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WCVI Salmon Bulletin
22 September 2022 Assessment Update
Area 23—Barkley Sound/Alberni Inlet

REPORTED CATCH

Tsu-ma-uss fished for EO on 17–20 September, and for FSC on 16 September. Estimated catch is 2180 Chinook from EO fishing, and 192 Chinook and 873 Coho for FSC.

Estimated catch in the recreational fishery over the week of 15–21 September is 305 Somass Chinook and ≈400 Somass Coho.

Table 1. Total reported Area 23 terminal salmon catch to date by species and sector

Sector	Sockeye	Chinook	Coho
Test fishery	7872	696	0
Tsu-ma-uss	96156	33576	2069
Maa-nulth	24297	1570	0
Area D	105712	16631	85
Area B	107791	11674	64
Recreational	10613	16326	*12933
Stewardship	0	0	0
Total	**352364**	**80473**	**15151**

*The proportion of Somass Coho in the recreational catch cannot be estimated at present.

ESCAPEMENT ESTIMATES

Chinook and Coho escapements through Stamp Falls have been very similar over the last week.

Table 3. Cumulative annual Pacific salmon escapement to 20 September 2022 as estimated in the Somass and Henderson rivers.

A. Somass River

Species	Stamp falls escapement	Sproat river escapement	7-day range in daily counts	Total	*Escapement target
Chinook	22348	2	370–1201	22350	21000
jack	1825	0	75–208	1825	–
Coho	15712	2664	743–1204	18376	–
jack	1452	174	91–152	1626	–
Chum	0	0	0	0	–
Pink	1	0	0	1	–
Sockeye	193625	365973	0–2	559598	383333
jack	41590	46694	0–1	88284	–

B. Henderson River

Species	Escapement	7-day range in daily counts	Total	*Escapement target
Chinook				–
Sockeye	17599	*NA*	17599	12750

*Based on the most current run size estimate.

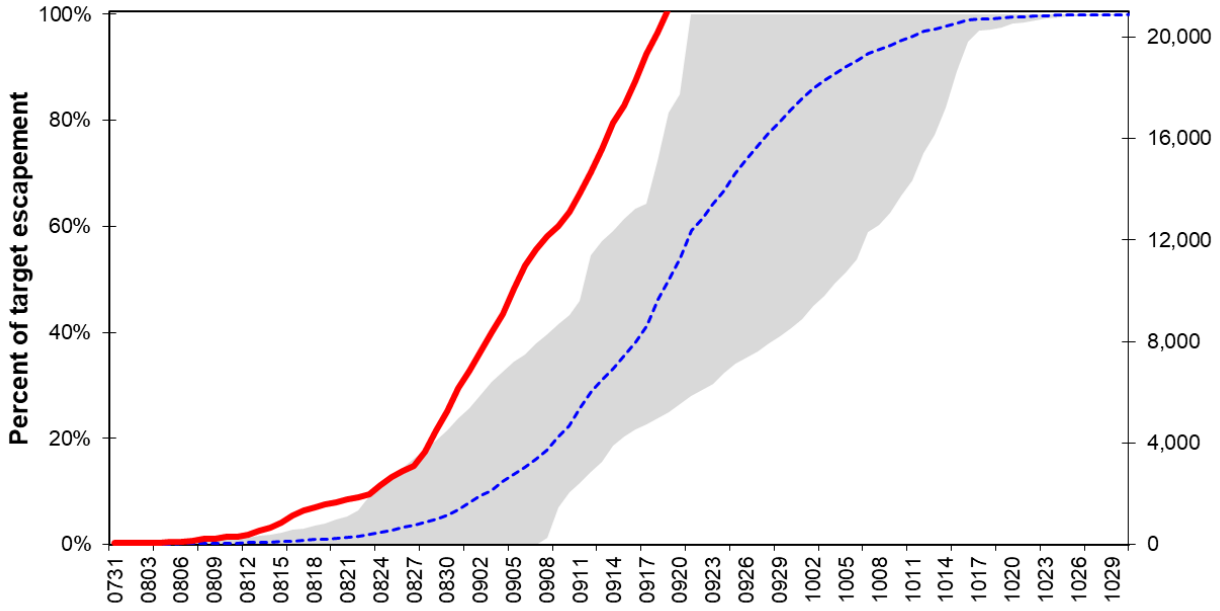


Figure 1. Daily Chinook escapement through the Stamp Falls fishway relative to historical average timing (blue dashed line; the grey shaded area shows the 90% quantile).

