MEMORANDUM NOTE DE SERVICE

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Distribution

From
De

Steve Cox-Rogers

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Your File - Votre référence
Date
October 31, 2002

Subject
Object

2002 ASSESSMENT UPDATE FOR MORICE-NANIKA SOCKEYE

The Morice-Nanika sockeye stock has been assessed by DFO since the late 1940's. The stock received considerable attention in the 1950's and early 1960's with the completion of the Moricetown Fishways on the Bulkley River (Palmer 1967). During the 1960's, 1970's and 1980's the stock was the focus of substantial study conducted as a direct result of Alcan's Kemano Completion Project initiative for the Morice-Nanika (Sheperd 1979). In the mid-1990's, the productive potential of the stock was reviewed and updated (Shortreed et al 1998). Over the past three years both DFO and Wet'suewet'en Fisheries have been addressing Morice-Nanika stock status with respect to productive potential and exploitation rate trends in both the mixed-stock commercial and terminal food fisheries. Management actions in 2002 focused on reducing Morice-Nanika harvests, in both Canadian commercial and in-river food fisheries, to address recent declines in escapement for this stock since the late 1990's. Previous memo's (Cox-Rogers 2000, 2001) addressed 2000 and 2001 impacts and pertinent background information for this stock.

Escapement Trends

The escapement record (Table 1, Figure 1) and total in-river Bulkley stock (Table 1, Figure 2) data for Morice-Nanika sockeye indicates that, prior to about 1954 or so, total in-river Bulkley returns were apparently quite strong (the average 1940-49 stock was 70000 fish). A period of marked decline in annual returns began after 1954. The decline continued throughout the 1960's, 1970's, and 1980's with annual average returns into the Bulkley of between 1700-9000 fish. During the early to mid 1990's, returns into the Bulkley were much stronger with the decade average close to 32000 fish. In-river returns since 1998, however, have been similar to the 1960-1980 average returns. For example, the 2000 visual spawning ground escapement estimate for Nanika River was just 3000 fish and the total in-river return to the Bulkley was estimated at 4905. In 2001, a mark-recapture estimate of spawning ground escapement was 5047 fish into the Bulkley (past Moricetown Canyon) with spawners distributed in the Nanika River, Morice Lake, and Atna Lake. In 2002, the mark-recapture estimate was 2800 or 14028 fish past Moricetown depending upon the mark rate used (Appendix Table 1). Several field surveys of the Little Bulkley system by Wet'suewet'en Fisheries in 2002 found few or no sockeye in the outlet area below Maxan Lake (Wet'suewet'en Fisheries, pers. comm). Evidence of spawning was found in Morice Lake and Atna Lake in 2002 (SKR consultants, pers comm, Smithers).

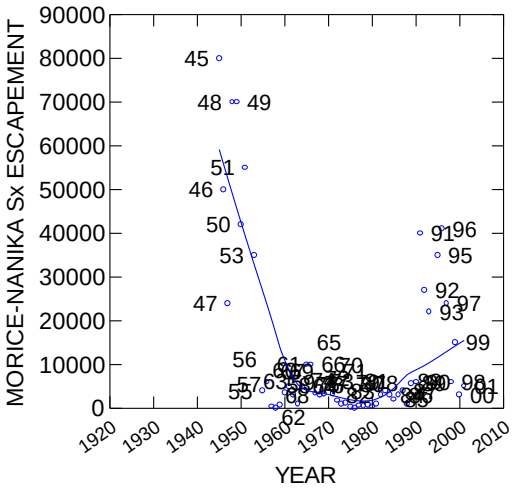

Figure 1. Morice-Nanika Escapements 1945-2001. The 2002 escapement estimate is 14028

The 2002 mark-recapture program deserves some comment. The population estimate for Morice/Nanika sockeye passing Moricetown was approximately 2800 fish based on mark rates obtained from the dipnet fishery at the foot of the falls. However, a total of 1125 sockeye were tagged in total by the program, which would indicate that 40% of the total return would have been captured by the beach seine and dipnet fishery in Moricetown canyon (1125/2800). This seems unrealistically high as mark rates for a companion coho tagging study conducted at Moricetown in 2002 were well below this (Barry Finnegan, DFO, pers comm). While the dipnet fishery mark rate (22%) and population estimate for the tagging period may be correct (2800 fish), the observed mark rate on the Nanika spawning grounds for two independent surveys (snorkel and dead pitch) by SKR consultants of Smithers was only 7.6%. This suggests that far more fish passed Moricetown than just 2800. Sockeye returned earlier to the Skeena in 2002 (Cox-Rogers, 2002) and the Moricetown tagging program did not start until early August because of high water conditions. It is likely that a significant portion of the 2002 Morice/Nanika return migrated past the falls prior to the start of tagging, which would explain the low mark rates seen on the spawning grounds. Objectively, there is little reason to discount a 2002 Morice/Nanika escapement closer to 14000 than 2800. A separate report is being prepared SKR Consultants Ltd regarding this issue (in prep).

