WCVI Salmon Bulletin
West Coast of Vancouver Island Chinook Terminal Return Forecast for 2025
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South Coast Area Stock Assessment

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SUMMARY

➢ The 2025 forecast return of Somass River Chinook (aka Stamp/Somass/Robertson Creek) including both natural and hatchery born Chinook to the terminal area of Barkley Sound and Alberni Inlet is 83,000 adults (95% CI: 65,000 – 105,000).

➢ Terminal Chinook returns of Conuma River, Nitinat River, and smaller WCVI indicator stocks are forecasted separately but combine to be 77,000 in 2025 (95% CI: 50,000 – 115,000). The forecast of aggregate terminal abundance (sum of all hatchery and wild indicator stocks, including Somass is 160,000 for adults (95% CI: 116,000 – 220,000).

➢ The overall expected adult age composition of the WCVI aggregate terminal Chinook run is 45% age-3, 42% age-4, and 13% age-5.

➢ The two Burman River Chinook forecasts are 1,500 (95% CI: 0 – 5,400) and 2,400 (95% CI: 300- 10,100) rounded to the nearest 100.

➢ The 2024 terminal return of Somass Chinook was approximately 100,000 adults (ages 3-5) and 6,000 jacks (age-2 males). The adult return was only 7% lower than the pre-season prediction.

➢ The 2024 aggregate terminal return (*i.e.* excluding catch in pre-terminal fisheries) of West Coast Vancouver Island (WCVI) Chinook index stocks—including Somass—was estimated at 203,000 adults (age 3-5) and 9000 jacks. The aggregate adults return was 20% lower than the pre-season prediction.

➢ After a period of modest increase in wild populations, escapements have been decreasing over the last five years for many wild stocks. Spawner levels in the Southwest Vancouver Island (SWVI) Conservation Unit (CU) remain below upper biological benchmarks with fewer than 100 spawners observed in some rivers in recent years. Wild WCVI Chinook therefore remains a stock of concern.

BACKGROUND

Chinook salmon spawn in over 100 medium and large rivers along the WCVI, with 60 systems having escapement records of at least 100 spawners. For implementation of Canada's Wild Salmon Policy, stock status is evaluated for a set of wild indicator populations within CUs, which are groups of biologically and genetically similar populations. There are three Chinook CUs defined within the WCVI; including SWVI (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 Northwest Vancouver Island (NWVI; populations within DFO Statistical Area 27, or Quatsino Sound).

The average-aggregate terminal return (catch and escapement) of WCVI Chinook is approximately 150,000; ranging from about 30,000–330,000 over the period from 1996–2024 (Table 2). A substantial portion of the annual terminal return and spawning escapement is hatchery-origin fish (Figure 1). About 20 WCVI populations receive some form of hatchery enhancement to supplement natural spawning. Annual releases of

Chinook smolts from WCVI enhancement facilities total about 15 million. The majority (*c.* 13 million) 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 2 million Chinook smolts are released annually from smaller facilities, including volunteer public involvement projects and community development projects. Natural-origin Chinook in the WCVI Stock Management Unit (SMU) are assessed as critical status (i.e. below the CU-status Limit Reference Point (LRP) (DFO 2025a, DFO 2025c)). Factors influencing the critical status for natural origin WCVI Chinook include declining, and overall low abundance of natural-origin spawners, low returns in many natural populations, reduction or loss of genetic diversity largely from hatchery stray influence, and changing size-at-age and age-at-maturity demographics where smaller females produce fewer eggs (DFO 2025a, DFO 2025c)).

Somass River Chinook includes the enhanced Stamp River/Robertson Creek Hatchery (RCH) stocks. RCH Chinook salmon stock is the coded-wire tag (CWT) "indicator stock" used by the Pacific Salmon Commission to estimate survival, exploitation rate, and marine distribution patterns of WCVI Chinook populations. Detailed assessments and forecasts of the Stamp/RCH indicator stock are undertaken annually to support stock assessments for WCVI Chinook as a whole. Management actions taken to achieve goals for this stock in pre-terminal fisheries are assumed to have similar effects on other WCVI stocks. Forecasts are developed for other WCVI Chinook (non-indicator) stocks including Conuma, Nitinat and aggregated Other WCVI Chinook. The aggregated Other WCVI stocks include PSC indicators: Artlish, Burman, Gold, Kaouk, Marble, Tahsis, & Tashish rivers; as well as "extensive" indicators Bedwell, Colonial, Cypre, Leiner, Megin, Moyeha, Nahmint, San Juan, Sarita, Tranquil, & Zeballos rivers.

A portion of the Other WCVI Chinook forecast includes the Burman River return; however, a separate Burman River forecast has been created to inform management decisions for certain near-terminal marine fishery opportunities in Nootka Sound. These fisheries are commonly referred to as Muchalat Inlet/Matchlee Bay fisheries, which are known to encounter both Burman River and Gold River stocks.

FORECAST METHODOLOGY

A new forecast methodology was implemented for 2025 using a sibling regression model for each of the WCVI stock groups (Somass, Conuma, Nitinat, and Other WCVI). For each forecast, abundances of age 2, 3, and 4 Chinook were log-transformed and regressed on the abundance of age 3, 4, and 5s, log-transformed respectively. Abundance was defined as harvests in WCVI (excluding non-WCVI and pre-terminal) catch plus the hatchery and natural escapement to each system. The age class predictions and their variances were summed, given that the age classes are independent from one another.

Abundance data was available beginning in the early 1980s, however non-stationarity, a change in the relationships of the age classes over time, was observed in the time series; therefore, data was restricted to the year 2000 onward, except for the "Other WCVI" group where data was restricted to 2015 onward since that is the year that

harvests in addition to escapements were recorded for the forecast. The result of using the most recent range of data is that the forecasted values predict that fish are returning at younger age-classes than the previous method we will call the cohort analysis method (i.e., predictions have shifted to forecasting less age 5s and more age 3s using their sibling cohorts). This corroborates both local observations and published research (Lamborn et al. 2025, Ohlberger et al. 2018, Lewis et al. 2015, Roni & Quinn 1995, Ricker 1981).

A comparison of the cohort analysis against the sibling regression model using the Mean Absolute Percentage of Error (MAPE) indicates that the new method (MAPE = 21.2%) is improved compared to the cohort analysis method (MAPE 25.5%) for Somass returns using 2000- 2024 data (Figure 2). This MAPE takes into account only the number of fish. A further investigation into the returns of eggs that are used in management decisions might find that the new sibling method might show even greater improvements over the cohort analysis method because fecundity and sex ratios vary by age class, and the relationships between the age classes have changed though time. For information on the cohort analysis methods, see the *2024 preseason WCVI Chinook Bulletin (Brown, 2024).* The MAPEs of the forecasts vary: Somass (MAPE = 21.2%, Figure 3), Conuma (MAPE = 30.5 %, Figure 4), Nitinat (MAPE 33.9%, Figure 5), Other WCVI Chinook returns (MAPE 18.9 %, Figure 6), and Burman (MAPE = 62.6%, Figure 7 and MAPE = 58.3% Figure 8).

