Skeena Sockeye Test Fishery DNA (2004)

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Introduction

The Tyee 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 exploitation rates on sub-stocks so that fisheries can be managed according to stock-specific productive capacities. 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 microsattelite DNA stock identification techniques (Beacham et al, 2004). Given escapement counts of known accuracy for several Skeena tributary systems, and known proportions of these stocks in the escapement samples from Tyee, the escapement to each specific sockeye stock within the Skeena River drainage. As well, stock composition estimates from the test fishery allow for stock-specific run-reconstruction back through mixed-stock marine fisheries in the Canada and S.S.E Alaskan approach waters. These analyses provide reconstructed run-timing distributions by stock which are vital to understanding migration routes, timing, and impacts by specific fisheries.

This project involved collection and analysis of sockeye DNA from the Tyee test fishery in 2004. This project continued the sequence of DNA samples being collected at Tyee for the years 2000-2003. Continuation of the program through 2004 has allowed improved our understanding of migration and abundance dynamics of Skeena River sockeye sub-stocks.

Methods

633 sockeye tissue samples (opercular punches) were collected proportionate to abundance from fish captured at the Tyee Test Fishery in 2004 following previously established sampling protocols. The tissue samples were shipped to the PBS lab in Nanaimo for analysis (Terry Beacham, DFO, Nanaimo). Analytical methods for the DNA analysis followed Beacham et al (2000). Analytical methods for the run-reconstruction into Area 4 followed Cox-Rogers (2003).

Results

Table 1 summarizes the weekly stock proportions for sockeye sampled at the Tyee test fishery in 2004. Table 2 shows the weekly escapements for sockeye sampled at the Tyee test fishery in 2004 using the data from Table 1. Table 3 shows the weekly reconstructed run-timing proportions for each stock into Area 4. In order to show how these data are being used, Figure 1 provides a preliminary assessment of run-timing for one Skeena River sockeye stock (Lakelse Lake) based on DNA samples collected at the Tyee Test fishery from 2000-2004. An assessment of all the 2000-2004 Tyee test fishery data is now being made to determine annual variability in stock-specific run-timing and abundance patterns.

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.

Cox-Rogers, S. et al 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working paper S2003-09, May 2003. On file with DFO, PSARC Secretariat Nanaimo, B.C.

Table 1. Weekly stock proportions for sockeye sampled at the Tyee test fishery in 2004.

Area 4 Skeena Test								**2004 Reconstructed Sockeye Run-Timing using weekly harvest rates**							
14 microsat, 1 MHC loci, 21 populations								Note week 71 always = July 1-7 in this analysis)							
Analyzed 13-Jan 2004								For 2000-2003: preliminary November post-season review escapement numbers have been u							
								and should be updated by applying known DNA stock id to escapement numbers							
Stock Composition of Samples (analyzed proportionate to weekly abundance)															
Week	61	62	63	64	71	72	73	74	75	81	82	83	84		
	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	
Sample dates	June 3-9	June 10-16	June 17-23	June 24-30	July 1-7	July 8-14	July 15-21	July 22-28	July 29-Au	Aug 5-11	Aug 12-18	Aug 19-25	Aug 26-28	Total	
N (screened)		17	54(5)	58(2)	57(4)	65	78(2)	70(5)	68(7)	55(4)	56(4)	55(1)		633(34)	
Alastair___		10.9	17.3	21.1	7.1	0.0	0.0	0.0	0.0	1.5	3.4	3.4		4.3	
Kalum_____		0.0	0.0	0.0	0.0	1.2	0.0	1.1	4.3	8.2	3.4	3.9		2.5	
Kitwanga___		0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0		0.1	
McDonnell__		0.0	1.9	0.0	1.9	1.3	1.0	0.0	0.0	0.0	0.0	0.0		0.6	
Motase____		0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	1.0	0.0	0.0		0.0	
SalixBear__		0.0	0.0	0.0	0.0	0.0	0.0	1.3	6.4	0.0	3.2	3.5		2.0	
Sustut____		0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.9	0.0	0.0	0.0		0.4	
Swan_____		0.0	1.3	0.0	0.0	8.4	0.0	0.9	0.0	0.0	0.0	0.0		1.1	
Nanika____		4.8	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0		0.3	
Four_Mile___		27.1	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1		11.8	
FultonLate__		0.0	45.8	0.0	0.0	88.3	38.7	67.2	65.5	75.4	58.3	67.1		52.7	
Grizzly____		0.0	0.0	0.0	24.5	0.0	22.4	0.0	0.0	0.0	0.0	0.0		0.0	
Lower_Babine		0.0	0.0	0.0	0.0	0.0	12.8	0.0	0.0	0.0	0.0	16.6		0.0	
Morrison___		25.3	0.0	8.7	0.0	0.0	0.2	1.3	20.8	0.0	0.0	0.0		0.0	
Pierre____		0.0	0.0	47.8	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0		0.0	
Pinkut____		0.0	1.2	0.0	55.0	0.0	18.1	22.8	0.0	0.0	13.1	0.0		12.9	
Tahlo_____		0.0	0.0	0.0	4.3	0.0	3.1	0.0	0.0	0.0	0.0	0.0		2.2	
Twain_Cr___		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Upper_Babine		0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	9.4	18.1	0.0		4.6	
Schulbuckhand		0.0	9.7	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0		0.9	
Williams___		31.9	1.1	20.3	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.4		2.6	
Lower Skeena		10.7	15.1	19.4	12.2	3.7	3.6	1.6	4.5	9.7	8.2	7.7		8.5	
Upper Skeena		0.1	1.2	0.1	0.1	7.9	1.3	3.9	8.5	1.6	3.8	3.4		3.5	
Bulkley		4.2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0		0.3	
Babine		56.6	74.9	64.8	87.7	87.2	94.1	93.5	87.0	88.7	87.9	88.1		84.2	
Lakelse		28.4	8.8	15.7	0.0	1.2	0.0	1.1	0.0	0.0	0.0	0.7		3.5	

