Lake Diatoms as Indicators of Late Holocene Climate Variability in the Boreal Region of the Northwest Territories, Canada

by

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A thesis submitted to the Faculty of Graduate and Postdoctoral Affairs in partial fulfillment of the requirement for the degree of

Master of Science

in

Earth Sciences

Carleton University

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Abstract

This thesis is comprised of two manuscripts that focus on diatom ecological change through a late Holocene ~ 3300 year record from a 116.2 cm freeze core obtained from Danny's Lake, Northwest Territories, Canada. The diatom results indicate that climate in this region has been relatively stable through the past 3330 cal. yr BP, although three distinct diatom assemblages are recognized. Time-series analysis was also carried out on select diatom species from the Danny's lake sediment core. We correlate the c. 89 and c. 145 year cycles with the 90 – 140 year Gleissberg cycle, while the c. 309-year cycle is attributed to the 300-year overtone of the 2115-year Hallstadt cycle. This research is part of a multi-proxy project mandated to determine late Holocene climate variability along the route of the economically important Tibbitt to Contwoyto Winter Road (TCWR), a seasonal ice road that stretches 600 km from Yellowknife to Nunavut.

Preface

Given the enormity of the ice road project, a significant amount of collaboration was involved during this research. Having said that, I was fully involved in setting up and carrying out the research, obtaining data and analyzing results, as well as preparing and writing the multi-author manuscripts presented in this thesis. Specifically, I was responsible for carrying out subsampling, diatom preparation and enumeration, as well as subsequent interpretation of data from the Danny's Lake freeze core. Input from colleagues came in the form of aiding in data analysis and interpretation, as well as reviewing manuscripts. In addition, I had access to age models, loss on ignition and magnetic data, which was shared between all collaborators who are studying the Danny's Lake core. Persons involved in any aspect of this project are acknowledged.

The manuscript presented in Chapter 2 of this thesis was written solely by myself, and will include the following additional authors when submitted for publication in the peer-reviewed literature; Andrew L Macumber, Jesse C Vermaire, R Timothy Patterson, Carley Crann, Helen M Roe, Jennifer M Galloway and Hendrik Falck. Please see Appendix A for a detailed declaration of involvement for each co-author on this paper.

The manuscript presented in Chapter 3 was written solely by myself, and will include the following authors when submitted for publication in the peer-reviewed literature; Andrew L Macumber, R Timothy Patterson, Graeme T Swindles, Helen M Roe, Jennifer M Galloway and Hendrik Falck. Please see Appendix A for a detailed declaration of involvement for each co-author in this paper.

Statement of Supervisor

April Sue Dalton was fully involved in setting up and conducting the research, obtaining data and analyzing results, as well as preparing and writing the material presented in the co-authored articles integrated in this thesis.

_____ _____

R Timothy Patterson Date

Acknowledgements

This project would not have been possible without a dedicated research team, which was headed by Dr. Tim Patterson. I wish to firstly thank him for introducing me to the Ice Road project and encouraging me to pursue this research. I am truly grateful for this opportunity.

I would secondly like to recognize Andrew L Macumber, Fritz Griffith and Carley Crann who both acted as a mentors, friends and teammates on the entire Danny's Lake project.

Thirdly, I would like to thank Helen Roe and Jesse Vermaire for teaching me how to process and identify the various species of diatoms that I encountered, as well as aiding in diatom ecology and interpretation. Both Jennifer Galloway and Hendrik Falck shared their knowledge on the boreal region of the Northwest Territories. Their assistance with logistical support and fieldwork was invaluable. Help with statistics, wavelet and spectral analysis, as well as data interpretation was graciously provided by Graeme Swindles.

Financial support for this research was provided by the Natural Sciences and Engineering Research Council of Canada (NSERC) strategic project grant to RTP, as well as financial and in-kind support from the Geological Survey of Canada, the Northwest Territories Geoscience Office, the North Slave Métis Alliance, and the Tibbitt to Contwoyto Winter Road Joint Venture. Support was also provided by the Polar Continental Shelf Program (PCSP) and Northern Scientific Training Program (NSTP), grants provided by the Northwest Territories Cumulative Impact Monitoring Program (CIMP) and the Northwest Territories Geosciences Office (NTGO). In addition, I would

like to thank the staff of the Tibbitt to Contwoyto Winter Road Joint Venture who provided important logistical support for field-work in this challenging region, as well as Robert Mercredi for assistance in core collection.

I would like to acknowledge the Dr. George A. Jeletzky Memorial Scholarship, awarded to students pursuing studies in the field of paleontology, for providing me with financial assistance. I am also grateful to my committee members, Dr Konrad Gajewski and Dr Paul Gammon, who graciously took time out of their busy summer schedules to serve on my committee.

Finally, I would like to thank family and friends who supported me along this journey.

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Chapter 1: Introduction

Goal of study

Diatom assemblages were examined from a record that spanned the last ~3300 years of the late Holocene in a freeze core collected from Danny's Lake, Northwest Territories (NT), Canada. The goal of this study was; (1) to quantify trends and natural modes of subarctic climate variability through the late Holocene period using diatom populations as proxies; (2) to determine whether diatom-derived late Holocene climate trends and cycles could be recognized based on time-series analysis; and (3) to employ select diatom assemblage components, which have previously been used to infer past ice-cover elsewhere, and by extension temperature, in the Danny's Lake core. For example, certain benthic taxa of the *Pseudostaurosira* complex tend to flourish under ice-covered conditions where light penetration is significantly reduced, while planktic species attributable to *Aulacoseira* complex tend thrive under ice-free conditions during wind-induced turbulence of the lake. This research is of significance to planners and policy makers as they strive to understand the nature of climate variability and possible future climate conditions along the route of the Tibbitt to Contwoyto Winter Road (TCWR).

Climate of Northwest Territories and Tibbitt to Contwoyto Winter Road

Northern regions have been referred to as the "miners' canary" of climate change due to their sensitivity to even slight climate variability (Lim et al., 2007). The reason that high latitude regions are so responsive to climate variability is because of the positive albedo feedback link between snowmelt and absorption of solar radiation (ACIA, 2004). Even minor arctic warming has far reaching implications, including the raising of global

sea levels due to the melting of polar ice and possible ecological consequences related to habitat loss (ACIA, 2004).

The TCWR is 88% built on frozen lakes and stretches 600 km northeast from Contwoyto Lake, NT, into Nunavut. This winter-only transportation route serves as the main corridor for getting critical mining supplies (e.g. fuel, tires, concrete, heavy equipment) to mine sites in the central NT and southern Nunavut. In 2006, the central NT was impacted by an especially mild and stormy winter related to the El Niño of that year. Due to unseasonably mild conditions, the TCWR was forced to cease operations a month early, which caused serious economic losses and the closing of one mine. In 2009, a NSERC strategic project grant was awarded to RT Patterson and collaborators which was mandated to determine the nature of natural climate cycles impacting this region through the last ~3500 years of the late Holocene, and to provide an indication of possible future climate variability in the region.

Diatoms in arctic lakes

The retreat of the Laurentide ice sheet in the central NT, ~ 9000 years before present (Dyke and Prest, 1987) resulted in the formation of many shallow lakes on the Canadian Shield, which underlays most of the boreal forest region. These shallow lakes are strongly influenced by seasonal weather conditions (Adrian et al., 1999; Kohler & Hoeg, 2000), thus making perfect reservoirs to capture a record of past climates. Diatoms (Class Bacillariophyceae) are single-celled protists that are found worldwide in most lacustrine environments. They are sensitive limnological indicators because of species-specific responses associated with changes in light availability, lake chemistry, nutrient

availability and water temperature (Adrian et al., 1999). If bioturbation is not severe, analysis of lake sediments containing benthic and planktic faunas can provide a valuable overview of the evolution of the entire lake ecosystem.

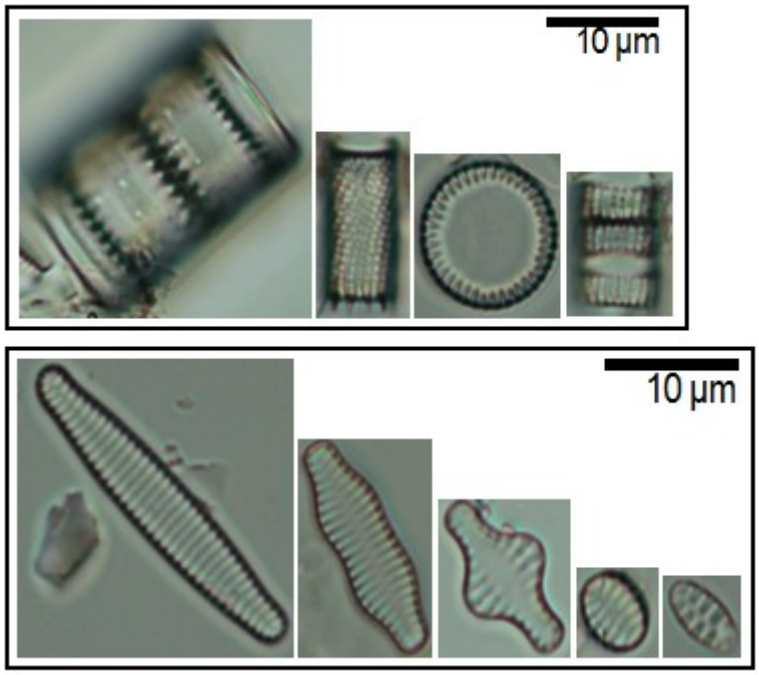

Figure 1.1. Common *Aulacoseira* complex and *Pseudostaurosira* complex found in the Danny's Lake core. From left to right: *A perglabra, A subarctica, A alpigena, A distans*. Bottom - Common *Pseudostaurosira* complex species found in the Danny's Lake core. From left to right: *Staurosira construens var. exigua, Staurosira construens var. binodis, Pseudostaurosira pseudoconstruens, Staurosira construens var. venter, Staurosirella pinnata.*

This research takes advantage of the utility of diatoms to infer past climate conditions. Of particular importance are two species groups, which are prominent in Danny's Lake: benthic *Pseudostaurosira* complex (Figure 1.1), which tend to flourish under ice-covered conditions where light penetration is significantly reduced (Smol,

1988) and planktic *Aulacoseira* complex (Figure 1.1), which require turbulent lake condition to thrive (Korhola, 1996; Sorvari & Korhola, 1998), thus past wind conditions can be inferred. In addition, *Achnanthidium minutissimum* live attached to the substrate of the lake, and have been demonstrated to be prone to habitat disruption caused by increased turbulence (Barnese & Lowe, 1992). Based on this characteristic, this species can be used to provide an indication of past wind and storm conditions.

Research gaps addressed

Most other studies in this region have focused on lakes located on the tundra, whereas this project is focused on a lake within the boreal forest (see Table 1.1). This project is unique because it is based on high-resolution data analysis of 6 years per sediment sample covering the past 3300 years, where the previous studies focused on broader Holocene timescales at lower resolution, as seen in Table 1.1. In addition, Chapter 3 documents the results of a time-series analysis of the diatom floras, which reveals considerable information on the nature of stationary and non-stationary trends and cycles that have characterized the late Holocene. Similar time-series analysis has not yet been conducted in the central NT.

High-resolution studies have the ability to reveal short-lived or high frequency climate events. Our study employs an unprecedented 6-year resolution for the Canadian North, enabled by the use of freeze coring and a custom-designed sledge microtome. The most obvious benefit of conducting a paleolimnological study at such a resolution is the

Table 1.1 Summary of paleolimnology studies from the treeline region of the Northwest Territories, Canada. "Loc" refers to the lake and "Res" refers to the estimated number of years represented in each sample of the study.

Lake	Loc	Proxy	Max yrBP	Res	Publication
P-49	Tundra	chironomids, sedimentology	6500	30	Upiter et al., 2013, *in review*
S41	Tundra	chironomids	2857	40	MacDonald et al., 2009
TK-2	Tundra	diatoms	9056	80	Paul et al., 2010
McMaster	Tundra	pollen	6180	500	Moser and Macdonald, 1990
Queen's	Tundra	diatoms, pollen	6150	600	Macdonald et al., 1993
Slipper	Tundra	diatoms	5660	140	Macdonald et al., 1993; Rühland and J. Smol, 2005
Toronto	Tundra	diatoms, isotopes, pollen	7040	125	Wolfe et al., 1996
UCLA	Tundra	pollen	8500	100	Huang et al., 2004
Waterloo	Tundra	pollen	7640	?	Macdonald et al., 1993
Danny's	Boreal	diatoms	3300	6	This dissertation

ability to see proxy-based lake conditions over a much shorter time interval. Decadal-scale or finer reconstructions of environment are most applicable for land-use planners. Furthermore, most mineral-based industry projects in the NT have an operating life on a decadal-scale so this resolution of environmental study is relevant. The only other study in our region that documented a pronounced cool and windy period at approximately 1400 cal. yr BP (Upiter et al., 2013, *in review*) was also conducted at a decadal-scale resolution.

Structure of dissertation

This thesis is primarily comprised of two manuscripts, which have been formatted for submission to specific journals. Input from co-authors and committee members will be incorporated into the manuscripts prior to submission for publication. Both manuscripts are based on the same diatom dataset from Danny's Lake, but utilize different methods to reveal the nature of past climate variability in this region. The manuscript presented in Chapter 2 focuses on down-core diatom trends through the late Holocene at Danny's Lake, NT. In this study, three diatom diatom assemblages are recognized that correspond to chronologically distinct limnological conditions that prevailed at Danny's Lake. This manuscript is being prepared for submission to Palaeogeography, Palaeoclimatology, Palaeoecology. The manuscript in Chapter 3 focuses on spectral and wavelet analysis of the *Aulacoseira* complex and *Pseudostaurosira* complex. Time-series analysis is a particularly useful tool for recognizing trends and cycles in climate proxy records. This manuscript is being prepared for submission to Earth and Planetary Science Letters. References for all chapters are presented in the style of Earth and Planetary Science Letters and listed at the end of the thesis.

Chapter 2: A 3330-year Multi-Proxy Climate Record from Canadian Subarctic: Detection of Storm event at 1100 cal. yr BP and Potential for Time-series Analysis

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Abstract

Freeze coring, paired with sampling using a sledge microtome, provides an important advance in high-resolution paleoclimate studies. We examine diatom assemblages from Danny's Lake, located 50 km south of the modern-day treeline in the Northwest Territories (NT), Canada. The diatom record indicates that climate in this region has been fairly stable over the past 3330 cal. yr BP, although subtle shifts in diatom assemblages suggest small-scale climate changes. The overall trend shows an increase in abundance of the heavily silicified *Aulacoseira* complex, coupled with a decline of *Pseudostaurosira* complex. At the beginning of the record, we infer cool conditions and low wind. This is evidenced by the high *Pseudostaurosira* complex, which thrive under conditions of increased ice-cover, along with low *Aulacosiera*

complex, which require turbulent lake condition to thrive in the photic zone. There is evidence of a period of active weather from 1480 – 1090 cal. yr BP, by means of a decrease in benthic *Achnanthidium minutissimum,* an increase in sediment grain size, and significant fluctuations in the magnetic susceptibility data through this interval. Evidence of the Medieval Warm Period (1040 - 970 cal. yr BP) at this site is provided by an increase in the relative abundance of *Discostella stelligera* complex, known to be an indicator of warmer surface waters. In recent times, the stabilization of diatom populations at Danny's Lake suggests a stable climate, which persists into present-day.

Keywords

Holocene, diatoms, paleolimnology, treeline, Northwest Territories, high-resolution, sledge microtome, freeze core, fresh water effect

1. Introduction

Northern regions of Canada are expected to be disproportionately affected by predicted climate warming. Northern Canada has warmed by 1.5 - 2^{o}C each decade since 1980, and climate model projections suggest that this warming will continue through the coming decades (ACIA, 2004). In the Northwest Territories (NT), Canada, evidence of this warming has been marked by a shift, beginning in the 19th century, of diatom communities from assemblages dominated by benthic flora to diatom assemblages dominated by planktic flora in lakes located 50 km (Rühland and Smol, 2005) and 265 km (Paul et al., 2010) north of the present-day treeline. In both cases, these changes were attributed to a decrease in winter ice-cover extent and duration, ultimately caused by a warmer climate.

The treeline in the NT corresponds to the position of the Arctic front during summer months (Bryson et al., 1969), which impacts regional air temperature, precipitation patterns and albedo (Macdonald et al., 1998). As a result, different biomes are seen on either side of this vegetation divide. Adding to the importance of the Arctic treeline is the sensitivity of the organisms inhabiting this region as they are often living close to their ecological tolerances (Wolfe et al., 1996; Macdonald et al., 1998; Pienitz et al., 1999; Rühland & Smol, 2002; Lloyd et al., 2003; Seppa et al., 2003). This area has been poorly studied in the NT (Huang et al., 2004; Peros et al., 2010), and a better understanding of how climate affects the transition across the treeline is needed (Macdonald et al., 1998; Huang et al., 2004) in order to better understand the timing and magnitude of past and future climate changes.

Present-day climate in the north and Pacific regions of Canada was established approximately 3500 years ago, with the onset of late Holocene neoglaciation (Karst-Riddoch et al., 2005; Rühland & Smol, 2005; Miller et al., 2010). Late Holocene conditions have been relatively stable (3500 yr BP – present-day), in part due to the relatively stable solar insolation at 65°N, which has been at a plateau since approximately 3500 yr BP (Berger et al., 1991; Steinhilber et al., 2009). There have, however, been major excursions in solar insolation through this interval that correlate well with pan-hemispheric events such as the Medieval Warm Period (MWP) and the Little Ice Age (LIA). These past climate changes may be used as analogues of how ecosystems respond to predicted climate change in northern Canada.

This research project is part of a much larger multi-proxy research study mandated to assess the impact of climate change on the long-term viability of the Tibbitt

to Contwoyto Winter Road (TCWR). This transportation route stretches 600 km from near Yellowknife, NT, northward across the treeline and into southern Nunavut (Figure 2.1). The TCWR is built primarily on frozen lakes and is the only overland access route for numerous diamond mines and mineral development projects in the region. The work was initiated in the wake of warmer-than-usual temperatures and increased storminess during the winter of 2006, brought on by an El Niño-Southern Oscillation event. That year, the TCWR season was shortened by 26 days below average, which led to significant financial losses for mining companies and sparked interest in having a better understanding of the climate variability in this region. With continued mining activity along the TCWR, policy makers and planners require a better understanding of the impact of climate change and natural climate variability in this region.

This research is focused on a paleolminological assessment of sediments from Danny's Lake, one of the numerous lakes located in the boreal forest portion of the TCWR, just south of the present-day treeline. A multi-proxy approach is employed to better understand how past changes in late Holocene (last ~3500 years) climate in the NT has impacted the Danny's Lake ecosystem. Diatoms (Class Bacillariophyceae) have been demonstrated to be sensitive indicators of environmental change (Smol, 1988). In arctic ecosystems, certain benthic taxa (*Pseudostaurosira* complex) flourish under ice-covered conditions where light penetration is significantly reduced, while planktic species (*Aulacoseira* complex) thrive under ice-free conditions and often in turbulent surface water (Korhola, 1996; Sorvari & Korhola, 1998). Diatom populations can also be used to infer past storm events. For example, a decrease of *Achnanthidium minutissimum,* which thrive on the lake substrate, is often a sign of habitat disturbance caused by increased

wind or precipitation (Barnese and Lowe, 1992). By understanding past climate variability in the NT, land-use managers will be better equipped to recognize, plan for, and respond to future climate change.

2. Site description

Danny's Lake (63 28.547^{o}N; -112 32.785^{o}W) is located in the present-day boreal forest region of the NT, approximately 150 km northeast of Yellowknife and 50 km south of the modern-day treeline (Figure 2.1). The catchment of Danny's Lake is underlain by Archean granitic gneiss bedrock consisting of an amphibolite-grade paragneiss to quartz biotite schist (Stubley, 1990; Davis et al., 1996). The land surrounding our study site is sparsely vegetated with black spruce (*Picea mariana*), white spruce (*Picea glauca*) and smaller amounts of tamarack (*Larix larincina*) and pine (*Pinus L.*). Climate in the Danny's Lake area is continental, alternating between long, cold winters (average January temperature -26.8^{o} C) to brief cool summers (average July Temperature 16.8 ^{o}C). Average annual precipitation is 164.5 mm (Environment Canada, 2013).

Danny's Lake has a surface area of 0.19 km^{2} (Figure 2.1) and maximum depth of 10 m. This lake was not thermally stratified when measured in August, 2011 (Table 2.1) The lake has an ephemeral inlet at its northeastern-most extent, and an outlet at the opposite southwestern end (Figure 2.1).

3. Methods

3.1 Freeze coring and subsampling

A 116.2 cm long sediment core was retrieved from a 4.4m deep sub-basin of Danny's Lake using a custom-designed two-faced freeze coring device (Galloway et al., 2010; Macumber et al., 2012). The sediment core was kept frozen and transported to Carleton University for analysis. Both faces of the core were sectioned into 0.1 cm subsamples using a custom-built sledge microtome (Macumber et al., 2011), and slices were allocated to several research projects. We allocated one slice every 0.5 cm until 56.3 cm to this diatom study in order to focus on limnological change over the past ~3500 cal. yr BP.

3.2 Radiocarbon dating and Bayesian age-depth modelling

Twenty-five bulk sediment samples were chosen for accelerator mass spectrometry (AMS) ^{14}C dating at the ^{14}CHRONO Centre for Climate, The Environment, and Chronology at Queen's University, Belfast, United Kingdom. All samples underwent a standard hydrochloric acid wash to remove carbonate material. Radiocarbon ages were calibrated using Calib software version 6.1.0 (Stuiver & Reimer, 1993) and the IntCal09 calibration curve (Reimer et al., 2009). Since bulk sediment samples at high latitudes commonly incorporate old carbon (eg. Abbott & Stafford, 1996), we calculated the freshwater reservoir effect (FRE) based on the projected age of the sediment-water interface from an age-depth model constructed in Clam (Crann et al., 2013 *in prep*.). The Clam model was constructed using a smooth spline with the smoothing parameter set to 0.7 and seven outliers were removed using the general outlier model (Bronk Ramsey, 2009a) in OxCal version 4.1 (Bronk Ramsey, 2009b). The calculation of the FRE is

based on the assumption that the sediment-water interface should yield an age close to the year the core was collected and also that the FRE has not changed over the past 3500 years. We are confident that the sediment-water interface was captured during freeze coring and was deposited in 2010. The FRE was subtracted from uncalibrated radiocarbon dates before Bayesian age-depth modelling was undertaken.

The age modeling procedure for Bacon is similar to that outlined in Blaauw and Christen (2011), but more numerous and shorter sections are used to generate a more flexible chronology (Blaauw & Christen, 2011). We used the memory properties suggested for lake sediment cores, with "strength" of 20 and a mean of 0.1. The accumulation mean of 80 yr/cm is based on a summary of accumulation rates for this region by Crann et al.2013 (*in prep.*) and the accumulation shape was set to 20, which is very high, but setting this parameter high reduced the noise associated with likely outliers.

3.3 Diatom sample preparation

Following UCL (2013), approximately 0.5 grams of wet sediment was weighed and transferred into a plastic vial at 0.5 cm intervals downcore to 56.3 cm depth. Sediment was treated with 10 ml of 35% peroxide and heated in an 80^{o}C water bath for 6 hours to digest any organic material. One ml of 10% HCl was then added to dissolve any carbonates. After given 24 hours for the diatoms in each vial to settle at the bottom, the majority of the HCl (approximately 14 ml) was suctioned off and replaced with deionized water. This procedure was repeated 5 times to ensure most of the HCl and peroxide had

been flushed from the samples. Ammonia was added to the final wash to ensure any clay particles remained in suspension and could be removed (UCL, 2013).

Diatom slurries were pipetted onto slides in 4 dilution series and allowed to dry. A cover slide was used to seal each dilution series, using Naphrax as a mounting medium. Diatoms were identified using an Olympus BX51 microscope at 1000X magnification under oil immersion. Diatom species were identified according to Krammer and Lange-Bertalot (1991) by creating transects on the cover slip. At least 400 frustules were identified in each sample in order to obtain statistically significant counts (Patterson & Fishbein, 1989). Species taxonomy was subsequently updated to reflect present-day naming conventions according to the Academy of Natural Sciences and collaborators (2011). See Appendix B for diatom species names and authorities (after Krammer & Lange-Bertalot, 1991) along with updated taxonomy (Academy of Natural Sciences and collaborators, 2011) and unique North American Diatom Ecological Database (NADED) identification numbers. Chrysophyte cysts were also enumerated in each sediment sample.

Diatom counts were converted to relative abundance (RE) and a square root data transform was applied. Constrained incremental sum of squares (CONISS) zones were determined using the rioja packing in R (Juggins, 2011; R Development Core Team, 2012) by comparison to a broken stick model (Bennett, 1996). Stratigraphic diagrams were creating using the C2 program (Juggins, 2011) and are comprised of only those species that reached at least 2% in one sample, after Fishbein & Patterson (1993). Grouped taxa (Table 2.2) are listed according to similar trends and ecology among

species (Paul et al., 2010). See Appendix C for a comprehensive list of diatom counts for the Danny's Lake sediment core.

Shannon Diversity Index (SDI) (Shannon, 1948) and the ratio of chrysophyte cysts to diatoms (C:D) was calculated. The C:D ratio may be used to better understand the trophic status of the lake over time, as an increase in chrysophyte cysts may indicate nutrient-poor waters (Smol, 1985). PCA and DCA were performed on all diatom species occurring in at least 2% in one or more samples.

3.4 Sedimentology

Particle size distributions were determined every 0.2 cm, on a separate face of the Danny's Lake freeze core, using a Beckman Coulter LS 13 320 Laser Diffraction-Particle Size Analyzer with a Universal Liquid Module (Coulter, 2003). The two separate faces of the freeze core were correlated by matching loss on ignition (LOI), magnetic susceptibility (MS) and color changes. Utilizing a protocol modified from Murray (2002) and van Hengstum et al. (2007), 10% H_2O_2 was added to sub-samples in an 80^{o}C water bath to remove organic matter. Grain size statistical parameters were calculated from the results in conjunction with the software package Gradistat v8.0 (Blott and Pye, 2001).

Organic, carbonate and minerogenic content were determined by LOI using a Thermo Scientific Thermolyne Benchtop Muffle Furnace (Model: F48025-60-80) at temperatures of 550 ^{o}C and 950 ^{o}C (Heiri et al., 2001). MS values were obtained by scanning the freeze core with a Bartington MS2B sensor set to low frequency (Dearing, 1999) as described by Sandgren and Snowball (2001) and recorded as standard

international (SI) units. See Appendix D for a list of stratigraphic and sedimentary values for the Danny's Lake sediment core.

4. Results

4.1 Chronology

A Bayesian age-depth model was constructed in Bacon based on the 25 radiocarbon dates obtained from the Danny's Lake core (Figure 2.2). According to this model, the average accumulation rate over the past ~3500 years was 60 years/cm. As the sledge microtome was set for a 0.1 cm slicing resolution, each slice represents 6 years. A uniform FRE of 430 years was subtracted from uncalibrated radiocarbon dates prior to constructing the age-depth model in Bacon (Crann et al., 2013 *in prep*). FREs can be caused by many factors, including: (1) dating submerged aquatic vegetation, which does not readily exchange CO_2 with the atmosphere; (2) input of ^{14}C "dead" carbon from bedrock; or (3) the in-wash of old organic material. Based on the δ13C values obtained during radiocarbon dating (Table 2.3), it was determined that the material dated was terrestrial in origin and not aquatic. It is also known that the old carbon is not likely derived from bedrock, as Danny's Lake is located in a granitic terrain. Therefore, the most likely cause of the FRE at Danny's Lake is the in-wash of old organic material during the spring melt (Crann et al., 2013 *in prep*). Previous studies have shown that the FRE changes over time (e.g. Barnekow et al., 1998; Saulnier-Talbot et al., 2009) with changes in climate and related changes in lake level, vegetation cover, and erosion (e.g. Stuiver, 1975; Geyh et al., 1998; Grimm et al., 2009; Blaauw et al., 2011), but since the regional climate at Danny's Lake has been fairly stable through the past 3500 years, application of a uniform correction is reasonable for dated sediments deposited during

this interval. Age-depth information for each mm slice throughout the examined portion of Danny's Lake sediment core is presented in Appendix F.

4.2 Diatom zonations

A diverse diatom flora consisting of 218 species were identified in the Danny's Lake freeze core (Figure 2.3). Over time, there was a general increase in the relative abundance of *Aulacoseira* complex, with a corresponding decrease in the abundance of *Pseudostaurosira* complex. Three diatom assemblages were identified using CONISS and by comparison to a broken stick model (Bennett, 1996).

4.2.1 First late Holocene diatom assemblage (56.3 – 32.3 cm)

Results of the SDI analysis show that diatom assemblage composition varied significantly through the 56.3 - 32.6 cm section of the sediment core (Figure 2.4). The first late Holocene diatom assemblage is dominated by *Aulacoseira alpigena,* which had an average RE of 25.6%, with a maximum abundance of 51.8% at 36.8 cm and a minimum abundance of 8.8% at 52.9 cm. Benthic *Pseudostaurosira* complex are the second most common species through this interval, having an average RE of 12.1%, reaching a maximum abundance of 20.4% at 56.3 cm and minimum abundance of 4.8% at 38.4 cm. *Achnanthidium minutissimum*, which live attached to the lake substrate, were characterized by a RE of 6.8% throughout this interval, which is the highest RE for this species over the entire sediment core. SDI values ranged from 2.1 to 3.3 through the basal part of the studied record. The results of PCA analysis show considerable variability at the bottom of the sediment core, with an average of 0.088, having a minumim of 0.063 at 52.9 cm and maximum of 0.095 at 39.7 cm. DCA analysis (Figure

2.4) has an average value of 85.7 and minimum and maximum axis loadings of 36 and 133, respectively. C:D ratio maintained an average of 11.4, but saw a high of 16.7 at 55.3 cm and low of 1.1 at 47.9 cm.

4.2.2 Active weather diatom assemblage (32.6 – 23.3 cm)

A significant shift in diatom composition is noted in this interval. *Achnanthidium minutissimum* dropped to an average RE of 4.4% in this zone, indicating decreased habitat preference for the lake substrate. Similar to the first late Holocene diatom assemblage, this interval was dominated by *Aulacoseira alpegina*, having an average RE of 33.8%, with a high of 42.3% at 28.9 cm and low of 24.4% at 23.9 cm. *Cyclotella ocellata* is the second most abundant species during this interval, with a relative abundance of 8.3% with a minimum and maximum RE of 5.1% and 12.1% at 26.3 cm and 31.5 cm, respectively. *Pseudostaurosira* complex decreases in this section of the core to an average RE of 6.7%. To starkly contrast the first late Holocene diatom assemblage, the PCA and DCA results are more stable during this interval, with minimum and maximum axis loadings of 0.092 to 0.095 and 22 to 72, respectively. SD index also reflects more stable diatom populations at this time, with an average value of 2.7. Similar to the first late Holocene diatom assemblage, C:D ratio fluctuates from a minimum of 1.9 to a maximum of 13.2 during this interval.

4.2.3 MWP and LIA diatom assemblage (23.0 - 0 cm)

The most recent diatom assemblage (23.0 - 0 cm) shows a decreased variability in many diatom species that continues into present-day. *Aulacoseira alpegina* is, again, the most common species during this interval with an average RE of 31.3%, exhibiting a

minimum of 19% at 18.4 cm and a maximum of 48.1% at 9.8 cm. The second most common species group is *Aulacoseira* complex, with an average RE of 14.7% and a maximum of 29.7 at 9.5 cm and minimum of 5.4 at 19.6 cm. *Achnanthidium minutissimum*, shows a recovery from the active weather period to 10.0% RE at 22.1 cm depth, and *Cyclotella ocellata* remains steady with an RE 6.9%. During the interval of 22.1 - 20.5 cm, a sustained RE of greater than 5.5% is seen in *Discostella stelligera* complex. This increase is unprecedented in this section of the sediment core. Results from PCA do not vary largely from those seen during the preivious interval, with the exception of 0.078 at 9.4 cm and 0.079 at 5.1 cm. DCA and SD index values do not change drastically from the previous intervals, but an increase in variability is seen in the C:D ratio during this interval.

4.3 Sedimentology

4.3.1 Magnetic susceptibility

From 32.3 – 56.3 cm, which corresponds with the first late Holocene diatom assemblage, low frequency MS values are consistently below 0. The interval from 32.6 - 23.3 cm, however, is characterized by increased variability, from a low of -4.1 at 28.0 cm to a high of 3 at 25.1 cm. From 23.0 – 0 cm, MS values are mostly less than 0 and display a moderate amount of variability. The minimum MS value in these most recent sediments is -4.4 at 2.8 cm and the maximum is 2.2 at 16.3 cm.

4.3.2 Loss on ignition

The components of LOI, expressed as percent organic, carbonate and minerogenic, are plotted over time in Figure 2.4. LOI data is missing for the top 10.0 cm

of the core due to insufficient sediment being available for this analysis. Organic matter fluctuates between 20 - 40% throughout the sediment core. Carbonate concentration is consistently less than 7%, with an exception of 7.75% at 43.0 cm. Minerogenic content makes up 60 - 80% of the sediment content throughout the core.

4.3.3 Grain size analysis

The majority of the Danny's Lake sediment core is comprised of sandy mud, with an average size of 33.9 μm. Of important note is a shift from intervals of coarse silt (31 - 16 μm) to intervals of very coarse silt (63 - 31 μm) between 31.0 to 17.1 cm, which corresponds well with the active weather diatom assemblage. During his interval, mean grain size is consistently elevated above the average variability seen within the rest of the core.

5. Discussion

With an average of 6 years represented by each sediment sample, this paper is the highest resolution analysis of paleoclimate proxies to date in this subarctic region. Lake S41, located just north of the treeline in the NT, had a similar sedimentation rate of 70 yr/cm, but analysis was performed at a decadal-scale (30 - 50 year) temporal resolution (MacDonald et al., 2009). Similarly, tundra lake TK-2 had a sedimentation rate of approximately 75 yr/cm, but was hindered by a sampling resolution of 1 cm, yielding 75 year "snapshots" of climate (Paul et al., 2010). Despite Danny's Lake being dominated by only a few diatom species, it is possible to derive evidence of significant ecological change throughout the late Holocene period.

5.1 Trend / zoning data

5.1.1 First late Holocene diatom assemblage (3330 – 1480 cal. yr BP)

We infer low wind and cool conditions during this period. This is evidenced by the high *Pseudostaurosira* complex, which thrive under conditions of increased ice-cover (Smol, 1988), along with low RE of *Aulacosiera* complex, which require turbulent lake condition to thrive in the photic zone (Korhola, 1996; Sorvari & Korhola, 1998). The initiation of the late Holocene period (Berger et al., 1991; Luan et al., 2012) is seen in most records in the NT as a prominent southward shift in the treeline around 3500 yr BP (approx. 3776 cal. yr BP) (Pienitz et al., 1999; Huang et al., 2004; Rühland and Smol, 2005; Paul et al., 2010). Pollen data from Danny's Lake show a continued increase in *Pteridium, Botrychium* abundances during this time period, coupled with the continued decrease in charcoal and *Pediastrum* abundances which supports the trend of climate continuing to become cooler and wetter (Sulfur, personal communication, 2013). Pollen data from UCLA Lake indicates a shift at 3000 cal. yr BP towards shrub tundra, indicating more cool and dry periods in the tundra farther north (Huang et al., 2004), which coincides with the beginning of the late Holocene period.

5.1.2 Active weather diatom assemblage (1480 – 1090 cal. yr BP)

Given our results, we suggest that a period of active weather took place at Danny's Lake from 1480 – 1090 cal. yr BP. During this time period, a decrease in *Achnanthidium minutissimum* occurred. *Achnanthidium minutissimum* live attached to the substrate of the lake, and therefore are prone to habitat disruption caused by increased turbulence. This would indicate cooler air and surface water temperatures during this

time period, and would have weakened the vertical stability of the water column making it more susceptible to wind-driven mixing.

To corroborate our inferred active weather, grain size data from the c. 1480 – c. 1090 cal. yr BP interval of the Danny's Lake core increase from coarse silt to very coarse silt, which stays consistently elevated throughout his period (Figure 2.4). An increase in grain size would be expected under increased precipitation and windier conditions. An increase in precipitation would result in coarser material being brought in from the catchment, and the increased wind would influence wave energy. This increased wave energy would result in coarser material remaining suspended within the water column over greater distances prior to falling out of suspension. The significant variation in MS observed through this interval provides further evidence that higher precipitation and wind levels characterized this interval. Large variations in this parameter through a sedimentary sequence are often attributed to increased erosion and sedimentation within a watershed (Dearing, 1999; Sandgren & Snowball, 2001). Relatively close to the Danny's Lake study site, a chironomid-inferred reconstruction of mean July temperatures at Lake P-49 indicates that temperatures reached an all-time late Holocene low of 10.2°C at 1540 cal. yr BP (Upiter et al., 2013, *in review*).

There is also evidence of a similar cooler, higher precipitation and windy period during this time elsewhere in the circumpolar region (Jackson et al., 2005; Reyes et al. 2006; Viau & Gajewski, 2009; Clegg et al., 2010; Sorrel et al., 2012). A pollen-based Holocene temperature and precipitation reconstruction for the MacKenzie region provided evidence for a significant increase in annual precipitation centered at 1100 cal. yr BP (Viau and Gajewski, 2009), which was unparalleled through the entire late

Holocene period. Evidence of widespread cooling in British Columbia and Alaska from 1550 – 1250 cal. yr BP has also been inferred from major glacier advances during that time period (Reyes et al., 2006), with high-resolution midge analysis in Alaska yielding evidence of a similar cooling of up to 1°C during this time (Clegg et al., 2010).

In studies carried out to the east of Danny's Lake, an increase in westerly winds and cooling in the Arctic during this time period has been attributed to an increase in North Atlantic Ocean surface variability (Jackson et al., 2005; Sorrel et al., 2012). In northern Europe, an increase in sedimentation during the interval from c. 1600 – c. 1250 cal. yr BP at several localities are also attributed to Northern Atlantic Ocean variability, which would also have lead to increased paleo-storm activity (Sorrel et al., 2012). A similarly timed increase in mean grain size for sediments deposited through this interval was observed in Iceland, which was attributed to decreased temperature and increased wind velocities (Jackson et al., 2005).

5.1.3 The MWP and LIA diatom assemblage (1040 cal. yr BP – present-day)

At the beginning of this interval, we observe a slight increase in *Discostella stelligera* complex from 1040 - 970 cal. yr BP. Other studies in this region of the Canadian Arctic, as well as from Finland, have attributed an increase in *Discostella stelligera* complex to a climate warming, especially with regards to 19th century climate recovery from the LIA (Sorvari & Korhola, 1998; Rühland & Smol, 2005; Paul et al., 2010). The MWP has been recognized in other proxy records to have impacted Arctic Canada between c. 1100 – c. 900 yr BP (approx. 1044 – 827 cal. yr BP) (Zabenskie and Gajewski, 2007; D'Arrigo et al., 2009; Paul et al., 2010). In addition, a pollen-based Holocene temperature reconstruction for the MacKenzie region shows a significant

increase in January temperature anomalies at 1100 cal. yr BP (Viau and Gajewski, 2009). MS appears stable, suggesting less erosion and transport in the watershed. Increased re-strengthened *Achnanthidium minutissimum* also suggests a return to more habitable lake substrate post-active weather period.

