Fisheries and Oceans Canada
Pêches et Océans Canada

WCVI Salmon Bulletin
Area 23 (Barkley Sound, Alberni Inlet) Sockeye Forecast for the 2025 Return
May 2025

Mikayla Hamilton and Sarah Power
South Coast Area Stock Assessment
Naniamo B.C. Canada

Canada

Cat. No. Fs141-13E-PDF

ISSN 2819-330X

Correct citation for this publication:

Hamilton, M. & Power, S. J. H. 2025. Area 23 (Barkley Sound, Alberni Inlet) Sockeye Forecast for the 2025 Return. West Coast of Vancouver Island Stock Assessment Bulletins. 21p

SUMMARY

1. For 2025 fishery management purposes, the Area 23 Roundtable has agreed to begin fisheries in the “moderate” zone (500,000-700,000 adult return) for early season harvest management. Hucuktlis Lake (previously known as Henderson Lake) Sockeye remains a constraining stock in the “Low” zone.
2. There is uncertainty among the 2025 forecast models. Predictions (Table 3) vary between 330,481 (survival stanza method), 477,312 (Coho leading indicator model), 593,720 (multivariate model), and 1,048,087 (sibling model). Forecast models for the 2025 aggregate Somass Sockeye return are described in Appendix A.
3. All models predict GCL will comprise the dominant portion of the run. In 2020 and 2021 (broods returning as ages 5 and 4 fish, respectively, in 2025), escapements were below the median for SPR. For GCL in 2020 escapement was below the median but above the following year (Figure 5). The estimated juvenile Sockeye abundances in Sproat Lake ang Great Central Lake in the 2022 and 2023 sea-entry years were low compared to the average historic levels. Therefore, a precautionary management approach for early season fisheries is warranted until the total run size and stock composition can be more accurately determined.
4. The recommended management outlook for Hucuktlis Sockeye is the “Low” zone for harvest management, corresponding to an expected return of 15,000–25,000 (Table 4). The key consideration influencing this outlook is low spawner abundances in the main contributing brood years, 2020–2021.

BACKGROUND

Great Central Lake, Sproat Lake, and Hucuktlis Lake (previously known as Henderson Lake) are the three main Sockeye stocks returning to Barkley Sound (Area 23). The status of each stock is assessed as a separate Conservation Unit (CU) for implementation of Canada’s Wild Salmon Policy. From 1980–2023, the median adult terminal returns (catch and escapement) of Great Central Lake, Sproat Lake, and Hucuktlis Lake Sockeye are 305,000; 241,000 and 23,000, respectively (Table 5). In the Somass Sockeye return, the historical median split between Great Central Lake and Sproat Lake abundance is around 55% Great Central, with an inter-quartile range around the mid 40s to low 60s.

The pre-season biological forecasts for Somass Sockeye (outlined in this bulletin) inform a *management forecast* that guides June fishing plans (Table 8). The run size forecasts are revised weekly starting in the third week of June based on in-season indicators described later in this bulletin. The first in-season reforecast is anticipated no earlier than Thursday June 19, 2025.

Data limitations preclude a statistical forecast for Hucuktlis Sockeye. Instead, a management zone is set based on an outlook that considers spawner abundances and smolt abundances (when available) and indicators related to marine survival rates for the contributing brood years. This outlook informs management decisions around the amount and timing of fisheries that are likely to intercept Hucuktlis Sockeye.

2025 SOMASS SOCKEYE BIOLOGICAL FORECASTS

Several indicators of varying accuracy are used to inform the pre-season Somass Sockeye biological forecasts: abundances of younger siblings from the same brood and smolt years as returning 2025 age classes, sea surface temperatures recorded at the Amphitrite Point Lightstation, survival rates of Coho from the same brood year but return as adults one year earlier, and estimates of winter smolt abundances in Great Central and Sproat Lakes. The predicted Somass aggregate return is further broken down into age- and stock-specific forecasts in Table 3.

Model forecasts for the 2025 aggregate Somass Sockeye return are described in detail in Appendix A and summarized here:

- The Multivariate forecast (Table 3) predicts a total return to the Somass River of 593,720 (95% prediction interval: 79,366–4,441,548) adult Sockeye. The predicted returns to Great Central and Sproat Lakes are 399,018 and 194,702 adult Sockeye, respectively (67% GCL).
- The Sibling forecast (Table 3) predicts a total return to the Somass River of 1,048,087 adult Sockeye. The predicted returns to Great Central and Sproat Lakes are 786,180 and 261,908 adult Sockeye, respectively (75% GCL). The model suggests age-4 fish will be the dominant age class in both the Great Central and Sproat returns (Table 3).
- The survival stanza method model (SStM) forecast (Table 3) predicts a total return to the Somass River of 330,481 adult Sockeye. The predicted returns to Great Central and Sproat Lakes are 269,819 and 60,662 adult Sockeye, respectively (82% GCL). The average spring (March, April, May) marine temperatures at Amphitrite Point during 1980-2024 was 9.39°C. In the year 2022, the average temperature of those 3 months was higher which resulted in a "fair" survival scenario for returning 5-year-olds. In 2023, the average temperature of those 3 months was 9.26°C, which was below the historic average, which results in a "high" survival scenario (5%) for returning 4-year-olds. However, smolt abundances were low in both Great Central and Sproat Lakes through 2022–2023 (Figure 4).
- The Coho Leading Indicator (CLI) model predicts a total return to the Somass River of 477,312 adult Sockeye. The predicted returns to Great Central and Sproat Lakes are 254,314 and 222999 adult Sockeye, respectively (53% GCL). The CLI model accounts for spawner abundances in the contributing brood years, as well as the survival rate of Robertson Creek Coho from the contributing sea-entry years. Coho survival rates were above the 6% average in 2022 (6.7%) and below in 2023 (5.1%).

2025 SOMASS SOCKEYE MANAGEMENT FORECAST

For fishery management purposes, the Area 23 Roundtable has agreed to manage to a forecast in the "moderate" zone (see Table 8) corresponding to an expected return of 500,000-700,000 adult Sockeye.

Based on the projected return, a precautionary approach to fisheries management will be required until in-season information can inform run size estimates. In-season indicators that will be applied to inform management in 2025 include:

- Stock compositions from samples collected by the test fishery in June will be used as an indicator of the relative proportions of Great Central and Sproat Lake at the end of the run.
- Area D gillnet catch rates in Area 23 in the second and third weeks of June will be used as an indicator of the final Somass Sockeye adult return.
- The total cumulative accounting (escapement, catch, Alberni Inlet abundance estimate, and lower river abundance estimate) and estimated run timing will be used to predict the final Somass Sockeye adult return.
- Scale samples collected from the test boat, fisheries, and escapement at the fishways will inform the predicted age composition of the return.
- River temperatures and inlet conditions will inform holding patterns and migration conditions, which affect escapement timing, pre-spawn natural mortality, and susceptibility to fisheries.

2025 HUCUKTLIS SOCKEYE OUTLOOK

The recommended management outlook for Hucuktlis Sockeye is the “Low” (below average) zone for harvest management, corresponding to an expected return of 15000–25000 Sockeye (Table 4). Spawner abundance in the 2020 brood year (4589 Sockeye) was far from the historical median of 18000, but in the 2021 brood year, 14520 spawners were estimated (Table 4). Therefore, expectations are for a low Hucuktlis sockeye return in 2025.

