2018 ATLANTIC SALMON IN-SEASON REVIEW FOR THE NEWFOUNDLAND AND LABRADOR REGION

Context

Declines in total Atlantic Salmon returns of >30% on more than half of monitored rivers in 2016 and 2017 warranted a full stock assessment of Atlantic Salmon in the Newfoundland and Labrador (NL) Region, which took place from February 28-March 1, 2018 (Fisheries and Oceans Canada [DFO] 2018).

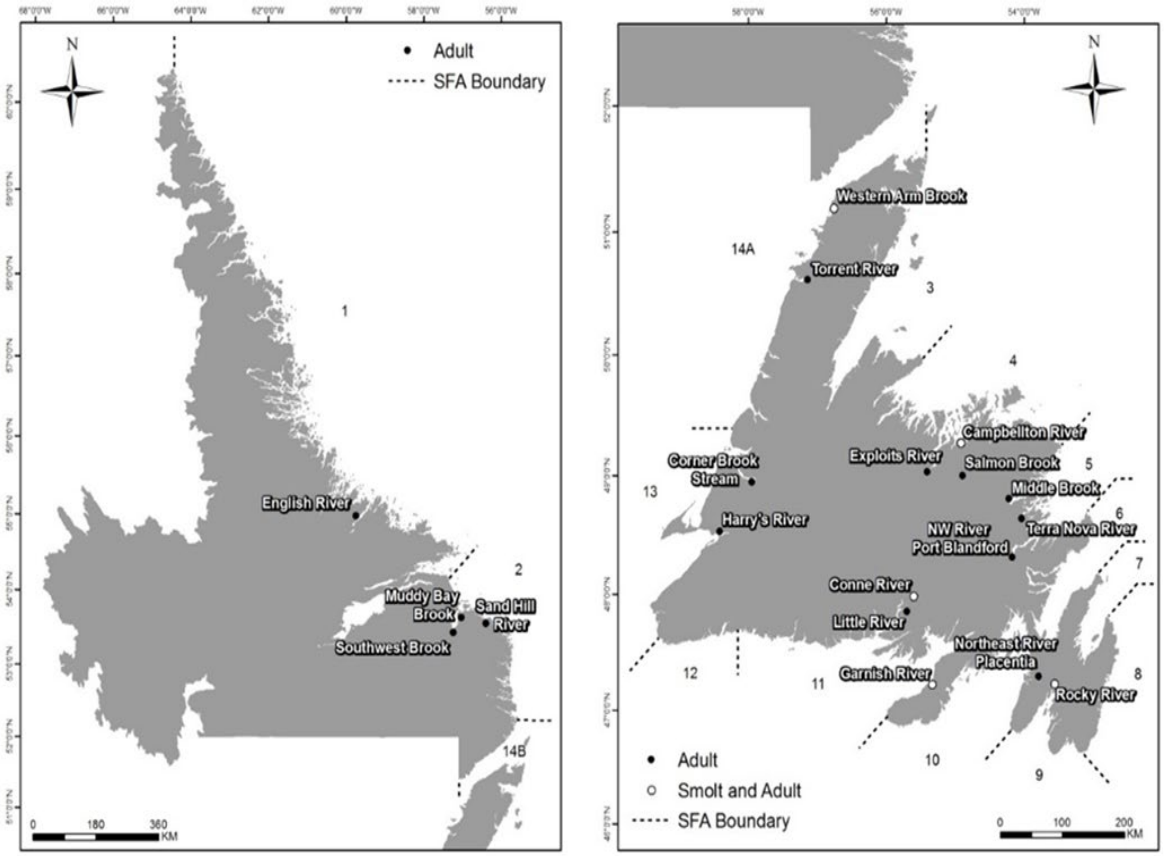

Figure 1: Maps showing the locations of rivers in SFAs 1–14B where Atlantic Salmon populations were monitored in 2018.

Following the assessment in March 2018, Resource Management requested that DFO Science conduct an in-season review of the status of Atlantic Salmon in the NL Region. The objective was to determine whether the 2016 and 2017 declines were outliers in the observed annual variability of salmon returns, or evidence of a declining trend in the abundance of salmon stocks.

