JAN 27/05
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2004 Bulkley/Morice Sockeye Program

The following is a brief data summary and discussion of the 2004 Bulkley/Morice Sockeye program. While the focus in 2004 continued to be the estimate of escapement based on mark and recovery of sockeye tagged at Moricetown, the program was also expanded to include work on the upper Bulkley River and Atna Lake.

Upper Bulkley River Sockeye

The status of sockeye in the upper Bulkley River including Maxan Lake has been uncertain. While small numbers of sockeye are recorded annually at the Bulkley River counting fence in Houston, none have been observed upstream of the falls below Bulkley Lake.

Various theories have been put forward regarding the origin these sockeye. These included straying from the main Nanika River run, small amounts of annual migratory production from kokanee in Maxan Lake or a small "stream type" sockeye population resident in the upper Bulkley.

Samples of DNA collected in 2003 and analyzed at the PBS lab found that the sockeye at the Houston fence were not Nanika and were unlike any of the other upper river stocks. This indicated that the Bulkley River sockeye were not merely Nanika River strays. Given this information, we increased our survey efforts in 2004.

The first question that we attempted to address was access. Could returning sockeye actually get to Bulkley or Maxan Lake given beaver dams and water levels in the early summer?

On June 29, Eugene Pierre (Wet'suwet'en Fisheries) and Barry Finnegan (DFO Smithers) surveyed the upper Bulkley by helicopter. We flew quickly from the Morice confluence to Topley looking for problem beaver dams. From Topley we continued upstream following the river more closely looking not only beaver dams, but also for chinook and sockeye.

Access over beaver dams was good. We did not find any dams that would block migration. Even the large beaver dam complex that was located about 1 km downstream of Foxy Creek in 2003 was breached. However, due to low water levels, access over Bulkley falls would be very difficult if not impossible. The low snow pack coupled with the early spring in 2004 meant that run-off was reduced. We concluded that it was unlikely that sockeye would be able to access either Bulkley or Maxan Lakes due to low water levels.

Despite this a survey of the area downstream of Maxan Lake was undertaken. On August 5, Randy Bryce (Toboggan Creek Hatchery) and

Barry Finnegan surveyed the area from Maxan Lake to a point approximately 500m downstream of Foxy Creek, then up Foxy Creek to the main forest service road. Access into Maxan Lake was blocked by a beaver dam at this time. Water levels from Maxan Lake downstream to Foxy Creek were very low. Water temperature was measured at 17.2 °C. Below Foxy Creek conditions were much improved. Flow more than doubled and the temperature dropped to 13°C. No fish were observed during this survey. This date coincides with historical records of sockeye seen spawning below Maxan Lake.

The status of the Maxan Lake sockeye population remains unresolved. It is likely that the population, if it still exists, is very small. Surveys of the expected spawning areas may not be the best approach. Hydroaccoustic and trawl surveys in Maxan Lake would be confounded by the large kokanee population. It is recommended that adult surveys be continued but that some consideration should be given to a smolt trapping operation at the mouth of Maxan Lake.

On August 24, the staff from Toboggan Creek Hatchery captured 12 sockeye in the Bulkley River near the confluence of McQuarrie Creek. These fish were caught during chinook broodstock capture operations using a small gill net. Of the 12 sockeye caught 5 were tagged at Moricetown;

Tag Number	Date Tagged
80387	July 27
80395	July 27
80075	July 14
80517	July 30
70044	July 23

EARLY TAGS

A subsequent survey on September 3, 2004 confirmed that these fish were in fact spawning in this area. DNA collected by the Toboggan Hatchery crew has been sent to PBS for analysis.

The upper Bulkley River coho assessment fence in Houston was operational on August 19, 2004. As in past years, the fence captured small numbers of sockeye. In all, 16 sockeye were caught. Of these, 2 (12.5%) were tagged in the Moricetown marking program.

Sockeye tag recovery data from the Houston fence in 2004.

Tag Number	Date Tagged	Date Captured
80583	August 5	August 26
70356	August 31	September 13

Atna Lake

We again attempted to locate and sample sockeye in and around Atna Lake and its main tributaries. On June 29, 2004 E. C. Pierre and Barry Finnegan flew to Atna falls to inspect water conditions and look for the elusive early sockeye. We checked the falls and the mouths of clear water tributaries just upstream of the falls. No fish were observed. Access is challenging this time of year due to high water levels. We decided to delay further inspections until after sockeye were captured at Moricetown.

On August 11, 2004 we returned to the mouth of the Atna River by boat. Debris prevented us from continuing upstream to the falls. We set a gill net off the mouth of the Atna River in an attempt to capture sockeye for DNA and scale samples. This survey was cut short due to what appeared to be large numbers of chinook. We captured 6 chinook in the first 20 minutes and observed others rolling in the general area. To avoid an over harvest on chinook we felt it was prudent to stop netting.

