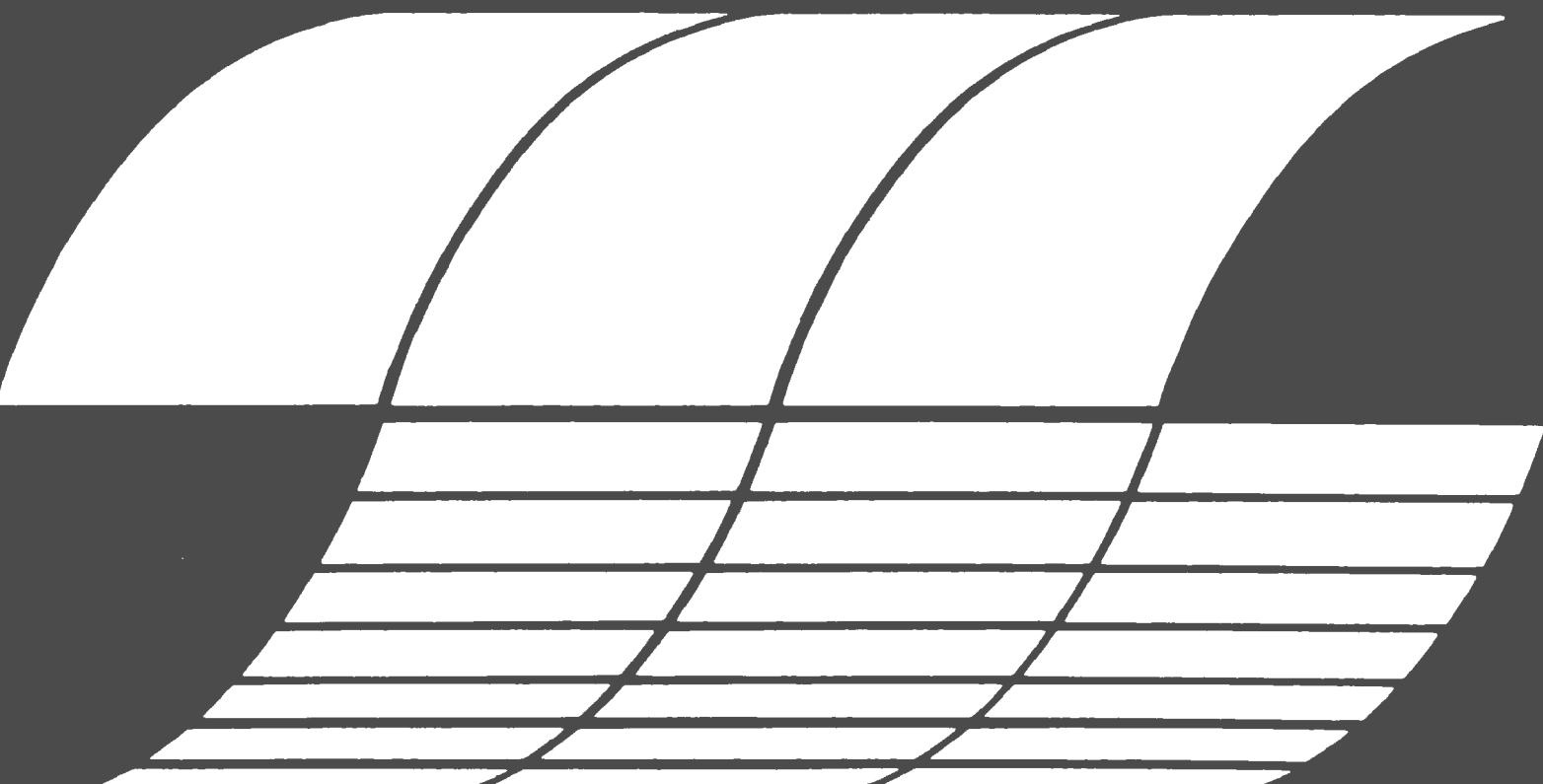


The Strait of Juan de Fuca Intertidal and Subtidal Benthos

Interagency
Energy/Environment
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Report



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THE STRAIT OF JUAN DE FUCA INTERTIDAL AND SUBTIDAL BENTHOS

Second Annual Report

Spring 1977 - Winter 1978

by

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by

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FOREWORD

Substantially increased petroleum tanker traffic and refining operations are anticipated in the region of northern Puget Sound and the Strait of Juan de Fuca as Alaskan crude oil production increases and as pipeline deliveries of crude from Canada to the region are terminated. This increased transport and refining activity will increase the opportunities for spills and leaks of crude oil and refined products into the marine environment. Recognizing the need for environmental information in the region, the U.S. Environmental Protection Agency has supported the Puget Sound Energy-Related Project under which studies involving biological characterizations, physical oceanography, trajectory modeling, pollutant monitoring, and fate and effects of oil have been implemented. This report has been administered by NOAA's Marine Ecosystems Analysis (MESA) Puget Sound Project office. A major part of the Project has involved a variety of biological studies intended to provide information on the characteristics of biological communities at risk to oil pollution in the region. This report presents the results of a two year field study of intertidal and shallow subtidal communities found at ten sites representative of common shoreline habitats along the Strait of Juan de Fuca. This study was conducted in consultation with representatives of the Washington State Department of Ecology.

ABSTRACT

Because of the threat of oil pollution from large scale oil shipment through the Strait of Juan de Fuca, this study was undertaken to document the pre-pollution communities in the shallow water zones along the Washington coast of the Strait of Juan de Fuca. The study objectives were to adequately describe the distribution, abundance, seasonal variations and annual variation of the intertidal and shallow subtidal benthos of this coastal area.

During the first year ten sites, representative of the range of habitats present, were sampled quarterly. Stratified random replicates were collected at each area. Strata used were high (+6'), mid (+3'), low (+0') intertidal and -5 m and -10 m. Distribution sampling at intermediate strata was conducted once. During the second year seven of the same sites were again sampled quarterly in the intertidal, while the remaining three intertidal sites and all subtidal strata were sampled once.

Over 1,000 different plant and animal species were collected during these two years, 176 of which had not previously been recorded in standard taxonomic keys for our region. The dominant groups were algae, molluscs, polychaete annelids, and crustaceans. In the intertidal, rock habitats were the richest in terms of number of species, density, and biomass (and probably productivity), followed by cobble, protected soft sediment, exposed sand, and exposed gravel habitats. Species richness values ranged from 177.5 (Tongue Pt. +0') to 1 (Dungeness Spit +6'); diversity 3.24 (North Beach Cobble +0') to 0.17 (Dungeness Spit +6'); density 56,874/m² (Jamestown +6') to 44/m² (Twin Rivers +6'); biomass 11,375 g/m² (Pillar Pt. +0') to < 2 g/m² (Dungeness +6'). Strong intertidal vertical zonation was found at all but the most exposed gravel and sand sites. Subtidal study sites were consistently rich. Community comparisons of the areas and levels sampled during this study validated the type habitat approach and the selection of strata to be sampled. Patchiness of organisms in the communities sampled generally obscured seasonal patterns in populations of component species. However, summed over all levels and areas, summer was most often the peak for species richness, abundance, and biomass and winter most often the low. Year to year community similarity was high in the rock, cobble, and protected soft sediment areas.

An important generalization from this mass of data stood out. The rich, complex, productive communities are to be found in rock and protected soft-sediment sites. These communities were the least variable over time and are the most vulnerable to long term damage from an oil spill. These data will be useful in assessment of damage from an oil spill, especially the measures of community similarity, species richness, and diversity, since the values of these parameters change with oil pollution effects. In addition these data should have broad use in coastal zone management decisions.

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SECTION I

INTRODUCTION

This report presents the second year results of an intertidal and shallow subtidal benthic sampling program at ten sites along the Washington State coast of the Strait of Juan de Fuca. The purpose of this program was to provide a quantitative characterization of the marine, shallow-water, bottom communities of the Strait.

In the past five years the greater Puget Sound region has seen a dramatic increase in marine crude and refined oil transport with the replacement of overland pipeline transport by large tanker transport. The possibility of Alaskan crude oil transshipment through this region to the Midwest means additional increases are possible in the near future. This tanker traffic increase also increases the risk of catastrophic and chronic oil pollution of the marine environment in this region.

Previous to 1974 virtually no quantitative data existed on the intertidal and shallow subtidal benthos of this region. The seriousness of this absence of information was two-fold. First the communities of these organisms have great recreational, ecological, and economic importance. This is especially true for the greater Puget Sound region. Hundreds of thousands of people live on or very near the shore and make use of its varied recreational activities from yachting to clam digging. These same areas are also highly productive of eelgrass and macro-algae, plants which are responsible for a very large percentage of greater Puget Sound primary production. After the economic importance of recreational uses of these communities, there is a large direct economic value based on commercial fisheries. Virtually all juvenile salmonids are dependent on intertidal and shallow water communities for food. These communities are also highly productive of commercial bottom fish and of shellfish.

The second reason an absence of quantitative data on the intertidal and shallow subtidal benthic communities of this region was so serious is the widely documented high susceptibility of these communities to damage from spilled oil (National Academy of Sciences, 1975; Malins, 1977; Wolfe, 1978). Put simply much or most oil floats and in the virtually closed greater Puget Sound basin most floating oil will come ashore (Oil on Puget Sound, 1972).

To respond to this oil pollution threat, in 1974 the Washington State Department of Ecology initiated field work for their Oil Baseline Studies. This work was largely confined to the San Juan Islands and the Rosario Strait mainland areas. In 1976 the federal government initiated field sampling along the Strait of Juan de Fuca under the EPA's Puget Sound

Energy-Related Research Project administered through NOAA's Marine Ecosystem Analysis Puget Sound Project office. This project was designed to identify the potential ecological consequences of increased petroleum transport and transfer activities anticipated for the greater Puget Sound region.

First year research components of the study reported on previously (Nyblade, 1978) consisted of defining the habitat types present along the Strait of Juan de Fuca, largely according to substratum/exposure, selection of ten sites along the length of the Strait representative of these habitat types, and quarterly determination of the vertical distribution of the organisms found at each.

In order to verify and amplify trends observed the first year and to document natural year to year variation, a second year of sampling was undertaken. Second year sampling consisted of continued quarterly determination of community composition at seven sites in the intertidal and annually at three sites intertidally and all sites subtidally. These components have permitted documentation of both seasonal and annual changes in the communities sampled.

This information is critical: to develop an understanding of the biology of the shallow water marine communities of this region, to evaluate the regional ecological importance of the various habitats, to determine the economic value of the various types of communities, and to enable any careful assessment of the impact of man's activities along the Strait, especially in assessing damage to this environment from oil pollution. Also, uses of this data base may very well involve activities quite unrelated to oil pollution, eg. damage from other pollutants, tideland utilization, siting studies--informed coastal zone management.

SECTION II

CONCLUSIONS

With the completion of this two year program of sampling along Washington's coast of the Strait of Juan de Fuca, a quantitative data set on the composition of the Strait's intertidal and shallow subtidal marine benthic communities has been established prior to any major perturbation such as a large oil spill from a tanker or submarine pipeline.

Exposed intertidal sand and gravel habitats contained relatively sparse, simple, low diversity communities dominated by worms and small crustaceans. Protected soft-sediment habitats exhibited dense, very diverse infaunal communities dominated by a vast array of polychaete species, small and large bivalves, and small and large crustaceans. Cobble and rock areas contained the richest communities with the largest standing crop biomass. Cobble and rock communities were dominated by macro-algae, herbivorous gastropods, barnacles, mussels, large and small crustaceans. Subtidal rock areas were equally rich. Communities there contained a large variety of algae, gastropods, small crustaceans, and the dominant algal grazers, sea urchins. Subtidal soft sediment areas were also species rich, but standing crop was much lower. Communities in these areas contained literally hundreds of species of polychaetes as well as a great variety of small bivalves and crustaceans.

Over 1,000 different plant and animal species were collected during the study. Second year species richness values ranged from 177.5 (Tongue Point +0') to 1 (Dungeness Spit +6'); diversity from 3.24 (North Beach Cobble +0') to 0.17 (Dungeness Spit +6'); density 56,874 /m² (Jamestown +6') to 44 /m² (Twin Rivers +6'); biomass 11,375 g/m² (Pillar Point +0') to < 2 g/m² (Dungeness +6'). Strong intertidal vertical zonation was found at all but the most exposed gravel and sand sites.

Little seasonal change in communities was documented during either of the two years of study. Surprisingly little annual change in communities was found comparing the first and second year data sets. It is clear that data variability may very well have masked real seasonal and annual changes. On the other hand major changes should be reflected in the summary parameters measured such as mean species richness, diversity, and community similarity. But little evidence was found among these parameters for seasonal or annual changes. Sanders (1978) argues forcefully for the utilization of such synthetic parameters in examining community change, rather than traditional species lists and the vast, unmanageable data set on individual species populations.

What is there specifically to be concluded about the response of the

communities studied to perturbations such as an oil spill? The following summarizes these conclusions. Life span/recruitment rates are the author's best estimate from direct experience.

<u>Increasing Damage/ Increasing Recovery Time</u>	<u>Habitat/Study Areas</u>	<u>Number of Macro-Species in Community</u>	<u>Life Span/ Recruitment Rates of Dominants</u>
↓	Gravel - Dungeness Spit Twin Rivers	few to 10's	<<1 yr.
	Sand - Kydaka Beach North Beach Sand	10's to 20's	<1 yr. to 1 yr.
	Mud - Jamestown		
	Mixed - Beckett Point	50 to 100	1 yr. to several years
	Cobble - North Beach Morse Creek		
	Rock - Pillar Point Tongue Point	100's	several yrs. to decades

There finally has begun to develop a literature to support such conclusions concerning longterm damage. Torrey Canyon recovery took from 5 to 10 years and by some measures remains incomplete (Southward and Southward, 1978). Other studies of other spills for shorter periods continued to show damage after 2½ to 3 years (Sanders, 1978; Hampson and Moul, 1978) with no prediction on when recovery might be complete. Hampson and Moul have documented severe salt marsh erosion following the killing of marsh grass by oil erosion of areas that may have taken hundreds of years or longer to accumulate. The rich, complex communities of rock and protected soft-sediment areas are the most vulnerable to long term damage because they are dominated by long-lived, irregularly recruiting species. Recovery of these communities from an oil spill could take decades here.

SECTION III

RECOMMENDATIONS

A number of recommendations for further studies can be made based on the two year Strait of Juan de Fuca sampling program:

1. Further quantitative monitoring of communities at the study sites should be undertaken. Sampling methodology must be identical or compatible with previous work in order to make comparisons with previous data possible. However, for the more complex communities only a subset of the dominant species need be fully processed, the remainder of the sample being processed for long term storage only. The need for further monitoring is two-fold. First, more information is needed on normal year to year variation of these marine communities. Second, only by updating will the validity of the original data base be maintained for post-perturbation comparisons. Should an oil spill occur in 1987, use of a ten year old data base for damage assessment would be weak unless validated by long-term monitoring.
2. Studies of community recruitment dynamics, especially of the key, long-lived species of the complex rock and protected soft-bottom communities, should be undertaken. Almost nothing is known about recruitment dynamics of regional marine species, particularly the long-lived species which apparently are highly irregular in recruitment. Without a better understanding of recruitment, there can be no basis for specific predictions on the recovery of their communities from a perturbation such as an oil spill which destroys key elements of the communities.
3. A general analysis and synthesis of the greater Puget Sound shallow water marine benthos data base should be undertaken. Although sampling methodology has been similar in studies during the past five years undertaken for METRO, the Washington State Department of Ecology, and the MESA Puget Sound office, technical report data presentation has not been compatible and generally the original data has not been presented.
4. Following data synthesis a field test should be undertaken to determine the degree to which the data base can be extrapolated to areas not previously sampled.
5. Additional regional taxonomic work is desperately needed on a number of important groups: gammarid amphipods, oligochaetes, free-living nematodes, ostracods, and cumaceans - in descending order of importance. The lumping of the species of these groups into higher taxa creates great problems in data analysis and comparison. When dominant species (eg. amphipods and oligochaetes in exposed gravel areas) are not identified to species, nothing can be said about long term community change or a potential change caused by pollution.

6. Samples processed and stored must be carefully curated as long as there is any use for the data based on them. The science of taxonomy is undergoing constant change. Without recourse to the original samples no use can be made of current taxonomic information.

SECTION IV

METHODS AND MATERIALS

IV-A. Field and Laboratory Procedures

Second year procedures followed directly those of the first year (Nyblade, 1978) to guarantee comparable data sets. The purpose of this methodology was to provide data to best document the abundance, distribution, seasonal and annual variation of organisms and populations in each major habitat type present and to do this with a finite set of resources.

All ten study sites sampled during the first year were resampled during the second (Table 1, Figure 1, site maps in Appendix III). Because of problems with irregularly shifting sediment (North Beach Cobble and Twin Rivers) or limited area available to sample (Pillar Point), these three areas were only sampled once during the second year. Since during the first year subtidal areas were fully processed for only one quarter they were sampled only once during the second year.

Because tidal height/water depth has an over-riding influence on community type present within a given habitat type, the strata marked and sampled during the first year were resampled during the second to obtain comparable data. Three strata were selected for sampling in the intertidal (high +6'; mid, generally +3'; low +0') and two in the subtidal (-5m, -10m). First year distributional sampling (Nyblade, 1978), showed these levels gave full coverage of the range of organisms present over the entire tidal and shallow water range at study areas.

The number, size, and type of randomly located replicates taken at each stratum in general was identical during the second year to the first year.

They were as follows:

Rock - intertidal (Tongue Point and Pillar Point): Four 0.25 m² quadrats, each consisting of five 0.01 m² subsection scrapes and the residual 0.2 m² scrape.

Cobble - intertidal (North Beach and Morse Creek): Four 0.25 m² quadrats, each consisting of five 0.01 m² subsection scrapes, the residual 0.2 m² scrape, and the under-cobble 0.05 m² x 15 cm sediment core fixed and dead-sieved through 1 mm mesh; four 0.25 m² x 30 cm deep quadrats live-sieved through 12.5 mm mesh.

Exposed Gravel and Sand - intertidal (Dungeness Spit, Twin Rivers, North Beach, and Kydaka Point): Five quadrats of 0.05 m² x 15 cm deep sediment cores fixed and dead-sieved through 1 mm mesh; five of 0.25 m² x 30 cm live-sieved through 12.5 mm mesh.

TABLE 1. LISTING OF STUDY AREA NAMES, LOCATIONS (COORDINATES), AND
INTERTIDAL 1977-78 SAMPLING DATES

Study Area- (intertidal habitat type)	Location	Intertidal Sampling Dates
1 Kydaka Point - (exposed sand)	124° 22' 20" W 48° 16' 14" N	Apr., Jun., Oct., Feb.
2 Pillar Point - (exposed rock)	124° 06' 03" W 48° 12' 51" N	May
3 Twin Rivers - (exposed gravel)	123° 56' 57" W 48° 09' 55" N	May
4 Tongue Point - (exposed rock)	123° 41' 42" W 48° 09' 57" N	May, Jun., Oct., Jan.
5 Morse Creek - (exposed cobble)	123° 20' 48" W 48° 07' 09" N	May, Jul., Nov., Feb.
6 Dungeness Spit - (exposed gravel)	48° 08' 47" N 123° 11' 12" W	May, Jul., Nov., Jan.
7 Jamestown - (protected sand)	48° 07' 51" N 123° 05' 11" W	Apr., Jun., Oct., Jan.
8 Beckett Point - (protected gravel/sand)	48° 04' 37" N 122° 52' 56" W	Apr., Jul., Oct., Jan.
9 North Beach - (exposed cobble)	48° 08' 36" N 122° 46' 59" W	Apr.
10 North Beach - (exposed sand)	48° 08' 35" N 122° 46' 51" W	May, Jul., Nov., Jan.

Protected Sand and Mixed - intertidal (Jamestown and Beckett Point):

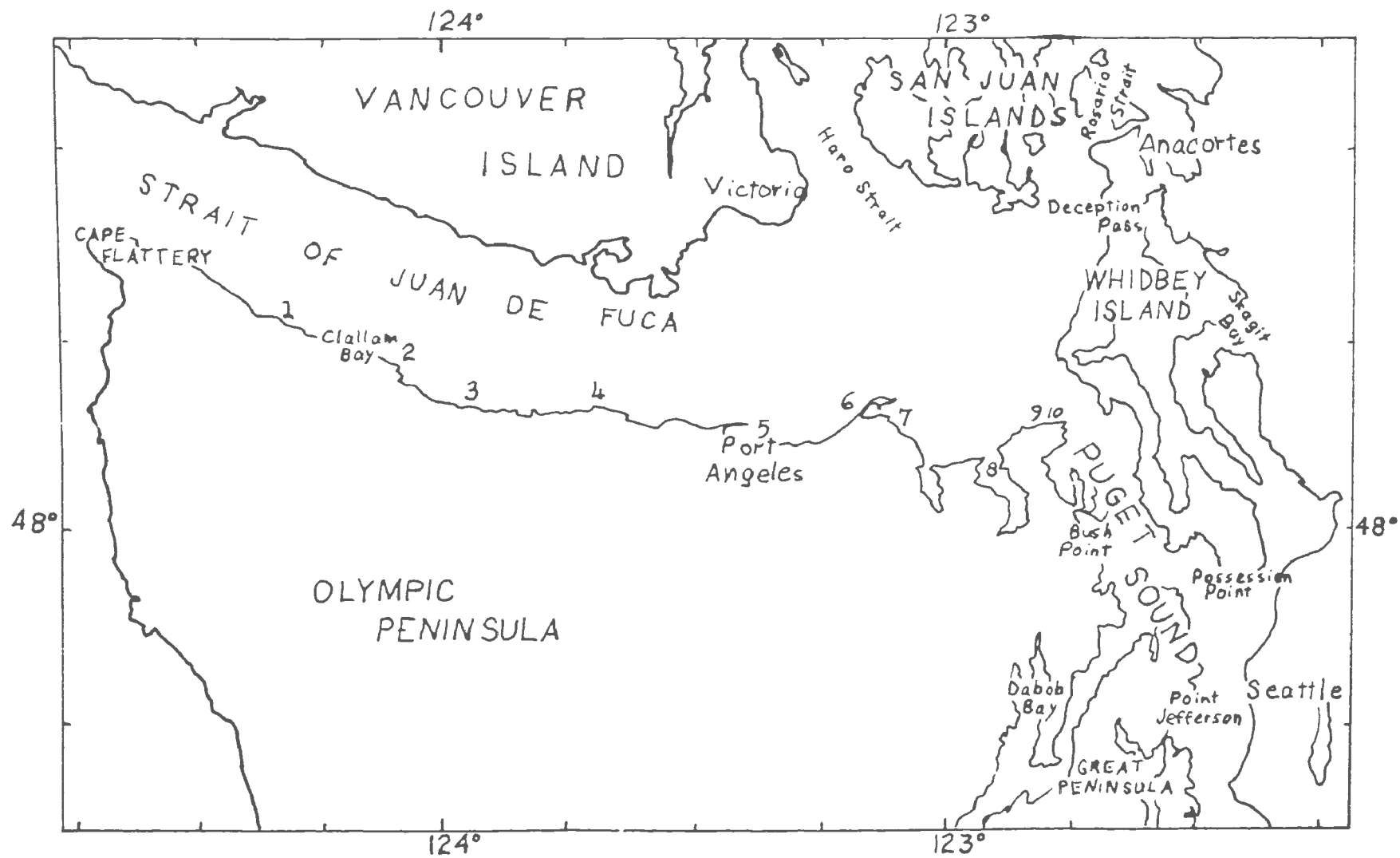
Two quadrats, each 0.05 m² x 15 cm deep, divided into 0.025m² x 15 cm cores, fixed and dead-sieved through 1 mm mesh; two 0.25 m² x 30 cm deep cores live-sieved through 12.5 mm mesh.

Rock - subtidal (Tongue Point): four quadrats, each a 0.25 m² scrape.

Soft-sediment - subtidal (all sites except Tongue Point): Two quadrats each a 0.1 m² Van Veen grab sample partitioned on the boat into equal halves.

Figure 1. Map of Study Sites

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In an effort to increase replicate number and hopefully to decrease sample variance at Beckett Point, Jamestown, and all soft bottom subtidal sites, the first year quadrat size was halved in the second year by sample partitioning. Instead of three replicates, four half size replicates were taken.

All samples collected during the second year program were completely processed and are stored in the Washington State Baseline Sample Repository of the University of Washington Friday Harbor Laboratories.

Highly detailed methodology descriptions, site maps, criteria for study area selection, explanations of the maps, driving directions, tidal reference point data, and details on access permissions from private and public agency land owners were presented in the first year report (Nyblade, 1978).

There are many potential sources of error in any field sample collection and their processing in the laboratory. Field errors include improperly determining quadrat boundaries, collecting the sample under water, failure to accurately count small organisms not removed. Although these mistakes generally cannot be detected once the sample has been collected, a carefully supervised and experienced field crew reduced these problems to a minimum.

Potential laboratory processing errors include improper sieving of samples, mis-counting, mis-weighting, mis-identifications, and clerical errors each time the data are transcribed. A carefully supervised, experienced staff and frequent referral to the original sample were used to minimize these sources of sampling error.

IV-B. Data Analysis

The Data Management Plan for the Puget Sound Energy-Related Research Project and MESA Puget Sound Project received from the Seattle-based project Office dated 15 January 1976 with subsequent revisions has been followed in this study. Raw data in the form of keypunched cards have been submitted to the Project Office on a quarter-by-quarter basis for ultimate archival in the United States Environmental Data and Information Service. All study data are available through the E.D.I.S.

A variety of data analyses have been used in this report. Each is listed and described below. Taken together they provide a clear descriptive summary of the communities studied and enable community comparisons.

IV-B-1. Species Richness:

As in the first year report, here species richness was the total number of identification categories/study area stratum/sampling period, thus summed over the replicates. The identification categories for plants and animals include both species and higher taxonomic categories where identification to species was not possible. This total number of species

found is a useful figure which summarizes one kind of community complexity but says nothing about relative abundance or numerical dominance.

IV-B-2. Diversity - H'

The following formula for diversity has been used (see Pielou, 1975, for a description of its use and calculation):

$$H' = - \sum_{i=1}^S p_i \log p_i$$

This weighs both species number and the evenness of their occurrence. It thus provides a better measure of community complexity than species richness because it weighs the relative abundance or the evenness of constituent species spread through their community. This index does not differentiate between low diversity due to low species richness or due to the overwhelming dominance of one or a very small number of species. In order to combine plants (biomass) and animals (individuals) into a single H' , plant biomass was converted to individuals (0.1 g = 1). (Algae of <0.1 g were considered 0.1 g for this index.)

IV-B-3. Total Number:

Total number is the summed number of individuals per identification categories where individuals are counted, eg. most animals but not plants which are weighed and not counted. Especially where community biomass is low, total number gives the most useful information on overall community abundance. This is the only measure which excludes plants.

IV-B-4. Total Biomass:

The total biomass is the biomass of categories where 0.1 g or more was present. When the "<0.1 g"'s seemed significant compared to the other biomass, they were totaled, added to the small real weight, and this new sum entered as a "less than" weight. This made it very clear when no meaningful community biomass information had been obtained. However, for algal rich communities, total biomass is the only realistic measure of overall community abundance. Biomass is also the first step in understanding community productivity.

IV-B-5. Similarity Index - D :

The key analysis in this second year report was the comparison of the first and second year communities at each stratum sampled. For this comparison the similarity index D (Schoener, 1968) was used.

$$D = 1 - \frac{1}{2} \sum_{i=1}^n |p_{x,i} - p_{y,i}|$$

This index gives weight to both species (identification) categories present and their abundance. The values of D range from 0.00 to 1.00, where 0.00 represents total dissimilarity from first to second year, while 1.00 means completely identical. Abundance values used (weight for algae, number for animals) were annual means or means for a comparable number of seasons. Because evolution of taxonomic knowledge from year to year may result in the same organism being called different names, artificially decreasing similarity, every effort was made to make the identification categories comparable from year one and year two. The index uses relative abundance of a species in the community from one year to the next. It is insensitive to absolute changes in abundance, as long as percentage community composition remains the same. Abundance changes, if uniform across the spectrum of community constituents, do not reflect a change in community structure. However, such changes may be of interest.

SECTION V

RESULTS

Replicate samples were successfully collected all four seasons at the seven seasonally sampled study areas and at all intertidal strata except +0' Tongue Point in the fall and winter and +0' Morse Creek in the winter. Spring sampling at Pillar Point, North Beach Cobble, Twin Rivers and all subtidal areas was successfully completed with the exception of -5m Morse Creek and -10m Twin Rivers. Bad weather/wave conditions were responsible for sample collection failures. All samples collected were completely processed and are presently stored at the Washington State Baseline Sample Repository, Friday Harbor Laboratories.

Approximately one thousand species of plants and animals were identified to species during the course of this study. Crustaceans were most numerous (280+), followed by algae (245+), annelids (220+), and molluscs (135+).

As found in the first year in general, although each stratum of each study area had a unique community, distinct substratum/exposure-associated communities were recognizable and these communities persisted from the first through the second year of sampling. The results are presented below by study area. These are arranged in increasing substratum fineness and where habitat types were paired, the eastern then western site.

The data are given largely in tabular format. The tables in the Results section are normalized to 1 m² surface area and abridged to include only the community species which are dominant by virtue of their high biomass, numerical abundance, or trophic importance. This determination of dominants is subjective. For a full listing see Appendix I. The values for species richness, diversity, total number (normalized to 1 m²), and total biomass (per 1 m²) were taken from the complete data sets given in Appendix I. Cobble and rock methodology precluded adding the 0.01 m² subsamples with the residual 0.2m² scrape for normalizing. In this case values for both sizes were normalized to 1.0 m² and species by species the value was selected for the table which would give the best measure of the true value in the quadrat. In general for small organisms the 0.01 m² normalized value was taken, while for large organisms the 0.2 m² normalized value was used. Cobble infaunal organisms were normalized to 1.0m² and added to epifaunal scrape organisms. Because large infaunal organisms were generally found only at Beckett and Jamestown, live sieve data are usually not commented on.

Special attention should be given to the fact that rock and cobble sampling methodology changed during the first year (Nyblade, 1978).

Original sampling methodology (first three quarters) involved first removing all large organisms from the 0.25 m² area, then taking the subsamples. This allowed recombination of normalized subsamples with the 0.25 m² large organism scrape, resulting in a single set of numbers for each quadrat location. Methodology for the last five sampling quarters involved removing the subsamples first; then the large organisms were removed from the remaining 0.2 m² area. The resulting sets of numbers are not objectively additive. To generate a single set of values for the organisms collected at each quadrat location, a species by species determination (subjective) of which subsampling value represents the best value would be necessary. This was done in order to compute first and second year community similarity. However, Appendix I gives the complete data set.

The Appendix I unabridged tables give number of replicates, means, and standard deviations in the sampled quadrat size; e.g., 0.05 m² x 15 cm or 0.25 m² (rock scrape). Cobble and rock entries are given in two or three data columns: the 0.01 m² scrape subsamples, the residual scrape (0.2m²), and for cobble the sediment sample (0.05 m² x 15 cm deep). In Appendix I tables ✓ means present but not quantified.

A Note of caution: The tables in the "Results" section are abridged, and the values are means normalized to 1 m² surface area. Appendix I tables must be consulted for the complete data. All statements concerning patchiness are based on the replicate variance seen in Appendix I table standard deviations.

Results of the physical field parameters measured {first year (Nyblade, 1978) sediment analysis summary, water temperature, salinity, and weather} are presented in Appendix II. Where noteworthy, they are mentioned in the study area results presented below.

Tongue Point (rock)

The substratum at Tongue Point over the tide heights and the depths sampled was solid rock. This rock was relatively smooth and flat with few pools or large crevices, and it sloped rather uniformly from +6' to 0'. This site was strongly exposed to local wave action from the north. However oceanic swells generally were fairly well damped this far into the Strait. No change in the physical environment was observed from year one to year two.

Table 2a presents a summary of the biological community over the four quarters of sampling at +6'. This community was dominated by a few species of red algae, herbivorous gastropods, and planktivorous barnacles and mussels. Algal biomass was highest in spring/summer declining in the fall and winter. Seasonal patterns in the herbivores were obscured by large winter recruitment of Littorina sitkana. As in the first year barnacles showed a major recruitment between spring and summer quarter sampling. Especially noteworthy was the massive recruitment of Musculus pygmaeus between winter 1977 and spring 1977 (5200 to 68,770 / m²) and its subsequent decline through the year.

Alaria was present in some quantity in the spring, but vanished in the following quarters. It probably burned off during summer low tides. The other algae showed no consistent pattern of seasonal change, while the herbivores increased in number and biomass from spring through summer declining in the fall/winter. Barnacle number peaked in the summer and then declined.

The massive barnacle and Musculus recruitment dominates the seasonal changes in diversity, total number, and biomass. Although species richness decreased from spring to summer (79 to 66), diversity increased because of the numerical dominance of Musculus in the spring.

Examination of the means and standard deviations in the Tongue Point +6' Appendix I table illustrates the spatial patchiness of the organisms in the +6' community. Still, dramatic population changes such as that of the barnacles and mussels showed through this variance. Despite the Musculus spring numerical dominance, overall community similarity between year one and two was high. (See Table 18 for all similarity values.)

Table 2b gives the abridged results for Tongue Point +3'. This community was structurally dominated by the brown alga Alaria, articulated coralline algae (Corallina and Bossiella), mussels, and barnacles. Associated with these were organisms which ate them--the herbivorous chiton (Cyanoplax) and gastropods (Collisella, Notoacmea, and Onchidella) and the carnivorous Thais and Leptasterias--and small organisms which inhabited the structure they provided--nematodes, polychaetes, oligochaetes, tanaids, isopods, amphipods, insect larvae, and the small Cucumaria. With the exception of the massive Musculus recruitment little consistent seasonal change in populations appeared, largely because of the patchiness of the major structural dominants. Corallina is a long-lived perennial alga which occurred in discrete patches of very dense algal turf.

Table 2a. Tongue Point (rock) dominant benthic organisms from the high (+6') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Phaeophyta								
Alaria spp.		17.0		0		0		<10.0
Rhodophyta								
Endocladia muricata		130.0		60.0		10.0		10.0
Gigartina papillata		217.5		96.5		23.5		1.5
Halosaccion glandiform		23.5		84.5		4.5		0.5
Iridaea spp.		17.5		302.5		63.0		2.0
Porphyra spp.		<10.0		3.5		0		3.0
Mollusca								
Gastropoda								
Collisella digitalis	260.0	48.5	370.0	45.0	290.0	44.5	290.0	29.5
C. strigatella	130.0	40.0	210.0	5.0	180.0	3.5	70.0	0.5
Littorina sitkana	520.0	10.0	2650.0	50.0	750.0	10.0	9990.0	<10.0
Siphonaria thersites	440.0	50.0	610.0	20.0	70.0	<10.0	0	
Bivalvia								
Musculus pygmaeus	68770.0	230.0	2040.0	10.0	320.0	<10.0	10.0	<10.0
Mytilus spp.	304.0	21.0	60.0	2.0	20.0	<10.0	20.0	<10.0

Table 2a. (cont.)

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Crustacea								
Cirripedia								
Balanus	586.0	70.5	16790.0	641.5	4620.0	144.0	5480.0	415.0
spp.								
Chthamalus	3980.0	70.0	4310.0	70.0	2270.0	50.0	3610	60.0
dalli								
Tanaidacea								
Pancolus	2090.0	<10.0	420.0	<10.0	510.0	<10.0	250.0	<10.0
californiensis								
Isopoda								
Dynamenella	3680.0	10.0	670.0	<10.0	3590.0	40.0	1990.0	<10.0
sheareri								
Amphipoda								
Gammaridea	320.0	10.0	330.0	50.0	370.0	10.0	40	<10.0
spp.								
Insecta								
Dipteran	390.0	<20.0	330.0	<10.0	360.0	<30.0	150.0	<10.0
larvae spp.								
Species Richness	79		66		56		44	
Diversity, H ¹	1.50		2.79		2.75		2.54	
Total Number	89,216		29,800		14,880		13,220	
Total Biomass (g)	3,466		1,619		446		374	

Table 2b. Tongue Point (rock) dominant benthic organisms from the mid (+3') intertidal zone, collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Phaeophyta								
Alaria		1173.5		899.5		1208.0		617.5
spp.								
Rhodophyta								
Bossiella		140.0		120.0		220.0		90.0
plumosa								
Corallina		970.0		1050.0		1060.0		250.0
vancouveriensis								
Halosaccion		6.0		55.0		969.5		227.5
glandiforme								
Cnidaria								
Anthozoa								
Anthopleura	30.0	<10.0	30.0	<10.0	270.0	40.0	340.0	50.0
elegantissima								
Nematoda spp.	1460.0	<10.0	3720.0	<10.0	1300.0	<10.0	270.0	<10.0
Mollusca								
Amphineura								
Cyanoplax	30.0	< 10.0	50.0	0.5	160.0	10.0	50.0	<10.0
dentiens								
Gastropoda								
Barleeia	1500.0	<10.0	0		4250.0	<10.0	4360.0	<10.0
haliotiphila								
Collisella	230.0	100.0	10.0	10.0	20.0	91.5	40.0	30.0
pelta								
Notoacmaea	0		10.0	<10.0	0		70.0	4.5
scutum								

Table 2b. (cont.)

		Spr 77		Sum 77		Fall 77		Win 78	
		#	wt	#	wt	#	wt	#	wt
Mollusca (cont.)									
Gastropoda									
Onchidella		0		0		370.0	190.0	220.0	<10.0
borealis									
Thais		0		50.0	5.0	20.0	<20.0	20.0	<20.0
spp.									
Bivalvia									
Musculus		1810.0	<10.0	48380.0	160.0	300.0	10.0	1080.0	<10.0
pygmaeus									
Mytilus		270.0	3.0	15.0	6.0	200	61.0	80.0	1.0
spp.									
Annelida									
Polychaeta									
Syllidae		3110.0	<40.0	2360.0	<20.0	6840.0	<30.0	1490.0	<20.0
spp.									
Oligochaeta		1480.0	<10.0	6310.0	<10.0	2200	<10.0	590.0	<10.0
spp.									
Crustacea									
Cirripedia									
Balanus		440.0	30.0	2400.0	20.0	480.0	30.0	810.0	590.0
spp.									
Tanaidacea									
Anatanaia		270.0	<10.0	3320.0	<10.0	2490.0	<10.0	80.0	<10.0
normani									
Pancolus		640.0	<10.0	1090.0	<10.0	2260.0	<10.0	770.0	<10.0
californiensis									
Isopoda									
Dynamenella		4970.0	10.0	4050.0	10.0	880.0	<10.0	2000.0	<10.0
sheareri									

Table 2b. (cont.)

		Spr 77		Sum 77		Fall 77		Win 78	
		#	wt	#	wt	#	wt	#	wt
Mollusca (cont.)									
Isopoda									
Idotea									
spp.		27.5	1.0	20.0	6.5	54.0	8.0	19.0	2.0
Amphipoda									
Gammaridea									
spp.		2390.0	3.0	5800.0	30.0	11250.0	70.0	2780.0	30.0
Decapoda									
Pagurus									
hirsutiusculus		20.0	1.0	10.0	<10.0	40.0	1.0	0	
Insecta									
Dipteran									
larvae spp.		1260.0	<10.0	5410.0	<10.0	410.0	<10.0	200.0	<20.0
Echinodermata									
Asteroidea									
Leptasterias									
hexactis		10.0	<10.0	50.0	<10.0	20.0	<10.0	0	
Holothuroidea									
Cucumaria									
pseudocurata		7120.0	150.0	6520.0	170.0	3150.0	140.0	1250.0	50.0
Species Richness		114		136		126		97	
Diversity, H¹		3.15		2.79		3.08		3.14	
Total Number		30,750.0		97,740.0		45,071.5		20,500.5	
Total Biomass (g)		2984.5		3711.5		4807.0		2279.5	

Species richness was fairly constant over the year. Musculus recruitment was mainly responsible for the total number peaking in the summer. Biomass peaked in the fall, largely because Alaria, large Corallina, and Halosaccion patches were sampled. Year one/year two community similarity was high (see Table 18).

Table 2c presents the summary results of Tongue Point +0'. Wave conditions prevented sampling at this tide height in the fall and winter. This community was structured by the brown algae Alaria and Hedophyllum, the seagrass Phyllospadix, the boring clam Hiatella arctica, and the large barnacles Balanus cariosus and B. nubilis. Important herbivores were the chitons, Lacuna, and the spider crab Pugettia gracilis and carnivores, Cancer oregonensis and Leptasterias. Small organisms associated with the structural organisms included the polychaetes, tanaids, isopods, and amphipods. No consistent seasonal population changes were detectable because of the over-riding patchiness of the major structural organisms of this community and because surf conditions prevented fall and winter sampling.

Species richness, diversity, total number, and biomass were high both quarters. The large patch of Phyllospadix with its associated worm fauna was responsible for the lower year one/year two similarity compared to +6' and +3'.

Table 2d gives the abridged results at Tongue Point -5 m and -10 m. The community at Tongue Point -5 m was dominated by algae and the urchins, Strongylocentrotus. Grazers besides the urchins included chitons, Acmaea mitra, Calliostoma, Lirularia, Margarites and Pugettia gracilis. The grazers exerted obvious strong pressure on this community. The only algae present in quantity have thwarted herbivores by chemical noxia (Desmarestia) or are structurally unpalatable (the calcareous alga Calliarthron). Numerical dominance at this level was by small organisms associated with Calliarthron--Granulina, the isopods, and amphipods. The community at -10 m was also dominated by grazers (chitons, Acmaea, Lirularia, Strongylocentrotus spp.). However, suspension feeders made an appearance (Calyptraea and Spirorbis). Low -5 m year one/year two similarity is due to the larger patch of Calliarthron sampled in year two with its associated rich worm fauna. Low -10m first and second year similarity was caused by much richer flora the second year. At both levels low similarity probably reflected patchiness, rather than major community change.

Table 2c. Tongue Point (rock) dominant benthic organisms from the low (+0') intertidal zone, collected spring 1977 through summer 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spring 1977		Summer 1977	
	#	wt	#	wt
Phaeophyta				
Alaria		3773.5		3104.0
spp.				
Hedophyllum		343.5		60.0
sessile				
Rhodophyta				
Bossiella		580.0		10.0
plumosa				
Iridaea		204.0		26.0
cordata				
Odonthalia		50.0		30.0
flocossa				
Spermatophyta				
Phyllospadix		927.0		4359.5
scouleri				
Nematoda	700.0	<10.0	2030.0	<10.0
spp.				
Mollusca				
Amphineura				
Katharina	6.5	<0.5	20.0	140.0
tunicata				
Tonicella	10.0	22.5	30.0	4.0
lineata				
Gastropoda				
Lacuna	20.0	<10.0	90.0	<10.0
variegata				
Velutina	0		30.0	<10.0
laevigata				

Table 2c. (cont.)

	Spring 1977		Summer 1977	
	#	wt	#	wt
Mollusca (cont.)				
Bivalvia				
Hiatella				
arctica	50.0	10.0	20.0	<10.0
Annelida				
Polychaeta				
Capitellidae				
Capitella	50.0	<10.0	1100.0	10.0
capitata				
Cirratulidae				
Cirratulus	280.0	✓	40.0	<10.0
cirratus				
Nereidae				
Nereis	420.0	<10.0	590.0	<30.0
spp.				
Sabellidae				
spp.	620.0	<80.0	1660.0	<50.0
Syllidae				
spp.	1510.0	<70.0	2500.0	<70.0
Terebellidae				
spp.	1060.0	✓	1600.0	<30.0
Oligochaeta				
spp.	190.0	<10.0	2830.0	<10.0
Crustacea				
Cirripedia				
Balanus	80.0	203.0	210.0	159.5
cariosus				
B.	40.0	130.5	0	
nubilus				

Table 2c. (cont.)

	Spring 1977		Summer 1977	
	#	wt	#	wt
Crustacea (cont.)				
Tanaidacea				
Anatanaïs	300.0	<10.0	780.0	<10.0
normani				
Isopoda				
Limnoria	90.0	<10.0	80.0	<10.0
algarum				
Amphipoda				
Gammaridea	1320.0	<10.0	3600.0	20.0
spp.				
Decapoda				
Cancer	10.0	10.0	10.0	40.0
oregonensis				
Oedignathus	20.0	40.0	0	
inermis				
Pugettia	170.0	10.0	670.0	20.0
gracilis				
Echinodermata				
Asteroidea				
Leptasterias	10.0	<10.0	10.0	<10.0
hexactis				
Species Richness	180		175	
Diversity, H ¹	2.33		2.17	
Total Number	10,470.0		28,279.5	
Total Biomass (g)	6,506.0		8,229.8	

Table 2d. Tongue Point (rock) dominant benthic organisms from the shallow (-5m, -10 m) subtidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Phaeophyta				
Desmarestia viridis		10.8		17.2
Rhodophyta				
Calliarthron tuberculosum		4487.2		6.8
Mollusca				
Amphineura				
Tonicella lineata	154.8	59.2	49.2	33.6
Gastropoda				
Acmaea mitra	7.2	2.0	5.2	1.6
Amphissa columbiana	315.2	13.6	7.2	1.2
Calliostoma ligatum	524.0	117.2	2.0	0.0
Calyptraea fastigiata	0		2.0	40.4
Fusitriton oregonensis	0		1.2	86.4
Granulina margaritula	540.0	4.0	0	
Lirularia lirulata	159.2	1.2	0	
Margarites pupillus	228.0	20.0	0	
Ocenebra lurida	53.2	7.6	0	

Table 2d. (cont.)

	-5 m		-10 m	
	#	wt	#	wt
Annelida				
Polychaeta				
Nereidae				
Nereis	160.8	< 0.4	7.2	< 0.4
spp.				
Platynereis	2153.2	< 0.4	62.0	< 0.4
bicanaliculata				
Serpulidae				
Spirorbis	63.2	< 0.4	2.0	< 0.4
spp.				
Crustacea				
Isopoda				
Ianiropsis	377.2	0.0	7.2	< 0.4
spp.				
Munna	265.2	0.0	0	
spp.				
Amphipoda				
Gammaridea	9348.0	12.8	120.0	1.2
spp.				
Decapoda				
Cancer	28.0	18.4	0	
oregonensis				
Paguridae	429.2	15.6	0	
spp.				
Pugettia	960.0	38.0	4.0	< 0.4
gracilis				
Echinodermata				
Echinoidea				
Strongylocentrotus	25.2	1116.0	16.0	701.2
droebachiensis				

Table 2d. (cont.)

	-5 m		-10 m	
	#	wt	#	wt
Echinodermata				
Echinoidea				
Strongylocentrotus franciscanus	9.2	2786.4	5.2	1723.2
Species Richness	209		94	
Species Diversity, H^1	1.45		3.00	
Total Number	18,634		834	
Total Biomass (g)	9,160		2,988	

Pillar Point (rock, intertidal; sand, subtidal)

The intertidal at Pillar Point from +0' to +6' was solid rock. Unlike Tongue Point, the rock was an irregular conglomerate, not smooth at all. The slope varied from 45° to 90°. There were no large crevices, and no pools were sampled. Seasonally, sand scouring at +0' might be significant as the rock at that level was adjacent to a sandy bottom. Because of this fact and the very limited area available for sampling on the rock outcrop, this area was sampled only once during the second year, in the spring. This site was exposed to both extreme wave action from the north and to rather continuous oceanic swells. Subtidally, the substratum was medium and fine sand at -5m and fine sand at -10m. Salinity in winter quarter of the first year showed some slight freshwater influence from the Pysht River, likely of no biological consequence. No major changes in the physical environment were observed over the course of the study.

Table 3a presents the abridged results for Pillar Point +6'. The community at this level was relatively simple and was dominated by grazers (Collisella digitalis and Littorina spp.) and by the planktivorous barnacles (Balanus glandula and Chthamalus dalli). Associated with this algal barnacle matrix were small crustaceans and dipteran larvae. The similarity between the first and second year community was very high.

Table 3b presents a summary of the +3' Pillar Point data set. The community at this level was structurally dominated by algae (Alaria, Hedophyllum, and to a lesser extent Corallina, Gigartina, Odonthalia, and Iridaea), Mytilus spp., and barnacles (Balanus spp.). Two sets of organisms were associated with these structuring components. There were those which eat them, the herbivores (limpets and chitons) and the carnivores (Thais spp.). And there were small organisms intimately dependent on the physical structuring of the dominants: nematodes, polychaetes, oligochaetes, tanaids, isopods, amphipods, and insect larvae.

Year one/year two community similarity was quite high despite considerably lower mussel and barnacle numbers.

An abridged data set for Pillar Point +0' appears in Table 3c. Two things stood out in this community. The community was totally structurally dominated by plants (Alaria, Egregia, Iridaea, and especially Phyllospadix), and large barnacles were absent. Sand scouring may have been responsible for the latter. Herbivores (chitons, Lacuna, Idotea, and Pugettia) and small plant-associated animals (polychaetes, oligochaetes, tanaids, isopods, and amphipods) were also abundant. Cancer oregonensis was the only major carnivore collected.

The similarity in data sets between year one and year two was low due to the massive amounts of Phyllospadix and its associated worm fauna collected the second year. This represents patchiness, not community change.

Table 3a. Pillar Point (rock) dominant benthic organisms from the high (+6') intertidal zone, collected spring 1977, expressed as number and/or biomass(g) per m². For complete data set see Appendix I.

	#	wt
Rhodophyta		
Gigartina		10.0
papillata		
Mollusca		
Collisella	120.0	41.0
digitalis		
Littorina	210.0	0.5
scutulata		
L.	1090.0	20.0
sitkana		
Crustacea		
Cirripedia		
Balanus	1770.0	70.0
glandula		
Chthamalus	7460.0	190.0
dalli		
Isopoda		
Idotea	31.5	2.0
montereyensis		
Amphipoda		
Gammaridea	70.0	<10.0
spp.		
Insecta		
Diptera	170.0	<10.0
larvae spp.		

Table 3a. (cont.)

	#	wt
Species Richness	42	
Diversity, H^1	1.85	
Total Number	11,620	
Total Biomass	480	

Table 3b. Pillar Point (rock) dominant benthic organisms from the mid(+3') intertidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	#	wt
Phaeophyta		
Alaria		2131.0
sp.		
Hedophyllum		1432.0
sessile		
Rhodophyta		
Corallina		20.0
vancouveriensis		
Gigartina		33.0
papillata		
Halosaccion		10.0
glandiforme		
Iridaea		784.0
cordata		
Odonthalia		220.0
floccosa		
Nemertea	150.0	10.0
spp.		
Nematoda	980.0	10.0
spp.		
Mollusca		
Amphineura		
Cyanoplax	1.5	<0.5
dentiens		
Katharina	19.0	298.0
tunicata		

Table 3b. (cont.)

	#	wt
Mollusca (cont.)		
Gastropoda		
Thais	20.0	<20.0
spp.		
Bivalvia		
Hiatella	40.0	2.0
arctica		
Mytilus	102.5	0.5
spp.		
Annelida		
Oligochaeta	140	<10.0
spp.		
Polychaeta		
Sabellidae	530.0	<50.0
spp.		
Syllidae	370.0	<40.0
spp.		
Pycnogonida	70.0	<50.0
spp.		
Crustacea		
Cirripedia		
Balanus	421.5	863.5
spp.		
Tanaidacea		
Leptochelia	2160.0	<10.0
dubia		

Table 3b. (cont.)

	#	wt
Crustacea (cont.)		
Isopoda		
Dynamenella	550.0	<10.0
sheareri		
Munna	790.0	<10.0
chromatocephala		
Amphipoda		
Caprellidea		
Cercops	290.0	<10.0
compactus		
Gammaridea	100.0	<10.0
spp.		
Insecta		
Diptera	130.0	<10.0
larvae spp.		
Species Richness	131	
¹		
Diversity, H	2.50	
Total Number	8,994	
Total Biomass	6,317	

Table 3c. Pillar Point (rock) dominant benthic organisms from the low (+0) intertidal zone, collected spring 1977, expressed as number and/or biomass(g) per m². For complete data set see Appendix I.

	#	wt
Phaeophyta		
Alaria		2593.5
spp.		
Egregia		1621.5
menziesii		
Rhodophyta		
Iridaea		261.0
cordata		
Spermatophyta		
Phyllospadix		6119.5
scouleri		
Nematoda	8200.0	<10.0
spp.		
Mollusca		
Amphineura		
Tonicella	2.5	<0.5
lineata		
Gastropoda		
Lacuna	20.0	<10.0
variegata		
Bivalvia		
Mytilus	20.0	<10.0
sp. (juv.)		
Annelida		
Oligochaeta	1630.0	<10.0
spp.		

Table 3c. (cont)

	#	wt
Annelida (cont.)		
Polychaeta		
Arenicolidae	2050.0	<10.0
spp.		
Lumbrineridae		
Lumbrineris	480.0	<10.0
spp.		
Spionidae	930.0	<50.0
spp.		
Syllidae	280.0	<40.0
spp.		
Crustacea		
Tanaidacea		
Antanais	40.0	<10.0
normani		
Isopoda		
Idotea	230.0	<20.0
spp.		
Amphipoda		
Caprellidea		
Caprella	10.0	<10.0
spp.		
Gammaridea	510.0	2.0
spp.		
Decapoda		
Cancer	2.5	1.5
oregonensis		
Pugettia	10.0	13.0
gracilis		

Table 3c. (cont.)

	<u>#</u>	<u>wt</u>
Species Richness	124	
Diversity, H^1	2.04	
Total Number	15,642	
Total Biomass (g)	11,375	

Table 3d gives a summary of the subtidal Pillar Point data set. The communities at -5m and -10m were similar. They were dominated by epifaunal and infaunal deposit feeders. Species richness and diversity were high at both levels. Neither density nor measured biomass were particularly high at either level. These communities run energetically on imported organics and an unknown amount fixed at the levels by the largely microscopic epiflora. Year one, year two similarity was surprisingly high considering the crudeness of grab sampling.

Table 3d. Pillar Point (fine-medium sand) dominant benthic organisms from the shallow (-5 m, -10 m) subtidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Mollusca				
Bivalvia				
Macoma	62.0	<2.0	12.0	<2.0
spp.				
Mysella	400.0	<2.0	96.0	<2.0
tumida				
Psephidia	476.0	2.0	216.0	2.0
lordi				
Tellina	46.0	<2.0	52.0	<2.0
spp.				
Tresus	70.0	<2.0	36.0	<2.0
capax				
Annelida				
Polychaeta				
Capitellidae				
Capitella	870.0	<2.0	66.0	<2.0
capitata				
Mediomastus	1830.0	<2.0	380.0	<2.0
sp.				
Cirratulidae				
spp.	320.0	<2.0	392.0	<2.0
Orbiniidae				
Scoloplos	200.0	<2.0	76.0	<2.0
sp.				
Spionidae				
Prionospio	3000	<2.0	770.0	<2.0
steenstrupi				

Table 3d. (cont.)

	-5 m		-10 m	
	#	wt	#	wt
Crustacea				
Cumacea	282.0	<2.0	12.0	<2.0
spp.				
Tanaidacea				
Leptochelia	366.0	<2.0	110.0	<2.0
dubia				
Amphipoda				
Gammaridea	2290.0	2.0	700.0	<2.0
spp.				
Species Richness	77		86	
Diversity, H^1	2.82		3.26	
Total Number	13,814		4,426	
Total Biomass (g)	<156		<172	

North Beach Cobble (cobble)

This area was selected in 1976 as a cobble habitat although the +6' substratum consisted of coarse sand. During the first year the +0' cobble was buried in sand, and cobble was uncovered at +6'. This sediment instability made this area unsuitable for baseline population monitoring. Because of this the area was sampled only once during the second year.

The beach had a fairly gentle slope and an offshore kelp bed doubtless moderated this area's exposure. There were no ocean swells at this end of the Strait and given the prevailing winds wave activity was probably fairly moderated.

North Beach subtidal will be discussed with North Beach Sand.

Table 4a presents summary data for North Beach Cobble +6'. The community present at this level was fairly simple, dominated by a grazer (Littorina scutulata), a surface detritivore (Exosphaeroma), an infauna detritivore (oligochaetes), and barnacles. Low similarity between year one and year two resulted from sediment instability. Spring year one found the area sand covered, while spring year two found the cobble exposed.

Table 4b presents an abridged data set for North Beach Cobble +3'. This community was dominated by grazers (Collisella spp., Littorina spp.), planktivores (Balanus spp.), under-rock detritivores (Exosphaeroma, Gnorimosphaeroma, and Hemigrapsus), and predatory gastropods (Thais spp.). Macroalgae were a very minor constituent of this community, as was the infauna.

As would be expected given the nature of the substratum in this area, the expected rock organism patchiness was even more extreme. The variance among replicates was very high (Appendix I). Year one/year two similarity was lower than for the Morse Creek +3' cobble community. A major factor in this was the much lower isopod number the second year.

Abridged results from North Beach Cobble +0' are given in Table 4c. The rich spring algal flora was dominated by Ulva, Alaria, Nereocystis, Iridaea and Pterosiphonia. Major epifaunal constituents were grazers (chitons, Lacuna, Notoacmea, and Idotea), planktivores (Balanus spp.), predators (Thais spp., Cancer spp.), and under-rock detritivores (Exosphaeroma, gammarids). The abundant worm infauna consisted of an active predator (Hemipodus), tube-building algal grazers (Nereidae spp., Onuphis), and detritivores (oligochaetes, Malacoceros).

The richer second year algal flora was primarily responsible for the fairly low year one/year two community similarity.

Table 4a. North Beach Cobble (cobble over sand) dominant benthic organisms from the high (+t') intertidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	#	wt.
Mollusca		
Gastropoda		
Littorina	720.0	34.0
scutulata		
Annelida		
Oligochaeta	140.0	<2.0
spp.		
Polychaeta		
Nereidae		
Nereis	30.0	<2.0
sp.		
Crustacea		
Cirripedia		
Balanus	320.0	18.0
glandula		
Isopoda		
Exosphaeroma	366.0	<2.0
media		
Amphipoda		
Gammaridea	6.0	<2.0
spp.		
Species Richness	16	
Diversity, H ¹	1.99	
Total Number	2,148	
Total Biomass (g)	78	

Table 4b. North Beach Cobble (cobble over sand) dominant benthic organisms from the mid (+3') intertidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	#	wt
Cnidaria		
Anthozoa		
Anthopleura	8.5	3.0
elegantissima		
Mollusca		
Gastropoda		
Collisella	50.0	0.0
pelta		
Collisella	50.0	0.5
strigatella		
Littorina	252.0	12.0
scutulata		
L.	1066.0	52.0
sitkana		
Thais	96.0	7.5
spp.		
Annelida		
Oligochaeta	76.0	<2.0
spp.		
Polychaeta		
Nereidae		
Nereis	56.0	<2.0
vexillosa		
Spionidae		
Polydora	76.0	<2.0
proboscidea		
Syllidae		
Syllis	126.0	<2.0
spp.		

Table 4b. (cont.)

	#	wt
Crustacea		
Cirripedia		
Balanus	126.0	14.0
spp.		
Isopoda		
Exosphaeroma	107.0	<1.0
media		
Gnorimosphaeroma	380.0	<2.0
oregonense		
Decapoda		
Hemigrapsus	10.0	23.0
nudus		
Insecta		
Diptera	20.0	<10.0
larvae spp.		
Species Richness	38	
1		
Diversity, H	2.48	
Total Number	3,802	
Total Biomass	128	

Table 4c. North Beach Cobble (cobble over sand) dominant benthic organisms from the low (+0')₂ intertidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	#	wt
Chlorophyta		
Ulva		90.0
spp.		
Phaeophyta		
Alaria		713.0
spp.		
Nereocystis		156.5
luetkeana		
Rhodophyta		
Gigartina		45.0
papillata		
Iridaea		409.5
cordata		
Pterosiphonia		174.0
bipinnata		
Mollusca		
Amphineura	10.0	<2.0
spp.		
Gastropoda		
Lacuna	886.0	<10.0
variegata		
Notoacmea	16.0	<10.0
scutum		
Annelida		
Oligochaeta	326.0	<10.0
spp.		
Polychaeta		
Glyceridae		
Hemipodus	120.0	<2.0
borealis		

Table 4c. (cont.)

	#	wt
Annelida		
Polychaeta		
Nereidae	50.0	<10.0
spp.		
Onuphidae		
Onuphis	100.0	<2.0
stigmatis		
Spionidae		
Malococeros	270.0	<10.0
glutaeus		
Crustacea		
Cirripedia		
Balanus	10.0	<10.0
cariosus		
Isopoda		
Exosphaeroma	30.0	<10.0
amplicauda		
E.	430.0	<10.0
media		
Idotea	1186.0	0.5
spp.		
Amphipoda		
Gammaridea	317.5	<2.0
spp.		
Decapoda		
Cancer	10.0	<10.0
spp.		
Species Richness	125	

Table 4c. (cont.)

	#	wt
Diversity, H^1	3.24	
Total Number	6,724	
Total Biomass	1,862	

Morse Creek (cobble, intertidal; gravel, subtidal)

Although +6' at this area, as at North Beach Cobble, also consisted of sandy gravel over buried cobble, this area was selected for a cobble habitat. During the course of the year, the +6' cobble was never uncovered, although live barnacles were recovered from buried cobble in several quadrats. Mid and low intertidal zone sediments consisted of cobble over sand. The subtidal sediment at -10 m consisted of gravel. No samples were collected at -5 m because small cobble prevented the grab from operating.

This beach had a fairly gentle slope and like North Beach only a moderate exposure to wave activity. No major changes in the physical environment were observed between the first and second year.

Table 5a presents the abridged results for Morse Creek +6'. This community was very simple, consisting of detritus feeding oligochaetes, isopods, and gammarid amphipods. The barnacles were buried in the gravel, and the Littorina were probably drift. The oligochaetes showed no seasonal pattern. However, the amphipods showed a peak in summer quarter. Diversity and species richness were uniformly low. Total number generally followed the amphipods. Biomass was insignificant.

Areas with sparse fauna generally show extreme patchiness, and this level was no exception (see variances, Appendix I). However, despite this patchiness, year one and year two community similarity was very high.

Abridged results for Morse Creek +3' are presented in Table 5b. The rock community at this area and level was basically two dimensional, with no structural dominants such as at Tongue and Pillar. Algal species richness was low and what algae occurred regularly (Fucus and Gigartina) were very patchy. Gastropod grazers, Idotea, and barnacles dominated the epifaunal community. Hemigrapsus and Pagurus, detritivores, dominated under-rock. The infaunal community was dominated by the detritivores Capitella, Malacoceros, Corophium, and dipteran larvae.

Species richness, diversity, and biomass were fairly constant. Numbers peaked in summer/fall. Intense barnacle recruitment occurred between spring and summer quarter sampling. The second year community was very similar to the first year.

Table 5c gives the summary results from Morse Creek +0'. Algae (Alaria, Hedophyllum, and Iridaea) were the structural dominants of the epi-community. Herbivore associates included Lacuna, Notoacmea and Pugettia. The infaunal community was dominated by detritivores (nematodes, Abarenicola, Capitella, Cirratulus, Armandia, spionids, Leptochelia and some gammarids). However, a herbivore (Nereis) and suspension feeders (Protothaca, Tresus, and sabellids) were also abundant. Important predators in this community were Thais spp. and Cancer spp.

Table 5a. Morse Creek (sandy gravel) dominant benthic organisms from the high (+6') intertidal zone, collected spring 1977 through winter 1978, expressed as number and/or biomass(g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Mollusca								
Gastropoda								
Littorina	60.0	<2.0	0		0		80.0	8.0
sitkana								
Annelida								
Oligochaeta	6.0	<2.0	40.0	<2.0	10.0	<2.0	20.0	<2.0
spp.								
Crustacea								
Cirripedia								
Balanus	6.0	<2.0	0		110.0	6.0	406.0	12.0
spp.								
87 Isopoda								
Gnorimosphaeroma	0		326.0	4.0	10.0	<2.0	116.0	<2.0
oregonense								
Amphipoda								
Gammaridea	110.0	<2.0	2028.0	4.0	1106.0	4.0	126.0	<2.0
spp.								
Species Richness	8		16		7		15	
Diversity, H ¹	1.31		0.76		0.48		1.72	
Total Number	206		2,458		1,257		844	
Total Biomass (g)	<16		<36		<20		<46	

Table 5b. Morse Creek (cobble over sand) dominant benthic organisms from the mid (+3) intertidal zone, collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Phaeophyta								
Fucus distichus		<10.0		190.5		<10.0		3.5
Rhodophyta								
Gigartina papillata		70.0		70.0		50.0		10.0
Platyhelminthes								
Turbellaria spp.	1.5	0.5	106.0	<12.0	796.0	<12.0	986.0	<12.0
Nemertea spp.	330.0	<12.0	670.0	<12.0	356.0	<12.0	456.0	<10.0
Mollusca								
Gastropoda								
Collisella pelta	10.0	0.5	20.0	12.5	30.0	8.0	60.0	12.5
C. strigatella	20.0	<10.0	40.0	0.5	40.0	10.0	80.0	<2.5
Lacuna variegata	0		<10.0	<10.0	226.0	<12.0	36.0	<12.0
Littorina sitkana	4496.0	426.0	866.0	20.0	260.0	12.0	650.0	120.0
Bivalvia								
Mytilus spp.	10.0	<10.0	36.0	<12.0	90.0	<12.0	36.0	0.5
Annelida								
Polychaeta								
Capitellidae								
Capitella capitata	346.0	2.0	836.0	<2.0	430.0	<2.0	366.0	<12.0

Table 5b. (cont.)

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida (cont.)								
Spionidae								
Malacoceros glutaeus	0		320.0	<2.0	1830.0	<2.0	60.0	<2.0
Crustacea								
Cirripedia								
Balanus glandula	0		620.0	28.0	5430.0	616.0	5246.0	660.0
B. spp. (juv.)	90.0	2.0	18,930.0	516.0	50.0	<10.0	0	
Isopoda								
Idotea wosnesenskii	14.0	7.0	36.0	20.5	136.0	20.5	21.5	10.5
Amphipoda								
Gammaridea spp.	6.0	<2.0	66.0	<12.0	476.0	0.5	100.0	<12.0
Corophium spp.	10.0	<10.0	1290.0	<24.0	17,590.0	10.0	2836.0	<12.0
Decapoda								
Hemigrapsus spp.	20.0	60.5	116.0	184.5	180.0	43.5	157.0	110.0
Pagurus spp.	36.0	18.0	96.0	27.0	46.0	1.0	286.0	<27.0
Insecta								
Dipteran larvae spp.	120.0	<10.0	2,136.0	<12.0	21,200	<12.0	400.0	<12.0
Species Richness	59		76		70		64	
Diversity, H ¹	2.34		2.04		1.97		2.50	
Total Number	6,452		29,420		33,278		13,514	
Total Biomass (g)	653		1,047		916		1,088	

Table 5c. Morse Creek (cobble over sand) dominant benthic organisms from the low (+0) intertidal zone, collected spring 1977 through fall 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Win 78	
	#	wt	#	wt	#	wt
Clorophyta						
Ulva		13.5		117.5		10.0
spp.						
Phaeophyta						
Alaria		702.5		503.0		1473.5
spp.						
Hedophyllum		57.5		0		0
sessile						
Rhodophyta						
Gigartina		39.5		142.5		118.0
papillata complex						
Iridaea		2,397.5		1,975.0		468.0
cordata						
Cnidaria						
Anthozoa						
Anthopleura	130.0	5.0	50.0	2.5	16.0	10.0
elegantissima						
Nemertea	0		360.0	4.0	250.0	<12.0
spp.						
Nematoda	490.0	<12.0	536.0	<12.0	114.0	<12.0
spp.						
Mollusca						
Gastropoda						
Lacuna	126.0	0.5	1000.0	12.0	834.0	12.0
variegata						
Notoacmea	26.0	5.5	62.0	7.5	46.0	20.0
spp.						

Table 5c. (cont.)

		Spr 77		Sum 77		Fall 77	
		#	wt	#	wt	#	wt
Mollusca (cont.)							
Gastropoda							
Thais spp.		3.1	0.5	0		0	
Bivalvia							
Mytilus spp.		190.0	<10.0	10.0	<10.0	0	
Protothaca staminea		6.0	<2.0	0		0	
Tresus capax		10.0	102.0	30.0	12.0	6.0	<2.0
Annelida							
Polychaeta							
Arenicolidae							
Abarenicola spp.		416.0	<12.0	62.0	<2.0	166.0	<2.0
Capitellidae							
Capitella capitata		0		1100.0	<12.0	3556.0	<12.0
Cirratulidae							
Cirratulus cirratus		1826.0	<12.0	1810.0	82.0	1380.0	<2.0
Nereidae							
spp.		766.0	<34.0	362.0	64.0	166.0	<28.0
Opheliidae							
Armandia brevis		0		60.0	<12.0	214.0	<2.0
Sabellidae							
spp.		11416.0	<62.0	7816.0	<70.0	76.0	<30.0

Table 5c. (cont.)

		Spr 77		Sum 77		Fall 77	
		#	wt	#	wt	#	wt
Annelida (cont.)							
Polychaeta							
Spionidae							
Malacoceros							
glutaeus							
		16.0	<2.0	736.0	<12.0	2286.0	<2.0
Crustacea							
Tanaidacea							
Leptochelia							
dubia							
		36.0	<12.0	36.0	<12.0	14.0	<2.0
Amphipoda							
Gammaridea							
spp.							
		916.0	12.0	1176.0	<148.0	1120.0	10.0
Decapoda							
Cancer							
spp.							
		12.5	15.5	46.0	35.0	6.0	4.0
Pugettia							
gracilis							
		40.0	<12.0	436.0	10.0	56.0	2.0
Species Richness		112		117		82	
Diversity, H ¹		2.14		2.55		2.29	
Total Number		17,843		17,450		10,360	
Total Biomass (g)		3,936		3,176		2,216	

Species richness, total numbers, total biomass, and populations of most component species showed a spring/summer maximum. However, as in all rock areas, the community components were very patchy. Despite this, a comparison of the first and second year data sets showed high similarity.

Table 5d presents the subtidal abridged data set for Morse Creek. The -10 m community was dominated by detritus feeders: Macoma, capitellids, maldanids, Armandia, spionids, Exogone, most gammarids, and ophiuroids. Suspension feeders (Calyptraea, Crenella, Mysella, and Leptochelia) were also abundant at -10 m.

Species richness and diversity were very high. However the total biomass was fairly low. Year one/year two community similarity was high.

Table 5d. Morse Creek (gravel) dominant benthic organisms from the shallow (-10 m) subtidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-10 m	
	#	wt
Phaeophyta		
Desmarestia ligulata		<2.0
Mollusca		
Gastropoda		
Amphissa columbiana	250.0	16.0
Calyptraea fastigiata	60.0	2.0
Bivalvia		
Crenella decussata	6.0	<2.0
Macoma spp.	86.0	0.0
Mysella tumida	396.0	2.0
Annelida		
Polychaeta		
Capitellidae		
Mediomastus sp.	510.0	<2.0
Maldanidae spp.	156.0	<2.0
Nereidae		
Platynereis bicanaliculata	70.0	<2.0
Opheliidae		
Armandia brevis	36.0	<2.0
Spionidae		
Malacoceros glutaeus	0	
Prionospio cirrifera	20.0	<2.0
P. steenstrupi	106.0	<2.0
Syllidae		
Exogone spp.	416.0	<2.0

Table 5d. (cont.)

	-10 m	
	#	wt
Crustacea		
Tanaidacea		
Leptochelia dubia	4806.0	2.0
Amphipoda		
Gammaridea spp.	2030.0	4.0
Decapoda		
Cancer productus	20.0	12.0
Paguridae spp.	116.0	8.0
Echinodermata		
Ophiuroidea spp.	166.0	2.0
Species Richness	127	
Species Diversity, H ¹	2.72	
Total Number	11,654	
Total Biomass (g)	<290	

Beckett Point (protected sand-gravel, intertidal; sand, subtidal)

The sediment at Beckett Point was a sandy gravel at +6', a gravel-sand mix at +3', a medium-fine sand with gravel at +0', fine sand at -5m, and medium to fine sand at -10m. The study area was completely protected inside Discovery Bay. The beach slope was fairly steep, and tidal action probably was mainly responsible for the fairly coarse sediment at the study site in the intertidal. The salinity showed no freshwater influence. Major physical environment changes from year one to year two were not observed.

Table 6a presents the summary data from +6' at Beckett Point. The community had two components, planktivorous epifaunal Balanus, responsible for most of the total biomass, and detritus feeding worms (nematodes, syllids, and oligochaetes) and isopods. The isopods and oligochaetes both showed peak numbers in fall quarter both years, perhaps correlated with fall plant die back. Year one, year two community similarity was quite high.

An abridged data set for Beckett Point +3' is presented in Table 6b. The community at this level was dominated by suspension feeding bivalves (Myrella, Mytilus, Protothaca, Transennella, and Tresus), detritus feeders (caprellids, ophiuroids, spionids, syllids, oligochaetes, isopods, amphipods, Dendroaster, and Leptosynapta), and a couple of carnivores (nemertean and Hemipodus). The bivalves were very patchy in distribution. Seasonal pattern showed a fall peak for species richness, diversity, and density. Year one/year two similarity was low, probably reflecting the patchy nature of the community rather than community change.

Table 6c gives the abridged results for Beckett Point +0'. This rich diverse community was dominated by suspension feeding bivalves (Clinocardium, Myrella, Protothaca, Transennella, and Tresus); deposit/detritus feeding worms, crustaceans, and echinoderms; and a number of carnivores (nemertean, Nassarius, Hemipodus, Glycinde, hesionids, nephtyids, phyllodocids, polynoids, Cancer, and Crangon). The majority of species and the total number peaked strongly in the fall. Species richness and diversity remained fairly constant through the year. Year one/year two community similarity was high.

Abridged subtidal results for Beckett Point are presented in Table 6d. The very rich, diverse communities at -5 m and -10 m at Beckett were very similar. The communities were dominated by deposit feeders: nematodes, Macoma, Tellina, ophiuroids, spionids, tanaids, and amphipods. There were a few suspension feeders (Myrella, chaetopterids) and carnivores (Nassarius, hesionids, and phyllodocids). The Van Veen grab operates best in fine sediments such as at Beckett. It is not surprising that Beckett subtidal communities showed the greatest year one/year two similarity of all subtidal communities sampled since grab-caused error would be at a minimum.

Table 6a. Beckett Point (sandy gravel) dominant benthic organisms from the high (+6) intertidal zone, collected spring 1977 through winter 1978, expressed as number an/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nematoda spp.	570.0	<2.0	172.0	<4.0	272.0	<4.0	420.0	<4.0
Annelida								
Oligochaeta spp.	580.0	<2.0	92.0	<4.0	832.0	<4.0	780.0	<4.0
Polychaeta								
Nereidae spp.	40.0	<2.0	12.0		44.0	<4.0	24.0	<8.0
Syllidae								
Syllis spp.	340.0	<2.0	140.0	<4.0	60.0	<4.0	140.0	<4.0
Crustacea								
Cirripedia								
Balanus glandula	0		112.0	28.0	480.0	168.0	432.0	168.0
Isopods								
Exosphaeroma media	10.0	<2.0	0		2452.0	16.0	80.0	<4.0
Species Richness	10		13		15		12	
Diversity, H ¹	1.43		2.04		1.44		1.69	
Total Number	1630		632		4,404		1904	
Total Biomass	<20		<68		<232		<212	

Table 6b. Beckett Point (gravel-sand) dominant benthic organisms from the mid(+3) intertidal zone, collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea spp.	30.0	<2.0	100.0	<4.0	212.0	<4.0	100.0	
Mollusca								
Gastropoda								
Lacuna variegata	0		172.0	0.0	3092.0	12.0	0	
Bivalvia								
Mysella tumida	20.0	<2.0	492	4.0	492	4.0	152.0	<4.0
Mytilus edulis	110.0		172.0	4.0	9012.0	20.0	460.0	<4.0
Protothaca staminea	90	<2.0	52.0	<4.0	172.0	16.0	32.0	<4.0
Transennella tantilla	60.0	<2.0	132.0	0.0	380.0	8.0	20.0	<4.0
Tresus sp.	0		6.0	292.0	90.0	26.0	10.0	40.0
Annelida								
Oligochaeta spp.	20.0	<2.0	100.0	<4.0	120.0	<4.0	152.0	<4.0
Polychaeta								
Capitellidae								
Notomastus tenuis	0		340.0	<4.0	132.0	<4.0	312.0	<4.0
Glyceridae								
Hemipodus borealis	1370.0	✓	1680.0	✓	3152.0	✓	1212.0	✓
Oweniidae								
Owenia fusiformis	190.0	<2.0	280.0	✓	8292.0	✓	1220.0	<4.0

Table 6b. (cont.)

		Spr 77		Sum 77		Fall 77		Win 78	
		#	wt	#	wt	#	wt	#	wt
Annelida									
Polychaeta									
Spionidae									
	Pygospio elegans	0		100.0	<4.0	188.0	<4.0	0	
	Spio filicornis	0		52.0	<4.0	572.0	<4.0	0	
	Spiophanes bombyx	0		0		60.0	<4.0	0	
Syllidae									
	Syllis spp.	20.0	<2.0	40.0	<4.0	12.0	<4.0	0	
Crustacea									
Cirripedia									
09	Balanus glandula	60.0	16.0	4712.0	96.0	792.0	136.0	40.0	0.0
Isopoda									
	Exosphaeroma spp.	460.0	<2.0	432.0	<8.0	1600.0	12.0	12.0	<4.0
Amphipoda									
	Gammaridea sp.	40.0	<2.0	1172.0	4.0	400.0	<4.0	32.0	<4.0
Echinodermata									
Echinoidea									
	Dendraster excentricus	0		40.0	<4.0	660.0	<4.0	0	
Holothuroidea									
	Leptosynapta clarki	0		12.0	<4.0	80.0	4.0	0	

Table 6b. (cont.)

	Spr 77	Sum 77	Fall 77	Win 78
Species Richness	23.0	55.0	75.0	29.0
Diversity, H ¹	1.89	2.20	2.73	2.15
Total Number	3,450	11,068	48,228	3,964
Total Biomass	< 54	< 836	< 532	< 184

Table 6c. Beckett Point (medium-fine sand) dominant benthic organisms from the low (+0) intertidal zone, collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea spp.	530.0	<2.0	860.0	✓	352.0	<4.0	480.0	<4.0
Nematoda spp.	900.0	<2.0	292.0	<4.0	8832.0	<4.0	1652.0	<4.0
Mollusca								
Gastropoda								
Lacuna variegata	80.0	<2.0	652.0	4.0	152.0	<4.0	32.0	<4.0
Nassarius mendicus	30.0	18.0	20.0	12.0	20.0	<4.0	0	
Bivalvia								
Clinocardium nuttallii	180.0	18.0	12.0	4.0	580.0	8.0	972.0	8.0
Macoma spp.	60.0	<2.0	36.0	48.0	64.0	4.0	184.0	12.0
Mysella tumida	4250.0	18.0	9772.0	16.0	19500.0	32.0	8812.0	16.0
Protothaca staminea	180.0	2.0	32.0	12.0	292.0	36.0	280.0	4.0
Transennella tantilla	490.0	2.0	1120.0	4.0	232.0	4.0	480.0	<4.0
Tresus capax	0		572.0	64.0	172.0	32.0	72.0	44.0
Annelida								
Oligochaeta spp.	220	<2.0	52.0	<4.0	1240.0	<4.0	140.0	<4.0
Polychaeta								
Capitellidae spp.	680.0	<8.0	824.0	<8.0	1712.0	<16.0	948	<16.0

Table 6c. (cont.)

		Spr 77		Sum 77		Fall 77		Win 78	
		#	wt	#	wt	#	wt	#	wt
Annelida									
Polychaeta									
Glyceridae									
Hemipodus borealis		940.0	<2.0	692.0	✓	480.0	<8.0	480.0	<4.0
Goniadidae									
Glycinde picta		180.0	<2.0	40	<4.0	0		200.0	<4.0
Hesionidae									
spp.		186.0	<4.0	232.0	<8.0	292.0		0	
Nephtyidae									
spp.		0		0		24.0	4.0	20.0	<4.0
Nereidae									
Platynereis bicanaliculata		250.0	<2.0	300.0	✓	1692.0	✓	1512.0	<4.0
Opheliidae									
Armandia brevis		20.0	<2.0	60.0	<0.0	1720.0	<4.0	740.0	<4.0
Oweniidae									
Owenia fusiformis		310.0	<2.0	1032.0	✓	1392.0	<4.0	872.0	<4.0
Phyllodocidae									
spp.		290.0	<10.0	484.0	<16.0	1160.0	<20.0	396.0	<16.0
Polynoidae									
spp.		50.0	<6.0	52.0	<8.0	64.0	8.0	64.0	<12.0
Spionidae									
spp.		645.0	<10.0	15236.0	<8.0	2232.0	<28.0	644.0	<24.0

Table 6c. (cont.)

		Spr 77		Sum 77		Fall 77		Win 78	
		#	wt	#	wt	#	wt	#	wt
Annelida (cont.)									
Polychaeta									
Syllidae									
Exogone spp.		720.0	<4.0	8920	<4.0	3104.0	<8.0	1600.0	<8.0
Crustacea									
Cumacea									
Cumella vulgaris		510.0	<2.0	52.0	<4.0	160.0	<4.0	32.0	<4.0
Tanaidacea									
Leptochelia dubia		9670.0	2.0	1798.0	8.0	44632.0	24.0	20372.0	8.0
Amphipoda									
Gammaridea spp.		1410.0	<2.0	3532.0	32.0	880.0	<4.0	820.0	4.0
Decapoda									
Cancer spp.		0		112.0	<8.0	12.0	<4.0	0	
Crangon nigricauda		0		12.0	<4.0	0		0	
Pagurus spp.		0		52.0	<4.0	0		0	
Echinodermata									
Echinoidea									
Dendraster excentricus		94.0	2.0	912.0	76.0	992.0	16.0	480.0	12.0
Holothuroidea									
Leptosynapta clarki		110.0	2.0	112.0	4.0	140.0	<4.0	80.0	✓

Table 6c. (cont.)

	Spr 77	Sum 77	Fall 77	Win 78
Species Richness	68	83	93	79
Diversity, H^1	2.52	2.51	2.13	2.30
Total Number	24,830	58,584	97,112	45,784
Total Biomass	<1,226	< 2,780	< 3,080	< 2,784

Table 6d. Beckett Point (medium-fine sand) dominant benthic organisms from the shallow (-5 m, -10 m) subtidal zone, collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Nemertea spp.	260.0	< 2.0	400.0	< 2.0
Nematoda spp.	160.0	< 2.0	360.0	< 2.0
Mollusca				
Gastropoda				
Alvinia sp.	316.0	< 2.0	340.0	6.0
Lacuna variegata	190.0	< 2.0	66.0	< 2.0
Mitrella tuberosa	50.0	2.0	326.0	14.0
Nassarius mendicus	0		20.0	0.0
Bivalvia				
Macoma spp.	200.0	4.0	206.0	2.0
Mysella tumida	1290.0	2.0	3076.0	4.0
Tellina sp.	376.0	10.0	146.0	12.0
Annelida				
Polychaeta				
Chaetopteridae				
Mesochaetopterus taylori	36.0	< 2.0	280.0	< 2.0
Phyllochaetopterus prolifica	0		826.0	< 2.0
Spiochaetopterus costarum	110.0	< 2.0	160.0	< 2.0
Hesionidae				
Micropodarke dubia	566.0	< 2.0	950.0	< 2.0
Nereidae				
Platynereis bicanaliculata	2096.0	✓	1360.0	< 2.0
Oweniidae				
Owenia fusiformis	130.0	< 2.0	6.0	< 2.0

Table 6d. (cont.)

	-5 m		-10 m	
	#	wt	#	wt
Annelida (cont.)				
Polychaeta				
Phyllodocidae				
<i>Eulalia sanguinea</i>	156.0	<2.0	250.0	<2.0
<i>Phyllodoce</i> spp.	122.0	<2.0	912.0	<2.0
Spionidae				
<i>Polydora socialis</i>	76.0	<2.0	1080.0	<2.0
<i>Prionospio steenstrupi</i>	1630.0	<2.0	730.0	<2.0
<i>Spiophanes berkeleyorum</i>	10.0	<2.0	0	
Crustacea				
Tanaidacea				
<i>Leptochelia dubia</i>	1260.0	<2.0	316.0	<2.0
Amphipoda				
Gammaridea spp.	2976.0	2.0	3026.0	6.0
Decapoda				
Paguridae spp.	36.0	<2.0	280.0	<2.0
Species Richness	83		90	
Diversity, H^1	2.77		3.05	
Total Number	13,416		17,542	
Total Biomass	<170		<214	

Dungeness Spit (sand-gravel)

The sediment at Dungeness Spit was sandy gravel at +6', gravel at +3', fine sand with gravel at +0', medium to fine sand with gravel at -5 m and medium sand with gravel at -10 m. The intertidal had a moderate slope and was extremely exposed to severe wave action. It was the only area east of Port Angeles which proved difficult to sample because of surf conditions. No noteworthy differences in the physical environment were observed between the first and second year.

Abridged results for Dungeness Spit +6', +3', and +0' are given in Tables 7a-c respectively. All three levels had a very species-poor community. In fact at +6' fall quarter absolutely no organisms were found. The only organisms found with any regularity at the three levels were deposit/detritus feeding oligochaetes and amphipods. No consistent seasonal pattern in populations appeared. The community similarity between the first and second years was high at +3, and low at +6' and 0', because of fewer oligochaetes and more amphipods found the second year. As expected with such a sparse fauna, patchiness was extreme (see Appendix I).

Subtidal summary results for Dungeness Spit are presented on Table 7d. Fauna was still extremely sparse at -5m. The community at -10 m, although of low biomass, was fairly rich in both species and total number. The community was composed of small bivalves and deposit feeding polychaetes (capitellids, dorvilleids, spionid, and syllids, and gammarids). Year one and year two subtidal community similarity was low at both levels. This probably reflects sampling inadequacy rather than community change.

Table 7a. Dungeness Spit (sandy gravel) dominant benthic organisms from the high (+6') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta	4.0	<2.0	0		0		4.0	<2.0
spp.								
Crustacea								
Amphipoda								
Gammaridea	4.0	<2.0	332.0	<2.0	0		0	
spp.								
Species richness	2		1		0		1	
Diversity - H'	0.69		0.00		0		0.00	
Total number	8		332		0		4	
Total biomass (g)	<2		<2		0		<2	

Table 7b. Dungeness Spit (sandy gravel) dominant benthic organisms from the mid (+3') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta	4.0	<2.0	0		0		0	
spp.								
Crustacea								
Amphipoda								
Gammaridea	272.0	0.0	4.0	<2.0	16.0	<2.0	572.0	<2.0
spp.								
Species richness	2		2		1		1	
Diversity - H'	0.08		0.56		0.00		0.00	
Total number	276		16		16		572	
Total biomass (g)	< 2		< 4		< 2		< 2	

Table 7c. Dungeness Spit (sandy gravel) dominant benthic organisms from the low (+0') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta								
spp.	8.0	< 2.0	0		0		0	
Crustacea								
Amphipoda								
Gammaridea								
spp.	40.0	< 2.0	140.0	< 2.0	492.0	< 2.0	68.0	< 2.0
Species richness	3		2		5		1	
Diversity - H'	0.69		0.13		0.27		0.00	
Total number	52		144		520		68	
Total biomass (g)	< 6		< 4		< 10		< 2	

Table 7d. Dungeness Spit (medium-fine sand with gravel) dominant benthic organisms from the shallow subtidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Nematoda spp.	0		876.0	<2.0
Mollusca				
Bivalvia				
Crenella decussata	30.0	<2.0	66.0	<2.0
Macoma spp.	0		52.0	<2.0
Mysella tumida	30.0	<2.0	70.0	<2.0
Psephidia lordi	40.0	<2.0	10.0	<2.0
Annelida				
Capitellidae				
Mediomastus sp.	70.0	<2.0	1060.0	0.0
Dorvilleidae				
Protodorvillea gracilis	0		456.0	<2.0
Hesionidae				
Micropodarke dubia	0		220.0	<2.0
Spionidae				
Prionospio steenstrupi	0		146.0	<2.0
Spiophanes bombyx	0		6.0	<2.0
Syllidae				
Exogone spp.	0		508.0	<2.0
Crustacea				
Tanaidacea				
Leptochelia dubia	6.0	<2.0	240.0	<2.0

Table 7d. (Cont.)

	-5 m		-10 m	
	#	wt	#	wt
Amphipoda				
Gammaridea spp.	380.0	<2.0	560.0	<2.0
Species richness	28		136	
Diversity - H'	2.43		3.82	
Total number	858		6764	
Total biomass (g)	<56		<322	

Twin Rivers (sand-gravel)

The sediment at Twin Rivers was sandy gravel at +6', gravel at +3', gravel with fine sand at +0', gravel at -5 m. The beach had a fairly steep slope and was very exposed to both waves and ocean swells. Wave conditions prevented sampling at -10 m during the second year.

Tables 8a-c present abridged results for Twin Rivers +6', +3', and +0' respectively for the single quarter sampled. At all levels species richness, diversity, and biomass were low. The communities, such as they are, were primarily composed of deposit feeding worms and gammarid amphipods. As expected with a sparse fauna, it was extremely patchy spatially. Year one, year two similarity was high at +6' and low at +3' and +0'.

