Interfacial Geochemistry and Macrofauna at a New Salmon Farm in Passamaquoddy Bay, Bay of Fundy

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ABSTRACT

Wildish, D.J., Akagi, H.M., and Hamilton, N. 2005. Interfacial geochemistry and macrofauna at a new salmon farm in Passamaquoddy Bay, Bay of Fundy. Can. Tech. Rep. Fish. Aquat. Sci. 2574: iii + 40 p.

In 1998, a new fish farm with a planned capacity of 240,000 Atlantic salmon commenced operations in Passamaquoddy Bay. Presented here are interfacial geochemical results (Eh_{NHE} and $S^{=}$) over an 18-mo period which spanned the first production cycle at the farm. Six locations within ~150 m of the salmon cages were sampled on 14 occasions. The results are interpreted on a seasonal basis, with our new understanding of the limitations of redox potential monitoring (Wildish et al. 2004). Total sulfide reached a median of 11,500 and range of 2,100 to 22,000 µM at all six locations by the end of the production cycle, and reflected the food utilization at this farm. A pre-operational study of the benthic macrofauna at the same locations showed that a predominantly deposit feeding community was present, which was consistent with the net depositional nature of sediments at the farm.

RÉSUMÉ

Wildish, D.J., Akagi, H.M., and Hamilton, N. 2005. Interfacial geochemistry and macrofauna at a new salmon farm in Passamaquoddy Bay, Bay of Fundy. Can. Tech. Rep. Fish. Aquat. Sci. 2574: iii + 40 p.

En 1998, une nouvelle exploitation piscicole, d'une capacité prévue de 240 000 saumons atlantique, a démarré dans la baie Passamaquoddy. On trouvera ici des résultats d'analyses géochimiques interfaciales (Eh_{NHE} et $S^{=}$) sur une période de dix-huit mois qui englobait le premier cycle de production dans cette exploitation. Six emplacements, situés dans un rayon de ~150 m des cages à saumon, ont été échantillonnés à 14 reprises. Les résultats sont interprétés en fonction de la saison, à la lumière de nos nouvelles connaissances sur les limites de la surveillance du potentiel d'oxydoréduction (Wildish et al, 2004). Les concentrations totales de sulfure dans les sédiments interfaciaux reflétaient l'utilisation des aliments dans cette exploitation. Elles atteignaient une valeur médiane de 11 500 µM et se situaient dans une fourchette de 2 100 à 22 000 µM dans la totalité des six emplacements à la fin du cycle de production. Une étude de la macrofaune benthique réalisée aux mêmes emplacements préalablement à l'entrée en service de l'exploitation révélait la présence d'une communauté essentiellement déposivore, ce qui est compatible avec les sédiments de dépôt net qui caractérisent l'exploitation.

INTRODUCTION

During 1998 a new salmon farm began operating in Passamaquoddy Bay, with a planned number of 240,000 smolts to be added to polar circle cages. Our initial sampling at this farm was at six locations, for macrofauna, on 8 May 1998. At this time only one of the cages held smolts and thus our macrofaunal sampling represented a pre-operational (before mariculture start-up) condition of the benthos. We were able to follow the buildup of organic enrichment in interfacial (= surficial, upper 2-cm layer) sediments, using geochemical methods, during most of the first production cycle (smolt introduction in spring 1998 to marketing fish in the fall/winter of 1999). Geochemical sampling was at irregular times (on 14 occasions) between 27 May 1998 and 8 October 1999 at the same six locations sampled for macrofauna.

We present here the macrofaunal and geochemical data obtained during the 18-mo period that we sampled at this salmon farm. Unfortunately, financial constraints precluded full taxonomic analysis of a planned post-operational series of 18 macrofaunal grab samples at the same six, established locations.

SAMPLING METHODS

The locations sampled were aligned along the prevailing current direction, a SW–NE transect running through the middle of the salmon farm (Fig. 1). Location 01 was sampled with the vessel tied up to the inner (yellow) buoys adjacent to the outer-most polar circle cage. Then steaming south westerly the next location, 02, was ~50 m away from the first and a final location, 03, a further ~50 m away, approximately in line with the outer (red) buoys which acted as lease area markers. A mirror image of this transect was repeated on the opposite side of the cages. In this case, the transect steamed was northeasterly, with location 04 nearest to the fish cages and 06 in line with the outer buoys. Sampling locations and their coordinates were taken from the GPS aboard the RV Pandalaus III (from which all sampling was conducted) and recorded in Table 1. Unfortunately the GPS data recorded here are pre-GAPS (grab acoustic positioning system, see in Mckeown et al., unpublished), so the sampling locations cannot be accurately determined. The sampling depth (Table 1) ranged from 37-42 m.

Grab sampling was completed from the RV Pandalaus III with a Hunter-Simpson, 0.1-m^2 grab (Wildish 1983) which was deployed with the aid of the main winch and boom from the stern. Three replicate grabs (A, B, C) were taken at each location (Table 1). Each grab sample was sieved separately through a 5-mm^2 and 1-mm^2 mesh with running seawater. Sieve contents were collected in individual, large plastic buckets and then added to a smaller bucket to which an appropriate volume of 40% formalin was added to seawater in the bucket to give a 5–10 % solution. Marked plastic lids were then hammered into place for secure transport to the Atlantic Reference Centre (ARC) for taxonomic identification. Here the macrofauna were transferred to 30% ethanol, identified to the lowest possible taxa and the density and wet biomass (alcohol weight inclusive of mollusc valves) determined. Because the sampling depths that we encountered exceeded safe SCUBA diving depths (~30m), sediments were sampled with a corer to measure geochemical variables. The same six locations were used as for the macrofaunal sampling, with the Pandalaus III steaming to the locations programmed in the vessels GPS system. The Kajak corer that we used (Wildish et al. 1999) consisted of a brass tube which was

Table 1. Sampling locations in Passamaquoddy Bay as decimal minutes, and depths in metres. All grab samples were completely full with an intact sediment-water interface.

Location	Coordinate North	Coordinate West	Depth m
01 A	45 04.26	67 00.03	39.0
01 B	45 04.34	67 00.14	37.7
01 C	45 04.36	67 00.15	37.0
02 A	45 04.30	67 00.09	39.9
02 B	45 04.29	67 00.11	39.9
02 C	45 04.31	67 00.10	39.6
03 A	45 04.24	67 00.16	41.0
03 B	45 04.24	67 00.16	41.0
03 C	45 04.23	67 00.15	41.0
04 A	45 04.47	66 59.95	41.0
04 B	45 04.45	66 59.93	41.0
04 C	45 04.43	66 59.94	41.0
05 A	45 04.49	66 59.94	42.0
05 B	45 04.47	66 59.97	41.3
05 C	45 04.50	66 59.97	41.0
06 A	45 04.56	66 59.96	41.0
06 B	45 04.56	66 59.93	39.1
06 C	45 04.59	66 59.93	39.0

fitted with a cylindrical core liner tube 50 cm long and 5cm in diameter. A 25-kg weight was attached to the corer to aid in sediment penetration. The assembled corer, after attachment to the winch wire, was allowed to free fall to the sediment (winch brake off). Impact was indicated by wire shudder and the depth at this time recorded from the vessel sonar. Each core liner was drilled at 5-cm intervals to just take a syringe and the hole covered by duct tape before deployment. We used plastic or metal core catchers inserted into the nose of every core to prevent loss of sediment sample. Each core tube was sub-sampled on board with a 5-cc cut-off syringe after peeling away the duct tape. We sub-sampled at the nearest hole to the sediment interface, which was usually within 2 cm of the interface. Syringe contents were extruded into a plastic beaker and the redox potential as Eh_{NHE} in millivolts, and total sulfides as micromoles, determined on board with the same sediment sample, using the methods and protocols outlined in Wildish et al. (1999). At the time we possessed four Orion platinum redox electrodes (Model 96-78) but did not record which were used. Our subsequent work (Wildish et al. 2004) showed that old and new probes could behave variably in oxic sediments. Seasonal temperature data for the local area were available from Robinson et al. (1996) and seasonal information on the total food used at the salmon farm obtained from Mark Moore (pers. comm.).

ANALYSIS

Macrofaunal density and biomass data, shown in Appendices 1 and 2, are given per 0.1-m^2 grab. Hence, multiplying by 10 will express the results per 1.0 m^2. We have expressed biomass and density dominants for the combined 18 grabs, treating them all as replicate samples.

The trophic type analysis was based on a total of 98 species (with a few to genus only) where this was known from previous studies in this area (Wildish and Peer 1983; Wildish et al.1983), as well as 53 species where the trophic type was designated from various sources during this study. The Trophic Ratio (TR) has been calculated on the basis of species (TRS) and density (TRN) as in Wildish (1984), e.g. TRS = number of deposit-feeding species divided by the total of deposit plus suspension feeders, multiplied by 100.

Salmon feeding rates were supplied as pounds of food used per month, including both wet feed from Connor's Brothers, Black's Harbour, and dry feed from Moore-Clarke, Bayside. We converted all rates to tonnes dry weight/month on the basis that wet feed was 64% and dry feed 94% dry matter.

We chose to base the time scale on days after summer solstice (DASS) as shown in Table 2.

Table 2. Methods of expressing cumulative time in the Northern Hemisphere.

Month	Days/Month	Julian days	DASS
January	31	31	224
February	28(29)	59	252
March	31	90	283
April	30	120	313
May	31	151	344
June	30	181	9
July	31	212	40
August	31	243	71
September	30	273	101
October	31	304	132
November	30	334	162
December	31	365	193

In the northern hemisphere we have taken the first day to be 22 June when expressed as DASS (days after the summer solstice). One advantage is that seasonal patterns may be compared directly in northern and southern hemispheres, with day 1 of the summer solstice in the southern hemisphere beginning on 22 December.

RESULTS

MACROFAUNA

The species times density and biomass matrices on which this section is based are shown in Appendices 1 and 2, respectively. Among the biomass dominants (Table 3), two large echinoderms were pre-eminent: *Molpadia oolitica* (rat tailed sea cucumber) and *Cucumaria frondosa* (sea cucumber). Both species were orders of magnitude larger in body size than the other species present in Table 4, where the density dominants were all small-bodied, deposit feeders. In Table 4 the most abundant organisms were unidentified nematodes.

Table 3. Benthic macrofauna biomass dominants collected on 8 May 1998 in 18 grab samples from Passamaquoddy Bay. Trophic types: D = deposit feeder, S = suspension feeder and C = carnivore.

Rank	Taxon	Trophic type	Biomass, g wet·m^{-2}	Density, number·m^{-2}
1	*Molpadia oolitica*	D	3387	110
2	*Cucumaria frondosa*	S	2511	20
3	*Pitar morhuana*	S	234	70
4	*Nephtys incisa*	D/C	1777	840
5	*Micura* sp.	C	118	600
6	*Nucula proxima*	D/S	115	5200
7	*Ctenodiscus crispatus*	D	99	10
8	*Lumbrinereis fragilis*	C	50	70
9	*Yoldia sapotilla*	D	48	1040
10	*Ninoe nigripes*	D	36	7610

Table 4. Benthic macrofauna density dominants collected on 8 May 1998 in 18 grab samples from Passamaquoddy Bay. Trophic types as in Table 3, A = algal scaper.

