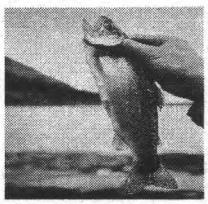
Canada Alberta Northwest Territories

Northern River Basins Study







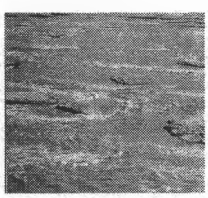


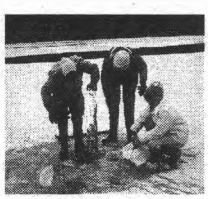

NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 50

AQUATIC MACROINVERTEBRATE IDENTIFICATIONS

ATHABASCA RIVER

MAY AND SEPTEMBER, 1993






Prepared for the
Northern River Basins Study
under Project 2327-C1

by

K. Saffran
D. A. Westworth and Associates Ltd.

NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 50

AQUATIC MACROINVERTEBRATE IDENTIFICATIONS

ATHABASCA RIVER
MAY AND SEPTEMBER, 1993

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PREFACE:

The Northern River Basins Study was initiated through the "Canada-Alberta-Northwest Territories Agreement Respecting the Peace-Athabasca-Slave River Basin Study, Phase II - Technical Studies" which was signed September 27, 1991. The purpose of the Study is to understand and characterize the cumulative effects of development on the water and aquatic environment of the Study Area by coordinating with existing programs and undertaking appropriate new technical studies.

This publication reports the method and findings of particular work conducted as part of the Northern River Basins Study. As such, the work was governed by a specific terms of reference and is expected to contribute information about the Study Area within the context of the overall study as described by the Study Final Report. This report has been reviewed by the Study Science Advisory Committee in regards to scientific content and has been approved by the Study Board of Directors for public release.

It is explicit in the objectives of the Study to report the results of technical work regularly to the public. This objective is served by distributing project reports to an extensive network of libraries, agencies, organizations and interested individuals and by granting universal permission to reproduce the material.

NORTHERN RIVER BASINS STUDY
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Whereas the above publication is the result of a project conducted under the Northern River Basins Study and the terms of reference for that project are deemed to be fulfilled,
IT IS THEREFORE REQUESTED BY THE STUDY OFFICE THAT;
this publication be subjected to proper and responsible review and be considered for release to the public.

F. J. Wrona — 10 April 95
(Dr. F. J. Wrona, Ph.D., Science Director) (Date)

Whereas it is an explicit term of reference of the Science Advisory Committee "to review, for scientific content, material for publication by the Board",
IT IS HERE ADVISED BY THE SCIENCE ADVISORY COMMITTEE THAT;
this publication has been reviewed for scientific content and that the scientific practices represented in the report are acceptable given the specific purposes of the project and subject to the field conditions encountered.
SUPPLEMENTAL COMMENTARY HAS BEEN ADDED TO THIS PUBLICATION: [ ] Yes [ ] No

P. A. Larkin — 12 April 95
(Dr. P. A. Larkin, Ph.D., Chair) (Date)

Whereas the Study Board is satisfied that this publication has been reviewed for scientific content and for immediate health implications,
IT IS HERE APPROVED BY THE BOARD OF DIRECTORS THAT;
this publication be released to the public, and that this publication be designated for: **[ ] STANDARD AVAILABILITY [ ] EXPANDED AVAILABILITY**

Lucille Partington — 12/04/95
(Lucille Partington, Co-chair) (Date)

Robert McLeod — 12/04/95
(Robert McLeod, Co-chair) (Date)

AQUATIC MACROINVERTEBRATE IDENTIFICATIONS, ATHABASCA RIVER, MAY AND SEPTEMBER, 1993

STUDY PERSPECTIVE

Fundamental to understanding the effects of industrial, agricultural and municipal-related contaminants within an aquatic ecosystem is understanding their origin, pathway, fate and effects on biological communities. The Northern River Basins Study is investigating the presence and distribution of these contaminants within the basins. Also being considered is how they enter the food chain, at what level, if they are transferred and if they are accumulated to concentrations that may have potential concerns for natural biological systems and humans. Benthic invertebrates are bottom-dwelling organisms that are very sensitive to environmental change and are important components of the food chain. Because benthic invertebrates are sensitive to changes in water quality and have limited mobility, these organisms can reflect both short term environmental disturbances as well as long term cumulative effects. Consequently, they are often used to monitor the state of aquatic environments. The abundance and types of benthic invertebrates present at a site can often indicate the extent to which the aquatic environment has been affected by pollutants.

Related Study Questions

1a)	*How has the aquatic ecosystem, including fish and/or other aquatic organisms, been affected by exposure to organochlorines or other toxic compounds?*
4a)	*What are the contents and nature of the contaminants entering the system and what is their distribution and toxicity in the aquatic ecosystem with particular reference to water, sediments and biota?*
13b)	*What are the cumulative effects of man-made discharges on the water and aquatic environment?*
14)	*What long term monitoring programs and predictive models are required to provide an ongoing assessment of the state of the aquatic ecosystems? These programs must ensure that all stakeholders have the opportunity for input.*

Benthic invertebrates were collected in May, 1993, from depositional areas at eight sites on the upper Athabasca River near Hinton and from seven similar sites in September, 1993. Under this project, benthic invertebrates from those collections were identified, sorted and counted to determine the abundance and types of invertebrates present at each site. The number of aquatic invertebrates per sample ranged from 40 to 8,028 individuals. Invertebrates were more abundant in fall samples. Oligochaete worms and chironomid larvae were generally the most common organisms.

This information will be evaluated and compared with previous studies on the Athabasca River to document changes in benthic invertebrate populations over time and to determine if populations have been affected by man-made discharges to the river. Furthermore, the data in this report will provide key information for other NRBS studies investigating the overall health and abundance of aquatic invertebrate communities found in depositional sediments downstream of municipal and industrial effluents.

REPORT SUMMARY

Seventy-five invertebrate samples (Eckman dredge) taken from depositional areas of the upper Athabasca river were processed. These samples represented eight sites of five replicates each collected in May 1993, and seven sites of five replicates each collected in September 1993. The number of aquatic invertebrates per sample ranged from 40 to 8028 individuals. Invertebrates were more abundant in the fall samples. Oligochaete worms and chironomid larvae were generally the most commonly occurring organisms.

ACKNOWLEDGEMENTS

We thank Dr. Joseph Culp (National Hydrology Research Institute, Saskatoon) for providing technical advice.

Sample sorting was performed by Paul Hvengaard, Darcy Lightle, Donelda Patriquin, Karen Saffran, and Nancy Westworth. Resorting for QA/QC analysis was done by Robert Ellis. Karen Saffran enumerated and identified the samples. Sherry Beckett identified the Oligochaeta. Gordon Kelbert assisted with data entry.

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1.0 INTRODUCTION

Examining the structure and composition of benthic invertebrate communities can provide useful information about the condition of aquatic environments. Sensitive to changes in water quality and limited in mobility, these organisms can reflect both short-term environmental disturbances as well as long-term cumulative effects (Lenat et al., 1980).

The purpose of this project, as directed by the Terms of Reference, provided in Appendix A, was to process 75 aquatic invertebrate samples taken from depositional areas of the upper Athabasca River near Hinton, Alberta.

The samples were collected using an Eckman grab sampler (152 mm x 152 mm); details regarding sample collection and handling are provided in Appendix D. Forty (eight sites, five replicates each) samples were collected in May 1993, and 35 (seven sites, five replicates each) were collected in September 1993. The geographic location for each site along with abbreviations of the site designations are listed in Table 1.

Table 1. Site designations and geographic locations for aquatic invertebrate collection sites along the Athabasca River, May and September, 1993.

Site Name	Site Labels	Sample Period	Geographic Location (northings/eastings)
Upstream of Hinton - Control 1	ARC	Spring	566146
Upstream of Hinton - Control 2	ARC2	Fall	Just downstream of ARC
Weldwood Haul Bridge	WHB HB	Spring, Fall	637202
Obed	OB	Spring, Fall	767312
Emerson Lakes - Site 1	AREL	Spring	887522
Emerson Lakes - Site 2	EL	Fall	300 m below AREL
Berland River	ARBER	Spring	095827
Windfall	ARW, WB	Spring Fall	623060
Blue Ridge	ARBR	Spring	056024
Athabasca	ARATHAB	Spring	536685

2.0 METHODS

2.1 SAMPLE PROCESSING

Sample processing generally followed the procedures described by Alberta Environment (1990). Samples were first prepared by removing the formalin in which they were stored and rinsing them through a series of sieves. Mesh sizes of 1 mm, 229 µm, and 74 µm were used. Organic material was separated from inorganic material (sand) in the two finest fractions by elutriation. The three organic fractions obtained were stored in 80% ethanol.

The coarse fraction (> 1 mm) of each sample was sorted in its entirety under a dissecting scope at a magnification of at least 7X. Because these depositional samples contained a large amount of organic debris, it was decided that the fine fraction would be subsampled according to the method of Wrona et al. (1982). Subsampling was standardized to at least one quarter (five 50 mL subsamples) of the fine fraction. Subsample counts were often low (< 100 organisms), but it was felt that the time taken to sort the entire fraction would have been excessive for the amount of data obtained in these cases. The finest fraction (< 74 µm) was not sorted but was saved.

The cone subsampler (Wrona et al., 1982) was also used to facilitate identification of Oligochaeta. When the number of worms was greater than 400, one quarter was removed for identification. The proportions of different families were then applied to the total number of oligochaetes in the sample, which had previously been counted.

2.2 QUALITY ASSURANCE/QUALITY CONTROL

Sample cleaning, fractioning, and subsampling were consistantly performed by one person (K. Saffran) who also supervised the sorting process. All enumerations and identifications (except Oligochaeta) were completed by K. Saffran. Further identification of Oligochaeta was done by S. Beckett.

A portion of the inorganic material from the first two samples processed was examined for the presence of additional animals. Since none were found, the inorganic fractions of subsequent samples were not sorted.

Four spring samples and four fall samples (10.7% of the total samples) were chosen at random to verify sorting efficiency. Resorting was undertaken by an individual (R. Ellis) not involved in the original sorting. A recovery of 95%, as suggested in Environment Canada (1993), was considered to be the minimum acceptable standard.

3.0 RESULTS

3.1 INVERTEBRATE COUNTS AND IDENTIFICATIONS

Table 2 lists the benthic invertebrates identified and their abundances in eight sets of samples (five replicates each) collected May 05 - 07 1993, from the upper Athabasca river. Table 3 lists the invertebrates identified and their abundances in seven sets of samples (five replicates each) collected September 15 - 17 1993. Invertebrate counts for the coarse (> 1 mm) fractions can be found in Appendix B; counts and details of subsampling for the fine fraction (< 1 mm > 229 µm) can be found in Appendix C.