Two models were used to forecast the adult Burman River terminal return (age 3-5s). The forecast is comprised of the estimated natural and hatchery-origin Burman Chinook harvested within Nootka Sound/Esperanza Inlet (out to 1 nautical mile) and escapement to Burman River. It excludes any Burman fish that might escape to other systems. One model is the sibling regression forecast as outlined for other stocks described above. The sibling regression forecast uses stock-specific age at return estimates derived from scales (age), and stock ID (DNA and otolith) for years 2016-2024. In years where biological data had more limited resolution for individual or natural stock identification (i.e. 2014 and 2015 relied largely on thermal mark data only), the Conuma hatchery harvest rate (i.e. Conuma hatchery origin in harvest divided by the total Conuma hatchery return) was applied to the Burman natural and hatchery escapement estimates to approximate the Burman specific harvest portion of the return. The second model is the recreational harvest forecast used for management in recent years, where a ratio of Burman to Conuma stocks encountered in biological samples from a portion of Esperanza Inlet recreational fishery in July and August is used to proportionally adjust the pre-season Conuma terminal adult Chinook return. The previous year or recent year average of this sample ratio is used in forecasting the current return year. Biological data from 2014 and 2015 was largely limited to otolith thermal mark data, while DNA was available in addition to thermal marks for the years 2016 to 2024. A comparison of the sibling forecasting method against the recreational harvest forecasting method using the MAPE for return years 2014 to 2024 suggest that both methods have poor predictive value of the adult terminal Burman River return as the MAPE is high for both the sibling forecast (MAPE = 62.6%; Figure 7) and the recreational harvest forecast (MAPE = 58.3%; Figure 8).

FORECAST PERFORMANCE FOR THE 2024 RETURN

The 2024 forecast predicted an aggregate terminal adult return of WCVI index stocks (i.e., excluding catch in pre-terminal fisheries) of 244,000, with predicted adult returns of 107,000, 48,000, and 35,000, and 54,000 to Somass, Conuma, Nitinat, Other WCVI respectively (Table 2). The estimated 2024 aggregate terminal adult return was 203,000. The estimated age composition at return of the WCVI aggregate was 16%, 66% and 14% for 3-, 4- and 5-year-old Chinook, respectively (Table 1). Overall, the total estimated 2024 WCVI adult Chinook return was 20% lower than the 2024 forecast (Table 2).

2025 FORECAST

Terminal return of Somass Chinook

The forecasted terminal return of adult Somass Chinook to Barkley Sound and Alberni Inlet in 2025 is approximately 83,000 (95% CI: 65,000–105,000; Figure 3, Table 3). This is a below average return when considering returns since 1985. The predicted adult age composition is 58%, 33%, and 9% of 3-, 4-, and 5-year-old fish, respectively. Note the dominate age-3 predicted in the return.

Terminal return of Conuma Chinook

The predicted terminal return of Conuma Chinook to Area 25 is 33,000 (95% CI: 22,000–48,000; Figure 4). The predicted adult age composition is 33%, 47% and 20% for 3-, 4- and 5-year-old fish, respectively.

Terminal return of Nitinat Chinook

The predicted terminal return of Nitinat Chinook to Area 22 is 21,000 (95% CI: 16,000–28,000; Figure 5). The predicted adult age composition is 28%, 65% and 7% for 3-, 4- and 5-year-old fish, respectively.

Terminal return of Other WCVI Chinook

The predicted terminal return of Other WCVI index stocks (see list in Table 3) is 23,000 (95% CI: 13,000–40,000, Figure 6). The predicted adult age composition is 34%, 48% and 18% for 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 CU, below the lower biological benchmark in many recent years (Figure 9).

Terminal return of Burman Chinook

The predicted adult terminal return of Burman Chinook is 2,304 (95% CI: 314- 10,115) with an age composition of 45 %, 40% and 15% for 3-, 4-, and 5-year old fish respectively using the sibling forecast (Figure 7, Table 4), and 1,546 (95% CI: 0 – 5,380) using the recreational harvest forecast (Figure 8, Table 4). Note that Burman is included in the Other WCVI forecast, but is also forecasted separately for management purposes.

ESCAPEMENT TARGET FOR SOMASS CHINOOK

The Chinook escapement target for the Somass River is adjusted annually based on the 7.1-million-egg target for Robertson Creek Hatchery broodstock, and a goal of allowing healthy natural-spawning biomass into the Stamp River habitat. In 2023, the Area 23 Harvest Committee reached a consensus to adopt a spawner escapement target to the Stamp River of 14,600 adult spawners. An egg target for Robertson Creek Hatchery of 9 million was agreed to be appropriate because it includes a 2 million egg buffer above the hatchery's 7 million egg target to account for uncertainty in the forecasted sex ratio. Thus, the adult escapement target for Somass Chinook is calculated annually as 14,600 adults plus the expected number of spawners to attain 9 million eggs for Robertson Creek Hatchery (18,400). Accordingly, the target for 2025 is 33,000 adult spawners.

2025 FISHERY MANAGEMENT

Based on the pre-season forecasts, directed terminal fisheries are expected for all sectors for Robertson and Conuma hatchery Chinook. Directed terminal harvests for Nitinat Chinook are expected for Food, Social and Ceremonial (FSC) and recreational fisheries. Terminal fisheries may occur for other smaller hatchery-supported stocks on the WCVI. Excess Salmon to Spawning Requirement (ESSR) fisheries by local First Nations may occur at Robertson and Nitinat hatcheries as well as a surplus to escapement fishery by the Five Nations at Conuma hatchery. Please refer to the 2025/2026 Southern Salmon Integrated Fisheries Management Plan for details (DFO, 2025b).

SOURCES OF UNCERTAINTY

The Mean Absolute Percentage Error (MAPE) for the forecast models used to predict terminal returns of Somass Chinook is 21.2% for the years when the models have been applied (2001-2024, Figure 3). This means that, on average, the estimated terminal return was about 21.2% higher or lower than the predicted return. This year's forecasts decrease the uncertainty around changing maturation rates, however, this is something that can and should be evaluated periodically and remains an item that will contribute to uncertainty. Other factors that contribute to uncertainty in the forecast include but are not limited to: uncertainty associated with sibling regression data, changing exploitation patterns in pre-terminal fisheries, and the changing ocean environment under climate change.

For other Chinook forecasts in this bulletin, there is higher uncertainty due to the general lower quality assessment data relative to the Robertson Creek Hatchery indicator stock which is a part of the Somass return. There are incomplete age data, relatively high uncertainty in spawner abundance estimates (for extensive indicator stocks in particular), and higher uncertainty in pre-terminal catch estimates. In addition, survival, exploitation, and maturation rates of other WCVI stocks could vary significantly from the Robertson Creek indicator stock. The MAPE of forecasts for other WCVI stocks ranged from 18.9–33.9% when a retrospective analysis was applied for the 2001–2024 return years.