For further information contact:

Mikayla Hamilton
WCVI Stock Assessment Biologist
Email: Mikayla.Hamilton@dfo-mpo.gc.ca

APPENDIX A. FORECAST METHODOLOGY

Statistical forecast models

Four models have historically been used to forecast Sockeye returns to Great Central and Sproat Lakes for over 40 years: the Survival Stanza Method (SStM), Surface Salinity Method (SSM), Salmonid Enhancement Program Biostandard Method (SEPB), and Coho Leading Indicator Method (CLI; Hyatt et al. 2003). In the 1980's a sibling regression model was developed that uses the relationships between the returns of Sockeye at earlier ages to predict future returns of their older siblings (*i.e.* predicts age 4, 5, and 6 returns based on the abundance of earlier returning age 3, 4, and 5 fish from matching brood years; Peterman 1982, DFO 2012). Since the early 2020's, a multivariate sibling model that combines sibling and other variables like smolt abundances and sea-entry conditions has been used, although the additional variables have changed depending on the year.

For the multivariate model in 2024 the inclusion of average January–February sea surface temperatures from ECCC buoy c46132 "South Brooks" was included, which appeared to more accurately predict survival rates compared to the nearshore temperatures recorded at the Amphitrite Point Lightstation (Figure 6). However, this ECCC buoy c46132 data was not included in 2025, as no updated buoy data was available from 2022 onward; instead, Amphitrite Point Lightstation data was used in the multivariate model to act as the sea surface temperature component of the model.

Sockeye from Great Central and Sproat Lakes exhibit diverse life histories with respect to freshwater and marine ages. Research suggests age-at-maturity and perhaps life history type (*i.e.* freshwater and marine ages) could be heritable in Sockeye salmon (Walters et al, 2021). Currently the sibling and multinomial forecast takes into account both stock- and life-history-specific predictors by separating the freshwater age components. For example, 4.2 returns predict 5.2 returns, and 4.3 returns predict 5.3 returns.

The SStM and SSM use annual estimates of the numbers of smolts from Great Central and Sproat Lakes and predictors of early marine survival (marine temperature and salinity measured off Amphitrite Point, Ucluelet, respectively) to estimate returns (Hyatt et al. 2003).

The CLI model is based on the observation that marine survivorships for both juvenile Sockeye and Coho migrating through Barkley Sound and up the West Coast of Vancouver Island often covary because both species face similar physical and biological conditions at sea-entry in a given year (Hyatt et al. 2003). Because Coho return one year earlier than most Sockeye, Coho survival values observed in one year can be used to predict survival of Sockeye returning the following year.

The Sibling-only and multivariate forecasts have provided the most accurate forecasts over the long term, with mean absolute percentage errors (MAPE) of 38% and 28%, respectively (Figure 7). The SStM has had a MAPE of 58%. Over the past 5 years, the Sibling and SStM models have performed the best (MAPEs of 33% and 61% respectively), while the CLI and SSM models have performed poorly (MAPEs of 77%, 72%, respectively; Figure 7).

The forecasts generated from all methods are evaluated based on their relative accuracy at predicting past returns along with other relevant information (*e.g.* marine environmental conditions or observations). A heuristic management forecast for the Somass aggregate return is produced to guide early season fisheries. This forecast sets pre-season expectations and guides early-season harvest planning.

2024 forecast performance

The pre-season management forecast for the previous year was in the "Moderate" zone with a predicted return of approximately 500000 adult Somass Sockeye (Table 2).

The observed return of approximately 680,000 adult Somass Sockeye was in the 55th percentile of all runs recorded since 1977 (Table 1, Table 5, Figure 2). Fish from the 2018–2021 brood years returned in 2024, with the majority contributed from 2020 and 2021. The proportion of age 4_2 fish (68%) was well above the sibling model prediction (13%) and well below the SStM prediction (80%) but similar to

predictions from the Multivariate and CLI models (61%, and 73% respectively). The 2024 return included an above average jack (ages 3_2 and 4_3) return to Great Central Lake.

The proportion of Great Central Lake in the total adult return (78%) was higher than expected pre-season (63%; average of the 4 forecast models employed). Returns are slightly dominated by Great Central Lake in the 2019 brood year (55%) and weighted heavily towards Great Central Lake in the 2020 brood year (78%). In the 2021 brood year, Great Central Lake (51%) is only slightly more abundant than Sproat Lake (49%) (Table 6).

All models, except the sibling forecast and the multivariate model, under-predicted the 2024 return (Table 2). The prediction from the multivariate model was closest to the observed return (absolute percentage error: 12%).

The return of approximately 8,306 Hucuktlis Lake Sockeye in 2024 was well below the 10-year median of *c.* 16000 (Table 1, Table 5, Figure 3) and below with the pre-season outlook for a return in the “low” management zone (15000–25000 Sockeye). Pre-season expectations were based on below-average spawner abundances in the 2020 brood year.

Sources of uncertainty

The mean absolute percentage errors (MAPEs) for five forecast models (SStM, SSM, CLI, Multivariate, and Sibling) that have historically been used to predict Somass Sockeye returns range from about 28–116%. Retrospective analysis suggests the Multivariate model is the best performing forecast. On average, the observed return is about 28% higher or lower than the return predicted by the Multivariate model. Factors that contribute to forecast uncertainty include, but are not limited to: model structure, assumptions about the relationships between returns and the predictor variables, and uncertainty in the source data (*e.g.* smolt abundances, age compositions in historical returns). Smolt estimates since 2018 were derived from a revamped acoustic-trawl survey program and are considered to have better accuracy compared to previous years in the historical record.

For the Hucuktlis Sockeye outlook, there is considerable uncertainty due to lower quality assessment data relative to the Somass stocks. There are less complete age data, relatively high uncertainty in the estimates of spawner abundance, and uncertainty in catch estimates. Catch estimates are particularly uncertain in recent years when the abundance of Hucuktlis Sockeye is low relative to the Somass stocks due to small sample sizes.

The relationships between available ocean indicators and survival rates in Area 23 Sockeye are uncertain. While there are weak correlations between spring sea surface temperatures and salinities measured at Amphitrite Point and Somass Sockeye survival (R^2 0.03–0.17), some years with seemingly excellent ocean conditions (*e.g.* 2002) have not yielded high survivorship.

An additional source of uncertainty for the 2025 forecast comes from using preliminary Maa-nulth catch data from the 2024 season. A discrepancy of approximately 700 more fish was accounted for in the final Maa-nulth catch reporting, which was received after the completion of the 2024 run-reconstruction and 2025 forecast. It is believed that the variability between models is much greater than the change these additional fish would induce, which may have slightly increased the forecasts that depend on sibling returns.

APPENDIX B. FUTURE DIRECTIONS FOR FORECASTING

Biological oceanographic covariates

The early marine period is believed to be a critical phase in Sockeye survival that can potentially explain a portion of return variability (Tanasichuk & Routledge, 2011). Measurements from physical oceanographic parameters, such as temperature and salinity, have been considered in the Area 23 Sockeye forecast since the late 1980s (Hyatt et al., 2003). However, some of these now show low correlation with Somass sockeye returns. These physical oceanographic characteristics are considered proxies for biological factors, namely predator and prey abundances, that are assumed to affect survival more directly (Koslow et al., 2002; Meuter, Peterman & Pyper, 2002). Wainwright (2021) points out that the predictive strength in climate slamon relationships is often ephemeral. The authors suggest that those with low correlation to sockeye returns dropped from further use and other indicators be explored. Tanasichuk & Routledge (2011) showed that for Somass Sockeye, a significant portion of return variability could be explained by euphausiid (krill) abundances in Barkley Sound during the juvenile marine migration period. DFO plankton surveys in Barkley Sound operated from 1991–2014 and were resumed in 2022. In addition, there has been some recent work on early juvenile survival via a DFO program called “Follow the Fish,” and newer collections of environmental data, that may identify other indicators useful for forecasting. To evaluate be useful for forecasting there needs to be several years of data.

