SLOCAN LAKE 2011 WATER QUALITY MONITORING PROJECT

WATER QUALITY MONITORING REPORT

BY **GALENA ENVIRONMENTAL Ltd**

FOR **SLOCAN LAKE STEWARDSHIP SOCIETY**

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VOLUNTEERS, FIELD WORK & EQUIPMENT

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- Offshore sampling program: Richard Johnson, Luce Paquin, Jonathan Sherrod, Kim Roshinsky, Hank Hasting, John Conklin, Wayne Schweitzer
- Nearshore sampling: Jane Murphy, Kevin Murphy, Luce Paquin, Lane Haywood, Richard Johnson
- Canoes were borrowed from: Silverton Resort, Kevin Murphy, Daniel Sherrod, Patrizia Menton and Clarence DenBok.

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1. INTRODUCTION

Galena Environmental Ltd was retained by the Slocan Lake Stewardship Society (SLSS) to conduct the second year of a trend-monitoring water quality program on Slocan Lake. The study was conducted from May to October 2011.

In 2000 and 2001, the University of British Columbia conducted a limnology study of the lake. In 2008, the Slocan Lake Stewardship (SLSS) undertook the first baseline study of Slocan Lake (Paquin 2009) in order to begin a comprehensive analysis of the lake's current condition and provide the basis for a projected lake management plan. The baseline study included a water quality component and results were to findings in the UBC study and to studies of nearby Arrow and Kootenay lakes. In 2010 (Paquin 2011), a trend- monitoring water quality program of Slocan Lake was undertaken. This study followed the same protocol as implemented in the 2008 baseline study with the addition of zooplankton sampling. The present document presents the findings of the 2011 program. As with the 2010 program, the 2011 program consisted of two components: an offshore component conducted monthly, and a nearshore component conducted during a 5-week period. The 2011 sites were identical to the 2010 sites. The SLSS intends to continue this study in 2012. Results from the 2011 survey confirmed that Slocan Lake has remained oligotrophic and relatively pristine. Physical parameters, nutrients and total metal results were all in the range of an oligotrophic waterbody.

General parameters, nutrients, and total metals met the British Columbia Water Quality Guidelines (BCWQG). Comparison between the 2010 and 2011 programs indicated little variability between the two year results and all results are within the provincial guidelines requirements for aquatic life and recreation. No abnormalities were found within the results and between the sites. Laboratory detection limits (DL) were sufficiently low to compare concentration results with the BCWQG.

Total coliforms were found at each of the seven sampling sites. Of all the sites, Slocan and Hills had the most total coliforms. High counts (137cfu) were observed off Carpenter Creek on August and at Hills (64cfu) in September. In general, counts for all sites averaged 10 cfu/100ml and were slightly higher than the one seen in 2010 when the average was 4cfu/100ml.

Zooplankton species, density and biomass results were similar with the 2010 results. Species present were in higher number in 2000-2001 survey (Andrusak *et al.* 2002) than for the 2010 and 2011 surveys.

The present 2011 trend-monitoring study will serve to assess long-term changes in water quality and will provide a basis for statistical identification of the possible causes of measured conditions or identified trends. The present report describes the results of this study.

2. METHODOLOGY

The 2011 nearshore and offshore programs reused the same sample sites (Figure 1), sampling protocols and methodology as the 2010 water program. All grab samples were shipped within 12 hours of the sampling day to an approved laboratory for analysis. Both, the nearshore and offshore programs were entirely conducted by volunteer members of the Slocan Lake Stewardship Society.

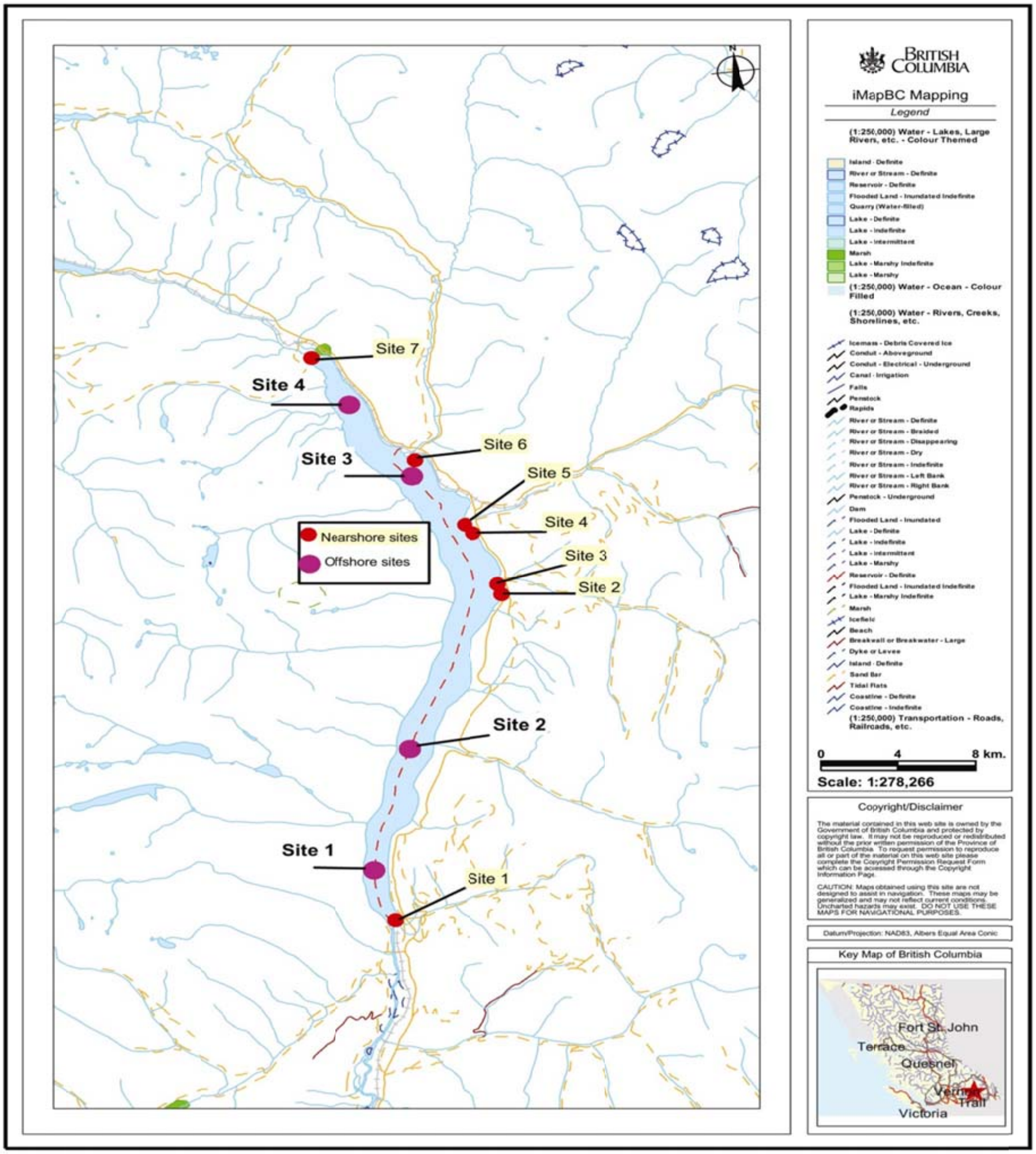

Figure 1: Slocan Lake and the nearshore and offshore sampling sites

2.1 Nearshore Sampling Program

Microbiological monitoring evaluates the degree of contamination from human and animal waste and wastewater. In the 2011, the nearshore study analyzed total coliforms as well as fecal coliforms. A detailed site description can be found in Appendix A.

2.1.1 Analytical Methods & Data Interpretation

Passmore Laboratory Ltd in Winlaw, which is certified by the Canadian Association for Laboratory Accreditation (CALA), was retained to conduct the analyses and interpretation of the water samples. Analyses were performed in accordance with methods outlined in the *Standard Methods of Examination of Water and Wastewater* (Wallace & Habou-Zamzam 1989). All tests were done using membrane filtration. Passmore Laboratory Ltd also provided the interpretation of the results (Appendix A).

2.2 Offshore Sampling Program

As previously mentioned, the program was designed based on the established Resource Inventory Standards Committee (RISC) standards which are presented in *Guidelines for Designing and Implementing a Water Quality Monitoring Program in British Columbia* (Cavanagh *et al.* 2004). As in 2010, the 2011 sampling was conducted within a 6-month period, from May to the end of October. Details regarding the offshore sampling sites can be found in Appendix B. As for the parameters, the same general chemistry, nutrients and total metals used in 2010 were reanalyzed in the 2011 program. CARO Analytical results can be found in Appendix B.

The 2011 program also repeated the zooplankton sampling from 2010. The tables representing the results can be found in Appendix C.

2.2.1 Analytical Methods & Data Interpretation

CARO Lab from Kelowna was retained to conduct the 2011 water sampling analysis for the nutrients and total metals. The Reported Detection Limit (RDL) denotes a value below which the parameter cannot be reliably differentiated from zero, determined by the level of resolution of the method or equipment used for analysis. The detection limit for each parameter can be found in Appendix B.

Dr Lidija Vidmanic, from LIMNO Lab. Ltd in Vancouver, conducted the analysis for the zooplankton species composition, density and biomass. Samples were collected in the same manner as in 2010. Zooplankton samples were analyzed for species density and biomass. For each replicate, organisms were identified to species level and counted up to 200 organisms of the predominant species. If 150 organisms were counted by the end of a split, a new split was not started. The lengths of 30 organisms of each species were measured for use in biomass calculations, using a mouse cursor on a live television image of each organism. Zooplankton species were identified with reference to taxonomic keys (Sandercock &

Scudder 1996, Pennak 1989, Wilson 1959, Brooks 1959). Lengths were converted to biomass (·g dry-weight) using empirical length-weight regression from McCauley (1984).

Seasonal average values of zooplankton density and biomass were calculated for samples collected at three stations from May to September in 2011, and from August to November in 2010. In 2000 and 2001 sampling season started in April and continued on the monthly basis throughout October at only two sampling stations.

2.3 Data Interpretation

Interpretation for the general chemistry, nutrients and total metals was conducted by Galena Environmental Ltd. and results were compared to the *BC Water Quality Guidelines for Protection of Aquatic Life and Recreational Uses* (RICS 1998) outlined on the Ministry of Environment website. Data was also compared to the 2010 sampling year. Zooplankton species were identified with reference to taxonomic keys (Sandercock and Scudder 1996, Pennak 1989, Wilson 1959, Brooks 1959).

Variations in the general chemistry and nutrient data among sites, according to months of sampling, depths and years (2010 and 2011) were charted in a series of graphs and figures. When possible, boxplots were used to display the variations in the nutrient concentrations among sites, depths and months without making any assumptions about their underlying statistical distributions and showing their dispersion and skewness (Massart *et al.* 2005). In such graphs, boxes represent between 25 per cent and 75 per cent of the ranked data. The horizontal line inside the box is the median. The length of the boxes is their interquartile range (Sokal & Rohlf 1995). A small box indicates that most data are found around the median (small dispersion of the data). The opposite is true for a long box: the data are dispersed and not concentrated around the median. Whiskers are drawn from the top of the box to the largest observation within 1.5 interquartile range of the top, and from the bottom of the box to the smallest observation within 1.5 interquantile range of the bottom of the box. To be conservative, the detection limit was used for graphing purposes when values were undetectable.

Variations in water temperature, dissolved oxygen, specific conductivity, and pH were represented with profiles over the water column depth, for the various months of sampling. Since total metals were sampled once during the 6-month sampling, results were qualitatively compared with 2010 program.

2.4 Quality Assurance (QA) & Quality Control (QC)

Quality assurance (QA) and quality control (QC) were essential components of this water quality sampling program. The QA/QC program was used to define confidence levels in the results. The Quality Assurance (QA) is a system of activities that ensure a water study will meet defined standards of quality. Separate QA programs exist for both the field sampling procedures (collection, preservation, filtration and shipping components) and analytical procedures (laboratory component). Therefore, QA is essentially the management system that operates to ensure credible results. The quality control (QC) component of this system is a set of activities intended to control the quality of the data from collection through to analysis. It consists of day-to-day activities such as: the adherence to written protocols; up-to-date and suitable training of personnel; the use of reliable, well maintained and properly calibrated equipment; the regular use of QC samples (blanks, reference samples, spikes and replicates); and diligent record keeping. The prime objective of the field QA program was to maximize accuracy by reducing introduced variability. Imprecise data is primarily the result of inconsistent field techniques and lab analysis, and the introduction of contaminants. Therefore, the best means of ensuring high precision is to maintain consistency during the sample collection, filtration, preservation and analytical processes.

2.4.1 Quality Assurance

Before starting the nearshore and the offshore programs, field volunteers were trained by a professional biologist to ensure sampling uniformity and accuracy. Prior to sampling, volunteers were properly trained to handle the equipment, learned contamination and collecting precautions of the grab samples.

Field Blank samples were used in the field and Reference Samples were performed in laboratory to document the bias and precision of the analytical laboratory process. Field blanks provide information on contamination resulting from the handling technique and from exposure to the atmosphere. Field blanks were submitted after a certain number of samples were collected in the field.

Replicate samples were submitted for zooplankton to assess precision of the entire program (field and laboratory components). Replicate samples were submitted each month for the three sampling sites.

2.4.2 Quality Control

Precautions were taken to ensure that the same 2010 sample sites were used in the 2011 study and that there was no contamination of the grab samples from turbulence caused by the canoe. To ensure accurate readings of temperature, dissolved oxygen, pH, conductivity and total dissolved solids, the Hanna HI9828 multi-meter probe was recalibrated prior to each sampling field trip with calibration solution provided with the multi-meter probe kit. Prior to sampling, site locations were verified with a handheld GPS. Equipment was cleaned and calibrated regularly during the entire program.