The spring samples generally contained fewer organisms than the fall samples. The lowest spring count was 40 individuals for sample ARC 1 93/05/05, while the highest was 2913 for ARATHAB 4 93/05/07. This high number was due to a large number of Ostracoda (96%). The lowest fall count was a total of 513 at site HB, sample B1 93/09/15. The highest total was 8028 for OB B2 93/09/17, the majority of which was tubificid worms (83%).

3.2 QUALITY ASSURANCE/QUALITY CONTROL

Table 4 summarizes the results of resorting 10% of the samples for quality control analysis. Sorting efficiency was acceptable, ranging between 95.6 to 99.8%. The average percentage of organisms overlooked was 1.5 ± 1.5 %.

Table 2. Summary of total invertebrate counts from eight sites on the upper Athabasca River, May 1993.

AREL	**93/05/05** Sorters*: P.H., D.P., K.S.					
		1	2	3	4	5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae			1		
	Tubificidae	102	179	177	372	573
ARTHROPODA						
	ARACHNOIDA					
	ACARI		2			4
	CRUSTACEA					
	CLADOCERA		4			
	OSTRACODA	4	7			
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	31	114	54	106	126
	Tanytarsini		4			3
	Orthocladiinae		7		4	6
	Diamesinae	66	41	70	186	166
	Tanypodinae					1
	Chironomid Pupae		2	4		
	EPHEMEROPTERA					
	Ephemerellidae					
	Serratella					1
MOLLUSCA						
	PELECYPODA					
	Sphaeriidae					
	Pisidium	1				
NEMATODA		1	1			1
	TOTAL	205	361	306	668	881

* Sorters: P.H. = Paul Hvengaard, D.L. = Darcy Lightle, D.P. = Dee Patriquin, K.S. = Karen Saffran, and N.W. = Nancy Westworth

WHB	**93/05/05** Sorters: D.P., K.S	1	2	3	4	5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Tubificidae	114	124	48	52	46
ARTHROPODA						
	ARACHNOIDA					
	ACARI	2				1
	CRUSTACEA					
	CLADOCERA					43
	COPEPODA	10	12			4
	OSTRACODA			8	12	8
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	55	12	24	33	32
	Tanytarsini	1			1	1
	Orthocladiinae	25	2		9	
	Diamesinae		8		6	1
	Tanypodinae	3	6	6		45
	Chironomid Pupae	10	2	5	3	23
	EPHEMEROPTERA					
	Baetidae					
	Baetis	2				
	PLECOPTERA (small)	2				
MOLLUSCA						
	PELECYPODA					
	Sphaeriidae					
	Pisidium			1		
NEMATODA		2			8	1
TARDIGRADA		2				
	TOTAL	228	166	92	124	205

ARATHAB 93/05/07 Sorters: D.P., K.S.	1	2	3	4	5
ANNELIDA					
OLIGOCHAETA					
HAPLOTAXIDA					
Naididae		4		3	
Tubificidae	14	13	6	5	12
ARTHROPODA					
CRUSTACEA					
CLADOCERA	12		4	16	4
COPEPODA	40	176	4	20	32
OSTRACODA	240	192	256	2800	412
INSECTA					
DIPTERA					
Ceratopogonidae		1			
Chironomidae					
Chironomini	14	119	6	9	17
Tanytarsini	31	17		34	18
Orthocladiinae	3	8	5	8	4
Diamesinae		4			
Tanypodinae	1		1		
Chironomid Pupae		1	1		
MOLLUSCA					
GASTROPODA					
PULMONATA					
Lymnaeidae	1		1	1	1
PELECYPODA					
Sphaeriidae					
Pisidium		5	1	1	1
NEMATODA	8	16		16	4
TOTAL	364	556	285	2913	505

ARC	93/05/05 Sorters: P.H., D.P., K.S.	1	2	3	4	5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Tubificidae		10	4	5	4
ARTHROPODA						
	ARACHNOIDA					
	ACARI		5		1	
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	18	26	35	74	44
	Tanytarsini	8				
	Orthocladiinae	9			15	9
	Diamesinae	4	8		8	1
	Chironomid Adult	1			1	
	Empididae					
	Chelifera			1		
	PLECOPTERA (small)			2		
	TOTAL	40	49	42	104	58

OB	93/05/05 Sorters: D.P., K.S.	1	2	3	4	5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Tubificidae	18	5	4	41	29
ARTHROPODA						
	ARACHNOIDA					
	ACARI	2	12		152	
	CRUSTACEA					
	CLADOCERA				4	
	COPEPODA		72	4	8	
	INSECTA					
	DIPTERA					
	Ceratopogonidae				1	
	Chironomidae					
	Chironomini	46	417	207	262	388
	Tanytarsini	1	23	26	12	16
	Orthocladiinae	3	21	44	27	8
	Diamesinae	102	268	119	349	234
	Tanypodinae	1	5	1	24	2
	Chironomid Pupae		1			
	Chironomid Adult	1	13		16	14
	Empididae					
	Chelifera				1	
	Hemerodromia	1			1	
	EPHEMEROPTERA					
	Ephemerellidae					
	Serratella		1			2
NEMATODA						4
	TOTAL	175	838	405	898	697

ARBR	**93/05/06** Sorters: D.P, K.S.	1	2	3	4	5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Tubificidae	653	1664	426	1316	324
ARTHROPODA						
	CRUSTACEA					
	CLADOCERA		8		16	
	COPEPODA	8		12	4	
	OSTRACODA	8			4	
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	39	90	47	49	61
	Tanytarsini		15			7
	Orthocladiinae	6	1	6	1	1
	Diamesinae		13	1	8	35
	Tanypodinae	1		1	5	2
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae	1				
	PELECYPODA					
	Sphaeriidae					
	Pisidium			2	1	
NEMATODA					8	
	TOTAL	716	1791	495	1412	430

ARBER	**93/05/06**	Sorters: D.P., K.S.	1	2	3	4	5
ANNELIDA							
	OLIGOCHAETA						
		HAPLOTAXIDA					
		Enchytraeidae					1
		Naididae	1				
		Tubificidae	145	209	137	47	154
ARTHROPODA							
INSECTA							
	DIPTERA						
		Chironomidae					
		Chironomini	41	59	54	52	58
		Tanytarsini		1			
		Orthocladiinae	31	11	19	47	43
		Diamesinae	10	15	19	1	7
		Chironomid Pupae	3	1	2		5
	EPHEMEROPTERA						
		Ephemerellidae	1				
NEMATODA				8	8		16
		TOTAL	232	304	239	147	284

ARW	**93/05/06** Sorters: D.P., K.S.	1	2	3	4	5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Tubificidae	464	733	231	185	143
ARTHROPODA						
	ARACHNOIDA					
	ACARI	1				1
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	48	49	27	42	28
	Tanytarsini		4		1	1
	Orthocladiinae	2	17		1	
	Diamesinae	28	55	17	43	18
	Tanypodinae		1	1		
	EPHEMEROPTERA					
	Ephemerellidae					
	Serratella					1
	MOLLUSCA					
	PELECYPODA					
	Sphaeriidae					
	Pisidium			1		
	TOTAL	543	859	277	272	192

Table 3. Summary of total invertebrate counts from eight sites on the upper Athabasca river, September 1993.

ABR	**93/09/17** Sorters: D.P., K.S.	1B	2B	3B	4B	5B
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae	32	8	3	17	47
	Tubificidae	2004	2396	627	403	159
ARTHROPODA						
	ARACHNOIDA					
	ACARI					6
	CRUSTACEA					
	CLADOCERA	108	244	20	48	48
	COPEPODA	164	120	64	57	100
	OSTRACODA		24	4		12
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	662	409	317	370	422
	Tanytarsini	64	54	51	219	173
	Orthocladiinae	1	7	4	8	9
	Diamesinae	11	12	15	11	20
	Tanypodinae	12				1
	Chironomid Pupae					1
	EPHEMEROPTERA (small)					4
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae			1	1	1
	PELECYPODA					
	Sphaeriidae					
	Pisidium	12	12	1	3	7
NEMATODA		8	16			4
	TOTAL	3078	3302	1107	1137	1014

WB	93/09/17 Sorters: D.P., K.S.	B1	B2	B3	B4	B5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae					4
	Tubificidae	2936	2166	1242	2004	4188
ARTHROPODA						
	CRUSTACEA					
	CLADOCERA	336	48	8	8	76
	COPEPODA	12	12			
	OSTRACODA	40	28	21	17	52
	INSECTA					
	DIPTERA					
	Ceratopogonidae	1			1	1
	Chironomidae					
	Chironomini	198	138	121	138	264
	Tanytarsini	9	36	16	9	28
	Diamesinae	17			1	
	Tanypodinae	3	88	153	123	215
	Tabanidae					
	Chrysops			1		
	HEMIPTERA					
	Corixidae		1	1		
	TRICHOPTERA					
	Limnephilidae					1
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae			1		
	PELECYPODA					
	Sphaeriidae					
	Pisidium	42	21	4	16	24
NEMATODA		1		4		20
	TOTAL	3595	2538	1572	2317	4873

OB	93/09/17 Sorters: D.L., D.P., K.S.	B1	B2	B3	B4	B5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae	48	31	36	65	43
	Tubificidae	364	6678	2179	1503	2972
ARTHROPODA						
	ARACHNOIDA					
	ACARI	4	1	4	22	5
	CRUSTACEA					
	CLADOCERA	128	552	368	336	660
	COPEPODA	16	20	20	20	20
	OSTRACODA	68	20	32	60	24
	INSECTA					
	DIPTERA					
	Ceratopogonidae					1
	Chironomidae					
	Chironomini	255	317	354	340	418
	Tanytarsini	152	120	65	209	158
	Orthocladiinae	41	24	51	186	77
	Diamesinae	231	189	271	310	240
	Tanypodinae	13	15	6	57	25
	Empididae					
	Chelifera	4	4			
	EPHEMEROPTERA					
	Ephemerellidae				12	
	HEMIPTERA					
	Corixidae	1				1
	PLECOPTERA (small)	1				
	TRICHOPTERA					
	Brachycentridae					
	Brachycentrus	1	2	1		1

CONTINUED.../

OB	93/09/17	/...CONTINUED				
		B1	B2	B3	B4	B5
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae			2	1	
	Physidae					
	Physa	1				
	PELECYPODA					
	Sphaeriidae					
	Pisidium	23	47	10	29	29
NEMATODA		20	8	12	4	12
	TOTAL	1371	8028	3411	3154	4686

