



## WCVI Salmon Bulletin July 19, 2018 Assessment Update Area 23 Sockeye – Barkley Sound/Alberni Inlet

### Summary:

- Preseason forecast was for a Somass sockeye return between 350,000 and 500,000, which is in the “Low” zone for harvest management. The pre-season plan was to use 350,000 Somass sockeye total return in the Somass Sockeye Management Table. A low proportion of 21% Great Central Lake in the total run was forecast, the lowest proportion in the historic range and well below the average of 56% for Great Central Lake (GCL) in the Somass aggregate. In consideration of this forecast, the preseason plan was to catch 70,000 and take them through June if possible and attain an escapement of at least 60,000 into GCL.
- **Based on run-timing and total accounting to July 18 a 300,000 run size is recommended.** The low proportion GCL creates a concern of not meeting the 60,000 minimum escapement level.

### Catch Estimates:

Total catch estimated to date is 79,607 adult sockeye:

Maanulth Treaty	18,039	No fishing this past week
Tsu-ma-uss	34,161	No catch from Tseshaht dipnet in Sproat River, and 1500 from Hupacasath dipnet in Sproat River.
Commercial Gillnet (Area D)	10,785	June 12 catch of 3442, 116 vessels with CPUE of 30. June 19 catch of 7343, 118 vessels with CPUE of 62
Commercial Seine Net (Area B)	6075	Catch from 5 vessels fishing from July 2-4.
Recreational	5710	Weekly catch of 287 in marine area. Estimate 431 boat trips this week with a catch per boat trip of 0.67.
Test Fishery	4837	
Stewardship	0	
<b>TOTAL</b>	<b>79,607</b>	

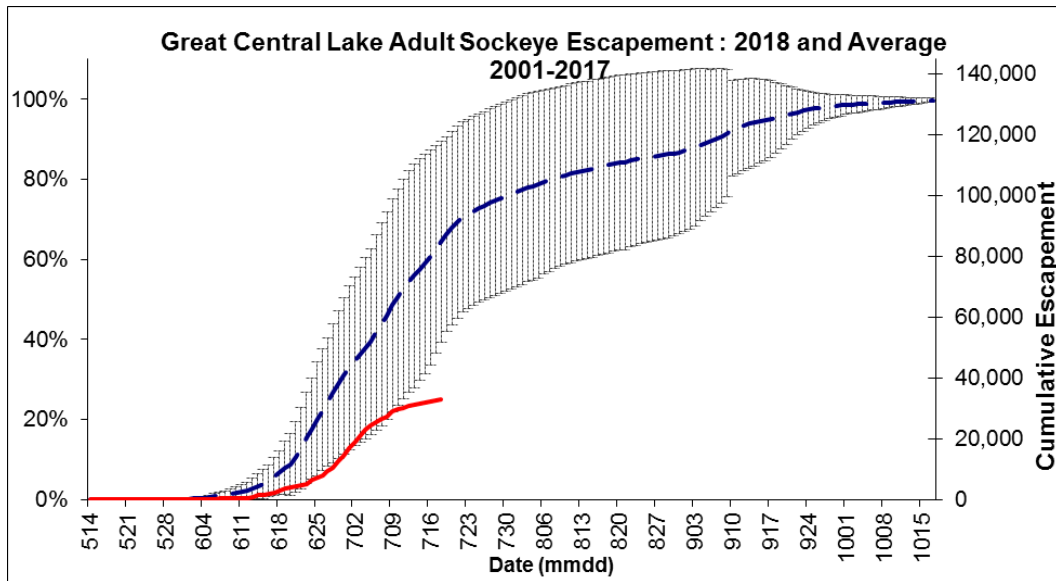
### Escapement Estimates:

Escapement through the Sproat River counters totals 139,311 adult sockeye, and 32,920 adult sockeye to Great Central Lake, for a total adult sockeye escapement to the Somass system of 172,231 sockeye adults, through Wednesday, July 18 (the estimates are extrapolated for July 18). About 19% of the observed escapement to date is into Great Central Lake and 81% into Sproat Lake.

