AN ABSTRACT OF THE THESIS OF

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Title: ZOOPLANKTON AND HYDROGRAPHY OF ALSEA BAY, OREGON, SEPTEMBER 1966 TO SEPTEMBER 1968

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Zooplankton and water were sampled from four stations in Alsea Bay ($124^{\circ}04'45''$ W. Long., $44^{\circ}26'22''$ N. Lat.) during September 1966 to September 1968. Salinity, dissolved oxygen and temperature were measured from bottom and surface samples. Zooplankton were taken with oblique tows of a #6 mesh net (0.239 mm aperture) attached to a Clarke-Bumpus plankton sampler.

The structure of the bay, tidal changes, and stream flow all affect the amount and salinity of water in the bay. The bay is shallow; the semi-diurnal tides have a mean range of 5.8 feet and a diurnal range of 7.7 feet (U.S.C. & G.S., 1965, 1966, 1967). Thus water volume in the bay at a 6 foot tide is approximately 3.8 times that at a zero foot tide. Stream flow is high in the winter and low in late summer-early fall; flow varies from over 10,000 cfs to less than 100 cfs in the Alsea River (U.S.G.S., 1967, 1968, 1969). Twice in the winter, on December 7, 1966 and February 19, 1967 , at low

tides, salinities less than 2‰ were found in bottom water (10.0 m or more) at the mouth (station 1) of Alsea Bay; stream flow was greater than 3,000 cfs. Even on a summer minus tide such as on August 5, 1968, when stream flow was 136 cfs, bottom (9.0 m) salinity at station 1 was as low as 26.12‰.

Over the sampling period, the most important member (numerically) of the zooplankton in Alsea Bay was the calanoid copepod _Acartia clausi_. It accounted for 40% of the total number of zooplankton in 326 samples taken over the two year sampling period from the four stations. The population maximum of _Acartia clausi_ was estimated at 37,000 per cubic meter of water at station 2 on July 29, 1968, when recently upwelled water ($\sigma_T \geq 25.5$) was present. The species was found throughout the bay; it was found least in winter samples.

Barnacle nauplii and the calanoid copepods _Pseudocalanus_ sp. and _Acartia longiremis_ accounted respectively for 11%, 8.1%, and 5.2% of the total number of zooplankton. As with _Acartia clausi_, barnacle nauplii were found throughout the bay and least in winter samples. Similarly, _Acartia longiremis_ was found least in winter samples. _A. longiremis_ and _Pseudocalanus_ sp. were found more commonly downstream and are thought to enter the bay with incoming tides.

For Alsea Bay, certain zooplankters may be considered as types of indicator species. The calanoid copepod Paracalanus parvus, the cyclopoid copepod Corycaeus sp., and the chordate group, Larvacea and larval Ascidacea, are three such groups that were found mostly in fall samples and least in summer samples; these zooplankters were found predominantly downstream and are thought to be representatives of warmer water than that normally found along the Oregon coast during the summertime. The calanoid copepods Clausocalanus spp. and Ctenocalanus vanus were found more in winter samples and are thought to represent oceanic water of a warmer temperate-subtropical origin.

The calanoid copepod Eurytemora sp. was found least in winter; this species was found usually upstream in the bay. Its highest population was estimated at 2,000 per cubic meter at station 1 on June 26, 1968, when sampling was done at a minus tide. The combination of minus tide and moderately low but sufficient stream flow was apparently enough to move the other more downstream zooplankton populations out to sea. The above is one indication that flushing in Alsea Bay during minus tides may allow only the establishment of zooplankton population members such as Eurytemora sp., barnacle nauplii, and Acartia clausi in the bay.

The calanoid copepod Acartia tonsa was not found in samples from summer 1967 but was found in samples from summer 1968.

Other measurements too showed the summers to be different. Bottom water at station 1 was less saline and warmer the second summer. In addition, more rain fell the second summer; furthermore, winds had a greater onshore component the second summer. The data show that samples taken for two consecutive summers can be quite different. Furthermore, the data show that long range studies are necessary to make meaningful predictions for estuaries such as Alsea Bay.

Zooplankton and Hydrography of Alsea Bay, Oregon,
September 1966 to September 1968

by

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TO THOSE WHO LOVE LIFE

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ZOOPLANKTON AND HYDROGRAPHY OF ALSEA BAY, OREGON, SEPTEMBER 1966 TO SEPTEMBER 1968

INTRODUCTION

Zooplankton (Gr. zoion - an animal, planktos - wandering) are the microscopic animals of marine and fresh water. Almost all aquatic animals at some time during their life cycle are part of the plankton even if only as eggs, such as for many fish. Other animals progress through their whole life cycle and remain part of the plankton. A copepod, such as *Acartia clausi* Giesbrecht, hatches from an egg to progress through six naupliar stages and six copepodite stages in becoming an adult of a little greater than 1 mm in length. "Plankton" is a relative term, describing to us the seeming helplessness of small plants (phytoplankton) and animals to move against environmental forces such as waves and currents; rather, they move with and can indicate the presence of such forces. In a different sense, we too are plankton, only recently having done other than move with the earth in its orbit around the sun.

Zooplankton are both herbivorous and carnivorous, mostly the former. The herbivores are the link in the energy flow between the primary producers (phytoplankton) and the carnivores, and provide a large portion of the aquatic animal biomass. The planktonic carnivores may themselves become food for other carnivores. The organisms die and are decomposed by bacteria into chemical compounds which can be used as building blocks for the growing phytoplankton.

In temperate latitudes as days progress into winter, the amount of light available to trigger photosynthesis in plants decreases. Because of the low quantities of chemical building blocks (nutrients) used at this time, the continued decomposition of organic materials, and the vertical mixing of waters due to cooling of the surface waters, the quantity of nutrients in surface waters increases. As the days lengthen into spring, the increasing light and nutrient buildup provide optimum conditions for phytoplankton growth. A population explosion (bloom) occurs. As food is ample, a zooplankton "bloom" occurs.

Because of the phytoplankton bloom, the nutrient supply becomes depleted. In waters deep enough, the heating of surface waters establishes a thermocline (part of water column where rapid change of temperature occurs). This, without a salinity change, causes a pycnocline (part of water column where rapid change in density occurs). The interchange of particles through the pycnocline is reduced; thus a renewed nutrient supply from below is lessened.

As summer goes to winter, the light available for heating surface waters decreases. These waters cool, the thermocline (and pycnocline!) break down. Vertical turbulence allows nutrients from below to enter the surface waters. Sufficient light is still available for ample photosynthetic activity to occur. A second and lesser phytoplankton bloom occurs, followed by a second and lesser zooplankton "bloom." Into winter, light becomes insufficient to stimulate a great amount of photosynthetic activity.

Along the Oregon coast during the winter, light available for photosynthesis is further decreased by cloud cover. During the summer, a northerly wind blows along the coast. When this wind is of sufficient intensity and duration, it is assisted by the rotation of the earth in moving coastal waters offshore. Cooler, more saline, denser, and nutrient enriched waters from below come to the surface. This process (upwelling) allows for phytoplankton (and zooplankton) blooms to occur during the summer.

Recently work has been done with zooplankton or portions thereof caught off the Oregon coast. Olson (1949) studied the pelagic cyclopoid copepods of Oregon and California coastal waters. Cross (1964) worked on seasonal and geographical distribution of pelagic copepods in Oregon coastal waters. Hebard (1966) described the distribution of euphausiids and copepods off Oregon as related to oceanographic conditions. Laurs (1967) worked with coastal upwelling and the ecology of the lower trophic levels.

Recent work done on zooplankton caught in Oregon estuaries to a great extent is based on research done in connection with the research group of Frolander (1970). Bergeron (1970) has worked with the zooplankton collected by that group in Yaquina Bay, Oregon, from 1961 to 1968. Russell (1964) looked at the endemic zooplankton population as a food supply for young herring in Yaquina Bay. McCormick (1969) reported on hydrographic and trophic relationships of hydromedusae in Yaquina Bay.

Haertel (1970) has just completed a study of zooplankton in the Columbia River estuary. Zimmerman (1970) has been collecting zooplankton in Netarts Bay, Oregon, an arm of the sea where relatively little land runoff occurs.

No evidence has been found of a sustained zooplankton sampling program occurring in Alsea Bay. Lyford (1966) worked with primary productivity and community structure in Lint Slough. The slough is a man-made estuarine impoundment connected to both fresh and salt-water sources by flood gates. The slough extends southward from Alsea Bay and is immediately west of Waldport, Oregon. During the period from July to December, 1964, Lyford found a

> . . . lack of zooplankton until early October when occasional nauplii and adult stages of the copepod *Acartia clausi* were present and continued to be present until the impoundment was flooded by fresh water in December (p. 25-26).

During September to November, 1965, the zooplankton in the slough consisted mainly of *Acartia clausi* and the larva of the polychaete *Polydora*.

The present thesis describes the interrelationships between zooplankton populations and physical-chemical parameters in Alsea Bay during the period September 1966 to September 1968.

LOCATION OF SAMPLING STATIONS

Four stations were regularly sampled in Alsea Bay (Figure 1, p. 19). Station 1 is located located mid-channel at the entrance of the bay between the tip of the sand spit to the north and the cliffs of Yaquina John Point to the south. Station 2 is approximately 5000 feet upstream from Station 1. It is immediately upstream from the center span of U.S. Highway 101 bridge over the bay. Station 3 is about two nautical miles upstream from Station 1, if one measures the distance by going along the south side upstream from the Old Town Docks. This station is in the channel immediately offshore from Oregon Highway 34 Milepost #1. Station 4 is a little more than four nautical miles upstream from Station 1. It is immediately downstream from the confluence of Drift Creek and Alsea River. Originally it was located south of center of midstream; but on June 26, 1967, it was moved to the deepest part of the channel along the north side. The increase in depth was about one meter, and this was enough to pick up a more saline water. The depth at Station 1 was approximately 12 m; at Station 2, 5 m; at Station 3, 3 m; and at Station 4, 3 m.

METHODS

Field Methods

Water and zooplankton samples were taken in Alsea Bay at approximately nine-day intervals from September 1966 to September 1968. Four locations were chosen from the area extending from the mouth of the bay to Drift Creek.

Water samples were taken first, except on two occasions. On September 10, 1966, the zooplankton sample was taken first at station 2. On September 7, 1968, water samples were taken both before and after the zooplankton sample at all four stations.

The water samples were taken from both surface and bottom water. On location the boat was anchored; a bucket thermometer tied to the boat was dropped into the surface water. Then a Van Dorn type bottle of 1.6 liter capacity was attached to a weighted cable that was lowered to the bottom via a portable winch. The bottle was located about half a foot (15 cm) above the weight to allow for proper closing.

Oxygen and salinity bottles were doubly rinsed in surface water off the side of the boat. The oxygen bottles were brown glass, glass-stoppered bottles of 250 ml capacity. Two types of salinity bottles were originally used: clear glass, rubber-gasketed glass-stoppered bottles of 380 ml capacity and clear glass, plastic-capped bottles of 500 ml capacity. Later only the latter were used.

The surface water sample was taken by dipping a previously doubly rinsed polyethylene bucket of 14 l capacity into the water and filling it half full with a minimum of agitation.

The bottom depth was recorded; a steel or brass messenger was attached to the cable and dropped to close the Van Dorn type bottle stationed above the bottom.

An oxygen bottle was dipped into the bucket of surface water horizontally and halfway, then tipped slowly vertically as it filled. In this manner bubbling was reduced to a minimum.

A salinity bottle was filled with surface water.

The Van Dorn type bottle was drawn up from the bottom. The bottle's upper seal was broken to introduce a centrigrade thermometer to the sample. While the thermometer was equilibrating, the surface temperature was read from the bucket thermometer. When equilibrium was reached, the bottom temperature was read. The thermometers were scaled in $0.1^{\circ}C$ increments.

Oxygen and salinity bottles were doubly rinsed in bottom sample water by unclamping a rubber hose (located near the bottom of the Van Dorn type bottle) to allow the water to run out. To minimize bubbling, the oxygen sample was taken by introducing the filled rubber hose upwards to the bottom of the brown glass bottle, returning the bottle to the upright position as the water was filling it. When full, the bottle was stoppered. The salinity sample was then taken.

The oxygen samples were treated according to the Winkler method, introducing approximately 1 cc of potassium permanganate solution and 1 cc of potassium hydroxide-potassium iodide solution to the samples. The bottles, when restoppered, were shaken for mixing of the reagents with the sample.

The zooplankton sampling began on the average approximately ten minutes after the water samples were drawn. The Clarke-Bumpus plankton sampler (Clarke and Bumpus, revised 1950) was used with a #6 mesh nylon net (0.239 mm width per aperture for #6 mesh silk net) (Sverdrup, Johnson and Fleming, 1942). The net was towed obliquely or step-wise in an attempt to sample the whole water column. There were up to four steps depending upon water depth. To reduce error, the net metering device was prevented by hand from turning in air both before and after sampling.

The open sampler was lowered immediately with the winch to the bottom sampling level, towed for a predetermined length of time, raised to the next level, towed again for the same length of time, etc. Normally the sampler was towed for 12 minutes. Once at station 1 (September 9, 1966) there was a 15 minute tow. Twice at station 1 (September 14 and October 28, 1966) the towing was cut short on the surface level by two minutes because of the strength of the outgoing tide.

The sampler was towed so that the angle between the cable and the vertical was approximately 45°. The towing angle was not always maintained at 45° (Table 1); this was especially so at station 1. Tidal movement was a major factor in changing the towing angle.

Table 1. Occasions and stations where towing angle of zooplankton net was estimated at other than 45° from the vertical.

Date	Towing angle (degrees from vertical)	Station
10 Sept. 1966	60	1
"	60	2
19 Oct. 1966	60	1
28 Oct. 1966	45-60	1
10 Feb. 1967	30	1
19 Feb. 1967	20-25	1
7 Oct. 1967	75-80	1
28 Dec. 1967	60	1

Because the channel was narrow and evidently changed depth, the plankton sampler had a tendency to hit bottom. Therefore the zooplankton tow was not as deep as the water sample taken from the bottom (Table 2). The tows reached about 60 percent down the water column. Because all tows except four on October 7 and 8, 1967, were daylight tows, organisms staying close to the bottom during the day may not have been caught by the net.

The tow completed, the net was rinsed down from the outer side to remove all the plankton to the retaining cup. The retaining cup was

Table 2. Comparison of average depths of lowest step of zooplankton tow with those of bottom water samples at the various stations in Alsea Bay.

Station	Average depth (m)	
	Lowest level zooplankton sample	Bottom water sample
1	5.4	9.5
2	3.0	4.6
3	2.1	3.4
4	1.7	2.8

removed from the net and its contents transferred to a clear glass sample bottle. The cup was rinsed and rerinsed from the outer side in order to transfer any remaining plankton. The sample was preserved by adding enough concentrated formalin to the sample (which was now in surface water taken at the station) to make a five to ten percent formalin solution. The net and cup were rinsed separately to be ready for the next sampling.

Lab Methods

Within 24 hours of sampling time, the water was analyzed for oxygen content using the Winkler thiosulfate titration as modified by Strickland and Parsons (1960) and Dobson (1964).

Salinity was measured electrically with the Australian C.S.I.R.O. and Hytech inductive salinometers (Brown and Hamen, 1961).

Zooplankton were counted by subsampling with a 1 cc Stempel pipette as described by Frolander (1968). A count of over 400 organisms was thought to give an adequate proportional representation of the various zooplankton groups. A second subsample was taken and counted if the first did not contain more than 300 organisms.

Sources useful in identifying the zooplankton were Pratt (1935), Davis (1955), Newell and Newell (1963), and Conseil permanent international pour l'Exploration de la Mer (1949-1967). The following references have been helpful in identifying the copepod zooplankton: Giesbrecht (1892), Sars (1903), Wilson (1932), Rose (1933), Mori (1937), Olson (1949), and Brodskii (1950, transl. 1967).

Classification, in general, followed Borradaile et al. (1963). However, the term "Protozoa" (one-celled animal) was replaced by the term "Protista" (one-celled plant or animal) since some of the "protozoans" have plant characteristics; for example, Volvox sp., a colonial "protozoan," contains chlorophyll. Borradaile classified both the jellyfish (as part of subphylum Cnidaria) and comb jellies (as subphylum Ctenophora) in the phylum Coelenterata. I followed Pratt (1935) in classifying comb jellies in phylum Ctenophora and jellyfish as part of phylum Coelenterata.

Volume measurements were made on 28 of the 327 zooplankton samples; the vacuum method of Frolander (1957) was used. The samples were those of measurable volume taken when phytoplankton did not clog the net and when phytoplankton and leaf debris did not add appreciable volume to the sample. Although volume for each individual zooplankter differs from the next (because of animal type, sex, growth stage, season, etc.), in general, volume increases with increasing numbers of zooplankters in the sample. A plot of volume versus numbers of zooplankton for the 28 samples indicated a somewhat proportional relationship between the two variables.

The ratio of the means (mean volume/mean numbers) was used to mathematically express this hypothetical proportional relationship between volume and numbers. From this relationship the non-measurable zooplankton volume for the other 299 samples could be estimated since an estimate of zooplankton numbers for each of these samples had already been calculated (Appendix I). Thus standing zooplankton biomass per sample could be estimated as could long term average standing biomass.

Statistical and Numerical Methods

To show more clearly relationships and trends in the data, I have used several statistical and numerical methods.

The chi-square test was used to see if various data (wind and supersaturated oxygen) changed when taken in a portion of one year as compared to the same portion of a second year. The chi-square was used to see if the presence or absence of various zooplankton groups in samples was the same or different when the samples were divided by season or by station; the chi-square was used also to see if the presence in samples of various zooplankton groups, when they accounted for more than 10% of a sample count, was the same or different when the samples were divided by station.

The one-tail t-test was used to see if mean wind intensity per month (May-August, 1967) from each directional quadrant (north, south, east, west) was the same or different from the mean wind intensity from the same direction for the same month 1968. The one-tail t-test was used to compare means and the F-test to compare variances of station 1 tide levels (at time of sampling) and temperatures and salinities of bottom water samples taken during summer 1967 with those taken summer 1968.

The probability level for rejection of the above tests was .05 in all cases.

The ratio of the means (mean volume/mean numbers) was used to mathematically express a hypothetical proportional relationship between volume and numbers of zooplankton for Alsea Bay samples.

I used McConnaughey's (1964) grouping coefficients which I shall call "assembling" coefficients to show association of various animal groups found in the zooplankton samples. McConnaughey assembles species while I have used his formula to assemble groups (species or otherwise) depending upon my identification. Working with groups more extensive than species lowers the resolution level of the results. McConnaughey's formula is:

$$d = \frac{(a + b)\,c}{ab} - 1$$

where

a = number of samples in which one animal species (group) is found,

b = number of samples in which a second species (group) is found,

c = number of samples in which both species (groups) are found,

d = assembling coefficient.

Values for the assembling coefficient range from -1 to 1; the higher values indicate more association. Normally only positive "d" values are used for association analysis, but the cutoff point is chosen at one's own discretion. Here, for convenience, any non-negative "d" value is used.

Having determined the assembling coefficient, I then assembled animal groups as McConnaughey (1964) assembled animal species. This assembling was begun by bringing together the most frequently occurring group with the one having the highest non-negative "d" value with it. To these two groups was added a third having the highest sum of non-negative "d" values with them. Groups were added similarly to this assemblage until no more could be added having non-negative "d" values with all the previously assembled groups. A second assemblage was then formed from the remaining groups in like manner. The assembling continued until all groups that could be assembled were assembled. Interrelationships of assemblages were indicated graphically by drawing lines between the assemblages.

Simple examination of the data seemed to show that the physical-chemical data and the composition of zooplankton samples were different when comparing samples taken in summer 1967 with those taken in summer 1968. To clarify this the biological data were analyzed for similarity between zooplankton samples by using two indices.

Sanders' (1960) index of affinity between samples is defined as the sum of the lower percentages of occurrence of each animal group. To illustrate:

Animal group	% Composition of sample one	% Composition of sample two	Lower % composition
A	22	11	11
B	74	23	23
C	0	65	0
D	4	1	1
	100	100	35

The affinity between samples is 35% or .35.

A similarity index (SIMI) based on Simpson's theory and used by Overton and Zipperer (1969) and Stander (1970) is defined as:

$$\text{SIMI} = \frac{\sum_{j=1}^{S} P_{1j}\ P_{2j}}{\sqrt{\sum_{j=1}^{S} P_{1j}^{2}} \cdot \sqrt{\sum_{j=1}^{S} P_{2j}^{2}}}$$

where

P = percentage composition in each of the two samples,

j = specific animal group, and

S = sample space (Overton and Zipperer, 1969).

SIMI as used in the above example would equal 0.36.

Most samples show some numerical similarity with the others. Hence a cutoff point must be chosen to emphasize the stronger similarities. The lower limit was set at 40% or .40 for Sanders' affinity and .50 for SIMI.

Samples were grouped as McConnaughey (1964) grouped (assembled) animal species.

DESCRIPTION OF ALSEA BAY

Alsea Bay (Figure 1), a drowned river valley, is located on the central Oregon coast and empties water from the Alsea River and its tributaries into the Pacific Ocean at 124°04'45" W. Longitude and 44°26'22" N. Latitude (U.S.G.S., 1956a, b). An unidentified writer describes the watershed (Oregon. State Water Resources Board, 1965):

> The Alsea River watershed covers 473 square miles (1225 km^2) in Lincoln, Benton, and Lane Counties. Elevations range from sea level to over 3,000 feet (914 m). Precipitation varies from 60 inches (152 cm) along the coast to 110 inches (279 cm) in the upper watershed.
>
> Approximately 94 percent of the area is covered by forest, 3 percent by cropland, and 3 percent by range and other uses. The yield is about 1,500,000 acre-feet (1.8×10^9 m^3) or 3,200 acre-feet per square mile (1.5×10^6 m^3 per km^2).
>
> The 1960 population was estimated at 3,850 persons with the greatest concentrations in the bay area. The interior is sparsely settled except along the lower main stem where the river frontage is being subdivided for summer homes.
>
> The economy of the Alsea River area is centered around forestry, agriculture, and recreation. Agriculture and sport fishing have long been in conflict, but efforts are being made to alleviate damages caused by fishermen to fences, crops, and other farm property. During periods of anadromous fish movements, up to 1,000 weekend fishermen have been recorded along the Alsea River. There are no ground water rights for this area (p. 77).

The river basin is bounded by Coast Range Mountains on all sides but its mouth, with the mountains generally increasing in height towards the east. The Willamette River basin lies to the east, the Yaquina River basin to the north and the Siuslaw River basin to the south.

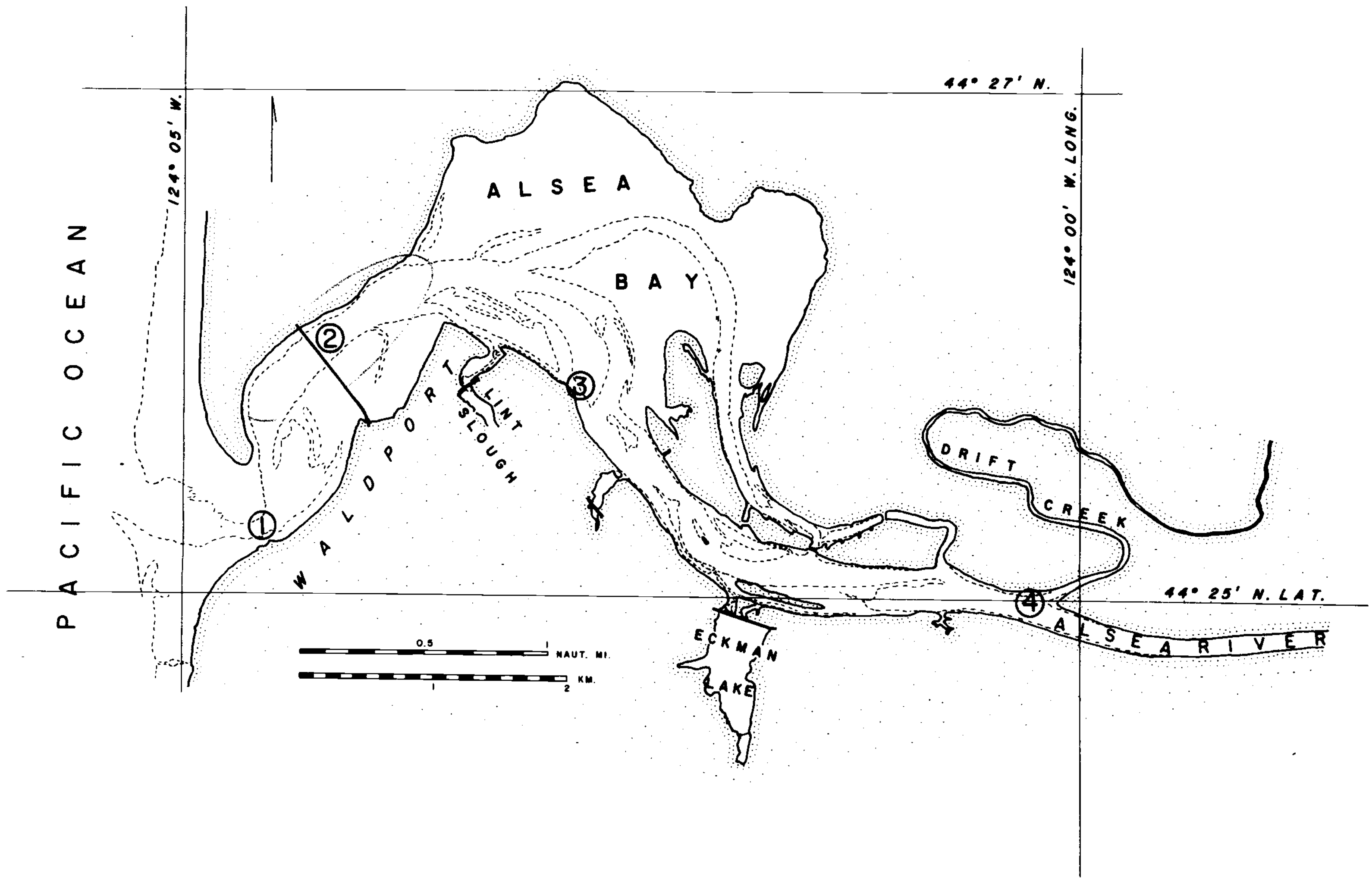


Figure 1. Alsea Bay, Oregon, with sampling stations 1, 2, 3, and 4. Dashed line indicates mean lower low water. Bay is shallow with depths of 12 m at station 1, 5 m at station 2, 3 m at stations 3 and 4.

The bay is shallow even in the channels, being 12 m deep at station 1, and 5, 3, and 3 m deep respectively at stations 2, 3, and 4. At station 4 Drift Creek joins the Alsea River to become Alsea Bay. Further upstream the river narrows; it deepens to 5 m under Oregon Highway 34 bridge (seven nautical miles upstream from the mouth of the bay), decreases to 3 m depth at the town of Tidewater (ten nautical miles upstream), and shows rapids at low water at Head of Tidewater (12 plus nautical miles upstream) (Giger, 1970). Previous to 1948, the bay had both a north and south channel between U.S. Highway 101 bridge and the entrance of Drift Creek. In 1948, a channel was blasted along the south shore upstream from the Waldport city docks to meet the south channel upstream (U.S. Army. Corps of Engineers, 1950); this channel is maintained and was used in computing mileage upstream. Previous to June, 1962, the north channel was blocked off in three places (U.S. Army. Corps of Engineers, 1962). Two of these dams blocked shallow high tide connections between the north and south channels downstream from the entrance of Drift Creek 0.9 and 1.2 nautical miles. The third dam is in the north channel itself, 0.6 nautical miles from the north channel's upstream beginning and 1.0 nautical miles downstream from the entrance of Drift Creek. The upstream portion of the old north channel is deeper than the channel adjacent to it (U.S. Army. Corps of Engineers, 1950, 1962); hence dense waters could remain in its depths. Water downstream of the dam in the old north channel would be replenished by tidal action at the downstream end.

The bay at its widest is 7500 feet (2600 m); the present channel at its widest is 1400 feet (430 m). The channel in the bay and river near the entrance of Drift Creek is about 500 feet (140 m) in width (U.S. Army. Corps of Engineers, 1950, 1962).

Two sloughs along the south side of the bay have been impounded for various uses. Previous to June, 1962, Eckman Slough (three nautical miles upstream) was dammed off and is used for recreational purposes. Before July, 1964, Lint Slough (immediately west of Waldport) was impounded so as to allow for regulation of salinity content of the pond. The downstream gate allows for the intrusion of salt water at high tide. The middle and upstream gates allow for the entrance of fresh water from the bypass. This impoundment is an experimental rearing pond for salmon. Below the pond and immediately upstream from the Oregon Highway 34 bridge crossing the slough is the sewage outfall for the town of Waldport, population 667 (U.S. Bureau of the Census, 1963). Sewage treatment is primary (Oregon. State Water Resources Board, 1965).

Navigation into the ocean is limited because of a shifting channel with a controlling depth of six to seven feet (2 m) (U.S. Army. Corps of Engineers, 1950).

The tides are semi-diurnal, cycling in approximately 12.4 hours. The mean range (mean high - mean low) is 5.8 feet (1.8 m). The diurnal range (mean higher high - mean lower low) is 7.7 feet (2.3 m) (U.S.C.G.S., 1965, 1966, 1967).

Estimates of the volume of water in the bay at mean lower low water and at a tide level of six feet (1.9 m) were made using the map of the U.S. Army Corps of Engineers (1950). Three areas were calculated averaging three measurements using the Ott Planimeter Type 33 #104716: the area covered by water at six feet below mean lower low water, that at mean lower low water (MLLW), and that at high tide. Depths in each level were estimated using soundings shown on the map. That volume of a level above deeper water was given six foot depth; that part not above deeper water was assumed to average three feet or less in depth. Results are shown in Table 3.

Table 3. Volume of water below and above MLLW in Alsea Bay, first four nautical miles from mouth.

Segment (nautical miles)		Volume below MLLW (10^6 ft^3)	Volume above MLLW (10^6 ft^3)
0-1		41	57
1-2		45	164
2-3	S. channel	13	41
	N. channel	7	31
3-4	S. channel	6	36
	N. channel	8	9

Thus, I computed that the total volume at a six foot tide is 3.8 times the volume below MLLW; this large number (3.8) is an indication of the shallowness of the bay.

Upstream Influence--River Runoff

During the sampling period, river runoff, measured at a gauging station 3.8 miles (5.1 km) southeast of the town of Tidewater, varied from daily lows of less than 60 cubic feet (1.7 m^3) per second to highs of more than 10,000 cubic feet (283 m^3) per second (Figures 2 and 3). The runoff lows occurred in September and October, 1966, and August and September, 1967. The highs were in January, 1967 and February, 1968. More rainfall occurred during the summer of 1968 than in the summer of 1967, hence stream flow did not go below 110 cubic feet (3.1 m^3) in summer, 1968 (U.S.G.S., 1967, 1968, 1969). Precipitation (U.S.E.S.S.A., 1966-1968) in the watershed slightly precedes an increase in streamflow (Figures 2 and 3) even in the winter when there is only a slight accumulation of snowpack.

Effect of Weather

The river basin is situated so that precipitation occurs when marine moisture laden air flows through and over it from offshore.

Normally during the summer months a high pressure cell is located off the Oregon coast so that movement onshore of marine air is

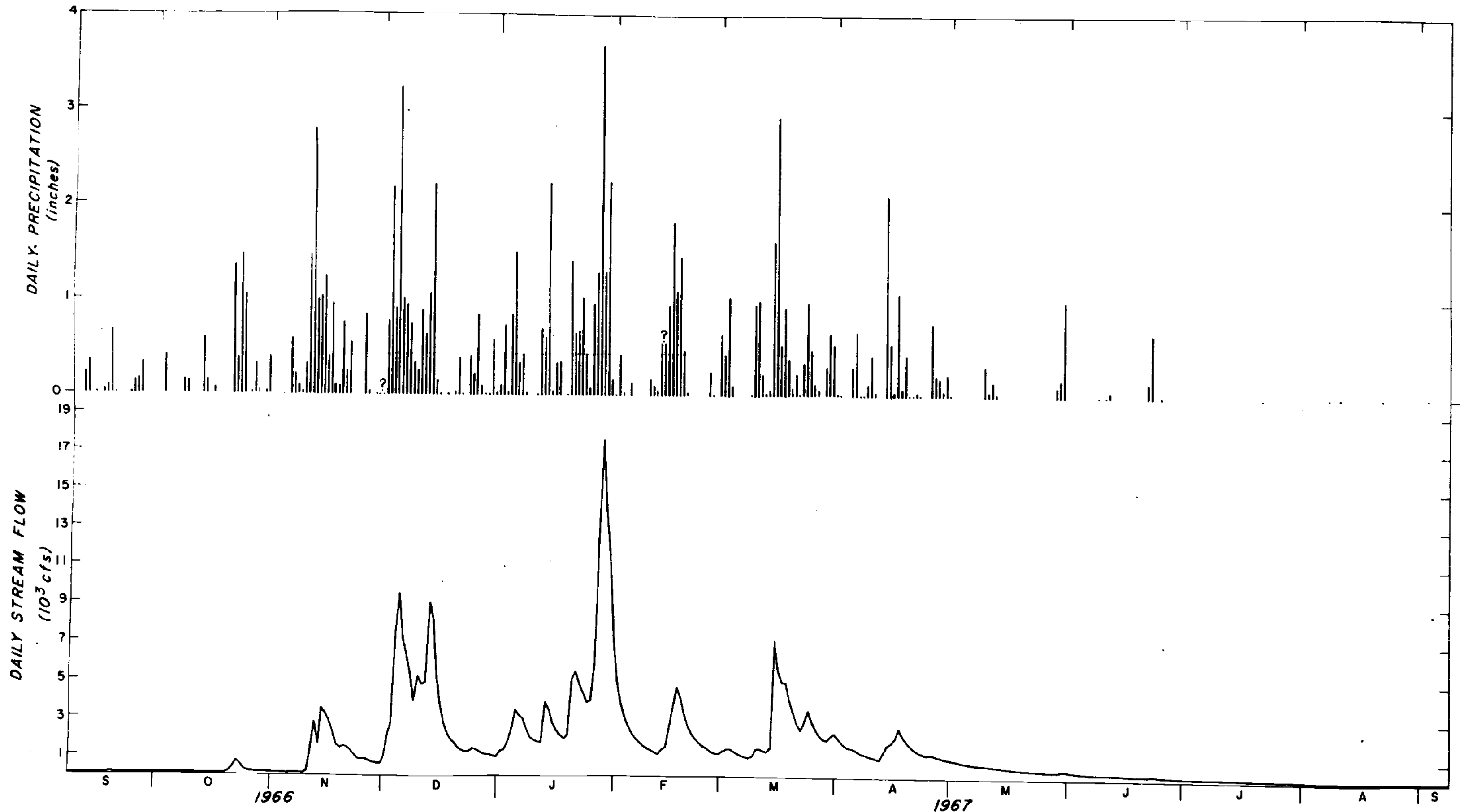


Figure 2. Daily stream flow on the Alsea River at 44°23'10" N, 123°49'50" W and daily rainfall at Tidewater (44°25' N, 123°54' W) from September 8, 1966, to September 8, 1967. Stream flow in cubic feet per second, rainfall in inches. Stream flow data from U.S.G.S. (1967, 1968), rainfall data from U.S.E.S.S.A. (1966-1967).

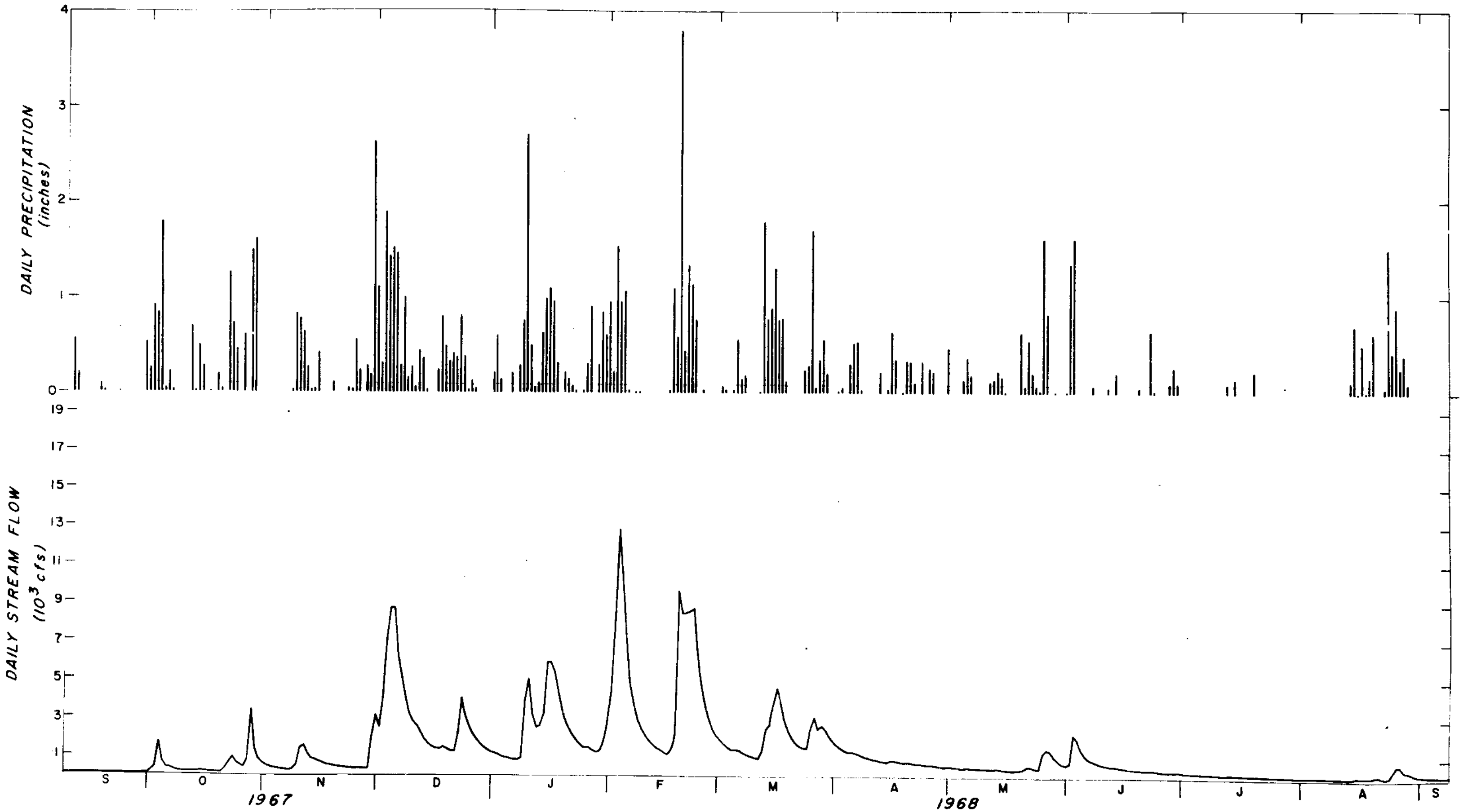


Figure 3. Daily stream flow on the Alsea River at 44°23'10" N, 123°49'50" W and daily rainfall at Tidewater (44°25' N, 123°54'W) from September 8, 1967, to September 8, 1968. Stream flow in cubic feet per second, rainfall in inches. Stream flow data from U.S.G.S. (1968, 1969), rainfall data from U.S.E.S.S.A. (1967-1968).

at a minimum, hence the low summer rainfall. Winds tend to blow from north to south along the coast.

Normally in winter offshore highs move south and barometric lows are well developed in the Gulf of Alaska. Fronts associated with these lows sweep inland along the Oregon coast causing much rainfall. As the fronts approach the Oregon coast, southwest winds are often intensified and become more southerly. Fisher (1970) illustrates the intensification and shift of southwest winds for the coast off Yaquina Bay, Oregon. As the fronts pass, the winds diminish and come more from the west. Hopkins (1971) gives a similar overall picture.

Oceanic Influence--Tides and Littoral Drift

Every tidal influx brings coastal ocean water into the bay. This water may be previous outgoing tidal water, may come from the surrounding oceanic surface water, and may come from the deeper ocean waters offshore. Kulm and Byrne (1966), in working with sedimentation in Yaquina Bay, Oregon, determined that "sea" (a term describing local wind driven waves) came more from the southwest quadrant than the northwest from October through March and more from the northwest quadrant from April through September. Swell (waves propagated non-locally) came more from the southwest quadrant in January and February and more from the northwest quadrant from

March through December. They deduced that littoral (coastal) drift varied seasonally, going mainly northward along the Oregon coast from November or December through March and to the south from April through October or November. They also concluded that yearly drift is predominantly to the south.

Wind's Effect on Oregon Coastal Water

Because of the earth's rotation, winds from the north tend to move surface waters along the Oregon coast to the right of south, or offshore. These waters are replaced by colder, denser, more saline and less oxygenated water from below. Winds from the south tend to pile up surface waters from offshore along the coast.

Continuous records of wind speed and direction were obtained from the U.S. Weather Bureau in Newport, Oregon, for the last 19 months of the sampling period. The station is located approximately 15 air miles north of Alsea Bay in Newport, one half mile northeast of the junction of U.S. Highways 20 and 101. The station is 159 feet (48.5 m) above sea level and the wind sensor is 25 to 30 feet above the gauge. The gauge is Weather Bureau Model F420 C-M4 made by the Electric Speed Indicator Co. Wind direction is measured in increments of 10°, speed in knots, once every three hours of the day.

On computer and with the help of members of the Oregon State University Department of Oceanography, the data were broken into east-west (U) and north-south (V) components. The Cosine-Lanczos filter taper was used to smooth out diurnal wind variations and show the long term trends of wind direction and speed (Mooers et al., 1968). It was modified to fit sampling at three-hour intervals (Appendix II); Fisher (1969) had done likewise for sampling spaced at four- and six-hour intervals. The results were plotted, wind from the east being the positive U-component and wind from the north the positive V-component (Figures 4-7).

East-west or U-component - Wind from the east appeared to be most prevalent and strongest from the middle of September to the end of March (Figures 4, 6, and 7); during April (Figure 4) this component appeared to slacken off and be hardly noticeable from the end of April to the middle of September (Figures 5 and 6). The westerly portion appeared to be of increased intensity and short duration during the winter (Figures 4, 6, and 7), and of less intensity and long duration in the summer (Figures 4, 5, and 6).

North-south or V-component - Southerly winds appeared to be more prevalent during October through March (Figures 4, 6, and 7); northerly, from May through August (Figures 5 and 6). April and September seemed to be times of changeover (Figures 4 and 6).

Kulm and Byrne (1966) speak of the winds along the Oregon coast:

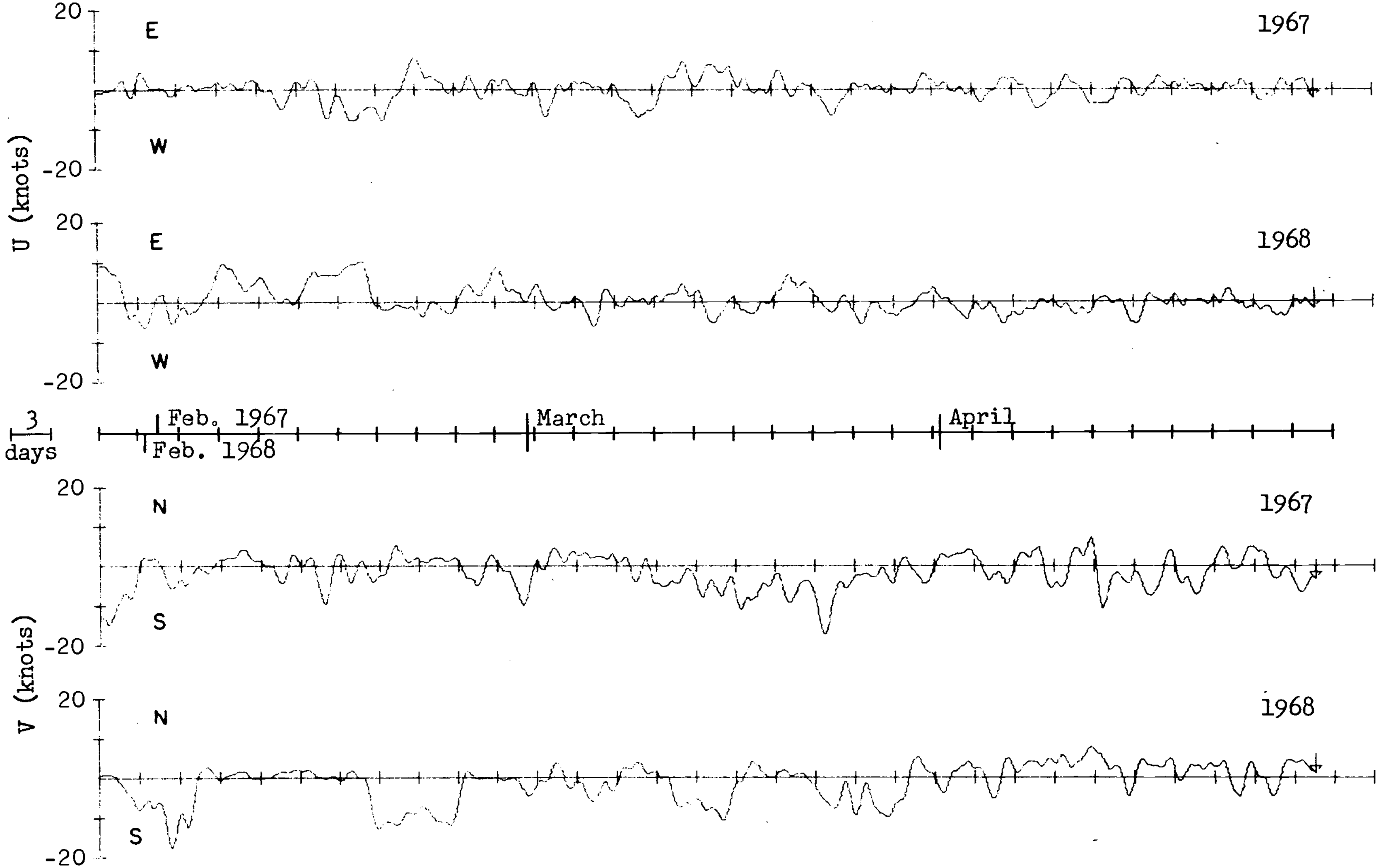


Figure 4. Newport, Oregon, Weather Bureau U- and V-component tapered wind. 1967: 1200, Jan. 27 to 2100, April 28, GMT. 1968: 1200, Jam. 28 to 2100, April 28, GMT. Long mark on date scale indicates beginning of month (Feb. 1967, Feb. 1968).

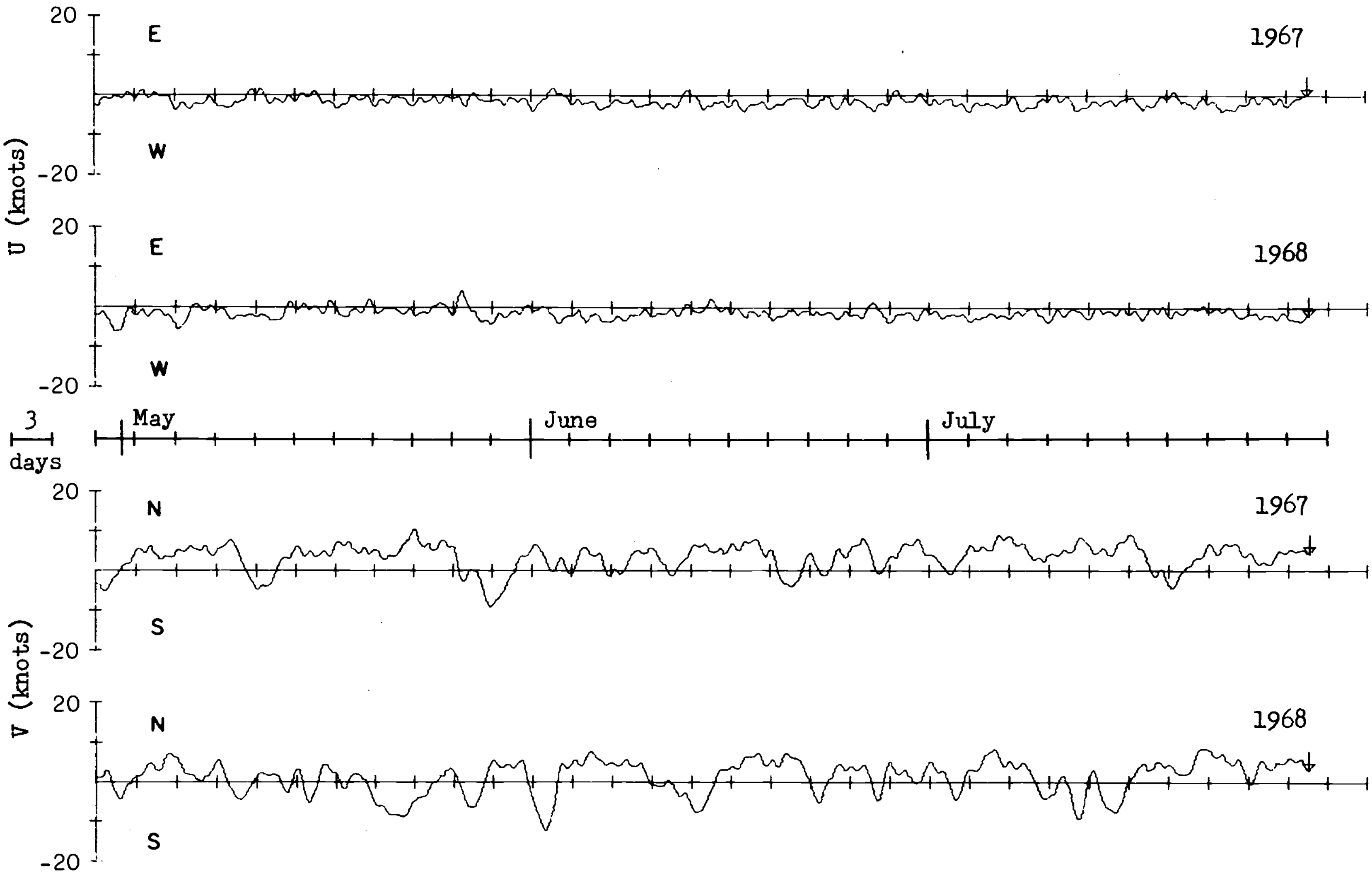


Figure 5. Newport, Oregon, Weather Bureau U- and V-component tapered wind. 0000, April 29 to 0900, July 29, 1967 and 1968, GMT.

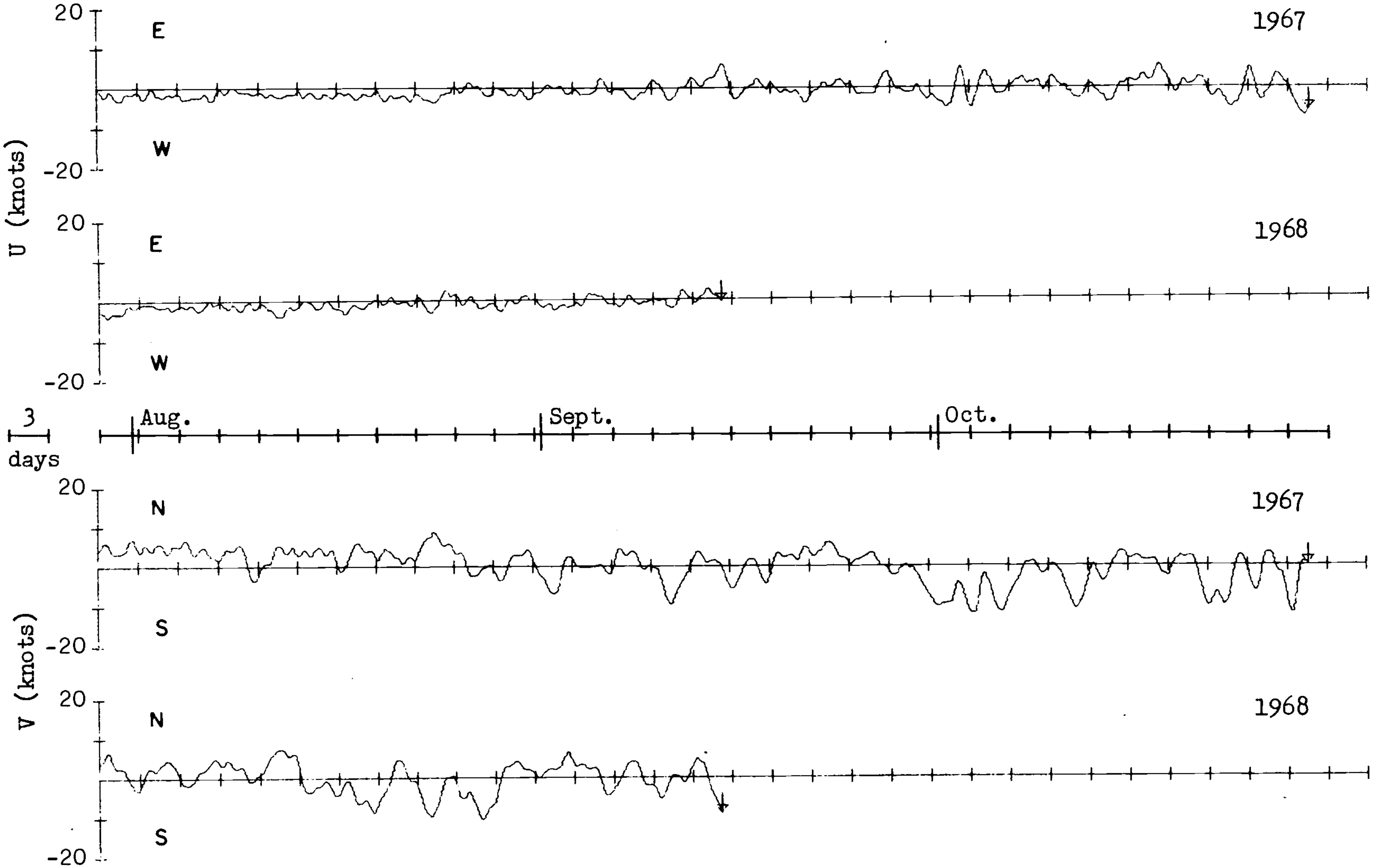


Figure 6. Newport, Oregon, Weather Bureau U- and V-component tapered wind. 1967: 1200, July 29 to 2100, Oct. 28, GMT. 1968: 1200, July 29 to 1200 Sept. 14, GMT.

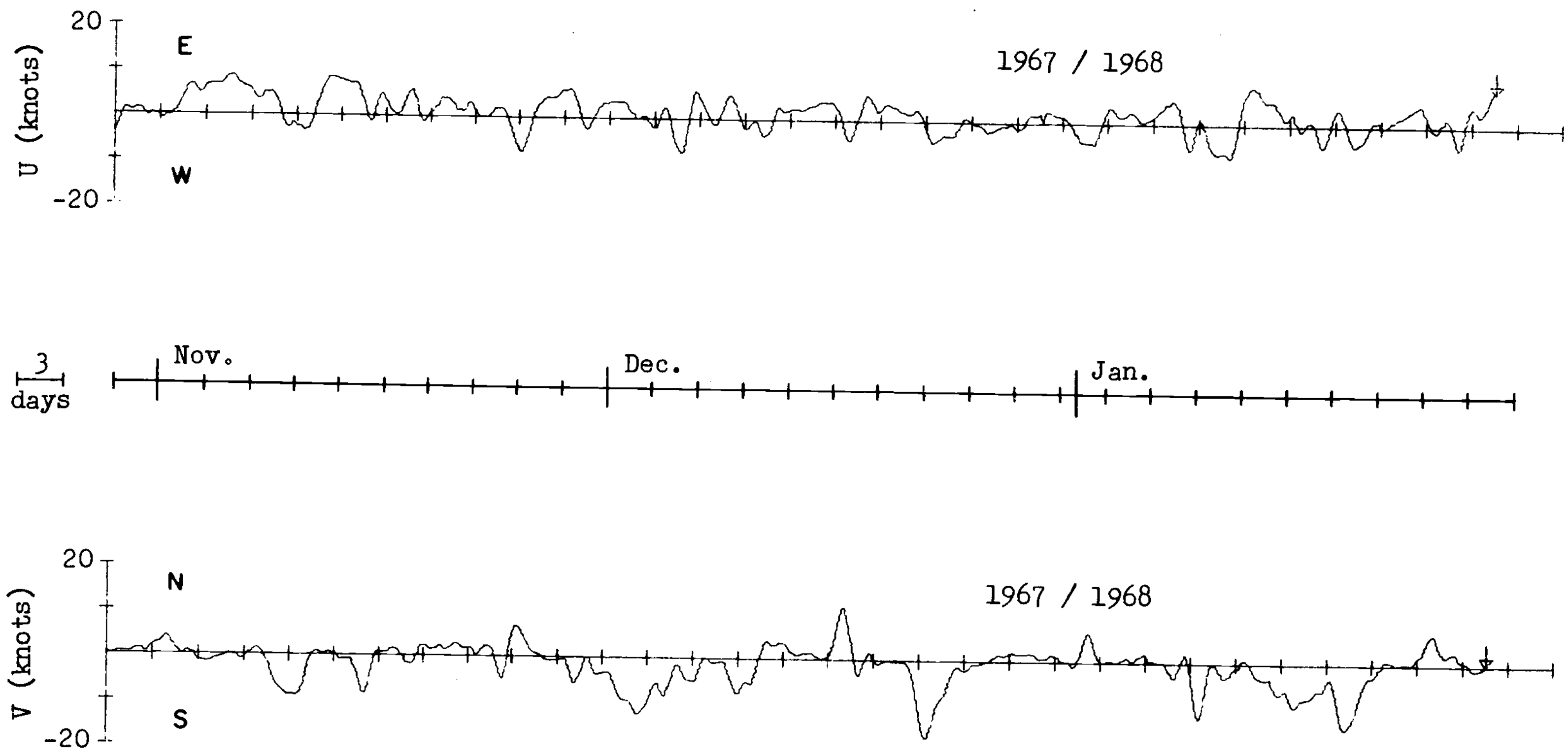


Figure 7. Newport, Oregon, Weather Bureau U- and V-component tapered wind. 0000, Oct. 29, 1967, to 0900, Jan. 28, 1968, GMT.