Additionally non-stationarity should be explored in the models using sibling regressions. Salmon have been returning at younger age classes. As such, the relationship between age classes may have changed, for example age 4s and following years age 5s may have changed through time, with the expectation that estimates of age 5s might be overestimated.

.

REFERENCES

DFO. 2012. Assessment of Area 23 Sockeye and 2010 Forecast (Barkley Sound and Alberni Inlet). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/033.

Hyatt, K. D., W. Luedke, D. P. Rankin, J. Till and D. Lewis 2003. Review of the year 2002 return of Barkley Sound Sockeye salmon and forecasts for 2003. Fisheries and Oceans Canada. Canadian Science Advisory Secretariat. Research Document. 2003/033. iv + 34p. https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/276685.pdf

Koslow, J.A., Hobday, A.J. and Boehlert, G.W. (2002) Climate variability and marine survival of coho salmon (*Oncorhynchus kisutch*) in the Oregon Production area. Fisheries Oceanography. 11:65–77

Mueter, F. J., Peterman, R. M. & Pyper, B. J. Opposite effects of ocean temperature on survival rates of 120 stocks of Pacific salmon (*Oncorhynchus spp.*) in northern and southern areas. Can. J. Fish. Aquat. Sci. 59, 456-463. (2002)

Peterman, R. M. (1982). Model of salmon age structure and its use in preseason forecasting and studies of marine survival. Canadian Journal of Fisheries and Aquatic Sciences, 39(11), 1444–1452. https://doi.org/10.1139/f82-195

Tanasichuk, R. W., & Routledge, R. (2011). An investigation of the biological basis of return variability for sockeye salmon (*Oncorhynchus nerka*) from Great Central and Sproat lakes, Vancouver Island. Fisheries Oceanography, 20(6), 462–478. https://doi.org/10.1111/j.1365-2419.2011.00596.x

Wainwright, T.C. 2021 Ephemeral relationships in salmon forecasting: A cautionary tale, Progress in Oceanography, Volume 193,102522,ISSN 0079-6611, https://doi.org/10.1016/j.pocean.2021.102522.

Waters, C.D., Clemento, A., Aykanat, T., Garza, J.C., Naish, K.A., Narum, S. and Primmer, C.R. (2021), Heterogeneous genetic basis of age at maturity in salmonid fishes. Mol Ecol, 30: 1435-1456. https://doi.org/10.1111/mec.15822

Harvard Citation Style – Mikayla added April 28 2025 according to CJFAS Guidelines (Canadian Science Publishing**):**

DFO (2012) *Assessment of Area 23 Sockeye and 2010 Forecast (Barkley Sound and Alberni Inlet)*. DFO Canadian Science Advisory Secretariat, Science Advisory Report 2012/033.

Hyatt, K.D., Luedke, W., Rankin, D.P., Till, J. and Lewis, D. (2003) *Review of the year 2002 return of Barkley Sound Sockeye salmon and forecasts for 2003*. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Research Document 2003/033, iv + 34 pp. Available at: https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/276685.pdf

Koslow, J.A., Hobday, A.J. and Boehlert, G.W. (2002) Climate variability and marine survival of coho salmon (*Oncorhynchus kisutch*) in the Oregon Production area. *Fisheries Oceanography*, 11, pp.65–77.

Mueter, F.J., Peterman, R.M. and Pyper, B.J. (2002) Opposite effects of ocean temperature on survival rates of 120 stocks of Pacific salmon (*Oncorhynchus* spp.) in northern and southern areas. *Canadian Journal of Fisheries and Aquatic Sciences*, 59, pp.456–463.

Peterman, R.M. (1982) Model of salmon age structure and its use in preseason forecasting and studies of marine survival. *Canadian Journal of Fisheries and Aquatic Sciences*, 39(11), pp.1444–1452. Available at: https://doi.org/10.1139/f82-195

Tanasichuk, R.W. and Routledge, R. (2011) An investigation of the biological basis of return variability for sockeye salmon (*Oncorhynchus nerka*) from Great Central and Sproat lakes, Vancouver Island. *Fisheries Oceanography*, 20(6), pp.462–478. Available at: https://doi.org/10.1111/j.1365-2419.2011.00596.x

Wainwright, T.C. (2021) Ephemeral relationships in salmon forecasting: A cautionary tale. *Progress in Oceanography*, 193, 102522. Available at: https://doi.org/10.1016/j.pocean.2021.102522

Waters, C.D., Clemento, A., Aykanat, T., Garza, J.C., Naish, K.A., Narum, S. and Primmer, C.R. (2021) Heterogeneous genetic basis of age at maturity in salmonid fishes. *Molecular Ecology*, 30, pp.1435–1456. Available at: https://doi.org/10.1111/mec.15822

APPENDIX C. TABLES AND FIGURES

Table 1. Total return of Sockeye to Barkley Sound in 2024.

Conservation Unit	Age at Return						Total	Adults
	3_2	**4_2**	4_3	**5_2**	**5_3**	**6's**		
Great Central Lake	45,868	427,365	6,472	77,829	21,763	6,040	585,337	532,997
Sproat Lake	43,562	112,523	2,765	30,241	4,215	456	193,762	147,435
Hucuktlis Lake	7	2,734		4,462	1,103		8,306	8,299
Total	**89,437**	**587,622**	**9,237**	**112,532**	**27,081**	**6,496**	**787,405**	**688,731**

Table 2. Forecast performance of Somass Sockeye models (GCL & SPL) for 2024. Absolute Percentage Error (APE) is the absolute value of (Forecast return – Observed return) × (Observed return)$^{-1}$.

2024 Management forecast: Moderate zone (*c.* 500000 adults)				
680,432 observed	**Forecast 2024**			
	SStM	**CLI**	**Sibling**	**Multivariate**
Expected	280,686	352,313	805,085	772,916
Obs. − Exp.	408,402	336,419	-116,354	-84,185
APE	59%	49%	17%	12%

Table 3. Predictions by age and lake for 2025 from the four best-performing Somass Sockeye forecast models.

Forecast		Age at return				% of return
		4_2	**5_2**	**5_3 and 6_3**	**Total**	
Sibling	GCL	438,220	294,098	53,861	**786,180**	75%
	SPL	181,609	61,923	18,375	**261,907**	25%
	Total	619,829	356,021	72,237	**1,048,087**	
	% at age	59%	34%	7%		
		4s	**5s**		**Total**	
SStM	GCL	170,665	99,154		**269,819**	82%
	SPL	38,582	22,080		**60,662**	18%
	Total	209,247	121,234		**330,481**	
	% at age	63%	37%			
		4_2	**5_2**	**5_3**	**6_3**	**Total**
CLI	GCL	176,237	58,866	16,686	2,524	**254,314**	53%
	SPL	130,596	76,186	13,821	2,396	**222,999**	47%
	Total	306,833	135,052	30,507	4,938	**477,312**	
	% at age	64%	28%	6%	1%		
		4_2	**5_2**	**5_3**	**6_3**	**Total**
Multivariate	GCL	212,118	148,489	28,652	9,760	**399,018**	67%
	SPL	126,269	54,133	11,834	2,465	**194,702**	33%
	Total	338,387	202,622	40,486	12,225	**593,720**	
	% at age	57%	34%	7%	2%		

Table 4. Factors considered in the 2025 outlook for the Hucuktlis Sockeye return, were the age 4s from last year.