For all the WCVI terminal forecasts, two key sources of uncertainty are the maturation rate and pre-terminal exploitation rates. There has been a trend in recent decades toward increased maturation rates in WCVI Chinook; fish are maturing sooner and returning to the terminal area at younger ages (Figure 10 Ohlberger 2018, local knowledge: Joint Working Group meeting May 21, 2025 Port Alberni). Increases in maturation rate will affect the expected return of older age classes relative to average rates (Lewis et al., 2015). The reliability of the terminal forecasts also depends on pre-terminal exploitation, which can vary from year to year, and which are not directly incorporated in the terminal adult Chinook forecasts in 2025. Variability in fishery exploitation patterns are caused by several factors including regulatory changes to fisheries, relative stock abundances in mixed-stock fisheries, changes in the marine distribution of the WCVI stock, and changes in the maturation rate of the WCVI stock (such as described above).

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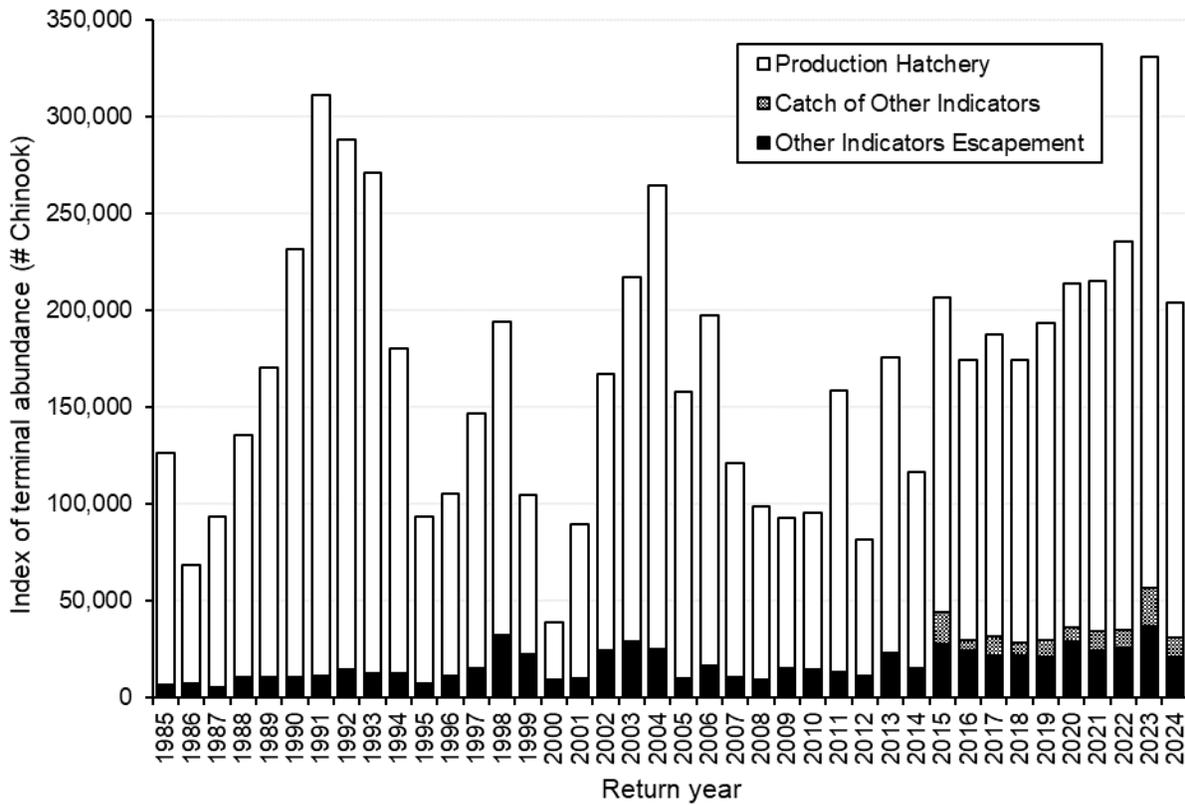
APPENDIX—FIGURES AND TABLES