> ...During the summer, onshore winds, originating from the north-northwest predominate. Winter winds are mainly off-shore and of low velocity. However, during winter, high velocity, but less frequent onshore winds are from the south to southwest. Fall and spring are transitional periods during which winter-type and summer-type winds alternate. Although the strongest winds, often more than 50 knots, occur during the winter, 25 knot winds are not uncommon during the summer months (p. 89).

If one assumes the neritic currents off Oregon to be wind driven they should flow more from the south in the winter and more from the north in the summer. That the coastal current runs northward in the winter and southward in the summer has been affirmed by drift bottle observations (Burt and Wyatt, 1964). Plankton might be more of a temperate or subtropical origin in the winter and more of a cold water origin in the summer. Frolander (1962) lends support to this argument for the coast of Washington and British Columbia as does Cross (1964) for the coast of Oregon.

The tapered data seem to show variations in north-south wind patterns between the two years (Figures 4-6). In 1967, during late February and early March (Figure 4), there were two five- to six-day periods of slight interrupted wind flow from the north; from May through August there were few major breaks in this northerly flow (Figures 5 and 6).

In 1968, during early April there was a nine-day period of uninterrupted wind flow from the north (Figure 4); from May to mid-August there were many breaks in this northerly flow (Figures 5 and

6). In mid- to late-August there is quite a bit of southerly flow (Figure 6).

In 1967, a current flowing south might be expected in late February, early March and from May through August. In 1968, a northerly current might flow with interruptions from April through mid-August. More plankton of a temperate or subtropical origin might appear in Alsea Bay during the summer of 1968 than in the summer of 1967. One might also expect there to be less upwelling during the second summer (1968) and thus generally warmer near-shore surface waters.

To further substantiate the hypothetical difference between the wind patterns along the mid-Oregon coast during the summers of 1967 and 1968, raw data (wind intensity and direction once every three hours) from the Newport U. S. Weather Bureau was analyzed. The data were taken month by month from May through August of each year. The observations were separated into five categories: calm, winds from the north quadrant (315° to 45°), winds from the east quadrant (45° to 135°), winds from the south quadrant (135° to 225°), and winds from the west quadrant (225° to 315°). No attempt was made to account for the effect of land contour on the pattern of wind flow.

The mean intensity of wind from each quadrant per month was determined by summing all intensities of wind within a quadrant and dividing the sum by the number of observations within that quadrant

(Table 4). In looking at all quadrants by month, mean intensity was highest from the north quadrant from May through August, 1967 and during May and July, 1968. However, in June and August, 1968, mean intensity was highest from the south. Mean intensity from the east was always lowest. Mean intensity from the west was always less than that from the north and was less than that from the south in both Mays and also in June and August of 1968.

Concerning the four quadrants, the greatest proportion of observations each month were from the north from May through August, 1967 and June and July, 1968. The least proportion of observations were from the south from May through August in 1967. The greatest proportion of observations were from the south during May and August, 1968; a greater proportion of winds were from the south than from either the west or east during June and July, 1968.

The data were further treated by comparing mean wind intensities of each month (May, June, July, and August, 1967) with the same month in 1968; a one-tail t-test (probability (p) = .05) was used. Off the Oregon coast, an increase in wind intensity from the south or west should bring more oceanic surface water inshore; an increase in wind intensity from the north or east should blow more oceanic surface water offshore and assist in upwelling. Zooplankton populations should reflect this change.

Mean wind intensities were different:

Table 4. Number of observations, mean wind velocity (knots), and variation (s^2) of wind data taken at U.S. Weather Bureau in Newport, Oregon, during May-August, 1967 and 1968. Observations have been divided into parts: calm, and winds from the north, east, south, and west quadrants.

	1967					1968				
	calm	North	East	South	West	calm	North	East	South	West
May										
number observations	28	113	49	28	30	22	55	50	68	53
$\bar{x}$		8.56	3.80	7.93	6.97		7.69	4.46	6.93	5.92
s^2		12.3256	0.6242	13.4021	7.1368		8.0680	2.1310	7.0841	3.7634
June										
number observations	30	113	30	27	40	43	90	33	39	35
$\bar{x}$		7.96	3.97	4.37	6.55		8.06	3.94	8.15	6.57
s^2		13.1238	2.3092	3.1652	5.8949		8.7721	1.1837	13.5020	6.0756
July										
number observations	40	133	35	12	28	26	106	35	52	29
$\bar{x}$		8.66	3.80	5.42	6.39		8.04	2.97	5.71	5.86
s^2		10.8317	0.9294	3.1743	7.0622		7.0462	1.0874	9.9348	7.4014
August										
number observations	82	90	23	16	37	44	51	41	74	38
$\bar{x}$		8.76	3.74	5.69	5.97		7.12	3.83	7.57	5.74
s^2		8.3205	0.4743	4.6292	5.6381		6.5459	1.2951	11.9474	4.6316

1) in May, when wind from the east was less intense in 1967 than in 1968 and wind from the west was more intense in 1967 than in 1968;

2) in June, when wind from the south was less intense in 1967 than in 1968;

3) in July, when wind from the east was more intense in 1967 than in 1968, and

4) in August, when wind from the north was more intense in 1967 than in 1968 and wind from the south was less intense in 1967 than in 1968.

The data were also treated by comparing five kinds of observations (calm, wind from the north, south, east, or west) of each month (May, June, July, and August) with the same month 1968; a chi-square test (p = .05) was used. The distribution of observations was different between each May, each July, and each August.

Thus the raw wind data from the Newport Weather Bureau make one think that while in May there may have been more onshore wind action in 1967 than in 1968, in June-August, especially August, there may have been more offshore wind action in 1967 than in 1968. In other words, upwelling may have been more prevalent during June-August (especially August), 1967 than in June-August, 1968. One might expect Oregon coastal surface water to be warmer and less saline during the second summer (upwelled water is colder and saltier). One might also expect a change in zooplankton populations with change in water conditions.

Classification of Alsea Bay

An estuary is defined by Pritchard (1955) as

> . . . a semi-enclosed coastal body of water having a free connection with the open sea and within which sea water is measurably diluted with fresh water run-off (p. 717-1).

Estuaries are then classified into types A, B, C, and D, where:

A is a two-layered system, marine water beneath and wedging upstream, fresh water above and moving downstream;

B is partially mixed;

C shows some lateral stratification, influenced by the earth's rotation, and

D is well-mixed.

The classification changes from A to D as stream flow decreases, as tidal velocity increases, as width increases and as depth decreases. Alsea Bay has low summer and high winter stream flows, a relatively large tidal velocity, is relatively narrow and shallow.

Burt and McAlister (1959) studied Oregon estuaries and defined them as types A, B, and D according to the salinity difference between surface and bottom at high water at the station nearest a mean salinity of 17‰ (half fresh water, half marine). Type A occurred when the salinity difference was greater than or equal to

20‰; type B, when the difference was between 4 and 19‰; and type D, when the difference was 3‰ or less. Alsea bay was found to be partially mixed (type B) in January, March, April, and October.

Salinity gradients determined by Giger (1970) during the present sampling period indicate a tendency toward stratification during periods of high stream flow (winter) and a tendency toward being well-mixed during periods of low stream flow (summer).

Data, taken at all stages of the tide at the four stations in the present study, indicate well-mixed water at the mouth of the Bay and a tendency toward stratification upstream (Table 5).

Table 5. Occurrences of salinity differences (x) between surface and bottom readings (‰) at sampling stations in Alsea Bay.

Station	$x \leq 3$‰	3‰ $< x <$ 20‰	20‰ $\leq x$
1	75	3	1
2	64	17	1
3	59	15	9
4A	20	9	2
4B	9	30	10

Stations 4A and 4B comprised station 4, immediately downstream from the entrance of Drift Creek (Figure 1). Station 4A was located in the central to south of central part of the channel and was sampled from September 19, 1966 to June 20, 1967. The north side of the channel was found to be deeper by about three feet (1 m), so the sampling was switched to 4B on June 26, 1967, until the end of the sampling period, September 7, 1968. I felt that sampling at station 4B would better represent the entire water column. Station 4A shows less stratification than 4B, and one might expect denser water in a deeper part of the channel.

At low tides, I could not find depths of more than 1 m anywhere across the present channel in places between stations 3 and 4. Evidently saline water intrudes upstream during high tides and remains in deep water pockets during tidal ebb.

Water at the entrance of the bay is well-mixed. There is no deep channel entrance for boats or for the water. Possibly over an extended period of heavy runoff, a deep channel could be established to allow for a salt wedge moving upstream beneath an outgoing layer of fresh water.

On 49 of 86 sampling trips, the salinity average between surface and bottom at one or more stations was at or within ± 5‰ of 16.5‰ (half ocean salinity). The station average closer to 16.5‰ was chosen as representative. On six of these 49 occasions salinity differences were less than 3‰ ; on 29 occasions salinity differences were 3 to 20‰ inclusive; on 15 occasions differences were greater than 20‰. Thus Alsea Bay tends to be a partially mixed (type B) estuary. Burt and McAlister (1959) earlier characterized this bay as being partially mixed. They used high tide data only. The present data is from all tidal stages.

Flushing of Alsea Bay

To calculate flushing time of river water moving through Alsea River and Bay, I used the modified prism method of Ketchum (1951) as outlined by Neal (1965). The method assumes a well-mixed system which Alsea Bay approaches when stream flow is at a minimum.

The method segments the estuary beginning at a point upstream from which there is no salt water intrusion. The zero segment extends upstream from this point just far enough to contain the stream flow per tidal cycle between two predefined tide levels. The two tide levels I used for Alsea Bay were mean lower low water (zero level) and six foot level. The tidal prism of zero segment is this stream flow per tidal cycle. A tidal cycle was 12.4 hours and stream flow depended upon time of year. The low tide volume for zero segment is the segment's volume of water below zero tide level.

The sum of the low tide volume and tidal prism volume of zero segment becomes the low tide volume of segment one when the tide changes from a six foot level to zero foot level. Segment one begins at the downstream end of segment zero and extends far enough downstream to contain the just defined low tide volume. Tidal prism volume of segment one is the volume above low tide volume of segment one due to tide change (six feet).

The sum of the low tide volume and tidal prism volume of segment one becomes the low tide volume of segment two. Segment two begins at the downstream end of segment one and extends far enough downstream to include its just defined low tide volume, etc. Segmentation continues until the sea is reached.

Neal (1965) defines flushing time in tidal cycle units. Flushing time per segment is the segment's total volume (tidal prism and low tide) divided by that volume (the segment's tidal prism volume) lost per tidal cycle (12.4 hours).

Volumes for portions of the estuary from the entrance to four nautical miles upstream were calculated from a chart of Alsea Bay (U.S. Army Corps of Engineers, 1950). Volumes of the downstream portion of the old north channel were added to nautical mile segment 1-2; the volume of the upstream portion was added to nautical mile segment 3-4. Volumes of portions of the estuary more than four nautical miles upstream from the mouth were estimated using widths and lengths found in 15 minute quadrangle maps of the area (U.S.G.S., 1956a, b) and using depths from Giger (1970). The bottom of these latter portions was assumed to be flat, with the river banks sloping 27.5° from the horizontal. Tide height was assumed to be six feet. Volumes per nautical mile were calculated and are in Table 6.

Maximum salinity intrusion is about 12 nautical miles upstream from the ocean at Head of Tidewater. Giger (1970) found salinity

Table 6. Low tide volume and tidal prism in 10^7 ft^3 per nautical mile upstream from the entrance of Alsea estuary.

Nautical mile	Low tide volume (10^7 ft^3)	Tidal prism (10^7 ft^3)
0 -1	4.12	5.72
1 -2	5.96	20.46
2 -3	1.30	4.15
3 -4	0.96	3.87
4 -5	2.90	2.34
5 -6	2.47	1.32
6 -7	2.28	0.99
7 -8	1.91	0.85
8 -9	1.39	0.76
9 -10	1.37	0.92
10 -11	0.89	0.68
11 -12	0.63	0.52
12 -12.5	0.35	0.34
12.5-13	0	0.29

extending this far on August 27, 1967 at high tide when stream flow was 63 $feet^3$ (1.8 m^3) per second. On May 9, 1968, when stream flow was 421 $feet^3$ (12 m^3) per second, he found salinity extending eight nautical miles upstream at high tide. On February 9, 1968, when stream flow was 3000 $feet^3$ (85 m^3) per second, he found salinity extensing 4.4 nautical miles upstream at high tide. Thus saline water extends farther upstream at times of low stream flow.

Flushing time was computed for these times of differing stream flows (Table 7). Results show a flushing time of 18.0 tidal cycles or less than ten days at a stream flow of 63 ft^3 per second, a flushing time of 8.1 tidal cycles or 100 hours at a stream flow of 421 ft^3 per second,

Table 7. Flushing time of Alsea estuary at various stream flows using modified prism method (Ketchum, 1951) as outlined by Neal (1965).

Segment number	Segment length (ft)	Tidal prism (10^7 ft^3)	Low tide volume (10^7 ft^3)	Flushing time (tidal cycles)
	Stream flow - 63 ft^3/sec Start - 12.5 nautical miles upstream			
0		.28	0	1.0
1	2410	.27	.28	2.0
2	5240	.46	.55	2.2
3	7310	.79	1.01	2.3
4	8020	1.16	1.80	2.6
5	10570	1.42	2.96	3.1
6	11240	2.13	4.38	3.1
7	20410	15.11	6.51	1.4
8 partial	10800	21.61	4.63	0.3
	76000			18.0
	Stream flow - 421 ft^3/sec Start - 8 nautical miles upstream			
0		1.88	3.04	2.6
1	14220	2.23	4.92	3.2
2	22510	12.15	7.15	1.6
3 partial	11910	25.32	9.83	0.7
	48640			8.1
	Stream flow - 3000 ft^3/sec Start - 4.5 nautical miles upstream			
0		13.40	12.74	2.0
1 partial	27360	35.37	13.79	0.7
				2.7

and a flushing time of 2.7 tidal cycles or 33 hours at a stream flow of 3000 ft^3 per second. As stream flow increases, the fresh and saline waters of the Alsea estuary mix less, so that fresh water flushing time should actually be less than that which was calculated for the higher stream flows. Ketchum (1951) explains this by saying that the saline water below acts as a false bottom. With such a false bottom, fresh water flushing time is reduced because the involved volume of the estuary is less.

PHYSICAL-CHEMICAL RESULTS

Water Temperature at the Four Sampling Stations

Water temperature (Figures 8-15) was more constant downstream with surface and bottom readings being about the same. In comparison, upstream temperatures were warmer in the summer and cooler in the winter, especially so with the surface readings. Table 8 indicates the greater range at the surface and upstream.

Table 8. Range of temperatures, surface and bottom, taken from September 19, 1966 to September 7, 1968 at four stations in Alsea Bay.

Station number	Surface temperature (°C)		Bottom temperature (°C)	
	low	high	low	high
1	7	16	8	15
2	7	17	8	16
3	4	19	7	18
4	4	22	6	19

At station 1, temperatures for both surface and bottom waters measured 13°C or more in September, 1966, September through November, 1967, and July through September, 1968; similar temperatures were measured here in May and June, 1968 at minus tides. At station 4, temperatures 13°C or more were measured in September, 1966, May through October, 1967, and May through September, 1968.

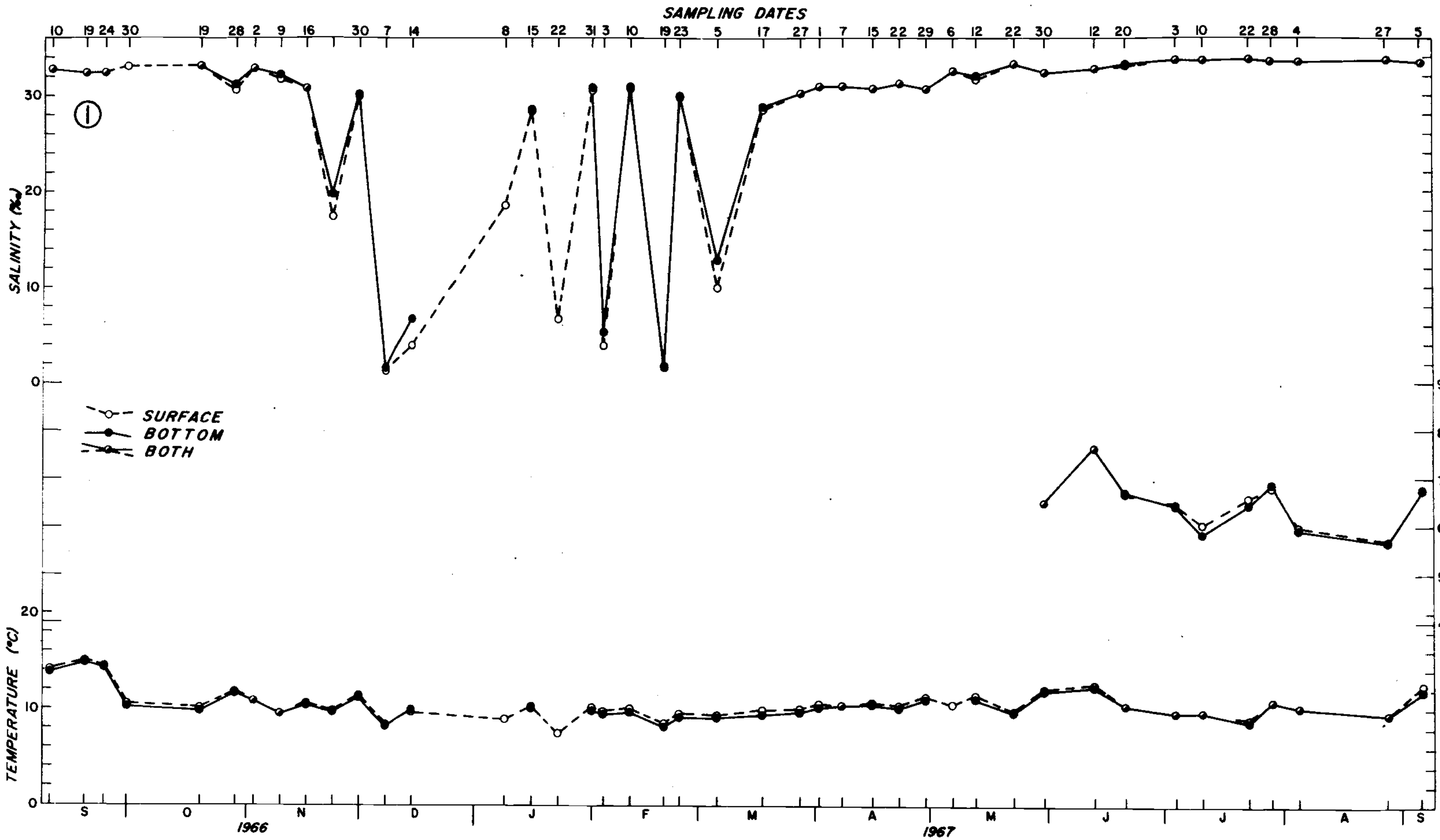


Figure 8. Station 1, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1966-September 8, 1967.

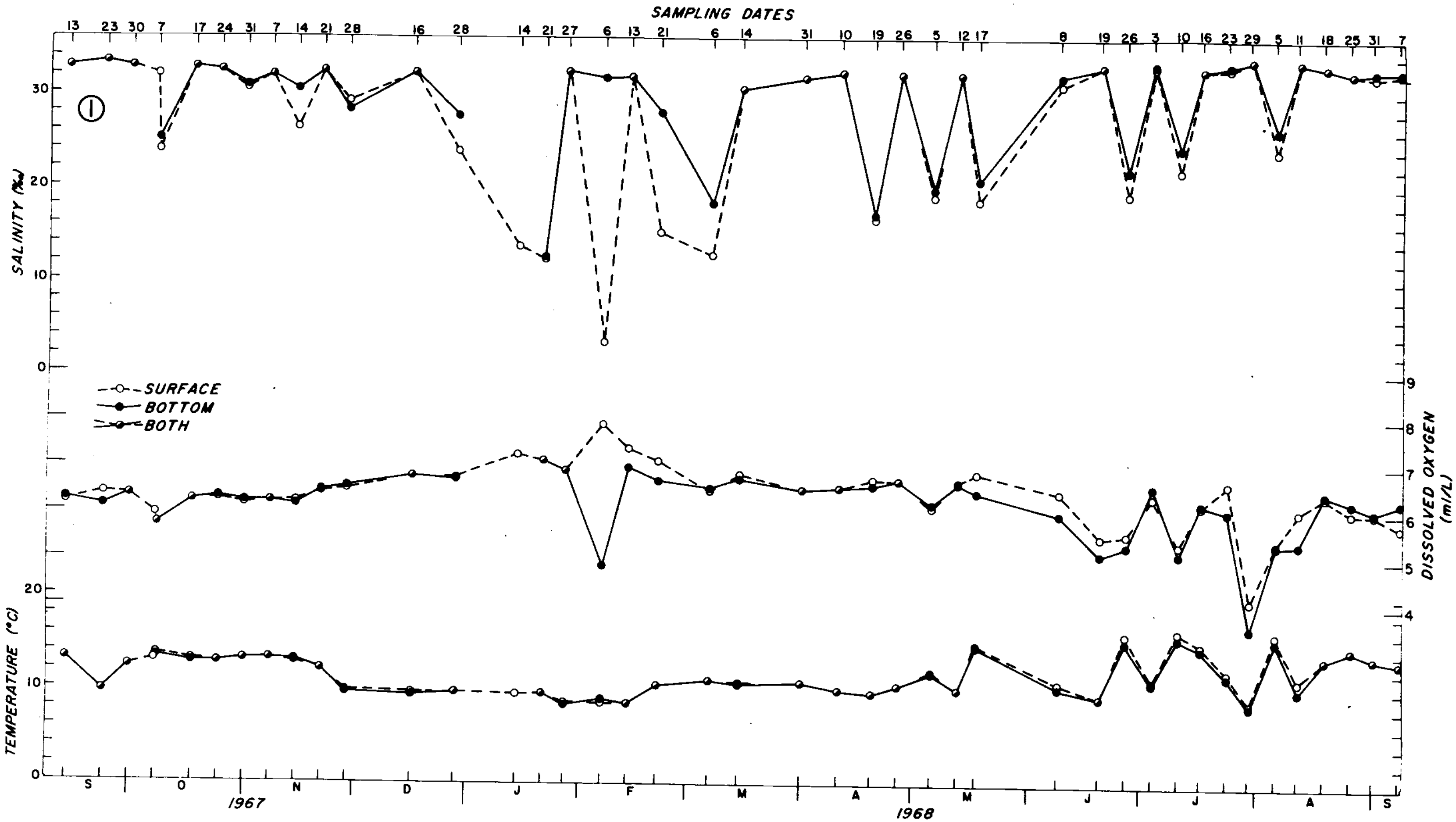


Figure 9. Station 1, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1967-September 8, 1968.

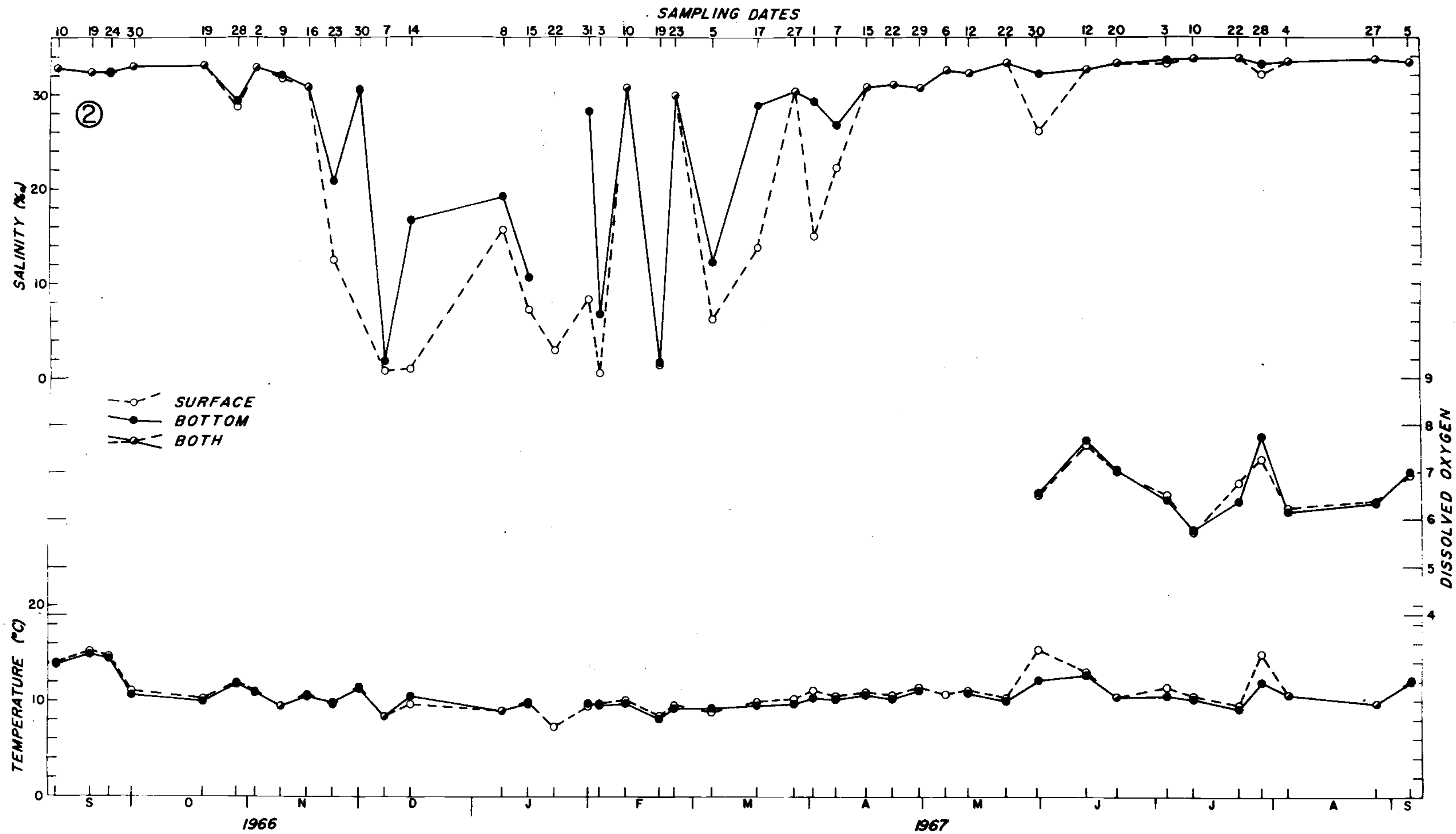


Figure 10. Station 2, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1966-September 8, 1967.

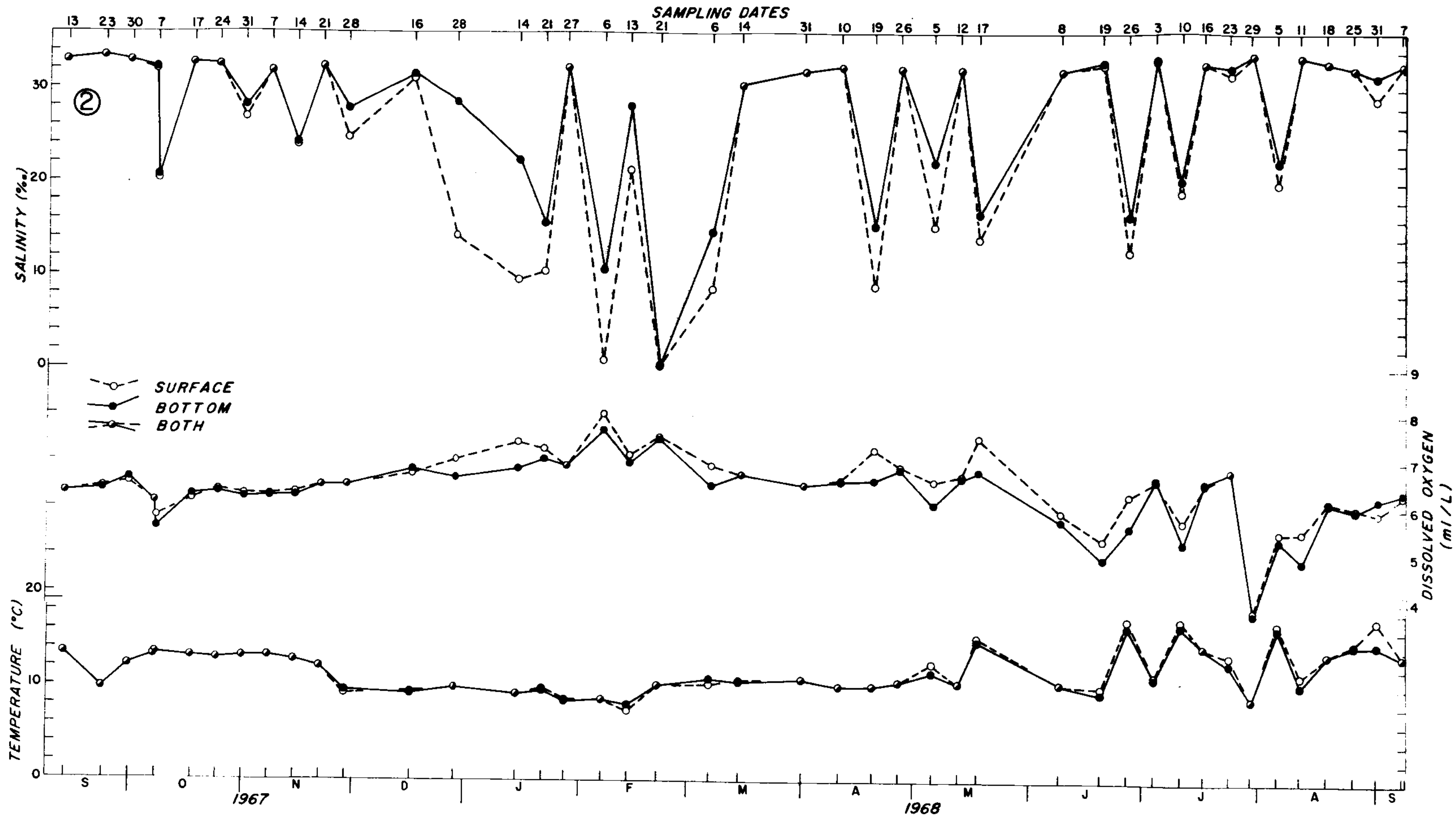


Figure 11. Station 2, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1967-September 8, 1968.

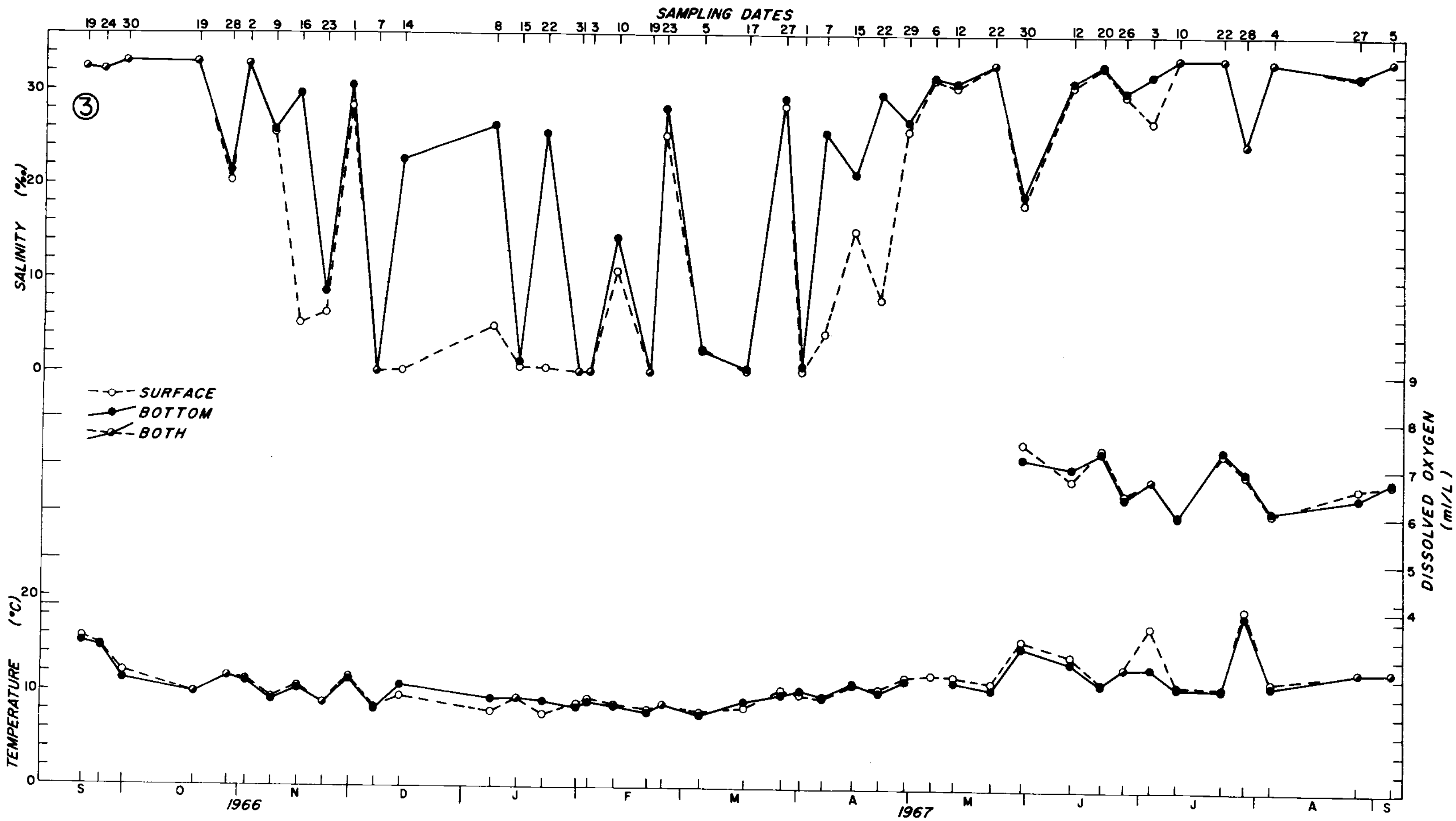


Figure 12. Station 3, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1966-September 8, 1967.

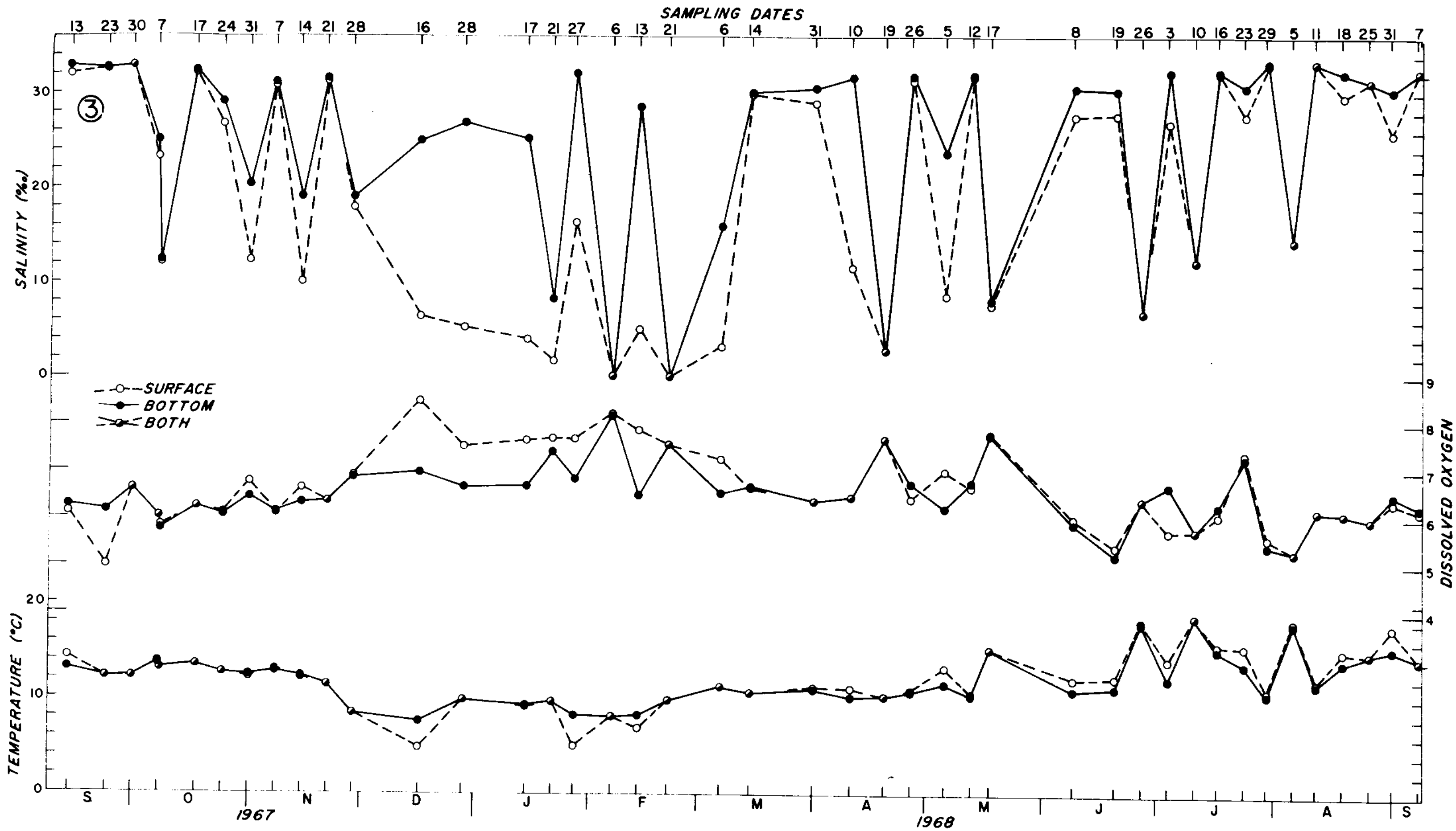


Figure 13. Station 3, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1967-September 8, 1968.

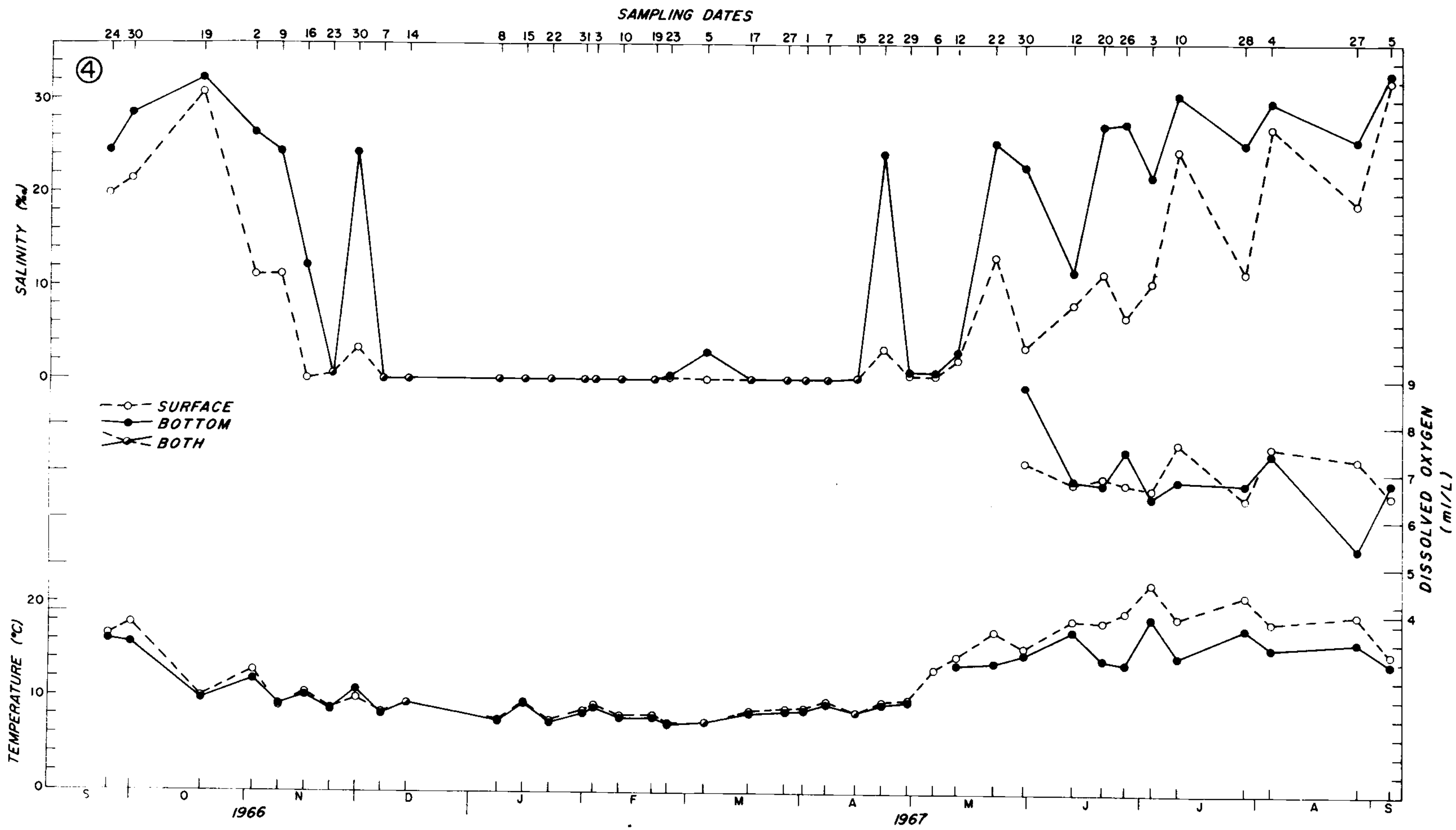


Figure 14. Station 4, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings taken during September 8, 1966-September 8, 1967.

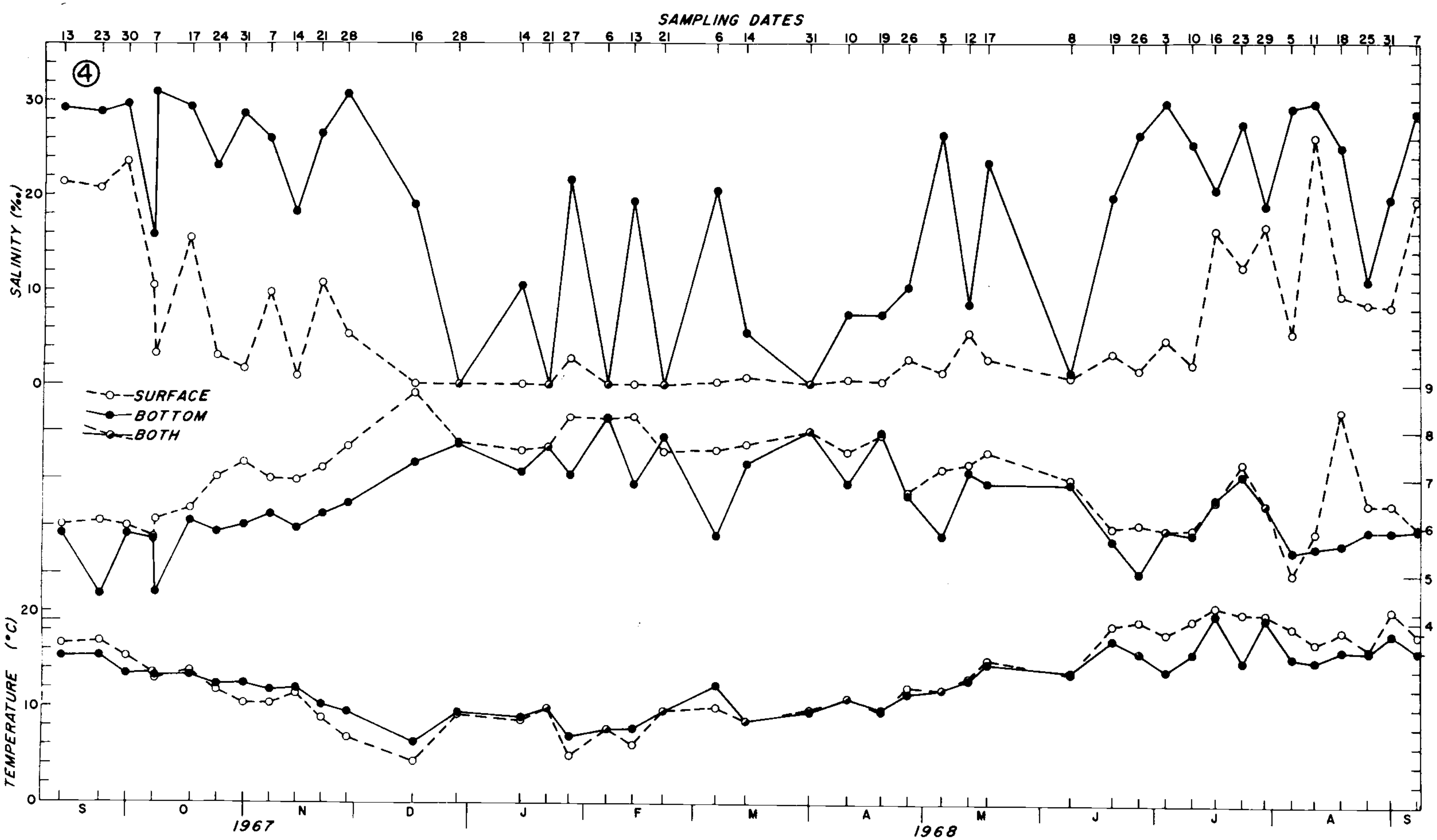


Figure 15. Station 4, Alsea Bay. Surface and bottom salinity, dissolved oxygen, and temperature readings raken during September 8, 1967-September 8, 1968.

Data from 1967 show warm water appearing first upstream and lasting latest downstream. Shallower landward water should show the presence of summer warming and winter cooling sooner than deeper seaward water since the amount of heat required to warm water is greater than that required to heat the same amount of land.

Salinities at the Four Sampling Stations

Salinities (Figures 8-15) were higher downstream and on the bottom. Noticeable freshening occurred at station 1 at times of high runoff and at times of minus tides. The freshest water and most noticeable layering occurred at station 4. Table 9 shows the months when salinity was measured at 33‰ or more at the different stations.

Table 9. Months during period from September 10, 1966 to September 7, 1968 when salinity was 33‰ or more at four stations in Alsea Bay.

Station 1	Station 2	Station 3	Station 4
	1966		
Sept. - Oct.	Sept. - Oct.	Sept.	--
	1967		
May-Oct.	May-Sept.	July-Sept.	--
	1968		
June-Aug.	July-Aug.	July-Aug.	--

May through October is the time of occurrence of highly saline waters in the bay, of warmer water, and of low runoff. This essentially is the warm dry summer season. November through April is the time of less saline, cooler water with more runoff; this essentially is the cool rainy winter season.

Salinity and Temperature

Using salinity and temperature as indicators, Pattullo and Denner (1965) characterized a typical Oregon surface coastal water. This water had a temperature of 10 to 11 ^{o}C and salinity of 33.0 to 33.5‰. The main processes thought to affect this typical water were: rainfall and runoff, Columbia River water, heating and upwelling. Rainfall and runoff were dominant during December through February; the other three were more prevalent from June through August. Cooling and evaporation were thought to be minor processes.

The Columbia River plume water was found to be more prevalent from 9 to 45 km offshore than inshore (24% to 17% of corresponding observations).

I feel that within an estuary such as the Alsea, the effect of Columbia River water may be reduced from that found along the coast; local heating and runoff may assist in producing water similar to Columbia River plume water in temperature and salinity characteristics. Thus, I modified the Pattullo-Denner (1965) diagram replacing the term CR (Columbia River plume) with the term R&H (rainfall, runoff, and heating).

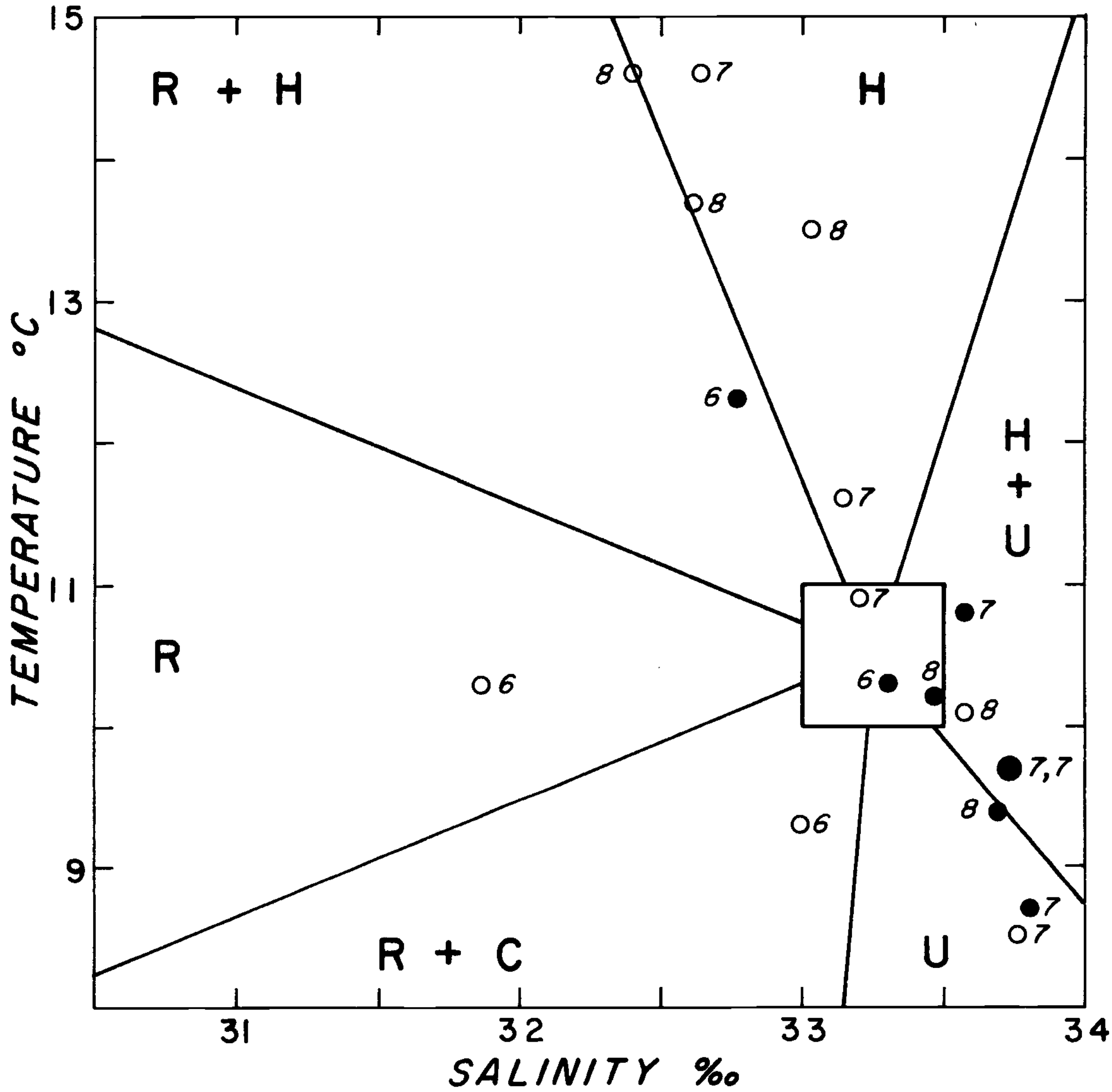
Co-occurring bottom temperatures and salinities taken from station 1 during the sampling period were compared with the modified Pattullo-Denner diagram (Figure 16) to see what processes were affecting the water present there (Table 10).

Rain fall and runoff predominated during the winter. During the summer several water types were present. Upwelled water was found in May, July, August and September, 1967 and in July, 1968. Heated water occurred in September, 1966, September and October, 1967, and July and August, 1968. This may indicate more upwelling occurring during summer 1967 than during summer 1968 with heating occurring earlier in the latter summer (1968). Rainfall, streamflow, and wind data (Figures 2-7) indicate more rain, higher streamflow, and more breaks in the northerly wind flow during the second summer, all of which indicate conditions less conducive to upwelling. Figure 16 indicates that June-August, 1967 bottom water samples from station 1 were more in the U (upwelled) or U + H (upwelled and heated) range than similar samples taken June-August, 1968; this too may indicate more upwelling occurring during summer 1967 than during summer 1968.

σ^T as an Indicator of Upwelling

σ^T is a measure of water density and is defined as $10^3(\rho - 1)$ where ρ = density.

Figure 16. Pattullo-Denner (1965) diagram modified for Alsea Bay, showing characteristics of Oregon coastal water as affected by various processes. Processes are: R, rainfall and runoff; R + C, rainfall, runoff and cooling; U, upwelling; H + U, heating and upwelling; H, heating; and R + H, rainfall, runoff, and heating. Diagram was modified by replacing CR (Columbia River plume) with R + H. Processes radiate from central core. The central core as characterized by Pattullo and Denner (1965) was assumed to represent seawater along the Oregon coast without local modifications; this seawater was described as having salinity of 33.0 to 33.5‰ and temperature of 10 to 11^{o}C. Data points from bottom water samples at station 1, Alsea Bay, summers 1967 and 1968. Closed points show summer data, 1968 (three minus tide data points are not shown for summer 1968 since salinities were less than 30.5‰). Numbers beside points show month sample was taken: 6=June, 7=July, 8=Aug. Large closed point shows two 1967 points of similar characteristics.


R + H
H
H
+
U
R
R + C
U
TEMPERATURE °C
SALINITY ‰
15
13
11
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7

Table 10. Processes affecting water sampled from the bottom at station 1. The table shows characteristics of station 1 bottom water by month for two years' sampling in Alsea Bay. Data points were characterized by placing them on the Pattullo-Denner (1965) diagram, as I modified it for Alsea Bay.

Month	CC	U	U & H	H	R & H (CR)	R	R & C	Total observations
Sept. 1966				2	1			3
Oct.						1	1	2
Nov.					1	3	1	5
Dec.						2		2
Jan. 1967						2		2
Feb.						4		4
Mar.						3		3
Apr.						5		5
May		1			1	1		3
June	1				1			2
July		1	3					4
Aug.	1	1						2
Sept.		1		3				4
Oct.				1	3			4
Nov.					3	1		4
Dec						1	1	2
Jan. 1968						1	1	2
Feb.						1	2	3
Mar.						3		3
Apr.						3		3
May						3		3
June						2	1	3
July	1	1		2		1		5
Aug.			1	2	2			5
Sept.					1			1

CC: central cell
U: upwelling
U & H: upwelling and heating
H: heating
R & H: rainfall, runoff, and heating; CR: Columbia River plume
R: rainfall and runoff
R & C: rainfall, runoff, and cooling

Collins (1964) delimited the permanent pycnocline in the oceanic waters off Oregon with σ^T values of 25.5 and 26.0; at an offshore station 105 nautical miles west of Newport, he found this pycnocline (layer of rapid density change) between depths of 50 and 150 m at all seasons. Laurs (1967) found the inshore portion of the pycnocline (frontal layer) to be relatively horizontal and at about 25-75 m in depth off the southern Oregon coast during periods of non-upwelling. During periods of upwelling, the pycnocline would intersect the sea surface near the coast because of offshore transport of surface waters; this upwelling would occur within 100 km (54 nautical miles) of the coast (Smith, 1964). This water would come from depths not exceeding 200-300 m (Sverdrup, Johnson and Fleming, 1942).

River runoff and tides could bring coastal upwelled water into an estuary. River runoff of sufficient magnitude could flow out to sea above an incoming salt wedge (Pritchard, 1955). This is probably not the case for Alsea Bay since the entrance has a six to eight foot (2 m) controlling depth (U.S. Army Corps of Engineers, 1950), and since upwelling occurs during late May to late September off Oregon (Bourke, 1969) when river runoff normally is quite low. In fact, river runoff in the Alsea and upwelling along the Oregon coast should be almost negatively correlated since runoff is almost the immediate product of storm systems which drive oceanic waters onshore rather than offshore. Therefore tides are considered to be the main factor in bringing recently upwelled water into Alsea Bay. This water would have a σ^T value of 25.5 or more.

σ^T values were computed from tables (U.S. Navy, Hydrographic Office, 1952) using corresponding salinities and temperatures from the four stations in Alsea Bay. Water having a σ^T value of 25.5 or more was found at stations 1, 2, and 3 (Table 11). σ^T values of 25.5 or more were most numerous at the bottom at station 1 and least numerous (but still occurring) upstream at the surface at station 3. These values occurred in October, 1966, May through September, 1967, and June through August, 1968. During July and August, 1967 such σ^T values were found in station 1 water samples on all six sampling trips when tide levels were calculated to be more than four feet above zero tide level (cf. Figure 17 for tide level at time of sampling at station 1); during July and August, 1968 such σ^T values were found on two of four trips when tide conditions were similar.

The σ^T data do not refute the idea that water of upwelled origin was found more often in the bay in July and August, 1967 than in the same months in 1968. These data plus the previously mentioned lower rainfall, lower streamflow, and increased offshore wind component during the summer of 1967 as compared with the summer of 1968 point to warmer, less saline hydrographic conditions along the coast and in Alsea Bay during summer 1968. Such conditions might induce the presence of zooplankton preferring warmer, less saline waters.

Table 11. σ^T values ≥ 25.5 as found at various stations in Alsea Bay.