Table 2. Weekly escapements for sockeye sampled at the Tyee test fishery in 2004.

Weekly Escapement by Stock														
Week	61	62	63	64	71	72	73	74	75	81	82	83	84	
Sample dates	June 3-9	June 10-16	June 17-23	June 24-30	July 1-7	July 8-14	July 15-21	July 22-28	July 29-Au	Aug 5-11	Aug 12-18	Aug 19-25	Aug 26-28	Total
Weekly 7-day Escapement														
	0	2923	16216	46149	88805	116576	175303	153111	213451	181177	73810	33817		1101338
Alastair___		505	3422	3265	0	0	0	0	3272	6107	2492	1462		20526
Kalum_____		0	0	0	1085	0	2012	6621	17482	6231	2899	838		37168
Kitwanga___		0	0	0	0	0	1795	0	0	0	0	0		1795
McDonnell__		0	316	0	1673	1495	1720	0	0	0	0	0		5203
Motase____		0	0	0	0	0	1658	0	0	1861	0	0		3519
SalixBear__		0	0	0	0	0	0	1938	13618	0	2386	1173		19115
Sustut____		0	0	0	0	0	0	1736	6282	0	0	0		8018
Swan_____		0	213	0	0	9773	0	1366	0	0	0	0		11352
Nanika____		142	0	0	0	0	1774	0	0	0	0	0		1916
Four_Mile___		792	3508	0	0	0	0	0	0	0	0	1723		6024
FultonLate__		0	7428	0	0	102991	67898	102930	139906	136577	42995	22694		623420
Grizzly____		0	0	0	21789	0	39335	0	0	0	0	0		61124
Lower_Babine		0	0	0	0	0	22353	0	0	0	0	5607		27959
Morrison___		740	0	4007	0	0	347	2047	44415	0	0	0		51556
Pierre____		0	0	22039	0	0	0	0	0	8073	0	0		30113
Pinkut____		0	198	0	48864	0	31691	34961	0	0	9701	0		125415
Tahlo_____		0	0	0	3787	0	5356	0	0	0	0	0		9142
Twain_Cr___		0	0	0	0	0	0	0	0	0	0	0		0
Upper_Babine		0	0	0	0	0	0	4647	0	17049	13338	0		35034
Schulbuckhand		0	1579	0	0	893	0	0	0	0	0	0		2472
Williams___		932	170	9376	0	0	0	1727	0	0	0	150		12356
Lower Skeena		312	2451	8936	10825	4359	6374	2421	9543	17502	6058	2613		71396
Upper Skeena		4	192	33	77	9255	2237	5909	18244	2939	2839	1154		42882
Bulkley		122	0	0	0	0	1667	0	0	0	0	0		1789
Babine		1656	12152	29921	77902	101605	165025	143114	185664	160737	64913	29801		972491
Lakelse		829	1420	7258	0	1357	0	1667	0	0	0	249		12779

Table 3. Weekly reconstructed run-timing proportions for Skeena River sockeye stocks into Area 4 in 2004.

