

PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE REPORT

2017 Exploitation Rate Analysis and Model Calibration
Volume Two: Appendix Supplement

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Note: Product names used in this publication are included for completeness but do not constitute product endorsement.

**APPENDIX A: RELATIONSHIP BETWEEN EXPLOITATION RATE INDICATOR STOCKS,
ESCAPEMENT INDICATOR STOCKS, MODEL STOCKS, AND ADDITIONAL
MANAGEMENT ACTION STOCKS IDENTIFIED IN THE PACIFIC SALMON TREATY
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Appendix A1– Indicator stocks for Transboundary Rivers, Southeast Alaska, Northern BC, and WCVI.

Region	Run ¹	Attachment					Annex Stock Group	Annex Indicators	Escapement Indicator (CTC Goal)	Exploitation Rate Indicator/Acronym		Smolt Age	Model Stock (Model Esc) /Acronym	
		I	II	III	IV	V								
Yakutat	Sp						<i>"SEAK fisheries will be managed to achieve escapement objectives for Southeast Alaska and Transboundary River Chinook stocks."</i>		Situk (500-1000)					
TBR									Taku (19000-36000)	Taku	TAK	1		
SEAK Inside									Stikine (14K-28K)	Stikine	STI	1		
									Alsek (3500-5300)					
									AK Hatcheries ²	AKS	1	Alaska SE (9,110)	AKS	
									Chilkat (1750-3500)	Chilkat (N Inside)	CHK	1		
									Unuk (1800-3800)	Unuk (S Inside)	UNU	1		
									Chickamin (450-900)					
NBC Area 1									Yakoun	Yakoun	Kitsumkalum (Deep Cr H)	1	North/ Central BC (117,500)	
NBC Area 3	S								Nass	Nass			NTH	
NBC Area 4									Skeena	Skeena				
CBC Area 8	Sp								Atnarko		Atnarko (Snootli H)	0		
CBC Area 9									Dean	Dean				
WCVI	F								Rivers Inlet					
							West Coast Vancouver Island Falls	WCVI Aggregate	Artlish	Robertson Cr H	RBT	0	WCVI Natural ³ (42,734)	
									Burman					
									Gold					
									Kaouk					
									Tahsis					
									Tashish					
									Marble					
													WCVI H (6,472)	
													RBH	

¹Sp=Spring, S=Summer, F=Fall

² Little Port Walter, Neets Bay, Whitman Lake, Deer Mountain, Crystal Lake

³The WCVI Natural model stock is the WCVI Hatchery indicator adjusted for differential terminal fishery impacts.

Appendix A2 – Indicator stocks for Fraser River and Strait of Georgia.

Region	Run ¹	Attachment					Annex Stock Group	Annex Indicators	Escapement Indicator (CTC Goal)	Exploitation Rate Indicator/Acronym		Smolt Age	Model Stock (Model Esc) /Acronym	
		I	II	III	IV	V								
Fraser River	Sp						Upper Fraser ² Mid Fraser ² Thompson ²		Fraser Sp 1.2	Nicola (Spius Cr H)	NIC	1	Fraser Early (93,700)	FRE
									Fraser Sp 1.3	Dome (Penny Cr H)	DOM	1		
									Fraser S 0.3	Lower Shuswap (Shuswap Falls H)	SHU	0		
										Middle Shuswap (Shuswap Falls H)	MSH	0		
									Fraser S 1.3			1		
	S						Fraser Late	Harrison R (75,100-98,500)		Chilliwack H	CHI	0	Fraser Late (75,100)	FRL
										Harrison (Chehalis H)	HAR			
Upper Strait of Georgia	F						Upper Strait of Georgia		Klinaklini	Quinsam H	QUI	0	Upper Strait of Georgia (23,300)	GSQ
									Kakwikan					
									Wakeman					
									Kingcome					
									Nimpkish					
Lower Strait of Georgia	F						Lower Strait of Georgia	Cowichan Nanaimo	Lower Strait of Georgia (6500)	Cowichan H	COW	0	LGS Natural (21,935)	GST
										Nanaimo H	NAN	0		
										Big Qualicum H	BQR	0		
	S									Puntledge H	PPS	0	(5,318)	GSH

¹Sp=Spring, S=Summer, F=Fall

²The three annex indicators for Fraser Early have been split into four escapement indicators representing life history types rather than geographic areas.

³Production and tagging discontinued.

APPENDIX B: ISBM INDICES

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Appendix B1—ISBM Indices for all British Columbia ISBM fisheries based on CWT-based exploitation rate analysis (1999–2016). The stock groups correspond to Annex 4, Chapter 3, Attachment IV of the 2009 PST Agreement.

Stock Group	Stock (CTC agreed goal year)	Base Per. Data ¹	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
North/ Central B.C.	Yakoun, Nass, Skeena, Atnarko, Dean (no goal)	-	N.A.																	
WCVI Falls	Artlish, Burman, Kauok, Tahsis, Tashish, Marble, Gold (no goal)	16	0.707	0.126	0.100	0.396	0.459	0.558	0.287	0.433	0.493	0.523	0.489	0.207	0.635	0.619	0.328	0.290	0.653	0.392
L. Georgia Strait	Cowichan (2005)	0	0.475	0.25	0.376	0.537	0.386	0.265	0.184	0.275	0.271	0.372	0.461	0.372	0.182	0.412	0.375	0.436	0.269	0.319
	Nanaimo (no goal)	0	0.163	0.154	0.260	0.247	NA													
U. Georgia Strait	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish (no goal)	16	0.243	0.102	0.053	0.125	0.073	0.115	0.211	0.121	0.185	0.087	0.202	0.372	0.092	0.142	0.070	0.047	0.190	0.209
Fraser Late	Harrison (2001)	0	0.137	0.066	0.123	0.054	0.038	0.053	0.085	0.076	0.037	0.053	0.06	0.107	0.091	0.132	0.149	0.274	0.168	0.167
Fraser Early (spring & summers)	Upper Fraser, Mid-Fraser, Thompson	-	N.A.																	
Puget Sound Spring	Nooksack (no goal) ¹	0	0.034	0.089	0.042	0.02	0.06	0.059	0.109	0.068	0.06	0.122	0.148	0.029	0.135	0.057	0.059	0.084	0.059	NC
	Skagit (no goal)	-	NA																	
Puget Sound Falls	Skagit (no goal)	-	NA																	
	Stillaguamish (no goal) ²	1	0.135	0.088	0.124	NC	NC	0.079	0.068	0.135	0.252	0.121	0.22	0.147	0.21	0.257	0.2	0.588	0.682	NC
	Snohomish (no goal)	-	NA																	
	Lake Wash. (no goal)	-	NA																	
	Green River (no goal) ²	9	0.185	0.109	0.188	0.298	0.223	0.197	0.274	0.185	0.142	0.158	0.270	0.130	0.261	0.300	0.277	0.406	0.970	NC

Key: Cases wherein the fishery met the obligation are colored in green whereas cases where the obligation was exceeded are colored in red. Cells are not colored in cases where a stock-year ISBM statistic cannot be calculated. The ISBM performance metrics reflect the combination of presence of an escapement goal and if so, whether or not it was met, and the CWT-based evaluation of exploitation rate as compared to the base years.

Note: NA means not available because of insufficient data (lack of stock specific tag codes, base period CWT recoveries, etc.). NC means not yet calculated.

¹This column contains the percentage of the maximum possible age-year combinations available for calculating the 1979–1982 base period average total mortality (landed catch and incidental mortality) which is the denominator of the postseason ISBM index. The base period average total mortality is based on data contributed from four possible age classes in each year of 4 possible base period years for a total of 16 possible age-year combinations. In practice, the postseason ISBM index is calculated for a CWT indicator stock when fewer than the maximum number of age-year combinations with data are available (<16). When actual CWT data are not available for the majority of ages in all of the base period years (0–1), the base period average is calculated from values found in the PSC Chinook Model's STK input file for the Model stock corresponding to the CWT indicator stock; in these cases, the ISBM index should be interpreted judiciously (see TCChinook (11)-04 for details).

- 2 An inconsistency was discovered between the approaches used to calculate the model-based and CWT-based indices. The former included harvest rates for terminal sport while the latter did not. Terminal sport harvest rates are now included in the calculation of both indices starting 2003. Further review is yet required to determine whether the base period terminal sport harvest rates obtained from analyses of Big Qualicum CWT recoveries adequately represent impacts that would have occurred on Cowichan Chinook salmon.
- 3 Indices for the Nanaimo stock are calculated from CWT recoveries for Cowichan; differences between Nanaimo and Cowichan stock indices are due to differences in terminal harvest.
- 4 Several problems have been identified in the approach previously used to calculate the CWT-based indices for Nanaimo Chinook salmon; indices for this stock will not be reported starting 2003 as their utility is questionable.
- 5 Stock or stock group with an agreed CTC escapement goal.
- 6 The terminal sport harvest rates for Chilliwack Hatchery Chinook salmon, the indicator stock, were removed from the calculation for the Harrison River naturals starting 2003 because sport harvest has been essentially zero on the natural population.
- 7 An error was detected in the Nooksack ISBM index estimate for 2011 as reported in TCChinook (14)-01; the corrected value appears here.
- 8 A review of the approach used to calculate both the CWT-based and model data-based indices for the WCVI naturals was carried out in 2008. A similar approach was adopted for both indices but due to modifications to the formerly used procedures, the historical time series of values was updated starting 2003.

Appendix B2—ISBM Indices for all southern US fisheries based on CWT-based exploitation rate analysis (1999–2016). The stock groups correspond to Annex 4, Chapter 3, and Attachment V of the 2009 PST Agreement.

Stock Group	Stock (CTC agreed goal in year)	Base Per. Data ¹	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fraser Late	Harrison (2001)	0	0.662	0.210	0.384	0.369	0.348	0.473	0.360	0.398	0.147	0.467	0.134	0.295	0.285	0.351	0.441	0.379	0.255	0.212
Puget Sound Spring	Nooksack (no goal)	0	0.257	0.117	0.328	0.225	0.443	0.434	0.476	0.812	0.935	1.482	0.585	0.758	0.890	1.866	0.872	1.298	0.547	NC
	Skagit (no goal)	-	NA	NA	NA	1.120	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Puget Sound Fall	Skagit (no goal)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA							
	Stillaguamish (no goal)	1	0.107	0.074	0.612	NC	NC	0.047	0.240	0.132	0.133	0.411	0.219	0.198	0.218	0.170	0.299	1.211	0.765	NC
	Snohomish (no goal)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA							
	Lake Wash. (no goal)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA							
	Green (no goal)	9	0.276	0.322	0.460	0.542	0.581	0.720	0.353	0.518	0.656	0.536	0.483	0.285	0.408	0.514	0.299	0.400	0.598	NC
WA Coast Falls	Hoko (no goal)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA							
	Grays (2014)	10	0.332	0.796	1.090	0.534	0.229	0.518	0.270	0.514	0.651	0.311	0.692	0.619	0.740	0.939	0.771	0.760	0.895	NC
	Queets (2004)	10	0.180	0.052	0.459	0.524	0.275	0.256	0.421	0.465	0.684	0.544	0.545	0.522	0.530	0.801	0.706	0.437	0.427	NC
	Hoh (2004)	10	1.487	1.344	1.546	0.974	1.306	1.194	0.973	1.508	1.588	0.956	1.011	0.828	1.754	1.590	2.598	1.254	1.359	NC
	Quillayute (2004)	10	1.206	0.844	1.235	1.448	0.908	1.539	0.973	1.091	1.136	1.205	1.835	1.361	1.692	1.957	1.762	2.597	2.094	NC
Columbia Fall	Brights (2002)	15	1.397	2.303	1.458	1.737	1.574	1.651	1.730	2.903	3.163	1.823	2.668	1.669	2.616	2.713	2.227	1.931	1.541	NC
	Deschutes (2010)	0	0.453	0.569	0.417	0.590	0.495	0.631	0.637	0.553	0.599	0.652	0.821	0.696	0.768	0.775	0.796	0.758	0.685	NC
	Lewis (1999)	9	0.045	0.333	0.333	0.312	0.533	0.183	0.745	1.288	0.663	0.551	0.217	0.554	1.374	0.870	1.106	0.793	0.472	NC
Columbia Summers	Summers (1999)	9	1.390	0.987	3.550	4.851	7.887	4.784	12.064	5.802	10.331	6.206	5.230	6.958	12.439	7.888	8.717	13.993	10.374	NC
N. Oregon Coast	Nehalem (1999)	13	2.103	1.600	3.447	2.330	2.305	3.342	2.271	3.838	1.195	1.835	0.234	1.950	1.861	1.690	2.525	3.668	3.759	NC
	Siletz (1999)	13	1.879	1.252	1.294	1.193	1.708	4.123	1.684	2.040	1.037	1.068	0.871	0.372	1.719	1.178	2.076	1.570	2.681	NC
	Siuslaw (1999)	13	1.611	2.721	2.019	1.972	1.876	1.771	1.395	2.429	2.506	1.882	1.869	1.773	2.646	1.830	2.831	2.132	3.099	NC

Key: Cases wherein the fishery met the obligation are colored in green whereas cases where the obligation was exceeded are colored in red. Cells are not colored in cases where a stock-year ISBM statistic cannot be calculated. The ISBM performance metrics reflect the combination of presence of an escapement goal and if so, whether or not it was met, and the CWT-based evaluation of exploitation rate as compared to the base years.

Note: NA means not available because of insufficient data (lack of stock specific tag codes, base period CWT recoveries, etc.). NC means not yet calculated.

¹This column contains the percentage of the maximum possible age-year combinations available for calculating the 1979–1982 base period average total mortality (landed catch and incidental mortality) which is the denominator of the postseason ISBM index. The base period average total mortality is based on data contributed from four possible age classes in each year of 4 possible base period years for a total of 16 possible age-year combinations. In practice, the postseason ISBM index is calculated for a CWT indicator stock when fewer than the maximum number of age-year combinations with data are available (<16). When actual CWT data are not available for the majority of ages in all of the base period years (0–1), the base period average is calculated from values found in the PSC Chinook Model's STK input file for the Model stock corresponding to the CWT indicator stock; in these cases, the ISBM index should be interpreted judiciously (see TCChinook (11)-04 for details).

² Stock or stock group with an agreed CTC escapement goal.

APPENDIX C: PERCENT DISTRIBUTION OF LANDED CATCH AND TOTAL MORTALITY AMONG FISHERIES AND ESCAPEMENT FOR EXPLOITATION RATE INDICATOR STOCKS BY CALENDAR YEAR WITH ANALOGOUS MODEL STOCKS LISTED IN PARENTHESES

Mortality distribution tables show the percent of estimated landed catch or total mortality for individual stocks attributed to specific fisheries. Landed catch mortalities are calculated from catch estimation and CWT sampling programs. Total mortality includes landed catch and incidental mortality (i.e., release mortality) which occurs in both retention and nonretention fisheries; incidental mortalities are estimated based on sampling data and/or internal algorithms (i.e., size-at-age vulnerability algorithms and gear-specific mortality rates). Mortality distribution within a calendar year sums to 100%.

Minimum criteria for reporting of distributions were applied to each calendar year and data that did not meet the minimum criteria (at least 3 ages and 105 estimated CWT recoveries) were either omitted or shaded. If only 1 age class was present in a calendar year, data from that year were omitted. If 2 age classes or less than 105 estimated CWTs were present in a calendar year, data from that year were shaded, but excluded from the calculation of the time period averages found at the bottom rows of the table. Where relevant, escapement includes interdam loss mortalities (i.e. Columbia River stocks).

Note that substantive changes have been made to the format of mortality distribution tables from previous reports (i.e., TCChinook (15)-1 V. 2). These changes include:

1. CWT database. A large number of changes have been made to the CWT database. The terminal fishery strays category was removed. These recoveries are now associated to the terminal fishery in which they occurred. A new freshwater fishery was created for Canadian terminal fishery impacts on the Taku and Stikine stocks.
2. Definition of strays. The Strays column in the mortality distribution layout was moved under escapement. Previously, strays included both escapement and terminal fisheries strays, but now it only includes escapement strays.
3. Revised table layout for AABM, ISBM, and terminal fisheries. The terminal fishery columns have been separated from the ISBM designation and by country. Impacts occurring in US and Canadian terminal fisheries include both marine and freshwater impacts. For the transboundary stocks (Taku and Stikine), the terminal fisheries (both US and Canada) are those under specific management provisions covered under Chapter 1. For all stocks, fishery impacts occurring in southern US terminal fisheries include freshwater impacts covered under the ISBM management framework. A small number of estimated recoveries of non-Alaskan hatchery stocks have occurred in Alaskan terminal fisheries and these recoveries are covered under the AABM management framework. For all stocks, fishery impacts occurring under Canadian terminal fisheries include freshwater impacts covered under the ISBM management framework for all CWT indicator stocks.
4. New organization for Canadian ISBM fisheries. These are now presented by gear type in two regional groupings (southern BC and north/central BC).
5. New fishery. A new column for Washington Coast Net was included. Previous reports had placed Washington Coast Net as part of Puget Sound Net.

6. New stock. Tables for the Phillips River Fall CWT indicator stock have been included for the first time.
7. To conserve space the 1979–1984 average is provided in lieu of annual data prior to 1985. These annual data are available in Appendix C of previous reports (i.e., TCChinook (15)-1 V. 2).

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APPENDIX D: MODEL ESTIMATES OF THE STOCK COMPOSITION OF THE AABM AND 3 ISBM OCEAN FISHERIES FOR 2016 AND THE AVERAGE, 1985–2015

This appendix shows the model estimates of the stock composition of the catch for the 3 AABM fisheries (Appendices D1, D2 and D4), and 3 ISBM ocean fisheries (Appendices D3, D5 and D6). These estimates are based on the summation of the contribution of the 30 model stocks for each fishery, expressed as a percentage of the total catch.

The estimated stock composition may not reflect the true stock composition in a given year for several reasons:

1. The yearly catch estimates by stock are influenced by the base period stock composition in a fishery which may not reflect the current stock composition in the fishery, amongst the 30 model stocks.
2. The distribution of certain stocks may have changed over time.
3. The 30 model stocks do not represent all production present in a fishery.

For example, in the SEAK fishery a substantial component (over 20%) of the catch is comprised of Alaska hatchery fish, most of which do not count as treaty catch and are not included in Appendix D1. Also, in the sport fishery portion of the present NBC AABM fishery, the base period data used is from fisheries which were located near shore and do not represent the current stock composition of the sport fishery which is located offshore.

Hence, these tables do not necessarily portray the true stock composition of the total catch of the fisheries in Appendices D1 to D6. There are genetic estimates for most of these fisheries in selected years which can provide more accurate accounting of contributions by stocks or stock groups.

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Appendix D1—Southeast Alaska all gear.

FISHERY	SOUTHEAST ALASKA ALL GEAR				
	2016	Average (1985–2015)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Total Return	Associated Escapement Indicator Stocks ¹
Columbia Upriver Bright	28.22%	18.11%	26.18%	13.04%	Columbia Upriver Bright, Deschutes
North/Central BC	10.61%	15.92%	20.40%	10.23%	Nass, Skeena, Yakoun, Dean, Rivers Inlet
WCVI Hatchery	16.06%	15.17%	52.51%	17.62%	NA
Oregon Coastal North Migrating	9.92%	13.68%	33.56%	15.09%	Nehalem, Siletz, Siuslaw
Mid-Columbia Brights	8.97%	6.64%	35.29%	13.83%	Not Represented
Upper Georgia Strait	6.48%	5.70%	34.01%	19.58%	Upper Georgia Strait
Fraser Early	3.37%	3.96%	24.76%	5.12%	Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, Fraser Summer 0.3
Columbia Upriver Summer	6.03%	3.94%	27.57%	12.79%	Columbia Upriver Summer
Alaska South SE	1.08%	3.55%	96.58%	33.55%	Unuk, Chickamin
WCVI Wild	1.88%	2.88%	54.19%	17.73%	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble
Washington Coastal Wild	1.81%	2.72%	17.25%	9.11%	Grays Harbor Fall, Quillayute Fall, Hoh Fall, Queets Fall
WA Coastal Hatchery	1.95%	2.23%	16.95%	8.55%	NA
Willamette River Hatchery	0.74%	2.22%	12.81%	5.33%	NA
Fall Cowlitz Hatchery	0.93%	1.00%	5.33%	2.18%	NA
Lewis River Wild	0.86%	0.86%	19.19%	8.29%	Lewis River
Lower GS Hatchery	0.12%	0.32%	3.58%	1.79%	NA
PS Hatchery Fingerling	0.13%	0.21%	0.52%	0.28%	NA
Lower Georgia Strait	0.18%	0.19%	3.87%	2.01%	Lower Georgia Strait
Fraser Late	0.04%	0.15%	0.31%	0.11%	Harrison
Snake River Fall	0.32%	0.13%	6.66%	4.07%	Not Represented
Spring Cowlitz Hatchery	0.16%	0.10%	2.25%	1.05%	NA
Skagit Summer/Fall	0.03%	0.09%	4.29%	1.15%	Skagit Summer/Fall
Stillaguamish Summer/Fall	0.02%	0.06%	20.06%	6.69%	Stillaguamish
PS Yearling	0.04%	0.05%	0.53%	0.34%	NA
Nooksack Fall	0.01%	0.04%	0.18%	0.13%	NA
Puget Sound Natural	0.01%	0.03%	0.70%	0.29%	Green, Lake Washington
Snohomish Summer/Fall	0.02%	0.03%	4.45%	1.17%	Snohomish
Spring Creek Hatchery	0.00%	0.00%	0.00%	0.00%	NA
Lower Bonneville Hatchery	0.00%	0.00%	0.00%	0.00%	NA
Nooksack Spring	0.00%	0.00%	0.00%	0.00%	Nooksack Spring

¹ NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D2—North BC troll.

FISHERY	NORTH TROLL				
	2016	Average (1985–2015)			Associated Escapement Indicator Stocks
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	
Oregon Coastal North Migrating	21.97%	26.43%	29.84%	14.19%	Nehalem, Siletz, Siuslaw
Columbia Upriver Bright	33.89%	17.06%	11.50%	6.01%	Columbia Upriver Bright, Deschutes
North/Central BC	7.17%	10.37%	6.85%	3.42%	Nass, Skeena, Yakoun, Dean, Rivers Inlet
WCVI Hatchery	1.47%	6.83%	9.72%	3.83%	NA
Fraser Early	7.02%	6.37%	17.63%	4.07%	Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, Fraser Summer 0.3
Willamette River Hatchery	2.08%	5.41%	13.49%	6.28%	NA
Upper Georgia Strait	5.64%	4.66%	13.00%	7.88%	Upper Georgia Strait
Washington Coastal Wild	3.12%	4.54%	13.47%	7.60%	Grays Harbor Fall, Quillayute Fall, Hoh Fall, Queets Fall
Mid-Columbia Brights	5.82%	4.32%	10.72%	4.49%	Not Represented
WA Coastal Hatchery	3.40%	3.74%	13.26%	7.13%	NA
Columbia Upriver Summer	4.17%	2.52%	8.62%	4.22%	Columbia Upriver Summer
WCVI Wild	0.17%	1.54%	9.81%	3.82%	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble
Fall Cowlitz Hatchery	0.85%	0.98%	2.11%	0.95%	NA
Lower GS Hatchery	0.23%	0.76%	3.23%	1.72%	NA
Fraser Late	0.30%	0.65%	0.44%	0.20%	Harrison
Lewis River Wild	0.48%	0.54%	4.18%	2.06%	Lewis River
Lower Georgia Strait	0.33%	0.42%	2.91%	1.66%	Lower Georgia Strait
Skagit Summer/Fall	0.31%	0.38%	5.84%	1.77%	Skagit Summer/Fall
PS Hatchery Fingerling	0.21%	0.38%	0.32%	0.19%	NA
Spring Cowlitz Hatchery	0.35%	0.33%	2.44%	1.24%	NA
Snake River Fall	0.66%	0.33%	5.53%	3.55%	Not Represented
Alaska South SE	0.05%	0.25%	2.16%	0.74%	Unuk, Chickamin
PS Yearling	0.14%	0.25%	0.71%	0.48%	NA
Nooksack fall	0.05%	0.24%	0.27%	0.20%	NA
Snohomish Summer/Fall	0.07%	0.21%	5.69%	1.77%	Snohomish
Puget Sound Natural	0.02%	0.15%	0.39%	0.18%	Green, Lake Washington
Spring Creek Hatchery	0.05%	0.13%	0.05%	0.04%	NA
Stillaguamish Summer/Fall	0.00%	0.12%	2.33%	0.89%	Stillaguamish
Nooksack Spring	0.01%	0.11%	1.62%	0.50%	Nooksack Spring
Lower Bonneville Hatchery	0.00%	0.00%	0.00%	0.00%	NA

¹ NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D3—Central BC troll.

FISHERY	CENTRAL TROLL				
	2016	Average (1985–2015)			Associated Escapement Indicator Stocks
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	
Fraser Late	0.00%	14.30%	1.39%	0.79%	Harrison
WCVI Hatchery	0.00%	11.43%	2.29%	0.97%	NA
Columbia Upriver Bright	0.00%	5.60%	0.59%	0.34%	Columbia Upriver Bright, Deschutes
Upper Georgia Strait	0.00%	4.78%	2.22%	1.40%	Upper Georgia Strait
North/Central BC	0.00%	4.67%	0.65%	0.28%	Nass, Skeena, Yakoun, Dean, Rivers Inlet
WCVI Wild	0.00%	2.54%	2.26%	0.95%	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble
Columbia Upriver Summer	0.00%	2.51%	2.20%	1.06%	Columbia Upriver Summer
Fraser Early	0.00%	2.22%	0.67%	0.23%	Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, Fraser Summer 0.3
Washington Coastal Wild	0.00%	2.21%	0.75%	0.49%	Grays Harbor Fall, Quillayute Fall, Hoh Fall, Queets Fall
Lower GS Hatchery	0.00%	1.96%	0.92%	0.63%	NA
Mid-Columbia Brights	0.00%	1.78%	0.69%	0.35%	Not Represented
WA Coastal Hatchery	0.00%	1.67%	0.73%	0.46%	NA
Oregon Coastal North Migrating	0.00%	1.66%	0.24%	0.13%	Nehalem, Siletz, Siuslaw
Lower Bonneville Hatchery	0.00%	1.49%	0.61%	0.31%	NA
PS Hatchery Fingerling	0.00%	1.20%	0.17%	0.11%	NA
Lower Georgia Strait	0.00%	1.19%	0.88%	0.62%	Lower Georgia Strait
Nooksack Fall	0.00%	1.16%	0.24%	0.20%	NA
Skagit Summer/Fall	0.00%	0.80%	1.43%	0.59%	Skagit Summer/Fall
Lewis River Wild	0.00%	0.60%	0.41%	0.23%	Lewis River
PS Yearling	0.00%	0.50%	0.25%	0.20%	NA
Snohomish Summer/Fall	0.00%	0.47%	1.24%	0.61%	Snohomish
Spring Creek Hatchery	0.00%	0.46%	0.07%	0.06%	NA
Puget Sound Natural	0.00%	0.45%	0.19%	0.12%	Green, Lake Washington
Willamette River Hatchery	0.00%	0.42%	0.07%	0.04%	NA
Spring Cowlitz Hatchery	0.00%	0.32%	0.15%	0.09%	NA
Fall Cowlitz Hatchery	0.00%	0.31%	0.03%	0.02%	NA
Stillaguamish Summer/Fall	0.00%	0.28%	1.33%	0.62%	Stillaguamish
Snake River Fall	0.00%	0.27%	0.47%	0.36%	Not Represented
Nooksack Spring	0.00%	0.24%	0.28%	0.13%	Nooksack Spring
Alaska South SE	0.00%	0.23%	0.01%	0.00%	Unuk, Chickamin

¹ NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D4—WCVI troll and outside sport.

FISHERY	WCVI TROLL AND OUTSIDE SPORT				
	2016	Average (1985-2015)			Associated Escapement Indicator Stocks
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	
Fraser Late	20.16%	25.49%	22.97%	11.08%	Harrison
PS Hatchery Fingerling	5.27%	10.42%	13.63%	8.40%	NA
Columbia Upriver Bright	26.38%	9.43%	7.89%	4.26%	Columbia Upriver Bright, Deschutes
Spring Creek Hatchery	12.66%	7.28%	12.83%	10.11%	NA
Fall Cowlitz Hatchery	6.38%	6.62%	19.94%	9.54%	NA
Lower Bonneville Hatchery	1.26%	4.82%	27.56%	12.89%	NA
Oregon Coastal North Migrating	2.98%	4.54%	6.55%	3.23%	Nehalem, Siletz, Siuslaw
Nooksack Fall	1.41%	4.12%	9.90%	7.56%	NA
Mid-Columbia Brights	4.29%	3.78%	11.59%	5.11%	Not Represented
WCVI Hatchery	0.00%	3.31%	5.47%	2.51%	NA
Columbia Upriver Summer	4.14%	3.16%	15.53%	7.54%	Columbia Upriver Summer
Washington Coastal Wild	2.58%	2.45%	9.23%	5.07%	Grays Harbor Fall, Quillayute Fall, Hoh Fall, Queets Fall
WA Coastal Hatchery	2.89%	2.19%	9.54%	4.88%	NA
Willamette River Hatchery	0.67%	1.91%	5.94%	2.83%	NA
Puget Sound Natural	0.45%	1.87%	16.62%	8.48%	Green, Lake Washington
PS Yearling	1.04%	1.57%	8.92%	6.36%	NA
Fraser Early	1.96%	1.52%	5.18%	1.12%	Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, Fraser Summer 0.3
Skagit Summer/Fall	0.62%	0.84%	19.24%	6.30%	Skagit Summer/Fall
WCVI Wild	0.00%	0.80%	5.44%	2.50%	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble
Lewis River Wild	0.94%	0.76%	9.60%	4.73%	Lewis River
Snake River Fall	1.46%	0.66%	20.57%	13.87%	Not Represented
Spring Cowlitz Hatchery	0.88%	0.66%	7.86%	4.37%	NA
North/Central BC	0.47%	0.49%	0.37%	0.18%	Nass, Skeena, Yakoun, Dean, Rivers Inlet
Lower GS Hatchery	0.27%	0.45%	2.78%	1.44%	NA
Snohomish Summer/Fall	0.15%	0.33%	18.45%	6.29%	Snohomish
Lower Georgia Strait	0.40%	0.25%	2.75%	1.53%	Lower Georgia Strait
Upper Georgia Strait	0.26%	0.16%	0.54%	0.32%	Upper Georgia Strait
Stillaguamish Summer/Fall	0.02%	0.09%	15.28%	5.98%	Stillaguamish
Nooksack Spring	0.04%	0.06%	10.18%	3.46%	Nooksack Spring
Alaska South SE	0.00%	0.00%	0.00%	0.00%	Unuk, Chickamin

¹ NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D5—Strait of Georgia sport and troll.

FISHERY	STRAIT OF GEORGIA SPORT AND TROLL				
	2016	Average (1985–2015)			Associated Escapement Indicator Stocks
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	
Fraser Late	37.71%	47.48%	36.10%	18.05%	Harrison
Lower GS Hatchery	5.89%	8.92%	42.59%	24.29%	NA
Nooksack Fall	5.11%	8.58%	17.55%	13.13%	NA
PS Hatchery Fingerling	7.86%	6.54%	7.31%	4.41%	NA
Lower Georgia Strait	7.85%	5.27%	43.29%	26.02%	Lower Georgia Strait
PS Yearling	6.46%	4.43%	19.36%	13.54%	NA
Fraser Early	7.18%	4.28%	11.69%	2.57%	Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, Fraser Summer 0.3
Upper Georgia Strait	8.11%	4.01%	10.77%	6.28%	Upper Georgia Strait
Columbia Upriver Bright	1.98%	1.35%	0.87%	0.45%	Columbia Upriver Bright, Deschutes
Skagit Summer/Fall	1.92%	1.21%	23.90%	7.59%	Skagit Summer/Fall
Puget Sound Natural	0.61%	1.06%	8.85%	4.19%	Green, Lake Washington
Spring Creek Hatchery	2.84%	1.00%	1.38%	1.08%	NA
Washington Coastal Wild	0.87%	0.87%	2.64%	1.49%	Grays Harbor Fall, Quillayute Fall, Hoh Fall, Queets Fall
WA Coastal Hatchery	1.01%	0.75%	2.67%	1.46%	NA
WCVI Hatchery	0.90%	0.73%	1.26%	0.41%	NA
North/Central BC	0.69%	0.61%	0.45%	0.21%	Nass, Skeena, Yakoun, Dean, Rivers Inlet
Lower Bonneville Hatchery	0.24%	0.58%	2.94%	1.25%	NA
Columbia Upriver Summer	0.89%	0.48%	2.25%	0.99%	Columbia Upriver Summer
Snohomish Summer/Fall	0.46%	0.46%	22.59%	7.45%	Snohomish
Nooksack Spring	0.57%	0.45%	65.69%	23.72%	Nooksack Spring
Mid-Columbia Brights	0.43%	0.45%	1.12%	0.48%	Not Represented
Stillaguamish Summer/Fall	0.09%	0.16%	23.50%	8.86%	Stillaguamish
WCVI Wild	0.11%	0.13%	1.29%	0.41%	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble
Willamette River Hatchery	0.11%	0.13%	0.33%	0.16%	NA
Spring Cowlitz Hatchery	0.10%	0.05%	0.49%	0.25%	NA
Fall Cowlitz Hatchery	0.00%	0.01%	0.03%	0.02%	NA
Lewis River Wild	0.00%	0.01%	0.13%	0.07%	Lewis River
Snake River Fall	0.01%	0.00%	0.10%	0.06%	Not Represented
Oregon Coastal North Migrating	0.00%	0.00%	0.00%	0.00%	Nehalem, Siletz, Siuslaw
Alaska South SE	0.00%	0.00%	0.00%	0.00%	Unuk, Chickamin

¹ NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D6—Washington/Oregon troll and sport.

