Meiofaunal Diversity and Sediment Attributes in Burrard Inlet and Fraser River Delta, British Columbia, Canada

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MEIOFAUNAL DIVERSITY AND SEDIMENT ATTRIBUTES IN BURRARD INLET AND FRASER RIVER DELTA, BRITISH COLUMBIA, CANADA

By

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ABSTRACT

Sutherland, T.F., Hoyle, M.A., Burnham, R., O'Neill, C., Galvao, M.A., Amos, C.L., Mortimor, J., Covert, P.A. 2023. Meiofaunal Diversity and Sediment Attributes in Burrard Inlet and Fraser River Delta, British Columbia, Canada. Can. Tech. Rep. Fish. Aquat. Sci. 3522: xviii + 91 p.

Sediment and meiofaunal samples were collected in Burrard Inlet and the Fraser River Delta, British Columbia, Canada, to examine sediment texture and meiofaunal distribution and diversity within the seabed. Sediment samples were analyzed for grain size fractionation, sediment porosity (%), organic constituents (%), trace-element concentration, and meiofaunal relative proportion, abundance, and frequency of occurrence. Sediment texture ranged from medium silt (58.01 μm) to very coarse sand (543.30 μm) with the majority of stations falling into coarse silt (53.25 μm - 105.20 μm) and very fine sand (98.27 μm – 181.2 μm) categories. The trace-element concentrations varied with both sediment attributes and station location and were compared to the Interim Sediment Quality Guidelines (ISQG) (CCME 1999). In terms of meiofauna taxa, nematodes, foraminiferans, and harpacticoid copepods represented the dominant meiofaunal taxa (87%) across the sampling area. Rare meiofauna, that occurred at a single station, included arachnids, cumaceans, gastropods, tanaidaceans, amphipods, calanoid copepods, cirriped larvae, and halacarids, Other predominant taxa included nematodes (*Richtersia* sp., Desmoscolesidae), bivalves, kinorhynchs, ostracods, rotifers and arthropod nauplius, and Annelids (Errantia, Sedentaria, Polychaeta, Oligochaeta).

RÉSUMÉ

Sutherland, T.F., Hoyle, M.A., Burnham, R., O'Neill, C., Galvao, M.A., Amos, C.L., Mortimor, J., Covert, P.A. 2023. Meiofaunal Diversity and Sediment Attributes in Burrard Inlet and Fraser River Delta, British Columbia, Canada. Can. Tech. Rep. Fish. Aquat. Sci. 3522: xviii + 91 p.

Des échantillons de sédiments et de méiofaune ont été prélevés dans l'inlet Burrard et le delta du fleuve Fraser, en Colombie-Britannique, au Canada, afin d'examiner la texture des sédiments ainsi que la distribution et la diversité de la méiofaune dans le fond marin. Des échantillons de sédiments ont été analysés pour le fractionnement granulométrique, la porosité des sédiments (%), les constituants organiques (%), la concentration en éléments traces et la proportion relative, l'abondance et la fréquence d'occurrence de la méiofaune. La texture des sédiments variait de limon moyen (58,01 μm) à sable très grossier (543,30 μm), la majorité des stations tombant dans du limon grossier (53,25 μm - 105,20 μm) et du sable très fin (98,27 μm – 181,2 μm) catégories. Les concentrations d'éléments traces variaient selon les caractéristiques des sédiments et l'emplacement de la station et ont été comparées aux recommandations provisoires pour la qualité des sédiments (ISQG) (CCME, 1999). En termes de taxons de méiofaune, les nématodes, les foraminifères et les copépodes harpacticoïdes représentaient les taxons de méiofaune dominants (87%) dans la zone d'échantillonnage. La méiofaune rare, présente à une seule station, comprenait des arachnides, des cumacés, des gastéropodes, des tanaïdacés, des amphipodes, des copépodes calanoïdes, des larves cirripées et des halacarides. et nauplius arthropodes, et Annélides (Errantia, Sedentaria, Polychaeta, Oligochaeta)

1.0 INTRODUCTION

In the event of an oil spill, the most susceptible benthic faunal communities are those associated with the following settings: 1) intertidal zones, 2) surface shoreline infrastructure; and 3) shallow subtidal zones (0-30m; Page et al. 1996). For example, both infauna and/or epifauna associated with intertidal zones and floating dock perimeters are at risk with direct contact and potential impact of low-density oil patches floating at the seawater surface. The current study, herein, focuses on the subtidal setting where meiofaunal communities and substrate textures may be influenced by a combination of oil-spill scenarios: 1) direct contact based on surface oil thickness, water depth, and seabed slope, and/or 2) indirectly through the scavenging of flocculated plankton (marine snow) by oil-contaminated water and subsequent deposition (Passow et al. 2012).

Oceans Protection Plan (OPP) is designed to keep Canadian coastlines safe and clean for future generations. The Canadian government partners with Indigenous and coastal communities to provide confidence that commercial shipping is taking place in way that protects and sustains the economic, environmental, social, and cultural health of our oceans and coastline. In order to preserve and restore marine ecosystems, a coastal environmental baseline and cumulative effects program has been developed. BC's coastline has two of the six high-use areas across Canada's three coasts. These areas of interest have baseline survey plans that include monitoring protocols and environmental indicators that will help confirm status quo and detect changes in the ecosystem in the event of a future oil spill (Genwest Systems Inc. 2014). A subtidal baseline survey was proposed as part of the Coastal Ecosystem Baseline Project (CEBP) in Burrard Inlet (BI) and Fraser River Delta (FRD), British Columbia, Canada. As part of the CEBP, Sutherland et al. (2022a) has provided a baseline survey focusing on epifaunal communities associated with floating-dock surface-perimeters located in BI, Indian Arm (IA), and the FRD.

Objective: To identify and characterize sediment texture and meiofaunal communities to provide a baseline status for future surveys contributing to the CEBP.

2.0 STUDY SITE

BI is a fjord adjoining the Salish Sea in the southwestern region of BC and whose sill is dominated by metropolitan, one of the most populous areas within Canada (Figure 1). The fjord is bordered to the east by Vancouver Island and by the southwest by the BC mainland. BI is oriented in an east-west direction (length: 37 km; width range: 0.5 – 4.0 km) and described as a sheltered fjord divided into 3 harbours (outer, central, and inner). These harbours are divided by two land constrictions located at the first narrows and second narrows that are associated with shallow seabed sills. The Central and Inner Harbour basins are both approximately 65 m deep, with the connecting sills, shallowing to 15 m (First Narrows) and 19 m (Second Narrows), respectively. The combination of land constrictions and shallow sills, influences local hydrodynamic regimes, where currents can reach up to 2 ms^{-1} during large tides at these junctures (Thompson, 1981; Stacey et al. 2002).

BI is characterized by two-layer estuarine circulation where freshwater input drives the surface flow towards the fjord entrance and entrains the deeper saline waters in the opposite direction

(Pickard, 1961). The Capilano, Seymour, and Indian rivers serve as the main rivers flow into the inlet and contribute significantly to estuarine circulation.

The Fraser River's seasonal snow-melt plume (uppermost 2-3 m; 4 - 9 psu) extends into the Salish Sea, wraps around Point Gray, and influences water-column salinity and stratification in the Outer Harbour of BI (Thomson, 1981). The seasonal surface temperature and salinity ranges in the Salish Sea are greatest at the mouth of the Fraser River, with temperature ranging between 6 – 20°C and salinity ranging from 17 – 30 psu. In general, the surface salinity in BI is usually > 18 psu, however when the Fraser River plume enters BI, salinity in the inlet may decrease to levels as low as 9 psu (Thomson, 1981). The Fraser River supports an annual particulate load (~17.3 x 106 tonnes) made up of 65% silt/clay and 35% sand transported during the spring-summer freshet (Barrie and Currie, 2000). The murky Fraser River plume is evident when it enters Burrard Inlet during the annual freshet spanning May to July (mid-June peak). This plume provides a significant source of silt and clay for the sheltered Burrard Inlet sediments through deposition processes (e.g. Spanish Banks). In turn, variations in sediment texture, organic content, and trace-elements can structure meiofaunal communities accordingly (Warwick, 1981; Sutherland et al. 2018). In addition, meiofauna have been considered as key indicators that provide responses to changes in sediment attributes, organic-enrichment, and/or anthropogenic impacts (e.g. oil spills) within a benthic setting (Danovaro et al. 1995; Sutherland et al. 2007).

Both Indian Arm and Port Moody Arm extend from the eastern termination of BI's Inner Harbour. Indian Arm runs in a north-south orientation with a length of 20 km, a width of 2 km, and a maximum depth of 220 m. Freshwater runoff in Indian Arm is supplied from various sources: 1) Indian River; 2) peripheral streams and rainfall; and 3) Buntzen power plant discharges (Dunbar and Burling, 1985). Indian Arm is separated from the BI Inner Harbour by a sill with a height of 29 m above the seabed. Deep-water renewal typically occurs in winter when dense-water intrudes from the Salish Sea and consequently, Indian Arm, under low-mixing, stratified, neap-tide conditions (Stacey et al. 2002).

Port Moody Arm runs in a northwest-southeast orientation with a length of 6.5 km, width of 0.9 km, and a maximum depth of 8.8 m. False Creek, which is located on the south shoreline of BI Outer Harbour, has a 3 km length, a width varying between 100 – 400 m, and a mean depth of 5 m.

In general, the BI coastline is diverse with both natural and man-made beaches. The inner and central shoreline may consist of either rocky substrate, industrial facilities or seawalls. Extensive tidal flats can be found on the southern Outer Harbour, Maplewood Flats and Port Moody Inlet with a tidal amplitude of approximately 4 metres.

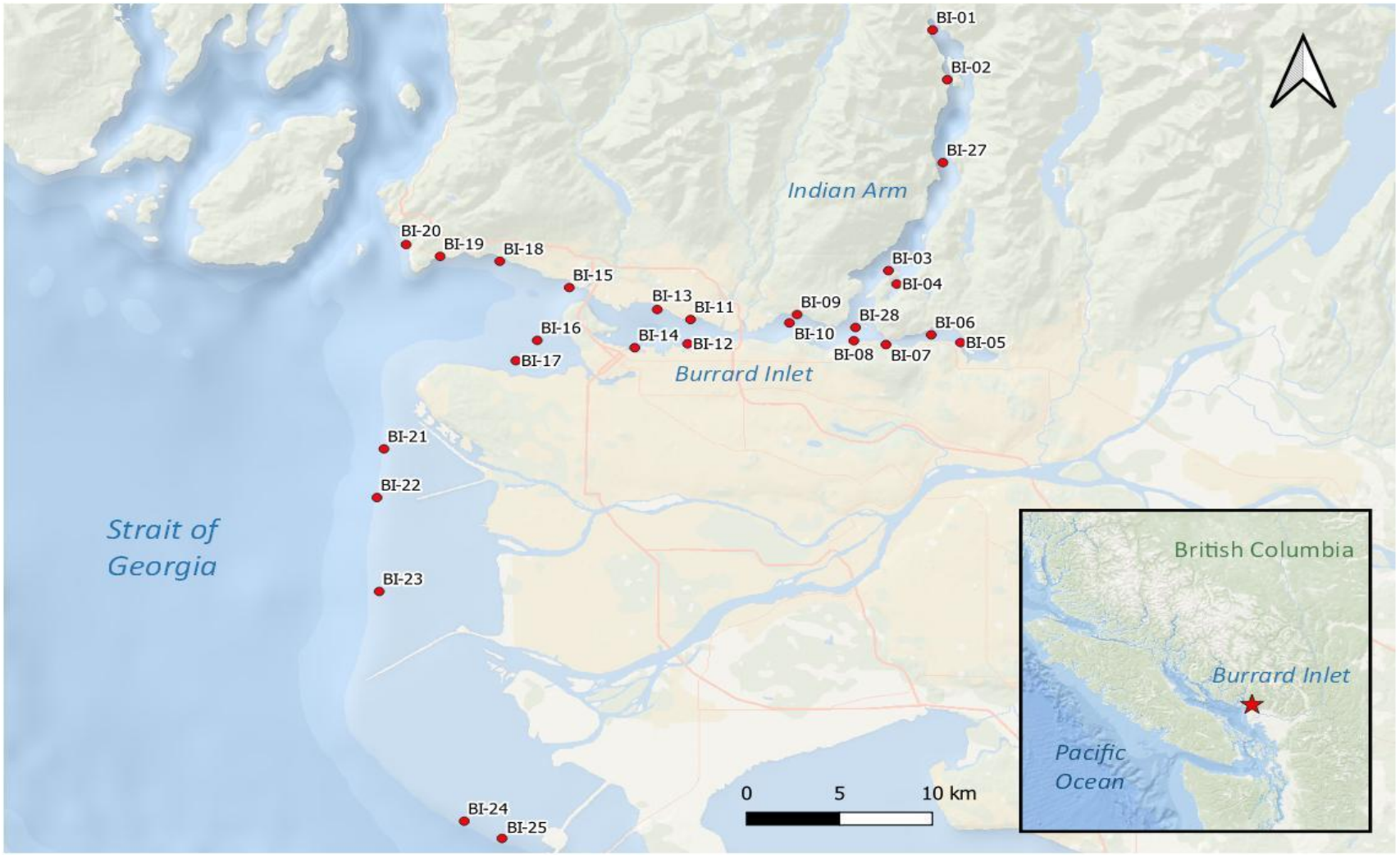


Figure 1: Locations of surveyed sampling stations in Burrard Inlet and Fraser River Delta in British Columbia, Canada

3.0 METHODS

Sample collection: Benthic samples were collected at 27 stations in BI and FRD, British Columbia, between September 2 – 7, 2020 (Figure 1). Replicate samples were limited to the following six stations: BI-3, BI-8, BI-11, BI-16, BI-18, BI-21. A Smith-McIntyre grab, with a sediment surface area of 0.1m^2, was used to collect a suite of sediment and meiofaunal samples (Gage and Bett, 2007). After the retrieval of a deployed grab, the overlying water was allowed to drain off the sediment surface without disturbance (Sutherland et al. 2022b). Surface subsamples were collected for analysis of sediment grain size, organic and water content, and carbon and nitrogen concentrations. These samples were frozen during storage and transport to the laboratory.

Sediment grain size analyses: In terms of sediment grain size analysis, organic material was removed with sodium hypochlorite (NaOCl) prior to sediment grain size fractionation. Thereafter, the bulk sediment sample was wet sieved to separate sand (63 µm) from finer material (silt and clay). The sand was sieved into six size classes; the fine silt and clays were analyzed following the pipette method (McKeague, 1978). The following grain size categories were reported on a dry weight basis: >2000 µm, <2000 µm, <1000 µm, <500 µm, <250 µm, <100 µm, <63 µm, <4 µm, <2 µm. Textural classes were expressed as sand, silt, and clay proportions with the silt-clay boundary (2 µm) set according to the Canadian System of Soil Classification (Soil Classification Working Group, 1998).

Sediment porosity and organic contents: Water content (percentage by mass) was calculated using the differential weight values between wet and dry measurements standardized by wet weight. After wet weight determination, sediment was dried at 55°C for 48 hours and desiccated for 2 hours until a constant sample weight was achieved. Organic content was derived from differential weight values expressed as percent between dry and ashed measurements (550°C for 2 hours) standardized by dry weight (Sutherland et al. 2018).

Sediment organic carbon and nitrogen concentrations: Prior to carbon and nitrogen analysis, carbonate material was removed from sediment samples through acidification. Total organic carbon and nitrogen values were obtained using a Thermo Finnigan FlashEA 1112 coupled to a Thermo Finnigan Delta Plus XL through a ConFlo III. Organic material was oxidized to carbon dioxide, various nitrogen bearing gases, and water. This gas mixture was then passed through a reduction furnace packed with elemental Cu at 680°C to reduce all nitrogen-bearing compounds to pure gaseous nitrogen. The resulting gases were then passed through a water trap to eliminate moisture. A gas chromatography column at 50°C was used to separate the carbon dioxide and nitrogen gases for analysis in the mass spectrometer. The data were blank corrected, and the percent carbon and nitrogen measurements were reported by mass (precision of 610%). (Eglington et al. 2005).

Trace-metal analysis was carried out according to the US EPA method, Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) 200.15 for metal and trace element analysis using ultrasonic nebulization (US EPA, 1994). The digestion process follows that of strong-acid

leachable metals (SALM) where a sample is first dried at 55°C, then is digested in a mixture of concentrated nitric (HNO_3) and hydrochloric (HCl) acids at 90°C for 2 h. The extracts are then analyzed for trace element content via inductively coupled plasma atomic emission spectroscopy (ICP-AES).

Meiofauna extraction: Meiofauna were extracted from sediment samples using a suspension and settling technique described by Warwick and Buchanan (1970). To facilitate the identification of meiofauna, Rose Bengal was added to the sample to stain organisms. Sediment samples were passed through a series of 0.5 mm and 0.063 mm sieves capturing the size category that defines meiofauna. The sediment sample retained on the 0.063 mm sieve was transferred to a 250 ml graduated cylinder (height: 33 cm) and filled to a volume of 280 ml (height: 32 cm) with filtered seawater that passes through a 0.45 μm filter membrane. After the sediment sample was gently suspended in the graduated cylinder using a rocking motion, the cylinder was placed on the counter for 60 seconds to allow for the settlement of larger particles. The organisms that remained in the supernatant were passed through a 0.063 μm sieve. The sample suspension and decantation procedure was then repeated three times on this retained sample. The final decanted sample was scanned under 10x and 40x magnification using a Leica Wild M3Z microscope and the meiofauna taxa were enumerated. Meiofauna abundance was standardized according to the volume of sediment collected based on the sample height (topmost 2-cm of surface sediments) and the core barrel diameter (2.6 cm). The data were then log-transformed ($y = \log(x+1)$) following the addition of one prior to analysis in order to normalize the data as required (Green and Montagna, 1996).

4.0 RESULTS

4.1 SUBTIDAL SEDIMENT TEXTURE

Estuaries are distinct features of the coastal zone where both fresh and marine inputs influence sediment deposition, transport and seabed sediment texture along with faunal communities and associated habitats (Bravender et al. 2002; Liu et al. 2010; Sutherland et al. 2013; 2018). The stations were categorized by sediment texture according to the Canadian System of Soil Classification (Soil Classification Working Group, 1998): Medium Silt (BI-05); Coarse Silt (BI-03, BI-06, Bi-07, BI-16, BI-17, BI-18, BI-23); Very Coarse Silt (BI-08, BI-12, BI-13, BI-19); Very Fine Sand (BI-01, BI-02, BI-14, BI-21, BI-22, BI-24); Fine Sand (BI-04, BI-11, BI-20); Medium Sand (BI-09, BI-10, BI-25); and Very Coarse Sand (BI-15). Each sediment texture category is associated with a range of arithmetic mean values (Folk and Ward, 1957): Medium Silt (58.01 μm); Coarse Silt (53.25 μm - 105.20 μm); Very Coarse Silt (90.07 μm - 190.10 μm); Very Fine Sand (98.27 μm - 181.2 μm); Fine Sand (194.3 μm - 330.6 μm); Medium Sand (331.3 μm - 460.8 μm); and Very Coarse Sand (543.3 μm). Seabed texture reflects the state of hydrodynamic conditions as well as the extent of particle deposition or erosion processes. These factors influence sediment porosity and organic content along with meiofaunal diversity (Molinaroli et al. 2009; Sutherland et al. 2018, 2020).

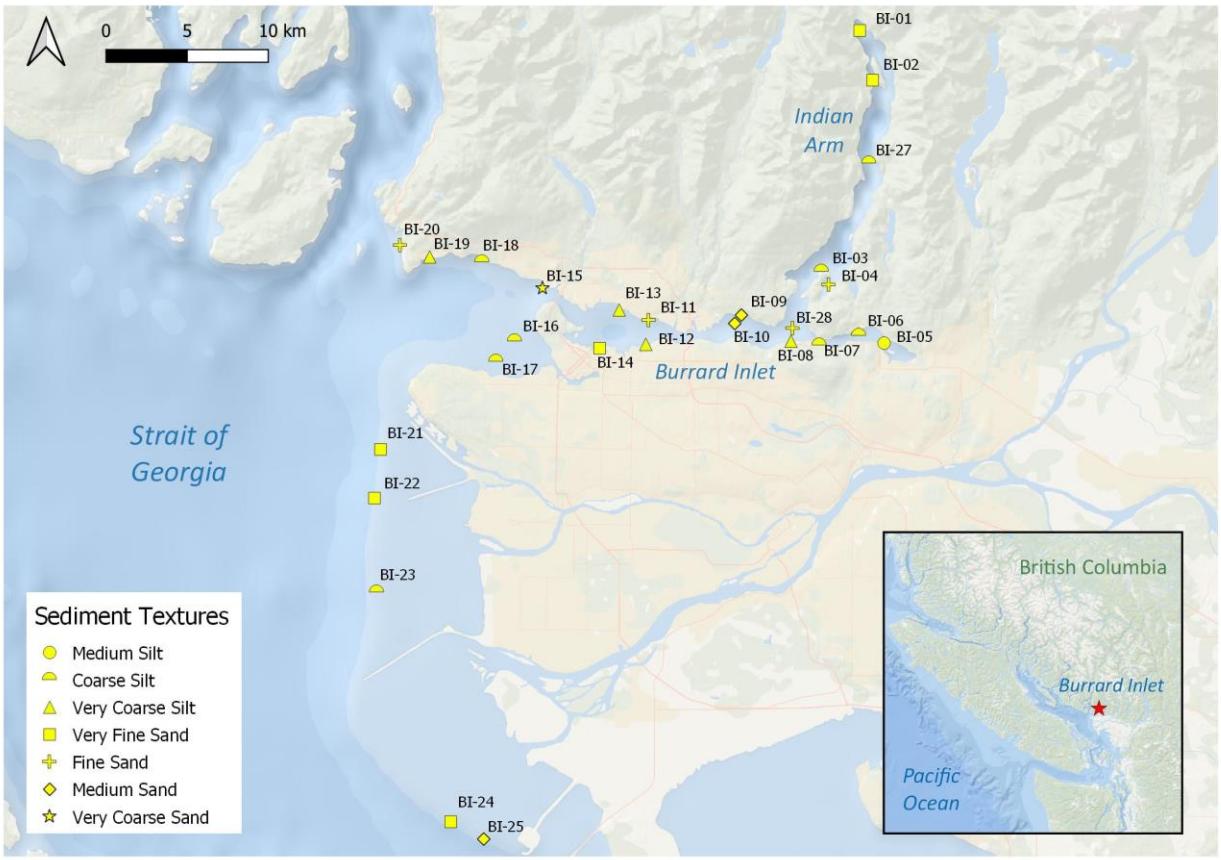


Figure 2: Station locations categorized by sediment texture classifications across Burrard Inlet and Fraser River Delta, British Columbia, Canada.

4.2 PRESENCE AND ABSENCE OF MEIOFAUNA TAXA AT SAMPLING STATIONS

In general, the dominant meiofauna taxa, consisting of nematodes, foraminiferans, and harpacticoid copepods, were present at ≥ 85% of the 27 stations located across BI and FRD (Table 2). Other predominant taxa, such as, nematodes (*Richtersia* sp., Desmoscolesidae), bivalves, kinorhynchs, ostracods, rotifers and arthropod nauplius, and Annelids (Errantia, Sedentaria, Polychaeta, Oligochaeta) ranged between 11 – 44% of frequency of occurrence, with the exception of stations BI-1, BI-13, and BI-27. Meiofauna that were considered to have a rare occurrence at a single station consisted of the following taxa: arachnids, cumaceans, gastropods, tanaidaceans, amphipods, calanoid copepods, cirriped larvae, and halacarids.

Table 1: Presence or absence of meiofauna taxa observed at each sampling station in Burrard Inlet and Fraser River Delta, British Columbia, Canada. Freq = Frequency; % = Percentage.

TAXA		STATION																									Freq
Major Group	Taxon	18	16	21	11	20	12	2	19	4	14	10	6	8	9	22	28	2	3	15	24	7	17	25	5	1	13	27	%
Nematoda	Nematoda	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	100
Misc	Foraminifera	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x		89
Arthropoda	Harp Copepod	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			x	x		85
Mollusca	Bivalvia	x	x	x	x	x			x					x	x		x				x			x	x				44
Nematoda	Richtersia sp.	x	x	x	x	x		x	x	x						x		x						x					41
Misc	Kinorhyncha	x	x	x		x	x	x	x			x				x		x					x						41
Nematoda	Desmoscolesidae	x	x	x		x	x	x	x					x	x								x						37
Arthropoda	Ostracoda	x	x	x		x	x		x		x							x		x									33
Arthropoda	Nauplius	x	x	x	x		x	x									x					x							30
Misc	Rotifera	x	x	x							x								x	x	x								26
Annelida	Errantia	x	x	x		x	x		x	x		x																	30
Annelida	Sedentaria	x			x	x		x				x				x	x												26
Annelida	Polychaeta				x		x			x	x																		15
Annelida	Oligochaeta						x	x			x																		11
Arthropoda	Halacaridae												x																4
Misc	Invertebrate									x																			4
Arthropoda	Arachnida					x																							4
Arthropoda	Cumacea)				x																								4
Mollusca	Gastropoda				x																								4
Arthropoda	Cirripedia larvae			x																									4
Arthropoda	Tanaidacea		x																										4
Arthropoda	Cal copepod	x																											4
Arthropoda	Amphipoda	x																											4
Total number of taxa		14	12	12	10	11	10	9	9	7	7	6	4	5	5	6	6	6	3	4	4	4	5	3	3	3	3	1	
Frequency of total taxa (%)		61	52	52	43	48	43	39	39	30	30	26	17	22	22	26	26	26	13	17	17	17	22	13	13	13	13	4	

4.3 SUBTIDAL SUBSTRATE AND MEIOFAUNAL ATTRIBUTES ACCORDING TO SURVEY STATION

The remaining portion of this report will be divided into station sections, where each station is characterized by substrate and meiofaunal attributes.

- The order of the following section stations will start at the southern FRD stations, proceed northward across the FRD bank, enter the BI entrance, travel through the central and inner harbours of BI, and end at the northern tip of Indian Arm.
- Relative percentage of sediment grain size categories and meiofauna taxa presented in pie charts with legends presenting the percent and/or abundance values where appropriate.
- Data tables include sediment porosity (water content), organic contact, and total organic carbon and nitrogen concentrations, and trace-element concentrations (cadmium, copper, lead, mercury, and zinc).

4.3.1 STATION BI-25

4.3.1.1 BI-25 Abstract

- Station BI-25 has a water depth of 24.0 m and is located on the outer bank of Roberts Bank of the Fraser River Delta.
- Sediment texture consisted of a moderately-sorted, medium sand with an arithmetic mean grain size of 331.60 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 28.79% and 1.44%, respectively, while TOC and TON estimates are 0.29% and 0.03%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL).
- The meiofauna community consisted of Nematoda, Bivalvia, and *Richtersia* sp. that ranged between 0.25 – 98.53 % (relative proportion) and 0.19 to 75.53 No.cm^{-2} (abundance).

4.3.1.2 Location of sampling station BI-25

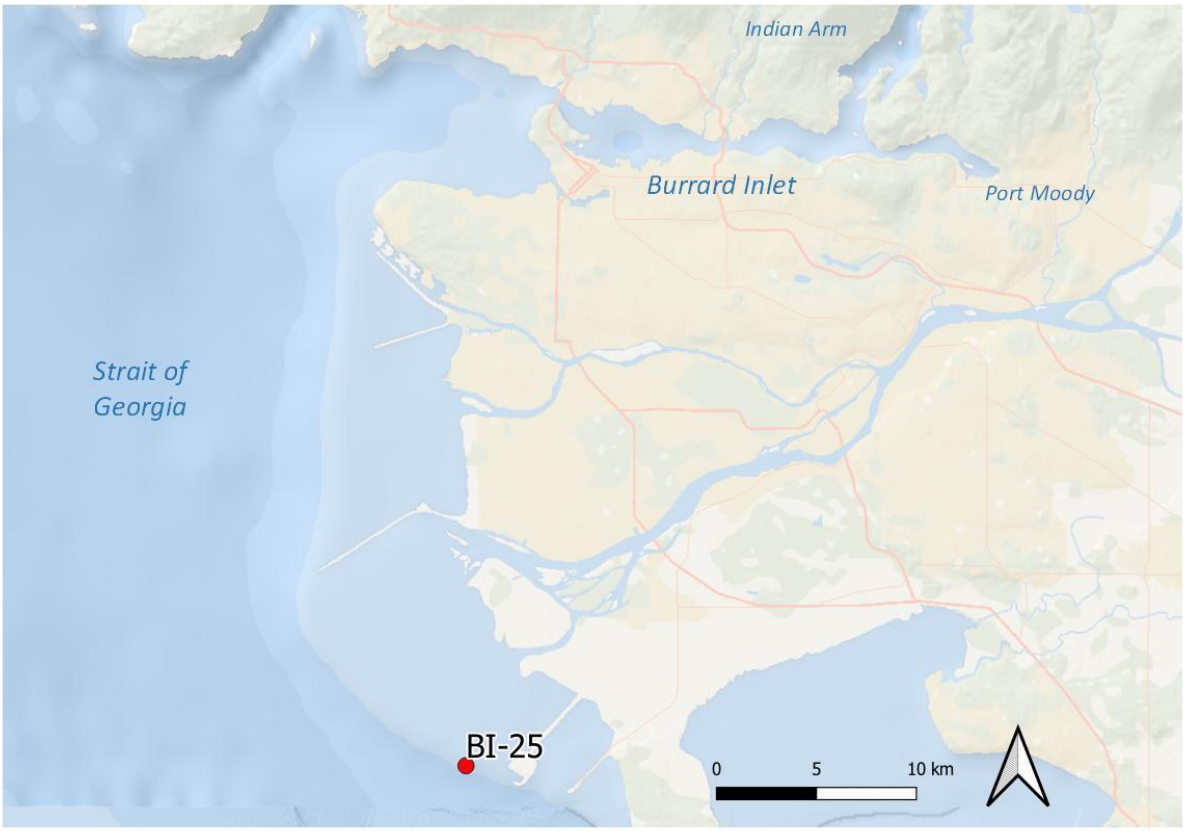
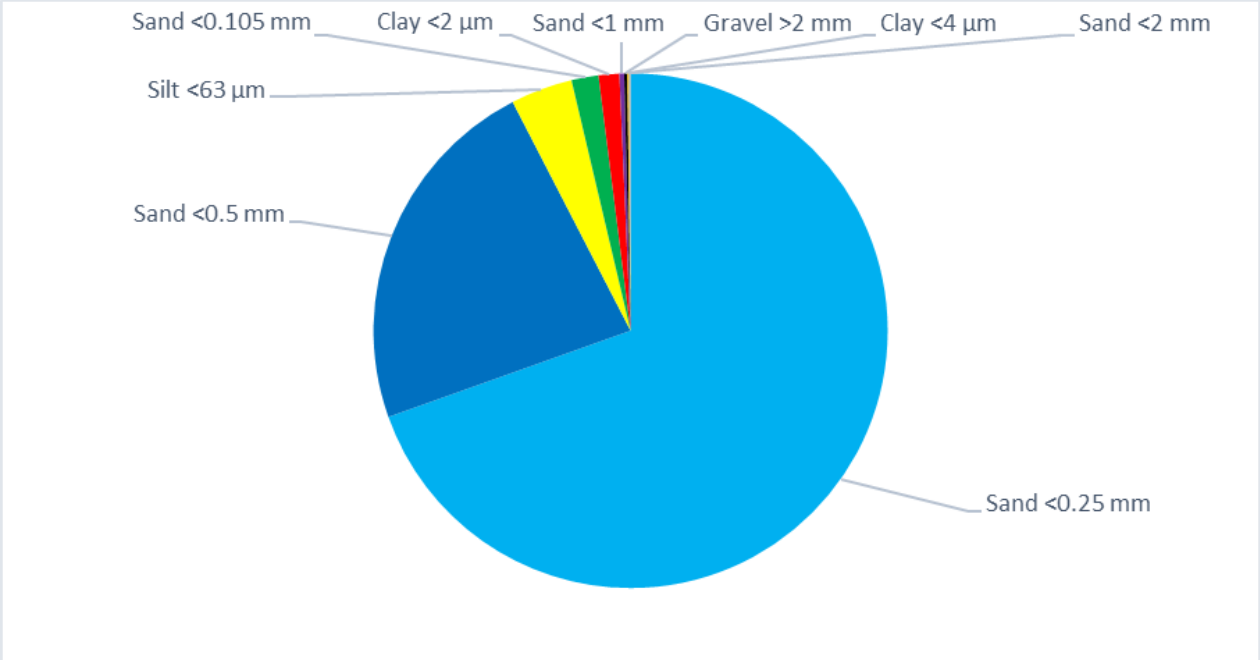


Figure 3: Location of BI-25 sampling station at Roberts Bank situated within the Fraser River Delta, British Columbia, Canada (49° 1’ 6.3” N; 123° 12’ 4.3” W). A Smith-McIntyre grab sample was collected on September 3rd, 2020. BI = Burrard Inlet.

4.3.1.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.2
	Sand	<2 mm	0.1
		<1 mm	0.3
		<0.5 mm	22.9
		<0.25 mm	69.6
		<0.105 mm	1.7
	Silt	<63 µm	3.9
	Clay	<4 µm	0.1
		<2 µm	1.3

Figure 4: Relative proportion of sediment grain size categories at station BI-25. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.1.4 Sediment geotechnical, organic, and trace-element estimates

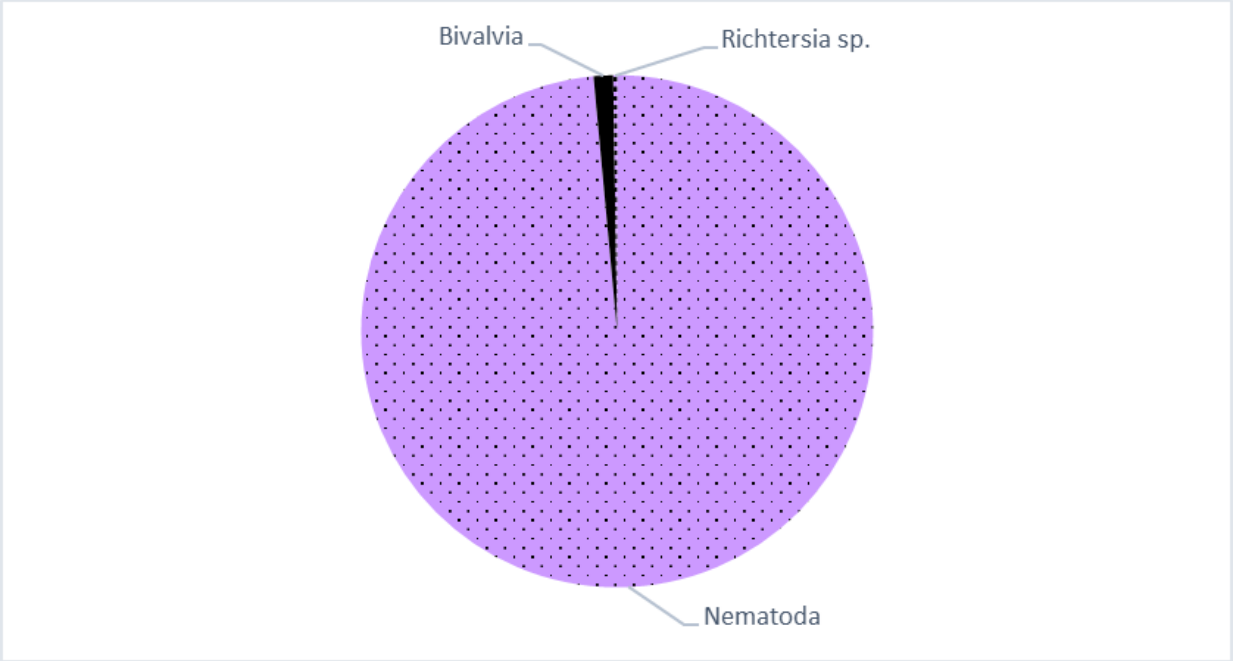
Table 2: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-25.

Variable	Porosity	Organic Content	TOC	TON
Percent	28.79	1.44	0.29	0.03

Table 3: Sediment trace-element concentrations (μg g^{-1}) at station BI-25.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.2	14	3	0.024	48

4.3.1.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	98.53	75.53
	Bivalvia	1.23	0.94
	Richtersia sp.	0.25	0.19

Figure 5: Relative proportion and abundance of meiofauna taxa at station BI-25. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.2 STATION BI-24

4.3.2.1 BI-24 abstract

- Station BI-24 has a water depth of 22.2 m and is located at the edge of the bank on Roberts Bank on the Fraser River Delta.
- Sediment texture consisted of a poorly-sorted, very fine sand with an arithmetic mean grain size of 134.50 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 41.38% and 2.38%, respectively, while TOC and TON estimates are 1.02% and 0.23%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (29 µg g^{-1}), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Harpacticoida, Bivalvia, and Rotifera that ranged between 1.33 – 90.67% (relative proportion) and 0.19 to 12.81 $No.cm^{-2}$ (abundance).

