

Technical Report No. 04-03

Fisheries Investigations in Streams Crossed by the Proposed Point Thomson Gas Cycling Project

by **Jack F. Winters**
and **William A. Morris**



Photograph by W.A. Morris 2002

May 2004

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THOMSON GAS CYCLING PROJECT**

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Acknowledgements

We thank Al Maki of ExxonMobil Production Company and Bill Streever of BP Exploration (Alaska) Inc. for providing funding and logistical support for this project. We also thank Wilson Cullor who performed many of the administrative and logistical coordination activities for this project. We thank Craig Bruce of Air Logistics of Alaska for safely transporting us to and from the sampling locations during both years of the project.

Introduction

Limited freshwater fish investigations have been conducted in the area of the proposed Point Thomson Gas Cycling Project. Seven tundra streams in the area were surveyed for suitable fish habitat by helicopter in August 1983 (Woodward-Clyde Consultants and Alaska Biological Research 1983). Three of these streams were physically sampled for fish. Ninespine stickleback (*Pungitius pungitius*) were present throughout the surveyed stream reaches. Fourhorn sculpin (*Myoxocephalus quadricornus*) were found in the estuarine portion of one stream. Other than this brief survey, no freshwater fish investigations have occurred in the project area. Surveys of drainages to the west, from the Badami Oilfield to the Sagavanirktok River, yielded mostly ninespine stickleback with the occasional Arctic grayling (*Thymallus arcticus*), Dolly Varden (*Salvelinus malma*), round whitefish (*Prosopium cylindraceum*), and fourhorn sculpin (Hemming 1996). In the Arctic National Wildlife Refuge to the east, Arctic grayling, ninespine stickleback, and Dolly Varden were the most common species found in coastal streams (West and Fruge 1989 cited in Hemming 1996).

We conducted fish surveys in streams crossed by the proposed Point Thomson Gas Cycling Project (Figure 1). The stream surveys were designed to provide preconstruction fish and water quality data for selected streams in the Point Thomson proposed development area, to provide data to support permit applications, and to provide data to make and support permit decisions. Data were collected during two summer seasons to account in part for yearly variation in fish distribution and numbers.

Methods

Stream surveys were conducted from August 1 through 8, 2002, and from July 7 through 14, 2003. Sampling in 2003 was conducted three weeks earlier than in 2002 in an attempt to sample during a period with higher stream flows and possibly different assemblages of fish species. A helicopter was used to access each of the sampling sites during both sampling seasons.

Fish were captured with fyke nets set within the streams or in lakes (2002 only) connected to the streams. One net was set in the old Point Thomson flooded material site. The fyke nets had an entrance frame opening of 0.7 m by 1.0 m that was placed facing downstream. The wings and leads of the nets were set to capture fish moving upstream and downstream. Nets were fished from 2 to 3 days at each net site. Net sites were selected to coincide with or to be just upstream of the proposed pipeline, road, and material site locations. Generally, two nets were set in streams crossed by the proposed facility roads and infield pipelines. One net was set in each major stream at or above the location where it is crossed by the proposed sales pipeline. Dolly Varden, Arctic grayling, and fourhorn sculpin were measured and released. Ninespine stickleback were counted and released, but not measured.

Water quality measurements of temperature, specific conductance, pH, dissolved oxygen concentration, and dissolved oxygen percent saturation were taken at each net site with a Hydrolab® Minisonde® water quality microprobe connected to a Surveyor® 4 water quality display unit.

