ANNEX XIII: APPENDIX B

MESH SIZE COMPARISON

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Tables

Abbreviations

Abbreviation	Definition
Dominion Diamond	Dominion Diamond Ekati Corporation
i.e.,	that is
N	number of ratios included in the calculation of summary statistics
n/a	not applicable

Units of Measure

Unit	Definition
µm	micrometre
mm	millimetre
org/m^2	number of organisms per square metre

B1 INTRODUCTION

Benthic invertebrate taxonomy samples collected at pelagic stations for the Dominion Diamond Ekati Corporation (Dominion Diamond) Jay Project 2013 baseline survey were field-sieved through a 250 micrometre (µm) mesh net. Samples were to be processed in the laboratory using 500 µm and 250 µm as the lowest mesh size, and results for the two mesh sizes were to be compared to aid in the selection of the appropriate mesh size for future monitoring. However, samples collected in Lac du Sauvage were mistakenly sieved through a 500 µm mesh screen in the laboratory, and the material that passed through this screen was discarded. As a result, organisms that were in the 250 to 500 µm size range were lost. Once this error was identified, the sieving procedure in the laboratory was corrected for the remaining samples. As a consequence of the laboratory error, the mesh size comparison was completed on a reduced set of samples. The following sections describe the methods used for sample processing and the results for the mesh size comparison.

B2 METHODS

The correctly processed samples were sieved through 1 millimetre (mm), 500 µm, and 250 µm mesh screens in the laboratory. Benthic invertebrates were identified and enumerated separately in each size fraction. The numbers of organisms retained by the 1 mm and 500 µm screens were combined to form the 500 µm dataset, which included all organisms larger than 500 µm in size. The umber of organisms in each entire sample (i.e., total numbers retained by all three screens) is referred to as the 250 µm dataset. The ratio of the number of organisms in the 250 µm dataset divided by those in 500 µm dataset was calculated for densities of major invertebrate groups, chironomid sub-groups, and total density, to evaluate the effect of mesh size used during sample processing on benthic invertebrate abundance.

B3 RESULTS

Differences were observed between the datasets obtained using the two different mesh sizes during sample processing. On average, mean total density was 1.8 times greater in the 250 µm dataset compared to the 500 µm dataset (Table B-1). Densities of small organisms, such as Acari, Oligochaeta, and Chironomidae were 2.0, 4.6, and 1.8 times greater, respectively, in the 250 µm dataset compared to the 500 µm dataset. Gastropoda and Bivalvia densities were the same in both datasets (ratios of 1.0), consistent with the larger size of these organisms. The greatest variability in the ratio was observed for Oligochaeta (aquatic worms), reflecting the shape of these organisms (i.e., often curled up and tangled in detritus, and easily broken into pieces during processing).

Densities in major chironomid groups also generally reflected the size of organisms in these groups (Table B-2). The typically larger Chironomini had the lowest mean ratio (1.3), indicating that most organisms in this group were retained by the 500 µm screen during sample processing. The smaller Tanytarsini and Orthocladiinae had higher ratios (2.6 and 1.9, respectively), suggesting that approximately half of the total individuals in these groups were retained by the 500 µm screen. Data are insufficient to calculate representative mean ratios for Pseudochironomini, Diamesinae, and Prodiamesinae, due their low numbers in the samples collected during this study.

Table B-1 Mesh Size Comparison for Major Taxonomic Groups for Selected Benthic Invertebrate Stations in the Jay Project Baseline Study Area, August and September 2013

