DRAFT

Slocan River Benthic Invertebrate Assessment

Spring, 2008

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March, 2008

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1.0 Introduction

Benthic Invertebrates have been used as indicators of water quality and the overall health of the Slocan River Ecosystem for 4 years. Invertebrates are studied because they are important indicators of biodiversity and productivity of aquatic systems. To date, however, collections have occurred in Autumn as per CABIN methodology and at headwaters & lower reach sites on the main river.

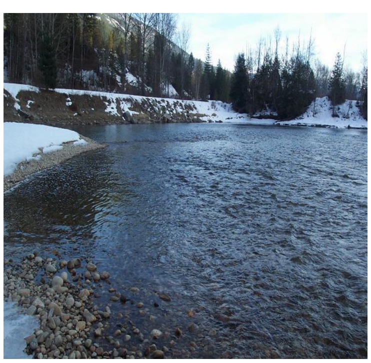
The Streamkeepers have also been studying fish populations since 2005 when changes in fishing regulations occurred. The river was opened to catch and release angling in that year and that year was the first opening of the rainbow trout fishery on the river in 13 years.
Snorkel surveys done in 2005 through 2007 by biologists indicate a significant increase in rainbow trout populations. White fish have routinely been counted informally and, in the past, approximately 10 white fish were observed for every 1 rainbow. In 2007, a “serious decline” in whitefish population was observed (1).

In an effort to better understand fish population dynamics and links between numbers, age class and species of fish in relation to food source, a study of benthic macroinvertebrates, the fish’s main food source, was recommended.

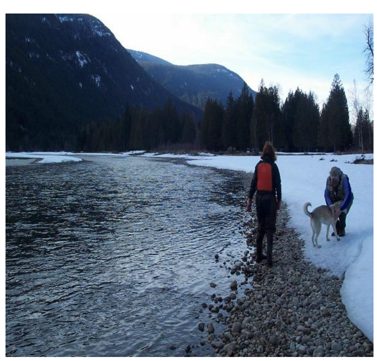
Many invertebrate species complete their life cycle by developing wings and leaving the water during the early spring. Midges and a variety of Mayfly (Baetidae) are known sources of food that emerge in “hatches” in early March. Fishermen are aware of this Mayfly and call it the “blue winged olive”. Once larvae reach maturity they transform to sub-imagos. This is done in large numbers and called the “hatch”. The emerging insects provide an important source of nutrients to fish that are becoming active after the winter. Hence, spring counts of invertebrate numbers and size can give a good indication of the volume and type of food available to fish (2).

Both white fish and trout share the same habitat and surveys have identified specific pools where mixed species of fish spend the winter. One such pool is located approximately 2 kilometers south of Slocan Park just below the “Rustic Rooster Bed and Breakfast”.

The riffle habitat just above the large pool was chosen as an appropriate site for invertebrate Collection (see photos below).



Collection Site downstream
Note pool at end of riffle



Upstream

Substrate

2.0 Acknowledgements

We are thankful to the Columbia Basin Trust and the Kootenay River Network for funding this project through CBT's Waters Initiative Program. Members of the Slocan Community who helped with this project were: Peter Corbett, R.P. Biologist, Jennifer Yeow, Microbiologist, Shanoon Bennett, Bsc, Liz Clow, Student, Katey Walsh, Student and Verena Shaw. Eva Johansson, MSc edited the report and members of the Slocan River Streamkeepers read and gave helpful comments. We are grateful to Streamkeepers and especially their Directors who endorsed this project.

3.0 Methodology

Four samples of invertebrates were collected over a three-week period. One sample was collected on March 6th and one on 13th . Two were collected on March 20th (1 sample and a replicate). Collection was done using a 400µm mesh kick-net. The net was placed downstream of the collector while the collector walked backward, kicking the substrate to disturb it. The collector was timed for 3 minutes and the sample was preserved in 99% isopropanol alcohol.

Due to water depth and velocity, the collector was not able zig-zag across the entire river as was recommended in the Field Guide. Rather, the collector moved upstream at approximately 3 to 4 meters from the east river bank.

The methodology for sample collection and habitat features are outlined in Environment Canada's "Invertebrate Biomonitoring Field and Laboratory Manual for running water habitats" prepared in 2001 and revised in 2006. Velocity was measured using tennis balls and the average of three "floats" was recorded.

Water Chemistry was done using a Hach Al-38 model Kit.

Unsorted samples were processed using a Marchant Box. Sub-samples were sorted to order by personnel with limited experience. A person with experience reviewed all sorted residues. Between 300 and 400 specimens were sorted and identified per sample.