Rank	Taxon	Trophic type	Density, number·m^{-2}	Biomass, g wet·m^{-2}
1	Nematoda	D	22400	0.18
2	*Ninoe nigripes*	D	7610	36
3	*Mediomastus ambiseta*	D	6410	2
4	*Nucula proxima*	D/S	5200	115
5	*Anobothrus gracilis*	D	3550	9
6	*Aricidea* sp.	D	3460	2
7	*Euchone incolor*	S	2650	0.27
8	Oligochaeta	D	2560	0.25
9	*Frigidoalvania pelagica*	O/A	2520	4
10	*Nucula delphinodonta*	S	2290	13

Of the 104 taxa listed in Appendices 1 and 2, we could assign trophic types to 45 of them from previous work (Wildish et al.1983). We have tentatively assigned trophic types to 53 fully identified species or distinct genera among the remaining taxa (Table 5).

Table 5. Tentative assignment of trophic types to Passamaquoddy Bay benthic macrofauna. Sources of information: 1. http://gmbis.marinebiodiversity.ca/Bay ; 2. Pollock (1998); 3. Wildish et al. (1983).

Species	Trophic group	Source of information
Peachia parasitica	C	1
Cyanophthalma cordiceps	C	1
Hartmania moorei	C	1
Pholoe tecta	C	2
Eteone longa	C	2
Paranaitis speciosa	C	1
Ehlersia cornuta	C	2
Sphaerosyllis sp.	C	2
Clavodorum sp.	S	1
Capitellides giardi	?D	
Praxiella praetermissa	D	2
Rhodine gracilor	D	3
Aricidea quadrilobata	?D	3
Paraonis fulgens	D	2
Levensinea gracilis	D	2
Tharyx sp.	?D	3
Cossura longocirrata	D	2
Galathowenia oculata	S	1
Melinna elizabethae	?D	3
Ampharete lindstroemi	?D	3
Apistobranchus typicus	?D	2
Diplocirrus hirsutus	D	2
Euchone incolor	?S	2
Frigidoalvania pelagica	O/A?	
Astryis zonalis	?C	2
Nassarius trivittatus	O	2
Curitoma incisula	O/A?	
Cylichna alba	O/A?	
Nucula delphinodonta	S	2
Nucula tenuis	D	2
Yoldia sapotilla	S/D or D	3
Nuculana tenuisulcata	D	3
Crenella sp.	S	2
Arctica islandica	S	2
Pitar morrhuana	S	2
Mya arenaria	S	2
Lyonsia hyalina	S	2
Pandora glacialis	?S	2
Periploma fragile	?S	2
Crystallophrisson nitidulum	A	1
Eudorella sp.	?S/A	2

Species	Trophic group	Source of information
Eudorella hispida	S/A	2
Diastylis sp.	?S/A	2
Diastylis quadrispinosa	S/A	2
Diastylis cornuifer	?S/A	2
Campylaspis rubicunda	S	1
Ptilanthura tenuis	C	1
Monoculodes tesselatus	D/O?	2
Metopella angusta	?	
Mayerella limicola	?	
Priapulus caudatus	D	2
Ctenodiscus crispatus	D	2
Cucumaria frondosa	S	2

Of the remaining six taxa, all were identified only to higher group, e.g. Amphipoda, and we did not attempt to assign trophic types to them. We were not able to determine the trophic type of the amphipod genera *Metopella* and *Mayerella* sp. The trophic type designations for gastropods in the above list is tentative and in disagreement with reference 1 in Table 5. A complete list of the trophic types used herein is given in Appendix 3.

Based on the above data we calculated the TRS(%) as 63 and the TRN(%) as 84 for all 18 locations combined.

SEASONAL PATTERN OF SALMON FEEDING

According to the amount of food supplied each month, the feeding rates (Table 6) show that during 1998 the greatest monthly total was supplied in August; whereas in 1999 it was in July. During the months of May to August there was an exponential increase in food utilization, with a slowing trend beginning in September and lasting through the winter. The least amount of food was supplied in February/March.

GEOCHEMISTRY

Dates of sampling for redox potential and total sulfides are shown in Table 7. Interfacial sampling (0-2 cm of sediment) was made on 14 occasions at all six locations near the fish farm and the results recorded in Appendix 4. As for the macrofauna, we have combined all six locations and expressed the results as seasonal patterns of Eh_{NHE} against time (Fig. 2) and total sulfides against time (Fig. 3). The Eh_{NHE} results for the mission of 27 May 1998 are inexplicably low and we have excluded them from presentation in Fig. 2. Unfortunately, the field note book does not record the Zobell standard readings prior to these measurements (although this was routinely done before and after sampling). The pattern in Fig. 2 shows a steady rise from DASS day 31 to day 155, followed by a slow decline to day 417. The last two samples (on days 458 and 473) are markedly negative and lower than the declining trend of the earlier samples. The total sulfide results for interfacial sediments (Fig. 3) shows a small exponential increase to DASS day 155 followed by a decline. There is a second more substantial exponential increase peaking at day 458.

Table 6. Fish feed utilization as monthly totals at a Passamaquoddy Bay salmon farm. Dry biomass after converting wet and dry feed based on known moisture contents.

Year	Month	Tonnes	Cumulative tonnes	Cumulative DASS Last day of month
1998	May	7.3	7.3	-
	June	17.6	24.9	9
	July	40.0	64.9	40
	August	62.2	127.1	71
	September	52.0	179.1	101
	October	36.5	215.6	132
	November	?	?	162
	December	28.0	243.6	193
1999	January	21.5	265.1	224
	February	9.7	274.8	252
	March	2.8	277.6	282
	April	9.9	287.5	313
	May	41.8	329.3	344
	June	64.4	393.7	374
	July	107.6	501.3	405
	August	83.5	584.8	436
	September	84.4	669.2	486

Table 7. Dates of sampling at locations 01 to 06, Passamaquoddy Bay during 1998-1999.

Mission #	Year	Date	Cumulative DASS day
2	1998	27 May	-
3		22 July	31
4		24 August	64
5		28 August	68
6		18 September	89
7		27 October	128
8		23 November	155
9	1999	7 January	200
10		1 March	284
11		12 May	325
12		5 July	379
13		13 August	417
14		23 September	458
15		8 October	473

Preliminary coring results taken at the beginning of this study (not shown) had suggested that the sediment profile in the area sampled lacked a redox potential discontinuity (RPD), that is, a region of the profile, where Eh changed from positive to negative as a result of the dominance of sulphate-reducing anaerobic bacteria. We repeated these observations with three cores sampled on 26 August 2004 with the results shown below (Table 8).

Table 8. Core profiling results on 26 August 2004 at the following reference locations: (3). 45 04.967N, 66 59.866W,depth 62 m; (4). 45 04.971N, 66 59.866W, depth 63.3 m;(5.) 45 05.077N, 66 59.867W, depth 37m. Eh is corrected to the normal hydrogen electrode, in mV, and $S^{=}$ is total sulphide in µM. Samples 3 and 4 were in a pockmark.

Depth	3		4		5	
cm	Eh	$S^{=}$	Eh	$S^{=}$	Eh	$S^{=}$
0-2	74.6	275	22.8	897	30.8	14.5
2-4	103.5	639	150.8	1070	67.1	405
4-6	114.0	1380	69.8	1360	71.1	635
6-8	107.2	1120	48.6	1390	57.8	892
8-10	98.2	1790	54.6	1810	23.0	1150
10-12	93.5	1420	54.9	1450	39.0	1460
12-14	128.5	1630	113.0	1550	65.8	1940
14-16	80.0	1400	147.2	1630	64.5	1900
16-18	117.5	1390	144.0	1640	42.0	2010
18-20	128.5	1680	66.8	1750	31.1	?
20-22	61.5	1950	42.0	2040		
22-24	50.0	1910	-14.0	2050		
24-26	43.2	2960	111.5	1650		
26-28	12.0	2500	93.2	2290		
28-30	32.5	2110	34.6	1780		
30-32	30.5		-18.9	2900		
32-34			-28.0	2300		

DISCUSSION

A farm pre-operational survey of the benthic macrofauna provided a structural and functional snapshot of the community existing prior to the salmon farm start-up beginning in May 1998. The macrofaunal community was mixed, consisting of both suspension-and deposit-feeding species, although biased to deposit feeders (TRS = 63%). This is consistent with the Holocene clay sediments reported to be present (Pecore and Fader 1990) and the net depositional nature of the deposits. The majority (by abundance) of the macrofauna found at six locations near the farm were small-bodied deposit feeders which trophically depend on autochthonous and allochthonous organic particles (from both marine and terrestrial sources) after they have reached the sediment surface.

In interpreting the geochemical results we have taken into account recent findings regarding redox potential measurements (Wildish et al. 2004). Two difficulties in interpreting Eh results were identified: probe poisoning and an inherent difficulty in oxic sediments caused by poorly poised sediments. Poor poising is due to the multiplicity of redox couples present in oxic sediments and consequent long period required to reach equilibrium. Poor poising is demonstrated by coring results at reference locations (Table 8) where profiles of Eh do not have a coherent pattern, consistent with oxic conditions. By contrast total sulfide levels increase exponentially with depth (at least to the maximum we were able to sample). Reference cores in Passamaquoddy Bay do not have a clear redox potential discontinuity, marked by sudden increase in sulphide and/or sediment darkening. Our farm-related sediments have a profile with a characteristic darkening (indicating anoxia and the dominance of sulphate reducing bacteria) from the sediment interface downwards for various depths.

Whether the Eh probe used for the 1998-99 results presented here was poisoned ('old' or 'new') is unknown, although results shown in Appendix 4 suggest it to be 'old'. We have compared the Eh_{NHE} seasonal results from Lime Kiln Bay (Wildish et al. 2001) with the present results (Fig. 4). After ~day 100, the Passamaquoddy Bay (PB) results are markedly lower than potentials measured in Lime Kiln Bay (LKB). This is consistent with Eh, following the seasonal dissolved oxygen concentrations in seawater as suggested by Whitfield (1974) at LKB, whereas the Eh at PB becomes increasingly negative as a result of the buildup of $S^{=}$. By days 458 and 473 Eh is very negative, consistent with high $S^{=}$ levels in interfacial sediments. In contrast to Eh, total sulfide concentrations provide values which are consistent with organic carbon enrichment from the farm. The highest $S^{=}$ values are found on day 458 (23 September1999), when the median at each one of the six individual locations at the farm exceeded 6000 µM $S^{=}$, that is to say, reached an anoxic state in interfacial sediments, according to the organic enrichment index of Wildish et al. (1999). As expected, the locations nearest the farm had higher $S^{=}$ values (see Appendix 4) than those more distant, although on day 458 locations running in a NE direction (locations 4, 5 and 6) had higher values than those in a SW direction (1, 2 and 3). This is consistent with the known residual circulation of Passamaquoddy Bay (Chevrier and Trites1960), which would tend to carry particles in a net NE direction from this location.

A composite pattern of the seasonal changes at the farm in Passamaquoddy Bay is shown in Fig. 5. The summer rise in seawater temperatures helps drive the feeding intake of growing salmon, as well as to increase the metabolism of the benthic community. Exponential peaks of feeding by salmon are mirrored by exponential peaks of total sulfide buildup in interfacial sediments, although with a ~40-80 day delay.

