Fisheries and Oceans Canada | Pêches et Océans Canada

South Coast Salmon
Strait of Georgia Stock Assessment
Final 2023 Escapement Bulletin– Area 18 Cowichan River

Updated May 2024

Summary

This bulletin summarizes salmon stock assessment and research activities conducted in the Cowichan River watershed by a variety of organizations including Cowichan Tribes, DFO, contractors and academic institutions.

Final 2023 Escapement Summary

Chinook

In the 2023 season, the counting fence ran from 16:00 on September 8th to 06:45 on October 18th. A total of **12,624 Chinook (8,658 adults and 3,966 jacks)** were recorded through the fence during operations. **57 adult PIT tags** and 42 **jack PIT tags** were detected while the fence was operational, resulting in a mark rate of 1 in 151 adults and 1 in 94 jacks. Using PIT tag detections following fence removal (75 adults and 81 jacks) we estimated that **43.2%** of adults and **34.1%** of jacks passed through the fence between September 8th and October 18th. Post-season expansions produced a total escapement estimate of **35,323 Chinook (23,318 adults and 12,006 jacks) including 31,294 natural spawners (19,855 adults and 11,439 jacks).** Hatchery contribution to the natural spawning population was estimated at 5.5% for jacks and 3.3% for adults based on adipose clips.

Coho, Chum & Pink

In addition to Chinook, a total of **2,211 Coho (1,838 adults, 373 Jacks)** were recorded through the fence in 2023 along with **49 Chum** and **416 Pink**. Counts from the Skutz Falls fishway camera were **12,062 Chinook (11,453 adults, 609 jacks), 15,579 Coho (15,080 adults and 499 jacks) and 4,637 Chum**. The camera was operational from October 21th to December 9th. Expanded estimates for **Coho Adults** were **18,724** using an expansion of Skutz Falls camera counts based on PIT tags detected at the fence site (133 Adults) and re-detections at Skutz Falls (98 Adults).

The lower-river DIDSON was installed on October 15th and removed on November 30th. **Chum** were below target (160,000) again in 2023 with a total estimate of **31,095**, and is much lower than the estimate from 2022 (**102,617**).

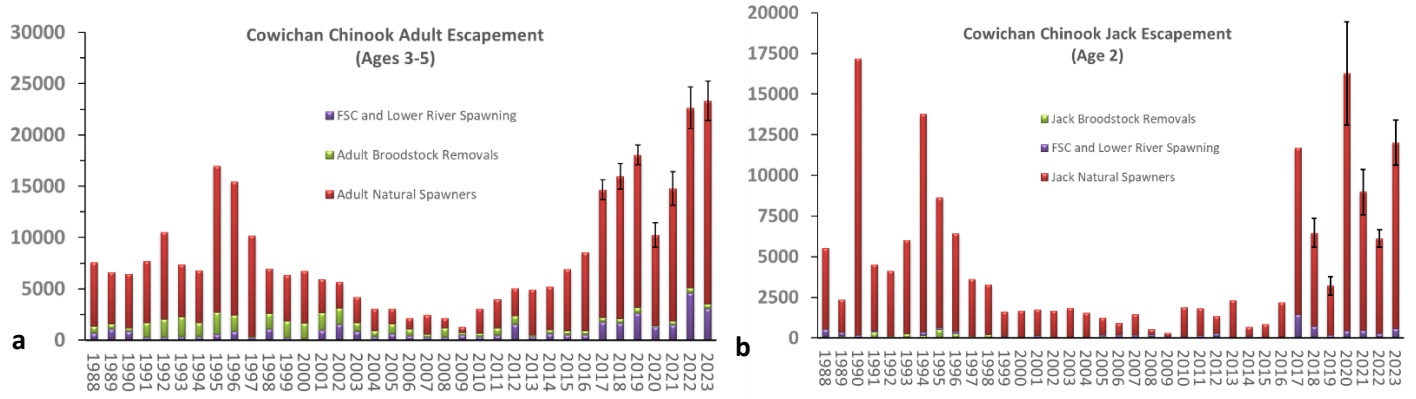

Figure 1: Cowichan Chinook escapement from the beginning of the indicator program to present (1988-2023). (a) Adult (age 3-5) returns are broken into natural spawners, broodstock removals and returns below the fence. (b) Jack (age-2) returns are also broken down to natural spawners and returns below the fence, with some broodstock removals.

