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Seasonal Changes in the Intertidal and Subtidal Macrobenthic Invertebrate Community Structure in Baker Bay, Lower Columbia River Estuary

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Seasonal Changes in the Intertidal and Subtidal Macrobenthic Invertebrate Community Structure in Baker Bay, Lower Columbia River Estuary

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ABSTRACT

Macrobenthic invertebrates and sediments at 1 subtidal and 10 intertidal stations along a transect in Baker Bay of the lower Columbia River estuary were sampled monthly from November 1980 to October 1981. Water column temperatures and salinities were also recorded at the subtidal station. The intertidal community consisted primarily of estuarine species, whereas the subtidal community had additional marine species. Marine species declined in abundance after the interstitial salinity minimum (June), indicating the important role of salinity in determining benthic community structure.

Filamentous algae, tide pools, and eelgrasses (*Zostera* spp.) were also important factors determining macrobenthic invertebrate community structure. By altering sediment characteristics, *Zostera* spp. had a positive effect on deposit feeders and a negative effect on the sand-dwelling amphipod *Eohaustorius estuaris*.

CONTENTS

INTRODUCTION

Changes in the faunal communities of estuaries are caused by physical, chemical, and biological processes. One of the most important physical factors determining the benthic fauna is salinity (Boesh 1977). In intertidal areas where physical conditions are extreme, distinct vertical distributions of benthic fauna have been observed (Brady 1943; Wells and Roberts 1980). Furthermore, benthic infauna diversity and density are affected by vegetative growth, particularly of eelgrass (*Zostera* spp.), which increases sediment stability and interrupts the movement of burrowing animals (Orth 1977; Ringold 1979).

For much of the year, the Columbia River estuary is characterized by low salinity due to large inputs of fresh water. Salinity is highest during late summer-early fall at the river mouth where surface salinity ranges from 5.8 to 30.5‰. Lowest salinity occurs in early summer as a result of snowmelt from the headwaters (Neal 1972). Large tidal fluctuations (>3.0 m) result in extensive tidal flats in the estuary.

The benthic macrofauna in the Columbia River estuary has been well studied (Haertel and Osterberg 1967; Higley and Holton 1975; Sanborn 1975; Higley et al. 1976; Higley and Holton 1978; Higley et al. 1979; Durkin and Emmett 1980; Durkin et al. 1981; Jones 1984). Major components of the benthic macrofauna include: the amphipods *Corophium salmonis*, *C. spinicorne*, and *Eohaustorius estuaris*; the polychaetes *Neanthes limnicola* and *Hobsonia florida*; and the bivalve *Macoma balthica*.

The objectives of this study were to determine the influences of seasonal changes in salinity and the presence of intertidal vegetation on the macrobenthic community and to describe the vertical changes in the benthic fauna along a tidal gradient on an intertidal-subtidal flat in Baker Bay, Columbia River estuary.

METHODS

Study Site

Baker Bay is located on the north side of the lower Columbia River estuary and has broad tidal flats consisting mainly of fine sand (Durkin and Emmett 1980). Eleven stations were sampled along a transect that extended from the mean high water level to the bottom of the adjacent boat channel at the northwest corner of Baker Bay (Fig. 1). Figure 2 depicts a cross section of the study site and shows station locations and the sediment characteristics of each station as observed in February 1981.

At Stations 1 and 2, three-square bullrush (*Scirpus americanus*) surrounded the sandy flats that were sampled. During late summer to early fall, filamentous algal mats, consisting of blue green algae (*Lyngbya* spp.) and a chrysophyte of the genus *Vaucheria*, densely covered the sediment surfaces of some areas at these stations.

Stations 1 through 10 were exposed during extremely low water. Patches of the eelgrasses *Zostera japonica* (on the upper intertidal area, Stations 3-7) and *Z. marina* (on the lower intertidal area, Stations 7-10) grew from July through October. Stations 4 through 7 had ripple marks on the sediment surface indicating relatively frequent wave disturbances.

Station 11, which was located at the bottom of the adjacent boat channel (subtidal), was about 4 m deep at mean low water.

Sampling Procedure

At each station, three benthic invertebrate samples and one sediment core (10 cm deep by 5 cm in diameter) were taken monthly from November 1980 to October 1981 (see Appendix), usually during the second negative tide series. Intertidal stations were sampled for invertebrates using a 506 cm^2 (10 cm deep) metal frame. At the subtidal site (and lower intertidal sites) a 506-cm^2 Ekman-Birge sediment sampler was used. The Ekman-Birge sampler was handled directly by scuba divers, except at Station 11 where it was operated from a research boat using a messenger weight. During the last 2 months, however, this sampler was operated directly by divers at Station 11 (less ship

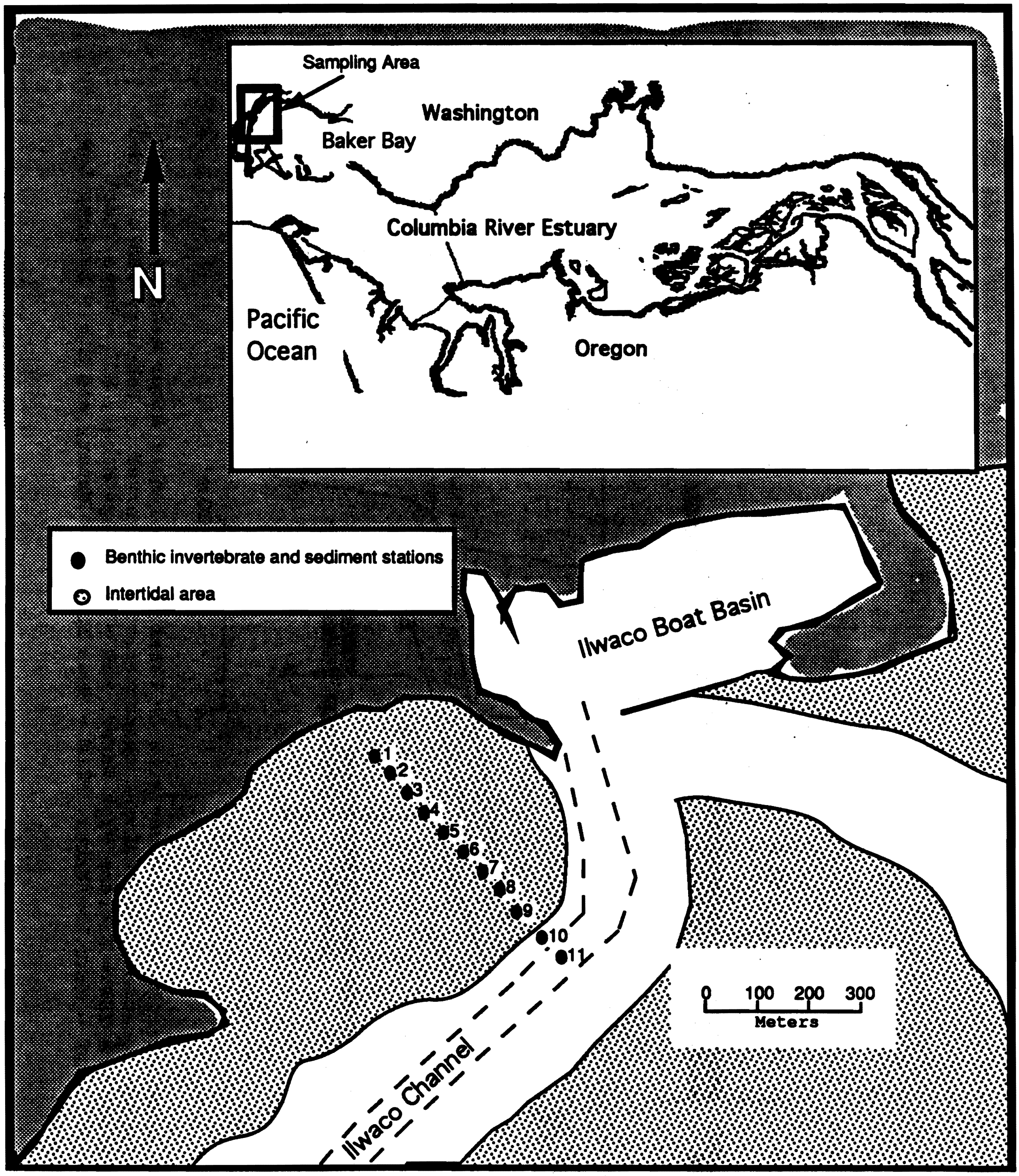

Figure 1.-- Benthic invertebrate and sediment sampling sites in Baker Bay, Columbia River estuary, November 1980 to October 1981.

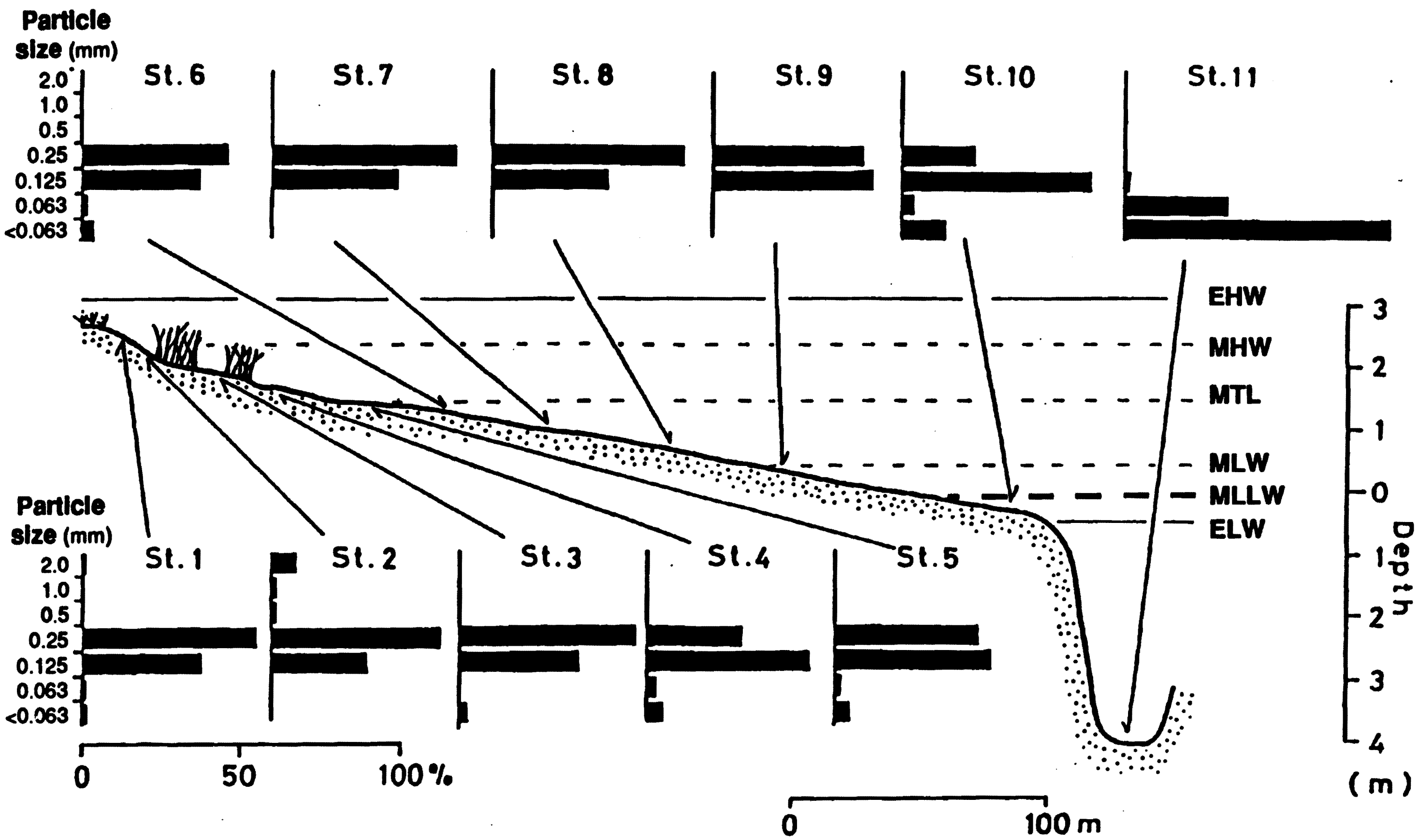

Figure 2.--A cross section of the study site in Baker Bay, Columbia River estuary, showing station locations and sediment characteristics observed in February 1981. Tidal levels are EHW = Extreme High Water, MHW = Mean High Water, MTL = Mean Tidal Level, MLW = Mean Low Water, MLLW = Mean Lower Low Water, and ELW = Extreme Low Water.

traffic reduced the hazards for divers). Invertebrate samples were placed in a sieve box and washed through a 0.595 mm (No. 30) screen. Samples were then fixed in a 4% formaldehyde solution containing Rose-bengal (a protein stain).

During October 1981, two stations (Stations 3 and 7) were sampled to a depth of 20 cm. These sediments were divided into top (0 to 10 cm) and bottom (10 to 20 cm) portions and analyzed separately to identify the efficiency of the sampling method.

Samples for benthic invertebrate analysis were rinsed of formaldehyde, and invertebrates were then picked from the sample, separated by species or major taxonomic groups, and counted. Wet weights of the invertebrates were determined to the nearest 0.001 g at Toho University, Chiba, Japan, using a Sartorius[1] 2355 balance. The weights of some invertebrates were not obtained because they were damaged during transport from the United States to Japan.

Sediment composition for the February 1981 samples was determined by sieving the sediment through a set of sieves (2.0, 1.0, 0.5, 0.25, 0.125, and 0.063 mm) and then weighing each pre-weighed seive. Interstitial salinities were determined by drawing water from the core sediment using an aspirator with a Millipore HA filter; a silver nitrate method was then used to measure salinity (Strickland and Parsons 1968). At Station 11 (subtidal boat channel), water temperature and salinity were measured monthly at 1-m intervals (surface to bottom) using a Beckman Model RS53 salinometer and probe.

Differences between benthic invertebrate densities in samples from stations with and without eelgrass, were tested for statistical significance using either a Chi-square test (no zeros in the data) or a Mann-Whitney test (some zeros in the data).

1/Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

RESULTS AND DISCUSSION

Water Temperature and Salinity

Water column temperatures at Station 11 ranged from 6.0°C in January to 17.7°C in August (Table 1). Vertical changes in temperatures varied little throughout the year.

Water column salinities tended to be lower during late winter to early summer, with the lowest salinity, 3.5‰, occurring near the surface in February (Table 2). The highest salinity, 22.4‰, was recorded at 5 m in December. Though salinity tended to increase with water depth, vertical differences in salinity were not great, suggesting that water in the study area was well mixed.

Throughout the year, interstitial salinities were lower at the intertidal sites than at the subtidal site (Table 3). Intertidal interstitial salinities were lowest during the spring and early summer, with the lowest levels occurring in late June (<2.0‰). Sanders et al. (1965) showed that in an Atlantic coast estuary, interstitial salinities remained relatively constant even though overlying water salinities varied diurnally. In Baker Bay, however, low interstitial salinities occurred in June as a result of the large input of fresh water from the Columbia River that consistently overlaid the tidal flat during this period.

Seasonal fluctuations of subtidal interstitial salinities were relatively small but followed a pattern similar to that of the intertidal stations.

Sediment Characteristics

The sediment of the tidal flat (Stations 1 through 9) consisted primarily of medium (0.500 mm ≤ 0.250 mm in diameter) and fine sand (0.250 mm ≤ 0.125 mm in diameter), (Fig. 2). Subtidal sediment was composed primarily of fine sand with some silt and clay (< 0.063 mm in diameter) at Station 10 and very fine sand (0.125 mm ≤.063 mm in diameter) and silt-clay at Station 11.

Table 1.--Monthly (1980-81) water column temperatures (°C) at Station 11 (subtidal channel site) in Baker Bay, Columbia River estuary.

	1980		1981									
(m) Depth	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
0	8.9	8.5	6.1	7.3	8.9	11.0	12.8	16.2	17.2	17.7	15.2	12.3
1	8.9	8.5	6.1	7.1	8.9	11.0	12.5	16.2	17.2	17.7	15.3	12.3
2	9.0	8.5	6.1	6.9	9.0	11.0	12.6	16.1	17.2	17.7	15.4	12.2
3	8.9	8.8	6.0	6.8	9.0	11.0	12.5	16.1	17.0	17.7	15.4	12.2
4	-*	8.8	6.0	6.9	8.9	11.0	12.6	16.1	16.8	17.6	15.3	12.2
5	-	9.1	6.1	-	9.1	-	12.6	16.1	16.8	17.6	15.5	12.1

* Temperatures not taken because of reduced water depth.

Table 2.--Monthly (1980-1981) water column salinities (ppt) at Station 11 (subtidal channel site) in Baker Bay, Columbia River estuary

	1980		1981									
(m) Depth	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
0	7.2	12.0	7.0	3.5	7.9	7.7	5.9	6.0	7.8	10.7	12.0	9.9
1	7.3	12.1	7.0	3.5	7.9	7.8	5.9	6.0	7.7	10.7	12.1	10.0
2	7.3	13.1	7.1	3.8	8.0	7.9	6.3	6.0	7.7	10.7	12.3	10.4
3	7.9	17.8	7.1	4.2	8.4	8.0	6.6	6.0	9.4	10.9	12.4	10.7
4	-*	21.1	7.1	5.9	8.6	8.3	7.0	6.2	11.0	10.9	12.4	11.3
5	-	22.4	7.7	-	10.3	-	8.2	6.8	11.9	11.2	12.4	11.9

* Salinities not taken because of reduced water depth.