Twin Rivers -5 m subtidal abridged results are given in Table 8d. Weather conditions prevented -10 m sampling. The community was dominated by deposit feeding annelids, and crustaceans. As with most of the Van Veen samples, variance among replicates was very high and might not reflect organism patchiness. In addition there was very little similarity between first and second year samples. First year species richness was 139 compared to 28 the second year. This is most likely a reflection of poor sampling, not year to year change.

Table 8a. Twin Rivers (sand, gravel) dominant benthic organisms from the high (+6') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77	
	#	wt
Annelida		
Oligochaeta	32.0	<2.0
spp.		
Crustacea		
Amphipoda		
Gammaridea	8.0	<2.0
spp.		
Species richness	3	
Diversity - H'	0.76	
Total number	44	
Total biomass (g)	<6	

Table 8b. Twin Rivers (sand, gravel) dominant benthic organisms from the mid (+3') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77	
	#	wt
Annelida		
Oligochaeta	28.0	<2.0
spp.		
Crustacea		
Isopoda		
Gnorimosphaeroma	32.0	<2.0
oregonense		
Amphipoda		
Gammaridea	576.0	<2.0
spp.		
Species richness	4	
Diversity - H'	0.63	
Total number	692	
Total biomass (g)	<8	

Table 8c. Twin Rivers (sand, gravel) dominant benthic organisms from the low (+0') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77	
	#	wt
Annelida		
Polychaeta		
Capitellidae		
Capitella	168.0	<2.0
capitata		
Spionidae		
Malacocerus	660.0	<2.0
glutaeus		
Crustacea		
Amphipoda		
Gammaridea	480.0	<2.0
spp.		
Species richness	15	
Diversity - H'	1.62	
Total number	1448	
Total biomass (g)	<30	

Table 8d. Twin Rivers (gravel) dominant benthic organisms from the shallow subtidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5m	
	#	wt
Mollusca		
Bivalvia		
<i>Myrella tumida</i>	6.0	<2.0
<i>Protothaca staminea</i>	10.0	6.0
Annelida		
Oligochaeta spp.	6.0	<2.0
Polychaeta		
Capitellidae		
<i>Mediomastus</i> sp.	410.0	<2.0
Cirratulidae		
<i>Tharyx multifilis</i>	5190.0	✓
Goniadidae		
<i>Glycinde picta</i>	70.0	<2.0
Nereidae		
<i>Platynereis bicanaliculata</i>	16.0	<2.0
Oweniidae		
<i>Owenia fusiformis</i>	670.0	<2.0
Spionidae		
<i>Prionospio steenstrupi</i>	150.0	<2.0
Crustacea		
Cumacea		
<i>Diastylopsis</i> sp.	1766.0	2.0

Table 8d. (Cont.)

	-5 m	
	#	wt
Isopoda		
Gnorimosphaeroma oregonense	230.0	2.0
Amphipoda		
Gammaridea spp.	1486.0	2.0

Species richness	28
Diversity - H'	1.69
Total number	8852
Total biomass (g)	<56

North Beach Sand (sand)

The sediment at +6' was sand with gravel, at +2' medium to fine sand with gravel, at +0' medium to very fine sand, at -5 m medium to coarse sand, and at -10 m sand and gravel. The mid-tide height of +2' was selected instead of +3' to stay out of the more gravelly upper intertidal. North Beach Sand had a moderately sloped beach and moderate exposure, as North Beach Cobble. No major changes in the physical environment were observed between the first and second year.

Abridged results for North Beach Sand +6' are given in Table 9a. The community was very low in species richness, diversity, total number of organisms, and total biomass. It was composed of deposit feeding worms and crustaceans. Species richness and total number appeared particularly depressed in the winter. The sparse fauna was of course very patchy in spatial distribution. First and second year community similarity was low.

Table 9b gives a summary data set for North Beach Sand +2'. Major components of this community were all detrital/deposit feeders (Paraonella, Eohaustorius, and Paraphoxus). The community was dominated by the fossorial amphipod Eohaustorius. Its populations peaked in the summer. Species richness, diversity, and total biomass were low and exhibited little seasonal pattern. The community was extremely similar from year one to year two.

Table 9c presents the abridged results for North Beach Sand +0'. This low diversity, low biomass community was comprised almost totally of deposit/detrital feeding polychaetes and crustaceans plus carnivorous nemerteans and was dominated by three species: the paraonid polychaete Paraonella, the mysid Archaeomysis, and the amphipod Eohaustorius. Paraonella and Eohaustorius populations peaked in the spring. Archaeomysis showed a severe population decline in the fall/winter. This may merely indicate migration of the species out of the littoral zone during this period. As at +2' this community showed great similarity from year one to year two.

Abridged subtidal data are given in Table 9d for North Beach. Except for fewer plants at -10 m, the communities at -5 m and -10 m were quite similar. They were composed of herbivores (Lacuna and Onuphis), suspension-feeding bivalves (Clinocardium, Crenella, Mysella, Psephidia), many deposit feeding annelids and small crustaceans, and carnivores (Natica, Micropodarke, and Cancer at -5 m). Species richness, diversity, total number, and biomass were high at both levels. Year to year similarity was low, again likely due to poor sampling methodology.

Table 9a. North Beach Sand (medium-fine sand with gravel) dominant benthic organisms from the high (+6') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta	24.0	<2.0	0		28.0	<2.0	8.0	<2.0
spp.								
Crustacea								
Amphipoda								
Gammaridea	4.0	<2.0	0		0		8.0	<2.0
spp.								
Species richness	10		8		6		5	
Diversity - H'	2.02		1.48		1.35		1.55	
Total number	92		156		48		28	
Total biomass (g)	<20		<18		<12		<10	

Table 9b. North Beach Sand (medium-fine sand with gravel) dominant benthic organisms from the mid (+2') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Polychaeta								
Paraonidae								
Paraonella	156.0	<2.0	132.0	<2.0	12.0	<2.0	36.0	<2.0
platybranchia								
Spionidae								
Pygospio	0		0		0		0	
elegans								
Crustacea								
Isopoda								
Exosphaeroma	0		0		0		2.6	<2.0
media								
Amphipoda								
Eohaustorius	2408.0	6.0	6072.0	8.0	1524.0	4.0	1988.0	2.0
spp.								
Paraphoxus	0		8.0	<2.0	156.0	<2.0	200.0	<2.0
spp.								
Species richness	10		15		10		10	
Diversity - H'	0.33		0.26		0.70		0.66	
Total number	2600		6372		1824		2352	
Total biomass (g)	<24		<32		<28		<22	

Table 9c. North Beach Sand (medium-fine sand with gravel) dominant benthic organisms from the low (+0') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea spp.	16.0	<2.0	20.0	<2.0	0		12.0	<2.0
Annelida								
Polychaeta								
Arenicolidae								
Abarenicola	64.0	<2.0	4.0	<2.0	24.0	<2.0	4.0	<2.0
claparedi								
oceanica								
Orbiniidae								
Scoloplos sp.	112.0	✓	132.0	✓	32.0	<2.0	112.0	<2.0
Paraonidae								
Paraonella	2168.0	✓	1984.0	✓	480.0	<2.0	1448.0	<2.0
platybranchia								
Spionidae spp.	92.0	<2.0	56.0	<2.0	124.0	<2.0	456.0	<2.0
Syllidae								
Syllis spp.	116.0	<2.0	124.0	<2.0	0		196.0	<2.0
Crustacea								
Mysidacea								
Archaeomysis	16.0	<2.0	1188.0	4.0	4.0	<2.0	0	
grebnitzkii								
Amphipoda								
Eohaustorius	2940.0	6.0	992.0	0.0	2792.0	0.0	2796.0	2.0
washingtonianus								

Table 9c. (Cont.)

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Amphipoda (cont.)								
Paraphoxus spp.	32.0	<2.0	16.0	<2.0	4.0	<2.0	0	
Species richness	16		21		18		19	
Diversity - H'	1.11		1.56		1.02		1.36	
Total number	5608		3692		3792		5296	
Total biomass (g)	<28		<34		<36		<38	

Table 9d. North Beach (coarse sand-gravel) dominant benthic organisms from the shallow subtidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Phaeophyta				
<i>Laminaria saccharina</i>		1655.0		0
<i>Pterygophora californica</i>		9163.0		0
Rhodophyta				
<i>Odonthalia washingtoniensis</i>		0		0
<i>Opuntiella californica</i>		700.0		0
Nematoda spp.	330.0	<1.0	260.0	<2.0
Mollusca				
Gastropoda				
<i>Lacuna variegata</i>	940.0	5.0	40.0	<2.0
<i>Margarites pupillus</i>	120.0	<1.0	0	
<i>Natica clausa</i>	5.0	<1.0	6.0	26.0
Bivalvia				
<i>Clinocardium nuttallii</i>	1375.0	1.0	30.0	0.0
<i>Crenella decussata</i>	15.0	<1.0	646.0	2.0
<i>Macoma</i> sp.	0		10.0	<2.0
<i>Mysella tumida</i>	100.0	<1.0	0	
<i>Psephidia lordi</i>	105.0	<1.0	46.0	0.0
Annelida				
<i>Oligochaeta</i> spp.	175.0	<1.0	1250.0	<2.0

Table 9d. (Cont.)

	-5 m		-10 m	
	#	wt	#	wt
Polychaeta				
Capitellidae				
Mediomastus sp.	35.0	<1.0	6.0	<2.0
Dorvilleidae				
Protodorvillea gracilis	290.0	<1.0	30.0	<2.0
Hesionidae				
Micropodarke dubia	540.0	<1.0	416.0	<2.0
Onuphiidae				
Onuphis spp.	285.0	<1.0	10.0	<2.0
Sabellidae spp.	25.0	<1.0	0	
Spionidae				
Polydora hamata	420.0	<1.0	0	
P. pygidialis	275.0	<1.0	0	
Prionospio steenstrupi	130.0	<1.0	30.0	<2.0
Spio filicornis	90.0	<1.0	270.0	<2.0
Syllidae				
Exogone spp.	395.0	<1.0	166.0	<2.0
Archiannelida				
Polygordiidae				
Polygordius sp.	520.0	<1.0	560.0	<2.0
Crustacea				
Tanaidacea				
Leptocheilia dubia	175.0	<1.0	176.0	<2.0

Table 9d. (Cont.)

	-5 m		-10 m	
	#	wt	#	wt
Isopoda				
Exosphaeroma spp.	655.0	0.0	136.0	<2.0
Amphipoda				
Gammaridea spp.	4275.0	6.0	630.0	2.0
Decapoda				
Cancer spp.	30.0	9.0	0	
Paguridae spp.	130.0	5.0	36.0	<2.0
Species richness	201		151	
Diversity - H'	1.44		3.86	
Total number	14103		7442	
Total biomass (g)	12021		1474	

Kydaka Beach (sand)

The sediment at Kydaka Beach at +6', +3', and +0' was uniformly very coarse to fine sand, at -5 m medium to fine sand, and at -10 m fine sand. The beach slope was moderately steep, and the area was exposed to extremely violent wave and ocean swell action. Salinity during winter quarter sampling was quite low (20.1⁰/oo). No major difference was observed in the physical environment between the first and second year.

Tables 10a-c present abridged results for Kydaka Beach +6', +3', and +0' respectively. The very low diversity, low total number, low biomass communities were fairly similar at all three levels. Deposit/detrital feeders dominate (oligochaetes, gammarids, Archaeomysis). A carnivore (Nephtys) occurred at +0'. No clear seasonal patterns emerged, probably because of the difficulty of accurately sampling such a sparse fauna. Winter did appear to be a depressed time for total number. Similarity in communities between year one and two was low at all three levels, doubtless due to the problems in sampling such a sparse fauna.

The summary subtidal results for Kydaka Beach appear in Table 10d. Major constituents were deposit feeding bivalves (Tellina), small suspension feeding bivalves (Mysella), deposit feeding polychaetes (capitellids and spionids) and small crustaceans (ostracods, cumaceans, and gammarid amphipods). Year one to year two community similarity was high given the limitations of grab sampling noted earlier.

Table 10a. Kydaka Beach (coarse-fine sand) dominant benthic organisms from the high (+6') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta	8.0	<2.0	68.0	<2.0	12.0	<2.0	8.0	<2.0
spp.								
Crustacea								
Amphipoda								
Gammaridea	0		44.0	<4.0	76.0	<2.0	0	
spp.								
Species richness	2		6		4		2	
Diversity - H'	0.64		1.23		0.71		0.64	
Total number	12		144		96		12	
Total biomass (g)	<4		<12		<8		<4	

Table 10b. Kydaka Beach (coarse-fine sand) dominant benthic organisms from the mid (+3') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta								
spp.	0		0		0		0	
Crustacea								
Mysidacea								
Archaeomysis	4.0	<2.0	212.0	<2.0	40.0	<2.0	0	
grebnitzkii								
Species richness	2		5		2		1	
Diversity - H'	0.6 ^a		0.87		0.45		0.00	
Total number	8		328		48		12	
Total biomass (g)	<4		<10		<4		<2	

Table 10 c. Kydaka Beach (coarse-fine sand) dominant benthic organisms from the low (+0') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Polychaeta								
Nephtyidae								
Nephtys spp.	0		0		8.0	<2.0	0	
Paraonidae								
Paraonella platybranchia	0		24.0	<2.0	8.0	<2.0	0	
Crustacea								
Mysidacea								
Archaeomysis grebnitzkii	4.0	<2.0	16.0	<2.0	0		0	
Amphipoda								
Gammaridea spp.	268.0	<8.0	64.0	<4.0	0		0	
Species richness	6		5		7		1	
Diversity - H'	0.61		1.25		1.77		0.00	
Total number	272		112		56		8	
Total biomass (g)	<12		<10		<14		<2	

Table 10d. Kydaka Beach (medium-fine sand) dominant benthic organisms from the shallow subtidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Mollusca				
Bivalvia				
<i>Mysella tumida</i>	610.0	2.0	1656.0	4.0
<i>Psephidia lordi</i>	0		1316.0	8.0
<i>Tellina</i> sp.	26.0	2.0	56.0	2.0
Annelida				
Polychaeta				
Capitellidae				
<i>Mediomastus</i> sp.	256.0	<2.0	1670.0	0.0
Orbiniidae				
<i>Scoloplos</i> spp.	110.0	<2.0	50.0	0.0
Oweniidae				
<i>Owenia fusiformis</i>	150.0	<2.0	220.0	0.0
Spionidae				
<i>Polydora socialis</i>	60.0	<2.0	116.0	0.0
<i>Prionospio steenstrupi</i>	740.0	<2.0	3850.0	0.0
Crustacea				
Ostracoda spp.	196.0	2.0	1560.0	2.0
Cumacea				
<i>Diastylis</i> sp.	0		46.0	2.0
<i>Diastylopsis</i> sp.	476.0	2.0	6.0	0.0

Table 10d. (Cont.)

	-5 m		-10 m	
	#	wt	#	wt
Isopoda				
<i>Edotea sublittoralis</i>	20.0	2.0	0	
Amphipoda				
Gammaridea spp.	2076.0	4.0	2576.0	6.0
Echinodermata				
Holothuroidea				
<i>Leptosynapta clarki</i>	336.0	6.0	0	
Species richness	54		96	
Diversity - H'	2.55		2.83	
Total number	6230		17,410	
Total biomass (g)	<114		<222	

Jamestown (protected sand)

The Jamestown sediment was sandy gravel at +6', fine sand at +1.4', medium sand at +0', coarse to medium sand at -5 m, and coarse to fine sand at -10 m. The +1.4' level was selected to avoid the upper intertidal gravel. The beach was fairly well protected by Dungeness Spit. Its slope was very gradual and was the widest beach sampled. No major changes in the physical environment were noted between the first and second year.

Table 11a presents the summary results of Jamestown +6'. This low diversity community was composed predominantly of deposit feeders (nematodes, oligochaetes and gammarid amphipods). Lowest species richness occurred in the summer-fall, highest total number in winter. The patchiness of the fauna was very great (Appendix I). However, because of the overwhelming numerical dominance of oligochaetes, year one and year two similarity was total.

Abridged results for Jamestown +1.4' are presented in Table 11b. The major components of this community were a small suspension-feeding bivalve (Transennella), a deposit feeding bivalve (Macoma), other deposit feeders (nematodes, arenicolids, capitellids, paraonids, spionids, oligochaetes, gammarids, and Leptosynapta), and carnivores (Nephtys, Eteone). No clear seasonal patterns appeared in the results, although spring appears to have lowest species richness and number. First and second year community similarity was high, but densities were greater in the second year.

Table 11c presents an abridged data set for Jamestown +0'. This high density, high biomass community was quite complex. Tube-building polychaetes and crustaceans and Upogebia provided major structuring elements and dominated the community. Most of the worms, Macoma, small crustaceans, and Leptosynapta were deposit/detritus feeders. Carnivores included nemerteans, hesionids, phyllodocids, and polynoids. A small, suspension-feeding bivalve (Transennella) was also abundant. No clear community seasonal changes appeared in the results. However, many polychaetes (e.g. Platynereis) showed peak numbers in fall/winter, evidence of recruitment. Community similarity between year one and two was very high.

Subtidal results for Jamestown are presented in abridged form in Table 11d. The communities of these two levels, -5 m, and -10 m, were quite similar. Both were very species rich, diverse, and had a high total number. Over ten species of suspension feeding bivalves and one deposit feeder were present. Herbivores included Margarites/Lirularia, Platynereis, Onuphis, and Pugettia. Among carnivores were nemerteans, Nassarius, Natica, hesionids, and polynoids. In addition there were many deposit/detritus feeding polychaetes and small crustaceans. Replicate variance was fairly low at this area and year one to year two similarity rather high for subtidal grab-sampled communities.

Table 11a. Jamestown (sandy gravel) dominant benthic organisms from the high (+6') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nematoda spp.	60.6	<2.0	72.0	<4.0	60.0	<4.0	20.0	<4.0
Annelida								
Oligochaeta spp.	148,830.0	<2.0	44,332.0	<4.0	30,640.0	<4.0	1,612.0	<4.0
Crustacea								
Amphipoda								
Gammaridea spp.	650.0	<2.0	0		140.0	<4.0	80.0	<4.0
Species richness	8		4		4		14	
Diversity - H'	0.07		0.02		0.07		0.73	
Total number	150,220		44,428		30,972		1876	
Total biomass (g)	<14		<16		<16		<52	

Table 11b. Jamestown (fine sand) dominant benthic organisms from the mid (+1.4') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nematoda spp.	40.0	<2.0	412.0	<4.0	252.0	<4.0	472.0	<4.0
Mollusca								
Bivalvia								
Macoma nasuta	60.0	156.0	20.0	148.0	72.0	340.0	12.0	80.0
Transenella tantilla	1270.0	8.0	760.0	<4.0	7232.0	32.0	5280.0	<4.0
Annelida								
Polychaeta								
Arenicolidae sp.	50.0	<2.0	700.0	<4.0	7052.0	<4.0	2132.0	<4.0
Capitellidae								
Capitella capitata	870.0	<2.0	3632.0	<4.0	3012.0	4.0	1140.0	<4.0
Paraonidae								
Paraonella platybranchia	60.0	<2.0	332.0	<4.0	112.0	<4.0	52.0	<4.0
Phyllodocidae								
Eteone longa	380.0	<2.0	17,520.0	<4.0	712.0	<4.0	1352.0	<4.0
Phyllodoce maculata	20.0	<2.0	12.0	<4.0	320.0	<4.0	340.0	<4.0

Table 11b. (Cont.)

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Spionidae								
Malacoceros glutaeus	5750.0	<2.0	820.0	<4.0	11,892.0	✓	13,040.0	<4.0
Polydora kempii japonica	80.0	<2.0	1880.0	<4.0	2940.0	✓	272.0	<4.0
Pygospio elegans	820.0	<2.0	51,512.0	<4.0	2740.0	<4.0	1980.0	<4.0
Crustacea								
Tanaidacea								
Leptochelia dubia	10.0	<2.0	40.0	<4.0	600.0	<4.0	1252.0	<4.0
Amphipoda								
Gammaridea spp.	906.0	<2.0	1048.0	<20.0	1868.0	<16.0	24.0	<8.0
Echinodermata								
Holothuroidea								
Leptosynapta clarki	10.0	<2.0	0		12.0	<4.0	172.0	<4.0
Species richness	33		38		48		38	
Diversity - H'	1.87		1.19		2.02		1.90	
Total number	11,536		68,244		61,368		28,632	
Total biomass (g)	<224		<340		<704		<220	

Table 11c. Jamestown (medium sand) dominant benthic organisms from the low (+0') intertidal zone collected spring 1977 (through winter 1978), expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea spp.	50.0	<2.0	32.0	<4.0	120.0	<4.0	100.0	<4.0
Nematoda spp.	0		12.0	<4.0	60.0	<4.0	340.0	<4.0
Mollusca								
Bivalvia								
Macoma spp.	320.0	<2.0	32.0	24.0	20.0	4.0	12.0	4.0
Transennella tantilla	780.0	4.0	540.0	<4.0	2560.0	12.0	1572.0	<4.0
Annelida								
Oligochaeta spp.	11,690.0	<2.0	9532.0	<4.0	19,820.0	<4.0	27,072.0	✓
Polychaeta								
Capitellidae								
Capitella capitata	1060.0	<2.0	632.0	<4.0	2960.0	<4.0	2332.0	<4.0
Mediomastus sp.	770.0	<2.0	1500.0	<4.0	1772.0	<4.0	1312.0	<4.0
Cirratulidae spp.	410.0	<2.0	192.0	<4.0	152.0	<4.0	224.0	<4.0

Table 11c. (Cont.)

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Dorvilleidae								
Dorvillea								
rudolphi	230.0	<2.0	180.0	<4.0	380.0	<4.0	192.0	4.0
Hesionidae								
Ophiodromus								
pugettensis	60.0	<2.0	92.0	<4.0	120.0	<4.0	160.0	<4.0
Lumbrineridae								
Lumbrineris								
spp.	1210.0	<2.0	1112.0	<4.0	2044.0	76.0	1172.0	✓
Maldanidae								
sp. (juv.)	550.0	<2.0	312.0	<4.0	2300.0	4.0	2172.0	✓
Nereidae								
Platynereis								
bicanaliculata	10.0	<2.0	0		820.0	0.0	332.0	<4.0
Opheliidae								
Armandia								
brevis	90.0	<2.0	20.0	<4.0	212.0	<4.0	280.0	<4.0
Orbiniidae								
Naineris								
spp.	560.0	<2.0	452.0	<4.0	692.0	<4.0	716.0	✓
Phyllodocidae								
Eteone								
longa	40.0	<2.0	20.0	<4.0	12.0	<4.0	40.0	<4.0

Table 11c. (Cont.)

		Spr 77		Sum 77		Fall 77		Win 78	
		#	wt	#	wt	#	wt	#	wt
Phyllodocidae (cont.)									
Phyllodoce		40.0	<2.0	52.0	<4.0	120.0	<4.0	252.0	<4.0
maculata									
Polynoidae									
Harmothoe		50.0	<2.0	380.0	<4.0	492.0	8.0	52.0	✓
imbricata									
Spionidae									
Malacoceros		650.0	<2.0	600.0	<4.0	2692.0	<4.0	4052.0	✓
glutaeus									
Syllidae									
Exogone		5220.0	<4.0	2560.0	<4.0	5180.0	<4.0	3432.0	<4.0
lourei									
Terebellidae									
Pista		560.0	✓	512.0	<4.0	340.0	20.0	492.0	✓
brevibranchiata									
Crustacea									
Tanaidacea									
Leptochelia		810.0	<2.0	1492.0	<4.0	1760.0	<4.0	2080.0	<4.0
dubia									
Amphipoda									
Gammaridea		590.0	<2.0	452.0	<4.0	218.0	16.0	660.0	<4.0
spp.									

Table 11c. (Cont.)

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Decapoda								
Pinnixa	50.0	4.0	24.0	0.0	140.0	<4.0	52.0	<4.0
spp.								
Upogebia	120.0	40.0	660.0	60.0	220.0	308.0	352.0	<4.0
pugettensis								
Echinodermata								
Holothuroidea								
Leptosynapta	220.0	<2.0	112.0	<4.0	20.0	<4.0	100.0	<4.0
clarki								
Species richness	47		57		78		62	
Diversity - H'	2.36		2.42		2.48		2.10	
Total number	25,910		24,216		50,412		51,644	
Total biomass (g)	302		252		1084		20	

Table 11d. Jamestown (coarse-fine sand) dominant benthic organisms from the shallow subtidal zone collected spring 1977, expressed as number and/or biomass (g) per m². For complete data set see Appendix I.

	-5 m		-10 m	
	#	wt	#	wt
Nemertea spp.	96.0	<2.0	170.0	<2.0
Nematoda spp.	1336.0	<2.0	426.0	<2.0
Mollusca				
Gastropoda				
Alvinia sp.	410.0	<2.0	26.0	<2.0
Margarites/Lirularia spp.	196.0	<2.0	226.0	<2.0
Nassarius mendicus	0		6.0	<2.0
Natica clausa	0		6.0	<2.0
Bivalvia				
Cardita ventricosa	0		0	
Clinocardium nuttallii	210.0	2.0	20.0	<2.0
Crenella decussata	1366.0	2.0	86.0	<2.0
Macoma spp.	126.0	4.0	452.0	34.0
Mysella tumida	1450.0	2.0	280.0	<2.0
Psephidia lordi	210.0	<2.0	156.0	<2.0
Annelida				
Ampharetidae				
Ampharete arctica	0		240.0	<2.0
Capitellidae				
Mediomastus sp.	426.0	<2.0	796.0	<2.0
Chaetopteridae				
Phyllochaetopterus prolifica	280.0	<2.0	80.0	<2.0

Table 11d. (Cont.)

	-5 m		-10 m	
	#	wt	#	wt
Cirratulidae spp.	50.0	<2.0	646.0	<2.0
Tharyx multifilis	76.0	<2.0	136.0	<2.0
Dorvilleidae				
Protodorvillea gracilis	236.0	<2.0	56.0	<2.0
Hesionidae				
Micropodarke dubia	406.0	<2.0	636.0	<2.0
Maldanidae spp.	392.0	<2.0	290.0	<2.0
Nicomache personata	400.0	<2.0	40.0	<2.0
Nereidae				
Platynereis bicanaliculata	326.0	<2.0	176.0	<2.0
Onuphidae				
Onuphis sp.	10.0	<2.0	66.0	<2.0
Oweniidae				
Owenia fusiformis	130.0	<1.0	50.0	<2.0
Paraonidae				
Aricidea sp.	36.0	<2.0	26.0	<2.0
Polynoidae				
Harmothoe imbricata	416.0	<2.0	200.0	<2.0
Sabellidae				
Sabella media	0		270.0	<2.0

Table 11d. (Cont.)

	-5 m		-10 m	
	#	wt	#	wt
Spionidae				
Malacoceros glutaeus	10.0	<2.0	16.0	<2.0
Polydora socialis	26.0	<2.0	46.0	<2.0
Prionospio steenstrupi	146.0	<2.0	166.0	<2.0
Spiophanes bombyx	50.0	<2.0	20.0	<2.0
Syllidae				
Exogone sp.	1940.0	<2.0	826.0	<2.0
Sphaerosyllis pirifera	70.0	<2.0	20.0	<2.0
Oligochaeta spp.	270.0	<2.0	620.0	<2.0
Crustacea				
Cumacea				
Diastylis sp.	6.0	<2.0	50.0	<2.0
Tanaidacea				
Leptochelia dubia	2646.0	<2.0	1370.0	<2.0
Amphipoda				
Gammaridea spp.	1660.0	4.0	1536.0	2.0
Decapoda				
Pugettia gracilis	146.0	<2.0	30.0	<2.0
Species richness	136		156	
Diversity - H'	3.49		3.81	
Total number	17,364		12,864	
Total biomass (g)	782		76	

SECTION VI

DISCUSSION

Prior to the initiation of these studies in the spring 1976 absolutely no quantitative information existed on the shallow water benthic communities along the Washington coast of the Strait of Juan de Fuca. With the completion of this second year of sampling and sample analysis a vast storehouse of quantitative data on the full range of intertidal and shallow subtidal communities has been accumulated. Strict, clear, replicable sampling has been done. Literally hundreds of thousands of organisms attributed to over one thousand species have been processed. All processed organisms have been retained in a long-term storage repository to enable future reference.

In the following discussion first the study areas will be compared. Then seasonal and annual changes will be considered.

VI-A. Study Area Comparisons

Summary information on species richness, species diversity, density, and biomass for the intertidal and subtidal are presented on Tables 12 and 13 respectively. The intertidal values were averaged over the four sample periods for the seven areas sampled quarterly.

Second year data confirmed first year data trends. Intertidal species richness and diversity were highest in the rock sites (Tongue Point, Pillar Point), followed by cobble (North Beach, Morse Creek) and protected sediment areas (Beckett, Jamestown). They were lowest in the exposed sand (North Beach, Kydaka) and gravel (Dungeness Spit, Twin Rivers) areas.

Intertidal species richness increased with decreasing tide height in all habitats except at Pillar Point where sand scouring reduced richness at +0' (Nyblade, 1978). In the severely exposed gravel (Dungeness Spit, Twin Rivers) and sand (Kydaka) areas the very low richness showed little tidal height difference. Species diversity showed a less distinct pattern. Except in species poor areas lowest diversity was found in the high intertidal.

High diversity and species richness were found in the subtidal. Patterns among the areas or between the two depths were difficult to discern. Generally, species richness was less in the most exposed areas (Kydaka, Twin Rivers -5m, Dungeness -5m). Still, all subtidal areas were species rich compared to gravel and sand intertidal habitats. At the subtidal rock site (Tongue Point) intense grazing by sea urchins was observed at both -5m and -10m. Species richness was much lower at -10m both years, reflecting the decline in algal species number with depth in

Table 12. Intertidal summary of second year community parameters by study area - tide height.

Pillar Point, North Beach Cobble, and Twin Rivers are spring 1977 data only; other areas means of four seasons (spring 1977 - winter 1978) (Tongue Point +0', spring-summer only; Morse Creek +0', spring - fall only).

Study Area		Mean Species Richness	Mean Diversity	Mean Total Density (#/m ²)	Mean Total Biomass (g/m ²)
Tongue Point (rock)	+6'	61.3	2.40	36,779	1476
	+3'	118.3	3.04	48,516	3446
	+0'	177.5	2.25	19,375	7368
Pillar Point (rock)	+6'	42	1.85	11,620	480
	+3'	131	2.50	8,994	6317
	+0'	124	2.04	15,642	11375
North Beach Cobble (cobble over sand)	+6'	16	1.99	2148	78
	+3'	38	2.48	3802	128
	+0'	125	3.24	6724	1862
Morse Creek (cobble over sand)	+6'	11.5	1.07	1191	<30
	+3'	67.3	2.21	20,666	926
	+0'	103.7	2.33	15,218	3109
Beckett Point (protected gravel-sand)	+6'	12.5	1.65	2143	<133
	+3'	45.3	2.24	16,678	<402
	+0'	80.8	2.37	56,578	<2468
Dungeness Spit (exposed gravel- sand)	+6'	1	0.17	86	<2
	+3'	1.5	0.16	220	<3
	+0'	2.8	0.27	196	<6
Twin Rivers (exposed gravel- sand)	+6'	3	0.76	44	<6
	+3'	4	0.63	692	<8
	+0'	15	1.62	1448	<30
North Beach Sand (semi-exposed sand)	+6'	7.3	1.60	81	<15
	+2'	10.5	0.49	3287	<27
	+0'	18.5	1.26	4597	<34

Table 12. (Cont.)

Study Area		Mean Species Richness	Mean Diversity	Mean Total Density (#/m ²)	Mean Total Biomass (g/m ²)
Kydaka Beach (exposed sand)	+6'	3.5	0.81	66	<7
	+3'	2.5	0.50	99	<5
	+0'	4.8	0.91	112	<10
Jamestown (protected sand)	+6'	7.5	0.22	56,874	<25
	+1.4'	38.2	1.75	42,445	<372
	+0'	60.3	2.34	38,046	<115

Table 13. Subtidal summary of second year community parameters by study area - depth. All parameters are for June 1977.

Study Area		Species Richness	Diversity H'	Total Density (#/m ²)	Total Biomass (g/m ²)
Tongue Point	-5 m	209	1.45	18,635	9160
(rock)	-10 m	94	3.00	834	2988
Pillar Point	-5 m	77	2.82	13,814	<156
(sand)	-10 m	86	3.26	4426	<172
Morse Creek	-10 m	127	2.72	11,654	<290
(cobble-gravel)					
Beckett Point	-5 m	83	2.77	13,416	<170
(sand)	-10 m	90	3.05	17,542	<214
Dungeness Spit	-5 m	28	2.43	858	<56
(sand-gravel)	-10 m	136	3.82	6764	<322
Twin Rivers	-5 m	28	1.69	8852	<56
(gravel)					
North Beach	-5 m	201	1.44	14,103	12,021
(cobble-gravel- sand)	-10 m	151	3.86	7442	1474
Kydaka Beach	-5 m	54	2.55	6230	<114
(sand)	-10 m	96	2.83	17,410	<222
Jamestown	-5 m	136	3.49	17,364	782
(sand)	-10 m	156	3.81	12,864	76

part but also a decline in polychaete and small crustacean species. This latter would imply that more or larger sediment pockets were sampled at -5m compared to -10m,

The above illustrates the difficulty of determining causes for observed patterns from the data alone. A very large number of factors, both real and sampling induced, could produce the observed patterns in species richness. Fortunately poor sampling is more likely to obscure patterns than create them. Of the patterns mentioned above it is clear that two factors are primarily responsible. First is the type of substratum. Rock supports the richest marine communities in this region. Second and virtually of equal importance is exposure to wave and current activity. Exposed rock communities are much richer than those from protected rock areas. The opposite exposure effect is found for soft sediment areas. Exposed soft sediment areas support very species poor communities, while the communities found in protected soft sediment areas may approach the richness of protected rock communities. (See Figure 4.)

Intertidal abundance and biomass followed fairly closely species richness patterns with highest values at the rock, cobble, and protected soft sediment areas. Patterns at these areas relative to tidal height were more complex. Biomass increased with decreasing tide height. No clear pattern in abundance was observed. In gravel and sand areas, low biomass precluded determination of tide height patterns. Density was usually lowest at the highest tide height.

For subtidal areas lowest densities occurred at exposed Dungeness -5m and Tongue Point -10m. In general, biomass decreased with increasing depth, due largely to decreased plant biomass with depth.

It is also possible to rank all study sites by biomass or standing crop and from this to make inferences about productivity and energy flow in the community. Rock habitats usually had by far the greatest standing crop with as much as 11.4 kg/m² found in this study. The 12.0 kg/m² found at North Beach -5m was mostly due to a single large Pterogophora; very large algae are not adequately sampled by the methodology employed in this study. Cobble areas were next in standing crop, although protected sediment areas at some levels where large bivalves and crustaceans were abundant also had a large standing crop. In rock and cobble areas a large percentage of the standing crop was benthic macro-algae (and some eelgrass), the major primary producers in these communities. Therefore, areas with little or no macro-algae such as the gravel and sand habitats would have low productivity. Energy flow in these communities would be based on importation from drift or the plankton. Although turnover rates are unknown, it is hard to imagine they are high enough to raise the energy flow and indirect productivity of these sparsely populated gravel and sand communities to the level of those of rock, cobble, or fine sediment communities. Ranking energy flow and net productivity in the rock, cobble and protected sediment systems is impossible without detailed rate studies.

The first year report (Nyblade, 1978) gave a detailed analysis of study area and tidal level similarities. Second year data confirmed first year patterns. Rock, cobble, and gravel intertidal areas were similar to

each other. Subtidal areas of similar sediment type showed high community similarity. Low similarity was found between communities at high, mid, and low tidal height at given study sites. Appendix II Tables 1 - 10 give the cumulative two year species list for each study site with the tidal height/depth range indicated for each species. Examination of these tables reinforces the patterns observed above,

In last years report a brief comparison was made between the Strait study sites and some San Juan Island DOE study sites. It would be very desirable to be able to expand on that to compare all study sites sampled by comparable methodology in the greater Puget Sound basin in the past five years. It would be valuable to know if regional faunal/floral trends exist within this larger area.

The number of sites sampled is now quite large with METRO sites from Puget Sound, DOE sites from San Juan Island and the Rosario Strait mainland area, and NOAA sites from Whidbey Island. To obtain the necessary original data and put it into a uniform format would be both very time consuming and expensive, putting regional comparisons beyond the scope of this report. (See Recommendations.)

Site to site trends in replicate variability would be of interest and would be possible using a similarity index. This would require extensive computer analysis and proved to be beyond the scope of this report.

VI-B. Seasonal Changes

Tables 14, 15, and 16 summarize seasonal changes many of which were noted area by area in the Results. Table 14 gives a summary of species richness seasonal changes. In areas with a high species richness, species richness remained high through the year, with some areas showing a slight decline in richness in the winter (Tongue +3, +0; Pillar +0). There was also often a winter depression in species richness at gravel and sand sites, species poor areas. Such winter depressions may be due to annual algal die-off and storm disturbance.

A summary of seasonal change in community density is presented in Table 15. Seasonal patterns were not particularly clear. However, more areas had their highest densities in the summer and lowest in the winter than during the other three quarters.

Seasonal change in biomass (Table 16) was not obvious. No meaningful biomass information was obtained from the low biomass areas, a majority of sites, giving a much shorter table than Table 14 and 15. Algae dominated the biomass at higher biomass areas. The patchiness of large algae distribution masked any seasonal trends.

Except for species which had a discrete period of massive recruitment (Balanus, Musculus, Platynereis), seasonal population changes of individual species were often not apparent. Reasons for this may be several. First, there may have been little population change over the year. The species may be long-lived or the individuals of a species may be replaced at the same rate as mortality. Inadequacy of the sampling methodology to adequately

Table 14. Second year (1977-78) seasonal change in species richness by study area - tide height.
Asterisk indicates seasonal peak.

Study Area		Spring	Summer	Fall	Winter
Tongue Point (rock)	+6'	79*	66	56	44
	+3'	114	136*	126	97
	+0'	180	175	—	—
Morse Creek (cobble over sand)	+6'	8	16*	7	15
	+3'	59	76*	70	64
	+0'	112	117*	82	—
Beckett Point (protected gravel-sand)	+6'	10	13	15*	12
	+3'	23	55	74*	29
	+0'	68	83	93*	79
Dungeness Spit (exposed gravel- sand)	+6'	2*	1	0	1
	+3'	2*	2*	1	1
	+0'	3	2	5*	1
North Beach Sand (semi-exposed sand)	+6'	10*	8	6	5
	+2'	9	13*	10	10
	+0'	16	21*	18	19
Kydaka Beach (exposed sand)	+6'	2	6*	4	2
	+3'	2	5*	2	1
	+0'	6	5	7*	1
Jamestown (protected sand)	+6'	8	4	4	14*
	+1.4'	33	36	46*	38
	+0'	47	57	76*	61

Table 15. Second year (1977-78) seasonal change in density by study area - tide height.
Asterisk indicates seasonal peak.

Study Area		Spring	Summer	Fall	Winter
Tongue Point (rock)	+6'	89,216*	29,800	14,880	13,220
	+3'	30,750	97,740*	45,072	20,501
	+0'	10,470	28,280	—	—
Morse Creek (cobble over sand)	+6'	206	2,458*	1,257	844
	+3'	6,452	29,420	33,278*	13,514
	+0'	17,843*	17,450	10,360	—
Beckett Point (protected gravel-sand)	+6'	1,630	632	4,404*	1,904
	+3'	3,450	11,068	48,228*	3,964
	+0'	24,830	58,584	97,112*	45,784
Dungeness Spit (exposed gravel- sand)	+6'	8	332*	0	4
	+3'	276	16	16	572*
	+0'	52	144	520*	68
North Beach Sand (semi-exposed sand)	+6'	92	156*	48	28
	+2'	2,600	6,372*	1,824	2,352
	+0'	5,608*	3,692	3,792	5,296
Kydaka Beach (exposed sand)	+6'	12	144*	96	12
	+3'	8	328*	48	12
	+0'	272*	112	56	8
Jamestown (protected sand)	+6'	150,220*	44,428	30,972	1,876
	+1.4'	11,536	68,244*	61,368	28,632
	+0'	25,910	24,216	50,412	51,644*

Table 16. Second year (1977-78) seasonal change in biomass by study area - tide height where significant biomass was measured. Asterisk indicates seasonal peak.

Study Area		Spring	Summer	Fall	Winter
Tongue Point (rock)	+6'	3466*	1619	446	374
	+3'	2985	3712	4807*	2280
	+0'	6506	8230	-	-
Morse Creek (cobble over sand)	+3'	653	1047	916	1088*
	+0'	3936*	3176	2216	-
Jamestown (protected sand)	+0'	302	252	1084*	20

reflect real population change may be another reason. The methodology used was designed to optimally describe the communities present, not necessarily to provide population information on component species useful for examining seasonal population change.

It is satisfying to note that the general composition or structure of the communities sampled remained stable at most areas sampled in terms of the dominant species and their general order of abundance. Community composition remained stable over the seasons sampled and between the first year and second, as discussed in the next section.

VI-C. Annual Changes

An essential goal of the second year program was to document changes from first year results. Observed changes may be due to real or extrinsic factors or may be the result of poor sampling design. Once changes are clearly determined to be due to extrinsic factors, speculation on what factor or factors produced the change becomes possible. One factor may be only the normal biological variation in an otherwise stable community, its biological noise. The community may not be stable. It may be undergoing slow directional change, because of its early successional stage or long-term changes in the physical environment. It may not be a stable community at all, representing just a single time frame of random change.

First year/second year comparisons of species richness, diversity, abundance, and biomass are presented in summary form for all sites in Table 17. Species richness and diversity showed very little year to year change especially in the richer intertidal sites. Figures 2 and 3 present graphically the relationship between richness/diversity and year one/year two percentage change in these parameters. The more complex the communities, the lower the year to year change in these parameters. Larger subtidal changes may be only a product of sampling error. Abundances also show surprisingly little change, generally much less than a factor of ten, and biomass changes are even less. An exception is North Beach -5m where much algae was collected the second year, probably a sampling problem caused by collecting larger cobble in the second year in this apparently heterogeneous area.

Table 18 presents a summary of the values for community similarity between the first and second year. These were mentioned in the Results. Community similarity in the intertidal from the first to second year was greatest at the rock, stable cobble, and protected soft bottom areas, all areas with rich, complex communities. This year to year constancy in overall community composition was an especially noteworthy result when one considers sampling problems due to organism patchiness and the irregular recruitment of some important individual component species. Figures 4 and 5 graphically present the relationship between sediment type, community complexity, and year to year community constancy. In general, species richness increases with increasing sediment particle size. The complex communities associated with rock/cobble and protected sediments show less year to year community change than the simpler exposed gravel and sand communities, with the exception of a few simple communities where taxonomic lumping may create artificially high community constancy.

Table 17. Comparison of first and second year summary community parameters. Asterisk: Pillar Point, North Beach Cobble, Twin Rivers comparison of spring 1976 with spring 1977; Tongue Point +0' spring-summer 1976 with spring-summer 1977; Morse Creek +0' spring-fall 1976 with spring-fall 1977.

Study Area	Stratum	Mean		Mean		Mean		Mean	
		Species Richness		Diversity	H'	Total Abundance	(#/m ²)	Total Biomass*	(g/m ²)
		'76-'77	'77-'78	'76-'77	'77-'78	'76-'77	'77-'78	'76-'77	'77-'78
Tongue Point	+6'	47.3	61.3	2.2	2.4	18,109	36,779	928	1,476
	+3'	103.3	118.3	2.6	3.0	28,371	48,516	2,575	3,446
	*+0'	150.3	177.5	2.5	2.3	4,474	19,375	5,262	7,368
	-5m	133	209	2.6	1.5	6,004	18,635	8,539	9,160
	-10m	59	94	2.1	3.0	604	834	778	2,988
Pillar Point	*+6'	26	42	0.9	1.9	27,282	11,620	640	480
	+3'	169	131	3.1	2.5	11,540	8,994	11,766	6,317
	+0'	123	124	1.8	2.0	729	15,642	7,548	11,375
	-5m	92	77	3.1	2.8	6,123	13,814	-	-
	-10m	91	86	3.3	3.3	4,715	4,426	-	-
North Beach Cobble	*+6'	12	16	1.5	2.0	283	2,148	-	78
	+3'	49	38	1.6	2.5	9,077	3,802	353	128
	+0'	122	125	3.5	3.2	5,512	6,724	908	1,862
Morse Creek	+6'	8.5	11.5	1.1	1.1	3,131	1,191	-	-
	+3'	56.8	67.3	1.8	2.2	21,388	20,666	791	926
	*+0'	101.8	103.7	2.6	2.3	12,794	15,218	1,683	3,109
	-5m	74		3.0		1,495		-	-
	-10m	149	127	2.8	2.7	8,863	11,654	-	-
Beckett Pt.	+6'	17.3	12.5	1.8	1.7	1,713	2,143	-	-
	+3'	40.0	45.3	2.0	2.2	4,716	16,678	-	-
	+0'	80.3	80.8	2.1	2.4	34,102	56,578	-	-
	-5m	101	83	2.9	2.8	15,522	13,416	-	-
	-10m	132	90	3.1	3.1	18,122	17,542	-	-
Dungeness Spit	+6'	4.0	1.0	1.0	0.2	60	86	-	-
	+3'	3.0	1.5	0.7	0.2	150	220	-	-
	+0'	3.3	2.8	0.8	0.3	97	196	-	-
	-5m	30	28	2.4	2.4	283	858	-	-
	-10m	90	136	3.0	3.8	3,828	6,764	-	-

Table 17. (Cont.)

Study Area	Stratum	Mean Species Richness		Mean Diversity H'		Mean Total Abundance (#/m ²)		Mean Total Biomass* (g/m ²)	
		'76-'77	'77-'78	'76-'77	'77-'78	'76-'77	'77-'78	'76-'77	'77-'78
Twin Rivers	*+6'	3	3	0.3	0.8	184	44	-	-
	+3'	5	4	0.6	0.6	332	692	-	-
	+0'	10	15	0.9	1.6	420	1,448	-	-
	-5m	139	28	3.5	1.7	5,282	8,852	-	-
	-10m	65	-	2.1	-	6,093	-	-	-
North Beach Sand	+6'	7.8	7.3	1.1	1.6	221	81	-	-
	+2'	10.8	10.5	0.7	0.5	3,521	3,287	-	-
	+0'	14.8	18.5	1.0	1.3	4,223	4,597	-	-
	-5m	163	201	3.6	1.4	9,303	14,103	390	12,021
	-10m	109	151	3.1	3.9	5,881	7,442	62	1,474
Kydaka Beach	+6'	3.3	3.5	0.8	0.8	175	66	-	-
	+3'	4.8	2.5	0.5	0.5	443	99	-	-
	+0'	6.3	4.8	1.5	0.9	42	112	-	-
	-5m	51	54	3.0	2.6	2,300	6,230	-	-
	-10m	53	96	2.9	2.8	4,568	17,410	-	-
Jamestown	+6'	6.8	7.5	0.1	0.2	22,319	56,874	-	-
	+1.4'	30.0	38.2	1.9	1.8	11,579	42,445	-	-
	+0'	64.0	60.3	2.2	2.3	56,076	38,046	-	-
	-5m	174	136	3.5	3.5	21,712	17,364	266	782
	-10m	144	156	3.2	3.8	20,747	12,864	106	76

* Blanks occur where community biomass for first, second or both years was low and uncertain due to the large numbers of <0.1 g. weights.

Table 18. Community similarity between year one and year two by study area - tide height. Similarity values range from 0.00, no similarity, to 1.00, total similarity. Blanks occur where two years of data were not obtained. Values for Pillar Point, North Beach Cobble, Twin Rivers are based on spring 1976 and spring 1977 only; Tongue Point +0' spring-summer 1976 and spring-summer 1977; Morse Creek +0' spring-fall 1976 with spring-fall 1977 only.

Study Area	Habitat Type	Tide Height				
		+6'	+3'	+0'	-5m	-10m
Tongue Point	rock	0.56	0.61	0.49	0.31	0.08
Pillar Point	rock intertidal; sand subtidal	0.80	0.67	0.36	0.57	0.54
North Beach Cobble	cobble over sand	0.17	0.47	0.33	-	-
Morse Creek	cobble over sand	0.79	0.68	0.52	-	0.61
Beckett Point	protected gravel-sand	0.76	0.37	0.56	0.58	0.65
II Dungeness Spit	exposed gravel-sand	0.24	0.83	0.21	0.30	0.34
Twin Rivers	exposed gravel-sand	0.79	0.09	0.12	0.21	-
North Beach Sand	semi-exposed sand intertidal; sand-gravel-cobble-subtidal	0.28	(+2') 0.96	0.79	0.08	0.42
Kydaka Beach	exposed sand	0.12	0.26	0.32	0.55	0.39
Jamestown	protected sand	1.00	(+1.4') 0.61	0.79	0.42	0.48

Generalizations in the subtidal are more of a problem because of the obvious inadequacy of the Van Veen grab sampling methodology. In sediment where the grab worked the best, year to year similarity was high. It is possible that most subtidal communities would show the community constancy found intertidally in rock and protected fine sediment areas if adequately sampled.

Comments on annual changes of dominant species in the various communities studied were made in the Results Section. In the exposed gravel and sand habitats populations changed greatly from year one to year two, i.e., community similarity was low. This might be only a sampling artifact due to the difficulty of sampling a sparse often aggregated fauna. However, great population oscillations may as likely be a real characteristic of these areas. In the habitats with more complex communities, some species populations changed greatly from year to year. However, the majority remained fairly stable from year one to year two.

In summary then, should one of the study sites be visited five or ten years from now, the same basic community should be found. Species composition, richness, and diversity should remain very similar, with perhaps slightly greater changes in overall abundance and biomass.

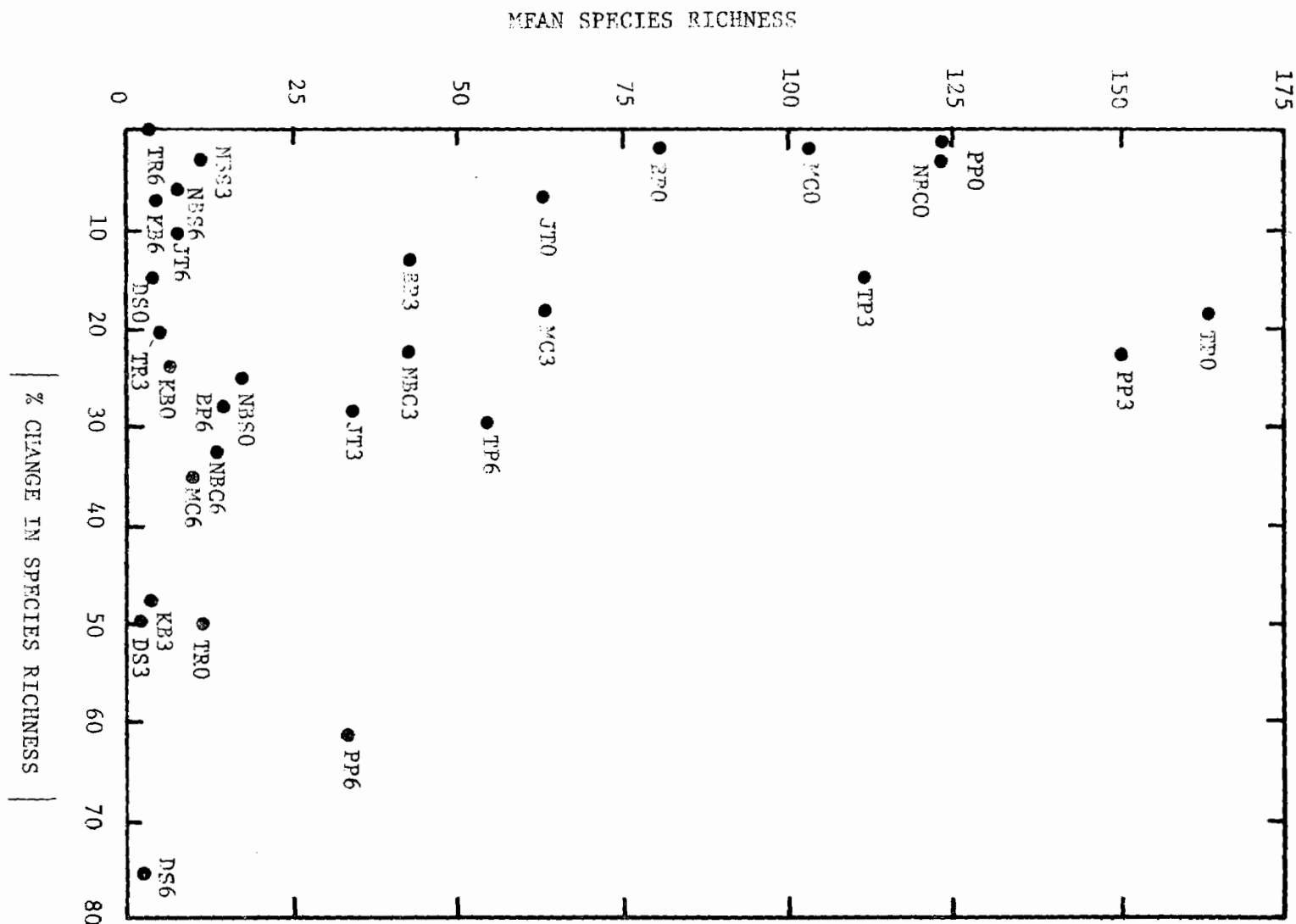


Figure 2. Intertidal species richness (mean of the first and second years) by study area - tide height compared with the percentage change in species richness between the first and second years. BP6 = Beckett Point +6', BP3 = Beckett Point +3', BPO = Beckett Point +0'; DS6, DS3, DS0 = Dungeness Spit +6', +3', +0'; JT6, JT3, JTO = Jamestown +6', +1.4', +0'; KB6, KB3, KB0 = Kydaka Beach +6', +3', +0'; MC6, MC3, MCO = Morse Creek +6', +3', +0'; NBC6, NBC3, NBC0 = North Beach Cobble +6', +3', +0'; NBS6, NBS3, NBS0 = North Beach Sand +6', +2', +0'; PP6, PP3, PP0 = Pillar Point +6', +3', +0'; TP6, TP3, TP0 = Tongue Point +6', +3', +0'; TR6, TR3, TR0 = Twin Rivers +6', +3', +0'.

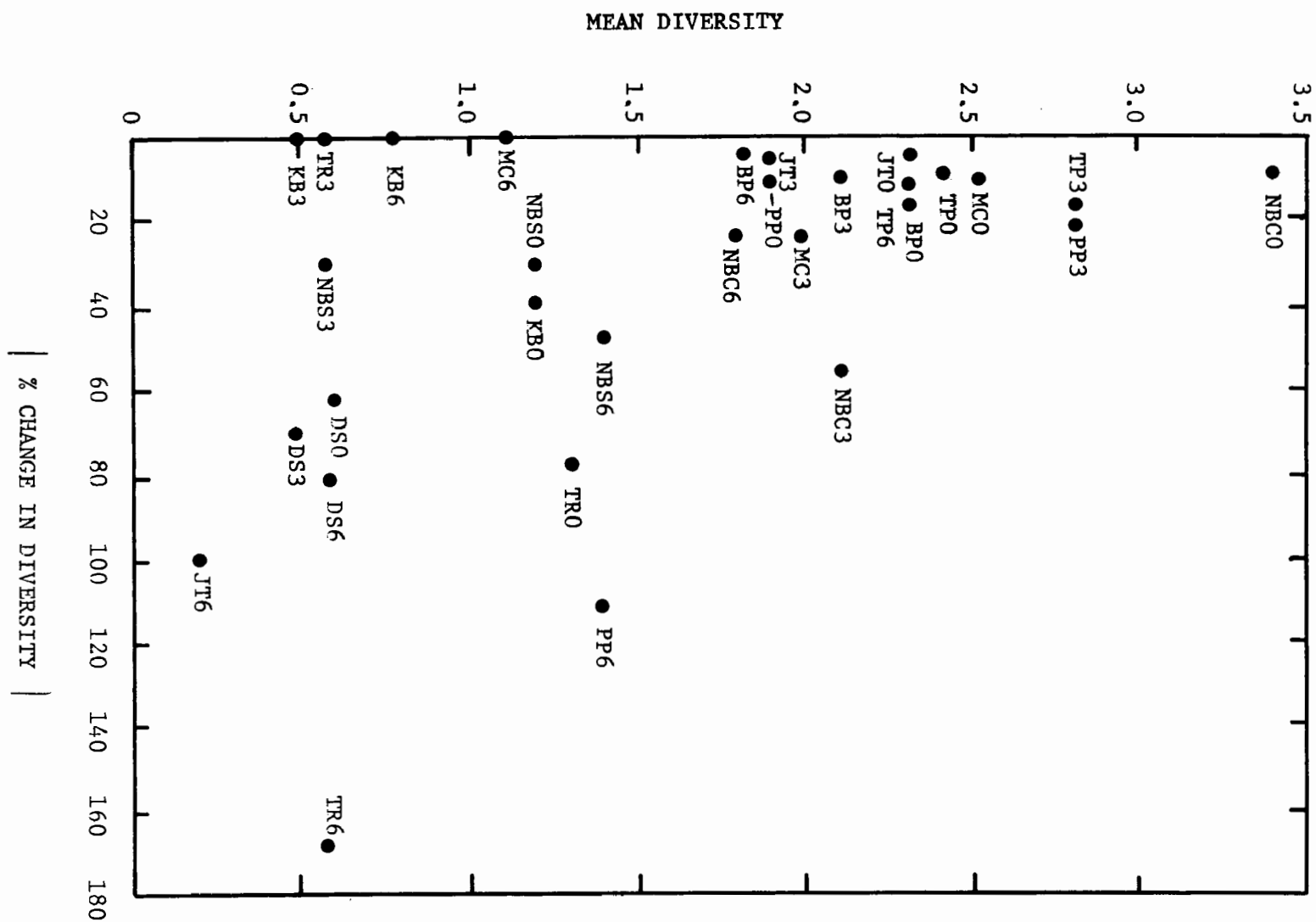


Figure 3. Intertidal diversity (mean of the first and second years) by study area - tide height compared with the percentage change in diversity between the first and second years. For study area abbreviations (e.g., BP6), see Figure 2.

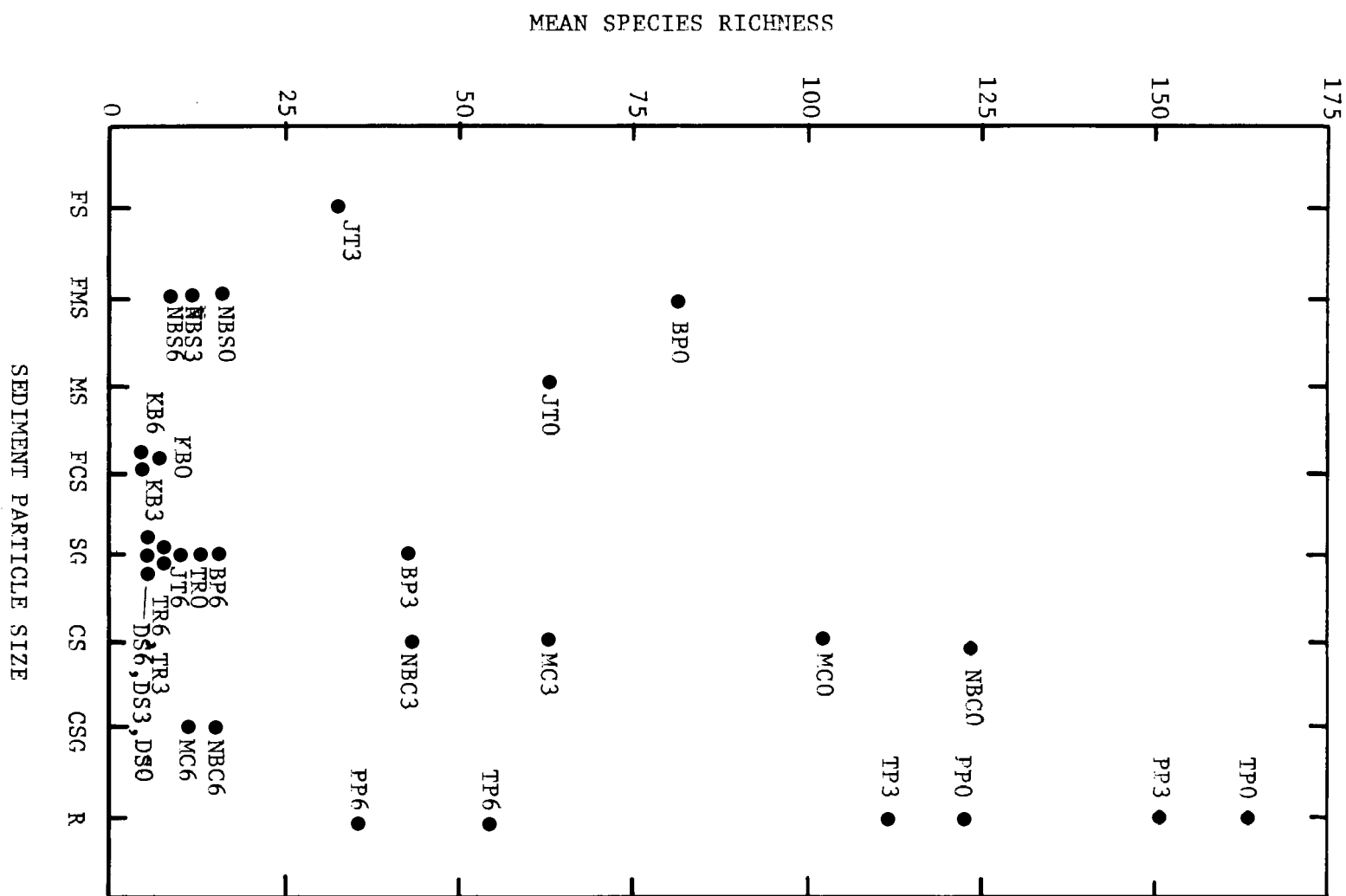


Figure 4. Intertidal species richness (mean of the first and second years) by study area-tide height compared with sediment particle size. For study area abbreviations (e.g., BP6), see Figure 2. FS = fine sand, FMS = fine-medium sand, MS = medium sand, FCS = fine-coarse sand, SG = sand and gravel, CS = cobble and sand, CSG = cobble, sand and gravel, R = rock.

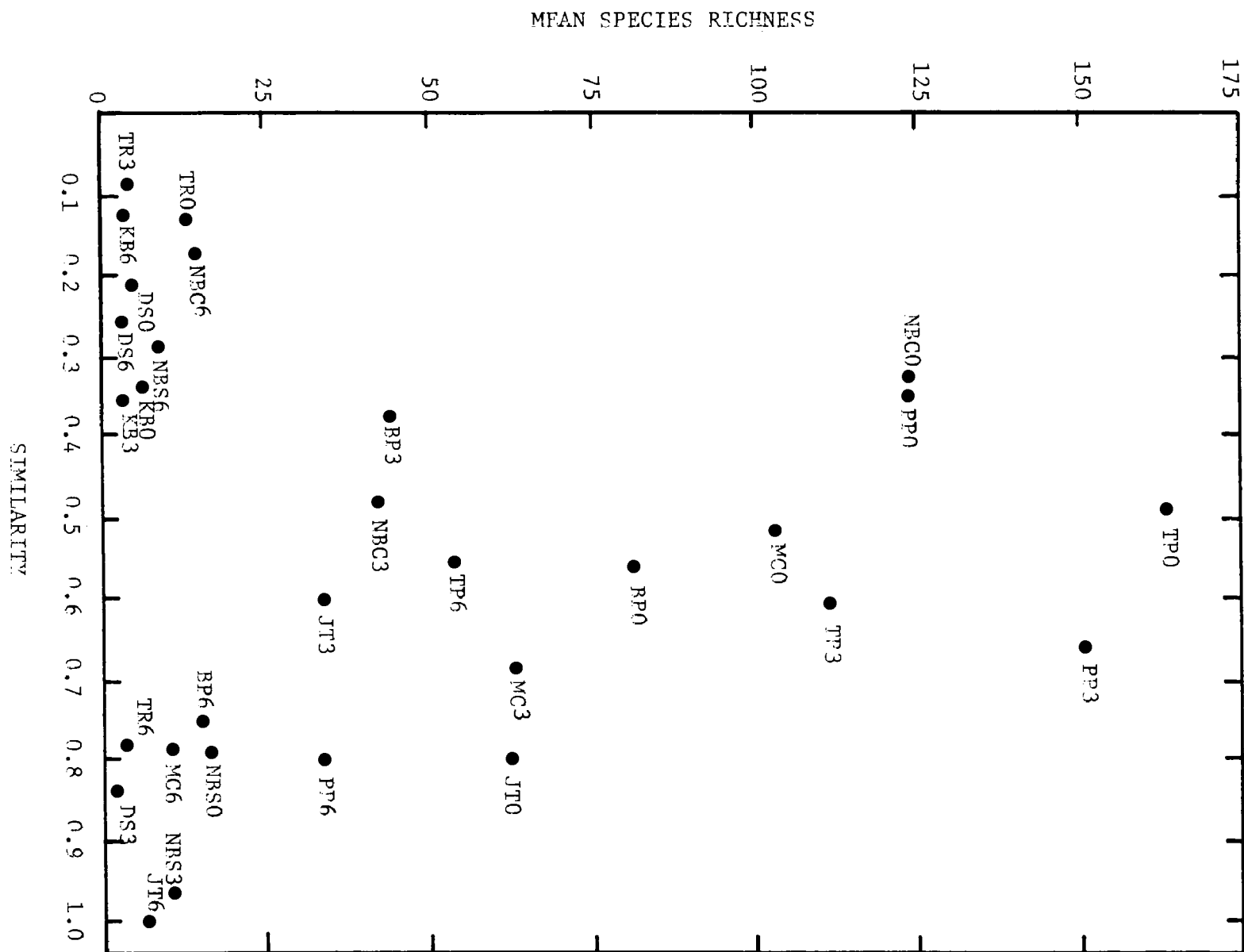


Figure 5. Intertidal species richness (mean of the first and second years) by study area - tide height compared with the similarity of communities between the first and second years. Values for similarities range from 0.0 (no similarity) to 1.0 (total similarity). For study area abbreviations (e.g., BP6), see Figure 2.

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APPENDIX I

COMPLETE DATA SETS

Table 1a. Tongue Point (rock) benthic organisms from the high (+A) intertidal zone collected spring 1977 through winter 1978, expressed as biomass (g) per 0.01 ($N=2$), and 0.2 ($N=4$) $m^2 \pm$ standard deviation.

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m^2 g $\pm$ SD	0.2 m^2 g $\pm$ SD	0.01 m^2 g $\pm$ SD	0.2 m^2 g $\pm$ SD	0.01 m^2 g $\pm$ SD	0.2 m^2 g $\pm$ SD	0.01 m^2 g $\pm$ SD	0.2 m^2 g $\pm$ SD
Chlorophyta								
Chaetomorpha	0.0	0	0	0	<0.1	0	0	0
sp.	+0.1							
Cladophoraceae	<0.1	0	0	0	0	0	0	0
app.								
Cladophora	<0.1	0	0	0	0	0	0	0
sp.								
Enteromorpha	<0.1	0	0	0	0	0	0	0
sp.								
Enteromorpha	<0.1	0	0	0	0	0	0	0
intestinalis								
Enteromorpha		0	0	0	0	0	<0.1	0
linza								
Monostroma	0	0	<0.1	0	0	0	<0.1	0
sp.								
Rhizoclonium	<0.1	0	<0.1	0	<0.1	0	<0.1	0
riparium								
Spongomorpha	<0.1	0	0	0	0	0	<0.1	0
coelata								
Spongomorpha	<0.1	0	0	0	0	0	<0.1	0
sp.								
Ulva	0.5	3.4	0.0	0.1	<0.1	0.1	0.0	0
sp.	+0.4	+5.0	+0.1	+0.2		+0.1	+0.0	
Ulvaria	0	0	<0.1	0	0	0	<0.1	0
sp.								
Bacillariophyta								
Pennales	<0.1	0	<0.1		0	0	0	0
sp.								
Phaeophyta								
Asteria	0.1	3.4	0		0	0	<0.1	0
sp.	+0.2	+6.8						

Tongue Point #6

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ² wt	0.2 m ² wt	0.01 m ² wt	0.2 m ² wt	0.01 m ² wt	0.2 m ² wt	0.01 m ² wt	0.2 m ² wt
<i>Anallipus japonicus</i>	0.4	0	0.2	0.1	0.0	0	0.0	0
<i>Costaria costata</i>	+1.3	0	+0.5	+0.1	+0.1	0	0.0	0
<i>Fucus distichus</i>	0	0	0	0	+0.1	0	0	0
<i>Laminariales</i>	0.1	0	0.3	6.7	0	1.5	0.6	0
app.	+0.6	0	+1.2	+7.4	0	+2.8	+1.0	0
<i>Petalonia fasciata</i>	0	0	0	0	0	0	0	0
<i>Pyralia</i>	0	0	0	0	0	0	0	0
app.	0	0	0	0	0	0	0	0
<i>Ralfsiaceae</i>	+0.1	0	0	0	0	0	0	0
app.	0	0	0	0	0	0	+0.1	0
<i>Ralfsia pacifica</i>	0	0	0	0	0	0	0	0
Rhodophyta								
<i>Acrochaetium</i>	+0.1	0	+0.1	0	0	0	0	0
app.	0	0	0	0	0	0	0	0
<i>Bonellia plumosa</i>	+0.1	0	0.0	0	0	0	0	0
<i>Callithamnion pilosum</i>	4.1	0	0.0	0	0	0	0.1	0
<i>Corallina vancouveriensis</i>	+8.0	0	+0.1	0	0	0	0	0
<i>Corallinaceae</i>	0	0	0.6	0	+0.1	0	0	0
app.	0	0	+2.0	0	0	0	0	0
<i>Cryptosiphonia woodii</i>	0.2	0	0.0	0	0	0	0	0
<i>Endocladia muricata</i>	+0.9	0	+0.1	0	0	0	0	0
	1.3	0	0.6	5.2	0.1	0	0.1	0
	+19.1	0	+0.7	+10.4	+0.2	0	+0.1	0

Tongue Point 44

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	g	wt	g	wt	g	wt	g	wt
Gigartimaceae	0	0	0.1	2.1	0.0	0	0	0
app.			+0.3	+4.3	+0.1			
Gigartina	3.6	43.2	2.0	19.3	1.1	4.7	0.1	0.4
papillata (compl)	+7.2	+39.2	+5.1	+26.2	+3.3	+6.6	+0.2	+0.4
Halosaccion	0.7	4.7	7.4	16.9	0.0	0.9	+0.1	0.1
glandiforme	+0.9	+4.2	+9.8	+42.9	+0.0	+0.8		+0.1
Hymenena	0.0	+0.1	+0.1	0	0	0	+0.1	0
sp.	0.1		*					
Hildebrandia	0	0		0	0	0	0	0
sp.								
Iridaea	0	0	1.1	0	0	0.6	0	0
cordata			+3.7			+0.8		
Iridaea	0	0	2.5	5.6	1.8	11.7	0	0
cornucopiae			+5.3	+11.1	+5.3	+13.8		
Iridaea	0	0	0.6	8.9	0.1	0.3	0	0.4
heterocarpa			+2.8	+14.8	0.5	0.5		0.6
Iridaea	0	3.5	1.2	0	0.0	0	0.0	0
sp.		+4.7	+3.9		+0.0		+0.0	
Macrophyllus	+0.1	0	0	0	0	0	0	0
conchatum								
Microcladia	1.1	0	0.0	0	+0.1	0	0	0
borealis	+1.8		+0.0					
Odonthalia	+0.1	0	0	0	0	0	0	0
floccosa								
Petroclia	0.1	0	*	0	*	0	*	0
middendorffii	+0.1							
Plocamium	+0.1	0	0	0	0	0	+0.1	0
tenax								
Polydipnomia	0.1	0	+0.1	0	+0.1	0	+0.1	0
hendryi	+0.1							
Polydipnomia	+0.1	0	0	0	0	0	0	0
pacificae								

Tongue Point #6

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Porphyra</i>		0		0		0		0		0		0		0.0		0.0
<i>pseudolancoleta</i>														+0.0		+0.0
<i>Porphyra</i>		0		0		0.2		0.2		0		0		0		0
<i>smithii</i>						+0.1		+1.3								
<i>Porphyra</i>		<0.1		<0.1				0		0		0		0		0
app.																
<i>Pteroeiphonia</i>		0.0		0		<0.1		0		0		0		0		0
<i>hipionata</i>		+0.1														
<i>Pteroeiphonia</i>		<0.1		0		0		0		0		0		0		0
<i>gardneri</i>																
Porifera																
<i>Halichondria</i>		0		✓		0		0		0		0		0		0
<i>panicea</i>																
Cnidaria																
<i>Anthozoa</i>																
<i>Anthozoa</i>		0.1	0.0	1.3	0.5	0		0		0.1	3.0	0		0		0
app.		±0.4	±0.0	±1.0	±0.9					±0.2	±0.0					
Platyhelminthes																
<i>Turbellaria</i>		0.5	<0.1	0.3	<0.1	3.4	<0.1	0.3	<0.1	9.1	0.0	0		2.5	<0.1	0
app.		±1.6		±0.5		±5.6		±0.3		±20.7	±0.1			±6.4		
Nemertea																
app.		0.9	<0.1	0		0.6	<0.1	0		0.1	<0.1	0		0.1	<0.1	0
		±2.1				±1.3				±0.3				±0.2		
<i>Epiectonema</i>		0.4	<0.1	0.3	0.1	0.2	<0.1	0		0.3	<0.1	0		0.2	<0.1	0
<i>gracile</i>		±0.6		±0.5		±0.4				±0.9				±0.4		
Nematoda																
app.		8.0	<0.1	0		0.1	<0.1	0		0.2	<0.1	0		0		0
		±19.1				±0.2				±0.1						

Tongue Point #6

	Spring '77			Summer '77			Fall '77			Winter '78		
	0.01 m ²		0.2 m ²	0.01 m ²		0.2 m ²	0.01 m ²		0.2 m ²	0.01 m ²		0.2 m ²
	#	wt		#	wt		#	wt		#	wt	
Mollusca												
Amphineura	4.1	0.1	0	1.0	0.0	0	0.4	0.1	0	0		0
app. (juv.)	+7.0	+0.1		+2.3	+0.1		+1.2					
Cyanolax	0.5	0.0	0	0		0	0.2	0.1	0.3	0.1	0	0
dentata	+1.1	+0.1					+0.5		+0.5	+0.1		
Mopalia	0		0	0.1	0.1	0	0		0	0		0
hindell				+0.2	+0.6							
Gastropoda												
Acmaeidae	0.9	0.0	0	0.5	0.1	0	0.2	0.0	0	0.1	0.1	0
app.	+2.0	+0.0		+1.2			+0.5	+0.1		+0.2		
Barleeia	1.4	0.1	0	0.1	0.1	0	0		0	0		0
heliophilis	+3.6			+0.2								
Cerithiopsis	0.1	0.1	0	0		0	0		0	0		0
sp.	+0.2											
Collisella	2.4	0.6	21.8	9.7	3.7	1.0	22.0	9.0	2.9	0.8	19.0	8.9
digitalis	+1.1	+0.9	+20.4	+9.1	+3.5	+1.1	+16.6	+8.1	+2.3	+0.8	+9.6	+5.2
Collisella	0.3	0.1	5.0	2.2	0.1	0.1	0.5	0.4	0		0	0
palta	+0.7	+0.2	+3.6	+2.6	+0.3	+0.2	+0.6	+0.5				
Collisella	1.3	0.4	0	2.1	0.3	4.5	1.0	1.8	0.2	2.3	0.7	0.7
strigatella	+1.9	+1.3		+2.1	+0.5	+4.7	+1.0	+4.4	+0.4	+2.6	+0.8	+2.0
Lacuna	0		0	0		0		0.1	0.1	0	0.2	0.1
variegata								+0.3			+0.5	
Littorina	0.1	0.0	0	0		0		0.1	0.1	0	0	0
scutellata	+0.2	+0.0						+0.2				
Littorina	5.2	0.1	0	26.5	0.5	0	7.5	0.1	0	9.9	0.0	0
siliqua	+9.6	+0.1		+34.2	+0.7		+7.2	+0.2		+9.1	+0.0	
Notosacma	0		0	0		0	0.2	0.0	0	0		0
femestrata							+0.7	+0.0				
Notosacma	0.1	0.0	0	0		0	0.1	0.0	0.8	0.2	0	0
peruviana	+0.2	+0.1					+0.2	+0.1	+1.0	+0.3		
Ochidella	1.1	0.1	0	1.0	0.0	0	0.9	0.0	0.1	0.1	0	0
borealis	+2.0			+2.4	+0.1		+2.7	+0.0	+0.2			

Tongue Point 49

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Siphonaria</i>	4.4	0.5	0.8	0.1	6.1	0.2	0		0.7	0.0	0		0		0	
<i>theresites</i>	+7.9	±1.2	±1.0	+0.2	±14.6	±0.4	0		+1.4	+0.1						
<i>Thais</i>	0.2	+0.1	0		0		0		0.2	0.1	1.8	0.7	0		0	
<i>canaliculata</i>	±0.5								+0.4	+0.3	+1.3	+0.5				
<i>Thais</i>	0.2	0.0	0.8	0.2	0.2	0.0	0.5	0.5	0		0		0		0	
<i>emarginata</i>	±0.7	+0.1	±1.0	+0.2	+0.5	+0.0	0.6	+0.6								
<i>Bivalvia</i>																
<i>larrea</i>	8.1	+0.1	0		0		0		0		0		0		0	
<i>cinula</i>	+19.5															
<i>Musculus</i>	687.7	2.3	0		20.4	0.1	0		3.2	0.0	0		0.1	+0.1	0	
<i>pygmaeus</i>	+1311.4	+4.3			+47.0	±0.1			+9.5	+0.1			+0.3			
<i>Mytilus</i>	0		0.6	2.2	0		0		0		0		0		0	
<i>californianus</i>			+1.5	+4.3												
<i>Mytilus</i>	0		0		0.2	0.1	0.5	0.4	0.2	0.0	0		0		0	
<i>edulis</i>					+0.7	±0.2	+1.0	+0.8	+0.5	+0.1						
<i>Mytilus</i>	1.0	0.1	0		0.4	+0.1	0		0		0		0.2	+0.1	0	
app. (juv.)	±5.6	+0.1			±1.1								+0.4			
Annelida																
<i>Oligochaeta</i>	5.8	+0.1	0		1.2	+0.1	0		0.2	+0.1	0		0		0	
sup.	+9.9				+3.6				+0.5							
Polychaeta																
<i>Nereidae</i>																
<i>Nereis</i>	0		0		0.1	+0.1	0		0.1	+0.1	0		0		0	
sp.					+0.2				+0.2							
<i>Sabellidae</i>	0.1	+0.1	0		0		0		0		0		0		0	
app.	+0.2															
<i>Sigalionidae</i>	0.1	+0.1	0		0		0		0		0		0		0	
app.	+0.2															
<i>Syllidae</i>																
<i>Syllis</i>	2.2	+0.1	0		0.3	+0.1	0		1.4	+0.1	0		0		0	
app.	+4.8				+0.7				+5.8							

Tongue Point #6

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.02 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Syllis	0.4	<0.1	0		1.1	<0.1	0		0.4	<0.1	0		0		0	
adenantes	±0.9				±1.9				±1.4							
Crustacea																
Ostracoda	0.2	<0.1	0		0		0		0		0		0		0	
app.	±0.5															
Cirripedia																
Balanus	2.1	1.0	7.8	14.1	22.7	6.3	40.8	110.3	30.8	1.8	8.0	18.8	3.5	0.1	9.0	26.5
carcinus	±4.5	±2.1	±5.8	±13.7	±66.2	±13.8	±71.0	±195.0	±36.4	±2.4	±14.7	±36.7	±4.9	±0.6	±16.1	±51.0
Balanus	1.1	0.1	0		6.0	0.5	0.5	0.8	11.5	0.5	2.0	0.8	22.1	0.9	1.8	1.2
glandula	±1.9	±0.1			±19.8	±1.4	±1.5	±1.7	±8.6	±0.5	±2.5	±1.0	±15.3	±1.2	±3.5	±2.5
Balanus	0		0		116.3	0.4	0		3.9	<0.1	0		0		0	
app. (juv.)					±77.8	±0.5			±6.2							
Chthamalus	39.8	0.7	0		43.1	0.7	0		22.7	0.5	0		36.1	0.1	0	
delit	±53.6	±1.0			±37.4	±0.7			±18.7	±0.5			±25.8	±0.6		
Cirripedia	26.6	<0.1	1.3	<0.1	22.9	<0.1	0		0		0		29.2	<0.1	0	
app. (juv.)	±52.0		±2.5		±39.5								±35.9			
Pollicipes	0.1	<0.1	0		0		0		0.1	0.1	0		0		0	
Polydora	±0.2								±0.2	±0.3						
Tanaidacea																
Anatommis	1.3	<0.1	0		0		0		0.9	<0.1	0		0		0	
normani	±2.5								±2.1							
Panulirus	20.9	<0.1	0		4.2	<0.1	0		5.1	0.0	0		2.5	<0.1	0	
californiensis	±11.1				±7.1				±8.5	±0.0			±2.7			
Isopoda																
Dynamenella	36.8	0.1	0		6.7	<0.1	0		35.9	0.4	0		19.9	<0.1	0	
chaereri	±41.6	±0.1			±9.6				±40.0	±0.7			±11.4			
Idotea	0		0		0		0		0		0		0.1	0.1	0	
app. (juv.)													±0.2			
Ligia	0		0.3	0.1	0		0		0		0		0		0	
pulex			±0.5	±0.7												
Parma	0.2	<0.1	0		0		0		0		0		0		0	
chromatophala	±0.5															

Tongue Point #6

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Mollusca																
<i>sp.</i>	0.1	<0.1	0		0		0		0		0		0		0	
+0.2																
Amphipoda																
<i>Ampithoe</i>	-		-		0.1	<0.1	0		-		-		-		-	
<i>similans</i>					+0.2											
<i>Hyale</i>	-		-		1.4	<0.1	0.8	<0.1	-		-		-		-	
<i>auceps</i>					+2.7		+1.5									
<i>Hyale</i>	-		-		0.8	<0.1	0		-		-		-		-	
<i>grandicornis</i>																
<i>californica</i>					+1.6											
<i>Hyale</i>	-		-		0.1	<0.1	0		-		-		-		-	
<i>sp.</i>					+0.5											
<i>Oligochinus</i>	-		-		0.9	<0.1	0.5	<0.1	-		-		-		-	
<i>lighti</i>					+2.0		+1.0									
Cammaridea	3.2	0.1	7.3	0.2	-		-		3.7	0.1	4.0	0.0	0.4	<0.1	0	
<i>sp.</i>	+4.3	+0.1	+10.9	+0.1					+5.1	+0.1	+7.4	+0.1	+0.8			
Insecta																
<i>Chironomidae</i>	0		0		0		0		0.3	<0.1	0		0		0	
									+0.9							
<i>Coleoptera</i>	0.4	0.1	0		0		0		0.1	<0.1	0		0		0	
	+1.3								+0.5							
<i>Diptera</i>	3.5	<0.1	0		3.3	<0.1	0		2.3	<0.1	0		1.5	<0.1	0	
<i>larvae</i>	+7.2				+1.0				+1.6				+2.5			
<i>Ephyridae</i>	0		0		0		0		0.9	<0.1	0		0		0	
									+2.2							
Echinoderms																
<i>Nelethoridea</i>																
<i>Cucumaria</i>	0		0		0.1	<0.1	0		0		0		0		0	
<i>pseudocurata</i>					+0.5											

Tongue Point 66

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	#	wt	#	wt	#	wt	#	wt
Species Richness	79		66		56		44	
Diversity - H'	1.90		2.79		2.75		2.54	
Total Number	21,853.9		7,450.0		3,720.0		1,305.0	
Total Biomass	864.5		404.8		111.4		93.6	

Table 1b. Tongue Point (rock) benthic organisms from the mid (+3') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.01 (N=20) and 0.2 (N=4) m² ± standard deviation.

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ² # wt	0.2 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.01 m ² # wt	0.2 m ² # wt
Chlorophyta								
Nitzschia	0	0	0	0	0	0	<0.1	0
sp.								
Chaetomorpha	0	0	0	0	<0.1	0	0	0
sp.								
Cladophora	0	0	<0.1	0	0	0	<0.1	0
sp.								
Cladophoraceae	<0.1	0	<0.1	0	0	0	0	0
sp.								
Enteromorpha	0	0	<0.1	0	0	0	0	0
intestinalis								
Enteromorpha	0	0	<0.1	0	0	0	0	0
linza								
Enteromorpha	<0.1	0	0	0	0	0	0	0
sp.								
Monostroma	0	0	0	0	<0.1	0	0	0
fascium								
Monostroma	0.0	0	0	0	0	0	0	0
sp.	±0.0							
Rhizoclonium	<0.1	0	<0.1	0	<0.1	0	<0.1	0
riparium								
Rhizoclonium	<0.1	0	0	0	0	0	0	0
sp.								
Spongomorpha	0.4	0	1.1	3.8	0.0	0	0	0
coelita	±1.4		±3.5	±7.7	<0.1			
Spongomorpha	0	0	<0.1	0	0	0	0	0
spinocens								
Spongomorpha	0.8	0	<0.1	0	<0.1	0	0	0
sp.	±3.1							
Ulva	1.3	0	0.1	0.3	0.2	0.3	<0.1	0
sp.	±3.3		±0.2	±0.5	±0.8	±0.5		
Ulvaria	0	0	<0.1	0	<0.1	0	<0.1	0
sp.								

Tongue Point #3

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
Urospora sp.	0	0	<0.1	0	0	0	0	0
Bacillariophyta								
Pennales sp.	<0.1	0	*	0	0	0	0	0
Phaeophyta								
Alaria sp.	23.9 +65.2	234.7 +179.6	18.2 +53.3	179.9 +159.8	6.1 +25.4	241.6 +362.7	6.2 +21.4	123.5 +109.0
Analipus japonica	0.1 +0.2	0	<0.1	0	0	0	0	0
Dennarestia sp.	<0.1	0	0	0	0	0	0	0
Ectocarpaceae sp.	<0.1	0	0	0	0	0	<0.1	0
Ectocarpus sp.	0	0	0	0	0	<0.1	0	0
Fucus distichus	0	0	0	0	<0.1	0.1 +0.2	0.0 +0.0	2.7 +2.7
Herophyllum sensile	0	15.2 +28.8	0	0	2.5 +6.8	49.6 +88.5	0	0
Laminaria groenlandica	0.4 +1.7	0	0	0	0	0	0	0
Laminariales sp.	0.0 +0.0	0	0.5 +1.9	0	0.1 +0.2	0.1 +0.2	0.0 +0.0	0
Leathesia difformis	<0.1	0	0	0	0	0	0	0
Petaloneta fascia	0.0 +0.0	0	0	0	0	0	<0.1	0
Phaeostrophon irregulare	<0.1	0	0	0	0	0	0	0

Tongue Point #3

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	#	wt	#	wt	#	wt	#	wt
<i>Ralfsia</i>	0	0	0	0	0	0	0	0
sp.								
<i>Ralfsiaceae</i>	0	0	0	0	0	0	0	0
sp.								
Rhodophyta								
<i>Acrochaetium</i>	<0.1	0	<0.1	0	<0.1	0	0	0
sp.								
<i>Antithamnion</i>	<0.1	0	<0.1	0	0	0	0	0
defectum								
<i>Antithamnion</i>	<0.1	0	0	0	0	0	0	0
kylinii								
<i>Antithamnionella</i>	<0.1	0	0	0	0	0	0	0
pacifica var. pacifica								
<i>Bosziella</i>	1.4	0	1.2	0	2.2	0	0.9	0
plumosa	+1.2		+1.4		+2.2		+1.7	
<i>Callithamnion</i>	0.1	0	1.0	0	1.0	0	<0.1	0
pilaeum	+0.1		+1.1		+5.5			
<i>Callithamnion/</i>	0.0	0	<0.1	0	<0.1	0	<0.1	0
<i>Pleuroseporium</i>	+0.1							
<i>Ceramium</i>	0	0	0	0	<0.1	0	<0.1	0
californicum								
<i>Ceramium</i>	0	0	0	0	0	0	<0.1	0
washingtonense								
<i>Ceramium</i>	0	0	0	0	<0.1	0	0	0
sp.								
<i>Corallina</i>	9.7	0	10.5	0	10.6	0	2.5	0
vancouveriensis	+8.7		+9.8		+9.3		+6.4	
<i>Corallinaceae</i>	0	0	<0.1	0	0	0	0.1	0
sp.								
<i>Cryptosiphonia</i>	<0.1	0	0.9	0	<0.1	0	0.0	0
woodii			+2.7				+0.1	

Tongue Point #1

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	#	wt	#	wt	#	wt	#	wt
Delesseriaceae	<0.1	0	<0.1	0	0	0	0	0
sp.								
Endocladia	<0.1	0	<0.1	0	<0.1	0	0.0	0
muricata								
Gigartina	0.1	0.1	0.2	0.5	0.2	2.3	2.0	0.2
papillata complex	±0.4	±0.1	±0.6	±0.5	±1.1	±1.0	±4.8	±1.1
Gracilaria	<0.1	0	0	0	0	0	0	0
skottbergii								
Halosaccus	0.6	1.2	2.6	11.0	6.4	193.9	3.3	45.5
glandiforme	±0.7	±1.2	±4.5	±16.1	±8.1	±82.4	±5.1	±34.4
Hymenocys	0.8	0.1	1.6	0	0.5	1.1	±0.1	0.1
sp.	±1.2	±0.3	±2.5		±0.8	±2.1		±1.0
Iridaea	0	1.0	0	0	0.2	0.1	0	0
cordata		±2.0			±0.4	±0.2		
Iridaea	0	0	0	0	0.0	0	0	0
heterocarpa					±0.1			
Iridaea	0.1	0.5	0.2	0	0.0	0	±0.1	0
sp.	±0.2	±1.0	±0.7		±0.1			
Macophyllum	✓	0	0	0	✓	0	✓	0
conchatum								
Microcladia	0.3	0	6.2	0	0.4	0	0.0	0
borealis	±0.4		±12.2		±0.7		±0.1	
Odonthalia	<0.1	0	<0.1	0	0	0	<0.1	0
floccosa								
Petrocelia	✓	0	✓	0	✓	0	✓	0
widendorffii								
Plocamium	0	0	0	0	<0.1	0	0	0
coccineum								
Plocamium	<0.1	0	0.1	0	0.1	0	0.2	0
tenue			±0.3		±0.5		±0.7	
Polydipnomia	0.2	0	0.0	0	0.1	0	±0.1	0
hendryi	±0.5		±0.0		±0.2			

Tongue Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Polysiphonia</i>																
<i>pacifica</i>																
<i>Porephyra</i>																
sp.																
<i>Prionitis</i>																
sp.																
<i>Pterosiphonia</i>																
<i>bipinnata</i>																
<i>Pordera</i>																
sp.																
<i>Halichondria</i>																
<i>paniculata</i>																
<i>Halidoma</i>																
<i>peruviana</i>																
<i>Cnidaria</i>																
<i>Anthosoa</i>																
sp.																
<i>Anthopleura</i>																
<i>elegantissima</i>																
<i>Tentacle</i>																
sp.																
<i>Hydrozoa</i>																
sp.																
<i>Platyhelminthes</i>																
<i>Turbellaria</i>																
app.																
<i>Bryozoa</i>																
app.																