Figure 1. Aggregate terminal Chinook return of WCVI indicator stocks, including major production hatcheries (Robertson Creek, Conuma and Nitinat) and all other indicator stocks—many of which are also supplemented with smaller hatchery production.
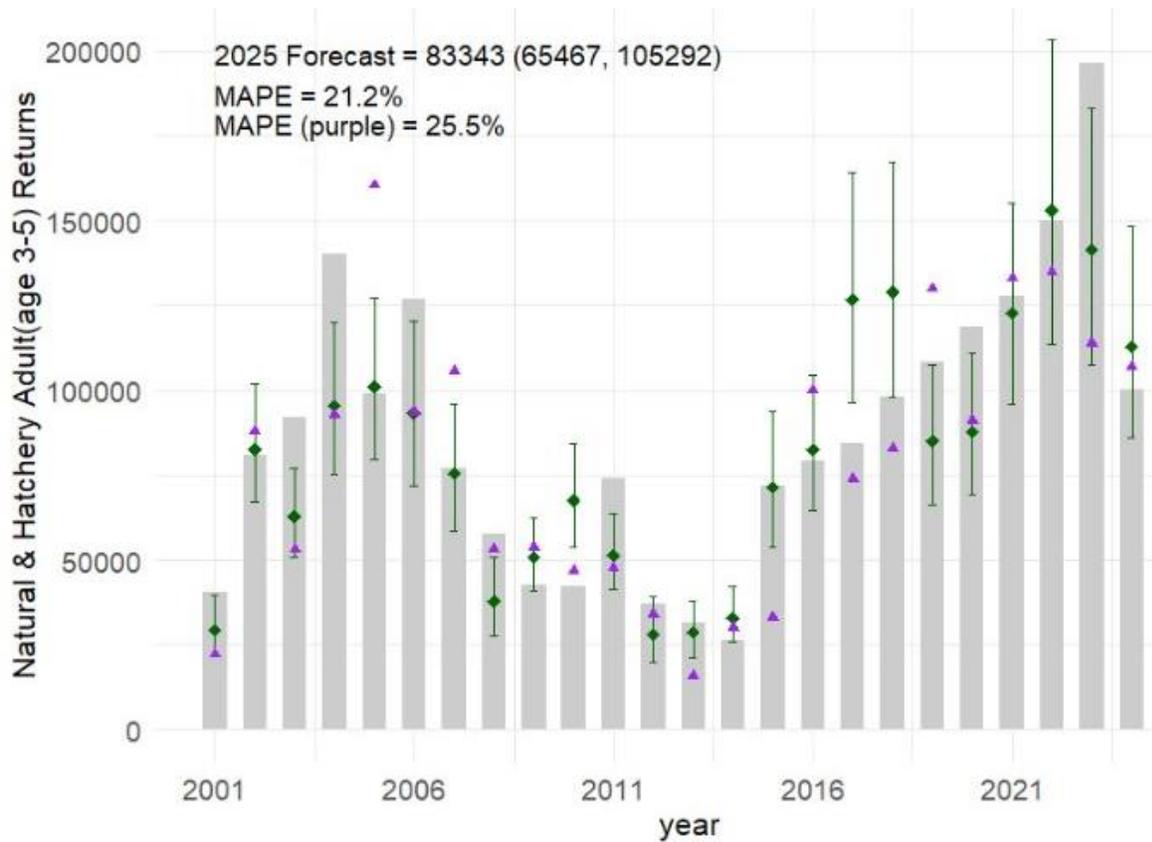
Figure 2. Retrospective performance of the cohort forecast method used in the 2024 Pre-season Chinook Forecast Bulletin compared to the newly implemented sibling regression method used for the 2025 forecast for predicting Somass terminal returns . The gray bars represent the returns for each year, with the purple triangles representing the cohort method's forecasted values (predicted forecast for a given year), and the green diamonds representing the sibling regression method's forecasted values surrounded by their associated 95% CI error bars.
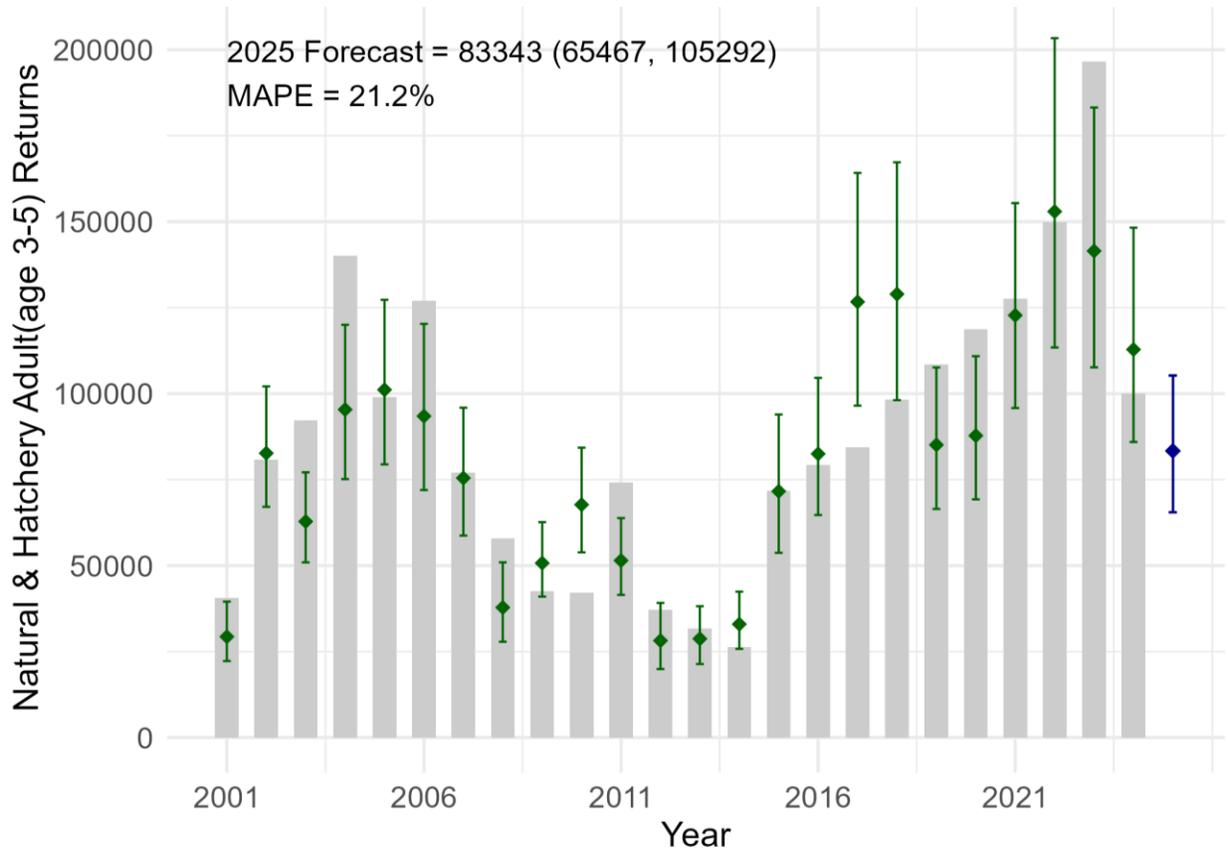
Figure 3. Somass adult Chinook (ages 3+) forecast predictions for 2025 [83,000 (65,000 – 105,000)] and retrospective performance of the sibling regression forecasting method since 2001. The gray bars represent the returns for each year, with the green diamonds representing the forecasted values surrounded by their associated 95% CI error bars.
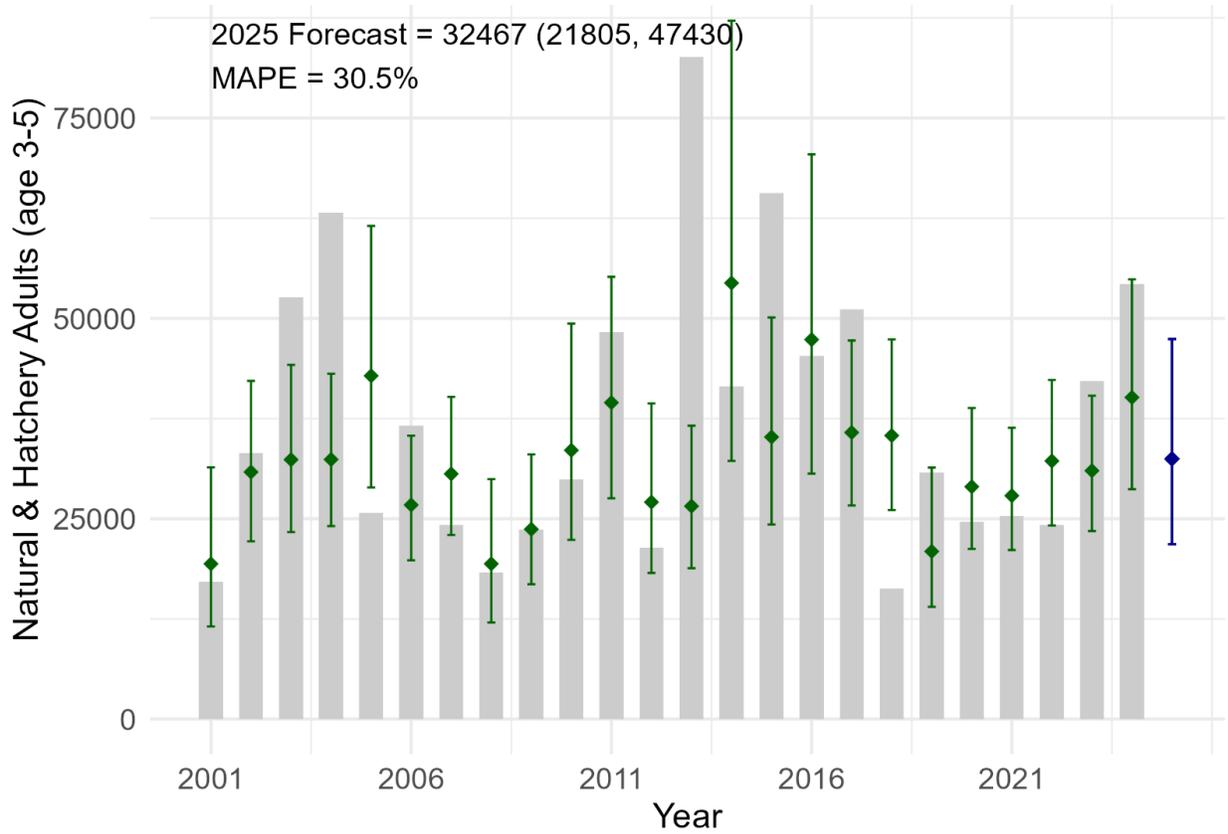
Figure 4. Conuma adult Chinook (ages 3+) forecast predictions for 2025 [32,000 (22,000 – 47,000)] and retrospective performance of the sibling regression forecasting method since 2001. The gray bars represent the returns for each year, with the green diamonds representing the forecasted values surrounded by their associated 95% CI error bars.