The LIA is a cooler period typically shown to immediately follow the MWP and lasting from approximately 750 – 200 yr BP (approx. 642 – 221 cal. yr BP) (Rühland & Smol, 2005; Finkelstein & Gajewski, 2008; MacDonald et al., 2009; Paul et al., 2010) does not appear to end in the diatom record for Danny's Lake. In fact, after the increase in *Discostella stelligera* complex which we attribute to the MWP, the remainder of this assemblage shows a stability which continues into present-day climate conditions.

The warming associated with the end of the LIA in previous studies of the Canadian Arctic and Finland is generally correlated with an increase in *Discostella stelligera* (Sorvari & Korhola, 1998; Rühland & Smol, 2005; Paul et al., 2010). At Slipper Lake, located 100 km north from our study site, significant ecological shifts were reported in the entire lake diatom assemblage composition after 100 cal. yr BP (Rühland & Smol, 2005). The Slipper Lake study found that diatom flora underwent a dramatic shift from benthic-dominated to planktic-dominated, which was interpreted as an increased temperature in recent times. At Danny's Lake, *Discostella stelligera* show no increase in recent times. The lack of increase in this taxa in response to post-LIA warming is unknown. Perhaps warming at the Danny's Lake locality was less pronounced than at open tundra locations such as Slipper Lake.

6. Conclusions

We examined diatom assemblages from the last ~3330 cal. yr BP in the boreal region of the NT. The large number of radiocarbon dates obtained from the Danny's Lake core permitted development of a very robust age model. We also successfully demonstrated the usefulness of freeze coring, paired with the sampling with a sledge microtome, which provides an important advance in high-resolution paleoclimate studies. A notable outcome of this research was the detection of an active weather period from 1480 – 1090 cal. yr BP, as evidenced by both diatom assemblage changes and a general increase grain-size. Also of significance was the response of *Discostella stelligera* to MWP warming, but not to warming in recent times. Although the results of this study provide clear evidence for the onset of the LIA, there is little evidence in neither diatom assemblages, grain size data nor MS data of the 19th century recovery from the LIA at this site. Given the success of this study, we strongly advocate the usage of freeze coring techniques, as well as the sledge microtome for subsampling.

Acknowledgements

Financial and in-kind support for the "Paleoclimatological assessment of the central NT: Implications for the long-term viability of the Tibbitt to Contwoyto Winter Ice Road" project was provided by a Natural Sciences and Engineering Research Council of Canada (NSERC) strategic project grant to RTP, the Geological Survey of Canada, the Northwest Territories Geoscience Office, the North Slave Métis Alliance, and the Tibbitt to Contwoyto Winter Road Joint Venture. We also acknowledge the support of the Polar

Continental Shelf Program (PCSP) and Northern Scientific Training Program (NSTP), as well as grants provided by the Northwest Territories Cumulative Impact Monitoring Program (CIMP). We would also like to specifically thank the personnel of the Northwest Territories Geosciences Office (NTGO) for their support, assistance with fieldwork and wealth of knowledge. In addition, we are indebted to the staff of the Tibbitt to Contwoyto Winter Road Joint Venture who provided logistical support for field-work in this challenging region. Staff provided valuable knowledge and assisted in sediment core collection. We particularly thank Robert Mercredi for his assistance in core collection.

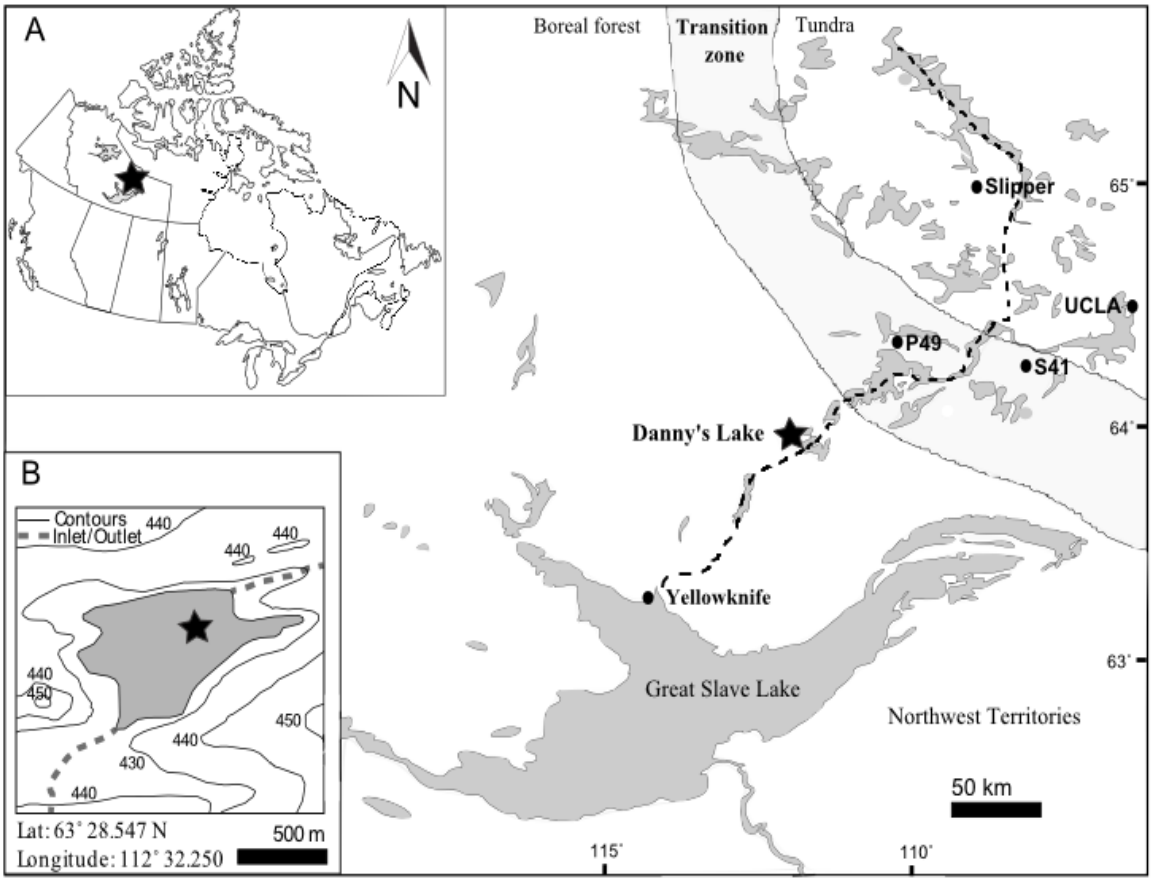

Figure 2.1 Location of Danny's Lake. Inset showing location the region (A) and of coring site (B), as denoted by the star. Other sites including Slipper Lake, Lake P-49, UCLA Lake and Lake S41 are also marked. The dashed line indicates the position of the Tibbitt to Contwoyto Winter Road. The relative position of boreal to tundra transition is also shown.

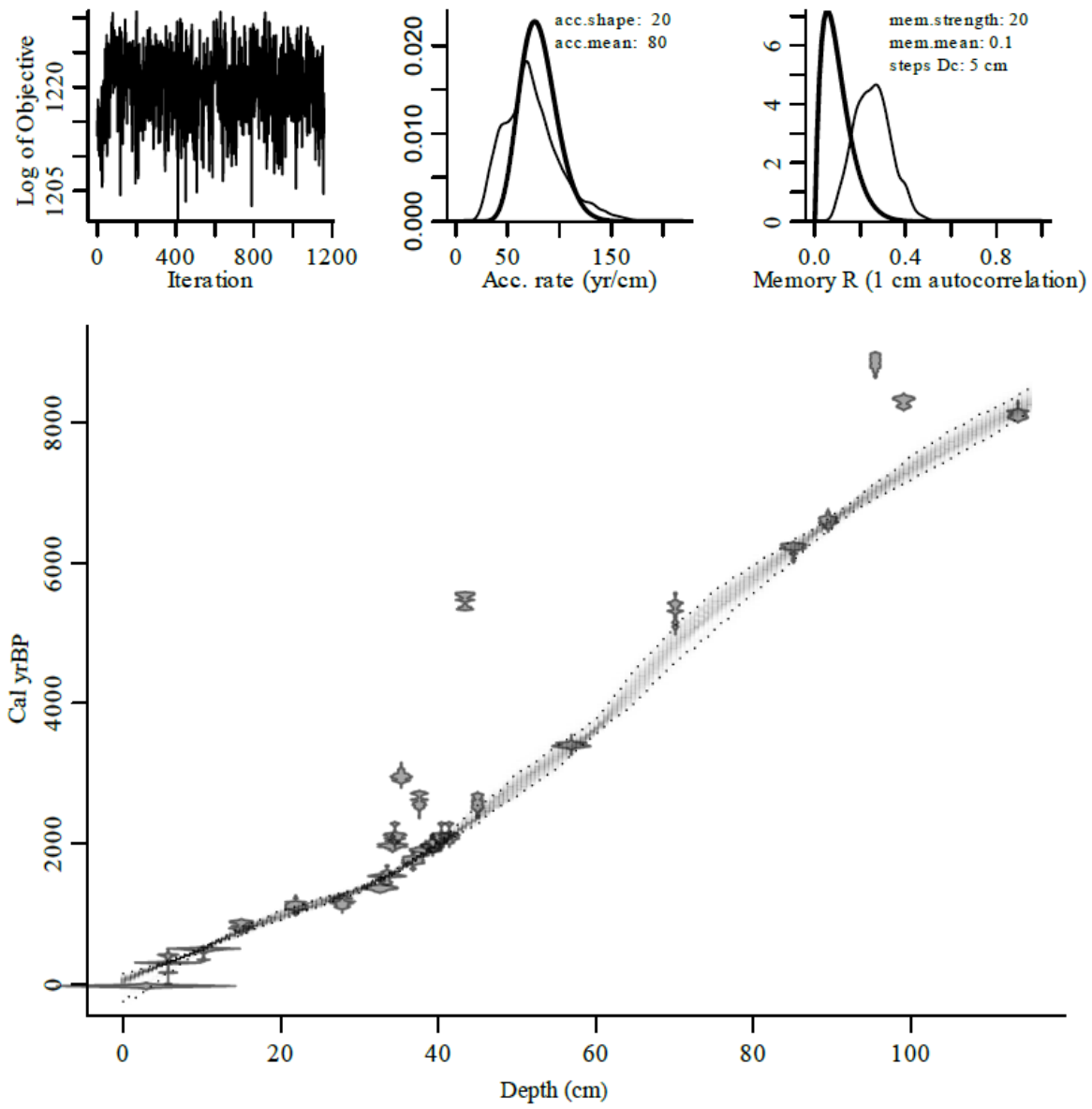

Figure 2.2 Bayesian age-depth model for Danny's Lake. On the top panel, the leftmost plot shows that the Markov Chain Monte Carlo runs were stable (1200 iterations), the middle plot shows the prior (curve) and posterior (filled histogram) distribution for the accumulation rate (yr/cm), and the rightmost plots show the prior (curve) and posterior (filled histogram) for the dependence of accumulation rate between sections. The major plot shows the age distributions of calibrated 14C dates and the grey-scale age-depth model indicates precisely dated sections of the chronology in darker grey, while lighter grey areas indicate less precise sections.

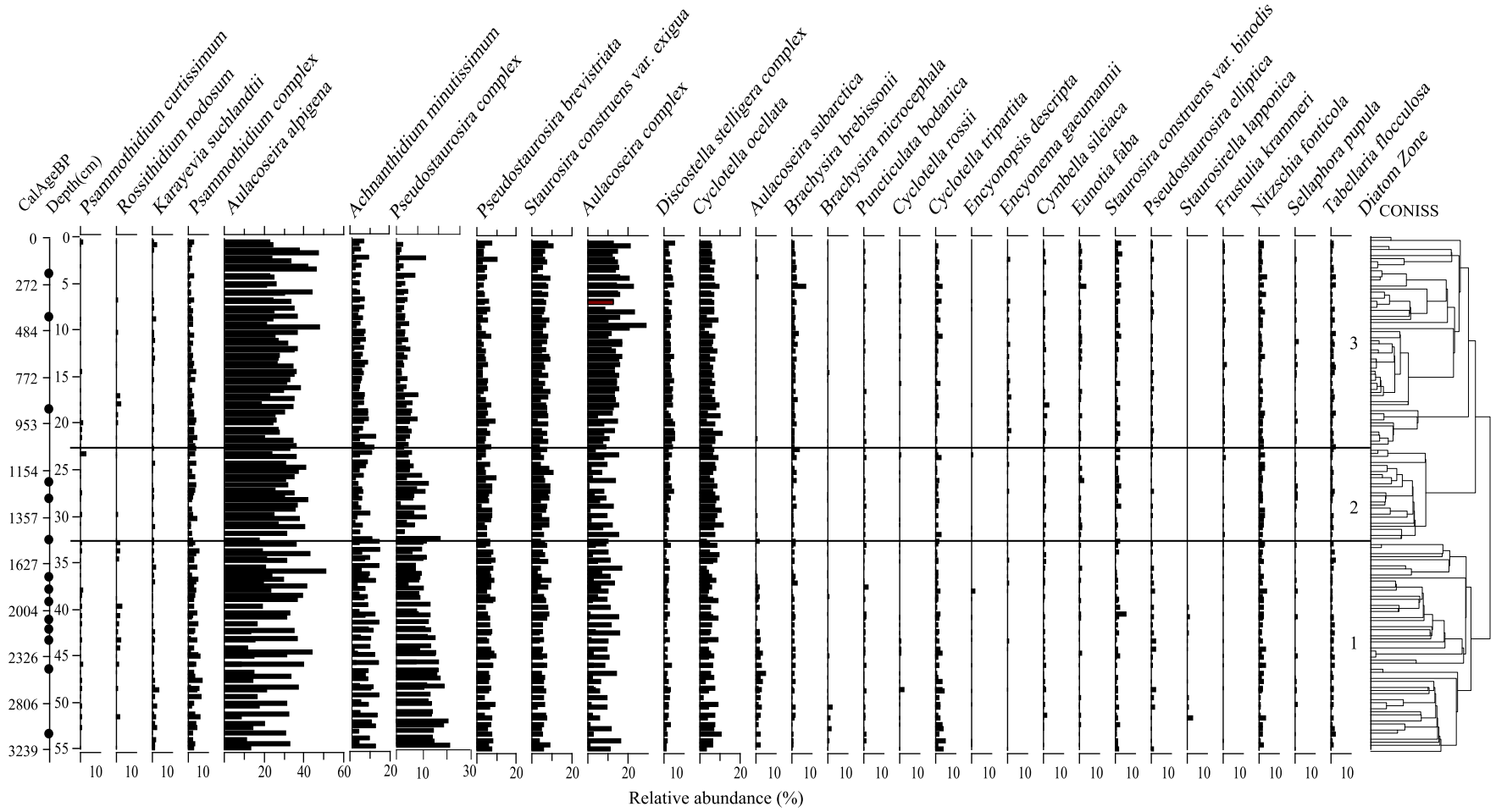

Figure 2.3. Statigraphic plot of each diatom species that reached a relative abundance of greater than 2% in at least one sample of the sediment core from Danny's Lake. Constrained incremental sum of squares (CONISS) zones were determined using the rioja packing in R (Juggins, 2011a; R Development Core Team, 2012) by comparison to a broken stick model (Bennett, 1996). Black dots along calibrated age axis indicate radiocarbon dates. Zone 1 refers to the first late Holocene diatom assemblage; zone 2 refers to the active weather diatom assemblage and zone 3 refers to the MWP and LIA diatom assemblage.

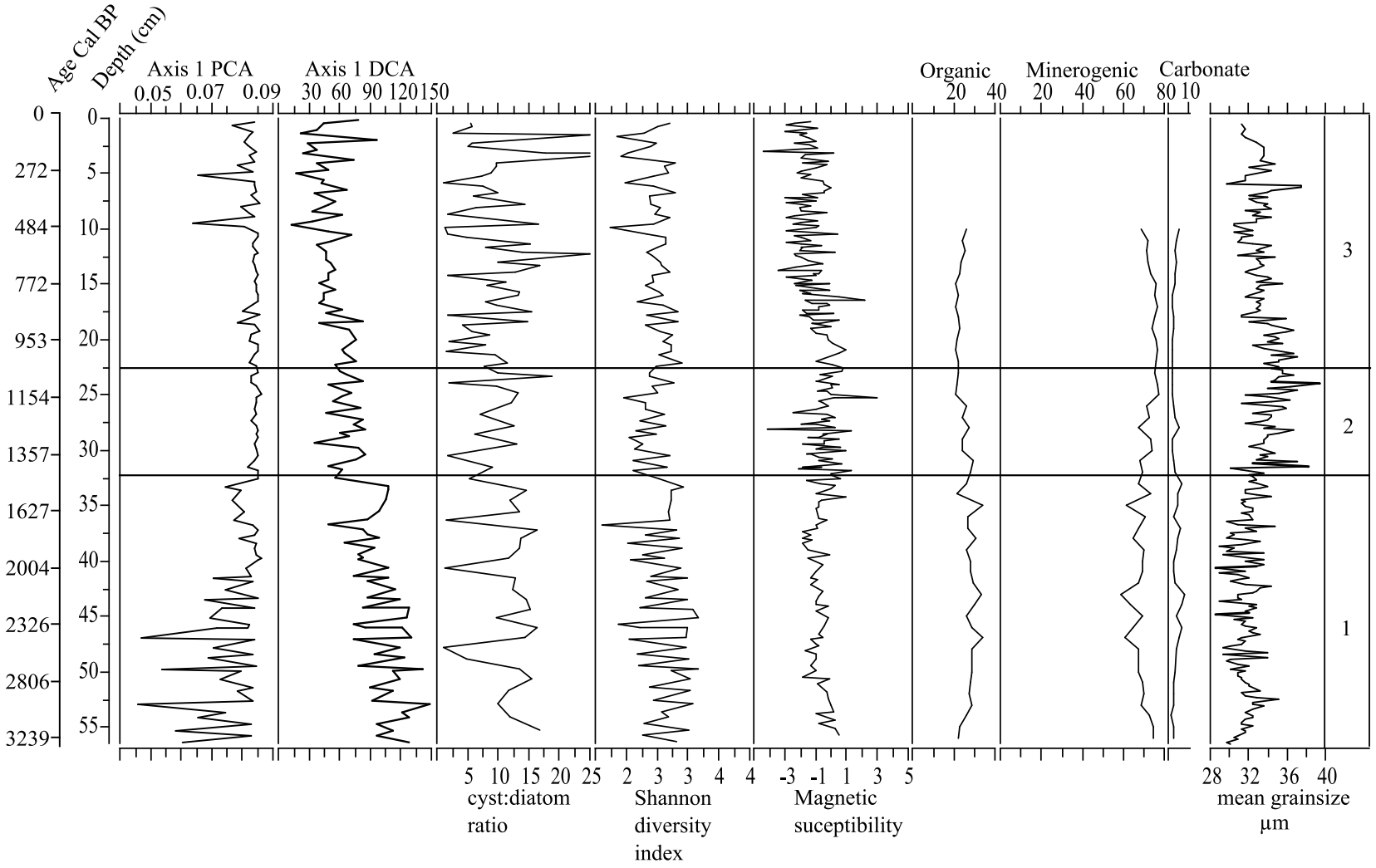

Figure 2.4. Sedimentological proxies for Danny's Lake zoned using diatom grouping. Magnetic susceptibility is noted in SI units. Zone 1 refers to the first late Holocene diatom assemblage; zone 2 refers to the active weather diatom assemblage and zone 3 refers to the MWP and LIA diatom assemblage.

Table 2.1. Water chemistry variables taken at specified depths of Danny's lake in winter 2010 and summer 2011.

	Dissolved oxygen mg/L		Conductivity (µS)		Temperature (˚C)		pH	
Depth (m)	Winter 2010	Summer 2011	Winter 2010	Summer 2011	Winter 2010	Summer 2011	Winter 2010	Summer 2011
0	9.91	8.74	12.8	34.8	0.2	14.5	6.61	8.1
0.5	13.03	8.68	22.7		0.2			
1	13.3	8.78	27.4		0.2			
1.5	14.47	8.98	27.4		0.7			
2	13.69	9.17	27		1.2			
2.5	13.11	9.17	27.1		1.7			
3	10.2	8.68	27.3		2.1			
3.5	7.68	8.55	27.4		2.6			
4	9.29	6.5	28.2	46.1	2.9	14.4		8.2
4.5	1.23		32.8		3.3			

Table 2.2 Diatom **s**pecies groupings included in stratigraphic diagram

Species Groupings	Comprising species
Pseudostaurosira	*Staurosira construens var. venter*
	Staurosirella pinnata
	Pseudostaurosira pseudoconstruens
Aulacoseira	*Aulacoseira distans*
	Aulacoseira lacustris
	Aulacoseira perglabra
Discostella stelligera	*Discostella pseudostelligera*
	Discostella stelligera
Psammothidium	*Achnanthes levanderi*
	Rossithidium pusillum

Table 2.3. Danny's Lake AMS radiocarbon results. δ13C (‰) values were calculated relative to the VDPB standard, freshwater reservoir corrected dates were calibrated with IntCal09 (Reimer et al. 2009), and calibrated ranges presented represent a relative area of greater than 95% (some values are composite). Outliers are shown in bold.

Lab ID (UBA-)	Depth (cm)	$\delta^{13}C$ (‰)	^{14}C age BP (1σ)				Corr. cal BP (2σ)
			Uncorrected		Corrected ΔR=430		
17359	5.7	-27.5	693	± 21	263	± 21	284-424
17360	10.2	-30.1	855	± 23	425	± 23	462-519
16543	15.0	-26.3	1329	± 23	899	± 23	740-908
17361	21.9	-29.2	1617	± 25	1187	± 25	1055-1177
17431	27.8	-27.8	1659	± 21	1229	± 21	1072-1257
16544	32.6	-27.5	1916	± 25	1486	± 25	1315-1408
20377	33.5	-24.7	2071	± 24	1641	± 24	1419-1611
20378	34.2	-27.8	2159	± 24	1729	± 24	1566-1703
17929	34.5	-30.2	2257	± 26	1827	± 26	1700-1825
20376	35.3	-29.5	2073	± 28	1643	± 28	1417-1614
20375	36.8	-29.5	2248	± 25	1818	± 25	1697-1822
17432	37.6	-29.0	2659	± 32	2229	± 32	2152-2335
20374	38.4	-27.6	2392	± 25	1962	± 25	1865-1953
20373	39.3	-29.1	2448	± 33	2018	± 33	1885-2059
17930	40.4	-28.6	2549	± 26	2119	± 26	2002-2152
20371	41.4	-28.7	2554	± 28	2124	± 28	2002-2154
20372	43.3	-24.7	4863	± 29	4433	± 29	4877-5276
16545	45.0	-29.1	2912	± 24	2482	± 24	2459-2717
16546	56.9	-26.2	3604	± 25	3174	± 25	3361-3446
16547	70.1	-29.6	5039	± 51	4609	± 51	5057-5471
16548	85.1	-31.3	5834	± 29	5404	± 29	6180-6286
17931	89.5	-29.6	6231	± 34	5801	± 34	6496-6674
16439	95.5	-27.3	8112	± 32	7682	± 32	8412-8541
17932	99.1	-28.9	7623	± 38	7193	± 38	7940-8111
16440	113.6	-24.9	7450	± 30	7020	± 30	7792-7935

Chapter 3: Diatom Data Reveal Solar Forcing as a Late Holocene Climate Control in Canadian Subarctic

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Abstract

Here we present evidence of the influence of solar forcing on seasonal winter ice-cover at Danny's Lake, Northwest Territories, in the Canadian subarctic. This research is based on high-resolution time-series analysis of diatom assemblages from a ~3300 cal. yr BP to present-day freeze core. Changes in the relative proportion of certain groups of diatom taxa have been demonstrated to provide an excellent proxy record of changes to seasonal ice-cover. As the duration of winter ice-cover in this region is primarily controlled by temperature, these diatom proxies also provide useful information on winter climate variability. We studied trends and cycles in the relative abundance of two species groups: (1) the heavily silicified *Aulacoseira* complex, a group of planktic diatom species that thrive in conditions of high turbulence, which keeps them suspended in the water

column; and (2) *Pseudostaurosira* complex, a group of benthic species that thrive under ice-cover conditions. Spectral analysis of changes in the relative abundance of these two diatom groups reveals statistically significant c. 89, 145 and 309-year cycles. Wavelet and cross-wavelet analysis of the diatom data resulted in the recognition of significant common power between diatom groups and total solar irradiance, suggesting that solar forcing plays a significant role in influencing year-over-year variation in ice-cover for this subarctic region. The c. 89 and 145 year cycles are attributed to the 90 – 140 year upper band of the Gleissberg solar cycle, while the c. 309 year cycle is recognized as the 300 year harmonic of the 2115 year Hallstadt cycle. The record presented here is also characterized by the disappearance of all major diatom cycles during the Medieval Warm Period c. 1050 – c. 850 cal. yr BP and Roman Warm Period c. 1800 – c. 2200 cal yr BP which corresponds with a major reduction in total solar irradiance during these intervals. This paired breakdown of cyclicities in both total solar irradiance and diatom populations suggests that solar forcing plays a key role in determining temporal variation of diatom assemblages. These results are of interest to policy makers and planners as they assess the long-term viability of industrially important ice roads in the region, which are subject to the influence of not only possible anthropogenic warming, but to significant natural climate variability.

Keywords

late Holocene, diatoms, paleolimnology, wavelet analysis, spectral analysis, Gleissberg solar cycle, Northwest Territories, fresh water effect

1. Introduction

With the retreat of the Laurentide Ice Sheet ~ 9000 years before present (yr BP) (Dyke and Prest, 1987), shallow lakes began to form on the exposed bedrock of the Canadian Shield, which covers a large portion of the Northwest Territories (NT), Canada. These arctic lakes are often located in catchments with little or no direct anthropogenic disturbance. The hydrology of these shallow lakes is strongly influenced by seasonal weather conditions (Adrian et al., 1999; Kohler & Hoeg, 2000), thus their limnologic history provides a useful archive of regional climate variability (Smol et al., 2005). The treeline region of the subarctic is a particularly good indicator of climate change because organisms inhabiting this region often live close to the edge of their ecological tolerances (Macdonald et al., 1998; Pienitz et al., 1999; Rühland & Smol, 2002; Lloyd et al., 2003; Seppa et al., 2003; Wolfe et al., 1996), and are thus sensitive to even the slightest climate variability (Lim et al., 2007).

Climate in the central NT became cooler but more stable during the late Holocene (~3500 yr BP – present-day), in part due to the development of relatively stable solar insolation at 65°N (Berger et al., 1991; Steinhilber et al., 2009). With the onset of the late Holocene, the treeline retreated southward to its modern-day position in the central NT (Karst-Riddoch et al., 2005; Rühland & Smol, 2005; Miller et al., 2010). This long-term stability offers an opportunity to discern more subtle cyclical variations in natural climate. There have been a large number of paleolimnological papers carried out in region, which have utilized a variety of proxies, including diatoms, pollen and chironomids (Douglas et al., 1994; Cremer et al., 2001; Michelutti et al., 2003; Huang et al., 2004; Le Blanc et al., 2004; Fallu et al., 2005; Karst-Riddoch et al., 2005; Tammy et

al., 2005; Finkelstein & Gajewski, 2008, 2007; Lim et al., 2007; Rolland et al., 2008; MacDonald et al., 2009; Adams & Finkelstein, 2010; Chakraborty et al., 2010; Clegg et al., 2010; Paul et al., 2010; Peros et al., 2010). However, the majority of these studies have not explored their results for trends and cycles, instead relying on proxy-based assemblage zoning to delineate data trends.

Changes in TSI influence the Earth's climate at annual, decadal, centennial, and millennial timescales (Bond et al., 2001; Wu et al., 2009; Gray et al., 2010). Solar forcing has been observed in many paleo-records as oscillatory patterns associated with an amplification of the well known 11-year Schwabe sunspot cycle (Peristykh and Damon, 2003). One such amplification, the Gleissberg cycle (Gleissberg, 1958), which has been observed in naked eye observations (Lean et al., 1995), is expressed at a lower band cycle of 50 - 80 years and an upper band cycle of 90 - 140 years. The Gleissberg cycle has been directly linked to solar sunspot activity, and has been widely reported in records spanning the last 12,000 years (Peristykh and Damon, 2003), as well as older records (Kern et al., 2012). Changes in TSI have also been shown to drive decadal-scale climate variability by means of teleconnections. For example, the relative positions of the Aleutian Low (AL) and North Pacific High (NPH) in the Northeast Pacific Ocean shift by more than 700 km through an 11-year sunspot cycle (Christoforou & Hameed, 1997; Hameed & Lee, 2005). Changes in the relative position of the AL and NPH result in cyclic weather and oceanic conditions in the Northeast Pacific (Patterson et al., 2013) that ultimately propagate inland towards the Danny's Lake study site (Porter et al., 2013).

Changes in solar variability have also been linked to changes in global temperature. For example, during the Maunder Minimum (c. 300 – c. 230 yr BP), the

Schwabe sunspot cycle was nonexistent for several decades (Lean et al., 1995; Jones et al., 2001). This disruption resulted in a reduction in regional temperatures of ~1°C in the Canadian Arctic (D'Arrigo et al., 2009; Rolland et al., 2009). Conversely, warm periods in the Holocene have been linked to increased solar activity (e.g. Veizer, 2005), such as the increase TSI that corresponds with the Medieval Warm Period (MWP), Roman Warm Period (RWP), and the present-day Modern Maxima (Jirikowic & Damon, 1994; Lean et al., 1995, Solanki et al., 2004). Changes in TSI have also been invoked to explain observed changes in many arctic proxy datasets , including Alaskan Holocene lake sediments (Hu et al., 2003), late Holocene glacier dynamics (Wiles et al., 2004), and a 700-year record of the linkage between solar forcing and boreal ecosystem response (Tinner et al., 2008).

Lake ice-cover in arctic regions impacts diatom (Class Bacillariophyceae) population assemblages by influencing habitat availability (Smol, 1988; Lotter & Bigler, 2000). Since winter ice-cover duration is primarily controlled by temperature in this region, relative changes in past temperature can be inferred from diatom populations (Smol, 1988; Lotter & Bigler, 2000). We focus on two key indicator groups, the *Aulacoseira* complex and the *Pseudostaurosira* complex. The *Aulacoseira* complex, which are panktic and require turbulene to thrive in the photic zone, is often used to infer changes in the influence of wind or precipitation on a lake (Korhola et al., 1996; Sorvari & Korhola 1998). The *Pseudostaurosira* complex is a collection of benthic species that have the ability to flourish under ice-covered lake conditions (Smol, 1988).

This research was designed to determine whether there is a correlation between trends and cycles in the diatom assemblages at Danny's Lake and TSI variability. To test

this hypothesis, we employed spectral and wavelet analysis on a ~3300 year late Holocene record of variability in the *Aulacoseira* and *Pseudostaurosira* complexes. We also use cross-wavelet techniques to compare our diatom data to published TSI data. This research was made possible by the combined use of freeze coring, which provides an undisturbed sediment core, and a custom-designed sledge microtome (Macumber et al., 2011), which permitted for unprecedented sampling resolution.

This research has industrial applications for policy makers and planners concerned over the long-term viability of the Tibbitt to Contwoyto Winter Road (TCWR), NT, and other ice roads in the subarctic region. The 600 km TCWR, which spans from near Yellowknife in the south, north through the central NT and into southern Nunavut (Figure 3.1), is the world's longest heavy haul winter ice road, carrying more than $500 million worth of critically needed supplies during a brief winter season to mining operations. Any significant shortening of the ice road season would require construction of an expensive permanent road, which might impact the viability of existing and future mining operations. As the thermometer record for the region only extends back to 1947, there is a critical need for an understanding of not only the influence of possible anthropogenic warming, but also the nature of natural climatic trends and cycles (Kelly & Wigley, 1992; Bond et al., 2001; Bard & Frank, 2006).

2. Site description and methodology

2.1 Danny's Lake, NT

Danny's Lake (63°28.547N; -112°32.785W) is located in the present-day boreal forest region of the NT, Canada, approximately 150 km northeast of Yellowknife and 20

km south of the modern-day treeline (Figure 3.1). Sparse vegetation presently surrounds the study site, comprised mainly of black spruce (*Picea mariana*) and white spruce (*Picea glauca*) with smaller amounts of tamarack (*Larix larincina*) and pine (*Pinus L.*) (Macumber et al., 2012). All lakes in the region overlay gneissic rocks of the Archean Slave craton (Davis et al., 1996). Climate in the Danny's Lake area is cold continental, with long, cold winters (average January temperature -26.8°C) and brief cool summers (average July Temperature 16.8°C) (Environment Canada, 2013). Average annual precipitation is 164.5 mm (Environment Canada, 2013).

Danny's Lake has a surface area of 0.19 km^2 (Figure 3.1) and maximum depth of 10 m. A lake-water temperature profile collected in August 2011 revealed that the lake was unstratified with the surface temperature of 14.5°C, nearly identical to the bottom temperature of 14.4°C. The water budget for the lake is derived from a very small catchment, and mostly sourced from spring melt water that arrives at the lake as surface runoff across the discontinuous permafrost and minimal till cover in this region. Ephemeral streams at the north and south end of the lake are noted on maps, but were not observed during August 2011 (Figure 3.1).

2.2 Freeze coring and diatom procedure

A 116.2 cm sediment core was retrieved from a 4.4 m sub-basin of Danny's Lake using a two-faced freeze coring device in March 2010 (Galloway et al., 2010; Macumber et al., 2012). The entire core was kept frozen and transported back to Carleton University where it was sub-sectioned into 1 mm samples using a custom-build sledge microtome (Macumber et al., 2011). Diatoms were enumerated every 0.5 cm until a depth of 56.3 cm. Diatom preparation and enumeration was conducted as per Dalton et al. (2013) *in prep*.

2.3 Diatom groups chosen for spectral / wavelet analysis

The diatom species groups *Aualcoseira* complex and *Pseudostaurosira* complex were dominant in the Danny's Lake sediment core (Dalton et al., 2013, *in prep.*) *Aulacoseira* complex and *Pseudostaurosira* complex made up an average of 40.8% (sd=9.30) and 22.8% (sd=6.12) of total diatoms counted in each of the 120 sediment slices enumerated (Table 3.1). It has been previously shown that the relative amount of benthic (*Pseudostaurosira* complex) diatom population is indicative of the length of year-over-year ice-cover (Smol, 1988; Lotter & Bigler, 2000). In addition, *Aulacoseira* complex are heavily silicified diatoms that require turbulence to stay in suspension in the photic zone (Reynolds, 1993), thus we interpret an increase in *Aulacoseira* complex as an increase in wind and/or precipitation (Korhola et al., 1996; Sorvari & Korhola 1998). Since solar irradiance has been shown to effect lake biota both directly and indirectly via teleconnections, we decided to include both species groups in our time-series analysis.

See Table 2.2 for a tally of which species comprise *Aulacoseira* complex and *Pseudostaurosira* complex, respectively.

Both diatom groups generated very high PCA1 and PCA 2 axis scores, representing 94.78 and 4.42% of the datasets variance, respectively (Table 1.1). Given the relative stability of the late Holocene period and the sensitivity of the subarctic to subtle climate change (Macdonald et al., 1998; Pienitz et al., 1999; Rühland & Smol, 2002; Lloyd et al., 2003; Seppa et al., 2003; Wolfe et al., 1996), we assumed that variations in diatom populations reflect small-scale climate changes, such as those strongly influenced by changes in solar irradiance.

2.4 Radiocarbon dating and age depth modelling

Twenty-five bulk organic sediment samples were used for accelerator mass spectrometry (AMS) ^{14}C dating at the ^{14}CHRONO Centre at Queen's University, Belfast. All samples underwent a standard hydrochloric acid wash to remove carbonate material. Radiocarbon ages were calibrated using Calib software version 6.1.0 (Stuiver & Reimer, 1993) and the IntCal09 calibration curve (Reimer et al., 2009), with the addition of a 430 year fresh water effect. See Dalton et al. (2013), *in prep* for additional chronological methods on the Danny's Lake sediment core.

2.5 Spectral and wavelet analysis

Raw diatom data counts for *Aulacoseira* complex and *Pseudostaurosira* complex were converted to relative abundance and then standardized. Spectral analysis was carried out using REDFIT in the PAST software package (Hammer et al., 2001). Diatom time-

series data were converted into the frequency domain using a Discrete Fourier transform and a null hypothesis test was used to assign statistical significance to the spectral peaks. A parametric approach was used to test the significance level of spectral peaks.

Wavelet analysis was carried out using the diatom data to explore the persistence and time of occurrence of significant frequencies throughout the paleorecord. Wavelet analysis was also conducted on TSI data from Steinhilber et al. (2009) for the past 3300 cal. yr BP. In order to align with TSI data, diatom data was interpolated to annual increments. A cross-wavelet transform of diatom data and reconstructed TSI time-series was carried out to identify and test the significance of common power using the Cross-wavelet package in Matlab (Torrence & Compo, 1998; Grinsted et al., 2004). The 95% significance level against red noise is shown by the black contour.

3. Results

3.1 Radiocarbon dating

Of the twenty-five radiocarbon dates acquired from this sediment core (Table 3.1), seven outliers were identified using the general outlier model (Bronk Ramsey, 2009a) in OxCal version 4.1 (Bronk Ramsey, 2009b). A freshwater effect estimate of 430 years was then subtracted from all uncalibrated ^{14}C dates as described in Dalton et al. (2013) *in prep*. The average accumulation rate is 60 yr/cm for the upper 56.3 cm of the Danny's Lake core, and since samples were taken at 0.5 cm intervals, 60 is also the average Nyquist Frequency. In paleoclimate studies, the Nyquist frequency is double the temporal sampling resolution, and describes the limit to what cycles can be resolved given the sampling resolution and age model (Davis, 1986).

3.2 Spectral analysis

The *Aulacoseira* complex and *Pseudostaurosira* complex display similar significant (95%) spectral peaks; spanning 141 – 148 years for *Aulacoseira* complex, and 141 – 154 years for *Pseudostaurosira* complex (Figure 3.3). For simplicity purposes, these cyclicities will be referred to as c. 145. A significant (95%) c. 89 year cycle was detected solely in the *Aulacoseira* complex data, and another significant (95%) c. 309 year cycle was observed in *Pseudostaurosira* complex results. Of additional interest are the very similar c. 63 year and c. 68 year cycles that were observed in the respective *Aulacoseira* complex and *Pseudostaurosira* complex spectral results. As they were slightly below the 95% confidence interval they are not considered further. Similarly, at the significant 99% confidence interval, we observed a c. 54 year cycle peak in the *Pseudostaurosira* complex spectral results. Again, we cannot consider this peak further as the wavelength fell just short of the statistically significant 60 year Nyquist frequency.

3.3 Wavelet analysis

The dominant c. 145-year frequency span identified in both diatom species is prominent between c. 1800 – c. 1200 cal. yr BP and c. 2700 – c. 2400 cal. yr BP in *Pseudostaurosira* complex and between c. 1800 – c. 1200 cal. yr BP and c. 2700 – c. 2200 cal. yr BP in *Aulacoseira* complex The c. 89 year cycle of *Aulacoseira* complex occurs between c. 600 – c. 300 cal. yr BP, c. 1650 – c. 1200 cal. yr BP and between c. 2500 – c. 2250 cal. yr BP (Figure 3.4). A 309 year cycle within the *Pseudostaurosira* complex occurs through a significant part of the record between c. 2800 – c. 550 cal. yr BP.