Table 3.--Monthly (1980-81) salinities (ppt) of interstitial waters in intertidal (stations 1-10) and subtidal (Station 11) sediments collected in Baker Bay, Columbia River estuary.

	1980		1981									
Station	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	-*	-	-	-	-	-	-	-	-	15.5	-	-
2	-	-	-	7.3	-	-	7.0	2.0	7.2	10.8	16.7	11.2
3	-	-	6.5	6.2	6.5	-	6.5	1.9	7.6	11.1	13.9	11.4
4	-	-	-	6.2	-	3.7	6.5	1.7	7.0	10.8	12.3	10.2
5	-	-	6.2	-	-	3.7	7.7	1.5	7.2	10.3	15.3	10.3
6	9.0	8.8	-	6.2	-	4.2	7.6	1.7	7.2	10.6	17.0	10.4
7	-	-	9.0	7.8	8.1	-	6.0	1.5	7.4	9.1	15.8	11.3
8	-	-	-	-	-	-	6.2	4.1	8.2	9.5	10.9	10.2
9	9.0	8.8	6.5	-	7.4	6.0	7.0	4.4	7.8	9.5	11.0	10.0
10	-	8.2	-	-	-	-	6.7	3.7	7.4	11.1	10.9	10.4
11	13.8	15.5	9.9	-	9.0	9.8	9.6	7.2	10.9	15.4	15.5	16.2

* Salinity not determined.

Benthic Invertebrates

Thirty-seven different benthic invertebrates were identified (Table 4). The polychaetes Neanthes limnicola and Hobsonia florida, the bivalve Macoma balthica, and the amphipods Corophium salmonis and Eohaustorius estuaris were abundant in the study area throughout the year (Figs. 3, 4). Gravimetrically, M. balthica was the dominant species in the intertidal community followed by N. limnicola. These two species comprised more than 90% of the total weight of the middle-low intertidal community (Fig. 4). At the subtidal site, M. balthica was the most important species numerically and gravimetrically, followed by the spionid polychaete Pseudopolydra kempi (Fig. 5).

In a previous Baker Bay study, Higley and Holton (1978) found oligochaetes and M. balthica abundant in the bay as a whole, with the haustorid amphipod E. estuaris and the capitellid polychaete Mediomastus californiensis abundant only in shallow and deep habitats, respectively. In a nearby intertidal mudflat in Baker Bay, Jones (1984) observed that Macoma balthica and the polychaetes H. florida and P. kempi were the dominant members of the benthic community, followed by oligochaetes and the polychaete N. limnicola. Oligochaetes were not abundant in our study. This may be related to sieve sizes: Higley and Holton (1978) used 0.425 mm screens, Jones (1984) used 0.125 mm screens, and we used 0.595 mm screens.

Efficiency of Sampling Method

Holton et al. (1984) reported that benthic invertebrates in Baker Bay were most abundant in the top 10 cm of the sediment. Similarly, our analysis showed that a 10-cm depth sample was sufficient to describe the macrobenthic community at our study site, although several species would be slightly underestimated (Table 5). For example, while sampling, we observed many adult soft-shell clams, Mya arenaria, in the lower intertidal areas. However, because they lived more that 20 cm below the sediment surface, we did not sample this species quantitatively. Thus, estimations of these undersampled species were excluded from our analysis.

Table 4.--Invertebrate taxa found in an intertidal-subtidal area in Baker Bay, Columbia River estuary, November 1980 through October 1981.

- Phylum Platyhelminthes
  - Class Turbellaria
- Phylum Nemertea
- Phylum Aschelminthes
  - Class Nematoda
- Phylum Annelida
  - Class Polychaeta
    - Subclass Errantia
      - Family Phyllodocidae
        - *Eteone dilatae*
        - *Eteone lighti*
      - Family Nereidae
        - *Neanthes limnicola*
      - Family Goniadidae
        - *Glycinde polygnatha*
      - Family Glyceridae
        - *Hemipodus borealis*
    - Subclass Sedentaria
      - Family Ampharetidae
        - *Hobsonia florida*
      - Family Spionidae
        - *Pseudopolydora kempi*
        - *Polydora ligni*
        - *Pygospio elegans*
      - Family Capitellidae
        - *Heteromastus filiformis*
      - Family Sabellidae
        - *Manayunkia aestuarina*
- Phylum Arthropoda
  - Class Crustacea
    - Subclass Cirripedia
      - Order Thoracica
        - Family Balanidae
          - *Balanus* sp.
    - Subclass Malacostraca
      - Superorder Peracaridae
        - Order Mysidacea
          - Family Mysidae
            - *Neomysis mercedis*
        - Order Cumacea
          - Family Leuconidae
            - *Hemileucon* sp.
        - Order Tanaidacea

Table 4.--(Continued).

- Family Tanaidae
  - *Pancolus californiensis*
- Order Isopoda
  - Suborder Flabellifera
    - Family Sphaeromatidae
      - *Gnorimosphaeroma lutea*
  - Suborder Valvifera
    - Family Idoteidae
      - *Saduria entomon*
- Order Amphipoda
  - Suborder Gammaridea
    - Family Eohaustoriidae
      - *Eohaustorius estuaris*
    - Family Gammaridae
      - *Eogammarus oclairi*
      - *Eogammarus confervicolus*
    - Family Corophiidae
      - *Corophium salmonis*
      - *Corophium spinicorne*
- Superorder Eucarida
  - Order Decapoda
    - Suborder Natantia
      - Family Crangonidae
        - *Crangon franciscorum*
    - Suborder Reptantia
      - Family Cancridae
        - *Cancer magister*
- Class Insecta
  - Order Diptera
    - Family Chironomidae
    - Family Dolichopodidae
    - Family Ephydridae

- Phylum Mollusca
  - Class Gastropoda
    - Order Sacoglossa
  - Class Bivalvia
    - Order Mytiloida
      - Family Mytilidae
        - *Mytilus edulis*
    - Order Veneroida
      - Family Cardiidae
        - *Clinocardium nuttallii*
      - Family Tellinidae
        - *Macoma balthica*
    - Order Myoida
      - Family Myidae
        - *Mya arenaria*

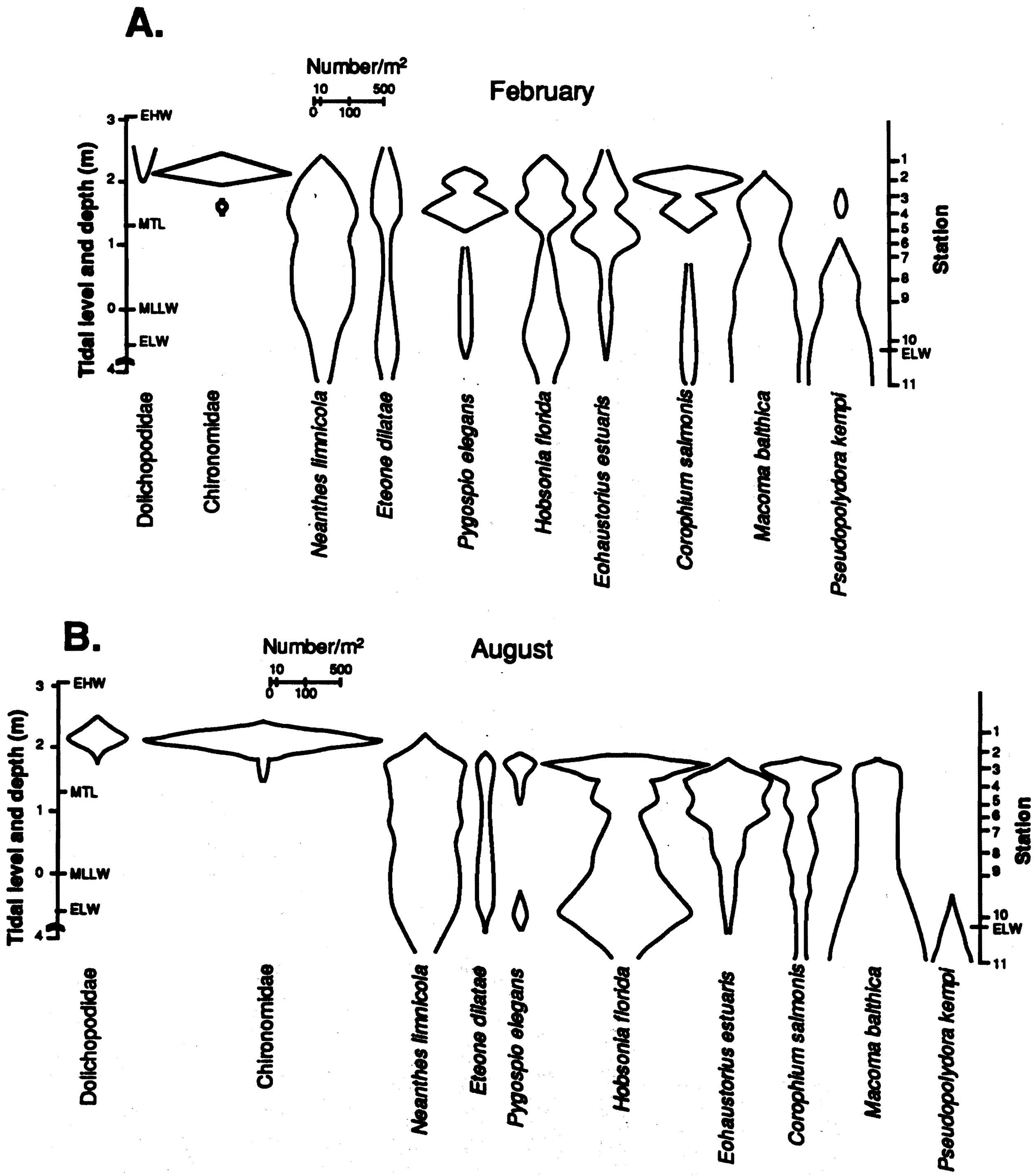

Figure 3.--Tidal elevation distributions (in number/m²) of macrobenthic invertebrates along a transect in Baker Bay, Columbia River estuary: A) February 1981 and B) August 1981.

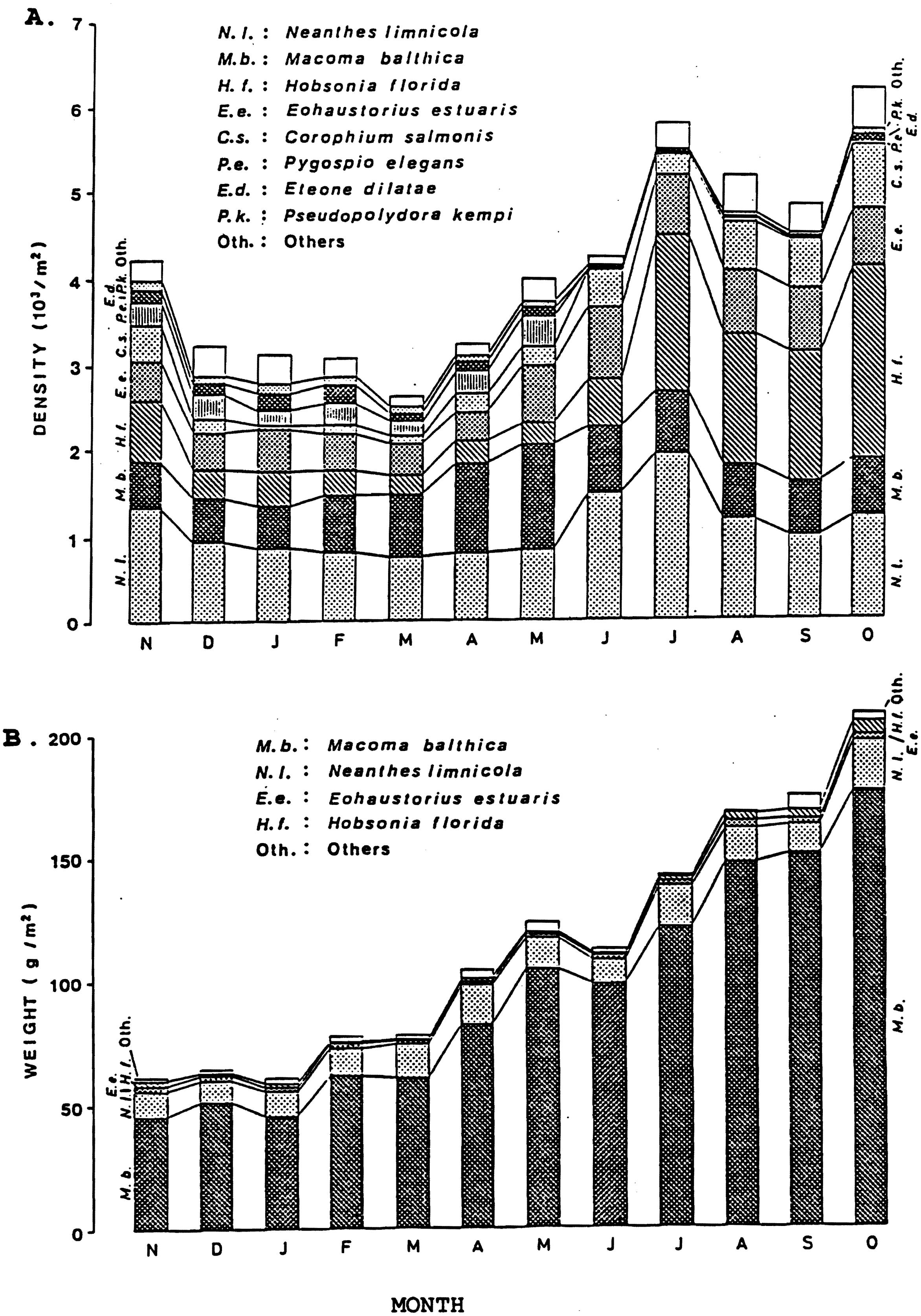

Figure 4.--Monthly changes (1980-81) in the densities (A) and weights (B) of macrobenthic invertebrates on middle-low sites (Stations 3-10) in Baker Bay, Columbia River estuary.

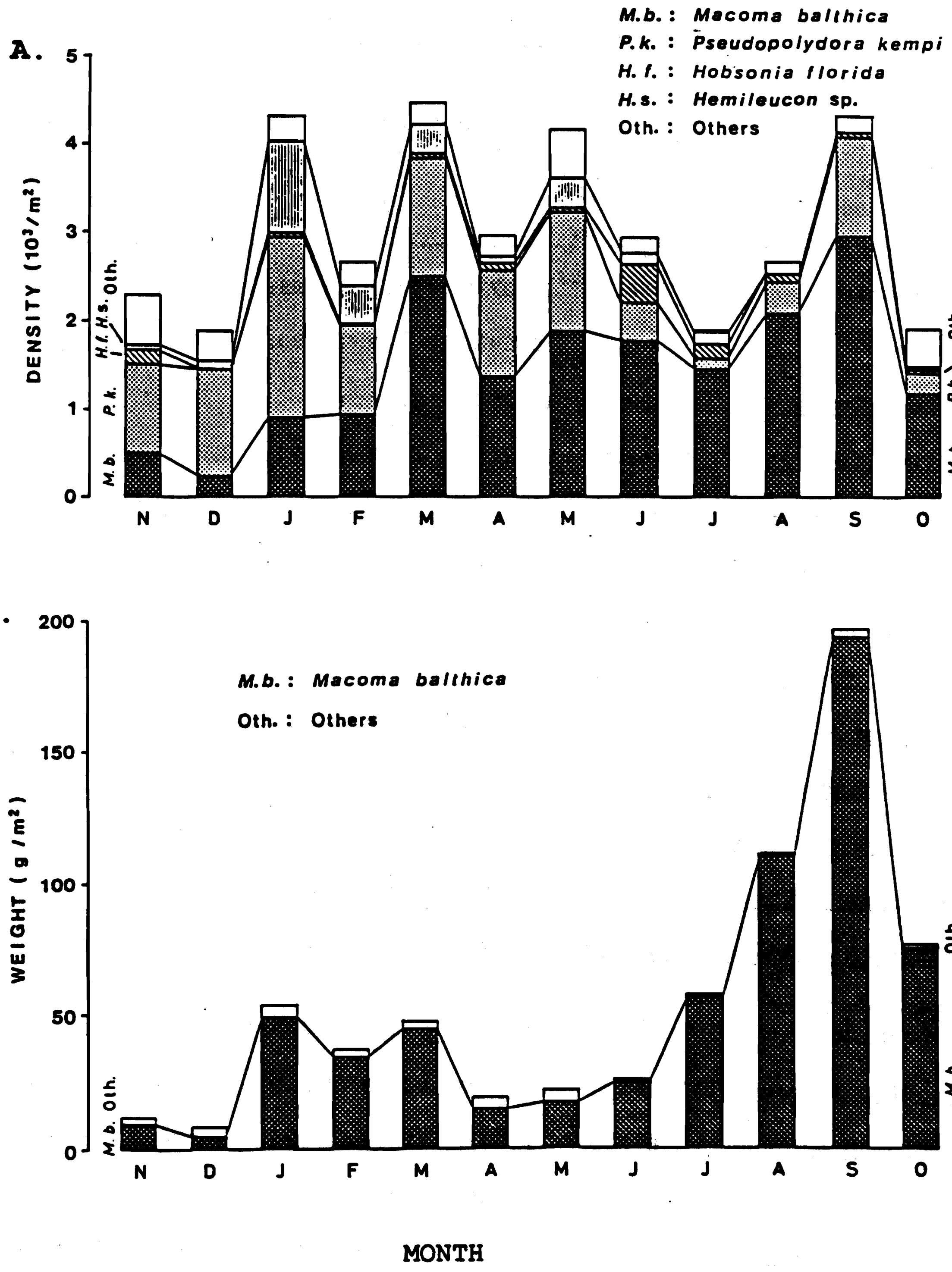

Figure 5.--Monthly changes (1980-81) in the densities (A) and weights (B) of macrobenthic invertebrates at a subtidal site (Station 11) in Baker Bay, Columbia River estuary.