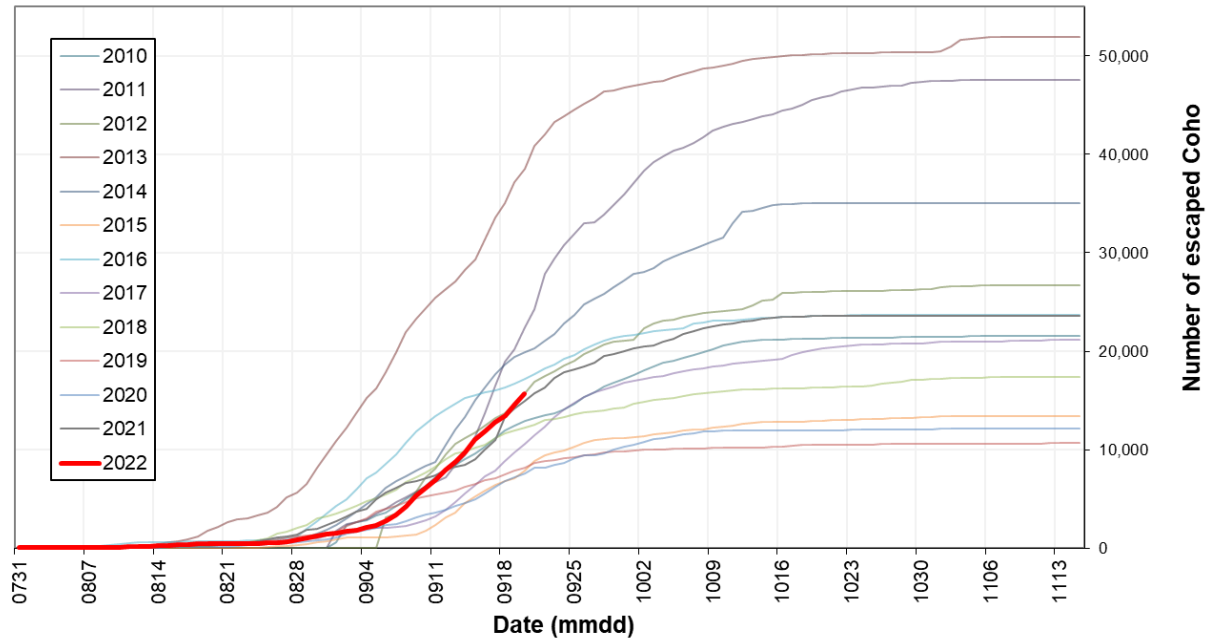


Figure 2. Daily Coho escapement through the Stamp Falls fishway relative to recent years (2010–2021).

TEST FISHERY

The final Area 23 Chinook test fishery for 2022 operated from 13–14 September and retained 58 Chinook. Average lengths were 738mm on the outside and 706mm on the inside. Sex ratios were 54% female on the outside and 43% female on the inside. Estimates of Chinook abundance in Area 23 were 1200 from Hocking Pt. in, and 1500 seaward of Ten Mile Pt. Coho prevalence continues to increase and sealions were abundant. All 2022 test fishery data are publicly available here.

BIOLOGICAL DATA

Observations from sampling thus far suggest a young, male-biased composition in the return.

Table 4. Area 23 Chinook age and sex data, 2022.