4.3.2.2 Location of sampling station BI-24

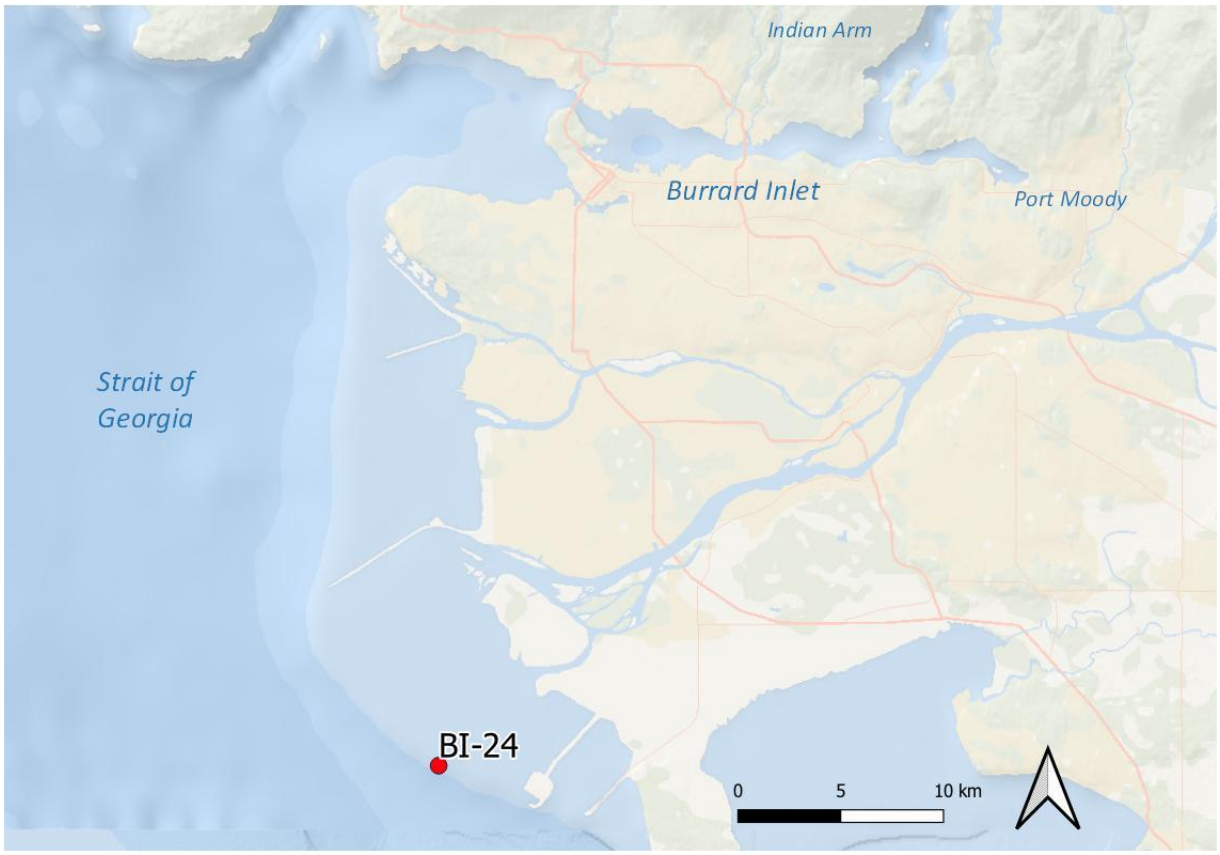
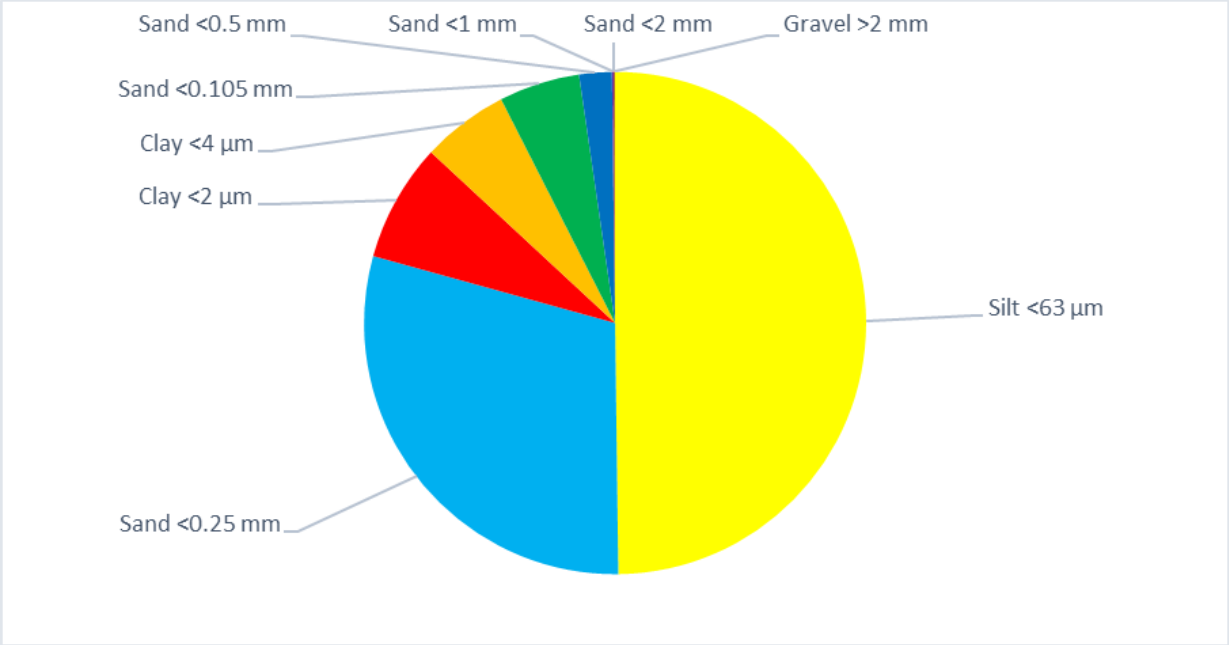


Figure 6: Location of BI-24 sampling station at the Roberts Bank situated in the Fraser River Delta, British Columbia, Canada (49° 1' 40.6" N; 123° 13' 44.3" W). A Smith-McIntyre grab sample was collected on September 3rd, 2020. BI = Burrard Inlet.

4.3.2.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.1
		<1 mm	0.1
		<0.5 mm	2.1
		<0.25 mm	29.5
		<0.105 mm	5.2
	Silt	<63 µm	49.8
	Clay	<4 µm	5.6
		<2 µm	7.6

Figure 7: Relative proportion of sediment grain size categories at station BI-24. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.2.4 Sediment geotechnical, organic, and trace-element estimates

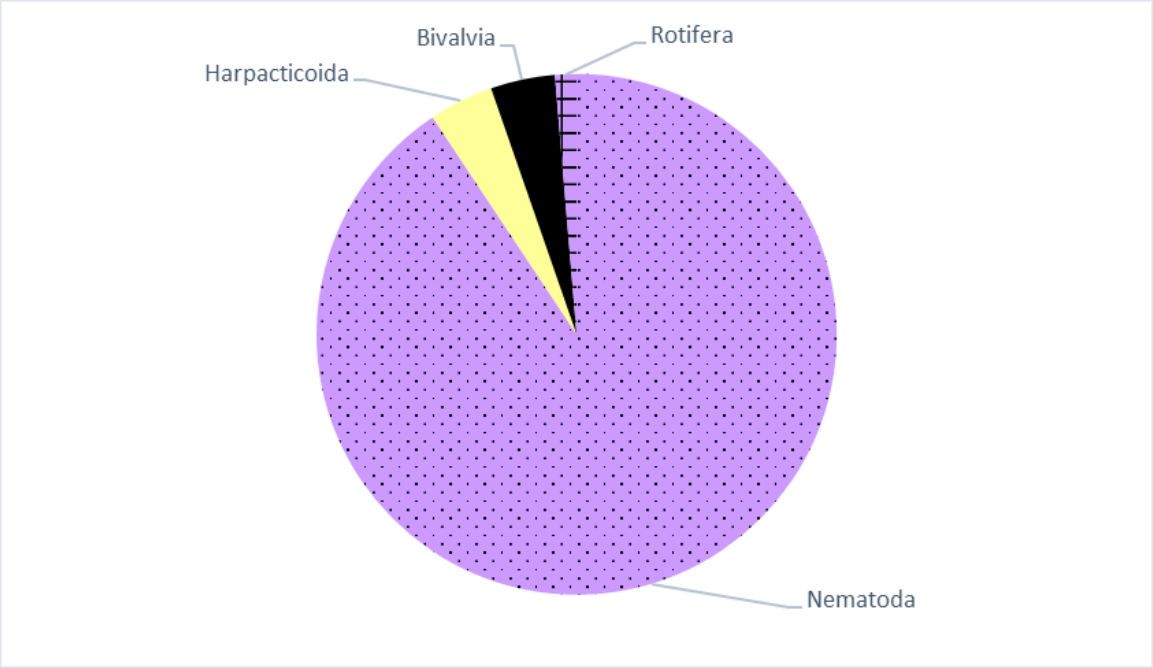
Table 4: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-24.

Variable	Porosity	Organic Content	TOC	TON
Percent	41.38	2.38	1.02	0.23

Table 5: Sediment trace-element concentrations (μg g^{-1}) at station BI-24.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.2	29	5.2	0.044	73

4.3.2.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	90.67	12.81
	Harpacticoida	4.00	0.57
	Bivalvia	4.00	0.57
	Rotifera	1.33	0.19

Figure 8: Relative proportion and abundance of meiofauna taxa at station BI-24. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.3 STATION BI-23

4.3.3.1 BI-23 abstract

- Station BI-23 has a water depth of 41.4 m and is located at midpoint offshore from the Fraser River Delta.
- Sediment texture consisted of a very poorly-sorted, coarse silt with an arithmetic mean grain size of 62.22 µm and a very fine skewed frequency profile towards coarse sediment.
- The sediment porosity and organic content estimates are 49.52% and 3.12%, respectively, while TOC and TON estimates are 1.07% and 0.25%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (37 µg g^{-1}), which exceeded TEL.The meiofauna community consisted of Nematoda, Harpacticoida, Kinorhyncha, Foraminifera, *Richtersia* sp., Desmoscolesidae, Arthropoda (nauplii),Sedentaria, and Oligochaeta that ranged between 0.07 – 93.89 % (relative proportion) and 0.19 - 364.36 No.cm^{-2} (abundance).

4.3.3.2 Location of sampling station BI-23

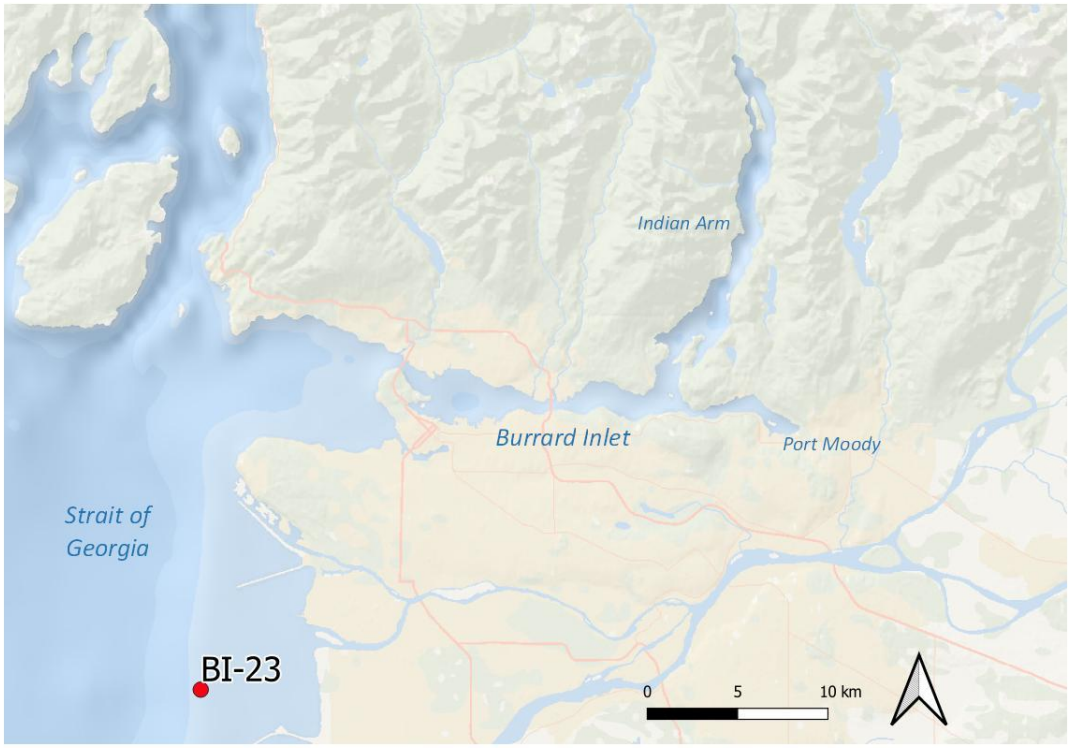
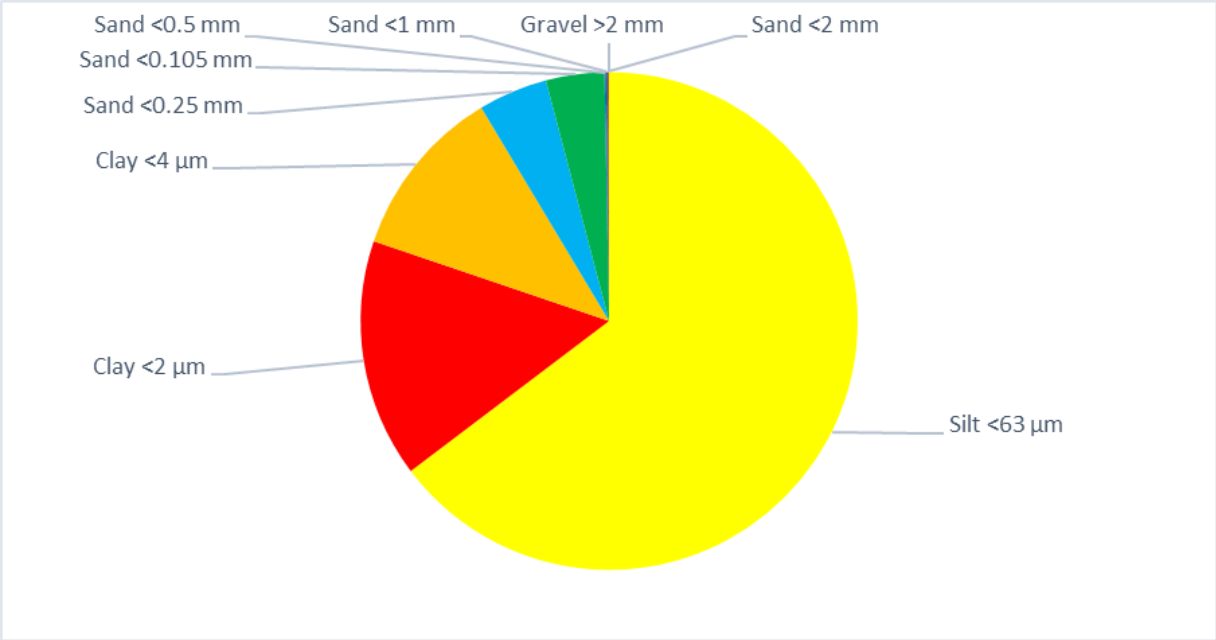


Figure 9: Location of BI-23 sampling station at mid Fraser River Delta, British Columbia, Canada (49° 9' 16.2" N; 123° 17' 29.8" W). A Smith-McIntyre grab was collected on September 3rd, 2020. BI = Burrard Inlet.

4.3.3.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.1
		<1 mm	0.1
		<0.5 mm	0.1
		<0.25 mm	4.5
		<0.105 mm	3.8
	Silt	<63 µm	64.7
	Clay	<4 µm	11.2
		<2 µm	15.5

Figure 10: Relative proportion of sediment grain size categories at station BI-23. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.3.4 Sediment geotechnical, organic, and trace-element estimates

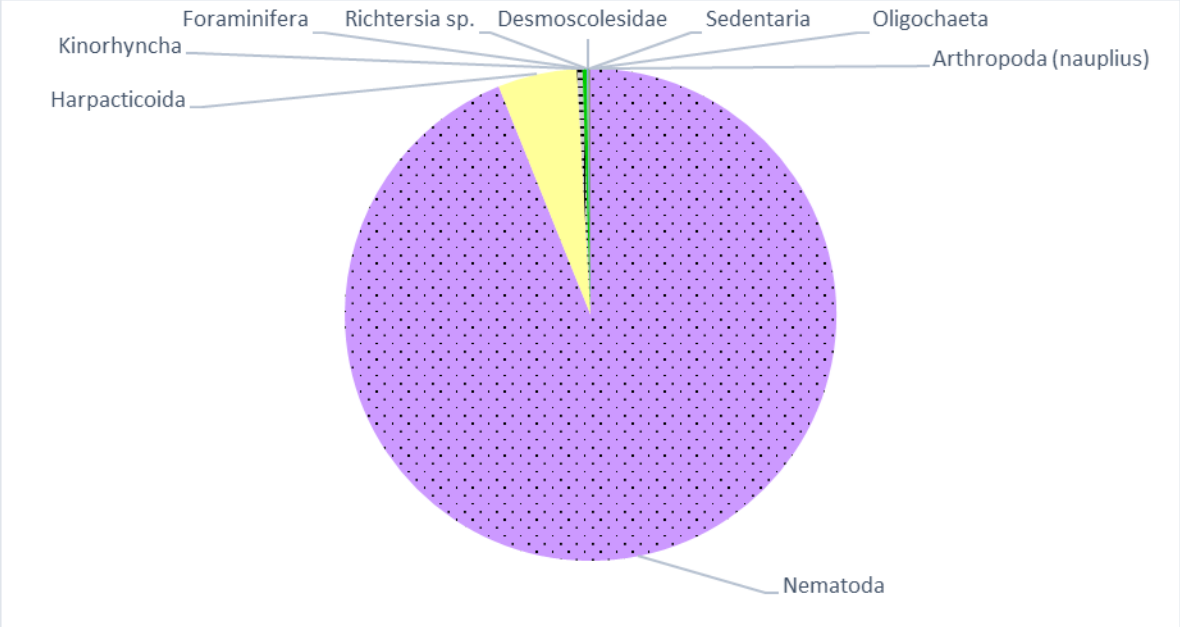
Table 6: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-23.

Variable	Porosity	Organic Content	TOC	TON
Percent	49.52	3.12	1.07	0.25

Table 7: Sediment trace-element concentrations (μg g^{-1}) at station BI-23.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.3	37	8.7	0.066	91

4.3.3.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	93.89	634.36
	Harpacticoida	5.21	35.22
	Kinorhyncha	0.36	2.45
	Foraminifera	0.28	1.88
	Richtersia sp.	0.08	0.57
	Desmoscolesidae	0.06	0.38
	Arthropoda (nauplius)	0.06	0.38
	Sedentaria	0.03	0.19
	Oligochaeta	0.03	0.19

Figure 11: Relative proportion and abundance of meiofauna taxa at station BI-23. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.4 STATION BI-22

4.3.4.1 BI-22 abstract

- Station BI-22 has a water depth of 30.2 m and is located at the edge of the bank at the northern point of Fraser River Delta.
- Sediment texture consisted of a poorly-sorted, very fine sand with an arithmetic mean grain size of 98.11 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 43.10% and 2.67%, respectively, while TOC and TON estimates are 0.71% and 0.06%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (33 µg g^{-1}), which exceeded the TEL.
- The meiofauna community consisted of Nematoda, Kinorhyncha, Harpacticoida, Foraminifera, *Richtersia* sp, and Sedentaria that ranged between 0.09 – 92.63% (relative proportion) and 0.19 to 198.90 No.cm^{-2} (abundance).

4.3.4.2 Location of sampling station BI-22

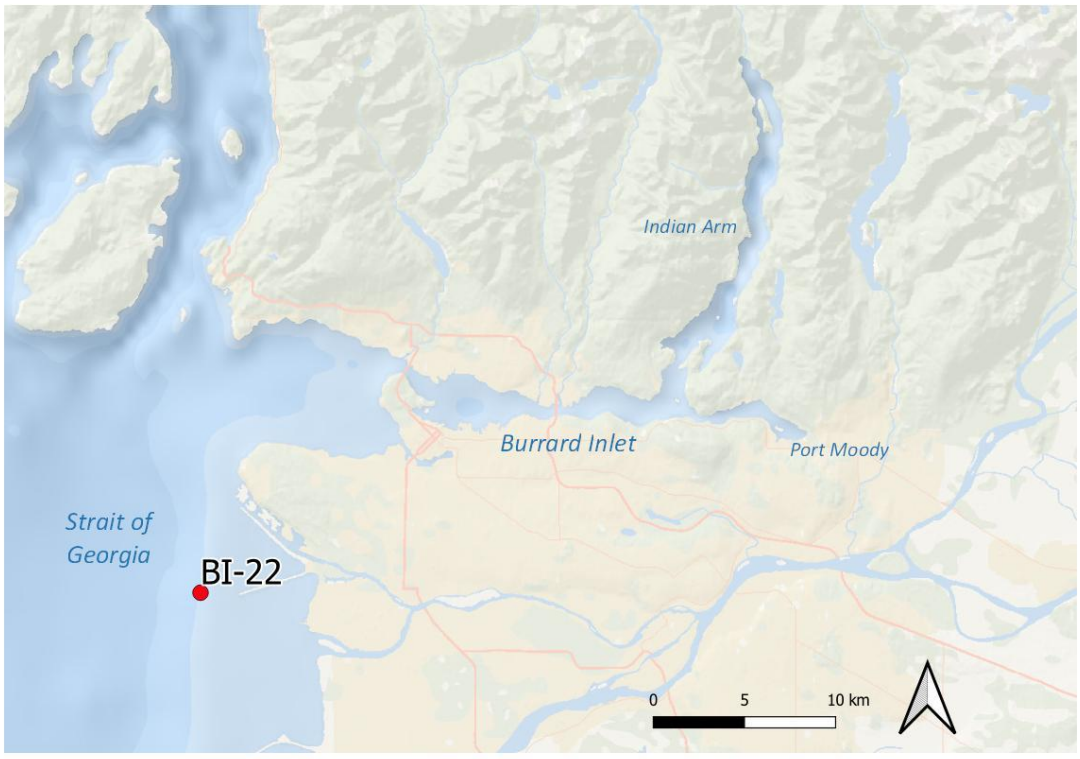
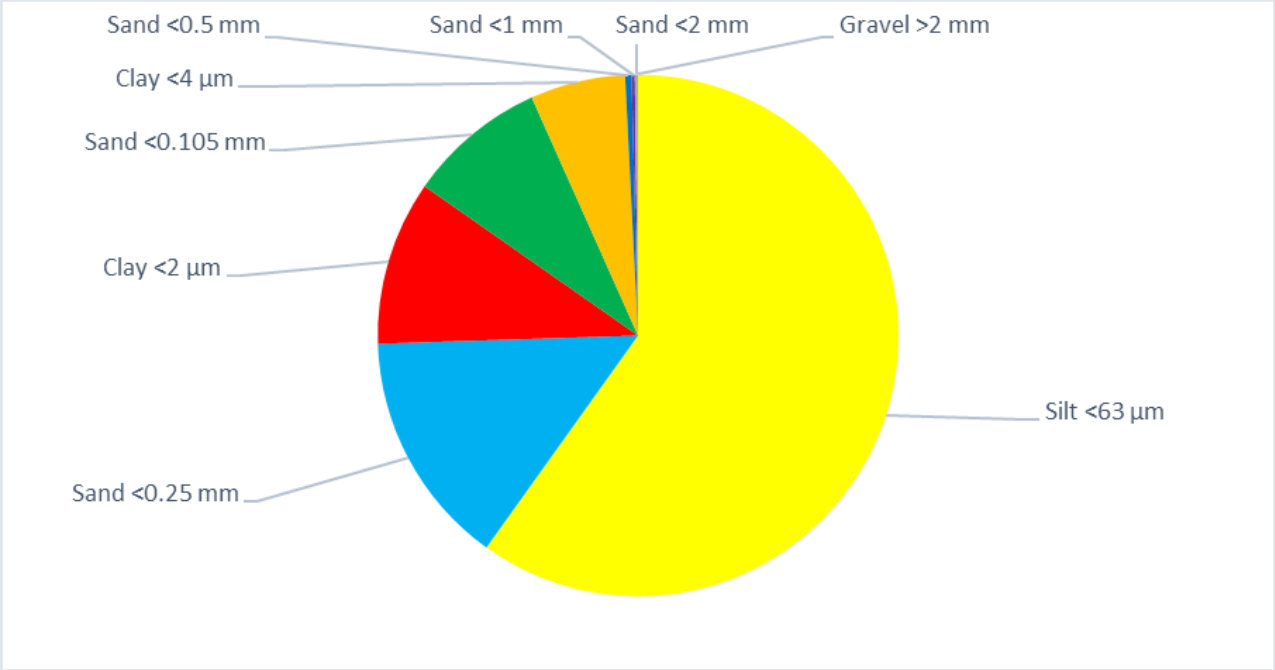


Figure 12: Location of BI-22 sampling station at the north-end of Fraser River Delta, British Columbia, Canada (49° 12' 22.2" N; 123° 17' 35.6" W). A Smith-McIntyre grab sample was collected on September 3rd, 2020. BI = Burrard Inlet.

4.3.4.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.2
		<1 mm	0.2
		<0.5 mm	0.4
		<0.25 mm	14.6
		<0.105 mm	8.6
	Silt	<63 µm	59.9
	Clay	<4 µm	5.9
		<2 µm	10.2

Figure 13: Relative proportion of sediment grain size categories at station BI-22. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.4.4 Sediment geotechnical, organic, and trace-element estimates

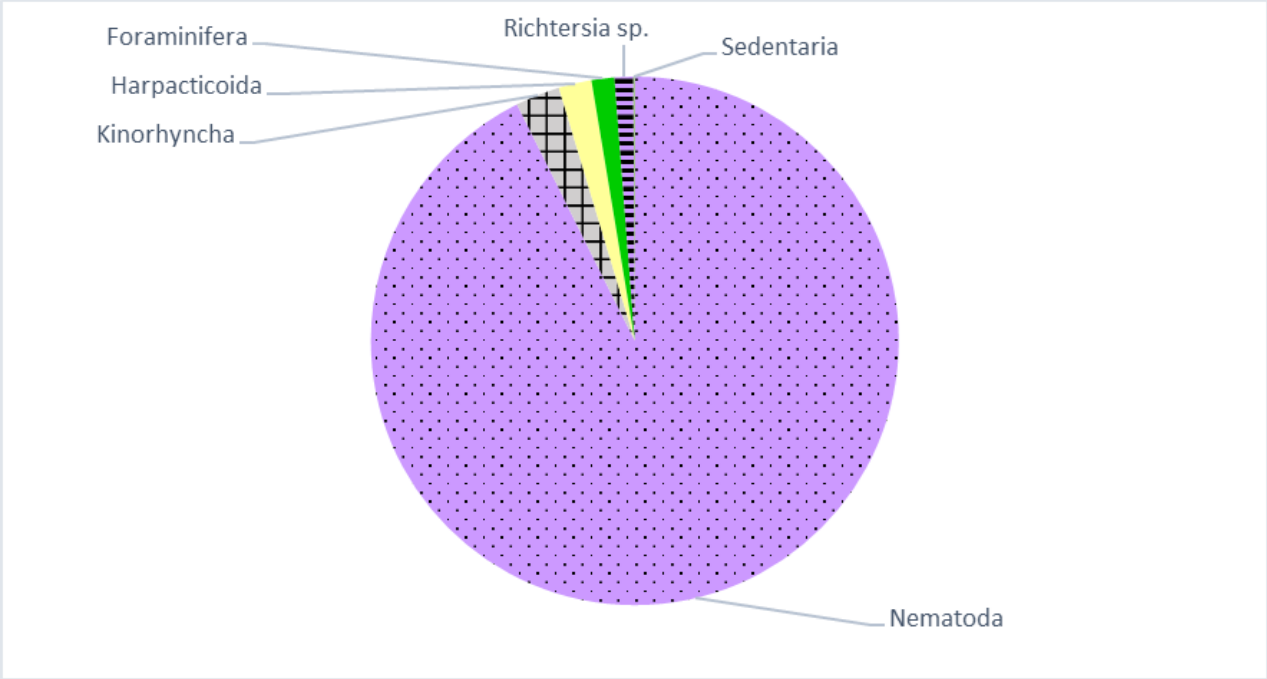
Table 8: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-22.

Variable	Porosity	Organic Content	TOC	TON
Percent	43.10	2.67	0.71	0.06

Table 9: Sediment trace-element concentrations (μg g^{-1}) at station BI-22.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.3	33	6.6	0.058	86

4.3.4.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	92.63	198.90
	Kinorhyncha	2.72	5.84
	Harpacticoida	2.02	4.33
	Foraminifera	1.40	3.01
	Richtersia sp.	1.14	2.45
	Sedentaria	0.09	0.19

Figure 14: Relative proportion and abundance of meiofauna taxa at station BI-22. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.5 STATION BI-21

4.3.5.1 BI-21 abstract:

- Station BI-21 has a water depth of 18.8 m and is located offshore from the northern point of Fraser River Delta.
- Sediment texture consisted of a poorly-sorted, very fine sand with an arithmetic mean grain size of 98.32 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 39.58% and 2.25%, respectively, while TOC and TON estimates are 0.57% and 0.07%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (29 µg g^{-1}), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Harpacticoida, Kinorhyncha, Foraminifera, *Richtersia* sp., Desmoscolesidae, Errantia, Bivalvia, Arthropoda (nauplii), Cirripedia, Ostracoda, and Rotifera that ranged between 0.03 – 91.87 % (relative proportion) and 0.06 to 198.58 No.cm^{-2} (abundance).

4.3.5.2 Location of sampling station BI-21

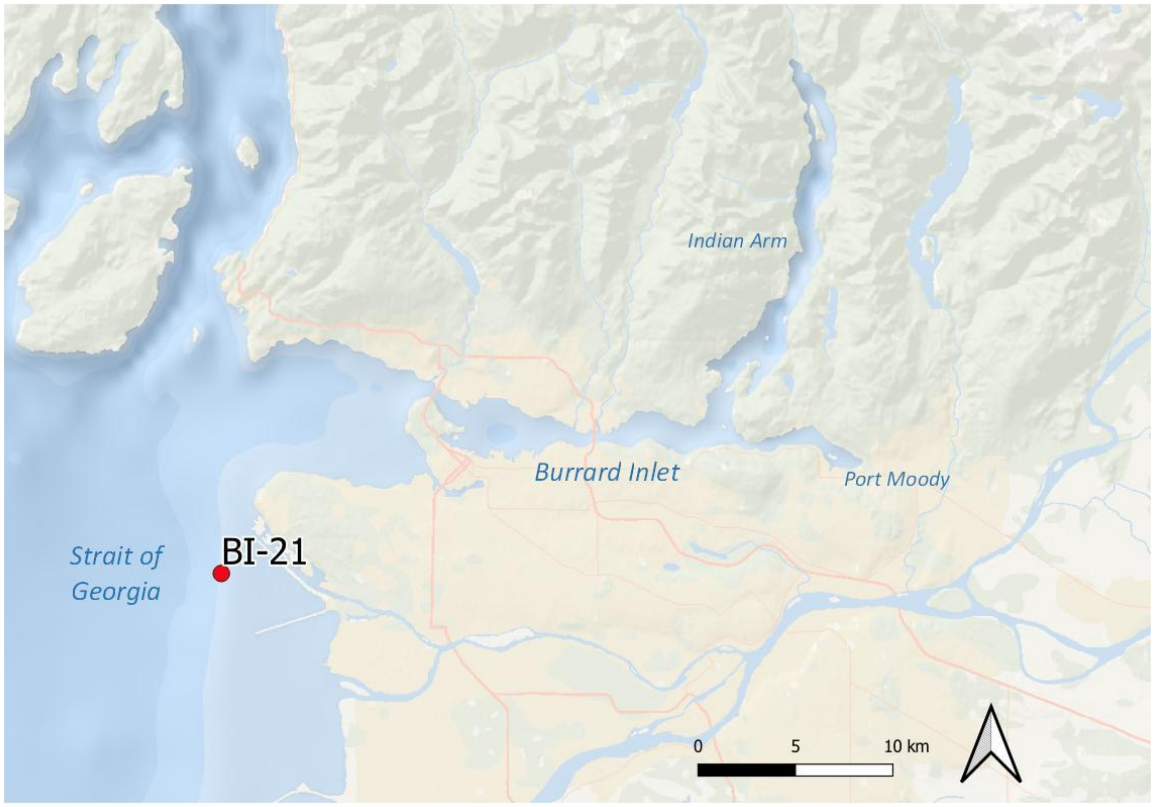
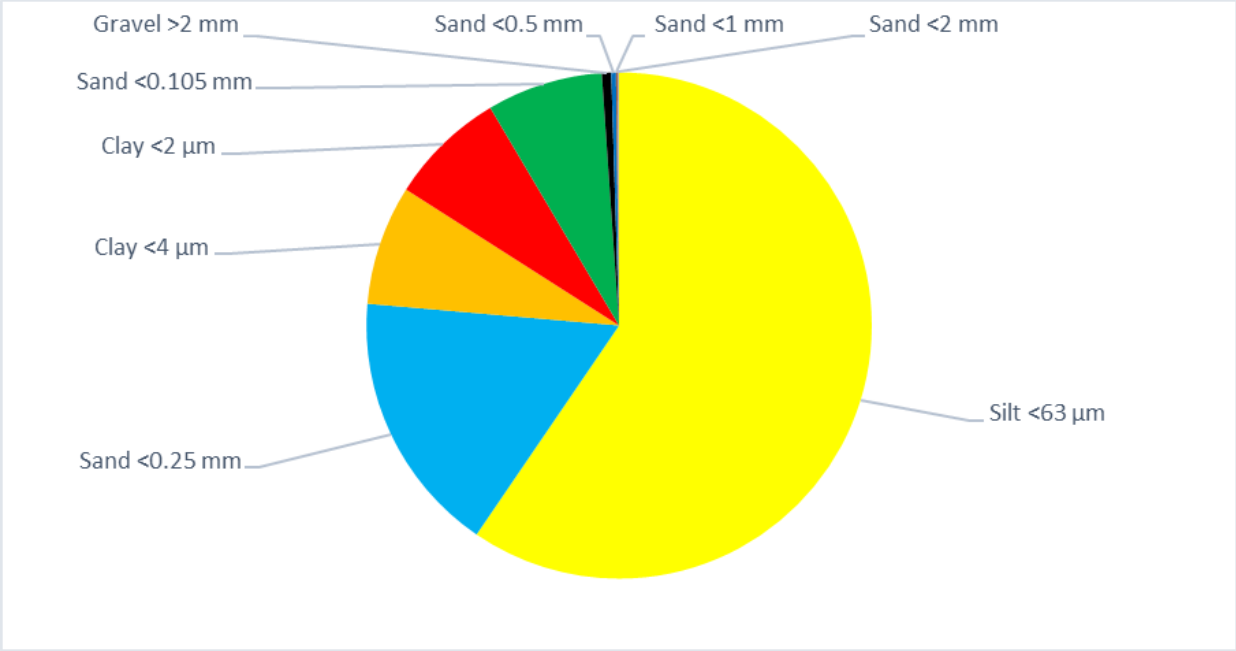


Figure 15: Location of BI-21 sampling station at the northern Fraser River Delta, British Columbia, Canada (49° 13' 58.4" N; 123° 17' 17.2" W). A Smith-McIntyre grab sample was collected on September 3rd, 2020. BI = Burrard Inlet.

