U.S. DEPARTMENT OF THE INTERIOR

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Occurrences of recent and Holocene intertidal diatoms (Bacillariophyta) in northern Willapa Bay, Washingon,

by

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INTRODUCTION

Evidence for Holocene relative sea-level changes is found in diatom-rich intertidal sediments around Willapa Bay, in coastal southwestern Washington (Atwater, 1987; 1988; Atwater et al., 1991). In order to better assess the Holocene record of sea-level changes in Willapa Bay based on fossil diatom assemblages, recent (surface) diatom assemblages in various intertidal settings in northern Willapa Bay were studied in detail along four leveled transects and four reconnaisance surveys. The purpose of the study was to determine if diatom species and assemblages could be used as proxies for intertidal elevations, based on their ecological preferences for certain environments in the intertidal zone, and thus be used to identify small-scale sea-level changes in local Holocene deposits.

The inequality of tidal heights where mixed tides occur along the Pacific coast causes differences in periods of exposure and submergence of intertidal areas. The result is a fairly predictable distribution of unvegetated lower intertidal areas, and a zonation of "low" and "high" marshes (Macdonald, 1977). The lower boundary of the low marsh in the Pacific Northwest is roughly equivalent to the elevation of mean lower high water (MLHW) (Macdonald and Barbour, 1977a), and the upper boundary is near mean higher high water (MHHW). The low marsh is typically submerged once per tidal day. The slope of the low marsh zone is usually along the open estuary where sediment accumulation is high, but may be quite steep (sometimes nearly vertical) along rivers feeding the estuary. The high marsh extends from MHHW to near extreme high water (EHW) (Macdonald and Barbour, 1977), and is submerged only during highest spring tides and storm surges. Certain diatom species are similarly distributed in three parallel zones, and one subzone, relative to tide level (Hemphill-Haley, 1992), apparently in response to the same physical factors (e.g., intertidal exposure and submergence, substrate, salinity) that are known to influence the distributions of marsh macrophytes (Frey and Basan, 1985; Macdonald, 1977b).

Recent diatoms were recorded in 142 surface sediment samples from tidal flats, channel banks, and intertidal marshes at eight localities in northern Willapa Bay (Figure 1). Table 1 lists

diatoms observed in lower intertidal (channel bank, tidal flat) and shallow subtidal samples below MLHW. Table 2 lists diatoms observed in middle intertidal (low marsh) samples between MLHW and MHHW. Table 3 lists diatoms observed in upper intertidal (high marsh and upland-transition) samples between MHHW and EHW.

Modern diatom samples were fixed with a cytoplasm stain in order to record the occurrences of possible autochthonous and allochthonous components of the assemblage, thus numbers of "live" and "empty" cells were recorded. Although allochthonous valves that were alive at or shortly before the time of collection would absorb the stain, this method helped to identify, in a qualitative sense, the propensity for allochthonous diatoms in intertidal assemblages (Hemphill-Haley, 1992).

Holocene diatoms were studied at four sites beside the Niawiakum River (Hemphill-Haley, 1992), on the east side of Willapa Bay (Figure 2), as a means of determining the kinds of rapid ecological changes that accompanied the most recent relative sea-level change, 250 yr B.P. (Atwater, 1987; Atwater et al., 1991). Results of diatom counts for Holocene samples are listed in Tables 4-7.

METHODS

Modern diatoms were counted in 127 surface samples collected at eight localities in northern Willapa Bay (Figure 1). Of these samples, 112 are from four leveled transects, T1-T4 (Figures 3-6). Relative-elevation measurements for transects T1-T4 were collected using a self-leveling level, which is accurate to ± 1 cm for both horizontal and vertical distances. At eight sampling "stations" along each transect, surface sediment was collected for diatoms and grain-size analysis, and dominant macrophtyes were recorded (see text). For transects T1, T3 and T4, the sampling stations were reoccupied to collect diatoms in April, July, September and December 1990. Diatom samples for transect T2 were collected in April and July 1990.

Based on measurements collected during 1990, transect T1, on the Willapa River, fluctuates between oligohalobous and b-mesohalobous salinities (i.e., 0-10 ‰; Table 1), probably in response to precipitation. Transect T2, on the South Fork Willapa River, is a freshwater site that experiences tidal fluctuations, but is beyond the influence of salt water incursion. Transects T3 and T4 experience a-mesohalobous salinities (i.e., about 10-25 ‰). Because tide gauge data were not available, tidal datums for the transects were estimated from 5-10 observations of high and low tide at each locality during calm weather. Accuracies are estimated at ± 10 cm for transects T1 and T2, and ± 5 cm for transects T3 and T4.

Fifteen samples were also collected during reconnaissance surveys in September 1990 of two salt marshes (Stony Point, Toke Point) and two tidal flats (Bay Center, Bone River) along Willapa Bay (Figure 1), and from the Niawiakum River channel. Five surface samples at were collected at Stony Point and 3 at Toke Point. The low and high marsh at Stony Point was determined by vegetation changes, and the debris line near EHW. Three samples were collected from the Bay Center sand flat, and 2 samples from the Bone River silt flat. Sample locations were estimated by pacing along a line normal to shore. Channel samples from the Niawiakum River were collected using a small dredge deployed from a canoe during low tide. Salinity data for the open bay (Washington State Department of Fisheries) indicate that a-mesohalobous salinities (i.e., 15-30 ‰) are typical, with polyhalobous salinities occurring infrequently.

Approximately 1 cc of surface sediment was collected for diatoms at each station by scraping the uppermost 1-2 millimeters with a small spatula. The sample was placed in a glass vial in the field and preserved in buffered 2% formaldehyde. Macrophyte samples were also collected at each locality to test for the occurrences of attached diatoms, but the samples were not counted and are not included in the analysis. References to an epiphytic lifeform for individual species are based on my observations, and from detailed analyses of epiphytes in Whiting (1983) and Main and McIntire (1974).

Diatoms collected in the field (excluding Toke Point samples that dried out) were stained for evidence of intact cytoplasm and mounted using the Taft Syrup Mount (TSM) method (Stevenson,

1984). The cells were stained by diluting the sample in 20 ml of distilled H_2O, and adding approximately 10 mg of Fast Green FCF cytoplasm stain. After 24 hours the sample was cleaned of excess stain by rinsing, centrifuging, and decanting until the supernatant remained relatively clear. The sample was then diluted to 5 ml, and a 0.1 ml w aliquot was transferred to a glass cover slip with a drop of the TSM medium, and allowed to dry. Cover slips were mounted on slides by inverting the cover slip on a warmed slide, and tapping it down. The edges of the cover slip were sealed with clear fingernail polish. This method , while inferior to acid cleaning and mounting in a high refractive-index medium such as Hyrax (r = 1.72), facilitates both taxonomic identification of most species (particularly heavily-silicified taxa with good fossilization potential) and identification of previously live vs. empty diatom frustules in a sample. For the analysis, total counts of live plus empty frustules were used, as both autochthonous and allochthonous diatoms will compose fossil deposits.

Grain size analysis for surface samples at transects T1-T4 (Figures 3-6), and the Bay Center and Bone River tidal flats (Table 8), were performed at the U.S. Geological Survey Branch of Pacific Marine Geology Sedimentology Laboratory using a Cimax Hydrophotometer and Rapid Settling Analyzer (RSA). Calibration tests indicate that the hydrophotometer is precise to ± 3% (Torresan, 1987), and the RSA is precise to ± 5% (Gardner et al., 1980). For this study, the dominant grain size (i.e., mode) is considered more significant than mean grain size, as the distribution of certain diatom species is a function of sediment grain size (Round, 1971; Riznyk, 1973; Whiting, 1983; Kosugi, 1987). Sediment texture for samples from Stony Point and Toke Point were estimated in the field.

Temperature and salinity data for transects T1-T4 (Figures 3-6) were collected from the adjacent channel near the surface at high tide using a YSI Model 33 S-C-T meter with reported accuracies of ± 0.5°C and ± 0.5 ppm, respectively. Additional salinity data are from unpublished measurements by the Washington State Department of Ecology Fisheries Laboratory, Nahcotta, Washington. Salinity terminology used in this study (Table 9) is modified from Hustedt (1957).

Holocene diatoms were collected above and below the 250 yr B.P. soil horizon at four sites beside the Niawiakum River (Figure 6). For Sites 1 and 2, 60 cm x 20 cm x 8 cm slabs of the outcrop were collected intact and subsampled in the laboratory. Samples from Sites 3 and 4 were collected directly from fresh outcrop surfaces. Each sample was divided for diatom and sediment-texture analyses. Sample intervals ranging from 2 cm to 35 cm were chosen in order to record closely-spaced ecologic changes associated with lithologic changes, and more gradual ecological shifts in massive deposits.

Diatom smear slides for Holocene samples were processed by the following method: 1) approximately 1 cc of sediment was dried and weighed; 2) organic debris was removed by gentle heating in concentrated nitric acid; 3) acid was removed and the sample was neutralized by repeated rinses in distilled water; 4) the total sample volume was reduced to 5 ml; 5) an 0.05 to 0.10 ml aliquot was transferred to a cover slip and allowed to dry; 6) the cover slip was permanently fixed to a glass slide using Hyrax.

Modern and Holocene diatoms were counted at magnifications of 625x or 1250x. Between 300-500 specimens per sample were counted along random vertical traverses near the middle of the cover slip, following standard procedures for point-counting diatom valves (Schrader and Gersonde, 1978). This number of counted specimens has been shown to be statistically sufficient to document species exceeding 1% of the population (Shaw, 1964, p. 109).

DESCRIPTIONS OF INTERTIDAL SAMPLE LOCATIONS

Transect T1. Transect T1 is located on the Willapa River above the town of Raymond, Washington (Figure 1), and extends from the river channel to the edge of upland vegetation (Figure 3). Salinity measurements in 1990 showed a b-mesohalobous range of 0-10 ‰. Stations T1-1 and T1-2 are on unvegetated channel bank. Station T1-3 is at the base of a small marsh scarp where *Lemna minor* (duckweed) is growing. Stations T1-4,5,6 are in a zone vegetated with *Carex lyngbei* and *Potentilla pacifica*. T1-7 is in a slight depression (Figure 3) vegetated by

Lilaeopsis occidentalis, and T1-8 is an unvegetated surface beneath the overhanging branches of a spruce tree rooted in the adjacent upland. Sediment texture is primarily moderately well sorted coarse silt and very fine sand (Table 8).

Transect T2. Transect T2 is located on a point bar in the upper reaches of the South Fork Willapa River (Figure 1; Figure 4). The transect extends from the river channel to the base of a small alder tree rooted in the highest part of the point bar. This site is along the tidal reaches of the river (i.e., the water level changes with the tide, but salt water does not intrude), and thus is an oligohalobous environment with a measured salinity range of only 0-0.5 ‰. Station T2-1 is on the unvegetated channel bank, and T2-2 is on the upper part of the bank where *Lemna minor* is growing. T2-3 is from a vegetated zone that is regularly submerged during high tide; stations T2-4, 5,6 are from the surface of the thickly vegetated point bar that remains above the water during typical high tides. Dominant macrophytes for T2-3,4,5,6 include *Phalaris arundinacea* and *Lysichitum americanum*; T2-6 is at the base of a small alder tree. Sediment texture is predominantly moderately well sorted very fine sand and coarse silt (Table 8).

Transect T3. Transect T3 is located on the lower Niawiakum River, close to the Highway 101 bridge (Figure 1). The transect extends from the river channel to the beginning of upland vegetation (Figure 5). Based on a salinity range of 10-27.5 ‰ during 1990, primarily a-mesohalobous conditions prevail. Station T3-S is from a depth of about 3 m in the river channel at the base of the transect. Stations T3-1,2,3 are from the channel bank, with *Zostera marina* (eel grass) growing at T3-1 and *Z. nana* growing at T3-3. T3-4 is from the middle intertidal (low marsh) on the steep marsh scarp, which is vegetated with *Salicornia virginica* and rare *Triglochin maritima*. T3-5,6,7,8 are on the nearly flat high marsh surface. The macrophytes at T3-5, which is closest to the channel, are *Distichlis spicata* and *Salicornia virginica*. Dominant macrophytes at T3-6,7 are *Deschampsia caespitosa* and *Potentilla pacifica*. T3-8 is at the transition from the marsh to a spruce forest, and is vegetated with *Carex obnuta* and *Achillea* sp. Sediment texture across the transect is moderately to poorly sorted, and predominantly very fine silt and coarse silt (Table 8).

Transect T4. Transect T4 is located on the upper Niawiakum River, about 25 m downriver from the Bay Center - South Bend road (Figure 1). The transect extends from the river channel to the highest part of a broad marsh. Station T4-S is from the floor of the river channel, about 0.5 m below MLLW, and stations T4-1,2 are on the unvegated channel bank. T4-3 is on a fairly steep-dipping marsh scarp, vegetated with *Carex lyngbei* and rare *Triglochin maritima*. T4-4 is at the upper part of the marsh scarp, and is regularly submerged by tides. Dominant macrophytes include *Distichlis spicata*, with rare *Deschampsia caespitosa* and *C. lyngbei*. Stations T4-5,6,7 are on the gently sloping high marsh surface, which is disected by numerous drainage channels. Dominant macrophytes are *D. caespitosa* and *Potentella pacifica*. T4-8 is on the highest part of the marsh, and dominant macrophytes are *P. pacifica* and *Juncus balticus*. Sediment texture (Table 8) is moderately to poorly sorted, predominantly coarse silt on the lower part of the transect, and fine to very fine silt on the higher parts of the marsh.

Transect SP. Transect SP is located on the east side of Willapa Bay near Stony Point (Figure 1). For this and other sample localities (TP, BC, BR; see below) bordering the open bay, unpublished salinitiy data from the Fisheries Laboratory at Nahcotta were used, and salinities are assumed to be mostly a-mesohalobous, with occassional periods of polyhalobous (i.e., "marine") salinities. SP-1,2 were collected from unvegetated surfaces of the tidal flat at the same level that patches of the introduced cordgrass, *Spartina alterniflora* (Sayce, 1988) are becoming established. SP-3 was collected on the tidal flat surface, near the marsh edge, where patches of *Triglochin maritima* are developing as the marsh extends bayward. Station SP-4 is from the gently-sloping low marsh, with thick stands of *T. maritima*, and rare *Salicornia virginica* and *Spartina alterniflora*. SP-5 is at the highest level of the marsh at Stony Point, where *Potentilla pacifica* is the dominant macrophyte. Small alder trees and unidentified leafy vascular plants are growing at the base of the Pleistocene terrace about 3 m from SP-5, indicating the presence of fresh water seepage from the adjacent upland. Sediment texture (estimated in the field) is moderately sorted coarse silt and fine sand.

Toke Point Marsh/Slough. TP samples were collected on a salt marsh and adjacent slough on the north side of Willapa Bay, near Toke Point (Figure 1). Live and dead populations of diatoms were not recorded because the samples dried out. Sample TP-1 is from the floor of a sandy slough, lined with *Zostera marina*. TP-2 is from a 1-m diameter patch of *Triglochin maritima*, at the edge of the marsh, and TP-3 is from a thick stand of *T. maritima* and *Salicornia virginica*. Sediment texture (estimated in the field) is moderately sorted fine sand.

Bay Center Tidal Flat. BC samples were collected on a sandy tidal flat west of the KOA campground, and south of the town of Bay Center (Figure 1). Sample BC-1 is from an unvegetated area of the tidal flat approximately 500 m from shore; BC-1,2 were collected from areas with sparse populations of *Zostera nana*, approximately 300 m and 50 m from shore, respectively. Sediment texture (Table 8) at all three locations was predominantly very well sorted fine sand.

Bone River Tidal Flat. BR samples were collected on a broad silty flat northwest of the mouth of the Bone River. The tidal flat is silty, and more difficult to traverse than the Bay Center tidal flat. Sample BR-1 was collected about 200 m from shore, and sample BR-2 was collected about 100 m from shore. Both sites were unvegetated, and predominantly moderately sorted very fine sand and coarse silt (Table 8).