Return Year	Age at Return	Brood year	Spawner abundance	Smolt Year	Smolt Abundance
2024	4	2020	4.5k (low)	2022	*unknown*
2023	3	2021	14.5k(avg)	2023	*unknown*

Table 5. Terminal adult return of Area 23 Sockeye; 1980–2024. “Total A23 Catch” includes Hucuktlis Sockeye.

RETURN YEAR	TEST FISHERY	FIRST NATIONS CATCH				COMMERCIAL CATCH					RECREATIONA	TOTAL A23 CATCH	HED catch	ESCAPEMENT				TOTAL RETURN		
		Tseshaht / Hupacasath Total Catch	Barkley Bands (FSC)	Maanulth First Nation	Total First Nations	Comm GN	Comm SN	Troll	Special Use	Total Comm Catch	Recreational			GCL adults	SPR adults	HED	Ttl Adult Esc		SOM return	HED return
1980	-	15,791	-		15,791	292,339	374,760	-	-	667,099	-	682,890		246,041	124,343	21,000	391,384	**1,074,874**	**1,053,874**	**21,000**
1981	-	17,000	-		17,000	391,950	617,474	-	-	1,009,424	-	1,026,424		135,124	118,710	40,000	353,834	**1,380,258**	**1,340,258**	**40,000**
1982	-	23,500	-		23,500	229,271	246,673	-	-	475,944	-	499,444		155,579	213,477	56,000	425,057	**924,501**	**868,501**	**56,000**
1983	-	30,000	-		30,000	315,478	603,827	-	-	919,305	-	949,305		339,204	239,763	45,000	623,967	**1,573,272**	**1,528,272**	**45,000**
1984	-	21,000	-		21,000	454,813	463,971	-	-	918,784	-	939,784		131,000	76,373	61,000	268,374	**1,208,158**	**1,147,158**	**61,000**
1985	77*	15,387	-		15,387	249,814	190,038	-	-	439,852	1,731	457,570		112,339	113,688	16,000	242,027	**699,597**	**683,597**	**16,000**
1986	2,885*	12,800	-		12,800	30,461	13,640	-	-	44,101	17	56,918		119,820	173,915	3,000	296,735	**353,653**	**350,653**	**3,000**
1987	6,933*	23,335	-		23,335	19,321	183,643	-	-	203,564	21,424	254,383		277,562	105,457	26,000	409,019	**663,402**	**637,402**	**26,000**
1988	10,470*	21,292	-		21,292	146,391	146,603	-	-	292,994	348	314,634		195,327	210,518	35,000	440,845	**755,479**	**720,479**	**35,000**
1989	648	23,335	-		23,335	4,145		-	-	4,145	139	27,619		171,652	133,349	36,000	341,000	**368,619**	**332,619**	**36,000**
1990	7,211*	10,480	-		10,480	3,617	8,062	-	-	11,679	14,430	36,589		163,320	93,631	32,000	288,952	**325,541**	**293,541**	**32,000**
1991	8,505*	36,523	-		36,523	282,833	762,634	-	-	1,045,467	78,551	1,160,541		402,976	140,123	37,000	580,099	**1,740,640**	**1,703,640**	**37,000**
1992	-	53,662	-		53,662	203,890	211,938	-	-	415,828	101,408	570,898		149,838	192,641	35,000	377,539	**948,437**	**913,437**	**35,000**
1993	11,997*	58,020	10,000		68,020	258,357	346,246	-	-	605,203	107,407	780,630		227,634	187,860	150,000	565,553	**1,346,183**	**1,196,183**	**150,000**
1994	10,475	53,656	10,000		63,656	74,381	-	-	-	74,381	30,261	179,373		113,121	142,162	18,000	273,282	**452,655**	**434,655**	**18,000**
1995	146	23,782	-		23,782	-	-	-	-	-	6,519	30,447		40,940	43,254	4,000	88,195	**118,642**	**114,642**	**4,000**
1996	4,513	28,139	-		28,139	-	-	-	-	-	28,033	60,685		157,087	207,716	56,000	420,804	**481,489**	**425,489**	**56,000**
1997	10,493	29,508	12,098		41,606	52,241	-	2,100	-	54,341	36,531	142,371		174,088	126,349	49,000	349,437	**492,408**	**443,408**	**49,000**
1998	17,522	45,200	30,859		76,059	49,324	-	9,003	-	58,327	55,421	207,329		184,542	142,360	82,000	408,902	**616,831**	**534,831**	**82,000**
1999	4,445	39,820	1,000		40,820	53,800	-	8,819	-	62,619	7,870	115,754		203,369	162,776	12,000	378,745	**494,499**	**482,499**	**12,000**
2000	6,304	36,643	16,500		53,143	16,260	-	5,236	-	21,496	24,315	105,864		52,043	108,568	23,000	183,611	**289,475**	**266,475**	**23,000**
2001	7,004	58,245	20,000		78,245	46,640	-	21,022	-	67,662	67,190	220,100		307,106	158,923	11,000	477,029	**697,130**	**686,130**	**11,000**
2002	9,207	99,014	41,575		140,589	131,176	202,893	51,087	-	385,156	58,718	593,670		259,482	130,371	18,000	468,453	**1,062,123**	**1,044,123**	**18,000**
2003	10,577	64,908	25,651		90,559	143,493	209,823	-	-	353,322	61,610	522,069		223,546	163,807	3,000	390,352	**912,421**	**909,421**	**3,000**
2004	10,318	119,522	28,673		148,195	46,420	48,041	-	-	94,461	81,836	334,810		213,021	113,798	3,000	329,819	**664,629**	**661,629**	**3,000**
2005	9,233	43,213	3,745		52,958	11,305	-	-	-	11,305	31,292	104,788		172,962	131,949	2,000	306,911	**411,700**	**409,700**	**2,000**
2006	11,188	35,808	5,000		40,808	5,443	-	-	-	5,443	30,514	87,959		135,493	61,940	3,000	200,433	**288,391**	**285,391**	**3,000**
2007	885	8,706	-		8,706	-	-	-	-	-	-	9,591		67,717	52,837	12,000	132,554	**142,145**	**130,145**	**12,000**
2008	-	-	-		-	-	-	-	-	-	-	-		59,589	65,333	11,000	135,921	**135,921**	**124,921**	**11,000**
2009	-	55,345	12,963		68,308	9,138	14,735	-	-	23,873	55,218	147,399		203,858	130,289	30,000	364,148	**511,547**	**481,547**	**30,000**
2010	-	85,596	20,915		106,511	240,170	495,495	-	-	735,665	77,462	919,638		255,339	296,356	30,000	582,296	**1,501,934**	**1,471,934**	**30,000**
2011	-	109,369		17,081	126,450	231,442	192,333	-	-	423,775	42,799	593,024	6,365	431,213	381,380	20,423	833,616	**1,426,640**	**1,399,252**	**27,388**
2012		154,351		18,047	172,398	116,106	73,550	-	-	135,656	16,940	385,593	5,342	147,440	192,226	17,133	356,800	**742,393**	**719,318**	**23,075**
2013	5,313	31,208		11,851	43,059	11,390	9,128	-	-	20,518	13,274	82,164	1,125	66,688	119,849	12,500	199,037	**281,201**	**267,576**	**13,625**
2014	9,636	164,319		19,659	183,978	169,685	243,337	-	5,190	418,212	16,313	628,739	21,656	66,298	159,751	11,837	237,885	**866,624**	**833,131**	**33,493**
2015	11,298	319,351		25,267	344,618	329,505	521,003	-	15,000	865,508	88,232	1,309,656	5,192	417,774	312,265	6,400	736,440	**2,046,096**	**2,034,504**	**11,592**
2016	8,887	170,326		26,765	197,091	161,607	228,329	-	13,124	403,060	51,680	660,719	23,111	220,952	211,926	10,700	443,578	**1,104,297**	**1,070,486**	**33,811**
2017	3,328	36,305		14,672	50,977	9,879	16,461	-	-	26,340	12,420	93,065	3,217	125,846	142,684	22,704	291,234	**384,299**	**358,378**	**25,921**
2018	4,837	35,886		18,278	54,164	10,785	6,075	-	-	16,860	5,566	81,427	626	36,418	146,312	12,203	194,933	**276,360**	**263,531**	**12,829**
2019	3,409	27,770		12,792	40,562	6,482	-	-	-	6,482	2,193	52,646	154	35,382	91,245	13,549	140,776	**193,422**	**179,719**	**13,703**
2020	6,314	35,830		7,876	43,766	6,361	-	-	-	6,361	6,575	63,616	443	109,174	131,529	4,589	245,292	**308,908**	**303,876**	**5,032**
2021	7,272	51,306		20,795	72,101	35,777	35,110	-	-	70,887	36,410	186,670	4,359	220,319	105,441	14,520	340,280	**526,950**	**508,071**	**18,879**
2022	7,872	98,114		22,698	120,812	99,292	108,395			207,687	9,531	345,902	7,731	194,241	366,294	18,646	579,181	**925,083**	**898,706**	**26,377**
2023	9,281	87,295		24,045	111,340	71,280	93,572			164,852	23,067	308,540	8196	120,379	122,622	13,113	256,714	**565,254**	**543945**	**21309**
2024	8,580	70,378		18,818	89,196	51,046	82,085		3,367	142,498	45,785	286,060	4,854	319,353	77,851	2,968	400,771	**686,831**	**679009**	**7822**
MEDIAN	5,313	36,523	-	18,548	50,977	52,241	63,795	-	-	94,461	21,424	254,383	5,023	172,962	140,123	18,000	353,834	663,402	637,402	23,000
YR MED	7,272	51,306	#N/A	18,969	63,133	23,584	25,786	-	-	48,613	12,847	139,868		117,510	144,498	12,352	268,263	455,624	433,224	16,291
YR MED	8,226	78,837	#N/A	18,278	54,164	10,785	6,075	-	-	16,860	6,575	81,427		109,174	131,529	13,549	245,292	308,908	303,876	13,703

