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WCVI Salmon Bulletin
18 June 2020 Assessment Update
Area 23 Sockeye—Barkley Sound/Alberni Inlet

CATCH ESTIMATES

For 2020 fishery management purposes, the Area 23 round table agreed to begin fisheries in the "critical" zone for early season harvest management, using a management forecast for Somass Sockeye of 168,788 adult sockeye. No harvest is available at this run size other than the test fishery.

Total retained catch for this week in the test fishery was 321 sockeye.

The total retained catch to date in the test fishery is 538 sockeye.

ESCAPEMENT ESTIMATES

The total adult sockeye escapement to the Somass system is estimated at about 18,639 adults (14,758 to Sproat, 3,881 to Great Central Lake) through Wednesday, 17 June (the estimates are extrapolated for 17 June). Approximately 21% of the observed escapement to date is from the Great Central Lake population. Future fisheries management of Somass sockeye as a combined stock requires similar productivity among the two populations.

Below are a series of figures that show 2020 sockeye escapement observations relative to average escapement timing for the period from 2002–2019. Although informative, in some years the observed escapement rate relative to average escapement timing may be a poor indication of final run abundance. In contrast to *run timing* (the return of sockeye to Alberni Inlet), escapement timing tends to be more variable and is affected by fishery activities and environmental conditions, such as river temperature and flow.

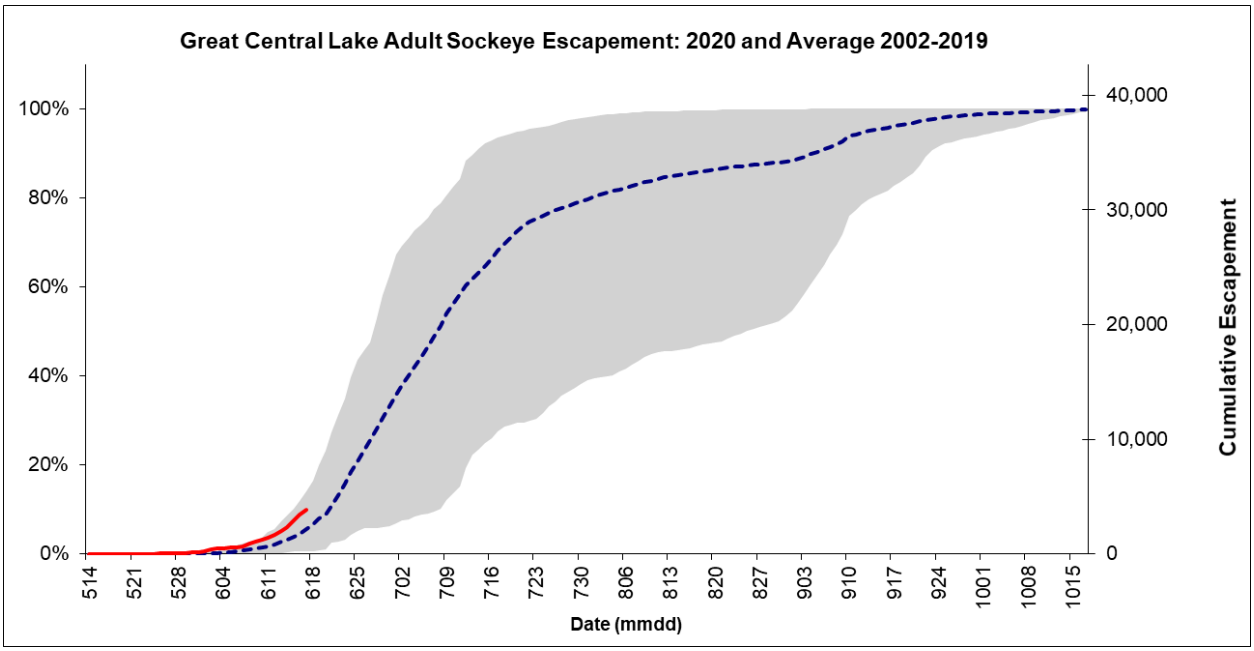

Figure 1. 2020 Great Central Lake sockeye escapement relative to average escapement timing. The dashed blue line show the historical average run timing, and the shaded area shows the 90th percentile of the historical data. The total expected escapement is based on a target of 38,821 assuming Great Central Lake sockeye will comprise 23% of the Somass return.