ARC	93/09/15 Sorters: D.L., D.P., K.S.	B1	B2	B3	B4	B5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae	1	20	2	6	16
	Tubificidae	8	4	32	30	45
ARTHROPODA						
	ARACHNOIDA					
	ACARI		4	11	2	2
	CRUSTACEA					
	CLADOCERA	128	108	96	160	368
	COPEPODA	56	36	40	52	96
	OSTRACODA		84	44	164	288
	INSECTA					
	DIPTERA					
	Ceratopogonidae				2	
	Chironomidae					
	Chironomini	89	172	166	135	111
	Tanytarsini	238	384	264	342	714
	Orthocladiinae	43	45	81	31	143
	Diamesinae	60	124	137	147	110
	Tanypodinae	2	23	4	11	21
	Chironomid Pupae	1	2		1	1
	Empididae	8				
	EPHEMEROPTERA					
	Baetidae					
	Baetis	4				
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae			1	1	
NEMATODA			21	30	12	
	TOTAL	638	1027	908	1096	1915

ARC2	93/09/15 Sorters: D.L., D.P., K.S.	B1	B2	B3	B4	B5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae	9	4	6	8	6
	Tubificidae	268	261	22	22	251
ARTHROPODA						
	ARACHNOIDA					
	ACARI	9	4	4	4	12
	CRUSTACEA					
	CLADOCERA	272	192	120	204	252
	COPEPODA	16	16		4	12
	OSTRACODA	64	24	76	80	80
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	143	204	206	191	122
	Tanytarsini	338	221	515	658	274
	Orthocladiinae	62	73	37	101	77
	Diamesinae	123	69	27	41	57
	Tanypodinae	8	5		9	4
	Chironomid Pupae	5	3	3	3	2
	PLECOPTERA (small)		4			
NEMATODA		16		8		12
	TOTAL	1333	1080	1024	1325	1161

HB	93/09/15 Sorters: K.S., N.W.	B1	B2	B3	B4	B5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae	16	11	7	13	8
	Tubificidae	252	189	149	292	410
ARTHROPODA						
	ARACHNOIDA					
	ACARI				6	
	CRUSTACEA					
	CLADOCERA	36	44	108	56	232
	COPEPODA	36	40	256	204	104
	OSTRACODA	28	116	244	148	180
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	39	46	131	136	112
	Tanytarsini	20	36	136	113	102
	Orthocladiinae	24	45	185	90	109
	Diamesinae	23	42	133	67	90
	Tanypodinae	9	25	101	39	40
	Chironomid Adult					4
	HEMIPTERA					
	Corixidae			1		4
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae	4		1		
	Planorbidae	1				1
	PELECYPODA					
	Sphaeriidae					
	Pisidium	9	6	10	9	1
NEMATODA		16	16	16	20	24
	TOTAL	513	616	1478	1193	1421

EL	93/09/15 Sorters: D.L, K.S., N.W.					
		B1	B2	B3	B4	B5
ANNELIDA						
	OLIGOCHAETA					
	HAPLOTAXIDA					
	Naididae	76	70	26	4	35
	Tubificidae	1653	2501	3532	1015	1746
ARTHROPODA						
	ARACHNOIDA					
	ACARI	15	13	13	14	13
	CRUSTACEA					
	CLADOCERA	480	600	348	64	196
	COPEPODA	4	8	12		
	OSTRACODA	17	24	44	12	12
	INSECTA					
	DIPTERA					
	Chironomidae					
	Chironomini	244	388	360	323	325
	Tanytarsini	13	23	20	32	46
	Orthocladiinae	20	18	26	33	29
	Diamesinae	210	290	280	227	251
	Tanypodinae	46	46	6	38	28
	Empididae					
	Chelifera				4	
	EPHEMEROPTERA					
	Ephemerellidae	4	4	4		
	MEGALOPTERA					
	Sialidae					
	Sialis	1				
	PLECOPTERA (small)	1				
MOLLUSCA						
	GASTROPODA					
	PULMONATA					
	Lymnaeidae		1		1	
	PELECYPODA					
	Sphaeriidae					
	Pisidium	7	6	2	1	5
NEMATODA			12	4	4	
	TOTAL	2791	4004	4677	1772	2686

Table 4. Summary of results of resorted samples for quality assurance and control analysis.

ARATHAB 1	**93/05/07**
ARTHROPODA	
CRUSTACEA	
CLADOCERA	1
OSTRACODA	2
INSECTA	
DIPTERA	
Chironomidae	
Chironomini	1
Orthocladiinae	1
QA/QC TOTAL	5
TOTAL COUNTED	109
% ERROR*	4.39%

WHB 1	**93/05/05**
ANNELIDA	
OLIGOCHAETA	1
ARTHROPODA	
CRUSTACEA	
COPEPODA	3
INSECTA	
DIPTERA	
Chironomidae	
Orthocladiinae	1
NEMATODA	1
QA/QC TOTAL	6
TOTAL COUNTED	205
% ERROR	2.84%

ARBR 2	**93/05/06**
ANNELIDA	
OLIGOCHAETA	8
ARTHROPODA	
CRUSTACEA	
CLADOCERA	1
INSECTA	
DIPTERA	
Chironomidae	
Chironomini	2
Orthocladiinae	1
QA/QC TOTAL	12
TOTAL COUNTED	1056
% ERROR	1.12%

OB 2	**93/05/05**
ARTHROPODA	
ARACHNOIDA	
ACARI	1
QA/QC TOTAL	1
TOTAL COUNTED	562
% ERROR	0.18%

*%ERROR = QA/QC TOTAL/(TOTAL COUNTED +QA/QC TOTAL)x100

OB B5	93/09/16	
ANNELIDA		
	OLIGOCHAETA	33
ARTHROPODA		
	INSECTA	
	DIPTERA	
	Chironomidae	
	Chironomini	3
	Tanytarsini	4
	Orthocladiinae	1
	Diamesinae	2
	Tanypodinae	1
QA/QC TOTAL		44
TOTAL COUNTED		1884
% ERROR		2.28%

ARC B3	93/09/15	
ARTHROPODA		
	CRUSTACEA	
	CLADOCERA	1
QA/QC TOTAL		1
TOTAL COUNTED		467
% ERROR		0.21%

WB B3	93/09/17	
ANNELIDA		
	OLIGOCHAETA	4
QA/QC TOTAL		4
TOTAL COUNTED		978
% ERROR		0.41%

ARC2 B4	93/09/15	
ARTHROPODA		
	INSECTA	
	DIPTERA	
	Chironomidae	
	Chironomini	2
	Tanytarsini	1
QA/QC TOTAL		3
TOTAL COUNTED		695
% ERROR		0.43%

4.0 REFERENCES

Alberta Environment. 1990. Selected Methods for the Monitoring of Benthic Invertebrates in Alberta Rivers. Environmental Quality Monitoring Branch. 41 pp.

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Merrit, R.W. and K.W. Cummins. 1984. An Introduction to the Aquatic Insects of North America. 2nd ed. Kendall/Hunt Publishing Company, Iowa. 722 pp.

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APPENDIX A: TERMS OF REFERENCE

OBJECTIVE

The purpose of this project is to process 75 benthic invertebrate samples which have been collected by Ponar or Eckman dredge from depositional areas of the upper Athabasca river.

REQUIREMENTS

1. Unless specified otherwise the identification and enumeration of aquatic invertebrates should follow procedures outlined in Alberta Environment (1990). All Quality Assurance/Quality Control (QA/QC) procedures must be documented at each phase of the sample processing according to Environment Canada (1993). Sorting will be completed by one person; identification should also involve only one person per major taxonomic grouping. The contractor must provide names and qualifications of the persons that will sort and identify samples. The person(s) who completed the QA/QC protocols must be identified.

2. Sorting must be performed under a dissecting microscope at no less than 6X magnification. Particularly abundant taxa may be subsampled according to methods outlined in Wrona et al. (1982). A minimum of five, 50 mL subsamples are required. Residue from sorted samples and unsorted portions of samples which were subsampled must be preserved in 80% ethanol, labelled appropriately, and returned to the Scientific Authority for this project.

3. Identification must be to genus when possible (i.e., for Ephemeroptera, Plecoptera, Trichoptera, Diptera, except Chironomidae, and remaining groups). Chironomidae will be identified to sub-family. As required, slidemounts will be made for high power microscopy. Individual genera of Ephemeroptera, Plecoptera, Trichoptera, Chironomidae (sub-family) and remaining groups must be stored in separate vials indicating what sample portions represent. All specimens must be returned to the Scientific Authority.

DELIVERABLES

1. The contractor is to prepare a comprehensive data report that includes the following information: invertebrate counts for each taxon, appropriately weighted for subsampling volume; the portion of the sample sorted and counts of each taxa in each subsample; and, details of QA/QC at all steps of the sample processing.

2. Ten copies of the draft report are to be submitted to the Component Coordinator.

3. Three weeks after receipt of review comments the consultant is to submit ten cerlox bound copies and two unbound, camera-ready originals of the final report to the Component Coordinator. An electronic copy of the report, in Word Perfect 5.1 format, is to be submitted at the same time as the final report. Data presented in tables, figures, appendices, etc. in the final report are also to be submitted in electronic form.