Stat Week	Dates	Sex	Sector	*N*	Gilbert-Rich age composition							
					2_1	3_1	3_2	4_1	4_2	5_1	5_2	6_1
83	21 Aug	F	Tsu-ma-uss	36	0%	7%	0%	73%	0%	20%	0%	0%
	21 Aug	M	Tsu-ma-uss	64	5%	63%	3%	27%	0%	0%	2%	0%
	22–23 Aug	F	Test	31	4%	30%	0%	52%	4%	11%	0%	0%
	22–23 Aug	M	Test	69	3%	83%	0%	12%	0%	0%	2%	0%
	25 Aug	F	Area B	101	1%	14%	0%	73%	1%	11%	0%	0%
	25 Aug	M	Area B	99	3%	52%	0%	38%	1%	6%	0%	0%
	24 Aug	F	Area D	19	0%	18%	0%	76%	6%	0%	0%	0%
	24 Aug	M	Area D	81	9%	77%	0%	14%	0%	0%	0%	0%
84	29 Aug	F	Area D	17	0%	25%	0%	75%	0%	0%	0%	0%
	29 Aug	M	Area D	83	3%	92%	0%	5%	0%	0%	0%	0%
	31 Aug	F	Tsu-ma-uss	35	0%	16%	0%	71%	0%	13%	0%	0%
	31 Aug	M	Tsu-ma-uss	65	3%	66%	0%	30%	0%	2%	0%	0%
	31 Aug	F	Test	28	0%	25%	0%	67%	0%	8%	0%	0%
	31 Aug	M	Test	72	12%	79%	0%	6%	3%	0%	0%	0%
91	5–6 Sep	F	Test	44	3%	19%	0%	70%	0%	8%	0%	0%
	5–6 Sep	M	Test	106	12%	71%	0%	14%	2%	1%	0%	0%
	7 Sep	F	Tsu-ma-uss	28	0%	22%	0%	74%	0%	4%	0%	0%
	7 Sep	M	Tsu-ma-uss	72	4%	72%	1%	22%	0%	0%	0%	0%
92	13–14 Sep	F	Test	28								
	13–14 Sep	M	Test	30								
	14 Sep	F	Tsu-ma-uss	29								
	14 Sep	M	Tus-ma-uss	71								

ENVIRONMENTAL CONDITIONS

Hydromet stations that collect data on environmental conditions (air and water temperature, barometric pressure, rainfall, and staff gauge) are located at both the Sproat River and Stamp Falls fish-ways. A pulse flow designed to aid steelhead migration was scheduled at the Elsie Lake Dam into the Ash River is being executed from 6–8 September.

Daily river temperatures over the past week ranged between 19.6–22.2°C (average 21.0°C) at the Sproat River fish-way, and between 16.2–20.1°C (average 18.2°C) at the Stamp Falls fish-way (Figure 3).

