WCVI Salmon Bulletin
2021 WCVI Chinook Terminal Forecast
27 May 2021

SUMMARY

- After ocean fisheries, the 2021 forecast return of Stamp/RCH adult Chinook to the terminal area of Barkley Sound and Alberni Inlet is **133,000** (range: 98,000–167,000).
- The 2020 estimated terminal return of WCVI index stocks (*i.e*. excluding catch in pre-terminal fisheries) was 217,000 adults. The 2020 pre-season forecast prediction was 22% lower than the observed return. The terminal return of the Stamp River/RCH CWT Indicator Stock was approximately 122,000 adults and 6,000 jacks (age-2 males), 24% higher than the pre-season prediction.
- In 2020, the total estimated pre-terminal exploitation rate on WCVI Chinook was 22%. Estimates for age 3, 4 and 5 year old fish were 6%, 20% and 37%, respectively.
- Terminal returns of other WCVI stocks are forecast to be moderate to strong in 2021. The forecast of aggregate terminal abundance (sum of all hatchery and wild indicator stocks) is 236,000 (range: 164,000–305,000), significantly higher than the long-term average of 157,000 (1980–2020). The overall expected adult age composition of the WCVI aggregate terminal run is 25% age-3, 59% age-4, and 16% age-5, with an expected sex ratio of 43% female.
- After a period of modest increase of wild populations, escapements have been decreasing over the last four years for wild stocks. Spawner levels in the SWVI CU remain below upper biological benchmarks with fewer than 100 spawners observed in some rivers in recent years. Therefore, wild WCVI Chinook remains a stock of concern.

BACKGROUND

- Chinook salmon spawn in over 100 medium and large rivers along the West Coast of Vancouver Island (WCVI), with 60 systems having escapement records of at least 100 spawners. For implementation of Canada's Wild Salmon Policy (WSP), stock status is evaluated for a set of wild indicator populations within conservation units (CUs). CUs are groups of biologically and genetically similar populations. There are three Chinook CUs defined within the WCVI; including Southwest Vancouver Island (populations within DFO Statistical Areas 20–24, or from San Juan to Clayoquot Sound); Nootka-Kyuquot (populations within DFO Statistical Areas 25 and 26) and North Vancouver Island (populations within DFO Statistical Area 27, or Quatsino Sound).
- The average aggregate terminal return (catch and escapement) of WCVI Chinook is approximately 157,000; ranging from about 40,000–300,000 over the period from 1980–2020. However, a large portion of the terminal return and spawning escapement is hatchery-origin fish. About twenty WCVI populations receive some form of hatchery enhancement to supplement natural spawning. Annual releases of Chinook smolts from WCVI enhancement facilities total about 21 million per year. The majority (17M) are released directly from three major hatcheries located on the Stamp, Nitinat, and Conuma rivers, but there is also additional enhancement of Chinook populations in nearby systems either directly or through straying. About 3 million Chinook smolts are released annually from smaller facilities, including volunteer public involvement projects and community development projects.
- The Stamp River/Robertson Creek Hatchery (RCH) Chinook salmon stock is the coded-wire-tag (CWT) indicator stock for survival, exploitation rate and marine distribution patterns of WCVI

Chinook populations. Detailed assessments and forecasts of the Stamp/RCH indicator stock are required annually for management and as an indicator of the status and expected returns for other WCVI populations. Management actions taken to achieve goals for this stock in pre-terminal fisheries are assumed to have similar effects on other WCVI stocks. Forecasts developed for other WCVI Chinook stocks to determine the expected aggregate abundance of WCVI Chinook and to inform terminal fishery management are based on trends in marine survival and exploitation rate of the RCH indicator stock.

FORECAST METHODOLOGY

Stamp River / Robertson Creek Hatchery (RCH)

Riddell *et al*. (PSARC 96-01) outlined the analytical framework for forecasting returns of Stamp River / RCH Chinook. This forecast follows the same procedures.

Cohort analysis is conducted using 'estimated' CWT recoveries (for select tag codes representing normal releases) to estimate production of RCH Chinook. The cohort model used is documented in Appendix 2 of Starr and Argue (1991) and was modified by the Pacific Salmon Commission's Chinook Technical Committee to account for the Chinook non-retention fisheries implemented in Canada (TCCHINOOK (99)-2). For each brood year, information generated from the cohort analyses and used in forecast models includes: i) survival to age 2 recruitment; ii) ocean exploitation rates by fishery and age; and iii) total estimated production. The cohort analysis produces estimates of CWT recoveries in all Canadian and USA fisheries, escapement, and stray escapement. Total production is then determined by expanding all estimated CWTs by the total release/CWT ratios for the selected tag codes and then correcting this using recent average observed total returns/CWT based estimates.

To forecast production of RCH Chinook, or "pre-fishery abundance", two sibling regression models are applied that use information from younger age classes to predict the production of older age classes:

- Model 1 uses total terminal return at a younger age class (independent variable) to predict total production (the surviving cohort in the ocean) of a subsequent age or ages from the same brood year. The dependent variable is the total (total ocean fishing mortality plus terminal run) production at a subsequent age or ages. All regressions are forced through the origin.
- Model 2 uses estimated total production (total fishing mortality plus escapement) of particular age classes to predict total production of subsequent ages (*i.e.*, the surviving cohort, dependent from the same brood year). All regressions are forced through the origin.