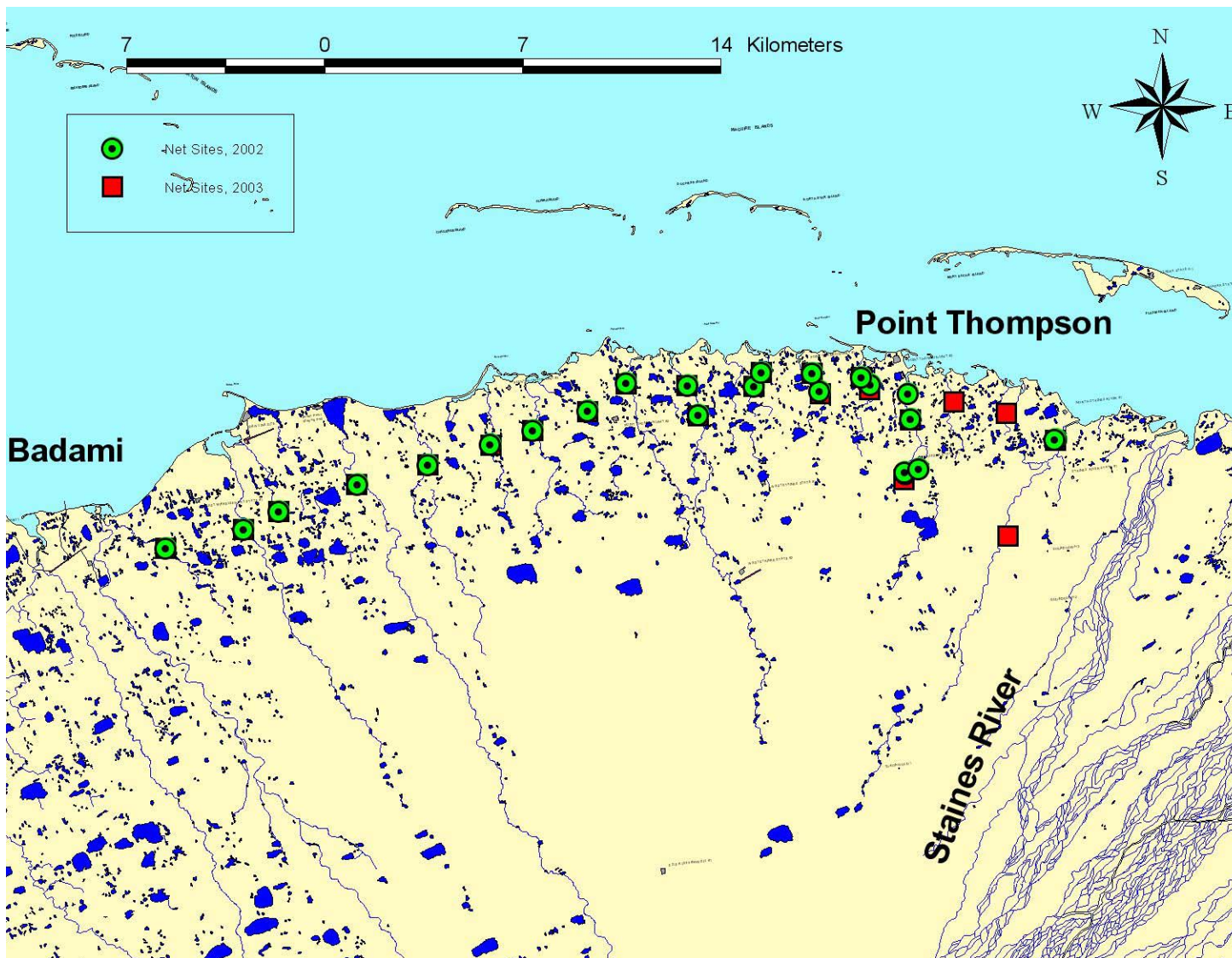


Figure 1. Fish sampling locations during 2002 and 2003.

Stream depth and width at the net sampling location, substrate, estimates of flow, and descriptions of instream or streambank vegetation were recorded at each of the net sites. Digital photographs, both aerial and ground, were taken at the sampling locations.

Results and Discussion

Stream Descriptions

All streams within the project area were small coastal plain originating streams. A few small drainages had insufficient water to place nets during our sampling periods and two streams, Streams R and S, had insufficient water in 2002 to place nets. All streams had low or non perceptible flows during both years of sampling. Many of the streams flowed through one or more shallow lakes, or were attached to small lakes with a short channel. Most stream banks were lined with sedges. A few streams had gravel banks on the inside of stream bends or contained small gravel bars. Specific stream characteristics and a photograph of each stream are included in Appendix 1.

Fish

All 15 stream systems sampled in 2002 contained ninespine stickleback as did the flooded gravel mine site (Table 1). Similarly, all but 2 of 17 streams sampled in 2003 contained ninespine stickleback. The two streams where nets did not catch ninespine stickleback in 2003 did have ninespine stickleback present in 2002. The total catch of ninespine stickleback was 3078 fish in 2002, with catches of ninespine stickleback ranging from 0 to 398 fish per day per net (Appendix 2). The total catch of ninespine stickleback was considerably lower in 2003, with only 724 fish captured. Catches ranged from 0 to 114 fish per day per net (Appendix 3).

Seven of the 15 streams sampled in 2002 contained 42 anadromous juvenile Dolly Varden (Table 1). These fish ranged in length from 115 to 220 mm. Daily catches of Dolly Varden were low, ranging from 0 to 6 fish per net (Appendix 2). For streams sampled with two nets, the net nearest the coast caught all of the fish (4 instances) or caught the most fish of the two nets (2 instances) (Figures 2, 3, 4).

Dolly Varden were recorded in four streams in 2003: one in a stream sampled only in 2003; one that also had Dolly Varden in 2002; and two that were sampled in 2002 but did not produce Dolly Varden in 2002 (Table 1). The Dolly Varden ranged in length from 124 to 140 mm. Catches of Dolly Varden were lower in 2003 than those from 2002. The total catch of Dolly Varden was 4 fish versus 42 Dolly Varden in 2002. The higher catches in 2002 were likely the result of sampling later in the open water season that allowed more time for juvenile fish to disperse from the Canning/Staines River system to the east or the Shaviovik River system to the west, the nearest systems supporting known overwintering areas for Dolly Varden.

