Skeena Sockeye Test Fishery DNA (2018): Report to PSC. March 15, 2019

Project Lead. Steve Cox-Rogers

Introduction

The Tyee gill-net test fishery at the mouth of the Skeena River provides daily estimates of the number of sockeye entering (escaping) into the Skeena River each year from mid-June through August. The annual escapement is comprised of numerous sockeye sub-stocks each with its own entry timing (early, mid, late etc). A key component of Skeena sockeye management is estimating annual abundance and harvest/exploitation rates on sub-stocks so that fisheries can be managed with consideration for sub-stock structure rather than just simple aggregate-stock abundance. Currently, estimating catch and escapement for each stock is very difficult as visual escapement assessments are of variable quality and estimates of the catch by stock in various fisheries are not complete. An alternative strategy is to sample (proportionate to abundance) sockeye captured at the test fishing site and determine their stock of origin using microsatelite DNA stock identification techniques (Beacham et al, 2014). Given escapement counts of known accuracy for several Skeena tributary systems, and known proportions of these stocks in the escapement samples from Tyee, allows estimation of escapement to each specific sockeye stock within the Skeena River drainage. As well, stock composition estimates from the Tyee test fishery allow for stock-specific run-reconstruction back through mixed-stock marine fisheries in the Canada and S.S.E Alaskan PSC Northern Boundary Area approach waters. These analyses provide reconstructed run-timing distributions, catch estimates, and harvest rates by sub-stock which are vital to understanding migration routes, timing, and impacts by specific fisheries. To date, sockeye DNA analysis for the Tyee test fishery includes the years 2000-2018…continuation of this program through 2019 is scheduled.

Methods

Sockeye tissue samples (tissues on Whatman paper) were collected proportionate to abundance from fish captured at the Tyee Test Fishery in 2018 following previously established sampling protocols. The tissue samples were shipped to the PBS lab in Nanaimo for analysis (Terry Beacham/John Candy, DFO, Nanaimo). A complete overview of the analytical process followed for Tyee Test Fishery DNA analysis can in the attached references, with their citation lists summarizing relevant methodologies and processing logistics.

Results

Table1 shows the weekly numbers of sockeye samples run for genetic analysis for samples collected at Tyee in 2018. Table 2 summarizes the weekly stock proportions for sockeye sampled at the Tyee test fishery in 2018, Table 3 shows the regional summary by week; ~500 samples, sub-sampled from the total collected in 2018, were run for analysis. An assessment of all the 2000-2018 Tyee test fishery data is now being made to determine annual variability in stock-specific run-timing and abundance patterns. A summary sheet showing 2000-2018 DNA results, applied to estimated abundance passing Tyee, is available upon request. All data and results from 2018 (and prior years) has been shared with Canada and U.S counterparts through the PSC NBTC process.

References

Beacham, T. D., and C. E. Withler, and K. M. Miller. 2000. Application of microsatellite DNA variation to estimation of stock composition and escapement of Skeena River sockeye salmon (Oncorhynchus nerka). . North Pacific Anadromous Fish Commission Bulletin 2: 263-276.

Table 1. Weekly selected samples for sockeye sampled at the Tyee test fishery in 2018.

Species = Sockeye Number of populations = 25 Baseline Description = bso_Damsh_slamg_20181219 Num
Number of chains = 10 Number of Reps = 20000 Reps Kept = 1000