Relationships between all possible age class combinations were examined using these two models. The actual models used for the forecast were based on the strongest correlations (highest R^2 values). In the case where more than one age class is used as a predictor (*e.g.* ages 2 & 3 fish) the total terminal runs at those ages were summed. Estimates of surviving cohort include natural mortality factors and are estimated as the pre-fishery abundance of the youngest age being predicted. Assuming recent average maturation rates, the remaining cohort was assigned either to the expected terminal run or to the surviving cohort remaining at sea. The terminal return to the Barkley Sound/Alberni Inlet is forecast after accounting for expected impacts in pre-terminal ocean fisheries. A forecast range is generated from the distribution of the deviations between the observed and forecast run size.

Beginning for the 2019 forecast and continuing in 2021, the following adjustments were made to the models based on recommendations made by Peterman *et al*. (2016): all sibling regressions were based on log-transformed data and only recent year average maturation rates were applied. Age-specific pre-terminal exploitation rates were assumed similar to the recent 3-year average (Figure 2, Table 3, Table 4).

Other WCVI Populations

Overall, the data available for other WCVI populations are less precise than those for the Stamp/RCH stock. However, trends in brood year survival and ocean fishery impacts for other WCVI Chinook populations are assumed similar to the RCH Indicator Stock. Therefore, it is possible to use brood

survival and age-specific exploitation rate information from the RCH cohort analysis to forecast returns for other WCVI terminal areas or populations.

In past years, the terminal return of the WCVI Chinook aggregate was forecast by expanding the expected return of the Stamp/RCH stock by the brood year average ratio of the return Stamp/RCH to the total of other WCVI index stocks. With increasingly detailed age data being collected from other stocks (*i.e.* sibling performance of earlier age classes that have already returned for the contributing brood years), specific forecasts have been developed for the Conuma and Nitinat hatchery returns, and the remaining index stocks as a whole (see list in Table 2). These models were initially developed to inform domestic management of Canadian fisheries, but have recently been applied to forecast the aggregate WCVI terminal abundance because the stock-specific forecasts are generally more accurate than the simple ratio method described above. The contribution of Stamp/RCH stock to the aggregate WCVI abundance has been variable due to apparent differences in marine survival rate among WCVI hatchery stocks and from changes in hatchery release strategies (Figure 5).

2020 RETURN, COHORT ANALYSIS RESULTS, AND FORECAST PERFORMANCE

The estimated *terminal* adult return of WCVI index stocks (*i.e.* excluding catch in pre-terminal fisheries) was 217,000 (Table 1, Figure 1). More specifically, the terminal returns of adult WCVI Chinook included returns of 122,000, 48,000, 35,000 and 12,000 to Stamp/RCH, Conuma Hatchery, Nitinat Hatchery and other extensive indicator stocks, respectively (Table 1). The estimated age composition at return of the WCVI aggregate as whole was 40%, 45% and 15% for 3, 4 and 5 year old Chinook, respectively.

The observed terminal returns of WCVI Chinook were higher than expected for Stamp/RCH, Conuma, and Nitinat stocks and lower than expected for the Other WCVI Index stocks (Table 2). Overall, the total WCVI forecast was 22% lower than the observed return (Table 2). Trends in marine survival rate to age 2 estimated through cohort analysis using RCH CWT recoveries are plotted in Figure 3. The long-term average marine survival rate is about 4.7%. For the 2015, 2016, 2017 and 2018 brood years (returned as age 5, 4, 3, 2 year old fish in 2020), the estimated survival rates to age 2 were 6.7%, 5.7%, 8.5% and 6.4%, respectively. Estimates for the 2016–2018 brood years are based on incomplete brood returns and therefore preliminary.

Age-specific *pre-terminal* exploitation rates estimated from the cohort analysis using RCH CWT recovery data are summarized in Table 3 and Figure 2. The estimated pre-terminal exploitation rate was 22%; Estimated pre-terminal exploitation rates on age 3, 4 and 5 year old fish in 2020 were 6%, 20% and 37%, respectively. In the last 3 years, the estimated pre-terminal exploitation rates of 4 and 5 year old WCVI Chinook have averaged about 31% and 41%, respectively. There is a general trend of increasing pre-terminal exploitation of 4 and 5 year old fish since about the 1999 brood year, roughly coinciding with the start of AABM management (Figure 2). The management objective is to limit fishery exploitation in Canadian AAMB fisheries to 10%, within which the Northern Troll fishery is limited to 3.2%. In 2020, the exploitation rate in Canadian AABM fisheries was estimated at 5.7% with the Northern Troll at 2.2%.

2021 FORECAST

Terminal return Stamp River / Robertson Creek Hatchery (RCH) Chinook

The forecast terminal return of adult Stamp/RCH Chinook to Barkley Sound and Alberni Inlet in 2021 is approximately 133,000 (range: 98,000–167,000). This is an above average return and similar to the strong return observed in 2020 (Table 4, Table 2). The predicted adult age composition is 23%, 62% and 15% of 3, 4 and 5-year old fish, respectively.

With an expected return of 133,000 adults, directed Chinook fisheries are expected in the terminal Alberni Inlet area for all sectors. Based on historical average age compositions and proportions of females returning in each age class, as well as historical fecundity estimates, an escapement target of 21,000 adults is expected to achieve the 39M egg target. However, in recent decades, body size, age at maturity, and fecundity have been declining in Chinook salmon originating from the west coast of North America (Lewis et al., 2015; Ohlberger et al., 2018, 2020). Hatchery staff have correspondingly observed a

decrease in the numbers of eggs yielded from groups of females. While it is likely that the escapement target is biased low, further work is needed to update the estimates of the proportion of females and their average fecundities by age. Stock assessment crews will conduct extensive biosampling on female Chinook in September and October to provided updated demographic data to inform the escapement target for 2022 and subsequent years. In the meantime, 2021 in-season management decisions will take a conservative approach to reflect the uncertainty in the current escapement target.