Spawning ground visual escapement estimates (helicopter) of the Nanika spawning grounds were also made in 2002. Three visits were made. Then first survey (Sept 5) encountered high water and poor counting conditions, but an estimate of 650 was made. The second survey (Sept 16) also encountered high water and poor counting conditions due to heavy wind, but a "creative" estimate of 1576 was made (B.C. 16 notes). The third survey (Sept 26) could not be conducted due to flood water conditions. A final B.C. 16 visual escapement estimate of 2100 spawners for 2002 (e.g 1.4*the Sept 16 count of 1500) is recorded in the B.C. 16 escapement data base. The realiability of this estimate is unknown, but it cannot be considered high.

Recent trends in escapement, despite the good returns in the 1990's, are still well below the predicted optimum for this stock. From Shortreed et al (1998), optimal escapements for the Morice-Nanika system range from 116300 based on spawning capacity to 137000-211000 based on PR model calculations of lake rearing capacity. Shortreed et al (1998) recommends an optimum escapement target of 110000 spawners for this system based on a consideration of the modified PR model estimate (137000) and spawning ground capacity. Capacity models are currently being configured for assessing Morcie-Nanika re-building options.

Catch Trends

Morice-Nanika sockeye are harvested in marine commercial fisheries in south-southeast Alaska and Canada (Areas 1-5), in mainstem Skeena River food and ESSR fisheries below Hazelton, and in the native food fishery at Moricetown Canyon. From about 1900 to 1964, a major native food fishery also took place at Hagwilget Canyon on the lower Bulkley River.

-In-River Fisheries

In-river food fishery catches at Moricetown have mirrored the escapement record (e.g. catch has increased with abundance, Table 1, Figure 3). Average catches at Moricetown were approximately 7000 from 1930-1939, 7000 from 1940-1949, 1400 from 1950-1959, 1400 from 1960-1969, 300 from 1970-1979, 8100 from 1980-1989, and 11000 from 1990-2000. The highest food fish catch on record occurred in 1995 (24000). Moricetown food fishery catches were 1905 in 2000, 1289 in 2001, and 331 in 2002.

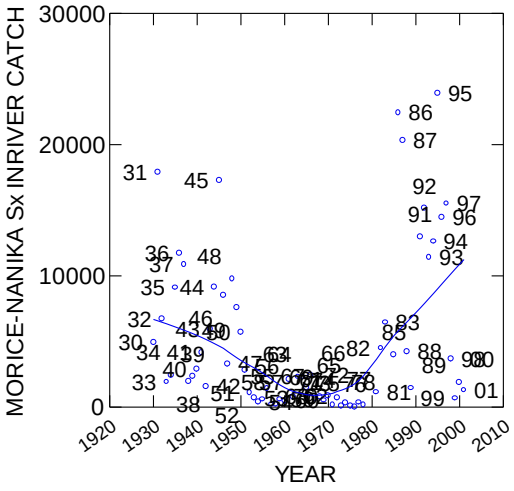

Figure 3. In-River Morice-Nanika Sockeye Catch at Moricetown Canyon 1930-2001. The 2002 catch was 331.

Calculated harvest rates for the food fishery (within the Bulkley system) are shown in Figure 4. Harvest rates show a fair amount scatter and have declined in recent years coincident with reduced returns since the mid-1990's. It is likely that errors in the catch or escapement data are responsible for a significant portion of the variability seen in figure 4, although harvest rates do appear highest in the late 1950's and

throughout the 1980's. Average in-river harvest rates on Morice-Nanika sockeye were 0.43 from 1950-59, 0.26 from 1960-69, 0.20 from 1970-79, 0.57 from 1980-1989, and 0.28 from 1990-2000. The Moricetown harvest rate on Nanika sockeye was 0.39 in 2000, 0.20 in 2001, and 0.02 in 2002.