DFO Resource Management requested that DFO Science conduct an in-season review to provide advice on the following:

1. Assess the status of the 2018 salmon stock by comparing the predicted total returns to river specific conservation targets.
2. Compare total predicted returns to final returns in relation to the following reference points: 2013-17 (previous five-year average); 2011-15[1] (see DFO 2018 for more information); and 2003-12 (2002-12 for Labrador), the 10-year period prior to current generation.
3. Determine how many rivers are predicted to meet or exceed the Limit Reference Point and the Upper Stock Reference Point.
4. Based on the results of the in-season review provide advice on the sustainability of a 2018 recreational fishery by considering the following five harvest scenarios:
    - Scenario 1: can the stock sustain additional human induced mortality?
    - Scenario 2: can the stock sustain a catch-and-release fishery?
    - Scenario 3: can the stock sustain an increase in harvest of one additional salmon?
    - Scenario 4: can the stock sustain an increase in one additional salmon on Class 2 Rivers, two additional salmon on Class 4 rivers and three additional salmon on Class 6 rivers?
    - Scenario 5: can the stock sustain removals of salmon consistent with 2016 removals (2 fish on Class 2, 4 fish on Class 4, 6 fish on Class 6)?

This Science Response Report results from the Science Response Process of July 10th and July 24th, 2018 on the 2018 Atlantic Salmon In-Season Review for the NL Region.

Analysis and Response

1. Stock status update and comparison to river specific conservation targets

Final adult salmon returns for 2018 are predicted based on the relationship between total returns on a given date (July 15 for Newfoundland and July 22 for Labrador) and final returns over the previous three generations (2002-17 where available). River specific conservation targets are based on egg deposition, which depends on the number of adult spawners in the population. The predicted 2018 returns were converted to number of spawners by removing estimates of harvest in the 2018 recreational fishery. Harvest estimates for 2018 are derived from the average harvest from 2012 to 2016 and the expected reductions in harvest due to the 2018 management plan (i.e. one salmon retention at the start of the season; Veinott and Cochrane 2015, DFO unpublished data).

2. Comparison of total predicted returns to the following reference points: 2013-17; 2011-15; and 2003-12

Newfoundland

Six of 11 assessed rivers (55%) are predicted to be below the recent 5-year mean (2013-17), 3 of 11 (27%) are predicted to show no change and 2 of 11 (18%) are predicted to increase (Table 1). In comparison to the five years prior to 2016 (2011-15), 7 of 9 rivers are predicted to show declines of greater than 25%. Three of 9 rivers (33%) are predicted to show declines from the 10-year period prior to current generation (2003-12) with Conne River showing a predicted decline of 77%.

Labrador

When compared to the recent 6-year mean (2012-17), 2018 returns are predicted to increase on three assessed rivers (Sand Hill River, Muddy Bay Brook, and Southwest Brook; Table 2), but by <10% on Southwest Brook and Muddy Bay Brook. However, adult returns on all these rivers are predicted to be below the 10-year mean (2002-11) and Sand Hill River is expected to be below the six-year mean (2010-15).

As of July 22, only six fish had returned to English River (SFA1), which is too low to make a prediction. It should also be noted that the count for Sand Hill River was adjusted by an additional 200 fish to account for the number of salmon that may have entered the river prior to installation of the counting fence, which was delayed in 2018 due to high water levels.

3. Number of rivers predicted to meet or exceed the Limit Reference Point and/or the Upper Stock Reference Point

Newfoundland

Under scenario 1, 5 of the 11 (45%) rivers with sufficient data to predict final returns are expected to meet or exceed the Limit Reference Point (i.e. >100% Conservation Limit Achieved [CL]); Table 3). These include: Campbellton River (SFA 4); Salmon Brook (SFA 4); Middle Brook (SFA 5); Northeast River, Placentia (SFA 10); and Western Arm Brook (SFA 14A). With the exception of Salmon Brook, which falls in the Cautious Zone (DFO 2009), these rivers are also predicted to exceed the Upper Stock Reference Point (150% CL) and be in the Healthy Zone.

The remaining six rivers (55%) are predicted to be in the Critical Zone (< 100% CL) at the end of season. These include: Exploits River (SFA 4), Terra Nova River(SFA 5), Rocky River (SFA 9), Garnish River and Conne River (SFA 11), and Harry's River (SFA 13).

