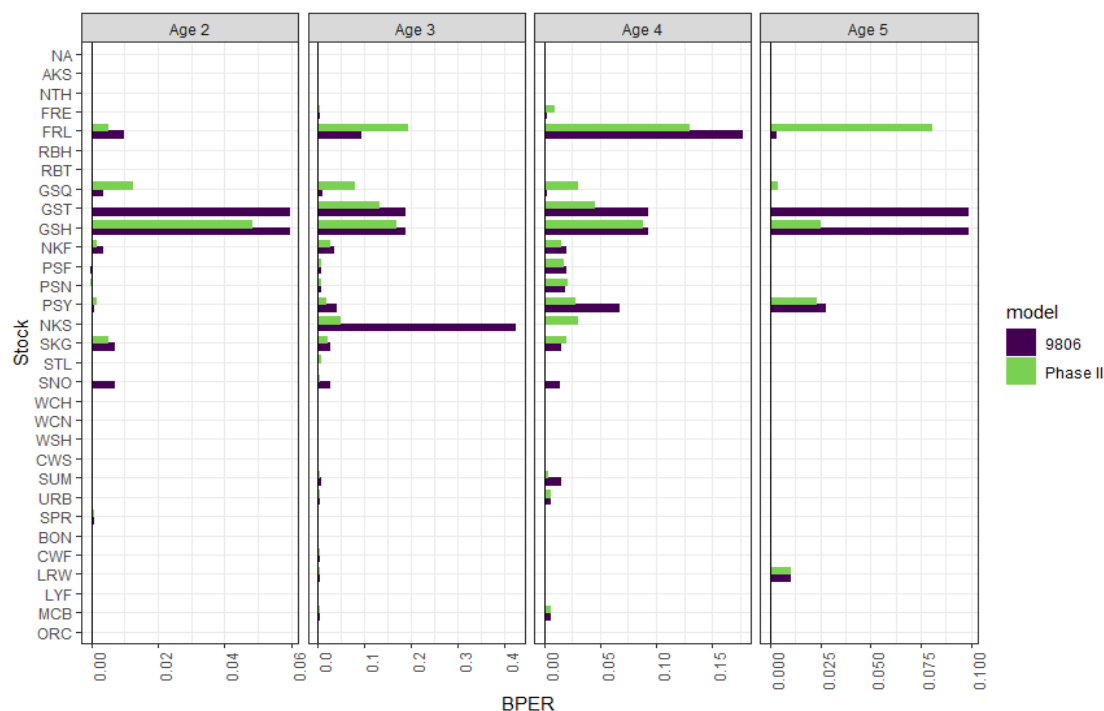


Figure 14—Base period exploitation rate by age for Strait of Georgia Troll.

### 3.6.3 Reported Catch

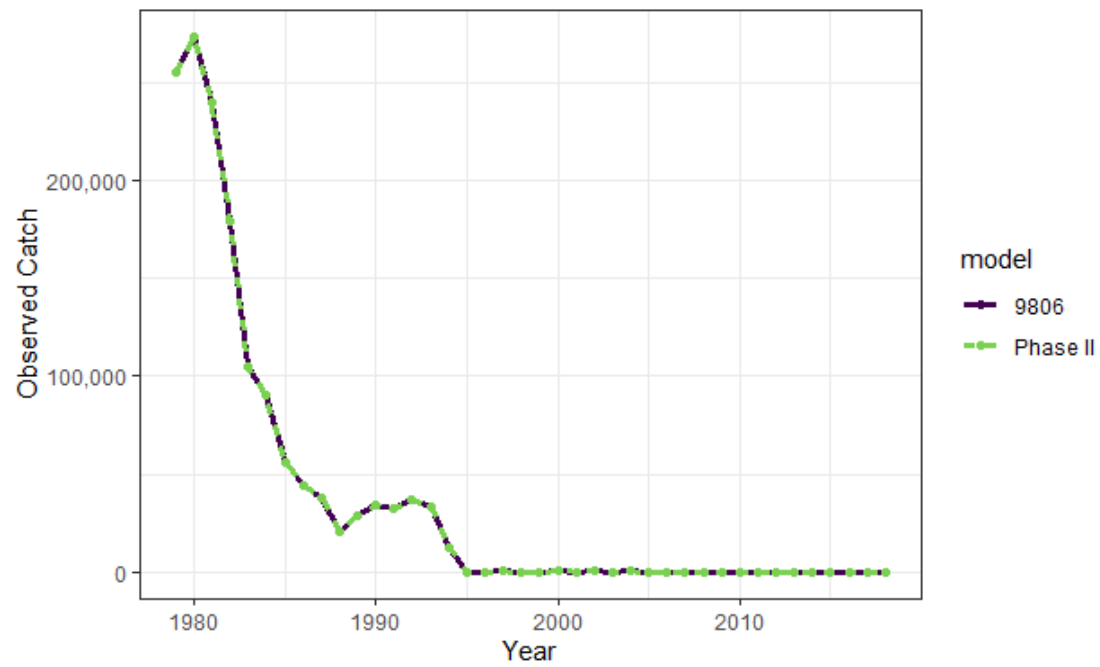


Figure 15—Reported catch for Strait of Georgia Troll.

## 3.7 Alaska Net (ALASKA N): Alaska Net (ALASKA N)

### 3.7.1 Description of Fishery and Changes

The Alaska net fishery includes two principal gear types: drift gillnet and purse seine. Drift gillnet fisheries are conducted primarily in inside waters of Southeast Alaska, and targets sockeye, chum, and pink salmon. There is also incidental harvest of Chinook salmon, which is mostly comprised of Alaska-origin hatchery stocks. Drift gillnet fisheries are conducted annually from the third weekend in June until early October. Purse seine fisheries are also conducted primarily in inside waters of Southeast Alaska and target chum and pink salmon. Similar to drift gillnet fisheries, there is incidental harvest of Chinook salmon in purse seine fisheries, which is primarily younger (ocean age-1 and -2) fish.

### 3.7.2 Base Period Exploitation Rate by Age

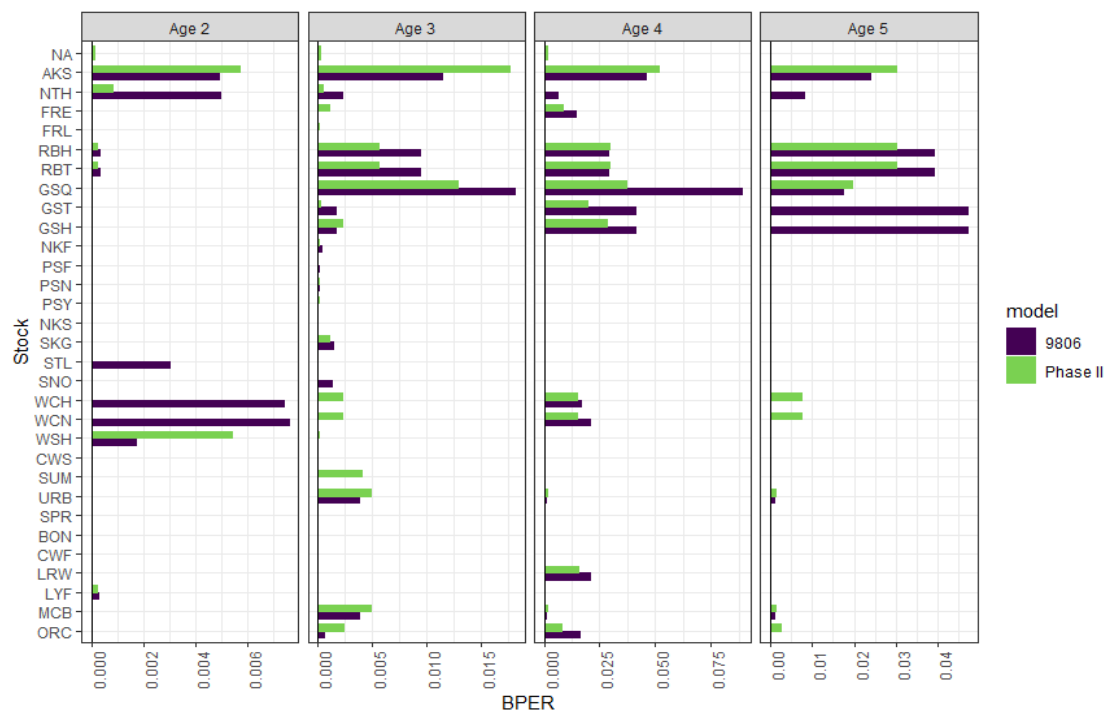


Figure 16—Base period exploitation rate by age for Alaska Net.



### 3.7.3 Reported Catch

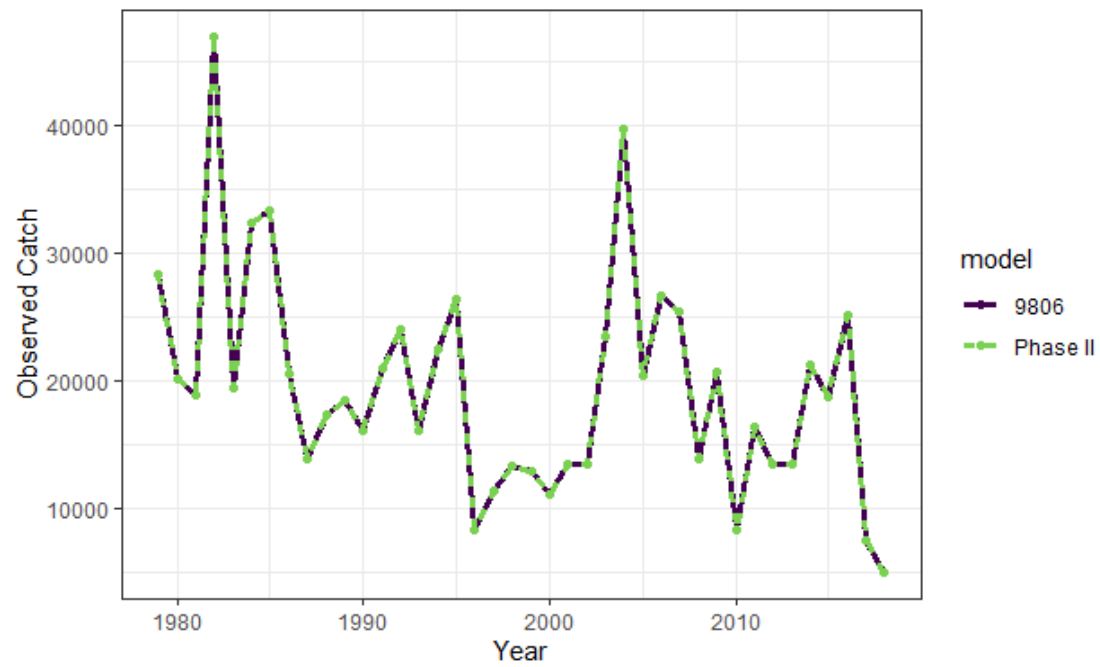


Figure 17—Reported catch for Alaska Net.

## 3.8 North B.C. Net (NORTH N): North B.C. Net (NORTH N)

### 3.8.1 Description of Fishery and Changes

The NBC Net fishery operates in British Columbia from the U.S.-Canada border south to Queen Charlotte Sound. The area includes the terminal areas of the Nass and Skeena Rivers and surrounds Haida Gwaii, with its eastern boundary the mainland north of Banks Island. The fleet is made up of seine and gillnet vessels with a number of effort limiting requirements including area licensing, vessel length and gear restrictions. Seine fisheries have not been permitted to retain Chinook salmon since 1998. The fishery operates in the summer on returning stocks. The fishery mainly targets sockeye, pink, and chum salmon but there is a Chinook directed gillnet fishery in the terminal area of the Skeena River when abundances permit.

### 3.8.2 Base Period Exploitation Rate by Age

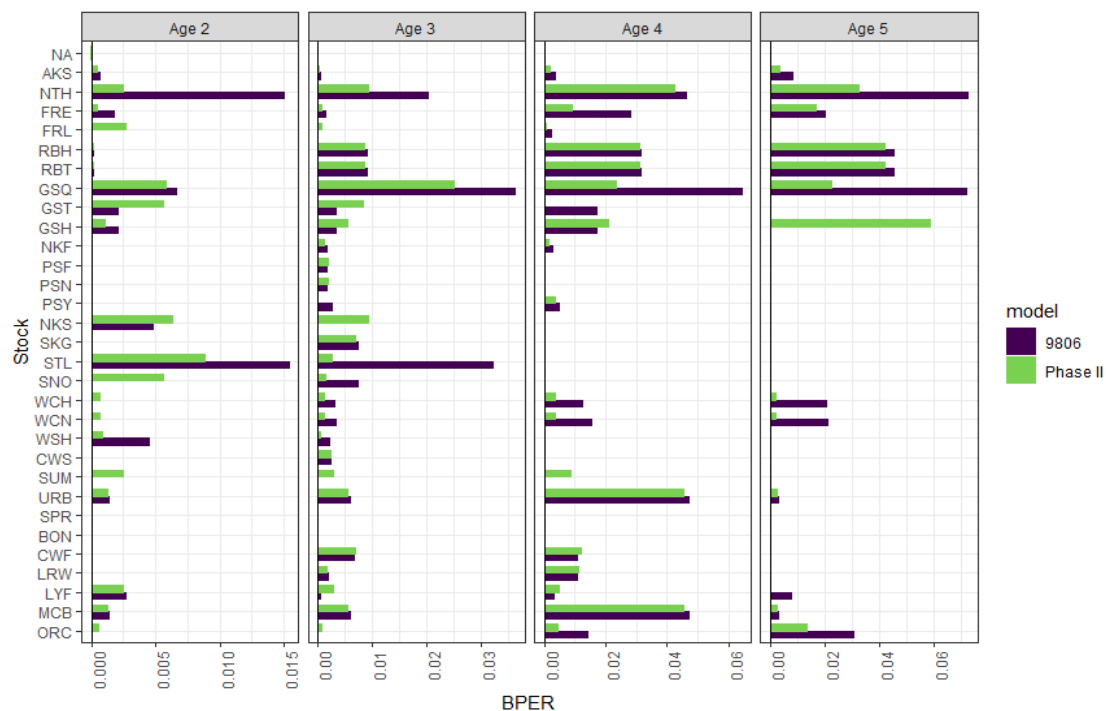


Figure 18—Base period exploitation rate by age for North Net.

### 3.8.3 Reported Catch

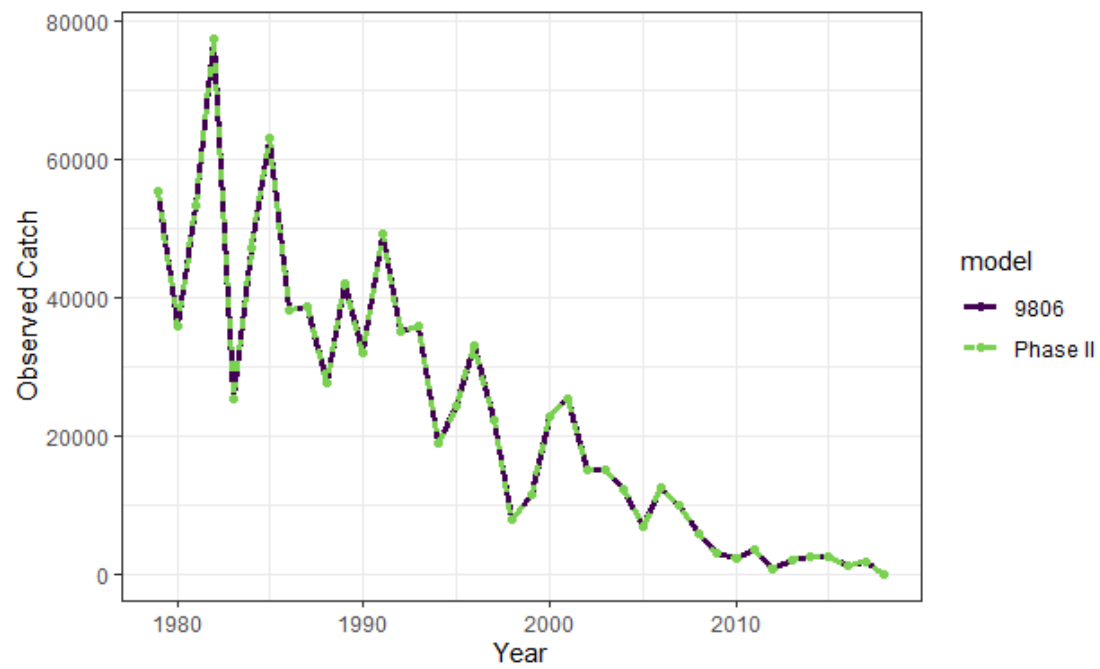


Figure 19—Reported catch for North Net.

## 3.9 Central B.C. Net (CENTRA N): Central B.C. Net (CENTRAL N)

### 3.9.1 Description of Fishery and Changes

The CBC Net fishery operates in British Columbia from Banks Island to Cape Caution. The area includes the terminal areas of the Kitimat, Dean and Bella Coola Rivers. The fleet is made up of seine and gillnet vessels with a number of effort limiting requirements including area licensing, vessel length and gear restrictions. Seine fisheries have not been permitted to retain Chinook salmon since 1998. The fishery operates in the summer. The fishery mainly targets sockeye, pink, and chum salmon but there is a Chinook directed gillnet fishery in the terminal area of the Bella Coola River.

### 3.9.2 Base Period Exploitation Rate by Age

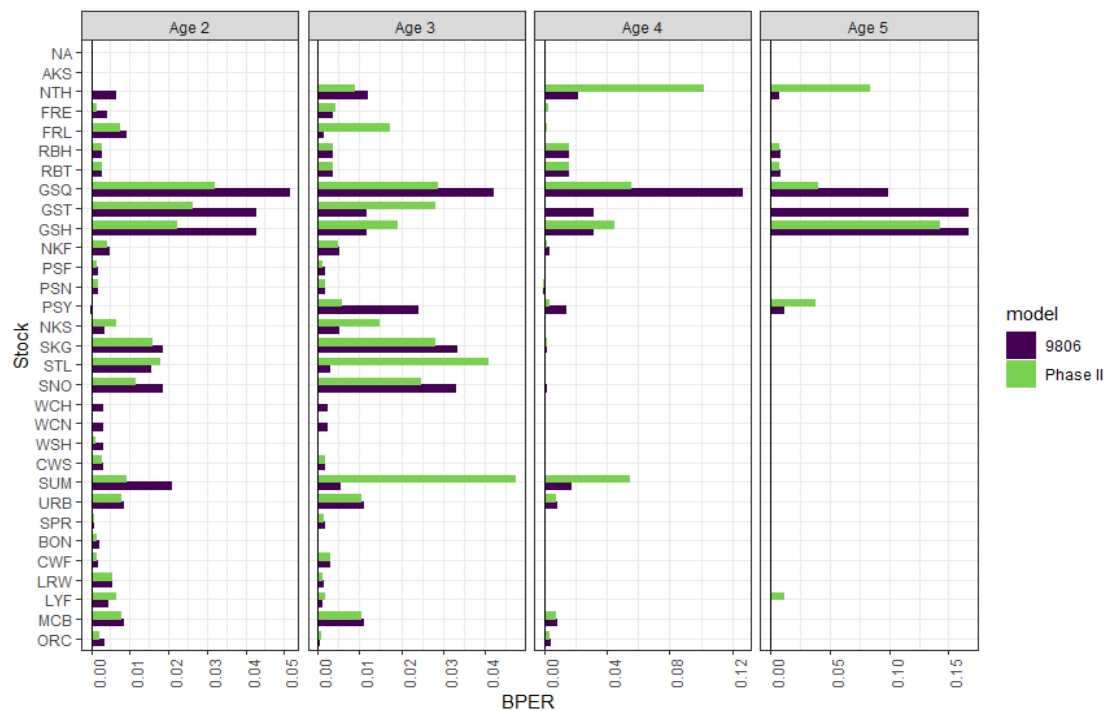


Figure 20—Base period exploitation rate by age for Central Net.

### 3.9.3 Reported Catch

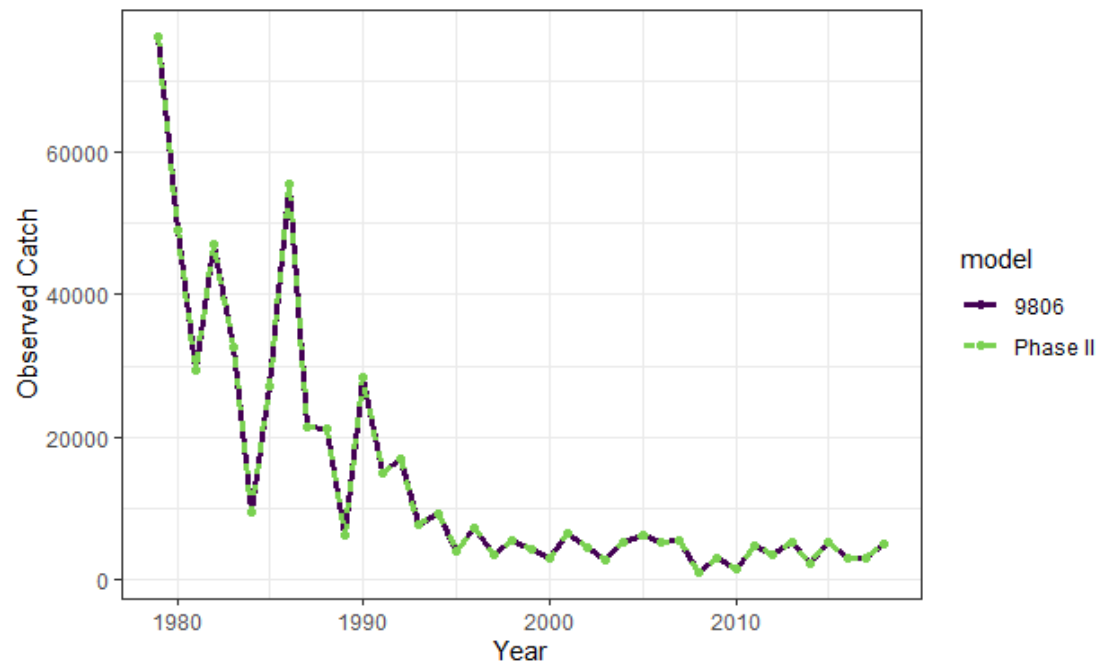


Figure 21—Reported catch for Central Net.

### **3.10 West Coast Vancouver Island Net (WCVI N): West Coast Vancouver Island Net (WCVI N)**

#### **3.10.1 Description of Fishery and Changes**

The West Coast of Vancouver Island (WCVI) Net fishery includes the inside areas on the west coast of Vancouver Island from PFMA 21 – 26, with a small offshore fishery in Area 121. There is only a small portion of offshore fishing in Area 121, which targets Nitinat chum in the fall. The general WCVI net fishery is Chinook non-retention (CNR) because Chinook are present in non-terminal areas. Fish are typically captured via gillnets, although some seine fishing does occur.

Area 23 also has a First Nations Economic Opportunity (EO) gillnet and drag seine fishery for sockeye, coho and Chinook. In the Chinook fishery, First Nations may capture up to 50% of the total commercial total allowable catch (TAC). These fisheries occur mainly in the Port Alberni Harbor and in the tidal portion of the Somass River.

The majority of net fisheries occur in the inside areas of WCVI. In the early summer, sockeye fisheries in Area 23 with Chinook bycatch are allowed, however, the fishery is CNR during the fall during chum fisheries. In Areas 23 and 25 (Barkley and Nootka Sound), there are targeted Chinook gill net fisheries in terminal areas. Area 23 also utilizes commercial seine nets. These fisheries open during the second week of August and occur one to two days per week until mid-September.

There are Limited Entry Fisheries that target chum in Areas 23 – 26. These fisheries open in late September until the end of October for four to eight vessels depending on the area. They are usually two-day openings on a weekly basis with a target harvest rate of 10-20%. The fishery is not open when forecasts fall below the lower reference point set by Fisheries and Oceans Canada (DFO).

### 3.10.2 Base Period Exploitation Rate by Age

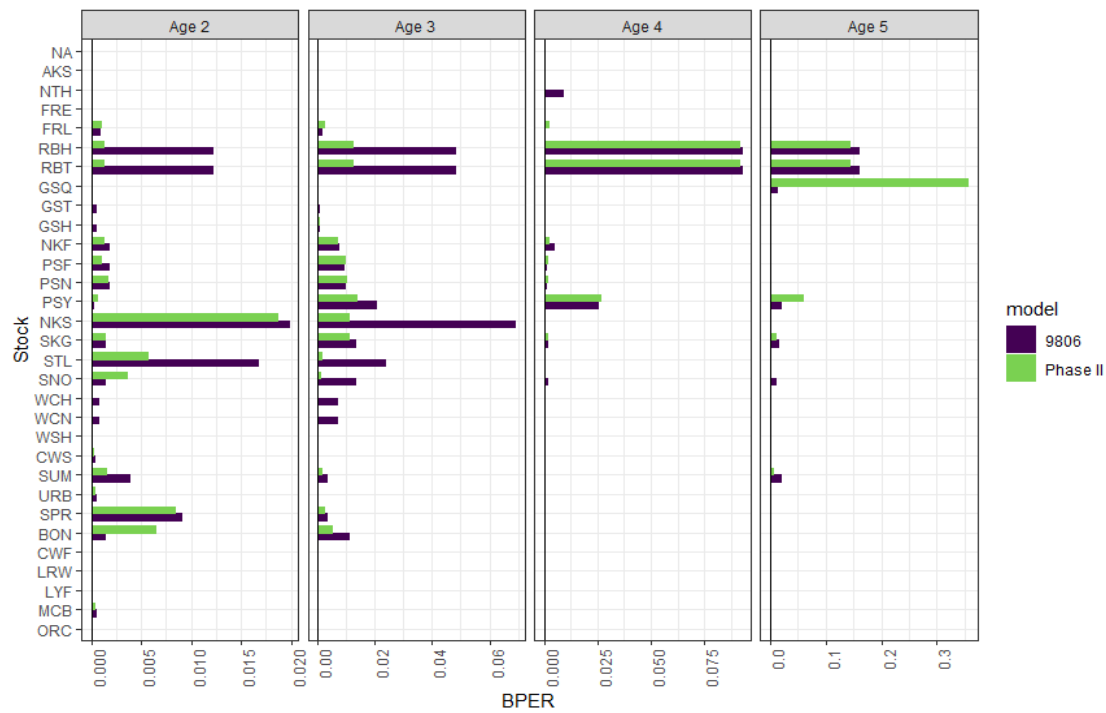


Figure 22—Base period exploitation rate by age for West Coast Vancouver Island Net.

### 3.10.3 Reported Catch

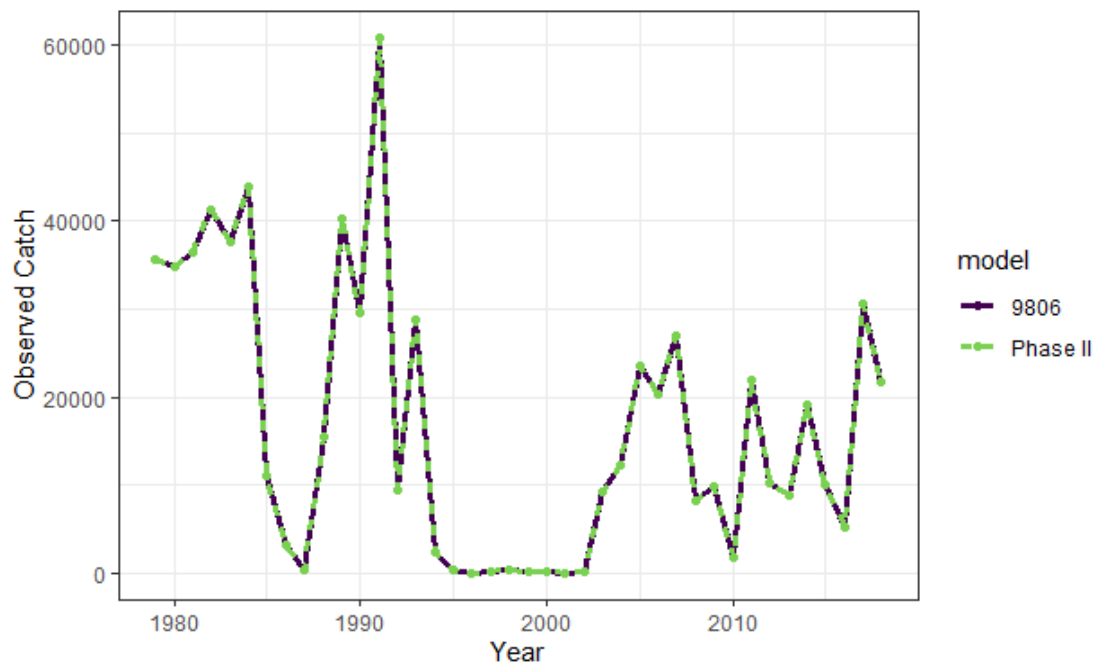


Figure 23—Reported catch for West Coast Vancouver Island Net.

### 3.11 Juan de Fuca Net (J DE F N): Juan de Fuca Net (J DE F N)

#### 3.11.1 Description of Fishery and Changes

The Juan de Fuca net fisheries operate in British Columbia in waters off the southern shore of Vancouver Island from Bonilla Point to Sombrio Point near Point Renfrew. The fishing area entails only portions of PFMA Subareas 20-1 and 20-3. The fleet is made up of seine vessels with a number of effort limiting requirements including area licensing, vessel length and gear restrictions. These fisheries only target Fraser sockeye and pink salmon; the retention of coho and Chinook is not permitted. The sockeye and pink salmon seine fisheries are ITQ fisheries and take place in July and August.

#### 3.11.2 Base Period Exploitation Rate by Age

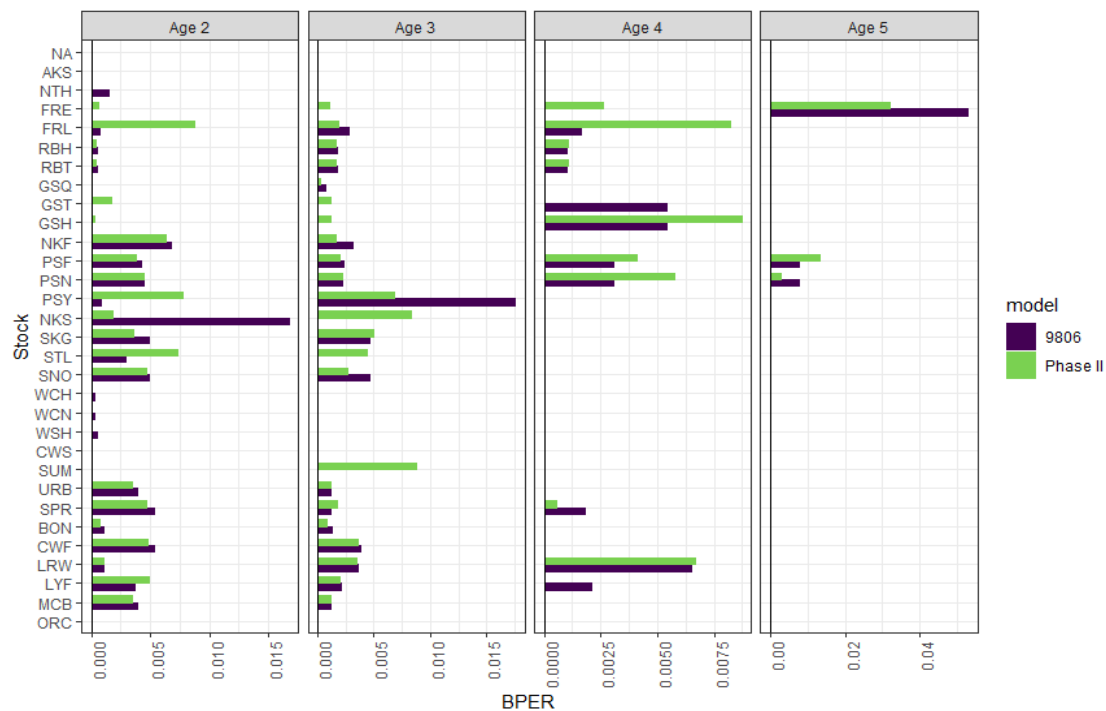


Figure 24—Base period exploitation rate by age for Juan de Fuca Net.



### 3.11.3 Reported Catch

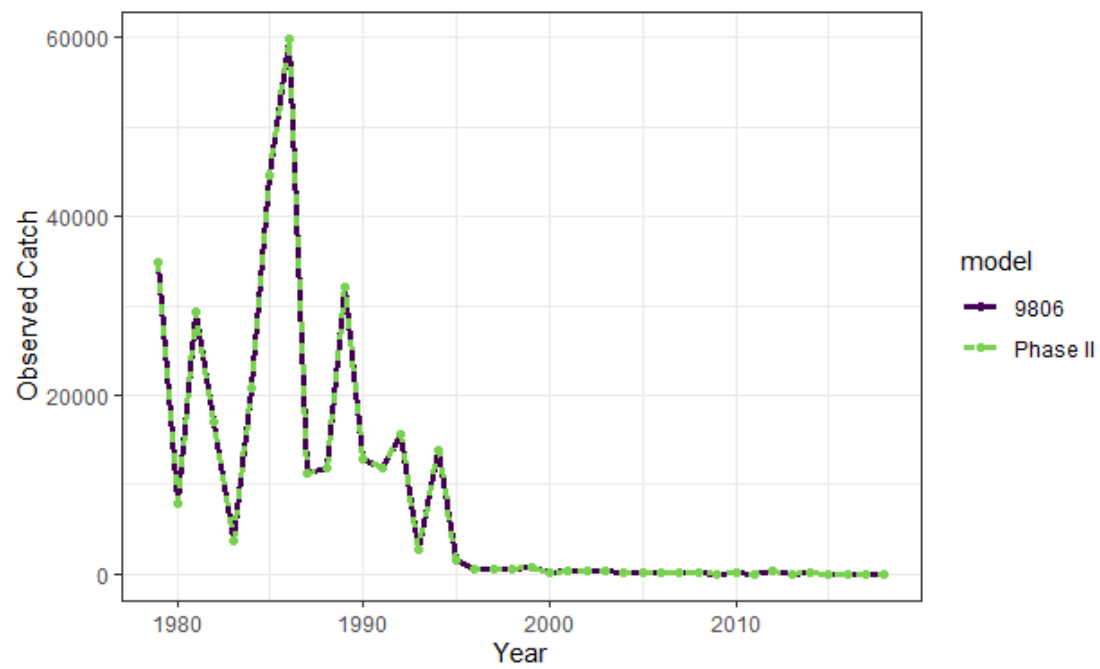


Figure 25—Reported catch for Juan de Fuca Net.