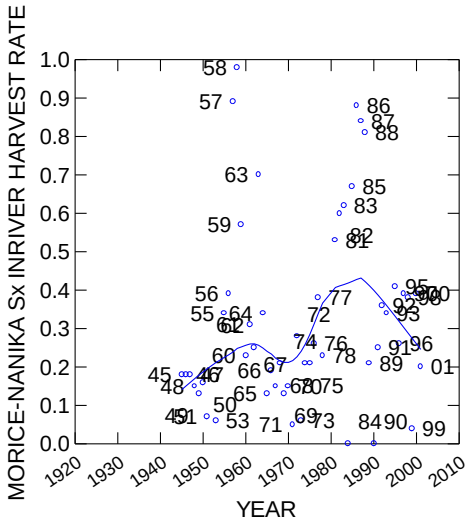

Figure 4. In-River Morice-Nanika Sockeye Harvest Rates 1945-2001. The 2002 harvest rate is 0.02.

-Marine Commercial Fisheries

Catch estimates for Morice-Nanika sockeye do not exist for marine commercial fisheries in Alaska or in Canadian Areas 1-5 and so marine exploitation rates cannot be calculated directly. An alternative option is to use harvest rate analysis to compute catches and escapements indirectly (Cox-Rogers 1994, Cox-Rogers 2000, 2001).

Annual catch, escapement, harvest rates, and exploitation rates for Morice-Nanika sockeye in the Area 1-5 marine fishery were calculated by applying known weekly sockeye harvest rates (source, Les Jantz, DFO) from 1956-2002 to the expected weekly proportions of Morice-Nanika sockeye migrating through the fishery (normal curve peak W/E July 1-8, s.d. = 1.5 weeks). Morice-Nanika run-timing is assumed stable among years. For 2002, in-river food fish catches of Morice-Nanika sockeye in the mainstem Skeena River below Hazelton were calculated by applying assumed weekly harvest rates for the IFF fisheries to the weekly escapements of Morice-Nanika sockeye calculated past the Tyee escapement boundary. Travel times for Morice-Nanika escapement moving upriver were 1 week Tyee to Terrace, 1 week Terrace to Hazelton, and 1 week Hazelton to Moricetown (21 days total). Marine exploitation in Alaska is asumed to be a constant 0.05, which might actually be too high given fishing patterns in recent years.

The calculated pattern of Morice-Nanika marine exploitation from 1956-2002 (Table 1) is shown in Figure 5. Marine exploitation rates have varied over time without consistent trend and range from an average of 0.14 from 1956-59, 0.35 from 1960-69, 0.32 from 1970-1979, 0.21 from 1980-89, and 0.32 from 1990-2000. The 2002 marine exploitation rate was 0.31.

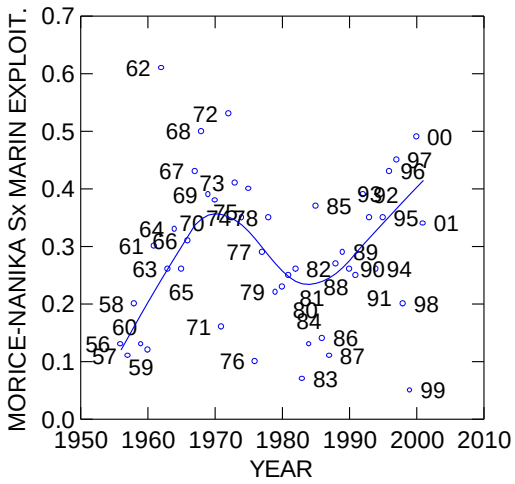

Figure 5. Morice-Nanika Sockeye Marine Exploitation 1956-2001. The 2002 marine exploitation rate is 0.31.

-2002 Fishery Impacts

Commercial fishing opportunities in Area 3/4/5 were reduced in 2002 prior to the peak of migration timing of Morice-Nanika sockeye (week ending July 7). As a result of these management actions, the Area 3/4/5 harvest rate on Morice-Nanika sockeye was estimated to be 13% less in 2002 compared to 2001. The Area 3/4/5 harvest rate on Morice-Nanika sockeye was estimated to be 0.27 in 2002 and 0.31 in 2001. Target harvest and exploitaion rates for Morice-Nanika sockeye in marine commercial and in-river IFF fisheries are under development.