Tongue Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Nemertode																
<i>sp.</i>	14.6	<0.1	0		37.2	<0.1	0		13.0	<0.1	0		2.7	<0.1	0	
	+12.6				+50.2				+13.1				+4.6			
Mollusca																
<i>Amphioneura</i>																
<i>sp. (juv.)</i>	0.2	<0.1	0		1.3	0.0	0		0.8	0.0	0		0.2	<0.1	0	
<i>Cyanoplax</i>	0.3	0.0	0		0.5	0.0	0.8	0.1	1.6	0.1	0.3	<0.1	0.5	0.0	0.8	0.1
<i>denticata</i>	+0.7	+0.1			+0.8	+0.1	+1.5	+0.2	+3.8	+0.1	+0.5		+1.1	+0.1	+1.0	+0.1
<i>Katharina</i>	0.2	0.0	1.8	4.8	0.4	<0.1	1.3	1.3	1.3	0.6	2.0	14.5	0.2	0.1	1.0	1.7
<i>tunicata</i>	+0.4	+0.0	+3.5	+9.7	+0.8		+1.5	+1.7	+3.8	+1.2	+2.2	+21.5	+0.5	+0.1	+0.8	+1.8
<i>Nopalis</i>	0		0		0.1	<0.1	0		0.1	<0.1	0		0		0	
<i>sp.</i>					+0.1				+0.2							
<i>Tonicella</i>	0		0		0.1	<0.1	0		0		0		0		0	
<i>linnata</i>					+0.1											
Gastropoda																
<i>Acmaeidae</i>	1.7	<0.1	0		3.0	<0.1	0		0.4	<0.1	0.3	<0.1	1.6	<0.1	0	
<i>sp. (juv.)</i>	+2.9				+4.8				+1.6		+0.5		+3.1			
<i>Barleeia</i>	15.0	<0.1	0		0		0		42.5	0.0	0		41.6	0.0	0	
<i>halictiphila</i>	+23.4								+45.1	+0.1			+73.8	+0.0		
<i>Bittium</i>	0.1	<0.1	0		12.6	<0.1	0		0		0		0		0	
<i>neochrichtii</i>	+0.2				+10.3											
<i>Cerithiopsis</i>	4.1	<0.1	0		2.0	0.0	0		1.3	<0.1	0		0.3	<0.1	0	
<i>sp.</i>	+5.5				+5.0	+0.0			+1.8				+0.7			
<i>Collisella</i>	0		0		0		0		0		0		0.3	<0.1	2.0	0.3
<i>digitalis</i>													+0.9		+4.0	+0.5
<i>Collisella</i>	2.3	1.0	0.5	0.3	0.1	0.1	0.1	0.6	0.2	<0.1	2.5	1.7	0.4	0.3	1.0	1.1
<i>pelta</i>	+5.7	+3.6	+1.0	+0.7	+0.1	+0.3	+0.5	+1.1	+0.7		+4.4	+2.2	+0.8	+0.8	+2.0	+2.2
<i>Collisella</i>	0.7	0.1	0		0.1	0.0	0		0.9	0.1	0.3	0.0	1.2	0.1	0	
<i>strigatella</i>	+1.2	+0.1			+0.6	+0.0			+1.8	+0.3	+0.5	+0.1	+2.0	+0.2		
<i>Crepidula</i>	0		0		0.2	<0.1	0		0.1	<0.1	0		0		0	
<i>sp.</i>					+0.5				+0.1							

Tongue Point #1

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	#	wt	#	wt	#	wt	#	wt
Cylichna	0		0		0		0	
sp.								
Homalopoma	0.1	<0.1	0		0		0	
baculum	±0.2		1.7	0.1	0		0	
Lacuna	1.0	<0.1	0		0		0	
variegata	±3.8		0.7	<0.1	1.8	<0.1	1.5	<0.1
Littoraria	0		0		0		0	
succincta			0		0.5	<0.1	0.2	<0.1
Littorina	0.3	<0.1	0		0		0.3	<0.1
altiana	±0.6		0.4	<0.1	0.5	<0.1	0.9	<0.1
Littorina	0		0		0		0.1	<0.1
scutellata			0		0		0.2	<0.1
Margaritana	0		0		0		0.2	<0.1
pupilla			0		0		0.2	<0.1
Notocma	0		0		0.2	0.0	0.2	<0.1
ferretrata			0		0.7	±0.1	0.2	<0.1
Notocma	0		0		0.1	<0.1	0	
persana			0		0.2		0.2	<0.1
Notocma	0		0.1	0.0	0		0.7	0.0
oculata			0.5	±0.1	0		1.2	±0.1
Oncidella	0		0		3.7	1.9	2.2	<0.1
borialis			0		5.8	±4.7	3.8	<0.1
Saxidomus	0		4.3	0.1	0		0	
dora			6.3	±0.2	0		0	
Siphonaria	0		0		0.2	<0.1	0	
cheriton			0		0.9		0	
Thais	0		0		0		0.3	0.1
canaliculata			0		0		0.7	±0.4
Thais	0		0.1	0.0	2.0	1.0	0	
emarginata			0.2	±0.1	2.2	±1.1	0.2	<0.1
Thais	0		0.4	0.0	0		0.2	<0.1
sp. (juv.)			0.7	±0.0	0.2		0.5	

Tongue Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Tricolia</i>	0		0		0		0		0.1	-0.1	0		0.1	-0.1	0	
<i>sp.</i>									+0.2				+0.2			
<i>Bivalvia</i>																
<i>Adula</i>	0		0		0.2	<0.1	0		0.1	-0.1	0		0		0	
<i>californiensis</i>					+0.5				+0.2							
<i>Strella</i>	0		0		0.5	0.0	0		0.1	-0.1	0		0		0	
<i>arctica</i>					+0.8	+0.0			+0.6							
<i>Lanana</i>	0.6	<0.1	0		0		0		0.1	-0.1	0		0.2	<0.1	0	
<i>cistula</i>	+1.2								+0.2				+0.5			
<i>Modiolus</i>	0		0		0.8	<0.1	0		0.1	-0.1	0		0		0.3	0.3
<i>rectus</i>					+2.0				+0.2						+0.5	+0.5
<i>Musculus</i>	18.1	<0.1	0		483.8	1.6	0		30.0	0.1	0		10.8	0.0	0	
<i>pygmaeus</i>	+22.2				+94.5	+3.0			+25.1	+0.2			+18.3	+0.1		
<i>Mytilus</i>	0		0		0		0		0.1	1.0	0.5	8.2	0.1	0.2	0	
<i>californianus</i>									+0.3	+4.0	+0.6	+14.8	+0.2	+0.7		
<i>Mytilus</i>	0.3	<0.1	0.3	0.6	0		3.0	1.2	1.5	0.2	0.3	0.2	0		0.5	0.2
<i>edulis</i>	+1.1		+0.5	+1.2			+6.0	+2.3	+2.8	+0.1	+0.5	+0.4			+0.6	+0.2
<i>Mytilus</i>	2.4	0.0	0		7.9	0.1	0		0.4	-0.1	0		0.7	0.0	0	
<i>sp. (juv.)</i>	+2.3	+0.1			+8.5	+0.1			+0.8				+1.0	+0.0		
<i>Transennella</i>	0.1	<0.1	0		0		0		0.5	-0.1	0		0.1	-0.1	0	
<i>tenuis</i>	+0.2								+0.8				+0.2			
<i>Annelida</i>																
<i>Oligochaeta</i>	14.8	<0.1	0		63.1	<0.1	0		22.0	<0.1	0		5.9	<0.1	0	
<i>sp.</i>	+14.8				+86.5				+24.0				+8.5			
<i>Polychaeta</i>																
<i>Arvicolidae</i>																
<i>Branchiomaldane</i>	0.1	-0.1	0		0		0		0		0		0		0	
<i>vincens</i>	+0.2															
<i>Capitellidae</i>																
<i>Capitella</i>	0		0		0.2	<0.1	0		0		0		0		0	
<i>capitata</i>					+0.5											

Tongue Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.02 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Chrysopetalidae																
Palaemonetes	0		0		0.1	<0.1	0		0		0		0		0	
bellis					<0.3											
Cirratiidae																
sp.	0.1	<0.1	0		0.1	<0.1	0		0.3	<0.1	0		0		0	
	<0.2				<0.2				<0.6							
Cirratus	0		0		0.1	<0.1	0		0		0		0		0	
cirratus					<0.2											
Lumbrineridae																
Lumbrineris	0.1	<0.1	0		0.1	<0.1	0		0.1	<0.1	0		0		0	
inflata	<0.2				<0.3				<0.5							
Nereidae																
sp.	0.2	<0.1	0		1.5	<0.1	0		0.8	<0.1	0		0.2	<0.1	0	
	<0.7				<4.0				<1.2				<0.4			
Nereis	0		0		0.1		0		0.1		0		0		0	
venillosa					<0.2				<0.3							
Nereis	0.1		0		0.1	<0.1	0		0.8	<0.1	0		0		0	
sp.	<0.3				<0.2				<1.7							
Platynereis	0		0		2.2	<0.1	0		0		0		0		0	
bicanaliculata					<4.4											
Onuphiidae																
Onuphis	0		0		0		0		0.1	<0.1	0		0		0	
stimulus									<0.1							
Onuphis	0		0		0		0		0.8	<0.1	0		0.1	<0.1	0	
sp. (juv.)									<2.5				<0.2			
Corbinidae																
Reinertus	0		0		0		0		0.2	<0.1	0		0		0	
sp.									<0.5							
Proteomicella	0.1	<0.1	0		0		0		0		0		0		0	
o. igobrancheia	<0.2															
Phyllodoceidae																
Phyllis	0		0		0.1	<0.1	0		0.1	<0.1	0		0		0	
quadriculata					<0.3				<0.2							

Tongue Point #1

	Spring '77		Summer '77		Fall '77		Winter '78	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	#	wt	#	wt	#	wt	#	wt
<i>Eulalia</i>	0.1	<0.1	0	0	0	0	0	0
<i>sanguinea</i>	±0.2							
<i>Eulalia</i>	0		0.2	<0.1	0	0	0	0
sp.			±0.5					
<i>Sabellidae</i>								
sp.	0		0.5	<0.1	0	2.3	<0.1	0
			±1.1			±6.6		
<i>Fabricia</i>	0.1	<0.1	0	4.2	<0.1	0	0.2	<0.1
<i>oregonica</i>	±0.7			±7.9		±1.9		±0.4
<i>Oriopsis</i>	0		0	1.7	<0.1	0	0	
<i>minuta</i>				±2.6				
<i>Schisobranchia</i>	0		0	0.2	<0.1	0	0.1	<0.1
<i>trispina</i>				±0.5		±0.2		
<i>Serpulidae</i>								
<i>Spirorbis</i>	0		0	0	0	0	0.1	<0.1
sp.							±0.2	
<i>Sigalionidae</i>								
<i>Pholoe</i>	2.6	<0.1	0	3.5	<0.1	0	3.4	<0.1
<i>minuta</i>	±3.3			±5.4		±6.7		±1.4
<i>Sponidae</i>								
<i>Polydora</i>	0		0	0	0	0.2	<0.1	0
<i>columbiana</i>						±0.5		±0.7
<i>Polydora</i>	0		0	0	0	0.2	<0.1	0
sp.						±0.5		±0.2
<i>Syllidae</i>								
<i>Enoplos</i>	0		0	0.1	<0.1	0	0.7	<0.1
<i>gemmifera</i>				±0.2		±0.7		
<i>Enoplos</i>	0.1	<0.1	0	0	0	0.2	<0.1	0
<i>louriei</i>	±0.2					±0.5		
<i>Sphaerocoryllis</i>	0.1	<0.1	0	0.2	<0.1	0	0	
<i>pirifera</i>	±0.5			±0.5				

Yonaguni Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Syllis</i>	0.1	<0.1	0		0		0		0		0		0.1	<0.1	0	
<i>adamantes</i>	±0.3												±0.3			
<i>Syllis</i>	30.8	<0.1	0		23.5	✓	0		68.0	<0.1	0		14.8	<0.1	0	
sp.	±26.3				±18.3				±70.9				±23.9			
<i>Terebellidae</i>																
sp.	0.3	<0.1	0		0.1	<0.1	0		0.1	<0.1	0		0.1	<0.1	0	
	±0.6				±0.2				±0.3				±0.2			
<i>Asphittire</i>	0		0		0.6	✓	0		0		0		0		0	
<i>cirrata</i>					±1.7											
<i>Nicola</i>	0		0		0.3	<0.1	0		0		0		0		0	
<i>zostericola</i>					±0.6											
<i>Sipuncula</i>																
<i>Phanocolodon</i>	0		0		0.1	<0.1	0		0		0		0		0	
<i>agassizii</i>					±0.2											
<i>Pycnogonida</i>																
<i>Halosoma</i>	0.3	<0.1	0		1.1	<0.1	0		1.1	<0.1	0		0.2	<0.1	0	
<i>compactum</i>	±0.4				±1.5				±2.1				±0.5			
<i>Halosoma</i>	0.2	<0.1	0		0.1	<0.1	0		1.0	<0.1	0		0		0	
<i>viridimaculata</i>																
<i>testinale</i>	±0.7				±0.2				±3.6							
<i>Halosoma</i>	0		0		0		0		0		0		0.1	<0.1		
sp.													±0.2			
<i>Phonichilidium</i>	0.1	<0.1	0		0		0		0		0		0		0	
<i>femoratum</i>	±0.5															
<i>Pycnogonum</i>	0		0		0.1	<0.1	0		0		0		0		0	
<i>pleurasi</i>					±0.3											
<i>Crustacea</i>																
<i>Ostracoda</i>																
app.	0.4	<0.1	0		9.1		0		14.3	<0.1	0		7.5	<0.1	0	
	±1.6				±15.0				±37.8				±12.8			

Tongue Point #3

	Spring '77			Summer '77			Fall '77			Winter '78			N			
	0.01 m ²		0	0.2 m ²		0	0.01 m ²		0	0.2 m ²		0				
	#	wt		#	wt		#	wt		#	wt					
Cirripedia																
<i>Balanus</i>	0.3	0.3	0	1.6	0.1	0	4.7	0.3	0.3	0.1	7.8	5.9	4.5	54.2		
<i>cariculus</i>	±0.9	±1.1		±4.7	±0.2		±12.2	±1.1	±0.5	±0.1	±17.3	±15.3	±8.4	±93.3		
<i>Balanus</i>	0		0	0		0	0.1	±0.1	0		0.3	±0.1	0			
<i>glandula</i>							±0.2				±0.6					
<i>Balanus</i>	4.1	<0.1	0	22.4	0.1	0	0		0		0		0			
<i>sp.</i>	±9.5			±44.9	±0.2											
<i>Chtamalus</i>	0.4	0.1	0	C		0	0.4	±0.1	0		0.6	0.0	0			
<i>dalli</i>	±1.1	±0.0					±0.9				±2.1	±0.0				
<i>Follicipes</i>	0		0	0		0	0		0.3	0.6	0		0			
<i>polymerus</i>									0.5	±1.3						
Tanaidacea																
<i>Anatulus</i>	2.7	<0.1	0		<0.1	0	24.9	<0.1	0		0.8	<0.1	0			
<i>normani</i>	±3.0						±52.3				±1.7					
<i>Leptochelia</i>	2.3	<0.1	0	3.8	<0.1	0	1.5	<0.1	0		0		0			
<i>duSis</i>	±5.7			±5.7			±4.4									
<i>Pinnellus</i>	6.4	<0.1	0	10.9	<0.1	0	22.5	<0.1	0		7.7	<0.1	0			
<i>californianus</i>	±7.1			±20.6			±42.5				±8.2					
Isopoda																
<i>Cirratulus</i>	3.9	0.1	0	1.2	0.1	4.8	0.4	1.0	0.0	0	0		0			
<i>harfordi</i>	±8.2	±0.2		±3.8	±0.1	±6.2	±0.5	±3.1	±0.1							
<i>Dynamenella</i>	49.7	0.1	0	40.5	0.1	0	8.8	0.0	0		20.0	<0.1	0			
<i>chaereri</i>	±59.7	±0.2		±57.3	±0.1		±18.4	±0.0			±29.9					
<i>Knophsphaeroma</i>	0.3	<0.1	0	0		0	0		0		0		0			
<i>amplicauda</i>	±1.3															
<i>Guerrinophoroma</i>	0.1		0	0.1	<0.1	0	0		0		0		0			
<i>oregonense</i>	±0.2			±0.5												
<i>lanitopsis</i>	1.7	<0.1	0	0.3	<0.1	0	1.8	<0.1	0		0		0			
<i>kincaidii</i>	±3.3			±1.1			±5.1									
<i>lanitopsis</i>	0.1	<0.1	0	0		0	0		0		0.1	<0.1	0			
<i>sp. (juv.)</i>	±0.3										±0.2					
<i>Idotea</i>	0.1	<0.1	5.5	0.2	1.8	0.3	4.0	1.3	0.6	0.1	10.8	1.6	0.8	0.1	3.4	0.4
<i>wormschenkii</i>	±0.2		±11.0	±0.4	±6.3	±0.5	±4.7	±1.7	±1.1	±0.2	±15.7	±1.5	±2.3	±0.2	±3.5	±0.5

Tongue Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Idotea</i>	1.4	<0.1	0		0.9	<0.1	0		0.1	<0.1	0		0		0	
<i>sp. (juv.)</i>	±4.9				±3.4				±0.2							
<i>Jaeropsis</i>	0		0		0		0		0.7	<0.1	0		0		0	
<i>sp. (juv.)</i>									±2.9							
<i>Limnoria</i>	0		0		0.1	<0.1	0		0.1	<0.1	0		0		0	
<i>algarum</i>					±0.2				±0.5							
<i>Munna</i>	1.1	<0.1	0		1.2	<0.1	0		0.9	<0.1	0		0.1	<0.1	0	
<i>chromo-</i>																
<i>cephala</i>	±1.6				±2.0				±1.5				±0.5			
<i>Munna</i>	0		0		0		0		0.1	<0.1	0		0		0	
<i>stephensoni</i>									±0.5							
Amphipoda																
<i>Gammaridea</i>	23.9	0.1	10.3	0.6	-		-		112.5	0.7	41.8	1.1	27.8	0.3	7.0	0.2
<i>sp.</i>	±15.2	±0.1	±35.2	±1.1					±104.1	±0.8	±68.7	±1.7	±32.8	±0.7	±4.7	±0.1
<i>Amphithoe</i>	-		-		0.1		3.0	0.1	-		-		-		-	
<i>sp.</i>					±0.2		±6.0	±0.2								
<i>Amphithoe</i>	-		-		23.1	0.1	6.3	0.3	-		-		-		-	
<i>simulans</i>					±29.2	±0.1	±6.1	±0.4								
<i>Amphithoe</i>	-		-		0.3	<0.1	0		-		-		-		-	
<i>sp.</i>					±0.7											
<i>Ampelisca</i>	-		-		0.7	<0.1	0		-		-		-		-	
<i>columbica</i>					±1.4											
<i>Caprellia</i>	0.1		0		3.0	<0.1	0		0.1	<0.1	0		0		0	
<i>granulif.</i>	±0.3				±8.6				±0.2							
<i>Cercops</i>	0.2		0		0		0		0		0		0		0	
<i>compactus</i>	±0.7															
<i>Corophium</i>	0		0		0		0		0.1	<0.1	0		0.1	<0.1	0	
<i>sp.</i>									±0.2				±0.2			
<i>Hyale</i>	-		-		11.5	<0.1	0.1	<0.1	-		-		-		-	
<i>ancipes</i>					±11.3		±0.5									
<i>Hyale</i>	-		-		0.1	<0.1	0		-		-		-		-	
<i>frequens</i>					±0.2											

Tongue Point +3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
<i>Hyale</i>	-		-		0.1	0.0	0		-		-		-		-	
<i>grandicornis</i>																
<i>californica</i>					±0.5	±0.1										
<i>Hyale</i>	-		-		0.2	<0.1	0		-		-		-		-	
sp.					±0.7											
<i>Jaes</i>	-		-		2.6	<0.1	0		-		-		-		-	
<i>falcata</i>					±5.0											
<i>Oligochinus</i>	-		-		9.4	<0.1	0.5	<0.1	-		-		-		-	
<i>lighti</i>					±6.1		±1.0									
<i>Parapleustes</i>	-		-		3.9	<0.1	0		-		-		-		-	
<i>neutillus</i>					±4.8											
<i>Syncheilidium</i>	-		-		0.1	<0.1	0		-		-		-		-	
<i>rectipalatum</i>					±0.2											
Decapoda																
<i>Carides</i>	0		0		0.1	<0.1	0		0		0		0		0	
sp.					±0.2											
<i>Pagurus</i>	0.1	<0.1	0.3	0.2	0		0		0.1	0.0	0.5	0.2	0		0	
<i>hirsutimaculatus</i>	±0.2		±0.5	±0.4					±0.2	±0.0	±1.0	±0.3				
<i>Paguridae</i>	0.1	<0.1	0		0.1	<0.1	0		0.1	<0.1	0		0		0	
sp.	±0.2				±0.3				±1.0							
<i>Pugettia</i>	0		0.3	0.0	0.3	0.0	0.5	0.1	0		0		0		0	
<i>gracilis</i>			±0.5	±0.1	±0.6	±0.0	±1.1	±0.1								
Insecta																
Chironomidae	0		0		0		0		0.1	<0.1	0		0.6	<0.1	0	
sp.									±1.1				±2.3			
Coleoptera	0		0		0.1		0		0		0		0		0	
sp.					±0.5											
Diptera	12.6	0.0	0		54.0	<0.1	0		3.3	<0.1	0		1.9	<0.1	0	
larvae	±27.7	±0.1			±132.3				±2.9				±2.3			
Dolichopodidae	0		0		0		0		0.8		0		0		0	
sp.									±2.5							
Ephydriidae	0		0		0		0		0		0		0.1	<0.1	0	
													±0.2			

Tongue Point #3

	Spring '77				Summer '77				Fall '77				Winter '78			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Bryosoa	✓		0		✓		0		✓		0		0		0	
sp.																
Echinodermata																
Asteroidea																
sp.	0		0		0.1	+0.1	0		0		0		0		0	
Leptasterias	0.1		0		0.5	+0.1	0.5	0.2	0.2	0.0	0		0		0	
hexactis	+0.2				+0.8		+1.0	+0.4	+0.4	+0.1						
Holothuroidea																
sp.	0		0		0.1	+0.1	0		0.1	+0.1	0		0.1	+0.1	0	
Cucumaria					+0.2				+0.3				+0.3			
minuta	0		0		0		0		0.6	0.0	0		0		0	
Cucumaria	71.2	1.5	1.0	0.5	65.2	1.7	0		31.5	1.4	0.3	0.1	12.5	0.5	0	
pseudocurata	+86.1	+1.5	+1.4	+0.8	+69.4	+1.7			+34.9	+1.4	+0.5	+0.2	+21.7	+0.9		
Leptosynapta	0		0		0.1	+0.1	0		0		0		0.1	0.0	0	
clarki					+0.3								+0.2	+0.1		
Species Richness	114				136				126				97			
Diversity, H'	3.17				2.79				3.08				3.14			
Total Number	7,799.8				24,363.1				11,556.4				4,491.0			
Total Biomass	799.4				965.2				1,216.9				569.9			

Table 1c. Tongue Point (rock) benthic organisms from the low (+0') intertidal zone collected spring and summer 1977, expressed as number and/or biomass (g) per 0.01 (N=20) and 0.2 (N=4) m² ± standard deviation.

	0.01 m ² Spr 77		0.2 m ²		0.01 m ² Sum 77		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Chlorophyta								
<i>Monostroma</i>		<0.1		0		0		0
sp.								
<i>Rhizoclonium</i>		<0.1		0		0		0
<i>riparium</i>								
<i>Spongomorpha</i>		<0.1		0		0		0
<i>coalita</i>								
<i>Spongomorpha</i>		<0.1		0		0		0
<i>spinescens</i>								
<i>Ulva</i>		0.0		0		<0.1		0
sp.		±0.1						
Bacillariophyta								
<i>Pennales</i>		<0.1		0		<0.1		0
spp.								
Phaeophyta								
<i>Alaria</i>		57.6		754.7		65.0		620.8
sp.		±110.9		±521.5		±118.6		±752.8
<i>Costaria</i>		0.1		0.7		0		0
<i>costata</i>		±0.2		±0.8				
<i>Degmaarestia</i>		0		2.2		0		0
<i>ligulata</i>				±4.5				
<i>Hedophyllum</i>		55.9		68.7		0		12.0
<i>sessile</i>		±59.9		±30.2				±16.7
<i>Laminaria</i>		0		0.4		0		4.9
<i>saccharina</i>				±0.7				±8.0
<i>Laminariales</i>		0.2		0		0		0.0
sp.		±1.0						±0.1

Tongue Point +0

	0.01 m ² Spr 77		0.2 m ²		0.01 m ² Sum 77		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Rhodophyta								
Acrochaetium		<0.1		0		0		0
sp								
Antithamnion		<0.1		0		0		0
defectum								
Antithamnion		0		0		0		<0.1
kylinii								
Antithamnionella		<0.1		0		0		0
pacifica								
var. pacifica								
Bossiella		5.8		0		0		0.1
plumosa		±8.5						±0.2
Calliarthron		0.0		0		0		0
tuberculosum		±0.2						
Callithamnion		0.0		0		0		0
pikeanum		±0.1						
Callithamnion/		<0.1		0		0		0
Pleonosporium								
Callophyllis		0		0		0		<0.1
sp.								
Constantinea		<0.1		0		0		0
simplex								
Corallina		0.5		0		0.1		✓
vancouveriensis		±1.1				±0.1		
Corallinaceae		✓		0		0		0
sp.								
Cryptonemia		0		0.1		0		0
ovalifolia				±0.1				
Cryptonemia		<0.1		0		0		0
sp.								

Tongue Point +0

	Spr 77		Sum 77	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	# wt	# wt	# wt	# wt
Cryptosiphonia woodii	<0.1	0	0	0
Delesseriaceae sp.	<0.1	0	0	0
Endocladia muricata	<0.1	0	0	0
Gigartina papillata	0.0 ±0.2	0	0	0
Gracilaria sp.	0	<0.1	0	0
Halosaccion glandiforme	<0.1	0	0	0
Halymenia coccinea	0	1.3 + 2.7	0	0
Heterosiphonia sp.	<0.1	0	0	0
Hildenbrandia occidentale	✓	0	0	0
Hymenena flabelligera	0.3 ±0.9	3.7 ±4.4	0	0
Hymenena sp.	0.2 ±0.3	0.8 ±1.0	0.7 ±0.3	0
Iridaea cordata	1.5 ±2.9	40.8 ±79.1	2.1 ±4.2	5.2 ±10.5
Iridaea sp.	0.0 ±0.1	0.0 ± 0.1	0	0
Laurencia spectabilis	0.0 ±0.1	0	0	0
Melobesia mediocris	0	<0.1	<0.1	0

Tongue Point +0

	Spr 77		Sum 77	
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²
	# wt	# wt	# wt	# wt
Membranoptera	<0.1	0	0	0
sp.				
Mesophyllum	0	✓	✓	0
conchatum				
Mesophyllum	✓	0	0	0
sp.				
Microcladia	0.0	0	<0.1	0
borealis	±0.0			
Neoptilota	0.0	0	0	0
hypnoides	±0.0			
Neoptilota	<0.1	0	0	0
sp. (juv.)				
Odonthalia	0.5	0.1	0.3	0
floccosa	±1.0	±0.3	±1.0	
Odonthalia	<0.1	0	0	0
kamtschatica				
Odonthalia	<0.1	0	0	0
sp.				
Petrocelis	✓	0	0	0
middendorffii				
Peyssonelia	<0.1	0	0	0
sp.				
Flocamium	<0.1	0	<0.1	0
tenue				
Polysiphonia	<0.1	0	<0.1	0
hendryi				
Polysiphonia	<0.1	0	0.1	0
pacifica			±0.2	
Porphyra	<0.1	0	0	0
sp.				

Tongue Point +0

	Spr 77		Sum 77	
	0.01 m ² # wt	0.2 m ² # wt	0.01 m ² # wt	0.2 m ² # wt
Pterosiphonia	<0.1	0	<0.1	0
bipinnata				
Pterosiphonia	<0.1	0	0	0
dendroidea				
Ptilothamniopsis	<0.1	0	0	0
lejolisea				
Rhodochorton	0	0	<0.1	0
sp.				
Rhodymenia	0.2	0.6	0	0
palmata	±0.5	±1.2		
Rhodymenia	<0.1	0	0	0
sp.				
Spermatophyta				
Phyllospadix	0.9	185.4	34.6	871.9
scouleri	±3.4	±370.9	±58.9	±1030.6
Porifera				
spp.	✓	0	0	✓
Halichondria	✓	0	0	0
pacifica				
Ophlitaspongia	0	0	0	✓
pennata				
Cnidaria				
Anthozoa	0.1	<0.1	0	0.7
spp	± 0.5		± 1.2	± 0.3
Anthopleura	0	0	0.1	0.0
elegantissima			± 0.2	± 0.1
Hydrozoa				
spp.	✓	✓	0	0

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
<i>Bittium</i>	0.0	<0.1	0.0	<0.1	0.3	0.0	0	
<i>eschrichtii</i>	±0.0		±0.1		±1.0	±0.1		
<i>Calliostoma</i>	0		0		0.3	0.1	1.0	0.9
<i>ligatum</i>					±0.7	±0.4	±2.0	±1.7
<i>Cerithiopsis</i>	0.1	<0.1	0		0.2	<0.1	0	
<i>sp.</i>	±0.3				±0.4			
<i>Crepidula</i>	0.2	<0.1	0		0.1	<0.1	0	
<i>sp. (juv)</i>	±0.4				±0.3			
<i>Homalopoma</i>	0		0		0.1	<0.1	0	
<i>baculum</i>					±0.2			
<i>Lacuna</i>	0.2	<0.1	0		0.9	<0.1	0	
<i>variegata</i>	±0.5				±1.0			
<i>Littorina</i>	0.1	<0.1	0		0		0	
<i>sitkana</i>	±0.2							
<i>Margarites</i>	0.3	0.0	1.5	0.6	0.2	<0.1	0.1	<0.1
<i>pupillus</i>	±0.8	±0.2	±3.0	±1.3	±0.4		±0.2	
<i>Margarites/</i>	0.1	<0.1	0		0		0	
<i>Lirularia</i>	±0.2							
<i>Mitrella</i>	2.1	0.2	0.3	0.1	0.7	0.1	0	
<i>carinata</i>	±4.9	±0.5	±0.7	±0.1	±1.8	±0.2		
<i>Mitrella</i>	0		0		0.8	0.1	0	
<i>gouldi</i>					±1.5	±0.1		
<i>Notoacmaea</i>	0.2	0.0	0		0		0	
<i>scutum</i>	±0.4	±0.1						
<i>Ocenebra</i>	0.1	0.0	0		0.1	<0.1	0.1	<0.1
<i>lurida</i>	±0.2	±0.0			±0.3		±0.2	
<i>Onchidella</i>	0.1	0.0	0		0		0	
<i>borealis</i>	±0.4	±0.0						

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ² #	wt	0.2 m ² #	wt	0.01 m ² #	wt	0.2 m ² #	wt
Nemertea								
app.	1.4 ±1.5	✓	0		2.2 ±4.0	<0.1	0	
Nematoda								
app.	7.0 ± 9.9	<0.1	0		20.3 ± 34.4	<0.1	0	
Mollusca								
Amphineura								
Cyanoplax	0.2	0.0	0.5	0.1	0.1	0.0	0	
dentiens	±0.4	±0.0	±0.6	±0.1	±0.2	±0.1		
Katharina	0		1.3	<0.1	0.2	1.4	0	
tunicata			±1.3		±0.4	±4.3		
Mopalia	0		0		0		0.3	1.2
sp. K							±0.5	±2.3
Tonicella	0.1	0.0	1.5	4.5	0.3	0.0	1.3	0.8
lineata	±0.3	±0.1	±0.6	±4.5	±0.6	±0.1	±1.5	±1.6
Gastropoda								
Acmaea	0		0		0.1	0.5	0	
mitra					±0.2	±2.1		
Acmaeidae	0		0		0.1	<0.1	0	
sp. (juv)					±0.2			
Acteocina	0		0		0.3	<0.1	0	
sp.					±0.9			
Alvinia	0.2	<0.1	0		2.4	<0.1	0	
sp.	±0.6				±9.8			
Barleeia	0.3	<0.1	0		0.7	<0.1	0	
haliotiphila	±0.4				±0.6			

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Thais	0		0		0.1	<0.1	0	
canaliculata					±0.2			
Thais	0		0		0.2	<0.1	0	
emarginata					±0.7			
Thais	0		0		0.1	<0.1	0	
sp. (juv.)					±0.2			
Trichotropis	0.1	<0.1	0		0		0	
cancellata	±0.2							
Velutina	0		0		0.3	<0.1	0	
laevigata					±0.7			
Bivalvia								
Hiatella	0.5	0.1	0.8	0.4	0.2	<0.1	0	
arctica	±1.2	±0.4	±1.5	±0.8	±0.4		0	
Lasaea	0.2	<0.1	0		0		0	
cistula	±0.7							
Lyonsia	0		0		0		0.1	0.0
californica							±0.2	±0.1
Modiolus	0		0		0		0.1	0.1
rectus							±0.2	±0.2
Musculus	0.7	<0.1	0		0.2	<0.1	0	
pygmaeus	±1.6				±3.8			
Myrella	0		0		0.1	<0.1	0	
tumida					±0.2			
Mytilus	0		0		0.1	<0.1	0	
californianus					±0.2			
Mytilus	0		0		0.1	<0.1	0	
edulis					±0.2			
Mytilus	0.7	<0.1	0		0.1	<0.1	0	
sp. (juv.)	±0.9				±0.2			
Protothaca	0.0	<0.1	0		0.2	<0.1	0	
staminea	±0.0				±0.5			

Tongue Point +0

	Spr 77		Sum 77		
	0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²	
	#	wt	#	wt	
Transennella	0		0		
cantilla			0.7	0.0	0
			±1.5	±0.1	
Zirfaea	0.1	0.0	0		0
pilsbryi	±0.5	±0.0			
Annelida					
Oligochaeta	1.9	<0.1	0		
spp.	±4.5		28.3	<0.1	0
			±68.0		
Polychaeta					
Arenicolidae	0.1	<0.1	0		0
spp.	±0.2		0		
Branchiomaldane	0.1	<0.1	0		0
vincenti	±0.4		3.5	<0.1	
			±7.6		
Capitellidae					
Capitella	0.5	<0.	0		0
capitata	±1.1		11.1	<0.1	
			±24.8		
Chrysopetalidae					
Paleonotus	0.2	<0.1	0		0
bellis	±0.4		0.5	<0.1	
			±0.9		
Cirratulidae	0.1	<0.1	0		0
spp.	±0.2		1.7	<0.1	
Cirratulus	2.8	✓	0		0
cirratus	±6.3		0.4	<0.1	
			±1.3		
Eunicoidea	0.4	<0.1	0		0
spp.	±0.9		0.2	<0.1	
			±0.5		
Eunicidae					
Eunice	0.2	✓	0		0
valens	±0.4		0		
Lumbrineridae					
Lumbrineris	0.1	<0.1	0		0
inflata	±0.2		0		

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Lumbrineris	1.2	<0.1	0		3.2	<0.1	0	
sp.	±2.0				±6.4			
Maldanidae	0		0		0.1	<0.1	0	
sp. (juv.)					±0.2			
Nereidae								
sp. (juv.)	0		0		4.5	<0.1	0	
Nereis	4.2	<0.1	0		1.3	<0.1	0	
sp.	±4.9				±1.7			
Nereis	0		0		0.1	<0.1	0	
pelagica					±0.2			
Platynereis	1.1	<0.1	0		1.2	<0.1	0	
bicanaliculata	±3.0				±2.6			
Onuphidae								
Onuphis	0.4	<0.1	0		11.7	<0.1	0	
stigmatis	±1.3				±24.9			
Onuphis	1.1	<0.1	0		0		0	
sp.	±3.0							
Orbiniidae								
Naineris	0.1	<0.1	0		7.0	<0.1	0	
dendritica	±0.2				±14.9			
Naineris	0.1	<0.1	0		0		0	
quadricuspida	±0.4							
Naineris	0.4	<0.1	0		2.2	<0.1	0	
sp.	±1.6				±5.5			
Scoloplos	0.1	<0.1	0		0		0	
sp.	±0.4							
Phyllodocidae								
Eulalia	0		0		0.1	<0.1	0	
billineata					±0.2			
Eulalia	0.2	<0.1	0		0.6	<0.1	0	
quadrioculata	±0.5				±1.2			

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ² #	wt	0.2 m ² #	wt	0.01 m ² #	wt	0.2 m ² #	wt
Eulalia	0.1	<0.1	0		0.1	<0.1	0	
sp.	±0.2				±0.2			
Polynoidae	0		0		0.3	<0.1	0	
sp.					±0.7			
Halosydna	0.1	<0.1	0		0		0	
brevisetosa	±0.2							
Sabellidae								
spp.	3.2	<0.1	0		2.4	<0.1	0	
	±5.4				±2.9			
Chone	0	0			0.8	<0.1	0	
ecaudata					±1.0			
Eudistylia	0.1	<0.1	0		0		0	
vancouveri	±0.2							
Fabricia	0.1	<0.1	0		0		0	
oregonica	±0.2							
Fabricinae	1.1	<0.1	0		0		0	
sp.	±4.5							
Oriopsis	1.1	<0.1	0		12.6	<0.1	0	
sp.	±4.7				±27.1			
Sabella	0.2	<0.1	0		0.5	<0.1	0	
media	±0.4				± 1.2			
Sabellastarte	0.2	<0.1	0		0.2	<0.1	0	
sp.	±0.5				±0.7			
Schizobranchia	0.2	<0.1	0		0		0	
insignis	±0.7							
Sabelliariidae								
Idanthyrus	0		0		0.1	<0.1	0	
armatus					±0.3			
Serpulidae								
Spirorbis	1.5	<0.1	0		2.7	<0.1	0	
sp.	±2.8				±5.6			
Sphaerodoridae								
Sphaerodoropsis	0.3	<0.1	0		0.2	<0.1	0	
minuta	±0.8				±0.9			

Tongue Point +C

	0.01 m ² Spr 77		0.2 m ²		0.01 m ² Sum 77		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Spionidae								
Polydora	0.1	<0.1	0		0.2	<0.1	0	
columbiana	±0.3				±0.4			
Polydora	0.3	<0.1	0		2.3	<0.1	0	
pygidialis	±0.8				±7.5			
Polydora	0		0		0.2	<0.1	0	
spungicola					±0.5			
Polydora	0.4	<0.1	0		0.9	<0.1	0	
sp.	±1.4				±1.5			
Syllidae								
Brania	0.4	<0.1	0		0.2	<0.1	0	
brevipharyngea	±0.8				±0.5			
Exogone	1.4	<0.1	0		0.7	<0.1	0	
gemmifera	±2.1				±1.0			
Exogone	0.5	<0.1	0		2.2	<0.1	0	
lourei	±1.2				±5.5			
Exogone	0.1	<0.1	0		0		0	
sp.	±0.3							
Odontosyllis	0.8	<0.1	0		0.9	<0.1	0	
sp.	±1.9				±2.1			
Sphaerosyllis	0.4	<0.10			0		0	
brandhorsti	±1.3							
Sphaerosyllis	0.4	<0.10	0		0.6	<0.1	0	
pirifera	±0.8				±1.0			
Sphaerosyllis	0		0		0.7	<0.1	0	
sp.					±2.0			
Syllis	11.1	✓	0		19.7	<0.1	0	
sp.	±25.2				±29.1			

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Terebellidae	4.1	✓	0		0.1	<0.1	0	
spp.	±8.7				±0.2			
Nicolea	6.5	<0.1	0		12.7	<0.1	0	
zostericola	±28.1				±20.4			
Polycirrus	0		0		3.2	<0.1	0	
sp.					±8.7			
Sipunculida								
Phascolosoma	0.1	<0.1	0		0.2	<0.1	0.1	0.0
agassizii	±0.2				±0.5		±0.2	±0.1
Pycnogonida								
Halosoma	0.1	<0.1	0		0.1	<0.1	0	
compactum	±0.2				±0.2			
Crustacea								
Ostracoda								
spp.	0.4	<0.1	0		3.4	<0.1	0	
Cirripedia	± 1.0				± 6.4			
Balanus	0.8	<0.1	7.3	40.6	2.1	2.0	2.0	31.9
cariosus	±1.3		±14.5	±81.2	±8.0	±8.4	±2.3	±42.7
Balanus	0.1	<0.1	0		0		0	
glandula	±0.2							
Balanus	0.4	17.2	1.5	26.1	0		0	
nubilis	±1.1	±58.8	±1.9	±41.0				
Balanus	0.7	0.0	0		2.6	0.0	0	
sp. (juv.)	±3.1	±0.1			±6.5	±0.1		
Chthamalus	0		0		0.1	<0.1	0	
dalli					±0.2			
Cumacea								
Cumella	0		0		0.4	<0.1	0	
vulgaris					±1.4			

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ²		0.2 m ²		0.01 m ²		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Tanaidacea								
Anatansis	3.0	<0.1	0		7.8	<0.1	0	
normani	±5.1				±12.8			
Leptochelia	4.9	<0.1	0		2.2	<0.1	0	
dubia	±13.0				±5.6			
Pancolus	0.1	<0.1	0		1.0	<0.1	0	
californiensis	±0.2				±4.3			
Isopoda								
Cirolana	0.1	<0.1	0		0		0	
narfordi	±0.2							
Dynamenella	0.8	<0.1	0		0.8	<0.1	0	
glabra	±1.5				±1.3			
Dynamenella	1.5	<0.1	0.1	<0.1	0.5	<0.1	0	
sheareri	±3.2		±0.4		±1.2			
Dynamenella	0.1	<0.1	0		0		0	
sp. (juv.)	±0.3							
Exosphaeroma	0		0		0.1	<0.1	0	
media					±0.2			
Exosphaeroma	5.7	0.0	0		2.6	<0.1	0	
rhomburum	±14.7	±0.1			±4.3			
Exosphaeroma	0.4	<0.1	0		0		0	
sp. (juv.)	±1.6							
Ianiropsis	0.2	<0.1	0		1.4	<0.1	0	
kincaidi	±0.5				±3.2			
Ianiropsis	0		0		0.1	<0.1	0	
tridens					±0.3			
Ianiropsis	0		0		1.9	<0.1	0	
sp.					±5.0			
Idotea	0		0.1	0.0	0		0	
montereyensis			±0.4	±0.1				
Idotea	0		0.1	0.0	0		0	
stenops			±0.2	±0.1				

Tongue Point +0

	0.01 m ² Spr 77		0.2 m ²		0.01 m ² Sum 77		0.2 m ²	
	#	wt	#	wt	#	wt	#	wt
Idotea	0.2	0.1	0		0		0.5	0.0
wosnesenskii	±0.5	±0.2					±0.6	±0.1
Idotea	0.5	<0.1			0.1	<0.1		
sp. (juv.)	±0.9				±0.2			
Jaeropsis	0.1	<0.1	0		0		0	
dubia	±0.2							
Jaeropsis	0		0		0.8	<0.1	0	
lobata					±2.2			
Jaeropsis	0		0		0.1	<0.1	0	
sp.					±0.2			
Limnoria	0.9	<0.1	0		0.8	<0.1	0	
algarum	±2.5				±2.0			
Limnoria	0.4	<0.1	0		0		0	
lignorum	±1.3							
Munna	0.4	<0.1	0		0.1	<0.1	0	
chromatocephala	±0.8				±0.2			
Munna	0		0		0.3	<0.1	0	
stephenseni					±0.8			
Munna	0		0		0.2	<0.1	0	
ubiquita					±0.7			
Paranthura	0		0		0.2	<0.1	0	
elegans					±0.4			
Synidotea	0		0		0.2	<0.1	0	
pettiboneae					±0.7			
Synidotea	0		0		1.1	<0.1	0	
sp. A.					±3.9			
Amphipoda								
Ampithoe	-		-		1.6	<0.1	0	
sp. C.					±4.6			
Ampithoidae	-		-		2.5	<0.1	0.8	0.1
spp.					±4.9		±1.5	±0.2

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ² #	wt	0.2 m ² #	wt	0.01 m ² #	wt	0.2 m ² #	wt
Aorodes	-		-		5.8	<0.1	0	
columbiae					±6.7			
Atylus	-		-		0.5	<0.1	0.3	<0.1
levienseis					±0.9		±0.5	
Caprella	0.1	<0.1	0		0		0	
greenleyi	±0.4							
Caprella	0.2	<0.1	0		0		0	
verrucosa	±0.7							
Cerops	0.2	<0.1	0		0.1	<0.1	0	
compactus	±0.7				±0.2			
Cymadusa	-		-		0.4	0.0	7.5	0.5
uncinata					±1.1	±0.1	±15.0	±1.1
Gammaridea	13.2	<0.1	1.0	0.0				
spp.	±9.6		±1.2	±0.1				
Gammaropsis	-		-		0.3	<0.1	0	
thompsoni					±0.8			
Hyale	-		-		1.1	<0.1	0	
frequens					±2.4			
Ischyrocerus	-		-		1.0	<0.1	0	
anguipes					±1.9			
Jassa	-		-		0.2	<0.1	0	
falcata					±0.5			
Lepidepcreum	-		-		0.1	<0.1	0	
(gurjanovae)					±0.5			
Lepidepcreum	-		-		0.5	<0.1	0	
sp. A					±2.0			
Velita	-		-		1.7	<0.1	0.3	<0.1
californica					±3.5		±0.5	
Metopa	-		-		0.1	<0.1	0	
cistella					±0.2			
Najna	-		-		0.2	<0.1	0	
consiliorum					±0.7			

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ² #	wt	0.2 m ² #	wt	0.01 m ² #	wt	0.2 m ² #	wt
Najna	-		-		1.3	<0.1	2.8	<0.1
sp.					±4.3		±3.8	
Oligochinus	-		-		0.1	<0.1	0	
lighti					±0.2			
Parapleustes	-		-		1.4	<0.1	0.5	<0.1
nautilus					±2.0		±1.0	
Parapleustes	-		-		1.0	<0.1	0	
pugettensis					±2.5			
Photis	-		-		0.4	<0.1	0	
bifurcata					±0.9			
Photis	-		-		0.2	<0.1	0	
brevipes					±0.9			
Photis	-		-		5.4	<0.1	2.0	<0.1
sp. A					±9.4		±4.0	
Photis	-		-		5.2	<0.1	0	
spp.					±8.9			
Polycheria	-		-		0.1	<0.1	0	
osborni					±0.2			
Pontogeneia	-		-		0.4	<0.1	0	
intermedia					±0.8			
Tritella	0.1	<0.1	0		0.3	<0.1	0	
pilimana	±0.2				±0.6			
Decapoda								
Cancer	0.1	0.1	0.1	0.2	0.1	0.4	0.5	0.0
oregonensis	±0.3	±0.4	±0.3	±0.2	±0.3	±1.6	±0.6	±0.1
Cancer	0.1	0.0	0		0		0	
sp. (juv.)	±0.3	±0.1						
Cryptolithodes	0		0		0.5	0.4	0.3	0.0
sitchensis					±1.0	±0.8	±0.5	±0.1
Oedignathus	0.2	0.4	0.1	0.6	0		0	
inermis	±0.4	±1.4	±0.3	±0.6				

Tongue Point +0

	Spr 77				Sum 77			
	0.01 m ² #	wt	0.2 m ² #	wt	0.01 m ² #	wt	0.2 m ² #	wt
Pagurus	0		0		0.1	<0.1	0	
hirsutiusculus					±0.2			
Pagurus	0.7	0.2	0.8	0.1	0.1	<0.1	0	
sp. (juv.)	±3.1	±0.7	±1.5	±0.2	±0.2			
Pinnotheres	0		0		0.1	0.0	0	
pugettensis					±0.2	±0.1		
Pinnotheridae	0.1	<0.1	0		0		0	
spp.	±0.2							
Pugettia	1.7	0.1	0.5	0.3	6.7	0.2	4.0	1.8
gracilis	±3.5	±0.4	±1.0	±0.6	±8.1	±0.4	±5.5	±2.3
Insecta								
Coleoptera	0.1	<0.1	0		0		0	
spp.	±0.2							
Diptera	0.3	<0.1	0		0.1	<0.1	0	
spp.	±0.7				±0.2			
Bryozoa								
spp.		✓	0		0		0	
Echinodermata								
Ophiuroidea	0.1	<0.1	0		0.1	<0.1	0	
sp. (juv.)	±0.3				±0.2			
Asteroidea								
Henricia	0.1	0.0	0.1	0.0	0.2	0.2	0	
leviuscula	±0.3	±0.1	±0.3	±0.1	±0.7	±1.0		
Leptasterias	0.1	<0.1	0		0.1	<0.1	0	
hexactis	±0.4				±0.3			
Holothuroidea								
Cucumaria	0.1	<0.1	0		0.2	0.0	0	
pseudocurata	±0.2				±0.5	±0.1		

		Tongue Point		+G			
		Spr 77				Sum 77	
		0.01 m ²	0.2 m ²	0.01 m ²	0.2 m ²		
		#	wt	#	wt	#	wt
Chordata							
Ascidacea							
sp.		0	0	✓		0	
Species Richness		178		170			
Diversity - H ¹		2.33		2.17			
Total Number		2617.5		6183.8			
Total Biomass (g)		1626.5		2057.5			

Table 1d. Tongue Point (rock) benthic organisms from the subtidal collected 17 June 1977, expressed as number and/or biomass (g) per 0.25 m² $\pm$ standard deviation (N=4).

	-5 m		-10 m	
	#	wt	#	wt
Chlorophyta				
Chaetomorpha		0.0		0
sp.		± 0.1		
Derbesia		0.1		0.0
marina		± 0.1		± 0.1
Monostroma		0.0		0.0
sp.		± 0.1		± 0.1
Rhizoclonium		0.0		0
riparium		± 0.1		
Spongomorpha		0.0		0
coalita		± 0.1		
Spongomorpha		0		0.0
spinescens				± 0.1
Ulvaria		0.0		0
sp.		± 0.1		
Bacillariophyta				
Pennales		0.0		0.0
spp.		± 0.1		± 0.1
Phaeophyta				
Costaria		0		3.6
costata				± 7.3
Desmarestia		0.0		0.8
ligulata		± 0.1		± 1.7
Desmarestia		2.7		4.3
viridis		± 2.1		± 8.5
Desmarestia		0.0		0
sp. (juv.)		± 0.1		
Ectocarpaceae		0.0		0
		± 0.1		

Tongue Point
Subtidal

	-5 m	-10 m
	# wt	# wt
Giffordia	0.0	0
ovata	±0.1	
Laminariales	2.3	0
sp.	±3.9	
Pterogophora	0	2.7
californica		±5.3
Pylaiella	0.0	0
tenella	±0.1	
Syringoderma		
abyssicola	0.0	0.0
	±0.1	±0.1
Rhodophyta		
Acrochaetium	0.0	0
sp.	±0.1	
Amplisiphonia	0.0	0
pacifica	±0.1	
Antithamnion	0.1	0.0
defectum	±0.0	±0.1
Antithamnion	0.0	0.0
kylinii	±0.1	±0.1
Bossiella	0.4	0
plumosa	±0.4	
Bonnemaisonia	0	0.9
nootkana		±1.9
Calliarthron	1121.8	1.7
tuberculosum	±688.5	±3.4
Callithamnion	0.0	0
biseriatum	±0.1	
Callithamnion	0.0	0
pikeanum	±0.1	

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Callithamnion/		0.1		0.0
Pleurosporium		±0.1		±0.1
Callophyllis		0		0.2
flabellulata				±0.2
Callophyllis		0		0.0
haenophylla				±0.1
Ceramium		0.0		0.1
californicum		±0.1		±0.1
Ceramium		0.0		0
sp.		±0.1		
Choreocolax		0.1		0.0
polysiphoniae		±0.0		±0.1
Corallinaceae		0.0		0.0
		±0.1		±0.1
Cruoria		0.1		0
profunda		±0.1		
Cryptonemia		0		0.1
ovalifolia				±0.2
Delesseriaceae		0.0		0
		±0.1		
Faucea		2.9		0.0
laciniata		±2.6		±0.1
Griffithsia		0		0.3
pacifica				±0.5
Herposiphonia		33.5		0.1
plumula		±27.7		±0.2
Herposiphonia plumula		0.0		0
var. plumula		±0.1		
Hollenbergia		0.0		0.0
subulata		±0.1		±0.1

Tongue Point
Subtidal

	-5 m	-10 m
	# wt	# wt
Hymenena	4.3	0
sp.	±4.2	
Iridaea	0.0	0
sp.	±0.1	
Mesophyllum	0.0	0
conchatum	±0.1	
Mesophyllum	0.0	0
sp.	±0.1	
Microcladia	0.1	0
borealis	±0.1	
Microcladia	0.0	0
sp.	±0.1	
Opuntiaella	0	0.0
californica		±0.1
Peyssonelia	0.0	0
pacifica	±0.1	
Peyssonelia	0.0	0
sp.	±0.1	
Platythamnion	0.0	0.2
pectinatum	±0.1	±0.2
Platythamnion	0	0.0
villosum		±0.1
Pleonosporium	0.0	0
vancouverianum	±0.1	
Polysiphonia	0.1	0
hendryi	±0.1	
Polysiphonia	0.1	0.0
pacifica	±0.1	±0.1
Polysiphonia	0.1	0.0
paniculata	±0.0	±0.1

Tongue Point
Subtidal

	-5 m	-10 m
	# wt	# wt
Polysiphonia	0.0	0
sp.	±0.1	
Polysiphonia	0.0	0.0
scopulorum	±0.1	±0.1
villosum		
Pterosiphonia	0.1	0.0
bipinnata	±0.1	±0.1
Pterosiphonia	0.1	0.0
dendroidea	±0.1	±0.1
Pterosiphonia	0.1	0.1
gardneri	±0.1	±0.1
Pterosiphonia	0.0	0.0
gracilis	±0.1	±0.1
Ptilothamnopsis	0.1	0.0
lejolisea	±0.0	±0.1
Rhodoptilum	0	0.0
plumosum		±0.1
Rhodymenia	0.1	0
sp.	±0.1	
Porifera	0.0	0
spp.	±0.1	
Cnidaria		
Hydrozoa	✓	✓
Aglaophenia	0	0.1
		±0.2
Plumularia	0	2.3
sp.		±4.6

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Anthozoa				
Actiniaria	0.6	<0.1	0	
spp.				
Platyhelminthes	4.7	<0.1	0	
spp.	±8.1			
Nemertea	15.3	<0.1	0.5	<0.1
spp.	±9.9		±0.6	
Nemetoda	31.0	<0.1	0.3	<0.1
spp.	±43.3		±0.5	
Mollusca				
Amphineura	6.0	0.0	0	
sp. (juv.)	±4.4	±0.1		
Cyanoplax	0		0.3	<0.1
dentiens			±0.1	
Mopalia	0.7	0.1	0	
sp.	±0.6	±0.2		
Toniceila	38.7	14.8	12.3	8.4
lineata	±31.9	±10.9	±13.7	±10.8
Gastropoda				
Acmaea	1.8	0.5	1.3	0.4
mitra	±2.4	±0.7	±2.5	±0.8
Acmaeidae	0.3	<0.1	0	
	±0.5			
Aeolididae	0.5	<0.1	2.5	<0.1
sp.	±1.0		±3.8	

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Alvinia	23.0	0.1	1.5	<0.1
sp.	±22.3	±0.1	±0.6	
Amphissa	78.8	3.4	1.8	0.3
columbiana	±54.3	±3.1	±2.2	±0.3
Balcis	0.3	<0.1	0	
montereyensis	±0.5			
Bittium	2.0	0.7	0	
eschrichtii	8	±0.9		
Bittium	3	0.9	0.3	0.0
spp.		±0.9	±0.5	±0.1
Calliostoma		29.3	0.5	0.0
ligatum		±29.5	±0.6	±0.1
Calyptraea	0		0.5	<0.1
fastigiata			±1.0	
Ceratostoma	0		0.8	3.4
foliatum			±1.0	±4.5
Cerithiopsis	13.5	0.4	0.3	<0.1
sp.	±15.3	±0.5	±0.5	
Collisella	0		0.8	0.1
ochracea			±1.5	±0.1
Crepidula	6.3	0.3	0.3	<0.1
sp.	±5.7	±0.4	±0.5	
Crepidatella	0.3	0.1	0	
lingulata	±0.5	±0.1		
Cryptobranchia	0.5	<0.1	0	
concentrica	±1.0			
Fusitriton	0		0.3	21.6
oregonensis			±0.5	±43.2
Granulina	135.3	1.0	0	
margaritula	±186.9	±1.4		

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Lacuna	24.3	0.0	0.5	<0.1
variegata	±31.3	±0.1	±1.0	
Lirularia	39.8	0.3	0	
lirulata	±41.3	±0.4		
Margarites	57.0	5.0	0	
pupillus	±50.9	±4.8		
Margarites/ Lirularia	2.0	0.0	0.3	<0.1
Lirularia	±4.0	±0.1	±0.5	
Mitrella	9.3	1.4	0	
carinata	±9.1	±1.5		
Moelleria	0.3	<0.1	0	
quadre	±0.5			
Nassarius	0.5	0.2	0	
mendicus	±0.6	±0.2		
Ocenebra	13.3	1.9	0	
lurida	±12.0	±2.4		
Odostomia	0.3	<0.1	0	
sp.	±0.5			
Oenopota	0.3	<0.1	0	
tabulata	±0.5			
Retusa	0.3	<0.1	0	
sp.	±0.5			
Searlesia	0.3	0.5	0	
dira	±0.5	±1.0		
Tegula	0.3	<0.1	0	
sp. (juv.)	±0.5			
Trichotropis	0.5	0.1	0.3	0.0
cancellata	±1.0	±0.2	±0.5	±0.1
Turridae	0.3	<0.1	0	
	±0.5			

Tongue Point
Subtidal

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	- 5 m		- 10 m	
	#	wt	#	wt
Velutina	0.3	<0.1	0	
laevigata	±1.0			
Bivalvia				
Clamys	0		0.3	0.0
hastata			±0.5	±0.1
Entodesma	0.3	<0.1	0	
saxicola	±0.6			
Hiatella	0		0.3	<0.1
arctica			±0.5	
Annelida				
Oligochaeta	0.8	<0.1	0	
spp.	±1.5			
Polychaeta				
Ampharetidae	0.3	<0.1	0	
spp.	±0.5			
Cirratulidae	13.0	<0.1	0.5	<0.1
spp.	±11.2		±1.0	
Dodecaceria	5.8	<0.1	0	
cencharum	±4.8			
Lunicidae				
Eunice	0.3	<0.1	0	
valens	±0.5			
Hesionidae				
Micropodarke	0.3	<0.1	0	
dubia	±0.5			
Ophiodromus	0.3	<0.1	0	
pugettensis	±0.5			
Lumbrineridae				
Lumbrineris	13.0	<0.1	0	
spp.	±15.0			

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Nereidae	22.3	<0.1	0	
sp.	±19.7			
Nereis	17.9	<0.1	1.8	<0.1
spp.	±15.9		±2.4	
Platynereis	538.3	<0.1	15.5	<0.1
bicanaliculata	±387.8		±19.4	
Onuphidae				
Onuphis	0.8	<0.1	0	
spp.	±1.5			
Opheliidae				
Armandia	2.5	<0.1	0	
brevis	±5.0			
Phyllodoceidae	0		0.3	<0.1
			±0.5	
Eulalia	5.3	<0.1	0.3	<0.1
quadrioculata	±7.4		±0.5	
Phyllodoce	1.5	<0.1	0.3	<0.1
sp.	±2.4		±0.5	
Pilargidae				
Sigambra	0.3	<0.1	0	
tentaculata	±0.5			
Polynoidae	5.5	<0.1	0.8	<0.1
spp.	±5.6		±1.0	
Arctone	0		0.3	<0.1
vittata			±0.5	
Harmothoe	1.8	<0.1	0	
imbricata	±3.5			
Polydoniidae				
Peisidice	0.3	<0.1	0	
aspera	±0.5			

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Sabellariidae				
Idanthyrus	2.2	<0.1	0	
armatus	±3.0			
Sabellaria			0.8	<0.1
cementarium			±1.0	
Sabellidae	3.0	<0.1	0.5	<0.1
spp.	±5.4		±1.0	
Chone	4.3	<0.1	0	
ecaudata	±6.1			
Oriopsis	0.3	<0.1	0	
minuta	±0.5			
Serpulidae	1.8	<0.1	0	
spp.	±2.1			
Spirorbis	15.8	<0.1	0.5	<0.1
spp.	±31.5		±1.0	
Sigalionidae	0.3	<0.1	0	
spp.	±0.5			
Sphaerodoridae				
Sphaerodoropsis	8.8	<0.1	0	
minuta	±13.1			
Spionidae				
Malococeros	2.5	<0.1	0	
glutaeus	±3.3			
Polydora	8.5	<0.1	0	
sp.	±8.7			
Prionospio	2.0	<0.1	0	
steenstrupi	±4.0			
Prionospio	1.3	<0.1	0	
sp.	±1.9			

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Spio	1.3	<0.1	0	
filicornis	±1.5			
Syllidae	7.5	<0.1	0	
spp.	±12.5			
Brania	4.5	<0.1	0	
brevipharyngea	±7.7			
Exogone	38.3	<0.1	0	
gemmifera	±64.2			
Exogone	23.5	<0.1	0	
lourei	±27.3			
Odontosyllis	9.5	<0.1	0	
sp.	±15.1			
Sphaerosyllis	1.3	<0.1	0	
pirifera	±1.9			
Syllis	31.0	<0.1	0	
spp.	±26.4			
Terebellidae	5.0	<0.1	0	
spp.	±8.7			
Nicolea	4.8	<0.1	0.3	<0.1
zostericola	±5.6		±0.5	
Pista	2.0	<0.1	0	
brevibranchiata	±4.0			
Polycirrus	4.5	<0.1	0	
spp.	±6.1			
Archiannelida				
Polygordiidae	0.3	<0.1	0	
spp.	±0.5			

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Sipunculida				
Phascolosoma	2.8	<0.1	0	
agassizii	±4.3			
Pycnogonida				
Achelia	0.3	<0.1	0	
chelata	±0.5			
Crustacea				
Ostracoda	12.0	<0.1	0	
spp.	±16.6			
Cumacea				
Cumella	5.3	<0.1	0	
vulgaris	±10.5			
Cumella	3.5	<0.1	0	
sp.	±2.9			
Diastylopsis	0.3	<0.1	0	
sp.	±0.5			
Lampropidae	0.3	<0.1	0	
sp.	±0.5			
Leptocuma	2.8	<0.1	0	
sp.	±4.9			
Tanaidacea				
Anatanais	1.5	<0.1	0	
normani	±2.4			
Leptochelia	3.8	<0.1	0.5	<0.1
dubia	±3.3		1.0	
Isopoda				
Anthuridae	0.3	<0.1	0	
sp.	±0.5			

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Colanthe	25.3	<0.1	0	
squamosissima	±30.5			
Dynamenella	0.3	<0.1	0	
dilitata	±0.5			
Dynamenella	0.5	<0.1	0	
glabra	±1.0			
Epicaridea	0.3	<0.1	0	
sp.	±0.5			
Exosphaeroma	0.3	<0.1	0	
rubrum	±0.5			
Ianiropsis	75.5	0.0	0	
analoga	±57.1	±0.1		
Ianiropsis	11.8	<0.1	0	
kincaidii	±12.9			
Ianiropsis	1.5	<0.1	0	
tridens	±3.0			
Ianiropsis	5.5	<0.1	0	
sp.	±7.6			
Idotea	1.5	<0.1	3.8	0.1
sp. (juv.)	±1.7		±7.5	
Jaeropsis	4.0	<0.1	0.3	0.1
dubia	±3.9		±0.5	
Jaeropsis	0		0.3	0.1
lobata			±0.5	
Munna	1.5	<0.1	0	
chromatocephala	±1.9			
Munna	26.5	<0.1	1.8	0.1
ubiquita	±31.7		±2.1	
Munna	38.3	0.0	0	
sp.	±46.2	±0.1		

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Parathura elegans	1.5 ±1.9	<0.1	0.3 ± 0.5	<0.1
Amphipoda				
Caprella californica	2.0 ±4.0	<0.1	0	
Caprella mendax	0.8 ±1.5	<0.1	0	
Caprella sp.	0		0.3 ±0.5	<0.1
Caprellidea sp. (juv.)	0.8 ±1.5	<0.1	93.5 ±183.0	<0.1
Gammaridea spp.	2337.0 ±1991.4	3.2 3.7	30.0 ±36.2	0.3 0.6
Metacaprella anomala	0.8 ±1.5	<0.1	0	
Metacaprella kennerlyi	1.5 ±3.0	<0.1	19.5 ±37.7	<0.1 ±0.1
Metacaprella sp.	0.5 ±1.0	<0.1	0	
Decapoda				
Cancer oregonensis	7.0 ±5.7	4.6 ±4.9	0	
Cancer sp. (juv.)	0.3 ±0.5	<0.1	0	
Caridea sp. (juv.)	29.8 ±31.5	<0.1	0	
Cryptolithodes sitchensis	1.3 ±2.5	0.5 ±0.9	0	
Cryptolithodes typicus	1.3 ±1.9	0.2 ±0.3	0	

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Cryptolithodes	10.8	0.1	0	
sp. (juv.)	±9.5	±0.1		
Discorsopagurus	3.0	0.1	0	
schmitti	±3.2	±0.1		
Elassochirus	0		0.3	0.1
tenuimanus			±0.5	±0.2
Hippolytidae	2.	<0.1	0	
sp. (juv.)	±5.0			
Lebbeus	0.8	<0.1	0	
sp. (juv.)	±1.5			
Majidae	92.5	0.2	0	
sp. (juv.)	±70.1	±0.2		
Mimulus	1.8	0.6	0	
foliatus	±2.1	±0.7		
Oregonia	0.5	0.2	0	
gracilis	±0.6	±0.2		
Pagurus	6.5	1.1	0	
beringanus	±11.7	±2.0		
Pagurus	13.5	0.9	0	
dalli	±19.8	±1.1		
Pagurus	4.3	0.5	0.3	0.2
kennerlyi	±7.9	±0.8	±0.5	±0.3
Paguridae	83.0	1.4	2.0	0.1
sp. (juv.)	±61.6	±1.6	±2.7	±0.1
Petrolisthes	5.0	0.1	0	
erionerus	±6.0	±0.2		
Phyllolithodes	2.3	<0.1	0	
papillosus	±3.3			
Pugettia	240.0	9.5	1.0	<0.1
gracilis	±235.5	±10.1	±1.4	

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Spirontocaris	1.3	0.1	0	
prionota	±2.5	±0.2		
Spirontocaris	64.8	0.3	0	
sp.	±79.5	±0.4		
Insecta				
Diptera	3.0	<0.1	0	
larvae spp.	±3.8			
Bryozoa		19.9		0
spp.		±39.8		
Heteropora		0		2.8
sp.				±5.6
Echinodermata				
Ophiuroidea	11.8	0.0	1.3	<0.1
(juv.)	±12.2	±0.1	±1.9	
Amphipholis	4.0	<0.1	0.8	<0.1
squamata	±8.0		±1.5	
Asteroidea	0.3	<0.1	0	
sp.	±0.5			
Echinoidea				
Strongylocentrotus	6.3	279.0	4.0	175.3
droebachiensis	±4.8	±206.5	±6.2	±319.2
Strongylocentrotus	2.3	696.6	1.3	430.8
franciscanus	±2.6	±804.6	±1.0	±391.3
Strongylocentrotus	0.3	32.4	0	
purpuratus	±0.5	±64.8		
Strongylocentrotus	2.5	4.7	0	
sp. (juv.)	±2.9	±7.4		

Table 2a. Pillar Point (rock) benthic organisms from the high (+6') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.01 (N=20) and 0.2 (N=4) m² $\pm$ standard deviation.

	0.01m ²		0.2m ²	
	#	wt	#	wt
Chlorophyta				
Cladophoraceae		<0.1		0
sp.				
Rhizoclonium		<0.1		0
riparium				
Ulva		<0.1		0
sp.				
Urospora		<0.1		0
sp.				
Bacillariophyta				
Pennales		<0.1		0
spp.				
Phaeophyta				
Analipus		0.2		0
japonicus		± 0.5		
Fucus		0.3		2.2
distichus		± 1.1		± 4.4
Rhodophyta				
Antithamnion		<0.1		0
dendroideum				
Endocladia		0.1		0
muricata		± 0.2		
Grigartina		0.1		0.7
papillata		± 0.2		± 0.9
Halosaccion				
glandiforme		± 0.2		± 0.2
Hildenbrandia		$\checkmark$		0
sp.				
Iridaea		0.1		0.0
heterocarpa		± 0.0		± 0.2

Tongue Point
Subtidal

	-5 m		-10 m	
	#	wt	#	wt
Holothuroidea	6.0	2.9	0.3	<0.1
sp.	±9.4	±4.8	±0.5	
Eupentacta	0.3	<0.1	0	
sp.	±0.5			
Parastichopus	0		0.3	85.3
californiensis			±0.5	±170.6
Chorodata/ Ascidacea	2.0	0.4	0	
	±4.0	±0.8		
Species Richness	209		94	
Diversity - H'	1.45		3.00	
Total Number	4,658.7		208.5	
Algal Biomass	1,169.4		15.0	
Animal Biomass	1,120.5		731.9	
Total biomass	2,289.9		746.9	

		0.01m ²		0.2m ²	
		#	wt	#	wt
Petrocelis			✓		0
	sp.				
Porphyra			0.0		0
	sp.		±0.0		0
Pterosiphonia			0.1		0
Spermatophyta					
Phyllospadix			0		1.1
scouleri			0		±2.2
Nematoda		0.1	<0.1		0
	sp.				
Mollusca					
Gastropoda					
Acmaeidae		0.5	<0.1		0
	sp. (juv.)	±1.4			
Collisella		1.2	0.7	11.3	8.2
digitalis		±1.9	±1.2	±6.1	±4.0
C.					
pelta		0.9	2.1	2.4	2.4
C.		0.1	<0.1	2.3	0.5
strigatella		±0.2		±4.5	±1.0
Littorina		2.1	0.0	0.3	0.1
scutulata		±1.8	±0.1	±0.5	±0.1
L.		10.9	0.2	0	
sitkana		±9.2	±0.3		
Notoacmaea			0	0.5	0.4
persona				±0.6	±0.6
N.					
scutum		±0.7	±0.5	±1.4	±1.1
Thais		0.1	0.1	0.5	0.6
emarginata		±0.2	±0.3	±1.0	±1.2

	0.01m ²		0.2m ²	
	#	wt	#	wt
Bivalvia				
Mytilus	0		3.3	1.6
californianus			±6.5	±3.2
M.	0.1	0.0	0	
edulis	±0.2	±0.1		
M.	4.0	0.1	0	
(spp. (juv.))	±6.5	±0.3	0	
Annelida				
Oligochaeta	0.3	<0.1	0	
sp.	±0.8			
Polychaeta				
Syllidae				
Syllis	0.2	<0.1		
adamantea	±0.4			
S.				
spp.	±0.4			
Crustacea				
Cirripedia				
Balanus	0.7	0.0	2.3	12.8
cariosus	1.7	0.2	±3.9	±18.3
B.	17.7	0.7	0	
glandula	±8.7	±0.6		
B.	0.4	<0.1	0	
sp. (juv.)	±0.9			
Guthamalus	74.6	1.9	0	
dalli	±47.1	±24		
Tanaidacea				
Pancolus	0.1	<0.1	0	
californiensis	.2			

Pillar Point

+6

		0.01m ²		0.2m ²	
		#	wt	#	wt
Isopoda					
Cryptothir		0.1	<0.1	0	
belani		±0.4			
Idotea		0		6.3	0.4
montereyensis				±12.5	±0.7
Amphipoda					
Gammaridea		0.7	<0.1	1.8	<0.1
sp.		±1.5		±3.5	
Insecta		1.7	<0.1	0	
Diptera larvae		±2.1			

Species richness	42
Diversity - H'	1.85
Total number	2905.0
Total biomass	120.0

Table 2b. Pillar Point (rock) benthic organisms from the mid (+3') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.01 (N=20) and 0.2 (N=4) m² ± standard deviation.

	0.01m ²		0.2m ²	
	#	wt	#	wt
Chlorophyta				
Chaetomorpha		<0.1		0
sp.				
Cladophoraceae		<0.1		0
sp.				
Enteromorpha		<0.1		0
linza				
Rhizoclonium		<0.1		0
riparium				
Spongomorpha		0.0		0
coarctata		±0.1		.
S.		<0.1		0
sp.				
Ulva		0.1		0.5
sp.		±0.2		±0.6
Bacillariophyta				
Pennales		±0.1		0
spp.		0.1		0
Phaeophyta				
Alaria		17.5		426.2
sp.		±37.6		±772.1
Ectocarpales		0.0		0
sp.		±0.0		
Ectocarpus		0.0		0
sp.		±0.1		
Egregia		0.2		0
menziesii		±0.7		
Hedophyllum		9.1		286.4
sessile		±37.7		±365.7
Laminariales		0.0		0.0
sp. (juv.)		±0.1		±0.1

Pillar Point

+3

	0.01m ²		0.2m ²	
	#	wt	#	wt
Ralfsiaceae		✓		0
sp.				
Sphacelaria		0.0		0
racemosa		0.1		
S.		±0.1		0
sp.		<0.1		0
Rhodophyta				
Acrochaetium		<0.1		0
sp.				
Ahnfeltia		0.0		0
plicata		<0.1		
Antithamnion		<0.1		0
defectum				
Antithamnionella		<0.1		0
pacifica var. pacifica				
A.				
glandulifera				
Bossiella		0.0		0
plumosa		±0.1		
Callithamnion		<0.1		0
/pleonosporium				
C.				
pikeanum		<0.1		
Ceramiales		<0.1		0
sp.				
Choreocolax		<0.1		0
polysiphoniae				
Corallina		0.2		0
vancouveriensis		±0.3		
Corallinaceae		✓		0
sp.				
Cryptosiphonia		1.0		0
woodii		±2.3		

	0.01m ²		0.2m ²	
	#	wt	#	wt
Delessariaceae		✓		0
sp.				
Delessaria		0.0		0
decepiens		±0.0		
Gigartinaceae		0.2		0
sp.		±0.3		
Gigartina		0.3		6.6
papillata		+0.7		±6.1
Halosaccion		0.1		0.2
glandiforme		+0.1		±0.4
Iridaea		7.1		156.8
cordata		±10.9		±161.5
I.		0.1		0.1
sp.		+0.2		±0.2
Membranoptera		0.0		0
multiramosa		±0.1		
M.		<0.1		0
sp.				
Microcladia		0.9		0
borealis		±1.0		
Neoptilota		0.8		0
asplenioides		±2.6		
Odonthalia		2.2		0
floccosa		±4.9		
Petrocelis		0		✓
middendorffii				
Phycodrys		<0.1		0
isabellae				
Platythamnion		<0.1		0
heteromorphum				
P.		<0.1		0
villosum				
P.		<0.1		0
sp.				

	0.01m ²		0.2m ²	
	#	wt	#	wt
Plocamium		0.5		0
tenu		+2.2		
Polysiphonia		<0.1		0
hendryi				
P.		0.1		0
pacifica		+0.1		
Porphyra		0.1		0.5
sp.		+0.1		+0.6
pterosiphonia		<0.1		0
bipinnata				
Ptilota		0.8		0
filicina		+2.0		
Ptilothamnionopsis		<0.1		0
lejolisea				
Rhodomenia		0.0		0.1
palmata		+0.1		+0.3
Scagelia		<0.1		0
occidentale				
Porifera				
spp.		✓		0
Platyhelminthes				
Turbellaria	0.1	<0.1		0
spp.	0.2			
Nemertea	1.5	<0.1	0	
spp.	+2.5			
Nematoda				
spp.	9.8	<0.1	0	
Mollusca	+19.6			
Amphinera				
Cyanoplax	0		0.3	<0.1
dentiens				0.5
Katharina	0.1	1.3	3.8	59.6
tunicata	+0.4	+5.8	+5.0	+62.9

	0.01m ²		0.2m ²	
	#	wt	#	wt
Mopalia	0		0.3	2.2
sp.	0		±0.5	±4.4
Gastropoda				
Acmaeidae	0.3	<0.1	0	
sp. (juv.)	±0.4			
Barleeia	0.5	<0.1	0	
haliotiphila	±2.0			
Thais	0.1	<0.1	0	
canaliculata	±0.4			
T.				
sp.	±0.3			
Bivalvia				
Adula	0.8	0	0.3	0.1
californiensis	±2.3		±0.5	±0.1
Hiatella	0.4	0.0	1.0	0.4
artica	±0.8	±0.1	±2.0	±0.7
Musculus	0.2	<0.1	0	
pygmaeus	±0.2			
Mytilus	0		0.5	0.1
edulis	0		±1.0	±0.2
M.	10.0	0.0	0	
sp. (juv.)	±23.8	±0.1		
Prothaca	0.1	<0.1	0	
staminea	±0.2			
Tresus	0.1	<0.1	0	
capax	±0.4			
Annelida				
Oligochaeta	1.4	<0.1	0	
spp.	±2.4			
Polychaeta				
Arenicolidae	1.0	<0.1	0	
sp.	±2.6			

Pillar Point +3

	0.01m ²		0.2m ²	
	#	wt	#	wt
Capitellidae				
Capitella	0.2	<0.1	0	
Capitata	±0.7			
Eunicoidea	0.2	<0.1	0	
sp.	±0.4			
Lumbrineridae				
Lumbrineris	0.2	<0.1	0	
sp.	±0.5			
Nereidae	0.6	<0.1	0	
sp.	±1.3			
Nereis	0.1	<0.1	0	
sp.	±0.4			
Orbiniidae	0.1	<0.1	0	
sp.	±0.2			
Naineris	0.1	<0.1	0	
dendritica	±0.4			
Phyllodocidae				
Eulalia	0.8	<0.1	0	
quadrioculata	±2.0			
E.	0.1	<0.1	0	
sp.	±0.2			
Polynoidae				
Halosydna	0.2	<0.1	0	
brevisetosa	±0.4			
Sabellidae				
spp.	1.8	<0.1	0	
Fabricia	2.5	<0.1	0	
oregonica	±4.6			

	0.01m ²		0.2m ²	
	#	wt	#	wt
Schizobranchia	0.3	<0.1	0	
insignis	±1.1			
Oriopsis	0.7	<0.1	0	
minuta	±1.3			
Serpulidae				
spp.	0.1 ±0.2	<0.1	0	
Sigalionidae				
Pholoe	0.9	<0.1	0	
minuta	±2.4			
Spionidae				
spp.	0.1	<0.1	0	
	±0.2			
Polydora	0.1	<0.1	0	
columbiana	±0.2			
P.	0.7	<0.1	0	
sp.	±1.4			
Syllidae				
Exogone	0.1	<0.1	0	
gemmaifera	±0.3			
E.	0.1	<0.1	0	
sp.	±0.2			
Odontosyllis	0.3	<0.1	0	
sp.	±1.1			
Syllis	3.2	<0.1	0	
spp.	±5.7			
Pycnogonida				
Achelie	0.2	<0.1	0	
gracilipes	±0.7			
A.				
nudiusscula	±0.2			
Halosoma	0.1	<0.1	0	
compactum	±0.2			

	0.01m ²		0.2m ²	
	#	wt	#	wt
H.	0.2	0.1	0	
viridintestinale	±0.7			
Nymphon	0.1	<0.1	0	
pixellae	±0.2			
Crustacea				
Ostracoda				
spp.	0.2	<0.1	0	
	±0.5			
Cirripedia				
Balanus	2.1	14.6	13.3	130.4
cariosus	±4.0	±33.6	±21.5	±211.1
B.	0		0.8	42.3
nubilis			±1.5	±84.6
B.	0.5	<0.1	0	
sp. (juv)	±1.1			
Cumacea				
Cumella	0.2	<0.1		
vulgaris	±0.5			
C.	0.1	<0.1	0	
sp.	±0.3			
Tanaidacea				
Leptochelia	21.6	<0.1	0	
dubia	±82.2			
Pancolus	0.9	<0.1	0	
californiensis	±2.0			
Isopoda				
Cirolana	0.2	<0.1	0.8	0.1
harfordi	±0.5		±1.5	±0.2
Dynamenella	5.5	<0.1	0	
sheari	±9.5			
Exosphaeroma	0.4	<0.1	0	
amplicauda	±1.1			
E.	0.3	<0.1	0	
media	±0.6			

Pillar Point +3

	0.01m ²		0.2m ²	
	#	wt	#	wt
Ianiropsis	1.1	< 0.1	0	
kincaidi	0.2			
Idotea	0.1	< 0.1	0	
vosnesenski	± 0.2			
I.	2.9	< 0.1	0	
sp. (juv.)	± 5.8			
Munna	7.9	< 0.1	0	
chromatocephala	± 30.0			
Amphipoda				
Cercops	2.9	< 0.1	0	
compactus	± 4.8			
Gammaridea	1.0	< 0.1	0	
spp.	± 2.2			
Insecta				
Diptera larvae	1.3	< 0.1	0	
spp.	± 1.8			
Bryozoa				
spp.		✓	0	
Echinodermata				
Eupentacta	0.5	< 0.1		
quinquesemita	± 2.0			
Leptasterias	0		0.3	0.2
hexactis			± 0.5	± 0.3
Ophiuroidea	0.1	< 0.1	0	
sp.	± 0.2			
Chordata				
Ascidacea		✓		0
Species richness	131			
Diversity - H'	2.50			
Total Number	2243.4			
Total biomass	1579.3			

Table 2c. Pillar Point (rock) benthic organisms from the low (+0') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.01 (N=20) and 0.2 (N=4) m² ± standard deviation.

	0.01m ²		0.2m ²	
	#	wt	#	wt
Chlorophyta				
Chaetomorpha		<0.1		0
sp.				
Cladophoraceae		<0.1		0
sp.				
Enteromorpha		<0.1		0
linza				
F.		<0.1		0
sp.				
Rhizoclonium		<0.1		0
riparium				
Spongomorpha		0.0		0
coalita		±0.0		
Ulothrix		<0.1		0
sp.				
Ulva		<0.1		+0.4
sp.				±0.9
Bacillariophyta				
Pennales		<0.1		0
spp.				
Phaeophyta				
Alaria		24.0		518.7
spp.		±78.8		±430.2
Ectocarpus		<0.1		0
sp.				
Egregia		5.3		324.3
menziesii		±23.7		±648.5
Feldmannia		<0.1		0
simplex				
Hedophnyllum		0		15.5
sessile				±30.9

	<u>0.01m²</u>		<u>0.2m²</u>	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Laminaria		+1.6		0
setchellii		+7.0		
Laminariales		+3.8		0
sp.		+16.1		0
Phaeostrophion		<0.1		0
irregulare				
Sphacelaria		<0.1		0
racemosa				
S.		<0.1		0
sp.				
Stictyosiphon		<0.1		0
totilis				
Rhodophyta				
Acrochaetium		<0.1		0
spp.				
Antithamnion		<0.1		0
defectum				
A.		+0.1		0
dendroideum		+0.1		
Bosziella		+0.0		0
plumosa		+0.0		
Callithamnion		<0.1		0
pikeanum				
Callithamnion		<0.1		0
Pleonosporium				
Ceramium		<0.1		0
eatonianum				
Choreocolax		<0.1		0
polysiphoniæ				
Corallina		+0.0		0
vancouveriensis		+0.0		
Corallianaceae		✓		0
sp.				

	0.01m ²		0.2m ²	
	#	wt	#	wt
Cryptosiphonia		<0.1		0
woodii				
Delesseriaceae		<0.1		0
sp.				
Endocladia		+0.0		0
muricata		-0.0		
Gigartina		+0.1		0
papillata		+0.2		
Gigartinaceae		+0.1		0
sp. (juv.)		+0.1		
Gracilaria		+0.0		0
andersonii		+0.1		
Gracilariophila		<0.1		0
oryzoides				
Gymnogongrus		+0.2		0
leptophyllus		+0.5		
Halosaccion		<0.1		0
glandiforme				
Iridaea		+5.1		+52.2
cordata		+7.9		+64.6
Iridaea		+0.1		<0.1
sp.		+0.3		
Membranoptera		<0.1		0
multiramosa				
M.		<0.1		0
sp. (juv.)				
Microcladia		<0.1		0
borealis				
Odonthalia		+0.0		0
floccosa		+0.1		
Platythamnion		<0.1		0
sp.				
Plocamium		<0.1		0
sp. (juv.)				