## 3.12 Puget Sound North Net (PGTNTH N): Puget Sound North Net (PGSDN N)

### 3.12.1 Description of Fishery and Changes

The North Puget Sound Net fishery (PGSDN N) operates in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, 6C, 6, 6A, 7, and 7A. This includes the Strait of Juan de Fuca and the Washington San Juan Islands. Timing of the fishery is typically from July through October. The one change in Phase II for this model fishery was the inclusion of the Strait of Juan de Fuca net fishery, which was previously included with Washington Coast net. The model fishery PGSDN N (fishery number 21) includes Exploitation Rate Analysis (ERA) fisheries PGSDN N (25) and TPGSDN TERM N (26).

### 3.12.2 Base Period Exploitation Rate by Age

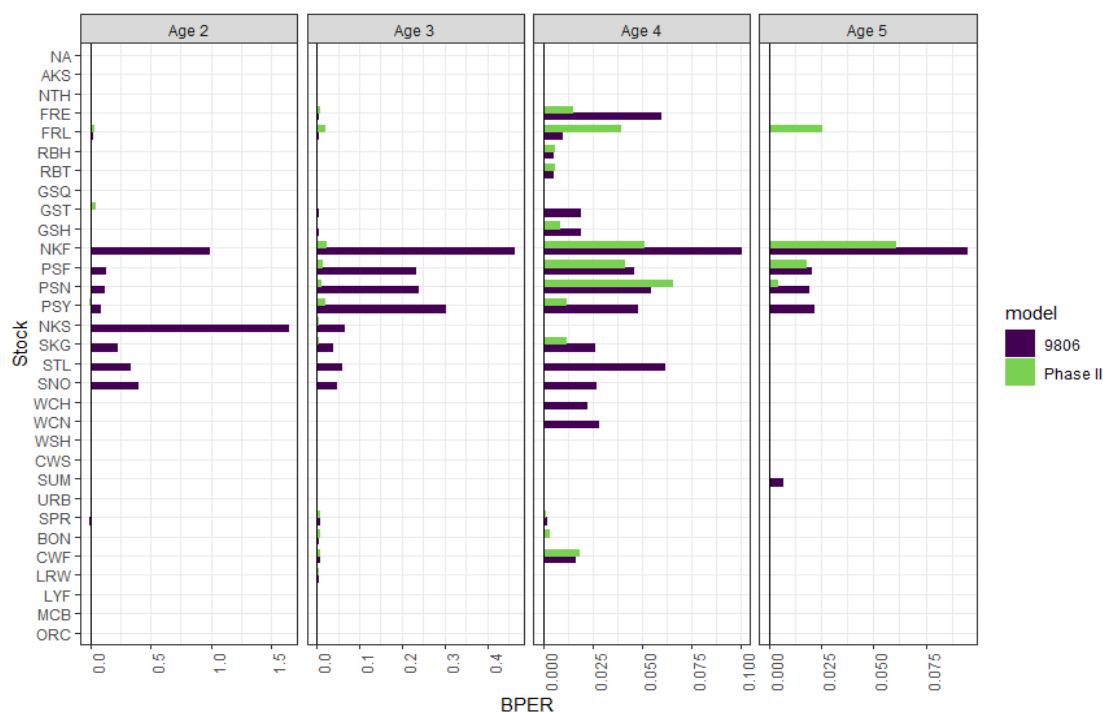


Figure 26—Base period exploitation rate by age for Puget Sound North Net.

### 3.12.3 Reported Catch

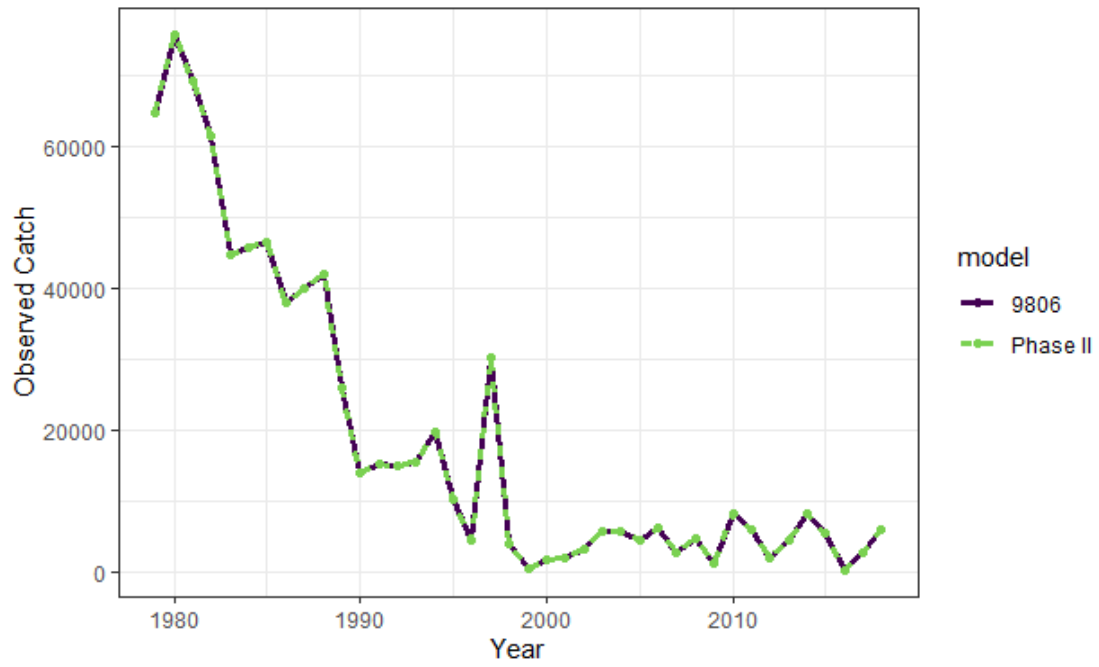


Figure 27—Reported catch for Puget Sound North Net.

### 3.13 Puget Sound Other Net (PGTSTH N): Puget Sound Other Net (PGSDO N)

#### 3.13.1 Description of Fishery and Changes

The Puget Sound Other Net fishery operates in all Puget Sound marine areas south of a line from Dungeness Spit east to Partridge Point on Whidbey Island, Washington, incorporating Puget Sound Salmon Management and Catch Reporting Areas 8, 9, 10, 11, 12, and 13 (including all relevant subareas), in addition to area 6B. This includes Hood Canal and its terminal areas, and terminal areas of the Skagit, Stillaguamish, Snohomish, Green and Nisqually Rivers. In the 9806 Model, this fishery also included net catch in the Bellingham Bay terminal areas (Catch Reporting Areas 7B, 7C, and 7D) in addition to freshwater net catches. In the Phase II Model, these catches are accounted for in the Puget Sound Freshwater Net fishery. The fishery typically occurs from July through October. The model fishery PGSDNO N (22) includes ERA fisheries PGSDO N (28) and TPGSDO TERM N (29).

#### 3.13.2 Base Period Exploitation Rate by Age

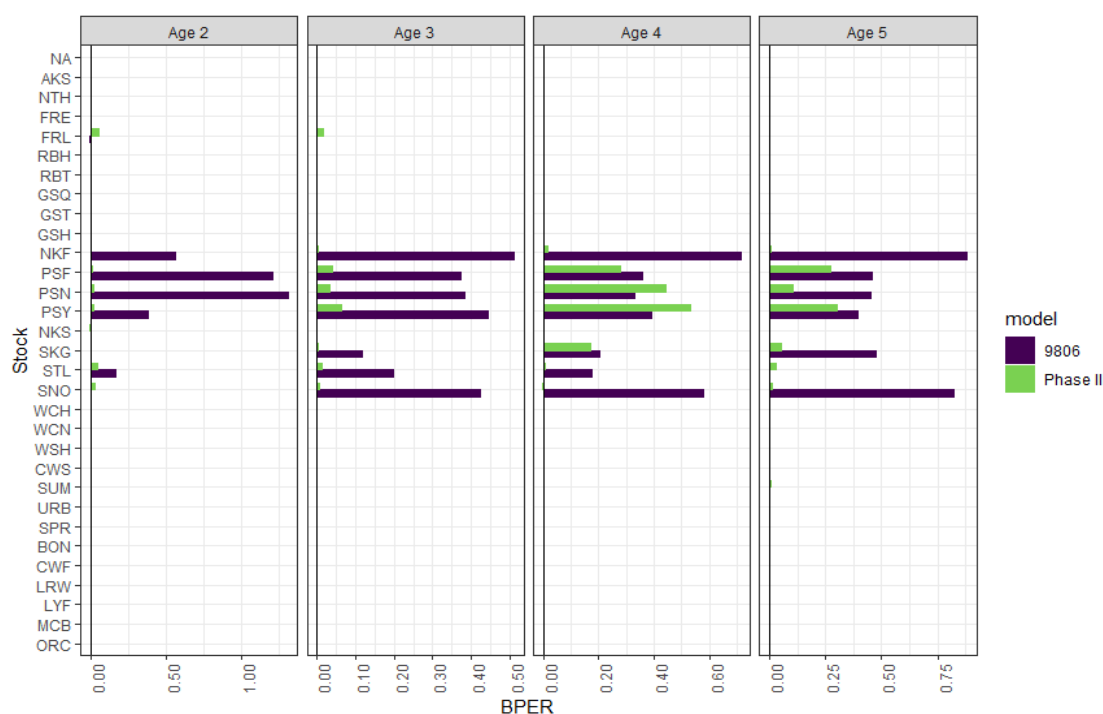


Figure 28—Base period exploitation rate by age for Puget Sound Other Net.

#### 3.13.3 Reported Catch

Catches for this fishery are accounted for in the Puget Sound Freshwater Net fishery.

## 3.14 Washington Coast Net (WASH CST N): Washington Coast Net (WASH CST N)

### 3.14.1 Description of Fishery and Changes

The Washington Coast Net Fishery (WASH CST N) operates along the coast of Washington and includes net catch in both tribal and non-tribal fisheries. In the 9806 Model, this fishery included marine net catches that occur in Grays Harbor and Willapa Bay, in addition to freshwater net catches occurring in the coastal river systems, including the Quillayute, Hoh, Queets, and Quinault Rivers as well as Grays Harbor tributaries. In the Phase II Model, this fishery represents only the marine net catch from Grays Harbor and Willapa Bay, as the freshwater net catch is represented in the new Washington Coast Freshwater Net fishery. There are no offshore net fisheries that operate off the Washington coast. The fishery typically occurs in August through October. The model fishery WASH CST N (23) includes the ERA fishery WASH CST N (30).

### 3.14.2 Base Period Exploitation Rate by Age

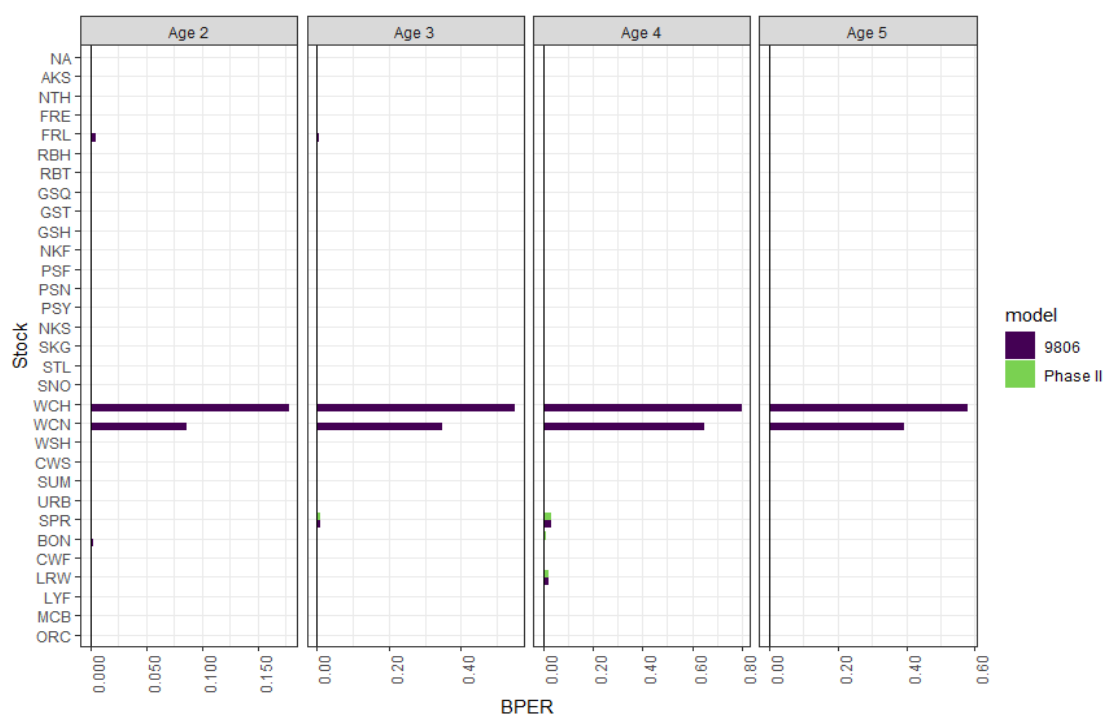


Figure 29—Base period exploitation rate by age for Washington Coast Net.

### 3.14.3 Reported Catch

Catches for this fishery are accounted for in the Washington Coast Freshwater Net fishery.

## 3.15 Johnstone Strait Net (JOHN ST N): Johnstone Strait Net (JNST N)

### 3.15.1 Description of Fishery and Changes

The Johnstone Strait net fisheries operate in British Columbia in waters off the eastern shores of Vancouver Island from Cape Caution through to Campbell River. The primary fishing areas include Johnstone Strait (portions of Areas 12 and 13) along the main migration route for Fraser-bound stocks. The fleet is made up of seine and gillnet vessels with a number of effort limiting requirements including area licensing, vessel length and gear restrictions. These fisheries only target chum, sockeye, and pink salmon; the retention of coho and Chinook is not permitted. The sockeye and pink salmon seine fisheries are ITQ fisheries which take place in July and August. The sockeye and pink salmon gill net fisheries are derby-style fisheries which take place in July and August whereas the chum salmon fisheries are derby-style fisheries that are managed to a target exploitation rate and take place from mid-October to early November.

### 3.15.2 Base Period Exploitation Rate by Age

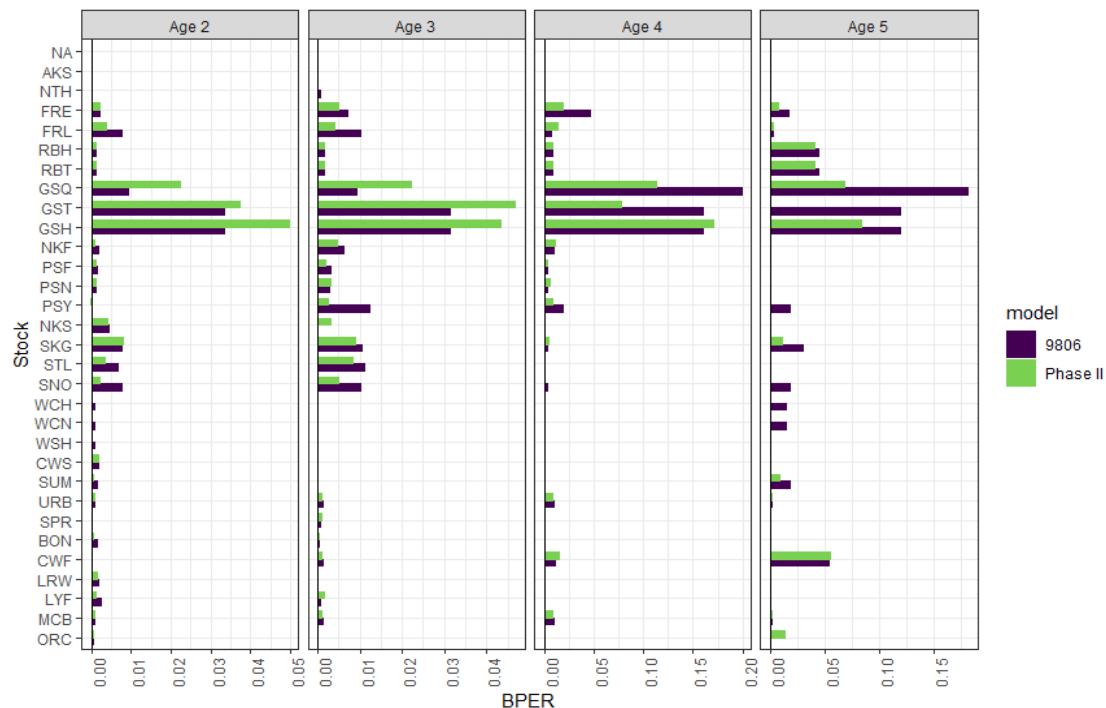


Figure 30—Base period exploitation rate by age for Johnstone Strait Net.

### 3.15.3 Reported Catch

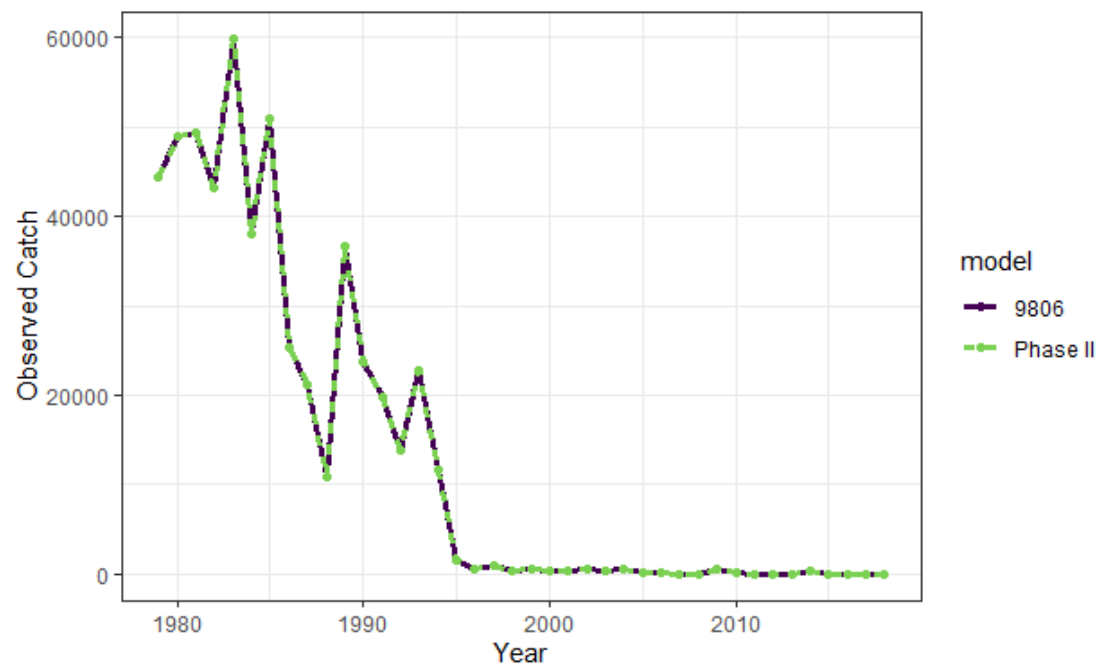


Figure 31—Reported catch for Johnstone Strait Net.

### **3.16 Fraser Net (FRASER N): Fraser Net (FRASER N)**

#### **3.16.1 Description of Fishery and Changes**

In BPC 9806 the Fraser Net fishery was based on commercial fisheries in the tidal Fraser River downstream of Mission, B.C., whereas the Phase II Chinook Model uses two net fisheries to represent the impacts on stocks: Fraser Net and Terminal Fraser Freshwater Net. Fraser Net represents the commercial fisheries that were commonly occurring in the base period years where gillnets were fished from vessels as they drifted in the tidal area of the Fraser River. The commercial gillnet fishery occurred in tidal waters from the Fraser River mouth, e.g. from the jetties in the North Arm and South Arm to the tidal boundary located upstream at Mission. The commercial fishery has targeted Chinook, sockeye, and chum mainly, but part of the fishery may have Chinook non-retention regulations when stocks of concern are present. Often, the gillnet mesh size is regulated, and different sizes are used when the fishery targets Chinook, sockeye, and chum, which can lead to different exploitation rates by age depending on the fisheries conducted each year.

This fishery has occasionally recovered CWTs from non-Fraser stocks that either move into the lower river, perhaps on tides, or they may have been intercepted near the mouth of the Fraser River by vessels fishing near the jetties. The Terminal Fraser Freshwater Net fishery represents all Fraser First Nation fisheries and any commercial fisheries in non-tidal waters upstream of Mission, since this fishery was not represented in version 9806 the total ERs on Fraser stocks are greater in the Phase II Model than it was in Model 9806.



### 3.16.2 Base Period Exploitation Rate by Age

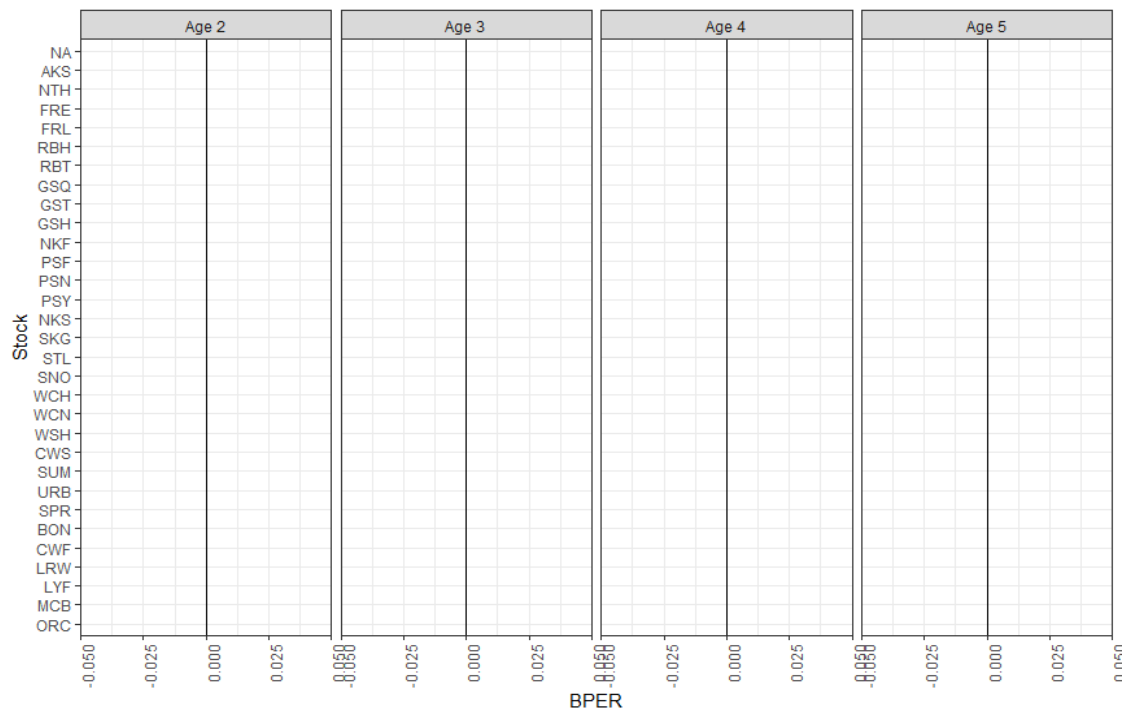


Figure 32—Base period exploitation rates for stocks that are in both 9806 and Phase II. Note that all of the Fraser stocks that were part of Fraser Early (FRE) and Fraser Late (FRL) stock groupings were further stratified in Phase II, thus no information is presented in the figure.

### 3.16.3 Reported Catch

Catch in the Fraser Net fishery is illustrated in the summary for the Terminal Fraser net fishery because the vast majority of catch consists of stocks originating from the Fraser River.

## 3.17 Alaska Sport (ALASKA S): Alaska Sport (ALASKA S)

### 3.17.1 Description of Fishery and Changes

The SEAK sport fishery operates in the marine waters of Southeast Alaska from Cape Suckling north of Yakutat to Dixon Entrance South of Ketchikan. The majority of sport fishery effort takes place from powered fishing vessels (private, guided, and commercial) although some sport fishery activities occur from non-powered vessels or from land. The vast majority of sport fishing effort takes place between April and October, although some Alaska resident sport fishing occurs before and after this time period. The fishery mainly targets Chinook and coho salmon, however most salmon species are harvested at times in this fishery.

### 3.17.2 Base Period Exploitation Rate by Age

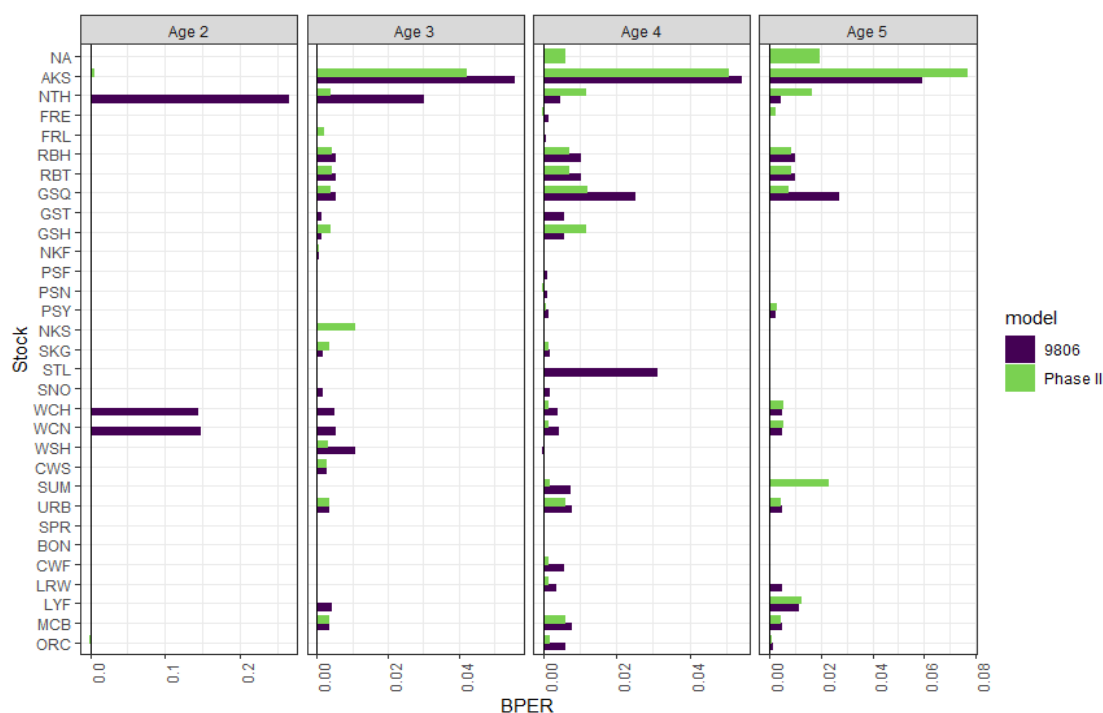


Figure 33—Base period exploitation rate by age for Alaska Sport.

### 3.17.3 Reported Catch

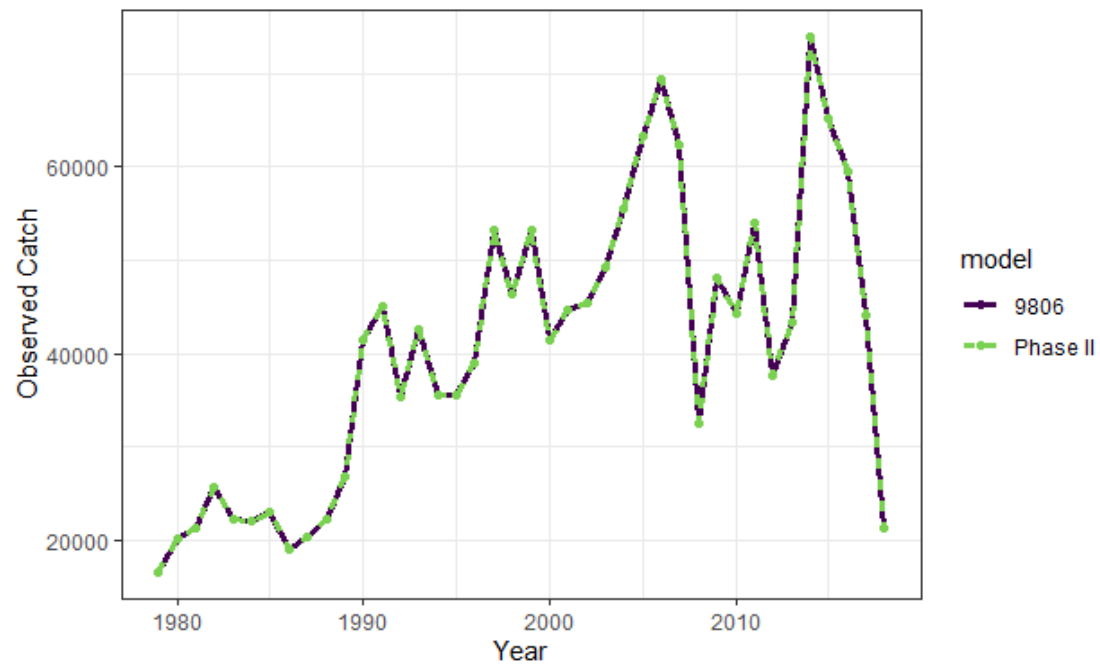


Figure 34—Reported catch for Alaska Sport.

### **3.18 North/Central B.C. Sport (NOR/CEN S): Central B.C. Sport (CBC S) and North B.C. AABM Sport (NBC AABM S) and North B.C. ISBM Sport (NBC ISBM S)**

#### **3.18.1 Description of Fishery and Changes**

The NBC AABM sport fishery operates in the waters around Haida Gwaii. The AABM area includes waters from the U.S.-Canada border to Queen Charlotte Sound but the actual fishing areas are primarily on the north and west shores of Graham Island, around Langara Island and off the northwest shore of Moresby Island. The majority of sport fishing effort takes place from fishing vessels associated with sport fishing lodges, both guided and unguided. A smaller portion of the effort is from sport fishing charters not associated with lodges and local sport fishermen. The majority of the fishery takes place from May to September with only a small local component from October to April. The fishery targets Chinook and coho salmon but all species of salmon may be harvested. The lodge-based sport fishery in the AABM area started in 1985 and grew until 2004. Lodge-based effort has stabilized since 2004.

The NBC ISBM sport fishery operates in the waters from the U.S.-Canada border to the southern tip of Banks Island. The western edge of the fishing area is the middle of Hecate Strait and eastern Dixon entrance, the AABM area boundary. The majority of the sport fishing effort takes place from private and charter fishing vessels operating in and around Chatham Sound. A small portion of the effort is from sport fishing lodges. The majority of the fishery takes place from May to September with a small local component fishing from October to April. The fishery targets Chinook and coho salmon but all species of salmon may be harvested.

The CBC sport fishery is an ISBM fishery that operates in the waters from Kitimat and the southern tip of Banks Island south to Cape Caution. The area is remote and difficult to access. Sport fishing effort is varied and takes place from private and charter fishing vessels operating out of Kitimat, Bella Bella, and Port Hardy as well as from sport fishing lodges around Bella Bella and in Rivers Inlet. The majority of the fishery takes place from May to September. The fishery targets Chinook and coho salmon but all species of salmon may be harvested.

### 3.18.2 Base Period Exploitation Rate by Age

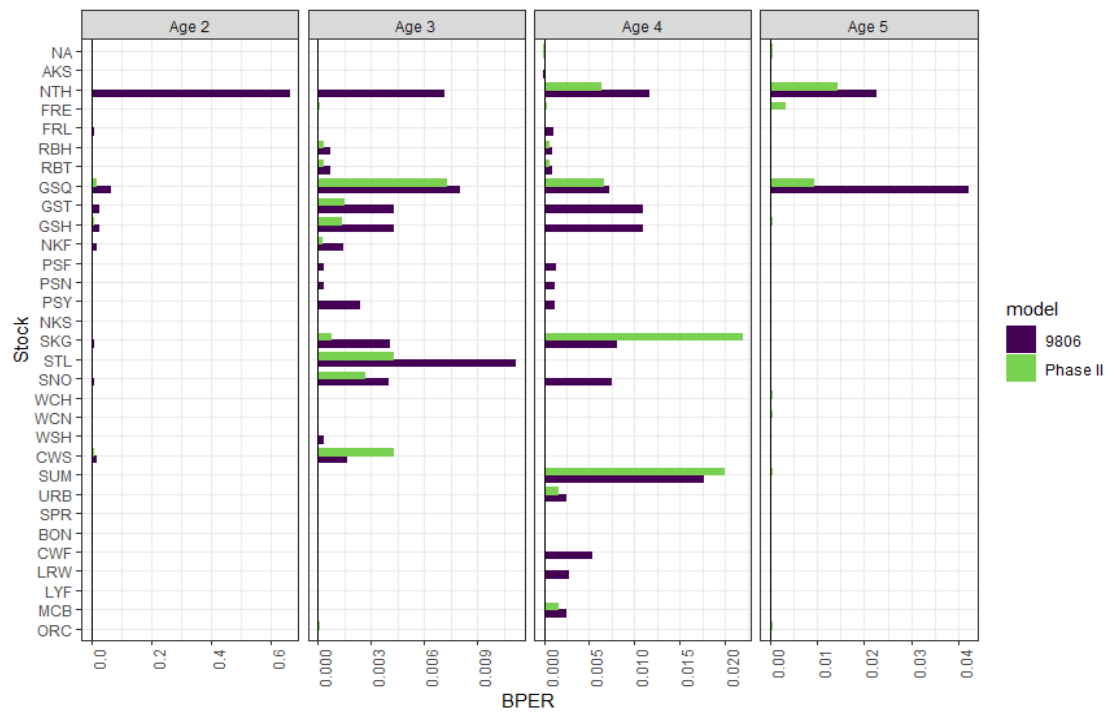


Figure 35—Base period exploitation rate by age for North/Central BC Sport (9806), Central BC Sport (Phase II), North Aggregate Abundance-Based Management Sport (Phase II), and North Individual Stock-Based Management Sport (Phase II).