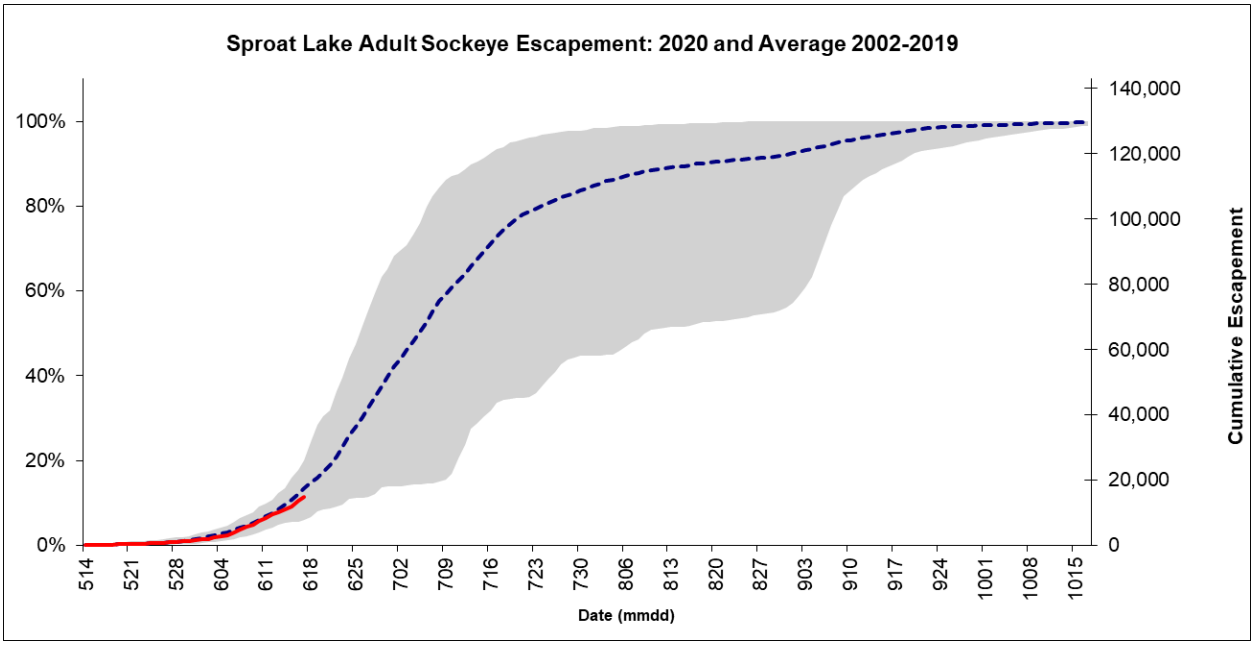

Figure 2. 2020 Sproat Lake sockeye escapement relative to average escapement timing. The dashed blue line show the historical average run timing, and the shaded area shows the 90th percentile of the historical data. The total expected escapement is based on a target of 129,927 assuming Sproat Lake sockeye will comprise 77% of the Somass return.

TEST FISHERY OBSERVATIONS

The test fishery operated from 14–15 June. The estimates of abundance outside 10-mile Point and inside 10-mile Point were 7,500 and 8,500 fish, respectively. The average catches per set were 37 and 17 in the outside and inside areas, respectively.

The average weight for fish caught this week was estimated at 3.3 lbs.

BIOLOGICAL MONITORING RESULTS

The aging lab at the Pacific Biological Station is currently closed in conjunction with ongoing COVID-19 mitigation measures. Ageing work will resume in a limited capacity at the end of June, at which point preliminary aging data from the Barkley Sound test fishery may be attainable.

The DNA lab has processed this week's samples from the test fishery; results are tabulated below. The portion of Henderson sockeye observed is not significantly different than zero. The relative proportion of Great Central Lake is higher than the preseason expectation based on the Sibling model (23%).

	2020 160 test barkley_sound INSIDE June08 65(0)		2020 159 test barkley_sound OUTSIDE June07 98(0)		2020 166 test barkley_sound INSIDE June15 98(0)		2020 165 test barkley_sound OUTSIDE June14 94(0)	
Stock	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Great_Central	38.8	(6.7)	43.1	(5.5)	33.8	(5.4)	45.5	(5.6)
Henderson	0.1	(1.1)	0.0	(0.7)	0.1	(0.6)	0.0	(0.7)
Sproat	61.1	(6.7)	56.8	(5.5)	66.1	(5.4)	54.4	(5.6)

Weekly information from the test fishery in June provides a good indication of the relative proportions of Great Central and Sproat Lake in the final return. Analysis using simple linear regression is used to relate proportions of GCL from the weekly test fishing samples to predict final proportion in the Somass sockeye return. Models use data averaged for Inside and Outside fishing areas and weeks collected in June test fishing samples. A summary of the predicted %GCL from Weeks 62 and 63 data are presented below.