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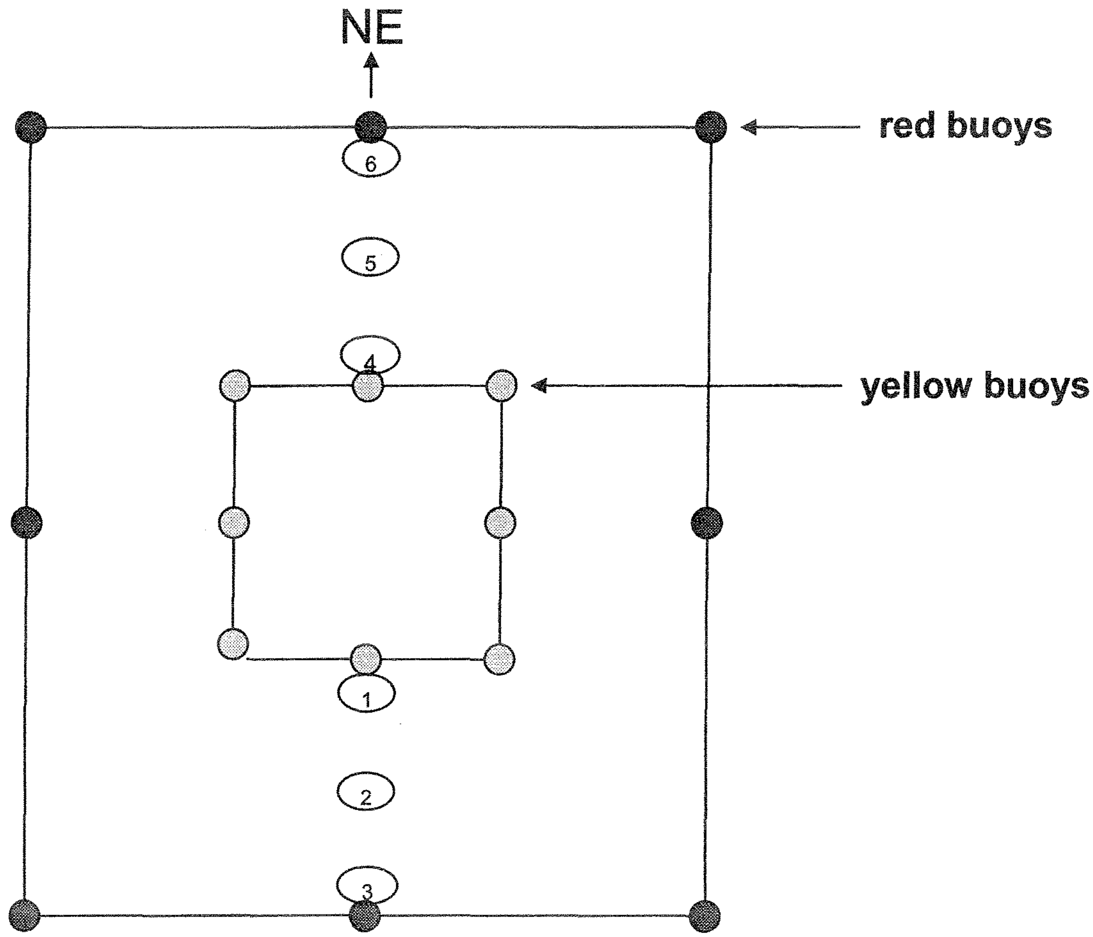

Fig. 1. Plan of the Passamaquoddy Bay salmon farm lease area. The distance from the yellow to red buoys is approximately 150 m.

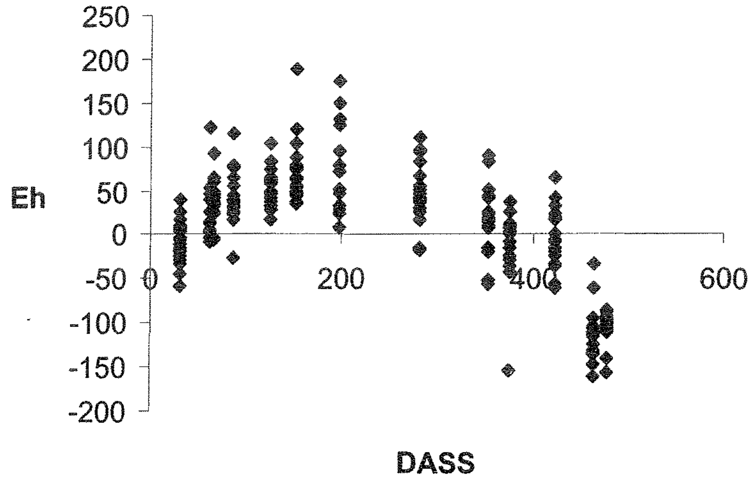

Fig. 2. Seasonal patterns in 1998-99 of interfacial Eh_{NHE} at six locations near a Passamaquoddy Bay salmon farm. Three replicate determinations made at each location.

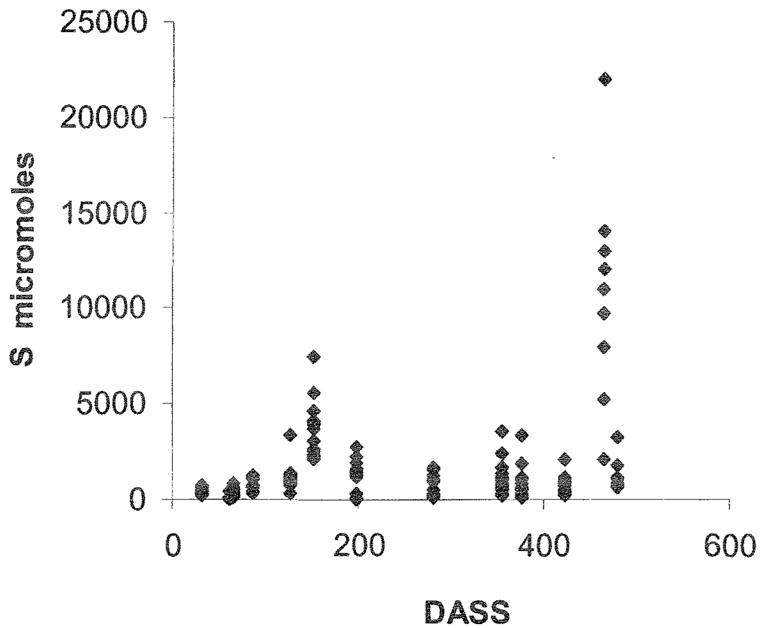

Fig. 3. Seasonal patterns in 1998-99 of interfacial total sulphide, µM, at six locations near a Passamaquoddy Bay salmon farm. Three replicate determinations made at each location.

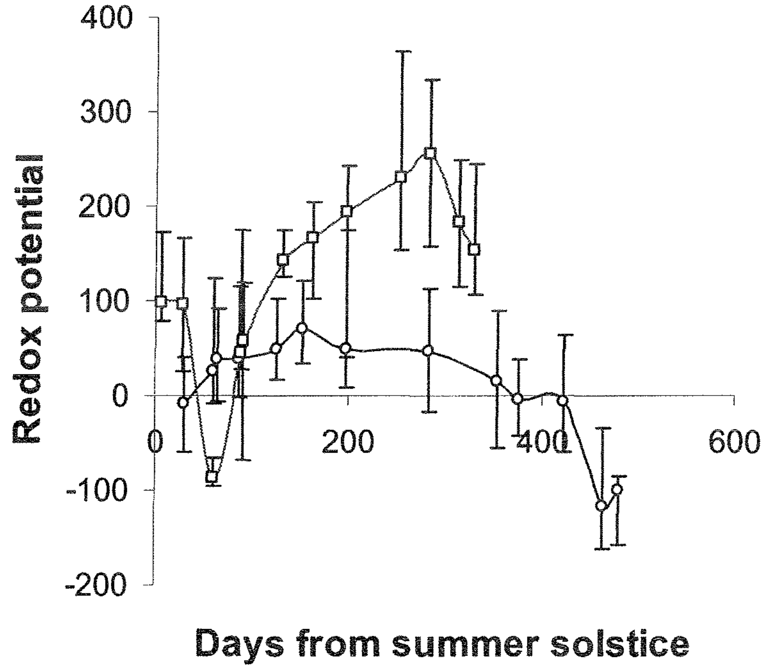

Fig. 4. Seasonal comparison of the median and range of Eh_{NHE} for Lime Kiln Bay reference location E (upper curve) in 2000-01 (Wildish et al. 2002) and the Passamaquoddy Bay salmon farm data, 1998-99 shown in Fig.1.

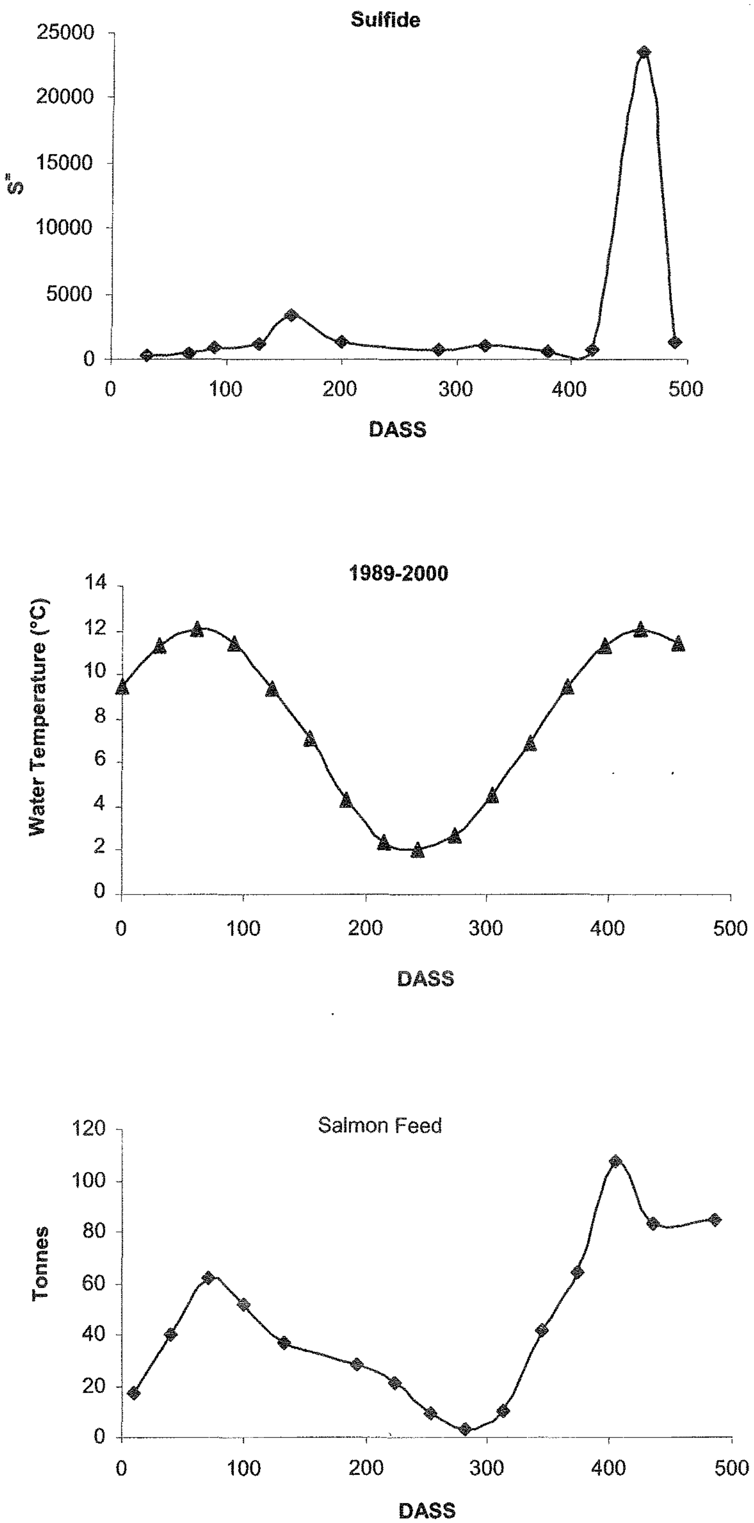

Fig. 5 Seasonal composite diagram during 1998-99 to show interfacial sediment total sulphide, µM, seawater temperature, degrees C, and monthly feed utilization at a Passamaquoddy Bay salmon farm.