FISHERY	WA/OR TROLL AND SPORT				
	2016	Average (1985-2015)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	Associated Escapement Indicator Stocks
Spring Creek Hatchery	28.12%	25.37%	32.02%	25.21%	NA
Fall Cowlitz Hatchery	17.62%	19.02%	42.00%	19.06%	NA
Fraser Late	14.69%	18.94%	12.40%	5.85%	Harrison
Lower Bonneville Hatchery	3.70%	9.42%	42.00%	18.14%	NA
Columbia Upriver Bright	7.57%	4.56%	2.79%	1.43%	Columbia Upriver Bright, Deschutes
Spring Cowlitz Hatchery	9.31%	4.45%	41.15%	21.31%	NA
PS Hatchery Fingerling	3.63%	4.21%	3.88%	2.27%	NA
Oregon Coastal North Migrating	2.09%	2.53%	2.80%	1.26%	Nehalem, Siletz, Siuslaw
Willamette River Hatchery	1.13%	1.76%	4.12%	1.80%	NA
Nooksack Fall	0.63%	1.57%	2.56%	1.90%	NA
Mid-Columbia Brights	1.78%	1.56%	3.59%	1.46%	Not Represented
Lewis River Wild	1.73%	1.41%	14.27%	6.27%	Lewis River
Snake River Fall	3.40%	1.10%	23.59%	14.77%	Not Represented
Washington Coastal Wild	0.91%	1.04%	2.63%	1.42%	Grays Harbor Fall, Quillayute Fall, Hoh Fall, Queets Fall
WA Coastal Hatchery	1.05%	0.89%	2.70%	1.37%	NA
Columbia Upriver Summer	1.61%	0.81%	2.42%	1.17%	Columbia Upriver Summer
Puget Sound Natural	0.31%	0.75%	5.20%	2.28%	Green, Lake Washington
PS Yearling	0.33%	0.27%	1.13%	0.76%	NA
Fraser Early	0.27%	0.19%	0.60%	0.11%	Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, Fraser Summer 0.3
Alaska South SE	0.03%	0.07%	0.81%	0.27%	Unuk, Chickamin
Lower GS Hatchery	0.02%	0.03%	0.16%	0.08%	NA
WCVI Hatchery	0.03%	0.02%	0.04%	0.01%	NA
Lower Georgia Strait	0.03%	0.02%	0.17%	0.09%	Lower Georgia Strait
WCVI Wild	0.00%	0.01%	0.04%	0.01%	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble
Skagit Summer/Fall	0.00%	0.00%	0.06%	0.02%	Skagit Summer/Fall
Snohomish Summer/Fall	0.00%	0.00%	0.08%	0.02%	Snohomish
Nooksack Spring	0.00%	0.00%	0.00%	0.00%	Nooksack Spring
North/Central BC	0.00%	0.00%	0.00%	0.00%	Nass, Skeena, Yakoun, Dean, Rivers Inlet
Stillaguamish Summer/Fall	0.00%	0.00%	0.00%	0.00%	Stillaguamish
Upper Georgia Strait	0.00%	0.00%	0.00%	0.00%	Upper Georgia Strait

¹ NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

APPENDIX E: FIGURES OF CHINOOK MODEL-GENERATED STOCK COMPOSITION OF ACTUAL LANDED CATCH FOR ALL (AABM AND ISBM) MODEL FISHERIES, 1979-2016

Stock abbreviations in each figure correspond to the following model stocks and aggregations:

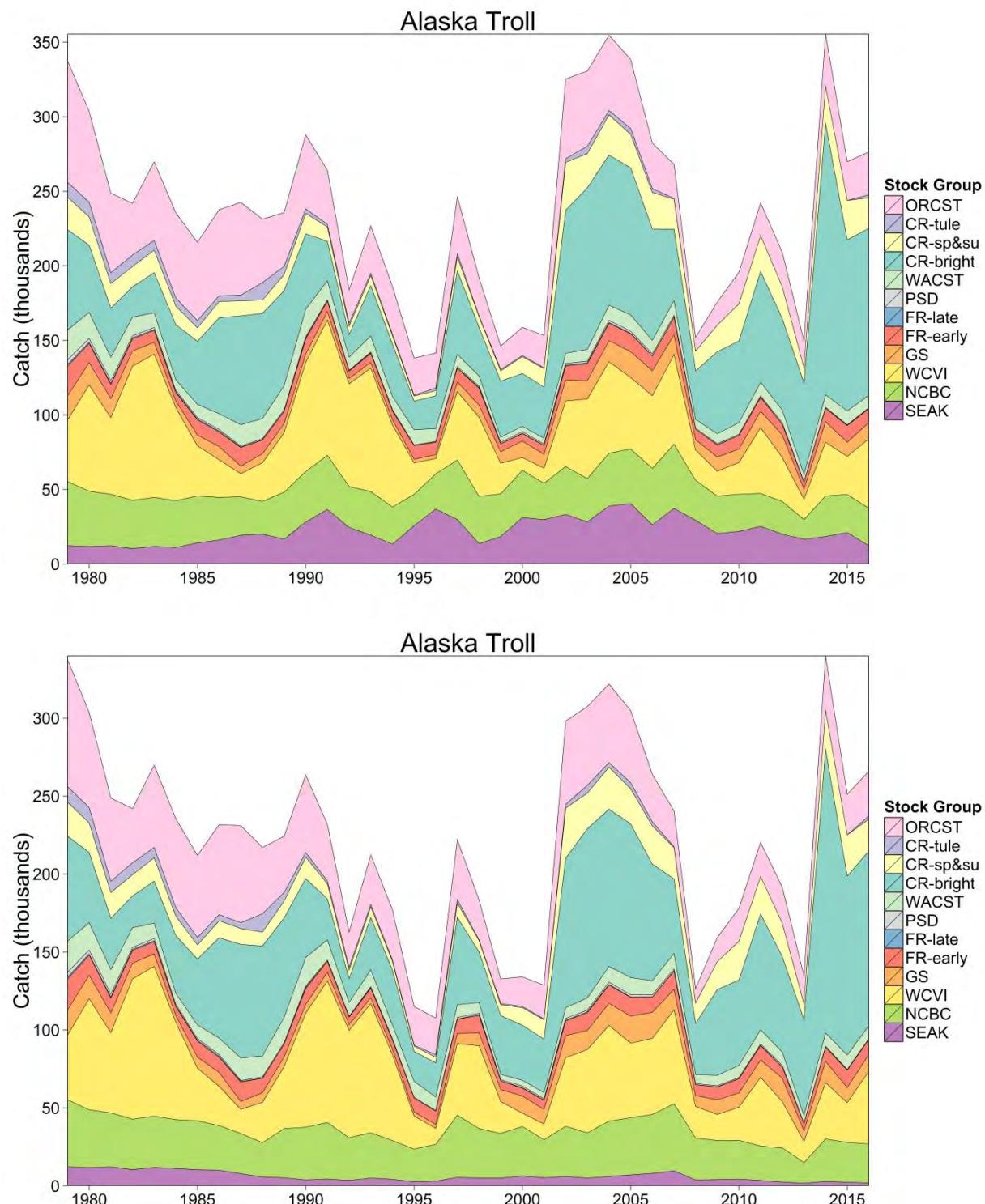
ORCST	Oregon Coast
CR-tule	Columbia River-Fall Tule stocks (Spring Creek, Lower River Hatchery, and Cowlitz Fall)
CR-sp&su	Columbia River Spring and Summer stocks (Willamette, Cowlitz Spring, Columbia Summers)
CR-bright	Columbia River Fall Bright stocks (Upriver, Mid-Columbia, Lewis River Wild, Lyons Ferry)
WACST	Washington Coast
PSD	Puget Sound stocks (Nooksack Fall and Spring, Natural Fall Fingerlings, Hatchery Fall Fingerlings, Hatchery Yearlings, Skagit Wild, Stillaguamish Wild, Snohomish Wild)
FR-late	Fraser River Late stock
FR-early	Fraser River Early stocks
GS	Georgia Strait stocks (Upper, Lower Natural, Lower Hatchery)
WCVI	West Coast Vancouver Island Stocks (hatchery and natural)
NCBC	North Central British Columbia stocks
SEAK	Southeast Alaska stocks

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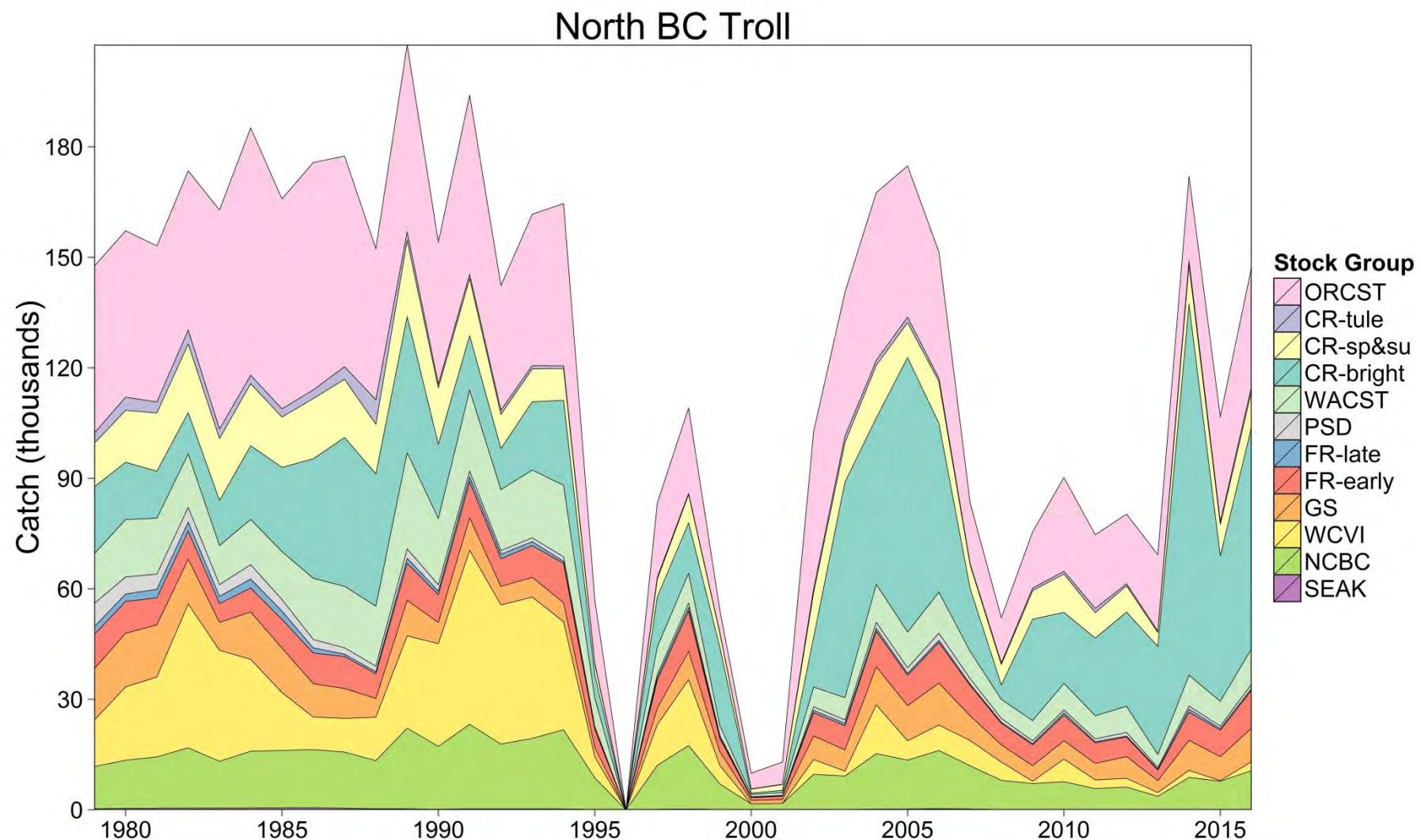
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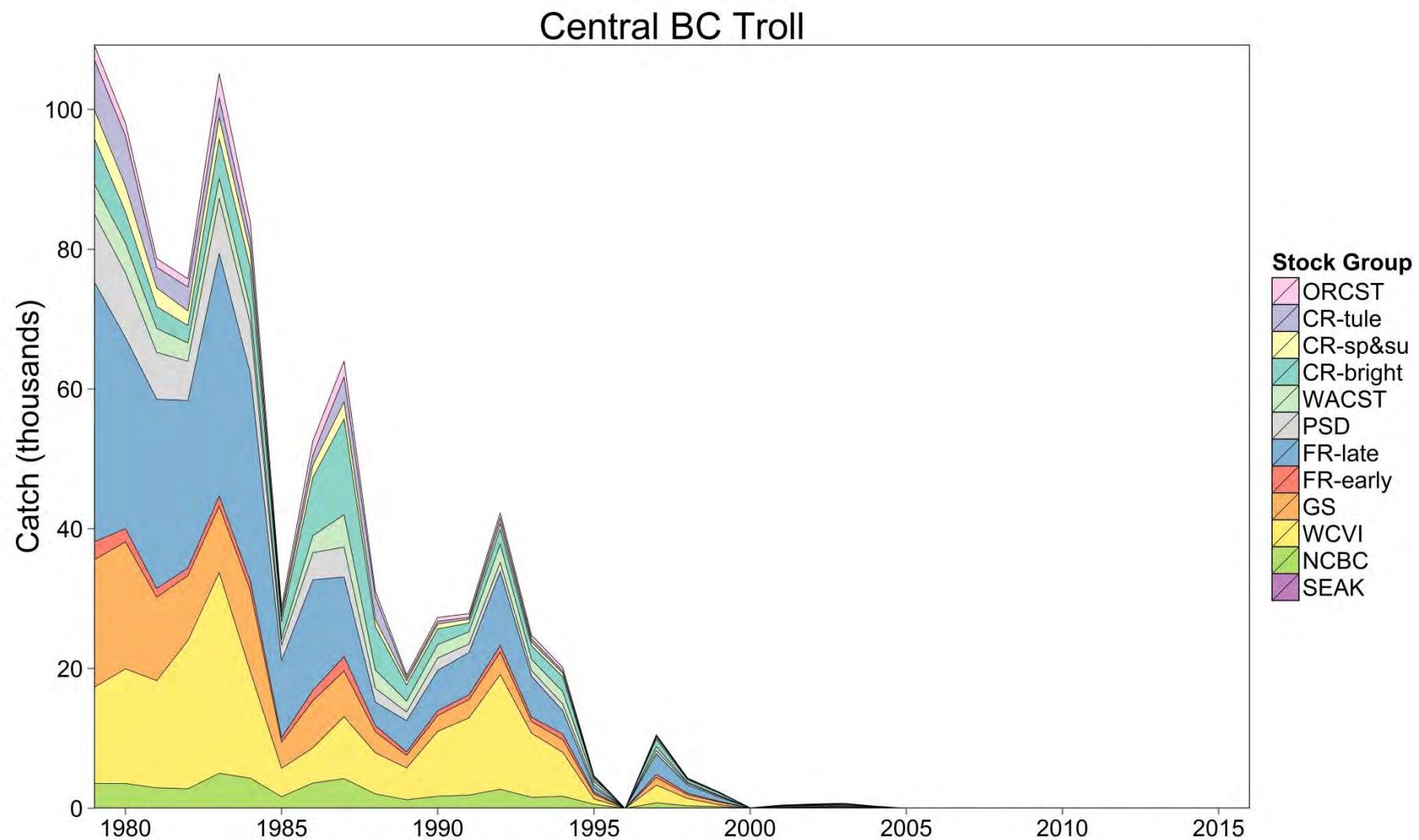
Appendix E1—Chinook Model Estimates of landed catch stock composition for Alaska troll with (upper) and without (lower) Alaska hatchery add-on and terminal exclusion, 1979–2016.



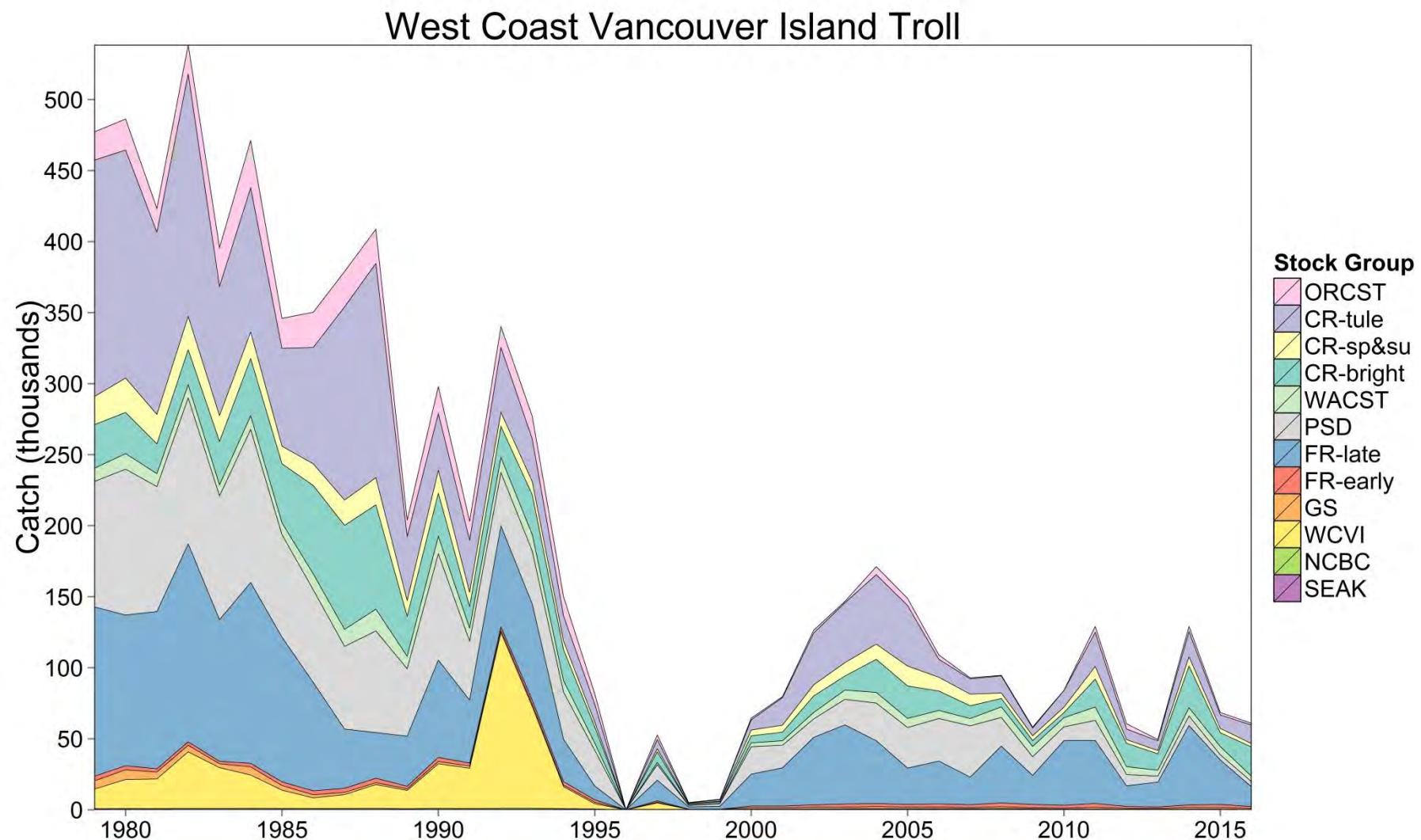
Appendix E2—Chinook Model Estimates of landed catch stock composition for North British Columbia troll, 1979–2016.



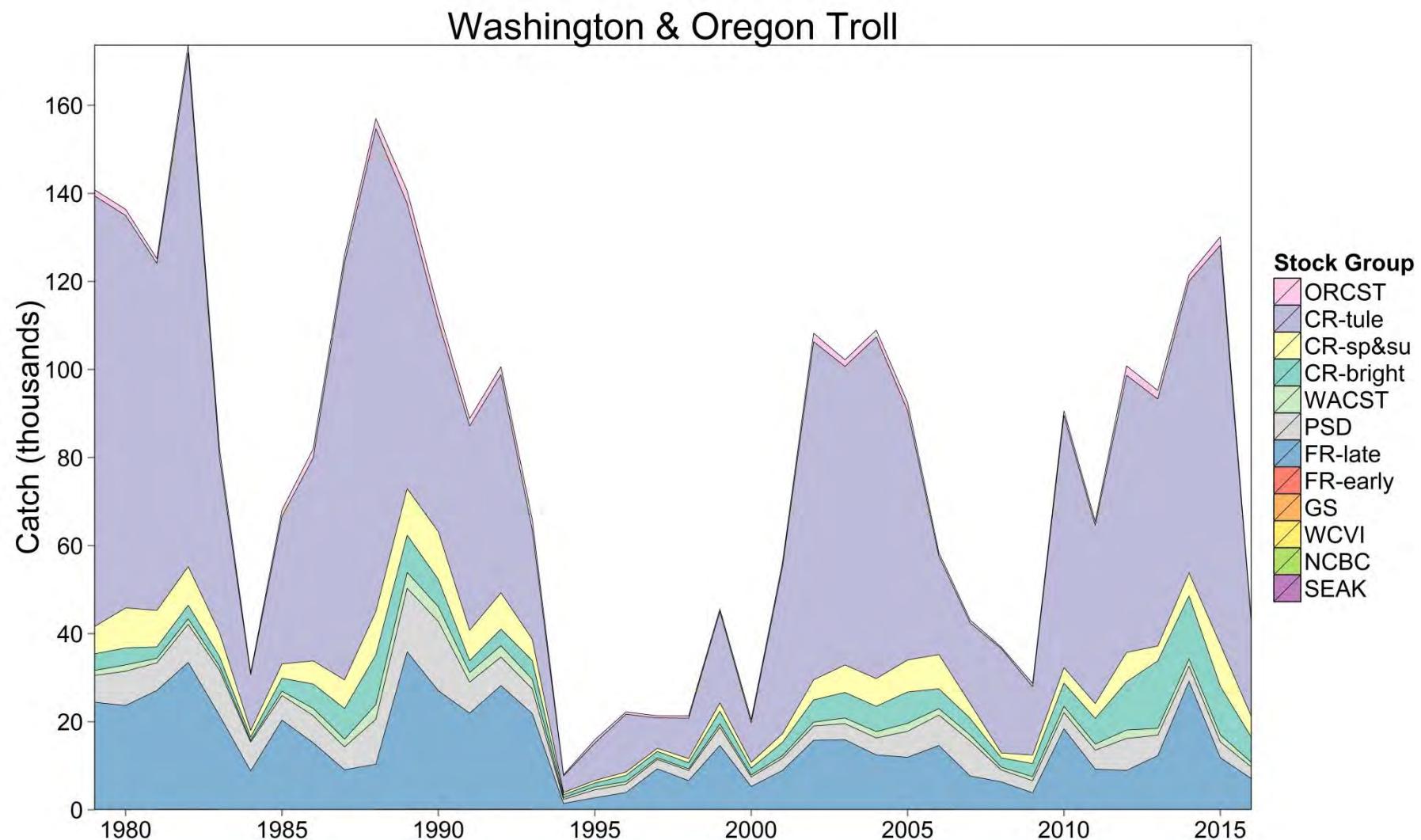
Appendix E3—Chinook Model Estimates of landed catch stock composition for Central British Columbia troll, 1979–2016.



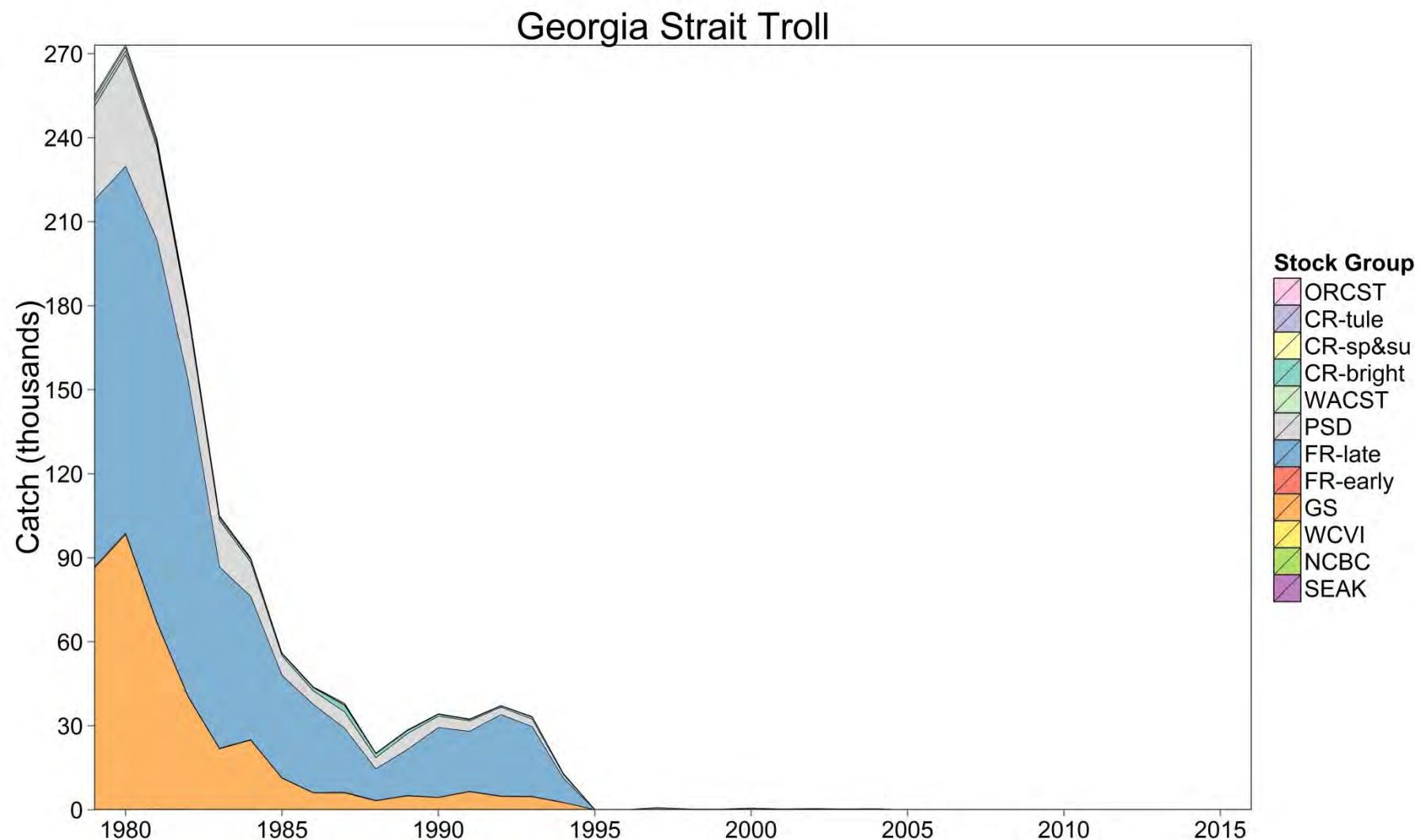
Appendix E4—Chinook Model Estimates of landed catch stock composition for West Coast Vancouver Island troll, 1979–2016.



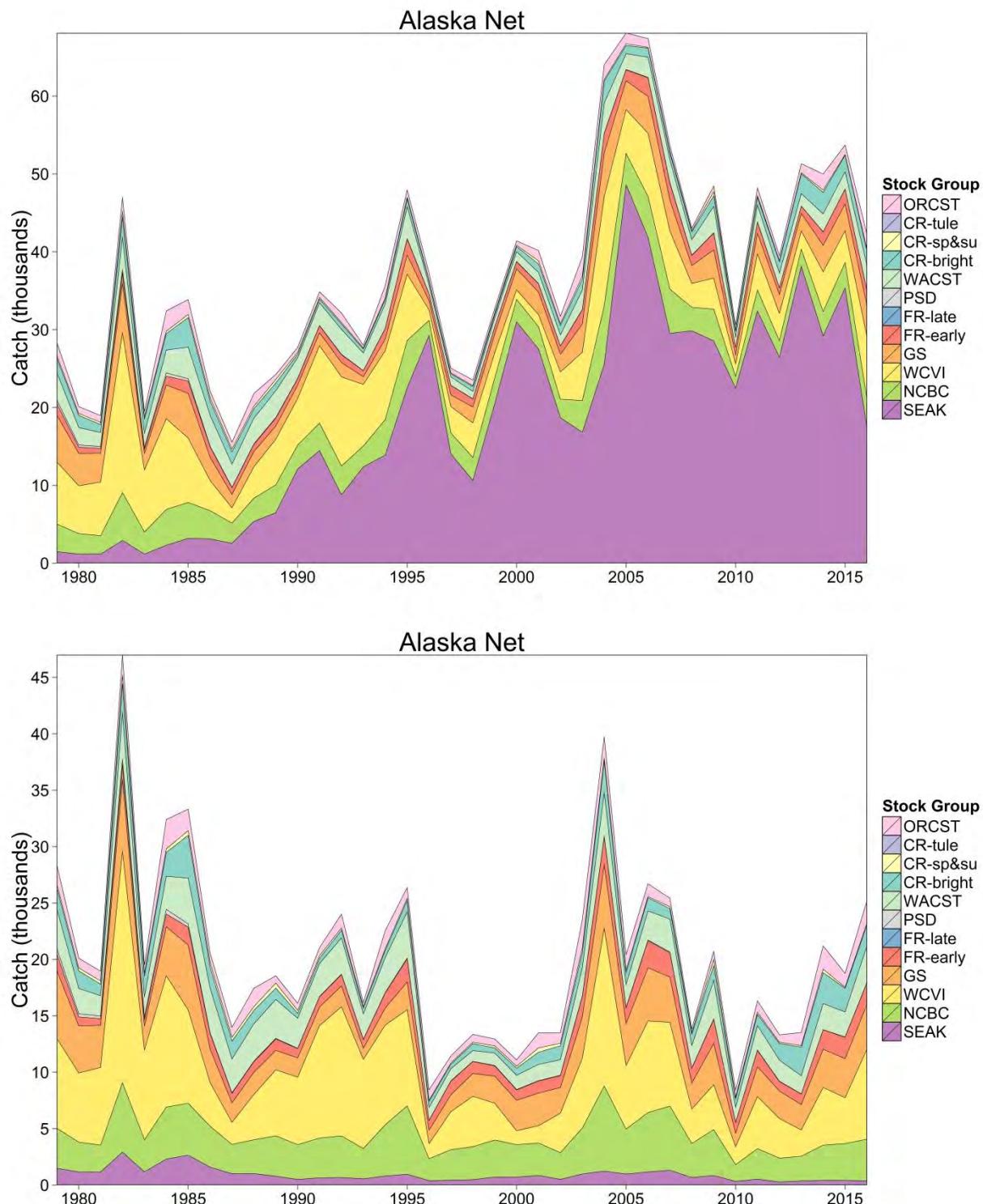
Appendix E5—Chinook Model Estimates of landed catch stock composition for Washington and Oregon troll, 1979–2016.