In freshwater, a small number of Morice-Nanika sockeye were estimated to have been caught in the Skeena River food fishery below Terrace in 2002 (Table 2). No ESSR fisheries were initiated below Terrace in 2002. A small IFF harvest of Morice-Nanika sockeye occurred at Moricetown Canyon in 2002 (331 fish, Table 2).

Morice-Nanika total run size was larger in 2002 (22192) than in 2001 (9659) or 2000 (10013). For 2002, 1119 fish were estimated to have been caught in the south-southeast Alaska fishery, 5805 in the Canadian Areas 1-5 fishery, 156 in the in-river Skeena IFF fishery, and 331 in the Moricetown fishery (Table 2).

Lake Productivity

Limnetic fish data from Morice Lake were collected in the fall of 1993 and limnological data were collected once monthly in 1978 and 1980 (Shortreed 2001). The surveys indicated that Morice Lake had excellent physical conditions for juvenile sockeye. However, the lake is ultra-oligotrophic. Zooplankton biomass is very low, which results in very slow growth rates for sockeye fry. Age 0 fall fry averaged only 0.8g, among the lowest recorded for a B.C. nursery lake. Sockeye stomachs were only 30% full and contained mostly bosminids. 90% or more of the returning adults are offspring of two-year old smolts, which confirms the lakes' low productivity and deficient food supply.

Current factors limiting sockeye production in Morice Lake include a) low escapements and fry recruitment b) low in-lake growth and/or survival and c) nutrient limitation (Shortreed 2001). Morice Lake was fertilized in 1980 and responded positively, with a 35% increase in phytoplankton biomass and a 60% increase in zooplankton biomass. As such, Morice Lake is considered a good candidate for nutrient additions (Shortreed 2001). Lake fertilization in conjunction with increased escapements would be the most effective restoration technique for Morice Lake sockeye (Shortreed et al 1998). It would increase fry growth rates and would possibly increase productivity by reducing the proportion of age-2 smolts.

An updated liminological survey of Morice lake was made in 2002. Results will be available early in 2003.

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Table 1. Nanika Sockeye Assessment Data: 1951-2002