Terminal return of other WCVI Chinook populations

Marine survival rates for the other major hatcheries and some other WCVI stocks appeared to be significantly higher than the survival estimated for the Robertson Creek Hatchery (RCH) CWT Indicator Stock for the 2009–2011 brood years. However, for the five most recent brood years (2014–2018), survival rate estimates from the RCH CWT Indicator Stock appear to be more representative of WCVI Chinook as a whole. Therefore, general expectations are for an above average return of adult Chinook to the WCVI area (Table 5). Similar to Area 23, directed fishery opportunities are expected in WCVI terminal areas dominated by hatchery stocks.

Conuma Hatchery: The predicted terminal return of Conuma Hatchery Chinook to Area 25 is 33,000 (range 20,000–47,000) with an age composition of 27%, 57% and 13% age 3, 4 and 5-year old fish, respectively.

Nitinat Hatchery: The predicted terminal return of Nititat Hatchery Chinook to Area 22 is 28,000 (range 19,000–35,000) with an age composition of 36%, 35% and 29% age 3, 4 and 5-year old fish, respectively.

Other WCVI Stocks: The predicted terminal return of other WCVI index stocks (see list in Table *2*) is 42,000 (28,000–56,000) with an age composition of 20%, 63% and 16% age 3, 4 and 5-year old fish, respectively. This forecast return results largely from index stocks that are enhanced. In most recent years, spawner abundances of wild indicator stocks within WCVI Conservation Units have been below provisional upper biological benchmarks and, in the case of the SWVI Conservation Unit, often below the lower biological benchmark in many years (Figure 6). Therefore, Canadian fisheries are managed to limit mortality on wild WCVI Chinook.

SOURCES OF UNCERTAINTY

The mean absolute percentage error (MAPE) for the forecast models used to predict terminal returns of Stamp/RCH Chinook is 26% for the years when the models have been applied (1988–2020, Figure 4). That is, on average, the observed return is about 26% higher or lower than the predicted return. In two of the last three years, the forecast has under-estimated the actual return. Factors that contribute to uncertainty in the forecast include, but are not limited to: model structure, uncertainty associated with cohort analysis CWT data and results that form the model inputs, etc.

For other WCVI Chinook stock forecasts, there is higher uncertainty due to the general lower quality assessment data relative to the Stamp/RCH indicator stock. There are less complete age data, relatively high uncertainty in the estimates of spawner abundance (for extensive indicator stocks in particular), and also higher uncertainty in catch estimates. In addition, survival, exploitation and maturation rates of other WCVI stocks could vary significantly from the Stamp/RCH indicator stock. The MAPE of forecasts for other WCVI stocks ranges from about 32–40% when a retrospective analysis is applied for the 1995–2020 return years.

For all the WCVI terminal forecasts, two key sources of uncertainty are the maturation rate and pre-terminal exploitation rate assumptions applied to generate run size estimates.

There is some evidence that maturation rates of WCVI Chinook have declined in recent years so that fish are maturing and returning to the terminal area at a younger age. Declines in maturation rate will affect the expected return of older age classes relative to average rates.

The reliability of the terminal forecasts is also dependent on the accuracy of the prediction of the age-specific pre-terminal exploitation rates, which can vary considerably from year to year. Variability in fishery exploitation patterns are caused by a number of factors including regulatory changes to fisheries,

relative stock abundance in mixed stock fisheries, changes in the marine distribution of the WCVI stock, changes in the maturation rate of the WCVI stock (such as described above), etc.

In 2016, a disruption to the water supply at Robertson Creek Hatchery precipitated an emergency release of 4 million fry. Because none of the fry in the emergency release received CWTs, they are not accounted for in any CWT expansion ratios from the 2016 brood years. As a result, the forecast predictions likely underestimated 4 year olds in 2020 and might also underestimate 5 year olds in 2021.

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APPENDIX A—FIGURES AND TABLES

Table 1. Estimated 2020 return of WCVI Chinook index stocks to the terminal WCVI area (*i.e.* after pre-terminal Canadian fisheries).

Stock	Age			Total
	3	4	5	
Area 23	68,000	49,000	6,000	122,000
Area 25	14,000	23,000	11,000	48,000
Area 21/22	4,000	18,000	13,000	35,000
Other WCVI	1,000	8,000	3,000	12,000
Total	87,000	98,000	32,000	**217,000**