### 3.18.3 Reported Catch

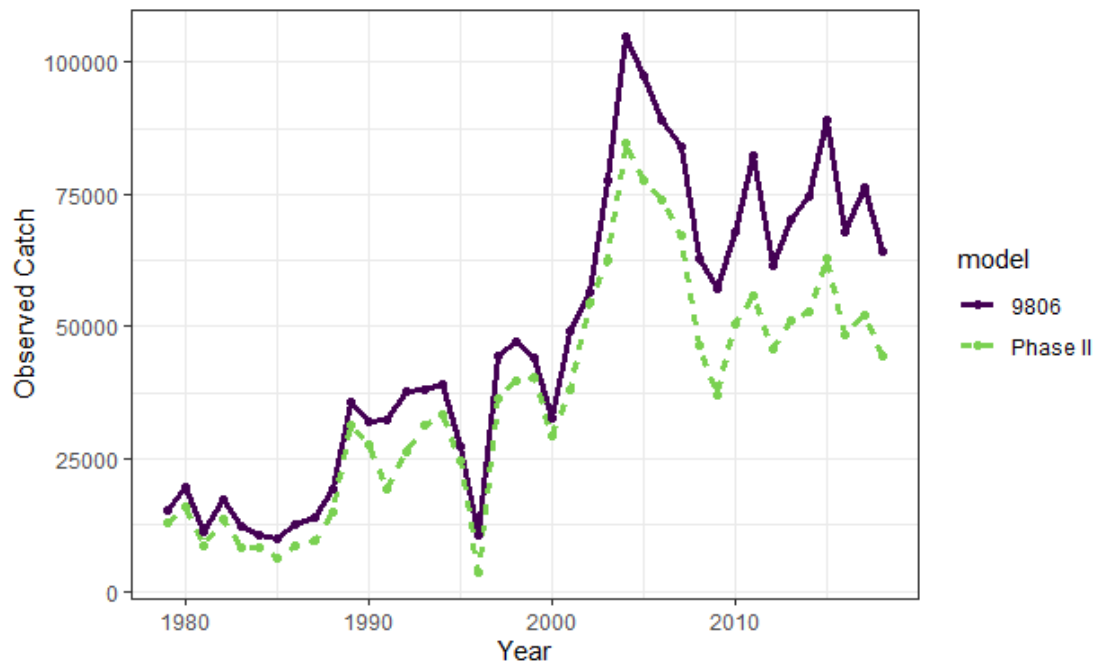


Figure 36—Reported catch for North/Central B.C. Sport (9806), Central B.C. Sport (Phase II), and North Aggregate Abundance-Based Management Sport (Phase II). The difference between catch values in the Phase II Model is due to the fact that North Individual Stock-Based Management Sport catch is no longer included in the ceiling file.

### 3.19 North/Central B.C. Sport (NOR/CEN S): Central B.C. Sport (CBC S)

#### 3.19.1 Description of Fishery and Changes

See section 3.18.1.

#### 3.19.2 Base Period Exploitation Rate by Age

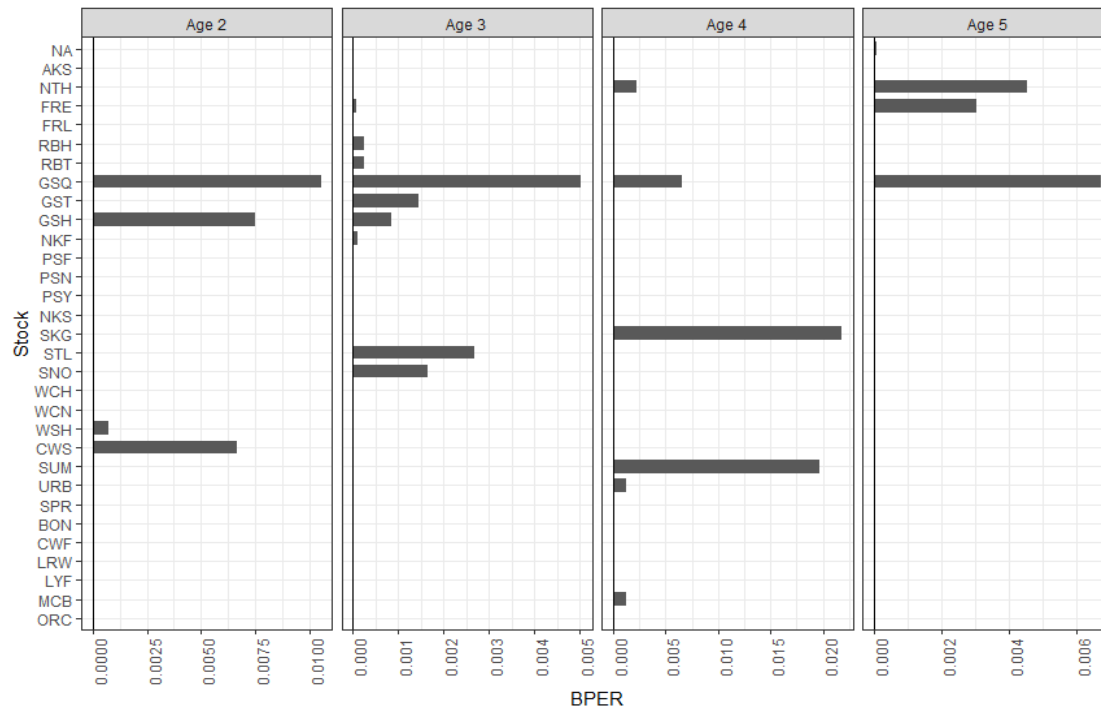


Figure 37—Base period exploitation rate by age for Central B.C. Sport (Phase II only).

### 3.19.3 Reported Catch

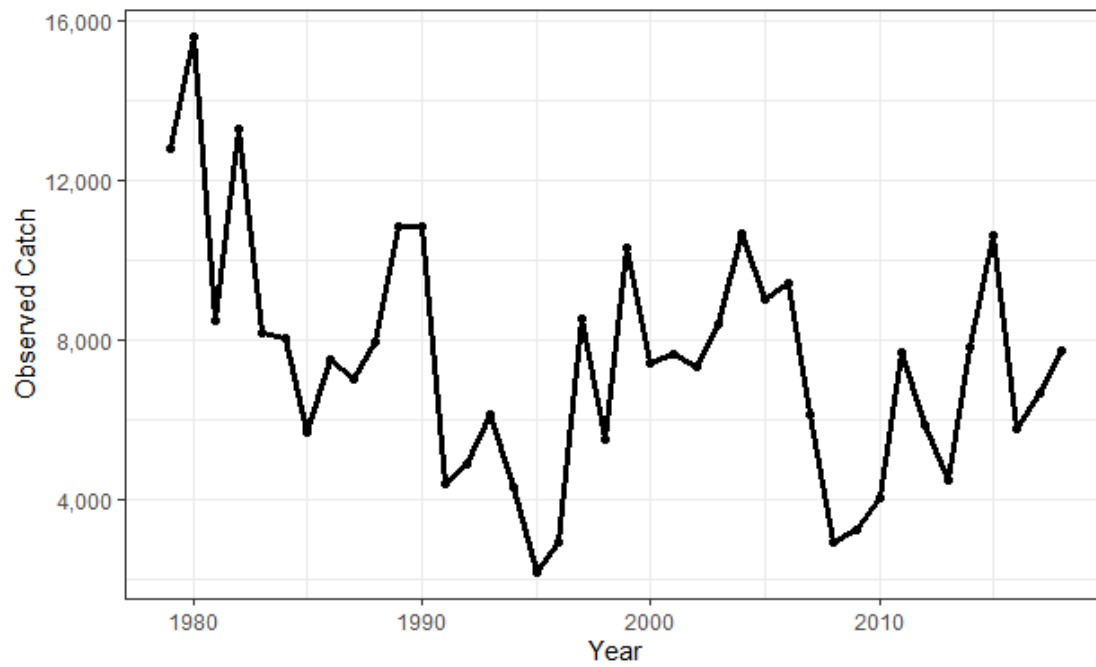


Figure 38—Reported catch for Central BC Sport (Phase II only).



## 3.20 North/Central B.C. Sport (NOR/CEN S): North B.C. AABM Sport (NBC AABM S)

### 3.20.1 Description of Fishery and Changes

See section 3.18.1.

### 3.20.2 Base Period Exploitation Rate by Age

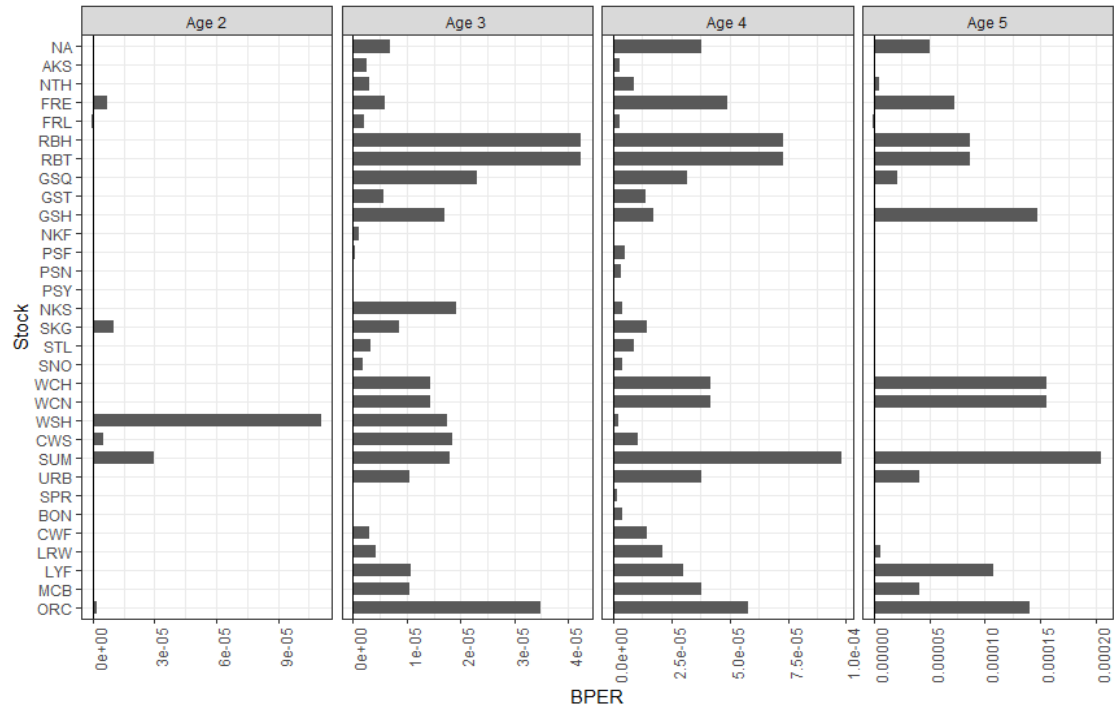


Figure 39—Base period exploitation rate by age for North Aggregate Abundance-Based Management Sport (Phase II only).

### 3.20.3 Reported Catch



Figure 40—Reported catch for North Aggregate Abundance-Based Management Sport (Phase II only)

## 3.21 North/Central B.C. Sport (NOR/CEN S): North B.C. ISBM Sport (NBC ISBM S)

### 3.21.1 Description of Fishery and Changes

See section 3.18.1.

### 3.21.2 Base Period Exploitation Rate by Age

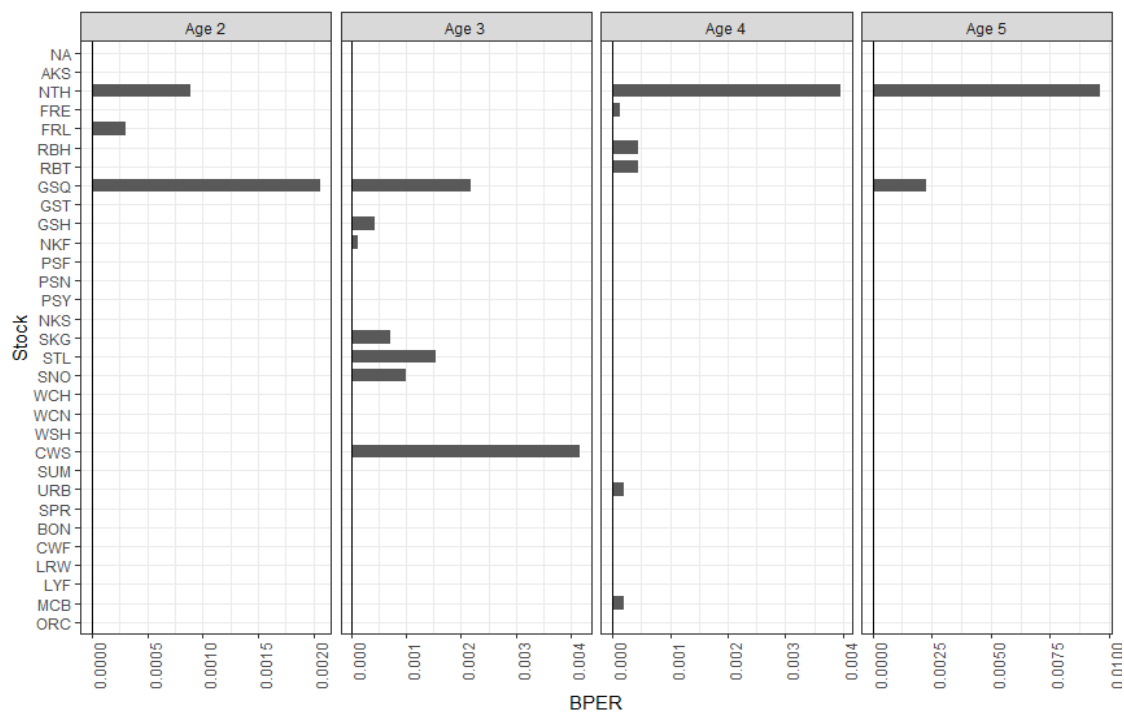


Figure 41—Base period exploitation rate by age for North Individual Stock-Based Management Sport (Phase II only).

### 3.21.3 Reported Catch

NBC ISBM Sport catch is no longer included in the ceiling file, therefore a reported catch figure does not exist for this fishery.

### **3.22 West Coast Vancouver Island Sport (WCVI S): West Coast Vancouver Island AABM Sport (WCVI AABM S) and West Coast Vancouver Island ISBM Sport (WCVI ISBM S)**

#### **3.22.1 Description of Fishery and Changes**

The WCVI AABM sport fishery occurs primarily in Barkley Sound, outer Clayoquot Sound, Nootka Sound, and offshore areas. The majority of fishing effort occurs from mid-July through August in northwest Vancouver Island and August through mid-September in southwest Vancouver Island.

The AABM sport fishery includes northwest WCVI (PFMA Areas 25–27, 125–127) from October 16 to June 30, and outside of the surf line (one nautical mile offshore) from July 1 to October 15, plus southwest WCVI (Areas 21, 23, 24, 121, 123, and 124) from October 16 through July 31, and outside one nautical mile offshore from August 1 to October 15. Areas inside the surf line and outside these AABM periods are ISBM.

The WCVI ISBM sport Chinook fisheries take place annually in inshore areas of WCVI (PFMA areas 21 to 27). ISBM periods in Areas 21 to 24 are August 1 to October 15, and in Areas 25 to 27 are July 15 to October 15. Chinook caught in these areas outside of this time period are accounted for as part of the AABM fishery catch. Catch and effort typically peaks in these areas during the months of July and August, and effort is largely abundance driven.

### 3.22.2 Base Period Exploitation Rate by Age

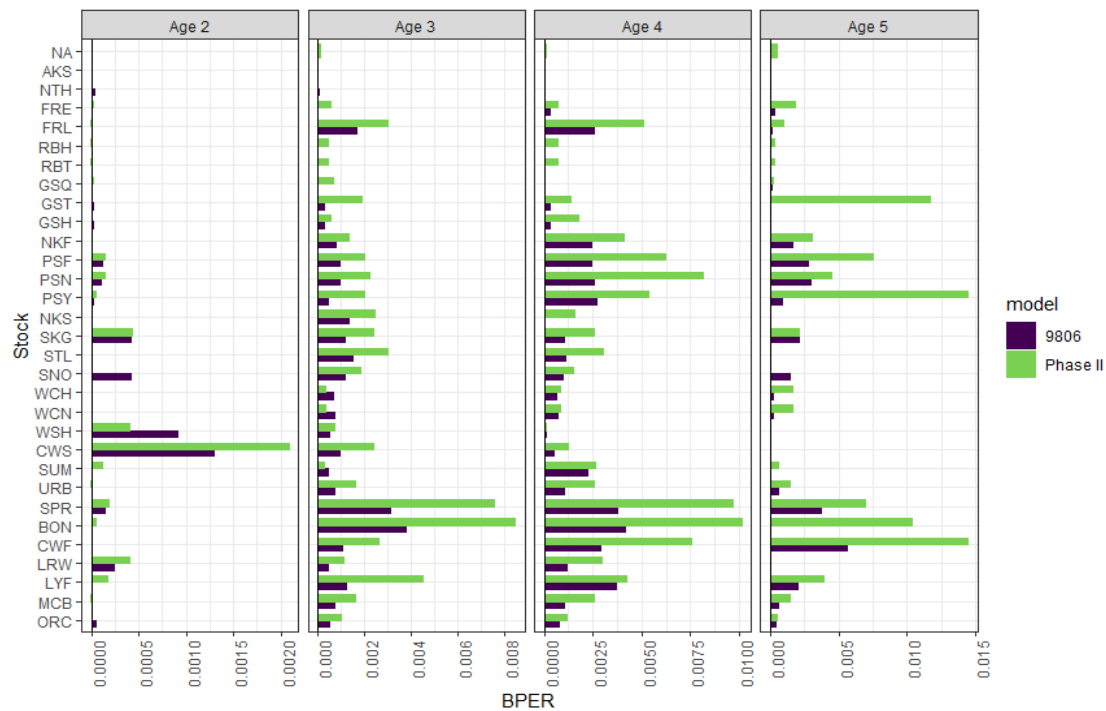


Figure 42—Base period exploitation rate by age for West Coast Vancouver Island (WCVI) Sport (9806), WCVI Aggregate Abundance-Based Management Sport (Phase II), and WCVI Individual Stock-Based Management Sport (Phase II).

### 3.22.3 Reported Catch

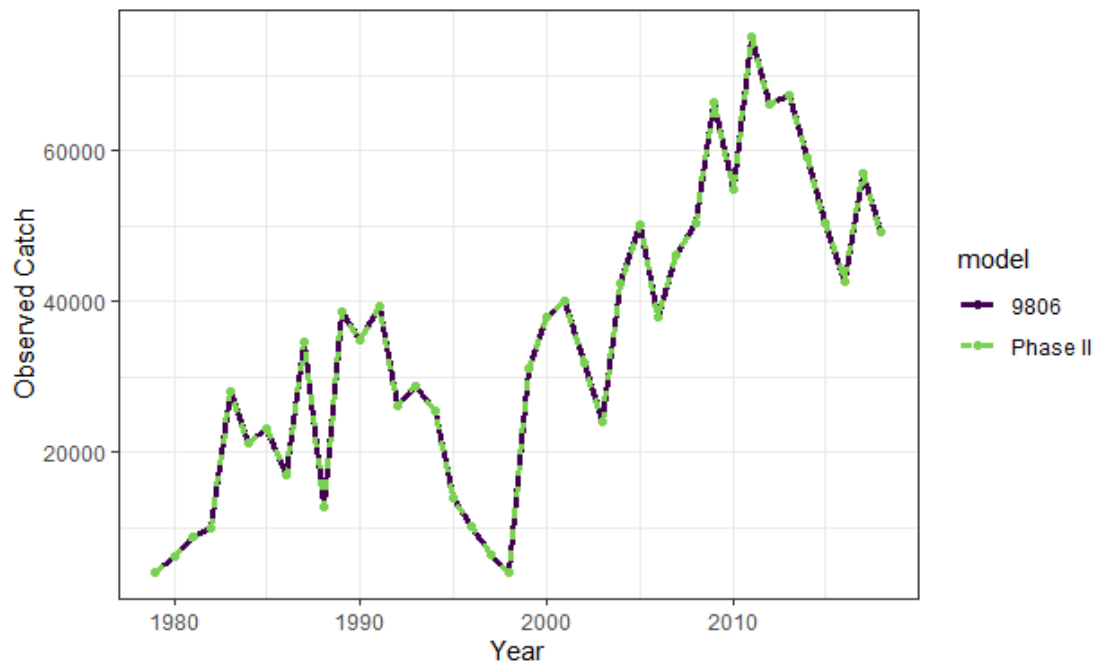


Figure 43—Reported catch for West Coast Vancouver Island (WCVI) Sport (9806), WCVI Aggregate Abundance-Based Management Sport (Phase II), and WCVI Individual Stock-Based Management Sport (Phase II).

## 3.23 West Coast Vancouver Island Sport (WCVI S): West Coast Vancouver Island AABM Sport (WCVI AABM S)

### 3.23.1 Description of Fishery and Changes

See section 3.22.1.

### 3.23.2 Base Period Exploitation Rate by Age

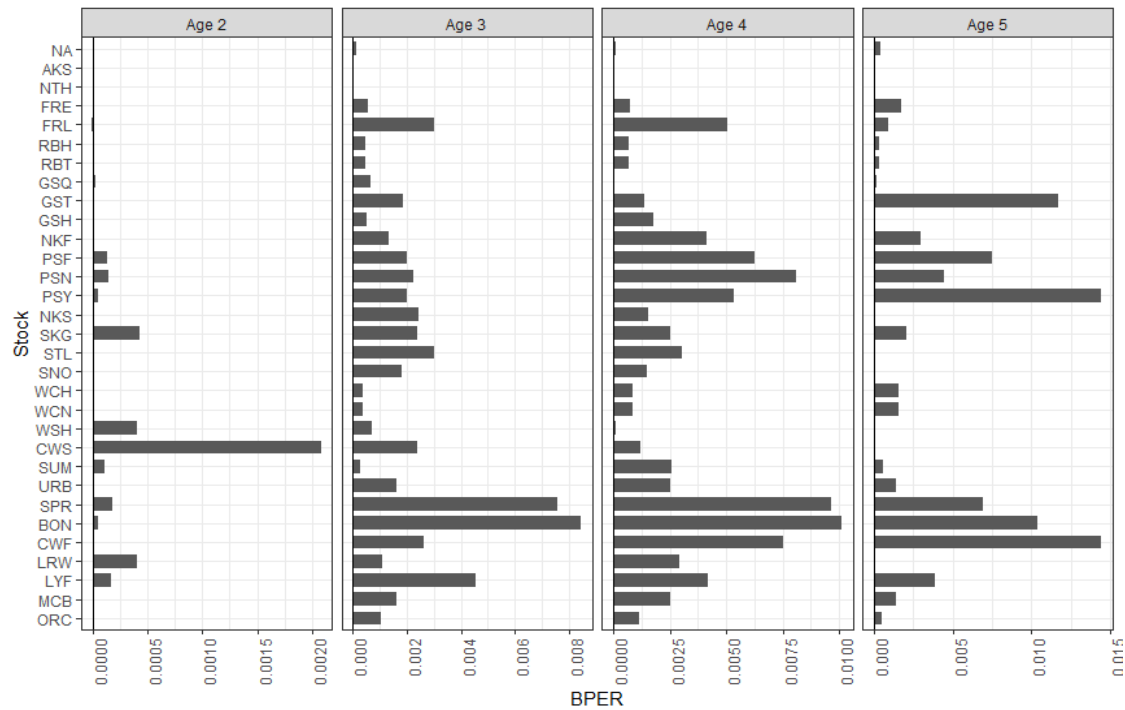


Figure 44—Base period exploitation rate by age for West Coast Vancouver Island Aggregate Abundance-Based Management Sport (Phase II only).

### 3.23.3 Reported Catch

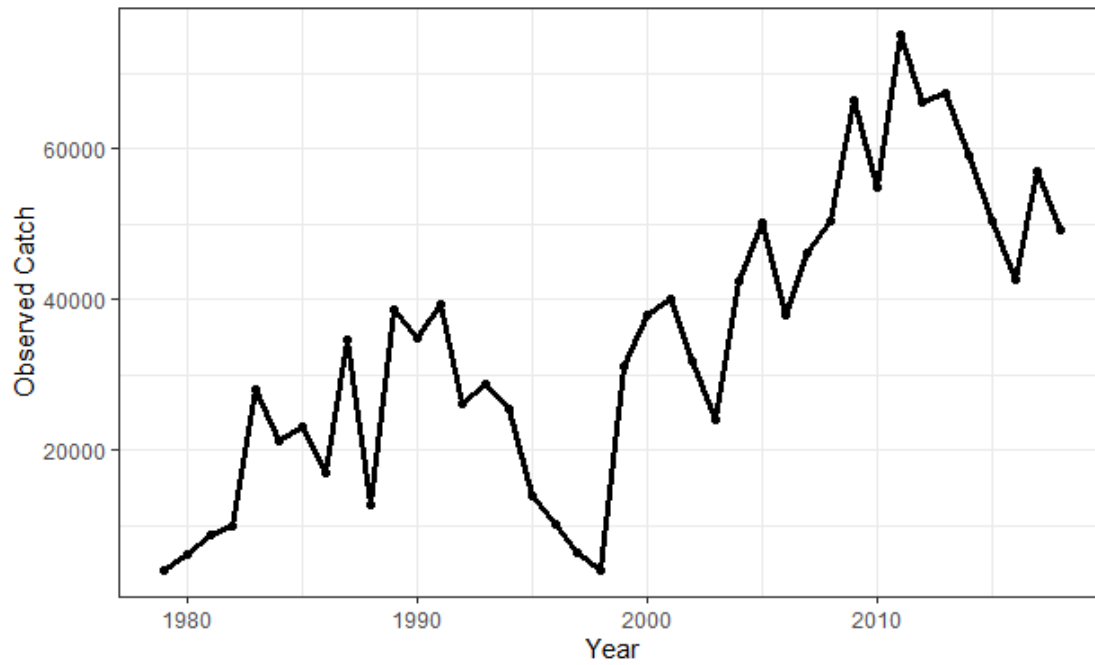


Figure 45—Reported catch for West Coast Vancouver Island Aggregate Abundance-Based Management Sport (Phase II only).



## 3.24 New Model Fishery: West Coast Vancouver Island ISBM Sport (WCVI ISBM S)

### 3.24.1 Description of Fishery and Changes

See section 3.22.1.

### 3.24.2 Base Period Exploitation Rate by Age

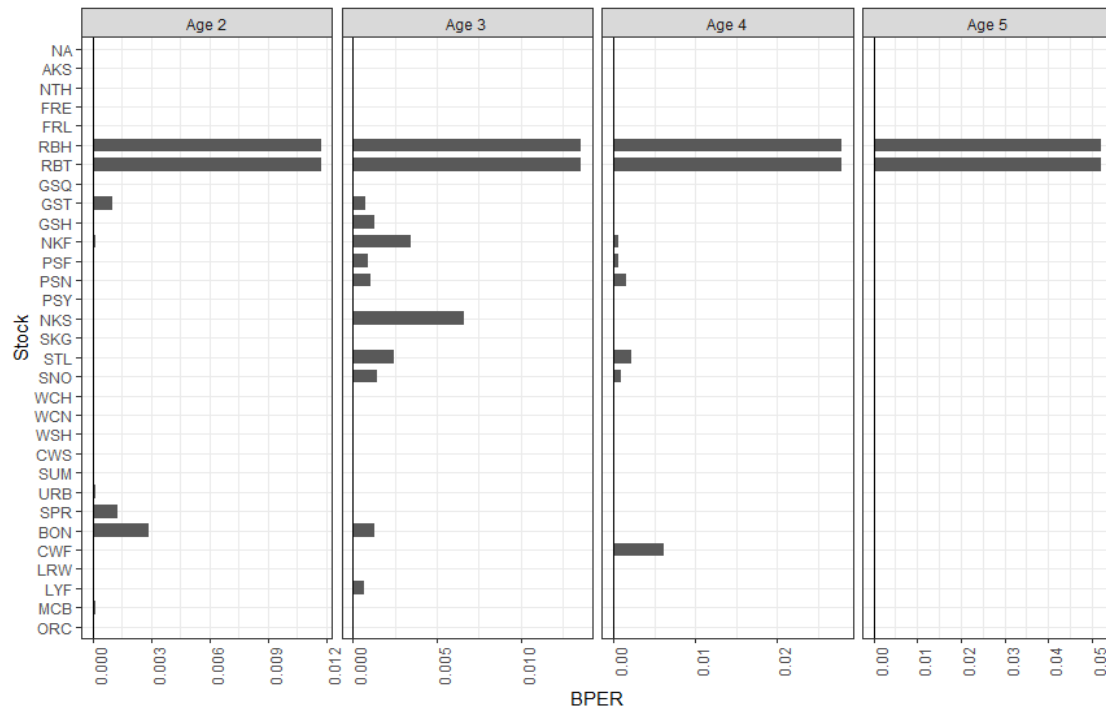


Figure 46—Base period exploitation rate by age for West Coast Vancouver Island Individual Stock-Based Management Sport (Phase II only).

### 3.24.3 Reported Catch

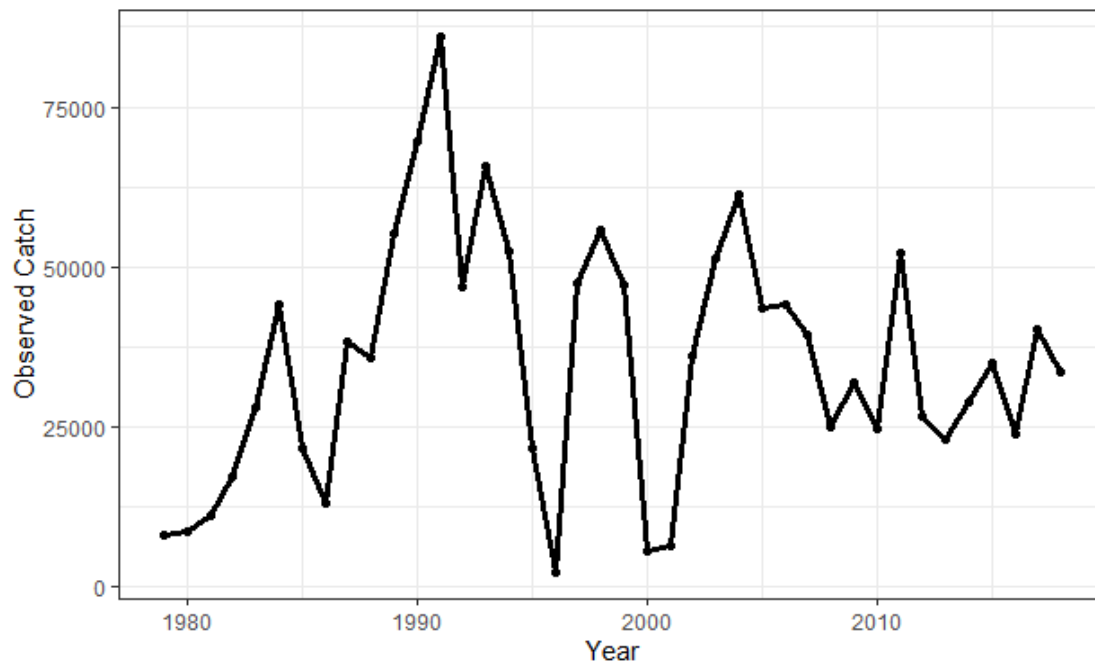


Figure 47—Reported catch for West Coast Vancouver Island Individual Stock-Based Management Sport (Phase II only).

### **3.25 Washington Coast Sport (WASH OCN S): North of Falcon Sport (N FALCON S) and South of Falcon Sport (S FALCON S)**

#### **3.25.1 Description of Fishery and Changes**

Ocean salmon sport fisheries off the coasts of Washington, Oregon, and California are managed by the PFMC and divided into two main areas, delineated by Cape Falcon, Oregon, located just south of the mouth of the Columbia River (Figure 9). The North of Cape Falcon area is comprised of four sub-areas and includes all waters off the Washington coast and approximately 50 miles of the northernmost Oregon coast. The remaining waters off the Oregon coast and those off the coast of California are managed as part of the South of Cape Falcon area, which is also broken down into multiple sub-areas. The “Washington Coast Sport” fishery of the 9806 Model includes only fisheries that occur in the North of Cape Falcon Area. In the Phase II Model, the “Washington Coast Sport” fishery is now the “North of Falcon Sport” fishery, and a new fishery, the “South of Falcon Sport” fishery, has been added, which represents the ocean sport fishery catch that occurs between Cape Falcon and Humbug Mountain on the southern Oregon coast. Sport fisheries that occur south of Humbug Mountain primarily catch Chinook stocks that are not included under the PST, thus catches in these fisheries are not included in the PSC Chinook Model. Those areas which are described for both North and South of Falcon troll fisheries and which are outlined in Figure 9 are identical to those which delineate those areas for sport fisheries North and South of Cape Falcon.

Ocean sport fisheries in the North of Falcon area that are managed by the PFMC occur between May and October each year, with the majority of catches (~80%) occurring during July and August. These fisheries have predominantly been under non-selective regulations, with the exception of small mark-selective fisheries that occurred early in the season between 2010 and 2015 (average landed catch ~3,400 Chinook). North of Falcon sport fisheries are managed with quotas determined annually each spring as part of the PFMC’s salmon season setting process. Quotas vary annually based on forecasted abundances of Chinook stocks and are shaped to meet conservation objectives associated with ESA-listed stocks and the PFMC’s Salmon Fishery Management Plan, as well as the Pacific Salmon Treaty. In recent years, the stocks most often responsible for limiting ocean sport quotas were ESA-listed Puget Sound and Lower Columbia River Fall tule Chinook.

South of Falcon sport fisheries between Cape Falcon and Humbug Mountain have occurred between March and November, however the majority of landings occur between June and September. These fisheries are managed as a season (no quota limits), as determined annually each spring as part of the PFMC’s salmon season setting process. Season structure varies annually based on abundances of both Sacramento River Fall Chinook and Klamath River Fall Chinook populations and can be limited by ESA impacts to California Coastal, Lower Columbia tule, and Snake River Wild fall Chinook stocks as well as a few local coho stocks.

### 3.25.2 Base Period Exploitation Rate by Age

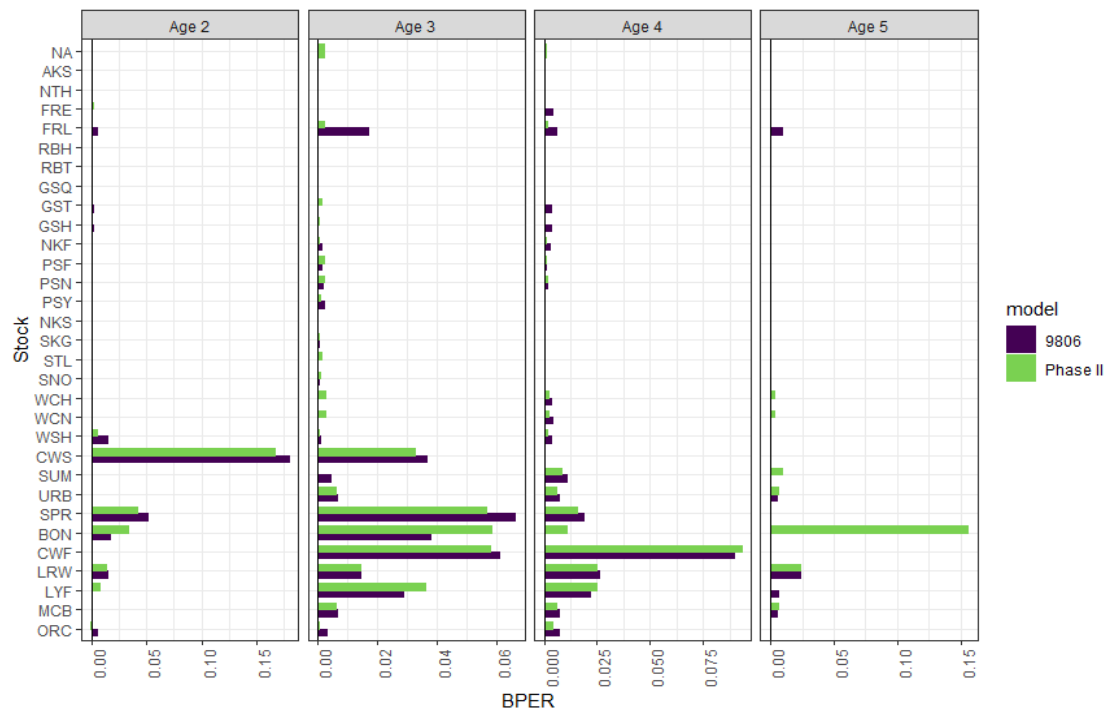


Figure 48—Base period exploitation rate by age for Washington Coast Sport (9806) and North of Falcon Sport (Phase II).