Sample	Vial ID	Year	Gear	Area	Mix Date	N	Excluded
1	173	2018	gill	SkeenaTyee	Jun22	1	0
2	176-179	2018	gill	SkeenaTyee	Jun25-Jun28	2	0
3	182-188	2018	gill	SkeenaTyee	Jul01-Jul07	17	0
4	189-195	2018	gill	SkeenaTyee	Jul08-Jul14	48	0
5	196-202	2018	gill	SkeenaTyee	Jul15-Jul21	115	0
6	203-209	2018	gill	SkeenaTyee	Jul22-Jul28	131	0
7	210-216	2018	gill	SkeenaTyee	Jul29-Aug04	121	0
8	217-223	2018	gill	SkeenaTyee	Aug05-Aug1	37	0
9	224-230	2018	gill	SkeenaTyee	Aug12-Aug1	9	0
10	231-235	2018	gill	SkeenaTyee	Aug19-Aug2	10	0
11	238-244	2018	gill	SkeenaTyee	Aug26-Sep0	4	0
12	245-249	2018	gill	SkeenaTyee	Sep02-Sep0	3	0
13	252-255	2018	gill	SkeenaTyee	Sep09-Sep1	2	0
14	173-255	2018	gill	SkeenaTyee	Jun22-Sep1	500	0

Table 2. Weekly stock proportions for sockeye sampled at the Tyee test fishery in 2018.

Sockeye Number of populations = 25 Baseline Description = bso_Damsh_slamg_20181219 Number of loci = 14 Max missing loci = 5
f chains = 10 Number of Reps = 20000 Reps Kept = 1000