Table 6. Escapement, catch, and total return-at-age to date from brood years contributing to the 2025 Somass Sockeye return. *Note*.—data from each brood year span multiple return years; *e.g.* fish from the 2019 brood year returned as age 3s in 2022, 4s in 2023, 5s in 2024, and will return as age 6s in 2025.

		2019 brood year			2020 brood year			2021 brood year		
	Age	GCL	SPL	TOTAL	GCL	SPL	TOTAL	GCL	SPL	TOTAL
Escapement	3_2	39,648	44,028	83,676	80,113	29,049	109,162	43,917	39,477	83,394
	4_2	80,852	64,745	145,597	267,755	61,534	329,289			
	4_3	8,174	3,347	11,521	5,630	2,367	7,997			
	5_2	38,297	14,350	52,647						
	5_3	14,523	1,082	15,605						
	TOTAL	181,494	127,552	309,046	353,498	92,950	446,448	43,917	39,477	83,394
Catch	3_2	7,122	14,120	21,242	10,666	5,404	16,070	1,951	4,085	6,036
	4_2	88,633	99,289	187,922	159,610	50,989	210,599			
	4_3	657	608	1,265	842	399	1,241			
	5_2	39,562	15,892	55,454						
	5_3	7,240	3,133	10,373						
	TOTAL	143,214	133,042	276,256	171,118	56,792	227,910	1,951	4,085	6036
Total Return	3_2	46,770	58,148	104,918	90,779	34,453	125,232	45,868	43,562	89,430
	4_2	169,485	164,034	333,519	427,365	112,523	539,888			
	4_3	8,831	3,955	12,786	6,472	2,766	9,238			
	5_2	77,859	30,242	108,101						
	5_3	21,763	4,215	25,978						
	TOTAL	**324,708**	**260,594**	**585,302**	**524,616**	**149,742**	**674,358**	**45,868**	**43,562**	**89,430**
% of Somass return		55%	45%		78%	22%		51%	49%	

Table 7. Excerpt from the management plan: Standardized Area 23 Sockeye Fishing Regime for early-season (June) fisheries. Typically, commercial seine fisheries are not planned until late June. However, all fisheries may be adjusted depending on in-season assessment results.

MANAGEMENT ZONE	FORECAST RUN SIZE	MAANULTH FIRST NATIONS	RECREATIONAL	TSUMASS ECONOMIC OPPORTUNITY	COMMERCIAL SEINE*	COMMERCIAL GILLNET
1 - Critical	**Less than 200,000**	no harvest	no harvest	no harvest	no harvest	no harvest
2 - Very Low	**200,000 to 350,000**	Open, fishing to target through limited effort (designated g/n vessels)	2 fish/day + Area restrictions + Late opening	Community/elder seine 1 day/week g/n	no harvest	1 day/week starting 64 (1 day total)
3 - Low	**350,000 to 500,000**	Open, fishing to target through limited effort (designated g/n vessels)	2 fish/day + Area restrictions	Community/elder seine 2 days/week g/n	seine fishing to target	1 day/week starting 63 (2 days total)
4 - Moderate	**500,000 to 700,000**	Open, fishing to target through limited effort (designated g/n vessels)	4 fish/day (time-area closures if required)	Community/elder seine 3 days/week g/n	seine fishing to target	1 day/week starting 62 (3 days total)
5 - High	**700,000 to 1,000,000**	Open, fishing to target through limited effort (designated g/n vessels)	4 fish/day (time-area closures if required)	Community/elder seine 4 days/week g/n	seine fishing to target	1 day/week starting 62 (3 days total)
6 - Abundant	**1,000,000 +**	Open, fishing to target through limited effort (designated g/n vessels)	4 fish/day	Community/elder seine 5 days/week g/n	seine fishing to target	1 day/week starting 61 (4 days total)