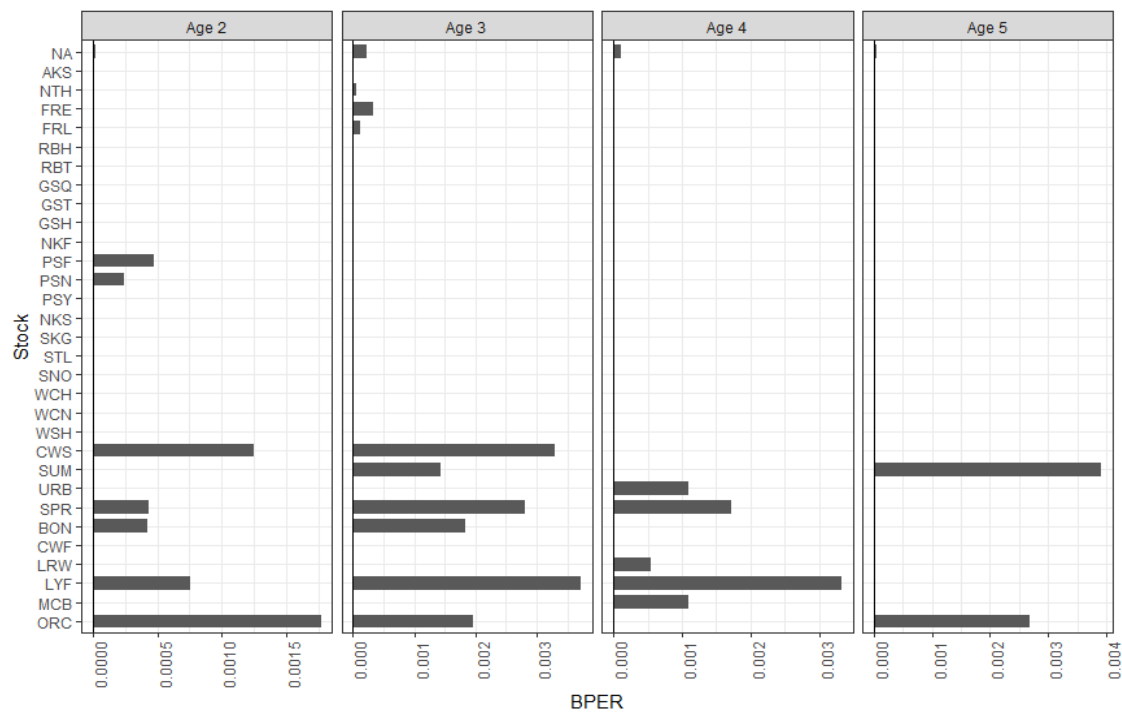


Figure 49—Base period exploitation rate by age for South of Falcon Sport (Phase II only).

### 3.25.3 Reported Catch

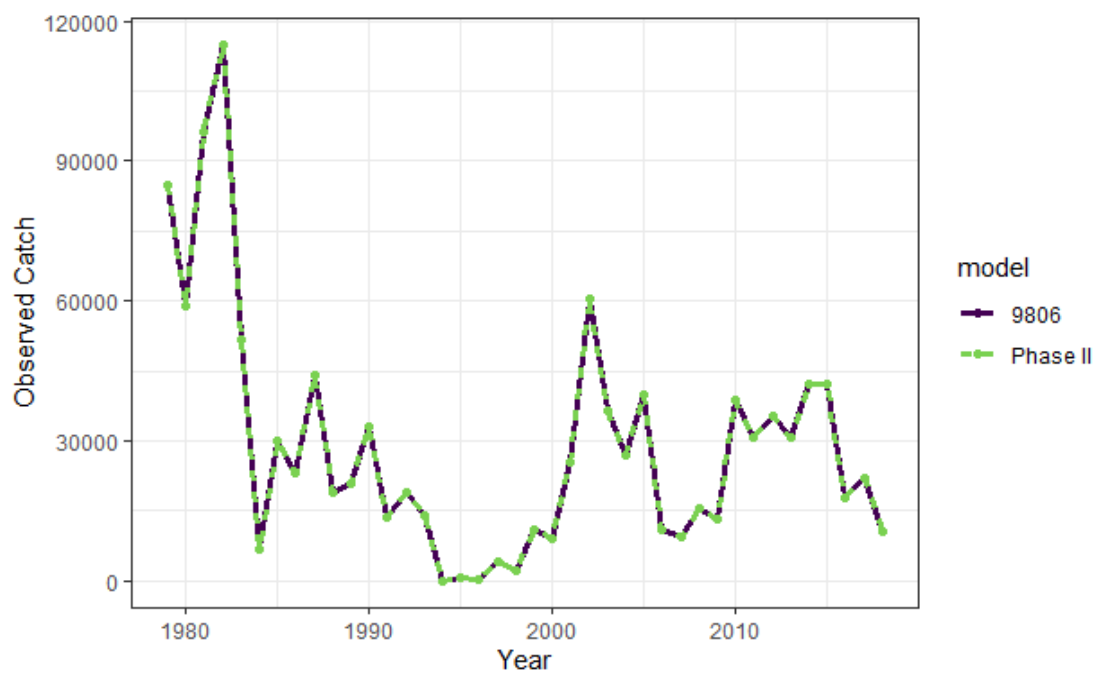


Figure 50—Reported catch for Washington Coast Sport (9806) and North of Falcon Sport (Phase II).



Figure 51—Reported catch for South of Falcon Sport (Phase II only).

## 3.26 Puget Sound North Sport (PGTNTHN S): Puget Sound North Sport (PGSDN S)

### 3.26.1 Description of Fishery and Changes

No changes were made to the Phase II Puget Sound North Sport fishery from Model calibration 9806. The fishery operates in Washington Marine Areas 5, 6, and 7, and includes waters of the U.S. Strait of Juan de Fuca and San Juan Islands. Fishing seasons vary by Marine Area and year, but generally include a summer fishery that occurs between July and September and a winter fishery that occurs between December and April. Catch and effort in this fishery are based on a calendar year. Prior to 2003, all fisheries were non-selective. Beginning in 2003, mark selective fisheries were increasingly implemented, and by 2014 all fisheries were under mark selective regulations, with the exception of the summer months in the San Juan Islands. The Model fishery PGSDN S (42) includes the ERA fisheries PGSDN S (57) and TPGSDN TERM S (58).

### 3.26.2 Base Period Exploitation Rate by Age

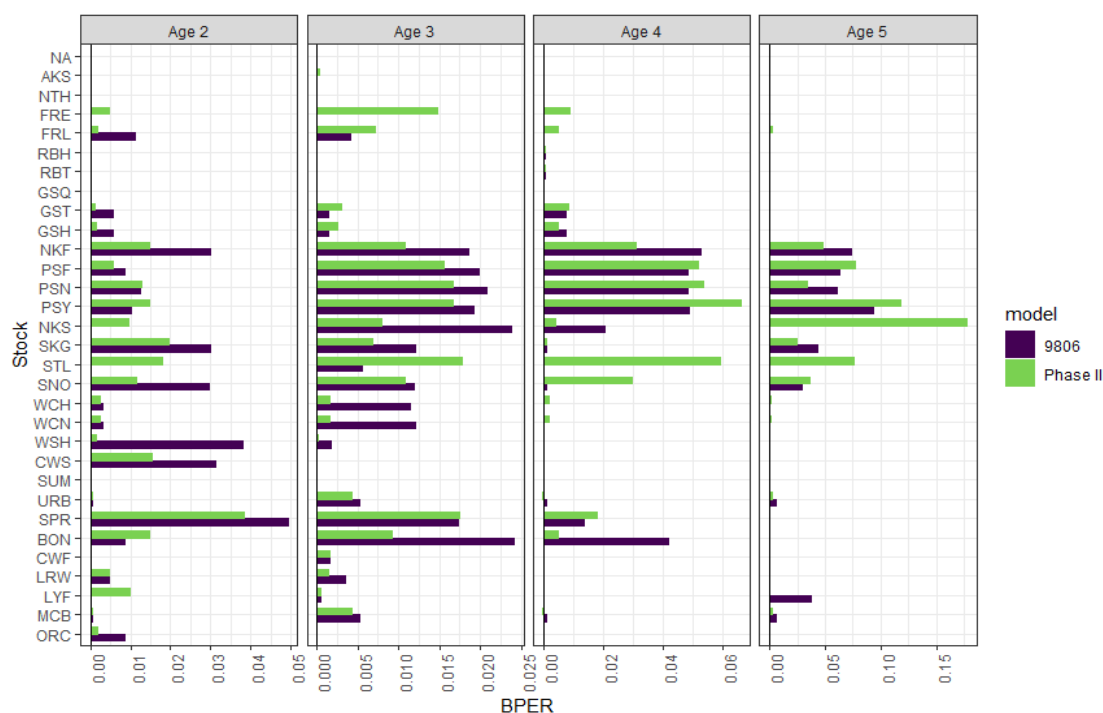


Figure 52—Base period exploitation rate by age for Puget Sound North Sport.

### 3.26.3 Reported Catch

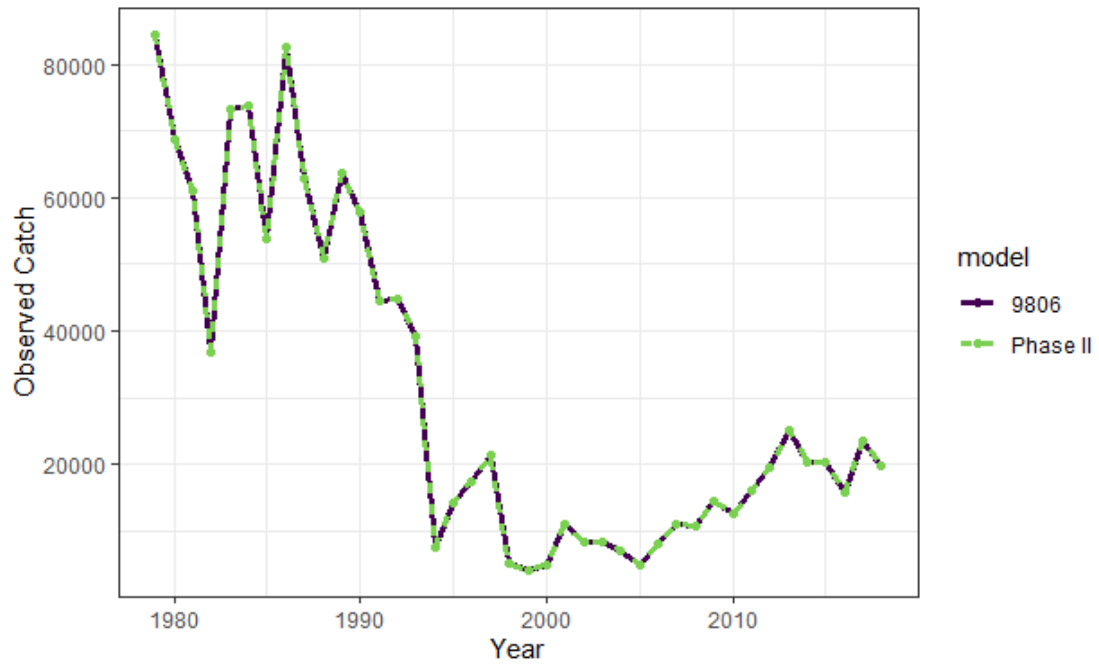


Figure 53—Reported catch for Puget Sound North Sport.

## 3.27 Puget Sound Other Sport (PGTSTH S): Puget Sound Other Sport (PGSDO S)

### 3.27.1 Description of Fishery and Changes

No changes were made to the Phase II Puget Sound Other Sport (PGSDO S) fishery from Model calibration 9806. The fishery operates in all waters east and south of a line from Point Wilson on the northeast of the Olympic Peninsula to Partridge Point on Whidbey Island (Marine Areas 8-1, 8-2, and 9-13). Some of the fine scale fisheries that comprise the PGSDO S are terminal fisheries. Timing of sport fisheries varies by marine area, but typically there is a summer season that occurs between June and September, and a winter fishery that occurs between December and April. Catch and effort for this fishery are based on the calendar year. Prior to 2005, all fisheries were non-selective. Beginning in 2005, mark selective fisheries were increasingly implemented, and by 2014 all fisheries were under mark selective regulations, with the exception of occasional small terminal area fisheries. The model fishery PGSDO S (43) includes the ERA fisheries PGSDO S (59) and TPGSDO TERM S (60).

### 3.27.2 Base Period Exploitation Rate by Age

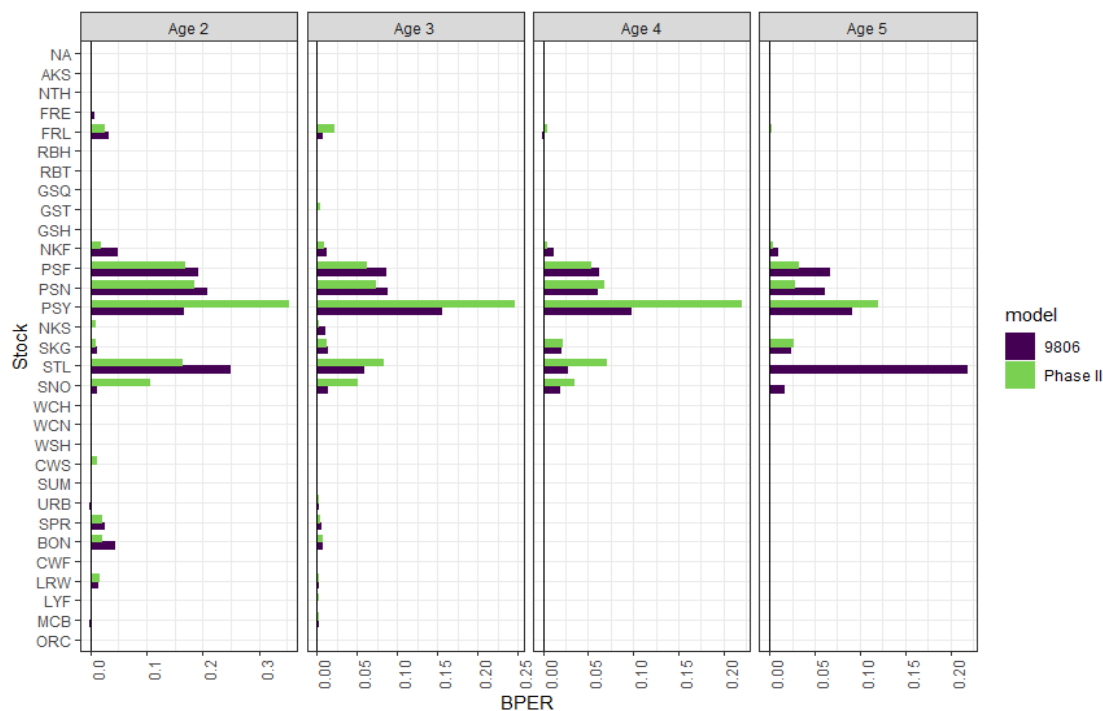


Figure 54—Base period exploitation rate by age for Puget Sound Other Sport.



### 3.27.3 Reported Catch

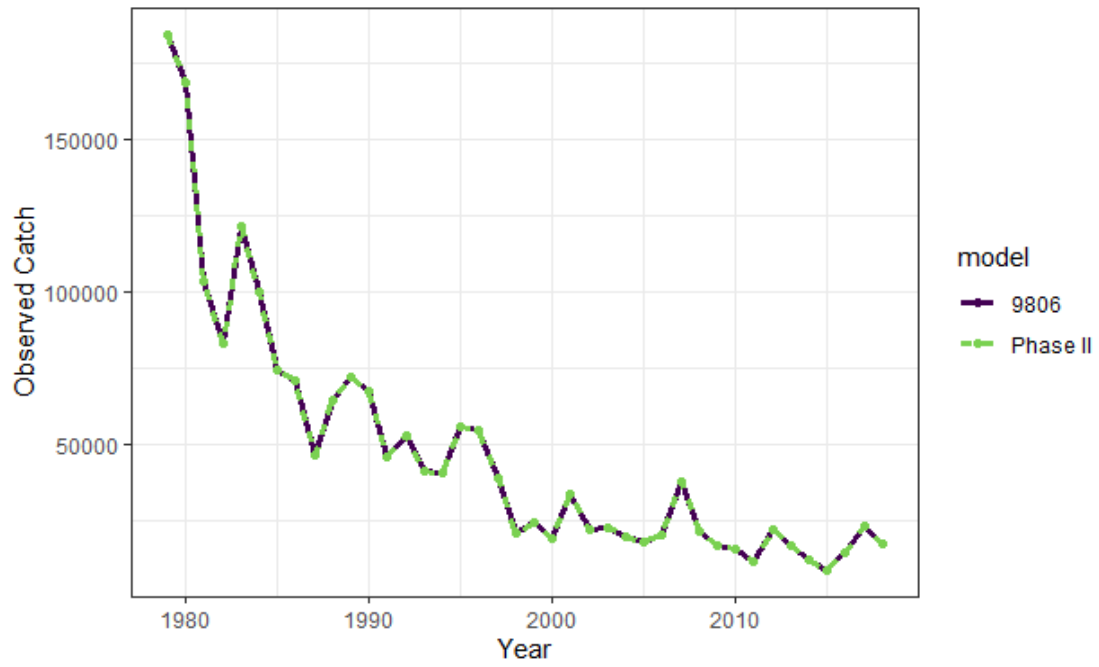


Figure 55—Reported catch for Puget Sound Other Sport.

## 3.28 Georgia Strait Sport (GEO ST S): Strait of Georgia Sport (GEO ST S) and B.C. Juan de Fuca Sport (BC JF S)

### 3.28.1 Description of Fishery and Changes

Recreational ISBM Chinook fisheries in inside waters normally take place from Queen Charlotte Strait south to the Strait of Juan de Fuca throughout the year. Significant areas of catch and effort occur in waters near Port Hardy and Campbell River, and in the Strait of Georgia and Southern Vancouver Island including Juan de Fuca Strait, with both catch and effort peaking during the summer months. There are opportunities to also harvest coho, pink, and chum during this fishery. The 9806 Model calibration was split into more geographically distinct areas for Phase II: the ISBM fishery in the marine waters of the Strait of Georgia and the ISBM fishery in the B.C. waters of the Strait of Juan de Fuca.

### 3.28.2 Base Period Exploitation Rate by Age

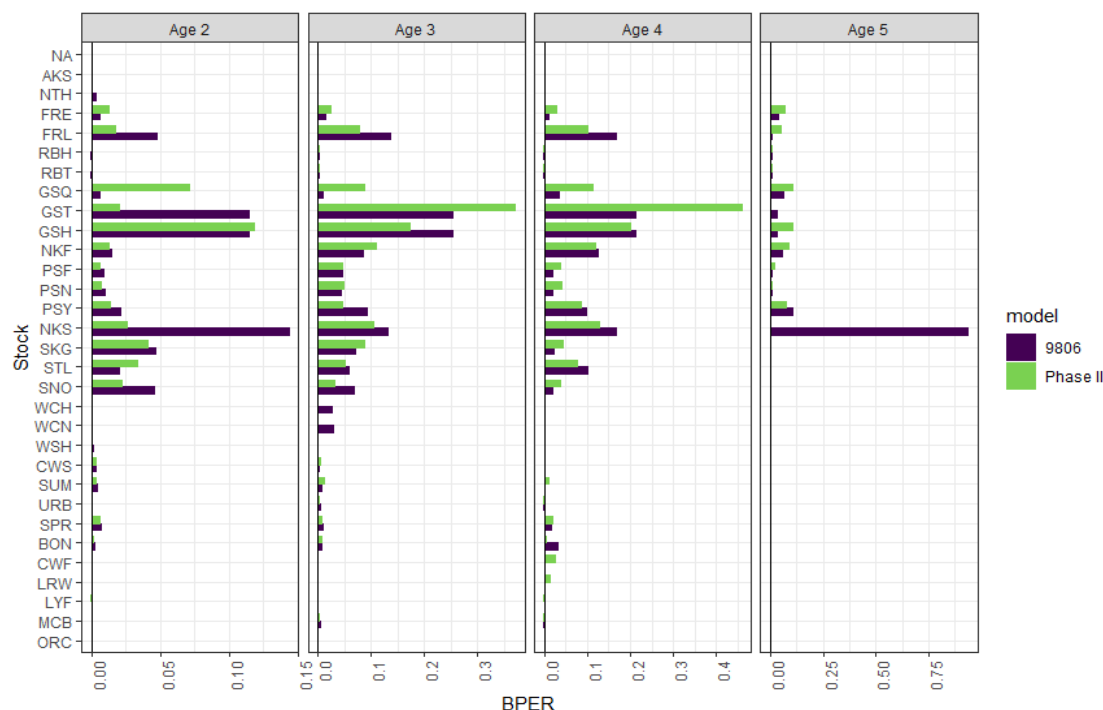


Figure 56—Base period exploitation rate by age for Georgia Strait Sport (9806), Strait of Georgia Sport (Phase II), and BC Juan de Fuca Sport (Phase II).

### 3.28.3 Reported Catch

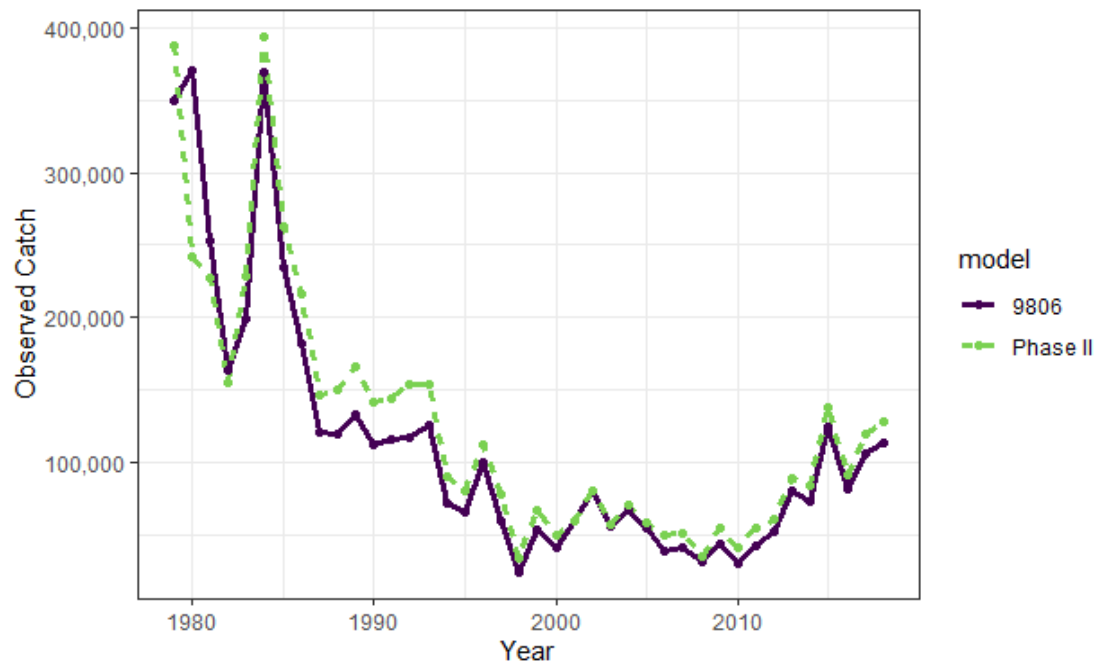


Figure 57—Reported catch for Georgia Strait Sport (9806), Strait of Georgia Sport (Phase II), and BC Juan de Fuca Sport (Phase II).

## 3.29 Georgia Strait Sport (GEO ST S): Strait of Georgia Sport (GEO ST S)

### 3.29.1 Description of Fishery and Changes

See section 3.28.1.

### 3.29.2 Base Period Exploitation Rate by Age

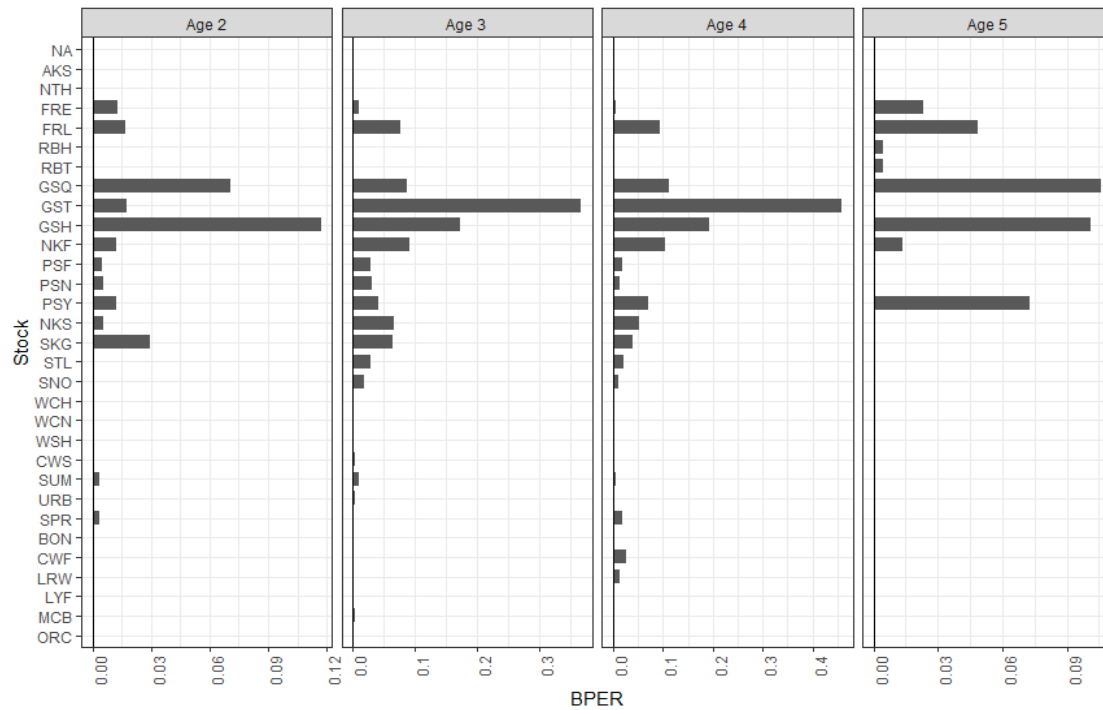


Figure 58—Base period exploitation rate by age for Strait of Georgia Sport (Phase II).

### 3.29.3 Reported Catch

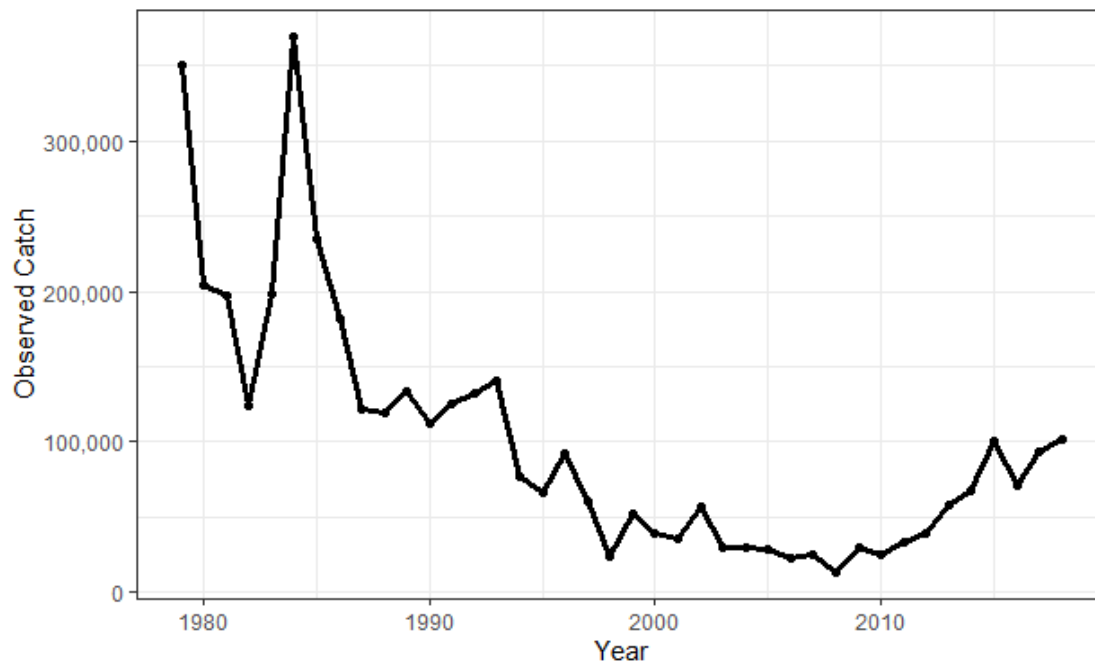


Figure 59—Reported catch for Strait of Georgia Sport (Phase II).

### 3.30 Georgia Strait Sport (GEO ST S): B.C. Juan de Fuca Sport (BC JF S)

#### 3.30.1 Description of Fishery and Changes

See section 3.28.1.

#### 3.30.2 Base Period Exploitation Rate by Age

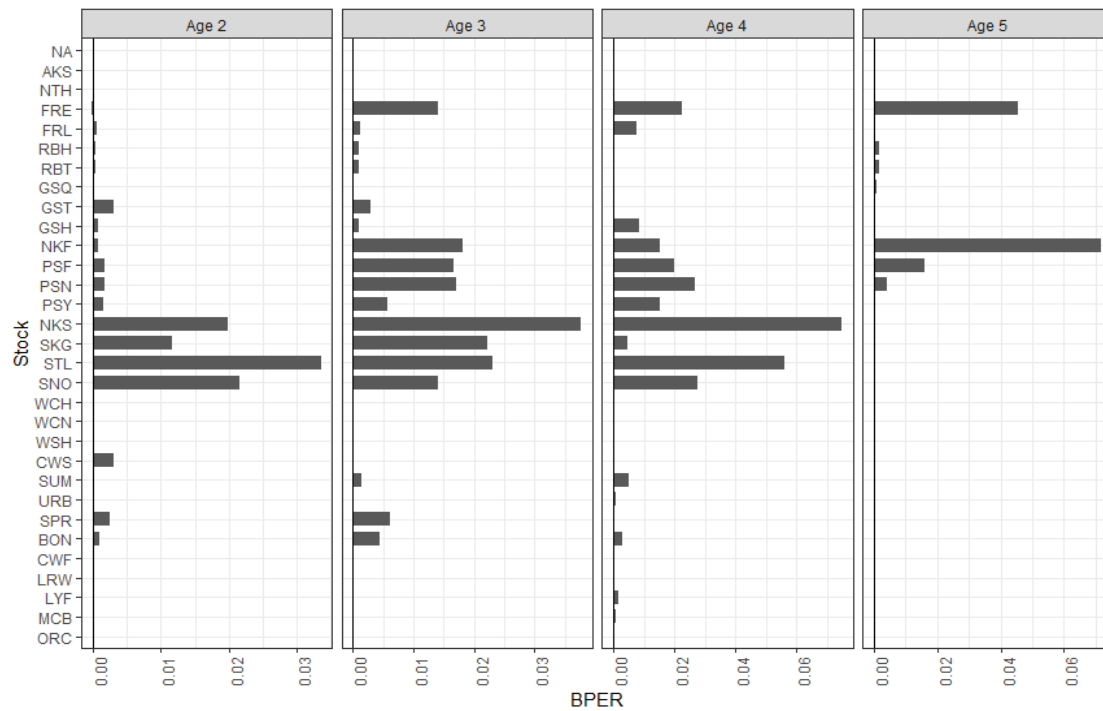


Figure 60—Base period exploitation rate by age for BC Juan de Fuca Sport (Phase II).

### 3.30.3 Reported Catch

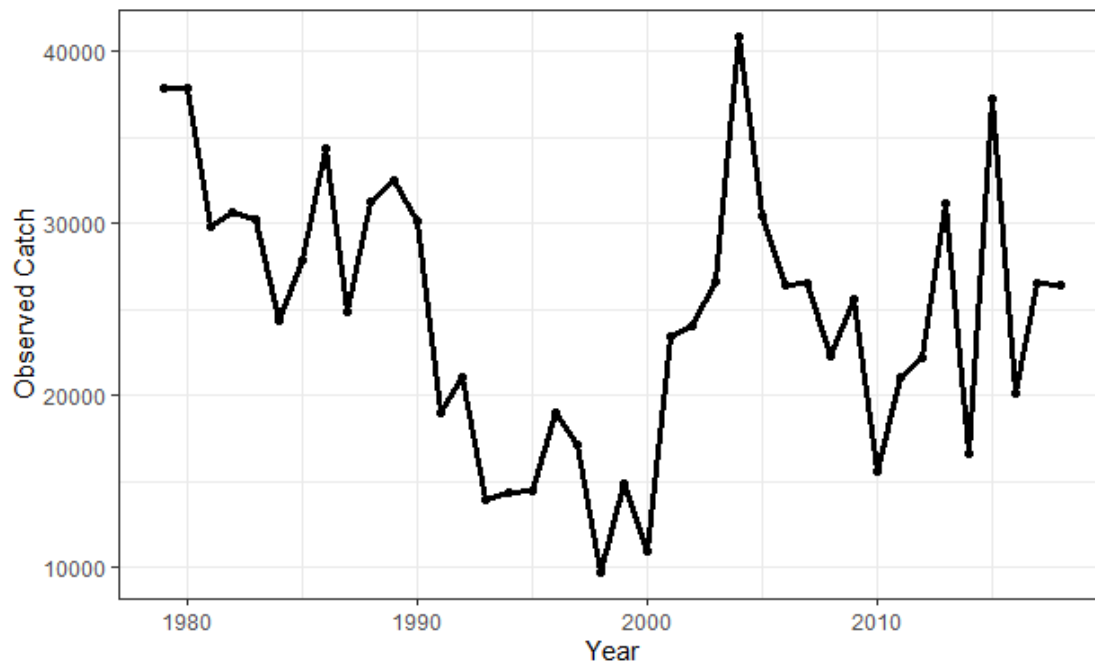


Figure 61—Reported catch for and BC Juan de Fuca Sport (Phase II).

## **4 Terminal Model Fisheries**

### **4.1 New Model Fishery: Alaska Yakutat Terminal Net (TAK YAK N)**

#### **4.1.1 Description of Fishery and Changes**

The Yakutat terminal net fishery occurs in Dry Bay at the Alsek River terminus. Although there is no directed Chinook salmon fishery, the directed sockeye salmon fishery opens during the peak of the Chinook salmon return to the Alsek River. Peak timing of the Chinook migration appears to be during the first two weeks of June, based on tagging studies conducted from 1998 through 2004. Alsek River Chinook harvests in the U.S. have been less than 1,000 Chinook salmon every year since 1981.