2023 Operations

General operations at the counting fence in 2023 incorporate a new low-flow design at the start of the season to increase fish passage when discharge is below baseflow. The design involves four 8 ft passageways with underwater and overhead cameras in half the river, while the other side still utilizes the traditional fence panels. Once river flow increases the regular two-passage configuration will be installed, with one passageway located against the bulkhead and one mid-river (Figure 8).

Past upgrades at the enumeration fence include: new fence rail (2017), building with internet (2018), concrete bulkhead (2019), utilization of two passageways and wider openings (2019) and new Passive Integrated Transponder (PIT) in-river arrays (2020). Since 2019, the two-passage design replaced traditional camera boxes to improve fish migration. Each passageway is instrumented with two under water cameras with motion detection capability as well as LED lights for night time operation. Results from 2018-2022 indicate that fish strongly prefer the wider passages compared to the traditional camera tunnels. Delays below the fence have been reduced with the highest single day migration totals observed in 2019 for the 33 year program.

Figure 2: Two-passage counting fence configuration with wide passageways located mid-river and at the bulkhead, first piloted in 2019.

Escapement Monitoring Methods

Counting Fence

The counting fence is located 150 m downstream of the Allenby Road bridge crossing and is accessed via Church Road on Cowichan Tribes land. The fence funnels migrating fish through two passages where species, size and origin can be evaluated. Cameras are set to record each migration event based on a motion trigger such that periods of inactivity can be skipped efficiently. Crews are present at the fence 24 hours per day to enumerate fish as they move past the cameras as well as to clear debris and maintain equipment as required. The floating panels pivot based on water levels and are expected to remain operational through mid-October. The fence is not designed to withstand high flows and will be removed when the discharge exceeds 30 m^3/s.

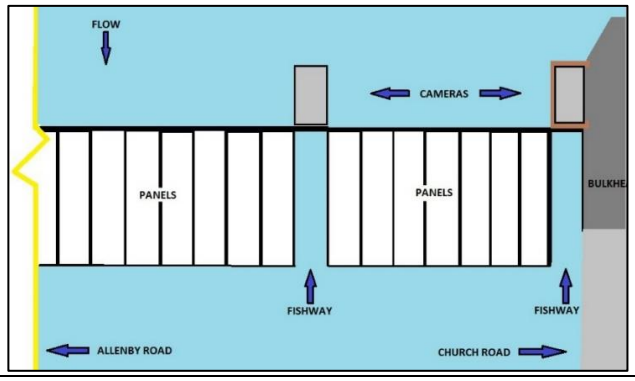

Figure 3: Traditional two-passage counting fence design used since 2019 (top) compared to the new low-flow design with four open passageways and overhead camera views (bottom).

PIT Tags

Returning chinook will also continue to be scanned for PIT tags using the in-river arrays at the counting fence and Skutz Falls, as well as during brood stock collection. Temporary arrays have also been installed in the south and north arm channels in order to better understand lower river migration behavior. Over 75,000 juveniles have been implanted with tags since 2014 with funding from the Pacific Salmon Foundation as part of the Salish Sea Marine Survival Project (2013-2018) and more recently the Pacific Salmon Commission. Due in part to the success of this tagging work, a new project has been funded through BCSRIF (BC Salmon Restoration and Innovation Fund) to investigate marine survival Bottlenecks through the first marine winter. PIT tag arrays and tag deployments have now occurred in other ECVI Chinook systems such as Nanaimo, Big Qualicum, Puntledge and Quinsam in addition to ongoing work in Cowichan.