Year	Estimated Nanika Alaska Catch	Estimated Nanika 1,3,4,5 Catch	Estimated Nanika Marine Escape.	Estimated Nanika Total Stock	Estimated Nanika Marine Exploit.	Estimated Nanika 1,3,4,5 h.r.	Nanika B.C. 16 Escape.	Palmer '87 Nanika Hagwilget Catch	Palmer '87 Nanika Motown Catch	DFO Nanika Motown Catch	Best Info Nanika Motown Catch	Inriver Bulkley Nanika Stock	Inriver Bulkley Nanika H.R	Estimated Skeena IFF+ESSR catch	Estimated Total Stock
1930								9060	4920		4920				
1931								15055	17871		17871				
1932								7307	6715		6715				
1933								895	1912		1912				
1934								2337	2451		2451				
1935								6975	9111		9111				
1936								1772	11723		11723				
1937								1303	10864		10864				
1938								1419	1951		1951				
1939								4105	2320		2320				
1940								6786	2873		2873				
1941								1900	4150		4150				
1942								232	1571		1571				
1943								982	5927		5927				
1944								1035	9154		9154				
1945							80000		3533		17300	97300	0.18		
1946							50000	2764	8673		8500	61264	0.18		
1947							24000	2129	3279		3300	29429	0.18		
1948							70000	2753	9829		9800	82553	0.15		
1949							70000	2550	7590		7600	80150	0.13		
1950							42000	2340	5735		5700	50040	0.16		
1951							55000	1405	2805	2805	2800	59205	0.07		
1952								1965	1087	1087	1100				
1953							35000	1630	727	727	700	37330	0.06		
1954								2000	445	445	400				
1955							4000	1500	575	575	600	6100	0.34		
1956	0.05	0.08	0.87	1.00	0.13	0.08	6000	2500	1429	30582	1400	9900	0.39	?	8477
1957	0.05	0.06	0.89	1.00	0.11	0.06	400	3000	175	20434	200	3600	0.89	?	672
1958	0.05	0.15	0.80	1.00	0.20	0.15	25	800	1265	165	200	1025	0.98	?	280
1959	0.05	0.08	0.87	1.00	0.13	0.08	750	400	624	824	600	1750	0.57	?	1549
1960	0.05	0.07	0.88	1.00	0.12	0.08	3500	523	473	473	500	4523	0.23	?	4569
1961	0.05	0.25	0.70	1.00	0.30	0.27	5000	178	2092	2092	2100	7278	0.31	?	10177
1962	0.05	0.56	0.39	1.00	0.61	0.59	3000	189	756	756	800	3989	0.25	?	9786
1963	0.05	0.21	0.74	1.00	0.26	0.22	1000		2316	2316	2300	3300	0.70	?	4475
1964	0.05	0.28	0.67	1.00	0.33	0.30	5000	226	2284	2284	2300	7526	0.34	?	10946
1965	0.05	0.21	0.74	1.00	0.26	0.22	10000		1501	1501	1500	11500	0.13	?	15546
1966	0.05	0.26	0.69	1.00	0.31	0.28	10000		2442	2442	2400	12400	0.19	?	18063
1967	0.05	0.38	0.57	1.00	0.43	0.39	3400		598	598	600	4000	0.15	?	6958
1968	0.05	0.45	0.50	1.00	0.50	0.48	3000		840	840	800	3800	0.21	?	7622
1969	0.05	0.34	0.61	1.00	0.39	0.35	3300		516	516	515	3815	0.13	?	6204
1970	0.05	0.33	0.62	1.00	0.38	0.35	4700		844	844	844	5544	0.15	?	8911
1971	0.05	0.11	0.84	1.00	0.16	0.11	3300		185	185	185	3485	0.05	?	4138
1972	0.05	0.48	0.47	1.00	0.53	0.50	1800		702	702	702	2502	0.28	?	5277
1973	0.05	0.36	0.59	1.00	0.41	0.38	1000		67	67	67	1067	0.06	?	1818
1974	0.05	0.30	0.65	1.00	0.35	0.32	1200		322	322	322	1522	0.21	?	2342
1975	0.05	0.35	0.60	1.00	0.40	0.37	225		59	59	59	284	0.21	?	474
1976	0.05	0.05	0.90	1.00	0.10	0.06	100		36	36	36	136	0.26	?	152
1977	0.05	0.24	0.71	1.00	0.29	0.25	600		366	366	366	966	0.38	?	1353
1978	0.05	0.30	0.65	1.00	0.35	0.31	500		150	150	150	650	0.23	?	998
1979	0.05	0.17	0.78	1.00	0.22	0.18	700					700		?	893
1980	0.05	0.18	0.77	1.00	0.23	0.19	400					400		?	517
1981	0.05	0.20	0.75	1.00	0.25	0.21	1000		1140	1140	1140	2140	0.53	?	2839
1982	0.05	0.21	0.74	1.00	0.26	0.22	3000		4500	4500	4500	7500	0.60	?	10071
1983	0.05	0.02	0.93	1.00	0.07	0.02	4000		6450	6450	6450	10450	0.62	?	11248
1984	0.05	0.08	0.87	1.00	0.13	0.08	3000					3000	0.00	?	3442
1985	0.05	0.32	0.63	1.00	0.37	0.34	2000			4000	4000	6000	0.67	?	9595
1986	0.05	0.09	0.86	1.00	0.14	0.09	3000				22450	25450	0.88	?	29437
1987	0.05	0.06	0.89	1.00	0.11	0.06	4000				20296	24296	0.84	?	27207
1988	0.05	0.22	0.73	1.00	0.27	0.24	1000			4250	4250	5250	0.81	?	7236
1989	0.05	0.24	0.71	1.00	0.29	0.26	5600				1450	7050	0.21	?	9962
1990	0.05	0.21	0.74	1.00	0.26	0.22	6000					6000	0.00	329	8529
1991	0.05	0.20	0.75	1.00	0.25	0.21	40000				13000	53000	0.25	917	72236
1992	0.05	0.34	0.61	1.00	0.39	0.35	27000				15138	42138	0.36	729	69931
1993	0.05	0.30	0.65	1.00	0.35	0.32	22000				11408	33408	0.34	578	52662
1994	0.05	0.21	0.74	1.00	0.26	0.22					12629				
1995	0.05	0.30	0.65	1.00	0.35	0.32	35000				23912	58912	0.41	1019	92701
1996	0.05	0.38	0.57	1.00	0.43	0.39	41000			14453	14453	55453	0.26	959	98138
1997	0.05	0.40	0.55	1.00	0.45	0.42	24000				15512	39512	0.39	683	73530
1998	0.05	0.15	0.80	1.00	0.20	0.16	6000			3674	3674	9674	0.38	167	12322
1999	0.05	0.00	0.95	1.00	0.05	0.00	15000				675	15675	0.04	271	16785
2000	0.05	0.44	0.51	1.00	0.49	0.47	3000				1905	4905	0.39	161	10004
2001	0.05	0.29	0.66	1.00	0.34	0.31	5047				1289	6336	0.20	19	9629
2002	0.05	0.26	0.69	1.00	0.31	0.27	14803				331	15134	0.02		21933
30-39 AVG								5023	6984		6984				
40-49 AVG							58800	2348	5658		7018	70139	0.16		
50-59 AVG	0.05	0.09	0.86	1.00	0.14	0.09	17897	1754	1487	6405	1370	21119	0.43		2745
60-69 AVG	0.05	0.30	0.65	1.00	0.35	0.32	4720	279	1382	1382	1382	6213	0.26		9435
70-79 AVG	0.05	0.27	0.68	1.00	0.32	0.28	1413		303	303	303	1686	0.20		2636
80-89 AVG	0.05	0.16	0.79	1.00	0.21	0.17	2700		4030	4068	8067	9154	0.57		11155
90-00 AVG	0.05	0.27	0.68	1.00	0.32	0.28	21900			9064	11231	31868	0.28	581	50684