#### **4.1.2 Base Period Exploitation Rate by Age**

This fishery was not in the 9806 Model calibration.

#### **4.1.3 Reported Catch**

This fishery was not in the 9806 Model calibration.



## 4.2 New Model Fishery: Alaska Transboundary River Terminal Net (TAK TBR N)

### 4.2.1 Description of Fishery and Changes

The Alaska Transboundary River Terminal Net fishery operates in the marine terminal waters adjacent to the Taku and Stikine rivers. These fisheries target Chinook, sockeye, and coho salmon, however pink and chum salmon are also incidentally harvested. The majority of the net fishery takes place June – September, where Chinook and sockeye salmon are primarily harvested earlier than coho salmon. Pre-season forecasts dictate whether Taku and Stikine River directed fisheries for Chinook salmon are prosecuted. Pre-season forecasts in combination with in-season escapement information is used to manage and prosecute directed fisheries for Taku and Stikine River sockeye salmon. The coho salmon fishery for the Taku and Stikine River are managed based on run strength assessments (e.g., harvest and effort levels, CWT recoveries and in river run size estimates (for the Taku River only)).

### 4.2.2 Base Period Exploitation Rate by Age

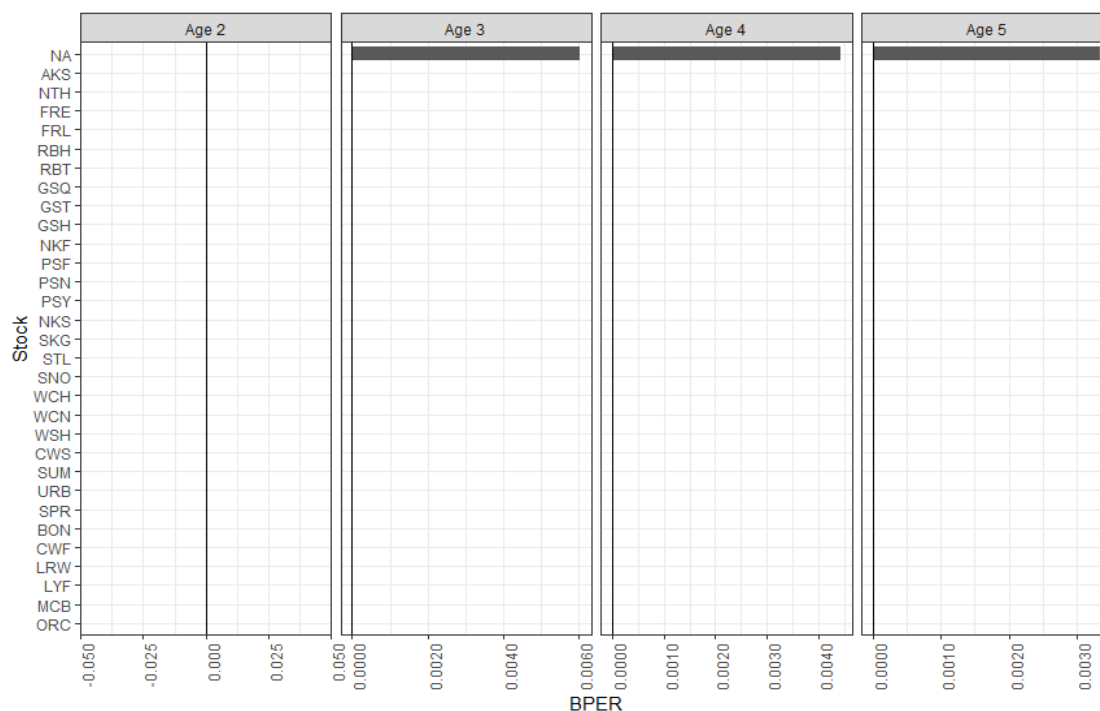


Figure 62—Base period exploitation rate by age for Alaska Transboundary River Terminal Net.

### 4.2.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.3 New Model Fishery: Canada Yakutat Freshwater Net (TYK YAK FN)

### 4.3.1 Description of Fishery and Changes

This fishery name is comprised of Canadian First Nation and recreational harvest in the Klukshu and Tatshenshini Rivers respectively, which are both part of the Alsek River basin. There is no commercial fishery in the Canadian portion of the Alsek River (Joint Transboundary Technical Committee, Draft 2020). The First Nation harvest is subsistence-based and while the most common gear is angling (snagging) other methods are used, including gaffing, small gillnets, and traps; while the recreational fishery is always rod and reel (Joint Transboundary Technical Committee, Draft 2020). The naming of this fishery (TYK YAK FN) does not accurately represent geographic location and gear.

The First Nations fishery is permitted to operate throughout the span of the run, and it targets Chinook, sockeye, and coho to a lesser degree. The recreational fishery that targets Chinook generally occurs July through early August when sufficient in-season information becomes available to indicate run size. The combined First Nation and recreational harvest peaked in 1979 (1,950) and has ranged between 19—317 during the last 20 years.

### 4.3.2 Base Period Exploitation Rate by Age

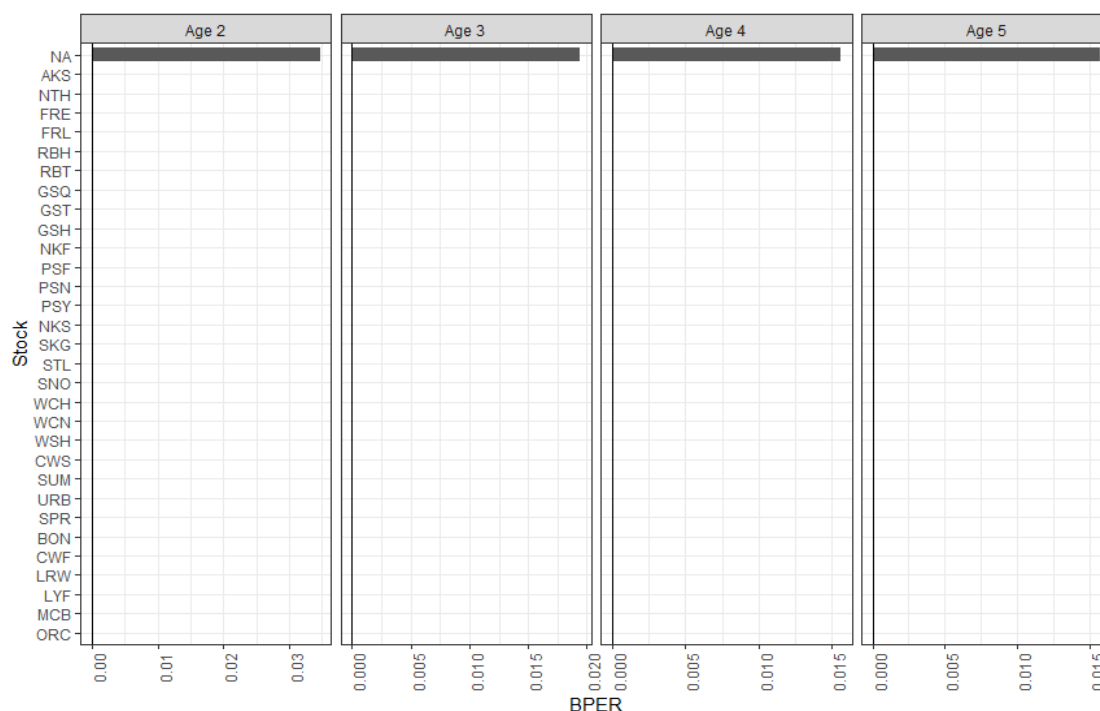


Figure 63—Base period exploitation rate by age for Canada Yakutat Freshwater Net.

### **4.3.3     Reported Catch**

This fishery was not in the 9806 Model calibration.

## **4.4 New Model Fishery: Canada Transboundary River Terminal Net (TBC TBR FN)**

### **4.4.1 Description of Fishery and Changes**

This fishery name is represented by Canadian catch in both the Stikine and Taku Rivers. In the Stikine River, there are Chinook directed commercial gillnet and assessment fisheries occurring in the lower and upper river; First Nation fisheries (predominantly gillnet and angling) in the upper river, and up to 2015, recreational fisheries (angling) at the mouth of the Tahltan River. Additionally, the directed sockeye commercial fishery in the lower Stikine River can include incidentally caught Chinook during years that the Chinook run exceeds agreed-upon management thresholds, otherwise all incidental Chinook catch must be released. The maximum combined harvest in the Stikine River occurred in 2004 (approximately 21,300) and since 2000 has ranged between 500—21,000. The timing of harvest can span mid-June until mid-August.

The Taku River comprises commercial gillnet, First Nation, recreational, and assessment fisheries that are each targeting Chinook. Similar to the Stikine River, the directed sockeye commercial fishery in the Taku River can include incidentally caught Chinook during years that the Chinook run exceeds agreed-upon management thresholds, otherwise all incidental Chinook catch must be released. The maximum combined Chinook harvest in the Taku River occurred in 2005 (approximately 8,400) and since 2000, the harvest has ranged between 15—8,400. The timing of harvest can span from late June until late September.

#### 4.4.2 Base Period Exploitation Rate by Age

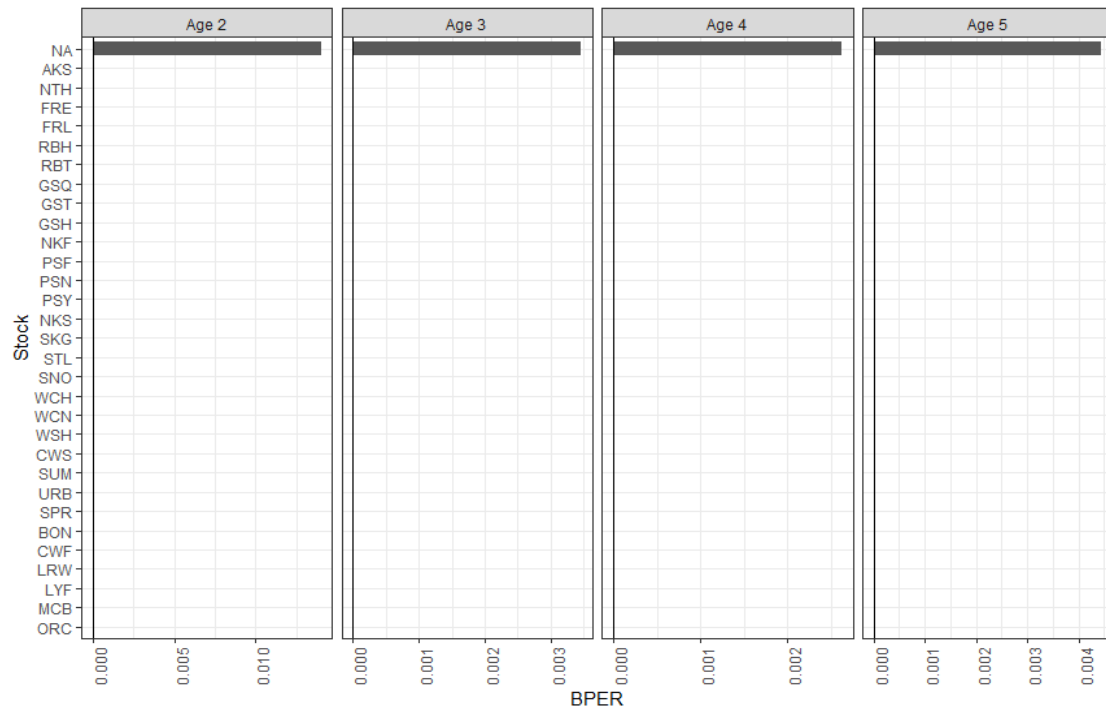


Figure 64—Base period exploitation rate by age for Canada Transboundary River Freshwater Net.

#### 4.4.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.5 New Model Fishery: Central B.C. Freshwater Net (TCENTRAL FN)

### 4.5.1 Description of Fishery and Changes

The CBC Freshwater Net fishery is dominated by a First Nation's gillnet drift fishery in the Bella Coola River, which targets Chinook from the Bella Coola and Atnarko Rivers. There are a few other locations where Chinook are caught in freshwater gillnets in river systems between Kitimat and Cape Caution, but these are very small fisheries, often with Chinook as bycatch in small numbers (less than 10).

### 4.5.2 Base Period Exploitation Rate by Age

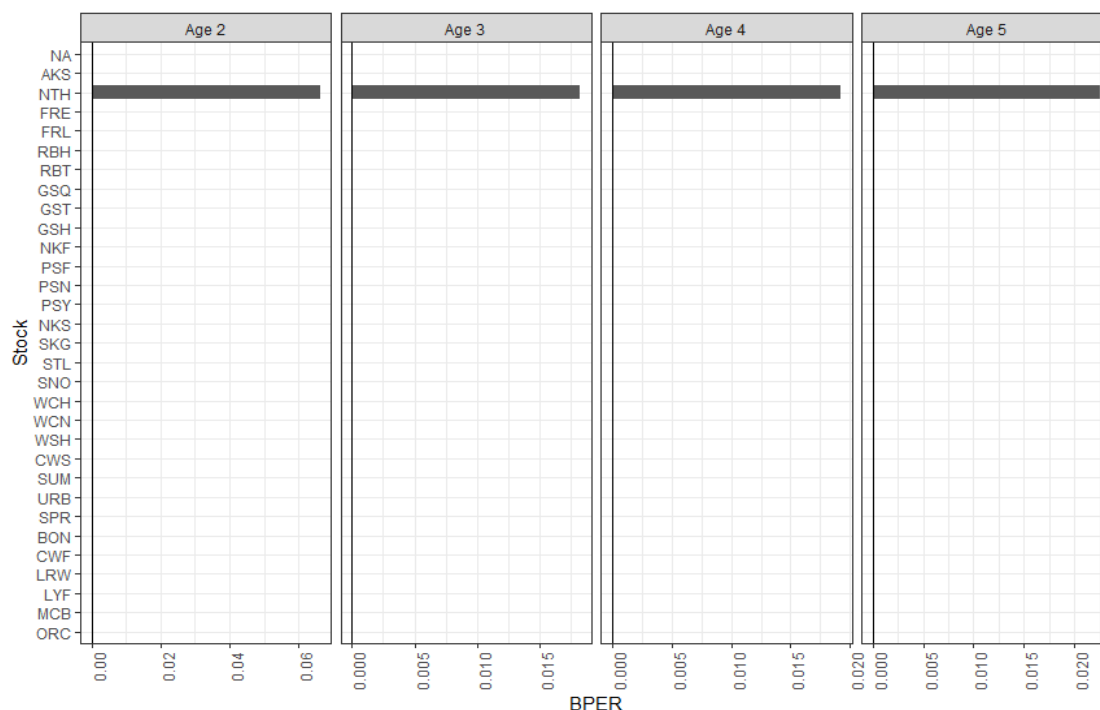


Figure 65—Base period exploitation rate by age for Central British Columbia Freshwater Net.

### 4.5.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.6 New Model Fishery: Strait of Georgia Freshwater Net (TGEO ST FN)

### 4.6.1 Description of Fishery and Changes

There are very few systems throughout the Strait of Georgia freshwater complex where net fisheries can take place as the river systems are small and shallow. Some examples include the Qunisam and Campbell Rivers, the Nanaimo River, the Big Qualicum River, and the Cowichan River. The fisheries are all conducted by First Nations using small gill nets targeting mostly enhanced stocks. These are very small fisheries, often with small catches of Chinook and coho (less than 10 per set).

### 4.6.2 Base Period Exploitation Rate by Age

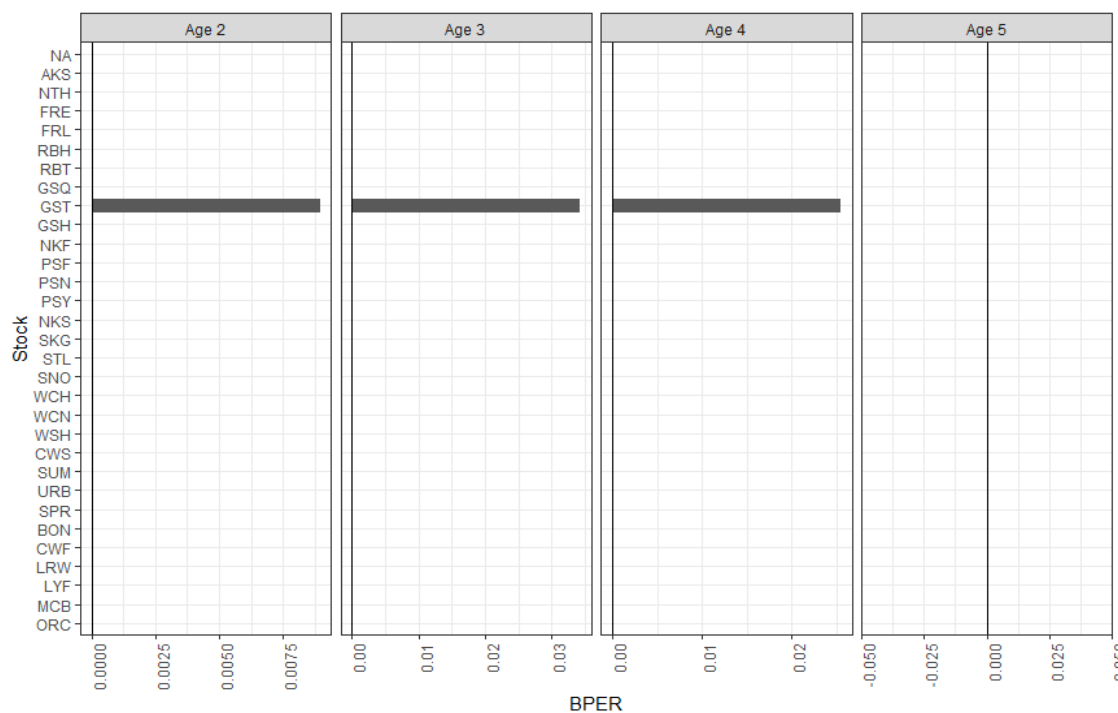


Figure 66—Base period exploitation rate by age for Strait of Georgia Freshwater Net.

### 4.6.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## **4.7 New Model Fishery: Fraser Freshwater Net (TFRAS FN)**

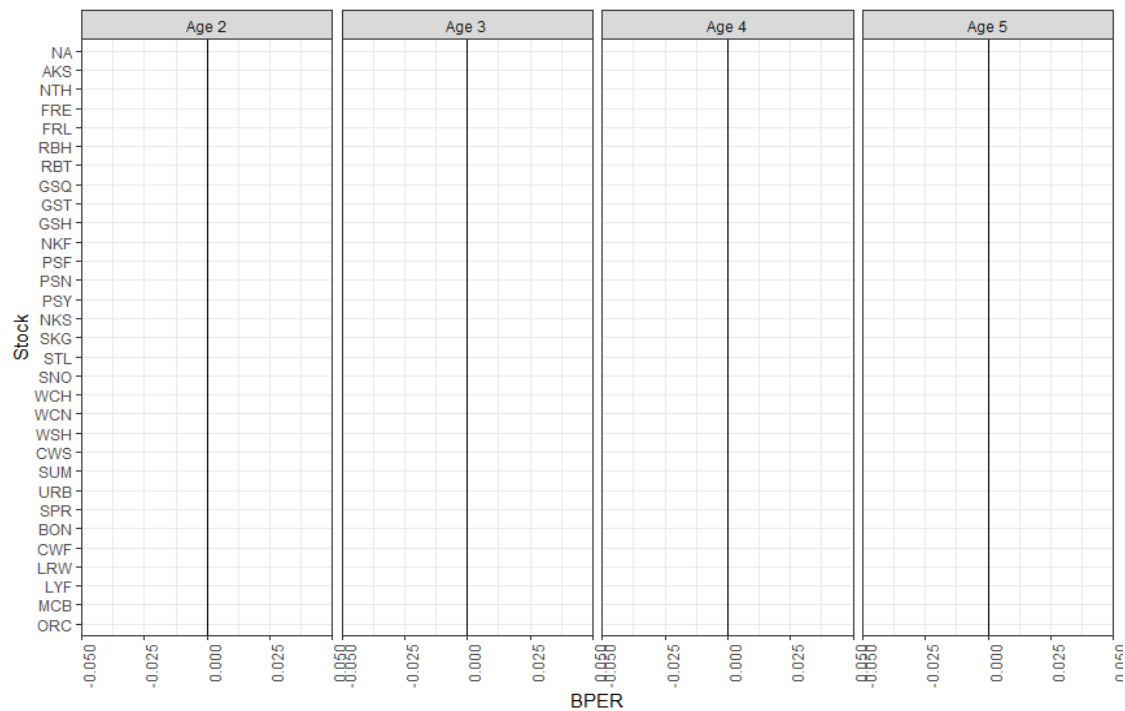
### **4.7.1 Description of Fishery and Changes**

The Fraser Freshwater Net was not a fishery in BPC 9806. Since that version of the Model, catch data in all the known commercial, First Nation and sport fisheries have been assembled and then have been used in annual run reconstruction analyses (English et al. 2007) to estimate the catch of the six Fraser model stocks in the net and sport fisheries. The Fraser Freshwater Net fishery includes the First Nation fisheries and commercial net fisheries that are upstream of Mission. One should note that the majority of Fraser First Nation harvest is from gillnets, but other fishing gears are used in different areas, such as dip net, gaffs, rod and reel angling and snagging, beach seines, fish traps, and fish wheels. The gillnet mesh size may be regulated in some of the First Nation fisheries when there are comigrating species of concern, but often the fisheries occur with specific restrictions on mesh size. These fisheries can target Chinook, sockeye, pink, coho or chum.

The CWT sampling was not initiated in the First Nation fisheries until well after the base period, and the separation of the different net fisheries only began around 2011. Previous recoveries were collapsed into a single, combined Fraser Net fishery as reported in Mark Recovery Program (MRP) and the Regional Mark Information System (RMIS) databases. Considerable work remains to more finely represent the characteristics of the Fraser Net fisheries, but sparse and limited CWT sample and catch data continue to be challenging issues with base period representation. The development of new techniques to construct historic exploitation series may provide opportunities to improve the representation of the Fraser net fisheries. As efforts continue to improve the representation of Fraser River fisheries for landed catch and incidental mortality, there are new limitations identified with data, such as incompleteness (i.e., negative bias). Improvements to these data, past and future, depend on resources (i.e., time, finances, human capacity, and expertise).

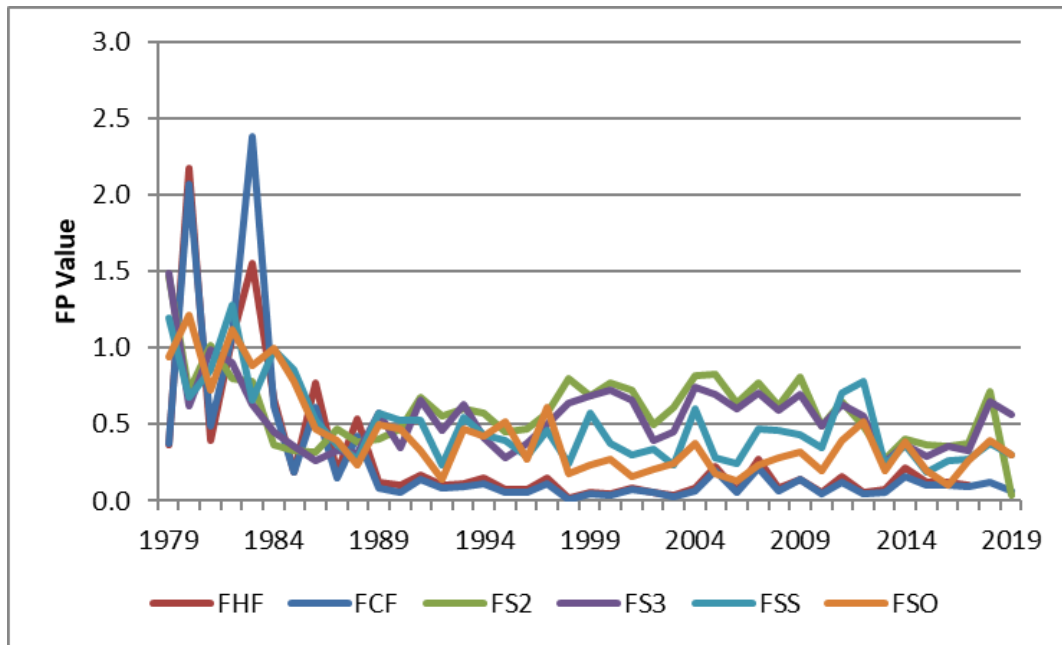


### 4.7.2 Base Period Exploitation Rate by Age



*Figure 67—Base period exploitation rate by age for Fraser River Freshwater Net. The figure illustrates exploitation rates for stocks that are in both 9806 and Phase II. Note that all of the Fraser stocks that were part of Fraser Early (FRE) and Fraser Late (FRL) were further stratified in Phase II, thus no information is presented in the figure.*

Fishery policy (FP) scalars are used in the model calibration for the six Fraser Model stocks to represent the temporal pattern for the combination of the Fraser Net and the Fraser Freshwater Net fisheries. Currently, the FP Scalars are based on the annual harvest rates estimated for each of the six Fraser River stocks from the Run Reconstruction model for the terminal run abundances at the Fraser River mouth (Figure 68).

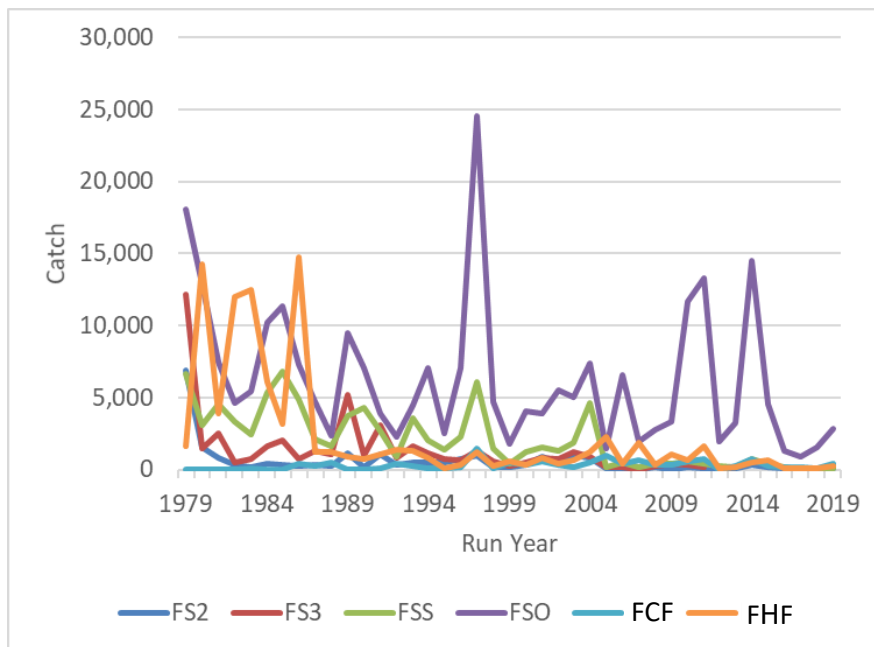


*Figure 68—Time series of FP Scalars for the combined Fraser net fisheries for the six Fraser River Model stocks in Phase II. The scalars are based on the time series of harvest rates generated from the Run Reconstruction model estimates of catch and river mouth abundance for each of the six Fraser River model stocks.*

*Note: Fraser River stocks include Fraser Harrison Fall (FHF), Fraser Chilliwack Fall (FCF), Fraser Spring 1.2 (FS2), Fraser Spring 1.3 (FS3), Fraser Summer Stream-type 1.3 (FSS), and Fraser Summer Ocean-type 0.3 (FSO).*

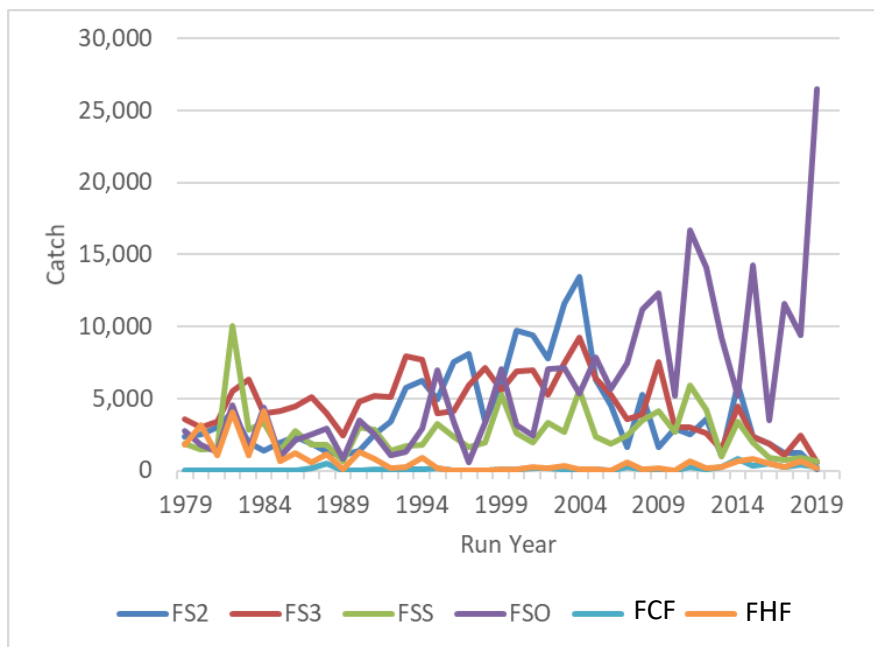
### 4.7.3 Reported Catch

The annual catch for each of the Fraser River model stocks is estimated using the Run Reconstruction model (English et al. 2007) and catch and escapement data. Several improvements have been made to the Run Reconstruction since the original publication, including: adding more years, stocks, fishery stratification, and further review of migration rate and other timing information. The Model currently produces times series of stock-specific catches for commercial (includes test fisheries; Figure 69) and First Nation fisheries (Figure 70).



*Figure 69—Fraser River commercial fishery catches for each of the six Fraser River Model stocks estimated using the Fraser Chinook Run Reconstruction model.*

*Note: Fraser River stocks include Fraser Harrison Fall (FHF), Fraser Chilliwack Fall (FCF), Fraser Spring 1.2 (FS2), Fraser Spring 1.3 (FS3), Fraser Summer Stream-type 1.3 (FSS), and Fraser Summer Ocean-type 0.3 (FSO).*



*Figure 70—Fraser River First Nation fishery catches for each of the six Fraser River Model stocks, estimated using the Fraser Chinook Run Reconstruction model.*

*Note: Fraser River stocks include Fraser Harrison Fall (FHF), Fraser Chilliwack Fall (FCF), Fraser Spring 1.2 (FS2), Fraser Spring 1.3 (FS3), Fraser Summer Stream-type 1.3 (FSS), and Fraser Summer Ocean-type 0.3 (FSO).*

## 4.8 Terminal Net (TERMINAL NET): Puget Sound Freshwater Net (TPS FN)

### 4.8.1 Description of Fishery and Changes

The Puget Sound Freshwater Net fishery (TPS FN) is a new fishery for Phase II, having the fine scale fisheries comprising TPS FN separated from the Puget Sound Other Net fishery (Model fishery 13) of calibration 9806. The fishery includes net catches in freshwater rivers of the Strait of Juan de Fuca and Puget Sound, in addition to terminal marine net catch occurring in Bellingham Bay (Catch Areas 7B, 7C, and 7D). Timing of fisheries in individual rivers vary by the run timing of the stock. The earliest fisheries occur in April targeting Nooksack River Spring Chinook. Most terminal net fisheries target fall Chinook and occur from July to October. The model fishery TPS FN (30) corresponds to the ERA fishery TPS FN (38).

### 4.8.2 Base Period Exploitation Rate by Age

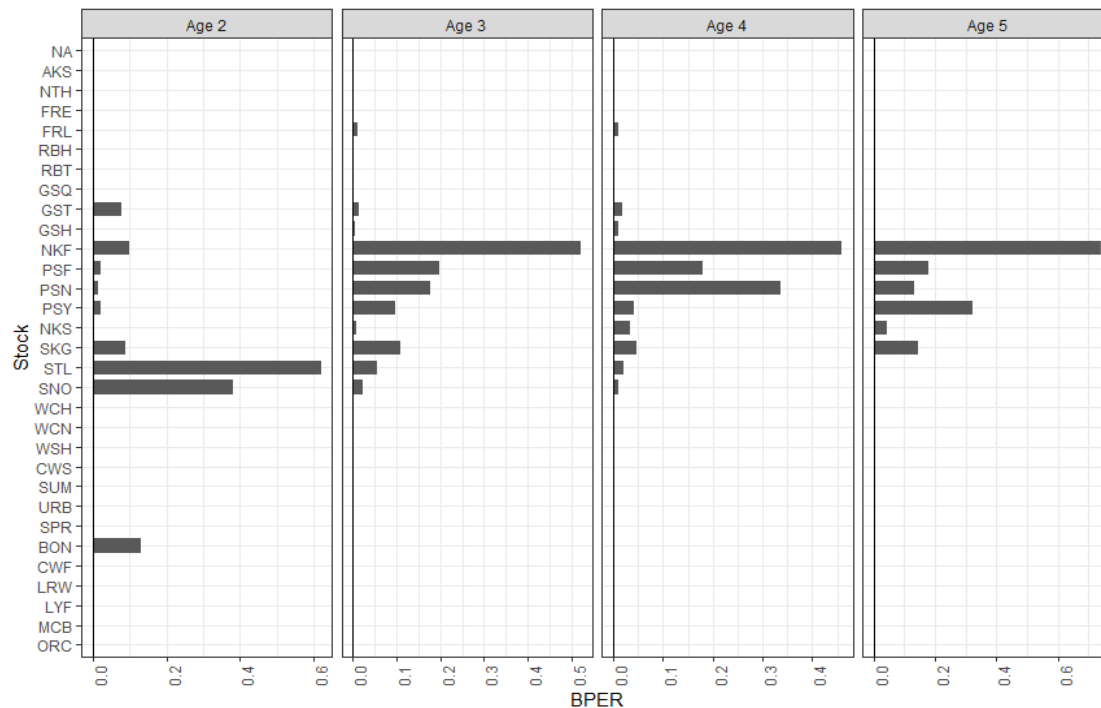


Figure 71—Base period exploitation rate by age for Puget Sound Freshwater Net.

### 4.8.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.9 Terminal Net (TERMINAL NET): Washington Coast Freshwater Net (TWAC FN)

### 4.9.1 Description of Fishery and Changes

The Washington Coast Freshwater Net fishery (TWAC FN) is a new fishery for Phase II, having the fine scale fisheries comprising TWAC FN separated from the Washington Coast Net fishery (Model fishery 14) of calibration 9806. These fisheries operate in coastal rivers of the north Washington coast, and tributaries of the Grays Harbor and Willapa Bay. The fisheries target fall Chinook, occurring from August through October. The Model fishery corresponds to the ERA fishery TWAC FN (39).