Table 1. Field Data for Invertebrate Collections, March, 20008

Site Location Information taken on Mar 06	**Two kilometers south of Slocan Park (Rustic Rooster beach)**
Stream Order	5
Habitat Type	Riffle
Habitat sample	Riffle
Canopy Cover	0-25%
Macrophyte Coverage	0-25%
Riparian Vegetation	Ferns, grasses, shrubs, deciduous trees, coniferous trees
Substrate Predominant 2^{nd} predominant Surrounding Embeddeness	 2.5 - 5cm 5-10cm 0.1 - 0.5 cm ¼ embedded
Benchfull Width	Approx. 50 meters
Wetted Width	Approx. 30 meters
Oxygen	11.5 mg/l
Alkalinity	20.52 mg/l
Hardness (CaCO3)	31.2 mg/l
PH	7.5
Average depth of sample collection	0.45 meters

Table 2. Field and Analytical Data

Date of Collection	**Average Water Velocity**	**Water Temperature**	**Number of Marchant Box cells counted**	**Total number of organisms counted**	**Total estimated number of organisms per sample**
Mar 06	0.87m/sec	4 ºC	8	370	4,625
Mar 13	0.61m/sec	5.7ºC	15	460	3,066
Mar 20 (1)	0.68m/sec	6.1ºC	7	497	7,100
(2) Replicate			7	464	6,628

4.0 Results

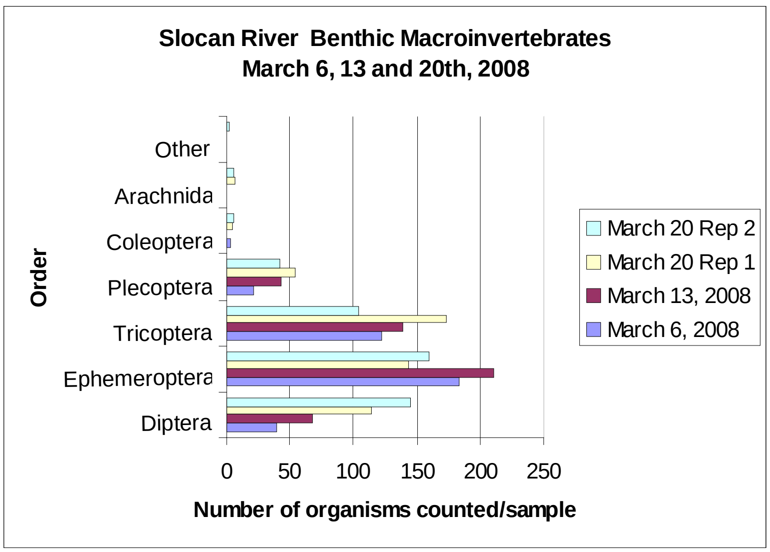
The total number of organisms per sample was 10 to 15 times greater than found in counts on samples taken at established monitoring sites at South Slocan and below Slocan City in September and October, 2006 and 2007 (3).

Regarding abundance, the dominant taxa by Order in all four samples was Ephemenoptera with Family Baetidae and Ephemerellidae being the most numerous taxa. Families Heptagenidae and Leptophlebiidae were also present, though in much smaller numbers.

The second most abundant taxa was Tricoptera with Families Hydropsychidae and Brachycentridae most numerous and Lepidostomatidae and Hydroptilidae identified at lower numbers. The third most abundant taxa was Diptera and within that group Chironomidae was most numerous. Other groups included Simulidae (black flies) and Tipulidae (crane flies).

Although there were lower numbers of Plecoptera (Stoneflies) many of the largest organisms e.g. those greater than 1cm in length were in this Order. Families included Perlidae and Perlodidae. See Chart 1 below.

Chart 1.



Using the mean percent abundance for all the taxa, the least variation from the mean was observed for Plecoptera while the most variation from the mean was seen in Ephemeroptera. This is not surprising considering Ephemenoptera had the highest percent abundance for all samples. See Chart 2. The Coefficient of Variation as a measurement of variability was highest for Diptera.

The highest number of organisms were observed in replicate samples collected on March 20th. Here, 7,100 and 6,530 organisms were estimated on the two samples using Marchant subsampling technique. The estimate for March 6th was 4,630 and the March 13th sampling estimate was 3,100 organisms.