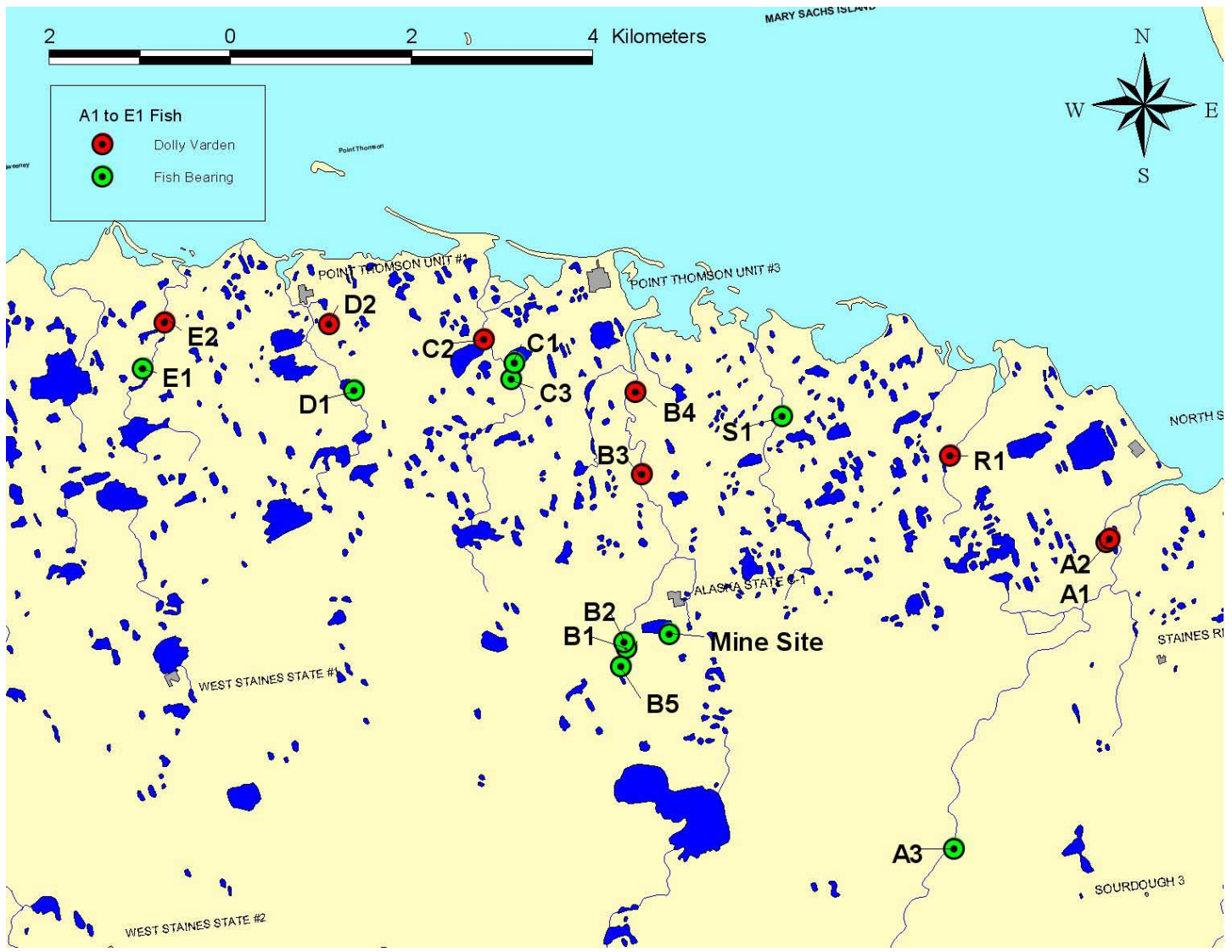


Figure 2. Locations of Dolly Varden captured at sampling sites in stream systems A to E.