Appendix 1. Macrofaunal species density (number/0.1m^2) matrix for 6 locations in Passamaquoddy Bay, with 3 replicate grabs/location sampled on 8th May 1998.

Replicate A

Binomen	TS01A	TS02A	TS03A	TS04A	TS05A	TS06A
Peachia parasitica	1	0	1	0	0	2
Nemertea (juveniles)	0	0	0	2	0	0
Micrura sp.	1	1	7	2	4	2
Cyanophthalma cordiceps	0	0	5	0	0	1
Nematoda	79	29	466	188	145	76
Polychaeta (pieces)	1	1	1	1	1	0
Harmothoe imbricata	1	0	0	0	0	0
Hartmania moorei	1	0	0	0	0	0
Pholoe sp.	0	0	1	0	1	0
Pholoe minuta	0	4	0	2	1	1
Pholoe tecta	0	0	0	0	0	0
Eteone longa	3	1	2	5	2	5
Paranaitis speciosa	0	0	0	0	0	0
Exogone verugera	0	0	0	0	0	0
Ehlersia cornuta	0	1	0	0	0	0
Sphaerosyllis sp.	0	0	0	0	0	0
Nephtys incisa	2	10	6	2	3	2
Clavodorum sp.	0	0	0	0	0	0
Scalibregma inflatum	0	0	0	0	0	0
Capitella capitata	0	0	0	3	0	0
Mediomastus ambiseta	31	12	39	70	17	52
Capitellides giardi	3	8	4	5	0	6
Maldane sarsi	0	2	0	0	0	0
Praxillella praetermissa	0	5	1	0	0	1
Rhodine gracilior	1	4	1	3	0	6
Sternaspis scutata	1	2	0	1	0	1
Aricidea sp.	6	12	18	38	10	18
Aricidea quadrilobata	8	3	10	19	3	5
Paraonis fulgens	0	0	0	3	1	3
Levensinea gracilis	11	12	17	17	10	12
Prionospio steenstrupi	0	0	0	0	0	0
Lumbrineris sp.	5	10	18	8	7	4
Lumbrineris fragilis	0	1	0	1	0	0
Lumbrineris impatiens	3	8	1	9	2	2
Ninoe nigripes	36	34	26	49	33	55
Tharyx sp.	7	5	1	3	0	8
Chaetozone setosa	1	2	10	6	1	3
Cossura longocirrata	9	2	30	16	5	9
Galathowenia oculata	2	4	7	3	0	3
Asabellides oculata	0	0	0	0	0	0

Binomen	TS01A	TS02A	TS03A	TS04A	TS05A	TS06A
Melinna elizabethae	1	0	0	0	0	0
Ampharete lindstroemi	11	6	5	17	2	2
Anobothrus gracilis	14	22	22	34	2	11
Terebellidae	0	0	0	0	0	0
Polycirrus medusa	0	0	0	0	0	0
Terebellides stroemi	2	2	3	6	1	4
Trichobranchus glacialis	0	0	2	1	0	1
Apistobranchus typicus	0	0	0	0	0	0
Pherusa plumosa	0	0	0	0	0	0
Brada villosa	0	0	0	0	0	0
Diplocirrus hirsutus	0	1	0	0	0	0
Potamilla neglecta	0	0	0	0	0	0
Euchone incolor	11	8	39	21	13	6
Oligochaeta	22	2	8	22	25	11
Frigidoalvania pelagica	4	31	11	24	7	16
Astryis zonalis	0	1	0	0	0	0
Nassarius trivittatus	0	0	0	0	0	0
Curitotoma incisula	0	0	0	0	0	0
Cylichna alba	0	7	1	2	1	2
Pelecypoda	0	0	0	0	0	0
Nucula sp.	0	0	1	0	5	9
Nucula proxima	20	27	20	33	27	49
Nucula delphinodonta	6	22	8	19	7	18
Nucula tenuis	2	1	2	1	1	0
Yoldia sapotilla	1	9	5	5	2	7
Nuculana tenuisulcata	1	3	0	0	0	0
Modiolus modiolus	0	2	0	3	0	0
Musculus niger	0	0	0	0	0	0
Crenella sp.	0	1	0	0	0	0
Crenella glandula	1	0	0	0	0	0
Astare undata	0	0	0	0	0	0
Cyclocardia borealis	0	0	1	1	1	0
Arctica islandica	0	0	1	0	0	0
Cerastoderma pinnulatum	0	2	0	0	0	0
Pitar morrhuana	0	0	2	1	0	0
Mya arenaria	1	11	5	13	0	12
Lyonsia hyalina	0	2	2	2	1	0
Pandora glacialis	0	0	0	0	0	0
Periploma fragile	2	1	3	2	1	3
Thyasira flexuosa	3	4	2	3	0	4
Crystallophrisson nitidulum	1	1	0	0	0	0
Ostracoda	0	0	1	2	0	0
Cumacea	0	0	0	1	0	0
Eudorella sp.	0	1	0	3	1	1
Eudorella hispida	2	2	4	6	0	6

Binomen	TS01A	TS02A	TS03A	TS04A	TS05A	TS06A
Diastylis sp.	0	0	0	1	0	0
Diastylis quadrispinosa	0	0	0	0	1	0
Diastylis sculpta	0	0	0	0	0	1
Diastylis cornuifer	0	0	0	0	0	0
Campylaspis rubicunda	0	1	0	1	0	0
Ptilanthura tenuis	0	0	0	1	0	1
Amphipoda	0	0	0	0	0	0
Argissa hamatipes	0	0	0	0	0	0
Anonyx sarsi	0	0	0	0	1	0
Monoculodes tesselatus	0	0	0	0	0	0
Phoxocephalus holbolli	0	0	0	0	0	0
Metopella angusta	0	0	0	0	0	0
Mayerella limicola	1	2	1	0	0	1
Phascolion strombi	0	0	0	0	0	0
Priapulus caudatus	0	0	0	0	0	0
Ctenodiscus crispatus	0	0	0	0	0	0
Ophiura sarsi	0	0	0	0	1	0
Cucumaria frondosa	0	0	0	0	0	0
Molpadia oolitica	0	0	1	1	0	0

Replicate B

Binomen	TS01B	TS02B	TS03B	TS04B	TS05B	TS06B
Peachia parasitica	0	1	1	0	1	0
Nemertea (juveniles)	2	9	4	0	2	1
Micrura sp.	0	3	8	8	3	6
Cyanophthalma cordiceps	0	0	0	1	1	2
Nematoda	84	61	98	176	80	51
Polychaeta (pieces)	1	1	1	1	1	1
Harmothoe imbricata	1	0	0	0	0	0
Hartmania moorei	1	0	0	0	0	0
Pholoe sp.	0	0	3	1	0	0
Pholoe minuta	4	0	3	0	1	1
Pholoe tecta	3	0	0	0	0	2
Eteone longa	3	3	5	2	3	1
Paranaitis speciosa	1	0	0	0	0	0
Exogone verugera	0	0	1	0	0	0
Ehlersia cornuta	0	0	0	0	0	0
Sphaerosyllis sp.	0	0	0	0	1	0
Nephtys incisa	10	8	3	1	3	7
Clavodorum sp.	0	0	1	0	0	0
Scalibregma inflatum	0	0	0	0	0	0
Capitella capitata	0	0	0	0	0	0
Mediomastus ambiseta	44	30	40	24	20	40

Binomen	TS01B	TS02B	TS03B	TS04B	TS05B	TS06B
Capitellides giardi	5	1	8	0	3	10
Maldane sarsi	0	0	3	0	0	1
Praxillella praetermissa	2	0	2	0	1	0
Rhodine gracilior	0	2	4	1	3	1
Sternaspis scutata	1	0	1	0	0	2
Aricidea sp.	20	20	19	23	19	13
Aricidea quadrilobata	4	0	14	6	7	6
Paraonis fulgens	0	0	2	0	2	1
Levensinea gracilis	11	10	16	7	4	10
Prionospio steenstrupi	1	0	1	0	0	0
Lumbrineris sp.	6	4	13	3	5	5
Lumbrineris fragilis	0	0	0	0	0	1
Lumbrineris impatiens	7	5	6	4	4	3
Ninoe nigripes	53	37	34	40	50	69
Tharyx sp.	2	4	4	4	4	6
Chaetozone setosa	9	5	8	6	3	4
Cossura longocirrata	4	14	16	3	8	4
Galathowenia oculata	4	3	2	0	0	7
Asabellides oculata	1	0	1	0	0	0
Melinna elizabethae	0	0	0	0	0	0
Ampharete lindstroemi	5	2	7	4	3	6
Anobothrus gracilis	23	28	30	17	26	23
Terebellidae	0	0	0	0	0	0
Polycirrus medusa	1	0	0	0	0	0
Terebellides stroemi	7	8	6	1	3	5
Trichobranchus glacialis	2	4	0	1	1	3
Apistobranchus typicus	0	1	0	0	0	0
Pherusa plumosa	0	1	1	0	0	0
Brada villosa	0	0	1	0	0	0
Diplocirrus hirsutus	0	0	0	0	0	0
Potamilla neglecta	0	0	0	0	0	0
Euchone incolor	15	20	26	9	14	5
Oligochaeta	21	19	7	15	9	7
Frigidoalvania pelagica	16	9	15	13	13	12
Astryis zonalis	0	1	2	0	0	0
Nassarius trivittatus	0	0	0	0	0	0
Curitotoma incisula	0	0	0	0	0	0
Cylichna alba	3	3	1	1	1	2
Pelecypoda	0	0	0	0	0	0
Nucula sp.	3	2	2	0	0	0
Nucula proxima	16	26	34	32	43	27
Nucula delphinodonta	6	22	13	13	20	18
Nucula tenuis	1	2	2	1	3	0
Yoldia sapotilla	21	9	3	1	3	4
Nuculana tenuisulcata	0	1	0	0	0	2