3.4 Cross-wavelet analysis

The cross-wavelet transforms show that both *Aulacoseira* complex and *Pseudostaurosira* complex abundances show significant non-stationary common power at c. 89 years with TSI through the entire record (Figure 3.5). The relationship is particularly strong between c. 600 cal. yr BP to present, with a pronounced but short-lived breakdown at this cycle bandwidth for both groups between at c. 400 cal. yr BP (Figure 3.5). A similar pattern of common power as was observed after c. 600 cal yr BP is prevalent between c. 1800 – c. 1100 cal. yr BP and again from c. 3000 – c. 2200 cal. yr BP. A c. 145 year bandwidth cycle is also apparent between c. 3200 – c. 2200 cal. yr BP for *Aulacoseira* complex and TSI. In addition, a very strong c. 309 year common power between *Pseudostaurosira* complex and TSI is prevalent between c. 1450 – c. 1050 cal. yr BP. There is a near complete breakdown between the diatom complex groups and TSI between c. 600 – 1100 cal. yr BP and c. 1800 – c. 2200 cal. yr BP.

4. Discussion

The strong common power between diatom populations and TSI support the hypothesis that solar variability has been a key driver of climate, ice-cover and lake hydrology in the Canadian Subarctic through the late Holocene (Figure 3.5). Based on the resolution of the results presented here, TSI influence of climate is responsible for significant short-term climate dynamics in this region from decadal to centennial scales.

4.1 Gleissberg cycle

The c. 89 and c. 145 year cycles detected in *Aulacoseira* complex and *Pseudostaurosira* complex correspond to the upper band (90 – 140 years) of the Gleissberg solar cycle (Ogurtsov et al., 2002). Weather in this region of the NT spawns from the northeast Pacific Ocean (Pienitz et. al, 1999; Hu et al., 2003), where solar irradiance has been previously shown to drive decadal-scale climate by means of controlling the relative position of the AL and NPH (Christoforou & Hameed, 1997; Hameed & Lee, 2005). This ocean teleconnection has been previously detected in treerings from the boreal NT region (Porter et al., 2013), as well as late Holocene glacier advance (Wiles et al., 2004) and temperature anomalies in Alaska (Papineau, 2001). Furthermore, dynamics of the AL have been shown to drive moisture shifts in the Yukon (Anderson et al., 2005).

We detect a c. 89 year cycle uniquely in *Aulacoseira* complex throughout the late Holocene period, and this frequency demonstrates common power to the TSI record of Danny's Lake. *Aulacoseira* complex are heavily silicified diatoms that require turbulence to stay in suspension in the photic zone (Reynolds, 1993), thus we interpret an increase in *Aulacoseira* complex as an increase in wind and/or precipitation (Korhola et al., 1996; Sorvari & Korhola, 1998). Given the teleconnection mechanism described above, we suggest that these changes in *Aulacoseira* complex are the result of increased wind and/or precipitation, ultimately caused by changes in TSI.

The c. 145 year cycle detected in both *Aulacoseira* complex and *Pseudostaurosira* complex time-series falls within the upper frequency band of the Gleissberg cycle

(Ogurtsov et al., 2002). The response of *Aulacoseira* complex can be explained as an increase in wind and/or precipitation resulting from the teleconnections between TSI and Pacfic Ocean pressure gyres. A study of ocean sediments from Effingham Inlet, British Columbia, found similar c. 135 year cycles in sediment deposition spanning the last 4500 years (Patterson et al., 2004), which hints at solar-driven Pacific Ocean dynamics as described above.

The mechanism for the c. 145 year solar cycle observed in *Pseudostaurosira* complex cannot be explained via increased precipitation from ocean teleconnections. *Pseudostaurosira* complex are benthic species that thrive in ice-cover conditions, therefore we suggest that a short-lived decrease in temperature, and resulting increase in year-over-year ice-cover, must be responsible for this periodicity. Changes in TSI have previously been linked to changes in temperature. For example, the Maunder Minimum, MWP, RWP and the present-day Modern Maxima all correspond to changes in TSI (Jirikowic & Damon, 1994; Lean et al., 1995, Solanki et al., 2004). Therefore, rather than being indirectly impacted by solar radiation via ocean teleconnections, we suggest that the *Pseudostaurosira* complex is being directly influenced by incoming TSI at Danny's Lake. We suggest that variability in TSI causes changes to regional temperature, which impacts year-over-year ice cover, and therefore diatom populations.

Regardless of whether the *Aulacoseira* complex and *Pseudostaurosira* complex are responding to pure solar irradiation or secondary effects of solar irradiation through teleconnections from the Pacific Ocean, diatoms and TSI share common power throughout a significant portion of the analyzed record. However, all cycles completely disappeared from both diatom records between c. 1200 – c. 600 cal. yr BP and c. 2200 –

c. 2000 cal. yr BP (Figure 3.3). Periodicities in TSI also broke down during these intervals, although the overall TSI levels increased (Steinhilber et al., 2009). These periods correspond to the MWP, where average temperatures rose in this region from ~10°C at c. 1540 yr BP to ~12°C by c. 800 yr BP (Upiter et al., 2013) and the RWP, associated with an increase in temperature similar to that observed during the Hypsithermal (Perner et al., 2012). This paired breakdown of both diatom and TSI cycles further corroborate our suggestion that solar irradiance is a key driver of climate in this region of the subarctic.

4.2 Hallstadt cycle

A significant c. 309 year cycle was detected in the *Pseudostaurosira* complex. This correlates with the c. 300 year harmonic of the 2115-year Hallstadt cycle (Damon & Jirikowic, 1992). A similar band of cycles was detected in the NE Pacific where c. 300 year cycles observed in a record of annually deposited laminated couplets, was attributed to solar forcing (Patterson et al., 2004). They attributed their record to solar derived teleconnections originating in the tropics. Previous research has documented the significant influence of climate teleconnections originating from the Pacific on climate in the NT (Porter et al., 2013), thus the presence of similar cycles in Holocene records from the two regions is not unexpected.

5. Implications

Results from this research have both regional and broader implications. Solar cycles have persisted throughout geologic history (Dean & Schwalb, 2000; Peristykh & Damon, 2003; Kern et al., 2012), and have been linked to climate forcing worldwide (Wu

et al., 2009). Both *Aulacoseira* complex and *Pseudostaurosira* complex share significant common power with TSI at various non-stationary cycle bandwidths through the entire late Holocene. This commonality indicates that changes in solar irradiance have had an important influence on climate and seasonal lake ice cover throughout this time period. TSI levels are presently very high when compared against earlier intervals in the late Holocene (Solanki et al., 2004; Usoskin et al., 2004; Roth & Jutes, 2013). Based on evidence linking other Holocene warm periods to increased solar activity (Veizer, 2005), it is therefore not surprising that we see present day warming. Since variations in TSI significantly influence the energy balance of the Earth, particularly at high latitudes (Veizer, 2005; Jungclaus et al. 2010) cyclicity in solar forcing is a dominant force in determining seasonal ice duration on high-latitude lakes. Our results have important implications for policy makers and planners regarding the future viability of the TCWR. Although the threat of anthropogenic-derived warming in arctic regions is of concern, the ability to recognize climate cycles that are governed by predictable variation in solar irradiance is important.

6. Conclusions

Trends and cycles in the relative abundance of *Aulacoseira* complex and *Pseudostaurosira* complex populations were analyzed from a freeze core from Danny's Lake, NT. Spectral analysis revealed statistically significant 89, c. 145 and 309 year cycles. Wavelet and cross-wavelet analysis of the diatom data indicated that these cycles were non-stationary and that they displayed significant common power with TSI. We suggest that solar forcing plays a significant role in influencing year-over-year variation in ice-cover in this subarctic region. The c. 89 and c. 145 year cycles are attributed to the

90 – 140 year upper band of the Gleissberg solar cycle, while the 309 year cycle is attributed to the 300 year harmonic of the 2115 year Hallstadt cycle. These results are of interest to policy makers and planners of the TCWR, which is subject to the influence of possible anthropogenic warming and also to significant natural climate variability.

Acknowledgements

Financial support for the "Paleoclimatological assessment of the central NT: Implications for the long-term viability of the Tibbitt to Contwoyto Winter Ice Road" project was provided by the Natural Sciences and Engineering Research Council of Canada (NSERC), the Geological Survey of Canada, the Northwest Territories Geoscience Office, the North Slave Métis Alliance, and the Tibbitt to Contwoyto Winter Road Joint Venture. We acknowledge the support of the Polar Continental Shelf Program (PCSP) and Northern Scientific Training Program (NSTP), as well as grants provided by Northwest Territories Cumulative Impact Monitoring Program (CIMP) to JMG and HF. We would also like to thank the Northwest Territories Geosciences Office (NTGO) for their support, fieldwork help and wealth of knowledge on the Yellowknife Region.

In addition, we are indebted to the staff of the Tibbitt to Contwoyto Winter Road Joint Venture who provided logistical support for field-work in this challenging region. Staff provided valuable knowledge and assisted in sediment core collection. We thank Robert Mercredi of the North Slave Métis Alliance for assistance in core collection.

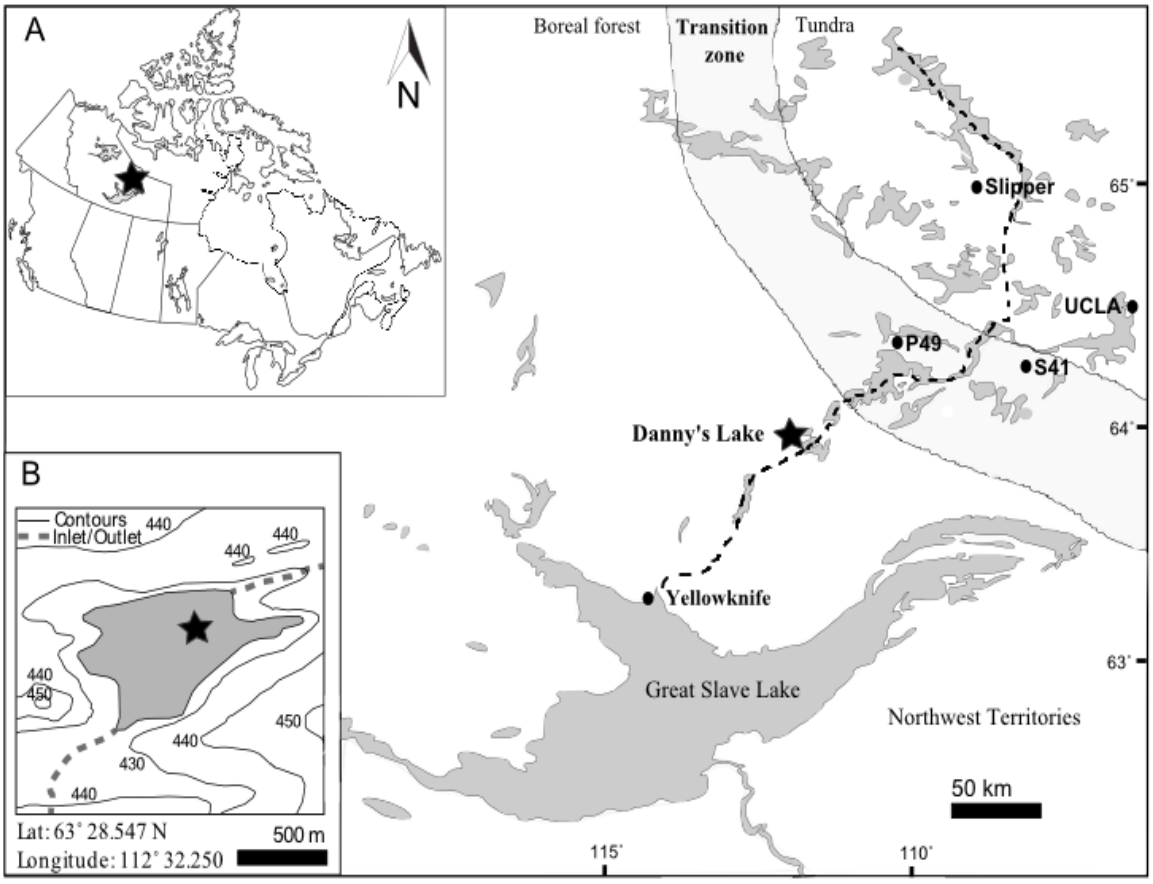

Figure 3.1 Location of Danny's Lake. Inset showing location the region (A) and of coring site (B), as denoted by the star. Other sites including Slipper Lake, Lake P-49, UCLA Lake and Lake S41 are also marked. The dashed line indicates the position of the Tibbitt to Contwoyto Winter Road. The relative position of boreal to tundra transition is also shown.

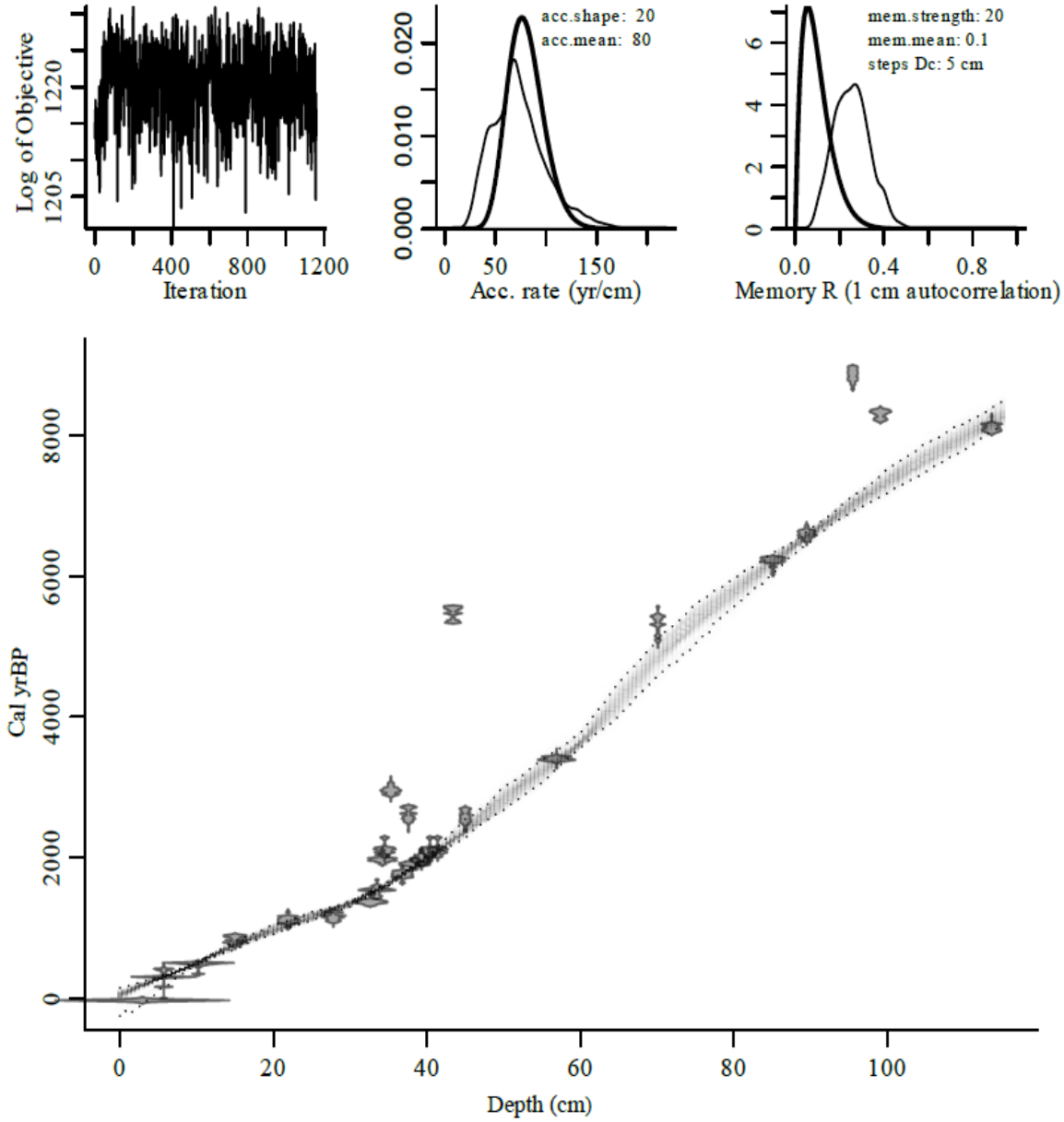

Figure 3.2. Bayesian age-depth model for Danny's Lake. On the top panel, the leftmost plot shows that the Markov Chain Monte Carlo runs were stable (1200 iterations), the middle plot shows the prior (curve) and posterior (filled histogram) distribution for the accumulation rate (yr/cm), and the rightmost plots show the prior (curve) and posterior (filled histogram) for the dependence of accumulation rate between sections. The major plot shows the age distributions of calibrated 14C dates and the grey-scale age-depth model indicates precisely dated sections of the chronology in darker grey, while lighter grey areas indicate less precise sections.

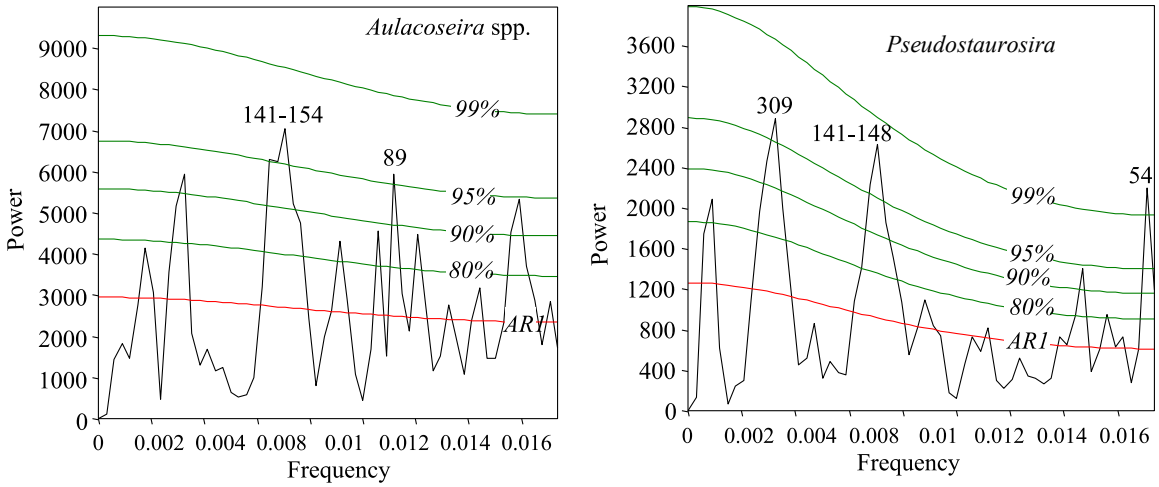

Figure 3.3. REDFIT spectral analysis results for *Aulacoseira* complex and *Pseudostaurosira* complex Only peaks surpassing the 95% confidence interval are statistically significant.

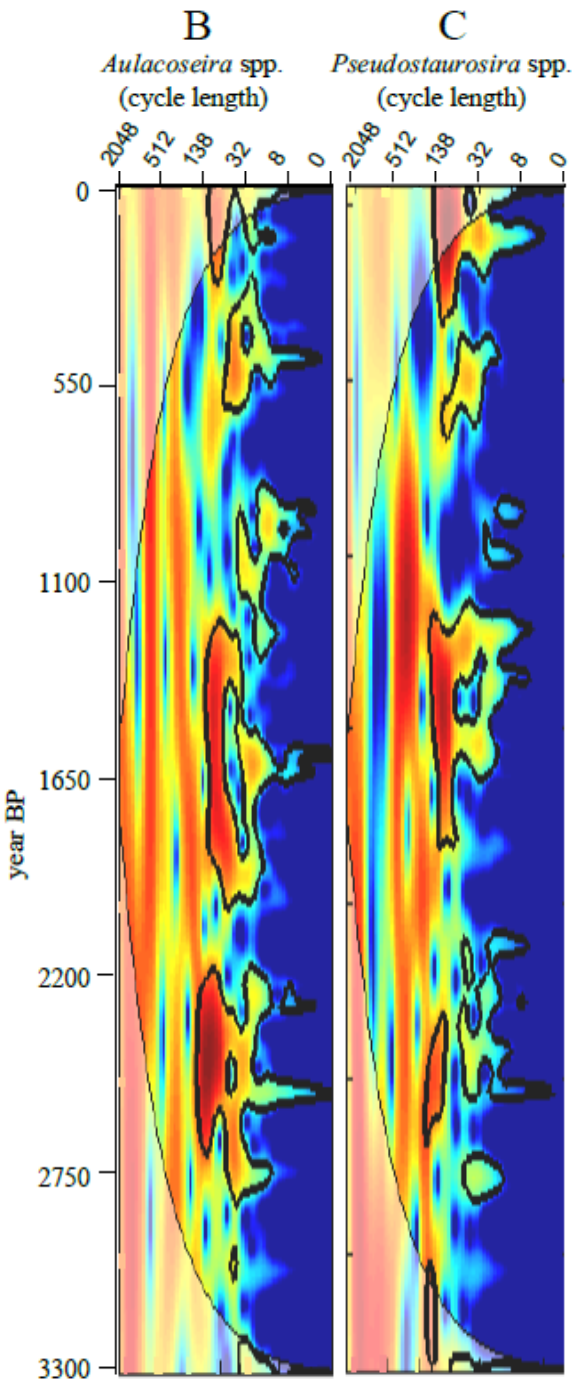

Figure 3.4. Wavelet results for *Aulacoseira* complex and *Pseudostaurosira* complex Wavelet scalograms show cycle strength and persistence during the time period. High values (red color) are assigned to areas where the indicated cycle is persistent. Low values (blue color) indicate lack of cyclicity at the given wavelength and time period, and dashed line indicates the cone of influence. Black line is 95% significance against red noise background

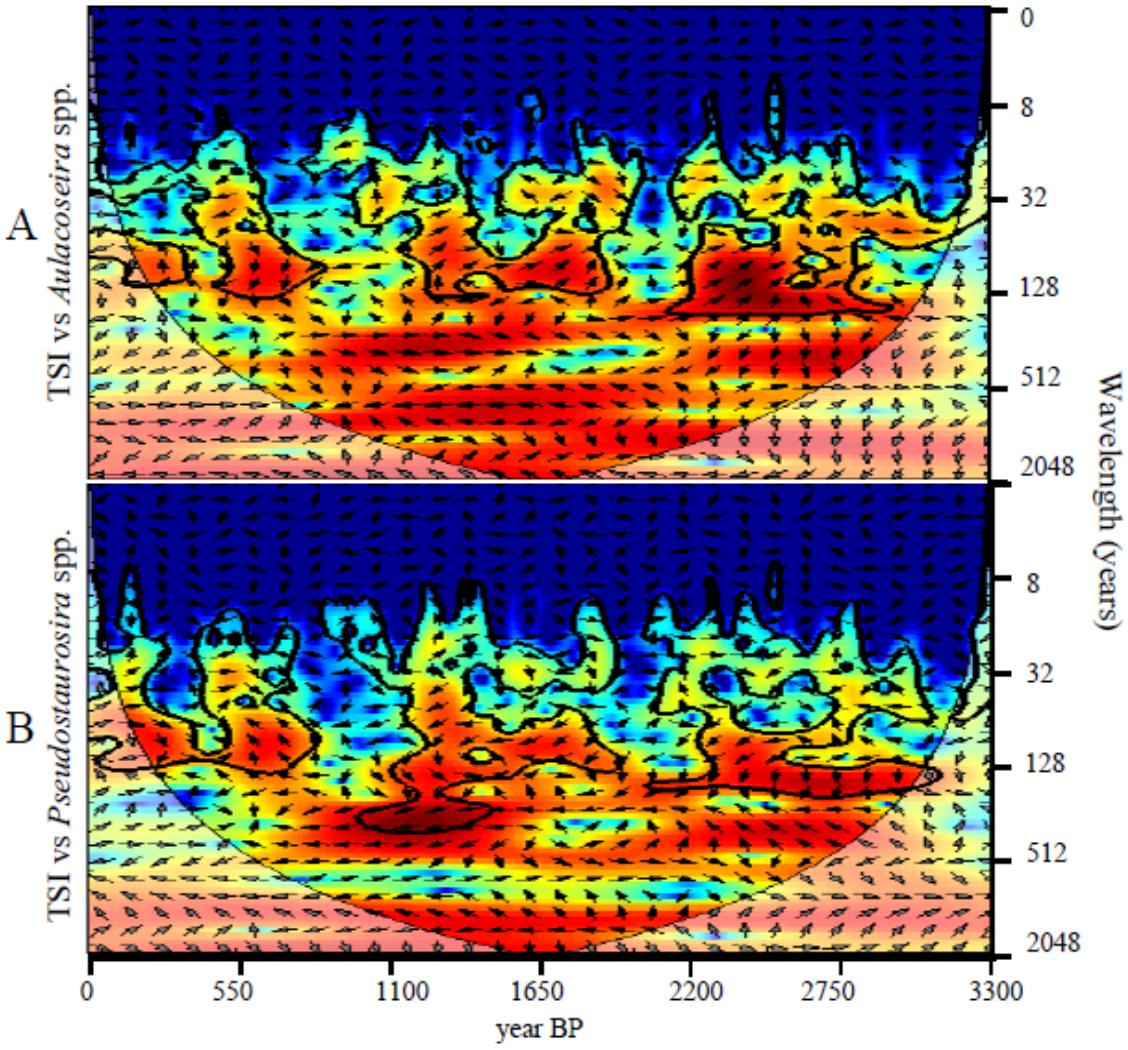

Figure 3.5. Cross-wavelet analysis for TSI and *Aulacoseira* complex (A); TSI and *Pseudostaurosira* complex (B). Vertical arrows indicate that one variable is leading the other. 95% significance level against red noise is shown as a thick contour. Arrows included are purported to indicate causality between TSI and diatoms. An arrow pointing upwards indicates that TSI is leading while an arrow downwards indicates that diatom species groups are leading. Horizontal arrows indicate in phase (arrow pointing right) or anti-phase (arrow point left) relationships between TSI and diatom species groups. Caution must be taken when interpreting phase relationships, as the slightest offset in the TSI or diatom age model may cause issues with causality.

Table 3.1. Summary of downcore relative abundance values and PCA axis for *Aulacoseira* complex and *Pseudostaurosira* complex

	Maximum	Minimum	Mean	St Dev	PCA Axis 1 Score	PCA Axis 2 Score
Pseudostaurosira complex	38.63	10.82	22.86	6.12	190.62	87.352
Aulacoseira complex	69.47	16.63	40.84	9.30	405.84	-47.144

Table 3.2. Radiocarbon results for Danny's Lake. $\delta^{13}C$ (‰) values were calculated relative to the VDPB standard, freshwater reservoir corrected dates were calibrated with IntCal09 (Reimer et al. 2009), and calibrated ranges presented represent a relative area of greater than 95% (some values are composite). Outliers are shown in bold.

Lab ID (UBA-)	Depth (cm)	$\delta^{13}C$ (‰)	^{14}C age BP (1σ)				Corr. cal BP (2σ)
			Uncorrected		Corrected ΔR=430		
17359	5.7	-27.5	693	± 21	263	± 21	284-424
17360	10.2	-30.1	855	± 23	425	± 23	462-519
16543	15.0	-26.3	1329	± 23	899	± 23	740-908
17361	21.9	-29.2	1617	± 25	1187	± 25	1055-1177
17431	27.8	-27.8	1659	± 21	1229	± 21	1072-1257
16544	32.6	-27.5	1916	± 25	1486	± 25	1315-1408
20377	33.5	-24.7	2071	± 24	1641	± 24	1419-1611
20378	34.2	-27.8	2159	± 24	1729	± 24	1566-1703
17929	34.5	-30.2	2257	± 26	1827	± 26	1700-1825
20376	35.3	-29.5	2073	± 28	1643	± 28	1417-1614
20375	36.8	-29.5	2248	± 25	1818	± 25	1697-1822
17432	37.6	-29.0	2659	± 32	2229	± 32	2152-2335
20374	38.4	-27.6	2392	± 25	1962	± 25	1865-1953
20373	39.3	-29.1	2448	± 33	2018	± 33	1885-2059
17930	40.4	-28.6	2549	± 26	2119	± 26	2002-2152
20371	41.4	-28.7	2554	± 28	2124	± 28	2002-2154
20372	43.3	-24.7	4863	± 29	4433	± 29	4877-5276
16545	45.0	-29.1	2912	± 24	2482	± 24	2459-2717
16546	56.9	-26.2	3604	± 25	3174	± 25	3361-3446
16547	70.1	-29.6	5039	± 51	4609	± 51	5057-5471
16548	85.1	-31.3	5834	± 29	5404	± 29	6180-6286
17931	89.5	-29.6	6231	± 34	5801	± 34	6496-6674
16439	95.5	-27.3	8112	± 32	7682	± 32	8412-8541
17932	99.1	-28.9	7623	± 38	7193	± 38	7940-8111
16440	113.6	-24.9	7450	± 30	7020	± 30	7792-7935

Chapter 4: Conclusions

This research is part of a much larger project with the mandate to determine how climate in the boreal region of the Northwest Territories (NT) has varied over the past 3500 yr BP. With a focus on high-resolution sampling, this research has revealed important information about past climate variability in the boreal region of the NT. Chapter 2 utilizes diatom populations in Danny's Lake, to discern climate trends in this region over the late Holocene. The diatom record for this time period shows that climate has been fairly stable over the past 3330 cal. yr BP, although subtle shifts in diatom assemblages suggest small-scale climate changes. In the first late Holocene period (3330 – 1480 cal. yr BP), there were cool, windy conditions. This is evidenced by the high *Pseudostaurosira* complex, which thrive under conditions of increased ice-cover, along with low *Aulacosiera* complex, which require turbulent lake conditions to thrive in the photic zone. From 1480 – 1090 cal. yr BP, there is evidence for period of active weather, evidenced by a decrease in benthic *Achnanthidium minutissimum,* an increase in sediment grain size, and significant fluctuations in the magnetic susceptibility data through this interval. Finally, the dominance of planktic *Aulacoseira* complex populations after 960 cal. yr BP suggests a stable Little Ice Age climate, which appears to persist into present-day at this site. Chapter 3 is the first study to examine two *Aulacoseira* complex and *Pseudostaurosira* complex diatom groups from a shallow Canadian subarctic lake to determine solar influence on climate over the late Holocene period. Spectral analysis of changes in the relative abundance of these two diatom groups reveals statistically significant c. 89, 145 and 309 year cycles, which correspond well with total solar

irradiance (TSI) over the late Holocene, suggesting a link between TSI and diatom populations in the subarctic.

Previous to this Danny's Lake research, chironomids were used to reconstruct past temperatures at Lake P-49, located along the Tibbitt to Contwoyto Winter Road (TCWR). In addition, there are currently several multi-proxy research projects underway on lake sediment cores spanning the TCWR. Modern day-surface sediments are also being analyzed to determine how environmental parameters impact lake biota, which can then be used to create training sets for downcore temperature and environmental inferences. With the continuation of mining in the NT, accurate forecasting of future climate is of utmost importance for policy planners. Results from this dissertation are of interest to policy makers and planners as they assess the long-term viability of industrially important ice roads in the region, which are subject to the influence of not only possible anthropogenic warming, but to significant natural climate variability.

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Appendix A. Co-author involvement declaration forms

Statement of Co-authors on Collaborative Activity

Carleton UNIVERSITY

Re: M.Sc dissertation prepared by April Sue Dalton for defence in July 2013

Chapter 2 - A 3330-year Multi-Proxy Climate Record from Canadian Subarctic: Detection of Storm event at 1100 cal yrBP and Potential for Time Series Analysis *

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- Contribution of particle size analysis data as a secondary proxy
- Sediment core acquisition and subsampling via sledge microtome
- Intellectual contributions, as well as aid in reviewing manuscript prior to inclusion in this thesis

I give permission for my work to be included in this M.Sc dissertation. My contributions as a co-author were adequately declared above and I have taken into consideration the rules and regulations of Carleton University's Academic Integrity policy**.

2013-06-12

Andrew L Macumber — Date

Ottawa-Carleton Geoscience Centre,
Carleton University,
Ottawa, Ontario

** Working title – subject to change. Regardless of title, this declaration of co-authorship pertains to Chapter 2 of the M.Sc thesis by April Sue Dalton.*

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- Teaching sediment preparation techniques for diatom analysis
- Aid in diatom identification and enumeration
- Intellectual contribution to diatom ecology and interpretation, as well as aid in reviewing manuscript prior to inclusion in this thesis

I give permission for my work to be included in this M.Sc dissertation. My contributions as a co-author were adequately declared above and I have taken into consideration the rules and regulations of Carleton University's Academic Integrity policy**.

Jesse C Vermaire

June 11 2013

Date

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Ottawa, Ontario

** Working title – subject to change. Regardless of title, this declaration of co-authorship pertains to Chapter 2 of the M.Sc thesis by April Sue Dalton.*

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- Sediment core collection, analysis and logistics
- Aid in interpretation of results, as well as aid in reviewing manuscript prior to inclusion in this thesis

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R Timothy Patterson

Ottawa Carleton Geoscience Centre,
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June 19th, 2013
Date

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- Sediment core collection, analysis and logistics, as well as aid in data interpretation

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Helen M Roe

13 June 2013
Date

Helen M Roe

School of Geography, Archaeology and Palaeoecology,
Queen's University of Belfast,
Belfast, UK

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- Construction of high resolution age-depth model for Danny's Lake sediment core
- Aid in interpretation of results, as well as aid in reviewing manuscript prior to inclusion in this thesis

I give permission for my work to be included in this M.Sc dissertation. My contributions as a co-author were adequately declared above and I have taken into consideration the rules and regulations of Carleton University's Academic Integrity policy**.

Carley Crann — June 11, 2013

Carley Crann — Date

Ottawa-Carleton Geoscience Centre,
Carleton University,
Ottawa, Ontario

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- Grant funding provided by NWT Cumulative Impact Monitoring Program for sediment core collection, field work logistics and subsequent data analysis
- Aid in interpretation of results, as well as aid in reviewing manuscript prior to inclusion in this thesis

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June 14th, 2013

Jennifer M Galloway
Natural Resources Canada / Ressources naturelles Canada,
Geological Survey of Canada / Commission geologique du Canada,
Calgary, Alberta

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Statement of Co-authors on Collaborative Activity

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Hendrik Falck — Date: June 10, 2013

Northwest Territories Geoscience Office
Yellowknife, Northwest Territories

** Working title – subject to change. Regardless of title, this declaration of co-authorship pertains to Chapter 3 of the M.Sc thesis by April Sue Dalton.*

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- Sediment core collection, subsampling and in data interpretation

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2013-06-12

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Ottawa-Carleton Geoscience Centre,
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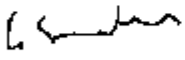
- Spectral, wavelet and cross-wavelet analysis of diatom and total solar irradiance data
- Aid in interpretation of results, as well as aid in reviewing manuscript prior to inclusion in this thesis

I give permission for my work to be included in this M.Sc dissertation. My contributions as a co-author were adequately declared above and I have taken into consideration the rules and regulations of Carleton University's Academic Integrity policy**.