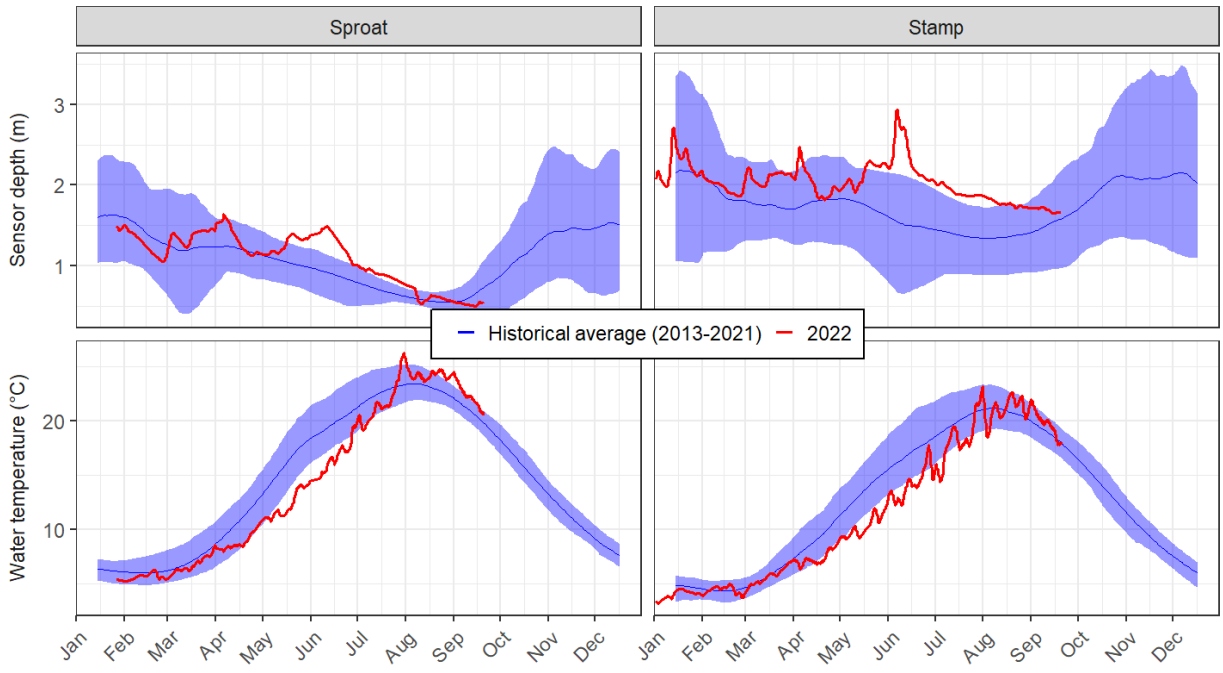


Figure 3. Sproat and Stamp River temperatures and depths compared to historical data. All measurements are collected by Hydromet stations that were installed at the fishways on both rivers in 2013. Current data are publicly available here. Coloured lines show the rolling 5-day mean and 30-day mean for 2022 and the historical data, respectively; the shaded area around the historical data shows its rolling 30-day 90% quantile.

The most recent harbor survey was conducted on 14 September. Sub-halocline temperatures and oxygen levels appear favourable for salmon migration from below the halocline to *c.* 15 m depth (Figures 4 & 5).

A “temp-oxy index”, based on physiological tolerances to water temperature and dissolved oxygen in Sockeye salmon, has been developed in consultation with DFO science to visualize the harbour survey data. The index is a 6-category scale that has been interpolated as a continuous measure in Figures 4 & 5 below. The categories are defined as:

0 = temperature > 24ºC or dissolved oxygen < 2 $mg \cdot L^{-1}$
1 = temperature 18–24ºC or dissolved oxygen 2–3 $mg \cdot L^{-1}$
2 = temperature < 18ºC & dissolved oxygen 3–4 $mg \cdot L^{-1}$
3 = temperature 16–18ºC & dissolved oxygen > 4 $mg \cdot L^{-1}$
4 = temperature 12–16ºC & dissolved oxygen > 4 $mg \cdot L^{-1}$
5 = temperature < 12ºC & dissolved oxygen > 4 $mg \cdot L^{-1}$