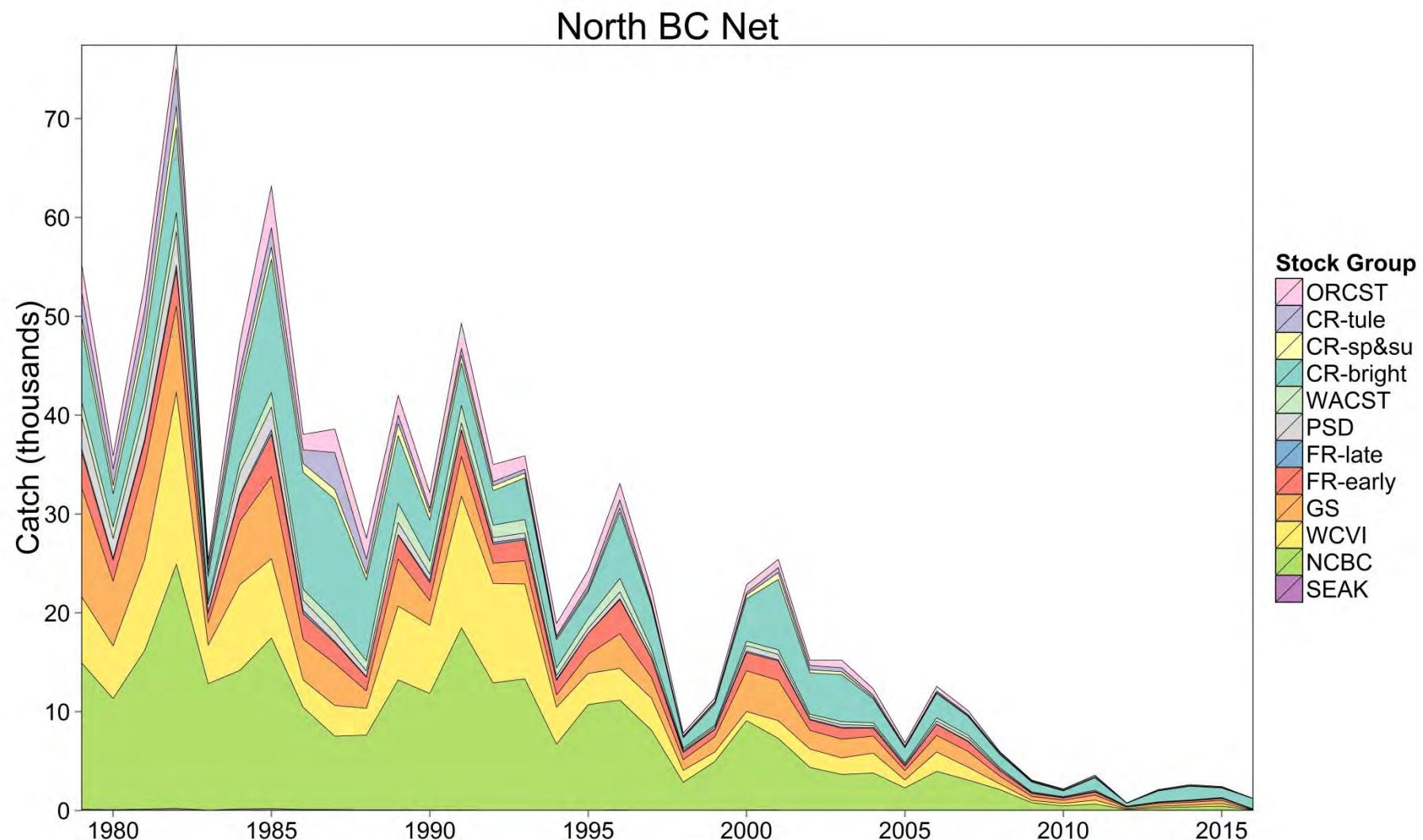
Appendix E6—Chinook Model Estimates of landed catch stock composition for Strait of Georgia troll, 1979–2016.



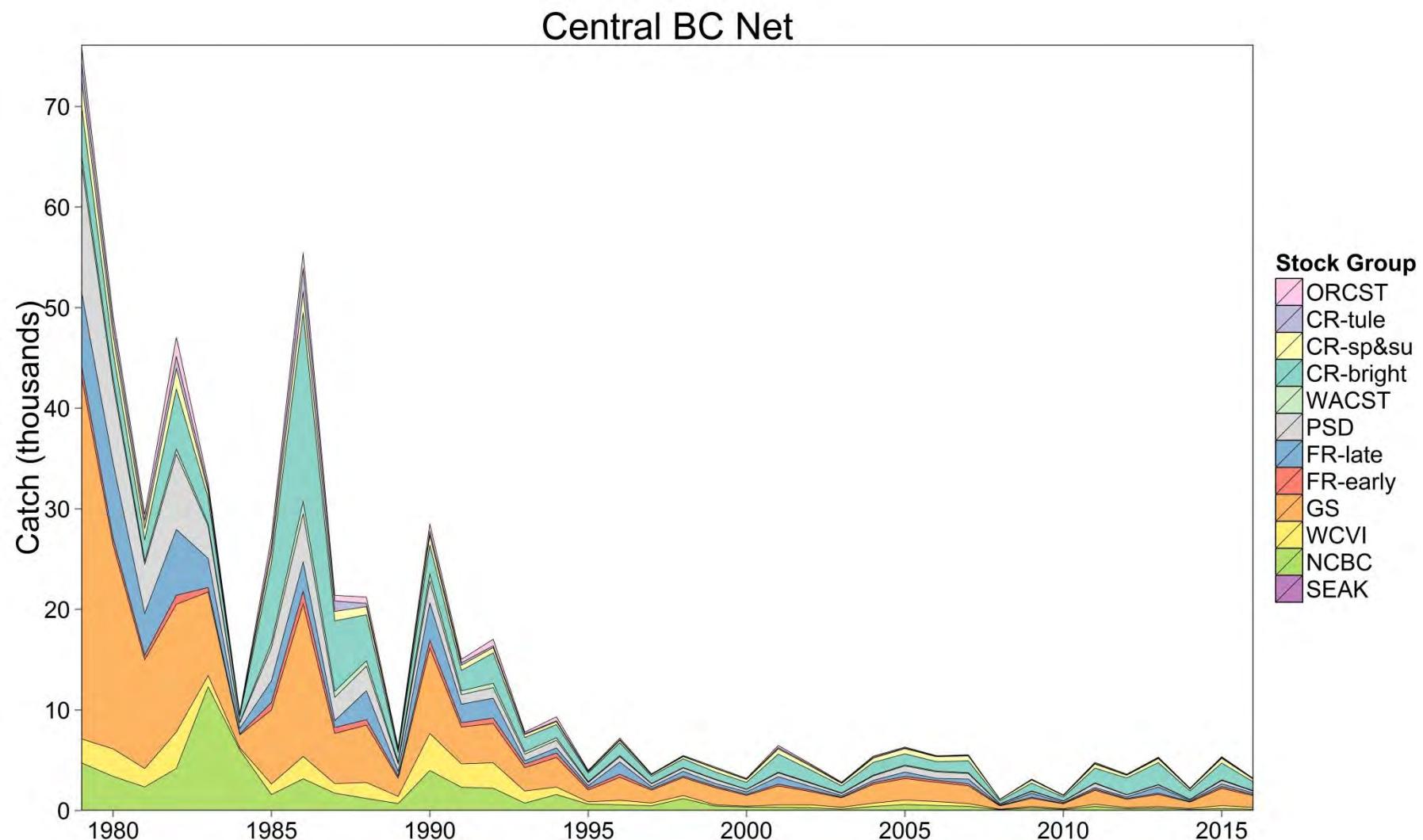
Appendix E7—Chinook Model Estimates of landed catch stock stock composition for Alaska net with (upper) and without (lower) hatchery add-on and terminal exclusion, 1979–2016.



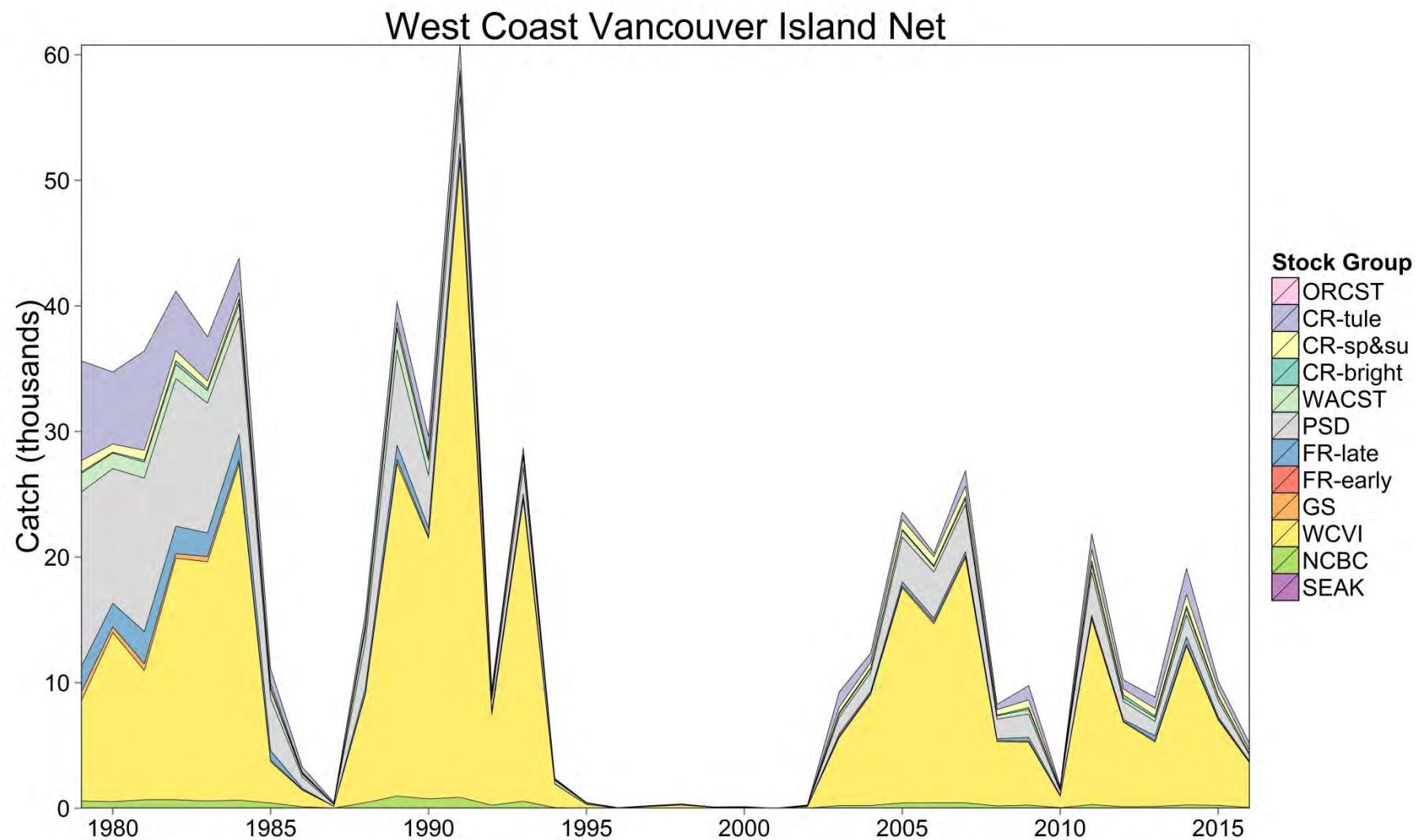
Appendix E8—Chinook Model Estimates of landed catch stock composition for North British Columbia net, 1979–2016.



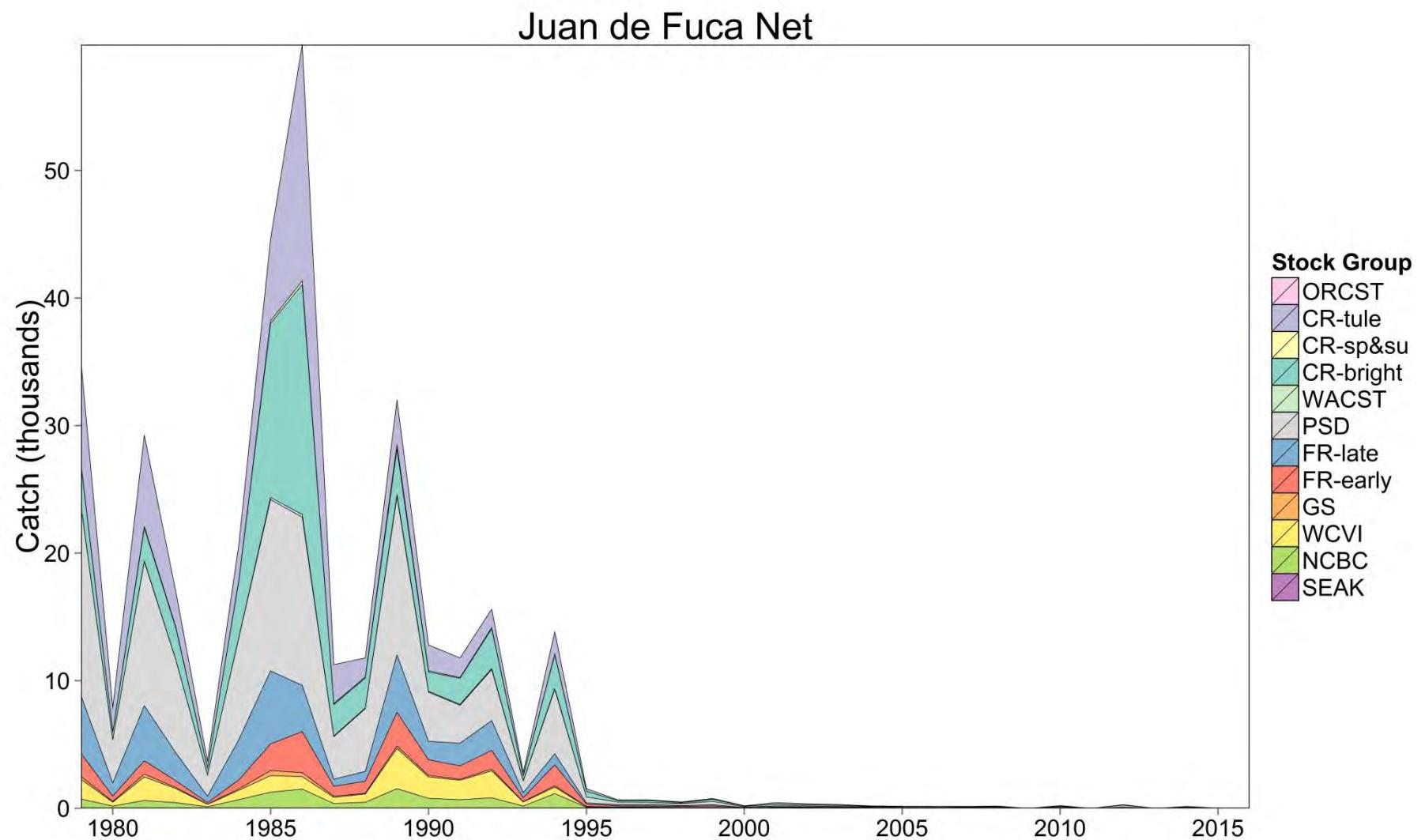
Appendix E9—Chinook Model Estimates of landed catch stock composition for Central British Columbia net, 1979–2016.



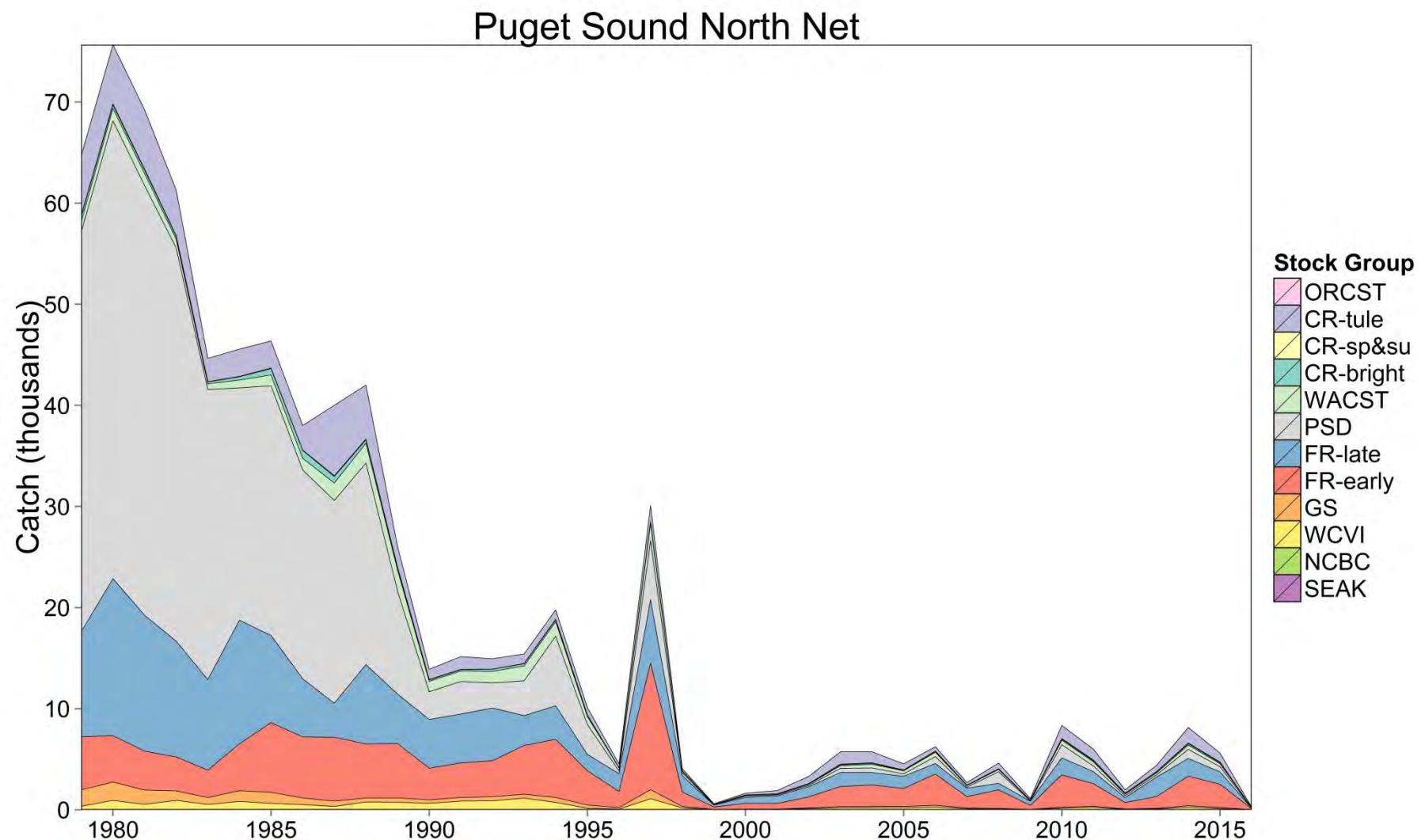
Appendix E10—Chinook Model Estimates of landed catch stock composition for West Coast Vancouver Island net, 1979–2016.



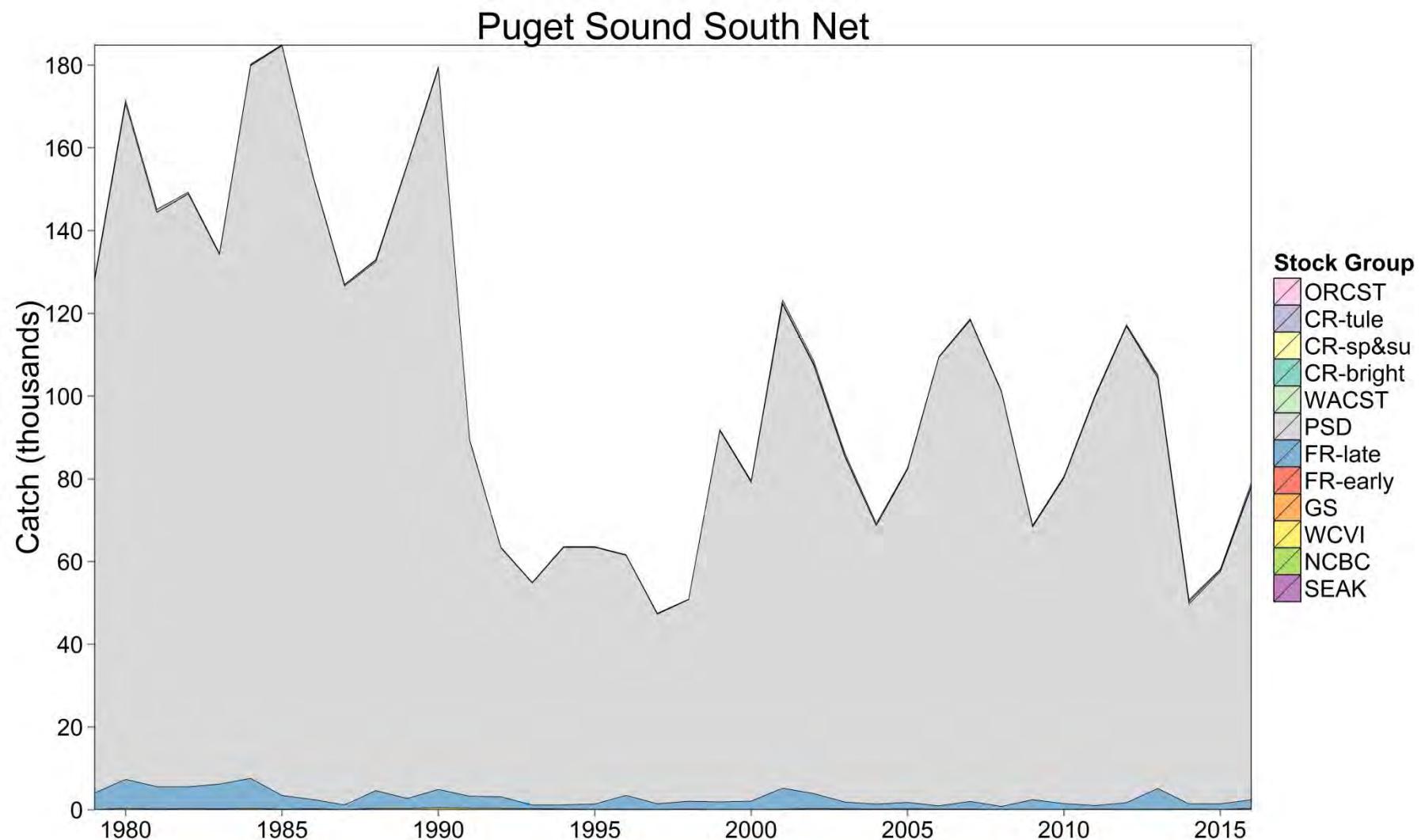
Appendix E11—Chinook Model Estimates of landed catch stock stock composition for Strait of Juan de Fuca net, 1979–2016.



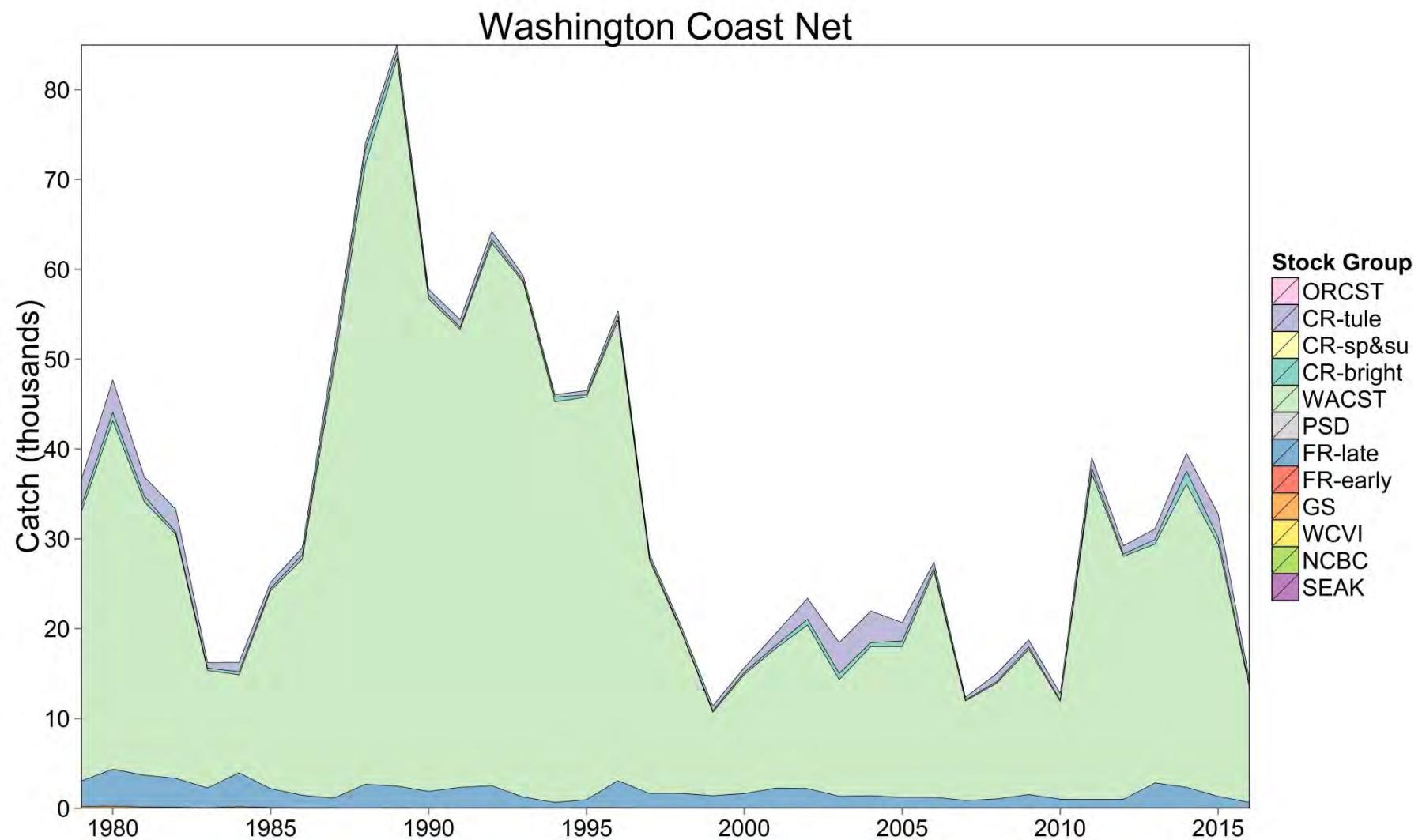
Appendix E12—Chinook Model Estimates of landed catch stock composition for North Puget Sound net, 1979–2016.



Appendix E13—Chinook Model Estimates of landed catch stock composition for South Puget Sound net, 1979–2016.

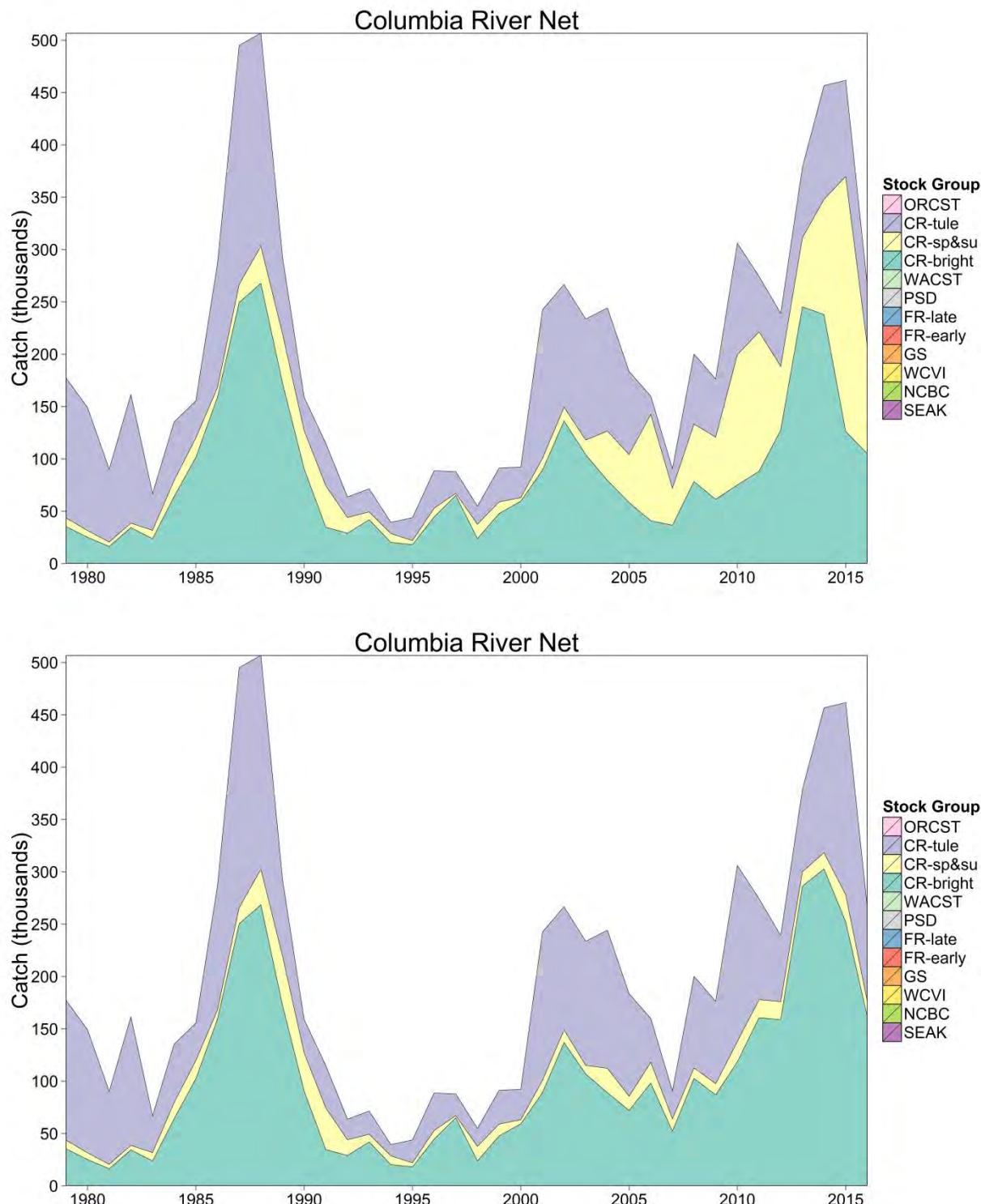


Appendix E14—Chinook Model Estimates of landed catch stock composition for Washington Coast net, 1979–2016.

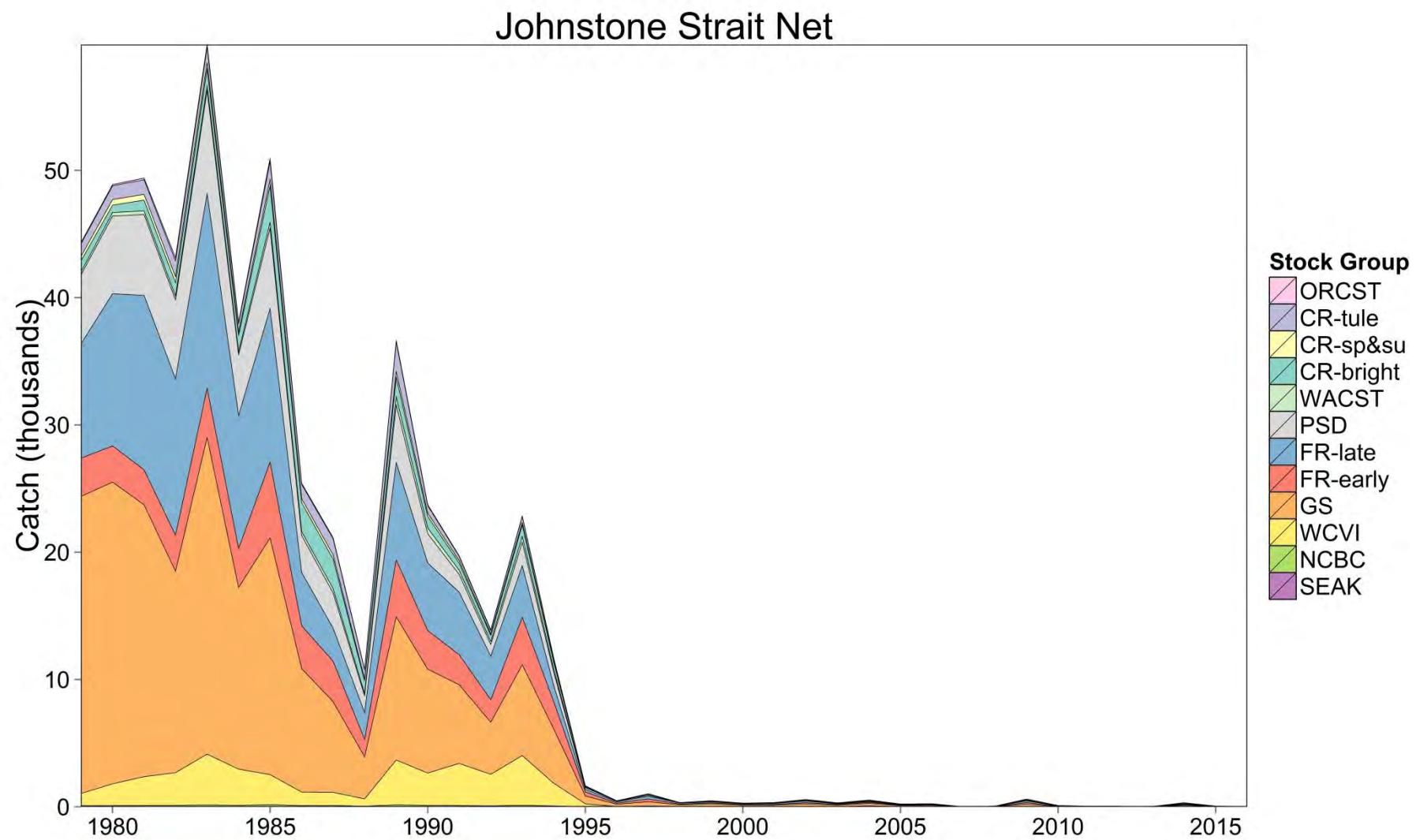


Appendix E15—Chinook Model Estimates of landed catch stock composition for Columbia River net, 1979–2016. The top figure is the version used in CLB 1702; the bottom figure is a corrected version.