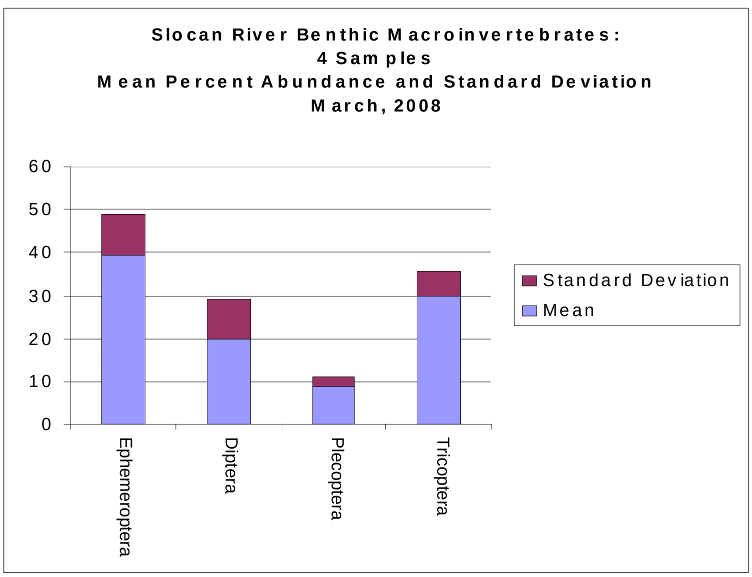
4.0 Results cont.

Regarding size, the majority of organisms (71 to 93%) were less than 0.5cm. Those that fell in the 0.5 to 1cm size range varied from 5 to 24% in abundance per sample. The two replicate samples (which were taken close to each other in the river) contained specimens close in size, while the other two samples varied in size range. This may indicate a large range in insect size across the river habitat.

Table 3. Mean, Standard Deviation and Coefficient of Variation for 4 Samples: Slocan River Benthic Macroinvertebrates, March, 2008

	Total Number of Specimens for 4 samples	Mean % Abundance	Standard Deviation	Coefficient of Variation
Ephemeroptera	696	39.5	9.6	.243
Diptera	367	20	8.9	.445
Plecoptera	581	8.8	2.1	.238
Tricoptera	538	30	5.7	.190

Chart 2.



5.0 Conclusions and Recommendations

This study is intended to establish a benchmark of the numbers and types of insects present above an important fish pool in the Slocan River. As such, the data represents a baseline that can be related to fish numbers, species, size, age class and overall fish health.

It would be helpful to live catch white fish and trout from the pool below the sample site and inspect stomach contents to determine food volume and type.

6.0 References

1. Peter Corbett, Slocan River Rainbow Trout Population Assessment:, 2007
2. Patrick McCafferty, Aquatic Entomology The Fisherman's and Ecologist's Illustrated Guide to Insects and Their Relatives
3. The Slocan River Streamkeepers, Monitoring , Assessment and School Outreach Activities, December, 2006

6.0 Appendix

River/Stream Name: Slocan River			Date Collected: Mar 6/08		
Site:	Tea Pot				
Sorter Name(s):			Date Sorted: Mar 15/08		
Order	small (<.5cm)	med (.5-1cm)	large (>1cm)	name	total ct
Diptera (flies)	30	6	4		40
Ephemeroptera (mayflies)	132	40	11		183
Plecoptera (stoneflies)	17	4			21
Tricoptera (caddisflies)	81	39	2		122
Coleoptera (Beetles)	2	1			3
Arachnida (mites)	1				1
Annelida (worms)					
					370
Total/ 8 cells counted = 4,625/100 organisms/100 cells or per sample	Tea Pot		Date Collected: Mar 13/08		
Site:			Date Sorted: Mar 17/08		
Sorter Name(s):	small (<.5cm)	med (.5-1cm)	large (>1cm)	name	total ct
Order					
Diptera (flies)	46	22			68
Ephemeroptera (mayflies)	170	40			210
Plecoptera (stoneflies)	33	6	4		43
Tricoptera (caddisflies)	115	22	2		139
Coleoptera (Beetles)					
Total/ 15cells counted = 3,066 organisms/100 cells or per sample					460

River/Stream Name: Slocan River			Date Collected: Mar 20/08		
Site:	Tea Pot				
Sorter Name(s):			Date Sorted: Mar 24/08		
Order	small (<.5cm)	med (.5-1cm)	large (>1cm)	name	total ct
Diptera (flies)	102	12			114
Ephemeroptera (mayflies)	120	21	3		144
Plecoptera (stoneflies)	39	13	2		54
Tricoptera (caddisflies)	139	32	2		173
Coleoptera (Beetles)	3	1			4
Arachnida (mites)	7				7
Annelida (worms)			1		1
					497
Total/ 7 cells counted = 7,100/100 organisms/100 cells or per sample	Tea Pot Quality Control Replicate		Date Collected: Mar 20/08		
Site:			Date Sorted: Mar 29/08		
Sorter Name(s):	small (<.5cm)	med (.5-1cm)	large (>1cm)	name	total ct
Order					
Diptera (flies)	137	4	4		145
Ephemeroptera (mayflies)	145	11	3		159
Plecoptera (stoneflies)	36	6			42
Tricoptera (caddisflies)	100	2	2		104
Coleoptera (Beetles)	6				6
Arachnida (mites)	6				6
Annelida (worms)	2				2
Total/ 7 cells counted = 6,628 organisms/100 cells or per sample					464