Table 2: 2002 Nanika River sockeye harvest rate analysis

Area 3/4 Run	Nanika
Other Fish Catch	0.05
Area 3/4/5 Run	0.95
ENTER peak week	27
Enter Weekly Code	5
ENTER S.D	1.5

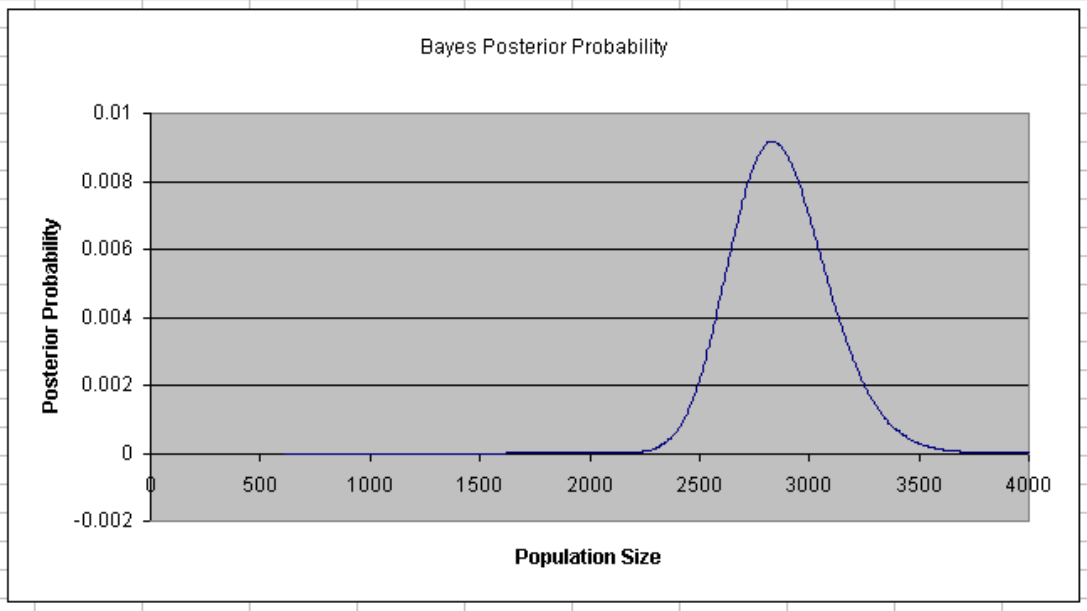
Notes: 1) Area 1-5 weekly harvest rates come from 2001 run-reconstruction
2) Terrace-Hazelton harvest rates from 2001 IFF catch data and Tyee Esc
3) Moricetown Mark-Recap Escapement Estimate was 5047
4) Sx movement : 1 week Tyee to Terrace, 1 week Terrace to Hazelton, 1 week hazelton to Moricetown
5) Moricetown weekly harvest rates were adjusted to recreate the reported sockeye catch of 1289
6) Total stock calculated as esc/(1-cumulative exploitation)