On August 25, 2004 we again returned to Atna falls by boat. This time we were able to travel upstream to the foot of the falls. We set a gill net at the falls and drifted with it downstream into the lower lake. No fish were caught. We angled at the falls and at various points downstream. No fish were caught by angling. The area upstream of the falls to a point opposite the hunter's cabin was surveyed by foot. Clear water inlet streams were inspected on the way. No fish were observed and all of the clear water inlet streams had either low or intermittent flow.

On September 16, 2004 a DFO crew consisting of Barry Finnegan, Ray Greens and Lou Dubuc (Lakes District Air Services) flew into Atna Lake. We set a gill net off the mouth of the main Atna River. While this fished, we electroshocked upstream along the main channel and through back channels. We shocked for 1 hour and captured only one bull trout. This was a repeat of work by B. Finnegan and K. Simpson (PBS) in 1993 that captured sockeye juveniles in this area. We then beach seined near shore and back channels areas of the main lake. Only small numbers of whitefish were caught. After 3 hours the gill net was retrieved. No fish were caught. No fish were observed on the lake or around the lake as we approached and departed.

The lack of fish does not mean they are not present. It does however suggest that they are present in low numbers. More intensive surveys will be required to improve our knowledge of Atna Lake sockeye.

Morice Lake

On September 17, 2004, R. Greens, B. Finnegan and L. Dubuc flew to the south end of Morice Lake. R. Greens and B. Finnegan swam sections of the lake followed by L. Dubuc in his plane. We swam to a point at 53° 51 46.9, 127° 45 30.0. Conditions were good with most of the shallow bench area along the shore visible. One untagged male sockeye was observed near the south end. No other adult sockeye were observed. Of note, 20–30 sockeye fry were also observed near the south end. No fish were observed as we approached or departed.

On September 24, 2004 R. Greens and B. Finnegan flew the perimeter of Morice Lake by helicopter following a swim survey of Nanika River. Conditions were fair with some wind and light rain. In all 12 sockeye were observed on the south east shore at one location. No other fish were observed.

On September 30, 2004 B. Finnegan flew by helicopter along the shore of Atna Bay, Atna Lake and upstream in Atna River. No fish were observed. From Atna Lake we flew straight line to the south end of Morice Lake and then proceeded along the south east shore to the mouth of the Nanika River. No fish were observed. We also flew the south end tributary to Morice Lake upstream to the first clear water tributary. One eagle was spotted but no fish were observed.

With low overall escapement of sockeye and poor weather throughout the spawning period it was difficult to find lake spawners in Morice Lake in 2004.

Babine Sockeye at Moricetown

The Babine sockeye assessment fence was installed and operational by July 13, 2004. Usually this would be of little interest with regards to Bulkley/Morice sockeye. However, 4 Moricetown sockeye tags were recovered at the fence and by a First Nations fisherman at Sutherland River at the extreme eastern end of Babine Lake. Reports from the fence crew suggest that as many as 30 Moricetown tags may have passed through the Babine weir. The fence crews were not initially aware of the importance of these tags. However, the excitement of the project biologist along with cash incentives changed recovery efforts.

Tags recovered from the Babine weir in 2004.

Tag Number	Date Tagged	Date Recovered
70351	Aug 27	Sept 7
70348	Aug 26	Sept 9
70342	Aug 23	Sept 7

Tag recovered from Sutherland River in 2004.

Tag number	Date Tagged	Date Recovered
80112	July 15	unknown

These recoveries are interesting for a number of reasons. The dates tagged suggest that groups of fish stray together. The dates of tagging and recovery indicate that the travel time from Moricetown to Babine may not be as long as one might expect. Bear in mind that these tags were visible below the Babine weir for 2 to 3 days before being captured. While not strictly "straying" this temporary incorrect homing does confound the estimate of mark and recapture for Bulkley/Morice sockeye. A full description of how this was corrected for follows.

This is a very curious and interesting problem. Every effort will be made to recover all tags at the Babine weir in 2005.

Nanika River

Regular surveys of Nanika River sockeye continued in 2004. These surveys included aerial counts for calculating AUC (area under the curve) escapement and swim surveys to provide mark/unmarked counts. The AUC estimate is for the Nanika River sockeye only. The mark ratios are used to calculate total sockeye escapement upstream of Moricetown.

Water levels and visibility in the Nanika River were poor for most of the fall in 2004. Despite this 5 aerial counts and 4 swim surveys were conducted.

The data for the aerial surveys follows. Note the September 4, 2004 data was provided by T. Turnbull (DFO). All other counts were done by B. Finnegan.

Date	Count	Estimated Observer Efficiency
Sept 4	606	40%
Sept 18	95	15%
Sept 24	59	15%
Sept30	1565	50%
Oct 15	10	30%

The data for the swim survey counts of sockeye in Nanika River for 2004.