Graeme T Swindles

School of Geography,
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Helen M Roe

13 June 2013
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Helen M Roe

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Belfast, UK

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Jennifer M Galloway

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Geological Survey of Canada / Commission geologique du Canada,
Calgary, Alberta

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Hendrik Falck — Date: June 10, 2013

Northwest Territories Geoscience Office,
Yellowknife, Northwest Territories

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Appendix B. Diatom species names and authorities according to Krammer & Lange-Bertlot (1991)

Diatom species names and authorities according to Krammer & Lange-Bertlot (1991). Updated species names and NADED ID numbers (in parentheses) according to Academy of Natural Sciences and collaborators (2011-2013)

Appendix B. Diatom species names and authorities according to Krammer & Lange-Bertlot (1991)

Species	Authority	Updated Species Name
Achnanthes curtissima	Carter	*Psammothidium curtissimum (186021)*
Achnanthes didyma	Hustedt	*Psammothidium didymum (186012)*
Achnanthes flexella	(Kützing) Brun	*Eucocconeis flexella (187001)*
Achnanthes helvetica	(Hustedt)Lange-Bertalot	*Psammothidium helveticum (186003)*
Achnanthes holsatica	Hustedt	*Platessa holsatica (2508002)*
Achnanthes imperfecta	Schimanski	*Achnanthes imperfecta (2051)*
Achnanthes joursacense	Heribaud	*Planothidium joursacense (155016)*
Achnanthes laevis	Østrup	*Eucocconeis laevis (187002)*
Achnanthes laterostrata	Hustedt	*Karayevia laterostrata (125002)*
Achnanthes levanderi	Hustedt	*Achnanthes levanderi (2022)*
Achnanthes minutissima	Kützing	*Achnanthidium minutissimum (1010)*
Achnanthes nodosa	Cleve	*Rossithidium nodosum (189006)*
Achnanthes Østrupii	(Cleve-Euler) Hustedt	*Planothidium oestrupii (155026)*
Achnanthes pergalli	Brun&Heribaud	-
Achnanthes ploenensis	Hustedt	*Karayevia ploenensis (125008)*
Achnanthes pseudoswazi	Carter	*Achnanthes pseudoswazi (2206)*
Achnanthes pusilla	(Grunow) De Toni	*Rossithidium pusillum (189003)*
Achnanthes semiaperta	Hustedt	*Achnanthidium semiapertum (1028)*
Achnanthes suchlandtii	Hustedt	*Karayevia suchlandtii (125009)*
Achnanthes trinodis	(W Smith) Grunow	*Achnanthes trinodis (2109)*
Achnanthes ventralis	(Krasske) Lange-Bertalot	*Psammothidium ventralis (186009)*
Amphipleura lindheimerii	Grunow	-
Amphora libyca	Ehrenberg	*Amphora copulata (7075)*
Amphora ovalis	(Kützing) Kützing	*Amphora ovalis (7001)*
Anomoeoneis brachysira	(Brebisson) Grunow	*Brachysira brebissonii (18005)*
Anomoeoneis vitrea	(Grunow) Ross	*Brachysira microcephala (18013)*
Aulacoseira alpigena	(Grunow) Krammer	*Aulacoseira alpigena (10028)*
Aulacoseira ambigua	(Grunow) Simonsen	*Aulacoseira ambigua (10008)*
Aulacoseira canadensis	(Hustedt) Simonsen	*Aulacoseira canadensis (10003)*
Aulacoseira crassipunctata	Krammer	*Aulacoseira crassipunctata (10001)*
Aulacoseira crenulata	(Ehrenberg) Thwaites	*Aulacoseira italica (10019)*
Aulacoseira distans	(Ehrenberg) Simonsen	*Aulacoseira distans (10009)*
Aulacoseira granulata	(Ehrenberg) Simonsen	*Aulacoseira granulata (10018)*
Aulacoseira lacustris	(Grunow) Krammer	*Aulacoseira lacustris (10060)*
Aulacoseira lirata	(Ehrenberg) Ross	*Aulacoseira lirata (10012)*
Aulacoseira muzzanensis	(Meister) Krammer	*Aulacoseira muzzanensis (10031)*
Aulacoseira perglabra	(Østrup) Haworth	*Aulacoseira perglabra (10006)*

Appendix B. Diatom species names and authorities according to Krammer & Lange-Bertlot (1991)

Species	Authority	Updated Species Name
Aulacoseira subarctica	(O Müller) Haworth	*Aulacoseira subarctica (10015)*
Aulacoseira tethera	Haworth	*Aulacoseira tethera (10033)*
Aulacoseira valida	(Grunow) Krammer	*Aulacoseira valida (10029)*
Bacillaria paradoxa	O Müller	*Bacillaria paradoxa (76001)*
Caloneis alpestris	Cleve	*Caloneis alpestris (12025)*
Caloneis lauta	Carter&Bailey-Watts	*Caloneis lauta (12026)*
Caloneis permagna	(Bailey) Cleve	*Caloneis permagna (12030)*
Caloneis silicula	(Ehrenberg) Cleve	*Caloneis silicula (12010)*
Caloneis tenuis	(Gregory) Krammer	*Caloneis tenuis (12013)*
Caloneis thermalis	(Grunow) Krammer	*Caloneis thermalis (12054)*
Caloneis undulata	(Gregory) Krammer	*Caloneis undulata (12022)*
Caloneis westii	(W Smith) Hendey	*Caloneis westii (12056)*
Cocconeis placentula	Ehrenberg	*Cocconeis placentula (16004)*
Cyclotella bodanica	Grunow	*Puncticulata bodanica (208004)*
Cyclotella comensis	Grunow	*Cyclotella comensis (20023)*
Cyclotella krammeri	Hakansson	*Cyclotella krammeri (20083)*
Cyclotella ocellata	Pantocsek	*Cyclotella ocellata (20009)*
Cyclotella pseudostelligera	Hustedt	*Discostella pseudostelligera (2506002)*
Cyclotella rossii	Hakansson	*Cyclotella rossii (20019)*
Cyclotella stelligera	Cleve & Grunow	*Discostella stelligera (2506003)*
Cyclotella tripartita	Hakansson	*Cyclotella tripartita (20085)*
Cymbella affinis	Kützing	*Cymbella affinis (23073)*
Cymbella amphicephala	Nägeli	*Cymbella amphicephala (23001)*
Cymbella angustata	(W Smith) Cleve	*Cymbopleura angustata (190013)*
Cymbella cesatii	(Rabenhorst) Grunow	*Cymbella cesatii (23004)*
Cymbella cistula	(Ehrenberg) Kirchner	*Cymbella cistula (23005)*
Cymbella cuspidata	Kützing	*Cymbopleura cuspidata (190001)*
Cymbella descripta	(Hustedt) Krammer & Lange-Bertalot	*Encyonopsis descripta (203014)*
Cymbella elginensis	Krammer	*Encyonema elginense (110044)*
Cymbella falaisensis	(Grunow) Krammer & Lange-Bertalot	*Encyonopsis falaisensis (203007)*
Cymbella gaeumannii	Meister	*Encyonema gaeumannii (110008)*
Cymbella gracilis	(Ehrenberg) Kützing	*Encyonema neogracile (110045)*
Cymbella helvetica	Kützing	*Cymbella helvetica (23099)*
Cymbella heteropleura	(Ehrenberg) Kützing	*Cymbella heteropleura (23100)*
Cymbella lapponica	Grunow	*Cymbella lapponica (23116)*
Cymbella microcephala	Grunow	*Encyonopsis microcephala (203002)*
Cymbella minuta	Hilse	*Encyonopsis minuta (203011)*
Cymbella rupicola	Grunow	*Cymbella rupicola (23020)*
Cymbella schimanskii	Krammer	-
Cymbella sileiaca	Bleisch	-

Appendix B. Diatom species names and authorities according to Krammer & Lange-Bertlot (1991)

Species	Authority	Updated Species Name
Cymbella sinuata	Gregory	*Reimeria sinuata (55002)*
Cymbella subaequalis	Grunow	*Cymbopleura subaequalis (190017)*
Cymbella tumidula	Grunow	*Cymbella tumidula (23082)*
Cymbella tynnii	Krammer	*Cymbella tynnii (47141)*
Denticula elegans	Kützing	*Denticula elegans (25001)*
Denticula keutzingii	Grunow	-
Diatoma mesodon	(Ehrenberg) Kützing	*Diatoma mesodon (27002)*
Diatoma vulgaris	Bory	*Diatoma vulgaris (27013)*
Diploneis boldtiana	Cleve	*Diploneis boldtiana (30012)*
Diploneis elliptica	(Kützing) Cleve	*Diploneis elliptica (30001)*
Diploneis finnica	(Ehrenberg) Cleve	*Diploneis finnica (30002)*
Diploneis marginestriata	Hustedt	*Diploneis marginestriata (30003)*
Diploneis ovalis	(Hilse) Cleve	*Diploneis ovalis (30009)*
Diploneis parma	Cleve	*Diploneis parma (30014)*
Epithemia adnata	(Kützing) Brebisson	*Epithemia adnata (32003)*
Epithemia smithii	Carruthers	*Epithemia smithii (32002)*
Epithemia sorex	Kützing	*Epithemia sorex (32006)*
Eunotia arcus	Ehrenberg	*Eunotia arcus (33001)*
Eunotia bigibba	Kützing	*Eunotia bigibba (33005)*
Eunotia bilunaris	(Ehrenberg) Mills	*Eunotia bilunaris (33185)*
Eunotia circumborealis	Lange-Bertalot & Norpel	*Eunotia circumborealis (33210)*
Eunotia denticulata	(Brebisson) Rabenhorst	*Eunotia denticulata (33011)*
Eunotia exigua	(Brebisson) Rabenhorst	*Eunotia exigua (33015)*
Eunotia faba	Ehrenberg	*Eunotia faba (33172)*
Eunotia implicata	Norpel	*Eunotia implicata (33168)*
Eunotia incisa	Gregory	*Eunotia incisa (33026)*
Eunotia minor	(Kützing) Grunow	*Eunotia minor (33183)*
Eunotia monodon	Ehrenberg	*Eunotia monodon (33035)*
Eunotia muscicola	Krasske	*Eunotia muscicola (33184)*
Eunotia paludosa	Grunow	*Eunotia paludosa (33083)*
Eunotia pectinalis	(Dillwyn) Rabenhorst	*Eunotia pectinalis (33039)*
Eunotia praerupta	Ehrenberg	*Eunotia praerupta (33045)*
Eunotia rhomboidea	Hustedt	*Eunotia rhomboidea (33051)*
Eunotia rhynchocephala	Hustedt	*Eunotia rhynchocephala (33191)*
Eunotia septentrionalis	Østrup	*Eunotia septentrionalis (33053)*
Eunotia serra	Ehrenberg	*Eunotia serra (33054)*
Eunotia soleirolii	(Kützing) Rabenhorst	*Eunotia soleirolii (33056)*
Fragilaria brevistriata	Grunow	*Pseudostaurosira brevistriata (73001)*
Fragilaria capucina	Desmazieres	*Fragilaria capucina (34006)*
Fragilaria construens f construens	(Ehrenberg) Grunow	*Staurosira construens (172001)*

Appendix B. Diatom species names and authorities according to Krammer & Lange-Bertlot (1991)

Species	Authority	Updated Species Name
Fragilaria construens f venter	(Ehrenberg) Hustedt	*Staurosira construens var. venter (172006)*
Fragilaria construens f. binodis	(Ehrenberg) Grunow	*Staurosira construens var. binodis (172005)*
Fragilaria delicatissima	(W Smith) Lange-Bertalot	-
Fragilaria elliptica	Schumann	*Pseudostaurosira elliptica (73025)*
Fragilaria exigua	Grunow	*Staurosira construens var. exigua (172022)*
Fragilaria fasciculata	(Agargh) Lange-Bertalot	*Tabularia fasciculata (200002)*
Fragilaria lapponica	Grunow	*Staurosirella lapponica (175002)*
Fragilaria leptostauron var. rhomboides	Grunow	*Staurosirella leptostauron var. rhomboides (175017)*
Fragilaria pinnata	Ehrenberg	*Staurosirella pinnata (175005)*
Fragilaria pseudoconstruens	Marciniak	*Pseudostaurosira pseudoconstruens (73002)*
Frustulia rhomboides	(Ehrenberg) deToni	*Frustulia krammeri (35039)*
Gomphonema acuminatum	Ehrenberg	*Gomphonema acuminatum (37001)*
Gomphonema angustatum	Kützing	*Gomphonema angustatum (37003)*
Gomphonema olivaceum	(Hornemann) Brebisson	*Gomphonema olivaceum (37065)*
Gomphonema parvulum	Kützing	*Gomphonema parvulum (37010)*
Gomphonema pseudosphaerophorum	Kobayasi	-
Gomphonema rhombicum	Fricke	*Gomphonema rhombicum (37080)*
Gomphonema sarcophagus	Gregory	*Gomphonema sarcophagus (37152)*
Gomphonema truncatum	Ehrenberg	*Gomphonema truncatum (37022)*
Navicula absoluta	Hustedt	*Navicula absoluta (46494)*
Navicula cocconeiformis	Gregory	*Cavinula cocconeiformis (195001)*
Navicula cryptocephala	Kützing	*Navicula cryptocephala (46014)*
Navicula difficillima	Hustedt	*Navicula difficillima (46017)*
Navicula elginensis	(Gregory) Ralfs	*Placoneis elginensis (194005)*
Navicula halophila	(Grunow) Cleve	*Craticula halophila (21005)*
Navicula levanderii	Hustedt	-
Navicula mediocris	Krasske	*Chamaepinnularia mediocris (212005)*
Navicula polyonca	Brebisson	*Pinnularia polyonca (52087)*
Navicula prominula	AWF Schmidt	-
Navicula pseudobryophila	Hustedt	*Navicula pseudobryophila (46807)*
Navicula pseudoscutiformis	Hustedt	*Cavinula pseudoscutiformis (195003)*
Navicula pseudoventralis	Hustedt	*Navicula pseudoventralis (46166)*
Navicula pupula	Kützing	*Sellaphora pupula (170006)*
Navicula riparia	Hustedt	*Craticula riparia (21016)*
Navicula schmassmannii	Hustedt	*Navicula schmassmannii (46066)*

Appendix B. Diatom species names and authorities according to Krammer & Lange-Bertlot (1991)

Species	Authority	Updated Species Name
Navicula soehrensis	Krasske	*Chamaepinnularia soehrensis (212006)*
Navicula striolata	(Grunow) Lange-Bertalot	*Navicula striolata (93266)*
Navicula subrotundata	Hustedt	*Navicula subrotundata (46079)*
Navicula trivalis	Lange-Bertalot	-
Navicula viridula	Kützing	*Navicula viridula (46408)*
Neidium affine	(Ehrenberg) Pfizer	*Neidium affine (47001)*
Neidium ampliatum	(Ehrenberg) Krammer	*Neidium ampliatum (47066)*
Neidium dubium	(Ehrenberg) Cleve	*Neidium dubium (47011)*
Neidium hitchcockii	(Ehrenberg) Cleve	*Neidium hitchcockii (47028)*
Neidium iridis	(Ehrenberg) Cleve	*Neidium iridis (47014)*
Neidium Septentrionalis	Cleve-Euler	*Neidium septentrionalis (47110)*
Nitzschia angustata	Grunow	*Nitzschia angustata (48093)*
Nitzschia behrei	Hustedt	*Nitzschia behrei (48585)*
Nitzschia diversa	Hustedt	*Nitzschia diversa (48411)*
Nitzschia elegans	Hustedt	*Nitzschia elegans (48010)*
Nitzschia fonticola	Grunow	*Nitzschia fonticola (48011)*
Nitzschia gisela	Lange-Bertalot	*Nitzschia gisela (48624)*
Nitzschia graciliformis	Lange-Bertalot & Simonsen	*Nitzschia graciliformis (48119)*
Nitzschia gracilis	Hantzsch	*Nitzschia gracilis (48015)*
Nitzschia recta	Hantzsch	*Nitzschia recta (48029)*
Nitzschia tropica	Hustedt	*Nitzschia tropica (48045)*
Pinnularia alpina	W Smith	*Pinnularia alpina (52807)*
Pinnularia appendiculata	(Agargh) Cleve	*Pinnularia appendiculata (52009)*
Pinnularia borealis	Ehrenberg	*Pinnularia borealis (52013)*
Pinnularia braunii	(Grunow) Cleve	*Pinnularia brauniana (103001)*
Pinnularia divergens	W Smith	*Pinnularia divergens (52025)*
Pinnularia episcopalis	Cleve	-
Pinnularia gibba	Ehrenberg	*Pinnularia gibba (52159)*
Pinnularia interrupta	W Smith	*Pinnularia interrupta (52194)*
Pinnularia karelica	Cleve	-
Pinnularia microstauron	(Ehrenberg) Cleve	*Pinnularia microstauron (52045)*
Pinnularia noblis	Ehrenberg	*Pinnularia nobilis (103038)*
Pinnularia nodsa	Ehrenberg	*Pinnularia nodosa (52048)*
Pinnularia polyonca	Brebisson	*Pinnularia polyonca (52087)*
Pinnularia pulchra	Østrup	*Pinnularia pulchra (52801)*
Pinnularia Subcapitata	Gregory	*Pinnularia subcapitata (52059)*
Pinnularia subrostrata	(A Cleve) Cleve-Euler	*Pinnularia subrostrata (52184)*
Pinnularia superdiverdentissima	Chaumont & Germain	-
Pinnularia viridis	(Nitzsch) Ehrenberg	*Pinnularia viridis (52071)*
Stauroneis acuta	W Smith	*Stauroneis acuta (62036)*

Species	Authority	Updated Species Name
Stauroneis anceps	Ehrenberg	*Stauroneis anceps (62002)*
Stauroneis gracillima	Hustedt	*Nupela gracillima (92026)*
Stauroneis javanica	(Grunow) Cleve	*Stauroneis cf. javanica (62045)*
Stauroneis phoenicenteron	(Nitzsch) Ehrenberg	*Stauroneis phoenicenteron (62015)*
Stauroneis producta	Grunow	*Stauroneis producta (62017)*
Stauroneis prominula	(Grunow) Hustedt	*Stauroneis prominula (62069)*
Stauroneis schimanskii	Krammer	*Stauroneis cf. schimanskii (62127)*
Stauroneis thermicola	(Petersen) Lund	*Stauroneis thermicola (62040)*
Stenopterobia anceps	(Lewis) Brebisson	*Stenopterobia anceps (63003)*
Stenopterobia delicatissima	(Lewis) Brebisson	*Stenopterobia delicatissima (63007)*
Surirella amphioxys	W Smith	*Surirella amphioxys (65069)*
Surirella angusta	Kützing	*Surirella angusta (65002)*
Surirella elegans	Ehrenberg	*Surirella elegans (65072)*
Surirella gracilis	Grunow	*Surirella gracilis (65013)*
Surirella linearis	W Smith	*Surirella linearis (65014)*
Tabellaria binalis	(Ehrenberg) Grunow	*Oxyneis binalis (9107001)*
Tabellaria fenestrata	(Lyngbye) Kützing	*Tabellaria fenestrata (67002)*
Tabellaria flocculosa	(Roth) Kützing	*Tabellaria flocculosa (67004)*
Tetracyclus glans	(Ehrenberg) Mills	*Tetracyclus glans (71006)*
Tetracyclus lacustris	Ralfs	*Tetracyclus lacustris (71003)*

Appendix C. Comprehensive diatom counts for the Danny's Lake sediment core

Updated species names and NADED ID numbers (in brackets) according to Academy of Natural Sciences and collaborators (2011-2013)

	Depth (cm)						
Updated Species Name	**0.5**	**0.7**	**1.4**	**1.7**	**2.3**	**2.5**	**3.2**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	7	5	3	1	3	4	5
Achnanthes pergalli						1	
Achnanthes pseudoswazi (2206)					1		
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	23	13	17	4	34	8	18
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)				1	1		
Aulacoseira alpigena (10028)	105	106	175	200	118	150	188
Aulacoseira ambigua (10008)	1			2	1		
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	31	24	25	10	50	14	23
Aulacoseira granulata (10018)						1	
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	21	59	17	33	13	49	27
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	6	9	28	10	3	4	19
Aulacoseira subarctica (10015)		2			4	1	
Aulacoseira tethera (10033)					3	1	
Aulacoseira valida (10029)	1						
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	6	6	7	9	1	9	11
Brachysira microcephala (18013)	2			1	2	1	
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	1	1	4		4	2	1
Cavinula pseudoscutiformis (195003)	5	1	2		3	2	2

	Depth (cm)						
Updated Species Name	**0.5**	**0.7**	**1.4**	**1.7**	**2.3**	**2.5**	**3.2**
Chamaepinnularia mediocris (212005)		1					
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)					1		
Craticula riparia (21016)							
Cyclotella comensis (20023)					1		1
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	26	26	27	26	30	34	23
Cyclotella rossii (20019)	1	1		2		1	1
Cyclotella tripartita (20085)		6	6	1	5	10	6
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	3	1	4	4	3	6	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)						1	
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)						1	
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)				1			
Diploneis finnica (30002)							
Diploneis marginestriata (30003)			1	1			
Diploneis ovalis (30009)							
Diploneis parma (30014)				1		1	
Discostella pseudostelligera (2506002)	15	11	1	10	3	15	8
Discostella stelligera (2506003)	10		10	4	2	3	4

	Depth (cm)						
Updated Species Name	**0.5**	**0.7**	**1.4**	**1.7**	**2.3**	**2.5**	**3.2**
Encyonema elginense (110044)						2	
Encyonema gaeumannii (110008)	1	1	1	1	8	3	3
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)						1	
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	2	1					1
Epithemia adnata (32003)							
Epithemia smithii (32002)	1						
Epithemia sorex (32006)					1		
Eucocconeis flexella (187001)							1
Eucocconeis laevis (187002)							
Eunotia arcus (33001)			2		1	1	2
Eunotia bigibba (33005)							
Eunotia bilunaris (33185)			1			2	2
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)				2			
Eunotia exigua (33015)							
Eunotia faba (33172)	2	5	8	4	1	8	6
Eunotia implicata (33168)							
Eunotia incisa (33026)		1	1	1			
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)		1	1	1		1	1
Eunotia soleirolii (33056)			1				
Fragilaria capucina (34006)	1	2					
Fragilaria delicatissima							
Frustulia krammeri (35039)	2	4	6			5	1
Gomphonema acuminatum (37001)		1					
Gomphonema angustatum (37003)		1		1	1	1	

	Depth (cm)						
Updated Species Name	**0.5**	**0.7**	**1.4**	**1.7**	**2.3**	**2.5**	**3.2**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)	1						
Gomphonema sarcophagus (37152)		1				1	
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)							
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	5	12	4			1	2
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	2	1	2		1	1	
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)	2	1	4				
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)						1	
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)				1		1	
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)		1					
Nitzschia behrei (48585)			1				
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	12	12	8	7	7	10	7
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**0.5**	**0.7**	**1.4**	**1.7**	**2.3**	**2.5**	**3.2**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)		1					
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)				2			
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)	1					1	
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)			4	3			1
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)	1			1			
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	7	2					2
Psammothidium didymum (186012)							
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)	1						
Pseudostaurosira brevistriata (73001)	37	18	17	16	51	14	25
Pseudostaurosira elliptica (73025)	5	5	1	3	8	3	2
Pseudostaurosira pseudoconstruens (73002)	5		3	1	12	2	1
Puncticulata bodanica (208004)	2	1	4	2	2	5	1
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)	3						
Rossithidium pusillum (189003)	7	3	5	1	7	1	
Sellaphora pupula (170006)		1		1	4	2	

	Depth (cm)						
Updated Species Name	**0.5**	**0.7**	**1.4**	**1.7**	**2.3**	**2.5**	**3.2**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)			2				
Stauroneis producta (62017)		2				1	
Stauroneis prominula (62069)	1		2	1			
Stauroneis thermicola (62040)							
Staurosira construens (172001)					1		
Staurosira construens var. binodis (172005)	15	7	8	15	7	10	3
Staurosira construens var. exigua (172022)	38	48	31	25	32	35	25
Staurosira construens var. venter (172006)	18	8	5	3	18	1	7
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	2	4	6			5	1
Staurosirella pinnata (175005)	3	3	1	1	24	2	4
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)			2				
Tabellaria fenestrata (67002)		4	1	1		2	
Tabellaria flocculosa (67004)	6	7	5	1	5	2	7
Tabularia fasciculata (200002)					1		
Tetracyclus glans (71006)	2			1		1	
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice	25	25	12	110	28	22	78
Total diatom counts per slice	449	431	464	417	478	445	444
Total microspheres per slice	358		1180		460		600

	Depth (cm)						
Updated Species Name	**3.4**	**4.1**	**4.3**	**5.0**	**5.2**	**5.9**	**6.1**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	1	8	3	4		5	3
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)		2					
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	6	17	7	13		9	15
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)			1		1		1
Aulacoseira alpigena (10028)	190	106	116	111	89	200	139
Aulacoseira ambigua (10008)				1			
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)						1	
Aulacoseira distans (10009)	13	38	34	20	22	31	20
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	34	28	56	34	60	30	46
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	11	8	7	7	13	8	8
Aulacoseira subarctica (10015)	1	7		1		1	
Aulacoseira tethera (10033)			1			1	
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	8	11	11	12	30	7	8
Brachysira microcephala (18013)		1	1			1	
Caloneis alpestris (12025)							
Caloneis lauta (12026)					1		
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)		1	2	4	1		
Cavinula pseudoscutiformis (195003)	1	2	4	1			5

	Depth (cm)						
Updated Species Name	**3.4**	**4.1**	**4.3**	**5.0**	**5.2**	**5.9**	**6.1**
Chamaepinnularia mediocris (212005)			1				
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)	1						
Craticula riparia (21016)							
Cyclotella comensis (20023)			1		1		
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	29	28	35	32	40	26	34
Cyclotella rossii (20019)	2	5	3	4	3	2	1
Cyclotella tripartita (20085)	2	6	9	7	14	6	7
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)			1				
Cymbella schimanskii							
Cymbella sileiaca		2	2	2		7	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)			1				
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)		1	1	3	1		
Diploneis ovalis (30009)							
Diploneis parma (30014)	1				5		1
Discostella pseudostelligera (2506002)	7	11	14	16	8	10	10
Discostella stelligera (2506003)	7	8	7	6		1	5

	Depth (cm)						
Updated Species Name	**3.4**	**4.1**	**4.3**	**5.0**	**5.2**	**5.9**	**6.1**
Encyonema elginense (110044)							1
Encyonema gaeumannii (110008)	1		3	1			1
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)						1	
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)		2	1	7			4
Epithemia adnata (32003)							
Epithemia smithii (32002)	1						
Epithemia sorex (32006)							
Eucocconeis flexella (187001)	1	1					1
Eucocconeis laevis (187002)							
Eunotia arcus (33001)	3		1		3	1	
Eunotia bigibba (33005)			1		1		
Eunotia bilunaris (33185)		2		1	2	1	2
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	5	2	6	4	16	2	2
Eunotia implicata (33168)							
Eunotia incisa (33026)				1			1
Eunotia minor (33183)							
Eunotia monodon (33035)					1		
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)	1						
Eunotia serra (33054)	1		2	1			1
Eunotia soleirolii (33056)		1	1		1		
Fragilaria capucina (34006)	1			2	1	1	
Fragilaria delicatissima							
Frustulia krammeri (35039)	1	2	3	3	4		5
Gomphonema acuminatum (37001)	1				1		
Gomphonema angustatum (37003)	1		2			1	1

	Depth (cm)						
Updated Species Name	**3.4**	**4.1**	**4.3**	**5.0**	**5.2**	**5.9**	**6.1**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)					1		
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)			1				
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)						1	3
Navicula absoluta (46494)							
Navicula cryptocephala (46014)		1	1	1		1	
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)		2				1	1
Navicula striolata (93266)							
Navicula subrotundata (46079)							3
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)		2					
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)	1						
Nitzschia fonticola (48011)	6	18	8	11	2	7	17
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**3.4**	**4.1**	**4.3**	**5.0**	**5.2**	**5.9**	**6.1**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)		1					
Pinnularia divergens (52025)					2		
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)			1		1		1
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)				1			
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1			3			
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)			1				1
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	1					1	
Psammothidium didymum (186012)							
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)			1				1
Pseudostaurosira brevistriata (73001)	18	25	19	15	7	18	20
Pseudostaurosira elliptica (73025)		5	1	1		5	6
Pseudostaurosira pseudoconstruens (73002)	1	8	3	1		5	
Puncticulata bodanica (208004)	3	1	3	1	7	1	3
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)		1		1			
Rossithidium pusillum (189003)	4	6	3	3	4	3	4
Sellaphora pupula (170006)	1	2	3	4			3

	Depth (cm)						
Updated Species Name	**3.4**	**4.1**	**4.3**	**5.0**	**5.2**	**5.9**	**6.1**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)							
Stauroneis producta (62017)	1	2		2		1	2
Stauroneis prominula (62069)						1	
Stauroneis thermicola (62040)							
Staurosira construens (172001)				2			
Staurosira construens var. binodis (172005)	9	10	10	14	9	9	4
Staurosira construens var. exigua (172022)	13	25	44	30	35	24	38
Staurosira construens var. venter (172006)	5	16	8	10	7	10	10
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	1	2	3	3	4		5
Staurosirella pinnata (175005)		9	3	3	1	5	3
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)				1			
Surirella angusta (65002)			1				
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)		1	1		1		
Tabellaria fenestrata (67002)	2	4	2	1	1	1	1
Tabellaria flocculosa (67004)	7	11	6	11	5	3	5
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)	2	1	1		3		
Tetracyclus lacustris (71003)					1		
Total chrysophyte cysts per slice	110	44	45	37	30	45	34
Total diatom counts per slice	407	453	462	417	410	450	455
Total microspheres per slice		100		295		230	

	Depth (cm)						
Updated Species Name	**6.8**	**7.0**	**7.7**	**8.0**	**8.6**	**8.9**	**9.5**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	4	5	5	6	6	8	8
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)		1				1	2
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	23	15	25	13	11	20	16
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)		1			2	1	1
Aulacoseira alpigena (10028)	107	154	176	113	160	108	100
Aulacoseira ambigua (10008)			1	1			1
Aulacoseira canadensis (10003)				1			
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	17	7	14	50	16	15	35
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	35	51	21	42	40	29	93
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							2
Aulacoseira perglabra (10006)	4	2	10	12	14	3	9
Aulacoseira subarctica (10015)	1	1	3		2	1	1
Aulacoseira tethera (10033)				1	5		
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	10	12	9	8	9	6	8
Brachysira microcephala (18013)	1	2	1	1	1	3	
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	4	3	4	1	5	2	
Cavinula pseudoscutiformis (195003)	4	4		2	4	7	4

	Depth (cm)						
Updated Species Name	**6.8**	**7.0**	**7.7**	**8.0**	**8.6**	**8.9**	**9.5**
Chamaepinnularia mediocris (212005)							
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)				1			
Craticula riparia (21016)							
Cyclotella comensis (20023)		1				2	
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	28	33	37	33	16	41	30
Cyclotella rossii (20019)	4			2		2	
Cyclotella tripartita (20085)	14	7	8	5	6	12	3
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca		1	4	4	4	1	1
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii			1		2		
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)							2
Diploneis ovalis (30009)							
Diploneis parma (30014)		2					
Discostella pseudostelligera (2506002)	7	19	11	14	15	12	7
Discostella stelligera (2506003)	5		1	3	2	1	9

	Depth (cm)						
Updated Species Name	**6.8**	**7.0**	**7.7**	**8.0**	**8.6**	**8.9**	**9.5**
Encyonema elginense (110044)				2			
Encyonema gaeumannii (110008)	6	2	6	3	1	4	
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	3		3				1
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	1	2	3	1	3	1	1
Epithemia adnata (32003)							
Epithemia smithii (32002)	1						
Epithemia sorex (32006)							
Eucocconeis flexella (187001)		2		1		2	
Eucocconeis laevis (187002)							
Eunotia arcus (33001)				1			
Eunotia bigibba (33005)					1		
Eunotia bilunaris (33185)	3	1	1			1	1
Eunotia circumborealis (33210)							1
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	1	5	3	5	4	3	1
Eunotia implicata (33168)							
Eunotia incisa (33026)					1		
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)	1	2			1	1	1
Eunotia soleirolii (33056)				1		2	
Fragilaria capucina (34006)	1	1	1				
Fragilaria delicatissima							
Frustulia krammeri (35039)	6	3	6	3	3	7	4
Gomphonema acuminatum (37001)		1			2		
Gomphonema angustatum (37003)	1	2	1		3	3	

	Depth (cm)						
Updated Species Name	**6.8**	**7.0**	**7.7**	**8.0**	**8.6**	**8.9**	**9.5**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)						1	
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	4	4	4	1	1	10	
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	4	1	1	2	2		1
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)		1			2		1
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)						1	
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	7	5	11	13	4	10	10
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**6.8**	**7.0**	**7.7**	**8.0**	**8.6**	**8.9**	**9.5**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)		2					
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							6
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)				1			
Pinnularia subcapitata (52059)		2	1		3	2	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)						1	2
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	1				1	2	3
Psammothidium didymum (186012)							
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)	2						
Pseudostaurosira brevistriata (73001)	29	20	34	25	13	26	10
Pseudostaurosira elliptica (73025)	2	5	4	6	5	3	
Pseudostaurosira pseudoconstruens (73002)	3	4	1		5	1	
Puncticulata bodanica (208004)	4	2	6	2	3	1	3
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)	5						
Rossithidium pusillum (189003)	9	1	4	5	2	3	5
Sellaphora pupula (170006)	4	2	2	2	3	5	1

	Depth (cm)						
Updated Species Name	**6.8**	**7.0**	**7.7**	**8.0**	**8.6**	**8.9**	**9.5**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)				1			
Stauroneis phoenicenteron (62015)							1
Stauroneis producta (62017)	2	1	2			1	
Stauroneis prominula (62069)			1	1			
Stauroneis thermicola (62040)							
Staurosira construens (172001)	2			1			1
Staurosira construens var. binodis (172005)	11	8	7	8	7	8	12
Staurosira construens var. exigua (172022)	28	34	33	29	22	40	35
Staurosira construens var. venter (172006)	6	8	11	4	5	9	20
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	6	3	6	3	3	7	4
Staurosirella pinnata (175005)	9	2	3	5	5	4	3
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)		2	1		2		
Tabellaria fenestrata (67002)	2	1		1	1		
Tabellaria flocculosa (67004)	5	3	11	4	4	9	5
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)		1	3	2	1		
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice	43	27	71	28	46	30	74
Total diatom counts per slice	437	454	501	446	433	443	465
Total microspheres per slice	160		710		31		69

	Depth (cm)						
Updated Species Name	**9.8**	**10.4**	**10.7**	**11.3**	**11.6**	**12.2**	**12.4**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	2	5	11	4	8	1	4
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)						1	1
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	8	26	25	25	15	20	4
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)							
Aulacoseira alpigena (10028)	200	173	127	121	143	150	155
Aulacoseira ambigua (10008)							
Aulacoseira canadensis (10003)						1	
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	20	17	26	26	24	15	20
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	54	27	23	41	39	23	31
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	14	11	2	9	13	10	10
Aulacoseira subarctica (10015)	1		3	1	2	1	3
Aulacoseira tethera (10033)					2		1
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	8	17	11	6	13	4	10
Brachysira microcephala (18013)		3		1	1	3	
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)				1			
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)		3		2	5	4	1
Cavinula pseudoscutiformis (195003)	4	3	4	5	2	3	3

	Depth (cm)						
Updated Species Name	**9.8**	**10.4**	**10.7**	**11.3**	**11.6**	**12.2**	**12.4**
Chamaepinnularia mediocris (212005)					1	1	
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)							
Craticula riparia (21016)							
Cyclotella comensis (20023)				1		1	
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	12	23	38	29	28	28	40
Cyclotella rossii (20019)	3		4				3
Cyclotella tripartita (20085)	5	7	18	6	4	4	7
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	4	3	6	2	4	7	
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)	1						
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii						1	
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)		1	2		1	1	
Diploneis ovalis (30009)							
Diploneis parma (30014)	1				2		2
Discostella pseudostelligera (2506002)	3	6	13	10	16	14	8
Discostella stelligera (2506003)	3	8	6	4	1	1	6

	Depth (cm)						
Updated Species Name	**9.8**	**10.4**	**10.7**	**11.3**	**11.6**	**12.2**	**12.4**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)	3	3	2	3	7	1	2
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1	1	1	1			1
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	2	2	1	1	1		2
Epithemia adnata (32003)							
Epithemia smithii (32002)				1	1		
Epithemia sorex (32006)							
Eucocconeis flexella (187001)	1	1	1			2	
Eucocconeis laevis (187002)							
Eunotia arcus (33001)		1	1		2	1	
Eunotia bigibba (33005)							
Eunotia bilunaris (33185)	2			1	2		2
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)				1			
Eunotia exigua (33015)							
Eunotia faba (33172)	5	4	7	6	5	2	6
Eunotia implicata (33168)							
Eunotia incisa (33026)							1
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)			1				
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)	2				1	1	
Eunotia soleirolii (33056)							1
Fragilaria capucina (34006)	1						
Fragilaria delicatissima							
Frustulia krammeri (35039)	2	3	3	4	5	3	2
Gomphonema acuminatum (37001)							
Gomphonema angustatum (37003)					1	4	

	Depth (cm)						
Updated Species Name	**9.8**	**10.4**	**10.7**	**11.3**	**11.6**	**12.2**	**12.4**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)				1			
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)							
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)		4	6	6	2	0	4
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	1	2	1				1
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)			1	2			
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)					1		1
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)					1		
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)	1						3
Nitzschia fonticola (48011)		6	7	7	9	7	5
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**9.8**	**10.4**	**10.7**	**11.3**	**11.6**	**12.2**	**12.4**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)					1		
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica				1			
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)	1						
Pinnularia subcapitata (52059)	1	3	1			4	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)							
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)		1	1	1	2	1	1
Psammothidium didymum (186012)							1
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)					1		
Pseudostaurosira brevistriata (73001)	11	23	37	11	16	12	20
Pseudostaurosira elliptica (73025)	1	1	6	4	1	5	2
Pseudostaurosira pseudoconstruens (73002)				1		1	4
Puncticulata bodanica (208004)	2	2	3	4	2		5
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)		4		3			
Rossithidium pusillum (189003)			5	1	3	6	4
Sellaphora pupula (170006)		1	3	10	2	1	

	Depth (cm)						
Updated Species Name	**9.8**	**10.4**	**10.7**	**11.3**	**11.6**	**12.2**	**12.4**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)		2					
Stauroneis producta (62017)			2	2	1	2	
Stauroneis prominula (62069)	1		1	2			2
Stauroneis thermicola (62040)							
Staurosira construens (172001)							
Staurosira construens var. binodis (172005)	3	9	15	3	8	8	5
Staurosira construens var. exigua (172022)	23	28	42	35	23	30	22
Staurosira construens var. venter (172006)	6	12	10	14	9	12	13
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	2	3	3	4	5	3	2
Staurosirella pinnata (175005)	1	4	6	4		2	6
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)			1			1	
Tabellaria fenestrata (67002)	1	2	1	3	3		2
Tabellaria flocculosa (67004)	1	11	6	6	9	5	7
Tabularia fasciculata (200002)				1			
Tetracyclus glans (71006)		1		1			
Tetracyclus lacustris (71003)							1
Total chrysophyte cysts per slice	43	50	24	66	35	53	114
Total diatom counts per slice	418	467	494	439	448	408	437
Total microspheres per slice		67		86		90	

	Depth (cm)						
Updated Species Name	**13.0**	**13.3**	**13.9**	**14.2**	**14.8**	**15.1**	**15.7**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	7	3	11	8	12	2	8
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)							
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	20	18	30	23	20	20	19
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)		2			1		
Aulacoseira alpigena (10028)	126	137	120	153	171	145	152
Aulacoseira ambigua (10008)							
Aulacoseira canadensis (10003)		1					
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	22	25	24	25	21	21	34
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	42	45	35	26	31	32	19
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	12	8	14	9	12	11	15
Aulacoseira subarctica (10015)	1	3	2		2		1
Aulacoseira tethera (10033)	3				2	1	
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)		12	6	10	7	8	10
Brachysira microcephala (18013)	2	1	1	2	4	2	2
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	3	2	2		1	2	3
Cavinula pseudoscutiformis (195003)	5	6	6	4	6	1	3

	Depth (cm)						
Updated Species Name	**13.0**	**13.3**	**13.9**	**14.2**	**14.8**	**15.1**	**15.7**
Chamaepinnularia mediocris (212005)				1	2		
Chamaepinnularia soehrensis (212006)			4				
Cocconeis placentula (16004)							
Craticula halophila (21005)				1	2		
Craticula riparia (21016)							
Cyclotella comensis (20023)		1		1	1	1	1
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	23	39	24	30	29	31	29
Cyclotella rossii (20019)		2					
Cyclotella tripartita (20085)	4	5	7	4	4	2	5
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	2	2	5		4	1	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)		1					
Cymbopleura cuspidata (190001)							2
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii			1				1
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1				3		1
Diploneis ovalis (30009)						1	
Diploneis parma (30014)	1					1	
Discostella pseudostelligera (2506002)	23	17	12	14	17	17	19
Discostella stelligera (2506003)	1		3	1	1		4

	Depth (cm)						
Updated Species Name	**13.0**	**13.3**	**13.9**	**14.2**	**14.8**	**15.1**	**15.7**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)	5	3	3	3	4	3	8
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1			1			
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	1	2	1	1	1	1	
Epithemia adnata (32003)							
Epithemia smithii (32002)							
Epithemia sorex (32006)							
Eucocconeis flexella (187001)				1			
Eucocconeis laevis (187002)							
Eunotia arcus (33001)	2					1	2
Eunotia bigibba (33005)				2			
Eunotia bilunaris (33185)		1	1	1		1	2
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)		1					
Eunotia exigua (33015)							
Eunotia faba (33172)	5	7	3	5	1		2
Eunotia implicata (33168)			2				
Eunotia incisa (33026)		2		1			
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)	2	1		1			1
Eunotia soleirolii (33056)						1	
Fragilaria capucina (34006)			1		2	1	
Fragilaria delicatissima							
Frustulia krammeri (35039)	2	3	9	4	1	2	4
Gomphonema acuminatum (37001)	3	1			1		1
Gomphonema angustatum (37003)		1	1	2	1	1	

	Depth (cm)						
Updated Species Name	**13.0**	**13.3**	**13.9**	**14.2**	**14.8**	**15.1**	**15.7**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)	1	1			1		
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	2	7	4	1	2	2	5
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	1		4	3	1	2	
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)	1			1	1	2	4
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)				1			
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	13	7	5	5	6	3	9
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)			1			1	
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**13.0**	**13.3**	**13.9**	**14.2**	**14.8**	**15.1**	**15.7**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)	1						
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1		3	3	2	1	1
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)		2		1		1	
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	1	1	1	1	4	1	
Psammothidium didymum (186012)					1	1	
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)	2		1				
Pseudostaurosira brevistriata (73001)	20	24	27	14	15	14	26
Pseudostaurosira elliptica (73025)	2	4	1	1	7	4	4
Pseudostaurosira pseudoconstruens (73002)		4			2	3	6
Puncticulata bodanica (208004)	2	3	3	1	2	3	3
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)			2	2			
Rossithidium pusillum (189003)	5	8	2	3	7	4	8
Sellaphora pupula (170006)	5	3	6	3	5	4	3