APPENDIX B: COARSE (>1mm) FRACTION COUNTS FOR MAY AND SEPTEMBER - 1993 SAMPLES FROM THE ATHABASCA RIVER

Site:	WHB	Date:	93/05/05	Fraction:	> 1mm
Sample #:	1	2	3	4	5
Oligochaeta	110	100	44	48	42
Enchytraeidae					
Naididae					
Tubificidae	110	100	44	48	42
Hydracarina					1
Cladocera					3
Chironomidae					
Chironomini	37	12	12	25	32
Tanytarsini	1			1	1
Orthocladiinae	21	2		5	
Diamesinae		4		6	1
Tanypodinae	1	2	6		41
Chironomid Pupae	10	2	5	3	23
Ephemeroptera					
Baetis	2				
Sphaeriidae					
Pisidium			1		
Nematoda					1
Total	182	122	68	88	145

Site:	AREL	Date:	93/05/05	Fraction:	> 1mm
Sample #:	1	2	3	4	5
	*Subsampled(1/4) for identification				
Oligochaeta	90	167	150	188	*517
Enchytraeidae					
Naididae			1		
Tubificidae	90	167	149	188	517
Hydracarina		2			
Ostracoda		3			
Chironomidae					
Chironomini	27	90	38	54	106
Tanytarsini		4			3
Orthocladiinae		7			6
Diamesinae	62	37	70	166	162
Tanypodinae					1
Chironomid Pupae		2			
Ephemeroptera					
Serratella					1
Sphaeriidae					
Pisidium	1				
Nematoda	1	1			1
Total	181	313	258	408	797

Site:	ARATHAB	Date:	93/05/07	Fraction:	> 1mm
Sample #:	1	2	3	4	5

Oligochaeta	6	13	2	8	8
Enchytraeidae					
Naididae				3	
Tubificidae	6	13	2	5	8
Ceratopogonidae		1			
Chironomidae					
Chironomini	6	11	2	5	1
Tanytarsini	7	1		6	2
Orthocladiinae	3		1	4	
Diamesinae					
Tanypodinae	1		1		
Chironomid Pupae		1	1		
Gastropoda					
Lymnaeidae	1		1	1	1
Sphaeriidae					
Pisidium		1	1	1	1
Total	24	28	9	25	13

Site:	ARC	Date:	93/05/05	Fraction:	> 1mm
Sample #:	1	2	3	4	5
Oligochaeta		2		1	
Enchytraeidae					
Naididae					
Tubificidae		2		1	
Hydracarina		1		1	
Chironomidae					
Chironomini	10	14	7	18	20
Tanytarsini					
Orthocladiinae	1			7	1
Diamesinae		4		4	1
Tanypodinae					
Chironomid Pupae	1			1	
Empididae					
Chelifera			1		
Plecoptera			2		
Total	12	21	10	32	22

Site:	OB	Date:	93/05/05	Fraction:	> 1mm
Sample #:	1	2	3	4	5
Oligochaeta	8	1	4	17	13
Enchytraeidae					
Naididae					
Tubificidae	8	1	4	17	13
Hydracarina		8		24	
Ceratopogonidae				1	
Chironomidae					
Chironomini	33	173	55	86	176
Tanytarsini	1	23	22	8	16
Orthocladiinae	1	5	8	7	4
Diamesinae	92	240	103	297	198
Tanypodinae	1	5	1	16	2
Chironomid Pupae	1	13		16	14

Adult Chironomid		1			
Empididae					
Chelifera				1	
Hemerodromia	1			1	
Ephemeroptera					
Serratella		1			2
Total	138	470	193	474	425

Site:	ARBR	Date:	93/05/06	Fraction:	> 1mm
Sample #:	1	2	3	4	5
	*Subsampled(1/4) for identification				
Oligochaeta	293	*780	290	*408	108
Enchytraeidae					
Naididae					
Tubificidae	293	780	290	408	108
Chironomidae					
Chironomini	7	10	19	21	13
Tanytarsini		7			7
Orthocladiinae	2	1	6	1	1
Diamesinae		13	1	8	31
Tanypodinae	1		1	1	2
Gastropoda					
Lymnaeidae	1				
Sphaeriidae					
Pisidium			2	1	
Total	304	811	319	440	162

Site:	ARBER	Date:	93/05/06	Fraction:	> 1mm
Sample #:	1	2	3	4	5
Oligochaeta	58	145	85	11	123
Enchytraeidae					1
Naididae	1				
Tubificidae	57	145	85	11	122
Chironomidae					
Chironomini	33	31	30	24	46
Tanytarsini		1			
Orthocladiinae	19	11	19	31	27
Diamesinae	10	15	19	1	7
Tanypodinae					
Chironomid Pupae	3	1	2		5
Ephemeroptera					
Ephemerella	1				
Total	124	204	155	67	208

Site:	ARW	Date:	93/05/06	Fraction:	> 1mm
Sample #:	1	2	3	4	5
	*Subsampled(1/4) for identification				
Oligochaeta	*424	*457	163	145	115
Enchytraeidae					
Naididae					
Tubificidae	424	457	163	145	115
Hydracarina	1				1

Chironomidae					
Chironomini	24	33	15	18	24
Tanytarsini		4		1	1
Orthocladiinae	2	9		1	
Diamesinae	28	51	17	39	18
Tanypodinae		1	1		
Ephemeroptera					
Serratella					1
Sphaeriidae					
Pisidium			1		
Total	479	555	197	204	160

Site:	ABR	Date:	93/09/17	Fraction:	> 1mm
Sample #:	1B	2B	3B	4B	5B
	*Subsampled(1/4) for identification				
Oligochaeta	*820	*872	274	116	106
Enchytraeidae					
Naididae			3	9	23
Tubificidae	820	872	271	107	83
Hydracarina					2
Copepoda				1	
Chironomidae					
Chironomini	578	365	225	270	286
Tanytarsini	8	6	11	11	13
Orthocladiinae	1	3			1
Diamesinae	11	4	11	7	4
Tanypodinae	4				1
Chironomid Pupae					1
Gastropoda					
Lymnaeidae			1	1	1
Sphaeriidae					
Pisidium	12	12	1	3	7
Total	1434	1262	523	409	422

Site:	WB	Date:	93/09/17	Fraction:	> 1mm
Sample #:	B1	B2	B3	B4	B5
	*Subsampled(1/4) for identification				
Oligochaeta	*1576	*1138	*510	*856	*1640
Enchytraeidae					
Naididae					4
Tubificidae	1576	1138	510	856	1636
Ostracoda			1	1	
Ceratopogonidae	1			1	1
Chironomidae					
Chironomini	158	118	121	130	232
Tanytarsini	1	16	8	5	12
Orthocladiinae					
Diamesinae	17			1	
Tanypodinae	3	76	137	119	171
Tabanidae					
Chrysops			1		
Hemiptera					
Corixidae		1	1		
Trichoptera					
Limnephilidae					1
Gastropoda					
Lymnaeidae			1		
Sphaeriidae					
Pisidium	42	21	4	16	24
Nematoda	1				
Total	1799	1370	784	1129	2081

Site:	OB	Date:	93/09/17	Fracton:	> 1mm
Sample #:	B1	B2	B3	B4	B5

*Subsampled(1/4) for identification

Oligochaeta	184	*1301	*531	*456	*599
Enchytraeidae					
Naididae	24	15	8	41	43
Tubificidae	160	1286	523	415	556
Hydracarina		1	4	2	5
Ceratopogonidae					1
Chironomidae					
Chironomini	115	137	126	136	214
Tanytarsini	12	12	9	25	26
Orthocladiinae	5		3	2	13
Diamesinae	15	29	43	38	44
Tanypodinae	9	11	2	13	25
Hemiptera					
Corixidae	1				1
Plecoptera	1				
Trichoptera					
Brachycentrus	1	2	1		1
Gastropoda					
Lymnaeidae			2	1	
Physa	1				
Sphaeriidae					
Pisidium	19	47	6	29	21
Total	363	1540	727	702	950

Site:	ARC	Date:	93/09/15	Fraction:	> 1mm
Sample #:	B1	B2	B3	B4	B5
Oligochaeta	5	16	26	16	21
Enchytraeidae					
Naididae	1	16	2	2	12
Tubificidae	4		24	14	9
Hydracarina			3	2	2
Ceratopogonidae			1	2	
Chironomidae					
Chironomini	65	108	78	83	55
Tanytarsini	122	232	168	226	474
Orthocladiinae	11	25	17	11	59
Diamesinae	8	36	21	15	18
Tanypodinae	2	11	4	3	13
Chironomid Pupae	1	2		1	1
Gastropoda					
Lymnaeidae				1	
Nematoda		1	2		
Total	214	431	320	360	643

Site:	ARC2	Date:	93/09/15	Fraction:	> 1mm
Sample #:	B1	B2	B3	B4	B5
Oligochaeta	73	125	20	22	89
Enchytraeidae					
Naididae	5	4	2	4	2
Tubificidae	68	121	18	18	87
Hydracarina	1		4	4	12
Chironomidae					

Chironomini	31	52	70	95	22
Tanytarsini	62	77	163	322	78
Orthocladiinae	14	9	5	25	5
Diamesinae	3	1	3	9	5
Tanypodinae		1		5	
Chironomid Pupae	1	3	3	3	2
Total	185	268	268	485	213

Site:	HB	Date:	93/09/15	Fraction:	> 1mm
Sample #:	B1	B2	B3	B4	B5
Oligochaeta	104	152	76	145	182
Enchytraeidae					
Naididae	4	3	3	5	8
Tubificidae	100	149	73	140	174
Hydracarina				2	
Chironomidae					
Chironomini	15	22	39	32	32
Tanytarsini	4	20	56	29	22
Orthocladiinae		17	25	10	13
Diamesinae	7	14	21	15	10
Tanypodinae	9	9	45	23	24
Hemiptera					
Corixidae			1		
Gastropoda					
Lymnaeidae	4		1		
Planorbidae	1				1
Sphaeriidae					
Pisidium	9	6	10	9	1
Total	153	240	274	265	285

Site :	EL	Date:	93/09/15	Fraction:	> 1mm
Sample #	B1	B2	B3	B4	B5
	*Subsampled(1/4) for identification				
Oligochaeta	*1253	*1579	*1966	*671	*857
Enchytraeidae					
Naididae	48	58	14	4	27
Tubificidae	1205	1521	1952	667	830
Hydracarina	7	5	5	6	1
Ostracoda	1				
Chironomidae					
Chironomini	108	124	104	95	77
Tanytarsini	5	3	8		2
Orthocladiinae	4	2	6	1	5
Diamesinae	50	86	72	59	47
Tanypodinae	10	10	2	2	
Megaloptera					
Sialis	1				
Plecoptera	1				
Gastropoda					
Lymnaeidae		1		1	
Sphaeriidae					
Pisidium	7	6	2	1	5
Total	1447	1816	2165	836	994

APPENDIX C: FINE (<1mm>229um) FRACTION COUNTS AND SUBSAMPLING RESULTS FOR MAY AND SEPTEMBER 1993 SAMPLES

Site: WHB Sample #:	1	Date:	93/05/05	Fraction:	< 1 mm >	229 um
50 ml Subsamples:		1	2	3	4	5
Oligochaeta			1			
Enchytraeidae						
Naididae						
Tubificidae						
Hydracarina		1				
Cladocera						
Copepoda		1			4	
Ostracoda						
Chironomidae						
Chironomini				1	1	2
Tanytarsini						
Orthocladiinae						1
Diamesinae						
Tanypodinae						
Chironomid Pupae						
Plecoptera (small)		1				
Nematoda						
Tardigrada		1				
Total #		4	1	1	5	3

Site: WHB Sample #:	1	...Continued					
50 ml Subsamples:	Total 50%	6	7	8	9	10	(Total)2
Oligochaeta			1				
Enchytraeidae							0
Naididae							0
Tubificidae	2						4
Hydracarina	1						2
Cladocera	0						0
Copepoda	5						10
Ostracoda	0						0
Chironomidae							
Chironomini	9	2		1		2	18
Tanytarsini	0						0
Orthocladiinae	2				1		4
Diamesinae	0						0
Tanypodinae	1		1				2
Chironomid Pupae	0						0
Plecoptera (small)	1						2
Nematoda	1				1		2
Tardigrada	1						2
Total #	23	2	2	1	2	2	46