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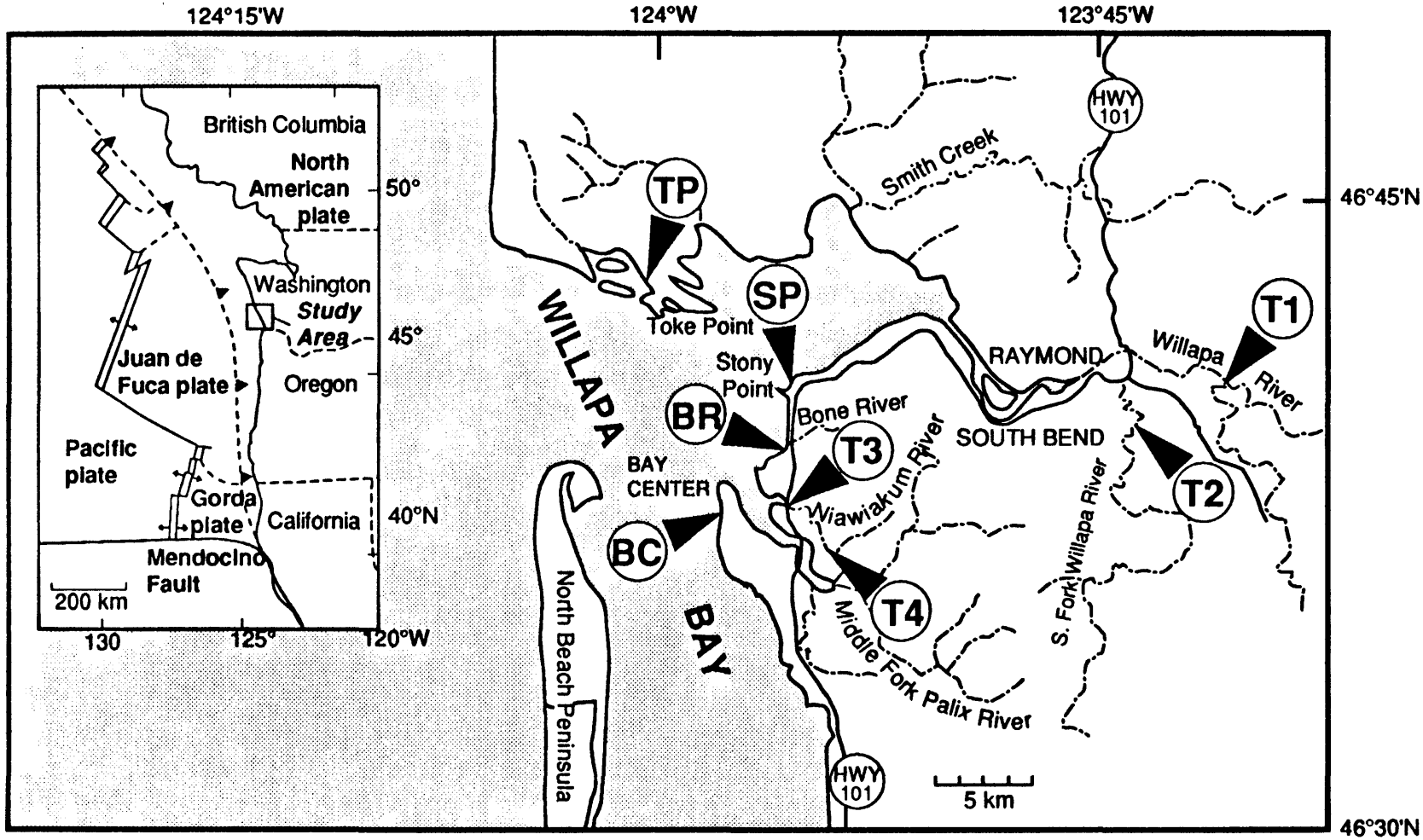


Figure 1. Surface sample locations in northern Willapa Bay, abbreviated as follows: TP - Toke Point; SP - Stony Point; BR - Bone River tidal flat; BC - Bay Center tidal flat; T1 - Transect T1, Willapa River; T2 - Transect T2, South Fork Willapa River; T3 - Transect T3, lower Niawiakum River; T4- Transect T4, upper Niawiakum River.

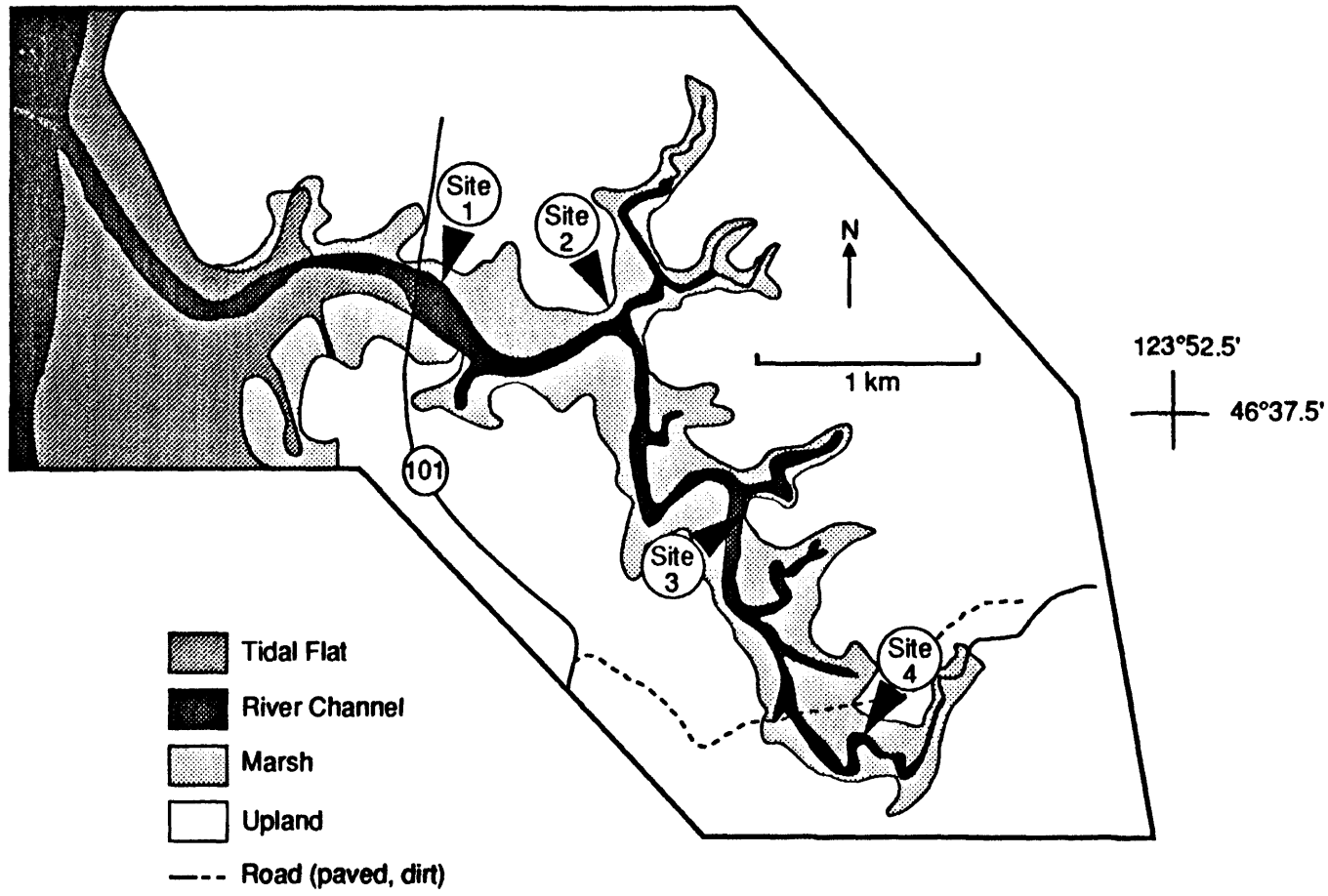
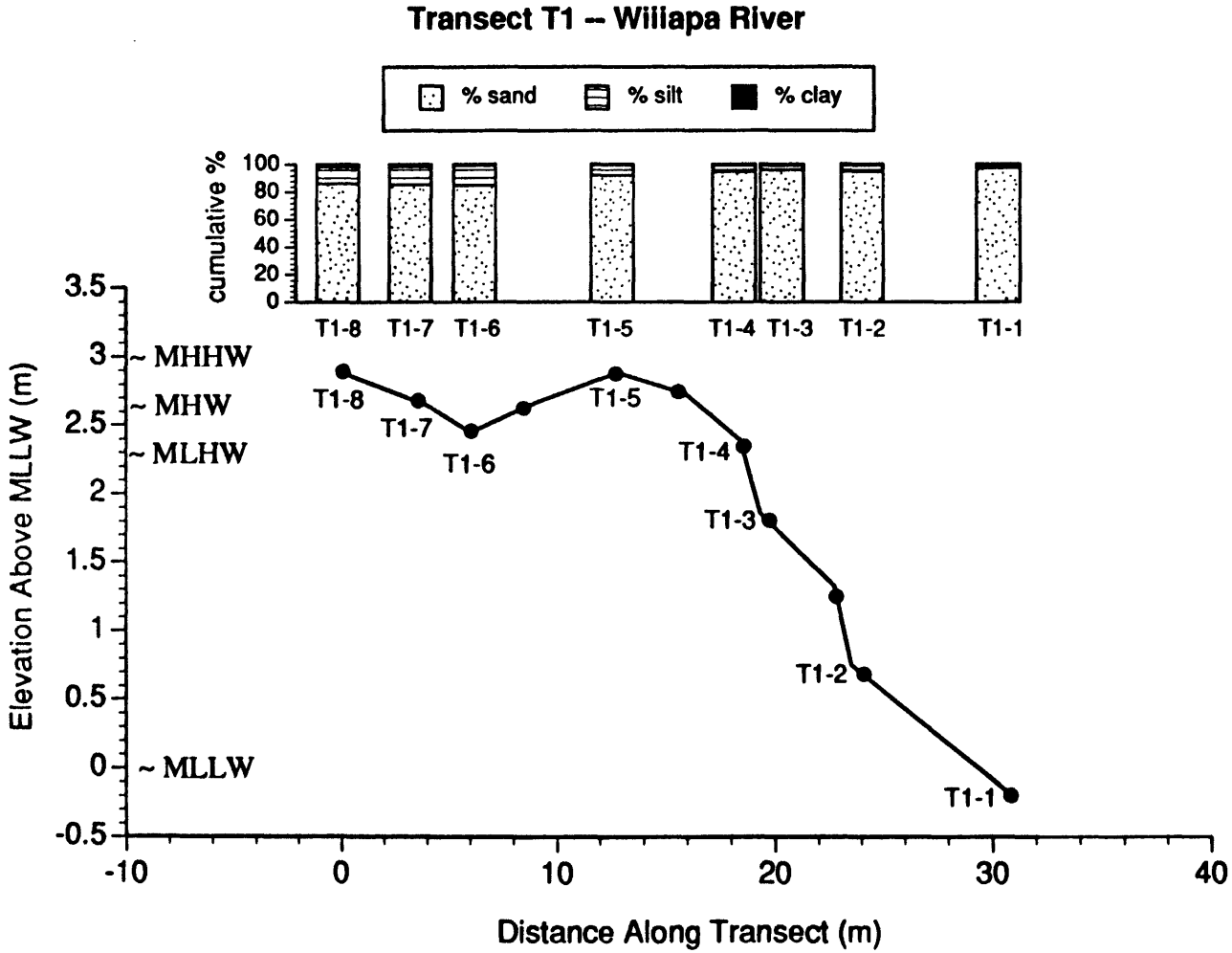
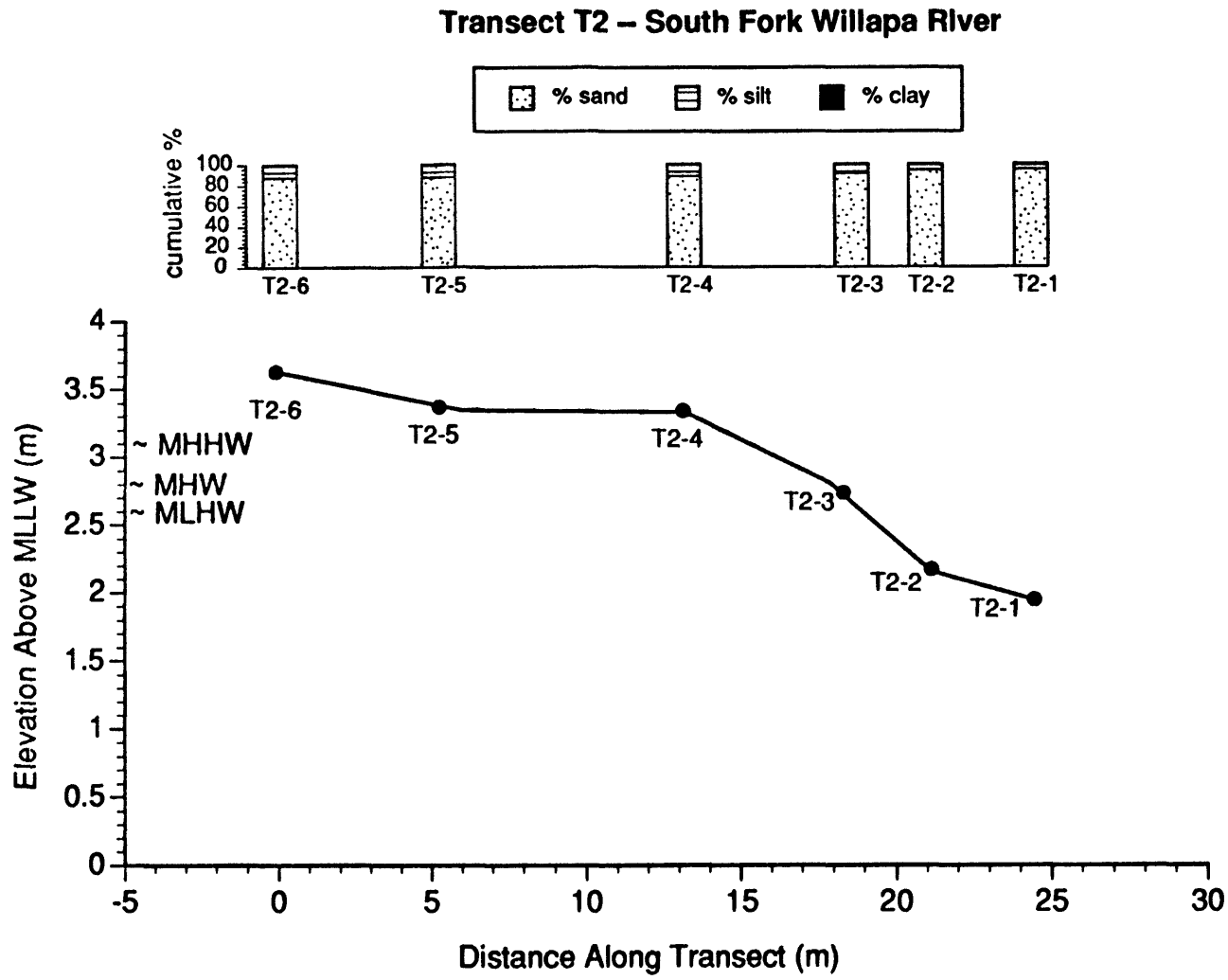


Figure 2. Outcrop locations for Holocene deposits along the Niawiakum River, on the east side of Willapa Bay.



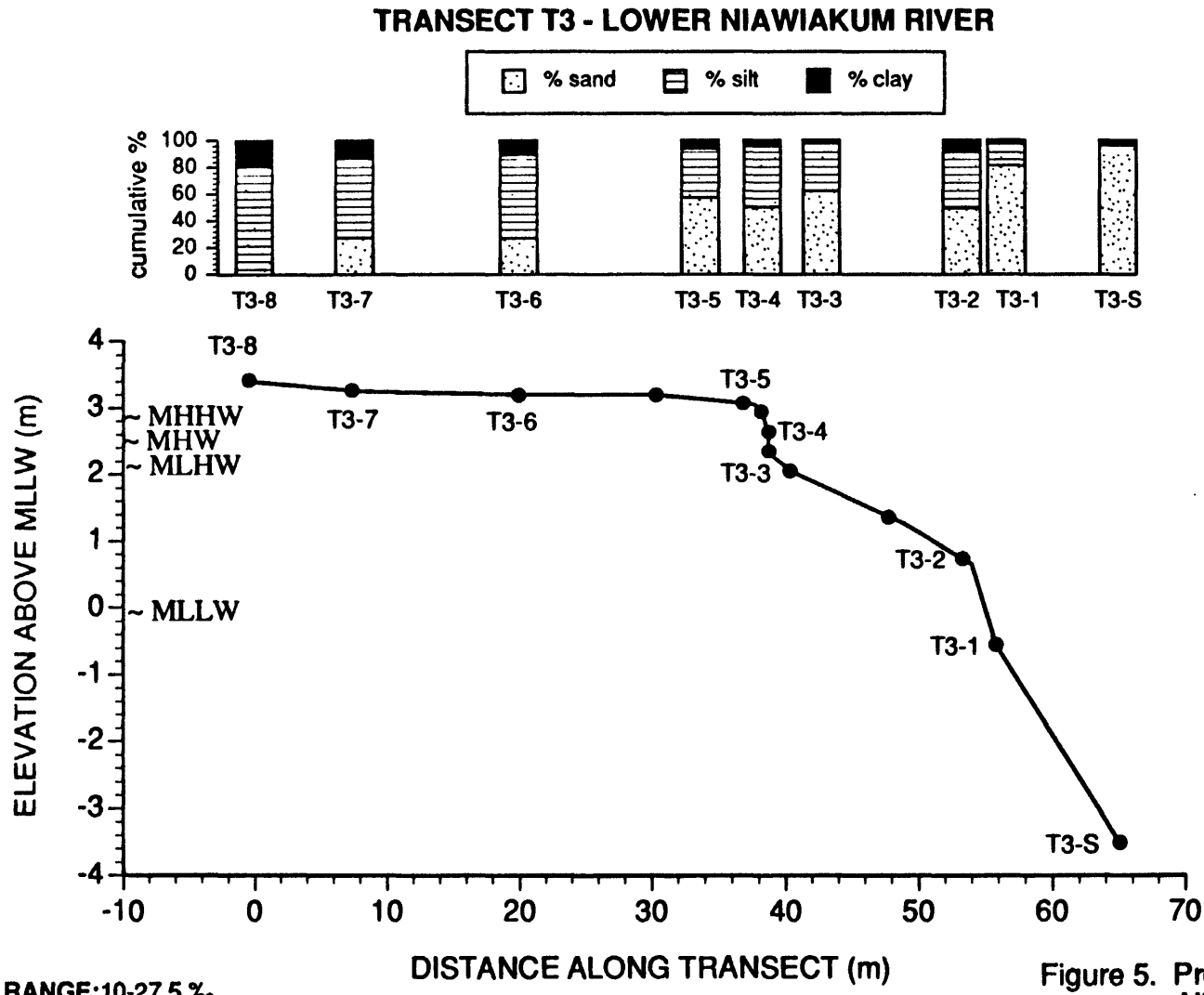
SALINITY RANGE: 0-10 ‰
MEAN SALINITY: 4.3 ‰
TEMP. RANGE: 5.2-22.5° C

Figure 3. Profile for transect T1, Willapa River.



