Mactaquac Aquatic Ecosystem Study
Report Series 2015-007

MACTAQUAC AQUATIC ECOSYSTEM STUDY

METHODS PAPER:

Sampling Physical Limnology and Plankton in the Mactaquac Head Pond

Adam Chateauvert

16 April 2015

Canadian Rivers Institute

UNB

Correct citation for this publication:

Chateauvert, A. 2015. METHODS PAPER: Sampling Physical Limnology and Plankton in the Mactaquac Head Pond. Mactaquac Aquatic Ecosystem Study Report Series 2015-007. Canadian Rivers Institute, University of New Brunswick. 5 p.

DISCLAIMER

Intended use and technical limitations of the report, "Sampling Physical Limnology and Plankton in the Mactaquac Head Pond". This interim report describes the methodologies being developed to quantitatively sample the physical limnology and plankton of the Mactaquac Head Pond. The CRI doesn't assume liability for any use of the included information and data outside the stated scope.

Introduction

Annual and in-season physic-chemical limnological and plankton community surveys of the Mactaquac Headpond (reservoir) are planned to establish a spatio-temporal understanding of the system (***Project 1B.1.6***). The surveys will be used in conjunction with an assessment based upon the acoustic volume scattering signature of plankton (***Project 1B.1.1***). The reservoir data will provide an opportunity to test and develop a rapid phytoplankton assessment tool using for example a "bbe AlgaeTorch".

Methods

Study Design

The limnological survey will consist of fixed site sampling of vertical profiles (standard approach of Wetzel 2001) and sets of longitudinal acoustic surveys derived from a towed underway profiler, MVP-30 (temperature and 200 kHz), during the bathymetry survey (Project 1B.1.1).

As of 2014, physical limnology (depth profiles) profiles were established for nine (9) locations within the Mactaquac Headpond and one location in the lotic environment upstream of the Town of Nackawic (Table 1 and Figure 1; depths 10-29m). Each location consists of three (3) sample points on a cross-reservoir transect: centre, left, and right banks.

In 2014, plankton samples were collected from four (4) of the same locations within the Mactaquac Headpond (Table 1, Figure 1). Sampling was conducted at the deepest point at each headpond site. Sampling was either an integrated vertical tow (~1 m above the bottom to the surface) or where thermally stratified, discrete samples were collected from the surface, metalimnion, and mid-hypolimnion.

Physical Limnology

At each location, a depth (vertical) profile was conducted at the deepest point based on bathymetry maps and on river left and river right creating a transect perpendicular to water flow. Profiles are to be conducted in late August/early September to capture thermal stratification.

A portable depth sounder was used to estimate site depth. Depth profiles were collected using a YSI 6600 V2 Sonde equipped with temperature, pressure, pH, optical dissolved oxygen, and turbidity probes. Probe calibration for pH (3-point), dissolved oxygen (100% saturation), and turbidity (distilled water) was conducted daily in the laboratory prior to sampling. Pressure calibration was conducted in the field. The Sonde was programmed to record probe readings every 20 seconds. For each reading, the Sonde was placed at the water surface for 1-2 minutes for equilibration, after which it was lowered at a rate of 1 m / min which produced a minimum resolution of 3 readings / m.

Plankton Sampling

When the water column was thermally stratified, plankton sampling was conducted at discrete depths using a 2.5 L Van Dorn bottle. Multiple pulls of the Van Dorn bottle were composited by pouring the collected water through a 35 µm mesh strainer and using a pre-filtered water (35

µm) to rinse the filtered material into a pre-labelled plastic jar. Epilimnion - Six (6) pulls of the Van Dorn bottle from 1 m below the water surface comprised a composite sample. Four (4) pulls of the Van Dorn bottle were composited to obtain metalimnion, mid-hypolimnion, and bottom samples. The depth of the metalimnion and mid-hypolimnion samples was determined using a portable depth sounder and temperature profiles recorded using a YSI 6600 V2 Sonde connected to a YSI 650 handheld that displayed the profile data.

Where no stratification was apparent, an integrated water column sample was collected using a net towed vertically from 1 m above the bottom (to a maximum depth of 30 m) to the surface using a plankton net (Supplier: Valox http://www.valoxltd.com, Manufacturer: Sea-Gear Corp. http://www.sea-gear.net): 35 µm mesh size, conical net with a 30 cm mouth, 90 cm length and removable cod-end (35 µm mesh size). After determining the depth, the net was deployed and allowed to sink to ~1 m above the bottom before being retrieved at a rate of ~15 cm/s. Pre-filtered water (35 µm) was used to rinse plankton stuck on the net into the cod-end of the plankton net. Plankton were collected in pre-labelled plastic jars (125 mL) and preserved to a final concentration of 5% neutral buffered formalin. Samples were returned to the laboratory and later shipped to EcoAnalysts (Moscow, Idaho; www.ecoanalysts.com/) for taxonomic identification, enumeration, and biovolume estimation of zooplankton and phytoplankton.

Notes for 2015: Additional weight can and should be added to the cod end to insure a direct bottom to surface pull. In addition, a flow meter can and should be added to the net opening to estimate total volume sampled as well as an estimate of the rate of retrieval (for standardizing effort among sites and technicians).

Laboratory Analysis

At the EcoAnalysts laboratory, using a 1 mL Hensen Stempel pipette, zooplankton samples were homogenized before removing 1 mL of sample and rinsed into a gridded Corning counting chamber. The rinse water contained a drop of soap to reduce surface tension. A target count of 300 organisms (range: 200 to 400 organisms) was identified to the lowest practical level. Copepod nauplii and other planktic organisms (insects, mites, etc.) were enumerated but not counted against the target count. Zooplankton biovolume was estimated through 30 measurements apportioned among the dominant three taxa in each sample.