As of July 15, no salmon had entered the Torrent River fishway, which is approximately 2 km upstream from the river mouth. While unusual, this is not unprecedented and given that Torrent River has exceeded the Upper Stock Reference Point during all of the past 10 years, it is expected to exceed the Upper Stock Reference Point again in 2018.

It should also be noted that the percent conservation limit achieved on all rivers is in decline when compared to the 2011-15 average, with the exception of Western Arm Brook. This means that stocks in the Healthy Zone have moved closer towards the Cautious Zone and stocks in the Critical Zone have moved further into the Critical Zone.

Labrador

Of the three rivers in Labrador with sufficient data to predict final returns, only Muddy Bay Brook is expected to meet or exceed the LRP (i.e. >100% CL; Table 4). Sand Hill River and Southwest Brook are expected to be in the Critical Zone (Table 4).

4. Provide advice on the sustainability of a continued fishery

Given the continued predicted declines in salmon returns (Tables 1 and 2) and CL (Tables 3 and 4) it is the recommendation of Science that all rivers on the island be closed to retention angling. The expected reduction in CL as a result of a catch-and-release fishery (S2) is expected to be minimal (~ - 2% relative change) and therefore Science recommends allowing a catch-and-release fishery. As water temperatures increase above 18^{o}C, mortality from catch-and-release angling will increase significantly (Dempson et al. 2002), and therefore Science recommends that all angling should cease when water temperatures exceed this value.

Conclusions

Given the continued declines in salmon population numbers, particularly the low returns to many rivers in 2016 and 2017, and the declines in conservation limit achieved, Science recommends a precautionary approach such that all rivers in Newfoundland and Labrador close to retention angling for the remainder of the season. It is recommended that catch-and-release angling be permitted to promote angler engagement and continued stewardship. Strict environmental protocols should be enforced and all angling should cease when water temperatures exceed 18°C.

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Sources of information

DFO. 2009. A Fishery Decision-Making Framework Incorporating the Precautionary Approach. Accessed July, 2018.

DFO. 2018. Stock Assessment of Newfoundland and Labrador Atlantic Salmon – 2017. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/034.

Veinott, G., and Cochrane, N. 2015. Characteristics of the Newfoundland and Labrador Atlantic Salmon (*Salmo salar*) Recreational Fishery based on Angler Logs and Phone Surveys (1994-2013). Can. Manuscr. Rep. Fish. Aquat. Sci. 3082: vii + 51 p.

Dempson, B., Furey, G., and Bloom, M. 2002. Effects of catch and release angling on Atlantic salmon, *Salmo salar* L., of the Conne River, Newfoundland. Fish. Man. Ecol. 2002. 9: 139-147.

APPENDIX: TABLES

Table 1. Predicted final counts (mean ± 90% prediction intervals) of Atlantic Salmon on Newfoundland rivers in 2018 in comparison to mean final count (and percent change) from three previous reference periods. Percent change of <10% is considered no change.

River Name	Predicted Final Count 2018 Mean	90th Prediction Interval	Mean Final Count 2013-2017	Mean Final Count 2011-2015	Mean Final Count 2003-2012	% Change from 2013-2017 Mean	% Change from 2011-2015 Mean	% Change from 2003-2012 Mean
Exploits River (SFA 4)	22119	(14926, 29312)	26457	32952	33036	-16	-33	-33
Campbellton River (SFA 4)	3529	(2451, 4607)	3677	4675	3756	-4	-25	-6
Salmon Brook (SFA 4)	1190	(613, 1767)	[c] 1201	[c] 1700	1212	-1	-30	-2
Terra Nova River (SFA 5)	3682	(2235, 5129)	4420	4506	3370	-17	-18	9
Middle Brook (SFA 5)	2066	(1006, 3125)	2913	3032	1809	-29	-32	14
Rocky River (SFA 9)	454	(149, 760)	[b] 325	[b] 477	553	40	-5	-18
NE Placentia (SFA 10)	737	(-, 1840)	[a] 636	-	-	16	-	-
Garnish River (SFA 11)	343	(111, 575)	[a] 485	-	-	-29	-	-
Conne River (SFA 11)	484	(307, 660)	1615	1857	2136	-70	-74	-77
Harry's River (SFA 13)	2547	(1910, 3184)	3671	3576	2607	-31	-29	-2
Torrent River (SFA 14A)	NC	NC	4028	4124	4428	-	-	-
Western Arm Brook (SFA 14A)	1214	(771, 1657)	1244	1313	1341	-2	-8	-9