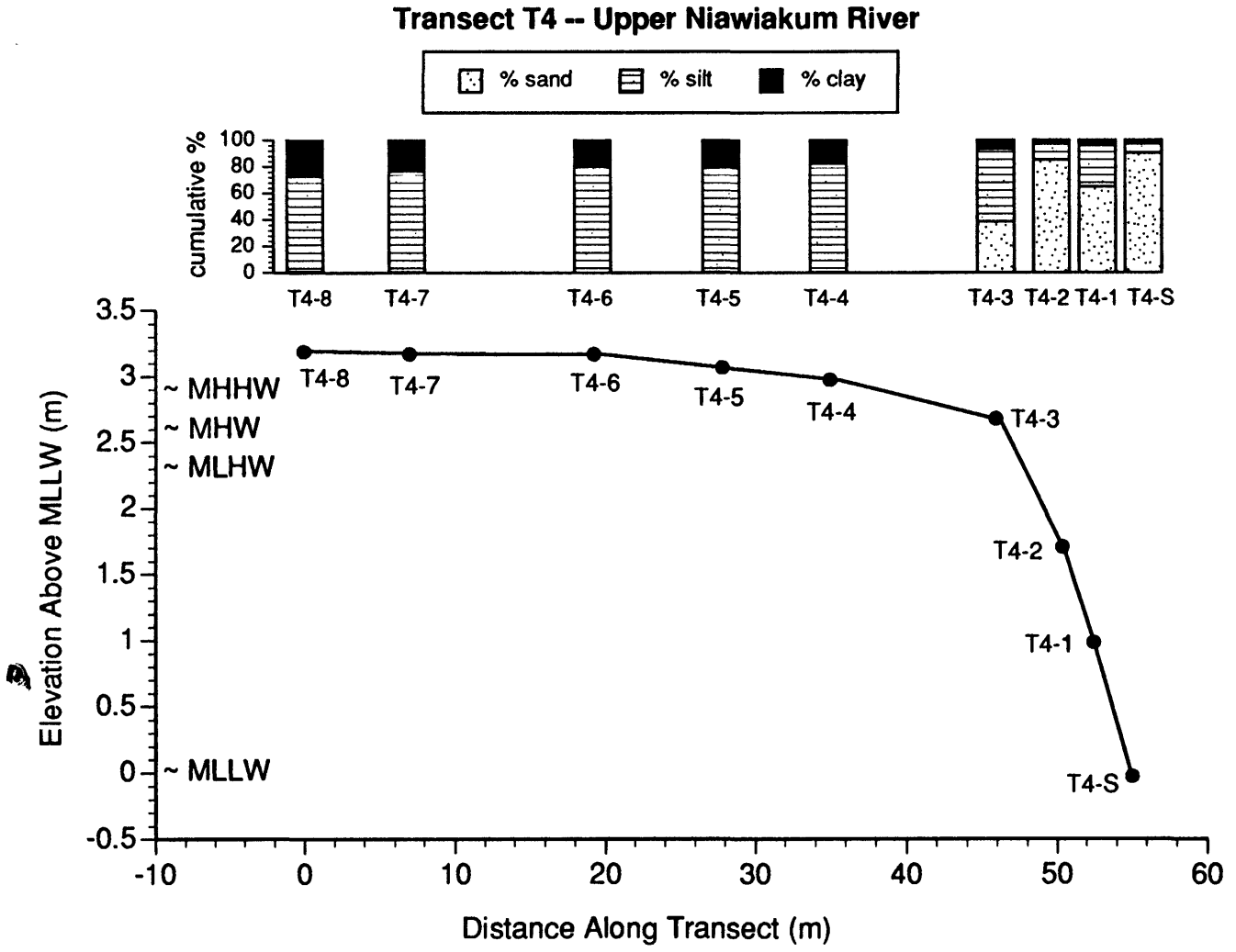
SALINITY RANGE: 0-0.5 ‰
MEAN SALINITY: 0.2 ‰
TEMP. RANGE: 10-26° C

Figure 4. Profile for transect T2, South Fork Willapa River.



SALINITY RANGE:10-27.5 ‰
MEAN SALINITY: 21.6 ‰
TEMP. RANGE: 6-22.5° C

Figure 5. Profile of transect T3, Niawiakum River



SALINITY RANGE: 2-23.4 ‰
MEAN SALINITY: 14.9 ‰
TEMP. RANGE: 4 -22.5° C

Figure 6. Profile of transect T4, lower Niawiakum River.

TABLE 1: Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Achnanthes brevipes														
Achnanthes delicatula														
Achnanthes exigua		2	8			2								
Achnanthes grimmei		1												
Achnanthes haukiana	47	16	35	28	6	12	20	8					32	4
Achnanthes lanceolata	34	36	37	42	31	34	18	16	20	28			6	
Achnanthes lapponica			4											
Achnanthes linearis	2	23	8	2		8								
Achnanthes minutissima group	82	122	36	26	28	74							2	2
Achnanthes oblongella		4												
Achnanthes pusilla		38	2	24	4	15	4	18		22				2
Actinocyclus curvatulus														
Actinoptychus adriaticus														
Actinoptychus senarius											2		6	
Amphora cf. coffeiformis			2								4	4	4	8
Amphora granulata														
Amphora libyca			2											
Amphora pediculus						1							8	6
Amphora proteus														
Amphora spp. misc.														
Amphora truncatula														
Amphora ventricosa													2	
Astorionella formosa														4
Aulacoseira granulata group		2										1	11	13
Bacillaria paradoxa		4	64	6	32	6							30	14
Caloneis bacillum				2			2	2	6			2		6

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Caloneis westii			2								2		6	
Camplyodiscus echineis													6	
Cerataulus turgidus														
Ceratoneis arcus	17	16	17	9	3	6								
Chaetoceros spp. misc.													4	
Cocconeis diminuta		2			10								2	1
Cocconeis disculus														
Cocconeis placentula		2								4		3		
Cocconeis placentula var. euglypta	28	18	24	13	38	7	14	14	10	4				
Cocconeis scutellum			2								14	10	12	6
Cocconeis scutellum var. parva											2	6	24	7
Coscinodiscus radiatus														2
Coscinodiscus radiatus f. obscurus														
Cyclotella spp. misc.	2	2	2											
Cymatosira belgica														
Cymbella aspera	4	2		8										1
Cymbella minuta	16	34	16	24	16	16	10		36	26				
Cymbella naviculoides	2	4				4	6			2				
Cymbella tumida	10	18		8		6	2							
Delphineis surirella												4	6	
Denticula subtilis		2				4								
Diatoma hiemale var. mesodon	12	13		4	4	17	8	4	8					
Dimerogramma minor													2	
Diploneis didyma	4													

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Diploneis interrupta						1								
Diploneis ovalis														
Diploneis psdeudovalis	2	2	2	2										
Diploneis smithii var. rhombica														
Endictya sp. 1													2	
Entoneis alata														
Entoneis tenuistriata						2						2		
Epithemia sorex			4		4	4								
Epithemia turgida			4			2								
Eunotia pectinalis	3	14	4		6	8	2						2	
Eunotia polydentula	2	10		4										
Fragilaria brevistriata	2													
Fragilaria construens var. pumilla		2												
Fragilaria construens var. venter														
Fragilaria leptostauron	8													
Fragilaria pinnata														
Frickea lewisiana													2	2
Frustulia linkei					2								2	
Frustulia rhomboides							2							
Frustulia vulgaris	12	17	20	7	11	2	2	8	38	18				
Frustulia weinholdii														
Gomphonema angustatum			5	6		2								
Gomphonema appendiculata		2		2										
Gomphonema olivaceum	6	14	2	4	12	2								

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Gomphonema parvulum	20	11	12	8	18	16	62	12	36	14			2	12
Gophoneis herculeana			4											
Grammatophora marina														3
Grammatophora oceanica											16	4	14	18
Gyrosigma balticum														2
Gyrosigma eximium		2		4										
Gyrosigma fasciola						2							2	4
Gyrosigma spenceri			2	2	6							6		6
Hyalodiscus laevis														
Hyalodiscus scoticus						2					6		18	4
Licmophora lyngbei	2	3			2	1								1
Mastogloia exigua														4
Mastogloia lanceolata														
Mastogloia smithii														10
Melosira moniliformis	12	6	16	8	25	2	4				34	15	146	58
Melosira nummuloides	4	2		6							14	4	63	16
Melosira octogona			2		4								34	2
Meridion circulare	2	4	8		6			6		4				
Navicula cancellata														
Navicula capitata							6							
Navicula cf. minima	2	19	16	24	26	30	4	4						
Navicula cincta	25	21	11	8	15	13							4	9
Navicula cocconeides		6			2				2					
Navicula cohnii														
Navicula cryptocephala			4			2								
Navicula cryptolyra														1
Navicula cryptotenella	2		36	4	4	8								
Navicula digitoradiata														

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Navicula finmarchia														
Navicula forcipata														
Navicula granulata														2
Navicula gregaria														4
Navicula halophila	92	93	210	130	241	109	68	56	40	56	2		40	19
Navicula lanceolata	16	30	22	12	18	26	142	26	16	6				
Navicula leptostriata	2	4				4						2		
Navicula lyra													2	
Navicula mutica												2		2
Navicula muticoides		1		1										
Navicula phyllepta														
Navicula pupula							8							
Navicula pusilla	2	4	4	2		1		2				2		6
Navicula pusilla var.														2
Navicula pygmaea		2												
Navicula radiosa				4	2	4							2	8
Navicula ramossima												4	11	13
Navicula rhyncocephala														
Navicula salinarum														
Navicula spp. misc.			2		2									
Navicula tenneloides														
Navicula tripunctata	3							2					12	4
Navicula viridula var. rostrata				4	2	4	20		6	2				
Neidium spp. misc.														
Nitzschia aerophila			4			2								
Nitzschia amphibia							2							
Nitzschia angularis														

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Nitzschia angustata				2						2				
Nitzschia brevissima				4	10	10	2	10	8	10				
Nitzschia cf. sigma			6	2	4	4						8	4	
Nitzschia cf. thermaloides														
Nitzschia cf. vermicularis														
Nitzschia circumsuta														
Nitzschia closterium													2	
Nitzschia coarctata											3	2	6	2
Nitzschia commutata	1		16		2							2		2
Nitzschia compressa			2								2		6	2
Nitzschia compressa var. vexans													4	2
Nitzschia constricta												2	6	
Nitzschia debilis	2	2	4		6	1								1
Nitzschia dissipata	9	16	24	2	16	5	14	4	22	4			4	4
Nitzschia dubia	2		4		4									
Nitzschia fasciculata														2
Nitzschia frustulum						2								
Nitzschia gandershiemiensis	2	4	8	2	4	4								2
Nitzschia gracilis			12				14		4					2
Nitzschia granulata												2		7
Nitzschia hantzschiana														
Nitzschia hummii													2	6
Nitzschia hybrida	4				2									
Nitzschia lanceola														
Nitzschia levidensis	12	9	12		10	2	4							2
Nitzschia littoralis	2													

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Nitzschia littoralis														
Nitzschia lorenziana		2	2						4			4		4
Nitzschia nana	14	14	22	10	37	38	2	4	12	6			4	6
Nitzschia navicularis		2			4	2								
Nitzschia palea	8	11	11	12	24	8	22	20	12	4		4	2	
Nitzschia pellucida		2	2						2					
Nitzschia pusilla														
Nitzschia scapelliformis	2	1	2		2									
Nitzschia sigma														
Nitzschia spp. misc.	6	2			4	2	10	2	14	10				2
Nitzschia subinflata													2	2
Nitzschia terrestris				4	2	2								
Nitzschia tyrblionella													2	
Nitzschia vitrea														
Odontella aurita											2		2	
Odontella obnuta														
Opephora marina														1
Paralia sulcata		2				2					6	8	39	60
Paralia sulcata (small		2	20	6	13	2					65	39	194	125
Pinnularia appendiculata	6	7	4				6		6	2				
Pinnularia interrupta	2	2	4	4	4	8	2		2					
Pinnularia lagerstedtii	2													
Pinnularia microstauron	2	3		1										
Pinnularia spp. misc.			4			2								
Pinnularia subcapitata	2	2	8			12	4							
Pinnularia sudetica									4					
Pinnularia viridis	2													

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Plagiogramma staurophorum														
Pleurosigma salinarum														
Rhabdonema arcuatum														
Rhaphoneis amphiceros													6	
Rhaphoneis cf. margaritalimbata													2	
Rhaphoneis psammicola													2	
Rhoicosphenia abbreviata	56	71	20	17	30	64	8	78	22	38				
Rhopalodia gibberula												4	6	12
Rhopalodia musculus														4
Stauroneis anceps	4	4		1	4									
Stauroneis phoenicenteron			6		8	12								
Stephanodiscus spp. misc.														4
Surirella brebissonii	41	22	40	31	38	16	4	2	4	6				
Surirella brightwellii			4											
Surirella fatuosa														
Surirella gemma	2	2	2	2			4		8					
Surirella lapponica		2	4	4			2	4	2					
Surirella ovalis	2	1												
Surirella pinnata					2									
Surirella spp. misc.														
Surirella tenera			4											
Synedra acus	15	29	12	32	8	11	12	8	10	4				37
Synedra fasciculata		2				4					28	44	64	37
Synedra fasciculata var. truncata														

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T1-1 Live Cells	T1-1 Empty Cells	T1-2 Live Cells	T1-2 Empty Cells	T1-3 Live Cells	T1-3 Empty Cells	T2-1 Live Cells	T2-1 Empty Cells	T2-2 Live Cells	T2-2 Empty Cells	T3-S Live Cells	T3-S Empty Cells	T3-1 Live Cells	T3-1 Empty Cells
Synedra pulchella		2												
Synedra vaucheriae	4	20		12	8	12		4		4				
Tabellaria fenestrata		10						4						
Thalassionema nitzschioides														17
Thalassiosira decipiens group		2		2	2	2					8	7	18	15
Thalassiosira eccentrica					2								4	
Thalassiosira pacifica											2			
Trachyneis aspera														
Trachyspenia australis														
unidentified	38	23	32	22	18	20	22	38	42	62	6	11	25	16
TOTAL DIATOMS:	721	903	946	610	848	708	538	356	396	338	218	212	927	664

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Achnanthes brevipes		4	2	2										
Achnanthes delicatula														
Achnanthes exigua														
Achnanthes grimmei														
Achnanthes haukiana	8		6	2		10		14		4				
Achnanthes lanceolata	5	1	6	2			2	2						
Achnanthes lapponica														
Achnanthes linearis														
Achnanthes minutissima group	4	14		4					4	26				
Achnanthes oblongella														
Achnanthes pusilla														
Actinocyclus curvatulus				1										
Actinoptychus adriaticus														
Actinoptychus senarius					2		2							
Amphora cf. coffeiformis		4		8										
Amphora granulata														
Amphora libyca														
Amphora pediculus		2		4			2	2						
Amphora proteus														
Amphora spp. misc.												2		
Amphora truncatula														
Amphora ventricosa	6		10	4		2	9		6	6	8			
Astorionella formosa		2												
Aulacoseira granulata group	1	5	1	6	6	4	6	10						
Bacillaria paradoxa	34	9	6	10	4	10	14	6	102	36				
Caloneis bacillum		18						2	10	2				

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Caloneis westii	11	4	4	4			14	2	12	16				
Camplyodiscus echineis				1									2	
Cerataulus turgidus			1				4							
Ceratoneis arcus														
Chaetoceros spp. misc.						1								
Cocconeis diminuta	2		5	5										
Cocconeis disculus														
Cocconeis placentula	3		7					1						
Cocconeis placentula var. euglypta		1		2										
Cocconeis scutellum	2	15	4	12	4	6	6	4	2	10				
Cocconeis scutellum var. parva	2	6		14		2	2	4	4	6	2			
Coscinodiscus radiatus			2	2										
Coscinodiscus radiatus f. obscurus	2													
Cyclotella spp. misc.	2		2	2				1	2	2				
Cymatosira belgica														
Cymbella aspera														
Cymbella minuta														
Cymbella naviculoides														
Cymbella tumida														
Delphineis surirella	9	18	6	1			6	6					2	
Denticula subtilis														
Diatoma hiemale var. mesodon														
Dimerogramma minor			2		2			1	12			2		
Diploneis didyma	5			2										