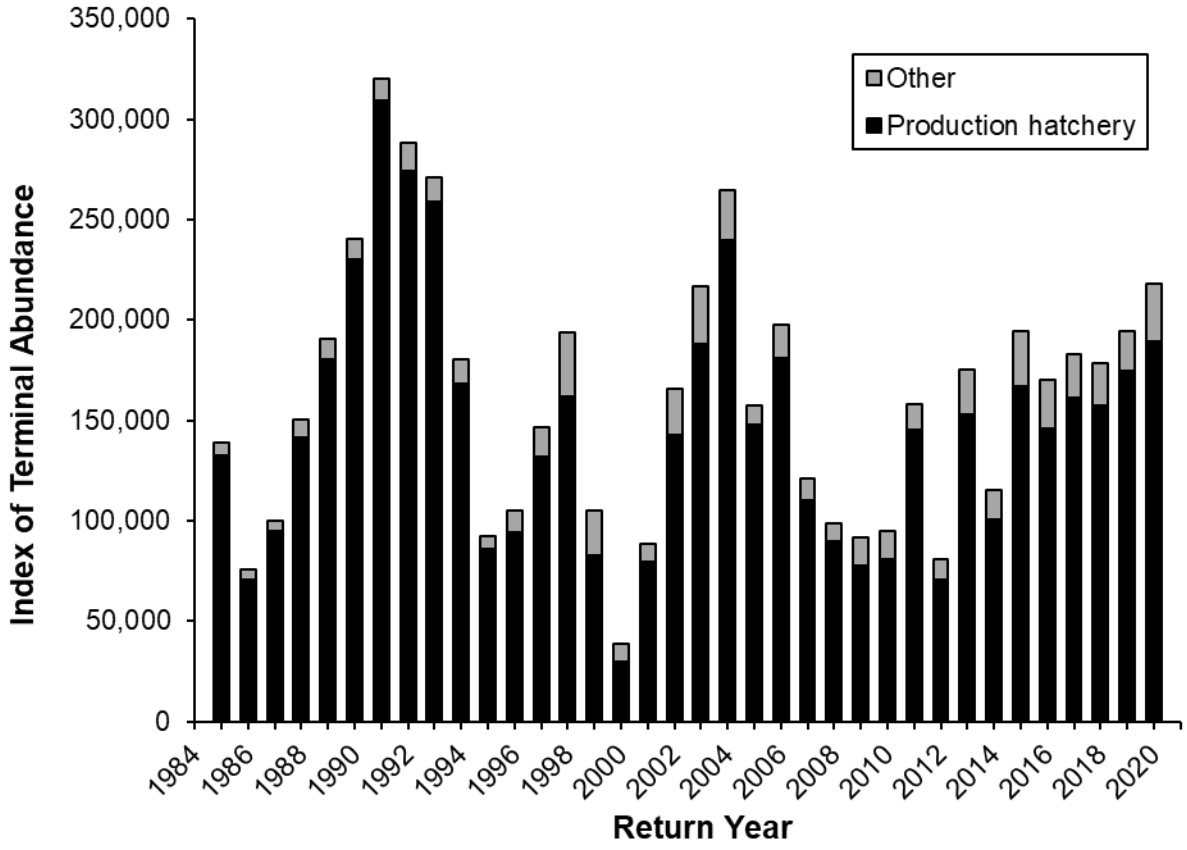

Figure 1. Aggregate terminal return of WCVI indicator stocks, including major hatchery facilities (Robertson, Conuma and Nitinat) and all other indicator stocks, many of which are also supplemented with hatchery production.

Table 2. The performance of 2020 WCVI Chinook adult (age 3+) terminal return forecasts. "APE" is the Absolute Percentage Error of the forecast, *i.e.* the discrepancy between predicted and observed returns.

Stock(s)	Average (1995–2020)	2020 Observed	2020 Forecast Range	2020 Forecast Prediction	APE
Escapement:					
WCVI Index Stocks*	17,000	29,000	15,000–30,000	22,000	24%
Terminal Run (Major Hatchery):					
Conuma	37,000	24,000	17,000–40,000	29,000	21%
Nitinat	25,000	34,000	12,000–25,000	18,000	47%
Somass/RCH	68,000	119,000	68,000–115,000	91,000	24%
Total	**148,000**	**206,000**	**112,000–210,000**	**160,000**	**22%**

*****An aggregate of the PSC indicators (Artlish, Burnam, Gold, Kaouk, Marble, Tahsis, & Tashish rivers) and other extensive indicators (Bedwell, Colonial, Cypre, Leiner, Megin, Moyeha, Nahmint, San Juan, Sarita, Tranquil, & Zeballos rivers).

Table 3. Age-specific exploitation rates of WCVI Chinook in pre-terminal fisheries, 2020 (estimated by cohort analysis using RCH Indicator Stock CWT recoveries).

Age	Alaska			NBC Troll	CBC Troll	WCVI Troll	NBC Net	NBC Sport	WCVI Sport	OTHER Ocean	Total Pre-Terminal
	Troll	Net	Sport								
3	0.8%	0.7%	0.3%	0.8%	0.0%	0.1%	0.0%	0.6%	0.6%	0.7%	4.6%
4	6.3%	1.4%	1.8%	1.3%	0.0%	0.2%	0.0%	1.5%	4.4%	2.3%	19.3%
5	12.8%	3.5%	4.5%	3.3%	0.0%	0.5%	0.0%	3.0%	2.8%	9.6%	40.0%