Date	Station 1 bottom	Station 1 surface	Station 2 bottom	Station 2 surface	Station 3 bottom	Station 3 surface
19 Oct. 66	25.5	25.5	25.5	25.5		
22 May 67	25.7	25.7	25.6	25.6		
20 June	25.6		25.6	25.6		
3 July	26.0	26.0	25.8			
10 July	26.0	26.0	25.9	25.9	25.7	25.6
22 July	26.3	26.2	26.1	26.0	25.7	25.6
28 July	25.7	25.7				
4 Aug.	25.7	25.7	25.6	25.6		
27 Aug.	26.1	26.0	26.0	26.0		
23 Sept.	25.8	25.8	25.8	25.8		
10 June 68	25.5	25.5	25.5			
29 July	26.2	26.2	26.2	26.1	25.6	
11 Aug.	25.8	25.6	25.8	25.5		

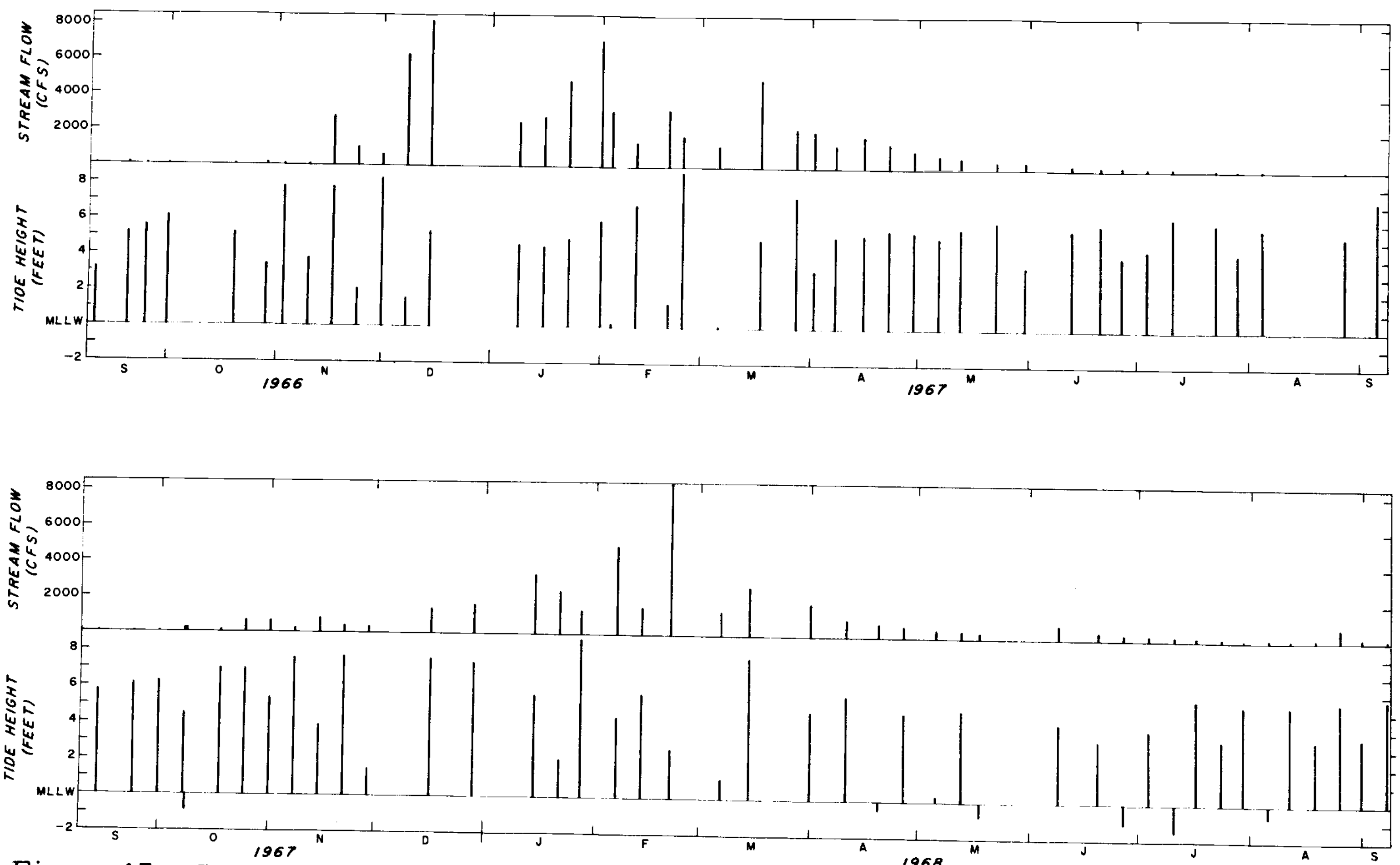

Figure 17. Stream flow in the Alsea River on sampling days and tide height for sampling times at station 1, Alsea Bay during both years of sampling. Upper half of graph, September 8, 1966 to September 8, 1967; lower half of graph, September 8, 1967 to September 8, 1968. Stream flow in cubic feet per second, tide height in feet above or below mean lower low water. Stream flow data from U.S.G.S. (1967, 1968, 1969), tide height derived from U.S.C. & G.S. (1965, 1966, 1967).

Dissolved Oxygen

The amount of dissolved oxygen in Alsea Bay normally seems adequate to support aquatic life. There is a relative lack of human pollution, the bay is shallow, and tidal flushing tends to keep the waters well-mixed. Of the four sampling stations involved, only station 4 appears to occupy an area where long term layering of waters of different densities may occur (Figures 8-15). Layering tends to prevent lower waters from coming into contact with the atmosphere where an equilibrium with atmospheric gases tends to occur.

Only on one of the 53 sampling trips from May 30, 1967 to September 7, 1968 was dissolved oxygen in surface water samples measured at less than 5 ml/L (Appendix I). On this trip (July 29, 1968) these low measurements were found at stations 1 and 2 associated with lower bottom dissolved oxygen values, with high σ^T values (indicative of recently upwelled coastal water), and high total zooplankton populations. The low values might be partially due to low oxygen content of recently upwelled water and partially due to respiration activity of the high total zooplankton populations.

I consider these surface oxygen values sufficiently accurate for me to say that the oxygen content of the surface waters of Alsea Bay is adequate to support aquatic life. However, there are better methods in taking the surface oxygen sample. I took the sample by letting the sample bottle fill without bubbling with water from a bucket just filled with surface water. A siphon used in filling the bottle would reduce air contact. Even better might be a sample drawn from a water sampler that had taken water immediately below the surface.

On six of 53 sampling trips from May 30, 1967 to September 7, 1968, dissolved oxygen in bottom water samples was measured at less than 5 ml/L; this constituted seven of 215 measurements (Appendix I and Table 12).

Table 12. Dates and places where dissolved oxygen was measured at less than 5 ml/L in Alsea Bay during May 30, 1967 to September 7, 1968. Associated bottom and surface σ^T values and total zooplankton numbers per cubic meter.

Date	Station	Surface O_2 (ml/L)	Bottom O_2 (ml/L)	σ^T bottom	σ^T surface	Total zooplankton (number/m^3)
23 Sept. 67	4	6.10	4.57	21.2	14.6	18000
7 Oct.	4	6.13	4.61	23.2	2.0	4200
6 Feb. 68	1	7.90	4.86	24.6	2.5	1300
19 June	2	5.33	4.93	25.5	25.1	4100
29 July	1	4.14	3.55	26.2	26.2	19000
"	2	3.83	3.77	26.2	26.1	45000
11 Aug.	2	5.50	4.87	25.8	25.5	47000

The only bottom readings below 4 ml/L were 3.55 and 3.77 ml/L at stations 1 and 2 on July 29, 1968. These two readings and the low bottom readings at station 4 on September 23, 1967 and at station 2 on August 11, 1968 all occurred along with total zooplankton populations estimated at 18,000/m^3 or more. Respiration would lower the oxygen content of these waters. However equally high total zooplankton populations occurred in five other samples during this period; bottom oxygen values associated with them ranged between 5 and 7 ml/L.

Two low bottom oxygen readings were found when density differences were greater than 0.02 gm/cc (σ^T difference greater than 20) between surface and bottom waters; these readings were found at station 4 on October 7, 1967 and at station 1 on February 6, 1968. These are times when the bottom water may have become gradually depleted in oxygen via respiration and decomposition with very little replenishment from above. An equally high density difference was also found at station 4 on October 31, 1967; the associated bottom oxygen value was 6.02 ml/L and the total zooplankton population was estimated at 700 per m^3 (Appendix I).

The seventh low bottom oxygen reading was found at station 2 on June 19, 1968. Total zooplankton population was not exceptionally high (estimated at 4100/m^3) and density difference between surface and bottom water was 0.0004 gm/cm (σ^T difference of .4). However the σ^T value for the bottom water was 25.5 which is the lower limit used in defining the permanent pycnocline found in waters off the Oregon coast (Collins, 1964). This σ^T value should indicate that the source of this bottom water at station 2 was from subsurface oceanic water that had been drawn upward during upwelling. One then notices that the two low oxygen values from July 29, 1968 and that from August 11, 1968 are associated with σ^T values that should indicate recently upwelled water. Freshly upwelled water is unsaturated regarding dissolved oxygen because of respiration and decomposition occurring within it and because of its previous absence from the surface where it could become saturated when in contact with the atmosphere.

From the data one might conclude that low oxygen values are in the bottom waters of Alsea Bay because of respiration and decomposition, interaction with sediments, density difference with surface water, and presence of recently upwelled coastal water.

A change in the saturation value of dissolved oxygen in estuarine waters depends on a change in the water temperature and/or salinity. Colder, fresher water can contain more oxygen than can warmer, more saline water. Supersaturation may occur when oxygen is liberated by photosynthesis in the water column at a rate greater than it is being used in respiration or other oxidative processes. Oxygen saturation values were calculated from tables (Gilbert, Pawley and Park, 1968) using corresponding salinities and temperatures from the four Alsea Bay stations.

From May 30, 1967, to September 7, 1968, supersaturation values in excess of 110% saturation were found for bottom oxygen measurements in two periods: May 30 through September 5, 1967, and May 17 through September 7, 1968 (Table 13). All samples in which more

Table 13. Number of bottom oxygen samples drawn in the morning and evening (PST) and number of these samples having greater than 110% saturation during two summer periods at four stations in Alsea Bay.

Samples	May 30-Sept. 5, 1967				May 17-Sept. 7, 1968			
	Station				Station			
	1	2	3	4	1	2	3	4
number taken, A. M.	2	0	0	0	7	7	5	6
number > 110% saturated	0	0	0	0	0	0	0	0
number taken, P. M.	8	10	11	10	8	8	10	9
number > 110% saturated	2	4	7	8	0	2	3	9

than 110% saturation was found were drawn later than 1200 PST. One might expect a byproduct of photosynthesis to be more in evidence during the summer and more so in the afternoon, simply because of increased available light and a photosynthetic buildup during the daylight hours. During the first summer period 21 of 39 samples drawn later than 1200 PST indicated saturation values of more than 110%; during the second summer period nine of 35 did likewise. Supersaturation was more in evidence during summer 1967 than during summer 1968 (chi-square test, p = .05). Another chi-square test at the .05 level showed supersaturation to be dependent upon station. The greatest proportion of saturation values more than 110% came from station 4; the least from station. These bottom samples were drawn from shallower water upstream; this may indicate a greater photosynthetic rate nearer the surface.

GENERAL BIOLOGICAL RESULTS

The net (#6 mesh, 0.239 mm aperture width, 160 mm mouth) used for sampling zooplankton normally retains individuals whose smallest diameter is greater than aperture width. There may be an avoidance problem in catching organisms longer than 3 mm since not many organisms of this size were caught; these larger organisms either may sense the coming net and avoid it or may not be present.

Normally the net was too coarse to catch the phytoplankton; but at times the amount of phytoplankton in the water was sufficient to clog the net. No estimates were made as to the amount and kinds of phytoplankton in the water.

Estimates of Number of Organisms per Unit Volume

The total number of organisms in a sample was estimated by multiplying the number of organisms counted in an aliquot by the dilution factor. The volume of water strained was estimated by multiplying the number of revolutions of the plankton sampler propeller by the amount of water passed per revolution, estimated at 0.0045 m^3/rev. The latter value was the mean value obtained for six different plankton samplers based on two calibration trips taken on December 31, 1966, and February 26, 1969 (Table 14). The calibration value for each sampler was obtained by towing the netless

Table 14. Cubic meters of water passed per propeller revolution of netless Clarke-Bumpus plankton samplers as determined from calibration trips of December 31, 1966, and February 26, 1969.

Clarke-Bumpus number	Dec. 31, 1966		Feb. 26, 1969	
	Average number revs.	m^3/rev.	Average number revs.	m^3/rev.
4	162.25	0.00454	167	0.00441
5	160.75	0.00458	163	0.00452
6	164.5	0.00447	158	0.00466
8	170.5	0.00432	159	0.00463
9	161.25	0.00456	148	0.00497
10	176.25	0.00418	168	0.00438

sampler horizontally through quiet water, back and forth at least once each way on a measured 200 foot (60.96 m) course.

For the rest of this paper the term "rev" will be used in place of "a propeller revolution of the plankton sampler."

For 12 min tows, normally about 7 m^3 of water were strained; this amounts to about 1,600 revs. Of the rev readings for the 327 zooplankton tows, there were 19 that I considered unacceptable. The rest were separated by station and averaged; there were higher rev readings (more water strained) per tow as one progressed toward the upstream stations (Table 15). The boat moved elliptically while the net was towed at each station. A comparable turn in deeper waters downstream would cause the net to strain through less water on the turn.

Table 15. Average number of revs per plankton sampler 12 minute tow at each station when revs recorded were greater than 40 /min and fully recorded.

	Station number			
	1	2	3	4
Number acceptable rev readings	77	77	78	76
Average number revs per tow	1481	1553	1608	1689

Four of the 19 unacceptable rev readings were caused by phytoplankton clogging the net (Table 16); these four readings each came to less than 40 revs per minute. Clarke and Bumpus (revised 1950) stated:

> . . . any clogging of the net, which has heretofore seriously interfered with quantitative work, is not a source of error with the plankton sampler provided that the flow of water through the tube does not drop below 1/2 knot. . . (p. 5).

At a speed of 1/2 knot, the netless sampler hypothetically passes 0.186 m^3 of water (15.4 m distance times 0.0121 m^2 cross sectional area) per minute. At 0.0045 m^3/rev, 41 revs per minute are recorded at 1/2 knot speed.

Yentsch and Duxbury (1956) stated (concerning unpublished work originally done by John Barlow (Frolander, personal communication, 1971)):

> At flow rates below 40 counts (revs) per min. frictional effects within the instrument (Clarke-Bumpus plankton sampler) approach equality with the water forces, and the calibration values (vol/count) increase markedly (p. 269).

Table 16. Unacceptable plankton sampler rev readings adjusted to average acceptable rev readings per 12 minute tow for the same station.

Date	Station	Original rev reading (12 min tow)	Adjusted rev reading (12 min tow)
30 Sept. 66	2	1710 ?	1553
"	3	1554 ?	1608
1 Apr. 67	1	?	1481
29 Apr.	2	14 ? ?	1553
12 June	3	355 PHYTO	1608
20 June	2	240 STUCK	1553
"	4	0 STUCK	1689
26 June	4	?	1689
10 July	3	1532 ?	1608
14 Nov.	2	956 STUCK	1553
"	3	996 STUCK	1608
"	4	030 STUCK	1689
16 Dec.	1	1813 ?	1481
27 Jan. 68	1	1725 ?	1481
13 Feb.	4	0 STUCK	1689
31 Mar.	1	952 STUCK	1481
26 Apr.	2	274 PHYTO	1553
"	3	402 PHYTO	1608
7 Sept.	2	329 PHYTO	1553

? = rev reading incompletely recorded
PHYTO = phytoplankton clogging of net
STUCK = rev counter stuck

Thus more water is filtered than measured; zooplankton numbers per cubic meter of water would be higher than they should be.

Rev readings from seven of the Alsea Bay zooplankton tows were unacceptable because the counter stuck; eight other readings were probably normal but they were incompletely recorded (Table 16). All 19 unacceptable readings were adjusted to the average number of revs per 12 minute tow according to station as an approximation of water volume filtered.

Protista

Protista are mostly too small to be caught in the #6 mesh net. At times they were observed in the sample counts (Table 17). Foraminifera were found more often downstream and during fall and winter (chi-square (χ^2) dependence upon station and season at $p = .05$). Radiolaria were observed from stations 1, 2, and 3. *Volvox* sp., but for once in June, was found from November through April; it was found at upstream stations 3 and 4. *Volvox* sp. occurrence may reflect the increased runoff freshening the upstream stations. A dinoflagellate was counted once from station 2 in the spring and a tintinnid once from station 1 in the summer.

For convenience, the observed Protista are considered part of the zooplankton for the rest of this paper. When number of animals per m^3 were summed for 326 Alsea Bay samples, the Protista accounted for 0.097‰ of the total (Table 18).

Table 17. Total number of samples, number of samples at each station, and number of seasonal samples in which various zooplankters were found. Chi-square (χ^2) values greater than 7.81 ($p = .05$) show difference by station or by season. Chi-square values are not given for zooplankters found in fewer than 26 samples because of inadequate sample size per category.

	Occurrences										
	Total	Station					Season				
		1	2	3	4	χ^2	fl	wn	sg	sm	χ^2
Total samples	327	81	83	83	80		94	64	84	85	
Protista											
Dinoflagellata	1	0	1	0	0		0	0	1	0	
Volvox sp.	19	0	0	8	11		0	10	8	1	
Foraminifera	70	26	21	15	8	10.21	27	21	14	8	12.84
Radiolaria	19	7	6	6	0		4	3	8	4	
Tintinnidium sp.	1	1	0	0	0		0	0	0	1	
Coelenterata											
Medusae	155	51	51	42	11	26.88	58	10	39	48	19.19
Siphonophora	8	3	3	2	0		0	1	6	1	
Ctenophora	15	7	5	2	1		7	2	4	2	
Nematoda	104	22	23	26	33	3.24	25	36	33	10	25.04
Annelida											
Adult	33	6	6	12	9	2.93	7	13	9	4	9.75
Larva	188	60	51	49	28	11.17	74	12	53	49	24.55
Arthropoda											
Crustacea											
Podon leuckarti	91	22	27	24	18	1.52	43	0	7	41	52.85
Podon polyphemoides	32	10	10	10	2	5.75	32	0	0	0	79.34
Evadne sp.	66	20	20	18	8	5.65	39	0	0	27	56.67
Fresh water cladocera	63	6	7	20	30	25.79	3	22	26	12	27.32
Ostracoda	31	6	3	6	16	13.17	4	8	15	4	11.59
Copepoda											
Acartia clausi	274	76	77	71	50	6.13	92	31	67	84	14.23
Acartia danae	32	10	10	7	5	2.15	20	10	2	0	27.94
Acartia longiremis	210	71	60	56	23	23.57	74	23	45	68	15.83
Acartia tonsa	129	41	42	33	13	16.09	23	24	50	32	14.07

(Continued on next page)

Table 17. (Continued)

	Occurrences										
	Total	Station					Season				
		1	2	3	4	χ^2	fl	wn	sg	sm	χ^2
Arthropoda											
Crustacea											
Copepoda, cont'd											
Acartia spp.	91	24	29	29	9	11.01	38	7	26	20	12.79
Calanus spp.	132	42	46	34	10	22.70	29	28	45	30	6.46
"*Calanus*-type"	9	2	2	3	2		4	0	3	2	
Calocalanus styliremis	14	3	8	3	0		0	6	6	2	
Centropages mcmurrichi	175	55	57	44	19	19.94	56	15	42	62	17.66
Clausocalanus spp.	76	31	26	16	3	23.84	10	37	25	4	53.44
Ctenocalanus vanus	91	34	30	19	8	17.75	18	37	25	11	30.10
Epilabidocera amphitrites	21	8	5	5	3		5	2	3	11	
Eucalanus sp.	16	4	6	5	1		6	2	8	0	
Eurytemora sp.	160	22	24	54	60	30.18	44	14	40	62	19.71
Metridia sp.	9	3	3	3	0		2	7	0	0	
Microcalanus sp.	10	3	4	2	1		0	3	2	5	
Paracalanus parvus	201	59	64	52	26	15.94	82	41	57	21	29.48
Pseudocalanus sp.	217	71	68	59	19	30.73	57	31	65	64	6.13
"*Pseudocalanus*-type"	130	42	41	36	11	18.80	36	27	39	28	2.08
Rhincalanus sp.	7	1	5	1	0		2	2	3	0	
Tortanus discaudatus	38	11	18	7	2	13.96	15	5	12	6	4.36
Unidentified calanoid	42	13	16	6	7	6.40	8	14	10	10	5.57
Elongated copepod nauplius	29	6	11	11	1	9.03	14	0	8	7	9.61
Copepod nauplius	216	65	62	54	35	9.44	52	29	67	68	10.71
Corycaeus sp.	152	46	50	44	12	23.05	60	34	44	14	23.80
Oncaea sp.	4	1	2	1	0		0	3	0	1	
Oithona similis f and c *Oithona* spp. m	248	73	77	69	29	22.43	84	34	65	65	6.66
Oithona spinirostris	63	17	24	18	4	12.84	24	15	10	14	5.20
Unidentified cyclopoid	97	19	19	32	27	5.00	34	23	24	16	5.59
Harpacticoid	254	58	55	74	67	3.57	73	55	72	54	3.45

(Continued on next page)

Table 17. (Continued)

	Occurrences										
	Total	Station					Season				
		1	2	3	4	χ^2	fl	wn	sg	sm	χ^2
Arthropoda											
Crustacea (cont'd)											
Barnacle nauplius	245	63	69	63	50	2.49	82	16	68	79	27.29
Barnacle cypris	205	53	51	56	45	0.95	87	13	41	64	36.45
Mysidacea	44	18	12	10	4	9.06	20	14	8	2	16.40
Cumacea	33	6	8	14	5	5.54	10	9	10	4	3.75
Tanaidacea	8	5	2	1	0		4	0	3	1	
Isopoda	57	19	16	14	8	4.40	23	5	13	16	6.35
Amphipoda	138	37	28	44	29	4.61	37	42	42	17	19.64
Euphausiacea	66	25	22	16	3	16.96	17	2	26	21	15.13
Shrimp adult	4	1	0	3	0		2	1	1	0	
Unidentified decapod larva	25	14	5	4	2		7	7	5	6	
Callianassa larva	82	25	31	20	6	15.95	9	5	34	34	32.12
Upogebia larva	23	8	7	7	1		0	5	18	0	
Crab zoea	107	37	40	24	6	26.15	29	10	34	34	8.74
Crab megalops	3	1	2	0	0		1	0	1	1	
Crab adult	1	0	1	0	0		1	0	0	0	
Porcelain crab zoea	16	8	4	4	0		3	3	1	9	
Hermit crab larva	3	3	0	0	0		2	0	1	0	
Insecta, Post-larva	27	3	5	5	14	11.32	2	13	11	1	23.09
Larva	54	4	8	9	33	40.22	5	28	19	2	48.11
Arachnida, Mite	47	12	10	12	13	0.52	10	15	15	7	7.51
Mollusca											
Gastropoda	172	66	52	43	11	37.40	70	14	46	42	20.28
Gastropod egg case	38	11	14	10	3	6.51	12	6	12	8	1.26
Pelecypoda	246	75	75	66	30	21.11	80	30	65	71	8.89
Ectoprocta, Cyphonautes larva	42	12	19	10	1	15.18	22	2	11	7	14.28
Chaetognatha	90	28	32	22	8	14.08	26	14	27	23	1.40
Phoronidea, Actinotroch	7	1	4	2	0		0	0	5	2	

(Continued on next page)

Table 17. (Continued)

	Total	Occurrences: Station 1	2	3	4	χ^2	Season: fl	wn	sg	sm	χ^2
Echinodermata											
Larva	61	24	19	15	3	15.57	21	0	19	21	15.00
Adult asteroid	6	4	0	2	0		4	0	2	0	
Chordata, Larvacea and											
larval Ascidacea	142	47	45	41	9	25.95	64	21	45	12	33.64
Thaliacea	17	4	8	3	2		10	1	4	2	
Fish egg	41	17	11	8	5	7.72	6	11	14	10	5.13
Fish larva	65	8	15	16	26	10.64	4	10	32	19	26.42
Unidentified											
Egg	232	63	67	63	39	7.49	57	52	73	50	7.15
C	7	4	3	0	0		2	2	3	0	
A	10	4	4	2	0		6	1	1	2	
B	4	1	1	1	1		4	0	0	0	
Miscellaneous	210	59	53	55	43	2.36	60	42	59	49	1.07
Nauplius	12	2	5	3	2		4	1	7	0	

fl (fall) = September-November
wn (winter) = December-February
sg (spring) = March-May
sm (summer) = June-August
f = female
c = copepodite
m = male

Table 18. Percent of total number of animals per cubic meter of water for 326* samples from Alsea Bay. Computer values were read to three places.

	%
Protista	
Dinoflagellata	.001
Volvox sp.	.002
Foraminifera	.052
Radiolaria	.041
Tintinnidium sp.	.001
Coelenterata	
Medusae	.372
Siphonophora	.010
Ctenophora	.002
Nematoda	.060
Annelida	
Adult	.017
Larva	.870
Arthropoda	
Crustacea	
Podon leuckarti	.923
Podon polyphemoides	.159
Evadne sp.	.628
Fresh water cladocera	.041
Ostracoda	.050
Copepoda	
Acartia clausi	39.931
Acartia danae	.026
Acartia longiremis	5.222
Acartia tonsa	.447
Acartia spp.	.311
Calanus spp.	.621
"*Calanus*-type"	.065
Calocalanus styliremis	.005
Arthropoda	
Crustacea	
Copepoda (con't)	
Centropages mcmurrichi	1.234
Clausocalanus spp.	.267
Ctenocalanus vanus	.169
Epilabidocera amphitrites	.025
Eucalanus sp.	.018
Eurytemora sp.	2.670
Metridia sp.	.005
Microcalanus sp.	.006
Paracalanus parvus	1.991
Pseudocalanus sp.	8.061
"*Pseudocalanus*-type"	.331
Rhincalanus sp.	.004
Tortanus discaudatus	.028
Unidentified calanoid	.032
Elongated copepod nauplius	.049
Copepod nauplius	3.462
Corycaeus sp.	.510
Oncaea sp.	.001
Oithona similis f and c	3.380
Oithona spp. m	.123
Oithona spinirostris	.041
Unidentified cyclopoid	.068
Harpacticoid	.590
Barnacle nauplius	11.470
Barnacle cypris	3.744
Mysidacea	.051
Cumacea	.023

(Continued on next page)

Table 18. (continued)

	%		%
Tanaidacea	.002	Ectoprocta, *Cyphonautes* larva	.065
Isopoda	.036	Chaetognatha	.116
Amphipoda	.125	Phoronidea, Actinotroch	.004
Euphausiacea	.339	Echinodermata	
Shrimp adult	.001	Larva	1.287
Unidentified decapod larva	.017	Adult asteroid	.005
Callianassa larva	.092	Chordata, Larvacea and	
Upogebia larva	.007	larval Ascidacea	2.654
Crab zoea	.211	Thaliacea	.077
Crab megalops	.002	Fish egg	.015
Crab adult	.000	Fish larva	.022
Porcelain crab zoea	.034	Unidentified	
Hermit crab larva	.002	Egg	1.652
Insecta, Post-larva	.003	C	.005
Larva	.012	A	.006
Arachnida, Mite	.017	B	.004
Mollusca		Miscellaneous	.264
Gastropoda	.400	Nauplius	.007
Gastropod egg case	.014		
Pelecypoda	4.300		

*Totals from a 327th sample taken at station 2 on April 7, 1967, were not included in the computations since part of the sample was lost when I transferred it to the storage bottle. This sample was included in recording occurrences of the various zooplankton groups per sample.

f = female; m = male; c = copepodite

Zooplankton

Sample counts of the 266 samples, from which more than 300 organisms were counted, were checked to see which zooplankton groups accounted for 10% or more of a count. Twenty-eight groups at one time or another individually accounted for 10% or more of the count (Table 19); the ten groups that did this most often were *Acartia clausi* Giesbrecht, barnacle nauplii, *Oithona similis* Claus, *Paracalanus parvus* (Claus), pelecypods, *Eurytemora* sp., *Pseudocalanus* sp., barnacle cyprids, copepod nauplii, and *Acartia longiremis* (Lilljeborg). Of these ten groups, and as 10% or more of the sample count, *Eurytemora* sp. and barnacle nauplii occurred more at upstream stations while *Oithona similis*, *Pseudocalanus* sp. and pelecypods occurred more at the downstream stations (χ^2 test, p = .05) (Table 19).

An Estimate of Zooplankton Volume

Zooplankton volume was measured for 28 samples (Table 20) using a partial vacuum to draw off water surrounding the organisms (Frolander, 1957). The samples chosen were those estimated to contain the least amount of debris and a measurable amount of zooplankton. Samples from stations 1 and 2, taken on August 11, 1968, had large amounts of zooplankton but the sampler meter readings

Table 19. Number of times zooplankton groups were >10% of a sample count when >300 organisms were counted. Samples were taken from four stations in Alsea Bay. Chi-square (χ^2) values greater than 7.81 show difference by station.* Occurrences by season were not calculated since I did not count at least 300 organisms from many winter samples. Some of these samples did not have 300 organisms, others were too loaded with debris to make the counting worth my while.

Zooplankton group	Occurrences > 10% of sample count at station 1	2	3	4	Sum	χ^2
Arthropoda, Crustacea						
Branchiopoda						
Fresh water cladocera	0	0	0	1	1	--
Podon leuckarti	5	5	3	0	13	--
Ostracoda	0	0	0	2	2	--
Copepoda						
Acartia clausi	34	37	35	33	139	2.90
Acartia danae	1	1	0	0	2	--
Acartia longiremis	9	9	7	3	28	1.34
Acartia tonsa	1	1	0	0	2	--
Calanus spp.	1	0	0	0	1	--
Clausocalanus spp.	3	0	2	0	5	--
Copepod nauplii	10	10	5	4	29	2.24
Corycaeus sp.	5	7	6	1	19	--
Ctenocalanus vanus	2	0	0	0	2	--
Eurytemora sp.	4	5	14	21	44	30.72
Harpacticoid copepods	0	1	4	4	9	--
Oithona similis	18	19	19	2	58	8.84
Paracalanus parvus	20	18	13	5	56	4.60
Pseudocalanus sp.	20	17	6	1	44	15.75
Cirripedia						
Barnacle nauplii	15	14	26	27	82	16.15
Barnacle cyprids	13	12	9	1	35	6.28
Malacostraca						
Mysids	0	0	1	0	1	--
Gammarid amphipods	0	0	1	0	1	--
Eucarida, Euphausiids	0	1	0	0	1	--
Decapoda						
Crab zoea	1	0	0	0	1	--
Callianassa larva	1	0	0	0	1	--
Mollusca, Pelecypoda	20	22	8	2	52	14.77
Echinodermata, larvae	2	2	3	0	7	--
Protochordata, Larvacea and larval Ascidacea	9	9	4	0	22	--
Unidentified eggs	3	2	5	1	11	--
Counts > 300 organisms	75	72	70	49	266	

*Chi-square (χ^2) values are not given for organisms whose total occurrences in this table are less than 28 because of inadequate sample size per category.

Table 20. Numbers and cc of zooplankton per m^3 of water from 28 cleaner and more measurable (volume-wise) samples taken in Alsea Bay. Volumes measured in late February 1970.

Date		Station	Number/ m^3	cc/m^3
24 Sept.	66	4	3521	.070
30 Sept.		4	9174	.104
2 Nov.		4	1644	.062
16 Nov.		3	2304	.088
23 Feb.	67	1	2124	.231
7 Apr.		1	3580	.215
10 July		2	1667	.066
28 July		4	3874	.049
27 Aug.		1	13609	.410
27 Aug.		4	16713	.218
5 Sept.		2	11313	.373
23 Sept.		4	17712	.338
7 Oct.		4	4224	.094
8 June	68	2	4069	.081
8 June		3	3591	.082
3 July		1	5489	.280
3 July		2	6034	.191
3 July		3	4979	.139
3 July		4	926	.009
10 July		4	5254	.065
16 July		2	22063	.332
23 July		1	2512	.064
23 July		2	1790	.086
23 July		4	4676	.040
29 July		1	18908	.857
29 July		2	44556	1.396
5 Aug.		2	977	.027
5 Aug.		4	5009	.095

were about half the normal number of revs; these samples were not included in estimating zooplankton volume.

Using the ratio of the means, a relationship between the number of zooplankton in the sample (x) and the displacement volume of the zooplankton (y) was ascertained. The number of zooplankton was calculated as the product of the number of zooplankton counted in a cc aliquot times the number of ccs from which that aliquot was drawn.

The relationship was:

$$r = \bar{y}/\bar{x}$$

where

r = ratio

$\bar{y}$ = mean of zooplankton volumes, and

$\bar{x}$ = mean of zooplankton numbers.

The ratio was used to estimate volume for the other 299 Alsea Bay zooplankton samples, so that long term average standing zooplankton biomass could be estimated.

For the 28 samples, $r = 0.000027$, and the estimated average volume over the entire sampling period for seasons of the year at each of the four stations has been calculated (Table 21).

Alsea Bay does not appear to have the highest standing zooplankton crop in the world. Using previous measurements, Riley, Stommel and Bumpus (1949) figured annual mean displacement volumes of 0.20-0.80 cc/m^3 off the New England coast and 0.05 cc/m^3 in the

Table 21. Average estimated zooplankton numbers and zooplankton volume/m^3 of water in Alsea Bay at four stations and during three-month periods. Estimates are from 326 samples collected at the four stations.

Station	Average estimated number zooplankton per m^3 during			
	Sept. - Nov.	Dec. - Feb.	March-May	June-Aug.
1	3032	704	2633	8098
2	3803	646	1972	8016
3	2407	171	1860	2798
4	3304	29	164	2971

Station	Average estimated zooplankton volume (cc/m^3) when r = .000027 Samples taken during:				Average*
	Sept. - Nov.	Dec. - Feb.	March-May	June-Aug.	
1	.082	.019	.071	.219	.098
2	.103	.017	.053	.216	.098
3	.065	.005	.050	.076	.049
4	.089	.001	.004	.080	.044

*Average of seasonal values, each season given equal weight.

Sargasso Sea. Deevey (1956), using the blot, dry and submerge method, measured mean annual displacement volumes of 0.68 cc/m^3 in Block Island Sound and 0.95 cc/m^3 in Long Island Sound with #10 mesh (0.150 mm aperture) net; with #2 mesh (0.342 mm aperture), volumes were 0.21 cc/m^3 in Block Island Sound and 0.29 cc/m^3 in Long Island Sound. Off Peru in the southern fall when conditions were changing from the El Niño to upwelling, Posner (1957) found displacement volumes of 0.068-2.16 cc/m^3 with #10 mesh and 0.056-1.05 cc/m^3 with #2 mesh.

Using #6 mesh (0.239 mm aperture) and a partial vacuum in drawing off water in determining displacement volumes (as was done for the larger and cleaner samples in the present study), Frolander (1962) recorded mean annual displacement volumes of 0.15 cc/m^3 inshore and 0.08 cc/m^3 outside the 100 fathom line off the Washington coast during December 1956-November 1957. Minimum monthly averages were 0.029 cc/m^3 inshore and 0.024 cc/m^3 offshore in February 1958. Maximum monthly averages were 0.14 cc/m^3 offshore in May 1957 and 0.32 cc/m^3 inshore.

In Alsea Bay, mean displacement volumes for the two-year sampling period, September 1966 to September 1968, were 0.10 cc/m^3 for stations 1 and 2, 0.05 cc/m^3 for station 3, and 0.04 cc/m^3 for station 4 (Table 21).

If Frolander's (1962) Washington and British Columbia coast zooplankton displacement volumes are indicative of displacement volumes along the Oregon coast, a combination of his findings and mine might give the following picture. For the area offshore Alsea Bay and the bay itself, highest average annual volumes might be found in the ocean inshore, followed by progressively lower volumes in the seaward part of Alsea Bay, in the offshore Pacific, and in the landward part of Alsea Bay.

The mean annual zooplankton displacement volumes off the Washington and British Columbia coast (Frolander, 1962) and mean displacement volumes for two years' sampling in Alsea Bay are lower by at least 25% of above mentioned values recorded off New England even when net mesh for the New England samples was larger (allowing for smaller forms to escape). One might conclude that the Pacific, off Washington and British Columbia, and Alsea Bay areas have a lower standing crop than the northwest Atlantic off New England. The mean displacement volumes for two years' sampling at Alsea Bay stations 3 and 4 (Table 21) are comparable to Sargasso Sea mean annual displacement volumes (Riley, Stommel and Bumpus, 1949). The Sargasso Sea is not high in standing crop.

Average displacement volumes during December-February in Alsea Bay ranged from 0.001 cc/m^3 at station 4 to 0.019 cc/m^3 at station 1 (Table 21); both values are lower than Frolander's (1962) minimum monthly displacement volumes inshore and off the Washington and British Columbia coast. Maximum average displacement volumes for three-month periods in Alsea Bay were 0.22 cc/m^3 at stations 1 and 2 during June-August (Table 21); these values fall between Frolander's (1962) maximum monthly values inshore and off the Washington and British Columbia coast. Maximum average displacement volumes for three-month periods in Alsea Bay at stations 3 and 4 were below Frolander's (1962) maximum monthly values from both inshore and off the Washington and British Columbia coast.

In single samples from Alsea Bay, displacement volumes were measured at 1.4 cc/m^3 at station 2 on July 29, 1968; on August 11, 1968, a value of 1.1 cc/m^3 was found at station 1 and one of 1.5 cc/m^3 at station 2 (these two latter values may be high since estimates of water passed through the sampler may have been low because of phytoplankton clogging the nets). These three values rank with highs found by Posner (1957) in the Peru current at the beginning of upwelling.

In addition to a comparison of mean annual displacement volumes of zooplankton between Frolander's (1962) nearshore and offshore volumes along the Washington and British Columbia coast and those mean displacement volumes for two years' sampling at stations 1 and 2 and stations 3 and 4 in Alsea Bay, an attempt was made to convert Laurs' (1967) trophic level II (zooplankton) biomass data that were taken in the Pacific up through 165 nautical miles off Brookings, Oregon (42° N. Lat.). Laurs' samples were collected using a 0 mesh (0.571 mm aperture) plankton net having a flowmeter; the net was towed obliquely from the surface to 200 m (depth permitting) and back with wire being payed out at 50 m/min and reeled in at 30 m/min. Towing speed was six knots and all these 40 min tows were taken between dusk and dawn.

Earlier, Ahlstrom and Thrailkill (1963) along with investigating plankton volume loss with time of preservation took 12 samples and compared their dry and wet weights. They found that on the average dry substance weight was 0.090 times that of wet weight plankton (preserved and corrected for interstitial water). Thus Laurs' (1967) g dry wt/10 m^2 for 25 m water column at station BH5 and for 100 m water column at the other stations was converted to g wet wt/m^3 by multiplying with the factor 0.044 for station BH5 and 0.011 for the remaining stations.

Without regarding the variance, highest standing crop appears to be 15 nautical miles offshore in the spring, while the area 25 to 45 miles offshore has a fairly high standing crop in the fall (Table 22).

Assuming biomass to be negligible during the winter months, mean annual displacement volume (each season being given equal weight) is 0.14 g wet wt/m^3 at BH5 (5 nautical miles offshore), 0.49 at 15 nautical miles offshore, 0.18 at 25-45 nautical miles offshore,

Table 22. Laurs' (1967) trophic level II (zooplankton) biomass data converted to g wet wt/m^3 and grouped by season; data from stations 5 to 165 nautical miles off Brookings, Oregon (42^{o} N. Lat.).

	Station			
	BH5	BH15	BH25-45	BH65-165
		March - May		
av. g wet wt/m^3	0.193	1.242	0.080	0.123
# samples	3	3	8	14
		July - August		
av. g wet wt/m^3	0.289	0.414	0.128	0.032
# samples	1	2	6	11
		September - October		
av. g wet wt/m^3	0.082	0.298	0.492	0.091
# samples	2	1	6	12
		December - February		
# samples	0	0	0	0

and 0.06 at 65-165 nautical miles offshore. A comparison with the Alsea data apparently agrees with the earlier conclusion that the largest standing crop of zooplankton should be found nearshore off Oregon with lower values in the seaward part of the estuaries and still lower far offshore and in the landward parts of the estuaries.

Results of Using McConnaughey's Grouping (Assembling) Coefficient

The assembling coefficient (McConnaughey's (1964) grouping coefficient) was used at or above the non-negative level to bring into assemblages* the various animal groups found in the 327 Alsea Bay zooplankton samples. Results were: 21 animal groups formed a major assemblage, 23 animal groups were related somewhat between themselves and to one or some members of the major assemblage, 35 animal groups were related only to one or some members of the major assemblage, and two groups (mysids and annelid adults) were not related at all (Table 23). Non-negative assembling coefficients for Alsea Bay zooplankton groups are in Table 24.

The grouping of 21 animal groups into one major assemblage may show that Alsea Bay is an area quite diverse in animal representation. This may be the normal situation but the mixing processes in the bay and the sampling method may have increased the correlation.

*An "assemblage" is here considered as a grouping of various organisms showing commonality of occurrence in samples treated statistically.

Table 23. McConnaughey's association using non-negative "assembling" coefficients for animal groups from Alsea Bay samples; boxes enclose members associated with one another. Lines between boxes indicate partial associations between assemblages. Members of third column are not associated with each other but only with one or more members of column one. Crab adults, tintinnida, and dinoflagellata were each counted from only one sample and were not included above. Mysids and annelid adults did relate.

Acartia clausi		*Acartia* spp. Chaetognath
Barnacle nauplius	*Eurytemora* sp. Fish larva	Foraminifera
Pelecypod		Isopoda Aquatic mite
Oithona similis	*Volvox* sp. Fresh water cladocera	*Cyphonautes* larva Unidentified calanoid copepod
Acartia longiremis	Insect post-larva	Fish eggs *Tortanus discaudatus*
Pseudocalanus sp.	Insect larva Nematode	Gastropod egg case Cumacea
Copepod nauplius		*Acartia danae* Ostracoda
Centropages mcmurrichi	Amphipod Unidentified cyclopoid copepod	Elongated copepod nauplius
Gastropod	Hermit crab larva	Unidentified decapod larva
Polychaete larva		*Upogebia* larva *Epilabidocera amphitrites*
Barnacle cypris	Echinoderm larva Euphausiid	Radiolaria Thaliacea
Unidentified eggs	*Callianassa* sp.	Porcelain crab zoea *Eucalanus* sp.
Paracalanus parvus	Crab zoea Crab megalops	Ctenophora *Calocalanus styliremis*
Miscellaneous	*Oncaea* sp. *Oithona spinirostris*	Unidentified nauplius Unidentified A
Harpacticoid copepod		*Microcalanus* sp. "*Calanus*-type" Siphonophora
Medusa	*Podon leuckarti* *Evadne* sp. *Podon polyphemoides*	Tanaidacea *Rhincalanus* sp.
Appendicularia and larval Ascidacea		Phoronid actinotroch Unidentified C
Corycaeus sp.	*Ctenocalanus vanus* *Clausocalanus* spp.	Echinoderm, adult asteroid
"*Pseudocalanus*-type"	*Metridia* sp.	Unidentified B Shrimp adult
Calanus sp.		
Acartia tonsa		

Table 24. McConnaughey's (1964) grouping (assembling) coefficient used to show relationships between various zooplankton groups found in 327 samples from four stations in Alsea Bay, Oregon. Here only non-negative values are recorded. Numbers following names indicate number of samples in which each corresponding zooplankton group was found. Letters (A, B, and C) before or above numbers indicate appropriate pairs to be matched in reading table.

Table 24. McConnaughey's (1964) grouping (assembling) coefficient used to show relationships between various zooplankton groups found in 327 samples from four stations in Alsea Bay, Oregon. Here only non-negative values are recorded. Numbers following names indicate number of samples in which each corresponding zooplankton group was found.

		274 254 248 246 245 232 217 216 A210 B210 205 201 188 175 172 160 155 152 142 138 132 130 129 107 104 97 A91 B91 C91 90 82 76 70 A66 B66 65 A63 B63 61 57 54 47 44 A42 B42 41 A38 B38 A33 B33 A32 B32 31 29 27 25 23 21 A19 B19 17 A16 B16 15 14 12 A10 B10 A9 B9 A8 B8 A7 B7 C7 6 A4 B4 C4 A3 B3 A1 B1 C1
Acartia clausi	274	.57 .83 .82 .85 .55 .71 .69 .73 .51 .67 .62 .64 .61 .60 .42 .57 .47 .50 .12 .40 .42 .43 .38 - .02 .30 .19 .32 .31 .27 .11 .11 .24 .22 - - .21 .22 .19 - - - .15 .10 .04 .14 .08 - - .12 .08 - .11 - .00 .08 .03 - .01 .06 .06 .06 .05 .05 - .04 - - .03 .03 .03 .03 .03 .03 .02 .01 .01 .01 .01 .01 .00 .00 .00
Harpacticoid	254	.51 .54 .50 .60 .38 .43 .34 .51 .43 .47 .35 .18 .25 .37 .12 .36 .22 .38 .13 .28 .12 .01 .23 .17 .04 .16 .06 .05 - .04 .13 - - .10 .15 - - - .15 .11 - .05 - - - - .06 - .02 - .05 - .02 - - - .02 - .00 - - - - .05 .04 - - .04 - - - .03 - .02 - .02 - - - .00 .00 .00
Oithona similis	248	.85 .70 .59 .74 .62 .71 .46 .55 .67 .58 .57 .60 .19 .54 .56 .50 .16 .42 .48 .41 .35 - .00 .19 .26 .29 .35 .25 .20 .12 .13 .19 - - .23 .16 .12 - - - .14 .11 .05 .12 .12 - - .09 .13 - .08 - .06 .09 - - .08 .07 .06 .06 - .06 - - .04 .04 .04 .03 .03 .03 .03 .03 .02 .02 .02 .02 .01 .01 .00 .00 .00
Pelecypoda	246	.72 .59 .74 .62 .74 .49 .58 .63 .62 .60 .66 .19 .55 .51 .49 .13 .48 .48 .42 .38 - .01 .29 .22 .32 .29 .25 .19 .14 .21 .23 - - .20 .23 .12 - - - .17 .09 .11 .12 .12 - - .09 .02 - .12 - .10 .09 .03 - .08 .07 .07 .07 .06 - - - .04 - - .03 .03 .03 .03 .03 .02 .02 .02 - .01 .01 .00 .00 .00
Barnacle nauplii	245	.44 .62 .68 .65 .41 .62 .44 .64 .54 .51 .38 .47 .26 .38 .01 .28 .27 .28 .33 - - .34 - .28 .11 .27 - - .25 .21 - - - .21 .04 - - - .17 - - .06 - - - .10 - - .04 - - - - - - .01 - - .06 - - .04 - - .04 .03 - - .03 - .02 - - - .01 .01 .00 .00 .00
Unidentified eggs	232	.52 .48 .43 .47 .36 .49 .39 .30 .36 .12 .23 .38 .28 .27 .31 .32 .22 .13 .20 - - .22 .06 .09 .04 19 .13 - .03 - - .03 - .02 - - - .01 .00 .00 .00
Pseudocalanus sp.	217	.60 .66 .36 .41 .46 .42 .54 .55 .05 .43 .38 .33 .01 .49 .35 .40 .33 - - - .20 .19 .24 .26 .17 - - .15 - - .13 .09 - - - - - .11 .07 - - - - - - - - - - .11 - - .03 - .07 .01 - - - - - - .04 .04 .04 - .03 .03 - .02 .02 - .01 - .00 .00 .00
Copepod nauplii	216	.51 .24 .43 .34 .48 .46 .39 .14 .36 .19 .31 - .31 .36 .21 .34 - - .06 .05 .17 .10 .14 .03 - .03 .29 - - - .03 - - - - - .05 .07 - .05 - - - - .03 .03 - .03 .02 - - .01 .01 .00 .00 .00
Acartia longiremis	A210	.37 .48 .45 .54 .66 .58 .08 .49 .27 .39 - .34 .28 .29 .33 - - .20 - .26 .14 .05 - - .23 .02 - - .05 .06 - - - - .00 - - - - - - - - - .10 - .07 - - - - .02 .08 .01 - - - .05 - - .04 - .04 .03 - - - - - - - - .00 .00 -
Miscellaneous	B210	.33 .32 .35 .23 .32 .07 .30 .25 .29 .20 .17 .22 .11 .07 .16 .19 - .02 .04 - - - .07 .02 .10 - .01 - .02 - - - - .06 - - - - - - - - - - - - - - - - .02 - - - - - - - - - .04 .04 - .03 .03 - - - .02 .01 .01 .00 - .00
Barnacle cyprids	205	.39 .54 .37 .41 .26 .35 .20 .26 - .12 .14 .01 .07 - - .29 - .13 .09 - - - .24 .04 - - - .06 .05 - - - .09 - - - - - - .16 - - .02 - - - - - - - - - - - - .05 - - - - - - - - - - .02 - - .01 .00 .00 .00
Paracalanus parvus	201	.42 .28 .41 - .23 .70 .50 .11 .27 .34 .31 .06 - - - .31 .13 .16 - .29 .10 - - - - .10 - - - - - - - - - - - - .16 .12 - - - - .07 - - .09 - - .08 .07 .07 - - - .04 - - - .03 - - .03 - .02 .02 .01 .01 .00 - .00
Annelid larvae	188	.41 .55 .04 .44 .25 .40 - .24 .17 .08 .13 - - .09 - .13 .00 - - - .13 .13 - - - .11 .03 - - - .14 - - - - - - .13 - - - - - - - - - - - - .08 - - - - - - - - - - - - - .02 - - .02 .01 .01 .01
Centropages mcmurrichi	175	.50 - .40 .11 .30 - .17 .15 .20 .27 - - .20 - .09 .06 .07 - - .06 .04 - - - .11 - - - - .03 - - - - - - - - - .00 - .02 - - .02 .01 .01 -
Gastropoda	172	- .50 .33 .44 - .21 .16 .28 .26 - - .09 - .14 .18 - - - .05 .17 - - .04 .13 - - - - .16 - - - - - - .00 - - - - - - - - - - - - - - - - - - - .05 .05 - .04 - - - .02 - .02 .02 .01 .01 .01
Eurytemora sp.	160	- - - - - - - - - - - - - - - - - - - .02 - .01 - -
Medusae	155	.15 .24 - .11 .06 .14 .28 - - - - - .07 - - - - .19 - - - .17 - - - - .09 - .05 - - .05 - - - - - .02 .02 .01 .01 .01
Corycaeus sp.	152	.31 - .16 .23 .28 - - - - .30 .02 .15 - .22 - - - - - .08 - - - - - .00 - - - - - - - .13 - - - - .00 - - .13 - - - - .09 - - - - - .05 - - - .05 .04 - - .03 - - .01 - .01
Larvacea and larval Ascidacea	142	- .14 .16 .12 - - - - - .08 .02 - - - - - - - - .17 - - - - .11 - - - - - - .19 - - - - - - - - .07 .05 - - - - - - - - - .06 - - - - .04 - - .03 .02 .02 .01 - .01
Amphipoda	138	- - - - .10 .11 - .02 .01 - -
Calanus spp.	132	.08 .12 - - - - .11 - - - .02 - .02 - - - - - .05 - - - - - - - - - .05 - - - .03 - - - - - - .01
"Pseudocalanus-type"	130	.02 - - - - .08 - .07 - - - - - - - - - - - - .01 .01 .01
Acartia tonsa	129	.01 - - - .01 - .24 .04 - .02 - - - - - - - - - - - - .07 - - - - - - - - .03 - - - .01 .01
Crab zoea	107	- - - - - - .01 - .03 - - - .01
Nematoda	104	- - - - - - - - - - - - - - - .01 - .01 - -
Unidentified cyclopoid	97	- .10 - .01 - -
Podon leuckarti	A91	- - - - - - .23 - .01 -
Ctenocalanus vanus	B91	- - - .50 - .01
Acartia spp.	C91	- .01 .01 .01
Chaetognatha	90	- .01 - .01
Callianassa sp.	82	- .01
Clausocalanus spp.	76	- .12 - - - - - - - - - - - - - - -
Foraminifera	70	- - - - - - - - - - - - - - - - - .07 - .01 .01 -
Evadne sp.	A66	- -
Euphausiacea	B66	- - - .07 - .02 .02
Fish larvae	65	- -
Fresh water cladocerans	A63	- - - .13 - - - - - - - - - - - - - - - - - .23 -
Oithona spinirostris	B63	- .06 - - - - .02 - -
Echinoderm larvae	61	- .05 - .02 -
Isopoda	57	- .02 .02 -
Insect larvae	54	- - - - - - - - - - - - - .06 -
Arachnida, mites	47	- -
Mysidacea	44	- .02 .02 -
Cyphonautes sp. larvae	A42	- .02 - .02
Unidentified calanoid	B42	- .02
Fish eggs	41	- -
Tortanus discaudatus	A38	- .03
Gastropod egg cases	B38	- .03 .03 -
Cumacea	A33	- .03
Annelid adults	B33	- -
Podon polyphemoides	A32	- -
Acartia danae	B32	- -
Ostracoda	31	- -
Elongated copepod nauplii	29	- -
Insect post-larvae	27	- -
Unidentified decapod larvae	25	- -
Upogebia sp.	23	- -
Epilabidocera amphitrites	21	- .05 -
Volvox sp.	A19	- -
Radiolaria	B19	- .05
Thaliacea	17	- -
Porcelain crab zoea	A16	- -
Eucalanus sp.	B16	- -
Ctenophora	15	- - - - - - - - - - - - - - - - - - - -
Calocalanus styliremis	14	- - - - - - - - - - - - - - - - - - .07
Unidentified nauplii	12	- - - - - - - - - - - - - - - - - -
Unidentified A	A10	- - - - - - - - - - - - - - - - -
Microcalanus sp.	B10	- - - - - - - - - - - - - - - .10
Metridia sp.	A9	- - - - - - - - - - - - - - -
"Calanus-type"	B9	- - - - - - - - - - - - .11 -
Siphonophora	A8	- - - - - - - - - - - - -
Tanaidacea	B8	- - - - - - - - - .13 - -
Rhincalanus sp.	A7	- - - - - - - - - - -
Phoronid actinotroch	B7	- - - - - - - - - -
Unidentified C	C7	- - - - - - - - -
Adult asteroid	6	- - - - - - - -
Oncaea sp.	A4	- - - - - - -
Unidentified B	B4	- - - - - -
Shrimp adult	C4	- - - - -
Crab megalops	A3	- - - -
Hermit crab larvae	B3	- - -
Crab adult	A1	- -
Tintinnidium sp.	B1	-
Dinoflagellata	C1	

The volume of water in the bay between stations 1 and 4 increases almost fourfold with a six foot tide rise from mean lower low water; the influx and ebb of the tide must cause some mixing in the bay. At times the oblique towing of the zooplankton net caused the sample to be taken from water of different salinities, temperatures and densities; this would result in a mixed sample drawn from at least two environments.

Possibly the most interesting parts of the association were the interrelationships shown between the 23 animal groups that were related somewhat between themselves and to one or some members of the main assemblage (Table 23). Interrelationships between these 23 animal groups were:

1) *Podon leuckarti*, *Evadne* sp., and *Podon polyphemoides*
2) *Ctenocalanus vanus* and *Clausocalanus* spp.
3) *Clausocalanus* spp. and *Metridia* sp.
4) *Oncaea* sp. and *Oithona spinirostris*
5) crab zoea and crab megalops
6) crab zoea and *Callianassa* sp.
7) euphausiids and echinoderm larvae
8) hermit crab larvae and echinoderm larvae
9) hermit crab larvae and amphipods
10) amphipods and unidentified cyclopoid copepods
11) amphipods and nematodes

12) nematodes and insect larvae

13) insect larvae and post-larval insect forms

14) insect larvae and fresh water cladocerans

15) fresh water cladocerans and Volvox sp.

16) Eurytemora sp. and fish larvae

In addition to being part of the major assemblage, medusae (from which siphonophores were excluded when counted separately) were associated with Acartia tonsa, crab zoea, crab megalops, hermit crab larvae, chaetognaths, euphausiids, echinoderm larvae, Cyphonautes larvae, siphonophores, and phoronid larvae.

McCormick (1969) in commenting specifically on the hydromedusae in Yaquina Bay, found the most commonly occurring hydromedusa Sarsia eximia (Allman) to correlate with all but Acartia tonsa and Eurytemora sp. of the 18 more commonly occurring zooplankton groups. According to my data, no sizable upstream population of Acartia tonsa was found in Alsea Bay; perhaps there was no niche where it might grow apart from more marine areas that medusae normally inhabit.

Results of Tests for Sample Composition Similarities

As other data (rainfall, streamflow, and coastal winds) indicated that there might be a difference in water conditions between the summers of 1967 and 1968, the zooplankton samples taken at station 1 during May through early September of each summer were analyzed for similarity with each other. If the samples taken from both summers were all quite the same, similar zooplankton populations would imply similar physical conditions during both summers or conditions not different enough to cause a population shift.

Sanders' (1960) index of affinity at the 40% level or higher showed some similarity between all samples but one (Table 25). The exception was taken on September 7, 1968, when the count contained Acartia longiremis and the category Larvacea and larval Ascidacea in excess of 10%. The remaining samples were grouped (Figure 18) as previously outlined in the methods.

The main group consisted of nine samples, five taken in 1967 (July 3 and 10, August 4 and 27, and September 5), and four in 1968 (July 3, 23, and 29, and August 11). These samples all had Acartia clausi in excess of 30% of the count and five had Pseudocalanus sp. in excess of 10%. The late August and early September samples from 1968 were not in this group.