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Diploneis interrupta	10	8		4				3	2					
Diploneis ovalis														
Diploneis psdeudovalis								1						
Diploneis smithii var. rhombica						2								
Endictya pacifica	6	1					4							
Entoneis alata														
Entoneis tenuistriata			2											
Epithemia sorex									10					
Epithemia turgida									4					
Eunotia pectinalis														
Eunotia polydentula		2												
Fragilaria brevistriata														
Fragilaria construens var. pumilla										1				
Fragilaria construens var. venter										2				
Fragilaria leptostauron														
Fragilaria pinnata						2								
Frickea lewisiana								4		14				
Frustulia linkei				2				2		2				
Frustulia rhomboides														
Frustulia vulgaris	8	4		2				8	2	2				
Frustulia weinholdii									2	4				
Gomphonema angustatum														
Gomphonema appendiculata														
Gomphonema olivaceum														

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Gomphonema parvulum				3										
Gophoneis herculeana														
Grammatophora marina														
Grammatophora oceanica	7	17	16	48	10	2	20	30	2	10	8	6		
Gyrosigma balticum	4							2						
Gyrosigma eximium		3	2	8				6	12	10				
Gyrosigma fasciola	4		1	4	2		14		44	12				
Gyrosigma spenceri		2	4	6		2	10	10	14	16	2			
Hyalodiscus laevis									4					
Hyalodiscus scoticus	23	5	56	10	6		8		8	4	2		6	
Licmophora lyngbei			2	8										
Mastogloia exigua	4		38	2			2	2	2	2				
Mastogloia lanceolata			4											
Mastogloia smithii		2												
Melosira moniliformis	933	62	35	16	176	40	322	80	58	28	182	8	400	
Melosira nummuloides	86	10	68	10	12	4	68	8	184	48			46	24
Melosira octogona	24	16	8		8		8	14	2					
Meridion circulare														
Navicula cancellata														
Navicula capitata														
Navicula cf. minima					2									
Navicula cincta	6	2		6				4	2	16				
Navicula cocconeides														
Navicula cohnii							4		2	12				
Navicula cryptocephala														
Navicula cryptolyra														
Navicula cryptotenella														
Navicula digitoradiata											4			

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Navicula finmarchia														
Navicula forcipata														
Navicula granulata														
Navicula gregaria														
Navicula halophila	17	6	91	58	2	8	74	100	118	58	14			
Navicula lanceolata			2	2			4	2	2					
Navicula leptostriata				2				2	4					
Navicula lyra		2												
Navicula mutica		2	10	2			4	18	18	46				
Navicula muticoides										6				
Navicula phyllepta												2		
Navicula pupula														
Navicula pusilla		6							2	2				
Navicula pusilla var.			2							2				
Navicula pygmaea										4				
Navicula radiosa	4	5		4			12	12	8	2				
Navicula ramossima			2	12				2	4	4	8	8	40	
Navicula rhyncocephala							2							
Navicula salinarum								2						
Navicula spp. misc.														
Navicula tenneloides	2	4		2										
Navicula tripunctata	34	4	2	2			2	10	30	8				
Navicula viridula var. rostrata														
Neidium spp. misc.														
Nitzschia aerophila														
Nitzschia amphibia														
Nitzschia angularis													2	

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Nitzschia angustata						4			2					
Nitzschia brevissima								2		6				
Nitzschia cf. sigma			18	26	4	4	4	11	22	8				
Nitzschia cf. thermaloides								2		2				
Nitzschia cf. vermicularis														
Nitzschia circumsuta							2							
Nitzschia closterium		1	6											
Nitzschia coarctata	4		2				6	2	4			2	2	
Nitzschia commutata	4	2												
Nitzschia compressa				2					2	4				
Nitzschia compressa var. vexans										4	2			
Nitzschia constricta							2		14	4				
Nitzschia debilis				2			5	12	4	2				
Nitzschia dissipata	8	6	12	6	4		4		12	20				
Nitzschia dubia														
Nitzschia fasciculata				2					2					
Nitzschia frustulum														
Nitzschia gandershiemiensis		2	4						8	12		2		
Nitzschia gracilis	6	2	8	4			4							
Nitzschia granulata		4	4	6			6	2	4	8				
Nitzschia hantzschiana									6					
Nitzschia hummii			6											
Nitzschia hybrida														
Nitzschia lanceola	2		10	2						2		2		
Nitzschia levidensis		2	4		2		8	2	2					
Nitzschia littoralis														

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Nitzschia littoralis			2	4										
Nitzschia lorenziana		2	2	3	2			1	8					
Nitzschia nana	4	4	12	16			2	6	16	18				
Nitzschia navicularis			2	6			6	6	4	4				
Nitzschia palea	6	1	4					7		8				
Nitzschia pellucida														
Nitzschia pusilla			2											
Nitzschia scapelliformis	2						2	14	6	2				
Nitzschia sigma		6												
Nitzschia spp. misc.	27	31					28	10	28	36				
Nitzschia subinflata	3			1				2	4					
Nitzschia terrestris				1					2	10				
Nitzschia tyrblionella									2	6				
Nitzschia vitrea							2							
Odontella aurita				1				1						
Odontella obnuta													2	
Opephora marina								17						
Paralia sulcata	11	8	74	22	58	80	52	10	22	4	2	4	48	
Paralia sulcata (small			65	85	38		162	116	67	60	3	12	20	
Pinnularia appendiculata														
Pinnularia interrupta														
Pinnularia lagerstedtii								2	4	12				
Pinnularia microstauron														
Pinnularia spp. misc.														
Pinnularia subcapitata								2						
Pinnularia sudetica														
Pinnularia viridis	2													

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Plagiogramma staurophorum														
Pleurosigma salinarum			2		2		28	6	4					
Rhabdonema arcuatum			6											
Rhaphoneis amphiceros	1		2	4				4						
Rhaphoneis cf. margaritalimbata	2					2	2	7						
Rhaphoneis psammicola				3				4			2			
Rhoicosphenia abbreviata		6		4				12						
Rhopalodia gibberula	14	4	62	30		2		6	10	4				
Rhopalodia musculus	2									2				
Stauroneis anceps														
Stauroneis phoenicenteron														
Stephanodiscus spp. misc.							2	2						
Surirella brebissonii	2		6				9	14	6					
Surirella brightwellii								2						
Surirella fatuosa														
Surirella gemma	1													
Surirella lapponica														
Surirella ovalis														
Surirella pinnata														
Surirella spp. misc.							2	1	2					
Surirella tenera														
Synedra acus				4										
Synedra fasciculata	114	87	51	128	22	20	18	70	12	50	68	84	150	
Synedra fasciculata var. truncata	4	3		2										

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	T3-2 Live Cells	T3-2 Empty Cells	T3-3 Live Cells	T3-3 Empty Cells	T4-S Live Cells	T4-S Empty Cells	T4-1 Live Cells	T4-1 Empty Cells	T4-2 Live Cells	T4-2 Empty Cells	SP-1 Live Cells	SP-1 Empty Cells	SP-2 Live Cells	SP-2 Empty Cells
Synedra pulchella														
Synedra vaucheriae									4					
Tabellaria fenestrata	1													
Thalassionema nitzschioides		13	3	13				4	6	20		2		
Thalassiosira decipiens group	23	56	65	41	2			10	4	6	4			
Thalassiosira eccentrica	31	15						5		2				
Thalassiosira pacifica	12	15												
Trachyneis aspera			2	4					4					
Trachyspenia australis														
unidentified	24	17	44	42	2	2	22	24	32	38	6	4	2	2
TOTAL DIATOMS:	1578	555	889	765	372	209	1003	775	1023	777	317	140	722	26

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Achnanthes brevipes								2	2					12
Achnanthes delicatula		2	26	10			2					56	48	144
Achnanthes exigua														12
Achnanthes grimmei														1
Achnanthes haukiana							2							254
Achnanthes lanceolata														320
Achnanthes lapponica														4
Achnanthes linearis														43
Achnanthes minutissima group		20	4		2		4	4	2	8	14		16	498
Achnanthes oblongella														4
Achnanthes pusilla														129
Actinocyclus curvatulus														1
Actinoptychus adriaticus									2					2
Actinoptychus senarius				4				2	1					19
Amphora cf. coffeiformis									6		2			42
Amphora granulata											6			6
Amphora libyca														2
Amphora pediculus					4			4	9					42
Amphora proteus											4	28	34	4
Amphora spp. misc.			40		6	2	2					12	34	98
Amphora truncatula										4	4			8
Amphora ventricosa		2	30	2	2		4							93
Astorionella formosa														6
Aulacoseira granulata group								2	1					69
Bacillaria paradoxa					2		14							403
Caloneis bacillum														52

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Caloneis westii	20	4												101
Camplyodiscus echineis														9
Cerataulus turgidus														5
Ceratoneis arcus														68
Chaetoceros spp. misc.														5
Cocconeis diminuta					8		4			2	6	4	2	53
Cocconeis disculus									4					4
Cocconeis placentula														20
Cocconeis placentula var. euglypta							2							175
Cocconeis scutellum	2		49	6	16	10	16		4		2			214
Cocconeis scutellum var. parva			38	4	14	2	8	26	36	2	4	64	44	323
Coscinodiscus radiatus														6
Coscinodiscus radiatus f. obscurus									2					4
Cyclotella spp. misc.														17
Cymatosira belgica								4	2			6		12
Cymbella aspera														15
Cymbella minuta														194
Cymbella naviculoides														18
Cymbella tumida														44
Delphineis surirella					2									60
Denticula subtilis														6
Diatoma hiemale var. mesodon														70
Dimerogramma minor			10						2					33
Diploneis didyma							2							13

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Diploneis interrupta		2			2									32
Diploneis ovalis			5											5
Diploneis psdeudovalis														9
Diploneis smithii var. rhombica														2
Endictya pacifica														13
Entoneis alata						2								2
Entoneis tenuistriata														6
Epithemia sorex														22
Epithemia turgida							2							12
Eunotia pectinalis														39
Eunotia polydentula														18
Fragilaria brevistriata														2
Fragilaria construens var. pumilla														3
Fragilaria construens var. venter														2
Fragilaria leptostauron														8
Fragilaria pinnata														2
Frickea lewisiana														22
Frustulia linkei														10
Frustulia rhomboides														2
Frustulia vulgaris														101
Frustulia weinholdii														6
Gomphonema angustatum														13
Gomphonema appendiculata														4
Gomphonema olivaceum														40

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Gomphonema parvulum														226
Gophoneis herculeana														4
Grammatophora marina														3
Grammatophora oceanica	8	4	8	16	20	8	26	8	32	12	26	2		398
Gyrosigma balticum														8
Gyrosigma eximium														47
Gyrosigma fasciola	2	4												95
Gyrosigma spenceri	2													90
Hyalodiscus laevis														4
Hyalodiscus scoticus				2	2	2		8	6	4	1			183
Licmophora lyngbei														19
Mastogloia exigua			5											61
Mastogloia lanceolata														4
Mastogloia smithii														12
Melosira moniliformis	84	94	54		1	2	10				1			2912
Melosira nummuloides	14	8	12	20	8	4		2		2				747
Melosira octogona				14	4	12	4			2				158
Meridion circulare														30
Navicula cancellata								2	4	4	2	6	4	22
Navicula capitata														6
Navicula cf. minima														127
Navicula cincta														142
Navicula cocconeides														10
Navicula cohnii														18
Navicula cryptocephala	2		1		4		8			2				23
Navicula cryptolyra											2			3
Navicula cryptotenella			4											58
Navicula digitoradiata		2	6											12

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Navicula finmarchia										6	4			10
Navicula forcipata											2			2
Navicula granulata				2	2	2	2						2	12
Navicula gregaria														4
Navicula halophila	20	12	10		2					2				1748
Navicula lanceolata														326
Navicula leptostriata														20
Navicula lyra								4	2	24	8		2	44
Navicula mutica														104
Navicula muticoides														8
Navicula phyllepta	4	6	10											22
Navicula pupula														8
Navicula pusilla														33
Navicula pusilla var.														6
Navicula pygmaea														6
Navicula radiosa				2	2									71
Navicula ramossima	4		1											113
Navicula rhyncocephala														2
Navicula salinarum														2
Navicula spp. misc.											2			6
Navicula tenneloides					2									10
Navicula tripunctata														113
Navicula viridula var. rostrata														38
Neidium spp. misc.											2			2
Nitzschia aerophila														6
Nitzschia amphibia														2
Nitzschia angularis	2													4

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Nitzschia angustata														10
Nitzschia brevissima														62
Nitzschia cf. sigma						2								127
Nitzschia cf. thermaloides														4
Nitzschia cf. vermicularis				6	6								4	16
Nitzschia circumsuta														2
Nitzschia closterium														9
Nitzschia coarctata			10	2										47
Nitzschia commutata														29
Nitzschia compressa		2				2								24
Nitzschia compressa var. vexans	4													16
Nitzschia constricta			12			4	2							46
Nitzschia debilis														41
Nitzschia dissipata	2			2	6									206
Nitzschia dubia														10
Nitzschia fasciculata														6
Nitzschia frustulum			2											4
Nitzschia gandershiemiensis		2					2							58
Nitzschia gracilis										4	2			62
Nitzschia granulata														43
Nitzschia hantzschiana														6
Nitzschia hummii							4							18
Nitzschia hybrida														6
Nitzschia lanceola				2	4	4								28
Nitzschia levidensis	2													73
Nitzschia littoralis														2

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Nitzschia littoralis														6
Nitzschia lorenziana	4													38
Nitzschia nana														247
Nitzschia navicularis														36
Nitzschia palea					4									168
Nitzschia pellucida														6
Nitzschia pusilla														2
Nitzschia scapelliformis			4											37
Nitzschia sigma		2									2			10
Nitzschia spp. misc.														212
Nitzschia subinflata														14
Nitzschia terrestris														21
Nitzschia tyrblionella														10
Nitzschia vitrea														2
Odontella aurita									1					7
Odontella obnuta				2										4
Opephora marina														18
Paralia sulcata			26	52	6	57	10	8	2					673
Paralia sulcata (small	10		48	71	8	64	6	28	8	1	1	2		1341
Pinnularia appendiculata														31
Pinnularia interrupta														28
Pinnularia lagerstedtii														20
Pinnularia microstauron														6
Pinnularia spp. misc.														6
Pinnularia subcapitata														30
Pinnularia sudetica														4
Pinnularia viridis														4

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Plagiogramma staurophorum				10										10
Pleurosigma salinarum														42
Rhabdonema arcuatum														6
Rhaphoneis amphiceros						4								21
Rhaphoneis cf. margaritalimbata														15
Rhaphoneis psammicola	2										2			15
Rhoicosphenia abbreviata											2			428
Rhopalodia gibberula				32	18	14	18					2		238
Rhopalodia musculus			38			4						2		52
Stauroneis anceps														13
Stauroneis phoenicenteron														26
Stephanodiscus spp. misc.														8
Surirella brebissonii						2								243
Surirella brightwellii														6
Surirella fatuosa				2										2
Surirella gemma														21
Surirella lapponica														18
Surirella ovalis														3
Surirella pinnata														2
Surirella spp. misc.														5
Surirella tenera														4
Synedra acus														182
Synedra fasciculata	52	64	71	10	40	2	58	10	34	136	66	16	62	1674
Synedra fasciculata var. truncata														9

TABLE 1 (cont.): Diatom Taxa in Lower Intertidal and Shallow Subtidal Samples														
species	SP-3 Live Cells	SP-3 Empty Cells	TP-1 Total Cells	BR-1 Live Cells	BR-1 Empty Cells	BR-2 Live Cells	BR-2 Empty Cells	BC-1 Live Cells	BC-1 Dead Cells	BC-2 Live Cells	BC-2 Empty Cells	BC-4 Live Cells	BC-4 Empty Cells	total per species observed
Synedra pulchella														2
Synedra vaucheriae														68
Tabellaria fenestrata														15
Thalassionema nitzschioides														78
Thalassiosira decipiens group			2					2						271
Thalassiosira eccentrica	2						2	2						65
Thalassiosira pacifica														29
Trachyneis aspera														10
Trachyspenia australis									10			8	2	20
unidentified	2	8	10	8	10	4	12	4	12	12	6	12	8	744
TOTAL DIATOMS:	244	238	530	281	207	209	226	122	184	227	173	220	262	20659