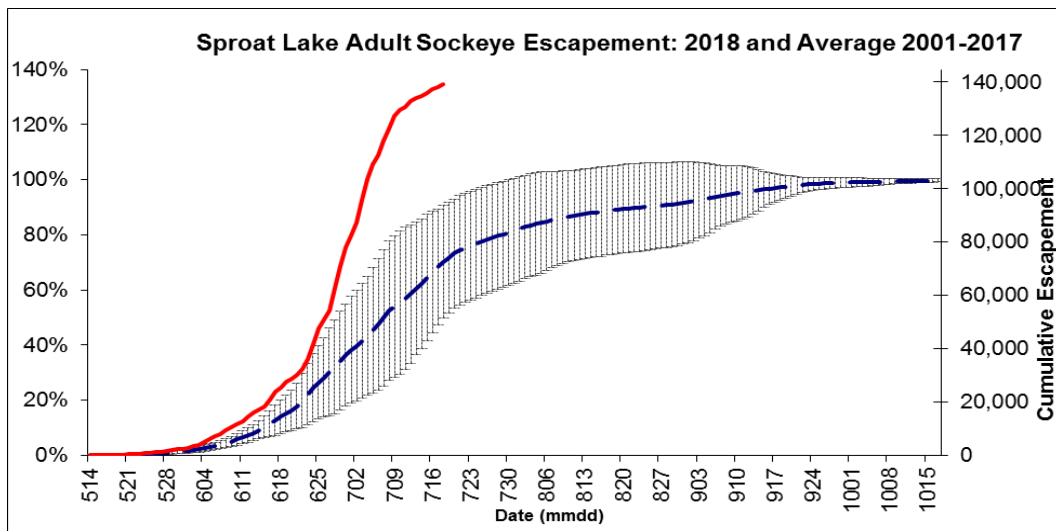
There have been 11,276 jacks through the Sproat River counters and 1870 jacks to Great Central Lake (13,145 total jacks to July 18).

Fisheries management of Somass sockeye as a combined stock requires similar productivity among the two populations, which has resulted in an average ratio of 56% GCL and 44% Sproat in the total return.

Below are a series of figures that express 2018 sockeye escapement observations relative to average escapement timing for the period from 2001 to 2017 and target escapement. The combined Somass escapement target is from the sockeye management table for the **re-forecasted run size of 300,000**, and the stock-specific escapement targets are based on the average stock composition of Somass returns (i.e., 56% Great Central Lake and 44% Sproat Lake).



**Figure 1. 2018 Great Central Lake sockeye escapement relative to average escapement timing. The total expected escapement is based on a target of 131,600 as assumed in the management table, based on Great Central Lake sockeye on average comprising 56% of the Somass aggregate return.**



**Figure 2. 2018 Sproat Lake sockeye escapement relative to average escapement timing. The total expected escapement is based on a target of 103,400 as assumed in the management table, based on Sproat Lake sockeye on average comprising 44% of the Somass aggregate return.**

Note that escapement timing tends to be more variable than run timing into Alberni Inlet and is influenced by the impact of fisheries and environmental conditions, such as weather, river temperature, or flow. In periods with low immigration into the river and higher pooling in the Inlet, the observed escapement rate may not be a good indicator of overall abundance. In 2018, there is no evidence of significant delay or pooling of sockeye in Alberni Inlet.

## Test Fishery Observations:

The test fishery operated two days this week from July 16 to 17. The estimate of abundance outside 10-Mile Point was 5000 fish and was estimated as 2500 fish inside 10-mile Point. The average catch per set was 9 and 5 in the outside and inside areas, respectively. Note that when abundance is low and migration rate is high the uncertainty in the test estimates may increase.

Location	In / Out	Date	Set No	Surface Water Temperature °C	Tide	Sockeye Adult Encounters	Sockeye Jack Encounters	Total Sockeye Encounters	Total Adult Sockeye Kept	Total Jack Sockeye Kept	Area Estimate
Coleman Creek	Out	7/16/2018	1	19	Low Slack	5	0	5	0	0	Ten Mile - Pill Point = 5,000
Pocohontas Point	Out	7/16/2018	2	18	Flood	16	0	16	11	0	
Coyote Bluff	Out	7/16/2018	3	17.8	Flood	56	0	56	20	0	
Hissin Point	Out	7/16/2018	4	18.8	Flood	20	0	20	17	0	
Chup Point	Out	7/16/2018	5	18	Flood	7	0	7	3	0	
Ten Mile Point	Out	7/16/2018	6	20.5	High Slack	5	0	5	5	0	
<b>Outside Totals</b>						<b>109</b>	<b>0</b>	<b>109</b>	<b>56</b>	<b>0</b>	
Hocking Point	In	17-Jul-18	1	18.5	Ebb	13	0	13	8	0	Alberni - Ten Mile = 2,500
Sprout Narrows	In	17-Jul-18	2	19	Ebb	17	0	17	7	0	
Underwood Cove	In	17-Jul-18	3	19	Ebb	5	0	5	0	0	
China Creek	In	17-Jul-18	4	19	Ebb	7	0	7	7	0	
Lone Tree Point	In	17-Jul-18	5	20.5	Flood	5	0	5	5	0	
Follinsbee Creek	In	17-Jul-18	6	20.5	Flood	11	0	11	0	0	
<b>Inside Totals</b>						<b>58</b>	<b>0</b>	<b>58</b>	<b>27</b>	<b>0</b>	
<b>Stat Week 07/3 Total</b>						<b>167</b>	<b>0</b>	<b>167</b>	<b>83</b>	<b>0</b>	