Figure 5. Nitinat adult Chinook (ages 3+) forecast predictions for 2025 [21,000 (16,000 – 28,000)] and retrospective performance of the sibling regression forecasting method since 2001. The gray bars represent the returns for each year, with the green diamonds representing the forecasted values surrounded by their associated 95% CI error bars.
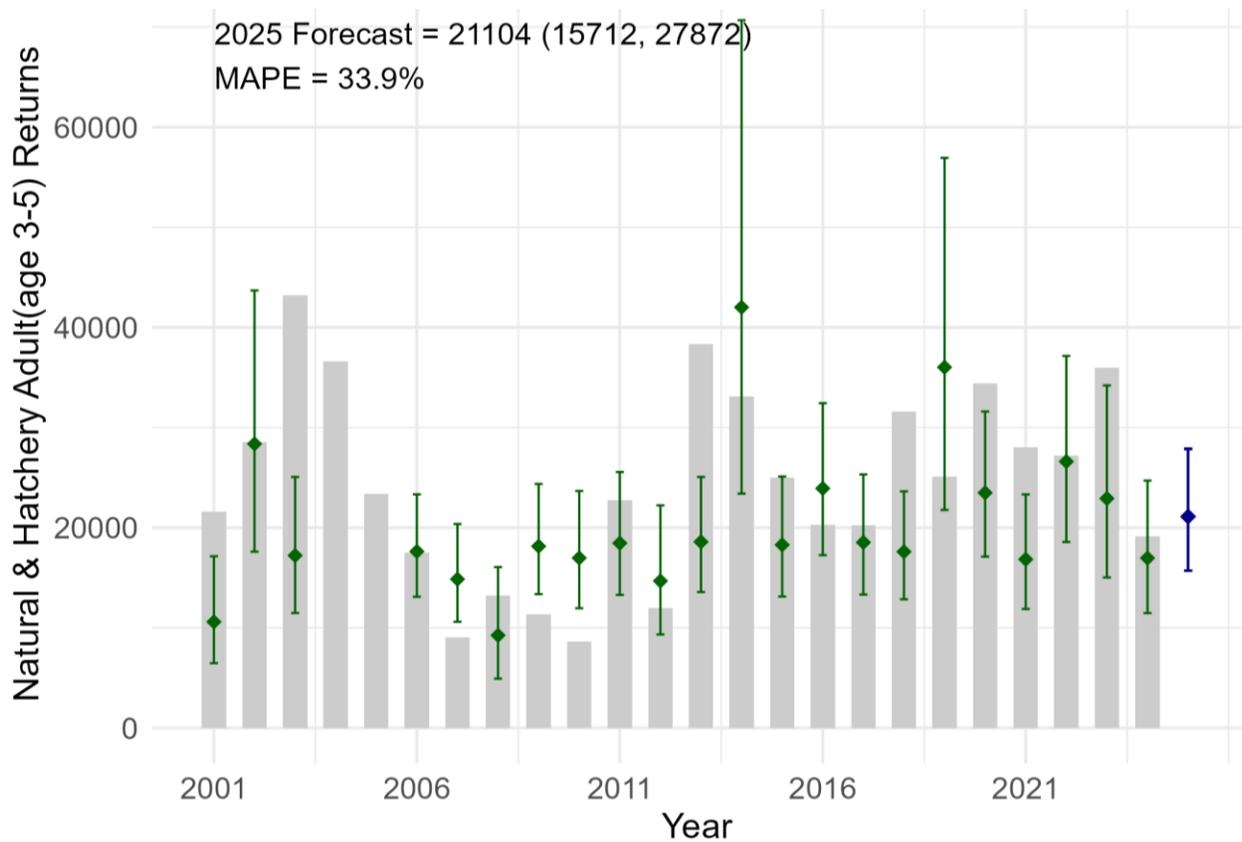
Figure 6. Other WCVI adult Chinook (ages 3+) forecast predictions for 2025 [23,000 (13,000-40,000)] and retrospective performance of the sibling regression forecasting method since 2016. The gray bars represent the returns for each year, with the green diamonds representing the forecasted values surrounded by their associated 95% CI error bars.
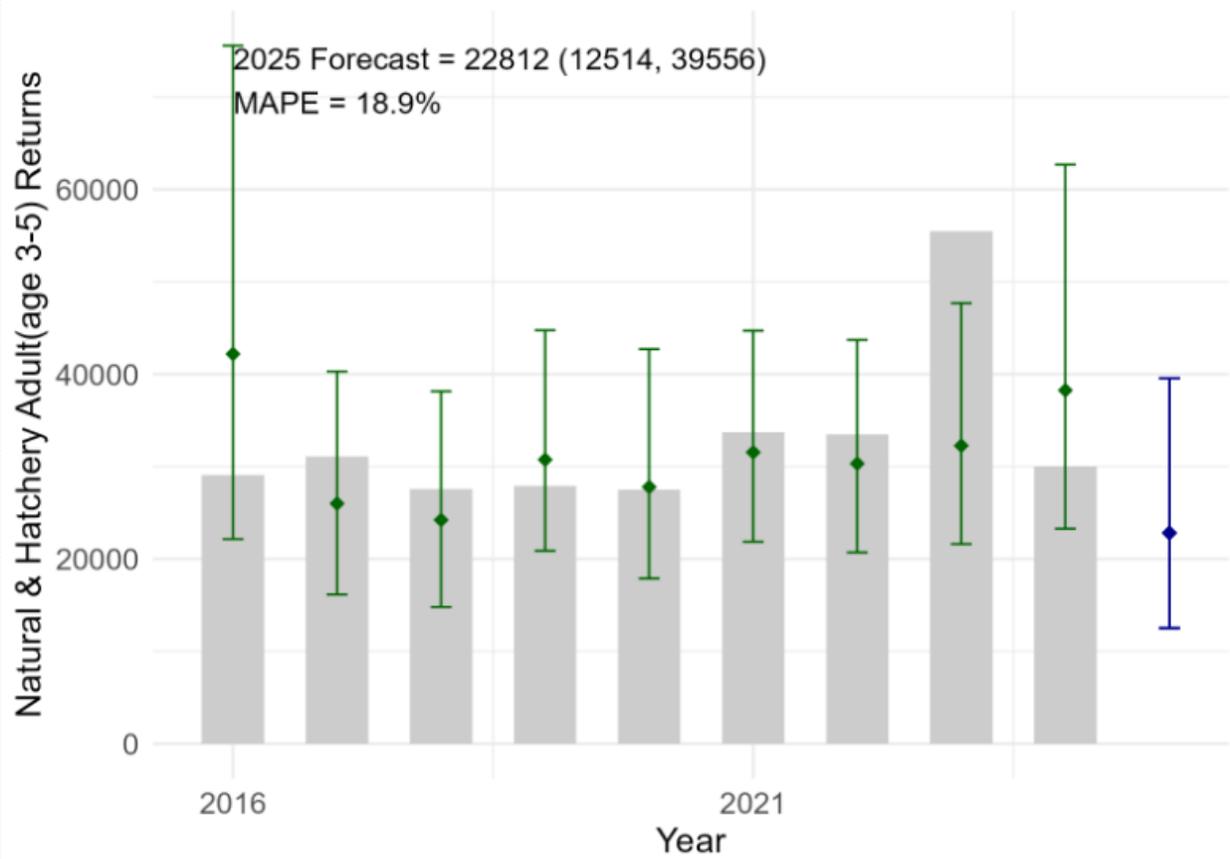