4.3.5.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.6
	Sand	<2 mm	0.1
		<1 mm	0.1
		<0.5 mm	0.3
		<0.25 mm	16.8
		<0.105 mm	7.4
	Silt	<63 µm	59.5
	Clay	<4 µm	7.7
		<2 µm	7.5

Figure 16: Relative proportion of sediment grain size categories at station BI-21. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.5.4 Sediment geotechnical, organic, and trace-element estimates

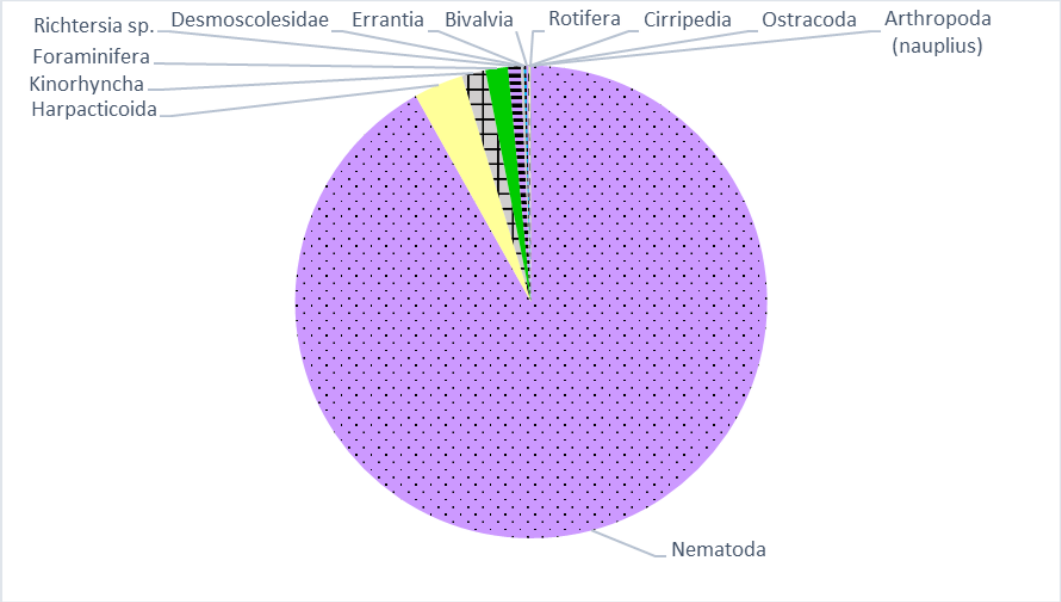
Table 10: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-21.

Variable	Porosity	Organic Content	TOC	TON
Percent	39.58	2.25	0.57	0.07

Table 11: Sediment trace-element concentrations (μg g^{-1}) at station BI-21.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.3	29	6.2	0.057	77

4.3.5.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	91.87	198.58
	Harpacticoida	3.40	7.35
	Kinorhyncha	1.63	3.52
	Foraminifera	1.54	3.33
	Richtersia sp.	0.87	1.88
	Desmoscolesidae	0.20	0.44
	Errantia	0.17	0.38
	Bivalvia	0.12	0.25
	Arthropoda (nauplius)	0.09	0.19
	Cirripedia	0.06	0.13
	Ostracoda	0.03	0.06
	Rotifera	0.03	0.06

Figure 17: Relative proportion and abundance of meiofauna taxa at station BI-21. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.6 STATION BI-20

4.3.6.1 BI-20 abstract

- BI-20 has a water depth of 21.2 m and is located at the north shore of the outer harbour entrance to BI.
- Sediment texture consisted of a very poorly-sorted, fine sand with an arithmetic mean grain size of 278.70 µm and a very fine skewed frequency profile towards coarse sediment.
- The sediment porosity and organic content estimates are 52.76% and 3.76%, respectively, while TOC and TON estimates are 0.93% and 0.32%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the copper concentration (45 µg g^{-1}), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Harpacticoida, Foraminifera, *Richtersia* sp., Kinorhyncha, Desmoscolesidae, Errantia, Ostracoda, Bivalvia, Sedentaria, and Arachnida that ranged between 0.14 – 80.39 % (relative proportion) and 0.19 to 108.11 No.cm^{-2} (abundance).

4.3.6.2 Location of sampling station BI-20

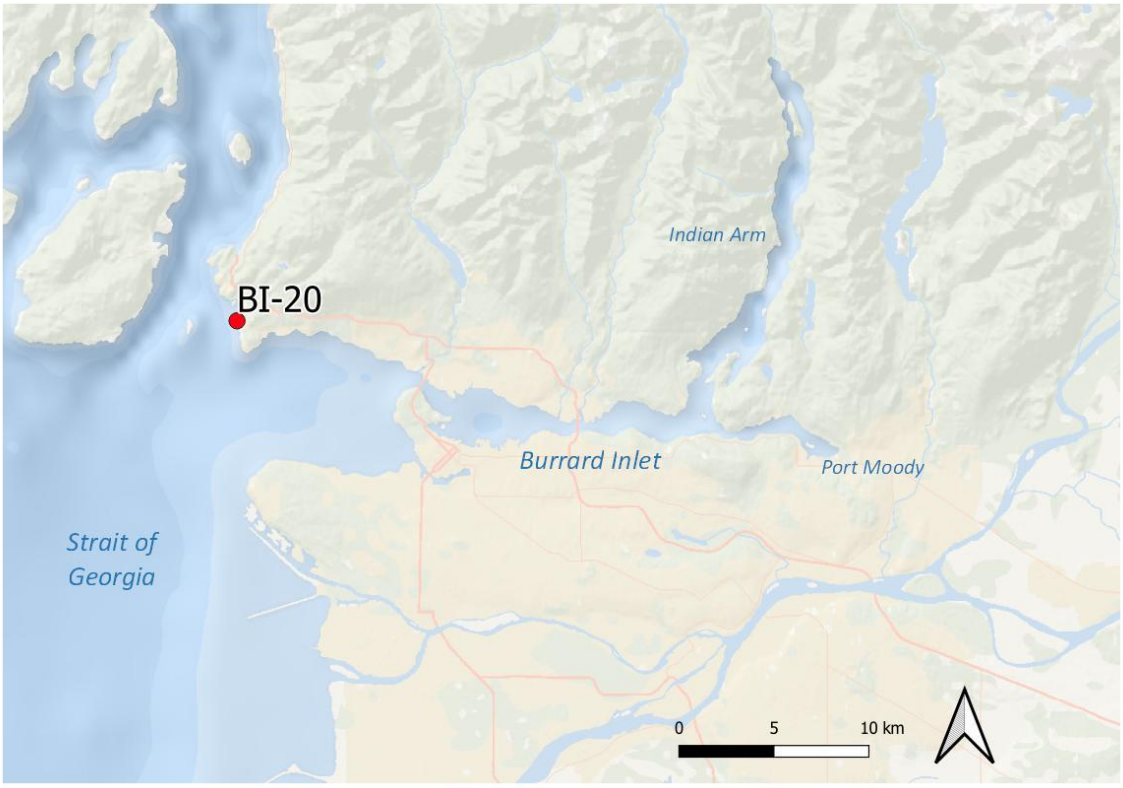
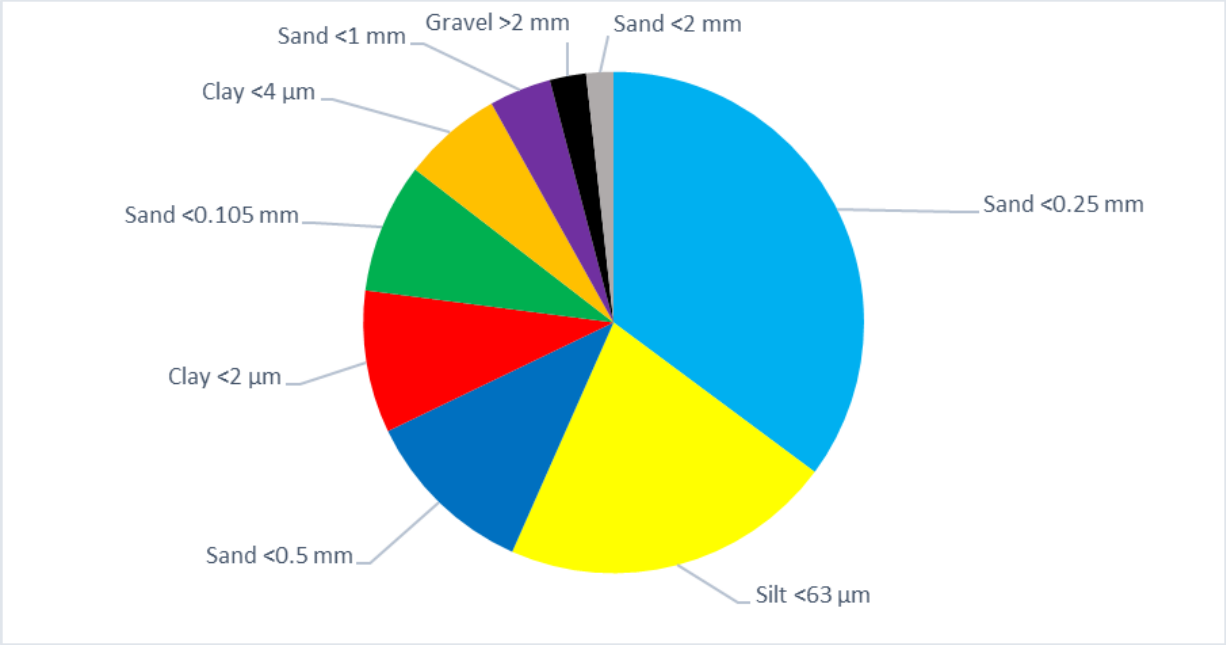


Figure 18: Location of BI-20 sampling station at the Outer Harbour of Burrard Inlet, British Columbia (49° 20' 42.1" N; 123° 16' 18.5" W). A Smith-McIntyre grab sample was collected on September 4th, 2020. BI = Burrard Inlet.

4.3.6.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	2.4
	Sand	<2 mm	1.8
		<1 mm	4.0
		<0.5 mm	11.2
		<0.25 mm	35.1
		<0.105 mm	8.4
	Silt	<63 µm	21.5
	Clay	<4 µm	6.4
		<2 µm	9.2

Figure 19: Relative proportion of sediment grain size categories at station BI-20. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.6.4 Sediment geotechnical, organic, and trace-element estimates

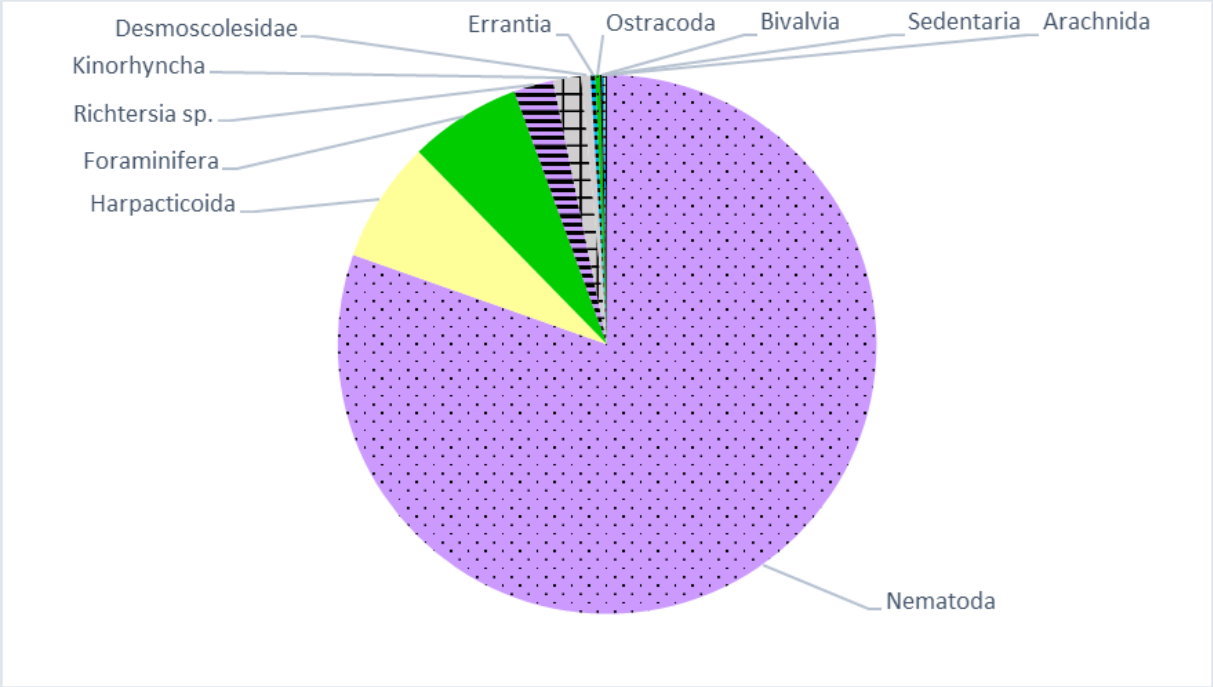
Table 12: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-20.

Variable	Porosity	Organic Content	TOC	TON
Percent	52.76	3.76	0.93	0.32

Table 13: Sediment trace-element concentrations (μg g^{-1}) at station BI-20.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.4	45	11	0.087	78

4.3.6.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	80.39	108.11
	Harpacticoida	7.28	9.79
	Foraminifera	6.72	9.04
	Richtersia sp.	2.38	3.20
	Kinorhyncha	1.68	2.26
	Desmoscolesidae	0.56	0.75
	Errantia	0.28	0.38
	Ostracoda	0.28	0.38
	Bivalvia	0.14	0.19
	Sedentaria	0.14	0.19
	Arachnida	0.14	0.19

Figure 20: Relative proportion and abundance of meiofauna taxa at station BI-20. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.7 STATION BI-19

4.3.7.1 BI-19 abstract

- Station BI-19 has a water depth of 92.3 m and is located on the north shore of the Outer Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, very coarse silt with an arithmetic mean grain size of 109.30 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 56.34% and 5.44%, respectively, while TOC and TON estimates are 1.64% and 0.26%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the copper concentration (100 $\mu g\ g^{-1}$), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, *Richtersia* sp., Desmoscolesidae, Bivalvia, Kinorhyncha, Errantia, and Ostracoda that ranged between 0.06 – 85.96 % (relative proportion) and 0.19 to 264.07 $No.cm^{-2}$ (abundance).

4.3.7.2 Location of sampling station BI-19

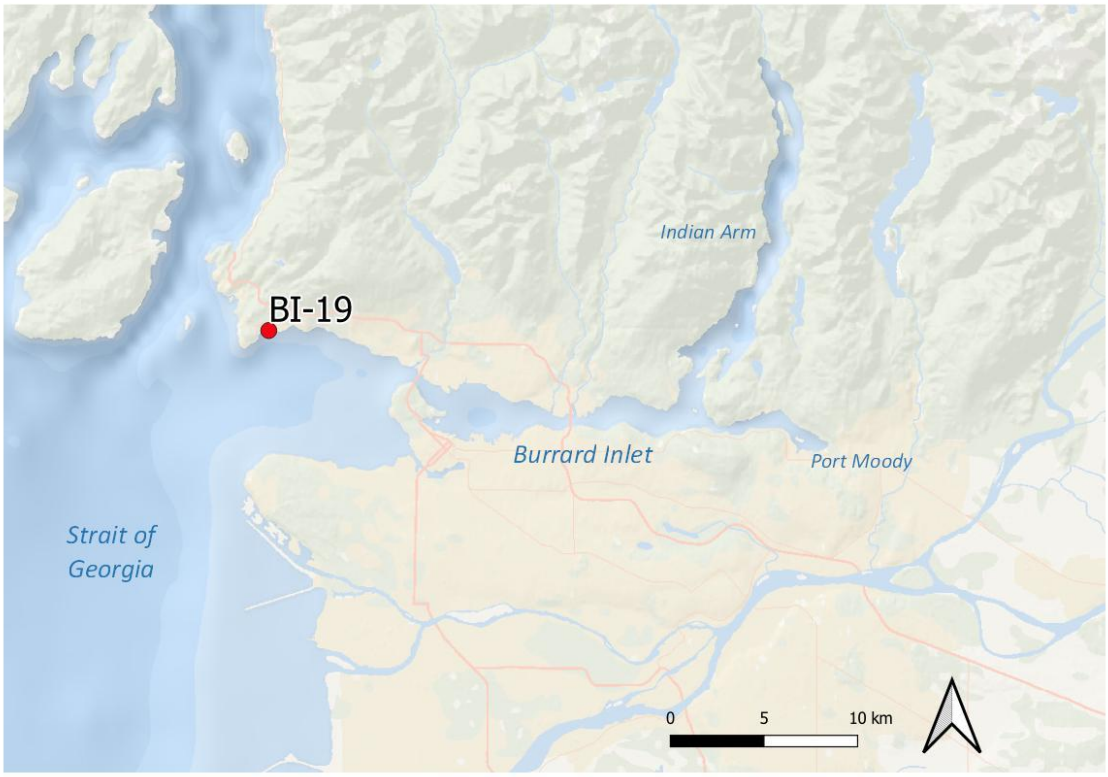
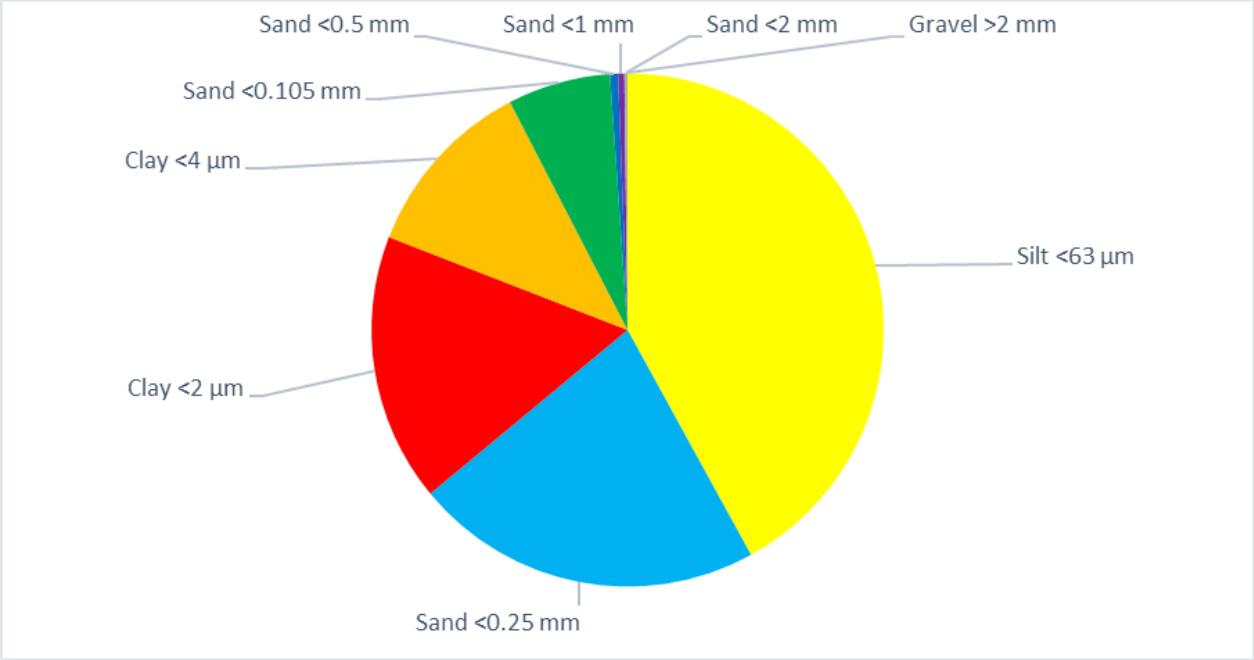


Figure 21: Location of BI-19 sampling station at the Outer Harbour of Burrard Inlet, British Columbia, Canada (49° 20' 18.7" N; 123° 14' 48.3" W). A Smith-McIntyre grab sample was collected on September 2nd, 2020. BI = Burrard Inlet.

4.3.7.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.2
		<1 mm	0.4
		<0.5 mm	0.5
		<0.25 mm	22.0
		<0.105 mm	6.5
	Silt	<63 µm	42.0
	Clay	<4 µm	11.5
		<2 µm	16.9

Figure 22: Relative proportion of sediment grain size categories at station BI-19. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.7.4 Sediment geotechnical, organic, and trace-element estimates

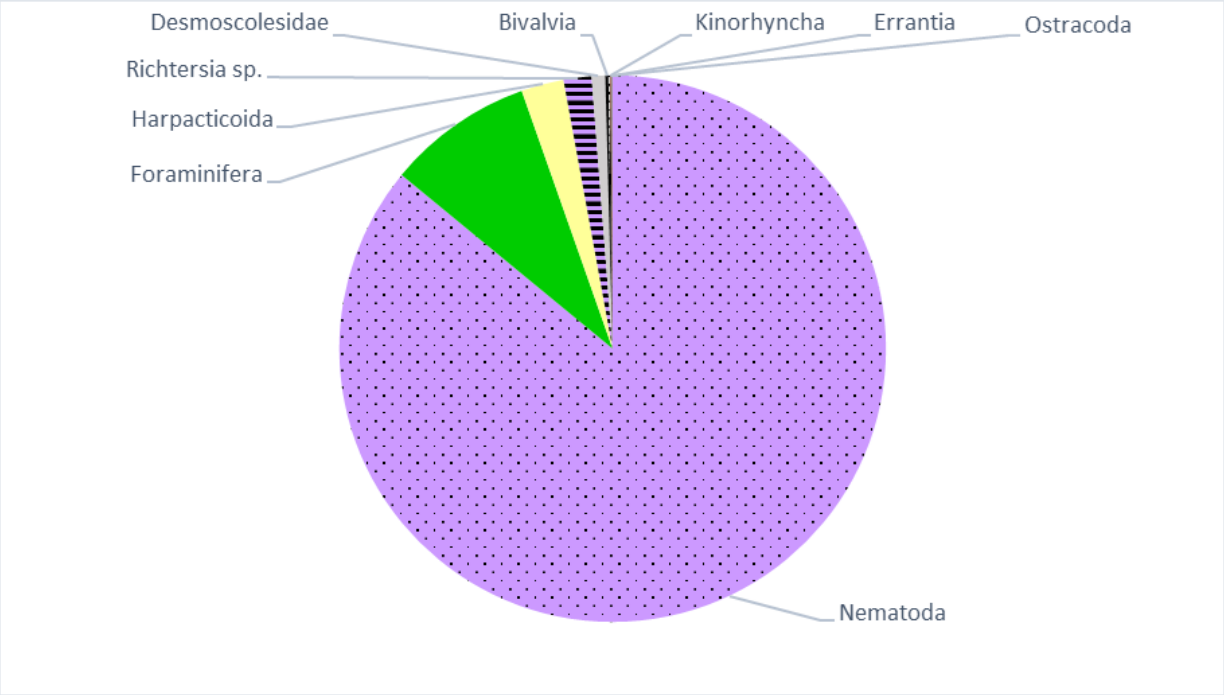
Table 14: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-19.

Variable	Porosity	Organic Content	TOC	TON
Percent	56.34	5.44	1.64	0.26

Table 15: Sediment trace-element concentrations (μg g^{-1}) at station BI-19.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.4	100	17	0.11	99

4.3.7.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	85.96	264.07
	Foraminifera	8.65	26.56
	Harpacticoida	2.51	7.72
	Richtersia sp.	1.66	5.09
	Desmoscolesidae	0.80	2.45
	Bivalvia	0.18	0.57
	Kinorhyncha	0.12	0.38
	Errantia	0.06	0.19
	Ostracoda	0.06	0.19

Figure 23: Relative proportion and abundance of meiofaunal taxa at station BI-19. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.8 STATION BI-18

4.3.8.1 BI-18 abstract

- Station BI-18 has a water depth of 14.5 m and is located on the north shore of the Outer Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, coarse silt with an arithmetic mean grain size of 67.35 µm and a very fine skewed frequency profile toward coarse sediment.
- The sediment porosity and organic content estimates are 60.98% and 6.52%, respectively, while TOC and TON estimates are 2.10% and 0.29%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of copper (143 µg g^{-1}) and mercury (0.14 µg g^{-1}) concentrations, which exceeded TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Desmoscolesidae*, Richtersia* sp., Kinorhyncha, Errantia, Arthropoda (nauplii), Rotifera, Ostracoda, and Bivalvia that ranged between 0.06 – 66.01 % (relative proportion) and 0.13 to 148.61 No.cm^{-2} (abundance).

4.3.8.2 Location of sampling station BI-18

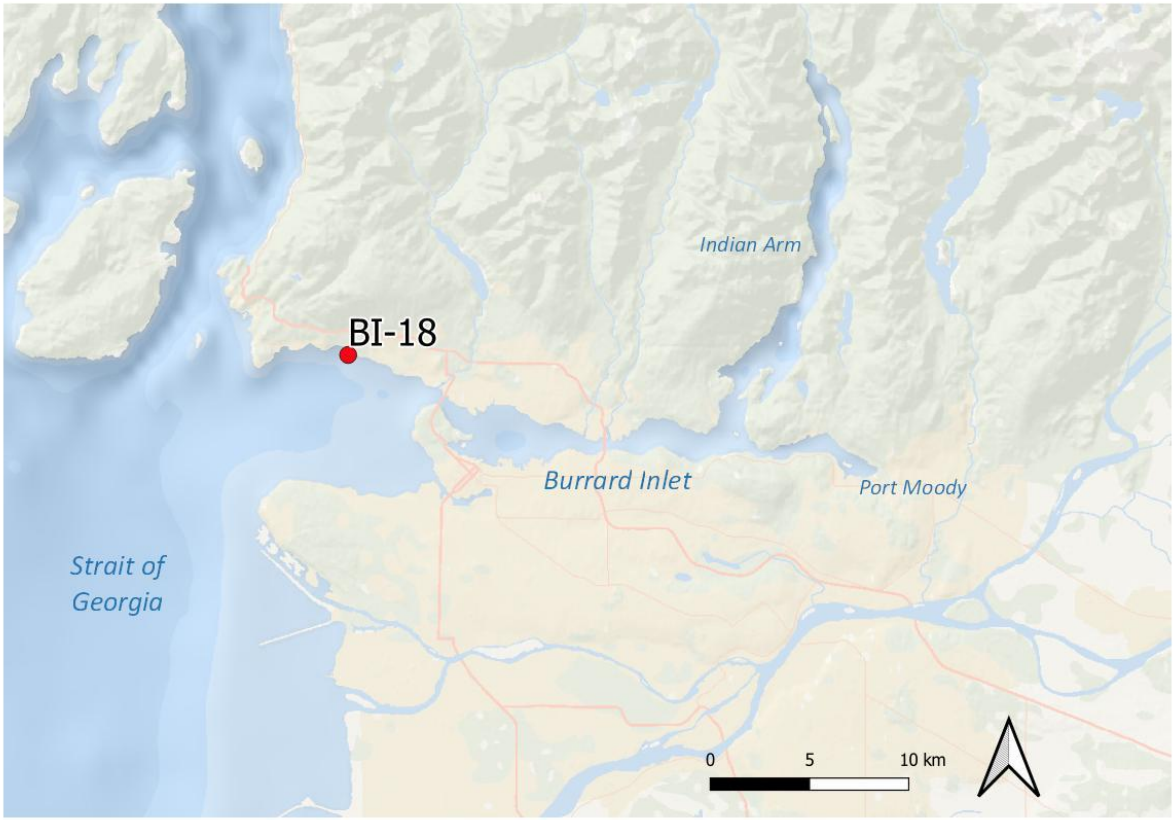
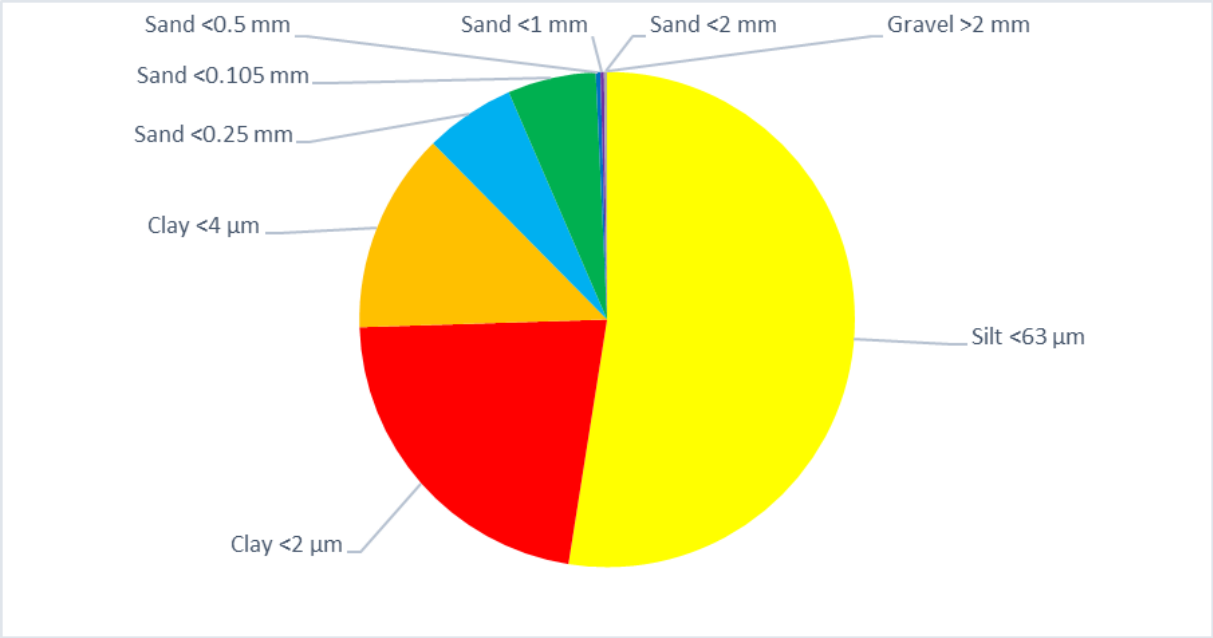


Figure 24: Location of BI-18 sampling station at the Outer Harbour of Burrard Inlet, British Columbia, Canada (49° 20’ 9” N; 123° 12’ 10.2” W). A Smith-McIntyre grab sample was collected on September 2nd, 2020. BI = Burrard Inlet.

4.3.8.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.2
		<1 mm	0.2
		<0.5 mm	0.3
		<0.25 mm	5.9
		<0.105 mm	5.8
	Silt	<63 µm	52.5
	Clay	<4 µm	13.1
		<2 µm	22.0

Figure 25: Relative proportion of sediment grain size categories at station BI-18. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.8.4 Sediment geotechnical, organic, and trace-element estimates

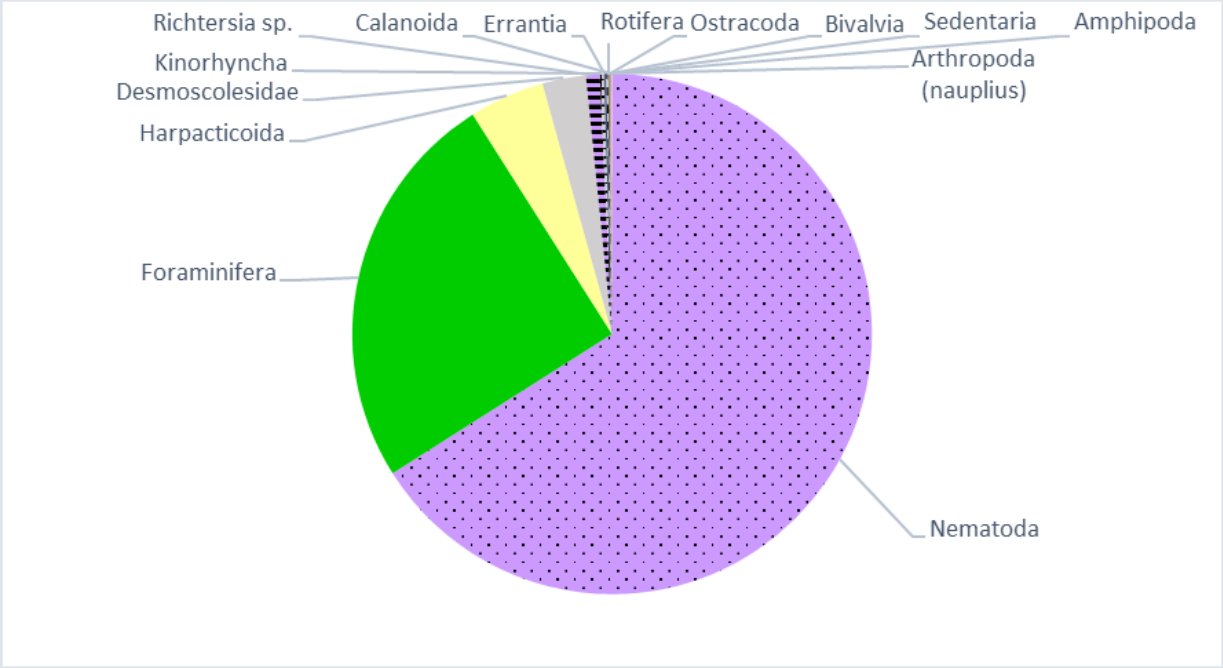
Table 16: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-18.

Variable	Porosity	Organic Content	TOC	TON
Percent	60.98	6.52	2.10	0.29

Table 17: Sediment trace-element concentrations (μg g^{-1}) at station BI-18.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.5	143	24	0.14	120

4.3.8.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	66.01	148.61
	Foraminifera	24.99	56.25
	Harpacticoida	4.68	10.55
	Desmoscolesidae	2.70	6.09
	Richtersia sp.	0.86	1.95
	Kinorhyncha	0.25	0.57
	Errantia	0.14	0.31
	Arthropoda (nauplius)	0.11	0.25
	Rotifera	0.06	0.13
	Ostracoda	0.06	0.13
	Bivalvia	0.06	0.13
	Sedentaria	0.03	0.06
	Amphipoda	0.03	0.06
	Calanoida	0.03	0.06

Figure 26: Relative proportion and abundance of meiofaunal taxa at station BI-18. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.9 STATION BI-17

4.3.9.1 BI-17 abstract

- BI-17 has a water depth of 13.0 m and is located at the southern shore of the outer Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, coarse silt with an arithmetic mean grain size of 55.19 µm and a very fine skewed frequency profile toward coarse sediment.
- The sediment porosity and organic content estimates are 51.45% and 4.17%, respectively, while TOC and TON estimates are 0.91% and 0.24%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (44 $\mu g\ g^{-1}$), which exceeded the TEL.
- The meiofauna community consisted of Nematoda, Harpacticoida, Foraminifera, Desmoscolesidae, and Kinorhyncha that ranged between 0.74 – 85.06 % (relative proportion) and 0.75 to 86.83 $No.cm^{-2}$ (abundance).