TABLE 2: Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Achnanthes brevipes													4	
Achnanthes delicatula														
Achnanthes exigua			4			4	6			8				
Achnanthes grimmei											2	10		
Achnanthes haukiana	3	4	18	8	16	32	4			2				
Achnanthes holsatica									6					
Achnanthes lanceolata	6	8			20	28	10	15		16	22	24		
Achnanthes minutissima group	6	24	34	30	18	44		31	8	24			22	82
Achnanthes oblongella						2		2		6				
Achnanthes petersenii					8	28	51	15	2	14				
Achnanthes pusilla	63	37	8	14	2	4	2	8		6	4	12		
Actinoptychus senarius														
Amphora coffaeiformis			2											6
Amphora granulata group														
Amphora pediculus	2	2						4	2	6				2
Amphora proteus														
Amphora ventricosa														2
Aulacoseira granulata group		2				3							2	6
Bacillaria paxillifer	38	11	38	8	60	6	20	8	10	58				
Biddulphia dubia														
Caloneis bacillum							2		32	14	12		12	
Caloneis westii							2						4	2
Cerataulus turgidus														2
Ceratoneis arcus	4	5	6	8	2	6	3	11		4		2		1
Cocconeis diminuta		1											2	1
Cocconeis placentula					2	2						2		

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Cocconeis placentula var. euglypta	6	6	2	7	6	8	9	7		6	4	20		
Cocconeis scutellum		2											6	6
Cocconeis scutellum var. parva		4												3
Cyclotella spp. misc.	2	1												
Cymbella aspera		3		2						2				
Cymbella minuta	8	10	16	4	6	2	8	10	8	10	14	14		
Cymbella naviculoides					2									
Cymbella tumida	6		2	2			12	2		4				
D. smithii var. rhombica					4	2	6	2		2				
Delphineis cf. surirella														
Denticula subtilis		2				2		6		4			12	32
Diatoma hiemale var. mesodon	2	2	2			2		2			2			
Diploneis interrupta														
Diploneis pseudovalis	2				2		4	2	12	2			12	2
Endictya sp. 1														
Entoneis alata					6									
Entoneis tenuistriata					10	2	12							
Epithemia sorex			2						2					
Eunotia pectinalis	8	12	4	8	2		7		12	16		2		
Eunotia polydentula			2			8		1	2	4				
Fragilaria construens var. pumilla				2		1								
Fragilaria construens var. venter						4								6
Fragilaria viridens				5		2		1						

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Frustulia linkei										4			8	8
Frustulia rhomboides	6													
Frustulia vulgaris	52	24	24	41	6	4	64	23	28	32	16		60	16
Gomphonema angustatum							3							2
Gomphonema olivaceum	4	2				4	3							
Gomphonema parvulum	12	12	2	10	8	4	24	3		2	4	2		
Gomphonema truncatulum	4													
Grammatophora oceanica													6	13
Gyrosigma acuminatum					4		3							
Gyrosigma eximium										6			224	48
Gyrosigma fasciola							6						2	
Gyrosigma spenceri	2				16	2	28	2	10	10			10	12
Hantzschia amphioxys			2					2						
Hyalodiscus scoticus														2
Mastogloia exigua													48	20
Melosira moniliformis	12	10	6		12		8		8				10	18
Melosira nummuloides								4						2
Melosira cf. octogona														
Meriodion circulare		4			2	3			2	2		16		
Navicula capitata				2								4		
Navicula cincta	9	13	2	13	16	12	18	8	20	24	8			
Navicula cocconeides										8				
Navicula cohnii									2					
Navicula cryptocephala						4				8				
Navicula cryptotenella	4	16		2	8			2		4			74	22
Navicula digitoradiata													6	2
Navicula directa														
Navicula halophila	160	143	210	97	168	150	136	88	95	144	120	87	25	36

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Navicula lanceolata	28	30	226	259	88	42	165	62	42	43	22	8	2	
Navicula libonensis		2												
Navicula mutica	61	54	30	16	68	58	24	33	54	112	32	26	19	6
Navicula muticoides		1				3		2						
Navicula peregrina			2											
Navicula phyllepta			6			2								
Navicula pusilla			2	1	2	6	5	3	2	2		4		
Navicula pusilla var.1														
Navicula radiosa					2	2	4	5.5	2	2			8	6
Navicula ramossima														
Navicula salinarum														2
Navicula spp. misc.						2			10	4				
Navicula stankovicii														
Navicula tenneloides													6	4
Navicula tripunctata					2						2	2	2	2
Navicula tripunctata var. schizonemoides													28	14
Navicula trivialis														
Navicula viridula var. rostrata					12	4	3	6	8					
Nitzschia aerophila			2	2			2							
Nitzschia amphibia				4		2								
Nitzschia cf. angustata	2	2	14	10	10	8	9	5	12	2	10	2		2
Nitzschia brevissima	4	4	8	12	4	10	3	3	32	32	34	18		
Nitzschia capitellata	2			2	4	11	14	5						
Nitzschia cf. flexoides			2											
Nitzschia cf. pellucida	2													
Nitzschia cf. sigma	14	4			6		2		2	4				

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Nitzschia coarctata														
Nitzschia commutata					8	18	10	8	8				2	
Nitzschia compressa														
Nitzschia compressa var. vexans							6			2			2	
Nitzschia constricta			2					6		4			4	6
Nitzschia debilis	2	2	4	2	14	17	16	8	22	12	10	2	2	
Nitzschia dissipata	64	33	44	22	22	14	28	9	22	12	2	4	15	18
Nitzschia dubia							2							
Nitzschia fasciculata	2						8	20					18	28
Nitzschia frustulum	4				8				20	4				
Nitzschia gracilis					10		5			4				
Nitzschia granulata													2	2
Nitzschia hantzschiana					6	8	23	11	22	32				
Nitzschia lanceola									2				6	2
Nitzschia levidensis	12	2	2	2	26	16	38	22	14				2	
Nitzschia linearis	4													
Nitzschia littoralis					4	2	2			2				
Nitzschia lorenziana		2			2	2	3	2	2				2	
Nitzschia nana	119	126	64	84	38	62	25	28	54	58	8	4	65	78
Nitzschia navicularis					2				4				18	10
Nitzschia palea	26	31	39	49	32	28	26	14	32	30	4		4	2
Nitzschia pellucida	4				6		2		2				2	
Nitzschia pusilla									4	6				
Nitzschia scapelliformis	2												52	11
Nitzschia spp. misc.														
Nitzschia subinflata														
Nitzschia terrestris	2	2			2	2	2	9						

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Nitzschia tryblionella			2			1								
Nitzschia tubicola				2		2	3		4					
Odontella obnuta														
Opephora martyi														
Paralia sulcata													2	
Paralia sulcata (small	6				5								20	15
Pinnularia appendiculata	30	2					4	2	10	2	10	4		
Pinnularia borealis						2								
Pinnularia ignobilis						4								
Pinnularia interrupta	8		2	2					4			2		
Pinnularia lagerstedtii									2	10		4		
Pinnularia microstauron	2		10	6	2			2						
Pinnularia subcapitata			4	4	8	6	21	12		8	2			
Pinnularia sudetica					2		2		8		2			
Pinnularia viridis	2						2		8		8			
Pleurosigma salinarum														
Rhabdonema arcuatum														
Rhaphoneis cf. margaritalimbata														
Rhaphoneis psammicola													3	3
Rhoicosphenia abbreviata	18	30	16	26	20	44	34	71	22	38	33	34		
Rhopalodia gibba		2												
Rhopalodia gibberula													56	33
Rhopalodia musculus														2
Scoliopleura tumida														
Stauroneis anceps		2	4	6		4		6						
Stauroneis kreigeri					2									
Stephanodiscus spp. misc.														2

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples														
species	T1-4 Live Cells	T1-4 Empty Cells	T1-5 Live Cells	T1-5 Empty Cells	T1-6 Live Cells	T1-6 Empty Cells	T1-7 Live Cells	T1-7 Empty Cells	T1-8 Live Cells	T1-8 Empty Cells	T2-3 Live Cells	T2-3 Empty Cells	T3-4 Live Cells	T3-4 Empty Cells
Suriella brebissonii	28	27	30	24	34	50	44	28	36	25	2	14		
Suriella brightwellii							3							
Suriella gemma	2				4	2			6		8			
Suriella lapponica				2	2		2			2				
Suriella ovalis					2	4	4	14						
Suriella tenera							6		4					
Surirella spp. misc.							2							
Synedra acus	8	28	6	2	2		4	8	6	4	10	20		
Synedra fasciculata													9	31
Synedra vaucheriae	4	14	12			12		2			6	4		
Tabellaria fenestrata	4	11												
Thalassionema nitzschioides														4
Thalassiosira eccentrica	1												11	9
Thalassiosira pacifica													6	2
Thalassiosira decipiens group		1		1		6	2	2					16	28
Trachyneis aspera														
unidentified	16	16	30	25	32	28	33	20	34	36	62	14	35	37
TOTAL DIATOMS:	904	788	949	828	899	859	1044	687.5	777	944	475	361	968	713

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Achnanthes brevipes		2					10	10	26
Achnanthes delicatula		2		20		2	20	2	46
Achnanthes eximium									22
Achnanthes grimmei									12
Achnanthes haukiana	12	2							101
Achnanthes holsatica									6
Achnanthes lanceolata		1							150
Achnanthes minutissima group	20	36	16	36		10		10	451
Achnanthes oblongella									10
Achnanthes linearis									118
Achnanthes pusilla									160
Actinoptychus senarius								2	2
Amphora coffaeiformis							6	30	44
Amphora granulata group					6	10	40	20	76
Amphora pediculus									18
Amphora proteus								10	10
Amphora ventricosa	2	2					16	20	42
Aulacoseira granulata group	2	2							17
Bacillaria paxillifer	4	10			8				279
Biddulphia dubia							2		2
Caloneis bacillum	14	8	112	30	12	4			252
Caloneis westii	2	8			24	12	14	28	96
Cerataulus turgidus									2
Ceratoneis arcus									52
Cocconeis diminuta		4							8
Cocconeis placentula									6

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Cocconeis placentula var. euglypta		2							83
Cocconeis scutellum	4	17			2		3		40
Cocconeis scutellum var. parva	2	8					1	2	20
Cyclotella spp. misc.		2							5
Cymbella aspera									5
Cymbella minuta									110
Cymbella naviculoides									2
Cymbella tumida	2								30
D. smithii var. rhombica									16
Delphineis surirella		6			2				8
Denticula subtilis	1	5	6	8					78
Diatoma hiemale var. mesodon									12
Diploneis interrupta	2		36	16					54
Diploneis pseudovalis	2		102	20					162
Endictya sp. 1							2		2
Entoneis alata									6
Entoneis tenuistriata									24
Epithemia sorex									4
Eunotia pectinalis	1								72
Eunotia polydentula		6							23
Fragilaria construens var. pumilla	1								4
Fragilaria construens var. venter		1							11
Fragilaria viridens									8

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Frustulia linkei	8	2							30
Frustulia rhomboides									6
Frustulia vulgaris	15	4	2			4			415
Gomphonema angustatum									5
Gomphonema olivaceum									13
Gomphonema parvulum									83
Gomphonema truncatulum									4
Grammatophora oceanica	2	22	4	1	4	2			54
Gyrosigma acuminatum								1	8
Gyrosigma eximium	22	6	22	20	6	10			364
Gyrosigma fasciola							2		10
Gyrosigma spenceri	17		10	6	4	2	6	1	138
Hantzschia amphioxys									4
Hyalodiscus scoticus	6	5			2				15
Mastogloia exigua	4	4					57	166	299
Melosira moniliformis	64	26		2	4	20	31	16	247
Melosira nummuloides	30	10	59	2		16	7		130
Melosira octogona	2								2
Meriodion circulare									29
Navicula capitata									6
Navicula cincta	22	30	40	31		2			268
Navicula cocconeides									8
Navicula cohnii	4	9							15
Navicula cryptocephala								6	18
Navicula cryptotenella			16	10	30	2	4	6	200
Navicula digitoradiata	2						25	6	41
Navicula directa								4	4
Navicula halophila	92	48	43	50	22	26	20	20	1980

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Navicula lanceolata									1017
Navicula libonensis	3	1							6
Navicula mutica	68	143	65	176					1045
Navicula muticoides	2								8
Navicula peregrina					4				6
Navicula phyllepta						8	20	10	46
Navicula pusilla	20	36	34	63					180
Navicula pusilla var.1	1	4							5
Navicula radiosa	2	20	10	12					75.5
Navicula ramossima					4	4	4		12
Navicula salinarum	8	2							12
Navicula spp. misc.									16
Navicula stankovicii					50	8		2	60
Navicula tenneloides									10
Navicula tripunctata		7							17
Navicula tripunctata var. schizonemoides	14	12							68
Navicula trivialis			2	4					6
Navicula viridula var. rostrata									33
Nitzschia aerophila									6
Nitzschia amphibia									6
Nitzschia angustata		2							90
Nitzschia brevissima	2	4							170
Nitzschia capitellata	4		2	6		12			62
Nitzschia cf. flexoides									2
Nitzschia cf. pellucida									2
Nitzschia cf. sigma	39	10	28	32	20	16	52		229

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Nitzschia coarctata		2							2
Nitzschia commutata	4	2	22	14					96
Nitzschia compressa	13								13
Nitzschia compressa var. vexans	4								14
Nitzschia constricta	16	8			8	4	10	8	76
Nitzschia debilis	47	18	50	10					238
Nitzschia dissipata	26	11	10	15	6	6			383
Nitzschia dubia									2
Nitzschia fasciculata	14	28	12	8		4	4	2	148
Nitzschia frustulum									36
Nitzschia gracilis								2	21
Nitzschia granulata	12	12							28
Nitzschia hantzschiana	2								104
Nitzschia lanceola									10
Nitzschia levidensis	2				4				142
Nitzschia linearis									4
Nitzschia littoralis									10
Nitzschia lorenziana	4		6						25
Nitzschia nana	11	8	36	66	6	8			948
Nitzschia navicularis	18	2	4		10				68
Nitzschia palea	11	15	18	16					377
Nitzschia pellucida									16
Nitzschia pusilla									10
Nitzschia scapelliformis	2		4	4		2	27	45	149
Nitzschia spp. misc.	2	2	4	6					14
Nitzschia subinflata	10	5							15
Nitzschia terrestris	6	6							31

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Nitzschia tryblionella		2							5
Nitzschia tubicola									11
Odontella obnuta						2	1		3
Opephora martyi		1							1
Paralia sulcata	16	7					30	2	57
Paralia sulcata (small	60	64	28	22	30		30	6	286
Pinnularia appendiculata									64
Pinnularia borealis									2
Pinnularia ignobilis									4
Pinnularia interrupta									18
Pinnularia lagerstedtii	23	9	22	39					109
Pinnularia microstauron									22
Pinnularia subcapitata									65
Pinnularia sudetica									14
Pinnularia viridis									20
Pleurosigma salinarum	2	2	4						8
Rhabdonema arcuatum		4							4
Rhaphoneis cf. margaritalimbata		4							4
Rhaphoneis psammicola	2								8
Rhoicosphenia abbreviata	5	6							397
Rhopalodia gibba									2
Rhopalodia gibberula	8	2							99
Rhopalodia musculus			22		2		42	146	214
Scoliopleura tumida							13	24	37
Stauroneis anceps									22
Stauroneis kreigeri									2
Stephanodiscus spp. misc.	1	2							5

TABLE 2 (cont.): Diatom Taxa in Middle Intertidal Samples									
species	T4-3 Live Cells	T4-3 Empty Cells	T4-4 Live Cells	T4-4 Empty Cells	SP-4 Live Cells	SP-4 Empty Cells	TP-2 Total Cells	TP-3 Total Cells	total per species observed
Suriella brebissonii	4								346
Suriella brightwellii									3
Suriella gemma							1		23
Suriella lapponica									8
Suriella ovalis									24
Suriella tenera									10
Surirella spp. misc.									2
Synedra acus									98
Synedra fasciculata	4	24		2	20	38	7	9	144
Synedra vaucheriae									54
Tabellaria fenestrata									15
Thalassionema nitzschioides	4	3						2	13
Thalassiosira eccentrica	1	4			4				30
Thalassiosira pacifica								2	10
Thalassiosira spp. misc.	2	7					2		67
Trachyneis aspera	2								2
unidentified	28	38			12	16	18	31	561
TOTAL DIATOMS:	890	829	851	747	306	250	527	651	16247.5

TABLE 3: Diatom Taxa in Upper Intertidal and Upland Transition Samples														
species	T2-4 Live Cells	T2-4 Empty Cells	T2-5 Live Cells	T2-5 Empty Cells	T2-6 Live Cells	T2-6 Empty Cells	T3-5 Live Cells	T3-5 Empty Cells	T3-6 Live Cells	T3-6 Empty Cells	T3-7 Live Cells	T3-7 Empty Cells	T3-8 Live Cells	T3-8 Empty Cells
Achnanthes brevissima var. intermedia														
Achnanthes delicatula										2				
Achnanthes grimmei	4	12	4	2								2		
Achnanthes haukiana								1		6			14	6
Achnanthes lanceolata	60	22	14	62	20	44		8						
Achnanthes minutissima group									6	16	8	18		
Achnanthes pusilla	10	19	8	22	10	28	4							6
Actinoptychus senarius										2				1
Amphora ovalis var. affinis									2			2		
Amphora ovalis var. pediculus								2				2		
Amphora spp. misc.														
Amphora veneta														
Amphora ventricosa							2					2		
Aulacosira granulata group							3	6				5		2
Bacillaria paradoxa										2				1
Caloneis bacillum	8		2	2	2	2	20	44	4	9	4	6	28	24
Caloneis linearis														
Caloneis westii											4			
Cocconeis disculus								2						
Cocconeis placentula				2						2		1		2
Cocconeis placentula var. euglypta	12	18	24	44	8	18	2							3
Cocconeis scutellum							2	1		6		6		5
Cocconeis scutellum var. parva								2				4		2

