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Champagne & Aishihik First Nations

Upper Nordenskiold River Water Temperature Investigations 2006

April, 2007

Yukon River Panel - Restoration and Enhancement Fund

Project #: CRE-55-06

Abstract

Temperature loggers were placed in the upper Nordenskiöld River at two sites on September 30, 2005. Two types of loggers (tidbit and minilog) were placed at each site. Loggers at both sites were collected on October 7, 2006 after 372 days in the water.

The minimum temperature recorded was $-0.14\text{ }^{\circ}\text{C}$ and the maximum temperature for the recording period was $19.5\text{ }^{\circ}\text{C}$. The upstream site (site 1) was consistently 0.85 to $0.95\text{ }^{\circ}\text{C}$ warmer than site 2 located downstream of a small unnamed tributary of the river.

There was some temperature discrepancy between the two types of loggers however for most of the recordings the discrepancy was slight.

Funding for the project was provided by the Yukon River Panel's Restoration and Enhancement (R&E) Fund.

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Introduction

Background

In 1998/99 Champagne & Aishihik First Nations (CAFN) were successful in obtaining funding from the Yukon River Panel's Restoration and Enhancement Fund to complete the first stage of a restoration and enhancement (R&E) plan, and a salmon & salmon habitat inventory for the Nordenskiöld River. Over the past five years the Yukon River Panel's Restoration & Enhancement (R&E) Program has been the primary funding agency for restoration activities on the CAFN Nordenskiöld restoration projects however, in 1999/2000, the Department of Fisheries & Ocean's Habitat Restoration and Salmon Enhancement Program (HRSEP) also contributed funding. The 1998/99 inventory and its restoration recommendations acted as a data resource and guide for planning future restoration activities in the upper Nordenskiöld River. The projects over the years have concentrated on:

- collecting juvenile chinook salmon (JCS) length and weight data;
- monitoring JSC utilization;
- obtaining stream temperature profiles through the placement of temperature data loggers;
- removing obstructions to salmon migration;
- collecting site specific salmon habitat and stream survey data;
- performing aerial spawning surveys; and
- collecting and cataloguing existing land use, biological, and traditional knowledge data for the area.

Yearly reports can be obtained from Yukon River Panel or the Champagne and Aishihik First Nations' offices (see references).

This current study only concentrated on collecting temperature data from the Nordenskiöld River.

Study Area

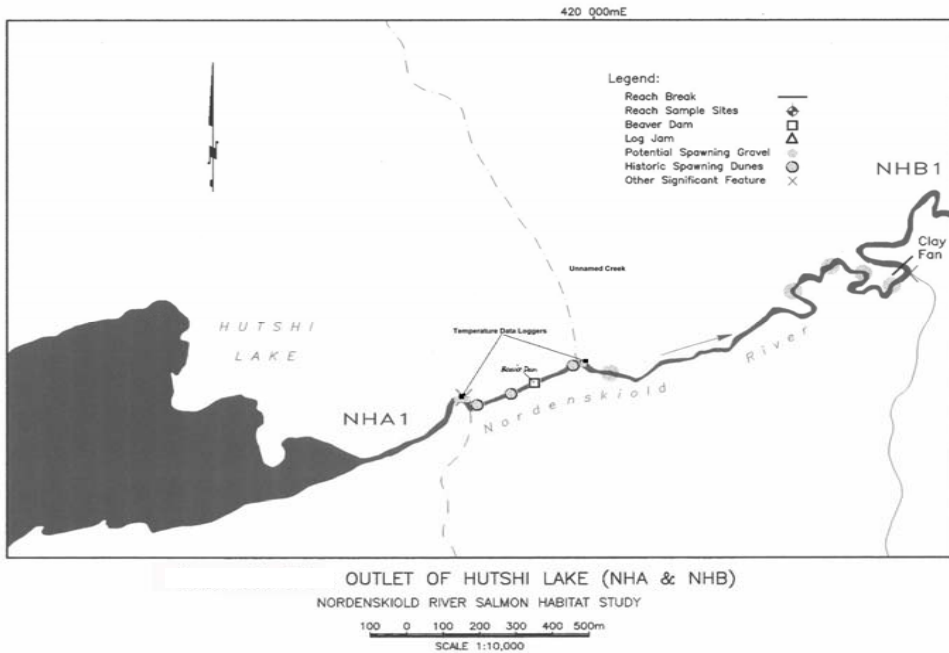
The Nordenskiöld River drainage basin lies within the Central Yukon Plateau Eco-region. The region is characterised by rolling hills and plateaus separated by broad, deeply cut valleys. The most common forest types are white and black spruce. Black spruce are dominant in colder, poorly drained areas. As naturally recurring fires are frequent, several vegetation communities are prevalent. Lodgepole pine and trembling aspen most commonly colonize burnt-over areas. Shrub birch and willow, with occasional paper birch and alpine fir, dominate the sub-alpine vegetation. Extensive grasslands occur on lower south-facing slopes. These grassland slopes form a significant vegetation feature in the Nordenskiöld River Valley. The cold, semiarid climate of the region has a mean annual temperature of approximately -3.5°C , with a summer mean of 12.0°C and a winter mean of -19.0°C .

The Nordenskiöld River drains an area of approximately 6370 square kilometres. The headwaters of the Nordenskiöld River are made up of Moraine Lake on the Kluane Plateau (elevation 910 meters) and Long Lake (elevation 1200 meters) both flowing north-east to a chain of three lakes known as Hutchi (Hutshi) Lakes (elevation 750 meters). The Nordenskiöld River's (traditional - *Chu`ena Chù*) north-south trending out-wash valley flows from Hutchi Lakes (traditional - *Chu`ena Mā n*) to its confluence with the Yukon River at Carmacks (elevation 525 meters). The major tributaries of the Nordenskiöld River include Long Lake Tributary, Moraine Lake Tributary (marked as *Nordenskiöld* on maps), Klusha Creek, Kirkland Creek, and Rowlinson Creek.

The Nordenskiöld River occurs within Champagne & Aishihik First Nations' (CAFN) traditional territory and contains partial overlaps with Little Salmon / Carmacks First Nation's (LSCFN) traditional territory. CAFN and LSCFN make up two of the 14 First Nation governments in the Yukon. Many CAFN members are descendents from or were past citizens of the historic Hutchi Village (traditional - *Chu`ena Keyi*) located on the southeast banks of the northern most Hutchi Lake. (Pumphrey, 2001)

Figure 1: Upper Nordenskiöld Study Area Showing Approximate Locations Of Temperature Logger Placement.

Comment [DP1]:



Methods

Temperature Data Loggers

Temperature loggers were placed at two different sites in the Nordenskiöld River on November 30, 2006. Site 1 was recovered the following year on October 7, 2007. Two different types of loggers (tidbit, minilog) were placed at each site. One set of loggers was placed at site 1 (figure 1) immediately upstream of a historic spawning dune on the left bank of the river (8V- 419449E - 6785822N Nad27). The other temperature data loggers were placed downstream of site 1 at site 2, located a few hundred metres downstream of the unnamed creek confluence on the Nordenskiöld River (08V - 420247E - 6786034N - Nad 27 (see figure 1) also on the left bank of the river.