Comments from the test boat: Most fish were still bright and fresh, and a small percentage were showing colour. No evidence of significant pooling or delay. The water was warmer than last week.

## Environmental Monitoring Results:

- Daily river temperatures over the past week ranged between 17.9 and 23.2oC (average 20.3oC) at the Stamp Falls fishway (Figure 6), and between 20.8 and 22.9oC (average 21.6 oC) at the Sproat River fishway (Figure 7). Please note the temperature data at the Sproat River fishway is only up to July 14, 2018 due to a technical issue.
- Over the past 5 years (2013-2017) daily river temperatures from July 10-17 ranged between 15.8 and 23.9 oC (average 19.8 oC) at the Stamp Falls fishway and between 19.7 and 25.4 oC (average 22.4 oC) at the Sproat River fishway.
- Inlet surface temperatures inside 10-Mile Point were measured between 18.5 to 20.5 °C by the test boat on July 17. The sea surface temperatures measured outside 10-Mile Point were between 17.8 °C and 20.5 °C on July 16.

## Biological Monitoring Results:

So far, the overall estimated age composition of the adult run (see table below) is very high to age 4<sub>2</sub> fish as expected.

Parameter		Observed	Preseason Forecast
<b>Somass Age Composition (Adults)</b>	4 <sub>2</sub>	86%	81%
	5 <sub>2</sub>	6%	15%
	5 <sub>3</sub>	5%	3%
	6 <sub>3</sub>	3%	1%

DNA samples are available from six weeks of test fishing, two weeks of commercial gillnet fishing (June 12 and 19), the Maa-nulth fisheries from June 10, June 22-24, and July 2, and the commercial seine fishery from July 2-4. The results are tabulated below. The portion of Henderson sockeye observed by the test boat this week has increased to 18.7% in the inside area and 35.8% in the outside area. The portion of Henderson sockeye observed in the Area B catch from July 2-4 was 6.7%. As expected the

relative portions of Great Central Lake sockeye are low across all samples (average of 19.3%). Forecast stock composition is 21% Great Central and 79% Sproat.

	2018		2018		2018		2018		2018		2018		2018							
	161		162		163		163		169		170		170							
	gill		seine test		seine test		gill		seine test		seine test		gill							
	BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd							
	FN (Maa-nulth)		W-OUTSIDE		W-INSIDE		Commercial		W-OUTSIDE		W-INSIDE		Commercial							
	10-Jun		11-Jun		12-Jun		12-Jun		18-Jun		19-Jun		19-Jun							
	20(0)		96(0)		96(0)		94(0)		96(0)		96(0)		100(0)							
Stock	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD						
Great_Central	20.7	(9.0)	6.8	(2.9)	16.3	(4.1)	10.4	(3.5)	15.5	(4.3)	26.5	(4.9)	26.4	(4.7)						
Henderson	0.0	(2.6)	0.0	(0.6)	0.0	(0.6)	0.0	(0.5)	0.6	(1.2)	0.0	(0.6)	0.0	(0.6)						
Sproat	79.3	(9.2)	93.2	(3.0)	83.7	(4.1)	89.6	(3.5)	83.9	(4.3)	73.5	(4.9)	73.6	(4.7)						
	2018		2018		2018		2018		2018		2018		2018		2018		2018		2018	
	173-175		175-176		176-177		182		183		183		183		189-191		190-191			
	gill		seine test		seine test		seine test		seine test		gill		seine		seine test		seine test			
	BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd		BarkleySnd		Area 23		BarkleySnd		BarkleySnd			
	FN (Maa-nulth)		W-INSIDE		W-OUTSIDE		W-INSIDE		W-OUTSIDE		FN (Maa-nulth)		Comercial		W-INSIDE		W-OUTSIDE			
	June22-June24		June24-June25		June25-June26		1-Jul		2-Jul		2-Jul		July2-July4		July8-July10		July9-July10			
	70(0)		141(0)		144(0)		100(0)		99(1)		49(0)		100(0)		100(0)		100(0)			
Stock	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Great_Central	27.3	(5.7)	14.2	(3.3)	20.7	(3.6)	17.6	(4.3)	8.7	(3.2)	30.8	(7.1)	20.3	(4.4)	22.2	(4.5)	17.7	(4.2)		
Henderson	0.0	(0.8)	0.0	(0.5)	0.8	(0.8)	0.0	(0.6)	6.0	(2.5)	0.3	(1.4)	6.7	(2.8)	3.8	(2.1)	14.9	(3.9)		
Sproat	72.7	(5.7)	85.8	(3.3)	78.5	(3.7)	82.4	(4.3)	85.3	(4.0)	68.9	(7.2)	72.9	(4.9)	74.0	(4.7)	67.4	(5.2)		
	2018		2018																	
	197		198																	
	seine test		seine test																	
	BarkleySnd		BarkleySnd																	
	W-OUTSIDE		W-INSIDE																	
	16-Jul		17-Jul																	
	56(0)		26(1)																	
Stock	Estimate	SD	Estimate	SD	Average															
Great_Central	10.4	(5.1)	21.9	(8.8)	19.3															
Henderson	35.8	(6.7)	18.7	(7.3)																
Sproat	53.8	(6.9)	59.4	(10.4)																