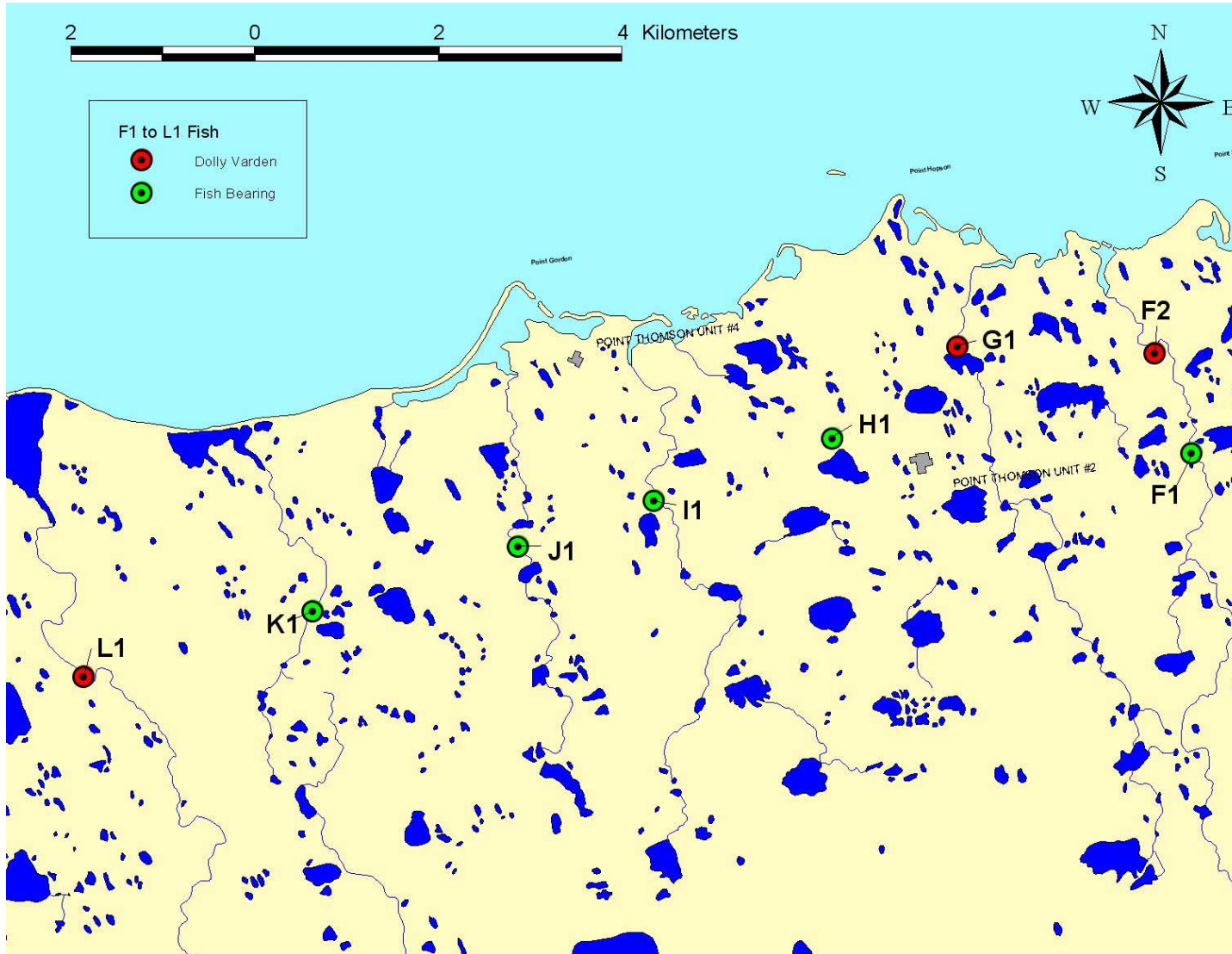


Figure 3. Locations of Dolly Varden captured at sampling sites in stream systems F to L.

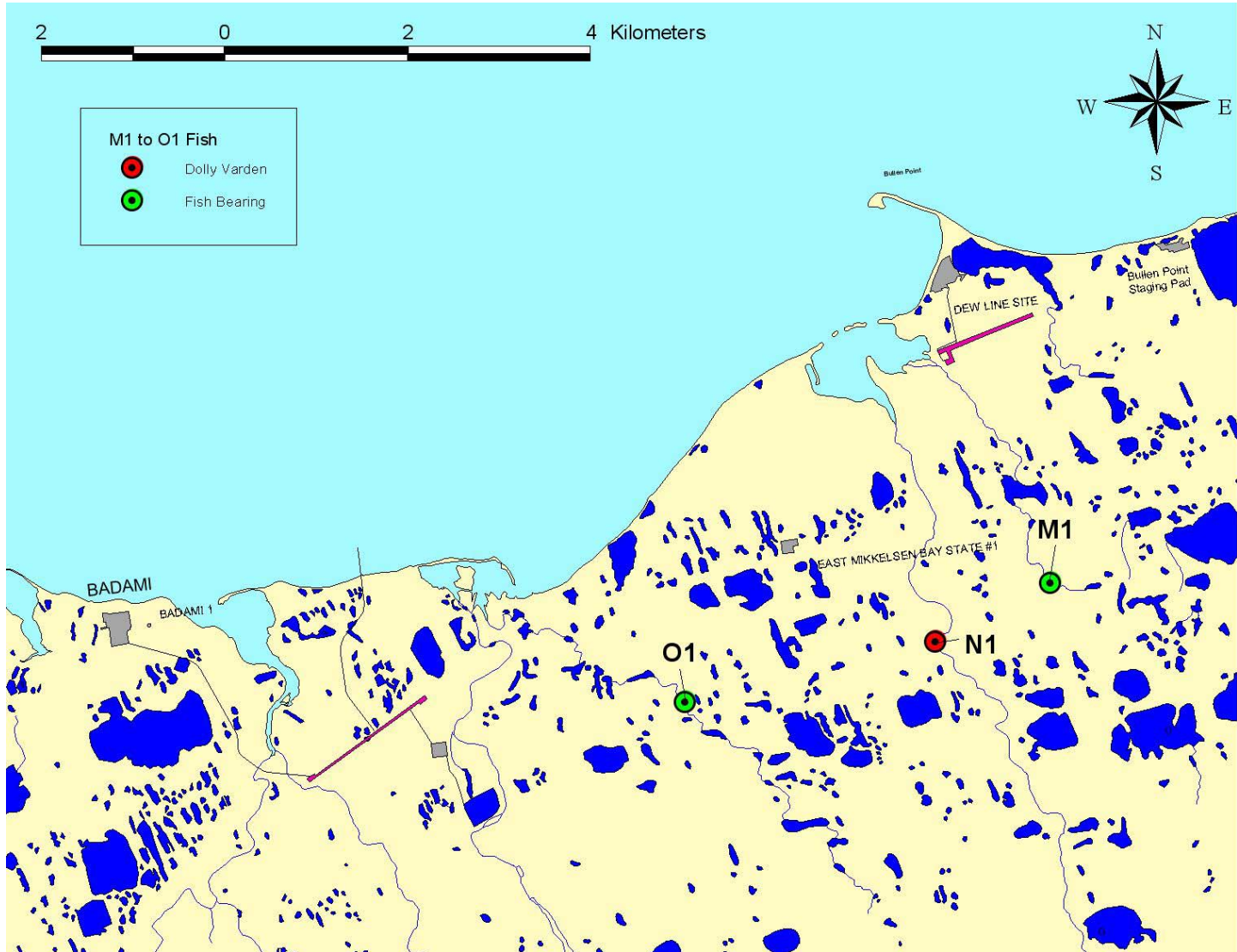


Figure 4. Locations of Dolly Varden captured at sampling sites in stream systems M to O.