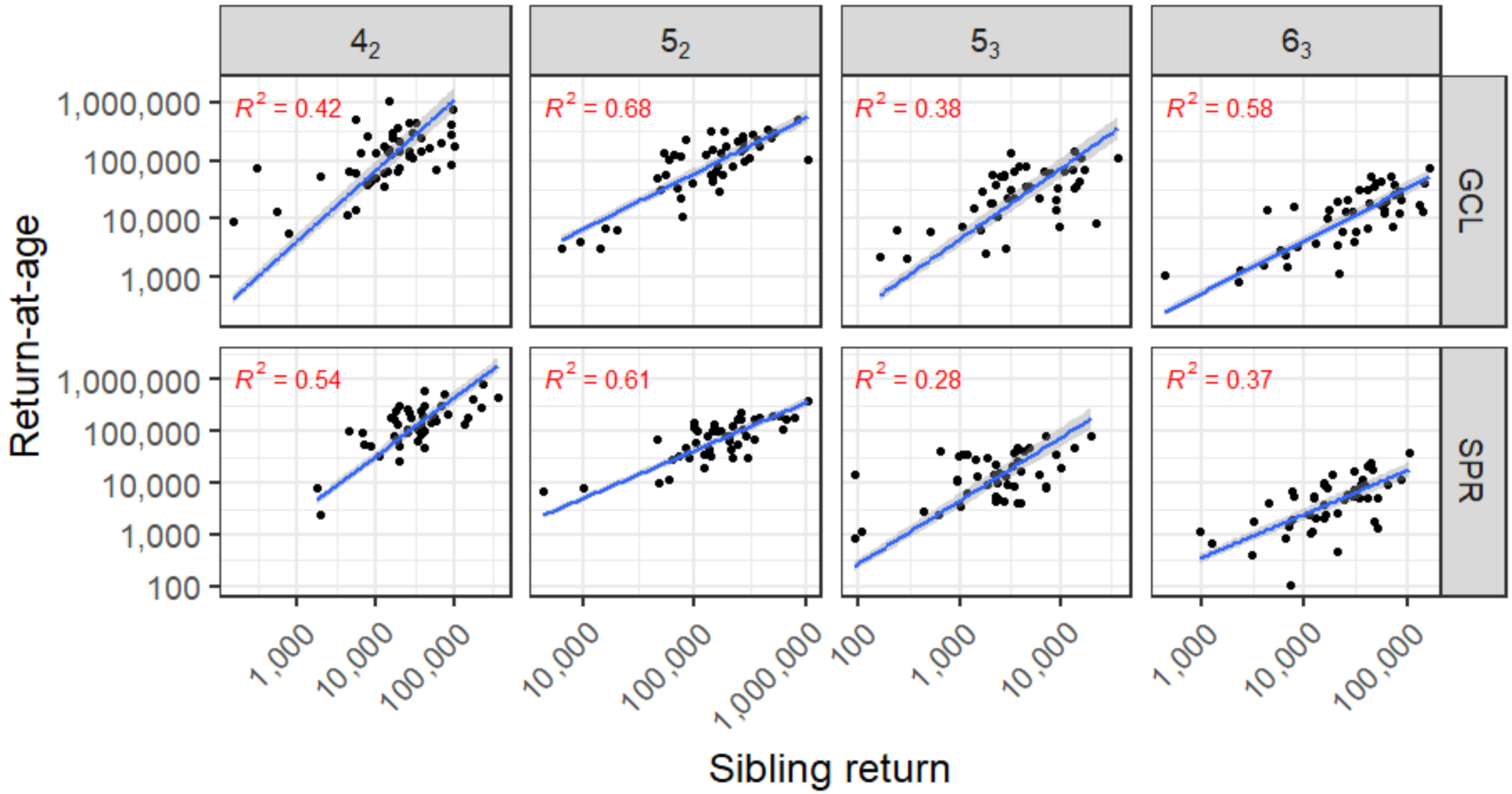

Figure 1. Sibling regression fits by Gilbert-Rich age (columns) and lake (rows; GCL = Great Central Lake, SPR = Sproat Lake). Blue lines and the shaded areas around them show the model predictions and 95% confidence intervals, respectively. Both x and y axes are plotted on a log-scale.

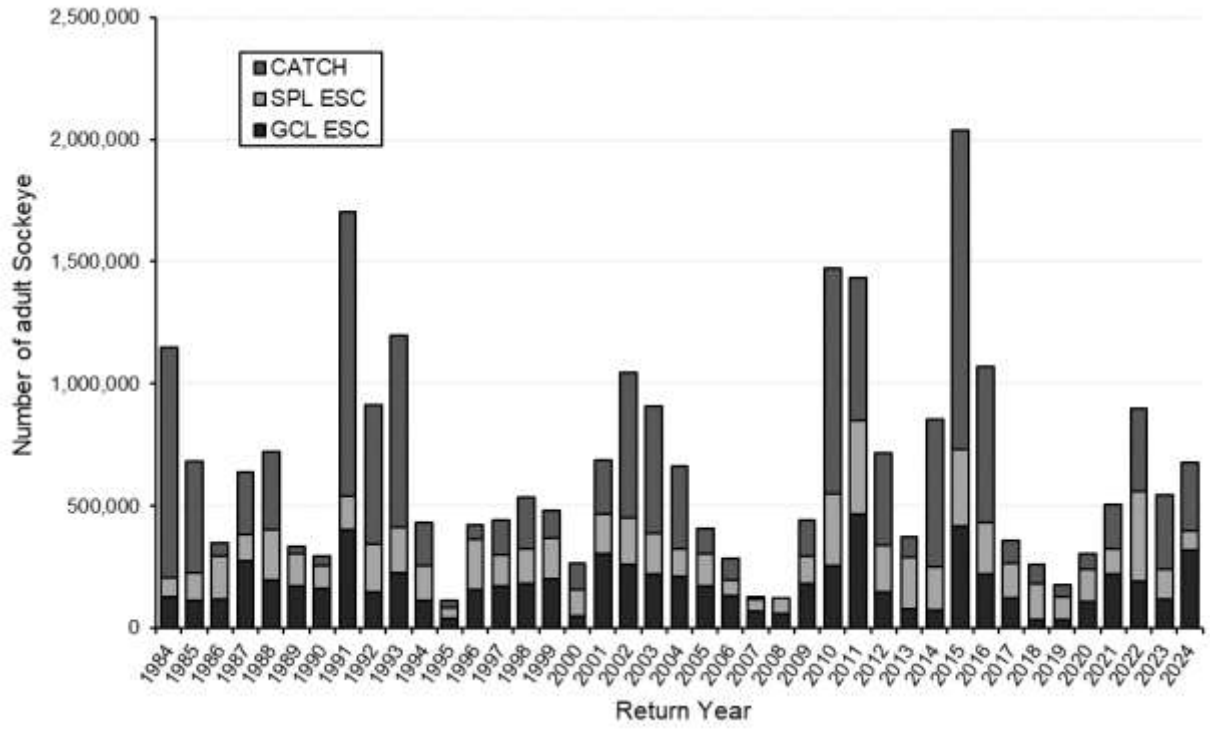

Figure 2. Estimated adult returns of Somass (Great Central (GCL) and Sproat Lake (SPL)) Sockeye, 1984–2024.