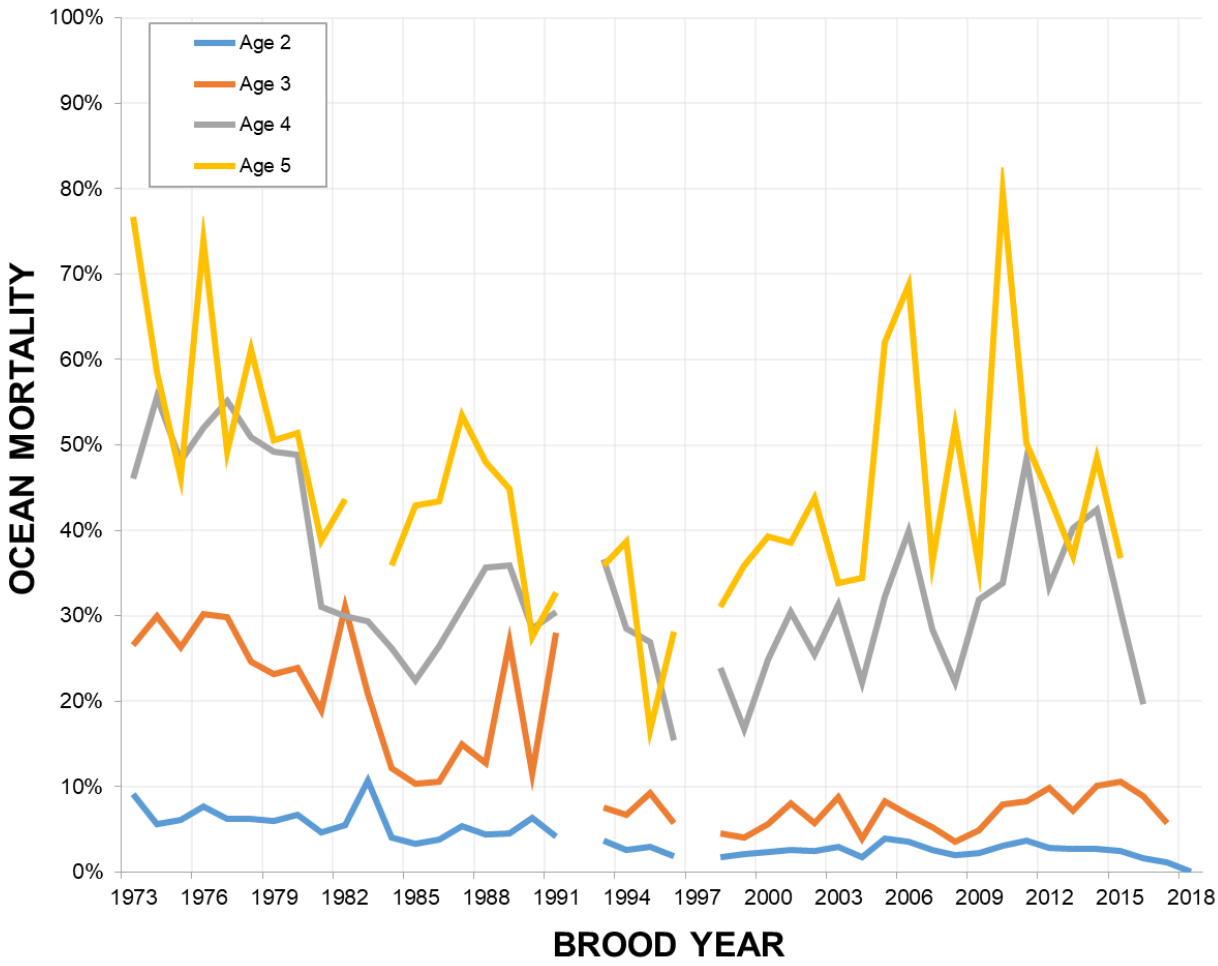

Figure 2. Age-specific exploitation rates of WCVI Chinook in pre-terminal fisheries, brood years 1973–2018. Exploitation rates are estimated by cohort analysis using RCH Indicator Stock CWT recoveries.