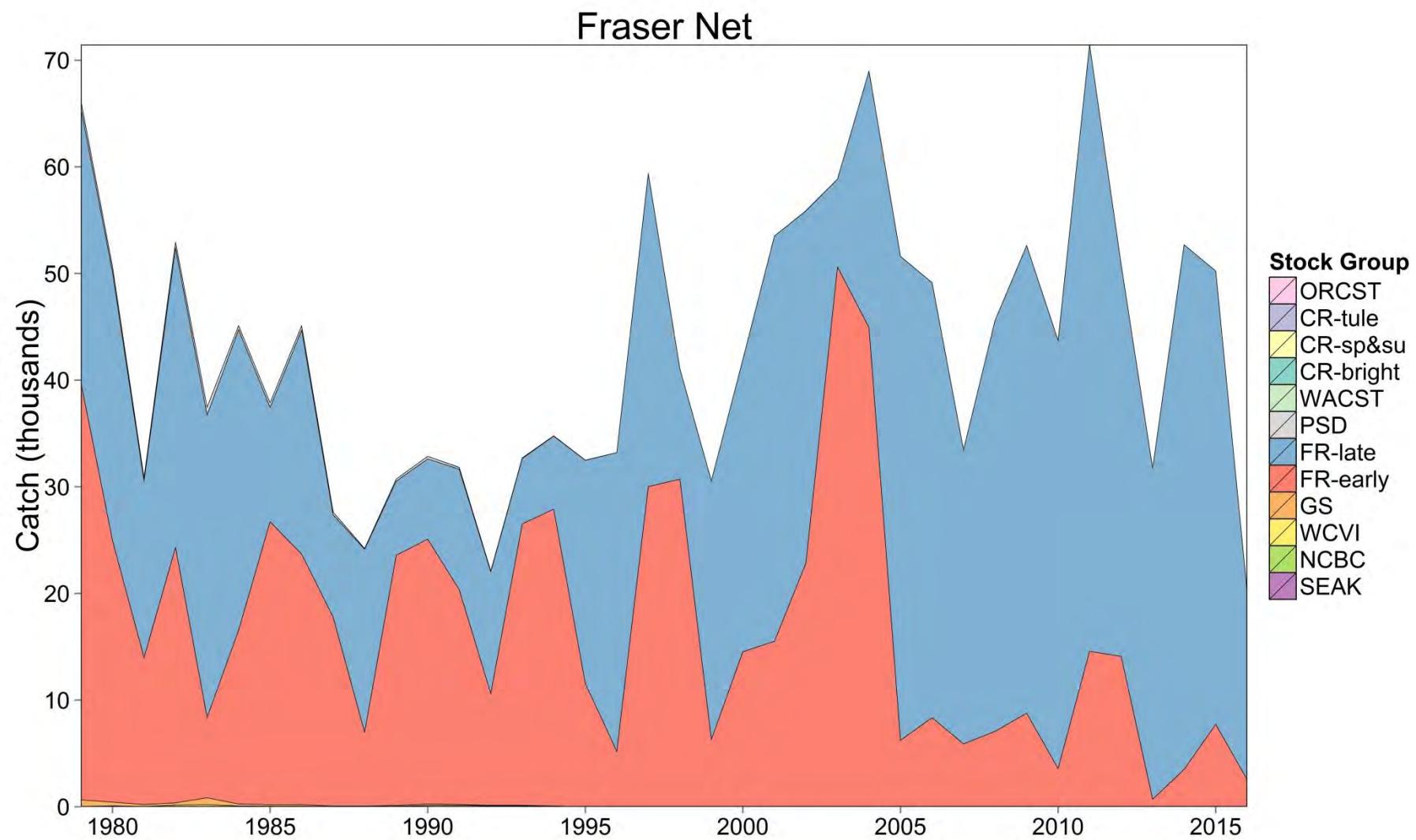
Note: An error was discovered after CLB1702 was adopted, which resulted in the landed stock composition of this fishery to be incorrect. The upper figure is from CLB1702, which had the error. Though the upper figure is wrong, it is included in this appendix because it is part of the official Model Calibration. The lower figure is from CLB1702_SUM_FP_Fix, which corrects the error.



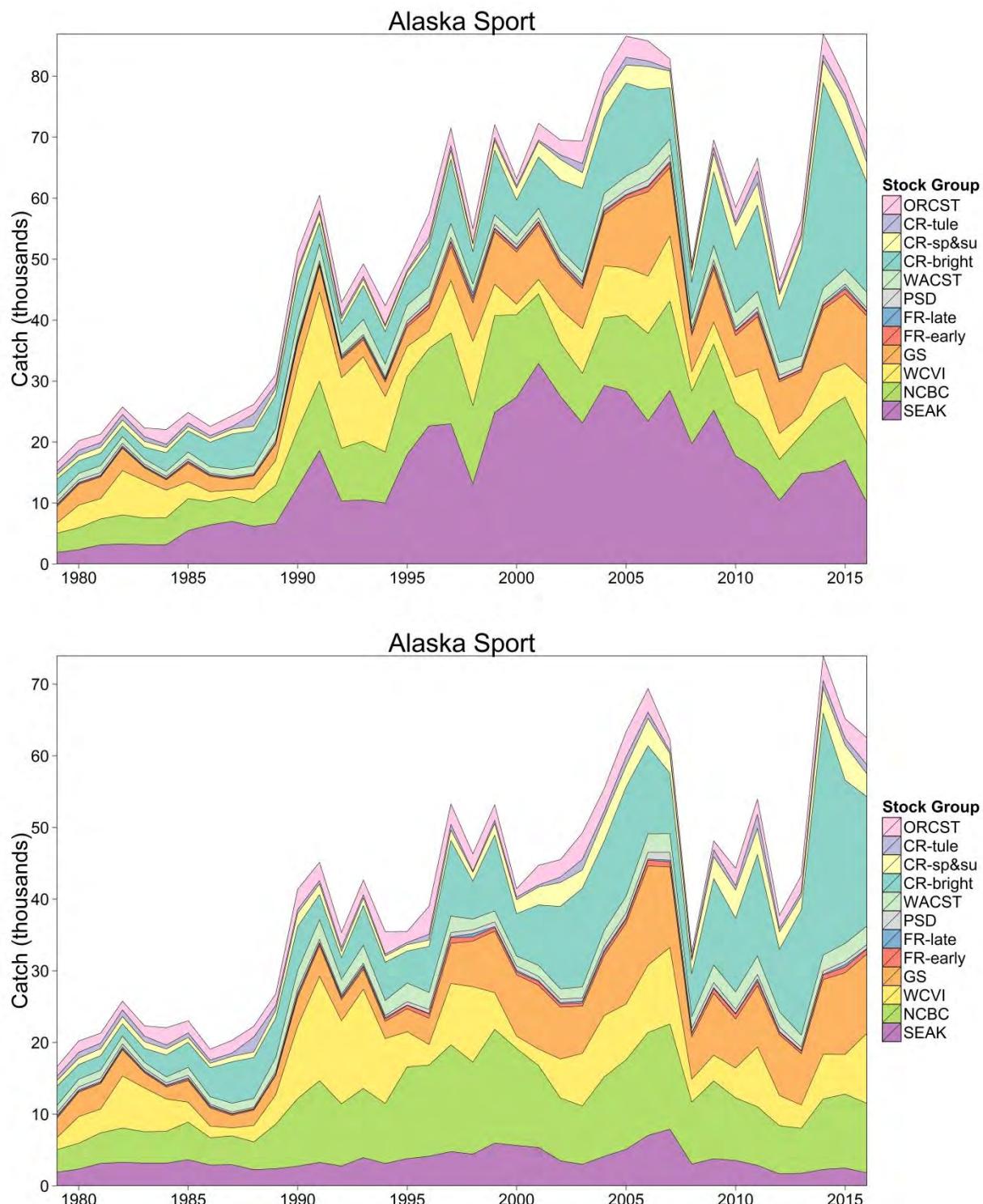
Appendix E16—Chinook Model Estimates of landed catch stock composition for Johnstone Strait net, 1979–2016.



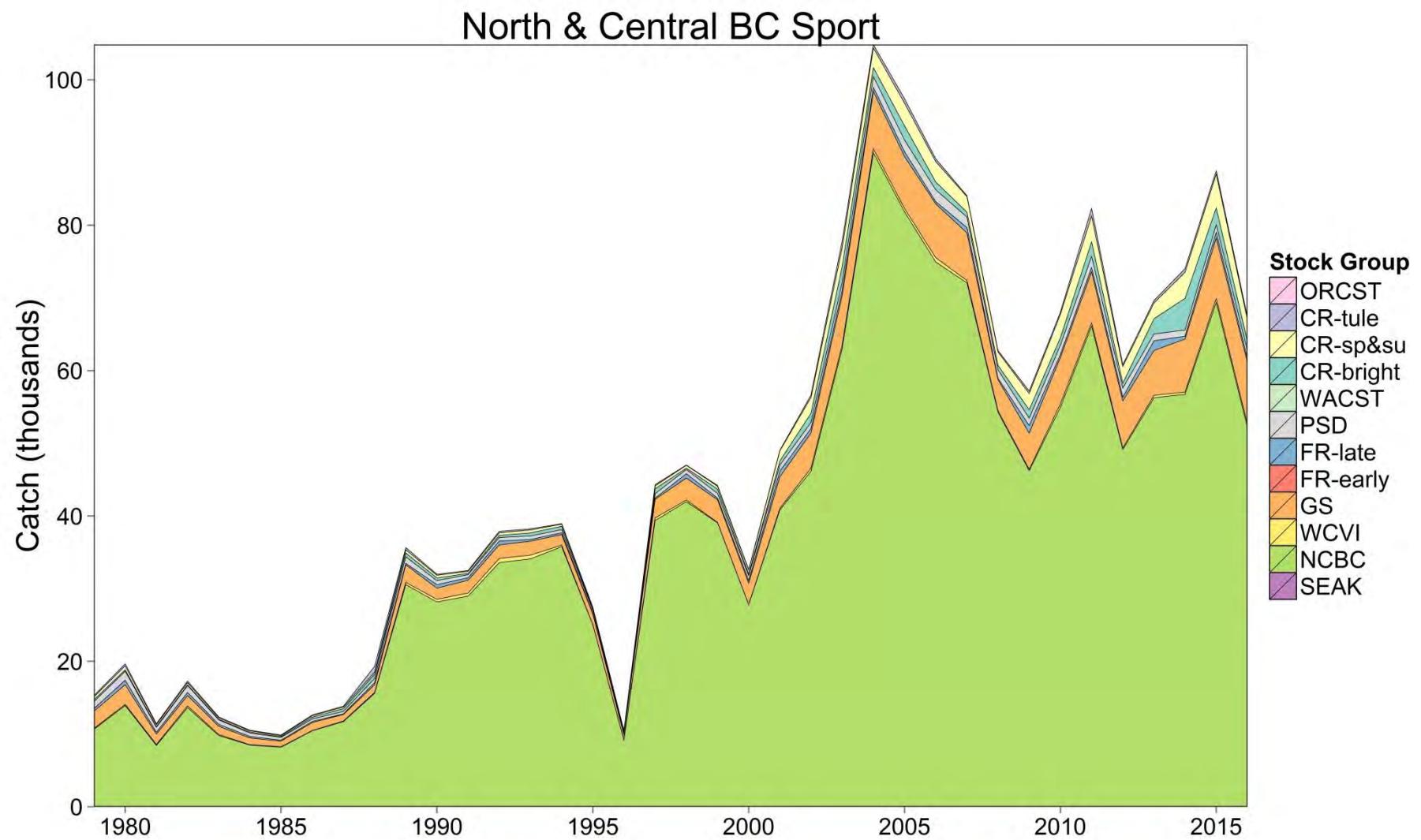
Appendix E17—Chinook Model Estimates of landed catch stock composition for Fraser River net, 1979–2016.



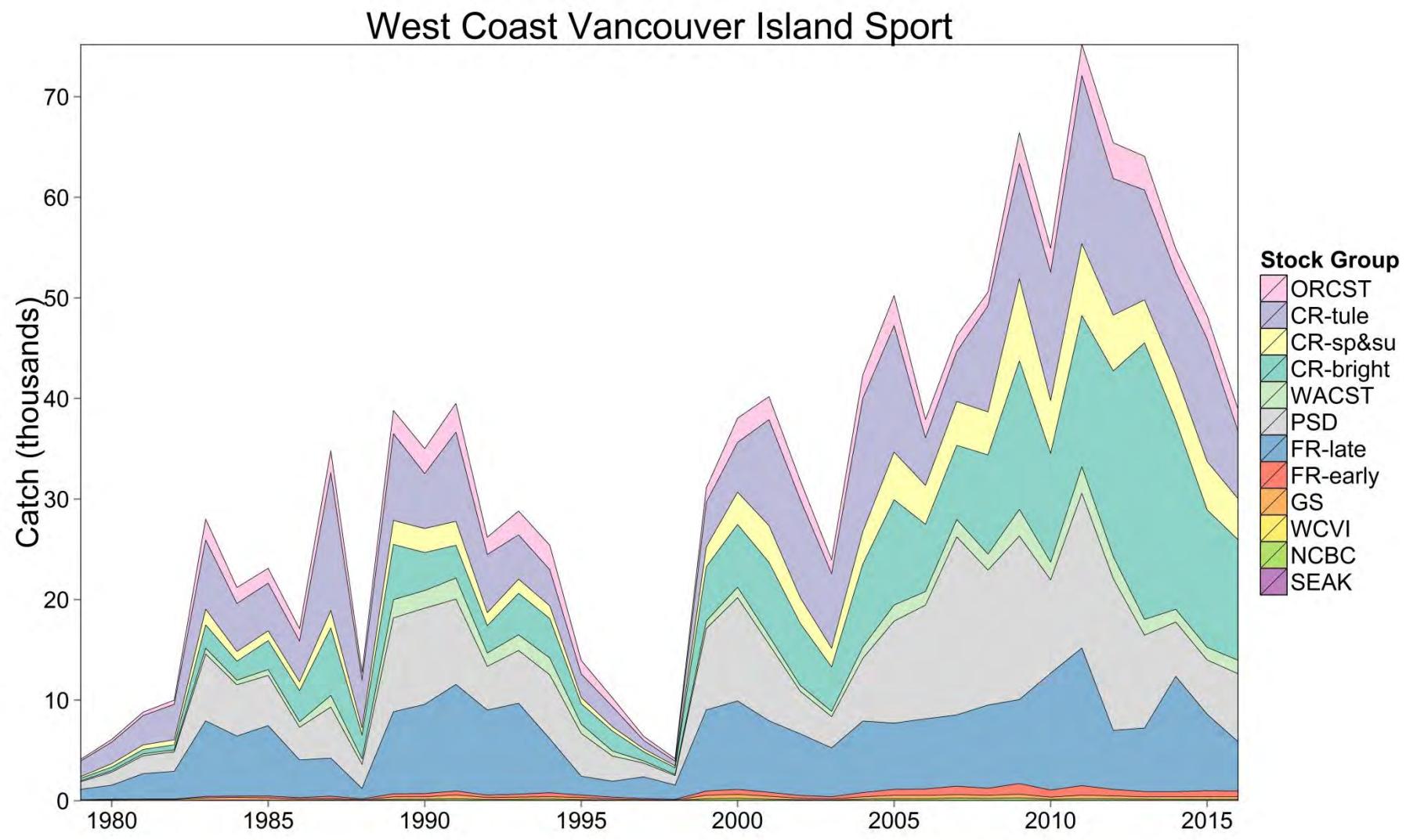
Appendix E18—Chinook Model Estimates of landed catch stock stock composition for Alaska sport with (upper) and without (lower) Alaska hatchery add-on and terminal exclusion, 1979–2016.



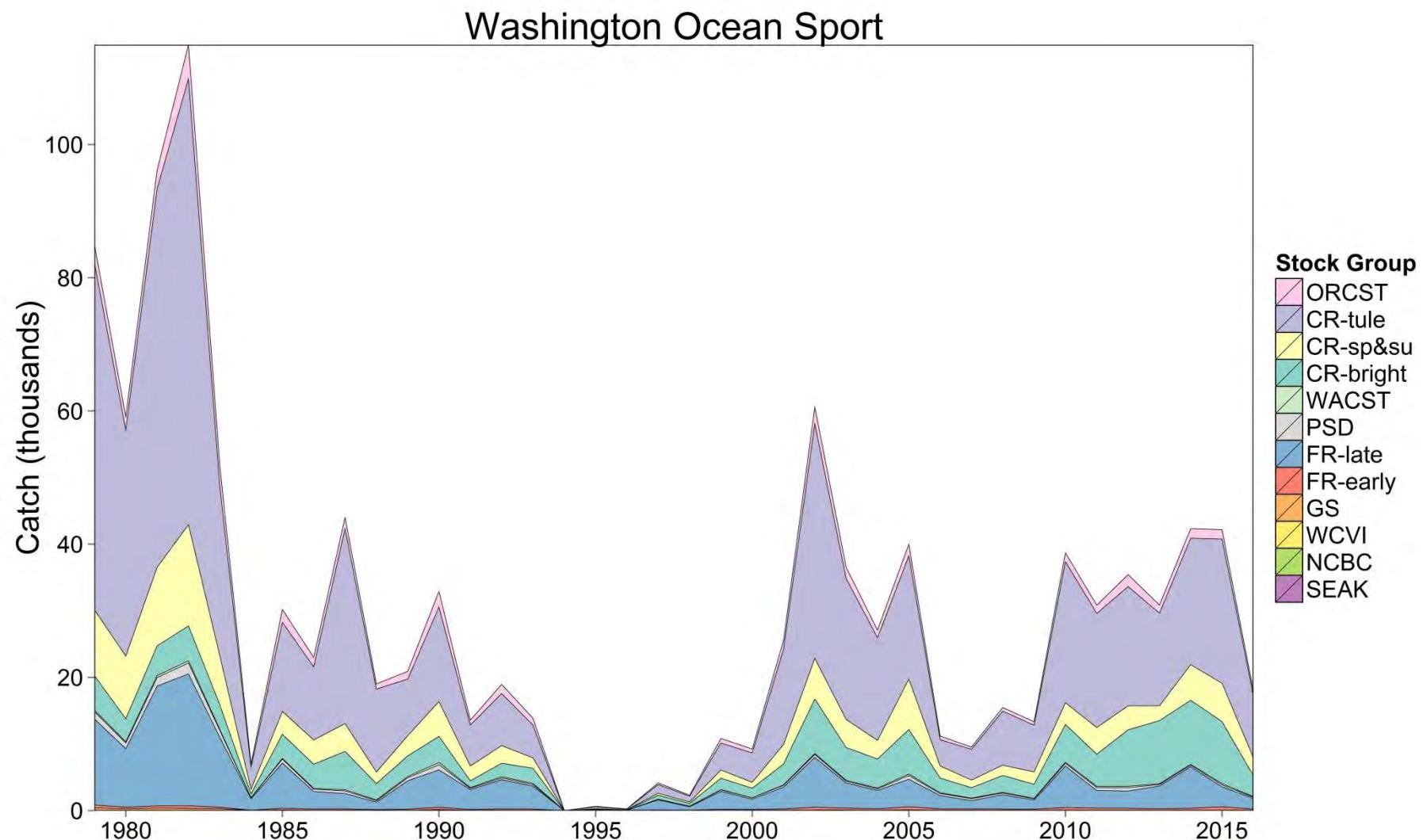
Appendix E19—Chinook Model Estimates of landed catch stock composition for North and Central British Columbia sport, 1979–2016.



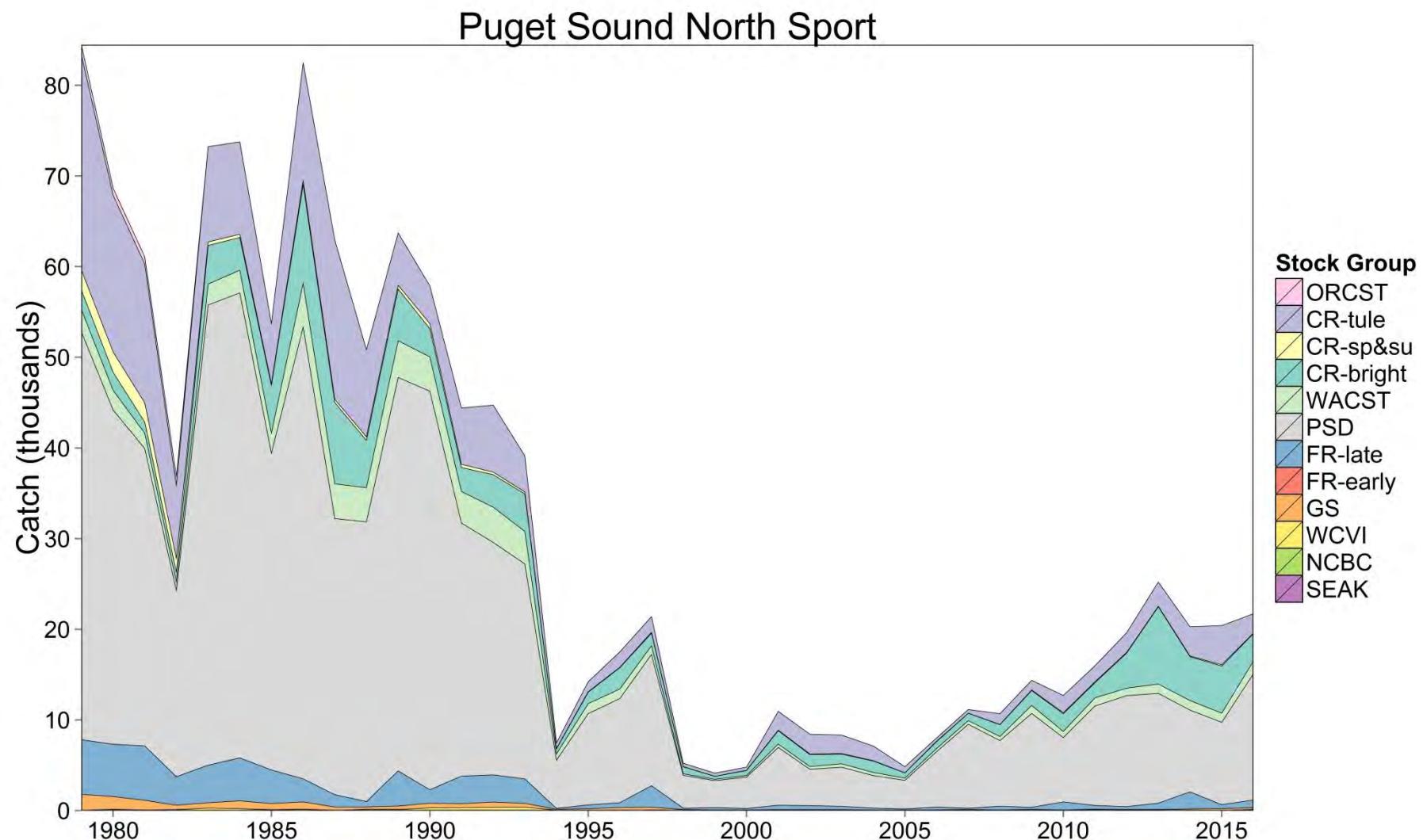
Appendix E20—Chinook Model Estimates of landed catch stock composition for West Coast Vancouver Island sport, 1979–2016.



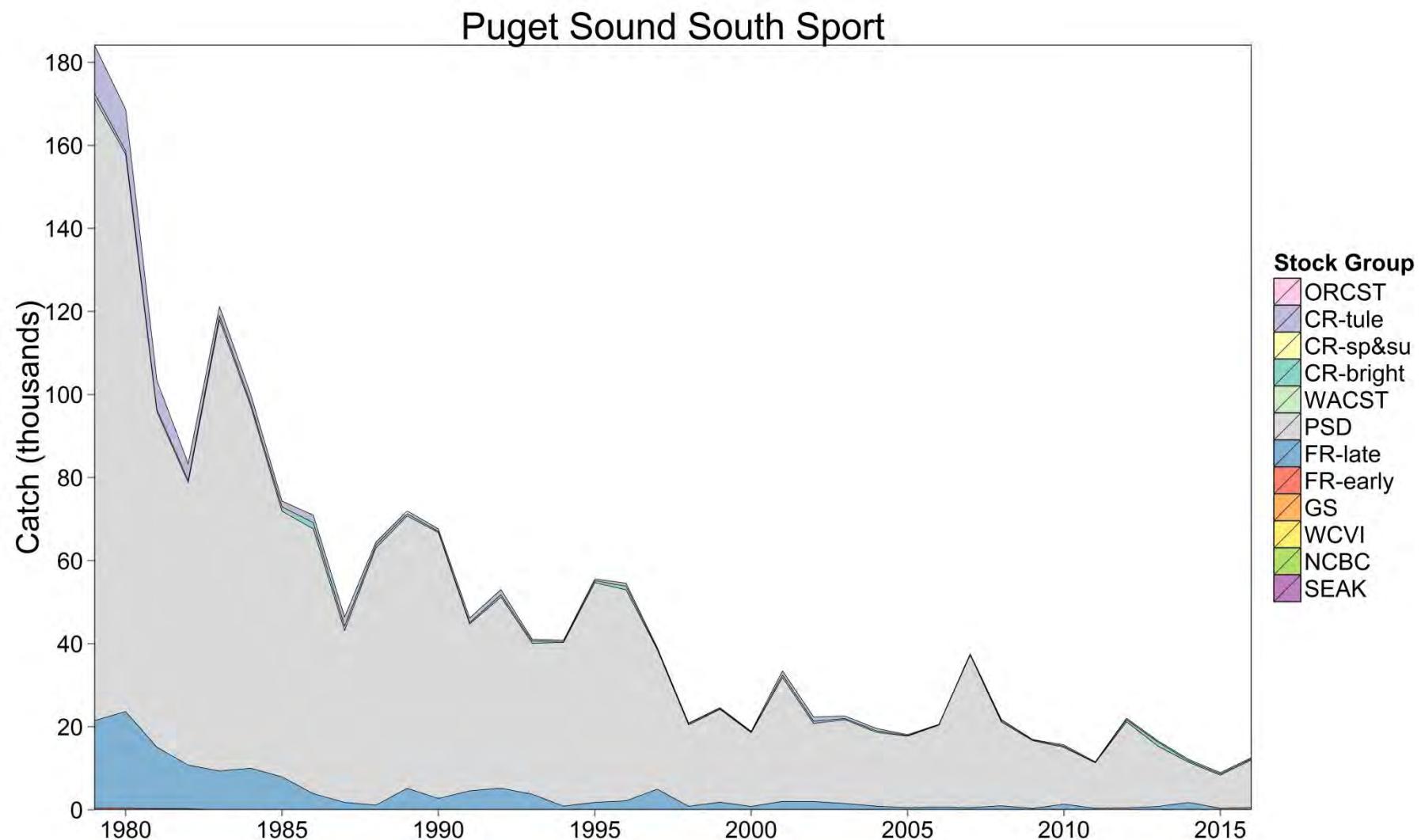
Appendix E21—Chinook Model Estimates of landed catch stock stock composition for Washington Ocean sport, 1979–2016.



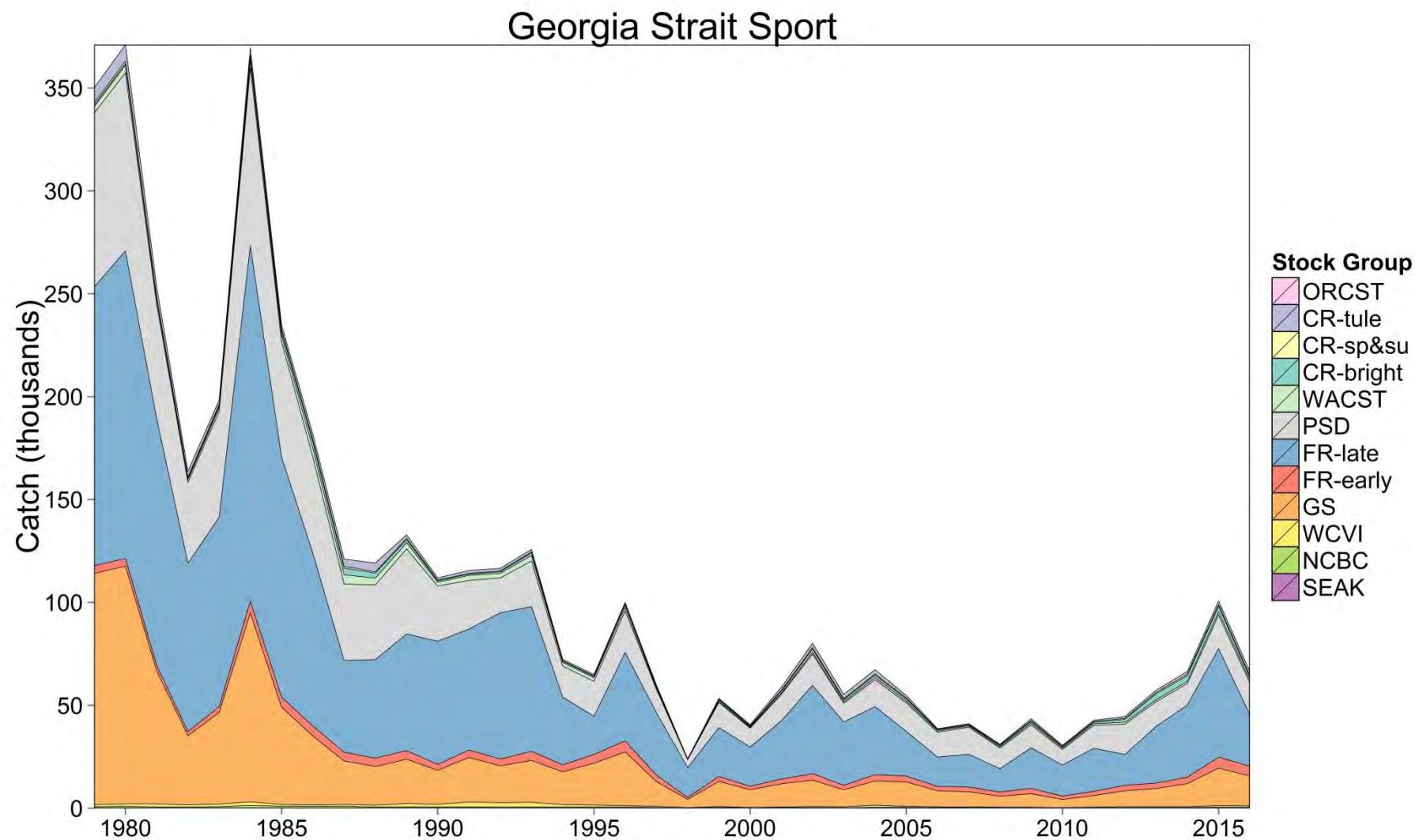
Appendix E22—Chinook Model Estimates of landed catch stock composition for North Puget Sound sport, 1979–2016.



Appendix E23—Chinook Model Estimates of landed catch stock stock composition for South Puget Sound sport, 1979–2016.

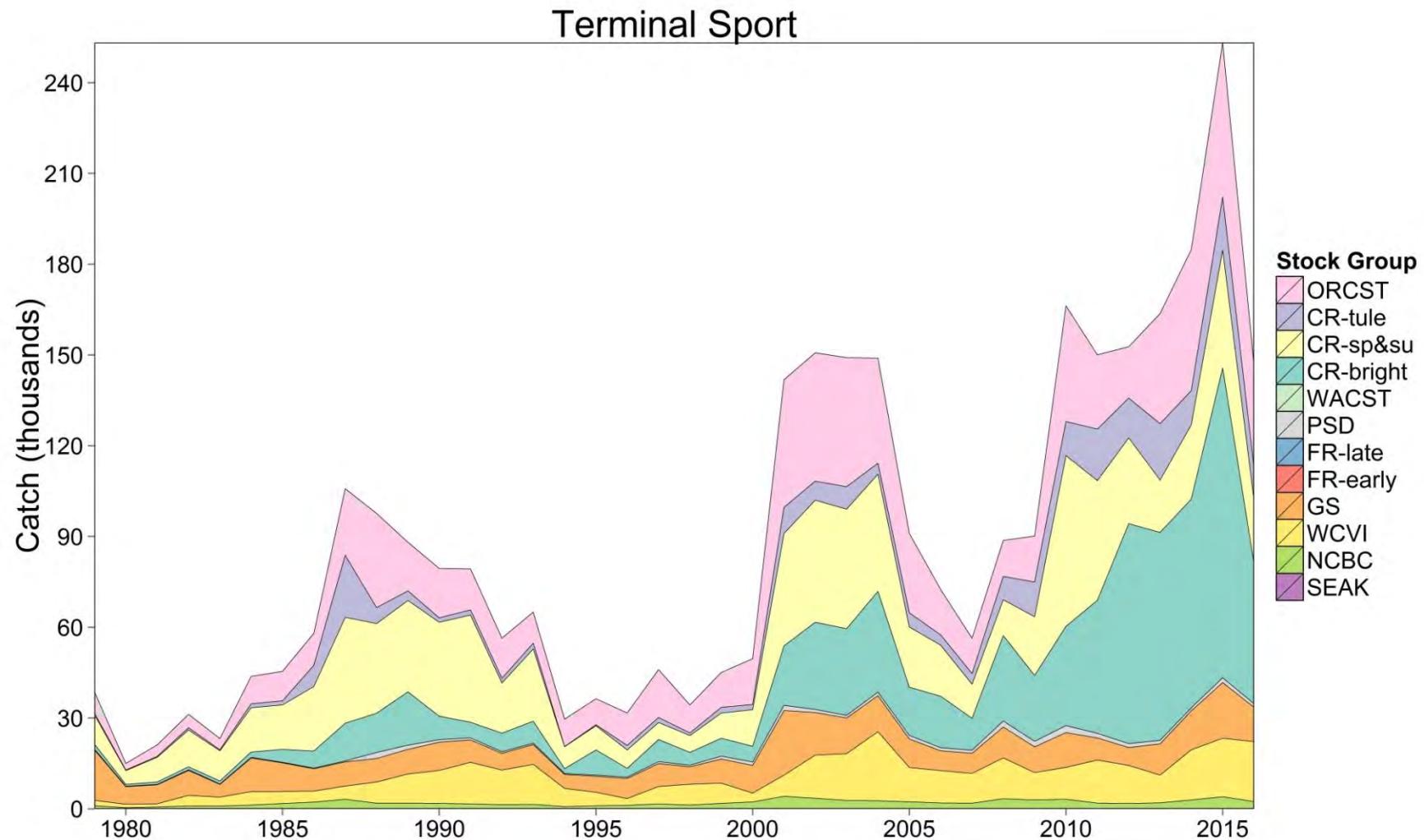


Appendix E24—Chinook Model Estimates of landed catch stock stock composition for Strait of Georgia sport, 1979–2016.