Binomen	TS01B	TS02B	TS03B	TS04B	TS05B	TS06B
Modiolus modiolus	0	0	1	1	0	0
Musculus niger	0	0	0	0	0	2
Crenella sp.	0	0	0	0	0	0
Crenella glandula	2	0	0	0	0	0
Astare undata	0	0	0	0	0	0
Cyclocardia borealis	0	1	1	0	0	0
Arctica islandica	0	0	0	0	0	0
Cerastoderma pinnulatum	0	0	0	0	0	0
Pitar morrhuana	1	0	0	0	0	0
Mya arenaria	15	7	11	1	4	8
Lyonsia hyalina	0	1	0	2	0	0
Pandora glacialis	0	1	0	0	0	0
Periploma fragile	2	4	4	1	1	1
Thyasira flexuosa	3	1	2	0	3	1
Crystallophrisson nitidulum	0	1	0	0	0	0
Ostracoda	1	0	1	0	0	0
Cumacea	0	0	1	0	2	0
Eudorella sp.	4	9	2	5	1	4
Eudorella hispida	1	4	8	1	4	2
Diastylis sp.	0	1	2	1	0	0
Diastylis quadrispinosa	1	0	0	0	0	0
Diastylis sculpta	0	1	0	0	1	0
Diastylis cornuifer	0	0	1	0	0	0
Campylaspis rubicunda	0	0	0	0	0	0
Ptilanthura tenuis	0	1	0	0	0	0
Amphipoda	0	0	0	0	1	0
Argissa hamatipes	0	1	0	1	0	0
Anonyx sarsi	0	0	0	0	0	0
Monoculodes tesselatus	0	1	0	0	0	0
Phoxocephalus holbolli	0	0	1	0	0	0
Metopella angusta	0	2	0	0	0	0
Mayerella limicola	0	1	1	1	1	0
Phascolion strombi	0	1	0	0	0	0
Priapulus caudatus	0	2	0	1	0	0
Ctenodiscus crispatus	0	0	0	0	0	0
Ophiura sarsi	0	0	0	0	0	0
Cucumaria frondosa	2	0	0	0	0	0
Molpadia oolitica	1	1	0	0	2	0

Replicate C

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Peachia parasitica	0	0	0	0	1	0
Nemertea (juveniles)	1	0	4	1	2	1
Micrura sp.	3	1	1	2	5	3

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Cyanophthalma cordiceps	0	0	0	0	0	0
Nematoda	429	16	152	36	34	40
Polychaeta (pieces)	1	1	1	1	1	1
Harmothoe imbricata	0	0	0	0	0	0
Hartmania moorei	0	0	0	0	0	0
Pholoe sp.	2	0	0	1	0	0
Pholoe minuta	2	1	1	2	1	5
Pholoe tecta	0	0	0	0	0	0
Eteone longa	5	3	3	10	4	1
Paranaitis speciosa	0	0	0	0	0	0
Exogone verugera	0	0	0	0	0	0
Ehlersia cornuta	0	0	0	0	0	0
Sphaerosyllis sp.	0	0	1	0	0	0
Nephtys incisa	6	4	4	6	2	5
Clavodorum sp.	0	0	0	0	0	0
Scalibregma inflatum	1	0	0	0	0	0
Capitella capitata	0	0	1	3	0	3
Mediomastus ambiseta	48	5	40	62	32	35
Capitellides giardi	6	5	2	5	1	2
Maldane sarsi	0	1	1	0	1	3
Praxillella praetermissa	6	1	0	0	0	2
Rhodine gracilior	0	0	1	0	1	3
Sternaspis scutata	0	0	2	0	0	0
Aricidea sp.	28	5	28	32	21	16
Aricidea quadrilobata	5	5	7	16	8	5
Paraonis fulgens	2	0	1	1	0	1
Levensinea gracilis	17	5	17	11	4	8
Prionospio steenstrupi	0	0	0	0	0	0
Lumbrineris sp.	3	0	5	5	7	1
Lumbrineris fragilis	0	1	1	0	0	2
Lumbrineris impatiens	2	5	2	3	1	5
Ninoe nigripes	49	10	29	58	55	44
Tharyx sp.	2	0	2	5	3	4
Chaetozone setosa	15	1	7	9	4	8
Cossura longocirrata	8	0	21	7	1	8
Galathowenia oculata	2	1	1	2	1	6
Asabellides oculata	0	0	0	0	0	0
Melinna elizabethae	0	0	0	0	0	0
Ampharete lindstroemi	12	6	13	12	4	4
Anobothrus gracilis	29	10	14	16	9	25
Terebellidae	1	0	0	0	0	0
Polycirrus medusa	0	0	0	0	0	0
Terebellides stroemi	0	1	1	5	1	2
Trichobranchus glacialis	0	0	0	0	1	1
Apistobranchus typicus	0	0	0	0	0	0

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Pherusa plumosa	0	0	0	0	0	0
Brada villosa	0	0	0	0	0	0
Diplocirrus hirsutus	0	0	0	0	0	0
Potamilla neglecta	0	0	0	0	2	0
Euchone incolor	22	6	18	14	13	5
Oligochaeta	29	3	14	19	8	15
Frigidoalvania pelagica	5	11	9	21	6	29
Astryis zonalis	0	1	0	0	0	2
Nassarius trivittatus	0	0	0	0	0	1
Curitotoma incisula	0	1	0	0	0	0
Cylichna alba	0	2	2	1	1	1
Pelecypoda	0	0	0	1	0	0
Nucula sp.	0	1	3	2	0	1
Nucula proxima	22	11	46	36	32	19
Nucula delphinodonta	7	11	4	20	7	8
Nucula tenuis	0	0	0	2	0	1
Yoldia sapotilla	4	3	5	12	5	5
Nuculana tenuisulcata	0	1	0	0	1	1
Modiolus modiolus	0	0	0	1	2	1
Musculus niger	0	0	0	0	0	0
Crenella sp.	0	0	0	0	0	0
Crenella glandula	1	0	1	0	0	0
Astare undata	0	0	1	0	0	0
Cyclocardia borealis	0	0	0	0	0	0
Arctica islandica	0	0	0	0	0	0
Cerastoderma pinnulatum	0	0	0	0	0	0
Pitar morrhuana	0	0	1	0	1	1
Mya arenaria	4	5	3	5	7	5
Lyonsia hyalina	0	0	0	0	2	1
Pandora glacialis	0	0	0	0	0	0
Periploma fragile	2	1	4	1	1	2
Thyasira flexuosa	2	0	0	5	2	2
Crystallophrisson nitidulum	0	0	1	0	0	0
Ostracoda	1	0	0	0	2	0
Cumacea	2	1	0	0	2	0
Eudorella sp.	2	1	2	1	0	2
Eudorella hispida	0	0	4	2	0	0
Diastylis sp.	0	0	2	0	0	0
Diastylis quadrispinosa	0	0	0	0	0	0
Diastylis sculpta	0	0	0	1	0	2
Diastylis cornuifer	0	0	0	0	0	0
Campylaspis rubicunda	0	0	0	1	1	1
Ptilanthura tenuis	0	0	0	0	1	0
Amphipoda	0	0	0	0	0	0
Argissa hamatipes	3	0	0	0	0	1

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Anonyx sarsi	0	0	0	0	0	0
Monoculodes tesselatus	0	0	0	0	0	0
Phoxocephalus holbolli	1	0	0	0	0	0
Metopella angusta	0	0	0	0	0	0
Mayerella limicola	1	0	0	0	0	0
Phascolion strombi	0	0	0	0	0	0
Priapulus caudatus	0	0	0	0	0	0
Ctenodiscus crispatus	0	0	0	1	0	0
Ophiura sarsi	0	0	0	0	0	1
Cucumaria frondosa	0	0	0	0	0	0
Molpadia oolitica	0	1	1	2	1	0

Appendix 2. Macrofaunal species biomass (grams wet·0.1 m^2) matrix for six locations in Passamaquoddy Bay, with three replicate grabs/location, sampled on 8 May 1998.

Replicate A

Binomen	TS01A	TS02A	TS03A	TS04A	TS05A	TS06A
Peachia parasitica	0.033	0	0.018	0	0	0.105
Nemertea (juveniles)	0	0	0	0	0	0
Micrura sp.	0.009	0.021	0.435	0.112	0.550	0.282
Cyanophthalma cordiceps	0	0	0.015	0	0	0.004
Nematoda	0.001	0.001	0.001	0.001	0.001	0.001
Polychaeta (pieces)	0.670	0.188	0.115	0.214	0.317	0.265
Harmothoe imbricata	0.002	0	0	0	0	0
Hartmania moorei	0.048	0	0	0	0	0
Pholoe sp.	0	0	0.001	0	0.001	0
Pholoe minuta	0	0.001	0	0.001	0.001	0.001
Pholoe tecta	0	0	0	0	0	0
Eteone longa	0.001	0.001	0.001	0.001	0.001	0.002
Paranaitis speciosa	0	0	0	0	0	0
Exogone verugera	0	0	0	0	0	0
Ehlersia cornuta	0	0.001	0	0	0	0
Sphaerosyllis sp.	0	0	0	0	0	0
Nephtys incisa	2.047	1.379	0.609	0.023	0.162	0.112
Clavodorum sp.	0	0	0	0	0	0
Scalibregma inflatum	0	0	0	0	0	0
Capitella capitata	0	0	0	0.011	0	0
Mediomastus ambiseta	0.008	0.002	0.003	0.021	0.002	0.031
Capitellides giardi	0.003	0.046	0.017	0.018	0	0.032
Maldane sarsi	0	0.004	0	0	0	0
Praxillella praetermissa	0	0.017	0.001	0	0	0.001
Rhodine gracilior	0.001	0.031	0.001	0.017	0	0.035
Sternaspis scutata	0.053	0.002	0	0.001	0	0.004
Aricidea sp.	0.001	0.024	0.002	0.008	0.002	0.007
Aricidea quadrilobata	0.001	0.001	0.002	0.006	0.001	0.002
Paraonis fulgens	0	0	0	0.001	0.001	0.001
Levensinea gracilis	0.001	0.001	0.001	0.004	0.001	0.001
Prionospio steenstrupi	0	0	0	0	0	0
Lumbrineris sp.	0.01	0.039	0.066	0.041	0.008	0.018
Lumbrineris fragilis	0	0.011	0	0.051	0	0
Lumbrineris impatiens	0.006	0.015	0.001	0.003	0.001	0.003
Ninoe nigripes	0.136	0.229	0.063	0.226	0.147	0.275
Tharyx sp.	0.004	0.05	0.002	0.002	0	0.072
Chaetozone setosa	0.001	0.001	0.005	0.003	0.001	0.002
Cossura longocirrata	0.001	0.001	0.001	0.001	0.001	0.001
Galathowenia oculata	0.007	0.003	0.01	0.012	0	0.001
Asabellides oculata	0	0	0	0	0	0