	Depth (cm)						
Updated Species Name	**13.0**	**13.3**	**13.9**	**14.2**	**14.8**	**15.1**	**15.7**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)							
Stauroneis producta (62017)	1		1		1	2	1
Stauroneis prominula (62069)							1
Stauroneis thermicola (62040)							
Staurosira construens (172001)		1	1	1			
Staurosira construens var. binodis (172005)	5	8	5	5	4	5	2
Staurosira construens var. exigua (172022)	40	48	28	30	24	35	16
Staurosira construens var. venter (172006)	11	12	7	9	7	4	9
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	2	3	9	4	1	2	4
Staurosirella pinnata (175005)	2	5	4	4		2	4
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)			1				
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)	1	1	1	2	1		1
Tabellaria flocculosa (67004)	8	3	10	12	10	4	3
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)		1			2	2	1
Tetracyclus lacustris (71003)							1
Total chrysophyte cysts per slice	44	83	57	44	53	34	62
Total diatom counts per slice	446	498	455	441	470	412	462
Total microspheres per slice	123		22		160		38

	Depth (cm)						
Updated Species Name	**16.0**	**16.6**	**16.9**	**17.5**	**17.8**	**18.4**	**18.7**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	3	3	4	8	3	6	3
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)	1					1	
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	18	15	14	22	20	25	10
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii					1		
Amphora copulata (7075)							
Amphora ovalis (7001)			2				
Aulacoseira alpigena (10028)	154	176	141	97	144	95	144
Aulacoseira ambigua (10008)				3			
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	24	30	13	10	22	45	8
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	33	34	37	36	24	27	41
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	14	7	15	11	11	7	6
Aulacoseira subarctica (10015)	2	1	0	2	1		2
Aulacoseira tethera (10033)	1		3	1			
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)				2			
Brachysira brebissonii (18005)	5	5	9	4	12	7	6
Brachysira microcephala (18013)		1	1			1	
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)		5		1	3	2	
Cavinula pseudoscutiformis (195003)	2	2	7	1	1	1	5

	Depth (cm)						
Updated Species Name	**16.0**	**16.6**	**16.9**	**17.5**	**17.8**	**18.4**	**18.7**
Chamaepinnularia mediocris (212005)		3					
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)	1				1		
Craticula riparia (21016)							
Cyclotella comensis (20023)	1	1		1			
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	39	25	34	26	32	49	35
Cyclotella rossii (20019)	4		1	1		1	
Cyclotella tripartita (20085)	13	3	6	6	4	9	7
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							1
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	1	3	4	4	2	16	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	4		1	1			1
Diploneis ovalis (30009)			1				
Diploneis parma (30014)	3		3	1			
Discostella pseudostelligera (2506002)	13	22	20	2	16	11	6
Discostella stelligera (2506003)	3			17		13	

	Depth (cm)						
Updated Species Name	**16.0**	**16.6**	**16.9**	**17.5**	**17.8**	**18.4**	**18.7**
Encyonema elginense (110044)					1		1
Encyonema gaeumannii (110008)	4	5	3	8	1	4	1
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)						2	
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	2	1	3	3	3	1	
Epithemia adnata (32003)							
Epithemia smithii (32002)			1	1			
Epithemia sorex (32006)							
Eucocconeis flexella (187001)					2		1
Eucocconeis laevis (187002)							
Eunotia arcus (33001)	1	2			2	1	
Eunotia bigibba (33005)	1				1	1	
Eunotia bilunaris (33185)		2		2			
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)						1	
Eunotia faba (33172)	3	3	7	5	5	2	3
Eunotia implicata (33168)							
Eunotia incisa (33026)		1				2	
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)			1				
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)			1				
Eunotia serra (33054)			2				
Eunotia soleirolii (33056)							
Fragilaria capucina (34006)	2				1	1	
Fragilaria delicatissima							
Frustulia krammeri (35039)	4		3	1	2	2	4
Gomphonema acuminatum (37001)							
Gomphonema angustatum (37003)	2	1	1	4	1		1

	Depth (cm)						
Updated Species Name	**16.0**	**16.6**	**16.9**	**17.5**	**17.8**	**18.4**	**18.7**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)				4			
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)						2	1
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	3	1	2			1	5
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	3	1	1		1	1	3
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula				1			
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)				2		2	
Navicula striolata (93266)				1			
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)	2	1	1				
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							1
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)	2	1					
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	6	7	9	3	9	8	4
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)					1		
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**16.0**	**16.6**	**16.9**	**17.5**	**17.8**	**18.4**	**18.7**
Nupela gracillima (92026)				1			
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)						1	
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)	2						
Pinnularia karelica							
Pinnularia microstauron (52045)				1			
Pinnularia nobilis (103038)			1				
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	3						2
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)	2		1				2
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	1		2		1	2	1
Psammothidium didymum (186012)	1						
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)					1		
Pseudostaurosira brevistriata (73001)	26	28	18	8	19	37	23
Pseudostaurosira elliptica (73025)	1	6	3	4	2	1	4
Pseudostaurosira pseudoconstruens (73002)	1	3	5		1	7	2
Puncticulata bodanica (208004)	3	2	8	3	2	3	5
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)				8		12	
Rossithidium pusillum (189003)	2	2	5	6	5	7	3
Sellaphora pupula (170006)	1	2		1		3	1

	Depth (cm)						
Updated Species Name	**16.0**	**16.6**	**16.9**	**17.5**	**17.8**	**18.4**	**18.7**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)				2			
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)	2						
Stauroneis phoenicenteron (62015)	2			1		2	
Stauroneis producta (62017)	1	3	3		1		2
Stauroneis prominula (62069)							
Stauroneis thermicola (62040)							
Staurosira construens (172001)			1	5		1	
Staurosira construens var. binodis (172005)	14	3	4	4	6	6	11
Staurosira construens var. exigua (172022)	32	26	45	34	20	37	32
Staurosira construens var. venter (172006)	3	10	5	27	9	14	11
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	4		3	1	2	2	4
Staurosirella pinnata (175005)	3	4	3	7	3	10	3
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)	2		1				
Tabellaria fenestrata (67002)	4	1	4	1	1	3	4
Tabellaria flocculosa (67004)	4	2	8	9	6	6	4
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)	1				1	1	1
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice	64	36	46	64	44	74	17
Total diatom counts per slice	489	454	471	415	407	502	417
Total microspheres per slice		54		224		240	

	Depth (cm)						
Updated Species Name	**19.3**	**19.6**	**20.2**	**20.5**	**21.1**	**21.4**	**22.1**
Achnanthes imperfecta (2051)	1						
Achnanthes levanderi (2022)	5	6	10	10	5	6	13
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)			2	1			
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	30	31	32	21	20	13	48
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)							
Aulacoseira alpigena (10028)	140	121	120	105	120	127	100
Aulacoseira ambigua (10008)	1						
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	23	6	33	13	32	18	18
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	19	10	28	19	18	17	23
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	14	9	8	4	9	2	13
Aulacoseira subarctica (10015)	2			1		1	4
Aulacoseira tethera (10033)		2					1
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	6	9	6	11	7	7	7
Brachysira microcephala (18013)	1			1	2		1
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)		3	5		3	2	4
Cavinula pseudoscutiformis (195003)	4	1	5	6	5	4	2

	Depth (cm)						
Updated Species Name	**19.3**	**19.6**	**20.2**	**20.5**	**21.1**	**21.4**	**22.1**
Chamaepinnularia mediocris (212005)			2	1	1		
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)			1	1			
Craticula riparia (21016)							
Cyclotella comensis (20023)	1			2			
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	18	50	16	33	29	52	38
Cyclotella rossii (20019)	2	1	1				2
Cyclotella tripartita (20085)	4	9	5	4	2		6
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)						1	
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	1	9	2	2	5	6	4
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1	2		2	1	1	1
Diploneis ovalis (30009)							
Diploneis parma (30014)				1		1	
Discostella pseudostelligera (2506002)	12	9	20	21	23	24	20
Discostella stelligera (2506003)		9	1	3	1	2	8

	Depth (cm)						
Updated Species Name	**19.3**	**19.6**	**20.2**	**20.5**	**21.1**	**21.4**	**22.1**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)	5	4	4	5	10	1	5
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1	1		1	1		
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	2	3	2		3	5	1
Epithemia adnata (32003)							
Epithemia smithii (32002)							
Epithemia sorex (32006)							
Eucocconeis flexella (187001)					3	2	
Eucocconeis laevis (187002)							3
Eunotia arcus (33001)	2	1			3		
Eunotia bigibba (33005)							
Eunotia bilunaris (33185)	2	3	2			1	1
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)		8	3	2	3	5	5
Eunotia implicata (33168)							
Eunotia incisa (33026)		2				1	
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)						1	
Eunotia soleirolii (33056)	1	1					
Fragilaria capucina (34006)	1	2	2			1	2
Fragilaria delicatissima							
Frustulia krammeri (35039)	4	4	2	4	4	3	5
Gomphonema acuminatum (37001)							
Gomphonema angustatum (37003)		1		1	1	2	1

	Depth (cm)						
Updated Species Name	**19.3**	**19.6**	**20.2**	**20.5**	**21.1**	**21.4**	**22.1**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)							
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	5	1	2		4	3	3
Navicula absoluta (46494)							
Navicula cryptocephala (46014)		4	2	3	5		3
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)		2		1			
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	14	12	10	9	9	8	9
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							1
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**19.3**	**19.6**	**20.2**	**20.5**	**21.1**	**21.4**	**22.1**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1	2		1	1	1	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)			1	2			
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	2		2	7	4	1	5
Psammothidium didymum (186012)				2	1		
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	26	22	44	26	23	33	24
Pseudostaurosira elliptica (73025)	5		1	4	8	5	5
Pseudostaurosira pseudoconstruens (73002)	5	3		1	2	4	3
Puncticulata bodanica (208004)		5	3	3	2	4	1
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)		4	1	5			2
Rossithidium pusillum (189003)	9	8	8	5	8	8	9
Sellaphora pupula (170006)	5	2	7		2		4

	Depth (cm)						
Updated Species Name	**19.3**	**19.6**	**20.2**	**20.5**	**21.1**	**21.4**	**22.1**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)		6					
Stauroneis producta (62017)				3	3	3	1
Stauroneis prominula (62069)			1		1		4
Stauroneis thermicola (62040)							
Staurosira construens (172001)	1				1		1
Staurosira construens var. binodis (172005)	4	6	4	11	4	11	8
Staurosira construens var. exigua (172022)	36	39	14	35	23	35	28
Staurosira construens var. venter (172006)	11	9	15	16	13	12	18
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	4	4	2	4	4	3	5
Staurosirella pinnata (175005)	11	14	22	4	4	10	3
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)	2	2	2	1	1	2	3
Tabellaria flocculosa (67004)	11	8	5	4	5	7	5
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)							2
Tetracyclus lacustris (71003)	1						
Total chrysophyte cysts per slice	26	40	50	33	46	41	55
Total diatom counts per slice	456	470	458	422	439	456	483
Total microspheres per slice	41		23		62		68

	Depth (cm)						
Updated Species Name	**22.4**	**23.0**	**23.3**	**23.9**	**24.2**	**24.9**	**25.3**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	4	9	11	12	2	9	3
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)			1	1			
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	15	22	40	42	15	30	24
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)							1
Aulacoseira alpigena (10028)	161	150	142	122	167	143	170
Aulacoseira ambigua (10008)				1			
Aulacoseira canadensis (10003)				2			
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	15	12	3	40	16	22	8
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)		1					
Aulacoseira lacustris (10060)	16	17	8	18	19	16	
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	6	9	7	22	4	7	
Aulacoseira subarctica (10015)	2			2	1		
Aulacoseira tethera (10033)							
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	8	6	18	7	11	2	6
Brachysira microcephala (18013)	3	2	1		3	3	2
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)			1				
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)					1		
Cavinula cocconeiformis (195001)	2	5	3		1	3	
Cavinula pseudoscutiformis (195003)	5	1	8	3	4	9	5

	Depth (cm)						
Updated Species Name	**22.4**	**23.0**	**23.3**	**23.9**	**24.2**	**24.9**	**25.3**
Chamaepinnularia mediocris (212005)	1					1	
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)		1					
Craticula riparia (21016)							
Cyclotella comensis (20023)		1					
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	37	25	32	34	44	37	34
Cyclotella rossii (20019)	1	1		4	2		
Cyclotella tripartita (20085)	4	1	4	7	15	3	5
Cymbella affinis (23073)							
Cymbella amphicephala (23001)				1			
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)		1					
Cymbella lapponica (23116)							
Cymbella rupicola (23020)				1			
Cymbella schimanskii							
Cymbella sileiaca	5	2	5	1	3	4	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii					1	1	
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)				2			
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1					1	1
Diploneis ovalis (30009)							1
Diploneis parma (30014)		1					
Discostella pseudostelligera (2506002)	19	19	1	14	11	13	13
Discostella stelligera (2506003)			11	7	2	2	1

	Depth (cm)						
Updated Species Name	**22.4**	**23.0**	**23.3**	**23.9**	**24.2**	**24.9**	**25.3**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)	1	2	2	2	2	5	
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1			4			
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	1	2	1	2	1	2	2
Epithemia adnata (32003)							
Epithemia smithii (32002)							
Epithemia sorex (32006)							
Eucocconeis flexella (187001)	1			1	1		
Eucocconeis laevis (187002)					1		
Eunotia arcus (33001)	1						
Eunotia bigibba (33005)					1		
Eunotia bilunaris (33185)	1	1		1		2	3
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	1	3	2	2	6	2	6
Eunotia implicata (33168)							
Eunotia incisa (33026)					1		
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)	2						
Eunotia serra (33054)					2		
Eunotia soleirolii (33056)		1		1			
Fragilaria capucina (34006)	1		1	1			
Fragilaria delicatissima							
Frustulia krammeri (35039)	5		5		8	2	
Gomphonema acuminatum (37001)				1			
Gomphonema angustatum (37003)	4	1		1	1	1	1

	Depth (cm)						
Updated Species Name	**22.4**	**23.0**	**23.3**	**23.9**	**24.2**	**24.9**	**25.3**
Gomphonema olivaceum (37065)					1		
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)	1	1	1				
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	1	3	4	1		8	2
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	2		2	1	2	1	
Navicula difficillima (46017)				1			
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)		1		2			
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)	1						
Neidium dubium (47011)							1
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	13	10	5	15	5	15	14
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)					1	3	
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**22.4**	**23.0**	**23.3**	**23.9**	**24.2**	**24.9**	**25.3**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)		1					
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							2
Pinnularia karelica							
Pinnularia microstauron (52045)					1		
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)						1	
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1				1		2
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)					1	1	
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	1	3	2	15			1
Psammothidium didymum (186012)	1						
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	20	30	21	24	13	31	17
Pseudostaurosira elliptica (73025)	3	5		6	3	3	
Pseudostaurosira pseudoconstruens (73002)	6	3	1	3	3	3	3
Puncticulata bodanica (208004)	8	3	5	3	8	3	2
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)			3	2	2		
Rossithidium pusillum (189003)	8	6	7	6	3	11	1
Sellaphora pupula (170006)	4	1		2	1	4	2

	Depth (cm)						
Updated Species Name	**22.4**	**23.0**	**23.3**	**23.9**	**24.2**	**24.9**	**25.3**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)	1		1				
Stauroneis producta (62017)	1			1	1	3	1
Stauroneis prominula (62069)						1	
Stauroneis thermicola (62040)							
Staurosira construens (172001)			1		1		
Staurosira construens var. binodis (172005)	6	3	11	2	11	1	7
Staurosira construens var. exigua (172022)	40	17	33	23	30	22	37
Staurosira construens var. venter (172006)	6	10	5	12	11	13	24
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	5		5		8	2	
Staurosirella pinnata (175005)	5	6	7	15	7	7	
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)		1	1				1
Tabellaria fenestrata (67002)	1	1	1	2	3	1	1
Tabellaria flocculosa (67004)	7	10	7	5	4	1	4
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)	1		1	1		1	
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice	36	41	80	55	45	60	
Total diatom counts per slice	467	411	431	501	467	456	410
Total microspheres per slice		24		97		22	

	Depth (cm)						
Updated Species Name	**25.7**	**26.3**	**26.7**	**27.3**	**27.8**	**28.2**	**28.6**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	2	10	1	9	8	8	5
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)	1	1		1			
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	13	22	8	12	18	21	12
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)							
Aulacoseira alpigena (10028)	155	160	153	147	112	160	134
Aulacoseira ambigua (10008)			2				
Aulacoseira canadensis (10003)							1
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	10	13	32	4	8	16	8
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	13		26		24		25
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	7		11		3		8
Aulacoseira subarctica (10015)			3				2
Aulacoseira tethera (10033)	4				1		1
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	10	4	13	5	3	2	8
Brachysira microcephala (18013)				1	1	2	3
Caloneis alpestris (12025)			1				
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)			1				
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	1	3	3	3	2	1	2
Cavinula pseudoscutiformis (195003)	2	2	1	7	4	3	2

	Depth (cm)						
Updated Species Name	**25.7**	**26.3**	**26.7**	**27.3**	**27.8**	**28.2**	**28.6**
Chamaepinnularia mediocris (212005)							2
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)			1				
Craticula riparia (21016)							
Cyclotella comensis (20023)	2		2				
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	29	23	36	40	30	36	43
Cyclotella rossii (20019)	3	1	2	1			
Cyclotella tripartita (20085)	4	3	11	6	4	8	3
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	1	8	8	5	2	4	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii					1		
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1		1		1		1
Diploneis ovalis (30009)							
Diploneis parma (30014)							
Discostella pseudostelligera (2506002)	10	9	9	18	20	11	14
Discostella stelligera (2506003)	1	7	4	2	2		3

	Depth (cm)						
Updated Species Name	**25.7**	**26.3**	**26.7**	**27.3**	**27.8**	**28.2**	**28.6**
Encyonema elginense (110044)	1				1		
Encyonema gaeumannii (110008)	3				5		
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1					1	
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	1	3	2	1	1	3	
Epithemia adnata (32003)							
Epithemia smithii (32002)	1						
Epithemia sorex (32006)			1				
Eucocconeis flexella (187001)	1			1			
Eucocconeis laevis (187002)							
Eunotia arcus (33001)					1		
Eunotia bigibba (33005)		1					
Eunotia bilunaris (33185)			1				
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	2	6	12	1	1	1	4
Eunotia implicata (33168)							
Eunotia incisa (33026)			2				
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)			1				
Eunotia serra (33054)			1		1		
Eunotia soleirolii (33056)			1				
Fragilaria capucina (34006)	2	2	3	1	1		
Fragilaria delicatissima							
Frustulia krammeri (35039)	3	3	3		1	1	3
Gomphonema acuminatum (37001)						1	
Gomphonema angustatum (37003)	1		1	1			2

	Depth (cm)						
Updated Species Name	**25.7**	**26.3**	**26.7**	**27.3**	**27.8**	**28.2**	**28.6**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)			1				1
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)		1					
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	2	1	1	3	5	3	5
Navicula absoluta (46494)							
Navicula cryptocephala (46014)		3	1	1		5	1
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)		2	1		2		
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							1
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	7	10	10	6	7	10	9
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**25.7**	**26.3**	**26.7**	**27.3**	**27.8**	**28.2**	**28.6**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis			1				
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)		2	3	1	1	2	1
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)	1	1	1	1			
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	3	2		1	3	4	3
Psammothidium didymum (186012)							
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)			1				
Pseudostaurosira brevistriata (73001)	21	47	24	38	35	30	26
Pseudostaurosira elliptica (73025)	1		2		7		
Pseudostaurosira pseudoconstruens (73002)	8	8	7	10	7	3	11
Puncticulata bodanica (208004)	2	3	5	2	5	2	4
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)							
Rossithidium pusillum (189003)	6	7		9	8	7	6
Sellaphora pupula (170006)	2	3	2	7	4	6	7

	Depth (cm)						
Updated Species Name	**25.7**	**26.3**	**26.7**	**27.3**	**27.8**	**28.2**	**28.6**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)							
Stauroneis producta (62017)	2	1	3		2		1
Stauroneis prominula (62069)							
Stauroneis thermicola (62040)							
Staurosira construens (172001)			2			2	
Staurosira construens var. binodis (172005)	6	9	9	15	9	2	4
Staurosira construens var. exigua (172022)	46	28	33	42	40	38	39
Staurosira construens var. venter (172006)	8	24	13	38	16	37	10
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	3	3	3		1	1	3
Staurosirella pinnata (175005)	5	12		8	11	10	8
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)		3	3	1	1	4	1
Tabellaria flocculosa (67004)	7	4	5	5	9	6	5
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)	1		2				1
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice	50		34		54		26
Total diatom counts per slice	416	455	490	454	429	451	435
Total microspheres per slice					38		

	Depth (cm)						
Updated Species Name	**28.9**	**29.5**	**29.9**	**30.5**	**30.9**	**31.5**	**31.9**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	5		6	5	8	3	1
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)					1	3	
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	18	11	17	36	9	6	19
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii				1			
Amphora copulata (7075)							
Amphora ovalis (7001)				1	1		1
Aulacoseira alpigena (10028)	179	152	162	120	157	121	173
Aulacoseira ambigua (10008)							
Aulacoseira canadensis (10003)	1						
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	26	20	7	22	7	16	28
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	1	31		21	1	34	6
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)		3		4		6	
Aulacoseira subarctica (10015)	1		3	5	1	2	
Aulacoseira tethera (10033)	1				1	1	1
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	3	11	4	5	4	6	2
Brachysira microcephala (18013)	2	1	1	1	2	1	1
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	1			1		5	4
Cavinula pseudoscutiformis (195003)	4	1	2	4	1	3	3

	Depth (cm)						
Updated Species Name	**28.9**	**29.5**	**29.9**	**30.5**	**30.9**	**31.5**	**31.9**
Chamaepinnularia mediocris (212005)							
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)	1						
Craticula halophila (21005)					1		
Craticula riparia (21016)							
Cyclotella comensis (20023)	1					2	
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	36	32	49	42	32	53	32
Cyclotella rossii (20019)		1	1		2	2	
Cyclotella tripartita (20085)	8	7	3	7	1	7	1
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	2	7	4	3		7	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1			3	1	1	1
Diploneis ovalis (30009)						1	
Diploneis parma (30014)						1	
Discostella pseudostelligera (2506002)	4	10	12	4	9	6	9
Discostella stelligera (2506003)	2	1	1	5	2		3

	Depth (cm)						
Updated Species Name	**28.9**	**29.5**	**29.9**	**30.5**	**30.9**	**31.5**	**31.9**
Encyonema elginense (110044)	1	3					
Encyonema gaeumannii (110008)		3		3		3	
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1					1	3
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	1	1	4	1	3	2	4
Epithemia adnata (32003)							
Epithemia smithii (32002)				1		2	
Epithemia sorex (32006)		1					
Eucocconeis flexella (187001)		1					
Eucocconeis laevis (187002)							
Eunotia arcus (33001)	1	1	1				
Eunotia bigibba (33005)							
Eunotia bilunaris (33185)		2				1	1
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	3	4	4	2	5	7	7
Eunotia implicata (33168)							
Eunotia incisa (33026)							
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)		2	1	2		1	
Eunotia soleirolii (33056)		1					
Fragilaria capucina (34006)	1	2	2	1	1	1	
Fragilaria delicatissima							
Frustulia krammeri (35039)		5	1	2		2	1
Gomphonema acuminatum (37001)						1	
Gomphonema angustatum (37003)	1	1			3	2	1

	Depth (cm)						
Updated Species Name	**28.9**	**29.5**	**29.9**	**30.5**	**30.9**	**31.5**	**31.9**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)				1			
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)	1			1			
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	2		2	5	1	1	6
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	1		2	4		1	2
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)				1			
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)	1				1		1
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	9	3	13	16	10	12	9
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**28.9**	**29.5**	**29.9**	**30.5**	**30.9**	**31.5**	**31.9**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)					1		
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	3	1	6		1	3	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)		1				1	1
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	2			5	1	2	1
Psammothidium didymum (186012)						1	2
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	27	12	37	38	32	19	23
Pseudostaurosira elliptica (73025)		4		4		2	
Pseudostaurosira pseudoconstruens (73002)	4		14	8	3	5	5
Puncticulata bodanica (208004)	3	6	3	4	2	5	3
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)				6			
Rossithidium pusillum (189003)	4	3	3	8	11	5	5
Sellaphora pupula (170006)	1	4	2		3	4	1

	Depth (cm)						
Updated Species Name	**28.9**	**29.5**	**29.9**	**30.5**	**30.9**	**31.5**	**31.9**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)	1						
Stauroneis producta (62017)	1	3	2			2	
Stauroneis prominula (62069)							
Stauroneis thermicola (62040)							
Staurosira construens (172001)				3			
Staurosira construens var. binodis (172005)	7	12	2	3	4	7	5
Staurosira construens var. exigua (172022)	21	32	34	25	37	40	23
Staurosira construens var. venter (172006)	22	5	26	17	33	9	23
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)		5	1	2		2	1
Staurosirella pinnata (175005)	1	2	9	7	11	4	2
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)			1		1	1	
Tabellaria fenestrata (67002)	1	1	3	2	3	1	3
Tabellaria flocculosa (67004)	5	3	3	8	4	4	6
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)		1		1			
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice		49		51		40	
Total diatom counts per slice	423	413	448	471	412	441	426
Total microspheres per slice				26			

	Depth (cm)						
Updated Species Name	**32.6**	**33.3**	**33.7**	**33.8**	**34.6**	**34.8**	**35.5**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	4	8	10	6	9	4	3
Achnanthes pergalli							2
Achnanthes pseudoswazi (2206)			1				
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	16	37	55	14	56	17	34
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii	1						
Amphora copulata (7075)							
Amphora ovalis (7001)				1		1	
Aulacoseira alpigena (10028)	149	79	99	159	92	174	98
Aulacoseira ambigua (10008)		5					
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	38	21	24	13	30	10	35
Aulacoseira granulata (10018)		6					
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	27	20	14	6	17		14
Aulacoseira lirata (10012)		2					
Aulacoseira muzzanensis (10031)		4					
Aulacoseira perglabra (10006)	9	4	8		4		4
Aulacoseira subarctica (10015)	5	9	1	3		3	2
Aulacoseira tethera (10033)	2		2	3			
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	6	10	10	5	7	1	7
Brachysira microcephala (18013)	1	2	3		2	3	1
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	1	4	2	2	3	3	5
Cavinula pseudoscutiformis (195003)	6	2	4	4	3	4	6

	Depth (cm)						
Updated Species Name	**32.6**	**33.3**	**33.7**	**33.8**	**34.6**	**34.8**	**35.5**
Chamaepinnularia mediocris (212005)	1						
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)	1						
Craticula riparia (21016)							
Cyclotella comensis (20023)		1				1	
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	38	16	24	38	26	40	40
Cyclotella rossii (20019)	1			2	2		1
Cyclotella tripartita (20085)	14	8	7	3	4	4	8
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)	1						
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	4	3	4	3	3	7	
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii					1		1
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)		1					
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1						1
Diploneis ovalis (30009)				1			
Diploneis parma (30014)							1
Discostella pseudostelligera (2506002)	6	4		12	4	2	5
Discostella stelligera (2506003)	2	4	7	3	4	2	3

	Depth (cm)						
Updated Species Name	**32.6**	**33.3**	**33.7**	**33.8**	**34.6**	**34.8**	**35.5**
Encyonema elginense (110044)							1
Encyonema gaeumannii (110008)	2	1	2		2		4
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	2			1	1		
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	2			6	1	3	
Epithemia adnata (32003)							
Epithemia smithii (32002)	1			1			1
Epithemia sorex (32006)	1						
Eucocconeis flexella (187001)							1
Eucocconeis laevis (187002)		1					
Eunotia arcus (33001)	1		1	1	1		
Eunotia bigibba (33005)							
Eunotia bilunaris (33185)	1						
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)			1				
Eunotia faba (33172)	4	1	1	4	2	1	
Eunotia implicata (33168)							
Eunotia incisa (33026)							
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)		1					
Eunotia septentrionalis (33053)							
Eunotia serra (33054)				1			2
Eunotia soleirolii (33056)							2
Fragilaria capucina (34006)		2	2		2	1	1
Fragilaria delicatissima							
Frustulia krammeri (35039)	5	2	1	2	2	2	
Gomphonema acuminatum (37001)	1					1	
Gomphonema angustatum (37003)			1		2		1

	Depth (cm)						
Updated Species Name	**32.6**	**33.3**	**33.7**	**33.8**	**34.6**	**34.8**	**35.5**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)	1		4				
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)		5	5		4	3	
Navicula absoluta (46494)							
Navicula cryptocephala (46014)					1	1	2
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)	1	2					
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	9	7	16	11	11	7	8
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**32.6**	**33.3**	**33.7**	**33.8**	**34.6**	**34.8**	**35.5**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)						1	
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1					2	2
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)	1						
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)		1	4		4	1	1
Psammothidium didymum (186012)					1		
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)	1	1					
Pseudostaurosira brevistriata (73001)	26	30	33	21	42	30	44
Pseudostaurosira elliptica (73025)	1	1	5		4		
Pseudostaurosira pseudoconstruens (73002)		13	7	10	9	2	9
Puncticulata bodanica (208004)	6	3	2	6	4	1	3
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)		3	10		9		6
Rossithidium pusillum (189003)	6	3	8	5	18	12	11
Sellaphora pupula (170006)	1	1		5		1	

	Depth (cm)						
Updated Species Name	**32.6**	**33.3**	**33.7**	**33.8**	**34.6**	**34.8**	**35.5**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)		1	1				1
Stauroneis producta (62017)				2		1	
Stauroneis prominula (62069)	1						
Stauroneis thermicola (62040)			2				
Staurosira construens (172001)	3	6	1		1		
Staurosira construens var. binodis (172005)	6	12	5	6	9	3	2
Staurosira construens var. exigua (172022)	30	21	33	35	28	27	18
Staurosira construens var. venter (172006)	8	48	28	29	31	17	30
Staurosirella lapponica (175002)						1	
Staurosirella leptostauron var. rhomboides (175017)	5	2	1	2	2	2	
Staurosirella pinnata (175005)	7	12	20	5	6	6	13
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)	1	2		1	2	1	5
Tabellaria flocculosa (67004)	5	2	8	3	9		11
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)	1	1					1
Tetracyclus lacustris (71003)							1
Total chrysophyte cysts per slice	25	53	69		56		59
Total diatom counts per slice	475	435	477	435	475	403	452
Total microspheres per slice		42	86		55		67

	Depth (cm)						
Updated Species Name	**35.6**	**36.3**	**36.8**	**37.2**	**37.7**	**38.0**	**38.4**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	9	16		4	15	13	6
Achnanthes pergalli							
Achnanthes pseudoswazi (2206)		1		1	2		
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	24	58	16	31	31	43	11
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)							
Aulacoseira alpigena (10028)	141	107	207	102	136	87	194
Aulacoseira ambigua (10008)		2					
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	22	42	8	16	12	40	22
Aulacoseira granulata (10018)			4				
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)		27	21	14	1	13	9
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)		19		19		7	
Aulacoseira subarctica (10015)	1		2	4	4	4	10
Aulacoseira tethera (10033)	1			1			
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	6	3	5	9	7	13	1
Brachysira microcephala (18013)	1	1	2	3			
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	1	2		5	2	2	4
Cavinula pseudoscutiformis (195003)	1	2	1	7	3	1	3

	Depth (cm)						
Updated Species Name	**35.6**	**36.3**	**36.8**	**37.2**	**37.7**	**38.0**	**38.4**
Chamaepinnularia mediocris (212005)						1	
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)				2		3	
Craticula riparia (21016)							
Cyclotella comensis (20023)						1	
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	29	19	18	26	38	22	30
Cyclotella rossii (20019)	2	1	1	1		1	1
Cyclotella tripartita (20085)	6	3	7	7	5	7	6
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	8	5	3	2	4	4	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)	1	1		2		4	
Diploneis ovalis (30009)			2		2		
Diploneis parma (30014)							
Discostella pseudostelligera (2506002)	8	11		10	8	9	7
Discostella stelligera (2506003)	4	4	3		4	1	

	Depth (cm)						
Updated Species Name	**35.6**	**36.3**	**36.8**	**37.2**	**37.7**	**38.0**	**38.4**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)		2		2		5	
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	1	1	1		1	1	1
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	6	1	1	2	2	1	3
Epithemia adnata (32003)							
Epithemia smithii (32002)			1				2
Epithemia sorex (32006)							
Eucocconeis flexella (187001)							
Eucocconeis laevis (187002)							
Eunotia arcus (33001)	1	1	1	2	1		1
Eunotia bigibba (33005)						1	
Eunotia bilunaris (33185)		1	1			1	1
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	3	7		1	5	2	2
Eunotia implicata (33168)							
Eunotia incisa (33026)						1	
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)							1
Eunotia soleirolii (33056)		1				1	
Fragilaria capucina (34006)	2				2	2	2
Fragilaria delicatissima						1	
Frustulia krammeri (35039)	1	4	1	2	1		
Gomphonema acuminatum (37001)	1			2		1	
Gomphonema angustatum (37003)		2			1		1

	Depth (cm)						
Updated Species Name	**35.6**	**36.3**	**36.8**	**37.2**	**37.7**	**38.0**	**38.4**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)				1			
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	4	10	3	5		6	3
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	3		1	1			
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)				3		3	
Navicula striolata (93266)				2			
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	11	5	4	12	7	9	3
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)		1					
Nitzschia recta (48029)							
Nitzschia tropica (48045)						1	

	Depth (cm)						
Updated Species Name	**35.6**	**36.3**	**36.8**	**37.2**	**37.7**	**38.0**	**38.4**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)	1						
Pinnularia karelica							
Pinnularia microstauron (52045)	1						
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)		1	2	1	2	1	2
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)	1				1		2
Placoneis elginensis (194005)							1
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	2	3		2		1	1
Psammothidium didymum (186012)	1	1		1		1	1
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	33	45	29	31	41	33	36
Pseudostaurosira elliptica (73025)		8		5		6	
Pseudostaurosira pseudoconstruens (73002)	11	6	3	7	6	7	4
Puncticulata bodanica (208004)	3	3		1	2	2	12
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)		1					
Rossithidium pusillum (189003)	6	9	4	4	9	6	8
Sellaphora pupula (170006)	2		2		4	1	2

	Depth (cm)						
Updated Species Name	**35.6**	**36.3**	**36.8**	**37.2**	**37.7**	**38.0**	**38.4**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)							
Stauroneis producta (62017)	1			1		1	
Stauroneis prominula (62069)							
Stauroneis thermicola (62040)							
Staurosira construens (172001)							
Staurosira construens var. binodis (172005)	3	3	4	4	6	2	8
Staurosira construens var. exigua (172022)	37	24	13	22	44	21	38
Staurosira construens var. venter (172006)	27	14	27	20	30	19	17
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)	1	4	1	2	1		
Staurosirella pinnata (175005)	7	18		13	5	12	1
Stenopterobia anceps (63003)						1	
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)			1				
Tabellaria fenestrata (67002)		2		2		1	
Tabellaria flocculosa (67004)	6	8	1	5	4	4	1
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)		1				1	
Tetracyclus lacustris (71003)					1		1
Total chrysophyte cysts per slice		53		69		59	
Total diatom counts per slice	441	511	401	422	450	432	461
Total microspheres per slice		42		70		22	

	Depth (cm)						
Updated Species Name	**38.8**	**39.5**	**39.7**	**39.9**	**40.6**	**41.4**	**41.6**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	9	10	9	3	8	9	6
Achnanthes pergalli					1		
Achnanthes pseudoswazi (2206)							2
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	25	15	30	23	31	12	49
Achnanthidium semiapertum (1028)		1					
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)				1			
Aulacoseira alpigena (10028)	106	195	126	165	90	130	82
Aulacoseira ambigua (10008)							
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	22	20	20	9	18	6	56
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	18	5	18	2	25		17
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	7		7		10		6
Aulacoseira subarctica (10015)	6	11	6	4	9		1
Aulacoseira tethera (10033)	1	1	2				
Aulacoseira valida (10029)					1		
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	3	6	7	2	7	6	11
Brachysira microcephala (18013)	2	4				2	
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)					1		
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	5	3	3		2		6
Cavinula pseudoscutiformis (195003)	8	3	3	1	2	2	1

	Depth (cm)						
Updated Species Name	**38.8**	**39.5**	**39.7**	**39.9**	**40.6**	**41.4**	**41.6**
Chamaepinnularia mediocris (212005)	4						
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)	1	1		1			
Craticula riparia (21016)							
Cyclotella comensis (20023)							1
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	22	21	31	43	27	23	34
Cyclotella rossii (20019)	1			1			3
Cyclotella tripartita (20085)	12	7	6	5	4	11	5
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)			1				
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca		4	2	2	1	2	5
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)							
Diploneis ovalis (30009)							
Diploneis parma (30014)							
Discostella pseudostelligera (2506002)	11	8	4	9	4	10	3
Discostella stelligera (2506003)		3	5	4	6	2	6

	Depth (cm)						
Updated Species Name	**38.8**	**39.5**	**39.7**	**39.9**	**40.6**	**41.4**	**41.6**
Encyonema elginense (110044)		1				1	
Encyonema gaeumannii (110008)	2		1				1
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	9		2			1	3
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	5	2	2	2	1	4	4
Epithemia adnata (32003)							
Epithemia smithii (32002)				1			1
Epithemia sorex (32006)							
Eucocconeis flexella (187001)		1				3	
Eucocconeis laevis (187002)							
Eunotia arcus (33001)							
Eunotia bigibba (33005)					1	1	
Eunotia bilunaris (33185)	1	2			2		1
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	2	2	3	5	2	5	3
Eunotia implicata (33168)							
Eunotia incisa (33026)							
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)	1						
Eunotia serra (33054)				1		2	1
Eunotia soleirolii (33056)							
Fragilaria capucina (34006)	1	1			1	1	2
Fragilaria delicatissima							
Frustulia krammeri (35039)	1	3	3	1		2	1
Gomphonema acuminatum (37001)		1				2	
Gomphonema angustatum (37003)	1	1		1		3	1

	Depth (cm)						
Updated Species Name	**38.8**	**39.5**	**39.7**	**39.9**	**40.6**	**41.4**	**41.6**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)							1
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)							
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	3	2	3	2	3	1	4
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	1	1	1		1		1
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)	3			1	4	2	3
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							1
Neidium ampliatum (47066)	1						
Neidium dubium (47011)		1					
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	18	11	12	12	11	11	13
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**38.8**	**39.5**	**39.7**	**39.9**	**40.6**	**41.4**	**41.6**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1	2	3	2	1	3	1
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)						1	
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	8	4	3	2	5		5
Psammothidium didymum (186012)					1		1
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)	3		1				
Pseudostaurosira brevistriata (73001)	24	35	44	38	23	24	18
Pseudostaurosira elliptica (73025)	10		1		7		9
Pseudostaurosira pseudoconstruens (73002)	17	9	6	4	8	5	7
Puncticulata bodanica (208004)	2	2	5	2		6	9
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)			2		15		11
Rossithidium pusillum (189003)	9	8	4	12	6	10	6
Sellaphora pupula (170006)	8	3	1		1	1	7