Appendix E25—Chinook Model Estimates of landed catch stock composition for Terminal sport, 1979–2016.

Note: Fisheries in Terminal Sport are ISBM, AABM, terminal exclusion, or hatchery add-on and depends on stock; for Canadian stocks (in Fraser, Georgia St, N BC, and WCVI), terminal is ISBM, for Southern US stocks (in WA and OR Coastal and Puget Sound), terminal is ISBM, for Transboundary stocks (STI and TAK), terminal is terminal exclusion or AABM, and for SEAK stocks (AKS, CHK and UNU), terminal is AABM or hatchery add-on.



APPENDIX F: INCIDENTAL MORTALITY RATES APPLIED IN THE CTC MODEL

Appendix F. Incidental mortality rates applied in the CTC model. Rates in original model were applied to all years. In the current model, rates in some fisheries vary in accordance to changes in management regulations.

Fishery Number	Fishery	Rates in original Model			Rates applied in Model CLB1702			Applicable Years
		Sublegal Rate	Legal Rate	Dropoff	Sublegal Rate	Legal Rate	Dropoff	
1	Alaska T	0.3	0.3	0	0.255	0.211	0.008	All
2	North T	0.3	0.3	0	0.255	0.211	0.017	1979–1995
2	North T				0.220	0.185	0.016	1996–current
3	Centr T	0.3	0.3	0	0.255	0.211	0.017	1979–1995
3	Centr T				0.220	0.185	0.016	1996–current
4	WCVI T	0.3	0.3	0	0.255	0.211	0.017	1979–1997
4	WCVI T				0.220	0.185	0.016	1998–current
5	WA/OR T	0.3	0.3	0	0.255	0.211	0.017	1979–1983
5	WA/OR T				0.220	0.185	0.016	1984–current
6	Str of Geo T	0.3	0.3	0	0.255	0.211	0.017	1979–1985,1987–1996
6	Str of Geo T				0.220	0.185	0.016	1986, 1998–current
7	Alaska N	0.9	0.9	0	0.9	0.9	0	All
8	North N	0.9	0.9	0	0.9	0.9	0	All
9	Centr N	0.9	0.9	0	0.9	0.9	0	All
10	WCVI N	0.9	0.9	0	0.9	0.9	0	All
11	J De F N	0.9	0.9	0	0.9	0.9	0	All
12	PgtNth N	0.9	0.9	0	0.9	0.9	0	All
13	PgtSth N	0.9	0.9	0	0.9	0.9	0	All
14	WashCst N	0.9	0.9	0	0.9	0.9	0	All
15	Col R N	0.9	0.9	0	0.9	0.9	0	All
16	John St N	0.9	0.9	0	0.9	0.9	0	All
17	Fraser N	0.9	0.9	0	0.9	0.9	0	All
18	Alaska S	0.3	0.3	0	0.123	0.123	0.036	All
19	Nor/Cen S	0.3	0.3	0	0.123	0.123	0.036	All
20	WCVI S	0.3	0.3	0	0.123	0.123	0.069	All
21	WashOcn S	0.3	0.3	0	0.123	0.123	0.069	All
22	PgtNth S	0.3	0.3	0	0.123	0.123	0.145	All
23	PgtSth S	0.3	0.3	0	0.123	0.123	0.145	All
24	Str of Geo S	0.3	0.3	0	0.322	0.322	0.069	1979–1981
24	Str of Geo S				0.123	0.123	0.069	1982–current
25	Col R S	0.3	0.3	0	0.123	0.123	0.069	All

APPENDIX G: TIME SERIES OF ABUNDANCE INDICES

Appendix G. Time series of abundance indices from 1979 to 2017 for SEAK, NBC, and WCVI AABM fisheries as estimated by CTC Chinook Model calibrations CLB1702 .

Year	Alaska T	North T	WCVI T
1979	0.95	1.04	1.10
1980	1.04	1.00	0.97
1981	0.95	0.96	0.93
1982	1.06	1.00	1.00
1983	1.24	1.20	0.93
1984	1.46	1.36	1.00
1985	1.30	1.26	0.96
1986	1.46	1.44	1.02
1987	1.75	1.74	1.21
1988	2.11	1.82	1.14
1989	1.74	1.60	0.97
1990	1.77	1.56	0.88
1991	1.70	1.46	0.76
1992	1.61	1.36	0.79
1993	1.59	1.35	0.70
1994	1.47	1.19	0.53
1995	1.04	0.96	0.42
1996	0.97	0.96	0.50
1997	1.24	1.10	0.58
1998	1.15	0.97	0.57
1999	1.06	0.93	0.52
2000	0.96	0.92	0.52
2001	1.14	1.20	0.82
2002	1.74	1.69	1.18
2003	2.16	1.84	1.21
2004	1.92	1.68	1.03
2005	1.72	1.47	0.84
2006	1.48	1.22	0.65
2007	1.12	0.91	0.53
2008	0.89	0.82	0.57
2009	1.04	0.97	0.57
2010	1.15	1.13	0.78
2011	1.42	1.23	0.80
2012	1.13	1.11	0.70
2013	1.57	1.52	0.95
2014	2.19	1.82	1.11
2015	1.82	1.57	0.97
2016	1.65	1.39	0.70
2017	1.27	1.15	0.77
2018	1.18	1.10	0.81

Note: This time series is NOT the first postseason AI for each year and is for trend analysis only (Figures 3.10–3.12). For evaluation of overage and underage, use the first postseason AI instead (Source 1402 PABD).

APPENDIX H: ABUNDANCE INDICES IN TOTAL AND BY MODEL STOCK FOR AABM FISHERIES, FROM CALIBRATION 1702

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Appendix H1 Abundance indices (AIs) for the Southeast Alaska troll fishery by model stock and year (stock groups 1–15 this page; 16–30 on following page), from CLB 1702. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.....	112
Appendix H2 Abundance indices (AIs) for the Northern BC troll fishery by stock and year (stock groups 1–15 this page; 16–30 on following page), from CLB 1702. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.....	114
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Appendix H1—Abundance indices (AIs) for the Southeast Alaska troll fishery by model stock and year (stock groups 1–15 this page; 16–30 on following page), from CLB 1702.
Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.

Year	Alaska South SE	North/Central	Fraser Early	Fraser Late	WCVI Hatchery	WCVI Natural	St. of Georgia Upper	St. of Georgia Lwr Nat	St. of Georgia Lwr Hat	Nooksack Fall	Pgt Sd Fing	Pgt Sd NatF	Pgt Sd Year	Nooksack Spring	Skagit Wild	AI Total
1979	0.03	0.12	0.06	0.00	0.05	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95
1980	0.04	0.13	0.04	0.00	0.10	0.14	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
1981	0.05	0.13	0.04	0.00	0.08	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95
1982	0.05	0.14	0.03	0.00	0.19	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06
1983	0.06	0.16	0.04	0.00	0.30	0.14	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24
1984	0.06	0.18	0.05	0.00	0.28	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.46
1985	0.07	0.20	0.06	0.00	0.15	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
1986	0.08	0.21	0.07	0.00	0.12	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.46
1987	0.08	0.23	0.07	0.00	0.09	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75
1988	0.06	0.24	0.07	0.00	0.20	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.11
1989	0.04	0.25	0.06	0.00	0.25	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74
1990	0.03	0.25	0.06	0.00	0.40	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.77
1991	0.04	0.26	0.06	0.00	0.53	0.12	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.70
1992	0.04	0.26	0.06	0.00	0.52	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61
1993	0.04	0.24	0.06	0.00	0.48	0.12	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.59
1994	0.04	0.22	0.06	0.00	0.36	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47
1995	0.03	0.22	0.07	0.00	0.15	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
1996	0.03	0.22	0.08	0.00	0.07	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97
1997	0.03	0.23	0.09	0.00	0.18	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24
1998	0.04	0.22	0.08	0.00	0.27	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15
1999	0.04	0.23	0.06	0.00	0.14	0.03	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06
2000	0.05	0.25	0.06	0.00	0.05	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
2001	0.05	0.24	0.08	0.00	0.07	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14
2002	0.04	0.24	0.09	0.00	0.23	0.03	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74
2003	0.04	0.23	0.10	0.00	0.34	0.03	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.16
2004	0.04	0.23	0.09	0.00	0.34	0.03	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92
2005	0.04	0.23	0.08	0.00	0.25	0.02	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.72
2006	0.05	0.21	0.09	0.00	0.23	0.03	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48
2007	0.05	0.20	0.08	0.00	0.23	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12
2008	0.03	0.18	0.07	0.00	0.12	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89
2009	0.03	0.17	0.08	0.00	0.09	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
2010	0.03	0.16	0.09	0.00	0.11	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15
2011	0.02	0.15	0.08	0.00	0.23	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42
2012	0.02	0.14	0.06	0.00	0.16	0.02	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13
2013	0.02	0.15	0.07	0.00	0.14	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57
2014	0.02	0.18	0.09	0.00	0.20	0.02	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.19
2015	0.02	0.18	0.10	0.00	0.16	0.02	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.82
2016	0.01	0.17	0.09	0.00	0.27	0.03	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65
2017	0.01	0.16	0.09	0.00	0.21	0.03	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27

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Table H1—Page 2 of 2 (stock groups 16–30).

Year	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	AI Total
1979	0.00	0.00	0.02	0.17	0.00	0.00	0.03	0.02	0.02	0.00	0.04	0.23	0.03	0.00	0.00	0.95
1980	0.00	0.00	0.03	0.13	0.00	0.00	0.03	0.02	0.03	0.00	0.03	0.21	0.03	0.00	0.00	1.04
1981	0.00	0.00	0.02	0.10	0.00	0.00	0.03	0.02	0.03	0.01	0.03	0.20	0.04	0.00	0.01	0.95
1982	0.00	0.00	0.02	0.07	0.00	0.00	0.03	0.01	0.03	0.00	0.02	0.16	0.03	0.00	0.01	1.06
1983	0.00	0.00	0.02	0.08	0.00	0.00	0.03	0.01	0.04	0.00	0.03	0.23	0.03	0.00	0.02	1.24
1984	0.00	0.00	0.01	0.20	0.00	0.00	0.03	0.01	0.04	0.00	0.03	0.37	0.03	0.00	0.02	1.46
1985	0.00	0.00	0.02	0.24	0.00	0.00	0.03	0.01	0.03	0.00	0.02	0.31	0.04	0.00	0.01	1.30
1986	0.00	0.00	0.02	0.33	0.00	0.00	0.03	0.01	0.04	0.00	0.03	0.32	0.05	0.00	0.02	1.46
1987	0.00	0.00	0.03	0.48	0.00	0.00	0.03	0.02	0.05	0.01	0.03	0.43	0.06	0.00	0.07	1.75
1988	0.00	0.00	0.05	0.50	0.00	0.00	0.14	0.03	0.06	0.00	0.03	0.40	0.07	0.00	0.13	2.11
1989	0.00	0.00	0.05	0.32	0.00	0.00	0.05	0.04	0.06	0.00	0.03	0.29	0.08	0.00	0.12	1.74
1990	0.00	0.00	0.04	0.24	0.00	0.00	0.02	0.02	0.07	0.00	0.02	0.31	0.07	0.00	0.08	1.77
1991	0.00	0.00	0.04	0.12	0.00	0.00	0.01	0.01	0.05	0.00	0.02	0.28	0.06	0.00	0.05	1.70
1992	0.00	0.00	0.05	0.10	0.00	0.00	0.02	0.01	0.03	0.00	0.02	0.25	0.05	0.00	0.04	1.61
1993	0.00	0.00	0.05	0.17	0.00	0.00	0.01	0.01	0.03	0.00	0.02	0.23	0.05	0.00	0.05	1.59
1994	0.00	0.00	0.04	0.21	0.00	0.00	0.01	0.01	0.02	0.00	0.02	0.27	0.05	0.00	0.05	1.47
1995	0.00	0.00	0.04	0.12	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.20	0.04	0.00	0.04	1.04
1996	0.00	0.00	0.04	0.13	0.00	0.00	0.02	0.01	0.01	0.00	0.02	0.20	0.04	0.00	0.05	0.97
1997	0.00	0.00	0.03	0.18	0.00	0.00	0.01	0.01	0.02	0.00	0.02	0.22	0.04	0.00	0.09	1.24
1998	0.00	0.00	0.02	0.11	0.00	0.00	0.00	0.01	0.02	0.00	0.02	0.15	0.03	0.00	0.06	1.15
1999	0.00	0.00	0.01	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.02	0.13	0.02	0.00	0.06	1.06
2000	0.00	0.00	0.01	0.17	0.00	0.00	0.01	0.01	0.03	0.00	0.04	0.12	0.02	0.00	0.05	0.96
2001	0.00	0.00	0.02	0.20	0.00	0.00	0.01	0.01	0.03	0.00	0.07	0.18	0.03	0.00	0.07	1.14
2002	0.00	0.00	0.02	0.33	0.00	0.00	0.02	0.02	0.07	0.00	0.10	0.26	0.03	0.00	0.16	1.74
2003	0.00	0.00	0.03	0.49	0.00	0.00	0.05	0.02	0.05	0.00	0.09	0.34	0.04	0.00	0.21	2.16
2004	0.00	0.00	0.03	0.38	0.00	0.00	0.03	0.02	0.06	0.00	0.09	0.31	0.04	0.00	0.15	1.92
2005	0.00	0.00	0.03	0.39	0.00	0.00	0.03	0.01	0.02	0.00	0.09	0.26	0.04	0.00	0.12	1.72
2006	0.00	0.00	0.03	0.26	0.00	0.00	0.02	0.02	0.03	0.00	0.08	0.19	0.04	0.00	0.11	1.48
2007	0.00	0.00	0.03	0.12	0.00	0.00	0.01	0.00	0.01	0.00	0.07	0.12	0.03	0.00	0.08	1.12
2008	0.00	0.00	0.02	0.12	0.00	0.00	0.01	0.00	0.01	0.00	0.06	0.07	0.03	0.00	0.08	0.89
2009	0.00	0.00	0.03	0.22	0.00	0.00	0.02	0.01	0.02	0.00	0.08	0.09	0.03	0.00	0.10	1.04
2010	0.00	0.00	0.03	0.22	0.00	0.00	0.01	0.01	0.05	0.00	0.09	0.14	0.03	0.00	0.09	1.15
2011	0.00	0.00	0.04	0.31	0.00	0.00	0.04	0.01	0.03	0.00	0.10	0.15	0.04	0.01	0.12	1.42
2012	0.00	0.00	0.04	0.19	0.00	0.00	0.01	0.01	0.03	0.00	0.08	0.15	0.04	0.01	0.11	1.13
2013	0.00	0.00	0.04	0.47	0.00	0.00	0.02	0.01	0.02	0.00	0.08	0.22	0.03	0.01	0.20	1.57
2014	0.00	0.00	0.04	0.74	0.00	0.00	0.02	0.03	0.03	0.00	0.11	0.24	0.03	0.01	0.35	2.19
2015	0.00	0.00	0.04	0.53	0.00	0.00	0.02	0.03	0.04	0.00	0.13	0.20	0.03	0.01	0.23	1.82
2016	0.00	0.00	0.04	0.42	0.00	0.00	0.02	0.01	0.01	0.00	0.10	0.21	0.03	0.01	0.14	1.65
2017	0.00	0.00	0.04	0.26	0.00	0.00	0.01	0.01	0.02	0.00	0.08	0.14	0.03	0.01	0.08	1.27

Appendix H2—Abundance indices (AIs) for the Northern BC troll fishery by stock and year (stock groups 1–15 this page; 16–30 on following page), from CLB 1702. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.

Year	Alaska South SE	North/Central	Fraser Early	Fraser Late	WCVI Hatchery	WCVI Natural	St. of Georgia Upper	St. of Georgia Lwr Nat	St. of Georgia Lwr Hat	Nooksack Fall	Pgt Sd Fing	Pgt Sd NatF	Pgt Sd Year	Nooksack Spring	Skagit Wild	AI Total
1979	0.00	0.08	0.07	0.01	0.04	0.05	0.06	0.02	0.02	0.01	0.00	0.00	0.00	0.02	0.01	1.04
1980	0.00	0.08	0.06	0.01	0.05	0.07	0.05	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.00
1981	0.00	0.09	0.05	0.01	0.06	0.08	0.06	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.96
1982	0.00	0.09	0.04	0.01	0.12	0.10	0.04	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.00
1983	0.00	0.11	0.05	0.01	0.16	0.08	0.04	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	1.20
1984	0.00	0.12	0.06	0.02	0.15	0.05	0.04	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.36
1985	0.00	0.13	0.07	0.01	0.09	0.03	0.06	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.26
1986	0.00	0.14	0.08	0.01	0.06	0.02	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.44
1987	0.00	0.15	0.09	0.01	0.07	0.02	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.74
1988	0.00	0.16	0.08	0.01	0.11	0.03	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.82
1989	0.00	0.17	0.08	0.01	0.16	0.04	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.60
1990	0.00	0.17	0.08	0.01	0.23	0.05	0.05	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	1.56
1991	0.00	0.17	0.07	0.01	0.29	0.07	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.46
1992	0.00	0.17	0.07	0.01	0.29	0.07	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.36
1993	0.00	0.16	0.07	0.01	0.26	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.35
1994	0.00	0.16	0.08	0.00	0.17	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.19
1995	0.00	0.14	0.08	0.00	0.08	0.02	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.96
1996	0.00	0.15	0.09	0.01	0.05	0.01	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.96
1997	0.00	0.16	0.10	0.01	0.12	0.03	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.10
1998	0.00	0.15	0.10	0.01	0.13	0.03	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.97
1999	0.00	0.16	0.08	0.01	0.07	0.01	0.07	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.93
2000	0.00	0.16	0.08	0.01	0.03	0.00	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.92
2001	0.00	0.17	0.09	0.01	0.06	0.01	0.09	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.20
2002	0.00	0.16	0.11	0.01	0.14	0.02	0.09	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.69
2003	0.00	0.16	0.12	0.01	0.18	0.02	0.09	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.84
2004	0.00	0.17	0.11	0.01	0.19	0.01	0.10	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	1.68
2005	0.00	0.16	0.10	0.01	0.13	0.01	0.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.47
2006	0.00	0.15	0.10	0.01	0.14	0.02	0.09	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	1.22
2007	0.00	0.14	0.10	0.00	0.11	0.01	0.07	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.91
2008	0.00	0.12	0.09	0.00	0.07	0.01	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.82
2009	0.00	0.12	0.09	0.00	0.05	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97
2010	0.00	0.11	0.10	0.01	0.08	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13
2011	0.00	0.11	0.11	0.01	0.12	0.01	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23
2012	0.00	0.10	0.09	0.00	0.09	0.01	0.09	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	1.11
2013	0.00	0.11	0.09	0.01	0.09	0.01	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.52
2014	0.00	0.12	0.10	0.01	0.10	0.01	0.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.82
2015	0.00	0.13	0.12	0.01	0.11	0.01	0.10	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.57
2016	0.00	0.12	0.12	0.01	0.14	0.02	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.39
2017	0.00	0.12	0.11	0.01	0.12	0.02	0.12	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15

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Table H2—Page 2 of 2 (stock groups 16–30).

Year	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	AI Total
1979	0.00	0.01	0.04	0.11	0.00	0.00	0.02	0.01	0.05	0.01	0.02	0.32	0.05	0.00	0.00	1.04
1980	0.00	0.01	0.04	0.08	0.00	0.00	0.02	0.01	0.06	0.01	0.02	0.29	0.06	0.00	0.00	1.00
1981	0.00	0.00	0.04	0.06	0.00	0.00	0.02	0.01	0.07	0.01	0.02	0.26	0.06	0.00	0.01	0.96
1982	0.00	0.00	0.03	0.05	0.00	0.00	0.02	0.01	0.08	0.01	0.02	0.25	0.05	0.00	0.01	1.00
1983	0.00	0.00	0.03	0.07	0.00	0.00	0.02	0.01	0.09	0.01	0.02	0.40	0.05	0.00	0.01	1.20
1984	0.00	0.00	0.03	0.14	0.00	0.00	0.02	0.01	0.08	0.01	0.02	0.49	0.06	0.00	0.01	1.36
1985	0.00	0.00	0.03	0.17	0.00	0.00	0.02	0.00	0.08	0.00	0.02	0.43	0.06	0.00	0.01	1.26
1986	0.00	0.00	0.04	0.24	0.00	0.00	0.02	0.01	0.10	0.01	0.02	0.48	0.08	0.00	0.02	1.44
1987	0.00	0.00	0.06	0.33	0.00	0.00	0.03	0.02	0.13	0.01	0.02	0.56	0.10	0.00	0.05	1.74
1988	0.00	0.00	0.08	0.32	0.00	0.00	0.08	0.02	0.14	0.01	0.02	0.49	0.12	0.00	0.09	1.82
1989	0.00	0.00	0.08	0.20	0.00	0.00	0.02	0.01	0.14	0.01	0.02	0.39	0.12	0.00	0.07	1.60
1990	0.00	0.00	0.07	0.15	0.00	0.00	0.01	0.01	0.14	0.00	0.01	0.39	0.11	0.00	0.05	1.56
1991	0.00	0.00	0.07	0.08	0.00	0.00	0.01	0.00	0.10	0.00	0.01	0.37	0.09	0.00	0.03	1.46
1992	0.00	0.00	0.08	0.07	0.00	0.00	0.01	0.01	0.07	0.01	0.01	0.32	0.08	0.00	0.03	1.36
1993	0.00	0.00	0.08	0.12	0.00	0.00	0.01	0.00	0.06	0.00	0.01	0.34	0.08	0.00	0.03	1.35
1994	0.00	0.00	0.07	0.13	0.00	0.00	0.01	0.01	0.05	0.00	0.01	0.32	0.07	0.00	0.03	1.19
1995	0.00	0.00	0.06	0.08	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.29	0.07	0.00	0.03	0.96
1996	0.00	0.00	0.05	0.09	0.00	0.00	0.01	0.00	0.04	0.00	0.01	0.27	0.06	0.00	0.04	0.96
1997	0.00	0.00	0.04	0.12	0.00	0.00	0.01	0.00	0.05	0.00	0.01	0.27	0.05	0.00	0.06	1.10
1998	0.00	0.00	0.03	0.08	0.00	0.00	0.00	0.00	0.05	0.00	0.02	0.21	0.04	0.00	0.04	0.97
1999	0.00	0.00	0.02	0.14	0.00	0.00	0.01	0.00	0.06	0.00	0.02	0.17	0.04	0.00	0.04	0.93
2000	0.00	0.00	0.02	0.11	0.00	0.00	0.00	0.00	0.07	0.00	0.04	0.21	0.04	0.00	0.03	0.92
2001	0.00	0.00	0.03	0.15	0.00	0.00	0.01	0.01	0.11	0.00	0.05	0.29	0.04	0.00	0.05	1.20
2002	0.00	0.00	0.04	0.24	0.00	0.00	0.02	0.01	0.15	0.00	0.06	0.44	0.05	0.00	0.11	1.69
2003	0.00	0.00	0.05	0.32	0.00	0.00	0.03	0.01	0.12	0.01	0.06	0.45	0.06	0.00	0.14	1.84
2004	0.00	0.00	0.05	0.25	0.00	0.00	0.01	0.01	0.10	0.01	0.06	0.40	0.07	0.00	0.09	1.68
2005	0.00	0.00	0.05	0.25	0.00	0.00	0.02	0.01	0.06	0.00	0.05	0.33	0.06	0.00	0.08	1.47
2006	0.00	0.00	0.05	0.16	0.00	0.00	0.01	0.00	0.05	0.01	0.05	0.22	0.05	0.00	0.07	1.22
2007	0.00	0.00	0.04	0.08	0.00	0.00	0.00	0.00	0.03	0.00	0.05	0.14	0.05	0.00	0.05	0.91
2008	0.00	0.00	0.04	0.09	0.00	0.00	0.01	0.00	0.04	0.00	0.05	0.10	0.04	0.00	0.06	0.82
2009	0.00	0.00	0.05	0.15	0.00	0.00	0.01	0.00	0.07	0.00	0.05	0.16	0.04	0.00	0.07	0.97
2010	0.00	0.00	0.06	0.16	0.00	0.00	0.01	0.00	0.10	0.00	0.06	0.22	0.05	0.01	0.06	1.13
2011	0.00	0.00	0.06	0.20	0.00	0.00	0.02	0.01	0.07	0.00	0.06	0.21	0.06	0.01	0.08	1.23
2012	0.00	0.00	0.06	0.15	0.00	0.00	0.01	0.01	0.05	0.00	0.06	0.24	0.06	0.01	0.07	1.11
2013	0.00	0.00	0.06	0.37	0.00	0.00	0.01	0.01	0.05	0.00	0.07	0.33	0.05	0.01	0.15	1.52
2014	0.00	0.00	0.06	0.51	0.00	0.00	0.01	0.02	0.07	0.00	0.07	0.32	0.05	0.01	0.22	1.82
2015	0.00	0.00	0.06	0.35	0.00	0.00	0.01	0.01	0.07	0.01	0.07	0.29	0.05	0.01	0.13	1.57
2016	0.00	0.00	0.06	0.28	0.00	0.00	0.01	0.01	0.03	0.01	0.07	0.26	0.05	0.01	0.09	1.39
2017	0.00	0.00	0.06	0.17	0.00	0.00	0.01	0.01	0.04	0.01	0.07	0.18	0.05	0.01	0.05	1.15

Appendix H3—Abundance indices (AIs) for the WCVI troll fishery by stock and year stock groups 1–15 this page; 16–30 on following page), from CLB 1702. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.

Year	Alaska South SE	North/Central	Fraser Early	Fraser Late	WCVI Hatchery	WCVI Natural	St. of Georgia Upper	St. of Georgia Lwr Nat	St. of Georgia Lwr Hat	Nooksack Fall	Pgt Sd Fing	Pgt Sd NatF	Pgt Sd Year	Nooksack Spring	Skagit Wild	AI Total
1979	0.00	0.00	0.01	0.27	0.01	0.02	0.00	0.01	0.01	0.08	0.04	0.03	0.02	0.00	0.02	1.10
1980	0.00	0.00	0.01	0.21	0.02	0.02	0.00	0.01	0.01	0.09	0.04	0.02	0.02	0.00	0.02	0.97
1981	0.00	0.00	0.00	0.24	0.02	0.03	0.00	0.00	0.01	0.08	0.04	0.02	0.02	0.00	0.02	0.93
1982	0.00	0.00	0.00	0.26	0.04	0.03	0.00	0.00	0.00	0.09	0.05	0.02	0.02	0.00	0.01	1.00
1983	0.00	0.00	0.00	0.23	0.05	0.02	0.00	0.00	0.00	0.10	0.06	0.03	0.02	0.00	0.01	0.93
1984	0.00	0.00	0.01	0.26	0.04	0.01	0.00	0.00	0.01	0.12	0.06	0.02	0.02	0.00	0.02	1.00
1985	0.00	0.00	0.01	0.27	0.03	0.01	0.00	0.00	0.01	0.10	0.05	0.02	0.01	0.00	0.01	0.96
1986	0.00	0.00	0.01	0.23	0.02	0.01	0.00	0.00	0.00	0.08	0.06	0.03	0.01	0.00	0.01	1.02
1987	0.00	0.00	0.01	0.13	0.02	0.01	0.00	0.00	0.00	0.06	0.08	0.03	0.01	0.00	0.01	1.21
1988	0.00	0.00	0.01	0.09	0.04	0.01	0.00	0.00	0.00	0.05	0.09	0.03	0.01	0.00	0.01	1.14
1989	0.00	0.00	0.01	0.17	0.05	0.01	0.00	0.00	0.00	0.06	0.10	0.03	0.02	0.00	0.01	0.97
1990	0.00	0.00	0.01	0.20	0.08	0.02	0.00	0.00	0.00	0.07	0.10	0.03	0.01	0.00	0.01	0.88
1991	0.00	0.00	0.01	0.17	0.09	0.02	0.00	0.00	0.00	0.04	0.07	0.02	0.01	0.00	0.00	0.76
1992	0.00	0.00	0.01	0.22	0.09	0.02	0.00	0.00	0.00	0.03	0.06	0.02	0.01	0.00	0.00	0.79
1993	0.00	0.00	0.01	0.19	0.08	0.02	0.00	0.00	0.00	0.03	0.06	0.01	0.01	0.00	0.00	0.70
1994	0.00	0.00	0.01	0.10	0.04	0.01	0.00	0.00	0.00	0.02	0.07	0.01	0.01	0.00	0.00	0.53
1995	0.00	0.00	0.01	0.05	0.02	0.00	0.00	0.00	0.00	0.02	0.08	0.01	0.01	0.00	0.00	0.42
1996	0.00	0.00	0.01	0.07	0.02	0.01	0.00	0.00	0.00	0.02	0.07	0.01	0.01	0.00	0.00	0.50
1997	0.00	0.00	0.01	0.16	0.04	0.01	0.00	0.00	0.00	0.03	0.07	0.01	0.01	0.00	0.01	0.58
1998	0.00	0.00	0.01	0.19	0.04	0.01	0.00	0.00	0.00	0.02	0.07	0.01	0.01	0.00	0.00	0.57
1999	0.00	0.00	0.01	0.12	0.01	0.00	0.00	0.00	0.00	0.03	0.08	0.02	0.01	0.00	0.01	0.52
2000	0.00	0.00	0.01	0.12	0.01	0.00	0.00	0.00	0.00	0.03	0.08	0.02	0.01	0.00	0.01	0.52
2001	0.00	0.00	0.01	0.14	0.02	0.00	0.00	0.00	0.00	0.04	0.09	0.02	0.01	0.00	0.01	0.82
2002	0.00	0.00	0.01	0.21	0.05	0.01	0.00	0.00	0.00	0.04	0.09	0.02	0.01	0.00	0.01	1.18
2003	0.00	0.00	0.01	0.23	0.05	0.00	0.00	0.00	0.00	0.02	0.09	0.01	0.02	0.00	0.01	1.21
2004	0.00	0.00	0.01	0.17	0.05	0.00	0.00	0.00	0.00	0.01	0.09	0.01	0.02	0.00	0.01	1.03
2005	0.00	0.00	0.01	0.10	0.04	0.00	0.00	0.00	0.00	0.02	0.10	0.01	0.02	0.00	0.01	0.84
2006	0.00	0.00	0.01	0.10	0.04	0.01	0.00	0.00	0.00	0.02	0.12	0.01	0.02	0.00	0.01	0.65
2007	0.00	0.00	0.01	0.08	0.03	0.00	0.00	0.00	0.00	0.02	0.12	0.01	0.03	0.00	0.01	0.53
2008	0.00	0.00	0.01	0.08	0.02	0.00	0.00	0.00	0.00	0.02	0.10	0.01	0.02	0.00	0.01	0.57
2009	0.00	0.00	0.01	0.07	0.02	0.00	0.00	0.00	0.00	0.02	0.09	0.01	0.02	0.00	0.00	0.57
2010	0.00	0.00	0.01	0.15	0.03	0.00	0.00	0.00	0.00	0.02	0.09	0.01	0.02	0.00	0.00	0.78
2011	0.00	0.00	0.01	0.14	0.04	0.00	0.00	0.00	0.00	0.03	0.10	0.01	0.02	0.00	0.01	0.80
2012	0.00	0.00	0.01	0.06	0.02	0.00	0.00	0.00	0.00	0.03	0.10	0.01	0.02	0.00	0.01	0.70
2013	0.00	0.00	0.01	0.09	0.03	0.00	0.00	0.00	0.00	0.02	0.09	0.01	0.02	0.00	0.01	0.95
2014	0.00	0.00	0.01	0.20	0.03	0.00	0.00	0.00	0.00	0.02	0.07	0.01	0.01	0.00	0.01	1.11
2015	0.00	0.00	0.01	0.16	0.03	0.00	0.00	0.00	0.00	0.02	0.06	0.01	0.01	0.00	0.01	0.97
2016	0.00	0.00	0.01	0.08	0.04	0.01	0.00	0.00	0.00	0.01	0.07	0.01	0.02	0.00	0.01	0.70
2017	0.00	0.00	0.01	0.10	0.03	0.00	0.00	0.00	0.00	0.01	0.09	0.01	0.02	0.00	0.01	0.77

-continued-

Table H3–Page 2 of 2 (stock groups 16–30).