Table 5.--Vertical distributions of benthic animals on a tidal flat in Baker Bay, Columbia River estuary, in October 1981.

Depth (cm) below sediment surface	Upper intertidal (Station 3)				Middle intertidal (Station 7)			
	0-10		10-20		0-10		10-20	
Turbellaria	968.4[a]	(0.079)[b]	448.6	(0.099)	59.3	(0.040)	0.0	(0.000)
Nemertea	0.0	(0.000)	0.0	(0.000)	39.5	(0.791)	0.0	(0.000)
Eteone dilatae	652.1	(2.352)	19.8	(+[c])	79.1	(0.059)	0.0	(0.000)
Neanthes limnicola	4,762.8	(62.925)	59.3	(0.099)	2,351.8	(40.988)	59.3	(1.304)
Hobsonia florida	5,671.9	(1.312)	118.6	(0.356)	3,359.7	(5.277)	39.5	(0.138)
Pseudopolydora kempi	19.7	(0.059)	0.0	(0.000)	39.5	(0.138)	0.0	(0.000)
Polydora ligni	0.0	(0.000)	0.0	(0.000)	19.8	(+)	0.0	(0.000)
Pygospio elegans	118.6	(0.020)	0.0	(0.000)	19.8	(0.079)	0.0	(0.000)
Heteromastus filiformis	0.0	(0.000)	0.0	(0.000)	19.8	(0.079)	0.0	(0.000)
Bnorimosphaeroma lutea	19.8	(0.020)	0.0	(0.000)	0.0	(0.000)	0.0	(0.000)
Eohaustorius estuaris	59.3	(0.277)	0.0	(0.000)	691.7	(2.51)	59.3	(0.138)
Eogammarus oclairi	59.3	(0.059)	19.7	(+)	0.0	(0.000)	59.3	(+)
Eogammarus confervicolus	59.33	(0.099)	98.8	(+)	375.5	(1.008)	19.8	(+)
Eogammarus spp. (juveniles)	138.4	(0.020)	0.0	(0.000)	0.0	(0.000)	0.0	(0.000)
Corophium salmonis	7,885.4	(8.834)	889.3	(0.119)	513.8	(0.573)	19.8	(+)
C. spinicorne	513.8	(1.047)	118.6	(0.020)	138.3	(0.040)	0.0	(0.000)
Chironomidae	237.2	(0.099)	19.7	(+)	0.0	(0.000)	0.0	(0.000)
Macoma balthica	1,067.1	(521.818)	19.8	(12.964)	988.1	(203.656)	39.5	(26.028)
TOTAL	22,233.1	(599.020)	1,812.2	(13.657)	8,695.7	(255.179)	296.5	(27.608)

[a] number/m^2
[b] weight (g)/m^2
[c] + = weight less than 0.020 g

Vertical Distribution Along the Tidal Gradient

The vertical distributions of abundant benthic invertebrates along the tidal gradient in winter (February 1981) and summer (August 1981) were similar (Fig. 3), suggesting that the distribution patterns did not change throughout the year. In the upper two stations (Stations 1 and 2) insect larvae (Dolichopodida and Chironomidae) were dominant; their distributions were restricted to this area. Most other invertebrates were distributed below this zone showing a clear zonal separation from the insect larvae, especially in summer. Neanthes limnicola and H. florida were also abundant in the upper tidal zone if tide pools existed. This agrees with Lewis (1961) who showed that physical conditions, such as desiccation, are important factors determining the upper limit of intertidal animals on rocky shores.

The densities of Pygospio elegans, H. florida, and C. salmonis were low in the middle tidal zone (Stations 5 through 8) where ripple marks on the sediment surface indicated that the substrate was relatively unstable. In contrast to polychaetes, the amphipod Eohaustorius estuaris was relatively abundant on this unstable sediment. Pseudopolydora kempi was one of the most important members of the intertidal flat community in Baker Bay (Jones 1984) and was often abundant from the low tidal zone to the subtidal bottom where the sediment had a high silt-clay content. This suggests that the stability of the sediment surface plays an important role in determining the species composition and abundance of intertidal invertebrates.

Seasonal Changes

Intertidal Community--Numerically dominant species throughout the year in the intertidal community were N. limnicola, H. florida, E. estuaris, Macoma balthica, and C. salmonis (Fig. 4). Peak densities were related to recruitment and were observed in May for M. balthica, June for E. estuaris, June and August through October for C. salmonis, July for N. limnicola, and July and October for H. florida. These population peaks coincided closely with peaks found in another Baker Bay intertidal flat, with the exception of M. balthica and E. estuaris (Jones 1984). Eohaustorius estuaris was not present in the other flat where M. balthica spat settled in late summer or early fall (Jones 1984). The reason for the different seasons of spat settlement on the two flats is unknown. Also of note, the decreases in densities of two spionid polychaetes, Pygospio elegans and Pseudopolydora kempi, coincided with the decline of interstitial salinities (Fig. 4).

More than 90% of the weight of the intertidal benthic community through the year consisted of M. balthica and N. limnicola. The community weight of M. balthica increased during warmer seasons (spring to fall), even after its population numbers had decreased in summer. This suggests the increase was related to individual growth.

The intertidal community biomass increased gradually during this study with a maximum in the final month, October 1981. Because observations were not made during the following winter, it is not known whether the community weight declined to the level observed in the previous winter.

Subtidal Community--Macoma balthica was the most numerous species for 8 months from May to October and accounted for the largest portion of the community biomass throughout the year at the subtidal site (Fig. 5). Total biomass of M. balthica increased in late summer and early fall. Because there were increases in both number and individual weights of M. balthica at the subtidal site, it is unclear whether the increases in total weight resulted more from growth or recruitment.

At the subtidal station, Pseudopolydora kempi was abundant until the interstitial salinity minimum of 7.2‰ occurred in June. The P. kempi population recovered in September but dropped again in numbers in October, perhaps due to predation or disturbance of the bottom by crabs and fishes (Virnstein 1977). The subtidal station is located in a channel known to have high densities of Dungeness crabs, Cancer magister (McCabe et al. 1986). Jones (1984) observed a sharp peak in the density of P. kempi in a mudflat in Baker Bay in August 1981. In contrast to P. kempi, densities of H. florida increased in June (Fig. 5). The cumacean of the genus Hemileucon was relatively more abundant in winter through spring.

Effect of Salinity on the Benthic Community

By identifying their preferred habitat, invertebrates collected in this study can be classified into three categories: 1) species of unknown salinity preferences, 2) estuarine species, or 3) marine species (Banse and Hobson 1974; Sanborn 1975; Smith and Carlton 1975; Higley and Holton 1978; Bousfield 1979) (Table 6). In the intertidal benthic community, estuarine species were dominant throughout the year except for October (Fig. 6). Marine species were an important component from November until June, when interstitial salinities reached a minimum and apparently reduced their numbers. Recovery of the marine species took about 4 months. During the recovery period the intertidal community was composed almost entirely of estuarine species and those with unknown salinity preferences. In October, high densities of chironomid larvae (unknown salinity preferences) at the upper intertidal stations (1 and 2) contributed almost half of the total community densities (Fig. 6).

Marine species were relatively more abundant in the subtidal community, especially during winter and spring before the June salinity decline. After the salinity minimum occurred, the population density of marine species remained low throughout the summer, recovering, at least temporarily, in September. The recovery of the marine species in the subtidal area occurred earlier than on the intertidal flat. This suggests that salinity (average and minimum) was an important factor affecting the population density of the marine species at the study area. However, densities of marine species also declined in October due primarily to lower densities of P. kempi. With just one year's data, it is not possible to determine unequivocally that the seasonal salinity decline regulated marine species abundances. Nevertheless, the dramatic decline in marine species densities after the salinity minimum strongly suggests a cause-and-effect relationship.

Effect of Vegetation on the Benthic Community

Filamentous Algae

Filamentous algae were first observed covering the sediment at the upper intertidal sites in January. They formed dense green mats in May and remained

Table 6.--List of benthic invertebrates and distributional areas on intertidal-subtidal sediments in the Baker Bay, Columbia River estuary (1980-81). Dotted lines show distribution of nominally freshwater species (commonly found in salinity of 0.0 ppt), estuarine species (commonly found in salinity ranging from 0.0 to 25.0 ppt), and marine species (commonly found at salinities greater than 25.0 ppt).

Fresh	Brackish	Marine
Unknown Salinity Preferences	**Estuarine Species**	**Marine Species**
Turbellaria	Eteone lighti	Eteone dilatae
Nemertea	Neanthes limnicola	Glycinde polygnatha
Balanus sp.	Hobsonia florida	Hemipodus borealis
Cumacea	Pygospio elegans	Polydora ligni
Chironomidae	Hemileucon sp.	Pseudopolydora kempi
Dolichopodidae	Neomysis mercedis	Heteromastus filiformis
Ephydridae	Eohaustorius estuaris	Eogammarus oclairi
Sacoglossa	Eogammarus confervicolus	Cancer magister
	Corophium salmonis	Clinocardium nuttallii
	Corophium spinicorne	Mya arenaria
	Gnorimosphaeroma lutea	
	Crangon franciscorum	
	Macoma balthica	
	Mytilus edulis	

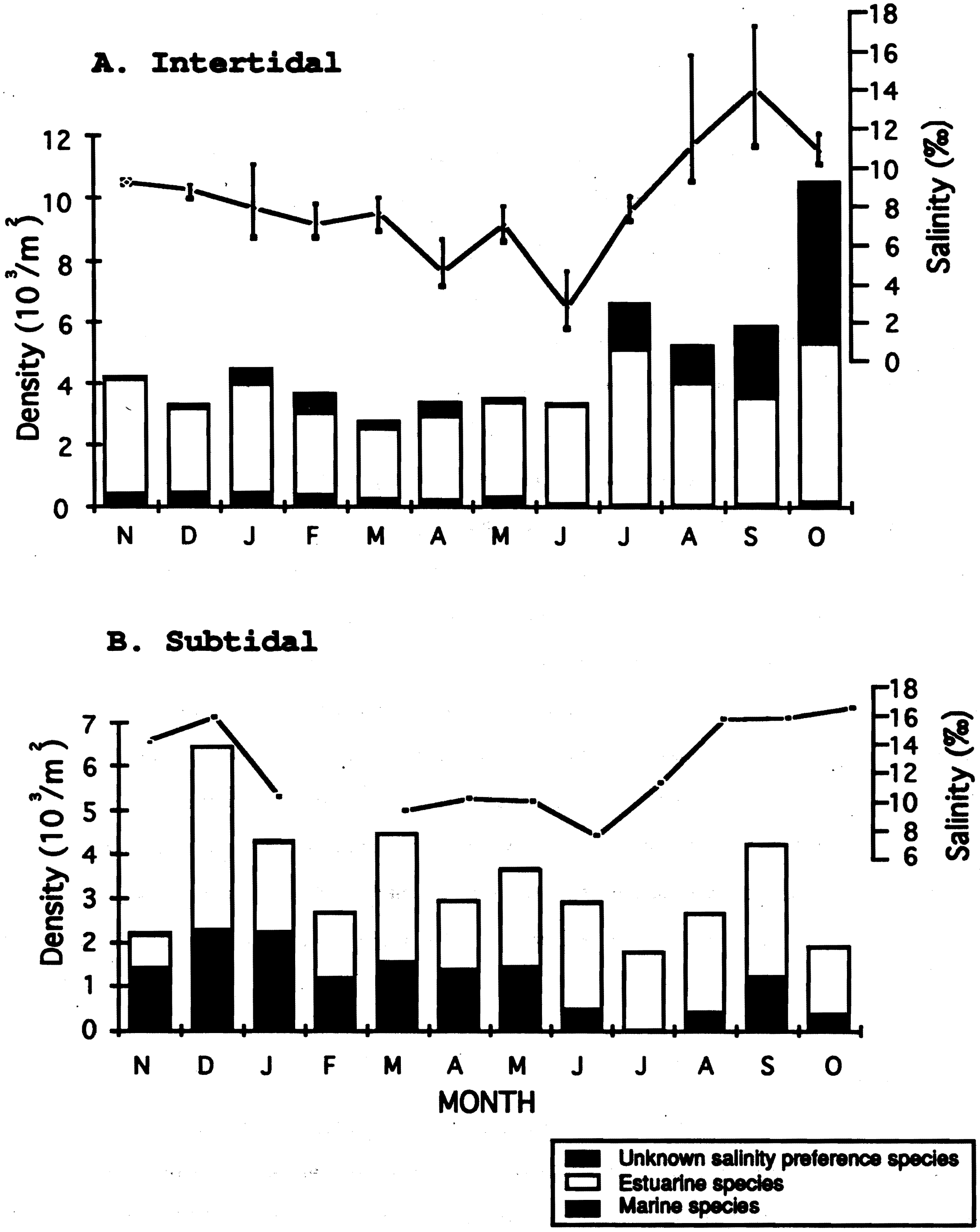

Figure 6.-- Seasonal changes (1980-81) of the macrobenthic invertebrate communities (defined by salinity preferences) and interstitial salinities at intertidal stations (A) and at a subtidal station (B) in Baker Bay, Columbia River estuary. Salinity means and ranges for intertidal stations represented by points within capped vertical lines.

until at least October. Insect larvae (Chironomidae and Dolichopodidae) and the sabellid polychaete, Manayunkia aestuarina, were abundant with the occurrence of the agal mat. However, the agal filaments reduced the effective size of the sieving screen, and without the agal mat a considerable number of these invertebrates could have passed through the 0.595 mm screen. It is unclear whether the presence of the algal mat provided habitat for the insect larvae and the sabellid polychaete.

A sacoglossan gastropod occurred with the filamentous algae starting in August and showed a maximum density of 1,680/m² in October. This gastropod feeds on algae and stores their chloroplasts in its cerata. Some Sacoglossa feed on the chrysophyte Vaucheria (Smith and Carlton 1975), one of the major components of the filamentous algal mat, suggesting that the algal mat provides habitat and food for this gastropod.

Lewis (1961) suggested that the upper distribution limit of intertidal animals is determined by their physiological tolerance to desiccation. Despite the capillary effect of the algae filaments, which prevents desiccation of the sediment surface, the abundance of most benthic animals, except insects, was lower in the algal mat zone in late summer (Table 7). The filamentous algal mat may, under certain conditions, eliminate some of the invertebrates that live below the sediment surface, perhaps by preventing feeding activity or reducing dissolved oxygen. The presence of a shallow tide pool at Station 2 apparently elevated the upper limits of some intertidal animals (Table 8).

Eelgrasses

The eelgrasses Zostera japonica and Z. marina formed patchy beds on the tidal flat during the summer. Eelgrass beds increase sediment stability, resulting in high infaunal diversity and density (Orth 1977), but the rhizomes of Zostera spp. physically hinder the movement of burrowing organisms (Ringold 1979). The amphipods Eogammarus confervicolus and Corophium spinicorne tended to be more abundant at stations with eelgrasses (Table 9), suggesting that eelgrass provides substratum for these epiphytic amphipods. The polychaetes

Table 7.--The mean number of benthic invertebrates per m² at two upper intertidal stations (Stations 1 and 2) in Baker Bay, Columbia River estuary, during February (no agal mat) and August (with agal mat) 1981.

	February (No agal mat)		August (With agal mat)	
Stations	1	2	1	2
Species	Mean number/m²	Mean number/m²	Mean number/m²	Mean number/m²
Turbellaria	0.0	0.0	0.0	19.8
Polychaeta				
Eteone dilatae	46.1	230.5	0.0	0.0
Neanthes limnicola	6.6	540.2	0.0	92.2
Polydora ligni	0.0	6.6	0.0	0.0
Pygospio elegans	0.0	955.2	0.0	0.0
Hobsonia florida	13.2	599.5	0.0	0.0
Crustacea				
Gnorimosphaeroma lutea	13.2	13.2	0.0	0.0
Eohaustorius estuaris	32.9	171.3	0.0	0.0
Eogammarus oclairi	0.0	65.9	0.0	0.0
Eogammarus confervicolus	0.0	540.2	0.0	0.0
Corophium salmonis	0.0	3,313.7	0.0	0.0
Corophium spinicorne	0.0	13.2	0.0	0.0
Insecta				
Dolichopodidae	112.0	72.5	26.4	797.1
Chironomidae	92.2	5,118.6	72.5	15,843.2
Bivalvia				
Macoma balthica	0.0	26.4	0.0	0.0
Gastropoda				
Sacoglossa	0.0	0.0	0.0	39.5
Total	316.2	11,667.0	98.9	16,791.8

Table 8.--Influence of a tide pool and agal mat on the abundance of intertidal invertebrates at a high intertidal flat (Station 2) in Baker Bay, Columbia River estuary, September 1981.