There were four groups of from two to five samples that related partially to the main group. Two May samples from 1967 (May 12 and 30) had Pseudocalanus sp. in excess of 30% of the count. In a five-sample group (May 22 and June 20, 1967, and May 12, June 19, and August 18, 1968), four of the samples had Acartia clausi as

	1967 6 May	12 May	22 May	30 May	12 Jun	20 Jun	3 Jul	10 Jul	22 Jul	28 Jul	4 Aug	27 Aug	5 Sep
6May67		.26	.32	.21	.25	.62	.51	.37	.43	.39	.31	.19	.26
12May			.19	.50	.24	.38	.34	.44	.37	.22	.13	.04	.07
22May				.21	.48	.43	.39	.32	.37	.46	.38	.24	.29
30May					.40	.38	.31	.39	.38	.29	.15	.04	.07
12Jun						.33	.20	.22	.28	.39	.22	.08	.11
20Jun							.69	.54	.65	.47	.45	.22	.26
3Jul								.75	.51	.56	.56	.45	.47
10Jul									.54	.54	.62	.51	.53
22Jul										.45	.43	.22	.27
28Jul											.61	.36	.46
4Aug												.59	.65
27Aug													.77
5Sep													

	1968 5 May	12 May	17 May	8 Jun	19 Jun	26 Jun	3 Jul	10 Jul	16 Jul	23 Jul	29 Jul	5 Aug	11 Aug	18 Aug	25 Aug	31 Aug	7 Sep
6May67	.36	.31	.22	.48	.43	.10	.39	.10	.32	.26	.33	.07	.40	.34	.18	.47	.31
12May	.16	.30	.16	.39	.15	.05	.53	.04	.19	.11	.33	.05	.29	.12	.15	.18	.16
22May	.33	.44	.26	.16	.56	.15	.31	.25	.27	.37	.34	.53	.36	.61	.20	.37	.22
30May	.13	.39	.36	.38	.15	.05	.41	.04	.24	.12	.35	.05	.29	.14	.11	.14	.12
12Jun	.29	.62	.46	.21	.39	.13	.19	.20	.36	.19	.23	.33	.27	.46	.34	.37	.21
20Jun	.44	.43	.25	.54	.48	.11	.49	.11	.36	.35	.51	.10	.55	.43	.19	.43	.23
3Jul	.26	.24	.16	.40	.47	.09	.66	.10	.28	.54	.71	.08	.68	.34	.14	.34	.19
10Jul	.16	.19	.18	.45	.45	.11	.80	.11	.27	.57	.75	.08	.76	.35	.12	.27	.16
22Jul	.28	.34	.23	.43	.45	.11	.53	.12	.35	.32	.49	.11	.54	.41	.14	.34	.21
28Jul	.27	.37	.31	.22	.55	.14	.55	.19	.40	.47	.54	.17	.59	.53	.21	.33	.25
4Aug	.29	.30	.24	.22	.53	.12	.51	.12	.30	.69	.65	.09	.77	.53	.18	.38	.24
27Aug	.05	.05	.08	.08	.33	.06	.41	.07	.16	.80	.67	.04	.64	.27	.06	.17	.12
5Sep	.11	.12	.14	.10	.41	.10	.47	.12	.35	.80	.68	.08	.67	.44	.10	.23	.24
5May68		.44	.26	.41	.34	.15	.13	.14	.16	.16	.13	.17	.22	.33	.25	.44	.20
12May			.39	.31	.41	.13	.19	.16	.31	.18	.22	.19	.29	.40	.34	.46	.37
17May				.20	.26	.55	.17	.53	.21	.22	.19	.35	.23	.25	.18	.29	.19
8Jun					.44	.15	.45	.07	.18	.12	.30	.04	.35	.27	.24	.52	.21
19Jun						.15	.48	.24	.34	.42	.41	.27	.51	.72	.31	.54	.26
26Jun							.10	.87	.10	.13	.06	.33	.10	.16	.13	.16	.08
3Jul								.11	.31	.45	.64	.07	.64	.38	.12	.27	.22
10Jul									.12	.14	.09	.41	.11	.24	.13	.16	.10
16Jul										.25	.28	.08	.32	.42	.20	.33	.28
23Jul											.74	.12	.73	.36	.12	.24	.16
29Jul												.06	.87	.33	.09	.23	.17
5Aug													.08	.33	.14	.13	.07
11Aug														.43	.12	.30	.18
18Aug															.33	.46	.29
25Aug																.47	.23
31Aug																	.35
7Sep																	

Table 25. Sanders' (1960) index of affinity used in showing similarity between zooplankton samples taken at station 1 in Alsea Bay, Oregon, during May-early September, 1967 and 1968. Values are recorded as a proportion of 1.00.

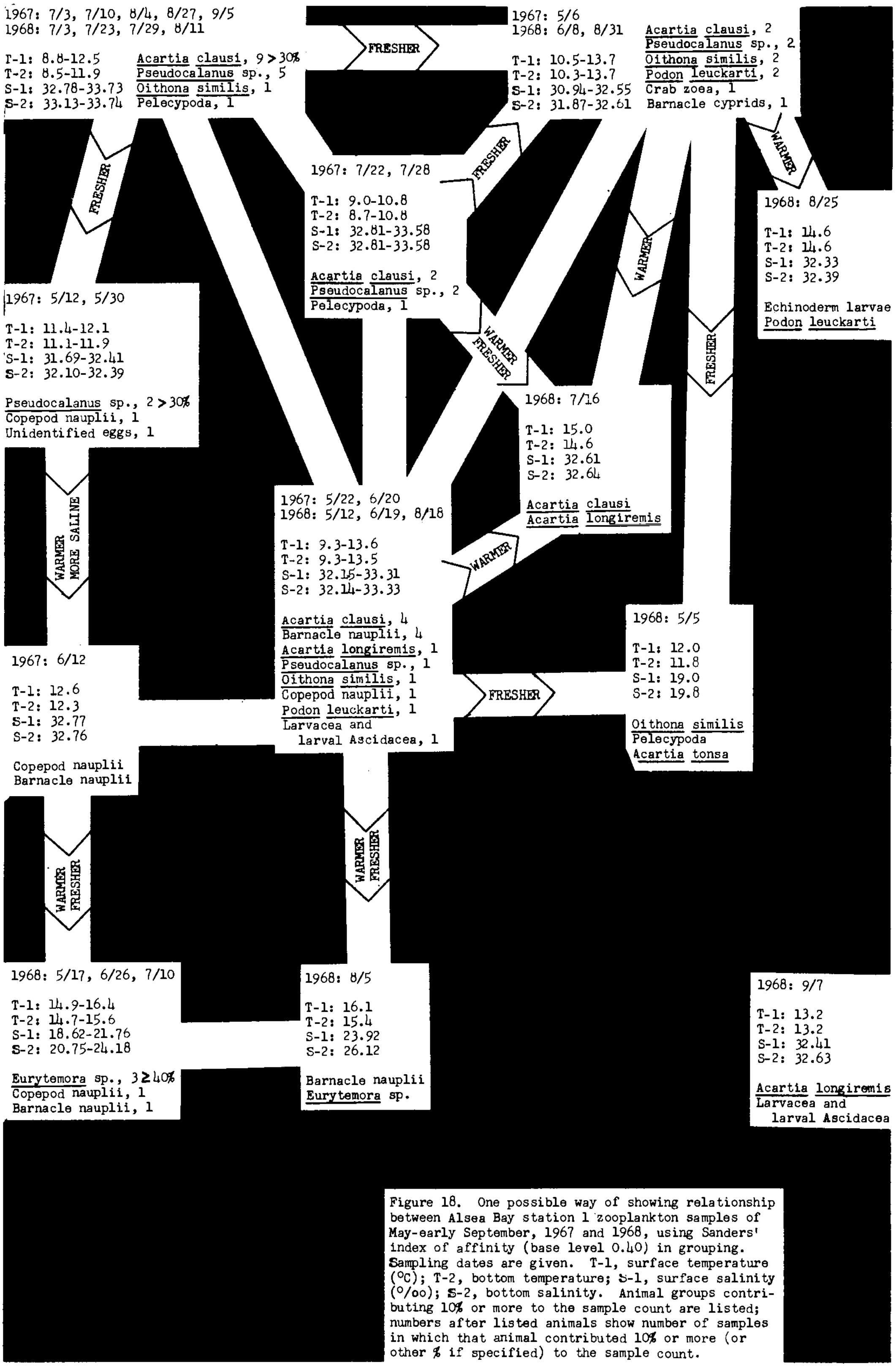

Figure 18. One possible way of showing relationship between Alsea Bay station 1 zooplankton samples of May-early September, 1967 and 1968, using Sanders' index of affinity (base level 0.40) in grouping. Sampling dates are given. T-1, surface temperature (°C); T-2, bottom temperature; S-1, surface salinity (°/oo); S-2, bottom salinity. Animal groups contributing 10% or more to the sample count are listed; numbers after listed animals show number of samples in which that animal contributed 10% or more (or other % if specified) to the sample count.

10% or more of the count, and four had barnacle nauplii as 10% or more. Two July 1967 samples (22 and 28) had both Acartia clausi and Pseudocalanus sp. in excess of 10% of the count. In a three-sample group (May 6, 1967, and June 8 and August 31, 1968), Acartia clausi, Pseudocalanus sp., Oithona similis, and Podon leuckarti represented more than 10% of the count in two of the samples. The latter three of these sample groups interrelate with one another.

Five samples do not group but are related to one or two of the above four minor groups. Two of these samples (June 12, 1967, which has copepod nauplii and barnacle nauplii as more than 10% of the count and August 5, 1968, which has barnacle nauplii and Eurytemora sp. as more than 10% of the count) also relate to a group of three samples taken in 1968 on May 17, June 26, and July 10. Eurytemora sp. accounted for 40% or more of each sample count in the latter group.

To see the effect of tides upon the movement of zooplankton populations up and down the bay, samples were taken at minus tides during the second year of sampling (Figure 19).* Those taken at

*Figure 19 shows the presence of Eurytemora sp. at the mouth of Alsea Bay in June, July and August 1968, when samples were taken at minus tides. Acartia clausi and Pseudocalanus sp. populations were normally higher in high tide samples than in low tide samples. These two latter species prefer more saline water than does Eurytemora sp.; Acartia clausi and Pseudocalanus sp. may have moved out to sea with the minus tides. Upstream data support this: when sampling was done at minus tides, Eurytemora sp. population was highest at the mouth of the bay and Acartia clausi and Pseudocalanus sp. were low throughout the bay (Appendix I).

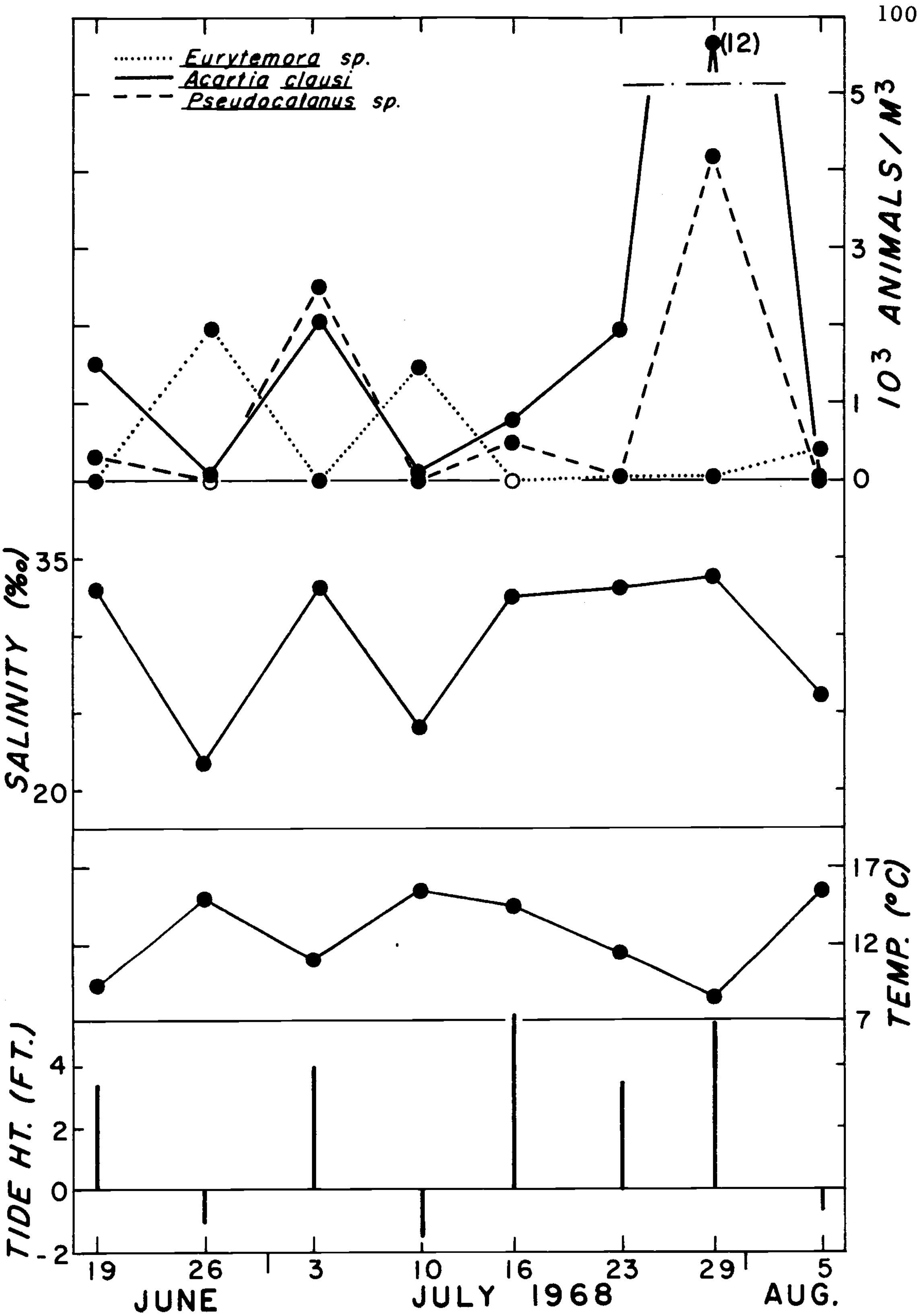

Figure 19. Relationship of Eurytemora sp., Acartia clausi, and Pseudocalanus sp. with bottom salinity, bottom temperature, and tide height at station 1, Alsea Bay, summer, 1968.

station 1 during May, June, and July are the three samples of the last mentioned above group. That in August is one of the two related to them. They all had Eurytemora sp. in the count in excess of 10%. Salinities ranged from 18.62-26.12‰ and temperatures were from 14.7-16.4°C; this implies rather warm and brackish water conditions. Stream flows on these particular dates were 353, 322, 215, and 136 cubic feet per second. The May stream flow reading was lower than all May readings from the previous summer; the June reading was higher than all but three of 30 June readings from the previous year; the July reading was higher than all the July readings of the previous year, as was the August reading when compared with the previous August readings. Thus if samples had been taken at minus tides during June-August 1967, they may not have shown the amount of warming and freshening with proportions of Eurytemora sp. in excess of 10% of the count.

A similarity index (SIMI) based on Simpson's (1949) theory (Overton and Zipperer, 1969; Stander, 1970) at the .50 level or higher showed some similarity between all samples tested (Table 26). The samples were grouped (Figure 20) as previously outlined in the methods.

The main group consisted of 12 samples, seven taken in 1967 (June 20, July 3, 10, and 28, August 4 and 27, and September 5), and five taken in 1968 (June 19, July 3, 23, and 29, and August 11).

	1967												
	6 May	12 May	22 May	30 May	12 Jun	20 Jun	3 Jul	10 Jul	22 Jul	28 Jul	4 Aug	27 Aug	5 Sep
6May67		.41	.26	.30	.21	.85	.74	.64	.44	.56	.53	.49	.53
12May			.08	.73	.28	.66	.48	.61	.51	.32	.06	.03	.03
22May				.19	.72	.39	.44	.40	.25	.62	.49	.44	.47
30May					.45	.55	.37	.43	.38	.33	.10	.04	.05
12Jun						.33	.21	.23	.23	.44	.19	.08	.12
20Jun							.87	.83	.59	.69	.62	.54	.54
3Jul								.96	.55	.87	.86	.86	.84
10Jul									.60	.85	.80	.80	.78
22Jul										.49	.42	.37	.37
28Jul											.88	.82	.85
4Aug												.96	.95
27Aug													.97
5Sep													

	1968																
	5 May	12 May	17 May	8 Jun	19 Jun	26 Jun	3 Jul	10 Jul	16 Jul	23 Jul	29 Jul	5 Aug	11 Aug	18 Aug	25 Aug	31 Aug	7 Sep
6May67	.49	.38	.14	.65	.57	.04	.63	.05	.38	.51	.59	.03	.60	.42	.08	.56	.32
12May	.08	.33	.10	.75	.18	.00	.78	.01	.18	.05	.35	.01	.30	.04	.02	.16	.10
22May	.32	.50	.21	.14	.80	.09	.34	.21	.18	.48	.45	.85	.47	.85	.19	.44	.12
30May	.14	.57	.31	.49	.16	.01	.54	.01	.22	.08	.31	.02	.26	.11	.05	.15	.07
12Jun	.31	.78	.43	.23	.49	.06	.26	.15	.21	.15	.21	.65	.22	.58	.36	.36	.24
20Jun	.49	.44	.19	.77	.64	.05	.84	.07	.29	.57	.72	.08	.73	.45	.08	.56	.15
3Jul	.22	.24	.14	.53	.73	.05	.89	.08	.29	.87	.95	.05	.94	.55	.07	.54	.18
10Jul	.16	.23	.16	.56	.70	.07	.97	.11	.30	.81	.94	.06	.93	.52	.06	.48	.16
22Jul	.25	.27	.12	.46	.43	.03	.62	.05	.23	.38	.51	.07	.51	.39	.05	.30	.10
28Jul	.23	.36	.26	.33	.81	07	.77	.13	.45	.85	.89	.28	.90	.77	.12	.53	.20
4Aug	.27	.21	.16	.19	.79	.07	.64	.10	.32	.96	.92	.09	.95	.71	.09	.55	.18
27Aug	.08	.07	.10	.12	.73	.05	.64	.09	.25	1.00	.94	.05	.95	.61	.06	.47	.17
5Sep	.10	.11	.12	.14	.76	.06	.64	.10	.46	.97	.92	.09	.93	.70	.07	.49	.21
5May68		.52	.18	.44	.43	.06	.13	.07	.07	.11	.11	.22	.20	.39	.09	.49	.08
12May			.35	.34	.40	.04	.25	.09	.24	.12	.19	.38	.22	.46	.35	.47	.59
17May				.10	.19	.83	.13	.83	.13	.17	.17	.38	.16	.21	.04	.13	.06
8Jun					.43	.02	.66	.02	.20	.14	.36	.01	.35	.22	.12	.59	.11
19Jun						.09	.61	.18	.33	.76	.74	.52	.78	.92	.21	.72	.19
26Jun							.04	.99	.03	.09	.06	.39	.06	.09	.02	.05	.01
3Jul								.07	.36	.65	.84	.05	.82	.44	.05	.42	.15
10Jul									.03	.13	.09	.50	.10	.18	.04	.09	.02
16Jul										.26	.30	.06	.31	.52	.17	.29	.25
23Jul											.95	.09	.96	.64	.07	.49	.17
29Jul												.05	.99	.59	.06	.49	.17
5Aug													.07	.63	.15	.22	.04
11Aug														.64	.07	.52	.18
18Aug															.25	.63	.21
25Aug																.52	.16
31Aug																	.30
7Sep																	

Table 26. The SIMI index (Overton and Zipperer, 1969, and Stander, 1970) used in showing similarity between zooplankton samples taken at station 1 in Alsea Bay, Oregon, during May-early September, 1967 and 1968. Possible values range from 0 to 1.00.

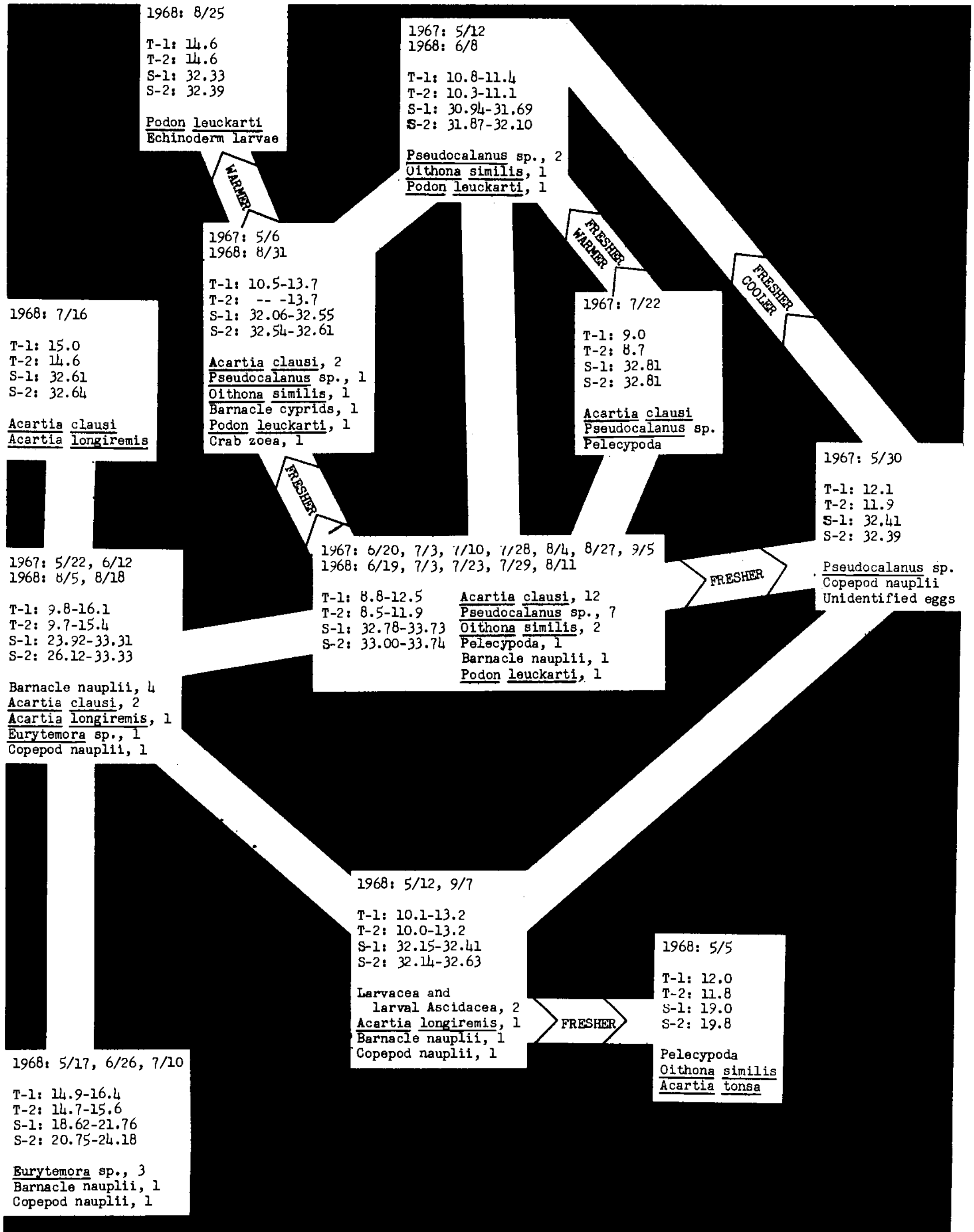

Figure 20. One possible way of showing relationship between Alsea Bay station 1 zooplankton samples of May-early September, 1967 and 1968, using the SIMI similarity index (base level 0.50) in grouping. Sampling dates are given. T-1, surface temperature (°C); T-2, bottom temperature; S-1, surface salinity (°/oo); S-2, bottom salinity. Animal groups contributing 10% or more to the sample count are listed; numbers after listed animals show number of samples in which that animal contributed 10% or more to the sample count.

These samples all had *Acartia clausi* in excess of 10% of the count and seven had *Pseudocalanus* sp. in excess of 10%.

There were five groups of from one to four samples that related partially to the main group. The sample from July 22, 1967, had *Acartia clausi*, *Pseudocalanus* sp. and pelecypods as more than 10% of the count. The sample from May 30, 1967, had *Pseudocalanus* sp., copepod nauplii, and unidentified eggs as more than 10% of the count. A two-sample group (May 12, 1967, and June 8, 1968) had *Pseudocalanus* sp. as greater than 10% of each count. Another two-sample group (May 6, 1967, and August 31, 1968) had *Acartia clausi* as more than 10% of each count. A four-sample group (May 22 and June 12, 1967, and August 5 and 18, 1968) had barnacle nauplii as greater than 10% of each count; two of the samples had *Acartia clausi* as more than 10% of the count. Each of these five groups were inter-related partially.

Four groups of from one to three samples related partially to at least one of the above five groups. There were two one-sample groups. A two-sample group (May 12 and September 7, 1968) had in common the category Larvacea and larval Ascidacea as greater than 10% of the count; related to this latter group was a sample from May 5, 1968, having pelecypods, *Oithona similis*, and *Acartia tonsa* as greater than 10% of the count. The fourth group (May 17, June 26, and July 10, 1968) were the three samples taken at minus tides in

May, June, and July in 1968; Eurytemora sp. was 40% or more of each sample count.

Salinity and temperature ranges were determined for each group by using the lowest and highest readings of all the surface and bottom salinity and temperature readings taken with each zooplankton sample in the group. There is less overlap of physical factors of groups formed using Sanders' index of affinity at the 40% level or higher than there is of groups formed using the SIMI similarity index at the .50 level or higher (Figures 18 and 20).

Grouping of samples in using each index shows large main groups consisting primarily of July samples from both years with all samples having Acartia clausi as greater than 10% of the count and a majority having Pseudocalanus sp. as greater than 10% of the count. Grouping with the SIMI index of similarity adds a mid-June and a late-July 1967 sample plus a mid-June 1968 sample to the main group formed using Sanders' index of affinity. Both groupings show a time extension of the group into late August and early September 1967, and only into mid-August 1968. Winds in late August 1968 were more southerly than winds in late August 1967 (Figure 6). Zooplankton populations in Alsea Bay are affected by offshore winds. With southerly winds warmer water neritic forms are brought into the bay by the tides; with northerly winds, colder water neritic forms are brought into the bay by tides. The large main grouping with either index shows the grouping of zooplankton samples when the water was relatively cool and quite saline. These samples are at least somewhat related to northerly coastal winds and upwelled water.

With each method, the three minus tide samples taken in May, June, and July are grouped together. As previously mentioned these are brackish and relatively warm water samples with Eurytemora sp. accounting for at least 40% of the count. Here the grouping of samples based on biological composition groups the three least saline samples of all those tested for similarity. Biological characteristics can indicate physical-chemical characteristics.

The difference in physical factors between sample groups seems more clearly defined when grouping with the Sanders' index of affinity at the 40% level or higher than when grouping with the SIMI index of similarity at the .50 level; also, Sanders' index of affinity is easier to calculate than is the SIMI index of similarity.

SOME OF THE MORE PREVALENT ZOOPLANKTON GROUPS

The zooplankton samples were divided according to station and time of year in order to get an idea of zooplankton distribution both spacially and seasonally (Table 17). The year was divided into three-month intervals beginning in September, December, March, and June to have a reasonable number of samples in each division and to show subtler changes in zooplankton population than could be found working with a rainy winter season and a dry summer season. December-February is the deep winter period when rainfall and runoff are high, and the amount of incident sunlight is low. This period is within the time when the northward moving surface coastal current (Davidson Current) occurs (Burt and Wyatt, 1964). June-August is the deep summer period when rainfall and runoff are low, and the amount of incident sunlight is high. During this time a southward moving surface coastal current occurs (Burt and Wyatt, 1964). September-November and March-May are considered the transition periods.

The percent of the total number of animals per cubic meter for 326 samples from Alsea Bay was calculated (Table 18).

Seven groups of Copepoda (*Acartia clausi*, *Pseudocalanus* sp., *Acartia longiremis*, copepod nauplii, *Oithona similis*, *Eurytemora* sp., and *Paracalanus parvus*) account for 65% of the total number of organisms per cubic meter of water. Barnacle nauplii, barnacle cyprids, and pelecypods account for 20%. Larvacea and larval Ascidacea account for 2.7%. Acartia clausi and barnacle nauplii together account for 51% (Table 18).

Nine of the above 11 zooplankton groups occur in a different proportion of samples when the samples are separated by season; one fails to reject the idea that the other two, Oithona similis and Pseudocalanus sp., occur in an even proportion of samples when the samples are separated by season (χ^2, p = .05). Eight of the above 11 zooplankton groups occur in a different proportion of samples when the samples are separated by station; one fails to reject the idea that Acartia clausi, barnacle nauplii, and barnacle cyprids occur in an even proportion of samples when the samples are separated by station (χ^2, p = .05). Acartia clausi, barnacle nauplii, and barnacle cyprids occurred in a lower proportion of sample counts during the period December-February. Acartia longiremis, copepod nauplii, and pelecypods were less prevalent during December-February and were less prevalent upstream at station 4. Pseudocalanus sp. and Oithona similis were less prevalent at station 4. Eurytemora sp. was found to be less prevalent at downstream stations 1 and 2 during December-February. Paracalanus parvus and the group, Larvacea and larval Ascidacea, were found in lower proportions of sample counts upstream at station 4 and during June-August; they were found in higher proportions of sample counts at stations 1, 2, and 3 during September-November (Table 17).

Acartia clausi Giesbrecht

Acartia clausi occupies a central position in Alsea Bay. It accounts for 40% of the total estimated number of animals per m^3, it occurs in more sample counts than any other animal category, and it occurs as greater than 10% of the sample count more than any other animal group at all four stations (Tables 17, 18, 19). It occurs in a lower proportion of sample counts during December-February (Table 17). Its population drops off in November of both years and after winter first becomes greater than an estimated 500/m^3 on April 29, 1967 and on June 19, 1968 (Appendix I). Peak populations occur in July through October (Figures 21 and 22). Estimated populations of greater than 10,000/m^3 occurred with water of 18.8-33.7‰ salinity and 19.0-8.5°C temperature (Table 27).

In samples taken at minus tides in June, July, and August 1968, there were very few Acartia clausi (Appendix I). If A. clausi is present in low numbers in the bay at minus tides, would the population be replenished by blooming within the bay or along the coast? It is possible that the deep parts of the previously mentioned north channel or of the river upstream from station 4 might retain part of the population.

In August 1967, a high population of Acartia clausi was found upstream at station 4 (Figure 21); in August 1968 only moderate A.

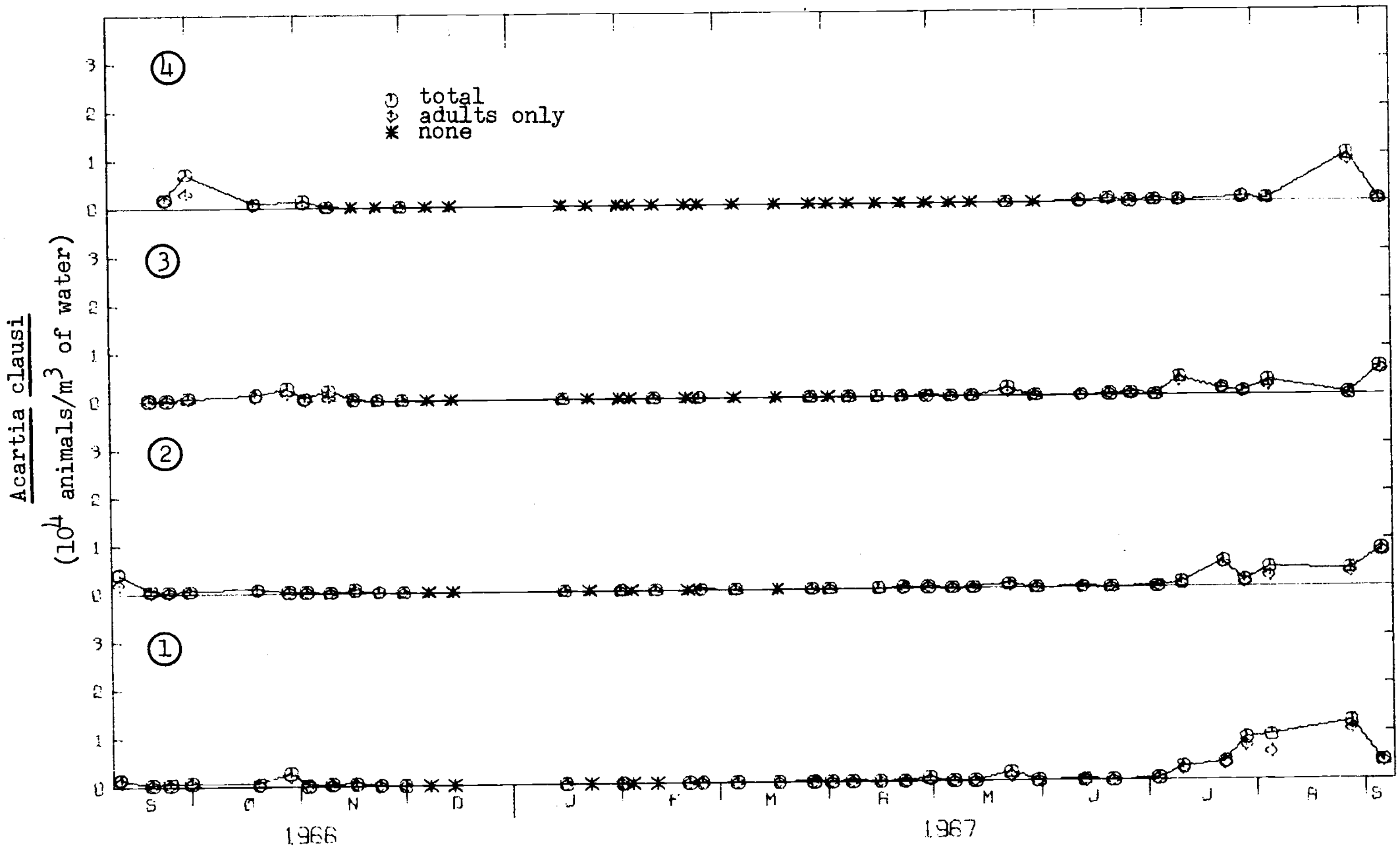

Figure 21. Acartia clausi population at stations 1-4, Alsea Bay, as sampled during September 8, 1966, to September 8, 1967. Numbers on vertical axis times 10,000. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. (1), (2), (3), (4) are respective station numbers.

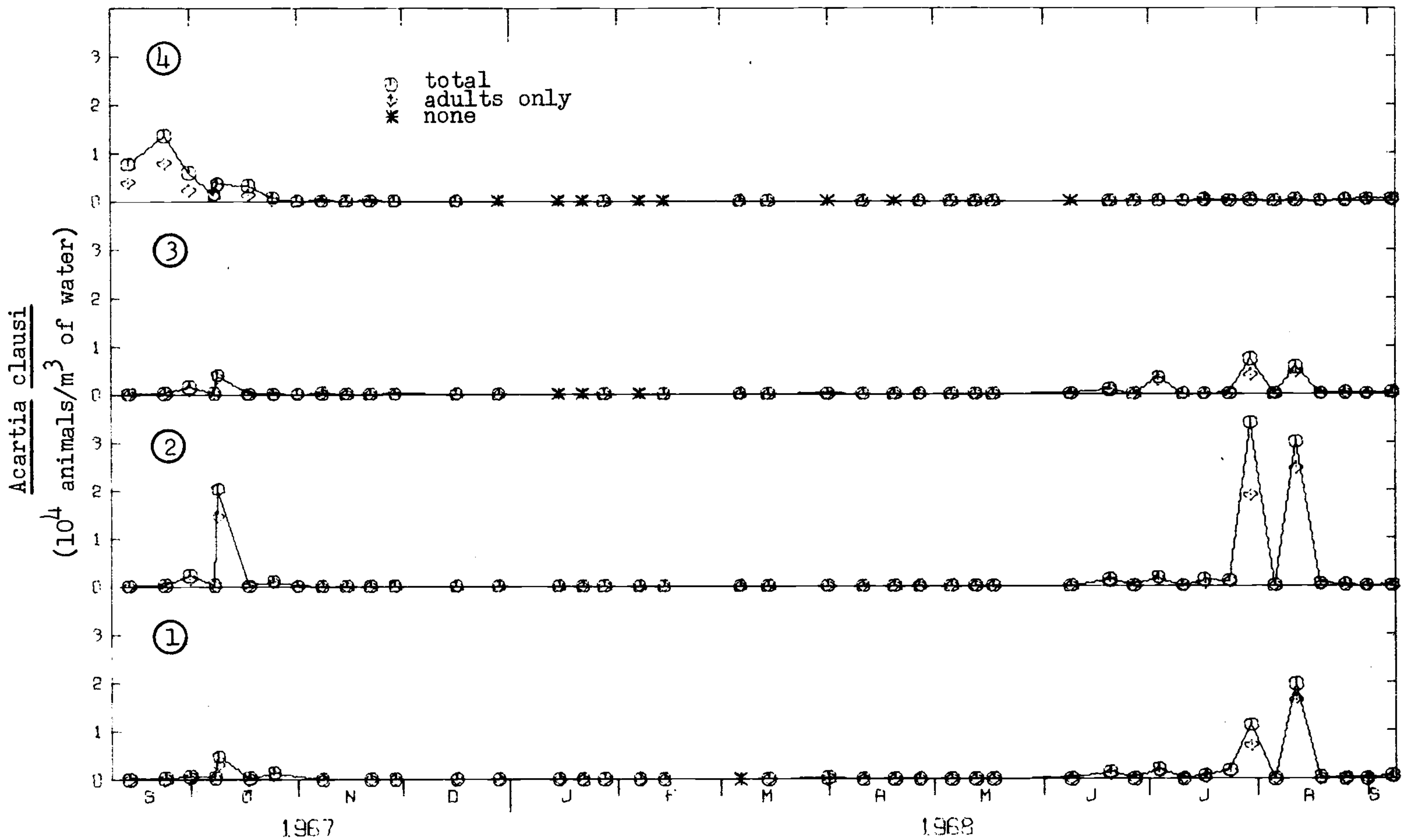

Figure 22. Acartia clausi populations at stations 1-4, Alsea Bay, as sampled during September 8, 1967, to September 8, 1968. Numbers on vertical axis times 10,000. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. ①, ②, ③, ④ are respective station numbers.

Table 27. Conditions when *Acartia clausi* occurred in Alsea Bay in numbers estimated at greater than 10,000/m^3 of water.

Date	Station	‰ Salinity		°C		10^3	Aliquot count		
		bottom	surface	bottom	surface	#/m^3	m	f	cop
27 Aug. 67	4	25.6	18.8	16.1	19.0	11	215	213	66
"	1	33.7	33.7	9.4	9.5	13	69	364	68
23 Sept.	4	28.8	20.7	15.4	16.9	15	344	282	470
7 Oct.	2	20.7	20.3	13.4	13.5	22	219	405	247
29 July 68	1	33.7	33.7	8.5	8.8	12	99	76	110
"	2	33.7	33.7	8.8	8.9	37	138	153	236
11 Aug.	1	33.5	33.6	10.1	11.2	21	225	169	77
"	2	33.5	33.5	10.3	11.4	33	150	107	57

m = male; f = female; cop = copepodite

clausi populations were found there (Figure 22). Perhaps increased stream flow the second summer prevented the establishment of high upstream populations of *Acartia clausi*.

On all 13 occasions when recently upwelled water ($\sigma^T \geq 25.5$) was found at station 1, *Acartia clausi* accounted for 10% or more of the sample count (Appendix I). On five of eight occasions when the *Acartia clausi* population was estimated at greater than $10,000/m^3$ of water, recently upwelled water ($\sigma^T \geq 25.5$) was found (Tables 11 and 27).

Frolander (1964) found *A. clausi* to be one of four copepods predominant in the zooplankton of Yaquina Bay, Oregon. It occupied the seaward half of the bay with *Pseudocalanus minutus* (Krøyer) downstream and *Acartia tonsa* Dana and *Eurytemora* sp. upstream. He also found that in Narragansett Bay, Rhode Island, in the northwest Atlantic, *Acartia clausi* occurred in large numbers from April through July and were more abundant in the bay than offshore. Hebard (1956) found *A. clausi* in the surface waters of Puget Sound, Washington, from May to December. Maximum numbers were found in June and July. Fulton (1968) found *A. clausi* to be a surface species, common in the spring and summer off British Columbia, Canada. Cameron (1957) called *A. clausi* a surface copepod found near the Queen Charlotte Islands off the British Columbia coast. Grainger (1965) called *A. clausi* primarily a coastal species along with *Eurytemora* herdmani and Acartia longiremis in the Arctic and adjacent Canadian waters. Willey (1931) found Acartia clausi in Hudson Bay in the summer of 1920. McMurrich (1917) found A. clausi to be almost always abundant in samples taken in the winter off St. Andrews, New Brunswick, in Passamaquoddy Bay between Maine and Canada. In the same bay Légaré and Maclellan (1960) found A. clausi to be an important neritic species along with Tortanus discaudatus and Eurytemora herdmani. Deevey (1956) perceived Acartia clausi to be one of three dominant copepods (along with Temora longiremis and Pseudocalanus minutus) during December-July in Long Island Sound, between Long Island, New York, and Connecticut. Acartia clausi was not present here in samples taken during August-October. Deevey called A. clausi "the species most adapted to Long Island Sound"; she found it incapable of maintaining numbers in the more saline Block Island Sound (Rhode Island). Bigelow (1924) thought A. clausi to be a neritic species, more southerly in distribution than Acartia longiremis. Brodskii (1950, transl. 1967) considered Acartia clausi to be a littoral inhabitant of warm surface waters, living in a slightly freshened sea environment. Esterly (1924) described A. clausi from San Francisco Bay, California; earlier he found A. clausi to be most abundant in March and absent or in small numbers during July-September at La Jolla in southern California.

Acartia clausi was present in Alsea Bay more than any other zooplankton group I caught, its population peaked during July-October. Not only is <u>Acartia clausi</u> a bay species but it may also be a coastal species associated with cool, quite saline, recently up-welled water off Oregon. High populations found both downstream and upstream in the bay as well as distributions described by the above mentioned authors, indicate that <u>Acartia clausi</u> succeeds well over wide ranges of salinity and temperature.

Barnacle Nauplii

Barnacle nauplii, occurring in 245 sample counts and comprising 11% of the total number of animals per m^3 (Tables 17 and 18), are found as greater than 10% of the sample count in 82 samples, more so at the upstream stations than the downstream (Table 19). Barnacle nauplii seasonally occur in a lower proportion of sample counts during December-February but by station do not seem to be unevenly distributed (χ^2, p = .05) (Table 19). Evidently barnacle nauplii, when they do occur in samples, account for a greater proportion of the total population in upstream samples than in downstream samples. The population drops and then remains below an estimated $100/m^3$ during the period December 1966-February 1967 and during November 1967-February 1968, populations greater than $1000/m^3$ were found during September-October 1966, May-September 1967, and June-August 1968 (Appendix I). Populations greater than $3000/m^3$ occurred with water of 2.1-33.3‰ salinity and 22.2-9.7°C temperature (Table 28).

Table 28. Conditions when barnacle nauplii occurred in Alsea Bay in numbers estimated at greater than 3000/m^3 of water.

Date	Station	‰ Salinity		°C		10^3	Aliquot
		bottom	surface	bottom	surface	#/m^3	count
22 May 67	1	33.3	33.3	9.7	9.8	3.8	190
"	2	33.3	33.3	10.0	10.3	5.0	222
"	3	32.9	32.9	10.6	11.3	6.0	288
3 July 67	4	21.7	10.4	18.5	22.2	3.5	557
27 Aug 67	4	25.6	18.8	16.1	19.0	5.7	260
10 July 68	4	25.3	2.1	15.8	19.2	5.1	651
23 July 68	4	27.5	12.4	14.9	20.0	4.3	539
5 Aug 68	4	29.0	5.4	15.4	18.5	5.0	734

Samples taken at minus tides in June, July, and August 1968 indicate low, moderate to high (station 4), and high levels, respectively, of barnacle nauplii populations (Appendix I).

Barnacle nauplii were not particularly associated with recently upwelled water from the Oregon coast ($\sigma^T \geq 25.5$). Of the 13 occasions when recently upwelled water was found at station 1, the barnacle nauplii population was 10% or more of the sample count only twice. Of eight occasions when the barnacle nauplii population was greater than 3000/m^3 of water, recently upwelled water was found at the same station only twice.

Cuzon du Rest (1963) found higher barnacle nauplii populations in saltier water in the salt marshes of Louisiana. The barnacle nauplii population peaked in April 1960 at the saltier water stations and in May and June 1960 at the fresher water stations. Cronin, Daiber and Hulbert (1962), in the Delaware River Estuary, found barnacle larvae most prevalent in the spring with maximum population densities occurring in salinities of 20-25‰; no larvae were found at less than 10‰, while very few were found at more than 30‰.

McMurrich (1917) in winter samples taken off St. Andrews, New Brunswick, found barnacle larvae to be abundant in March and April, coincident with an increase in the phytoplankton. Légaré and Maclellan (1960), in the same bay (Passamaquoddy), found barnacle larvae from March through July; the larvae were very abundant in April and May. The larvae (predominantly the cypris stage) along with the calanoid copepods Calanus finmarchicus and Pseudocalanus minutus and harpacticoid copepods were used as food by herring outside the bay.

Barnacle nauplii were quite evident throughout Alsea Bay, being present in a greater proportion of samples during spring, summer and fall than during winter (Table 17). Sampling at minus tides during summer 1968 indicated that despite the advective effects of the tide, barnacle nauplii were still present in the bay, especially on the later dates. It is possible that more than one species is involved, although I did not see any obvious differences in the nauplii examined. This larval stage is probably more widely distributed than the later planktonic and final presessile barnacle cypris stage and the adult sessile stage. Planktonic stages of a sessile animal provide for dispersal into other environments which might be unfavorable to the organism's growth and reproduction.

Barnacle Cyprids

The final presessile stage of the barnacle is the cypris. It accounts for 3.7% of the total estimated number of animals per m^3 and occurs in 205 sample counts (Tables 17 and 18). In 35 of the 266 sample counts of over 300 organisms, barnacle cyprids account for more than 10% of the count, the occasions being more numerous, but not significantly so (χ^2, $p = .05$), at the downstream stations (Table 19). Seasonally, the cyprids are in a low proportion of sample counts from December-February (Table 17). The cyprids occur in numbers estimated at greater than $100/m^3$ in September-November 1966; in March, July, August, and October 1967; and during April-June and August 1968 (Appendix I). Estimated populations of greater than $1000/m^3$ occur with water of 5.2-33.3‰ salinity and 13.6-9.7°C temperature; these populations appear to associate more with the higher salinities and lower temperatures (Table 29). Samples taken at minus tides during June-August 1968 indicate almost a complete lack of barnacle cyprid population.

Cuzon du Rest (1963) found the barnacle cyprid population to peak to a lesser degree than barnacle nauplii in April 1960 at the saltier

Table 29. Conditions when barnacle cyprids occurred in Alsea Bay in numbers estimated at greater than 1000/m^3 of water.

Date	Station	‰ Salinity bottom	‰ Salinity surface	°C bottom	°C surface	10^3 #/m^3	Aliquot count
19 Oct 66	3	33.0	32.9	9.9	10.0	1.3	96
28 Oct 66	1	31.2	30.6	11.6	11.8	1.0	87
2 Nov 66	1	32.9	32.8	10.8	10.9	1.1	73
"	2	32.8	32.8	10.8	11.0	2.7	105
"	3	32.7	32.7	11.1	11.3	1.9	120
16 Nov 66	1	30.8	30.7	10.4	10.6	1.8	211
"	3	29.6	5.2	10.4	10.6	1.4	224
27 Mar 67	1	30.2	30.2	9.7	10.0	2.2	265
"	2	30.2	30.2	9.7	10.2	2.3	504
"	3	29.2	28.3	9.9	10.4	4.0	397

water stations in the salt marshes of southeastern Louisiana.

Barnacle cyprids, the final planktonic stage of barnacles, were found in fewer (although not significantly fewer, χ^2, p = .05) Alsea Bay zooplankton samples than were barnacle nauplii. Both cyprids and nauplii were found in proportionally fewer samples in the winter than in any other season. However, while the nauplii were found in relatively the same number of samples during spring, summer and fall, the cyprids were found in proportionally more samples as these seasons progressed (χ^2, p = .05). Highest estimated barnacle cyprid populations were found in October and November 1966 and in March 1967; conditions for these peaks centered around values of 30‰ salinity and 10°C temperature (Table 29).

In Alsea Bay, the data suggest that at times the barnacle nauplii may die off before reaching the cypris stage; however, the cypris stage may not be in the water column as long as the nauplius stage and thus is less subjected to plankton sampling. In late summer and fall, although water is generally warming (probably contributed to by the cessation of upwelling), the water is normally fairly saline through the bay. If barnacle cyprids need this higher salinity for their development, fall would be the time for their abundant appearance in Alsea Bay.

Pelecypoda

Pelecypods occurred in 246 of 327 sample counts and comprised 4.3% of the total estimated number of organisms per m^3 (Tables 17 and 18). They occurred as more than 10% of the count in 52 of 266 samples in which more than 300 organisms were counted (Table 19); most of these occurrences were downstream. Pelecypods were present in a lower proportion of sample counts upstream and during December-February (Table 17). Pelecypods were in numbers estimated at greater than $100/m^3$ in all months but December 1966, November 1967-January 1968, March and September 1968. They were found in numbers estimated at greater than $500/m^3$ in September-November 1966; June-August 1967; and June and August 1968 (Appendix I). Estimated populations of $1000/m^3$ or more occurred with water of 32.8-33.8‰ salinity and 11.6-8.7°C temperature (Table 30). Samples taken at minus tides during June-August 1968 indicated almost a lack of pelecypods within Alsea Bay (Appendix I).

Table 30. Conditions when pelecypods occurred in Alsea Bay in numbers estimated at 1000 or more per m^3 of water.

Date	Station	‰ Salinity bottom	‰ Salinity surface	^oC bottom	^oC surface	10^3 #/m^3	Aliquot count
30 Sept 66	1	--	33.1	10.2	10.5	1.4	128
2 Nov 66	1	32.9	32.8	10.8	10.9	1.5	95
"	2	32.8	32.8	10.8	11.0	1.8	68
22 July 67	1	33.8	33.8	8.7	9.0	1.0	110
"	2	33.8	33.7	9.1	9.5	1.4	81
4 Aug 67	1	33.5	33.5	10.2	10.2	2.2	106
"	2	33.4	33.4	10.6	10.6	1.3	61
"	3	33.3	33.2	11.2	11.6	1.0	73
11 Aug 68	1	33.6	33.5	10.1	11.2	2.7	59

Legare and Maclellan (1960) in Passamaquoddy Bay between New Brunswick and Maine found pelecypods from spring through autumn (most prevalent in autumn). Cuzon du Rest (1963) in the salt marshes of southeastern Louisiana took almost all the pelecypods during spring and early summer.

Pelecypods found in Alsea Bay zooplankton samples were associated with the ocean end of the bay. Highest estimated populations were found with water of about 33‰ salinity and 10^oC temperature (Table 30); four of the nine highest estimated populations were associated with recently upwelled water ($\sigma^T \geq 25.5$). Pelecypod numbers were low in winter and peaked in summer and fall.

Copepod Nauplii

Although the #6 mesh net openings were too large to adequately sample copepod nauplii, the nauplii were found in 216 sample counts and comprised 3.5% of the total estimated number of animals per m^3 (Tables 17 and 18). In 29 sample counts the nauplii made up more than 10% of the total count (Table 19). They occurred in a greater proportion of the sample counts downstream and during March-August (Table 17). The nauplii occurred in numbers estimated at greater than 100/m^3 in November 1966; during February-August 1967; and during March-May, July and August 1968 (Appendix I). The nauplii population when estimated at numbers of 1000/m^3 or more occurred with water of 30.7-33.7‰ salinity and 12.1-8.5°C temperature (Table 31).

Table 31. Conditions when copepod nauplii were found in Alsea Bay in numbers estimated at 1000 or more per m^3 of water. The #6 mesh net used would select the later stages of the larger forms.

Date	Station	‰ Salinity		°C		10^3	Aliquot
		bottom	surface	bottom	surface	#/m^3	count
2 Nov 66	2	32.8	32.8	10.8	11.0	1.5	56
29 Apr 67	1	30.7	30.7	11.0	11.3	1.8	69
30 May 67	1	32.4	32.4	11.9	12.1	1.0	123
28 July 67	1	33.6	33.6	10.8	10.8	2.2	31
29 July 68	1	33.7	33.7	8.5	8.8	1.1	27
"	2	33.7	33.7	8.8	8.9	1.4	20
"	3	33.3	33.1	10.5	10.9	1.0	63
11 Aug 68	1	33.6	33.5	10.1	11.2	1.6	35
"	2	33.5	33.5	10.3	11.4	1.9	18

Samples taken at minus tides during June-August 1968 indicated extremely low numbers of the larger copepod nauplii in Alsea Bay (Appendix I).

Cuzon du Rest (1963) found copepod nauplii present all year in the salt marshes of southeastern Louisiana. The nauplii occurred in greater numbers in the fresher waters and hit their peak in April. Beers and Stewart (1967), in studying the microzooplankton across the California current, found the copepods including nauplii to be most numerous of Metazoans.

Highest estimated populations of copepod nauplii found in Alsea Bay #6 mesh net zooplankton samples were associated with salinities greater than 30‰ (usually about 33‰) and temperatures of about 10°C (Table 31). Six of the nine highest estimated populations were associated with recently upwelled water ($\sigma^T \geq 25.5$). Those copepod nauplii found in Alsea Bay zooplankton samples are probably mostly representatives of larger marine copepods such as Calanus spp. because the net used would normally catch only the larger forms.

Pseudocalanus sp.

Pseudocalanus sp. was found in 217 samples and accounted for 8.1% of the total estimated number of organisms per m^3 (Tables 17 and 18). Most of its occurrences, both in proportion of samples and as greater than 10% of a sample count (Tables 17 and 19), were downstream. Seasonally, Pseudocalanus sp. apparently was not unevenly distributed in sample counts (χ^2, $p = .05$) (Table 17). The population peaked downstream during April, May and July 1967, and in April, July and August 1968 (Figures 23 and 24). When the population estimate

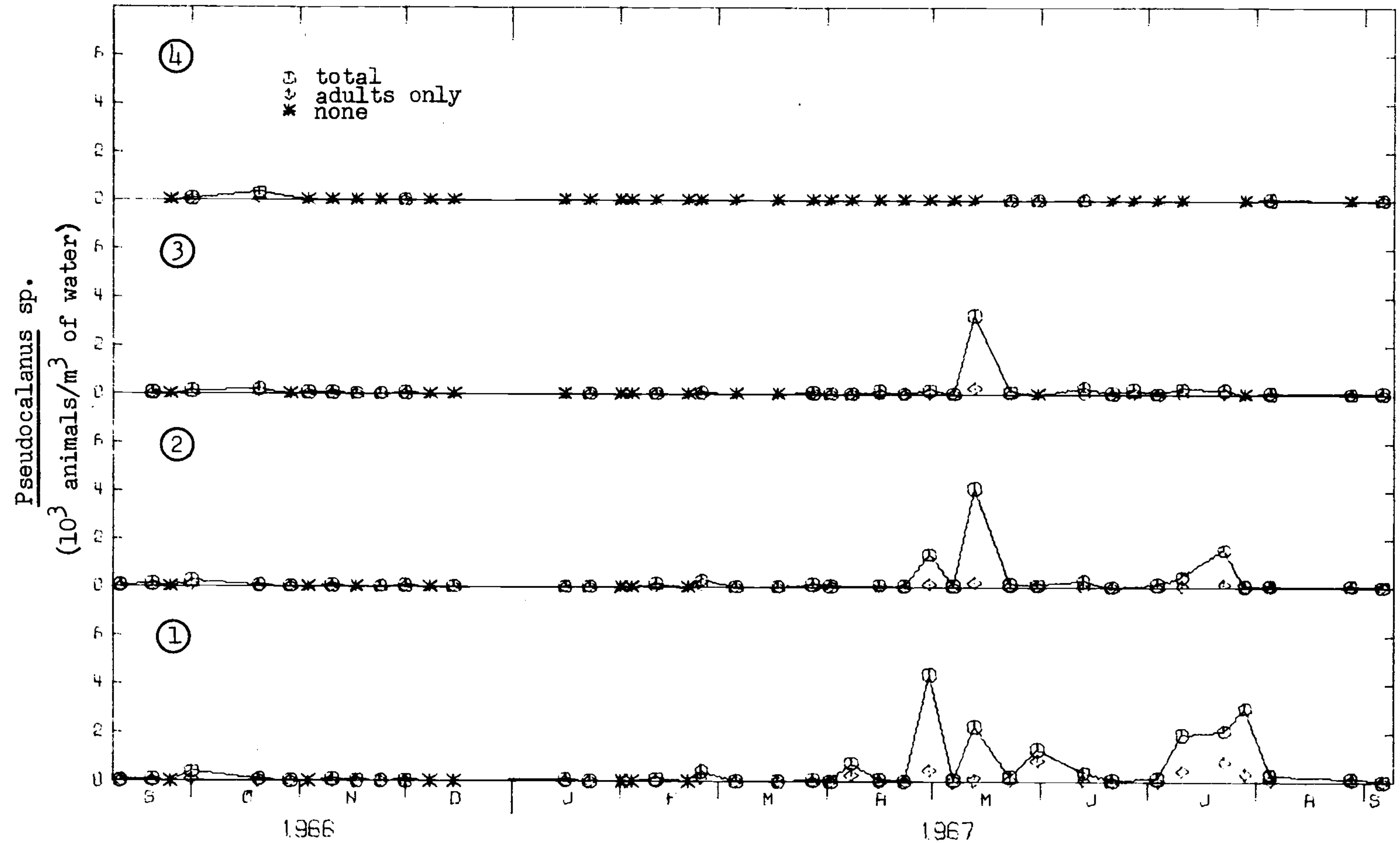

Figure 23. Pseudocalanus sp. population at stations 1-4, Alsea Bay, as sampled during September 8, 1966, to September 8, 1967. Numbers on vertical axis times 1,000. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. ①, ②, ③, ④ are respective station numbers.