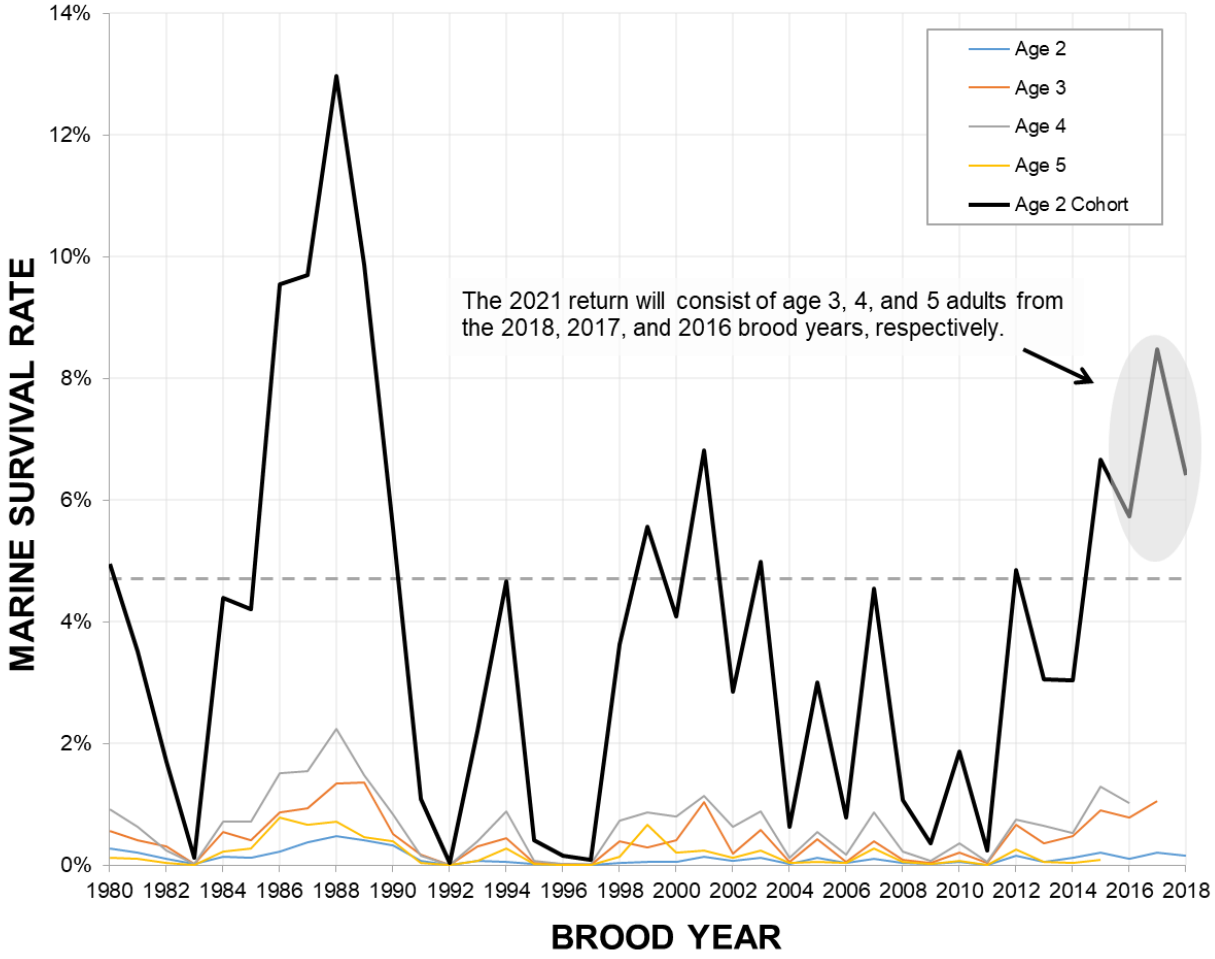

Figure 3. Estimated survival by age of WCVI Chinook (estimated by cohort analysis using RCH Indicator Stock CWT recoveries). The thick black line shows the survival rates from smolt to age 2, whereas the thin coloured lines show survival-at-age. *Note.*—estimates for the last 3 sea-entry years are preliminary as they are based on incomplete brood years. The grey dashed line shows the long-term average marine survival rate to age 2.

Table 4. Summary of the 2021 Stamp River/Robertson Creek Hatchery forecast pre-fishery abundance and return of mature fish to Canada and the terminal run WCVI area.

Model	Pre-Fishery Abundance[1]	Return to Canada[2]	Terminal Return[3]	Terminal Age Comp
2. Terminal return versus Total Production				
2018 brood	143,706	31,737	30,683	23%
2017 brood	152,468	97,438	81,138	61%
2016 brood	27,485	21,800	20,726	16%
Total	323,659	150,974	132,547	
3. Total Production versus Total Production				
2018 brood	149,006	32,907	31,815	24%
2017 brood	158,293	101,160	84,238	63%
2016 brood	23,603	18,721	17,799	13%
Total	330,903	152,788	133,852	
Average of both models				
2018 brood	146,356	32,322	**30,683**	**23%**
2017 brood	155,381	99,299	**82,688**	**62%**
2016 brood	25,544	20,261	**19,262**	**15%**
Total	327,281	151,881	**132,634**	

1. Forecast total production from the respective brood years.
2. Forecast mature return to Canada prior to fisheries.
3. Forecast mature return to Barkley Sound/Alberni Inlet.

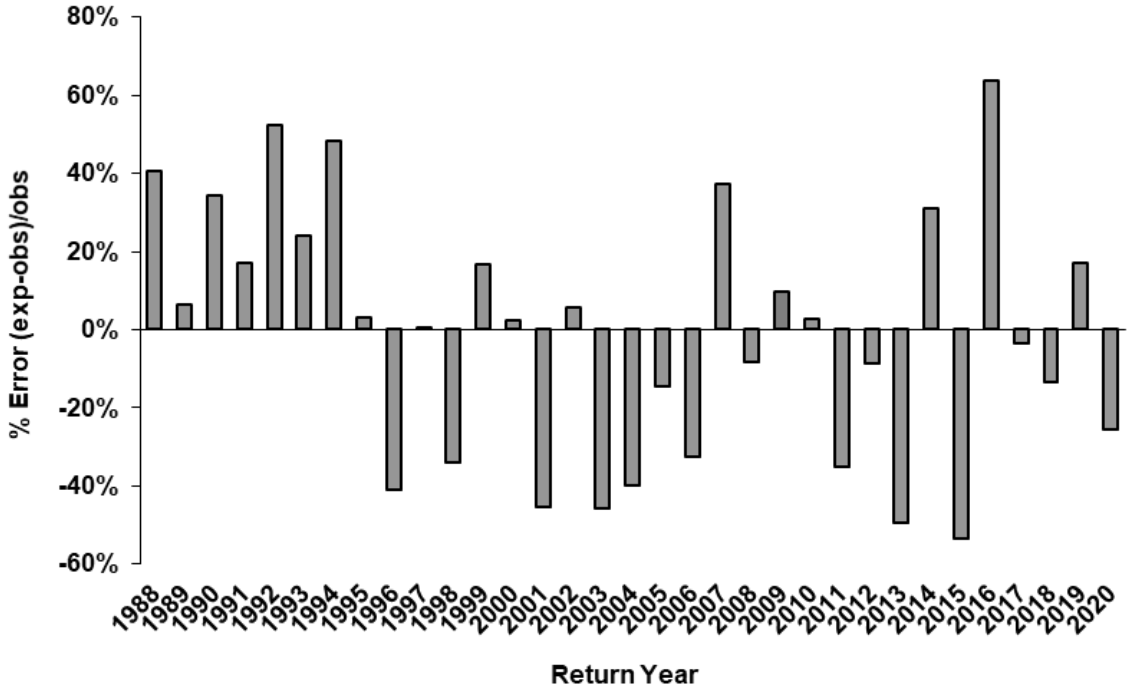

Figure 4. Average annual percentage error of the Somass/RCH terminal run forecast (both sibling models averaged), 1988–2020. The mean absolute percentage error (MAPE) in the forecast terminal run size versus observed is 26% since 1988.