Before each sampling day, laboratory personnel were notified that the samples would shortly be delivered to them. Samples were analyzed at the laboratory in conjunction with quality control measures to ensure data accuracy and quality.

3. Results and Analysis

3.1 Microbiology

The microbiology results and analysis can be found in Appendix A.

3.2 General chemistry

3.2.1 Water temperature and dissolved oxygen (DO)

The profiles of temperature and dissolved oxygen (DO) are presented for all the sites and months for which sampling was performed in 2011 (Figure 2). Some sites could not be sampled on given months because of equipment failures or adverse atmospheric conditions. July was excluded since only one site was sampled.

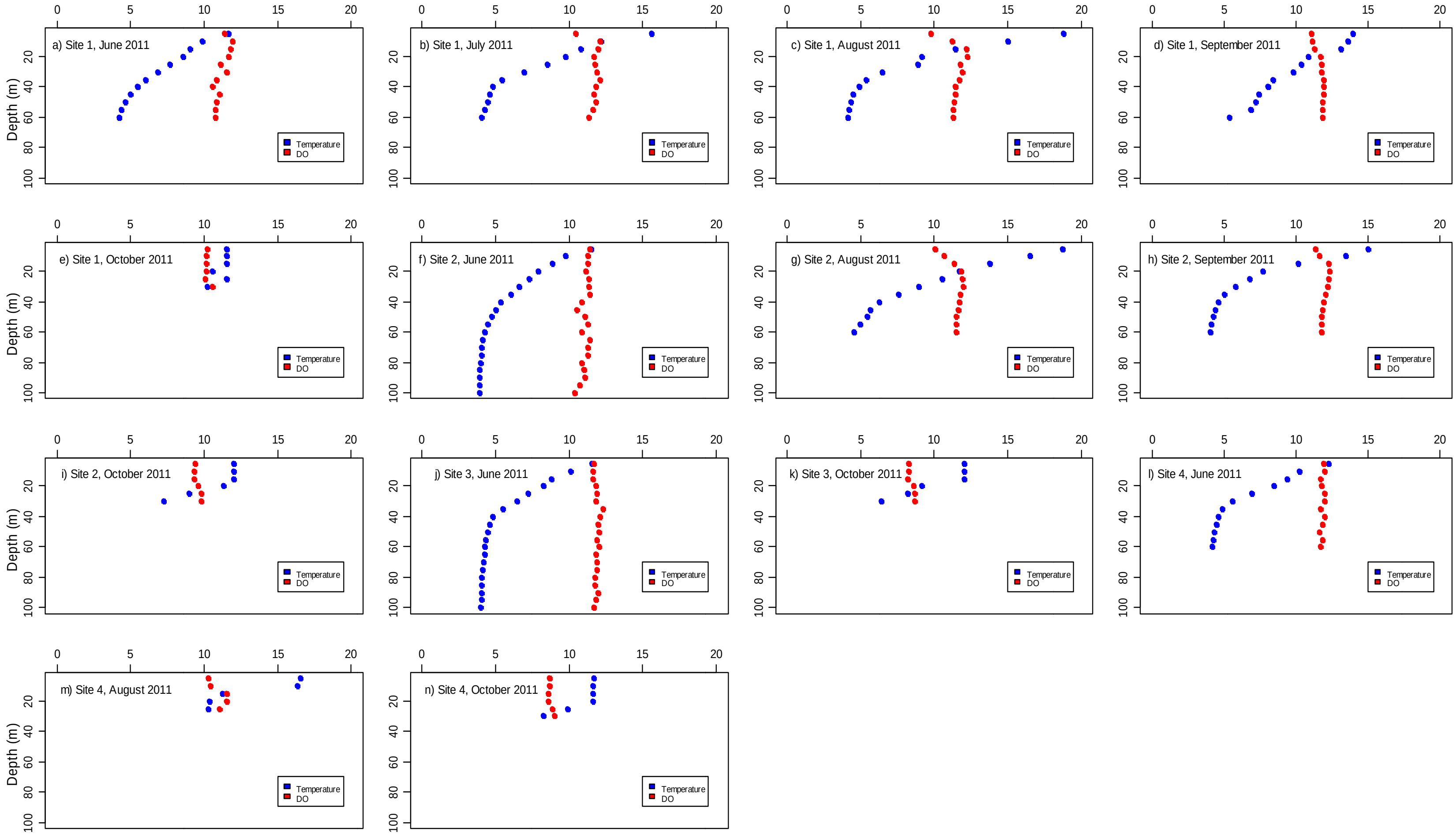

Figure 2: Temperature and dissolved oxygen profiles, for the four sites and months for which sampling occurred

The thermocline was established between 20 and 30 m between June and August at sites 1, 2 and 3 (Figure 2 and Figure 3). Site 4 seemed to have had the thermocline around the same values in June (and probably July), but it seemed shallower in August, although the lack of data prevents confirming this observation. Dissolved oxygen was markedly lower in October, but otherwise rather constant at all depths and for all months (Figure 4).

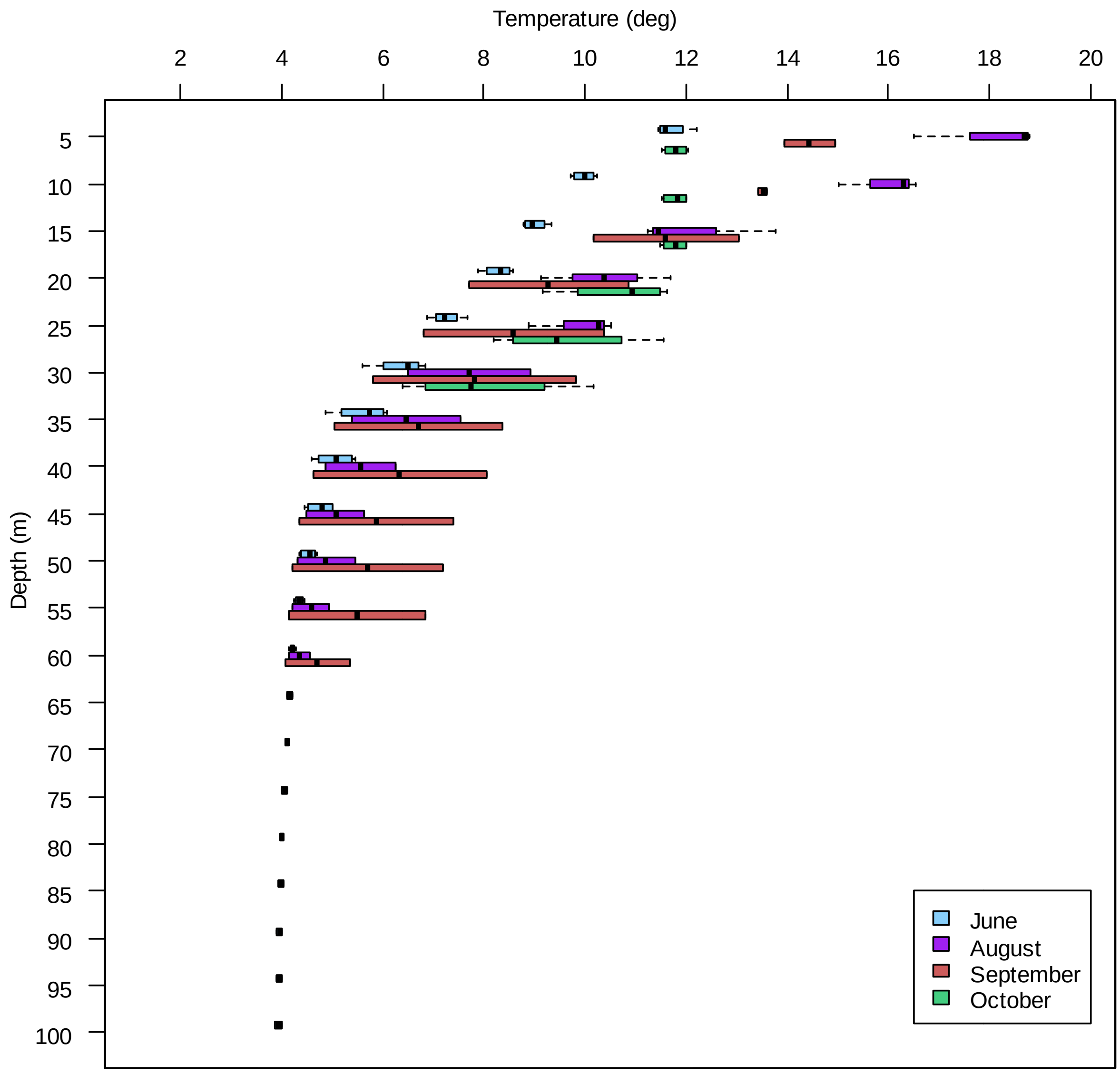

Figure 3: Variations in temperature across sampling sites according to the depth and months

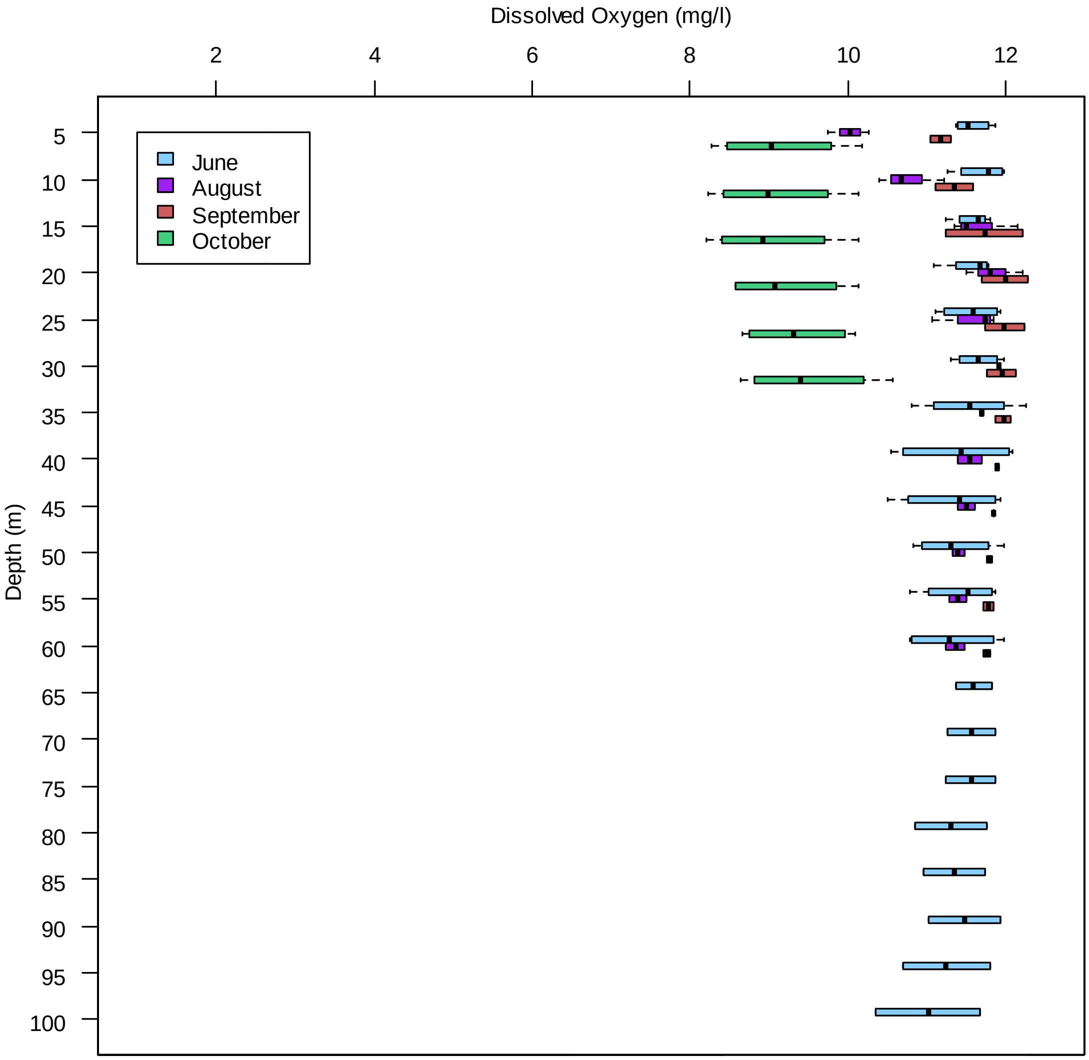

Figure 4: Variations in dissolved oxygen across sampling sites according to the depth and months

3.2.2 Specific conductivity and pH

Conductivity was also fairly constant across depths and months for all months but June, which showed much higher conductivity, and an increase in conductivity with depth (Figure 5). Similarly, pH was also quite different in June compared to the other months of the summer and fall (Figure 6). It varied around 7.5 in June, with a slight increase as depth increased, but varied around 8.0 for the other months, with a slight decrease in values as depth increased. Values from all months seemed to converge at a depth of about 60m.