	0.01m ²		0.2m ²	
	#	wt	#	wt
Polysiphonia		<0.1		0
hendryi				
P.		<0.1		0
pacificus				
P.		<0.1		0
sp.				
Porphyra		<0.1		0
sp.				
Pterosiphonia		<0.1		0
bipinnata				
Pterosiphonia		<0.1		0
sp. (juv.)				
Ptilota		+0.3		0
filicina		-0.6		
Rhodymeria		<0.1		0
sp.				
Spermatophyta				
Phyllospadix		+24.1		+1223.9
scouleri		-57.3		-1685.2
Porifera		✓		
spp.				0
Cnidaria				
Hydrozoa				
spp.		✓		0
Nemertea				
spp.	2.1	<0.1	0	
	± 5.4			

Pillar Point + 0

		0.01m ²		0.2m ²	
		#	wt	#	wt
Nematoda				0	
	spp.	82.0	<0.1		
		±203.6			
Mollusca					
	Amphineura				
	Tonicella	0		0.5	
	lineata			±0.1	
Gastropoda					
	Acmaeidae	0.1	<0.1	0	
	sp. (juv.)				
	Lacuna	0.2	<0.1	0	
	variegata	<0.4			
	Thais	0.1	0.2	0	
	lamellosa	±0.2	±1.0		
Bivalvia					
	Adula	0.5	<0.1	0	
	californiensis	±1.2			
	Musculus	0.1	<0.1	0	
	pygmaeus	±0.4			
	Myrella	0.3	<0.1	0	
	tumida	±0.9			
	Mytilus	0.2	<0.1	0	
	sp. (juv.)	±0.4			
Annelida					
	Oligochaeta				
	spp.	16.3	<0.1	0	
		±42.0			

	0.01m ²		0.2m ²	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Polychaeta				
spp.	0.2 ±0.4	<0.1	0	
Arenicolidae				
sp.	20.4 ±47.5	<0.1	0	
Branchiomaldane				
vincenti	0.1 ±0.3	<0.1	0	
Capitellidae				
Capitella	0.4 ±0.8	<0.1	0	
capitata				
Mediomastus	0.2 ±0.7	<0.1	0	
sp.				
Cirratulidae				
Cirratulus	0.2 ±0.5	<0.1	0	
cirratus				
Eunicoidea				
sp.	0.1 ±0.2	<0.1	0	
Lumbrineridae				
Lumbrineris	4.8 ±8.6	<0.1	0	
sp.				
Nereidae				
Nereis	0.1 ±0.2	<0.1	0	
pelagica				
N.	0.2 ±0.5	<0.1	0	
sp.				
Orbinidae				
sp.	0.2 ±0.5	<0.1	0	
Naineris	1.6 ±3.9	<0.1	0	
dendritica				
Phyllodocidae				
Eteone	0.1 ±0.3	<0.1	0	
longa				

Pillar Point

+ 0

	0.01m ²		0.2m ²	
	#	wt	#	wt
Eulalia	1.2	<0.1	0	
quadrioculata	±3.1			
Phyllococe	0.2	<0.1	0	
maculata	±0.7			
Polynoidae				
Halosydna	0.1	<0.1	0	
brevisetosa	±0.2			
Sabellariidae				
sp.	0.1	<0.1	0	
	±0.2			
Sabellidae				
sp.	0.1	<0.1	0	
	±0.2			
Schizothaenia	0.1	<0.1	0	
insignis	±0.3			
Spionidae				
Malacocercus	0.1	<0.1	0	
gluteus	±0.2			
Polydora	1.7	<0.1	0	
columbiana	±5.1			
P.	1.3	<0.1	0	
limicola	±4.1			
P.	5.4	<0.1	0	
sp.	±15.1			
Pygospio	0.8	<0.1	0	
elegans	±2.1			
Syllidae				
Brania	0.1	<0.1	0	
brevipharyngea	±0.2			
Exogone	0.1	<0.1	0	
lourci	±0.3			
E.	0.1	<0.1	0	
sp.	±0.2			
Syllis	2.5	<0.1	0	
spp.	±4.7			

Pillar Point + 0

	0.01m ²		0.2m ²	
	#	wt	#	wt
Terebellidae				
sp.	0.1	<0.1		
	±0.4		0	
Thelepus	0.2	<0.1	0	
crispus	±0.6			
Pycnogonida				
Halosoma	0.2	<0.1	0	
compactum	±0.7			
Crustacea				
Ostracoda				
spp.	0.2	<0.1	0	
	±0.6			
Cirripedia				
Balanus	0.1	<0.1	0	
sp. (juv.)	±0.2			
Cumacea				
Cumella	0.7	<0.1	0	
vulgaris	±2.2			
Tanaidacea				
Aristonais	0.4	<0.1	0	
normani	±1.6			
Leptochelia	0.2	<0.1	0	
dubia	±0.5			
Pancolus	0.2	<0.1	0	
californiensis	±0.5			
Isopoda				
Exosphaeroma	0.2	<0.1	0	
amplicauda	±0.4			
E.	0.1	<0.1	0	
media	±0.2			
E.	0.1	<0.1	0	
rhomburum	±0.3			

		0.01m ²		0.2m ²	
		#	wt	#	wt
Gnathosphaeroma		0.4	<0.1	0	
oregonense		±1.0			
Ianirorais		0.3	<0.1	0	
kincaidi		±0.6			
Idotea		1.0	0.1	33.5	2.3
montereyensis		±2.2	±0.1	±53.2	±3.5
I.		1.3	±0.1	0	
sp. (juv.)		±2.8			
Munna		0.1	<0.1	0	
stephenseni		±0.2			
Amphipoda					
Ceratos		0.1	<0.1	0	
compactus		±0.2			
Gammaridea					
spp.		5.1	<0.1	8.0	0.4
		±5.6		±14.7	±0.7
Decapoda					
Cancer		0		0.5	0.3
oregonensis				±0.6	±0.2
Cryptolithodes		0.1	<0.1	0	
sitchensis		±0.2			
Pagurus		0.1	0.0	0.3	0.4
hispidusculus		±0.2	±0.0	±0.5	±0.8
Pugettia		0.1	0.1	1.3	2.6
gracilis		±0.3	±0.3	±1.0	±2.2
Insecta					
Diptera					
spp. (juv.)		0.2	<0.1	0	
		±0.4			
Bryozoa					
spp.			✓		0

Pillar Point + 0

Species richness	124
Diversity - H'	2.04
Total number	3910.6
Total biomass	2843.8

Table 24. Pillar Point (fine-med. sand) benthic organisms from the subtidal zone collected 22 June 1977, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=4).

	-5m		-10m	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Cnidaria				
Anthozoa	1.8	0.1	0	
spp.	±1.7	±0.1		
Platyhelminthes	0.3	<0.1	0	
spp.	±0.5			
Nemertea	12.0	<0.1	6.0	<0.1
spp.	±4.3		±2.7	
Nematoda	19.3	<0.1	4.8	<0.1
spp.	±10.1		±2.1	
Mollusca				
Gastropoda				
Opisthobranchia	0		0.3	<0.1
Aeolididae			±0.5	
Odostomia sp.	0.5	<0.1	0	
	±1.0			
Prosobranchia				
Alvinia	0.3	<0.1	0	
sp.	±0.5			
Amphissa	0		0.3	0.0
columbiana			±0.5	±0.1
Calyptraea	0		1.0	0.1
fastigiata			±0.8	
Lacuna	7.8	0.1	1.5	0.1
variegata	±6.2	±0.2	±2.4	

Pillar Point Subtidal

	-5m		-10m	
	#	wt	#	wt
Margarites	0.3	<0.1	2.3	0.0
pupillus	±0.5		<1.7	<0.1
Thais	0		0.3	<0.1
lamellosa			±0.5	
Rivalvia				
Clinocardium	0.5	0.3	0	
nuttallii	±0.6	±0.7		
Lucinoma	0	0.5	<0.1	
tenuisculpta			±1.0	
Macoma	0.3	<0.1	0.3	0.1
nasuta	±0.5		±0.5	±0.1
M.	2.8	<0.1	0.3	<0.1
sp. (juv.)	±3.4		±0.5	
Mya	0.5	0.1	0.8	0.0
arenaria	±1.0	±0.2	±1.0	±0.1
Myrella	20.0	<0.1	4.8	<0.1
tumida	±8.0		±6.2	
Solen	0		0.3	<0.1
sicarius			±0.5	
Tellina	2.3	<0.1	2.6	0.1
spp.				±0.1
Transennella	23.8	0.1	10.8	0.1
tantilla		±0.2		±0.1
Tresus	3.5	<0.1	1.8	0.1
capax	±3.3		±1.5	±0.1
Annelida				
Oligochaeta				
spp.	5.5	<0.1	1.5	<0.1
	±2.4		±1.3	

Pillar Point Subtidal

	-5m		-10m	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Polychaeta				
Arabellidae				
Arabella	0		0.3	<0.1
iricolor			±0.5	
Capitellidae				
Capitella	43.5	<0.1	3.3	<0.1
capitata	±8.7		±3.8	
Mediomastus	91.5	<0.1	19.0	<0.1
sp.	±57.3		±10.6	
Notozastus	0		0.3	<0.1
lineatus			±0.5	
V.	0		0.3	<0.1
tenuis			±0.5	
Chaetopteridae				
Spirochaetopterus	0		0.3	<0.1
costarum			±0.5	
Cirratulidae	14.5	0.1	4.5	<0.1
sp.	±5.5		±1.7	
Cirratulus	0		0.3	<0.1
cirratus			±0.5	
Chaetozone	1.5	<0.1	9.8	<0.1
setosa	±1.7		±5.7	
Dorvilleidae				
Protodorvillea	0.8	<0.1	3.3	<0.1
gracilis	±1.0		±2.1	
Glyceridae				
Glycera	0		0.3	<0.1
americana			±0.5	
Coniadiidae				
Glycinde	1.0	<0.1	1.8	<0.1
armigera	±1.4		±1.5	

Pillar Point Subtidal

	-5m		-10m	
	#	wt	#	wt
Goniada	1.0	<0.1	0.3	<0.1
maculata	±0.8		±0.5	
Hesionidae				
sp. A	0		0.5	<0.1
			±0.6	
Gyptis	0.5	<0.1	1.3	<0.1
brevipalpa	±1.0		±1.0	
Micropodarka	1.3	<0.1	1.0	<0.1
dubia	±1.3		±0.8	
Lumbrineridae				
Lumbrineris	3.0	<0.1	0.3	<0.1
sp.	±3.6		±0.5	
Maldanidae				
Euclymene	17.3	<0.1	4.8	<0.1
sp.	±8.5		±2.5	
Nephtyidae				
Nephtys	0		0.5	<0.1
caecoides			±1.0	
N.	0		0.3	<0.1
californiensis			±0.5	
N.	0		0.3	<0.1
ciliata			±0.5	
N.	0.3	<0.1	0.8	<0.1
sp.	±0.5			
Nereidae				
Nereis	2.0	<0.1	0.8	<0.1
sp. (juv.)	±1.6		±1.0	
Platynereis	5.0	<0.1	2.8	<0.1
bicanaliculata	±4.2		±3.1	
Onuphidae				
Onuphis	0.5	<0.1	1.3	<0.1
elegans	±0.6		±0.5	

Pillar Point Subtidal

	-5m		-10m	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Orbiniidae				
Scoloplos	10.0	<0.1	3.8	<0.1
sp.	±6.7		±0.5	
Oveniidae				
Myriochele	0		0.3	<0.1
oculata			±0.5	
Ovenia	1.8	<0.1	0.5	<0.1
fusiformis	±2.2		±0.6	
Paraonidae				
Aricidea	0		5.5	<0.1
sp.			±3.9	
Pectinariidae				
Pectinaria	0.3	<0.1	0	
granulata	±0.5			
Phyllodoce				
Eteone	0		0.3	<0.1
longa			±0.5	
E.	0.8	<0.1	0	
tuberculata	±0.5			
Eulalia	0.3	<0.1	0	
viridis	±0.5			
Phyllodoce	2.3	<0.1	0.3	<0.1
groenlandica	±2.6		±0.5	
P.	0.8	<0.1	0.5	<0.1
maculata	±1.0		±0.6	
P.	12.5	<0.1	3.8	<0.1
sp. (juv.)	±4.9		±2.5	
Polynoide				
Harmothoe	2.8	<0.1	0.3	<0.1
imbricata	±2.5		±0.5	

Pillar Point Subtidal

	-5m		-10m	
	#	wt	#	wt
H.	0	0.3	0.1	
lunulata			0.5	
Sabellidae				
Chone	0		0.3	<0.1
ncaudata			0.5	
Potamilla	0.3	<0.1	0	
myriops	±0.5			
Sabella	0		0.3	<0.1
media			±0.5	
Scalibregmidae				
Scalibregma	0		0.3	<0.1
inflatum			±0.5	
Sigalionidae				
Pholoe	0.3	<0.1	0.3	<0.1
minuta	±0.5		±0.5	
Spicnidae				
Malacoceros	0		0.3	<0.1
glutaeus			±0.5	
Polydora	0.5	<0.1	0.8	<0.1
socialis	±1.0		±0.1	
Prionospio	0.3	<0.1	0	
cirrifer	±0.5			
P.	150.0	<0.1	33.5	<0.1
steenstrupi	±38.3		±18.3	
Spio	0		0.3	<0.1
filicornis			±0.5	
Syllidae				
Exogone	0.8	<0.1	0	
sp.	±1.0			
Pionosyllis	0		0.3	<0.1
uraga			±0.5	

Pillar Point Subtidal

	-5m		-10m	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Streptosyllis	0.3	<0.1	0	
latipalpa	±0.5			
Syllides	0.3	<0.1	0	
longocirrata	±0.5			
Syllis	0.3	<0.1	2.5	<0.1
spn.	±0.5		±2.7	
Crustacea				
Gerrhacoda				
spn.	51.8	<0.1	11.5	<0.1
Leptostraca	±4.2		±4.7	
Nebalia	0.3	<0.1	0	
pugettensis	±0.5			
Cymacea				
Diastylis	1.0	<0.1	0	
sp.	±2.0			
Diastylopsis	4.3	<0.1	0.3	<0.1
sp.	±2.9		±0.5	
Lampropidae	8.8	<0.1	0.3	<0.1
	±10.1		±0.5	
Tanaidacea				
Anatanais	0.8	<0.1	0.3	<0.1
normani	±1.0		±0.5	
Leptocheilia	18.3	<0.1	5.5	<0.1
dubia	±13.2		±3.1	
Isopoda				
Aega	0		0.3	<0.1
symmetrica			±0.5	
Eteone	0		0.3	<0.1
sp. (juv.)			±0.5	
Laciniopsis	0.3	<0.1	0	
sp.	±0.5			

Pillar Point Subtidal

	-5m		-10m	
	#	wt	#	wt
Jaeropsis	0.5	<0.1	0	
dubia	±1.0			
Munna	0.5	<0.1	0	
sp.	±1.0			
Paranthura	0.3	<0.1	0.3	<0.1
elegans	±0.5		±0.5	
Synidotea	0.5	<0.1	0	
bicuspidata	±1.0			
S.	0.3	<0.1	0	
sp. (juv.)	±0.5			
Amphipoda				
Gammaridea	114.5	0.1	35.0	<0.1
sp.	±34.3	±0.1	±17.9	
Corophia	2.0	<0.1	0	
sp.	±2.5			
Caprellia				
Caprellia	0		0.3	<0.1
sp.			±0.5	
Tritella	0.5	<0.1	0.5	<0.1
pilimana	±1.0		±1.0	
Decapoda				
Majidae	0		0.3	<0.1
sp. (juv.)			±0.5	
Pinnotheridae	1.3	<0.1	0.5	<0.1
sp.	±1.5		±0.6	
Paguridae	0		0.5	<0.1
spp.			±0.6	
Pugettia	1.6	<0.1	0.3	<0.1
gracilis			±0.5	
Phoronida	8.5	<0.1	0.8	<0.1
spp.	5.1		±0.5	

Pillar Point Subtidal

	<u>-5m</u>		<u>-10m</u>	
	<u>#</u>	<u>wt</u>	<u>#</u>	<u>wt</u>
Echinodermata				
Ophiuroidea	0		0.3	<0.1
sp. (juv.)			±0.5	
Holothuroidea				
Leptosynapta	1.3	<0.1	0	
clarki	±1.5			
Species Richness	77		86	
Diversity - H	2.82		3.26	
Total number	690.7		221.3	
Plant biomass	0.0		0.0	
Animal biomass	<7.9		<8.4	
Total Biomass	<7.9		<8.4	

Table 3a. North Beach Cobble (sand-gravel-cobble) benthic organisms from the high (+6') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.01 (N=20), 0.05 (N=4), and 0.2 (N=4) m² $\pm$ standard deviation.

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Nemertea	0		0		1.5	<0.1
spp.					± 1.3	
Nematoda	0		0		1.0	<0.1
spp.					± 1.2	
Mollusca						
Gastropoda						
Acmaeidae	0		0		0.3	<0.1
sp. (juv.)					± 0.5	
Collisella	0.1	<0.1	0		0	
digitalis	± 0.2					
Littorina	0.4	0.0	0		34.5	1.7
scutulata	± 1.6	± 0.0			± 37.3	± 1.8
L.	0.1	<0.1	0		7.8	1.1
sitkana	± 0.2				± 7.5	± 1.4
Notoacmea	0		0		0.5	<0.1
persona					± 1.0	
Thais	0		0		0.3	0.1
lamellosa					± 0.5	± 0.3
Annelida						
Oligochaeta	0		0		7.0	<0.1
spp.					± 5.7	
Polychaeta						
Nereidae						
Nereis	0		0		6.8	<0.1
vexillosa					± 6.2	
N.	0		0		1.5	<0.1
sp.					± 3.0	
Syllidae						
Syllis	0		0		0.8	<0.1
sp.					± 1.0	

Norta Beach Cobble +6

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Crustacea						
Cirripedia						
Balanus	0		0		16.0	0.9
glandula					±26.1	±1.8
Chthamalus	0.2	< 0.1	0		6.8	0.1
dalli	±0.7				±12.8	±0.2
Isopoda						
Exosphaeroma	0		0		18.3	< 0.1
medis					±13.1	
Amphipoda						
gammaridea	0		0		0.3	< 0.1
spp.					±0.5	
Species richness	16					
Diversity -H'	1.99					
Total number	537					
Total biomass	19.5					

Table 3b. North Beach Cobble (cobble over sand) benthic organisms from the mid (+3') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.01 (N=20), 0.05 (N=4), and 0.2 (N=4) m² ± standard deviation.

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Rhodophyta						
Choreocolax		< 0.1		0		0
polysiphoniae						
Polysiphonia		< 0.1		0		0
hendryi						
Cnidaria						
Anthopleura	0		0.5	0.2	0.3	0.1
elegantissima			±1.0	±0.4	±0.5	±0.1
Nematoda	0			0	7.3	< 0.1
spp.					±3.8	
Mollusca						
Amphineura	0.1	< 0.1	0		0	
sp. (juv.)	±0.4					
Gastropoda						
Acmaeidae	0.7	< 0.1	0		0	
sp. (juv.)	±1.3					
Gollisella	0.5	0.0	0		0	
pelta	±0.9	±0.0				
C.	0.5	0.0	0.3	0.1	0	
strigatella	±0.8	±0.0	±0.5	±0.2		
Littorina	2.2	0.1	0			0.1
scutulata	±2.5	±0.2			±0.3	±0.1
Littorina	4.4	0.3	1.8	0.9	31.3	1.1
sithana	±0.9	±0.6	±2.4	±1.5	±26.1	±0.6
Notoacmea	0.1	0.0	0		0	
fenestrata	±0.2	±0.0				
H.	0		0		1.3	0.1
persona					±2.5	±0.2
H.	0.3	0.0	0.3	0.4	0	
scutum	±0.8	±0.0	±0.5	±0.8		

North Beach Cobble +3

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Notoacmea	0		0.8	0.2	0	
sp.			±1.5	±0.4		
Searlesia	0		0.3	0.8	0.5	0.3
dira			±0.5	±1.5	±1.0	±0.6
Thais	0		0.8	0.3	0	
emarginata			±1.5	±0.5		
T.	0		0.3	0.1	0.5	0.3
lamellosa			±1.5	±0.2	±0.6	±0.4
T.	0		0.5	0.2	0.3	<0.1
sp. (juv.)			±1.0	±0.4	±0.5	
Bivalvia						
Mysella	0.1	<0.1	0		0	
tumida	±0.4					
Mytilus	0.1	<0.1	0		0	
sp. (juv.)	±0.3					
Protothaca	0.1	<0.1	0		0	
staminea	±0.2					
Annelida						
Oligochaeta						
spp.	0		0		3.8	<0.1
					±1.7	
Polychaeta						
Capitellidae						
Capitella	0		0		0.3	<0.1
capitata					±0.5	
Glyceridae						
Hemipodus	0				0.3	<0.1
borealis					±0.5	
Lumbrineridae						
Lumbrineris	0				0.5	<0.1
sp.					±1.0	

North Beach Cobble +3

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Nereidae						
Nereis	0		0		2.8	< 0.1
vexillosa					±2.2	
N.	0		0		4.8	
sp.					±5.6	
Spionidae						
Polydora	0		0		3.8	< 0.1
proboscidea					±4.3	
Pygospio	0		0		0.3	< 0.1
elegans					±0.5	
Syllidae						
Syllis	0		0		6.3	< 0.1
sp.					±4.3	
Crustacea						
Cirripedia						
Balanus	0.4	0.1	0		0.5	0.1
cariosus	±1.3	±0.3			±1.0	±0.2
B.	0.3	< 0.1	0		2.3	0.1
glandula	±0.7				±4.5	±0.2
Chthamalus	0.3	< 0.1	0		0	
dalli	±0.9					
Isopoda						
Exosphaeroma	0.1	< 0.1	0		48.5	0.0
media	±0.2				±40.8	±0.1
Gnoringosphaeroma	0		0		19.0	0.0
oregonense					±22.0	±0.1
Amphipoda						
gammaridea						
spp.	0		0		0.5	< 0.1
					±1.0	
Decapoda						
Hemigrapsus	0.1	0.2	1.3	4.6	0	
nudus	±0.2	±0.7	±1.9	±5.6		

North Beach Cobble +3

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Insecta						
Diptera	0.2	< 0.1	0		0	
larva	±0.5					
Species richness	38					
Diversity -H'	2.48					
Total number	950.5					
Total biomass	32.1					

Table 3c. North Beach Cobble (cobble over sand) benthic organisms from the low (+0') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.01 (N=20), 0.05 (N=4), and 0.2 (N=4) m² $\pm$ standard deviation.

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Chlorophyta						
Cladophoraceae		< 0.1		0		0
sp.						
Enteromorpha		< 0.1		0		0
linza						
Monostroma		0.0		0		0
fuscum		± 0.0				
M.		0.2		4.3		0
spp.		± 0.6		± 8.5		
Ulva		0.9		8.2		< 0.1
spp.		± 1.1		± 8.0		
Bacillariophyta						
Pennales		< 0.1		0		< 0.1
Phaeophyta						
Alaria		5.5		142.6		0.0
spp.		± 15.1		± 212.0		± 0.0
Analipus		0.6		0		0
japonicus		± 1.6				
Desmarestia		0.0		0		0
aculeata		± 0.0				
Ectocarpus		< 0.1		0		0
sp.						
Fucus		0.1		13.3		0
distichus		± 0.3		± 21.0		
Laminariales		0.0		0		0
sp.		± 0.0				
Leathesia		< 0.1		0		0
difformis						
Nereocystis		0		31.3		0
luetkeana				± 62.6		

North Beach Cobble +0

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Petalonia		< 0.1		0		0
fascia						
Ralfsiaceae		✓				✓
Sphacelaria		< 0.1		0		0
racemosa						
Rhodophyta						
Antithamnion		< 0.1		0		0
defectum						
Antithamnionella		< 0.1		0		0
pacifica						
Callithamnion						
/Pleonosporium		< 0.1		0		0
Ceramium		< 0.1		0		0
pacificum						
Choreocolax		< 0.1		0		< 0.1
polysiphoniae						
Crytonemia		0.0		0		0
sp.		±0.0				
Gigartina		0.0		2.2		1.7
papillata		±0.0		±3.8		±2.6
Gigartinaceae		0		0		0.4
spp.						±0.6
Herposiphonia		< 0.1		0		0
plumula						
Laurencia		0		0.0		0
spectabilis				±0.1		
Hollenbergia		< 0.1		0		0
sublata						
Hymenena		0.0		0.3		0
spp.		±0.0		±0.5		

North Beach Cobble +0

	0.01 m ²	0.2 m ²	0.05 m ² x 15 cm
	# wt	# wt	# wt
Iridaea	2.0	80.7	0.3
cordata	±4.5	±79.2	±0.6
I.	0.1	0	0
spp.	±0.1		
Odonthalia	<0.1	0	0
floccosa			
O.	<0.1	0	0
sp.			
Petrocelis	/		/
middendorffii			
Pikea	0.0	0	0
californica	±0.1		
Plocamium	0.1	0	0
coccineum	±0.2		
P.	0.1	0	0
spp.	±0.1		
Polysiphonia	0	0.1	0
laticoma		±0.2	
Polysiphonia	0.0	0	0
hendryi	±0.0		
P.	0.1	0	0.2
pacifica	±0.3		±0.2
P.	0.1	0	<0.1
paniculata	±0.4		
Porphyra	0.0	<0.1	0
spp	±0.0		
Pterosiphonia	1.7	0	0.2
bipinnata	±2.3		±0.2
P.	<0.1	0	0
dendroidea			

North Beach Cobble +)

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Scaphella		< 0.1		0		< 0.1
occidentale						
Spermatophyta						
Phyllospadix		0		0		0.0
scouleri						±0.0
Platyhelminthes						
Turbellaria						
spp.	0.6	< 0.1	0		0	
	±1.6					
Nemertea	0.3	< 0.1	0		1.8	< 0.1
spp.	±0.9				±2.9	
Nematoda	0.6	< 0.1	0		5.8	< 0.1
spp.	±1.4				±4.0	
Mollusca						
Amphineura	0		0		0.5	< 0.1
spp.					±0.6	
Cyanoplax	0		0.3	0.0	0	
dentiens			±0.5	±0.0		
Gastropoda						
Acmaeidae	0.2	< 0.1	0		1.8	< 0.1
spp. (juv.)	±0.7					
Amphissa	0		0		0.3	< 0.1
columbiana					±0.5	
Collisella	0		0.3	0.3	0	
pelta			±0.5	±0.6		
Lacuna	7.7	0.0	0.3	< 0.1	5.8	0.0
variegata	±7.1	±0.1	±0.5		±2.8	±0.0
Notoacmea	0.1	< 0.1	0.5	< 0.1	0.3	0.0
scutum	±0.2		±1.0		±0.5	±0.1
Onchidella	0.1	< 0.1	0		0	
borealis	±0.2					

North Beach Cobble +0

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		0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
		#	wt	#	wt	#	wt
Bivalvia							
Macoma		0		0		0.3	< 0.1
sp.						±0.5	
Mya		0		0		0.1	< 0.1
arenaria						±0.2	
Mysella		0		0		0.3	< 0.1
tumida						±0.5	
Mytilus		0.2	< 0.1	0		0.5	< 0.1
app. (juv.)		± 0.7				±1.0	
Venerupis		0		0		0.3	1.9
japonica						±0.5	±3.9
Annelida							
Oligochaeta		0.1	< 0.1	0		15.8	< 0.1
app.		±0.2				±7.0	
Polychaeta							
Arenicolidae		0		0		0.3	< 0.1
						±0.5	
Capitellidae							
Capitella		0.2	< 0.1	0		0.8	< 0.1
capitata		±0.9				±1.0	
Mediomastus		0		0		0.3	< 0.1
sp.						±0.5	
Notomastus		0		0		0.5	< 0.1
tenuis						±1.0	
N.		0		0		0.3	< 0.1
sp.						±0.5	
Cirratulidae		0.1	< 0.1	0		1.8	< 0.1
app. (juv.)		±0.2				±3.5	
Cirratulus		0		0		0.3	< 0.1
cirratus						±0.5	

North Beach Cobble +0

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Tharyx	0		0		1.0	< 0.1
multifilis					±1.4	
Dorvilleidae						
Protodorvillea	0		0		0.3	< 0.1
gracilis					±0.5	
Eunicidae						
Eunice	0		0		1.4	< 0.1
valens					±2.0	
Glyceridae						
Hemipodus	0		0		6.0	< 0.1
borealis					±0.8	
Lumbrineridae						
Lumbrineris	0.1	< 0.1	0		0.3	< 0.1
spp.	±0.4				±0.5	
Nereidae	0.5	< 0.1	0		0	
spp.	±1.4					
Nereis	0.1	< 0.1	0		0	
vexillosa	±0.2					
N.	0.5		0		0	
spp.	±1.6					
Platynereis	0.1	< 0.1	0.3	< 0.1	0.5	< 0.1
bicanaliculata	±0.3		±0.5		±1.0	
Onuphidae	0.2	< 0.1	0		0	
sp.	±0.7					
Onuphis	0		0		5.0	< 0.1
stigmatis					±3.8	
Opheliidae						
Armandia	0		0		0.5	< 0.1
brevis					±0.6	

North Beach Cobble +0

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Phyllodoctidae						
<i>Eteone</i>	0		0		0.3	< 0.1
<i>longa</i>					±0.5	
<i>Hesionura</i>	0		0		0.3	< 0.1
<i>coineauli</i>						
<i>difficilis</i>					±0.5	
<i>Phyllodoce</i>	0		0		0.3	< 0.1
<i>maculata</i>					±5	
<i>Phyllodoce</i>	0.1	< 0.1	0		0.3	< 0.1
<i>sp.</i>	±0.3				±0.5	
Polynoidae						
<i>Harmothoe</i>	0		0		0.3	< 0.1
<i>imbricata</i>					±0.5	
Syllidae	0.1	< 0.1	0		0.3	< 0.1
<i>spp.</i>	±0.2				±0.5	
<i>Fabricia</i>	0.5	< 0.1	0		0.3	< 0.1
<i>oregonica</i>	±2.0				±0.5	
Spionidae						
<i>Malococeros</i>	0.2	< 0.1	0		12.5	< 0.1
<i>glutaeus</i>	±0.7				±11.7	
<i>Polydora</i>	4.2	< 0.1	0		0.8	< 0.1
<i>columbiana</i>	±17.4				±1.5	
<i>P.</i>	0.7	< 0.1	0		4.0	< 0.1
<i>proboacidea</i>	±2.2				±73	
<i>Pygospio</i>	0		0		0.5	< 0.1
<i>elegans</i>					±0.6	
<i>Spio</i>	0		0		0.5	< 0.1
<i>filicornis</i>					±1.0	
<i>Spiophanes</i>	0		0		2.0	< 0.1
<i>bombyx</i>					±2.2	

North Beach Cobble +0

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Syllidae						
Exogone	0.5	<0.1	0		0.3	<0.1
gemmifera	±1.3				±0.5	
E.	0.7	<0.1	0		1.0	<0.1
lourei	±2.2				±1.4	
Syllis	0.2	<0.1	0		6.0	<0.1
spp.	±0.7				±2.9	
Terebellidae	1.2	<0.1	0		2.0	<0.1
spp.	±4.7				±2.3	
Crustacea						
Ostracoda	0.4	<0.1	0		0	
spp.	±0.8					
Cirripedia						
Balanus	0.1	0.0	0		0	
cariosus	±0.4	±0.1				
Balanus	0.1	<0.1	0		0	
glandula	±0.4					
B.	0		0		0.3	<0.1
sp. (juv.)					±0.5	
Mysidacea						
Archeomysis	0.1	<0.1	0		0.5	
grebnitzkii	±0.3				±1.0	
Cumacea						
Cumella	0.1	<0.1	0		0	
vulgaris	±0.3					
Lampropidae	0.1	<0.1	0		0.3	<0.1
spp.	±0.2				±0.5	
Tanaidacea						
Leptochelia	0.1	<0.1	0		0	
dubia	±0.3					

North Beach Cobble +0

	0.01 m ²		0.2 m ²		0.5 m ² x 15 cm	
	#	wt	#	wt		wt
Isopoda						
Exosphaeroma	0.2	<0.1	0		0.5	<0.1
amplicauda	±0.7				±1.0	
Exosphaeroma	3.7	<0.1	0		3.0	<0.1
media	±8.2				±2.4	
E.					0.8	<0.1
onctoncum					±1.5	
E.	6.6	<0.1	0		0.5	<0.1
spp. (juv.)	±13.5				±0.1	
Gnoringosphaeroma	1.3	<0.1	0		0	
oregonense	±2.8					
Idotea	0.5	<0.1	0		0	
montereyensis	±1.0					
I.	4.0	<0.1	1.0	0.1	0	
vosnesenskii	±6.5		±0.8	±0.1		
I.	6.4	<0.1	0		4.8	<0.1
spp. (juv.)	±13.1				±3.7	
Munna	0.2	<0.1	0		0	
chromatocephala	±0.5					
Amphipoda						
Gammaridea	0		0.3	0.0	15.8	<0.1
sp			±0.5	±0.1	±6.2	
Decapoda						
Cancer	0.1	<0.1	0		0	
oregonensis	±0.2					
Crangon	0.3	0.2	0		0	
munitella	±0.5	±0.4				

North Beach Cobble +0

	0.01 m ²		0.2 m ²		0.05 m ² x 15 cm	
	#	wt	#	wt	#	wt
Insecta						
Dipteran	0.2	< 0.1	0		0.8	< 0.1
larvae	±0.5				±1.5	
Bryozoa						
Bryozoa		0		0	0.3	< 0.1
spp.					±0.5	
Species richness	125					
Diversity -H'	3.24					
Total number	1681.1					
Total biomass	465.6					

Table 4a. Morse Creek (sand-gravel-cobble) benthic organisms from the high (+6') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.01 (N=20), 0.05 (N=4), and 0.2 (N=4) m² ± standard deviation.

	Spr 77				Sum 77			
	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	
	# wt	# wt	# wt	# wt	# wt	# wt	# wt	
Nematoda	0	0	0	0	0	0.3 < 0.1	0	
app.						±0.5		
Nemertea	0	0	0	0	0	0.3 < 0.1	0	
app.						±0.5		
Mollusca								
Gastropoda								
Collisella	0	0	0	0	0	0	0	
stripatella								
Lacuna	0	0	0	0	0	0.3 < 0.1	0	
variegata						±0.5		
Littorina	0	0	0	0	0	0	0	
scutulata								
L.	0	0	3.0 0.0	0	0	0	0	
sitkana			+2.9 +0.1					
Notoacmea	0	0	0.5 < 0.1	0	0	0	0	
persona			±0.5					
Bivalvia								
Myrella	0	0	0	0	0	0.3 < 0.1	0	
tumida						±0.5		
Mytilus	0	0	0	0	0	0	0	
edulis								
M.	0	0	0	0	0	0	0	
sp. (juv.)								
Annelida								
Polychaeta								
Nereidae								
Nereis	0	0	0	0	0	0.8 0.1	0	
vexillosa						±0.5 ±0.1		
N.	0	0	0	0	0	0.3 < 0.1	0	
sp.						±0.5		
Spionidae								
Polydora	0	0	0	0	0	0.3 < 0.1	0	
proboscidea						±0.5		
P.	0	0	0	0	0	0.3 < 0.1	0	
sp. A						±0.5		
Oligochaeta	0	0	0.3 < 0.1	0	0	2.0 < 0.1	0	
app.			±0.5			±2.8		
Crustacea								
Cirripedia								
Balanus	0	0	0	0	0	0	0	
glandula								
B.	0	0	0.3 < 0.1	0	0	0	0	
app. (juv.)			±0.5					

tidal
(a)

Fall 77

Win 78

0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt
0.3 < 0.1 ±0.5	0	0	0	0	0	0.8 < 0.1 ±0.5
0.3 < 0.1 ±0.5	0	0	0	0	0	1.0 < 0.1 ±1.4
0	0	0	0	0	0	0.3 < 0.1 ±0.5
0.3 < 0.1 ±0.5	0	0	0	0	0	0
0	0	0	0.3 < 0.1 ±0.5	0	0	0
0	0	0	0	0	0	4.0 0.4 ±3.4 ±0.2
0	0	0	0	0	0	0.5 0.0 ±1.0 ±0.0
0.3 < 0.1 ±0.5	0	0	0	0	0	0.3 < 0.1 ±0.5
0	0	0	0	0	0	0.3 < 0.1 ±0.5
0	0	0	0	0	0	0.5 < 0.1 ±1.0
0.8 0.1 ±0.5 ±0.1	0	0	0	0	0	0
0.3 < 0.1 ±0.5	0	0	0	0	0	0
0.3 < 0.1 ±0.5	0	0	0	0	0	0
0.3 < 0.1 ±0.5	0	0	0	0	0	0
2.0 < 0.1 ±2.8	0	0	0.5 < 0.1 ±1.0	0	0	1.0 < 0.1 ±1.2
0	0	0	5.5 0.3 ±11.0 ±0.5	0	0	20.3 0.6 ±33.0 ±0.6
0	0	0	0	0	0	0

Morse Creek +6

	Spr 77						Sum 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Crustacea (cont.)												
Cirripedia												
Chthamalus												
dalli	0		0		0		0		0		0	
Mysidacea												
sp. (juv.)	0		0		0		0		0		0	
Tanaidacea												
Leptochelia					0.3 < 0.1		0		0		0	
dubia	0		0		± 0.5							
Isopoda												
Exosphaeroma					0.3 < 0.1		0		0		0	
sp.	0		0		± 0.5							
Gnoriomphaeroma					0		0		0		16.3 0.2	
oregonense	0		0								$\pm 32.5 \pm 0.3$	
Cumacea												
sp. (juv.)	0		0		0		0		0		0.3 < 0.1	
											± 0.5	
Amphipoda												
Gammaridea					5.5 < 0.1		-		-		-	
sp.	0		0		± 1.9							
Allorchestes					-		0		0		0.3 < 0.1	
angustus	-		-								± 0.5	
Corophium					0		0		0		0.3 < 0.1	
brevis	0		0								± 0.5	
C.					0		0		0		0	
sp.	0		0									
Orchestia					-		0		0		0.3 < 0.1	
sp.	-		-								± 0.5	
Orchestoidea					-		0		0		1.5 < 0.1	
pudgettensis	-		-								± 1.7	
Paramoera					-		0		0		99.0 0.2	
columbiana	-		-								$\pm 125.4 \pm 0.1$	
Insecta												
Dipteran					0.3 < 0.1		0		0		0	
larvae	0		0		± 0.5							
Species Richness			8						16			
Diversity, H ¹			1.31						0.76			
Total Number			51.5						614.5			
Total Biomass (g)			< 0.8						< 9.0			

Creek +6		Fall 77				Win 78	
0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	
#	wt	#	wt	#	wt	#	wt
0		0		0		0	0.5 < 0.1 ±1.0
0		0		0.3 < 0.1 ±0.5	0	0	0
0		0		0	0	0	0.3 < 0.1 ±0.5
0		0		0	0	0	0
16.3 0.2 ±32.5 ±0.3		0		0.5 < 0.1 ±1.0	0	0	5.8 < 0.1 ±7.7
0.3 < 0.1 ±0.5		0		0	0	0	0
-		0		55.3 0.2 ±31.5 ±0.2	0	0	6.3 < 0.1 ±6.3
0.3 < 0.1 ±0.5	-	-		-	0	0	0
0.3 < 0.1 ±0.5	0	0		0	0	0	0
0	0	0		0.3 < 0.1 ±0.5	0	0	0.3 < 0.1 ±0.5
0.3 < 0.1 ±0.5	-	-		-	-	-	-
1.5 < 0.1 ±1.7	-	-		-	-	-	-
99.0 0.2 ±125.4 ±0.1	-	-		-	-	-	-
0		0		0		0	0
		7				15	
		0.48				1.72	
		313.5				211.0	
		<5.0				<11.5	

Table 4b. Morse Creek (cobble over sand) benthic organisms from the mid (+3') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.01 (N=29), 0.05 (N=4), and 0.2 (N=4) m² + standard deviation.

	Spr 77						Sum 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Chlorophyta												
Cladophoraceae												
sp.		<0.1		0		0		0		0		0
Enteromorpha												
linza		<0.1		0		0		0.2		3.4		0
								<u>+0.1</u>		<u>+3.4</u>		
Monostroma												
sp.		0		0		0		<0.1		0		0
Spongomorpha												
coacta		0		0		0		<0.1		0		0
S.												
sp.		<0.1		0		0		<0.1		0		0
Ulothrix												
sp.		<0.1		0		0		0		0		0
Ulva												
sp.		0		0		0		0.3		5.4		0
								<u>+0.5</u>		<u>+5.4</u>		
Urospora												
sp.		<0.1		0		0		<0.1		0		0
Bacillariophyta												
Pennales												
sp.		0.0		0		0		<0.1		0		0
		<u>+0.1</u>										
Phaeophyta												
Alaria												
sp.		0		0		0		0		0		0
Desmarestia												
aculeata		<0.1		0		0		0		0		0
Fucus												
distichus		<0.1		0		0		0.4		38.1		0
								<u>+1.9</u>		<u>+43.8</u>		
Laminariales												
spp.		0		0		0		0.1		0		0
								<u>+0.5</u>				
Petalonia												
fascia		0		0		0		0		0.3		0
										<u>+0.6</u>		
Rhodophyta												
Acrochaetium												
sp.		<0.1		0		0		0		<0.1		0
Ahnfeltia												
plicata		0.0		0		0		0		0		0
		<u>+0.1</u>										
Crytosiphonia												
woodii		<0.1		0		0		0		0		0
Endocladia												
muricata		<0.1		0		0		0		0		0
Gigartinaceae												
sp.		0		0		0		0		0		0
Gigartina												
papillata complex		0.7		0		0		0.7		0.8		0
		<u>+1.3</u>						<u>+1.6</u>		<u>+0.6</u>		

Fall 77

Win 78

0.05 $\frac{m^2}{wt}$	0.01 $\frac{m^2}{wt}$	0.2 $\frac{m^2}{wt}$	0.05 $\frac{m^2}{wt}$	0.01 $\frac{m^2}{wt}$	0.2 $\frac{m^2}{wt}$	0.05 $\frac{m^2}{wt}$
0	0	0	0	0	0	0
0	0.1	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0.2 ± 0.2	0.9 ± 1.3	0	<0.1	0	0
0	0	0	0	0	0	0
0	0.1	0	0	0	0	0
0	0	0	0	0.9 ± 4.0	5.9 ± 8.9	0
0	0	0	0	0	0	0
0	<0.1	<0.1	✓	0	0.7 ± 1.4	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0.1	0	0	0	0	0
0	0.5 ± 1.8	5.0 ± 6.1	0	0.1 ± 0.1	0.1 ± 0.1	0

	Spr 77						Sum 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Rhodophyta (cont.)												
Iridaea		0		0		0				0		0
cordata												
I.		0		0		0		0		0		0
sp.												
Odenthalia		0		0		0		0		0		0
floccosa												
Polyaiphonia		0		0		0		0		0		0
hendryi												
P.		<0.1		0		0		<0.1		0		0
pacifica												
P.		<0.1		0		0		0		0		0
sp.												
Porphyra		0		0		0		0.1		0.6		0
sp.								+0.1		+0.7		
Rhodochorton		0		0		0		0		0		0
sp.												
Rhodomela		<0.1		0		0		0		0		0
larix												
Rhodymenia		<0.1		0		0		0		0		0
sp.												
Cnidaria												
Anthozoa		0.4 <0.1		1.0 0.0		0		0		0		0
sp.		+1.1		+2.0 +0.1								
Anthopleura		0.1 <0.1		0		0		0		0		0.3 <0.1
elegantissima		0.2										+0.5
Platyhelminthes												
Turbellaria		0		0.3 0.1		0		0.9 <0.1		0.3 <0.1		0.8 <0.1
app.				+0.5 +0.2				+3.8		+0.5		+1.0
Nemertea												
sp.		0.1 <0.1		0.3 0.0		16.0 0.0		0.2 <0.1		0		32.5 <0.1
Emplectonema		+0.2		+0.5 +0.1		+4.5 +0.1		+0.4				+8.5
gracile		0		0.3 0.0		0		0.1 <0.1		0		0
				+0.5 +0.01				+0.2				
Nematoda												
sp.		0.1 <0.1		0		6.5 <0.1		0.6 <0.1		0		26.8 <0.1
		+0.2				+8.5		+1.0				+26.6
Mollusca												
Amphineura		0.1 <0.1		0		0		0		0		0.3 <0.1
sp. (juv.)		+0.2										+0.5
Cyanoplax		0		0		0		0.3 0.1		0		0
dentiens								+0.5 +0.1				
Gastropoda												
Acmaeidae		1.0 <0.1		0		0.3 <0.1		0.2 <0.1		0		1.0 <0.1
sp.		+1.5						+0.4				+1.4

Fall 77

Win 78

0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
0		0		0		0		0		0.5		0	
0		0		<0.1		0		0		$\frac{+1.0}{0}$		0	
0		0		0		0		<0.1		0		0	
0		0		0		0		<0.1		0		0	
0		<0.1		0		0		0		0		0	
0		0		0		0		0		0		0	
0		0		0		0		<0.1		0		0	
0		0		0		0		<0.1		0		0	
0		0		0		0		0		0		0	
0		0		0		0		0		0		0	
0		0		0		0		0		0		0.8	0.1
0.3	<0.1	0		0		0		0		0		$\frac{+0.5}{0}$	$\frac{+0.1}{0}$
± 0.5													
0.8	<0.1	6.6	<0.1	0		6.8	<0.1	8.9	<0.1	0		4.8	<0.1
± 1.0		± 7.2				± 3.7		± 14.0				± 4.1	
32.5	<0.1	0.1	<0.1	0		17.3	<0.1	0.2	<0.1	0		21.8	✓
± 8.5		± 0.2		0		± 7.5		± 0.5		0		± 10.7	
0		0		0		0		0		0		0	
26.8	<0.1	0.1	<0.1	0		21.8	<0.1	0.1	<0.1	0		17.0	<0.1
± 26.6		± 0.3				± 13.3		± 0.2				± 13.1	
0.3	<0.1	0		0		0		0		0		0	
± 0.5		0		0.3	0.0	0		0.1	<0.1	0.3	0.1	0.5	0.1
0				± 0.5	± 0.1			± 0.2		± 0.5	± 0.2	± 1.0	± 0.1
1.0	<0.1	0.6	<0.1	0		0.3	<0.1	0		1.8	<0.1	1.3	<0.1
± 1.4		± 1.0				± 0.5				± 2.4		± 1.9	

	Spr 77						Sum 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Mollusca (cont.)												
Gastropoda												
Archidoria												
sp.												
Collisella	0		0		0		0		0		0	
digitalis												
C.	0.1	< 0.1	0.3	0.1	0		0.2	0.2	6.3	2.5	0	
pelta	+0.3		+0.5	+0.2			+0.4	+0.8	+11.2	+4.2		
C.	0.2	< 0.1	0		0		0.4	0.2	0.5	0.1	0	
strigatella	+0.4						+0.9	+0.2	+1.0	+0.1		
Lacuna	0		0		0		0.1	< 0.1	0		0	
variegata							+0.2					
Littorina	0		0.3	0.2	0		0		0		0	
scutulata			+0.5	+0.3								
L.	25.8	3.2	2.5	0.8	95.8	5.3	6.6	0.9	0.5	0.1	10.3	0.5
sitkana	+11.9	+2.3	+2.6	+0.8	+41.6	+1.4	+12.5	0.1	+1.0	+0.2	+12.3	+0.5
Margarites	0		0		0.3	< 0.1	0		0		0	
pupillus					+0.5							
Notoacmea	0		3.8	2.7	0		0.1	0.0	2.5	1.1	1.0	0.1
fenestrata			+2.9	+0.9			+0.2	+0.0	+2.1	+0.8	+2.0	+0.1
N.	0		0		0		0.2	0.0	0		0	
persona							+0.5	+0.1				
N.	0		0		0		0.6	0.1	5.3	1.6	0	
scutum							+0.9	+0.2	+5.4	+1.8		
Ocenebra	0		0		0		0		0		0	
lurida												
Onchidella	0.8	1.6	3.8	2.6	1.3	< 0.1	0		0		0	
horealis	+1.1	+4.7	+2.2	+1.0	+1.5							
Thais	0		0		0		0		0		0	
emarginata												
T.	0		0.3	0.2	0		0		2.5	< 0.1	0	
lamellosa			+0.5	+0.5					+4.4			
T.	0		0		0		0		0		0.3	< 0.1
sp. (juv.)											+0.5	
Bivalvia												
Clinocardium	0		0		0		0		0		0	
nuttallii												
Macoma	0		0		0		0		0		0	
inquinata												
M.	0		0		0		0		0		0	
sp. (juv.)												
Musculus	0		0		0		0.1	< 0.1	0		0	
pygmaeus							+0.2					
Mysella	0		0		3.5	< 0.1	0		0		3.5	< 0.1
tumida					+2.4						+0.6	
Mytilus	0		0		0		0		0		0	
californianus												

Creek +3

Fall 77

Win 78

0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
0		0.1	0.0	0		0		0.1	< 0.1	2.5	1.5	0	
		<u>+0.3</u>	<u>+0.0</u>					<u>+0.2</u>		<u>+3.0</u>	<u>+1.8</u>		
0		0.2	0.1	1.8	1.6	0.5	0.0	0.6	0.4	2.5	2.5	0	
		<u>+0.5</u>	<u>+0.5</u>	<u>+2.2</u>	<u>+1.2</u>	<u>+1.0</u>	<u>+0.1</u>	<u>+0.9</u>	<u>+0.7</u>	<u>+1.9</u>	<u>+3.0</u>		
0		0.4	0.0	0		0		0.6	0.0	1.8	< 0.1	1.0	< 0.1
		<u>+0.8</u>	<u>+0.1</u>					<u>+1.4</u>	<u>+0.0</u>	<u>+1.3</u>		<u>+1.4</u>	
0		2.2	0.0	0		0.3	< 0.1	0.3	< 0.1	0		0.3	< 0.1
		<u>+6.4</u>	<u>+0.1</u>			<u>+0.5</u>		<u>+0.6</u>				<u>+0.5</u>	
0		0.1	< 0.1	0		1.5	0.0	0		0		0	
		<u>+0.3</u>				<u>+3.0</u>	<u>+0.1</u>						
10.3	0.5	1.9	0.1	0		3.5	0.1	5.4	1.2	0.3	0.1	5.5	0.0
<u>+12.3</u>	<u>+0.5</u>	<u>+2.5</u>	<u>+0.1</u>			<u>+3.9</u>	<u>+0.1</u>	<u>+10.0</u>	<u>+3.4</u>	<u>+0.5</u>	<u>+0.1</u>	<u>+3.7</u>	<u>+0.1</u>
0		0		0		0		0		0		0	
1.0	0.1	0.3	0.1	5.8	3.4	0		0.6	1.1	5.8	2.5	0	
<u>+2.0</u>	<u>+0.1</u>	<u>+0.4</u>	<u>+0.3</u>	<u>+2.6</u>	<u>+1.7</u>	0		<u>+0.8</u>	<u>+3.1</u>	<u>+3.9</u>	<u>+1.7</u>	0	
0		0		0		0		0		0		0	
0		0.6	0.3	7.5	4.6	0		0.8	0.3	11.5	5.8	4.5	0.0
		<u>+0.9</u>	<u>+0.5</u>	<u>+5.0</u>	<u>+2.4</u>			<u>+1.0</u>	<u>+0.5</u>	<u>+5.5</u>	<u>+2.0</u>	<u>+3.8</u>	<u>+0.1</u>
0		0		0		0.3	< 0.1	0		0		0	
						<u>+0.5</u>							
0		0		0		0		0		0		0	
0		0		0		0		0.1	< 0.1	0		0	
								<u>+0.2</u>					
0		0		0		0		0		1.0	0.8	0	
										<u>+2.0</u>	<u>+1.7</u>		
0.3	< 0.1	0		0		0		0		0		0	
<u>+0.5</u>													
0		0		0		0.5	< 0.1	0		0		0.3	0.3
						<u>+0.6</u>						<u>+0.5</u>	<u>+0.5</u>
0		0		0		0		0		0		0.3	0.1
												<u>+0.5</u>	<u>+0.2</u>
0		0		0		0.3	< 0.1	0		0		0.5	0.1
						<u>+0.5</u>						<u>+0.6</u>	<u>+0.1</u>
0		0.3	< 0.1	0		0		0		0		0	
		<u>+1.1</u>											
3.5	< 0.1	0		0		0		0		1.3	< 0.1	3.3	< 0.1
<u>+0.6</u>										<u>+2.5</u>		<u>+3.9</u>	
0		0		0		2.0	< 0.1	0		0.3	0.1	0	
						<u>+2.7</u>				<u>+0.5</u>	<u>+0.1</u>		

Morse Creek +3

Spr 77

Sum 77

	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt
--	-----------------------------	----------------------------	-----------------------------	-----------------------------	----------------------------	-----------------------------

Mollusca (cont.)

Bivalvia

Mytilus
edulis

0

0

0

0

0

0

M. 0.1 < 0.1
sp. (juv.) +0.2

0

0

0.3 0.0
+0.7 +0.1

0

0.3 < 0.1
+0.5

Protothaca
staminea

0

0

0.5 < 0.1
1.0

0

0

0

Tresus
capax

0

0

0

0

0

0

Annelida

Archiannelida

Saccocirridae
Saccocirrus
sp.

0

0

0

0

0

0

Polychaeta

Arenicolidae
sp.
Aharenicola
pacifica

0

0

1.8 0.1
+2.2 +0.1

0

0

0

A.
sp.

0

0

0.5 0.1
+0.6 +0.1

0

0

0.5 < 0.1
+1.0

Capitellidae

Capitella
capitata

0.1 < 0.1

0

16.8 0.1
+15.4 +0.0

0

0

41.8 < 0.1
+6.2

Mediomastus
sp.

+0.2

0

1.0 < 0.1
+2.0

0

0

0

Notomastus
tenuis

0

0

0

0

0

0

Cirratulidae
sp.

0

0

0

0

0

0

Cirratulus
cirratus

0.1 < 0.1
+0.2

0

6.3 0.1
+4.0 +0.0

0

0

8.3 < 0.1
+6.9

Dorvilleidae

Protodorvillea
gracilis

0

0

0

0

0

1.0 < 0.1
+1.4

Glyceridae

Hemipodus
borealis

0

0

0

0

0

0

Creek +3

Fall 77

Win 78

0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt
0	0	0	0	0	0	0.3 < 0.1 +0.5
0.3 < 0.1 +0.5 0	0.5 0.0 +0.8 +0.1 0	0	0	0.2 < 0.1 +0.4 0	0	0.5 < 0.1 +0.6 0.8 0.6 +1.0 +1.0 0.3 0.1 +0.5 +0.1
0	0	0.3 0.1 +0.5 +0.2	0	0	0.2 0.0 +0.5 +0.1	0.3 < 0.1 +0.5 +0.1
0	0	0	0	0	0	1.8 < 0.1 +2.4
0	0	0	0.5 < 0.1 +1.0 0	0	0	0.8 < 0.1 +1.0 0.3 < 0.1 +0.5 0
0.5 < 0.1 +1.0	0	0	0.8 < 0.1 +1.5	0	0	0
41.8 < 0.1 +6.2 0	0	0	21.5 < 0.1 +21.0 0.5 < 0.1 +1.0 0.3 < 0.1 +0.5	0.3 < 0.1 +0.5 0	0	16.8 < 0.1 +17.8 0
0	0	0	0.3 < 0.1 0.5 1.8 < 0.1 +3.5	0	0	0
8.3 < 0.1 +6.9	0	0	0	0	0	2.0 < 0.1 +2.2
1.0 < 0.1 +1.4	0	0	0	0	0	0
0	0	0	0	0	0	0.5 < 0.1 + 1.0

Morse Creek +3

Spr 77

Sum 77

0.01 m²
wt0.2 m²
wt0.05 m²
wt0.01 m²
wt0.2 m²
wt0.05 m²
wt

Annelida (cont.)

Polychaeta

Nereidae

Nereis	0.1 < 0.1	0	0	0	0.3 < 0.1	0
vexillosa	+0.2				+0.5	
N.	0	0	0	0.1 < 0.1	0	0.3 < 0.1
sp.				+0.4		+0.5
Platynereis	0	0	0	0	0	0.3 < 0.1
bicanaliculata						+0.5

Opheliidae

Armandia	0	0	0.5 < 0.1	0	0	0
brevia			+1.0			

Oweniidae

Owenia	0	0	0.5	0	0	0
fusiformis						

Phyllodocidae

Eteone	0	0	1.3 0.1	0	0	1.8 < 0.1
longa			+1.9 +0.1			+1.7
Eulalia	0	0	0.3 0.0	0	0	0
viridis			+0.5 +0.1			

Sabellidae

Fabricia	0.1 < 0.1	0	0	0.3 < 0.1	0	0.3 < 0.1
oregonica	+0.5			+0.7		+0.5
F.	0	0	0	0	0	0.3 < 0.1
sp.						+0.5

Spionidae

Malacoceros	0	0	0	0	0	16.0 < 0.1
glutaeus						+14.4
Polvdora	0	0	0	0	0	0
columbiana						
P.	0	0	0	0.1 < 0.1	0	0
sp.				+0.2		
Pygospio	0 0	0	0	0	0	0
elegans						
Scoelelepis	0	0	0	0	0	1.0 < 0.1
sp. C						+1.2
Spio	0	0	0	0	0	0
filicornis						

Syllidae

Syllis	0	0	0	0.1 < 0.1	0	0
adamantea				+0.3		

Creek +3

		Fall 77				Win 78			
0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²	
#	wt	#	wt	#	wt	#	wt	#	wt
0		0		0.1	0.9	0		0	
				<u>+0.2</u>	<u>+1.9</u>				
0.3 < 0.1		0.1 < 0.1		0		1.3 < 0.1		0	
<u>+0.5</u>		<u>+0.2</u>				<u>+2.5</u>			
0.3 < 0.1		0		0		0		0	
<u>+0.5</u>									
0		0		0		0.5 < 0.1		0	
						<u>+1.0</u>			
0		0		0		0		0	
1.8 < 0.1		0		0		4.5 < 0.1		0	
<u>+1.7</u>						<u>+2.6</u>			
0		0		0		0		0	
0.3 < 0.1		0.3 < 0.1		0		2.5 < 0.1		0.1 < 0.1	
<u>+0.5</u>		<u>+0.7</u>				<u>+3.1</u>		<u>+0.3</u>	
0.3 < 0.1		0		0		0		0	
<u>+0.5</u>									
16.0 < 0.1		0		0		91.5 < 0.1		0	
<u>+14.4</u>						<u>+56.3</u>			
0		0.5 < 0.1		0		2.3 < 0.1		0.6 < 0.1	
		<u>+0.8</u>				<u>+3.2</u>		<u>+1.5</u>	
0		0		0		0.3 < 0.1		0	
						<u>+0.5</u>			
0		0		0		0.5 < 0.1		0	
						<u>+1.0</u>			
1.0 < 0.1		0		0		0		0	
<u>+1.2</u>									
0		0		0		0.5 < 0.1		0	
						<u>+1.0</u>			
0		0.1 < 0.1		0		0		0	
		<u>+0.3</u>							

Morse Creek +3

	Spr 77						Sum 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Annelida (cont.)												
Polychaeta												
Syllidae												
Syllis	0		0		0		0.1	< 0.1	0		0.5	< 0.1
app.							± 0.2				± 1.0	
Oligochaeta	0.1	< 0.1	0		0.3	< 0.1	0.2	< 0.1	0		1.0	< 0.1
app.	± 0.2				± 0.5		± 0.5				± 1.4	
Phoronida												
Phoronopsis	0		0		0		0		0		0	
harmeri												
Crustacea												
Ostracoda												
app.	0		0		0		0.1	< 0.1	0		0	
							± 0.3					
Cirripedia												
Balanus	1.1	0.3	0		0		4.7	0.6	0		25.8	0.4
cariosus	± 3.4	± 1.5					± 15.8	± 1.3			± 48.9	± 0.7
B.	0		0		0		7.0	0.2	1.3	0.1	24.0	0.4
glandula							± 22.7	± 0.6	± 2.5	± 0.2	± 33.0	± 0.6
B.	0.3	< 0.1	0		3.0	0.1	175.4	5.1	0		69.5	0.3
app. (juv.)	± 0.8				± 6.0	± 0.1	± 214.2	± 7.4			± 39.8	± 0.2
Chthamalus	0		0		0		0		0		0	
dalli												
Cumacea												
Cumella	0.1	< 0.1	0		0		0		0		0	
vulparis	± 0.2											
Tanaidacea												
Anatanaia	0		0		0		0		0		0	
normani												
Leptochelia	0		0		0		0		0		0.3	< 0.1
dubia											± 0.5	
Isopoda												
Gnoriomphaeroma	0		0		1.0	< 0.1	0.1	< 0.1	0		1.0	< 0.1
oregonense					± 1.4		± 0.2				± 2.0	
Ianiropsis	0		0		0		0		0		0	
kincaidii												
Idotea	0		0		0		0		0		0	
schmitti												
I.	0		2.8	1.4	0		0.3	0.0	19.0	4.1	0.3	< 0.1
wosnesenskii			± 2.5	± 1.2			± 0.4	± 0.1	± 15.6	± 3.7	± 0.5	

Creek +3

Fall 77						Win 78							
0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
0.5 < 0.1		0.3 < 0.1		0		0		0.5 < 0.1		0		0.3 < 0.1	
<u>+1.0</u>		<u>+0.7</u>						<u>+1.0</u>				<u>+0.5</u>	
1.0 < 0.1		0.2 < 0.1		0		2.3 < 0.1		0		0		0.8 < 0.1	
<u>+1.4</u>		<u>+0.4</u>				<u>+3.2</u>						<u>+0.5</u>	
0		0		0		0.3 < 0.1		0		0		0	
						<u>+0.5</u>							
0		0.9 < 0.1		0		0		1.0 < 0.1		0		11.5 < 0.1	
		<u>+2.1</u>						<u>+1.4</u>				<u>+23.0</u>	
25.8 0.4		0.4 0.3		21.0 12.5		6.3 0.3		0.8 0.1		0.5 4.2		0	
<u>+48.9</u> <u>+0.7</u>		<u>+1.3</u> <u>+0.9</u>		<u>+42.0</u> <u>+25.1</u>		<u>+11.2</u> <u>+0.5</u>		<u>+1.9</u> <u>+0.3</u>		<u>+1.0</u> <u>+8.4</u>			
24.0 0.4		46.9 5.6		2.3 0.2		37.0 2.8		26.5 3.5		0		129.8 15.5	
<u>+33.0</u> <u>+0.6</u>		<u>+34.1</u> <u>+4.3</u>		<u>+3.9</u> <u>+0.2</u>		<u>+51.5</u> <u>+4.6</u>		<u>+34.3</u> <u>+4.9</u>				<u>+204.0</u> <u>+27.1</u>	
69.5 0.3		0.5 < 0.1		0		0		0		0		0	
<u>+39.8</u> <u>+0.2</u>		<u>+2.0</u>											
0		0		0		0		0		0		0.3 < 0.1	
												<u>+0.5</u>	
0		0		0		0		0		0		0.3 < 0.1	
												<u>+0.5</u>	
0		0.1 0.1		0		0		0		0		0	
		<u>+0.2</u>											
0.3 < 0.1		0		0		0		0		0		0	
<u>+0.5</u>													
1.0 < 0.1		1.3 0.0		0.5 0.0		52.8 0.7		0		0		0.5 < 0.1	
<u>+2.0</u>		<u>+2.6</u> <u>+0.1</u>		<u>+1.0</u> <u>+0.1</u>		<u>+51.4</u> <u>+0.8</u>						<u>+1.0</u>	
0		0.2 < 0.1		0		0		0		0		0	
		<u>+0.7</u>											
0		0		5.3 2.0		0		0		0		0	
				<u>+10.5</u> <u>+3.9</u>									
0.3 < 0.1		1.0 0.1		11.0 3.7		1.8 0.1		0		4.3 2.1		0	
<u>+0.5</u>		<u>+3.0</u> <u>+0.2</u>		<u>+12.8</u> <u>+4.3</u>		<u>+2.2</u> <u>+0.1</u>				<u>+6.6</u> <u>+3.8</u>			

Spr 77

Sum 77

	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt
Crustacea (cont.)						
Isopoda						
Idotea	0.1 < 0.1	0	0	0.3 < 0.1	0	2.0 < 0.1
app. (juv.)	+0.2			+1.1		+3.4
Limnoria	0	0	0	0	0	0.3 < 0.1
alparum						+0.8
Amphipoda						
Gammaridea	0	0	0.3 < 0.1	0.3 < 0.1	1.0 < 0.1	1.8 < 0.1
app.			+0.5	+0.7	+1.4	+1.0
Allerchestes	-	-	-	0.1 < 0.1		
angustus				+0.2		
Ampithoe	-	-	-	0.2 < 0.1	0.3 < 0.1	0.5 < 0.1
simulans				+0.7	+0.5	+0.7
Corophium	0	0	0	4.5 < 0.1	0	9.5 < 0.1
brevis				+12.5		+19.0
C.	0.1 < 0.1	0	0	4.6 < 0.1	0	9.5 < 0.1
sp.	0.2			+12.5		+19.0
Hyalina	-	-	-	0.1 < 0.1	0	0
frequens				+0.2		
Orchestia	-	-	-	0	0	0.3 < 0.1
sp.						+0.5
Paramoera	-	-	-	0	0	0.3 < 0.1
"pogetica" n. sp.						+0.5
Paraphoxus	-	-	-	0	0	0.3 < 0.1
spinosus Type B						+0.5
Pontogeneia	-	-	-	0	0	0.5 < 0.1
cf. ivanovi						+1.0
Decapoda						
Cancer	0	0	0	0	0	0
magister						
C.	0	0	0	0	0	0
oregonensis						
Cryptolithodes	0	0	0	0.3 < 0.1	0	7.3 < 0.1
sp. (juv.)				+0.6		+2.4
Hemigrapsus	0	4.0 12.1	0	0	8.0 36.9	0
nudus		+2.2 +7.9			+3.4 +32.5	
H.	0	0	0	0	0	0
oregonensis						
H.	0	0	0	0.1 0.1	0	3.3 < 0.1
sp. (juv.)				+0.4		+2.6
Pagurus h.	0	0	0	0.2 0.0	3.3 1.0	2.0 1.1
hirsutiusculus				+0.4 +0.1	+2.4 +1.0	+1.6 +1.8
P.	0.1 < 0.1	0	1.3 0.9	0.1 < 0.1	0	1.3 < 0.1
app. (juv.)	+0.2		+1.9 +1.4	+0.2		+1.5
Pugettia	0	0	0	0	0	0.5 < 0.1
sp. (juv.)						+1.0

Fall 77				Win 78			
0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	
# wt	# wt	# wt	# wt	# wt	# wt	# wt	# wt
2.0 < 0.1	0.1 < 0.1	0	0.5 < 0.1	0	0	0	
+3.4	+0.3		+1.0				
0.3 < 0.1	0	0	0	0	0	0	
+0.8							
1.8 < 0.1	3.7 < 0.1	3.5 0.1	5.3 < 0.1	0.4 < 0.1	0.3 < 0.1	3.0 < 0.1	
+1.0	+3.9	+3.5 +0.1	+4.6	+1.6	+0.5	+4.1	
0.5 < 0.1	-	-	-	-	-	-	
+0.7							
9.5 < 0.1	0	0	0	0	0	0	
+19.0							
9.5 < 0.1	167.6 0.1	0	41.5 < 0.1	20.7 < 0.1	0	38.3 < 0.1	
+19.0	+175.7 +0.1		+67.8	+38.4		+73.2	
0							
0.3 < 0.1	-	-	-	-	-	-	
+0.5							
0.3 < 0.1	-	-	-	-	-	-	
+0.5							
0.3 < 0.1	-	-	-	-	-	-	
+0.5							
0.5 < 0.1	-	-	-	-	-	-	
+1.0							
0	0	0.3 0.4	0	0	0	0	
		+0.5 +0.8					
0	0	0.5 2.1	0	0	0	0	
		+1.0 +4.2					
7.3 < 0.1	0	0	0	0	0	0	
+2.4							
0	0	4.0 7.9	3.0 0.0	0	5.8 18.4	0.3 0.4	
		+5.0 +6.5	+6.0 +0.1		+5.6 +19.7	+0.5 +0.8	
0	0	0	5.0 0.2	0	0	2.3 0.4	
			+6.2 +0.7			+3.9 +0.8	
3.3 < 0.1	0	0	0	0.2 0.1	0	2.8 0.1	
+2.6				+0.5		+5.5 +0.2	
2.0 1.1	0.1 0.0	0.8 0.2	0.3 < 0.1	2.4 0.0	1.0 0.2	1.3 0.8	
+1.6 +1.8	+0.2 +0.0	+1.0 +0.2	+0.5	+5.5 +0.0	+1.4 +0.2	+1.5 +1.3	
1.3 < 0.1	0	0	1.5 0.1	0.2 < 0.1	0	0	
+1.5			+2.4 +0.2	+0.4			
0.5 < 0.1	0	0	0	0	0	0	
+1.0							

Morse Creek +3

	Spr 77				Sum 77			
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²	
	#	wt	#	wt	#	wt	#	wt
Insects								
Dipteran	1.2	<0.1	0		0		20.9	<0.1
larvae	<u>±2.4</u>						<u>±40.0</u>	
								2.3 <0.1
								<u>±1.9</u>
Species Richness			59				76	
Diversity, H ¹			2.34				2.04	
Total Number			1613.1				7355.0	
Total Biomass			163.3				261.8	

: Creek +3

Fall 77			Win 78			
0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²
# wt	# wt	# wt	# wt	# wt	# wt	# wt
2.3 <0.1	20.8 <0.1	0	2.0 <0.1	2.2 <0.1	0	9.0 <0.1
<u>+1.9</u>	<u>+43.8</u>		<u>+4.0</u>	<u>+3.8</u>		<u>+13.7</u>
		70			64	
		1.97			2.50	
		8319.4			3378.5	
		229.0			271.9	

Table 4c. Horse Creek (cobble over sand) benthic organisms from the low (<0') intertidal zone collected Spring 1977 through fall 1977, expressed as number and/or biomass (g) per 0.01 (N=20), 0.05 (N=4), and 0.2 (N=4) m² ± standard deviation.

	Spr 77			Sum 77			Fall 77		
	0.01 m ² #	0.2 m ² wt	0.05 m ² wt	0.01 m ² #	0.2 m ² wt	0.05 m ² wt	0.01 m ² wt	0.2 m ² wt	0.05 m ² wt
Chlorophyta									
Closterothrix	0	0	0	<0.1	0	0	0	0	0
sp.									
Closterothrix	<0.1	0	0	0	0	0	0	0	0
sp.									
Ectocarpus	0	0	0	<0.1	0	0	0	0	0
flavescens									
E.	0	0	0	<0.1	0	0	0	0	0
intertextilis									
E.	0.0	0.0	0	<0.1	0.4	0	0	0	0
littoralis	±0.1	±0.1			±0.5				
E.	0	0	0	0	0	0	<0.1	0	0
sp.									
Heterostroma	0.0	0	0	0	0	0	0	0	0
sp.	±0.0								
Ceramium	0.5	0	0	0	0	0	0	0	0
aculeatum	±1.4								
E.	<0.1	0	0	0	0	0	0	0	0
spinosum									
E.	0.0	0	0	0.7	0	0	0	0	0
sp.	±0.1			±2.8					
Viola	<0.1	0	0	0	0	0	0	0	0
sp.									
Vicia	0.0	2.7	0	3.6	23.5	0	0.1	0.2	0
sp.	±1.3	±0.9		±7.3	±26.5	0	±0.1	±0.2	
Bacillariophyta									
Fragilaria	0.1	0	0	<0.1	0	0	0	0	0
sp.	±0.1								
Phaeophyta									
Alaria	<0.1	140.3	0	10.3	100.6	0	0	294.7	0
sp.		±194.4		±29.8	±177.2			±143.2	

Morse Creek 40

	Apr 77			Sum 77			Fall 77		
	0.01 m ²	0.2 m ²	3.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²
	# wt	# wt	# wt	# wt	# wt	# wt	# wt	# wt	# wt
Phaeophyta (cont.)									
<i>Detonula</i>	<0.1	0	0	0	0	0	0	0	0
<i>detonula</i>	<0.1	0	0	0	0	0	0	0	0
<i>Detonula</i>	<0.1	0	0	0	0	0	0	0	0
<i>sp.</i>	0	0	0	<0.1	0	0	0	0	0
<i>Detonula</i>	<0.1	0	0	<0.1	0	0	0	0	0
<i>sp.</i>	<0.1	0	0	<0.1	0	0	0	0	0
<i>Detonula</i>	<0.1	0	0	0	0	0	0	0	0
<i>sp.</i>	0	11.5	0	0	0	0	0	0	0
<i>Detonula</i>	0	± 23.0	0	0	0	0	0	0	0
<i>Detonula</i>	3.8	0.1	0	0.1	1.1	0	0	1.2	0
<i>Detonula</i>	± 17.1	± 0.3	0	± 0.2	± 2.2	0	0	± 1.1	0
<i>Detonula</i>	0	0	0	0	0	0	0	11.8	0
<i>Detonula</i>	<0.1	0.0	0	0.1	0	0	0	± 70.5	0
<i>Detonula</i>		± 0.1		± 0.2				<0.1	0
Rhodophyta									
<i>Acetabularia</i>	<0.1	0	0	<0.1	0	0	<0.1	0	0
<i>sp.</i>	0.0	0	0	<0.1	0	0	<0.1	0	0
<i>Albatella</i>	± 0.1	0	0	0	0	0	0	0	0
<i>Albatella</i>	<0.1	0	0	0	0	0	0	0	0
<i>Cryptosiphonia</i>	0	<0.1	0	0	0	0	0	0	0
<i>sp.</i>	0	0	0	0	0	0	0	0	0
<i>Detonula</i>	<0.1	0	0	0	0	0	0	0	0
<i>Detonula</i>	0	0	0	0	0	0	0	0	0
<i>Detonula</i>	<0.1	0	0	0	0	0	0	0	0
<i>Detonula</i>	0	0	0	0	0	0	0.0	0	0
<i>Detonula</i>							± 0.1		

Morse Creek +0

	Spr 77			Sum 77			Fall 77		
	0.01 m ² wt	0.2 m ² wt	0.05 m ² wt	0.01 m ² wt	0.2 m ² wt	0.05 m ² wt	0.01 m ² wt	0.2 m ² wt	0.05 m ² wt
Rhodophyta (cont.)									
<i>Cigarina</i>	1.8	7.9	0	1.1	28.5	0	1.3	23.6	0
<i>papillata</i> complex	±3.5	±6.8		±7.7	±31.6		±2.4	±21.0	
<i>Elasmodon</i>	<0.1	0	0	0	0	0	0	0	0
<i>glandiformis</i>									
<i>Synonema</i>	<0.1	0	0	0	0	0	0	0	0
sp.									
<i>Iridaea</i>	23.0	479.5	0	13.6	395.0	0	1.8	93.6	0
<i>cardata</i>	±64.5	±106.1		±2.5	±210.6		±2.3	±75.1	
1.	0.1	4.0	0	1.4	0	0	<0.1	0	0
<i>heterocarpa</i>	±0.5	±4.7		±6.3					
1.	0.4	0	0	<0.1	0	0	<0.1	0	0
sp. (juv.)	±1.2								
<i>Heterosiphonia</i>	0	0	0	0	0	0	<0.1	0	0
sp.									
<i>Odeanella</i>	<0.1	0	0	0	0	0	0	0	0
<i>flavescens</i>									
<i>Pocillopora</i>	0	0	0		0	0	0	0	0
<i>subdenticulata</i>									
<i>Polysiphonia</i>	0.0	0	0	0	0	0	<0.1	0	0
<i>laticarpa</i>	±0.1								
<i>Polysiphonia</i>	0.0	0	0	0.1	0	0	<0.1	0	0
<i>pacifica</i>	±0.1			±0.1					
<i>Porphyra</i>	0	0	0	<0.1	0	0	0	0	0
<i>minuta</i>									
P.	0.0	0	0	<0.1	0	0	0	0	0
sp.	±0.1								
<i>Rhodochorton</i>	0	0	0	<0.1	0	0	<0.1	0	0
sp.									
<i>Rhodospira</i>	<0.1	0	0	0	0	0	0	0	0
<i>laxa</i>									
<i>Rhodospira</i>	<0.1	0	0	0	0	0	0	0	0
<i>californica</i>									

Morse Creek +0

	Apr 77			Sum 77			Fall 77		
	0.01 m ² wt	0.1 m ² wt	0.05 m ² wt	0.01 m ² wt	0.2 m ² wt	0.05 m ² wt	0.01 m ² wt	0.2 m ² wt	0.05 m ² wt
Rhodophyta (cont.)									
<i>Rhodomonas</i>	<0.1	0	0	0	0	0	0	0	0
<i>pacifica</i>									
<i>R. palmita</i>	0.3 ±1.1	0	0	0.7 ±1.4	8.2 ±4.2	0	<0.1	0.9 ±0.6	0
<i>R. sp. (juv.)</i>	0.0 ±0.0	0	0	0	0	0	0	0	0
Porifera									
<i>Halimodendria</i>									
<i>pasaden</i>	0	0	0	0	✓	0	0	✓	0
<i>Halimodendria</i>									
<i>peruviana</i>	0	0	0	0	✓	0	0	✓	0
<i>Siphonopoda</i>									
<i>peruviana</i>	0	0	0	0	✓	0	0	0	0
Cnidaria									
<i>Anthus</i>	0.8 ±1.9	<0.1	0.3 ±0.5	0.2 ±0.4	2.5 ±2.1	0.2 ±0.3	0	0	0.3 ±0.5
<i>Anthopleura</i>	0	0	0	0	0	0	0.5 ±1.0	<0.1	0
<i>elegantissima</i>	0	0	0	0.1 ±0.2	<0.1	0.3 ±0.5	0.1 ±0.2	0.1 ±0.2	0
<i>Anthopleura</i>	0	0	0	0	0	0	0	0	0
<i>sp.</i>									
Hydras									
<i>sp.</i>	✓	0	0	✓	0	0	0	0	0
Flatulimithus									
<i>Turbellaria</i>	1.0 ±2.5	<0.1	0	1.5 ±7.0	<0.1	0	0	0	0.3 ±0.5
Scorpaenidae									
<i>sp.</i>	0	0	0	0.3 ±0.6	<0.1	0	16.5 ±13.2	0.1 ±0.1	12.0 ±6.1

Morse Creek +0

	Spr 77						Sum 77						Fall 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Hydrates (cont.)																		
<i>Euplectes gracile</i>	0		0		0		0.1	<0.1	0		0		0		0		0	
							±0.3											
Nautea	4.8	<0.1	0		0.5	<0.1	5.1	<0.1	0		1.3	<0.1	0.2	<0.1	0		4.7	<0.1
sp.	±15.1				±0.6		±8.3				±2.5		±0.5				±5.0	
Helicon																		
<i>Amphione</i>	0.1	<0.1	0		0.3	0.0	0		0		0		0		0		0	
sp. (juv.)	±0.2				±0.5	±0.1												
<i>Cynoplon dentatus</i>	0		0		0		0		0		0.3	0.1	0		0		0	
											±0.5	±0.2						
Gastropoda																		
<i>Amphione</i>	0.1	<0.1	0		0.5	0.0	0.1	<0.1	0		1.3	<0.1	0.1	<0.1	0		0.7	<0.1
sp. (juv.)	±0.2				±1.0	±0.1	±0.2				±1.5		±0.2				±1.2	
<i>Collinsella</i>	0.1	<0.1	0		0		0.2	<0.1	0		0		0		0		0	
polita	±0.2						±0.7											
<i>Laema</i>	1.1	<0.1	2.8	0.1	0.8	<0.1	9.7	0.1	0.5	<0.1	1.5	0.1	6.2	0.1	0		10.7	0.1
variegata	±2.0		±5.5	±0.1	±1.0		±9.2	±0.1	±0.6		±0.6	±0.1	±9.1	±0.1			±16.8	±0.1
<i>Margarita</i>	0.3	0.1	1.8	0.1	0		0		0		0		0		0		0	
<i>Lirulera</i>	±0.6	±0.5	±3.5	±0.2														
<i>Margarita</i>	0		0		0		0		0		0		0.1	<0.1	0		0	
sp.													±0.2					
<i>Zonitoides</i>	0		0		0		0.1	<0.1	0.8	0.5	1.3	<0.1	0.1	0.0	0		0	
foveolata							±0.2		±1.0	±0.6	±1.5		±0.3	±0.1				
H.	0.2	0.0	2.5	1.1	0.3	0.0	0.7	<0.1	1.3	0.6	0.3	0.1	0.3	0.2	0		0.3	<0.1
acutus	±0.4	±0.1	±3.1	±1.5	±0.5	±0.1	±0.4		±1.9	±0.9	±0.5	±0.1	±0.6	±0.5			±0.5	
<i>Quadrula</i>	0		0		0		0		0		0		0.1	<0.1	0		0	
lurida													±0.2					
<i>Quadrula</i>	0		0.5	<0.1	0		0		0		0		0		0		0	
sp. (juv.)			±1.0															
<i>Quadrula</i>	0		0		0		0		0		0		0		0		0	
hirsuta																		

Moreau Creek #0

	Spr 77						Sum 77						Fall 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Gastropoda (cont.)																		
<i>Thais</i>	0		0.5	0.4	0		0		0		0		0		0		0	
<i>emarginata</i>			±0.6	±0.5														
<i>T.</i>	0.1	<0.1	0		0		0		0		0		0		0		0	
<i>lucellana</i>	±0.2																	
Bivalvia																		
<i>Adula</i>	0.1	<0.1	0		0		0		0		0		0		0		0	
<i>californiana</i>	±0.2																	
<i>Clanoridium</i>	0		0		0		0		0		0		0		0		0.3	<0.1
<i>cuttallii</i>																	±0.6	
<i>Cryptosoma</i>	0		0		0.5	0.0	0		0		0		0		0		0	
<i>californicum</i>					±1.0	±0.1												
<i>Hiatella</i>	0.1	<0.1	0		0		0		0		0		0		0		0	
<i>arctica</i>	±0.2																	
<i>Macoma</i>	0		0		0		0		0		0		0		0		0.3	0.3
<i>iniquata</i>																	±0.6	±0.7
<i>M.</i>	0		0		0.7	1.9	0		0		0		0		0		0	
<i>muscula</i>					±0.5	±3.8												
<i>M.</i>	0.1	<0.1	0		0		0		0		0		0		0		0.3	<0.1
<i>sp.</i>	±0.2																±0.6	
<i>Musculus</i>	0.2	<0.1	0		0		0		0		0		0.1	<0.1	0		0	
<i>pygmaeus</i>	±0.3												±0.2					
<i>Mytilus</i>	0.1	<0.1	0		2.3	<0.1	0		0		9.8	<0.1	0		0		7.7	<0.1
<i>tumida</i>	±0.2				±2.2						±3.9						±6.7	
<i>Mytilus</i>	1.9	<9.1	0.5	<0.1	0		0.1	<0.1	0		0		0		0		0	
<i>sp. (juv.)</i>	±2.6		±1.0				±0.3											
<i>Prothaca</i>	0		0		0.3	0.0	0		0		0		0		0		0	
<i>staminea</i>					±0.5	±0.1												
<i>Trochus</i>	0		0		0.5	5.1	0.1	<0.1	0		1.0	0.1	0		0		0.3	0.0
<i>capax</i>					±0.6	±5.9	±0.2				±2.0	±0.2					±0.5	±0.1

Morse Creek #0

	Spr 77						Sum 77						Fall 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Annelida																		
Archaeonellidae																		
<i>Succocirrus</i>																		
sp.	0		0		1.3	<0.1	0		0		0		0		0		0	
					±2.5													
Polychaeta																		
<i>Arenicolidae</i>																		
sp.	0.1	<0.1	0		20.3	<0.1	0		0		3.1	<0.1	0		0		8.3	<0.1
	±0.3				±15.3												±4.7	
Capitellidae																		
<i>Capitella</i>							0.5	<0.1	0		52.5	<0.1	0.1	<0.1	0		177.3	<0.1
<i>capitata</i>							±1.0				±32.5		±0.2				±34.6	
<i>Mediomorus</i>							0		0		1.3	<0.1	0		0		0.3	<0.1
sp.	0		0		2.5	<0.1					±1.0						±0.5	
					±3.1													
Cirratulidae																		
<i>Cirratulus</i>							0.2	<0.1	0		89.5	4.1	0		0		69.0	<0.1
<i>cirratulus</i>	0.2	<0.1	0		90.3	<0.1					±75.5	±4.9					±23.5	
					±11.3													
Corvillidae																		
<i>Procorvillus</i>							0		0		1.3	<0.1	0		0		2.3	<0.1
<i>gracilis</i>	0		0		0.8	<0.1					±1.3						±3.2	
					±1.0													
Goniatidae																		
<i>Glyptode</i>							0.3	<0.1	0		0		0		0		0.3	<0.1
<i>picta</i>	0		0		±0.5												±0.6	
Corvillidae																		
sp. (juv.)	0.2	<0.1	0		0		0.5	<0.1	0		0.3	<0.1	0.6	<0.1	0		2.0	<0.1
	±0.7						±1.6				±0.5		±0.9				±1.0	
<i>Corvillus</i>							0.2	<0.1	0		0.5	3.2	0		0		1.3	<0.1
<i>venulosus</i>	±0.4		±0.5	<0.1	±0.6		±0.5				±1.0	±6.4					±0.6	
sp.	2.9	<0.1	0		0		0.6	<0.1	0		0.3	<0.1	0		0		0.7	<0.1
	±7.1						±0.9				±0.5						±0.6	
<i>Polydora</i>							1.8	<0.1	0		1.5	<0.1	0.2	<0.1	0		0.3	<0.1
<i>bicamellulata</i>	4.1	<0.1	0.3	<0.1	1.3	<0.1	±2.7				±2.4		±0.5				±0.6	
	±9.2		±0.5		±1.3													

Moree Creek #0

	Spr 77						Sum 77						Fall 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Scorillidae (cont.)																		
<i>Schizobrachia</i>																		
<i>lunigata</i>	0.1	<0.1	0		0		0.3	<0.1	0		0.5	<0.1	0		0		0.3	<0.1
	±0.2						±0.9				±1.0						±0.6	
Spionidae																		
<i>Malacostrum</i>																		
<i>glacium</i>	0		0		0.8	<0.1	0.1	<0.1	0		36.3	<0.1	0		0		114.3	<0.1
					±1.5		±0.4				±29.9						±86.2	
<i>Polydora</i>																		
<i>columbiana</i>	0		0		0		2.7	<0.1	0		0		2.7	<0.1	0		2.3	<0.1
							±4.5						±5.9				±2.3	
<i>P. proboscidea</i>	0.5	<0.1	0		0		0		0		0		0		0		0	
	±1.8																	
<i>P. noronhai</i>	0		0		0		0		0		0.3	<0.1	0		0		0	
											±0.5							
<i>P. sp.</i>	0.2	<0.1	0		0		0.5	<0.1	0		0.2	<0.1	0		0		0.3	<0.1
	±0.9						±0.7				±0.5						±0.6	
<i>Scalimopsis</i>	0		0		0.3	<0.1	0		0		0		0		0		0	
<i>sp. C</i>					±0.5													
<i>S. squamata</i>	0		0		0		0		0		1.0	<0.1	0		0		0	
											±1.4							
<i>Spio</i>	0		0		0		0		0		0		0		0		1.3	<0.1
<i>filicornis</i>																	±1.5	
Syllidae																		
<i>Diogenes</i>																		
<i>gumifera</i>	0.4	<0.1	0		0		1.6	<0.1	0		0		0.4	<0.1	0		0	
	±0.9						±2.7						±1.0					
<i>S. leurai</i>	0.1	<0.1	0		0.5	<0.1	0		0		0.2	<0.1	0		0		0	
	±0.2				±1.0						±0.5							
<i>Sphaerocoryllia</i>	0		0		0		0.1	<0.1	0		0		0		0		0	
<i>pirifera</i>							±0.2											
<i>Syllis</i>	0.5	<0.1	0		1.3	<0.1	0.4	<0.1	0		0.5	<0.1	0.1	<0.1	0		1.7	<0.1
<i>sp.</i>	±1.5				±2.9		±1.0				±1.0		±0.4				±0.6	
Terebellidae																		
<i>app.</i>	0		0		0		0.1	<0.1	0		0		0.1	<0.1	0		0	
							±0.2						±0.3					

Morse Creek #0

	Spr 77			Sum 77			Fall 77		
	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²	0.01 m ²	0.2 m ²	0.05 m ²
	#	wt	#	#	wt	#	#	wt	#
Oligochaeta app.	0		0	0.6 ± 2.5	< 0.1	0	0	0	0.7 ± 0.6
Hirudinea app.	0		0	0.1 ± 0.2	< 0.1	0	0	0	0
Pyrosomidae Phreatobiotus fauvelianus	0		0	0.3 ± 0.7	< 0.1	0	0.5 ± 0.6	0.0 ± 0.1	0
Crustacea Ostracoda app.	0.2 ± 0.4	< 0.1	0	9.7 ± 28.4	< 0.1	0	0.3 ± 1.3	< 0.1	0
Cirripedia Balanus coriaceus	0		0	0.1 ± 0.2	< 0.1	0	0.3 ± 0.5	< 0.1	0.3 ± 0.6
Leptostreus Balanus pogonotus	0		0	0		0	0.3 ± 0.5	< 0.1	0
Cnidaria Cnidaria vulgaris	0.1 ± 0.2	< 0.1	0	0.3 ± 0.5	< 0.1	0.1 ± 0.2	0		0
Lepidoptera app.	0		0	0		0	0.3 ± 0.5	< 0.1	0
Tentaculata Antennaria securus	0		0	1.5 ± 3.4	< 0.1	0	0.1 ± 0.7	< 0.1	0
Leptochloa dubia	0.3 ± 0.3	< 0.1	0.3 ± 0.5	0.3 ± 0.5	< 0.1	0.3 ± 0.8	0.3 ± 0.5	< 0.1	0.7 ± 1.2

Norse Creek +0

	Spr 77				Sum 77				Fall 77			
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.01 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Tricladus (cont.)												
<i>Pascalis</i>	0.1	<0.1	0		0		0		0		0	
<i>californiensis</i>	±0.2											
Isopoda												
<i>Dynamosella</i>	0		0		0		0		0.2	<0.1	0	
<i>chaetori</i>									±0.9			
<i>Isophaedon</i>	0.2	<0.1	0		0.5	<0.1	0		0	<0.1	0	
<i>suplicatus</i>	±0.4				±0.6				±1.6			
<i>E.</i>	1.6	<0.1	0		2.0	<0.1	0		0		0	
<i>media</i>	±4.8				±4.0							
<i>E.</i>	0.4	<0.1	0		0		0		0		0	
<i>rhombus</i>	±1.3											
<i>Cherimaphorans</i>	0.3	<0.1	0		0		0		0.1	<0.1	0	
<i>oregonensis</i>	±0.8								±0.2			
<i>Isopoda</i>	0.2	<0.1	0.3	<0.1	0.3	<0.1	0		2.8	<0.1	0	
<i>limnoidi</i>	±0.5		±0.5		±0.5		±0.6		±3.2		±0.6	
<i>Idetes</i>	0		0		0.5	<0.1	0		0		0	
<i>aculeata</i>					±1.0							
<i>I.</i>	0.6	<0.1	0.5	<0.1	0		0.4	<0.1	4.8	<0.1	0	
<i>veumensis</i>	±1.6		±1.0		±0.3		±1.0	<0.1	±1.4	<0.1	0	
<i>I.</i>	0.4	<0.1	1.0	<0.1	0.5	<0.1	0.3	<0.1	0		0	
<i>sp. (juv.)</i>	±0.4		±2.0		±0.6		±0.9				±0.5	
<i>Limoria</i>	0.1	<0.1	0		0.3	<0.1	0		0		0	
<i>algae</i>	±0.2				±0.5							
<i>limn.</i>	0		0		0		0.1	<0.1	0		0	
<i>chromatophylla</i>							±0.2					
<i>Paratrichia</i>	0		0		0.5	<0.1	0		0		0	
<i>elegans</i>					±0.6							
Amphipoda												
<i>Caecidius</i>	8.0	0.1	0		5.8	0.1	—		9.0	0.1	2.5	0.1
<i>sp.</i>	±8.9	±0.1			±7.6	±0.0	—		±9.1	±0.1	±3.5	±0.1

Horse Creek #0

	Spr 77			Sum 77			Fall 77		
	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt	0.01 m ² # wt	0.2 m ² # wt	0.05 m ² # wt
Amphipoda (cont.)									
Asellus	-	-	-	0.1 <0.1	0	0	-	-	-
Asellus	-	-	-	0.2 <0.1	0.5 <0.1	0	-	-	-
Asellus	-	-	-	0.4 <0.1	1.0	0	-	-	-
A. sp.	-	-	-	0.1 <0.1	0	0	-	-	-
A. sp.	-	-	-	0.4 <0.1	0.3 <0.1	0.5 <0.1	-	-	-
A. similis	-	-	-	2.9 <0.1	0.5 <0.1	1.0	-	-	-
A. sp.	-	-	-	0.1 <0.1	0.5 <0.1	0	-	-	-
A. sp.	-	-	-	0.3 <0.1	1.0	0	-	-	-
Asellus	-	-	-	0.1 <0.1	0	1.0 <0.1	-	-	-
Asellus	-	-	-	0.3 <0.1	0	1.4	-	-	-
Caprellia	0	0	0	0.1 <0.1	0	0	0	0	0
Caprellia	-	-	-	0.4 <0.1	0	0	0	0	0
Caprellia	0	0	0	0.1 <0.1	0	0	0	0	0
Caprellia	0	0	0	0.2 <0.1	0	0.3 <0.1	0	0	0
Caprellia	0	0	0	0	0	0.5	0	0	0
Caprellia	-	-	-	1.9 <0.1	0	0	-	-	-
Caprellia	-	-	-	4.4 <0.1	0	0.5 <0.1	-	-	-
Caprellia	-	-	-	0.5 <0.1	0	0.6	-	-	-
Caprellia	-	-	-	1.4 <0.1	0	1.0 <0.1	-	-	-
Caprellia	-	-	-	0	0	2.0	-	-	-
Caprellia	-	-	-	0.1 <0.1	0	7.0 <0.1	-	-	-
Caprellia	-	-	-	0.2 <0.1	0	7.4	-	-	-
Caprellia	-	-	-	0.2 <0.1	0	0	-	-	-
Caprellia	-	-	-	0.4 <0.1	0	0	-	-	-
Caprellia	-	-	-	5.6 <0.1	0	0	-	-	-
Caprellia	-	-	-	21.6 <0.1	0	0	-	-	-
Caprellia	-	-	-	0.1 <0.1	0	0	-	-	-
Caprellia	-	-	-	0.4 <0.1	0	0	-	-	-

Morse Creek #0

	Spr 77						Sum 77						Fall 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt	#	wt
Amphipods (cont.)																		
<i>Photia</i>	-		-		-		0		0		0.3	<0.1	-		-		-	
sp.											0.5							
<i>Pontoporeia</i>	-		-		-		0		0		1.0	<0.1	-		-		-	
eg. <i>ivannovi</i>											1.2							
Isopods																		
<i>Conot</i>	0		0.5	1.1	0		0.1	<0.1	0		1.3	0.6	0		0		0	
<i>oregonensis</i>			1.0	2.1			0.2				0.8							
<i>C.</i>	0.1	0.1	0		0		0		0.2	3.8	0.3	0.2	0		0		0.3	0.2
<i>productus</i>	0.2	0.7							0.5	0.6	0.5	0.6					0.6	0.4
<i>hemigrapsus</i>	0		0		0		0		0		0		0		0.3	2.0	0	
<i>rubus</i>															0.5	4.0		
<i>Mytilus</i>	0.1	0.0	0		0		0		0		0		0		0		0	
sp. (juv.)	0.2	0.0																
<i>Pagurus b.</i>	0		0		0.3	0.1	0		0		0		0.1	<0.1	0		0	
<i>hirotimaculus</i>					0.5	0.1							0.2					
<i>P.</i>	0.1	<0.1	0		0		0.4	<0.1	0		0.8	<0.1	0		0		1.3	0.0
sp. (juv.)	0.2						0.7				0.5						1.2	0.1
<i>Pinnis</i>	0		0		0.3	<0.1	0		0		0		0		0		0	
<i>fabu</i>					0.5													
<i>P.</i>	0		0		0.5	0.1	0		0		0		0		0		0	
sp.					0.6	0.1												
<i>Pugotia</i>	0.3	<0.1	0.3	<0.1	0.5	0.0	3.4	0.1	2.0	0.5	4.8	<0.1	0.3	0.0	0		1.3	0.1
<i>gracilis</i>	0.6		0.5		1.0	0.1	3.7	0.1	2.3	0.9	3.3		0.5	0.1			2.3	0.2
<i>P.</i>	0		0		0		0		0		0.3	0.1	0		0		0	
<i>productus</i>											0.5	0.2						
<i>Tolmanus</i>	0		0		0		0.1	<0.1	0		0		0		0		0	
<i>chirogaster</i>							0.3											
Insects																		
<i>Hydrops</i>	0.7	<0.1	0.5	<0.1	0.3	<0.1	3.2	<0.1	0		0		0.1	<0.1	0		0	
larvae	1.0		1.0		0.5		10.6						0.2					

Morse Creek #0

	Spr 77						Sum 77						Fall 77					
	0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²		0.01 m ²		0.2 m ²		0.05 m ²	
	♂	wt	♂	wt	♂	wt	♂	wt	♂	wt	♂	wt	♂	wt	♂	wt	♂	wt
Bryozoa app.	✓		0		0				0		✓		0		0		0	
Echinozoonta																		
Echinozoidea	0.1	<0.1	0		0		0.1	<0.1	0		0.5	<0.1	0		0		0	
app.	±0.2						±0.7				±0.6							
Echinozoidea	0		0.3	<0.1	0		0		0		0		0.1	<0.1	0		0.3	0.1
pseudoquinquecostata			±0.5										±0.2				±0.6	
Species richness			112						177						82			
Diversity - H'			2.14						2.55						2.29			
Total number			4,460.8						4,362.5						2,509.9			
Total biomass (g)			984.0						794.0						553.4			

Table 4d. Morse Creek (gravel-cobble) benthic organisms from the subtidal zone collected 7 June 1977, expressed as number and/or biomass (g) per 0.05 (N=4) m² ± standard deviation.