	Abundance Number/m^2		
Taxon	Inside tide pool covered by agal mat	Outside tide pool covered by agal mat	Inside tide pool no agal mat
Turbellaria	39.5	0.0	118.6
Neanthes limnicola	479.1	0.0	2,272.7
Pygospio elegans	0.0	0.0	19.8
Hobsonia florida	59.3	0.0	2,687.7
Corophium salmonis	39.5	0.0	59.3
Chironomidae	18,102.8	32,628.5	1,857.7
Dolichopodidae	1,067.2	197.6	59.3
Ephydridae	1,442.7	3,359.7	0.0
Sacoglossa	237.2	19.8	0.0
Macoma balthica	0.0	0.0	98.8
Total	21,467.3	36,205.6	7,173.9

Table 9.--The abundance of major macrobenthic invertebrate species on a tidal flat with and without eelgrass in Baker Bay, Columbia River estuary, August 1981.

Species	Eel-grass	Station 3	4	5	6	7	8
Neanthes limnicola	No	90[a]	45	44	31	61	41**
	Yes	104[b]	94	101	95	86	32
Hobsonia florida	No	333	14	5	7	13	40**
	Yes	347	88	163	15	22	61
Eogammarus confervicolus	No	2	1	0	0	0	0*
	Yes	18	2	16	3	9	0
Corophium salmonis	No	123	7	6	3	6	12**
	Yes	115	4	43	2	8	17
Corophium spinicorne	No	1	0	0	0	0	0*
	Yes	6	0	35	3	5	1
Eohaustorius estuaris	No	6	110	63	136	15	11**
	Yes	0	62	30	17	18	16
Macoma balthica	No	26	34	20	21	22	20
	Yes	36	36	29	28	26	29
Total[c]	No	620	217	176	198	118	125**
	Yes	677	291	479	166	177	159

[a] Mean number contained in two 506 cm^2 samples (Samples A and B, See Appendix Table).
[b] Number contained in one 506 cm^2 sample (Sample C).
[c] Includes all species collected.
*Significant difference: Mann-Whitney, $P < 0.05$.
**Highly significant difference: Chi-square, $P < 0.001$.

N. limnicola and H. florida were more abundant in eelgrass beds than outside the beds between Stations 4 and 6. The positive effect of Zostera spp. beds on these surface-feeding polychaetes is probably related to increased sediment stability. However, the gammarid amphipod Eohaustorius estuaris, which prefers unstable sediment (Bosworth 1973), was less abundant on the Zostera spp.beds.

CONCLUSIONS

The macrobenthic community structure in a fine-sand tidal flat and adjacent muddy subtidal site in Baker Bay showed few seasonal changes in species composition. The intertidal community consisted mainly of estuarine species, such as M. balthica, N. limnicola, C. salmonis, H. florida, and E. estuaris, which were abundant throughout the year. Marine species, such as P. kempi, tended to increase in population densities from the intertidal to subtidal sites and declined in abundance after the June salinity minimum. This indicates that a seasonal reduction in salinity is probably an important factor maintaining the community structure of an estuarine-species dominated intertidal-subtidal benthos. This reduction was caused by the large spring freshet of the Columbia River.

Two zones of benthic invertebrate communities were observed in the tidal flat. The first was an high upper tidal zone (Stations 1 and 2) dominated by insect larvae (Chironomidae and Dolichopodidae). A filamentous algal mat covered the sediment surface here during summer. The second zone was the middle-lower tidal zone. Here, the surface deposit feeders, such as M. balthica, N. limnicola, and H. florida were abundant on the relatively stable sediments of the lower tidal areas and on eelgrass beds in the middle tidal level. The sand-dwelling amphipod E. estuaris was abundant in the unstable sediments of this middle tidal level.

At the subtidal site, M. balthica was the dominant species while P. kempi was more abundant here than at the other sites. The reduced densities of estuarine species in the subtidal site may be related to salinity, sediment texture, and perhaps intense fish or crab predation.

Our results suggest that one of the most important factors determining the macrobenthic animal community structure in the Columbia River estuary is salinity. Also, increased sediment stability and Zostera spp. have a positive effect on densities of deposit feeders and a negative effect on the densities of E. estuaris.

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Appendix Table--Numbers and weight (g) of benthic invertebrates collected at 11 sites in Baker Bay, Columbia River estuary, November 1980 - October 1981.

Station (sample)		3(A)	(B)	(C)	4(A)	(B)	(C)	5(A)	(B)	(C)	6(A)	(B)	(C)
Date November 1980		17			17			17			17		
Taxon													
TURBELLARIA	No.	3	7	1	4	2	6	6	6	13	8	5	4
	Wt.	0.002	0.003	+	0.002	0.001	0.003	0.003	0.001	0.005	0.004	0.003	0.002
NEMERTEA	No.	4	7	1			3	2				1	
	Wt.	0.009	0.013				0.004	0.003				0.011	
POLYCHAETA													
Eteone dilatae	No.	18	23	17	2	6	4	1	3	8	2		
	Wt.	0.039	0.057	0.037	0.003	-	0.004	0.001	0.003	0.007	0.003		
Neanthes limnicola	No.	111	105	112	100	112	98	27	32	55	35	37	36
	Wt.	1.458	1.428	1.208	0.472	0.505	0.480	0.206	0.135	0.470	0.130	0.110	0.170
Pseudopolydora kempi	No.	3		2	3			1	4	2		2	1
	Wt.	0.001		0.004	0.011			0.001	0.003	0.002		+	0.002
Polydora ligni	No.								3	2			
	Wt.								0.003	0.008			
Pygospio elegans	No.	73	116	56	17	9	4	2	7	9	2		1
	Wt.	0.075	0.044	0.025	0.005	0.001	0.001	+	0.002	0.002	+		+
Heteromastus filiformis	No.									1			
	Wt.									0.003			
Hobsonia florida	No.	271	286	183	6	5	4	3	8	3		3	3
	Wt.	0.958	0.015	0.433	0.012	0.004	0.002	0.006	0.014	0.006		0.002	0.002
CRUSTACEA													
Eohaustorius estuaris	No.		2	6	72	28	29	38	105	15	76	34	94
	Wt.		0.004	0.034	0.467	0.124	0.112	0.119	0.190	0.048	0.266	0.076	0.337
Eogammarus confervicolus	No.		1										
	Wt.		0.004										
Corophium salmonis	No.	323	143	20	3	2	1	1	1	3			
	Wt.	0.304	0.146	0.018	0.005	0.001	+	+	0.002	0.002			
Corophium spinicorne	No.	2											
	Wt.	0.003											
BIVALVIA													
Macoma balthica	No.	14	28	10	18	35	28	12	11	13	18	13	22
	Wt.	1.189	4.148	0.691	2.037	12.037	7.399	1.487	0.956	0.237	1.073	2.941	1.712

Appendix Table--Continued.

Station (sample) Date November 1980		7(A) 24	(B)	(C)	8(A) 24	(B)	(C)	9(A) 24	(B)	(C)	10(A) 24	(B)	(C)
Taxon													
TURBELLARIA	No.	1	3	6	5		3	1	2				
	Wt.	+	0.001	0.001	0.002		0.002	0.002	0.002				
NEMERTEA	No.										1		
	Wt.										0.005		
POLYCHAETA													
Eteone dilatae	No.		2	5	2	4	2	8	3	3		2	
	Wt.		0.004	0.005	0.001	0.003	0.004	0.005		0.004		0.003	
Neanthes limnicola	No.	52	80	93	112	75	76	82	87	91	9	10	16
	Wt.	0.500	1.125	0.546	0.761	0.401	0.340	0.532	0.458	0.790	0.066	0.555	0.144
Glycinde polygnatha	No.											1	
	Wt.											0.013	
Pseudopolydora kempi	No.	6	7	2	14	5	11	21	13	36	10	36	16
	Wt.	0.007	0.027	0.002	0.049	0.031	0.041	0.057	0.038	0.106	0.020	0.049	0.034
Polydora ligni	No.		1			1		19	7	12	10	14	12
	Wt.		0.001			0.001		0.143	0.038	0.050	-	0.016	0.032
Pygospio elegans	No.		3	1	6	6	7		2			1	
	Wt.		0.001	- -	0.002	0.001	0.004		0.001			-	
Hobsonia florida	No.	5	3	3	9	5	4	13	6	6	12	21	10
	Wt.	0.008	0.005	0.004	0.005	0.002	0.003	0.063	0.023	0.004	0.026	0.049	0.039
CRUSTACEA													
Hemileucon sp.	No.		1										
	Wt.		-										
Eohaustorius estuaris	No.	12	10	14	9	3	2	1					
	Wt.	0.060	-	0.083	0.057	0.014	0.013	0.007					
Eogammarus oclairi	No.		1						1				
	Wt.		0.008						0.008				
Eogammarus confervicolus	No.							4	1				
	Wt.							-	0.004				
Corophium salmonis	No.				1			1			1	1	1
	Wt.				-			0.002			-	-	0.001
Corophium spinicorne	No.				1			1	2			3	
	Wt.				-			-	0.002			0.003	
Crangon franciscorum	No.								1				
	Wt.								0.073				
BIVALVIA													
Clinocardium nuttallii	No.										1		
	Wt.										0.003		
Macoma balthica	No.	27	34	28	15	22	17	37	32	46	42	47	58
	Wt.	0.294	1.595	1.110	1.047	1.143	0.535	1.449	0.754	1.678	4.211	1.636	4.440
Mya arenaria	No.			1	1			2		1	20	31	41
	Wt.			0.118	0.001			0.002		-	0.117	0.058	0.127

Appendix Table--Continued.

Station (sample) Date November 1980		11(A) 24	(B)	(C)
Taxon				
TURBELLARIA	No.	1	1	5
	Wt.	0.001	0.001	0.003
POLYCHAETA				
Neanthes limnicola	No.	1	1	1
	Wt.	0.010	+	0.001
Glycinde polygnatha	No.	1		1
	Wt.	0.012		0.002
Pseudopolydora kempi	No.	70	17	67
	Wt.	0.106	0.027	0.214
Polydora ligni	No.	21	8	4
	Wt.	0.044	0.012	0.009
Pygospio elegans	No.	1	1	1
	Wt.	+	+	+
Heteromastus filiformis	No.	1	1	
	Wt.	0.013	0.011	
Hobsonia florida	No.	23	2	
	Wt.	0.025	0.003	
CRUSTACEA				
Hemileucon sp.	No.	4		4
	Wt.	0.001		0.001
BIVALVIA				
Macoma balthica	No.	52	6	18
	Wt.	2.343	0.110	0.574
Mya arenaria	No.	10	6	6
	Wt.	0.017	0.005	0.079

Appendix Table--Continued.

Station (sample) Date December 1980		3(A) 17	(B)	(C)	4(A) 17	(B)	(C)	5(A) 17	(B)	(C)	6(A) 17	(B)	(C)
Taxon													
TURBELLARIA	No.	22	7	4	2	2	4	11	3	30	3	3	6
	Wt.	0.009	0.004	0.002	0.001	+	0.002	0.002	+	0.011	0.002	0.001	0.003
NEMERTEA	No.	4	3	4	1	1				2	3	6	2
	Wt	+	+	+	+	+				+	+	+	+
POLYCHAETA													
Eteone dilatae	No.	17	11	16	4	6	6	4	2	5	1	5	1
	Wt.	0.066	0.008	0.082	0.002	0.006	0.012	0.003	0.002	0.003	0.001	0.007	0.001
Eteone lighti	No.						1						
	Wt.						0.001						
Neanthes limnicola	No.	64	115	39	92	73	74	32	25	40	14	27	23
	Wt.	0.376	1.530	0.880	0.622	0.520	0.391	0.172	0.197	0.278	0.146	0.095	0.037
Pseudopolydora kempi	No.	1	3			2	2	1	2	2	1	2	1
	Wt.	0.002	0.002			-	0.003	0.003	0.002	0.003	+	0.001	0.002
Polydora ligni	No.				1				2				
	Wt.				0.002				0.002				
Pygospio elegans	No.	125	219	55	10	9	1	1	1	1		1	
	Wt.	0.057	0.099	0.025	0.003	0.003	+	+	+	+		+	
Hobsonia florida	No.	103	109	70	4	6	5	3		1	1	1	
	Wt.	0.087	0.092	0.059	0.006	0.015	0.014	-		0.003	0.002	0.002	
CRUSTACEA													
Eohaustorius estuaris	No.	1			96	75	36	13	56	50	42	97	44
	Wt.	0.003			0.662	0.503	0.236	0.034	0.129	0.111	0.129	0.331	0.133
Eogammarus oclairi	No.				1								
	Wt.				0.002								
Eogammarus confervicolus	No.		1				1			1		1	
	Wt.		0.009				0.010			0.001		0.002	
Corophium salmonis	No.	19	15	131	2	3			2				
	Wt.	0.009	0.012	0.089	0.001	0.003			0.005				
INSECTA													
Dolichopodidae	No.			1									
	Wt.			0.001									
Chironomidae	No.	8		8									
	Wt.	+		0.005									
BIVALVIA													
Macoma balthica	No.	28	34	17	32	38	38	13	10	7	16	21	11
	Wt.	0.960	0.663	2.786	5.478	7.754	6.865	1.813	0.731	0.695	1.095	5.548	0.982

Appendix Table--Continued.

Station (sample)		7(A)	(B)	(C)	8(A)	(B)	(C)	9(A)	(B)	(C)	10(A)	(B)	(C)
Date December 1980		17			22			22			22		
Taxon													
TURBELLARIA	No.	1	5	3									
	Wt.	-	0.001	0.001									
NEMERTEA	No.												1
	Wt.												0.004
POLYCHAETA													
Eteone dilatae	No.		2	1			1			4			2
	Wt.		0.003	0.001			0.001			0.003			0.003
Neanthes limnicola	No.	63	47	86	43	103	31	37	43	34	9	12	21
	Wt.	0.305	0.318	0.638	0.245	0.770	0.329	0.389	0.171	0.136	0.100	0.163	0.432
Pseudopolydora kempi	No.	1	6	6	17	6	15	29	13	17	14	16	19
	Wt.	0.001	-	0.003	0.030	0.007	0.062	0.057	0.028	0.056	0.011	0.026	0.019
Polydora ligni	No.				6	3	4	22	23	11	26	11	37
	Wt.				-	-	0.032	0.118	0.090	0.056	0.069	0.029	0.053
Pygospio elegans	No.	1	1						1		4	1	9
	Wt.	+	+						+		0.002	+	0.001
Heteromastus filiformis	No.									1	4	1	1
	Wt.									0.005	0.091	0.003	0.011
Hobsonia florida	No.	2	1	4	1	6	7	8	11	8	18	5	25
	Wt.	0.004	0.002	0.012	+	0.005	0.013	0.033	0.045	0.012	0.061	0.007	0.056
CRUSTACEA													
Hemileucon sp.	No.			1									
	Wt.			+									
Eohaustorius estuaris	No.	3	6	2	3	4	1		2	3			1
	Wt.	0.006	0.030	0.008	0.018	0.019	0.003		0.009	0.004			0.005
Eogammarus oclairi	No.					1							
	Wt.					0.001							
Eogammarus confervicolus	No.			1	3			5		1			1
	Wt.			0.002	0.006			0.019		0.002			0.013
Eogammarus sp. or spp. (young)	No.											2	
	Wt.											0.004	
Corophium salmonis	No.	1			3	1		2	1	3		2	
	Wt.	0.002			0.003	+		0.001	0.003	0.004		0.002	
Corophium spinicorne	No.										2		11
	Wt.										0.001		0.007
BIVALVIA													
Mytilus edulis	No.											3	
	Wt.											0.018	
Macoma balthica	No.	16	24	21	31	20	14	24	23	22	34	60	60
	Wt.	2.134	1.344	1.236	3.672	0.835	1.970	2.278	1.633	1.388	3.377	3.274	4.025
Mya arenaria	No.					1	1			3	34	36	50
	Wt.					0.021	0.001			0.037	0.154	0.060	0.788

Appendix Table--Continued.

Station (sample) Date December 1980		11(A) 22	(B)	(C)
Taxon				
POLYCHAETA				
Eteone lighti	No.	1		
	Wt.	+		
Glycinde polygnatha	No.		1	
	Wt.		0.009	
Pseudopolydora kempi	No.	31	94	90
	Wt.	0.127	0.438	0.308
Polydora ligni	No.	1	2	
	Wt.	0.002	0.004	
Heteromastus filiformis	No.			1
	Wt.			0.011
CRUSTACEA				
Hemileucon sp.	No.	1	6	10
	Wt.	+	0.002	0.001
Crangon franciscorum	No.	1		
	Wt.	0.002		
BIVALVIA				
Macoma balthica	No.	5	19	10
	Wt.	0.332	0.713	0.274
Mya arenaria	No.		4	5
	Wt.		0.004	0.009

Appendix Table--Continued.