Model	Predicted	Upper 95%	Lower 95%	Regression r^2
Week 62 Average	43.1%	61.2%	30.4%	0.9009
Week 63 Average	40.9%	60.3%	27.7%	0.8264
Week 62 and 63 Average	42.6%	57.7%	31.4%	0.9247
Week 62, 63 and 64 Average	–	–	–	0.9372

Based on the combined Weeks 62 and 63 Averages model, the predicted proportion of GCL in the final return is approximately 43% (95% PI: 31–58%).

ACCOUNTING TO DATE

Parameter		Observed	Expected	Target
Escapement	Sproat	14,758 (79%)	17,484 (89%)	129,967
	Great Central	3,881 (21%)	2,145 (11%)	38,821
	TOTAL	**18,639**	**19,629**	**168,788**
Catch	538 from the Test Boat. No harvest is available in the "critical" management zone			
Somass Age Composition (Adults)	4_2	70%*	13%	
	5_3		76%	
	5_2	30%*	10%	
	6_3			
Stock Composition	Sproat	71%	77%	46%
	Great Central	29%	23%	54%
Harvest Rate		1%	**0% (June)**	
Somass Run Size Forecast		Pre-season management forecast: 168,788 (critical)		

*As the ageing lab is currently closed, these proportions are estimated from the distribution of lengths

The following table summarizes the accounting for Somass sockeye to June 17, 2020:

SOMASS (GCL + SPL)

TOTAL ADULT CATCH=	538	
TOTAL ADULT ESCAPEMENT=	**18,639**	
TOTAL CATCH PLUS ESCAPEMENT=	19,176	
Abundance Estimates:	Estimate	Lower CI
inner Alberni inlet estimate=	7,500	3,750
outer Alberni Inlet estimate=	8,500	4,250
	16,000	8,000
lower river abundance est.	3,293	1,647
TOTAL ACCOUNTING	**38,469**	28,823
Harvest rate	**1%**	**2%**

Based on the total accounting to 17 June, the following table summarizes the expected total return based on the run timing assumptions of Early, Recent Average, and Long Term Average:

	50% Date	% Observed	Predicted Return	Lower CI
Early	17-Jun	51.9%	74,192	55,589
Recent Ave	**24-Jun**	**31.8%**	**120,787**	**90,500**
Long term Ave	1-Jul	16.9%	227,381	170,366

There is no change from the pre-season forecast of 168,788 for the stock aggregate. The first in-season reforecast is expected 25 June.

ENVIRONMENTAL MONITORING RESULTS

Daily river temperatures over the past week ranged from 17.3–19.1℃ (average: 18.0℃) at the Sproat River fishway and from 14.3–17.1℃ (average: 15.6℃) at the Stamp Falls fishway. Figures 3 and 4 show the average daily water temperatures at Sproat River and Stamp Falls fishways compared to the 2013 to 2019 average temperature.