Year	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	AI Total
1979	0.00	0.01	0.01	0.05	0.17	0.13	0.08	0.01	0.01	0.01	0.02	0.05	0.01	0.00	0.00	1.10
1980	0.00	0.01	0.01	0.04	0.14	0.10	0.08	0.01	0.01	0.02	0.02	0.04	0.01	0.00	0.00	0.97
1981	0.00	0.01	0.01	0.03	0.12	0.09	0.08	0.01	0.02	0.01	0.02	0.04	0.01	0.00	0.00	0.93
1982	0.00	0.01	0.01	0.03	0.13	0.10	0.09	0.01	0.02	0.01	0.01	0.04	0.01	0.00	0.01	1.00
1983	0.00	0.01	0.01	0.05	0.04	0.09	0.08	0.01	0.02	0.01	0.02	0.06	0.01	0.00	0.01	0.93
1984	0.00	0.01	0.01	0.08	0.05	0.08	0.08	0.01	0.02	0.01	0.02	0.08	0.01	0.00	0.00	1.00
1985	0.00	0.00	0.01	0.10	0.03	0.07	0.08	0.01	0.02	0.01	0.01	0.06	0.01	0.00	0.00	0.96
1986	0.00	0.00	0.01	0.15	0.02	0.12	0.09	0.01	0.02	0.01	0.02	0.07	0.02	0.00	0.01	1.02
1987	0.00	0.00	0.02	0.18	0.01	0.24	0.18	0.02	0.03	0.01	0.02	0.08	0.02	0.00	0.04	1.21
1988	0.00	0.00	0.02	0.14	0.03	0.12	0.27	0.02	0.03	0.01	0.02	0.07	0.03	0.00	0.04	1.14
1989	0.00	0.00	0.02	0.09	0.04	0.05	0.13	0.01	0.03	0.01	0.01	0.06	0.03	0.00	0.03	0.97
1990	0.00	0.00	0.01	0.06	0.04	0.02	0.06	0.01	0.03	0.01	0.01	0.06	0.02	0.00	0.02	0.88
1991	0.00	0.00	0.02	0.04	0.05	0.05	0.04	0.01	0.02	0.01	0.01	0.05	0.02	0.00	0.01	0.76
1992	0.00	0.00	0.02	0.05	0.04	0.06	0.05	0.01	0.01	0.01	0.01	0.05	0.02	0.00	0.01	0.79
1993	0.00	0.00	0.02	0.06	0.02	0.03	0.04	0.00	0.01	0.00	0.01	0.05	0.02	0.00	0.02	0.70
1994	0.00	0.00	0.01	0.05	0.02	0.02	0.02	0.01	0.01	0.00	0.01	0.05	0.02	0.00	0.01	0.53
1995	0.00	0.00	0.01	0.04	0.02	0.02	0.03	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.01	0.42
1996	0.00	0.00	0.01	0.06	0.03	0.02	0.04	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.02	0.50
1997	0.00	0.00	0.01	0.05	0.02	0.02	0.03	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.03	0.58
1998	0.00	0.00	0.01	0.05	0.02	0.02	0.02	0.00	0.01	0.00	0.01	0.03	0.01	0.00	0.02	0.57
1999	0.00	0.00	0.00	0.07	0.03	0.01	0.02	0.00	0.01	0.00	0.02	0.02	0.01	0.00	0.02	0.52
2000	0.00	0.00	0.01	0.06	0.02	0.02	0.02	0.01	0.01	0.00	0.03	0.03	0.01	0.00	0.02	0.52
2001	0.00	0.00	0.01	0.09	0.10	0.06	0.04	0.01	0.03	0.00	0.04	0.05	0.01	0.01	0.04	0.82
2002	0.00	0.00	0.01	0.14	0.18	0.08	0.07	0.01	0.03	0.01	0.06	0.07	0.01	0.01	0.06	1.18
2003	0.00	0.00	0.01	0.14	0.18	0.06	0.11	0.01	0.03	0.01	0.05	0.07	0.01	0.01	0.06	1.21
2004	0.00	0.00	0.01	0.13	0.17	0.04	0.09	0.01	0.02	0.01	0.05	0.06	0.01	0.01	0.04	1.03
2005	0.00	0.00	0.01	0.12	0.10	0.02	0.08	0.01	0.01	0.01	0.05	0.05	0.01	0.01	0.04	0.84
2006	0.00	0.00	0.01	0.07	0.03	0.01	0.04	0.00	0.01	0.01	0.05	0.03	0.01	0.01	0.03	0.65
2007	0.00	0.00	0.01	0.04	0.02	0.01	0.02	0.00	0.01	0.00	0.04	0.02	0.01	0.01	0.03	0.53
2008	0.00	0.00	0.01	0.07	0.06	0.01	0.03	0.00	0.01	0.00	0.04	0.02	0.01	0.01	0.03	0.57
2009	0.00	0.00	0.01	0.08	0.04	0.01	0.04	0.00	0.02	0.00	0.05	0.02	0.01	0.01	0.03	0.57
2010	0.00	0.00	0.01	0.10	0.09	0.02	0.05	0.00	0.02	0.00	0.05	0.03	0.01	0.01	0.03	0.78
2011	0.00	0.00	0.01	0.10	0.06	0.02	0.09	0.01	0.01	0.01	0.05	0.03	0.01	0.02	0.04	0.80
2012	0.00	0.00	0.01	0.11	0.06	0.03	0.04	0.01	0.01	0.01	0.04	0.04	0.01	0.02	0.05	0.70
2013	0.00	0.00	0.01	0.26	0.08	0.02	0.05	0.01	0.01	0.00	0.05	0.05	0.01	0.02	0.09	0.95
2014	0.00	0.00	0.01	0.26	0.11	0.02	0.06	0.01	0.02	0.01	0.07	0.05	0.01	0.03	0.10	1.11
2015	0.00	0.00	0.01	0.18	0.14	0.02	0.06	0.01	0.01	0.01	0.07	0.04	0.01	0.02	0.06	0.97
2016	0.00	0.00	0.01	0.14	0.05	0.01	0.05	0.01	0.01	0.01	0.05	0.04	0.01	0.02	0.04	0.70
2017	0.00	0.00	0.01	0.08	0.18	0.02	0.04	0.01	0.01	0.01	0.05	0.02	0.01	0.02	0.02	0.77

APPENDIX I: FISHERY EXPLOITATION RATE INDICES BY STOCK, AGE AND FISHERY, BASED ON CWT DATA

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Appendix I1—Alaska troll Stratified Proportion Fishery Index (SPFI) values as landed catch, based on CWT data.

YEAR	SPFI	WIN/SPR	JUNE OUT	JUNE IN	JULY OUT	JULY IN	FALL	ER Stock Identifiers	Age 4	Age 5	Age 6
1979	0.78	1.21	1.05	0.57	0.70	0.37	0.70	Alaska Southeast			
1980	1.29	0.63	0.95	1.45	1.58	1.84	1.58	Quinsam	Age 4	Age 5	
1981	1.13	1.21	1.12	0.91	1.10	0.87	1.10	Robertson Creek	Age 3	Age 4	Age 5
1982	0.79	0.96	0.89	1.07	0.62	0.92	0.62	Salmon River Hatchery	Age 4	Age 5	
1983	0.87	1.04	0.59	0.63	1.25	0.82	1.25	Columbia Upriver Brights	Age 4	Age 5	
1984	0.62	0.36	0.94	1.08	0.53	0.28	0.53	Willamette Spring Hatchery	Age 4	Age 5	
1985	0.67	0.45	0.59	0.82	0.82	0.71	0.82				
1986	0.45	0.44	0.15	0.39	1.25	0.54	1.25				
1987	0.47	0.59	0.17	0.54	0.62	1.31	0.62				
1988	0.41	1.37	0.00	0.14	0.64	1.16	0.64				
1989	0.50	0.83	0.20	0.42	0.54	0.50	0.54				
1990	0.70	0.63	0.11	0.87	1.16	1.08	1.16				
1991	0.60	1.35	0.22	0.88	0.79	0.50	0.79				
1992	0.38	1.02	0.06	0.49	0.40	0.21	0.40				
1993	0.46	0.73	0.02	0.27	0.92	0.25	0.92				
1994	0.40	0.65	0.04	0.12	0.67	0.15	0.67				
1995	0.48	0.46	0.05	0.32	0.79	0.91	0.79				
1996	0.43	0.56	0.09	0.57	0.55	0.48	0.55				
1997	0.59	0.63	0.15	0.56	1.48	0.08	1.48				
1998	0.39	0.81	0.05	0.15	0.95	0.38	0.95				
1999	0.57	0.80	0.11	0.25	0.97	0.11	0.97				
2000	0.44	0.87	0.09	0.10	1.43	0.05	1.43				
2001	0.38	0.53	0.07	0.13	0.64	0.12	0.64				
2002	0.49	0.39	0.06	0.11	1.11	0.14	1.11				
2003	0.45	0.68	0.06	0.13	0.86	0.30	0.86				
2004	0.40	0.81	0.06	0.16	0.96	0.27	0.96				
2005	0.45	0.90	0.11	0.21	1.22	0.39	1.22				
2006	0.59	1.49	0.11	0.64	1.36	0.11	1.36				
2007	0.58	1.23	0.14	0.84	1.16	0.17	1.16				
2008	0.44	0.81	0.08	0.71	0.69	0.09	0.69				
2009	0.57	0.72	0.15	0.33	1.08	0.15	1.08				
2010	0.34	1.13	0.04	0.26	0.74	0.07	0.74				
2011	0.38	1.03	0.05	0.25	0.83	0.13	0.83				
2012	0.61	1.62	0.09	0.18	1.15	0.08	1.15				
2013	0.33	0.80	0.09	0.44	0.50	0.12	0.50				
2014	0.56	1.26	0.08	0.53	1.04	0.13	1.04				
2015	0.44	1.14	0.09	1.33	0.67	0.34	0.67				

Appendix I2—Alaska troll Stratified Proportion Fishery Index (SPFI) values as total mortality, based on CWT data.

YEAR	SPFI	WIN/SPR	JUNE OUT	JUNE IN	JULY OUT	JULY IN	FALL	ER Stock Identifiers	Age 4	Age 5	Age 6
1979	0.76	1.17	1.04	0.55	0.67	0.36	0.67	Alaska Southeast			
1980	1.22	0.62	0.91	1.47	1.43	1.75	1.43	Quinsam	Age 4	Age 5	
1981	1.13	1.20	1.15	0.89	1.11	0.82	1.11	Robertson Creek	Age 3	Age 4	Age 5
1982	0.89	1.00	0.90	1.08	0.79	1.07	0.79	Salmon River Hatchery	Age 4	Age 5	
1983	0.99	1.01	0.60	0.68	1.68	0.75	1.68	Columbia Upriver Brights	Age 4	Age 5	
1984	0.66	0.37	0.93	1.07	0.63	0.43	0.63	Willamette Spring Hatchery	Age 4	Age 5	
1985	0.77	0.46	0.57	0.79	1.07	0.69	1.07				
1986	0.52	0.48	0.15	0.40	1.47	0.62	1.47				
1987	0.54	0.60	0.16	0.50	0.75	1.72	0.75				
1988	0.43	1.30	0.01	0.15	0.65	1.26	0.65				
1989	0.56	0.81	0.20	0.41	0.62	0.58	0.62				
1990	0.87	0.77	0.13	0.92	1.49	1.06	1.49				
1991	0.62	1.27	0.21	0.82	0.82	0.63	0.82				
1992	0.44	0.97	0.06	0.46	0.57	0.22	0.57				
1993	0.51	0.70	0.02	0.25	1.07	0.25	1.07				
1994	0.48	0.63	0.04	0.14	0.87	0.20	0.87				
1995	0.57	0.46	0.05	0.33	0.96	0.93	0.96				
1996	0.51	0.56	0.10	0.55	0.68	0.51	0.68				
1997	0.59	0.62	0.15	0.52	1.43	0.10	1.43				
1998	0.38	0.78	0.05	0.15	0.90	0.34	0.90				
1999	0.62	0.80	0.11	0.24	1.08	0.14	1.08				
2000	0.46	0.88	0.09	0.10	1.48	0.08	1.48				
2001	0.40	0.51	0.07	0.13	0.67	0.15	0.67				
2002	0.49	0.41	0.06	0.11	1.05	0.16	1.05				
2003	0.44	0.69	0.06	0.12	0.81	0.27	0.81				
2004	0.40	0.80	0.06	0.15	0.92	0.27	0.92				
2005	0.47	0.98	0.11	0.25	1.20	0.36	1.20				
2006	0.59	1.45	0.12	0.63	1.34	0.11	1.34				
2007	0.58	1.21	0.13	0.84	1.14	0.16	1.14				
2008	0.45	0.78	0.08	0.65	0.71	0.11	0.71				
2009	0.59	0.73	0.14	0.32	1.09	0.17	1.09				
2010	0.36	1.15	0.04	0.25	0.77	0.08	0.77				
2011	0.37	1.04	0.05	0.24	0.80	0.12	0.80				
2012	0.60	1.58	0.09	0.21	1.09	0.11	1.09				
2013	0.34	0.81	0.09	0.43	0.50	0.20	0.50				
2014	0.55	1.28	0.08	0.58	0.99	0.13	0.99				
2015	0.43	1.13	0.09	1.24	0.63	0.36	0.63				

Appendix I3—Landed catch exploitation rate indices by stock and age in the NBC troll fishery, based on CWT data. Base period is 1979–1982.

Year	ER Stock Identifiers ¹												
	AKS Age 4	QUI Age 3	QUI Age 4	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 4	URB Age 5	WSH Age 4	Fishery Index
1979		0.55	0.89	1.15	0.83	0.48	1.17			1.10		0.65	0.83
1980		0.79	0.97	1.05	0.85	0.77		0.94		1.02	1.14	1.18	0.94
1981		1.78	1.42	0.85	1.04	1.75	1.27		1.00	1.27	1.50	1.53	1.28
1982	1.00	0.89	0.72	0.94	1.28		0.56	1.06		0.61	0.36	0.64	0.82
1983	1.59	1.22	1.50	0.98	0.73	0.75	0.58	1.24	0.23	1.23		1.27	0.80
1984	1.14	0.26	0.49	0.39	1.37	1.67		1.49	1.32	1.99		0.51	1.23
1985	0.76	0.24	0.60	0.92	1.87	1.70	0.42		1.31	1.59	1.49	0.22	1.23
1986	0.71	0.95	0.83		0.92		0.12	1.26		1.14	1.74		1.00
1987	0.60	0.35	0.61	0.45			0.20	0.88	1.08	1.61	1.80		0.95
1988	1.98	0.18	0.69	0.30	0.62			0.67	0.35	0.99	2.06	0.80	0.68
1989	0.91	0.43	0.44	0.37	0.88	1.05	0.14	0.61	1.01	0.94	3.69	0.37	0.97
1990	1.93	0.35	0.94	0.28	0.71	0.55	0.18	0.55	1.04	1.14	2.08	0.31	0.82
1991	0.64	0.42	0.65	0.35	0.71	1.10	0.14	0.86	1.04			0.28	0.77
1992	0.11		1.87	0.27	0.57	0.63	0.14	0.55	0.45			0.10	0.58
1993	0.27			0.14	0.62	0.83	0.13	1.28	1.16	1.06		0.21	0.83
1994	0.05			0.29	0.72	0.86	0.22	1.12	1.01	0.87	1.81	0.12	0.87
1995	0.00				0.41	0.20	0.13	0.00	0.39		0.50	0.16	0.29
1996	0.00			0.00			0.00	0.00	0.00	0.00		0.00	0.00
1997		0.38	0.25	0.21	0.31		0.18	0.22	0.18	0.50		0.13	0.25
1998	0.00	0.00	0.00		0.50		0.07	0.96	0.53		1.10	0.00	0.47
1999	0.00	0.16	0.18		0.35	0.55	0.10	0.42	0.22	1.10		0.00	0.35
2000	0.00	0.00	0.06				0.05	0.57	0.16	0.00	0.00	0.01	0.14
2001	0.00	0.00	0.01	0.00			0.05	0.36	0.40	0.00		0.02	0.19
2002	0.44		0.16	0.00	0.48		0.19	0.64	0.71	0.20		0.22	0.44
2003	0.00	0.00	0.00	0.04	0.05	0.00	0.05	0.67	0.25	0.69	0.95	0.05	0.25
2004	0.83	0.00	0.06	0.09	0.20	0.44	0.09	0.55	0.47	0.68	1.20	0.20	0.40
2005	0.17	0.07	0.04	0.03	0.33	0.11	0.11	0.96	0.47	1.37	0.92	0.10	0.43
2006	0.36	0.08	0.06	0.09	0.26	0.26		1.00	0.72	1.27	1.31	0.05	0.56
2007	0.09		0.43		0.46	0.43	0.00	1.17	0.66	1.07		0.00	0.57
2008	0.10			0.08	0.63	0.19	0.07	0.72				0.05	0.34
2009	0.91		0.11	0.19	0.21		0.01	1.34	0.97	1.77		0.03	0.69
2010	0.21	0.00		0.13	0.09		0.21	1.07	0.41			0.14	0.35
2011	0.00	0.00	0.00	0.00	0.32		0.06	0.90	0.54	0.55		0.15	0.36
2012	0.25		0.09	0.08	0.21	0.36	0.04	1.37	0.62	1.45	2.47	0.08	0.66
2013			0.12	0.01	0.19	0.14	0.02	0.92	0.73	0.84		0.11	0.42
2014	0.42	0.00	0.00		0.25		0.06	0.72	0.29	0.95	1.54	0.18	0.43
2015	0.16	0.00	0.00	0.03		0.00	0.02	0.45	0.41	0.39	0.93	0.17	0.27

¹Stock Identifiers: AKS = ALASKA SPRING; QUI = QUINSAM; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; URB = COLUMBIA UPRIVER BRIGHT; WSH = WILLAMETTE SPRING

Appendix I4—Total mortality exploitation rate indices by stock and age in the NBC troll fishery, based on CWT data. Base period is 1979–1982.

Year	ER Stock Identifiers ¹											
	AKS Age 4	QUI Age 3	QUI Age 4	RBT Age 3	RBT Age 4	SRH Age 5	SRH Age 3	SRH Age 4	URB Age 5	URB Age 4	WSH Age 4	Fishery Index
1979		0.56	0.88	1.16	0.83	0.48	1.17		1.10		0.63	0.83
1980		0.79	0.97	1.02	0.85	0.77		0.94	1.03	1.14	1.14	0.94
1981		1.76	1.43	0.85	1.04	1.76	1.25		1.00	1.27	1.51	1.52
1982	1.00	0.89	0.72	0.96	1.28		0.57	1.06		0.60	0.35	0.70
1983	1.63	1.20	1.50	0.98	0.73	0.76	0.64	1.24	0.23	1.23	1.25	0.81
1984	1.15	0.27	0.50	0.49	1.37	1.68		1.50	1.32	1.98	0.50	1.22
1985	0.79	0.26	0.61	1.07	1.86	1.73	0.50		1.31	1.58	1.46	0.21
1986	0.72	0.92	0.84		0.91		0.16	1.27		1.15	1.71	
1987	0.67	0.48	0.65	0.49			0.32	0.90	1.11	1.66	1.82	0.98
1988	2.19	0.29	0.71	0.35	0.64			0.70	0.36	1.04	2.09	0.91
1989	0.96	0.49	0.46	0.44	0.89	1.06	0.28	0.66	1.02	1.01	3.69	0.39
1990	2.36	0.54	0.98	0.38	0.74	0.56	0.33	0.59	1.06	1.22	2.13	0.34
1991	0.75	0.57	0.67	0.47	0.73	1.12	0.32	0.90	1.05		0.31	0.80
1992	0.21		1.93	0.41	0.60	0.66	0.19	0.57	0.47		0.12	0.61
1993	0.25			0.32	0.65	0.86	0.30	1.33	1.17	1.12	0.23	0.86
1994	0.12			0.51	0.75	0.88	0.41	1.16	1.02	0.90	1.86	0.14
1995	0.08				0.43	0.22	0.23	0.03	0.42		0.53	0.21
1996	0.13			0.07			0.04	0.02	0.03	0.06	0.06	0.04
1997		0.37	0.25	0.26	0.32		0.21	0.23	0.18	0.51	0.14	0.26
1998	0.00	0.00	0.00		0.51		0.19	0.98	0.53		1.08	0.00
1999	0.00	0.17	0.18		0.34	0.56	0.13	0.42	0.23	1.11	0.00	0.35
2000	0.00	0.00	0.06				0.07	0.57	0.16	0.00	0.00	0.01
2001	0.05	0.00	0.01	0.00			0.07	0.36	0.42	0.00		0.02
2002	0.57		0.16	0.04	0.49		0.25	0.65	0.71	0.21		0.25
2003	0.08	0.00	0.00	0.04	0.05	0.00	0.11	0.69	0.26	0.71	0.96	0.06
2004	0.91	0.00	0.06	0.13	0.21	0.46	0.17	0.58	0.49	0.69	1.25	0.21
2005	0.22	0.06	0.04	0.06	0.34	0.11	0.24	1.00	0.49	1.42	0.96	0.10
2006	0.45	0.07	0.06	0.13	0.26	0.26		1.02	0.72	1.29	1.31	0.07
2007	0.11		0.42		0.46	0.42	0.04	1.19	0.67	1.05	0.00	0.57
2008	0.09			0.12	0.65	0.18	0.13	0.74			0.06	0.35
2009	0.96		0.11	0.20	0.21		0.12	1.36	0.98	1.79	0.03	0.70
2010	0.23	0.00		0.16	0.09		0.26	1.08	0.41		0.14	0.35
2011	0.05	0.00	0.00	0.07	0.35		0.10	0.98	0.58	0.60	0.17	0.39
2012	0.32		0.09	0.14	0.22	0.38	0.09	1.39	0.62	1.42	2.47	0.09
2013			0.12	0.03	0.19	0.14	0.09	1.00	0.80	0.92	0.11	0.45
2014	0.45	0.00	0.00		0.25		0.10	0.73	0.29	0.97	1.53	0.17
2015	0.15	0.00	0.00	0.03		0.00	0.06	0.46	0.41	0.40	0.95	0.19

¹Stock Identifiers: AKS = ALASKA SPRING; QUI = QUINSAM; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; URB = COLUMBIA UPRIVER BRIGHT; WSH = WILLAMETTE SPRING

Appendix I5—Landed catch exploitation rate indices by stock and age in the WCVI troll fishery, based on CWT data. Base period is 1979–1982.

Year	ER Stock Identifiers ¹																				Fishery Index					
	CWF Age	GAD Age	GAD Age	LRH Age	LRH Age	RBT Age	RBT Age	SAM Age	SAM Age	SPR Age	SPR Age	SPS Age	SPS Age	SRH Age	SRH Age	SUM Age	URB Age	URB Age	UWA Age	UWA Age	WSH Age					
1979						1.16		1.17	1.26		1.00	1.00	0.97	0.84		1.13	1.57		1.12	1.63	0.70	1.22	1.03	1.06		
1980				0.55	0.90		1.41	1.43					1.17	1.39			1.10	0.69	1.10	0.98	1.38	0.85	1.11	1.02		
1981	0.79	0.73		1.14	0.79	0.85	0.67	0.58	1.00				0.94	0.63	0.72		0.43		1.31		0.99	0.84	0.89	0.63	0.87	
1982	1.21	1.27	1.00	1.15	1.31	1.16	0.75	0.73		1.00			0.93	1.14	1.29	0.87		0.90		0.78	0.39	1.07	1.05	1.23	1.05	
1983	1.36		1.41	1.64	1.64	0.96	0.42	0.84	1.83		0.96		1.44	0.93	1.64	0.89	1.55			0.28	0.43	0.70	1.08	0.28	1.16	
1984	1.29	2.08		2.12	2.89		1.31	1.11	1.04			1.08	1.30	1.38	1.60	0.96		0.41		0.62	1.21	1.74	0.73	0.72	1.41	
1985	0.89		0.84	1.20	1.13		0.48	0.00					0.53	0.90	0.81	0.65				0.60	0.95	0.80	1.01	0.44	0.84	
1986	1.27			1.11	1.22	0.47		1.10					1.19	1.00	0.89	1.07		0.20		1.05	1.29	0.84	1.09		1.05	
1987	0.85			0.93		1.45	0.27						0.45		0.75	0.51	0.27	0.23		0.72	0.73	0.36	0.41		0.62	
1988	0.84	0.43		1.11	1.37	1.05	0.44	0.57		0.60			0.98		0.28	0.68		0.65	1.23	0.06	1.75		0.77	0.88	0.90	
1989	0.52	0.26	0.48	0.28	0.56	0.56	0.22	0.34	0.00	0.21	0.59		0.58	0.39	0.33	0.34	0.35			0.80		0.82		0.55	0.47	
1990	0.71	1.00	0.94	1.13		1.21	0.67	0.51	1.49	0.41	0.85		0.91	0.72	0.73	0.76	0.73	0.46	1.64					0.85	0.91	
1991			0.79	0.80		0.74	0.59	0.53	1.36	0.25	0.56	1.07	0.60	0.62	0.37	0.51	0.95	0.36	0.51					0.08	0.66	
1992	1.14		0.31	0.65		0.32	1.54	2.41	5.08	1.05	0.26		0.43	0.74	0.68	0.69	1.37	2.66	0.94					0.17	0.80	
1993			0.72	1.08	0.68		1.07	2.27	2.41	1.11	0.42		0.53	0.99	0.97	0.45	1.22	1.24		0.45	1.82			0.45	0.83	
1994	0.12					0.22	0.59	0.66	1.28	0.06	0.69		0.81	0.63	0.19	0.41		0.39			0.88			0.26	0.52	
1995		0.22				0.43		0.44	0.28	0.16	0.37		0.36	0.35	0.27	0.20	0.04							0.12	0.31	
1996	0.00	0.00	0.00	0.00			0.00			0.00	0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1997	0.38		0.21	0.74			0.00	0.04		0.02	0.24		0.47	0.40	0.04	0.27	0.00	0.03	0.07					0.00	0.30	
1998							0.00				0.08		0.05	0.00	0.00	0.03	0.00	0.00	0.00	0.01				0.04	0.03	
1999	0.04	0.13	0.09				0.00			0.07			0.02		0.02	0.05	0.00	0.00	0.03	0.00				0.00	0.06	
2000			1.11	0.09	1.73					1.10			0.05	0.76	0.03	0.64	0.00	0.00	0.22	0.09	0.47			0.08	0.67	
2001	0.74	1.04	0.30		0.72	0.00			0.42	0.36		0.15	0.60	0.46	0.54	0.00	0.05	0.51	0.09	0.16			0.19	0.48		
2002	0.57	0.17	0.62	0.29	0.39		0.02	0.00		0.26	0.40		0.28	0.69	0.39	0.44	0.00	0.00	0.58	0.06	0.24			0.30	0.42	
2003	0.53	0.12	0.73	0.27	0.76	0.12	0.00	0.00		0.59			0.29	0.58	0.33	0.52	0.00	0.00	0.68	0.12	0.09			0.61	0.47	
2004			0.08	1.18	0.38	1.04	0.12	0.03	0.02	0.00	0.18	0.58		0.35	0.81	0.35	0.79	0.19	0.27	0.33	0.12	0.45		2.33	0.60	
2005	0.30	0.73	0.96	0.70	1.70	0.12	0.00	0.00		0.11	0.78		0.88	1.19	0.65	0.78	0.16	0.23	0.59	0.09	0.42			1.30	0.78	
2006	0.27	0.87				0.46	0.00	0.00	0.00	0.38	0.75		0.57	1.40	0.52	0.71		0.28	0.42					0.66	1.59	0.70
2007	0.98	0.79	0.69				0.02		1.28	0.57		0.62	0.93	0.99	0.69	0.00		0.52		0.12				0.23	0.69	
2008	0.48	0.37	0.42			0.00		0.00	0.71	0.33		0.21		0.49	0.31	0.24	0.00	0.26	0.22					0.18	0.32	
2009	0.00	0.64	0.52	0.20	0.23			0.00		0.62	0.16		0.16	0.06	0.56	0.19	0.04	0.04	0.41		0.11			0.10	0.22	
2010	0.11	0.98	0.44	0.34			0.04	0.26		0.97	0.12		0.25	0.37	0.47	0.12	0.00	0.00	0.32	0.09				0.23	0.28	
2011	0.07	0.42	0.22	0.41	0.75		0.00	0.00		0.00	0.41		0.25	0.59	0.04	0.19	0.12	0.55	0.25	0.00	0.32			0.51	0.33	
2012	0.20	0.30	0.24	0.16	0.00			0.00	0.17	0.34	0.05		0.11	0.45	0.35	0.16	0.04	0.42	0.33	0.08	0.31			1.16	0.21	
2013	0.06	0.20	0.23	0.18	0.14		0.00			0.14	0.09		0.16	0.16	0.03	0.20	0.04	0.07	0.21	0.04	0.25			0.28	0.15	
2014	0.13	0.18	0.27	0.26		0.21		0.18		0.70	0.26		0.12	0.31	0.45	0.24	0.11	0.26	1.07	0.05	0.43			1.19	0.31	
2015	0.07	0.09	0.20	0.33		0.01				0.15			0.09	0.23	0.23	0.12	0.04	0.10	0.13	0.02	0.09			0.15	0.16	

¹Stock Identifiers: CWF = COWLITZ FALL TULE; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; WSH = WILLAMETTE SPRING; GAD = G ADAMS FALL FING; SAM = SAMISH FALL FING; SUM = COL RIVER SUMMERS; CHI = CHILLIWACK; LRH = LOWER RIVER TULE; SPR = SPRING CREEK TULE; URB = COLUMBIA UPSTREAM BRIGHT; LRW = LEWIS RIVER WILD; SPS = SO SOUND FALL FING; UWA = U OF W FALL ACCEL (*discontinued*)

Appendix I6—Total mortality exploitation rate indices by stock and age in the WCVI troll fishery, based on CWT data. Base period is 1979–1982.