The Habitat and Enhancement Branch of the Department of Fisheries and Oceans Canada, Whitehorse area office, supplied and pre-programmed two of the temperature data loggers (tidbit type loggers). The other two loggers (Vemco-minilog) were provided by Champagne and Aishihik First Nations. The data loggers were programmed to record temperature every hour.

Results

All four loggers were recovered after 372 days of recording on October 7, 2006. Graphs of daily minimum and maximum temperatures recorded at each site by the tidbit type logger are presented in Appendix 1 and 2. Actual daily minimum and maximum temperature for both loggers at both sites is presented in Appendix 3.

Site 1

. The minimum temperature recorded at Site 1 was 0.94°C on the tidbit type logger. This temperature was recorded on 8 different days between March 13 and April 7, 2006 (see appendix 1). The Vemco minilog type logger recorded a minimum temperature of 1.0 °C on April 7, 2006.

The maximum temperature recorded at site 1 was 19.5 °C on July 6, 2006 on the minilog type logger (see appendix 1) whereas the tidbit logger recorded a maximum temperature of 19.52 °C on July 5, 2006.

Average temperatures for both are tabled below (table 1)

Site 2

The minimum temperature recorded at Site 2 was –0.14 °C on the tidbit logger on 13 occasions between March 1, 2006 and April 1, 2006 inclusive. The minimum temperature recorded on the minilog logger at this site was –0.1 °C. This temperature was also recorded on 13 occasions between March 1-31, 2006 inclusive.

The maximum temperature recorded at site 2 was 19.2 °C for both logger types on July6, 2006.

Average Temperatures

Average minimum and maximum temperatures ranged from 4.85 °C to 6.84 °C with slight variance between logger types and site (table 1). Based on an overall average between sites, site 1 was 0.85 – 0.95 °C warmer than site 2.

Table 1: Average minimum and maximum water temperatures recorded at two different sites on the Nordenskiöld River using two types of loggers. Temperatures were recorded continuously every hour from September 30, 2005 to October 7, 2006.

Site	1			2		
Logger Type	Average Min T °C	Average Max T °C	Overall Avg T °C	Average Min T °C	Average Max T °C	Overall Avg T °C
minilog	5.89	6.84	6.35	4.85	6.06	5.42
tidbit	5.83	6.76	6.26	4.87	6.03	5.39

Discussion

The minimum temperatures recorded during this temperature monitoring program was similar to those recorded during the 2003-2004 program (Petkovich 2004). During that period the minimum temperature was -0.13 °C at the downstream site (site 2) and 0.78 °C at the upstream site (site 1). During this current program minimum temperature recorded was -0.14 at site 2 and 0.94 at site 1.

Maximum temperatures recorded during the 2003-2004 program were higher than during the 2005-2006 recording period. During the 2003-04 period a maximum temperature of 25.07 °C was attained at the upstream site (site 1) and a maximum temperature of 23.88 °C was reached at the downstream site (site 2). During this study the maximum temperature recorded was 19.5 °C at site 1.

As in 2003-2004 a temperature differential was recorded between site 1 and site 2 throughout the entire recording period with site 1 consistently recording approximately 1 °C higher than site 2. This is likely due to the influence of colder water coming in from the unnamed tributary located upstream of site 2.

During this current recording period two different types of loggers were used; the tidbit logger, as has been used in previous years and a Vemco minilog type logger. Although there was some differential in temperature noted between the two types of loggers placed at the exact same location, the differential is relatively small.

Appendix 2 charts daily maximum and minimum temperatures at the two sites throughout the year of monitoring. Because the temperature difference between the two loggers is so small only data from the tidbit logger are charted.

References

Pumphrey, I., March, 1999. *Champagne & Aishihik First Nations' Salmon Restoration Development Plan for the upper Nordenskiöld River: Salmon & Salmon Habitat Inventory*. Yukon River Panel

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Petkovich 2004. Champagne & Aishihik First Nations' Upper Nordenskiöld River Juvenile Chinook Salmon Investigations 2004

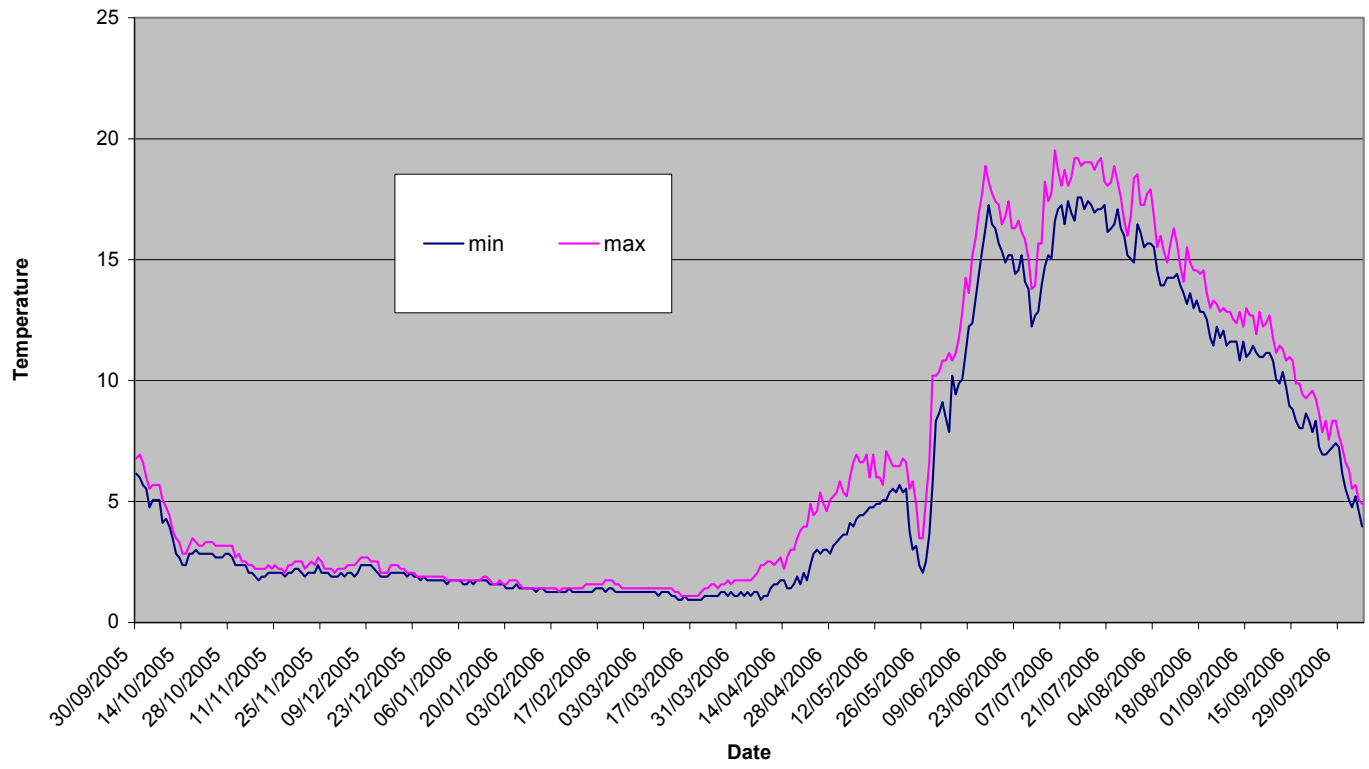
Appendices

Appendix 1: Temperature Chart : Upper Nordenskiöld River Temperature Monitoring Program 2005-2006 (Site 1)