Stock	173 StatWk25 Jun22 1(0) Estima	SD	176-179 StatWk26 Jun25-Jun28 2(0) Estima	SD	182-188 StatWk27 Jul01-Jul07 17(0) Estima	SD	189-195 StatWk28 Jul08-Jul14 48(0) Estima	SD	196-202 StatWk29 Jul15-Jul21 115(0) Estima	SD	203-209 StatWk30 Jul22-Jul28 131(0) Estima	SD	210-216 StatWk31 Jul29-Aug04 121(0) Estima	SD	217-223 StatWk32 Aug05-Aug11 37(0) Estima	SD	224-230 StatWk33 Aug12-Aug18 9(0) Estima	SD	231-235 StatWk34 Aug19-Aug23 10(0) Estima	SD	238-244 StatWk35 Aug26-Sep01 4(0) Estima	SD	245-249 StatWk36 Sep02-Sep06 3(0) Estima	SD	252-255 StatWk37 Sep09-Sep12 2(0) Estima	SD	173-255 StatWkALL Jun22-Sep12 500(0) Estima	SD
McDonnell	0.0	(9.3)	0.0	(5.1)	0.0	(1.2)	1.3	(2.3)	0.0	(0.2)	0.0	(0.1)	0.0	(0.2)	0.0	(0.6)	0.0	(2.0)	0.0	(1.7)	0.0	(4.0)	0.0	(4.5)	0.0	(5.5)	0.0	(0.1)
Motase	0.0	(8.4)	0.0	(6.2)	0.0	(1.1)	0.2	(0.8)	0.4	(0.7)	0.0	(0.2)	0.5	(0.8)	0.0	(0.5)	0.0	(1.7)	0.0	(2.1)	0.0	(3.0)	0.0	(4.0)	0.0	(5.0)	0.2	(0.3)
Shass	0.0	(9.0)	0.0	(7.0)	2.0	(6.0)	0.2	(1.1)	2.8	(4.3)	1.5	(3.7)	1.7	(4.1)	0.6	(2.1)	0.5	(3.1)	0.1	(1.9)	2.8	(10.1)	3.9	(13.8)	1.7	(9.4)	1.4	(1.8)
Swan_Kispox	0.0	(7.3)	0.0	(7.1)	0.0	(1.0)	0.0	(0.4)	0.0	(0.3)	0.1	(0.4)	0.0	(0.2)	0.0	(0.5)	0.0	(2.2)	0.0	(1.6)	0.0	(3.5)	0.0	(5.7)	0.0	(5.4)	0.0	(0.1)
U_Babine	0.0	(7.3)	0.0	(5.3)	1.3	(4.7)	0.2	(1.3)	1.6	(3.8)	1.9	(3.7)	6.6	(6.7)	0.5	(2.1)	0.4	(2.8)	15.3	(18.7)	2.5	(10.6)	7.4	(17.7)	2.9	(10.2)	1.4	(2.0)
Pinkut	0.0	(8.0)	0.0	(6.2)	1.4	(4.5)	1.4	(3.5)	3.7	(7.1)	0.6	(1.9)	0.9	(2.4)	0.8	(3.0)	0.6	(3.5)	4.4	(10.4)	4.0	(13.3)	39.3	(35.0)	0.2	(5.6)	1.0	(1.9)
Fulton_L	0.0	(6.5)	0.0	(5.6)	6.5	(12.2)	28.5	(11.8)	8.3	(10.1)	15.1	(11.5)	36.3	(17.3)	49.6	(15.6)	1.7	(6.8)	9.4	(19.7)	21.2	(27.4)	11.1	(22.1)	11.8	(22.7)	16.6	(5.9)
L_Babine	0.0	(8.7)	0.0	(6.0)	5.5	(10.3)	46.7	(11.6)	27.6	(15.0)	4.6	(9.0)	21.9	(18.2)	15.1	(18.6)	7.5	(15.4)	3.0	(10.5)	28.2	(28.3)	1.4	(8.0)	30.2	(30.7)	41.9	(9.5)
Nanika	0.0	(8.3)	0.0	(5.9)	12.9	(8.9)	2.6	(2.7)	1.7	(1.2)	0.7	(0.8)	0.0	(0.2)	0.0	(0.5)	0.0	(1.7)	0.0	(1.4)	0.0	(3.7)	0.0	(5.0)	0.0	(6.4)	1.2	(0.5)
Morrison	0.0	(9.0)	2.8	(11.2)	11.2	(14.0)	4.2	(8.5)	23.3	(16.3)	60.2	(16.5)	26.8	(18.2)	23.2	(17.0)	81.4	(22.0)	42.9	(33.7)	2.8	(10.4)	18.0	(28.4)	13.5	(24.8)	21.8	(9.9)
Williams	0.0	(5.8)	37.0	(25.4)	0.3	(2.0)	1.2	(1.9)	1.7	(1.3)	0.0	(0.1)	0.0	(0.2)	0.0	(0.6)	0.0	(1.8)	0.0	(1.3)	0.0	(2.4)	0.0	(4.5)	0.0	(5.8)	0.8	(0.4)