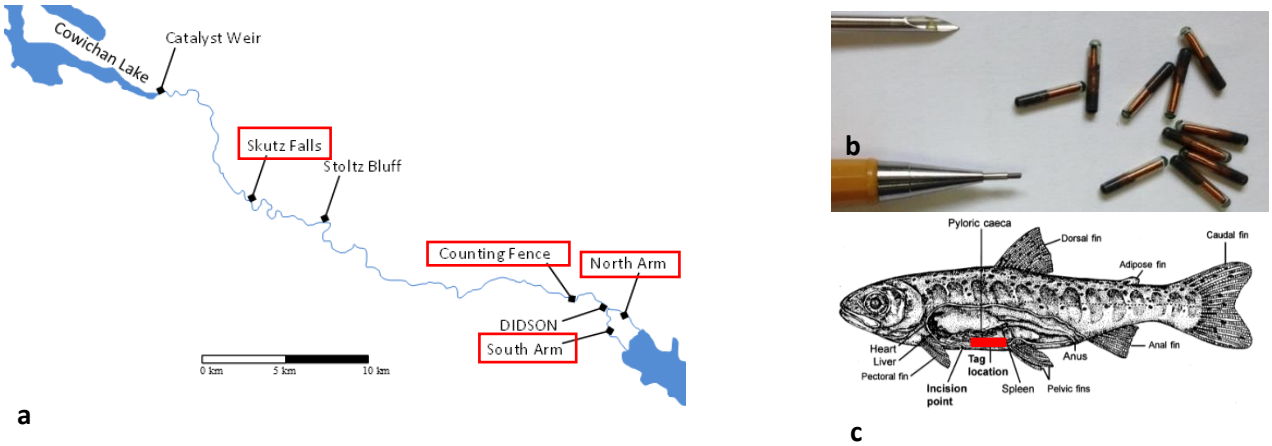

Figure 4: (a) Locations of PIT antennas (red) along with other places of interest in the Cowichan River. (b) PIT tags and implantation needle compared to the size of a mechanical pencil. (c) Anatomy of a salmon smolt with tag location in red.

PIT tags operate on Radio Frequency Identification (RFID) technology and do not have a battery. They can be read at short distances (50-150 cm) with an antenna that both charges the tag with a magnetic field and listens for the response. Tag detections are linked to a tagging data base which provides information on the time, location, origin and size of each fish on the day it was tagged. The proportion of tags in the population passing through the fence and/or in brood sets can be used to expand the number of detections on the permanent arrays to a total run size. This can be particularly useful in years when the operation of the fence does not cover the entire run time (installed late or removed due to high water).

DIDSON

Dual-frequency Identification Sonar (DIDSON) technology uses high frequency sound waves to visualize and count fish in a wide range of stream conditions. DIDSONs are especially useful when water is turbid and traditional video cameras would not be able to capture a clear image. The images produced can tell us the size of fish, how many pass through and which direction they are going. This information, combined with species composition information, helps us count how many fish are moving upstream to spawn.

Environmental Conditions

Dry conditions throughout the spring and summer led to low storage levels in Lake Cowichan, resulting in reduced flow starting early June. On June 9th, flow was reduced below typical levels from 15 to 9 m^3/s. By June 30th flow was reduced to 4.5 m^3/s instead of the normal baseflow of 7 m^3/s. On August 24th the lake reached a "zero storage" level and pumps were used to at the weir to sustain flow levels around 4.5 m^3/s. Flows at the fence jumped from 6 m^3/s to 24.8 m^3/s on October 18th and the fence was removed. Rainfall continued to increase lake storage and the weir went off control on October 19th (Figure 2).