Appendix 2: Temperature Chart : Upper Nordenskiöld River Temperature Monitoring Program 2005-2006 (Site 2)

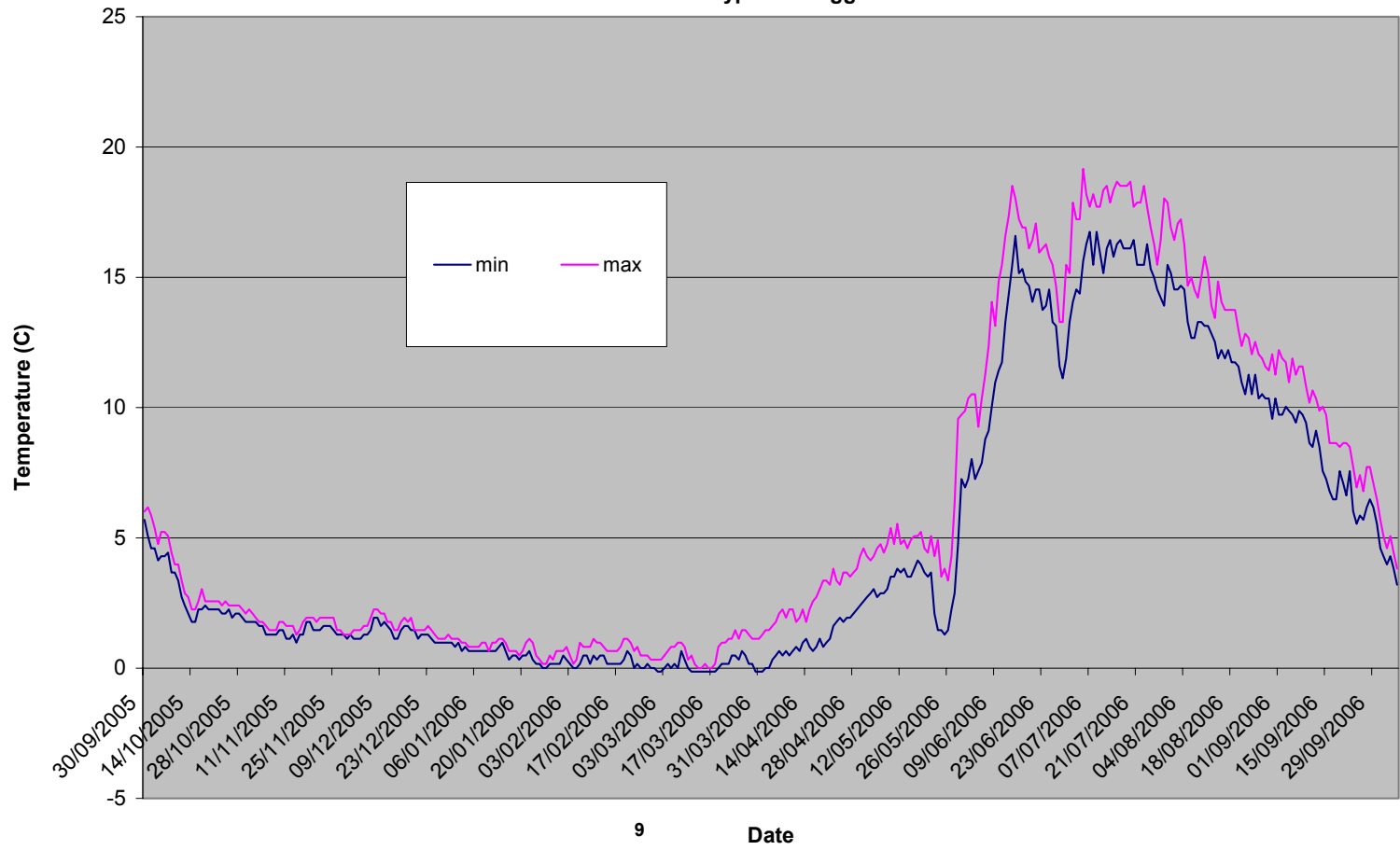
Appendix 3: Minimum and Maximum Daily Temperatures Recorded at Sites 1 and 2 on the Upper Nordenskiöld River 2005-2006

Appendix 1: Upper Nordenskiöld River Temperature Monitoring Program 2005-2006 (Site 1)
Tidbit Type Datalogger



Appendix 2: Upper Nordenskiöld River Water Temperature Monitoring Program 2005-2006 (Site 2)