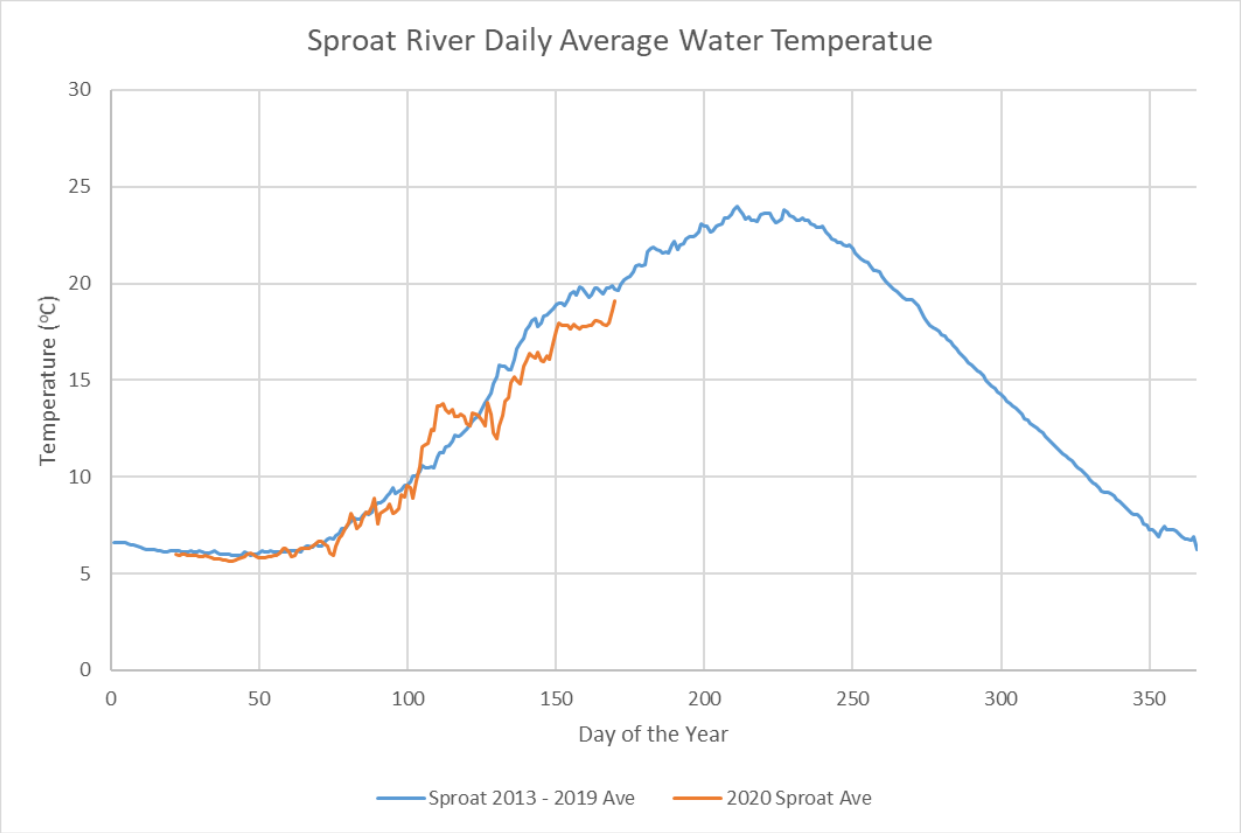

Figure 3: Average daily water temperature collected at Sproat River hydromet station. DOY 153 = June 1, DOY 183 = July 1.