### Accounting abundance to date:

The following tables summarize the accounting for Somass sockeye to July 18, 2018. GCL accounted for 19% of the total Somass sockeye to date. The fisheries have resulted in a harvest rate of approximately 30% on the Sproat Lake stock and a harvest rate of 31% on the Great Central Lake stock. The total Somass aggregate return to date is about 258,996 sockeye with a harvest rate of 30%.

Total accounting from all sources.

Stock	Catch	Esc	Catch + Esc	Catch + Esc Stock comp (%)	Inner Alberni Inlet estimate	Outer Alberni Inlet estimate	In-river estimate	Total Accounting	Total accounting Stock comp (%)	Harvest rate
SPR	63,738	139,311	203,049	81%	1,485	2,690	1,937	209,161	81%	30%
GCL	15,204	32,920	48,124	19%	548	520	644	49,835	19%	31%
HED	665	-	665	-	468	1,790				
<b>TOTAL</b>	<b>79,607</b>	<b>172,231</b>	<b>251,838</b>	<b>100%</b>	<b>2,500</b>	<b>5,000</b>	<b>2,581</b>	<b>258,996</b>	<b>100%</b>	<b>30%</b>

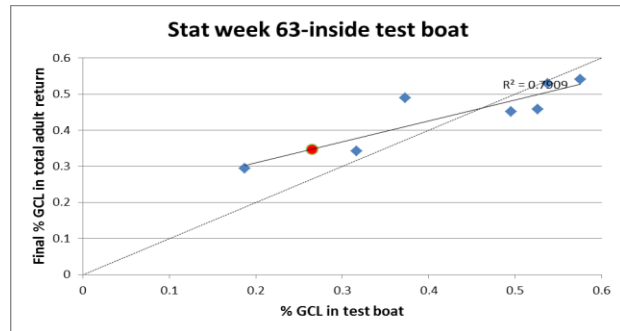
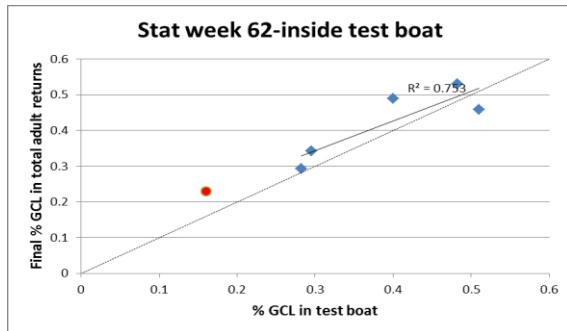
Total accounting for catch and escapement **relative to expected**.