Site: WHB Sample #:	2	Date:	93/05/05	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	1		1	2	
Enchytraeidae							0

Naididae							0
Tubificidae	6						24
Cladocera	0						0
Copepoda	3	1	1	1			12
Ostracoda	0						0
Chironomidae							
Chironomini	0						0
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1			1			4
Tanypodinae	1	1					4
Chironomid Pupae	0						0
Nematoda	0						0
Total #	11	4	2	2	1	2	44

Site: WHB Sample #:	3	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta			1				
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	0						0
Copepoda	0						0
Ostracoda	2	1			1		8
Chironomidae							
Chironomini	3			1	2		12
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	6	1	1	1	3	0	24

Site: WHB Sample #:	4	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta			1				
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	0						0
Copepoda	0						0
Ostracoda	3		1		1	1	12
Chironomidae							
Chironomini	2	1			1		8
Tanytarsini	0						0
Orthocladiinae	1					1	4
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	2				1	1	8
Total #	9	1	2	0	3	3	36

Site: WHB Sample #:	5	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta			1				
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	10	4	4		2		40
Copepoda	1		1				4
Ostracoda	2	1	1				8
Chironomidae							
Chironomini	0						0
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	1	1					4
Chironomid Pupae	0						0
Nematoda	0						0
Total #	15	6	7	0	2	0	60

Site: AREL Sample #:	1	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)*4
Oligochaeta		1	1	1			
Enchytraeidae							0
Naididae							0
Tubificidae	3						12
Cladocera	0						0
Copepoda	0						0
Ostracoda	1				1		4
Chironomidae							
Chironomini	1	1					4
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1		1				4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	6	2	2	1	1	0	24

Site: AREL Sample #:	2	Date:	93/05/05	Fraction:	< 1mm >	229 um	
50 ml Subsample:	Total 25%	1	2	3	4	5	(Total)*4
Oligochaeta			1		1	1	
Enchytraeidae							0
Naididae							0
Tubificidae	3						12
Cladocera	1			1			4
Copepoda	0						0
Ostracoda	1					1	4
Chironomidae							
Chironomini	6	1	1	2	1	1	24

Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1					1	4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda							0
Total #	12	1	2	3	2	4	48

Site: AREL Sample #:	3	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1	2	1	1	2	
Enchytraeidae							0
Naididae							0
Tubificidae	7				1		28
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	4	4					16
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	1		1				4
Nematoda	0						0
Total #	12	5	3	1	2	2	48

Site: AREL Sample #:	4	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		9	8	11	8	10	
Enchytraeidae							0
Naididae							0
Tubificidae	46						184
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	13	2	6	1	1	3	52
Tanytarsini	0						0
Orthocladiinae	1	1					4
Diamesinae	5		1	1	2	1	20
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	65	12	15	13	11	14	260

Site: AREL Sample #:	5	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1	4	3	2	4	
Enchytraeidae							0

Naididae							0
Tubificidae	14						56
Hydracarina	1					1	4
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	5	1			3	1	20
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1					1	4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	21	2	4	3	5	7	84

Site: ARATHAB Sample #:	1	Date:	93/05/07	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1				1	
Enchytraeidae							0
Naididae							0
Tubificidae	2						8
Cladocera	3		1	1	1		12
Copepoda	10	3	3	1	2	1	40
Ostracoda	60	9	10	17	9	15	240
Chironomidae							
Chironomini	2			2			8
Tanytarsini	6	2			3	1	24
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	2		1			1	8
Total #	85	15	15	21	15	19	340

Site: ARATHAB Sample #:	2	Date:	93/05/07	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1					
Enchytraeidae							0
Naididae	1						4
Tubificidae							0
Cladocera	0						0
Copepoda	44	5	9	11	9	10	176
Ostracoda	48	6	8	9	12	13	192
Chironomidae							
Chironomini	27	6	9	2	5	5	108
Tanytarsini	4				3	1	16
Orthocladiinae	2			2			8
Diamesinae	1		1				4
Tanypodinae	0						0
Chironomid Pupae	0						0
Sphaeriidae	0						

Pisidium	1	1					4
Nematoda	4	1	2		1		16
Total #	132	20	29	24	30	29	528

Site: ARATHAB Sample #:	3	Date:	93/05/07	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta			1				
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	1			1			4
Copepoda	1	1					4
Ostracoda	64	16	10	13	11	14	256
Chironomidae							
Chironomini	1		1				4
Tanytarsini	0						0
Orthocladiinae	1	1					4
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	69	18	12	14	11	14	276

Site: ARATHAB Sample #:	4	Date:	93/05/07	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta							
Enchytraeidae							0
Naididae							0
Tubificidae							0
Cladocera	4	1			1	2	16
Copepoda	5	1	1	2		1	20
Ostracoda	700	107	144	140	151	158	2800
Chironomidae							
Chironomini	1	1					4
Tanytarsini	7	1	2		1	3	28
Orthocladiinae	1	1					4
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	4	1	2	1			16
Total #	722	113	149	143	153	164	2888

Site: ARATHAB Sample #:	5	Date:	93/05/07	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta						1	
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	1	1					4
Copepoda	8	4	1	1	2		32

Ostracoda	103	15	20	16	27	25	412
Chironomidae							
Chironomini	4	1	1	1	1		16
Tanytarsini	4	3		1			16
Orthocladiinae	1					1	4
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	1	1					4
Total #	123	25	22	19	30	27	492

Site: ARC Sample #:	1	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta							
Enchytraeidae							0
Naididae							0
Tubificidae							0
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	2	1				1	8
Tanytarsini	2	1			1		8
Orthocladiinae	2	1			1		8
Diamesinae	1		1				4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	7	3	1	0	2	1	28

Site: ARC Sample #:	2	Date:	93/05/05	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta						2	
Enchytraeidae							0
Naididae							0
Tubificidae	2						8
Hydracarnia	1		1				4
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	3			1	1	1	12
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1	1					4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	7	1	1	1	1	3	28

Site: ARC Sample #:	3	Date:	93/05/05	Fraction:	< 1 mm >	229 um	

50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta					1		
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	7	1	1	3	2		28
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	8	1	1	3	3	0	32

Site: ARC Sample #:	4	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1					
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	14	2	2	2	6	2	56
Tanytarsini	0						0
Orthocladiinae	2	2					8
Diamesinae	1			1			4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	18	5	2	3	6	2	72

Site: ARC Sample #:	5	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1					
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	6	5			1		24
Tanytarsini	0						0
Orthocladiinae	2	1				1	8
Diamesinae	0						0

Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	9	7	0	0	1	1	36

Site: OB Sample #:	1	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	Total
	Entire sample counted						
Oligochaeta	10						
Enchytraeidae							0
Naididae							0
Tubificidae	10						10
Hydracarina	2						2
Cladocera							0
Copepoda							0
Ostracoda							0
Chironomidae							
Chironomini	13						13
Tanytarsini							0
Orthocladiinae	2						2
Diamesinae	10						10
Tanypodinae							0
Chironomid Pupae							0
Nematoda							0
Total #	37						37

Site: OB Sample #:	2	Date:	93/05/05	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta					1		
Enchytraeidae							0
Naididae							0
Tubificidae	1						4
Hydracarina	1					1	4
Cladocera	0						0
Copepoda	18	2	4	6	3	3	72
Ostracoda	0						0
Chironomidae							
Chironomini	61	13	6	21	7	14	244
Tanytarsini	0						0
Orthocladiinae	4		2	1	1		16
Diamesinae	7	2		3	1	1	28
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	92	17	12	31	13	19	368

Site: OB Sample #:	3	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta							
Enchytraeidae							0
Naididae							0

Tubificidae							0
Cladocera	0						0
Copepoda	1				1		4
Ostracoda	0						0
Chironomidae							
Chironomini	38	5	6	8	5	14	152
Tanytarsini	1			1			4
Orthocladiinae	9	1	1	3	2	2	36
Diamesinae	4	1		1	2		16
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	53	7	7	13	10	16	212

Site: OB Sample #:	4	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2		1	1	2	
Enchytraeidae							0
Naididae							0
Tubificidae	6						24
Hydracarina	32	4	6	6	9	7	128
Cladocera	1	1					4
Copepoda	2		1	1			8
Ostracoda	0						0
Chironomidae							
Chironomini	44	11	9	10	5	9	176
Tanytarsini	1		1				4
Orthocladiinae	5		2	1	1	1	20
Diamesinae	13		3	5	1	4	52
Tanypodinae	2				1	1	8
Chironomid Pupae	0						0
Nematoda	0						0
Total #	106	18	22	24	18	24	424

Site: OB Sample #:	5	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2		1	1		
Enchytraeidae							0
Naididae							0
Tubificidae	4						16
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	53	12	9	13	13	6	212
Tanytarsini	0						0
Orthocladiinae	1				1		4
Diamesinae	9	3	1	3	1	1	36
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	1		1				4
Total #	68	17	11	17	16	7	272

Site: ARBR Sample #:	1	Date:	93/05/05	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		21	23	11	23	12	
Enchytraeidae							0
Naididae							0
Tubificidae	90						360
Cladocera	0						0
Copepoda	2	1				1	8
Ostracoda	2	1		1			8
Chironomidae							
Chironomini	8	1		3	1	3	32
Tanytarsini	0						0
Orthocladiinae	1	1					4
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	103	25	23	15	24	16	412

Site: ARBR Sample #:	2	Date:	93/05/06	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		57	43	43	37	41	
Enchytraeidae							0
Naididae							0
Tubificidae	221						884
Cladocera	2	1		1			8
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	20	8	4		5	3	80
Tanytarsini	2	2					8
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	245	68	47	44	42	44	980

Site: ARBR Sample #:	3	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		5	7	8	5	9	
Enchytraeidae							0
Naididae							0
Tubificidae	34						136
Cladocera	0						0
Copepoda	3			1	1	1	12
Ostracoda	0						0
Chironomidae							
Chironomini	7	4		1	1	1	28

Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	44	9	7	10	7	11	176

Site: ARBR Sample #:	4	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		45	42	46	43	51	
Enchytraeidae							0
Naididae							0
Tubificidae	227						908
Cladocera	4		1			3	16
Copepoda	1				1		4
Ostracoda	1			1			4
Chironomidae							
Chironomini	7	2	1	4			28
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	1					1	4
Chironomid Pupae	0						0
Nematoda	2	1	1				8
Total #	243	48	45	51	44	55	972