Schulbuckhand	0.0	(8.0)	13.1	(19.0)	0.4	(2.3)	0.8	(1.6)	0.1	(0.5)	0.0	(0.1)	0.0	(0.2)	0.0	(0.5)	0.0	(2.0)	0.0	(1.8)	0.0	(4.2)	0.0	(5.2)	0.0	(6.3)	0.0	(0.2)
Pierre	0.0	(7.6)	0.0	(5.4)	12.1	(15.3)	0.9	(3.1)	5.5	(8.1)	4.6	(6.3)	0.9	(2.4)	6.3	(10.1)	0.7	(4.4)	3.9	(9.9)	4.1	(12.9)	4.3	(14.1)	18.3	(26.6)	3.7	(3.4)
SalixBear	0.0	(7.5)	0.0	(5.7)	0.1	(1.4)	0.3	(1.2)	0.1	(0.5)	0.6	(0.8)	0.0	(0.2)	0.0	(0.5)	0.0	(1.9)	0.1	(1.8)	0.0	(3.2)	0.0	(3.9)	0.0	(4.8)	0.2	(0.3)
Alastair	0.0	(8.3)	0.0	(6.9)	9.1	(7.0)	0.0	(0.5)	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)	0.0	(0.5)	0.0	(1.8)	0.0	(2.0)	25.0	(17.2)	0.0	(4.9)	0.0	(5.7)	0.5	(0.3)
Kitwanga	100.0	(28.5)	0.0	(6.6)	0.0	(1.2)	0.0	(0.5)	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)	0.0	(0.5)	0.0	(1.9)	0.0	(1.9)	0.0	(3.4)	0.0	(4.8)	0.0	(5.0)	0.2	(0.2)
Kalum	0.0	(8.4)	0.0	(4.4)	1.1	(3.8)	0.7	(1.6)	0.0	(0.2)	0.6	(0.9)	1.7	(1.4)	0.7	(1.7)	0.0	(1.9)	0.0	(1.3)	0.0	(3.7)	0.0	(5.7)	0.0	(6.5)	0.7	(0.6)
Twain_Cr	0.0	(6.7)	0.0	(5.9)	4.2	(8.9)	4.8	(6.3)	8.5	(9.4)	1.9	(3.9)	0.7	(1.9)	0.2	(1.3)	0.2	(2.5)	19.6	(23.6)	0.1	(4.4)	7.8	(17.0)	1.8	(9.4)	2.2	(2.4)
Four_Mile	0.0	(8.6)	0.0	(6.5)	16.4	(17.9)	0.2	(1.2)	9.9	(10.3)	4.9	(6.5)	1.2	(2.8)	0.5	(2.2)	0.1	(1.9)	1.1	(5.3)	5.8	(14.7)	3.1	(10.1)	0.4	(5.2)	2.6	(2.8)
Tahlo	0.0	(8.1)	0.0	(5.4)	0.4	(2.7)	0.1	(0.9)	0.4	(1.5)	0.8	(2.0)	0.5	(1.7)	0.6	(2.7)	7.1	(15.5)	0.2	(2.7)	3.7	(12.1)	3.8	(12.9)	19.6	(26.6)	0.4	(1.0)
Sustut	0.0	(9.0)	0.0	(5.7)	5.9	(5.5)	2.3	(2.2)	2.7	(1.5)	1.3	(1.1)	0.0	(0.4)	0.0	(0.4)	0.0	(1.6)	0.0	(1.6)	0.0	(3.4)	0.0	(4.4)	0.0	(5.6)	1.4	(0.5)
Stephens_Kispox	0.0	(8.9)	0.0	(5.4)	0.0	(1.1)	0.0	(0.4)	0.0	(0.2)	0.1	(0.4)	0.0	(0.2)	0.0	(0.5)	0.0	(1.9)	0.0	(1.7)	0.0	(3.4)	0.0	(4.0)	0.0	(5.7)	0.0	(0.1)
Kalum_lake	0.0	(7.4)	0.0	(5.5)	2.9	(5.5)	0.0	(0.4)	0.0	(0.2)	0.4	(0.7)	0.3	(0.8)	2.1	(2.7)	0.0	(1.8)	0.0	(1.5)	0.0	(3.7)	0.0	(4.3)	0.0	(5.9)	0.4	(0.5)
Johnston_Lake	0.0	(7.9)	47.2	(24.8)	6.0	(5.2)	0.1	(0.6)	0.9	(0.9)	0.0	(0.2)	0.0	(0.2)	0.0	(0.4)	0.0	(2.0)	0.0	(1.9)	0.0	(3.2)	0.0	(5.1)	0.0	(5.6)	0.7	(0.4)
Damsh_slamg	0.0	(8.9)	0.0	(7.3)	0.3	(2.0)	3.4	(2.9)	0.6	(1.0)	0.1	(0.4)	0.0	(0.2)	0.0	(0.5)	0.0	(1.8)	0.2	(2.3)	0.0	(3.2)	0.0	(3.5)	0.0	(5.7)	0.7	(0.5)