### 4.9.2 Base Period Exploitation Rate by Age

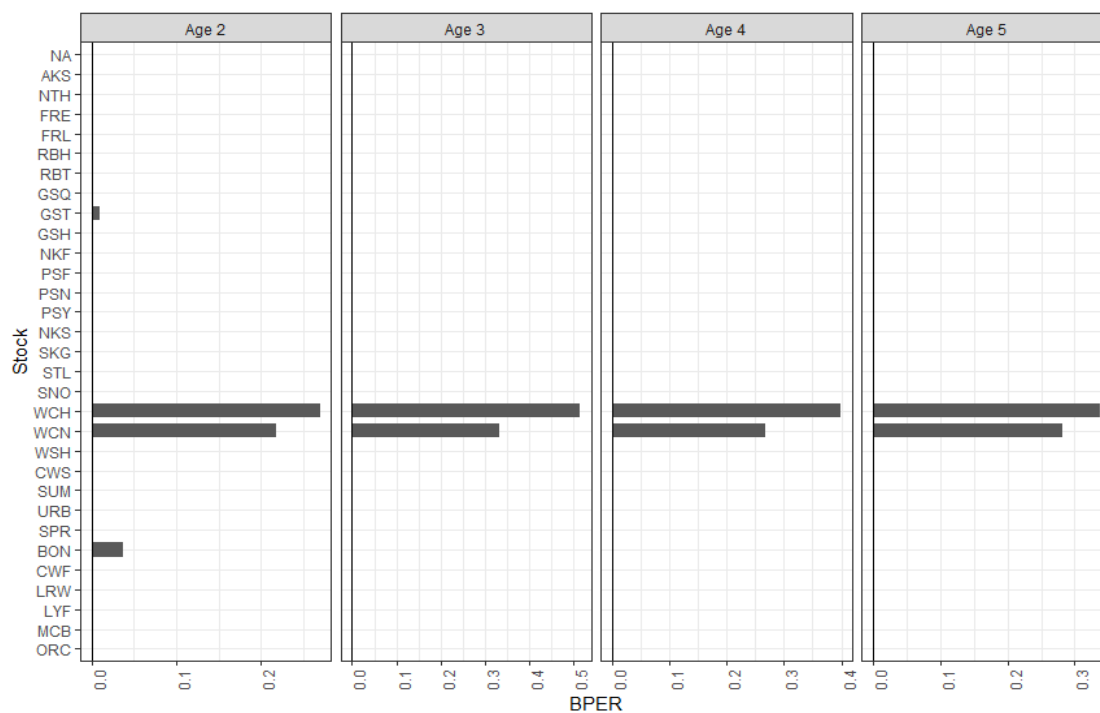


Figure 72—Base period exploitation rate by age for Washington Coast Freshwater Net.

### 4.9.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.10 Terminal Net (TERMINAL NET): Columbia River Net (TCOL R N)

### 4.10.1 Description of Fishery and Changes

In the Columbia Basin, fisheries are managed under the jurisdiction of the United States v. Oregon court case. This case provides a framework within which the parties comprising states (Oregon, Washington and Idaho) and tribes (Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation) may cooperatively enhance fish runs and manage fisheries. The case was first brought to courts in 1968 to enforce the reserved fishing rights of the four Columbia River tribes that signed treaties with the U.S. government in 1855 and historically fished in the Columbia River. Specifically, this case describes the limits of state regulations of treaty fisheries and ensures the treaty tribes 50 percent of the harvestable surplus of natural-origin and hatchery-origin fish destined to pass through their usual and accustomed fishing areas. Consequently, treaty and non-treaty fisheries are managed differently in the Columbia. Regulations also change throughout the season for spring-, summer- and fall-run Chinook. The current U.S. v Oregon management agreement started in 2019 and extends until 2027. A map of Columbia River management zones below McNary Dam is shown below (Figure 73). Note that this map does not show the section of the Columbia River upstream of McNary Dam or the Snake River, where additional fisheries occur.

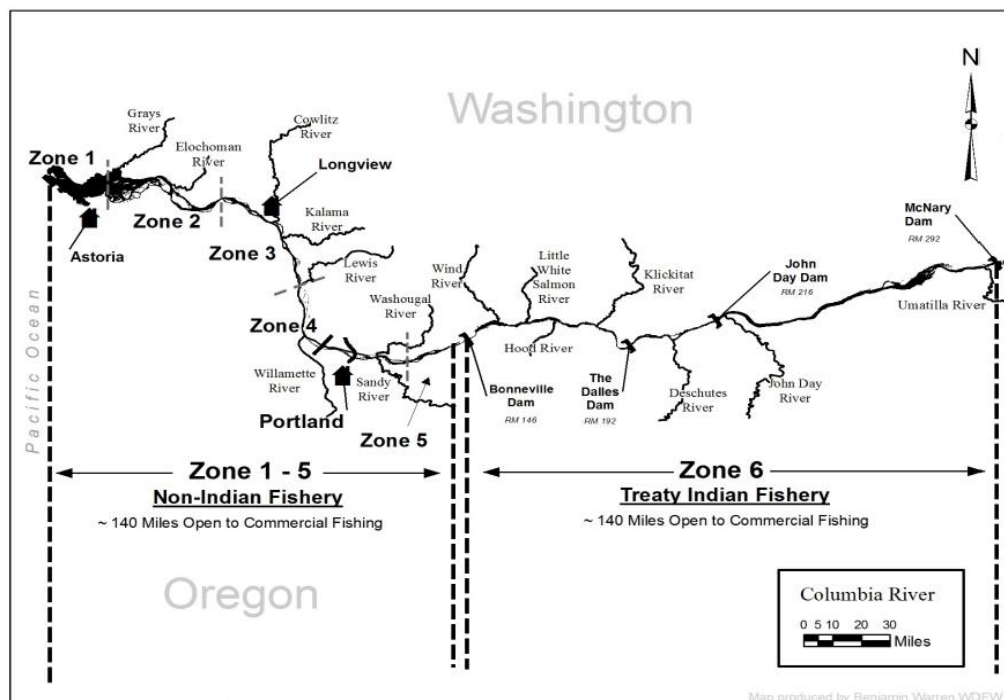


Figure 73—Map of Columbia River fishery management zones downstream of McNary Dam. Note that fisheries occur above McNary Dam and in the Snake River.

Note: RM refers to river mile.

## Spring Management Period

Non-treaty and treaty spring season fisheries are managed in accordance with the harvest rate schedule provided in Table A1 of the 2018–2027 U.S. v Oregon management agreement (Table 11). This harvest rate schedule was the first to incorporate a sliding scale, with increasing or decreasing allowable impact rates depending on the total upriver spring Chinook run size. This harvest rate schedule and the preseason forecast for upriver spring Chinook are used to plan fisheries based on the available impacts allocated to treaty and non-treaty fisheries. Non-treaty fisheries are required to meet the catch balance provisions for upriver (originating above Bonneville Dam) spring Chinook. Under these provisions, non-treaty fisheries are managed to remain within ESA impacts and to not exceed the total allowable catch available for treaty fisheries. In addition, prior to the first run size update from the Technical Advisory Committee (TAC), non-treaty fisheries are managed for an allowed treaty catch guideline that is 70% of forecasted run size (i.e. 30% run size buffer).

*Table 11—Revised version of Table A1 of the U.S. v Oregon management agreement.*

2018–2027 Harvest Rate Schedule for Chinook in Spring Management Period							
Total Upriver Spring and Snake River Summer Chinook Run Size <sup>6</sup>	Sneke River Natural Spring/Summer Chinook Run Size <sup>1</sup>	Treaty Zone 6 Total Harvest Rate <sup>2,5</sup>	Treaty Catch Guideline	Non-Treaty Natural Harvest Rate <sup>3</sup>	Non-Treaty Mortality Guideline	Total Natural Harvest Rate <sup>4</sup>	Non-Treaty Natural Limited Harvest Rate <sup>4</sup>
<27,000	<2,700	5.00%		<0.5%		<5.5%	0.50%
27,000	2,700	5.00%	1,350	0.50%	1,350	5.50%	0.50%
33,000	3,300	5.00%	1,650	1.00%	1,650	6.00%	0.50%
44,000	4,400	6.00%	2,640	1.00%	2,640	7.00%	0.50%
55,000	5,500	7.00%	3,850	1.50%	3,850	8.50%	1.00%
82,000	8,200	7.40%	6,068	1.60%	6,068	9.00%	1.50%
109,000	10,900	8.30%	9,047	1.70%	9,047	10.00%	
141,000	14,100	9.10%	12,831	1.90%	12,831	11.00%	
217,000	21,700	10.00%	21,700	2.00%	21,700	12.00%	
271,000	27,100	10.80%	29,268	2.20%	29,268	13.00%	
326,000	32,600	11.70%	38,142	2.30%	38,142	14.00%	
380,000	38,000	12.50%	47,500	2.50%	47,500	15.00%	
434,000	43,400	13.40%	58,156	2.60%	58,156	16.00%	
488,000	48,800	14.30%	69,784	2.70%	69,784	17.00%	

<sup>1</sup>If the Snake River natural spring/summer forecast is less than 10% of the total upriver run size, the allowable mortality rate will be based on the Snake River natural spring/summer Chinook run size. In the event the total forecast is less than 27,000 or the Snake River natural spring/summer forecast is less than 2,700, Oregon and Washington would keep their mortality rate below 0.5% and attempt to keep actual mortalities as close to zero as possible while maintaining minimal fisheries targeting other harvestable runs.

<sup>2</sup>Treaty Fisheries include: Zone 6 ceremonial, subsistence, and commercial fisheries from January 1–June 15. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.

<sup>3</sup>Non-Treaty Fisheries include: Commercial and recreational fisheries in Zones 1–5 and mainstem recreational fisheries from Bonneville Dam upstream to the Hwy 395 Bridge in the Tri-Cities and commercial and recreation SAFE (Selective Areas Fisheries Evaluation) fisheries from January 1–June 15; Wanapum tribal fisheries, and Snake River mainstem recreational fisheries upstream to the Washington-Idaho border from April through June. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.

<sup>4</sup>If the Upper Columbia River natural spring Chinook forecast is less than 1,000, then the total allowable mortality for treaty and non-treaty fisheries combined would be restricted to 9% or less. Whenever Upper Columbia River natural fish restrict the total allowable mortality rate to 9% or less, then non-treaty fisheries would transfer 0.5% harvest rate to treaty fisheries. In no event would non-treaty fisheries go below 0.5% harvest rate.

<sup>5</sup>The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.

<sup>6</sup>If the total in river run is predicted to exceed 380,000, the Parties agree to consider increasing the total allowed harvest rate and to reinstate consultation with NOAA Fisheries if necessary.

The mainstem Columbia River from Buoy 10 to the Interstate-5 (I-5) Bridge is open for spring Chinook retention during January 1 through March 31, and the area from the I-5 Bridge upstream to the Oregon/Washington border above McNary Dam closes effective January 1. The purpose of these regulations is to target early-migrating hatchery-origin Willamette spring Chinook and reduce the catch of upriver spring Chinook.

Tributary spring Chinook recreational fisheries downstream of Bonneville Dam have been mark-selective since 2001. The largest of these tributary fisheries occurs on the Willamette River. Fisheries on the Willamette, but also on the Columbia, are managed to ensure that cumulative freshwater mortality does not exceed 15% of the combined wild spring Chinook run destined for the Willamette River. This guideline is managed with a suite of management activities, including mark-selective fisheries. Additionally, Willamette fisheries are managed to meet escapement goals for hatchery-produced spring Chinook over Willamette Falls and to the Clackamas River. These goals are designed to provide for full mark-selective recreational fisheries in the Willamette River and its tributaries upstream of Willamette Falls, and meet hatchery broodstock goals (Joint Columbia River Management Staff 2021).

Springtime commercial salmon fisheries on the Columbia have occurred since 1878. Beginning in 1957, all non-treaty commercial fisheries have been restricted to Zones 1–5 and treaty commercial fisheries to Zone 6. The first full fleet live-capture commercial fishery took place in 2002. The fishery was limited to commercial fishers who held appropriate licenses and gear and had completed a state-sponsored workshop concerning live-capture techniques. Beginning in 2004, test fishing was implemented as a tool to help determine the optimum time for fishing periods based on observed Chinook and steelhead catch rates. After test fishing results are known, the decisions of whether to fish and using which commercial gear are made. Fishing periods are scheduled to maximize retention of hatchery spring Chinook and minimize handling of steelhead and unmarked Chinook. This process continues until either the upriver Chinook impact allocation, the hatchery Willamette harvest allocation, or the wild winter steelhead impact limit are reached; however, the upriver spring Chinook impact allocation is typically the most constraining factor.

Treaty fisheries occurring above Bonneville Dam for spring Chinook are not described here. A small percentage of the catch above Bonneville Dam is also comprised of non-treaty recreational catches. Spring Chinook stock originating above Bonneville Dam are not represented in the Pacific Salmon Treaty and are not generally intercepted in mixed stock Chinook fisheries occurring in Canada and Alaska.

### ***Summer Management Period***

Mainstem Columbia River summer Chinook fisheries occurring from June 16 through July 31 are managed in accordance with the harvest rate schedule provided in Table A2 of the 2018–2027 U.S. v Oregon management agreement (Table 12). Table A2 follows the general framework described below but provides a more detailed description of incremental harvest rates and escapement past fisheries. U.S. v Oregon parties manage upper Columbia River summer Chinook based on an interim management goal of 29,000 hatchery and natural origin adults, as measured at the Columbia River mouth. This management goal is based on an interim



combined spawning escapement goal of 20,000 hatchery and natural adults upstream of Priest Rapids Dam.

*Table 12—Current framework for Upper Columbia summer Chinook harvest rates as found in the U.S. v Oregon management agreement Table A2.*

Upper Columbia Summer Chinook Fishery Framework		
Run Size at River Mouth	Allowed Treaty Harvest	Allowed Non-Treaty Harvest
<5,000	5%	<100 Chinook
5,000—<16,000	5%	<200 Chinook
16,000—<29,000	10%	5%
29,000—<32,500	10%	5-6%
32,500—<36,250	10%	7%
(125% of 29,000 goal)		
36,250-50,000	50% of total harvestable <sup>1</sup>	50% of total harvestable <sup>1</sup>
>50,000	50% of 75% of margin above	50% of 75% of margin above
	50,000 plus 10,500 <sup>2</sup>	50,000 plus 10,500 <sup>2</sup>

<sup>1</sup>The total number of harvestable fish is defined as the run size minus 29,000 for run sizes of 36,250 to 50,000.

<sup>2</sup>For the purposes of this Agreement, the total number of harvestable fish at run sizes greater than 50,000 is to be determined by the following formula:  $(0.75 * (\text{run size} - 50,000)) + 21,000$ .

Based on this framework, the sharing formula allows for greater numbers of fish to be harvested when runs are greater than 50,000 fish. Non-treaty PFMC area ocean fisheries and all in-river fisheries are included in the treaty/non-treaty sharing of upper Columbia summer Chinook.

Wanapum Tribal fisheries occur on the mainstem Columbia River in McNary Pool between Priest Rapids Dam and Vernita Bridge. Colville Tribal summer fisheries typically occur on the mainstem Columbia River upstream of Wells Dam. Wanapum and Colville catches count as part on the non-treaty catch share. Allocations and guidelines for these fisheries are determined by an agreement between these two Tribes and the state of Washington.

Treaty fisheries are managed individually by the four Columbia River treaty tribes through either a permit system or a general regulation system. The tribes have defined regulations concerning lawful gear, fishing area, and other miscellaneous regulations concerning the tribal ceremonial and subsistence, and commercial fisheries. The tribes implement commercial summer fisheries depending on the run size. Since 2004, the tribes have had directed commercial gillnet fisheries in the summer season targeting upper Columbia River summer Chinook.

Beginning in 2005, the management period for summer Chinook at or below Bonneville Dam was reclassified from June 1–July 31 to June 16–July 31 because new information indicated that the June 1–June 15 portion of the summer run typically contained significant numbers of listed Snake River spring/summer Chinook, while the later portion of the run was mostly upper Columbia origin summer Chinook, which are not listed under the ESA. This reclassification allowed the states to maintain protections for listed Snake River spring/summer Chinook, while allowing more substantial fisheries on the upper Columbia summer Chinook run.

### Fall Management Period

Fall season fisheries in the Columbia River basin below the confluence of the Snake River are managed according to the abundance-based harvest rate schedule from the 2018-2027 U.S. v Oregon management agreement (Table 13). If non-treaty mark-selective fisheries are implemented that impact Upriver Brights, the non-treaty ocean and in-river fisheries may not harvest more than 50% of the harvestable surplus of Upriver Brights (URB). Upriver fall Chinook escapement goals include 7,000 adult Bonneville Pool Hatchery fall Chinook (4,000 females) to Spring Creek Hatchery, and a 60,000 adult URB fall Chinook (natural and hatchery) management goal above McNary Dam. Based on preseason run size forecasts, a fishing schedule is developed annually for non-treaty recreational and commercial fisheries through the North of Falcon management process.

*Table 13—Abundance-based harvest rate schedule from the 2018-2027 U.S. v Oregon management agreement for fall fisheries.*

Expected URB River Mouth Run Size	Expected River Mouth Snake River Natural-origin Run Size <sup>1</sup>	Treaty Total Harvest Rate	Non-Treaty Harvest Rate	Total Harvest Rate	Expected Escapement of Snake R. Natural-origin Past Fisheries
<60,000	<1,000	20%	1.50%	21.50%	784
60,000	1,000	23%	4%	27.00%	730
120,000	2,000	23%	8.25%	31.25%	1,375
>200,000	5,000	25%	8.25%	33.25%	3,338
	6,000	27%	11%	38.00%	3,720
	8,000	30%	15%	45.00%	4,400
<ol style="list-style-type: none"> <li>1. If the Snake River natural fall Chinook forecast is less than the level corresponding to an aggregate URB run size, the allowable mortality rate will be based on the Snake River natural fall Chinook run size.</li> <li>2. Treaty Fisheries include; Zone 6 Ceremonial, subsistence, and commercial fisheries from Aug 1-Dec 31.</li> <li>3. Non-Treaty Fisheries include: Commercial and recreational fisheries in Zones 1-5 and mainstem recreational fisheries from Bonneville Dam upstream to the confluence of the Snake River and commercial and recreational SAFE (Selective Areas Fisheries Evaluation) fisheries from August 1-December 31.</li> <li>4. The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.</li> <li>5. Fishery impacts in Hanford sport fisheries count in calculations of the percent of harvestable surplus achieved.</li> <li>6. When expected river-mouth run sizes of naturally produced Snake River Fall Chinook equal or exceed 6,000, the states reserve the option to allocate some proportion of the non-treaty harvest rate to supplement fall Chinook directed fisheries in the Snake River.</li> </ol>					

Traditional non-treaty commercial fisheries below Bonneville Dam occurred during "early fall" (August to mid-September) targeting Chinook, and during the "late fall" (mid-September to mid-November) targeting coho. Although coho typically outnumber Chinook in the late fall season catch, Chinook landings have occasionally been significant during the mid-September timeframe. Since 1992, fall season commercial fisheries below Bonneville Dam have been reduced in response to ESA listings of Chinook and other salmonid species. During 1995-1998, extremely low coho abundance curtailed nearly all commercial fishing opportunities during the late fall period. During 1997-2001, early fall fisheries consisted primarily of short fishing periods targeting sturgeon. Since 2002, August fisheries have expanded in time with increased

emphasis placed on targeting Chinook. Since 2011, the early fall commercial season has primarily occurred in Zones 4 and 5 due to ESA constraints and reduced allocation guidelines for Lower Columbia tule Chinook.

Fall treaty fisheries occur in the mainstem Columbia River from just downstream of Bonneville Dam upstream to McNary Dam. They include commercial and ceremonial and subsistence fisheries. The URB harvest rate is used as a surrogate for harvest rates on Snake River Wild Chinook. The steelhead B-Index harvest rate is used to control impacts on ESA-listed steelhead. Treaty commercial gillnet fisheries have typically occurred from mid to late August through late September or early October. Fishery restrictions may include mesh size restrictions to target Chinook. Area restrictions to reduce impacts on specific Chinook stocks have occurred in the past but have not occurred recently other than closure of the area near Spring Creek Hatchery. This closed area is normally reduced when it becomes clear that Spring Creek Hatchery will meet its broodstock collection goals. Fall treaty tributary fisheries (including those in the Snake Basin) are not discussed in this report for brevity.

#### 4.10.2 Base Period Exploitation Rate by Age

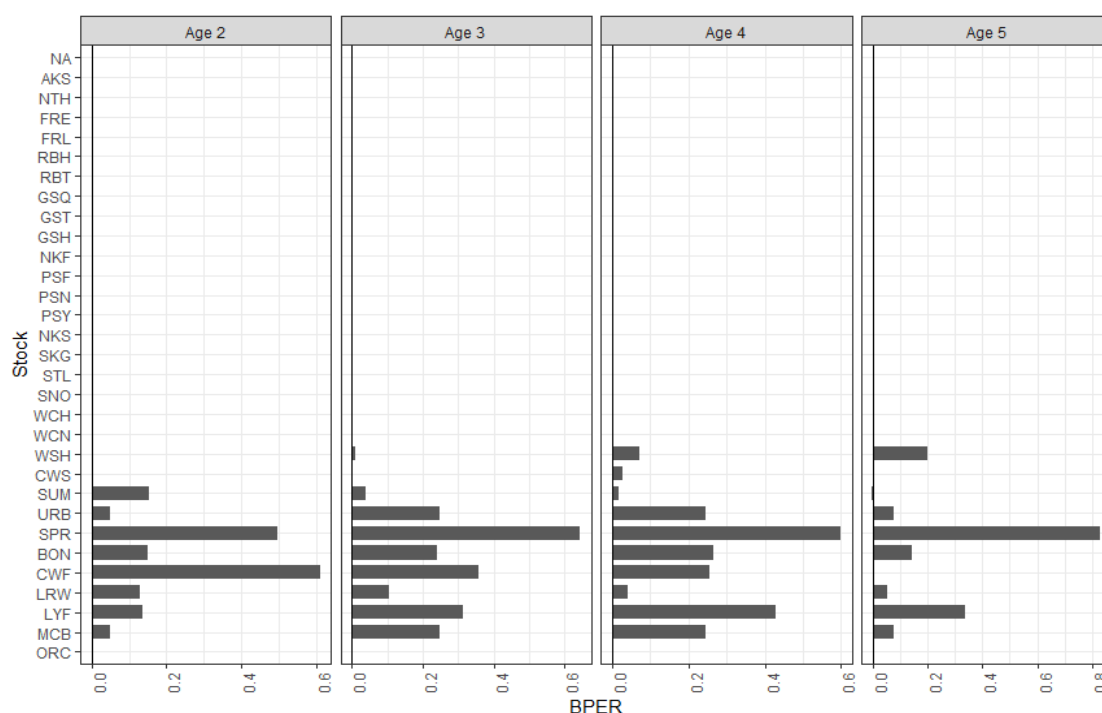


Figure 74—Base period exploitation rate by age for Columbia River Net.

#### 4.10.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.11 New Model Fishery: Alaska Transboundary River Terminal Sport (TAK TBR S)

### 4.11.1 Description of Fishery and Changes

The Alaska Transboundary River Terminal sport fishery operates in the terminal marine areas in front of the Alsek, Taku, and Stikine Rivers. These terminal sport fisheries may take place year-round, although the majority of effort and harvest occurs between April and October. Terminal sport harvest is monitored and reported on an accounting year that runs from October 1 through September 30. The majority of Alaska Transboundary River Terminal sport fishery effort takes place from powered fishing vessels (private, guided, and commercial) although some sport fishery activities occur from non-powered vessels or from land. The fishery mainly targets Chinook and coho, however most salmon species are harvested at times in this fishery.

### 4.11.2 Base Period Exploitation Rate by Age

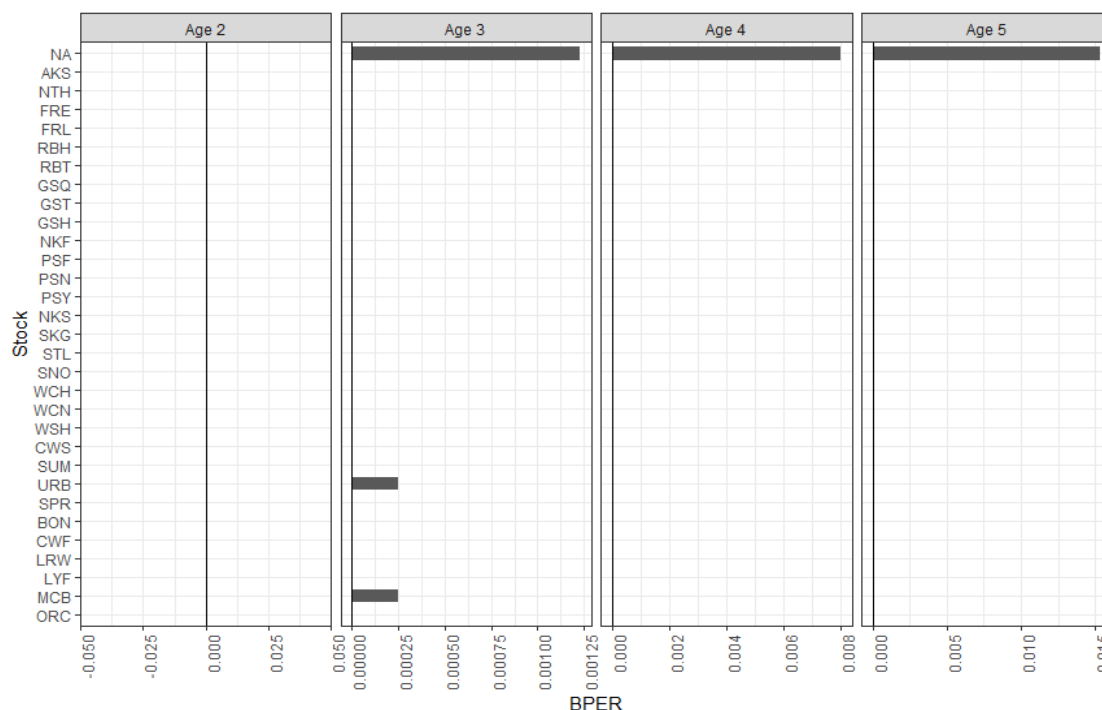


Figure 75—Base period exploitation rate for Alaska Transboundary River Sport.

### 4.11.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.12 New Model Fishery: North B.C. Freshwater Sport (TNORTH FS)

### 4.12.1 Description of Fishery and Changes

The NBC freshwater sport fishery for Chinook salmon occurs in river systems from the U.S.-Canada border, south to Grenville Channel. Most of the fishery is associated with the Nass and Skeena River systems and occurs from April to September. Harvest is monitored by a creel survey in the lower Skeena River below Terrace. Freshwater sport catches of Nass Chinook are most often estimated using a fill procedure. Most of the fishery occurs from the bank or from jet boats. The fishery targets Chinook, coho and sockeye.

### 4.12.2 Base Period Exploitation Rate by Age

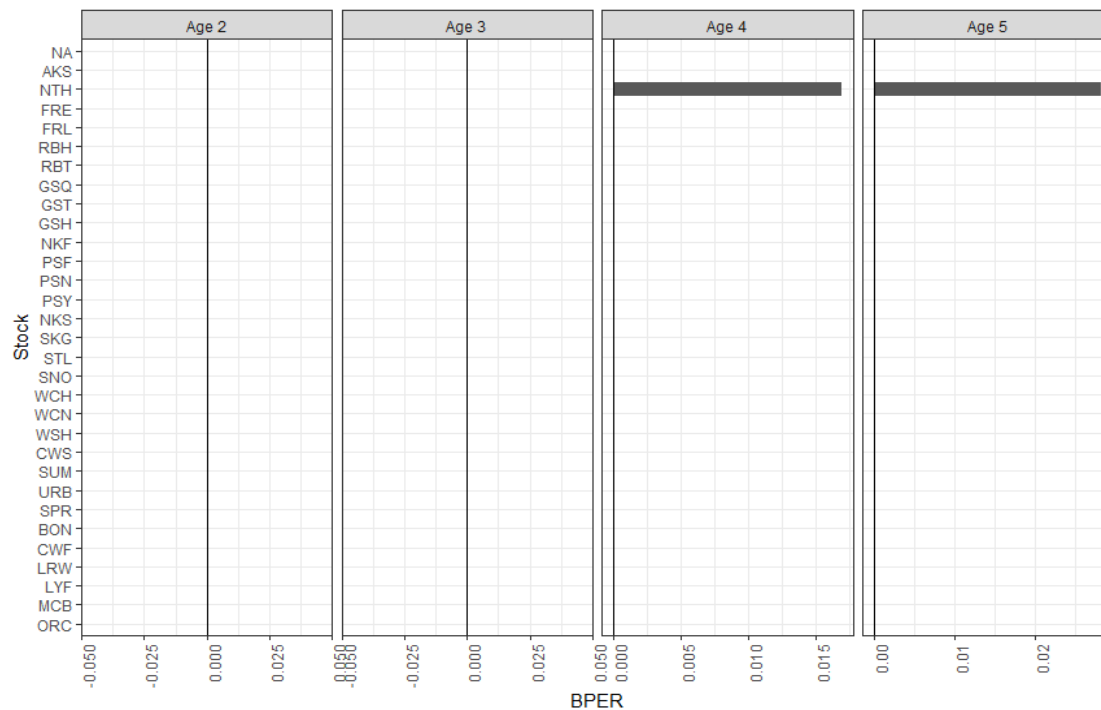


Figure 76—Base period exploitation rate for North BC Freshwater Sport.

### 4.12.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.13 New Model Fishery: Central B.C. Freshwater Sport (TCENTRAL FS)

### 4.13.1 Description of Fishery and Changes

The CBC freshwater sport fishery for Chinook salmon occurs in river systems from Kitimat to Cape Caution. Most of the fishery is associated with the Kitimat, Dala, Kildala, Dean, and Bella Coola River systems and occurs from April to September. Harvest is not monitored. Most of the fishery occurs from the bank or from drift boats. The fishery targets Chinook and coho salmon.

### 4.13.2 Base Period Exploitation Rate by Age

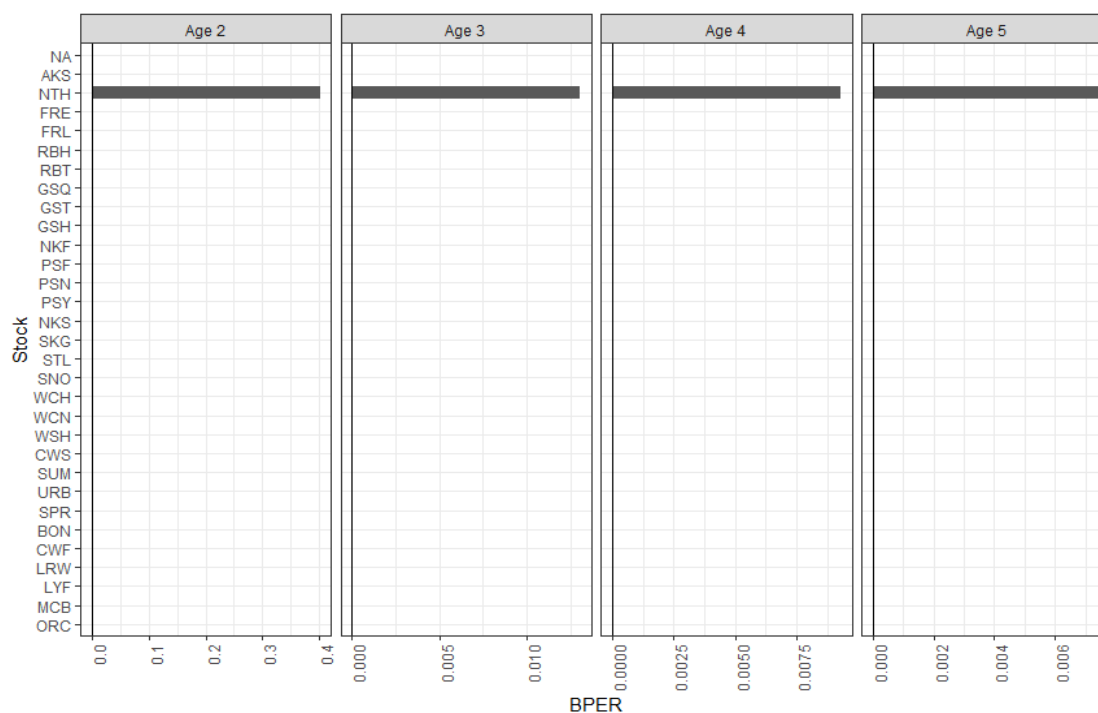


Figure 77—Base period exploitation rate for Central BC Freshwater Sport.

### 4.13.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.14 New Model Fishery: Strait of Georgia Freshwater Sport (TGS FS)

### 4.14.1 Description of Fishery and Changes

The Strait of Georgia freshwater sport fishery occurs in river systems along the east coast of Vancouver Island. Pink, Chinook, coho, and chum are targeted in the major systems of the Quinsam/Campbell, Puntledge, Big and Little Qualicum, Nanaimo, and Cowichan Rivers, between mid-July and the end of December. Fisheries in each system are abundance driven and timings are species specific. Angling is by rod and reel, however local regulations and gear restrictions may vary between system. Harvest is monitored on the Quinsam/Campbell River by a creel survey and by catch card on the Cowichan River.

### 4.14.2 Base Period Exploitation Rate by Age

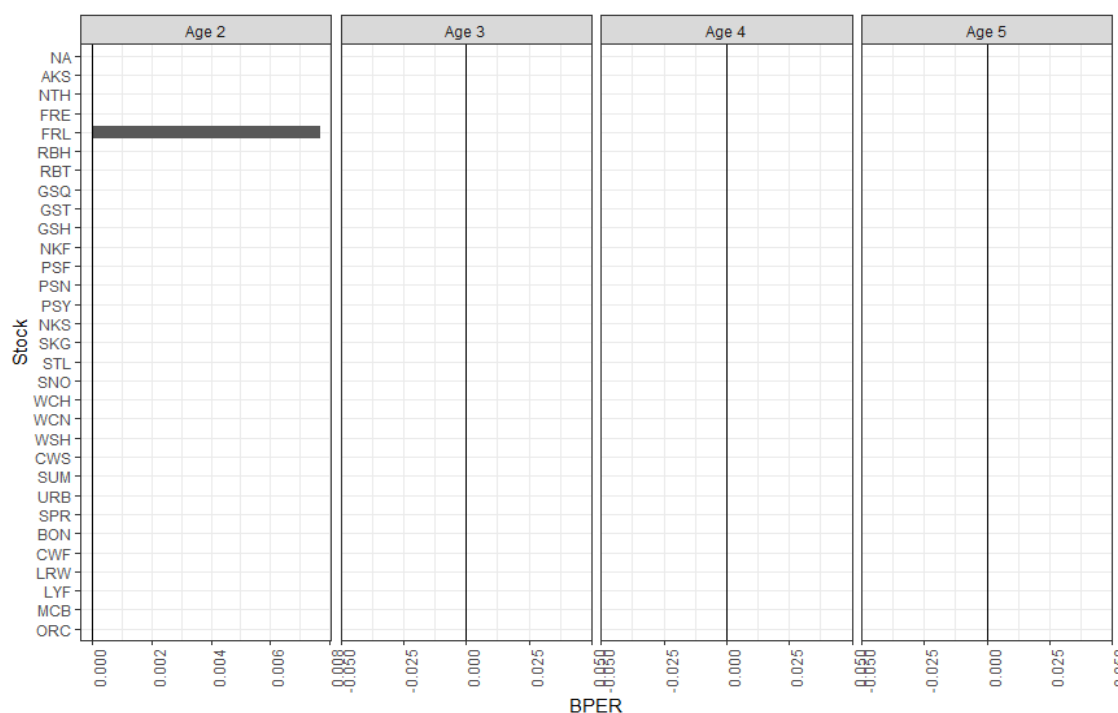


Figure 78—Base period exploitation rate for Strait of Georgia Freshwater Sport.