Waterbody	Station	Dataset	Units	Density						
				Acari	Gastropoda	Oligochaeta	Bivalvia	Total Chironomidae	Other	Total
Lake Af1	Af-10	500 µm	org/m²	0	0	534	440	500	0	1,474
		250 µm		26	0	1,448	448	836	0	2,758
		Ratio	n/a	—	—	2.7	1.0	1.7	—	1.9
Duchess Lake	Af-1	500 µm	org/m²	0	0	151	22	1,897	0	2,070
		250 µm		0	0	625	22	2,457	0	3,104
		Ratio	n/a	—	—	4.1	1.0	1.3	—	1.5
	Af-2	500 µm	org/m²	0	0	69	26	552	0	647
		250 µm		0	17	690	26	1,552	9	2,294
		Ratio	n/a	—	—	10.0	1.0	2.8	—	3.5
	Af-4	500 µm	org/m²	52	26	259	534	1,948	26	2,845
		250 µm		86	26	1,017	534	2,836	26	4,525
		Ratio	n/a	1.7	1.0	3.9	1.0	1.5	1.0	1.6
	Af-7	500 µm	org/m²	9	0	34	164	1,198	9	1,414
		250 µm		9	0	155	164	2,121	9	2,458
		Ratio	n/a	1.0	—	4.6	1.0	1.8	1.0	1.7
Lake E1	E-L1-1	500 µm	org/m²	9	9	17	43	603	0	681
		250 µm		34	9	26	43	793	0	905
		Ratio	n/a	3.8	1.0	1.5	1.0	1.3	—	1.3
	E-L1-2	500 µm	org/m²	26	43	190	328	3,474	0	4,061
		250 µm		52	43	371	336	5,966	0	6,768
		Ratio	n/a	2.0	1.0	2.0	1.0	1.7	—	1.7
Lake C1	C-L1	500 µm	org/m²	9	0	34	121	681	0	845
		250 µm		26	0	52	121	1,259	0	1,458
		Ratio	n/a	2.9	—	1.5	1.0	1.8	—	1.7

Table B-1 Mesh Size Comparison for Major Taxonomic Groups for Selected Benthic Invertebrate Stations in the Jay Project Baseline Study Area, August and September 2013

Waterbody	Station	Dataset	Units	Density						
				Acari	Gastropoda	Oligochaeta	Bivalvia	Total Chironomidae	Other	Total
Paul Lake	PL-1	500 µm	org/m²	26	0	52	422	1,052	17	1,569
		250 µm		86	0	302	431	2,534	17	3,370
		Ratio	n/a	3.3	—	5.8	1.0	2.4	1.0	2.1
	PL-2	500 µm	org/m²	43	0	9	216	3,259	0	3,527
		250 µm		52	0	138	216	4,207	0	4,613
		Ratio	n/a	1.2	—	15.3	1.0	1.3	—	1.3
	PL-3	500 µm	org/m²	0	0	181	95	276	0	552
		250 µm		9	0	276	95	552	0	932
		Ratio	n/a	—	—	1.5	1.0	2.0	—	1.7
	PL-4	500 µm	org/m²	9	0	121	34	414	0	578
		250 µm		9	0	241	34	578	0	862
		Ratio	n/a	1.0	—	2.0	1.0	1.4	—	1.5
	PL-5	500 µm	org/m²	17	9	95	336	8,164	0	8,621
		250 µm		26	9	422	336	16,000	0	16,793
		Ratio	n/a	1.5	1.0	4.4	1.0	2.0	—	1.9
Mean Ratio				2.0	1.0	4.6	1.0	1.8	1.0	1.8
Minimum Ratio				1.0	1.0	1.5	1.0	1.3	1.0	1.3
Maximum Ratio				3.8	1.0	15.3	1.0	2.8	1.0	3.5
N				9	4	13	13	13	3	13

Note: Data are mean densities calculated from individual Ekman grabs collected at each station.

org/m^2 = number of organisms per square metre; µm = micrometre; n/a = not applicable; — = unable to calculate ratio between total and 500 µm fractions, because no individuals were present in the 500 µm fraction (i.e., division by zero); N = number of ratios included in the calculation of summary statistics.