Table 5. 2021 pre-season terminal run size expectations for indexed WCVI Chinook populations in addition to Stamp/Robertson Creek Hatchery. The total is the terminal run prediction for the WCVI aggregate (*i.e.* summed index stocks).

Stock	Age						Total	Range
	3	%	4	%	5	%		
RCH	31,000	23%	83,000	62%	19,000	14%	133,000	98,000–167,000
CON	10,000	30%	19,000	58%	4,000	12%	33,000	20,000–47,000
NIT	10,000	37%	9,000	33%	8,000	30%	27,000	18,000–35,000
OTHER	9,000	21%	27,000	63%	7,000	16%	43,000	28,000–56,000
Total	60,000	25%	138,000	58%	38,000	16%	**236,000**	**164,000–305,000**

Figure 5. Estimated contribution of Stamp/RCH Chinook to the total return of WCVI indexed stocks, 1986-2020. The predicted contribution for 2021 (56%) is plotted in red.

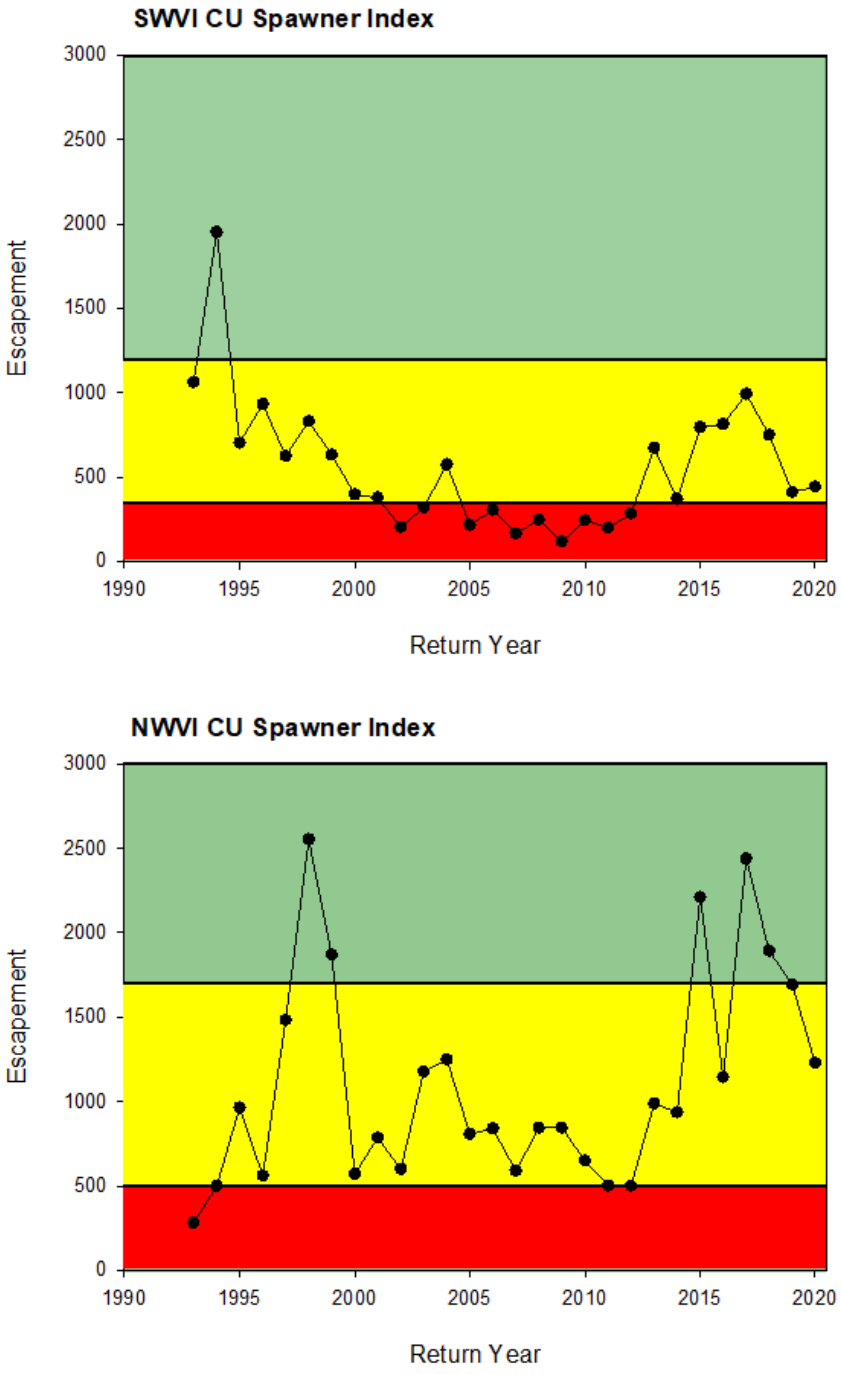

Figure 6. Spawner abundances of SWVI and NWVI Conservation Units relative to provisional lower and upper biological benchmarks (0.40 and 0.85 $S_{MSY,}$ respectively; S_{MSY} for index stocks is estimated by the habitat model described in Parken et al. 2006). For each CU, spawner abundances are the summed estimates for wild index stocks that receive little or no enhancement. For each CU, the upper and lower biological benchmarks are summed across the same wild index stocks.