Site: ARBR Sample #:	5	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		10	11	8	11	14	
Enchytraeidae							0
Naididae							0
Tubificidae	54						216
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	12	1	3	1	6	1	48
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1	1					4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	67	12	14	9	17	15	268

Site: ARBER Sample #:	1	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		6	5	5	3	3	
Enchytraeidae							0

Naididae							0
Tubificidae	22						88
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	2				1	1	8
Tanytarsini	0						0
Orthocladiinae	3	1				2	12
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	27	7	5	5	4	6	108

Site: ARBER Sample #:	2	Date:	93/05/06	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		4	4	2	2	4	
Enchytraeidae							0
Naididae							0
Tubificidae	16						64
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	7	3	1	1	1	1	28
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	2				2		8
Total #	25	7	5	3	5	5	100

Site: ARBER Sample #:	3	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	13	4	5	(Total)4
Oligochaeta		3	2	2	2	4	
Enchytraeidae							0
Naididae							0
Tubificidae	13						52
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	6	2	3	1			24
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	2				2		8
Total #	21	5	5	3	4	4	84

Site: ARBER Sample #:	4	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	2	1	2	2	
Enchytraeidae							0
Naididae							0
Tubificidae	9						36
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	7	2	2	1	1	1	28
Tanytarsini	0						0
Orthocladiinae	4			1	2	1	16
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	20	4	4	3	5	4	80

Site: ARBER Sample #:	5	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		3	2	1	1	1	
Enchytraeidae							0
Naididae							0
Tubificidae	8						32
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	3			1	1	1	12
Tanytarsini	0						0
Orthocladiinae	4		1	1	1	1	16
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	4		2		1	1	16
Total #	19	3	5	3	4	4	76

Site: ARW Sample #:	1	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	1	2	3	2	
Enchytraeidae							0
Naididae							0
Tubificidae	10						40
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	6	1	2	2		1	24

Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	16	3	3	4	3	3	64

Site: ARW Sample #:	2	Date:	93/05/06	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		10	12	13	14	20	
Enchytraeidae							0
Naididae							0
Tubificidae	69						276
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	4	1	1	1		1	16
Tanytarsini	0						0
Orthocladiinae	2	1	1				8
Diamesinae	1	1					4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	76	13	14	14	14	21	304

Site: ARW Sample #:	3	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		4	3	3	5	2	
Enchytraeidae							0
Naididae							0
Tubificidae	17						68
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	3		2			1	12
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	20	4	5	3	5	3	80

Site: ARW Sample #:	4	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		3	3	1	2	1	
Enchytraeidae							0

Naididae							0
Tubificidae	10						40
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	6	1	3			2	24
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	1			1			4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	17	4	6	2	2	3	68

Site: ARW Sample #:	5	Date:	93/05/06	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	1	1		3	
Enchytraeidae							0
Naididae							0
Tubificidae	7						28
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Chironomidae							
Chironomini	1					1	4
Tanytarsini	0						0
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Cladocera	0						0
Copepoda	0						0
Ostracoda	0						0
Nematoda	0						0
Total #	8	2	1	1	0	4	32

Site: ABR Sample #:	B1	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		59	61	53	66	65	
Enchytraeidae							0
Naididae	8						32
Tubificidae	296						1184
Cladocera	27	3	6	6	6	6	108
Copepoda	41	6	4	11	8	12	164
Ostracoda	0						0
Chironomidae							
Chironomini	21	4	3	3	5	6	84
Tanytarsini	14	3	1	1	4	5	56
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	2	1			1		8
Chironomid Pupae	0						0
Nematoda	2	1				1	8
Total #	411	77	75	74	90	95	1644

Site: ABR Sample #:	B2	Date:	93/09/17	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		83	76	92	78	54	
Enchytraeidae							0
Naididae	2						8
Tubificidae	381						1524
Cladocera	61	13	11	12	15	10	244
Copepoda	30	4	7	8	6	5	120
Ostracoda	6	2	2		1	1	24
Chironomidae							
Chironomini	11	4	1	1	3	2	44
Tanytarsini	12		4	3	4	1	48
Orthocladiinae	1			1			4
Diamesinae	2		1		1		8
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	4	1	1		1	1	16
Total #	510	107	103	117	109	74	2040

Site: ABR Sample #:	B3	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		21	14	24	19	11	
Enchytraeidae							0
Naididae							0
Tubificidae	89						356
Cladocera	5	1	1	1		2	20
Copepoda	16	3	4	5		4	64
Ostracoda	1	1					4
Chironomidae							
Chironomini	23	7	1	6	5	4	92
Tanytarsini	10	1	4	3	2		40
Orthocladiinae	1				1		4

Diamesinae	1		1				4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	146	34	25	39	27	21	584

Site: ABR Sample #:	B4	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		13	18	13	19	13	
Enchytraeidae							0
Naididae	2						8
Tubificidae	74						296
Cladocera	12	1	1	2	4	4	48
Copepoda	14	2		3	6	3	56
Ostracoda	0						0
Chironomidae							
Chironomini	25	7	6	2	3	7	100
Tanytarsini	52	12	8	10	12	10	208
Orthocladiinae	2		1			1	8
Diamesinae	1					1	4
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	182	35	34	30	44	39	728

Site: ABR Sample #:	B5	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		4	6	3	5	7	
Enchytraeidae							0
Naididae	6						24
Tubificidae	19						76
Hydracarina	1			1			4
Cladocera	12	2	4	3	2	1	48
Copepoda	25	6	4	3	5	7	100
Ostracoda	3	2			1		12
Chironomidae							
Chironomini	34	7	8	4	7	8	136
Tanytarsini	40	6	7	8	8	11	160
Orthocladiinae	2		1	1			8
Diamesinae	4	1		1		2	16
Tanypodinae	0						0
Chironomid Pupae	0						0
Ephemeroptera (small)	1		1				4
Nematoda	1				1		4
Total #	148	28	31	24	29	36	592

Site: WB Sample #:	B1	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		67	62	73	78	60	
Enchytraeidae							0

Naididae							0
Tubificidae	340						1360
Cladocera	84	18	26	16	9	15	336
Copepoda	3	1	1	1			12
Ostracoda	10		1	2	4	3	40
Chironomidae							
Chironomini	10	5	1			4	40
Tanytarsini	2			2			8
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	0						0
Total #	449	91	91	94	91	82	1796

Site: WB Sample #:	B2	Date:	93/09/17	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		47	42	64	55	49	
Enchytraeidae							0
Naididae							0
Tubificidae	257						1028
Cladocera	12	1	3	2	5	1	48
Copepoda	3		2		1		12
Ostracoda	7	1	2		1	3	28
Chironomidae							
Chironomini	5		1	3		1	20
Tanytarsini	5	1	1	1	1	1	20
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	3				3		12
Chironomid Pupae	0						0
Nematoda	0						0
Total #	292	50	51	70	66	55	1168

Site: WB Sample #:	B3	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		44	28	33	37	41	
Enchytraeidae							0
Naididae							0
Tubificidae	183						732
Cladocera	2	1			1		8
Copepoda	0						0
Ostracoda	5	1		1	1	2	20
Chironomidae							
Chironomini	0						0
Tanytarsini	2	1		1			8
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	4	2	1		1		16
Chironomid Pupae	0						0
Nematoda	1		1				4
Total #	197	49	30	35	40	43	788

Site: WB Sample #:	B4	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		56	61	55	60	55	
Enchytraeidae							0
Naididae							0
Tubificidae	287						1148
Cladocera	2		1			1	8
Copepoda	0						0
Ostracoda	4	3				1	16
Chironomidae							
Chironomini	2	2					8
Tanytarsini	1				1		4
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	1	1					4
Chironomid Pupae	0						0
Nematoda	0						0
Total #	297	62	62	55	61	57	1188

Site: WB Sample #:	B5	Date:	93/09/17	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
	*Subsampled(1/4) for identification						
Oligochaeta *		112	127	125	142	132	
Enchytraeidae							0
Naididae							0
Tubificidae	638						2552
Cladocera	19	4	7	4	4		76
Copepoda	0						0
Ostracoda	13	5	2	4	1	1	52
Chironomidae							
Chironomini	8	2	3		2	1	32
Tanytarsini	4	1	1		2		16
Orthocladiinae	0						0
Diamesinae	0						0
Tanypodinae	11	3	1		4	3	44
Chironomid Pupae	0						0
Nematoda	5	1	1	1		2	20
Total #	698	128	142	134	155	139	2792

Site: OB Sample #:	B1	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		15	5	9	13	15	
Enchytraeidae							0
Naididae	6						24
Tubificidae	51						204
Hydracarina	1	1					4
Cladocera	32	9	7	7	6	3	128
Copepoda	4		1	1	1	1	16
Ostracoda	17	6	3	2	4	2	68
Chironomidae							

Chironomini	35	10	6	4	8	7	140
Tanytarsini	35	7	10	6	4	8	140
Orthocladiinae	9	4	2	1	2		36
Diamesinae	54	11	15	7	14	7	216
Tanypodinae	1				1		4
Chironomid Pupae	0						0
Empididae							
Chelifera	1					1	4
Sphaeriidae							
Pisidium	1					1	4
Nematoda	5	2				3	20
Total #	252	65	49	37	53	48	1008

Site: OB Sample #:	B2	Date:	93/09/16	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
	*Subsampled(1/4) for identification						
Oligochaeta *		301	259	284	249	259	
Enchytraeidae							0
Naididae	4						16
Tubificidae	1348						5392
Cladocera	138	34	24	32	17	31	552
Copepoda	5	1			1	3	20
Ostracoda	5	2	1	1		1	20
Chironomidae							
Chironomini	45	10	8	6	11	10	180
Tanytarsini	27	6	5	8	2	6	108
Orthocladiinae	6	3		1	2		24
Diamesinae	40	7	8	5	13	7	160
Tanypodinae	1				1		4
Chironomid Pupae	0						0
Emididae							
Chelifera	1	1					4
Nematoda	2		1			1	8
Total #	1622	365	306	337	296	318	6488

Site: OB Sample #:	B3	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		72	95	94	83	77	
Enchytraeidae							0
Naididae	7						28
Tubificidae	414						1656
Cladocera	92	10	22	29	14	17	368
Copepoda	5	1	3			1	20
Ostracoda	8	2		3	1	2	32
Chironomidae							
Chironomini	57	7	10	10	18	12	228
Tanytarsini	14	5	4		4	1	56
Orthocladiinae	12	3	3	1	3	2	48
Diamesinae	57	11	8	17	10	11	228
Tanypodinae	1		1				4
Chironomid Pupae	0						0
Sphaeriidae							
Pisidium	1	1					4