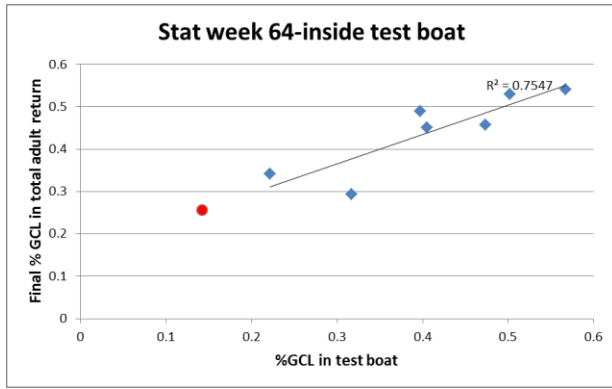
Parameter		Observed	Expected	Target
<b>Escapement</b>	Sproat	139,311 (81%)	56% (July 18)	103,400
	Great Central	32,920 (19%)	44% (July 18)	131,600
	<b>TOTAL</b>	<b>172,231</b>		<b>235,000</b>
<b>Catch</b>	Sproat	63,738 (81%)	-	-
	Great Central	15,204 (19%)	-	-
	<b>TOTAL</b>	<b>78,942</b>		
<b>Stock Composition</b>	Sproat	81%	79% (preseason forecast)	44%
	Great Central	19%	21% (preseason forecast)	56%
<b>Harvest Rate</b>		30%		22%

SOMASS (GCL + SPL)			
TOTAL ADULT CATCH=		78,942	
TOTAL ADULT ESCAPEMENT=		<b>172,231</b>	
TOTAL CATCH PLUS ESCAPEMENT=		251,173	
Abundance Estimates:		Estimate	Lower CI
inner Alberni inlet estimate=		2,033	1,017
outer Alberni Inlet estimate=		3,210	1,605
		5,243	2,622
<i>lower river</i>		2,581	-
TOTAL ACCOUNTING=		<b>258,997</b>	253,794
Harvest rate		<b>30%</b>	<b>31%</b>

**Predicting Stock Composition from the test fishery:**

Information from the test fishery in June can be used to predict the relative proportions of Great Central and Sproat Lake at the end of the run (see below). Based on this relationship the percent Great Central in the final Somass adult return may range between 23 and 35%.

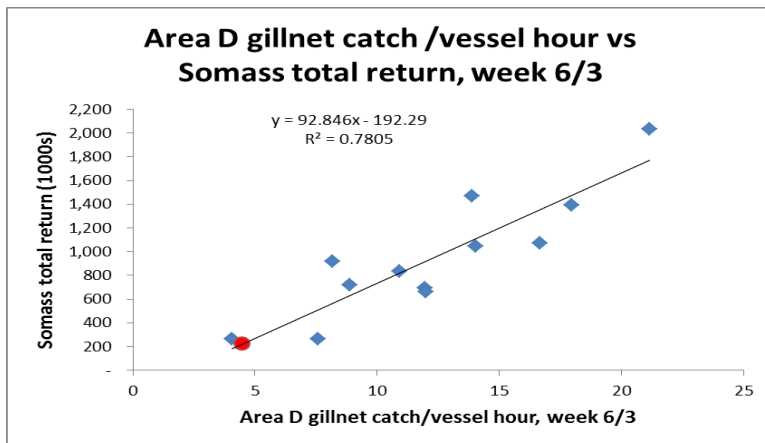




**Figure 3. The relationship between the percent composition of Great Central lake sockeye in the inside test boat samples in June and the percent composition of Great Central Lake sockeye in total adult returns.**