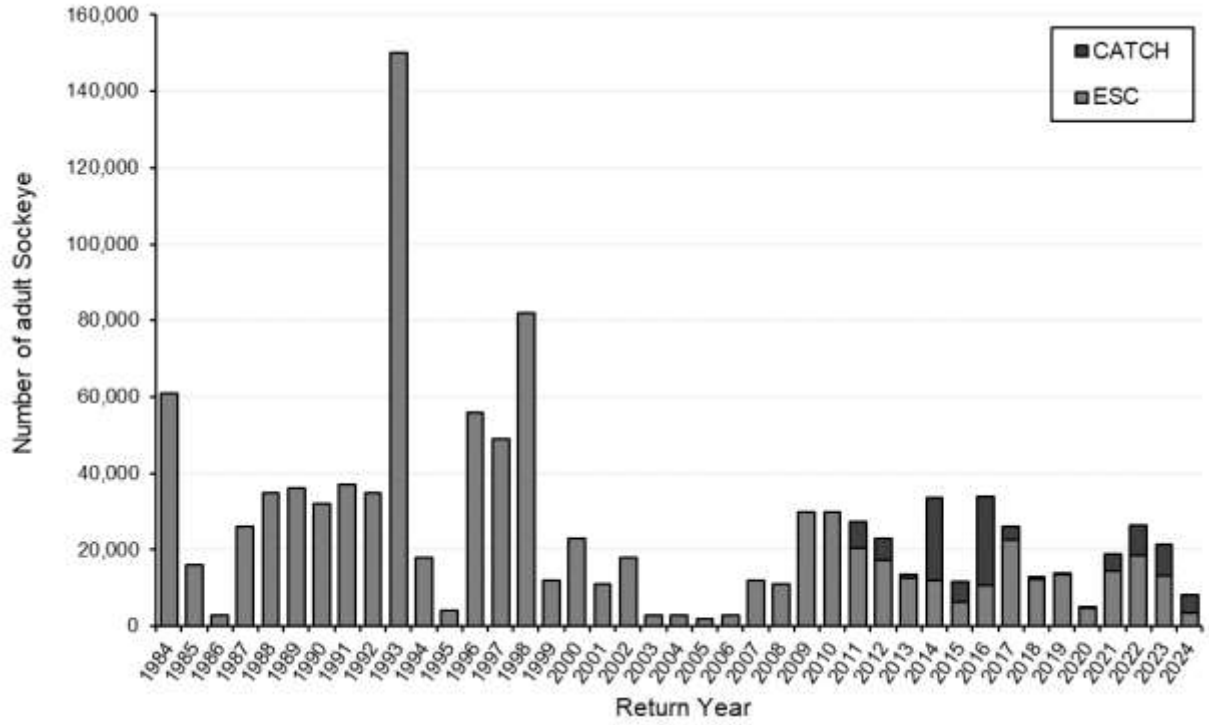

Figure 3. Estimated adult returns of Hucuktlis Lake Sockeye, 1984–2024. Catch estimates begin in 2011 when genetic sampling was instituted.

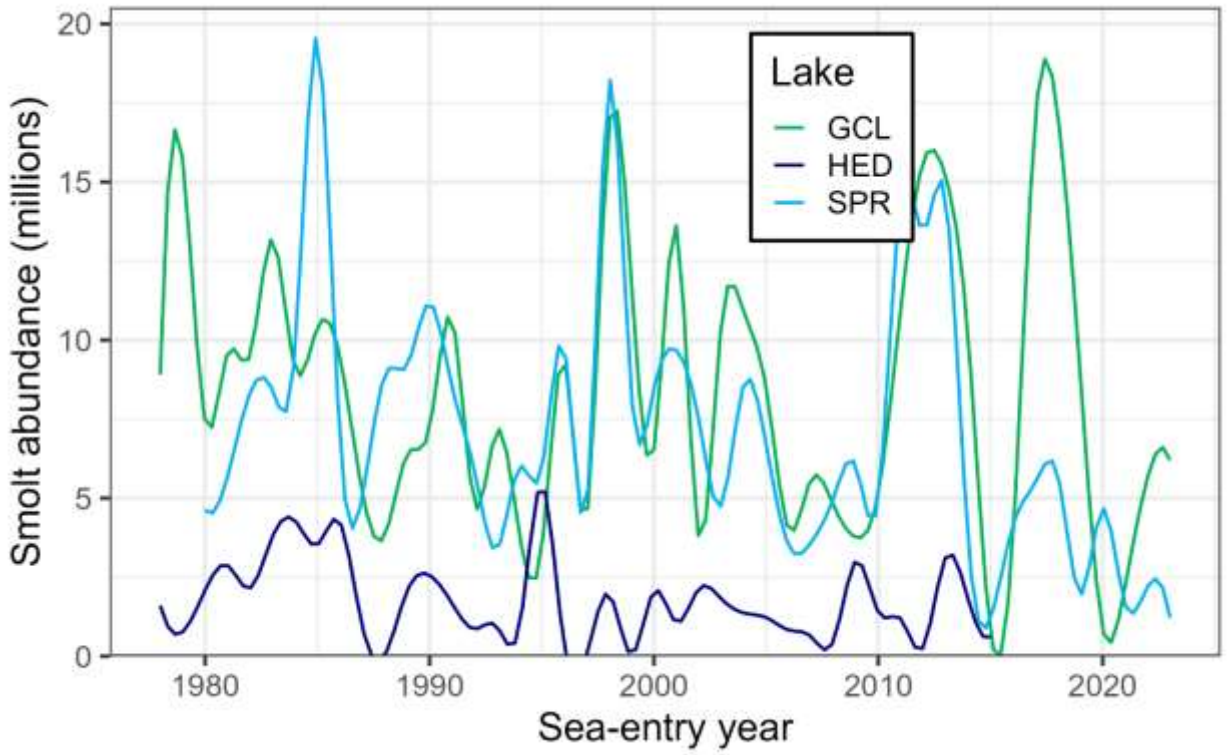

Figure 4. Estimated Sockeye "pre-smolt" juvenile abundances for Great Central (GCL), Sproat (SPR), and Hucuktlis (HED) Lakes by sea-entry year. Most adult Sockeye returning in 2025 are associated with the production from the 2022 and 2023 sea-entry years.

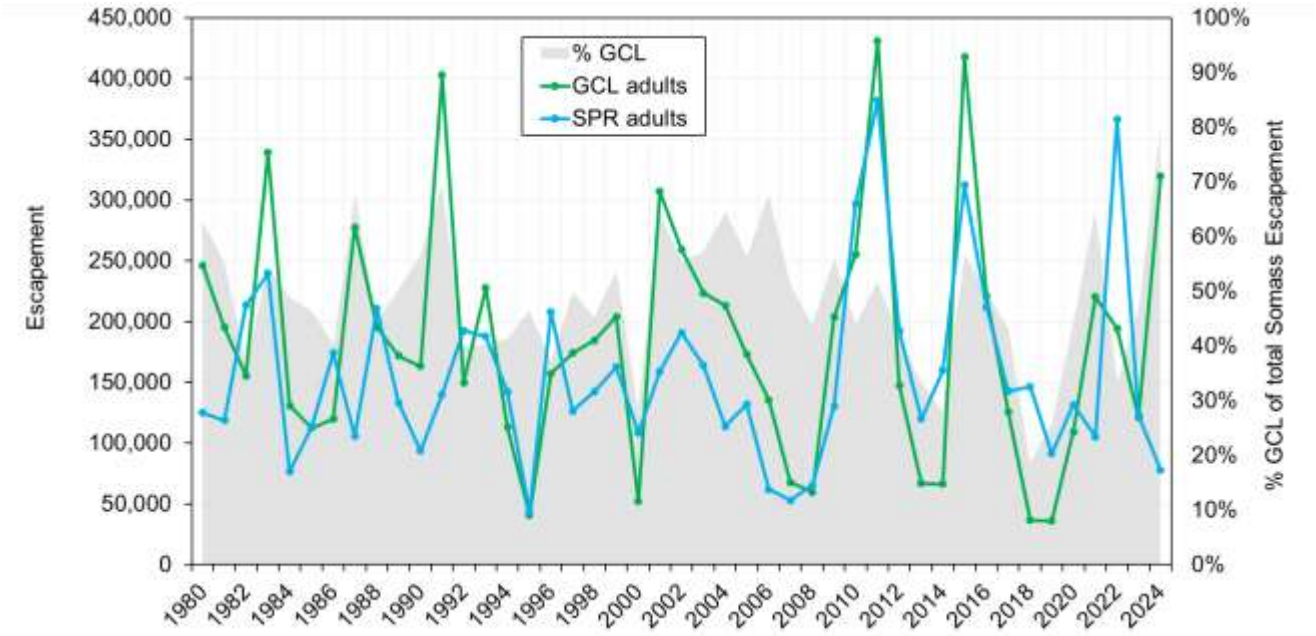

Figure 5. Time series of adult escapements to the Somass River from Great Central Lake (GCL), and Sproat Lake (SPR). The gray area shows the historical median % Great Central Lake in the total return (56%).