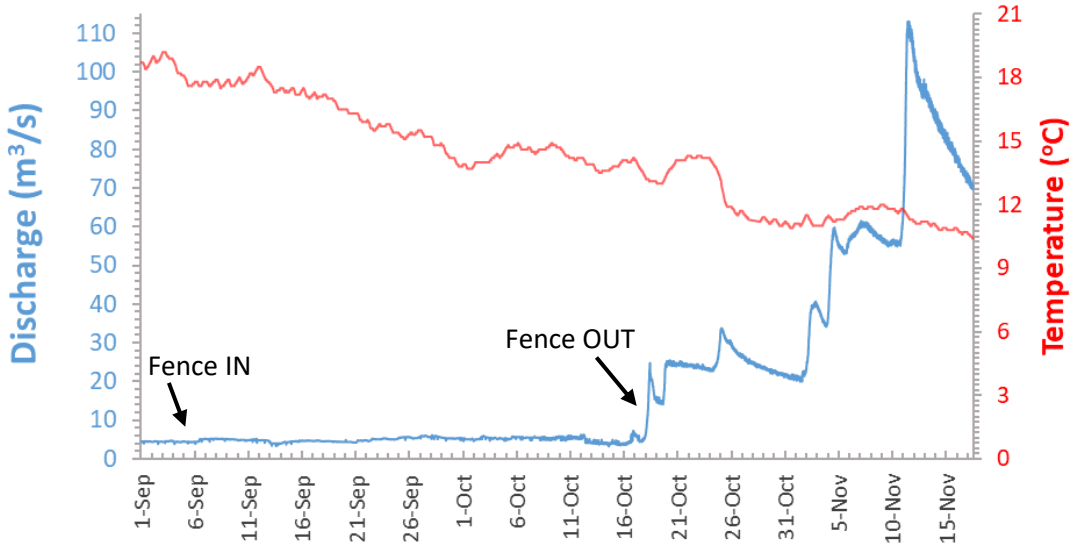

Figure 5: Discharge (m^3/s) and Temperature (°C) at Water Survey of Canada Station 08HA011, Cowichan River in Duncan. Discharge levels when the salmon counting fence was installed and removed are indicated.

2023 Adult Enumeration

Counting Fence

Enumeration at the counting fence began on September 8th at 4:00 PM. Totals from video based counts are presented below. From October 5th to 10th the fence was closed to aid in brood stock collection for the Cowichan River Hatchery. On October 18th the fence was removed due to the significant increase in flows and turbidity.

Chinook

Chinook migrating past cameras at the counting fence are evaluated for size to determine if they are adults or jacks, and the presence of an adipose fin to determine if they are wild or hatchery origin. Counts from September 8th to October 18th at 6:45 AM are presented in Table 1.

Table 1: Cumulative totals for 2023 Chinook Migration past the fence by age and origin.

	Wild (unclipped)	Hatchery (clipped)	Unknown	Total
Adults	7,021	195	1,442	**8,658**
Jacks	2,722	157	1,087	**3,966**
Total	**9,743**	**352**	**2,529**	**12,624**

Adult Chinook in-season counts are compared to run-timing curves to determine if escapement is on track to meet the target of 6500, using early, normal and late run-timing based on historic escapement and flow conditions (Figure 3).

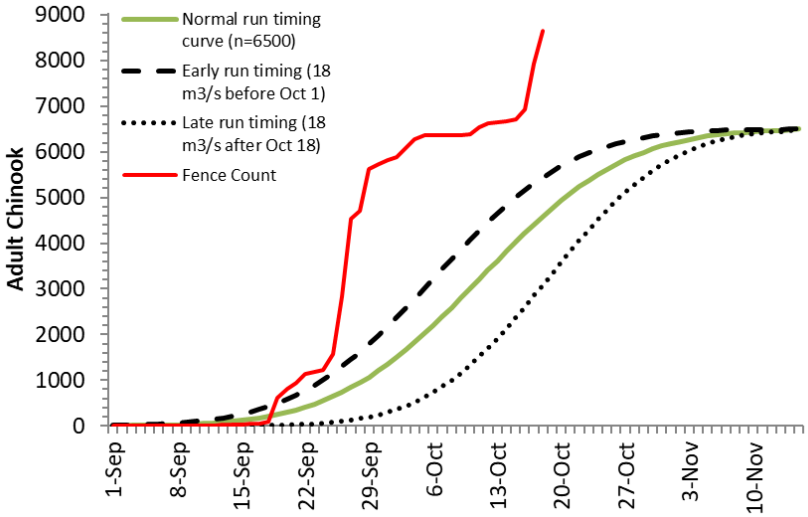

Figure 6: In-season adult Chinook counts compared to normal, early and late run-timing curves based on river conditions.

Coho, Chum and Pink

In addition to Chinook, all other salmon species are identified as they migrate past counting fence cameras. Counts for Coho, Chum and Pink from September 8th to October 18th at 6:45 AM are presented in Table 2.

Table 2: Cumulative totals for 2023 Coho, Chum and Pink migration past the fence, up to October 18th at 8:00 AM.