**Predicting final return from Area D Gillnet Catch:**

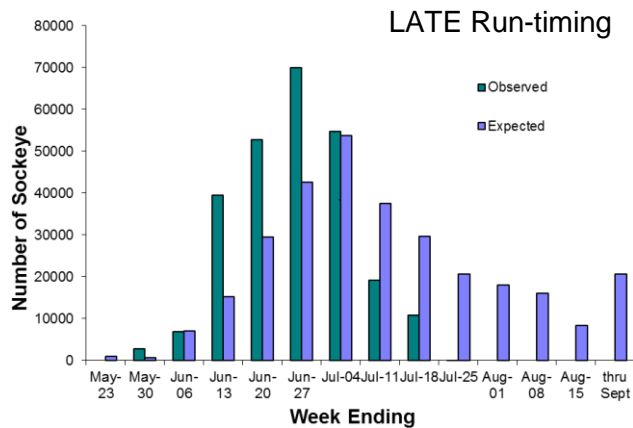
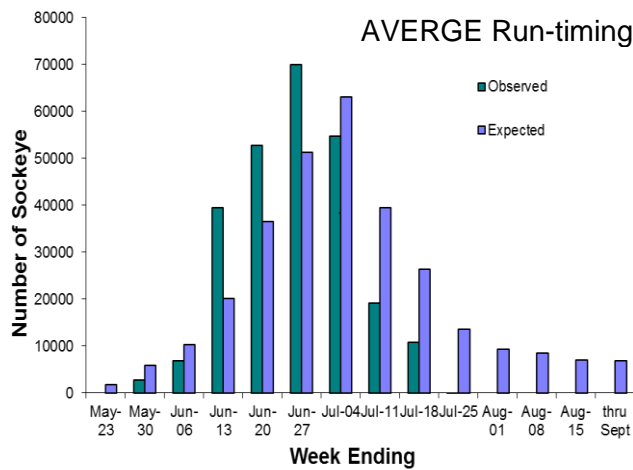
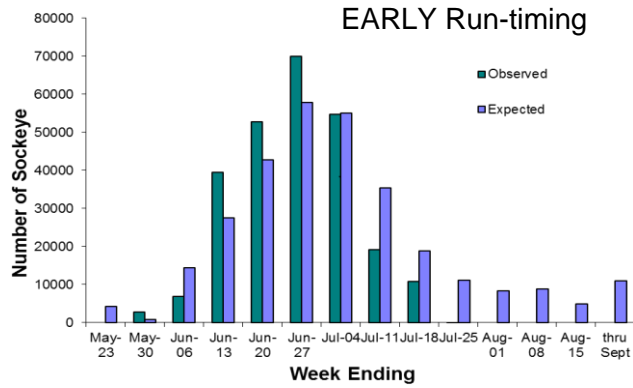
Information from the Area D gillnet catch in Area 23 in the third and fourth weeks of June appear to give a good indication of the final Somass sockeye adult return (see below). Based on this relationship the Somass sockeye adult return in 2018 would be forecast at approximately 224,000.



**Figure 4. The relationship between Area D gillnet catch /vessel hour and Somass total return in the third week of June.**

**Predicting final return from accounted abundance to date and run timing:**

TOTAL EXPECTED IF					
Timing	50% date	% of run to date	Predicted GCL return	Predicted SPR return	Predicted Somass return
EARLY	28-Jun	84.5%	58,969	247,498	306,467
AVG	1-Jul	82.2%	60,628	254,461	315,089
LATE	6-Jul	71.0%	70,190	294,593	364,784






**Figure 5. 2018 weekly observed abundance (green bars) and weekly expected abundance (blue bars) on a 300,000 Somass sockeye return, assuming early run-timing (top), average run-timing (middle) and late run-timing (bottom). The observed bars have the best fit with the expected bars for the early run timing and 300,000 return.**

### Run re-forecast:

- Management forecasts are based on the range of indicators, including the preseason forecast of 21% GCL, the June Area D fishery prediction of 224,000 Somass aggregate, the June test fishing indication of low proportion GCL between 23% and 35%, and the DNA information showing an average of 19% GCL in the early fisheries.
- Observed abundance relative to expected abundance under early, average, and late timing suggests an early run timing. With the total accounting of 258,996 Somass aggregate abundance, and assuming an early run-timing, a run-size of 306,500 is predicted.
- **At this time our advice is to adopt a 300,000 run size for management purposes, and assume early run-timing.** Management using the Somass aggregate is not recommended due to the current forecast of a low return of GCL stock.
- With early run-timing applied to GCL total accounting to date the total GCL return is predicted to be 59,000 and under average run-timing 60,600. Both of these predicted GCL returns are below the upper biological benchmark for GCL.

### Considerations:

- The preseason agreed minimum escapement for Great Central Lake was about 60,000 sockeye, based on long term WSP biological benchmarks shown below, production-oriented management, and the need to get back to management of Somass as an aggregate.

TOTAL EXPECTED IF			
Predicted escapement assuming no further catch (minus catch to date)			
Timing	50% date	Great Central	Sproat
EARLY 	28-Jun	43,765	183,760
AVG 	1-Jul	45,424	190,723
LATE 	6-Jul	54,986	230,855
Lower WSP benchmark		29,290	12,060
Upper WSP benchmark		91,640	65,570

- When we account for catch to date of GCL the predicted escapement would be 43,700 (assume early run-timing), 45,400 (assume average run-timing) or 55,000 (assume late run-timing).
- The preseason agreed total allowable catch was 70,000 sockeye under a 350,000 aggregate run size with a harvest rate of 25%. At a 300,000 run-size the harvest rate in the Somass sockeye management table is 22%. Catch to date is about 79,600 total (79,000 Somass catch). The harvest rate for abundance to date is 30%.