APPENDIX B—HARVEST TABLE

Terminal run	TAC	HR	ESC*	Level	Maa-nulth	Exp. Sport Catch	Total Comm. TAC	Tsumass FSC	Tsumass EO	Reg. Comm	AreaD	AreaB	Special Use
15,000	750	0		Critical	200	275	-	275	-	-	-	-	-
20,000	1,200	6%	18,800	Critical	200	500	-	500	-	-	-	-	-
25,000	4,000	16%	21,000	Low/Critical	1,500	1,000	-	1,500	-	-	-	-	-
30,000	9,000	30%	21,000	Low	1,500	8,500	-	1,500	-	-	-	-	-
35,000	14,000	40%	21,000	Low	1,500	11,550	950	1,500	-	-	-	-	-
40,000	19,000	48%	21,000	Low	1,500	13,200	4,300	1,500	1,400	1,400	933	467	-
45,000	24,000	53%	21,000	Low	1,500	14,850	7,650	1,500	3,075	3,075	2,050	1,025	-
50,000	29,000	58%	21,000	Moderate	2,000	16,500	10,500	2,000	4,250	4,250	2,833	1,417	-
55,000	34,000	62%	21,000	Moderate	2,000	18,150	13,850	2,000	5,925	5,925	3,950	1,975	-
60,000	39,000	65%	21,000	Moderate	2,000	19,800	17,200	2,000	7,600	7,600	5,067	2,533	-
65,000	44,000	68%	21,000	Moderate	2,000	21,450	20,550	2,000	9,275	9,275	6,183	3,092	-
70,000	49,000	70%	21,000	Abundant	2,600	23,100	23,300	2,000	10,650	10,650	7,100	3,550	980
75,000	54,000	72%	21,000	Abundant	2,600	24,750	26,650	2,000	12,325	12,325	8,217	4,108	1,080
80,000	59,000	74%	21,000	Abundant	2,600	26,400	30,000	2,000	14,000	14,000	9,333	4,667	1,180
85,000	64,000	75%	21,000	Abundant	2,600	28,050	33,350	2,000	15,675	15,675	10,450	5,225	1,280
90,000	69,000	77%	21,000	Abundant	2,600	29,700	36,700	2,000	17,350	17,350	11,567	5,783	1,380
95,000	74,000	78%	21,000	Abundant	2,600	31,350	40,050	2,000	19,025	19,025	12,683	6,342	1,480
100,000	79,000	79%	21,000	Abundant	2,600	33,000	43,400	2,000	20,700	20,700	13,800	6,900	1,580
105,000	84,000	80%	21,000	Abundant	2,600	34,650	46,750	2,000	22,375	22,375	14,917	7,458	1,680
110,000	89,000	81%	21,000	Abundant	2,600	36,300	50,100	2,000	24,050	24,050	16,033	8,017	1,780
115,000	94,000	82%	21,000	Abundant	2,600	37,950	53,450	2,000	25,725	25,725	17,150	8,575	1,880
120,000	99,000	83%	21,000	Abundant	2,600	39,600	56,800	2,000	27,400	27,400	18,267	9,133	1,980
125,000	104,000	83%	21,000	Abundant	2,600	41,250	60,150	2,000	29,075	29,075	19,383	9,692	2,080
130,000	109,000	84%	21,000	Abundant	2,600	42,900	63,500	2,000	30,750	30,750	20,500	10,250	2,180
135,000	**114,000**	**84%**	21,000	**Abundant**	**2,600**	**44,550**	**66,850**	**2,000**	**32,425**	**32,425**	**21,617**	**10,808**	**2,280**
140,000	119,000	85%	21,000	Abundant	2,600	46,200	70,200	2,000	34,100	34,100	22,733	11,367	2,380
145,000	124,000	86%	21,000	Abundant	2,600	47,850	73,550	2,000	35,775	35,775	23,850	11,925	2,480
150,000	129,000	86%	21,000	Abundant	2,600	49,500	76,900	2,000	37,450	37,450	24,967	12,483	2,580
155,000	134,000	86%	21,000	Abundant	2,600	51,150	80,250	2,000	39,125	39,125	26,083	13,042	2,680
160,000	139,000	87%	21,000	Abundant	2,600	52,800	83,600	2,000	40,800	40,800	27,200	13,600	2,780
165,000	144,000	87%	21,000	Abundant	2,600	54,450	86,950	2,000	42,475	42,475	28,317	14,158	2,880
170,000	149,000	88%	21,000	Abundant	2,600	56,100	90,300	2,000	44,150	44,150	29,433	14,717	2,980
175,000	154,000	88%	21,000	Abundant	2,600	57,750	93,650	2,000	45,825	45,825	30,550	15,275	3,080
180,000	159,000	88%	21,000	Abundant	2,600	59,400	97,000	2,000	47,500	47,500	31,667	15,833	3,180