Tidbit type datalogger



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Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
01/10/2005	6.0	6.9	6.1	7.0	5.1	6.2	5.0	6.2
02/10/2005	5.7	6.6	5.8	6.7	4.6	5.9	4.7	5.6
03/10/2005	5.5	6.0	5.5	6.1	4.6	5.4	4.7	5.4
04/10/2005	4.8	5.5	4.8	5.4	4.1	4.8	4.6	5.3
05/10/2005	5.1	5.7	4.9	5.5	4.3	5.2	4.1	4.6
06/10/2005	5.1	5.7	5.2	5.8	4.3	5.2	4.3	5.2
07/10/2005	5.1	5.7	5.0	5.8	4.4	5.1	4.3	5.3
08/10/2005	4.1	5.1	5.0	5.8	3.7	4.4	4.1	5.2
09/10/2005	4.3	4.8	4.1	4.9	3.7	4.0	3.7	4.1
10/10/2005	4.0	4.4	4.4	4.7	3.4	4.0	3.7	4.0
11/10/2005	3.5	3.8	3.8	4.6	2.7	3.4	3.1	4.0
12/10/2005	2.9	3.5	3.4	3.8	2.4	2.9	2.6	3.2
13/10/2005	2.7	3.3	2.9	3.5	2.1	2.7	2.5	2.9
14/10/2005	2.4	2.9	2.6	3.2	1.8	2.3	2.2	2.6
15/10/2005	2.4	2.9	2.5	2.9	1.8	2.3	1.7	2.3
16/10/2005	2.9	3.2	2.5	2.9	2.3	2.6	1.9	2.3
17/10/2005	2.9	3.5	2.8	3.2	2.3	3.0	2.3	2.6
18/10/2005	3.0	3.3	2.9	3.7	2.4	2.6	2.3	3.1
19/10/2005	2.9	3.2	3.1	3.4	2.3	2.6	2.3	2.6
20/10/2005	2.9	3.2	2.9	3.2	2.3	2.6	2.3	2.6
21/10/2005	2.9	3.3	2.9	3.1	2.3	2.6	2.3	2.6
22/10/2005	2.9	3.3	2.9	3.4	2.3	2.6	2.3	2.6
23/10/2005	2.9	3.3	2.9	3.4	2.1	2.4	2.2	2.6
24/10/2005	2.7	3.2	2.8	3.4	2.1	2.6	2.2	2.5
25/10/2005	2.7	3.2	2.8	3.4	2.3	2.4	2.2	2.6
26/10/2005	2.7	3.2	2.8	3.2	1.9	2.4	2.2	2.5
27/10/2005	2.9	3.2	2.6	3.2	2.1	2.4	2.0	2.5
28/10/2005	2.9	3.2	2.9	3.4	2.1	2.4	2.2	2.3
29/10/2005	2.7	3.2	2.9	3.2	1.9	2.3	2.2	2.3
30/10/2005	2.4	2.7	2.6	3.2	1.8	2.1	1.9	2.3
31/10/2005	2.4	2.9	2.5	2.6	1.8	2.3	1.7	2.2
01/11/2005	2.4	2.5	2.5	2.9	1.8	2.1	1.9	2.3
02/11/2005	2.4	2.5	2.5	2.6	1.8	1.9	1.9	2.0
03/11/2005	2.1	2.4	2.3	2.6	1.6	1.8	1.7	1.9
04/11/2005	2.1	2.4	2.0	2.5	1.6	1.8	1.7	1.9
05/11/2005	1.9	2.2	2.0	2.5	1.3	1.6	1.3	1.9
06/11/2005	1.7	2.2	2.0	2.3	1.3	1.5	1.4	1.6
07/11/2005	1.9	2.2	1.9	2.2	1.3	1.5	1.3	1.4
08/11/2005	1.9	2.2	1.9	2.3	1.3	1.5	1.3	1.6
09/11/2005	2.1	2.4	2.0	2.3	1.5	1.8	1.4	1.6
10/11/2005	2.1	2.2	2.2	2.5	1.5	1.8	1.6	1.7
11/11/2005	2.1	2.4	2.2	2.3	1.1	1.6	1.6	1.7
12/11/2005	2.1	2.2	2.0	2.5	1.1	1.6	1.3	1.7
13/11/2005	2.1	2.2	2.2	2.3	1.3	1.6	1.4	1.6
14/11/2005	1.9	2.1	2.0	2.3	1.0	1.3	1.1	1.6
15/11/2005	2.1	2.4	2.0	2.2	1.3	1.5	1.1	1.4
16/11/2005	2.1	2.4	2.2	2.5	1.3	1.8	1.3	1.6

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Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
17/11/2005	2.2	2.5	2.2	2.5	1.8	1.9	1.4	1.9
18/11/2005	2.2	2.5	2.3	2.6	1.8	1.9	1.7	1.9
19/11/2005	2.1	2.5	2.3	2.6	1.5	1.9	1.6	2.0
20/11/2005	1.9	2.2	1.9	2.5	1.5	1.8	1.4	1.9
21/11/2005	2.1	2.4	2.0	2.3	1.5	1.9	1.4	1.9
22/11/2005	2.1	2.5	2.2	2.5	1.6	1.9	1.7	1.9
23/11/2005	2.1	2.4	2.3	2.6	1.6	1.9	1.7	2.0
24/11/2005	2.4	2.7	2.2	2.5	1.6	1.9	1.7	1.9
25/11/2005	2.1	2.5	2.3	2.8	1.5	1.9	1.7	2.0
26/11/2005	2.1	2.2	2.0	2.6	1.3	1.5	1.4	1.9
27/11/2005	2.1	2.2	2.2	2.3	1.3	1.5	1.3	1.4
28/11/2005	1.9	2.2	2.0	2.5	1.3	1.3	1.3	1.6
29/11/2005	1.9	2.1	1.9	2.2	1.1	1.3	1.3	1.4
30/11/2005	1.9	2.2	2.0	2.2	1.3	1.3	1.3	1.3
01/12/2005	2.1	2.2	2.0	2.3	1.1	1.5	1.3	1.4
02/12/2005	1.9	2.2	2.0	2.3	1.1	1.5	1.4	1.4
03/12/2005	2.1	2.4	1.9	2.3	1.1	1.5	1.3	1.6
04/12/2005	2.1	2.4	2.0	2.5	1.3	1.6	1.4	1.6
05/12/2005	1.9	2.4	2.0	2.5	1.3	1.6	1.3	1.6
06/12/2005	2.1	2.5	2.2	2.6	1.5	1.9	1.6	1.9
07/12/2005	2.4	2.7	2.5	2.6	1.9	2.3	1.9	2.0
08/12/2005	2.4	2.7	2.5	2.8	1.9	2.3	2.0	2.2
09/12/2005	2.4	2.7	2.5	2.8	1.6	2.1	1.7	2.2
10/12/2005	2.4	2.5	2.5	2.8	1.8	2.1	1.7	2.2
11/12/2005	2.2	2.5	2.3	2.6	1.6	1.8	1.6	2.0
12/12/2005	2.1	2.5	2.3	2.6	1.5	1.8	1.7	1.9
13/12/2005	1.9	2.1	2.0	2.6	1.1	1.5	1.3	1.9
14/12/2005	1.9	2.1	2.0	2.2	1.1	1.5	1.1	1.3
15/12/2005	1.9	2.1	2.0	2.2	1.5	1.8	1.3	1.7
16/12/2005	2.1	2.4	2.2	2.3	1.6	1.9	1.6	1.9
17/12/2005	2.1	2.4	2.2	2.5	1.6	1.8	1.7	1.9
18/12/2005	2.1	2.4	2.2	2.5	1.5	1.9	1.6	1.9
19/12/2005	2.1	2.2	2.2	2.3	1.5	1.5	1.4	1.6
20/12/2005	2.1	2.2	2.0	2.3	1.1	1.5	1.3	1.6
21/12/2005	1.9	2.1	2.0	2.2	1.3	1.5	1.3	1.6
22/12/2005	2.1	2.1	2.0	2.2	1.3	1.5	1.3	1.6
23/12/2005	1.9	2.1	1.9	2.2	1.3	1.6	1.3	1.6
24/12/2005	1.9	1.9	1.9	2.0	1.1	1.5	1.3	1.6
25/12/2005	1.7	1.9	1.9	2.0	1.0	1.3	1.1	1.4
26/12/2005	1.9	1.9	1.9	2.0	1.0	1.1	1.0	1.3
27/12/2005	1.7	1.9	1.9	2.0	1.0	1.1	1.0	1.3
28/12/2005	1.7	1.9	1.9	2.0	1.0	1.1	1.0	1.3
29/12/2005	1.7	1.9	1.9	2.0	1.0	1.3	1.1	1.3
30/12/2005	1.7	1.9	1.9	2.0	1.0	1.1	1.0	1.3
31/12/2005	1.7	1.9	1.9	2.0	0.8	1.1	0.8	1.3
01/01/2006	1.7	1.9	1.9	2.0	1.0	1.1	0.8	1.1
02/01/2006	1.6	1.7	1.7	1.9	0.7	1.0	0.8	1.1