Table 3. Regional weekly stock proportions for sockeye sampled at the Tyee test fishery in 2018.

Species = Sockeye Number of populations = 25 Baseline Description = bso_Damsh_slamg_20181219 Number of loci = 14 Max missing loci = 5
Number of chains = 10 Number of Reps = 20000 Reps Kept = 1000

Code	Region1	StatWk25 Jun22 1(0)	StatWk26 Jun25-Jun28 2(0)	StatWk27 Jul01-Jul07 17(0)	StatWk28 Jul08-Jul14 48(0)	StatWk29 Jul15-Jul21 115(0)	StatWk30 Jul22-Jul28 131(0)	StatWk31 Jul29-Aug04 121(0)	StatWk32 Aug05-Aug11 37(0)	StatWk33 Aug12-Aug18 9(0)	StatWk34 Aug19-Aug23 10(0)	StatWk35 Aug26-Sep01 4(0)	StatWk36 Sep02-Sep06 3(0)	StatWk37 Sep09-Sep12 2(0)	StatWkALL Jun22-Sep12 500(0)
		Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD
10	Lower Skeena	100.0 (26.6)	97.2 (22.8)	19.9 (10.0)	4.1 (3.8)	2.8 (1.6)	1.1 (1.2)	2.0 (1.5)	2.7 (3.1)	0.0 (6.0)	0.0 (5.3)	25.0 (18.8)	0.0 (14.5)	0.0 (17.4)	3.3 (0.9)
11	Upper Skeena	0.0 (16.6)	0.0 (12.1)	6.4 (6.1)	6.2 (3.6)	3.8 (1.9)	2.0 (1.4)	0.5 (0.8)	0.0 (0.9)	0.0 (3.7)	0.3 (3.9)	0.0 (6.3)	0.0 (7.7)	0.0 (10.5)	2.5 (0.7)
12	Bulkley	0.0 (8.3)	0.0 (5.9)	12.9 (8.9)	2.6 (2.7)	1.7 (1.2)	0.7 (0.8)	0.0 (0.2)	0.0 (0.5)	0.0 (1.7)	0.0 (1.4)	0.0 (3.7)	0.0 (5.0)	0.0 (6.4)	1.2 (0.5)
13	Babine	0.0 (22.5)	2.8 (19.8)	60.8 (13.2)	87.1 (5.7)	91.7 (2.7)	96.1 (1.9)	97.5 (1.6)	97.3 (3.3)	100.0 (7.1)	99.7 (6.6)	75.0 (19.2)	100.0 (16.7)	100.0 (20.0)	93.1 (1.2)