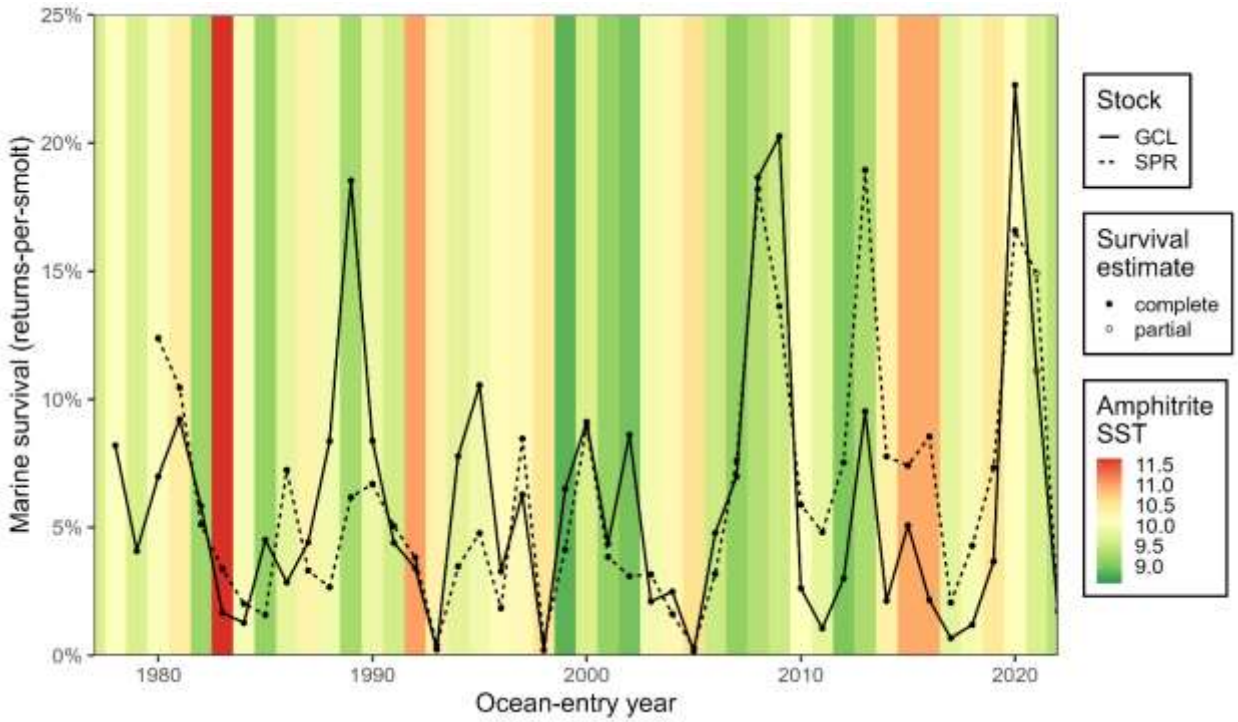

Figure 6. Time series of the marine survival rate index for Somass Sockeye stocks for Great Central Lake (GCL), and Sproat Lake (SPR). Coloured tiles show average January–February sea surface temperatures (SST; °C) measured from the Amphitrite Point Lightstation which is measured by contracted observers, with the database maintained by the Government of Canada (lightstations). Unfilled dots show years where the survival rate index is based on incomplete broods (not all fish that went to sea in those years have returned as adults). Stock code GCL refer to Great Central Lake, while stock code SPR refers to Sproat Lake. The majority of Sockeye returning in 2025 went to sea in 2022 (ages 5_2 and 6_3) and 2023 (ages 4_2 and 5_3).

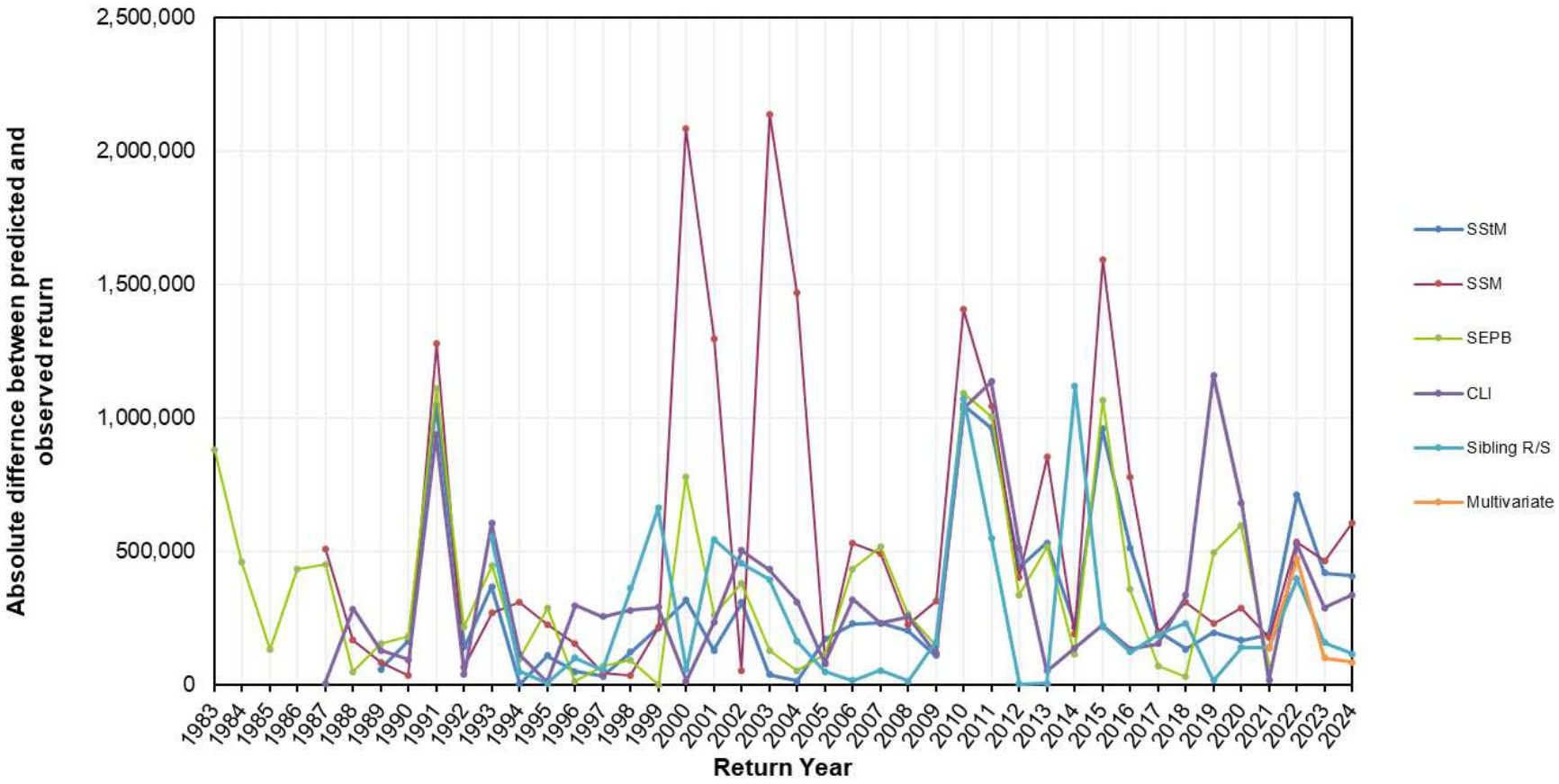

Figure 7. Time series of differences between predictions from the various forecast models and the observed Somass Sockeye returns.