Four nets were placed in lakes connected to streams (Sample sites B1, B2, C1, and D1) in 2002. Several species of anadromous whitefish are known to ascend coastal stream systems with connected lakes (Morris 2000). These species, least cisco (*Coregonus sardinella*), broad whitefish (*Coregonus nasus*), and humpback whitefish (*Coregonus pidschian*), were caught in sampling efforts conducted in Lions Lagoon offshore of the project area in 1999 (LGL 2000 cited in URS 2001). None of these species were caught in the sampled lakes or their associated streams. The lack of these species in the sampled lakes and associated streams may be a function of few fish present in the offshore waters or inadequate stream flow to entice fish to enter the systems.

Species captured other than ninespine stickleback and Dolly Varden were limited to Arctic grayling and fourhorn sculpin. The one 60 mm Arctic grayling that was captured in stream L probably originally came from the Shaviovik River system, the closest river system with a known Arctic grayling population. Although Arctic grayling are considered to be a freshwater species, they can move through nearshore Beaufort Sea waters, particularly in early summer when freshwater runoff greatly reduces the salinity of the nearshore waters (Hemming 1993, 1996)

One stream (sample site B4 near the creek mouth) also contained 12 fourhorn sculpin. This marine species is tolerant of estuarine waters that will occur in the lower reaches of some of these stream systems, particularly when stream flows are low and salt water may intrude into the lower reaches of the stream (Morrow 1980).

Table 1. Summary of total number of fish caught by species at each of the sampling locations within the Point Thomson study area for the years 2002 and 2003.

Sampling Site	Dolly Varden		Ninespine Stickleback		Arctic Grayling		Fourhorn Sculpin	
	2002	2003	2002	2003	2002	2003	2002	2003
A1	5	NS	149	NS	0	NS	0	NS
A2	2	0	100	8	0	0	0	0
A3	NS	0	NS	5	NS	0	NS	NS
B1	0	NS	146	NS	0	NS	0	0
B2	0	NS	234	NS	0	NS	0	0
B3	6	0	149	74	0	0	0	NS
B4	8	NS	58	NS	0	NS	12	NS
B5	NS	0	NS	99	NS	0	NS	0
Mine Site	0	NS	197	NS	0	NS	0	NS
C1	0	NS	3	NS	0	NS	0	0
C2	1	0	426	20	0	0	0	NS
C3	NS	0	NS	189	NS	0	NS	NS
D1	0	0	36	0	0	0	0	0
D2	7	0	50	3	0	0	0	0
E1	0	0	160	9	0	0	0	0
E2	1	0	239	22	0	0	0	0
F1	0	0	157	31	0	0	0	0
F2	1	0	22	7	0	0	0	0
G1	0	1	373	22	0	0	0	0
H1	0	0	117	33	0	0	0	0
I1	0	0	19	0	0	0	0	0
J1	0	0	18	14	0	0	0	0
K1	0	0	61	10	0	0	0	0
L1	11	1	75	3	0	1	0	0
M1	0	0	49	5	0	0	0	0
N1	0	1	28	25	0	0	0	0
O1	0	0	212	79	0	0	0	0
R1	NS	1	NS	50	NS	0	NS	0
S1	NS	0	NS	16	NS	0	NS	0
								0
Totals	42	4	3078	724	0	1	12	0

NS = not sampled

Water Quality

Water quality measurements recorded at the net sites in 2002 and 2003 were typical of North Slope coastal plain waters. The pH of the waters were slightly alkaline and the specific conductance values were indicative of fresh water (Tables 2 and 3). The specific conductance values were slightly higher in August 2002 than those recorded in July 2003, most likely the result of lower stream flows during the August sampling event.

Table 2. Point Thomson area water quality data, August 2002.