Station (sample) Date January 1981		2(A) 12	(B)	(C)	3(A) 12	(B)	(C)	4(A) 12	(B)	(C)	5(A) 12	(B)	(C)
Taxon													
TURBELLARIA	No.	21	126	55	41	13	38	4	4		9	9	7
	Wt.	0.006	0.050	0.044	0.010	0.003	0.012	0.001	0.001		0.002	0.003	0.003
NEMERTEA	No.				2	2	2		2	1	1		
	Wt.				0.003	0.003	0.003		0.005	0.024	0.003		
POLYCHAETA													
Eteone dilatae	No.	5	6	4	10	28	28	7	9	16	3	3	6
	Wt.	0.025	0.010	0.003	0.030	0.072	0.069	0.012	0.012	0.024	0.002	0.002	0.009
Neanthes limnicola	No.	30	23	16	96	89	82	70	70	67	30	30	32
	Wt.	0.636	0.492	0.260	1.261	1.425	0.313	0.390	0.397	0.470	0.305	0.642	0.357
Pseudopolydora kempi	No.	1				1					1		2
	Wt.	+				+					0.003		0.006
Pygospio elegans	No.	74	234	130	15	89	74	5	3	1			
	Wt.	0.060	0.143	0.070	0.018	0.117	0.097	0.002	0.001	+			
Heteromastus filiformis	No.		1	1									
	Wt.		0.003	0.003									
Hobsonia florida	No.	193	103	71	122	80	35	4	5	5	1	1	2
	Wt.	0.083	0.230	0.485	0.491	0.300	0.131	0.004	0.013	0.014	0.006	0.005	0.003
CRUSTACEA													
Gnorimosphaeroma lutea	No.			1									
	Wt.			0.007									
Eohaustorius estuaris	No.	5	1	6	1	6	6	30	45	60	107	39	63
	Wt.	0.025	0.005	0.041	0.006	0.038	0.034	0.207	0.296	0.367	0.290	0.087	0.169
Eogammarus oclairi	No.		1	4									
	Wt.		0.010	0.025									
Eogammarus confervicolus	No.	10	72	177	4		1	2					
	Wt.	0.027	0.189	0.451	0.004		+	-					
Eogammarus sp. or spp. (young)	No.		28	8									
	Wt.		0.021	0.008									
Corophium salmonis	No.	283	176	155	18	9	12	2	1		1	1	1
	Wt.	0.388	0.267	0.201	0.012	0.006	0.008	0.002	0.002		0.001	-	0.001
Crangon franciscorum	No.							1					
	Wt.							0.031					
INSECTA													
Dolichopodidae	No.	3	1	1									
	Wt.	0.006	0.002	0.003									
Chironomidae	No.	104	112	84	2		1						
	Wt.	0.058	0.067	0.049	0.003		+						
BIVALVIA													
Macoma balthica	No.		3	1	29	34	20	34	26	32	10	6	5
	Wt.		0.045	0.015	2.478	2.650	3.487	5.527	2.714	2.276	1.634	0.820	0.323
Mya arenaria	No.	1								1	1		
	Wt.	+								0.003	0.003		

Appendix Table--Continued.

Station (sample) Date January 1981		6(A) 12	(B)	(C)	7(A) 12	(B)	(C)	8(A) 26	(B)	(C)	9(A) 26	(B)	(C)
Taxon													
TURBELLARIA	No.	2	1		1								
	Wt.	0.001	+		+								
NEMERTEA	No.		2	2	1		1	1					
	Wt.		0.023	0.006	0.004		0.008	0.003					
POLYCHAETA													
Eteone dilatae	No.	1		3	1	1	1	1	2	2	7	7	6
	Wt.	0.002		0.002	0.003	0.001	0.003	0.001	0.001	0.002	0.008	0.016	0.011
Neanthes limnicola	No.	15	23	12	40	36	48	43	61	65	38	31	42
	Wt.	0.149	0.291	0.058	0.587	0.606	0.472	0.288	0.713	0.509	0.497	0.067	0.463
Pseudopolydora kempi	No.	1	1		1		1	10	6	13	35	42	41
	Wt.	0.002	0.002		0.003		0.002	0.022	0.013	0.022	0.111	0.120	0.110
Polydora ligni	No.							2			6	8	6
	Wt.							0.015			0.025	0.057	0.015
Pygospio elegans	No.		4		3	1	4	2			3	2	
	Wt.		0.002		0.003	+	0.002	0.001			0.001	+	
Heteromastus filiformis	No.												2
	Wt.												0.043
Hobsonia florida	No.	1	2		1	1	1	15	18	3	28	22	25
	Wt.	-	0.003		0.002	0.002	+	0.014	0.048	0.007	0.038	0.062	0.053
CRUSTACEA													
Neomysis mercedis	No.									1			
	Wt.									0.024			
Hemileucon sp.	No.	1		1									
	Wt.	+		+									
Eohaustorius estuaris	No.	98	86	43	11	14	7		1		2	2	1
	Wt.	0.286	0.269	0.142	0.015	0.061	0.032		0.004		0.003	0.013	0.005
Eogammarus confervicolus	No.							3	1		1	1	4
	Wt.							-	-		-	-	0.007
Corophium salmonis	No.									1	1	1	3
	Wt.									0.004	0.001	0.001	0.003
Corophium spinicorne	No.								6		2		
	Wt.								0.005		-		
BIVALVIA													
Macoma balthica	No.	18	16	10	20	15	16	43	41	34	48	43	28
	Wt.	1.838	0.993	0.869	1.086	0.980	0.882	1.898	3.302	1.732	2.435	3.049	1.419
Mya arenaria	No.								1	2	10	4	9
	Wt.								0.001	0.008	0.032	0.007	0.046

Appendix Table--Continued.

Station (sample) Date January 1981		10(A) 26	(B)	(C)	11(A) 26	(B)	(C)
Taxon							
TURBELLARIA	No.					1	1
	Wt.					0.001	0.001
POLYCHAETA							
Eteone dilatae	No.	1	5	2	1	1	
	Wt.	+	0.003	0.003	0.002	0.001	
Neanthes limnicola	No.	8	19	5	1	2	
	Wt.	0.087	0.162	0.029	0.001	0.003	
Glycinde polygnatha	No.				1	3	
	Wt.				0.007	0.041	
Pseudopolydora kempi	No.	22	56	11	88	96	126
	Wt.	0.081	0.0344	0.006	0.373	0.378	0.477
Polydora ligni	No.			3	1	1	
	Wt.			0.005	0.002	0.003	
Pygospio elegans	No.		4				
	Wt.		0.001				
Heteromastus filiformis	No.		3	3			
	Wt.		0.211	0.055			
Hobsonia florida	No.	9	34	32	5	1	3
	Wt.	0.029	0.041	0.128	0.003	+	0.005
CRUSTACEA							
Hemileucon sp.	No.				36	52	71
	Wt.				0.011	0.011	0.032
Eohaustorius estuaris	No.	1					
	Wt.	0.003					
Eogammarus oclairi	No.					1	2
	Wt.					0.008	0.028
Eogammarus confervicolus	No.			1		2	
	Wt.			0.002		0.005	
Corophium salmonis	No.	4	1	1	1	2	
	Wt.	0.004	+	+	0.002	0.001	
Corophium spinicorne	No.		2				1
	Wt.		0.001				0.001
INSECTA							
Chironomidae	No.				1	1	
	Wt.				0.001	+	
BIVALVIA							
Mytilus edulis	No.					2	1
	Wt.					-	0.001
Macoma balthica	No.	21	36	46	38	62	37
	Wt.	2.114	2.183	2.583	3.907	6.437	4.701
Mya arenaria	No.	24	26	52	5	2	4
	Wt.	0.035	0.042	1.000	0.004	-	0.030

Appendix Table--Continued.

Station (sample)		1(A)	(B)	(C)	2(A)	(B)	(C)	3(A)	(B)	(C)	4(A)	(B)	(C)
Date February 1981		28			10			10			10		
Taxon													
TURBELLARIA	No.			1	4	35	6	1	3	2	4	26	10
	Wt.			+	0.002	0.022	0.002	-	0.002	0.004	0.001	0.007	0.004
NEMERTEA	No.					3		3	2	5		1	3
	Wt.					0.021		0.006	0.004	0.029		0.002	0.003
POLYCHAETA													
Eteone dilatae	No.	1	4	2	7	18	10	9	5	12	15	19	20
	Wt.	0.003	0.010	0.002	0.035	0.124	0.039	0.019	0.004	0.030	0.064	0.075	0.079
Neanthes limnicola	No.		1		20	58	4	54	55	29	76	62	74
	Wt.		-		0.420	0.452	0.144	0.246	0.324	0.161	1.480	1.131	1.126
Pseudopolydora kempi	No.									1	1		
	Wt.									0.001	0.003		
Polydora ligni	No.					1							
	Wt.					0.001							
Pygospio elegans	No.				49	89	7	4	2	5	96	115	83
	Wt.				0.024	0.026	0.003	0.002	+	0.002	0.035	0.027	0.013
Hobsonia florida	No.		1	1	29	59	3	1	2	32	66	72	69
	Wt.		+	+	0.047	0.873	0.006	0.003	0.007	0.283	0.228	0.181	0.226
CRUSTACEA													
Hemileucon sp.	No.												2
	Wt.												0.001
Gnorimosphaeroma lutea	No.	1		1		2							
	Wt.	0.011		-		0.048							
Eohaustorius estuaris	No.		2	3	5	8	13	21	54	48	1	4	1
	Wt.		0.012	0.016	0.035	0.055	0.072	0.149	0.370	0.274	0.006	0.026	0.004
Eogammarus oclairi	No.				1	7	2						
	Wt.				0.002	0.071	0.010						
Eogammarus confervicolus	No.				22	36	24				1	1	1
	Wt.				0.061	0.163	0.103				+	0.003	0.001
Corophium salmonis	No.				256	180	67	1			27	39	34
	Wt.				0.432	0.262	0.095	0.003			0.021	0.031	0.022
Corophium spinicorne	No.					2							
	Wt.					0.003							
INSECTA													
Dolichopodidae	No.	6	8	3	5	2	4						
	Wt.	0.016	0.015	0.011	0.011	0.010	0.017						
Chironomidae	No.	12	2		126	57	594				4	2	
	Wt.	0.005	0.001		0.090	0.038	0.526				0.003	0.002	
BIVALVIA													
Macoma balthica	No.				2	1	1	34	30	73	41	41	28
	Wt.				0.026	0.435	+	1.271	6.643	5.473	6.909	6.260	1.695
Mya arenaria	No.								1				
	Wt.								0.001				

Appendix Table--Continued.

Station (sample) Date February 1981		5(A) 10	(B)	(C)	6(A) 10	(B)	(C)	7(A) 10	(B)	(C)	8(A) 27	(B)	(C)
Taxon													
TURBELLARIA	No.	3	4			1							1
	Wt.	0.002	0.001			+							0.001
NEMERTEA	No.		2	1	2		4						
	Wt.		0.009	0.008	0.003		0.018						
POLYCHAETA													
Eteone dilatae	No.	2	1	4	3	1	1	1	2	1	1	1	
	Wt.	0.005	0.004	0.010	0.002	0.002	0.001	0.001	0.003	0.003	+	0.002	
Neanthes limnicola	No.	23	24	41	24	23	22	70	51	48	33	41	49
	Wt.	-	0.377	0.863	0.170	0.257	0.252	1.008	0.578	0.522	0.427	0.458	1.062
Pseudopolydora kempi	No.				4	2	4	1	3	2	12	35	19
	Wt.				+	0.005	0.004	0.001	0.007	0.003	0.036	0.120	0.055
Polydora ligni	No.												1
	Wt.												0.001
Pygospio elegans	No.	1		2				1	1	2	1	3	1
	Wt.	+		0.001				0.001	+	0.001	0.001	0.001	+
Hobsonia florida	No.			2		1		3	1	2	5	5	10
	Wt.			0.006		0.002		0.006	0.003	0.003	0.008	0.011	0.009
CRUSTACEA													
Hemileucon sp.	No.								1	1	1		
	Wt.								+	+	+		
Saduria entomon	No.	1											
	Wt.	0.136											
Eohaustorius estuaris	No.	85	49	22	31	70	95	4	2	5		2	
	Wt.	0.278	0.166	0.049	0.097	0.251	0.340	0.023	0.007	0.024		0.013	
Eogammarus confervicolus	No.									3			
	Wt.									0.008			
Corophium salmonis	No.	1									1	1	1
	Wt.	+									0.001	+	+
BIVALVIA													
Mytilus edulis	No.								1				
	Wt.								0.006				
Macoma balthica	No.	11	17	18	13	17	17	13	22	18	53	42	55
	Wt.	1.803	2.371	3.136	1.752	2.719	1.141	1.679	1.700	1.923	1.393	2.841	1.375
Mya arenaria	No.					1					2		
	Wt.					0.003					0.004		

Appendix Table--Continued.

Station (sample)		9(A)	(B)	(C)	10(A)	(B)	(C)	11(A)	(B)	(C)
Date February 1981		27			27			27		
Taxon										
POLYCHAETA										
Eteone dilatae	No.	1	1	4	2	3	5	2		
	Wt.	0.002	0.002	0.002	-	0.005	0.014	0.005		
Eteone lighti	No.									1
	Wt.									0.008
Neanthes limnicola	No.	48	44	51	9	13	2	2		1
	Wt.	0.641	0.654	0.554	0.185	0.168	0.001	0.013		0.014
Hemipodus borealis	No.							1	1	1
	Wt.							0.007	0.011	0.006
Pseudopolydora kempi	No.	7	11	19	8	21	31	33	38	82
	Wt.	0.008	0.016	0.045	0.003	0.021	0.045	0.008	0.107	0.318
Polydora ligni	No.	3	3	3		4	1			1
	Wt.	0.010	0.023	0.006		0.010	0.004			0.004
Pygospio elegans	No.		1	1		4				
	Wt.		-	+		0.001				
Heteromastus filiformis	No.			1		1	1		1	1
	Wt.			0.008		0.001	0.027		0.003	0.005
Hobsonia florida	No.	9	6	1	28	20	32	1	2	
	Wt.	0.032	0.017	-	0.060	0.044	0.053	0.004	0.003	
CRUSTACEA										
Neomysis mercedis	No.	1								
	Wt.	-								
Hemileucon sp.	No.							27	28	18
	Wt.							0.010	-	0.008
Gnorimosphaeroma lutea	No.							1	2	
	Wt.							0.004	0.012	
Eohaustorius estuaris	No.	4	1	2			1			
	Wt.	0.014	0.003	0.005			0.002			
Eogammarus oclairi	No.					1		1	7	
	Wt.					0.001		0.007	0.045	
Eogammarus confervicolus	No.							1	3	
	Wt.							0.003	0.005	
Corophium salmonis	No.		1	2	2	1	3			1
	Wt.		+	0.006	0.001	0.001	0.005			0.002
Corophium spinicorne	No.						1			
	Wt.						+			
Cancer magister	No.						1			
	Wt.						0.632			
BIVALVIA										
Mytilus edulis	No.			1						
	Wt.			+						
Macoma balthica	No.	37	33	40	58	60	51	39	48	58
	Wt.	5.264	2.901	4.228	4.610	2.686	3.257	1.701	3.891	4.998
Mya arenaria	No.		1	2	53	55	34		1	6
	Wt.		+	0.033	0.120	0.200	0.543		0.001	-

Appendix Table--Continued.

Station (sample) Date March 1981		2(A) 13	(B)	(C)	3(A) 13	(B)	(C)	4(A) 13	(B)	(C)	5(A) 13	(B)	(C)
Taxon													
TURBELLARIA	No.	3	7	1	5	10	1	1	1	1	12	10	1
	Wt.	0.001	0.002	+	0.002	0.004	+	+	+	+	0.004	0.003	-
NEMERTEA	No.						1				2	3	
	Wt.						+				-	0.012	
POLYCHAETA													
Eteone dilatae	No.	13	20	17	6	16	7	1	6	6	3	3	1
	Wt.	0.084	0.081	0.095	0.017	0.059	0.038	0.003	0.013	0.014	0.006	0.003	0.002
Neanthes limnicola	No.	3	2	22	33	99	27	60	53	63	20	28	53
	Wt.	0.086	0.010	0.486	1.025	1.946	1.142	0.558	0.429	0.591	0.381	0.290	0.728
Pseudopolydora kempi	No.									2			
	Wt.									0.003			
Pygospio elegans	No.	41	11	43	4	111	40	4	6	2	1	1	1
	Wt.	0.015	0.005	0.019	0.001	0.021	0.009	0.001	0.002	+	+	+	+
Hobsonia florida	No.	14	1	29	37	71	85	3			1	1	4
	Wt.	0.010	+	0.253	0.073	0.192	0.240	0.009			0.006	0.003	0.017
CRUSTACEA													
Hemileucon sp.	No.										2		1
	Wt.										0.001		+
Eohaustorius estuaris	No.	28	31	6	1			66	54	22	33	30	30
	Wt.	0.166	0.255	0.033	0.006			0.542	0.369	0.108	0.117	0.089	0.079
Eogammarus confervicolus	No.	1	8	4	2					2		6	
	Wt.	+	0.008	0.002	-					0.008		0.002	
Corophium salmonis	No.	5	1	1	12	55	16	3	1		3		
	Wt.	0.007	+	0.003	0.009	0.048	0.012	0.006	0.002		0.004		
INSECTA													
Dolichopodidae	No.	2	1	1	3		8						
	Wt.	0.008	0.006	0.005	0.006		0.008						
Chironomidae	No.	58	68	40	23	10	10						
	Wt.	0.040	0.050	0.027	0.010	0.004	0.007						
BIVALVIA													
Macoma balthica	No.	4	2	1	6	36	10	36	33	36	31	17	17
	Wt.	0.362	0.218	0.002	3.023	4.268	1.997	1.541	8.172	10.400	0.156	2.553	4.093

Appendix Table--Continued.