Figure 7. Burman adult Chinook (ages 3+) forecast predictions for 2025 [2,300 (300 – 10,100)] and retrospective performance of the sibling regression forecasting method since 2014. The gray bars represent the returns for each year, with the green diamonds representing the forecasted values surrounded by their associated 95% CI error bars.
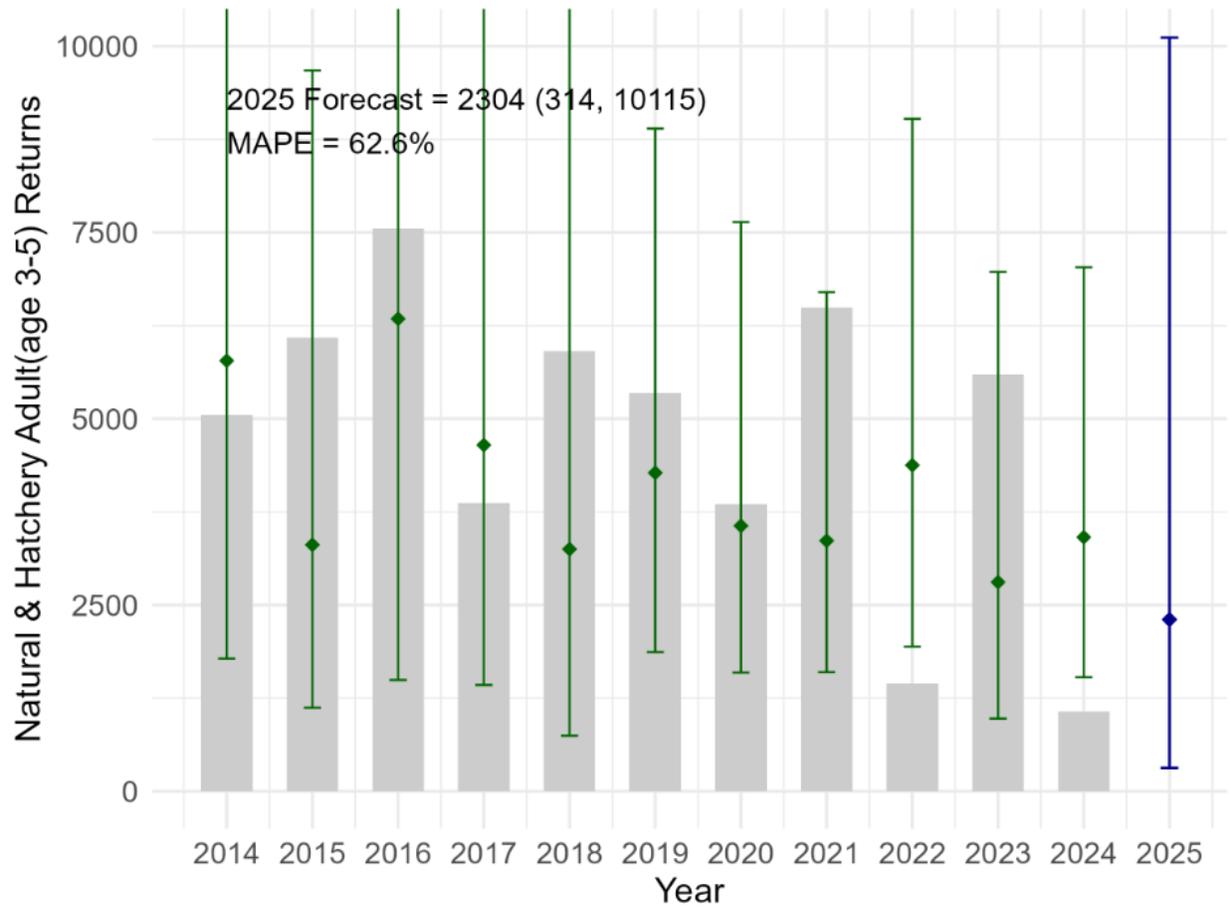
Figure 8. Burman adult Chinook (ages 3+) forecast predictions for 2025 [1,500 (0 – 5,400)] and retrospective performance of the recreational harvest method since 2014. The gray bars represent the returns for each year, with the green diamonds representing the forecasted values surrounded by their associated 95% CI error bars.
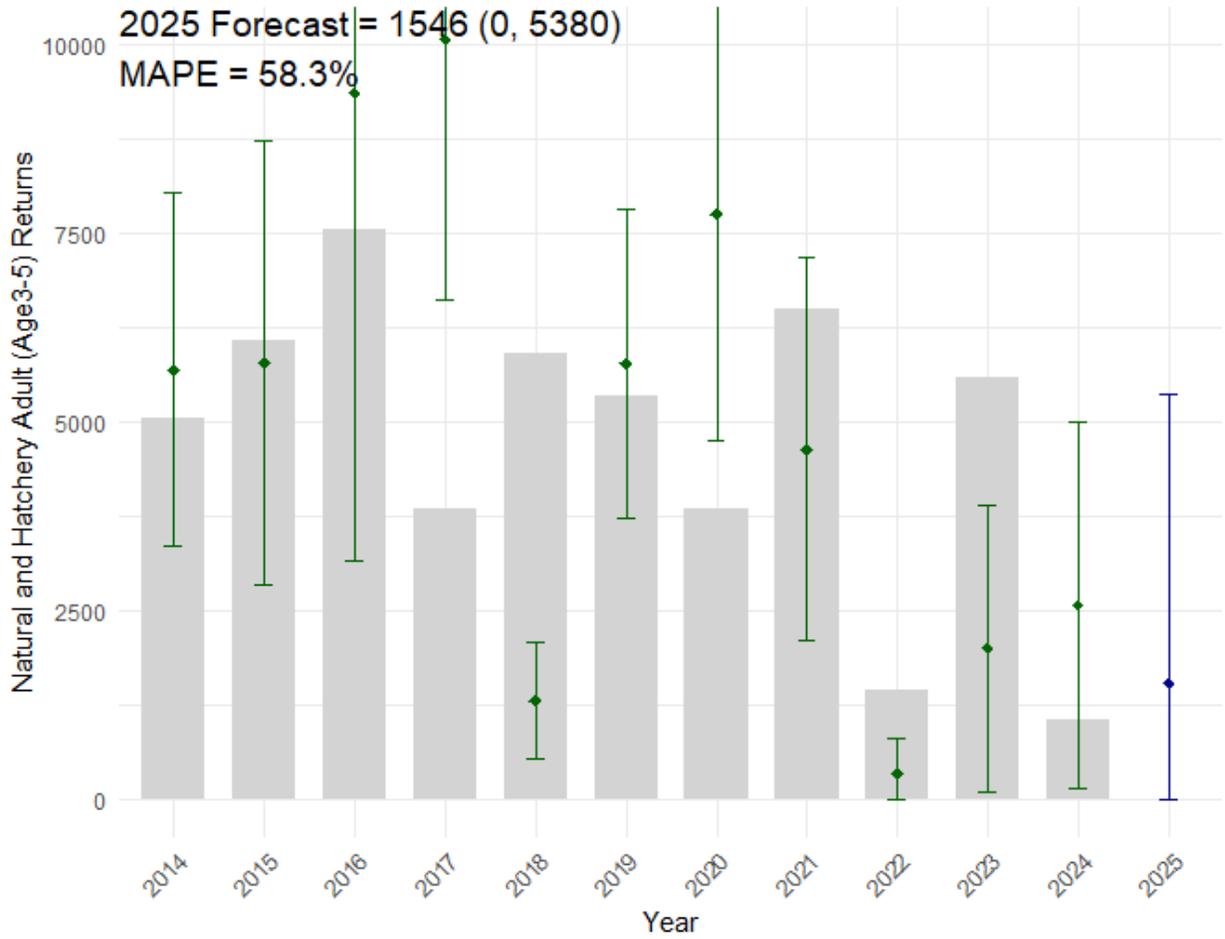
a Clayoquot Sound: Megin, Moyeha, & Bedwell spawner indicators