Binomen	TS01A	TS02A	TS03A	TS04A	TS05A	TS06A
Melinna elizabethae	0.022	0	0	0	0	0
Ampharete lindstroemi	0.007	0.003	0.002	0.011	0.001	0.001
Anobothrus gracilis	0.041	0.064	0.069	0.089	0.009	0.022
Terebellidae	0	0	0	0	0	0
Polycirrus medusa	0	0	0	0	0	0
Terebellides stroemi	0.003	0.002	0.002	0.003	0.001	0.003
Trichobranchus glacialis	0	0	0.006	0.005	0	0.007
Apistobranchus typicus	0	0	0	0	0	0
Pherusa plumosa	0	0	0	0	0	0
Brada villosa	0	0	0	0	0	0
Diplocirrus hirsutus	0	0.002	0	0	0	0
Potamilla neglecta	0	0	0	0	0	0
Euchone incolor	0.001	0.001	0.002	0.002	0.001	0.001
Oligochaeta	0.001	0.001	0.001	0.001	0.001	0.001
Frigidoalvania pelagica	0.007	0.045	0.011	0.039	0.012	0.032
Astryis zonalis	0	0.001	0	0	0	0
Nassarius trivittatus	0	0	0	0	0	0
Curitotoma incisula	0	0	0	0	0	0
Cylichna alba	0	0.012	0.007	0.002	0.004	0.003
Pelecypoda	0	0	0	0	0	0
Nucula sp.	0	0	0.001	0	0.001	0.004
Nucula proxima	0.431	0.636	0.511	0.836	0.492	1.074
Nucula delphinodonta	0.040	0.105	0.040	0.096	0.031	0.092
Nucula tenuis	0.001	0.001	0.011	0.002	0.002	0
Yoldia sapotilla	0.001	0.603	0.318	0.135	0.182	0.091
Nuculana tenuisulcata	0.001	0.102	0	0	0	0.005
Modiolus modiolus	0	0.001	0	0.001	0	0
Musculus niger	0	0	0	0	0	0
Crenella sp.	0	0.001	0	0	0	0
Crenella glandula	0.001	0	0	0	0	0
Astare undata	0	0	0	0	0	0
Cyclocardia borealis	0	0	0.001	0.018	0.009	0
Arctica islandica	0	0	0.170	0	0	0
Cerastoderma pinnulatum	0	0.002	0	0	0	0
Pitar morrhuana	0	0	17.254	2.355	0	0
Mya arenaria	0.001	0.126	0.106	0.087	0	0.152
Lyonsia hyalina	0	0.001	0.001	0.001	0.001	0
Pandora glacialis	0	0	0	0	0	0
Periploma fragile	0.133	0.001	0.008	0.002	0.06	0.008
Thyasira flexuosa	0.012	0.005	0.007	0.032	0	0.008
Crystallophrisson nitidulum	0.077	0.002	0	0	0	0
Ostracoda	0	0	0.001	0.001	0	0
Cumacea	0	0	0	0.001	0	0
Eudorella sp.	0	0.001	0	0.001	0.001	0.001
Eudorella hispida	0.003	0.002	0.002	0.004	0	0.004

Binomen	TS01A	TS02A	TS03A	TS04A	TS05A	TS06A
Diastylis sp.	0	0	0	0.001	0	0
Diastylis quadrispinosa	0	0	0	0	0.003	0
Diastylis sculpta	0	0	0	0	0	0.001
Diastylis cornuifer	0	0	0	0	0	0
Campylaspis rubicunda	0	0.001	0	0.001	0	0
Ptilanthura tenuis	0	0	0	0.004	0	0.002
Amphipoda	0	0	0	0	0	0
Argissa hamatipes	0	0	0	0	0	0
Anonyx sarsi	0	0	0	0	0.001	0
Monoculodes tesselatus	0	0	0	0	0	0
Phoxocephalus holbolli	0	0	0	0	0	0
Metopella angusta	0	0	0	0	0	0
Mayerella limicola	0.001	0.001	0.001	0	0	0.001
Phascolion strombi	0	0	0	0	0	0
Priapulus caudatus	0	0	0	0	0	0
Ctenodiscus crispatus	0	0	0	0	0	0
Ophiura sarsi	0	0	0	0	0.132	0
Cucumaria frondosa	0	0	0	0	0	0
Molpadia oolitica	0	0	30.062	46.974	0	0

Replicate B

Binomen	TS01B	TS02B	TS03B	TS04B	TS05B	TS06B
Peachia parasitica	*0*	*0.387*	*0.344*	*0*	*0.069*	*0*
Nemertea (juveniles)	0.001	0.008	0.002	0	0.001	0.001
Micrura sp.	0	0.107	1.797	2.078	1.115	1.349
Cyanophthalma cordiceps	0	0	0.001	0	0.002	0.003
Nematoda	0.001	0.001	0.001	0.001	0.001	0.001
Polychaeta (pieces)	0.227	0.172	0.196	0.119	0.197	0.144
Harmothoe imbricata	0.001	0	0	0	0	0
Hartmania moorei	0.055	0	0	0	0	0
Pholoe sp.	0	0	0.001	0.001	0	0
Pholoe minuta	0.001	0	0.001	0	0.001	0.001
Pholoe tecta	0.001	0	0	0	0	0.001
Eteone longa	0.001	0.001	0.002	0.002	0.001	0.001
Paranaitis speciosa	0.005	0	0	0	0	0
Exogone verugera	0	0	0.001	0	0	0
Ehlersia cornuta	0	0	0	0	0	0
Sphaerosyllis sp.	0	0	0	0	0.001	0
Nephtys incisa	1.932	2.010	0.006	0.001	0.011	0.138
Clavodorum sp.	0	0	0.001	0	0	0
Scalibregma inflatum	0	0	0	0	0	0
Capitella capitata	0	0	0	0	0	0
Mediomastus ambiseta	0.023	0.017	0.012	0.013	0.008	0.020

Binomen	TS01B	TS02B	TS03B	TS04B	TS05B	TS06B
Capitellides giardi	0.030	0.006	0.038	0	0.010	0.029
Maldane sarsi	0	0	0.019	0	0	0.001
Praxillella praetermissa	0.002	0	0.007	0	0.001	0
Rhodine gracilior	0	0.042	0.017	0.003	0.006	0.013
Sternaspis scutata	0.001	0	0.001	0	0	0.001
Aricidea sp.	0.036	0.040	0.011	0.007	0.010	0.012
Aricidea quadrilobata	0.007	0	0.009	0.002	0.001	0.003
Paraonis fulgens	0	0	0.001	0	0.001	0.001
Levensinea gracilis	0.001	0.001	0.002	0.001	0.001	0.002
Prionospio steenstrupi	0.001	0	0.001	0	0	0
Lumbrineris sp.	0.015	0.013	0.072	0.003	0.006	0.011
Lumbrineris fragilis	0	0	0	0	0	1.660
Lumbrineris impatiens	0.010	0.031	0.005	0.004	0.004	0.012
Ninoe nigripes	0.218	0.284	0.175	0.178	0.180	0.345
Tharyx sp.	0.027	0.003	0.002	0.002	0.002	0.008
Chaetozone setosa	0.006	0.004	0.003	0.003	0.001	0.002
Cossura longocirrata	0.001	0.001	0.001	0.001	0.001	0.001
Galathowenia oculata	0.006	0.016	0.001	0	0	0.012
Asabellides oculata	0.001	0	0.008	0	0	0
Melinna elizabethae	0	0	0	0	0	0
Ampharete lindstroemi	0.004	0.001	0.004	0.003	0.001	0.003
Anobothrus gracilis	0.023	0.082	0.101	0.046	0.086	0.049
Terebellidae	0	0	0	0	0	0
Polycirrus medusa	0.010	0	0	0	0	0
Terebellides stroemi	0.003	0.002	0.004	0.001	0.001	0.002
Trichobranchus glacialis	0.012	0.037	0	0.002	0.025	0.006
Apistobranchus typicus	0	0.006	0	0	0	0
Pherusa plumosa	0	0.004	0.003	0	0	0
Brada villosa	0	0	0.001	0	0	0
Diplocirrus hirsutus	0	0	0	0	0	0
Potamilla neglecta	0	0	0	0	0	0
Euchone incolor	0.002	0.002	0.002	0.001	0.001	0.001
Oligochaeta	0.002	0.002	0.001	0.002	0.002	0.001
Frigidoalvania pelagica	0.033	0.014	0.039	0.026	0.024	0.022
Astryis zonalis	0	0.008	0.057	0	0	0
Nassarius trivittatus	0	0	0	0	0	0
Curitotoma incisula	0	0	0	0	0	0
Cylichna alba	0.003	0.004	0.003	0.005	0.002	0.002
Pelecypoda	0	0	0	0	0	0
Nucula sp.	0.001	0.001	0.001	0	0	0
Nucula proxima	0.438	0.813	0.629	0.550	1.004	0.568
Nucula delphinodonta	0.030	0.154	0.083	0.072	0.109	0.145
Nucula tenuis	0.001	0.012	0.003	0.004	0.004	0
Yoldia sapotilla	0.460	0.275	0.15	0.001	0.348	0.265
Nuculana tenuisulcata	0	0.016	0	0	0	0.008

Binomen	TS01B	TS02B	TS03B	TS04B	TS05B	TS06B
Modiolus modiolus	0	0	0.001	0.001	0	0
Musculus niger	0	0	0	0	0	0.259
Crenella sp.	0	0	0	0	0	0
Crenella glandula	0.012	0	0	0	0	0
Astare undata	0	0	0	0	0	0
Cyclocardia borealis	0	0.003	0.036	0	0	0
Arctica islandica	0	0	0	0	0	0
Cerastoderma pinnulatum	0	0	0	0	0	0
Pitar morrhuana	0.045	0	0	0	0	0
Mya arenaria	0.167	0.068	0.123	0.002	0.010	0.029
Lyonsia hyalina	0	0.001	0	0.004	0	0
Pandora glacialis	0	0.001	0	0	0	0
Periploma fragile	0.001	0.006	0.007	0.001	0.002	0.001
Thyasira flexuosa	0.002	0.004	0.002	0	0.002	0.002
Crystallophrisson nitidulum	0	0.043	0	0	0	0
Ostracoda	0.001	0	0.001	0	0	0
Cumacea	0	0	0.001	0	0.001	0
Eudorella sp.	0.001	0.002	0.001	0.001	0.001	0.001
Eudorella hispida	0.002	0.004	0.003	0.001	0.001	0.001
Diastylis sp.	0	0.001	0.001	0.001	0	0
Diastylis quadrispinosa	0.005	0	0	0	0	0
Diastylis sculpta	0	0.001	0	0	0.001	0
Diastylis cornuifer	0	0	0.001	0	0	0
Campylaspis rubicunda	0	0	0	0	0	0
Ptilanthura tenuis	0	0.002	0	0	0	0
Amphipoda	0	0	0	0	0.001	0
Argissa hamatipes	0	0.001	0	0.001	0	0
Anonyx sarsi	0	0	0	0	0	0
Monoculodes tesselatus	0	0.001	0	0	0	0
Phoxocephalus holbolli	0	0	0.001	0	0.001	0
Metopella angusta	0	0.001	0	0	0	0
Mayerella limicola	0	0.001	0.001	0.001	0.001	0
Phascolion strombi	0	0.135	0	0	0	0
Priapulus caudatus	0	0.006	0	0.002	0	0
Ctenodiscus crispatus	0	0	0	0	0	0
Ophiura sarsi	0	0	0	0	0	0
Cucumaria frondosa	251.100	0	0	0	0	0
Molpadia oolitica	24.919	28.272	0	0	68.334	0