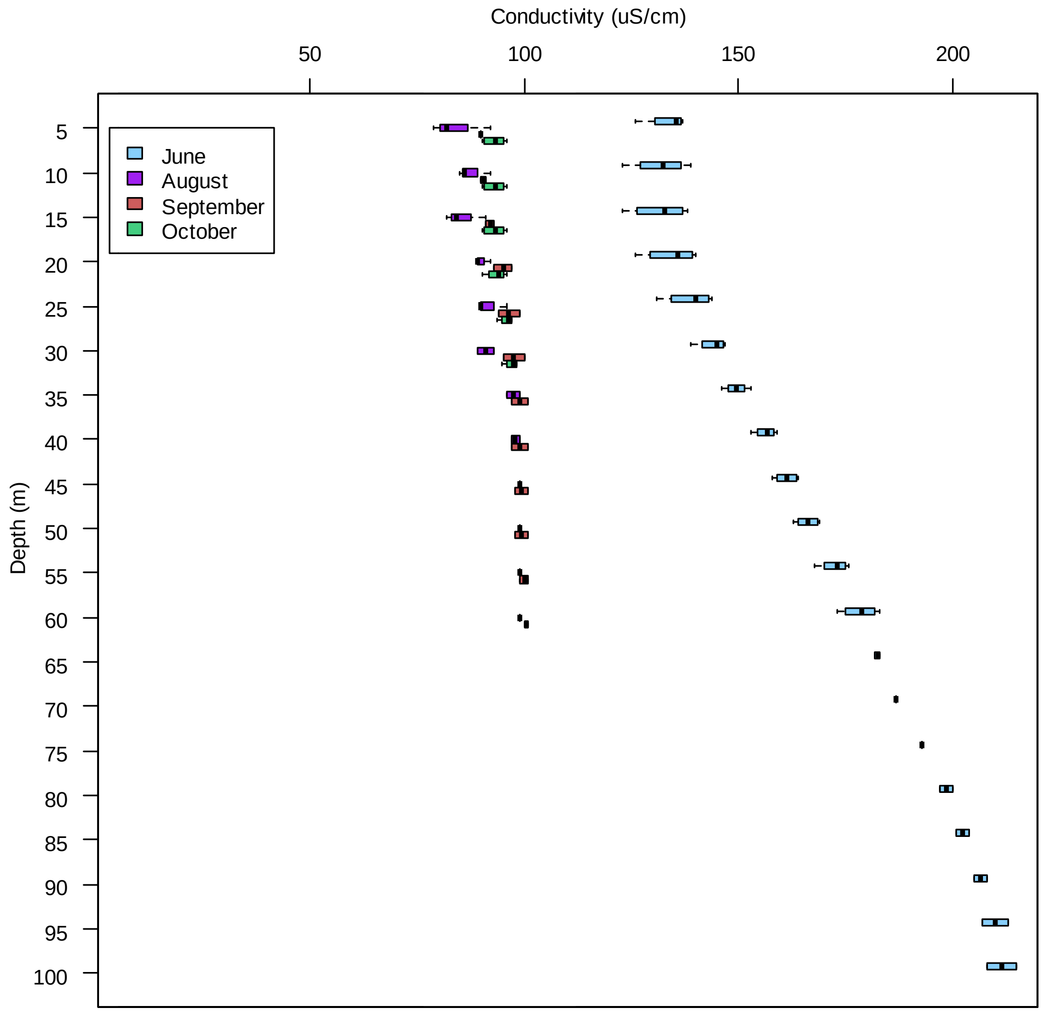

Figure 5: Variations in conductivity across sampling sites according to the depth and months

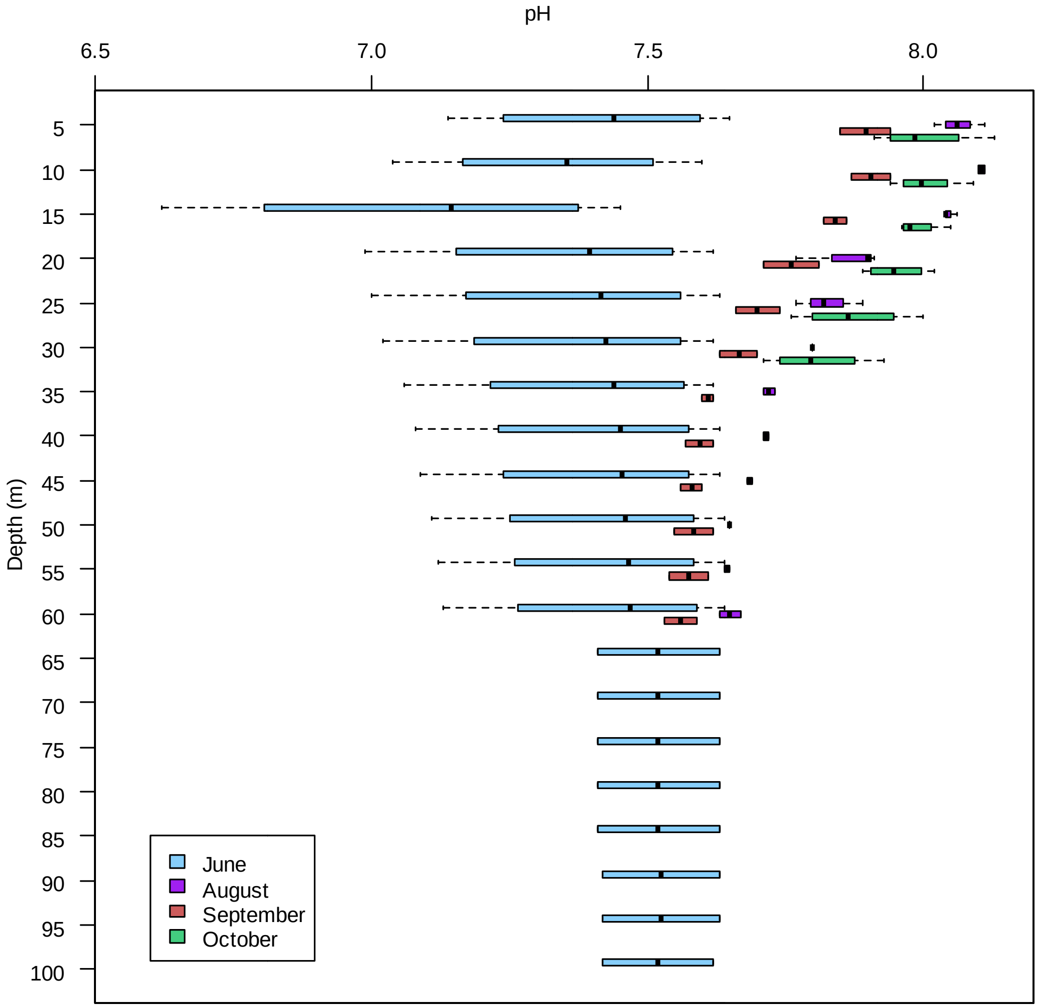

Figure 6: Variations in pH across sampling sites according to the depth and months

3.2.3 Nutrients

3.2.3.1 Nitrate (NO3) & Nitrite (NO2)

The first step of the analyses focused on describing general trends in the variation of nutrients in 2010 and 2011. There was more variation in Nitrogen and Nitrate in August, September and October, than during the earlier months of the season (Figure 7a and Figure 8a). Concentration was also higher deeper in the water column (50 m), than at closer to the surface (5m; Figure 7b and Figure 8b), but seemed rather constant among sites for the two years.

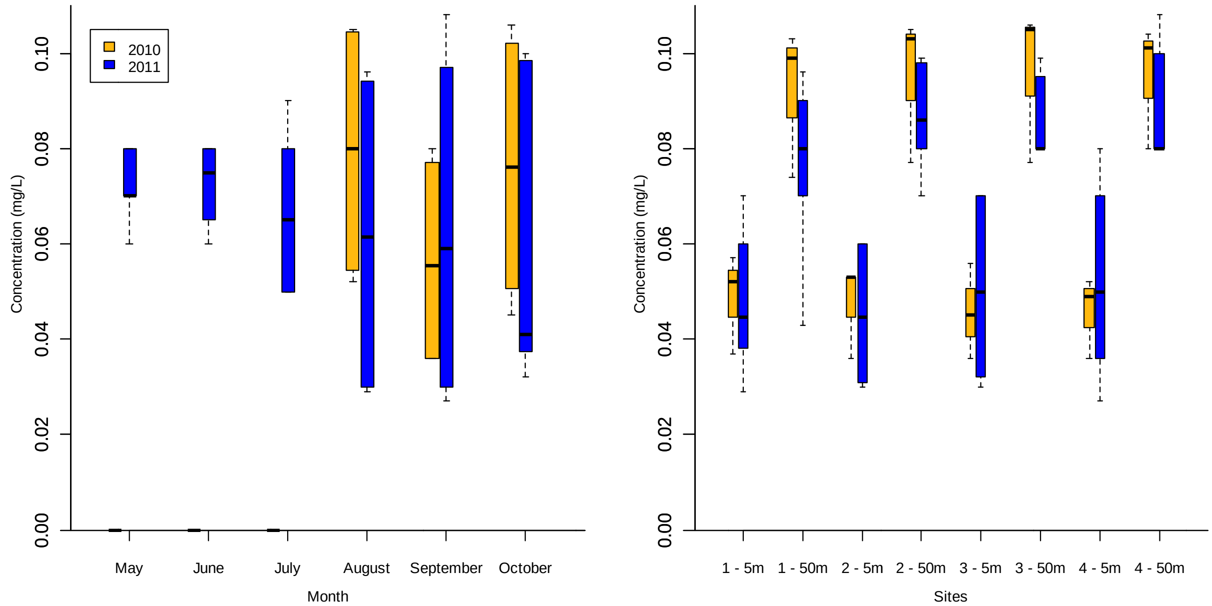

Figure 7: Concentration of Nitrogen (Nitrate+Nitrite) a) over months, and b) over sampling sites, between 2010 and 2011. No sampling occurred in May, June and July 2010.

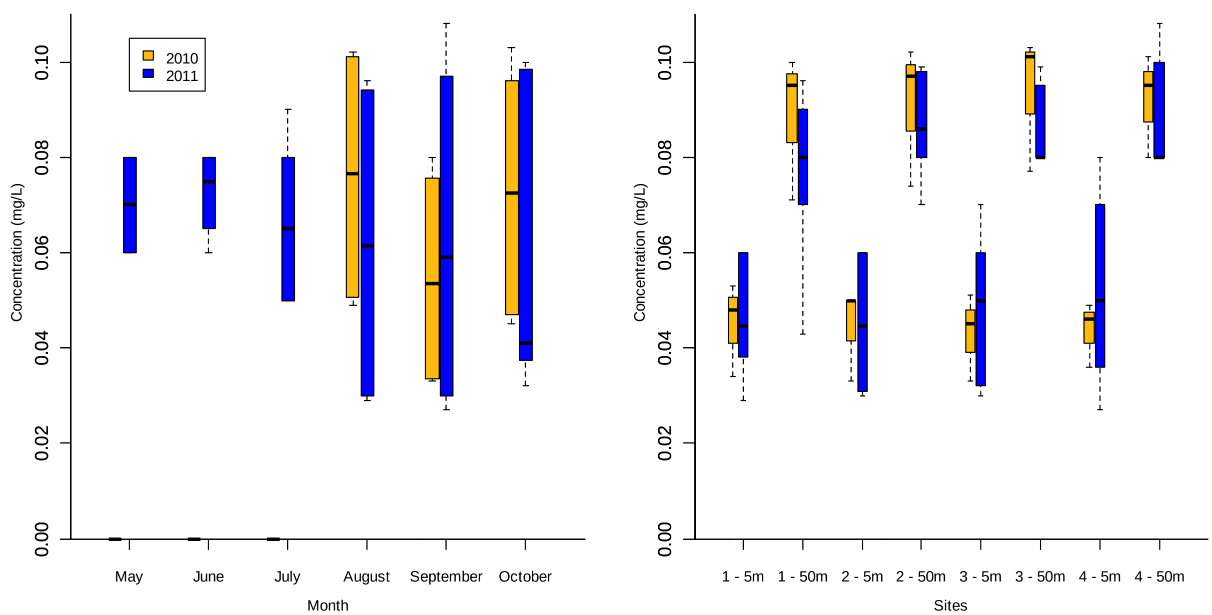

Figure 8: Concentration of Nitrate a) over months, and b) over sampling sites, between 2010 and 2011. No sampling occurred in May, June and July 2010.

3.2.3.2 Total Nitrogen

Concentration of total Nitrogen was different over the season than the concentration of nitrogen and nitrate; there was almost no variation among sites in 2010, but more variation, and an increase in concentration over the months in 2011 (Figure 9a and Figure 10a). There was considerable variation in concentration over months for the same sites, but not so much among sites or depths in 2011 for the Kjeldahl total Nitrogen (Figure 9b). The non-Kjeldahl total Nitrogen showed higher concentrations in 2011 than in 2010 (Figure 10b).