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples														
species	T2-4 Live Cells	T2-4 Empty Cells	T2-5 Live Cells	T2-5 Empty Cells	T2-6 Live Cells	T2-6 Empty Cells	T3-5 Live Cells	T3-5 Empty Cells	T3-6 Live Cells	T3-6 Empty Cells	T3-7 Live Cells	T3-7 Empty Cells	T3-8 Live Cells	T3-8 Empty Cells
Hantzschia amphioxys					2									
Hyalodiscus scoticus							2	5	4	8	2	8	4	10
Licmophora lyngbei						2								
Mastogloia exigua										2				4
Melosira cf. octogona														
Melosira moniliformis										2			14	4
Melosira nummuloides							4	2	6	4		4		8
Meridion circulare				2										
N. cocconeides			2											
Navicula capitata	2			2	2	2								
Navicula cincta		2	4			4	49	157	99	187	86	183	33	22
Navicula cohni								2				6		1
Navicula contenta														
Navicula cryptocephala														
Navicula cryptotenella														
Navicula delawarensis							2	14		2				
Navicula digitoradiata														2
Navicula digitoradiata var. minima														
Navicula gregaria	2	2						2						
Navicula halophila	62	34	42	22	40	32	38	42	43	53	80	79	8	14
Navicula lanceolata			6	2		4	4	4			2	2	2	
Navicula leptopus														
Navicula libonensis														
Navicula mutica	44	36	2	22	12	16	30	172	84	184	78	235	18	85
Navicula muticoides											2	2		
Navicula peregrina														
Navicula phyllepta														

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples														
species	T2-4 Live Cells	T2-4 Empty Cells	T2-5 Live Cells	T2-5 Empty Cells	T2-6 Live Cells	T2-6 Empty Cells	T3-5 Live Cells	T3-5 Empty Cells	T3-6 Live Cells	T3-6 Empty Cells	T3-7 Live Cells	T3-7 Empty Cells	T3-8 Live Cells	T3-8 Empty Cells
Navicula pupula						2								
Navicula pusilla	18	20			2	2	50	55	74	62	38	79	24	45
Navicula pygmaea							4	2				2		
Navicula pygmaea									1	2				
Navicula radiosa							2	2	4			2	6	8
Navicula ramossima							2	4	2	2				
Navicula rhyncocephala														
Navicula salinarum							16	10					12	8
Navicula seminulum	2		6	13		4								
Navicula tenneloides								20	4	14	10	10	34	8
Navicula tripunctata	4									3		2		
Navicula tripunctata var. schizonemoides								6		2				
Navicula trivialis													4	4
Nitzschia angustata						2	2					2		
Nitzschia brevissima	28	12	16	12	6	2				8				
Nitzschia capitellata							4	2			2			6
Nitzschia cf. sigma							4	6	4	10	10	6	12	19
Nitzschia coarctata														2
Nitzschia commutata							6	4	4	7	4	4	14	6
Nitzschia compressa														2
Nitzschia compressa var. vexans								2						
Nitzschia constricta								2	2	2				
Nitzschia debilis	8	2		2		2	36	46	20	36	41	68	20	38
Nitzschia dissipata	6	14	10	8	4	16	32	36	11	15	18	18	24	19
Nitzschia dubia									4				4	
Nitzschia fasciculata							6	8	2			8		

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples														
species	T2-4 Live Cells	T2-4 Empty Cells	T2-5 Live Cells	T2-5 Empty Cells	T2-6 Live Cells	T2-6 Empty Cells	T3-5 Live Cells	T3-5 Empty Cells	T3-6 Live Cells	T3-6 Empty Cells	T3-7 Live Cells	T3-7 Empty Cells	T3-8 Live Cells	T3-8 Empty Cells
Nitzschia frustulum														
Nitzschia gracilis				2										2
Nitzschia granulata							2	2	2	2				2
Nitzschia inconspicua														
Nitzschia lanceola								2		2				
Nitzschia levidensis													1	2
Nitzschia linearis														
Nitzschia littoralis														
Nitzschia lorenziana							8	8						2
Nitzschia nana	4		2		10	2	12	40	16	25	28	28	28	32
Nitzschia navicularis										2				
Nitzschia palea	14	8	6	8	4	6	18	40	10	9	10	8	13	15
Nitzschia pellucida	2						6	8				2	26	8
Nitzschia pusilla													26	38
Nitzschia recens										7				8
Nitzschia scapelliformis							2		2	12			2	1
Nitzschia spp. misc.	20	8					4	10						
Nitzschia terrestris								2				2	2	
Odontella aurita												2	2	2
Paralia sulcata								30	4			2	18	5
Paralia sulcata (small							10	64	9	28	14	38	54	64
Pinnularia appendiculata	60	4	62	8	68	40								1
Pinnularia gibba								4		4	2			
Pinnularia interrupta	2		6	4	2	4								
Pinnularia lagerstedtii	6	6	4		2		56	86	119	152	92	182	21	48
Pinnularia subcapitata	14		10	6	56	34						2		
Pinnularia sudetica			2	2	6									4
Pinnularia viridis	2	2												

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples

species	T2-4 Live Cells	T2-4 Empty Cells	T2-5 Live Cells	T2-5 Empty Cells	T2-6 Live Cells	T2-6 Empty Cells	T3-5 Live Cells	T3-5 Empty Cells	T3-6 Live Cells	T3-6 Empty Cells	T3-7 Live Cells	T3-7 Empty Cells	T3-8 Live Cells	T3-8 Empty Cells
Rhaphoneis cf. margaritalimbata							2	6	2			2		6
Rhaphoneis psammicola												1		
Rhoicosphenia abbreviata	28	38	17	106	24	62	2	2	4			2		
Rhopalodia gibberula								10				8		6
Stauroneis anceps	2			6	4									
Stauroneis undulata						2								
Stephanodiscus spp. misc.										2				2
Surirella brebissonii														
Surirella fatuosa														6
Synedra acus	4	8		3	6	2				12				
Synedra fasciculata							4	2		7	4	22		16
Synedra vaucheriae				4										6
Thalassionema nitzschioides								2	6	7		6		
Thalassiosira eccentrica								1		2				2
Thalassiosira pacifica							2	5						
Thalassiosira spp. misc.							2	2	4	5	2	2		11
unidentified	36	28	22	28	28	24	6	36	16	14	16	16	16	24
TOTAL DIATOMS:	538	335	331	432	378	407	520	1161	608	1000	581	1123	569	804

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples											
species	T4-5 Live Cells	T4-5 Empty Cells	T4-6 Live Cells	T4-6 Empty Cells	T4-7 Live Cells	T4-7 Empty Cells	T4-8 Live Cells	T4-8 Empty Cells	SP-5 Live Cells	SP-5 Empty Cells	total per species observed
Achnanthes brevissima var. intermedia								2			2
Achnanthes delicatula										2	4
Achnanthes grimmei											24
Achnanthes haukiana	4	4						1		4	40
Achnanthes lanceolata									14	2	246
Achnanthes minutissima group	30	30	24	14	6	6	10	24	10	10	212
Achnanthes pusilla											107
Actinoptychus senarius						2					5
Amphora ovalis var. affinis											4
Amphora ovalis var. pediculus			4	12	2						22
Amphora spp. misc.										6	6
Amphora veneta										2	2
Amphora ventricosa				4		2					10
Aulacosira granulata group		6		2		3				1	28
Bacillaria paradoxa			2								5
Caloneis bacillum	42	12	8	8	12	2	10	6	4		259
Caloneis linearis				2							2
Caloneis westii	2	2		4				2		2	16
Cocconeis disculus											2
Cocconeis placentula											7
Cocconeis placentula var. euglypta											129
Cocconeis scutellum				2		4			2		28
Cocconeis scutellum var. parva						4					12

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples											
species	T4-5 Live Cells	T4-5 Empty Cells	T4-6 Live Cells	T4-6 Empty Cells	T4-7 Live Cells	T4-7 Empty Cells	T4-8 Live Cells	T4-8 Empty Cells	SP-5 Live Cells	SP-5 Empty Cells	total per species observed
Coscinodiscus radiatus f. obscurus											1
Cyclotella spp. misc.											2
Cymbella minuta										2	54
Cymbella naviculiformis											2
Cymbella tumida											4
Delphineis surirella		2				2					8
Denticula subtilis	16	30	14	28	6	28	36	32			406
Diatoma hiemale var. mesodon											27
Dimeregramma minor											2
Diploneis didyma	6	2	6	2	2		6				50
Diploneis interrupta	2			2							8
Diploneis pseudovalis	42	10	40	16	28	10	14	14	6	2	304
Endictya pacifica						2					8
Epithemia turgida											4
Eunotia pectinalis					2						46
Fragilaria construens var. venter						2					2
Frustulia linkei	10	10									53
Frustulia rhomboides											6
Frustulia vulgaris	12	7	6	18		4	4				239
Frustulia weinholdii							2				4
Gomphonema parvulum									6	4	72
Grammatophora oceanica	2	2	2		2	4					53
Gyrosigma eximium	3		10	20	4	6					53
Gyrosigma fasciola			8	4							12
Gyrosigma spenceri	4	2	2	2							12

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples											
species	T4-5 Live Cells	T4-5 Empty Cells	T4-6 Live Cells	T4-6 Empty Cells	T4-7 Live Cells	T4-7 Empty Cells	T4-8 Live Cells	T4-8 Empty Cells	SP-5 Live Cells	SP-5 Empty Cells	total per species observed
Hantzschia amphioxys											2
Hyalodiscus scoticus		4	4	2	4	4		2			63
Licmophora lyngbei											2
Mastogloia exigua		2		2		2	2				14
Melosira cf. octogona			4		2		2				8
Melosira moniliformis	10	2	8	10	2	4		3			59
Melosira nummuloides	4	4	8		8		2				54
Meridion circulare											2
N. cocconeides											2
Navicula capitata											8
Navicula cincta	60	77	124	104	46	84	34	26	2	4	1387
Navicula cohni		4		10	2	20	2	4			51
Navicula contenta									10	10	20
Navicula cryptocephala		8	10	14	2						34
Navicula cryptotenella	44	16	28	2	6	6	10	10			122
Navicula delawarensis			2		4	8	2				34
Navicula digitoradiata											2
Navicula digitoradiata var. minima										2	2
Navicula gregaria		4									10
Navicula halophila	18	28	22	30	4	18	26	14	2	14	765
Navicula lanceolata									44	18	88
Navicula leptopus			6	16	2						24
Navicula libonensis		13									13
Navicula mutica	48	96	90	150	118	216	49	78	10	24	1897
Navicula muticoides				2		2				2	10
Navicula peregrina		2									2
Navicula phyllepta									4	6	10

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples											
species	T4-5 Live Cells	T4-5 Empty Cells	T4-6 Live Cells	T4-6 Empty Cells	T4-7 Live Cells	T4-7 Empty Cells	T4-8 Live Cells	T4-8 Empty Cells	SP-5 Live Cells	SP-5 Empty Cells	total per species observed
Navicula pupula											2
Navicula pusilla	40	45	38	42	124	98	100	67			1023
Navicula pygmaea	8	4	6	4							30
Navicula pygmaea											3
Navicula radiosa			4	6			8				42
Navicula ramossima											10
Navicula rhyncocephala		8		2					4		14
Navicula salinarum	6	8		2	2	2		4	2	8	80
Navicula seminulum											25
Navicula tenneloides							49	14			163
Navicula tripunctata		2									11
Navicula tripunctata var. schizonemoides						2					10
Navicula trivialis	4	16					28	4			60
Nitzschia angustata	2		6	4		2					20
Nitzschia brevissima				4	2						90
Nitzschia capitellata	10	6	4	14	6	2	20	22		2	100
Nitzschia cf. sigma	26	7	24	46	2	6	12	98			292
Nitzschia coarctata						2					4
Nitzschia commutata	2	4	4		4	4	4	6	10	4	91
Nitzschia compressa		2		2		2				2	10
Nitzschia compressa var. vexans			2								4
Nitzschia constricta			4								10
Nitzschia debilis	26	24	60	24	28	24	116	60	2	4	687
Nitzschia dissipata	29	26	2	16	6	8	24	12	4	4	362
Nitzschia dubia											8
Nitzschia fasciculata	20	12	20	12	6	14	62	32		2	204

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples											
species	T4-5 Live Cells	T4-5 Empty Cells	T4-6 Live Cells	T4-6 Empty Cells	T4-7 Live Cells	T4-7 Empty Cells	T4-8 Live Cells	T4-8 Empty Cells	SP-5 Live Cells	SP-5 Empty Cells	total per species observed
Nitzschia frustulum									2	2	4
Nitzschia gracilis											4
Nitzschia granulata			4								14
Nitzschia inconspicua										2	2
Nitzschia lanceola											4
Nitzschia levidensis			2	4							9
Nitzschia linearis	2										2
Nitzschia littoralis			2	2							4
Nitzschia lorenziana	44	4	14	8		6					94
Nitzschia nana	54	81	22	22	12	26	30	33	2	12	521
Nitzschia navicularis			4	2			2				10
Nitzschia palea	20	20	8	10	16	16	30	24	2		315
Nitzschia pellucida			2	2		2	4		2	12	76
Nitzschia pusilla						4	22	4			94
Nitzschia recens											15
Nitzschia scapelliformis	2	2	22	8		4					57
Nitzschia spp. misc.											42
Nitzschia terrestris	2				2	2	4				16
Odontella aurita											6
Paralia sulcata			2	6	1	5			3		76
Paralia sulcata (small	17	20	22	38	6	35		5		3	427
Pinnularia appendiculata											243
Pinnularia gibba											10
Pinnularia interrupta											18
Pinnularia lagerstedtii	105	103	88	113	190	226	95	136	10	6	1846
Pinnularia subcapitata			2	4		8	4	2	12		154
Pinnularia sudetica											14
Pinnularia viridis											4

TABLE 3 (cont.): Diatom Taxa in Upper Intertidal and Upland Transition Samples											
species	T4-5 Live Cells	T4-5 Empty Cells	T4-6 Live Cells	T4-6 Empty Cells	T4-7 Live Cells	T4-7 Empty Cells	T4-8 Live Cells	T4-8 Empty Cells	SP-5 Live Cells	SP-5 Empty Cells	total per species observed
Rhaphoneis cf. margaritalimbata					2			2			22
Rhaphoneis psammicola											1
Rhoicosphenia abbreviata						4			2	2	293
Rhopalodia gibberula	2		4			6					36
Stauroneis anceps									16	10	38
Stauroneis undulata											2
Stephanodiscus spp. misc.											4
Surirella brebissonii									2	2	4
Surirella fatuosa											6
Synedra acus											35
Synedra fasciculata		2	4	2	2	14	4	3		2	88
Synedra vaucheriae											10
Thalassionema nitzschioides		2		2		3					28
Thalassiosira eccentrica						2					7
Thalassiosira pacifica											7
Thalassiosira spp. misc.				3		6		5		2	44
unidentified	20	30	44	28	16	20	26	18	12	18	542
TOTAL DIATOMS:	800	807	852	914	691	1000	855	769	201	216	15892

TABLE 4: Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Achnanthes brevipes					1						
Achnanthes brevipes var. intermedia			2								
Achnanthes delicatula	1		1		1	37	40	1			
Achnanthes minutissima group						4	1				
Achnanthes spp. misc.						4	3	1			
Actinocyclus curvatulus		1		2	1	2	1				
Actinocyclus kutzingii	8	5	5	3	9		2		7	1	
Actinocyclus normanii	2		2						1		
Actinocyclus octonarius					1						
Actinocyclus spp. misc.		1									
Actinoptychus adriaticus (vulgaris)			1								
Actinoptychus marmoreus			1	1							
Actinoptychus senarius	13	9	8	3	8		4	1	2		
Actinoptychus splendens		2	6		2						
Amphora coffeiformis						2	2				
Amphora libyca						5	5				
Amphora mexicana		2	1	4	4	1					
Amphora ostrearia							1				
Amphora proteus							4				
Amphora ventricosa	1										
Aulacoseira granulata group	24	25	30	14	18	9	6	10	93	8	16
Biddulphia dubia					1	3					
Biremis ambigua						4	2	1			

TABLE 4 (cont.): Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Caloneis bacillum											1
Caloneis brevis			1								
Caloneis cf. bacillum	1										
Caloneis linearis		2							3		
Caloneis westii	6	17	9	9	9	1	3		5		10
Camplyodiscus echineis		3	12	3	7						
Cerataulus turgidus			14	3	8	1					1
Chaetoceros spp. misc.						3					
Cocconeis diminuta			2	2	8	32	31		1		
Cocconeis disculus		2			1						
Cocconeis molesta				1	1						
Cocconeis placentula			1				2				
Cocconeis placentula var. euglypta			1	1	2	1	1	2	2		
Cocconeis scutellum						3	3				
Cocconeis scutellum var. parva					2	4	2	1			
Coscinodiscus jonesiana				2							
Coscinodiscus oculusiridis	1	16		1	3		1				2
Coscinodiscus radiatus f. obscurus	2	1	1	5	9		1		2		
Cyclotella spp. misc.		2	7	6	8	2		1	7		2
Cymbella affinis								2			
Cymbella aspera		1	5	1	2				2		7
Cymbella muellerii	2										
Delphineis sp.1			10			4	2	7	24		