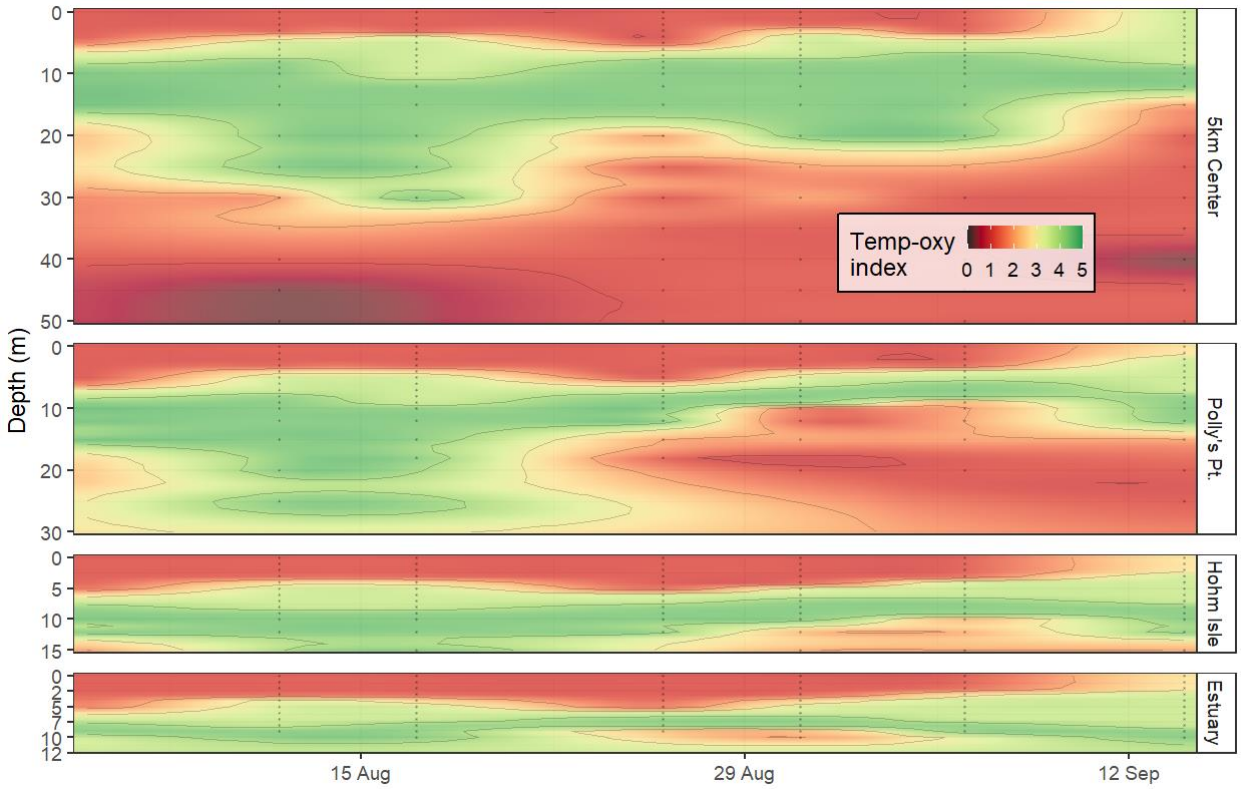


Figure 4. Time series of the temp-oxy index–depth profile from temperature and oxygen measurements recorded at 4 sites in Alberni Inlet during Catalyst Paper's 2022 Harbour Survey. Black points show raw CTD measurements and black lines show 1-unit contours. Values between surveys are interpolated.

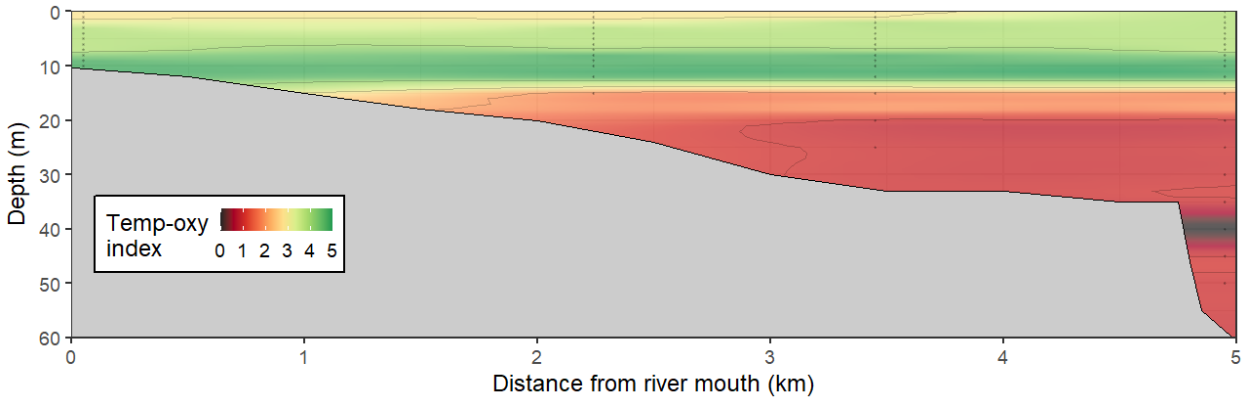


Figure 5. Cross-section of the temp-oxy index–depth profile from temperature and oxygen measurements recorded at 4 sites in Alberni Inlet during Catalyst Paper's 2022 Harbour Survey. Black points show raw CTD measurements and black lines show 1-unit contours. Values between surveys are interpolated.

RUN TIMING AND INFLUX EXPECTATIONS

Peak run timing of Somass/RCH Chinook to the terminal area typically occurs around the 28th of August. Fishery plans are made given the expected abundance, available TAC, and assumption that about half the migration occurs prior to 28 August, and half thereafter. Table 5 updates the expected run timing in relation to the prediction for a 135000 terminal run size.

Table 5. Expected influx to the terminal area based on average run timing of a 28 August peak migration. The abundance is adjusted for the escapement target of 21000.