	-10 m.
#	wt
Chlorophyta	
<i>Darbesia marina</i>	< 0.1
<i>Halicystis ovalis</i>	< 0.1
<i>Spongomorpha</i> sp.	< 0.1
Bacillariophyta	
<i>Pennales</i> spp.	< 0.1
Phaeophyta	
<i>Desmarestia ligulata</i>	< 0.1
<i>D. viridis</i>	< 0.1
<i>Ectocarpaceae</i> sp.	< 0.1
<i>Ectocarpus</i> sp.	< 0.1
<i>Laminariales</i> spp.	0.1 ± 0.1
<i>Ralfsia pacifica</i>	
<i>Stictyosiphon tortilis</i>	< 0.1
<i>Syringoderma abyssicola</i>	< 0.1
Rhodophyta	
<i>Acrochaetium</i> sp.	< 0.1
<i>Ahnfeltia plicata</i>	< 0.1
<i>Antithamnion defectum</i>	< 0.1
<i>Calliophyllis flabellulata</i>	< 0.1
<i>Corallinaceae</i> sp.	< 0.1
<i>Delesseriaceae</i> sp.	< 0.1
<i>Gracilaria</i> sp.	< 0.1
<i>Halosaccion glandiforme</i>	< 0.1
<i>Hymenena</i> sp.	< 0.1
<i>Iridea</i> sp.	< 0.1
<i>Leptofauchea pacifica</i>	< 0.1
<i>Peyssonellia pacifica</i>	
<i>Platythamnion heteromorphum</i>	< 0.1
<i>Polyneura latissima</i>	0.0 ± 0.1
<i>Pulysiphonia pacifica</i>	< 0.1
<i>Pterosiphonia dendroidea</i>	< 0.1
<i>Rhodochorton</i> sp.	< 0.1

Morse Creek Subtidal

	-10 m.	
	#	wt
Porifera spp.		✓
Cnidaria		
Hydrozoa spp.		<0.1
Tubularia	3.8 ± 4.5	<0.1
Anthozoa spp.	2.3 ± 3.9	<0.1
Halimeda sp.	0.5 ± 0.6	<0.1
Nemertea spp.	5.5 ± 1.7	<0.1
Nematoda spp.	21.5 ± 4.8	<0.1
Mollusca		
Amphineura sp. (juv.)	0.3 ± 0.5	<0.1
Mopalia sp. B	0.3 ± 0.5	0.0 ± 0.1
Tonicella lineata	0.3 ± 0.5	<0.1
Gastropoda		
Aeolidacea sp. (juv.)	0.3 ± 0.5	<0.1
Amphissa columbiana	12.5 ± 11.7	0.8 ± 1.5
Calliostoma ligatum	0.5 ± 1.0	0.4 ± 0.6
Calyptraea fastigiata	3.0 ± 1.4	0.1 ± 0.2
Collisella ochracea	0.3 ± 0.5	0.0 ± 0.1
Crepidula sp.	0.3 ± 0.5	0.0 ± 0.1
Margarites pupillus	0.3 ± 0.5	<0.1
Margarites/lirularia	0.3 ± 0.5	<0.1
Natica clausa	0.3 ± 0.5	<0.1
Trichotropis cancellata	0.3 ± 0.5	<0.1
Bivalvia		
Crenella decussata	0.3 ± 0.5	<0.1
Hamularia kennerleyi	0.3 ± 0.5	<0.1
Macoma secta	0.3 ± 0.5	0.0 ± 0.1
M. sp. (juv.)	4.0 ± 3.7	0.0 ± 0.1

Morse Creek Subtidal

	-10 m.	
	#	wt
Bivalvia (cont.)		
<i>Modiolus rectus</i>	0.3 ± 0.5	<0.1
<i>Musculus discors</i>	0.3 ± 0.5	<0.1
<i>Myrella tumida</i>	19.8 ± 5.0	<0.1
<i>Protothaca staminea</i>	1.8 ± 1.7	0.4 ± 0.9
<i>Transennella tantilla</i>	0.5 ± 0.6	<0.1
Annelida		
<i>Oligochaeta</i> spp.	5.8 ± 4.3	<0.1
Polychaeta		
<i>Ampharetidae</i> spp.	0.3 ± 0.5	<0.1
<i>Asabellides littoralis</i>	0.3 ± 0.5	<0.1
Capitellidae		
<i>Capitella capitata</i>	0.3 ± 0.5	<0.1
<i>Mediomastus</i> sp.	25.5 ± 10.4	<0.1
Cirratulidae		
<i>Chaetozone setosa</i>	1.3 ± 1.9	<0.1
<i>Cirratulus cirratus</i>	3.5 ± 3.0	<0.1
<i>Tharyx multifilis</i>	8.8 ± 8.3	<0.1
Dorvilleidae		
<i>Protodorvillea gracilis</i>	1.5 ± 3.0	<0.1
Flabelligeridae		
<i>Pherusa plumosa</i>	0.3 ± 0.5	<0.1
Glyceridae		
<i>Glycera americana</i>	0.3 ± 0.5	<0.1
<i>G. sp. (juv.)</i>	0.3 ± 0.5	<0.1
Coniadiidae		
<i>Glycinde picta</i>	3.5 ± 1.7	<0.1

Morse Creek Subtidal

	-10 m.	
	#	wt
Nesionidae		
<i>Micropodarke dubia</i>	7.3 ± 4.0	<0.1
Maldanidae sp. (juv.)	7.8 ± 4.6	<0.1
<i>Axiobella rubrocincta</i>	0.3 ± 0.5	<0.1
<i>Nicomache lumbricalis</i>	0.3 ± 0.5	<0.1
Nereidae		
<i>Nereis</i> sp. (juv.)	0.3 ± 0.5	<0.1
<i>Platynereis bicanaliculata</i>	3.5 ± 1.7	<0.1
Opheliidae		
<i>Armandia brevis</i>	1.8 ± 1.3	<0.1
Orbiniidae		
<i>Scoloplos</i> sp.	1.3 ± 0.5	<0.1
Oweniidae		
<i>Owenia fusiformis</i>	0.8 ± 1.0	<0.1
Paraonidae		
<i>Aricides</i> sp.	0.5 ± 1.0	<0.1
Phyllodocidae		
<i>Eteone longa</i>	0.3 ± 0.5	<0.1
<i>Eulalia sanguinea</i>	0.5 ± 1.0	<0.1
<i>Phyllodoce madeirensis</i>	0.3 ± 0.5	<0.1
<i>P.</i> sp. (juv.)	0.5 ± 0.6	<0.1
Polynoidae		
<i>Harmothoe imbricata</i>	1.0 ± 0.8	<0.1
Sabellariidae		
<i>Sabellaria cementarium</i>	0.8 ± 0.5	<0.1
Sabellidae		
<i>Chone ecaudata</i>	1.8 ± 1.0	<0.1

Horse Creek Subtidal

	-10 m.	
	#	wt
Scalebregmidae		
Scalebregma inflatum	0.5 ± 0.6	<0.1
Serpulidae		
Spirorbis moerchi	0.3 ± 0.5	<0.1
S. sp.	0.3 ± 0.5	<0.1
Spionidae		
Polydora armata	0.3 ± 0.5	<0.1
P. socialis	0.3 ± 0.5	<0.1
P. sp.	0.3 ± 0.5	<0.1
Prionospio cirrifera	1.0 ± 0.8	<0.1
P. steenstrupi	5.3 ± 3.4	<0.1
Syllidae		
Exogone gemmifera	0.5 ± 1.0	<0.1
E. lourei	0.8 ± 1.0	<0.1
E. spp.	19.5 ± 2.1	<0.1
Syllis spp.	0.3 ± 1.5	<0.1
Terebellidae sp.	0.3 ± 0.5	<0.1
Sipuncula		
Golfingia vulgaris	0.3 ± 0.5	<0.1
Crustacea		
Ostracoda spp.	0.8 ± 1.5	<0.1
Cumacea		
Cumella spp.	0.8 ± 0.5	<0.1
Diastylis spp.	6.8 ± 6.4	<0.1
Leptocuma spp.	2.0 ± 2.7	<0.1
Tanaidacea		
Leptochelia dubia	240.3 ± 48.8	0.1 ± 0.1

Morse Creek Subtidal

	-10 m.	
	#	wt
Isopoda		
<i>Ianiropsis analoga</i>	10.5 ± 6.7	<0.1
<i>Jaeropsis obia</i>	5.0 ± 6.7	<0.1
Amphipoda		
<i>Cyprina mendax</i>	0.5 ± 1.0	<0.1
<i>C. striata</i>	0.3 ± 0.5	<0.1
<i>Gammaridea</i> spp.	101.5 ± 41.8	0.2 ± 0.1
Decapoda		
<i>Cancer productus</i>	1.0 ± 1.4	0.6 ± 0.8
<i>Caridea</i> sp. (juv.)	0.5 ± 0.6	<0.1
<i>Discorsopagurus schmitti</i>	0.5 ± 1.0	<0.1
<i>Eualus</i> sp.	0.5 ± 1.0	<0.1
<i>Paguridae</i> sp. (juv.)	5.5 ± 2.4	0.0 ± 0.1
<i>Pagurus beringanus</i>	0.3 ± 0.5	0.4 ± 0.9
<i>Pinnixa</i> sp. (juv.)	1.0 ± 1.4	<0.1
<i>Pugettia gracilis</i>	3.0 ± 2.2	<0.1
Echinodermata		
<i>Ophiuroidea</i> spp.	8.3 ± 6.2	<0.1
Holothuroidea		
<i>Mopalia intermedia</i>	0.5 ± 0.6	<0.1
Species richness		
	127	
Diversity - H'		
	2.72	
Total number		
	581.1	
Total biomass (g)		
	<14.4	

Table 5a. Beckett Point (protected sand-gravel) benthic organisms from the high (+6') inter-tidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 (N=2; spring) and 0.025 (N=4; summer-winter m² + standard deviation.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea	1.5	<0.1	0.3	<0.1	0.8	<0.1	0.8	<0.1
app.	±0.7		±0.5		±0.5		±0.5	
Nematoda	28.5	<0.1	4.3	<0.1	6.8	<0.1	8.5	<0.1
app.	±9.2		±1.9		±4.1		±6.2	
Mollusca								
Gastropoda								
Fartulus	0		0		0.3	<0.1	0	
occidentale					±0.5			
Lacuna	0		0		0.3	<0.1	0	
variegata					±0.5			
Littorina	0		0.3	0.1	0		0	
sitkana			±0.5	±0.1				
Bivalvia								
Macoma	0		0.3	<0.1	0		0	
sp. (juv.)			±0.5					
Mytilus	1.0	<0.1	0		2.0	<0.1	0.5	<0.1
sp. (juv.)	±0.0				±1.2		±1.0	
Protothaca	0		0		0		0.8	<0.1
staminea							±1.0	
Transennella	0		0		1.8	<0.1	0	
tentilla					±1.0			
Annelida								
Oligochaeta	29.0	<0.1	2.3	<0.1	20.8	<0.1	19.0	<0.1
app.	±11.3		±1.0		±8.9		±9.5	
Polychaeta								
Glyceridae								
Hemipodus	0.5	<0.1	0		0		0	
borealis	±0.7							

Beckett Point #6

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nereidae								
Nereis	2.0	<0.1	0.3	✓	0		0.3	<0.1
vexillosa	±1.4		±0.5				±0.5	
N.	0		0		0.3	<0.1	0.3	<0.1
sp.					±0.5		±0.5	
Platynereis	0		0.3	✓	0.8	<0.1	0.3	<0.1
bicanaliculata			±0.5		±0.5		±0.5	
Pisiconidae	0.5	<0.1	0		0		0	
spp.	±0.7							
Syllidae								
Exogone	0		0		0.3	<0.1	0	
lourei					±0.5			
Syllis	17.0	<0.1	3.5	<0.1	1.5	<0.1	3.5	<0.1
spp.	±11.3		±4.5		±1.7		±3.7	
Crustacea								
Cirripedia								
Balanus	0		2.8	0.7	12.0	4.2	10.8	4.2
glandula			±4.3	±0.8	±11.2	±4.2	±11.9	±6.6
B.	0		0.5	<0.1	0.3	<0.1	0	
sp. (juv.)			±1.0		±0.5			
Isopoda								
Exosphaeroma	0.5	<0.1	0		61.3	0.4	2.0	<0.1
media	±0.7				±30.6	±0.2	±2.5	
Amphipoda								
Gammaridea	1.0	<0.1	—		0.8	<0.1	0.8	<0.1
spp.	±1.4				±1.0		±1.0	
Anisogammaropsis	—		0.3	<0.1	—		—	
confervicolus			±0.5					
Orchestoidea	—		0.3	<0.1	—		—	
pugettensis			±0.5					

Beckett Point +6

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Insecta								
Dipteran	0		0.3	<0.1	0		0	
larvae			±0.5					
Species richness	10		13		15		12	
Diversity - H'	1.43		2.04		1.44		1.69	
Total number	81.5		15.8		110.1		47.6	
Total biomass (g)	<1.0		<1.7		<5.8		<5.3	

Table 5b. Beckett Point (protected sand-gravel) benthic organisms from the mid (+3') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 (N=2; spring) and 0.025 (N=4; summer-winter) m² ± standard deviation.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Chlorophyta								
Enteromorpha		0		0		0		0
compressa								
E.		0		✓		0		✓
intestinalis								
E.		0		✓		0		✓
linza								
Ulva		0		✓		0		✓
sp.								
U.		0		0		0		0
taeniata								
Urospora		0		✓		0		0
app.								
Bacillariophyta								
Pennales		0		✓		0		✓
app.								
Phaeophyta								
Feldmania		0		0		0		0
app.								
Rhodophyta								
Ceramium		0		✓		0		0
pacificum								
C.		0		0		0		✓
app.								
Polysiphonia		0		✓		0		0
cifica								
		0		✓		0		0
aniculata								
Platyhelminthes								
Turbellaria	0		0		0.3	<0.1	0	
sp.					0.5			

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea spp.	1.5 ±0.7	<0.1	2.5 ±3.0	<0.1	5.3 ±4.0	<0.1	2.5 ±4.4	<0.1
Nematoda spp.	0.5 ±0.7	<0.1	0.3 ±0.5	<0.1	6.8 ±7.0	<0.1	0	
Mollusca								
Amphineura spp. (juv.)	0		0.8 ±1.0	<0.1	0		0	
Gastropoda								
Acmaeidae spp. (juv.)	0		1.0 ±1.1	<0.1	6.3 ±3.0 ±0.1	0.1	0.3 ±0.5	<0.1
Aglaja diomedea	0		0		1.3 ±0.5	<0.1	0	
Alvinia spp.	1.0 ±1.4	<0.1	0.8 ±1.0	<0.1	21.5 ±20.6 ±0.1	0.1	0	
Collisella strigatella	0		0		1.0 ±2.0 ±0.2	0.1	0	
Fartulum occidentale	41.0 ±58.0	<0.1	0.3 ±0.5	<0.1	0.8 ±1.0	<0.1	0.3 ±0.5	<0.1
Haminoea vesicula	0		0		10.0 ±9.9 ±0.2	0.2	0	
Lacuna variegata	0		4.3 ±3.2 ±0.1	0.0	77.3 ±12.4 ±0.1	0.3	0	
Littorina scutulata	0.5 ±0.7 ±0.1	0.1	0.3 ±0.5 ±0.1	0.0	0		0.3 ±0.5	<0.1
L. sitkana	0.5 ±0.7 ±0.1	0.1	0.3 ±0.5	<0.1	0		0	
Margarites papillus	0		0		0.3 ±0	<0.1	0	
Ocenebra lurida	0		0		0 ±0.5	<0.1	0	
Thais spp.	0		0.8 ±0.5	<0.1	0		0	

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Bivalvia								
Adula	0.5	<0.1	0		0		0	
californiensis	±0.7							
Clinocardium	0		0		8.3	0.4	0	
nuttallii					±10.1	±0.5		
Mysella	1.0	<0.1	17.3	0.1	17.3	0.1	3.8	<0.1
tumida	±0.0		±8.5	±0.1	±11.4	±0.1	±1.5	
Mytilus	5.5	<0.1	4.3	0.1	225.3	0.5	11.5	<0.1
spp. (juv.)	±7.8		±1.3	±0.1	±85.7	±0.2	±2.1	
Protothaca	4.5		1.3	<0.1	43.0	0.4	0.8	<0.1
staminea	±6.4		±1.5		±33.5	±0.4	±1.0	
Transennella	3.0	<0.1	3.3	0.0	9.5	0.2	0.5	<0.1
tantilla	±4.2		±2.6	±0.1	±7.2	±0.1	±0.6	
Tresus	0			14.6	4.5	1.3	0.5	2.0
capax			±0.5	±9.2	±3.1	±1.6	±0.6	±1.7
Annelida								
Oligochaeta	1.0	<0.1	2.5	<0.1	3.0	<0.1	3.8	<0.1
spp.	±1.4		±2.1		±2.2		±5.6	
Polychaeta								
Capitellidae								
Capitella	2.0	<0.1	0.5	<0.1	0.5	<0.1	0.3	<0.1
capitata	±1.4		±1.0		±1.0		±0.5	
Mediomastus	0		1.0	<0.1	0.3	<0.1	0	
spp.			±2.0		±0.5			
Notomastus	1.0	<0.1	8.5	<0.1	3.3	<0.1	7.8	<0.1
tenuis	±1.4		±9.3		±3.3		±7.8	
Chaetopteridae								
Spiochaetopterus	0		0		0.3	<0.1	0	
costarium					±0.5			
Chrysopetalidae								
Palaenotus	0		0		0.5	<0.1	0	
ballis					±0.6			

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Cirratulidae app. (juv.)	0		0.3 ± 0.5	<0.1	0		0	
Dorvilleidae app.	0		0		0.5 ± 0.6	<0.1	0	
Protodorvillea gracilis	0		0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
Glyceridae Hamipodus borealis	68.5 ± 2.1	✓	43.5 ± 2.5	✓	78.8 ± 4.6	✓	30.3 ± 11.1	✓
Hesionidae Micropodarka dubia	0		0.3 ± 0.5	<0.1	11.3 ± 3.3	<0.1	0	
Ophiodromus pugettensis	0		0		1.8 ± 1.7	<0.1	0	
Nereidae Nereis sp.	0		0		1.3 ± 1.0	<0.1	0	
Platynereis bicanaliculata	0		0		9.8 ± 10.2	<0.1	0	
Onuphiidae Onuphis sp.	0		0		0		0.5 ± 1.0	<0.1
Opheliidae Armandia brevis	0		0		2.8 ± 1.7	<0.1	0	
Ophelia limacina	0		0		0.5 ± 0.6	<0.1	0	

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Ocenebidae								
Oceneb	9.5	<0.1	7.0	✓	207.3	✓	30.5	<0.1
fusiformis	±7.8		±6.5		±86.2		±24.0	
Phyllococeidae								
Eteone	0		0		1.3	<0.1	0	
longa					±1.0			
Eulalia	0		0		0.8	<0.1	0	
quadrilobata					±1.5			
E.	0		0		2.8	<0.1	0	
sanguinea					±1.7			
Phyllococe	0		0		1.3	<0.1	0	
maculata					±1.0			
P.	0		0		0.8	<0.1	0	
app.					±1.5			
Pisiconidae								
Pisicon	0		0		0.5	<0.1	0	
sp.					±0.6			
Polynoidae								
Hermothoe	0		0		1.0	<0.1	0	
lunulata					±1.4			
Sabellidae	0		0		0.3	<0.1	0	
app.					±0.5			
Sigalionidae								
Pholoe	0		0		0.3	<0.1	0	
minuta					±0.5			
Spionidae								
Polydora	0		0		0.8	<0.1	0	
columbiana					±1.0			

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Spionidae (cont.)								
Polydora	0.5	<0.1	0		0		0	
proboscidea	±0.7							
P.	0		0		0.5	<0.1	0	
sp.					±0.6			
Prionospio	0.5	<0.1	0		1.0	<0.1	0	
cirrifera	±0.7				±2.0			
P.	0		0.5	<0.1	0.5	<0.1	0	
steenstrupi			±0.6		±1.0			
Pygospio	0		2.5	<0.1	47.0	<0.1	0	
elegans			±2.9		±47.3			
Scolalapis	0		0		0.5	<0.1	0	
sp.					±0.6			
Spio	0		1.3	<0.1	14.3	<0.1	0	
filicornis			±1.0		±8.6			
Spiophanes	0		0		1.5	<0.1	0	
bombyx					±1.7			
Syllidae								
Brania	0		0		0.3	<0.1	0	
brevipharyngia					±0.5			
Exogone	1.0	<0.1	0		1.3	<0.1	0	
leurei	±1.4				±1.0			
Sphaerosyllis	0		0		0.5	<0.1	0	
pirifera					±1.0			
Syllis	1.0	<0.1	1.0	<0.1	0.3	<0.1	0	
spp.	±1.4		±1.4		±0.5			
Terebellidae	0		0		0		0.3	<0.1
spp.							±0.5	
Polycirrus	0		0		0.5	<0.1	0	
sp. A					±1.0			
Crustacea								
Ostracoda	0		0		1.0	<0.1	0	
spp.					±1.2			

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Cirripedia								
<i>Belanus</i>	3.0	0.8	117.8	2.4	19.8	3.4	1.0	0.0
<i>glandula</i>	± 4.2	± 1.1	± 83.7	± 2.0	± 26.2	± 3.5	± 1.4	± 0.1
<i>B.</i>	0		0		0.5	< 0.1	0	
<i>sp. (juv.)</i>					± 0.6			
Osmacea								
<i>Canella</i>	0		0		1.3	< 0.1	0	
<i>vulgaris</i>					± 1.5			
Tanaidacea								
<i>Leptochelia</i>	0		0		15.0	< 0.1	0.3	< 0.1
<i>dubia</i>					± 12.9		± 0.5	
Isopoda								
<i>Exosphaeroma</i>	0		3.8	< 0.1	40.0	0.3	0	
<i>aplicauda</i>			± 3.3		± 14.9	± 0.1		
<i>E.</i>	23.0	< 0.1	7.0	< 0.1	0		0.3	< 0.1
<i>media</i>	± 5.7		± 8.7				± 0.5	
<i>Gnorimosphaeroma</i>	0		4.3	< 0.1	0		0	
<i>oregonense</i>			± 6.0	± 0.2				
Amphipoda								
<i>Allorchestes</i>	-		0.5	< 0.1	-		-	
<i>augustus</i>			± 0.6					
<i>Anisogammarus</i>	-		28.5	0.1	-		-	
<i>confervicolus</i>			± 15.2	± 0.2				
<i>Caprella</i>	0		0		0.8	< 0.1	0	
<i>laeviuscula</i>					± 1.0			
<i>Corophium</i>	0		0.5	< 0.1	5.3	< 0.1	0	
<i>spp.</i>			± 1.0		± 3.8			
<i>Gammaridea</i>	2.0	< 0.1	-		10.0	0.1	0.8	< 0.1
<i>spp.</i>	± 1.4				± 6.7		± 1.0	
<i>Orchestoidea</i>	-		0.3	< 0.1	-		-	
<i>pugettensis</i>			± 0.5					

Beckett Point +3

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Decapoda								
Cancer	0		0.3	0.0	0		0	
magister			±0.5	±0.1				
Hemigrapsus	0		0.3	0.2	2.8	0.1	0	
oregonensis			±0.5	±0.4	±1.5	0.1		
Pagurus	0		0.3	0.0	1.3	0.1	0	
hirsutiusculus			±0.5	±0.1	±1.0	±0.1		
P.	0		2.8	<0.1	1.3	0.0	0	
app. (juv.)			±2.1		±1.9	±0.1		
Pinnixidae	0		0.3	0.1	0		0.3	<0.1
app.			±0.5	±0.2			±0.5	
Insecta								
Dipteran	0		0.3	<0.1	0		0	
larvae			±0.5					
Phoronida								
Phoronopsis	0		0.3	<0.1	6.0	<0.1	1.3	<0.1
harmeri			±0.5		±4.1		±1.3	
Echinodermata								
Echinoidea								
Dendraster	0		1.0	0.1	16.8	0.0	0.8	0.0
excentricus			±0.8	±0.1	±11.9	±0.1	±1.0	±0.1
Holothuroidea								
Leptosynapta	0		0.3	<0.1	2.0	0.1	0	
clarki			±0.5		±4.0	±0.1		
Species richness	23		55		74		29	
Diversity - H'	1.89		2.20		2.73		2.15	
Total number	172.5		276.7		965.7		99.1	
Total biomass (g)	< 2.7		< 20.9		< 13.3		< 4.1	

Table 5c. Beckett Point (protected sand) benthic organisms from the low (+0') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 (N=2; spring) and 0.025 (N=4; summer-winter) m² + standard deviation.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Chlorophyta								
Enteromorpha		0		✓		0		0
intestinalis								
E.		0		✓		✓		0
linza								
Ulva		0		✓		✓		0
sp.								
Urospora		0		0		✓		0
spp.								
Rhodophyta								
Ceramium		0		✓		✓		0
pacificum								
Cnidaria								
Anthosoa	0.5	<0.1	0.8	<0.1	0.8	<0.1	1.8	<0.1
sp.	± 0.7		± 1.0		± 1.5		± 2.9	
Platyhelminthes								
Turbellaria	0.5	<0.1	0		0.5	<0.1	0	
spp.	± 0.7				± 1.0			
Nemertea								
spp.	26.5	<0.1	21.5	✓	8.3	<0.1	12.0	<0.1
	± 12.0		± 9.3		± 4.0		± 2.4	
Nematoda								
spp.	45.0	✓	7.3	<0.1	220.8	<0.1	41.3	<0.1
	± 12.7		± 3.9		± 188.8		± 19.3	
Mollusca								
Amphineura	0		0		0.5	<0.1	0	
spp.					± 1.0			
Gastropoda								
Acmaeidae	0		0		0.3	<0.1	0	
spp. (juv.)					± 0.5			
Aglaia	0		0		0		0.3	<0.1
diomedea							± 0.5	

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Gastropoda (cont.)								
Alvinia	2.5	<0.1	0.8	<0.1	7.3	<0.1	1.5	<0.1
sp.	± 3.5		± 1.5		± 3.6		± 3.0	
Cylichna	6.0	0.1	0.3	0.0	0.5	0.1	0	
sp.	± 8.5	± 0.1	± 0.5	± 0.1	± 0.6	± 0.1		
Partulum	0		0.3	<0.1	0		0.3	<0.1
occidentale			± 0.5				± 0.5	
Haminoea	0		0.3	<0.1	1.8	<0.1	0.3	<0.1
vesicula			± 0.5		± 1.5		± 0.5	
Lacuna	4.0	<0.1	16.3	0.1	3.8	<0.1	0.8	<0.1
variegata	± 0.0		± 13.4	± 0.1	± 2.6		± 1.0	
Littorina	0		0.3	<0.1	0		0	
sitkana			± 0.5					
Margarites/	0		0		0.3	<0.1	0	
Lirularia					± 0.5			
Mitrella	1.0	<0.1	0		0.8	<0.1	0.3	<0.1
tuberosa	± 1.4				± 1.0		± 0.5	
Maesarius	1.5	0.9	0.5	0.3	0.5	<0.1	0	
mendicus	± 2.1	± 1.2	± 0.6	± 0.4	± 0.6			
Odostomia	9.0	<0.1	0		0.5	<0.1	0	
sp.	± 12.7				± 0.6			
Ocenebra	0		0		0		0.3	<0.1
lurida							± 0.5	
Bivalvia								
Clinocardium	9.5	0.9	0.3	0.1	5	0.2	24.3	0.2
nuttallii	± 3.5	± 1.1	± 0.5	± 0.3	± 0.1		± 3.8	± 0.1
Crenella	0.5	<0.1	0				0	
decussata	± 0.7							
Mistella	1.5	<0.1	0		0.3	<0.1	0	
arctica	± 2.1				± 0.5			
Lucinoma	1.5	<0.1	0		0		1.3	0.6
tenuisculpta	± 2.1						± 1.0	± 0.5
Macoma	0		0.3	0.1	1.3	0.1	0	
inquinata			± 0.5	± 0.1	± 2.5	± 0.2		

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Bivalvia(cont.)								
Macoma	0		0.3	1.1	0.3	0.1	0.8	0.3
nasuta			± 0.5	± 2.2	± 0.5	± 0.1	± 1.0	± 0.5
M.	0		0		0		1.5	< 0.1
secta							± 3.0	
M.	3.0	< 0.1	0.3	< 0.1	0		2.3	< 0.1
spp. (juv.)	± 1.4		± 0.5				± 3.3	
Myaella	212.5	0.9	244.3	0.4	487.5	0.8	220.3	0.4
tumida	± 181.7	± 0.9	± 205.3	± 0.2	± 89.0	± 0.5	± 64.7	± 0.1
Mytilus	0		0.3	0.1	0		0	
edulis			± 0.5	± 0.1				
M.	2.0	< 0.1	1.0	< 0.1	0.3	< 0.1	0	
sp. (juv.)	± 2.8		± 0.8		± 0.5			
Panope	0.5	0.3	0		0		0	
generosa	± 0.7	± 0.4						
Protothaca	9.5	0.1	0.8	0.3	7.3	0.9	7.0	0.1
staminea	± 9.2	± 0.1	± 0.5	± 0.5	± 5.4	± 1.7	± 2.6	± 0.2
Tellina	0		0		0		1.5	0.2
modesta							± 2.4	± 0.2
T.	6.0	< 0.1	5.8	0.2	1.5	0.0	4.0	0.1
spp. (juv.)	± 1.4				± 3.0	± 0.1	± 3.9	± 0.2
Transennella	24.5	0.1	28.0	0.1	5.8	0.1	12.0	< 0.1
tantilla	± 5.0	± 0.1	± 20.4	± 0.1	± 4.9	± 0.1	± 5.7	
Tresus	0		14.3	6	4.3	0.8	1.8	1.1
capax			± 15.8	± 1.7	± 3.0	± 1.1	± 2.1	± 2.2
Annelida								
Oligochaeta	11.0	< 0.1	1.3	< 0.1	31.0	< 0.1	3.5	< 0.1
spp.	± 10.2		± 0.5		± 10.2		± 3.3	
Polychaeta								
Capitellidae	0		0		1.0	< 0.1	0.8	< 0.1
sp.					± 2.0		± 1.5	
Capitella	4.0	< 0.1	0		3.5	< 0.1	4.5	< 0.1
capitata	± 5.7				± 2.4		± 8.4	

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Capitellidae (cont.)								
<i>Mediomastus</i>	15.5	<0.1	8.3	<0.1	31.0	<0.1	11.3	<0.1
sp.	± 12.0		± 4.7		± 3.6		± 11.7	
<i>Notomastus</i>	0		2.0	✓	0		3.3	<0.1
<i>lineatus</i>			± 1.8				± 3.3	
N.	11.0	<0.1	10.3	<0.1	7.3	<0.1	3.8	<0.1
<i>tenuis</i>	± 2.8		± 18.5		± 3.8		± 2.6	
N.	3.5	<0.1	0		0		0	
sp. (juv.)	± 5.0							
Chaetopteridae								
<i>Mesochaetopterus</i>	5.0	<0.1	13.3	✓	2.5	<0.1	2.5	<0.1
<i>taylori</i>	± 5.0		± 12.6		± 1.3		± 2.9	
<i>Spiochaetopterus</i>	0.5	<0.1	4.0	/	0.5	<0.1	2.3	<0.1
<i>costarum</i>	± 0.7		± 1.6		± 0.6		± 1.7	
Cirratulidae								
spp. (juv.)	0		0		1.5	<0.1	0.5	<0.1
<i>Tharyx</i>	1.5	<0.1	0.3	<0.1	± 1.0		± 0.6	
<i>multifilis</i>	± 2.1		± 0.5		0		0	
Dorvilleidae								
<i>Dorvillea</i>	0		0		0		0.3	<0.1
<i>rudolphi</i>							± 0.5	
<i>Protodorvillea</i>	4.5	<0.1	1.0	<0.1	6.0	<0.1	1.3	<0.1
<i>gracilis</i>	± 6.4		± 0.0		± 1.6		± 1.0	
Glyceridae								
spp. (juv.)	0		0		0.3	<0.1	0	
<i>Glycera</i>	0		0		± 0.5			
<i>americana</i>					0.3	✓	0	
G.	0		0		± 0.5			
<i>tesselata</i>					0.3	<0.1	0	
<i>Nemipodus</i>	47.0	<0.1	17.3	✓	± 0.5			
<i>borealis</i>	± 19.8		± 4.9		12.0	<0.1	12.0	<0.1
					± 1.4		± 2.9	

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Goniadidae								
<i>Glycinde</i>	9.5	< 0.1	1.0	< 0.1		< 0.1	5.0	< 0.1
<i>picta</i>	± 6.4		± 0.8				± 0.0	
Hesionidae								
sp. (juv.)	0		0.5	< 0.1	0	< 0.1	0	
<i>Hesionid</i>			± 1.0		± 1.0			
sp. A	0		0		4.3	< 0.1	2.3	< 0.1
<i>Micropodarke</i>	5.0	< 0.1	4.8	< 0.1	± 4.6		± 2.6	
<i>dubia</i>	± 2.8		± 1.0		20.3	< 0.1	10.5	< 0.1
<i>Ophiodromus</i>	4.3	0.0	1.0	< 0.1	± 10.8		± 5.5	
<i>pugettensis</i>	± 8.5	± 0.1	± 0.0		12.3	< 0.1	8.8	< 0.1
					± 4.0		± 5.9	
Magelonidae								
<i>Magelc a</i>	0		0.3	< 0.1	0		3.3	< 0.1
<i>japonica</i>			± 0.5				± 1.3	
<i>M.</i>	0		6.3	< 0.1	2.0	< 0.1	0	
<i>pitelkai</i>			± 7.6		± 1.2			
Aldanidae								
sp. (juv.)	1.5	< 0.1	0.8	< 0.1	4.0	< 0.1	1.3	< 0.1
<i>Axiobella</i>	± 2.1		± 1.0		± 2.2		± 1.5	
<i>rubrocincta</i>	0		0.3	< 0.1	0.8	< 0.1	0.8	✓
			± 0.5		± 1.0		± 1.0	
Nephtyidae								
<i>Nephtys</i>	0		0		0.3	0.1	0	
<i>caecoides</i>					± 0.5	± 0.3		
<i>N.</i>	0		0		0.3	< 0.1	0.5	< 0.1
sp. (juv.)					± 0.5		± 0.6	
Nereidae								
sp. (juv.)	0		0		35.3	✓	21.5	< 0.1
<i>Nereis</i>					± 11.9		± 9.7	
sp.	14.0	< 0.1	4.8	< 0.1	9.5	✓	8.5	< 0.1
<i>Platynereis</i>	± 2.8		± 3.3		± 6.5		± 3.1	
<i>bicanaliculata</i>	12.5	< 0.1	7.5	✓	42.3	✓	37.8	< 0.1
	± 0.7		± 5.1		± 16.0		± 9.0	

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Onuphidae								
Diopatra	0		0.5	< 0.1	0		0.3	< 0.1
ornata			± 0.6				± 0.5	
Opheliidae								
Armandia	1.0	< 0.1	1.5	< 0.1	43.0	< 0.1	18.5	< 0.1
brevis	± 1.4		± 1.3		± 20.0		± 6.8	
Orbinidae								
Scoloplos	3.5	< 0.1	1.3	< 0.1	2.5	< 0.1	5.0	< 0.1
sp.	± 2.1		± 1.0		± 1.3		± 4.6	
Oweniidae								
Owenia	15.5	< 0.1	25.8	✓	34.8	< 0.1	21.8	< 0.1
fusiformis	± 20.5		± 4.8		± 12.3		± 10.5	
Pectinariidae								
Pectinaria	0		0		0		0.5	< 0.1
granulata							± 0.6	
Phyllodocidae								
Staene	1.0	< 0.1	1.8	< 0.1	0.5	< 0.1	0.3	< 0.1
longa	± 0.0		± 1.5		± 0.6		± 0.5	
E.	0		0		0.3	< 0.1	0	
tuberculata					± 0.5			
E.	0		0		0.3	< 0.1	0	
sp. (juv.)					± 0.5			
Eulalia	3.5	< 0.1	0.5	< 0.1	5.8	< 0.1	3.0	< 0.1
languinea	± 3.5		± 0.6		± 1.9		± 0.8	
Phyllodoce	0.5	< 0.1	0		0		0	
groenlandica	± 0.7							
P.	9.5	< 0.1	7.0	✓	21.8	✓	5.3	< 0.1
maculata	± 10.6		± 4.6		± 9.6		± 3.5	
P.	0		2.5	< 0.1	0.3	< 0.1	0.8	< 0.1
sp. A			± 1.3		± 0.5		± 0.5	

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Phyllodoctidae (cont.)								
Phyllodoce	0.5	< 0.1	0.3	< 0.1	0		0.5	< 0.1
sp.	<u>+0.7</u>		<u>+ 0.5</u>				<u>+1.0</u>	
Polynoidae								
sp.	0.5	< 0.1	0		0.8	< 0.1	0	
Arctonoe	<u>+0.7</u>				<u>+1.0</u>			
vittata	0		0		0		0.3	< 0.1
Maranthoe							<u>+0.5</u>	
imbricata	1.5	< 0.1	0.5	< 0.1	0		0.3	< 0.1
H.	<u>+2.1</u>		<u>+0.6</u>				<u>+0.5</u>	
lunulata	0		0.8	< 0.1	0.8	< 0.1	1.0	< 0.1
Lepidasthenia			<u>+0.5</u>		<u>+1.0</u>		<u>+0.8</u>	
berkeleyae	0.5	< 0.1	0		0		0	
	<u>+0.7</u>							
Sigalonidae								
Phoxe	1.0	< 0.1	0		1.3	< 0.1	0	
minuta	<u>+1.4</u>				<u>+1.3</u>			
Spionidae								
Malacoceros	0		1.5	< 0.1	5.8	< 0.1	0.8	< 0.1
glutaeus			<u>+1.9</u>		<u>+5.6</u>		<u>+1.0</u>	
Polydora	37.5	< 0.1	259.8	✓	19.8	✓	3.5	< 0.1
socialis	<u>+53.0</u>		<u>+118.5</u>		<u>+22.5</u>		<u>+5.2</u>	
P.	0		68.0	✓	1.8	< 0.1	0	
sp. A			<u>+52.6</u>		<u>+2.1</u>			
P.	0		0		5.8	< 0.1	0	
sp.					<u>+11.5</u>			
Prionospio	4.5	< 0.1	2.8	< 0.1	11.0	< 0.1	4.8	< 0.1
steenstrupi	<u>+2.1</u>		<u>+2.2</u>		<u>+3.4</u>		<u>+2.4</u>	
Pygospio	2.0	< 0.1	1.3	< 0.1	1.8	< 0.1	0.5	< 0.1
elegans	<u>+0.0</u>		<u>+1.3</u>		<u>+2.2</u>		<u>+0.6</u>	
Scolecopsis	0.5	< 0.1	0		0		0	
sp.	<u>+0.7</u>							
Spio	0		25.0	✓	0.8	< 0.1	1.0	< 0.1
filicornis			<u>+6.2</u>		<u>+1.0</u>		<u>+1.4</u>	

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Spionidae (cont.)								
<i>Spiophanes</i>	6.5	< 0.1	22.5	< 0.1	9.0	< 0.1	5.5	< 0.1
<i>bombyx</i>	<u>+9.2</u>		<u>+22.8</u>		<u>+6.2</u>		<u>+3.1</u>	
Syllidae								
<i>Brania</i>	0		0		0.5	< 0.1	0	
<i>brevipharyngia</i>					<u>+1.0</u>			
<i>Exogone</i>	1.0	< 0.1	0		0.3	< 0.1	0.5	< 0.1
<i>gemmifera</i>	<u>+1.4</u>				<u>+0.5</u>		<u>+0.6</u>	
<i>E.</i>	35.0	< 0.1	22.3	< 0.1	77.3	< 0.1	39.5	< 0.1
<i>leurei</i>	<u>+0.0</u>		<u>+8.7</u>		<u>+22.8</u>		<u>+4.5</u>	
<i>Sphaerosyllis</i>	0		0		0.3	< 0.1	0	
<i>pirifera</i>					<u>+0.5</u>			
<i>S.</i>	0		0		0		0.3	< 0.1
<i>sp.</i>							<u>+0.5</u>	
<i>Syllis</i>	1.5	< 0.1	2.8	< 0.1	1.0	< 0.1	0.3	< 0.1
<i>spp.</i>			<u>+2.1</u>		<u>+1.4</u>		<u>+0.5</u>	
Crustacea								
<i>Ostracoda</i>	1.5	< 0.1	2.0	< 0.1	4.0	< 0.1	0.3	< 0.1
<i>spp.</i>	<u>+0.7</u>		<u>+4.0</u>		<u>+3.7</u>		<u>+0.5</u>	
Leptostraca								
<i>Nebalia</i>	0.5	< 0.1	0		2.8	< 0.1	1.8	< 0.1
<i>pugattensis</i>	<u>+0.7</u>				<u>+1.0</u>		<u>+1.3</u>	
Mysidacea								
<i>Archaeomysis</i>	0		0		0		0.3	< 0.1
<i>grebnitskii</i>							<u>+0.5</u>	
Cumacea								
<i>Cumella</i>	25.5	< 0.1	1.3	< 0.1	4.0	< 0.1	0.8	< 0.1
<i>vulgaris</i>	<u>+0.7</u>		<u>+1.9</u>		<u>+2.2</u>		<u>+1.1</u>	
Tanaidacea								
<i>Leptochelia</i>	483.5	0.1	449.5	0.2	1115.8	0.6	509.3	0.2
<i>dubia</i>	<u>+5.0</u>	<u>+ 0.1</u>	<u>+332.7</u>	<u>+0.1</u>	<u>+308.9</u>	<u>+0.2</u>	<u>+177.9</u>	<u>+0.1</u>

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Crustacea (cont.)								
Isopoda								
Exosphaeroma	1.0	<0.1	0		0.8	<0.1	0	
implicauda	+1.4				+1.5			
Ianiropsis	0		0		0		0.3	<0.1
kincaidii							+0.5	
Amphipoda								
Caprellidea								
Caprella	0		0		0		0.3	<0.1
laeviuscula							+0.5	
Gammaridea	70.5	<0.1	-		22.0	<0.1	20.5	0.1
spp.	+64.4				+15.8		+13.7	+0.1
Ampelisca	-		1.5	<0.1	-		-	
agassizii			+1.7					
Ampithoe	-		3.5	<0.1	-		-	
liacertosa			+0.1					
Anisogammarus	-		0.3	<0.1	-		-	
confervicolus			+0.5					
Aeroides	-		1.0	<0.1	-		-	
columbiae			+0.8					
Corophium	-		3.8	<0.1	-		-	
acherusicum			+3.0					
C.	1.5	<0.1	3.0	<0.1	0.3	<0.1	0	
spp.	+0.7		+2.5		+0.5			
Gammaropsis	-		0.5	<0.1	-		-	
thompsoni			+1.0					
Melita	-		0.3	<0.1	-		-	
dentata			+0.5					
Paraphoxus	-		1.8	<0.1	-		-	
sp. type A			+2.2					
P.	-		6.8	<0.1	-		-	
sp. type C			+5.6					
Photis	-		72.0	0.8	-		-	
brevipes			+64.7	+1.5				

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Gammaridea (cont.)								
Pontogenesia			0.3	<0.1				
cf. rostrata	-		± 0.5		-		-	
Synchlidium			0.3	<0.1				
rectipalpus	-		± 0.5		-		-	
Decapoda								
Cancer	0		0.8	<0.1	0		0	
oregonensis			± 1.5					
C.	0		2.0	<0.1	0.3	<0.1	0	
spp.			± 2.7		± 0.5			
Caridea	0		0.3	<0.1	0.3	<0.1	0	
sp. (juv.)			± 0.5		± 0.5			
Crangonidae	0		0.3	<0.1	0		0	
sp. (juv.)			± 0.5					
Matantia	0		0.3	<0.1	0		0	
sp.			± 0.5					
Pagurus	J		1.3	<0.1	0		0	
spp. (juv.)			± 0.5					
Pinnixa	1.0	<0.1	0.8	<0.1	2.6	0.1	0.3	<0.1
sp.	± 1.4		± 1.5		± 5.5	± 0.1	± 0.5	
Pinnotheridae	0		0.5	<0.1	0.3	<0.1	0.3	<0.1
spp.			± 0.6		± 0.5		± 0.5	
Pugettia	0		6.8	<0.1	0		0	
gracilis			± 5.4					
Phoronida								
Phoronopsis	1.5	<0.1	0.3	<0.1	0.5	<0.1	0	
harmeri	± 2.1		± 0.5		± 1.0			
Echinodermata								
Echinoidea								
Dendraster	4.7	0.1	22.8	1.9	24.8	0.4	12.0	0.3
excentricus	± 2.5	± 0.1	± 4.9	± 2.8	± 4.6	± 0.1	± 6.2	± 0.1

Beckett Point +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Holotheroidea								
Leptosynapta								
clarki	5.5	0.1	2.8	0.1	3.5	0.0	2.0	✓
	± 6.4	± 0.1	± 1.0	± 0.2	± 1.9	± 0.1	± 1.2	
Species richness	68		83		93		79	
Diversity - H'	2.52		2.51		2.13		2.30	
Total number	1241.5		1464.6		2427.8		1144.6	
Total biomass (g)	< 61.3		< 69.5		< 77.0		< 69.6	

Table 5.4. Beckett Point (sand) benthic organisms from the subtidal zone collected 6 June 1977, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=4).

	-5 m.		-10 m.	
	#	wt	#	wt
Chlorophyta				
Ulva sp.		< 0.1		0
Rhodophyta				
Ceramium nigrum		< 0.1		0
Cnidaria				
Anthozoa				
Actinaria sp.	0.5 $\pm$ 1.0	0.1 $\pm$ 0.2	0	
Platyhelminthes				
Turbellaria spp.	0.3 $\pm$ 0.5	< 0.1	0	
Nemertea spp.	13.0 $\pm$ 5.8	< 0.1	20.0 $\pm$ 2.5	< 0.1
Nematoda spp.	8.0 $\pm$ 4.2	< 0.1	18.0 $\pm$ 7.9	< 0.1
Mollusca				
Gastropoda				
Acmaeidae sp. (juv.)	0.3 $\pm$ 0.5	< 0.1	0	
Aglaja diomedea	0		0.3 $\pm$ 0.5	0.1 $\pm$ 0.2
Alvinia sp.	15.8 $\pm$ 8.1	< 0.1	17.0 $\pm$ 12.5	0.3 $\pm$ 0.6
Amphissa columbiana	0.3 $\pm$ 0.5	< 0.1	0	
Cerithiopsis sp.	0.3 $\pm$ 0.5	< 0.1	0	
Columbellidae	0.5 $\pm$ 1.0	< 0.1	0	
Crepidula spp. (juv.)	0.5 $\pm$ 0.6	< 0.1	0.5 $\pm$ 1.0	< 0.1
Cylichna sp.	0.5 $\pm$ 0.6	< 0.1	1.3 $\pm$ 1.5	< 0.1
Eminovavescula	0		0.3 $\pm$ 0.5	< 0.1
Lacuna variegata	9.5 $\pm$ 5.9	< 0.1	3.3 $\pm$ 4.3	< 0.1
Margarites pupillus	1.3 $\pm$ 2.5	0.1 $\pm$ 0.2	0	
Margarites/Lirularia	2.0 $\pm$ 1.4	< 0.1	0	
Mitrella carinata	0.3 $\pm$ 0.5	< 0.1	0	
Mitrella tuberosa	2.5 $\pm$ 2.7	0.1 $\pm$ 0.1	16.3 $\pm$ 18.6	0.7 $\pm$ 1.2
Nassarius mendicue	0		1.0 $\pm$ 0.8	0.0 $\pm$ 0.1
Odostomia sp.	0		2.8 $\pm$ 4.9	< 0.1
Turbonilla sp.	1.3 $\pm$ 0.1	< 0.1	0.8 1.0	< 0.1

Beckett Point Subtidal

	-5 m.		-10 m.	
	#	wt	#	wt
Bivalvia				
<i>Acila castrensis</i>	0		0.3 ± 0.5	<0.1
<i>Clinocardium nuttallii</i>	0		0.3 ± 0.5	<0.1
<i>Crenella decussata</i>	0		1.8 ± 1.7	0.3 ± 0.5
<i>Cryptomya californica</i>	0.5 ± 1.0	<0.1	0	
<i>Lucinoma tenuisculpta</i>	2.8 ± 1.9	<0.1	3.8 ± 2.1	<0.1
<i>Lyonsia californica</i>	0.3 ± 0.5	<0.1	0	
<i>Macoma</i> sp. (juv.)	10.0 ± 7.1	0.2 ± 0.3	10.3 ± 10.3	0.1 ± 0.1
<i>Mya arenaria</i>	0		0.3 ± 0.5	<0.1
<i>Myrella tumida</i>	64.5 ± 16.5	0.1 ± 0.1	153.8 ± 44.4	0.2 ± 0.1
<i>Mytilus</i> sp. (juv.)	0		0.3 ± 0.5	<0.1
<i>Nucula tenuis</i>	0		0.3 ± 0.5	<0.1
<i>Pododemus capio</i>	0.3 ± 0.5	<0.1	0	
<i>Tellina</i> sp.	18.8 ± 11.3	0.5 ± 0.5	7.3 ± 6.0	0.6 ± 0.6
Annelida				
<i>Oligochaeta</i> spp.	4.8 ± 3.6	<0.1	1.3 ± 1.5	<0.1
Polychaeta				
<i>Ampharetidae</i> sp.	0		0.3 ± 0.5	<0.1
<i>Ampharete arctica</i>	0.3 ± 0.5	<0.1	0	
Capitellidae				
<i>Capitella capitata</i>	0		1.0 ± 2.0	<0.1
<i>Mediomastus</i> sp.	0.3 ± 0.5	<0.1	1.8 ± 2.1	<0.1
<i>Notomastus lineatus</i>	0		1.5 ± 1.7	<0.1
Chaetopteridae				
<i>Mesochaetopterus taylori</i>	1.8 ± 2.9	<0.1	14.0 ± 13.9	<0.1
<i>Phyllochaetopterus prolifica</i>	0		41.3 ± 49.3	<0.1
<i>Spiochaetopterus costarum</i>	5.5 ± 3.1	<0.1	8.0 ± 4.9	<0.1
Dorvilleidae				
<i>Protodorvillea gracilis</i>	0		0.3 ± 0.5	<0.1
Glyceridae				
<i>Glycera</i> sp. (juv.)	0.8 ± 1.5	<0.1	0.3 ± 0.5	<0.1

Beckett Point Subtidal

	-5 m		-10 m.	
	#	wt	#	wt
Glyceridae (cont.)				
<i>Hemipodus borealis</i>	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
Coniadiidae				
<i>Glycinde picta</i>	1.8 ± 1.0	<0.1	3.0 ± 3.2	<0.1
Resionidae				
<i>Micropodarka dubia</i>	28.3 ± 8.2	<0.1	47.5 ± 28.4	<0.1
<i>Ophiodromus pugettenis</i>	0		0.8 ± 1.5	<0.1
Lumbrineridae				
<i>Lumbrineris</i> sp.	0		1.3 1.0	0.1
Magelonidae				
<i>Magelona pitelkai</i>	0.5 ± 0.6	<0.1	0	
Maldenidae				
<i>Axiobella rubrocincta</i>	1.0 ± 0.8	<0.1	0.3 ± 0.5	<0.1
<i>Euclymene</i> sp.	0		2.5 ± 3.8	<0.1
<i>Micomache lumbricolus</i>	0		1.3 ± 1.0	<0.1
<i>M. personata</i>	0		1.3 ± 1.5	<0.1
Nephtyidae				
<i>Nephtys ferruginea</i>	0.8 ± 0.5	<0.1	1.0 ± 1.4	<0.1
<i>N.</i> sp.	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
<i>N.</i> sp. (juv.)	0.5 ± 0.6	<0.1	2.5 ± 1.3	<0.1
Nereidae				
<i>Nereis procera</i>	0.5 ± 0.6	<0.1	0	
<i>N.</i> sp. (juv.)	0		0.5 ± 1.0	<0.1
<i>Platynereis bicanaliculata</i>	104.8 ± 68.7	✓	68.0 ± 51.7	<0.1
Onuphiidae				
<i>Diopatra ornata</i>	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1

Beckett Point Subtidal

	-5 m.		-10 m.	
	#	wt	#	wt
Opheliidae				
Armandia brevis	14.5 ± 3.9	<0.1	3.0 ± 1.6	<0.1
Orbiniidae				
Scolopelos sp.	2.0 ± 0.8	<0.1	1.3 ± 1.3	<0.1
Oweniidae				
Owenia fusiformis	6.5 ± 7.2	<0.1	0.3 ± 0.5	<0.1
Pectinariidae				
Pectinaria granulata	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
Phyllodoce				
Eteone longa	0		0.3 ± 0.5	<0.1
Eulalia sanguinea	7.8 ± 5.1	<0.1	12.5 ± 4.2	<0.1
Phyllodoce groenlandica	0		0.3 ± 0.5	<0.1
P. maculata	0.5 ± 1.0	<0.1	4.0 ± 5.7	<0.1
P. sp. A.	2.3 ± 4.5	<0.1	8.8 ± 5.2	<0.1
P. sp. (juv.)	3.3 ± 1.1	<0.1	32.5 ± 5.7	<0.1
Polynoidae				
Harmothoe imbricata	2.8 ± 1.0	<0.1	3.8 ± 3.0	<0.1
H. lunulata	0		1.3 ± 1.0	<0.1
Tenonia kitsapensis	0		0.3 ± 0.5	<0.1
Sabellidae				
Chone acaudata	0		0.3 ± 0.5	<0.1
Fabriciinae	0		0.3 ± 0.5	<0.1
Serpulidae				
Spirorbis nakamurai	0		0.3 ± 0.5	<0.1
Sigalionidae				
Pholoe minuta	0		4.0 ± 2.6	<0.1
Spionidae				
Polydora limicola	0		0.5 ± 1.0	<0.1

Beckett Point Subtidal

	-5 m.		-10 m.	
	#	wt	#	wt
Spionidae (cont.)				
<i>Polydora pygidialis</i>	1.3 ± 2.5	<0.1	0	
<i>P. socialis</i>	3.8 ± 3.0	<0.1	54.0 ± 39.1	<0.1
<i>P. sp.</i>	1.0 ± 0.8	<0.1	0.8 ± 1.5	<0.1
<i>Prionospio steenstrupi</i>	81.5 ± 5.8	<0.1	36.5 ± 10.8	<0.1
<i>Spio filicornis</i>	0.8 ± 1.0	<0.1	0.3 ± 0.5	<0.1
<i>Spiophanes bombyx</i>	0.5 ± 0.6	<0.1	0	
Syllidae				
<i>Exogone sp.</i>	0.5 ± 0.6	<0.1	0.5 ± 0.6	<0.1
<i>Sphaerosyllis brandhorsti</i>	0.8 ± 1.5	<0.1	0	
<i>Syllis spp.</i>	0		1.6 ± 2.1	<0.1
Terebellidae spp.				
	0		0.3 ± 0.5	<0.1
Sipuncula spp.				
<i>Golfingia pudgetensis</i>	0		0.3 ± 0.5	<0.1
	0		0.3 ± 0.5	<0.1
Crustacea				
Ostracoda spp.				
	2.8 ± 2.1	<0.1	42.3 ± 16.3	<0.1
Leptostraca				
<i>Nebalia pudgetensis</i>	2.0 ± 1.8	<0.1	5.8 ± 4.9	<0.1
Cumacea				
<i>Cumella vulgaris</i>	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
<i>Diastylis sp.</i>	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
<i>Leptocuma sp.</i>	0.3 ± 0.5	<0.1	0	
Tanaidacea				
<i>Leptochelia dubia</i>	63.0 ± 14.5	<0.1	15.8 ± 5.7	<0.1
Isopoda				
<i>Limnoria algarum</i>	0		0.3 ± 0.5	<0.1
<i>Munna ubiquata</i>	0.3 ± 0.5	<0.1	0	
<i>Paranthura elegans</i>	0.3 ± 0.5	<0.1	1.3 ± 1.5	<0.1

Beckett Point Subtidal

	-5 m.		-10 m.	
	#	wt	#	wt
Amphipoda				
Gammaridea spp.	148.8 ± 17.6	0.1 ± 0.1	151.3 ± 42.0	0.3 ± 0.3
Caprella sp.	0.3 ± 0.5	<0.1	0	
Metacaprella kennerlyi	1.3 ± 0.1	<0.1	0	
Decapoda				
Callinassidae sp. (juv.)	0.3 ± 0.5	<0.1	0	
Cancer oregonensis	0.3 ± 0.5	0.2 ± 0.4	0	
Crangon sp.	2.5 ± 2.1	0.0 ± 0.1	0	
Hippolytidae sp. (juv.)	1.3 ± 1.9	<0.1	1.3 ± 1.0	<0.1
Paguridae sp. (juv.)	0.8 ± 1.0	<0.1	14.0 ± 7.6	<0.1
Pagurus beringanus	1.0 ± 2.0	<0.1	0	
Pinnotheridae sp. (juv.)	1.0 ± 1.2	<0.1	3.3 ± 1.7	<0.1
Pugettia gracilis	2.8 ± 2.1	0.0 ± 0.1	4.8 ± 3.8	<0.1
Phoronida				
Phoronopsis harmeri	0		0.5 ± 0.6	<0.1
Echinodermata				
Ophiuroidea spp.	0		0.3 ± 0.5	<0.1
Holothuroidea				
Leptosynapta clarki	0.3 ± 0.5	<0.1	0	
Species richness	83		90	
Diversity - H'	2.77		3.05	
Total number	70.8		877.1	
Total biomass (g)	<8.5		<10.7	

Table 6a. Dungeness Spit (exposed sand-gravel) benthic organisms from the high (+6') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida								
Oligochaeta	0.2	<0.1	0		0		0.2	<0.1
app.	± 0.5						± 0.5	
Crustacea								
Amphipoda								
Gammaridea	0.2	<0.1	-		0		0	
app.	± 0.5							
Orchestoidea	-		16.6	<0.1	-		-	
pugetlensis			± 34.3					
Species Richness	2		1		0		1	
Diversity, H ¹	0.69		0.00		0		0.00	
Total Number	0.4		16.6		0		0.2	
Total Biomass	<0.2		<0.1		0		<0.1	

Table 6b. Dungeness Spit (exposed sand-gravel) benthic organisms from the mid (+3') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Amelidae								
app.	0		0.6	<0.1	0		0	
			± 1.3					
Oligochaeta	0.2	<0.1	0		0		0	
app.	± 0.5							
Crustacea								
Amphipoda								
Gammaridea	13.6	0.0	-		0.8	<0.1	28.6	<0.1
app.	± 26.6	± 0.1			± 0.8		± 15.9	
Orchestoidea	-		0.2	<0.1	-		-	
pugilans			± 0.5					
Species Richness	2		2		1		1	
Diversity, H ¹	0.08		0.56		0.00		0.00	
Total Number	13.8		0.8		0.8		23.6	
Total Biomass	< 0.1		< 0.2		< 0.1		< 0.1	

Table 60. Dungeness Spit (exposed sand-gravel) benthic organisms from the low (+0') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Mollusca								
Gastropoda								
Amphissa	0		0		0.8	<0.1	0	
columbiana					± 1.8			
Lacuna	0		0		0.2	<0.1	0	
variegata					± 0.5			
Bivalvia								
Clinocardium	0		0		0.2	<0.1	0	
app.					± 0.5			
Crenella	0.2	<0.1	0		0		0	
decussata	± 0.5							
Annelida								
Oligochaeta	0.4	<0.1	0		0		0	
	± 0.9							
Dorvilleidae								
Protodorvillea	0		0		0.2	<0.1	0	
gracilis					± 0.5			
Spionidae	0		0.2	<0.1	0		0	
app.			± 0.5					
Crustacea								
Amphipoda								
Gammarides	2.0	<0.1	-		24.6	<0.1	3.4	<0.1
app.	± 2.2				± 24.1		± 4.6	
Paramera								
"Serrata" n. sp.	-		7.0	<0.1	-		-	
			± 5.2					
Species Richness	3		2		5		1	
Diversity, H ¹	0.69		0.13		0.27		0.00	
Total Number	2.6		7.2		26.0		3.4	
Total Biomass	< 0.3		< 0.2		< 0.5		< 0.1	

Table 6d. Dungeness Spit (sand-gravel) benthic organisms from the subtidal zone collected 6 June 1977, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=4).

	-5 m.		-10 m.	
	#	wt.	#	wt.
Chlorophyta				
Chaetomorpha californica	0		0.0±0.1	
Bacillariophyta				
Pennella	0		0.1±0.1	
Phaeophyta				
Alaria spp.	0		0.2±0.4	
Costaria costata	0		0.2±0.2	
Desmarestia aculeata	0		0.1±0.1	
D. ligulata var. ligulata	0		0.1±0.0	
Ectocarpaceae	0		0.1±0.1	
Feldmania spp.	0		0.0±0.1	
Giffordia ovata	0		0.0±0.1	
Haplogloia andersonii	0		0.1±0.1	
Hedophyllum sessile (juv.)	0		0.0±0.1	
Laminariales spp.	0		0.1±0.1	
Laminaria spp.	0		1.1±2.0	
Ralfsiaceae	0		0.0±0.1	
Ralfsia pacifica	0		0.1±0.1	
Stictyosiphon tortilis	0		0.1±0.1	
Syringoderma abyssicola	0		0.1±0.0	
Rhodophyta				
Aclochaetium spp.	0		0.1±0.0	
Antithamnion defectum	0		0.0±0.1	
A. spp.	0.0±0.1		0	
Botryocladia pseudodichotoma	0		0.0±0.1	
Callithamnion/Plenosporium	0		0.0±0.1	
Choreocolax polysiphoniae	0		0.0±0.1	
Cruoriopsis aestuarii	0.0±0.1		0.0±0.1	
Cryptonemia borealis	0		0.0±0.1	
C. ovalifolia	0		0.0±0.1	
Euthora fruticulosa	0		0.0±0.1	
Gigarinaceae	0		0.0±0.1	
Goniotrichum albidii	0		0.1±0.1	

Dungeness Spit Subtidal

	-5 m.		- 10 m.	
	#	wt.	#	wt.
Rhodophyta (cont.)				
Gracilaria spp.		0		0.2 ± 0.2
Gymnogongrus leptophyllus		0		0.0 ± 0.1
Halymenia spp.		0		0.1 ± 0.1
Hollenbergia subulata		0		0.1 ± 0.1
Iridaea spp.		0		0.1 ± 0.1
Leptofauchea pacifica		0		0.1 ± 0.1
Membranoptera spp.		0		0.0 ± 0.1
Peyssonellia pacifica		0		0.1 ± 0.0
Phycodrys isabelliae		0		0.0 ± 0.1
Platythamnion pectinatum		0		0.0 ± 0.1
P. villosum		0		0.1 ± 0.1
P. spp.		0		0.1 ± 0.2
Polysiphonia hendryi		0		0.1 ± 0.0
P. pacifica		0		0.1 ± 0.1
Porphyra spp.		0		0.1 ± 0.2
Pterosiphonia dendroidea		0		1.0 ± 1.0
Rhodymenia spp.		0		0.0 ± 0.1
Stenogramme interrupta		0		0.1 ± 0.0
Squamariaceae		0.0 ± 0.1		0.0 ± 0.1
Thuretellopsis peggiana		0		0.1 ± 0.0
Cnidaria				
Hydrozoa				
Coryne tubulosa	0		0.3 ± 0.5	<0.1
Anthozoa				
spp.	0		0.5 ± 1.0	<0.1
Platyhelminthes				
Turbellaria spp.	0		6.8 ± 2.6	<0.1
Nemertea spp.	1.3 ± 0.6	<0.1	43.8 ± 32.7	<0.1
Mollusca				
Amphineura				
Cryptobranchia concentrica	0		0.3 ± 0.5	<0.1

Dungeness Spit Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Mollusca				
Gastropoda				
<i>Amphissa columbiana</i>	1.8 ± 3.5	<0.1	0.8 ± 1.0	<0.1
<i>Calyptrea fastigata</i>	0.3 ± 0.5	<0.1	4.3 ± 1.9	<0.1
<i>Lacuna variegata</i>	1.0 ± 1.4	<0.1	2.0 ± 2.7	<0.1
<i>Margarites/Lirularia</i>	0		3.8 ± 2.2	<0.1
<i>Margarites pupillus</i>	0.3 ± 0.5	<0.1	0	
<i>Mitrella tuberosa</i>	0.3 ± 0.5	<0.1	0	
<i>Natica clausa</i>	0		0.3 ± 0.5	<0.1
<i>Trichotropis cancellata</i>	0		0.3 ± 0.5	<0.1
Bivalvia				
<i>Clinocardium nuttalli</i>	0.5 ± 0.6	<0.1	0	
<i>Crenella decussata</i>	1.8 ± 2.9	<0.1	3.3 ± 4.6	<0.1
<i>Emiliaria hennerleyi</i>	0		0.3 ± 0.5	0.4 ± 0.9
<i>Macoma</i> sp.	0		2.3 ± 1.7	<0.1
<i>M.</i> sp. juv.	0		0.3 ± 0.5	<0.1
<i>Mya arenaria</i>	0		0.5 ± 0.6	0.2 ± 0.4
<i>Myella tumida</i>	1.5 ± 1.0	<0.1	3.5 ± 4.4	<0.1
<i>Protothaca staminea</i>	0		0.5 ± 0.5	<0.1
<i>Trasacella tantilla</i>	2.0 ± 2.2	<0.1	0.5 ± 0.5	<0.1
<i>Tresus capax</i>	0		0.3 ± 0.5	<0.1
Annelida				
<i>Oligochaeta</i> spp.	0		13.5 ± 8.8	<0.1
Polychaeta				
<i>Acrocirridae</i> spp.	0		0.5 ± 1.0	<0.1
Capitellidae				
<i>Mediomastus</i> spp.	3.5 ± 1.7	<0.1	53.0 ± 9.3	0.0 ± 0.1
<i>Notomastus lineatus</i>	0		1.3 ± 1.5	<0.1
<i>Cirratulidae</i> spp.	0		1.8 ± 3.5	<0.1
<i>Chaetoxona setosa</i>	0		3.8 ± 1.7	<0.1
<i>Caulericiella</i> spp.	0		1.3 ± 2.5	<0.1
<i>Cirratulus cirratus</i>	0		1.3 ± 1.5	<0.1
<i>Tharyx multifilis</i>	0		2.5 ± 3.0	<0.1
Corvillidae				
<i>Protodorvillea gracilis</i>	0		22.8 ± 29.3	<0.1
Glyceridae				
<i>Glycinde picta</i>	0.5 ± 0.6	<0.1	0.3 ± 0.5	<0.1

Dungeness Spit Subtidal

	-5 m.		-10 m.	
	<i>f</i>	wt.	<i>g</i>	wt.
Annelids (cont.)				
Polychaeta				
Nesionidae				
Glyptis brevipalpa	0		0.3 ± 0.5	<0.1
Micropodarke dubia	0		11.0 ± 3.4	<0.1
Maldanidae (juv.)	0		3.8 ± 3.3	<0.1
Axiiothella rubrocincta	0		1.3 ± 2.5	<0.1
Nephtyidae				
Nephtys ciliata	0		0.3 ± 0.5	<0.1
N. ferruginea	0		0.5 ± 1.0	<0.1
N. sp.	0		0.3 ± 0.5	<0.1
Nereidae				
Nereis sp.	0		0.3 ± 0.5	<0.1
Platynereis bicanaliculata	0.3 ± 0.5	<0.1	3.5 ± 2.7	<0.1
Opheliidae				
Armandia brevis	0.3 ± 0.5	<0.1	0	
Travisia for. sp.	0		0.5 ± 0.6	<0.1
Orbinidae				
Scoloplos sp.	0.5 ± 1.0	<0.1	0	
Oweniidae				
Owenia fusiformis	0		6.0 ± 3.4	<0.1
Phyllodocidae				
Eteone longa	0		0.5 ± 0.6	<0.1
Eulalia sanguinea	0		0.3 ± 0.5	<0.1
Phyllodoce sp. (juv.)	0		0.5 ± 0.6	<0.1
Polynoidae				
Harmothoe imbricata	0.5 ± 1.0	<0.1	0.8 ± 1.0	<0.1
Sabellidae				
Chone sp.	0		0.5 ± 0.6	<0.1
Sabella media	0		0.3 ± 0.5	<0.1
Scalibregmidae				
Scalibregma inflatum	0		5.3 ± 4.7	<0.1
Serpulidae spp.				
Spirorbis sp.	0		1.3 ± 2.5	<0.1

Dungeness Spit Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Sigalionidae				
Pholoe minuta	0		0.5 ± 0.6	<0.1
Spionidae				
Malacoceros glutaeus	2.8 ± 4.9	<0.1	0	
Prionospio cirrifera	0		0.3 ± 0.5	<0.1
P. steenstrupi	0		7.3 ± 3.8	<0.1
Spio filicornis	0		1.3 ± 0.2	<0.1
Spiophanes bombyx	0		0.3 ± 0.5	<0.1
Syllidae				
Exogone spp.	0		20.8 ± 24.5	<0.1
E. gemifera	0		0.3 ± 0.5	<0.1
E. lourei	0		4.3 ± 4.0	<0.1
Sphaerosyllis pirrifera	0		1.3 ± 1.5	<0.1
Syllides longocirrata	0		1.0 ± 1.2	<0.1
Syllis spp.	0		5.0 ± 1.4	<0.1
Terebellidae				
Polycirrus sp. A	0		9.6 ± 11.3	<0.1
P. sp. B	0		1.0 ± 2.0	<0.1
P. sp.	0		7.0 ± 8.1	<0.1
Archannelida				
Polygordiidae				
Polygordius sp.	0		5.0 ± 2.5	<0.1
Crustacea				
Cumacea				
Diastylis sp.	0.8 ± 0.5	<0.1	1.0 ± 1.4	<0.1
Lampropidae sp.	0.5 ± 1.0	<0.1	0	
Leptocuma sp.	0		0.3 ± 0.5	<0.1
Tanaidacea				
Leptochelia dubia	0.3 ± 0.5	<0.1	12.3 ± 14.8	<0.1

	Dungeness Spit		Subtidal	
	-5 m.		-10 m.	
	#	wt.	#	wt.
Crustacea (cont.)				
Isopoda				
<i>Exophaeroma amplicanda</i>	0		0.3 ± 0.5	<0.1
<i>E. rhomburum</i>	0		5.8 ± 7.0	<0.1
<i>E. sp. (juv.)</i>	0		1.8 ± 3.5	<0.1
<i>Gnathomorpha oregonense</i>	2.0 ± 2.7	<0.1	0	
<i>Idotea sp. (juv.)</i>	0		0.3 ± 0.5	<0.1
Amphipoda				
Gammaridea	19.0 ± 23.6	<0.1	28.0 ± 8.5	<0.1
Decapoda				
Callinassidae sp. (juv.)	0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
<i>Remigrapsus oregonensis</i>	0		0.3 ± 0.5	<0.1
Hippolytidae	0		0.3 ± 0.5	<0.1
Majidae (juv.)	0		2.8 ± 3.0	<0.1
Paguridae sp. (juv.)	0.3 ± 0.5	<0.1	0.5 ± 0.6	<0.1
Pinnotheridae (juv.)	0		0.3 ± 0.5	<0.1
<i>Pugettia gracilis</i>	0		0.8 ± 1.5	<0.1
Phoronida				
<i>Phoronopsis harmeri</i>	0		0.5 ± 0.6	<0.1
E yozoa		0	0.0 ± 0.1	<0.1
Echinodermata				
Opniuroidea spp.	0		1.3 ± 1.3	<0.1
Holothuroidea				
<i>Leptosynapta clarki</i>	0		0.3 ± 0.5	<0.1
Species Richness	28		136	
Diversity, H ¹	2.43		3.82	
Total number	42.9		338.2	
Total biomass (g)	< 2.8		< 16.1	

Table 7. Twin Rivers (exposed sand-gravel) benthic organisms from the high (+6') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=3).

	#	wt
Annelida Diplochaeta spp. Polychaeta Syllidae Exogone lourei	1.6 $\pm$ 1.1 0.2 $\pm$ 0.4	< 0.1 < 0.1
Crustacea Amphipoda Gammaridea spp.	0.4 $\pm$ 0.5	< 0.1
Species Richness	3	
Diversity, H ¹	0.76	
Total Number	2.2	
Total Biomass	0.3	

Table 3. Twin Rivers (exposed sand-gravel) benthic organisms from the mid (+) intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=5).

	#	wt
Annelida		
Oligochaeta spp.	1.4 ± 1.5	< 0.1
Crustacea		
Isopoda		
Gnorimosphaeroma oregonense	1.6 ± 2.1	< 0.1
Amphipoda		
Gammaridea spp.	28.8 ± 30.9	< 0.1
Insecta		
Diptera larvae spp.	2.8 ± 5.2	< 0.1
Species Richness	4	
Diversity, H¹	0.63	
Total Number	34.6	
Total Biomass	< 0.4	

Table 7a. Twin Rivers (exposed sand-gravel) benthic organisms from the low (+0') intertidal zone collected spring 1977, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	+0'	
	#	wt.
Platyhelminthes		
Turbellaria spp.	0.6 $\pm$ 0.9	<0.1
Annelida		
Polychaeta		
Arenicolidae spp.	1.4 $\pm$ 1.7	<0.1
Capitellidae		
Mediomastus spp.	0.2 $\pm$ 0.4	<0.1
Capitella capitata	8.4 $\pm$ 9.6	<0.1
Notomastus tenuis	0.8 $\pm$ 1.3	<0.1
Goniadidae		
Glycinde picta	0.6 $\pm$ 0.5	<0.1
Lumbrineridae		
Lumbrineris zonata	1.2 $\pm$ 2.7	<0.1
Lumbrineris spp.	1.2 $\pm$ 2.2	<0.1
Nereidae		
Nereis spp.	0.4 $\pm$ 0.5	<0.1
Orbinidae		
Scoloplos spp.	0.2 $\pm$ 0.4	<0.1
Paraonidae		
Paraonella platybranchia	0.2 $\pm$ 0.4	<0.1
Spionidae		
Malacoceros glutans	33.0 $\pm$ 19.1	<0.1
Prionospio steenstrupi	0.2 $\pm$ 0.4	<0.1
Crustacea		
Amphipoda		
Gammaridea spp.	8.0 $\pm$ 12.3	<0.1
Eohaustorius washingtonianus	16.0 $\pm$ 11.0	<0.1
Species Richness	15	
Diversity, H ¹	1.62	
Total Number	72.4	
Total Biomass	<1.5	

Table 16. 7 in Rivers (gravel) benthic organisms from the subtidal zone collected 22 June 1977, expressed as number and/or biomass (g) per 0.03 m² ± standard deviation (N=4).

	-5 m.	
	#	wt.
Nemertea spp.	1.3 ± 0.5	<0.1
Nematoda spp.	0.8 ± 1.0	<0.1
Mollusca		
Bivalvia		
Myseila tumida	0.3 ± 0.5	<0.1
Protothaca staminea	0.5 ± 0.6	0.3 ± 0.4
Tellina sp.	1.0 ± 0.8	<0.1
Annelida		
Oligochaeta spp.	0.3 ± 0.5	<0.1
Polychaeta		
Capitellidae		
Mediomastus sp.	20.5 ± 13.0	<0.1
Cirratulidae		
Tharyx multifilis	259.5 ± 365.6	✓
Goniadidae		
Glycinde picta	3.5 ± 2.9	<0.1
Nephtyidae		
Nephtys caecoides	0.3 ± 0.5	<0.1
N. sp. (juv.)	0.3 ± 0.5	<0.1
Nereidae		
Nereis procera	0.3 ± 0.5	<0.1
N. sp. (juv.)	0.3 ± 0.5	<0.1
Platynereis bicanaliculata	0.8 ± 1.5	<0.1
Orbinidae		
Naineris uncinata	0.5 ± 1.0	<0.1
Scoloplos sp.	3.5 ± 1.3	<0.1
Oweniidae		
Owenia fusiformis	33.5 ± 38.2	<0.1
Phyllodocidae		
Eteone longa	0.3 ± 0.5	<0.1
Phyllodoce maculata	0.8 ± 1.0	<0.1

Twin Rivers Subtidal 22 June 1977

	-5 m.	
	ϕ	wt.
Annelida (cont.)		
Polychaeta		
Spionidae		
<i>Polydora socialis</i>	0.3 ± 0.5	< 0.1
<i>Prionospio steenstrupi</i>	7.5 ± 3.8	< 0.1
<i>Spiophanes bombyx</i>	0.3 ± 0.5	< 0.1
Cristata		
<i>Astracoda</i> spp.	0.3 ± 0.5	< 0.1
Cumacea		
<i>Diastylopsis</i> sp.	88.3 ± 25.5	0.1 ± 0.1
Isopoda		
<i>Edotea sublittoralis</i>	0.8 ± 0.5	< 0.1
<i>Gnorimosphaeroma oregonense</i>	16.5 ± 21.8	0.1 ± 0.1
<i>Synidotea bicuspidata</i>	0.3 ± 0.5	< 0.1
Amphipoda		
<i>Gammaridea</i> spp.	74.3 ± 25.9	0.1 ± 0.1
Species Richness	28	
Diversity, H^1	1.69	
Total Number	442.6	
Total Biomass	< 2.8	

Table 8a. North Beach Sand (exposed sand) benthic organisms from the high (+6') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea spp.	0.2 ± 0.5	<0.1	0.2 ± 0.5	<0.1	0		0	
Mollusca								
Gastropoda								
<i>Lacuna</i>	0		0		0.2 ± 0.5	<0.1	0.2 ± 0.5	<0.1
<i>variegata</i>					0		0	
<i>Littorina</i>	0.8 ± 0.8	<0.1	0.2 ± 0.5	0.0 ± 0.0				
<i>scutulata</i>								
<i>L. sitkana</i>	1.0 ± 1.0	<0.1	0.4 ± 0.9	0.0 ± 0.0	0		0	
Bivalvia								
<i>Mytilus</i>	0.2 ± 0.5	<0.1	0		0		0	
app. (juv.)								
Annelida								
Oligochaeta								
app.	1.2 ± 1.6	<0.1	0		1.4 ± 1.1	<0.1	0.4 ± 0.6	<0.1
Polychaeta								
Nephtyidae								
<i>Nephtys</i>	0.2 ± 0.5	<0.1	0		0		0	
<i>californiensis</i>								
Nereidae								
<i>Nereis</i>	0.2 ± 0.5	<0.1	0		0		0	
sp.								
Spionidae								
<i>Malacocerus</i>	0		0		0.2 ± 0.5	<0.1	0	
<i>gluteus</i>								
Archiannehida								
Polygordius	0		2.2 ± 1.6	<0.1	0		0	
app.								