	Coho	Chum	Pink	Unknown
Adults	1,838	49	416	49
Jacks	373			
Total	**2,211**	**49**	**416**	**49**

PIT Tags

Passive Integrated Transponder (PIT) tags applied to juvenile or marine Chinook are detected when the tagged salmon return to Cowichan River. Detections are linked to a unique number that indicates the species and age at tagging. In 2023, 57 adults and 42 jack Chinook were detected during fence operations. By the end of the season, **132 adult** and **123 jack Chinook** passed the counting fence site (Figure 4).

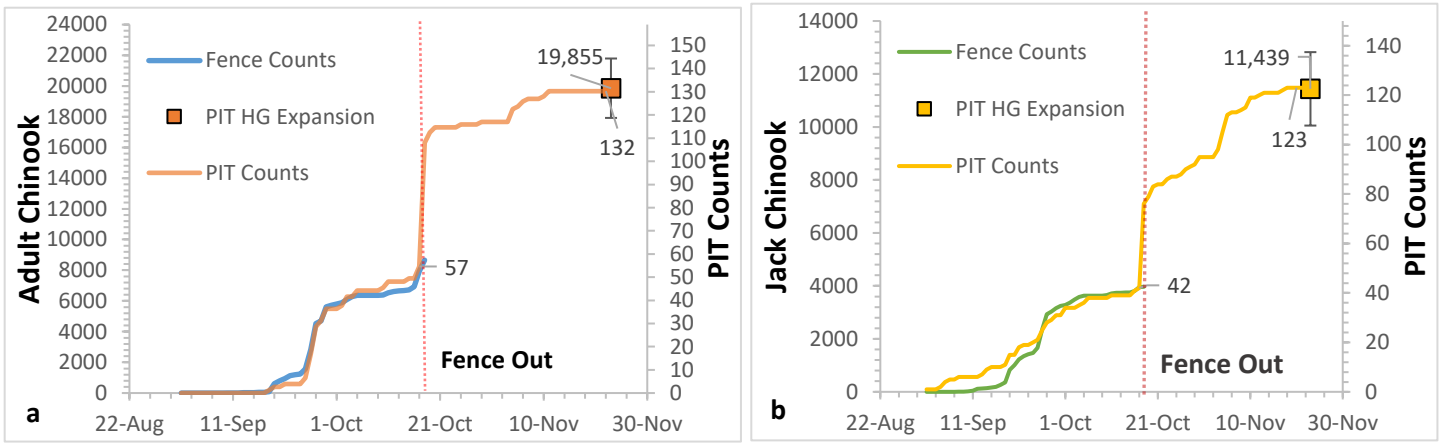

Figure 7: Passive Integrated Transponder (PIT) tags in Chinook (adults (a) & jacks (b)) detected at the salmon counting fence site in 2023 compared to video-based fence counts.

Lower River DIDSON

A Dual-frequency Identification Sonar (DIDSON) was installed 5 km below the counting fence on October 14th as part of the annual Chum assessment program (since 2006). An in-season Chum escapement estimate is produced from on-site review by Cowichan Tribes Fisheries Staff. In 2023 a total of **31,095 Chum** were counted at the DIDSON site. The 2023 counts are presented below relative to the run timing curves for the escapement target of 160,000 fish (Figure 5) and forecast models (Figure 6).