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Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
03/01/2006	1.7	1.7	1.7	1.9	0.8	1.0	0.8	1.0
04/01/2006	1.7	1.7	1.7	1.9	0.7	0.8	0.7	0.8
05/01/2006	1.7	1.7	1.7	1.9	0.7	0.8	0.7	1.0
06/01/2006	1.7	1.7	1.7	1.9	0.7	0.8	0.7	1.0
07/01/2006	1.6	1.7	1.7	1.9	0.7	0.8	0.7	1.0
08/01/2006	1.6	1.7	1.7	1.9	0.7	1.0	0.7	0.8
09/01/2006	1.7	1.7	1.7	1.9	0.7	1.0	0.7	1.0
10/01/2006	1.6	1.7	1.7	1.9	0.7	0.7	0.7	0.8
11/01/2006	1.7	1.7	1.7	1.9	0.7	1.0	0.7	1.0
12/01/2006	1.7	1.7	1.7	1.9	0.7	1.0	0.7	1.0
13/01/2006	1.7	1.9	1.9	2.0	0.8	1.1	1.0	1.1
14/01/2006	1.7	1.9	1.9	2.0	1.0	1.1	1.0	1.1
15/01/2006	1.6	1.7	1.7	1.9	0.7	1.0	0.7	1.0
16/01/2006	1.6	1.6	1.6	1.7	0.3	0.7	0.4	0.7
17/01/2006	1.6	1.6	1.6	1.7	0.5	0.7	0.5	0.8
18/01/2006	1.6	1.7	1.6	1.7	0.5	0.7	0.5	0.7
19/01/2006	1.6	1.6	1.6	1.7	0.3	0.5	0.4	0.5
20/01/2006	1.4	1.6	1.6	1.7	0.5	0.7	0.5	0.7
21/01/2006	1.4	1.7	1.6	1.7	0.5	1.0	0.5	1.0
22/01/2006	1.4	1.7	1.6	1.9	0.7	1.1	0.7	1.1
23/01/2006	1.6	1.7	1.6	1.9	0.3	1.0	0.4	1.0
24/01/2006	1.4	1.6	1.6	1.6	0.2	0.5	0.2	0.5
25/01/2006	1.4	1.4	1.6	1.6	0.2	0.3	0.2	0.5
26/01/2006	1.4	1.4	1.4	1.6	0.0	0.2	0.0	0.2
27/01/2006	1.4	1.4	1.4	1.6	0.0	0.2	0.2	0.4
28/01/2006	1.4	1.4	1.4	1.6	0.2	0.5	0.2	0.7
29/01/2006	1.3	1.4	1.4	1.6	0.2	0.3	0.0	0.4
30/01/2006	1.4	1.4	1.4	1.6	0.2	0.7	0.2	0.7
31/01/2006	1.4	1.4	1.4	1.6	0.2	0.7	0.2	0.7
01/02/2006	1.3	1.4	1.4	1.6	0.5	0.7	0.2	0.8
02/02/2006	1.3	1.4	1.4	1.6	0.3	0.8	0.4	0.7
03/02/2006	1.3	1.4	1.4	1.6	0.2	0.5	0.4	0.8
04/02/2006	1.3	1.4	1.4	1.6	0.0	0.2	0.2	0.5
05/02/2006	1.3	1.3	1.4	1.4	0.0	0.3	0.0	0.4
06/02/2006	1.3	1.4	1.3	1.4	0.2	1.0	0.0	0.5
07/02/2006	1.3	1.4	1.3	1.6	0.5	0.8	0.4	1.0
08/02/2006	1.4	1.4	1.4	1.6	0.5	0.8	0.5	0.8
09/02/2006	1.3	1.4	1.4	1.6	0.2	0.8	0.2	1.0
10/02/2006	1.3	1.4	1.3	1.6	0.5	1.1	0.2	0.8
11/02/2006	1.3	1.4	1.3	1.6	0.3	1.0	0.5	1.3
12/02/2006	1.3	1.4	1.4	1.6	0.5	1.0	0.4	1.0
13/02/2006	1.3	1.6	1.4	1.6	0.5	0.8	0.5	1.0
14/02/2006	1.3	1.6	1.3	1.7	0.2	0.7	0.2	0.8
15/02/2006	1.3	1.6	1.3	1.6	0.2	0.7	0.2	0.7
16/02/2006	1.4	1.6	1.4	1.6	0.2	0.7	0.2	0.7
17/02/2006	1.4	1.6	1.4	1.6	0.2	0.7	0.2	0.8
18/02/2006	1.4	1.6	1.4	1.7	0.2	0.8	0.2	0.7