### 4.14.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.15 New Model Fishery: West Coast Vancouver Island Freshwater Sport (TWCVI FS)

### 4.15.1 Description of Fishery and Changes

The majority of effort is concentrated on returning Chinook and coho production from enhancement facilities on the WCVI, primarily the Somass, Stamp, and Nitinat Rivers. There is also effort directed on wild coho stocks in some WCVI rivers, but effort is considered to be minimal. Chum retention opportunities also exist and is also considered to be low. As a recreational fishery, the gear used is rod and reel. The season is dependent on the species with some Chinook and coho salmon opportunities starting as early as August 25, and the majority of these opportunities continue through the fall closing on December 31.

### 4.15.2 Base Period Exploitation Rate by Age

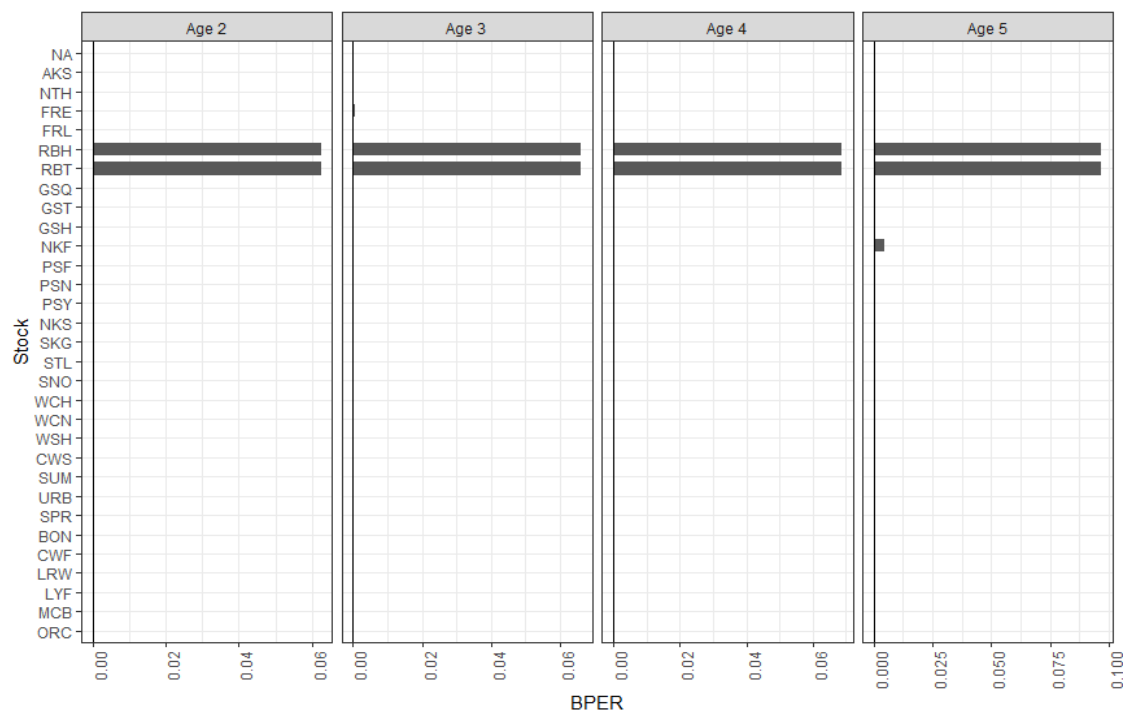


Figure 79—Base period exploitation rate for West Coast Vancouver Island Freshwater Sport.

### 4.15.3 Reported Catch

This fishery was not in the 9806 Model calibration.



## 4.16 New Model Fishery: Fraser River Freshwater Sport (TFRASER FS)

### 4.16.1 Description of Fishery and Changes

The Fraser Freshwater Sport was a terminal fishery in 9806 BPC under the TERMINAL SPORT designation, and was represented using FP scalars. Since that version of the model, catch data in all the known commercial, First Nation and sport fisheries have been assembled and then these data are used in annual run reconstruction analyses (English et al. 2007) to estimate the catch of the six Fraser model stocks in the net and sport fisheries. The Fraser Freshwater Sport fishery includes all recreational fisheries in the Fraser River. Most of the recreational fishery is shore-based, but some is boat-based, and a range of hook and line methods have been used in different years and locations, including trolling and casting lures, bar-fishing, and drift fishing with and without a float with bait, yarn, and plastics (e.g. corkies, spin-and-glows, beads). These fisheries can target Chinook, sockeye, coho, pink, and chum and the regulations can be Chinook retention or non-retention depending on the circumstances.

The Fraser Freshwater Sport catch is estimated by creel survey methods, or by indirect methods when a creel survey was not conducted (see methods in English et al. 2007). Catches for each of the Fraser River model stocks are estimated using the Run Reconstruction model and catch and escapement data. CWT sampling occurs throughout the migration routes used by the indicator stocks, as well as any fisheries in rivers where the indicator stocks are.

### 4.16.2 Base Period Exploitation Rate by Age

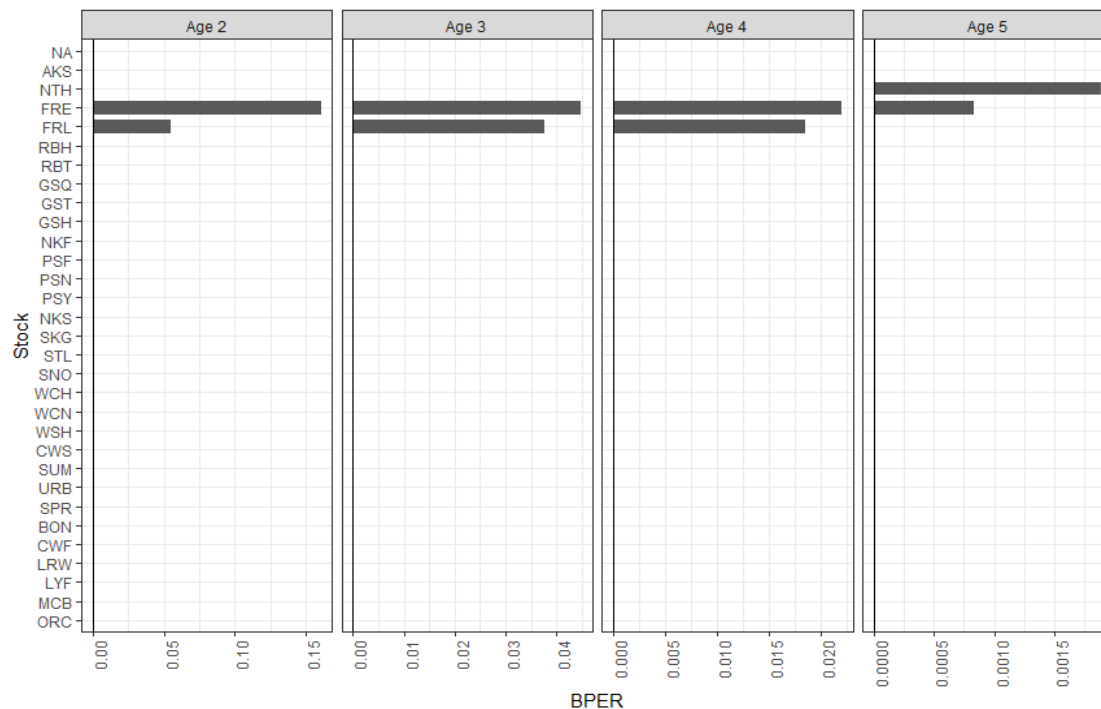
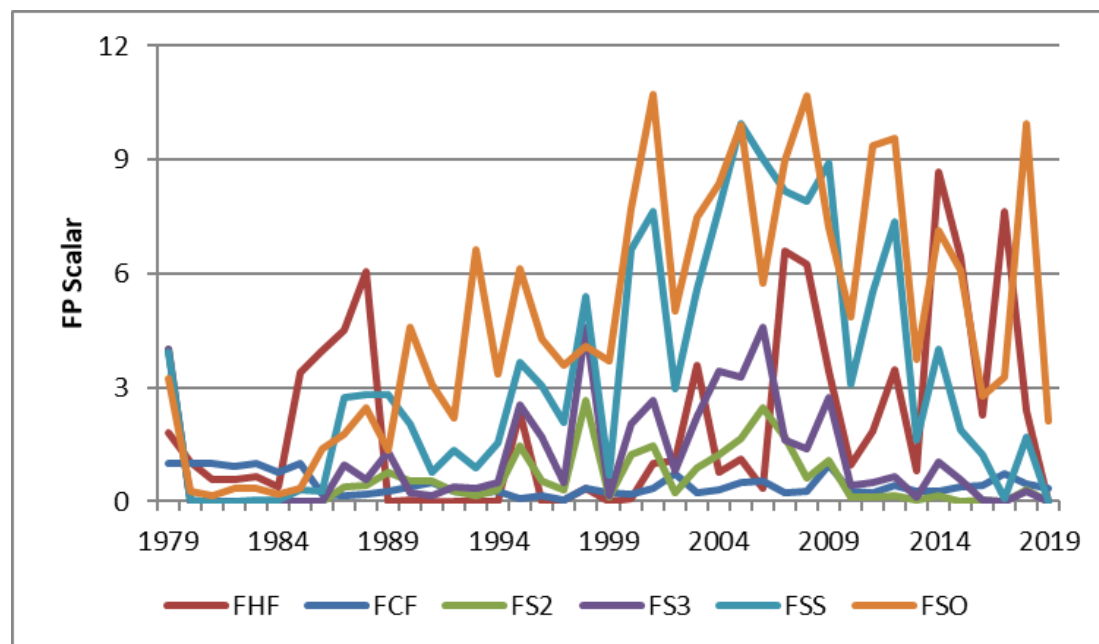


Figure 80—Base period exploitation rate for Fraser River Freshwater Sport.

FP scalars are used in the model calibration for the six Fraser model stocks to represent the temporal pattern for the combination of the Fraser Net and the Fraser Freshwater Net fisheries. Currently, the FP scalars are based on the annual harvest rates estimated for each of the six Fraser River stocks from the Run Reconstruction model for the terminal run abundances at the Fraser River mouth (Figure 81).

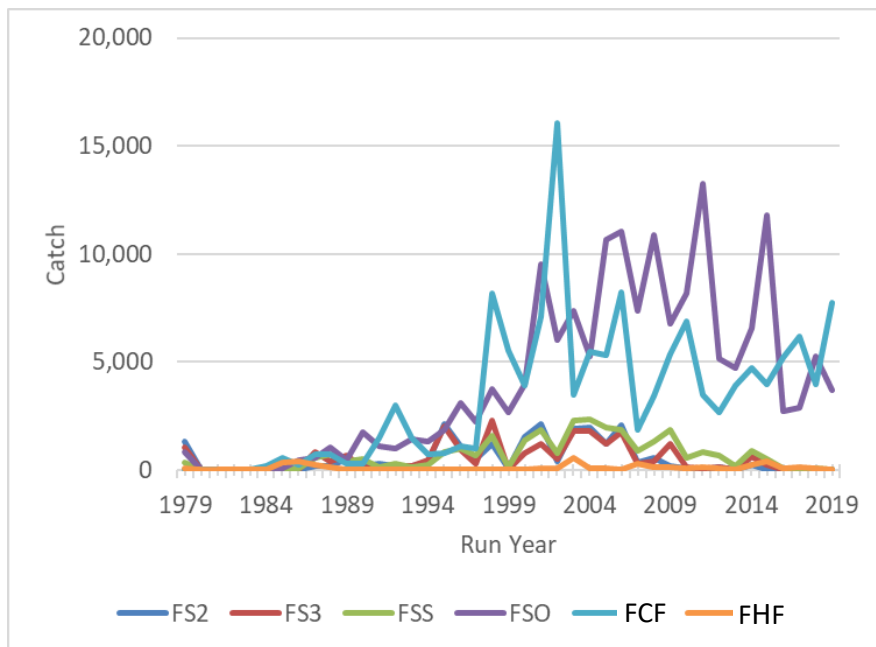


*Figure 81—Time series of FP Scalars for the Fraser Freshwater Sport fisheries for the six Fraser River model stocks in Phase II. The scalars are based on the time series of harvest rates generated from the Run Reconstruction model estimates of catch and river mouth abundance for each of the 6 Fraser River model stocks.*

*Note: Fraser River stocks include Fraser Harrison Fall (FHF), Fraser Chilliwack Fall (FCF), Fraser Spring 1.2 (FS2), Fraser Spring 1.3 (FS3), Fraser Summer Stream-type 1.3 (FSS), and Fraser Summer Ocean-type 0.3 (FSO).*

### 4.16.3 Reported Catch

The annual catch for each of the Fraser River model stocks is estimated using the Run Reconstruction model (English et al. 2007) and catch and escapement data. Several improvements have been made to the Run Reconstruction since the original publication, including: adding more years, stocks, fishery stratification, and further review of migration rate and other timing information. The model currently produces times series of stock-specific catches for commercial (includes test fisheries), First Nation and recreational fisheries (Figure 82). There are several gaps in the recreational fishery data where fisheries were open, but catch was not estimated directly with a creel survey. Since these gaps would produce underestimates of the terminal run, exploitation and ocean stock abundance, a variety of indirect methods have been applied to address the missing data (see English et al. 2007 for examples). Improvements to these data, past and future, depend on resources (i.e. time, finances, human capacity, and expertise).



*Figure 82—Fraser Freshwater Sport fishery catches for each of the six Fraser River model stocks estimated using the Fraser Chinook Run Reconstruction model.*

*Note: Fraser River stocks include Fraser Harrison Fall (FHF), Fraser Chilliwack Fall (FCF), Fraser Spring 1.2 (FS2), Fraser Spring 1.3 (FS3), Fraser Summer Stream-type 1.3 (FSS), and Fraser Summer Ocean-type 0.3 (FSO).*

## 4.17 New Model Fishery: Puget Sound Freshwater Sport (TPS FS)

### 4.17.1 Description of Fishery and Changes

The Puget Sound Freshwater sport fishery (TPS FS) is a new fishery for Phase II, having the fine scale fisheries comprising TPS FS separated from the Terminal Sport fishery (Model fishery 25) of calibration 9806. The fishery operates in freshwater rivers of the Strait of Juan de Fuca and Puget Sound. Timing of fisheries in individual rivers vary by the run timing of the stock. The earliest fisheries start in June targeting Skagit River Spring Chinook. These fisheries have been mostly mark-selective in recent years, with one notable exception being the fall Chinook fishery that occurs on the Samish River. The model fishery TPS FS (54) includes ERA fishery TPS FS (75).

### 4.17.2 Base Period Exploitation Rate by Age

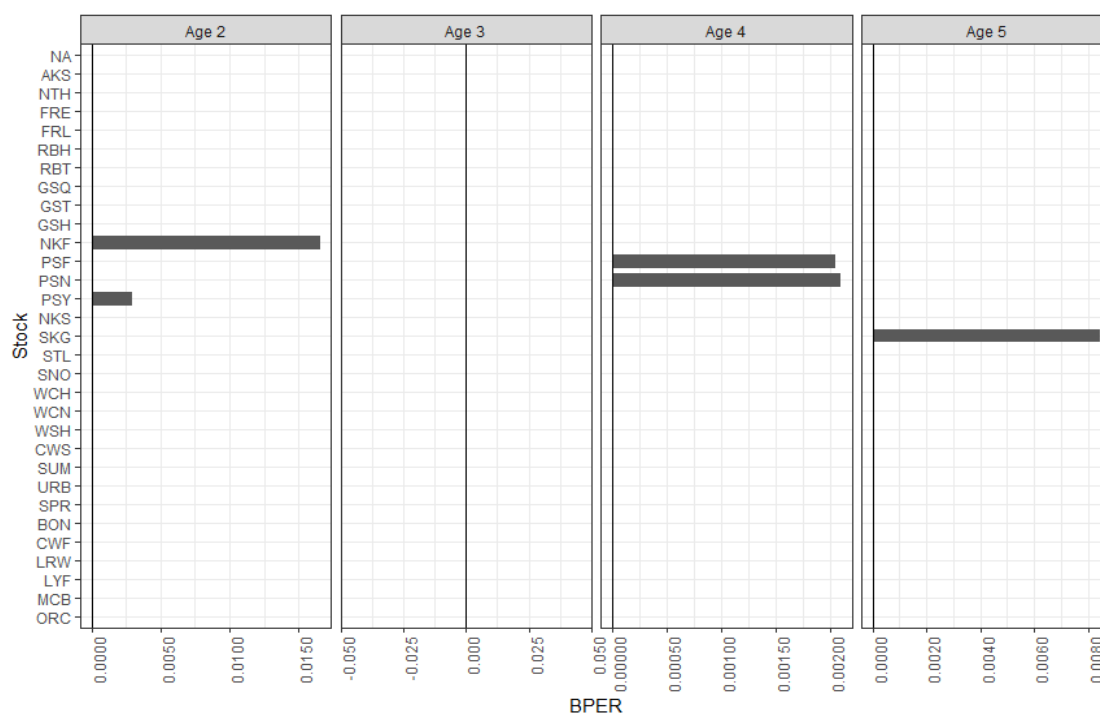


Figure 83—Base period exploitation rate for Puget Sound Freshwater Sport.

### 4.17.3 Reported Catch

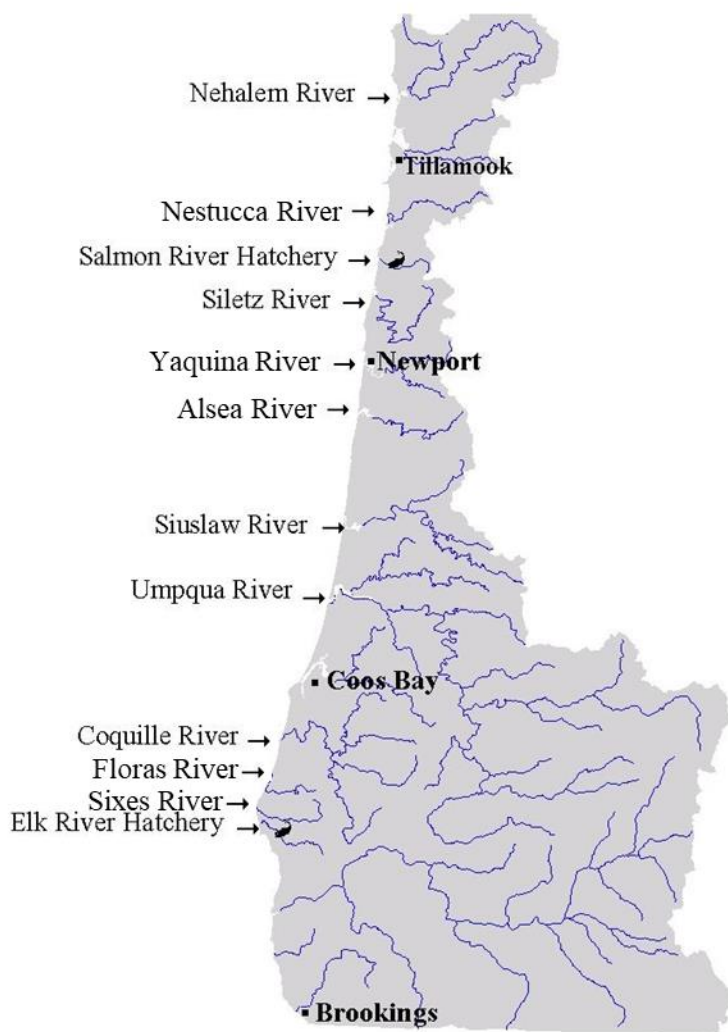
This fishery was not in the 9806 Model calibration.

## **4.18 New Model Fishery: South of Falcon Freshwater Sport (TSF FS)**

### **4.18.1 Description of Fishery and Changes**

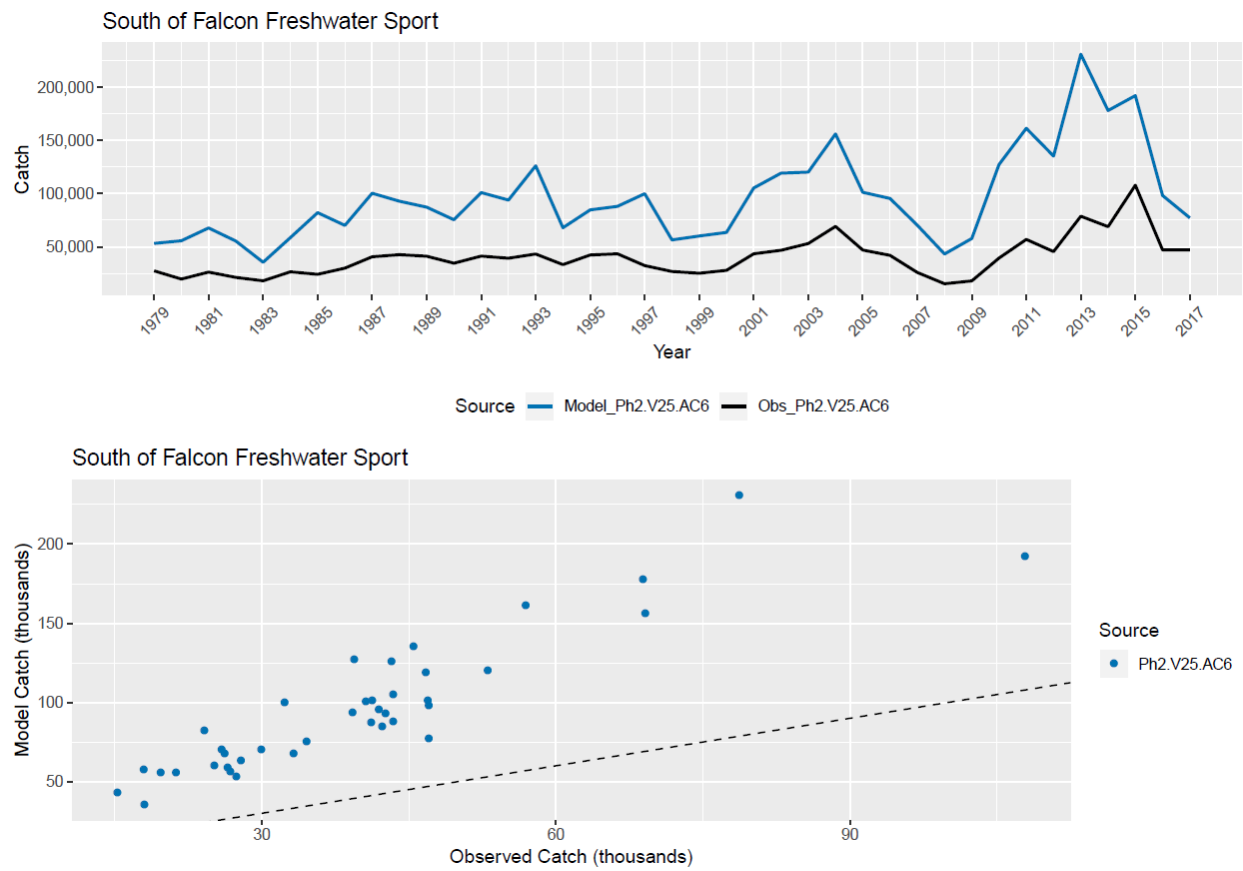
The previously configured 9806 Chinook Model did not have specific terminal freshwater fisheries designated with their geographic or stock constraints built into the fisheries stratification. In the Phase II configuration of the Model and its fisheries stratification, many of those terminally located fisheries are specifically broken out and no longer lumped into the generic “Terminal Sport” fisheries strata that was the catch-all for all terminal sport recoveries in the old Model’s stratification scheme.

One new stratification, Terminal South of Falcon Freshwater sport fisheries (TSF FS), includes those Chinook fisheries located within the jetties of predominantly fall returning, mostly naturally produced Coastal Oregon Chinook stocks’ natal basins. These fisheries take place between July through December annually, and are governed by both ISBM and terminal stock conservation restrictions in place through Oregon Department of Fish and Wildlife (ODFW) management plans. Harvest recoveries of CWTs of the Exploitation Rate Indicator Stocks (ERIS) of both Salmon and Elk Rivers for the North Oregon coast (NOC) and Mid-Oregon coast (MOC) aggregates, respectively, are reflective of the intensive fisheries in each of these hatchery-dominated basins. Exploitation rates in these basins have long been known to generally exceed the rates in each aggregate’s natural-production basins. Terminal fisheries of the NOC stock aggregate occur in basins from the Nehalem south to the Siuslaw: Nehalem, Tillamook complex, Nestucca, Salmon, Siletz, Yaquina, Alsea, and Siuslaw Rivers (Figure 84). Fisheries of the MOC stock aggregate occur in the Umpqua, Coos, Coquille, Floras, Sixes and Elk Rivers (Figure 84).



*Figure 84—Oregon Coast Chinook salmon producing rivers.*

During Phase II development and review, it was observed that the modeled catch for TSF FS was biased high in depicting terminal harvest of both the NOC and MOC aggregates' production. One remedial approach developed to account for terminal harvest model disparities has been referred to as the "Larrie method" in honor of the Analytical Working Group (AWG) member who developed it to tune the Model FP scalars to account for differences between modeled and observed terminal catch. The AWG decided that this method should only be applied to terminal fisheries in which the Model calibrates to the terminal run, not escapement estimates. Nevertheless, although both the NOC and MOC are modeled to escapement and terminal harvest estimates are not available within a usable PST time framework, the Larrie method was applied to the TSF FS during preliminary investigations. This resulted in modeled and observed estimates of catch that correlated but did not match well (Figure 85), and thus led to an investigation of an alternative approach to reconcile modeled and observed catch.



*Figure 85—Results of the Larrie method applied to the South of Falcon Freshwater Sport fisheries. The dashed line in the bottom figure represents the 1:1 line of observed and modeled catches.*

#### **Approach:**

Salmon and Elk River terminal harvest rates that are applied by the Model to the NOC and the MOC are known to generally exceed those on the naturally produced aggregates. The Salmon River Hatchery (SRH) CWT releases and recoveries are used to generate the NOC Model (MDL) file, and Elk River Hatchery (ELK) CWT releases and recoveries are used to generate the MOC MDL file, and the \*.MDL files contribute to modeled expectations of terminal recruitment to TSF FS through generation of stock parameters carried into the stock (\*.STK) file for each aggregate. The \*.STK file contains initial cohort abundance, maturation rates, adult equivalence factors, and exploitation rates for each stock. To depict these terminal fisheries on an aggregated level, an assessment of the harvest rates encountered within each aggregate was performed. In a previous iteration, escapement indicator stocks (EIS) terminal harvest rates generated terminal harvest recoveries. This approach instead used terminal harvest rates encountered by the entire aggregate's production (Table 14).

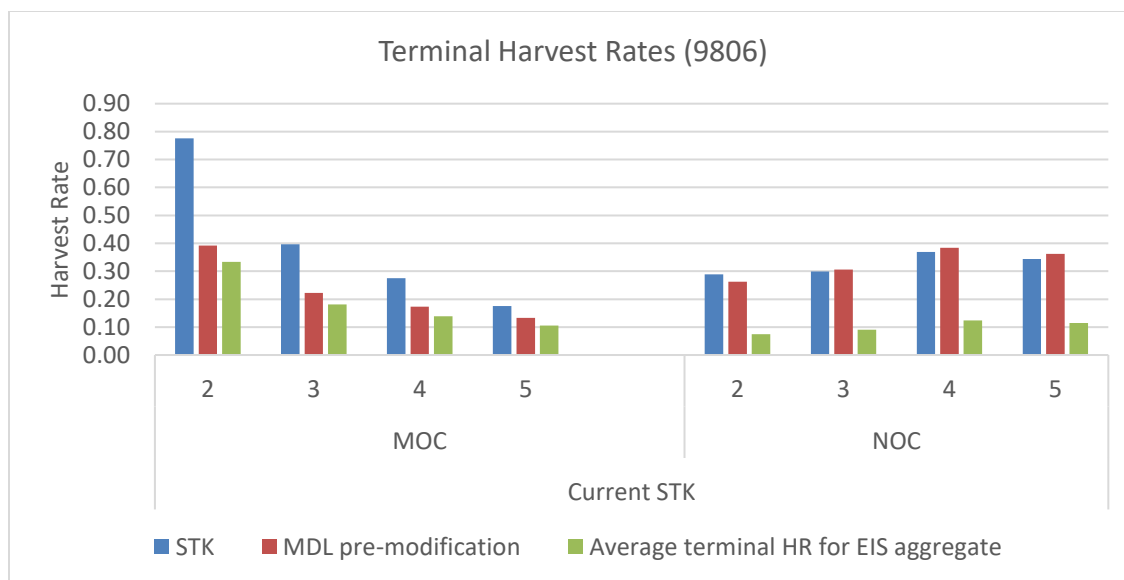
*Table 14—Terminal harvest rate indicators for North Oregon Coast (NOC; top) and Mid-Oregon Coast (MOC; bottom). Average base period harvest rates are highlighted.*

Terminal harvest rate NOC indicators					
Year	Nehalem	Siletz	Siuslaw	EIS average	Base period EIS average
1979	0.0475	0.087	0.180	0.1050	0.1086
1980	0.1060	0.100	0.096	0.1006	
1981	0.0441	0.151	0.141	0.1122	
1982	0.0976	0.102	0.151	0.1167	

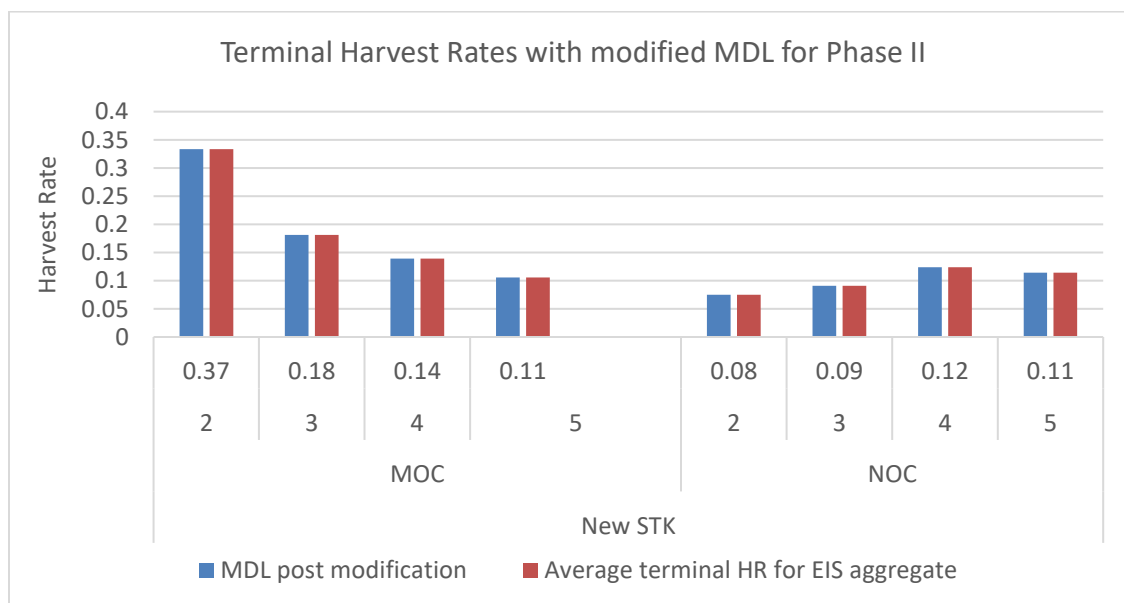
Terminal harvest rate MOC indicators				
Year	Umpqua	Coquille	EIS average	Base period EIS average
1979	0.202563	0.159312	0.180937	0.164026
1980	0.221352	0.123233	0.172292	
1981	0.185506	0.132355	0.15893	
1982	0.21002	0.077873	0.143946	

The EIS average harvest rates (highlighted values) generated estimates of terminal harvest recoveries that were needed to produce the overall base period terminal harvest rate (at age) by MOC or NOC MDL. Harvest was allocated to the MDL entries in proportion to those CWT recoveries at age in order to produce an overall harvest which was identical to that base period EIS average rate in the tables above. While harvest rates at age may vary slightly, the overall harvest rate matches for each aggregate for the base period. Escapement recoveries were held constant as each MDL file was modified, and terminal sport recoveries were adjusted to maintain the age composition and modified to overall harvest determined to be needed to generate the aggregate's base period terminal harvest rate.