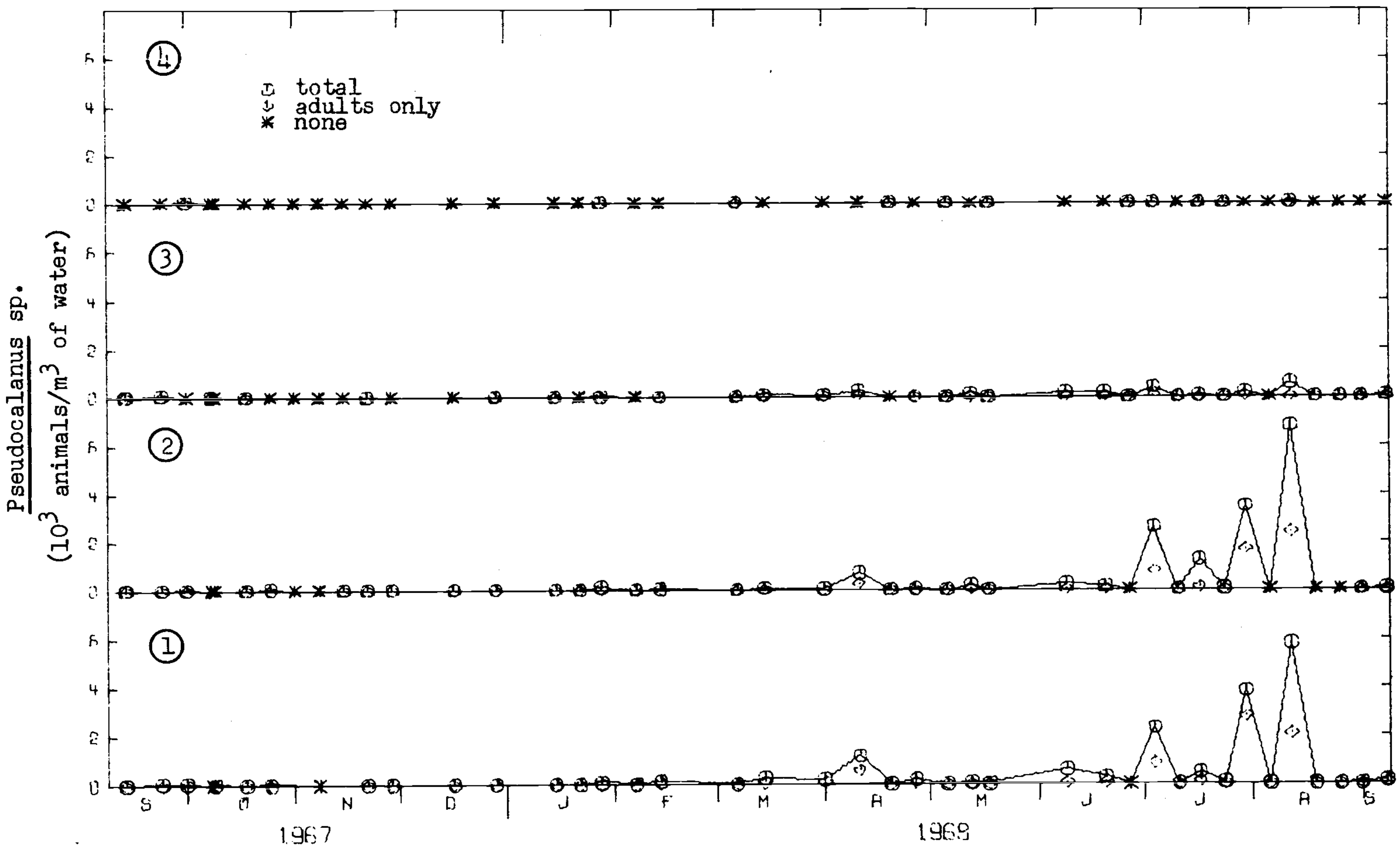

Figure 24. Pseudocalanus sp. population at stations 1-4, Alsea Bay, as sampled during September 8, 1967, to September 8, 1968. Numbers on vertical axis times 1,000. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. 1, 2, 3, 4 are respective station numbers.

exceeded 2000 /m^3, conditions previously measured indicated 30.6-33.8‰ salinity and 12.0-8.5°C temperature (Table 32). Samples taken at minus tides during June-August 1968 indicate minimal numbers of Pseudocalanus sp. in the bay.

Of the 13 highest population estimates of Pseudocalanus sp. (Table 32), seven are associated with recently upwelled water ($\sigma^T \geq 25.5$) (Table 11). Of 13 times at station 1 when recently upwelled water was found, eight times Pseudocalanus sp. was 10% or more of the sample count (Appendix I).

Frolander (1964) found Pseudocalanus minutus to be the most seaward of four copepod species predominant in Yaquina Bay, Oregon. In Narragansett Bay, Rhode Island, he found Pseudocalanus minutus to be abundant in late winter and early spring; more numerous offshore than onshore, and more numerous in water of higher salinity and lower temperature. Cross (1964) found P. minutus to be the most abundant calanoid copepod off the Oregon coast occurring in greater numbers nearshore. The population increased in April, was high in May and remained so until July. Hebard (1966) found P. minutus more common in the summer off the Oregon coast; Haertel (1970) in the Columbia River Estuary between Oregon and Washington saw P. minutus as the most abundant copepod in water of 15‰ salinity and over. It hit a late July population peak simultaneously with Acartia clausi and Acartia longiremis. Hebard (1956) stated that

Table 32. Conditions when Pseudocalanus sp. occurred in Alsea Bay in numbers estimated at greater than 2000/m^3 of water.

Date	Station	‰ Salinity		°C		10^3	Aliquot count		
		bottom	surface	bottom	surface	#/m^3	m	f	cop
29 Apr. 67	1	30.7	30.7	11.0	11.3	48	8	10	163
12 May	1	32.1	31.7	11.1	11.4	25	3	24	598
"	2	32.2	32.2	10.8	11.1	45	5	8	276
"	3	30.9	30.6	11.4	12.0	36	7	10	211
10 July	1	33.7	33.7	9.7	9.6	21	20	34	185
22 July	1	33.8	33.8	8.7	9.0	23	12	85	151
28 July	1	33.6	33.6	10.8	10.8	33	0	5	41
3 July 68	1	33.2	32.9	10.9	11.1	25	7	85	152
"	2	33.2	33.0	11.1	11.3	28	8	64	176
29 July	1	33.7	33.7	8.5	8.8	42	6	65	27
"	2	33.7	33.7	8.8	8.9	38	0	26	28
11 Aug.	1	33.6	33.5	10.1	11.2	63	1	48	90
"	2	33.5	33.5	10.3	11.4	74	2	23	46

m = male; f = female; cop = copepodite

Pseudocalanus minutus along with Corycaeus affinis and Microcalanus pusillis made up the bulk of the zooplankton stock in the particular area of Puget Sound that he sampled. Frolander (1962) found zooplankton samples dominated by Pseudocalanus minutus and Oithona similis off the coast of Washington and British Columbia; the Pseudocalanus minutus population peaked in May. Cameron (1957) found P. minutus to be a surface zooplankter in the Queen Charlotte Islands area when sampling in July and August 1953. Fulton (1968) considered P. minutus to be an abundant surface and mid-depth zooplankter off British Columbia. Grainger (1965) found P. minutus in the Arctic and adjacent Canadian waters to be widely occurring and with seven other species making up 99% of the copepod population in the upper 50 m of the central Arctic. Cairns (1967) found Pseudocalanus sp. to be one of the six most abundant copepods in Tanquary Fjord, Ellesmere Island; the adult females showed a bimodal distribution. McLaren (1969) discovered Pseudocalanus minutus to be the highest zooplankton producer in Ogac Lake, a landlocked fjord on Baffin Island; the species' production measured at 410-510 mgC/m^2/yr. Légaré and Maclellan (1960) thought P. minutus to be an important boreal species along with Calanus finmarchicus and Centropages typicus in Passamaquoddy Bay region in 1957 and 1958; Pseudocalanus minutus, Calanus finmarchicus, and barnacle larvae were food for herring outside the bay. Deevey (1956) found Pseudocalanus minutus, Acartia clausi, and Temora longicornis to dominate zooplankton populations during December-July in Long Island Sound; Deevey called Pseudocalanus minutus the only neritic copepod capable of surviving and reproducing successfully in the sound but found it more numerous in Block Island Sound. Cronin, Daiber and Hulbert (1962) found P. minutus in the Delaware River estuary in the winter and rarely in the spring.

Frolander (1964) and Cross (1964) question the speciation of Pseudocalanus along the Oregon coast. Frolander (1962) observed specimens from the coast of Washington and British Columbia and wrote:

> Specimens of Pseudocalanus from 14 stations of cruises 151, 158, 168, 175 and 179 were very kindley examined by Dr. Thomas E. Bowman, Division of Marine Invertebrates of the Smithsonian Institution. He pointed out that it has been the practice to lump all members of the genus into a single species, P. minutus (Krøyer), with the forma or subspecies elongatus, major, and gracilis and that With (1915) lowered the status of the three species recognized by Sars (1900, 1901-1903) because he found intermediate forms, and most workers have followed him. Dr. Bowman believes that the systematics of Pseudocalanus must be thoroughly investigated on a world-wide basis before it can be determined whether With was correct. Almost all of the specimens examined from the present study were provisionally identified as belonging to P. gracilis Sars characterized by the protruding forehead, long antenna, and slender body and legs. The cephalothorax was about 2.0-2.2 times as long as the urosome, while in P. elongatus this ratio is 2.4-2.5. The specimens examined were noted as unquestionably different from Atlantic specimens of P. minutus and were placed on deposit in the Smithsonian collection by Dr. Bowman (p. 663).

Brodskii (1950, transl. 1967) called P. gracilis a surface dwelling species of cold oceanic waters often confused with P.

elongatus, a mass species that inhabited cold surface waters.

Pseudocalanus sp. may be considered to be a cool water coastal zooplankter off Oregon. It is numerically the second most important copepod in Alsea Bay and is found there in all seasons of the year, with peaks occurring in spring and summer.

Acartia longiremis (Lilljeborg)

Acartia longiremis accounted for 5.2% of the total number of zooplankton per m^3 in Alsea Bay and was found in 210 sample counts (Tables 17 and 18). When *A. longiremis* occurred as more than 10% of a sample count (28 times), the species was not distributed significantly differently by station (χ^2, p = .05) (Table 19). Otherwise, *A. longiremis* was in a lower proportion of sample counts upstream at station 4 and during December-February (Table 17). In 1967 populations estimated at greater than 700/m^3 were found in April, late July, August and September; in 1968 similar populations were not found in the spring but only in July, August and September (Figures 25 and 26; Appendix I). Populations estimated at more than 1000/m^3 occurred with water of 30.7-33.6‰ salinity and 15.0-10.4°C temperature (Table 33). Sampling at minus tides during June-August 1968 indicates low numbers of *A. longiremis* in the bay (Appendix I).

Of the seven highest population estimates of *A. longiremis* (Table 33), only one was associated with recently upwelled water

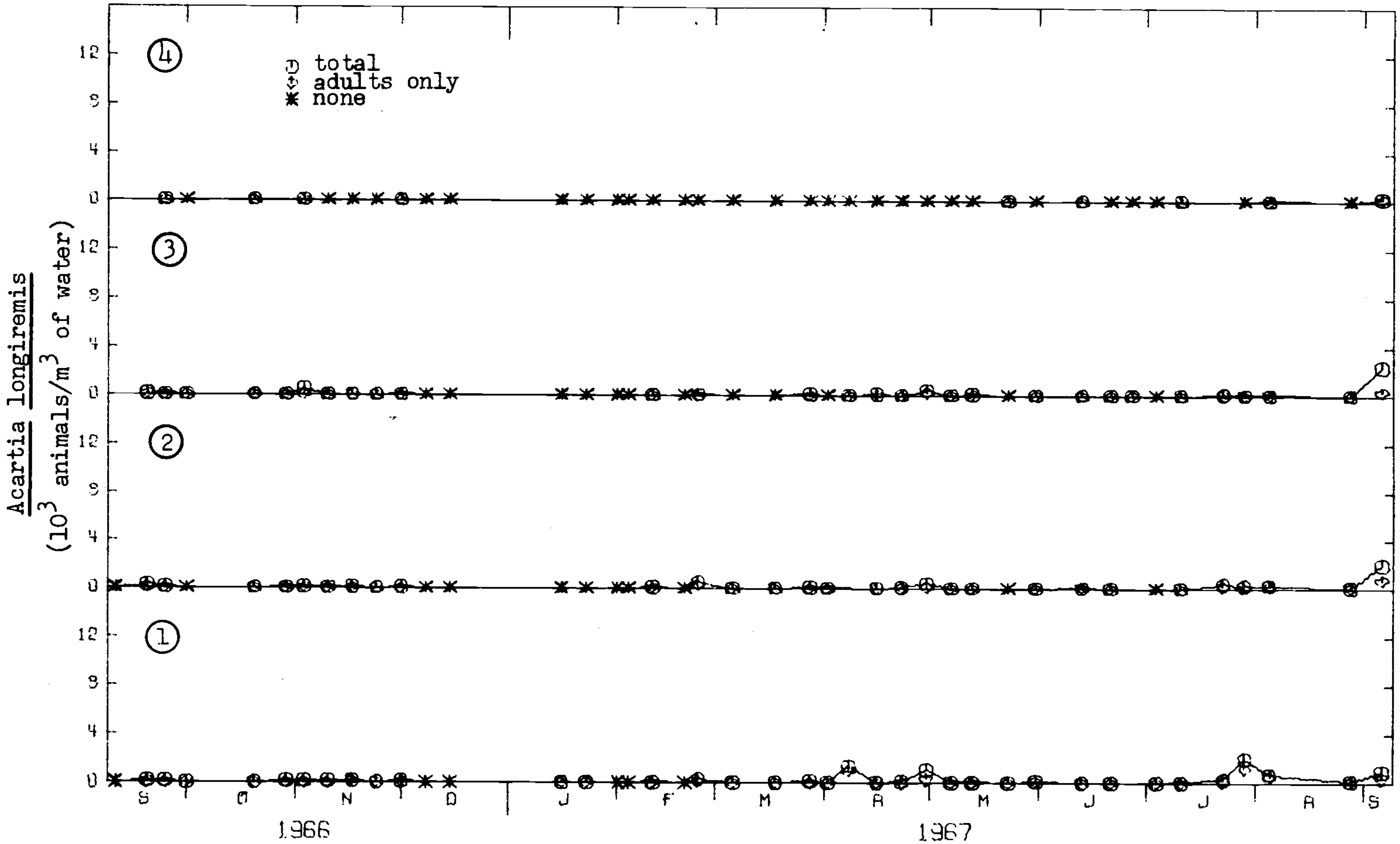

Figure 25. Acartia longiremis population at stations 1-4, Alsea Bay, as sampled during September 8, 1966, to September 8, 1967. Numbers on vertical axis times 1,000. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. ①, ②, ③, ④ are respective station numbers.

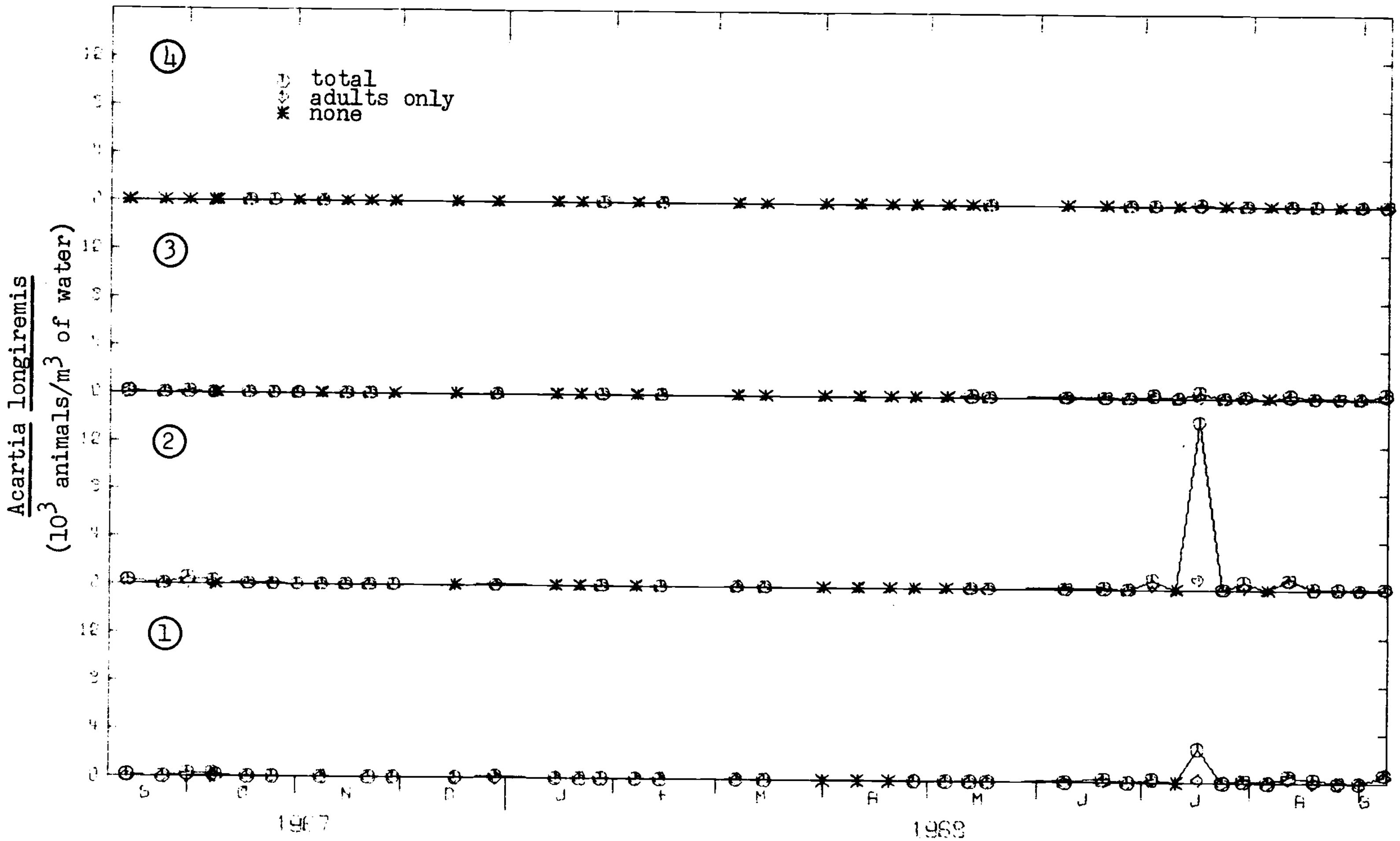

Figure 26. Acartia longiremis population at stations 1-4, Alsea Bay, as sampled during September 8, 1967, to September 8, 1968. Numbers on vertical axis times 1,000. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. 1, 2, 3, 4 are respective station numbers.

Table 33. Conditions when Acartia longiremis occurred in Alsea Bay in numbers estimated at greater than 1000 /m^3 of water.

Date	Station	‰ Salinity		°C		10^3	Aliquot count		
		bottom	surface	bottom	surface	#/m^3	m	f	cop
7 Apr. 67	1	31.0	30.9	10.4	10.4	1.5	127	57	86
29 Apr.	1	30.7	30.7	11.0	11.3	1.2	6	7	31
28 July	1	33.6	33.6	10.8	10.8	2.1	9	9	12
5 Sept.	2	33.4	33.4	12.0	12.2	2.1	12	13	44
"	3	33.4	33.4	12.7	12.8	2.6	12	4	107
16 July 68	1	32.6	32.6	14.6	15.0	3.0	25	5	267
"	2	32.7	32.7	14.3	14.4	15.	29	1	465

m = male; f = female; cop - copepodite

($\sigma^T \geq 25.5$). Normally, these estimates were associated with warmer temperatures than were the highest estimated populations of Pseudo-calanus sp. (Tables 32 and 33).

Cross (1964) found Acartia longiremis to be a neritic copepod important in the summer off Oregon; at maximum numbers in July, the population decreased from north to south. Hebard (1966) found A. longiremis inshore spring and summer off Oregon. Haertel (1970) called A. longiremis a polyhaline species (most abundant in waters 15‰ or more salinity) that was occasionally present in the Columbia River estuary in high numbers; it hit a population peak simultaneously with Acartia clausi and Pseudocalanus and had a high positive correlation with temperature. Hebard (1956) found Acartia longiremis in Puget Sound throughout the year but most commonly in the spring and summer; Acartia longiremis was more of a surface than a deep species and reached its highest estimated population in late July. Frolander (1962) said A. longiremis was most abundant in May and inshore off the coast of Washington and British Columbia. Légaré (1957) found A. longiremis preferring surface waters and accounting for 18% of the copepod population in July and 2% in November in the Strait of Georgia. Fulton (1968) called A. longiremis a surface species, abundant in the spring and summer off British Columbia. Cameron (1957), when sampling in the Queen Charlotte Islands area in July and August 1953, found A. longiremis to be a surface copepod.

Grainger (1965) called *A. longiremis* primarily a coastal species along with *Acartia clausi* and *Eurytemora herdmani* in the Arctic and adjacent Canadian waters. Willey (1931) found *Acartia longiremis* in Hudson Bay in the summer of 1920. Sherman (1966) said *A. longiremis* and seven other copepod species were common in the Gulf of Maine. Brodskii (1950, transl. 1967) called *A. longiremis* a neritic surface species.

The overall impression gained is that *Acartia longiremis* is a seasonal coastal copepod inhabiting temperate to boreal waters and preferring warmer temperatures for its population maxima than does *Pseudocalanus* sp. In Alsea Bay, *Acartia longiremis* occurs primarily downstream and during summer and fall with peaks in April and July-September.

Oithona similis Claus

Olson (1949), in a sampling program extending from lower California to Oregon, found four species of *Oithona* in samples taken from May 21 through May 27, 1939, off the Oregon coast. *Oithona similis* was identified from all 12 of his stations off Oregon; *O. spinirostris*, from 11; *O. nana*, from three; and *O. setigera*, from two. The *O. nana* female is about 0.63 mm long and has no rostrum; the *O. similis* female is about 0.77 mm long and has a rostrum that is visible from a lateral view but not from a dorsal view. Both *O. spinirostris* and O. setigera have a rostrum visible in a dorsal view. The O. setigera female is about 1.57 mm long and has a relatively more narrow forehead from the dorsal view than does the O. spinirostris female, which is about 1.21-1.44 mm long. Cameron (1957) found Oithona plumifera as a subsurface species when sampling during the summer of 1953 in the Queen Charlotte Islands area off British Columbia. Olson (1949) states that O. spinirostris and O. plumifera females differ not in size but in that O. plumifera has fine hairs located ventrally on the anterior swelling of the genital segment while O. spinirostris does not. The O. spinirostris female has a small papilla on the ventral swelling of the fifth thoracic segment; O. plumifera was not observed to have one. O. plumifera was not found where surface water temperature was less than 16°C; O. spinirostris was found where surface water temperature was less than 18°C. Olson states:

> . . . Oithona plumifera may occur north of Pt. Conception (California), but apparently only as a southern form swept into the area by currents (p. 178).

He also says:

> . . . O. similis and O. spinirostris are northern forms which reach their southern limits in the area surveyed. Oithona nana is usually considered to be a warm water form. Its occurrence at La Jolla and at scattered points north to the Columbia River suggests a greater range for it in this area. It occurs in very insignificant numbers (p. 176).

Olson considers Oithona to be a truly pelagic genus. He feels that O.

similis may be the most abundant copepod species in the water constituting more than 90% of the cyclopoid population and 50% or more of the total copepod population. In his samples off the Oregon coast, *O. similis* accounted for 73-94% of the cyclopoid population.

In the present study *Oithona* spp. found in the samples have been called *Oithona spinirostris* if the rostrum was showing from the dorsal view or *Oithona similis* if no rostrum was evident from the dorsal view. *Oithona spinirostris* was a minor constituent in zooplankton samples from Alsea Bay (Appendix I). *Oithona* males were considered to be *Oithona similis*.

Oithona similis was found in 248 sample counts from Alsea Bay and constituted 3.5% of the total estimated number of zooplankton per m^3 (Tables 17 and 18). The species accounted for more than 10% of a sample count 58 times, significantly less so at the upstream station 4 (χ^2, $p = .05$) (Table 19). *O. similis* occurred in a lower proportion of sample counts at upstream station 4; the species was not found in significantly different proportions of samples when samples were divided by season (Table 17). Populations estimated at greater than $100/m^3$ occurred during September-November 1966, January-May and July-October 1967, and February-September 1968 (Appendix I). Estimated populations of $500/m^3$ or more occurred with water of 11.6-33.0‰ salinity (tending towards the higher salinities) and 11.0-9.4°C temperature (Table 34).

Table 34. Conditions when *Oithona similis* occurred in Alsea Bay in numbers estimated at 500 or more per m^3 of water.

Date	Station	‰ Salinity		°C		100	Aliquot count	
		bottom	surface	bottom	surface	#/m^3	m	f & cop
19 Oct. 66	3	33.0	32.9	9.9	10.0	5.0	0	38
2 Nov.	1	32.9	32.8	10.8	10.9	6.3	0	41
"	2	32.8	32.8	10.8	11.0	32.	0	121
"	3	32.7	32.7	11.1	11.3	9.4	1	57
17 Mar. 67	1	28.9	28.5	9.4	9.9	5.0	20	206
"	2	28.7	13.8	9.5	9.9	5.5	15	264
14 Mar. 68	1	30.6	30.6	10.6	10.8	6.4	13	135
"	2	30.4	30.4	10.6	10.7	6.4	18	118
"	3	30.2	29.9	10.5	10.6	6.5	17	141
31 Mar.	1	31.8	31.8	10.7	10.8	5.7	17	173
10 Apr.	1	32.4	32.4	10.0	10.1	8.9	4	120
"	2	32.4	32.4	10.0	10.1	15.	11	265
"	3	31.7	11.6	10.1	11.0	8.3	5	151

m = male; f & c = female and copepodite

Cross (1964) found Oithona similis to be the dominant cyclopoid copepod accounting for an average of 51% of the adult copepod population off the Oregon coast. It was the predominant copepod at most stations in January; was in great numbers 45, 65 and 105 miles offshore in April and May; and again was predominant in October. Off Newport, one period of abundance occurred in April and May 35 to 105 miles out, while a second peak was found inshore in September and October.

Haertel (1970) found Oithona similis occasionally present in high numbers in the Columbia River estuary. Frolander (1962) found O. similis and Pseudocalanus minutus dominating the zooplankton samples off the coast of Washington and British Columbia; the Oithona similis population was high in November.

O. similis occurred widely in the Arctic and adjacent Canadian waters and with seven other species comprised 99% of the copepod population in the upper 50 m of the central Arctic (Grainger, 1965). O. similis was one of six most abundant copepods in Tanquary Fjord, Ellesmere Island (Cairns, 1967). O. similis was the second highest producer (after Pseudocalanus minutus) at 202-347 mg $C/m^2/yr$ at Ogac Lake, a landlocked fjord in Baffin Island (McLaren, 1969).

McMurrich (1917) found Oithona similis in small numbers in three gatherings in winter samples off St. Andrews, New Brunswick. Légaré and Maclellan (1960), in the same area (Passamaquoddy Bay), found O. similis primarily a summer and fall species which together with five other species accounted for 74% of the total zooplankton population. Sherman (1966) found O. similis one of the eight common copepods in the Gulf of Maine.

Deevey (1956) found Oithona spp. present all year and dominant with Acartia tonsa and Paracalanus crassirostris during July-December in Long Island Sound. Cuzon du Rest (1963) found Oithona spp. the third zooplankton dominant after Acartia tonsa and Eurytemora hirundoides in the salt marshes of southeastern Louisiana; Oithona spp. were mostly in the more saline waters, were highest in population in April, and were present during April-December.

Beers and Stewart (1967), in sampling the microzooplankton across the California current, found Oithona among the five copepod genera important as metazoans in his samples. Esterly (1928) found O. similis to be present more in day hauls than night hauls at La Jolla; O. nana was another species of the nine found in numbers sufficient to analyze.

Both O. similis and O. nana have been called O. helgolandica (Olson, 1949). Hebard (1956) reported O. helgolandica from Puget Sound regularly but not abundantly during June-October. Légaré (1957) found O. helgolandica comprising 18% of the copepod population in July and 25% in November in the Strait of Georgia; the greatest concentration of the species was from 50 to 20 m. The species was called a surface inhabitant of the Queen Charlotte Islands area in summer 1953 (Cameron, 1957). Fulton (1968) said *O. helgolandica* was a common species found at all depths off British Columbia. Willey (1931) found *O. helgolandica* in Hudson Bay in summer 1920. From the northern geographical distribution of these reports, I believe *O. helgolandica* here to be primarily if not entirely synonymous with *O. similis*.

The occurrence of *Oithona similis* in the lower end of Alsea Bay somewhat parallels that of *Pseudocalanus* sp.; however, *Oithona similis* was normally found in lower numbers. Highest population estimates for *O. similis* in Alsea Bay were found in fall 1966 and in the springs of 1967 and 1968; these highs were associated with temperatures around 10°C. *Oithona similis* was found throughout the year and primarily downstream in Alsea Bay.

Eurytemora sp.

Eurytemora sp. comprised 2.7% of the total estimated number of zooplankton per m^3 and was found in 160 samples (Tables 17 and 18). The species accounted for more than 10% of the sample count 44 times, these occasions being significantly more upstream (χ^2, p = .05) (Table 19). *Eurytemora* sp. occurs in a lower proportion of sample counts downstream and during December-February (Table 17). Estimated populations were greater than $100/m^3$ during September

1966, April and June-November 1967, and May-September 1968 (Figures 27 and 28; Appendix I). Populations estimated at greater than 700 /m^3 occurred with water of 0.7-30.0‰ salinity and 18.4-8.8°C temperature (Table 35). Samples taken at minus tides during June-August 1968 indicated Eurytemora sp. to be in greatest estimated numbers downstream at station 1 (Appendix I).

The speciation of Eurytemora along the Oregon coast is unclear. I have illustrated the Eurytemora sp. I found in Alsea Bay (Figure 29). These adults were taken from a large adult population found at Station 4 on October 7, 1967. The water sampled at this station at this time had 15.8‰ salinity and 13.5°C temperature at the bottom (2 m); the water had 10.4‰ salinity and 13.6°C temperature at the surface.

Female: 19 specimens were measured for length from tip of rostrum to end of caudal rami (1.12-1.26 mm); paired spines on tip of distal segment of fifth legs of approximately equal size.

Male: 13 specimens were measured for length from tip of rostrum to end of caudal rami (1.06-1.18 mm); second segment of left fifth leg of approximately equal width throughout; distal portion of terminal segment of left fifth leg planar medianally, knobbed laterally; right antenna segments 13 through 18 swollen, segments eight through 12 having spines with comparative lengths of 1.0:1.6:1.2:1.6:2.6, respectively.

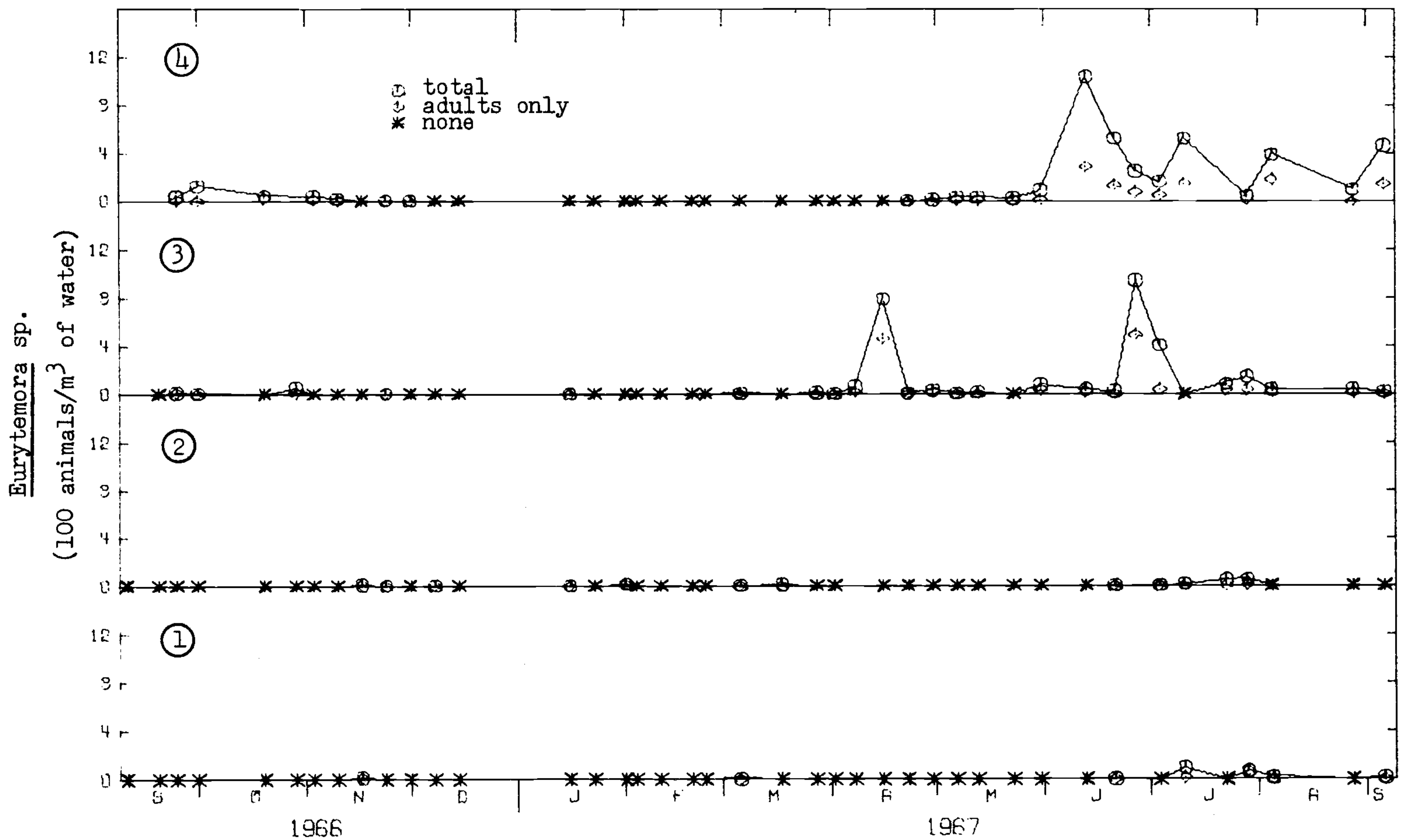

Figure 27. Eurytemora sp. population at stations 1-4, Alsea Bay, as sampled during September 8, 1966, to September 8, 1967. Numbers on vertical axis times 100. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. ①, ②, ③, ④ are respective station numbers.

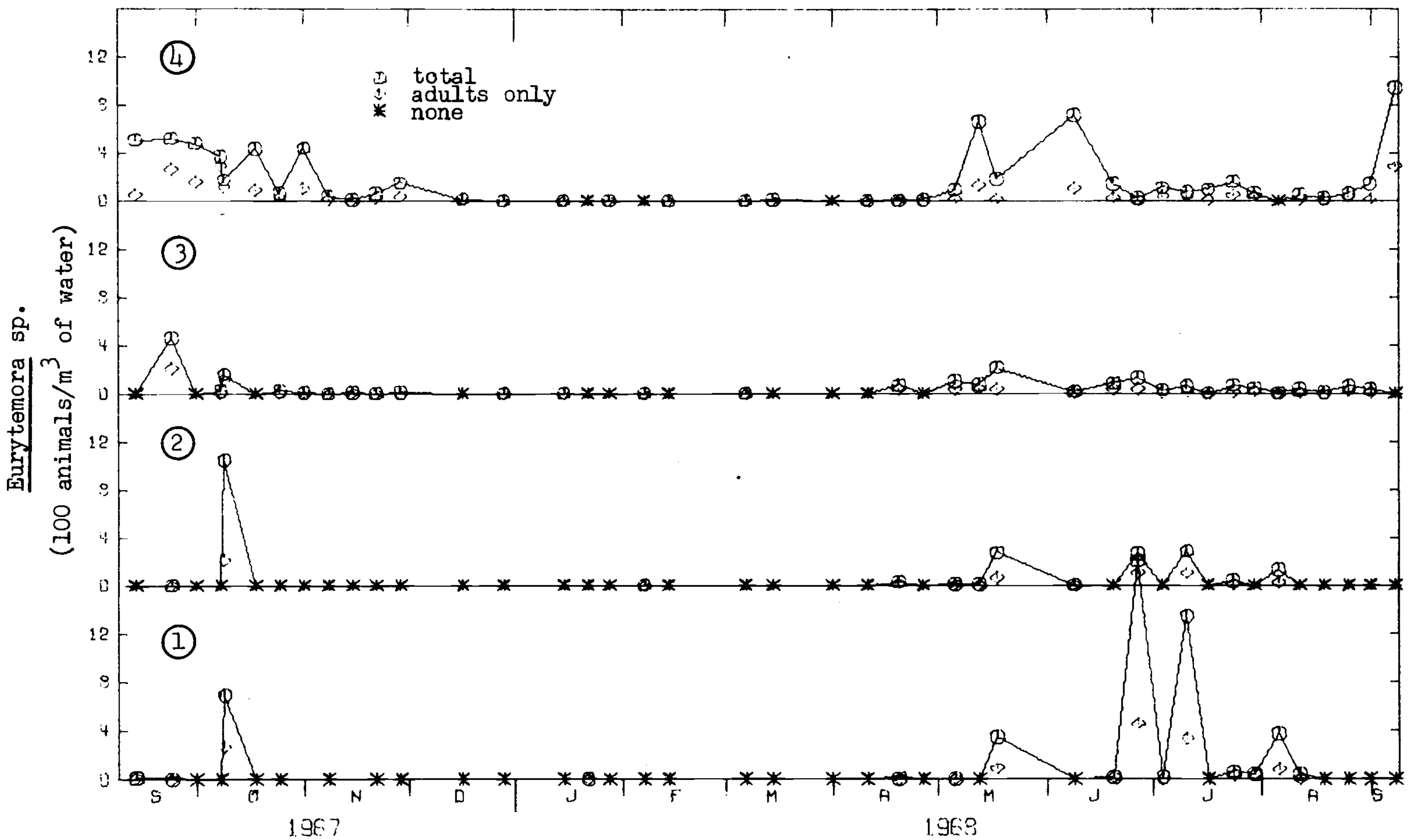

Figure 28. Eurytemora sp. population at stations 1-4, Alsea Bay, as sampled during September 8, 1967, to September 8, 1968. Numbers on vertical axis times 100. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. 1, 2, 3, 4 are respective station numbers.

Table 35. Conditions when <u>Eurytemora</u> sp. occurred in Alsea Bay in numbers estimated at greater than 700/m^3 of water.

Date	Station	‰ Salinity bottom	‰ Salinity surface	°C bottom	°C surface	10^3 #/m^3	Aliquot count m	Aliquot count f	Aliquot count cop
15 Apr. 67	3	21.2	15.1	11.2	11.0	0.86	94	38	96
12 June	4	11.6	8.1	17.2	18.4	1.1	74	16	237
26 June	3	30.0	29.7	12.9	13.0	1.0	54	6	54
7 Oct.	1	25.1	23.9	13.5	13.7	0.75	11	7	29
"	2	20.7	20.3	13.4	13.5	1.2	3	6	36
12 May 68	4	8.5	5.5	12.9	13.1	0.72	34	13	188
8 June	4	1.3	0.7	13.8	13.6	0.78	33	10	255
26 June	1	21.7	19.2	15.2	16.0	2.0	51	41	271
10 July	1	24.2	21.8	15.6	16.4	1.5	49	40	276
7 Sept.	4	28.6	19.4	16.0	17.7	1.0	37	5	97

m = male; f = female; cop = copepodite

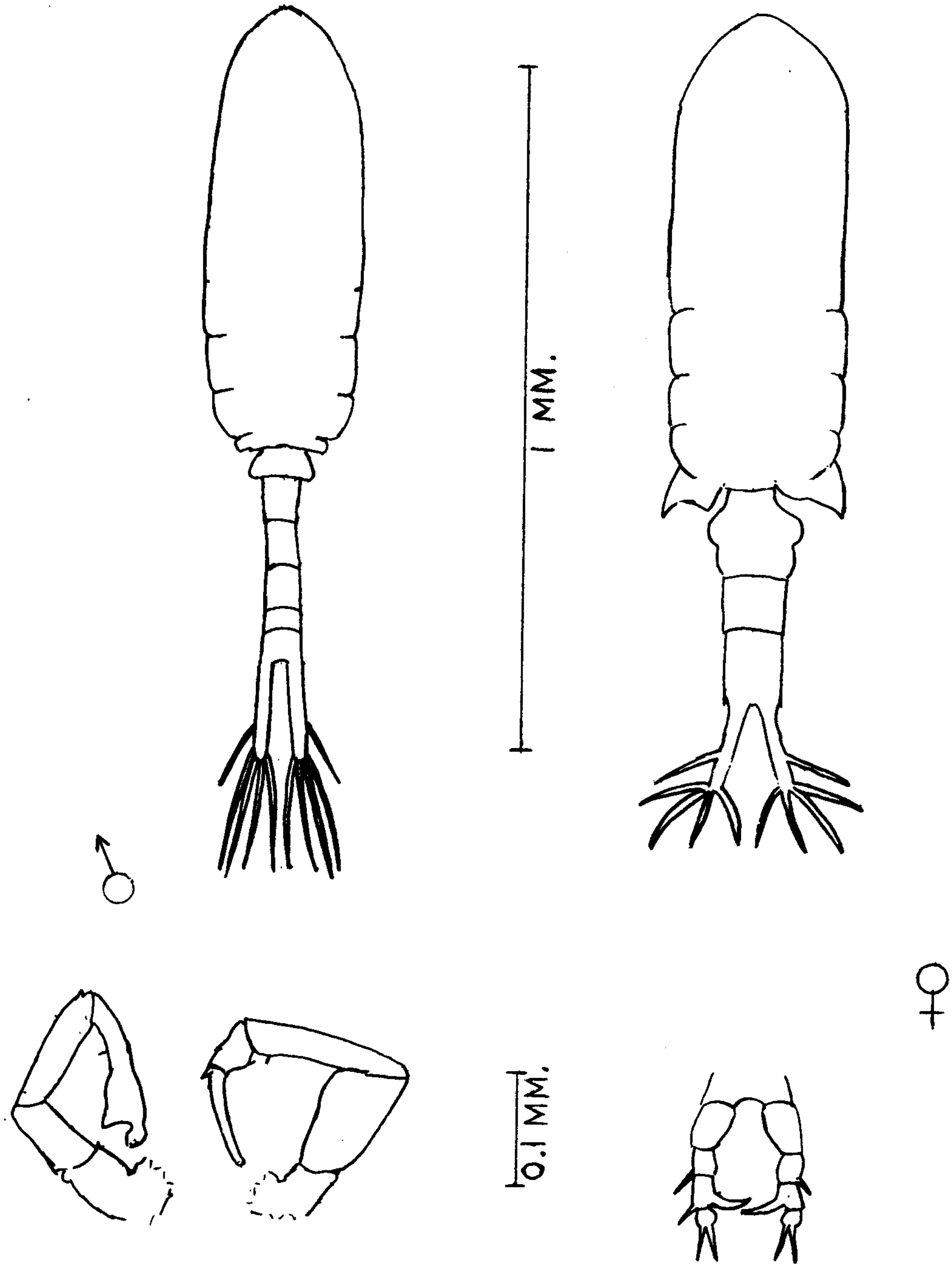

Figure 29. Eurytemora sp. found at station 4, Alsea Bay, on October 7, 1967. Male and its fifth pair of legs on left; female and its fifth pair of legs on right.

Heron (1964) gives the ratio for spine length of segments eight through 12 of the right male antenna as 1.0:1.7:1.2:1.6:3.1 for Eurytemora americana. She follows after Gurney (1933) in calling E. americana Williams 1906, E. thompsoni Willey 1923, E. transversalis Campbell 1930 and E. kieferi Smirnov 1931 all E. americana. Brodskii (1950, transl. 1967) has each species separate. Fulton (1968) includes E. thompsoni and E. transversalis under E. americana in reporting on British Columbia zooplankton; he calls the species a common surface form. He finds E. hirundoides to be another common surface form and records E. pacifica (johansoni) as having been previously reported.

Cameron (1957) found E. hirundoides as a surface inhabitant in the Queen Charlotte Islands area in the summer of 1953. Légaré (1957) found E. hirundoides in June and November samplings in the Strait of Georgia; E. johansoni (pacifica) was in the June sampling.

Haertel (1970) found Eurytemora affinis the most abundant zooplankter in the Columbia River estuary; she called the species oligohaline (0.2-10‰ salinity) with the center of its abundance in salinities 0.5-1.0‰. The population peaked three times, the highest being in late April and early May when estimates ranged from 10^4 to more than 10^5 #/m^3. Lower peaks were found in late July and during November-January.

Frolander (1964) found Eurytemora sp. to be the most upstream of four copepods dominating the zooplankton population in Yaquina Bay.

Esterly (1924) found Eurytemora hirundoides in San Francisco Bay; Eurytemora was most abundant in the haul made where salinity was the lowest encountered in the bay (20 of 27 animals at 3.25‰).

Eurytemora sp. was found over a wide range of salinities and temperatures in Alsea Bay. Although the species was found mainly upstream, the greatest numbers of Eurytemora sp. were found at the mouth of the bay (station 1) when zooplankton were sampled at minus tides in the summer of 1968. Eurytemora sp. was found primarily during spring, summer and fall in Alsea Bay.

Unidentified Eggs and Harpacticoid Copepods

Unidentified eggs (including all but those identified as fish eggs) were seen in 232 samples and were not in significantly differing proportions of samples when the samples were divided by station or by season (χ^2, $p = .05$) (Table 17). These eggs comprised 1.7% of the total number of zooplankton per m^3 (Table 18) and were more than 10% of the sample count 11 times (Table 19).

Harpacticoid copepods accounted for 0.59% of the total estimated numbers of zooplankton per m^3 and were found in 254 samples (Table 18); the harpacticoids were not in significantly differing proportions of samples when samples were divided by station or by season (Table

17). The harpacticoids were more than 10% of the sample count nine times, four each at stations 3 and 4 (Table 19).

Paracalanus parvus Claus

Paracalanus parvus was found in 201 Alsea Bay samples (Table 17); the species comprised 2.0% of the total estimated number of zooplankton per m^3 in 326 samples (Table 18). It was more than 10% of the sample count 56 times with no significant difference in distribution by station (χ^2, p = .05) (Table 19). *P. parvus* occurred in a lower proportion of sample counts upstream and during June-August (Table 17). It was not found in numbers estimated at more than 100/m^3 during December 1966, May-September and November 1967, and April-June 1968 (Appendix I). It occurred in numbers estimated at more than 400/m^3 with water of 28.4-32.8‰ salinity and 15.2-9.7°C temperature (Table 36).

Hebard (1956) found *P. parvus* in Puget Sound during June-November. Legare (1957) called *P. parvus* a surface species present in June and November samplings from the Strait of Georgia. *P. parvus* was thought to be associated with the higher surface temperatures and the upper 14 m of water when found in summer samples in the Queen Charlotte Islands area by Cameron (1957). Fulton (1968) called *P. parvus* an abundant surface and mid-depth species off British Columbia.

Table 36. Conditions when *Paracalanus parvus* was found in Alsea Bay in numbers estimated at greater than 400 /m^3 of water.

Date	Station	‰ Salinity		°C		10^3	Aliquot count		
		bottom	surface	bottom	surface	#/m^3	m	f	cop
19 Sept. 66	2	32.4	32.4	14.9	15.2	0.44	4	49	11
2 Nov.	2	32.8	32.8	10.8	11.0	0.78	1	10	19
"	3	32.7	32.7	11.1	11.3	0.84	1	9	42
30 Nov.	1	30.2	30.0	11.2	11.4	0.41	13	88	76
"	2	30.5	30.3	11.2	11.4	0.44	12	176	102
"	3	30.4	28.3	11.3	11.6	0.46	19	153	126
15 Jan. 67	1	28.6	28.4	10.1	10.3	0.43	16	74	55
31 Jan.	1	30.9	30.5	9.8	10.2	0.42	0	7	13
10 Feb.	1	30.9	30.7	9.7	10.1	0.80	9	82	81
"	2	30.7	30.6	9.7	10.0	0.79	10	68	87
24 Oct.	1	32.5	32.5	12.9	12.9	0.40	4	17	50
"	2	32.5	32.5	12.9	12.9	0.66	6	35	82

m = male; f = female; cop = copepodite

Cronin, Daiber and Hulbert (1962) called P. parvus a fall and oceanic (18-20‰) species in the Delaware River estuary. Deevey (1956) found P. parvus in Long Island Sound during May-July and November. Bigelow (1924) called P. parvus a year round resident of the Gulf of Maine; he considered it probably cosmopolitan in temperate and tropical seas.

Woodmansee (1958) found P. parvus to account for 27% of the copepod population (10% of the total number of zooplankters) off Chicken Key, Florida. The species was most prominant from November to mid-June. Woodmansee considered it an oceanic and neritic species, a summer and fall species in more northern areas, and a winter and spring species in warmer areas.

P. parvus was one of nine groups of copepods occurring off La Jolla in numbers sufficient for analysis (Esterly, 1928). Esterly (1924) found the species to be most abundant early in the year in San Francisco Bay.

Brodskii (1950, transl. 1967) called P. parvus a euryhaline inhabitant of the open sea and near shore.

In Alsea Bay, Paracalanus parvus was more a downstream than upstream zooplankter and was found primarily in fall and least in summer. This calanoid copepod probably prefers warmer marine water; the species would probably be present in more lower bay summer samples if upwelling was not a prominant feature of that season.

Larvacea and Larval Ascidacea

Larvacea and larval Ascidacea accounted for 2.7% of the total estimated number of zooplankters per m^3 in 326 Alsea Bay samples (Table 18) and were found in 142 sample counts (Table 17). They occurred as greater than 10% of the sample count 22 times (Table 19). They were in a lower proportion of the sample counts during June-August and upstream at station 4(Table 17). They were found in numbers estimated at more than $100/m^3$ during September and November 1966; February, April-June, and September-October 1967; and March-May and August-September 1968 (Appendix I). They occurred in numbers estimated at greater than $1000/m^3$ with water of 25.7-32.6‰ salinity and 14.7-11.0°C temperature (Table 37).

Table 37. Conditions when Larvacea and larval Ascidacea occurred in Alsea Bay in numbers estimated at more than $1000/m^3$ of water. Parentheses indicate water samples taken after zooplankton tow.

Date	Station	‰ Salinity		°C		10^3	Aliquot
		bottom	surface	bottom	surface	$\#/m^3$	count
29 Apr 67	1	30.7	30.7	11.0	11.3	2.6	99
"	2	30.6	30.6	11.2	11.4	1.4	154
"	3	26.7	25.7	11.5	11.9	1.2	164
12 June 67	2	32.6	32.6	12.7	13.0	1.5	230
7 Sept 68	1	32.6	32.4	13.2	13.2	3.4	258
		(32.6	32.3	13.4	14.4)		
"	2	32.6	32.6	13.4	13.5	1.4	327
		(32.6	32.5	13.5	14.0)		
"	3	32.4	32.4	14.1	14.2	1.1	154
		(32.4	32.4	14.5	14.7)		

Légaré (1957) found Appendicularia (a Larvacean) to be the second most abundant zooplankton group next to copepods in June samples from the Strait of Georgia.

As with *Paracalanus parvus*, the chordate group, Larvacea and larval Ascidacea, was found in Alsea Bay in more downstream than upstream samples; it was found primarily in fall samples and least in summer samples. This group may prefer warmer marine water and would probably be present in more lower bay summer samples if upwelling was not a prominant feature of that season.

SEASONAL AND INDICATOR ZOOPLANKTON GROUPS

Corycaeus sp.

The cyclopoid copepod, Corycaeus sp., was found in 152 sample counts (Table 17) and accounted for 0.51% of the total estimated number of zooplankters per m^3 for 326 Alsea Bay samples (Table 18). It comprised more than 10% of a sample count 19 times (Table 19) and occurred in a lower proportion of sample counts upstream and during June-August (Table 17), it followed distribution patterns of Paracalanus parvus and the Larvacea and larval Ascidacea group. Corycaeus sp. was found in numbers estimated at greater than $100/m^3$ during November 1966, October 1967, and August-September 1968 (Appendix I).

Olson (1949), in studying samples taken from off Oregon, California, and lower California during a cruise from May 10 to July 10, 1939, stated that Corycaeus anglicus was the only Corycaeus species found north of Pt. Conception (California) and that as far south as San Diego it was the only corycaeid of importance in the samples.

Hebard (1956) found Corycaeus sp. with Pseudocalanus minutus and Microcalanus pusillis comprising most of the zooplankton stock in Puget Sound; Corycaeus sp. was present throughout the year, having its greatest abundance during September-November in deeper waters and during July-December in surface waters. It was considered to be more a surface than a deep water form.

Légaré (1957) found Corycaeus affinis present in June and comprising 2% of the copepod population in November samplings from the Strait of Georgia. Cameron (1957) found C. affinis to be common in the warmest surface water of the area in summer 1953 off the Queen Charlotte Islands.

Fulton (1968) considered C. anglicus Lubbock 1857 and C. affinis McMurrich 1916 to be synonymous; the species was thought to be common and a mid-depth inhabitant of British Columbia.

Esterly (1928) found Corycaeus spp. to be one of nine copepod groups present off La Jolla in numbers sufficient for analysis.

Corycaeus sp. was found more commonly in the oceanic end of Alsea Bay; it was found primarily in fall samples and least in summer samples. This cyclopoid copepod, similar to Paracalanus parvus and the chordate group just mentioned, probably prefers warmer marine waters and probably would be found more often in lower bay summer samples if upwelling were not so prominant then.

In addition to Paracalanus parvus, Larvacea and larval Ascidacea, and Corycaeus sp., the three calanoid copepod groups Clausocalanus spp., Ctenocalanus vanus, and Acartia danae were in a greater proportion of samples taken during December-February than June-August (Table 17).

Clausocalanus spp.

Clausocalanus spp. were found in 76 samples predominantly at the three downstream stations, predominantly during December-February and secondarily during March-May (Table 17). The species found in samples taken during November 1966-June 1967, November 1967-May 1968, and August 1968; they occurred in numbers estimated at greater than 100 /m^3 during November 1966, January-March 1967, and February 1968 (Appendix I). The estimated population high was 250 /m^3 at station 1 on February 10, 1967, and at station 2 on February 23, 1967 (Appendix I).

Frost and Fleminger (1968) seemed to indicate that in the Northern hemisphere the most northerly ranging *Clausocalanus* species would be those classified as subtropical and/or warm temperate. Related to the Oregon zooplankton program, Bowman (1969) identified four species taken from Yaquina Bay (immediately north of Alsea Bay) on March 5, 1969, as female *C. paululus* and both male and female *C. jobei*, *C. parapergens*, and *C. acuicornis*. Frost and Fleminger (1968) call *C. acuicornis* and *C. parapergens* tropical and subtropical circumglobal species; *C. paululus* is a subtropical and/or warm temperate species; and *C. jobei* is a neritic, circumglobal, and essentially tropical or tropical-subtropical species.

Hebard (1966) found *Clausocalanus* sp. onshore off Oregon when environmental conditions were rather uniform from the coastline offshore.

Cameron (1957) found C. acuicornis a deep water form off the Queen Charlotte Islands in summer 1953.

Esterly (1924, 1928) found C. acuicornis in San Francisco Bay and off La Jolla. Beers and Stewart (1967), in sampling microzooplankton across the California current, found the Clausocalanus genus to be an important part of the metazoans along with Microcalanus, Paracalanus, Oithona, and Microsetella.

In Alsea Bay, Clausocalanus spp. were found more in downstream samples and more during the spring and especially winter. The presence of Clausocalanus spp. in Alsea Bay indicates the presence of waters of warmer oceanic origin.

Ctenocalanus vanus Giesbrecht

Ctenocalanus vanus was identified from 91 samples and occurred in a greater proportion of samples during December-February and downstream (Table 17). The species was identified as occurring during November 1966-July 1967 and September 1967-August 1968; its numbers were estimated at greater than 100/m^3 during November 1966 and January and February 1967 (Appendix I). Its highest estimated population was 240/m^3 at station 1 on November 30, 1966 (Appendix I). Late stage C. vanus female copepodites from Alsea Bay did not have a fully developed fifth leg as shown by Esterly (1924); these were called females in Appendix I.

Bowman (1969) identified Ctenocalanus vanus males from Yaquina Bay but called what were tentatively identified as fifth stage C. vanus females aberrant Pseudocalanus minutus females.

Esterly (1924, 1928) found Ctenocalanus vanus in San Francisco Bay and off La Jolla. Brodskii (1950, transl. 1967) says C. vanus is an oceanic, warm surface water inhabitant.

In Alsea Bay, Ctenocalanus vanus was found more in downstream samples and more during the spring and especially winter. As with Clausocalanus spp., the presence of the calanoid copepod Ctenocalanus vanus in Alsea Bay indicates the presence of waters of warmer oceanic origin.

Acartia danae Giesbrecht

Acartia danae was identified from 32 samples and was found in Alsea Bay during February-March 1967, and October 1967-February 1968; its highest estimated population was 61/m^3 at station 1 on November 7, 1967 (Appendix I).