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Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
19/02/2006	1.3	1.7	1.4	1.6	0.3	1.1	0.2	1.0
20/02/2006	1.4	1.7	1.4	1.7	0.7	1.1	0.4	1.3
21/02/2006	1.4	1.7	1.4	1.9	0.5	1.0	0.7	1.3
22/02/2006	1.3	1.6	1.4	1.9	0.0	0.7	0.2	1.1
23/02/2006	1.3	1.6	1.4	1.7	0.2	0.8	0.0	0.7
24/02/2006	1.3	1.4	1.3	1.7	0.0	0.5	0.0	0.8
25/02/2006	1.3	1.4	1.4	1.6	0.0	0.5	0.0	0.5
26/02/2006	1.3	1.4	1.4	1.6	0.2	0.5	0.0	0.5
27/02/2006	1.3	1.4	1.4	1.6	0.0	0.3	0.0	0.5
28/02/2006	1.3	1.4	1.3	1.6	0.0	0.3	0.0	0.5
01/03/2006	1.3	1.4	1.3	1.6	-0.1	0.3	-0.1	0.5
02/03/2006	1.3	1.4	1.3	1.6	-0.1	0.3	-0.1	0.5
03/03/2006	1.3	1.4	1.3	1.4	0.0	0.5	-0.1	0.5
04/03/2006	1.3	1.4	1.3	1.4	0.2	0.7	0.0	0.7
05/03/2006	1.3	1.4	1.3	1.6	0.0	0.8	0.0	0.7
06/03/2006	1.3	1.4	1.3	1.4	0.2	0.8	0.0	0.8
07/03/2006	1.1	1.4	1.3	1.6	0.0	1.0	0.0	0.8
08/03/2006	1.3	1.4	1.3	1.4	0.7	1.0	0.0	1.1
09/03/2006	1.3	1.4	1.3	1.6	0.3	0.8	0.5	1.0
10/03/2006	1.3	1.4	1.3	1.6	0.0	0.3	0.0	0.8
11/03/2006	1.1	1.4	1.3	1.6	-0.1	0.5	0.0	0.5
12/03/2006	1.1	1.3	1.3	1.4	-0.1	0.2	-0.1	0.5
13/03/2006	0.9	1.3	1.1	1.4	-0.1	0.0	-0.1	0.2
14/03/2006	0.9	1.1	1.1	1.3	-0.1	0.0	-0.1	0.0
15/03/2006	1.1	1.1	1.1	1.3	-0.1	0.2	-0.1	0.0
16/03/2006	0.9	1.1	1.1	1.3	-0.1	0.0	-0.1	0.2
17/03/2006	0.9	1.1	1.1	1.3	-0.1	0.0	-0.1	0.2
18/03/2006	0.9	1.1	1.1	1.3	-0.1	0.2	-0.1	0.2
19/03/2006	0.9	1.1	1.1	1.3	0.0	0.8	-0.1	0.2
20/03/2006	0.9	1.3	1.1	1.3	0.2	1.0	0.2	0.8
21/03/2006	1.1	1.4	1.1	1.3	0.2	1.0	0.2	1.1
22/03/2006	1.1	1.4	1.1	1.4	0.2	1.1	0.2	1.0
23/03/2006	1.1	1.6	1.3	1.6	0.5	1.1	0.5	1.1
24/03/2006	1.1	1.6	1.3	1.6	0.5	1.5	0.5	1.3
25/03/2006	1.1	1.4	1.3	1.7	0.3	1.1	0.4	1.6
26/03/2006	1.3	1.6	1.4	1.6	0.7	1.5	0.7	1.3
27/03/2006	1.3	1.6	1.4	1.7	0.5	1.5	0.7	1.4
28/03/2006	1.1	1.7	1.1	1.7	0.2	1.3	0.2	1.6
29/03/2006	1.3	1.6	1.3	1.7	0.2	1.1	0.0	1.4
30/03/2006	1.1	1.7	1.3	1.7	-0.1	1.1	-0.1	1.3
31/03/2006	1.1	1.7	1.3	1.7	-0.1	1.1	-0.1	1.1
01/04/2006	1.3	1.7	1.3	1.9	-0.1	1.3	0.0	1.3
02/04/2006	1.1	1.7	1.3	1.9	0.0	1.5	0.0	1.3
03/04/2006	1.3	1.7	1.3	1.7	0.0	1.5	0.0	1.4
04/04/2006	1.1	1.7	1.3	1.9	0.3	1.6	0.4	1.6
05/04/2006	1.3	1.9	1.3	2.0	0.5	1.8	0.7	1.7
06/04/2006	1.3	2.1	1.4	2.2	0.7	2.1	0.7	2.0

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Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
07/04/2006	0.9	2.4	1.0	2.3	0.5	2.3	0.5	2.0
08/04/2006	1.1	2.4	1.1	2.5	0.7	1.9	0.7	2.2
09/04/2006	1.1	2.5	1.1	2.5	0.5	2.3	0.5	2.0
10/04/2006	1.4	2.5	1.3	2.6	0.7	2.3	0.7	2.3
11/04/2006	1.6	2.4	1.4	2.5	0.8	1.8	0.8	2.0
12/04/2006	1.6	2.5	1.6	2.8	0.7	1.9	0.7	2.0
13/04/2006	1.7	2.7	1.6	2.8	1.0	2.3	1.0	2.2
14/04/2006	1.7	2.2	1.9	2.8	1.1	1.8	1.1	2.2
15/04/2006	1.4	2.7	1.6	2.8	0.8	2.3	1.0	2.2
16/04/2006	1.4	3.0	1.4	3.1	0.7	2.6	0.7	2.6
17/04/2006	1.6	3.0	1.6	3.1	0.8	2.7	0.8	2.8
18/04/2006	1.9	3.5	1.9	3.7	1.1	3.0	1.1	3.1
19/04/2006	1.6	3.8	1.6	3.8	0.8	3.4	1.0	3.4
20/04/2006	2.1	4.0	1.9	4.0	1.0	3.4	1.0	3.4
21/04/2006	1.7	4.0	1.9	4.0	1.1	3.2	1.1	3.2
22/04/2006	2.4	4.9	2.5	5.0	1.6	3.8	1.6	3.8
23/04/2006	2.9	4.4	2.8	4.4	1.8	3.4	1.7	3.4
24/04/2006	3.0	4.6	3.1	4.6	1.9	3.2	1.9	3.2
25/04/2006	2.9	5.4	2.9	5.5	1.8	3.7	1.7	3.7
26/04/2006	3.0	4.9	3.1	5.0	1.9	3.7	2.0	3.7
27/04/2006	3.0	4.6	3.1	4.7	1.9	3.5	1.9	3.7
28/04/2006	2.9	5.1	2.9	5.2	2.1	3.7	2.0	3.7
29/04/2006	3.2	5.2	3.2	5.3	2.3	3.8	2.2	3.8
30/04/2006	3.3	5.4	3.4	5.5	2.4	4.3	2.3	4.3
01/05/2006	3.5	5.8	3.7	5.8	2.6	4.6	2.6	4.6
02/05/2006	3.6	5.4	3.7	5.5	2.7	4.3	2.8	4.3
03/05/2006	3.6	5.2	3.7	5.3	2.9	4.1	2.8	4.1
04/05/2006	4.1	6.0	4.1	6.1	3.0	4.3	3.1	4.4
05/05/2006	4.0	6.6	4.1	6.7	2.7	4.6	2.8	4.6
06/05/2006	4.3	6.9	4.4	7.0	2.9	4.8	2.8	4.7
07/05/2006	4.4	6.6	4.6	6.8	2.9	4.4	2.9	4.7
08/05/2006	4.4	6.6	4.6	6.8	3.0	4.8	3.1	4.7
09/05/2006	4.6	6.9	4.6	7.0	3.5	5.4	3.5	5.5
10/05/2006	4.8	6.0	4.9	6.1	3.5	4.8	3.5	4.7
11/05/2006	4.8	6.9	4.9	7.0	3.8	5.5	3.8	5.6
12/05/2006	4.9	6.0	5.0	6.1	3.7	4.8	3.7	4.7
13/05/2006	4.9	6.0	5.0	6.1	3.8	4.9	3.8	4.9
14/05/2006	5.1	5.7	5.2	5.8	3.5	4.6	3.5	4.6
15/05/2006	5.1	7.1	5.2	7.1	3.5	4.9	3.4	4.9
16/05/2006	5.4	6.8	5.5	6.8	3.8	5.1	3.8	5.0
17/05/2006	5.5	6.5	5.5	6.5	4.1	5.1	4.1	5.2
18/05/2006	5.4	6.5	5.3	6.5	4.0	5.2	4.1	5.3
19/05/2006	5.7	6.5	5.6	6.5	3.7	4.6	3.7	4.6
20/05/2006	5.4	6.8	5.5	7.0	3.5	4.4	3.5	4.6
21/05/2006	5.5	6.6	5.2	6.8	3.7	5.1	3.4	5.2
22/05/2006	3.8	5.5	3.2	5.5	2.1	4.3	1.0	4.3
23/05/2006	3.0	5.8	2.9	6.1	1.5	4.9	1.0	5.0