[a] 2015-2017, [b] excludes 2015, [c] excludes 2014

Table 2. Predicted final counts (mean ± 90% prediction intervals) of Atlantic Salmon on Labrador rivers in 2018 in comparison to mean final count (and percent change) from three previous reference periods. Percent change of <10% is considered no change.

River Name	Predicted Final Count 2018 Mean	90th Prediction Interval	Mean Final Count 2012-2017	Mean Final Count 2010-2015	Mean Final Count 2002-2011	% Change from 2012-2017	% Change from 2010-2015	% Change from 2002-2011
English River (SFA 1)	-	-	794	680	360	-	-	-
Sand Hill River (SFA 2)	3123[a]	(2533, 3994)	2910	4122	4751	7	-24	-34
Muddy Bay Brook (SFA 2)	334	(129, 539)	311	369	389[b]	7	-9	-14
Southwest Brook, Paradise River (SFA 2)	253	(115, 390)	190[c]	261[c]	402[c]	33	-3	-37

[a] 200 additional fish due to late fence installation, [b] excludes 2002, [c] excludes 2002, 2010, 2012

Table 3. Predicted percent conservation limits (mean ± 90% prediction intervals) for Atlantic Salmon on Newfoundland rivers in 2018 under five harvest scenarios, showing comparisons to mean conservation limits (with percent change) from three previous reference periods. Percent change of <10% is considered no change. The five fisheries management scenarios are as follows: S1: Mortality to In-Season Review (July 15); S2: Catch-and Release Only Following In-Season Review; S3: Second Tag After In-Season Review; S4: Half Previous Tags After In-Season Review; S5: All Previous Tags After In-Season Review.

River	Fisheries Management Scenarios	Predicted % Conservation Limit (CL) Achieved 2018	% CL 2013-2017 Mean	% CL 2011-2015 Mean	% CL 2003-2012 Mean	% Change from 2013-2017	% Change from 2011-2015	% Change from 2003-2012
Exploits River (SFA 4)	S1	47	-	-	-	-7	-27	-29
-	S2	45	-	-	-	-10	-29	-31
-	S3	44	-	-	-	-12	-31	-33
-	S4	41	-	-	-	-19	-37	-38
-	S5	40	50	64	66	-21	-38	-39
Campbellton River (SFA 4)	S1	334	-	-	-	6	-19	4
-	S2	330	-	-	-	5	-20	2
-	S3	324	-	-	-	3	-22	0
-	S4	309	-	-	-	-2	-26	-4
-	S5	305	315	415	323	-3	-26	-5
Salmon Brook (Gander River) (SFA 4)	S1	138	-	-	-	3	-26	0
-	S2	137	-	-	-	2	-27	0
-	S3	135	-	-	-	1	-28	-1
-	S4	132	-	-	-	-1	-29	-3
-	S5	132	134	187	137	-2	-30	-4
Terra Nova River (SFA 5)	S1	58	-	-	-	-16	-18	9
-	S2	57	-	-	-	-17	-19	8
-	S3	56	-	-	-	-18	-19	7
-	S4	55	-	-	-	-20	-21	4
-	S5	55	69	70	53	-21	-22	4