Nematoda	3	1		1		1	12
Total #	671	113	146	155	133	124	2684

Site: OB Sample #:	B4	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		59	50	57	60	52	
Enchytraeidae							0
Naididae	6						24
Tubificidae	272						1088
Hydracarina	5		2	1		2	20
Cladocera	86	15	14	16	19	22	344
Copepoda	5		2	1	1	1	20
Ostracoda	15	8	1	2	3	1	60
Chironomidae							
Chironomini	51	11	12	12	8	8	204
Tanytarsini	46	7	4	7	17	11	184
Orthocladiinae	46	11	7	10	13	5	184
Diamesinae	68	17	10	20	10	11	272
Tanypodinae	11	1	3	2	3	2	44
Chironomid Pupae	0						0
Ephemeroptera							
Ephemerellidae	3	2				1	12
Nematoda	1		1				4
Total #	615	131	106	128	134	116	2456

Site: OB Sample #:	B5	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
	*Subsampled(1/4) for identification						
Oligochaeta *		133	105	134	125	107	
Enchytraeidae							0
Naididae							0
Tubificidae	604						2416
Cladocera	165	30	29	49	25	32	660
Copepoda	5	1	1		1	2	20
Ostracoda	6	1	2	1		2	24
Chironomidae							
Chironomini	51	15	5	16	10	5	204
Tanytarsini	33	10	5	7	8	3	132
Orthocladiinae	16	4	5	1	5	1	64
Diamesinae	49	8	7	17	9	8	196
Tanypodinae	0						0
Chironomid Pupae	0						0
Sphaeriidae							
Pisidium	2				1	1	8
Nematoda	3	1		1		1	12
Total #	934	203	159	226	184	162	3736

Site: ARC Sample #:	B1	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta						1	
Enchytraeidae							0

Naididae							0
Tubificidae	1						4
Cladocera	32	7	6	3	8	8	128
Copepoda	14	5	4	1	2	2	56
Ostracoda	0						0
Chironomidae							
Chironomini	6	1	1		2	2	24
Tanytarsini	29	6	4	9	3	7	116
Orthocladiinae	8	4		1	3		32
Diamesinae	13	3	2	2	2	4	52
Tanypodinae	0						0
Chironomid Pupae	0						0
Empididae	2	1	1				8
Ephemeroptera							
Baetis	1			1			4
Nematoda	0						0
Total #	106	27	18	17	20	24	424

Site: ARC Sample #:	B2	Date:	93/09/15	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta			1	1			
Enchytraeidae							0
Naididae	1						4
Tubificidae	1						4
Hydracarina	1	1					4
Cladocera	27	9	5	4	2	7	108
Copepoda	9	1		1	2	5	36
Ostracoda	21	4	2	3	4	8	84
Chironomidae							
Chironomini	16	3	5	1	4	3	64
Tanytarsini	38	11	5	5	12	5	152
Orthocladiinae	5		2	1		2	20
Diamesinae	22	3	5	2	7	5	88
Tanypodinae	3	2		1			12
Chironomid Pupae	0						0
Nematoda	5	1			1	3	20
Total #	149	35	25	19	32	38	596

Site: ARC Sample #:	B3	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta			1		1		
Enchytraeidae							0
Naididae							0
Tubificidae	2						8
Hydracarina	2				1	1	8
Cladocera	24	7	5	3	4	5	96
Copepoda	10	2	1	2	3	2	40
Ostracoda	11	3	1	1	2	4	44
Chironomidae							
Chironomini	22	3	4	3	5	7	88
Tanytarsini	24	4	3	5	5	7	96
Orthocladiinae	16	6	4	3	1	2	64

Diamesinae	29	7	5	3	6	8	116
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	7	1	2	1	2	1	28
Total #	147	33	26	21	30	37	588

Site: ARC Sample #:	B4	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta				1	2	2	
Enchytraeidae							0
Naididae	1						4
Tubificidae	4						16
Cladocera	40	5	10	13	7	5	160
Copepoda	13	4	4	3		2	52
Ostracoda	41	8	7	5	13	8	164
Chironomidae							
Chironomini	13	4	1	2	2	4	52
Tanytarsini	29	11	4	2	7	5	116
Orthocladiinae	5	3			2		20
Diamesinae	33	14	9	4	4	2	132
Tanypodinae	2			2			8
Chironomid Pupae	0						0
Nematoda	3				3		12
Total #	184	49	35	32	40	28	736

Site: ARC Sample #:	B5	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	2		3	3	
Enchytraeidae							0
Naididae	1						4
Tubificidae	9						36
Cladocera	92	15	15	18	23	21	368
Copepoda	24	5	2	5	6	6	96
Ostracoda	72	9	21	16	15	11	288
Chironomidae							
Chironomini	14	2	8	2	1	1	56
Tanytarsini	60	13	16	7	13	11	240
Orthocladiinae	21	2	6	4	8	1	84
Diamesinae	23	2	4	5	7	5	92
Tanypodinae	2	1			1		8
Chironomid Pupae	0						0
Nematoda	0						0
Total #	318	51	74	57	77	59	1272

Site: ARC2 Sample #:	B1	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		10	6	13	11	11	
Enchytraeidae							0
Naididae	1						4
Tubificidae	50						200

Hydracarina	2			1	1		8
Cladocera	68	18	12	13	8	17	272
Copepoda	4	3			1		16
Ostracoda	16	6	1	1	8		64
Chironomidae							
Chironomini	28	9	4	6	5	4	112
Tanytarsini	69	21	11	10	17	10	276
Orthocladiinae	12	3		2		7	48
Diamesinae	30	4	5	8	7	6	120
Tanypodinae	2	1	1				8
Chironomid Pupae	1		1				4
Nematoda	4	2		2			16
Total #	287	77	41	56	58	55	1148

Site: ARC2 Sample #:	B2	Date:	93/09/15	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		7	10	7	5	6	
Enchytraeidae							0
Naididae							0
Tubificidae	35						140
Hydracarina	1		1				4
Cladocera	48	8	8	7	10	15	192
Copepoda	4	1	1		1	1	16
Ostracoda	6	3		1	1	1	24
Chironomidae							
Chironomini	38	3	9	3	7	16	152
Tanytarsini	36	8	9	10	4	5	144
Orthocladiinae	16	1	5	4	2	4	64
Diamesinae	17	2	1	3	5	6	68
Tanypodinae	1		1				4
Chironomid Pupae	0						0
Plecoptera (small)	1	1					4
Nematoda	0						0
Total #	203	34	45	35	35	54	812

Site: ARC 2 Sample #:	B3	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1			1		
Enchytraeidae							0
Naididae	1						4
Tubificidae	1						4
Cladocera	30	6	10	6	4	4	120
Copepoda	0						0
Ostracoda	19	7	2	3	5	2	76
Chironomidae							
Chironomini	34	11	9	5	6	3	136
Tanytarsini	88	30	23	11	14	10	352
Orthocladiinae	8	2	2	1	1	2	32
Diamesinae	6	1	1		3	1	24
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	2	1	1				8

Total #	189	59	48	26	34	22	756

Site: ARC2 Sample #:	B4	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		1			1		
Enchytraeidae							0
Naididae	1						4
Tubificidae	1						4
Cladocera	51	8	7	13	13	10	204
Copepoda	1			1			4
Ostracoda	20	2	3	3	6	6	80
Chironomidae							
Chironomini	24	6	3	5	6	4	96
Tanytarsini	84	15	18	17	18	16	336
Orthocladiinae	19	3	6	3	3	4	76
Diamesinae	8	4		2	1	1	32
Tanypodinae	1	1					4
Chironomid Pupae	0						0
Nematoda	0						0
Total #	210	40	37	44	48	41	840

Site: ARC2 Sample #:	B5	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		6	6	8	9	13	
Enchytraeidae							0
Naididae	1						4
Tubificidae	41						164
Cladocera	63	9	9	15	14	16	252
Copepoda	3	1		1		1	12
Ostracoda	20	3	4	4	4	5	80
Chironomidae							
Chironomini	25	5	4	5	4	7	100
Tanytarsini	49	8	9	11	6	15	196
Orthocladiinae	18	2	3	3	4	6	72
Diamesinae	13	2	4	2	2	3	52
Tanypodinae	1			1			4
Chironomid Pupae	0						0
Nematoda	3	3					12
Total #	237	39	39	50	43	66	948

Site: HB Sample #:	B1	Date:	93/06/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		6	5	12	10	8	
Enchytraeidae							0
Naididae	3						12
Tubificidae	38						152
Cladocera	9			3	3	3	36
Copepoda	9			6	1	2	36
Ostracoda	7	2	2	1	1	1	28
Chironomidae							

Chironomini	6			4	2		24
Tanytarsini	4	1	1	1	1		16
Orthocladiinae	6	2			2	2	24
Diamesinae	4			3	1		16
Tanypodinae	0						0
Chironomid Pupae	0						0
Nematoda	4	1	1		2		16
Total #	90	12	9	30	23	16	360

Site: HB Sample #:	B2	Date:	93/09/15	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	2	2	3	3	
Enchytraeidae							0
Naididae	2						8
Tubificidae	10						40
Cladocera	11	8	2	1			44
Copepoda	10	8		2			40
Ostracoda	29	3	5	3	12	6	116
Chironomidae							
Chironomini	6	2	2	1	1		24
Tanytarsini	4				2	2	16
Orthocladiinae	7	3	1		3		28
Diamesinae	7	1	2	2	1	1	28
Tanypodinae	4	2	1		1		16
Chironomid Pupae	0						0
Nematoda	4	2	2				16
Total #	94	31	17	11	23	12	376

Site: HB Sample #:	B3	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		2	5	4	7	2	
Enchytraeidae							0
Naididae	1						4
Tubificidae	19						76
Cladocera	27	5	8	3	5	6	108
Copepoda	64	23	11	14	5	11	256
Ostracoda	61	15	13	13	7	13	244
Chironomidae							
Chironomini	23	6	3	4	8	2	92
Tanytarsini	20	2	5	3	6	4	80
Orthocladiinae	40	10	7	9	7	7	160
Diamesinae	28	6	7	4	6	5	112
Tanypodinae	14	4	5	1	1	3	56
Chironomid Pupae	0						0
Nematoda	4	3		1			16
Total #	301	76	64	56	52	53	1204

Site: HB Sample #:	B4	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		7	2	12	8	11	

Enchytraeidae							0
Naididae	2						8
Tubificidae	38						152
Hydracarina	1			1			4
Cladocera	14		3	4	3	4	56
Copepoda	51	9	11	12	11	8	204
Ostracoda	37	5	5	6	11	10	148
Chironomidae							
Chironomini	26	6	5	4	4	7	104
Tanytarsini	21	4	8	3	3	3	84
Orthocladiinae	20	3	3	6	1	7	80
Diamesinae	13	4	4	1	2	2	52
Tanypodinae	4		1		1	2	16
Chironomid Pupae	0						0
Nematoda	5	1	1		1	2	20
Total #	232	39	43	49	45	56	928