Range Week Ending	2001 Week Ending	Stat Week	code	Prop	Area 1-5 h.r (1)	Area 1-5 catch	Area 1-5 Tyee esc	Ter-Haz h.r (2)	Ter-Haz Catch	Ter-Haz Esc	Motown h.r (3)	Motown Catch	Motown Esc	Calc. Tot. Stock
Jun 3	Jun 2	54 22	0	0.0010	catch	0.0000	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Jn 4-10	Jun 9	61 23	1	0.0072	0.0000	0.0000	0.0072	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	
Jn 11-17	Jun 16	62 24	2	0.0342	0.0022	0.0001	0.0341	0.0000	0.0000	0.0072	0.0000	0.0000	0.0010	
Ju 18-24	Jun 23	63 25	3	0.1039	0.0057	0.0006	0.1033	0.0000	0.0000	0.0341	0.0000	0.0000	0.0072	
Jn 25-1	Jun 30	64 26	4	0.2023	0.0053	0.0011	0.2012	0.0000	0.0000	0.1033	0.0000	0.0000	0.0341	
Jl 2-8	Jul 7	71 27	5	0.2526	0.2025	0.0511	0.2015	0.0000	0.0000	0.2012	0.0000	0.0000	0.1033	
Jl 9-15	Jul 14	72 28	6	0.2023	0.6518	0.1318	0.0704	0.0000	0.0000	0.2015	0.0000	0.0000	0.2012	
Jl 16-22	Jul 21	73 29	7	0.1039	0.4871	0.0506	0.0533	0.0000	0.0000	0.0704	0.0000	0.0000	0.2015	
Jl 23-29	Jul 28	74 30	8	0.0342	0.5914	0.0202	0.0140	0.1000	0.0053	0.0479	0.0000	0.0000	0.0704	
Jl 30-5	Aug 4	75 31	9	0.0072	0.6832	0.0049	0.0023	0.1000	0.0014	0.0126	0.2310	0.0111	0.0369	
Au 6-12	Aug 11	81 32	10	0.0010	0.2769	0.0003	0.0007	0.1000	0.0002	0.0021	0.2500	0.0031	0.0094	
Au 13-19	Aug 18	82 33	11	0.0001	0.3026	0.0000	0.0001	0.1000	0.0001	0.0006	0.2500	0.0005	0.0015	
Au 20-26	Aug 25	83 34	12	0.0000	0.2722	0.0000	0.0000	0.1000	0.0000	0.0001	0.2500	0.0002	0.0005	
Au 27-2	Sep 1	84 35	13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	
Se 3-9	Sep 8	91 36	14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Se 10-16	Sep 15	92 37	15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Se 17-23	Sep 22	93 38	16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Se 24-30	Sep 29	94 39	17	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	
			Total	0.9497		0.2607	0.6890		0.0070	0.6819		0.0149	0.6671	
			h.r			0.2746			0.0102			0.0218		
			exploit.	0.0503		0.2607			0.0070			0.0149		
			cum explo	0.0503		0.3110			0.3181			0.3329		
			cal. fish	1116		5786			156			330	14803	22192

APPENDIX 1. 2002 Morice-Nanika Escapement Estimation

2002 Moricetown Sockeye Tagging				Estimated population at Moricetown from tagging program		
Total sockeye tagged by seine crew	638					
Tag Loss adj. sockeye tagged by crew	614	M		**Bayes Population Estimate**	**Point**	**2834**
Total sockeye catch at fishway	623	C			**lower**	**2469**
Total sockeye tags recovered at fishway	135	R			**upper**	**3334**
Total sockeye tags above Moricetown	1125					
				Peterson Population Estimate	**Point**	**2733**
calculated Mark rate at dipnet fishery	**0.22**				**v**	**42629.48**
rate of seine tag loss	0.038				**lower**	**2328**
expected Mark rate above Moricetown	**0.40**				**upper**	**3137**

Note: If population really is just 2834 fish, then its doubtful that 40% of the run was tagged at Moricetown.



Modified 'Peterson estimate

N=(((M+1)(C+1))/(R+1))-1

V=((N^2)(C-R))/((C+1)(R+2))

95% C.L. = N+/- 1.96 SQ RT (v)

Bayes Estimate is from BAYESTAG.xls

Adjusted Escapement above Moricetown		
Tags Out	1125	M
Mark Rate	0.076	R/C
Point	**14803**	