River	Fisheries Management Scenarios	Predicted % Conservation Limit (CL) Achieved 2018	% CL 2013-2017 Mean	% CL 2011-2015 Mean	% CL 2003-2012 Mean	% Change from 2013-2017	% Change from 2011-2015	% Change from 2003-2012
Middle Brook (SFA 5)	S1	226	-	-	-	-31	-32	15
-	S2	222	-	-	-	-32	-34	13
-	S3	217	-	-	-	-34	-35	10
-	S4	204	-	-	-	-38	-39	4
-	S5	201	328	335	197	-39	-40	2
Rocky River (SFA 9)	S1	47	-	-	-	42	-2	-18
-	S2	-	-	-	-	-	-	-
-	S3	-	-	-	-	-	-	-
-	S4	-	-	-	-	-	-	-
-	S5	-	33	48	57	-	-	-
NE Placentia River (SFA 10)	S1	410	-	-	-	19	-	-
-	S2	400	-	-	-	16	-	-
-	S3	390	-	-	-	-	-	-
-	S4	370	-	-	-	-	-	-
-	S5	365	344	-	-	-	-	-
Garnish River (SFA 11)	S1	33	-	-	-	-23	-	-
-	S2	32	-	-	-	-24	-	-
-	S3	32	-	-	-	-26	-	-
-	S4	30	-	-	-	-30	-	-
-	S5	30	43	-	-	-31	-	-
Conne River (SFA 11)	S1	18	-	-	-	-74	-78	-80
-	S2	-	-	-	-	-	-	-
-	S3	-	-	-	-	-	-	-
-	S4	-	-	-	-	-	-	-

River	Fisheries Management Scenarios	Predicted % Conservation Limit (CL) Achieved 2018	% CL 2013-2017 Mean	% CL 2011-2015 Mean	% CL 2003-2012 Mean	% Change from 2013-2017	% Change from 2011-2015	% Change from 2003-2012
-	S5	-	70	80	91	-	-	-
Harry's River (SFA 13)	S1	85	-	-	-	-25	-22	-10
-	S2	82	-	-	-	-28	-25	-13
-	S3	79	-	-	-	-30	-28	-16
-	S4	73	-	-	-	-35	-33	-22
-	S5	72	113	109	94	-37	-34	-24
Torrent River (SFA 14A)	S1	-	-	-	-	-	-	-
-	S2	-	-	-	-	-	-	-
-	S3	-	-	-	-	-	-	-
-	S4	-	-	-	-	-	-	-
-	S5	-	723	794	772	-	-	-
Western Arm Brook (SFA 14A)	S1	399	-	-	-	9	2	-12
-	S2	-	-	-	-	-	-	-
-	S3	-	-	-	-	-	-	-
-	S4	-	-	-	-	-	-	-
-	S5	-	365	392	452	-	-	-

Table 4. Predicted percent conservation limits (mean ± 90% prediction intervals) for Atlantic Salmon on Labrador rivers in 2018 under five harvest scenarios, showing comparisons to mean conservation limits (with percent change) from three previous reference periods. Percent change of <10% is considered no change. The five fisheries management scenarios are as follows: S1: Mortality to In-Season Review (July 22); S2: Catch-and-Release Only Following In-Season Review; S3: Second Tag After In-Season Review; S4: Half Previous Tags After In-Season Review; S5: All Previous Tags After In-Season Review.

River	Fisheries Management Scenarios	Predicted % Conservation Limit (CL) Achieved 2018	% CL 2012-2017 Mean	% CL 2010-2015 Mean	% CL 2002-2011 Mean	% Change from 2012-2017	% Change from 2010-2015	% Change from 2002-2011
English River (SFA 1)	S1	-	-	-	-	-	-	-
-	S2	-	-	-	-	-	-	-
-	S3	-	-	-	-	-	-	-
-	S4	-	-	-	-	-	-	-
-	S5	-	232	192	90	-	-	-
Sand Hill River (SFA 2)	S1	76	-	-	-	4	-22	-30
-	S2	75	-	-	-	3	-23	-30
-	S3	75	-	-	-	2	-23	-31
-	S4	75	-	-	-	2	-23	-31
-	S5	75	73	97	108	2	-23	-31
Muddy Bay Brook (SFA 2)	S1	122	-	-	-	2	-10	-13
-	S2	121	-	-	-	1	-10	-14
-	S3	121	-	-	-	1	-10	-14
-	S4	120	-	-	-	0	-11	-15
-	S5	120	120	135	141	0	-11	-15
Southwest Brook, Paradise River (SFA 2)	S1	76	-	-	-	19	-10	-38
-	S2	73	-	-	-	15	-14	-40
-	S3	72	-	-	-	13	-15	-41
-	S4	70	-	-	-	10	-17	-42
-	S5	70	64	85	122	9	-18	-43

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