4.3.9.2 Location of sampling station BI-17

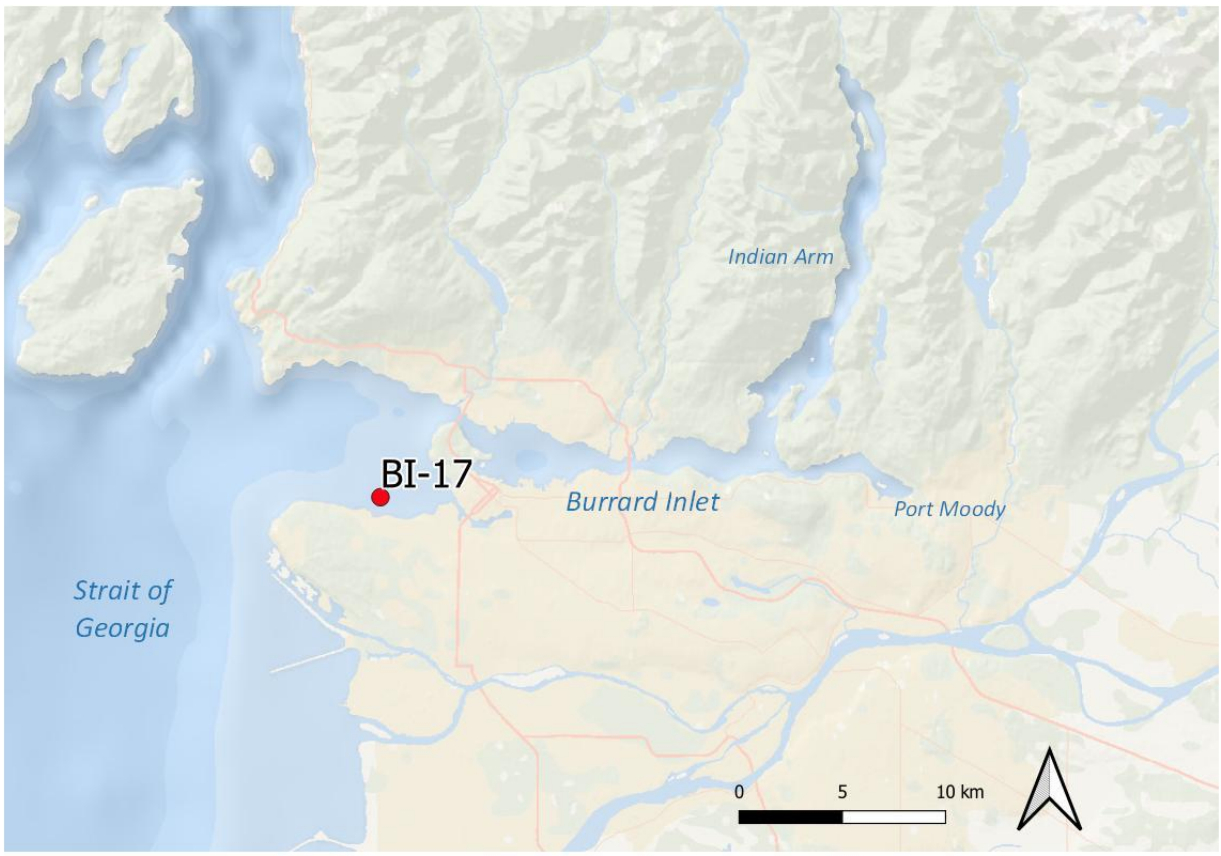
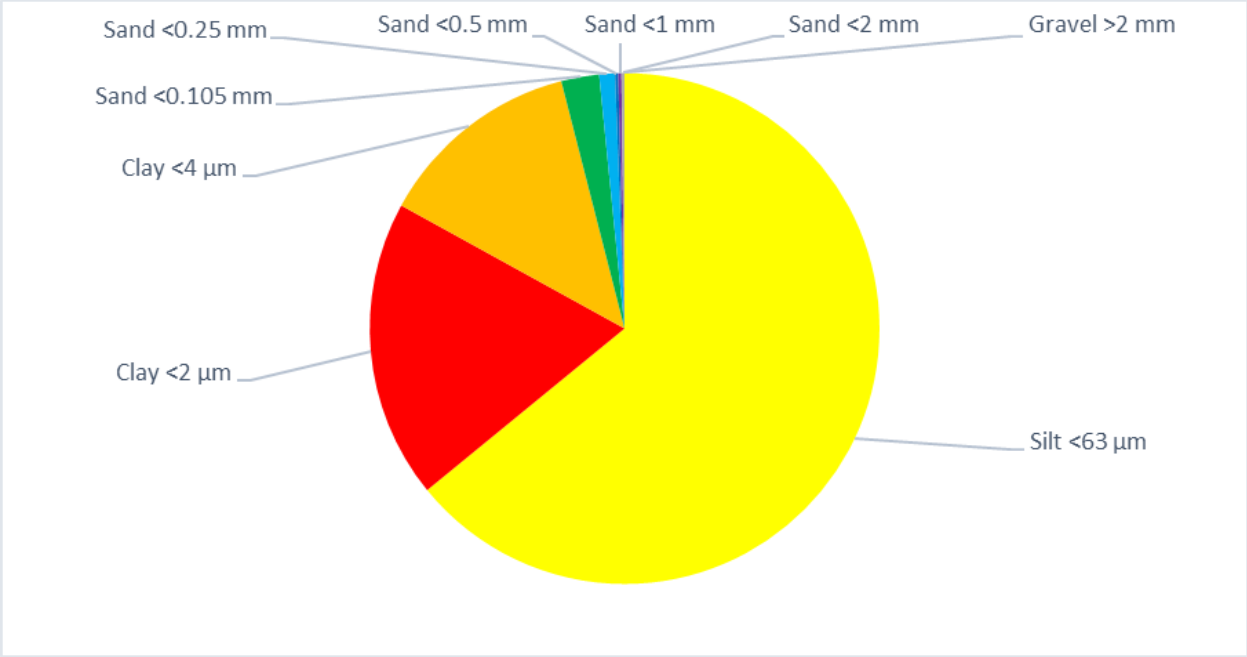


Figure 27: Location of BI-17 sampling station at the Outer Harbour of Burrard Inlet, British Columbia (49° 16' 52.8" N; 123° 11' 27.5" W). A Smith-McIntyre grab sample was collected on September 3rd, 2020. BI = Burrard Inlet.

4.3.9.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.2
		<1 mm	0.2
		<0.5 mm	0.2
		<0.25 mm	1.0
		<0.105 mm	2.4
	Silt	<63 µm	64.1
	Clay	<4 µm	13.0
		<2 µm	18.9

Figure 28: Relative proportion of sediment grain size categories at station BI-17. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.9.4 Sediment geotechnical, organic, and trace-element estimates

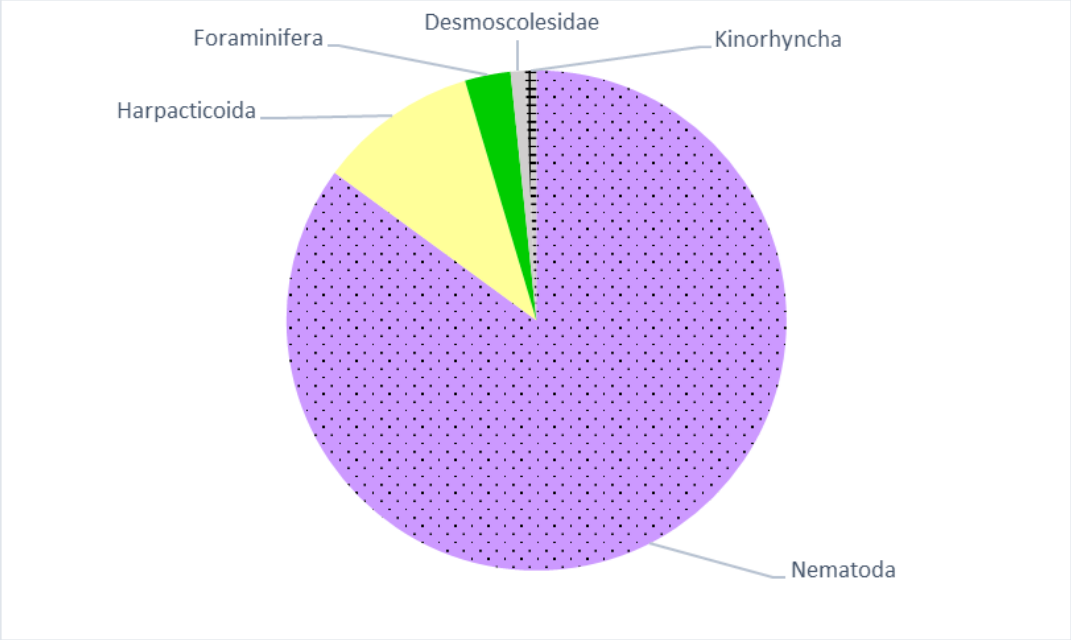
Table 18: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-17.

Variable	Porosity	Organic Content	TOC	TON
Percent	51.45	4.17	0.91	0.24

Table 19: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-17.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.4	44	15	0.11	110

4.3.9.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	85.06	86.83
	Harpacticoida	10.33	10.55
	Foraminifera	2.95	3.01
	Desmoscolesidae	0.92	0.94
	Kinorhyncha	0.74	0.75

Figure 29: Relative proportion and abundance of meiofaunal taxa at station BI-17. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.10 STATION BI-16

4.3.10.1 BI-16 abstract

- Station BI-16 has a water depth of 17.0 m and is located on the southern shoreline in the Outer Harbour of Burrard Inlet.
- Sediment texture consisted of a very poorly sorted, coarse silt with an arithmetic mean grain size of 86.92 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 57.63% and 4.41%, respectively, while TOC and TON estimates are 1.01% and 0.24%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the copper concentration (45 µg g^{-1}), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Desmoscolesidae, Errantia, Kinorhyncha, Rotifera, Ostracoda, Bivalvia, *Richtersia* sp., Arthropoda (nauplius), and Tanaidacea that ranged between 0.03 – 79.35 % (relative proportion) and 0.06 to 179.06 No.cm^{-2} (abundance).

4.3.10.2 Location of sampling station BI-16

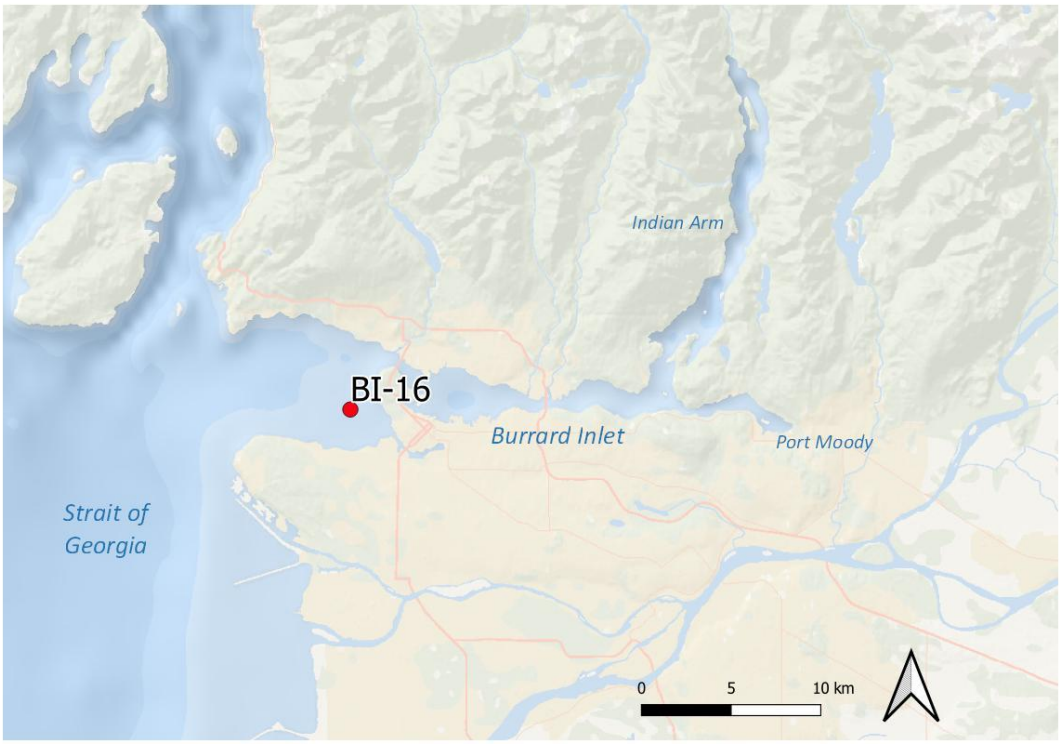
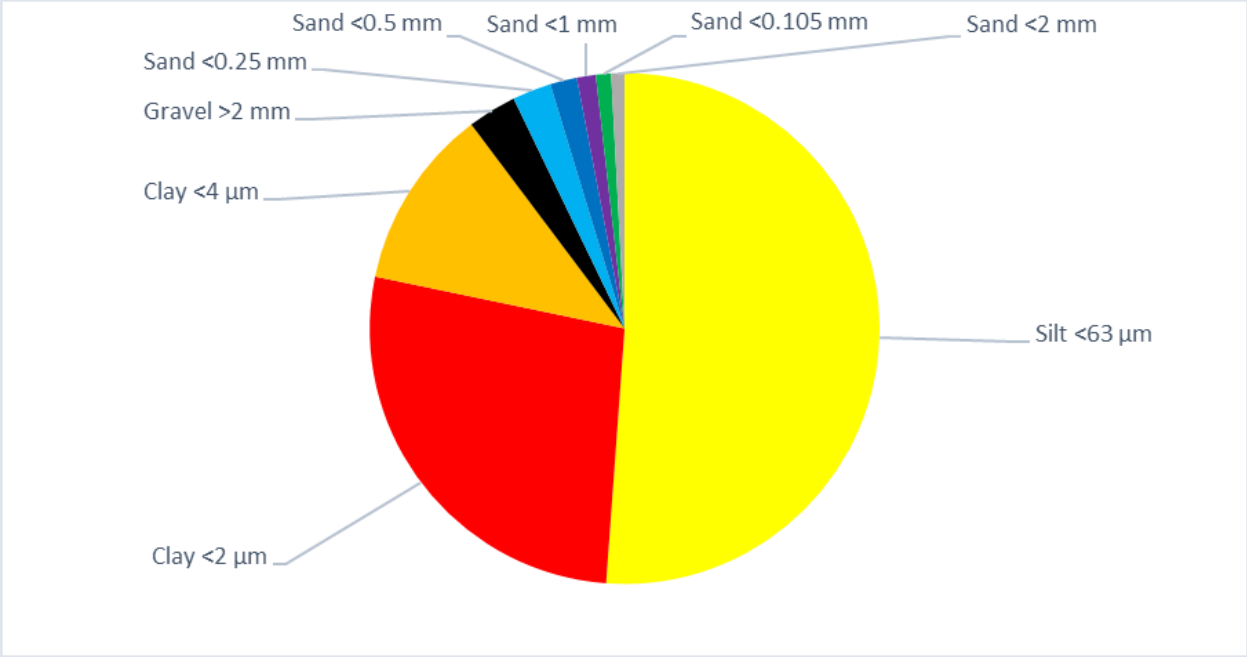


Figure 30: Location of BI-16 sampling station at the Outer Harbour of Burrard Inlet, British Columbia (49° 17’ 33” N; 123° 10’ 31” W). A Smith-McIntyre grab was collected on September 2nd, 2020. BI = Burrard Inlet.

4.3.10.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	3.2
	Sand	<2 mm	0.8
		<1 mm	1.2
		<0.5 mm	1.7
		<0.25 mm	2.5
		<0.105 mm	1.0
	Silt	<63 µm	51.1
	Clay	<4 µm	11.5
		<2 µm	27.1

Figure 31: Relative proportion of sediment grain size categories at station BI-16. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.10.4 Sediment geotechnical, organic, and trace-element estimates

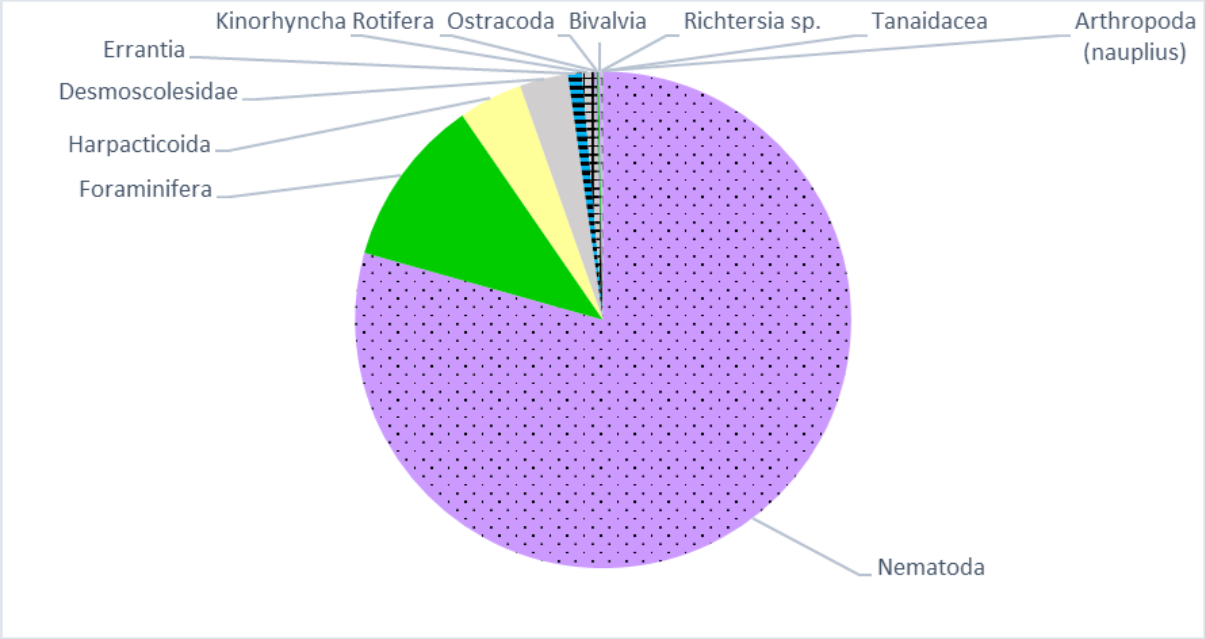
Table 20: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-16.

Variable	Porosity	Organic Content	TOC	TON
Percent	57.63	4.41	1.01	0.24

Table 21: Sediment trace-element concentrations (μg g^{-1}) at station BI-16.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.5	45	13	0.10	110

4.3.10.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	79.35	179.06
	Foraminifera	11.05	24.92
	Harpacticoida	4.17	9.42
	Desmoscolesidae	3.14	7.09
	Errantia	0.92	2.07
	Kinorhyncha	0.78	1.76
	Rotifera	0.17	0.38
	Ostracoda	0.14	0.31
	Bivalvia	0.11	0.25
	Richtersia sp.	0.08	0.19
	Arthropoda (nauplius)	0.06	0.13
	Tanaidacea	0.03	0.06

Figure 32: Relative proportion and abundance of meiofauna at station BI-16. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.11 STATION BI-15

4.3.11.1 BI-15 abstract

- Station BI-15 has a water depth of 25.6 m and is located on the north end of the Outer Harbour of BI.
- Sediment texture consisted of a poorly-sorted, very coarse sand with an arithmetic mean grain size of 745.80 µm and a very fine skewed frequency profile towards fine sediments.
- The sediment porosity and organic content estimates are 17.15% and 0.90%, respectively, while TOC and TON estimates are 0.71% and 0.21%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL).
- The meiofauna community consisted of Nematoda, Harpacticoida, Foraminifera, Rotifera, and Ostracoda that ranged between 0.86 – 73.28 % (relative proportion) and 0.19 to 16.01 No.cm^{-2} (abundance).

4.3.11.2 Location of sampling station BI-15

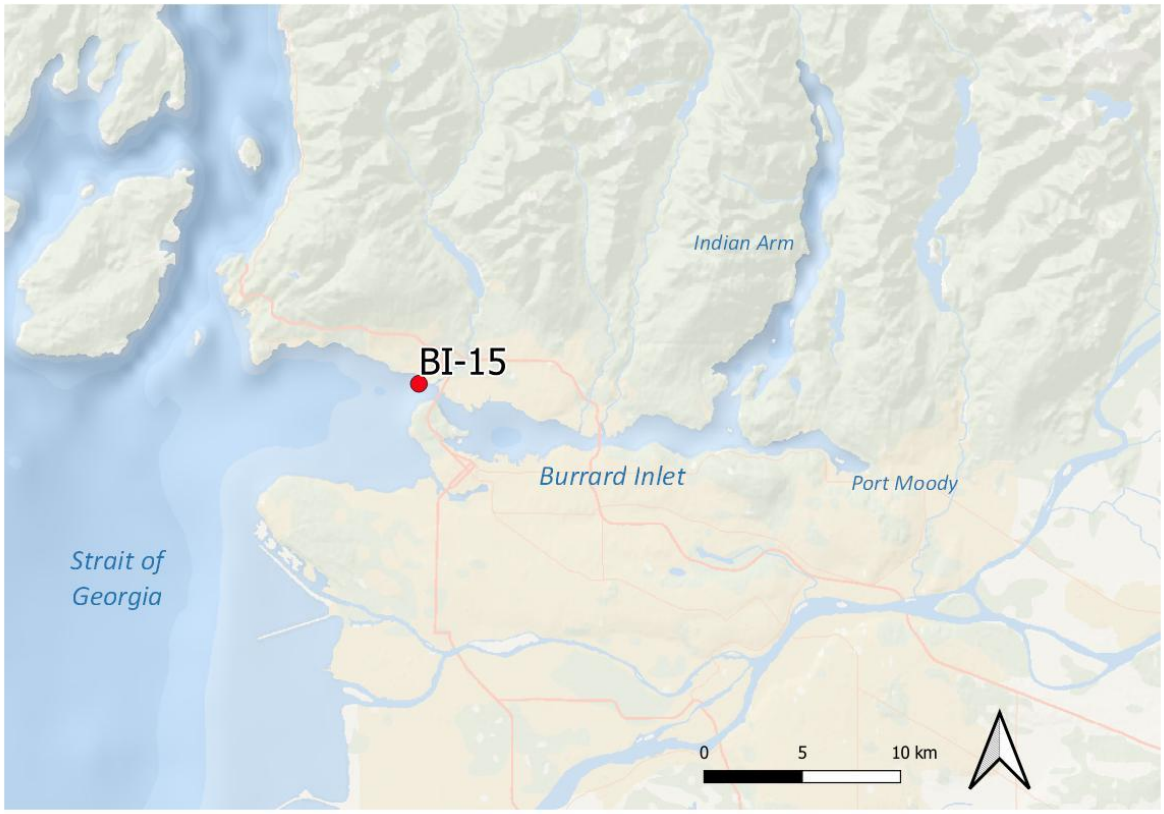
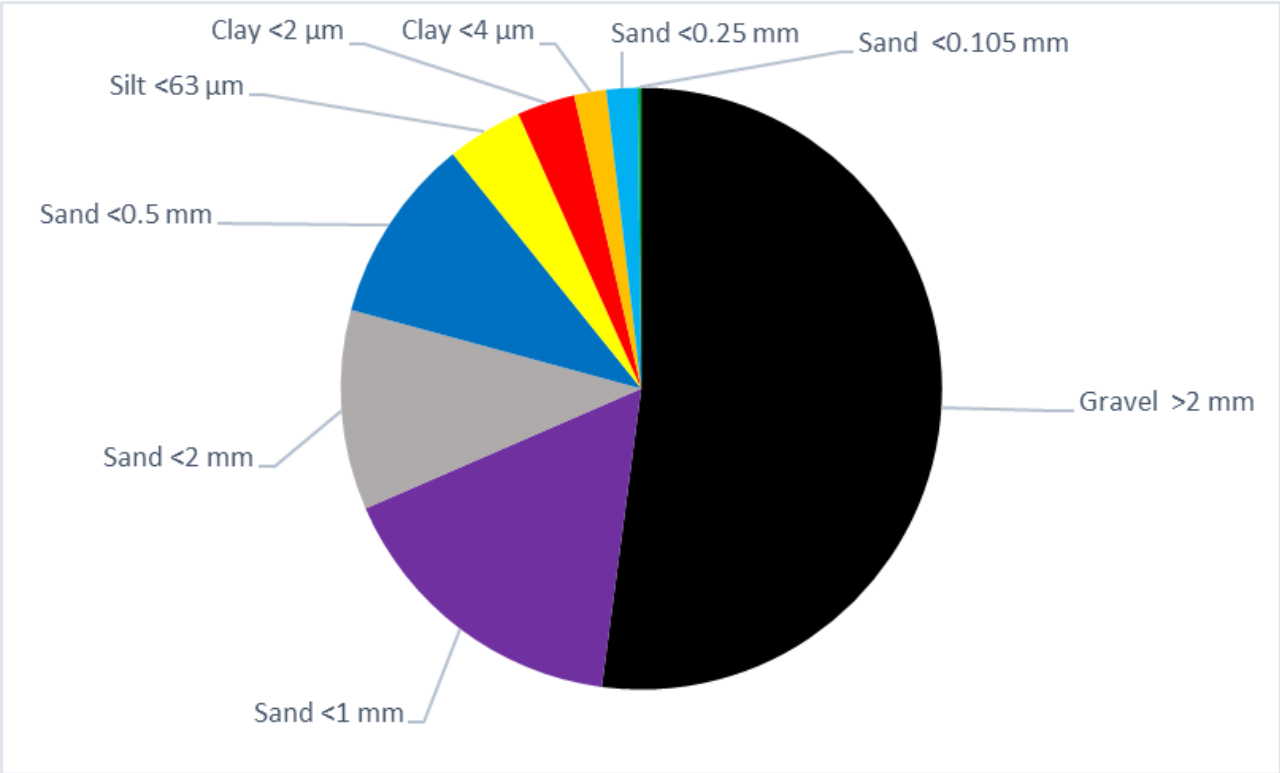


Figure 33: Location of BI-15 sampling station at the Outer Harbour of Burrard Inlet, British Columbia, Canada (49° 19’ 17.2” N; 123° 9’ 6” W). A Smith-McIntyre grab was collected on September 4th, 2020. BI = Burrard Inlet.

4.3.11.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	52.1
	Sand	<2 mm	10.7
		<1 mm	16.4
		<0.5 mm	10.0
		<0.25 mm	1.7
		<0.105 mm	0.2
	Silt	<63 µm	4.1
	Clay	<4 µm	1.7
		<2 µm	3.1

Figure 34: Relative proportion of sediment grain size categories at station BI-15. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.11.4 Sediment geotechnical, organic, and trace-element estimates

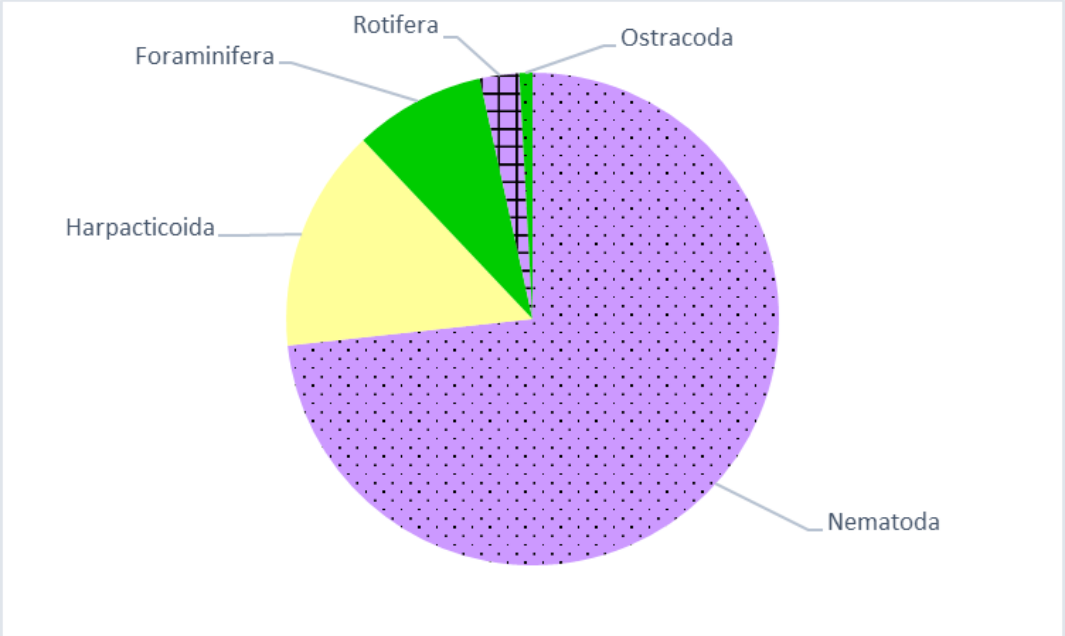
Table 22: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-15.

Variable	Porosity	Organic Content	TOC	TON
Percent	17.15	0.90	0.71	0.21

Table 23: Sediment trace-element concentrations at station BI-15.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.08	18	4	0.013	40

4.3.11.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	73.28	16.01
	Harpacticoida	14.66	3.20
	Foraminifera	8.62	1.88
	Rotifera	2.59	0.57
	Ostracoda	0.86	0.19

Figure 35: Relative proportion and abundance of meiofauna at station BI-15. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.12 STATION BI-14

4.3.12.1 BI-14 abstract

- Station BI-14 has a water depth of 15.8 m and is located in the Central Harbour of BI.
- Sediment texture consisted of a poorly-sorted, very fine sand with an arithmetic mean grain size of 136.10 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 28.72% and 1.62%, respectively, while TOC and TON estimates are 0.38% and 0.03%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below the Probable Effects Level (PEL), while cadmium (0.91 µg g^{-1}) and copper (94 µg g^{-1}) concentrations exceeded the TEL.
- The meiofauna community consisted of Nematoda, Harpacticoida, Foraminifera, Polychaeta, Ostracoda, Oligochaeta, and Rotifer that ranged between 0.13 – 94.62 % (relative proportion) and 0.19 to 142.39 No.cm^{-2} (abundance).

4.3.12.2 Location of sampling station BI-14

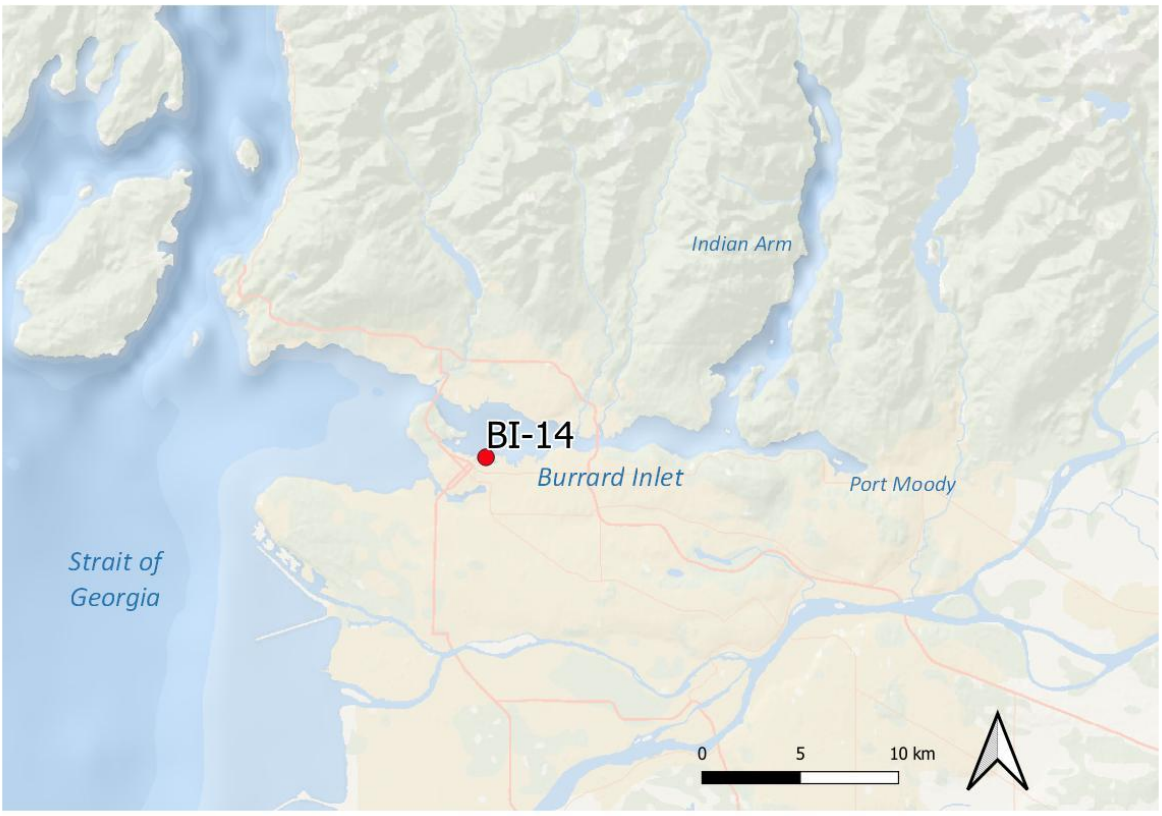
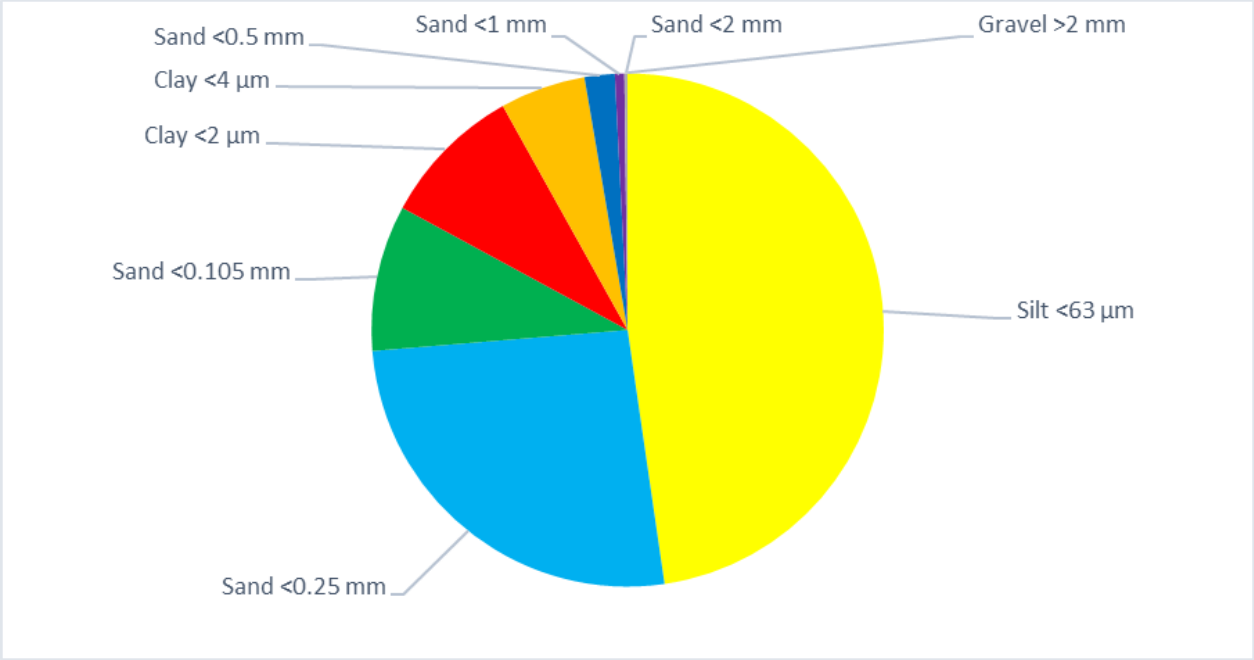


Figure 36: Location of BI-14 sampling station at the Central Harbour of Burrard Inlet, British Columbia, Canada (49° 17’ 18.5” N; 123° 6’ 12.6” W). A Smith McIntyre grab sample was collected on September 4th, 2020. BI = Burrard Inlet.

4.3.12.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.2
		<1 mm	0.6
		<0.5 mm	1.9
		<0.25 mm	26.0
		<0.105 mm	9.2
	Silt	<63 µm	47.7
	Clay	<4 µm	5.4
		<2 µm	9.0

Figure 37: Relative proportion of sediment grain size categories at station BI-14. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.12.4 Sediment geotechnical, organic, and trace-element estimates

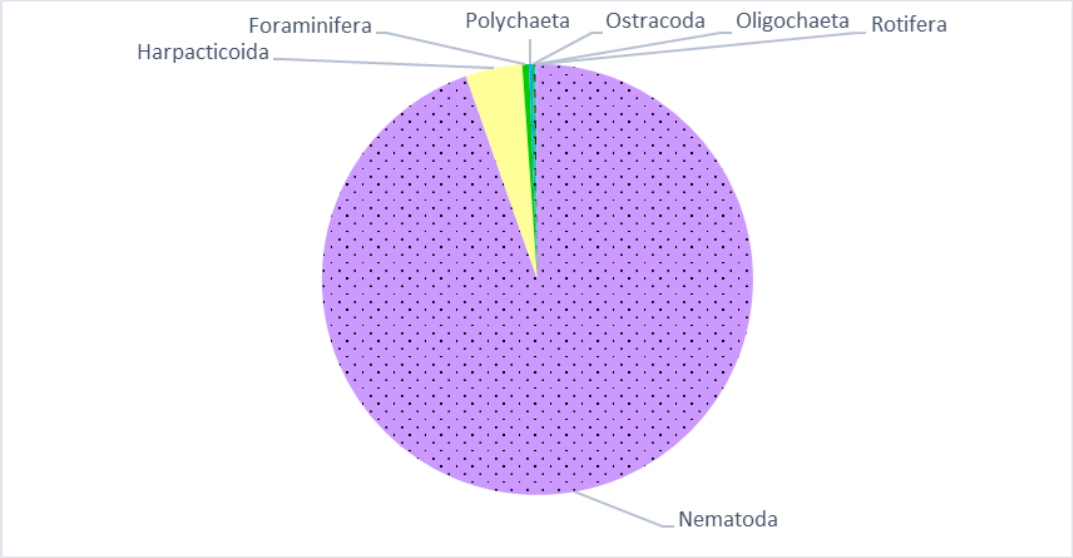
Table 24: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-14.