Date	Observer	No.Unmarked	No. Marked	Percent
Sept 9	B. Finnegan	6	1	14.29
Sept 18	B. Finnegan	33	6	15.38
Sept 24	B. Finnegan	26	4	13.33
Oct 5	B. Finnegan	124	20	13.89
	B. Michel	142	16	10.13

Wet'suwet'en Fisheries crews working at both Moricetown falls and at a location downstream close to Idiot rock tagged a total of 1605 sockeye in 2004. While the number of fish tagged in known, the number of sockeye that moved upstream of Moricetown is open to some debate.

Recoveries at Babine, while biologically interesting, are mathematically challenging when considering mark to unmarked ratios in the Nanika River. The actual tag loss, the number of sockeye that shed their tags is thought to be less than 5%. Even with a slightly higher mortality rate for tagged fish, it seems unlikely that tag loss can be more than 10%. However, the recovery of tagged Moricetown sockeye at the Babine weir makes the question of tag loss in this study more complex. While we know that the tag loss is not 100% the actual tag loss from the study area is in fact unknown.

The fact that 3 of the 4 recovered tags from Babine came from the seine crew at Moricetown may provide some insight. Dead pitch on the Nanika River spawning ground in 2003 showed that the seine tags were 10% less common than would be expected based on the numbers tagged at Moricetown. It is possible that the tag loss from the seine crew is higher than the loss from the canyon crew. Other information may come to light following the analysis of DNA samples taken from sockeye by the seine crew. It may be possible to determine the stock composition of the sockeye at Moricetown given that this appears to be a mixed stock. Past DNA analysis suggests that gene flow and hence straying between Babine and upper Bulkley/Morice is low. Therefore, we can expect that all Babine fish caught at Moricetown will leave the area.

AUC Estimate for Nanika River

Based on the five aerial surveys and using an estimate of stream residence time of 10 days, the AUC estimate for Nanika River sockeye in 2004 is 5999. This estimate must be viewed with caution. Poor visibility during the September 18 and 24 survey presents a problem. This was the expected peak of spawning for Nanika River sockeye, yet virtually no fish were visible. Counts before and after suggest that much larger numbers of sockeye were likely present during the September 18 and 24 surveys. Therefore, the estimate of 5999 is likely an underestimate of the true escapement.

Mark Recapture Estimate for Total Bulkley/Morice Sockeye

Based on 4 swim surveys the mark rate on the spawning grounds was 13.4%(10.13-15.38). The question then becomes what tag loss rate to apply given the problem of stray Babine River sockeye. We know from the 2003 dead pitch that actual tag loss is about 3%. With a small amount of differential survival due to handling actual loss is probably 5%. However, the data suggests that seine caught sockeye are more likely to leave the survey area than dipnet caught sockeye from the canyon. Given this, I suggest that a differential tag loss rate be applied for 2004, 10% for the canyon and 20% for the seine crew.

Total tagged by the seine crew = 761
Total tagged by the dipnet canyon crew= 844

Corrected for tag loss
seine crew = 609
dipnet crew= 760
Total sockeye tags upstream of Moricetown in 2004 =1369

With a mark rate of 13.4% the escapement of sockeye upstream of Moricetown in 2004 = 10,216

In Canyon Estimate

It is also possible to generate a variety of estimates using fish marked by the seine crew and recaptured in the canyon by the dipnet crew. These are stratified by time, in this case by week.

Again tag loss must be considered. Estimates with no tag loss and with 20% tag loss are presented.

No Tag Loss
ML Darroch= 4423 (3725-5121)
Schaefer= 4172
Pooled Peterson = 3964 (3556-4372)

20% Tag Loss
ML Darroch= 3541 (3046-4036)
Schaefer= 3342
Pooled Peterson= 3168 (2858-3478)

Conclusion

An array of estimates has been presented. What then is the escapement of sockeye to the Nanika River and in total upstream of Moricetown?

The AUC estimate for sockeye escapement to Nanika River is 5999. If, as in previous years, the peak of spawning was mid September, then this is an underestimate. With a total escapement upstream of Moricetown of 10,216 a more likely estimate for escapement to Nanika River is 7500–8000.

The difference between the in canyon estimate and the mark recapture estimate reflects the reality of estimating the population based solely on small numbers of marks and recaptures in the canyon. Also, because the dipnet fishery in the canyon only operates 5 days per week, the in canyon estimate will always be an underestimate. As in past years the mark recapture estimate for the upstream aggregate Bulkley/Morice sockeye population should be the most accurate.

The total escapement of sockeye to the Bulkley River upstream of Houston is unknown. With a better understanding of the life history of these fish it should be possible to improve escapement data in future years.

Tag loss and the presence of Babine River sockeye at Moricetown is a concern for the mark recapture program. Other upstream stocks such as Bear or Motasse could be present in small numbers. Samples of DNA will hopefully provide a better understanding of the stock mix at the beach seine site.