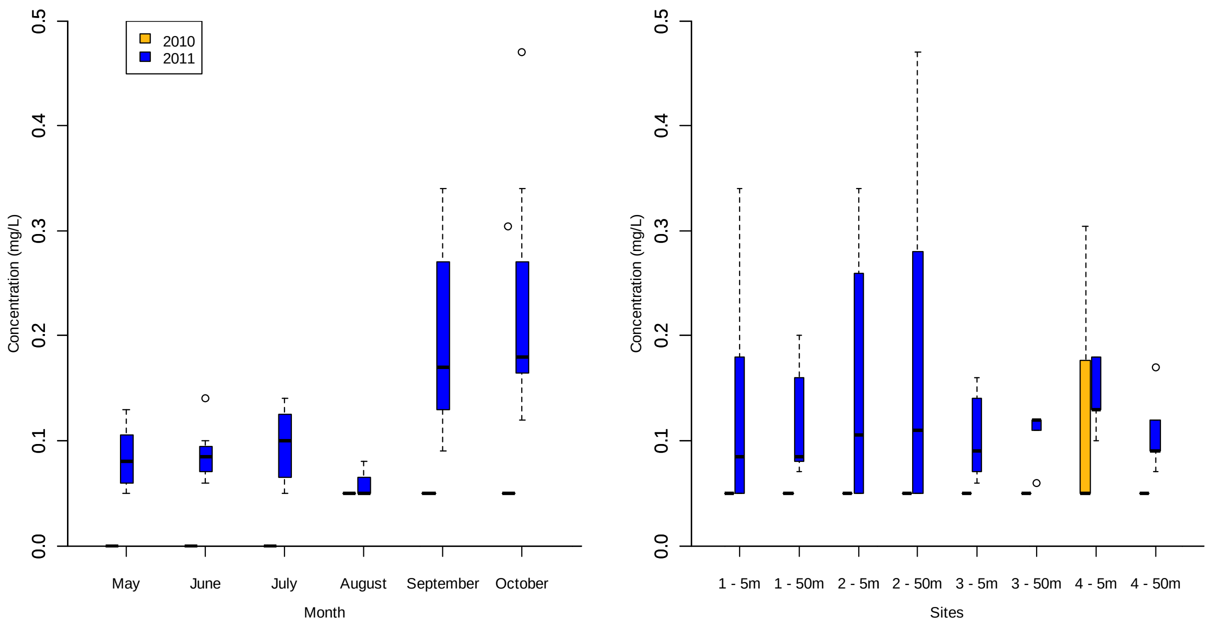

Figure 9: Concentration of Total Nitrogen (Kjeldahl) a) over months, and b) over sampling sites, between 2010 and 2011. No sampling occurred in May, June and July 2010.

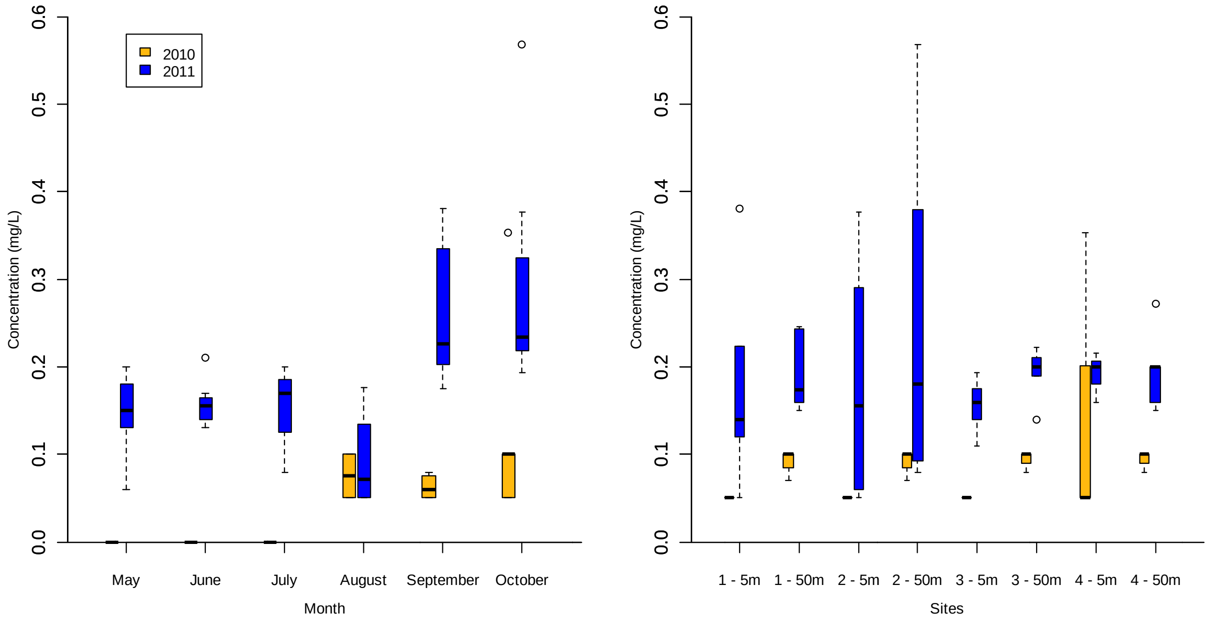

Figure 10: Concentration of Total Nitrogen a) over months, and b) over sampling sites, between 2010 and 2011. No sampling occurred in May, June and July 2010.

3.2.3.3 Total phosphorus (TP) and chlorophyll-a

Concentration of total Phosphorus was much higher in 2010 than in 2011, for the months that were sampled in both years (August, September and October; Figure 11a and b); in 2011, no Phosphorus could be detected above the detection limit (0.05 mg/L). Conversely, the concentrations of total chlorophyll-a were higher in 2011 than in 2010 over the same three months, and for most sampling sites and depths (Figure 12a and b).

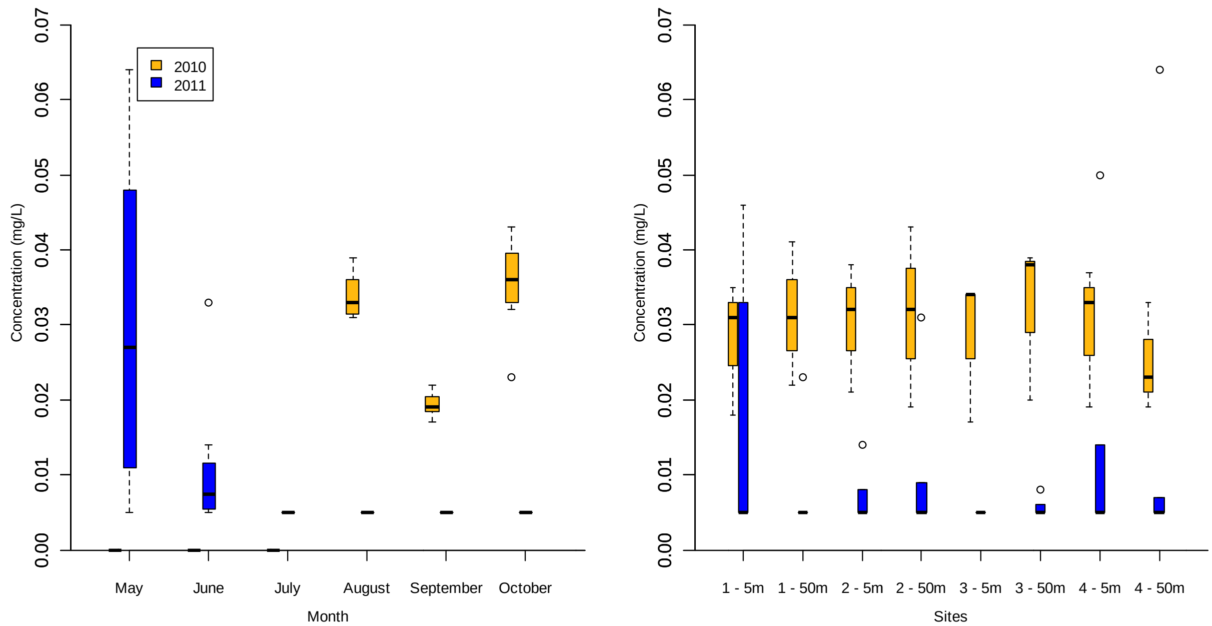

Figure 11: Concentration of Total Phosphorus a) over months, and b) over sampling sites, between 2010 and 2011. No sampling occurred in May, June and July 2010

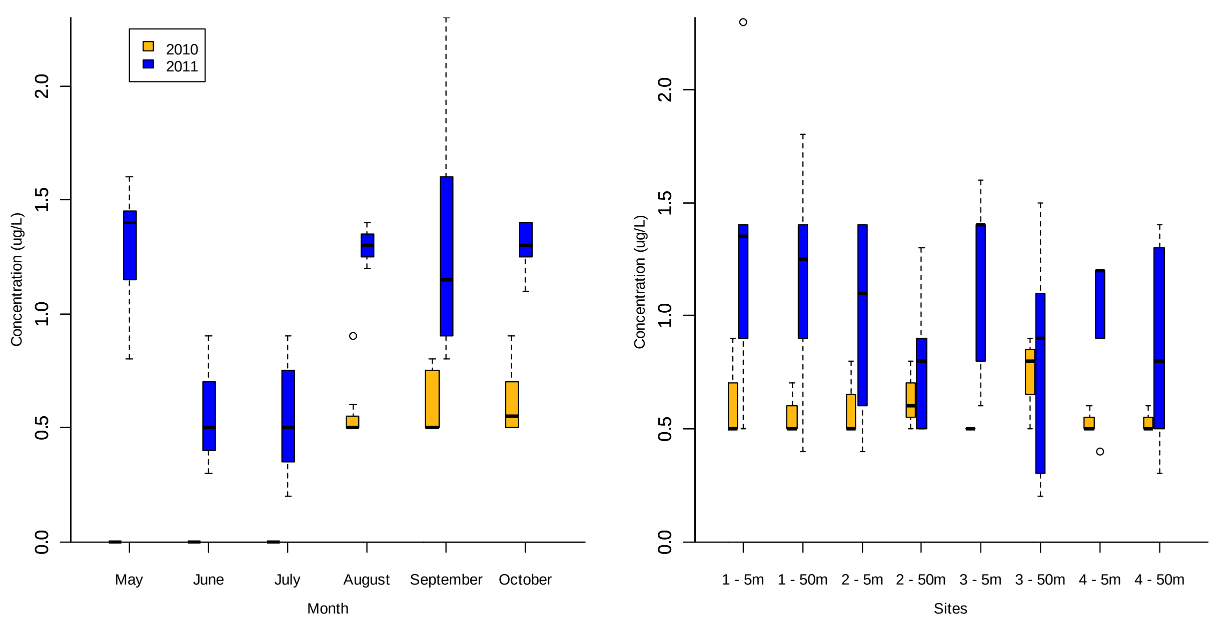

Figure 12: Concentration of Total Chlorophyll-a a) over months, and b) over sampling sites, between 2010 and 2011. No sampling occurred in May, June and July 2010

3.3 Total metals

Metal concentrations were analysed at just two sites due to budgetary constraints. All 36 metals showed normal concentrations for Slocan Lake (Appendix B). Many metals revealed concentration levels below the detection limits. Concentrations were comparable at the two sites. Little vertical stratification of total metals was detected.

Calcium levels increased slightly with depth reflecting the increase of specific conductance. Sodium (~1mg/L) and potassium (~0.5mg/L) concentrations were low and correspond to readings found in the previous studies. Zinc levels were comparable to the previous results, in both the epilimnion and hypolimnion with respective concentrations of ~0.018mg/L in the epilimnion and ~0.021mg/L in the hypolimnion.

Appendix B shows that, as in 2010, all cadmium readings were found in trace concentrations, meaning concentrations of less than 0.1 µg/L (0.0001mg/L). The difference with 2010, is that site 4 did not exhibit metal concentrations as high as during the 2010 sampling.

3.4 Zooplankton

Zooplankton results were compared to the 2010 (Galena Environmental 2011) and the 2000-2001 (Andrusak *et al.* 2002) Slocan Lake studies.

3.4.1 Species Present

One calanoid copepod species was identified in the samples from Slocan Lake in 2011. *Leptodiaptomus pribilofensis* (Juday & Muttkowski) was present in samples during the sampling season from May to September but in considerably low number, while cyclopoid copepod species *Diacyclops bicuspidatus thomasi* (Forbes) prevailed numerically in samples (Table 1).

Only two species of Cladocera *Daphnia rosea* (Sars) and *Bosmina longirostris* (O.F.Muller) were present in Slocan Lake samples during the studied period in 2011 (Table 1).

Table 1: List of species identified in 2011 (May - Sept.), 2010 (Aug. - Nov.) and 2000-2001 (April - Oct.)

COPEPODA	2000	2001	2010	2011
CYCLOPOIDA				
Diacyclops bicuspidatus thomasi	+	+	+	+
CALANOIDA				
Leptodiaptomus pribilofensis	+	+	+	+
Leptodiaptomus ashlandi	+	+		
CLADOCERA				
Daphnia rosea	+	+	+	+
Bosmina longirostris			+	+
Alona sp.	+	+		
Eubosmina longispina	+	+		
Sida cristallina	+	+		
Scapholeberis kingi	+	+		

3.4.2 Density and Biomass

The zooplankton density was numerically dominated by copepods, which averaged 79% of the 2011 population (Appendix C/Figure 1). *Daphnia* spp comprised 4%, while cladocerans other than *Daphnia* comprised 17%. Copepods were the most abundant zooplankton at each station during the studied season (Appendix C/Figure 2). They dominated during the whole sampling season, with populations peaking in July-August. Copepods were comprised of calanoids and cyclopoids.

The seasonal average zooplankton density in 2010 (May to September) increased slightly to 11.83 individuals/L from 8.99 individuals/L in 2010 (Table 2, Appendix C/Figure 3). That was the result of Copepoda and Cladocera other than *Daphnia* abundance increase, while *Daphnia* spp. stayed at the similar level as in 2010.

Table 2: Seasonal average zooplankton density in Slocan Lake 2000, 2001 (April to October), 2010 (August to November) and 2011 (May to September)

ind/L	2000	2001	2010	2011
total	21.30	21.15	8.99	11.83
Copepoda	20.01	15.16	7.48	9.30
Daphnia	0.10	1.74	0.57	0.49
other Cladocera	1.19	4.25	0.95	2.04

In the 2011 sampling season, zooplankton biomass reached its peak in August, dominated by *Daphnia* with 35.00·g/L, which made up 56% of the total biomass at that time (Appendix C/Figure 4). However, on average for the whole study season May to September, *Daphnia* comprised 30%, cladocerans other than *Daphnia* comprised 10%, while copepods made up to 60% of the total zooplankton biomass (Appendix C/Figure 4).