b Kyuquot Sound: Kaouk, Artlish, Tashish spawner indicators
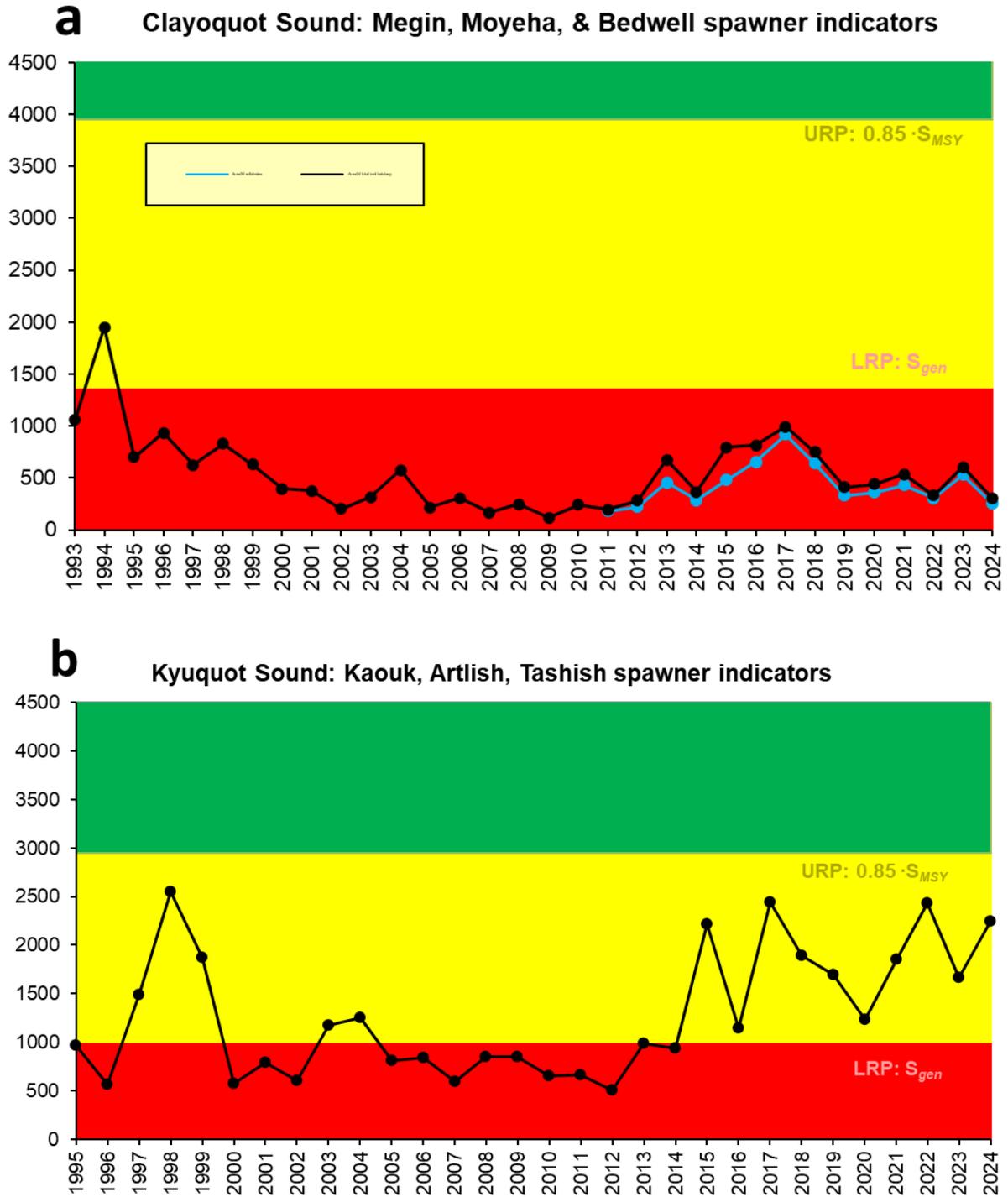
Figure 9. Spawner abundances of a) SWVI and b) NWVI CUs relative to provisional lower (red) and upper (green) biological benchmarks (S_{gen} and 0.85% S_{MSY}, respectively; S_{MSY} for index stocks is estimated in Holt et al. 2023). For each CU, spawner abundances are the summed estimates for wild index stocks that receive little or no enhancement. The upper and lower biological benchmarks are summed across the same wild index stocks.
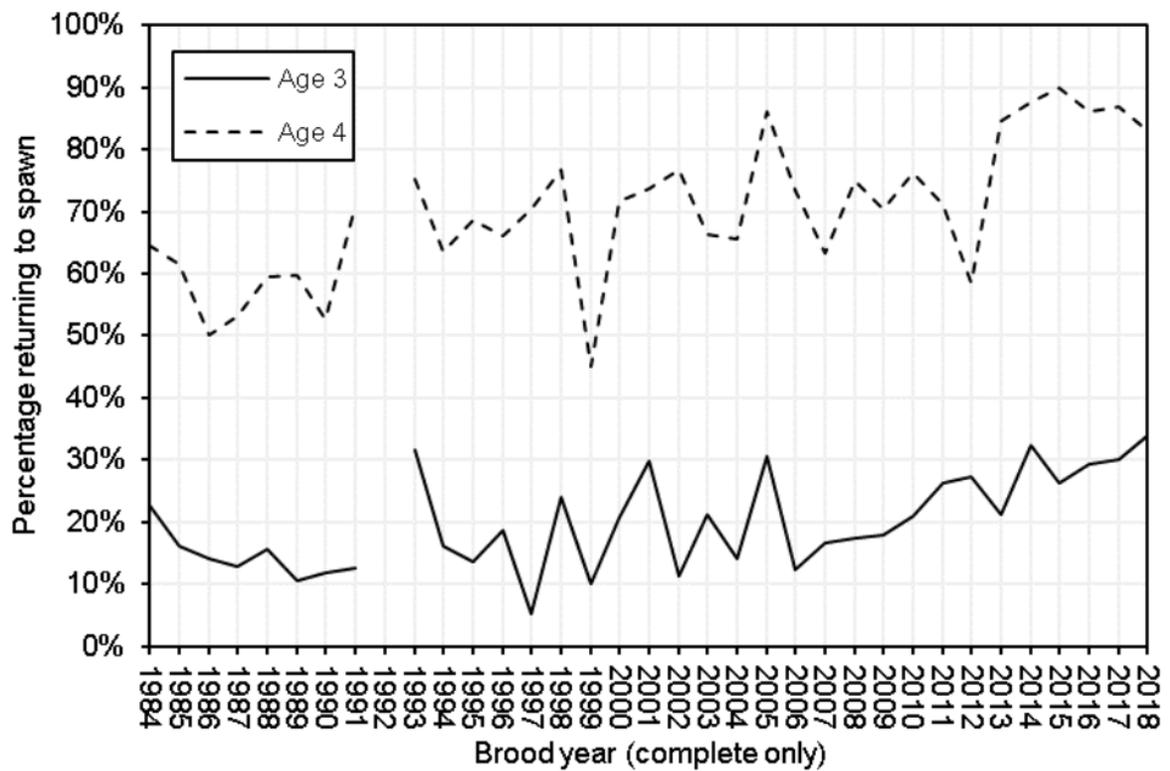
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Figure 10. Maturation rates for Stamp/RCH Chinook estimated from the CTC's CWT-based cohort analysis. Data from 1992 were excluded because too few CWT recoveries were observed to yield accurate estimates. All age 5 fish are assumed to be mature, and <2% of fish mature at age 2.