Sampling Site	Location		Date Sampled	Temperature °C	Specific Conductance µS/cm	pH	Dissolved Oxygen mg/L	Percent Saturation
	North	West						
A1	70.14051	146.11674	8/3/2002	12.89	300.2	8.01	9.90	93.2
A2	70.14055	146.11795	8/3/2002	12.65	303.2	8.02	9.89	92.7
B1	70.13532	146.25753	8/3/2002	13.74	204.3	7.89	10.15	97.3
B2	70.13591	146.25775	8/3/2002	14.16	203.2	7.77	9.84	95.0
B3	70.15259	146.24729	8/3/2002	12.10	247.4	7.80	8.88	82.2
B4	70.16076	146.24638	8/3/2002	15.91	273.8	7.86	8.37	84.2
Mine Site	70.13624	146.24476	8/3/2002	11.90	295.9	8.05	10.52	97.1
C1	70.16509	146.27980	8/3/2002	14.80	251.2	8.15	9.79	96.2
C2	70.16782	146.28763	8/3/2002	16.17	257.0	7.64	8.76	88.5
D1	70.16491	146.32660	8/3/2002	16.01	230.5	8.05	9.39	94.6
D2	70.17102	146.33125	8/3/2002	17.09	245.1	7.59	8.69	89.5
E1	70.16877	146.38566	8/3/2002	14.37	303.6	7.62	9.03	87.7
E2	70.17321	146.37754	8/3/2002	12.55	301.0	7.85	9.48	89.3
F1	70.16168	146.43918	8/3/2002	16.72	293.7	7.83	8.65	88.5
F2	70.17173	146.44643	8/3/2002	16.89	298.8	7.80	8.23	84.6
G1	70.17464	146.50172	8/3/2002	16.98	287.6	7.93	8.66	89.0
H1	70.16697	146.53970	8/7/2002	5.61	241.9	7.35	10.21	81.3
I1	70.16277	146.59185	8/7/2002	6.31	278.6	7.84	11.61	94.4
J1	70.15994	146.63157	8/7/2002	5.94	265.8	7.83	11.72	94.2
K1	70.15552	146.69080	8/7/2002	6.26	304.7	7.73	11.62	94.3
L1	70.15164	146.75691	8/7/2002	6.75	283.6	7.91	11.02	90.5
M1	70.14583	146.83076	8/7/2002	5.84	275.7	7.70	11.78	94.5
N1	70.14130	146.86477	8/7/2002	6.63	254.2	7.90	11.74	96.2
O1	70.13793	146.93698	8/7/2002	6.79	231.6	7.63	11.10	91.2

Lakes = B1, B2, C1, D1, Mine site

Table 3. Point Thomson area water quality data, July 2003.

Sampling Site	Location		Date	Temperature °C	Specific Conductance $\mu\text{S}/\text{cm}$	pH	Dissolved Oxygen mg/L	Percent Saturation
	North	West						
A2	70.14055	146.17125	7/9/2003	7.33	271.0	8.32	11.24	93.8
A3	70.11150	146.11795	7/9/2003	7.75	282.1	8.13	10.63	88.8
B3	70.15259	146.24729	7/9/2003	7.51	225.3	7.96	10.67	88.5
B5	70.13351	146.25964	7/9/2003	7.03	216.0	7.90	10.83	88.7
C2	70.16782	146.28763	7/9/2003	7.92	198.3	7.93	11.02	92.3
C3	70.16351	146.28133	7/9/2003	8.00	200.3	8.07	11.28	94.7
D1	70.16491	146.32660	7/9/2003	8.43	198.8	7.80	10.45	88.5
D2	70.17102	146.33125	7/9/2003	8.81	205.7	7.80	10.94	92.1
E1	70.16877	146.38566	7/11/2003	11.72	223.1	7.66	8.89	81.3
E2	70.17321	146.37754	7/11/2003	12.12	225.7	8.00	9.10	85.0
F1	70.16168	146.43918	7/11/2003	12.20	284.0	7.91	8.96	83.0
F2	70.17173	146.44643	7/11/2003	11.90	296.8	7.88	9.10	83.8
G1	70.17464	146.50172	7/11/2003	13.01	232.1	8.23	10.13	95.7
H1	70.16697	146.53970	7/11/2003	12.20	129.7	7.62	9.50	87.6
I1	70.16277	146.59185	7/11/2003	12.56	216.6	7.95	9.96	93.0
J1	70.15994	146.63157	7/11/2003	12.22	231.8	7.98	10.44	96.4
K1	70.15552	146.69080	7/13/2003	8.88	281.3	7.89	10.61	91.0
L1	70.15164	146.75691	7/13/2003	8.91	255.6	8.07	10.53	90.0
M1	70.14583	146.83076	7/13/2003	9.16	228.4	7.82	9.85	85.0
N1	70.14130	146.86477	7/13/2003	9.56	233.8	8.02	10.31	89.8
O1	70.13793	146.93698	7/13/2003	10.03	170.4	7.93	10.16	89.5
R1	70.15069	146.15915	7/9/2003	7.12	215.6	8.15	11.93	98.0
S1	70.15665	146.20552	7/9/2003	6.89	227.1	7.80	10.80	88.4

Summary

Sampling results from this study indicate streams within the general area of the Point Thomson Project, from the Staines River on the east to the Badami Oilfield to the west, all contain fish. Ninespine stickleback are the most numerous fish species present in the area's fresh waters. Relatively low numbers of anadromous fish, particularly juvenile Dolly Varden most likely from the Staines/Canning River system, use these streams for rearing during the open water period. The presence of resident ninespine stickleback in early July in streams distant from known overwintering streams indicates some limited areas of free water exist in each of these stream systems in late winter that provide overwintering habitat for ninespine stickleback.