Total zooplankton biomass and biomass of other cladocerans increased to 26.08·g/L in 2011 from 22.86·g/L in 2010 (Table 3, Appendix C/Figure 3). Biomass of copepods and cladocerans other than *Daphnia* also increased in comparison to 2010, while *Daphnia* biomass decreased to 7.95·g/L, from 10.11·g/L 2010 (Table 3). In comparison to 2000-2001 data decrease of total zooplankton biomass during the study period in 2010 and 2011 was due to significant decreases in the biomass of other cladocerans and copepods. *Daphnia* spp. made up 5% and 57% in 2000, 2001 and 44% and 30% of the total zooplankton biomass in 2010 and 2011.

Table 3. Seasonal average zooplankton biomass in Slocan Lake 2000-2001 (April to October), 2010 (August to November) and 2011 (May to September)

g/L	2000	2001	2010	2011
total	27.07	58.94	22.86	26.08
Copepoda	24.24	17.65	11.36	15.53
Daphnia	1.27	33.77	10.11	7.95
other Cladocera	1.56	7.52	1.39	2.60

The largest zooplankton population in 2011 was seen in August at site 2 with 29.71 individuals/L and biomass of 94.98 ·g/L (Appendix C/Figures 2 & 5). *Daphnia* first appeared in July, reaching the highest density in August at site 2 with 3.62 individuals/L and biomass 56.84 ·g/L which comprised up to 60% of total biomass at that time.

4 RECOMMENDATIONS

It is recommended that the Slocan Lake sampling program continue on an annual basis for at least one more year at the four established lake sites. Continued and regular monitoring of Slocan Lake is obviously the best way to maintain up-to-date records on the status of the lake and to gauge any variations due to natural causes or to developments in land use around the lake. A community based monitoring program serves both to accumulate valuable data and increase awareness within the local population of water quality and shoreline issues. Findings from these studies are important tools for land planners to use in determining future development possibilities within the area.

Recommendations for the Nearshore Sampling

- The Nearshore Program should be continued for a minimum of one more year in order to provide a better understanding of natural variability within Slocan Lake;
- Monitoring should continue to focus on septic runoff entering the lake and determine any patterns in coliform leaching. Bacterial source tracking would also differentiate between septic leaching and wildlife sources; and
- Future monitoring programs should use the same sampling sites in order to maintain uniformity in the comparison of results.

Recommendations for the Offshore Sampling

- The Offshore Program should be continued for a minimum of one more year to help determine significant changes and trends within the watershed;
- General parameter readings should be conducted monthly over a one year period, at least;
- Zooplankton sampling should continue to be a part of future monitoring programs; and
- Future monitoring programs should use the same sampling sites in order to maintain uniformity in the comparison of results.

5 CONCLUSION

The purpose of this study was to collect comprehensive data on the present condition of Slocan Lake. The information collected in the present study is intended to help identify and evaluate any future trends or variations in water quality as development along the shores of Slocan Lake progresses, and to help establish guidelines and recommendations for any such development in order to maintain the present status of the lake. The parameters tested proved to be well within the Provincial Water Quality Guidelines, indicating that this oligotrophic lake has maintained its pristine condition. But this study constitutes only one necessary and vital phase in what should be a multi-year trend-monitoring study. The full use and significance of its findings will only be meaningful when set within the context of the larger endeavour. Future development projects and community planning initiatives can only benefit from the availability of the most complete and comprehensive data on the present condition of Slocan Lake and the trends revealed by that data.

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7 APPENDICES

Appendix A: Nearshore Detailed Sampling Sites, Coliform Results & Interpretation

Appendix B: Offshore Detailed Sampling Sites, Parameters Sampled & CARO Analytical Services Results

Appendix C: Zooplankton Results

Appendix A

Nearshore Detailed Sampling Sites, Coliform Results & Interpretation

Nearshore detailed sampling sites

Nearshore sampling sites

Site 1-Slocan
- ☐ located approximately 10m from the shore, at the end of the public dock
- ☐ Lat: 49^0 46' 10" N, Lon: 117^0 28' 23" W
- ☐ Site is located within the town, in front of the public beach

Site 2-Silverton
- ☐ located approximately 15m offshore
- ☐ Lat: 49^0 56' 54'' N, Lon: 117^0 21' 26'' W
- ☐ Site is located within the town, in a bay in front of the Silverton Hotel
- ☐ Site has abundant macrophytes

Site 3-Silverton
- ☐ located approximately 20m south of Silverton Creek and approximately 20m offshore
- ☐ Lat: 49^0 57' 06'' N, Lon: 117^0 21' 44'' W
- ☐ Site will provide information on coliform transport from septic systems to the creek

Site 4-New Denver
- ☐ located in front of the Slocan Lake hospital, approximately 20m offshore
- ☐ Lat: 49^0 58' 59'' N, Lon: 117^0 22' 31'' W
- ☐ Site has some macrophytes

Site 5-New Denver
- ☐ located approximately 20m south of Carpenter Creek and approximately 20m offshore
- ☐ Lat: 49^0 59' 16'' N, Lon: 117^0 22' 48'' W
- ☐ Site will provide information on coliform transport from septic systems to the creek

Site 6-Rosebery
- ☐ located approximately 20m south of Wilson Creek and approximately 20m offshore
- ☐ Lat: 50^0 01' 44'' N, Lon: 117^0 24' 54'' W
- ☐ Site will provide information on coliforms transport from septic systems to the creek

Site 7-Hills
- ☐ located in front of Hills public beach and cottage area at approximately 15m offshore
- ☐ Lat: 50^0 05' 18'' N, Lon: 117^0 28' 12'' W
- ☐ Site has abundant macrophytes

PASSMORE LABORATORY LTD.

4235 Upper Passmore Road
Winlaw, B.C. VOG 2JO
250 - 226 - 7339 passlab@xplornet.com

Client: Slocan Lake Stewadship Society

Email: galena@netidea.com

September 23, 2011

We have tested the samples of water submitted by you August 16, 23, September 01, 09 and 16, 2011 and report as follows:

Method of Testing:

Five samples were collected at seven sites over 30 days in accordance with Provincial Health Guidelines for evaluation of Total, Thermotolerant Coliforms and E.coli bacteria. Analyses was performed in accordance with methods outlined in the "Standard Methods of Examination of Water and Wastewater", 17th edition, 1989 published by the American Public Health Association, Specifically, Section 9222D. All tests were done by Membrane Filtration

Results of Testing:

	8/16/2010		8/23/2010		9/01/2010		9/09/2010		9/16/2010	
	Total cfu/100 ml	Fecal cfu/100 ml	Total cfu/100 ml	Fecal cfu/100 ml	Total cfu/100 ml	Fecal cfu/100 ml	Total cfu/100 ml	Fecal cfu/100 ml	Total cfu/100 ml	Fecal cfu/100 ml
1. Slocan	3	0	0	0	6	0	6	2	4	0
2. Silverton Hotel	1	0	4	3*	6	0	2	0	12	0
3. Silverton Creek	3	0	12	0	8	0	7	3	11	0
4. New Denver Hospital	1	0	12	2*	6	0	7	0	13	0
5. Carpenter Creek	137	0	0	0	7	0	6	0	6	0
6. Wilson Creek	7	0	3	1*	1	0	9	1*	19	0
7. Hills	22	0	30	0	10	0	64	1*	11	1*
8. QA/QC (in house)	0	0	0	0	0	0	0	0	0	0

cfu = colony forming units, Gt = Greater than
*All Thermotolerant Coliform colonies were tested for E.coli and found to be negative

Analyst:
Jennifer Yeow, Microbiologist, Passmore Laboratory Ltd.

Passmore Laboratory Ltd. complies with methods and certification through UBC's Canadian Microbiological Proficiency Testing Progeram

PASSMORE LABORATORY LTD.

Background:

Coliforms refer to a group of bacteria that have been tested for over 90 years as indicators of human infection. They are defined as rod-shaped non-spore forming organisms. Coliforms are abundant in the feces of warm-blooded animals, but can also be found in the aquatic environment, in soil and on vegetation. Their presence is used to indicate other pathogenic organisms of fecal origin that may be present. These include other bacteria, viruses, protozoa (Giardia, Cryptosporidium) and multicellular parasites. The three tests done are described:

1. Total Coliforms – Bacteria that ferment lactose at 35°C. This group includes bacteria from warm-blooded animal source as well as plant source. E.g. from algae, decaying plants

2. Thermotolerant or Fecal Coliforms – Bacteria that have the capacity to grow at elevated temperature e.g. recently shed from the intestine of warm blooded animals

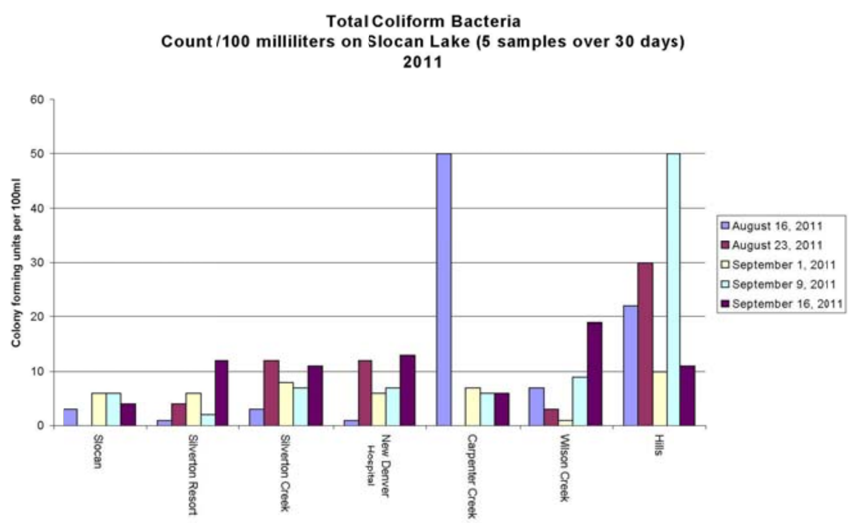
3. E.coli – Bacteria that are a subgroup of the Total and Thermotolerant groups that are known to inhabit humans, warm blooded animals and some serotypes are pathogenic to humans.

Provincial Government Guidelines for “raw”or untreated *drinking water* state that no Thermotolerant (Fecal Coliforms) and no E.coli. should be present. Guidelines for water used for *primany contact recreation* use state the Thermotolerant Colifrom level should not exceed a geometric mean of 200/100ml in 5 samples taken in a 30 day period. Also, the E.coli level should not exceed a geometric mean of 77/100ml in 5 samples over a 30 day period.

Findings:

Total Coliforms

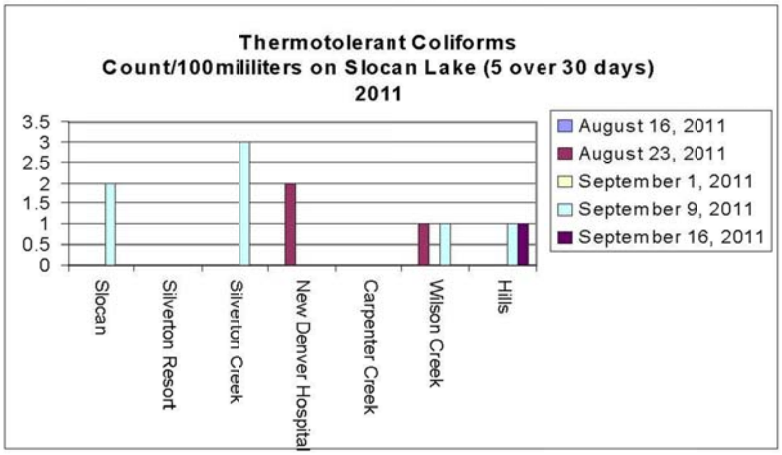
The test results for 2010 showed high counts in regions where the water was likely to experience human and/or tributary creek nutrient input (Bonanza Creek in Hills and Slocan City). In addition, there was one very high count at Slocan (greater than 300cfu). In 2011 we did not see high Total Coliform counts at the Slocan site. However, counts at the Hills site remained relatively high. High counts (137cfu) were observed off Carpenter Creek on August 16th and at Hills (64cfu) on Sept 9th. Counts at the other sites averaged 10 cfu/100ml and were slightly higher than seen in 2010 when the average was 4cfu/100ml.



Findings:

Thermotolerant Coliform Bacteria

In 2010, samples collected at Slocan and Hills on September 22nd showed low (1-2cfu/ml) counts for Thermotolerant Bacteria. Both samples were tested for E.coli and found to be positive. In 2011, eight samples were found to contain Thermotolerant coliforms (averaging 2 cfu/100ml) taken from all sites and none of the samples were positive for E.coli. See chart below:



As we have seen in 2011, there are organisms other than E.coli isolated in the test for Thermotolerant bacteria that may not be from human/warm blooded animal source. However, they may still have a correlation with disease and so, are recommended as indicators of water quality.

Respectfully Submitted,

Jennifer Yeow, Microbiologist
Passmore Laboratory Ltd.