At the EcoAnalysts laboratory, phytoplankton samples were analyzed using the Utermohl method using a minimum magnification of 630X. The volume of sample settled in the Utermohl chamber was dependent on organism density. A minimum of 300 biological units (cells, colonies, or filaments) were counted with soft algae taxa and live diatom taxa being identified to genus or species when possible. Phytoplankton biovolume was estimated through 25 measurements of dominant taxa and 5 measurements per subdominant taxon.

References

Wetzel, R. G. 2001. Limnology. Third Edition. Academic Press, New York. 656 p.

Figure 1. Physical limnology and plankton sampling sites, MAES 2014

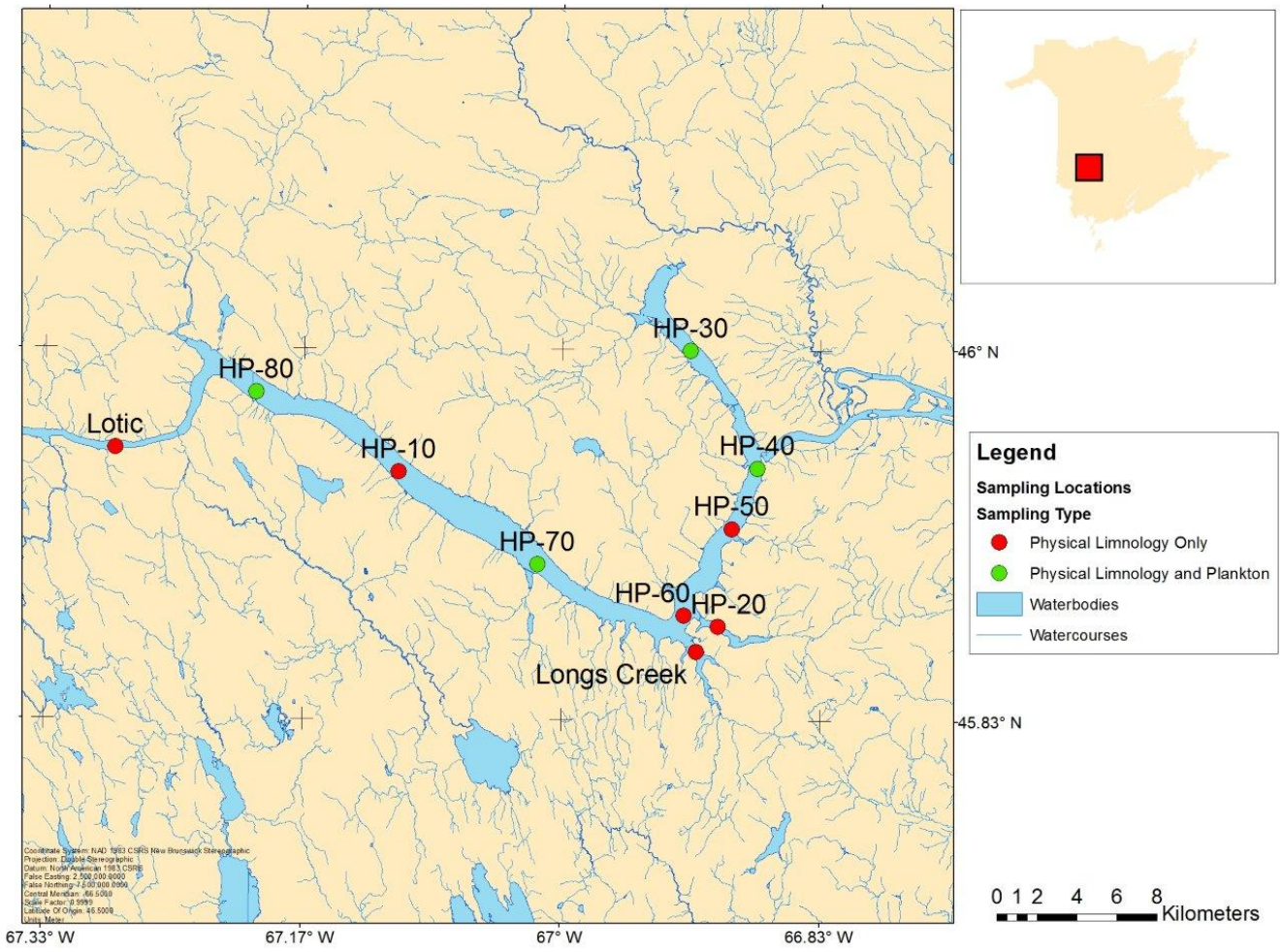

Table 1. MAES physical limnology and plankton sampling sites, MAES 2014.

				Samples in 2014	
Site	**Description**	**Latitude**	**Longitude**	**Physical Limnology**	**Plankton**
HP-30	Mactaquac Arm	N46.00012	W66.91730	x	x
HP-40	Mactaquac Dam	N45.94717	W66.87388	x	x
HP-50	U/S Mactaquac Dam	N45.91996	W66.89037	x	-
HP-60	U/S Kelly Creek	N45.88094	W66.92110	x	-
HP-20	Kelly Creek	N45.87588	W66.89915	x	-
Longs Creek	Longs Creek	N45.86466	W66.91315	x	-
HP-70	U/S Longs Creek	N45.90372	W67.01537	x	x
HP-10	D/S Nackawic	N45.94509	W67.10531	x	-
HP-80	Nackawic	N45.98052	W67.19748	x	x
Lotic	U/S Nackawic (Lotic)	N45.95523	W67.28825	x	-

U/S indicates upstream
D/S indicates downstream