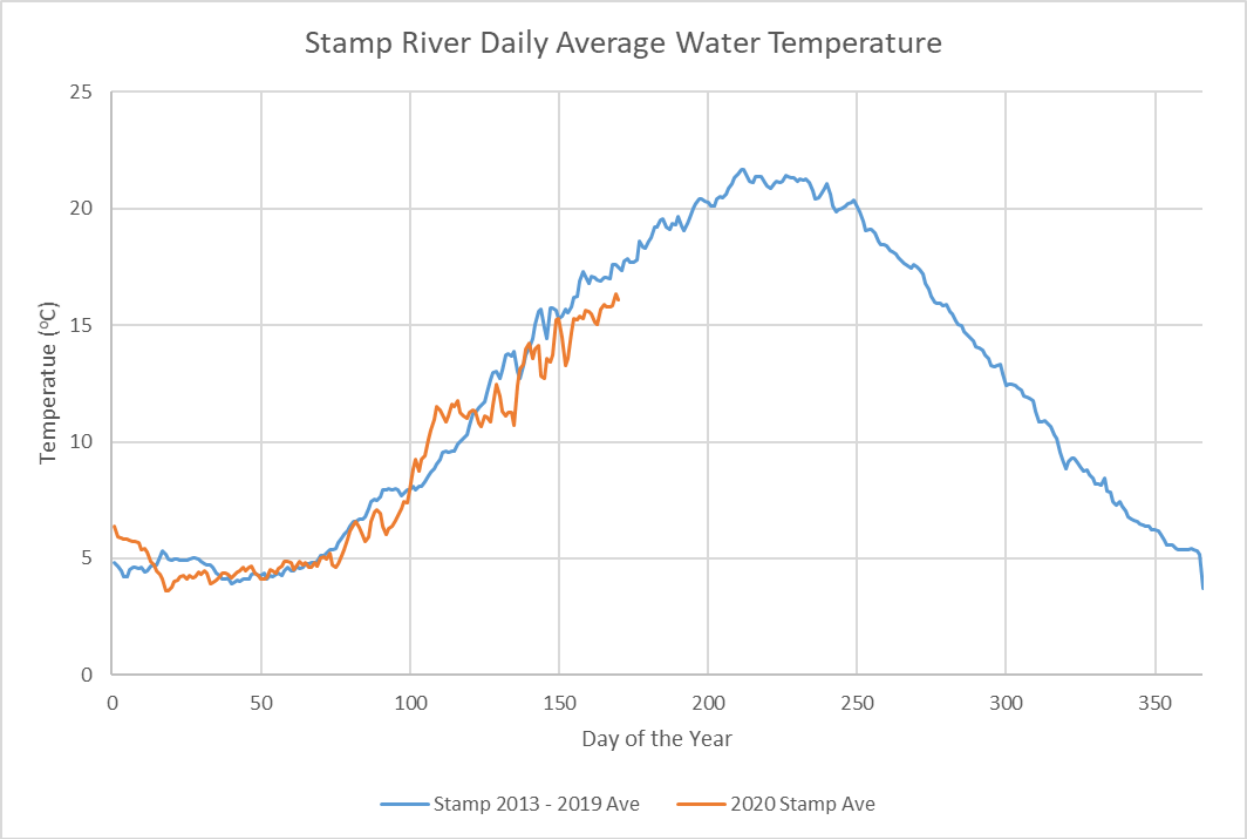

Figure 4: Average daily water temperature collected at Stamp River hydromet station.
DOY 153 = June 1, DOY 183 = July 1.

Alberni Inlet surface temperatures inside 10-Mile Point measured between 14–15℃ by the test boat on 15 June. The sea surface temperatures measured outside 10-Mile Point were between 14–18℃ on 14 June.

SOURCES OF UNCERTAINTY

There are several sources of uncertainty in the in-season assessment and management process:

1) The test fishery assessment of the abundance of fish in Alberni Inlet is based on a subjective assessment by an experienced seine captain. Although this index has been reliable over the years, as source of uncertainty it becomes more of an issue when a large portion of the accounting is based on this number relative to more certain catch and escapement numbers. Both the overall accounting and harvest rate estimate rely on this assessment.

2) The in-season forecast expands the total accounting for the portion of the return that is normally accounted for by the date. However, run timing can vary significantly from year to year depending on factors such as environmental conditions and the age composition of the run. For this reason, the run size is not adjusted until the end of the June when about half the run has normally been accounted for.

3) The effects of adverse environmental conditions on spawners are not accounted for. Escapement is assessed at the Sproat and Stamp fishways prior to spawning. However, fish that hold in Alberni Inlet for prolonged periods and/or are subject to very high temperatures during their river migration may not spawn successfully.

BACKGROUND INFORMATION

Run size expectations

Somass sockeye: For 2020 fishery management purposes, the Area 23 round table agreed to begin fisheries in the “critical” zone for early season harvest management, using a forecast for Somass sockeye of 168,788 adults.

There is considerable uncertainty in the 2020 forecast. The forecasts vary between 168,788 based on Sibling models, to 992,000 based on coho survivals in the same ocean entry year. Model forecasts for the 2020 aggregate Somass sockeye return are 169,000 (Sibling); 476,000 (Sea Surface temperature); 601,000 (Sea Surface Salinity), 857,000 (SEP Biostandards), 992,000 (Coho Leading Indicator).

The forecast from the Sibling Model suggests a low proportion (23%) of Great Central Lake sockeye in the 2020 return, which indicates the total return to Great Central Lake will very likely fall below the fishery reference point of 100,000, requiring a precautionary approach to fishery management.

The first reforecast is expected 25 June.

The ages of return for sockeye to Sproat and Great Central lakes range from 3–6 years, with ages 4 and 5 fish predominant. Sockeye produced from brood years 2014–2017 will return in 2020, with 2015 and 2016 being the main contributing brood years. There are three key points to consider for these contributing brood years:

1) Poor returns from the 2015 brood year (age 3 and age 4 returns so far) are indicating low returns of 5 year olds in 2020.

2) The returns so far from the 2015 brood years have had a low proportion of Great Central Lake stock (26%).

3) Jack (age 3) returns from 2016 brood were significantly better than those from the 2015 brood. While still well below the historic average, they did improve 10-fold for GCL and 4-fold for Sproat.

Henderson sockeye: The recommended management outlook for Henderson sockeye is the "very low" zone for harvest management, corresponding to an expected return of less than 15,000. The key factors influencing this outlook are the low spawner abundances in the main contributing brood years (2015 and 2016) for the 2020 return, as well as low marine survival rates experienced by these two brood years. There were no surveys in Henderson Lake to estimate juvenile production from either of the main contributing brood years (2016 and 2017 sea-entry years). Based on the spawner abundances in 2014 and 2015, the smolt abundances in the 2016 and 2017 sea-entry years are estimated to be low (less than 1M).