Station (sample) Date March 1981		6(A) 13	(B)	(C)	7(A) 13	(B)	(C)	8(A) 26	(B)	(C)	9(A) 26	(B)	(C)
Taxon													
TURBELLARIA	No.	1	2	2	1		1						
	Wt.	+	0.001	0.002	+		+						
NEMERTEA	No.		2	2									
	Wt.		0.010	0.011									
POLYCHAETA													
Eteone dilatae	No.	2	3	4	1	2					1	2	2
	Wt.	0.005	0.004	0.002	0.002	0.003					0.002	0.002	0.002
Neanthes limnicola	No.	29	28	7	58	48	50	44	26	30	42	32	34
	Wt.	0.908	0.766	0.121	0.507	1.358	1.218	0.768	0.727	0.394	0.662	0.613	0.686
Pseudopolydora kempi	No.		1	1			1	4	1	2	15	9	10
	Wt.		0.002	+			0.002	0.011	0.007	-	0.042	0.027	0.012
Polydora ligni	No.								1		4	4	1
	Wt.								0.004		0.015	0.026	0.007
Pygospio elegans	No.		5	3		4	2		1	1	2	3	
	Wt.		0.001	+		0.001	+		+	+	+	0.001	
Hobsonia florida	No.		4	1		1	1	4	3	6	6	11	11
	Wt.		0.012	0.001		0.002	0.002	0.016	0.008	0.005	0.005	0.031	0.026
CRUSTACEA													
Hemileucon sp.	No.	1											
	Wt.	+											
Eohaustorius estuaris	No.	72	50	40	8	15	15	1	1	1	2	4	4
	Wt.	0.260	0.089	0.150	0.036	0.060	0.085	0.016	0.008	0.005	0.005	0.031	0.026
Eogammarus confervicolus	No.						1				3		
	Wt.						+				0.006		
Corophium salmonis	No.			1		1		1	2		3	2	
	Wt.			0.002		0.002		0.002	0.005		0.004	0.003	
Corophium spinicorne	No.										2		
	Wt.										0.004		
Crangon sp.	No.					3							
	Wt.					0.007							
BIVALVIA													
Macoma balthica	No.	37	21	29	29	33	36	34	12	32	105	70	65
	Wt.	1.193	1.999	3.151	2.795	3.000	1.997	0.888	2.882	0.461	2.197	3.260	2.878
Mya arenaria	No.					1		1	1		4		1
	Wt.					0.212		0.001	0.002		0.041		+

Appendix Table--Continued.

Station (sample) Date March 1981		10(A) 26	(B)	(C)	11(A) 26	(B)	(C)
Taxon							
POLYCHAETA							
Eteone dilatae	No.	1	8	4			2
	Wt.	+	0.014	0.008			0.003
Neanthes limnicola	No.	12	18	13	2	1	
	Wt.	0.166	0.170	0.187	0.004	0.002	
Hemipodus borealis	No.				1		
	Wt.				0.011		
Pseudopolydora kempi	No.	13	19	18	65	80	60
	Wt.	0.012	0.026	0.027	0.063	0.308	0.230
Polydora ligni	No.	2	1	2	1	1	1
	Wt.	0.006	0.005	0.010	0.006	0.011	0.004
Pygospio elegans	No.	2	7	3			
	Wt.	+	0.003	.001			
Heteromastus filiformis	No.	1	2	1	2	3	
	Wt.	0.003	0.045	0.012	0.003	0.004	
Hobsonia florida	No.	10	10	9	3	3	2
	Wt.	0.041	0.032	0.019	0.005	0.005	0.002
CRUSTACEA							
Hemileucon sp.	No.			1	13	32	5
	Wt.			+	0.005	0.010	0.002
Eohaustorius estuaris	No.	1		1	2		
	Wt.	0.004		0.003	0.008		
Eogammarus confervicolus	No.						1
	Wt.						0.002
Corophium salmonis	No.	1		3			
	Wt.	0.002		0.007			
BIVALVIA							
Mytilus edulis	No.			1	1	2	
	Wt.			0.002	0.001	0.001	
Macoma balthica	No.	37	71	59	136	165	81
	Wt.	1.655	6.283	3.026	5.925	2.785	5.129
Mya arenaria	No.	21	29	22	1	3	9
	Wt.	0.193	0.136	0.186	+	0.018	0.024

Appendix Table--Continued.

Station (sample) Date April 1981		2(A) 10	(B)	(C)	3(A) 10	(B)	(C)	4(A) 10	(B)	(C)	5(A) 10	(B)	(C)
Taxon													
TURBELLARIA	No.		3		5	1	1		1	3	1	12	1
	Wt.		0.001		0.003	+	+		+	0.002	+	0.006	+
NEMERTEA	No.								1			1	1
	Wt.								0.009			0.007	0.004
POLYCHAETA													
Eteone dilatae	No.	10	1	2	14	9	2	5	3	3	3	5	5
	Wt.	0.028	+	0.002	0.043	0.027	0.005	0.010	0.004	0.003	0.006	0.005	0.004
Neanthes limnicola	No.	3		12	38	54	51	46	66	52	40	81	26
	Wt.	0.077		0.154	0.802	1.254	0.783	0.589	0.614	0.543	0.480	1.632	0.590
Pseudopolydora kempi	No.			1			1						
	Wt.			0.003			0.004						
Pygospio elegans	No.	8	1	20	98	92	60		1	5	2	3	5
	Wt.	0.002	+	0.004	0.024	0.020	0.014		+	0.001	+	0.001	0.001
Hobsonia florida	No.	14	2	30	81	45	50	1	2	1	3	6	1
	Wt.	0.145	0.001	0.269	0.189	0.098	0.160	0.004	0.007	0.004	0.019	0.042	0.004
CRUSTACEA													
Hemileucon sp.	No.	1			1	1	1				1		1
	Wt.	+			0.001	+	+				+		+
Eohaustorius estuaris	No.		16	3				25	39	44	22	34	55
	Wt.		0.112	0.009				0.131	0.166	0.160	0.068	0.107	0.232
Eogammarus oclairi	No.	1											
	Wt.	0.001											
Eogammarus confervicolus	No.		1			1					2	5	1
	Wt.		0.001			0.001					0.006	0.026	+
Corophium salmonis	No.		6	1	56	124	38	8	3		1		
	Wt.		0.002	+	0.123	0.242	0.076	0.015	0.008		0.003		
Corophium spinicorne	No.	2											
	Wt.	+											
Gammaridae	No.			1									
	Wt.			0.001									
INSECTA													
Dolichopodidae	No.	3	3	3	2								
	Wt.	0.017	0.018	0.014	0.008								
Chironomidae	No.	349	182	30	7	7	1						
	Wt.	0.293	0.153	0.017	0.003	0.004	+						
BIVALVIA													
Macoma balthica	No.	3			16	38	45	40	26	63	40	41	30
	Wt.	0.042			0.473	9.880	13.719	9.350	3.480	7.245	2.080	5.963	1.333

Appendix Table--Continued.

Station (sample) Date April 1981		6(A) 10	(B)	(C)	7(A) 10	(B)	(C)	8(A) 23	(B)	(C)	9(A) 10	(B)	(C)
Taxon													
TURBELLARIA	No.	1	2	5			3					1	
	Wt.	+	0.001	0.003			-					+	
NEMERTEA	No.	2	2	2									
	Wt.	0.041	0.015	0.033									
POLYCHAETA													
Eteone dilatae	No.	8	2	3		1		1		2		1	1
	Wt.	0.012	0.004	0.005		0.002		+		-		0.002	+
Neanthes limnicola	No.	28	35	33	54	76	57	36	26	37	16	39	40
	Wt.	0.546	0.796	0.792	1.380	1.974	1.387	0.788	0.601	0.629	3.000	0.766	0.915
Pseudopolydora kempi	No.		1			1		5	2	3	3	11	7
	Wt.		0.003			0.002		0.006	0.013	0.009	0.007	0.058	0.020
Polydora ligni	No.											2	1
	Wt.											0.010	0.014
Pygospio elegans	No.		3	1	1	4	5	4	5	2		3	1
	Wt.		0.001	+	+	0.001	0.001	0.001	0.001	+		0.001	+
Heteromastus filiformis	No.								1		1		
	Wt.								0.034		0.010		
Hobsonia florida	No.			2	2	2	7	11	6	13	4	9	6
	Wt.			0.008	0.006	0.005	0.022	0.014	0.006	0.020	0.029	0.020	0.009
CRUSTACEA													
Hemileucon sp.	No.										1		1
	Wt.										+		+
Gnorimosphaeroma lutea	No.						1						
	Wt.						0.011						
Eohaustorius estuaris	No.	45	65	53	4	4	5	5	3	6	2		3
	Wt.	0.174	0.256	0.212	0.019	0.014	0.024	0.023	0.016	0.011	0.004		0.016
Eogammarus confervicolus	No.				2		8	2				2	
	Wt.				0.004		0.032	0.004				0.003	
Corophium salmonis	No.		2	2	1	2	6			1	5	3	3
	Wt.		0.003	0.004	0.002	0.007	0.009			0.002	0.009	0.006	0.005
Crangon franciscorum	No.			1				4		1			
	Wt.			0.010				0.073		0.007			
Corophium sp.(juvenile)	No.					1							
	Wt.					0.002							
BIVALVIA													
Macoma balthica	No.	35	33	31	62	39	57	81	97	53	64	109	68
	Wt.	2.757	2.116	3.986	2.947	2.050	4.515	7.063	3.098	1.678	2.119	2.248	3.622
Mya arenaria	No.				1		1	1	1	1	1	2	1
	Wt.				0.007		0.112	+	0.002	0.028	0.009	0.028	0.027

Appendix Table--Continued.

Station (sample) Date April 1981		10(A) 23	(B)	(C)	11(A) 23	(B)	(C)
Taxon							
POLYCHAETA							
Eteone dilatae	No.		8			1	
	Wt.		0.008			0.002	
Neanthes limnicola	No.	8	12	13			3
	Wt.	0.066	0.050	0.040			0.032
Hemipodus borealis	No.				1	1	
	Wt.				0.017	0.035	
Pseudopolydora kempi	No.	19	23	15	61	79	41
	Wt.	0.026	0.035	0.021	0.382	0.394	0.163
Polydora ligni	No.	1	3	2		2	1
	Wt.	0.002	0.012	0.003		0.007	0.008
Pygospio elegans	No.	2	17	5			
	Wt.	+	0.004	0.001			
Heteromastus filiformis	No.	2	2	1		2	1
	Wt.	0.021	0.016	0.006		0.005	0.005
Hobsonia florida	No.	19	28	18	3	4	5
	Wt.	0.043	0.056	0.036	0.005	0.003	0.005
CRUSTACEA							
Hemileucon sp.	No.	2	2		6	4	1
	Wt.	+	+		0.002	0.001	0.001
Saduria entomon	No.				1		
	Wt.				+		
Eohaustorius estuaris	No.	3	2	2			
	Wt.	0.009	0.003	0.007			
Eogammarus oclairi	No.						3
	Wt.						0.016
Eogammarus confervicolus	No.						3
	Wt.						0.005
Corophium salmonis	No.	3	4	2			1
	Wt.	-	0.007	0.005			0.001
Corophium spinicorne	No.		1	2			
	Wt.		0.004	0.005			
Crangon franciscorum	No.						1
	Wt.						0.005
Mytilus edulis	No.				1	1	
	Wt.				0.001	+	
BIVALVIA							
Macoma balthica	No.	73	67	45	76	79	52
	Wt.	2.010	4.289	2.071	1.463	0.885	2.360
Mya arenaria	No.	8	26	15		2	9
	Wt.	0.237	0.487	0.063		0.033	0.125

Appendix Table--Continued.

Station (sample) Date May 1981		2(A) 21	(B)	(C)	3(A) 21	(B)	(C)	4(A) 21	(B)	(C)	5(A) 21	(B)	(C)
Taxon													
TURBELLARIA	No.				3	4	1	3	1	2	-	19	5
	Wt.				0.002	0.003	+	0.002	0.015	0.001	-	0.007	-
NEMERTEA	No.								1		-	1	1
	Wt.								-		-	0.004	0.001
POLYCHAETA													
Eteone dilatae	No.	10			8	12	5	7	3	6	-	8	3
	Wt.	0.028			0.031	0.014	0.006	0.004	0.002	0.006	-	0.011	0.005
Neanthes limnicola	No.	5	2	2	76	64	55	32	40	40	-	72	42
	Wt.	0.119	0.118	0.065	0.815	1.093	1.045	0.519	0.564	0.590	-	0.285	0.511
Pygospio elegans	No.	7			230	81	47	2	2	4	-	7	
	Wt.	0.001			0.016	0.014	0.005	+	+	+	-	0.001	
Heteromastus filiformis	No.								2		-		
	Wt.								0.013		-		
Hobsonia florida	No.	12	12	1	51	32	16				-		
	Wt.	0.014	0.014	0.001	0.092	0.054	0.037				-		
CRUSTACEA													
Hemileucon sp.	No.						1			1	-		
	Wt.						+			+	-		
Pancolus californiensis	No.						1				-		
	Wt.						+				-		
Eohaustorius estuaris	No.					2		227	102	131	-	62	50
	Wt.					0.003		0.315	0.206	0.408	-	0.145	0.154
Eogammarus confervicolus	No.					2					-	2	
	Wt.					0.001					-	0.001	
Corophium salmonis	No.			1	27	67	46	1	2		-	2	1
	Wt.			+	0.014	0.076	0.044	0.002	0.004		-	0.003	+
Crangon franciscorum	No.										-	1	
	Wt.										-	0.055	
INSECTA													
Dolichopodidae	No.	8	6	7		1					-		
	Wt.	0.017	0.007	0.013		0.005					-		
Chironomidae	No.	22	22	18							-		
	Wt.	0.013	-	0.010							-		
BIVALVIA													
Macoma balthica	No.	6	3	1	44	35	39	49	31	44	-	20	37
	Wt.	0.162	1.838	0.872	10.437	12.932	15.595	5.601	5.274	4.982	-	1.496	3.198

Appendix Table--Continued.

Station (sample)		6(A)	(B)	(C)	7(A)	(B)	(C)	8(A)	(B)	(C)	9(A)	(B)	(C)
Date May 1981		21			21			20			20		
Taxon													
TURBELLARIA	No.	3	7	18	4	3	1	1					
	Wt.	0.002	0.004	0.007	0.002	0.001	+	+					
NEMERTEA	No.		2	2					1				
	Wt.		0.022	0.019					0.009				
POLYCHAETA													
Eteone dilatae	No.	6	9	5					1		4	3	5
	Wt.	0.005	0.013	0.004					0.001		0.009	0.004	0.004
Neanthes limnicola	No.	13	36	33	58	40	29	48	80	78	44	32	18
	Wt.	0.365	0.437	0.366	0.933	0.471	1.174	0.834	0.840	1.109	0.430	0.295	0.353
Pseudopolydora kempi	No.		1	1	1			2	12	6	17	21	33
	Wt.		0.002	0.001	0.001			0.006	0.045	0.025	0.053	0.051	0.101
Polydora ligni	No.									1	2		1
	Wt.									0.002	0.006		0.003
Pygospio elegans	No.	2			6	5	1				12	9	4
	Wt.	+			0.001	0.001	+				0.005	0.004	0.002
Heteromastus filiformis	No.											1	
	Wt.											0.002	
Hobsonia florida	No.			1	4	3	1	8	5	4	12	24	18
	Wt.			0.005	0.008	0.008	0.003	0.008	0.010	0.029	0.043	0.087	0.045
CRUSTACEA													
Hemileucon sp.	No.						1				1	1	
	Wt.						+				+	+	
Isopoda	No.		1		1								
	Wt.		+		+								
Eohaustorius estuaris	No.	39	54	50	9	23	4	6	3	1	2	1	1
	Wt.	0.123	0.132	0.137	0.014	0.061	0.017	0.034	0.017	0.005	0.006	0.001	+
Eogammarus confervicolus	No.							2	3	4		13	
	Wt.							0.002	0.004	0.009		0.019	
Corophium salmonis	No.		1	3	2	7	1	9	1	2	8	4	7
	Wt.		0.001	0.005	0.005	0.012	0.002	0.013	+	0.002	0.009	0.003	0.015
Corophium spinicorne	No.										1	3	1
	Wt.										0.002	0.002	0.001
Crangon franciscorum	No.	2	1	3	1	4							
	Wt.	0.015	0.006	0.225	0.002	0.096							
BIVALVIA													
Macoma balthica	No.	39	22	25	45	45	45	75	77	71	92	86	116
	Wt.	4.725	2.723	3.046	3.820	3.184	2.940	5.192	1.900	3.763	4.188	6.434	4.267
Mya arenaria	No.						1			1	4	3	4
	Wt.						0.110			0.027	0.049	0.138	0.132

Appendix Table--Continued.