Cross (1964) found A. danae to be excluded from the Oregon coast during the summer although it was always present at greater than 100 miles offshore; the species reappeared along the coast in October in decreasing numbers from south to north. It was suggested that A. danae had a reciprocal relationship with Centropages mcmurrichi; when one was present in a sample, the other wasn't. The presence of Acartia danae would indicate surface current movement off Oregon from warmer areas; the presence of Centropages mcmurrichi would indicate surface current movement from cooler regions.

Hebard (1966) found Acartia danae off Oregon in the winter.

Frolander (1962), in finding A. danae off the coast of Washington and British Columbia, thought that its presence might show water of a more southerly origin. Salinities of more than 32‰ were common where A. danae was found. Temperatures ran from 6.16-16.31°C; the species was most abundant in the warmer water.

Acartia danae was found primarily in fall and winter samples in Alsea Bay. For this bay, Acartia danae indicates a change in seasons. In the fall, when Acartia danae is present, upwelling is over and waters of warmer oceanic origin are appearing along the Oregon coast.

Acartia tonsa Dana

Acartia tonsa was not found to be a population dominant in Alsea Bay. It was counted from 129 samples (Table 17) and comprised 0.45% of the total estimated number of zooplankton per m^3 in 326 samples (Table 18). It was found in a higher proportion of samples downstream and during March-May, and in a lower proportion upstream and during September-November (Table 17). Population estimates exceeded 100/m^3 during April 1967, and March and June-September 1968; only once did the estimate exceed 300/m^3: a 730/m^3 estimate for seven A. tonsa in a count from a station 2 sample of August 11, 1968 (Figures 30 and 31; Appendix I). I found no evidence of A. tonsa at any of the sampling stations from May 30 to September 30, 1967; while during the same period of 1968, only in counts from July 29 and August 5 did the same situation exist. Samples taken at minus tides during the second summer (June-August 1968) indicate low numbers or a lack (August 5) of A. tonsa in the bay.

Frolander (1964), in a tidal cycle study in Yaquina Bay on August 9 and 10, 1963, found A. tonsa populations greater than 10,000/m^3 in water 20°C temperature and 29‰ salinity to water 21°C temperature and 18‰ salinity. A. tonsa occupied a midpoint location in the bay between the other population dominants Eurytemora sp. upstream and Acartia clausi and Pseudocalanus minutus downstream.

Conover (1956) has implied that Acartia tonsa becomes dominant over A. clausi in warmer summer waters of approximately 20°C because of a temperature control over the developing stages of the two species.

In Alsea Bay, the water conditions may not be stable enough or warm enough to allow development of a large A. tonsa population.

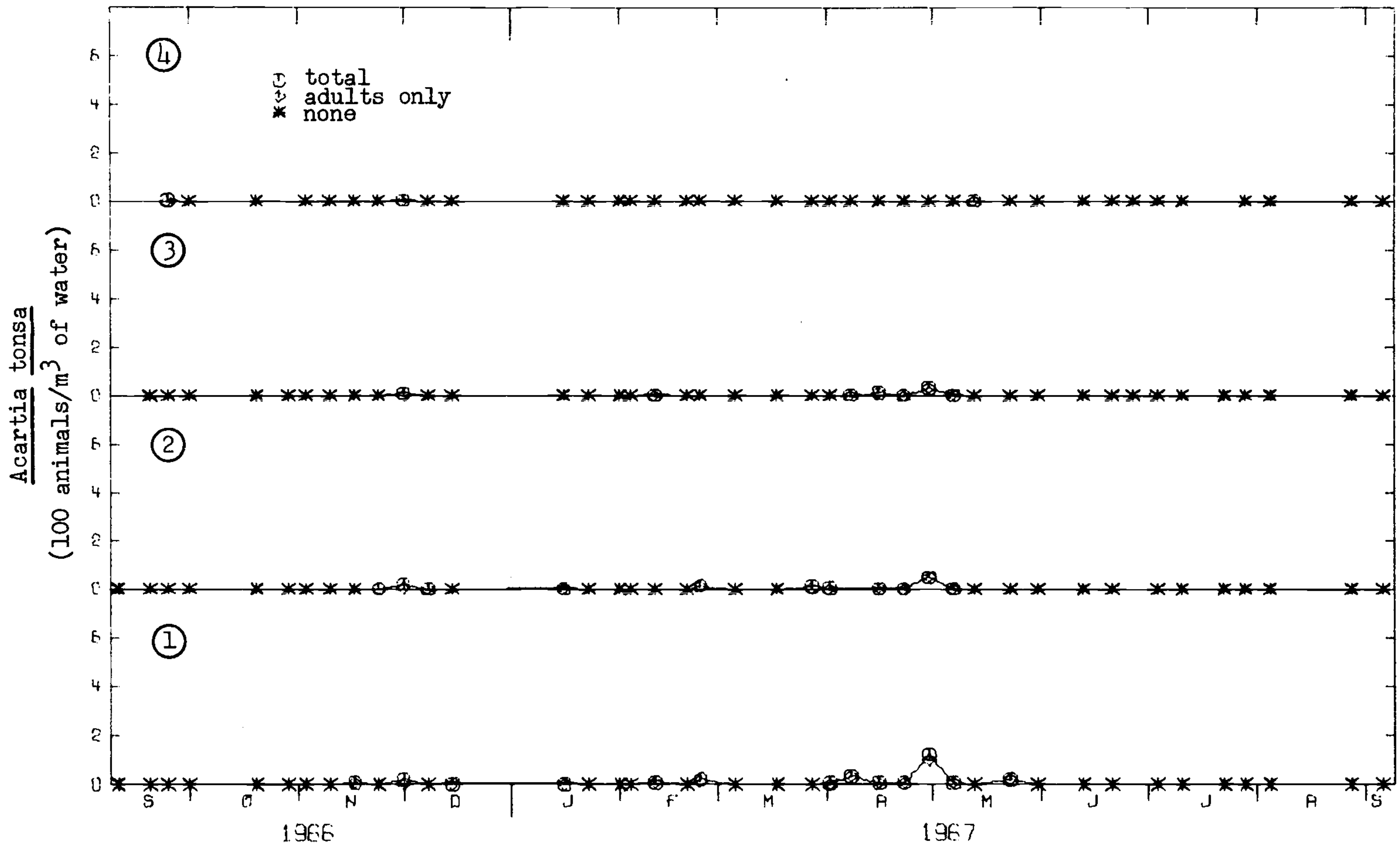

Figure 30. <u>Acartia</u> <u>tonsa</u> population at stations 1-4, Alsea Bay, as sampled during September 8, 1966, to September 8, 1967. Numbers on vertical axis times 100. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. ①, ②, ③, ④ are respective station numbers.

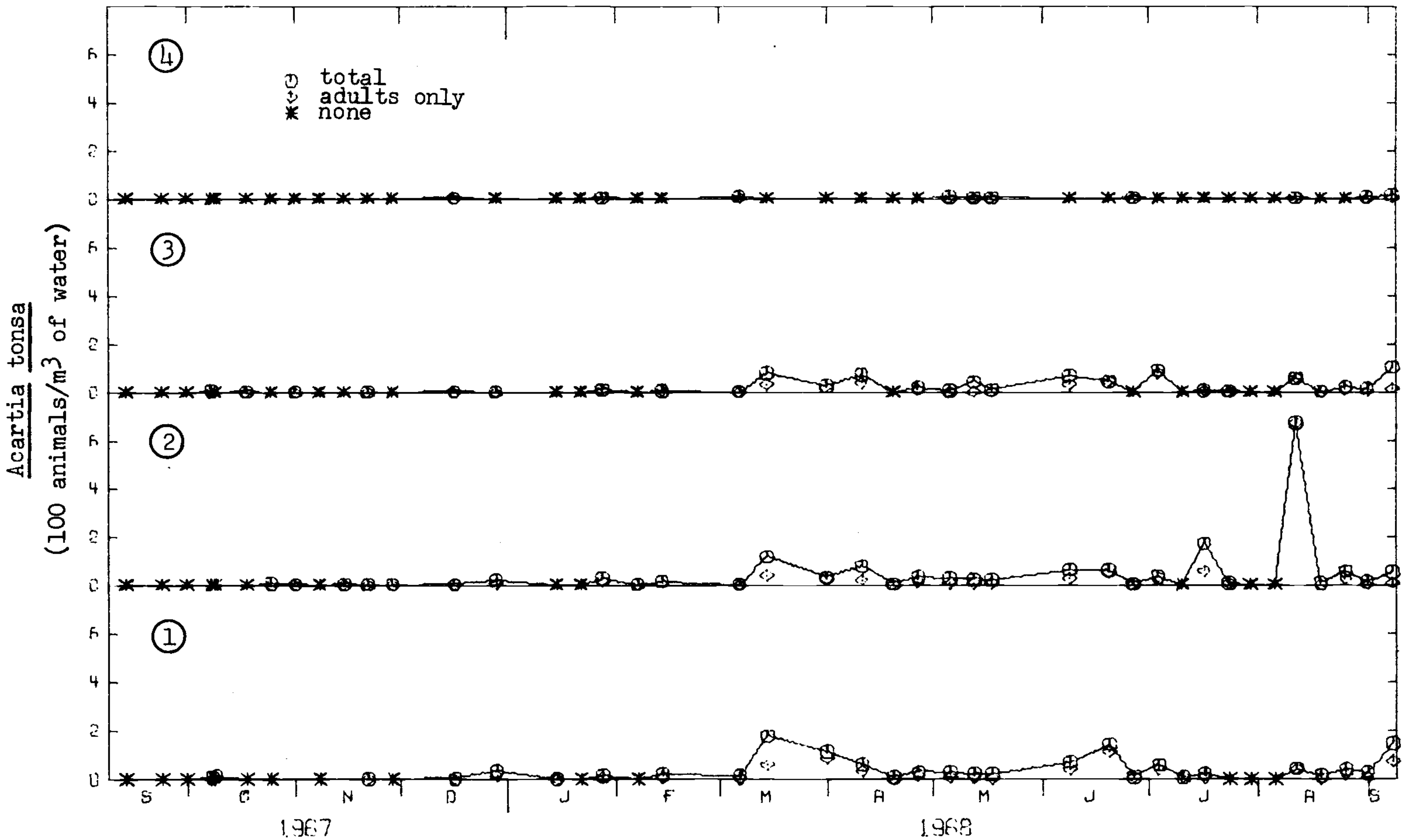

Figure 31. Acartia tonsa population at stations 1-4, Alsea Bay, as sampled during September 8, 1967, to September 8, 1968. Numbers on vertical axis times 100. "Adults only" points are not connected and are always the same as or lower than corresponding "total" points which include both adults and copepodites. ①, ②, ③, ④ are respective station numbers.

The water rises above 20^{o}C in July and August at station 4 but does not stay there (Figures 14 and 15). The population could develop upstream from station 4 in the summer as low stream flow enhances the saline influence and warming on the water upstream. One might expect to see some evidence of such a population when sampling at low tides or at times of increased stream flow.

During summer 1967 stream flow in the Alsea River was quite low (Figure 2) and sampling in the bay was done only at relatively high tides (Figure 17); thus a far upstream A. tonsa population might not have been found. However, if one assumes that Eurytemora sp. in Alsea Bay is the same as that in Yaquina Bay and if conditions in both bays were alike, one might expect a dominant Acartia tonsa population sandwiched between a dominant A. clausi population downstream and a dominant Eurytemora sp. upstream. During May 30-September 30 Acartia clausi and Eurytemora sp. are always found together in at least one sample from each of the 14 sampling trips; Acartia tonsa were not counted in any of the samples (Appendix I). On October 7 and 8 when stream flow had increased, A. tonsa was one of 473 zooplankters subsampled from a station 1 sample taken at mid-tide, one of 503 at station 1 at a minus tide, one of 441 at station 3 at mid-tide, and was not counted from the five other mid-tide and low tide samples. Acartia danae was found in the bay at this time also, at all four stations during mid-tide and at none of the stations during low tide. Perhaps the two species had come into the bay from the sea.

During summer 1968 stream flow was higher than the previous summer (Figures 2 and 3) and sampling was done at both high and low tides (Figure 17). During June 8-September 7 in 42 samples from stations 1, 2, and 3, *A. clausi* was counted in greater numbers than *A. tonsa* but for once at station 2 on June 8. On this same date *Eurytemora* sp. was found alone without *Acartia tonsa* and *A. clausi* at station 4. On five occasions *A. tonsa* was counted from station 4 samples but both *A. clausi* and *Eurytemora* sp. were counted in greater numbers. Once, August 5 at a minus tide, *Acartia clausi* was found alone at station 4 but *A. tonsa* was not found at any of the stations; *Eurytemora* sp. was found with *Acartia clausi* at the downstream stations (Appendix I).

Samples from both summers seem to indicate that *Acartia tonsa* does not establish itself in any great numbers in Alsea Bay.

Esterly (1924) found *Acartia tonsa* in San Francisco Bay only in April and July. He (Esterly, 1923) found *A. tonsa* throughout the year at La Jolla; in a two-year study it was found to be more numerous than *Acartia clausi* during June through October and less numerous during December-April. *A. tonsa* along with *A. clausi* was found more often in night hauls than day hauls at La Jolla (Esterly, 1928).

Cuzon du Rest (1963) called *A. tonsa* the principal component of the zooplankton in the salt marshes of southeastern Louisiana; its population exploded in April 1960. Woodmansee (1958) found A. tonsa comprising 60% of the copepod population and 22% of the total number of zooplankton off Chicken Key, Florida; A. tonsa was more prevalent from June through November or December and most abundant in October.

Cronin, Daiber and Hulbert (1962) called A. tonsa the most abundant and persistent zooplankter in the Delaware River estuary; it was considered an "estuarine" (5-18‰ salinity) species.

Deevey (1956) found A. tonsa present all year in Long Island Sound and a copepod dominant with Paracalanus crassirostris and Oithona spp. during July-December; A. tonsa was called an inhabitant of warmer waters.

Bigelow (1924) stated that A. tonsa was taken in the Gulf of Maine but once from Plymouth Harbor; he thought Cape Cod to be the northern boundary of the species distribution.

Brodskii (1950, transl. 1967) called A. tonsa a neritic species found also in freshened and fully freshened waters.

For Alsea Bay, Acartia tonsa is a coastal copepod that does not get established in great numbers in the fresher waters of the bay. Chi-square values tend to support this contention (Table 17).

Marine Cladocera

Three marine cladocera, Podon leuckarti, Podon polyphemoides, and Evadne sp., appear periodically in Alsea Bay.

Podon leuckarti Sars

Podon leuckarti was found in 91 samples (Table 17) and comprised 0.92% of the total estimated number of zooplankton per m^3 for 326 samples (Table 18). The species was present during September-November 1966, May-November 1967, and April-September 1968; it was present in numbers estimated at more than 100/m^3 during September-November 1966, August 1967, and June and August-September 1968 (Appendix I). Estimated populations of more than 500/m^3 occurred with water of 27.7-33.0‰ salinity and 14.8-9.3°C temperature (Table 38).

Table 38. Conditions when Podon leuckarti was found in Alsea Bay in numbers estimated at greater than 500 per m^3 of water.

Date	Station	‰ Salinity		°C		#/m^3	Aliquot count
		bottom	surface	bottom	surface		
28 Oct 66	1	31.2	30.6	11.6	11.8	590	49
19 June 68	1	33.0	33.0	9.3	9.3	650	59
"	2	33.0	32.6	9.4	10.0	680	108
"	3	30.3	27.7	11.1	12.2	610	65
25 Aug 68	1	32.4	32.3	14.6	14.7	690	64
"	2	32.2	32.2	14.6	14.8	1100	166

P. leuckarti accounted for more than 10% of a sample count 13 times, all of these instances at the three downstream stations (Table 19); however, the species was found relatively frequently at station 4 (Table 17).

Hebard (1956) found P. leuckarti in Puget Sound during May and June. Fulton (1968) records the species as being found off British Columbia. McMurrich (1916) found P. leuckarti in a September cruise off British Columbia.

In Passamaquoddy Bay, Légaré and Maclellan (1960) found P. leuckarti common but scarce during November-May; they called it a neritic species. Deevey (1956) found P. leuckarti in Long Island Sound in June; she noted also that the species had been found in Block Island Sound.

Baker (1938) did not record P. leuckarti from Monterey Bay, California.

For Alsea Bay, Podon leuckarti is a seasonal marine cladoceran occurring somewhat in the spring but mostly in summer and fall.

Podon polyphemoides (Leuckart)

Podon polyphemoides was found in 32 Alsea Bay sample counts, all but two from the three downstream stations (Table 17), and accounted for 0.16% of the average estimated number of zooplankters per m^3 in 326 samples (Table 18). The species was present during September-November 1966 and October-November 1967; only during September-October 1966 was the population estimated at more than $100/m^3$ (Appendix I). The maximum estimated population was $200/m^3$ at station 1 on October 28, 1966 (Appendix I).

McMurrich (1916) found _P. polyphemoides_ during a September cruise of the west coast of Vancouver Island, British Columbia. Fulton (1968) records the species as being found off this province.

McMurrich (1917) discovered _P. polyphemoides_ off St. Andrews, New Brunswick, in October.

P. polyphemoides, _Evadne nordmanni_, and _Penilia avirostris_ were the three predominant cladocera in Long Island Sound; _Podon polyphemoides_ occurred during June-August 1952 and May-June 1953 (Deevey, 1956). Deevey felt that _P. polyphemoides_ apparently preferred water of lower salinity as she had found it to be the only cladocera in Tisbury Great Pond and not present with _P. leuckarti_ and _P. intermedius_ in Block Island Sound.

Baker (1938) called _P. polyphemoides_ predominantly coastal, moderately eurythermal and somewhat euryhaline. She found it occurring throughout the entire year at Monterey Bay in greatest frequency during the winter months and in greatest numbers in May. Males were found from April through August. Baker felt that reports suggested that this species was carried by currents from colder regions to warmer ones; previous reports indicated the range of _P. polyphemoides_ to be from the southern California coast to British Columbia in the northeast Pacific.

In Alsea Bay, _Podon polyphemoides_ is present as a seasonal marine cladoceran in the fall. The species was found in fewer samples than the other marine cladocerans.

Evadne sp.

Evadne sp. was counted from 66 Alsea Bay samples (Table 17) and accounted for 0.63% of the total estimated number of zooplankton per m^3 for 326 samples (Table 18). The species occurred during September-November 1966, July-November 1967, and June-September 1968 (Appendix I). Estimated populations greater than 200/ m^3 were found with water of 30.7-33.6‰ salinity and 14.9-10.2°C temperature (Table 39).

Table 39. Conditions when Evadne sp. occurred in Alsea Bay in numbers estimated at greater than 200 per m^3 of water.

Date	Station	‰ Salinity		°C		#/m^3	Aliquot count
		bottom	surface	bottom	surface		
16 Nov 66	1	30.8	30.7	10.4	10.6	380	45
"	2	30.7	30.7	10.4	10.6	320	38
28 July 67	1	33.6	33.6	10.8	10.8	1700	24
"	2	33.1	32.0	11.9	14.9	210	37
4 Aug 67	1	33.5	33.5	10.2	10.2	640	30
"	2	33.4	33.4	10.6	10.6	380	18
11 Aug 68	2	33.5	33.5	10.3	11.4	210	2

Baker (1938) differentiated between Evadne nordmanni, E. spinifera, and E. tergestina on the basis of spines on the exopodites of the thoracic appendages. Working posteriorly from the first to the fourth thoracic appendage, the number of exopodite spines were 2-2-1-1 for E. nordmanni, 2-2-2-1 for E. spinifera, and 2-3-3-1 for E. tergestina. E. tergestina was found at one station off southern California; it was called a warm water, stenothermal and moderately stenohaline species that was found (on the basis of samplings from other parts of the world) in the open ocean slightly less frequently than along the coast. E. spinifera was found at three stations off southern California; it was thought to occupy warmer sections of the temperate zone and to be as commonly if not more often found as a pelagic rather than a coastal form. E. nordmanni was found at three stations off southern California, and in the southern end of Monterey Bay each month of the year. Relatively few specimens were found in the bay during the winter with greatest frequencies being in early May; males were found during February-November.

Fulton (1968) reported that both E. nordmanni and E. tergestina had earlier been found off British Columbia. McMurrich (1916) found E. nordmanni during a September cruise off the west coast of Vancouver Island.

Hebard (1956) found Evadne sp. during May, June, and October in Puget Sound.

Légaré and Maclellan (1960) called E. nordmanni a neritic species which was common but scarce during November-May in Passamaquoddy Bay. Deevey (1956) found E. nordmanni during

April-August 1952 in Long Island Sound; greatest numbers of this species were recorded during June and July. Cronin, Daiber and Hulbert (1962) found *E. nordmanni* in the Delaware River estuary during spring 1953 in salinities down to 15.6‰.

Evadne sp., the third marine cladoceran found in Alsea Bay, was found there seasonally, in summer and fall.

DISCUSSION

Alsea Bay ($124^{\circ}04'45''$ W. Long., $44^{\circ}26'22''$ N. Lat.) is the most seaward position of one of several small watersheds between the crest of the Coast Range mountains and the Pacific Ocean in Oregon. The watershed drains 473 square miles or about 0.0018 the drainage of the almost 259,000 square miles (Neal, 1967) of the Columbia River Basin. The average annual runoff yield of the Alsea watershed is about 1.8×10^9 m^3; this amount of water would flow into the ocean in ten days with a low Columbia River flow of 2,300 m^3/sec or in one day with a high flow of 24,300 m^3/sec as reported by Haertel (1970).

The time of high stream flow in the Alsea Basin as with the other small coastal watersheds is during the rainy winter season, while peak flows in the Columbia are normally in June because of snow melt in Canada. However, even in the Columbia peak flows occur in the winter when heavy rains, or snow melt, run off the more coastal portions of the basin.

Tides in Alsea Bay are semi-diurnal having a mean range of 5.8 feet and a diurnal range of 7.7 feet (U.S.C. & G.S., 1965, 1966, 1967). The bay is shallow. The volume of water in the bay at six foot tide level was calculated to be 3.8 times the volume of water at zero tide level; the calculation was made using a chart of the U.S. Army Corps of Engineers (1950).

Flushing times were calculated for the Alsea estuary by using the modified prism method of Ketchum (1951). The times varied from 2.7 tidal cycles (33 hours) at a high stream flow of 85 m^3/sec, to 8.1 tidal cycles (100 hours) at an intermediate stream flow of 12 m^3/sec, to 18.0 tidal cycles (less than ten days) at a low stream flow of 1.8 m^3/sec (Table 7). Neal (1967) predicted a flushing time of 9.91 tidal cycles (a little more than five days) for low flow in the Columbia River estuary using the same method. Thus, during periods of low stream flow, the time taken for pollution to wash out of the Alsea estuary would be almost double the time taken for pollution to wash out of the Columbia estuary.

The Alsea estuary was classified as being partially mixed, Pritchard's (1955) type B estuary, with tendencies toward being well-mixed at times of low stream flow (type D) and being two-layered (type A) at times of high stream flow. Burt and McAlister (1959) had found Alsea Bay to be partially mixed in the four months when they sampled: January, March, April and October. Burt and McAlister (1959) also found that the Nehalem, Siletz, Columbia, Siuslaw, Umpqua, Yaquina, and Coos estuaries were partially mixed on occasion; the first five at times were found to be two-layered and the last five at times were found to be well-mixed. Normally when an estuary is well-mixed, at least in Oregon, stream flow is low. This is the time when water conditions are critical to the life within the water; this is the time when pollution may have its greatest effect on the estuarine environment. This may suggest to some that the time to dump wastes is during periods of high stream flow; but the author believes that finally we will have to consider the effect of pollution upon the oceans. There is another alternative which may mean extreme alterations in our way of life, the diminishment or recycling of wastes.

Water temperature in Alsea Bay reflected a normal pattern of winter lows and summer highs. The extremes, both warm and cool, were greater upstream and at the surface (Table 8). The extreme lows for surface and bottom samples for the four stations ranged from 4.3°C at station 4 surface to 8.2°C at station 1 bottom; all the extremes during the sampling period were recorded during December-February (Appendix I). In Yaquina Bay at four stations during April 1966 to November 1967, McCormick (1969) found extreme lows ranging from 7.6°C at the farthest upstream station 39 surface and bottom to 8.7°C at the farthest downstream station 15 bottom; all the extremes were recorded during January-February except the one at station 15 bottom which occurred in June along with highly saline water and was evidence of recently upwelled water having entered the bay. That recently upwelled water is thought to enter Alsea Bay has previously been discussed in this paper; let it be sufficient to say that the cool saline waters entering Alsea Bay during the summer are not as cool as the extremes recorded in the fresher winter water.

In Yaquina Bay during November 1962 to January 1964, Matson (1964), for the same stations that were reported by McCormick (1969) above, found extreme lows ranging from 4.2°C at station 39 surface to 6.8°C at station 15 bottom; these lows were recorded during January-February. Queen (Queen and Burt, 1955) sampled at several stations inside and outside the mouth of Coos Bay during January 1930 to February 1932. At bay stations III, IV, V, and VI (III being most seaward and others progressing numerically upstream) extreme lows ranged from 6.4°C at VI surface to 7.9°C at IV surface; all the extreme lows for these four stations were recorded during January-February.

Extreme high readings of water temperature at the four Alsea Bay stations ranged from 22.2°C at station 4 surface to 15.6°C at station 1 bottom; the eight extreme values were recorded during June and July (Appendix I). Extreme temperature highs at stations 15, 21, 29, and 39 in Yaquina Bay ranged from 22.3°C at station 39 surface to 15.4°C at station 15 bottom; all eight extreme values were recorded during June and July (McCormick, 1969). Earlier extreme highs at the same Yaquina Bay stations ranged from 21.3°C at station 39 bottom to 15.8°C at station 15 bottom; six of the extreme values were recorded during July, the two at station 15 during August and September (Matson, 1964). Extreme highs at stations III, IV, V, and

VI in Coos Bay ranged from 21.4°C at VI surface to 17.3°C at III bottom; the eight extreme values were recorded during June (Queen and Burt, 1955).

Salinity readings from Alsea Bay also reflect a pattern of winter lows and summer highs. The extreme lows for surface and bottom samples for the four stations ranged from 0.02‰ at station 4 surface and bottom to 1.71‰ at station 1 bottom (Appendix I); all the extremes were recorded during December and February. In Yaquina Bay at stations 15, 21, 29, and 39, extreme lows ranged from 0.48‰ at station 39 surface to 20.78‰* at station 15 bottom (McCormick, 1969); the eight extremes were recorded during February-March. Earlier in Yaquina Bay at the same stations, extreme lows for the surface and bottom samples ranged from 0.67‰ at station 39 surface to 26.08‰ at station 15 bottom (Matson, 1964); the extremes were recorded during November-January and March-April. At stations III, IV, V, and VI in Coos Bay, extreme lows ranged from 0.0‰ in surface and bottom samples at stations V and VI to 11.7‰ at station III bottom (Queen and Burt, 1955); the eight extremes were recorded during February-April.

Extreme high salinity readings at the four Alsea Bay stations ranged from 32.00‰ at station 4 surface to 33.81‰ at station 1 surface

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*A salinity of 10.50‰ was recorded for station 15 bottom while that for the surface taken at the same time was 25.51‰ on December 10, 1966 (McCormick, 1969). I suggest the 10.50‰ salinity may be in error.

and bottom (Appendix I); the extremes from stations 1, 2, and 3 were recorded during July while those from station 4 were recorded during September. In Yaquina Bay at stations 15, 21, 29, and 39, extreme highs ranged from 28.97 at station 39 surface to 33.74‰[**] at station 15 surface (McCormick, 1969); the extremes at stations 15 and 21 were recorded during July and August and those at stations 29 and 39 during September. Earlier samples taken in Yaquina Bay at the same stations indicate extreme highs ranging from 27.33‰ at station 39 surface to 33.64‰ at station 15 bottom (Matson, 1964); the extremes at stations 15 and 21 were recorded during July-September while those at stations 29 and 39 during August (station 29 bottom) and October. At stations III, IV, V, and VI in Coos Bay, extreme highs ranged from 28.7‰ at station VI surface to 33.0‰[***] at station III surface (Queen and Burt, 1955); the extremes at stations III and IV were recorded during July and those at stations V and VI during July and September-November.

[**] A salinity of 33.81‰ was recorded for station 15 surface while that for the bottom taken at the same time was 29.60‰ on March 9, 1967; the temperature was warmer by 0.02 °C for the surface water (McCormick, 1969). Readings taken as is would indicate surface water being denser than bottom water.

A salinity of 42.86‰ was reported in McCormick's (1969) appendix for station 15 bottom on October 8, 1966; a check of the original data shows this value to have been 32.86‰ (Frolander, 1970).

[***] A salinity of 33.6‰ was reported for station III bottom on January 11, 1930, but was surrounded by earlier and later bottom readings of approximately 23‰ taken at the same station on the same tidal cycle (Queen and Burt, 1955); it would be rare to find so high a salinity reading as 33.6‰ anywhere near an Oregon estuary in January because of runoff and dilution of coastal waters.

In review, all the extreme salinity lows for Alsea, Yaquina and Coos bays were recorded during November-April with the fresher water being upstream. The extreme low of 1.71‰ reported from station 1 bottom in Alsea Bay was much lower than the more than 10‰ reported for the bottom at the most seaward stations in Yaquina and Coos bays. This indicates either that Alsea Bay flushes more completely than the others or that readings were not taken in the other bays when similar conditions might have existed. Conditions of high stream flow and low tide evidently flush out Alsea Bay (Table 40).

Table 40. Times and conditions at the bottom of the mouth of Alsea Bay (station 1 bottom) when salinity readings were less than 20‰. Stream flows from U.S. Geological Survey (1967, 1968, 1969). Tide heights computed from U.S. Coast and Geodetic Survey (1965, 1966, 1967).

Date	Time (PST)	Sample depth (m)	Stream flow (cfs)	Estimated tide height (ft from MLLW)	Salinity (‰)
23 Nov 66	1444	10	1050	2.1	19.75
7 Dec	1615	11.5	6270	1.6	1.71
14 Dec	1603	3.2*	8180	5.3	6.78
3 Feb 67	1412	11.5	3120	0.2	5.45
19 Feb	1311	10.0	3220	1.3	1.88
5 Mar	1308	9.5*	1210	0.1	12.88
21 Jan 68	1032	10.3	2350	2.1	12.56
6 Mar	1235	12.7	1310	1.1	18.28
19 Apr	1341	12.3*	742	-0.5	17.11
5 May	1136	11.7	485	0.3	19.8

*indicates that depth measurements were corrected because of cable slant.

All the extreme salinity highs for Alsea, Yaquina and Coos bays were during July-November, with the fresher water being upstream. There was a tendency for the extremes to be present later upstream than downstream. Stream flow in rivers along the Oregon coast normally decreases during the summer (Figures 2 and 3 for Alsea River), giving marine water a chance to permeate farther upstream as the fresh water flow decreases.

σ^T is a measure of water density and was computed for Alsea Bay water samples from concurrent salinity and temperature readings (Appendix I). Collins (1964) defined the upper limit of the permanent pycnocline off the Oregon coast at a σ^T value of 25.5; he found that water having this σ^T value was always below 50 m at 105 nautical miles west of Newport. Nearer the coast it would appear at the surface during periods of northerly wind stress (Smith, 1964). Hence if water had a σ^T value of 25.5 or more, its occurrence in Alsea Bay was attributed to the presence of recently upwelled waters. Water of this type was found in Alsea Bay in October 1966, May-September 1967, and June-August 1968. Haertel (1970), in the Columbia estuary, and Bourke (1969), in Yaquina Bay, attributed low dissolved oxygen readings in summer samples to upwelled waters; thus they assumed the presence of recently upwelled waters in those estuaries.

Dissolved oxygen values in Alsea Bay were never found to be below 3.5 ml/L (5 ppm) and low values in the bottom waters were attributed to respiration, decomposition, interaction with sediments, density difference with surface water, and presence of recently upwelled coastal water.

Burt (Queen and Burt, 1955) commented on the Coos Bay dissolved oxygen data:

> Examination of all the oxygen data indicated that levels remained above 2 ml/L (without correction) at all stations during all seasons. According to meager data now available, this is above the lethal level for marine organisms, including food fishes (p. 4).

However they (Queen and Burt, 1955) also reported on testing for H_2S and other reducing substances in Coos Bay waters at station VI; here a maximum of 1.4 ml/l was found at the bottom in October and November 1930. Presence of these reducers should indicate a nearby reducing environment. Since the high values of these reducers in both surface and bottom waters at station VI occurred in October and November, the present author thinks these values may be due to bottom scouring. This part of the year is normally the time when rainfall and streamflow increases. Other readings taken in April indicate that highest reducing substance readings for both surface and bottom were found when the tide was at the low part of its cycle (-0.3 ft).

Bella (1970) recently has been testing for free sulfides (H_2S, HS^-, and $S^=$) in shallow waters above tidal flats in two Oregon estuaries. At Isthmus Slough in Coos Bay, he found a sudden increase in free sulfide concentration at shallow water depths during the ebbing tide; this slough is partially protected from the main channel and is in an area containing pulp and paper mills. At Toledo up the Yaquina Bay estuary near a pulp mill and sawmills, he found free sulfides to be periodically present at times of slight surface scour. In Yaquina Bay near the Oregon State University Marine Science Center, he did not detect free sulfides; the two areas in Yaquina Bay have relatively high tidal velocities.

I am not aware of quantities of H_2S being in Alsea Bay.

Haertel (1970) indicated average dissolved oxygen measurements to be 2-3 ml/L in summer and 6-7 ml/L in winter in saline waters (30‰) in the Columbia estuary; average values were 5-6 ml/L in late summer and 7-8 ml/L in winter in fresh water.

It appears that Oregon estuaries now contain enough oxygen to support aquatic life; however the presence of H_2S in Oregon estuarine waters may be indicative of a future time when oxygen demanding organisms may not survive. They may die from lack of oxygen or from direct reaction to reducing substances.

Dissolved oxygen was found in excess of 110% saturation in Alsea Bay in bottom water samples only during mid-May through early September 1967 and 1968 in samples taken from May 30, 1967 to September 7, 1968 (Appendix I and Table 13). Chi-square tests at the .05 level indicated that this supersaturation was more in evidence during summer 1967 than in summer 1968 and that it occurred in differing proportions of samples when samples were divided by station. The greatest proportion of these values came from station 4 and the least from station 1. Because the bottom samples were from shallower water upstream, station dependence may merely indicate a greater photosynthetic rate nearer the surface.

The calanoid copepod *Acartia clausi* was found in more sample counts than any other zooplankter in Alsea Bay (Table 17). McCormick (1966) after specifically sorting through total samples for medusae found *A. clausi* to occur in more sample counts than any other zooplankter in Yaquina Bay. When ranked by number of sample counts in which they occurred, only *Oithona similis*, copepod nauplii, harpacticoid copepods, pelecypods, barnacle cyprids, and gastropod larvae were found to be more highly ranked in Alsea Bay than they were in Yaquina Bay (Table 41). Other groups which were not mentioned by McCormick for Yaquina Bay that occurred in more than 100 of 327 sample counts in Alsea Bay were unidentified eggs, polychaete larvae, *Centropages mcmurrichi*, "miscellaneous", *Corycaeus* sp., amphipoda, nematoda, and "*Pseudocalanus*-type"*. The data may suggest that larval forms and bottom forms are in a greater relative

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*"*Pseudocalanus*-type" are copepods, generally the younger copepodites, which were difficult to identify because of close similarities between *Pseudocalanus* sp., *Paracalanus parvus*, *Ctenocalanus vanus*, and *Clausocalanus* spp.

Table 41. Number of sample counts in which various zooplankton groups occurred and rank of each group based on those occurrences in Yaquina and Alsea Bays, Oregon.

	Yaquina Bay*		Alsea Bay	
Animal group	number/ occurrence	rank	number/ occurrence	rank
Acartia clausi	158	1	274	1
Eurytemora sp.	108	2	160	16
Pseudocalanus sp.	98	3	217	7
Barnacle nauplii	92	4	245	5
Paracalanus parvus	88	5	201	12
Decapod larvae	87	6	group subdivided (1)	
Acartia longiremis	80	7	210	9-1/2
Oithona similis	79	8	248	3
Podon sp.	72	9	group subdivided	
Acartia tonsa	70	10	129	23
Copepod nauplii	67	11	216	8
Harpacticoid copepod	66	12	254	2
Pelecypods	65	13	246	4
Barnacle cyprids	49	14	205	11
Gastropod larvae	36	15-1/2	172	15
Calanus sp.	36	15-1/2	132	21
Oikopleura sp.	35	17	part of group (2)	
Evadne sp.	23	18	66	unranked
Medusae	176*		155	17
Unidentified eggs	--		232	6
Polychaete larvae	--		188	13
Centropages mcmurrichi	--		175	14
Miscellaneous	--		210	9-1/2
Corycaeus sp.	--		152	18
Amphipoda	--		138	20
Nematoda	--		104	25
"*Pseudocalanus*-type"	--		130	22

*from McCormick (1969) who perused total samples for medusae.

(1) crab zoea occurred in 107 sample counts, rank 24

(2) Larvacea and larval Ascidacea occurred in 142 sample counts, rank 19

prevalence in Alsea Bay than in Yaquina Bay.

Russell (1964) listed zooplankters found in Yaquina Bay in eight samples taken in May, July, August, September, and December 1962 and August 1963. He found ostracods which were never found in great numbers in Alsea Bay (Appendix I), while he did not list barnacle cyprids which were found in many samples in Alsea Bay (Table 17). He found *Candacia columbiae* as 0.01% of one sample; this species was not identified from Alsea Bay samples. He further found *Acartia clausi*, Harpacticoida, copepod nauplii, and barnacle nauplii in all eight samples; these were all found in more than 210 of 327 sample counts in Alsea Bay (Table 17).

In the Columbia River and estuary, Haertel (1970) found and listed many fresh water zooplankton species, six "oligohaline" (preferring water of 0.2-10‰ salinity) species and 28 "polyhaline" (most abundant in water 15‰ salinity or more) species. From Alsea Bay in the present study, the fresh water species were grouped and not finely described (e.g., fresh water cladocera, unidentified cyclopoid copepods, harpacticoids; the latter two groups would include marine specimens). The fresh water species may have occurred in many samples but never in great numbers per unit volume of water. In the summer they would normally be found upstream from the most upstream station sampled, and in winter were found but in low numbers per m^3 of water (Appendix I).

The six Columbia estuary "oligohaline" species (Haertel, 1970) were a coelenterate, three amphipods, a harpacticoid copepod Canuella canadiensis, and the calanoid copepod Eurytemora affinis. The latter two were found in 50% or more of the samples, and E. affinis was found in greater numbers per m^3 than any other zooplankter in the estuary. In Alsea Bay Eurytemora sp. was found in more upstream than downstream samples (Table 17) and in numbers up to 2000 /m^3 (Appendix I), far from the maximum 100, 000 /m^3 reported from the Columbia (Haertel, 1970). Perhaps in sampling upstream of station 4 during periods of low stream flow in the Alsea, one would find Eurytemora sp. in numbers greater than those reported.

Conspicuous in their absence from the Columbia estuary are the calanoid copepods Acartia tonsa, A. danae, Clausocalanus spp., and Ctenocalanus vanus, the first a relatively warm water estuarine species and the others indicative of relatively warmer oceanic conditions than otherwise found along the Oregon coast. The "polyhaline" groups reported as being found in the Columbia (Haertel, 1970) otherwise appear to be similar to those in Alsea Bay, although the mysids, isopods, shrimp larvae, carb larvae, and chaetognaths were not as specifically identified in Alsea Bay. Pseudocalanus sp. was the most abundant copepod in Columbia estuary waters of salinity 15‰ or more; Acartia clausi was the second most abundant polyhaline copepod but was not consistently present. Three other Columbia estuary "polyhaline" species, Acartia longiremis, Calanus finmarchicus, and Oithona similis, were occasionally present in large numbers. In Alsea Bay Acartia clausi accounted for 40%, Pseudocalanus sp. for 8.1%, and Eurytemora sp. for 2.7% of the total number of zooplankton/m^3 of water from 326 samples (Table 18); evidently conditions were relatively more favorable to the propagation of Eurytemora affinis and Pseudocalanus sp. in the Columbia estuary.

Estimates of biomass in the Alsea estuary apparently indicate that the mean annual displacement volume is somewhat higher at the downstream stations than upstream (Table 21), while average seasonal volumes are highest during June-August at stations 1, 2, and 3 and during September-November at station 4. Frolander's (1962) data from offshore Washington and British Columbia and Laurs' (1967) converted data (Table 22) from offshore Brookings, Oregon, apparently indicate that mean annual displacement volume is higher in nearshore regions than in the Alsea estuary; values far offshore (beyond the 100 fathom line for Frolander and 65-165 nautical miles offshore for Laurs) are somewhat higher than values found at upstream stations 3 and 4 in Alsea Bay. Off Brookings (42 N. Lat.), Oregon, the station having the greatest mean annual standing zooplankton crop (15 nautical miles offshore) has highest seasonal values during spring while highest seasonal values at 25-45 nautical miles offshore occur during the fall (Laurs, 1967); the significance of this escapes me.

However it does appear that highest average seasonal displacement volumes occur progressively later in the year as one progresses inland from the most productive nearshore area.

Laurs (1967) states that euphausiids make up 72.0% of the biomass of all his offshore samples while salps make up 13.1% and copepods make up 14.3%. Neither salps nor euphausiids were caught in any great quantity in Alsea Bay; while euphausiids might escape the sampler because of slower towing speeds, salps would not be expected to do so. I did not find evidence of anyone else catching great quantities of salps or euphausiids in estuaries, but at times I found evidence of early stages of euphausiids in Alsea Bay samples (Appendix I).

Results of using McConnaughey's (1964) grouping (assembling) coefficient for Alsea Bay zooplankton groups indicated an assemblage of 21 animal groups (Table 23); the assemblage included copepods (*Acartia clausi*, *A. longiremis*, *A. tonsa*, *Oithona similis*, *Pseudocalanus* sp., "*Pseudocalanus*-type," *Centropages mcmurrichi*, *Calanus* spp., *Paracalanus parvus*, *Corycaeus* sp. and harpacticoids), copepod nauplii, barnacle nauplii and cyprids, pelecypod spat, polychaete larvae, gastropods, medusae, Larvacea and larval Ascidacea, unidentified eggs, and the category "miscellaneous." Most of these animals were found to occur in a lower proportion of sample counts during December-February and upstream at station 4 (Table 17).

The presence of one large assemblage of zooplankters in Alsea Bay may be attributed to several factors. The method of towing the zooplankton sampler in steps from bottom to surface may show more association than one would find by towing at discrete levels. Also, the bay is shallow; and the large sized tides found there would aid in mixing water and zooplankton. Furthermore, mixing of coastal water from wave action and currents would cause coastal zooplankton populations entering the bay with the tides to be more mixed than otherwise. These data indicate that the organisms represented are somewhat tolerant of salinity and temperature changes; however, not all the organisms in this large assemblage may be able to successfully reproduce in Alsea Bay.

All but four zooplankton groups that were counted from more than 100 of the 327 Alsea Bay zooplankton samples were included in the large main assemblage. One exception, _Eurytemora_ sp., occurred more at upstream stations 3 and 4 than downstream stations 1 and 2; it occurred more during June-August and less during December-February (Table 17). _Eurytemora_ sp. was not part of the main assemblage because it occurred in fresher waters than at least some members of that assemblage.

A second exception, crab zoea, was associated with most members of the main assemblage, occurred in proportionally fewer sample counts in the winter than in other seasons, and occurred in proportionally fewer sample counts at upstream station 4 than downstream (especially at stations 1 and 2) (Table 17). Evidently the seasonality of the occurrence of crab zoea in Alsea Bay samples prevented the zoea from being associated with some of the lesser occurring members of the main assemblage.

The other two exceptions, amphipods and nematodes, were associated with some members of the main assemblage and were associated with each other (Tables 23 and 24). They occurred in more sample counts in the winter and less in the summer, and they did not occur in significantly differing proportions of samples when samples were divided by station (Table 17). The amphipods and nematodes were not part of the main assemblage because their seasonal occurrence in Alsea Bay samples was different than that of many members of the main assemblage. Perhaps the presence of amphipods and nematodes in samples taken other seasons was masked by greater numbers of other zooplankton and the higher dilution factors used in obtaining the aliquot subsamples for counting at that time. It might be expected that both animals would be bottom or near bottom dwellers; perhaps the high winter stream flow would cause them to be more mixed into the water column at that time.

The assembling coefficient also showed a high relationship between Clausocalanus spp. and Ctenocalanus vanus (Table 24); these both occurred in more sample counts in the winter and in less sample counts at upstream station 4 (Table 17). *Clausocalanus* spp. and *Ctenocalanus vanus* are winter time species in Alsea Bay. They are warmer water species and indicate the presence of warmer oceanic waters along the coast at that time.

The three marine cladocerans, *Podon leuckarti*, *Podon polyphemoides*, and *Evadne* sp. were interrelated (Table 37); they did not occur in significantly differing proportions of samples when the samples were divided by station (χ^2, p = .05) (Table 17). *Podon leuckarti* occurred during April-November; *Evadne* sp. occurred during June-November; *Podon polyphemoides* was found only during September-November (Appendix I). These species are seasonal and remain in Alsea Bay until runoff becomes heavy in late fall.

McConnaughey's (1964) grouping (assembling) coefficient when used at the non-negative level did separate out some of the more peculiarly occurring animal groups. However, relationships might be shown more clearly if a higher cut-off level was used in determining association between the more highly occurring animal groups; a lower cut-off level might be used when working with the lesser occurring animal groups.

Sanders' (1960) index of affinity and a similarity index (SIMI), based on Simpson's (1949) theory as used by Overton and Zipperer (1969) and Stander (1970), measured similarity of composition of station 1, Alsea Bay, zooplankton samples taken during May-

September, 1967 and 1968. The samples were grouped, as outlined in the methods, to show the more closely related samples. With each index, a main group of samples was formed; these samples were mostly from July and early August of both years (Figures 18 and 20).

Nine samples formed a main sample group when Sanders' index of affinity was used; six of these were associated with recently upwelled water ($\sigma^T \geq 25.5$). Twelve zooplankton samples formed a main sample group when the SIMI index of similarity was used; nine of these were associated with recently upwelled water ($\sigma^T \geq 25.5$). With either index, the majority of samples of these main groups were associated with recently upwelled water ($\sigma^T \geq 25.5$).

The species that was numerically important (10% or more of the sample count) in all samples for both main groups was *Acartia clausi*. With each index, two-thirds of those main group samples associated with recently upwelled water ($\sigma^T \geq 25.5$) had *Pseudocalanus* sp. as 10% or more of the count. The data suggest that with the presence of upwelled water in Alsea Bay one may usually expect the presence of *Acartia clausi* and to a lesser degree the presence of *Pseudocalanus* sp. A check of all 28 zooplankton samples taken in Alsea Bay along with recently upwelled water ($\sigma^T \geq 25.5$) supports the above statement. All 28 samples had *Acartia clausi* as 10% or more of the count, while 13 had *Pseudocalanus* sp. at 10% or more of the count.

Zooplankton samples from station 1 Alsea Bay taken in late August 1968 in contrast to the August 27, 1967, sample were not part of the main sample groupings found using each index. This indicates that zooplankton sample composition was different in late August 1968 compared to late August 1967; so were the winds (Figure 6). The data suggest that the presence or absence of given zooplankton species may be directly related to wind direction.

Three samples taken at minus tides during May, June and July 1968 (stream flow was 215 cfs or more (U.S.G.S., 1969)) were quite similar in zooplankton composition; in each of these three samples *Eurytemora* sp., which normally is found upstream, occurred as 40% or more of the count. Another minus tide sample from August 1968, when stream flow was lower (135 cfs (U.S.G.S., 1969)), related partially in zooplankton composition to the other three minus tide samples but also related to other samples. Stream flow could become low enough so that zooplankton populations in Alsea Bay would not be moved as extensively with minus tides.

Eurytemora sp. population estimates for the four minus tide samples taken at station 1 during May-August 1968 were always higher than those taken at any of the upstream stations on the same day (Appendix I). This may indicate that the bulk of brackish water *Eurytemora* sp. had been moved to the mouth in the strong tide. In an August minus tide sample from station 4, there were no *Eurytemora* sp. in a 742 animal count containing 98.9% barnacle nauplii and 0.9% Acartia clausi. It is possible that flushing during minus tides in Alsea Bay permits only the establishment of zooplankton populations such as Eurytemora sp., barnacle nauplii, and Acartia clausi. The more seagoing animals may simply never have the chance to get established.

Chemical, physical and biological conditions appeared to differ between the summers of 1967 and 1968 in Alsea Bay when a comparison of the data was made.

There were more supersaturated O_2 values (110% saturation or more) in bottom water samples from all stations during late May-early September 1967 than during mid-May-early September 1968 (χ^2, $p = .05$).

When bottom water samples taken from station 1 during June-August 1967 and 1968 (excluding the three minus tide samples from 1968) were compared, temperatures were lower, salinities were higher, and tide levels at time of sampling were lower during summer 1967 (one-tail t-test, $p = .05$). Temperature variance was less during summer 1967 while there were no significant differences in salinity and tide level variances between the summers (F-test, $p = .05$).

σ^T values of 25.5 or more (an indication of deep or upwelled water off the Oregon coast) were found in October 1966, May-September 1967 and June-August 1968 in Alsea Bay. Of bottom water samples taken at station during June-August, seven of nine had σ^T values of 25.5 or more in 1967 while three of ten had these high σ^T values in 1968. (Three other station 1 bottom water samples were taken during June-August 1968; because they were taken at minus tides, they were not included with the ten above.) Although sampling number is small, proportionally there is evidence that recently upwelled water was in Alsea Bay more during June-August 1967 than in June-August 1968.

Newport Weather Bureau wind data taken during June-August 1967 and 1968 suggested a greater onshore component during the second summer, with wind from the south being more intense in June of 1968, with wind from the east being less intense in July of 1968, and with wind from the north being less intense and wind from the south being more intense in August of 1968 (χ^2, $p = .05$).

Rainfall and stream flow (Figures 2 and 3) were higher the second summer.

The warm water estuarine copepod Acartia tonsa was not counted from Alsea Bay samples taken during May 30-September 30, 1967; the species during a similar period in 1968 (up to the end of sampling on September 7) was found on all sampling days but July 29, and August 5 (Figures 30 and 31).

Both the biological and physical-chemical data indicate that the two summers were different.

CONCLUSIONS

In moving through space, one may encounter a galaxy called the Milky Way. Near one end of this galaxy is a minor star called the sun. Around this sun revolve several planets, the third away from the sun being the blue planet. This planet is blue because its surface is covered mostly by a unique liquid called water. Most of the rest of the surface is land or earth. The water is divided by the land into several oceans.

The planet rotates on its axis toward a direction called east, from a direction called west. At each end of the axis is a white ice-cap, the one surrounded by land being toward the north, and the one surrounded by water being toward the south.

The largest ocean is the Pacific, and three-quarters of the way from the south ice-cap to the north ice-cap along its eastern shore is a land presently called Oregon. Along the Oregon coast are several estuaries; here fresh water running off the land meets the salty water of the ocean.

The Alsea estuary is found along the mid-Oregon coast, it drains the coastal watershed immediately southwest of Mary's Peak, highest point in the Coast Range mountains. This estuary is one of the many Oregon estuaries that drain only coastal watersheds; others are the Nehalem, Tillamook, Nestucca, Salmon, Siletz, Yaquina, Siuslaw, Coos, and Coquille. The Rogue, Umpqua, and Columbia drain inland areas as well, but only the Columbia has a well developed snow melt run-off peak in June in addition to the rainy winter run-off peaks characteristic of the coastal watersheds. Netarts Bay and Sand Lake might more properly be termed coastal lagoons rather than estuaries since land area to supply run-off there is negligible.

Two major forces affect the saltiness of the water in Alsea Bay, tides and fresh water run-off. Average daily change in tides is 7.7 feet. A change from a six foot tide level to zero tide level removes 74% of the water from the Bay (the area between the ocean and the entrance of Drift Creek).

Weather affects the amount of fresh water run-off. Offshore highs predominate in the summer; they prevent moisture-laden marine air going inland. Predominant in the winter are series of atmospheric lows; they sweep inland bringing rain to the Alsea watershed and surrounding areas. Fall and spring are transitional weather periods.

Fresh water run-off is heavy during the rainy season (November-March) and becomes light especially during August and September. Stream flow in the Alsea River inland from the bay varies from over 10,000 ft^3/sec in rainy periods to 60 ft^3/sec near the end of dry periods. Flushing time, using Ketchum's (1951) modified prism method, varies from near zero with heavy run-off to ten days with low run-off.

The water in the estuary normally is partially mixed (fresh and salt) from surface to bottom. The water tends to become well mixed during dry periods and stratified during times of heavy run-off. A combination of extremely heavy run-off and low tide may remove almost all salt water from the bay as station 1 bottom water salinity readings indicate on December 7, 1966 (11.5 m depth), and on February 19, 1967 (10.0 m depth).

Only when run-off is reduced and remains low for a long period of time are conditions sufficiently stable to allow for large zooplankton populations to develop. Zooplankton standing crop over the sampling period was greater in the bay nearer the ocean. Standing crop increases later in the year upstream as marine water progresses upstream with reduction in stream flow.

The primary zooplankton inhabitant of the bay (as caught by the Clarke-Bumpus plankton sampler, #6 mesh net) is the arthropod copepod *Acartia clausi*. It was found in numbers up to 37,000 /m^3 of water. In less salty water upstream lives the copepod *Eurytemora* sp. It was found in numbers up to 2000 /m^3 of water (at a minus tide at downstream station 1). The copepod *Pseudocalanus* sp. may move in and out of the bay at the entrance. This animal was found in numbers up to 7400/m^3 of water. Barnacle nauplii were found in the bay in numbers up to 6000 /m^3 of water while barnacle cyprids were found in numbers up to 4000 /m^3 of water. The copepod *Acartia tonsa* does not significantly add to the bay's zooplankton population. It normally is found in warm, somewhat fresher than marine, water. Evidently water in Alsea Bay does not stay warm enough long enough to allow an *Acartia tonsa* population to develop.

Sampling at minus tides during times of moderately low run-off (done in June-August 1968) indicate brackish water *Eurytemora* sp. populations brought to the bay entrance (station 1) and *Acartia clausi* and *Pseudocalanus* sp. populations swept out to sea. Flushing at minus tides may permit only the establishment of populations of *Eurytemora* sp., barnacle nauplii, and *Acartia clausi* in the bay.

Near ocean observations in Alsea Bay can indicate coastal oceanographic conditions, since each incoming tide brings with it coastal ocean water.

Weather affects water conditions along the coast. Offshore highs have associated with them north winds blowing to the south along the coast. With help of the earth's rotation, the surface waters are blown offshore and are replaced by cooler, more saline, and denser waters from below. Evidence for this recently upwelled water being in Alsea Bay was found in October 1966, May-September 1967, and June-August 1968.

Storms (lows) approaching Oregon from the sea many times have strong southwest winds which pile up oceanic surface water along the coast. When a series of storms is of sufficient duration a northward coastal surface current is set up. The presence of the copepods *Clausocalanus* spp. and *Ctenocalanus vanus* in Alsea Bay zooplankton samples primarily during December-February is thought to be evidence of temperate--subtropical oceanic surface water. The presence of the copepod *Acartia danae* would substantiate this also, but it was found in fewer samples than and was not significantly correlated with the above two groups.

Marine Cladocera were found seasonally in Alsea Bay zooplankton samples (*Podon leuckarti* appeared as early as April up into November); they did not contribute greatly to the zooplankton population.

The copepods *Paracalanus parvus* and *Corycaeus* sp. and the chordate group Larvacea and larval Ascidacea seem to be of marine origin; they occurred in a low proportion of samples during June-August and a relatively high proportion during September-November. These three animal groups might be more prevalent in coastal ocean samples during the summer if upwelling did not occur.

The summers of 1967 and 1968 were different according to observations in Alsea Bay. There was more evidence of upwelled water in the bay in 1967, and the copepod *Acartia tonsa* was not found in June-August 1967 samples but was found in most June-August 1968 samples. Evidently long-range sampling is necessary to adequately describe estuaries such as Alsea Bay hydrographically and biologically.

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APPENDICES

APPENDIX I

ALSEA BAY BIOLOGICAL AND PHYSICAL-CHEMICAL DATA, 1966-1968

Some of the Bases for the Physical-Chemical Data

Alsea River stream flows are from U.S. Geological Survey (1967, 1968, 1969).

Tide heights are calculated for time of sampling from U.S. Coast and Geodetic Survey (1965, 1966, 1967); tide times are corrected for Waldport. Since I thought that tidal effects occurred later upstream, I made an additional 40 minute correction to station 4 sampling times in computing tide heights there.

Oxygen saturation values were calculated using tables (Gilbert, Pawley and Park, 1968).

Sigma-t values were calculated using U.S. Navy, Hydrographic Office (1952) tables.

Explanation of Terms Used in the Biological Data

x factor - factor that multiplies numbers counted to convert into numbers/m^3 of water. The factor is obtained by dividing the dilution factor (number of cc of sample from which was drawn number of cc to be counted) by water volume sampled.

f.- female

m.- male

c.- copepodite, always includes stages IV and IV and may include stages I, II, and III.

III - stage III copepodite, when specified in the count*

II - stage II copepodite, when specified in the count*

I - stage I copepodite, when specified in the count*

h.- adult copepod of undetermined sex

"Total zooplankton/m^3, computer" and "Total zooplankton/m^3" - First total is sometimes higher because organisms removed from the sample before counting were included in the columns and in this total. Second total is the product of "x factor" times total organisms counted (hand tally)

"Total zooplankton count, computer" and "Total zooplankton count" - First count is computer tallied, second count is hand tallied.

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*There were counts when stages I, II, and III were not specified but were only included in the "copepodite" category.