Site: HB Sample #:	B5	Date:	93/09/15	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		13	16	11	7	12	
Enchytraeidae							0
Naididae							0
Tubificidae	59						236
Cladocera	58	9	14	14	13	8	232
Copepoda	26	5	1	6	8	6	104
Ostracoda	45	5	10	11	9	10	180
Chironomidae							
Chironomini	20	7	4	1	5	3	80
Tanytarsini	20	5	3	2	6	4	80
Orthocladiinae	24	6	2	4	4	8	96
Diamesinae	20	5	1	7	5	2	80
Tanypodinae	4	1	1	1		1	16
Chironomid Pupae	0						0
Chironomid Adult	1	1					4
Corixidae	1				1		4
Nematoda	6		2	2	2		24
Total #	284	57	54	59	60	54	1136

Site: EL Sample #:	B1	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		36	27	25	16	15	
Enchytraeidae							0
Naididae	7						28
Tubificidae	112						448
Hydracarina	2			1		1	8
Cladocera	120	32	27	25	21	15	480
Copepoda	1		1				4
Ostracoda	4		2		1	1	16
Chironomidae							
Chironomini	34	10	6	13	4	1	136
Tanytarsini	2				2		8
Orthocladiinae	4	1		1	1	1	16

Diamesinae	40	9	5	10	12	4	160
Tanypodinae	9	1	3	2	1	2	36
Chironomid Pupae	0						0
Emphemerellidae	1			1			4
Nematoda	0						0
Total #	336	89	71	78	58	40	1344

Site: EL Sample #:	B2	Date:	93/09/16	Fraction:	< 1mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		52	53	41	50	52	
Enchytraeidae							0
Naididae	3						12
Tubificidae	245						980
Hydracarina	2		1			1	8
Cladocera	150	40	27	25	32	26	600
Copepoda	2		1	1			8
Ostracoda	6	1	2	1		2	24
Chironomidae							
Chironomini	66	10	21	22	3	10	264
Tanytarsini	5	3		2			20
Orthocladiinae	4	2	2				16
Diamesinae	51	17	9	13	6	6	204
Tanypodinae	9	1	3	3	1	1	36
Chironomid Pupae	0						0
Ephemerellidae	1					1	4
Nematoda	3			2	1		12
Total #	547	126	119	110	93	99	2188

Site: EL Sample #:	B3	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		83	69	81	74	91	
Enchytraeidae							0
Naididae	3						12
Tubificidae	395						1580
Hydracarina	2		1			1	8
Cladocera	87	25	11	13	20	18	348
Copepoda	3	1	1	1			12
Ostracoda	11	4		2	2	3	44
Chironomidae							
Chironomini	64	14	17	11	6	16	256
Tanytarsini	3		1	1		1	12
Orthocladiinae	5	1	3			1	20
Diamesinae	52	11	10	11	12	8	208
Tanypodinae	1				1		4
Chironomid Pupae	0						0
Ephemerellidae	1					1	4
Nematoda	1				1		4
Total #	628	139	113	120	116	140	2512

Site: EL Sample #:	B4	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4

Oligochaeta		18	20	22	11	16	
Enchytraeidae							0
Naididae							0
Tubificidae	87						348
Hydracarina	2		2				8
Cladocera	16	1	4	4	2	5	64
Copepoda	0						0
Ostracoda	3			1	2		12
Chironomidae							
Chironomini	57	10	18	6	10	13	228
Tanytarsini	8	1	1	5	1		32
Orthocladiinae	8	2	3	1	1	1	32
Diamesinae	42	10	10	5	6	11	168
Tanypodinae	9	2	1	2	1	3	36
Chironomid Pupae	0						0
Empididae							
Chelifera	1		1				4
Nematoda	1		1				4
Total #	234	44	61	46	34	49	936

Site: EL Sample #:	B5	Date:	93/09/16	Fraction:	< 1 mm >	229 um	
50 ml Subsamples:	Total 25%	1	2	3	4	5	(Total)4
Oligochaeta		53	46	47	42	43	
Enchytraeidae							0
Naididae	2						8
Tubificidae	229						916
Hydracarina	3	2	1				12
Cladocera	49	11	13	5	11	9	196
Copepoda	0						0
Ostracoda	3	2	1				12
Chironomidae							
Chironomini	62	15	12	12	10	13	248
Tanytarsini	11	3	2	1	3	2	44
Orthocladiinae	6	2	2		1	1	24
Diamesinae	51	13	21	10	4	3	204
Tanypodinae	7	5		1		1	28
Chironomid Pupae	0						0
Nematoda	0						0
Total #	423	106	98	76	71	72	1692

APPENDIX D: FIELD NOTES REGARDING SAMPLE COLLECTION

This appendix comprises extracts from field notes regarding benthos sample collections that were conducted by Bob Crosley, Ecological Research Division, Environment Canada, Calgary, Alberta.

D.1 Benthos Collection, May, 1993

Main stem Athabasca River bottom sediments and benthos were collected during the period May 5-7, 1993. Sampling was done in depositional areas located within 1-2 kilometers of the suspended sediment collection locations. The sampling locations were in small bays or backwaters behind gravel bars or islands, typified by sandy beds overlain with varying thicknesses of silt-clay material interspersed with layers of organic debris.

A stainless steel Ekman dredge (152 mm x 152 mm x 152 mm) with operating handle was used for all collections. The dredge was pressed gently into the bottom sediments at each site to a depth of approximately 50-75 mm.

For benthos samples the dredge contents were transferred into a nylon sieve net (approx. 450 mm x 600 mm) and washed to remove as much inorganic matter and organic debris as possible. The washed sample was carefully transferred to a 500 mL glass, wide-mouth container (2-3 wash steps) and preserved with adequate quantities of formalin. Five replicates were sampled at each location. Samples were labelled with the site label, benthos, a sequential number and date (eg ARC-Benthos -1 93/May/5).

1. Athabasca River u/s Hinton

Site label:	ARC
Date/Time:	May 5, 1993; 0900 hrs
Notes:	Sampled right side 100 m. above Maskuta Ck. General backwater along right, high bank left, muddy beach loft. Sandy silt over detritus.

2. Athabasca River at Weldwood Haul Bridge

Site label:	ARWHB
Date/Time:	May 5, 1993; 1200 hrs
Notes:	Approx. 1 km below Weldwood Haul Bridge right bank opposite Fish Ck. Small bay sand overlain with brown silt-clay 1 cm thick. Worm burrows. Petroleum (?) leaching from mud banks in area.

3. Athabasca River at Obed

Site label: AROB
Date/Time: May 3, 1993; 1600 hrs
Notes: Small rock bay 1 km. below Obed bridge right side. Near Baseline Ck. Small amount silt overlying sand. Numerous worms.

4. Athabasca River at Emerson Lakes

Site label: AREL
Date/Time: May 5, 1993; 1830 hrs
Notes: Approx. 2 km below bridge left side. Small bay causing backwater. 2 cm silt over sandy silt. Sandy beach.

5. Athabasca River u/s Berland River

Site label: ARBer
Date/Time: May 6, 1993; 1100 hrs
Notes: Approx. 1 km above Berland R. in splits area. In lee of large island, three channels in area. Thin layer silt overlaying sand. Some fines silt-clay up to 4 cm thick.

6. Athabasca River at Windfall

Site label: ARW
Date/Time: May 6, 1993; 1430 hrs
Notes: Approx. 2 km below bridge right side behind large bar. Mud beach, high sand with layer of silt.

7. Athabasca River near Blue Ridge

Site label: ARBR
Date/Time: May 6, 1993; 1730 hrs
Notes: Approx. 500 meters below bridge right side behind gravel bar. Silty sand in backwater, ice remaining at edge.

8. Athabasca River at Athabasca

Site label: ARAthab
Date/Time: May 7, 1993; 1100 hrs
Notes: 1.5 km below bridge left side in bay behind gravel bar. Silt layer over sand. Little benthic life. Some organic debris.

D.2 Benthos Collection, September , 1993

In the fall of 1993 depositional bottom sediments and benthos were collected from the RSS reach of the Athabasca River for the Triad study by Kristin Day and Trevor Reynoldson (projects 2326-C1, 2327-C1 and 2328-C1).

Benthos samples were collected during the period September 15-17, 1993, at seven locations in the RSS reach. All samples were collected in five-replicate using a stainless steel Ekmann dredge. Organic analysis collection protocols were used.

Samples for benthic invertebrate community structure were screened through a 210 um dip net and preserved in formalin.

1. Athabasca River u/s Hinton (Control 1)

Labels:	ARC-B-1, 2, 3, 4, 5
Date/Time:	15 September 93 0900 Hrs
Site Description:	200 meters above Maskuta Creek right side in open bay. No bar to main current. Silt with organic layers.

2. Athabasca River u/s Hinton (Control 2)

Labels:	ARC2-B-1, 2, 3, 4, 5
Date/Time:	15 September 93 1100 Hrs
Site Description:	in protected bay just downstream of ARC, more sand and less organic debris than first control site.

3. Athabasca River near Weldwood Haul Bridge

Labels:	HB-B-1, 2, 3, 4, 5
Date/Time:	15 September 93 1400 Hrs
Site Description:	same site as May (637202) across from small creek approx. 1 km below bridge. Open bay, little sand, wood chips and fibre in substrate.

4. Athabasca River near Obed Bridge

Labels:	OB-B-1, 2, 3, 4, 5
Date/Time:	16 September 93 1000 Hrs
Site Description:	same bay as collected during May (767312), 1 km below bridge right side. More silt than at previous sites. Organic debris 3 cm below surface.

5. Athabasca River near Emerson Lakes Bridge

Labels:	EL-B-1, 2, 3, 4, 5
Date/Time:	16 September 93 1400 Hrs
Site Description:	left side approximately 300 meters below May location (095827). Open bay with sandy beach.

6. Athabasca River above Berland River

Labels:	BR-B-1, 2, 3, 4, 5
Date/Time:	17 September 93 1100 Hrs
Site Description:	sampled in bay 750 meters above Berland River (250 meters below previous site). Shallow, fairly sandy, numerous emerging and in-place invertebrates.

7. Athabasca River near Windfall Bridge

Labels:	WB-B-1, 2, 3, 4, 5
Date/Time:	17 September 93 1300 Hrs
Site Description:	same site as May (623060), 2 km below bridge right side. Very good depositional zone. Fines in abundance. Numerous invertebrates.