Week		Expected		Observed
Starts	*Ends*	*Influx*	*%*	*Influx*
28-Jul	3-Aug	6703	5%	1557
4-Aug	10-Aug	13153	10%	1012
11-Aug	17-Aug	15977	12%	4377
18-Aug	24-Aug	19174	14%	37406
25-Aug	31-Aug	23393	17%	53875
1-Sep	7-Sep	26366	20%	13939
8-Sep	14-Sep	17620	13%	0
15-Sep	21-Sep	9376	7%	1711
22-Sep	28-Sep	2835	2%	
29-Sep	5-Oct	399	0%	
6-Oct	12-Oct	5	0%	
Total		**135000**	**100%**	**112627**

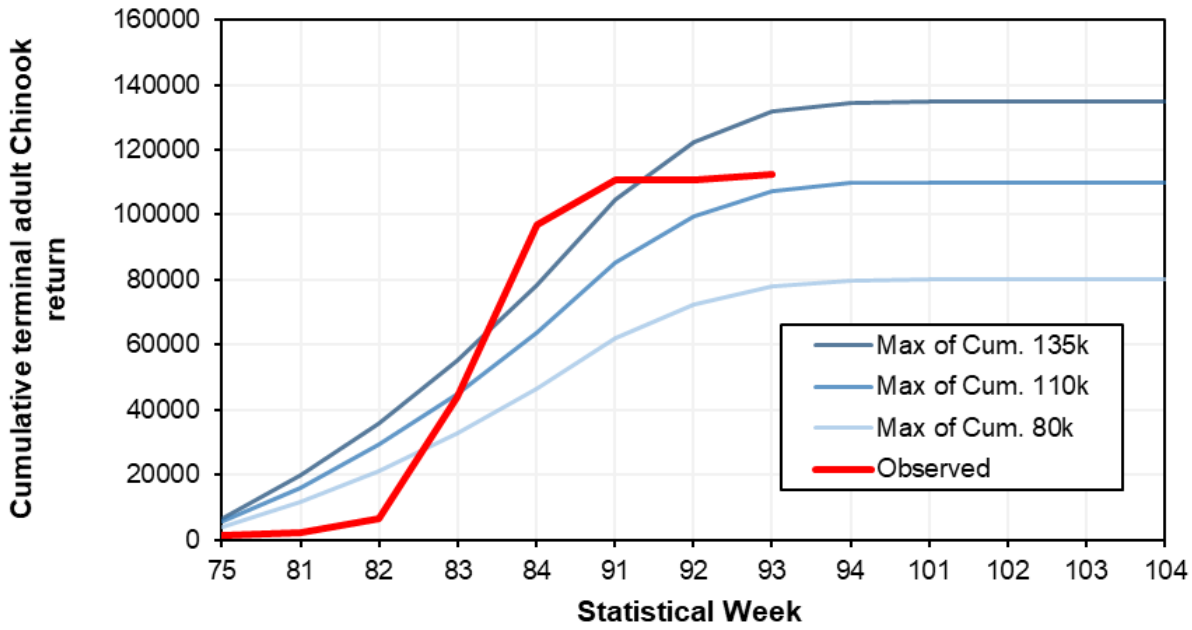


Figure 7. Observed total accounting of Chinook in Area 23 versus expected influx for three different run sizes: 135000 (pre-season forecast), 110000 (upper PI from week 84 in-season re-forecast), and 80000 (midpoint prediction from week 84 in-season re-forecast).

TERMINAL FISHERY ALLOCATION

Table 6 (below) shows allocations associated with the pre-season expected run size of Somass/Robertson Creek Hatchery Chinook. The escapement target was bumped up to 26000 to reflect uncertainties related to the age and sex composition observed in the return.

Table 6. Allocation of Somass/Robertson Creek Hatchery Chinook associated with the pre-season forecast of 135000.

Category	In-season	Remaining @ 135k
Terminal run	135000	22373
ESC	26000	3651
TAC	109000	28652
Level	Abundant	
Maa-nulth	†1860	250
Tsu-ma-uss FSC	2000	1003
Exp. Sport Catch	‡39550	8779
Tsumass EO	37747	6107
Area D	25165	9160
Area B	12582	1221
Special Use*	2778	2007

*Includes Test Fish requirements and Stewardship; Stewardship is 1.5% of total TAC – Treaty & FSC.
†Maa-nulth terminal Chinook TAC of 2600 is shared between PFMAs 23 and 26; 70% (1820) is predicted to be Somass/RCH.
‡10000 pieces were set for an expected future rec catch, the rest (17576 pieces) was reallocated to the commercial TAC on 8 Sep.