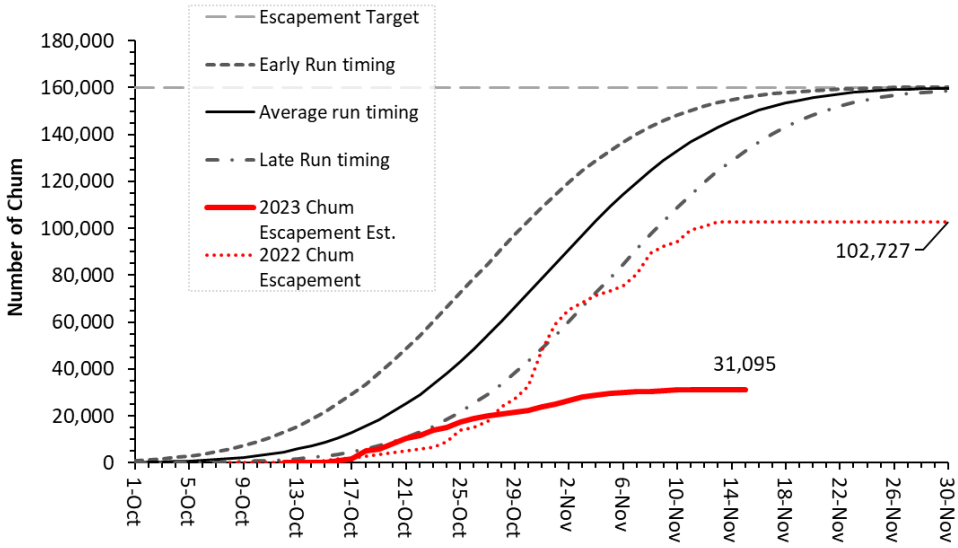

Figure 8: In-season Chum escapement estimates from DIDSON sonar data compared to 2022 escapement and run-timing curves for the escapement target of 160,000 Chum.

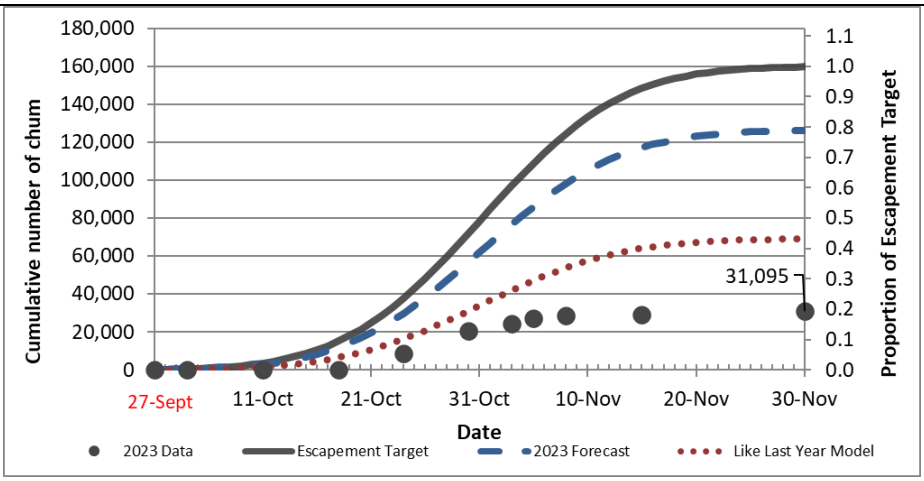

Figure 9: In-season cumulative Chum returns to Cowichan River and run-timing curves for the escapement target (160,000), 2023 Forecast and Like-Last-Year Forecast.

2023 Photos

Below are photos captured during stock assessment activities in the Cowichan River. Included are photos of the counting fence with all panels installed (top left), a male Chinook going through the Skutz Falls fishway (top right), Cowichan River Hatchery staff collecting brood stock using a seine net (bottom left), and a Chinook male before otolith extraction by DFO Stock Assessment Technician, Paul (bottom right) (Figure 7).

Figure 10: Photos captured during Stock Assessment activities in the Cowichan River in 2023.

For more information Contact:

Karalea Filipovic, Strait of Georgia Salmon Stock Assessment Biologist
Karalea.Filipovic@dfo-mpo.gc.ca
778-268-2847

Kevin Pellett, Strait of Georgia Salmon Stock Assessment Lead Biologist
Kevin.Pellett@dfo-mpo.gc.ca
250-756-7273

Wayne Paige Jr., Cowichan Tribes Aboriginal Fisheries Guardian
WaPaige@cowichantribes.com
778-422-2255

Don Elliott, Cowichan Hatchery Manager
Don.Elliott@cowichantribes.com
250-746-5741

Fisheries and Oceans Canada

Pêches et Océans Canada

Cowichan Tribes

 Cat. No. Fs1-97E-PDF ISSN 2818-2235

Correct citation:

Fisheries and Oceans Canada. 2024. South Coast Assessment Bulletin, final 2023 Escapement Bulletin– Area 18 Cowichan River: 8 p