Appendix B

Offshore Detailed Sampling Sites, Parameters Sampled & CARO Analytical Services Results

Offshore detailed sampling sites

Offshore Sample Sites

Site 1

- located 5.3 km north of the town of Slocan, in front of Cape Horn & Evans Creek
- Lat: 49^0 48' 51" N, Lon: 117^0 28' 26" W

Site 2

- located 11 km north of the lake outlet, slightly downstream of Enterprise Creek
- Lat: 490 51' 46'' N, Lon: 117^0 26' 17'' W
- Site is the same as Site # SL2 in the UBC-MOE collection of reports

Site 3

- located 23.2 km north of the lake outlet, slightly upstream of Wee Sandy Creek
- Lat: 500 00' 35'' N, Lon: 117^0 24' 39'' W
- Site is the same as Site # SL1 in the UBC-MOE collection of reports

Site 4

- located 27.6 km north of the lake outlet, in front of Shannon Creek
- Lat: 500 04' 20'' N, Lon: 117^0 27' 22'' W

Water parameters and laboratory Detection Limit

Nutrients			
Parameters	**D.L. (mg/L)**	**Parameters**	**D.L. (mg/L)**
Nitrate (NO3) Nitrite (NO2)	0.01 0.01	Total Phosphorus	0.005
Total Kjeldahl	0.05	Chlorophyll-a	0.1
Total Nitrogen	0.05		
Total Metals			
Parameters	**D. L. (mg/L)**	**Parameters**	**D. L. (mg/L)**
Aluminum	0.005	Molybdenum	0.0001
Antimony	0.0001	Nickel	0.0002
Arsenic	0.0005	Phosphorus	0.02
Barium	0.005	Potassium	0.02
Beryllium	0.0001	Selenium	0.0005
Bismuth	0.0001	Silicon	0.5
Boron	0.004	Silver	5E-05
Cadmium	1E-05	Sodium	0.02
Calcium	0.5	Strontium	0.001
Chromium	0.0005	Tellurium	0.0002
Cobalt	5E-05	Thallium	2E-05
Copper	0.0002	Thorium	0.0001
Iron	0.01	Tin	0.0002
Lead	0.0001	Titanium	0.005
Lithium	0.0001	Uranium	2E-05
Magnesium	0.01	Vanadium	0.001
Manganese	0.0002	Zinc	0.004
Mercury	2E-05	Zirconium	0.0001

CARO Analytical Services (Kelowna)	Client Galena Environmental Ltd.
Analytical Testing Report	Attention Luce Paquin
Work Order: K1F0046	Project Name Slocan Lake Stewartship Society
Report Date: 6/8/2011 4:27:35 PM	Project Number [none]

Note: This is not the original data. Please refer to PDF / Hardcopy report.

General Method	Analyte	Units	RDL								
LAB ID				K1F0046-01	K1F0046-02	K1F0046-03	K1F0046-04	K1F0046-05	K1F0046-06	K1F0046-07	K1F0046-08
CLIENT ID				Site 1 - 5m	Site 2 - 5m	Site 3 - 5m	Site 4 - 5m	Site 1 - 50m	Site 2 - 50m	Site 3 - 50m	Site 4 - 50m
DATE SAMPLED				31-May-11	31-May-11	31-May-11	31-May-11	31-May-11	31-May-11	31-May-11	31-May-11
DATE RECEIVED				01-Jun-11	01-Jun-11	01-Jun-11	01-Jun-11	01-Jun-11	01-Jun-11	01-Jun-11	01-Jun-11
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water
General Parameters	Nitrogen, Nitrate+Nitrite as N	mg/L	0.01	0.07	0.06	0.07	0.08	0.07	0.07	0.08	0.08
General Parameters	Nitrogen, Nitrate as N	mg/L	0.01	0.06	0.06	0.06	0.08	0.07	0.07	0.08	0.08
General Parameters	Nitrogen, Nitrite as N	mg/L	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
General Parameters	Nitrogen, Total Kjeldahl	mg/L	0.05	0.05	<0.05	0.07	0.13	0.08	0.08	0.12	0.09
General Parameters	Nitrogen, Total	mg/L	0.05	0.12	0.06	0.14	0.2	0.15	0.15	0.2	0.16
General Parameters	Phosphorus, Total	mg/L	0.005	0.046	0.014	<0.005	0.05	0.023	0.031	0.008	0.064
General Parameters	Chlorophyll-a	ug/L	0.1	1.4	1.1	1.6	1.2	1.4	0.8	1.5	1.4

CARO Analytical Services (Kelowna)		Client	Galena Environmental Ltd.
Analytical Testing Report		Attention	Luce Paquin
Work Order: K1F1337		Project Name	Slocan Lake Stewartship Society
Report Date: 7/7/2011 3:52:25 PM		Project Number	[none]

Note: This is not the original data. Please refer to PDF / Hardcopy report.

General Method	Analyte	Units	RDL											
LAB ID				K1F1337-01	K1F1337-02	K1F1337-03	K1F1337-04	K1F1337-05	K1F1337-06	K1F1337-07	K1F1337-08	K1F1337-09	K1F1337-10	K1F1337-11
CLIENT ID				Site 1 - 5m	Site 1 - 50m	Site 2 - 5m	Site 2 - 50m	Site 2 - 50m Q	Site 3 - 5m	Site 3 - 50m	Site 4 - 5m	Site 4 - 5m QA	Site 4 - 50m	Site 1 - 5m QA/QC
DATE SAMPLED				29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11	29-Jun-11
DATE RECEIVED				30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11	30-Jun-11
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
General Parameters	Nitrogen, Nitrate+Nitrite as N	mg/L	0.01	0.06	0.08	0.06	0.08	0.08	0.07	0.08	0.07	0.07	0.08	
General Parameters	Nitrogen, Nitrate as N	mg/L	0.01	0.06	0.08	0.06	0.08	0.08	0.07	0.08	0.07	0.07	0.08	
General Parameters	Nitrogen, Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
General Parameters	Nitrogen, Total Kjeldahl	mg/L	0.05	0.08	0.09	0.07	0.14	0.11	0.09	0.06	0.1	0.09	0.07	
General Parameters	Nitrogen, Total	mg/L	0.05	0.14	0.17	0.13	0.21	0.19	0.16	0.14	0.16	0.17	0.15	
General Parameters	Phosphorus, Total	mg/L	0.005	0.033	<0.005	0.008	0.009	<0.005	0.005	0.006	0.014	0.013	0.007	
General Parameters	Chlorophyll-a	ug/L	0.1	0.9	0.4	0.6	0.5	0.5	0.8	0.3	0.4		0.5	1

CARO Analytical Services (Kelowna)
Analytical Testing Report
Work Order: K1H0215
Report Date: 8/11/2011 4:05:00 PM

Client: Galena Environmental Ltd.
Attention: Luce Paquin
Project Name: Slocan Lake Stewartship Society
Project Number: [none]

Note: This is not the original data. Please refer to PDF / Hardcopy report.

General Method	Analyte	Units	RDL								
LAB ID				K1H0215-01	K1H0215-02	K1H0215-03	K1H0215-04	K1H0215-05	K1H0215-06	K1H0215-07	K1H0215-08
CLIENT ID				Site 1 - 5m	Site 1 - 50m	Site 2 - 5m	Site 2 - 50m	Site 3 - 5m	Site 3 - 50m	Site 4 - 5m	Site 4 - 50m
DATE SAMPLED				28-Jul-11	28-Jul-11	28-Jul-11	28-Jul-11	28-Jul-11	28-Jul-11	28-Jul-11	28-Jul-11
DATE RECEIVED				04-Aug-11	04-Aug-11	04-Aug-11	04-Aug-11	04-Aug-11	04-Aug-11	04-Aug-11	04-Aug-11
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water
General Parameters	Nitrogen, Nitrate+Nitrite as N	mg/L	0.01	0.05	0.09	0.05	0.08	0.05	0.08	0.05	0.08
General Parameters	Nitrogen, Nitrate as N	mg/L	0.01	0.05	0.09	0.05	0.08	0.05	0.08	0.05	0.08
General Parameters	Nitrogen, Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
General Parameters	Nitrogen, Total Kjeldahl	mg/L	0.05	0.09	0.07	0.14	<0.05	0.06	0.11	0.13	0.12
General Parameters	Nitrogen, Total	mg/L	0.05	0.14	0.16	0.18	0.08	0.11	0.19	0.18	0.2
General Parameters	Phosphorus, Total	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
General Parameters	Chlorophyll-a	ug/L	0.1	0.5	0.9	0.4	0.5	0.6	0.2	0.9	0.3

CARO Analytical Services (Kelowna)
Analytical Testing Report
Work Order: K1I0013
Report Date: 9/9/2011 9:15:55 AM

Client Galena Environmental Ltd.
Attention Luce Paquin
Project Name Slocan Lake Stewartship Society
Project Number [none]

Note: This is not the original data. Please refer to PDF / Hardcopy report.

General Method	Analyte	Units	RDL				
LAB ID				K1I0013-01	K1I0013-02	K1I0013-03	K1I0013-04
CLIENT ID				Site 1 - 5m	Site 1 - 50m	Site 2 - 5m	Site 2 - 50m
DATE SAMPLED				30-Aug-11	30-Aug-11	30-Aug-11	30-Aug-11
DATE RECEIVED				01-Sep-11	01-Sep-11	01-Sep-11	01-Sep-11
MATRIX				Water	Water	Water	Water
General Parameters	Hardness, Total (Total as CaCO3)	mg/L	1.25	35.6	44.4	37.4	50.4
General Parameters	Nitrogen, Nitrate+Nitrite as N	mg/L	0.01	0.029	0.096	0.031	0.092
General Parameters	Nitrogen, Nitrate as N	mg/L	0.01	0.029	0.096	0.031	0.092
General Parameters	Nitrogen, Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01
General Parameters	Nitrogen, Total Kjeldahl	mg/L	0.05	<0.05	0.08	<0.05	<0.05
General Parameters	Nitrogen, Total	mg/L	0.05	<0.050	0.177	<0.050	0.092
General Parameters	Phosphorus, Total	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
General Parameters	Chlorophyll-a	ug/L	0.1	1.3	1.2	1.4	1.3
Total Recoverable Metals by ICPMS	Aluminum	mg/L	0.005	0.02	0.007	0.062	0.011
Total Recoverable Metals by ICPMS	Antimony	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001
Total Recoverable Metals by ICPMS	Arsenic	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Recoverable Metals by ICPMS	Barium	mg/L	0.005	0.019	0.025	0.02	0.026
Total Recoverable Metals by ICPMS	Beryllium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Recoverable Metals by ICPMS	Bismuth	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Recoverable Metals by ICPMS	Boron	mg/L	0.004	0.006	0.005	0.004	0.005
Total Recoverable Metals by ICPMS	Cadmium	mg/L	1E-05	0.00011	0.00012	0.00013	0.00013
Total Recoverable Metals by ICPMS	Calcium	mg/L	0.5	11.4	14.1	12	16.4
Total Recoverable Metals by ICPMS	Chromium	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Recoverable Metals by ICPMS	Cobalt	mg/L	5E-05	<0.00005	<0.00005	<0.00005	<0.00005
Total Recoverable Metals by ICPMS	Copper	mg/L	0.0002	0.0006	0.0002	0.0004	0.0003
Total Recoverable Metals by ICPMS	Iron	mg/L	0.01	0.02	<0.01	0.01	<0.01
Total Recoverable Metals by ICPMS	Lead	mg/L	0.0001	0.0002	0.0007	0.0001	0.0002
Total Recoverable Metals by ICPMS	Lithium	mg/L	0.0001	0.0007	0.001	0.0008	0.0011
Total Recoverable Metals by ICPMS	Magnesium	mg/L	0.01	1.74	2.22	1.81	2.3
Total Recoverable Metals by ICPMS	Manganese	mg/L	0.0002	0.0012	0.0006	0.0013	0.0009
Total Recoverable Metals by ICPMS	Mercury	mg/L	2E-05	<0.00002	0.00005	<0.00002	<0.00002
Total Recoverable Metals by ICPMS	Molybdenum	mg/L	0.0001	0.0009	0.001	0.0009	0.001
Total Recoverable Metals by ICPMS	Nickel	mg/L	0.0002	0.0004	0.0003	0.0003	0.0004
Total Recoverable Metals by ICPMS	Phosphorus	mg/L	0.02	<0.02	<0.02	<0.02	<0.02
Total Recoverable Metals by ICPMS	Potassium	mg/L	0.02	0.46	0.53	0.45	0.55
Total Recoverable Metals by ICPMS	Selenium	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Recoverable Metals by ICPMS	Silicon	mg/L	0.5	2.6	3	2.6	3.1
Total Recoverable Metals by ICPMS	Silver	mg/L	5E-05	<0.00005	<0.00005	<0.00005	<0.00005
Total Recoverable Metals by ICPMS	Sodium	mg/L	0.02	0.99	1.26	0.98	1.3
Total Recoverable Metals by ICPMS	Strontium	mg/L	0.001	0.165	0.215	0.174	0.225
Total Recoverable Metals by ICPMS	Tellurium	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Recoverable Metals by ICPMS	Thallium	mg/L	2E-05	<0.00002	<0.00002	<0.00002	<0.00002
Total Recoverable Metals by ICPMS	Thorium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Recoverable Metals by ICPMS	Tin	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Recoverable Metals by ICPMS	Titanium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Total Recoverable Metals by ICPMS	Uranium	mg/L	2E-05	0.00029	0.00031	0.00029	0.00036
Total Recoverable Metals by ICPMS	Vanadium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Total Recoverable Metals by ICPMS	Zinc	mg/L	0.004	0.018	0.02	0.018	0.021
Total Recoverable Metals by ICPMS	Zirconium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

CARO Analytical Services (Kelowna)	Client Galena Environmental Ltd.
Analytical Testing Report	Attention Luce Paquin
Work Order: K1I1246	Project Name Slocan Lake Stewartship Society
Report Date: 10/7/2011 4:50:33 PM	Project Number [none]

Note: This is not the original data. Please refer to PDF / Hardcopy report.