Year	Stock Identifiers ¹																				Fishery Index																							
	CWF Age 4	GAD Age 3	GAD Age 4	LRH Age 3	LRH Age 4	LRW	RBT Age 3	RBT Age 4	RBT Age 5	SAM Age 3	SAM Age 4	SAM Age 5	SPR Age 3	SPR Age 4	SPS Age 3	SPS Age 4	SRH Age 3	SRH Age 4	SUM Age 3	URB Age 4	URB Age 3	UWA Age 4	UWA Age 3	WSH Age 4																				
1979				1.15			1.20	1.25		1.00	1.00	0.95	0.84			1.13	1.54		1.11	1.64	0.70	1.23	1.00	1.05																				
1980				0.56	0.88		1.38	1.42				1.16	1.39			0.92	0.63	0.73		1.12	0.69	1.10	1.00	1.37	0.85																			
1981	0.79	0.72		1.14	0.78	0.85	0.66	0.60	1.00							0.97	1.14	1.27	0.87		1.31		0.98	0.83	0.88	0.64																		
1982	1.21	1.28	1.00	1.16	1.34	1.15	0.75	0.72		1.00						1.40	0.92	1.58	0.89	1.44		0.88		0.79	0.38	1.11	1.05																	
1983	1.37		1.40	1.63	1.66	0.96	0.45	0.83	1.87		0.96					1.08	1.24	1.33	1.57	0.96		0.43		0.27	0.41	0.72	1.08																	
1984	1.31	1.89		2.08	2.94		1.31	1.11	1.08							0.56	0.93	0.82	0.66				0.64	1.20	1.69	0.74	0.72	1.40																
1985	0.91		0.84	1.23	1.17		0.48	0.00								1.08	1.19	0.99	0.92	1.06		0.20		1.06	1.30	0.85	1.09		1.04															
1986	1.29			1.02	1.20	0.47		1.09									0.46	0.94	0.53	0.38	0.27		0.87	0.79	0.46	0.44		0.70																
1987	0.89			1.23		1.49	0.29										1.00	0.39	0.72	0.71	1.28	0.41	1.89			0.81	0.96	0.99																
1988	0.92	0.52		1.36	1.53	1.11	0.49	0.60		0.76							0.64	0.40	0.40	0.35	0.43		0.81			0.57	0.50																	
1989	0.55	0.40	0.49	0.33	0.62	0.59	0.24	0.34	0.00	0.37	0.61						0.94	0.74	0.96	0.79	0.82	0.49	1.66				0.91	0.95																
1990	0.76	1.05	0.95	1.18		1.24	0.71	0.53	1.55	0.51	0.86						1.07	0.63	0.64	0.50	0.53	1.02	0.40	0.52					0.09	0.68														
1991			0.82	0.76		0.77	0.66	0.55	1.40	0.45	0.58						0.51	0.76	0.74	0.70	1.52	2.70	0.94							0.25	0.84													
1992	1.16		0.31	0.78		0.34	1.89	2.51	5.25	1.02	0.27						1.44	2.35	2.53	1.22	0.44									0.47	0.90													
1993			0.74	1.24	0.77												0.24	0.71	0.69	1.33	0.26	0.70									0.27	0.55												
1994	0.11																0.48	0.47	0.31	0.27	0.41											0.15	0.36											
1995		0.32															0.04	0.07	0.02	0.02	0.04											0.03	0.04											
1996	0.03	0.07	0.03	0.06													0.01	0.04	0.09	0.25	0.56	0.44	0.14	0.29	0.01	0.03	0.07	0.07				0.00	0.34											
1997	0.38		0.21	0.89													0.00	0.08	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01					0.03	0.03											
1998			0.04	0.13	0.08												0.00	0.07	0.01	0.02	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00				0.00	0.05											
1999																		0.00	0.07	0.01	0.02	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00				0.00	0.05										
2000			1.10	0.08	1.75												0.70	0.00	0.37	0.35	0.14	0.58	0.41	0.54	0.00	0.05	0.50	0.08	0.15			0.07	0.65											
2001		0.62	1.07	0.28														0.00	0.00	0.22	0.39	0.26	0.68	0.35	0.44	0.00	0.00	0.57	0.06	0.25			0.17	0.46										
2002	0.56	0.14	0.62	0.27	0.38												0.01	0.00	0.57	0.57	0.26	0.57	0.31	0.52	0.00	0.00	0.67	0.11	0.09			0.55	0.45											
2003	0.54	0.09	0.71	0.25	0.76												0.12	0.00	0.00	0.57	0.32	0.79	0.31	0.78	0.17	0.27	0.32	0.11	0.44			2.12	0.58											
2004			0.07	1.18	0.35	1.04		0.12	0.03	0.02	0.00	0.15	0.57				0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00															
2005	0.29	0.62	0.96	0.63	1.70												0.44	0.00	0.00	0.00	0.35	0.73	0.53	1.40	0.46	0.70						0.29	0.75											
2006			0.24	0.86													0.44	0.00	0.00	0.00	0.35	0.73	0.53	1.40	0.46	0.70						0.28	0.42			0.64	1.45	0.68						
2007		0.83	0.79	0.62													0.02		1.11	0.56	0.56	0.90	0.87	0.69	0.00								0.52	0.12			0.20	0.66						
2008		0.39	0.36	0.38													0.00		0.62	0.33	0.19	0.43	0.31	0.21	0.00								0.26	0.20			0.16	0.30						
2009	0.00	0.53	0.51	0.20	0.23												0.00		0.56	0.15	0.15	0.05	0.49	0.18	0.03	0.04	0.40						0.10				0.09	0.22						
2010	0.11	0.83	0.44	0.31													0.03	0.25	0.85	0.12	0.23	0.35	0.42	0.12	0.00	0.00	0.32	0.09									0.21	0.27						
2011	0.07	0.36	0.22	0.38	0.74												0.00	0.00	0.00	0.41	0.23	0.57	0.04	0.19	0.11	0.56	0.24	0.00									0.47	0.31						
2012	0.20	0.25	0.23	0.14	0.00												0.00	0.17	0.30	0.05	0.10	0.43	0.31	0.16	0.04	0.42	0.32	0.08	0.30									1.06	0.20					
2013	0.06	0.16	0.23	0.16	0.13												0.00		0.13	0.09	0.15	0.15	0.03	0.19	0.04	0.07	0.21	0.03	0.25									0.25	0.15					
2014	0.13	0.15	0.27	0.24													0.20		0.17	0.61	0.25	0.11	0.30	0.40	0.23	0.10	0.26	1.06	0.05	0.42									1.08	0.29				
2015	0.06	0.09	0.19	0.32													0.01		0.08	0.22	0.22	0.11	0.04	0.10	0.13	0.02	0.09										0.14	0.15						

¹Stock identifiers: CWF= COWLITZ FALL TULE; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; WSH = WILLAMETTE SPRING; GAD = G ADAMS FALL FING; SAM = SAMISH FALL FING; SUM= COL RIVER SUMMERS; CHI= CHILLIWACK; LRH= LOWER RIVER TULE; SPR= SPRING CREEK TULE; URB = COLUMBIA UPRIVER BRIGHT; LRW = LEWIS RIVER WILD; SPS = SO SOUND FALL FING; UWA = U OF W FALL ACCEL (*discontinued*)

Investigation into Aspects of the SPFI

Various issues with the WCVI and NBC troll fishery SPFIs, as well as ongoing work by the CTC-AWG to develop updated 1979–1982 base period data for calibration of the PSC Coast Wide Chinook Model, prompted investigation in 2017 into data and methods used in SPFI calculations. One issue prompting the investigation was the large divergence occurring in a few years between the SPFI and both the ROM and Model FIs calculated for the WCVI troll fishery (see years 1987, 1988 and 1992 in TCCHINOOK (18)-01 Figures 3.16 and 3.17). A second issue was the large between-year changes in the WCVI SPFI (e.g. between 1988 and 1989 in TCCHINOOK (18)-01 Figures 3.16 and 3.17) compared to the other FIs and compared to FIs for the NBC and SEAK fisheries. A third issue was that in comparison with the SEAK troll fishery, there was little correlation between the Model FI and the WCVI and NBC SPFIs. A possible cause of these issues for the WCVI fishery was low or no actual landed catch, and therefore few CWT recoveries, in one or two of the three seasonal fishing periods. For the NBC fishery, changes in management of the fishery starting in 1999 to limit impacts on Canadian stocks of conservation concern (e.g., from the WCVI region) could have potentially affected the stock composition of the catch and thus the age-specific CWT data from stocks used in the SPFI calculations.

Recognition of these issues resulted in exploration of methods for imputing abundance in strata with low or zero catch. It also led to an updated analysis of the stock- and age- combinations meeting specified criteria for inclusion in the calculation of the SPFI for each AABM troll fishery. Rationale for this work was provided in the CTC's Harvest Rate Index Analysis report (CTC 2009a). The CTC described the need for imputation (see p. 98) but was only able to explore one imputation method (i.e., Average Proportion Correction) during the study leading to the report. The CTC also concluded that SPFI performance increased with contribution of data from more stocks (see p. 89). Results from the current work are described in the next sections with a focus on results for the WCVI and NBC fisheries.

Review of CWT Indicator Stocks Used in SPFI Calculations

Stocks used in the SPFI calculated for each AABM troll fishery were originally selected if an age-specific average of estimated CWTs in the fishery for years 1979–1995 exceeded 35 recoveries. For the updated analysis, the same average CWT recovery requirement was maintained but evaluated over years 1979–2015 with the exception that data from 1996, 1998 and 1999 were excluded. The three years were excluded because the NBC and WCVI troll fisheries were either closed (1996) or they were opened for only a limited portion of the year (1998–1999) and the CWT recoveries were unlikely to be representative of a more typical fishing year. The outcome of the updated analysis was that new stock-age combinations were found that met the criteria for inclusion in SPFI calculations for each troll fishery whereas some of those currently included were found to no longer meet the criteria (see Appendices I11 and I13). There was a net loss of 3 stock-age combinations from calculation of the WCVI troll SPFI and a net gain of 1 stock-age combination for the NBC troll SPFI.

SPFIs calculated with the new data set based on the updated list of stock-age combinations differed noticeably from values calculated with the current list of stock-age combinations. This was true for both the NBC and WCVI troll fisheries but most noticeable for the NBC fishery (Appendix I7 and I8). The CTC-AWG has identified the need for further work to understand how the selection of data affects the SPFIs values. Selection criteria used to include or exclude year, stock and age combinations may also need reconsideration.

Investigation of Methods to Impute Abundance

Calculation of the SPFIs requires an estimate of yearly harvest rate ($H_{.y}$) by AABM (Equation 1).

There are two possible equations to estimate $H_{.y}$, in the second option (Equation 2) the denominator equals the total yearly abundance across all fishery strata. Cases of low or no catch in a stratum can result in underestimates of total abundance ($N_{.y}$), leading to biased estimates of both the yearly harvest rate and the SPFIs. To adjust for this influence, stratum-specific abundances estimated from years with low or no catch can be replaced by imputed values. Data imputation can be implemented by numerous statistical methods and currently the imputation of abundance has been evaluated using just three methods. The average proportion correction (APC) method was described in TCCHINOOK (09)-2¹, while the accrued average proportion correction (AAPC) method was a newly proposed variation of the APC, and finally the use of a linear regression model (LM) was evaluated.

r_{tysa} = CWT contribution in strata t, year y, stock s and age a.

c_{tysa} = Adult equivalent CWT contribution in strata t, year y, stock s, and age a.

h_{ty} = CWT harvest rate in strata t and year y.

T_{ty} = Treaty catch in strata t and year y.

N_{ty} = Abundance in strata t and year y.

$N_{.y}$ = Total abundance in year y across all strata (total yearly abundance).

$H_{.y}$ = Harvest rate in year y.

$S_{.y}$ = SPFIs in year y.

$$S_{.y} = \frac{H_{.y}}{\left(\frac{\sum_{y=1979}^{1982} H_{.y}}{4} \right)}$$

Equation 1

¹ <http://www.psc.org/download/35/chinook-technical-committee/2120/tcchinook09-2.pdf>

$$H_{.y} = \frac{\sum_t \left[\left(\frac{\sum_s \sum_a c_{tysa}}{\sum_s \sum_a r_{tysa}} \right) * T_{ty} \right]}{N_{.y}}$$

Equation 2

Imputation by the Average Proportion Correction Method (APC)

Imputation using an average proportion correction method (APC) was described in TCCHINOOK (09)-2:

“For the application of the APC method, abundance estimates for all years in which all three strata had recorded catches were used to estimate the average percentage of the total yearly abundance that occurred in each stratum. The total yearly abundance was then estimated by dividing the sum of the abundances from the strata that could be estimated by the average percent of the total yearly abundance that these strata comprise. The total yearly abundance estimate was then substituted into the denominator of Equation 4-13 to produce the yearly HRI estimate...”

The APC method was considered for imputation of total yearly abundance for years when one or more strata contain catch estimates less than 1000. The APC method only allows for imputation of total annual abundance across strata. Thus, neither stratum-specific harvest rates nor the stratum fishery index can be estimated.

Imputation by the Accrued Average Proportion Correction Method (AAPC)

The AAPC method is a variation on the APC. While the APC method estimates the stratum specific average proportion (of total abundance) across all years with complete data, the AAPC relies on an expanding time series window of average proportion within each stratum. This approach likely better accommodates time series trends in strata proportions, which have been documented.

Imputation By Linear Models

A multivariate linear model (LM) provided the 3rd method to impute stratum-specific abundances. The natural logarithm of abundance was modelled as a function of the categorical variables: calendar year and fishery strata. Stratum-specific abundances were estimated (imputed) from this relationship. Application of this model necessitates more than one fishery stratum be available, which limits its use to the SEAK and WCVI AABMs (NBC has just one stratum). Unlike the APC and AAPC methods, the LM allows for imputation of stratum-specific abundance. Thus, the stratum-specific harvest rate and stratum fishery index can also be estimated.

Evaluation of Imputation Methods

The APC, AAPC, and LM imputation methods were evaluated by a jackknife approach. Only years with stratum catch exceeding a specified threshold and possessing an abundance

estimate for each stratum were retained for the evaluation. Unlike the intended application of imputation to strata with low catch values, the jackknife evaluation was applied to strata considered complete, thus allowing for the best likely estimation of performance metrics. While prior application of the APC relied on a minimum stratum catch threshold of 1000, the minimum catch for this evaluation was set at 4000.

The jackknife method was applied as follows:

1. Step through each unique year-stratum combination,
2. Reset the abundance in that year-stratum to NA (aka NULL),
3. Fit the model using the remaining data,
4. Predict an abundance estimate for the empty year-stratum,
5. Calculate the error between the predicted abundance and the ‘known’ value.

Model performance was compared using both mean percent error (MPE) and mean absolute percent error (MAPE). Performance metrics were calculated in two separate ways, one on stratum-specific abundance and the second on total annual abundance across strata. In both cases the percent error and absolute percent error was calculated annually, and the averages were than estimated across all yearly percent errors. The performance metrics specific to each method and AABM are presented in the following tables. The stratum-specific results indicate that the LM method had both the least uncertainty (MAPE) and bias (MPE) for both AABM’s. Differences between methods, based on the annual total abundance errors, were negligible and the best method was not consistent across metrics or AABM. Based on the stratum-specific results it was determined that the LM was the best method for abundance imputation.

Appendix I7–Imputation method performance metrics based on stratum-specific error estimates for the WCVI AABM troll fishery.

Imputation Method	AABM	MAPE	MPE
AAPC	WCVI	35.6	-14.1
APC	WCVI	37.1	-12.1
LM	WCVI	33.3	-8.0
AAPC	SEAK	51.4	-28.0
APC	SEAK	49.4	-27.6
LM	SEAK	36.9	-11.1

Appendix I8. Imputation method performance metrics based on yearly total error estimates for the WCVI AABM troll fishery.

Imputation Method	AABM	MAPE	MPE
AAPC	WCVI	10.23	0.91
APC	WCVI	11.43	-0.12
LM	WCVI	10.86	0.35
AAPC	SEAK	5.60	-0.10
APC	SEAK	5.34	-0.03
LM	SEAK	5.12	0.86

Issues Associated with Imputation

The application of abundance imputation has not considered all possible conditions of data availability. If there is no estimate or a zero estimate of CWT recoveries within a year-stratum, the associated CWT harvest rate, stratum harvest rate, and stratum fishery index are unavailable or zero. However, estimates of the across stratum annual harvest rate and the SPFI can be impacted by the imputation rules of application. Under the conditions of zero or no CWT recoveries in a stratum, the numerator of equation 2 is unaffected. But, it is still possible to impute the abundance for a stratum without recoveries, which can be included in the annual total abundance summation. Total abundance is the denominator of the annual harvest rate equation. Thus, while strata lacking recoveries make no change to the numerator of equation 2, the denominator can increase, potentially resulting in underestimates of annual harvest rate and the SPFI.

There exist two variations on the assumed imputation procedure, both concerning strata with zero or no CWT recoveries (and thus no abundance estimate). The first variation is imputation for strata with catch below the threshold. The second variation is imputation of abundance regardless of catch size (also while abundance is unknown). Neither case will influence the stratum harvest rate or the stratum fishery index. Both cases will result in underestimates of annual harvest rate and the SPFI, but the extent of the impact is not clear. As the second case leads to imputing abundance for all catch levels, one could expect additional strata to be imputed when they would otherwise be excluded. Thus, the second case is likely to result in lower estimates of annual harvest rate and the SPFI than the first case.

Imputing abundance using LMs for strata with low catches was demonstrated to improve the accuracy of total annual abundance estimates. However, the specific rules of application to strata lacking recovery data likely requires further investigation.

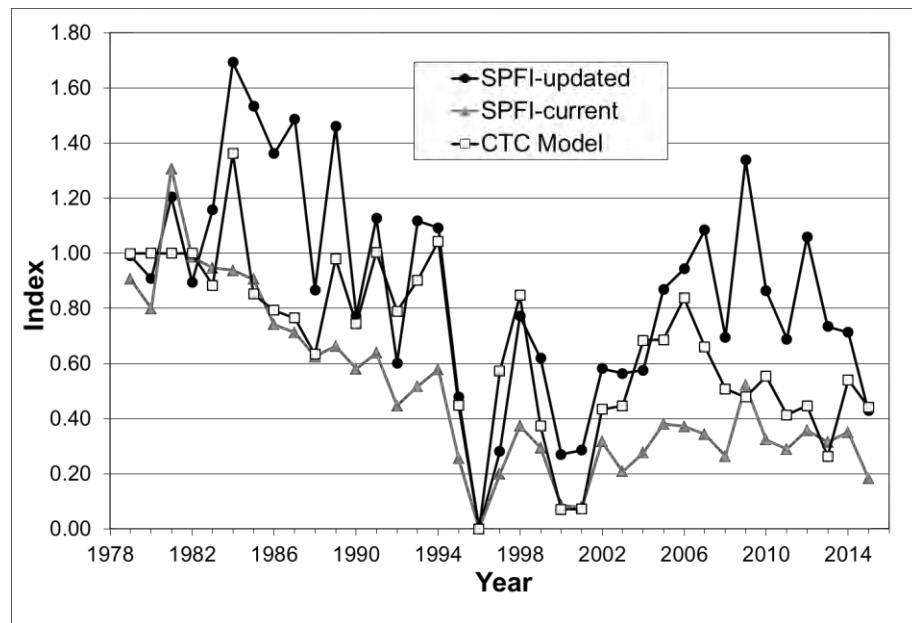
Implementation of the LM Imputation Method

Imputation is required in multiple strata for both the SEAK and WCVI AABM troll SPFIs. It is not required for the NBC fishery as the SPFI is based on a single stratum. The specific strata requiring imputation for calculation of the WCVI SPFI are provided in Appendix I14 along with the SPFI values calculated with and without imputation. Imputation can have a substantial effect on the estimated SPFI (Appendix I10). The imputation had the desired effect of reducing the magnitude of the SPFI calculated in a few years and in decreasing the difference between the SPFI and the Model FI (Appendix I10). The WCVI SPFI based on the updated list of contributing stock-age combinations and using the LM imputation was closer to the Model FI in most years although the value calculated for 2007 is an exception. The NBC SPFI based on the updated list of contributing stock-age combinations was closer to the Model FI from 1990 to 2006 (Appendix I9). In other years, it was noticeably different compared to SPFI calculated with the current stock-age list. As noted previously, the CTC anticipates further consideration of the approach used to select stock-age combinations.

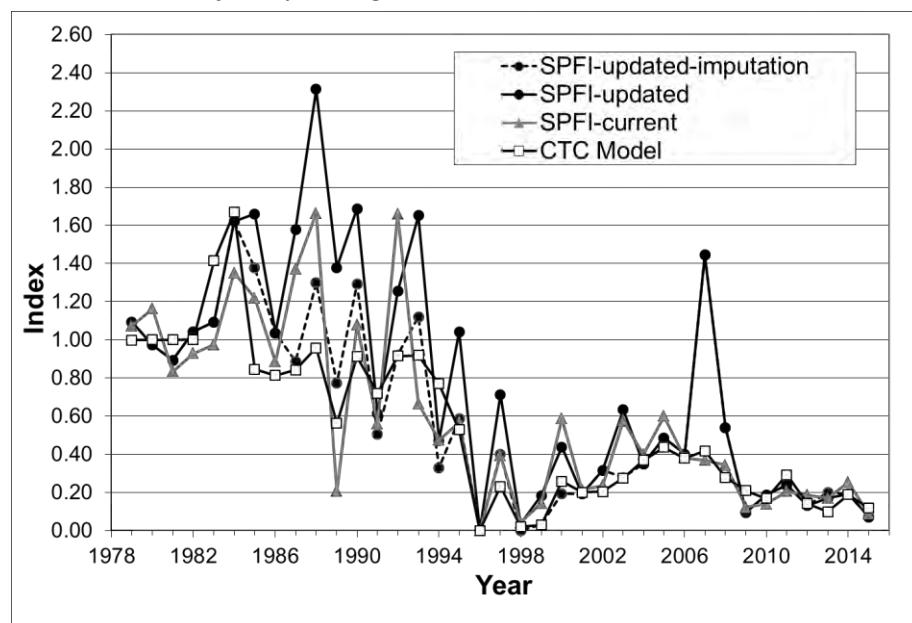
SPFIs and CTC Model FIs based on landed catch only have been presented in Appendix I9 and I10 to illustrate the effects of imputation of abundance in strata without catch and of changing

the included stock-age combinations. Similar effects are reflected in the FIs based on total mortality and the values are provided in Appendices I11 and I13.

Appendix I9—Estimated SPFIs based on the current set of stock-age combinations and an updated list, and model landed catch fishery indices for the NBC troll fishery through 2015.



Appendix I10—Estimated SPFIs based on the current set of stock-age combinations, on an updated list, on an updated list with LM imputation and model landed catch fishery indices for the WCVI troll fishery through 2015.



Appendix I11—NBC troll fishery Stratified Proportion Fishery Index (SPFI) values as landed catch and total mortality, based on CWT data and computed with the current set of selected stock-age combinations and an updated set of selected stock-age combinations.

Year	Total Mortality		Landed Catch	
	Current	Updated	Current	Updated
1979	0.91	0.99	0.91	0.99
1980	0.79	0.91	0.80	0.91
1981	1.32	1.19	1.31	1.20
1982	0.99	0.91	0.99	0.90
1983	0.96	1.22	0.95	1.16
1984	0.93	1.71	0.94	1.69
1985	0.89	1.55	0.91	1.53
1986	0.74	1.45	0.74	1.36
1987	0.80	1.61	0.71	1.49
1988	0.68	0.91	0.62	0.87
1989	0.74	1.46	0.66	1.46
1990	0.65	0.79	0.58	0.77
1991	0.64	1.13	0.64	1.13
1992	0.50	0.63	0.45	0.60
1993	0.56	1.16	0.52	1.12
1994	0.56	1.09	0.58	1.09
1995	0.27	0.51	0.26	0.48
1996*	0.00	0.00	0.00	0.00
1997	0.19	0.28	0.20	0.28
1998	0.36	0.77	0.37	0.77
1999	0.28	0.60	0.29	0.62
2000	0.10	0.27	0.09	0.27
2001	0.10	0.30	0.08	0.29
2002	0.34	0.60	0.32	0.58
2003	0.22	0.57	0.21	0.56
2004	0.30	0.62	0.28	0.58
2005	0.38	0.89	0.38	0.87
2006	0.37	0.94	0.37	0.94
2007	0.35	1.07	0.34	1.09
2008	0.29	0.76	0.26	0.70
2009	0.52	1.33	0.52	1.34
2010	0.36	0.90	0.32	0.86
2011	0.32	0.75	0.29	0.69
2012	0.40	1.12	0.36	1.06
2013	0.37	0.85	0.32	0.74
2014	0.35	0.72	0.35	0.71
2015	0.18	0.43	0.18	0.43

Appendix I12—Stock-age combinations used for estimation of NBC Stratified Proportion Fishery Index (SPFI).

ER Stock Identifiers	Current Stock-Ages			Updated Stock-Ages		
	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5
Alaska Southeast		X				
Quinsam	X	X				
Robertson Creek	X	X	X	X	X	X
Salmon River Hatchery	X	X	X		X	X
Columbia Upriver Brights	X	X	X		X	
Willamette Spring Hatchery		X			X	
Elk River					X	
Queets Fall Fingerling					X	X
Lower Shuswap Summer				X	X	
Columbia River Summers					X	X

Appendix I13–WCVI troll fishery Stratified Proportion Fishery Index (SPFI) values as landed catch and total mortality based on CWT data and computed with the current set of selected stock-age combinations, an updated set of selected stock-age combinations and the updated stock-age combinations with imputation for strata with low or no catch.

Year	Total Mortality			Landed Catch			Imputed Strata ²
	No Imputation		Imputation	No Imputation		Imputation	
	Current	Updated	Updated	Current	Updated	Updated	
1979	1.06	1.08	1.08	1.07	1.09	1.09	
1980	1.16	0.97	0.97	1.16	0.97	0.97	
1981	0.85	0.90	0.90	0.83	0.89	0.89	
1982	0.94	1.05	1.05	0.93	1.04	1.04	
1983	0.95	1.11	1.11	0.98	1.09	1.09	
1984	1.36	1.65	1.65	1.35	1.62	1.62	
1985	1.21	1.67	1.38	1.22	1.66	1.38	10
1986	0.88	1.05	1.05	0.89	1.04	1.04	
1987	1.56	1.83	1.03	1.37	1.58	0.89	10, 11
1988	1.76	2.41	1.35	1.66	2.31	1.30	10, 11
1989	0.24	1.51	0.85	0.21	1.38	0.77	10, 11
1990	1.11	1.76	1.34	1.08	1.69	1.29	10
1991	0.60	0.67	0.56	0.56	0.61	0.51	10
1992	1.71	1.32	0.97	1.66	1.25	0.92	11
1993	0.69	1.73	1.18	0.67	1.65	1.12	11
1994	0.48	0.48	0.34	0.47	0.47	0.33	11
1995	0.67	1.28	0.72	0.57	1.04	0.59	10, 11
1996 ¹	0.00	0.00	0.00	0.00	0.00	0.00	
1997	0.38	0.69	0.39	0.39	0.71	0.40	10, 11
1998 ¹	0.04	0.03	0.00	0.04	0.03	0.00	
1999	0.14	0.17	0.03	0.14	0.18	0.03	11, 12
2000	0.55	0.42	0.18	0.59	0.44	0.19	12
2001	0.20	0.18	0.18	0.22	0.19	0.19	
2002	0.22	0.30	0.30	0.24	0.32	0.32	
2003	0.54	0.61	0.27	0.57	0.63	0.28	12
2004	0.38	0.33	0.33	0.40	0.35	0.35	
2005	0.57	0.46	0.46	0.60	0.49	0.49	
2006	0.36	0.38	0.38	0.38	0.40	0.40	
2007	0.35	1.38	1.38	0.37	1.44	1.44	
2008	0.32	0.51	0.51	0.34	0.54	0.54	
2009	0.12	0.09	0.09	0.12	0.10	0.10	
2010	0.13	0.18	0.18	0.14	0.19	0.19	
2011	0.20	0.23	0.23	0.21	0.24	0.24	
2012	0.18	0.13	0.13	0.19	0.13	0.13	
2013	0.16	0.16	0.19	0.17	0.17	0.20	12
2014	0.24	0.18	0.18	0.25	0.19	0.19	
2015	0.08	0.07	0.07	0.09	0.07	0.07	

Note: SPFI values were calculated including CWT estimate from the Chilliwack Hatchery stock. Data for this stock could not be included in the calculation of the ROM indices due to lack of CWT recoveries in the 1979-82 base period.

Appendix I14–Stock-age combinations used for estimation of WCVI Stratified Proportion Fishery Index (SPFI).

ER Stock Identifiers	Current Stock-Ages			Updated Stock-Ages		
	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5
Chilliwack River Hatchery	X	X		X	X	
George Adams Fall Fingerling	X	X		X	X	
Columbia Lower River Hatchery	X	X		X	X	
Robertson Creek	X	X	X	X	X	
Samish Fall Fingerling	X	X		X	X	
Spring Creek Tule	X	X		X	X	
South Puget Sound Fingerling	X	X		X	X	
Columbia River Summers		X		X		X
Upriver Brights	X	X		X		
Willamette Spring Hatchery		X				X
Cowlitz Fall Tule		X				
Lewis River Wild		X				
Salmon River Hatchery	X	X	X			

APPENDIX J: PRESEASON FORECASTS INCLUDING 2017 AND POSTSEASON ESTIMATES FOR PSC MODEL STOCKS, 1999-2016

Note: there was no CTC consensus on the 2015 and 2016 model calibrations (CLB 1503 and 1601). Outputs from CLB 1503 were used by the Commission to configure AABM fisheries in 2015. Abundances indices for AABM fisheries generated from CLB 1601 were accepted by the Commission. For each stock group in Appendix J, preseason PSC Model forecasts for 2015 are from CLB 1503 and forecasts for 2016 are from CLB 1601.

Data in Appendix J are used to evaluate Chinook Model and Agency Forecasts. The following terminology is used:

- Model Forecast. The Model forecast for a stock is from that year's calibration (e.g., 2017 is from CLB1702). These data do not change from year-to-year and can be found in a given year's model calibration out files. [source: stage 2 checkCLB.out file]
- Agency Forecast. The Agency forecast for a stock is what was provided to the CTC for use with that year's Model calibration. These data do not change from year-to-year and can be found in a given year's model calibration input file. [source: OCNyear.FCS files]
- Postseason Return. The postseason return is the most up to date estimate of either the terminal return or the escapement, depending on how the stock is reported in the FCS file. [source: checkCLB.out or FCS file]