Variable	Porosity	Organic Content	TOC	TON
Percent	28.72	1.62	0.38	0.03

Table 25: Sediment trace-element concentrations at station BI-14.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.91	94	5.6	0.098	66

4.3.12.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	94.62	142.39
	Harpacticoida	4.26	6.40
	Foraminifera	0.50	0.75
	Polychaeta	0.25	0.38
	Ostracoda	0.13	0.19
	Oligochaeta	0.13	0.19
	Rotifera	0.13	0.19

Figure 38: Relative proportion and abundance of meiofauna taxa at station BI-14. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.13 STATION BI-13

4.3.13.1 BI-13 abstract

- Station BI-13 has a water depth of 22.6 m and is located in the Central Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, very coarse silt with an arithmetic mean grain size of 96.95 μm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 55.76% and 7.39%, respectively, while TOC and TON estimates are 3.22% and 0.34%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell above the Theoretical Effects Level (TEL) and below the Probable Effects Level (PEL). However, the copper concentration (160 $\mu g\ g^{-1}$) was and exception as it exceeded the PEL
- The meiofauna community consisted of Nematoda, Foraminifera, and Harpacticoida that ranged between 0.17 – 79.37 % (relative proportion) and 0.19 to 89.84 $No.cm^{-2}$ (abundance).

4.3.13.2 Location of sampling station BI-13

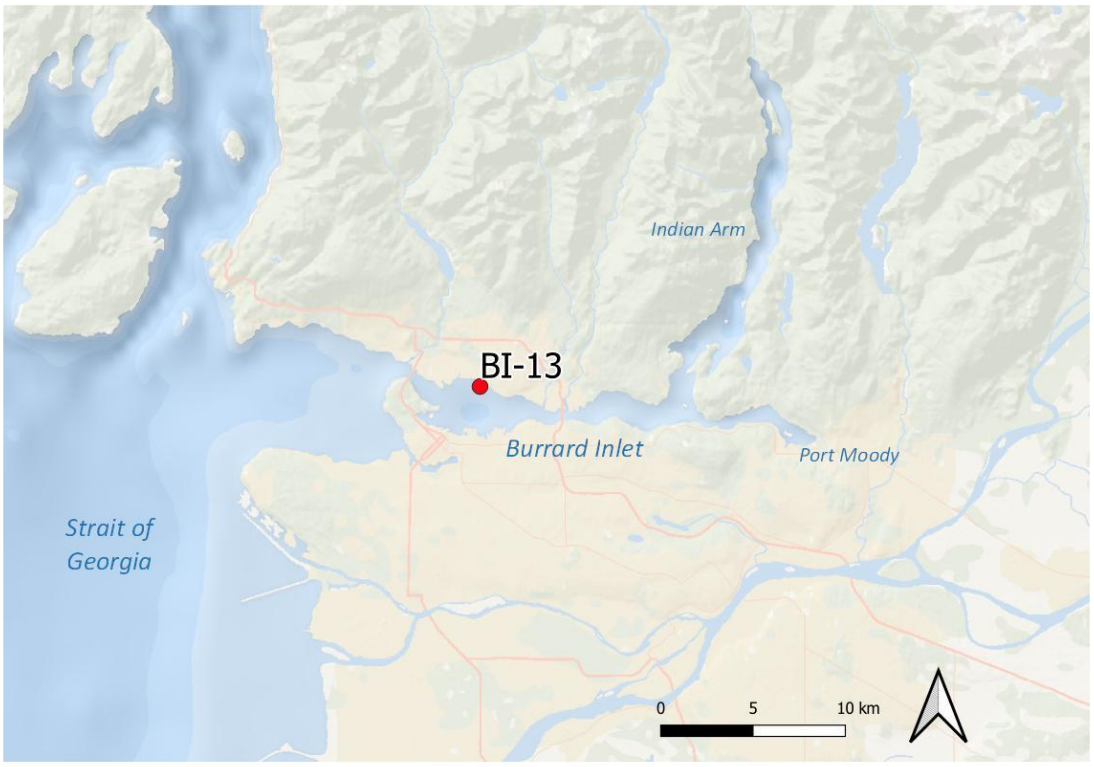
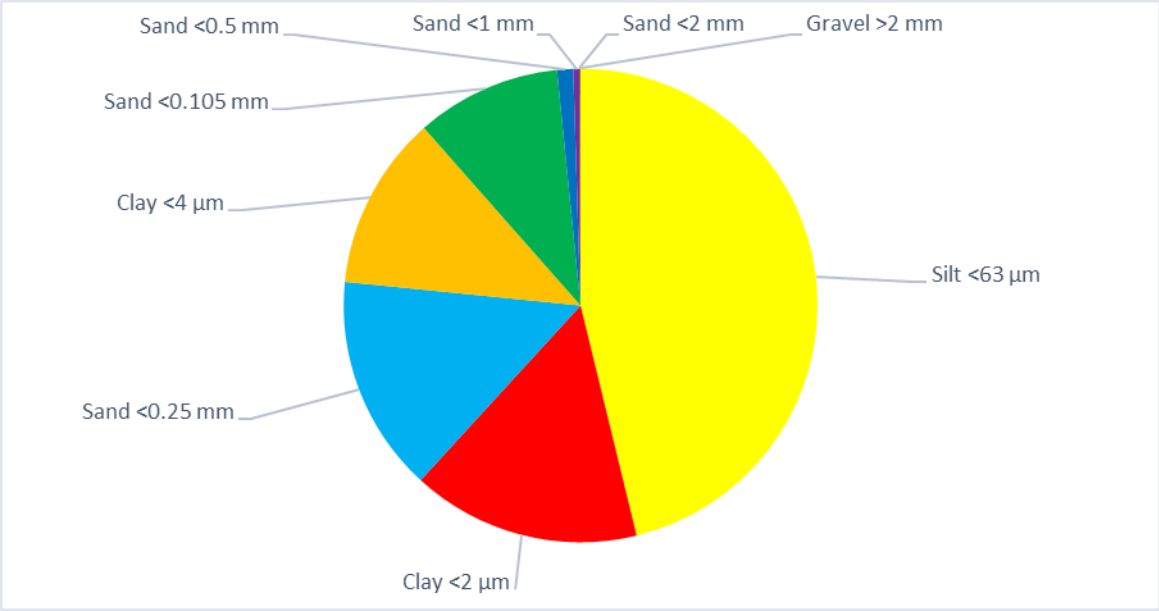


Figure 39: Location of BI-13 sampling station at the Central Harbour of Burrard Inlet, British Columbia, Canada (49° 18’ 34” N; 123° 5’ 13” W). A Smith-McIntyre grab sample was collected on September 7th, 2020. BI = Burrard Inlet.

4.3.13.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.1
		<1 mm	0.4
		<0.5 mm	1.1
		<0.25 mm	14.8
		<0.105 mm	9.9
	Silt	<63 µm	46.2
	Clay	<4 µm	11.9
		<2 µm	15.6

Figure 40: Relative proportion of sediment grain size categories at station BI-13. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.13.4 Sediment geotechnical, organic, and trace-element estimates

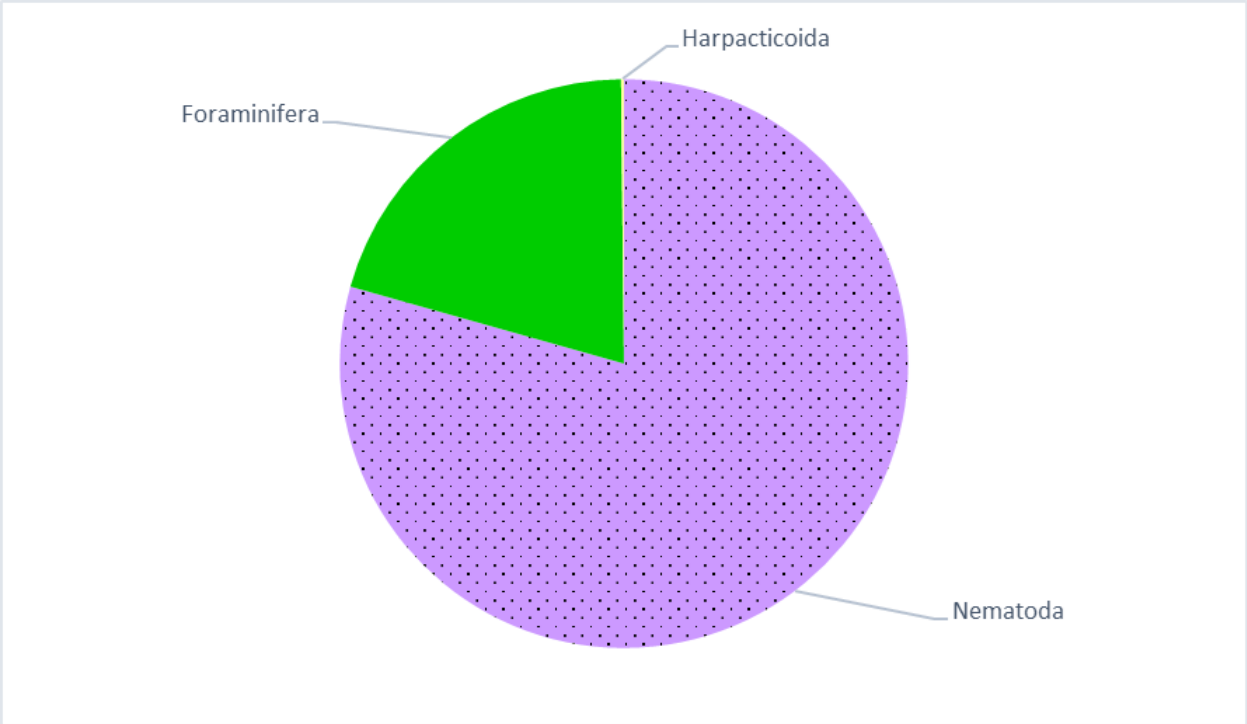
Table 26: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-13.

Variable	Porosity	Organic Content	TOC	TON
Percent	55.76	7.39	3.22	0.34

Table 27: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-13.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	1.3	160	34	0.19	180

4.3.13.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	79.37	89.84
	Foraminifera	20.47	23.17
	Harpacticoida	0.17	0.19

Figure 41: Relative proportion and abundance of meiofauna taxa at station BI-13. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.14 STATION BI-12

4.3.14.1 BI-12 abstract

- Station BI-12 has a water depth of 22.8 m and is located in the Central Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, very coarse silt with an arithmetic mean grain size of 163.60 μm and a fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 44.24% and 5.81%, respectively, while TOC and TON estimates are 2.49% and 0.35%, respectively.
- The following trends where observed when applying the Interim Sediment Quality Guidelines (ISQG) (CCME 1999): 1) the sediment lead concentration fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL); 2) cadmium (1.0 μg g^{-1}); mercury (0.22 μg g^{-1}), and zinc (124 μg g^{-1}) exceeded the TEL; and 3) copper (120 μg g^{-1}) exceeded both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL).
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Arthropoda (nauplii), Desmoscolesidae, Ostracoda, Kinorhyncha, Polychaeta Oligochaeta and Errantia that ranged between 0.03 – 89.43 % (relative proportion) and 0.19 to 506.85 No.cm^{-2} (abundance).

4.3.14.2 Location of sampling station BI-12

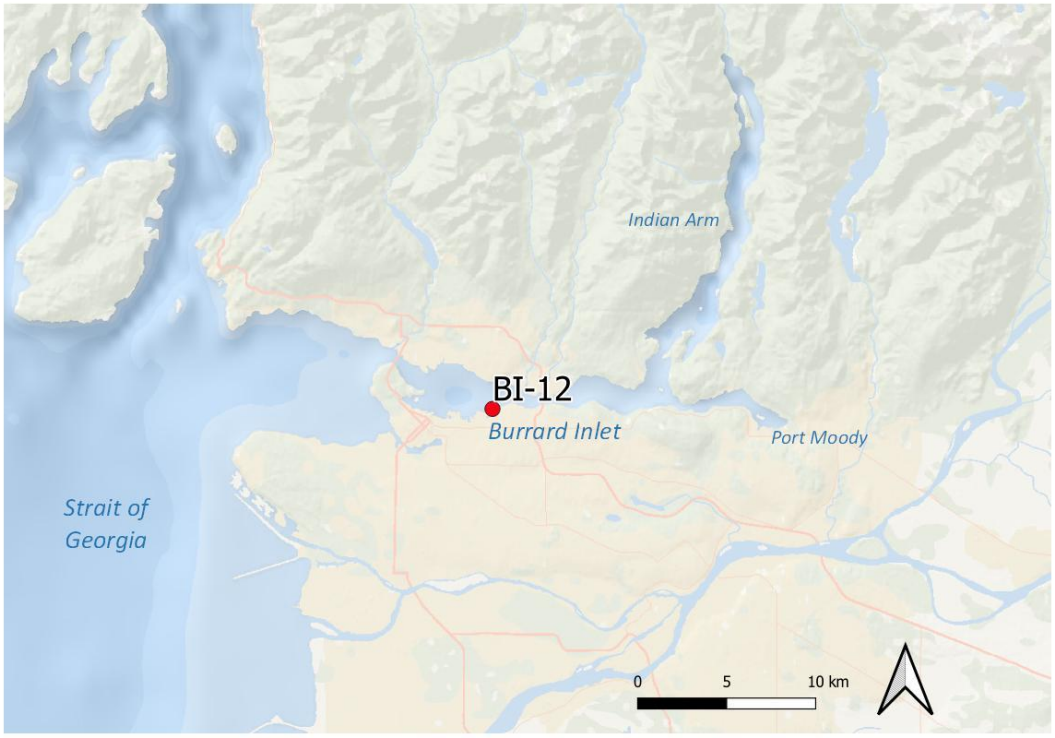
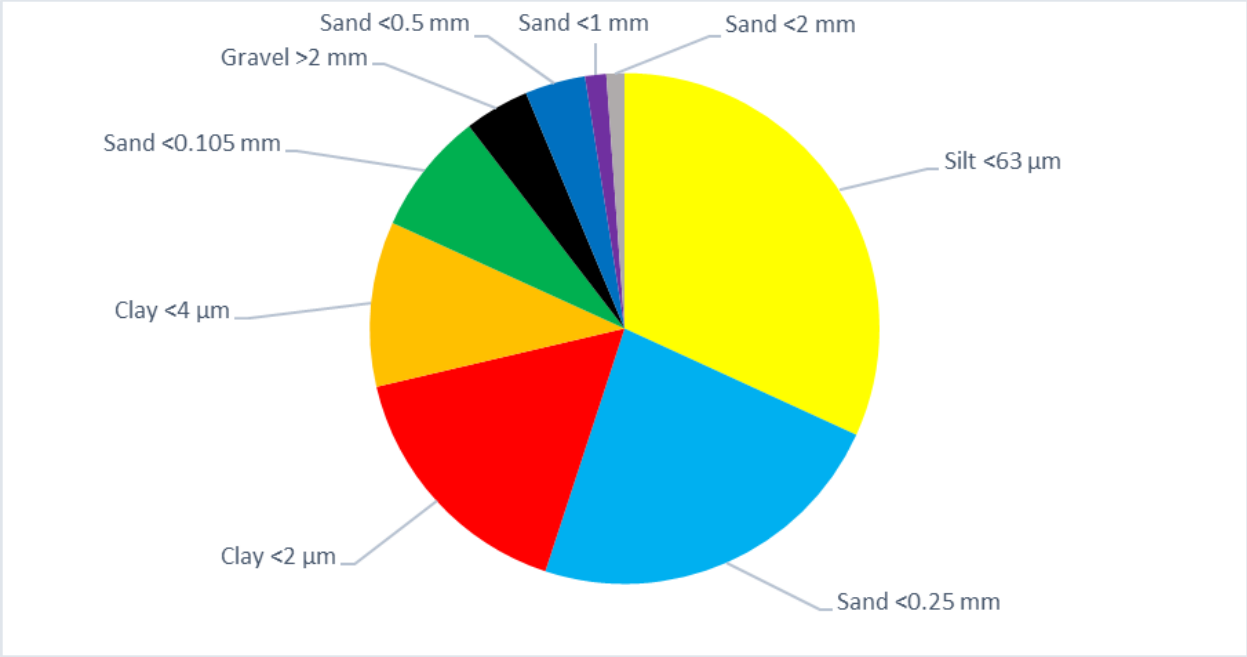


Figure 42: Location of BI-12 sampling station at the Central Harbour of Burrard Inlet, British Columbia, Canada (49° 17' 26" N; 123° 3' 52.4" W). A Smith-McIntyre grab sample was collected on September 4th, 2020. BI = Burrard Inlet.

4.3.14.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	4.3
	Sand	<2 mm	1.1
		<1 mm	1.3
		<0.5 mm	3.8
		<0.25 mm	23.2
		<0.105 mm	7.8
	Silt	<63 µm	31.8
	Clay	<4 µm	10.4
		<2 µm	16.3

Figure 43: Relative proportion of sediment grain size categories at station BI-12. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.14.4 Sediment geotechnical, organic, and trace-element estimates

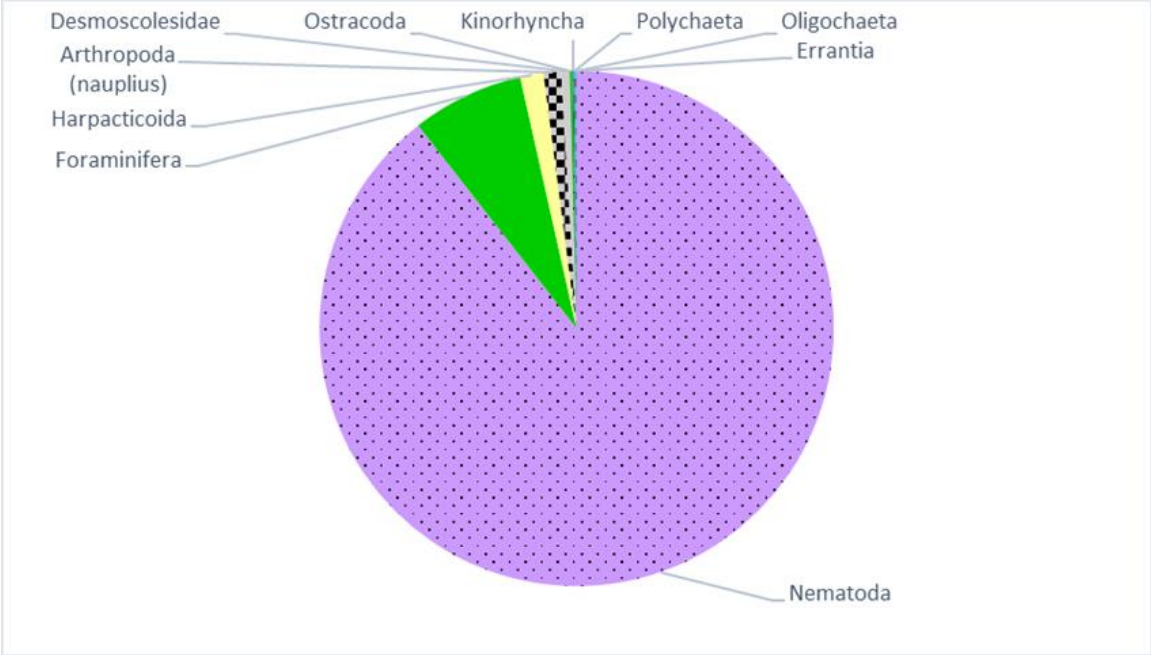
Table 28: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-12.

Variable	Porosity	Organic Content	TOC	TON
Percent	44.24	5.81	2.49	0.35

Table 29: Sediment trace-element concentrations (μg g^{-1}) at station BI-12.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	1.0	120	26	0.22	150

4.3.14.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	89.43	506.85
	Foraminifera	7.05	39.93
	Harpacticoida	1.46	8.29
	Arthropoda (nauplius)	1.10	6.22
	Desmoscolesidae	0.53	3.01
	Ostracoda	0.17	0.94
	Kinorhyncha	0.10	0.57
	Polychaeta	0.07	0.38
	Oligochaeta	0.07	0.38
	Errantia	0.03	0.19

Figure 44: Relative proportion and abundance of meiofauna taxa at station BI-12. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.15 STATION BI-11

4.3.15.1 BI-11 Abstract

- Station BI-11 has a water depth of 21.9 m and is located in the Central Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, fine sand with an arithmetic mean grain size of 262.80 μm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 35.14% and 3.20%, respectively, while TOC and TON estimates are 1.12% and 0.20%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of copper (25 $\mu g\ g^{-1}$) which exceeded the TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Arthropoda (nauplius), Bivalvia, Polychaeta, Gastropoda, Sedentaria, *Richtersia* sp. and Cumacean that ranged between 0.09 – 92.73 % (relative proportion) and 0.06 to 66.49 $No.cm^{-2}$ (abundance).

4.3.15.2 Location of sampling station BI-11

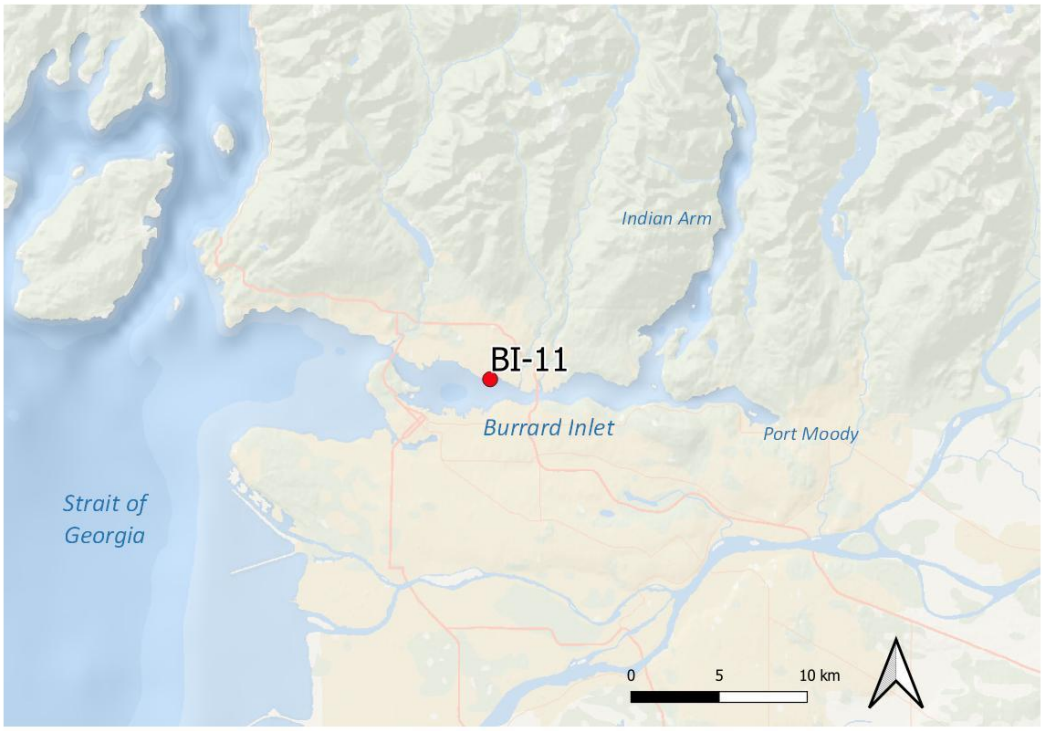
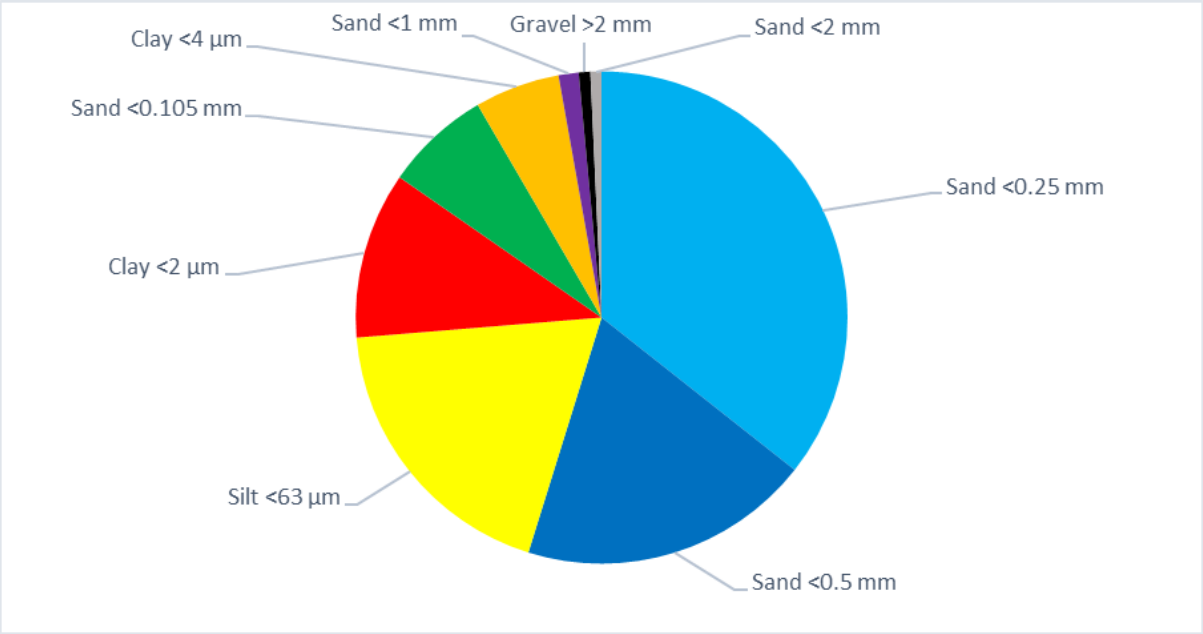


Figure 45: Location of BI-11 sampling station at the Central Harbour of Burrard Inlet, British Columbia (49° 18' 14" N; 123° 3' 44.5" W). A Smith-McIntyre grab sample was collected on September 7th, 2020. BI = Burrard Inlet.

4.3.15.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.8
	Sand	<2 mm	0.7
		<1 mm	1.3
		<0.5 mm	19.2
		<0.25 mm	35.6
		<0.105 mm	6.9
	Silt	<63 µm	18.9
	Clay	<4 µm	5.6
		<2 µm	10.9

Figure 46: Relative proportion of sediment grain size categories at station BI-11. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.15.4 Sediment geotechnical, organic, and trace-element estimates

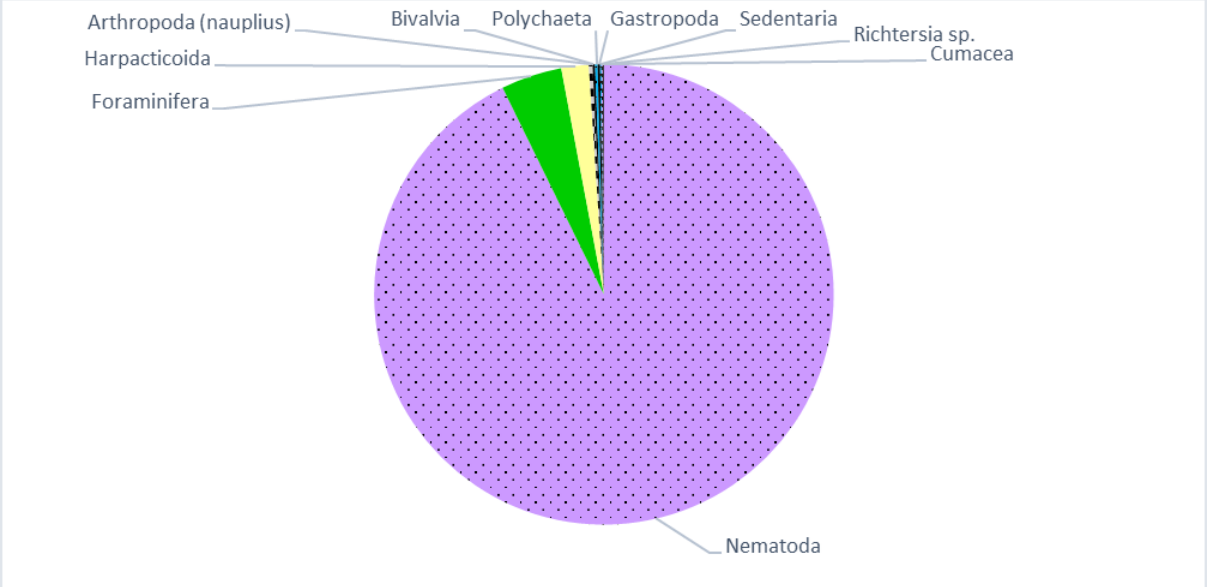
Table 30: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-11.

Variable	Porosity	Organic Content	TOC	TON
Percent	35.14	3.20	1.12	0.20

Table 31: Sediment trace-element concentrations (μg g^{-1}) at station BI-11.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.3	25	5.0	0.030	55

4.3.15.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	92.73	66.49
	Foraminifera	4.29	3.08
	Harpacticoida	1.93	1.38
	Arthropoda (nauplius)	0.26	0.19
	Bivalvia	0.18	0.13
	Polychaeta	0.18	0.13
	Gastropoda	0.18	0.13
	Sedentaria	0.09	0.06
	Richtersia sp.	0.09	0.06
	Cumacea	0.09	0.06

Figure 47: Relative proportion and abundance of meiofauna taxa at station BI-11. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.16 STATION BI-10

4.3.16.1 BI-10 abstract

- Station BI-10 has a water depth of 39.4 m and is located in the Inner Harbour of BI.
- Sediment texture consisted of a poorly-sorted, medium sand with an arithmetic mean grain size of 460.80 μm and a fine skewed frequency profile towards fine sediments.
- The sediment porosity and organic content estimates are 28.48% and 1.53%, respectively, while TOC and TON estimates are 0.17% and 0.02%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL).
- The meiofauna community consisted of Nematoda, Harpacticoida, Sedentaria, Foraminifera Errentia, and Kinorhyncha, that ranged between 0.31 – 88.85 % (relative proportion) and 0.19 to 54.06 No.cm^{-2} (abundance).

4.3.16.2 Location of sampling station BI-10

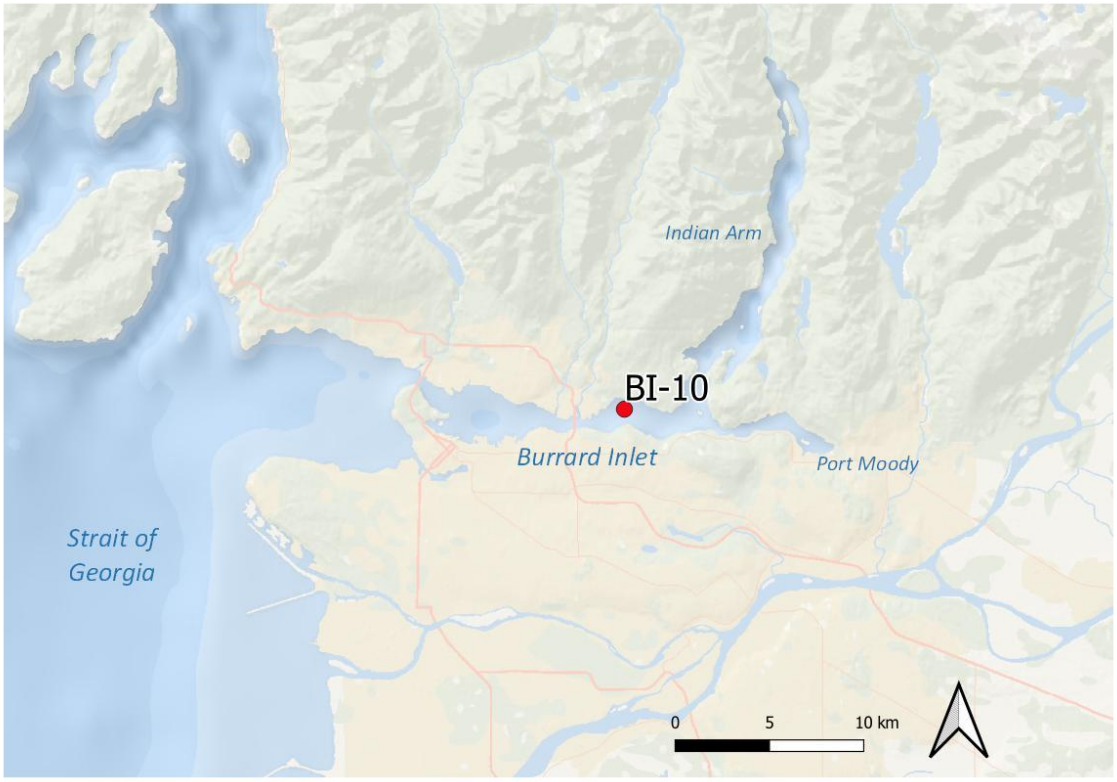
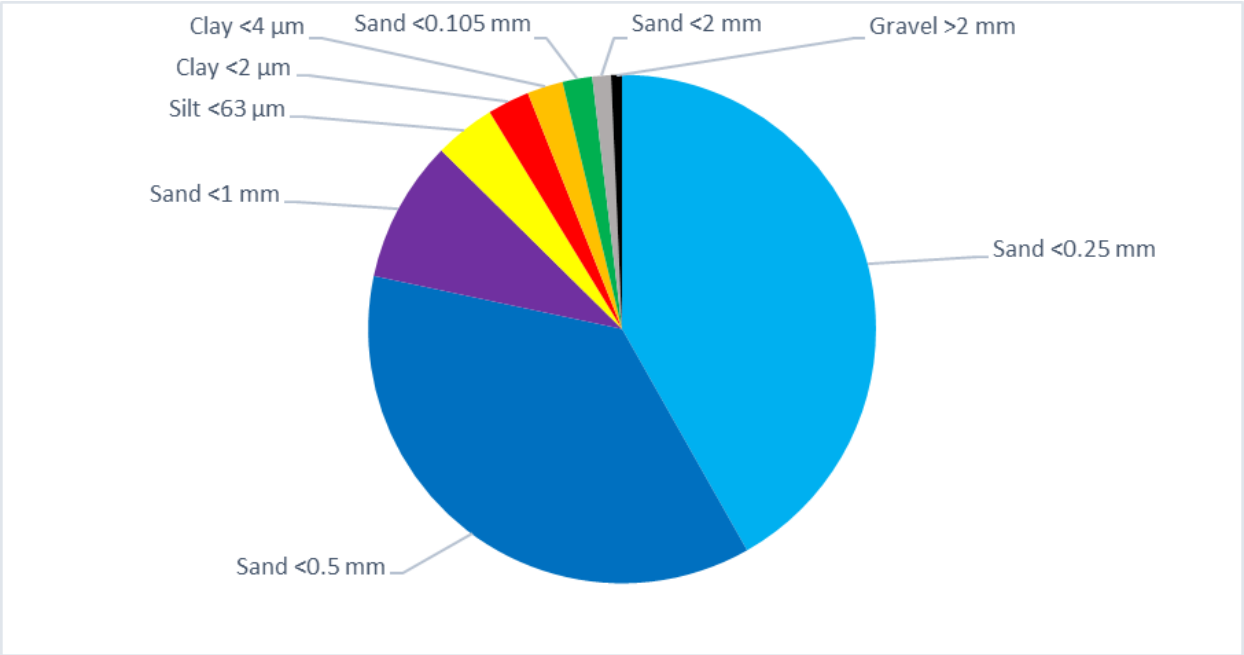


Figure 48: Location of BI-10 sampling station at the Inner Harbour of Burrard Inlet, British Columbia, Canada (49° 18' 7.4" N; 122° 59' 22.6" W). A Smith-McIntyre grab was collected on September 5th, 2020. BI = Burrard Inlet.

4.3.16.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.7
	Sand	<2 mm	1.2
		<1 mm	9.0
		<0.5 mm	36.5
		<0.25 mm	41.8
		<0.105 mm	1.9
	Silt	<63 µm	3.9
	Clay	<4 µm	2.3
		<2 µm	2.7

Figure 49: Relative proportion of sediment grain size categories at station BI-10. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.16.4 Sediment geotechnical, organic, and trace-elements estimates

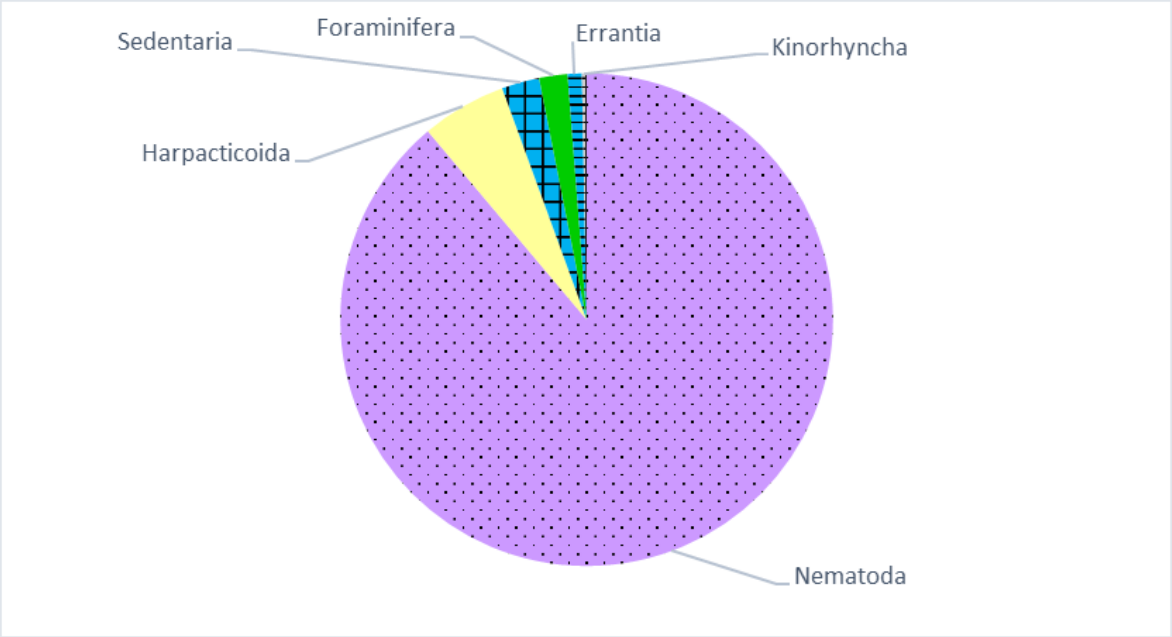
Table 32: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-10.