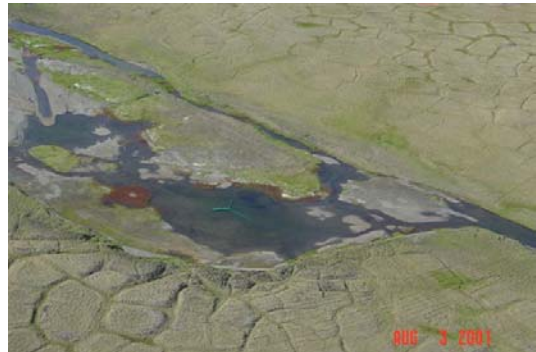
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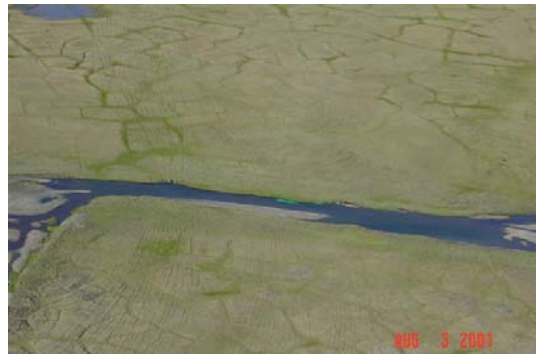
Appendix 1. Sample Site Description and Photograph

NOTE: The date stamp for photographs taken in 2002 incorrectly states 2001.

Sample Site A1
70.14051°N 146.11674°W
stream bead/former pond drained by creek
up to 1 m deep
up 40 m wide
estimated 2 cfs flow
small cobble/gravel/sand bottom
Arctophila fulva lining east and south
margins of bead
sedges and gravel lining remaining banks



Sample Site A2
70.14055°N 146.11795°W
0.5 m deep
10 m wide
small cobble/gravel bottom
estimated 2 cfs flow
sedge and gravel banks



Sample Site A3
70.11150°N 146.11795°W
0.5 m deep
8 m wide
estimated 2 cfs flow
small cobble/gravel bottom
sedge lined banks



Sample Site B1

70.13532°N 146.25753°W

lake connected to Creek B

1.2 m deep at net site

thin peat bottom over gravel

sedge lined shoreline

sample site located in the upper
right margin of the larger lake



Sample Site B2

70.13591°N 146.25775°W

lake connected to Creek B

1.2 m deep at net site

thin peat bottom over gravel

sedge lined shoreline

sample site located in the upper
left margin of the smaller lake



Sample Site B3

70.15259°N 146.24729°W

0.5 m deep

3-10 m wide

cobble/gravel bottom

sedge lined banks



Sample Site B4

70.16076°N 146.24638°W

0.5 m deep

3-10 m wide

gravel bottom

sedge lined banks opposite gravel bars



Sample Site B5
70.13351°N 146.25964°W
0.75 m deep
6 m wide
sedge lined banks



Sample Site C1
70.16509°N 146.27980°W
lake connected to Creek C
1.0 m deep at net site
Arctophila fulva beds surrounding net



Sample Site C2
70.16782°N 146.28763°W
0.5 m deep
5 m wide
gravel bottom
sedge lined banks



Sample Site C3
70.16351°N 146.28133°W
0.5 m deep
10 m wide
peat/gravel bottom
sedge lined banks



Sample Site D1

70.16491°N 146.32660°W

lake connected to Creek D sampled in 2002

sedge lined shoreline with *Arctophila fulva*

beds present in lake

creek sampled in 2003 approximately 75 m
upstream of lake

0.5 m deep

sedge lined bead with *Arctophila fulva*



Sample Site D2

70.17102°N 146.33125°W

0.75 m deep

12 m wide bead

sedge lined banks with *Arctophila fulva*

throughout bead



Sample Site E1

70.16877°N 146.38566°W

0.5 m deep

6 m wide

gravel bottom

sedge lined banks



Sample Site E2

70.17321°N 146.37754°W

0.75 m deep

8 m wide

gravel bottom

sedge lined banks



Sample Site F1
70.16168°N 146.43918°W
0.5 m deep
10 m wide
gravel bottom
sedge and *Arctophila fulva* lined banks



Sample Site F2
70.17173°N 146.44643°W
0.5 m deep
5-8 m wide
estimated 1 cfs flow
gravel bottom
sedge lined banks/gravel bar



Sample Site G1
70.17464°N 146.50172°W
10 m wide
0.75 m deep
estimated 2 cfs flow
gravel bottom
sedge lined banks/gravel bar



Sample Site H1
70.16697°N 146.53970°W
5 m wide elongated stream bead
0.5 to 1 m deep
estimated 0.5 cfs flow
peat bottom with some gravel present
sedge lined banks



Sample Site I1
70.16277°N 146.59185°W
0.5 m deep
3-10 m wide
gravel bottom
sedge lined stream bed
algae growing on stream bottom



Sample Site J1
70.15994°N 146.63157°W
1.0 m deep stream bed
6 m wide
estimated 1-2 cfs flow
sedge lined peat banks



Sample Site K1
70.15552°N 146.69080°W
0.5 m deep
10 m wide
large stream bed with gravel/peat bottom
some sedges growing on peat substrate
sedge lined banks



Sample Site L1
70.15164°N 146.75691°W
0.5 to 0.75 m deep
7-12 m wide
estimated 1 cfs flow
gravel bottom, gravel bars present
sedge lined banks



Sample Site M1
70.14583°N 146.83076°W
0.5 to 0.75 m deep
7-10 m wide
gravel bottom
sedge lined banks



Sample Site N1
70.14130°N 146.86477°W
0.5 to 1.0 m deep
6 m wide
gravel bottom with peat along stream
margins
sedge lined banks



Sample Site O1
70.13793°N 146.93698°W
stream head
0.5 to 0.75 m deep
10 m wide
estimated 0.5 to 1.0 cfs flow
gravel bottom
sedge lined banks



Sample Site R1
70.15069°N 146.15915°W
0.1 to 0.8 m deep
4 m wide
estimated 1.0 cfs flow
gravel bottom
sedge lined banks



Sample Site S1

70.15665°N 146.20552°W

0.4 to 0.8 m deep

3 m wide

no apparent flow

thin peat bottom over gravel

sedge lined banks

Arctophila fulva present in stream



Flooded Material Site

70.13624°N 146.24476°W



Appendix 2. Fish catch summary table, 2002.