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 1 IN ALSEA BAY, OREGON
SEPTEMBER 1966 TO SEPTEMBER 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV
Surface salinity (°/oo)	32.84	32.44	32.41	33.06	33.17	30.63	32.80	31.70	30.72	17.46	30.02
Bottom salinity (°/oo)	32.85	32.45	32.44		33.10	31.21	32.88	32.21	30.80	19.75	30.15
Surface temperature (°C)	14.1	15.0	14.4	10.5	10.1	11.8	10.9	9.6	10.6	9.9	11.4
Bottom temperature (°C)	13.9	14.9	14.3	10.2	9.8	11.6	10.8	9.5	10.4	9.7	11.2
Surface sigma-t	24.5	24.0	24.1	25.4	25.5	23.3	25.1	24.5	23.5	13.4	22.9
Bottom sigma-t	24.6	24.1	24.2		25.5	23.7	25.2	24.9	23.6	15.2	23.0
Surface dissolved oxygen (ml/L)											
Bottom dissolved oxygen (ml/L)											
Surface oxygen saturation (%)											
Bottom oxygen saturation (%)											
Tide level (ft)	3.2	5.2	5.6	6.1	5.2	3.4	7.7	3.8	7.8	2.1	8.3
Time of zooplankton tow (PST)	1513	1245	1125	1248	1237	1511	1336	1320	1334	1451	1331
Alsea River stream flow (ft³/sec)	54	108	67	67	67	143	108	112	2840	1050	654

Date	7DEC	14DEC	15JAN67	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR	6MAY
Surface salinity (°/oo)	1.35	4.05	28.41	6.73	30.51	4.00	30.73	1.73	29.87	18.04	28.53	30.21	30.94	30.90	30.72	31.24	30.71	32.59
Bottom salinity (°/oo)	1.71	6.78	28.62		30.85	5.45	30.86	1.88	30.01	12.88	25.93	30.22	30.93	31.00	30.72	31.24	30.71	32.54
Surface temperature (°C)	5.4	9.7	10.3	7.5	10.2	9.8	10.1	8.6	9.6	9.4	9.9	10.0	10.6	10.4	10.7	10.4	11.3	10.5
Bottom temperature (°C)	8.3	9.9	10.1		9.8	9.5	9.7	8.2	9.2	9.2	9.4	9.7	10.2	10.4	10.5	10.1	11.0	
Surface sigma-t	1.0	3.0	21.8	5.2	23.4	2.9	23.6	1.2	23.0	7.7	21.9	23.2	23.7	23.7	23.5	24.0	23.4	25.0
Bottom sigma-t	1.2	5.1	22.0		23.8	4.1	23.8	1.4	23.2	9.9	22.3	23.3	23.8	23.8	23.6	24.0	23.5	
Surface dissolved oxygen (ml/L)																		
Bottom dissolved oxygen (ml/L)																		
Surface oxygen saturation (%)																		
Bottom oxygen saturation (%)																		
Tide level (ft)	1.6	5.3	4.5	4.9	5.9	.2	6.8	1.3	8.7	.1	4.9	7.3	3.2	5.1	5.2	5.5	5.4	5.1
Time of zooplankton tow (PST)	1627	1610	1200	1202	1526	1419	1055	1721	1118	1504	1619	1344	1634	1345	1709	1133	1700	1231
Alsea River stream flow (ft³/sec)	6270	8180	2770	4820	7060	3120	1360	3220	1740	1210	4930	2170	2040	1270	1740	1400	1010	725

Date	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
Surface salinity (°/oo)	31.69	33.31	32.41	32.77	33.12		33.73	33.72	33.81	33.58	33.47	33.66	33.45
Bottom salinity (°/oo)	32.10	33.31	32.39	32.76	33.30		33.72	33.72	33.81	33.58	33.47	33.69	33.42
Surface temperature (°C)	11.4	9.8	12.1	12.6	10.4		9.6	9.6	9.8	10.8	10.2	9.5	12.5
Bottom temperature (°C)	11.1	9.7	11.9	12.3	10.3		9.7	9.7	8.7	10.8	10.2	9.4	11.9
Surface sigma-t	24.1	25.7	24.6	24.8	25.4		26.0	26.0	26.2	25.7	25.7	26.0	25.7
Bottom sigma-t	24.5	25.7	24.6	24.8	25.6		26.0	26.0	26.3	25.7	25.7	26.1	25.4
Surface dissolved oxygen (ml/L)			6.50	7.63	6.68		6.46	6.04	6.59	6.80	5.99	5.69	6.75
Bottom dissolved oxygen (ml/L)			6.50	7.65	6.73		6.43	5.84	6.45	6.88	5.92	5.66	6.75
Surface oxygen saturation (%)			105.9	125.9	105.5		108.5	94.1	101.1	108.5	94.1	88.2	112.1
Bottom oxygen saturation (%)			105.5	125.4	106.2		108.3	91.1	98.3	109.7	93.1	87.6	110.1
Tide level (ft)	5.6	6.8	3.5	5.6	5.9		4.5	6.3	6.0	4.3	5.7	5.3	7.1
Time of zooplankton tow (PST)	1515	1117	1602	1555	1230		1206	1537	1513	1424	1159	1419	1327
Alsea River stream flow (ft³/sec)	690	419	425	276	205	198	196	138	112	105	85	62	59

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV
X factor	7.51	4.26	6.44	10.87	5.80	12.01	15.46	3.19	8.54	.87	2.31
Protista											
Foraminifera	0	29.8	6.4	0	11.6	0	77.3	3.2	0	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0
Tintinnidium sp.	0	0	0	0	0	0	0	0	0	0	0
Coelenterata											
Medusa	0	8.5	19.3	54.6	0	0	15.5	0	0	.9	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	.3	0	0	0	0	0	0	0
Nematoda	0	8.5	0	0	5.8	0	0	0	8.5	0	0
Annelida											
Adult	0	0	0	0	0	0	0	0	0	0	0
Larva	22.5	55.4	12.9	293.5	23.2	48.0	371.0	22.3	341.6	5.2	0
Arthropoda											
Crustacea											
Podon leuckarti	240.3	4.3	25.8	0	98.6	588.5	46.4	57.4	8.5	0	0
Podon polyphemoides	157.7	17.0	64.4	32.6	58.0	204.2	15.5	6.4	0	0	0
Evadne sp.	0	4.3	25.3	21.7	63.8	84.1	30.9	19.1	384.3	0	2.3
Fresh water Cladocera	0	0	0	0	0	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	1577.1	349.3	1610.0	478.3	255.2	72.1	61.8	159.5	222.0	.9	16.2
Barnacle cypris	721.0	68.2	528.1	500.0	371.2	1044.9	1128.6	102.1	1801.9	213.1	43.9
Mysidacea	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	15.5	0	0	0	0
Amphipoda	0	4.3	6.4	10.9	0	0	0	6.4	17.1	0	0
Euphausiacea	0	8.5	0	0	0	0	0	0	17.1	0	0
Shrimp adult	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	0	0	0	0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	7.5	0	6.4	21.7	0	0	0	3.2	0	0	6.9
Crab megalops	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0
Hermit crab larva	0	0	6.4	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	0	0	0	0	0	8.5	.9	0
Mollusca											
Gastropoda	75.1	25.6	6.4	87.0	29.0	72.1	46.4	0	102.5	.9	9.2
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	871.2	51.1	219.0	1391.4	551.0	480.4	1468.7	82.9	546.6	36.5	67.0
Ectoprocta, Cyphonautes larva	0	0	0	32.6	11.6	0	46.4	0	0	0	0
Chaetognatha	0	0	0	0	0	0	0	0	0	0	2.3
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0
Echinodermata											
Larva	22.5	38.3	212.5	0	5.8	0	0	0	0	0	0
Adult Asteroidea	0	0	0	0	0	0	30.9	3.2	0	0	2.3
Chordata, Larvacea and larval Ascidacea	368.0	93.7	676.2	21.7	29.0	12.0	216.4	22.3	51.2	0	4.6
Thaliacea	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	0	0	0	0	0
Fish larva	0	0	0	0	0	12.0	0	0	0	0	0
Unidentified											
Egg	0	21.3	12.9	65.2	23.2	0	77.3	9.6	8.5	0	0
"C"	0	0	0	0	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	3.2	0	1.7	0
"B"	0	8.5	0	0	0	0	0	0	0	0	0
Miscellaneous	0	4.3	6.4	0	0	12.0	30.9	28.7	76.9	.9	9.2
Nauplius	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	5760.2	1657.1	4411.4	4913.8	2685.4	5632.7	5380.1	1390.8	5746.0	284.5	1372.1
Total zooplankton count, computer	767.0	389.0	685.0	452.0	463.0	469.0	348.0	436.0	626.0	442.0	594.0
Total zooplankton count	767.0	389.0	685.0	452.0	463.0	469.0	348.0	436.0	626.0	442.0	594.0
Total zooplankton/m³	5760.2	1657.1	4411.4	4913.2	2685.4	5632.7	5380.1	1390.8	5746.0	284.5	1372.1

Date	7DEC	14DEC	15JAN67	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR	6MAY
X factor	.94	1.76	2.95	.79	20.89	2.72	4.67	3.95	5.59	.14	2.22	8.27	1.50	5.55	.99	1.83	26.44	1.39
Protista																		
Foraminifera	0	3.5	3.0	0	0	0	4.7	4.0	5.6	.1	0	0	6.0	0	4.0	0	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8
Tintinnidium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata																		
Medusa	0	0	3.0	0	0	0	0	0	5.6	1.1	6.7	0	4.5	.1	5.9	9.1	26.4	0
Siphonophora	0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	5.9	0	0	0	0	0	0	0	0	0
Nematoda	12.2	0	3.0	0	20.9	8.2	0	0	0	.3	0	0	0	0	0	0	0	1.4
Annelida																		
Adult	0	0	3.0	0	0	0	0	0	0	.1	0	0	3.0	0	0	0	0	0
Larva	0	0	3.0	0	0	0	18.7	0	11.2	.1	20.0	16.5	0	16.7	1.0	5.5	26.4	0
Arthropoda																		
Crustacea																		
Podon leuckarti	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresh water Cladocera	0	0	0	0	0	0	0	0	0	0	28.9	0	0	0	1.0	0	0	0
Ostracoda	0	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	0	0	5.9	0	0	0	0	4.0	5.6	1.0	84.4	0	0	199.8	6.9	12.5	105.8	0
Barnacle cypris	0	0	0	0	0	0	0	0	0	.1	77.7	2191.5	18.0	0	0	0	26.4	0
Mysidacea	3.8	1.8	0	0	0	2.7	0	0	0	0	4.4	0	0	5.6	0	3.7	0	0
Cumacea	.9	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	0	1.4
Isopoda	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	1.8	0	1.4
Amphipoda	3.8	1.8	0	0	0	0	4.7	0	0	1.0	0	0	12.0	5.6	5.0	12.8	0	12.5
Euphausiacea	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0	0
Shrimp adult	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	.5	0	0	4.7	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	0	0	0	0	5.6	1.4	0	0	0	0	0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	5.7	0	0	0	0	0	0	0	0
Crab zoea	0	0	0	0	0	0	0	0	72.7	.3	0	0	0	16.7	1.0	18.3	0	59.9
Crab megalops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	5.6	0	0	0	0	0	0	0	0	0
Hermit crab larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	2.8	0	0	.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	1.8	0	.5	0	0	0	0	0	0	0	0	1.5	0	0	0	0	1.4
Mollusca																		
Gastropoda	0	1.8	3.0	.8	0	0	9.3	0	5.6	.1	4.4	8.3	3.0	22.2	3.0	1.8	0	2.8
Gastropod egg case	0	0	0	0	0	0	0	0	0	.3	0	0	1.5	0	0	0	0	1.4
Pelecypoda	0	5.3	277.3	3.1	104.4	0	359.6	0	83.8	14.3	46.6	140.6	34.5	316.4	32.7	49.4	0	34.8
Ectoprocta, Cyphonautes larva	0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetognatha	0	0	26.5	0	0	0	0	0	0	0	0	0	4.5	0	1.0	0	26.4	0
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata																		
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.7	0	0
Adult Asteroidea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	26.5	0	0	0	126.1	0	0	0	0	8.3	3.0	16.7	72.3	135.4	2617.6	25.0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	0	3.0	0	0	0	18.7	0	5.6	0	2.2	0	0	0	1.0	5.5	0	0
Fish larva	0	0	0	0	0	0	0	0	0	.4	0	0	0	0	0	0	0	0
Unidentified																		
Egg	0	3.5	123.9	39.8	41.8	49.0	84.1	15.8	28.0	7.8	68.8	33.1	37.5	27.8	5.9	11.0	317.3	4.2
"C"	0	0	0	0	0	0	0	0	0	0	4.4	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	.9	0	11.8	0	0	0	0	15.8	.1	1.0	2.5	0	4.5	0	6.9	12.8	26.4	4.2
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	42.3	73.9	1433.7	106.1	1086.3	62.6	2381.7	55.3	2124.6	76.7	1065.9	3622.3	615.0	3579.9	476.2	926.0	12585.4	557.4
Total zooplankton count, computer	45.0	42.0	486.0	136.0	52.0	23.0	510.0	14.0	380.0	548.0	480.0	438.0	410.0	645.0	481.0	506.0	476.0	401.0
Total zooplankton count	45.0	42.0	486.0	136.0	52.0	23.0	510.0	14.0	380.0	548.0	480.0	438.0	410.0	645.0	481.0	506.0	476.0	401.0
Total zooplankton/m³	42.3	73.9	1433.7	106.1	1086.3	62.6	2381.7	55.3	2124.2	76.7	1065.5	3622.3	615.0	3579.8	476.2	926.0	12585.4	557.4

Date	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	3.95	20.10	8.13	8.44	.47	0	1.21	8.74	9.15	71.33	21.22	26.12	9.43
Protista													
Foraminifera	0	0	0	0	0		0	0	0	0	0	0	0
Radiolaria	0	0	0	0	0		0	0	0	0	0	0	0
Tintinnidium sp.	0	0	0	0	0		0	0	0	0	0	0	0
Coelenterata													
Medusa	0	181.1	0	177.2	1.6		2.4	35.4	36.6	142.7	42.4	53.0	.8
Siphonophora	0	0	0	0	0		0	0	0	0	0	0	0
Ctenophora	0	0	2.2	0	0		0	0	0	0	0	0	0
Nematoda	0	0	0	0	0		0	0	0	0	0	0	0
Annelida													
Adult	0	0	0	0	0		0	0	0	0	0	0	0
Larva	0	221.1	24.4	67.5	2.8		0	8.7	173.9	356.7	21.2	0	0
Arthropoda													
Crustacea													
Podon leuckarti	0	0	0	0	0		0	0	0	0	191.0	0	0
Podon polyphemoides	0	0	0	0	0		0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0		0	0	9.1	1711.9	636.6	0	0
Fresh water Cladocera	0	0	0	0	0		0	0	0	0	0	0	0
Ostracoda	0	0	8.1	0	0		0	0	0	0	0	0	0
Barnacle nauplius	27.6	3819.0	32.5	1147.8	3.3		3.6	43.7	228.8	2781.9	599.3	0	198.0
Barnacle cypris	0	0	8.1	84.4	5.6		1.2	0	18.3	71.3	382.0	0	0
Mysidacea	0	0	0	0	0		0	0	9.3	0	0	0	0
Cumacea	0	0	0	0	0		1.2	0	0	0	0	0	0
Tanaidacea	0	0	0	0	0		0	0	9.1	0	0	0	0
Isopoda	0	0	0	0	.5		0	8.7	0	71.3	0	0	0
Amphipoda	0	0	0	42.2	.9		3.6	0	0	0	0	0	0
Euphausiacea	0	140.7	195.1	135.0	2.8		0	0	27.5	356.7	148.5	0	0
Shrimp adult	0	0	0	0	0		0	0	0	0	0	0	0
Unidentified decapod larva	0	0	8.1	0	0		1.2	0	27.5	0	0	0	0
Callianassa larva	0	20.1	8.1	8.4	.5		0	17.5	0	0	21.2	0	9.4
Upogebia larva	0	0	0	0	0		0	0	0	0	0	0	0
Crab zoea	0	140.7	0	0	16.9		30.3	8.7	146.4	0	21.2	0	9.4
Crab megalops	0	0	0	0	0		0	0	0	0	0	0	0
Porcelain crab zoea	0	20.1	0	0	0		0	0	18.3	0	21.2	0	0
Hermit crab larva	0	0	0	0	0		0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0		0	0	0	0	0	0	0
Larva	0	0	0	0	0		0	0	0	0	0	0	0
Arachnida, Mite	0	20.1	0	0	0		1.2	0	0	0	0	0	0
Mollusca													
Gastropoda	4.0	120.6	8.1	42.2	1.9		0	17.5	9.1	0	233.4	0	9.4
Gastropod egg case	0	0	0	0	0		2.4	0	0	0	0	0	0
Pelecypoda	35.5	201.0	56.9	135.0	19.3		8.5	218.5	1006.5	713.3	2249.3	0	0
Ectoprocta, Cyphonautes larva	0	20.1	0	0	0		0	0	0	0	0	0	0
Chaetognatha	4.0	0	0	8.4	0		0	.2	0	0	0	0	0
Phoronidea, Actinotroch (larva)	0	0	0	8.4	0		0	0	0	0	0	0	0
Echinodermata													
Larva	0	60.3	8.1	388.2	.5		0	0	0	71.3	0	0	0
Adult Asteroidea	0	0	0	0	0		0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	134.3	20.1	8.1	320.7	0		0	0	0	0	0	0	0
Thaliacea	0	0	0	0	0		1.2	0	0	0	0	0	0
Fish egg	0	0	0	0	1.4		1.2	0	0	0	0	0	0
Fish larva	0	0	0	0	0		0	0	0	0	0	0	0
Unidentified													
Egg	252.8	562.9	1284.5	8.4	8.0		18.1	17.5	118.9	2353.9	63.7	0	0
"C"	0	0	0	0	0		0	0	0	0	0	0	0
"A"	0	0	0	0	0		0	0	0	0	0	0	0
"B"	0	0	0	0	0		0	0	0	0	0	0	0
Miscellaneous	23.7	40.2	0	16.9	.5		6.1	0	64.0	71.3	63.7	26.1	0
Nauplius	0	0	0	0	0		0	0	0	0	0	0	0
Total zooplankton/m³, computer	3310.1	8723.6	4343.6	4532.3	205.1		546.9	5804.0	8848.2	28603.3	17899.5	13609.3	5413.6
Total zooplankton count, computer	838.0	434.0	534.0	537.0	436.0		452.0	664.0	967.0	401.0	843.0	521.0	574.0
Total zooplankton count	838.0	434.0	534.0	537.0	436.0		452.0	664.0	967.0	401.0	843.0	521.0	574.0
Total zooplankton/m³	3310.1	8723.4	4341.4	4532.3	204.9		546.9	5803.4	8848.0	28603.3	17888.5	13608.5	5412.8

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC
X factor	7.51	4.26	6.44	10.87	5.80	12.01	15.46	3.19	8.54	.87	2.31	.94
Arthropoda, Crustacea, Copepoda												
Acartia clausi f.	450.6	157.6	128.8	260.9	98.6	1116.9	77.3	127.6	316.0	8.7	2.3	0
" " m.	465.6	80.9	296.2	347.8	185.6	1032.9	15.5	86.1	76.9	4.3	0	0
" " c.	593.3	89.5	77.3	139.4	208.8	588.5	30.9	105.3	93.9	4.3	2.3	0
" " III	0	0	0	0	0	0	0	12.8	0	0	0	0
" " II	0	8.5	0	0	23.2	0	0	12.5	0	0	0	0
" " I	15.0	0	0	0	23.2	0	0	0	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	0	38.3	12.9	0	0	12.0	0	28.7	25.6	2.6	18.5	0
" " m.	0	25.6	12.9	0	0	0	0	3.2	51.2	2.6	20.6	0
" " c.	0	59.6	83.7	10.9	5.8	48.0	30.9	54.2	68.3	3.5	25.4	0
" " III	0	0	25.8	0	11.6	36.0	46.4	12.8	0	0	9.2	0
" " II	0	0	0	0	0	12.0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	3.2	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	8.5	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	18.5	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	6.4	0	0	0	0	0	0	0	0	0
" " III	0	0	19.3	0	52.2	0	15.5	0	51.2	0	0	0
" " II	0	21.3	0	0	5.8	0	77.3	0	102.5	0	6.9	0
" " I	0	0	32.2	0	0	0	61.8	3.2	51.2	0	2.3	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	2.3	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	21.7	0	0	0	0	42.7	1.7	9.2	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	20.8	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	4.3	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	6.4	0	0	0	0	0	0	0	0	0
" " c.	30.0	34.1	38.6	21.7	11.6	24.0	0	0	8.5	0	4.6	0
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	57.8	.9
" " m.	0	0	0	0	0	0	0	0	0	0	2.3	0
" " c.	0	0	0	0	0	0	0	0	0	0	55.4	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	6.4	0	0	150.1	.9
" " m.	0	0	0	0	0	0	0	0	0	0	9.2	0
" " c.	0	0	0	0	0	0	0	6.4	0	0	80.9	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	8.5	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	.9	0	0
Eurytemora sp. f.	0	0	0	0	0	0	0	0	8.5	0	0	0
" " m.	0	0	0	0	0	0	0	0	8.5	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Metridia sp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus parvus f.	15.0	166.1	32.2	130.4	87.0	48.0	123.7	9.6	111.0	17.4	203.3	0
" " m.	0	12.8	6.4	10.9	29.0	12.0	0	12.8	8.5	4.3	30.0	0
" " c.	22.5	29.8	25.8	97.8	29.0	48.0	154.6	44.7	76.9	10.4	175.6	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	0	0	0	54.4	17.4	0	0	6.4	0	0	0	0
" " m.	0	0	0	0	5.8	0	0	0	0	.9	0	0
" " c.	22.5	51.1	0	337.0	52.2	12.0	0	44.7	34.2	6.1	30.0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0
" c.	7.5	0	0	0	0	0	0	0	0	0	0	0
" III	0	0	0	0	23.2	0	15.5	3.2	8.5	0	0	0
" II	0	4.3	0	0	11.6	0	46.4	3.2	0	0	0	0
" I	0	0	6.4	0	0	0	30.9	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	0	0	0	0	0	0	0	0	0	0	2.3	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	0	0	9.2	0
Copepod nauplius	45.1	17.0	45.1	21.7	58.0	0	247.4	38.3	162.3	0	41.6	0
Corycaeus sp. f.	0	0	0	0	0	0	0	3.2	17.1	6.1	11.5	0
" " m.	0	0	0	0	0	0	15.5	3.2	8.5	8.7	30.0	0
" " c.	0	0	0	21.7	0	0	30.9	0	8.5	19.1	115.5	0
Oncaea sp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	15.0	21.3	83.7	369.6	150.8	0	231.9	127.6	281.8	19.1	50.8	0
Oithona sp. m.	0	0	0	10.9	5.8	0	0	0	0	0	0	0
Oithona similis c.	7.5	17.0	25.8	43.5	23.2	0	402.0	76.6	42.7	0	0	0
Oithona spinirostris f.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	11.6	0	0	0	8.5	0	0	0
Unidentified cyclopoid copepod	0	4.3	0	0	0	0	0	0	0	0	0	2.8
Harpacticoid copepod	7.5	12.8	0	10.9	17.4	12.0	46.4	25.5	59.8	2.6	9.2	12.2

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

Date	14DEC	15JAN67	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR
X factor	1.76	2.95	.78	20.89	2.72	4.67	3.95	5.59	.14	2.22	8.27	1.50	5.55
Arthropoda, Crustacea, Copepoda													
Acartia clausi f.	0	0	0	0	0	0	4.0	5.6	2.7	0	41.3	0	11.1
" " m.	0	3.0	0	41.8	0	0	0	0	1.4	2.2	49.6	0	44.4
" " c.	0	0	0	20.9	0	0	0	0	2.0	0	16.5	3.0	55.5
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	5.6	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	8.3	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	0	5.9	.8	0	0	23.3	0	78.3	.4	2.2	24.8	0	316.4
" " m.	0	0	0	0	0	4.7	0	95.0	.1	0	8.3	6.0	704.9
" " c.	0	5.9	0	0	0	9.3	0	83.8	0	0	33.1	10.5	444.0
" " III	0	0	0	0	0	4.7	0	5.6	0	0	41.3	1.5	22.2
" " II	0	0	0	0	0	4.7	0	0	0	0	8.3	0	0
" " I	0	0	0	0	0	0	0	0	0	0	8.3	0	0
" " n.	0	0	0	0	0	0	0	0	0	0	0	0	11.1
Acartia tonsa f.	1.8	3.0	0	0	0	4.7	0	5.6	0	0	0	0	22.2
" " m.	1.8	0	0	0	0	0	0	5.6	0	0	0	1.5	11.1
" " c.	0	0	0	0	0	4.7	0	11.2	0	0	0	1.5	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	1.5	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	5.6
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	9.3	0	67.1	.1	0	0	0	0
" " m.	0	0	0	0	0	0	0	11.2	.1	0	0	12.0	0
" " c.	0	8.9	0	0	0	32.7	0	229.2	.6	15.5	49.6	24.0	149.9
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	.1	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	5.6
" " c.	0	3.0	0	0	0	4.7	0	50.3	.4	0	8.3	1.5	38.9
Clausocalanus spp. f.	3.5	67.8	5.5	41.8	0	163.4	0	150.9	.4	8.9	115.8	22.5	5.6
" " m.	1.8	5.9	.4	0	0	4.7	0	0	.1	2.2	8.3	0	0
" " c.	3.5	76.7	8.6	20.9	2.7	79.4	0	33.5	.4	0	57.9	16.5	0
" " III	0	0	0	0	0	0	0	0	0	0	8.3	1.5	0
Ctenocalanus vanus f.	7.0	73.8	10.1	0	0	42.0	0	22.4	.4	0	16.5	0	0
" " m.	0	3.0	0	0	0	0	0	0	0	0	0	0	0
" " c.	3.5	88.5	17.9	0	0	9.3	0	83.8	.3	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	5.6	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	3.0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	41.3	6.0	0
Eurytemora sp. f.	0	0	0	0	0	0	0	0	1.0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	.6	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	2.1	0	0	0	0
Metridia sp. f.	0	0	0	0	0	0	0	5.6	0	0	0	0	0
" " c.	0	0	.8	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	4.7	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	5.6	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus parvus f.	8.8	218.3	3.4	146.2	0	382.9	0	178.9	12.5	46.6	99.2	55.5	99.9
" " m.	0	47.2	0	0	0	42.0	0	22.4	.8	4.4	0	10.5	5.6
" " c.	7.0	152.3	3.1	271.6	0	373.6	0	22.4	1.5	4.4	33.1	19.5	5.6
" " III	0	0	0	0	0	4.7	0	0	0	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	0	5.9	0	0	0	9.3	0	123.0	2.7	0	16.5	9.0	131.2
" " m.	0	3.0	0	0	0	4.7	0	16.8	.1	0	0	6.0	133.2
" " c.	0	35.4	1.5	0	0	88.7	0	285.1	.6	4.4	49.6	21.0	455.1
" " III	0	0	0	0	0	0	0	0	0	0	0	0	77.7
" " II	0	0	0	0	0	0	0	0	.1	0	8.3	0	11.1
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	5.6	0	0	0	0	0
" c.	0	0	1.6	20.9	0	51.4	0	0	0	0	0	0	22.2
" III	0	0	0	0	0	9.3	0	0	0	2.2	0	0	11.1
" II	0	0	0	0	0	0	0	0	0	2.2	0	0	0
" I	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	0	17.7	0	0	0	0	0	0	0	0	8.3	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	0	0	0	1.5	0
Copepod nauplius	0	14.8	.4	62.7	0	219.5	4.0	229.2	.4	106.6	306.0	184.5	38.9
Corycaeus sp. f.	0	23.6	.4	0	0	0	0	0	1.1	2.2	8.3	0	0
" " m.	0	20.6	0	0	0	0	0	5.6	.1	4.4	16.5	0	0
" " c.	1.8	29.5	1.6	20.9	0	9.3	4.0	0	1.7	2.2	0	0	0
Oncaea sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	0	3.0	1.6	167.1	0	144.8	0	33.5	5.3	452.9	124.1	51.0	105.4
Oithona sp. m.	0	0	0	0	0	0	0	0	0	44.4	0	3.0	5.6
Oithona similis c.	0	0	0	83.6	0	0	0	0	0	4.4	8.3	0	0
Oithona spinirostris f.	0	0	0	0	0	0	0	0	0	0	0	1.5	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	0	0	0	0	0	0	.3	0	0	0	0
Harpacticoid copepod	10.6	0	.8	20.9	0	4.7	4.0	0	.7	2.2	0	4.5	0

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

Date	15APR	22APR	29APR	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	.99	1.83	26.44	1.39	3.95	20.10	8.13	8.44	.47	0	1.21	8.74	9.15	71.33	21.22	26.12	9.43
Arthropoda, Crustacea, Copepoda																	
Acartia clausi f.	4.0	64.0	238.8	26.4	15.8	542.7	56.9	42.2	15.5		84.7	1713.0	2131.9	4208.5	3480.1	9507.7	2432.9
" " m.	3.0	22.0	158.6	34.9	7.9	582.9	16.3	76.0	10.3		118.6	751.6	1477.4	3352.5	2546.4	1802.3	1442.8
" " c.	1.0	11.0	238.0	27.9	19.8	482.4	0	25.3	12.2		29.0	314.6	237.9	1711.9	3416.4	1776.2	132.0
" " III	0	0	0	1.4	4.0	120.6	0	0	0		0	0	27.5	0	382.0	0	0
" " II	0	1.8	0	0	0	140.7	0	0	0		0	0	0	0	84.9	0	0
" " I	0	0	79.3	0	0	60.3	0	0	0		0	0	0	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	9.4
Acartia danae f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Acartia longiremis f.	7.9	22.0	185.1	13.9	15.8	20.1	40.7	8.4	0		1.2	26.2	128.1	642.0	360.7	104.5	329.6
" " m.	8.9	49.4	158.6	8.3	15.8	0	32.5	8.4	.9		1.2	8.7	82.3	642.0	191.0	52.2	163.3
" " c.	9.9	5.5	370.2	16.7	15.8	0	32.5	16.9	1.9		0	17.5	36.6	856.0	169.8	0	169.7
" " III	2.0	0	52.9	0	0	0	24.4	0	0		0	0	9.1	0	21.2	0	198.0
" " II	0	1.8	211.5	0	4.0	0	0	0	0		0	0	0	0	0	0	113.2
" " I	0	0	185.1	0	0	0	0	0	0		0	0	0	0	0	0	18.9
" " n.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Acartia tonsa f.	3.0	3.7	79.3	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	1.0	0	26.4	4.2	0	20.1	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	.0	0	0		0	0	0	0	0	0	0
" " I	0	1.8	26.4	0	0	0	0	0	0		0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " III	0	14.6	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " I	0	5.5	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	3.0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	5.9	3.7	79.3	0	0	0	32.5	236.3	3.3		0	0	164.7	142.7	0	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	8.4	0		0	26.2	0	71.3	0	26.1	0
" " m.	0	0	0	0	0	0	0	8.4	.5		0	26.2	9.1	356.7	42.4	26.1	0
" " c.	0	11.0	132.2	0	43.5	0	8.1	42.2	6.6		36.3	192.3	91.5	1854.6	1336.9	52.2	28.3
Clausocalanus spp. f.	27.7	0	0	0	0	0	0	0	1.4		0	0	0	0	0	0	0
" " m.	2.0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	11.9	0	0	0	7.9	0	0	0	1.9		0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Ctenocalanus vanus f.	1.0	0	0	0	0	0	0	8.4	.5		0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	2.8	0	0	0	0	2.4		0	8.7	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	.5		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Eurytemora sp. f.	0	0	0	0	0	0	0	0	0		0	8.7	0	71.3	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	8.7	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	.5		0	78.7	0	0	21.2	0	9.4
Metridia sp. f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	5.7	0	0	0	0	0
Tortanus discaudatus f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Paracalanus parvus f.	38.6	36.6	158.6	27.8	7.9	0	8.1	0	0		0	0	0	0	0	0	0
" " m.	6.9	1.8	52.9	2.8	0	0	0	0	0		0	0	0	0	0	0	0
" " c.	20.8	3.7	52.9	11.1	7.9	0	0	0	0		0	0	0	71.3	0	0	0
" " III	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " n.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Pseudocalanus sp. f.	5.0	7.3	264.4	8.3	94.8	50.3	764.2	33.8	.5		4.9	297.2	777.8	356.7	42.4	52.2	0
" " m.	7.9	1.8	211.5	11.1	11.9	0	146.3	16.9	4.2		3.6	174.8	109.8	0	21.2	26.1	9.4
" " c.	31.7	11.0	2194.5	48.7	1599.8	160.8	520.3	295.4	36.7		67.8	1284.8	860.1	2924.5	233.4	52.2	18.9
" " III	0	0	1401.3	0	553.0	0	8.1	33.8	3.3		39.9	314.6	347.7	0	0	0	0
" " II	1.0	0	634.6	0	169.9	0	0	16.9	.5		4.8	17.5	164.7	0	0	0	0
" " I	0	0	79.3	0	39.5	0	0	0	0		0	0	9.1	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" c.	0	0	0	1.4	4.0	0	0	0	0		0	0	0	356.7	0	0	0
" III	8.9	3.7	0	0	4.0	0	0	8.4	0		6.1	0	0	0	0	0	0
" II	0	1.8	0	0	0	0	0	0	0		0	0	9.1	0	0	0	0
" I	1.0	1.8	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Unidentified calanoid c.	0	0	0	0	7.9	0	0	0	.5		0	0	9.1	0	21.2	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	8.4	0		0	0	0	0	0	0	0
Copepod nauplius	1.0	98.8	1824.4	4.2	106.7	442.2	1000.0	970.6	6.1		4.8	35.0	183.0	2211.2	785.1	0	28.3
Corycaeus sp. f.	1.0	0	0	7.0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	1.0	0	0	19.5	0	0	0	0	0		0	8.7	0	0	0	0	0
" " c.	1.0	0	0	12.5	0	0	0	0	0		0	0	0	0	0	0	0
Oncaea sp. f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Oithona similis f.	96.0	232.4	317.3	98.7	63.2	341.7	0	67.5	28.2		54.4	96.1	109.8	71.3	84.9	26.1	94.3
Oithona sp. m.	2.0	5.5	0	7.0	0	20.1	0	0	0		1.2	0	0	0	21.2	0	0
Oithona similis c.	0	18.3	0	0	0	20.1	0	0	0		0	0	0	0	0	0	0
Oithona spinirostris f.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	26.1	0
" " c.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	0	0	0	0	0	0	.5		4.8	0	0	0	0	0	0
Harpacticoid copepod	9.9	0	0	8.3	7.9	120.6	0	8.4	0		1.2	8.7	18.3	0	21.2	0	0

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 1 IN ALSEA BAY, OREGON
SEPTEMBER 1967 TO SEPTEMBER 1968

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 1 IN ALSEA BAY, OREGON
PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 1 IN ALSEA BAY, OREGON

Date	13SEP67	22SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	29NOV	16DEC	28DEC	14JAN68	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
Surface salinity (°/oo)	32.44	32.39	32.97	12.06	23.56	32.76	32.52	30.50	31.95	26.29	32.42	29.17	32.19	23.46	13.65	12.30	32.39	3.39	31.85	12.74	30.56	31.88	32.36	16.63	32.20	19.00	32.15	19.62	30.94	32.99	19.28	32.92	21.76	32.61	32.78	33.72	23.92	33.50	33.88	32.33	32.06	32.41
Bottom salinity (°/oo)	32.94	33.40	32.90		25.09	32.78	32.52	30.86	31.96	30.42	32.42		32.19	27.60		12.56	32.33	31.72	31.88	18.28	30.60	31.77	32.39	17.11	32.18	19.80	32.14	20.75	31.87	33.00	21.74	33.20	24.19	32.64	33.13	33.74	26.12	33.56	33.84	32.39	32.61	32.63
Surface temperature (°C)	13.3	9.8	12.4	13.1	13.7	13.1	12.9	13.2	13.4	13.0	12.2	9.9	9.7	9.7	9.5	9.6	8.5	8.6	8.6	11.0	10.8	10.8	10.1	9.8	10.6	12.0	10.1	14.9	10.5	9.3	16.0	11.1	16.4	15.0	12.1	8.8	16.1	11.2	17.6	14.7	13.7	13.2
Bottom temperature (°C)	13.2	9.7	12.4		13.5	12.9	12.9	13.3	13.3	13.2	12.1		9.4	9.8		9.6	4.4	9.0	8.5	11.0	10.6	10.7	10.0	9.6	10.4	11.8	10.0	14.7	10.3	9.3	15.2	10.9	15.6	14.6	11.6	8.5	15.4	10.1	13.5	14.6	13.7	13.2
Surface sigma-t	24.7	25.8	24.9	24.1	17.7	24.7	24.5	22.9	24.0	19.7	24.6	22.5	24.8	18.4	10.5	9.4	25.2	2.5	24.7	9.6	23.4	24.3	24.9	12.7	24.7	14.3	24.7	13.5	23.7	25.5	13.7	25.2	15.6	24.2	24.9	26.2	17.3	25.6	24.8	24.0	24.0	24.4
Bottom sigma-t	24.9	25.5	24.9	-	15.7	24.7	24.5	23.2	24.0	22.8	24.6		24.9	21.3		9.6	25.2	24.6	24.9	13.8	23.4	24.3	24.9	13.1	24.7	14.9	24.7	15.1	24.5	25.5	15.8	25.4	17.6	24.3	25.2	26.2	19.1	25.8	24.8	24.8	24.4	24.6
Surface dissolved oxygen (ml/L)	6.21	6.39	6.37	5.95	5.75	6.24	6.28	5.99	6.22	6.23	6.43	6.50	6.78	6.74	7.24	7.13	6.83	7.90	7.38	6.47	6.83	6.49	6.54	6.72	6.70	6.11	6.66	6.85	6.43	5.48	5.54	6.34	5.33	6.16	6.63	4.14	5.36	6.05	6.38	6.04	6.02	5.74
Bottom dissolved oxygen (ml/L)	6.27	6.13	6.36		5.74	6.26	6.32	6.03	6.24	6.16	6.47		6.77	6.71		7.12	6.99	4.86	6.97	6.53	6.72	6.51	6.53	6.58	6.71	6.19	6.62	6.44	5.97	5.11	5.30	6.55	5.12	6.21	6.04	3.55	5.33	5.35	6.44	6.25	6.07	6.26
Surface oxygen saturation (%)	104.3	99.7	104.8	98.8	91.7	104.2	104.3	98.5	103.8	99.5	104.9	98.8	104.6	99.7	99.0	97.0	104.1	99.0	110.8	91.3	107.1	102.4	102.0	94.2	105.3	91.6	103.9	108.9	101.1	84.3	90.4	101.4	89.0	106.6	108.3	63.2	90.1	97.4	107.6	103.8	101.2	95.8
Bottom oxygen saturation (%)	105.3	95.3	104.6		92.0	104.0	104.8	99.7	104.0	101.5	105.4		103.8	100.8		96.9	103.6	73.6	104.3	95.2	105.0	102.7	101.6	92.4	105.3	92.8	103.0	103.2	93.1	78.6	86.5	104.5	85.5	106.5	97.9	53.9	89.6	84.0	105.4	107.2	102.4	104.3
Tide level (ft)	5.9	6.2	6.3	4.5	-0.9	7.0	7.0	5.4	7.6	3.9	7.7	2.5	7.6	7.4	5.6	2.1	8.7	4.4	5.7	1.1	7.7	4.8	5.7	-0.5	4.8	.3	5.0	-0.8	4.3	3.4	-1.1	4.0	-1.5	5.7	3.5	5.4	-0.7	5.4	3.5	5.6	3.7	5.8
Time of zooplankton tow (PST)	1009	1256	1113	1730	2119	1241	1444	1307	1513	1357	1344	1337	1243	1122	1345	1041	935	1727	830	1244	1236	1407	927	1109	1135	1045	1244	1128	1109	857	720	550	742	1743	1733	1543	446	1517	1422	1352	1244	1229
Alsea River stream flow (ft³/sec)	75	59	78	260	260	154	685	667	285	815	422	367	1380	1610	3280	2350	1320	4860	1480	1310	2680	1800	942	742	616	485	400	353	781	416	322	267	215	213	172	151	136	114	177	762	243	160

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968
ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	13SEP67	22SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC	14JAN68	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
X factor	2.50	1.26	3.33	4.36	15.99	3.61	5.68	0	.78	0	.47	.62	.45	.99	.11	.27	1.25	2.24	3.09	.92	4.36	3.00	7.15	.41	7.78	.64	2.50	2.51	5.67	10.97	5.41	10.24	4.01	10.10	5.71	42.49	2.73	45.40	3.49	10.75	1.81	13.31
Protista																																										
Foraminifera	0	5.0	3.3	8.7	0	0	0		0		0	3.7	0	0	1.2	.5	6.3	2.2	0	0	0	3.0	0	0	15.6	0	0	0	0	0	0	0	4.0	10.2	0	0	0	0	0	0	5.4	0
Radiolaria	0	0	0	0	0	0	0		0		0	0	.4	0	0	0	0	0	0	0	0	30.0	71.5	0	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10.8	0	39.9
Tintinnidium sp.	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	10.2	0	0	0	0	0	0	0	0
Coelenterata																																										
Medusa	20.0	13.9	10.0	17.4	79.9	46.9	11.4		1.4		1.9	1.2	.4	0	0	0	3.8	0	0	0	38.7	69.0	121.6	3.7	93.4	5.8	23.2	0	5.6	0	0	0	0	10.2	11.4	0	0	147.1	17.5	21.5	14.5	13.8
Siphonophora	0	0	0	0	0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	.2	57.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6	0
Ctenophora	0	0	0	0	0	0	0		0		0	0	0	0	.1	.5	0	0	0	0	.3	0	0	.8	7.8	1.3	0	2.5	0	11.0	0	0	0	0	0	0	2.7	0	7.0	0	0	3.5
Nematoda	2.5	10.1	0	0	0	0	0		.7		0	4.3	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
Annelida																																										
Adult	0	0	0	0	0	0	0		0		0	0	0	0	.1	.6	1.3	0	0	.6	0	0	0	0	0	.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	5.0	7.6	16.6	56.7	32.0	14.4	22.7		.7		.5	10.5	0	1.0	.6	1.1	0	13.4	0	.9	109.0	15.0	64.3	7.0	155.6	3.2	23.2	10.0	0	0	0	0	0	10.2	22.8	42.5	49.1	45.4	3.5	10.8	7.2	26.6
Arthropoda																																										
Crustacea																																										
Podon leuckarti	0	1.3	3.3	17.4	0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	332.2	647.2	5.4	20.5	0	10.2	5.7	0	0	0	129.1	688.8	115.8	116.5
Podon polyphemoides	0	0	0	26.2	16.0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21.9	0	10.2	0	0	0	0	0	136.2	0	32.3	12.7	133.1
Evadne sp.	0	0	0	21.8	0	0	0		4.2		0	0	0	0	.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.0	0	0	0	0	0	0	0	1.4	0
Fresh water Cladocera	0	0	0	0	0	0	0		0		0	.6	0	0	0	0	0	0	0	2.6	30.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostracoda	0	0	0	0	16.0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	197.5	2.5	134.5	187.5	191.9	14.4	98.9		2.1		15.5	3.1	0	1.4	.1	24.9	0	6.7	0	115.0	579.9	132.0	321.8	6.6	241.2	19.8	131.6	52.7	0	1042.2	140.7	71.7	296.7	162.9	68.5	0	1198.3	681.9	432.8	451.5	48.9	113.8
Barnacle cypris	80.0	18.9	79.9	252.9	79.9	657.0	0		0		.5	0	0	0	1.5	.6	0	15.7	0	.9	0	0	79.7	31.6	217.0	15.4	51.6	12.6	129.5	32.9	0	0	0	10.2	17.1	0	5.5	90.8	34.9	96.8	114.0	26.6
Mysidacea	5.0	1.3	22.0	0	98.7	29.6	0		0		0	0	.4	2.4	0	0	0	6.7	3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10.2	0	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanaidacea	0	1.3	0	0	0	0	0		0		.5	.6	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
Isopoda	2.5	3.8	3.3	0	0	7.2	0		0		.9	.6	0	0	0	0	1.3	2.2	0	0	0	0	0	.8	7.8	0	0	0	0	0	0	0	0	30.5	11.4	0	0	45.4	0	0	1.8	0
Amphipoda	5.0	3.8	0	8.7	0	3.6	0		2.1		0	0	0	1.2	0	0	1.3	2.2	0	0	0	0	7.2	0	23.3	0	5.2	12.6	0	0	0	0	0	0	0	0	5.5	0	0	0	0	0
Euphausiacea	7.5	0	0	34.9	0	0	0		3.5		0	0	0	0	0	0	0	0	0	0	0	0	78.7	1.2	101.1	0	10.1	7.5	0	0	0	0	0	193.4	0	0	0	0	14.8	0	0	39.9
Shrimp adult	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
Unidentified decapod larva	0	1.3	6.7	4.4	0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	6.7	4.4	16.0	0	0		0		0	0	0	0	0	0	0	0	0	12.9	0	12.0	7.2	24.6	0	5.0	0	0	0	21.9	5.4	0	4.0	0	0	0	8.2	0	3.5	43.0	0	0
Upogebia larva	0	0	0	0	0	0	0		0		0	0	0	0	0	.8	1.3	0	3.1	.9	0	3.0	0	10.9	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	10.0	0	53.3	13.1	0	7.2	11.4		0		0	0	1.4	2.9	.3	0	7.5	0	0	0	161.3	0	0	.8	0	1.3	0	0	0	131.6	5.4	20.5	0	0	91.4	0	2.7	0	7.0	43.0	0	0
Crab megalops	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
Porcelain crab zoea	0	0	10.0	0	0	0	0		0		0	0	0	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	11.0	0	81.9	0	0	0	0	0	0	0	0	0	0
Hermit crab larva	2.5	0	0	0	0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	7.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	.2	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
Larva	0	0	0	0	0	0	0		0		0	.6	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
Arachnida, Mite	0	1.3	0	0	0	0	0		0		0	0	0	.7	0	.3	0	0	0	0	0	0	0	0	7.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca																																										
Gastropoda	7.5	1.3	43.3	30.5	191.9	14.4	5.7		2.1		5.2	3.7	.9	1.9	.2	0	3.8	0	0	.9	13.1	9.0	21.5	2.5	93.4	1.3	36.1	2.5	22.5	21.9	0	41.0	4.0	10.2	5.7	42.5	0	45.4	10.5	0	5.4	79.9
Gastropod egg case	0	0	0	0	0	3.6	0		0		0	0	.4	0	.1	.8	0	0	0	3.7	0	0	0	0	0	0	0	0	0	0	5.4	0	0	10.2	0	0	0	0	0	0	0	0
Pelecypoda	137.5	17.6	69.9	143.9	95.9	115.5	96.6		14.7		21.6	32.9	3.6	5.8	20.7	4.9	86.3	271.0	339.9	14.7	61.0	48.0	42.9	23.0	435.7	71.0	108.4	30.1	140.0	471.7	59.5	92.2	16.0	71.3	28.5	42.5	5.5	2678.6	157.1	107.5	45.3	13.3
Ectoprocta, Cyphonautes larva	2.5	1.3	0	0	0	3.6	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.8	0	2.6	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6	26.6
Chaetognatha	0	0	0	0	0	0	5.7		2.1		.9	3.7	.4	5.0	0	0	1.3	0	3.1	.9	0	0	21.5	.8	54.5	0	10.3	0	5.6	21.9	0	20.5	0	0	11.4	42.5	0	45.4	0	0	0	53.2
Phoronidea, Actinotroch (larva)	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
Echinodermata																																										
Larva	195.0	0	0	0	0	0	11.4		.7		0	0	0	0	0	0	0	0	0	0	4.4	12.0	50.0	0	210.1	0	64.5	0	0	11.0	0	0	0	417.4	0	0	0	0	38.4	2762.8	77.8	26.6
Adult Asteroidea	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
Chordata, Larvacea and larval Ascidacea	197.5	0	63.3	43.6	32.0	0	125.0		51.1		0	3.7	.4	2.0	1.4	0	3.8	17.9	24.7	7.4	213.6	207.0	321.5	0	194.5	0	185.8	5.0	0	0	0	0	0	0	0	0	0	0	7.0	365.5	23.5	3434.0
Thaliacea	0	0	0	0	0	0	5.7		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	3.6	492.5
Fish egg	2.5	0	6.7	0	0	0	0		.7		0	.6	0	0	.1	0	1.3	0	0	0	0	3.0	0	.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.5	0	0	0
Fish larva	0	0	0	0	16.0	0	0		0		0	0	0	0	0	0	0	0	3.1	0	0	0	0	0	0	0	0	5.0	0	0	5.4	0	4.0	0	0	0	2.7	0	0	0	0	0
Unidentified																																										
Egg	15.0	16.4	0	0	32.0	0	5.7		0		.9	5.0	.4	5.9	12.9	5.1	5.0	9.0	6.2	54.3	91.6	0	14.3	3.3	54.5	7.0	110.9	2.5	0	0	0	0	0	71.3	0	424.9	2.7	90.8	20.9	172.0	16.3	145.4
"C"	0	0	0	0	16.0	0	0		0		.5	0	.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
"A"	0	0	0	0	0	0	0		0		0	.6	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
"B"	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
Miscellaneous	2.5	3.8	6.7	8.7	48.0	14.6	28.4		2.8		3.5	8.7	3.1	0	1.8	3.2	22.5	6.7	15.5	2.8	13.1	0	50.0	.8	70.0	10.9	7.7	5.0	0	0	0	0	4.0	0	0	0	8.2	90.8	7.0	32.3	10.9	33.9
Nauplius	2.5	0	0	0	0	0	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	1177.5	543.1	1855.3	2193.1	7566.2	1527.9	2726.4		331.1		196.0	256.1	203.4	506.2	79.1	97.5	528.8	1288.0	1195.8	442.5	3139.6	1941.2	3996.8	194.8	3298.7	256.0	1192.0	941.3	1902.9	5035.2	2369.6	5488.6	1989.0	6311.6	2512.4	18908.0	1889.2	35513.7	1671.7	5579.4	861.6	7018.4
Total zooplankton count, computer	471.0	431.0	558.0	503.0	473.0	423.0	480.0		473.0		417.0	413.0	452.0	515.0	719.0	361.0	423.0	575.0	387.0	481.0	720.0	647.0	559.0	475.0	424.0	400.0	462.0	375.0	338.0	459.0	438.0	536.0	496.0	620.0	440.0	445.0	692.0	782.0	479.0	519.0	476.0	527.0
Total zooplankton count	471.0	431.0	558.0	503.0	473.0	423.0	480.0		473.0		417.0	413.0	452.0	515.0	719.0	361.0	423.0	575.0	387.0	481.0	720.0	647.0	559.0	475.0	424.0	403.0	462.0	375.0	338.0	459.0	438.0	536.0	496.0	620.0	440.0	445.0	692.0	782.0	479.0	519.0	473.0	527.0
Total zooplankton/m³	1177.5	543.1	1855.1	2193.1	7563.3	1527.0	2726.4		331.1		195.9	256.1	203.4	504.7	79.1	97.5	528.8	1288.0	1195.8	442.5	3139.2	1941.0	3996.9	194.8	3298.7	256.0	1192.0	941.3	1902.9	5035.2	2369.6	5488.6	1989.0	6311.6	2512.4	18908.1	1883.2	35502.8	1671.7	5579.3	856.1	7014.4

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	13SEP67	22SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	15DEC	28DEC	14JAN69	21JAN
X factor	2.50	1.26	3.33	4.36	15.99	3.61	5.68	0	.70	0	.47	.62	.45	.98	.11	.27
Arthropoda, Crustacea, Copepoda																
Acartia clausi f.	30.0	171.0	293.0	117.7	1966.9	79.4	499.8		5.6		8.9	1.2	2.7	19.6	.2	.5
" " m.	15.0	22.8	229.9	161.3	1375.1	83.0	448.7		2.8		9.9	0	4.5	4.9	0	.8
" " c.	27.5	35.5	186.5	200.6	1774.9	93.9	318.1		1.4		6.6	3.1	4.5	5.9	.6	.5
" " III	10.0	0	16.6	30.5	48.0	0	5.7		0		0	0	0	0	0	0
" " II	5.0	0	0	0	32.0	0	5.7		0		0	0	0	0	0	0
" " I	5.0	0	0	8.7	0	0	0		0		0	0	.4	0	0	0
" " h.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Acartia danae f.	0	0	0	4.4	0	0	0		10.5		1.4	0	1.8	3.9	.2	0
" " m.	0	0	0	0	0	0	0		4.9		0	0	0	0	0	0
" " c.	0	0	0	4.4	0	0	0		35.0		.9	.6	0	2.0	0	0
" " III	0	0	0	0	0	0	0		8.4		0	0	0	0	0	0
" " II	0	0	0	0	0	0	0		2.1		0	0	0	0	0	0
Acartia longiremis f.	10.0	6.3	33.3	8.7	16.0	3.6	17.0		4.9		1.4	3.1	.4	58.8	0	.3
" " m.	20.0	2.5	23.3	34.9	16.0	10.8	5.7		0		0	0	0	11.9	0	0
" " c.	52.5	0	176.5	149.2	48.0	14.4	0		.7		0	.6	.4	24.5	.1	0
" " III	12.5	0	36.6	74.1	0	0	0		0		0	0	.4	7.8	0	0
" " II	22.5	0	20.0	26.2	0	0	0		0		0	0	0	1.0	0	0
" " I	7.5	0	0	4.4	0	0	0		0		0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Acartia tonsa f.	0	0	0	0	0	0	0		0		0	0	.4	10.8	0	0
" " m.	0	0	0	0	0	0	0		0		0	0	1.4	2.0	.1	0
" " c.	0	0	0	4.4	16.0	0	0		0		.5	0	.4	20.6	.1	0
" " III	0	0	0	0	0	0	0		0		0	0	.9	0	.1	0
" " II	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " I	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Acartia spp. f.	0	0	0	4.4	0	0	0		0		0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " c.	0	0	0	4.4	32.0	0	0		0		0	0	0	0	0	0
" " III	0	0	0	0	0	3.6	0		0		0	.6	0	0	0	0
" " II	0	0	0	39.2	0	0	0		0		0	0	0	0	0	0
" " I	0	0	6.7	4.4	16.0	0	0		0		0	0	0	0	0	0
Calanus spp. f.	0	1.3	0	0	0	0	0		0		0	0	.4	0	.1	0
" " m.	0	0	0	0	0	0	0		0		.5	0	0	0	0	0
" " c.	0	1.3	3.3	0	0	3.6	0		0		0	0	0	0	.9	6.5
"Calanus-type" c.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Calocalanus styliremis f.	0	0	13.3	0	0	0	0		0		0	0	0	0	.1	0
Centropages mcmurrichi f.	0	0	10.0	0	0	0	0		0		0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " c.	2.5	1.3	69.9	17.4	0	0	0		1.4		.5	0	0	9.8	0	0
Clausocalanus spp. f.	0	0	0	0	0	0	0		7.7		0	0	.9	3.9	.5	.5
" " m.	0	0	0	0	0	0	0		0		0	0	0	2.0	.2	0
" " c.	0	0	0	0	0	0	0		13.3		0	1.2	.4	29.4	.8	1.6
" " III	0	0	0	0	0	0	0		0		0	0	.4	2.9	0	0
Ctenocalanus vanus f.	0	0	0	4.4	0	0	0		14.0		.5	4.3	0	2.9	.4	.3
" " m.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " c.	2.5	0	0	4.4	0	0	0		9.1		0	9.9	.4	9.8	.7	1.1
" " III	0	0	0	0	0	0	0		0		0	1.9	0	2.0	0	0
" " II	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " c.	0	0	0	8.7	0	0	0		0		0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0		0		0	0	0	0	.2	0
Eurytemora sp. f.	5.0	1.3	0	0	111.9	0	0		0		0	0	0	0	0	0
" " m.	2.5	0	0	0	175.9	0	0		0		0	0	0	0	0	0
" " c.	0	3.8	0	0	463.7	0	0		0		0	0	0	0	0	.3
Metridia sp. f.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0		0		0	.6	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0		0		0	0	0	0	0	.3
" " c.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Tortanus discaudatus f.	0	0	0	4.4	0	0	0		0		0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0		0		0	0	0	0	.1	.3
" " c.	0	0	0	4.4	0	0	0		0		0	3.1	0	0	0	0
Paracalanus parvus f.	0	25.2	10.0	78.5	16.0	57.8	96.6		19.6		31.5	25.4	43.2	64.7	6.5	4.9
" " m.	2.5	8.8	0	26.2	16.0	32.5	22.7		1.4		5.2	5.0	10.3	4.9	.4	.5
" " c.	2.5	15.1	3.3	26.2	64.0	133.6	284.0		34.3		17.9	16.7	56.7	46.1	5.2	6.2
" " III	0	0	0	0	0	0	0		0		0	0	.4	0	0	0
" " h.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Pseudocalanus sp. f.	0	11.3	23.3	0	0	0	0		0		.5	0	2.3	0	0	1.3
" " m.	0	6.3	0	0	0	0	0		0		0	0	.4	1.0	0	0
" " c.	7.5	45.4	30.0	0	16.0	3.6	17.0		0		.9	3.7	7.2	8.8	.3	1.1
" " III	0	10.1	6.7	0	16.0	0	5.7		0		0	0	.9	1.0	0	0
" " II	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " I	0	0	0	0	0	0	0		0		0	0	0	1.0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " c.	0	1.3	0	0	0	0	5.7		0		0	0	.4	0	.1	.5
" " III	0	0	0	0	0	0	0		0		0	2.5	0	2.9	0	0
" " II	0	0	0	0	0	3.6	0		0		0	.6	0	0	0	0
" " I	0	0	0	4.4	0	0	0		0		0	.6	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Unidentified calanoid c.	0	0	0	0	0	0	0		0		0	0	0	2.9	.1	0
Elongated copepod nauplius	0	0	0	13.1	0	0	0		.7		0	0	0	0	0	0
Copepod nauplius	5.0	0	46.6	17.4	0	0	0		0		0	2.5	0	1.0	9.8	4.9
Corycaeus sp. f.	0	3.8	0	0	0	3.6	249.9		9.1		9.9	2.5	9.4	10.8	.4	0
" " m.	0	0	0	4.4	16.0	28.9	159.0		18.2		22.1	6.2	16.2	23.5	.6	0
" " c.	2.5	0	0	4.4	0	13.0	22.7		16.8		11.8	6.8	12.1	8.8	1.4	0
Oncaea sp. f.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0		0		0	0	0	0	0	0
Oithona similis f.	17.5	59.2	73.3	178.8	159.9	14.4	119.3		16.8		10.3	25.4	4.5	46.1	4.3	16.5
Oithona sp. n.	0	3.8	0	13.1	0	0	5.7		0		.5	.6	.9	0	0	.3
Oithona similis c.	0	0	0	0	0	0	11.4		2.8		.9	16.7	0	2.9	0	3.4
Oithona spinirostris f.	0	3.8	0	0	0	0	0		0		0	.6	0	8.8	.4	0
" " c.	0	1.3	0	0	0	0	0		0		0	0	.4	0	0	0
Unidentified cyclopoid copepod	0	12.6	6.7	4.4	111.9	7.2	0		0		.5	1.2	0	0	.3	.3
Harpacticoid copepod	10.0	5.0	0	17.4	95.9	0	5.7		.7		0	10.5	3.1	2.9	.8	1.9