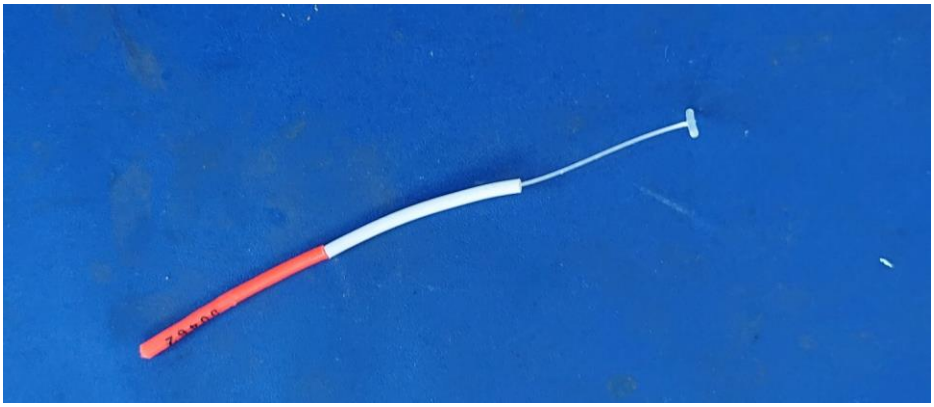
CHINOOK TAGGING STUDIES

Researchers from UBC in the Pacific Salmon Ecology and Conservation Laboratory applied 146 acoustic tags on Chinook in Barkley Sound this August. As of 20 September, a total of 12 tag recoveries have been reported: 3 from recreational fishers, 1 from Area D, 5 from Area B, and 3 from Tsu-ma-uss EO.

Recovery of the tags (see example below) is key as the tag contains important data and can be re-used. Tags from fish caught in any fishery can be returned for reward in Port Alberni at Gone Fishin' or the Port Boat House.

For further information on the study please contact by Phone – 604-834-6421 or email – UBC.salmontraking@gmail.com
and check out their website at - http://www.pacificsalmonecologyconservationlab.ca/

The test boat applied PIT tags on some Chinook in addition to those tagged in the UBC study. These fish have been marked with floy tags:



If you encounter a fish with one of these tags, please contact Pat Vek (Pat.Vek@dfo-mpo.gc.ca).

For more information contact:
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BACKGROUND INFORMATION

Pre-season expectations for Somass/Robertson Creek Hatchery Chinook

The forecast terminal return of adult Stamp/RCH Chinook to Barkley Sound and Alberni Inlet in 2022 is approximately 135000 (range: 100000–170000). The predicted adult age composition is 36%, 54% and 11% of 3, 4, and 5-year-old fish, respectively.

Prior to 2019, Area 23 Chinook harvest was based on an combined escapement target of 39 million eggs to Robertson Creek Hatchery and the natural river system. Subsequently, early season harvest management has been based on an escapement target of 21000 adult spawners. The broodstock target for Robertson Creek Hatchery is 9 million eggs, which, based on the forecast age composition, corresponds to an escapement of ≈8500 adults or ≈3000 females. The remaining ≈12500 adult escapement is for natural river spawning. However, the productivity of the natural spawning grounds in the Stamp River is poorly quantified. Planning is underway for future studies to investigate the benefits of allowing more or fewer spawners into the system.

Pre-season expectations for other WCVI Chinook stocks

Terminal returns of other WCVI stocks are forecast to be moderately abundant in 2022:

- Conuma Hatchery Terminal Return: 40000 (range: 24000–56000)
    - 5 August reforecast: 26500
    - 12 August reforecast: 27000
- Nitinat Hatchery Terminal Return: 27000 (range: 18000–36000)
- Aggregate return of other WCVI index stocks: 38000 (range: 25000–51000)

The WCVI Index stocks forecast 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. Therefore, Canadian fisheries are managed to limit mortality on wild WCVI Chinook.