North Beach Sand + 6

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Crustacea								
Ostracoda spp.	0.2 ± 0.5	<0.1	0		0		0.2 ± 0.5	<0.1
Cirripedia								
Calanus	0		0.2 ± 0.5	<0.1	0.2 ± 0.5	<0.1	0	
carinosus								
B. glandula	0		0.4 ± 0.6	<0.1	0.2 ± 0.5	<0.1	0	
Mysidacea								
Archaeomysis grebrutskii	0		4.0 ± 5.4	<0.1	0		0	
Tanaidacea								
Leptochelia dubia	0		0		0.2 ± 0.5	<0.1	0	
Isopoda								
Exosphaeroma media	0		0		0		0.2 ± 0.5	<0.1
Laniropeis kincaidii	0		0.2 ± 0.4		0		0	
Amphipoda								
Gammaridea spp.	0.2 ± 0.5	<0.1	0		0		0.4 ± 0.6	0.1
Decapoda								
Pagurus spp. (juv.)	0.4 ± 0.6	<0.1	0		0		0	
Species Richness	10		8		6		5	
Diversity, H ¹	2.02		1.48		1.35		1.55	
Total Number	4.6		7.8		2.4		1.4	
Total Biomass (g)	<1.0		<0.9		<0.6		<0.5	

Table 8b. North Beach Sand (exposed sand) benthic organisms from the mid (+2') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea	0.2	<0.1	0.6	<0.1	0.2	<0.1	0	
sp.	± 0.5		± 0.9		± 0.5			
Nematoea	0.2	<0.1	0		0		0	
app.	± 0.5							
Mollusca								
Gastropoda								
Lacuna	0		0		0.4	<0.1	0	
variegata					± 0.6			
Littorina	0		0		0.2	<0.1	0.2	<0.1
scutulata					± 0.5		± 0.5	
Bivalvia								
Myxella	0.2	<0.1	0		0		0	
tumida	± 0.5							
Tellina	0		0		0.2	<0.1	0	
sp. (juv.)					± 0.5			
Annelida								
Polychaeta								
Arenicolidae								
Arenicola	0.2	<0.1	0.4	<0.1	0		0	
sp.	± 0.5		± 0.6					
Capitellidae								
Capitella	0		0.4	<0.1	1.4	<0.1	0	
capitata			± 0.9		± 1.7			
Mageloniidae								
Magelona	0		0.2	<0.1	0		0	
pitelkai			± 0.5					
Nereidae								
Nereis	0		0.2	<0.1	0		0	
vexillosa			± 0.5					
Parsonidae								
Parsonella	7.8	<0.1	6.6	<0.1	9.6	<0.1	1.8	<0.1
platybranchia	± 12.5		± 5.6		± 0.9		± 1.8	

North Beach Sand +2

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida (cont.)								
Polychaeta								
Magelonidae								
Magelona	0		0.2	<0.1	0		0	
pitelkai			± 0.5					
Nereidae								
Nereis	0		0.2	<0.1	0		0	
vexillosa			± 0.5					
Paraonidae								
Paraonella	7.8	<0.1	6.6	<0.1	0.6	<0.1	1.8	<0.1
platybranchia	± 12.5		± 5.6		± 0.9		± 1.8	
Spionidae								
Malacoceros	0.4	<0.1	0		0		1.0	<0.1
gluteus	± 0.9						± 2.2	
Pygospio	0		5.2	<0.1	3.2	<0.1	1.8	<0.1
elegans			± 2.2		± 3.6		± 2.1	
Syllidae								
Streptosyllis	0		0.2	<0.1	0		0.4	<0.1
latipalpa			± 0.5				± 0.6	
Crustacea								
Cirripedia								
Balanus	0		0		0.4	0.0	0	
cariosus					± 0.9	± 0.0		
B. glandula	0		0		0.6	0.0	0.2	<0.1
					± 1.3	± 0.0	± 0.5	
Mysidacea								
Archaeomysis	0		0.4	<0.1	0		0	
grebitskii			± 0.6					
Cumacea								
Diastylopsis	0.2	<0.1	0		0		0	
sp.	± 0.5							
Tanaidacea								
Leptochelia	0.2	<0.1	0.2	<0.1	0		0	
dubia	± 0.5		± 0.4					
Isopoda								
Eucosphaeroma	0		0		0		2.6	<0.1
media							± 3.1	

North Beach Sand + 2

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Crustacea (cont.)								
Amphipoda								
Eohaustorius	120.4	0.3	303.6	0.4	76.2	0.2	99.4	0.1
spp.	± 28.1	± 0.2	± 129.4	± 0.1	± 60.6	± 0.2	± 39.1	± 0.1
Paraphoxus	0		0.2	< 0.1	-		-	
c.f.abronius			± 0.5					
P. spinosus	0		0.2	< 0.1	-		-	
Type B			± 0.5					
P.spp.	0		0		7.8	< 0.1	10.0	< 0.1
					± 7.4		± 7.8	
Decapoda								
Crangon	0		0		0		0.2	0.2
franciscorum							± 0.5	± 0.4
Species Richness	9		13		10		10	
Diversity, H^1	0.33		0.26		0.70		0.66	
Total Number	130.0		318.6		91.2		117.6	
Total Biomass (g)	< 1.2		< 1.4		< 1.4		< 1.1	

Table 8c. North Beach Sand (exposed sand) benthic organisms from the low (+0') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	Spr 77		Sum 77		Aut 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Cnidaria								
Anthozoa								
Anthopleura elegantissima	0		0.2 $\pm$ 0.5	<0.1	0		0	
Nemertea spp.	0.8 $\pm$ 1.3	<0.1	1.0 $\pm$ 0.7	<0.1	0		0.6 $\pm$ 0.6	<0.1
Nematoda spp.	0		0		0.2 $\pm$ 0.5	<0.1	0.2 $\pm$ 0.5	<0.1
Mollusca								
Gastropoda								
Littorina sitkana	0		0.2 $\pm$ 0.5	<0.1	0.2 $\pm$ 0.5	<0.1	0.2 $\pm$ 0.5	<0.1
Bivalvia								
Myrella tumida	0.4 $\pm$ 0.6	<0.1	0		0		0	
Annelida								
Oligochaeta spp.	0		0		0		3.2 0.5	<0.1
Polychaeta								
Arenicolidae								
Arenicola (clapredi) oceanica	3.2 $\pm$ 2.0	<0.1	0.2 $\pm$ 0.5	<0.1	1.2 $\pm$ 1.0	<0.1	0.2 $\pm$ 0.5	<0.1
Capitellidae	0		0.2 $\pm$ 0.5	<0.1	2.4 $\pm$ 2.2	<0.1	2.0 $\pm$ 1.9	<0.1
Capitella capitata								
Goniadidae								
Glyceride picta	0		0		0.2 $\pm$ 0.5	<0.1	0.8 $\pm$ 0.5	<0.1
Magelonidae								
Magelona pitelkai	0.7 $\pm$ 0.5		0.2 $\pm$ 0.5	0.1	0		0.6 $\pm$ 0.9	<0.1

North Beach Sand +0

Spr 77

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Annelida (cont)								
Polychaeta								
Nephtyidae								
Nephtys	0		0		1.8	<0.1	0.2	<0.1
app. (juv.)					+ 1.6		+0.5	
N. californiensis	0		0		- 0.2	<0.1	- 0	
					+0.5			
Orbinidae								
Scolopelos	5.6	✓	6.6	✓	7.6	<0.1	5.6	<0.1
sp.	+ 2.5		+ 2.9		+ 1.5		+ 2.5	
Owenidae								
Owenia	0		0.2	<0.1	0		0	
fusiformis			+ 0.5					
Parsonidae								
Parsonella	108.4	✓	54.2	✓	24.0	<0.1	72.4	<0.1
platybrachia	+ 95.1		+ 17.7		+ 19.0		+ 35.6	
Spionidae								
Alalacoceros	4.6	<0.1	1.0	<0.1	5.6	<0.1	22.2	<0.1
giuteus	+ 5.1		+ 1.4		+ 2.3		+ 16.1	
Polyora	0		0.2	<0.1	0		0	
socialis			+ 0.5					
Pygospio	0		1.4	<0.1	0.6	<0.1	0.2	<0.1
elegans			+ 1.1		+ 0.9		+ 0.5	
Spiophanes	0		0.2	<0.1	0		0.4	<0.1
bombyx			+ 0.5				+ 0.6	
Syllidae								
Streptosyllis	5.3	<0.1	6.2	<0.1	0		9.8	<0.1
latipalpa	+ 6.1		+ 3.4				+ 5.2	
Syllis	0		0		0		0.4	<0.1
app.							+ 0.9	
Crustacea								
Cirripedia								
Balanus	0		0.2	<0.1	0		0	
glandula			+ 0.5					

North Beach Sand +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Crustacea (cont.)								
Mysidacea								
Archaeomysis grebnitzkii	0.8	<0.1	59.4	0.2	0.2	<0.1	0	
	+ 1.3		+ 52.6	+ 0.1	+ 0.5			
Cumacea								
Diastylopsis spp.	0.2	<0.1	2.0	<0.1	0		0	
	+ 0.5		+ 2.6					
Lampropidae spp.	0		0.6	<0.1	0.2	<0.1	0.2	<0.1
			+ 1.3		+ 0.5		+ 0.5	
Isopoda								
Exosphaeroma media	0.6	<0.1	0		0.6	<0.1	1.0	<0.1
	+ 1.3				+ 0.6		+ 0.7	
Gnorimosphaeroma oregonense	0.2	<0.1	0		0		0	
	+ 0.5							
Tecticeps pugettensis	0.2	0.0	0		0		0	
	+ 0.5	+ 0.0						
Amphipoda								
Gammaridea	0.8		-		10.8	<0.1	8.0	<0.1
	+ 1.3				+ 3.9		+ 1.9	
Eohaustorius spp.	147.0	0.3	49.6	0.0	139.6	0.0	139.8	0.1
	+ 128.6	+ 0.4	+ 61.7	+ 0.1	+ 62.1	+ 0.0	+ 92.9	+ 0.1
Paraphoxus c.f. abronius	-		0.6		-		-	
			+ 0.6					
P. spinosus Type B	-		0.2		-		-	
			+ 0.5					
P. spp.	1.6	<0.1	0		0.2	<0.1	0	
	+ 1.5				+ 0.5			
Species Richness	16		21		18		19	
Diversity, H ¹	1.11		1.56		1.02		1.36	
Total Number	280.4		184.6		189.6		264.8	
Total Biomass	<1.4		<1.7		<1.8		<1.9	

Table 8d. North Beach Sand (sand-gravel-cobble) benthic organisms from the subtidal zone collected 24 June 1977, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=4) at -10m, per 0.1 m² ± standard deviation (N=2) at -5m.

	-5 m.		-10 m.	
	#	wt.	#	wt.
Chlorophyta				
<i>Bryopsis</i>		0		< 0.1
<i>corticulans</i>				
<i>B. sp.</i>		0		< 0.1
<i>Chaetomorpha</i>		< 0.1		< 0.1
<i>californica</i>				
<i>Derbesia</i>		< 0.1		< 0.1
<i>marina</i>				
Bacillariophyta				
<i>Pennales</i>		< 0.1		0
<i>sp.</i>				
Phaeophyta				
<i>Desmarestia</i>		0		< 0.1
<i>aculeata</i>				
<i>D. ligulata</i>		0		< 0.1
<i>var. ligulata</i>				
<i>Ectocarpales</i>		< 0.1		0
<i>sp.</i>				
<i>Laminaria</i>		165.5		0
<i>saccharina</i>		+ 234.1		
<i>L. sp.</i>		- 0.5		0
		+ 0.7		
<i>Laminariaceae</i>		0.1		0
<i>sp.</i>		+ 0.1		
<i>Pterygophora</i>		916.3		0
<i>californica</i>		+ 1295.8		
<i>Ralfsia</i>				
<i>pacifica</i>				
<i>Sphacelaria</i>		0		< 0.1
<i>sp.</i>				
<i>Syringoderma</i>		< 0.1		< 0.1
<i>abyssicola</i>				

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Rhodophyta				
Acrochaetium		<0.1		<0.1
sp.				
Antithamnion		0.1		<0.1
defectum		+ 0.1		
A. dendroideum		0		<0.1
A. kyllini		<0.1		0
Antithamnionella pacifica		0		<0.1
var. pacifica				
Bonneissonia		<0.1		0
nootkana				
Botrycladia		0		0.2
pseudodichotoma				+ 0.4
Botryoglossum		5.7		0
farlowianum		+ 8.0		
Callithamnion/		<0.1		0
Pleurosporium				
Callophyllis		1.0		0.3
flabellulata		+ 1.3		+ 0.5
C. haenophylla		0.9		0
		+ 1.2		
C. pinnata		0		3.5
				+ 7.1
C. sp.		0.3		0.1
		+ 0.2		+ 0.3
Ceramium		<0.1		<0.1
californicum				
C. gardneri		0		<0.1
C. strictum		<0.1		<0.1
C. sp.		<0.1		0

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Rhodophyta (cont.)				
Choreocolax		< 0.1		0
polysiphoniae				
Constantinea		4.6		0
simplex		+ 6.5		
Corallineaceae		0		✓
sp.				
Cruoria		✓		0
profunda				
Cryptosiphonia		< 0.1		0.1
borealis				+ 0.1
C. obovata		0		0.4
				+ 0.8
C. ovalifolia		0		+ 0.1
				+ 0.3
C. sp.		< 0.1		0.1
				+ 0.1
Delessariaceae		4.3		0.0
sp.		+ 5.9		+ 0.1
Delessaria		< 0.1		< 0.1
decipiens				
Euthora		0.5		0.1
fruticulosa		+ 0.6		+ 0.1
Gigartina		< 0.1		0.1
sp.				+ 0.1
Gonimophyllum		< 0.1		0
skottsbergii				
Gracilaria		0.3		0.8
sp.		+ 0.1		+ 0.7
Griffithsia		0		< 0.1
pacifica				
Halosaccion		0		1.7
glandiforme				+ 3.0
Halymenia		1.6		0
coccinea		+ 2.3		
Herposiphonia		0		0.1
grandis				+ 0.1
H. plumula		0.1		0
		+ 0.1		

North Beach Subtidal

	-5 m.	-10 m.	
#	wt.	#	wt.
Rhodophyta (cont.)			
Heterosiphonia	<0.1		0
japonica			
Hollenbergia	0		<0.1
subulata			
Hymenena	2.0		0
smithii	+ 2.8		
H. sp.	0.8		0
	+ 1.1		
Iridaea	<0.1		1.8
sp.			+ 3.6
Laurencia	5.2		0
spectabilis	+ 7.3		
Membranoptera	0		<0.1
platyphylla			
Neogardhiella	<0.1		0
baileyi			
Nienburgia	0		<0.1
andersoniana			
Nitophyllum	3.8		0
mirabile	+ 5.3		
Odonthalia	<0.1		0.1
floccosa			+ 0.2
O. washingtonensis	0		0.1
			+ 0.1
Opuntia	70.0		0
californica	+ 98.9		
Petrocelia	✓		0
middendorffii			
Peyssonellia	✓		✓
pacifica			
Phycodrys	0		0.0
isabelliae			+ 0.1
Platysiphonia	<0.1		0
clevelandii			
Platythamnia	0		<0.1
heteromorphum			

North Beach Subtidal

	-5 m.		-10 m.
	#	wt.	#
			wt.
Rhodophyta (cont.)			
Platythemanion		< 0.1	0.2
pectinatum			+ 0.2
P. villosus		< 0.1	< 0.1
Plocamium		0.4	0
cartilagineum		+ 0.5	
P. coccineum		0	0.0
			+ 0.1
P. sp.		0	0.0
			+ 0.1
Polyneura		0.3	0.2
latissima		+ 0.3	+ 0.1
Polysiphonia		< 0.1	0.1
hendryi			+ 0.2
P. pacifica		< 0.1	< 0.1
P. scopulorum		< 0.1	0
Pterochondria		< 0.1	0
woodii			
Pterosiphonia		1.1	< 0.1
bipinnata		+ 1.3	
P. dendroidea		1.3	0.7
		+ 1.6	+ 0.6
P. gardneri			< 0.1
P. gracilis		< 0.1	0
Ptilota		0	0.1
filicina			+ 0.1
Rhodoptilum		0.3	0.1
plumosum		+ 0.2	+ 0.1
Rhodymenia		0	6.7
pertusa			+ 13.4
R. stipitata		0	< 0.1
R. sp.		0.7	1.2
		+ 0.0	+ 0.9

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Rhodophyta (cont.)				
Sarcodiotheca		0		0.4
furcata				± 0.7
Scagelia		<0.1		± 0.5
occidentale				± 0.8
Squamariaceae		<0.1		0
app.				
Stenogramme		<0.1		0.2
interrupta				± 0.2
Thuretillopsis		0		<0.1
peggiana				
Trailliella		<0.1		0
intricata				
Cnidaria				
Hydrozoa		✓		✓
app.				
Anthozoa				
Ealampa	0.5	<0.1	0.3	<0.1
deceatentaculata	± 0.7		± 0.5	
Platyhelminthes				
Turbellaria	1.5	<0.1	0	
app.	± 2.1			
Nemertea	7.0	<0.1	4.8	<0.1
app.	± 4.2		± 3.4	
Nematoda	33.0	<0.1	13.0	<0.1
app.	± 24.0		± 6.6	
Mollusca				
Amphineura	0		0.5	0.1
sp. (juv.)			± 0.6	± 0.1

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Mollusca (cont.)				
Amphineura				
Lepidoxona	0		0.3	0.4
mertensii			± 0.5	± 0.9
Tonicella	3.0	0.1	0	
lineata	± 4.2	± 0.2		
Gastropoda				
Acmaea	2.5	0.1	0	
mitre	± 3.5	± 0.1		
Alvinia	3.0	0.1	0	
sp.	± 1.4			
Amphissa	0		0.5	
columbiana			± 1.0	
Calliostoma	2.0	< 0.1	0	
ligatum	± 2.8			
Calyptrea	1.0	< 0.1	3.8	2.3
fastigiata	± 1.4		± 3.0	± 3.0
Cerithiopsis	0.5	< 0.1	0	
sp.	± 0.7			
Collisella	1.0	< 0.1	0	
ochracea	± 1.4			
Lacuna	94.0	0.5	2.0	< 0.1
variegata	± 125.9	± 0.9	± 3.4	
Laila	0.5	< 0.1	0	
cockerellii	± 6.7			
Margarites/	0		1.5	< 0.1
Lirularia			2.4	
M. pupillus	12.0	< 0.1	0	
	± 17.0			
Natica	0.5	< 0.1	0.3	1.3
clausa	± 0.7		± 0.5	± 1.4
Odontomia	0.5	< 0.1	0	
sp.	± 0.7			
Searlesia	1.0	< 0.1	0	
dira	± 0.0			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Mollusca (cont.)				
Bivalvia				
Astarte	0		3.8	2.3
compacta			+ 3.6	+ 0.3
Clinocardium	137.5	0.1	1.5	0.0
nuttallii	+ 154.9	+ 0.2	+ 1.3	+ 0.1
Crenella	1.5	< 0.1	32.3	0.1
decussata	+ 2.1		+ 14.9	+ 0.1
Cryptomya	0.5	< 0.1	0	
californica	+ 0.7			
Entodesma	0		0.3	< 0.1
saxicola			+ 0.5	
Glycymeris	0.3	2.5	0	
subobsoleta	+ 0.5	+ 5.0		
Humularia	0		0.3	43.2
kennerlyi			+ 0.5	+ 86.5
Lasaea	0.5	< 0.1	0	
cistula	+ 0.7			
Macoma	0		0.5	< 0.1
sp. (juv.)			+ 1.0	
Myaella	10.0	< 0.1	1.0	< 0.1
tumida	+ 4.2		+ 1.4	
Semele	0		0.3	2.7
rubropicta			+ 0.5	+ 5.3
Tellina	3.0	< 0.1	0	
sp.	+ 4.2			
Transennella	10.5	< 0.1	2.3	0.0
tantilla	+ 4.9		+ 1.7	+ 0.1
Tresus	0		0.3	< 0.1
canax			+ 0.5	
Annelida				
Oligochaeta	17.5	< 0.1	62.5	< 0.1
spp.	+ 9.2		+ 23.2	
Polychaeta				
Acrocirridae	0.5	< 0.1	0	
spp.	+ 0.7			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Acrocirridae				
Macrochaeta	0		2.5	< 0.1
sp.			+ 1.7	
Capitellidae				
Capitella	4.5	< 0.1	2.0	< 0.1
capitata	+ 3.5		+ 2.3	
Mediomastus	- 3.5	< 0.1	- 0.3	< 0.1
sp.	+ 2.1		+ 0.5	
Notomastus	- 0		- 2.3	< 0.1
lineatus			+ 2.6	
N. tenuis	1.0	< 0.1	0.3	< 0.1
	+ 1.4		+ 0.5	
Cirratulidae	0		8.5	< 0.1
app.			+ 6.0	
Caulerella	0		0.5	< 0.1
gracilis			+ 1.0	
Cirratulus	3.5	< 0.1	5.0	< 0.1
cirratulus	+ 0.7		+ 3.2	
Dorvilleidae				
Protodorvillea	29.0	< 0.1	1.5	< 0.1
gracilis	+ 25.5		+ 0.6	
Eunicidae				
Eunice	0.5	< 0.1	0	
valens	+ 0.7			
Glyceridae				
Glycera	0		0.8	< 0.1
capitata			+ 1.0	
Hemipodus	7.0	< 0.1	8.5	< 0.1
borealis	+ 9.9		+ 4.1	
Nesionidae	4.5	< 0.1	0	
sp. A	+ 6.4			
Micropodarke	54.0	< 0.1	20.3	< 0.1
dubia	+ 12.7		+ 15.3	
Ophiodromus	0.5	< 0.1	0	
pugettensis	+ 0.7			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Maldanidae	7.5	0.1	1.3	0.1
spp. (juv.)	+ 7.8		+ 1.0	
Axiothella	0.5	0.1	0	
rubrocincta	+ 0.7			
Nicomache	2.5	0.1	0	
lumbricalis	+ 4.5			
N. personata	4.5	0.1	0	
	+ 4.9			
Nephtyidae				
Nephtys	0		0.8	0.1
californiensis			+ 1.0	
N. sp. (juv.)	0		0.3	0.1
			+ 0.5	
Nereidae				
Nereis	5.5	0.1	0	
pelagica	+ 7.8			
N. sp.	1.0	0.1	0	
	+ 1.4			
Flatynereis	6.0	0.1	10.8	0.1
bicanaliculata	+ 2.8		+ 5.6	
Onuphidae				
Onuphis	28.5	0.1	0.5	0.1
stigmatis	37.5		+ 1.0	
Opheliidae				
Ophelia	0		0.3	0.1
limacina			+ 0.5	
Oweniidae				
Owenia	1.0	0.1	1.8	0.1
fusiformis	+ 1.4		+ 1.5	
Phyllodocidae				
Eulalia	1.5	0.1	0	
macroceros	+ 2.1			
E. nigriannulata	0.5	0.1	0	
	+ 0.7			
E. quadrioculata	1.0	0.1	0	
	+ 1.4			
E. viridis	1.0	0.1	0	
	+ 1.4			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Phyllodoctidae				
Eulalia	0.5	<0.1	0	
sp.	± 0.7			
Hesionura	4.0	<0.1	8.8	<0.1
coarctatodifficilis	± 0.0		± 2.1	
Phyllodoce	1.0	<0.1	0	
groenlandica	± 0.0			
P. sp. (juv.)	0.5	<0.1	0.5	<0.1
	± 0.7		± 0.6	
Pilargidae				
Sigambra	8.5	<0.1	0	
tentaculata	± 12.0			
Pisionidae				
Pisione	0		0.3	<0.1
sp.			± 0.5	
Polynoidae	1.5	<0.1	0.3	<0.1
sp.	± 2.1		± 0.5	
Harmothoe	2.5	<0.1	0.3	<0.1
imbricata	± 0.7		± 0.5	
Harmothoe	0		0.3	<0.1
lunulata			± 0.5	
Etebrillidae	2.5	<0.1	0	
sp.	± 3.5			
Chone	3.5	<0.1	2.3	<0.1
ecaudata	± 4.9		± 1.2	
Oriopsis	45.5	<0.1	0	
minuta	± 64.3			
Potamilla	0.5	<0.1	0	
intermedia	± 0.7			
Scalebregidae				
Scalebregma	0.5	<0.1	0	
inflatum	± 0.7			
Serpulidae				
Crucigera	0.5	<0.1	0	
zygophora	± 0.7			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Serpulidae				
Serpula	1.0	<0.1	0	
vermicularis	+ 1.4			
Spirorbis	- 2.5	<0.1	0	
sp.	+ 3.5			
Sigalionidae				
Pholoe	0		0.3	<0.1
minuta			+ 0.5	
Sphaerodoridae				
Sphaerodoropsis	0.5	<0.1	0	
minuta	+ 0.7			
Spionidae				
Malacoceros	0.5	<0.1	0	
glutaeus	+ 0.7			
Polydora	42.0	<0.1	0	
hamata	+ 59.4			
P. pygidialis	27.5	<0.1	0	
	+ 38.9			
P. socialis	0		1.8	<0.1
			+ 1.3	
P. spongicola	0.5	<0.1	0	
	+ 0.7			
P. sp.	3.5	<0.1	0	
	+ 4.9			
Prionospio	13.0	<0.1	1.5	<0.1
steenstrupi	+ 2.8		+ 1.3	
Pygospio	0.5	<0.1	0	
elegans	+ 0.7			
Scolecopsis	2.0	<0.1	2.3	<0.1
sp. A	+ 1.4		+ 1.5	
Spio	9.0	<0.1	13.5	<0.1
filicornis	+ 0.0		+ 6.6	
Spiophanes	0		3.3	<0.1
bombyx			+ 1.5	

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Syllidae				
Brania	1.5	<0.1	0	
brevipharyngea	+ 2.1			
Exogone	7.5	<0.1	0	
gemmifera	+ 10.6			
E. lourei	+ 4.0	<0.1	1.3	<0.1
	+ 4.2		+ 1.9	
E. spp.	28.0	<0.1	7.0	<0.1
	+ 26.9		+ 2.7	
Pionosyllis	0		0.3	<0.1
uraga			+ 0.5	
Sphaerosyllis	4.0	<0.1	12.8	<0.1
parifera	+ 4.2		+ 6.2	
Syllis	2.0	<0.1	0	
armillaris	+ 2.8			
Syllis	5.5	<0.1	2.8	<0.1
sp.	+ 4.9		+ 1.1	
Trypanosyllis	2.0	<0.1	0	
gemmipara	+ 2.8			
Terebellidae				
Polycirris	0.5	<0.1	9.8	<0.1
sp. A	+ 0.7		+ 9.2	
P. sp. B	0.5	<0.1	2.3	<0.1
	+ 0.7		+ 1.9	
Archiannelida				
Polygordiidae				
Polygordius	52.0	<0.1	28.0	<0.1
sp.	+ 38.2		+ 22.3	
Saccocirridae				
Saccocirrus	0		1.5	<0.1
eroticus			+ 1.7	
Sipuncula				
Phascolosoma	0.5	<0.1	0	
agassizii	+ 0.7			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Crustacea				
Ostracoda	6.5	<0.1	0.5	<0.1
app.	+ 6.4		+ 1.0	
Cirripedia				
Balanus	1.5	0.5	0	
sp.	+ 2.1	+ 1.0		
Leptostraca				
Nebalia	0.5	<0.1	0	
pugettensis	+ 0.7			
Mysidacea				
Archaeomysis	1.0	<0.1	0	
grebnitzkii	+ 1.4			
Cumacea				
Cumella	0.5	0.1	0.5	<0.1
sp.	0.7	+ 1.0	+ 1.0	
Elnastylopsis	0.5	<0.1	0	
sp.	+ 0.7			
Tanaidacea				
Leptochelia	17.5	<0.1	8.8	<0.1
dubia	+ 13.4		+ 6.9	
Isopoda				
Caecianiropeis	0.5	<0.1	0	
psammophila	+ 0.7			
Cirolana	1.0	<0.1	0	
harfordi	+ 0.0			
C. vancouverensis	0		0.5	0.0
			+ 1.0	+ 0.1
Exosphaeroma	0.5	<0.1	0	
avolicauda	+ 0.7			
E. media	6.5	<0.1	0	
	+ 9.2			
E. rhomburum	58.5	0.0	6.0	<0.1
	+ 82.7	+ 0.1	+ 3.4	
Laniropeis	1.5	<0.1	0.5	<0.1
analoga	+ 2.1		+ 6.9	
I. tridens	0.5	<0.1	0	
	+ 0.7			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Crustacea (cont.)				
Isopoda				
Idotea	2.5	<0.1	0	
rufescens	+ 2.1			
I. sp. (juv.)	- 0.5	<0.1	0	
	+ 0.7			
Jaeropsis	- 5.5	<0.1	0	
dubia	+ 7.8			
J. lobata	- 2.0	<0.1	0	
	+ 2.8			
J. setosa	- 0.5	<0.1	0	
	+ 0.7			
Janirilata	- 0.5	<0.1	0	
occidentales	+ 0.7			
Limnoria	- 13.5	<0.1	0	
algarum	+ 19.1			
Munna	0		0.3	<0.1
stephenseni			+ 0.5	
M. ubiquita	0.5	<0.1	- 0	
	+ 0.7			
M. sp.	- 0.5	<0.1	0	
	+ 0.7			
Amphipoda				
Gammaridea	427.5	0.6	31.5	0.1
app.	+ 328.8	+ 0.9	+ 3.7	+ 0.1
Corophium	0		8.3	<0.1
sp.			+ 3.4	
Caprellidea				
Caprella	19.0	<0.1	0.3	<0.1
californica	+ 26.9		+ 0.5	
C. sp.	- 4.0	<0.1	- 0.3	<0.1
	+ 5.7		+ 0.5	
C. sp. (juv.)	- 1.0	<0.1	0	
	+ 1.4			
Metacaprella	- 0.5	<0.1	0	
kennerlyi	+ 0.7			

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Crustacea (cont.)				
Amphipoda				
Caprellidea				
Tritella	0		0.3	< 0.1
pilimana			± 0.5	
Decapoda				
Cancer	1.5	0.3	0	
oregonensis	± 0.7	± 0.3		
Cancer	0.5	0.6	0	
productus	± 0.7	± 0.8		
C. sp. (juv.)	1.0	< 0.1	0	
	± 1.4			
Caridea	0.5	< 0.1	0	
sp.	± 0.7			
Crangon	0		0.3	1.0
alaskensis			± 0.5	± 2.0
Hippolyte	0.5	< 0.1	0	
clarki	± 0.7			
Hippolytidae	0.5	< 0.1	0	
sp.	± 0.7			
Lebbeus	0		1.0	0.0
sp.			± 1.2	± 0.1
Majidae	9.5	0.1	0.3	< 0.1
sp. (juv.)	± 13.4	± 0.1	± 0.5	
Oregonia	0		1.0	0.0
gracilis			± 1.4	± 0.1
Paguridae	13.0	0.5	1.8	< 0.1
sp. (juv)	± 5.7	± 0.6	± 0.5	
Phyllolithodes	0.5	0.1	0	
papillosus (juv.)	± 0.7			
Pinnixa	0.5	0.1	0	
sp. (juv.)	± 0.7			
Pugettia	3.5	0.1	4.5	0.1
gracilis	± 3.5		± 3.1	

North Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Bryozoa	/			
spp.				
Echinodermata				
Ophiuroidea	0		0.3	0.1
spp. (juv.)			± 0.5	
Holothuroidea				
Leptosynapta	4.5	0.1	1.5	0.1
clarki	± 0.7	± 0.1	± 1.3	± 0.1
Ascidacea				
Pyura	0.5	6.7	0	
haustor	± 0.7	± 9.5		
Species Richness	201		151	
Diversity, H^1	1.44		3.86	
Total number	1410.3		372.1	
Total biomass	1202.1		73.7	

Table 9a. Kydaka Beach (exposed sand) benthic organisms from the high (+6') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt.	#	wt.	#	wt.	#	wt.
Annelida								
Oligochaeta spp.	0.4	<0.1	3.4	<0.1	0.6	<0.1	0.4	<0.1
	$\pm$ 0.5		$\pm$ 2.1		$\pm$ 0.9		$\pm$ 0.5	
Polychaeta								
Capitellidae spp.	0		0		0.2	<0.1	0	
					$\pm$ 0.4			
Spionidae								
Pygospio elegans	0		0.2	<0.1	0.2	<0.1	0	
			$\pm$ 0.4		$\pm$ 0.4			
Syllidae								
Syllis spp.	0		0		0		0.2	<0.1
							$\pm$ 0.4	
Crustacea								
Isopoda								
Cirolana vancouverensis	0.2	<0.1	0		0		0	
	$\pm$ 0.4							
Amphipoda								
Gammaridea spp.	0		-		3.8	<0.1	0	
					$\pm$ 3.3			
Ischyrocerus anguipes	-		0.2	<0.1	-		-	
			$\pm$ 0.4					
Orchestoidea pugettensis	-		2.0	<0.1	-		-	
			$\pm$ 1.7					
Insecta								
Dipteran larvae spp.	0		1.4	<0.1	0		0	
			$\pm$ 2.6					
Species Richness	2		6		4		2	
Diversity, H¹	0.64		1.23		0.71		0.64	
Total Number	0.6		7.2		4.8		0.6	
Total Biomass (g)	<0.2		<0.6		<0.4		<0.2	

Table 9b. Kydaka Beach (exposed sand) benthic organisms from the mid (+3') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² + standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt.	#	wt.	#	wt.	#	wt.
Nemertea	0		0.6	<0.1	0		0	
spp.			± 0.9					
Annelida								
Polychaeta								
Nephtyidae								
Nephtys	0		0.2	<0.1	0.4	<0.1	0	
californiensis			± 0.4		± 0.5			
Phyllodocidae								
Eteone	0		0.2	<0.1	0		0	
longa			± 0.4					
Spionidae								
Pygospio	0.2	<0.1	0		0		0	
elegans	± 0.4							
Crustacea								
Mysidacea								
Archaeomysis	0.2	<0.1	10.6	<0.1	2.0	<0.1	0	
grebnitzkii	± 0.4		± 7.1		± 1.2			
Amphipoda								
Gammaridea sp.	0		0		0		0	
Eohaustorius	0		4.8	<0.1	0		0.6	<0.1
washingtonianus			± 2.6				± 1.3	
Species Richness	2		5		2		1	
Diversity, H ¹	0.69		0.87		0.45		0.00	
Total Number	0.4		16.4		2.4		0.6	
Total Biomass	<0.2		<0.5		<0.2		<0.1	

Table 9c. Kydaka Beach (exposed sand) benthic organisms from the low (+0') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=5).

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt.	#	wt.	#	wt.	#	wt.
Annelida								
Oligochaeta	0		0		0		0.4	<0.1
spp.							± 0.5	
Polychaeta								
Magelonidae								
Magelona	0		0		0.2	<0.1	0	
sp.(juv.)					± 0.4			
Nephtyidae								
Nephtys	0		0		0.4	<0.1	0	
californiensis					± 0.5			
Oweniidae								
Owenia	0		0		0.2	<0.1	0	
fusiformis					± 0.4			
Paraonidae								
Paraoneila	0		1.2	<0.1	0.4	<0.1	0	
platybranchia			± 0.8		± 0.9			
Spionidae								
Malaceros	0		0		0.4	<0.1	0	
glutaeus					± 0.5			
Pygospio	0		0		1.0	<0.1	0	
elegans					± 1.7			
Scolecopsis	0		0.4	<0.1	0.2	<0.1	0	
squamata			± 0.9		± 0.4			
Crustacea								
Ostracoda	0.2	<0.1	0		0		0	
spp.	± 0.4							
Mysidacea								
Archaeomysis	0.2	<0.1	0.8	<0.1	0		0	
grebnitzkii	± 0.4		± 0.8					
Amphipoda								
Gammaridea	1.2	<0.1	-		0		0	
spp.	± 2.7							
Atylus	-		0.2	<0.1	-		-	
tridens			± 0.4					
Eohaustorius	1.2	<0.1	3.0	<0.1	0		0	
washingtonianus	2.7		± 1.2					

Kydaka Beach +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt.	#	wt.	#	wt.	#	wt.
Crustacea								
Amphipoda								
Gammaridea								
Eohaustorius		10.8 <0.1	0		0		0	
sp.		± 18.6						
Paraphoxus		0.2 <0.1	0		0		0	
sp.		± 0.4						
Species Richness	6		5		7		1	
Diversity, H^1	0.61		1.25		1.77		0.00	
Total number	13.8		5.6		2.8		0.4	
Total biomass (g)	<0.6		<0.5		<0.7		<0.1	

Table 9d. Kydaka Beach (sand) benthic organisms from the subtidal zone collected 21 June 1977, expressed as number and/or biomass (g) per 0.05 m² ± standard deviation (N=4).

	-5 m.		-10 m.	
	#	wt.	#	wt.
Rhodophyta				
Antithamion defectum		0		<0.1
Choreocolax polysiphoniae		0		<0.1
Leptofaucha pacifica		0		<0.1
Polysiphonia hendryi		0		<0.1
Pterosiphonia bipinnata		0		<0.1
P. gracilis		0		<0.1
Cnidaria				
Hydrozoa spp.		0		✓
Nemertea spp.	8.5 ± 7.0	<0.1	12.3 ± 5.8	0.0 ± 0.1
Nematoda spp.	3.3 ± 5.3	<0.1	23.8 ± 12.6	0.0 ± 0.1
Mollusca				
Gastropoda				
Amphissa columbiana	0		0.3 ± 0.5	0.1 ± 0.2
Calliostoma sp.	0.3 ± 0.5	0.0 ± 0.1	0	
Lacuna variegata	1.8 ± 2.8	0.1 ± 0.1	0	
Nassarius mendicus	0		0.3 ± 0.5	0.2 ± 0.3
Odostomia sp.	0		0.8 ± 1.0	0.1 ± 0.1
Trichotropsis cancellata	0		1.3 ± 2.5	0.1 ± 0.2
Bivalvia				
Clinocardium nuttallii	0.3 ± 0.5	0.0 ± 0.1	0.8 ± 1.0	0.1 ± 0.1
Hiatella arctica	0		0.8 ± 1.5	0.0 ± 0.1
Lucinoma tenuisculpta	0.3 ± 0.5	0.0 ± 0.1	8.8 ± 5.0	0.4 ± 0.3
Macoma sp.	0		0.5 ± 1.0	0.0 ± 0.1
Myrella tumida	30.5 ± 22.7	0.1 ± 0.0	82.8 ± 79.5	0.2 ± 0.1
Solen sicarius	0.3 ± 0.5	0.0 ± 0.1	0.3 ± 0.5	0.0 ± 0.1
Tellina sp.	1.3 ± 0.5	0.1 ± 0.1	2.8 ± 1.5	0.1 ± 0.0
Transennella tantilla	0		65.8 ± 23.7	0.4 ± 0.2
Annelida				
Oligochaeta spp.	0.3 ± 0.5	<0.1	0.8 ± 1.0	0.0 ± 0.1

Kvdaka Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Ampharetidae sp. (juv.)	0		0.3 ± 0.5	<0.1
Capitellidae				
Capitella capitata	13.0 ± 8.8	<0.1	15.3 ± 14.5	0.0 ± 0.1
Mediomastus sp.	12.8 ± 11.9	<0.1	83.5 ± 52.7	0.0 ± 0.1
Notomastus lineatus	0.5 ± 1.0	<0.1	0.3 ± 0.1	<0.1
N. sp.	0		0.5 ± 1.0	0.0 ± 0.1
Ceratonereis spp.	0		0.3 ± 0.5	0.0 ± 0.1
Cirratulidae sp.	0		1.5 ± 1.0	<0.1
Chaetozone setosa	0.3 ± 0.5	<0.1	0	
Flabelligeridae				
Pherusa plumosa	0		0.3 ± 0.5	<0.1
Glyceridae				
Glycera capitata	0		0.3 ± 0.5	<0.1
Hemipodus borealis	0		0.5 ± 1.0	0.0 ± 0.1
Goniadidae				
Glycinde picta	1.0 ± 0.8	<0.1	2.5 ± 2.1	0.0 ± 0.1
Hesionidae				
Micropodarke dubia	0		1.0 ± 1.4	0.0 ± 0.1
Lumbrineridae				
Lumbrineris sp.	0		1.5 ± 0.6	0.0 ± 0.1
Magelonidae				
Magelona puelkai	0.5 ± 0.6	<0.1	0	
Maldanidae spp.				
Nicomache personata	1.8 ± 2.4	<0.1	17.6	0.0 ± 0.1
	0		3.5 ± 3.3	0.0 ± 0.1
Nephtyidae				
Nephtys caeca	0		0.8 ± 1.5	0.0 ± 0.1
N. caecoides	1.5 ± 1.3	<0.1	1.8 ± 1.3	<0.1
N. sp. (juv.)	0.3 ± 0.5	<0.1	1.0 ± 1.4	<0.1
Nereidae				
Nereis procera	0.5 ± 0.6	<0.1	0	
N. sp. (juv.)	0		0.5 ± 0.6	<0.1
Platynereis bicanaliculata	2.3 ± 3.9	<0.1	2.3 ± 4.5	<0.1

Kydaka Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Onuphidae				
Onuphis elegans	0.8 ± 1.0	<0.1	0.8 ± 1.0	0.1
O. stigmatis	0.3 ± 0.5	<0.1	0.8 ± 1.5	0.0 ± 0.1
O. sp. (juv.)	0.3 ± 0.5	<0.1		← 0.3 ± 0.5
Opheliidae				
Armandia brevis	0.8 ± 0.5	<0.1	5.5 ± 4.1	0.0 ± 0.1
Orbinidae				
Naineris uncinata	0		1.0 ± 1.4	0.0 ± 0.1
Scoloplos sp.	5.5 ± 3.1	<0.1	2.5 ± 2.4	0.0 ± 0.1
Oweniidae				
Owenia fusiformis	7.5 ± 2.4	<0.1	11.0 ± 5.4	0.0 ± 0.1
Parsonidae				
Parsonella platybranchia	0.3 ± 0.5	<0.1	0	
Pectinariidae				
Pectinaria granulata	0		2.8 ± 2.2	0.0 ± 0.1
Phyllodoceidae				
Eteone longa	0		1.3 ± 1.9	0.0 ± 0.1
Eulalia viridis	0.3 ± 0.5	<0.1	0	
Phyllodoce groenlandica	0		3.5 ± 6.4	0.0 ± 0.1
P. maculata	0		1.0 ± 2.0	<0.1
P. multiseriata	0		0.8 ± 1.5	0.0 ± 0.1
P. sp. A	0.3 ± 0.5	<0.1	1.0 ± 0.8	<0.1
P. sp. (juv.)	1.0 ± 1.2	<0.1	4.5 ± 3.7	<0.1
Polynoidae				
Eunoe senta	0		0.3 ± 0.5	<0.1
Harmothoe imbricata	0		0.8 ± 1.0	0.0 ± 0.1
Sabellidae				
Eudistylia vancouveri	0		0.3 ± 0.5	0.0 ± 0.1
Schizobranchia insignis	0		0.5 ± 1.0	0.0 ± 0.1
Sigalionidae				
Pheloe minuta	1.0 ± 1.4	<0.1	2.8 ± 3.1	0.0 ± 0.1
Spionidae				
Malacoceros glutaeus	0.8 ± 1.5	<0.1	8.5 ± 8.2	0.0 ± 0.1
Polydora caulleryi	0		0.3 ± 0.5	<0.1

Kydaka Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Annelida (cont.)				
Polychaeta				
Spionidae				
Polydora socialis	3.0 ± 2.5	<0.1	5.8 ± 2.9	0.0 ± 0.1
P. sp. A	0		0.3 ± 0.5	<0.1
Prionospio cirrifera	0		8.0 ± 3.5	0.0 ± 0.1
P. steenstrupi	37.0 ± 19.4	<0.1	192.5 ± 70.5	0.0 ± 0.1
Pygospio elegans	0		32.0 ± 35.2	0.0 ± 0.1
Spio filicornis	0.3 ± 0.5	<0.1	0.3 ± 0.5	0.0 ± 0.1
Spiophanes bombyx	1.8 ± 1.5	<0.1	3.8 ± 1.0	0.0 ± 0.1
Syllidae				
Exogone gemmifera	0		0.8 ± 1.5	0.0 ± 0.1
E. spp.	0		9.8 ± 7.8	<0.1
Sphaerosyllis pirifera	0		0.3 ± 0.5	0.0 ± 0.1
Streptosyllis latipalpa	0.3 ± 0.5	<0.1	0	
Syllis sp.	0		0.3 ± 0.5	0.0 ± 0.1
Terebellidae				
Thelepus sp.	0		0.5 ± 1.0	0.0 ± 0.1
Sipuncula spp.	0.3 ± 0.5	<0.1	0	
Crustacea				
Ostracoda spp.	9.8 ± 4.7	0.1 ± 0.0	78.0 ± 29.1	0.1 ± 0.0
Leptostraca				
Nebalia pugettensis	0.3 ± 0.5	0.0 ± 0.1	0.3 ± 0.5	0.0 ± 0.1
Mysidacea				
Archaeomysis grebnitzkii	0.3 ± 0.5	0.0 ± 0.1	0	
Cumacea				
Cumella vulgaris	0		0.3 ± 0.5	0.0 ± 0.1
Diastylis sp.	0		2.3 ± 1.5	0.1 ± 0.0
Diastylopsis sp.	23.8 ± 8.8	0.1 ± 0.0	0.3 ± 0.5	0.0 ± 0.1
Lampropidae spp.	0.3 ± 0.5	0.0 ± 0.1	0	
Tanaidacea				
Anatania normani	0		0.5 ± 1.0	0.0 ± 0.1
Leptochelia dubia	0		8.0 ± 2.9	0.1 ± 0.0

Kydaka Beach Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Crustacea (cont.)				
Isopoda				
Cyathura munda	0		0.5 ± 0.6	0.1 ± 0.1
Edotea sublittoralis	1.0 ± 1.4	0.1 ± 0.1		
Limnoria algarum	0		3.8 ± 7.5	0.0 ± 0.1
Munna stephensi	0		0.5 ± 1.0	0.0 ± 0.1
Paranthura elegans	0		2.3 ± 1.0	0.1 ± 0.0
Synidotea bicuspidata	2.0 ± 2.5	0.1 ± 0.1	0	
Amphipoda				
Caprellidea				
Tritella pilimana	3.0 ± 3.6	0.1 ± 0.1	0	
Gammaridea spp.	103.8 ± 60.7	0.2 ± 0.2	128.8 ± 51.4	0.3 ± 0.2
Decapoda				
Cancer oregonensis	0.3 ± 0.5	0.0 ± 0.1	0	
Pinnotheridae sp. (juv.)	5.8 ± 11.5	0.0 ± 0.1	0.8 ± 1.0	0.5 ± 0.6
Pugettia gracilis	0		0.3 ± 0.5	0.0 ± 0.1
Phoronida				
Phoronopsis harmeri	1.0 ± 0.8	0.0 ± 0.1	0.8 ± 1.5	0.0 ± 0.1
Bryozoa spp.		✓		✓
Echinodermata				
Ophiuroidea sp. (juv.)	0		0.3 ± 0.5	0.0 ± 0.1
Echinoidea				
Dendraster excentricus	0.3 ± 0.5	0.0 ± 0.1	0	
Holothuroidea				
Leptosynaps clarki	16.8 ± 18.6	0.3 ± 0.2	0	
Species Richness	54		96	
Diversity, H ¹	2.55		2.83	
Total Number	311.5		870.5	
Total Biomass	<5.7		<11.1	

Table 10a. Jamestown (protected sand-gravel) benthic organisms from the high (+6') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 (N=2; spring) and 0.025 (N=4; summer-winter) m² $\pm$ standard deviation.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Nemertea								
spp.	0		0		0		0.3	<0.1
<i>Paranemertes</i>							± 0.5	
<i>peregrina</i>	8.0	<0.1	0		0		0	
	± 11.3							
Nematoda								
spp.	3.0	<0.1	1.8	<0.1	1.5	<0.1	0.5	<0.1
	± 1.4		± 1.7		± 1.9		± 0.6	
Mollusca								
<i>Gastropodi</i>								
<i>Acmaeidae</i>							0.5	<0.1
spp.	0		0		0		± 0.5	
<i>Lacuna</i>							0.5	<0.1
<i>variegata</i>	0		0		0		± 1.0	
<i>Bivalvia</i>								
<i>Transennella</i>							0.3	<0.1
<i>tantilla</i>	0		0		0		± 0.5	
Annelida								
<i>Oligochaeta</i>								
spp.	7441.5	<0.1	1108.3	<0.1	766.0	<0.1	40.3	<0.1
	± 1013.3		± 844.5		± 592.5		± 21.7	
<i>Polychaeta</i>								
<i>Nereidae</i>								
spp. (juv.)	0		0.3	<0.1	0		0	
<i>Nereis</i>			± 0.5					
<i>vexillosa</i>	0		0		0		0.5	<0.1
							± 1.0	
<i>Phyllodoce</i>								
spp.								
<i>maculata</i>	1.0	<0.1	0		0		0.3	<0.1
	± 0.0						± 0.5	
<i>Polynoidae</i>								
<i>Harmothoe</i>								
<i>imbricata</i>	0		0		0		0.5	<0.1
							± 0.6	

Jamestown +6

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Crustacea								
Cumacea								
Cumella	4.5	<0.1	0		0		0	
vulgaris	± 6.4							
Tanaidacea								
Leptochelia	18.5	<0.1	0.3	<0.1	0		0.5	<0.1
dubia	± 26.2		± 0.5				± 0.6	
Amphipoda								
Caprellidea	0		0		3.3	<0.1	0	
app.					± 6.5			
Gammaridea	32.5	<0.1	0		3.5	<0.1	2.0	<0.1
app.	± 46.0				± 4.4		± 1.4	
Decapoda								
Pinnixa	0		0		0		0.3	<0.1
app. (juv.)							± 0.5	
Pugettia	0		0		0		0.3	<0.1
gracilis							± 0.5	
Insecta								
Dipteran	2.0	<0.1	0		0		0	
larvae	± 2.8							
Dolichopodidae	0		0		0		0.3	<0.1
app.							± 0.5	
Species richness	8		4		4		14	
Diversity - H'	0.07		0.02		0.07		0.73	
Total number	7511.0		1110.7		774.3		46.9	
Total biomass (g)	<0.7		<0.4		<0.7		<1.3	

Table 10b. Jamestown (protected sand) benthic organisms from the mid (+1.4') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 (N=2; spring) and 0.025 (N=4; summer-winter) m² $\pm$ standard deviation.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Chlorophyta								
Ulva		0		0		✓		0
taeniata								
U.		0		0		✓		✓
sp.								
Rhodophyta								
Ceramium		0		0		✓		0
estorianum								
Cnidaria								
Anthozoa	0		0		0.5	0.1	0	
app.					± 0.6	± 0.1		
Hydrozoa								
Coryne	0		0		✓	<0.1	0	
sp.								
Nemertea	1.0	<0.1	1.5	<0.1	0.3	<0.1	0.3	<0.1
app.	± 1.4		± 1.7		± 0.5		± 0.5	
Paranemertes	0		0		0.3	<0.1	0	
peregrina					± 0.5			
Nematoda	2.0	<0.1	10.3	<0.1	6.3	<0.1	11.8	<0.1
app.	± 2.8		± 12.3		± 4.7		± 6.4	
Mollusca								
Gastropoda								
Acmaeidae	0		0		0		0.3	<0.1
app.							± 0.5	
Aglaja	0		0		0.5	<0.1	0.3	<0.1
diomedea					± 0.6		± 0.5	
Lacuna	0		0		0.3	<0.1	0.3	<0.1
variegata					± 0.5		± 0.5	
Opiethobranchia	0		0		0		0.3	<0.1
							± 0.5	

Jamestown +1.4

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Bivalvia								
Macoma	0		0		0.5	3.8	0	
inquinata					±1.0	±7.6		
M.	3.0	7.8	0.5	3.7	1.8	8.5	0.3	2.0
nasuta	±1.4	±0.6	±0.6	±4.7	±1.7	±9.7	±0.5	±3.9
M.	0.5	0.2	0		0		0.3	<0.1
app.	±0.7	±0.2					±0.5	
Mytilus	0.5	<0.1	0		0.3	0.1	0	
sp.	±0.7				±0.5			
Transennella	63.5	0.4	19.0	0.1	180.8	0.8	132.0	<0.1
tentilla	±9.2	±0.2	±17.3		±16.4	±1.0	±23.0	
Annelida								
Oligochaeta	38.0	<0.1	40.3	<0.1	542.0	0.2	12.5	<0.1
spp.	±24.0		±24.4		±1046.0	±0.4	±10.0	
Polychaeta								
Arenicolidae	2.5	<0.1	17.5	<0.1	176.3	<0.1	53.3	<0.1
spp. (juv.)	±3.5		±28.7		±21.6		±25.1	
Capitellidae								
Capitella	43.5	<0.1	90.8	<0.1	75.3	0.1	23.5	<0.1
capitata	±24.8		±69.4		±36.2	±0.1	±8.9	
Mediomastus	±1.0	<0.1	1.5	<0.1	0.5	<0.1	0	
sp.	±1.4		±1.7		±1.0			
Notomastus	0		0		0		0.8	<0.1
sp.							±1.0	
Cirratulidae								
spp.	0		0		0		0.3	<0.1
							±0.5	
Goniadidae								
Glycinde	0		0.3	<0.1	0		0.5	<0.1
picta			±0.5				±1.0	
Lumbrineridae								
Lumbrineris	0.5	<0.1	0		0.3	<0.1	0	
spp.	±0.7				±0.5			

Jamestown +1.4

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Maldenidae	1.0	<0.1	0		0		0.5	<0.1
app. (juv.)	±1.4						±1.0	
Nephtyidae								
Nephtys	2.5	✓	0.3	<0.1	0.3	✓	0	
caeca	±0.7		±0.5		±0.5			
N.	0		0.3	<0.1	0.3	✓	2.3	✓
caecoides			±0.5		±0.5		±1.7	
N.	0		0		0		0.8	<0.1
californiensis							±1.5	
N.	0		0		0.8	<0.1	1.0	<0.1
app. (juv.)					±1.0		±1.4	
Nereidae								
Nereis	0		0		3.0	<0.1	0.8	<0.1
app. (adult)					±3.4		±1.5	
N.	0		15.8	<0.1	0.3	<0.1	0	
app. (juv.)			±10.2		±0.5			
Platynereis	0		0		2.5	<0.1	0	
bicanaliculata					±3.0			
Opheliidae								
Armendia	3.0	<0.1	0		1.3	<0.1	0.5	<0.1
brevis	±4.2				±1.3		±0.6	
Orbinidae								
Mainieris	0		0.3	<0.1	1.3	<0.1	0.3	<0.1
app.			±0.5		±2.5		±0.5	
Scoloplos	3.0	<0.1	0		0.3	<0.1	0.5	<0.1
app.	±0.0				±0.5		±0.6	
Paraonidae								
Paraonella	3.0	<0.1	8.3	<0.1	2.8	<0.1	1.3	<0.1
platybranchia	±2.8		±5.4		±3.1		±1.5	

Jamestown +1.4

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Phyllodocidae	0		0.5	<0.1	0		0	
spp.			± 0.6					
Eteone	19.0	<0.1	43.8	<0.1	17.8	<0.1	33.8	<0.1
longa	± 5.7		± 13.7		± 5.7		± 16.8	
E.	0		0		0.5	<0.1	0	
tuberculata					± 1.0			
Eulalia	0.5	<0.1	0		0.3	<0.1	0	
sanguinea	± 0.7				± 0.5			
Phyllodoce	1.0	<0.1	0.3	<0.1	8.0	<0.1	8.5	<0.1
maculata	± 1.4		± 0.5		± 4.2		± 8.1	
P.	0		0.5	<0.1	0		0	
spp.			± 1.0					
Polynoidae	0		± 0.3	<0.1	0		0	
spp.			± 0.5					
Spionidae	0.5	<0.1	40.0	<0.1	0.5	<0.1	0	
spp. (juv.)	± 0.7		± 72.2		± 0.1			
Malacoceros	287.5	<0.1	20.5	<0.1	297.3	✓	326.0	<0.1
glutinosus	± 369.8		± 14.3		± 20.8		± 38.5	
Polydora	4.0	<0.1	47.0	<0.1	73.5	✓	6.8	<0.1
kempj japonica	± 1.4		± 27.4		± 14.1		± 5	
P.	0		0.3	<0.1	0		0	
quadrilobata			± 0.5					
P.	0.5	<0.1	0		0		0	
sp.	± 0.7							
Prionospio	0.5	<0.1	0		0		0	
cirrifera	± 0.7							
Pygospio	41.0	<0.1	1287.8	<0.1	68.5	<0.1	49.5	<0.1
elegans	± 72.6		± 1495.7		± 8.5		± 35.2	
Scolelepis	0		0		0.3	<0.1	0	
sp. C					± 0.5			
Spiophanes	0		0		0		0.3	<0.1
bombyx							± 0.5	

Jamestown +1.4

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Syllidae								
Exogone	2.0	<0.1	0		1.0	<0.1	4.0	<0.1
lourei	±1.4				±0.8		±5.0	
Streptosyllis	2.5	<0.1	1.8	<0.1	1.0	<0.1	1.8	<0.1
latipalpa	±2.1		±3.5		±0.8		±1.5	
Syllis	0.5	<0.1	1.1	<0.1	0		0	
app.	±0.7		±1.5					
Crustacea								
Cumacea								
Cumella	2.5	<0.1	0.8	<0.1	2.5	<0.1	3.3	<0.1
vulgaris	±3.5		±0.5		±1.0		±2.0	
Tanaidacea								
Leptochelia	0.5	<0.1	1.0	<0.1	15.0	<0.1	31.3	<0.1
dubia	±0.7				±9.6		±10.8	
Isopoda								
Exosphaeroma	0		0		1.0	<0.1	0	
media					±1.2			
Amphipoda								
Ampelisca	—		2.8	<0.1	—		—	
agassizii			±1.7					
Ampithoe	—		0.3	<0.1	—		—	
lacertosa			±0.5					
Anisogammarus	—		0.3	<0.1	—		—	
confervicolus			±0.5					
Caprella	0		0		0.3	<0.1	0	
laeviuscula					±0.5			
Caprellidae	0		0		0.3	<0.1	0	
app.					±0.5			
Corophium	42.3	<0.1	24.3	<0.1	—		—	
scherusicum	±22.7		±6.6					
C.	0		28.5	<0.1	—		—	
salmonis			±27.2					

Jamestown +1.4

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Amphipoda (cont.)								
Corophium spp.	0		0		23.3 <0.1 ± 4.4		0.3 <0.1 ± 0.5	
Gammaridea spp.	3.0 <0.1 ± 4.2		-		22.8 0.0 ± 9.6 ± 0.1		0.3 <0.1 ± 0.5	
Paraphoxus spinosus type A	-		0.5 <0.1 ± 0.6		-		-	
Pontogeneia cf rostrata	-		1.3 <0.1 ± 1.9		-		-	
Decapoda								
Caridea spp.	0		0		0.5 <0.1 ± 0.6		0	
Pinnixa sp. (juv.)	0		0		0		0.8 <0.1 ± 1.5	
Pinnotheridae spp.	0		0		0.3 <0.1 ± 0.5		0	
Upogebia pugettensis	0		1.5 1.3 ± 1.9 ± 2.7		0		0	
Echinodermata								
Holothuroidea								
Leptosynapta clarki	0.5 <0.1 ± 0.7		0		0.3 <0.1 ± 0.5		4.3 <0.1 ± 2.9	
Species richness	33		36		46		38	
Diversity - H'	1.87		1.19		2.02		1.90	
Total number	576.8		1706.1		1533.9		715.8	
Total biomass (g)	<11.7		<8.5		<17.5		<5.5	

Table 10c. Jamestown (protected sand) benthic organisms from the low (+0') intertidal zone collected spring 1977 through winter 1978, expressed as number and/or biomass (g) per 0.05 (N=2; spring) and 0.025 (N=4; summer-winter) m² $\pm$ standard deviation.

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Chlorophyta								
Enteromorpha prolifera		0	✓		0		0	
Ulva sp.		0	✓		✓		✓	
Urospora sp.		0	0		0		✓	
Rhodophyta								
Delesseriaceae		0	0		0		✓	
Hymenena sp.		0	0		0		✓	
Pterosiphonia bipinnata		0	0		0		✓	
P. sp.		0	0		0		✓	
Cnidaria								
Anthozoa sp.	0.5 ± 0.7	<0.1	8.0 ± 5.6	<0.1	2.5 ± 1.9	0.0 ± 0.1	0.3 ± 0.5	<0.1
Halimnophila deceitfulata	31.0 ± 11.3	0.1 ± 0.0	2.5 ± 5.0	<0.1	0		2.0 ± 4.0	<0.1
Nemertea								
spp.	2.5 ± 2.1	<0.1	0.8 ± 0.5	<0.1	3.0 ± 1.8	<0.1	2.5 ± 1.3	<0.1
Nematoda								
spp.	0		0.3 ± 0.5	<0.1	1.5 ± 1.3	<0.1	8.5 ± 9.5	<0.1
Mollusca								
Gastropoda								
Alvinia sp.	0		0		0.3 ± 0.5	<0.1	0.3 ± 0.5	<0.1
Lacuna variegata	0		0		0.3 ± 0.5	<0.1	0	
Aeolididae sp. (juv.)	0		0		0.3 ± 0.5	<0.1	0	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 77	
	#	wt	#	wt	#	wt	#	wt
Bivalvia								
<i>Cryptomya</i>	0		0.3	<0.1	0.5	0.5	0	
<i>californica</i>			± 0.5		± 0.6	± 0.6		
<i>Macoma</i>	0		0.3	0.3	0.5	0.1	0	
<i>inquinata</i>			± 0.5	± 0.5	± 0.6	± 0.2		
<i>Macoma</i>	0		0		0		0.3	0.1
<i>nasuta</i>							± 0.5	± 0.3
M.	16.0	0.1	0.5	0.3	0		0	
app.	± 27.7	± 0.2	± 1.0	± 0.7				
<i>Protothaca</i>	0		0.3	0.9	0		0	
<i>staminea</i>			± 0.5	± 1.8				
<i>Trasenerella</i>	39.0	0.2	13.5	<0.1	64.0	0.3	39.3	<0.1
<i>tantilla</i>	± 44.2	± 0.2	± 1.7		± 30.7	± 0.3	± 16.6	
<i>Tresus</i>	0		0		0		1.8	0.4
<i>capax</i>							± 0.5	± 0.7
Annelida								
<i>Oligochaeta</i>	584.5	<0.1	238.3	<0.1	495.5	<0.1	676.3	✓
app.	± 135.0		± 84.7		± 140.5		± 189.6	
Polychaeta								
<i>Arenicolidae</i>	1.0	<0.1	1.5	<0.1	2.0	<0.1	4.0	<0.1
sp. (juv.)	± 1.4		± 1.9		± 1.4		± 2.9	
<i>Branchiomacridane</i>	12.0	<0.1	4.5	<0.1	2.8	<0.1	2.3	<0.1
<i>vincenti</i>	± 2.8		± 4.4		± 3.0		± 3.9	
Capitellidae								
<i>Capitella</i>	53.0	<0.1	15.8	<0.1	54.0	<0.1	58.3	<0.1
<i>capitata</i>	± 8.5		± 4.9		6.0		± 23.5	
<i>Mediomastus</i>	38.5	<0.1	37.5	<0.1	44.3	<0.1	32.8	<0.1
sp.	± 2.1		± 14.8		± 9.4		± 13.9	
Cirratulidae								
sp.	14.5	<0.1	1.5	<0.1	1.0	<0.1	3.8	<0.1
	± 20.5		± 3.0		± 1.4		± 3.5	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Cirratulidae (cont.)								
<i>Cirratulus</i>	1.5	<0.1	0.8	<0.1	1.8	<0.1	0	
<i>cirratus</i>	± 2.1		± 1.0		± 1.7			
<i>Tharyx</i>	4.5	<0.1	2.5	<0.1	1.0	<0.1	1.8	<0.1
<i>multifilis</i>	± 3.5		± 2.4		± 1.4		± 1.5	
Dorvilleidae								
<i>Dorvilles</i>	16.5	<0.1	4.5	<0.1	9.5	<0.1	4.8	<0.1
<i>rudolphi</i>	± 23.3		± 2.7		± 8.7		± 3.4	
<i>Protodorvilles</i>	2.0	<0.1	0		0		0	
<i>gracilis</i>	± 2.8							
Eunicoides								
<i>sp.</i>	0		0		0.5	<0.1	0	
					± 1.0			
Goniadidae								
<i>Glycinde</i>	0		0		0		0.5	<0.1
<i>picta</i>							± 1.0	
Hesionidae								
<i>Cyrtis</i>	0.5	<0.1	0		0		0	
<i>brevipalpa</i>	± 0.7							
<i>Ophiodromus</i>	3.0	<0.1	2.3	<0.1	3.0	<0.1	4.0	<0.1
<i>pugettensis</i>	± 1.4		± 1.5		± 2.9		± 0.8	
<i>O.</i>	0		0		0.3	<0.1	0	
<i>sp. A</i>					± 0.5			
Lumbrineridae								
<i>Lumbrineris</i>	0		1.5	<0.1	0		0	
<i>inflata</i>			± 1.9					
<i>L.</i>	60.5	<0.1	26.3	<0.1	51.1	1.9	29.3	✓
<i>spp.</i>	± 2.1		± 6.2		± 2.1			
Maldanidae								
<i>sp. (juv.)</i>	27.5	<0.1	7.8	<0.1	57.5	0.1	54.3	✓
	± 38.9		± 15.5		± 12.8	± 0.1	± 15.0	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Maldanidae (cont.)								
<i>Axiothella</i>	49.5	<0.1	26.3	<0.1	20.8	0.2	6.0	✓
<i>rubrocincta</i>	±40.3		±11.6		±7.4	±0.2	±5.4	
<i>Euclymene</i>	0		0		0.3	<0.1	0	
<i>delineata</i>					±0.5			
Nephtyidae								
<i>Nephtys</i>	0		0		0.5	<0.1	0	
<i>caeca</i>					±1.0			
<i>N.</i>	0		0		0.3	<0.1	0	
<i>caecoides</i>					±0.5			
<i>N.</i>	0		0		0		0.3	<0.1
<i>californiensis</i>							±0.5	
<i>N.</i>	0		0		0		0.3	<0.1
<i>sp. (juv.)</i>							±0.5	
Nereidae								
<i>Nereis</i>	0		0.3	<0.1	0		0.8	<0.1
<i>vexillosa</i>			±0.5				±1.0	
<i>N.</i>	0		1.0	<0.1	0.3	<0.1	5.5	<0.1
<i>sp. (juv.)</i>			±1.4		±0.5		±11.0	
<i>Platynereis</i>	0.5	<0.1	0		20.5	0.0	8.3	<0.1
<i>bicanaliculata</i>	±0.7				±4.4	±0.1	±7.9	
Onuphidae								
<i>Onuphis</i>	0.5	<0.1	0		0		0	
<i>iridescens</i>	±0.7							
<i>O.</i>	0.5	<0.1	0		0		0	
<i>stigmatus</i>	±0.7							
Opheliidae								
<i>Armandia</i>	4.5	<0.1	0.5	<0.1	5.3	<0.1	7.0	<0.1
<i>brevis</i>	±2.1		±0.6		±1.9		±3.2	
Orbiniidae								
<i>Mainaris</i>	0.5	<0.1	0		0		0.3	<0.1
<i>dendritica</i>	±0.7						±0.5	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Orbiniidae (cont.)								
<i>Maineris</i>	27.5	<0.1	11.3	<0.1	3.5	<0.1	10.8	✓
<i>uncinata</i>	±17.7		± 2.2		± 7.0		± 7.5	
"	0		0		13.8	<0.1	6.8	<0.1
<i>sp.</i>							± 3.9	
Phyllodocidae								
<i>Eteone</i>	2.0	<0.1	0.5	<0.1	0.3	<0.1	1.0	<0.1
<i>longa</i>	±0.0		±0.6		±0.5		±0.8	
<i>E.</i>	0		0		0.3	<0.1	0	
<i>tuberculata</i>					±0.5			
<i>Eulalia</i>	1.0	<0.1	0		0.8	<0.1	0.8	<0.1
<i>sanguinea</i>	±1.4				±1.0		±1.0	
<i>E.</i>	0		0.3	0.1	0		0	
<i>sp. (juv.)</i>			0.5					
<i>Phyllodoce</i>	2.0	<0.1	1.3	<0.1	3.0	<0.1	6.3	<0.1
<i>maculata</i>	±1.4		±0.5		±3.1		±3.4	
<i>P.</i>	0		0		2.5	<0.1	0	
<i>sp.</i>					±2.4			
Polyneidae								
<i>Harmothoe</i>	2.5	<0.1	9.5	<0.1	12.3	0.2	1.3	✓
<i>imbricata</i>	±3.5		±3.0		±2.1	±0.2	±1.0	
<i>H.</i>	1.0	<0.1	0		0		0	
<i>sp. (juv.)</i>	±1.4							
Sabellidae								
<i>Chone</i>	0		0.3	<0.1	0		0	
<i>sp.</i>			±0.5					
Sphaerodoridae								
<i>Sphaerodopsis</i>	0		0		0.3	<0.1	0	
<i>minuta</i>					±0.5			
Spionidae								
<i>Malacoceros</i>	32.5	<0.1	15.0	<0.1	67.3	<0.1	101.3	✓
<i>glutans</i>	±19.1		±10.8		± 2.1		± 37.5	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Spionidae (cont.)								
Polydora	0		0.3	<0.1	0		0	
sp.			±0.5					
Pygospio	0		0		0		0.3	<0.1
elegans							±0.5	
Spio	0		0.3	<0.1	0		0	
filicornis			±0.5					
Syllidae								
Brania	0		0.3	<0.1	0		0	
brevipharyngea			±0.5					
Erogone	0		0		1.5	<0.1	0	
gemmifera					±1.3			
E.	130.5	<0.1	64.0	<0.1	129.5	<0.1	85.8	<0.1
lourai	±94.0		±17.8		±40.8		±33.5	
Sphaerosyllis	0		0		0.3	<0.1	0	
brandhorsti					±0.5			
S.	0		0		0.3	<0.1	0	
pirifera					±0.5			
S.	8.5	<0.1	0		0.5	<0.1	0	
sp.	±10.6				±0.6			
Streptosyllis	0		0		0		0.5	<0.1
latipalpa							±1.0	
Syllides	0		0		1.0	<0.1	0	
longocirrata					±1.4			
Syllis	0		1.0	<0.1	0		6.5	✓
spp.			±0.8				±9.1	
Terebellidae								
spp.	0		0		12.3	<0.1	0.5	<0.1
Eupolyornia	3.5	✓	0.5	<0.1	±12.3		±1.0	
heterobranchia	±3.5		±0.6		0.3	<0.1	1.3	✓
Nicoles	0		0		±0.5		±1.9	
zostericola					1.3	<0.1	0	
Pista	26.0	✓	12.8	<0.1	±1.3			
brevibranchiata	±2.8		±3.9		8.5	0.5	12.3	✓
					±4.2	±0.4	±2.2	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Terebellidae (cont.)								
Polycirrus	8.5	<0.1	3.3	<0.1	1.0	<0.1	2.0	<0.1
sp.	±0.7		±3.6		±6.7		±1.8	
Sipuncula								
Colpugia	0		0		0		0.3	<0.1
pugettensis							±0.5	
Crustacea								
Leptostraca								
Nebalia	0		0		0.3	<0.1	1.0	<0.1
pugettensis					±0.5		±0.8	
Ostracoda	0		0		0.2	<0.1	0	
app.					±1.0			
Mysidacea								
Archaeomysis	0		0		0		4.5	<0.1
grebnitzkii							±9.0	
Cumacea								
Cumella	0		0		0.3	<0.1	0	
vulgaris					±0.5			
Leptocuma	0.5	<0.1	0		0		0	
sp.	±0.7							
Tanaidacea								
Leptochelia	40.5	<0.1	37.3	<0.1	44.0	<0.1	52.0	<0.1
dubia	±20.5		±22.9		±10.2		±19.3	
Isopoda								
Exosphaeroma	0		0		0.3	<0.1	1.8	<0.1
amplicauda					±0.5		±1.3	
Idotea	0		0		0.5	<0.1	0	
sp. (juv.)					±1.0			

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Isopoda (cont.)								
Phyllodorus	0		0.3	< 0.1	0		0	
abdominalis			± 0.5					
Synidotea	0		0		0.5	< 0.1	0	
bicuspidata					± 1.0			
Amphipoda								
Caprellidea								
Caprella	0		0.3	< 0.1	0.3	< 0.1	0	
sp.			± 0.5		± 0.5			
Gammaridea	29.5	< 0.1	-		54.5	0.4	16.5	< 0.1
app.	± 9.2				± 9.3	± 0.3	± 5.5	
Ampithoe	-		2.8	< 0.1	-		-	
lacertosa			± 5.5					
Calliopielia	-		0.3	< 0.1	-		-	
pratti			± 0.5					
Coreophium	0.5	0.1	0		0.3	0.1	3.5	0.1
app.	0.7				0.5		1.7	
Melita	-		0.5	< 0.1	-		-	
dentata			± 1.0					
Paraphoxus	-		0.3	< 0.1	-		-	
similis			± 0.5					
P.	-		1.3	< 0.1	-		0.5	< 0.1
spinosus type A			± 2.5				± 0.5	
Pontogeneia	-		0.3	< 0.1	-		-	
cf. ivanovi			± 0.5					
P.	-		5.5	< 0.1	-		-	
cf. rostrata			± 10.3					
Tritella	0		0.3	< 0.1	0		0	
pillimana			± 0.5					
Decapoda								
Callinassidae	0		0.3	< 0.1	0		0	
sp. (juv.)			± 0.5					
Caridea	0		0		0		0.8	< 0.1
app.							± 1.0	

Jamestown +0

	Spr 77		Sum 77		Fall 77		Win 78	
	#	wt	#	wt	#	wt	#	wt
Decapoda (cont.)								
Heptacarpus	0		0		0.5	0.0	0	
sp.					±1.0	±0.1		
Pinnixa	0		0.3	0.0	0		0	
littoralis			±0.5	±0.1				
P.	2.5	0.2	0.3	<0.1	3.5	<0.1	1.3	<0.1
sp. (juv.)	±0.7	±0.1	±0.5				±1.3	
Upogebia	6.0	2.0		.5	5.5	7.2	8.3	<0.1
pugettensis	±0.0	±1.1		3	±0.8	±8.0	±5.6	
Insecta								
Diptera	0				0		0.3	<0.1
larva							±0.5	
Phoronida								
Phoronopsis	1.0	<0.1	1.0	<0.1	0.3	<0.1	0	
harmeri	±0.0		±0.8		±0.5			
Echinodermata								
Ophuroidea	1.5	<0.1	0.5	<0.1	8.8	<0.1	4.8	<0.1
app.	±0.7		±1.0		±8.3		±1.5	
Amphipholus	0		0		6.3	0.1	0	
squamata					12.5	0.2		
Holothuroidea								
Leptosynapta	11.0	<0.1	2.9	<0.1	0.5	<0.1	2.5	<0.1
clarki	±4.2		±1.5		±0.6		±3.8	
Species richness	47		57		76		61	
Diversity - H'	2.36		2.42		2.48		2.10	
Total number	1295.5		605.4		1260.0		1291.1	
Total biomass (g)	15.1		6.3		27.1		0.5	

Table 10d. Jamestown (sand) benthic organisms from the subtidal zone collected 7 June 1977, expressed as number and/or biomass (g) per 0.05 m² $\pm$ standard deviation (N=4).

	-5 m.	-10 m.
	#	#
	wt.	wt.
Chlorophyta		
Chaetomorpha	<0.1	<0.1
californica		
Cladophora	<0.1	<0.1
pygmaea		
Entocladia	0	<0.1
viridis		
Phaeophyta		
Ectocarpus	0	<0.1
sp.		
Laminariales	2.5	0
	± 5.0	
Ralfsia	<0.1	<0.1
sp.		
Stictyosiphon	0	<0.1
tortilis		
Syringoderma	0	<0.1
abyssicola		
Rhodophyta		
Antithamnion	<0.1	0
glandulifera		
Asterocolax	0	<0.1
gardneri		
Callithamnion/	<0.1	<0.1
Pleonosporium		
Callophyllis	<0.1	0.5
flabellulata		± 1.1
C.	0	0.2
haenophylla		± 0.3
C.	<0.1	0
sp. (juv.)		
Ceramium	0.1	0
californicum	± 0.1	

Jamestown Subtidal

	-5 m.	-10 m.
#	wt.	# wt.
Rhodophyta (cont.)		
Choreocolax	<0.1	0
polysiphoniae		
Cruoriaceae	<0.1	0
Euthora	<0.1	<0.1
fruticulosa		
Fauchea	3.5	0
laciniata	±5.6	
Coniotrichum	0	<0.1
alsidii (= C. elegans)		
Gracilaria	11.0	<0.1
verrucosa	±14.6	
Gymnogongus	<0.1	0
leptophyllus		
Halymenia	2.5	0
californica	±5.0	
Herposiphonia	<0.1	<0.1
grandis		
Hymenena	<0.1	0
sp.		
Iridaea	0.3	0
sp.	±18.5	
Membranoptera	0	<0.1
platyphylla		
Peyssonellia	<0.1	<0.1
pacificca		
Platythamnion	0	<0.1
heteromorphum		
P.	0	0.1
pectinatum		±0.1
P.	<0.1	0
reversum		
P.	0	0.3
villosus		±0.6

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Rhodophyta (cont.)				
Plocamium		0.1		0
coccineum		±0.2		
Polyneura		7.2		0.2
latissima		±12.9		±0.4
Polysiphonia		0.2		<0.1
hendryi		±0.3		
P.		<0.1		0
pacifica				
Pterosiphonia		0		<0.1
bipinnata				
P.		0.6		0
dendroides		±0.2		
Rhodoptilum		0		<0.1
plumosum				
Rhodymenia		0.1		<0.1
sp.		±0.1		
Scagelia		<0.1		<0.1
occidentale				
Stenogramme		0.1		<0.1
interrupta		±0.0		
Porifera				
spp.		✓		
Cnidaria				
Anthozoa	2.8	0.1	1.5	<0.1
spp.	±2.5	±0.1	±1.9	
Halimnophora	0		0.3	<0.1
deceitaculata			±0.5	
Platyhelminthes - Turbellaria				
spp.	0		0.3	<0.1
			±0.5	
Nemertea				
spp.	4.8	<0.1	8.5	<0.1
	±4.8		±1.7	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Nemertoda	66.8	<0.1	21.3	<0.1
app.	±37.5		±11.3	
Mollusca				
Amphineura				
Mopelia	0.3	0.3	0	
lignosa	±0.5	±0.6		
Gastropoda				
Alvinia	20.5	<0.1	1.5	<0.1
sp.	±7.2		±1.5	
Amphisca	0		0.3	<0.1
columbiana			±0.5	
Bittium	3.8	0.0	0	
eschrichtii	±4.4	±0.1		
Calyptraea	2.0	0.1	1.5	<0.1
fastigata	±2.2	±0.1	±1.3	
Cerithiopsis	2.3	<0.1	0	
sp.	±2.9			
Collisella	0.3	<0.1	0	
ochracea	±0.5			
Lacuna	0.3	<0.1	0.8	<0.1
variegata	±0.5		±1.5	
Margarites/	9.8	<0.1	11.3	<0.1
Lirularia	±6.2		±6.7	
Margarites	0		0.8	<0.1
pupillus			±4.3	
Messarium	0		0.5	<0.1
mendicus			±0.5	
Natica	0		0.3	<0.1
clausa			±0.5	
Odostomia	0		1.5	<0.1
sp.			±3.0	
Oenopota	0		0.3	<0.1
tabulata			±0.5	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Gastropoda (cont.)				
Thais	0.3	< 0.1	0	
sp.	± 0.5			
Trichotropis	0		0.3	0.0
cancellata			± 0.5	± 0.1
Turbonilla	0.5	< 0.1	0.5	< 0.1
sp.	± 1.0		± 0.6	
Bivalvia				
Chlamys	0		0.3	< 0.1
haastata			± 0.6	
Clinocardium	10.5	0.1	1.0	< 0.1
nuttallii	± 7.1	± 0.1	± 1.2	
Crenella	68.3	0.1	4.3	< 0.1
decussata	± 59.7	± 0.1	± 4.4	
Lucinoma	0		3.0	< 0.1
tenuisculpta			± 1.2	
Lyonsia	0		0.5	< 0.1
californica			± 0.6	
Macoma	0.3	0.1	4.3	1.7
nasuta	± 0.5	± 0.1	± 8.5	± 3.4
Macoma	6.0	0.1	18.3	< 0.1
sp. (juv.)	± 3.5	± 0.1	± 5.7	
Musculus	0.3	< 0.1	0.8	0.1
discors	± 0.5		± 1.0	± 0.1
Mya	1.0	< 0.1	0.8	< 0.1
arenaria	± 1.4		± 0.5	
Myseella	72.5	0.1	14.0	< 0.1
tumida	± 33.1	± 0.1	± 6.9	
Maculana	0		3.3	0.1
hamata			± 1.9	± 0.1
Macula	0.5	< 0.1	0	
tennis	± 0.6			
Protothaca	0.3	0.1	0.8	0.0
staminea	± 0.5	± 0.3	± 1.5	± 0.1

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Bivalvia (cont.)				
<i>Transennella</i>	10.5	<0.1	7.8	<0.1
<i>tentilla</i>	±4.7		±1.7	
<i>Tresus</i>	0.3	<0.1	1.3	0.1
<i>capax</i>	±0.5		±1.3	±0.2
Annelida				
Archiannelida				
<i>Polygordius</i>	0.3	<0.1	0	
sp.	±0.5			
Polychaeta				
Ampharetidae				
<i>Ampharete</i>	0		12.0	<0.1
<i>arctica</i>			±3.2	
app. (juv.)	0		1.5	<0.1
			±2.4	
Apistobranchidae				
<i>Apistobranchus</i>	0		0.3	<0.1
sp.			±0.5	
Capitellidae				
<i>Capitella</i>	0		1.0	<0.1
<i>capitata</i>			±0.8	
<i>Mediomastus</i>	21.3	<0.1	39.8	<0.1
sp.	±11.6		±15.4	
Chaetopteridae				
<i>Phyllochaetopterus</i>	14.0	<0.1	4.0	<0.1
<i>prolifera</i>	±6.3		±4.1	
<i>Spiochaetopterus</i>	0.3	<0.1	1.8	<0.1
<i>costarum</i>	±0.5		±1.0	
Girratulidae				
spp.	2.5	<0.1	32.3	<0.1
	±2.7		±38.6	

James Town Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Cirratulidae (cont.)				
Chaetoxone	3.0	<0.1	5.5	<0.1
setosa	±1.4		±3.9	
Cirratulus	0		0.3	<0.1
cirratus			±0.5	
Theryx	3.8	<0.1	6.8	<0.1
multifilis	±7.5		±8.6	
Dorvilleidae				
Protodorvillia	11.8	<0.1	2.8	<0.1
gracilis	±7.3		±2.2	
Dorvillea	1.5	<0.1	0	
rudolphi	±1.3			
Glyceridae				
Glycera	0		0.5	<0.1
sp. (juv.)			±0.6	
G.	1.5	<0.1	0.5	<0.1
americana	±1.0		±0.6	
G.	1.0	<0.1	0	
capitata	±1.2			
Goniadidae				
Glycinde	2.0	<0.1	2.8	<0.1
picta	±0.8		±2.8	
Goniada	0		0.8	<0.1
maculata			±1.0	
Hesionidae				
Gyptis	0		0.5	<0.1
brevipalpa			±0.6	
Micropodarke	20.3	<0.1	31.8	<0.1
dubia	±8.7		±11.7	
Lumbrineridae				
Lumbrineris	4.5	<0.1	4.3	<0.1
sp.	±1.0		±2.2	

Janestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Maldanidae	14.3	<0.1	19.0	<0.1
spp. (juv.)	±10.4		±8.5	
Euclymene	5.3	<0.1	4.5	<0.1
sp.	±10.5		±7.7	
Nicomache	20.0	<0.1	2.0	<0.1
personata	±7.4		±2.5	
Nephtyidae				
Nephtys	0.3	<0.1	0	
sp.	±0.5			
N.	0		1.0	<0.1
ciliata			±1.4	
Nereidae				
Nereis	0.3	<0.1	1.0	<0.1
sp. (juv.)	±0.5		±0.8	
N.	0.3	<0.1	0.5	<0.1
procera	±0.5		±0.6	
Platynereis	16.3	<0.1	8.8	<0.1
bicanaliculata	±7.7		±8.7	
Onuphidae				
Onuphis	0		1.0	<0.1
iridescens			±0.8	
O.	0.5	<0.1	0	
stigmatis	±1.0			
O.	0		2.3	<0.1
sp. (juv.)			±1.7	
Opheliidae				
Ammotrypane	0		0.3	<0.1
sulogaster			±0.5	
Armandia	3.3	<0.1	0	
brevis	±2.1			
Travisia	0		0.5	<0.1
forbesii			±1.0	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Orbiniidae				
Scoloplos	2.8	<0.1	1.5	<0.1
sp.	±1.7		±1.0	
Oweniidae				
Owenia	6.5	<0.1	2.5	<0.1
fusiformis	9		±1.0	
Paraonidae				
Aricides	1.8	<0.1	1.3	<0.1
sp.	±1.0		±1.0	
Pectinariidae				
Pectinaria	0		3.0	<0.1
granulata			±2.2	
Phyllodoceidae				
Eteone	0.5	<0.1	0.8	<0.1
longa	±1.0		±1.0	
Eulalia	0.3	<0.1	1.5	<0.1
sanguinea	±0.5		±1.9	
Phyllodoce	0		0.3	<0.1
sp. A			±0.5	
Phyllodoce	1.3	<0.1	0.8	<0.1
groenlandica	±1.3		±1.0	
Phyllodoce	0		2.0	<0.1
maculata			±1.2	
Phyllodoce	1.3	<0.1	5.8	<0.1
sp. (juv.)	±1.3		±5.2	
Polynoidae				
Harmothoe	20.8	<0.1	10.0	<0.1
imbricata	±8.2		±7.0	
H.	0.5	<0.1	1.5	<0.1
lunulata	±0.6		±1.3	
H.	0.5	<0.1	0	
sp.	±1.0			

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Sabellidae				
Chone	1.5	< 0.1	3.8	< 0.1
ecaudata	± 1.3		± 1.5	
C.	0		5.0	< 0.1
spp.			± 5.6	
Euchone	0		4.0	< 0.1
analis			± 2.2	
Laonome	0		2.0	< 0.1
sp.			± 4.0	
Potamilla	0		0.3	< 0.1
intermedia			± 0.5	
P.	0		0.5	< 0.1
myriops			± 1.0	
Sabella	0		13.5	< 0.1
media			± 10.2	
Scalebregmidae				
Scalebregma	0		1.3	< 0.1
inflatum			± 1.3	
Serpulidae				
Spirorbis	0		0.3	< 0.1
sp.			± 0.5	
Sigalionidae				
Pholoe	1.5	< 0.1	1.0	< 0.1
minuta	± 0.6		± 0.8	
Spionidae				
Leonice	0		0.8	< 0.1
cirrata			± 1.3	
Malacoceros	0.5	0.1	0.8	0.1
glutaeus	0.6		1.0	
Polydora	0		0.3	0.1
sp. A.			0.5	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Spionidae (cont.)				
Polydora	0		2.5	<0.1
quadrilobata			±1.9	
P.	1.3	<0.1	2.3	<0.1
socialis	±1.3		±1.3	
Prionospio	0.5	<0.1	0	
cirrifer	±0.6			
P.	7.3	<0.1	8.3	<0.1
steenstrupi	±2.5		±3.3	
Spiophanes	0.3	<0.1	1.5	<0.1
berkeleyorum	±0.5		±1.7	
S.	4.5	<0.1	1.0	<0.1
bombyx	±3.9		±0.8	
Syllidae				
Exogone	1.0	<0.1	0.8	<0.1
louriei	±1.4		±1.5	
E.	96.0	<0.1	40.5	<0.1
app.	±43.5		±21.5	
Pionosyllis	0.3	<0.1	0	
uraga	±0.5			
Sphaerosyllis	0.5	<0.1	0	
brandhorsti	±0.6			
S.	3.5	<0.1	1.0	<0.1
pirifera	±2.7		±1.4	
Syllides	1.3	<0.1	1.0	<0.1
longocirrata	±1.5		±0.8	
Syllis	4.0	<0.1	2.3	<0.1
app.	±5.1		±2.9	
Terebellidae	0.5	<0.1	1.0	<0.1
app.	±1.0		±1.4	
Nicoles	0.5	<0.1	0.3	<0.1
rostericola	±0.6		±0.5	
Pista	0		0.8	<0.1
brevibranchiata			±1.0	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Terebellidae (cont.)				
Pista	0		0.5	<0.1
cristata			±1.0	
Polycirrus	1.3	<0.1	0.3	<0.1
sp. A.	±1.0		±0.5	
Proclea	0		1.0	<0.1
graffi			±1.4	
Oligochaeta	13.5	<0.1	31.0	<0.1
spp.	±14.9		±19.9	
Sipunculida	1.8	<0.1	0.3	<0.1
spp.	±2.1		±0.5	
Phascolosoma	0.3	<0.1	0.3	<0.1
agassizii	±0.5		±0.5	
Priapulida				
Priapulus				
caudatus	0		0.3	<0.1
			±0.5	
Crustacea				
Ostracoda	16.8	<0.1	18.8	<0.1
spp.	±6.7		±11.9	
Leptostraca				
Nebalia	0.3	<0.1	0.3	<0.1
pugettensis	±0.5		±0.5	
Cumacea				
Cumella	0.3	<0.1	3.0	<0.1
vulgaris	±0.5		±1.2	
Diastylis	0.3	<0.1	2.5	<0.1
sp.	±0.5		±1.9	
Lampropidae	0.5	<0.1	0.5	<0.1
spp.	±1.0		±1.0	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Tanaidacea				
Leptochelia	132.3	0.0	68.5	<0.1
dubia	± 41.9	± 0.1	± 43.6	
Isopoda				
Epicaridea	0.3	<0.1	0	
sp.	± 0.5			
Exosphaeroma	0.8	<0.1	0	
media	± 1.0			
E.	1.0	<0.1	0.5	<0.1
rhomburum	± 1.2		± 1.0	
Cnoriinosphaeroma	0		0.3	<0.1
oregonense			± 0.5	
Jaeropsis	0		0.3	<0.1
dubia			± 0.5	
Paranthura	0		1.3	<0.1
elegans			± 1.5	
Amphipoda				
Corophium	0.3	<0.1	0	
spp.	± 0.5			
gammaridea	83.0	0.2	76.8	0.1
spp.	± 28.8	± 0.2	± 48.1	± 0.1
Decapoda				
Caridea	1.3	<0.1	1.3	<0.1
sp. (juv.)	± 1.9		± 1.5	
Crangon	0.5	0.1	0.5	0.1
munitella	± 1.0	± 0.1	± 1.0	± 0.2
Crangon	0.8	0.1	0	
sp.	± 1.0	± 0.1		
Heptacarpus	0.3	0.1	0	
stimpsoni	± 0.5	± 0.2		
Hippolytidae	2.3	<0.1	0	
sp.	± 4.5			

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Decapoda (cont.)				
Oregonia	0.3	0.1	0	
<i>gracilis</i>	± 0.5	± 0.1		
Pagurus	0		0.3	0.1
<i>beringanus</i>			± 0.5	± 0.3
Paguridae	2.3	< 0.1	4.8	< 0.1
sp. (juv.)	± 2.1		± 5.0	
Pinnixa	0.3	< 0.1	0	
sp.	± 0.5			
Pinnotheridae	0.5	< 0.1	1.8	< 0.1
sp. (juv.)	± 1.0		± 1.3	
Pugettia	7.3	0.0	1.5	< 0.1
<i>gracilis</i>	± 4.8	± 0.1	± 1.7	
Pugettia	0.3	0.0	0	
<i>producta</i>	± 0.5	± 0.1		
Pugettia	0.3	< 0.1	0.5	< 0.1
sp. (juv.)	± 0.5		± 0.6	
Spirontocaris	0.3	0.1	0	
<i>prionota</i>	± 0.5	± 0.1		
Phoronida				
Phoronopsis	0		2.3	< 0.1
<i>harmeri</i>			± 0.5	
Bryozoa				
spp.				
Echinodermata				
Ophiuroidea	1.5	< 0.1	0.3	0.1
sp. (juv.)	± 1.3		± 0.5	± 0.1
Holothuroidea				
Eupentacta	0		0.3	0.1
sp.			± 0.5	± 0.2
Leptosynapta	7.3	0.1	0.3	< 0.1
<i>clarki</i>	± 4.6	± 0.1	± 0.5	

Jamestown Subtidal

	-5 m.		-10 m.	
	#	wt.	#	wt.
Species richness	136		156	
Diversity - H'	3.49		3.81	
Total number	668.2		643.2	
Total biomass (g)	39.1		3.8	

APPENDIX II

COMPLETE SPECIES LISTS

Table 1. Tongue Point (rock). Complete list of all benthic organisms collected from spring 1976 through winter 1978. Checks indicate tide heights where organism was found.