Station (sample) Date May 1981		10(A) 20	(B)	(C)	11(A) 20	(B)	(C)
Taxon							
TURBELLARIA	No.				1		
	Wt.				+		
POLYCHAETA							
Eteone dilatae	No.		1	1		1	
	Wt.		0.002	0.002		0.002	
Neanthes limnicola	No.	8	5	6			3
	Wt.	0.215	0.135	0.107			0.058
Hemipodus borealis	No.					1	1
	Wt.					0.002	0.006
Pseudopolydora kempi	No.	1	27	9	59	72	72
	Wt.	+	0.038	0.006	0.361	0.429	0.430
Polydora ligni	No.	4	2	4	2	1	
	Wt.	0.004	0.006	0.005	0.009	0.004	
Pygospio elegans	No.	2	19	4	1		
	Wt.	+	0.004	+	-		
Heteromastus filiformis	No.	1	2	3	2	3	
	Wt.	0.008	-	0.015	0.005	0.007	
Hobsonia florida	No.	32	48	51	3	3	1
	Wt.	0.113	-	0.106	0.010	0.004	0.001
CRUSTACEA							
Hemileucon sp.	No.	3	8		22	17	14
	Wt.	0.001	0.003		0.007	0.006	0.004
Eogammarus confervicolus	No.				1	1	
	Wt.				-	0.002	
Corophium salmonis	No.	14	13	9	1		
	Wt.	0.033	0.026	0.010	-		
Corophium spinicorne	No.	1					
	Wt.	0.002					
BIVALVIA							
Macoma balthica	No.	125	168	119	90	77	104
	Wt.	6.410	6.775	6.460	1.8876	0.972	2.470
Mya arenaria	No.	37	43	42	1		1
	Wt.	0.911	1.780	0.786	0.123		0.036

Appendix Table--Continued.

Station (sample) Date June 1981		2(A) 22	(B)	(C)	3(A) 22	(B)	(C)	4(A) 22	(B)	(C)	5(A) 22	(B)	(C)
Taxon													
TURBELLARIA	No.				2	4		1		8	1	2	
	Wt.				+	0.002		+		0.003	+	0.001	
NEMERTEA	No.												1
	Wt.												0.005
POLYCHAETA													
Eteone dilatae	No.			1	4		6	5	3	7		3	3
	Wt.			0.002	0.003		0.006	0.004	0.004	0.004		0.003	0.002
Neanthes limnicola	No.	4	1	4	145	182	113	39	43	48	68	87	78
	Wt.	0.001	0.001	0.006	0.685	1.057	0.455	0.405	0.288	0.282	0.563	0.469	0.357
Pygospio elegans	No.				6	6	9						
	Wt.				0.002	0.002	0.003						
Hobsonia florida	No.	2			42	83	13	1	3	3	4	1	3
	Wt.	0.004			0.037	0.072	0.012	+	0.003	0.001	0.002	+	0.006
CRUSTACEA													
Hemileucon sp.	No.			1									
	Wt.			+									
Eohaustorius estuaris	No.				5		8	150	176	137	49	58	104
	Wt.				0.038		0.046	0.198	0.437	0.312	0.182	0.141	0.364
Eogammarus confervicolus	No.					1						1	
	Wt.					0.002						+	
Eogammarus sp. or spp. (young)	No.			1						1	6	5	3
	Wt.			0.001						+	0.002	0.002	0.002
Corophium salmonis	No.				34	143	17	4	2		1	8	3
	Wt.				0.089	0.333	0.028	0.004	0.003		0.002	0.013	0.002
Gammaridae	No.												1
	Wt.												+
Crangon franciscorum	No.										1		1
	Wt.										0.069		0.063
INSECTA													
Dolichopodidae	No.	9	6	11		1							
	Wt.	0.009	0.006	0.029		0.004							
Chironomidae	No.	27	3	25									
	Wt.	0.004	0.001	0.003									
BIVALVIA													
Macoma balthica	No.	1		1	30	29	51	42	35	53	22	32	24
	Wt.	0.049		0.006	12.241	9.204	13.886	12.879	7.345	15.528	0.669	2.833	0.964

Appendix Table--Continued.

Station (sample)		6(A)	(B)	(C)	7(A)	(B)	(C)	8(A)	(B)	(C)	9(A)	(B)	(C)
Date June 1981		22			22			29			29		
Taxon													
TURBELLARIA	No.	1	2				3						
	Wt.	0.001	0.001				0.002						
NEMERTEA	No.												1
	Wt.												0.003
POLYCHAETA													
Eteone dilatae	No.	1	1	3	1	1					1	1	2
	Wt.	+	0.002	0.003	+	+					0.002	+	0.004
Neanthes limnicola	No.	61	57	84	79	62	100	44	135	99	67	80	63
	Wt.	0.401	0.334	0.342	0.931	0.370	0.743	0.342	0.880	0.412	1.115	0.457	0.245
Pseudopolydora kempi	No.										2	1	1
	Wt.										-	0.003	0.001
Pygospio elegans	No.				1								
	Wt.				-								
Heteromastus filiformis	No.											1	
	Wt.											0.013	
Hobsonia florida	No.	8	1	2	9	2	10	9	31	27	46	59	47
	Wt.	0.002	+	0.001	0.003	0.002	0.005	0.004	0.026	0.016	0.039	0.027	0.027
CRUSTACEA													
Eohaustorius estuaris	No.	81	98	109	9	20	6		1	3	1	1	1
	Wt.	0.225	0.319	0.305	0.017	0.055	0.027		0.004	0.006	0.005	0.002	0.003
Eogammarus confervicolus	No.								3	1			
	Wt.								0.006	0.002			
Eogammarus sp. or spp. (young)	No.	1	2	1					1				
	Wt.	+	+	+					+				
Corophium salmonis	No.	6	4	5	12	20	16	9	7	15	22	22	20
	Wt.	0.009	0.005	0.016	0.017	0.045	0.023	0.024	0.026	0.044	0.053	0.054	0.064
Crangon franciscorum	No.	1			2	2							
	Wt.	0.022			0.236	0.057							
BIVALVIA													
Macoma balthica	No.	27	20	18	28	39	27	37	34	23	27	35	17
	Wt.	1.208	1.080	0.613	2.199	2.004	3.113	5.821	2.532	2.004	2.001	3.299	1.179

Appendix Table--Continued.

Station (sample)		10(A)	(B)	(C)	11(A)	(B)	(C)
Date June 1981		29			29		
Taxon							
TURBELLARIA	No.						1
	Wt.						0.001
NEMERTEA	No.	1					
	Wt.	0.003					
POLYCHAETA							
Neanthes limnicola	No.	14	11	13	4	5	6
	Wt.	0.063	0.014	0.062	0.008	0.014	0.011
Pseudopolydora kempi	No.	2	6	4	26	18	22
	Wt.	0.002	0.004	0.002	0.078	0.066	-
Heteromastus filiformis	No.	1	1	1	1	2	1
	Wt.	0.001	0.012	0.001	0.006	0.005	0.007
Hobsonia florida	No.	51	89	90	28	18	19
	Wt.	0.071	0.112	0.066	0.019	0.003	0.015
CRUSTACEA							
Hemileucon sp.	No.				9	3	7
	Wt.				0.002	0.001	0.002
Corophium salmonis	No.	12	31	49			1
	Wt.	0.036	0.075	0.147			0.001
BIVALVIA							
Macoma balthica	No.	77	102	111	67	83	119
	Wt.	5.795	6.032	5.261	0.946	2.358	4.420
Mya arenaria	No.	3	8	9			
	Wt.	0.174	0.432	0.490			

Appendix Table--Continued.

Station (sample) Date July 1981		2(A) 22	(B)	(C)	3(A) 22	(B)	(C)	4(A) 22	(B)	(C)	5(A) 22	(B)	(C)
Taxon													
TURBELLARIA	No.	1	5	1	4	11	26	17	5	4	6	6	1
	Wt.	0.001	0.002	+	0.002	0.007	0.011	0.004	0.001	+	0.002	0.002	+
POLYCHAETA													
Eteone dilatae	No.	4	4	7	4	2	2				1	2	1
	Wt.	0.002	0.002	0.003	0.005	0.002	0.011				0.007	0.002	0.002
Neanthes limnicola	No.	19	9	7	184	283	332	50	65	140	68	103	127
	Wt.	0.025	0.026	0.002	0.809	1.734	2.841	0.365	0.621	1.713	0.597	0.752	1.631
Pygospio elegans	No.						20						
	Wt.						0.003						
Hobsonia florida	No.	1	1		53	88	243	8	7	30	5	12	11
	Wt.	+	0.001		0.057	0.081	0.230	0.004	0.002	0.016	0.007	0.008	0.007
CRUSTACEA													
Gnorimosphaeroma lutea	No.						5						2
	Wt.						0.005						0.004
Eohaustorius estuaris	No.					5		155	232	65	70	55	20
	Wt.					0.046		0.420	0.834	0.230	0.259	0.120	0.053
Eogammarus confervicolus	No.						53			2			28
	Wt.						0.123			0.005			0.045
Eogammarus oclairi	No.						1						
	Wt.						0.003						
Corophium salmonis	No.	1			12	17	53	4	5		7	1	1
	Wt.	0.003			0.021	0.034	0.065	0.004	0.002		0.004	0.002	0.004
Corophium spinicorne	No.						26	1		2			2
	Wt.						0.061	0.001		0.002			0.001
INSECTA													
Dolichopodidae	No.	26	17	20	5	1		1					
	Wt.	0.093	0.068	0.067	0.005	0.002		0.004					
Chironomidae	No.	443	538	869		1							
	Wt.	0.191	0.125	0.301		+							
BIVALVIA													
Macoma balthica	No.	2			22	30	44	49	26	59	22	28	17
	Wt.	0.043			9.052	6.589	16.258	19.202	7.232	11.404	2.720	4.507	6.857

Appendix Table--Continued.

Station (sample) Date July 1981		6(A) 22	(B)	(C)	7(A) 22	(B)	(C)	8(A) 27	(B)	(C)	9(A) 27	(B)	(C)
Taxon													
TURBELLARIA	No.	1			1	2	4	1	1		1	4	3
	Wt.	+			+	0.002	0.002	0.001	+		+	0.002	0.001
NEMERTEA	No.	1											
	Wt.	0.026											
POLYCHAETA													
Eteone dilatae	No.		1	2			1				2	1	
	Wt.		0.001	0.002			+				0.001	0.002	
Neanthes limnicola	No.	64	53	119	79	132	150	84	59	58	72	57	52
	Wt.	0.317	0.424	1.563	0.899	1.221	1.306	0.726	0.593	0.554	0.453	0.492	0.279
Pseudopolydora kempi	No.									1	2	1	3
	Wt.									0.003	0.004	0.003	0.014
Heteromastus filiformis	No.				1								1
	Wt.				0.010								0.024
Hobsonia florida	No.	7	7	10	23	22	26	44	57	94	257	315	265
	Wt.	+	0.005	0.010	0.040	0.028	0.042	0.045	0.056	0.103	0.267	0.307	0.322
CRUSTACEA													
Gnorimosphaeroma lutea	No.												2
	Wt.												+
Eohaustorius estuaris	No.	71	94	38	25	15	10	1	1	2			
	Wt.	0.144	0.256	0.086	0.092	0.037	0.022	0.007	0.007	0.002			
Eogammarus oclairi	No.										1		
	Wt.										-		
Eogammarus confervicolus	No.	2		5			26			1	3		
	Wt.	0.006		0.016			0.054			0.001	0.005		
Corophium salmonis	No.	2	2		5	4	5	39	9	34	13	18	21
	Wt.	+	0.004		0.012	0.007	0.010	0.052	0.008	0.049	0.036	0.037	0.049
Corophium spinicorne	No.						3	1			13	2	9
	Wt.						0.003	0.001			0.008	0.001	0.013
Crangon franciscorum	No.	1			2	1	1						
	Wt.	0.079			0.128	0.012	0.119						
BIVALVIA													
Macoma balthica	No.	24	14	20	24	23	28	26	21	30	53	52	59
	Wt.	4.639	4.490	3.004	1.179	3.719	4.703	1.988	3.394	3.319	5.590	5.106	4.303
Mya arenaria	No.												3
	Wt.												0.029

Appendix Table--Continued.

Station (sample)		10(A)	(B)	(C)	11(A)	(B)	(C)
Date July 1981		27			27		
Taxon							
TURBELLARIA	No.		1	4			
	Wt.		+	0.001			
POLYCHAETA							
Eteone dilatae	No.	2	1				
	Wt.	0.006	0.001				
Neanthes limnicola	No.	9	3	9	1	2	1
	Wt.	0.109	0.007	0.005	0.002	0.016	0.001
Pygospio elegans	No.	1					
	Wt.	+					
Heteromastus filiformis	No.		2				
	Wt.		-				
Hobsonia florida	No.	169	212	245	7	15	3
	Wt.	0.160	0.154	0.213	0.004	0.011	0.003
CRUSTACEA							
Hemileucon sp.	No.		1		4	13	3
	Wt.		+		0.001	0.004	0.001
Eohaustorius estuaris	No.		4	2			
	Wt.		0.008	0.005			
Corophium salmonis	No.	2	22	9			
	Wt.	0.002	0.054	0.030			
Corophium spinicorne	No.	8	1	2			
	Wt.	0.004	0.002	0.002			
BIVALVIA							
Macoma balthica	No.	66	80	80	67	83	71
	Wt.	7.456	5.406	5.439	4.994	6.080	6.348
Mya arenaria	No.	1	4	10			
	Wt.	0.002	0.070	0.195			

Appendix Table--Continued.

Station (sample) Date August 1981		1 (A) 21	(B)	(C)	2 (A) 21	(B)	(C)	3 (A) 21	(B)	(C)	4 (A) 21	(B)	(C)
Taxon													
TURBELLARIA	No.					3		13	21	32	1	3	7
	Wt.					0.001		0.008	0.012	0.015	+	0.002	0.003
NEMERTEA	No.												1
	Wt.												0.029
POLYCHAETA													
Eteone dilatae	No.							5	5	5	4		3
	Wt.							0.005	0.007	0.005	0.005		0.004
Neanthes limnicola	No.				1	11	2	83	104	97	94	36	54
	Wt.				0.027	0.005	0.011	0.128	0.620	0.175	0.523	0.331	0.347
Pygospio elegans	No.							3	23	20			1
	Wt.							+	0.004	0.003			+
Hobsonia florida	No.							351	347	315	88	14	14
	Wt.							1.128	0.785	0.745	0.127	0.013	0.016
CRUSTACEA													
Eohaustorius estuaris	No.							3		8	62	98	121
	Wt.							0.021		-	0.266	0.378	0.439
Eogammarus oclairi	No.								1				
	Wt.								0.015				
Eogammarus confervicolus	No.							3	18		2	1	
	Wt.							0.004	0.069		0.002	0.003	
Corophium salmonis	No.							153	115	93	4	4	9
	Wt.							0.465	0.327	0.213	0.007	0.004	0.016
Corophium spinicorne	No.							1	6				
	Wt.							0.002	0.004				
INSECTA													
Dolichopodidae	No.		4		30	47	44	2					
	Wt.		0.006		-	0.090	0.080	0.003					
Chironomidae	No.		6	5	1122	493	790		1	2			
	Wt.		-	0.002	0.403	0.195	0.323		+	+			
GASTROPODA													
Sacoglossa	No.				2	3	1			1			
	Wt.				0.001	0.007	0.002			0.003			
BIVALVIA													
Macoma balthica	No.							24	36	27	36	38	29
	Wt.							16.384	13.120	10.776	6.704	14.091	9.682

Appendix Table--Continued.