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Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
24/05/2006	3.2	4.9	2.8	4.9	1.5	3.5	1.4	3.8
25/05/2006	2.4	3.5	2.5	3.8	1.3	3.8	1.3	3.8
26/05/2006	2.1	3.5	2.0	3.5	1.5	3.4	1.1	3.2
27/05/2006	2.5	5.1	2.8	5.2	2.3	4.3	1.7	4.3
28/05/2006	3.6	6.6	4.6	6.8	2.9	6.3	3.1	6.4
29/05/2006	5.7	10.2	5.8	10.3	4.8	9.6	4.7	9.6
30/05/2006	8.3	10.2	8.5	10.3	7.3	9.7	7.2	9.8
31/05/2006	8.7	10.4	8.4	10.3	6.9	9.9	7.1	9.9
01/06/2006	9.1	10.8	8.6	10.5	7.3	10.4	7.0	9.9
02/06/2006	8.5	10.8	9.2	10.8	8.0	10.5	7.3	10.3
03/06/2006	7.9	11.1	7.8	10.8	7.3	10.5	7.3	10.5
04/06/2006	10.2	10.8	8.4	11.1	7.6	9.3	7.5	10.5
05/06/2006	9.4	11.1	9.9	10.8	7.9	10.4	7.5	8.9
06/06/2006	9.9	11.8	9.5	11.1	8.8	11.3	7.8	10.3
07/06/2006	10.1	12.8	9.9	11.7	9.1	12.4	8.9	11.4
08/06/2006	11.1	14.3	10.1	12.9	10.0	14.1	9.0	12.4
09/06/2006	12.2	13.6	11.1	14.3	11.0	13.1	10.1	14.0
10/06/2006	12.4	15.2	12.3	13.8	11.4	14.8	11.1	13.2
11/06/2006	13.3	15.8	12.6	15.2	11.7	15.5	11.4	14.9
12/06/2006	14.4	16.9	13.5	15.9	13.3	16.6	11.7	15.5
13/06/2006	15.4	17.7	14.5	16.9	14.4	17.4	13.3	16.6
14/06/2006	16.3	18.9	15.4	17.7	15.5	18.5	14.3	17.4
15/06/2006	17.3	18.2	16.3	18.9	16.6	18.0	15.4	18.6
16/06/2006	16.5	17.7	16.5	17.7	15.2	17.2	15.1	17.1
17/06/2006	16.3	17.4	16.5	17.8	15.3	16.9	15.1	17.4
18/06/2006	15.7	17.3	15.7	17.5	14.8	16.9	14.9	16.9
19/06/2006	15.4	16.5	15.4	17.4	14.7	16.1	14.6	16.9
20/06/2006	14.9	16.8	14.9	16.3	14.1	16.4	14.2	16.0
21/06/2006	15.2	17.4	14.9	16.8	14.5	17.1	14.2	16.5
22/06/2006	15.2	16.3	15.2	17.4	14.5	16.0	14.5	16.9
23/06/2006	14.4	16.3	14.5	16.3	13.8	16.1	13.8	16.0
24/06/2006	14.6	16.6	14.5	16.3	13.9	16.3	13.9	16.2
25/06/2006	15.2	16.1	14.6	16.6	14.5	15.8	14.0	16.3
26/06/2006	14.1	15.8	14.0	15.9	13.3	15.5	13.3	15.2
27/06/2006	13.8	15.0	14.0	15.9	13.1	14.7	13.5	15.4
28/06/2006	12.2	13.8	12.3	14.2	11.6	13.3	11.7	13.6
29/06/2006	12.7	13.9	12.3	13.9	11.1	13.3	11.1	13.3
30/06/2006	12.8	15.7	12.7	14.0	11.9	15.5	11.4	13.3
01/07/2006	13.9	15.7	13.2	15.7	13.3	15.2	12.1	15.5
02/07/2006	14.7	18.2	14.0	15.7	14.1	17.9	13.3	15.2
03/07/2006	15.2	17.4	14.9	18.1	14.5	17.2	14.5	18.0
04/07/2006	15.0	17.7	15.1	16.8	14.4	17.2	14.5	16.8
05/07/2006	16.6	19.5	16.2	17.7	15.6	19.2	15.5	17.4
06/07/2006	17.1	18.7	17.1	19.5	16.3	18.2	16.3	19.2
07/07/2006	17.3	18.1	17.4	18.4	16.7	17.7	16.8	18.1
08/07/2006	16.5	18.7	16.5	18.0	15.5	18.2	15.5	17.4
09/07/2006	17.4	18.1	17.1	18.8	16.7	17.7	16.2	18.3