	+6'	+3'	+0'	-5m	-10m
Chlorophyta					
<i>Blidingia</i> sp.		✓			
<i>Chaetomorpha</i> sp.	✓	✓	✓	✓	
<i>Cladophora</i> sp.	✓	✓	✓		
<i>Codium</i> sp.			✓		
<i>Derbesia marina</i>			✓	✓	✓
<i>Enteromorpha compressa</i>			✓		
<i>E. crinita</i>			✓		
<i>E. intestinales</i>	✓	✓	✓		
<i>E. linza</i>	✓	✓	✓	✓	
<i>Monostroma fuscum</i>	✓	✓	✓		
<i>Rhizoclonium riparium</i>	✓	✓	✓	✓	
<i>Spongomorpha coalita</i>	✓	✓	✓	✓	
<i>S. spinescens</i>	✓	✓	✓		✓
<i>Ulothrix</i> sp.		✓			
<i>Ulva</i> spp.	✓	✓	✓	✓	
<i>Ulvaria</i> sp.	✓	✓			
<i>Urospora</i> sp.		✓			
Bacillariophyta					
<i>Pennales</i> spp.	✓	✓	✓	✓	✓
Phaeophyta					
<i>Alaria</i> spp.	✓	✓	✓	✓	
<i>Analipus japonicus</i>	✓	✓		✓	
<i>Costaria costata</i>	✓		✓		✓
<i>Desmarestia aculeata</i>			✓		
<i>D. ligulata</i>			✓	✓	✓
<i>D. viridis</i>				✓	✓

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Ectocarpus parvus</i>			✓		
<i>Fucus disticus</i>	✓	✓			
<i>Giffordia ovata</i>				✓	
<i>Hedophyllum sessile</i>		✓	✓		
<i>Laminaria groenlandica</i>		✓	✓		
<i>L. saccharina</i>			✓		
<i>L. setchellii</i>			✓		
<i>Leathesia difformis</i>	✓	✓	✓		
<i>Nereocystis leutkeana</i>				✓	
<i>Petalonia fascia</i>	✓	✓	✓		
<i>Phaeostrophion irregulare</i>		✓			
<i>Pterogophora californica</i>					✓
<i>Pylaiella tenella</i>				✓	
<i>Ralfsia pacifica</i>	✓	✓			
<i>Saundersella simplex</i>	✓				
<i>Sphacelaria norrissii</i>					✓
<i>S. racemosa</i>		✓			
<i>Syringoderma abyssicola</i>				✓	✓
Rhodophyta					
<i>Acrochaetium</i> sp.	✓	✓	✓	✓	✓
<i>Ahnfeltia plicata</i>			✓		
<i>Amplisiphonia pacifica</i>				✓	
<i>Antithamnion defectum</i>		✓	✓	✓	✓
<i>A. dendroideum</i>	✓	✓	✓		
<i>A. kylinii</i>		✓	✓	✓	✓
<i>Antithamnionella pacifica</i> var. <i>pacifica</i>		✓	✓		
<i>Bonnemaisonia nootkana</i>					✓
<i>Bosziella orbisiana</i>				✓	✓
<i>B. plumosa</i>	✓	✓	✓	✓	
<i>Calliarthron tuberculosum</i>			✓	✓	✓
<i>Callithamnion biserialum</i>				✓	
<i>C. pikeanum</i>	✓	✓	✓	✓	

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Callophyllis edentata</i>			✓		
<i>C. flabellulata</i>					✓
<i>C. firma</i>			✓		
<i>C. haenophylla</i>			✓		✓
<i>Ceramium californicum</i>		✓		✓	✓
<i>C. pacificum</i>		✓			
<i>C. washingtoniense</i>		✓		✓	
<i>Choreocolax polysiphoniae</i>			✓	✓	✓
<i>Clathromorphum parvum</i>			✓	✓	
<i>Corallina vancouveriensis</i>	✓	✓	✓		
<i>Constantinea simplex</i>			✓		
<i>Cruoria profunda</i>				✓	
<i>Cryptonemia obovata</i>			✓		
<i>C. ovalifolia</i>			✓		✓
<i>Cryptosiphonia woodii</i>	✓	✓	✓		
<i>Delesseria decipiens</i>			✓		
<i>Endocladia muricata</i>	✓	✓	✓	✓	
<i>Erythrotrichia parksii</i>			✓		
<i>Farlowia mollis</i>		✓			
<i>Fauchea laciniata</i>				✓	✓
<i>Gigartina papillata</i>	✓	✓	✓		
<i>Gloiopeltis furcata</i>	✓				
<i>Gonimophyllum skottsbergii</i>		✓	✓		
<i>Goniotrichum elegans</i>		✓			
<i>Gracilaria verrucosa</i>		✓			
<i>Grateloupia doryphora</i>			✓		
<i>Griffithsia pacifica</i>					✓
<i>Halosaccion glandiforme</i>	✓	✓	✓	✓	
<i>Halymenia coccinea</i>			✓		
<i>Harveyella mirabilis</i>			✓		
<i>Herposiphonia grandis</i>				✓	
<i>Herposiphonia plumula</i>				✓	✓

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Heterosiphonia</i> sp.			✓		
<i>Hildenbrandia occidentale</i>		✓	✓		
<i>Hollenbergia nigricans</i>				✓	
<i>Hollenbergia subulata</i>				✓	✓
<i>Hymenena flabelligera</i>		✓	✓		
<i>H. multiloba</i>		✓			
<i>H. setchellii</i>		✓			
<i>Iridaea cordata</i>		✓	✓		
<i>I. cornucopiae</i>	✓				
<i>I. heterocarpa</i>	✓	✓			
<i>I. lineare</i>			✓		
<i>Laurencia spectabilis</i>			✓		
<i>Leptofauhea pacifica</i>			✓		
<i>Lithophyllum</i> sp.			✓		
<i>Lithothamnion californicum</i>					✓
<i>L. muricatum</i>		✓			
<i>Melobesia mediocris</i>			✓		
<i>Membranoptera dimorpha</i>			✓		
<i>M. multiramosa</i>			✓		
<i>M. platyphylla</i>			✓		
<i>Mesophyllum conchatum</i>	✓	✓	✓	✓	
<i>M. lamellatum</i>			✓		
<i>Microcladia borealis</i>	✓	✓	✓	✓	
<i>M. coulteri</i>		✓			
<i>Neoptilota californica</i>			✓		
<i>N. hypnoides</i>			✓		
<i>Odonthalia floccosa</i>	✓	✓	✓		
<i>O. kantschatica</i>			✓		
<i>Opuntiella californica</i>					✓
<i>Petrocelis middendorffii</i>	✓	✓	✓		
<i>Peyssonellia pacifica</i>				✓	
<i>Phycodrya</i> sp.			✓		
<i>Platythamnion pectinatum</i>				✓	✓
<i>P. villosum</i>			✓		✓
<i>Pleonosporium vancouverianum</i>				✓	

TONGUE POINT

	+6'	+3'	+0'	-5 m	-10 m
<i>Plocamium coccineum</i>		✓			
<i>P. pacificum</i>			✓		
<i>P. tenue</i>	✓	✓	✓		
<i>Polysiphonia hendryi</i>	✓	✓	✓	✓	
<i>P. pacifica</i>	✓	✓	✓	✓	✓
<i>P. paniculata</i>				✓	✓
<i>P. scopulorum</i> var. <i>villosum</i>				✓	✓
<i>Porphyra pseudolanceolata</i>	✓				
<i>P. smithii</i>	✓				
<i>P. sp.</i>	✓	✓	✓	✓	✓
<i>Pterosiphonia bipinnata</i>	✓	✓	✓	✓	✓
<i>P. dendroidea</i>	✓	✓	✓	✓	✓
<i>P. gardneri</i>	✓			✓	✓
<i>P. gracilis</i>				✓	✓
<i>Prionitis lanceolata</i>		✓			
<i>Ptilota filicina</i>			✓		
<i>Ptilota pectinata</i>			✓		
<i>Ptilothamnionopsis lejolisea</i>			✓	✓	✓
<i>Rhodochorton purpureum</i>			✓		
<i>Rhodoglossum californicum</i>			✓		
<i>Rhodomela larix</i>	✓	✓	✓		
<i>Rhodoptilum plumosum</i>					✓
<i>Rhodymenia californica</i>			✓		
<i>pacific</i>			✓		
<i>R. palmata</i>			✓	✓	✓
<i>R. pertusa</i>				✓	
<i>Rhodymeniocolax botryoidea</i>			✓		
<i>Scagelia occidentale</i>		✓		✓	✓
Spermatophyta					
<i>Phyllospadix scouleri</i>		✓	✓	✓	
Porifera spp.					
<i>Halichondria panicea</i>	✓	✓	✓		
<i>Haliclona permollis</i>		✓			
<i>Ophlitaspongia pennata</i>		✓	✓		

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
Cnidaria					
Anthozoa					
Anthopleura elegantissima		✓	✓		
Balanophyllia elegans				✓	
Tealia sp.		✓			
Hydrozoa spp.		✓	✓	✓	✓
Aglaophenia sp.					✓
Plumularia sp.					✓
Sertularella sp.			✓		
Sertularia sp.			✓		
Platyhelminthes					
Turbellaria spp.	✓	✓	✓	✓	
Nemertea spp.	✓	✓	✓	✓	✓
Emplectonema gracile	✓	✓			
Nematoda spp.	✓	✓	✓	✓	✓
Mollusca					
Amphineura					
Cyanoplax dentiens	✓	✓	✓		✓
Katharina tunicata		✓	✓		
Lepidozona cooperi					✓
L. mertensii					✓
Mopalia ciliata			✓		
M. hindsii	✓		✓		
M. lignosa				✓	
M. muscosa		✓			
M. sp. l.			✓		

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Tonicella lineata</i>		✓	✓	✓	✓
<i>Gastropoda</i>					
<i>Acteocina</i> sp.			✓		
<i>Acmaea mitra</i>			✓	✓	✓
<i>Aeolididae</i> sp.				✓	✓
<i>Alvinia</i> sp.		✓	✓	✓	✓
<i>Amphissa columbiana</i>			✓	✓	✓
<i>Balcis montereyensis</i>				✓	
<i>Barleeia haliotiphila</i>	✓	✓	✓		
<i>Bittium eschrichtii</i>		✓	✓	✓	
<i>Calliostoma ligatum</i>		✓	✓	✓	✓
<i>Calyptraea fastigiata</i>		✓	✓		✓
<i>Cerithiopsis</i> sp.	✓	✓	✓	✓	✓
<i>Ceratostoma foliatum</i>					✓
<i>Collicella digitalis</i>	✓	✓	✓		
<i>C. ochracea</i>					✓
<i>C. pelta</i>	✓	✓	✓		
<i>C. strigatella</i>	✓	✓			
<i>Crepidula aculeata</i>			✓		
<i>C. adunca</i>				✓	
<i>C. fornicata</i>			✓		
<i>Crepidatella lingulata</i>			✓	✓	
<i>Cryptobranchia concentrica</i>				✓	
<i>Cylichna</i> sp.		✓			
<i>Diaphana</i> sp.				✓	
<i>Diodora aspera</i>			✓		✓
<i>Fusitriton oregonensis</i>				✓	✓
<i>Granulina margaritula</i>				✓	✓
<i>Homalopoma baculum</i>		✓	✓		
<i>Lacuna variegata</i>	✓	✓	✓	✓	✓
<i>Lirularia lirulata</i>		✓		✓	✓
<i>L. succincta</i>		✓			

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Littorina scutulata</i>	✓	✓	✓		
<i>L. sitkana</i>	✓	✓	✓	✓	
<i>Margarites pupillus</i>		✓	✓	✓	
<i>Mitrella carinata</i>			✓	✓	
<i>M. gouldi</i>			✓		
<i>M. tuberosa</i>				✓	
<i>Moelleria</i> sp.				✓	
<i>Nassarius mendicus</i>				✓	✓
<i>Notoacmea fenestrata</i>	✓	✓			
<i>N. persona</i>	✓	✓			
<i>N. scutum</i>		✓	✓	✓	
<i>Ocenebra lurida</i>			✓	✓	✓
<i>Odostomia</i> sp.			✓	✓	
<i>Oenopota tabulata</i>				✓	
<i>Onchidella borealis</i>	✓	✓	✓		
<i>Retusa</i> sp.				✓	
<i>Searlesia dira</i>		✓		✓	
<i>Siphonaria thersites</i>	✓	✓			
<i>Thais canaliculata</i>	✓	✓	✓		
<i>T. emarginata</i>	✓	✓	✓		
<i>T. lamellosa</i>		✓	✓		
<i>Tricolia</i> sp.		✓			
<i>Trichotropis cancellata</i>			✓	✓	✓
<i>Velutina laevigata</i>		✓	✓	✓	
<i>Vermetus compactus</i>			✓		
Bivalvia					
<i>Adula californiensis</i>		✓	✓		
<i>Chlamys hastata</i>					✓
<i>Entodesma saxicola</i>				✓	

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Hiatella arctica</i>	✓	✓	✓		✓
<i>Lasaea cistula</i>	✓	✓	✓		
<i>Lyonsia californica</i>			✓		
<i>Modiolus rectus</i>		✓	✓		
<i>Musculus discors</i>		✓			
<i>M. pygmaeus</i>	✓	✓	✓		
<i>Mysella tumida</i>			✓	✓	
<i>Mytilus californianus</i>	✓	✓	✓		
<i>M. edulis</i>	✓	✓	✓		
<i>Netastoma</i> sp.			✓		
<i>Penitella penita</i>			✓		
<i>Protothaca staminea</i>		✓	✓		
<i>Transennella tantilla</i>		✓	✓		
<i>Tresus capax</i>			✓		
<i>Zirfaea pilsburyi</i>			✓		

Annelida

Archiannelida

Polygordiidae

Polygordius sp.

Oligochaeta spp.

Polychaeta

Ampharetidae spp.

Arenicolidae sp.

Branchiomaldane vincenti

Capitellidae

Capitella capitata

Chrysopetalidae

Palaenotus bellis

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
Cirratulidae					
<i>Cirratulus cirratus</i>		✓	✓	✓	
<i>Docecoceria concharum</i>				✓	
<i>Tharyx multifilis</i>			✓	✓	
Eunicidae					
<i>Eunice valens</i>			✓	✓	
Hesionidae					
<i>Micropodarke dubia</i>				✓	
<i>Ophiodromus pugettensis</i>				✓	
Lumbrineridae					
<i>Lumbrineris inflata</i>		✓	✓	✓	
Maldanidae					
<i>Nicomache personata</i>					✓
Nereidae					
<i>Nereis pelagica</i>			✓	✓	
<i>N. vexillosa</i>		✓			
<i>Platynereis bicanaliculata</i>		✓	✓	✓	✓
Onuphidae					
<i>Onuphis stigmatus</i>		✓	✓		
Opheliidae					
<i>Armandia brevis</i>		✓		✓	

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
Orbiniidae					
<i>Naineris dendritica</i>			✓		
<i>N. quadricuspida</i>			✓		
<i>Protoariciella oligobranchia</i>		✓			
<i>Scoloplos</i> spp.		✓	✓		
Phyllodocidae					
<i>Eteone longa</i>			✓		
<i>Eulalia bilineata</i>			✓		
<i>E. nigrimaculata</i>			✓		
<i>E. quadrioculata</i>		✓	✓	✓	✓
<i>E. sanguinea</i>		✓	✓		
<i>E. viridis</i>				✓	
<i>Phyllodoce</i> sp.				✓	✓
Pilargidae					
<i>Sigambra tentaculata</i>				✓	
Polynoidae					
<i>Arctonoe vittata</i>					✓
<i>Halosynda brevisetosa</i>			✓		
<i>Harmothoe imbricata</i>			✓	✓	
Polydoriidae					
<i>Peisidice aspera</i>				✓	
Sabellidae					
<i>Chone ecaudata</i>			✓	✓	
<i>Eudistylia polymorpha</i>					✓
<i>E. vancouveri</i>			✓		
<i>Fabricia oregonica</i>	✓	✓	✓		

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Oriopsis minuta</i>		✓	✓	✓	
<i>Sabella media</i>			✓		
<i>Sabellastarte</i> sp.			✓		
<i>Schizobranchia insignis</i>		✓	✓		
<i>Sabellariidae</i>					
<i>Idanthyrus armatus</i>			✓	✓	✓
<i>Sabellaria cementarium</i>			✓		✓
<i>Serpulidae</i>					
<i>Spirorbis nakamurai</i>					✓
<i>S. spirillum</i>		✓	✓	✓	✓
<i>Sigalionidae</i>					
<i>Pholoe minuta</i>		✓			
<i>Sphaerodoridae</i>					
<i>Sphaerodoropsis minuta</i>			✓	✓	
<i>Spionidae</i>					
<i>Malacoceros glutaeus</i>				✓	
<i>Polydora columbiana</i>		✓	✓		
<i>P. pygidialis</i>			✓		
<i>P. spongicola</i>			✓		
<i>Prionospio steenstrupi</i>				✓	
<i>Spio filicornis</i>				✓	
<i>Syllidae</i>					
<i>Autolytus</i> sp.			✓		
<i>Brania brevipharyngea</i>			✓	✓	

TONGUE POINT

	+6'	+3'	+0'	-5 m	-10 m
<i>Exogone gemmifera</i>		✓	✓	✓	
<i>E. lourei</i>		✓	✓	✓	
<i>Odontosyllis</i> sp.			✓	✓	
<i>Sphaerosyllis brandhorsti</i>			✓		
<i>S. pirifera</i>		✓	✓	✓	
<i>Syllis adamantea</i>	✓	✓			
<i>S. alternata</i>			✓		
<i>S. hyalina</i>		✓			
<i>S. stewarti</i>		✓	✓		
Terebellidae					
<i>Amphitrite cirrata</i>		✓			
<i>Nicolea zostericola</i>		✓	✓	✓	✓
<i>Pista brevibranchiata</i>				✓	
<i>Polycirrus</i> spp.			✓	✓	
Sipunculida					
<i>Phascolosoma agassizii</i>		✓	✓	✓	
Crustacea					
Ostracoda spp.	✓	✓	✓	✓	
Cirripedia					
<i>Balanus cariosus</i>	✓	✓	✓		
<i>B. glandula</i>	✓	✓	✓		
<i>B. nubilus</i>			✓		
<i>Chthamalus dalli</i>	✓	✓	✓		
<i>Pollicipes polymerus</i>	✓	✓			
Amphipoda					
<i>Allorchestes cingilla</i>		✓	✓		
<i>Amphilocheus</i> sp. A				✓	
<i>Ampithoe simulans</i>	✓	✓	✓		
<i>A. sp. C</i>			✓	✓	
<i>A. mea</i>				✓	

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Aoroides columbiae</i>		✓	✓	✓	✓
<i>Atylus levidensis</i>			✓	✓	
<i>Caprella californica</i>				✓	
<i>C. drepanechir</i>			✓		
<i>C. greenlyi</i>		✓	✓		
<i>C. laeviuscula</i>		✓	✓		
<i>C. mendax</i>				✓	
<i>C. natalensis</i>			✓		
<i>C. verrucosa</i>			✓		
<i>Ceradocus spinicaudus</i>					✓
<i>Cercops compactus</i>			✓		
<i>Corephium brevis</i>		✓			
<i>Cymadusa uncinata</i>			✓		
<i>Deutella californica</i>			✓		
<i>Eohaustorius</i> sp.		✓			
<i>Erichthonius brasiliensis</i>				✓	
<i>Gammaropsis</i> sp. B.				✓	
<i>G. thompsoni</i>			✓	✓	
<i>Hyalo anceps</i>	✓	✓	✓	✓	
<i>H. frequens</i>		✓	✓	✓	
<i>H. grandicornis californica</i>	✓	✓			
<i>H. pugettensis</i>	✓	✓			
<i>Ischyrocerus anguipes</i>			✓	✓	✓
<i>Jassa falcata</i>		✓	✓		
<i>Kermystheus ociosa</i>				✓	
<i>Lepidepecreum</i> sp. A.			✓	✓	
<i>L. gurjanovae</i>			✓		
<i>Leucothoe</i> sp. A.			✓		
<i>Maera simile</i>				✓	
<i>Melita californica</i>			✓		
<i>Metacaprella anomala</i>				✓	
<i>M. kennerlyi</i>				✓	✓
<i>Metopa cistella</i>			✓		
<i>Najna</i> cf. <i>consiliorum</i>		✓	✓	✓	

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Oligochinus lighti</i>	✓	✓	✓	✓	
<i>Orchomene</i> sp. A.				✓	
<i>O.</i> sp. B		✓			
<i>Panoploea hedgepethi</i>				✓	
<i>Parallorchestes ochotensis</i>		✓			
<i>Paramoera serrata</i>	✓				
<i>P.</i> sp. E.		✓			
<i>Paraphoxus</i> spp.				✓	
<i>Parapleustes nautilus</i>	✓	✓	✓		
<i>P.</i> pugettensis			✓		
<i>P.</i> sp. B.				✓	
<i>Photis bifurcata</i>			✓	✓	
<i>P.</i> brevipes			✓	✓	
<i>P.</i> sp. A.			✓		
<i>Pleusirus securus</i>					✓
<i>Pleustes depressa</i>				✓	
<i>Podocerus cristatus</i>				✓	
<i>Polycheria osborni</i>			✓		
<i>Pontogeneia</i> sp. D				✓	
<i>P.</i> intermedia			✓		
<i>P.</i> rostrata			✓		
<i>Stenothoides</i> sp.			✓		
<i>Synchelidium rectipinnum</i>		✓		✓	
<i>Tritella pilimana</i>			✓		
<i>Cumacea</i>					
<i>Bathycuma</i> sp.		✓			
<i>Cumella vulgaris</i>			✓	✓	
<i>Diastylopsis</i> sp.				✓	
<i>Lampropidae</i> sp.		✓		✓	
<i>Leptocuma</i> sp.				✓	
<i>Vaunthompsonia</i> sp.			✓		

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
Decapoda					
Callinassidae sp. (juv.)				✓	
Cancer oregonensis			✓	✓	
C. productus			✓		
Cryptolithodes sitchensis			✓		
C. typicus				✓	
Discorsopagurus schmitti				✓	✓
Elassochinus tenuimanus					✓
Fabia subquadrata		✓			
Heptacarpus stimpsoni			✓		
Lebbeus sp. (juv.)				✓	
Mimulus foliatus				✓	
Oedignathus inermis			✓		
Oregonia gracilis				✓	
Pachycheles rudis			✓		
Pagurus beringanus		✓		✓	✓
P. caurinus				✓	✓
P. dalli				✓	
P. h. hirsutiusculus		✓	✓		
P. kennerlyi				✓	✓
Petrolisthes eriomerus				✓	
Phyllolithodes papillosus				✓	
Pinnotheres pugettensis			✓		
Pugettia gracilis		✓	✓	✓	✓
Spirontocaris prionota				✓	
Isopoda					
Bopyridae sp.		✓			
Cirolana harfordi		✓	✓		
Colanthura squamosissima			✓	✓	
Dynamenella dilatata			✓	✓	
D. glabra		✓	✓	✓	
D. shearer	✓	✓	✓		

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
<i>Exosphaeroma amplicauda</i>		✓	✓		
<i>E. media</i>	✓	✓	✓		
<i>E. rhomburum</i>		✓	✓	✓	
<i>Gnorimosphaeroma oregonense</i>	✓	✓	✓	✓	
<i>Ianiropsis analoga</i>			✓	✓	
<i>I. kincaidii</i>	✓	✓	✓	✓	
<i>I. minuta</i>			✓		
<i>I. tridens</i>			✓	✓	
<i>Idotea aculeata</i>			✓		
<i>I. montereyensis</i>			✓		
<i>I. resecta</i>			✓		
<i>I. schmitti</i>			✓		
<i>I. stenops</i>			✓		
<i>I. wosnesenskii</i>	✓	✓	✓		
<i>Jaeropsis dubia</i>			✓	✓	✓
<i>J. lobata</i>		✓	✓	✓	✓
<i>J. setosa</i>			✓		✓
<i>Ligia pallasi</i>	✓				
<i>Limnoria algarum</i>		✓	✓		
<i>Munna chromatoccephala</i>	✓	✓	✓	✓	
<i>M. stephenseni</i>		✓	✓	✓	
<i>M. ubiquita</i>			✓	✓	✓
<i>Paranthura elegans</i>			✓	✓	✓
<i>Synidotea pettiboneae</i>			✓		
<i>S. sp. A</i>			✓		
Tanaidacea					
<i>Anatanaeis normani</i>	✓	✓	✓	✓	
<i>Leptochelia dubia</i>	✓	✓	✓	✓	✓
<i>Pancolus californiensis</i>	✓	✓	✓		
Insecta					
<i>Chironomidae</i> sp.	✓	✓			
<i>Coleoptera</i> sp.	✓	✓	✓		
<i>Collembola</i> sp.			✓		
<i>Dipteran</i> larvae	✓	✓	✓	✓	
<i>Dolichopodidae</i> sp.		✓			
<i>Ephydriidae</i> sp.	✓	✓			

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
Pycnogonida					
<i>Achelia chelata</i>				✓	
<i>A. spinoseta</i>		✓			
<i>Ammothella tuberculata</i>			✓		
<i>Halosoma compactum</i>		✓	✓		
<i>H. viridintestinate</i>		✓	✓		
<i>Phoxichilidium femoratum</i>		✓	✓		
<i>Pycnogonum stearnsi</i>		✓			
Bryozoa spp.					
		✓	✓	✓	✓
<i>Bicrisia</i> sp.			✓		
<i>Cheilostomata</i> sp.			✓		
<i>Crisia</i> sp.			✓		
<i>Filicrisia</i> sp.			✓		
<i>Flustrella</i> sp.			✓		
<i>Heteropora magna</i>					✓
<i>H.</i> sp.					✓
<i>Hippothoa hyalina</i>			✓		
<i>Membranipora</i> sp.			✓		
Echinodermata					
Asteroidea					
<i>Henricia leviacula</i>			✓		
<i>Leptasterias hexactis</i>		✓	✓		
<i>Othasterias koechleri</i>					✓
<i>Pisaster ochraceous</i>				✓	
Echinoidea					
<i>Strongylocentrotus droebachiensis</i>				✓	✓
<i>S. franciscanus</i>				✓	✓
<i>S. purpuratus</i>				✓	

TONGUE POINT

	+6'	+3'	+0'	-5m	-10m
Holothuroidea					
Cucumaria miniata		✓			
C. pseudocurata	✓	✓	✓		
Eupentacta quinquesemita				✓	
Leptosynapta clarki		✓			
Parastichopus californiensis					✓
Thyone bentii				✓	
Ophiuroidea					
Amphipholis squamata			✓	✓	✓
Diamphiodia occidentalis			✓		
Chordata					
Ascidacea sp.		✓	✓	✓	

Table 2. Pillar Point (rock intertidal; fine-medium sand subtidal).
Complete list of all benthic organisms collected from spring 1976
through spring 1977. Checks indicate tide height where organism was
found.

	Tide Ht.				
	+6'	+3'	-0'	-5m	-10m
Chlorophyta					
Bryopsis sp.		✓			
Chaetomorpha sp.		✓	✓		
Cladophoraceae sp.	✓	✓	✓		
Enteromorpha crinita		✓			
E. intestinalis		✓	✓		
E. linza		✓	✓		
Monostroma fuscum	✓	✓	✓		
Rhizoclonium riparium	✓	✓	✓		
Spongomorpha coalita	✓	✓	✓		
S. spinescens	✓	✓			
Ullothrix sp.	✓	✓	✓		
Ulva spp.	✓	✓	✓		
Urospora sp.	✓		✓		
Bacillariophyta					
Pennales spp.	✓	✓	✓	✓	✓
Phaeophyta					
Alaria spp.		✓	✓		
Analipus japonicus	✓	✓	✓		
Cymathere triplicata			✓		✓
Desmarestia aculeata	✓				
D. ligulata				✓	
Ectocarpus silulans		✓			
Egregia menziensis		✓	✓		
Feldmannia simplex			✓		
Fucus distichus	✓	✓	✓		
Giffordia sp.		✓	✓		
Hedophyllum sessile		✓	✓		
Laminaria groenlandica		✓			
L. saccharina			✓		
L. setchellii			✓		
Leathesia difformis			✓		
Nereocystis luetkeana					✓
Petalonia fasciata		✓	✓		
Phaeosiphonia irregularis			✓		

PILLAR POINT

	Tide Ht.				
	+6'	+3'	-0'	-5m	-10m
Phaeophyta (cont.)					
Ralfsiaceae sp.		✓			
Sphacelaria racemosa		✓	✓		
Stictyosiphon totillis			✓		
Rhodophyta					
Acrochaetium sp.		✓	✓		
Ahnfeltia gigartinoides			✓		
A. plicata	✓	✓	✓		
Antithamnion defectum		✓	✓		
A. dendroideum	✓	✓	✓		
A. kyllini		✓			
Antithamnionella glandulifera		✓	✓		
A. pacifica		✓			
Bostella plumosa		✓	✓		
Callithamnion acutum		✓	✓		
C. pikeanum		✓	✓		
Callophyllis firma			✓		
Ceramium eatonianum			✓		
Choreocolax polysiphoniae		✓	✓		
Corallina vancouveriensis		✓	✓		
Cryptosiphonia woodii		✓	✓		
Delesseria decipiens		✓	✓		
Dilsea californica			✓		
Endocladia muricata	✓		✓		
Erythrophyllum delessaroides		✓			
Erythrotrichia parksii		✓			
Gigartina papillata	✓	✓	✓		
Gloiopeltis furcata			✓		
Gracilaria andersonii			✓		
G. sjoestedtii					
Gracilariophila oryzoides			✓		
Gymnogongrus leptophyllus			✓		
G. linearis			✓		

PILLAR POINT

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Rhodophyta (cont.)					
Halosaccion glandiforme	✓	✓	✓		
Halymenia coccinea		✓			
Herposiphonia gracilis			✓		
H. grandis		✓			
H. plumula		✓			
Hildenbrandia prototypus			✓		
Hymenena sp.		✓	✓		
Iridaea cordata		✓	✓		
I. heterocarpa	✓	✓	✓		
Lithothamnion californicum			✓		
Lophosiphonia villum		✓			
Membranoptera dimorpha		✓			
M. multiramosa		✓	✓		
M. platyphylla		✓	✓		
Microphyllum conchatum			✓		
Microcladia borealis		✓	✓		
Nemalion elminthoides			✓		
Neogardhiella baileyi		✓			
Neoptilota asplenioides	✓	✓	✓		
N. californica		✓			
Odonthalia floccosa		✓			
Petrocelis middenforffii	✓	✓	✓		
Phycodrys isabellae		✓			
Pikea californica		✓			
Platythamnion heteromorphum		✓			
P. pectinatum		✓	✓		
P. villosum		✓	✓		
Plocamium coccineum			✓		
P. tenue		✓			
Polysiphonia hendeyi	✓	✓	✓		
P. pacifica	✓	✓	✓		
Porphyra spp.	✓	✓	✓		
Pterosiphonia bipinnata	✓	✓	✓		
P. dendroidea		✓	✓		
Ptilota filicina		✓	✓		
Ptilothamnionopsis lejolisea		✓	✓		

PILLAR POINT

Tide St.

	+6'	+3'	+0'	-5m	-10m
Rhodophyta (cont.)					
<i>Rhodochorton purpureum</i>		✓			
<i>Rhodoglossum californicum</i>			✓		
<i>Rhodomeia larix</i>		✓			
<i>Rhodymenia palmata</i>		✓	✓		
<i>Scagellia occidentale</i>		✓	✓		✓
<i>Smithora naiadum</i>			✓		
<i>Tiffaniella synderae</i>			✓		
Spermatophyta					
<i>Phyllospadix scouleri</i>	✓	✓	✓		
<i>Fostera marina</i>				✓	
Porifera spp.	✓	✓	✓		
<i>Halichondria panicea</i>		✓	✓		
<i>Halicionia permellis</i>		✓	✓		
<i>Ophlitaspongia pennata</i>		✓	✓		
Cnidaria					
Hydrozoa spp.		✓	✓	✓	
<i>Alciatnaria</i> sp.			✓		
<i>Obelia</i> sp.			✓		
<i>Phialidium</i> sp.			✓		
Anthozoa					
<i>Anthopleura elegantissima</i>		✓			
Scyphozoa					
<i>Balielystus auricula</i>			✓		
Platyhelminthes					
<i>Turbellaria</i> spp.	✓	✓		✓	✓
Nemertea spp.	✓	✓	✓	✓	✓
<i>Amphiporus</i> sp.		✓			
<i>Cerebratulus</i> sp.				✓	
Nematoea spp.	✓	✓	✓	✓	✓
Mollusca					
Amphineura					
<i>Chaetopleura gemma</i>		✓			
<i>Cyanoplax dentatus</i>		✓	✓		

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Mollusca (cont.)					
Amphidromia (cont.)					
<i>Cartharina tuniata</i>		x	x		
<i>Topallia ciliata</i>		x	x		
<i>M. hindsi</i>		x	x		
<i>M. lignosa</i>			x		
<i>M. muscosa</i>		x	x		
<i>M. sp. A</i>		x			
<i>Conicella lineata</i>		x	x		
Gastropoda					
<i>Aeolidiadae</i> spp.				x	x
<i>Alvinia</i> sp.				x	
<i>Amphissa columbiana</i>		x	x		x
<i>Archidoris montereyensis</i>			x		
<i>Barleeia halliottiphila</i>		x	x		
<i>Bittium eschrichtii</i>		x	x		
<i>Calyptraea fastigiata</i>			x		x
<i>Cerithiopsis</i> sp.		x	x		
<i>Celliseila digitalis</i>	x	x	x		
<i>C. peita</i>	x	x	x		
<i>C. strigatella</i>	x	x			
<i>Grepidula</i> sp.		x			
<i>Homatopoma baculum</i>			x		
<i>Lacuna variegata</i>		x	x	x	x
<i>Littorina scutulata</i>	x		x		
<i>L. sitkana</i>	x	x	x		
<i>Margarites pupillus</i>			x	x	x
<i>Mitrella carinata</i>			x		
<i>Moelleria</i> sp.		x	x		
<i>Notoacmea persona</i>	x				
<i>N. scutum</i>	x	x	x		
<i>Odostomia</i> sp.				x	x
<i>Onchidella borealis</i>		x			
<i>Regula funebris</i>		x			
<i>Thais canalliculata</i>		x			
<i>T. emarginata</i>	x	x	x		
<i>T. lamellosa</i>		x	x		x
<i>Turbonilla</i> sp.	x	x			
<i>Velutina laevigata</i>			x		
<i>Vermetus compactus</i>			x		

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Bivalvia (cont.)					
Adula calif. rniensis		✓	✓		
Clinocardium nuttallii				✓	
Hiatella arctica		✓	✓		
Lasaea cistula		✓			
Lucinoma tenuisculpta				✓	✓
Macoma nasuta				✓	✓
Musculus pygmaeus		✓	✓		✓
Mya arenaria				✓	✓
Mysella tumida		✓	✓	✓	✓
Mytilus californianus	✓	✓			
M. edulis	✓	✓	✓		
Panopea generosa				✓	
Penitella conradi		✓			
Protothaca staminea		✓	✓		
Solen sicarius		✓		✓	✓
Tellina spp.				✓	✓
Transennella tantilla		✓	✓	✓	✓
Tresus capax		✓		✓	✓
Zirfaea pilsbryi		✓			
Annelida					
Oligochaeta spp.	✓	✓	✓	✓	✓
Polychaeta					
Aphroditidae spp.		✓			
Arbaciidae					
Arabella tricolor					✓
Arenicolidae					
Branchiomaldae vincenti			✓		
Caprellidae					
Capitella capitata		✓	✓	✓	✓
Mediomastus sp.			✓	✓	✓
Neomastus lineatus				✓	✓
N. tenuis					✓
Chaetopterida					
Spiochaetopterus costarum					✓

PI' ER POINT

	+6'	+3'	+0'	-5m	-10m
Polychaeta (cont.)					
Chrysopetalidae					
Paleanotus bellis		✓	✓		
Cirratulidae					
Chaetozone setosa				✓	✓
Cirratulus cirratus		✓	✓		✓
Tharyx multifilis				✓	✓
Dorvilleidae					
Protodervillea gracilis				✓	✓
Fiabelligeridae					
Pherusa plumosa			✓		
Glyceridae					
Glycera americana					✓
Goniadidae					
Glycinde armigera				✓	✓
G. picta			✓		✓
Goniada brunnesc					✓
G. maculata				✓	✓
Hesionidae					
Gyptis brevipalpa				✓	✓
Hesionidae sp. A					✓
Micropodarke dubia				✓	✓
Ophiodromus pugettensis				✓	✓
Lumbrineridae					
Lumbrineris inflata		✓	✓		
L. zonata				✓	✓
Maldanidae					
Euclymene sp.				✓	✓
Nephtyidae					
Nephtys caeca				✓	
N. caecoides				✓	✓
N. californiensis				✓	✓
N. ciliata					✓
Nereidae					
Nereis brandtii				✓	
N. pelagica			✓		
N. vexillosa		✓	✓		
Platynereis bicanaliculata		✓	✓	✓	✓

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Polychaeta (cont.)					
Onuphidae					
<i>Onuphis elegans</i>				✓	✓
<i>O. iridescens</i>					✓
<i>O. stigmatis</i>				✓	✓
Opheliidae					
<i>Armandia brevis</i>			✓		✓
Orbinidae					
<i>Naineris dendritica</i>		✓	✓		
<i>N. uncinata</i>				✓	
<i>Coloplos</i> sp.				✓	✓
Owenidae					
<i>Myriochele oculata</i>					✓
<i>Owenia fusiformis</i>			✓	✓	✓
Paraonidae					
<i>Aricidea</i> sp.					✓
Pectinariidae					
<i>Pectinaria granulata</i>				✓	
Phyllodoceidae					
<i>Eteone longa</i>			✓	✓	✓
<i>E. tuberculata</i>				✓	
<i>Eulalia bilineata</i>				✓	
<i>E. quadrioculata</i>		✓	✓		
<i>E. sanguinea</i>				✓	
<i>E. viridis</i>				✓	
<i>Phyllodoce groenlandica</i>				✓	✓
<i>P. maculata</i>			✓	✓	✓
<i>P. multiserata</i>					✓
Polynoidae					
<i>Halosydna brevisetosa</i>		✓	✓		
<i>Harmothoe imbricata</i>				✓	✓
<i>H. lunulata</i>		✓		✓	✓
Sabellariidae					
<i>Sabellaria cementarium</i>		✓			
Sabellidae					
<i>Chone caudata</i>				✓	✓
<i>Eudistylia vancouveri</i>		✓	✓		
<i>Fabricia oregonica</i>		✓			

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Polychaeta (cont.)					
Sabelliidae (cont.)					
Manayunkia aestuarine		✓			
Oriopsis minuta		✓			
Potamilla myriops				✓	✓
Sabellia media					✓
Schizobranchia insignis		✓	✓		
Scalibregmidae					
Scalibregma inflatum				✓	✓
Serpulidae					
Spirorbis nakamurai		✓			
S. spirillum		✓			
Sigalionidae					
Pholoe minuta		✓		✓	✓
Spionidae					
Malacoceros glutaeus			✓	✓	✓
Polydora columbiana		✓	✓		
P. limicola			✓		
P. socialis				✓	✓
P. sp. A				✓	
Prionospio cirrifer				✓	✓
P. steenstrupi				✓	✓
Pygospio elegans			✓		
Spio filicornis				✓	✓
Spiophanes bombyx				✓	
Syllidae					
Brania brevipharyngea			✓		
Exogone gemmifera		✓	✓	✓	
E. lourei			✓		
Odontosyllis sp.		✓			
Pionosyllis uraga					✓
Sphaerosyllis pirifera		✓			
Streptosyllis latipalpa				✓	
Syllides longocirrata				✓	
Syllis adamantea	✓	✓			
S. hyalina		✓			
S. pulchra		✓			
S. stewarti		✓	✓		

PILLAR POINT

	+6'	+3'	+0'	-5	-10m
Polychaeta (cont.)					
Terebellidae					
Thelepus crispus			✓		
Sipunculida					
Phascolosoma agassizii		✓	✓		
Pycnogonida					
Achelia chelata		✓	✓		
A. gracilipes		✓			
A. nudiuscula		✓	✓		
Halosoma compactum		✓	✓		
H. viridintestinale		✓	✓		
Nymphon pixellae		✓	✓		
N. spinosissima			✓		
Phoxochilidium femoratum		✓	✓		
Pycnogonum rickettsi		✓	✓		
Crustacea					
Ostracoda spp.		✓	✓	✓	✓
Cirripedia					
Balanus cariosus	✓	✓	✓		
B. glandula	✓	✓	✓		
B. nubilis		✓	✓		
B. rostratus alaskensis			✓		
Chthamalus dalli	✓	✓	✓		
Leptostraca					
Nebalia pugettensis				✓	✓
Cumacea					
Cumella vulgaris		✓	✓		
Diastylis sp.				✓	✓
Diastylopsis sp.				✓	✓
Lamproidea sp.				✓	✓
Leptocuma sp.		✓		✓	
Tanaidacea					
Anatanais normani		✓	✓	✓	✓
Leptochelia dubia		✓	✓	✓	✓
Pancolus californiensis	✓	✓	✓		
Pseudotanais oculatus			✓		

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Isopoda					
<i>Aega symmetrica</i>					✓
<i>Cirolana harfordi</i>		✓	✓		
<i>Cryptothir balani</i>	✓				
<i>Dynamenella glabra</i>		✓			
<i>D. shearer</i>	✓	✓	✓		
<i>Edotea sublittoralis</i>				✓	
<i>Exosphaeroma amplicauda</i>	✓	✓	✓		
<i>E. media</i>	✓	✓	✓		
<i>E. rhomburum</i>		✓	✓		
<i>Gnorimosphaeroma oregonense</i>	✓	✓	✓		
<i>Ianiropsis analoga</i>			✓		
<i>I. kincaid</i>		✓	✓		
<i>Idotea aculeata</i>			✓		
<i>I. fewkesi</i>			✓		
<i>I. montereyensis</i>	✓		✓		
<i>I. rufescens</i>			✓		
<i>I. wosnesenskii</i>	✓	✓	✓		
<i>Jaeropsis dubia</i>			✓		
<i>J. setosa</i>			✓		
<i>Limnoria algarum</i>		✓	✓		
<i>Munna chromatoccephala</i>		✓	✓		
<i>M. stephensi</i>		✓	✓		
<i>M. ubiquita</i>			✓		
<i>Munnagonium waldronense</i>					✓
<i>Paranthura elegans</i>				✓	✓
<i>Synidotea bicuspidata</i>			✓	✓	
<i>S. pettiboneae</i>			✓		
Amphipoda					
<i>Acceðomoera vagor</i>			✓		
<i>Allorchestes angustus</i>			✓		
<i>Ampelis agassizi</i>				✓	
<i>A. hancocki</i>					✓
<i>Ampithoe humeralis</i>					✓
<i>A. mea</i>			✓		
<i>A. simulans</i>		✓	✓		
<i>Anisogammarus pugettensis</i>			✓		
<i>Aoroides columbiae</i>			✓	✓	✓
<i>Atylus levidensis</i>			✓	✓	
<i>A. tridens</i>			✓		

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Amphipoda (cont.)					
Calliopiella pratti		✓	✓		
Calliopius sp. A			✓		
Caprella incisa			✓		
C. irregularis			✓		
C. laeviuscula			✓	✓	✓
C. natalensis			✓		
C. pustulata			✓		
Caprella verrucosa			✓		
Cercops compactus		✓	✓		
Corophium brevis		✓	✓		
Deutella californica			✓		
Erichthonius brasiliensis				✓	
Gammaropsis thompsoni				✓	
Hyale anceps		✓			
H. frequens		✓	✓		
Ischyrocerus anguipes		✓	✓	✓	✓
Ischyroceridae sp. 2			✓		
Jassa falcata		✓	✓	✓	
Megaluropus longimerus				✓	
Melita californica			✓		
M. desdichaada				✓	✓
Monoculodes zernovi					✓
Najna consiliorum		✓	✓		
Oligochinus lighti		✓			
Orchomene sp. A				✓	
O. sp. B		✓			
Parallorchestes ochotensis			✓		
Paraphoxus cognatus/simulans					✓
P. nautilus		✓			
P. spinosus			✓		✓
P. variatus					✓
Parapleustes pugettensis			✓	✓	
P. nautilus			✓		
Photis sp. A		✓	✓		
P. bifurcata					✓
Photis brevipes			✓		
Pleusymetes sp. A.					✓
Pontogeneia ivanovi			✓		
P. rostrata			✓	✓	✓

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Amphipoda (cont.)					
Protomedea sp. A				✓	✓
Synchelidium rectipalmum				✓	✓
S. shoemakeri				✓	✓
Tritella pilimana			✓	✓	✓
Westwoodilla caecula				✓	✓
Decapoda					
Callinassidae sp.				✓	✓
Cancer gracilis		✓			✓
C. oregonensis		✓	✓		
Crangon munitella				✓	
Cryptolithodes sitchensis			✓		
Hemigrapsus nudus		✓			
Oedignathus inermis		✓			
Pagurus granosimanus		✓			
P. h. hirsutiusculus		✓	✓		
Pandalus montagui tridens				✓	
Pinnotheridae sp.				✓	✓
Pugettia gracilis		✓	✓	✓	✓
Telmessus cheiragonus		✓			
Insecta					
Coleopteran larvae	✓				
Dipteran larvae	✓	✓	✓		
Phoronida					
Phoronis ijimai				✓	
Bryozoa spp.					
Crisia sp.			✓	✓	
Filicrisia sp.			✓		
Flustrella sp.		✓	✓		
Heteropora magna			✓		
Hippothoa sp.			✓		
Membranipora membranacea			✓		
Microporella sp.			✓		
Echinodermata					
Ophiuroidea spp.		✓			✓
Asteroidea					
Leptasterias hexactis		✓	✓		

PILLAR POINT

	+6'	+3'	+0'	-5m	-10m
Echinodermata (cont.)					
Holothuroidea					
Eupentacta quinquesemita		✓			
Leptosynapta clarki				✓	✓
Chordata - Ascidiacea spp.		✓			

Table 3. North Beach Cobble (cobble over sand). Complete list of all benthic organisms collected from spring 1976 through spring 1977. For subtidal see North Beach Sand, Table 8. Checks indicate tide heights where organism was found.

	+6'	+3'	+0'
Chlorophyta			
Cladophora sp.		✓	✓
Enteromorpha intestinalis			✓
E. linza		✓	✓
Monostroma fuscum			✓
Rhizoclonium sp.			✓
Spongomorpha coalita		✓	✓
S. spinescens			✓
Ulva spp.		✓	✓
Bacillariophyta			
Pennales spp.			✓
Phaeophyta			
Alaria spp.		✓	✓
Analipus japonicus			✓
Desmarestia aculeata		✓	✓
Ectocarpus sp.			✓
Fucus distichus			✓
Hedophyllum sessile			✓
Laminaria saccharina			✓
Leathesia difformis			✓
Nereocystis luetkeana			✓
Petalonia fascia		✓	✓
Phaeostrophion irregulare		✓	✓
Ralfsiaceae spp.			✓
Scytosiphon lomentaria			✓
Sphacelaria norrissii			✓
S. racemosa			✓
Rhodophyta			
Antithamnion defectum			✓
A. dendroideum			✓
Antithamnionella glandulifera			✓
A. pacifica			✓
Bossiella plumosa		✓	✓
Calliarthron tuberculosum			✓
Ceramium pacificum			✓
Choreocolax polysiphoniae		✓	✓
Cryptosiphonia woodii			✓
Crytonemia sp.			✓
Dilsea californica		✓	
Gigartinae spp.		✓	✓

NORTH BEACH COBBLE	+6'	+3'	+0'
<i>Herposiphonia grandis</i>			✓
<i>H. plumula</i>			✓
<i>Hollenbergia nigricans</i>			✓
<i>H. sublata</i>			✓
<i>Hymenena flabelligera</i>		✓	
<i>Iridaea cordata</i>			✓
<i>I. heterocarpa</i>			✓
<i>Laurencia spectabilis</i>			✓
<i>Lomentaria baileyana</i>			✓
<i>Membranoptera weeksiae</i>			✓
<i>Microcladia borealis</i>			✓
<i>Odonthalia floccosa</i>		✓	✓
<i>Petrocelis middendorffii</i>		✓	✓
<i>Pikea californica</i>			✓
<i>Platythamnion villosum</i>			✓
<i>Pleonosporium</i> sp.			✓
<i>Plocamium coccineum</i>		✓	✓
<i>Polyneura latissima</i>			✓
<i>Polysiphonia hendryi</i>		✓	✓
<i>P. pacifica</i>		✓	✓
<i>P. paniculata</i>			✓
<i>Porphyra</i> spp.		✓	✓
<i>Pterochondria woodii</i>			✓
<i>Pterosiphonia bipinnata</i>		✓	✓
<i>P. dendroidea</i>		✓	✓
<i>Rhodomela larix</i>			✓
<i>Rhodoptilum plumosum</i>			✓
<i>Scagelia occidentale</i>		✓	✓
Spermatophyta			
<i>Phyllospadix scouleri</i>			✓
Cnidaria			
Hydrozoa			
spp.			✓
Anthozoa			
<i>Anthopleura elegantissima</i>	✓	✓	✓
Platyhelminthes			
<i>Turbellaria</i> spp.	✓	✓	✓
Nemertea			
spp.	✓	✓	✓

NORTH BEACH CORRE

	+6'	+3'	+0'
Nematoda			
spp.	✓	✓	✓
Mollusca			
Amphineura			
Cyanoplax dentiens		✓	✓
Katharina tunicata		✓	
Lepidozona mertensii			✓
Mopalia lignosa			✓
M. muscosa			✓
Gastropoda			
Alvinia sp.	✓		
Amphissa columbiana			✓
Archidoris montereyensis		✓	
Collisella digitalis	✓	✓	
C. pelta	✓	✓	✓
C. strigatella	✓	✓	✓
Lacuna variegata	✓	✓	✓
Littorina scutulata	✓	✓	✓
L. sitkana	✓	✓	✓
Margarites pupillus			✓
Notoacmaea fenestrata		✓	✓
N. persona	✓	✓	
N. scutum		✓	✓
Onchidella borealis		✓	✓
Searlesia dira		✓	✓
Thais emarginata	✓	✓	✓
T. lamellosa	✓	✓	✓
Bivalvia			
Adula californiensis			✓
Crenella decussata	✓		
Macoma sp.			✓
Musculus pygmaeus			✓
Mya arenaria		✓	✓
Mysella tumida	✓	✓	✓
Mytilus edulis		✓	✓
Protothaca staminea		✓	✓
Solen sicarius			✓
Transennella tantilla		✓	✓
Venerupis japonica			✓
Oligochaeta	✓	✓	✓
spp.			

NORTH BEACH COBBLE

	+6'	+3'	+0'
Polychaeta			
Arenicolidae			
Abarenicola sp. (juv)			✓
Capitellidae			
Capitella capitata	✓	✓	✓
Decamastus gracilis			✓
Mediomastus sp.	✓		✓
Notomastus tenuis			✓
Cirratulidae			
Cirratulus cirratus			✓
Tharyx multifilis			✓
Dorvilleidae			
Protodorvillea gracilis		✓	✓
Eunicidae			
Eunice valens			✓
Glyceridae			
Hemipodus borealis		✓	✓
Lumbrineridae			
Lumbrineris inflata			✓
Nephtyidae			
Nephtys caeca			✓
Nereidae			
Nereis vexillosa	✓	✓	✓
Platynereis bicanaliculata	✓	✓	✓
Onuphidae			
Onuphis stigmatis			✓
Opheliidae			
Armandia brevis			✓
Ophelia limacina			✓
Orbinidae			
Scoloplos spp.			✓
Paraonidae			
Paraonella platybranchia		✓	

NORTH BEACH COBBLE

	+6'	+3'	+0'
Phyllodocidae			
<i>Eteone longa</i>		✓	✓
<i>Eulalia quadrioculata</i>		✓	✓
<i>E. sanguinea</i>			✓
<i>Hesionura coineaui difficilis</i>			✓
<i>Phyllodoce maculata</i>			✓
Pisicionidae			
<i>Pisione</i> sp.	✓		
Polynoidae			
<i>Halosydna brevisetosa</i>			✓
<i>Harmothoe imbricata</i>			✓
Sabellidae			
<i>Fabricia oregonica</i>			✓
<i>Schizobranchia insignis</i>			✓
Spionidae			
<i>Malacocerus glutaeus</i>			✓
<i>Polydora columbiana</i>		✓	✓
<i>P. proboscidea</i>		✓	✓
<i>P. sp. A</i>		✓	
<i>Prionospio steenstrupi</i>			✓
<i>Pygospio elegans</i>		✓	✓
<i>Spio cirrifer</i>			✓
<i>S. filicornis</i>		✓	✓
<i>Spiophanes bombyx</i>			✓
Syllidae			
<i>Exogone gemmifera</i>			✓
<i>E. lourei</i>			✓
<i>Syllis adamantea</i>	✓	✓	
<i>S. hyalina</i>		✓	
Terebellidae			
<i>Eupolyornia heterobranchia</i>			✓
Crustacea			
Ostracoda			
spp.		✓	✓
Cirripedia			
<i>Balanus cariosus</i>	✓	✓	✓
<i>B. glandula</i>	✓	✓	✓
<i>Chthamalus dalli</i>	✓	✓	

NORTH BEACH COBBLE

	+6'	+3'	+0'
Mysidacea			
<i>Archaeomysis grebnitzkii</i>			✓
Cumacea			
<i>Cumella vulgaris</i>			✓
<i>Lampropidae</i> spp.			✓
Tanaidacea			
<i>Anatanaïs normani</i>			✓
<i>Leptochelia dubia</i>			✓
<i>Pancolus californiensis</i>		✓	✓
Isopoda			
<i>Dynamenella sheareri</i>		✓	✓
<i>Exosphaeroma arpicauda</i>	✓	✓	✓
<i>E. media</i>	✓	✓	✓
<i>E. onctoncum</i>			✓
<i>Gnорinosphaeroma oregonense</i>	✓	✓	✓
<i>Idotea aculeata</i>			✓
<i>I. montereyensis</i>			✓
<i>I. resecata</i>			✓
<i>I. vosnesenskii</i>		✓	✓
<i>Jatropsis lobata</i>			✓
<i>Munna chromatoccephala</i>			✓
<i>M. stephenseni</i>			✓
Amphipoda			
<i>Accedomoera</i> sp.			✓
<i>Ampithoe simulans</i>			✓
<i>Anonyx</i> sp. B			✓
<i>Atylus tridens</i>			✓
<i>Calliopielia pratti</i>	✓		✓
<i>Caprella incisa</i>		✓	
<i>Corophium brevis</i>		✓	
<i>Eohauatorius washingtonianus</i>			✓
<i>Guernea</i> sp. A			✓
<i>Hyale frequens</i>			✓
<i>Ischyrocerus anguipes</i>			✓
<i>Megaluropus longimerus</i>			✓
<i>Melita californica</i>			✓
<i>Oligochinus lighti</i>			✓
<i>Orchestia</i> sp.	✓		
<i>Parallorchestes ochotensis</i>			✓

NORTH BEACH COBBLE

	+6'	+3'	+0'
<i>Paramoera mohri</i>	✓	✓	
<i>Paraphoxus spinosus</i>		✓	✓
<i>Parapleustes pugettensis</i>			✓
<i>Photis brevipes</i>			✓
<i>Pontogeneia cf. ivanovi</i>			✓
<i>P. sp. D</i>			✓
<i>Synchelidium shoemakeri</i>			✓
Decapoda			
<i>Cancer gracilis</i>			✓
<i>C. oregonensis</i>			✓
<i>Crangon munitella</i>			✓
<i>C. nigricauda</i>			✓
<i>Hemigrapsus nudus</i>		✓	
<i>H. oregonensis</i>		✓	
<i>Pagurus granosimanus</i>			✓
<i>P. hirsutiusculus</i>		✓	✓
<i>Pugettia gracilis</i>			✓
Insecta			
Dipteran larvae		✓	✓
Bryozoa			
spp.		✓	✓
Enchinodermata			
Holothuroidea			
<i>Eupentacta quinquesemita</i>			✓

Table 4. Morse Creek (cobble over sand-gravel intertidal; gravel-cobble subtidal). Complete list of all benthic organisms collected from spring 1976 through winter 1978. Checks indicate tide heights where organism was found.

	+6'	+3'	+0'	-5m	-10m
Chlorophyta					
<i>Elidingia minima</i>		✓	✓		
<i>Cladophora</i> sp.		✓	✓		
<i>Derbesia marina</i>					✓
<i>Enteromorpha flexuosa</i>			✓		
<i>E. intestinalis</i>		✓	✓		
<i>E. linza</i>		✓	✓		
<i>Halicystis ovalis</i>					✓
<i>Monostroma</i> sp.		✓	✓		
<i>Rhizoclonium</i> sp.			✓		
<i>Spongomorpha coalita</i>		✓	✓		
<i>S. spinescens</i>		✓	✓		
<i>Ulothrix</i> sp.		✓	✓		
<i>Ulva</i> spp.		✓	✓		
<i>Urospora</i> sp.		✓	✓		
Bacillariophyta					
<i>Pennales</i> spp.		✓	✓	✓	✓
Phaeophyta					
<i>Alaria</i> spp.		✓	✓		
<i>Anelopus japonicus</i>		✓			
<i>Desmarestia aculeata</i>		✓	✓		
<i>D. ligulata</i>		✓		✓	✓
<i>D. viridis</i>				✓	✓
<i>Ectocarpus simulans</i>			✓		
<i>Fucus distichus</i>		✓	✓		
<i>Hedophyllum sessile</i>			✓		
<i>Laminaria groenlandica</i>			✓		
<i>L. saccharina</i>			✓		
<i>L. setchellii</i>			✓		
<i>Nereocystis luetkeana</i>				✓	
<i>Petalonia fascia</i>		✓	✓		
<i>Ralfsia pacifica</i>					✓
<i>Sphacelaria racemosa</i>			✓		
<i>S. subfusca</i>			✓		
<i>Stictyosiphon tortilis</i>					✓
<i>Syringoderma abyssicola</i>					✓
Rhodophyta					
<i>Acrochaetium</i> sp.		✓	✓	✓	✓
<i>Ahnfeltia plicata</i>		✓	✓	✓	✓
<i>Antithamnion defectum</i>					✓
<i>A. dendroideum</i>			✓		

MORSE CREEK

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Rhodophyta (cont.)					
<i>Bangia fuscopurpureum</i>		✓			
<i>Bossiella plumosa</i>			✓		
<i>Botryoglossum farlowianum</i>					✓
<i>Callithamnion pikeanum</i>			✓		
<i>Callophyllis flabellulata</i>					✓
<i>Ceramium pacificum</i>			✓		
<i>Choreocolax polysiphoniae</i>			✓		
<i>Corallina vancouveriensis</i>			✓		
<i>Cryptosiphonia woodii</i>		✓	✓		
<i>Delesseria decipiens</i>			✓		
<i>Endocladia muricata</i>		✓	✓		
<i>Erythrotrichia parksii</i>			✓		
<i>Gigartina papillata</i> complex		✓	✓		
<i>Gonimophyllum skottsbergii</i>					✓
<i>Gracilaria verrucosa</i>					✓
<i>Gymnogongrus leptophyllis</i>		✓			
<i>Halosaccion glandiforme</i>			✓		✓
<i>Halymenia coccinea</i>				✓	
<i>Hildenbrandia</i> sp.					✓
<i>Hymenena</i> sp.			✓		✓
<i>Iridaea cordata</i>		✓	✓		
<i>I. heterocarpa</i>			✓		
<i>Leptofaucheia pacifica</i>					✓
<i>Membranoptera</i> sp.			✓		
<i>Microcladia borealis</i>		✓	✓		
<i>Odonthalia floccosa</i>		✓	✓		
<i>O. washingtoniensis</i>					✓
<i>Petrocelis middendorffii</i>			✓		
<i>Peyssonelia pacifica</i>				✓	✓
<i>Platythamnion heteromorphum</i>					✓
<i>Pleonosporium</i> sp.			✓		
<i>Plocamium coccineum</i>					✓
<i>Polyneura latissima</i>			✓		✓
<i>Polysiphonia hendryi</i>		✓	✓		
<i>P. pacifica</i>		✓	✓		✓
<i>Porphyra miniata</i>			✓		
<i>Prionitis lyallii</i>			✓		
<i>Pterosiphonia bipinnata</i>			✓		✓
<i>P. dendroidea</i>				✓	✓

MORSE CREEK

	+6'	+3'	Tide Ht. +0'	-5m	-10m
Rhodophyta (cont.)					
<i>Ptilota filicina</i>			✓		
<i>P. pectinata</i>					✓
<i>Rhodochorton purpureum</i>		✓	✓		
<i>Rhodomela larix</i>		✓	✓		
<i>Rhodymenia californica</i>			✓		
<i>R. pacifica</i>			✓		
<i>R. palmata</i>			✓		
<i>R. pertusa</i>			✓		
<i>Sarcodiotheca furcata</i>			✓		
<i>Scagelia occidentale</i>				✓	✓
Porifera spp.					✓
<i>Halichondria panicea</i>			✓		
<i>Haliclona permollis</i>			✓		
<i>Ophlitaspongia pennata</i>			✓		
Cnidaria					
Hydrozoa spp.			✓		✓
<i>Tubularia</i> sp.			✓		✓
Anthozoa					
<i>Anthopleura elegantissima</i>		✓	✓		
<i>Halcampa</i> sp.					✓
<i>Tealia</i> sp.				✓	
Platyhelminthes					
<i>Turbellaria</i> spp.		✓	✓		
Nemertea spp.	✓	✓	✓	✓	✓
<i>Emplectonema gracile</i>		✓	✓		
Nematoda spp.	✓	✓	✓	✓	✓
Mollusca					
Amphineura					
<i>Cyanoplax dentiens</i>		✓	✓		
<i>Katharina tunicata</i>			✓		
<i>Mopalia</i> sp. B					✓
<i>Tonicella lineata</i>					✓

MORSE CREEK

	+6'	+3'	Tide Ht. +0'	-5m	-10m
Polychaeta (cont.)					
Goniadidae					
<i>Glycinde picta</i>		✓	✓		✓
Hesionidae					
<i>Micropodarke dubia</i>			✓		✓
<i>Ophiodromus pugettensis</i>					✓
Lumbrineridae					
<i>Lumbrineris inflata</i>			✓		✓
Magelonidae					
<i>Magelona pitelkai</i>					✓
Maldanidae					
<i>Axiiothella rubrocincta</i>					
<i>Euclymene</i> sp.				✓	✓
<i>Nicomache personata</i>					✓
<i>N. lubricalis</i>					✓
Nephtyidae					
<i>Nephtys calca</i>					✓
<i>N. californiensis</i>		✓			
Nereidae					
<i>Micronereis nanaimoensis</i>					✓
<i>Nereis pelagica</i>					✓
<i>N. vexillosa</i>	✓	✓	✓		
<i>Platynereis bicanaliculata</i>		✓	✓	✓	✓
Opheliidae					
<i>Armandia brevis</i>		✓	✓	✓	✓
Orbinidae					
<i>Scoloplos</i> sp.		✓		✓	✓
Oweniidae					
<i>Owenia fusiformis</i>		✓			✓
Paraonidae					
<i>Aricidea</i> sp.					✓
<i>Paraonella platybranchia</i>		✓			
Pectinariidae					
<i>Pectinaria granulata</i>					✓
Phyllodocidae					
<i>Eteone longa</i>		✓	✓		✓
<i>E. tuberculata</i>			✓		

MORSE CREEK

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Gastropoda					
<i>Acmea mitra</i>			✓		✓
<i>Aeolididae</i> sp.			✓		✓
<i>Alvinia</i> sp.				✓	
<i>Amphissa columbiana</i>			✓	✓	✓
<i>Archidoris montereyensis</i>		✓	✓		
<i>Barleeia haliotiphila</i>			✓		
<i>Calliostoma ligatum</i>			✓		✓
<i>Calyptraea fastigiata</i>					✓
<i>Collisella digitalis</i>		✓			
<i>C. ochracea</i>					✓
<i>C. pelta</i>		✓	✓		
<i>C. strigatella</i>	✓	✓			
<i>Crepidula</i> sp.				✓	✓
<i>Lacuna variegata</i>	✓	✓	✓	✓	✓
<i>Lirularia lirulata</i>				✓	
<i>Littorina scutulata</i>	✓	✓			
<i>L. sitkana</i>	✓	✓	✓		
<i>Margarites pupillus</i>		✓		✓	✓
<i>Nassarius mendicus</i>			✓	✓	
<i>Natica clausa</i>					✓
<i>Notoacmea fenestrata</i>		✓	✓		
<i>N. persona</i>	✓	✓	✓		
<i>N. scutum</i>		✓	✓		
<i>Ocenebra lurida</i>		✓	✓		
<i>Onchidella borealis</i>		✓	✓		
<i>Searlesia dira</i>			✓		
<i>Thais emarginata</i>		✓	✓		
<i>T. lamellosa</i>		✓	✓		
<i>Trichotropis cancellata</i>			✓		✓
Bivalvia					
<i>Adula californiensis</i>		✓	✓		
<i>Clinocardium nuttallii</i>		✓	✓		✓
<i>Grenella decussata</i>					✓
<i>Cryptomya californica</i>			✓		
<i>Hiatella arctica</i>		✓	✓		
<i>Humularia kennerleyi</i>					✓
<i>Lucinoma tenuisculpta</i>				✓	✓
<i>Lyonsia californica</i>		✓			
<i>Macoma inquinata</i>		✓	✓		
<i>M. nasuta</i>			✓		
<i>M. secta</i>					✓

MORSE CREEK

Bivalvia (Cont.)	+6'	+3'	Tide Ht. +0'	-5m	-10m
<i>Modiolus rectus</i>					✓
<i>Musculus discors</i>					✓
<i>M. pygmaeus</i>		✓	✓		
<i>Mya arenaria</i>			✓	✓	✓
<i>Mysella tumida</i>	✓	✓	✓	✓	✓
<i>Mytilus californianus</i>		✓			
<i>M. edulis</i>	✓	✓	✓		
<i>Protothaca staminea</i>	✓	✓	✓	✓	✓
<i>Tellina nukuloides</i>			✓		
<i>Transemella tantilla</i>			✓		✓
<i>Tresus capax</i>		✓	✓		
Annelida					
<i>Oligochaeta</i> spp.	✓	✓	✓	✓	✓
Polychaeta					
Ampharetidae					
<i>Ampharete arctica</i>		✓	✓		
<i>Asabellides littoralis</i>			✓		✓
Arenicolidae					
<i>Abarenicola pacifica</i>		✓			
<i>Branchiomaldane vincenti</i>					✓
Capitellidae					
<i>Capitella capitata</i>	✓	✓	✓	✓	✓
<i>Mediomastus</i> sp.		✓	✓	✓	✓
<i>Notomastus tenuis</i>		✓	✓		✓
Chrysopetalidae					
<i>Paleonotus bellis</i>			✓		
Cirratulidae					
<i>Chaetozone setosa</i>					✓
<i>Cirratulus cirratus</i>		✓	✓	✓	✓
<i>Tharyx multifilis</i>		✓			✓
Dorvilleidae					
<i>Protodorvillea gracilis</i>		✓	✓	✓	✓
Flabelligeridae					
<i>Pherusa plumosa</i>					✓
Glyceridae					
<i>Glycera americana</i>					✓
<i>Hemipodus borealis</i>		✓	✓		✓

MORSE CREEK

	+6'	+3'	Tide Ht. +0'	-5m	-10m
Phyllodocidae (cont.)					
Eulalia quadrioculata			✓		
E. sanguinea					✓
E. viridis		✓			✓
Hesionura coineaui difficilis					✓
Phyllodoce maculata			✓	✓	✓
P. madeirensis					✓
Polynoidae					
Harmothoe imbricata			✓		✓
Sabellariidae					
Idanthyrus armatus					✓
Sabellaria cementarium			✓	✓	✓
Sabellidae					
Chone ecaudata			✓		✓
Fabricia oregonica		✓	✓		
Jasmineira sp.					✓
Manayunkia aestuarine			✓		
Schizobranchia insignis			✓		✓
Sabella sp.			✓		
Sabellastarte sp.			✓		
Scalibregmidae					
Scalibregma inflatum					✓
Serpulidae					
Spirorbis moerchi					✓
S. nakamurai					✓
S. spirillum					✓
Sigalionidae					
Pholoe minuta					✓
Sphaerodoridae					
Sphaerodorum papillifera					✓
Spionidae					
Malacoceros glutaeus		✓	✓		
Polydora armata					✓
P. columbiana	✓	✓	✓		✓
P. commensalis			✓		
P. proboscidea	✓		✓		
P. socialis			✓	✓	✓
P. spongicola					✓
P. sp. A	✓				✓
Prionospio cirrifera				✓	✓
P. steenstrupi		✓		✓	✓

MORSE CREEK

	+6'	+3'	Tide Ht. +0'	-5m	-10m
Spionidae (cont.)					
Pygospio elegans		✓	✓		✓
Scolecopsis sp. C		✓	✓		
S. squamata			✓		
Spio filicornis		✓	✓		
Spiophanes bombyx					✓
Syllidae					
Autolytus sp.				✓	✓
Exogone gemmifera			✓		✓
E. lourei			✓		✓
Eusyllis sp.				✓	
Spaerosyllis pirifera			✓		
Syllis adamantea		✓			
S. heterochaeta				✓	
S. longocirrata					✓
Trypanosyllis gemmipara				✓	✓
Terebellidae spp.			✓		✓
Archannelida					
Polygordidae					
Polygordius sp.					✓
Saccocirridae					
Saccocirrus sp.		✓	✓		
Hirudinea sp.			✓		
Sipuncula					
Golfingia vulgaris					✓
Phascolosoma agassizii			✓		
Pycnogonida					
Halosoma compactum			✓		
H. viridintestinales			✓		
Nymphon grossipes			✓		
Phoxichilidium femoratum		✓	✓		
Crustacea					
Ostracoda spp.		✓	✓		✓
Cirripedia					
Balanus cariosus	✓	✓	✓		
B. glandula	✓	✓	✓		
B. nubilis			✓		
Chthamalus dalli	✓	✓			

MORSE CREEK

	+6'	+3'	Tide Ht. +0'	-5m	-10m
Crustacea (cont.)					
Leptostraca					
<i>Nebalia pugetensis</i>			✓	✓	
Cumacea					
<i>Cumella vulgaris</i>		✓	✓	✓	✓
<i>Diastylis</i> sp.		✓			✓
<i>Lampropidae</i> spp.			✓		
<i>Leptocuma</i> sp.					✓
Tanaidacea					
<i>Anatanais normani</i>		✓	✓		
<i>Leptochelia dubia</i>	✓	✓	✓	✓	✓
<i>Pancolus californiensis</i>			✓		✓
Isopoda					
<i>Caccianiropsis psammophila</i>			✓		
<i>Dynamenella sheareri</i>			✓		
<i>Exosphaeroma amplicauda</i>			✓		
<i>E. media</i>		✓	✓	✓	
<i>E. rhomburum</i>			✓		
<i>Gnorimosphaeroma oregonense</i>	✓	✓	✓		
<i>Ianiropsis analoga</i>			✓		✓
<i>I. kincaidii</i>		✓	✓		
<i>I. magnocula</i>					✓
<i>Idotea aculeata</i>			✓		
<i>I. montereyensis</i>			✓		
<i>I. schmitti</i>		✓	✓		
<i>I. wosnesenskii</i>		✓	✓		
<i>Jaeropsis dubia</i>					✓
<i>J. lobata</i>			✓		
<i>Limnoriid algarum</i>		✓	✓		
<i>Munna chromatoccephala</i>			✓		
<i>M. stephensi</i>				✓	
<i>Paranthura elegans</i>			✓		✓
Amphipoda					
<i>Accedomoera vagor</i>			✓		✓
<i>A. sp. C</i>			✓		
<i>Allorchestes angustus</i>	✓	✓	✓		
<i>Ampelisca cristata</i>					✓
<i>A. pugetica</i>				✓	✓
<i>Ampithoe lacertosa</i>			✓		
<i>A. mea</i>			✓		
<i>A. simulans</i>		✓	✓		
<i>Anonyx laticoxae</i>					✓
<i>Aoroides columbiae</i>		✓	✓	✓	✓
<i>Atylus levidensis</i>				✓	✓

MORSE CREEK

	+6'	+3'	Tide 'ft. +0'	-5m	-10m
Amphipoda (cont.)					
Caprella laeviuscula					✓
C. mendax					✓
C. natalensis			✓		
C. striata					✓
Cercops compactus			✓		
Corophium brevis	✓	✓	✓		
C. crassicorne					✓
Eohaustorius washingtonianus			✓		
Gammaropsis thompsoni					✓
Guernea sp. A					✓
Hyale frequens		✓	✓		
Ischyrocerus sp. 2					✓
I. anguipes		✓	✓	✓	✓
Jassa falcata			✓		
Kermystheus ociosa				✓	✓
Maera simile				✓	✓
Melita californica			✓		
M. dentata				✓	✓
M. desdichada			✓	✓	✓
Najna consiliorum				✓	
Orchestia sp.	✓	✓			
Orchestoidea pugettensis	✓				
Parallorchestes ochotensis			✓		
Paramoera columbiana	✓		✓		
P. "pugetica" n. sp.		✓			
P. serrata	✓				
Paraphoxus cognatus					✓
P. spinosus / obtusidens		✓	✓		
P. spinosus Type B		✓			
Parapleustes pugettensis			✓		
Photis brevipes			✓		
P. sp. D			✓	✓	✓
Pleusirus secorrus				✓	✓
Pontogeneia cf. ivanovi		✓	✓		
Stenothoides beringiensis					✓
Synchelidium rectipalium					✓
Westwoodilla caecula					✓
Decapoda					
Callinassidae sp. (juv.)			✓	✓	
Cancer magister		✓			
C. oregonensis		✓	✓		✓
C. productus			✓		✓

MORSE CREEK

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Decapoda (cont.)					
Crangon dalli				✓	
C. munitella					✓
Cryptolithodes sp. (juv.)		✓			
Discorsopagurus schmitti					✓
Eulalius sp. (juv.)			✓		✓
Hemigrapsus nudus		✓	✓		
H. oregonensis		✓			
Heptacarpus sp. (juv.)			✓		
Hippolyte clarki			✓		
Oedignathus inermis			✓		
Pagurus h. hirsutiusculus		✓	✓		
P. beringanus					✓
Pinnixa faba			✓		
Pugettia gracilis			✓	✓	✓
P. productus			✓		
Telmessus cheiragonus			✓		
Upogebia pugettensis			✓		
Insecta					
Dipteran larvae	✓	✓	✓		
Phoronida					
Phoronopsis harmeri		✓			
Bryozoa spp.			✓		✓
Flustrella sp.			✓		
Hippothoa hyalina			✓		
Membranipora sp.			✓		
Echinodermata					
Ophiuroidea					
Amphipholis squamata					✓
Holothuroidea					
Cucumaria sp.			✓		
Eupentacta pseudoquinquesemita			✓		
Leptosynapta clarki			✓		✓
Mopalia intermedia					✓

Table 5. Beckett Point (protected sand-gravel intertidal; sand subtidal).
Complete list of all benthic organisms collected from spring 1976 through
winter 1978. Checks indicate tide heights where organism was found.

	+6'	+3'	+0'	-5m	-10m
Chlorophyta					
Enteromorpha					
compressa		✓			
E. intestinalis		✓	✓		
E. linza		✓	✓		
Ulva taeniata		✓			
Urospora spp.		✓	✓		
Bacillariophyta					
Pennales spp.		✓			
Phaeophyta					
Feldmania		✓			
spp.					
Rhodophyta					
Ceramium					
nibrum				✓	
C. pacificum		✓	✓		
Polysiphonia pacifica		✓			
Polysiphonia paniculata		✓			
Porphyra sp.			✓		
Spermatophyta					
Zostera marina			✓		
Cnidaria					
Anthozoa					
Actinaria spp.			✓	✓	✓
Platyhelminthes					
Turbellaria spp.		✓	✓	✓	✓
Nemertea					
spp.	✓	✓	✓	✓	✓
Nematoda					
spp.	✓	✓	✓	✓	✓
Mollusca					
Gastropoda					
Aeolididae					
sp. (juv.)				✓	✓
Aglaia					
diomedea		✓	✓		✓
Alvinia spp.	✓	✓	✓	✓	✓
Amphissa					
columbiana			✓	✓	
Barleeia					
haliotiphila			✓		
Cerithiopsis sp.				✓	

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
Collisella					
ocrachea				✓	
C. pelta	✓	✓			
C. strigatella	✓	✓			
Crepidula adunca					✓
Crepipetella lingulata				✓	
Cylichna sp.			✓	✓	✓
Fartulum occidentale	✓	✓	✓		
Haminoea vesicula	✓	✓	✓		✓
Lacuna variegata	✓	✓	✓	✓	✓
Lirularia lirulata				✓	✓
Littorina scutulata	✓	✓			
L. sitkana	✓	✓	✓		
Margarites pupillus		✓		✓	
Mitrella carinata				✓	
M. tuberosa			✓	✓	✓
Nassarius mendicus			✓		✓
Natica clausa					✓
Notoacmea persona	✓				
N. scutum		✓			
Ocenebra lurida		✓	✓		
Odostomia sp.		✓	✓		✓
Polinices lewisii			✓		
Solarisella obscura					✓
Thais spp.		✓			
Turbonilla sp.				✓	✓
Bivalvia					
Acila castrensis					✓
Adula californiensis		✓	✓		
Clinocardium nuttallii	✓	✓	✓	✓	✓
Grenella decussata		✓	✓	✓	✓
Cryptomya californica				✓	
Hiatella arctica			✓		
Lucinoma tenuisculpta		✓	✓	✓	✓
Lyonsia californica			✓	✓	
Macoma inquinata			✓		✓
M. nasuta			✓		✓
M. secta			✓	✓	
Modiolus sp.				✓	
Musculus pygmaeus			✓		
Mya arenaria			✓	✓	✓
Mysella tumida	✓	✓	✓	✓	✓
Mytilus edulis	✓	✓	✓		
Nucula tenuis					✓

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
<i>Panope generosa</i>			✓		
<i>Pododesmus cepio</i>				✓	
<i>Protothaca staminea</i>	✓	✓	✓		
<i>Psephidia lordi</i>				✓	✓
<i>Saxidomus giganteus</i>		✓			
<i>Tellina carpenteri</i>			✓		
<i>T. modesta</i>			✓		
<i>Transennella tantilla</i>	✓	✓	✓		
<i>Tresus capax</i>		✓	✓		
<i>T. nuttallii</i>		✓			
Annelida					
<i>Oligochaeta</i>					
spp.	✓	✓	✓	✓	✓
<i>Polychaeta</i>					
Ampharetidae					
Amphrete					
arctica				✓	
Arenicolidae					
sp. (juv.)	✓		✓		
Capitellidae					
Capitella					
capitata		✓	✓		✓
Mediomastus sp.		✓	✓	✓	✓
Notomastus lineatus			✓		✓
N. tenuis		✓	✓		✓
Chaetopteridae					
Mesochaetopterus taylori			✓	✓	✓
Phyllochaetopterus prolifica					✓
Spiochaetopterus costarum		✓	✓	✓	✓
Chrysopetalidae					
Paleonotus bellis		✓			
Cirratulidae					
Chaetozone setosus			✓		
Cirratulus cirratus		✓	✓		
Tharyx multifilis		✓	✓		
Dorvilleidae					
Dovillea annulata		✓			
D. rudolphi			✓		
Protodorvillea gracilis		✓	✓	✓	✓
Eunicoidea					
sp.			✓		
Glyceridae					
Glycera americana			✓		
G. capitata					✓
G. tessellata			✓		
Hemipodus borealis	✓	✓	✓	✓	✓

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
Goniadidae					
<i>Glycinde armigera</i>			✓		
<i>G. picta</i>			✓	✓	✓
Hesionidae					
<i>Gyptis brevipalpa</i>			✓		✓
<i>Hesionid</i> sp. A		✓	✓		
<i>Micropodarke dubia</i>		✓	✓	✓	✓
<i>Ophiodromus pugettensis</i>		✓	✓	✓	✓
Lumbrineridae					
<i>Lumbrineris zonata</i>					✓
Magelonidae					
<i>Magelona japonica</i>			✓	✓	
<i>M. pitelkat</i>			✓	✓	✓
Maldanidae					
<i>Axiiothella rubrocincta</i>			✓	✓	✓
<i>Euclymene delineata</i>			✓		
<i>Maldane glebifex</i>			✓		
<i>Nichomache lumbricalis</i>					✓
<i>N. personata</i>					✓
Nephytidae					
<i>Nephtys californiensis</i>			✓	✓	✓
<i>N. caeca</i>			✓		
<i>N. caecoides</i>			✓		
<i>N. ferringinea</i>				✓	✓
Nereidae					
<i>Nereis pelagica</i>					✓
<i>N. procera</i>				✓	✓
<i>N. vexillosa</i>	✓				
<i>Platynereis bicanaliculata</i>	✓	✓	✓	✓	✓
Onuphidae					
<i>Diopatra ornata</i>			✓	✓	✓
<i>Onuphis stigmatus</i>		✓			
Opheliidae					
<i>Armandia brevis</i>		✓	✓	✓	✓
<i>Ophelia limacina</i>		✓			
Orbiniidae					
<i>Scoloplos</i> sp.			✓	✓	✓
Oweniidae					
<i>Owenia fusiformis</i>	✓	✓	✓	✓	✓
Paranoidae					
<i>Aricidia</i> sp.					✓
Pectineriidae					
<i>Pectinaria granulata</i>			✓	✓	✓

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
Phyllodocidae					
Eteone longa		✓	✓		✓
E. tuberculata			✓		
Eulalia quadrioculata		✓		✓	✓
E. sanguinea		✓	✓	✓	✓
E. viridis				✓	
Hesionura coineaui difficilis		✓			
Phyllodoce castanea					✓
P. groenlandica			✓		✓
P. maculata		✓	✓	✓	✓
P. sp. A			✓	✓	✓
Pilargidae					
Pilargis berkleyae					✓
Sigambra tentaculata				✓	✓
Pisyonidae					
Pisione sp.		✓			
Arctonoe vittata			✓		
Harmothoe imbricata			✓	✓	✓
H. lunulata		✓	✓		✓
Lepidasthenia berkleyae			✓		✓
Tenonia kitsapensis					✓
Sabelliidae					
Chone ecaudata					✓
Sabella media					✓
Serpulidae					
Spirobis nakamurai					✓
Sigalonidae					
Pholoe minuta		✓	✓		✓
Spionidae					
Malacocerus glutaeus			✓		✓
Polydora caulleryi			✓		✓
P. columbiana		✓			
P. limicola					✓
P. proboscidea	✓	✓			
P. pygidialis			✓	✓	
P. quadrilobata				✓	
P. socialis			✓	✓	✓
P. sp. A			✓	✓	✓
Prionospio cirrifer	✓	✓		✓	✓
P. steenstrupi		✓	✓	✓	✓
Pygospio elegans	✓	✓	✓		
Scoelelepis sp.		✓	✓		
Spio filicornis		✓	✓	✓	✓
Spiophanes berkeleyorum			✓	✓	✓
S. bombyx		✓	✓	✓	✓
Syllidae					
Brania brevipharyngia		✓	✓		
Exogone gemmifera			✓	✓	
E. lourei	✓	✓	✓	✓	✓
Sphaerosyllis brandhorsti			✓	✓	✓
S. pirifera		✓	✓	✓	

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
Terebellidae					
Polycirrus sp. A		✓			
Archiannelida					
Polygordius sp.		✓			
Protodrilidae sp.		✓			
Sipuncula					
Golfingia vulgaris					✓
G. pugettensis					✓
Crustacea					
Leptostraca					
Nebalia pugettensis			✓	✓	✓
Ostracoda					
spp.		✓	✓	✓	✓
Cirripedia					
Balanus glandula	✓	✓			
Cumacea					
Cumella vulgaris		✓	✓	✓	✓
Diastylis sp.				✓	✓
Diastylopsis sp.				✓	✓
Eudorella sp.					✓
Lampropidae sp.				✓	
Leptocuma sp.			✓	✓	
Tanaidacea					
Leptochelia dubia	✓	✓	✓	✓	✓
Isopoda					
Cirolana vancouveriensis	✓				
Dynamenella shearerii			✓		
Exosphaeroma amplicauda		✓	✓		
E. media	✓	✓	✓		
Gnorimosphaeroma oregonense		✓		✓	
Ianiropsis kincaidii			✓		
Idotea resicata				✓	
Limnoria algarum					✓
Munna ubiquata				✓	
Paranthura elegans				✓	✓
Mysidacea					
Archaeomysis grebnitzkii			✓		
Amphipoda					
Allorchestes augustus		✓			
Ampelisca agassizii			✓	✓	✓
A. pugetica				✓	✓
Ampithoe lacertosa			✓		
Anisogammarus confervicolus	✓	✓	✓		
Aoroides columbiae			✓	✓	✓

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
Amphipoda					
Byblis serrata				✓	
Caprella laeviscula		✓	✓		
Corophium ascherusicum			✓		
C. crassicorne					✓
Dulichia sp. A				✓	
Gammaropsis thompsoni			✓	✓	✓
Guernea sp. A				✓	✓
Hippomedon sp. B					✓
Ischyrocerus anguipes				✓	✓
Metacaprella kennerlyi				✓	
Melita dentata			✓		✓
M. desdichada				✓	✓
Orchomene sp. A				✓	✓
Orchestoidea pugettensis	✓	✓			
Pachynus					
cf. barnardi				✓	✓
Paramoera "seriata" n. sp.			✓		
Paraphoxus sp. A			✓		
P. sp. C			✓		
P. spinosus			✓		
Photis brevipes			✓	✓	✓
Pleusirus secorrus				✓	
Podoceropsis					
inaequiscyllis				✓	✓
Pontogeneia					
cf. rostrata			✓	✓	✓
Protomedeia sp. A				✓	✓
Synhelidium rectipalmum			✓	✓	
S. shoemakeri				✓	✓
Tritella pilimana			✓		
Westwoodilla caecula				✓	✓
Decapoda					
Callinassidae sp. (juv.)				✓	✓
Cancer gracilis				✓	✓
C. magister		✓			
C. oregonensis			✓	✓	✓
C. productus			✓		
Crangon nigracauda			✓		
Hemigrapsus nudus	✓	✓			
H. oregonensis	✓	✓			

BECKETT POINT

	+6'	+3'	+0'	-5m	-10m
Hippolytidae					
sp.			✓	✓	✓
Labidochirus splendescens					✓
Oregonia gracilis			✓		
Pagurus beringanus				✓	
P. h. hirsutiusculus		✓	✓		
Pinnixa littoralis		✓			
P. occidentalis			✓		
Pugettia gracilis			✓	✓	✓
Telmessus cheiragonus			✓		
Upogebia pugettensis		✓			
Insecta					
Dipteran larvae	✓	✓	✓		
Phoronida					
Phoronopsis hamneri		✓	✓		✓
Phoronis ijimai				✓	
Echinodermata					
Echinoidea					
Dendraster excentricus		✓	✓		
Holothuroidea					
Leptosynapta clarki		✓	✓	✓	
Molpadia intermedia				✓	
Ophiuroidea					
Amphipholis squamata				✓	

Table 6. Dungeness Spit (exposed gravel-sand). Complete list of all benthic organisms collected spring 1976 through winter 1978. Checks indicate tide heights where organism was found.