General Method	Analyte	Units	RDL								
LAB ID				K1I1246-01	K1I1246-02	K1I1246-03	K1I1246-04	K1I1246-05	K1I1246-06	K1I1246-07	K1I1246-08
CLIENT ID				Site 1 - 5m	Site 1 - 50m	Site 2 - 5m	Site 2 - 50m	Site 3 - 5m	Site 3 - 50m	Site 4 - 5m	Site 4 - 50m
DATE SAMPLED				28-Sep-11	28-Sep-11	28-Sep-11	28-Sep-11	28-Sep-11	28-Sep-11	28-Sep-11	28-Sep-11
DATE RECEIVED				30-Sep-11	30-Sep-11	30-Sep-11	30-Sep-11	30-Sep-11	30-Sep-11	30-Sep-11	30-Sep-11
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water
General Parameters	Nitrogen, Nitrate+Nitrite as N	mg/L	0.01	0.038	0.08	0.03	0.099	0.03	0.095	0.027	0.108
General Parameters	Nitrogen, Nitrate as N	mg/L	0.01	0.038	0.08	0.03	0.099	0.03	0.095	0.027	0.108
General Parameters	Nitrogen, Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
General Parameters	Nitrogen, Total Kjeldahl	mg/L	0.05	0.34	0.16	0.26	0.28	0.14	0.12	0.18	0.09
General Parameters	Nitrogen, Total	mg/L	0.05	0.381	0.243	0.29	0.38	0.175	0.21	0.206	0.2
General Parameters	Phosphorus, Total	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
General Parameters	Chlorophyll-a	ug/L	0.1	2.3	1.8	1.1	0.9	1.4	0.9	1.2	0.8

CARO Analytical Services (Kelowna)
Analytical Testing Report
Work Order: K1J1030
Report Date: 11/3/2011 3:00:41 PM

Client Galena Environmental Ltd.
Attention Luce Paquin
Project Name Slocan Lake Stewartship Society
Project Number [none]

Note: This is not the original data. Please refer to PDF / Hardcopy report

General Method	Analyte	Units	RDL								
LAB ID				K1J1030-01	K1J1030-02	K1J1030-03	K1J1030-04	K1J1030-05	K1J1030-06	K1J1030-07	K1J1030-08
CLIENT ID				Site 1 - 5m	Site 1 - 50m	Site 2 - 5m	Site 2 - 50m	Site 3 - 5m	Site 3 - 50m	Site 4 - 5m	Site 4 - 50m
DATE SAMPLED				25-Oct-11	25-Oct-11	25-Oct-11	25-Oct-11	25-Oct-11	25-Oct-11	25-Oct-11	25-Oct-11
DATE RECEIVED				27-Oct-11	27-Oct-11	27-Oct-11	27-Oct-11	27-Oct-11	27-Oct-11	27-Oct-11	27-Oct-11
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water
General Parameters	Nitrogen, Nitrate+Nitrite as N	mg/L	0.01	0.039	0.043	0.039	0.098	0.032	0.099	0.036	0.1
General Parameters	Nitrogen, Nitrate as N	mg/L	0.01	0.039	0.043	0.039	0.098	0.032	0.099	0.036	0.1
General Parameters	Nitrogen, Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
General Parameters	Nitrogen, Total Kjeldahl	mg/L	0.05	0.18	0.2	0.34	0.47	0.16	0.12	0.18	0.17
General Parameters	Nitrogen, Total	mg/L	0.05	0.223	0.246	0.377	0.569	0.194	0.222	0.216	0.272
General Parameters	Phosphorus, Total	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
General Parameters	Chlorophyll-a	ug/L	0.1	1.4	1.3	1.4		1.4	1.1	1.2	1.3

Appendix C

Zooplankton Results

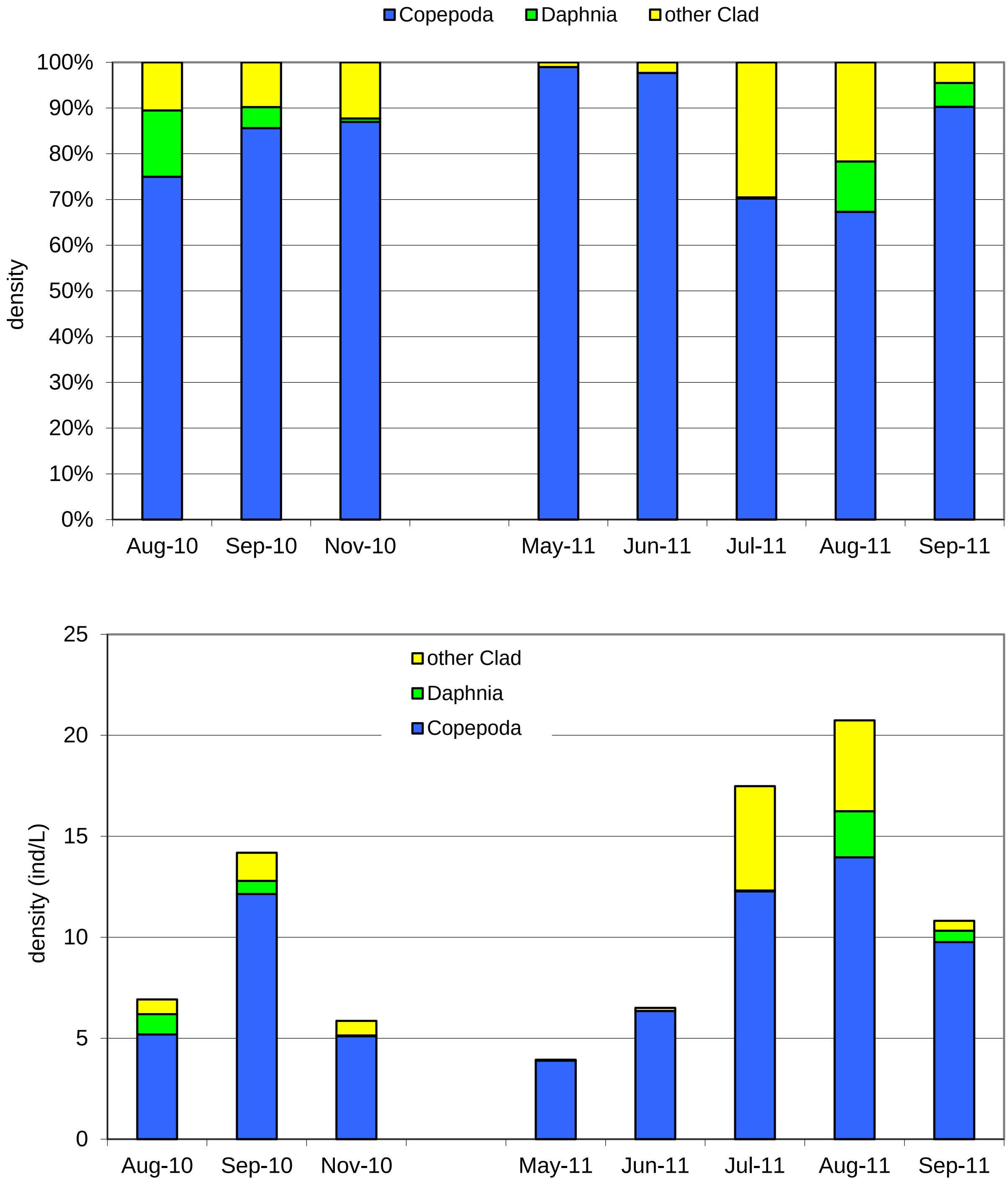


Figure 1. Seasonal average composition of zooplankton density in Slocan Lake in 2010-2011