TABLE 4 (cont.): Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Delphineis surirella	18		1	9	11	7	15	2	1		1
Denticula subtilis	1										
Didymosphenia geminata			1								
Dimeregramma minor	1	3	2	4	3	4		1	1		3
Diploneis didyma	2		1		2				3		
Diploneis gruendleri			1								
Diploneis interrupta	1	34	4		2	1		3	4	2	57
Diploneis oblongella	10										
Diploneis pseudovalis	2					1	1				
Diploneis smithii			1								
Endictya sp.1	5		16	15	12	2	7	3	9		2
Epithemia sorex					1						
Epithemia turgida	7	7	19	5	10	1	5		1		
Fragilaria brevistriata							1				
Fragilaria pinnata				2			1		1		
Frickea lewisiana				2							
Frustulia rhombica					2						
Gomphoneis herculeana					2						
Gomphonema angustatum								1			
Gomphonema olivaceum						2					
Gomphonema truncatum				1							
Grammatophora oceanica	11						4	1			
Gyrosigma balticum				6	2	2	2				

TABLE 4 (cont.): Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Gyrosigma spencerii	1										
Hantzschia amphioxys								1	4		
Hantzschia virgata							5				
Hyalodiscus laevis	2	6	4	1	1				2		2
Mastogloia exigua	1					4	4				
Melosira moniliformis	2	12		1		7	6		3		
Melosira nummuloides	3							1			
Navicula cancellata	3				2						
Navicula cincta							1		2		
Navicula cryptolyra			2	3	3	36	21		1		
Navicula cryptotenella						1					
Navicula digitoradiata							4	1			
Navicula elginensis	2										
Navicula gregaria	2			1	4						
Navicula halophila							2				
Navicula lyra	1	2		1			2	3	1		
Navicula mutica					1	4		22	3	10	11
Navicula phyllepta									1		
Navicula pseudoforcipata								1	1		
Navicula pupula							2				
Navicula pusilla		1		2			7	60	49	42	15
Navicula pusilla var. 1		11						2	1		
Navicula spp.misc.	4										
Nitzschia acuminata			1		1						
Nitzschia aerophila							2				
Nitzschia angulata							2				
Nitzschia coarctata				1		1	1				
Nitzschia commutata	11										

TABLE 4 (cont.): Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Nitzschia complanata			1								
Nitzschia compressa	2										
Nitzschia compressa var. vexans	2										
Nitzschia constricta						2	2				
Nitzschia debilis	2							1			
Nitzschia dissipata	2										
Nitzschia fasciculata	16										
Nitzschia frustulum	5					1					
Nitzschia granulata	15	3	13	11	6	6	6	4	20		2
Nitzschia hungarica				1			3				
Nitzschia levidensis						1	1				
Nitzschia littoralis					1						
Nitzschia nana	5						3		2		
Nitzschia navicularis	1	2									
Nitzschia scapelliformis	1										
Nitzschia sigma				1	1	4		1			
Nitzschia sigma var. 1	6								1		
Nitzschia terrestris							2	7	4	0.5	
Nitzschia tryblionella			2	2							
Nitzschia vitrea	1										
Odontella aurita	1			1		1			3		
Odontella obnuta			3								
Opephora pacifica						14	8				
Paralia sulcata	89	75	275	214	159	91	107	32	329	2	14
Paralia sulcata (small form)	35	30	107	125	58	57	35	38	315	11	63
Pinnularia borealis					1						
Pinnularia lagerstedtii			1				7	14	13	38	20

TABLE 4 (cont.): Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Pinnularia stomatophora				1					3		
Rhabdonema arcuatum	3	1		1	4		1				
Rhaphoneis amphiceros	3	3	1	1	3	3	5	1			
Rhaphoneis cf. margaritalimbata						1					
Rhaphoneis psammicola	2		1		2	7	2	1	4	0.5	
Rhoicosphenia abbreviata	2				2						
Rhopalodia gibberula	10		1			2	2				
Rhopalodia musculus						1					
Scoliopleura tumida	1	8	18	51	5	2	3	2			
Skeletonema costata						5					
Stephanodiscus spp. misc.	1	4	3	1					3		
Stephanopyxis spp. misc.									1		
Surirella fatuosa				1							
Synedra fasciculata						9	11	2			
Thalassionema nitzschioides					1	4	4	1	1		
Thalassionema nitzschioides var. parva							1				
Thalassiosira eccentrica	2		1		1	4	4	1			
Thalassiosira pacifica					1	2	1				
Thalassiosira spp. misc.			1		5	8	8	5			
Trachyneis aspera	7			4	1						

TABLE 4 (cont.): Diatom Counts for Niawiakum River Site 1											
	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1	Site 1
species	2 cm	10 cm	30 cm	40 cm	45 cm	52 cm	54 cm	55 cm	60 cm	62 cm	72 cm
Trachysphenia australis			2								
Total valves counted:	365	291	603	530	416	420	428	239	936	115	229

TABLE 5: Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Achnanthes brevipes	4	4				2					
Achnanthes delicatula			3		1	3	28		3		1
Achnanthes haukinana		22		1				1			
Achnanthes lanceolata			1								
Achnanthes minutissima group		11	1		1			1	1		2
Achnanthes spp. misc.		4									
Actinocyclus curvatulus			1		3	5	3		1		
Actinocyclus kutzingii	2		11	2	9	4	3		1	2	3
Actinocyclus normanii			1								1
Actinocyclus spp. misc.	3				2						
Actinoptychus adriaticus (vulgaris)	1				2						
Actinoptychus marmoreus						1					
Actinoptychus senarius		2	9		7	10	5	7	4	4	2
Actinoptychus splendens			2	1	1	1	1			1	
Amphora proteus							2				
Aulacoseira granulata group	2	3	11	6	22	3	8	7	17	37	53
Biddulphia alternans									1		
Biddulphia dubia		1				2	1				
Caloneis bacillum	2										
Caloneis brevis						1	1				0.5
Caloneis cf. bacillum		1				1			2		
Caloneis linearis				1	1						
Caloneis permagna					1						
Caloneis sublinearis		1									

TABLE 5 (cont.): Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Caloneis westii	1	4	13	23	7	7	1	2	3	2	
Camplyodiscus echineis		2	4		5	8			1	1	3
Cerataulus turgidus			7	1	8	3	6		2		
Chaetoceros spp. misc.	1	9						1			
Cocconeis diminuta	4	4	3		4		5	6	1	2	4
Cocconeis directa var. flexella			3								
Cocconeis disculus	1		1						3		
Cocconeis placentula		1									
Cocconeis placentula var. euglypta	4	1			5		1		1		
Cocconeis scutellum	1	1			4						
Cocconeis scutellum var. parva	2	5									1
Coscinodiscus jonesiana					2						
Coscinodiscus marginatus	1				1	1					1
Coscinodiscus oculusiridis			3	12	5	2	2	1			2
Coscinodiscus radiatus	1				1						
Coscinodiscus radiatus f. obscurus		1	2	2	9	2	3	1	3	1	1
Coscinodiscus spp. misc.			2								
Cyclotella spp. misc.		1	8	2	6	2	3		2		9
Cymbella aspera			4		1	1			1	4	2
Cymbella minuta		1									

TABLE 5 (cont.): Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Cymbella muellerii						1					
Cymbella spp. misc.					1						
Cymbella tumida					1						
Delphineis sp.1						7	9	1	2		
Delphineis surirella	1		15	5	10	7	5		4	3	8
Denticula elegans					1						
Denticula subtilis		2				1				1	
Denticulopsis seminae									6		
Dimeregramma minor	1		1		2	10	3	2	4		2
Diploneis didyma				2							
Diploneis interrupta	2		6	125	3	1	1	6	1		4
Diploneis oblongella									1		
Diploneis smithii var. rhombica								2	1		
Endictya sp.1			33	8	13	9	11	1	3	5	
Epithemia sorex					1						
Epithemia turgida		1	3	3	18	3	4		3		2
Eunotia pectinalis		1									
Fragilaria brevistriata			2								
Fragilaria pinnata		1	2							1	
Frickea lewisiana		2									
Gomphoneis herculeana		2									
Gomphonema auger									1		
Gomphonema olivaceum	1										
Gomphonema parvulum	2										
Grammatophora oceanica	2	4	1	1	2						

TABLE 5 (cont.): Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Gyrosigma balticum					5	1	3	1	3		
Gyrosigma eximium					1				1		
Hantzschia amphioxys	1			1		2					1
Hantzschia virgata					2			1			
Hyalodiscus laevis			1	3	1	1			2	8	3
Hyalodiscus scoticus	3	8					1				
Mastogloia exigua				1							
Mastogloia smithii var. lacustris					2						
Melosira moniliformis	8	33		1	1	2	1				
Melosira nummuloides	6	15									
Melosira octogona	2										
Navicula cancellata							1				
Navicula cincta	197	3	3	1				2		2	
Navicula cryptolyra		3					8				
Navicula cryptotenella			2								
Navicula digitoradiata		4					2				
Navicula directa							1				
Navicula forcipata											1
Navicula gregaria		1	1		2	1	5	1			
Navicula libonensis				1							
Navicula lyra		2			2				2		
Navicula mutica	18	17		2						8	5
Navicula punctulata			2		1		2				
Navicula pusilla	10	10			2					43	50
Navicula pusilla var. 1			1	2						2	1
Navicula spp.misc.							1				
Nitzschia acuminata						1			3		0.5
Nitzschia aerophila		17									

TABLE 5 (cont.): Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Nitzschia coarctata	1				2						
Nitzschia complanata						1					
Nitzschia compressa	1										
Nitzschia constricta		2								2	
Nitzschia debilis	38	10			2						
Nitzschia dissipata								2			4
Nitzschia fasciculata						1					
Nitzschia frustulum			1								
Nitzschia gandershiemiensis	8										
Nitzschia gracilis							14				
Nitzschia granulata		4	18	33	10	8		3	8		2
Nitzschia levidensis		1							1		
Nitzschia littoralis						1					
Nitzschia lorenziana			1	20	3						
Nitzschia nana	2		2	2					1	1	
Nitzschia navicularis		2							1		
Nitzschia pusilla	3										
Nitzschia scapelliformis	3	1	3	2							
Nitzschia sigma			1	15	7	6	6	1	3		
Nitzschia sigma var. 1			2	3	1						
Nitzschia spp. misc.				2							
Nitzschia subinflata		2									
Nitzschia terrestris	4									13	3
Odontella aurita	1	1		5		10	2	2	6		
Odontella longicruris					2						
Odontella obnuta					5						
Opephora marina					2						
Opephora martyi							1				

TABLE 5 (cont.): Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Paralia sulcata	26	30	216	59	161	185	149	39	87	30	106
Paralia sulcata (small form)	66	122	551	155	186	71	146	77	99	23	55
Pinnularia gibba var. parva		4									
Pinnularia interrupta		12									
Pinnularia lagerstedtii	15	10		9						42	26.5
Pinnularia stomatophora			1		1		1				
Pinnularia viridis							1				
Plagiogramma staurophorum					5	5					
Rhabdonema arcuatum					6	2	1				
Rhaphoneis amphiceros	1		4		4	2	4	1			
Rhaphoneis cf. margaritalimbata		8	4		1			3		1	
Rhaphoneis psammicola	1	4	24	6	4		7	2	3	1	
Rhizosolenia hebetata						1			23		
Rhizosolenia styliformis								1	6		
Rhoicosphenia abbreviata	1	2			1		1				
Rhopalodia gibba					2						
Rhopalodia gibberula	3	6	6	1	1	1					
Rhopalodia musculus		1	6	5							
Scoliopleura tumida		5	4		10	14	5		3		1
Stephanodiscus spp. misc.	1		1		1	1		1	1	1	4

TABLE 5 (cont.): Diatom Counts for Niawiakum River Site 2											
	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
species	2 cm	15 cm	35 cm	55 cm	66 cm	70 cm	74 cm	76 cm	88 cm	90 cm	92 cm
Surirella fatuosa						1					
Synedra fasciculata	1	12	2		8	4	6	2	9		3
Synedra vaucheriae				1							
Tabellaria fenestriata									1		1
Terpsinoe americana					2	2					
Thalassionema nitzschioides		5		1	2		2	4	14	1	4
Thalassionema nitzschioides var. parva								2	1		
Thalassiosira eccentrica	1	5	1			1					
Thalassiosira pacifica			2	5	3		1		1		
Thalassiosira spp. misc.	1	10	4	11	13	5	1		8		
Trachyneis aspera				29	2		3				
Total valves counted:	462	464	1017	571	626	428	482	184	360	242	372.5

TABLE 6: Diatom Counts for Niawiakum River Site 3								
	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3
species	2 cm	25 cm	50 cm	70 cm	80 cm	88 cm	95 cm	105 cm
Achnanthes brevipes								1
Achnanthes brevipes var. intermedia				1				
Achnanthes haukinana		3				7		
Achnanthes lanceolata					1	1		
Achnanthes minutissima group		74						
Actinocyclus curvatulus			1	5	1			
Actinocyclus kutzingii			4	2			3	
Actinoptychus marmoreus	1		2					
Actinoptychus senarius	3		5	5	2	11	2	1
Amphora proteus						2		
Amphora spp. misc.						2		
Aulacoseira granulata group	2	2	11	5	5	3	1	10
Biddulphia dubia	1		1			2		
Caloneis cf. bacillum		4						
Caloneis westii	8		10	91	3	3	32	
Camplyodiscus echineis			2	1	1	4		
Camplyodiscus fatuosa	2			1				
Cerataulus turgidus	2		3	1	5	1		
Cocconeis diminuta				1	3	9		
Cocconeis disculus		2						
Cocconeis placentula						2		2
Cocconeis placentula var. euglypta							2	
Cocconeis scutellum	3							
Cocconeis scutellum var. parva	3	4			1	1		
Cocconeis splendida		7						
Coscinodiscus jonesiana			1					
Coscinodiscus oculusiridis	17		5	10	2		14	
Coscinodiscus radiatus f. obscurus	1				2	1	1	
Cyclotella spp. misc.	2		2		2	1	2	
Cymbella aspera			2	1	1			
Delphineis sp.1		1						
Delphineis surirella	1	6	6	4				2
Denticula subtilis	4	19					1	

TABLE 6 (cont.): Diatom Counts for Niawiakum River Site 3								
	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3
species	2 cm	25 cm	50 cm	70 cm	80 cm	88 cm	95 cm	105 cm
Didymosphenia geminata			1					
Dimeregramma minor						8	3	
Diploneis didyma	6							
Diploneis interrupta			43	3		3		
Diploneis oblongella					1		1	
Diploneis smithii var. rhombica					1			
Diploneis stroemi					1			
Endictya sp.1	3	1	16	3	4	7	5	6
Epithemia sorex						2		
Epithemia turgida			8	2	7	1	4	
Eunotia pectinalis								1
Fragilaria leptostauron						2		
Frustulia linkei	1							
Gomphoneis herculeana					1			
Grammatophora oceanica	4	6	2	2	4			
Gyrosigma balticum				2	6	2	1	
Gyrosigma eximium				1			3	
Gyrosigma spencerii					2	1		
Hantzschia amphioxys								6
Hyalodiscus laevis			1	1		1		
Hyalodiscus scoticus	3	2						
Mastogloia smithii					2		1	
Melosira moniliformis	4	2	4		1			
Melosira nummuloides	10		1					1
Navicula cincta	42	90						15
Navicula digitoradiata			3	13			11	
Navicula gregaria			2	1				
Navicula halophila		26						
Navicula lyra			2	2				
Navicula mutica	10	20						7
Navicula phyllepta		21						
Navicula pusilla	12	2	3					62
Navicula pusilla var. 1			13				2	
Navicula pygmaea						4		
Navicula rhyncocephala			1					
Navicula stankovicii		2						
Nitzschia aerophila	1							
Nitzschia coarctata		1						
Nitzschia complanata					1			

TABLE 6 (cont.): Diatom Counts for Niawiakum River Site 3								
	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3
species	2 cm	25 cm	50 cm	70 cm	80 cm	88 cm	95 cm	105 cm
Nitzschia compressa var. vexans						1		
Nitzschia constricta						1		
Nitzschia debilis	1	28						
Nitzschia dubia							1	
Nitzschia granulata			4	2	13		11	4
Nitzschia levidensis						1		
Nitzschia nana	4	7					1	
Nitzschia palea		8						
Nitzschia pellucida	4							
Nitzschia perminuta		12						
Nitzschia recens	1				1			
Nitzschia scapelliformis				1				
Nitzschia sigma		1						
Nitzschia sigma var. 1	6		1.5	5		1	6	
Nitzschia terrestris	7							4
Odontella aurita	3					1		
Odontella obnuta	4			1	2		1	
Paralia sulcata	18	7	58	41	60	68	42	9
Paralia sulcata (small form)	84	35	91	41	99	128	59	94
Pinnularia interrupta		1						15
Pinnularia lagerstedtii	19	10			1		1	48
Pinnularia viridis			2		1			
Rhabdonema arcuatum					2	1		
Rhaphoneis amphiceros				1	1	3		
Rhaphoneis cf. margaritalimbata		3		1				2
Rhaphoneis psammicola			1	1		4		1
Rhoicosphenia abbreviata	2	2						
Rhopalodia gibba						1		
Rhopalodia gibberula	2						2	2
Rhopalodia musculus	1		1					
Scoliopleura tumida	2		10	79	72	7	85	
Stephanodiscus spp. misc.			1					
Surirella brightwellii						1		
Surirella fatuosa					1		2	
Synedra fasciculata		8		2		2	1	4
Terpsinoe americana							1	