Table 1. Estimated 2024 returns of WCVI Chinook index stocks to the terminal WCVI area (i.e*.,* after pre-terminal Canadian fisheries).

Stock(s)	Age					Age 3-5 Total	Total
	2	**3**	**4**	**5**	**6**		
Somass	5,837	18,395	63,075	18,593	0	100,063	105,900
Conuma	1,614	4,730	47,355	2,164	11	54,249	55,874
Nitinat	362	6,845	7,962	4,328	0	19,135	19,497
Other WCVI*	811	3,294	21,610	4,975	160	29,879	30,850
Total **(% Total Run)**	**8,624** (4%)	**33,264** (16%)	**140,002** (66%)	**30,060** (14%)	**171** (0%)	**203,326**	**212,121**

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

Table 1. The performance of 2024 WCVI Chinook adult (age 3-5 years) terminal return forecasts. "PE" is the percentage error of the forecast, i.e*.,* the discrepancy between predicted and observed returns. Note: Average and Forecast values were rounded to 1000, the WCVI average-aggregate return (1996-2024) value is presented as the total and does not equal the sum of the average return by stock.

Stock(s)	Average (1996–2024)	2024 Observed	2024 Forecast Range	2024 Forecast Prediction	% Error
Somass	79,000	100,063	49,000 – 165,000	107,000	+7%
Conuma	36,000	54,249	31,000 – 64,000	48,000	-12%
Nitinat	26,000	19,135	24,000 – 45,000	35,000	+83%
Other WCVI*	34,000	29,879	37,000 – 71,000	54,000	+81%
Total	**150,000**	**203,326**	**141,000-345,000**	**244,000**	**+20%**

*An aggregate of the Pacific Salmon Commission indicators (Artlish, Burnam, Gold, Kaouk, Marble, Tahsis, & Tashish rivers) and "extensive" indicators (Bedwell, Colonial, Cypre, Leiner, Megin, Moyeha, Nahmint, San Juan, Sarita, Tranquil, & Zeballos rivers).
†Average from 2015–2022. Prior to 2015, catch was not included; only escapement estimates for the systems were available.

Table 2. 2025 pre-season terminal run size expectations for indexed WCVI Chinook populations in addition to Somass (RCH). The total is the terminal run prediction for the WCVI aggregate (*i.e.,* summed index stocks). Note: Numbers rounded to 1000s. If the total is different, it is because the individual stock forecasts were summed and then rounded to the 1000s.

Stock(s)	Age						Total	Range
	3	**%**	**4**	**%**	**5**	**%**		
Somass	48,000	58%	27,000	33%	8,000	9%	83,000	65,000 - 105,000
Conuma	11,000	33%	16,000	47%	7,000	20%	33,000	22,000 - 47,000
Nitinat	6,000	28%	14,000	65%	2,000	7%	21,000	16,000 - 28,000
Other WCVI*	8,000	34%	11,000	48%	4,000	18%	23,000	13,000 - 40,000
Total	**72,000**	45%	**67,000**	42%	**20,000**	13%	**160,000**	**116,000-220,000**

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

Table 3. Burman Chinook 2025 pre-season terminal run size prediction. Burman is included in Other WCVI, but broken out separately for management purposes. Numbers are rounded to the 100s.

Method	Range	Prediction
Recreational Harvest Method	0 – 5,400	1,500
Terminal Run Sibling Method	300 – 10,100	2,300