*Figure 86—Terminal harvest rates by age for rivers in both North Oregon Coast (NOC) and Mid-Oregon Coast (MOC) areas using the 9806 Model calibration.*



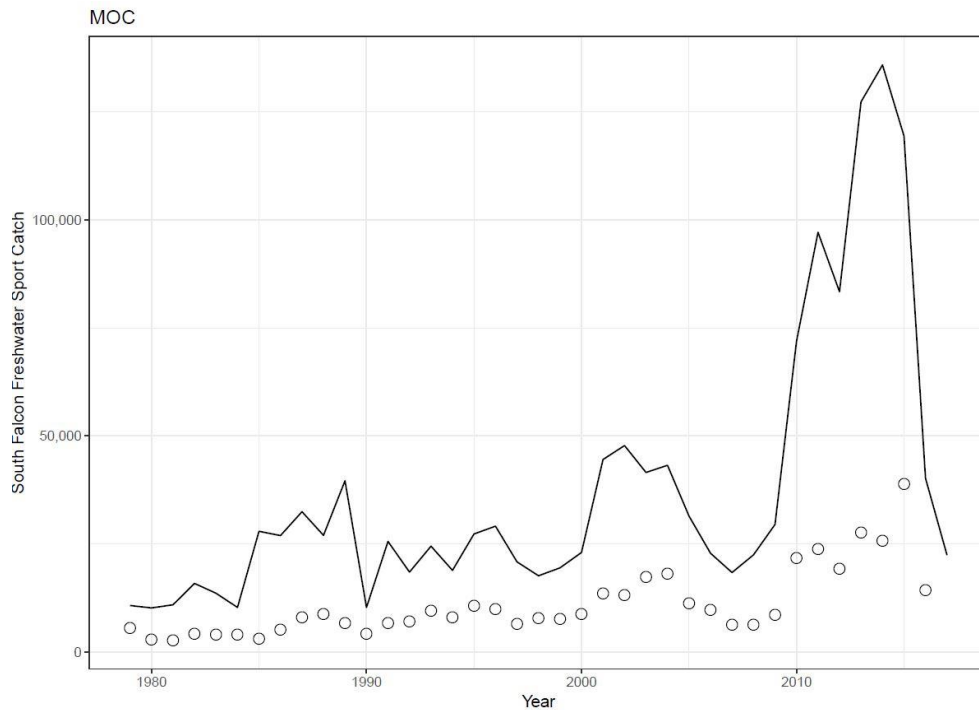
*Figure 87—Terminal harvest rates by age for rivers in both North Oregon Coast (NOC) and Mid-Oregon Coast (MOC) areas using the Phase II Model.*

In addition to those external modifications made on the MDL files themselves for NOC and MOC, a newer version of the MOC MDL was constructed using out of base (OOB) procedures after selection of a different series of CWTs. In previous editions, tag codes representing brood years 1977, 1978, 1979 and 1980 were selected to construct the MDL for the Elk/MOC aggregate. In review it was observed that the earlier brood years in this series had very poor survival, and consequently low numbers of tag recruitment across fisheries. Additionally, all

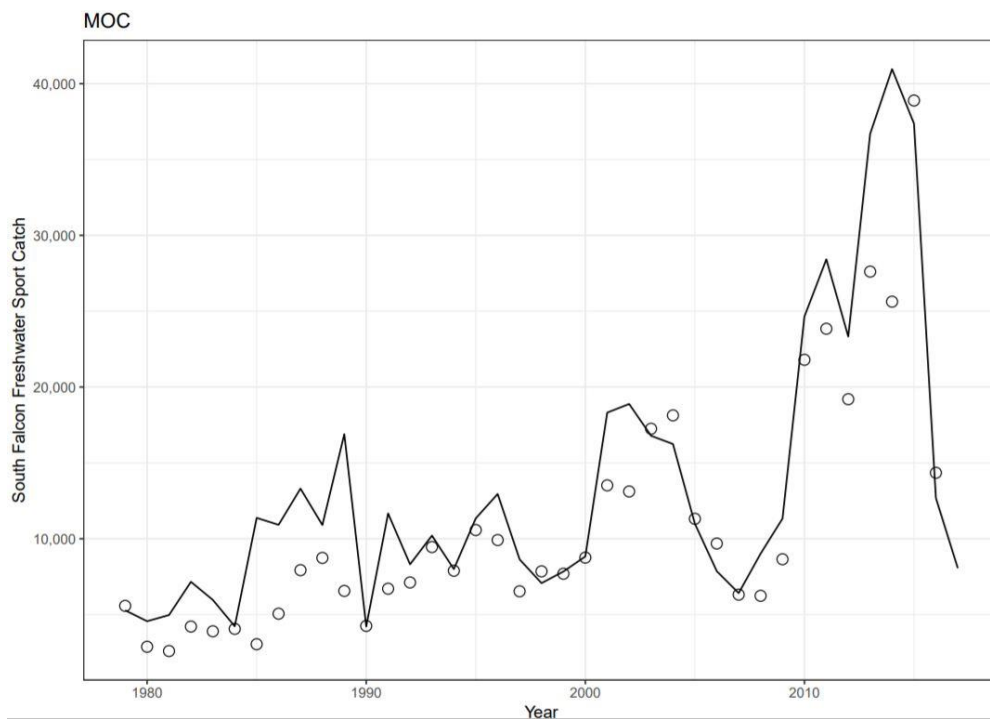
brood year (BY) releases suffer from a lack of consistent, appropriately sized tagged release groups. Release sizes approaching the recommended 200,000 in the Elk River do not begin until the 1990 brood year. A review of the tag code by brood year recoveries across fisheries showed that a stable regime of recoveries was observed beginning in the 1997 BY, and was stable through BY 1999. Subsequently, tag codes from these broods were chosen to represent the MOC in the construction of the updated MDL file (Table 15). Earlier brood year releases were also reviewed and considered for MDL construction, but all suffered from either poor release sizes, survival, or inconsistent recovery within the suite of C-file fisheries which were examined. The resultant MDL constructed from these new tag codes provides a more representative dispersal of recoveries amongst fisheries and escapement than the previously constructed MDL.

*Table 15—Elk/MOC Phase II brood year MDL construction.*

<b>BY</b>	<b>Initial Phase II</b>	<b>Modified Phase II</b>
1977	071646	
1978	072008	
1979	072242	
	072243	
	072244	
	072245	
1980	072535	
	072536	
	072537	
	072538	
1997		091857
		092449
1998		092810
1999		093052



*Figure 88—Initial Mid-Oregon Coast (MOC) MDL, without newer codes and terminal fisheries adjustments, and the resultant observed (circles) and modeled catch (solid line).*



*Figure 89—Modified Mid-Oregon Coast (MOC) MDL, with newer codes and terminal fisheries adjustments, and the resultant observed (circles) and modeled catch (solid line).*

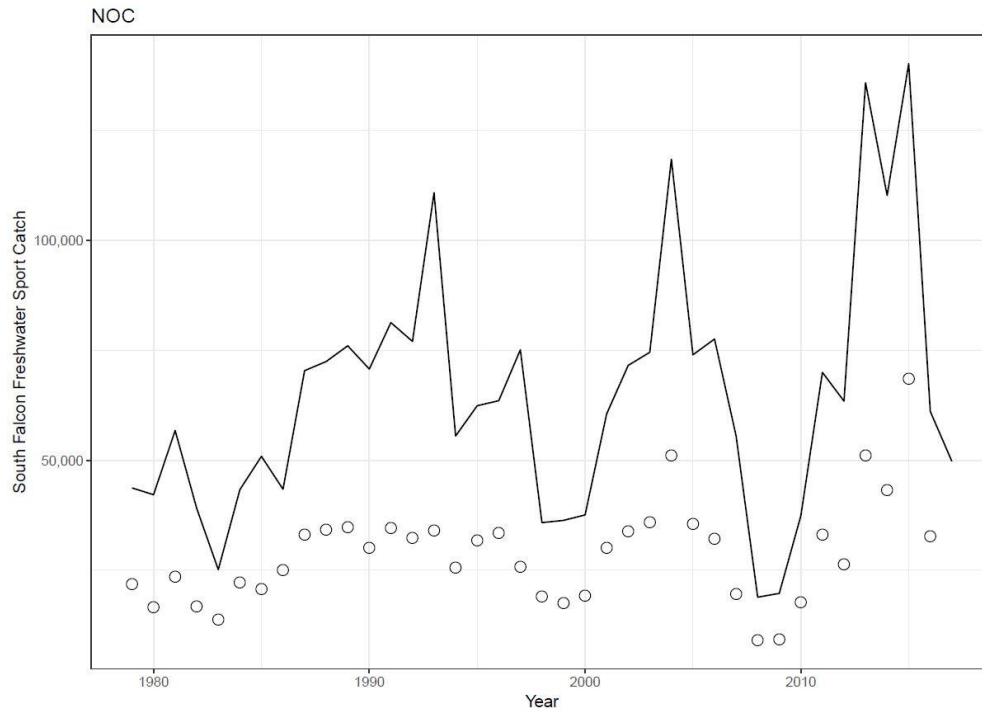


Figure 90—Initial North Oregon Coast (NOC) MDL, without terminal fisheries adjustments, and the resultant observed (circles) and modeled catch (solid line).

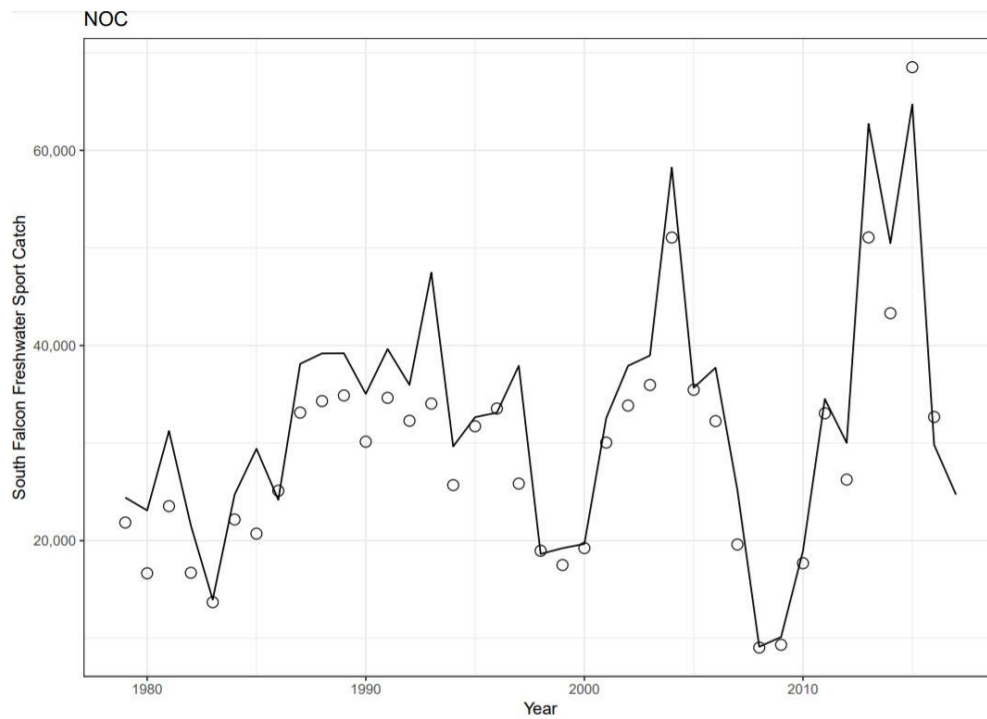


Figure 91—Modified North Oregon Coast (NOC) MDL, with terminal fisheries adjustments, and the resultant observed (circles) and modeled catch (solid line).

### 4.18.2 Base Period Exploitation Rate by Age

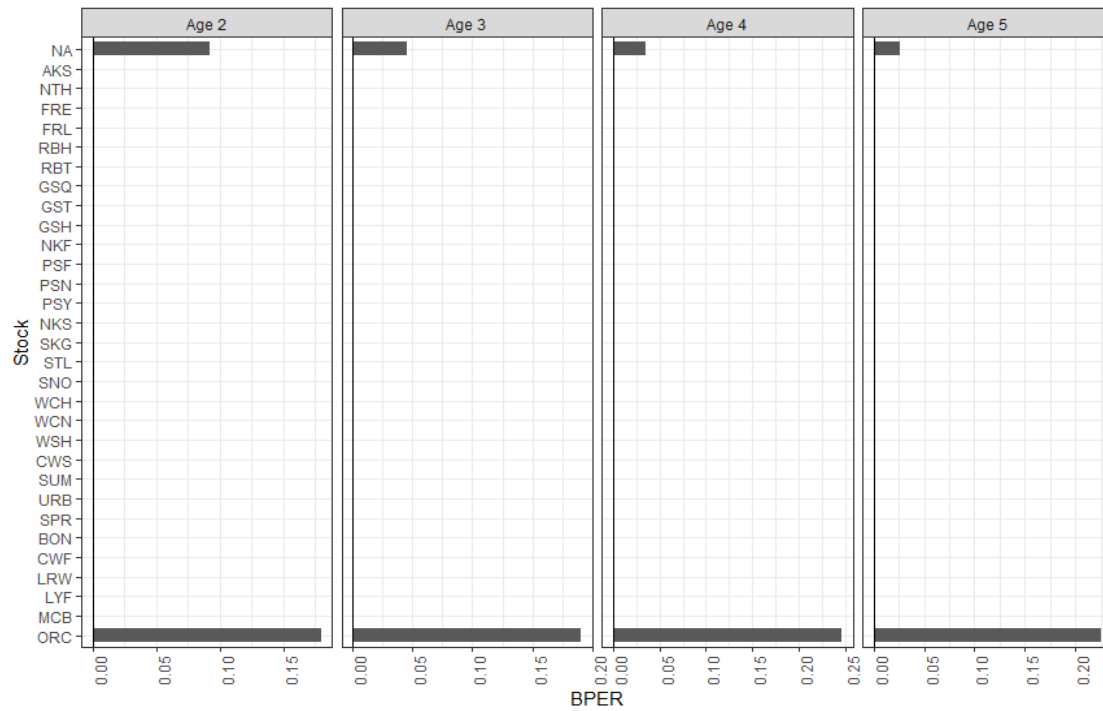


Figure 92—Base period exploitation rate for South of Falcon Freshwater Sport.

### 4.18.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 4.19 Terminal Sport (TERMINAL SPORT): Columbia River Sport (TCOLRS)

### 4.19.1 Description of Fishery and Changes

In the Columbia Basin, fisheries are managed under the jurisdiction of the United States v. Oregon court case. This case provides a framework within which the parties comprising states (Oregon, Washington and Idaho) and tribes (Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation) may cooperatively enhance fish runs and manage fisheries. The case was first brought to courts in 1968 to enforce the reserved fishing rights of the four Columbia River tribes that signed treaties with the U.S. government in 1855 and historically fished in the Columbia River. Specifically, this case describes the limits of state regulations of treaty fisheries and ensures the treaty tribes 50 percent of the harvestable surplus of natural-origin and hatchery-origin fish destined to pass through their usual and accustomed fishing areas. Consequently, treaty and non-treaty fisheries are managed differently in the Columbia. Regulations also change throughout the season for spring-, summer- and fall-run Chinook. The current U.S. v Oregon management agreement started in 2019 and extends until 2027. A map of Columbia River management zones below McNary Dam is shown in Figure 91. Note that this map does not show the section of the Columbia River upstream of McNary Dam or the Snake River, where additional fisheries occur.

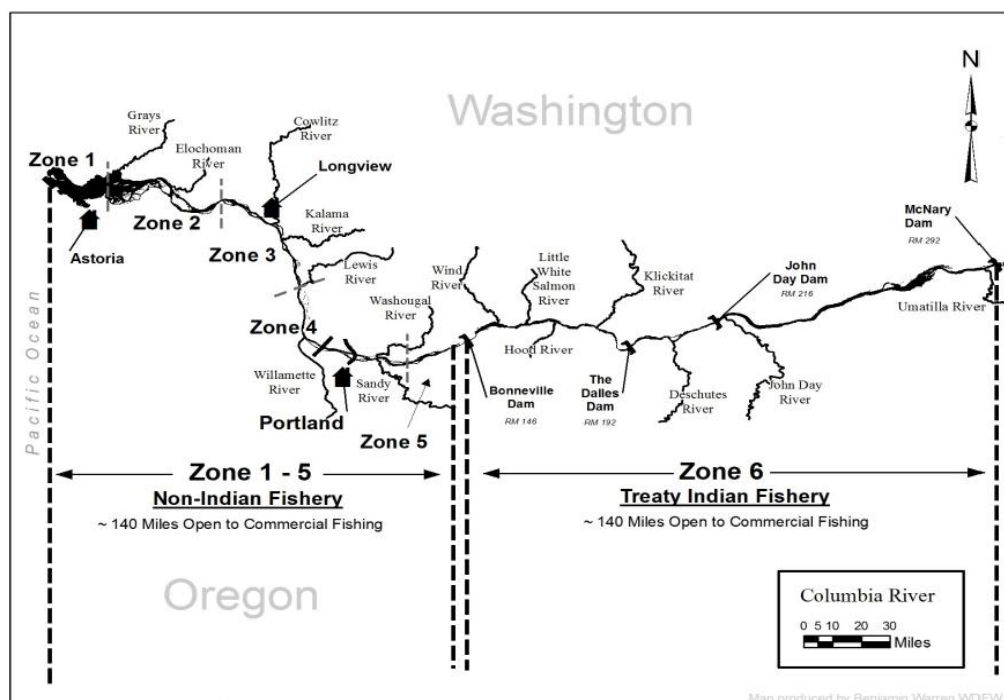


Figure 93—Map of Columbia River fishery management zones downstream of McNary Dam. Note that fisheries occur above McNary Dam and in the Snake River.

Note: RM refers to river mile.

## Spring Management Period

Non-treaty and treaty spring season fisheries are managed in accordance with the harvest rate schedule provided in Table A1 of the 2018–2027 U.S. v Oregon management agreement (Table 16). This harvest rate schedule was the first to incorporate a sliding scale, with increasing or decreasing allowable impact rates depending on the total upriver spring Chinook run size. This harvest rate schedule and the preseason forecast for upriver spring Chinook are used to plan fisheries based on the available impacts allocated to treaty and non-treaty fisheries. Non-treaty fisheries are required to meet the catch balance provisions for upriver (originating above Bonneville Dam) spring Chinook. Under these provisions, non-treaty fisheries are managed to remain within ESA impacts and to not exceed the total allowable catch available for treaty fisheries. In addition, prior to the first run size update from the Technical Advisory Committee (TAC), non-treaty fisheries are managed for an allowed treaty catch guideline that is 70% of forecasted run size (i.e. 30% run size buffer). The following table is the revised version of Table A1 of the management agreement.

*Table 16—Revised version of Table A1 of the U.S. v Oregon management agreement for Chinook salmon during the spring management period.*

2018–2027 Harvest Rate Schedule for Chinook in Spring Management Period							
Total Upriver Spring and Snake River Summer Chinook Run Size <sup>5</sup>	Snake River Natural Spring/Summer Chinook Run Size <sup>7</sup>	Treaty Zone 6 Total Harvest Rate <sup>2,3</sup>	Treaty Catch Guideline	Non-Treaty Natural Harvest Rate <sup>3</sup>	Non-Treaty Mortality Guideline	Total Natural Harvest Rate <sup>4</sup>	Non-Treaty Natural Limited Harvest Rate <sup>4</sup>
<27,000	<2,700	5.00%		<0.5%		<5.5%	0.50%
27,000	2,700	5.00%	1,350	0.50%	1,350	5.50%	0.50%
33,000	3,300	5.00%	1,650	1.00%	1,650	6.00%	0.50%
44,000	4,400	6.00%	2,640	1.00%	2,640	7.00%	0.50%
55,000	5,500	7.00%	3,850	1.50%	3,850	8.50%	1.00%
82,000	8,200	7.40%	6,068	1.60%	6,068	9.00%	1.50%
109,000	10,900	8.30%	9,047	1.70%	9,047	10.00%	
141,000	14,100	9.10%	12,831	1.90%	12,831	11.00%	
217,000	21,700	10.00%	21,700	2.00%	21,700	12.00%	
271,000	27,100	10.80%	29,268	2.20%	29,268	13.00%	
326,000	32,600	11.70%	38,142	2.30%	38,142	14.00%	
380,000	38,000	12.50%	47,500	2.50%	47,500	15.00%	
434,000	43,400	13.40%	58,156	2.60%	58,156	16.00%	
488,000	48,800	14.30%	69,784	2.70%	69,784	17.00%	

<sup>1</sup>If the Snake River natural spring/summer forecast is less than 10% of the total upriver run size, the allowable mortality rate will be based on the Snake River natural spring/summer Chinook run size. In the event the total forecast is less than 27,000 or the Snake River natural spring/summer forecast is less than 2,700, Oregon and Washington would keep their mortality rate below 0.5% and attempt to keep actual mortalities as close to zero as possible while maintaining minimal fisheries targeting other harvestable runs.

<sup>2</sup>Treaty Fisheries include: Zone 6 ceremonial, subsistence, and commercial fisheries from January 1–June 15. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.

<sup>3</sup>Non-Treaty Fisheries include: Commercial and recreational fisheries in Zones 1–5 and mainstem recreational fisheries from Bonneville Dam upstream to the Hwy 395 Bridge in the Tri-Cities and commercial and recreation SAFE (Selective Areas Fisheries Evaluation) fisheries from January 1–June 15; Wanapum tribal fisheries, and Snake River mainstem recreational fisheries upstream to the Washington-Idaho border from April through June. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.

<sup>4</sup>If the Upper Columbia River natural spring Chinook forecast is less than 1,000, then the total allowable mortality for treaty and non-treaty fisheries combined would be restricted to 9% or less. Whenever Upper Columbia River natural fish restrict the total allowable mortality rate to 9% or less, then non-treaty fisheries would transfer 0.5% harvest rate to treaty fisheries. In no event would non-treaty fisheries go below 0.5% harvest rate.

<sup>5</sup>The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.

<sup>6</sup>If the total in river run is predicted to exceed 380,000, the Parties agree to consider increasing the total allowed harvest rate and to reinitiate consultation with NOAA Fisheries if necessary.

The mainstem Columbia River from Buoy 10 to the I-5 Bridge is open for spring Chinook retention during January 1 through March 31, and the area from the I-5 Bridge upstream to the Oregon/Washington border above McNary Dam closes effective January 1. The purpose of these regulations is to target early-migrating hatchery-origin Willamette spring Chinook and reduce the catch of upriver spring Chinook.

During 1995–1999, recreational fisheries for spring Chinook on the lower Columbia River were all but eliminated to protect a weak return of upriver spring Chinook in 1995 and low Willamette spring Chinook runs during 1996–1999. A large expected return in 2001 of upriver spring Chinook, which a majority were marked hatchery fish, prompted the states to adopt the first mark-selective recreational fishery for spring Chinook on the lower Columbia River. At the same time, the states opened the area of the Columbia from the I-5 Bridge upstream to Bonneville Dam. The recreational fishery had not been open upstream of the I-5 Bridge during the month of April since 1977. The states also provided a limited recreational fishery for the mainstem Columbia River from The Dalles Dam upstream to McNary Dam in 2001. Since 2001, mark-selective spring Chinook fisheries have occurred annually in the Columbia River. These fisheries are generally characterized by high effort and low catch rates. Regulations (such as bag limits and area specific closures) can and/or have changed since 2001. The joint staff reports produced by the Joint Columbia River Management Staff of ODFW and Washington Department of Fish and Wildlife (WDFW) provide more detailed description of the annual changes in the fishery.

Tributary spring Chinook recreational fisheries downstream of Bonneville Dam have been mark-selective since 2001. The largest of these tributary fisheries occurs on the Willamette River. Fisheries on the Willamette and the Columbia are managed to ensure that cumulative freshwater mortality does not exceed 15% of the combined wild spring Chinook run destined for the Willamette River. This guideline is managed with a suite of management activities, including mark-selective fisheries. Additionally, Willamette fisheries are managed to meet escapement goals for hatchery-produced spring Chinook over Willamette Falls and to the Clackamas River. These goals are designed to provide for full mark-selective recreational fisheries in the Willamette River and its tributaries upstream of Willamette Falls, and meet hatchery broodstock goals (Joint Columbia River Management Staff 2021).

Treaty fisheries occurring above Bonneville Dam for spring Chinook are not described here. A small percentage of the catch above Bonneville Dam is also comprised of non-treaty recreational catches. Spring Chinook stock originating above Bonneville Dam are not represented in the Pacific Salmon Treaty and are not generally intercepted in mixed stock Chinook fisheries occurring in Canada and Alaska.

### ***Summer Management Period***

Mainstem Columbia River summer Chinook fisheries occurring from June 16 through July 31 are managed in accordance with the harvest rate schedule provided in Table A2 of the 2018–2027 U.S. v Oregon management agreement (Table 17). U.S. v Oregon parties manage upper Columbia River summer Chinook based on an interim management goal of 29,000 hatchery and natural origin adults, as measured at the Columbia River mouth. This management goal is based



on an interim combined spawning escapement goal of 20,000 hatchery and natural adults upstream of Priest Rapids Dam.

*Table 17—Revised version of Table A2 of the U.S. v Oregon management agreement for Chinook salmon during the summer management period.*

Upper Columbia Summer Chinook Fishery Framework		
Run Size at River Mouth	Allowed Treaty Harvest	Allowed Non-Treaty Harvest
<5,000	5%	<100 Chinook
5,000—<16,000	5%	<200 Chinook
16,000—<29,000	10%	5%
29,000—<32,500	10%	5-6%
32,500—<36,250	10%	7%
(125% of 29,000 goal)		
36,250-50,000	50% of total harvestable <sup>1</sup>	50% of total harvestable <sup>1</sup>
>50,000	50% of 75% of margin above 50,000 plus 10,500 <sup>2</sup>	50% of 75% of margin above 50,000 plus 10,500 <sup>2</sup>

<sup>1</sup>The total number of harvestable fish is defined as the run size minus 29,000 for run sizes of 36,250 to 50,000.

<sup>2</sup>For the purposes of this Agreement, the total number of harvestable fish at run sizes greater than 50,000 is to be determined by the following formula:  $(0.75 * (\text{run size} - 50,000)) + 21,000$ .

Based on this framework, the sharing formula allows for greater numbers of fish to escape when runs are greater than 50,000 fish. Non-treaty PFMC area ocean fisheries and all in-river fisheries are included in the treaty/non-treaty sharing of upper Columbia summer Chinook.

The summer recreational fishery was closed to retention of adult summer Chinook under permanent regulations from June 1 to July 31 every year during 1974 to 2001. In 2002, the states opened several recreational summer Chinook fisheries. The high mark rate for summer Chinook allowed the states to adopt mark-selective fishery regulations to provide an opportunity to harvest abundant hatchery Chinook while limiting the impact to ESA-listed Snake River wild spring/summer Chinook. In 2002, a fishery between Tongue Point and Bonneville Dam was opened. This fishery now extends downstream to the Astoria-Megler Bridge. The states also opened the area from Bonneville Dam upstream to McNary Dam to the retention of adipose fin-clipped summer Chinook that same year. Additionally, summer Chinook recreational fisheries also started occurring upstream of Priest Rapids Dam. Regulations (such as bag limits, retention of unclipped Chinook, and area specific closures) in all three of these fisheries can and/or have changed since 2002 (Joint Columbia River Management Staff 2021).

Beginning in 2005, the management period for summer Chinook at or below Bonneville Dam was reclassified from June 1–July 31 to June 16–July 31 because new information indicated that the June 1–June 15 portion of the summer run typically contained significant numbers of listed Snake River spring/summer Chinook, while the later portion of the run was mostly upper Columbia origin summer Chinook, which are not listed under the ESA. This reclassification allowed the states to maintain protections for listed Snake River spring/summer Chinook, while allowing more substantial fisheries on the upper Columbia summer Chinook run.

## Fall Management Period

Fall season fisheries in the Columbia River Basin below the confluence of the Snake River are managed according to the abundance-based harvest rate schedule from the 2018-2027 U.S. v Oregon management agreement (Table 18). If non-treaty mark-selective fisheries are implemented that impact URB, the non-treaty ocean and in-river fisheries may not harvest more than 50% of the harvestable surplus of URB. Upriver fall Chinook escapement goals include 7,000 adult Bonneville Pool Hatchery fall Chinook (4,000 females) to Spring Creek Hatchery, and a 60,000 adult URB fall Chinook (natural and hatchery) management goal above McNary Dam. Based on preseason run size forecasts, a fishing schedule is developed annually for non-treaty recreational and commercial fisheries through the North of Falcon management process.

*Table 18—Revised version of Table A3 of the U.S. v Oregon management agreement for Chinook salmon during the fall management period.*

<b>Table A3. Chinook harvest rate schedule for fall management period.</b>					
Expected URB River Mouth Run Size	Expected River Mouth Snake River Natural-origin Run Size <sup>1</sup>	Treaty Total Harvest Rate	Non-Treaty Harvest Rate	Total Harvest Rate	Expected Escapement of Snake R. Natural- origin Past Fisheries
<60,000	<1,000	20%	1.50%	21.50%	784
60,000	1,000	23%	4%	27.00%	730
120,000	2,000	23%	8.25%	31.25%	1,375
>200,000	5,000	25%	8.25%	33.25%	3,338
	6,000	27%	11%	38.00%	3,720
	8,000	30%	15%	45.00%	4,400
<ol style="list-style-type: none"> <li>1. If the Snake River natural fall Chinook forecast is less than the level corresponding to an aggregate URB run size, the allowable mortality rate will be based on the Snake River natural fall Chinook run size.</li> <li>2. Treaty Fisheries include; Zone 6 Ceremonial, subsistence, and commercial fisheries from Aug 1-Dec 31.</li> <li>3. Non-Treaty Fisheries include: Commercial and recreational fisheries in Zones 1-5 and mainstem recreational fisheries from Bonneville Dam upstream to the confluence of the Snake River and commercial and recreational SAFE (Selective Areas Fisheries Evaluation) fisheries from August 1-December 31.</li> <li>4. The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.</li> <li>5. Fishery impacts in Hanford sport fisheries count in calculations of the percent of harvestable surplus achieved.</li> <li>6. When expected river-mouth run sizes of naturally produced Snake River Fall Chinook equal or exceed 6,000, the states reserve the option to allocate some proportion of the non-treaty harvest rate to supplement fall Chinook directed fisheries in the Snake River.</li> </ol>					

The fall recreational salmon fishery occurs throughout the Columbia River with primary catch areas for Chinook in the estuary (Buoy 10), the Lower Columbia between Tongue Point and Bonneville Dam, and the Hanford Reach area below Priest Rapids Dam. Smaller fisheries occur near most tributary mouths on the mainstem Columbia River between Bonneville and McNary dams, in the mainstem upstream of McNary Dam and on the Snake River.

The popularity of the lower Columbia fall salmon fishery has grown considerably over the years, and anglers continue to fish successfully in new areas of the Lower Columbia for fall Chinook. Historically, high water temperatures on the mainstem during August and September hindered

anglers' ability to catch fall Chinook in the shallows, and the majority of the catch occurred at or below tributary mouths where water temperatures were cooler. Beginning in the late 1990s, anglers began targeting fall Chinook in deeper areas of the river with excellent results, especially in and around shipping lanes. The recreational catch of adult fall Chinook on the mainstem has increased from an average of 2,300 during the 1980s, to 5,000 fish during the 1990s, 14,700 during the 2000s, and 25,400 since 2010. Angler trips have also increased from an average of about 41,000 trips in the 1980s, to 54,000 trips in the 1990s, 94,000 trips in the 2000s, and 125,000 trips annually since 2010. Because of the increased effort and catch, the recreational opportunity for fall Chinook on the mainstem Columbia River downstream of Bonneville Dam has been constrained in terms of the daily bag limit and/or fewer fishing days since 2004 in order to meet ESA and harvest-sharing guidelines. The states also adopted mark-selective regulations for fall Chinook on the mainstem between Tongue Point and Warrior Rock during a portion of the season in 2012 through 2017 to reduce impacts to lower Columbia tule fall Chinook.

Similar to the trend in the Lower Columbia fishery, Chinook catches in the Buoy 10 fishery have also increased as anglers have become more effective at catching Chinook in this area, especially in recent years with large returns. While the average number of angler trips by decade has remained relatively stable since the 1990s, annual Chinook harvest has increased from an average of 6,700 in the 1990s, 10,000 in the 2000s, to 21,000 since 2010. A significant portion of the Chinook catch in the Buoy 10 fishery is tule stock. The increased Chinook harvest, coupled with a decrease in the allowable exploitation rates on Lower Columbia River tules, has required the states to reduce opportunity for Chinook since 2007, with retention seasons averaging about 30 days during August and early September. Additionally, the states have adopted mark-selective regulations for a portion of the season during 2013-2016 to increase the likelihood of meeting the Chinook retention end-date objective of Labor Day.

Fall treaty fisheries occur in the mainstem Columbia River from just downstream of Bonneville Dam upstream to McNary Dam. They include commercial and ceremonial and subsistence fisheries. The URB harvest rate is used as a surrogate for harvest rates on Snake River Wild Chinook. The steelhead B-Index harvest rate is used to control impacts on ESA-listed steelhead. Area restrictions to reduce impacts on specific Chinook stocks have occurred in the past, but have not occurred recently other than closure of the area near Spring Creek Hatchery. This closed area is normally reduced when it becomes clear that Spring Creek Hatchery will meet its broodstock collection goals. Fall treaty tributary fisheries (including those in the Snake Basin) are not discussed in this report for brevity.

### 4.19.2 Base Period Exploitation Rate by Age

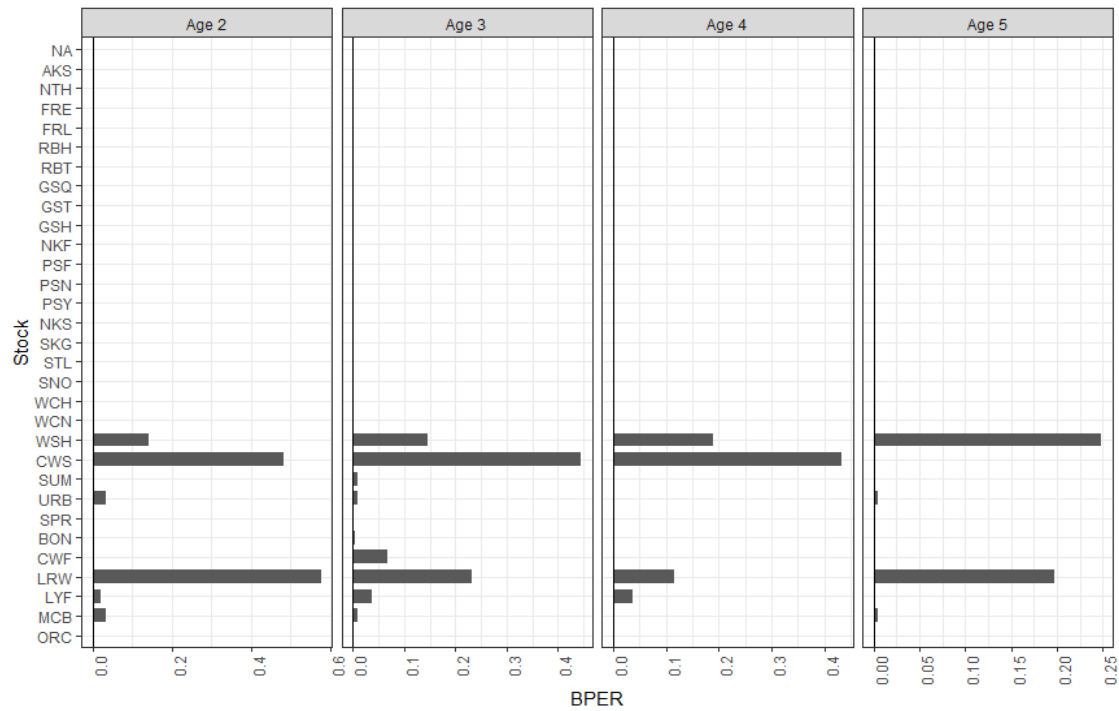


Figure 94—Base period exploitation rate for Columbia River Sport.

### 4.19.3 Reported Catch

This fishery was not in the 9806 Model calibration.

## 5 Recommendations

Throughout the documentation process, the AWG identified changes needed to the base period stratification. The following are recommended changes:

Naming Conventions:

- TAK YAK FN name does not accurately describe the catches in the fishery. Fishery is primarily an angling fishery, not a net fishery.
- TAK TBR N name does not include all transboundary rivers, just the Taku and Stikine Rivers.
- To conform to official naming conventions, all Georgia Strait fisheries were updated to Strait of Georgia, while keeping the fishery acronym the same.

## 6 References Cited

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