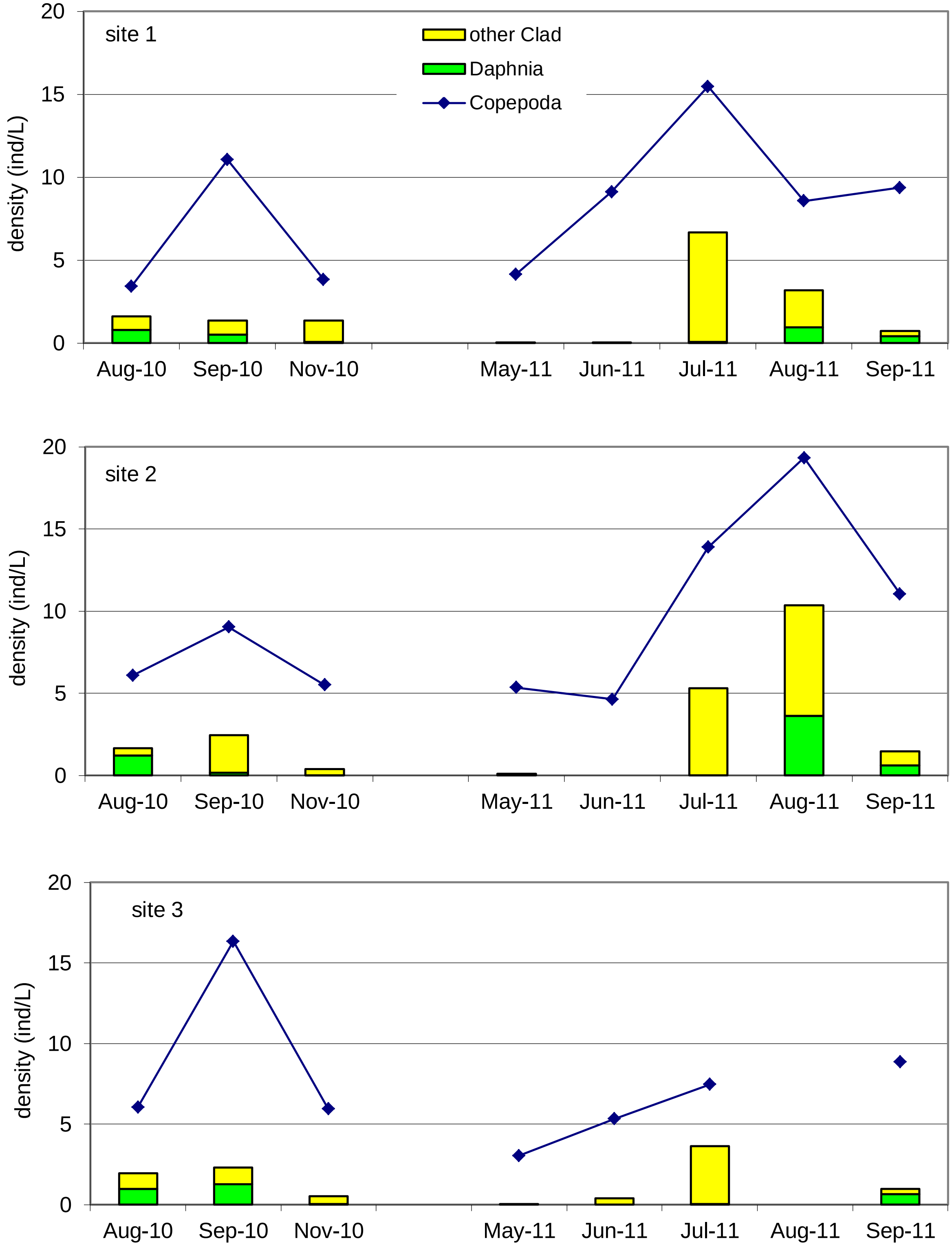


Figure 2. Zooplankton density at three sites in Slocan Lake in 2010-2011

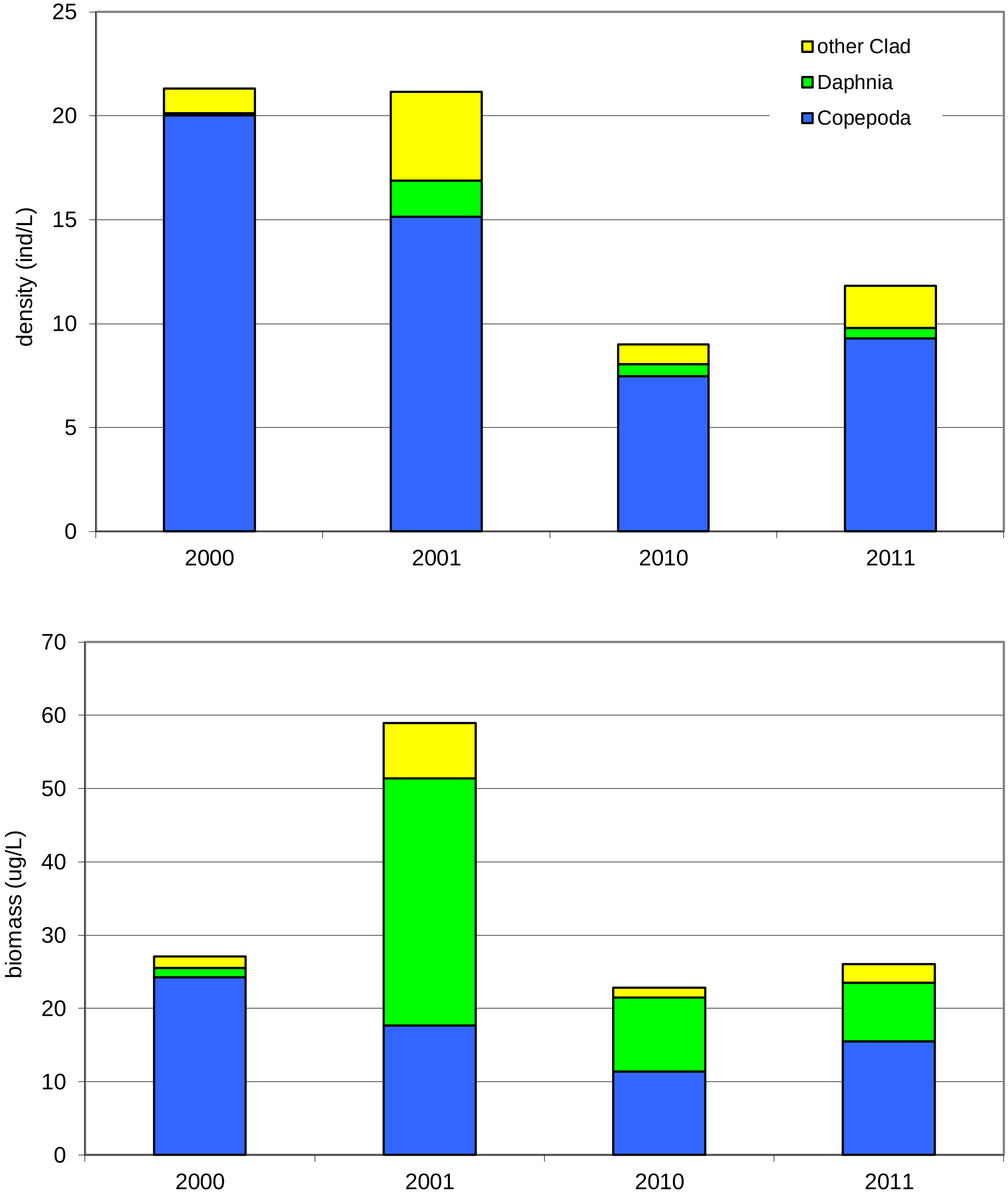
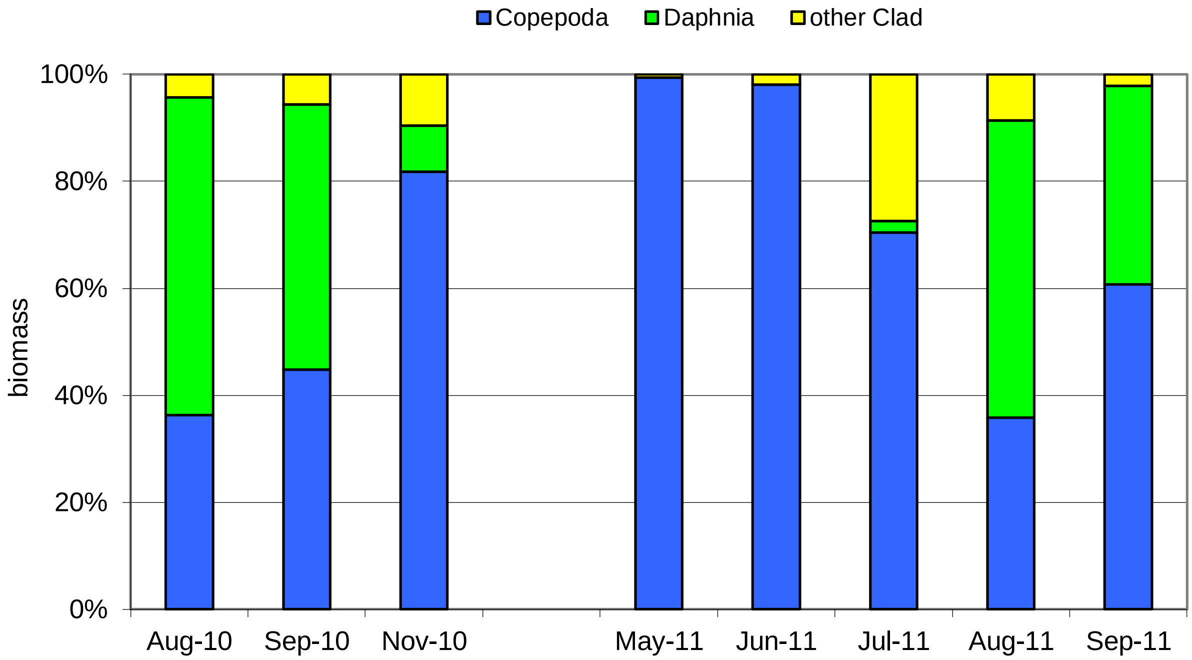


Figure 3. Seasonal average (August - October) zooplankton density and biomass in Slocan Lake in 2000, 2001, 2010 and 2011



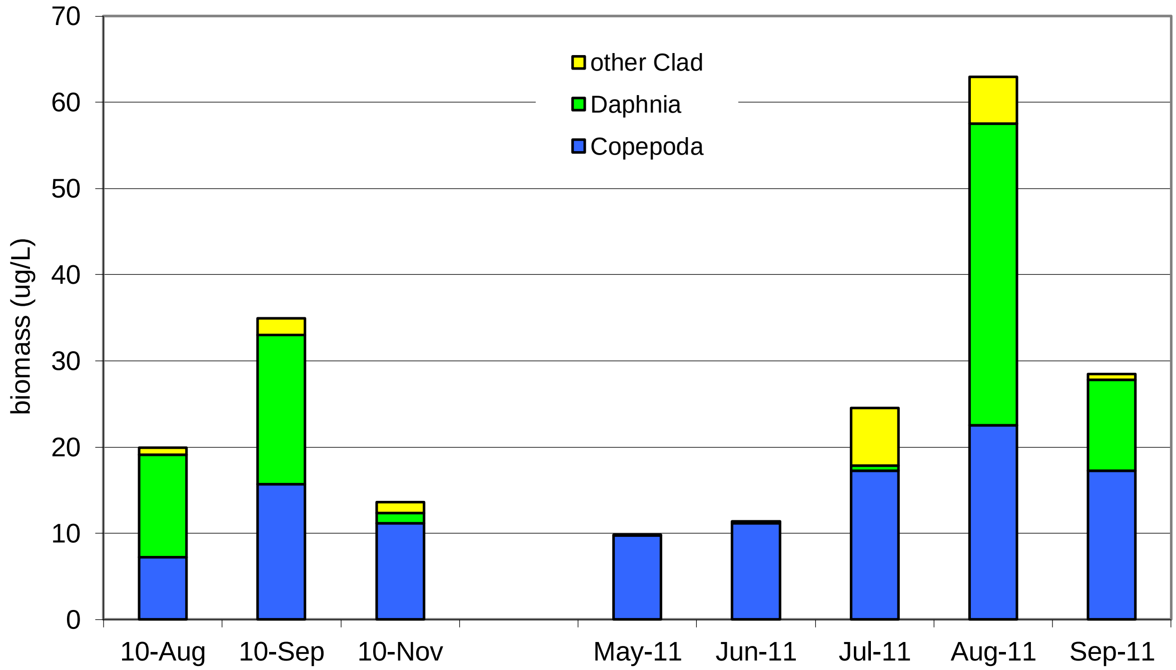


Figure 4. Monthly average composition of zooplankton biomass in Slocan Lake in 2010-2011

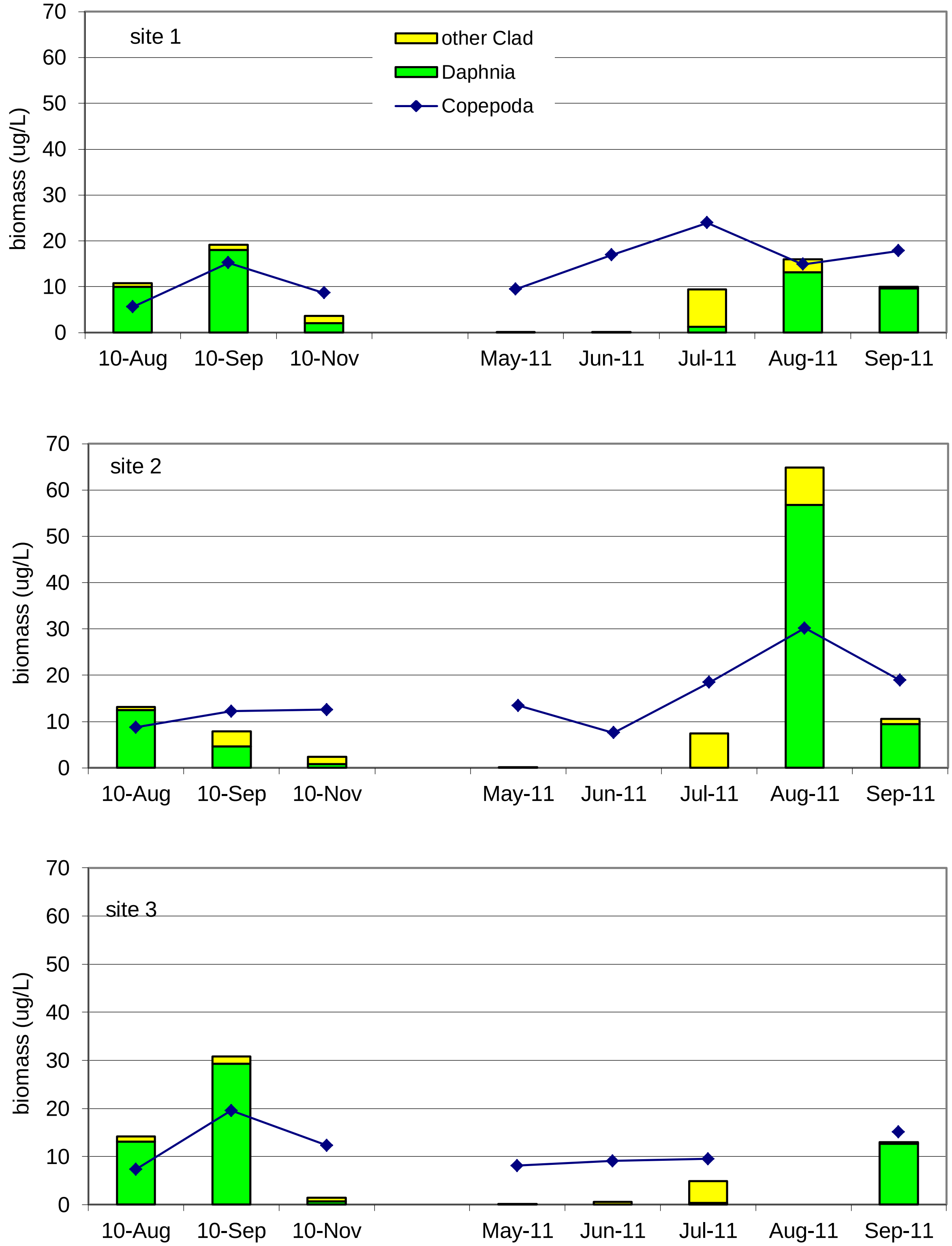


Figure 5. Zooplankton biomass at three sites in Slocan Lake in 2010-2011

seasonal average zooplankton biomass ug/L

	2000	2001	2010	2011
Copepoda	24.23642	17.65177	11.36183	15.53227
Daphnia	1.269021	33.77175	10.11278	7.949944
other Clad	1.562633	7.520211	1.386058	2.595993
total	27.06807	58.94373	22.86067	26.07821

zooplankton biomass (ug/L) at each station

station 1

	10-Aug	10-Sep	10-Nov	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Copepoda	5.570468	15.23574	8.632657	9.456328	16.90325	23.93726	14.88691	17.83323
Daphnia	9.949754	18.05381	2.014524	0	0	1.224095	13.17109	9.614633
other Clad	0.872194	1.144886	1.630578	0.055629	0.117112	8.228002	2.875269	0.403897
total	16.39242	34.43444	12.27776	9.511957	17.02036	33.38935	30.93327	27.85176

station 2

	10-Aug	10-Sep	10-Nov	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Copepoda	8.779531	12.21157	12.5541	13.44413	7.599798	18.44273	30.16671	18.92148
Daphnia	12.51277	4.594242	0.784502	0	0	0	56.83972	9.471739
other Clad	0.681973	3.283852	1.57679	0.127513	0	7.437559	7.972366	1.119174
total	21.97428	20.08966	14.91539	13.57164	7.599798	25.88028	94.9788	29.51239
							59.84464	

station 3

	10-Aug	10-Sep	10-Nov	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Copepoda	7.371979	19.5749	12.32557	8.10639	9.088857	9.513983		15.06869
Daphnia	13.08437	29.29395	0.727067	0	0	0.392923		12.63508
other Clad	1.063818	1.504686	0.715749	0.039691	0.557024	4.550741		0.3555
total	21.52017	50.37354	13.76838	8.14608	9.645881	14.45765		28.05927

average monthly zooplankton biomass (ug/L) in Slocan Lake

	10-Aug	10-Sep	10-Nov	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Copepoda	7.240659	15.67407	11.17077	9.778308	11.1973	17.29799	22.52681	17.27447
Daphnia	11.84897	17.314	1.175364	0	0	0.539006	35.0054	10.57382
other Clad	0.872662	1.977808	1.307706	0.065631	0.224712	6.738768	5.423818	0.62619
total	19.96229	34.96588	13.65384	9.843939	11.42201	24.57576	62.95603	28.47447
							55.60294	

% of zooplankton density in Slocan Lake

	Aug-10	Sep-10	Nov-10	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Copepoda	36.27169	44.82675	81.81413	99.33329	98.03264	70.38638	35.78181	60.6665
Daphnia	59.35676	49.51685	8.608304	0	0	2.193242	55.60294	37.13437
other Clad	4.371552	5.656395	9.577565	0.666713	1.967362	27.42038	8.615247	2.199129