**Sources of Uncertainty:**

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

One of the key sources of uncertainty is the test fishery assessment of the abundance of fish in Alberni Inlet, which 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.

In addition to the overall accounting, another source of uncertainty with the in-season forecast is the presumed run timing. 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.

Another source of uncertainty is the effect of adverse environmental conditions on spawners. The 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 fishery management purposes, the recommended management forecast for 2018 is precautionary and in the “low” zone for early season harvest management; corresponding to an expected return of between 350,000 to 500,000 adult fish. The forecast is revised in-season (see above). An expected run-size of 350,000 results in a TAC for Somass sockeye of 82,500.

#### **July 19, 2018- Reforecast to 300,000 run-size and assuming early run-timing.**

The expected Somass sockeye stock composition is about 21% Great Central and 79% Sproat Sockeye. The expected Somass sockeye age composition is about 81%, 15%, 3%, and 1% of age 4<sub>2</sub>, 5<sub>2</sub>, 5<sub>3</sub> and 6<sub>3</sub> adults, respectively.

Model forecasts for the 2018 Somass sockeye return are: 130,000 (SStM); 575,000 (SSM), 234,000 (SEPB), 600,000 (CLI), and 494,000 (Sibling). The predicted Somass sockeye returns from each forecast model are further broken down into stock-specific forecasts.

The age of return for sockeye to Sproat and Great Central lakes ranges from 3 to 6 years with age 4 and 5 fish predominant. Sockeye produced from brood years 2012 to 2015 will return in 2018, with 2013 and 2014 being the main contributing brood years. There are two key points to consider for these contributing brood years.

Point 1: Low returns from the 2013 brood year (age 3 and age 4 returns so far), results in expected low returns of 5 year olds in 2018.

Point 2: The returns so far from both the 2013 and 2014 brood years had a low proportion of Great Central Lake stock (23%, and 8%, respectively).

#### **Henderson sockeye:**

Statistical forecast models for Henderson sockeye are currently not generated due to data limitations. An outlook is produced based on spawner and smolt abundance for the contributing brood years and trends in indicators related to marine survival rate. Based on these observations, we recommend a management outlook for Henderson sockeye in the “very low zone” for harvest management, corresponding to an expected return of less than 15,000 adult fish.

For planning purpose, a management forecast of **15,000** results in a TAC for Henderson sockeye of **2250**. This TAC may be revised in-season.

### **IN-SEASON ASSESSMENT:**

#### **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 and 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 zigzagging 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 Maanulth 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).

### **Escapement Monitoring:**

Video monitoring systems were installed at the Sproat fishway and Stamp Falls fishway in late April. Fish passing through both fishways are recorded 24 hours a day (i.e., tunnels are lit up at night) using a video monitoring system. Trained and experienced observers review a subsample of the video from both sites in order to generate estimates of escapement to each system. Biological samples of sockeye salmon are collected 2-3 times/week from fish at both counting sites to estimate the age and sex composition of escapement. The age results from biosampling are applied to total escapement numbers in order to estimate daily adult and jack escapement numbers. Escapement estimates reported here are preliminary as not all video has been sampled and reviewed.

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. 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 will support this initiative.

### **Run Size Estimation:**

In order to forecast the return of Somass sockeye in-season the two most pertinent questions are: What is the abundance accounted for to date? 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 provides an indication 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.

Attachment 1. Somass management table.