Table B-2 Mesh Size Comparison for Chironomidae Groups for Selected Benthic Invertebrate Stations in the Jay Project Baseline Study Area, August and September 2013

Waterbody	Station	Dataset	Units	Density						
				Chironomini	Pseudochironomini	Tanytarsini	Diamesinae	Orthocladiinae	Prodiamesinae	Tanypodinae
Lake Af1	Af-10	500 µm	org/m²	181	0	129	0	103	0	86
		250 µm		198	0	397	0	121	0	121
		Ratio	n/a	1.1	—	3.1	—	1.2	—	1.4
Duchess Lake	Af-1	500 µm	org/m²	129	0	108	0	1,616	0	43
		250 µm		151	0	108	0	2,112	22	65
		Ratio	n/a	1.2	—	1.0	—	1.3	—	1.5
	Af-2	500 µm	org/m²	103	0	69	9	345	9	17
		250 µm		121	0	664	9	698	9	52
		Ratio	n/a	1.2	—	9.6	1.0	2.0	1.0	3.0
	Af-4	500 µm	org/m²	405	0	888	9	379	0	267
		250 µm		448	0	1,310	26	741	0	310
		Ratio	n/a	1.1	—	1.5	3.0	2.0	—	1.2
	Af-7	500 µm	org/m²	319	0	241	0	543	9	86
		250 µm		509	0	379	0	1,103	17	112
		Ratio	n/a	1.6	—	1.6	—	2.0	2.0	1.3
Lake C1	C-L1	500 µm	org/m²	164	0	448	0	34	0	34
		250 µm		241	0	914	0	34	0	69
		Ratio	n/a	1.5	—	2.0	—	1.0	—	2.0
Lake E1	E-L1-1	500 µm	org/m²	319	0	138	0	147	0	0
		250 µm		336	0	267	0	190	0	0
		Ratio	n/a	1.1	—	1.9	—	1.3	—	—
Lake E1	E-L1-2	500 µm	org/m²	500	0	397	0	2,483	0	95
		250 µm		681	9	1,362	0	3,784	0	129
		Ratio	n/a	1.4	—	3.4	—	1.5	—	1.4

Table B-2 Mesh Size Comparison for Chironomidae Groups for Selected Benthic Invertebrate Stations in the Jay Project Baseline Study Area, August and September 2013

Waterbody	Station	Dataset	Units	Density						
				Chironomini	Pseudochironomini	Tanytarsini	Diamesinae	Orthocladiinae	Prodiamesinae	Tanypodinae
Paul Lake	PL-1	500 µm	org/m²	371	0	560	0	69	9	43
		250 µm		466	9	1,543	0	388	9	121
		Ratio	n/a	1.3	—	2.8	—	5.6	1.0	2.8
	PL-2	500 µm	org/m²	1,431	0	638	0	1,129	0	60
		250 µm		1,552	0	1,224	0	1,371	0	60
		Ratio	n/a	1.1	—	1.9	—	1.2	—	1.0
	PL-3	500 µm	org/m²	103	0	86	0	86	0	0
		250 µm		138	0	164	0	250	0	0
		Ratio	n/a	1.3	—	1.9	—	2.9	—	—
	PL-4	500 µm	org/m²	95	0	147	0	147	0	26
		250 µm		164	0	198	0	155	0	60
		Ratio	n/a	1.7	—	1.4	—	1.1	—	2.3
	PL-5	500 µm	org/m²	638	26	5,897	0	1,371	9	224
		250 µm		871	34	12,216	0	2,526	17	336
		Ratio	n/a	1.4	1.3	2.1	—	1.8	2.0	1.5
Mean Ratio				1.3	1.3	2.6	2.0	1.9	1.5	1.8
Minimum Ratio				1.1	1.3	1.0	1.0	1.0	1.0	1.0
Maximum Ratio				1.7	1.3	9.6	3.0	5.6	2.0	3.0
N				13	1	13	2	13	4	11

Note: Data are mean densities calculated from individual Ekman grabs collected at each station.

org/m^2 = number of organisms per square metre; µm = micrometre; n/a = not applicable; — = unable to calculate ratio between total and 500 µm fractions because no individuals were present in the 500 µm fraction (i.e., division by zero); N = number of ratios included in the calculation of summary statistics.

B4 SUMMARY

The results of the mesh size comparison indicate that using a 250 µm mesh sieve in the field resulted in more representative samples for smaller invertebrates, such as Acari, Chironomidae, and Oligochaeta, which is consistent with expectations. There were no differences in numbers of larger invertebrates between the 250 µm the 500 µm datasets. On average, total invertebrate density was 1.8 times higher in the 250 µm dataset compared to the 500 µm dataset.