Code	Region2	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD	Estima SD
1	Alastair Lake	0.0 (8.3)	0.0 (6.9)	9.1 (7.0)	0.0 (0.5)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.5)	0.0 (1.8)	0.0 (2.0)	25.0 (17.2)	0.0 (4.9)	0.0 (5.7)	0.5 (0.3)
2	Lakelse Lake	0.0 (9.8)	50.0 (23.9)	0.7 (3.1)	2.0 (2.1)	1.8 (1.3)	0.0 (0.2)	0.0 (0.2)	0.0 (0.8)	0.0 (2.6)	0.0 (2.2)	0.0 (4.8)	0.0 (7.2)	0.0 (8.4)	0.8 (0.4)
3	Zymoetz River	0.0 (9.3)	0.0 (5.1)	0.0 (1.2)	1.3 (2.3)	0.0 (0.2)	0.0 (0.1)	0.0 (0.2)	0.0 (0.6)	0.0 (2.0)	0.0 (1.7)	0.0 (4.0)	0.0 (4.5)	0.0 (5.5)	0.0 (0.1)
4	Kitwanga Lake	100.0 (28.5)	0.0 (6.6)	0.0 (1.2)	0.0 (0.5)	0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.0 (0.5)	0.0 (1.9)	0.0 (1.9)	0.0 (3.4)	0.0 (4.8)	0.0 (5.0)	0.2 (0.2)
5	Kitsumkalum Lake	0.0 (11.0)	0.0 (6.9)	4.0 (6.6)	0.7 (1.6)	0.0 (0.3)	0.9 (1.0)	2.0 (1.4)	2.7 (2.7)	0.0 (2.6)	0.0 (2.0)	0.0 (5.2)	0.0 (7.1)	0.0 (8.7)	1.0 (0.5)
6	Kispiox River-lake	0.0 (11.2)	0.0 (8.8)	0.1 (1.4)	0.0 (0.3)	0.0 (0.3)	0.2 (0.5)	0.0 (0.2)	0.0 (0.7)	0.0 (2.9)	0.0 (2.4)	0.0 (4.9)	0.0 (6.9)	0.0 (7.8)	0.0 (0.1)
8	Motase Lake	0.0 (8.4)	0.0 (6.2)	0.0 (1.1)	0.2 (0.8)	0.4 (0.7)	0.0 (0.2)	0.0 (0.2)	0.5 (0.8)	0.0 (0.5)	0.0 (1.7)	0.0 (2.1)	0.0 (3.0)	0.0 (4.0)	0.0 (5.0)	0.2 (0.3)
9	Morice Lake	0.0 (8.3)	0.0 (5.9)	12.9 (8.9)	2.6 (2.7)	1.7 (1.2)	0.7 (0.8)	0.0 (0.2)	0.0 (0.5)	0.0 (1.7)	0.0 (1.4)	0.0 (3.7)	0.0 (5.0)	0.0 (6.4)	1.2 (0.5)
10	Bear Lake	0.0 (7.5)	0.0 (5.7)	0.1 (1.4)	0.3 (1.2)	0.1 (0.5)	0.6 (0.8)	0.0 (0.2)	0.0 (0.5)	0.0 (1.9)	0.1 (1.8)	0.0 (3.2)	0.0 (3.9)	0.0 (4.8)	0.2 (0.3)
11	Sustut Lake	0.0 (9.0)	0.0 (5.7)	5.9 (5.5)	2.3 (2.2)	2.7 (1.5)	1.3 (1.1)	0.0 (0.1)	0.0 (0.4)	0.0 (1.6)	0.0 (1.6)	0.0 (3.4)	0.0 (4.4)	0.0 (5.6)	1.4 (0.5)
12	Slamgeesh River	0.0 (8.9)	0.0 (7.3)	0.3 (2.0)	3.4 (2.9)	0.6 (1.0)	0.1 (0.4)	0.0 (0.2)	0.0 (0.5)	0.0 (1.8)	0.2 (2.3)	0.0 (3.2)	0.0 (3.5)	0.0 (5.7)	0.7 (0.5)
13	Babine Lake	0.0 (22.5)	2.8 (19.8)	60.8 (13.2)	87.1 (5.7)	91.7 (2.7)	96.1 (1.9)	97.5 (1.6)	97.3 (3.3)	100.0 (7.1)	99.7 (6.6)	75.0 (19.2)	100.0 (16.7)	100.0 (20.0)	93.1 (1.2)
14	Johnston Lake	0.0 (7.9)	47.2 (24.8)	6.0 (5.2)	0.1 (0.6)	0.9 (0.9)	0.0 (0.2)	0.0 (0.2)	0.0 (0.4)	0.0 (2.0)	0.0 (1.9)	0.0 (3.2)	0.0 (5.1)	0.0 (5.6)	0.7 (0.4)

Budgeting

Of the $10000 CDN assigned to this project, $10,000 CDN was spent on the analysis.
The DFO allocator account information for this work, current to February 15, 2018, is:

5G500 810   750   57365 $10,000 (Source. Cindy Leighton, DFO Admin, Prince Rupert)

Project Evaluation

DFO will complete an overall evaluation report at the end of the project and will consider such things as:

Project Evaluation

DFO will complete an overall evaluation report at the end of the project and will consider such things as: Answers: Yes to #1-5, No to #6

1. Did the intended activities take place within scope, within budget? Yes
2. Were the resources allocated in the most efficient and effective manner, or given the results would a different allocation have been more appropriate, and if so will be considered for any potential future projects as applicable? Yes
3. Were the milestones achieved? Yes
4. Were the deliverables of the project delivered? Yes
5. Did the collaboration achieve its purpose? Yes
6. Were there any difficulties encountered within the performance of the project and if so, how were they managed to achieve resolution? No

Budget Summary by Fiscal Year April 1, 2018 – March 31, 2019

Fiscal Year – 2018-2019	PSC	DFO	Total
Description	Financial Contribution to DFO*	Direct Share of Costs	Total
Lab processing			
500 fish samples @ $20.00/sample (CDN)	**10,000**		
Original projection Was 1080 samples	**10000**		
Grand Total	**10,000**	**0**	**10,000**