Genus Species	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Chlorophyta					
<i>Chaetomorpha californica</i>					✓
Bacillariophyta					
<i>Pennales</i> spp.					✓
Phaeophyta					
<i>Alaria</i> spp.					✓
<i>Costaria costata</i>					✓
<i>Desmarestia aculeata</i>					✓
<i>D. ligulata</i> var. <i>ligulata</i>					✓
<i>Ectocarpaceae</i>					✓
<i>Feldmania</i> spp.					✓
<i>Giffordia ovata</i>					✓
<i>Haplogloia andersonii</i>					✓
<i>Hedophyllum sessile</i>					✓
<i>Laminaria</i> spp.					✓
<i>Ralfsia pacifica</i>					✓
<i>Stictyosiphon tortilis</i>					✓
<i>Syringoderma abyssicola</i>					✓
Rhodophyta					
<i>Acrochaetium</i> spp.					✓
<i>Antithamnion defectum</i>					✓
<i>Botryocladia pseudodichotoma</i>					✓
<i>Callithamnion/Pleonosporium</i>					✓
<i>Choreocolax polysiphoniae</i>					✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
<i>Cruoriopsis aestuarii</i>				✓	
<i>Cryptonemia borealis</i>					✓
<i>C. ovalifolia</i>					✓
<i>Euthora fruticulosa</i>					✓
<i>Gigartinaceae</i> spp.					✓
<i>Goniotrichum alsidii</i>					✓
<i>Gracilaria</i> spp.					✓
<i>Gymnogongrus leptophyllus</i>					✓
<i>Halymenia</i> spp.					✓
<i>Hollenbergia subulata</i>					✓
<i>Iridaea</i> spp.					✓
<i>Leptofaucea pacifica</i>					✓
<i>Membranoptera</i> spp.					✓
<i>Odonthalia</i> sp.					✓
<i>Peyssonelia pacifica</i>					✓
<i>Phycodrys isabelliae</i>					✓
<i>Platythamnion pectiatum</i>					✓
<i>P. villosum</i>				✓	✓
<i>Polysiphonia hendryi</i>				✓	✓
<i>P. pacifica</i>					✓
<i>Porphyra</i> spp.					✓
<i>Pterosiphonia dendroidea</i>					✓
<i>P. gracilis</i>					✓
<i>Ptilota filicina</i>				✓	
<i>Rhodoptilum plumosum</i>					✓
<i>Rhodymenia</i> spp.					✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
<i>Scagelia occidentale</i>				✓	✓
<i>Stenogramme interrupta</i>					✓
<i>Thuretellopsis peggiana</i>					✓
Cnidaria					
Hydrozoa					
<i>Coryne tubulosa</i>					✓
<i>Hydroidea</i> spp.					✓
<i>Tubularia</i> sp.					✓
Anthozoa					
<i>Halcapa</i> sp.					✓
Platyhelminthes					
<i>Turbellaria</i> spp.	✓	✓		✓	✓
<i>Nemertea</i> spp.	✓	✓	✓	✓	✓
<i>Nematoda</i> spp.	✓		✓		✓
Mollusca					
Amphineura					
<i>Cryptobranchia concentrica</i>					✓
<i>Leptochiton internexus</i>					✓
Gastropoda					
<i>Aeolididae</i> spp.					✓
<i>Amphissa columbiana</i>			✓	✓	✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
<i>Calliostoma ligatum</i>				✓	
<i>Calyptraea fastigata</i>				✓	✓
<i>Lacuna variegata</i>			✓	✓	✓
<i>Margarites pupillus</i>				✓	
<i>Mitrella tuberosa</i>				✓	
<i>Natica clausa</i>					✓
<i>Thais canaliculata</i>				✓	
<i>Trichotropis cancellata</i>					✓
Bivalvia					
<i>Clinocardium nuttallii</i>			✓	✓	✓
<i>Crenella decussata</i>			✓	✓	✓
<i>Humilaria kennerleyi</i>					✓
<i>Macoma</i> sp.					✓
<i>Modiolus</i> sp.					✓
<i>Mya arenaria</i>					✓
<i>Mysella tumida</i>				✓	✓
<i>Protothaca staminea</i>					✓
<i>P. tenerrima</i>					✓
<i>Tellina</i> sp.					✓
<i>Transenella tantiila</i>				✓	✓
<i>Tresus capax</i>					✓
Annelida					
<i>Oligochaeta</i> spp.	✓	✓	✓	✓	✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Polychaeta					
Acrocirridae spp.					✓
Arenicolidae spp.	✓				
Capitellidae					
Capitella capitata				✓	✓
Mediomastus sp.				✓	✓
Notomastus lineatus					✓
N. tenuis					✓
Cirratulidae					
Chaetozona setosa					✓
Cauleriella sp.					✓
Cirratulus cirratus					✓
Tharyx multifilis					✓
Dorvilleidae					
Protodorvillea gracilis			✓		✓
Goniadidae					
Glycinde picta					✓
Hesionidae					
Gyptis brevipalpa					✓
Micropodarke dubia					✓
Maldanidae					
Axiothella rubrocincta					✓
Luclymene sp.					✓
Nephtyidae					
Nephtys caeca					✓
N. ciliata					✓
N. ferruginea					✓
Nereidae					
Nereis sp.					✓
Platynereis bicanaliculata				✓	✓
Opheliidae					
Armandia brevis				✓	✓
Travisia forbesii					✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Orbiniidae					
<i>Scoloplos</i> sp.					✓
Oweniidae					
<i>Owenia fusiformis</i>					✓
Paraonidae					
<i>Paraonella platybranchia</i>				✓	
Phyllodocidae					
<i>Eteone longa</i>					✓
<i>Eulalia sanguinea</i>					✓
Polynoidae					
<i>Harmothoe imbricata</i>					✓
Sabellidae					
<i>Chone</i> sp.					✓
<i>Sabella media</i>					✓
Scalibregmidae					
<i>Scalibregma inflatum</i>					✓
Serpulidae					
<i>Spirorbis</i> sp.					✓
Sigalionidae					
<i>Pholoe minuta</i>					✓
Spionidae					
<i>Malacoceros glutaeus</i>			✓	✓	✓
<i>Polydora quadrilobata</i>				✓	
<i>P. socialis</i>					✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Prionospio cirrifera					✓
P. steenstrupi					✓
Spio filicornis					✓
Spiophanes bombyx					✓
Syllidae					
Eusyllis sp.					✓
Exogone gemmifera					✓
E. lourei					✓
Sphaerosyllis pirrifera					✓
Syllis heterochaeta					✓
S. longocirrata					✓
Terebellidae					
Polycirrus sp. A					✓
P. sp. B					✓
Archiannelida					
Polygordiidae					
Polygordius sp.					✓
Sipuncula					
Phascolosoma agassizii					✓
Crustacea					
Cirripedia					
Balanus rostratus alaskensis				✓	
Cumacea					
Diastylis sp.				✓	✓
Lampropidae				✓	✓
Leptocuma sp.					✓
Leptostylis sp.					✓

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Leptostraca					
<i>Nebalia pugettensis</i>				✓	
Mysidacea					
<i>Archaeomysis grebnitzkii</i>	✓		✓	✓	
Tanaidacea					
<i>Leptochelia dubia</i>				✓	✓
Isopoda					
<i>Exosphaeroma amplicauda</i>					✓
<i>E. rhomburum</i>					✓
<i>Gnorimosphaeroma oregonense</i>					✓
<i>Idotea</i> sp. (juv.)					✓
Amphipoda					
<i>Accedomoera vagor</i>				✓	
<i>Ampelisca cristata</i>					✓
<i>A. macrocephala</i>				✓	
<i>Anoryx laticoxae</i>				✓	✓
<i>Aoroides columbize</i>					✓
<i>Atylus levidensis</i>					✓
<i>Caprella laeviuscula</i>					✓
<i>Corophium crassicorne</i>					✓
<i>Eohaustorius washingtonianus</i>				✓	
<i>Guernea</i> sp. A.					✓
<i>Ischyrocerus anguipes</i>				✓	✓
<i>Melita californica</i>					✓
<i>M. dentata</i>					✓
<i>M. desdichada</i>				✓	✓
<i>Orchomene</i> sp. A.					✓
<i>Orchestoidea pugettensis</i>	✓	✓			
<i>Paramoera serrata</i> n. sp.		✓	✓		
<i>Paraphoxus</i> spp.				✓	✓
<i>Paraphoxus spinosus</i>	✓				
<i>Parapleustes</i> sp.				✓	
<i>Photis</i> sp.					✓
<i>Synchelidium shoemakeri</i>				✓	
<i>Tiron biocellata</i>				✓	

Dungeness Spit

	Tide Ht.				
	+6'	+3'	+0'	-5m	-10m
Decapoda					
Callinassidae (juv.)				✓	✓
Hemigrapsus oregonensis					✓
Hippolytidae spp. (juv.)					✓
Paguridae spp. (juv.)				✓	✓
Pinnotheridae spp. (juv.)					✓
Pugettia gracilis					✓
Phoronida					
Phoronopsis harmeri					✓
Bryozoa spp.					✓
Membranipora sp.					✓
Echinodermata					
Ophiuroidea spp.					✓
Holothuroidea					
Eupentacta sp. (juv.)					✓
Leptosynapta clarki					✓
Chordata - Ascidacea					
Cnemidocarpa finmarkiensis					✓

Table 7. Twin Rivers (exposed gravel-sand). Complete list of all benthic organisms collected spring 1976 through spring 1977. Checks indicate tide heights where organism was found.

	+6'	+3'	+0'	-5m	-10m
Chlorophyta					
Enteromorpha linza				✓	
Ulva spp.				✓	
Bacillariophyta					
Pennales spp.				✓	
Phaeophyta					
Desmarestia viridis				✓	
Ralfsia sp.				✓	
Syringoderma abyssicola				✓	
Rhodophyta					
Acrochaetium sp.				✓	
Antithamnion dendroideum				✓	
Ceramium washingtoniense				✓	
Gracilaria verrucosa				✓	
Gracilaria sjoestedtii				✓	
Gymnogongrus leptophyllus				✓	
Hollenbergia subulata				✓	
Iridaea sp.				✓	
Neoptilota asplenioides				✓	
Platythamnion reversum				✓	
Platythamnion pectinatum				✓	
Platythamnion villosum				✓	
Pleonosporium sp.				✓	
Polysiphonia hendryi				✓	
Polysiphonia pacifica				✓	
Polysiphonia paniculata				✓	
Porphyra sp.				✓	
Pterosiphonia bipinnata				✓	
P. dendroidea				✓	
Ptilota filicina				✓	
Rhodymenia palmata				✓	
Sarcodiotheca furcata				✓	
Scagelia occidentale				✓	
Stenogramme interrupta				✓	
Cnidaria					
Hydrozoa					
spp.				✓	
Scyphozoa					
Halicyclystus auricula				✓	
Anthozoa					
Halcampa decententaculata				✓	✓
Platyhelminthes					
Turbellaria					
spp.			✓		
Nemertea					
spp.	✓	✓	✓	✓	✓
Amphiporus sp.			✓		
Nematoda					
spp.		✓		✓	✓

TWIN RIVERS

	<u>+6'</u>	<u>+3'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Mollusca					
Gastropoda					
Aglaja diomedea					✓
Calyptreaea fastigiata				✓	
Crepidula perforans				✓	
Lacuna variegata				✓	
Lirularia lirulata				✓	✓
Margarities pupillus				✓	
Thais canaliculata				✓	
Thais lamellosa				✓	
Bivalvia					
Clinocardium sp.					✓
Crenella decussata				✓	
Lucinoma tenuisculpta					✓
Macoma spp.				✓	✓
Modiolus sp.					✓
Musculus sp.				✓	
Mya sp.				✓	
Mysella tumida				✓	✓
Protothaca staminea				✓	
Psephidia lordi				✓	✓
Tellina sp.				✓	✓
Transennella tantilla				✓	
Annelida					
Oligochaeta					
spp.		✓	✓	✓	✓
Polychaeta					
Arenicolidae					
Abarenicola sp. (juv.)		✓			
Ampharetidae					
Ampharete arcuica					✓
Capitellidae					
Barantolla americana					✓
Capitella capitata			✓	✓	✓
Mediomastus spp.			✓	✓	✓
Notomastus tenuis			✓		
Cirratulidae					
Chaetozone setosa					✓
Tharyx multifilis				✓	✓
Glyceridae					
Glycera sp.					✓
Hemipodus borealis				✓	✓
Goniadidae					
Glycinde picta			✓	✓	✓
Goniada sp. (juv.)					✓
Hesionidae					
Gyptis brevipalpa				✓	
Micropodarke dubia				✓	
Lumbrineridae					
Lumbrineris luti					✓
L. zonata			✓		✓

TWIN RIVERS

	+6'	+3'	+0'	-5m	-10m
Crustacea					
Ostracoda					
spp.	✓			✓	✓
Cirripedia					
Balanus sp.				✓	
Cumacea					
Cumella sp.				✓	
Diastylis sp.				✓	
Diastylopsis sp.				✓	
Leptocuma sp.				✓	✓
Tanaidacea					
Leptochelia dubia				✓	✓
Isopoda					
Edotea sublittoralis				✓	✓
Gnorimosphaeroma oregonense	✓	✓	✓	✓	
Idotea sp.				✓	
Synidotea bicuspidata				✓	
S. pettiboneae				✓	
Amphipoda					
Caprellidea					
Caprella gracillior				✓	
Tritella pilimana				✓	
Gammaridea					
Accedomoera vagor				✓	
Ampelisca agassizi				✓	✓
A. macrocephala					✓
A. pugetica				✓	
Anonyx laticoxae				✓	
Aoroides columbiae				✓	✓
Argissa hamatipes				✓	
Atylus levidensus				✓	
Eohaustorius washingtonianus				✓	
Gammaropsis thompsoni				✓	
Guernea sp. A				✓	
Hyalé pugettensis				✓	
Ischyrocerus anguipes				✓	
Jassa falcata				✓	
Lepidepcreum sp. A				✓	
Melita desdichada				✓	
Monoculodes zernovi					✓
Orchestia georgiana	✓	✓			
Orchomene sp. A				✓	
Paraphoxus spp.				✓	✓
Paramoera "serrata" n.s.p.	✓				
Pnotis brevipes				✓	
Pnotis sp. D				✓	✓
Pleusirus securus				✓	
Pontogeneia rostrata				✓	
Protomedis sp. A				✓	✓
Synchelidium rectipalmum				✓	
S. shoemakeri					✓
Trion biocellata				✓	
Westwoodilla caecula				✓	✓

TWIN RIVERS

	+6'	+3'	+0'	-5m	-10m
Magelonidae					
<i>Magelona pitelkai</i>					✓
Maldanidae					
<i>Euclymene dilineata</i>					✓
Nephtyidae					
<i>Nephtys caecoides</i>				✓	
<i>N. californiensis</i>			✓	✓	✓
Nereidae					
<i>Micronereis nanaimoensis</i>				✓	✓
<i>Nereis pelagica</i>					✓
<i>N. procera</i>				✓	✓
<i>N. vexillosa</i>			✓		
<i>Platynereis bicapaliculata</i>				✓	✓
Onuphidae					
<i>Onuphis iridescens</i>					✓
Opheliidae					
<i>Armandia brevis</i>				✓	✓
Orbinidae					
<i>Naineris uncinata</i>				✓	✓
<i>Scoloplos</i> sp.			✓	✓	✓
Owenidae					
<i>Owenia fusiformis</i>				✓	✓
Paraonidae					
<i>Aricidea</i> sp.					✓
<i>Paraonella platybranchia</i>			✓		
Phyllodocidae					
<i>Eteone longa</i>			✓	✓	✓
<i>E. tuberculata</i>				✓	
<i>Phyllodoce maculata</i>				✓	✓
Polynoidae					
<i>Arctone vittata</i>				✓	
<i>Harmothoe imbricata</i>				✓	
Sigalionidae					
<i>Pholoe minuta</i>					✓
Sphaerodoridae					
<i>Sphaerodoropsis minuta</i>				✓	✓
Spionidae					
<i>Malcoceros glutaeus</i>		✓	✓	✓	
<i>Polydora socialis</i>				✓	
<i>Prionospio steenstrupi</i>			✓	✓	✓
<i>P. cirrifera</i>				✓	
<i>Spio filicornis</i>				✓	
<i>Spiophanes bombyx</i>				✓	
Syllidae					
<i>Autolytus</i> sp.				✓	
<i>Exogone gemmifera</i>				✓	✓
<i>E. loueri</i>	✓		✓	✓	✓
Terebellidae					
sp.				✓	
Pycnogonida					
<i>Nymphon pixellae</i>				✓	

TWIN RIVERS

	<u>+6'</u>	<u>+3'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Decapoda					
Callinassidae sp. (juv.)				✓	✓
Cancer gracilis				✓	
C. oregonensis				✓	
Hippolytidae sp. (juv.)				✓	
Pagaurus beringanus				✓	
P. kennerlyi				✓	
Pinnixa sp.				✓	
Pugettia gracilis				✓	
Insecta					
Diptera larva spp.		✓		✓	
Phoronida					
Phoronis iijimai				✓	
Bryozoa					
spp.				✓	

Table 8. North Beach Sand (exposed sand intertidal; sand-gravel-cobble subtidal). Complete list of all benthic organisms collected spring 1976 through winter 1978. Checks indicate tide heights where organism was found.

	+6'	+2'	+0'	-5m	-10m
Chlorophyta					
<i>Bryopsis corticulans</i>					✓
<i>Chaetomorpha californica</i>				✓	✓
<i>Derbesia marina</i>				✓	✓
Bacillariophyta					
Pennales spp.				✓	✓
Phaeophyta					
<i>Alaria</i> sp.				✓	
<i>Agarum cribrosum</i>				✓	
<i>Costaria costata</i>			✓		
<i>Desmarestia aculeata</i>					✓
<i>D. ligulata</i>				✓	
<i>Ectocarpales</i> sp.				✓	
<i>Laminaria saccharina</i>				✓	
<i>Pterygophora californica</i>				✓	
<i>Sphacelaria</i> sp.					✓
<i>Syringoderma abyssicola</i>				✓	✓
Rhodophyta					
<i>Acrochaetium</i> sp.				✓	✓
<i>Abrufeltia plicata</i>				✓	
<i>Antithamnion defectum</i>				✓	✓
<i>A. dendroideum</i>				✓	✓
<i>A. kyllini</i>				✓	
<i>Antithamnionella pacifica</i>					✓
<i>A. glandulifera</i>					✓
<i>Bonnemaisonia nootkana</i>				✓	
<i>Botrycladia pseudodichotoma</i>				✓	✓
<i>Botryoglossum farlowianum</i>				✓	
<i>Calliarthron tuberculosum</i>				✓	✓
<i>Callithamnion</i> sp.				✓	✓
<i>Callophyllis firma</i>					✓
<i>C. flabellulata</i>				✓	✓
<i>C. haenophylla</i>				✓	
<i>C. pinnata</i>					✓
<i>Ceramium californicum</i>				✓	✓
<i>C. gardneri</i>					✓
<i>C. strictum</i>				✓	✓
<i>C. washingtonense</i>					✓
<i>Choreocolax polysiphoniae</i>				✓	
<i>Constantinea simplex</i>				✓	
<i>Cruoria profunda</i>				✓	
<i>Cryptonemia borealis</i>					✓
<i>C. obovata</i>				✓	✓
<i>C. ovalifolia</i>				✓	✓
<i>Delessaria decipiens</i>				✓	✓
<i>Euthora fruticulosa</i>				✓	✓
<i>Gigartina</i> sp.				✓	✓
<i>Conimophyllum skottsbergii</i>				✓	

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Goniotrichum elegans					✓
Gracilaria verrucosa				✓	✓
G. sjoestedtii				✓	
Griffithsia pacifica					✓
Halosaccion glandiforme					✓
Halymenia coccineae				✓	
Herposiphonia grandis				✓	✓
H. plumula				✓	
Heterosiphonia densiuscula				✓	
H. japonica				✓	
Hildenbrandia sp.				✓	✓
Hollenbergia subulata					✓
Hymenena smithii				✓	
Iridaea sp.				✓	✓
Laurencia spectabilis				✓	
Lophosiphonia villum				✓	
Membranoptera platyphylla					✓
Neogardhiella baileyi				✓	
Nienburgia andersoniana				✓	✓
Nitophyllum mirabile				✓	
Odonthalia floccosa				✓	✓
O. kamtschatica				✓	✓
O. washingtoniensis				✓	✓
Opuntia californica				✓	
Petrocelis middendorffii				✓	
Peyssonellia pacifica				✓	✓
Phycodrys isabelliae					✓
Pikea robusta				✓	
Platysiphonia clevelandii				✓	
Platythamnion heteromorphum					✓
P. pectinatum				✓	✓
P. villosum				✓	✓
Plocamium cartilagineum				✓	
P. coccineum				✓	✓
Polyneura latissima				✓	✓
Polysiphonia hendryi				✓	✓
P. pacifica				✓	✓
P. scopulorum				✓	
Porphyra spp.				✓	✓
Pterochondria woodii				✓	
Pterosiphonia bipinnata				✓	✓
P. dendroidea				✓	✓
P. gardneri					✓
P. gracilis				✓	
P. pacificum					✓
Ptilota filicina					✓
Rhodoglossum californicum					✓
Rhodoptilum plumosum				✓	✓
Rhodymenia palmata				✓	✓
R. pertusa					✓
R. stipitata					✓
Sarcodiotheca furcata				✓	✓

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Scagelia occidentale				✓	✓
Stenogramme interrupta				✓	✓
Thuretellopsis peggiana				✓	✓
Trailliella intricata				✓	
Spermatophyta					
Zostera marina				✓	
Cnidaria					
Hydrozoa					
spp.				✓	
Anthozoa					
Anthopleura elegantissima			✓		
Halcampa decententaculata			✓	✓	✓
Platyhelminthes					
Turbellaria					
spp.				✓	
Itaspiella armata	✓				
Nemertea					
spp.	✓	✓	✓	✓	✓
Nematoda					
spp.	✓	✓	✓	✓	✓
Mollusca					
Amphineura					
Lepidomona mertensii					✓
Mopalia lignosa					✓
M. sp. 1					✓
Tonicella lineata				✓	
Gastropoda					
Acmaea mitra				✓	
Aeolididae sp.				✓	
Alvinia sp.				✓	
Amphissa columbiana					✓
Calliostoma ligatum				✓	
Calyptraea fastigiata				✓	✓
Cerithiopsis sp.				✓	
Collisella ochracea				✓	
Lacuna variegata	✓	✓	✓	✓	✓
Laila cockerellii				✓	
Lirularia lirulata				✓	✓
Littorina scutulata	✓	✓			
L. sitkana	✓		✓		
Margaritites pupillus				✓	✓
Notoacmea perona	✓				
Nassarius mendicus				✓	✓
Natica clausa				✓	✓
Odostomia sp.				✓	
Searlesia dira				✓	
Bivalvia					
Astarte compacta					✓
Cardit ventricosa					✓
Clinocardium nuttallii				✓	✓
Creneilla decussata			✓	✓	✓

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
<i>Cryptomya californica</i>				✓	
<i>Entodesma saxicola</i>					✓
<i>Glycymeris subobsoleta</i>				✓	
<i>Humilaria kennerlyi</i>					✓
<i>Lasaea cistula</i>				✓	
<i>Lucinoma tenuisculpta</i>				✓	✓
<i>Macoma secta</i>					✓
<i>Macoma</i> spp.				✓	✓
<i>Mya</i> sp.				✓	✓
<i>Mysella tumida</i>		✓	✓	✓	✓
<i>Mytilus</i> spp.	✓				
<i>Protothaca staminea</i>		✓			✓
<i>Psephidia lordi</i>				✓	✓
<i>Semele rubropicta</i>					✓
<i>Tellina</i> spp.		✓		✓	✓
<i>Transennella tantilla</i>				✓	✓
<i>Tresus capax</i>					✓
<i>Zirfaea pilsbryi</i>					✓
Annelida					
<i>Oligochaeta</i>					
spp.	✓	✓	✓	✓	✓
Polychaete					
Acrocirridae					
spp.				✓	
<i>Macrochaeta</i> sp.					✓
Arenicolidae					
<i>Abarenicola</i> sp.		✓			
<i>A. clapedi oceanica</i>			✓		
Capitellidae					
<i>Capitella capitata</i>		✓	✓	✓	✓
<i>Mediomastus</i> sp.				✓	✓
<i>Notomastus lineatus</i>				✓	✓
<i>Notomastus tenuis</i>				✓	✓
Cirratulidae					
<i>Caulleriella gracilis</i>					✓
<i>Chaetozone setosa</i>					✓
<i>Cirratulus cirratus</i>				✓	✓
<i>Cirriformia</i> sp.				✓	
<i>Tharyx multifilis</i>				✓	✓
Dorvilleidae					
<i>Protodorvillea gracilis</i>				✓	✓
Eunicidae					
<i>Eunice valens</i>				✓	
Flabelligeridae					
<i>Pherusa plumosa</i>					✓
Glyceridae					
<i>Glycera capitata</i>					✓
<i>Hemipodus borealis</i>	✓	✓		✓	✓
Goniadidae					
<i>Glycinde armigera</i>					✓
<i>G. picta</i>			✓	✓	✓

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Hesionidae					
Hesionidae sp. A				✓	
Micropodarke dubia				✓	✓
Ophiotromus pugettensis				✓	✓
Magelonidae					
Magelona pitelkai		✓	✓		
Maldanidae					
Axiothella rubrocincta				✓	✓
Euclymene sp.				✓	
Nicomache lumbricalis				✓	
N. personata				✓	
Nephtyidae					
Nephtys californiensis	✓		✓		✓
Nereidae					
Micronereis nanaimoensis				✓	✓
Nereis pelagica				✓	✓
N. vexillosa	✓	✓			
Platynereis bicanaliculata				✓	✓
Onuphidae					
Onuphis iridescent				✓	
Onuphis stigmatis				✓	✓
Opheliidae					
Armandia brevis				✓	✓
Ophelia limacina				✓	✓
Orbiniidae					
Naineris uncinata		✓	✓		
Scoloplos sp.		✓	✓		✓
Oweniidae					
Owenia fusiformis			✓	✓	✓
Paraonidae					
Paraonella platybranchia	✓	✓	✓	✓	
Phyllodoceidae					
Eteone sp.				✓	
Eulalia bilineata				✓	
Eulalia macroceros				✓	
E. nigrimaculata				✓	✓
E. quadrioculata				✓	
E. viridis				✓	
Hesionura coineaui difficilis	✓			✓	✓
Phyllodoce groenlandica				✓	
P. maculata				✓	
Pilargidae					
Sigambra tentaculata				✓	
Pisionidae					
Pisone sp.					✓
Polynoidae					
Harmothoe imbricata				✓	✓
H. lunulata				✓	✓
Sabellidae					
Chone ecaudata				✓	
Oriopsis minuta				✓	
Potamilla intermedia				✓	

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Leptrostraca					
<i>Nebalia pugettensis</i>				✓	✓
Mysidacea					
<i>Archaeomysis grebnitzkii</i>	✓	✓	✓	✓	
<i>Holmesiella anomala</i>				✓	
Cumacea					
<i>Cumella</i> sp.				✓	✓
<i>Diastylis</i> sp.					✓
<i>Diastylopsis</i> spp.		✓	✓	✓	
<i>Lampropidae</i> spp.			✓	✓	
Tanaidacea					
<i>Leptochelia dubia</i>	✓	✓		✓	✓
Isopoda					
<i>Caecianiropsis psammophila</i>				✓	
<i>Cirolana harfordi</i>				✓	
<i>C. vancouverensis</i>					✓
<i>Exosphaeroma amplicauda</i>		✓		✓	
<i>E. media</i>	✓	✓	✓	✓	
<i>E. rhomburum</i>				✓	✓
<i>Gnorimosphaeroma oregonense</i>			✓		
<i>Ianiropsis analoga</i>				✓	✓
<i>I. kincaidii</i>	✓				
<i>I. tridens</i>				✓	
<i>Idotea rufescens</i>				✓	
<i>Jaeuropsis dubia</i>				✓	✓
<i>J. lobata</i>				✓	
<i>J. setosa</i>				✓	
<i>Janirilata occidentales</i>				✓	
<i>Limnoria algarum</i>				✓	
<i>Munna stephenseni</i>					✓
<i>M. ubiquita</i>				✓	
<i>Munnagonium waldronense</i>				✓	
<i>Paranthura elegans</i>				✓	✓
<i>Tecticeps pugettensis</i>			✓		
Amphipoda					
Gammaridea					
<i>Accedomoera vagor</i>				✓	✓
<i>Ampelisca cristata</i>				✓	✓
<i>A. pugetica</i>				✓	✓
<i>Ampithoe simulans</i>				✓	✓
<i>Anonyx laticoxae</i>				✓	✓
<i>Aorides columbiae</i>	✓			✓	✓
<i>Atylus levidensis</i>				✓	
<i>A. tridens</i>	✓			✓	
<i>Corophium crassicorne</i>				✓	✓
<i>Eohaustorius washingtonianus</i>	✓	✓	✓		
<i>Erichthonius brasiliensis</i>				✓	
<i>Gammaropsis thompsoni</i>				✓	✓
<i>Guerneia</i> sp. A				✓	
<i>Ischyrocercus anguipes</i>				✓	✓
<i>Maera simile</i>				✓	
<i>Megaluropus longimerus</i>				✓	

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Scalebregmidae					
<i>Scalebregma inflatum</i>				✓	
Serpulidae					
<i>Crucigera zygophora</i>				✓	
<i>Serpula vermicularis</i>				✓	
<i>Spirorbis nakamurai</i>				✓	
Sigalionidae					
<i>Pholoe minuta</i>					✓
Sphaerodoridae					
<i>Sphaerodoropsis minuta</i>				✓	
Spionidae					
<i>Laonice cirrata</i>				✓	
<i>Malococeros glutaeus</i>	✓	✓	✓	✓	
<i>Polydora hamata</i>				✓	
<i>P. pygidialis</i>				✓	
<i>P. socialis</i>		✓	✓	✓	✓
<i>P. spongicola</i>				✓	
<i>Prionospio cirrifera</i>				✓	✓
<i>Prionospio steenstrupi</i>				✓	✓
<i>Pygospio elegans</i>	✓	✓	✓	✓	✓
<i>Scoelelepis</i> sp. A				✓	✓
<i>Spio cirrifera</i>			✓		
<i>Spio filicornis</i>				✓	✓
<i>Spiophanes bombyx</i>			✓	✓	✓
Syllidae					
<i>Brania brevis</i>				✓	
<i>Exogone georgiana</i>				✓	
<i>E. lourei</i>	✓			✓	✓
<i>Pionosyllis</i> sp.					✓
<i>Sphaerosyllis</i> sp.			✓	✓	✓
<i>Streptosyllis latipalpa</i>		✓	✓		
<i>Syllis armillaris</i>				✓	
<i>S. heterochaeta</i>				✓	
<i>S. hyalina</i>	✓				
<i>Trypanosyllis gemmipara</i>				✓	
Terebellidae					
<i>Polycirris</i> sp. A				✓	✓
<i>P.</i> sp. B				✓	✓
Archiannelida					
Polygordiidae					
<i>Polygordius</i> spp.	✓			✓	✓
Protodrillidae spp.					✓
Saccocirridae					
<i>Saccocirrus eroticus</i>					✓
Sipuncula					
<i>Golfingia pugettensis</i>				✓	
<i>Phascolosoma agassizii</i>				✓	
Crustacea					
Ostracoda					
spp.	✓			✓	✓
Cirripedia					
<i>Balanus cariosus</i>	✓	✓			
<i>B. glandula</i>	✓	✓	✓		

NORTH BEACH SAND

	<u>+6'</u>	<u>+2'</u>	<u>+0'</u>	<u>-5m</u>	<u>-10m</u>
Melita californica					✓
Melita desdichada				✓	✓
Orchestia sp. (juv.)	✓				
Orchomene sp. A				✓	
Paramoera "serrata" n. sp.	✓				
Paraphoxus spp.		✓	✓	✓	✓
P. c.f. abronius		✓	✓		
P. spinosus type B		✓	✓		
Parapleustes pugettensis				✓	
Photis brevipes				✓	
Pleusirus securus				✓	
Pontogeneia ivanovi				✓	
P. rostrata				✓	✓
Protomedeia sp. A				✓	
Synchelidium rectipalmum				✓	✓
Caprellidea					
Caprella augusta				✓	
Caprella gracilior				✓	✓
Caprella californica				✓	✓
Metacaprella kennerlyi				✓	
Tritella pilimana					✓
Decapoda					
Cancer oregonensis				✓	✓
C. productus				✓	
Crangon alaskensis					✓
C. franciscorum		✓			
C. munitella				✓	
Hippolyte clarki				✓	
Lebbeus sp.					✓
Lophopanopeus bellus					✓
Oregonia gracilis				✓	✓
Paguridae sp. (juv.)	✓			✓	✓
Phyllolithodes papillosus				✓	
Pinnixa sp.				✓	✓
Pugettia gracilis				✓	✓
Insecta					
Diptera larva	✓		✓		
Bryozoa					
spp.				✓	✓
Brachopoda					
Telebratalia transversa					✓
Echinodermata					
Ophiuroidea spp. (juv.)					✓
Holothuroidea					
Leptosynapta clarki				✓	✓
Mopadia intermedia					✓
Ascidacea					
Pyura haustor				✓	

Table 9. Kydaka Beach (exposed sand). Complete list of all benthic organisms collected spring 1976 through winter 1978. Checks indicate tide heights where organism was found.

	+6'	+3'	+0'	-5m	-10m
Rhodophyta					
<i>Anthithamnion defectum</i>					✓
<i>Choreocolax polysiphoniae</i>					✓
<i>Leptofauchoea pacifica</i>					✓
<i>Polysiphonia hendryi</i>					✓
<i>Pterosiphonia bipinnata</i>					✓
<i>P. gracilis</i>					✓
Cnidaria					
Hydrozoa spp.					✓
Anthozoa spp.					✓
Nemertea spp.	✓	✓	✓	✓	✓
Nematoda spp.				✓	✓
Mollusca					
Gastropoda					
<i>Aglaia diomedea</i>				✓	
<i>Amphissa columbiana</i>					✓
<i>Calliostoma</i> sp.				✓	
<i>Lacuna variegata</i>				✓	✓
<i>Nassarius rendicus</i>					✓
<i>Odostomia</i> sp.					✓
<i>Trichotropsis cancellata</i>					✓
Bivalvia					
<i>Clinocardium nuttallii</i>				✓	✓
<i>Hiatella arctica</i>					✓
<i>Lucinoma tenuisculpta</i>				✓	✓
<i>Macoma</i> sp.				✓	✓
<i>Mysella tumida</i>				✓	✓
<i>Semele rubropicta</i>			✓		
<i>Solen sicarius</i>				✓	✓
<i>Tellina</i> sp.				✓	✓
<i>Transemella tantilla</i>					✓
Annelida					
<i>Oligochaeta</i> spp.	✓	✓	✓	✓	✓
Polychaeta					
Capitellidae					
<i>Capitella capitata</i>				✓	✓
<i>Decamastus gracilis</i>					✓
<i>Mediomastus</i> sp.				✓	✓
<i>Notomastus lineatus</i>				✓	✓
Chrysotellidae spp.					✓
Cirratulidae					
<i>Chaetozone setosa</i>				✓	
<i>Tharyx</i> sp.					✓
Flabelligeridae					
<i>Pherusa plumosa</i>					✓
Glyceridae					
<i>Glycera capitata</i>					✓
<i>Hemipodus borealis</i>			✓		✓

KYDAKA BEACH

	+6'	+3'	+0'	-5m	-10m
Goniadidae					
<i>Glycinde picta</i>				✓	✓
Hesionidae					
<i>Micropodarke dubia</i>					✓
Lumbrineridae					
<i>Lumbrineris</i> sp.					✓
Magelonidae					
<i>Magelona piteikai</i>				✓	
Maldanidae					
<i>Axiothella rubrocincta</i>				✓	
<i>Euclymene</i> sp.				✓	✓
<i>Nicomache personata</i>					✓
Nephtyidae					
<i>Nephtys caeca</i>				✓	✓
<i>N. caecoides</i>				✓	✓
<i>N. californiensis</i>		✓	✓	✓	✓
Nereidae					
<i>Nereis procera</i>				✓	
<i>Platynereis bicanaliculata</i>				✓	✓
Onuphiidae					
<i>Onuphis elegans</i>				✓	✓
<i>O. iridescens</i>					✓
<i>O. stigmatis</i>				✓	✓
Opheliidae					
<i>Armandia brevis</i>		✓	✓	✓	✓
Orbiniidae					
<i>Naineris uncinata</i>					✓
<i>Scoloplos</i> sp.				✓	✓
Oweniidae					
<i>Owenia fusiformis</i>			✓	✓	✓
Paraonidae					
<i>Paraonella platybranchia</i>			✓	✓	
Pectinariidae					
<i>Pectinaria granulata</i>					✓
Phyllodoceidae					
<i>Eteone longa</i>			✓		✓
<i>Eulalia viridis</i>				✓	
<i>Phyllodoce castanea</i>					✓
<i>P. groenlandica</i>					✓
<i>P. maculata</i>					✓
<i>P. multiseriata</i>					✓
<i>P. sp. A</i>				✓	✓
Polynoidae					
<i>Eunoe senta</i>					✓
<i>Harmothoe imbricata</i>					✓
Sabellidae					
<i>Eudistylia vancouveri</i>					✓
<i>Schizobranchia insignis</i>					✓
Sigalionidae					
<i>Pholoe minuta</i>				✓	✓
<i>Thalenessa spinosa</i>				✓	✓

KYDAKA BEACH

	+6'	+3'	+0'	-5m	-10m
Spionidae					
Laonice cirratus					✓
Malacocegos glutaeus	✓	✓	✓	✓	✓
Polydora caulleryi					✓
P. socialis				✓	✓
P. sp. A					✓
Prionospio cirrifera					✓
P. steenstrupi				✓	✓
Pygospio elegans	✓	✓	✓		✓
Scoelelepis squamata			✓		
Spio filicornis				✓	✓
Spiophanes bombyx				✓	✓
Syllidae					
Exogone gemmifera					✓
E. lourei					✓
Sphaerosyllis pirifera					✓
Streptosyllis latipalpa				✓	
Syllis sp.	✓	✓			✓
Terebellidae					
Thelepus sp.					✓
Sipuncula spp.				✓	
Friapulida					
Priapulus caudatus					✓
Crustacea					
Ostracoda spp.			✓	✓	✓
Leptostraca					
Nebalia pugettensis				✓	✓
Mysidacea					
Archaeomysis grebnitzkii	✓	✓	✓	✓	
Cumacea					
Cumella vulgaris					✓
Diastylis sp.				✓	✓
Diastylopsis sp.				✓	✓
Lampropidae spp.				✓	
Leptocuma sp.				✓	
Tanaidacea					
Anatanaïs normani					✓
Leptochelia dubia	✓	✓	✓		✓
Isopoda					
Cirolana vancouverensis	✓	✓			
Cyathura munda					✓
Edotea sublittoralis				✓	✓
Gnorimosphaeroma oregonense	✓			✓	
Idotea wosnesenskii					✓
Limnoria algarum					✓
Munna stephenseni					✓
Paranthura elegans					✓
Synidotea bicuspidata				✓	

KYDAKA BEACH

	+6'	+3'	+0'	-5m	-10m
Amphipoda					
<i>Ampelisca agassizi</i>				✓	✓
<i>A. macrocephala</i>				✓	✓
<i>Ampithoe humeralis</i>					✓
<i>Aoroides columbiae</i>				✓	✓
<i>Atylus levidensus</i>					✓
<i>A. tridens</i>			✓		
<i>Caprella laeviuscula</i>					✓
<i>Dulichia</i> sp. A				✓	✓
<i>Eohaustorius</i> sp. B				✓	✓
<i>F. washingtonianus</i>		✓	✓		
<i>Erichthonius brasiliensis</i>					✓
<i>Hippomedon</i> sp. A				✓	
<i>Ischyrocerus anguipes</i>	✓	✓			✓
<i>Lepidepcreum</i> sp. A					✓
<i>Megaluropus longimerus</i>				✓	✓
<i>Melita desdichada</i>					✓
<i>Monoculodes spinipes</i>				✓	✓
<i>Najua consiliorum</i>					✓
<i>Orchestoidea pugettensis</i>	✓		✓		
<i>Orchomene</i> sp. A					✓
<i>Paraphoxus epistomus</i>		✓			
<i>P. milleri</i>			✓		
<i>P. vigitegus</i>				✓	
<i>P. spp.</i>			✓	✓	✓
<i>Parapleustes</i> spp.					✓
<i>Photis brevipes</i>				✓	✓
<i>P. sp. A</i>				✓	✓
<i>Pleustes depressa</i>					✓
<i>Pontogeneia rostrata</i>					✓
<i>Protomedeia</i> sp. A				✓	✓
<i>P. sp. B</i>			✓		
<i>Synchelidium shoemakeri</i>				✓	✓
<i>Tiron biocellata</i>		✓			
<i>Tritella pilimana</i>				✓	
<i>Westwoodilla caecula</i>					✓
Decapoda					
<i>Cancer oregonensis</i>				✓	
<i>Callinassidae</i> sp. (juv.)				✓	
<i>Paguridae</i> sp. (juv.)					✓
<i>Pinnotheridae</i> sp. (juv.)				✓	✓
<i>Pugettia gracilis</i>					✓
Insecta					
Diptera larvae	✓				
Phoronida					
<i>Phoronopsis harmeri</i>				✓	✓
Bryozoa spp.					
				✓	✓
Echinodermata					
<i>Ophiuroidea</i> sp. (juv.)					✓
Echinoidea					
<i>Dendraster excentricus</i>				✓	
Holothuroidea					
<i>Leptosynapta clarki</i>				✓	✓

Table 10. Jamestown (protected sand). Complete list of all benthic organisms collected spring 1976 through winter 1978. Checks indicate tide heights where organism was found.

	+6'	+1.4'	+0'	-5m	-10m
Chlorophyta					
Chaetomorpha californica				✓	✓
Cladophora pygmaea				✓	✓
Endocladia viridis					✓
Enteromorpha intestinalis	✓				
E. linza	✓	✓			
E. prolifera	✓		✓		
Monostroma sp.			✓		
Ulva taeniata		✓			
U. spp.	✓	✓	✓		
Urospora sp.			✓		
Bacillariophyta					
Pennales spp.		✓		✓	
Phaeophyta					
Cymathere triplicata				✓	
Desmarestia sp.				✓	
Ectocarpus sp.					✓
Laminaria saccharina				✓	
Ralfsia sp.				✓	✓
Stictyosiphon tortilis					✓
Syringoderma abyssicola					✓
Rhodophyta					
Antithamnion glandulifera				✓	
Asterocolax gardneri					✓
Bangia tenuis				✓	
Callithamnion/Pleonosporium				✓	✓
Callophyllis flabellulata				✓	✓
C. haenophylla					✓
C. marginata				✓	
Ceramium californicum				✓	
C. eatorianum		✓			
C. washingtoniense	✓		✓		
Choreocolax polysiphoniae				✓	
Delesseriaceae spp.			✓		
Euthora fruticulosa				✓	✓
Faucheia laciniata				✓	
Goniotrachum alsidii					✓
Gracilaria sjoestedtii				✓	
G. verrucosa			✓	✓	✓
Gymnogongrus leptophyllus				✓	
Halymenia californica				✓	
Herposiphonia grandis				✓	✓
Hymenena sp.			✓	✓	
H. flabelligera				✓	
Iridaea sp.				✓	
Membranoptera platyphylla					✓
Neogradhiella baileyi				✓	
Neoptilota asplenoides				✓	
Nitophyllum sp.				✓	
Peyssonellia pacifica				✓	✓
Platythamnion heteromorphum					✓
P. pectinatum					✓

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
Platythamnion reversum				✓	
P. villosum					✓
Plocamium coccineum				✓	
P. tenue				✓	
Polyneura latissima				✓	✓
Polysiphonia hendryi	✓		✓	✓	✓
P. pacifica				✓	
Porphyra sp.	✓		✓	✓	
Pterosiphonia bipinnata			✓		✓
P. dendroidea			✓	✓	
Rhodoglossum roseum				✓	
Rhodoptilum plumosum					✓
Rhodymenia palmata			✓	✓	
Seagelia occidentale				✓	✓
Stenogramme interrupta				✓	✓
Spermatophyta					
Zostera marina			✓	✓	
Porifera					
spp.				✓	
Cnidaria					
Hydrozoa					
spp.				✓	
Coryne sp.		✓			
Anthozoa					
spp.		✓	✓	✓	✓
Halcyon decententaculata			✓	✓	✓
Platyhelminthes					
Turbellaria spp.					✓
Nemertea					
spp.	✓	✓	✓	✓	✓
Paranemertes peregrina	✓	✓	✓		
Nematoda					
spp.	✓	✓	✓	✓	✓
Mollusca					
Amphineura					
Mopalia lignosa				✓	
Tonicella sp.				✓	
Gastropoda					
Aeolididae					
sp.			✓		✓
Aglaia diomedea		✓			
Alvinia sp.			✓	✓	✓
Amphissa columbiana					✓
Bittium eschrichtii				✓	
Boreotrophon orr us					✓
Calyptraea fastigata				✓	✓
Cerithiopsis sp.				✓	
Collisella ochracea				✓	
Lacuna variegata	✓	✓	✓	✓	✓
Margarites pupillus				✓	✓
Nassarius mendicus					✓
Natica clausa				✓	✓

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
<i>Odostomia</i> sp.					✓
<i>Oenopota</i> <i>tabulata</i>					✓
<i>Polinices</i> <i>pallidus</i>					✓
<i>Thais</i> sp.				✓	
<i>Trichotropis</i> <i>cancellata</i>					✓
<i>Turbonilla</i> sp.				✓	✓
Bivalvia					
<i>Cardita</i> <i>ventricosa</i>				✓	✓
<i>Chlamys</i> <i>hastata</i>					✓
<i>Clinocardium</i> <i>nuttallii</i>				✓	✓
<i>Crenella</i> <i>decussata</i>		✓		✓	✓
<i>Cryptomya</i> <i>californica</i>			✓		
<i>Lucinoma</i> <i>tenuisculpta</i>					✓
<i>Lysonia</i> <i>californica</i>					✓
<i>Macoma</i> <i>balthica</i>			✓		
<i>M. crassula</i>				✓	
<i>M. inquinata</i>		✓	✓		
<i>M. nasuta</i>	✓	✓	✓	✓	✓
<i>Modiolus</i> <i>rectus</i>				✓	
<i>Musculus</i> <i>discors</i>				✓	✓
<i>Mya</i> <i>arenaria</i>				✓	✓
<i>Mysella</i> <i>tumida</i>		✓	✓	✓	✓
<i>Mytilus</i> <i>edulis</i>		✓	✓		
<i>Nuculana</i> <i>hamata</i>					✓
<i>Nuculana</i> <i>minuta</i>					✓
<i>Nucula</i> <i>tenuis</i>				✓	
<i>Protothaca</i> <i>staminea</i>			✓	✓	✓
<i>Psephidia</i> <i>lordi</i>			✓	✓	✓
<i>Solen</i> <i>sicarius</i>					✓
<i>Tellina</i> sp.					✓
<i>Trachycardium</i> sp.				✓	
<i>Transennella</i> <i>tantilla</i>	✓	✓	✓	✓	✓
<i>Tresus</i> <i>capax</i>			✓	✓	✓
<i>Yoldia</i> sp.					✓
Annelida					
<i>Oligochaeta</i> spp.	✓	✓	✓	✓	✓
<i>Archiannelida</i>					
<i>Polygordiidae</i>					
<i>Polygordius</i> sp.				✓	✓
<i>Polychaeta</i>					
<i>Ampharetidae</i>					
<i>Ampharete</i> <i>arctica</i>				✓	✓
<i>Apistobrachidae</i>					
<i>Apistobrachus</i> sp.					✓
<i>Arenicolidae</i>					
<i>Branchiomaldane</i> <i>vincenti</i>			✓		
<i>Capitellidae</i>					
<i>Capitella</i> <i>capitata</i>	✓	✓	✓	✓	✓
<i>Mediomastus</i> sp.		✓	✓	✓	✓
<i>Notomastus</i> <i>lineatus</i>				✓	
<i>N. tenuis</i>				✓	✓

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
Chaetopteridae					
Phyllochaetopterus prolifica				✓	✓
Spirochaetopterus costarum				✓	✓
Cirratulidae					
Chaetozone setosa				✓	✓
Cirratulus cirratus		✓	✓	✓	✓
Tharyx multifiliis			✓	✓	✓
Dorvilleidae					
Dorvillea rudolphi			✓	✓	
Protodorvillea gracilis			✓	✓	✓
Eunicoidea					
sp.			✓		
Glyceridae					
Glycera americana				✓	✓
G. capitata				✓	✓
G. tessellata				✓	
Hemipodus borealis		✓		✓	✓
Goniadidae					
Glycinde picta		✓	✓	✓	✓
Goniada maculata					✓
Hesionidae					
Hesionid sp. A				✓	✓
Gyptis brevipalpa			✓		✓
Micropodarke dubia		✓		✓	✓
Ophiodromus pugettensis			✓		✓
Lumbrineridae					
Lumbrineris inflata		✓	✓		✓
Maldanidae					
Axiocheila rubrocincta			✓	✓	✓
Euchonea delineata			✓		
Nicomache personata				✓	✓
Nephtyidae					
Nephtys caeca		✓	✓		
N. caecoides		✓	✓		
N. californiensis		✓	✓		✓
N. ciliata					✓
Nereidae					
Nereis paucidentata			✓		
N. pelagica					✓
N. procera				✓	✓
N. vexillosa	✓		✓		
Platynereis bicanaliculata	✓	✓	✓	✓	✓
Onuphidae					
Onuphis iridescent			✓	✓	✓
O. stigmatis		✓	✓	✓	✓
Opheliidae					
Ammotrypane sulogaster					✓
Armandia brevis		✓	✓	✓	✓
Travisia forbesii				✓	✓

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
Orbiniidae					
<i>Naineris dendritica</i>			✓		
<i>N. quadricuspida</i>			✓		
<i>N. uncinata</i>			✓		
<i>Scoloplos</i> spp.		✓	✓	✓	✓
Oweniidae					
<i>Owenia fusiformis</i>				✓	✓
Paraonidae					
<i>Aricidea</i> sp.			✓	✓	✓
<i>Paraonella platybranchia</i>		✓			
Pectinariidae					
<i>Pectinaria granulata</i>					✓
Phyllodocidae					
<i>Eteone longa</i>		✓	✓	✓	✓
<i>E. tuberculata</i>		✓	✓		
<i>Eulalia bilineata</i>			✓		
<i>E. nigramaculata</i>			✓		
<i>E. sanguinea</i>		✓	✓	✓	✓
<i>Phyllodoce groenlandica</i>				✓	✓
<i>P. maculata</i>	✓	✓	✓	✓	✓
<i>P. sp. A</i>					✓
Polynoidae					
<i>Eunoe</i> sp.			✓	✓	
<i>Harmothoe imbricata</i>	✓	✓	✓	✓	✓
<i>H. lunulata</i>			✓	✓	✓
Sabellidae					
<i>Chone ecaudata</i>				✓	✓
<i>C. gracilis</i>					✓
<i>Euchone analis</i>					✓
<i>Eudistylia vancouveri</i>				✓	✓
<i>Laonome</i> sp.					✓
<i>Potamilla intermedia</i>				✓	✓
<i>P. myriops</i>					✓
<i>Sabella media</i>				✓	✓
<i>Sabellastarte</i> sp.					✓
Scalebregmidae					
<i>Scalebregma inflata</i>				✓	✓
Serpulidae					
<i>Spirorbis</i> sp.					✓
Sigalionidae					
<i>Pholoe minuta</i>				✓	✓
Sphaerodoridae					
<i>Sphaerodoropsis minuta</i>			✓		✓
Spionidae					
<i>Laonice cirrata</i>			✓		✓
<i>Malacocerus glutaeus</i>		✓	✓	✓	✓
<i>Polydora</i> sp. A					✓
<i>P. kempji japonica</i>		✓			
<i>P. quadrilobata</i>		✓		✓	✓
<i>P. socialis</i>				✓	✓
<i>Prionospio cirrifer</i>		✓		✓	✓
<i>P. enstrupi</i>			✓	✓	✓
<i>Pygospio elegans</i>		✓	✓		

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
<i>Scolecopsis</i> sp. C		✓			
<i>Spio filicornis</i>		✓	✓	✓	✓
<i>Spiophanes berkeleyorum</i>			✓	✓	✓
<i>S. bombyx</i>		✓		✓	✓
Syllidae					
<i>Brania brevipharyngea</i>			✓		
<i>Exogone gemmifera</i>			✓	✓	✓
<i>E. lourei</i>	✓	✓	✓	✓	✓
<i>Pionosyllis uraga</i>				✓	
<i>Sphaerosyllis brandhorsti</i>			✓	✓	
<i>S. pirifera</i>			✓	✓	✓
<i>Streptosyllis latipalpa</i>		✓	✓		
<i>Syllides longocirrata</i>			✓	✓	✓
<i>Syllis alternata</i>				✓	
Terebellidae					
<i>Eupolyornia heterobranchia</i>			✓	✓	
<i>Neoamphitrite</i> sp.			✓		
<i>Nicolea zostericola</i>			✓	✓	✓
<i>Pista brevibranchiata</i>		✓	✓		✓
<i>P. cristata</i>					✓
<i>Polycirrus</i> sp. A				✓	✓
<i>Proclea graffi</i>					✓
<i>Thelepus crispus</i>			✓		
<i>Hirudinea</i> sp.			✓		
Sipunculida					
<i>Golfingia pugettensis</i>			✓	✓	✓
<i>Phascolosoma agassizii</i>				✓	✓
Priapulida					
<i>Priapulus caudatus</i>					✓
Crustacea					
Ostracoda					
spp.			✓	✓	✓
Leptostraca					
<i>Nebalia pugettensis</i>			✓		✓
Mysidacea					
<i>Acanthomysis sculpta</i>				✓	
<i>Archaeomysis grebnitzkii</i>			✓		
Cumacea					
<i>Cumella vulgaris</i>	✓	✓	✓	✓	✓
<i>Dyastylis</i> sp.				✓	✓
<i>Dyastylopsis</i> sp.	✓	✓			
<i>Eudorella</i> sp.		✓	✓	✓	
<i>Eudorellopsis</i> sp.					✓
<i>Lampropidae</i> spp.				✓	✓
<i>Lamrops</i> sp.				✓	
<i>Leptocuma</i> sp.			✓		
<i>Leptostylis</i> sp.					✓
Tanaidacea					
<i>Leptochelia dubia</i>	✓	✓	✓	✓	✓

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
Isopoda					
<i>Dynamenella shearer</i>	✓				
<i>Exosphaeroma amplicauda</i>			✓	✓	
<i>E. media</i>		✓	✓	✓	✓
<i>E. rhomburum</i>				✓	✓
<i>Gnorimosphaeroma oregonense</i>					✓
<i>Idotea</i> sp. (juv)			✓		
<i>Jaeropsis dubia</i>				✓	✓
<i>Munna</i> sp.				✓	
<i>Munnogonium waldronense</i>					✓
<i>Paranthura elegans</i>				✓	✓
<i>Phyllodurus abdominalis</i>			✓		
<i>Synidotea bicuspidata</i>			✓		
Amphipoda					
<i>Ampelisca agassizi</i>		✓			
<i>A. cristata</i>				✓	✓
<i>A. pugetica</i>			✓	✓	✓
<i>Ampithoe lacertosa</i>		✓	✓		
<i>Anisogammarus confervicolus</i>		✓			
<i>A. pugettensis</i>			✓		
<i>Anonyx laticoxae</i>				✓	
<i>Aoroides columbiae</i>			✓	✓	✓
<i>Argissa hamatipes</i>				✓	✓
<i>Atylus collingi</i>			✓		
<i>A. tridens</i>				✓	
<i>Byblis veleronis</i>					✓
<i>Calliopliella pratti</i>			✓		
<i>Caprella laeviuscula</i>		✓	✓		
<i>Corophium acherusicum</i>		✓			
<i>C. crassicorne</i>				✓	✓
<i>C. salmonis</i>	✓	✓			
<i>Guernea</i> sp. A				✓	✓
<i>Hippomedon</i> sp. A					✓
<i>Ischyrocerus anguipes</i>			✓	✓	
<i>Lepidepcreum</i> sp. A				✓	✓
<i>Melita dentata</i>			✓	✓	✓
<i>Orchomene</i> sp. A				✓	✓
<i>Paraphoxus cognatus</i>			✓		
<i>P. robustus</i>				✓	
<i>P. similis</i>			✓		
<i>P. spinosus</i>		✓	✓		
<i>P. spinosus</i> type A			✓		
<i>P. spinosus/obtusidens</i>			✓		
<i>P. tridentatus</i>					
<i>Parapleustes</i> sp.				✓	✓
<i>Photis brevipes</i>			✓	✓	
<i>P.</i> sp. D				✓	
<i>Pleusirus securus</i>				✓	
cf. <i>Podoceropsis inaequistylis</i>				✓	
<i>Pontogeneia</i> cf. <i>ivanovi</i>			✓	✓	✓
<i>Pontogeneia</i> cf. <i>rostrata</i>		✓	✓	✓	
<i>P.</i> sp. D			✓		

JAMESTOWN

	+6'	+1.4'	+0'	-5m	-10m
Protomedeia sp. A			✓	✓	
Stenothoides beringiensis				✓	
Synchelidium rectipalmum			✓	✓	✓
S. shoemakeri			✓	✓	✓
Tiron biocellata				✓	✓
Tritella pilimana			✓		
Westwoodiella caecula				✓	
Decapoda					
Argis dentata					✓
Cancer gracilis				✓	
Crangon franciscorum		✓			
C. munitella				✓	✓
C. nigricauda		✓	✓		
Heptacarpus stimpsoni				✓	
H. tenuissimus			✓		
Oregonia gracilis				✓	
Pagurus beringanus					✓
Pinnixa littoralis			✓		
Pugettia gracilis	✓		✓	✓	✓
P. producta				✓	
Scleroplax granulata				✓	
Spirontocaris prionota				✓	
Telemessus cheiragonus			✓		
Upogebia pugettensis		✓	✓	✓	
Insecta					
Dipteran larvae	✓		✓		
Dolichopodidae spp.	✓				
Phoronida					
Phoronis iijimai			✓	✓	✓
Phoronopsis harmeri			✓		✓
Bryozoa					
spp.					✓
Echinodermata					
Holothuroidea					
Cucumaria sp.					✓
Eupentacta pseudoquinquesemita				✓	
Leptosynapta clarki		✓	✓	✓	✓
Molpadia intermedia				✓	✓
Ophiuroidea					
spp.			✓	✓	✓
Amphiodia urtica			✓		
Amphipholus squamata			✓		
Diamphiodia periercta			✓		

APPENDIX III

PHYSICAL PARAMETERS

Table 1. Second year (1977-78) physical factor data on salinity, water and air temperature, weather, and sampling date.

	North Beach Sand	North Beach Cobble	Beckett Point	Jamestown	Duquenois Spit	Horse Creek	Tongue Point	Twin River	Pillar Point	Kydeba Beach
<u>Salinity ‰</u>										
Spring 1977	31.4	30.2	31.0	30.6	32.9	29.1	32.3	30.8	32.5	26.5
Summer 1977	30.5	-	31.2	30.3	29.9	23.9	33.2	-	-	30.9
Fall 1977	30.1	-	30.5	30.2	29.1	30.1	30.9	-	-	30.3
Winter 1978	28.5	-	30.1	29.3	30.3	29.9	28.7	-	-	20.1
<u>Water Temperature °C</u>										
Spring 1977	12.0	10.3	10.6	10.5	10.4	8.8	8.2	no data	10.4	8.1
Summer 1977	12.4	-	11.2	14.2	11.1	11.2	8.5	-	-	9.0
Fall 1977	6.5	-	7.8	7.4	7.5	7.8	7.3	-	-	8.0
Winter 1978	6.2	-	6.2	5.8	6.3	7.5	5.5	-	-	7.8
<u>Air Temperature °C</u>										
Spring 1977	12.0	10.7	12.0	8.6	12.6	8.5	10.3	no data	9.0	9.0
Summer 1977	16.9	-	13.0	19.5	10.9	12.0	12.2	-	-	11.4
Fall 1977	6.5	-	6.4	5.7	7.8	5.4	4.3	-	-	5.0
Winter 1978	6.2	-	5.9	1.4	5.6	11.8	5.0	-	-	6.8
<u>Precipitation (✓-light, // -moderate, /// -heavy)</u>										
Spring 1977	0	0	0	✓	0	0	0	no data	0	0
Summer 1977	0	-	0	0	0	✓	0	-	-	0
Fall 1977	0	-	0	0	✓	✓	///	-	-	0
Winter 1978	///	-	0	0	✓	✓	///	-	-	✓

	North Beach Sand	North Beach Cobble	Beckett Point	Jamestown	Dungeness Spit	Morse Creek	Tongue Point	Twin Rivers	Pillar Point	Kodak Beach
<u>Date (GMT)</u>										
Spring 1977	8 May	7 April	6 April	8 April	7 May	4 May	6 May	3 May	5 May	5 April
Summer 1977	29 July	-	1 July	28 June	27 July	28 July	10 June	-	-	29 June
Fall 1977	15 Nov.	-	19 Oct.	17 Oct.	12 Nov.	13 Nov.	16 Oct.	-	-	15 Oct.
Winter 1978	10 Jan.	-	11 Jan.	7 Jan.	9 Jan.	6 Feb.	8 Jan.	-	-	8 Feb.

Table 2. Sediment Type by Study Area - Tide Height

Study Area	Tide Height	+6'	+3'	+0'	-5m	-10m
Tongue Point	rock	rock	rock	rock	rock	rock
Pillar Point	rock	rock	rock	rock	fine-med sand	fine-med sand
North Beach Cobble	cobble/sand gravel	cobble/sand	cobble/sand	cobble/sand	--	--
Morse Creek	cobble/sand- gravel	cob /sand	cobble/sand	cobble/sand	cobble/gravel	cobble/gravel
Beckett Point	sand-gravel	sand-gravel	sand-gravel	fine-med sand	fine-med sand	fine-med sand
Dungeness Spit	sand-gravel	sand-gravel	sand-gravel	sand-gravel	sand-gravel	sand-gravel
Twin Rivers	sand-gravel	sand-gravel	sand-gravel	sand-gravel	gravel	fine sand-silt
North Beach Sand	fine-med sand	fine-med sand	fine-med sand	(+2') fine-med sand	cobble/sand- gravel	cobble/sand- gravel
Kydaka Beach	fine-coarse sand	fine-coarse sand	fine-coarse sand	fine-coarse sand	fine-med sand	fine-med sand
Jamestown	sand-gravel	fine sand	fine sand	(+1.4') med sand	fine-coarse sand	fine-coarse sand

KYDAKA BEACH
STUDY AREA

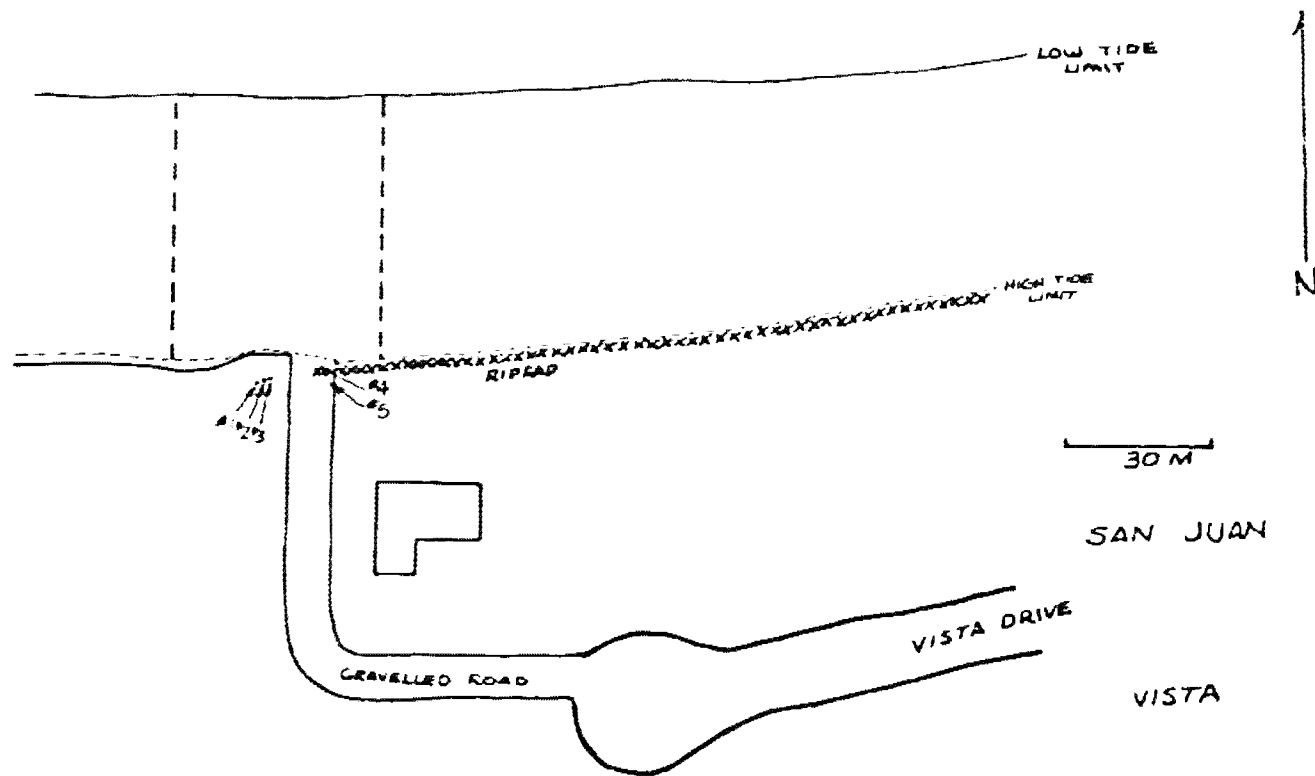
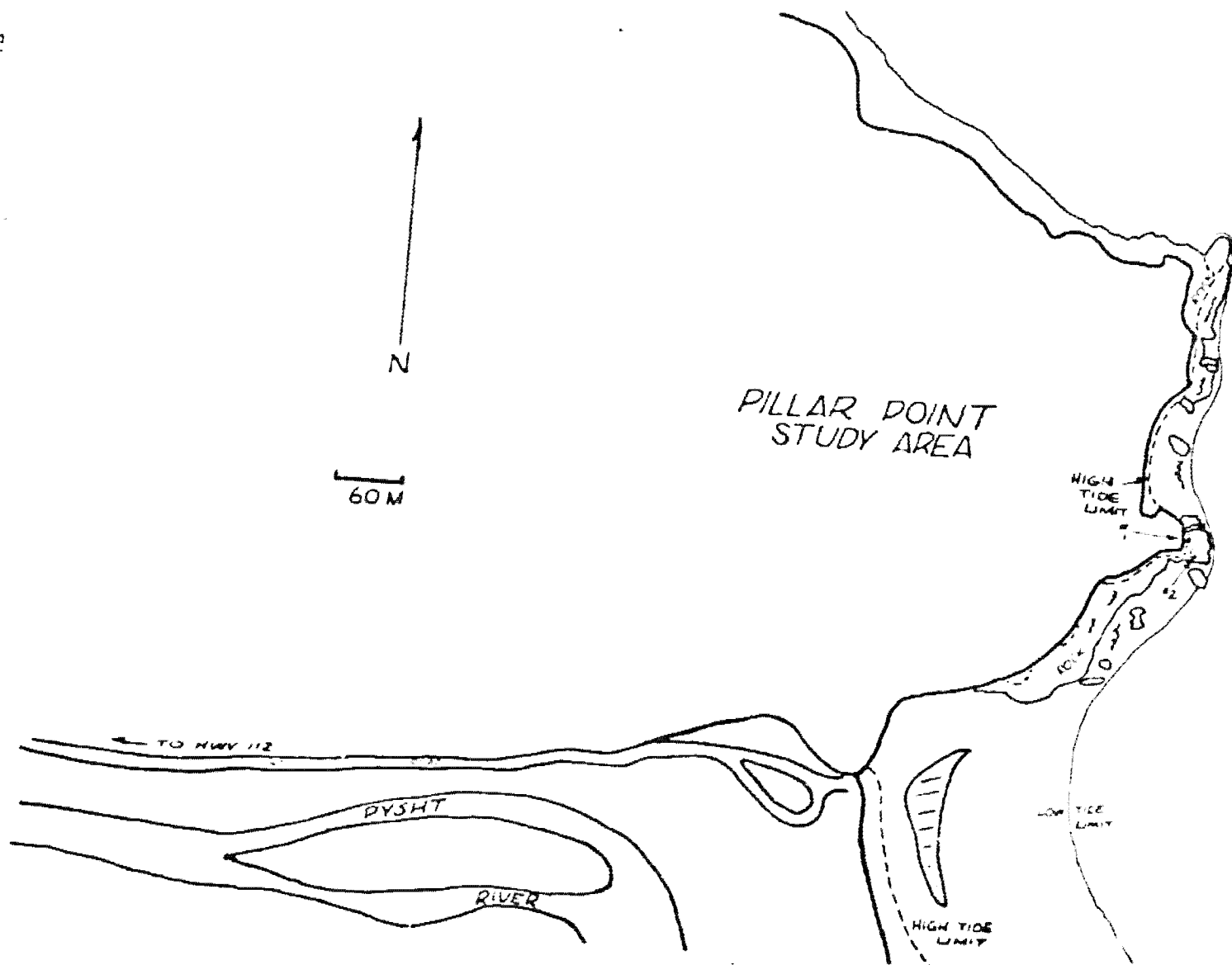


Figure 1.

Figure 2



TWIN RIVERS STUDY AREA

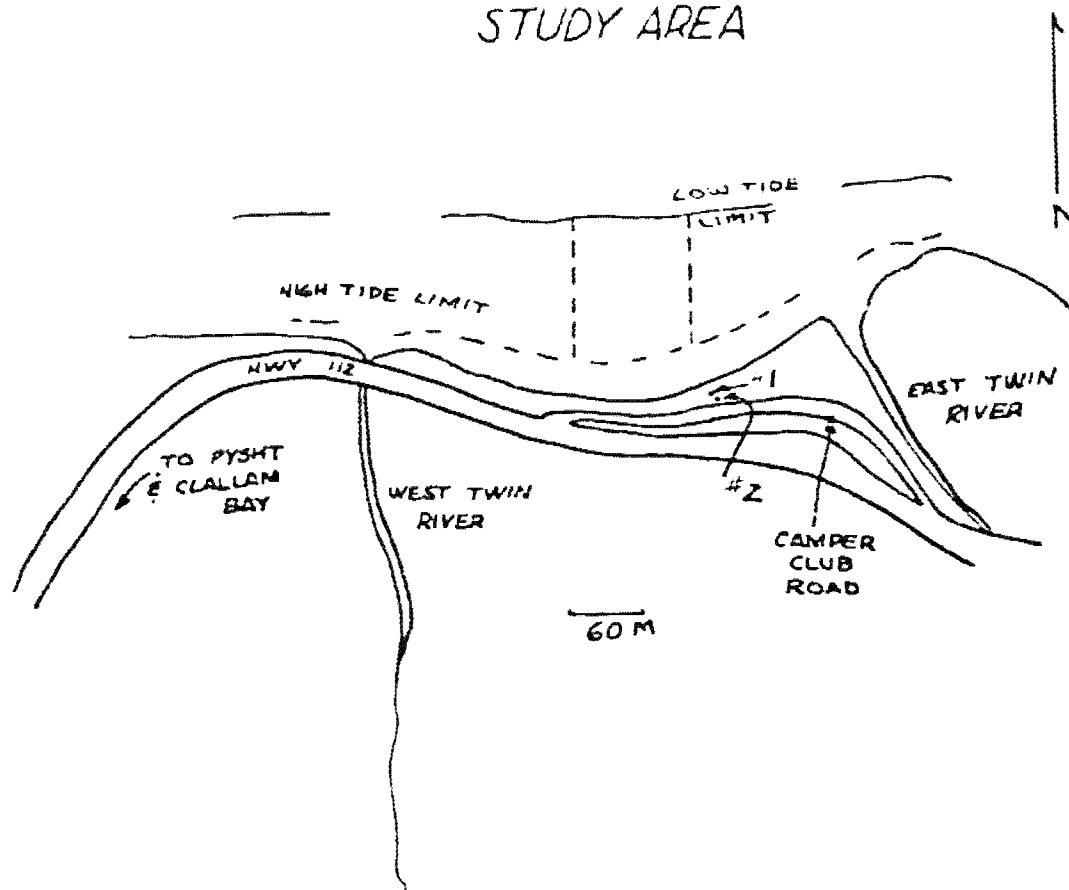


Figure 3

TONGUE POINT STUDY AREA

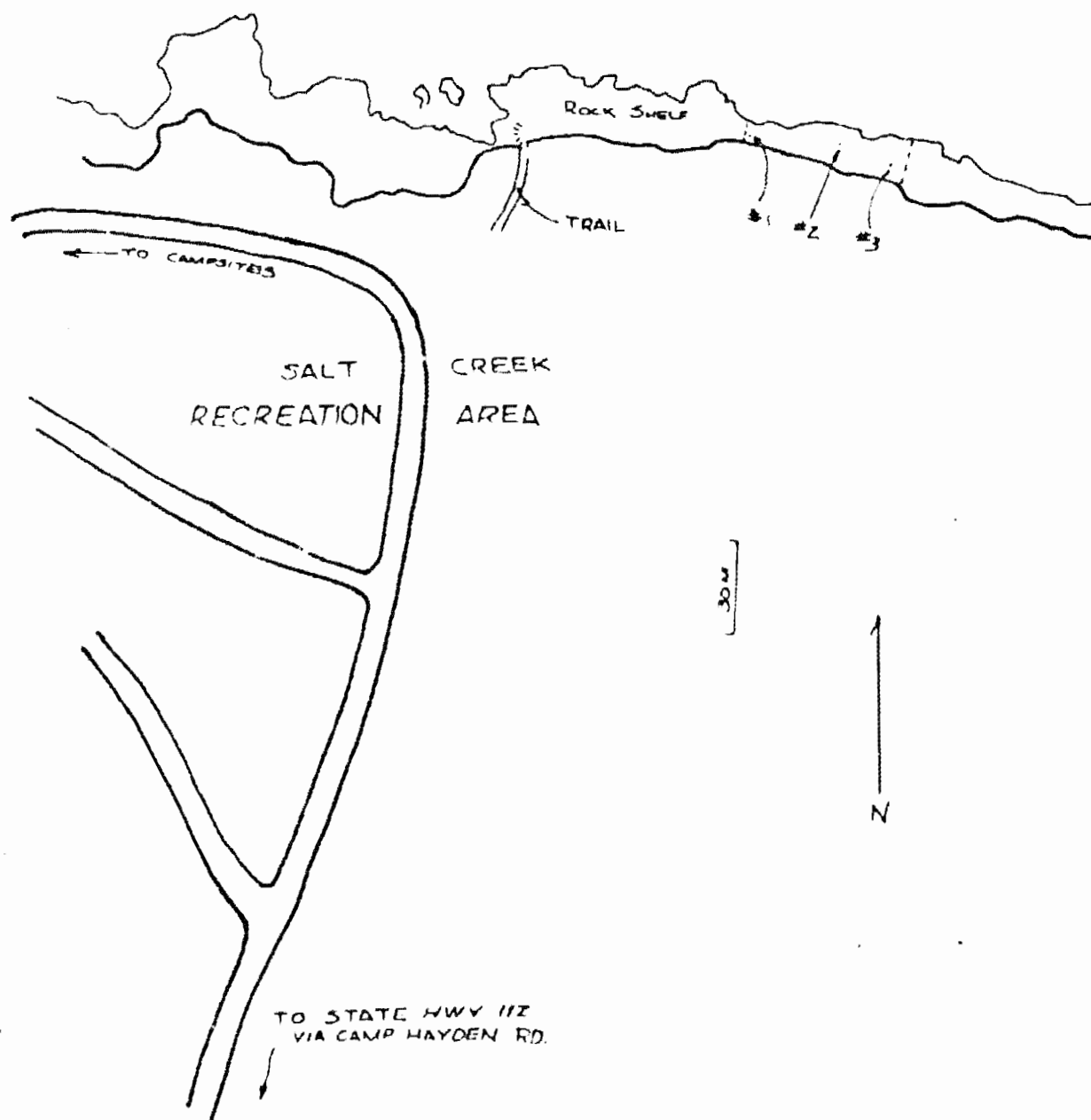


Figure 4.

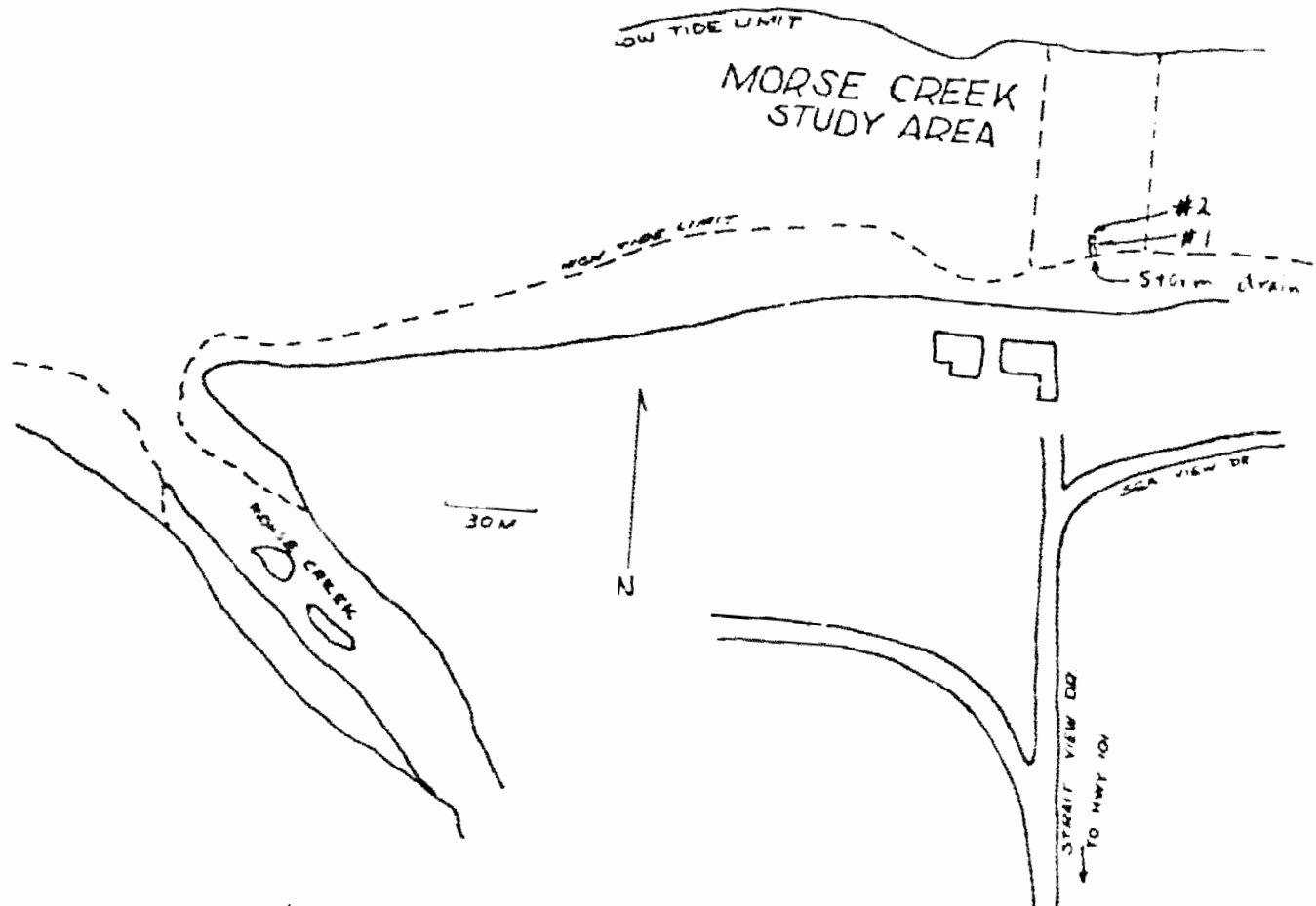


Figure 5.

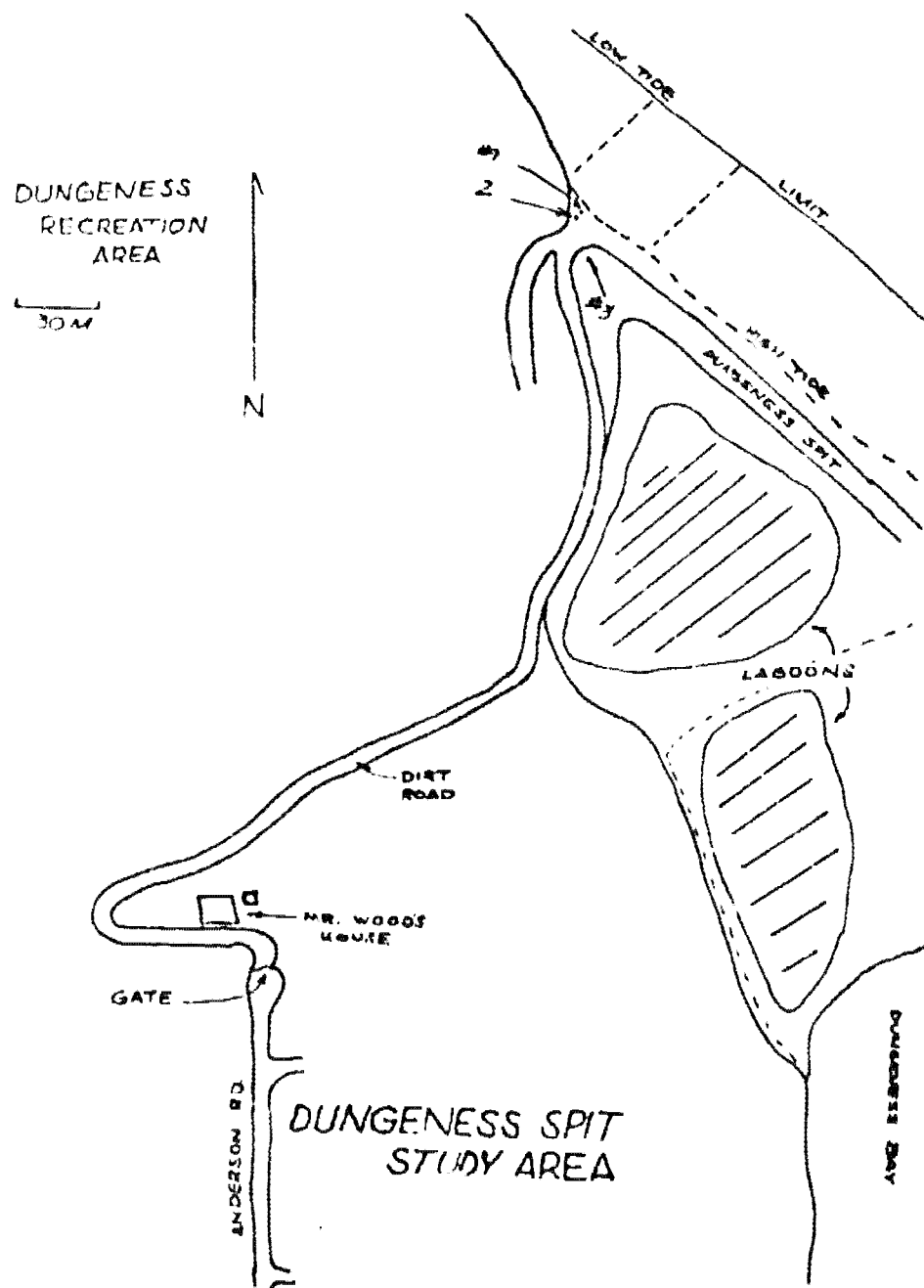
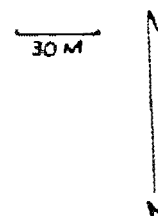
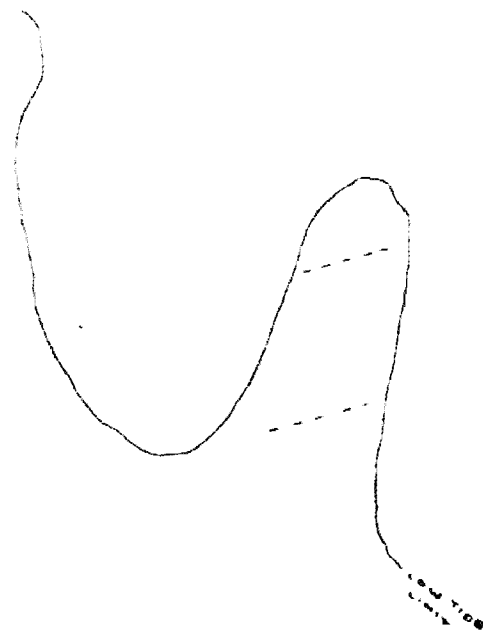


Figure 6.



JAMESTOWN STUDY AREA

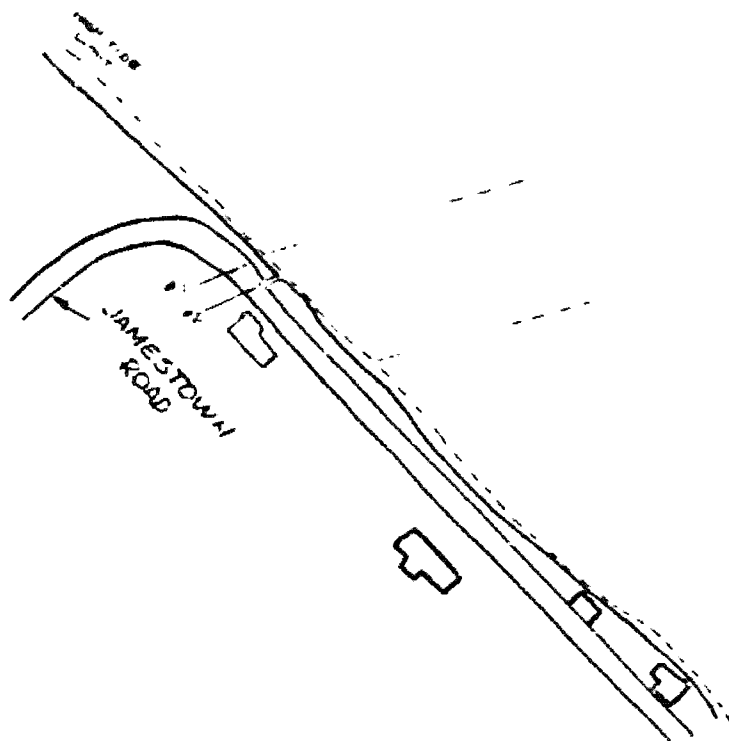


Figure 7

FIGURE 2

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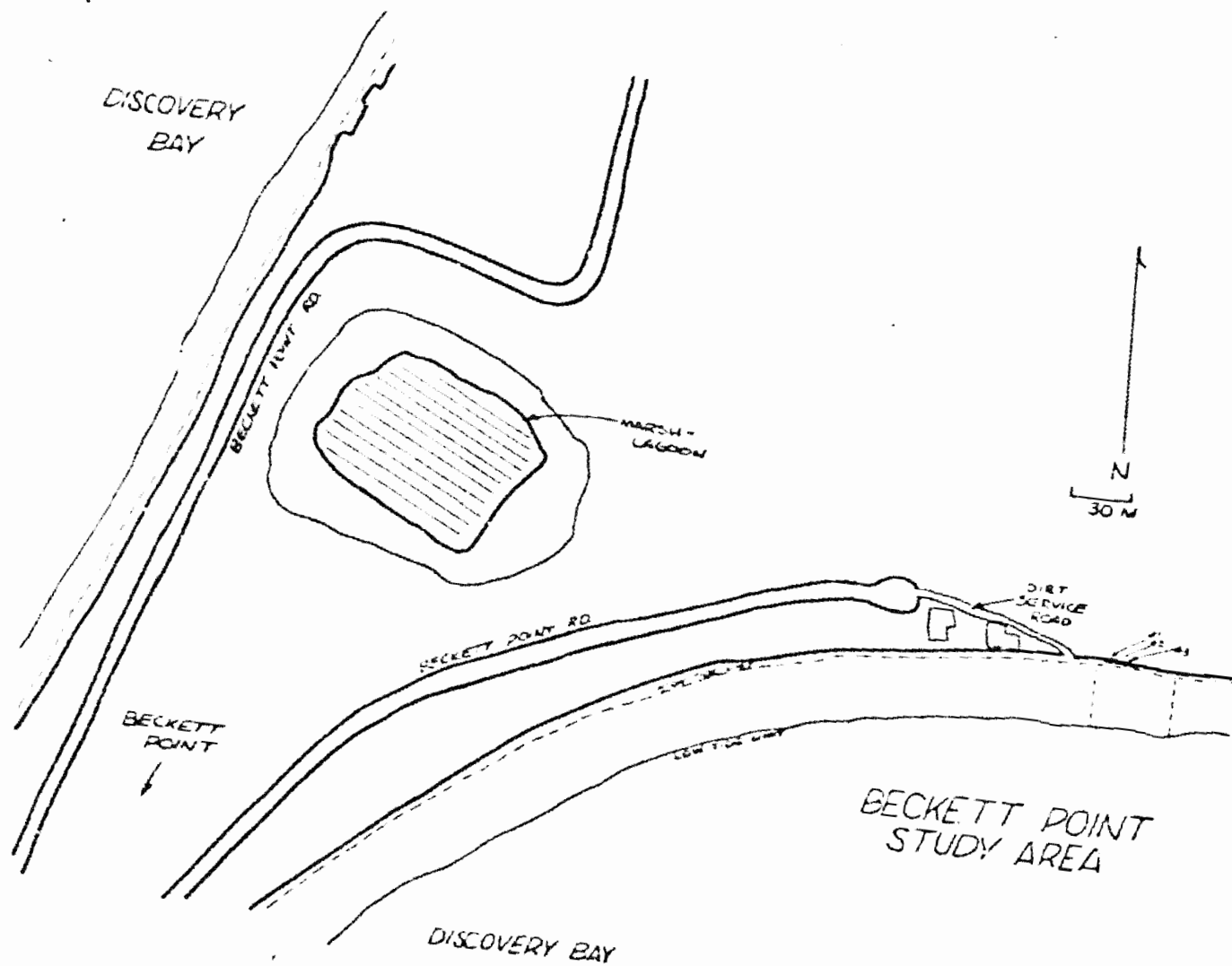


Figure 9