TABLE 6 (cont.): Diatom Counts for Niawiakum River Site 3								
	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3	Site 3
species	2 cm	25 cm	50 cm	70 cm	80 cm	88 cm	95 cm	105 cm
Thalassionema nitzschioides	2	3				1		
Thalassiosira eccentrica		4	1		1	2		
Thalassiosira pacifica	2							
Thalassiosira spp. misc.	5	10		4		2	2	4
Trachyneis aspera			1	1		2	21	
Trachysphenia australis	2							
unidentified	1					2		
Total valves counted:	316	434	326.5	338	314	310	325	301

TABLE 7: Diatom Counts for Niawiakum River Site 4								
	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4
species	2 cm	10 cm	35 cm	55 cm	65 cm	74 cm	80 cm	100 cm
Achnanthes delicatula	1	3				17		
Achnanthes haukinana						1		
Achnanthes lanceolata							1	
Achnanthes minutissima group		5						
Actinocyclus curvatulus		1	1				1	3
Actinocyclus kutzingii	3		7			6	3	5
Actinocyclus normanii				1				
Actinocyclus octonarius	1							
Actinocyclus spp. misc.						1		
Actinoptychus adriaticus (vulgaris)						1		
Actinoptychus marmoreus							1	1
Actinoptychus senarius		1	8	2	3	8	11	5
Amphora proteus					1	2		
Aulacoseira granulata group	15	1	24	5	15	10	40	34
Biddulphia dubia						2		
Caloneis aerophila								1
Caloneis cf. bacillum		28	5					
Caloneis westii	2	38	20	103	71	9	4.5	7
Camplyodiscus echineis				8		0.5	0.5	5.5
Cerataulus turgidus			1			2	1	1
Cocconeis diminuta						12		
Cocconeis placentula			1		1			
Cocconeis placentula var. euglypta					1			
Cocconeis scutellum	3							
Cocconeis scutellum var. parva	1							
Coscinodiscus jonesiana				1				1
Coscinodiscus oculusiridis	2		3	2	3		3	2
Coscinodiscus radiatus f. obscurus	2		1	1	1	1	3	
Cyclotella spp. misc.			4				4	1
Cymbella affinis						2		
Cymbella aspera				1		frag		
Cymbella muellerii			1					
Cymbella pusilla		5						

TABLE 7 (cont.): Diatom Counts for Niawiakum River Site 4								
	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4
species	2 cm	10 cm	35 cm	55 cm	65 cm	74 cm	80 cm	100 cm
Delphineis sp.1				3	1			
Delphineis surirella					4	3		
Denticula subtilis	3	7						
Dimeregramma minor						4		
Diploneis didyma						1	1	
Diploneis interrupta			2	4	2		6	31
Diploneis oblongella								1
Diploneis ovalis	1		1					
Diploneis pseudovalis		1	1				1	
Diploneis smithii var. rhombica			1				5	
Endictya sp.1	1	4	11	3	3	12	14	4
Epithemia adnata					1		1	
Epithemia sorex			1		1			
Epithemia turgida			16	2		2	2	7
Eunotia formica							1	
Fragilaria construens var. pumila			2					
Fragilaria nitzschioides				1				
Frustulia linkei		20	2					
Frustulia vulgaris		24	6	1				
Gomphoneis herculeana			1					
Gomphonema eximium				1				
Grammatophora oceanica	10	1	4	3	3		1	
Gyrosigma balticum				1	1	4		1
Gyrosigma eximium		2		4				
Gyrosigma spencerii			1					
Hantzschia amphioxys			1					
Hyalodiscus laevis	5	3	13	1	2	2	5	9
Hyalodiscus scoticus	14	1		2				
Mastogloia smithii var. lacustris			2					
Melosira moniliformis		20	3	1	2	3	1	4
Melosira nummuloides		2		1		5	1	2
Navicula cancellata						2		
Navicula cincta	11	3						
Navicula cryptolyra						6		1
Navicula cryptotenella			1				2	
Navicula digitoradiata				1	1			
Navicula gregaria			1			3	2	
Navicula lyra						1	1	

TABLE 7 (cont.): Diatom Counts for Niawiakum River Site 4								
	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4
species	2 cm	10 cm	35 cm	55 cm	65 cm	74 cm	80 cm	100 cm
Navicula mutica	25	6	1	1			1	2
Navicula muticoides		1		2		1		
Navicula pusilla	54	5	6	1	1		27	3
Navicula pusilla var. 1			11	2	2		3	28
Navicula schoenfeldii				2				
Navicula slesvicensis			1					
Neidium densestriatum				1	1	4		
Nitzschia angulata			2	1				
Nitzschia bilobata	1							
Nitzschia circumsuta			2					1
Nitzschia commutata		18	6					
Nitzschia commutata var.1		14						
Nitzschia compressa var. vexans		2		1				
Nitzschia constricta	3	2						
Nitzschia debilis	3	2						
Nitzschia dissipata			2					
Nitzschia fasciculata		30	4					
Nitzschia granulata	6	2	9	16	11	34	44	18
Nitzschia hummii			1	13		2	2	2
Nitzschia levidensis	1			4	4		2	
Nitzschia littoralis	1			2	1	2	2	
Nitzschia nana		1		1				
Nitzschia navicularis	4	1	1					
Nitzschia plana				3		2		
Nitzschia scapelliformis						0.5		
Nitzschia sigma			2	3		3		
Nitzschia socialis						1		
Nitzschia spp. misc.					1			
Nitzschia subinflata				1				
Nitzschia terrestris	1							
Odontella aurita						2		
Odontella obnuta						1		
Paralia sulcata	13	19	60	28	61	163	171	113
Paralia sulcata (small form)	108	36	347	56	72	240	481	213
Pinnularia brevicostata							4	
Pinnularia lagerstedtii	25	5						
Pinnularia subcapitata							2	
Pinnularia viridis				1		1		
Rhabdonema arcuatum			1			1		

TABLE 7 (cont.): Diatom Counts for Niawiakum River Site 4								
	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4	Site 4
species	2 cm	10 cm	35 cm	55 cm	65 cm	74 cm	80 cm	100 cm
Rhaphoneis amphiceros						1		1
Rhaphoneis cf. margaritalimbata	3							
Rhaphoneis psammicola						1		
Rhoicosphenia abbreviata					2			1
Rhopalodia musculus	2	28	1					1
Scoliopleura tumida	2		3	14	10	2	1	1
Stephanodiscus spp. misc.			2			1	1	3
Surirella brébissoni		1						
Surirella brightwellii							1	
Surirella fatuosa						1		
Surirella sp. oblong			2	3		3	3	
Synedra acus						0.5		
Synedra fasciculata	2	2	1		1	4	2	1
Synedra vaucheriae			1					
Thalassionema nitzschioides	2							
Thalassiosira eccentrica						2		
Thalassiosira pacifica								1
Thalassiosira spp. misc.	3	4				2		1
Trachyneis aspera			1	2	36	0.5	1	
Total valves counted:	334	349	613	311	320	598	865	516.5

TABLE 8: Grain-size Data for Surface Samples

Sample	% sand	% silt	% clay	Shepard (1954) sediment texture term	mean (Folk and Ward, 1957)	(mean) Wentworth (1922) size class
T1-1	97.41	2.50	0.10	sand	2.81 ϕ	fine sand
T1-2	94.64	5.18	0.19	sand	2.94 ϕ	fine sand
T1-3	96.25	3.68	0.07	sand	2.92 ϕ	fine sand
T1-4	94.97	4.80	0.23	sand	2.94 ϕ	fine sand
T1-5	92.29	7.54	0.17	sand	3.24 ϕ	very fine sand
T1-6	85.26	14.33	0.41	sand	3.32 ϕ	very fine sand
T1-7	85.40	13.65	0.95	sand	3.41 ϕ	very fine sand
T1-8	86.49	12.43	1.07	sand	3.79 ϕ	very fine sand
T2-1	94.91	4.66	0.43	sand	3.76 ϕ	very fine sand
T2-2	94.32	5.16	0.52	sand	3.77 ϕ	very fine sand
T2-3	91.25	8.52	0.22	sand	3.24 ϕ	very fine sand
T2-4	88.62	11.13	0.25	sand	3.31 ϕ	very fine sand
T2-5	87.62	11.87	0.51	sand	3.11 ϕ	very fine sand
T2-6	87.89	11.89	0.22	sand	3.34 ϕ	very fine sand
T3-S	96.36	3.43	0.20	sand	2.71 ϕ	fine sand
T3-1	81.29	18.31	0.40	sand	3.61 ϕ	very fine sand
T3-2	49.47	41.88	8.65	silty sand	5.07 ϕ	medium silt
T3-3	62.38	37.05	0.57	silty sand	3.73 ϕ	very fine sand
T3-4	50.21	45.31	4.47	silty sand	4.71 ϕ	coarse silt
T3-5	57.32	36.69	5.98	silty sand	4.70 ϕ	coarse silt
T3-6	27.02	62.16	10.82	silty sand	5.67 ϕ	medium silt
T3-7	27.66	59.68	12.66	silty sand	5.70 ϕ	medium silt
T3-8	0.22	79.98	19.80	silt	6.94 ϕ	fine silt
T4-S	90.36	8.55	1.09	sand	2.74 ϕ	fine sand
T4-1	65.13	31.06	3.80	silty sand	4.54 ϕ	coarse silt
T4-2	85.54	13.24	1.23	sand	3.79 ϕ	very fine sand
T4-3	38.72	54.87	6.42	sandy silt	5.30 ϕ	medium silt
T4-4	0.43	81.68	17.89	silt	6.90 ϕ	fine silt
T4-5	0.31	78.81	20.89	silt	7.02 ϕ	very fine silt
T4-6	0.24	79.73	20.03	silt	7.07 ϕ	very fine silt
T4-7	0.65	75.97	23.38	silt	7.16 ϕ	very fine silt
T4-8	0.83	71.64	27.53	clayey silt	7.46 ϕ	very fine silt
BC1	99.76	0.23	0.02	sand	2.42 ϕ	fine sand
BC2	99.78	0.21	0.01	sand	2.32 ϕ	very fine sand
BC3	99.78	0.20	0.02	sand	2.34 ϕ	very fine sand
BR1	85.55	14.17	0.28	sand	3.30 ϕ	very fine sand

TABLE 8 (cont.): Grain-size Data for Surface Samples (Dominant grain size is based on modal analysis)

Sample	modal analysis (1st/2nd modes)	Wentworth (1922) size class (modes)	sorting (Folk and Ward, 1957)	sorting term (Folk,1974) (modes)
T1-1	3ϕ/2.5ϕ	very fine sand/fine sand	0.57 ϕ	moderately well sorted
T1-2	3.5ϕ/3ϕ	very fine sand	0.62 ϕ	moderately well sorted
T1-3	3ϕ/3.5ϕ	very fine sand	0.52 ϕ	moderately well sorted
T1-4	3.5ϕ/3ϕ	very fine sand	0.69 ϕ	moderately well sorted
T1-5	3.5ϕ/3ϕ	very fine sand	0.50 ϕ	moderately well sorted
T1-6	4ϕ/3.5ϕ	coarse silt/very fine sand	0.77 ϕ	moderately sorted
T1-7	4ϕ/3.5ϕ	coarse silt/very fine sand	0.86 ϕ	moderately sorted
T1-8	4ϕ	coarse silt	0.48 ϕ	well-sorted
T2-1	4ϕ	coarse silt	0.17 ϕ	very well sorted
T2-2	4ϕ	coarse silt	0.21 ϕ	very well sorted
T2-3	3.5ϕ/4ϕ	very fine sand/coarse silt	0.61 ϕ	moderately well sorted
T2-4	3.5ϕ/4ϕ	very fine sand/coarse silt	0.64 ϕ	moderately well sorted
T2-5	3.5ϕ/3ϕ	very fine sand	0.72 ϕ	moderately sorted
T2-6	3.5ϕ/4ϕ	very fine sand/coarse silt	0.62 ϕ	moderately well sorted
T3-S	2.5ϕ/3ϕ	fine sand/very fine sand	0.53 ϕ	moderately well sorted
T3-1	4ϕ/3.5ϕ	coarse silt/very fine sand	0.53 ϕ	moderately well sorted
T3-2	4ϕ	coarse silt	1.67 ϕ	poorly sorted
T3-3	4ϕ/4.5ϕ	coarse silt	0.66 ϕ	moderately well sorted
T3-4	4ϕ	coarse silt	1.36 ϕ	poorly sorted
T3-5	4ϕ	coarse silt	1.44 ϕ	poorly sorted
T3-6	4ϕ/5.5ϕ	coarse silt/medium silt	1.70 ϕ	poorly sorted
T3-7	4ϕ/5.5ϕ	coarse silt/medium silt	1.73 ϕ	poorly sorted
T3-8	6ϕ/7ϕ	fine silt/very fine silt	1.30 ϕ	poorly sorted
T4-S	2.5ϕ/3ϕ	fine sand/very fine sand	0.92 ϕ	moderately sorted
T4-1	4ϕ	coarse silt	1.25 ϕ	poorly sorted
T4-2	4ϕ	coarse silt	0.53 ϕ	moderately well sorted
T4-3	4ϕ	coarse silt	1.53 ϕ	poorly sorted
T4-4	7.5ϕ/7ϕ	very fine silt	1.25 ϕ	poorly sorted
T4-5	7.5ϕ/7ϕ	very fine silt	1.29 ϕ	poorly sorted
T4-6	7.5ϕ/7ϕ	very fine silt	1.30 ϕ	poorly sorted
T4-7	7.5ϕ/6.5ϕ	very fine silt/fine silt	1.47 ϕ	poorly sorted
T4-8	6.5ϕ/7.5ϕ	fine silt/very fine silt	1.34 ϕ	poorly sorted
BC1	2.5ϕ/3ϕ	fine sand/very fine sand	0.32 ϕ	very well sorted
BC2	2.5ϕ/3ϕ	fine sand/very fine sand	0.32 ϕ	very well sorted
BC3	2.5ϕ/3ϕ	fine sand/very fine sand	0.30 ϕ	very well sorted
BR1	3.5ϕ/4ϕ	very fine sand/coarse silt	0.78 ϕ	moderately sorted

TABLE 8 (cont.): Grain-size Data for Surface Samples

Sample	skewness (Folk and Ward, 1957)	skewness term (Folk,1974)
T1-1	0.05	near symmetrical
T1-2	-0.11	coarse skewed
T1-3	0.04	near symmetrical
T1-4	-0.14	coarse skewed
T1-5	0.07	near symmetrical
T1-6	-0.17	coarse skewed
T1-7	-0.14	coarse skewed
T1-8	0.40	strongly fine skewed
T2-1	0.06	near symmetrical
T2-2	0.20	fine skewed
T2-3	-0.08	near symmetrical
T2-4	-0.07	near symmetrical
T2-5	0.06	near symmetrical
T2-6	-0.06	near symmetrical
T3-S	0.41	strongly fine skewed
T3-1	-0.12	coarse skewed
T3-2	0.66	strongly fine skewed
T3-3	-0.54	strongly coarse skewed
T3-4	0.78	strongly fine skewed
T3-5	0.81	strongly fine skewed
T3-6	0.10	fine skewed
T3-7	0.06	near symmetrical
T3-8	0.26	fine skewed
T4-S	0.46	strongly fine skewed
T4-1	0.81	strongly fine skewed
T4-2	0.41	strongly fine skewed
T4-3	0.18	fine skewed
T4-4	0.10	fine skewed
T4-5	0.19	fine skewed
T4-6	0.21	fine skewed
T4-7	0.20	fine skewed
T4-8	0.30	fine skewed
BC1	0.14	fine skewed
BC2	0.21	fine skewed
BC3	0.29	fine skewed
BR1	0.01	near symmetrical

TABLE 9. Definitions for Salinity Terms Used in this Study

Term	Salinity Range	Comment
Polyhalobous	> 30 ‰	**includes "marine" species**
Mesohalobous	0.2-30 ‰	**includes all "brackish" species**
a-Mesohalobous	10-30 ‰	includes species of"higher" brackish conditions
b-Mesohalobous	0.2-10 ‰	includes species of "lower" brackish conditions
Oligohalobous	< 0.2 ‰	**includes all "freshwater" species**
Halophilous		stimulated by small amounts of salt
Indifferent		tolerates small amounts of salt
Halophobous		does not tolerate small amounts of salt
Euryhalobous (Euryhalinous)		occurring over broad ranges of salt concentration, often encompassing two or more large spectral designations

(Modified from Hustedt (1957))