Weekly Proportions by Stock in Area 4 (Run-Timing)														
Week	61	62	63	64	71	72	73	74	75	81	82	83	84	
Sample dates	June 3-9	June 10-16	June 17-23	June 24-30	July 1-7	July 8-14	July 15-21	July 22-28	July 29-Au	Aug 5-11	Aug 12-18	Aug 19-25	Aug 26-28	Total
Alastair___		0.046	0.342	0.205	0.000	0.000	0.000	0.000	0.140	0.174	0.093	0.001		1.000
Kalum_____		0.000	0.000	0.000	0.035	0.000	0.045	0.282	0.461	0.109	0.067	0.000		1.000
Kitwanga___		0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000		1.000
McDonnell__		0.000	0.111	0.000	0.303	0.366	0.220	0.000	0.000	0.000	0.000	0.000		1.000
Motase_____		0.000	0.000	0.000	0.000	0.000	0.533	0.000	0.000	0.467	0.000	0.000		1.000
SalixBear__		0.000	0.000	0.000	0.000	0.000	0.000	0.166	0.722	0.000	0.111	0.001		1.000
Sustut_____		0.000	0.000	0.000	0.000	0.000	0.000	0.309	0.691	0.000	0.000	0.000		1.000
Swan_____		0.000	0.027	0.000	0.000	0.855	0.000	0.118	0.000	0.000	0.000	0.000		1.000
Nanika_____		0.166	0.000	0.000	0.000	0.000	0.834	0.000	0.000	0.000	0.000	0.000		1.000
Four_Mile___		0.170	0.827	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003		1.000
FultonLate__		0.000	0.026	0.000	0.000	0.248	0.085	0.245	0.206	0.134	0.055	0.001		1.000
Grizzly____		0.000	0.000	0.000	0.439	0.000	0.561	0.000	0.000	0.000	0.000	0.000		1.000
Lower_Babine		0.000	0.000	0.000	0.000	0.000	0.994	0.000	0.000	0.000	0.000	0.006		1.000
Morrison___		0.028	0.000	0.106	0.000	0.000	0.005	0.060	0.801	0.000	0.000	0.000		1.000
Pierre_____		0.000	0.000	0.858	0.000	0.000	0.000	0.000	0.000	0.142	0.000	0.000		1.000
Pinkut_____		0.000	0.003	0.000	0.389	0.000	0.179	0.373	0.000	0.000	0.056	0.000		1.000
Tahlo_____		0.000	0.000	0.000	0.500	0.000	0.500	0.000	0.000	0.000	0.000	0.000		1.000
Twain_Cr___		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
Upper_Babine		0.000	0.000	0.000	0.000	0.000	0.000	0.246	0.000	0.372	0.382	0.000		1.000
Schulbuckhand		0.000	0.717	0.000	0.000	0.283	0.000	0.000	0.000	0.000	0.000	0.000		1.000
Williams___		0.105	0.021	0.727	0.000	0.000	0.000	0.147	0.000	0.000	0.000	0.000		1.000
Lower Skeena		0.009	0.076	0.174	0.173	0.094	0.072	0.052	0.126	0.154	0.070	0.001		1.000
Upper Skeena		0.000	0.009	0.001	0.002	0.303	0.038	0.191	0.366	0.039	0.050	0.000		1.000
Bulkley		0.154	0.000	0.000	0.000	0.000	0.846	0.000	0.000	0.000	0.000	0.000		1.000
Babine		0.003	0.027	0.042	0.089	0.157	0.133	0.219	0.176	0.101	0.054	0.001		1.000
Lakelse		0.085	0.161	0.516	0.000	0.107	0.000	0.130	0.000	0.000	0.000	0.000		1.000
Total		0.005	0.031	0.056	0.089	0.158	0.124	0.205	0.177	0.100	0.054	0.001		1.000

Figure 1. Run-timing proportions for Lakelse Lake sockeye into Area 4 based on DNA tissue samples collected at the Tyee Test fishery 2000-2004. Week 71 is the first week of July etc. The peak of migration for this stock appears to be near the latter part of June.