Variable	Porosity	Organic Content	TOC	TON
Percent	28.48	1.53	0.17	0.02

Table 33: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-10.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.3	17	4	0.033	41

4.3.16.5 Relative proportion of meiofauna abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	88.85	54.06
	Harpacticoida	5.57	3.39
	Sedentaria	2.48	1.51
	Foraminifera	1.86	1.13
	Errantia	0.93	0.57
	Kinorhyncha	0.31	0.19

Figure 50: Relative proportion and abundance of meiofauna taxa at station BI-10. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.17 STATION BI-09

4.3.17.1 BI-09 abstract

- Station BI-09 has a water depth of 27.0 m and is located in the Inner Harbour of BI.
- Sediment texture consisted of a poorly-sorted, medium sand with an arithmetic mean grain size of 331.70 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 27.74% and 1.16%, respectively, while TOC and TON estimates are 0.14% and 0.01%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL),
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Bivalvia, and Desmoscolesidae that ranged between 0.42 – 97.05 % (relative proportion) and 0.19 to 43.32 No.cm^{-2} (abundance).

4.3.17.2 Location of sampling station BI-09

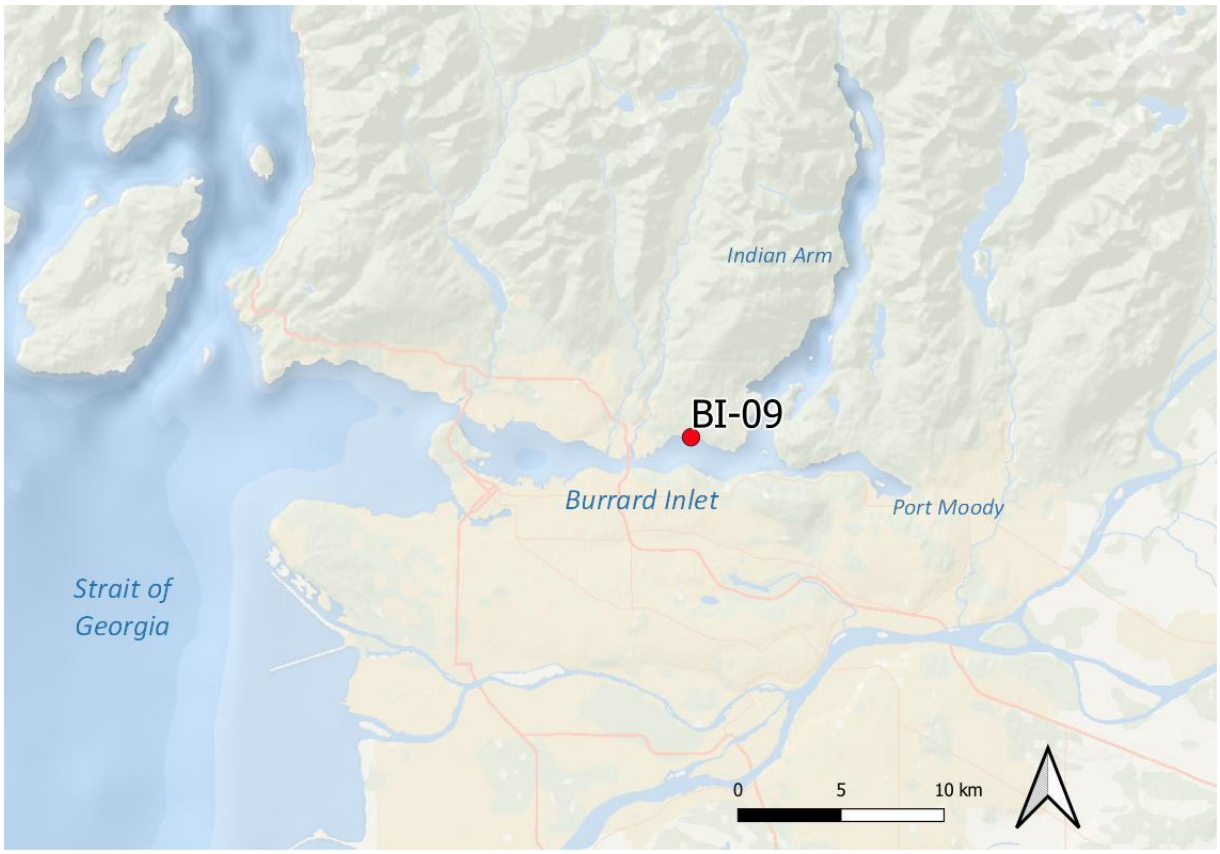
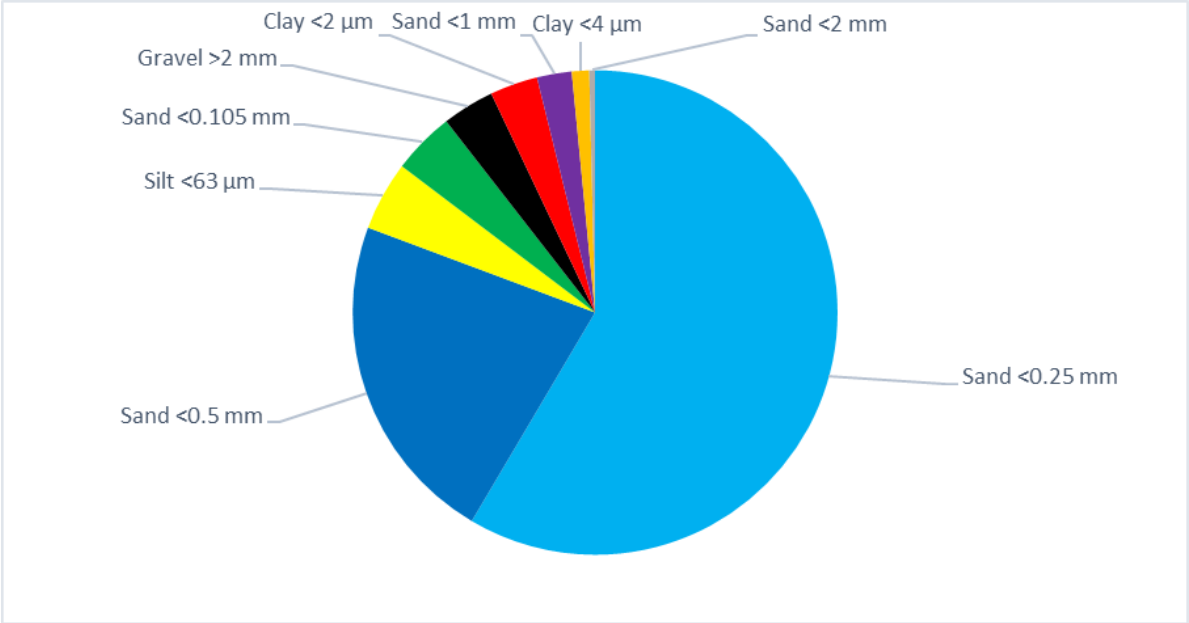


Figure 51: Location of BI-09 sampling station at the Inner Harbour of Burrard Inlet, British Columbia, Canada (49° 18’ 24” N; 122° 59’ 2.4” W). A Smith-McIntyre grab was collected on September 5th, 2020. BI = Burrard Inlet.

4.3.17.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	3.6
	Sand	<2 mm	0.4
		<1 mm	2.3
		<0.5 mm	22.2
		<0.25 mm	58.4
		<0.105 mm	4.1
	Silt	<63 µm	4.6
	Clay	<4 µm	1.2
		<2 µm	3.2

Figure 52: Relative proportion of sediment grain size categories at station BI-09. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.17.4 Sediment geotechnical, organic, and trace-element estimates

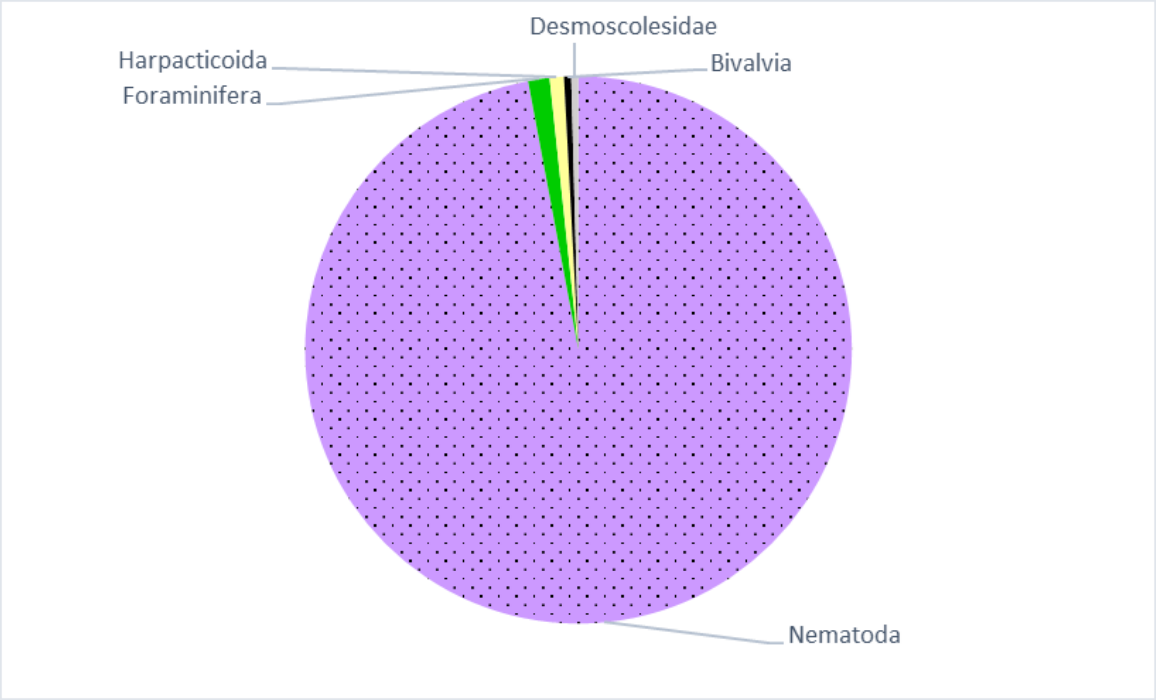
Table 34: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-09.

Variable	Porosity	Organic Content	TOC	TON
Percent	27.74	1.16	0.14	0.01

Table 35: Sediment trace-element concentrations (μg g^{-1}) at station BI-09.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.3	12	4	0.022	36

4.3.17.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	97.05	43.32
	Foraminifera	1.27	0.57
	Harpacticoida	0.84	0.38
	Bivalvia	0.42	0.19
	Desmoscolesidae	0.42	0.19

Figure 53: Relative proportion and abundance of meiofauna taxa at station BI-09. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.18 STATION BI-08

4.3.18.1 BI-08 abstract

- Station BI-08 has a water depth of 17.3 m and is located in the Inner Harbour of BI.
- Sediment texture consisted of a very poorly-sorted, very coarse silt with an arithmetic mean grain size of 98.64 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 55.81% and 9.35%, respectively, while TOC and TON estimates are 2.77% and 0.33%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL) with the exception of copper (84 $\mu g\ g^{-1}$), which exceeded the TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Bivalvia, and Desmoscolesidae that ranged between 0.10 – 83.51 % (relative proportion) and 0.06 to 53.74 $No.cm^{-2}$ (abundance).

4.3.18.2 Location of sampling station BI-08

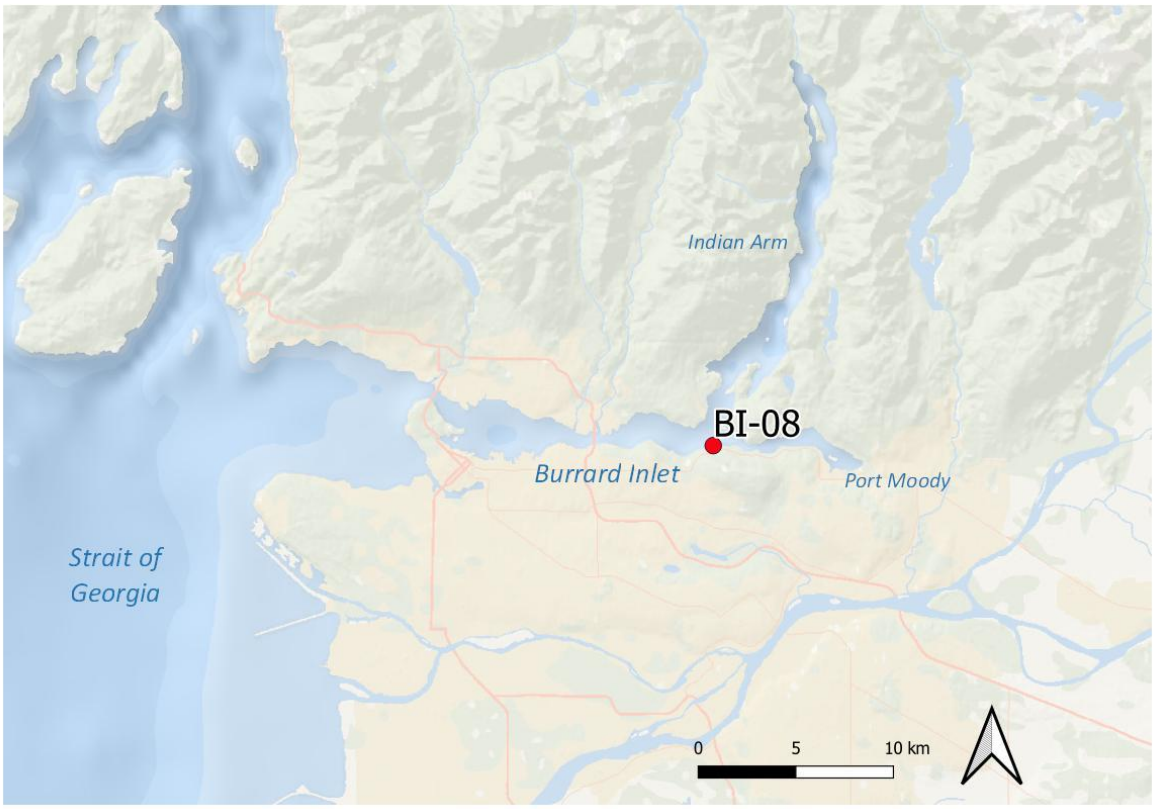
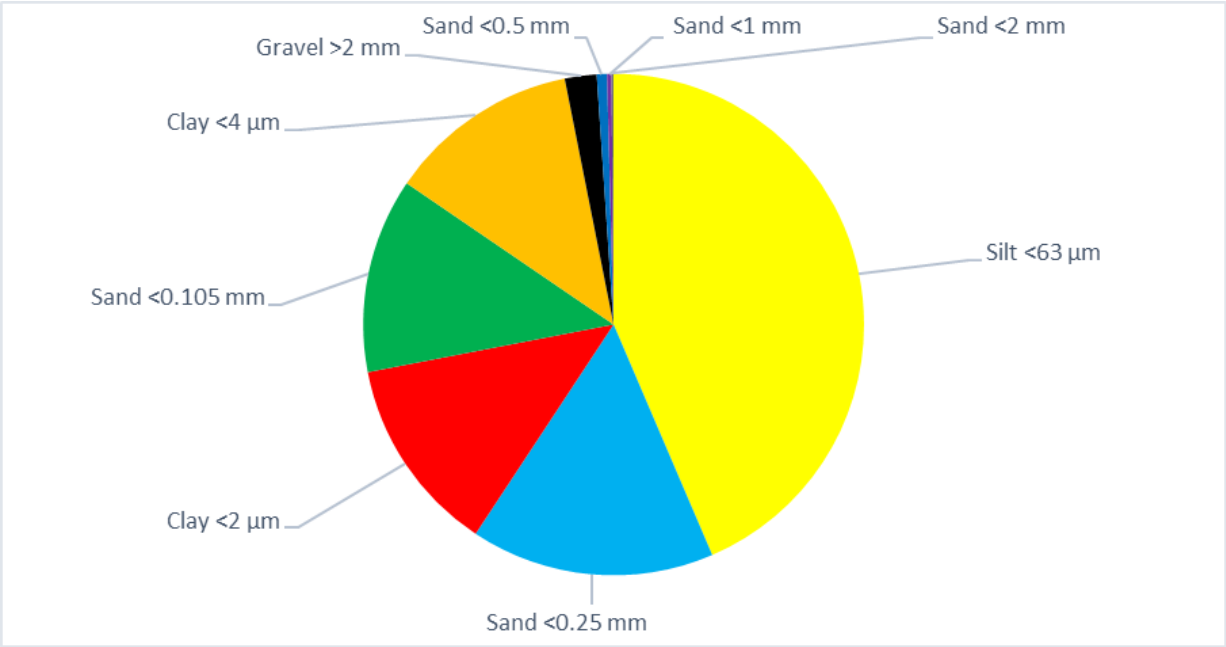


Figure 54: Location of BI-08 sampling station in the Inner Harbour of Burrard Inlet, British Columbia, Canada (49° 17' 32" N; 122° 56' 31.9" W). A Smith-McIntyre grab sample was collected on September 6th, 2020. BI = Burrard Inlet.

4.3.18.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	2.1
	Sand	<2 mm	0.1
		<1 mm	0.3
		<0.5 mm	0.7
		<0.25 mm	15.7
		<0.105 mm	12.6
	Silt	<63 µm	43.5
	Clay	<4 µm	12.3
		<2 µm	12.7

Figure 55: Relative proportion of sediment grain size categories at station BI-08. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.18.4 Sediment geotechnical, organic, and trace-element estimates

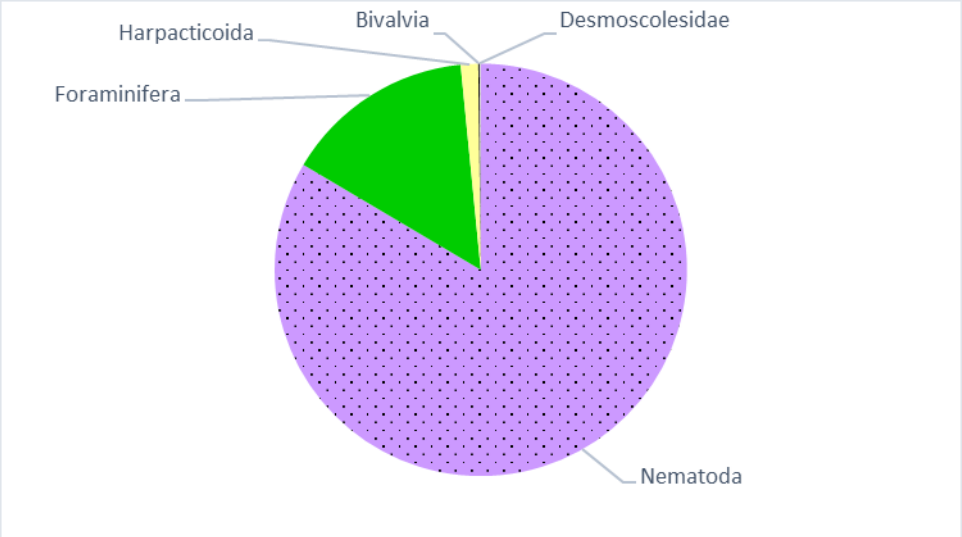
Table 36: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-08.

Variable	Porosity	Organic Content	TOC	TON
Percent	55.81	9.35	2.77	0.33

Table 37: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-08.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.74	84	22	0.13	110

4.3.18.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	83.51	53.74
	Foraminifera	14.93	9.61
	Harpacticoida	1.37	0.88
	Bivalvia	0.10	0.06
	Desmoscolesidae	0.10	0.06

Figure 56: Relative proportion and abundance of meiofauna taxa at station BI-08. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.19 STATION BI-07

4.3.19.1 BI-07 abstract

- Station BI-07 has a water depth of 21.3 m and is located on the west end of Port Moody Arm located at the head of BI.
- Sediment texture consisted of a very poorly-sorted, coarse silt with an arithmetic mean grain size of 64.18 μm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 62.44% and 8.85%, respectively, while TOC and TON estimates are 2.37% and 0.34%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc exceeded the Theoretical Effects Levels, while they fell below the Probable Effects Levels (PEL) with the exception of copper (120 $\mu g\ g^{-1}$).
- The meiofauna community consisted of Nematoda, Foraminifera, Arthropoda, and Harpacticoida that ranged between 1.39 – 52.50 % (relative proportion) and 0.94 to 35.60 $No.cm^{-2}$ (abundance).

4.3.19.2 Location of sampling station BI-07

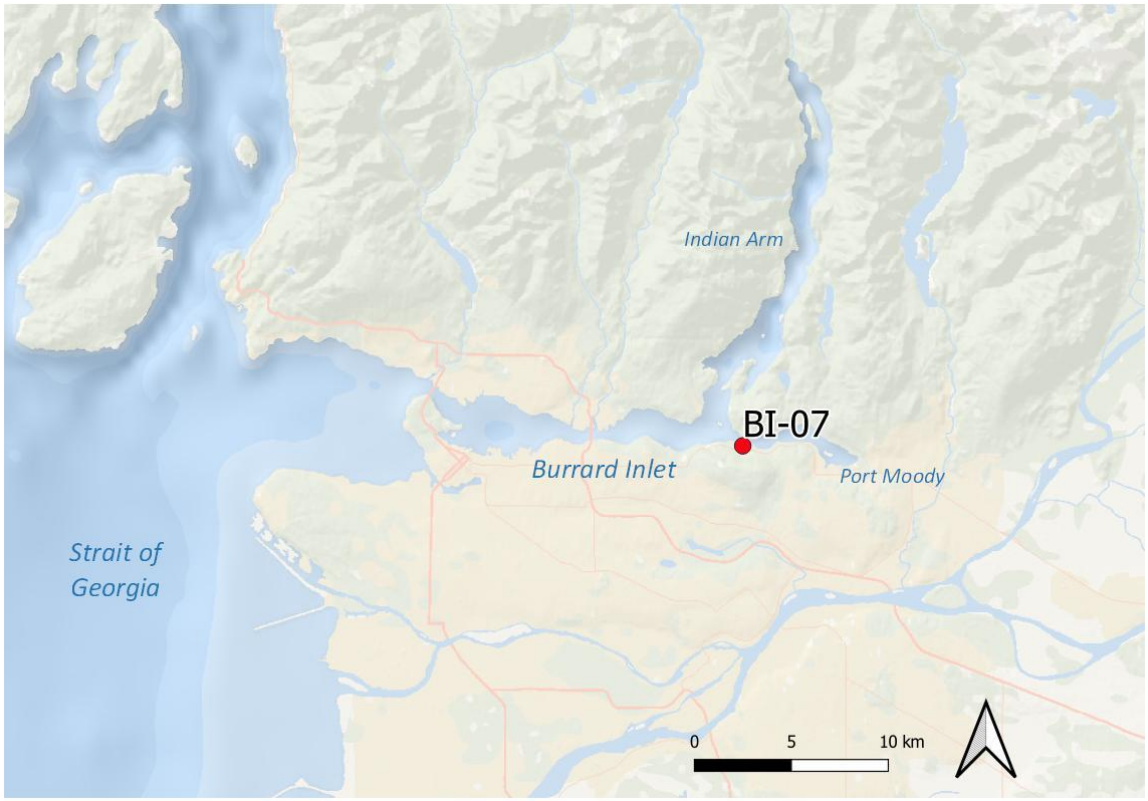
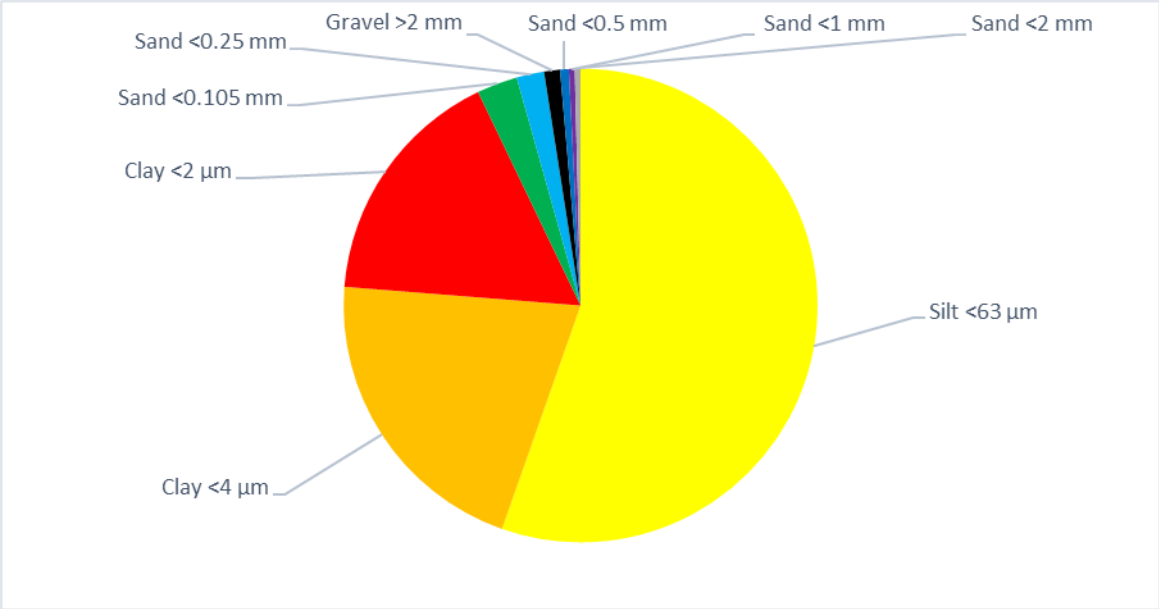


Figure 57: Location of BI-07 sampling station at the west end of Port Moody Arm, British Columbia, Canada (49° 17' 24.7" N; 122° 55' 6.8" W). A Smith-McIntyre grab sample was collected on September 5th, 2020. BI = Burrard Inlet.

4.3.19.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	1.1
	Sand	<2 mm	0.4
		<1 mm	0.4
		<0.5 mm	0.6
		<0.25 mm	1.9
		<0.105 mm	2.8
	Silt	<63 µm	55.4
	Clay	<4 µm	20.9
		<2 µm	16.6

Figure 58: Relative proportion of sediment grain size categories at station BI-07. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.19.4 Sediment geotechnical, organic, and trace-element estimates

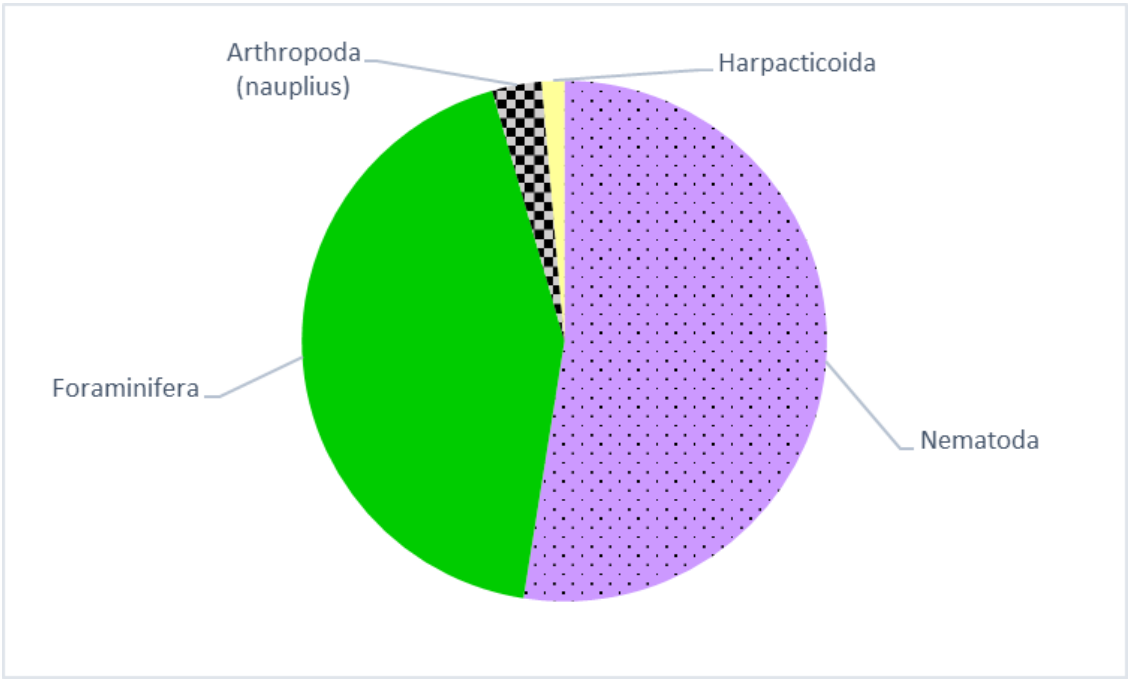
Table 38: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-07.

Variable	Porosity	Organic Content	TOC	TON
Percent	62.44	8.85	2.37	0.34

Table 39: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-07.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.87	120	34	0.17	140

4.3.19.5 Relative proportion of meiofauna taxa



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	52.50	35.60
	Foraminifera	43.06	29.19
	Arthropoda (nauplius)	3.06	2.07
	Harpacticoida	1.39	0.94

Figure 59: Relative proportion and abundance of meiofauna taxa at station BI-07. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.20 STATION BI-06

4.3.20.1 BI-06 abstract

- Station BI-06 has a water depth of 14.5 m and is located on the west end of the Port Moody Arm located at the head of BI.
- Sediment texture consisted of a very poorly-sorted, coarse silt with an arithmetic mean grain size of 63.67 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 68.25% and 9.37%, respectively, while TOC and TON estimates are 1.97% and 0.30%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Probable Effects Level (PEL), while all the trace-element concentrations exceeded TEL: cadmium (1.4 µg g^{-1}); copper (100 µg g^{-1}); lead (41 µg g^{-1}); mercury (0.17 µg g^{-1}); and zinc (140 µg g^{-1}).
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, and Halacaridae that ranged between 0.71 – 70.92 % (relative proportion) and 0.19 to 18.83 No.cm^{-2} (abundance).

4.3.20.2 Location of sampling station BI-06

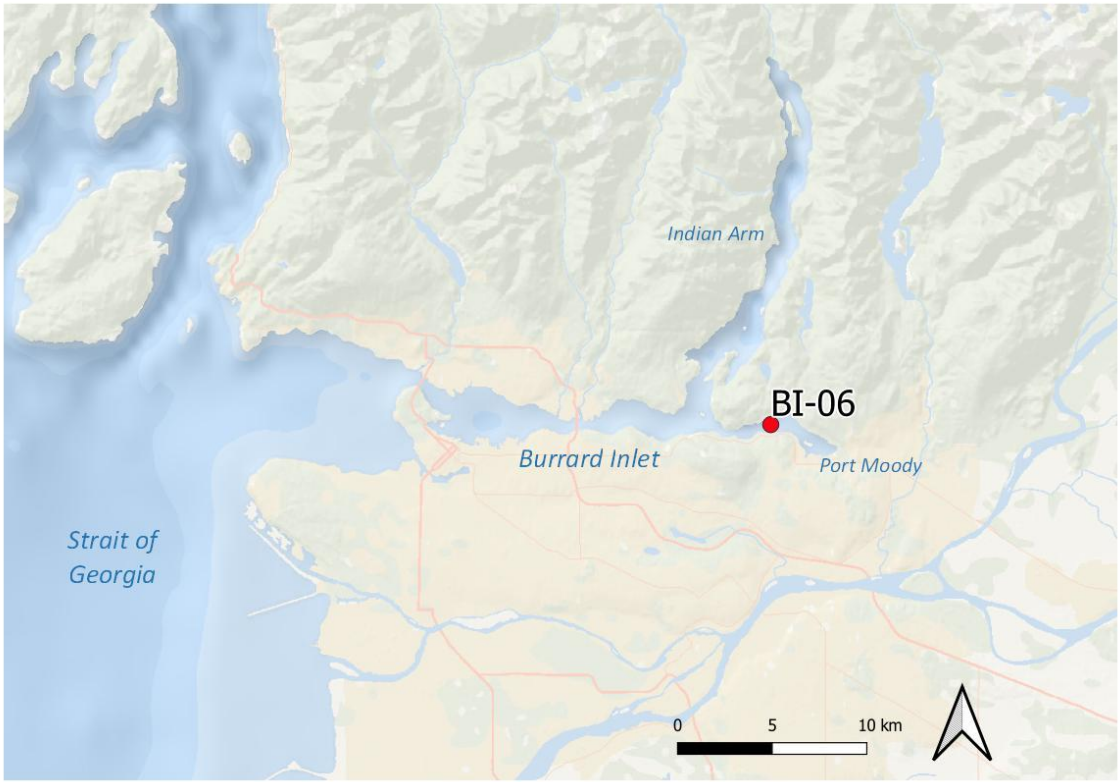
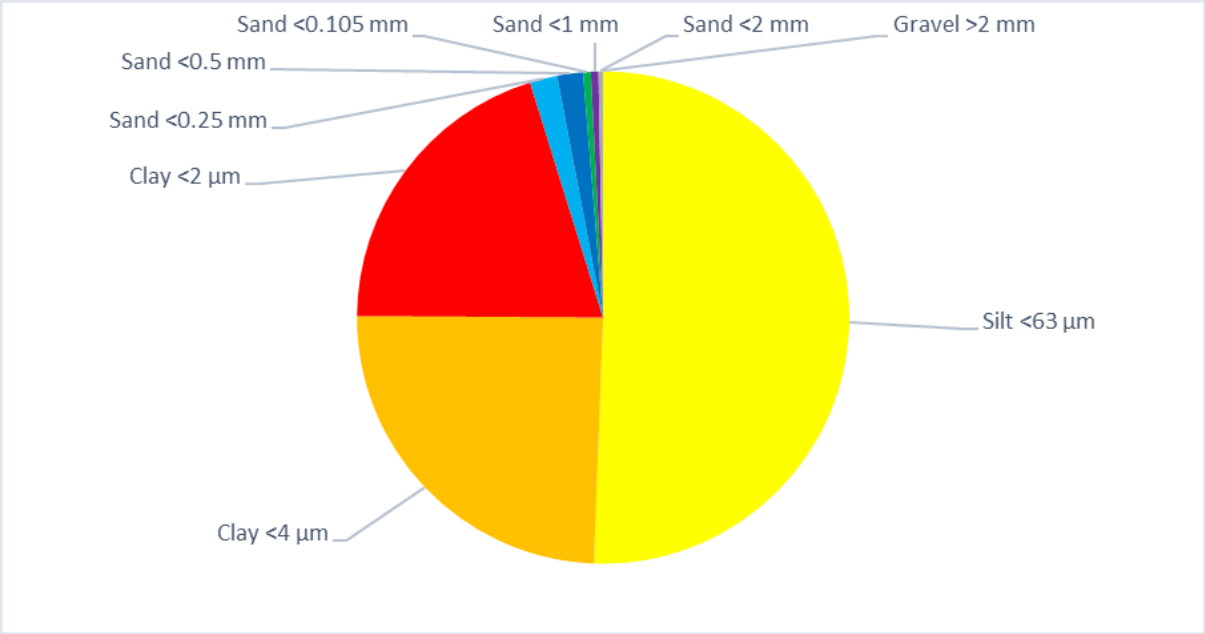


Figure 60: Location of BI-06 sampling station at the west end of Port Moody Arm, British Columbia, Canada (49° 17' 43.8" N; 122° 53' 6.9" W). A Smith-McIntyre grab sample was collated on September 5th, 2020. BI = Burrard Inlet.