Replicate C

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Peachia parasitica	0	0	0	0	0.298	0
Nemertea (juveniles)	0.001	0	0.002	0.001	0.001	0.001
Micrura sp.	0.607	0.014	0.488	0.413	1.012	1.398
Cyanophthalma cordiceps	0	0	0	0	0	0
Nematoda	0.001	0.001	0.001	0.001	0.001	0.001
Polychaeta (pieces)	0.176	0.117	0.082	0.278	0.117	0.069
Harmothoe imbricata	0	0	0	0	0	0
Hartmania moorei	0	0	0	0	0	0
Pholoe sp.	0.001	0	0	0.001	0	0
Pholoe minuta	0.001	0.001	0.001	0.002	0.001	0.001
Pholoe tecta	0	0	0	0	0	0.001
Eteone longa	0.001	0.001	0.001	0.003	0.001	0.001
Paranaitis speciosa	0	0	0	0	0	0
Exogone verugera	0	0	0	0	0	0
Ehlersia cornuta	0	0	0	0	0	0
Sphaerosyllis sp.	0	0	0.001	0	0	0
Nephtys incisa	0.624	0.021	2.631	4.302	0.181	1.514
Clavodorum sp.	0	0	0	0	0	0
Scalibregma inflatum	0.013	0	0	0	0	0
Capitella capitata	0	0	0.003	0.020	0	0.010
Mediomastus ambiseta	0.009	0.001	0.008	0.014	0.005	0.011
Capitellides giardi	0.026	0.018	0.006	0.014	0.004	0.008
Maldane sarsi	0	0.003	0.001	0	0.001	0.009
Praxillella praetermissa	0.034	0.003	0	0	0	0.003
Rhodine gracilior	0	0	0.007	0	0.009	0.008
Sternaspis scutata	0	0	0.001	0	0	0
Aricidea sp.	0.016	0.005	0.015	0.016	0.005	0.009
Aricidea quadrilobata	0.002	0.002	0.003	0.005	0.003	0.001
Paraonis fulgens	0.001	0	0.001	0.001	0	0.001
Levensinea gracilis	0.003	0.001	0.003	0.002	0.001	0.001
Prionospio steenstrupi	0	0	0	0	0	0
Lumbrineris sp.	0.003	0	0.036	0.003	0.007	0.001
Lumbrineris fragilis	0	1.286	1.889	0	0	0.072
Lumbrineris impatiens	0.002	0.007	0.001	0.002	0.001	0.006
Ninoe nigripes	0.257	0.038	0.182	0.284	0.222	0.193
Tharyx sp.	0.002	0	0.002	0.013	0.003	0.003
Chaetozone setosa	0.011	0.002	0.004	0.006	0.025	0.006
Cossura longocirrata	0.001	0	0.001	0.001	0.001	0.001
Galathowenia oculata	0.016	0.002	0.001	0.010	0.005	0.009
Asabellides oculata	0	0	0	0	0	0
Melinna elizabethae	0	0	0	0	0	0
Ampharete lindstroemi	0.014	0.006	0.013	0.004	0.004	0.002
Anobothrus gracilis	0.051	0.012	0.044	0.038	0.023	0.048

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Terebellidae	0.005	0	0	0	0	0
Polycirrus medusa	0	0	0	0	0	0
Terebellides stroemi	0	0.002	0.001	0.005	0.001	0.001
Trichobranchus glacialis	0	0	0	0	0.003	0.007
Apistobranchus typicus	0	0	0	0	0	0
Pherusa plumosa	0	0	0	0	0	0
Brada villosa	0	0	0	0	0	0
Diplocirrus hirsutus	0	0	0	0	0	0
Potamilla neglecta	0	0	0	0	0.033	0
Euchone incolor	0.002	0.001	0.002	0.002	0.002	0.001
Oligochaeta	0.002	0.001	0.001	0.002	0.001	0.002
Frigidoalvania pelagica	0.005	0.016	0.013	0.037	0.006	0.056
Astryis zonalis	0	0.007	0	0	0	0.015
Nassarius trivittatus	0	0	0	0	0	0.058
Curitotoma incisula	0	0.100	0	0	0	0
Cylichna alba	0	0.008	0.013	0.004	0.003	0.009
Pelecypoda	0	0	0	0.008	0	0
Nucula sp.	0	0.001	0.001	0.001	0	0.001
Nucula proxima	0.407	0.252	1.059	0.760	0.627	0.425
Nucula delphinodonta	0.037	0.055	0.009	0.098	0.027	0.047
Nucula tenuis	0	0	0	0.004	0	0.010
Yoldia sapotilla	0.526	0.066	0.383	0.325	0.373	0.341
Nuculana tenuisulcata	0	0.005	0	0	0.003	0.003
Modiolus modiolus	0	0	0	0.001	0.001	0.001
Musculus niger	0	0	0	0	0	0
Crenella sp.	0	0	0	0	0	0
Crenella glandula	0.004	0	0.002	0	0	0
Astare undata	0	0	0.008	0	0	0
Cyclocardia borealis	0	0	0	0	0	0
Arctica islandica	0	0	0	0	0	0
Cerastoderma pinnulatum	0	0	0	0	0	0
Pitar morrhuana	0	0	3.014	0	0.625	0.114
Mya arenaria	0.005	0.073	0.015	0.065	0.036	0.024
Lyonsia hyalina	0	0	0	0	0.002	0.001
Pandora glacialis	0	0	0	0	0	0
Periploma fragile	0.435	0.002	0.002	0.003	0.026	0.003
Thyasira flexuosa	0.001	0	0	0.003	0.002	0.001
Crystallophrisson nitidulum	0	0	0.011	0	0	0.006
Ostracoda	0.001	0	0	0	0.001	0
Cumacea	0.001	0.001	0	0	0.001	0
Eudorella sp.	0.001	0.001	0.001	0.001	0	0.001
Eudorella hispida	0	0	0.002	0.001	0	0
Diastylis sp.	0	0	0.001	0	0	0
Diastylis quadrispinosa	0	0	0	0	0	0
Diastylis sculpta	0	0	0	0.001	0	0.001

Binomen	TS01C	TS02C	TS03C	TS04C	TS05C	TS06C
Diastylis cornuifer	0	0	0	0	0	0
Campylaspis rubicunda	0	0	0	0.001	0.001	0.001
Ptilanthura tenuis	0	0	0	0	0.003	0
Amphipoda	0	0	0	0	0	0
Argissa hamatipes	0.002	0	0	0	0	0.001
Anonyx sarsi	0	0	0	0	0	0
Monoculodes tesselatus	0	0	0	0	0	0
Phoxocephalus holbolli	0.001	0	0	0	0	0
Metopella angusta	0	0	0	0	0	0
Mayerella limicola	0.001	0	0	0	0	0
Phascolion strombi	0	0	0	0	0	0
Priapulus caudatus	0	0	0	0	0	0
Ctenodiscus crispatus	0	0	0	9.883	0	0
Ophiura sarsi	0	0	0	0	0	0.146
Cucumaria frondosa	0	0	0	0	0	0
Molpadia oolitica	0	26.069	31.932	57.160	24.926	0

Appendix 3. Macrofaunal species list and trophic types for 18 grab samples at six locations in Passamaquoddy Bay sampled on 8th May 1998.

Binomen	Trophic type
Peachia parasitica	C
Nemertea (juveniles)	
Micrura sp.	C
Cyanophthalma cordiceps	C
Nematoda	D
Polychaeta (pieces)	
Harmothoe imbricata	C
Hartmania moorei	C
Pholoe sp.	C
Pholoe minuta	C
Pholoe tecta	C
Eteone longa	C
Paranaitis speciosa	C
Exogone verugera	D/A/C
Ehlersia cornuta	C
Sphaerosyllis sp.	C
Nephtys incisa	D/C
Clavodorum sp.	S
Scalibregma inflatum	D
Capitella capitata	D
Mediomastus ambiseta	D
Capitellides giardi	?D
Maldane sarsi	D
Praxillella praetermissa	D
Rhodine gracilior	D
Sternaspis scutata	D
Aricidea sp.	D
Aricidea quadrilobata	?D
Paraonis fulgens	D
Levensinea gracilis	D
Prionospio steenstrupi	D
Lumbrineris sp.	C
Lumbrineris fragilis	C
Lumbrineris impatiens	A
Ninoe nigripes	D
Tharyx sp.	?D
Chaetozone setosa	D
Cossura longocirrata	D
Galathowenia oculata	S
Asabellides oculata	D
Melinna elizabethae	?D
Ampharete lindstroemi	?D

Binomen	Trophic type
Anobothrus gracilis	D
Terebellidae	D
Polycirrus medusa	D
Terebellides stroemi	D
Trichobranchus glacialis	D
Apistobranchus typicus	?D
Pherusa plumosa	D
Brada villosa	D
Diplocirrus hirsutus	D
Potamilla neglecta	S
Euchone incolor	?S
Oligochaeta	D
Frigidoalvania pelagica	O/A?
Astryis zonalis	?C
Nassarius trivittatus	O/A?
Curitotoma incisula	O/A?
Cylichna alba	O/A?
Pelecypoda	
Nucula sp.	D/S
Nucula proxima	D
Nucula delphinodonta	S
Nucula tenuis	D
Yoldia sapotilla	S/D or D
Nuculana tenuisulcata	D
Modiolus modiolus	S
Musculus niger	S
Crenella sp.	S
Crenella glandula	S
Astare undata	S
Cyclocardia borealis	S
Arctica islandica	S
Cerastoderma pinnulatum	S
Pitar morrhuana	S
Mya arenaria	S
Lyonsia hyalina	S
Pandora glacialis	?S
Periploma fragile	?S
Thyasira flexuosa	S
Crystallophrisson nitidulum	A
Ostracoda	
Cumacea	
Eudorella sp.	?S/A
Eudorella hispida	S/A
Diastylis sp.	?S/A
Diastylis quadrispinosa	S/A

Binomen	Trophic type
Diastylis sculpta	S
Diastylis cornuifer	?S/A
Campylaspis rubicunda	S
Ptilanthura tenuis	C
Amphipoda	
Argissa hamatipes	D
Anonyx sarsi	D/C/O
Monoculodes tesselatus	D/O?
Phoxocephalus holbolli	D
Metopella angusta	?
Mayerella limicola	?
Phascolion strombi	D
Priapulus caudatus	D
Ctenodiscus crispatus	D
Ophiura sarsi	C
Cucumaria frondosa	S
Molpadia oolitica	D

Appendix 4. Geochemical data for six locations in Passamaquoddy Bay near a salmon farm. The sampling dates are shown and all determinations were completed aboard the sampling vessel. Note that the Eh results for 27 May 1998 were suspect, and for this date we calculated the expected results on the basis of the measured total sulphide values, with the equation: $Eh = 63.287*LN(S^{=}) + 468.14$.