Area 23 Chinook in-season indicators

- Terminal Recreational CPUE Index: Terminal area fisheries provide an indication of the final run size. For terminal areas and time periods where effort is directed towards a dominant stock, an in-season CPUE index of terminal abundance is developed from recreational fishery catch statistics. The index relates catch per unit effort (CPUE) for the year in the terminal area sport fisheries to total terminal return (catch plus escapement) of Somass/RCH Chinook using simple linear regressions. Relationships were calculated for standardized weeks starting mid-August from historical catch, effort and abundance data for return years 2002–2021. For CPUE to be related to abundance, the following conditions are assumed: 1) run timing is similar from year to year, 2) catchability is similar from year to year and linear over the forecasting range, and 3) the contribution of Somass/Robertson Creek Hatchery fish to the terminal catch during the period of interest is relatively constant. Notwithstanding these and other assumptions, the Barkley recreational CPUE abundance index appears to provide an index of the terminal Somass/Robertson Creek Hatchery Chinook run starting in about mid-August. However, the CPUE index is most informative during the last week of August and first week of September.
- Distant Fishery Indicator, SEAK AABM: South-east Alaskan (SEAK) AABM fisheries have been used as a distant fishery index for Somass/Robertson Creek Hatchery

Chinook terminal run size. However, given recent changes to the management of Alaskan fisheries, this indicator has performed poorly over recent years (2018–present).

- Earlier returning WCVI stocks: Although there is some variation observed in production and survival across WCVI Chinook stocks, over the longer term the terminal abundance of WCVI Chinook is correlated among stocks. Chinook stocks originating from the NWVI area return about one month earlier than those originating from SWVI area. Therefore observed terminal returns of Chinook in areas such as Nootka Sound also provide information in-season regarding expectations of the terminal return to the Somass/RCH system.

Area 23 hatchery Chinook escapement objectives

- The target Chinook escapement for the Stamp River system and Robertson Creek hatchery is based on an objective of 39M eggs. An adult escapement of 21000 has historically been sufficient to achieve the 39-M egg target for the Stamp/RCH system.

Area 23 Sockeye escapement objectives

- The optimal spawning escapement target for production is considered about 350000 adults (200000 and 150000 for Great Central and Sproat Lake respectively). However for stock evaluation purposes the escapement target increases with run size so that the allowable exploitation rate never exceeds 70%. The combined Somass escapement target at the in-season run size forecast of 900000 is 383333 adults.

Area 23 Sockeye biological benchmarks

- Biological benchmarks are used to assess the conservation status of salmon conservation units (CUs). CUs below the lower biological benchmark are considered at risk of extirpation. CUs above the upper biological benchmark are considered healthy.
- For the Great Central Lake CU, the lower and upper abundance benchmarks are 30000 and 90000 spawners, respectively. For the Sproat Lake CU, the lower and upper abundance benchmarks are 12000 and 65000 spawners, respectively.
- *Note.*—to achieve production objectives associated with Somass stocks, the fishery reference points and the corresponding escapement targets under the Somass sockeye management plan are higher than biological reference points for the Somass CUs.

Area 23 hatchery Coho management

- Coho escapement targets for the Stamp River system and larger Somass watershed are under review. However, since 1997, when marine fishery impacts on mixed Coho stocks were greatly reduced, Coho escapement through Stamp Falls has averaged about 40000 annually. Escapement in the most recent 5 years has averaged 17000 annually. A large portion of these fish are produced from Robertson Creek Hatchery.

Escapement monitoring program

Fish counting operations on the Somass system are run by the Hupacasath First Nation in cooperation with DFO. The objective of the program is to estimate escapement of Sockeye, Chinook and Coho using video counts from the Sproat and Stamp Falls fish-ways.

Fish passing through both fish-ways are recorded 24 hours per day (tunnels are illuminated at night) using a video monitoring system. Trained and experienced observers review a subsample of the video from both sites to generate estimates of escapement to each system. The sub-sampling routine consists of the observers reviewing a portion of the minutes of each hour of video footage and these counts are expanded to estimate hourly counts. During times of high

fish passage, observers may only review 5, 10, 15, 20, or 30 minutes of each hour to keep up to date on counts. During periods of slow migration the observers typically review all 60 minutes of each hour.