	Depth (cm)						
Updated Species Name	**38.8**	**39.5**	**39.7**	**39.9**	**40.6**	**41.4**	**41.6**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)			1				
Stauroneis producta (62017)	2					1	
Stauroneis prominula (62069)							
Stauroneis thermicola (62040)							
Staurosira construens (172001)			1		2		1
Staurosira construens var. binodis (172005)		4	10	8	11	22	11
Staurosira construens var. exigua (172022)	15	32	30	33	38	34	27
Staurosira construens var. venter (172006)	22	20	14	27	27	24	29
Staurosirella lapponica (175002)					6		8
Staurosirella leptostauron var. rhomboides (175017)	1	3	3	1		2	1
Staurosirella pinnata (175005)	7	14	15	9	24	2	7
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)		3	2	1	4	3	3
Tabellaria flocculosa (67004)	5	4	5	3	5		8
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)					1		
Tetracyclus lacustris (71003)			1			1	
Total chrysophyte cysts per slice	60		53		47		64
Total diatom counts per slice	446	490	459	443	458	393	504
Total microspheres per slice	37		130		16		28

	Depth (cm)						
Updated Species Name	**41.8**	**42.6**	**43.3**	**43.5**	**44.2**	**44.3**	**45.2**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	3	12	6	8	3	13	12
Achnanthes pergalli						1	3
Achnanthes pseudoswazi (2206)			1	1		1	2
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	23	51	30	43	15	39	41
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)	1						
Aulacoseira alpigena (10028)	132	75	152	67	150	78	67
Aulacoseira ambigua (10008)		1					2
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	4	32	12	45	6	30	33
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)		20	5	28	2	15	20
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)		2		6		7	2
Aulacoseira subarctica (10015)	4	3	8	9	11	11	11
Aulacoseira tethera (10033)							3
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	6	7	4	8		9	12
Brachysira microcephala (18013)	1	1		1	2	2	2
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)						1	
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	2	2	3	3	1	5	4
Cavinula pseudoscutiformis (195003)	5	1	3	2	8	3	9

	Depth (cm)						
Updated Species Name	**41.8**	**42.6**	**43.3**	**43.5**	**44.2**	**44.3**	**45.2**
Chamaepinnularia mediocris (212005)							
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)				1		1	
Craticula riparia (21016)							
Cyclotella comensis (20023)				1		1	
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	38	28	25	26	38	21	26
Cyclotella rossii (20019)	2	3	1	2	2	4	7
Cyclotella tripartita (20085)	8	7	8	8	4	10	13
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)		2					
Cymbella rupicola (23020)							
Cymbella schimanskii				1			
Cymbella sileiaca	1	2	4	3	1	4	7
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							1
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)			1			1	
Diploneis ovalis (30009)							
Diploneis parma (30014)							
Discostella pseudostelligera (2506002)	7	5	8		7	6	8
Discostella stelligera (2506003)	1	1		2	5		2

	Depth (cm)						
Updated Species Name	**41.8**	**42.6**	**43.3**	**43.5**	**44.2**	**44.3**	**45.2**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)		1		1		5	4
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)	3		2	3	2		
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	3	2	1	1	6	1	1
Epithemia adnata (32003)							
Epithemia smithii (32002)				1	1		
Epithemia sorex (32006)							
Eucocconeis flexella (187001)					1		
Eucocconeis laevis (187002)							
Eunotia arcus (33001)		1					
Eunotia bigibba (33005)	1			1		1	
Eunotia bilunaris (33185)	1		1				2
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	4	1	3	3	2	1	
Eunotia implicata (33168)						1	
Eunotia incisa (33026)							
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)	1	1	3				
Eunotia soleirolii (33056)							
Fragilaria capucina (34006)	1	3		1	2	2	2
Fragilaria delicatissima							
Frustulia krammeri (35039)		1			1	3	1
Gomphonema acuminatum (37001)	1				1	1	
Gomphonema angustatum (37003)	1		2		1		

	Depth (cm)						
Updated Species Name	**41.8**	**42.6**	**43.3**	**43.5**	**44.2**	**44.3**	**45.2**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)				3		1	2
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)							
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	3	3	2	8	5	8	6
Navicula absoluta (46494)							
Navicula cryptocephala (46014)	1	2	1		1	2	2
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)	1	3		3	1	1	2
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis		1					
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	9	9	7	7	5	10	20
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**41.8**	**42.6**	**43.3**	**43.5**	**44.2**	**44.3**	**45.2**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)				1			
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)	1		1				
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)	1		1	1	1	1	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)	1	1	1	3		2	1
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)							
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)		4	1	3		5	4
Psammothidium didymum (186012)					1		1
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	29	30	34	36	22	33	40
Pseudostaurosira elliptica (73025)		5		7		13	13
Pseudostaurosira pseudoconstruens (73002)	8	10	9	11	11	11	18
Puncticulata bodanica (208004)	4	5	4	6	5		6
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)		7		5		13	12
Rossithidium pusillum (189003)	6	11	10	8	4	11	6
Sellaphora pupula (170006)	3		1			1	2

	Depth (cm)						
Updated Species Name	**41.8**	**42.6**	**43.3**	**43.5**	**44.2**	**44.3**	**45.2**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)							1
Stauroneis producta (62017)	1				1		
Stauroneis prominula (62069)				1		1	
Stauroneis thermicola (62040)							
Staurosira construens (172001)						2	
Staurosira construens var. binodis (172005)	5	7	5	9	5	3	8
Staurosira construens var. exigua (172022)	32	25	24	21	26	22	31
Staurosira construens var. venter (172006)	39	25	25	25	31	24	23
Staurosirella lapponica (175002)		2		5		3	3
Staurosirella leptostauron var. rhomboides (175017)		1			1	3	1
Staurosirella pinnata (175005)	6	20	13	27	6	38	30
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)						2	2
Tabellaria flocculosa (67004)	7	9	5	11	6	7	8
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)				1			1
Tetracyclus lacustris (71003)							
Total chrysophyte cysts per slice		55		70		75	52
Total diatom counts per slice	411	445	427	478	404	495	540
Total microspheres per slice		33		15		24	31

	Depth (cm)						
Updated Species Name	**45.7**	**46.0**	**46.1**	**47.0**	**47.1**	**47.9**	**48.4**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	1	10	18	17	5	9	14
Achnanthes pergalli				4		1	
Achnanthes pseudoswazi (2206)						2	
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	5	10	47	52	8	32	26
Achnanthidium semiapertum (1028)							
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)							
Aulacoseira alpigena (10028)	202	130	74	41	170	71	153
Aulacoseira ambigua (10008)			4			3	
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	14		32	26	12	37	10
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)		8	17	12	2	23	2
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)			4	4		8	
Aulacoseira subarctica (10015)	16	2	14	7	14	24	11
Aulacoseira tethera (10033)	1						
Aulacoseira valida (10029)							
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	3	8	6	4	8	7	2
Brachysira microcephala (18013)		5	1	1	3	1	2
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	2		1			3	5
Cavinula pseudoscutiformis (195003)	3	2	5	4	2	5	2

	Depth (cm)						
Updated Species Name	**45.7**	**46.0**	**46.1**	**47.0**	**47.1**	**47.9**	**48.4**
Chamaepinnularia mediocris (212005)							
Chamaepinnularia soehrensis (212006)				1			
Cocconeis placentula (16004)							
Craticula halophila (21005)							
Craticula riparia (21016)							
Cyclotella comensis (20023)			1				
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	25	30	23	31	28	28	34
Cyclotella rossii (20019)	4	1		1	1	2	1
Cyclotella tripartita (20085)	17	5	8	9	8	5	7
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)			1				
Cymbella lapponica (23116)						1	
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca		2	5	2	6	3	2
Cymbella tumidula (23082)							
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)		3					
Diploneis ovalis (30009)							
Diploneis parma (30014)							
Discostella pseudostelligera (2506002)	2	5	6	18	7	9	6
Discostella stelligera (2506003)			4	1	2		1

	Depth (cm)						
Updated Species Name	**45.7**	**46.0**	**46.1**	**47.0**	**47.1**	**47.9**	**48.4**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)			1				
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)				2		1	
Encyonopsis falaisensis (203007)			1				
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	5	2	1	1	3	2	3
Epithemia adnata (32003)							
Epithemia smithii (32002)			1		1		
Epithemia sorex (32006)							
Eucocconeis flexella (187001)		2					
Eucocconeis laevis (187002)							
Eunotia arcus (33001)			1	1			1
Eunotia bigibba (33005)							
Eunotia bilunaris (33185)	1						
Eunotia circumborealis (33210)							
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	6	2		2	3	1	3
Eunotia implicata (33168)						1	
Eunotia incisa (33026)			3			2	
Eunotia minor (33183)							
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)							
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)							
Eunotia soleirolii (33056)							
Fragilaria capucina (34006)			2			1	
Fragilaria delicatissima							
Frustulia krammeri (35039)		2	1	3	1	1	1
Gomphonema acuminatum (37001)			2			1	
Gomphonema angustatum (37003)	1	2			2		

	Depth (cm)						
Updated Species Name	**45.7**	**46.0**	**46.1**	**47.0**	**47.1**	**47.9**	**48.4**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)			2				
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)						1	
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	4	1	1	5		6	2
Navicula absoluta (46494)							
Navicula cryptocephala (46014)		1	1		1		1
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)							
Navicula schmassmannii (46066)	2	2	2	6		3	
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)							
Neidium hitchcockii (47028)							
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	8		14	17	7	11	7
Nitzschia gisela (48624)							
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**45.7**	**46.0**	**46.1**	**47.0**	**47.1**	**47.9**	**48.4**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)							
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)							
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)				1		2	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							
Pinnularia viridis (52071)			1	1			
Placoneis elginensis (194005)							
Planothidium joursacense (155016)			1				
Planothidium oestrupii (155026)			1				
Platessa holsatica (2508002)				2			
Psammothidium curtissimum (186021)			3	7		3	0
Psammothidium didymum (186012)				2		2	
Psammothidium helveticum (186003)							
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	42	41	33	38	36	29	31
Pseudostaurosira elliptica (73025)			6	6			
Pseudostaurosira pseudoconstruens (73002)	12	11	19	21	5	18	8
Puncticulata bodanica (208004)	5	3	1	3	6	3	3
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)			3	8		3	
Rossithidium pusillum (189003)	5	12	14	3	8	6	3
Sellaphora pupula (170006)	1	7	2	1	1	1	3

	Depth (cm)						
Updated Species Name	**45.7**	**46.0**	**46.1**	**47.0**	**47.1**	**47.9**	**48.4**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)						1	
Stauroneis producta (62017)	2						2
Stauroneis prominula (62069)			2	1		2	
Stauroneis thermicola (62040)							
Staurosira construens (172001)						1	
Staurosira construens var. binodis (172005)	7	10	5	5	4	1	8
Staurosira construens var. exigua (172022)	24	32	27	29	34	24	31
Staurosira construens var. venter (172006)	21	40	38	36	20	21	51
Staurosirella lapponica (175002)							
Staurosirella leptostauron var. rhomboides (175017)		2	1	3	1	1	1
Staurosirella pinnata (175005)	7	10	16	18	7	35	11
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)							
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)							
Tabellaria fenestrata (67002)	1		2		5	1	
Tabellaria flocculosa (67004)	3	4	9	9		4	6
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)			1			1	
Tetracyclus lacustris (71003)						1	
Total chrysophyte cysts per slice			80	67		47	
Total diatom counts per slice	452	407	489	466	421	465	454
Total microspheres per slice			23	13		9	

	Depth (cm)						
Updated Species Name	**48.8**	**49.5**	**49.7**	**49.9**	**50.6**	**51.4**	**51.7**
Achnanthes imperfecta (2051)							
Achnanthes levanderi (2022)	24	5	19	3	17	6	4
Achnanthes pergalli			1				
Achnanthes pseudoswazi (2206)	1		2		2		
Achnanthes trinodis (2109)							
Achnanthidium minutissimum (1010)	32	13	43	36	49	17	33
Achnanthidium semiapertum (1028)			1				
Amphipleura lindheimerii							
Amphora copulata (7075)							
Amphora ovalis (7001)		1		1		1	
Aulacoseira alpigena (10028)	71	151	53	96	72	142	85
Aulacoseira ambigua (10008)			1		1		4
Aulacoseira canadensis (10003)							
Aulacoseira crassipunctata (10001)							
Aulacoseira distans (10009)	9	10	11	25	18	8	18
Aulacoseira granulata (10018)							
Aulacoseira italica (10019)							
Aulacoseira lacustris (10060)	21	2	10		18	1	23
Aulacoseira lirata (10012)							
Aulacoseira muzzanensis (10031)							
Aulacoseira perglabra (10006)	2			2	6		6
Aulacoseira subarctica (10015)	18	7	14	10	12	7	14
Aulacoseira tethera (10033)							
Aulacoseira valida (10029)	4		2		3		
Bacillaria paradoxa (76001)							
Brachysira brebissonii (18005)	10	3	4	7	3	3	10
Brachysira microcephala (18013)	1		1	2	3		12
Caloneis alpestris (12025)							
Caloneis lauta (12026)							
Caloneis permagna (12030)							
Caloneis silicula (12010)							
Caloneis tenuis (12013)							
Caloneis thermalis (12054)							
Caloneis undulata (12022)							
Caloneis westii (12056)							
Cavinula cocconeiformis (195001)	3		3	2	2	2	4
Cavinula pseudoscutiformis (195003)	5	4	4	2	5	4	4

	Depth (cm)						
Updated Species Name	**48.8**	**49.5**	**49.7**	**49.9**	**50.6**	**51.4**	**51.7**
Chamaepinnularia mediocris (212005)							
Chamaepinnularia soehrensis (212006)							
Cocconeis placentula (16004)							
Craticula halophila (21005)	1						
Craticula riparia (21016)					1		
Cyclotella comensis (20023)				1			
Cyclotella krammeri (20083)							
Cyclotella ocellata (20009)	16	32	16	21	10	42	23
Cyclotella rossii (20019)	3		12	3	2	3	1
Cyclotella tripartita (20085)	18	2	17	21	9	12	12
Cymbella affinis (23073)							
Cymbella amphicephala (23001)							
Cymbella cesatii (23004)							
Cymbella cistula (23005)							
Cymbella helvetica (23099)							
Cymbella heteropleura (23100)							
Cymbella lapponica (23116)							
Cymbella rupicola (23020)							
Cymbella schimanskii							
Cymbella sileiaca	4	5	7	2	3	4	2
Cymbella tumidula (23082)							1
Cymbella tynnii (47141)							
Cymbopleura angustata (190013)							
Cymbopleura cuspidata (190001)							
Cymbopleura subaequalis (190017)							
Denticula elegans (25001)							
Denticula keutzingii							2
Diatoma mesodon (27002)							
Diatoma vulgaris (27013)							
Diploneis boldtiana (30012)							
Diploneis elliptica (30001)							
Diploneis finnica (30002)							
Diploneis marginestriata (30003)				1			
Diploneis ovalis (30009)		1				1	
Diploneis parma (30014)			1				
Discostella pseudostelligera (2506002)	10	8	17	15	11	8	12
Discostella stelligera (2506003)	2				2	3	1

	Depth (cm)						
Updated Species Name	**48.8**	**49.5**	**49.7**	**49.9**	**50.6**	**51.4**	**51.7**
Encyonema elginense (110044)							
Encyonema gaeumannii (110008)			2		1		1
Encyonema neogracile (110045)							
Encyonopsis descripta (203014)				3		2	
Encyonopsis falaisensis (203007)							
Encyonopsis microcephala (203002)							
Encyonopsis minuta (203011)	1	4	3	3	1	2	
Epithemia adnata (32003)							
Epithemia smithii (32002)		1	1	1		1	1
Epithemia sorex (32006)							
Eucocconeis flexella (187001)				1		1	
Eucocconeis laevis (187002)							
Eunotia arcus (33001)			1				
Eunotia bigibba (33005)						1	
Eunotia bilunaris (33185)		1		2			
Eunotia circumborealis (33210)					1		
Eunotia denticulata (33011)							
Eunotia exigua (33015)							
Eunotia faba (33172)	1	2		1	4	2	2
Eunotia implicata (33168)							
Eunotia incisa (33026)							1
Eunotia minor (33183)							1
Eunotia monodon (33035)							
Eunotia muscicola (33184)							
Eunotia paludosa (33083)			1				
Eunotia pectinalis (33039)							
Eunotia praerupta (33045)							
Eunotia rhomboidea (33051)							
Eunotia rhynchocephala (33191)							
Eunotia septentrionalis (33053)							
Eunotia serra (33054)		2					
Eunotia soleirolii (33056)	1				1		1
Fragilaria capucina (34006)	1	1	2	1		2	1
Fragilaria delicatissima							
Frustulia krammeri (35039)	1	3			1		
Gomphonema acuminatum (37001)							
Gomphonema angustatum (37003)		1		2		1	

	Depth (cm)						
Updated Species Name	**48.8**	**49.5**	**49.7**	**49.9**	**50.6**	**51.4**	**51.7**
Gomphonema olivaceum (37065)							
Gomphonema parvulum (37010)							
Gomphonema pseudosphaerophorum							
Gomphonema rhombicum (37080)							
Gomphonema sarcophagus (37152)	3		2				1
Gomphonema truncatum (37022)							
Karayevia laterostrata (125002)			1	1			
Karayevia ploenensis (125008)							
Karayevia suchlandtii (125009)	8	6	5	17	6	2	13
Navicula absoluta (46494)							
Navicula cryptocephala (46014)		1	1	1	2	3	
Navicula difficillima (46017)							
Navicula levanderii							
Navicula prominula							
Navicula pseudobryophila (46807)							
Navicula pseudoventralis (46166)			1				
Navicula schmassmannii (46066)	2	3	5	5	2	3	3
Navicula striolata (93266)							
Navicula subrotundata (46079)							
Navicula trivalis							
Navicula viridula (46408)							
Neidium affine (47001)							
Neidium ampliatum (47066)							
Neidium dubium (47011)		1					
Neidium hitchcockii (47028)			1				
Neidium iridis (47014)							
Neidium septentrionalis (47110)							
Nitzschia angustata (48093)							
Nitzschia behrei (48585)							
Nitzschia diversa (48411)							
Nitzschia elegans (48010)							
Nitzschia fonticola (48011)	12	8	11	7	5	4	6
Nitzschia gisela (48624)	1						
Nitzschia graciliformis (48119)							
Nitzschia gracilis (48015)							
Nitzschia recta (48029)							
Nitzschia tropica (48045)							

	Depth (cm)						
Updated Species Name	**48.8**	**49.5**	**49.7**	**49.9**	**50.6**	**51.4**	**51.7**
Nupela gracillima (92026)							
Oxyneis binalis (9107001)							
Pinnularia alpina (52807)							
Pinnularia appendiculata (52009)							2
Pinnularia borealis (52013)							
Pinnularia brauniana (103001)							
Pinnularia divergens (52025)							
Pinnularia episcopalis							
Pinnularia gibba (52159)							
Pinnularia interrupta (52194)							
Pinnularia karelica							
Pinnularia microstauron (52045)					1		
Pinnularia nobilis (103038)							
Pinnularia nodosa (52048)							
Pinnularia polyonca (52087)							
Pinnularia polyonca (52087)	1						
Pinnularia pulchra (52801)							
Pinnularia subcapitata (52059)		3	1	2	1	2	
Pinnularia subrostrata (52184)							
Pinnularia superdiverdentissima							1
Pinnularia viridis (52071)			1				1
Placoneis elginensis (194005)							
Planothidium joursacense (155016)							
Planothidium oestrupii (155026)					1		
Platessa holsatica (2508002)							
Psammothidium curtissimum (186021)	4		4		2		4
Psammothidium didymum (186012)			2				
Psammothidium helveticum (186003)					2		
Psammothidium ventralis (186009)							
Pseudostaurosira brevistriata (73001)	32	30	31	30	19	42	33
Pseudostaurosira elliptica (73025)	2		13		6		9
Pseudostaurosira pseudoconstruens (73002)	13	8	11	11	10	16	8
Puncticulata bodanica (208004)	3	2	3	6	2	3	6
Reimeria sinuata (55002)							
Rossithidium nodosum (189006)			5				
Rossithidium pusillum (189003)	10	1	8	18	13	7	7
Sellaphora pupula (170006)	6		4	5		6	

	Depth (cm)						
Updated Species Name	**48.8**	**49.5**	**49.7**	**49.9**	**50.6**	**51.4**	**51.7**
Stauroneis acuta (62036)							
Stauroneis anceps (62002)							
Stauroneis cf. javanica (62045)							
Stauroneis cf. schimanskii (62127)							
Stauroneis phoenicenteron (62015)	3				1		2
Stauroneis producta (62017)							
Stauroneis prominula (62069)			1		1		
Stauroneis thermicola (62040)							
Staurosira construens (172001)	4		1		2		5
Staurosira construens var. binodis (172005)	5	6	6	8	7	3	9
Staurosira construens var. exigua (172022)	31	26	25	33	27	30	15
Staurosira construens var. venter (172006)	44	28	41	22	29	31	40
Staurosirella lapponica (175002)	3				5		6
Staurosirella leptostauron var. rhomboides (175017)	1	3			1		
Staurosirella pinnata (175005)	23	11	35	14	17	7	15
Stenopterobia anceps (63003)							
Stenopterobia delicatissima (63007)							
Surirella amphioxys (65069)			1				
Surirella angusta (65002)							
Surirella elegans (65072)							
Surirella gracilis (65013)							
Surirella linearis (65014)		1					
Tabellaria fenestrata (67002)	1				2	1	2
Tabellaria flocculosa (67004)	2	6	8	1	7	8	6
Tabularia fasciculata (200002)							
Tetracyclus glans (71006)	1				1		
Tetracyclus lacustris (71003)							1
Total chrysophyte cysts per slice	23		64		66		55
Total diatom counts per slice	475	403	477	445	430	444	474
Total microspheres per slice	31		20		31		17

	Depth (cm)							
Updated Species Name	**52.6**	**52.9**	**53.6**	**54.1**	**54.7**	**55.3**	**55.8**	**56.3**
Achnanthes imperfecta (2051)								
Achnanthes levanderi (2022)	7	18	8	14	8	6	7	9
Achnanthes pergalli		1						
Achnanthes pseudoswazi (2206)	1							
Achnanthes trinodis (2109)						1		
Achnanthidium minutissimum (1010)	15	51	36	42	14	35	13	51
Achnanthidium semiapertum (1028)								
Amphipleura lindheimerii								
Amphora copulata (7075)								
Amphora ovalis (7001)	1							
Aulacoseira alpigena (10028)	139	42	90	63	148	55	142	70
Aulacoseira ambigua (10008)								2
Aulacoseira canadensis (10003)								
Aulacoseira crassipunctata (10001)								
Aulacoseira distans (10009)	12	20	8	35	15	48	6	40
Aulacoseira granulata (10018)			2	1		3		
Aulacoseira italica (10019)								
Aulacoseira lacustris (10060)		8		11		20		13
Aulacoseira lirata (10012)								
Aulacoseira muzzanensis (10031)								
Aulacoseira perglabra (10006)		2		4		12		7
Aulacoseira subarctica (10015)	12	7	6	1	12		12	
Aulacoseira tethera (10033)	1							
Aulacoseira valida (10029)						1		
Bacillaria paradoxa (76001)								
Brachysira brebissonii (18005)	8	8	3		4	4	4	3
Brachysira microcephala (18013)	1	8	1	9	1	5		4
Caloneis alpestris (12025)								
Caloneis lauta (12026)								
Caloneis permagna (12030)								
Caloneis silicula (12010)								
Caloneis tenuis (12013)								
Caloneis thermalis (12054)		1						
Caloneis undulata (12022)								
Caloneis westii (12056)								
Cavinula cocconeiformis (195001)	1	6	3	4	1	3		2
Cavinula pseudoscutiformis (195003)	2	7	1	1	1	4	6	4

	Depth (cm)							
Updated Species Name	**52.6**	**52.9**	**53.6**	**54.1**	**54.7**	**55.3**	**55.8**	**56.3**
Chamaepinnularia mediocris (212005)								
Chamaepinnularia soehrensis (212006)								
Cocconeis placentula (16004)								
Craticula halophila (21005)					1			
Craticula riparia (21016)								
Cyclotella comensis (20023)	2							
Cyclotella krammeri (20083)								
Cyclotella ocellata (20009)	33	21	35	32	52	33	30	20
Cyclotella rossii (20019)	1	2	2		1	1		2
Cyclotella tripartita (20085)	7	13	15	17	9	24	6	21
Cymbella affinis (23073)								
Cymbella amphicephala (23001)								
Cymbella cesatii (23004)						1		
Cymbella cistula (23005)								
Cymbella helvetica (23099)								
Cymbella heteropleura (23100)								
Cymbella lapponica (23116)								
Cymbella rupicola (23020)								
Cymbella schimanskii								
Cymbella sileiaca	8	3	2	2			2	1
Cymbella tumidula (23082)								
Cymbella tynnii (47141)								
Cymbopleura angustata (190013)								
Cymbopleura cuspidata (190001)								1
Cymbopleura subaequalis (190017)								1
Denticula elegans (25001)								
Denticula keutzingii		1						
Diatoma mesodon (27002)						1		
Diatoma vulgaris (27013)								
Diploneis boldtiana (30012)								
Diploneis elliptica (30001)								
Diploneis finnica (30002)						1		
Diploneis marginestriata (30003)		1			1	1	1	
Diploneis ovalis (30009)							1	
Diploneis parma (30014)		1						
Discostella pseudostelligera (2506002)	7	9	12	6	9	10	6	7
Discostella stelligera (2506003)	3	1	5		2	1		

	Depth (cm)							
Updated Species Name	**52.6**	**52.9**	**53.6**	**54.1**	**54.7**	**55.3**	**55.8**	**56.3**
Encyonema elginense (110044)								
Encyonema gaeumannii (110008)								3
Encyonema neogracile (110045)						1		
Encyonopsis descripta (203014)	1					3	3	
Encyonopsis falaisensis (203007)								
Encyonopsis microcephala (203002)		1				1		
Encyonopsis minuta (203011)	6	1	2		4	3	3	1
Epithemia adnata (32003)								
Epithemia smithii (32002)	1				1	1		
Epithemia sorex (32006)								1
Eucocconeis flexella (187001)	1						1	
Eucocconeis laevis (187002)								
Eunotia arcus (33001)			1					2
Eunotia bigibba (33005)	1					1		2
Eunotia bilunaris (33185)		1						
Eunotia circumborealis (33210)								
Eunotia denticulata (33011)								
Eunotia exigua (33015)								
Eunotia faba (33172)	4		4		2		3	1
Eunotia implicata (33168)						3		
Eunotia incisa (33026)								
Eunotia minor (33183)								
Eunotia monodon (33035)								
Eunotia muscicola (33184)								
Eunotia paludosa (33083)								
Eunotia pectinalis (33039)						1		
Eunotia praerupta (33045)								
Eunotia rhomboidea (33051)								
Eunotia rhynchocephala (33191)								
Eunotia septentrionalis (33053)		1						
Eunotia serra (33054)								
Eunotia soleirolii (33056)								
Fragilaria capucina (34006)	2	1	1		3	3	2	
Fragilaria delicatissima								
Frustulia krammeri (35039)	1	1				3		
Gomphonema acuminatum (37001)		1						1
Gomphonema angustatum (37003)		1			1	1		2

	Depth (cm)							
Updated Species Name	**52.6**	**52.9**	**53.6**	**54.1**	**54.7**	**55.3**	**55.8**	**56.3**
Gomphonema olivaceum (37065)								
Gomphonema parvulum (37010)								
Gomphonema pseudosphaerophorum								
Gomphonema rhombicum (37080)								
Gomphonema sarcophagus (37152)								
Gomphonema truncatum (37022)								
Karayevia laterostrata (125002)								
Karayevia ploenensis (125008)								
Karayevia suchlandtii (125009)	4	9	6	12	2	11	7	9
Navicula absoluta (46494)		1						
Navicula cryptocephala (46014)	1	1	1	1	1		2	
Navicula difficillima (46017)								
Navicula levanderii								
Navicula prominula								
Navicula pseudobryophila (46807)				1				
Navicula pseudoventralis (46166)								
Navicula schmassmannii (46066)			7	2	1	3		4
Navicula striolata (93266)								
Navicula subrotundata (46079)								
Navicula trivalis								
Navicula viridula (46408)								
Neidium affine (47001)								
Neidium ampliatum (47066)								
Neidium dubium (47011)								
Neidium hitchcockii (47028)								
Neidium iridis (47014)								
Neidium septentrionalis (47110)								
Nitzschia angustata (48093)								
Nitzschia behrei (48585)								
Nitzschia diversa (48411)								1
Nitzschia elegans (48010)								
Nitzschia fonticola (48011)	5	17	10	8	11	4	12	2
Nitzschia gisela (48624)								
Nitzschia graciliformis (48119)								
Nitzschia gracilis (48015)								
Nitzschia recta (48029)								
Nitzschia tropica (48045)								

	Depth (cm)							
Updated Species Name	**52.6**	**52.9**	**53.6**	**54.1**	**54.7**	**55.3**	**55.8**	**56.3**
Nupela gracillima (92026)								
Oxyneis binalis (9107001)								
Pinnularia alpina (52807)								
Pinnularia appendiculata (52009)						1		
Pinnularia borealis (52013)								
Pinnularia brauniana (103001)								
Pinnularia divergens (52025)								
Pinnularia episcopalis								
Pinnularia gibba (52159)								
Pinnularia interrupta (52194)							1	
Pinnularia karelica		1						
Pinnularia microstauron (52045)						1		
Pinnularia nobilis (103038)								
Pinnularia nodosa (52048)								
Pinnularia polyonca (52087)								
Pinnularia polyonca (52087)								
Pinnularia pulchra (52801)								
Pinnularia subcapitata (52059)	1				1			
Pinnularia subrostrata (52184)								
Pinnularia superdiverdentissima								
Pinnularia viridis (52071)	1					3		
Placoneis elginensis (194005)								
Planothidium joursacense (155016)								
Planothidium oestrupii (155026)								
Platessa holsatica (2508002)								
Psammothidium curtissimum (186021)	1	4	1	4	1	0	1	4
Psammothidium didymum (186012)							1	
Psammothidium helveticum (186003)								
Psammothidium ventralis (186009)				1				
Pseudostaurosira brevistriata (73001)	19	38	32	24	38	41	28	41
Pseudostaurosira elliptica (73025)		2		2		3		9
Pseudostaurosira pseudoconstruens (73002)	8	5	10	14	11	20	8	21
Puncticulata bodanica (208004)	4	5	1	3	7	8	1	4
Reimeria sinuata (55002)								
Rossithidium nodosum (189006)		9		1		1		2
Rossithidium pusillum (189003)	8	11	11	6	5	6	8	8
Sellaphora pupula (170006)	3		1		2	1	1	2

	Depth (cm)							
Updated Species Name	**52.6**	**52.9**	**53.6**	**54.1**	**54.7**	**55.3**	**55.8**	**56.3**
Stauroneis acuta (62036)								
Stauroneis anceps (62002)								
Stauroneis cf. javanica (62045)								
Stauroneis cf. schimanskii (62127)								
Stauroneis phoenicenteron (62015)				1				
Stauroneis producta (62017)	2		1		3		1	
Stauroneis prominula (62069)								
Stauroneis thermicola (62040)								
Staurosira construens (172001)		8						
Staurosira construens var. binodis (172005)	4	8	11	4	4	8	7	10
Staurosira construens var. exigua (172022)	31	37	27	22	28	19	40	33
Staurosira construens var. venter (172006)	32	40	39	38	40	20	28	51
Staurosirella lapponica (175002)		14						
Staurosirella leptostauron var. rhomboides (175017)	1	1				3		
Staurosirella pinnata (175005)	18	19	37	24	16	25	25	32
Stenopterobia anceps (63003)								
Stenopterobia delicatissima (63007)								
Surirella amphioxys (65069)								
Surirella angusta (65002)								
Surirella elegans (65072)								
Surirella gracilis (65013)								
Surirella linearis (65014)	1							
Tabellaria fenestrata (67002)						1		
Tabellaria flocculosa (67004)	1	7	4	9	12	6	6	4
Tabularia fasciculata (200002)								
Tetracyclus glans (71006)				1				
Tetracyclus lacustris (71003)								
Total chrysophyte cysts per slice		47		50		79		
Total diatom counts per slice	423	476	436	420	473	476	425	508
Total microspheres per slice		27		27		24		21

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Ratio of cyst to diatom, Shannon diversity index, axis 1 PCA, axis 1 DCA, organic, carbonate and clay percent, magnetic susceptibility and grainsize (um)

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
0.2									30.16
0.3								-1.3	
0.4								-2.4	
0.5	5.59	2.97	0.094	64					32.57
0.6								-2.9	
0.7	5.85	2.81	0.088	31					
0.8									31.73
0.9								-0.9	
1.2								-3	32.29
1.3								-1.6	
1.4	2.63	2.64	0.093	25					
1.5								-2	
1.6									32.11
1.7	26.38	2.28	0.092	9					
1.8								-1.4	
2									32.34
2.1								-1	
2.2								-2.4	
2.3	5.86	2.79	0.091	82					
2.4								-1.4	34.16
2.5	5.00	2.72	0.092	16					
2.7								-0.9	
2.8									34.88
3								-4.4	
3.1								0.2	
3.2	17.67	2.42	0.094	26					35.23
3.3								-1.7	
3.4	27.94	2.33	0.092	11					
3.6								-1.9	35.20
3.9								-0.2	
4								-1.8	34.44
4.1	9.76	3.04	0.094	61					
4.2								-0.3	
4.3	9.84	2.89	0.089	25					
4.4									36.76
4.5								-1	
4.7									32.86
4.8								-1.9	

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
4.9								-2.2	
5	8.94	2.94	0.094	35					35.98
5.1								-1.3	
5.2	7.39	2.75	0.079	6					
5.4								-1.9	32.52
5.7								-0.5	
5.8									32.63
5.9	1.00	2.38	0.094	31					
6								-0.4	
6.1	7.56	2.76	0.094	30					29.53
6.3								0	40.45
6.5									40.22
6.6								-0.4	
6.7								-0.4	36.05
6.8	9.98	3.04	0.094	53					
6.9								-1.8	35.81
7	5.99	2.71	0.093	23					
7.1								-0.9	32.83
7.2								-3	
7.3									35.40
7.5								-1	33.22
7.6								-2.9	
7.7	14.34	2.71	0.095	42					33.98
7.8								-1.9	
7.9								-1.3	35.77
8	6.33	2.85	0.090	36					
8.1								-2	35.00
8.3									36.36
8.4								-1.9	
8.5								-0.3	32.57
8.6	1.70	2.77	0.092	21					
8.7								-1.4	34.81
8.8								-2.4	
8.9	6.89	2.97	0.094	50					33.50
9								-2.9	
9.1									35.92
9.3								-0.9	34.01
9.4								-1.9	

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
9.5	16.53	2.76	0.078	20					33.94
9.6								-2.5	
9.7								-0.8	30.90
9.8	1.34	2.19	0.091	0					
9.9								-1	31.11
10					26.0	5.1	68.9		
10.1									32.51
10.2								-2.9	
10.3									33.41
10.4	1.78	2.66	0.095	37					
10.5								0.4	30.89
10.6								-2.4	
10.7	4.88	2.92	0.095	57					33.29
10.8								-1.9	
10.9									32.09
11					24.0	3.8	72.2		
11.1								-1.3	31.97
11.2								-2.9	
11.3	15.17	2.91	0.094	39					31.26
11.4								-1.9	
11.5								-0.6	33.69
11.6	7.97	2.82	0.094	25				-1.9	
11.7								-1.8	36.23
11.9									34.40
12					25.4	3.3	71.3	-2	
12.1								0.3	33.90
12.2	13.86	2.66	0.095	34					
12.3								-2.4	34.87
12.4	26.27	2.73	0.094	33				-2.3	
12.5								-1.9	31.59
12.7									36.44
12.8								-1.5	
12.9									34.13
13	10.00	2.85	0.093	34	23.9	3.8	72.3		
13.1								-0.5	34.82
13.2								-0.7	

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
13.3	16.77	2.87	0.094	38					34.45
13.4								-2.3	
13.5									35.14
13.7								-3.4	34.15
13.8								-0.6	
13.9	12.78	2.96	0.094	42					33.04
14					23.2	3.2	73.6	-0.8	
14.1								-1.1	32.65
14.2	1.69	2.73	0.095	35				-1	
14.3								-2.9	34.28
14.5									35.40
14.6								-1.2	
14.7								-1.3	36.17
14.8	11.36	2.76	0.094	35					
14.9								-2.4	33.97
15					20.8	3.3	75.9	-0.1	
15.1	8.29	2.65	0.094	28				-2.3	37.71
15.3									34.74
15.5								-0.1	34.11
15.6								-2	
15.7	13.54	2.83	0.094	43					35.17
15.8								-1.3	
15.9								-1.8	34.84
16	13.20	2.88	0.095	32	22.5	2.1	75.4		
16.1								0.5	33.15
16.3									32.44
16.4								2.2	
16.5								-1.7	35.05
16.6	7.93	2.54	0.095	31					
16.7								-1.2	34.23
16.8								-0.3	
16.9	9.83	2.87	0.093	28				-0.1	34.34
17					21.2	2.1	76.7	-0.8	
17.1									34.69
17.3								-0.8	34.15

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
17.4								-1.8	
17.5	15.46	3.07	0.091	50					34.40
17.6								-1.6	
17.7								0.2	34.29
17.8	1.86	2.67	0.095	33				-2	
17.9								-1.4	31.88
18					22.3	2.4	75.3		
18.1									31.80
18.2								-1.1	
18.3								0.5	38.41
18.5	14.80	3.06	0.089	69				-0.7	33.14
18.6								-1.2	
18.7	4.12	2.66	0.094	28					35.50
18.8								0	
18.9									36.33
19					23.0	2.8	74.2	-1.3	
19.3	5.75	2.84	0.095	56					39.11
19.4								-1	
19.5									38.34
19.6	8.58	2.99	0.093	57				-0.3	
19.7									35.24
19.9									36.95
20					21.8	1.9	76.3	-0.2	
20.1									37.10
20.2	1.96	2.88	0.093	63					
20.3									35.59
20.4								0.1	
20.5	7.89	2.99	0.095	57					37.52
20.7									33.33
20.9									34.99
21					21.2	2.0	76.8	1	
21.1	1.57	2.98	0.095	50					
21.2								0.5	
21.3									39.50
21.4	9.58	2.83	0.094	52					

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
21.5									36.25
21.7									39.89
21.9								-1	37.35
22					22.4	1.6	76.0		
22.1	11.56	3.12	0.092	63					37.29
22.3								0.1	34.95
22.4	7.79	2.79	0.094	43					
22.5								0.8	37.21
22.7									36.18
22.9								0.7	38.03
22.97	9.98	2.69	0.095	48					
23					22.4	2.1	75.5		
23.1								-0.7	37.63
23.3	18.78	2.70	0.093	53				0.1	39.54
23.5									36.98
23.7								-0.9	36.70
23.8								-1	
23.9	1.98	3.02	0.093	69					36.22
24					21.6	1.7	76.7	0.5	
24.1								0	42.92
24.2	9.84	2.74	0.094	37					
24.3								0.1	38.61
24.5									35.53
24.6								-0.9	
24.7								-0.3	39.75
24.9	13.22	2.81	0.095	58					37.11
25					21.0	1.6	77.4	0	
25.1									32.35
25.2								3	
25.3		2.38	0.094	49				0.2	35.55
25.5									39.07
25.6								-0.8	
25.7	12.17	2.64	0.094	41				-0.5	36.39
25.9									31.94
26					26.0	2.4	71.6	-0.2	