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Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
10/07/2006	16.9	18.4	16.9	18.1	16.0	17.7	16.0	17.5
11/07/2006	16.6	19.2	16.6	18.4	15.2	18.4	15.1	17.7
12/07/2006	17.6	19.2	17.5	19.2	16.1	18.5	16.2	18.4
13/07/2006	17.6	18.9	17.7	19.2	16.4	17.9	16.5	18.4
14/07/2006	17.1	19.0	17.1	18.9	15.8	18.4	15.7	18.0
15/07/2006	17.4	19.0	17.4	19.1	16.3	18.7	16.3	18.4
16/07/2006	17.3	19.0	17.2	19.1	16.4	18.5	16.3	18.6
17/07/2006	16.9	18.7	16.9	19.1	16.1	18.5	16.2	18.6
18/07/2006	17.1	19.0	17.1	18.8	16.1	18.5	16.2	18.4
19/07/2006	17.1	19.2	17.2	19.1	16.1	18.7	16.2	18.6
20/07/2006	17.3	18.2	17.4	19.1	16.4	17.7	16.5	18.8
21/07/2006	16.1	18.1	16.2	17.8	15.5	17.9	15.5	17.1
22/07/2006	16.3	18.2	16.3	18.1	15.5	17.9	15.4	17.8
23/07/2006	16.5	18.9	16.5	18.3	15.5	18.5	15.5	17.8
24/07/2006	17.1	18.2	17.1	18.9	16.3	17.7	16.3	18.4
25/07/2006	16.3	17.6	16.3	17.7	15.3	16.9	15.2	16.9
26/07/2006	16.0	16.6	16.0	17.7	15.0	16.3	14.9	16.9
27/07/2006	15.2	16.0	15.2	16.8	14.5	15.5	14.5	16.0
28/07/2006	15.0	16.8	15.1	16.8	14.2	16.4	14.2	16.3
29/07/2006	14.9	18.4	14.9	18.0	13.9	18.0	13.9	17.4
30/07/2006	16.5	18.5	16.5	18.4	15.5	17.9	15.4	18.1
31/07/2006	16.1	17.3	16.2	18.4	15.2	16.9	15.1	18.0
01/08/2006	15.5	17.3	15.5	17.4	14.5	16.4	14.5	16.6
02/08/2006	15.7	17.7	15.7	17.5	14.5	17.1	14.6	16.6
03/08/2006	15.7	17.9	15.7	17.7	14.7	17.2	14.6	17.1
04/08/2006	15.5	16.8	15.7	17.8	14.5	16.3	14.5	17.2
05/08/2006	14.6	15.5	14.6	16.0	13.3	14.7	13.3	15.1
06/08/2006	13.9	16.0	14.0	16.0	12.7	15.0	12.7	15.1
07/08/2006	13.9	15.4	14.0	15.7	12.7	14.5	12.7	14.9
08/08/2006	14.3	14.9	14.2	15.4	13.3	14.2	13.3	14.6
09/08/2006	14.3	15.7	14.5	15.7	13.3	15.0	13.3	14.8
10/08/2006	14.3	16.3	14.3	16.3	13.1	15.8	13.2	15.7
11/08/2006	14.4	15.7	14.6	16.3	13.1	15.2	13.2	15.7
12/08/2006	13.9	14.7	14.0	15.1	12.8	13.9	12.9	14.3
13/08/2006	13.6	14.1	13.8	14.6	12.5	13.4	12.6	13.9
14/08/2006	13.2	15.5	13.3	15.4	11.9	14.8	11.8	14.9
15/08/2006	13.6	14.9	13.8	15.4	12.2	14.1	12.1	14.8
16/08/2006	13.0	14.6	13.2	14.5	11.9	13.8	11.8	13.8
17/08/2006	13.3	14.6	13.5	14.5	12.2	13.8	12.3	13.9
18/08/2006	12.8	14.4	13.0	14.5	11.7	13.8	11.7	13.8
19/08/2006	12.8	14.6	13.0	14.5	11.7	13.8	11.7	13.8
20/08/2006	12.5	13.6	12.7	14.0	11.6	13.0	11.7	13.3
21/08/2006	11.8	13.0	12.0	13.0	11.0	12.4	10.9	12.4
22/08/2006	11.5	13.3	11.7	13.3	10.5	12.8	10.5	12.9
23/08/2006	12.2	13.2	12.3	13.2	11.3	12.7	11.2	12.6
24/08/2006	11.8	12.8	11.8	13.2	10.5	12.1	10.5	12.3
25/08/2006	12.1	13.0	12.1	13.0	11.3	12.5	11.2	12.6

CAFN – Upper Nordenskiöld River Temperature Investigations 2006

Appendix 3: Minimum and Maximum daily temperatures (°C) recorded at site 1 and 2 by two types of dataloggers(minilog, tidbit) on the upper Nordenskiöld River - October 1, 2005 - October 6, 2006.

Site	1	1	1	1	2	2	2	2
Logger Type	Tidbit	Tidbit	Minilog	Minilog	Tidbit	Tidbit	Minilog	Minilog
Date	Mini	Max	Min	Max	Min	Max	Min	Max
26/08/2006	11.5	12.8	11.7	12.9	10.4	12.1	10.3	12.1
27/08/2006	11.6	12.8	11.8	12.9	10.5	11.9	10.5	12.0
28/08/2006	11.6	12.5	11.7	12.7	10.4	11.6	10.3	11.7
29/08/2006	11.6	12.4	11.7	12.3	10.4	11.4	10.3	11.4
30/08/2006	10.8	12.8	11.1	12.7	9.6	12.1	9.5	12.0
31/08/2006	11.6	12.2	11.8	12.3	10.4	11.3	10.3	11.4
01/09/2006	11.0	13.0	11.2	12.9	9.7	12.2	9.8	12.1
02/09/2006	11.1	12.7	11.4	12.7	9.7	11.9	9.6	11.8
03/09/2006	11.5	12.7	11.5	12.7	10.0	11.7	10.1	11.8
04/09/2006	11.1	11.9	11.4	12.1	9.9	11.0	9.9	10.9
05/09/2006	11.0	12.8	11.2	12.7	9.7	11.9	9.6	11.8
06/09/2006	11.0	12.2	11.2	12.3	9.4	11.3	9.5	11.2
07/09/2006	11.1	12.4	11.2	12.4	9.9	11.6	9.9	11.7
08/09/2006	11.1	12.7	11.4	12.6	9.7	11.6	9.8	11.5
09/09/2006	10.8	11.8	11.1	11.8	9.4	10.8	9.5	10.6
10/09/2006	10.1	11.1	10.2	11.2	8.6	10.2	8.6	10.2
11/09/2006	9.9	11.5	10.1	11.5	8.5	10.7	8.4	10.6
12/09/2006	10.4	11.3	10.6	11.4	9.1	10.4	9.2	10.3
13/09/2006	9.7	10.8	9.9	10.9	8.5	9.9	8.4	9.9
14/09/2006	9.0	11.0	9.2	10.9	7.6	10.0	7.5	10.1
15/09/2006	8.8	10.8	9.2	10.8	7.3	9.7	7.3	9.8
16/09/2006	8.3	9.9	8.6	9.9	6.8	8.6	6.7	8.7
17/09/2006	8.0	9.9	8.3	9.8	6.5	8.6	6.5	8.7
18/09/2006	8.0	9.4	8.3	9.5	6.5	8.6	6.7	8.6
19/09/2006	8.7	9.3	8.6	9.3	7.6	8.5	7.4	8.4
20/09/2006	8.3	9.4	8.4	9.5	7.1	8.6	7.1	8.7
21/09/2006	7.9	9.6	8.1	9.6	6.6	8.6	6.7	8.7
22/09/2006	8.3	9.3	8.1	9.3	7.6	8.5	7.0	8.4
23/09/2006	7.3	8.7	7.5	8.7	6.0	7.7	6.1	7.7
24/09/2006	6.9	7.9	7.3	7.7	5.5	6.9	5.6	6.4
25/09/2006	6.9	8.3	7.3	8.3	5.9	7.4	5.9	7.5
26/09/2006	7.1	7.6	7.3	7.7	5.7	6.8	5.8	6.8
27/09/2006	7.3	8.3	7.3	8.4	6.2	7.7	6.2	7.8
28/09/2006	7.4	8.3	7.5	8.3	6.5	7.7	6.4	7.7
29/09/2006	7.3	7.7	7.3	7.9	6.2	7.1	6.1	7.1
30/09/2006	6.2	7.3	7.0	7.8	5.5	6.5	5.8	7.1
01/10/2006	5.5	6.6	6.2	7.1	4.6	5.7	5.3	6.2
02/10/2006	5.1	6.3	5.6	6.8	4.3	5.1	4.3	5.8
03/10/2006	4.8	5.5	5.3	6.4	4.0	4.6	4.1	5.2
04/10/2006	5.2	5.7	5.0	5.6	4.3	5.1	4.0	4.6
05/10/2006	4.6	5.1	5.0	5.8	3.8	4.4	3.8	5.0
06/10/2006	4.0	4.9	4.4	5.2	3.2	3.8	3.4	4.4