4.3.20.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.3
		<1 mm	0.5
		<0.5 mm	1.7
		<0.25 mm	1.8
		<0.105 mm	0.5
	Silt	<63 µm	50.6
	Clay	<4 µm	24.5
		<2 µm	20.1

Figure 61: Relative proportion of sediment grain size categories at station BI-06. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.20.4 Sediment geotechnical, organic, and trace-element estimates

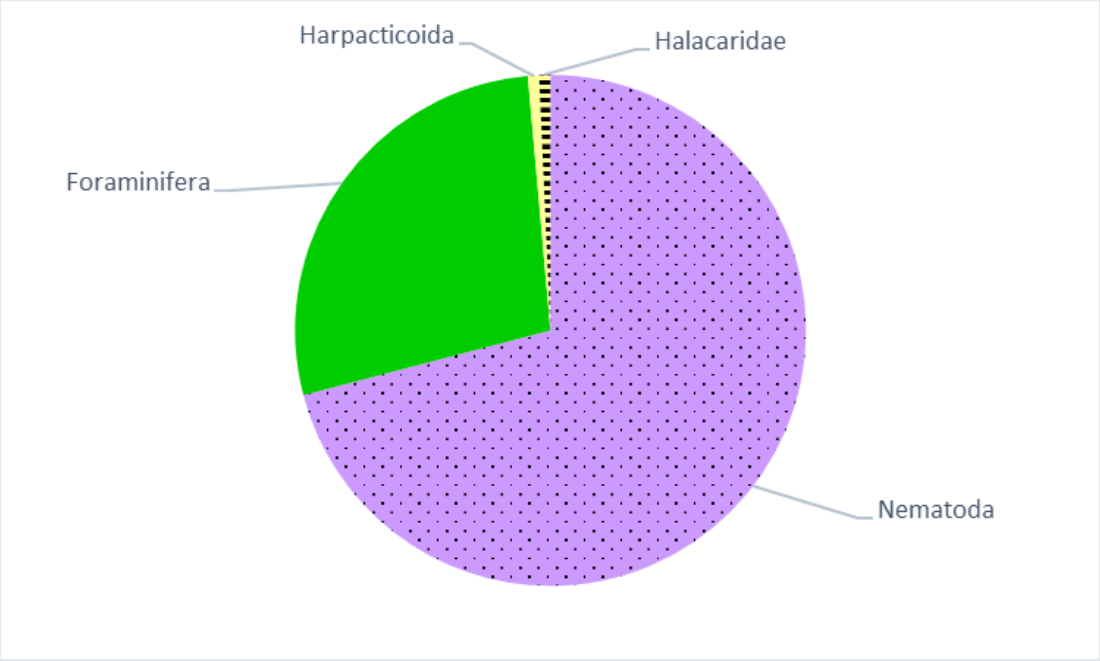
Table 40: Percent values of sediment porosity, organic content, total organic carbon (TOC, and total organic nitrogen (TON) station BI-06.

Variable	Porosity	Organic Content	TOC	TON
Percent	68.25	9.37	1.97	0.30

Table 41: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-06.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	1.4	100	41	0.17	140

4.3.20.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	70.92	18.83
	Foraminifera	27.66	7.35
	Harpacticoida	0.71	0.19
	Halacaridae	0.71	0.19

Figure 62: Relative proportion and abundance of meiofauna taxa at station BI-06. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3 STATION BI-05

4.3.21.1 BI-05 abstract

- Station BI-05 has a water depth of 17.0 m and is located in central Port Moody Arm located at the head of BI.
- Sediment texture consisted of a very poorly-sorted, medium silt with an arithmetic mean grain size of 57.84 μm and a fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 67.05% and 8.76%, respectively, while TOC and TON estimates are 2.49% and 0.34%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of cadmium (2.4 μg g^{-1}) and copper (62 μg g^{-1}) which exceeded the TEL.
- The meiofauna community included Foraminifera, Nematoda, and Bivalvia that ranged between 7.14 – 57.14 % (relative proportion) and 0.19 to 1.51 No.cm^{-2} (abundance).

4.3.21.2 Location of sampling station BI-05

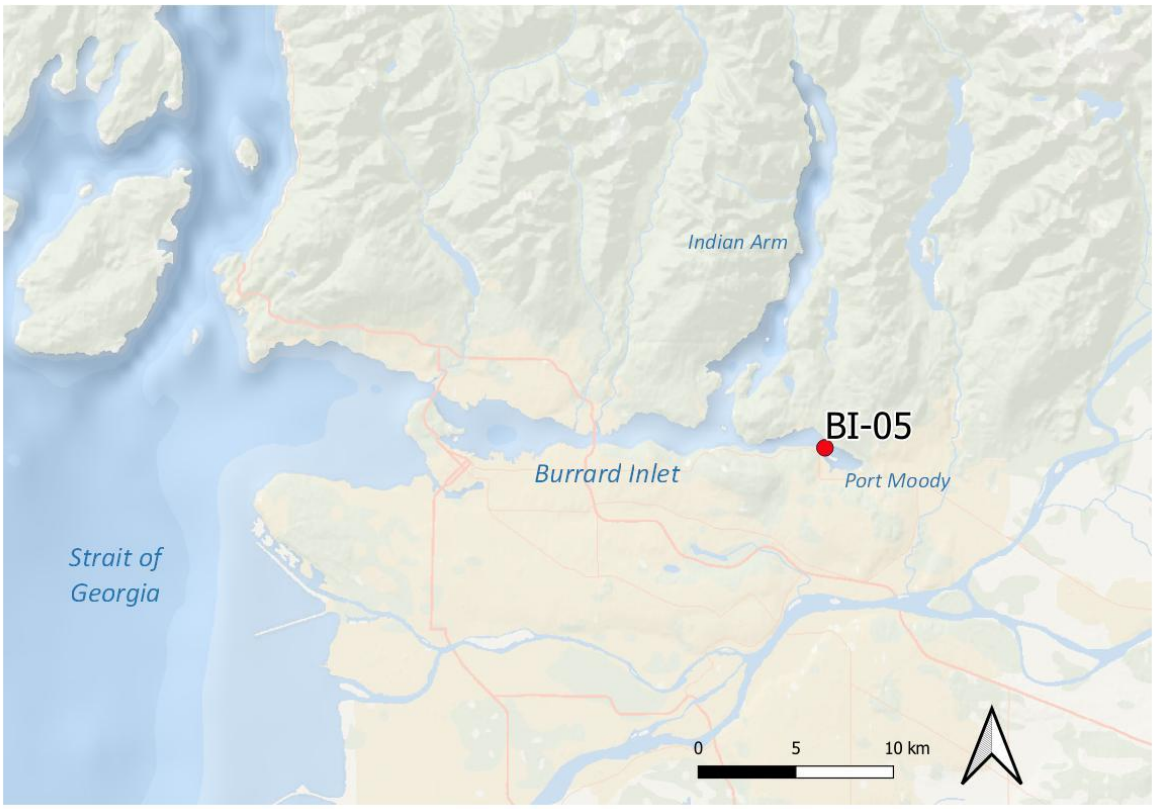
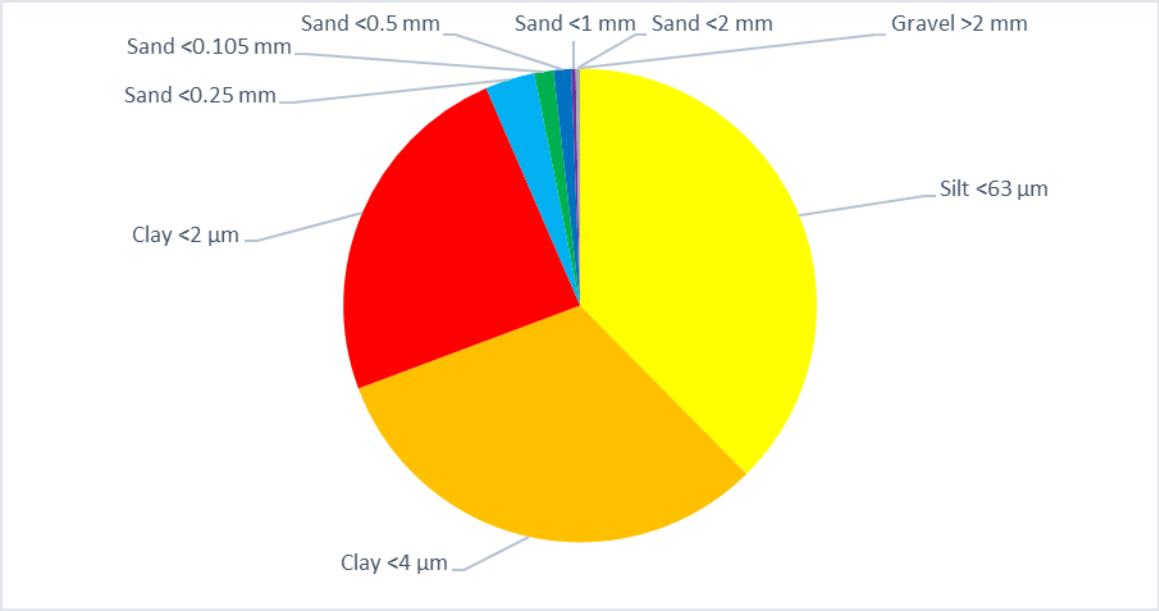


Figure 63: Location of BI-05 sampling station in central Port Moody Arm, British Columbia, Canada (49° 17' 28.6" N; 122° 51' 49.5" W). A Smith-McIntyre grab sample was collected on September 5th, 2020. BI = Burrard Inlet.

4.3.21.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.3
		<1 mm	0.3
		<0.5 mm	1.2
		<0.25 mm	3.4
		<0.105 mm	1.3
	Silt	<63 µm	37.6
	Clay	<4 µm	31.7
		<2 µm	24.2

Figure 64: Relative proportion of sediment grain size categories at station BI-05. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.21.4 Sediment geotechnical, organic, and trace-elements estimates

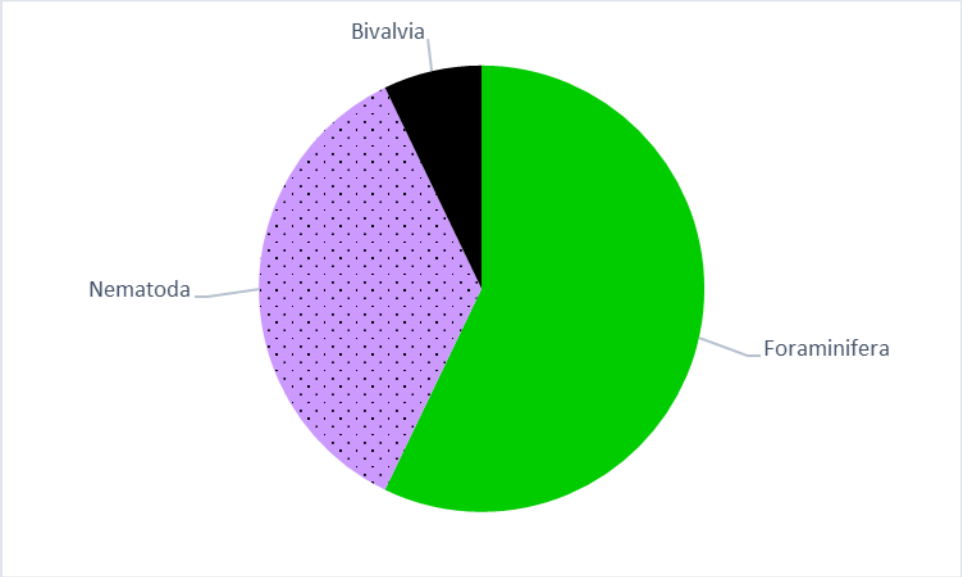
Table 42: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-05.

Variable	Porosity	Organic Content	TOC	TON
Percent	67.05	8.76	2.49	0.34

Table 43: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-05.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	2.4	62	22	0.098	130

4.3.21.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Foraminifera	57.14	1.51
	Nematoda	35.71	0.94
	Bivalvia	7.14	0.19

Figure 65: Relative proportion and abundance of meiofauna taxa at station BI-05. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.22 STATION BI-28

4.3.22.1 BI-28 abstract

- Station BI-28 has a depth of 29.0 m and is located at the sill that divides Indian Arm and Burrard Inlet.
- Sediment texture consisted of a poorly-sorted, fine sand with an arithmetic mean grain size of 194.30 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 48.93% and 5.23%, respectively, while TOC and TON estimates are 1.68% and 0.32%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (50 µg g^{-1}), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Harpacticoida, Sedentaria, Bivalvia, and Arthropoda (nauplii) that ranged between 0.11 – 84.10 % (relative proportion) and 0.19 to 138.44 $No.cm^{-2}$ (abundance).

4.3.22.2 Location of sampling station BI-28

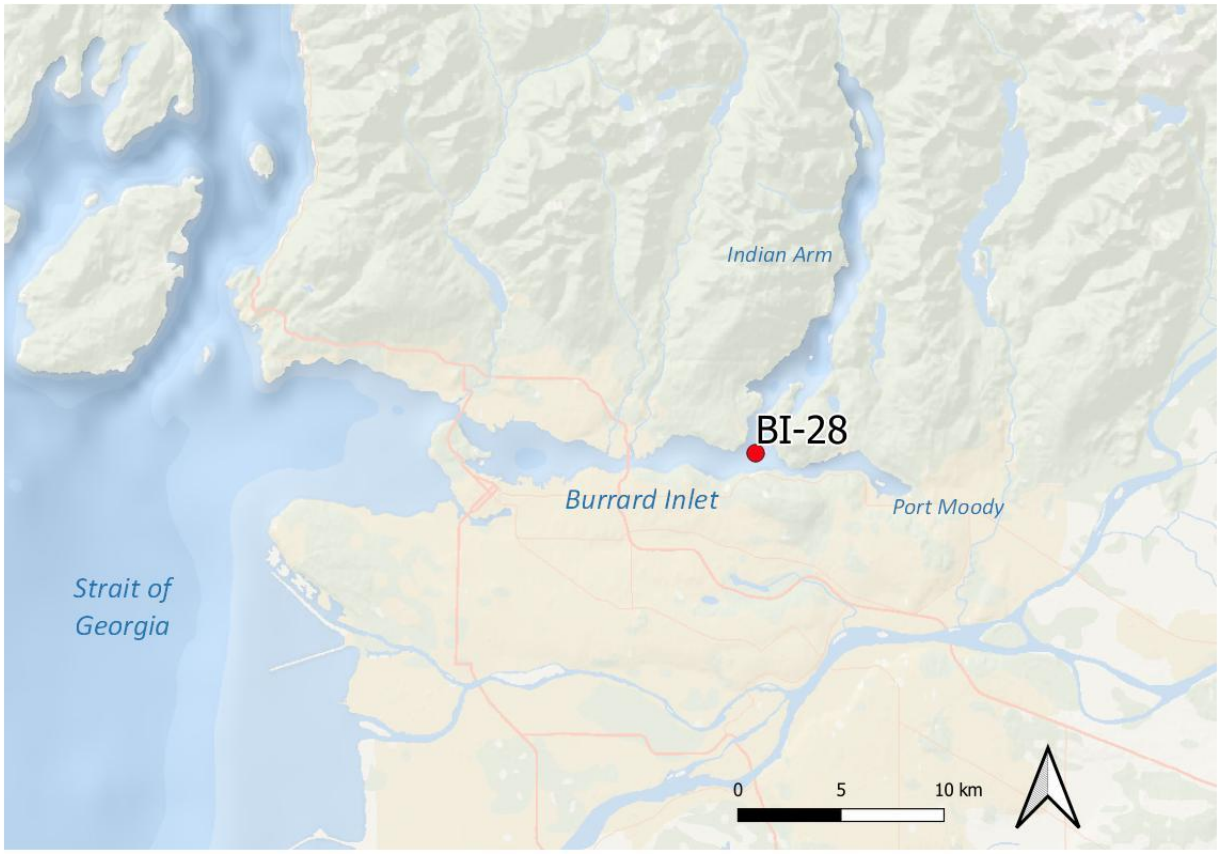
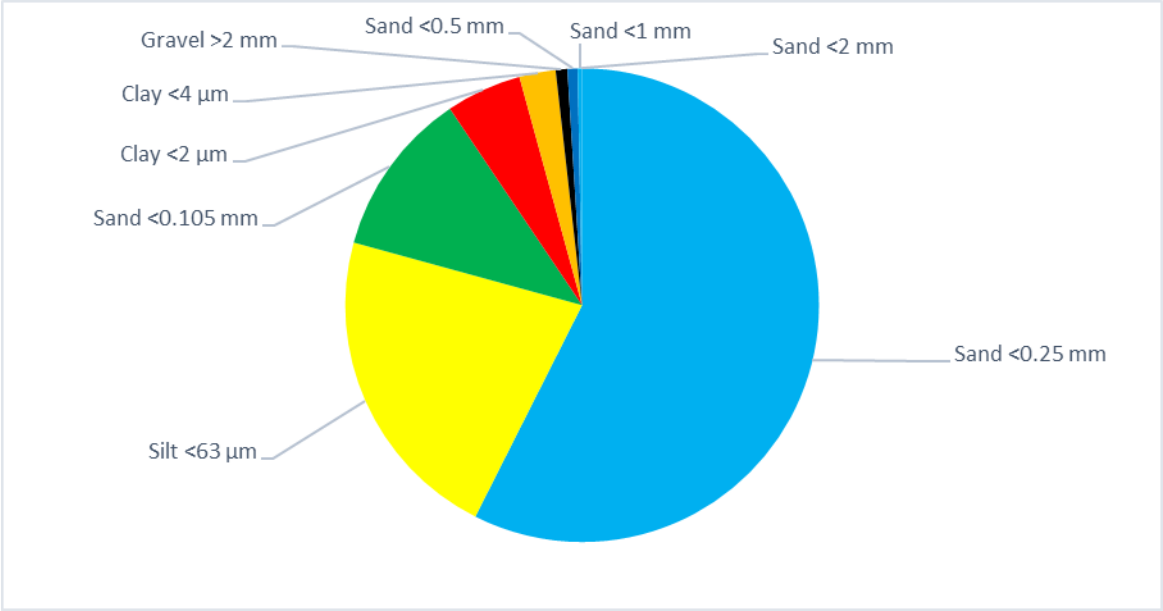


Figure 66: Location of BI-28 sampling station in the Inner Harbour of Burrard Inlet, British Columbia, Canada (49° 17' 58.3" N; 122° 56' 27.6" W). A Smith-McIntyre grab sample was collected on September 6th, 2020. BI = Burrard Inlet.

4.3.22.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.8
	Sand	<2 mm	0.0
		<1 mm	0.3
		<0.5 mm	0.7
		<0.25 mm	57.4
		<0.105 mm	11.3
	Silt	<63 µm	21.8
	Clay	<4 µm	2.5
		<2 µm	5.2

Figure 67: Relative proportion of sediment grain size categories at station BI-28. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.22.4 Sediment geotechnical, organic, and trace-element estimates

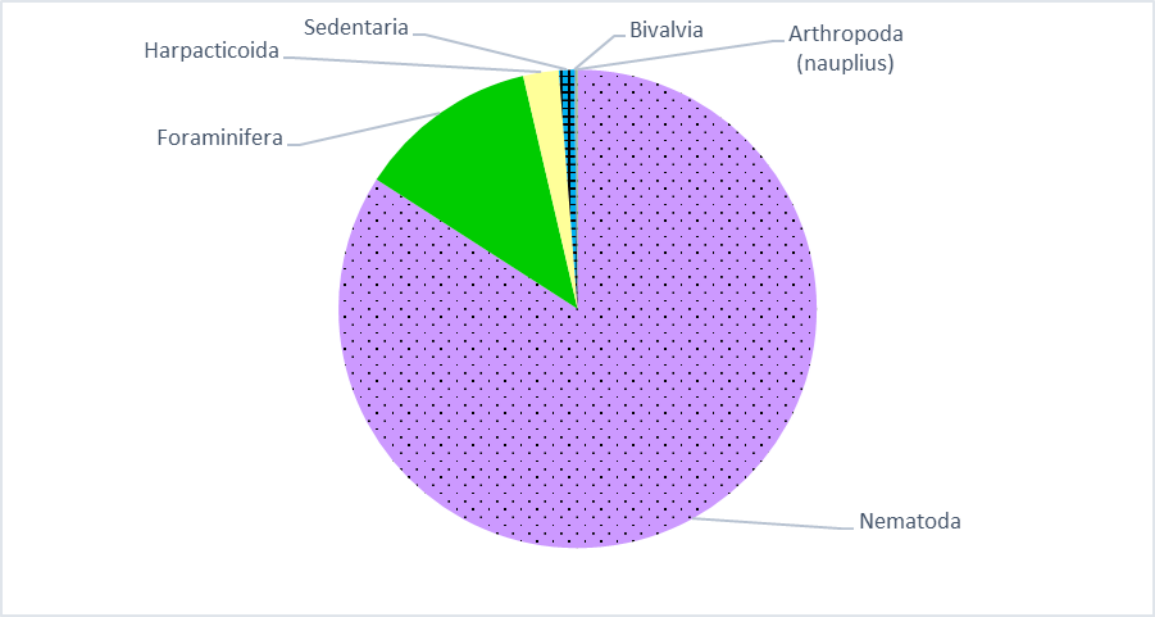
Table 44: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-28.

Variable	Porosity	Organic Content	TOC	TON
Percent	48.93	5.23	1.68	0.32

Table 45: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-28.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.54	50	15	0.084	81

4.3.22.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	84.10	138.44
	Foraminifera	12.24	20.15
	Harpacticoida	2.40	3.96
	Sedentaria	1.03	1.70
	Bivalvia	0.11	0.19
	Arthropoda (nauplius)	0.11	0.19

Figure 68: Relative proportion and abundance of meiofauna taxa at station BI-28. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.23 STATION BI-03

4.3.23.1 BI-03 abstract

- Station BI-03 has a water depth of 53.0 m and is located at the on the south end of Indian Arm located at the head of BI.
- Sediment texture consisted of a very poorly-sorted, coarse silt with an arithmetic mean grain size of 65.23 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content values are 63.20% and 8.77%, respectively, while TOC and TON estimates are 1.80% and 0.33%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of cadmium (0.86 µg g^{-1}), copper (107 µg g^{-1}), lead (31 µg g^{-1}), mercury (0.18 µg g^{-1}) which exceeded the TEL.
- The meiofauna community included Nematoda, Foraminifera, and Rotifera that ranged between 0.26 – 69.08 % (relative proportion) and 0.19 to 50.35 No.cm^{-2} (abundance).

4.3.23.2 Location of Sample Site BI-03

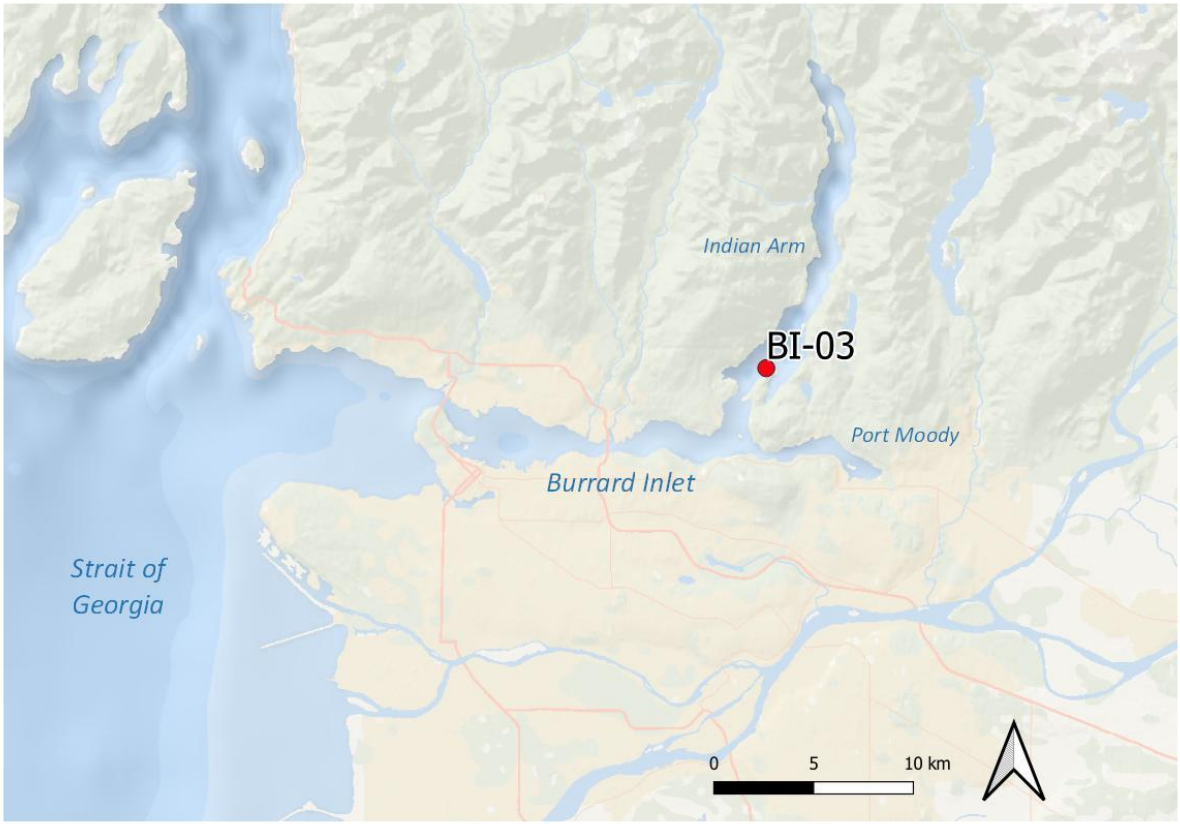
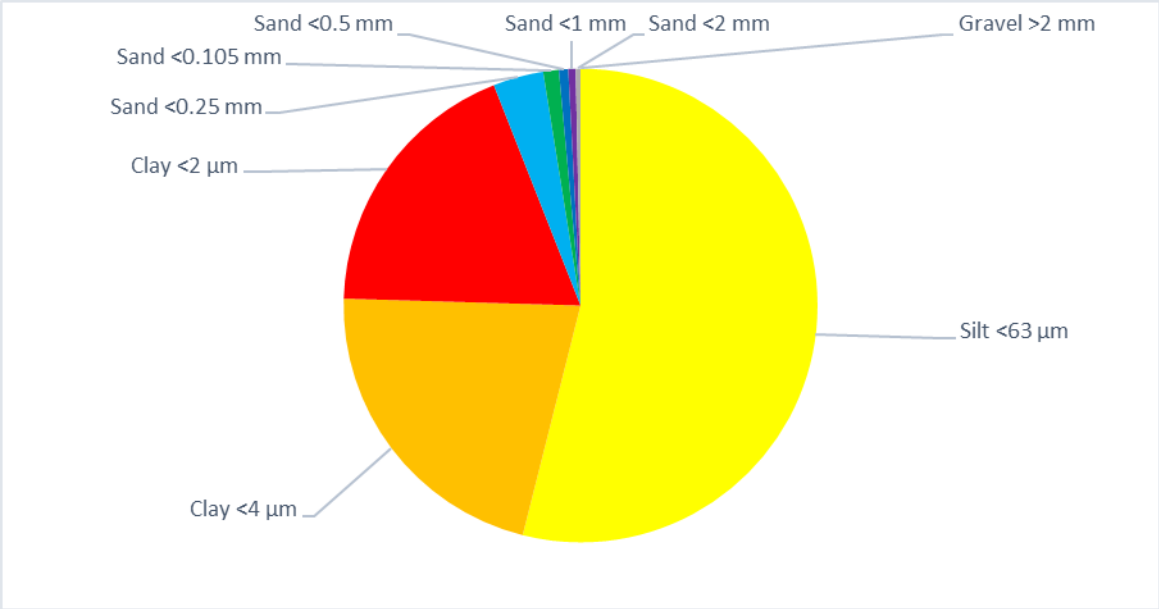


Figure 69: Location of BI-03 sampling station at the south end of Indian Arm, British Columbia, Canada (49° 19' 50.6" N; 122° 55' 0.3" W). A Smith-MacIntyre grab sample was collected on September 6th, 2020. BI = Burrard Inlet.

4.3.23.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.3
		<1 mm	0.5
		<0.5 mm	0.6
		<0.25 mm	3.4
		<0.105 mm	1.1
	Silt	<63 µm	53.9
	Clay	<4 µm	21.5
		<2 µm	18.6

Figure 70: Relative proportion of sediment grain size categories at station BI-03. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.23.4 Sediment geotechnical, organic, and trace-elements estimates

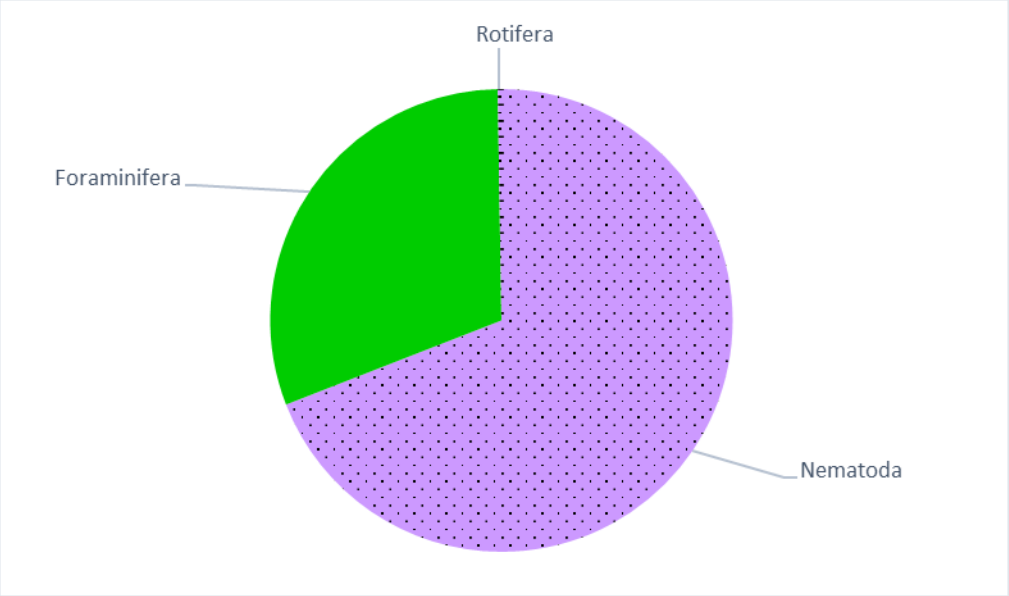
Table 46: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-03.

Variable	Porosity	Organic Content	TOC	TON
Percent	63.20	8.77	1.80	0.33

Table 47: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-03.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.86	107	31	0.18	130

4.3.23.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	69.08	50.35
	Foraminifera	30.66	22.35
	Rotifera	0.26	0.19

Figure 71: Relative proportion and abundance of meiofauna taxa at station BI-03. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.24 STATION BI-04

4.3.24.1 BI-04 abstract

- Station BI-04 has a water depth of 32.0 m and is located at the southeast coastline of Indian Arm located at the head of BI.
- Sediment texture consisted of a poorly-sorted, fine sand with an arithmetic mean grain size of 330.60 μm and a very fine skewed frequency profile towards fine sediments.
- The sediment porosity and organic content estimates are 23.47% and 1.10%, respectively, while TOC and TON estimates are 0.14% and 0.01%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL).
- The meiofauna community included Nematoda, Foraminifera, Harpacticoida, and Polychaeta that ranged between 0.12 – 54.43 % (relative proportion) and 0.19 to 87.96 No.cm^{-2} (abundance).

4.3.24.2 Location of sampling station BI-04

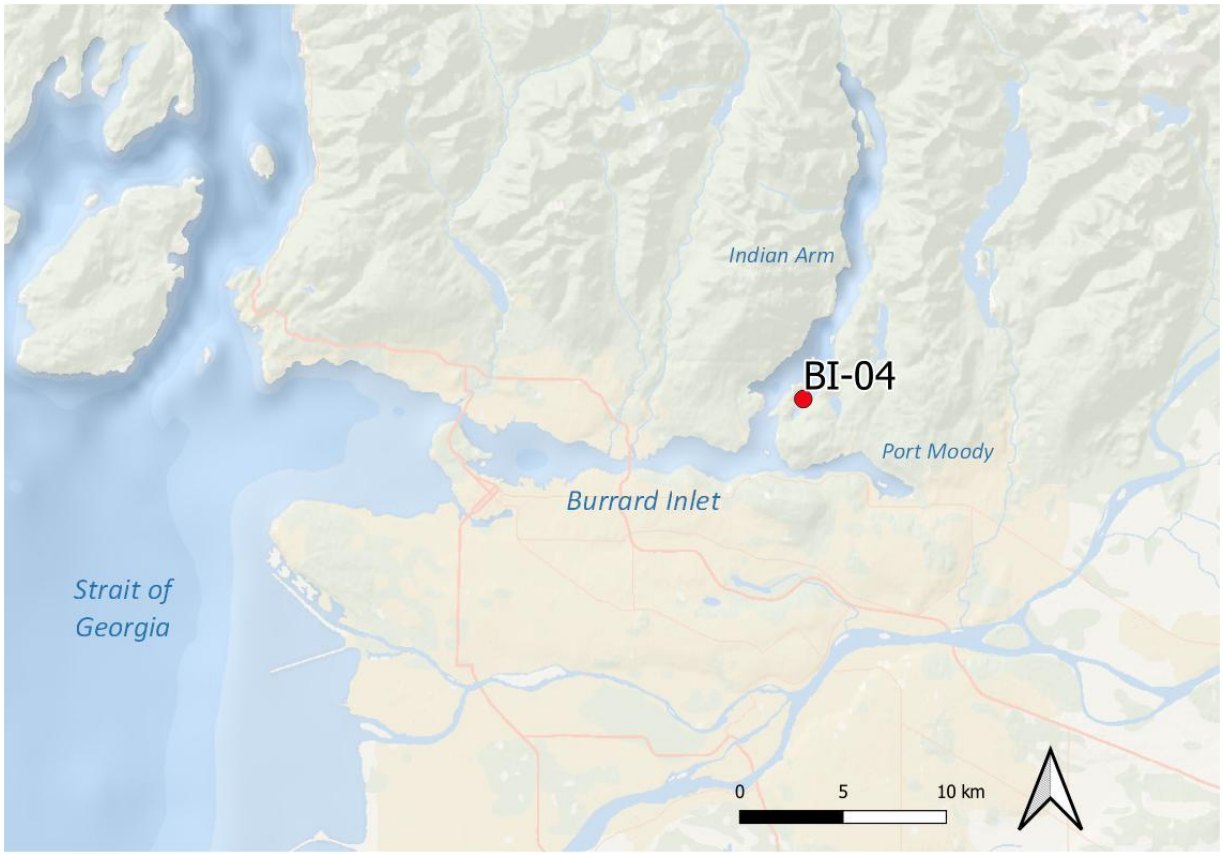
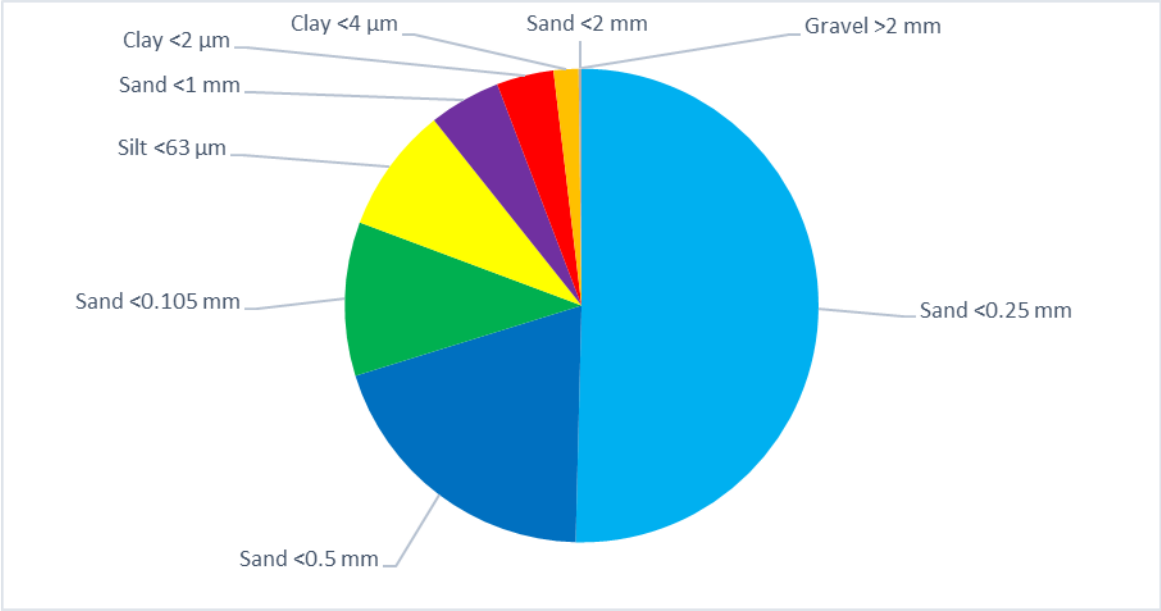


Figure 72: Location of BI-04 sampling station at the south end of Indian Arm, British Columbia, Columbia (49° 19' 24" N; 122° 54' 38" W). A Smith-McIntyre grab sample was collected on September 5th, 2020. BI = Burrard Inlet.