May 27th, 1998

		Observed Eh		Calculated
Station	Sulfide	Raw	Corrected	Eh
1A	670	-360	-146	56.3
1B	410	-415	-201	87.4
1C	310	-425	-211	105.1
2A	260	-441	-227	116.2
2B	290	-488	-274	109.3
2C	190	-415	-201	136.1
3A	560	-422	-208	67.7
3B	720	-373	-159	51.8
3C	490	-358	-144	76.1
4A	650	-470	-256	58.2
4B	210	-439	-225	129.7
4C	420	-480	-266	85.9
5A	330	-446	-232	101.1
5B	270	-434	-220	113.8
5C	660	-425	-211	57.3
6A	570	-480	-266	66.5
6B	430	-517	-303	84.4
6C	470	-519	-305	78.8

Date: July 22nd, 1998

		Observed Eh		Calculated
Station	Sulfide	Raw	Corrected	Eh
1A	680	-237.4	-23.4	55.4
1B	250	-272.6	-58.6	118.7
1C	330	-205.1	8.9	101.1
2A	340	-231.8	-17.8	99.2
2B	190	-188.3	25.7	136.1
2C	170	-210.3	3.7	143.1
3A	570	-257.8	-43.8	66.5
3B	210	-233.5	-19.5	129.7
3C	450	-243.5	-29.5	81.5
4A	230	-174.1	39.9	124.0
4B	550	-247	-33.0	68.8
4C	310	-209.3	4.7	105.1
5A	670	-203.8	10.2	56.3
5B	390	-196.7	17.3	90.6
5C	170	-219.6	-5.6	143.1
6A	410	-228	-14.0	87.4
6B	300	-224.4	-10.4	107.2
6C	280	-218.2	-4.2	111.5

August 24th, 1998

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	150	-183.5	25.5	151.0
1B	50	-206.7	2.3	220.6
1C	81	-183.5	25.5	190.0
2A	420	-169.2	39.8	85.9
2B	17	-204.8	4.2	288.8
2C	110	-162.0	47.0	170.7
3A	46	-182.1	26.9	225.8
3B	1.1	-195.0	14.0	462.1
3C	13	-196.7	12.3	305.8
4A	78	-155.4	53.6	192.4
4B	2.3	-203.4	5.6	415.4
4C	100	-217.5	-8.5	176.7
5A	13	-182.2	26.8	305.8
5B	24	-182.9	26.1	267.0
5C	6.4	-212.5	-3.5	350.7
6A	81	-85.8	123.2	190.0
6B	7.5	-183.3	25.7	340.6
6C	81	-197.2	11.8	190.0

August 28th, 1998

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	290	-116.6	92.4	109.3
1B	180	-172.5	36.5	139.5
1C	410	-167.2	41.8	87.4
2A	340	-143.9	65.1	99.2
2B	370	-148.7	60.3	93.9
2C	580	-164.2	44.8	65.4
3A	670	-176.2	32.8	56.3
3B	440	-161.9	47.1	82.9
3C	310	-215.3	-6.3	105.1
4A	340	-159.6	49.4	99.2
4B	590	-161.9	47.1	64.4
4C	240	-148.5	60.5	121.3
5A	480	-184.3	24.7	77.4
5B	820	-175.7	33.3	43.5
5C	340	-174.4	34.6	99.2
6A	460	-213.5	-4.5	80.1
6B	53	-183.3	25.7	216.9
6C	120	-185.2	23.8	165.2

September 18th, 1998

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	440	-134.3	79.7	82.9
1B	1100	-157.9	56.1	24.9
1C	1300	-181.5	32.5	14.4
2A	1300	-190.1	23.9	14.4
2B	460	-182.3	31.7	80.1
2C	350	-186.9	27.1	97.4
3A	1100	-159.1	54.9	24.9
3B	630	-240.0	-26.0	60.2
3C	1100	-197.3	16.7	24.9
4A	1000	-138.2	75.8	31.0
4B	1000	-169.1	44.9	31.0
4C	730	-99.7	114.3	50.9
5A	1000	-182.6	31.4	31.0
5B	1100	-158.2	55.8	24.9
5C	580	-149.9	64.1	65.4
6A	1200	-173.8	40.2	19.4
6B	330	-183.5	30.5	101.1
6C	720	-176.1	37.9	51.8

October 27th, 1998

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	1200	-110.7	103.3	19.4
1B	3300	-151.8	62.2	-44.6
1C	1200	-185.8	28.2	19.4
2A	810	-152.6	61.4	44.3
2B	920	-131.7	82.3	36.2
2C	1000	-165.2	48.8	31.0
3A	1300	-196.6	17.4	14.4
3B	1300	-176.2	37.8	14.4
3C	1200	-176.8	37.2	19.4
4A	790	-170.9	43.1	45.9
4B	1000	-152.5	61.5	31.0
4C	1100	-166.4	47.6	24.9
5A	1000	-179.9	34.1	31.0
5B	1400	-168.2	45.8	9.7
5C	690	-140.9	73.1	54.5
6A	910	-195.9	18.1	36.9
6B	1200	-155.7	58.3	19.4
6C	350	-148.5	65.5	97.4

November 23rd, 1998

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	4000	-24.7	189.3	-56.8
1B	7400	-167.7	46.3	-95.7
1C	4600	-125.5	88.5	-65.6
2A	2600	-110.4	103.6	-29.5
2B	2200	-139.4	74.6	-18.9
2C	5500	-138.5	75.5	-76.9
3A	3900	-125.9	88.1	-55.2
3B	2500	-136.2	77.8	-27.0
3C	2600	-150.3	63.7	-29.5
4A	2600	-93.1	120.9	-29.5
4B	2200	-148.3	65.7	-18.9
4C	3700	-177.5	36.5	-51.8
5A	2100	-158.2	55.8	-16.0
5B	2300	-135.2	78.8	-21.7
5C	4100	-169.5	44.5	-58.3
6A	2500	-179.2	34.8	-27.0
6B	3000	-160.2	53.8	-38.6
6C	2200	-164.0	50.0	-18.9

January 07, 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	110	-69.9	149.1	170.7
1B	18	-44.2	174.8	285.2
1C	100	-88.9	130.1	176.7
2A	1500	-94.6	124.4	5.3
2B	2200	-168.7	50.3	-18.9
2C	2700	-148.0	71.0	-31.9
3A	300	-124.7	94.3	107.2
3B	1400	-168.0	51.0	9.7
3C	1200	-171.5	47.5	19.4
4A	1100	-140.1	78.9	24.9
4B	1400	-194.6	24.4	9.7
4C	1600	-190.1	28.9	1.2
5A	1200	-172.8	46.2	19.4
5B	1300	-196.2	22.8	14.4
5C	1900	-185.3	33.7	-9.7
6A	2200	-186.1	32.9	-18.9
6B	1500	-172.5	46.5	5.3
6C	1400	-210.1	8.9	-24.4

April 1st, 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	524	-152.2	66.8	71.9
1B	324	-181.6	37.4	102.3
1C	123	-135.5	83.5	163.6
2A	77	-107.3	111.7	192.9
2B	575	-236.2	-17.2	66.0
2C	159	-163.3	55.7	147.3
3A	1050	-175.9	43.1	27.9
3B	567	-193.8	25.2	66.9
3C	546	-179.1	39.9	69.3
4A	981	-172.7	46.3	32.2
4B	490	-121.2	97.8	76.1
4C	1250	-172.8	46.2	16.8
5A	247	-124.5	94.5	119.5
5B	958	-173.2	45.8	33.7
5C	1650	-233.8	-14.8	-0.7
6A	1020	-202.8	16.2	29.7
6B	906	-189.0	30.0	37.2
6C	1530	-167.7	51.3	4.1

May 12th, 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	218	-198.1	15.9	127.4
1B	1360	-130.8	83.2	11.5
1C	3580	-264.9	-50.9	-49.7
2A	181	-172.1	41.9	139.1
2B	844	-162.2	51.8	41.7
2C	543	-232.5	-18.5	69.6
3A	788	-189.0	25.0	46.0
3B	1040	-195.6	18.4	28.5
3C	880	-123.6	90.4	39.1
4A	584	-186.9	27.1	65.0
4B	768	-206.5	7.5	47.7
4C	1030	-203.0	11.0	29.1
5A	1080	-227.9	-13.9	26.1
5B	1640	-206.4	7.6	-0.3
5C	883	-169.3	44.7	38.8
6A	1150	-206.0	8.0	22.1
6B	2450	-270.2	-56.2	-25.7
6C	354	-199.1	14.9	96.7

July 5th, 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	209	-182	27	130.0
1B	530	-171	38	71.1
1C	1860	-245	-36	-8.3
2A	117	-209	0	166.8
2B	294	-196	13	108.4
2C	180	-206	3	139.5
3A	184	-216	-7	138.1
3B	1030	-196	13	29.1
3C	1130	-201	8	23.2
4A	3360	-364	-155	-45.7
4B	224	-252	-43	125.7
4C	616	-233	-24	61.6
5A	236	-225	-16	122.4
5B	324	-223	-14	102.3
5C	222	-171	38	126.2
6A	812	-199	10	44.1
6B	203	-217	-8	131.9
6C	109	-237	-28	171.2

August 13th, 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	860	-269	-60	40.5
1B	1200	-243	-34	19.4
1C	2100	-264	-55	-16.0
2A	190	-185	24	136.1
2B	350	-216	-7	97.4
2C	340	-166	43	99.2
3A	270	-216	-7	113.8
3B	1100	-177	32	24.9
3C	550	-193	16	68.8
4A	390	-186	23	90.6
4B	730	-189	20	50.9
4C	280	-225	-16	111.5
5A	910	-145	64	36.9
5B	1100	-214	-5	24.9
5C	530	-232	-23	71.1
6A	1200	-208	1	19.4
6B	870	-229	-20	39.8
6C	1000	-245	-36	31.0

September 23th 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	12000	-269	-60	-126.3
1B	2100	-242	-33	-161.7
1C	14000	-342	-133	-136.0
2A	13000	-333	-124	-131.4
2B	11000	-319	-110	-120.8
2C	13000	-340	-131	-131.4
3A	9700	-342	-133	-112.8
3B	7900	-325	-116	-99.8
3C	5200	-316	-107	-73.4
4A	120000	-345	-136	-272.0
4b	12000	-303	-94	-126.3
4C	46000	-346	-137	-211.3
5A	13000	-325	-116	-131.4
5B	22000	-325	-116	-164.7
5C	71000	-361	-152	-238.8
6A	12000	-333	-124	-126.3
6B	11000	-322	-113	-120.8
6C	11000	-312	-103	-120.8

October 8th 1999

Station	Sulfide	Observed Eh Raw	Observed Eh Corrected	Calculated Eh
1A	1000	-302	-88	31.0
1B	1800	-298	-84	-6.2
1C	1200	-308	-94	19.4
2A	650	-314	-100	58.2
2B	660	-298	-84	57.3
2C	1200	-326	-112	19.4
3A	1000	-306	-92	31.0
3B	1100	-296	-82	24.9
3C	860	-322	-108	40.5
4A	1000	-321	-107	31.0
4B	3200	-354	-140	-42.6
4C	3200	-371	-157	-42.6
5A	720	-307	-93	51.8
5B	1000	-311	-97	31.0
5C	1100	-316	-102	24.9
6A	820	-312	-98	43.5
6B	1100	-326	-112	24.9
6C	850	-313	-99	41.3