Somass Run Size	Escapement Goal	Harvest Rate	Test Fish	Total TAC	Maanulth Treaty	Recreational (expected)	Commercial TAC	Comm Stewardship	Tsumass TAC	Area B Seine	Area D Gillnet
200,000	170,000	15%	5,000	25,000	5,000	4,000	16,000		12,800	-	3,200
250,000	200,000	20%	5,000	45,000	9,000	10,000	26,000		20,800	-	5,200
300,000	235,000	22%	5,000	60,000	11,000	15,000	34,000		27,200	-	6,800
350,000	262,500	25%	5,000	82,500	13,250	21,000	48,250		28,950	11,580	7,720
400,000	283,333	29%	8,000	108,667	14,179	28,000	66,487		33,244	19,946	13,297
450,000	304,167	32%	8,000	137,833	15,016	36,000	86,817		41,672	27,087	18,058
500,000	325,000	35%	8,000	167,000	15,853	45,000	106,147	5,000	45,516	33,378	22,252
550,000	331,250	40%	8,000	210,750	17,109	49,500	144,141	10,000	60,363	44,267	29,511
600,000	337,500	44%	8,000	254,500	18,365	54,000	182,135	10,000	65,411	64,034	42,690
650,000	343,750	47%	8,000	298,250	19,620	58,500	220,130	10,000	79,849	78,168	52,112
700,000	350,000	50%	8,000	342,000	20,876	63,000	258,124	10,000	81,881	99,746	66,497
750,000	358,333	52%	8,000	383,667	22,072	67,500	294,095	10,000	93,751	114,206	76,137
800,000	366,667	54%	8,000	425,333	22,886	72,000	330,447	10,000	105,748	128,820	85,880
850,000	375,000	56%	8,000	467,000	22,886	76,500	367,614	10,000	118,013	143,761	95,841
900,000	383,333	57%	8,000	508,667	22,886	81,000	404,781	10,000	130,278	158,702	105,801
950,000	391,667	59%	8,000	550,333	22,886	85,500	441,947	10,000	142,543	173,643	115,762
1,000,000	400,000	60%	8,000	592,000	22,886	90,000	479,114	10,000	145,425	194,213	129,475
1,050,000	400,833	62%	8,000	641,167	22,886	94,500	523,781	15,000	147,546	216,741	144,494
1,100,000	401,667	63%	8,000	690,333	22,886	99,000	568,447	15,000	149,431	242,410	161,607
1,150,000	402,500	65%	8,000	739,500	22,886	100,000	616,614	15,000	162,436	263,507	175,671
1,200,000	409,286	66%	8,000	782,714	22,886	100,000	659,828	15,000	174,104	282,435	188,290
1,250,000	416,071	67%	8,000	825,929	22,886	100,000	703,043	15,000	185,771	301,363	200,908
1,300,000	422,857	67%	8,000	869,143	22,886	100,000	746,257	15,000	197,439	320,291	213,527
1,350,000	429,643	68%	8,000	912,357	22,886	100,000	789,471	15,000	209,107	339,218	226,146
1,400,000	436,429	69%	8,000	955,571	22,886	100,000	832,685	15,000	220,775	358,146	238,764
1,450,000	443,214	69%	8,000	998,786	22,886	100,000	875,900	15,000	232,443	377,074	251,383
1,500,000	450,000	70%	8,000	1,042,000	22,886	100,000	919,114	15,000	244,111	396,002	264,001
1,550,000	465,000	70%	8,000	1,077,000	22,886	100,000	954,114	15,000	253,561	411,332	274,221
1,600,000	480,000	70%	8,000	1,112,000	22,886	100,000	989,114	15,000	263,011	426,662	284,441
1,650,000	495,000	70%	8,000	1,147,000	22,886	100,000	1,024,114	15,000	272,461	441,992	294,661
1,700,000	510,000	70%	8,000	1,182,000	22,886	100,000	1,059,114	15,000	281,911	457,322	304,881
1,750,000	525,000	70%	8,000	1,217,000	22,886	100,000	1,094,114	15,000	291,361	472,652	315,101
1,800,000	540,000	70%	8,000	1,252,000	22,886	100,000	1,129,114	15,000	300,811	487,982	325,321

Attachment 2. Henderson Management Table

Henderson Run Size	Escapement Goal	Harvest Rate	Total TAC	Maanulth Treaty	Remaining TAC	Other Fisheries	Maanulth Harvest Agreement
5,000	4,250	15%	750	201	549	439	110
10,000	8,500	15%	1,500	403	1,097	878	219
15,000	12,750	15%	2,250	604	1,646	1,317	329
20,000	16,375	18%	3,625	973	2,652	2,121	530
25,000	20,000	20%	5,000	1,343	3,658	2,926	732
35,000	25,750	26%	9,250	2,484	6,766	5,413	1,353
45,000	31,500	30%	13,500	3,625	9,875	7,900	1,975
52,500	33,750	36%	18,750	5,034	13,716	10,973	2,743
60,000	36,000	40%	24,000	6,444	17,556	14,045	3,511
67,500	36,750	46%	30,750	8,256	22,494	17,995	4,499
75,000	37,500	50%	37,500	10,069	27,431	21,945	5,486
90,000	45,000	50%	45,000	12,083	32,918	26,334	6,584
105,000	52,500	50%	52,500	14,096	38,404	30,723	7,681
120,000	60,000	50%	60,000	16,110	43,890	35,112	8,778
135,000	67,500	50%	67,500	18,124	49,376	39,501	9,875
150,000	75,000	50%	75,000	20,138	54,863	43,890	10,973

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