4.3.24.3 Relative proportion of meiofaunal abundance



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.2
		<1 mm	4.9
		<0.5 mm	19.8
		<0.25 mm	50.4
		<0.105 mm	10.5
	Silt	<63 µm	8.6
	Clay	<4 µm	1.7
		<2 µm	3.9

Figure 73: Relative proportion of sediment grain size categories at station BI-04. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.24.4 Sediment geotechnical, organic, and trace-elements estimates

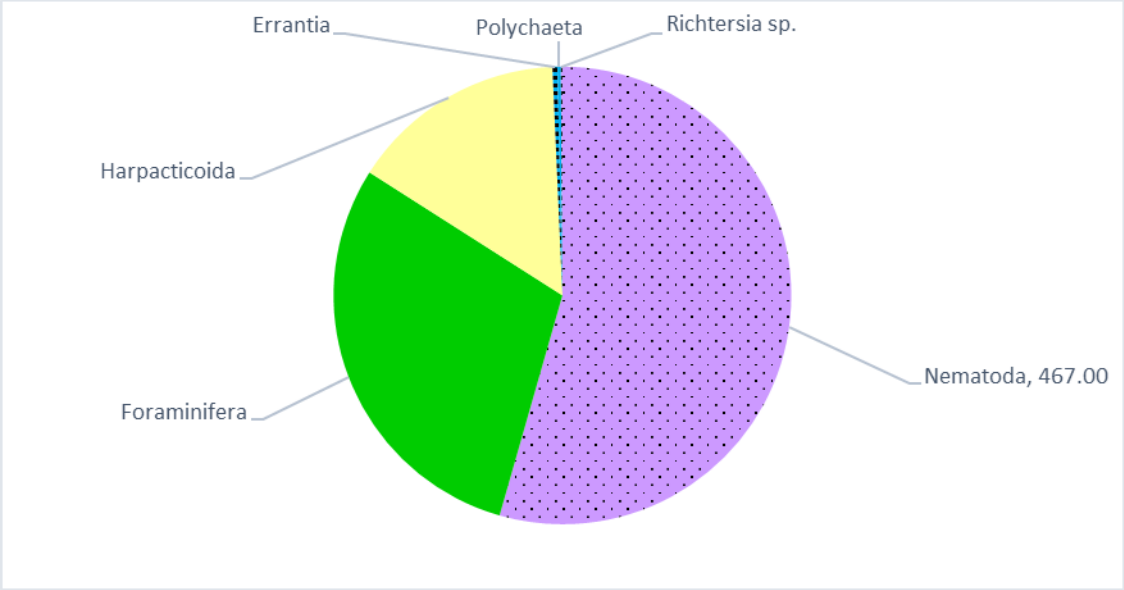
Table 48: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-04.

Variable	Porosity	Organic Content	TOC	TON
Percent	23.47	1.10	0.14	0.01

Table 49: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-04.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.30	9.7	5	0.024	29

4.3.24.5 Relative proportion of meiofauna taxa



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	54.43	87.96
	Foraminifera	29.60	47.84
	Harpacticoida	15.27	24.67
	Errantia	0.35	0.57
	Polychaeta	0.23	0.38
	Richtersia sp.	0.12	0.19

Figure 74: Relative proportion and abundance of meiofauna taxa at station BI-04. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.25 STATION BI-27

4.3.25.1 BI-27 abstract

- Station BI-27 has a water depth of 220m and is located in the center of Indian Arm located at the head of Burrard Inlet.
- Sediment texture consisted of a poorly-sorted, coarse silt with an arithmetic mean grain size of 57.94 µm and a very fine skewed frequency profile towards coarse sediment.
- The sediment porosity and organic content estimates are 75.27% and 8.57%, respectively, while TOC and TON estimates are 1.87% and 0.27%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell above the Theoretical Effects Level (TEL) and below the Probable Effects Level (PEL).
- The meiofauna community consisted of one taxa (Nematoda) with an abundance of 0.57 No.cm^{-2}.

4.3.25.2 Location of sampling station BI-27

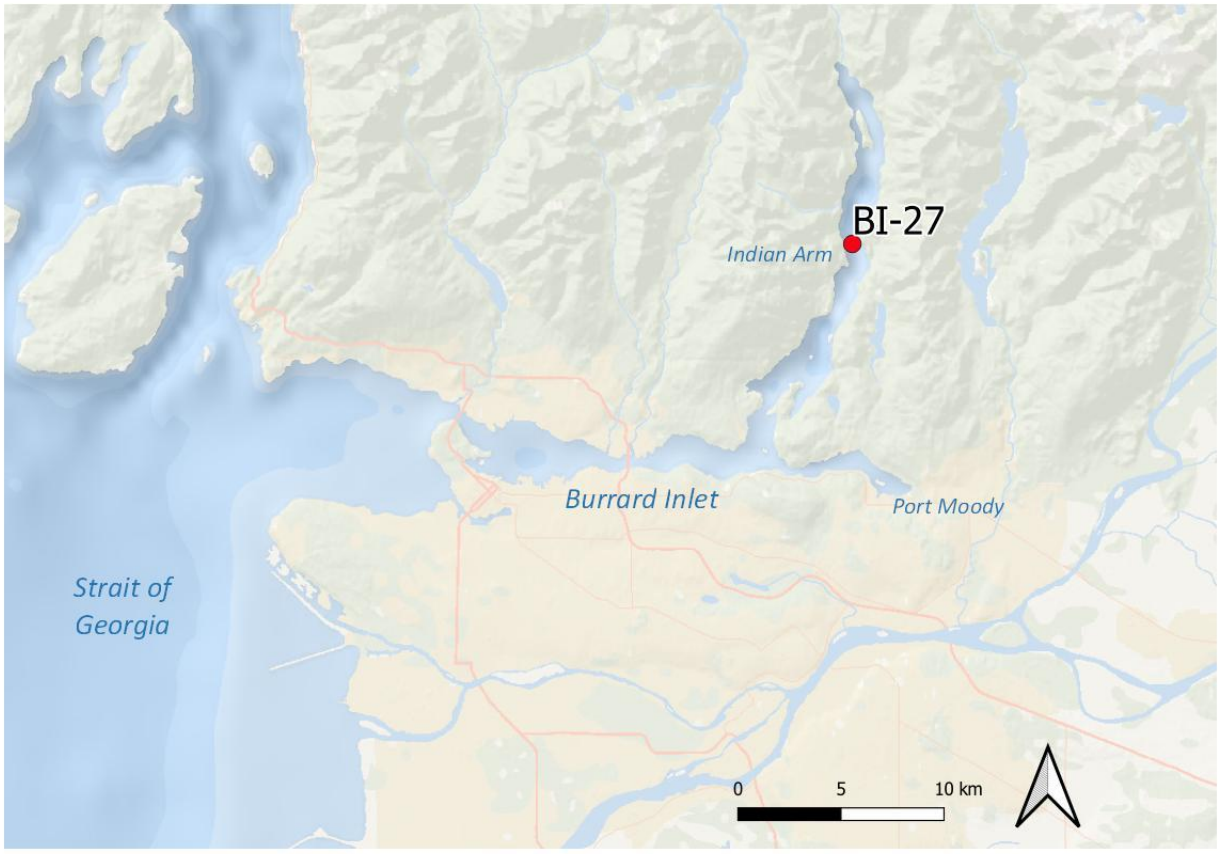
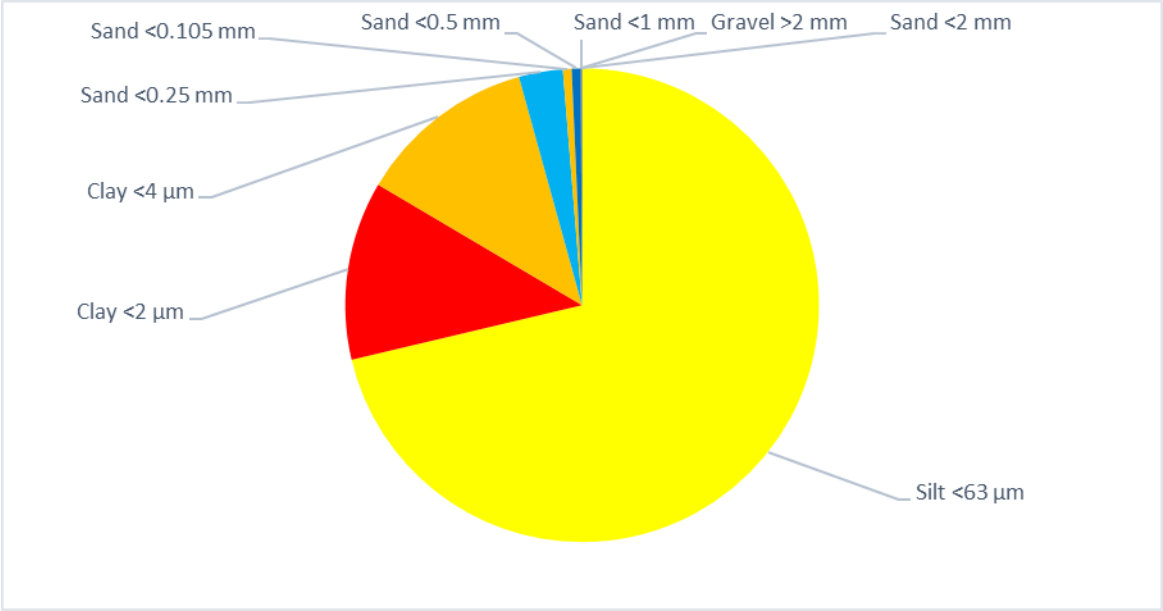


Figure 75: Location of BI-27 sampling station at the center of Indian Arm, British Columbia (49° 23' 23.9" N; 122° 52' 36" W). A Smith-McIntyre grab sample was collected on September 6th, 2020. BI = Burrard Inlet.

4.3.25.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.0
		<1 mm	0.1
		<0.5 mm	0.6
		<0.25 mm	3.0
		<0.105 mm	0.6
	Silt	<63 µm	71.3
	Clay	<4 µm	12.2
		<2 µm	12.2

Figure 76: Relative proportion of sediment grain size categories at station BI-27. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.25.4 Sediment geotechnical, organic, and trace-element estimates

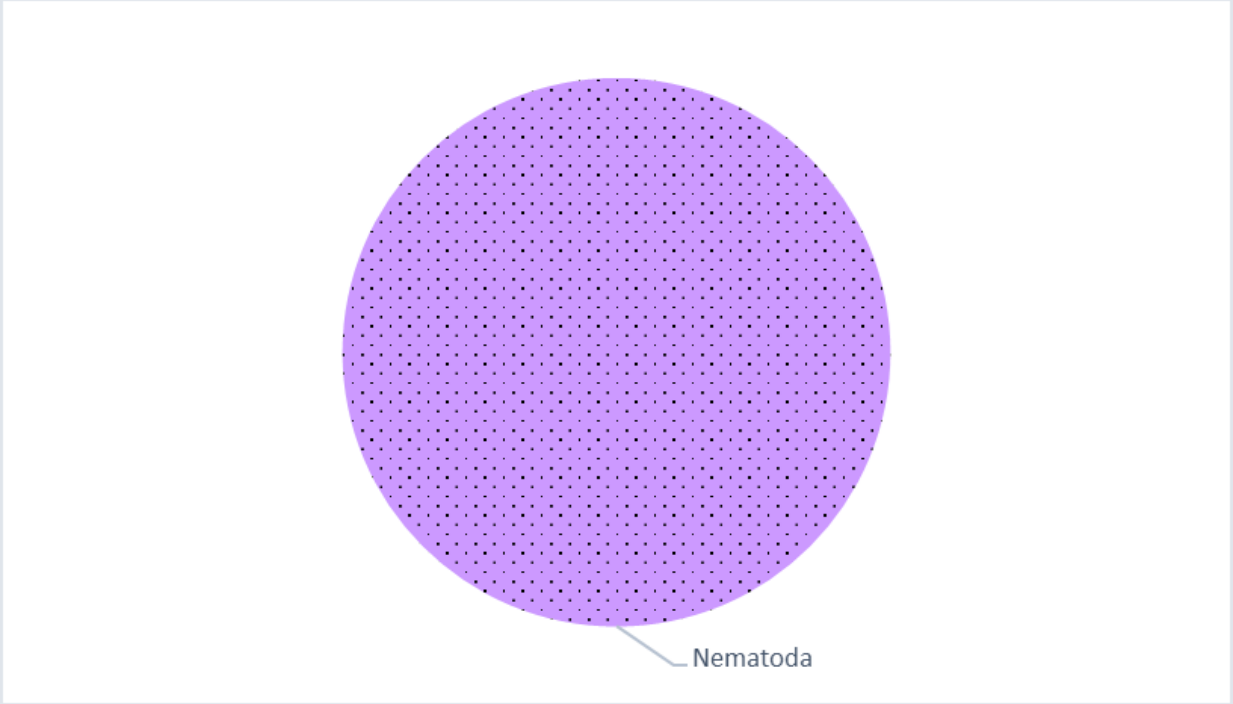
Table 50: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-27.

Variable	Porosity	Organic Content	TOC	TON
Percent	75.27	8.57	1.87	0.27

Table 51: Sediment trace-element concentrations ($\mu g\ g^{-1}$) at station BI-27.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.73	92	45	0.15	150

4.3.25.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	100.00	0.57

Figure 77: Relative proportion and abundance of meiofauna taxa at station BI-27. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.26 STATION BI-02

4.3.26.1 BI-02 abstract

- Station BI-02 has a water depth of 48.3 m and is located at the inner termination of Indian Arm located at the head of BI.
- Sediment texture consisted of a poorly-sorted, very fine sand with an arithmetic mean grain size of 181.10 µm and a very fine skewed frequency profile towards coarse sediments.
- The sediment porosity and organic content estimates are 43.28% and 6.05%, respectively, while TOC and TON estimates are 1.48% and 0.23%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of the observed copper concentration (38 $\mu g\ g^{-1}$), which exceeded TEL.
- The meiofauna community consisted of Nematoda, Foraminifera, Kinorhynchs, Harpacticoida, and Ostracoda that ranged between 0.37 – 77.90 % (relative proportion) and 0.19 to 39.18 $No.cm^{-2}$ (abundance).

4.3.26.2 Location of sampling station BI-02

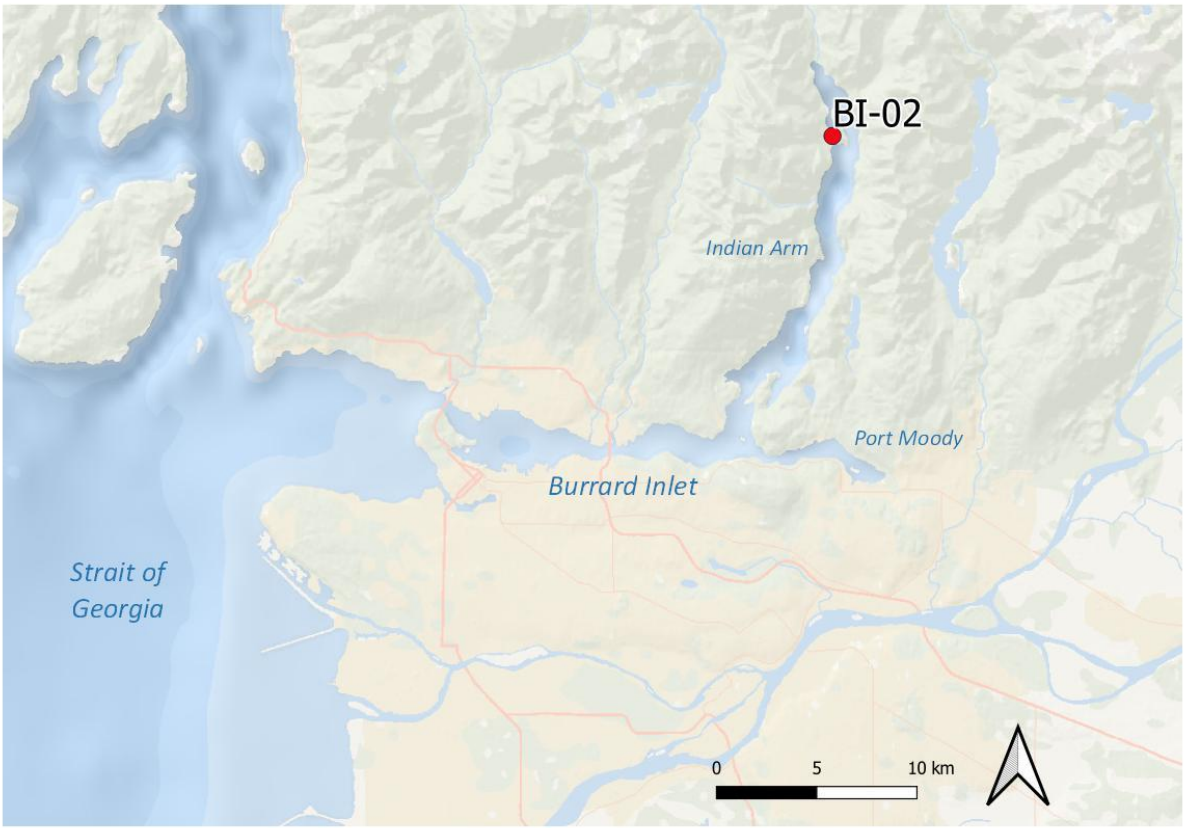
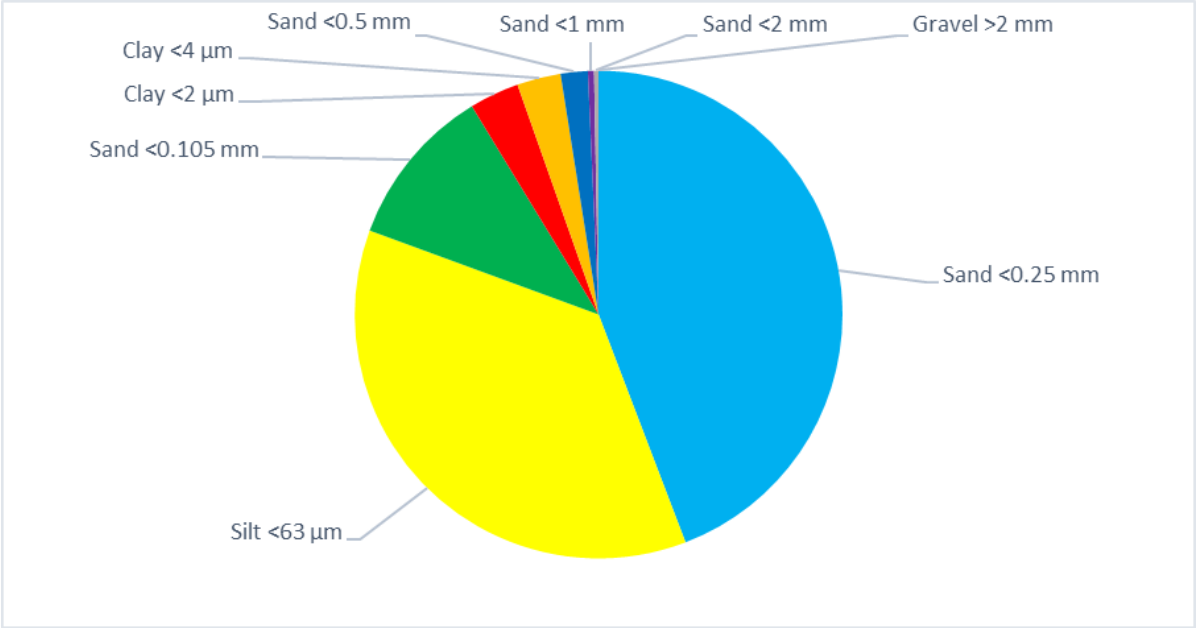


Figure 78: Location of BI-02 sampling station at the north end of Indian Arm, British Columbia, Canada (49° 26' 7" N; 122° 52' 24.4" W). A Smith-McIntyre grab sample was collected on September 6th, 2020. BI = Burrard Inlet.

4.3.26.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.3
		<1 mm	0.4
		<0.5 mm	1.8
		<0.25 mm	44.2
		<0.105 mm	10.7
	Silt	<63 µm	36.4
	Clay	<4 µm	2.9
		<2 µm	3.3

Figure 79: Relative proportion of sediment grain size categories at station BI-02. Relative proportion values are outlined in the legend located below the pie chart.

4.3.26.4 Sediment geotechnical, organic, and trace-element estimates

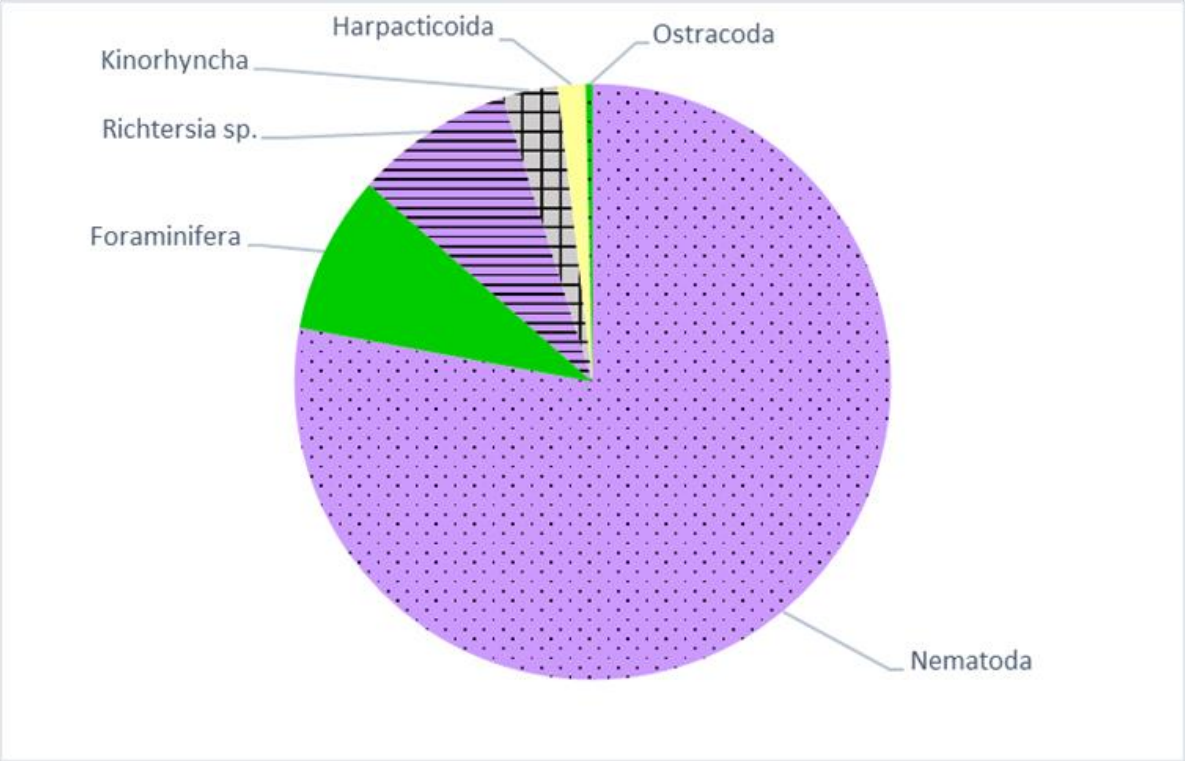
Table 52: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-02.

Variable	Porosity	Organic Content	TOC	TON
Percent	43.28	6.05	1.48	0.23

Table 53: Sediment trace-element concentrations (μg g^{-1}) at station BI-02.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.5	38	7.2	0.035	67

4.3.26.5 Relative proportion of meiofauna taxa



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Nematoda	77.90	39.18
	Foraminifera	8.61	4.33
	Richtersia sp.	8.61	4.33
	Kinorhyncha	3.00	1.51
	Harpacticoida	1.50	0.75
	Ostracoda	0.37	0.19

Figure 80: Relative proportion and abundance of meiofauna taxa at station BI-02. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

4.3.27 STATION BI-01

4.3.27.1 BI-01 abstract

- BI-01 has a water depth of 37.6 m and is located at the inner termination of Indian Arm located at the head of BI.
- Sediment texture consisted of a poorly-sorted, very fine sand with an arithmetic mean grain size of 171.70 µm and a symmetrical frequency profile.
- The sediment porosity and organic content estimates are 51.94% and 9.61%, respectively, while TOC and TON estimates are 3.74% and 0.40%, respectively.
- In terms of Interim Sediment Quality Guidelines (ISQG) (CCME 1999), the sediment trace-element concentrations of cadmium, copper, lead, mercury, and zinc fell below both the Theoretical Effects Level (TEL) and Probable Effects Level (PEL), with the exception of copper (48 $\mu g\ g^{-1}$) which exceeded the TEL.
- The meiofauna community included Harpacticoida, Foraminifera, and Nematoda that ranged between 25 – 50 % (relative proportion) and 0.19 – 0.38 No. cm^{-2} (abundance).

4.3.27.2 Location of sampling station BI-01

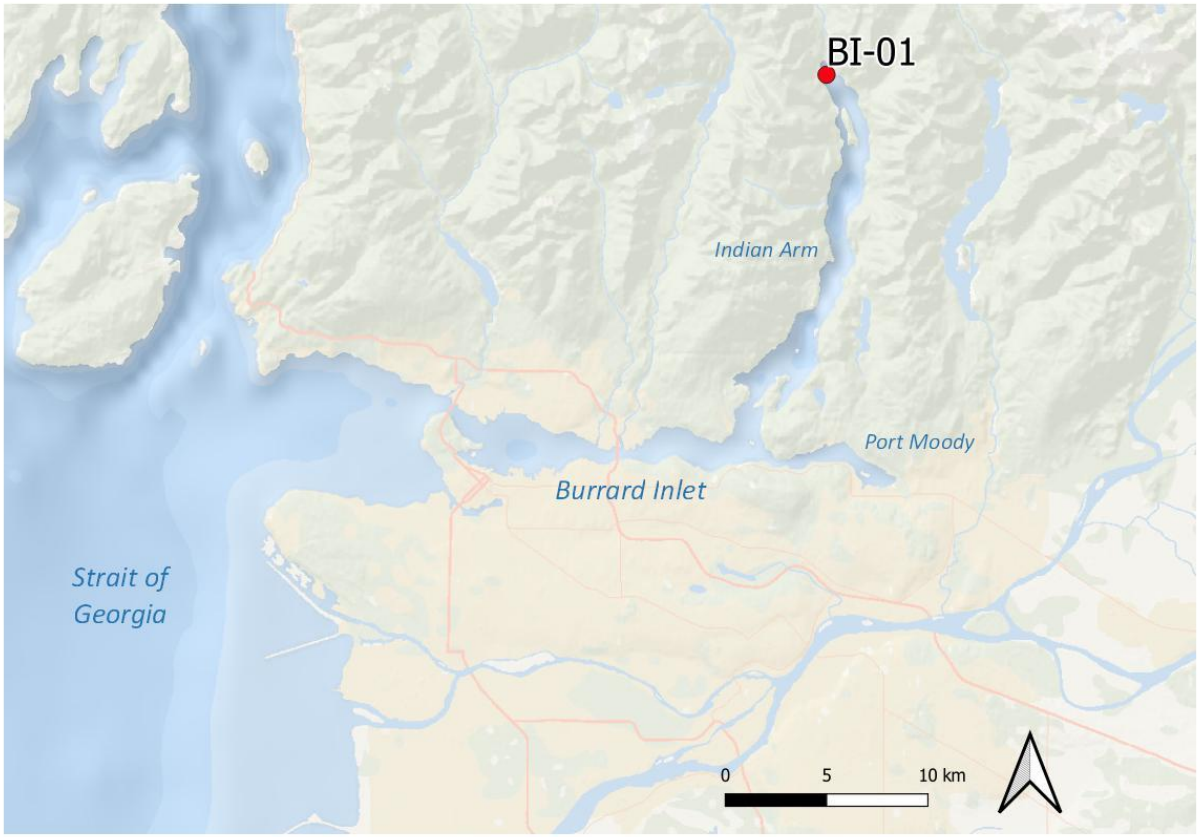
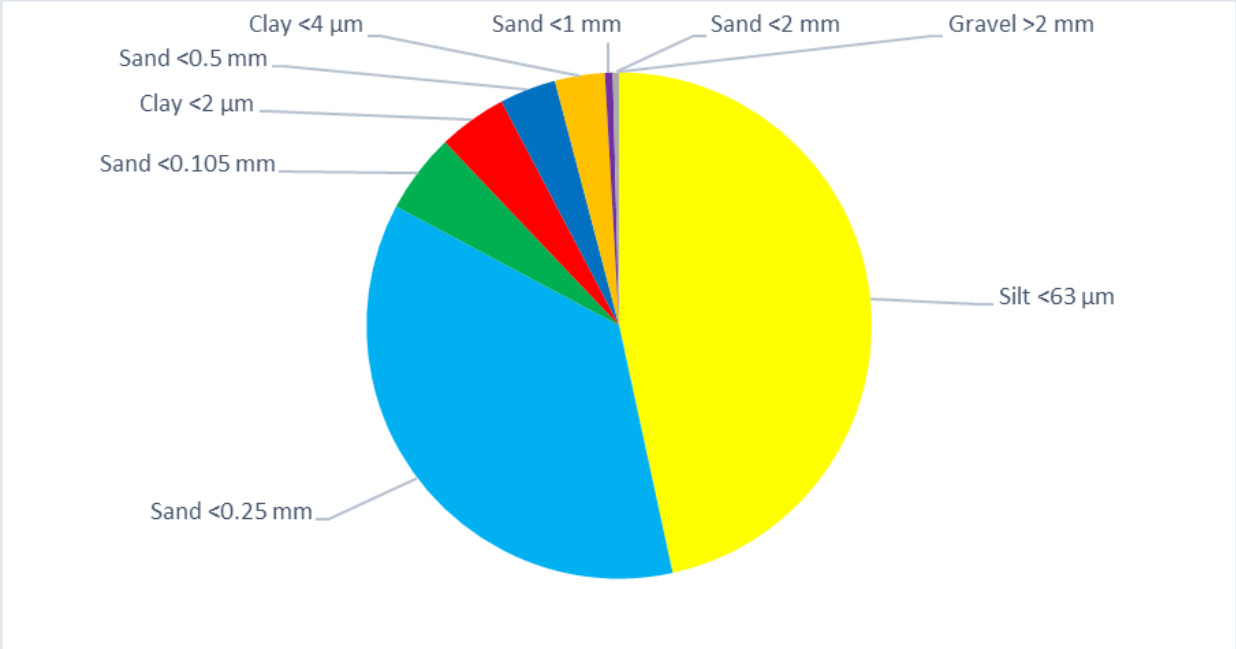


Figure 81: Location of BI-01 sampling station at the north end of Indian Arm, British Columbia, Canada (49° 27’ 45” N; 122° 53’ 3.4” W). A Smith-McIntyre grab sample was collected on September 6th, 2020. BI = Burrard Inlet.

4.3.27.3 Relative proportion of sediment grain size categories



	Sediment Group and Grain Size		Percentage (%)
	Gravel	>2 mm	0.0
	Sand	<2 mm	0.4
		<1 mm	0.5
		<0.5 mm	3.6
		<0.25 mm	36.2
		<0.105 mm	5.1
	Silt	<63 µm	46.6
	Clay	<4 µm	3.2
		<2 µm	4.4

Figure 82: Relative proportion of sediment grain size categories at station BI-01. Relative proportion values are outlined in the legend located below the pie-chart.

4.3.27.4 Sediment geotechnical, organic, and trace-element estimates

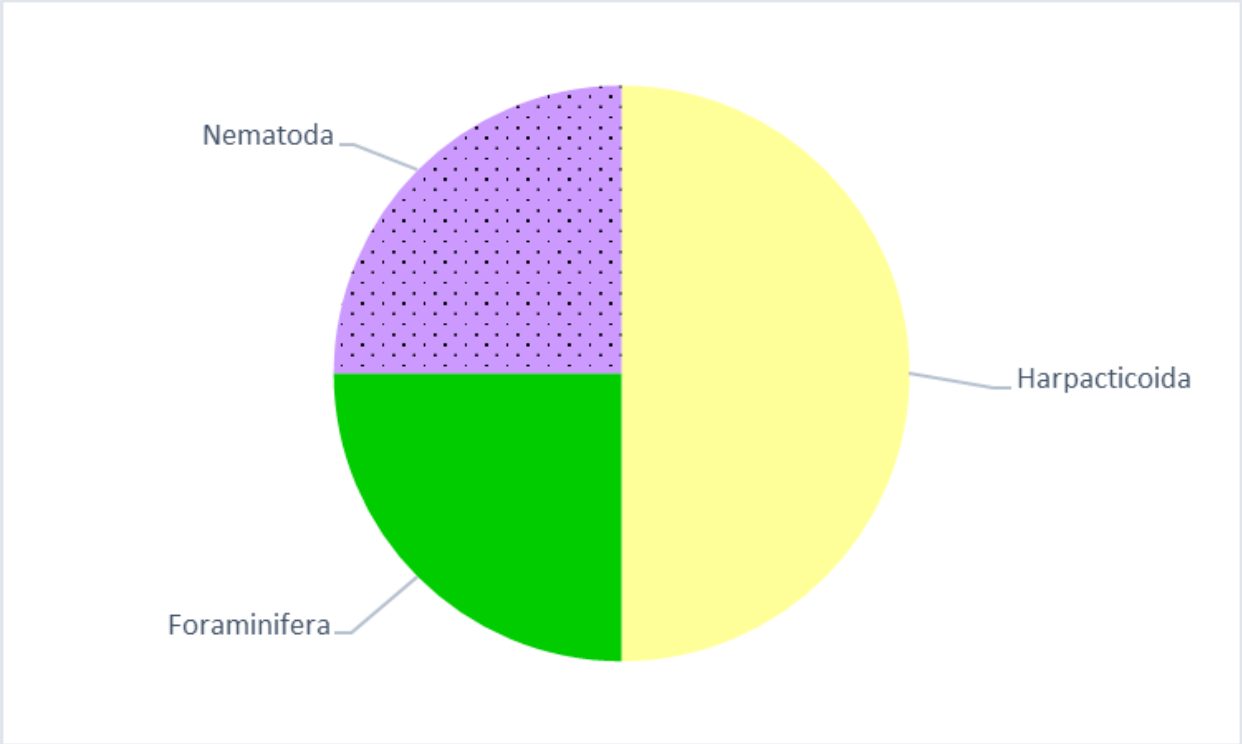
Table 54: Percent values of sediment porosity, organic content, total organic carbon (TOC), and total organic nitrogen (TON) at station BI-01.

Variable	Porosity	Organic Content	TOC	TON
Percentage	51.94	9.61	3.74	0.40

Table 55: Sediment trace-element concentrations (μg g^{-1}) at station BI-01.

Variable	Cadmium	Copper	Lead	Mercury	Zinc
Concentration	0.5	48	12	0.039	93

4.3.27.5 Relative proportion of meiofaunal abundance



	Taxon	Percentage (%)	Abundance (No. cm^{-2})
	Harpacticoida	50.00	0.38
	Foraminifera	25.00	0.19
	Nematoda	25.00	0.19

Figure 83: Relative proportion and abundance of meiofauna taxa at station BI-01. Relative proportion and abundance estimates are outlined in the legend below the pie-chart.

5.0 SUMMARY

This Ocean Protection Plan study provides data pertaining to subtidal sediment texture, geotechnical attributes (water and organic content), trace-element concentrations, and meiofauna communities. Future studies can examine the relationships between sediment variables and meiofaunal diversity within the contrasting environments explored from the tidal-bank interface of the Fraser River Delta to the protected harbours within Burrard Inlet. In addition, this 2020 survey will provide a status quo for past and future studies examining changes in habitat associated with climate change or local urban developments.

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