Sampling Site	Location		Dates Fished	Dolly Varden			Ninespine Stickleback			Fourhorn Sculpin
	North	West		Day 1	Day 2	Total	Day 1	Day 2	Total	Total
A1	70.14051	146.11674	8/1-3/2002	1	4	5	90	59	149	
A2	70.14055	146.11795	8/1-3/2002	2	0	2	38	62	100	
B1	70.13532	146.25753	8/1-3/2002	0	0	0	40	106	146	
B2	70.13591	146.25775	8/1-3/2002	0	0	0	100	104	234	
B3	70.15259	146.24729	8/3-6/2002	5	1	6	92	57	149	
B4	70.16076	146.24638	8/1-3/2002	4	4	8	24	34	58	12
Mine Site	70.13624	146.24476	8/1-3/2002	0	0	0	40	157	197	
C1	70.16509	146.27980	8/1-3/2002	0	0	0	0	3	3	
C2	70.16782	146.28763	8/3-6/2002	1	0	1	398	28	426	
D1	70.16491	146.32660	8/1-3/2002	0	0	0	20	16	36	
D2	70.17102	146.33125	8/3-6/2002	4	3	7	45	5	50	
E1	70.16877	146.38566	8/3-6/2002	0	0	0	119	41	160	
E2	70.17321	146.37754	8/3-6/2002	0	1	1	190	49	239	
F1	70.16168	146.43918	8/3-6/2002	0	0	0	78	79	157	
F2	70.17173	146.44643	8/3-6/2002	1	0	1	16	6	22	
G1	70.17464	146.50172	8/3-6/2002	0	0	0	270	103	373	
H1	70.16697	146.53970	8/6-8/2002	0	0	0	43	74	117	
I1	70.16277	146.59185	8/6-8/2002	0	0	0	12	7	19	
J1	70.15994	146.63157	8/6-8/2002	0	0	0	10	8	18	
K1	70.15552	146.69080	8/6-8/2002	0	0	0	28	33	61	
L1	70.15164	146.75691	8/6-8/2002	5	6	11	33	42	75	
M1	70.14583	146.83076	8/6-8/2002	0	0	0	16	33	49	
N1	70.14130	146.86477	8/6-8/2002	0	0	0	13	15	28	
O1	70.13793	146.93698	8/6-8/2002	0	0	0	78	134	212	
Totals				23	19	42	1793	1255	3078	12

Appendix 3. Fish catch summary table, 2003.

Sampling Site	Location		Dates Fished	Dolly Varden			Ninespine Stickleback			Arctic Grayling
	North	West		Day 1	Day 2	Total	Day 1	Day 2	Total	Total
A2	70.14055	146.17125	7/8-10/2003	0	0	0	2	6	8	
A3	70.11150	146.11795	7/8-10/2003	0	0	0	3	2	5	
B3	70.15259	146.24729	7/8-10/2003	0	0	0	34	40	74	
B5	70.13351	146.25964	7/8-10/2003	0	0	0	50	49	99	
C2	70.16782	146.28763	7/8-10/2003	0	0	0	7	13	20	
C3	70.16351	146.28133	7/8-10/2003	0	0	0	75	114	189	
D1	70.16491	146.32660	7/9-11/2003	0	0	0	0	0	0	
D2	70.17102	146.33125	7/9-11/2003	0	0	0	2	1	3	
E1	70.16877	146.38566	7/10-12/2003	0	0	0	5	4	9	
E2	70.17321	146.37754	7/10-12/2003	0	0	0	14	8	22	
F1	70.16168	146.43918	7/10-12/2003	0	0	0	4	27	31	
F2	70.17173	146.44643	7/10-12/2003	0	0	0	2	5	7	
G1	70.17464	146.50172	7/10-12/2003	1	0	1	12	10	22	
H1	70.16697	146.53970	7/10-12/2003	0	0	0	18	15	33	
I1	70.16277	146.59185	7/10-12/2003	0	0	0	0	0	0	
J1	70.15994	146.63157	7/10-12/2003	0	0	0	4	10	14	
K1	70.15552	146.69080	7/12-14/2003	0	0	0	8	2	10	
L1	70.15164	146.75691	7/12-14/2003	0	1	1	1	2	3	1
M1	70.14583	146.83076	7/12-14/2003	0	0	0	1	4	5	
N1	70.14130	146.86477	7/12-14/2003	1	0	1	14	11	25	
O1	70.13793	146.93698	7/12-14/2003	0	0	0	37	42	79	
R1	70.15069	146.15915	7/8-10/2003	0	1	1	38	12	50	
S1	70.15665	146.20552	7/8-10/2003	0	0	0	6	10	16	
Totals				2	2	4	337	387	724	1