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
AKS ¹ (Alaska SSE)	1999	11,866	NA	12,219	NA	NA	97%
	2000	18,967	NA	16,164	NA	NA	117%
	2001	22,130	NA	21,590	NA	NA	103%
	2002	15,650	NA	18,679	NA	NA	84%
	2003	22,316	NA	14,576	NA	NA	153%
	2004	11,880	NA	17,107	NA	NA	69%
	2005	25,204	NA	15,235	NA	NA	165%
	2006	17,966	NA	20,730	NA	NA	87%
	2007	25,653	NA	15,012	NA	NA	171%
	2008	14,626	NA	13,780	NA	NA	106%
	2009	14,362	NA	10,463	NA	NA	137%
	2010	16,445	NA	15,674	NA	NA	105%
	2011	17,065	NA	11,808	NA	NA	145%
	2012	12,557	NA	6,826	NA	NA	184%
	2013	4,838	NA	8,337	NA	NA	58%
	2014	4,239	NA	10,588	NA	NA	40%
	2015	6,812	NA	9,961	NA	NA	68%
	2016	7,099	NA	5,997	NA	NA	118%
	2017	4,896	NA		NA		
	AVG				NA	NA	112%
NTH ² (North/ Central BC)	1999	149,387	NA	154,294	NA	NA	97%
	2000	159,818	NA	188,482	NA	NA	85%
	2001	189,088	NA	212,176	NA	NA	89%
	2002	228,073	NA	147,381	NA	NA	155%
	2003	154,103	NA	165,029	NA	NA	93%
	2004	171,070	NA	153,292	NA	NA	112%
	2005	154,552	NA	132,480	NA	NA	117%
	2006	132,710	NA	151,915	NA	NA	87%
	2007	156,017	NA	123,388	NA	NA	126%
	2008	131,262	NA	112,038	NA	NA	117%
	2009	119,761	NA	127,131	NA	NA	94%
	2010	136,998	NA	114,904	NA	NA	119%
	2011	119,323	NA	95,091	NA	NA	125%
	2012	98,010	NA	80,339	NA	NA	122%
	2013	86,819	NA	94,564	NA	NA	92%
	2014	94,878	NA	95,975	NA	NA	99%
	2015	95,587	NA	154,141	NA	NA	62%
	2016	146,607	NA	99,656	NA	NA	147%
	2017	108,254	104,935		103%		
	AVG				103%	NA	108%
RBH+RBT ² (WCVI Hatchery + Natural)	1999	77,836	68,400	105,402	114%	65%	74%
	2000	21,040	15,040	39,227	140%	38%	54%
	2001	33,702	30,633	89,209	110%	34%	38%
	2002	128,068	109,882	167,548	117%	66%	76%
	2003	111,430	105,801	217,662	105%	49%	51%
	2004	166,548	144,180	261,827	116%	55%	64%
	2005	244,768	218,840	157,906	112%	139%	155%
	2006	152,483	138,878	197,866	110%	70%	77%
	2007	151,925	117,321	121,232	129%	97%	125%
	2008	67,347	60,255	99,325	112%	61%	68%
	2009	76,063	58,382	92,944	130%	63%	82%
	2010	75,748	61,586	95,366	123%	65%	79%
	2011	98,929	74,708	163,092	132%	46%	61%
	2012	70,838	54,765	82,131	129%	67%	86%
	2013	32,180	NA ⁴	181,138	NA	NA	18%
	2014	205,989	216,727	120,473	95%	180%	171%
	2015	91,710	105,003	209,263	87%	50%	44%
	2016	235,776	224,119	165,589	105%	135%	142%
	2017	172,885	163,568		106%		
	AVG				115%	75%	81%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
GSQ ¹ (Upper Strait of Georgia)	1999	16,450	NA	26,783	NA	NA	61%
	2000	19,452	NA	35,101	NA	NA	55%
	2001	25,828	NA	42,436	NA	NA	61%
	2002	41,492	NA	41,022	NA	NA	101%
	2003	36,882	NA	40,500	NA	NA	91%
	2004	39,766	NA	31,803	NA	NA	125%
	2005	38,798	NA	28,490	NA	NA	136%
	2006	39,171	NA	50,989	NA	NA	77%
	2007	41,711	NA	24,877	NA	NA	168%
	2008	30,065	NA	19,392	NA	NA	155%
	2009	26,173	NA	31,323	NA	NA	84%
	2010	26,624	NA	22,480	NA	NA	118%
	2011	23,998	NA	18,751	NA	NA	128%
	2012	25,756	NA	42,830	NA	NA	60%
	2013	31,498	NA	40,341	NA	NA	78%
	2014	30,162	NA	41,418	NA	NA	73%
	2015	26,699	NA	37,253	NA	NA	72%
	2016	26,084	NA	38,648	NA	NA	67%
	2017	40,981	39,106		105%		
	AVG				105%	NA	95%
GSH ² (Lower Strait of Georgia Hatchery)	1999	22,896	NA	23,015	NA	NA	99%
	2000	19,165	NA	21,322	NA	NA	90%
	2001	17,547	NA	29,633	NA	NA	59%
	2002	25,051	NA	22,064	NA	NA	114%
	2003	21,222	NA	21,496	NA	NA	99%
	2004	16,573	NA	20,852	NA	NA	79%
	2005	21,046	NA	25,941	NA	NA	81%
	2006	18,169	NA	22,109	NA	NA	82%
	2007	24,378	NA	12,733	NA	NA	191%
	2008	11,765	NA	12,011	NA	NA	98%
	2009	17,551	NA	13,380	NA	NA	131%
	2010	7,999	NA	11,605	NA	NA	69%
	2011	14,671	NA	11,480	NA	NA	128%
	2012	10,104	NA	8,462	NA	NA	119%
	2013	5,568	NA	8,242	NA	NA	68%
	2014	6,116	NA	15,665	NA	NA	39%
	2015	18,566	NA	9,888	NA	NA	188%
	2016	5,475	NA	10,236	NA	NA	53%
	2017	10,414	11,820		88%		
	AVG				88%	NA	99%
GST ¹ (Lower Strait of Georgia Natural)	1999	14,236	NA	8,715	NA	NA	163%
	2000	11,094	NA	8,223	NA	NA	135%
	2001	7,955	NA	8,569	NA	NA	93%
	2002	8,833	NA	7,812	NA	NA	113%
	2003	8,088	NA	5,903	NA	NA	137%
	2004	5,157	NA	3,642	NA	NA	142%
	2005	4,459	NA	4,870	NA	NA	92%
	2006	4,070	NA	4,880	NA	NA	83%
	2007	7,782	NA	4,778	NA	NA	163%
	2008	6,823	NA	5,646	NA	NA	121%
	2009	5,701	NA	3,106	NA	NA	184%
	2010	2,972	NA	5,763	NA	NA	52%
	2011	10,778	NA	7,595	NA	NA	142%
	2012	11,433	NA	6,291	NA	NA	182%
	2013	8,267	NA	5,440	NA	NA	152%
	2014	11,910	NA	6,579	NA	NA	181%
	2015	13,177	NA	9,840	NA	NA	134%
	2016	7,469	NA	10,639	NA	NA	70%
	2017	11,163	10,639		105%		
	AVG				105%	NA	130%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
FRE ² (Fraser Early)	1999	162,865	NA	105,473	NA	NA	154%
	2000	118,058	NA	116,233	NA	NA	102%
	2001	122,333	NA	154,175	NA	NA	79%
	2002	170,232	NA	189,335	NA	NA	90%
	2003	202,363	NA	191,700	NA	NA	106%
	2004	185,450	NA	147,813	NA	NA	125%
	2005	151,591	NA	135,177	NA	NA	112%
	2006	141,517	NA	203,460	NA	NA	70%
	2007	196,060	NA	110,555	NA	NA	177%
	2008	128,347	NA	149,048	NA	NA	86%
	2009	153,593	NA	136,201	NA	NA	113%
	2010	144,214	NA	203,948	NA	NA	71%
	2011	174,183	NA	161,748	NA	NA	108%
	2012	175,729	NA	77,285	NA	NA	227%
	2013	83,719	NA	165,166	NA	NA	51%
	2014	176,008	NA	159,656	NA	NA	110%
	2015	173,286	NA	236,551	NA	NA	73%
	2016	258,884	NA	126,975	NA	NA	204%
	2017	180,300	184,349		98%		
	AVG				98%	NA	114%
FRL ¹ (Fraser Late)	1999	84,686	82,650	188,873	102%	44%	45%
	2000	187,970	220,400	133,998	85%	164%	140%
	2001	141,745	131,800	192,693	108%	68%	74%
	2002	132,946	160,100	172,451	83%	93%	77%
	2003	127,144	114,780	308,769	111%	37%	41%
	2004	104,597	97,227	206,892	108%	47%	51%
	2005	121,315	108,061	130,229	112%	83%	93%
	2006	115,489	116,682	116,985	99%	100%	99%
	2007	122,402	107,311	110,736	114%	97%	111%
	2008	125,100	116,038	88,667	108%	131%	141%
	2009	119,892	91,391	100,220	131%	91%	120%
	2010	119,953	118,891	195,898	101%	61%	61%
	2011	353,646	284,604	182,777	124%	156%	193%
	2012	107,738	93,652	70,362	115%	133%	153%
	2013	70,178	73,584	106,463	95%	69%	66%
	2014	131,118	118,361	112,963	111%	105%	116%
	2015	88,165	72,037	145,486	122%	50%	61%
	2016	57,236	51,903	93,941	110%	55%	61%
	2017	112,272	107,065		105%		
	AVG				108%	88%	95%
NKS ⁴ (Nooksack Spring)	1999	1,048	NA	989	NA	NA	106%
	2000	834	NA	1,526	NA	NA	55%
	2001	982	NA	2,452	NA	NA	40%
	2002	1,216	NA	4,030	NA	NA	30%
	2003	1,301	NA	3,061	NA	NA	43%
	2004	1,708	NA	1,849	NA	NA	92%
	2005	1,549	NA	2,167	NA	NA	71%
	2006	583	677	1,539	86%	44%	38%
	2007	582	575	1,620	101%	35%	36%
	2008	371	378	1,584	98%	24%	23%
	2009	336	315	2,197	107%	14%	15%
	2010	374	390	2,421	96%	16%	15%
	2011	340	309	1,236	110%	25%	28%
	2012	271	243	1,225	112%	20%	22%
	2013	1,331	NA	1,466	NA	NA	91%
	2014	1,361	1,273	1,273	107%	100%	107%
	2015	1,192	1,119	1,119	107%	100%	107%
	2016	1,308	1,324	1,324	99%	100%	99%
	2017	1,297	1,291		100%		
	AVG				102%	48%	57%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
NKF ² (Nooksack/ Samish Fall Fingerling)	1999	27,206	27,000	43,709	101%	62%	62%
	2000	21,277	19,000	35,630	112%	53%	60%
	2001	33,974	36,450	71,437	93%	51%	48%
	2002	50,361	54,420	62,519	93%	87%	81%
	2003	48,259	45,750	33,339	105%	137%	145%
	2004	37,980	34,200	18,118	111%	189%	210%
	2005	19,808	19,523	20,703	101%	94%	96%
	2006	16,795	16,899	38,455	99%	44%	44%
	2007	22,086	18,834	39,390	117%	48%	56%
	2008	34,392	35,271	33,750	98%	105%	102%
	2009	26,072	23,014	25,884	113%	89%	101%
	2010	32,061	32,627	41,239	98%	79%	78%
	2011	39,144	37,902	40,678	103%	93%	96%
	2012	45,719	43,973	41,557	104%	106%	110%
	2013	50,065	48,257	37,525	104%	129%	133%
	2014	46,771	44,046	32,053	106%	137%	146%
	2015	40,315	39,739	23,696	101%	168%	170%
	2016	29,171	28,611	15,988	102%	179%	182%
	2017	21,922	21,997		100%		
	AVG				103%	103%	107%
SKG ² (Skagit Summer/ Fall Wild)	1999	8,967	7,600	5,139	118%	148%	174%
	2000	6,988	7,300	16,266	96%	45%	43%
	2001	9,064	9,183	14,193	99%	65%	64%
	2002	12,635	13,455	18,114	94%	74%	70%
	2003	11,906	11,348	10,583	105%	107%	113%
	2004	18,761	20,359	22,144	92%	92%	85%
	2005	16,220	19,493	22,784	83%	86%	71%
	2006	22,402	21,811	21,246	103%	103%	105%
	2007	12,324	14,252	12,646	86%	113%	97%
	2008	18,598	18,302	14,254	102%	128%	130%
	2009	22,193	20,400	10,977	109%	186%	202%
	2010	9,894	11,853	7,926	83%	150%	125%
	2011	12,556	13,044	8,382	96%	156%	150%
	2012	10,020	8,337	15,422	120%	54%	65%
	2013	7,287	13,018	13,312	56%	98%	55%
	2014	15,221	17,874	12,777	85%	140%	119%
	2015	9,820	11,387	13,315	86%	86%	74%
	2016	14,336	14,361	17,426	100%	82%	82%
	2017	15,947	14,429		111%		
	AVG				96%	106%	101%
STL ⁴ (Stillaguamish Summer/Fall Wild)	1999	1,303	NA	1,194	NA	NA	109%
	2000	1,370	1,500	1,612	91%	93%	85%
	2001	1,328	1,360	1,351	98%	101%	98%
	2002	1,372	1,449	1,564	95%	93%	88%
	2003	1,860	2,050	990	91%	207%	188%
	2004	1,795	NA	1,509	NA	NA	119%
	2005	1,377	NA	1,036	NA	NA	133%
	2006	1,113	1,169	1,253	95%	93%	89%
	2007	1,424	1,510	607	94%	249%	235%
	2008	689	637	1,671	108%	38%	41%
	2009	1,268	1,086	1,001	117%	108%	127%
	2010	898	817	783	110%	104%	115%
	2011	812	783	1,018	104%	77%	80%
	2012	569	395	1,534	144%	26%	37%
	2013	1,393	1,328	854	105%	156%	163%
	2014	1,000	850	432	118%	197%	231%
	2015	514	525	459	98%	114%	112%
	2016	346	299	595	116%	50%	58%
	2017	360	266		135%		
	AVG				107%	114%	117%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
SNO ² (Snohomish Wild)	1999	5,804	5,600	2,524	104%	222%	230%
	2000	5,997	6,000	3,269	100%	184%	183%
	2001	5,876	5,760	6,742	102%	85%	87%
	2002	6,524	6,700	7,422	97%	90%	88%
	2003	6,033	5,450	5,786	111%	94%	104%
	2004	12,845	15,700	10,994	82%	143%	117%
	2005	10,161	NA	4,963	NA	NA	205%
	2006	7,824	8,729	7,180	90%	122%	109%
	2007	11,153	12,289	2,832	91%	434%	394%
	2008	6,103	6,541	6,986	93%	94%	87%
	2009	8,503	8,410	1,830	101%	460%	465%
	2010	8,050	9,858	3,488	82%	283%	231%
	2011	8,281	7,600	1,414	109%	537%	586%
	2012	2,506	2,775	3,361	90%	83%	75%
	2013	3,835	3,161	2,684	121%	118%	143%
	2014	3,416	3,327	2,375	103%	140%	144%
	2015	3,809	4,159	2,329	92%	179%	164%
	2016	3,586	3,339	4,386	107%	76%	82%
	2017	3,775	3,412		111%		
	AVG				99%	197%	194%
PSF+PSY ² (Puget Sound Fingerling + Yearling)	1999	66,260	69,285	146,471	96%	47%	45%
	2000	67,306	69,800	100,425	96%	70%	67%
	2001	102,899	105,955	145,822	97%	73%	71%
	2002	114,889	124,608	147,447	92%	85%	78%
	2003	114,275	133,850	144,177	85%	93%	79%
	2004	127,902	132,300	143,731	97%	92%	89%
	2005	104,084	110,542	155,325	94%	71%	67%
	2006	107,292	113,486	191,623	95%	59%	56%
	2007	127,115	135,714	221,341	94%	61%	57%
	2008	166,071	159,200	160,626	104%	99%	103%
	2009	138,299	133,187	136,695	104%	97%	101%
	2010	138,238	140,074	144,296	99%	97%	96%
	2011	172,415	168,642	155,941	102%	108%	111%
	2012	153,462	153,989	192,714	100%	80%	80%
	2013	189,645	184,783	182,276	103%	101%	104%
	2014	191,307	188,039	80,047	102%	235%	239%
	2015	128,255	131,300	96,003	98%	137%	134%
	2016	109,207	96,430	120,939	113%	80%	90%
	2017	142,320	144,238		99%		
	AVG				98%	94%	93%
PSN ² (Puget Sound Natural)	1999	28,536	28,400	23,215	100%	122%	123%
	2000	15,364	10,000	17,882	154%	56%	86%
	2001	19,938	18,900	26,107	105%	72%	76%
	2002	20,008	19,801	25,009	101%	79%	80%
	2003	25,743	26,600	9,233	97%	288%	279%
	2004	24,616	23,200	16,023	106%	145%	154%
	2005	22,208	17,715	10,903	125%	162%	204%
	2006	20,182	21,301	13,095	95%	163%	154%
	2007	18,964	17,014	12,094	111%	141%	157%
	2008	23,118	21,100	18,637	110%	113%	124%
	2009	24,698	23,073	6,772	107%	341%	365%
	2010	14,734	15,128	6,745	97%	224%	218%
	2011	18,115	15,997	6,893	113%	232%	263%
	2012	14,396	13,860	10,213	104%	136%	141%
	2013	12,079	8,767	7,770	138%	113%	155%
	2014	9,253	8,125	7,354	114%	110%	126%
	2015	7,797	7,478	9,546	104%	78%	82%
	2016	7,801	7,066	8,368	110%	84%	93%
	2017	8,901	8,040		111%		
	AVG				111%	148%	160%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
WCH ² (Washington Coastal Hatchery)	1999	35,221	42,752	13,535		82%	316%
	2000	16,244	NA	22,571		NA	72%
	2001	15,792	NA	23,166		NA	68%
	2002	23,678	NA	34,243		NA	69%
	2003	20,755	18,222	41,766	114%	44%	50%
	2004	28,900	NA	39,651		NA	73%
	2005	28,626	NA	40,458		NA	71%
	2006	36,950	NA	51,155		NA	72%
	2007	41,801	40,497	22,669	103%	179%	184%
	2008	34,841	31,251	26,397	111%	118%	132%
	2009	41,756	42,595	38,162	98%	112%	109%
	2010	38,347	NA	41,498		NA	92%
	2011	38,208	NA	63,942		NA	60%
	2012	45,128	44,300	40,311	102%	110%	112%
	2013	33,629	25,304	44,091	133%	57%	76%
	2014	40,866	42,907	51,226	95%	84%	80%
	2015	42,604	38,120	54,902	112%	69%	78%
	2016	57,443	52,174	31,983	110%	163%	180%
	2017	47,587	47,079		101%		
	AVG				106%	125%	102%
WCN ² (Washington Coastal Natural)	1999	42,107	43,780	25,065		96%	175%
	2000	34,741	NA	26,507		NA	131%
	2001	34,563	35,306	34,747		98%	102%
	2002	33,902	33,489	36,183	101%	93%	94%
	2003	32,785	NA	39,947		NA	82%
	2004	28,185	NA	57,917		NA	49%
	2005	34,857	NA	41,461		NA	84%
	2006	43,866	NA	38,246		NA	115%
	2007	35,695	32,362	26,270	110%	123%	136%
	2008	32,187	26,923	31,219	120%	86%	103%
	2009	35,485	31,318	27,215	113%	115%	130%
	2010	39,215	NA	40,293		NA	97%
	2011	32,205	NA	49,824		NA	65%
	2012	45,153	41,500	40,637	109%	102%	111%
	2013	35,464	34,023	34,086	104%	100%	104%
	2014	44,952	46,275	32,459	97%	143%	138%
	2015	48,297	50,360	52,225	96%	96%	92%
	2016	48,034	41,095	27,085	117%	152%	177%
	2017	39,456	36,705		107%		
	AVG				106%	117%	110%
CWS ² (Cowlitz Spring)	1999	3,363	3,950	4,799		85%	82%
	2000	4,922	6,050	6,132		81%	99%
	2001	3,684	4,849	7,182		76%	68%
	2002	5,534	6,800	11,644		81%	58%
	2003	9,550	11,700	25,584		82%	46%
	2004	20,802	27,350	28,696		76%	95%
	2005	18,349	24,850	16,227		74%	153%
	2006	12,838	15,250	19,685		84%	77%
	2007	9,945	10,600	19,519		94%	54%
	2008	9,544	12,400	6,838		77%	181%
	2009	6,413	14,400	7,867		45%	183%
	2010	18,927	19,409	12,211		98%	159%
	2011	9,654	10,602	7,946		91%	133%
	2012	9,287	8,724	15,429		106%	57%
	2013	9,348	7,727	11,244		121%	69%
	2014	9,569	9,400	11,452		102%	82%
	2015	15,530	14,100	27,941		110%	50%
	2016	35,176	30,977	26,786		114%	116%
	2017	24,763	21,300		116%		
	AVG				90%	98%	83%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
WSH ² (Willamette Spring)	1999	46,181	49,875	57,787	93%	86%	80%
	2000	57,202	61,211	61,292	93%	100%	93%
	2001	59,207	59,600	85,695	99%	70%	69%
	2002	73,151	77,434	127,613	94%	61%	57%
	2003	108,530	112,521	132,199	96%	85%	82%
	2004	113,708	112,701	157,126	101%	72%	72%
	2005	105,111	122,280	68,642	86%	178%	153%
	2006	48,880	52,388	64,044	93%	82%	76%
	2007	44,542	61,071	43,301	73%	141%	103%
	2008	20,185	40,851	32,628	49%	125%	62%
	2009	44,161	41,205	42,088	107%	98%	105%
	2010	70,960	66,360	118,187	107%	56%	60%
	2011	117,375	109,600	85,975	107%	127%	137%
	2012	105,098	88,202	70,153	119%	126%	150%
	2013	58,436	65,982	53,062	89%	124%	110%
	2014	58,496	64,189	51,794	91%	124%	113%
	2015	54,162	55,440	87,071	98%	64%	62%
	2016	73,333	70,100	49,768	105%	141%	147%
	2017	38,756	40,190		96%		
	AVG				95%	103%	96%
SUM ² (Columbia River Summer)	1999	21,653	20,900	21,867	104%	96%	99%
	2000	27,214	28,038	22,595	97%	124%	120%
	2001	27,029	24,500	52,960	110%	46%	51%
	2002	70,290	77,700	89,524	90%	87%	79%
	2003	97,280	87,600	83,058	111%	105%	117%
	2004	83,246	78,569	65,623	106%	120%	127%
	2005	66,190	62,400	60,272	106%	104%	110%
	2006	75,848	78,512	77,573	97%	101%	98%
	2007	56,948	45,555	37,035	125%	123%	154%
	2008	50,171	52,000	55,532	96%	94%	90%
	2009	68,114	70,700	53,881	96%	131%	126%
	2010	81,403	88,800	72,364	92%	123%	112%
	2011	89,000	91,900	80,574	97%	114%	110%
	2012	91,202	91,200	58,300	100%	156%	156%
	2013	72,042	73,500	67,603	98%	109%	107%
	2014	69,644	67,500	78,304	103%	86%	89%
	2015	76,664	73,000	126,882	105%	58%	60%
	2016	105,748	93,300	91,048	113%	102%	116%
	2017	75,738	63,100		120%		
	AVG				104%	104%	107%
BON+CWF ² (Bonneville + Cowlitz Hatcheries)	1999	26,112	34,800	39,881	75%	87%	65%
	2000	17,095	23,700	26,971	72%	88%	63%
	2001	28,732	32,200	94,240	89%	34%	30%
	2002	100,401	137,600	156,411	73%	88%	64%
	2003	100,196	115,900	154,960	86%	75%	65%
	2004	64,696	77,100	108,308	84%	71%	60%
	2005	65,971	74,100	73,861	89%	100%	89%
	2006	49,173	55,800	58,317	88%	96%	84%
	2007	49,219	54,900	32,689	90%	168%	151%
	2008	58,557	59,000	60,268	99%	98%	97%
	2009	91,519	88,800	76,738	103%	116%	119%
	2010	95,581	90,600	103,055	105%	88%	93%
	2011	139,873	133,430	108,961	105%	122%	128%
	2012	132,629	126,999	84,798	104%	150%	156%
	2013	86,456	94,600	103,213	91%	92%	84%
	2014	98,459	110,000	101,827	90%	108%	97%
	2015	84,204	94,900	128,705	89%	74%	65%
	2016	131,890	133,700	81,860	99%	163%	161%
	2017	85,726	92,400		93%		
	AVG				91%	101%	93%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
SPR ² (Spring Creek Hatchery)	1999	63,203	65,800	50,189	96%	131%	126%
	2000	17,335	21,900	20,528	79%	107%	84%
	2001	56,089	56,600	124,954	99%	45%	45%
	2002	153,070	144,400	160,836	106%	90%	95%
	2003	89,116	96,900	180,592	92%	54%	49%
	2004	124,820	138,000	175,245	90%	79%	71%
	2005	92,021	114,100	93,145	81%	122%	99%
	2006	43,421	50,000	27,918	87%	179%	156%
	2007	19,421	21,800	14,549	89%	150%	133%
	2008	87,109	87,200	79,433	100%	110%	110%
	2009	46,652	59,300	48,970	79%	121%	95%
	2010	167,251	169,000	128,554	99%	131%	130%
	2011	105,900	116,400	70,531	91%	165%	150%
	2012	72,135	63,800	56,947	113%	112%	127%
	2013	36,276	38,000	86,703	95%	44%	42%
	2014	108,724	115,100	127,586	94%	90%	85%
	2015	145,389	160,500	166,359	91%	96%	87%
	2016	84,230	89,600	44,555	94%	201%	189%
	2017	158,396	158,400		100%		
	AVG				93%	113%	104%
URB ² (Columbia Upriver Bright)	1999	173,712	147,500	165,889	118%	89%	105%
	2000	212,317	171,100	156,553	124%	109%	136%
	2001	150,973	127,200	232,491	119%	55%	65%
	2002	249,721	281,000	276,948	89%	101%	90%
	2003	246,890	280,400	373,191	88%	75%	66%
	2004	246,943	292,200	362,804	85%	81%	68%
	2005	318,535	352,200	278,339	90%	127%	114%
	2006	231,319	253,900	230,390	91%	110%	100%
	2007	168,594	182,400	114,064	92%	160%	148%
	2008	151,839	162,500	196,881	93%	83%	77%
	2009	259,415	259,900	212,047	100%	123%	122%
	2010	296,816	310,800	324,908	96%	96%	91%
	2011	388,138	398,200	322,234	97%	124%	120%
	2012	365,693	353,500	297,827	103%	119%	123%
	2013	437,422	432,500	778,254	101%	56%	56%
	2014	874,989	973,300	683,461	90%	142%	128%
	2015	489,123	500,300	795,915	98%	63%	61%
	2016	568,210	589,000	406,572	96%	145%	140%
	2017	253,016	260,000		97%		
	AVG				98%	103%	101%
LYF ¹ (Snake River Wild) Time series reworked per TAC guidance November 2016	1999	523	NA	905	NA	NA	58%
	2000	1,243	NA	1,148	NA	NA	108%
	2001	733	734	5,163	100%	14%	14%
	2002	2,066	NA	2,116	NA	NA	98%
	2003	2,493	2,185	3,856	114%	57%	65%
	2004	4,323	3,725	2,983	116%	125%	145%
	2005	4,453	4,000	2,602	111%	154%	171%
	2006	8,285	3,500	2,483	237%	141%	334%
	2007	3,128	2,700	2,016	116%	134%	155%
	2008	2,718	2,534	2,222	107%	114%	122%
	2009	5,743	6,952	1,431	83%	486%	401%
	2010	2,609	2,610	9,583	100%	27%	27%
	2011	9,199	8,006	7,895	115%	101%	117%
	2012	10,401	8,683	12,797	120%	68%	81%
	2013	15,154	14,900	20,425	102%	73%	74%
	2014	31,106	31,642	14,172	98%	223%	219%
	2015	18,072	NA	16,212	NA	NA	111%
	2016	15,912	12,800	9,772	124%	131%	163%
	2017	11,091	8,100		137%		
	AVG				119%	132%	137%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
MCB ² (Mid-Columbia Bright)	1999	37,951	38,300	50,800	99%	75%	75%
Post season return	2000	53,460	50,600	37,200	106%	136%	144%
Reworked per	2001	45,055	43,500	76,600	104%	57%	59%
TAC guidance	2002	102,085	96,200	108,400	106%	89%	94%
November 2016	2003	126,698	104,800	150,300	121%	70%	84%
Reworked per	2004	94,895	90,400	122,600	105%	74%	77%
TAC guidance	2005	93,837	89,400	97,900	105%	91%	96%
November 2016	2006	90,780	88,300	80,471	103%	110%	113%
Reworked per	2007	77,470	68,000	47,575	114%	143%	163%
TAC guidance	2008	59,481	54,000	75,489	110%	72%	79%
November 2016	2009	99,685	94,400	73,069	106%	129%	136%
Reworked per	2010	82,454	72,600	78,937	114%	92%	104%
TAC guidance	2011	108,005	100,000	87,235	108%	115%	124%
November 2016	2012	100,809	90,800	61,392	111%	148%	164%
Reworked per	2013	113,333	105,200	249,588	108%	42%	45%
TAC guidance	2014	377,357	360,100	203,175	105%	177%	186%
November 2016	2015	156,711	113,300	170,620	138%	66%	92%
Reworked per	2016	115,632	101,000	88,299	114%	114%	131%
TAC guidance	2017	62,130	45,600		136%		
	AVG				111%	100%	109%
LRW ² (Lewis River Wild)	1999	3,068	2,600	3,349	118%	78%	92%
Time series	2000	4,053	3,500	10,234	116%	34%	40%
reworked per TAC	2001	16,574	16,700	15,721	99%	106%	105%
guidance	2002	18,910	18,200	24,948	104%	73%	76%
November 2016	2003	25,820	24,600	26,021	105%	95%	99%
Reworked per	2004	24,590	24,100	22,327	102%	108%	110%
TAC guidance	2005	21,937	20,200	16,767	109%	120%	131%
November 2016	2006	19,818	16,600	17,896	119%	93%	111%
Reworked per	2007	10,306	10,100	4,276	102%	236%	241%
TAC guidance	2008	4,479	3,800	7,120	118%	53%	63%
November 2016	2009	9,363	8,500	7,533	110%	113%	124%
Reworked per	2010	11,034	9,700	11,491	114%	84%	96%
TAC guidance	2011	13,429	12,500	15,376	107%	81%	87%
November 2016	2012	17,806	16,200	12,112	110%	134%	147%
Reworked per	2013	16,713	14,200	25,841	118%	55%	65%
TAC guidance	2014	42,365	34,200	25,805	124%	133%	164%
November 2016	2015	32,374	18,900	32,403	171%	58%	100%
Reworked per	2016	29,122	22,200	13,034	131%	170%	223%
TAC guidance	2017	19,063	12,500		153%		
	AVG				117%	101%	115%
ORC ¹ (Oregon Coastal)	1999	65,249	72,084	82,084	91%	88%	79%
Observed return	2000	61,457	63,259	67,771	97%	93%	91%
reworked per	2001	58,062	66,412	130,795	87%	51%	44%
ODFW review	2002	73,055	73,914	171,904	99%	43%	42%
November 2016	2003	101,310	85,483	183,183	119%	47%	55%
Reworked per	2004	135,716	131,904	138,150	103%	95%	98%
TAC guidance	2005	133,886	167,213	106,632	80%	157%	126%
November 2016	2006	125,550	136,373	109,112	92%	125%	115%
Reworked per	2007	108,338	131,195	46,242	83%	284%	234%
TAC guidance	2008	53,417	70,101	39,887	76%	176%	134%
November 2016	2009	32,254	48,072	53,550	67%	90%	60%
Reworked per	2010	51,234	59,806	72,206	86%	83%	71%
TAC guidance	2011	73,043	78,199	99,247	93%	79%	74%
November 2016	2012	82,789	80,749	91,655	103%	88%	90%
Reworked per	2013	70,385	80,095	117,203	88%	68%	60%
TAC guidance	2014	81,984	109,029	133,614	75%	82%	61%
November 2016	2015	63,642	94,715	144,548	67%	66%	44%
Reworked per	2016	110,710	119,374	103,789	93%	115%	107%
TAC guidance	2017	80,529	87,243		92%		
	AVG				89%	102%	88%

¹ Escapement; ² Terminal Run; ³ Puget Sound run sizes for 2015 are preliminary postseason projections based on partial return information; ⁴ An agency forecast was provided in 2013 for the WCVI aggregate (27,339) but the decision was made by the CTC to exclude it from the Model calibration. The Model forecast was 32,180 and both forecasts were large under-forecasts.

APPENDIX K: ISSUES WITH AND CHANGES TO THE EXPLOITATION RATE ANALYSIS

Changes to data and analysis involved in the ERA

In 2014, a standardized fishery structure of 186 fisheries across all PST jurisdictions was implemented in the CAS database for the ERA. Formerly, the fishery structure used to create the Cfiles, a text file summarizing the estimated recoveries for an individual CWT, was agency-specific. Implementation of the expanded fishery strata required extensive review and modifications to the fishery definition tables in the CAS database. Three strata for escapement completed the output to the Cfiles for a total of 189 reporting strata. Since that time 8 additional fisheries have been added to the standardized structure and 2 have been removed resulting in the current total of 195 strata.

In 2017, the 195 Cfile reporting strata are mapped to a total of 80 PSC reporting strata for output from the cohort analysis procedure. The 80 reporting strata (with the 80th being escapement to the stream of origin) is an increase from the 69 strata put into place in 2014 which was an increase from 33 strata that existed prior to that time. The 2017 expanded reporting strata continue to improve upon the definitions of stock-specific terminal fisheries, as well as country-specific designation of the true terminal fisheries for each CWT indicator. Previous to 2014, terminal freshwater fishery impacts were grouped under a single *terminal sport* or *terminal net* fishery regardless of whether the impacts occurred in the watershed of origin for the stock or in another watershed, or possibly even in the other country. Improved reporting strata for terminal fishery impacts will result in improved stock- and country-specific estimates of ISBM fishery impacts.

New and previously undefined strata for the estimated CWT recoveries were introduced in 2014 to make up the list of 189 Cfile reporting strata and the 69 PSC reporting strata. These included Alaska Terminal Troll, and four categories for recoveries in freshwater areas outside of the watershed of origin (i.e., strays). The four stray categories introduced in 2014 were 1) any recovery in a freshwater fishery in Canada outside the terminal area defined for a stock, 2) any recovery in a freshwater fishery in BC outside the terminal area defined for a stock, 3) any escapement recovery in Canada outside the stream of origin, and 4) any escapement recovery in the US outside the stream of origin. These stray fishery and escapement reporting strata required modifications to the cohort analysis program. In 2017, two of the stray categories were removed, and four Canadian transboundary river fisheries and four Alaska troll MSF fisheries were added. Modifications to the Visual Basic compute code have been made so that the estimated recoveries in the stray categories were included in the estimation of the cohort sizes at age but were excluded from calculation of the true terminal fishery harvest rates. The structure of output files from the cohort analysis was modified to include the new stray categories to facilitate their use in subsequent calculations such as the ISBM indices. Prior to 2014, if stray recoveries were included at all, and they occurred outside the other country of origin, they counted in the ISBM index of the home country.

Programs that process output from the cohort analysis of the CWT recoveries also required modification to read the new expanded list of 80 PSC reporting strata and to process the stray categories as required (e.g., the program used to generate the mortality distribution tables).

APPENDIX L: ISSUES WITH AND CHANGES TO THE PSC CHINOOK MODEL CALIBRATION

Changes to data inputs to the Chinook Model calibration

Changes to escapement or terminal run data in the FCS (forecast) file:

- In 2017 Canada (DFO) began to supply forecasts (using ForecastR) of escapement/terminal return
- FRL - entire escapement time series beyond the base period (1983 onwards) was updated
- GSQ – escapement from 1994-2015 updated
- NKF – terminal run updated for 1979-2015
- PSF – terminal run time series was updated from 1979 onwards
- PSN – terminal run time series was updated from 1979 onwards
- SNO – terminal run time series was updated from 1979 onwards
- NOC – entire escapement time series beyond the base period (1983 onwards) was updated; these were mostly increases in escapement for unsurveyed areas in many years but also age structure was re-evaluated for all years

The 2017 calibration that was agreed upon (1702) by the Commission used terminal Columbia River Net fishery FP values that were subsequently discovered to have been incorrectly calculated and also associated to the incorrect stock identification code. Calibration 1702 supplied an AI to set the allowable catch for the North BC Troll AABM fishery ($AI=1.15$) that was found to be slightly overestimated compared to a later recalibration (1703; $AI=1.14$). Calibration 1703 did not result in a change to the AI for the SEAK and WCVI AABM fisheries.

Changes to data inputs to the Chinook Model calibration

Changes to escapement or terminal run data in the FCS (forecast) file:

- FRL – entire escapement time series outside of the base period from 1985 onwards was updated
- RBT – entire terminal run time series from 1979 onwards was reviewed and updated
- GSQ – escapement from 2008 onwards was updated
- GST – escapement time series from 2010 onwards was updated
- PSF – entire terminal run time series was updated
- LYF – escapement time series from 2005 onwards was updated

Stock-specific FP values were calculated and entered into the Northern Troll FPA file to represent changes in impacts that have occurred given the DFO management objective of limiting impacts on WCVI-origin Chinook salmon since 2000.

Three variants of the forecast for the WCVI stock aggregate were provided by Diana Dobson (DFO) this year in addition to the standard forecast. The standard forecast has been based on a fixed set of fishery scalars relative to fishery impacts observed in the 1979–1981 base period, with the expansion to the total aggregate based on high quality terminal run data available for the Somass River stock, the watershed-of-origin for the Robertson Creek CWT indicator. The decision was made by the CTC to use a variant forecast, which was based on fishery scalars reflecting recent exploitation rates, with separate expansions for each of the three large hatchery systems and the natural systems, to obtain the total aggregate forecast. The variant forecast was almost twice the magnitude of the standard forecast (216,728 vs 111,550 for the aggregate terminal return) but was considered to better represent the trends in abundance of the contributing stocks.

The agency forecast for 2013 was used as input in the model forecast (.FCS) file in place of the observed return in 2013 for some stocks. The 2013 return was not available in time for the model calibration for three of the stocks (PSN, WCH and WCN) but was available for three others (CWS, SNO and STL). The 2013 forecast and observed return for the latter stocks is as follows:

CWS (forecast for 2013 = 7727; 2013 observed return = 12147)
SNO (forecast for 2013 = 3161; 2013 observed return = 3294)
STL (forecast for 2013 = 1328; 2013 observed return = 854)