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
26.1								-0.6	37.94
26.3		2.65	0.094	66				-1	38.29
26.5									37.02
26.6								-2.5	
26.7	6.98	2.90	0.094	34				-0.3	33.71
26.9									35.93
27					24.4	3.0	72.7	0.3	
27.1								-0.1	36.08
27.2								-0.6	
27.3		2.59	0.093	69				-0.1	35.60
27.5									34.47
27.6								-1.9	
27.7								-1	32.68
27.8	12.62	2.91	0.094	60					
27.9									36.69
28					27.8	4.8	67.3	0.3	
28.1								-4.1	35.31
28.2		2.53	0.095	70				1.3	
28.3									39.23
28.5								-0.5	37.39
28.6	6.19	2.79	0.094	46				-0.3	
28.7									35.75
28.8								-0.8	
28.9		2.45	0.094	55				-1.5	35.70
29					24.2	2.2	73.6	0.5	
29.1								-0.4	35.24
29.3									35.04
29.4								-0.4	
29.5	12.98	2.61	0.094	22				-1.8	35.08
29.7								0.6	33.18
29.8								-0.5	
29.9		2.51	0.094	64				-1	34.32
30					24.1	2.1	73.7	1	
30.1									34.90
30.3								-1.6	36.76

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
30.4								-1.3	
30.5	1.87	2.96	0.095	72					34.81
30.6								-0.8	
30.7									35.71
30.8								0.1	
30.9		2.49	0.094	62				-0.8	33.99
31					29.5	2.7	67.8		
31.1									39.64
31.2								0.7	
31.3									33.77
31.5	9.11	2.93	0.092	37				-1.8	41.55
31.6								-0.6	
31.7								-2.1	30.54
31.9		2.49	0.095	50				1.3	31.97
32					27.9	2.9	69.1		
32.1									35.14
32.2								0	
32.3								0.1	32.72
32.5									33.71
32.6	5.32	2.82	0.095	43				0.6	
32.7								-1.6	34.22
32.9									33.05
33					26.1	6.5	67.4		
33.1								-0.7	34.10
33.2								0.3	
33.3	12.24	3.14	0.086	93					35.60
33.5								0	34.42
33.7	14.50	2.99	0.090	93					32.41
33.9								-1	32.25
34					21.8	4.6	73.6		
34.1									34.08
34.3								1	36.32
34.5								-0.6	32.13
34.6	11.84	2.99	0.088	91					
34.7								-0.8	32.65

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
34.9									32.07
35					34.0	4.4	61.6		
35.1								-0.8	32.27
35.3								-1	33.34
35.5	13.54	2.96	0.091	85					33.40
35.7									31.90
35.9									33.21
36					26.7	2.6	70.7		
36.1								-0.8	
36.3	1.45	2.97	0.088	74				-0.3	33.46
36.4								-0.5	
36.5									29.70
36.7									31.49
36.8		2.08	0.093	36				-1	
36.9									36.51
37					26.7	5.9	67.4	-0.9	
37.1									32.62
37.2	16.43	3.05	0.095	69					
37.3								-1.8	34.21
37.5									30.58
37.7		2.65	0.094	73				-1.3	30.97
37.9								-1.8	29.82
38	13.66	3.09	0.090	84	30.9	4.5	64.7		
38.1								-1.2	32.32
38.3									34.45
38.4		2.43	0.094	51				-1.8	
38.5									31.86
38.7									28.90
38.8	13.48	3.12	0.094	80					
38.9									30.98
39					26.5	3.5	70.1	-1.5	
39.1									29.98
39.3									35.18
39.4								-0.1	
39.5		2.62	0.094	64					29.30

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
39.7									32.87
39.7	11.62	2.89	0.095	68					
39.8								-1.5	
39.9		2.46	0.095	64					35.29
40					27.9	2.6	69.5		
40.1									32.52
40.3									35.21
40.4								-0.5	
40.5									33.89
40.7	1.26	3.10	0.092	93					28.03
40.9								-1	32.25
41					28.5	2.3	69.2		
41.1									28.48
41.3									31.51
41.4		2.71	0.093	60					
41.5								-1.3	32.75
41.6	12.72	3.20	0.083	94					
41.7								-0.9	31.65
41.8		2.67	0.093	74					
41.9									30.48
42					29.5	2.9	67.6		
42.1									32.27
42.2								-1.3	
42.3									36.14
42.5									34.40
42.6	12.39	3.08	0.086	100					
42.7									34.13
42.8								-0.5	
42.9									33.34
43					33.3	7.7	58.9		
43.1									31.42
43.2								-0.8	
43.3		2.65	0.095	74					31.46
43.5	14.64	3.19	0.081	103					31.78
43.6								-1	

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
43.7									28.90
43.9								-1	34.25
44					29.9	6.6	63.6		
44.1								-0.2	32.75
44.2		2.58	0.094	68					
44.3	15.24	3.26	0.086	112					34.06
44.5								-1	32.61
44.7									32.73
44.9									28.27
45					26.5	4.0	69.4		
45.1								-0.2	33.59
45.2	9.65	3.34	0.082	111					
45.3									30.70
45.5									32.33
45.7		2.30	0.093	61					32.12
45.9								-0.4	32.23
46		2.57	0.092	72	29.1	6.0	64.8		
46.1	16.39	3.19	0.084	106					34.30
46.3									33.13
46.5									33.62
46.7								-0.8	34.40
46.9								-0.5	32.01
47	14.48	3.18	0.065	116	33.9	5.1	61.0		
47.1		2.43	0.094	60				-1.3	31.56
47.3									32.21
47.5								-1	31.81
47.7								-0.8	30.08
47.9	1.13	3.18	0.083	103					29.48
48					28.5	3.9	67.6		
48.1								-1.7	32.26
48.3									35.50
48.4		2.55	0.093	80					
48.5								-1	29.26
48.7									35.58
48.8	4.85	3.20	0.082	109					

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
48.9								-1	30.50
49.1									30.04
49.3									31.14
49.5		2.56	0.094	65				-1.3	32.86
49.7	13.42	3.33	0.070	125					30.46
49.9		2.99	0.090	98				-1	32.24
50					28.9	3.4	67.6		
50.1									31.51
50.3									31.29
50.5								-1.8	32.05
50.6	15.38	3.23	0.085	103					
50.7								-0.1	31.99
50.9									32.26
51					27.9	2.7	69.4		
51.1								-0.9	32.94
51.3									33.23
51.4		2.69	0.093	76					
51.5									33.87
51.7	11.63	3.24	0.089	98					34.50
51.9								-0.3	32.06
52					27.5	2.7	69.8		
52.1									32.53
52.3									33.95
52.5								-0.2	36.98
52.6		2.76	0.094	77					
52.7									33.50
52.9	9.89	3.27	0.064	133					33.69
53					28.7	2.8	68.6	0	
53.1									34.85
53.3									33.44
53.5									33.01
53.6		2.86	0.086	106				0.2	
53.7									32.22
53.8								-1	
53.9									33.70

Appendix D. List of stratigraphic and sedimentary values for the Danny's Lake sediment core

Depth (cm)	C:D	Shan	Axis 1 PCA	Axis 1 DCA	Org	Carb	Cla	Mag Sus	Mean grain size
54					26.0	1.3	72.7		
54.1	11.95	2.95	0.079	112					33.55
54.3									32.42
54.4								0.3	
54.5									31.87
54.7		2.64	0.093	81				-0.8	32.16
54.9									33.26
55					22.9	2.2	74.9		
55.1									31.89
55.2								0.3	
55.3	16.72	3.21	0.073	98					32.44
55.5									32.21
55.7									31.21
55.8		2.62	0.093	81				0.5	
55.9									30.93
56					22.6	2.6	74.8		
56.1									31.26
56.3		3.05	0.075	113					29.64
56.5									30.44

Appendix E. Diatom and TSI data for time-series analysis

Aulacoseira complex and *Pseudostaurosira* complex relative abundances, along with TSI data (Steinhilber et al., 2009) which were subjected to spectral and wavelet analysis

Cal. yr BP	**TSI**	***Aulacoseira***	***Pseudostaurosira***
-58	0.14	-2.3016	2.3582
-53	0.23	-1.9034	1.9950
-48	0.35	-1.5052	1.6319
-43	0.44	-1.1070	1.2687
-38	0.44	-0.7088	0.9056
-33	0.34	-0.3106	0.5424
-28	0.22	0.0876	0.1792
-23	0.19	0.4859	-0.1839
-18	0.26	0.6898	-0.3949
-13	0.36	0.7644	-0.5043
-8	0.38	0.8389	-0.6137
-3	0.32	0.9134	-0.7232
3	0.22	1.0028	-0.8545
8	0.16	1.0773	-0.9639
13	0.16	1.1518	-1.0733
18	0.16	1.2263	-1.1828
23	0.13	1.3009	-1.2922
28	0.07	1.3972	-1.3725
33	0.01	1.5809	-1.3360
38	-0.01	1.7646	-1.2996
43	-0.02	1.9483	-1.2631
48	-0.04	2.1320	-1.2267
53	-0.05	1.8523	-0.8990
58	-0.04	1.5725	-0.5714
63	0	1.2928	-0.2437
68	0.06	1.0130	0.0839
73	0.12	0.7333	0.4116
78	0.17	0.4536	0.7393
83	0.19	0.1738	1.0669
88	0.17	-0.1059	1.3946
93	0.11	0.1760	0.6274
98	0.02	0.5983	-0.4136
103	-0.03	0.9551	-1.2467
108	-0.05	1.0499	-1.2485
113	-0.04	1.1447	-1.2502
118	-0.08	1.2395	-1.2520
123	-0.17	1.3343	-1.2537
128	-0.27	1.4291	-1.2555
133	-0.31	1.5240	-1.2572
138	-0.24	1.6188	-1.2590
143	-0.11	1.7136	-1.2607
148	0.02	1.8084	-1.2625

Cal. yr BP	**TSI**	***Aulacoseira***	***Pseudostaurosira***
153	0.12	1.9227	-1.3960
158	0.21	2.0500	-1.6173
163	0.28	2.1773	-1.8386
168	0.31	2.0211	-1.7383
173	0.29	1.7939	-1.5576
178	0.22	1.5667	-1.3769
183	0.16	1.3395	-1.1963
188	0.15	1.1124	-1.0156
193	0.19	0.8852	-0.8349
198	0.24	0.6580	-0.6542
203	0.27	0.4309	-0.4735
208	0.25	0.2037	-0.2928
213	0.19	0.1433	-0.2441
218	0.13	0.3330	-0.3933
223	0.06	0.5227	-0.5424
228	-0.02	0.5676	-0.6153
233	-0.12	0.5158	-0.6374
238	-0.24	0.4641	-0.6595
243	-0.36	0.4124	-0.6816
248	-0.43	0.3607	-0.7037
253	-0.42	0.3090	-0.7257
258	-0.36	0.2573	-0.7478
263	-0.32	0.2056	-0.7699
268	-0.31	0.1539	-0.7920
273	-0.33	0.1022	-0.8140
278	-0.34	0.3395	-1.1552
283	-0.31	0.5871	-1.3342
288	-0.27	0.8501	-1.2701
293	-0.24	1.1131	-1.2059
298	-0.22	1.3761	-1.1418
303	-0.18	1.6391	-1.0776
308	-0.11	1.9020	-1.0135
313	-0.04	1.7195	-0.9296
318	0	0.8685	-0.8162
323	0.02	0.5653	-0.7409
328	0.03	0.3990	-0.6751
333	0.07	0.2327	-0.6093
338	0.12	0.0664	-0.5435
343	0.13	-0.0998	-0.4777
348	0.08	-0.2661	-0.4118
353	0.01	0.2177	-0.5994
358	-0.03	0.7260	-0.7955

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
363	0.02	0.6827	-0.7730
368	0.12	0.6394	-0.7505
373	0.2	0.5960	-0.7279
378	0.21	0.5527	-0.7054
383	0.13	0.5093	-0.6829
388	-0.01	0.5055	-0.6825
393	-0.15	0.6598	-0.7709
398	-0.26	0.8141	-0.8592
403	-0.34	0.9399	-0.9526
408	-0.41	1.0467	-1.0494
413	-0.47	1.1535	-1.1462
418	-0.5	1.2604	-1.2429
423	-0.49	1.3672	-1.3397
428	-0.43	0.9591	-1.1352
433	-0.37	0.2078	-0.7299
438	-0.34	-0.5435	-0.3245
443	-0.33	-0.2029	-0.4395
448	-0.32	0.1378	-0.5544
453	-0.29	0.4785	-0.6693
458	-0.25	0.8192	-0.7842
463	-0.25	1.1598	-0.8991
468	-0.32	1.9590	-1.3439
473	-0.48	2.7582	-1.7887
478	-0.67	2.8730	-1.8781
483	-0.86	2.5315	-1.7307
488	-0.95	2.1900	-1.5833
493	-0.89	1.8485	-1.4358
498	-0.79	1.5070	-1.2884
503	-0.63	1.1655	-1.1410
508	-0.43	0.8186	-0.9597
513	-0.23	0.4498	-0.6429
518	-0.09	0.0811	-0.3261
523	-0.05	-0.2876	-0.0094
528	-0.11	-0.3523	0.0161
533	-0.19	-0.2143	-0.1526
538	-0.24	-0.0764	-0.3214
543	-0.21	0.0616	-0.4901
548	-0.14	0.1996	-0.6588
553	-0.05	0.3376	-0.8276
558	0.07	0.4755	-0.9963
563	0.2	0.6136	-1.1717
568	0.34	0.7518	-1.3487

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
573	0.44	0.8899	-1.5257
578	0.48	0.9682	-1.5906
583	0.48	0.9567	-1.4876
588	0.46	0.9451	-1.3845
593	0.42	0.9336	-1.2815
598	0.36	0.9221	-1.1784
603	0.26	0.9105	-1.0754
608	0.12	0.8990	-0.9723
613	-0.04	0.9157	-0.9322
618	-0.17	0.9748	-0.9866
623	-0.26	1.0078	-1.0232
628	-0.31	0.9368	-0.9890
633	-0.36	0.8658	-0.9548
638	-0.4	0.7948	-0.9206
643	-0.42	0.7238	-0.8864
648	-0.42	0.6528	-0.8522
653	-0.42	0.5818	-0.8179
658	-0.44	0.5144	-0.7599
663	-0.48	0.4613	-0.6065
668	-0.53	0.4081	-0.4530
673	-0.53	0.3550	-0.2996
678	-0.42	0.3405	-0.3635
683	-0.2	0.3356	-0.4818
688	0.07	0.3307	-0.6000
693	0.33	0.3258	-0.7183
698	0.5	0.3209	-0.8366
703	0.56	0.3160	-0.9548
708	0.49	0.3111	-1.0731
713	0.34	0.4371	-1.1631
718	0.19	0.5958	-1.2460
723	0.11	0.7545	-1.3290
728	0.11	0.8607	-1.3959
733	0.16	0.8882	-1.4388
738	0.21	0.9157	-1.4816
743	0.24	0.9432	-1.5245
748	0.26	0.9707	-1.5673
753	0.26	0.9982	-1.6102
758	0.22	1.0258	-1.6530
763	0.15	1.0486	-1.5968
768	0.09	1.0645	-1.3920
773	0.09	1.0803	-1.1873
778	0.13	1.0632	-1.0898

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
783	0.17	0.9967	-1.1534
788	0.18	0.9302	-1.2170
793	0.17	0.8637	-1.2805
798	0.18	0.7972	-1.3441
803	0.24	0.7264	-1.2056
808	0.32	0.6556	-1.0670
813	0.35	0.7760	-1.0099
818	0.3	0.9441	-0.9731
823	0.19	1.1122	-0.9363
828	0.09	1.2804	-0.8995
833	0.07	1.4485	-0.8628
838	0.13	0.8306	-0.8448
843	0.21	0.2800	-0.7989
848	0.27	0.1252	-0.7040
853	0.29	-0.0296	-0.6092
858	0.27	-0.1844	-0.5144
863	0.24	-0.3392	-0.4196
868	0.19	0.2567	-0.8260
873	0.14	0.8525	-1.2324
878	0.11	0.6630	-1.0778
883	0.09	0.2772	-0.7828
888	0.1	-0.1087	-0.4879
893	0.1	-0.4945	-0.1929
898	0.07	-0.2762	-0.1393
903	0.02	0.3449	-0.2466
908	-0.08	0.8169	-0.3258
913	-0.19	0.6925	-0.2924
918	-0.3	0.5680	-0.2590
923	-0.35	0.4436	-0.2257
928	-0.29	0.3191	-0.1923
933	-0.17	-0.2904	-0.3203
938	-0.04	-0.8999	-0.4483
943	0.02	-0.8326	-0.4179
948	0.01	-0.5963	-0.3478
953	-0.05	-0.3599	-0.2778
958	-0.12	-0.1235	-0.2077
963	-0.14	-0.0013	-0.1344
968	-0.08	-0.3361	-0.0475
973	0.05	-0.6710	0.0393
978	0.19	-0.6093	-0.0932
983	0.31	-0.4486	-0.2805
988	0.38	-0.2878	-0.4678

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
993	0.39	-0.1271	-0.6550
998	0.38	0.0336	-0.8423
1003	0.37	-0.1780	-0.3945
1008	0.38	-0.3896	0.0534
1013	0.39	-0.5131	0.1334
1018	0.38	-0.5778	-0.0317
1023	0.32	-0.6424	-0.1969
1028	0.22	-0.7071	-0.3621
1033	0.1	-0.7718	-0.5272
1038	-0.03	-0.8365	-0.6924
1043	-0.15	-0.3781	-0.6927
1048	-0.24	0.0804	-0.6930
1053	-0.26	0.2967	-0.7056
1058	-0.18	0.3516	-0.7263
1063	-0.04	0.4065	-0.7471
1068	0.12	0.4614	-0.7678
1073	0.25	0.5163	-0.7886
1078	0.34	0.2341	-0.7761
1083	0.36	-0.1324	-0.7554
1088	0.33	-0.3240	-0.7612
1093	0.26	-0.2533	-0.8069
1098	0.18	-0.1825	-0.8527
1103	0.12	-0.1117	-0.8984
1108	0.1	-0.0410	-0.9441
1113	0.11	0.1050	-0.9613
1118	0.14	0.3012	-0.9594
1123	0.17	0.4444	-0.9544
1128	0.22	0.3760	-0.9367
1133	0.27	0.3077	-0.9190
1138	0.33	0.2393	-0.9014
1143	0.37	0.1710	-0.8837
1148	0.39	0.1026	-0.8660
1153	0.37	0.0886	-0.7770
1158	0.31	0.1559	-0.5809
1163	0.22	0.2232	-0.3848
1168	0.1	0.2864	-0.2122
1173	-0.01	0.3327	-0.1336
1178	-0.06	0.3791	-0.0551
1183	-0.06	0.4254	0.0235
1188	-0.01	0.2794	0.2043
1193	0.03	0.1334	0.3852
1198	0.08	-0.0126	0.5661

Cal. yr BP	**TSI**	***Aulacoseira***	***Pseudostaurosira***
1203	0.14	-0.1586	0.7470
1208	0.22	-0.2221	0.7871
1213	0.27	0.0441	0.2640
1218	0.25	0.3104	-0.2591
1223	0.15	0.5766	-0.7821
1228	0	0.2984	-0.2860
1233	-0.16	0.0202	0.2102
1238	-0.26	-0.2580	0.7064
1243	-0.3	-0.5362	1.2025
1248	-0.31	-0.8144	1.6987
1253	-0.33	-0.7852	1.5331
1258	-0.38	-0.7560	1.3676
1263	-0.47	-0.7268	1.2021
1268	-0.6	-0.6977	1.0365
1273	-0.77	-0.5376	0.9070
1278	-0.97	-0.3775	0.7774
1283	-0.97	-0.2175	0.6478
1288	-0.97	-0.1354	0.4593
1293	-0.97	-0.0729	0.2561
1298	-0.83	-0.0104	0.0529
1303	-0.64	0.2121	-0.1527
1308	-0.46	0.5414	-0.3600
1313	-0.31	0.8706	-0.5673
1318	-0.2	0.9054	-0.6681
1323	-0.14	0.9402	-0.7690
1328	-0.11	0.9750	-0.8698
1333	-0.11	1.0098	-0.9706
1338	-0.13	0.9570	-0.9403
1343	-0.17	0.5535	-0.3855
1348	-0.22	0.1500	0.1693
1353	-0.22	-0.2534	0.7242
1358	-0.15	-0.2847	0.5781
1363	-0.06	-0.3160	0.4321
1368	-0.01	-0.3473	0.2860
1373	-0.03	-0.3786	0.1400
1378	-0.1	-0.4099	-0.0061
1383	-0.17	-0.4412	-0.1521
1388	-0.15	-0.3734	0.0482
1393	-0.03	-0.2808	0.3350
1398	0.13	-0.1882	0.6219
1403	0.26	-0.0956	0.9088
1408	0.31	-0.0539	0.8820

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
1413	0.25	-0.0460	0.6460
1418	0.13	-0.0381	0.4100
1423	0.03	-0.0303	0.1741
1428	0.05	-0.0224	-0.0619
1433	0.2	-0.0145	-0.2979
1438	0.38	-0.0067	-0.5339
1443	0.47	0.1871	-0.5536
1448	0.45	0.3809	-0.5733
1453	0.34	0.5746	-0.5930
1458	0.22	0.7684	-0.6127
1463	0.14	0.8442	-0.6524
1468	0.12	0.8414	-0.7053
1473	0.1	0.8387	-0.7582
1478	0.07	0.8359	-0.8111
1483	0.04	0.8332	-0.8641
1488	0.02	0.8304	-0.9170
1493	0.02	0.8276	-0.9699
1498	0.02	0.8249	-1.0229
1503	0.01	0.5664	-0.6908
1508	-0.01	0.3079	-0.3588
1513	0	0.0495	-0.0268
1518	0.03	-0.2090	0.3052
1523	0.05	-0.4675	0.6372
1528	0.05	-0.7260	0.9692
1533	0.01	-0.9844	1.3013
1538	-0.05	-1.0885	1.3423
1543	-0.12	-1.0895	1.1895
1548	-0.15	-1.0906	1.0366
1553	-0.12	-1.0917	0.8837
1558	-0.03	-0.8931	0.6787
1563	0.08	0.1037	0.2648
1568	0.14	-0.0409	0.3179
1573	0.17	-0.1855	0.3709
1578	0.2	-0.3301	0.4239
1583	0.26	-0.4747	0.4769
1588	0.34	-0.6192	0.5300
1593	0.4	-0.7638	0.5830
1598	0.39	-0.9084	0.6360
1603	0.33	-1.0530	0.6891
1608	0.29	-0.8193	0.5479
1613	0.29	-0.0179	0.1153
1618	0.34	0.5945	-0.2163

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
1623	0.38	0.4513	-0.1446
1628	0.38	0.3082	-0.0728
1633	0.39	0.1651	-0.0011
1638	0.46	0.0219	0.0707
1643	0.6	-0.1212	0.1424
1648	0.74	-0.2643	0.2142
1653	0.8	-0.4075	0.2859
1658	0.77	-0.5506	0.3576
1663	0.66	-0.6937	0.4294
1668	0.53	-0.6130	0.5288
1673	0.42	-0.3831	0.6466
1678	0.33	-0.3708	0.5910
1683	0.21	-0.3585	0.5353
1688	0.07	-0.3462	0.4797
1693	-0.08	-0.3339	0.4240
1698	-0.21	-0.3216	0.3684
1703	-0.26	-0.3093	0.3127
1708	-0.21	-0.2970	0.2571
1713	-0.11	-0.2848	0.2014
1718	0.01	-0.2725	0.1458
1723	0.12	-0.2602	0.0901
1728	0.22	-0.0813	0.0141
1733	0.32	0.2086	-0.0754
1738	0.42	0.4985	-0.1648
1743	0.49	0.7884	-0.2543
1748	0.48	1.0784	-0.3438
1753	0.4	1.3683	-0.4333
1758	0.25	1.6582	-0.5228
1763	0.12	1.9481	-0.6123
1768	0.09	1.6823	-0.5151
1773	0.17	1.2775	-0.3712
1778	0.29	0.8727	-0.2274
1783	0.38	0.4679	-0.0835
1788	0.39	0.0631	0.0604
1793	0.34	-0.3416	0.2043
1798	0.27	-0.4555	0.3233
1803	0.23	-0.4966	0.4362
1808	0.24	-0.5377	0.5490
1813	0.3	-0.5788	0.6618
1818	0.34	-0.6198	0.7747
1823	0.33	-0.6609	0.8875
1828	0.23	-0.7020	1.0004

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
1833	0.05	-0.7185	0.9793
1838	-0.17	-0.6980	0.7574
1843	-0.37	-0.6775	0.5355
1848	-0.49	-0.6569	0.3136
1853	-0.42	-0.6364	0.0916
1858	-0.2	-0.4027	0.0344
1863	0.06	-0.1157	0.0184
1868	0.28	0.1714	0.0024
1873	0.4	0.4584	-0.0136
1878	0.4	0.7454	-0.0296
1883	0.29	1.0325	-0.0457
1888	0.12	0.8714	-0.0752
1893	-0.06	0.5983	-0.1082
1898	-0.19	0.3251	-0.1412
1903	-0.24	0.0520	-0.1741
1908	-0.22	-0.2211	-0.2071
1913	-0.13	-0.4942	-0.2401
1918	0	-0.4547	-0.2219
1923	0.14	-0.3370	-0.1909
1928	0.26	-0.2193	-0.1599
1933	0.36	-0.1016	-0.1289
1938	0.43	0.0160	-0.0979
1943	0.48	0.1337	-0.0669
1948	0.48	0.2514	-0.0359
1953	0.42	0.3691	-0.0049
1958	0.31	0.4868	0.0262
1963	0.2	0.6045	0.0572
1968	0.14	0.6376	0.1141
1973	0.16	0.3323	0.2750
1978	0.21	0.0270	0.4359
1983	0.29	-0.2035	0.5712
1988	0.34	-0.1352	0.6043
1993	0.37	-0.0668	0.6373
1998	0.37	-0.0293	0.6795
2003	0.33	-0.1155	0.7580
2008	0.24	-0.2017	0.8365
2013	0.14	-0.2878	0.9150
2018	0.06	-0.3740	0.9934
2023	0.04	-0.4602	1.0719
2028	0.07	-0.5464	1.1504
2033	0.15	-0.6325	1.2289
2038	0.24	-0.7187	1.3074

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
2043	0.3	-0.8049	1.3859
2048	0.32	-0.8087	1.3625
2053	0.27	-0.7919	1.3137
2058	0.17	-0.7751	1.2648
2063	0.08	-0.7583	1.2159
2068	0.06	-0.7415	1.1670
2073	0.11	-0.7247	1.1182
2078	0.21	-0.7079	1.0693
2083	0.28	-0.6910	1.0204
2088	0.31	-0.6742	0.9716
2093	0.27	-0.6574	0.9227
2098	0.22	-0.7146	0.7024
2103	0.16	-0.8211	0.3677
2108	0.12	-0.9276	0.0331
2113	0.11	-0.8508	0.4032
2118	0.14	-0.7741	0.7733
2123	0.18	-0.7463	0.9888
2128	0.2	-0.7920	0.9724
2133	0.18	-0.8376	0.9560
2138	0.13	-0.8833	0.9396
2143	0.11	-0.9290	0.9231
2148	0.13	-0.9746	0.9067
2153	0.21	-1.0203	0.8903
2158	0.33	-1.0660	0.8739
2163	0.45	-1.1116	0.8574
2168	0.55	-1.1573	0.8410
2173	0.63	-1.1661	0.8198
2178	0.64	-1.0272	0.7794
2183	0.59	-0.8884	0.7390
2188	0.48	-0.7495	0.6986
2193	0.34	-0.6107	0.6581
2198	0.22	-0.4718	0.6177
2203	0.13	-0.3330	0.5773
2208	0.06	-0.1942	0.5369
2213	0	-0.0553	0.4965
2218	0	-0.0181	0.5119
2223	0.08	-0.3872	0.7504
2228	0.23	-0.7563	0.9889
2233	0.38	-0.8358	1.0360
2238	0.46	-0.7222	0.9555
2243	0.47	-0.6087	0.8750
2248	0.42	-0.4951	0.7945

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
2253	0.36	-0.3815	0.7140
2258	0.3	-0.2680	0.6335
2263	0.21	-0.1544	0.5530
2268	0.11	-0.0409	0.4725
2273	0.04	0.0727	0.3920
2278	0.06	-0.5954	0.7531
2283	0.15	-1.3223	1.1511
2288	0.25	-1.3558	1.1628
2293	0.27	-1.3892	1.1745
2298	0.17	-1.4227	1.1863
2303	-0.02	-1.4561	1.1980
2308	-0.23	-1.4896	1.2097
2313	-0.39	-1.5230	1.2215
2318	-0.46	-1.5565	1.2332
2323	-0.46	-1.5899	1.2449
2328	-0.42	-1.6234	1.2567
2333	-0.35	-1.6568	1.2684
2338	-0.28	-1.6903	1.2801
2343	-0.23	-1.7237	1.2919
2348	-0.19	-1.5617	1.2386
2353	-0.18	-1.2694	1.1420
2358	-0.16	-0.9771	1.0454
2363	-0.14	-0.6848	0.9487
2368	-0.12	-0.3924	0.8521
2373	-0.07	-0.1001	0.7555
2378	0.01	0.1922	0.6589
2383	0.14	0.4845	0.5623
2388	0.29	0.7769	0.4656
2393	0.4	1.0692	0.3690
2398	0.44	0.8703	0.5960
2403	0.43	0.5486	0.9038
2408	0.41	0.2269	1.2116
2413	0.43	-0.0948	1.5195
2418	0.51	-0.4164	1.8273
2423	0.59	-0.7348	1.9748
2428	0.61	-1.0397	1.4810
2433	0.55	-1.2955	1.0927
2438	0.44	-1.3546	1.1263
2443	0.31	-1.4137	1.1598
2448	0.21	-1.4728	1.1934
2453	0.17	-1.5319	1.2270
2458	0.19	-1.5910	1.2606

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
2463	0.26	-1.6501	1.2942
2468	0.34	-1.7091	1.3278
2473	0.4	-1.7682	1.3614
2478	0.4	-1.8273	1.3950
2483	0.33	-1.8864	1.4285
2488	0.24	-1.9455	1.4621
2493	0.17	-2.0046	1.4957
2498	0.12	-2.0637	1.5293
2503	0.07	-2.1227	1.5629
2508	-0.02	-2.1818	1.5965
2513	-0.13	-2.2409	1.6301
2518	-0.16	-2.3000	1.6636
2523	-0.06	-0.8111	1.0261
2528	0.12	0.6779	0.3886
2533	0.29	0.5940	0.4135
2538	0.4	0.5102	0.4384
2543	0.44	0.4263	0.4633
2548	0.47	0.3425	0.4882
2553	0.49	0.2586	0.5131
2558	0.5	0.1748	0.5380
2563	0.46	0.0909	0.5629
2568	0.37	0.0071	0.5878
2573	0.27	-0.0768	0.6127
2578	0.21	-0.1606	0.6376
2583	0.18	-0.2445	0.6625
2588	0.17	-0.3284	0.6874
2593	0.18	-0.4122	0.7123
2598	0.22	-0.4961	0.7372
2603	0.3	-0.5799	0.7621
2608	0.39	-0.5879	0.8067
2613	0.41	-0.5453	0.8643
2618	0.33	-0.5028	0.9220
2623	0.12	-0.4602	0.9797
2628	-0.14	-0.4176	1.0373
2633	-0.35	-0.3751	1.0950
2638	-0.41	-0.3325	1.1526
2643	-0.33	-0.2899	1.2103
2648	-0.18	-0.2473	1.2680
2653	-0.01	-0.2500	1.3198
2658	0.18	-0.4336	1.3486
2663	0.34	-0.6173	1.3774
2668	0.43	-0.8009	1.4061

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
2673	0.4	-0.9845	1.4349
2678	0.22	-1.1681	1.4636
2683	-0.05	-1.3517	1.4924
2688	-0.32	-1.5354	1.5211
2693	-0.48	-1.5815	1.5096
2698	-0.48	-1.4215	1.4375
2703	-0.43	-1.2615	1.3655
2708	-0.4	-1.1014	1.2935
2713	-0.41	-0.9414	1.2214
2718	-0.42	-0.7814	1.1494
2723	-0.4	-0.6213	1.0774
2728	-0.39	-0.4613	1.0053
2733	-0.41	-0.3013	0.9333
2738	-0.49	-0.1412	0.8612
2743	-0.57	0.0188	0.7892
2748	-0.62	0.1788	0.7172
2753	-0.63	-0.2669	0.9062
2758	-0.65	-0.7126	1.0952
2763	-0.69	-1.1584	1.2842
2768	-0.7	-1.6041	1.4732
2773	-0.62	-2.0498	1.6622
2778	-0.47	-2.3417	1.7494
2783	-0.31	-2.0181	1.4294
2788	-0.18	-1.6946	1.1094
2793	-0.11	-1.3710	0.7894
2798	-0.08	-1.1786	0.6051
2803	-0.05	-1.1831	0.6243
2808	0.01	-1.1876	0.6434
2813	0.1	-1.1921	0.6626
2818	0.25	-1.1966	0.6818
2823	0.43	-1.2011	0.7009
2828	0.59	-1.2055	0.7201
2833	0.67	-1.2100	0.7392
2838	0.63	-1.2145	0.7584
2843	0.48	-1.2190	0.7776
2848	0.26	-1.2235	0.7967
2853	0.08	-1.2279	0.8159
2858	0.02	-1.2324	0.8351
2863	0.04	-1.1840	0.8479
2868	0.04	-1.1356	0.8607
2873	-0.05	-1.0872	0.8735
2878	-0.19	-1.0388	0.8863

Cal. yr BP	TSI	*Aulacoseira*	*Pseudostaurosira*
2883	-0.25	-0.9904	0.8991
2888	-0.13	-0.9420	0.9119
2893	0.09	-0.8936	0.9247
2898	0.25	-0.8452	0.9375
2903	0.28	-0.7968	0.9503
2908	0.19	-0.7483	0.9631
2913	0.09	-0.6999	0.9759
2918	0.05	-0.6515	0.9887
2923	0.1	-0.6031	1.0015
2928	0.13	-0.5842	1.0082
2933	0.07	-0.6831	0.9902
2938	-0.1	-0.7819	0.9722
2943	-0.33	-0.8808	0.9542
2948	-0.53	-0.9797	0.9362
2953	-0.6	-1.0786	0.9182
2958	-0.6	-1.0247	0.8979
2963	-0.59	-0.9708	0.8776
2968	-0.59	-0.9169	0.8573
2973	-0.53	-0.8630	0.8369
2978	-0.39	-0.8091	0.8166
2983	-0.21	-0.7552	0.7963
2988	-0.04	-0.7012	0.7760
2993	0.1	-0.6473	0.7557
2998	0.18	-0.5934	0.7353
3003	0.2	-0.5395	0.7150
3008	0.18	-0.4856	0.6947
3013	0.11	-0.4317	0.6744
3018	0.04	-0.3778	0.6541
3023	-0.02	-0.3239	0.6338
3028	-0.07	-0.2700	0.6134
3033	-0.11	-0.4195	0.6989
3038	-0.15	-0.8741	0.9431
3043	-0.17	-1.3287	1.1873
3048	-0.15	-1.7834	1.4316
3053	-0.1	-2.2380	1.6758
3058	-0.06	-2.5890	1.8750
3063	-0.04	-2.5254	1.8946
3068	-0.05	-2.4617	1.9142
3073	-0.04	-2.3981	1.9338
3078	0.01	-2.3345	1.9534
3083	0.07	-2.2709	1.9730
3088	0.11	-2.2072	1.9926

Cal. yr BP	**TSI**	***Aulacoseira***	***Pseudostaurosira***
3093	0.14	-2.1436	2.0122
3098	0.16	-2.0800	2.0318
3103	0.19	-2.0164	2.0514
3108	0.21	-1.9527	2.0710
3113	0.22	-1.8891	2.0906
3118	0.18	-1.8255	2.1102
3123	0.12	-1.7844	2.0095
3128	0.08	-1.7432	1.9088
3133	0.08	-1.7021	1.8081
3138	0.1	-1.6610	1.7074
3143	0.11	-1.6199	1.6066
3148	0.07	-1.5788	1.5059
3153	-0.01	-1.5377	1.4052
3158	-0.13	-1.4966	1.3045
3163	-0.23	-1.4311	1.2346
3168	-0.26	-1.3293	1.2108
3173	-0.21	-1.2274	1.1871
3178	-0.12	-1.1256	1.1633
3183	-0.05	-1.0237	1.1396
3188	-0.01	-0.9219	1.1158
3193	0.04	-0.8200	1.0921
3198	0.11	-0.7182	1.0683
3203	0.21	-0.6163	1.0446
3208	0.29	-0.5145	1.0208
3213	0.3	-0.4126	0.9971
3218	0.25	-0.5073	0.9935
3223	0.16	-0.6020	0.9899
3228	0.11	-0.6967	0.9863
3233	0.12	-0.7913	0.9827
3238	0.18	-0.8860	0.9791
3243	0.25	-0.9807	0.9755
3248	0.28	-1.0754	0.9719
3253	0.25	-1.1701	0.9683
3258	0.15	-1.2648	0.9647
3263	0.01	-1.2672	0.9920
3268	-0.12	-1.1313	1.0657
3273	-0.19	-0.9953	1.1393
3278	-0.15	-0.8594	1.2130
3283	-0.06	-0.7234	1.2867
3288	0.04	-0.5875	1.3603
3293	0.12	-0.4516	1.4340
3298	0.2	-0.3791	1.5230

Cal. yr BP	**TSI**	***Aulacoseira***	***Pseudostaurosira***
3303	0.27	-0.5606	1.6733
3308	0.31	-0.7421	1.8236
3313	0.27	-0.9236	1.9740
3318	0.15	-1.1051	2.1243
3323	-0.04	-1.2865	2.2746
3328	-0.22	-1.4680	2.4250
3333	-0.32	-1.6495	2.5753

Appendix F. Age-depth information for the Danny's Lake sediment core

Age-depth information for the Danny's Lake core based on 25 radiocarbon dates and the age depth model constructed in Bacon. All dates are shown in calibrated years before present (AD 1950) and the maximum probability (MAP) was used for assigning ages to proxy data.