Station (sample) Date August 1981		5(A) 21	(B)	(C)	6(A) 21	(B)	(C)	7(A) 21	(B)	(C)	8(A) 26	(B)	(C)
Taxon													
TURBELLARIA	No.	56	59	22	3	2		1				1	
	Wt.	0.014	0.017	0.006	0.001	0.002		+				0.001	
POLYCHAETA													
Eteone dilatae	No.	1	1		1				1		2	1	
	Wt.	0.001	+		-				0.001		0.002	0.002	
Neanthes limnicola	No.	34	101	53	95	24	37	57	86	66	40	32	43
	Wt.	0.420	1.241	0.905	2.085	0.447	0.652	1.038	1.352	0.967	0.305	0.490	0.287
Pygospio elegans	No.		1										
	Wt.		+										
Heteromastus filiformis	No.				1				1	1	2	1	
	Wt.				0.008				0.002	0.003	0.005	0.003	
Hobsonia florida	No.	7	163	3	15	9	4	9	22	16	50	61	29
	Wt.	0.007	0.568	0.006	0.026	0.015	0.005	0.007	0.042	0.014	0.093	0.107	0.023
CRUSTACEA													
Gnorimosphaeroma lutea	No.		1		1								
	Wt.		+		0.002								
Eohaustorius estuaris	No.	52	30	73	14	144	128	17	18	12	8	16	13
	Wt.	0.124	0.039	0.189	0.033	0.362	0.348	0.096	0.063	0.034	0.027	0.040	0.035
Eogammarus oclairi	No.								1				
	Wt.								0.005				
Eogammarus confervicolus	No.		16		3				9				
	Wt.		0.024		0.013				-				
Corophium salmonis	No.	4	43	7	2	4	2	10	8	2	11	17	13
	Wt.	0.003	0.064	0.002	0.006	0.007	0.005	0.018	0.009	0.004	0.024	0.024	0.013
Corophium spinicorne	No.		35		3				5			1	
	Wt.		0.050		0.004				0.003			0.002	
BIVALVIA													
Macoma balthica	No.	18	29	22	28	20	22	21	26	23	21	29	18
	Wt.	4.219	14.205	4.190	7.452	2.754	4.833	4.541	5.154	4.221	4.900	5.525	4.920

Appendix Table--Continued.

Station (sample) Date August 1981		9(A) 26	(B)	(C)	10(A) 26	(B)	(C)	11(A) 26	(B)	(C)
Taxon										
TURBELLARIA	No.	2				3	1			
	Wt.	-				0.002	+			
NEMERTEA	No.				1	1	2			
	Wt.				0.006	0.004	-			
POLYCHAETA										
Eteone dilatae	No.	2	2	2	1	1	2			
	Wt.	0.002	0.002	0.001	-	0.001	0.001			
Neanthes limnicola	No.	62	54	51	50	46	28	10		1
	Wt.	1.156	1.086	0.951	0.591	0.651	0.330	0.049		0.003
Pseudopolydora kempi	No.				3	3	3	14	20	17
	Wt.				0.010	0.014	0.018	0.009	0.015	0.015
Pygospio elegans	No.					1	2			
	Wt.					+	+			
Heteromastus filiformis	No.	1	1		1		3	3	2	3
	Wt.	0.035	0.005		0.017		0.074	0.011	0.021	-
Hobsonia florida	No.	55	56	31	162	280	200	7		6
	Wt.	0.073	0.075	0.040	0.278	0.518	0.355	0.008		0.006
CRUSTACEA										
Hemileucon sp.	No.							2		
	Wt.							+		
Eohaustorius estuaris	No.	1		5	1					
	Wt.	0.004		0.010	0.006					
Eogammarus confervicolus	No.	1					3			
	Wt.	0.395					0.004			
Corophium salmonis	No.	2	1	5	1			1		
	Wt.	-	0.002	-	0.002			0.002		
Corophium spinicorne	No.	7	4			8	4			
	Wt.	0.004	0.004			0.004	0.002			
Crangon franciscorum	No.	1								
	Wt.	0.395								
BIVALVIA										
Macoma balthica	No.	28	25	18	60	88	66	129	69	118
	Wt.	7.223	7.818	3.125	7.182	9.246	8.036	10.557	7.487	15.692
Mya arenaria	No.									1
	Wt.									-

Appendix Table--Continued.

Station (sample) Date September 1981		2(A) 15	(B)	(C)	3(A) 15	(B)	(C)	4(A) 15	(B)	(C)	5(A) 15	(B)	(C)
Taxon													
TURBELLARIA	No.	2	6		8	43	36	5	2	15	1	4	2
	Wt.	0.002	-		0.005	0.020	0.014	0.001	0.001	0.004	+	0.002	0.001
NEMERTEA	No.											1	
	Wt.											0.010	
POLYCHAETA													
Eteone dilatae	No.				7	19	5	1		1		1	
	Wt.				0.008	0.029	-	+		0.001		+	
Neanthes limnicola	No.	4	115		29	86	123	56	67	58	32	42	26
	Wt.	0.030	2.015		0.213	0.704	0.688	0.417	0.290	0.327	0.505	0.618	0.621
Pseudopolydora kempi	No.								1				
	Wt.								0.001				
Pygospio elegans	No.		1				5						
	Wt.		+				+						
Hobsonia florida	No.	3	136		14	172	471	31	114	67	16	93	7
	Wt.	0.005	-		0.008	0.273	-	0.049	0.359	0.157	0.063	-	0.005
CRUSTACEA													
Gnorimosphaeroma lutea	No.											1	
	Wt.											0.001	
Eohaustorius estuaris	No.						3	64	74	79	128	53	66
	Wt.						0.031	0.267	0.343	0.223	0.379	0.168	-
Eogammarus oclairi	No.						1						
	Wt.						0.005						
Eogammarus confervicolus	No.				1		19		1			5	
	Wt.				+		-		-			-	
Corophium salmonis	No.	2	3		9	131	382	9	4	16	4	37	3
	Wt.	0.004	0.002		0.001	0.213	0.890	0.002	0.004	0.022	0.006	0.078	0.004
Corophium spinicorne	No.					1	9		2			12	
	Wt.					0.002	0.009		0.002			-	
INSECTA													
Dolichopodidae	No.	54	3	10	22	2							
	Wt.	0.259	0.007	0.040	0.065	0.005							
Chironomidae	No.	916	94	1651	9	2							
	Wt.	0.579	0.037	1.076	0.003	+							
Ephydridae?	No.	73		170									
	Wt.	0.201		0.899									
GASTROPODA													
Sacoglossa	No.	12		1	22	3							
	Wt.	0.056		0.010	0.050	0.004							
BIVALVIA													
Macoma balthica	No.		5		21	39	25	27	45	33	19	36	16
	Wt.		1.358		7.087	17.916	9.952	10.318	14.082	11.926	4.082	12.353	4.516

Appendix Table--Continued.

Station (sample) Date September 1981		6(A) 15	(B)	(C)	7(A) 15	(B)	(C)	8(A) 25	(B)	(C)	9(A) 25	(B)	(C)
Taxon													
TURBELLARIA	No.	2	2					3	1	2	2	2	2
	Wt.	-	+					-	+	0.001	0.001	0.001	0.001
NEMERTEA	No.							1	1				1
	Wt.							0.004	0.002				0.004
POLYCHAETA													
Eteone dilatae	No.				1				1	1	2	3	2
	Wt.				0.001				0.001	0.001	0.001	0.002	0.001
Neanthes limnicola	No.	64	68	108	71	57	36	42	16	18	53	25	65
	Wt.	1.194	0.400	0.314	0.665	0.437	0.730	0.932	0.789	0.990	0.995	0.970	0.774
Pseudopolydora kempi	No.						1	5	6	1	1	2	
	Wt.						-	0.003	-	0.001	0.002	-	
Heteromastus filiformis	No.				1	1				1	1		
	Wt.				0.015	0.030				0.039	0.023		
Hobsonia florida	No.	5	5	4	10	3	8	67	40	46	66	67	49
	Wt.	-	0.016	0.018	0.012	-	-	0.113	0.091	0.100	0.165	0.209	0.148
CRUSTACEA													
Gnorimosphaeroma lutea	No.										1		
	Wt.										0.001		
Eohaustorius estuaris	No.	106	113	154	7	9	21	15	12	10	1	1	
	Wt.	-	0.312	0.461	0.029	-	0.066	0.052	0.044	0.032	0.002	0.003	
Eogammarus oclairi	No.	1				2							
	Wt.	0.004				0.007							
Eogammarus confervicolus	No.	2				2				3	3	3	
	Wt.	0.005				0.008				0.011	0.007	0.005	
Corophium salmonis	No.	5	1	9	5	18	9	9	14	15	6	1	1
	Wt.	0.014	-	0.023	-	-	0.010	0.020	0.027	-	0.014	-	0.003
Corophium spinicorne	No.	1				10				3	3		12
	Wt.	+				0.018				0.005	0.003		0.006
BIVALVIA													
Macoma balthica	No.	17	21	22	19	22	8	16	24	18	20	21	15
	Wt.	3.315	3.635	5.300	5.027	7.245	1.124	3.691	7.026	3.521	6.240	8.151	3.767

Appendix Table--Continued.

Station (sample) Date September 1981		10(A) 25	(B)	(C)	11(A) 25	(B)	(C)
Taxon							
TURBELLARIA	No.	2		2			
	Wt.	0.002		0.005			
NEMERTEA	No.		1				
	Wt.		0.006				
POLYCHAETA							
Eteone dilatae	No.				1		
	Wt.				+		
Neanthes limnicola	No.	23	17	7	2	2	1
	Wt.	0.371	0.166	0.265	0.024	0.012	0.011
Pseudopolydora kempi	No.	3	6	1	78	57	39
	Wt.	0.005	0.009	0.001	0.165	0.101	0.047
Pygospio elegans	No.	2	3				
	Wt.	+	+				
Heteromastus filiformis	No.	1	1	1	4	2	3
	Wt.	0.001	0.002	0.048	0.019	0.042	0.011
Hobsonia florida	No.	197	247	61	4	4	1
	Wt.	0.497	0.547	0.152	0.001	0.002	+
CRUSTACEA							
Balanus sp.	No.	1					
	Wt.	0.025					
Cumacea	No.						3
	Wt.						0.004
Eogammarus oclairi	No.			2			
	Wt.			0.008			
Eogammarus confervicolus	No.		9	5			
	Wt.		0.006	0.017			
Corophium salmonis	No.			2			
	Wt.			0.002			
Corophium spinicorne	No.	3	29	23			
	Wt.	0.004	0.042	0.017			
Gammaridae	No.					1	
	Wt.					-	
Crangon franciscorum	No.			2			
	Wt.			0.897			
BIVALVIA							
Macoma balthica	No.	87	118	37	138	148	162
	Wt.	13.643	13.802	5.815	18.345	19.872	20.936
Mya arenaria	No.	3					
	Wt.	5.020					

Appendix Table--Continued.

Station (sample) Date October 1981		2(A) 21	(B)	(C)	3(A) 21	(B)	(C)	4(A) 21	(B)	(C)	5(A) 21	(B)	(C)
Taxon													
TURBELLARIA	No.	12	5	47	41	4	29	5	11	3	43	10	13
	Wt.	-	-	0.008	0.027	0.002	0.017	0.002	0.004	0.001	0.010	0.003	0.003
NEMERTEA	No.											2	
	Wt.											0.037	
POLYCHAETA													
Eteone dilatae	No.				24	8	18			1			2
	Wt.				0.109	0.020	0.051			0.002			-
Neanthes limnicola	No.		1	4	121	90	156	57	78	63	41	79	42
	Wt.		0.015	0.218	1.993	0.866	1.973	0.502	0.476	0.490	0.668	1.077	0.625
Pseudopolydora kempi	No.					2					1	1	
	Wt.					0.004					+	0.001	
Pygospio elegans	No.						9						1
	Wt.						0.001						+
Heteromastus filiformis	No.							1		1			
	Wt.							0.004		0.002			
Hobsonia florida	No.				226	70	140	21	31	59	11	168	20
	Wt.				0.596	0.142	0.270	0.057	0.080	0.175	0.026	0.825	0.043
CRUSTACEA													
Gnorimosphaeroma lutea	No.				1								
	Wt.				0.001								
Eohaustorius estuaris	No.					3	1	135	20	53	87	49	48
	Wt.					0.018	0.004	0.683	0.076	-	0.334	-	0.222
Eogammarus oclairi	No.				4							1	
	Wt.				0.005							0.002	
Eogammarus confervicolus	No.					3	4				1	13	
	Wt.					-	0.004				-	0.035	
Eogammarus sp. or spp. (young)	No.												9
	Wt.												-
Corophium salmonis	No.				98	111	397	15	32	66	4	51	10
	Wt.				0.145	0.112	0.422	0.018	-	0.082	0.002	0.128	0.005
Corophium spinicorne	No.		1		27	2	11			2		22	3
	Wt.		+		0.050	0.002	0.029			0.001		0.016	0.001
INSECTA													
Dolichopodidae	No.	22	29	27		2							
	Wt.	-	0.046	0.070		0.004							
Chironomidae	No.	1575	3417	1454	18						1		
	Wt.	1.355	1.452	1.200	0.007						0.001		
Ephydridae	No.	12		15									
	Wt.	-		0.130									
GASTROPODA													
Sacoglossa	No.	90	65	100	2								
	Wt.	-	0.161	-	0.004								
BIVALVIA													
Macoma balthica	No.				22	22	38	19	41	39	15	61	17
	Wt.				8.516	9.895	21.657	6.733	14.868	16.562	6.051	17.025	4.848

Appendix Table--Continued.

Station (sample)		6(A)	(B)	(C)	7(A)	(B)	(C)	8(A)	(B)	(C)	9(A)	(B)	(C)
Date October 1981		21			21			26			26		
Taxon													
TURBELLARIA	No.	2	6	3	1	2	1	11	8	11	15	13	13
	Wt.	0.001	0.003	0.002	+	0.002	0.001	0.004	0.003	0.003	0.008	0.008	0.008
NEMERTEA	No.					1	2		1	1			
	Wt.					0.024	0.037		0.005	0.056			
POLYCHAETA													
Eteone dilatae	No.				1	4	1	2	2	2	2		
	Wt.				+	0.003	0.002	0.002	0.003	0.001	0.002		
Neanthes limnicola	No.	31	40	30	58	82	41	32	46	40	96	70	91
	Wt.	0.437	1.035	3.096	1.396	0.983	0.768	0.493	0.297	0.255	2.240	0.775	1.237
Pseudopolydora kempi	No.			1		2	1	1	9	6	5	4	7
	Wt.			+		0.002	0.009	+	0.019	0.008	0.022	-	0.064
Polydora ligni	No.				1						1		6
	Wt.				+						0.002		0.007
Pygospio elegans	No.					1			1				
	Wt.					0.001			+				
Heteromastus filiformis	No.						1		1				
	Wt.						0.006		+				
Hobsonia florida	No.	9	27	11	45	120	94	113	361	269	152	128	150
	Wt.	0.010	0.056	0.009	0.052	0.173	0.176	0.190	0.424	0.384	0.219	0.288	0.364
CRUSTACEA													
Hemileucon sp.	No.							3		1			
	Wt.							0.001		+			
Eohaustorius estuaris	No.	127	65	105	22	10	22	13	38	20		1	1
	Wt.	0.470	0.242	0.381	0.091	0.028	0.074	0.087	0.198	0.079		0.002	0.004
Eogammarus confervicolus	No.	1	21		3	15					5	2	
	Wt.	0.002	0.072		0.008	0.070					0.015	0.010	
Corophium salmonis	No.	2	11		6	5	29	12	20	23	4		2
	Wt.	0.001	0.015		0.006	0.007	0.031	0.024	0.027	0.049	0.004		0.005
Corophium spinicorne	No.	1	32			10		1	3	1	9	3	1
	Wt.	+	0.018			0.003		0.001	0.001	+	0.005	0.002	0.001
INSECTA													
Chironomidae	No.												1
	Wt.												0.002
BIVALVIA													
Macoma balthica	No.	12	24	17	27	27	22	40	32	41	32	18	39
	Wt.	3.983	8.692	3.285	4.277	6.907	4.454	12.737	6.005	9.719	5.936	2.892	5.800
Mya arenaria	No.									1			
	Wt.									0.004			

Appendix Table--Continued.

Station (sample) Date October 1981		10(A) 26	(B)	(C)	11(A) 26	(B)	(C)
Taxon							
TURBELLARIA	No.	1	1	12			
	Wt.	0.001	0.001	0.004			
NEMERTEA	No.		1	2			
	Wt.		0.006	0.005			
POLYCHAETA							
Eteone dilatae	No.			1			
	Wt.			0.001			
Neanthes limnicola	No.	21	26	28	1	1	2
	Wt.	0.516	1.402	0.939	0.001	0.014	0.087
Pseudopolydora kempi	No.	23	18	27	7	9	18
	Wt.	0.088	0.033	0.089	0.006	0.011	0.033
Polydora ligni	No.	2	7	7	1		1
	Wt.	0.001	0.013	0.009	0.001		0.003
Pygospio elegans	No.	3	2	13			
	Wt.	0.001	+	0.004			
Heteromastus filiformis	No.	1	2	4	2	5	7
	Wt.	0.037	0.100	0.110	0.022	0.032	0.146
Hobsonia florida	No.	138	154	229		3	6
	Wt.	0.397	0.471	0.870		0.003	0.006
CRUSTACEA							
Hemileucon sp.	No.	2					3
	Wt.	+					0.001
Eogammarus oclairi	No.			2			
	Wt.			0.009			
Eogammarus confervicolus	No.		1		6		
	Wt.		0.001		-		
Corophium salmonis	No.	2	1				
	Wt.	0.001	0.001				
Corophium spinicorne	No.		28	28			
	Wt.		0.019	0.014			
BIVALVIA							
Macoma balthica	No.	79	57	68	69	96	47
	Wt.	12.069	12.155	11.369	6.530	12.163	4.266
Mya arenaria	No.				2	1	1
	Wt.				0.005	0.004	0.002

+ Weight < 0.001 g.
- Indicates weight not taken.

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