IN-SEASON ASSESSMENTS

Test Fishery

The purpose of the test fishery is to estimate abundance of sockeye in the Alberni Canal, to collect biological specimens for assessment (age, stock composition, and parasite load) and to provide observations of fish behavior and condition. The test fishery uses a combination of hydro-acoustic soundings and seine sets to determine the abundance of sockeye in Alberni Inlet. The boat follows a systematic route sounding throughout the canal by zig-zagging in transects from one side to another. Choice of set location is dependent on either identifiable sockeye schools or typical holding areas. For both the area "inside" 10-mile point and for the area "outside" 10-mile point, an average catch per set is determined. These numbers are then expanded to total abundance for each area given scalars to account for the quality of sets/fishing conditions and also a scalar approximating the number of similar sets that are required to fish the entire area. There is considerable judgment and subjectivity involved in the determination of the abundance estimate; however, over the years this information has been an important component of the in-season re-forecast method.

Catch Monitoring

All harvesters in the Maa-nulth First Nation, Tsu-ma-uss Economic Opportunity, Area B Seine and Area D Gillnet fisheries are required to report catch and total catch is estimated from the sum of reports. Verification programs are in place for the Maanulth, Tsu-mas-uss Economic Opportunity and Area D fisheries. All Area B catch is validated. Validation and verification information may be used to revise catch estimates generated from individual harvester reports. The recreational catch is monitored and estimated through the WCVI Creel Survey program. Catch is estimated from the average catch-per-unit-effort (CPUE) and effort (boat-days). Currently, no sockeye fisheries have operated in 2020 other than the Test Fishery.

Escapement monitoring

Fish counting operations on the Somass river system are run by the Hupačasath 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 fishways. Counting operations began on 15 and 28 April at the Sproat and Stamp Falls fishways, respectively.

Fish passing through all fishways are recorded 24 hours per day (tunnels are illuminated at night) using a video monitoring system. Trained and experienced observers review migration on the recordings from both sites to estimate escapement into each system. For most time periods, observers typically review all 60 minutes of each hour. During periods of high migration, observers review clips varying from 5–30 minutes from each hour of video footage depending on fish density. Counts from these shortened clips are then expanded to estimate hourly totals.

Escapement for Henderson Lake sockeye will be estimated through a mark-resight program conducted on Clemens Creek spawning grounds in September and October. The Uchucklesaht First Nation is working on developing an in-season monitoring program at the outlet to Henderson Lake.

Biological monitoring

Fish are sampled for age composition from all fisheries and escapement. Fish are sampled for stock composition (estimated through DNA analysis) from the test fishery and commercial fisheries.

Environmental monitoring

Other information is considered such as river or Inlet conditions that may impact run and escapement timing. River temperature, discharge and barometric pressure are monitored remotely at Stamp Falls and the Sproat fishway (current data are available here). As river temperatures increase, the migration rate from Alberni Inlet to the Somass River system slows down, resulting in lower daily escapement rates and often higher “catchability” of fish in Alberni Inlet fisheries.

Fishery indices

In addition to information gathered through the test fishery and catch and escapement monitoring, there is a strong relationship between the commercial gillnet CPUE in late June and final run size. One objective of the “standardized early season fishing regime” developed in 2012 is to plan more consistent early-season fisheries to gain assessment information. Additional monitoring data (*e.g.* effort, average CPUE) gathered through verification programs may support this initiative.

Run size estimation

To forecast the return of Somass sockeye in-season, the most pertinent questions are: 1) what is the abundance accounted for to date? and 2) is the run on-time, early, or late? In the simplest form, the run reforecast is the total abundance accounted for divided by the portion expecting to return by the reforecast date. However, when considering these questions, uncertainty in the data must be accounted for. If most of the abundance is accounted for in either catch or escapement, then the data are fairly certain. On the other hand, if the bulk of the abundance is associated with test fishery estimates, the data are more uncertain. In the latter case, a more precautionary approach is warranted before major upgrades or downgrades in the forecast. The observed age and stock composition of the return provide indications of run timing and abundance, particularly when compared to pre-season expectations and long-term average observations. As well, environmental conditions that may affect “catchability” need to be

considered. For example, extended holding of fish in Alberni Inlet due to inhospitable river conditions may create the impression of abundance when in fact new migration is insignificant.

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