Depth (cm)	min	max	MAP
0	-254	146	-68.4
0.1	-205	145	-61.6
0.2	-197	153	-54.8
0.3	-193	152	-48
0.4	-185	155	-41.2
0.5	-176	159	-34.4
0.6	-173	162	-27.5
0.7	-164	166	-20.7
0.8	-266	164	-13.9
0.9	-257	168	-7.1
1	-249	171	-0.3
1.1	-240	175	6.5
1.2	-232	188	13.3
1.3	-223	192	20.2
1.4	-215	185	27
1.5	-206	189	33.8
1.6	-198	192	40.6
1.7	-189	196	47.4
1.8	-180	200	54.2
1.9	-172	203	61
2	-163	207	67.9
2.1	-155	210	74.7
2.2	-146	214	81.5
2.3	-138	212	88.3
2.4	-129	216	95.1
2.5	-121	224	101.9
2.6	-113	227	108.7
2.7	-105	230	115.6
2.8	-96	229	122.4
2.9	-88	232	129.2
3	-80	235	136
3.1	-72	243	142.8
3.2	-63	242	149.6
3.3	-55	245	156.4
3.4	-47	253	163.3
3.5	-39	256	170.1
3.6	-30	260	176.9
3.7	-22	258	183.7
3.8	-14	266	190.5
3.9	-6	269	197.3
4	3	273	204.1

Depth (cm)	min	max	MAP
4.1	11	276	211
4.2	19	279	217.8
4.3	27	282	224.6
4.4	36	286	231.4
4.5	44	284	238.2
4.6	52	287	245
4.7	75	290	251.8
4.8	69	299	258.6
4.9	77	302	265.5
5	85	305	272.3
5.1	98	318	276.5
5.2	102	312	280.7
5.3	115	315	285
5.4	128	328	289.2
5.5	131	326	293.4
5.6	135	335	297.7
5.7	143	333	301.9
5.8	151	336	306.1
5.9	159	339	310.3
6	167	342	314.6
6.1	173	348	318.8
6.2	181	356	323
6.3	190	360	327.3
6.4	193	363	331.5
6.5	202	367	335.7
6.6	211	371	339.9
6.7	219	369	344.2
6.8	223	378	348.4
6.9	246	386	352.6
7	235	385	356.9
7.1	258	388	361.1
7.2	267	392	365.3
7.3	275	400	369.5
7.4	284	404	373.8
7.5	292	407	378
7.6	301	416	382.2
7.7	309	419	386.5
7.8	313	423	390.7
7.9	317	427	394.9
8	325	435	399.1
8.1	334	439	403.4

Depth (cm)	min	max	MAP
8.2	347	442	407.6
8.3	346	446	411.8
8.4	364	454	416.1
8.5	373	458	420.3
8.6	376	456	424.5
8.7	385	465	428.7
8.8	393	468	433
8.9	397	477	437.2
9	400	480	441.4
9.1	414	484	445.7
9.2	418	488	449.9
9.3	421	491	454.1
9.4	425	495	458.3
9.5	433	503	462.6
9.6	437	507	466.8
9.7	440	510	471
9.8	444	514	475.3
9.9	447	522	479.5
10	451	526	483.7
10.1	460	530	489.5
10.2	464	534	495.2
10.3	473	543	501
10.4	477	547	506.8
10.5	486	551	512.5
10.6	490	555	518.3
10.7	494	559	524.1
10.8	498	568	529.8
10.9	512	572	535.6
11	511	576	541.3
11.1	515	580	547.1
11.2	524	584	552.9
11.3	528	588	558.6
11.4	537	597	564.4
11.5	541	601	570.2
11.6	545	605	575.9
11.7	554	614	581.7
11.8	558	618	587.5
11.9	562	622	593.2
12	566	626	599
12.1	575	635	604.7
12.2	579	639	610.5
12.3	583	648	616.3
12.4	587	652	622
12.5	591	656	627.8
12.6	600	665	633.6
12.7	599	669	639.3
12.8	608	678	645.1
12.9	611	681	650.8
13	616	686	656.6
13.1	621	696	662.4
13.2	626	701	668.1
13.3	621	706	673.9
13.4	632	712	679.7
13.5	637	722	685.4
13.6	642	727	691.2
13.7	642	732	697
13.8	648	738	702.7
13.9	653	743	708.5
14	658	753	714.2
14.1	663	758	720
14.2	664	764	725.8
14.3	664	769	731.5
14.4	669	779	737.3
14.5	674	784	743.1
14.6	675	790	748.8
14.7	678	798	754.6
14.8	682	802	760.3
14.9	686	811	766.1
15	689	814	771.9
15.1	694	819	775.5
15.2	703	828	779.1
15.3	708	828	782.8
15.4	713	833	786.4
15.5	717	837	790
15.6	722	837	793.6
15.7	726	841	797.3
15.8	736	851	800.9
15.9	736	851	804.5
16	745	855	808.1
16.1	750	860	811.8
16.2	754	864	815.4
16.3	759	869	819

Depth (cm)	min	max	MAP
16.4	763	873	822.7
16.5	768	878	826.3
16.6	773	883	829.9
16.7	777	887	833.5
16.8	777	887	837.2
16.9	791	896	840.8
17	791	896	844.4
17.1	796	901	848
17.2	800	910	851.7
17.3	805	920	855.3
17.4	809	919	858.9
17.5	813	923	862.6
17.6	822	932	866.2
17.7	826	936	869.8
17.8	829	944	873.4
17.9	827	942	877.1
18	831	946	880.7
18.1	844	959	884.3
18.2	842	952	887.9
18.3	845	955	891.6
18.4	853	963	895.2
18.5	851	966	898.8
18.6	854	969	902.5
18.7	862	977	906.1
18.8	865	985	909.7
18.9	873	993	913.3
19	876	996	917
19.1	879	1004	920.6
19.2	882	1007	924.2
19.3	885	1015	927.8
19.4	888	1018	931.5
19.5	891	1026	935.1
19.6	894	1029	938.7
19.7	892	1032	942.4
19.8	900	1040	946
19.9	898	1043	949.6
20	902	1042	953.2
20.1	906	1046	957.3
20.2	916	1056	961.3
20.3	920	1060	965.3
20.4	925	1055	969.3
20.5	929	1064	973.3
20.6	934	1069	977.4
20.7	938	1063	981.4
20.8	943	1068	985.4
20.9	943	1068	989.4
21	952	1077	993.4
21.1	957	1077	997.5
21.2	961	1081	1001.5
21.3	961	1081	1005.5
21.4	965	1085	1009.5
21.5	970	1090	1013.5
21.6	980	1095	1017.5
21.7	984	1099	1021.6
21.8	984	1099	1025.6
21.9	988	1103	1029.6
22	998	1108	1033.6
22.1	1002	1112	1037.6
22.2	1002	1112	1041.7
22.3	1005	1115	1045.7
22.4	1013	1123	1049.7
22.5	1015	1125	1053.7
22.6	1017	1127	1057.7
22.7	1020	1130	1061.8
22.8	1022	1137	1065.8
22.9	1030	1140	1069.8
23	1032	1142	1073.8
23.1	1034	1149	1077.8
23.2	1037	1152	1081.9
23.3	1044	1154	1085.9
23.4	1046	1161	1089.9
23.5	1049	1164	1093.9
23.6	1056	1166	1097.9
23.7	1059	1174	1102
23.8	1061	1176	1106
23.9	1063	1178	1110
24	1066	1181	1114
24.1	1073	1188	1118
24.2	1070	1190	1122
24.3	1078	1198	1126.1
24.4	1085	1205	1130.1
24.5	1087	1207	1134.1

Depth (cm)	min	max	MAP
24.6	1090	1210	1138.1
24.7	1092	1212	1142.1
24.8	1095	1220	1146.2
24.9	1097	1222	1150.2
25	1104	1229	1154.2
25.1	1099	1229	1158.3
25.2	1113	1233	1162.3
25.3	1113	1233	1166.3
25.4	1123	1238	1170.4
25.5	1122	1237	1174.4
25.6	1127	1242	1178.5
25.7	1131	1241	1182.5
25.8	1136	1246	1186.6
25.9	1140	1250	1190.6
26	1145	1255	1194.7
26.1	1149	1254	1198.7
26.2	1154	1259	1202.8
26.3	1159	1264	1206.8
26.4	1163	1263	1210.9
26.5	1168	1268	1214.9
26.6	1172	1267	1219
26.7	1177	1272	1223
26.8	1181	1276	1227.1
26.9	1186	1276	1231.1
27	1191	1281	1235.2
27.1	1195	1285	1239.2
27.2	1200	1290	1243.3
27.3	1199	1289	1247.3
27.4	1204	1294	1251.4
27.5	1208	1293	1255.4
27.6	1213	1298	1259.5
27.7	1217	1302	1263.5
27.8	1217	1302	1267.6
27.9	1227	1307	1271.6
28	1231	1311	1275.7
28.1	1231	1311	1279.7
28.2	1235	1315	1283.8
28.3	1235	1315	1287.8
28.4	1239	1319	1291.9
28.5	1244	1324	1295.9
28.6	1248	1328	1300
28.7	1253	1333	1304
28.8	1258	1338	1308.1
28.9	1262	1342	1312.1
29	1262	1342	1316.2
29.1	1266	1346	1320.2
29.2	1271	1351	1324.3
29.3	1274	1354	1328.3
29.4	1276	1361	1332.4
29.5	1279	1364	1336.4
29.6	1281	1366	1340.5
29.7	1284	1374	1344.5
29.8	1291	1376	1348.6
29.9	1288	1378	1352.6
30	1296	1386	1356.7
30.1	1298	1388	1362.1
30.2	1305	1390	1367.5
30.3	1312	1397	1372.9
30.4	1324	1404	1378.3
30.5	1326	1406	1383.7
30.6	1333	1413	1389.2
30.7	1340	1420	1394.6
30.8	1347	1422	1400
30.9	1354	1429	1405.4
31	1356	1431	1410.8
31.1	1363	1438	1416.2
31.2	1370	1440	1421.6
31.3	1377	1447	1427.1
31.4	1383	1453	1432.5
31.5	1394	1459	1437.9
31.6	1400	1465	1443.3
31.7	1406	1471	1448.7
31.8	1412	1477	1454.1
31.9	1413	1478	1459.5
32	1419	1484	1465
32.1	1425	1490	1470.4
32.2	1431	1496	1475.8
32.3	1442	1502	1481.2
32.4	1449	1509	1486.6
32.5	1455	1515	1492
32.6	1461	1521	1497.4
32.7	1467	1527	1502.9

Depth (cm)	min	max	MAP
32.8	1473	1533	1508.3
32.9	1479	1539	1513.7
33	1485	1545	1519.1
33.1	1491	1551	1524.5
33.2	1497	1557	1529.9
33.3	1498	1558	1535.3
33.4	1504	1564	1540.8
33.5	1510	1570	1546.2
33.6	1516	1576	1551.6
33.7	1522	1587	1557
33.8	1528	1593	1562.4
33.9	1534	1599	1567.8
34	1540	1605	1573.2
34.1	1547	1612	1578.7
34.2	1548	1618	1584.1
34.3	1552	1622	1589.5
34.4	1561	1631	1594.9
34.5	1565	1635	1600.3
34.6	1569	1639	1605.7
34.7	1573	1648	1611.1
34.8	1582	1657	1616.6
34.9	1586	1661	1622
35	1594	1669	1627.4
35.1	1598	1673	1634.9
35.2	1606	1681	1642.5
35.3	1615	1685	1650
35.4	1623	1693	1657.6
35.5	1631	1701	1665.1
35.6	1640	1705	1672.6
35.7	1648	1713	1680.2
35.8	1651	1716	1687.7
35.9	1660	1725	1695.3
36	1668	1733	1702.8
36.1	1676	1736	1710.4
36.2	1685	1745	1717.9
36.3	1693	1753	1725.4
36.4	1697	1757	1733
36.5	1705	1765	1740.5
36.6	1713	1773	1748.1
36.7	1722	1782	1755.6
36.8	1730	1790	1763.2

Depth (cm)	min	max	MAP
36.9	1732	1792	1770.7
37	1739	1799	1778.2
37.1	1746	1806	1785.8
37.2	1753	1813	1793.3
37.3	1760	1820	1800.9
37.4	1767	1827	1808.4
37.5	1774	1834	1815.9
37.6	1781	1841	1823.5
37.7	1793	1853	1831
37.8	1800	1860	1838.6
37.9	1807	1867	1846.1
38	1814	1874	1853.7
38.1	1821	1881	1861.2
38.2	1828	1888	1868.7
38.3	1830	1895	1876.3
38.4	1837	1902	1883.8
38.5	1848	1913	1891.4
38.6	1854	1919	1898.9
38.7	1860	1930	1906.5
38.8	1861	1936	1914
38.9	1877	1947	1921.5
39	1883	1953	1929.1
39.1	1889	1964	1936.6
39.2	1895	1970	1944.2
39.3	1901	1976	1951.7
39.4	1908	1983	1959.3
39.5	1914	1994	1966.8
39.6	1920	2000	1974.3
39.7	1930	2010	1981.9
39.8	1938	2018	1989.4
39.9	1940	2025	1997
40	1948	2033	2004.5
40.1	1957	2042	2010.9
40.2	1966	2046	2017.4
40.3	1976	2056	2023.8
40.4	1985	2065	2030.2
40.5	1989	2074	2036.7
40.6	1998	2083	2043.1
40.7	2008	2093	2049.5
40.8	2012	2102	2055.9
40.9	2021	2111	2062.4

Depth (cm)	min	max	MAP
41	2025	2115	2068.8
41.1	2034	2124	2075.2
41.2	2039	2134	2081.7
41.3	2048	2143	2088.1
41.4	2052	2152	2094.5
41.5	2061	2161	2101
41.6	2065	2175	2107.4
41.7	2075	2185	2113.8
41.8	2079	2194	2120.2
41.9	2088	2208	2126.7
42	2092	2217	2133.1
42.1	2101	2231	2139.5
42.2	2106	2241	2146
42.3	2112	2252	2152.4
42.4	2123	2268	2158.8
42.5	2130	2280	2165.3
42.6	2131	2286	2171.7
42.7	2141	2296	2178.1
42.8	2146	2316	2184.5
42.9	2150	2330	2191
43	2155	2340	2197.4
43.1	2165	2340	2203.8
43.2	2169	2364	2210.3
43.3	2174	2374	2216.7
43.4	2179	2369	2223.1
43.5	2188	2383	2229.6
43.6	2198	2393	2236
43.7	2203	2403	2242.4
43.8	2207	2417	2248.8
43.9	2212	2427	2255.3
44	2217	2442	2261.7
44.1	2211	2451	2268.1
44.2	2216	2461	2274.6
44.3	2221	2471	2281
44.4	2245	2480	2287.4
44.5	2250	2495	2293.9
44.6	2245	2505	2300.3
44.7	2249	2519	2306.7
44.8	2254	2529	2313.1
44.9	2258	2538	2319.6
45	2278	2548	2326

Depth (cm)	min	max	MAP
45.1	2275	2560	2335.6
45.2	2287	2567	2345.2
45.3	2300	2600	2354.8
45.4	2307	2582	2364.4
45.5	2319	2584	2373.9
45.6	2326	2596	2383.5
45.7	2343	2603	2393.1
45.8	2355	2605	2402.7
45.9	2363	2593	2412.3
46	2375	2600	2421.9
46.1	2387	2627	2431.5
46.2	2394	2614	2441.1
46.3	2406	2641	2450.7
46.4	2418	2643	2460.2
46.5	2428	2658	2469.8
46.6	2432	2672	2479.4
46.7	2442	2672	2489
46.8	2451	2681	2498.6
46.9	2460	2690	2508.2
47	2469	2684	2517.8
47.1	2473	2693	2527.4
47.2	2482	2692	2537
47.3	2488	2703	2546.5
47.4	2499	2714	2556.1
47.5	2505	2720	2565.7
47.6	2510	2730	2575.3
47.7	2521	2741	2584.9
47.8	2526	2751	2594.5
47.9	2531	2761	2604.1
48	2540	2770	2613.7
48.1	2545	2780	2623.2
48.2	2554	2794	2632.8
48.3	2569	2809	2642.4
48.4	2574	2819	2652
48.5	2578	2828	2661.6
48.6	2583	2838	2671.2
48.7	2592	2852	2680.8
48.8	2597	2862	2690.4
48.9	2606	2876	2700
49	2611	2891	2709.5
49.1	2615	2905	2719.1

Depth (cm)	min	max	MAP
49.2	2625	2915	2728.7
49.3	2629	2919	2738.3
49.4	2634	2934	2747.9
49.5	2643	2953	2757.5
49.6	2648	2963	2767.1
49.7	2652	2977	2776.7
49.8	2657	2987	2786.3
49.9	2661	3001	2795.8
50	2671	3016	2805.4
50.1	2681	3021	2814.1
50.2	2687	3022	2822.8
50.3	2692	3022	2831.4
50.4	2703	3038	2840.1
50.5	2714	3039	2848.8
50.6	2724	3044	2857.5
50.7	2740	3055	2866.1
50.8	2745	3060	2874.8
50.9	2751	3066	2883.5
51	2761	3071	2892.1
51.1	2776	3081	2900.8
51.2	2780	3090	2909.5
51.3	2779	3094	2918.2
51.4	2783	3098	2926.8
51.5	2791	3101	2935.5
51.6	2799	3114	2944.2
51.7	2806	3121	2952.9
51.8	2818	3123	2961.5
51.9	2829	3144	2970.2
52	2830	3135	2978.9
52.1	2837	3157	2987.5
52.2	2852	3167	2996.2
52.3	2853	3153	3004.9
52.4	2863	3163	3013.6
52.5	2868	3188	3022.2
52.6	2879	3179	3030.9
52.7	2889	3189	3039.6
52.8	2895	3215	3048.2
52.9	2900	3220	3056.9
53	2911	3231	3065.6
53.1	2926	3236	3074.3
53.2	2917	3242	3082.9
53.3	2922	3247	3091.6
53.4	2928	3253	3100.3
53.5	2953	3263	3109
53.6	2939	3274	3117.6
53.7	2964	3279	3126.3
53.8	2970	3290	3135
53.9	2975	3290	3143.6
54	2981	3301	3152.3
54.1	2991	3311	3161
54.2	3002	3322	3169.7
54.3	2992	3327	3178.3
54.4	2998	3338	3187
54.5	3003	3348	3195.7
54.6	3009	3349	3204.3
54.7	3019	3369	3213
54.8	3025	3370	3221.7
54.9	3030	3385	3230.4
55	3036	3391	3239
55.1	3049	3399	3246.2
55.2	3062	3402	3253.4
55.3	3075	3415	3260.6
55.4	3089	3424	3267.8
55.5	3097	3427	3275
55.6	3110	3435	3282.2
55.7	3123	3443	3289.4
55.8	3127	3452	3296.6
55.9	3140	3445	3303.8
56	3153	3463	3310.9
56.1	3166	3471	3318.1
56.2	3175	3465	3325.3
56.3	3188	3478	3332.5
56.4	3201	3486	3339.7
56.5	3214	3499	3346.9
56.6	3228	3508	3354.1
56.7	3231	3511	3361.3
56.8	3239	3514	3368.5
56.9	3252	3517	3375.7
57	3265	3530	3382.9
57.1	3279	3534	3390
57.2	3287	3542	3397.2
57.3	3295	3550	3404.4

Depth (cm)	min	max	MAP
57.4	3303	3558	3411.6
57.5	3317	3567	3418.8
57.6	3323	3573	3426
57.7	3339	3579	3433.2
57.8	3350	3585	3440.4
57.9	3363	3593	3447.6
58	3370	3600	3454.8
58.1	3381	3606	3462
58.2	3392	3622	3469.1
58.3	3403	3628	3476.3
58.4	3409	3639	3483.5
58.5	3420	3645	3490.7
58.6	3426	3656	3497.9
58.7	3437	3667	3505.1
58.8	3448	3673	3512.3
58.9	3459	3684	3519.5
59	3465	3690	3526.7
59.1	3476	3701	3533.9
59.2	3482	3707	3541.1
59.3	3498	3718	3548.2
59.4	3499	3729	3555.4
59.5	3505	3735	3562.6
59.6	3516	3746	3569.8
59.7	3522	3752	3577
59.8	3533	3763	3584.2
59.9	3539	3769	3591.4
60	3550	3780	3598.6
60.1	3561	3791	3613.2
60.2	3577	3802	3627.9
60.3	3584	3809	3642.6
60.4	3595	3825	3657.3
60.5	3606	3836	3671.9
60.6	3617	3852	3686.6
60.7	3623	3858	3701.3
60.8	3638	3878	3715.9
60.9	3643	3893	3730.6
61	3656	3911	3745.3
61.1	3664	3924	3759.9
61.2	3673	3938	3774.6
61.3	3681	3951	3789.3
61.4	3689	3969	3803.9
Depth (cm)	**min**	**max**	**MAP**

Depth (cm)	min	max	MAP
61.5	3702	3977	3818.6
61.6	3715	3980	3833.3
61.7	3723	3998	3847.9
61.8	3732	4027	3862.6
61.9	3745	4030	3877.3
62	3753	4043	3892
62.1	3766	4081	3906.6
62.2	3774	4089	3921.3
62.3	3782	4102	3936
62.4	3789	4114	3950.6
62.5	3800	4125	3965.3
62.6	3806	4126	3980
62.7	3811	4136	3994.6
62.8	3821	4151	4009.3
62.9	3826	4166	4024
63	3832	4222	4038.6
63.1	3842	4197	4053.3
63.2	3847	4217	4068
63.3	3862	4237	4082.6
63.4	3867	4272	4097.3
63.5	3878	4273	4112
63.6	3883	4283	4126.6
63.7	3893	4303	4141.3
63.8	3903	4318	4156
63.9	3894	4334	4170.7
64	3899	4344	4185.3
64.1	3909	4359	4200
64.2	3914	4384	4214.7
64.3	3919	4389	4229.3
64.4	3925	4405	4244
64.5	3930	4420	4258.7
64.6	3940	4435	4273.3
64.7	3980	4450	4288
64.8	3991	4471	4302.7
64.9	3996	4486	4317.3
65	4001	4496	4332
65.1	4013	4508	4345.5
65.2	4029	4544	4359
65.3	4036	4556	4372.5
65.4	4052	4562	4386
65.5	4064	4569	4399.4
Depth (cm)	**min**	**max**	**MAP**

65.6	4071	4576	4412.9
65.7	4077	4582	4426.4
65.8	4094	4594	4439.9
65.9	4095	4605	4453.4
66	4132	4617	4466.9
66.1	4144	4624	4480.4
66.2	4155	4635	4493.9
66.3	4172	4647	4507.4
66.4	4183	4658	4520.8
66.5	4185	4670	4534.3
66.6	4192	4677	4547.8
66.7	4208	4683	4561.3
66.8	4220	4695	4574.8
66.9	4231	4716	4588.3
67	4258	4723	4601.8
67.1	4240	4735	4615.3
67.2	4271	4741	4628.7
67.3	4278	4753	4642.2
67.4	4289	4764	4655.7
67.5	4296	4781	4669.2
67.6	4308	4788	4682.7
67.7	4324	4794	4696.2
67.8	4331	4801	4709.7
67.9	4338	4813	4723.2
68	4349	4854	4736.6
68.1	4361	4846	4750.1
68.2	4372	4862	4763.6
68.3	4389	4874	4777.1
68.4	4396	4896	4790.6
68.5	4407	4907	4804.1
68.6	4419	4924	4817.6
68.7	4435	4955	4831.1
68.8	4442	4947	4844.6
68.9	4454	4964	4858
69	4461	4971	4871.5
69.1	4467	4987	4885
69.2	4479	5004	4898.5
69.3	4486	5006	4912
69.4	4502	5012	4925.5
69.5	4514	5019	4939
69.6	4526	5036	4952.5
69.7	4542	5052	4965.9
69.8	4554	5069	4979.4
69.9	4556	5076	4992.9
70	4567	5092	5006.4
70.1	4576	5101	5016.3
70.2	4589	5114	5026.2
70.3	4607	5152	5036
70.4	4615	5130	5045.9
70.5	4614	5164	5055.8
70.6	4607	5147	5065.7
70.7	4645	5160	5075.5
70.8	4618	5163	5085.4
70.9	4666	5201	5095.3
71	4680	5205	5105.2
71.1	4688	5213	5115
71.2	4696	5211	5124.9
71.3	4704	5234	5134.8
71.4	4723	5238	5144.7
71.5	4731	5246	5154.5
71.6	4739	5254	5164.4
71.7	4702	5262	5174.3
71.8	4710	5270	5184.2
71.9	4714	5284	5194
72	4717	5292	5203.9
72.1	4730	5300	5213.8
72.2	4743	5308	5223.7
72.3	4747	5317	5233.5
72.4	4760	5325	5243.4
72.5	4773	5333	5253.3
72.6	4781	5346	5263.2
72.7	4845	5355	5273
72.8	4803	5363	5282.9
72.9	4816	5371	5292.8
73	4824	5379	5302.7
73.1	4827	5387	5312.5
73.2	4836	5396	5322.4
73.3	4884	5409	5332.3
73.4	4887	5422	5342.2
73.5	4890	5440	5352
73.6	4904	5454	5361.9
73.7	4907	5462	5371.8

Depth (cm)	min	max	MAP
73.8	4885	5480	5381.7
73.9	4923	5488	5391.5
74	4901	5501	5401.4
74.1	4965	5510	5411.3
74.2	4973	5523	5421.2
74.3	4976	5531	5431
74.4	4984	5539	5440.9
74.5	4993	5553	5450.8
74.6	5001	5566	5460.7
74.7	5009	5579	5470.5
74.8	5017	5587	5480.4
74.9	5030	5600	5490.3
75	5034	5614	5500.2
75.1	5049	5619	5506.8
75.2	5055	5625	5513.5
75.3	5080	5630	5520.2
75.4	5096	5636	5526.8
75.5	5081	5646	5533.5
75.6	5092	5652	5540.2
75.7	5107	5657	5546.8
75.8	5163	5668	5553.5
75.9	5173	5673	5560.2
76	5179	5684	5566.8
76.1	5189	5684	5573.5
76.2	5200	5695	5580.2
76.3	5205	5700	5586.8
76.4	5221	5706	5593.5
76.5	5236	5711	5600.2
76.6	5241	5716	5606.8
76.7	5256	5726	5613.5
76.8	5267	5732	5620.2
76.9	5207	5742	5626.8
77	5287	5752	5633.5
77.1	5298	5753	5640.2
77.2	5313	5763	5646.8
77.3	5328	5773	5653.5
77.4	5339	5784	5660.2
77.5	5349	5794	5666.8
77.6	5359	5799	5673.5
77.7	5369	5804	5680.2
77.8	5370	5810	5686.8
77.9	5320	5815	5693.5
78	5395	5825	5700.2
78.1	5406	5836	5706.8
78.2	5396	5841	5713.5
78.3	5401	5846	5720.2
78.4	5412	5852	5726.9
78.5	5422	5867	5733.5
78.6	5432	5867	5740.2
78.7	5443	5873	5746.9
78.8	5453	5883	5753.5
78.9	5468	5893	5760.2
79	5478	5903	5766.9
79.1	5479	5914	5773.5
79.2	5489	5904	5780.2
79.3	5494	5914	5786.9
79.4	5500	5925	5793.5
79.5	5515	5930	5800.2
79.6	5520	5940	5806.9
79.7	5531	5951	5813.5
79.8	5541	5961	5820.2
79.9	5551	5966	5826.9
80	5558	5973	5833.5
80.1	5548	5978	5840.2
80.2	5562	5982	5846.9
80.3	5591	5996	5853.5
80.4	5605	6005	5860.2
80.5	5608	6013	5866.9
80.6	5606	6021	5873.6
80.7	5614	6009	5880.2
80.8	5638	6018	5886.9
80.9	5641	6021	5893.6
81	5654	6029	5900.2
81.1	5667	6037	5906.9
81.2	5676	6051	5913.6
81.3	5684	6059	5920.2
81.4	5697	6077	5926.9
81.5	5710	6080	5933.6
81.6	5729	6084	5940.3
81.7	5742	6092	5946.9
81.8	5735	6100	5953.6
81.9	5740	6100	5960.3

Depth (cm)	min	max	MAP
82	5749	6104	5966.9
82.1	5758	6108	5973.6
82.2	5767	6117	5980.3
82.3	5776	6126	5986.9
82.4	5805	6135	5993.6
82.5	5814	6144	6000.3
82.6	5824	6149	6007
82.7	5833	6153	6013.6
82.8	5847	6162	6020.3
82.9	5856	6171	6027
83	5815	6170	6033.6
83.1	5824	6184	6040.3
83.2	5869	6194	6047
83.3	5843	6198	6053.6
83.4	5897	6207	6060.3
83.5	5901	6211	6067
83.6	5880	6220	6073.7
83.7	5909	6229	6080.3
83.8	5899	6229	6087
83.9	5923	6243	6093.7
84	5917	6247	6100.3
84.1	5936	6256	6107
84.2	5950	6265	6113.7
84.3	5959	6274	6120.4
84.4	5969	6279	6127
84.5	5978	6278	6133.7
84.6	5982	6287	6140.4
84.7	5996	6296	6147
84.8	6004	6304	6153.7
84.9	6010	6310	6160.4
85	6021	6321	6167
85.1	6034	6329	6176.1
85.2	6052	6337	6185.2
85.3	6057	6342	6194.4
85.4	6067	6352	6203.5
85.5	6077	6357	6212.6
85.6	6091	6361	6221.7
85.7	6101	6366	6230.8
85.8	6106	6371	6239.9
85.9	6110	6375	6249
86	6115	6385	6258.1
86.1	6144	6389	6267.2
86.2	6139	6394	6276.3
86.3	6159	6399	6285.4
86.4	6168	6408	6294.5
86.5	6178	6413	6303.6
86.6	6183	6418	6312.7
86.7	6192	6427	6321.8
86.8	6182	6432	6330.9
86.9	6216	6436	6340
87	6226	6441	6349.1
87.1	6236	6446	6358.2
87.2	6245	6455	6367.3
87.3	6260	6465	6376.4
87.4	6285	6470	6385.5
87.5	6274	6474	6394.6
87.6	6284	6484	6403.7
87.7	6294	6494	6412.8
87.8	6308	6498	6421.9
87.9	6318	6503	6431
88	6317	6512	6440.1
88.1	6327	6517	6449.2
88.2	6337	6527	6458.3
88.3	6346	6531	6467.4
88.4	6356	6541	6476.5
88.5	6371	6546	6485.6
88.6	6375	6550	6494.7
88.7	6385	6560	6503.8
88.8	6395	6565	6512.9
88.9	6399	6574	6522.1
89	6414	6589	6531.2
89.1	6423	6593	6540.3
89.2	6433	6608	6549.4
89.3	6438	6613	6558.5
89.4	6447	6622	6567.6
89.5	6452	6632	6576.7
89.6	6457	6642	6585.8
89.7	6466	6651	6594.9
89.8	6471	6661	6604
89.9	6480	6670	6613.1
90	6505	6685	6622.2
90.1	6497	6692	6629.8

Depth (cm)	min	max	MAP
90.2	6503	6698	6637.4
90.3	6515	6705	6645
90.4	6526	6711	6652.7
90.5	6543	6718	6660.3
90.6	6554	6729	6667.9
90.7	6576	6736	6675.5
90.8	6583	6743	6683.1
90.9	6589	6749	6690.8
91	6596	6756	6698.4
91.1	6606	6761	6706
91.2	6614	6769	6713.6
91.3	6622	6772	6721.3
91.4	6630	6780	6728.9
91.5	6637	6787	6736.5
91.6	6640	6795	6744.1
91.7	6648	6803	6751.7
91.8	6661	6811	6759.4
91.9	6659	6814	6767
92	6671	6826	6774.6
92.1	6679	6834	6782.2
92.2	6687	6842	6789.8
92.3	6695	6855	6797.5
92.4	6707	6862	6805.1
92.5	6715	6870	6812.7
92.6	6723	6878	6820.3
92.7	6731	6886	6827.9
92.8	6739	6894	6835.6
92.9	6746	6906	6843.2
93	6754	6914	6850.8
93.1	6757	6922	6858.4
93.2	6770	6935	6866
93.3	6777	6942	6873.7
93.4	6780	6950	6881.3
93.5	6788	6963	6888.9
93.6	6797	6972	6896.5
93.7	6802	6982	6904.1
93.8	6806	6991	6911.8
93.9	6811	7001	6919.4
94	6815	7010	6927
94.1	6820	7015	6934.6
94.2	6829	7029	6942.3
94.3	6834	7034	6949.9
94.4	6838	7043	6957.5
94.5	6848	7058	6965.1
94.6	6847	7062	6972.7
94.7	6857	7077	6980.4
94.8	6861	7086	6988
94.9	6871	7096	6995.6
95	6875	7105	7003.2
95.1	6878	7108	7010.2
95.2	6885	7115	7017.2
95.3	6893	7123	7024.2
95.4	6901	7131	7031.2
95.5	6913	7138	7038.2
95.6	6916	7146	7045.2
95.7	6923	7153	7052.1
95.8	6931	7161	7059.1
95.9	6929	7169	7066.1
96	6941	7176	7073.1
96.1	6944	7179	7080.1
96.2	6956	7191	7087.1
96.3	6959	7194	7094.1
96.4	6967	7202	7101.1
96.5	6974	7214	7108.1
96.6	6967	7217	7115
96.7	6989	7229	7122
96.8	6992	7232	7129
96.9	6990	7240	7136
97	6997	7247	7143
97.1	7005	7255	7150
97.2	7012	7262	7157
97.3	7020	7275	7164
97.4	7028	7283	7171
97.5	7035	7290	7177.9
97.6	7038	7293	7184.9
97.7	7045	7305	7191.9
97.8	7053	7313	7198.9
97.9	7058	7323	7205.9
98	7064	7329	7212.9
98.1	7070	7340	7219.9
98.2	7076	7346	7226.9
98.3	7082	7357	7233.9

Depth (cm)	min	max	MAP
98.4	7083	7363	7240.8
98.5	7093	7388	7247.8
98.6	7099	7384	7254.8
98.7	7100	7390	7261.8
98.8	7106	7401	7268.8
98.9	7110	7410	7275.8
99	7119	7424	7282.8
99.1	7123	7433	7289.8
99.2	7122	7442	7296.8
99.3	7136	7451	7303.7
99.4	7140	7460	7310.7
99.5	7149	7474	7317.7
99.6	7153	7483	7324.7
99.7	7157	7492	7331.7
99.8	7161	7501	7338.7
99.9	7165	7510	7345.7
100	7173	7528	7352.7
100.1	7181	7531	7359.5
100.2	7188	7538	7366.4
100.3	7195	7545	7373.3
100.4	7203	7548	7380.1
100.5	7210	7550	7387
100.6	7217	7562	7393.9
100.7	7224	7569	7400.8
100.8	7232	7572	7407.6
100.9	7244	7594	7414.5
101	7251	7606	7421.4
101.1	7258	7613	7428.2
101.2	7246	7621	7435.1
101.3	7273	7628	7442
101.4	7280	7635	7448.8
101.5	7267	7637	7455.7
101.6	7275	7645	7462.6
101.7	7282	7637	7469.4
101.8	7304	7654	7476.3
101.9	7301	7656	7483.2
102	7304	7649	7490
102.1	7316	7661	7496.9
102.2	7318	7663	7503.8
102.3	7325	7670	7510.7
102.4	7328	7683	7517.5
102.5	7340	7685	7524.4
102.6	7347	7692	7531.3
102.7	7354	7704	7538.1
102.8	7347	7712	7545
102.9	7356	7726	7551.9
103	7366	7731	7558.7
103.1	7360	7720	7565.6
103.2	7360	7730	7572.5
103.3	7389	7759	7579.3
103.4	7384	7769	7586.2
103.5	7389	7774	7593.1
103.6	7388	7783	7600
103.7	7398	7793	7606.8
103.8	7407	7802	7613.7
103.9	7412	7812	7620.6
104	7416	7816	7627.4
104.1	7421	7821	7634.3
104.2	7425	7830	7641.2
104.3	7435	7840	7648
104.4	7439	7844	7654.9
104.5	7444	7854	7661.8
104.6	7448	7863	7668.6
104.7	7458	7868	7675.5
104.8	7463	7878	7682.4
104.9	7472	7887	7689.2
105	7472	7887	7696.1
105.1	7480	7895	7700.8
105.2	7488	7898	7705.5
105.3	7496	7906	7710.2
105.4	7505	7910	7714.9
105.5	7513	7913	7719.6
105.6	7521	7921	7724.4
105.7	7525	7920	7729.1
105.8	7533	7928	7733.8
105.9	7541	7931	7738.5
106	7549	7934	7743.2
106.1	7538	7943	7747.9
106.2	7546	7941	7752.6
106.3	7554	7954	7757.3
106.4	7562	7952	7762
106.5	7571	7956	7766.7

Depth (cm)	min	max	MAP
106.6	7579	7969	7771.4
106.7	7582	7967	7776.1
106.8	7592	7977	7780.8
106.9	7602	7982	7785.5
107	7607	7977	7790.2
107.1	7612	7997	7794.9
107.2	7617	8007	7799.7
107.3	7626	8016	7804.4
107.4	7636	8016	7809.1
107.5	7646	8021	7813.8
107.6	7651	8031	7818.5
107.7	7655	8030	7823.2
107.8	7660	8035	7827.9
107.9	7670	8045	7832.6
108	7675	8050	7837.3
108.1	7685	8080	7842
108.2	7689	8059	7846.7
108.3	7694	8094	7851.4
108.4	7699	8104	7856.1
108.5	7713	8108	7860.8
108.6	7717	8117	7865.5
108.7	7721	8121	7870.2
108.8	7725	8130	7875
108.9	7728	8138	7879.7
109	7732	8142	7884.4
109.1	7741	8151	7889.1
109.2	7745	8125	7893.8
109.3	7749	8164	7898.5
109.4	7753	8168	7903.2
109.5	7752	8172	7907.9
109.6	7761	8151	7912.6
109.7	7765	8150	7917.3
109.8	7774	8159	7922
109.9	7777	8167	7926.7
110	7786	8206	7931.4
110.1	7790	8180	7936.5
110.2	7803	8203	7941.6
110.3	7816	8211	7946.7
110.4	7815	8220	7951.8
110.5	7828	8223	7956.9
110.6	7827	8232	7962

Depth (cm)	min	max	MAP
110.7	7840	8235	7967.1
110.8	7843	8243	7972.2
110.9	7852	8247	7977.3
111	7860	8245	7982.3
111.1	7864	8229	7987.4
111.2	7877	8252	7992.5
111.3	7885	8245	7997.6
111.4	7899	8259	8002.7
111.5	7902	8257	8007.8
111.6	7916	8271	8012.9
111.7	7924	8274	8018
111.8	7932	8282	8023.1
111.9	7941	8296	8028.2
112	7949	8304	8033.3
112.1	7953	8298	8038.3
112.2	7956	8301	8043.4
112.3	7964	8309	8048.5
112.4	7968	8313	8053.6
112.5	7976	8321	8058.7
112.6	7984	8329	8063.8
112.7	7993	8333	8068.9
112.8	8001	8341	8074
112.9	8010	8350	8079.1
113	8013	8353	8084.2
113.1	8021	8361	8089.3
113.2	8029	8369	8094.3
113.3	8035	8375	8099.4
113.4	8045	8385	8104.5
113.5	8051	8391	8109.6
113.6	8057	8397	8114.7
113.7	8063	8413	8119.8
113.8	8074	8414	8124.9
113.9	8079	8419	8130
114	8080	8425	8135.1
114.1	8081	8426	8140.2
114.2	8092	8437	8145.3
114.3	8098	8438	8150.3
114.4	8103	8448	8155.4
114.5	8109	8469	8160.5
114.6	8115	8475	8165.6
114.7	8121	8471	8170.7

Depth (cm)	min	max	MAP
114.8	8132	8482	8175.8
114.9	8133	8488	8180.9
115	8143	8493	8186