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY	8JUN	19JUN
X factor	1.25	2.24	3.09	.92	4.36	3.00	7.15	.41	7.78	.64	2.58	2.51	5.63	10.97
Arthropoda, Crustacea, Copepoda														
Acartia clausi f.	2.5	9.0	18.5	0	4.4	96.0	21.5	7.4	0	1.9	2.6	15.1	33.8	416.9
" " m.	1.3	0	15.5	0	8.7	51.0	0	5.3	7.8	.6	15.5	7.5	22.5	691.1
" " c.	1.3	4.5	9.3	0	34.9	39.0	0	.8	7.8	4.5	2.6	12.6	39.4	384.0
" " III	0	0	0	0	0	0	0	0	0	0	0	7.5	0	0
" " II	0	0	0	0	0	0	0	0	0	0	2.6	2.5	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	6.3	2.2	18.5	0	4.4	0	0	0	0	0	0	0	5.6	0
" " m.	6.3	0	6.2	.9	0	0	0	0	0	.6	25.8	7.5	22.5	131.6
" " c.	5.0	0	3.1	0	0	0	0	0	7.8	0	2.6	7.5	0	54.8
" " III	1.3	0	3.1	0	0	0	0	0	0	0	0	0	16.9	32.9
" " II	0	0	0	0	0	0	0	0	7.8	0	2.6	5.0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	5.0	0	6.2	.9	21.8	30.0	21.5	0	7.8	1.3	7.7	0	33.8	65.8
" " m.	3.8	0	3.1	.9	39.2	63.0	14.3	.4	7.8	3.2	2.6	0	5.6	54.8
" " c.	3.8	0	12.4	7.4	100.3	27.0	28.6	7.4	15.6	25.6	10.3	10.0	33.8	32.9
" " III	0	0	0	.9	8.7	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	17.4	0	0	0	0	0	0	7.5	0	0
" " I	0	0	0	1.8	4.4	0	0	.4	0	0	2.6	2.5	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	2.5	0	0
" " II	0	0	0	0	0	0	0	0	23.3	0	0	0	0	11.0
" " I	0	0	0	.9	4.4	0	0	0	31.1	0	0	0	0	0
Calanus spp. f.	10.0	2.2	0	0	4.4	0	0	0	0	0	0	0	0	0
" " m.	1.3	0	6.2	0	0	0	0	0	0	0	0	0	0	0
" " c.	23.8	4.5	3.1	11.0	130.8	33.0	143.0	0	15.6	0	20.6	5.0	0	21.9
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	3.0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	1.3	0	0	0	0
" " c.	1.3	0	3.1	0	4.4	0	7.2	0	7.8	2.6	12.9	5.0	5.6	0
Clausocalanus spp. f.	5.0	30.6	30.9	10.1	13.1	3.0	0	0	0	0	0	0	0	0
" " m.	1.3	15.7	3.1	1.8	8.7	3.0	0	0	0	0	0	0	0	0
" " c.	2.5	22.4	3.1	11.0	8.7	0	7.2	0	0	0	0	0	0	0
" " III	0	0	0	0	8.7	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	2.5	15.7	3.1	2.8	0	3.0	0	0	0	0	0	0	0	0
" " m.	1.3	17.9	0	0	0	3.0	0	0	0	0	0	0	0	0
" " c.	8.8	29.1	6.2	0	0	6.0	35.8	0	0	1.3	0	0	0	0
" " III	0	0	3.1	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	3.1	0	0	0	0	0	7.8	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	0	0	0	0	0	0	0	.8	0	0	0	30.1	0	11.0
" " m.	0	0	0	0	0	0	0	2.9	0	.6	0	62.8	0	0
" " c.	0	0	0	0	0	0	0	2.1	0	.6	0	283.6	0	0
Metridia sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	4.4	0	7.2	1.2	0	0	0	0	0	0
Paracalanus parvus f.	36.3	87.4	105.1	19.3	113.4	117.0	21.5	.4	23.3	1.3	0	0	0	0
" " m.	8.8	13.4	46.4	5.5	4.4	21.0	7.2	0	0	.6	0	0	0	0
" " c.	22.5	82.9	27.8	11.0	26.2	33.0	28.6	.4	0	1.9	0	7.5	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	23.8	13.4	43.3	1.8	78.5	57.0	514.8	4.5	46.7	.6	12.9	0	33.8	11.0
" " m.	10.0	9.0	61.8	.9	17.4	15.0	93.0	.8	15.6	.6	5.2	0	28.2	32.9
" " c.	65.0	9.0	46.4	15.6	161.3	117.0	665.0	10.7	132.3	1.3	59.3	32.6	557.4	274.3
" " III	0	0	0	1.8	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	1.8	8.7	0	0	0	0	0	0	0	0	0
" " I	0	0	0	.9	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	6.0	0	0	0	0	0	0	0	0
" " c.	1.3	0	3.1	0	0	0	7.2	0	0	0	0	0	0	0
" " III	3.8	6.7	0	0	0	0	7.2	0	0	1.9	0	0	0	0
" " II	0	0	0	.9	0	0	0	0	46.7	0	0	0	0	0
" " I	0	0	0	0	0	3.0	7.2	0	31.1	0	2.6	0	0	0
Rhincalanus sp. c.	0	0	0	3.7	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	1.3	0	0	0	0	0	0	.4	0	0	0	7.5	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepod nauplius	12.5	6.7	0	8.3	283.4	33.0	93.0	1.6	522.4	7.7	149.6	251.0	0	54.8
Corycaeus sp. f.	0	0	0	0	4.4	3.0	21.5	0	7.8	.6	0	0	11.3	0
" " m.	1.3	0	6.2	0	21.8	6.0	0	0	15.6	1.9	0	0	22.5	11.0
" " c.	1.3	0	3.1	5.5	17.4	9.0	0	1.6	15.6	0	0	2.5	0	0
Oncaea sp. f.	0	4.5	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	88.8	416.6	256.5	90.2	562.4	498.0	214.5	11.9	62.2	41.0	41.3	15.1	354.7	230.4
Oithona sp. n.	8.8	31.4	24.7	2.8	56.7	51.0	28.6	0	0	0	2.6	0	28.2	21.9
Oithona similis c.	0	31.4	3.1	0	26.2	21.0	643.5	0	23.3	1.3	7.7	0	5.6	0
Oithona spinirostris f.	0	4.5	6.2	0	0	3.0	7.2	0	0	.6	0	0	5.6	43.9
" " c.	0	0	3.1	0	0	0	7.2	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	0	1.8	8.7	3.0	0	0	0	.6	0	0	0	0
Harpacticoid copepod	1.3	9.0	0	1.8	4.4	0	7.2	6.2	93.4	3.8	12.9	2.5	0	0

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 1 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
X factor	5.41	10.24	4.01	10.18	5.71	42.49	2.73	45.40	3.49	10.75	1.81	13.31
Arthropoda, Crustacea, Copepoda												
Acartia clausi f.	48.7	757.8	56.1	183.2	125.6	3229.2	8.2	7672.6	27.9	118.3	39.8	93.2
" " m.	16.2	768.0	44.1	203.6	1290.5	4206.5	10.9	10215.0	146.6	10.8	23.5	173.0
" " c.	43.3	522.2	36.1	305.4	525.3	4673.9	38.2	3495.8	216.4	32.3	54.3	319.4
" " III	0	0	0	10.2	0	0	0	0	0	10.8	0	0
" " II	0	0	0	0	0	0	0	0	7.0	0	0	0
" " I	0	0	0	0	0	0	0	0	17.5	0	0	13.3
" " h.	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	5.4	81.9	0	50.9	0	42.5	0	317.8	7.0	32.3	7.2	319.4
" " m.	0	153.6	0	254.5	11.4	127.5	0	181.6	45.4	21.5	3.6	279.5
" " c.	5.4	51.2	0	1669.5	5.7	0	2.7	45.4	184.7	10.8	12.7	106.5
" " III	0	0	0	651.5	0	0	0	0	20.9	0	1.8	26.6
" " II	0	0	0	386.8	0	42.5	0	0	45.4	0	0	26.6
" " I	0	0	0	10.2	0	0	0	0	10.5	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	20.5	4.0	0	0	0	0	0	0	0	3.6	26.6
" " m.	5.4	20.5	0	10.2	0	0	0	45.4	0	21.5	1.8	53.2
" " c.	5.4	20.5	0	10.2	0	0	0	0	14.0	21.5	18.1	66.6
" " III	0	0	0	0	0	0	0	0	0	0	5.4	13.3
" " II	0	0	0	0	0	0	0	0	0	0	1.8	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	45.4	0	0	0	0
" " c.	0	10.2	0	0	0	0	0	0	0	0	0	0
" " III	5.4	20.5	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	40.7	0	0	0	0	0	0	0	0
" " I	0	0	0	30.5	0	0	0	45.4	0	10.8	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	127.5	0	272.4	3.5	10.8	0	0
"Calanus-type" c.	0	0	0	529.4	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	21.5	0	0
" " m.	0	0	0	20.4	0	0	0	45.4	0	0	0	13.3
" " c.	5.4	92.2	0	132.3	17.1	170.0	5.5	590.2	34.9	161.3	5.4	53.2
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	1.8	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	0	0	0	1.8	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	42.5	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	20.4	0	0	0	0	7.0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	221.8	0	160.4	0	0	0	46.4	0	0	0	0	0
" " m.	275.9	0	196.5	0	22.8	42.5	39.2	0	0	0	0	0
" " c.	1466.1	10.2	1106.8	0	40.0	0	316.7	45.4	0	0	0	0
Metridia sp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	13.3
" " c.	0	0	0	0	0	0	0	45.4	3.5	0	0	13.3
Paracalanus parvus f.	0	0	0	0	0	0	0	0	0	10.8	3.6	13.3
" " m.	0	0	0	0	0	0	0	0	0	32.3	1.8	26.6
" " c.	0	10.2	0	0	0	42.5	0	0	0	32.3	5.4	39.9
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	0	870.4	0	112.0	0	2761.9	0	2179.2	0	0	3.6	39.9
" " m.	0	71.7	0	10.2	0	254.9	0	45.4	0	0	1.8	0
" " c.	0	1556.5	8.0	376.7	57.1	1147.2	5.5	3949.8	3.5	10.8	25.3	93.2
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	136.2	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	5.4	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	5.7	0	0	0	0	0	0	0
" " I	0	0	0	10.2	0	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	0	0	0	0	0	0	0	0	0	10.8	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	17.5	0	0	0
Copepod nauplius	5.4	30.7	4.0	213.8	119.9	1147.2	19.1	1589.0	38.4	21.5	0	13.3
Corycaeus sp. f.	0	0	0	0	0	0	0	0	0	21.5	12.7	13.3
" " m.	0	0	0	0	0	0	0	0	0	32.3	10.9	0
" " c.	0	0	0	0	0	0	0	0	0	75.3	14.5	93.2
Oncaea sp. f.	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	0	30.7	0	20.4	11.4	212.5	5.5	408.6	0	0	72.4	173.0
Oithona sp. n.	0	10.2	4.0	0	0	0	0	45.4	0	0	0	26.6
Oithona similis c.	0	0	0	0	0	0	0	0	0	10.8	1.8	39.9
Oithona spinirostris f.	0	10.2	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	0	0	0	0	0	0	0	0	1.8	0
Harpacticoid copepod	27.0	0	28.0	10.2	5.7	42.5	109.2	0	7.0	0	10.9	13.3

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 2 IN ALSEA BAY, OREGON

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 2 IN ALSEA BAY, OREGON
SEPTEMBER 1966 TO SEPTEMBER 1967

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 2 IN ALSEA BAY, OREGON

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67	22JAN	31JAN
Surface salinity (°/oo)	32.44	32.42	32.32	33.05	33.07	28.63	32.77	31.57	30.66	12.45	30.31	.76	.94	7.23	2.94	8.26
Bottom salinity (°/oo)	32.81	32.41	32.46	33.06	33.06	29.27	32.79	31.95	30.68	20.75	30.47	1.77	16.67	10.53		28.09
Surface temperature (°C)	14.0	15.2	14.7	11.1	10.1	11.9	11.0	9.5	10.6	9.6	11.4	8.4	9.5	9.8	7.3	9.4
Bottom temperature (°C)	14.8	14.9	14.4	10.6	9.9	11.7	10.8	9.4	10.4	9.8	11.2	8.3	10.4	9.6		9.7
Surface sigma-t	24.5	24.0	24.0	25.3	25.5	21.7	25.1	24.4	23.5	9.5	23.1	.5	.5	5.4	2.3	6.3
Bottom sigma-t	24.6	24.0	24.2	25.4	25.5	22.2	25.1	24.7	23.5	15.9	23.2	1.3	12.7	8.1		21.6
Surface dissolved oxygen (ml/L)																
Bottom dissolved oxygen (ml/L)																
Surface oxygen saturation (%)																
Bottom oxygen saturation (%)																
Tide level (ft)	4.5	6.9	5.1	6.0	5.9	2.5	7.8	2.6	8.0	2.5	8.0	1.2	6.2	4.1	4.1	5.4
Time of zooplankton tow (PST)	1600	1357	1155	1336	1324	1554	1426	1405	1407	1419	1406	1551	1541	1125	1234	1453
Alsea River stream flow (ft^3/sec)	54	108	67	67	67	143	198	112	2840	1050	654	6270	8180	2770	4820	7060

Date	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR
Surface salinity (°/oo)	.53	30.61	1.39	29.84	6.24	13.94	20.29	14.96	22.21	30.73	30.93
Bottom salinity (°/oo)	6.71	30.68	1.65	29.86	12.35	24.73	30.21	29.15	26.60	30.72	31.03
Surface temperature (°C)	9.7	10.0	8.4	9.5	8.8	9.9	10.2	11.2	13.5	15.9	10.6
Bottom temperature (°C)	9.5	9.7	8.1	9.2	9.2	9.5	9.7	10.3	10.2	10.6	10.2
Surface sigma-t	.2	23.5	1.0	23.0	4.8	10.6	23.7	11.3	17.0	23.5	23.7
Bottom sigma-t	5.1	23.7	1.2	23.1	9.5	22.2	23.3	22.4	20.5	23.5	23.9
Surface dissolved oxygen (ml/L)											
Bottom dissolved oxygen (ml/L)											
Surface oxygen saturation (%)											
Bottom oxygen saturation (%)											
Tide level (ft)	.4	6.0	1.9	8.6	.3	4.5	7.1	2.5	3.7	4.9	5.0
Time of zooplankton tow (PST)	1359	1020	1243	1939	1420	1547	1422	1554	1422	1624	1213
Alsea River stream flow (ft^3/sec)	3120	1360	3220	1740	1210	4930	2170	2040	1270	1780	1400

Date	29APR	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
Surface salinity (°/oo)	30.63	32.46	32.21	33.29	26.08	32.62	33.30		33.17	33.69	33.71	32.04	33.39	33.69	33.40
Bottom salinity (°/oo)	30.62	32.55	32.21	33.24	32.16	32.67	33.20		33.59	33.70	33.76	33.13	33.42	33.65	33.41
Surface temperature (°C)	11.4	10.7	11.1	10.9	15.4	13.0	10.5		11.4	10.5	9.5	14.9	10.6	9.5	12.2
Bottom temperature (°C)	11.2		10.8	10.0	12.2	12.7	10.4		10.5	10.2	9.1	11.9	10.6	9.7	12.0
Surface sigma-t	23.3	24.9	24.5	25.6	19.1	24.6	25.6		25.3	25.9	26.0	23.7	25.6	26.0	25.3
Bottom sigma-t	23.4		24.7	25.6	24.4	24.6	25.6		25.8	25.9	26.1	25.2	25.6	26.0	25.4
Surface dissolved oxygen (ml/L)					6.51	7.57	7.01		6.51	5.73	6.76	7.26	6.23	6.38	6.93
Bottom dissolved oxygen (ml/L)					6.56	7.67	7.05		6.41	5.78	6.37	7.74	6.16	6.34	7.01
Surface oxygen saturation (%)					129.2	126.0	110.9		105.0	90.8	105.0	125.2	98.9	99.5	113.8
Bottom oxygen saturation (%)					106.8	126.8	111.2		101.5	91.0	98.0	126.3	97.8	95.3	114.8
Tide level (ft)	4.0	5.5	5.4	6.2	2.7	5.0	5.5		3.9	6.1	5.4	3.6	5.9	4.7	7.1
Time of zooplankton tow (PST)	1616	1201	1445	1149	1528	1514	1315		1252	1609	1549	1348	1234	1347	1351
Alsea River stream flow (ft^3/sec)	1910	725	608	418	425	276	205	198	156	138	112	105	85	62	68

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67	22JAN	31JAN
X factor	11.61	6.88	5.83	5.72	9.43	6.16	26.13	2.58	8.41	1.07	1.50	.12	1.88	1.83	1.56	16.49
Protista																
Dinoflagellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foraminifera	0	27.5	0	0	16.9	0	0	5.0	0	0	0	0	0	0	3.1	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata																
Medusa	11.6	20.6	11.7	45.9	9.4	0	52.3	0	8.4	0	0	0	0	1.8	0	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	.5	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	0	0	0	0	0	0	78.4	0	0	0	0	1.3	0	1.8	4.7	16.5
Annelida																
Adult	0	0	0	0	0	0	0	0	8.4	0	0	0	0	0	0	0
Larva	0	61.9	5.8	268.8	47.2	6.2	783.9	20.0	269.1	6.4	4.5	0	0	0	0	16.5
Arthropoda																
Crustacea																
Podon leuckarti	255.4	20.6	23.3	17.2	216.9	221.8	104.5	52.5	8.4	2.1	0	0	0	0	0	0
Podon polyphemoides	116.1	13.8	174.9	11.4	113.2	129.4	0	2.5	0	0	0	0	0	0	0	0
Evadne sp.	0	0	46.6	5.7	75.4	37.0	26.1	17.5	319.6	1.1	0	0	0	0	0	0
Fresh water Cladocera	0	0	0	0	0	0	0	0	0	0	0	1.3	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	1706.7	626.1	1166.8	291.7	367.8	98.6	914.5	165.0	134.6	2.1	4.5	0	0	0	0	0
Barnacle cypris	220.6	68.8	81.6	423.3	509.2	665.3	2743.6	130.0	622.3	165.9	49.5	0	1.9	0	0	0
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	.2	5.6	0	3.1	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0	.1	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	5.0	0	0	6.2	0	5.0	0	0	0	.1	0	0	0	0
Amphipoda	0	6.9	5.8	5.7	0	0	0	0	0	0	0	5.1	0	3.7	0	98.9
Euphausiacea	0	0	0	0	0	0	0	0	8.4	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	23.2	0	52.5	0	0	0	0	0	8.4	0	0	0	0	0	0	0
Crab megalops	11.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab adult	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0	.1	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	1.5	1.1	1.9	0	1.6	16.5
Arachnida, Mite	0	0	0	0	9.4	0	0	0	0	0	1.5	.1	0	0	1.6	0
Mollusca																
Gastropoda	23.2	13.8	0	22.9	47.2	55.4	104.5	2.5	50.5	1.1	7.5	0	0	0	0	0
Gastropod egg case	0	6.9	11.7	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	394.7	172.0	87.4	446.2	828.4	431.2	1776.8	72.5	227.1	30.0	129.0	0	1.9	0	0	49.5
Ectoprocta, Cyphonautes larva	0	0	0	40.0	18.9	0	156.8	5.0	8.4	0	3.0	0	0	0	0	0
Chaetognatha	0	0	5.8	0	0	0	0	0	0	0	3.0	0	0	1.8	0	0
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata																
Larva	23.2	82.6	75.8	0	0	0	0	2.5	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	381.9	536.6	180.7	40.0	28.3	43.1	653.3	42.5	16.8	0	3.0	0	0	0	0	0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified																
Egg	0	27.5	0	57.2	9.4	6.2	156.8	5.0	42.0	1.1	7.5	.5	7.5	415.4	46.8	197.9
"C"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	5.0	0	0	0	0	0	0	0	0
Miscellaneous	23.2	0	0	0	9.4	0	26.1	10.8	8.4	0	4.5	0	0	0	3.1	49.5
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m^3, computer	7743.9	3178.6	2635.2	3135.2	3866.3	2310.0	14841.0	962.5	3288.3	404.5	1161.0	23.5	101.5	479.5	149.8	1319.2
Total zooplankton count, computer	667.0	462.0	452.0	548.0	410.0	375.0	568.0	385.0	391.0	378.0	774.0	196.0	54.0	262.0	96.0	80.0
Total zooplankton count	667.0	462.0	452.0	548.0	410.0	375.0	568.0	385.0	391.0	378.0	774.0	196.0	54.0	262.0	96.0	80.0
Total zooplankton/m^3	7743.9	3178.6	2635.2	3134.6	3866.3	2310.0	14841.0	962.5	3288.3	404.5	1161.0	23.5	101.5	479.5	149.8	1319.2

Date	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR
X factor	1.48	4.77	7.98	7.44	.13	1.96	4.47	1.36	.14	1.46	2.55
Protista											
Dinoflagellata	0	0	0	0	0	0	0	0	0	0	0
Foraminifera	0	4.8	0	22.3	0	0	0	1.4	.1	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0
Coelenterata											
Medusa	0	0	0	14.9	.1	0	0	0	0	10.2	12.8
Siphonophora	0	0	0	0	0	0	0	0	0	1.5	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	0
Nematoda	0	4.8	7.9	0	.3	0	0	0	.1	0	0
Annelida											
Adult	0	0	0	0	0	2.0	0	0	0	0	0
Larva	0	4.8	0	0	0	5.9	4.5	0	.4	2.9	10.2
Arthropoda											
Crustacea											
Podon leuckarti	0	0	0	0	0	0	0	0	0	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0
Fresh water Cladocera	0	0	0	0	0	7.8	0	0	0	2.9	0
Ostracoda	0	0	0	0	.1	0	0	0	0	0	0
Barnacle nauplius	4.2	14.3	0	0	2.3	105.8	17.9	4.1	2.1	28.4	33.1
Barnacle cypris	0	0	0	0	0	0	2252.9	9.5	.4	0	0
Mysidacea	0	0	0	0	0	0	0	0	0	1.5	0
Cumacea	0	0	0	0	0	0	0	0	0	0	2.6
Tanaidacea	0	0	0	0	0	0	0	0	0	1.5	0
Isopoda	0	0	0	0	0	0	0	0	.3	0	0
Amphipoda	1.4	9.5	0	0	1.4	2.0	0	1.4	0	2.9	0
Euphausiacea	0	0	0	7.4	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	.6	3.9	0	10.9	1.3	0	0
Upogebia larva	0	0	0	0	1.8	0	0	1.4	.6	0	0
Crab zoea	0	4.8	0	74.4	.3	3.9	0	12.2	0	2.9	2.6
Crab megalops	0	0	0	0	0	0	0	0	0	0	0
Crab adult	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	1.4	0	0	0	0	2.0	0	0	0	0	0
Larva	2.8	0	0	0	0	2.0	0	0	0	0	0
Arachnida, Mite	0	0	0	0	.1	0	0	0	0	0	0
Mollusca											
Gastropoda	0	0	0	29.8	0	0	4.5	0	1.1	1.5	5.1
Gastropod egg case	0	0	0	0	.3	5.9	0	1.4	0	1.5	0
Pelecypoda	0	372.1	0	126.5	1.2	39.2	40.2	13.6	24.4	100.7	73.9
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	.3	0	0
Chaetognatha	0	0	0	22.3	0	0	0	2.7	0	1.5	0
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	2.6
Echinodermata											
Larva	0	0	0	0	0	0	0	0	0	0	2.6
Chordata, Larvacea and larval Ascidacea	0	152.6	0	7.4	0	0	8.9	0	.1	111.0	158.1
Thaliacea	0	0	0	0	0	0	0	0	0	0	2.6
Fish egg	0	4.8	0	0	0	3.9	0	0	0	0	0
Fish larva	0	0	0	0	.4	0	0	0	0	0	0
Unidentified											
Egg	15.4	104.9	31.6	215.8	9.0	58.8	4.5	43.5	3.4	4.4	10.2
"C"	0	4.8	0	0	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	1.4	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	1.4	4.8	0	7.4	.1	0	0	0	.4	4.4	12.8
Nauplius	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m^3, computer	43.4	2532.9	63.2	3645.6	32.8	1005.5	3294.4	534.5	128.2	608.8	1162.8
Total zooplankton count, computer	31.0	531.0	8.0	490.0	252.0	513.0	737.0	393.0	916.0	417.0	456.0
Total zooplankton count	31.0	531.0	8.0	490.0	252.0	513.0	737.0	393.0	916.0	417.0	456.0
Total zooplankton/m^3	43.4	2532.9	63.2	3645.6	32.8	1005.5	3294.4	534.5	128.2	608.8	1162.8

Date	29APR	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	8.94	.86	15.59	22.33	1.88	6.56	.14	0	1.03	2.56	17.65	5.62	21.12	13.56	31.08
Protista															
Dinoflagellata	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Foraminifera	0	0	0	0	3.8	0	0		0	0	0	5.6	0	0	0
Radiolaria	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Coelenterata															
Medusa	62.6	6.0	0	44.7	0	59.0	.3		2.1	.1	0	0	63.4	13.6	1.1
Siphonophora	0	3.4	0	22.3	0	0	0		0	0	0	0	0	0	0
Ctenophora	0	0	0	0	.2	0	0		0	0	0	0	0	0	0
Nematoda	0	0	0	0	1.9	0	0		0	0	17.7	0	0	0	0
Annelida															
Adult	0	0	0	0	0	6.6	0		0	0	0	0	0	0	0
Larva	8.9	1.7	0	223.3	3.8	98.4	1.7		0	0	105.9	16.9	0	0	0
Arthropoda															
Crustacea															
Podon leuckarti	0	0	0	0	0	0	.1		0	0	0	11.2	105.6	0	0
Podon polyphemoides	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0		0	0	17.7	207.9	380.2	0	0
Fresh water Cladocera	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Barnacle nauplius	71.5	.9	155.9	4957.3	9.4	91.8	3.9		25.8	0	688.3	148.5	232.3	0	484.0
Barnacle cypris	17.9	0	0	0	0	72.2	5.6		2.1	0	52.9	2 .5	443.5	0	62.2
Mysidacea	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	.1		0	0	0	0	0	0	0
Amphipoda	0	0	0	0	1.9	0	0		1.0	0	0	0	0	0	0
Euphausiacea	0	0	0	201.0	94.0	45.9	.8		0	0	88.3	67.4	21.1	0	0
Unidentified decapod larva	0	0	0	0	0	0	.4		0	0	35.3	0	0	0	0
Callianassa larva	17.9	.9	0	0	1.9	0	0		2.1	7.7	0	0	21.1	13.6	155.4
Upogebia larva	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Crab zoea	17.9	.9	0	0	3.8	6.6	.4		0	2.6	70.6	0	42.2	0	0
Crab megalops	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Crab adult	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	.3		0	0	0	0	42.2	0	62.2
Insecta, Post-larva	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	22.3	0	0	0		0	0	0	0	0	13.6	0
Mollusca															
Gastropoda	17.9	.9	0	111.7	1.9	6.6	2.1		0	2.6	0	5.6	42.2	0	0
Gastropod egg case	0	0	0	0	0	0	.3		2.1	0	0	5.6	0	0	0
Pelecypoda	53.6	12.0	62.4	156.3	5.6	157.4	20.4		48.2	7.7	1429.6	191.1	1288.3	27.1	93.2
Ectoprocta, Cyphonautes larva	0	.9	0	22.3	0	0	0		0	0	0	5.6	0	0	0
Chaetognatha	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Phoronidea, Actinotroch (larva)	0	4.3	0	0	0	0	0		0	0	0	0	0	0	0
Echinodermata															
Larva	0	0	0	22.3	3.8	249.3	.1		0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	1376.8	27.5	265.0	44.7	3.8	1508.8	0		0	0	0	5.6	0	0	0
Thaliacea	0	.9	0	0	0	0	0		0	0	0	0	0	0	0
Fish egg	8.9	.9	0	0	1.9	6.6	1.5		0	0	0	0	0	0	0
Fish larva	0	0	0	0	0	6.6	0		0	0	0	0	0	0	0
Unidentified															
Egg	125.2	1.7	498.9	647.6	193.6	98.4	7.3		10.3	10.2	194.1	134.9	0	0	0
"C"	0	.9	0	22.3	0	0	0		0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0		0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0		0	0	0	0	0	0	0
Miscellaneous	17.9	8.6	15.6	89.3	1.9	39.4	1.0		2.1	2.6	70.6	5.6	21.1	0	0
Nauplius	0	0	0	22.3	3.8	0	0		0	0	0	0	0	0	0
Total zooplankton/m^3, computer	5149.4	373.2	6189.2	9244.6	910.1	3404.6	145.0		414.1	1666.7	11154.0	2978.6	8384.6	4407.0	11314.2
Total zooplankton count, computer	576.0	434.0	397.0	414.0	484.0	519.0	1036.0		402.0	651.0	632.0	530.0	397.0	325.0	364.0
Total zooplankton count	576.0	434.0	397.0	414.0	484.0	519.0	1036.0		402.0	651.0	632.0	530.0	397.0	325.0	364.0
Total zooplankton/m^3	5149.4	373.2	6189.2	9244.6	909.9	3404.6	145.0		414.1	1666.6	11154.0	2978.6	8384.6	4407.0	11313.1

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1966, TO SEPTEMBER 8, 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	11.61	6.88	5.83	5.72	9.43	6.16	26.13	2.50	8.41	1.87	1.50	.12	1.88	1.83	1.56	16.49	1.48	4.77	7.90	7.44	.13	1.96	4.47	1.36	.14	1.46	2.55	8.94	.86	15.59	22.33	1.88	6.56	.14	0	1.03	2.56	17.65	5.62	21.12	13.56	31.08
Arthropoda, Crustacea, Copepoda																																										
Acartia clausi f.	626.9	227.0	122.4	205.9	132.0	172.5	261.3	10.0	311.2	18.2	3.0	0	0	0	0	0	0	0	0	0	.1	0	40.2	1.4	1.8	7.3	138.1	143.0	19.8	46.8	201.0	1.9	19.7	12.2		29.9	345.6	2876.9	713.7	1415.0	2128.9	4910.6

Acartia clausi m.; c.; III; II; I; n.
Acartia danae f.; m.; c.; III; II
Acartia longiremis f.; m.; c.; III; II; I
Acartia tonsa f.; m.; c.; III; II; I
Acartia spp. c.; III; II; I
Calanus spp. f.; m.; c.
"Calanus-type" c.
Calocalanus styliremis f.
Centropages mcmurrichi f.; m.; c.
Clausocalanus spp. f.; m.; c.; III
Ctenocalanus vanus f.; m.; c.; III
Epilabidocera amphitrites m.; c.
Eucalanus sp. f.; c.
Eurytemora sp. f.; m.; c.
Metridia sp. f.; m.; c.
Microcalanus sp. f.; m.
Tortanus discaudatus m.; c.
Paracalanus parvus f.; m.; c.; III; n.
Pseudocalanus sp. f.; m.; c.; III; II; I; n.
"Pseudocalanus-type" f.; c.; III; II; I
Rhincalanus sp. c.
Unidentified calanoid c.
Elongated copepod nauplius
Copepod nauplius
Corycaeus sp. f.; m.; c.
Oncaea sp. f.; c.
Oithona similis f.
Oithona sp. m.
Oithona similis c.
Oithona spinirostris f.; c.
Unidentified cyclopoid copepod
Harpacticoid copepod

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 2 IN ALSEA BAY, OREGON
PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 2 IN ALSEA BAY, OREGON
SEPTEMBER 1967 TO SEPTEMBER 1968
PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 2 IN ALSEA BAY, OREGON

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC	14JAN68
Surface salinity (°/oo)	32.86	33.42	32.87	32.04	20.29	32.64	32.54	26.92	31.91	23.97	32.39	24.77	31.06	14.35	9.64
Bottom salinity (°/oo)	32.97	33.44	32.92	32.20	20.68	32.72	32.54	28.23	31.92	24.32	32.39	27.87	31.40	28.57	22.41
Surface temperature (°C)	13.5	9.7	12.2	13.2	13.5	13.2	12.9	13.1	13.2	12.5	12.2	9.2	9.4	9.8	9.1
Bottom temperature (°C)	13.4	9.7	12.1	13.2	13.4	13.0	12.9	13.2	13.2	12.8	12.0	9.6	9.2	9.9	9.2
Surface sigma-t	24.7	25.8	24.9	24.1	15.0	24.6	24.5	20.2	24.0	18.0	24.6	19.1	24.0	11.0	7.4
Bottom sigma-t	24.5	25.8	25.0	24.2	15.3	24.6	24.5	21.2	24.0	18.2	24.6	21.5	24.5	22.0	17.3
Surface dissolved oxygen (ml/L)	6.33	6.42	6.52	6.11	5.79	6.16	6.36	6.29	6.26	6.31	6.49	6.49	6.71	7.32	7.48
Bottom dissolved oxygen (ml/L)	6.32	6.37	6.62	6.13	5.57	6.26	6.32	6.21	6.23	6.24	6.49	6.47	6.82	6.54	6.83
Surface oxygen saturation (%)	105.6	99.7	106.5	101.8	90.2	102.7	105.6	101.3	104.3	99.1	105.9	94.7	102.0	97.1	97.9
Bottom oxygen saturation (%)	105.2	99.1	108.2	102.2	86.8	104.2	104.8	101.0	103.5	98.1	105.7	96.9	103.8	100.8	98.1
Tide level (ft)	5.6	5.5	5.9	3.7	-1.0	6.7	6.9	3.4	7.3	2.9	7.4	1.6	6.7	6.3	4.8
Time of zooplankton tow (PST)	1045	1223	1143	1809	2156	1310	1411	1414	1442	1443	1311	1415	1325	1200	1414
Alsea River stream flow (ft^3/sec)	75	59	79	260	260	154	685	667	285	815	422	367	1380	1610	3290

Date	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY	8JUN	19JUN
Surface salinity (°/oo)	10.49	32.33	.98	21.42	8.61	30.39	31.86	32.36	8.89	32.21	15.28	32.12	13.99	31.99	32.64
Bottom salinity (°/oo)	15.74	32.33	10.70	28.19	14.66	30.44	31.95	32.37	15.43	32.19	22.21	32.18	16.72	32.02	32.96
Surface temperature (°C)	9.7	8.6	8.6	7.4	10.2	10.7	10.9	10.1	10.1	10.6	12.5	10.4	15.3	10.4	10.0
Bottom temperature (°C)	9.5	8.4	8.7	8.0	10.8	10.6	10.8	10.0	10.0	10.5	11.5	10.4	14.9	10.4	9.4
Surface sigma-t	8.0	25.1	.6	16.8	6.5	23.3	24.4	24.9	6.7	24.7	11.3	24.7	9.8	24.8	25.1
Bottom sigma-t	16.1	25.1	8.2	22.0	11.1	23.3	24.4	24.9	11.8	24.7	16.8	24.7	12.0	24.9	25.5
Surface dissolved oxygen (ml/L)	7.26	6.91	8.01	7.13	6.90	6.71	6.48	6.59	7.25	6.88	6.57	6.69	7.50	5.91	5.33
Bottom dissolved oxygen (ml/L)	7.04	6.93	7.66	6.95	6.49	6.71	6.53	6.56	6.58	6.82	6.07	6.64	6.78	5.74	4.93
Surface oxygen saturation (%)	97.6	104.1	98.9	97.4	93.0	104.8	102.4	103.0	97.7	108.3	97.0	104.9	116.6	92.6	83.1
Bottom oxygen saturation (%)	97.5	103.6	100.8	100.7	92.1	104.4	102.5	102.0	92.0	107.1	91.8	104.1	106.4	89.5	76.0
Tide level (ft)	2.4	8.6	3.8	4.8	1.3	7.8	4.7	5.7	-0.6	4.8	.6	5.0	-0.4	4.1	3.6
Time of zooplankton tow (PST)	1012	907	1650	755	1311	1201	1436	955	1135	1202	1014	1207	1158	1141	806
Alsea River stream flow (ft^3/sec)	2350	1320	4860	1480	1310	2680	1800	942	742	616	485	400	353	781	416

Date	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
Surface salinity (°/oo)	12.64	32.97	18.89	32.65	31.46	33.71	19.90	33.46	32.82	32.20	28.91	32.59
Bottom salinity (°/oo)	16.39	33.16	20.23	32.65	32.28	33.79	22.23	33.53	32.93	32.23	31.29	32.59
Surface temperature (°C)	17.2	11.3	17.2	14.4	13.5	8.9	16.4	11.4	13.7	14.8	17.2	13.5
Bottom temperature (°C)	16.4	11.1	16.6	14.3	12.6	8.8	16.3	10.3	13.6	14.6	14.7	13.4
Surface sigma-t	8.5	25.2	13.2	24.3	23.6	26.1	14.0	25.5	24.6	23.9	20.9	24.5
Bottom sigma-t	11.5	25.3	14.4	24.3	24.4	26.2	15.9	25.4	24.7	23.9	23.2	24.5
Surface dissolved oxygen (ml/L)	6.27	6.59	5.71	6.52	6.80	3.83	5.49	5.50	6.15	6.01	5.93	6.28
Bottom dissolved oxygen (ml/L)	5.60	6.63	5.26	6.56	6.80	3.77	5.32	4.87	6.12	5.46	6.22	6.35
Surface oxygen saturation (%)	100.5	105.8	95.0	111.6	113.3	58.6	91.5	88.7	103.9	103.4	104.6	105.5
Bottom oxygen saturation (%)	90.6	106.4	87.4	112.1	111.8	57.6	84.8	76.9	103.4	102.2	105.8	106.4
Tide level (ft)	-0.8	3.8	-1.0	5.7	3.3	5.6	-0.4	5.1	3.6	5.7	4.5	5.6
Time of zooplankton tow (PST)	749	620	811	1712	1702	1511	515	1549	1452	1312	1315	1317
Alsea River stream flow (ft^3/sec)	322	267	215	213	172	151	136	114	177	762	243	150

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968
ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968
ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC	14JAN68
X factor	1.50	1.45	6.18	3.39	25.51	2.37	5.36	1.96	.66	.72	.28	.35	1.33	.72	.25
Protista															
Dinoflagellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foraminifera	0	5.8	0	6.8	0	0	0	2.0	0	2.9	.6	.7	2.7	1.4	2.8
Radiolaria	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	.3
Coelenterata															
Medusa	12.0	24.7	12.4	17.0	0	33.3	10.7	29.4	.7	1.4	.7	0	0	0	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	2.4	0	0	0	0	0	0	0	0	0
Nematoda	4.5	1.5	0	3.4	25.5	0	0	3.9	1.3	0	0	.4	0	0	.3
Annelida															
Adult	0	0	0	0	0	0	0	3.9	0	2.2	0	0	1.3	0	0
Larva	0	8.7	6.2	33.9	0	26.1	42.9	78.6	.7	1.4	1.4	.7	0	0	0
Arthropoda															
Crustacea															
Podon leuckarti	0	0	38.9	10.2	0	0	0	0	0	0	.3	0	0	0	0
Podon polyphemoides	0	0	0	10.2	0	0	0	5.9	5.3	0	0	0	0	0	0
Evadne sp.	0	0	0	13.6	0	0	0	11.8	3.3	0	0	0	0	0	0
Fresh water Cladocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	103.5	7.3	568.6	166.1	102.0	7.1	10.7	9.8	1.3	.7	5.9	.4	0	0	0
Barnacle cypris	27.0	23.2	55.6	342.4	25.5	497.7	16.1	35.3	1.3	29.5	0	1.8	0	0	1.0
Mysidacea	0	1.5	12.4	0	77.6	9.9	5.4	3.9	0	0	0	0	0	0	.5
Cumacea	0	2.9	6.2	0	0	0	0	0	0	0	0	0	1.3	0	0
Tanaidacea	0	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	2.9	0	0	0	0	0	2.0	0	0	.3	.4	0	0	0
Amphipoda	0	1.5	0	0	25.5	2.5	5.4	0	.7	0	.3	0	1.3	0	.3
Euphausiacea	6.0	0	6.2	17.0	0	0	0	0	2.0	0	0	0	0	0	0
Unidentified decapod larva	0	0	18.5	0	0	0	0	0	0	0	0	0	0	1.4	0
Callianassa larva	0	0	0	13.6	0	0	0	0	0	0	0	0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	6.0	0	68.0	10.2	0	9.5	10.7	0	0	.7	0	0	0	0	0
Crab megalops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab adult	0	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	2.4	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca															
Gastropoda	6.0	5.8	86.5	20.3	25.5	7.1	10.7	3.9	4.0	4.3	3.6	2.8	0	1.4	0
Gastropod egg case	1.5	1.5	0	6.8	0	0	0	0	0	0	0	0	0	0	.3
Pelecypoda	45.0	50.8	49.4	64.4	0	111.4	59.0	149.0	13.9	40.3	12.6	13.6	0	5.0	16.5
Entoprocta, Cyphonautes larva	0	1.5	0	0	0	0	0	2.0	0	0	0	0	0	0	0
Chaetognatha	0	.1	0	3.4	0	0	42.9	0	.7	3.6	1.1	4.2	0	0	.3
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata															
Larva	141.0	0	0	0	0	0	10.7	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	241.5	2.9	61.8	81.4	25.5	0	117.9	21.6	35.8	0	.6	0	0	7.9	.8
Thaliacea	0	0	6.2	0	0	0	0	25.5	.7	0	0	0	0	0	0
Fish egg	0	0	6.2	0	0	0	0	0	0	0	0	.4	0	0	.3
Fish larva	0	0	0	0	0	0	0	0	0	0	.3	0	0	.7	0
Unidentified															
Egg	0	16.0	0	3.4	0	0	0	7.8	.7	0	1.7	2.1	1.3	.7	17.5
"C"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	0	.7	0	0	0	0	0	0
"E"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	1.5	11.6	0	13.6	0	0	53.6	7.8	1.3	4.3	.6	1.8	4.1	0	1.3
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m^3, computer	1176.0	687.4	4356.9	1725.5	23827.4	1169.1	2937.3	807.5	291.2	309.6	180.4	130.2	149.1	334.1	113.5
Total zooplankton count, computer	784.0	474.0	705.0	509.0	934.0	493.0	548.0	412.0	441.0	430.0	644.0	372.0	112.0	464.0	454.0
Total zooplankton count	784.0	474.0	705.0	509.0	934.0	493.0	548.0	412.0	441.0	430.0	644.0	372.0	112.0	464.0	454.0
Total zooplankton/m^3	1176.0	687.3	4356.9	1725.5	23826.3	1168.4	2937.3	807.5	291.1	309.6	180.3	130.2	149.0	334.1	113.5

Date	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY	8JUN	19JUN
X factor	1.26	.94	.13	1.66	.13	4.67	1.84	5.53	.13	2.68	.42	4.80	1.24	2.63	6.25
Protista															
Dinoflagellata	0	0	0	0	0	0	0	5.5	0	0	0	0	0	0	0
Foraminifera	3.8	.9	0	0	0	0	0	0	0	0	0	0	0	0	0
Radiolaria	0	0	0	0	0	0	12.9	83.8	0	0	0	0	0	0	0
Coelenterata															
Medusa	0	4.7	.1	0	0	9.3	36.8	94.0	1.3	18.8	6.3	62.4	1.2	0	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	0	0	.5	0	0	0	0	0	.5	0	.4	0	5.0	0	0
Annelida															
Adult	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	0	.9	0	0	0	14.0	27.6	38.7	2.6	21.4	0	91.2	3.7	0	6.3
Arthropoda															
Crustacea															
Podon leuckarti	0	0	0	0	0	0	0	0	0	2.7	.4	0	1.2	126.2	675.0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.5
Fresh water Cladocera	0	0	.5	0	0	14.0	0	0	.1	0	0	0	0	0	0
Ostracoda	0	0	.1	0	0	0	0	0	0	0	.4	0	0	0	0
Barnacle nauplius	0	.9	0	1.7	1.0	312.9	11.0	226.7	.9	56.3	5.0	259.2	48.4	2.6	750.0
Barnacle cypris	0	.9	.5	5.0	0	0	0	16.6	17.2	48.2	10.9	48.0	2.5	18.4	18.8
Mysidacea	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	.9	.1	0	0	0	0	0	0	0	0	4.8	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	.9	.1	0	0	0	1.8	0	.3	0	.4	0	0	0	0
Amphipoda	1.3	0	.9	3.3	0	0	0	0	1.3	0	0	0	1.2	0	0
Euphausiacea	0	0	0	0	0	14.0	3.7	55.3	0	48.2	1.3	38.4	0	0	0
Unidentified decapod larva	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	1.7	2.6	0	0	5.5	5.5	2.7	3.8	4.8	0	0	12.5
Upogebia larva	0	0	0	0	.1	0	1.8	0	1.2	0	0	4.8	0	0	0
Crab zoea	0	7.5	0	0	.3	4.7	5.5	16.6	.3	8.0	.4	4.8	0	0	12.5
Crab megalops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab adult	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.3
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	.3	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	.9	.4	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca															
Gastropoda	0	2.8	0	0	0	14.0	0	16.6	0	29.5	.8	57.6	0	10.5	18.8
Gastropod egg case	0	0	0	0	0	0	0	0	.1	0	0	0	0	0	0
Pelecypoda	1.3	65.8	8.8	122.8	.1	32.7	12.9	66.4	6.9	187.6	69.3	235.2	13.6	97.3	525.0
Entoprocta, Cyphonautes larva	0	.9	0	0	0	0	0	5.5	0	0	.4	4.8	0	0	0
Chaetognatha	0	1.9	0	3.5	0	0	3.7	66.4	.5	8.0	.4	4.8	3.7	15.8	62.5
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	2.7	.4	0	0	0	0
Echinodermata															
Larva	0	0	0	0	0	0	1.8	0	0	37.5	.4	81.6	0	0	0
Chordata, Larvacea and larval Ascidacea	0	11.3	0	10.0	0	168.1	134.3	276.5	0	64.3	0	172.8	2.5	0	0
Thaliacea	0	0	0	1.7	0	0	0	0	0	0	0	4.8	0	0	0
Fish egg	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0	0
Fish larva	0	.9	.1	1.8	.5	0	.5	0	.9	0	.8	0	3.7	0	0
Unidentified															
Egg	3.8	6.6	2.9	13.3	17.2	56.0	0	33.2	2.3	32.2	2.1	196.8	1.2	2.6	6.3
"C"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"E"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	6.3	11.3	.8	3.3	0	0	0	5.5	.4	34.8	3.4	24.0	0	2.6	6.3
Nauplius	0	0	0	0	0	0	0	0	.1	2.7	0	0	0	0	0
Total zooplankton/m^3, computer	69.3	550.8	53.7	712.4	32.5	1984.7	944.4	3782.5	93.9	1072.0	228.1	2150.4	638.6	1091.4	4068.8
Total zooplankton count, computer	55.0	586.0	413.0	429.0	250.0	425.0	513.0	684.0	722.0	400.0	543.0	448.0	515.0	415.0	651.0
Total zooplankton count	55.0	586.0	413.0	429.0	250.0	425.0	513.0	684.0	722.0	400.0	543.0	448.0	515.0	415.0	651.0
Total zooplankton/m^3	69.3	550.8	53.7	712.1	32.5	1984.7	943.9	3782.5	93.9	1072.0	228.1	2150.4	638.6	1091.4	4068.8

Date	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
X factor	1.28	11.45	1.28	30.90	3.96	78.50	2.84	104.59	2.91	6.79	1.38	4.29
Protista												
Dinoflagellata	0	0	0	0	0	0	0	0	0	0	0	0
Foraminifera	0	0	0	0	0	0	0	0	0	0	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	34.8	0	8.6
Coelenterata												
Medusa	0	11.5	0	30.9	4.0	.1	0	15.3	5.8	34.0	7.8	4.3
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	.1	.6
Nematoda	0	0	0	0	0	0	0	0	0	0	0	0
Annelida												
Adult	0	0	0	0	0	0	0	0	0	0	0	0
Larva	1.3	11.5	0	0	15.8	0	6.1	0	0	6.8	2.6	12.9
Arthropoda												
Crustacea												
Podon leuckarti	2.6	0	0	30.9	0	0	0	0	157.1	1127.1	107.9	21.4
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	209.2	23.3	34.0	15.6	60.1
Fresh water Cladocera	0	0	1.3	0	0	0	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	35.8	68.7	162.6	185.4	114.8	70.5	765.0	209.2	348.5	258.0	76.7	47.2
Barnacle cypris	0	0	0	0	15.8	0	0	0	37.8	5.1	70.2	17.2
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	4.0	0	0	0	0	0	0	0
Amphipoda	1.3	0	0	0	0	0	0	0	0	0	0	0
Euphausiacea	0	0	0	61.8	4.0	0	0	0	2.9	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	9.0	11.5	2.6	0	7.9	70.5	4.1	0	0	6.8	2.6	4.3
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	0	34.3	0	0	15.8	0	0	0	11.6	6.8	2.6	4.3
Crab megalops	0	0	0	0	0	0	0	0	0	0	1.3	0
Crab adult	0	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	1.3	0
Larva	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	0	0	0	0	0	0	6.8	0	0
Mollusca												
Gastropoda	0	22.9	0	0	4.0	0	0	104.6	2.9	27.2	2.6	21.4
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	6.4	148.8	2.6	92.7	47.5	141.0	0	523.0	148.4	88.3	48.1	25.7
Entoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0	6.8	2.6	8.6
Chaetognatha	1.3	22.9	0	0	51.5	70.5	0	0	0	6.8	1.3	21.4
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata												
Larva	0	0	0	2008.5	0	0	0	0	2.9	2498.7	23.4	0
Chordata, Larvacea and larval Ascidacea	0	0	0	0	0	0	0	0	0	258.8	6.5	1482.8
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	90.1
Fish egg	0	0	0	0	0	0	0	0	0	0	0	0
Fish larva	17.9	0	1.3	0	0	0	2.0	0	0	0	0	0
Unidentified												
Egg	0	22.9	0	0	7.9	493.5	8.2	209.2	26.2	0	22.1	90.1
"C"	0	0	0	0	0	0	0	0	0	0	0	0
"A"	0	0	0	0	0	0	0	0	0	0	1.3	0
"E"	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	0	0	0	0	7.9	0	0	0	2.9	0	3.9	13.0
Nauplius	0	0	0	0	0	0	0	0	0	0	0	8.6
Total zooplankton/m^3, computer	500.5	6034.2	547.8	22062.6	1789.9	44556.1	977.2	46871.6	1411.3	5262.3	622.8	2626.2
Total zooplankton count, computer	391.0	527.0	428.0	714.0	452.0	632.0	479.0	448.0	485.0	775.0	479.0	612.0
Total zooplankton count	391.0	527.0	428.0	714.0	452.0	632.0	479.0	448.0	485.0	775.0	479.0	612.0
Total zooplankton/m^3	500.5	6034.1	547.8	22062.6	1789.9	44556.0	977.2	46856.3	1411.3	5262.3	622.7	2625.5

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC
X factor	1.50	1.45	6.18	3.39	25.51	2.37	5.36	1.96	.66	.72	.28	.35	1.33
Arthropoda, Crustacea, Copepoda													
Acartia clausi f.	16.5	140.7	642.7	111.9	10331.5	66.4	412.7	35.3	11.9	10.8	15.7	1.8	6.6
" " m.	9.0	36.3	964.1	100.5	5586.7	40.3	420.8	35.3	4.0	3.6	9.2	1.8	4.0
" " c.	75.0	56.6	877.6	101.7	5918.3	26.1	300.2	27.4	4.0	7.2	8.1	.7	1.3
" " III	22.5	2.9	43.3	10.2	306.1	2.4	5.4	3.9	0	0	0	0	0
" " II	4.5	0	6.2	6.8	76.5	0	0	0	0	0	0	0	0
" " I	3.0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	2.0	11.9	0	.3	0	0
" " m.	0	0	0	0	0	0	0	0	4.0	.7	0	0	0
" " c.	0	0	0	6.8	0	0	16.1	0	23.1	0	.8	0	0
" " III	0	0	0	0	0	0	0	0	7.9	0	0	0	0
" " II	0	0	0	0	0	0	0	0	.7	0	0	0	0
Acartia longiremis f.	45.0	7.3	43.3	13.6	0	7.1	26.8	5.9	2.8	2.2	.3	2.5	0
" " m.	54.0	8.7	86.5	44.1	0	11.9	5.4	3.9	0	3.6	0	0	0
" " c.	102.0	0	296.6	128.8	0	14.2	21.4	3.9	.7	1.4	.3	0	0
" " III	45.8	0	55.6	57.6	0	4.7	0	3.9	0	.7	0	0	0
" " II	52.5	1.5	49.4	44.1	0	2.4	0	2.0	0	0	0	0	0
" " I	37.5	0	0	3.4	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	0	0	0	0	0	0	0	0	0	0	.7	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	.4	0
" " c.	0	0	0	0	0	0	5.4	2.0	0	2.9	.6	0	2.7
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	1.5	0	0	0	0	0	0	.7	.7	0	0	0
" " II	0	0	0	0	0	0	0	2.0	0	0	0	0	0
" " I	0	0	12.4	0	0	0	0	2.0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	.4	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	6.2	0	0	2.4	21.4	0	.7	0	0	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	4.5	0	18.5	0	0	0	0	2.0	0	0	0	.4	0
" " c.	13.5	5.8	68.0	17.0	0	7.1	37.5	3.9	0	0	0	0	0
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	3.3	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	.6	0	0
" " c.	0	0	0	0	0	0	0	0	8.6	0	0	.7	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	0	6.6	0	.6	1.8	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	7.9	0	2.5	8.1	1.3
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0		0
Eucalanus sp. f.	0	0	0	0	0	0	0	0	.1	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	0	0	0	0	153.1	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	76.5	0	0	0	0	0	0	0	0
" " c.	0	1.5	0	0	918.4	0	0	0	0	0	0	0	0
Metridia sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	6.2	0	0	0	0	0	0	1.4	1.7	.4	0
Paracalanus parvus f.	15.0	27.5	0	33.9	25.5	64.0	187.6	49.0	13.2	26.6	25.8	33.3	23.9
" " m.	0	10.2	0	3.4	0	11.9	32.2	13.7	1.3	1.4	5.0	.4	5.3
" " c.	10.5	24.7	0	27.1	0	71.1	439.5	80.4	41.6	34.6	18.8	15.4	66.5
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	.3	0	0
Pseudocalanus sp. f.	0	2.9	0	0	0	0	0	0	0	0	0	0	5.3
" " m.	0	0	0	0	0	0	10.7	0	0	0	0	0	0
" " c.	3.0	5.8	18.5	0	0	7.1	48.2	0	0	.7	1.7	7.3	2.7
" " III	0	7.3	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" c.	3.0	0	0	0	0	0	0	0	2.0	0	0	0	0
" III	0	1.5	0	0	0	0	10.7	0	0	0	0	0	0
" II	1.5	0	0	0	0	0	5.4	0	0	0	0	0	0
" I	0	0	0	3.4	0	0	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	3.0	0	0	0	0	0	0	0	0	0	.3	0	0
Elongated copepod nauplius	0	0	0	3.4	0	0	0	3.9	0	0	0	0	0
Copepod nauplius	27.0	5.8	80.3	13.6	0	0	5.4	0	1.3	.7	0	0	0
Corycaeus sp. f.	0	2.9	0	0	0	4.7	230.5	29.4	7.9	15.8	7.6	3.5	2.7
" " m.	0	0	0	3.4	0	56.9	198.3	52.9	17.2	15.1	25.8	8.8	2.7
" " c.	1.5	0	0	3.4	0	35.5	21.4	33.3	7.3	64.8	15.1	5.6	0
Oncaea sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	18.0	111.7	68.0	125.4	0	14.2	59.0	2.0	25.7	23.0	8.4	5.9	8.0
Oithona sp. m.	0	11.6	0	6.8	0	0	0	0	0	0	.6	0	0
Oithona similis c.	6.0	16.0	6.2	3.4	0	4.7	10.7	0	1.3	0	0	0	0
Oithona spinirostris f.	0	2.9	6.2	3.4	0	2.4	0	0	.7	0	0	1.0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	20.3	6.2	0	76.5	2.4	0	5.9	0	0	.6	.4	0
Harpacticoid copepod	0	1.5	0	3.4	51.0	0	0	5.9	.7	0	0	1.8	4.0

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	28DEC	14JAN68	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY
X factor	.72	.25	1.26	.94	.13	1.66	.13	4.67	1.84	5.53	.13	2.68	.42	4.80	1.24
Arthropoda, Crustacea, Copepoda															
Acartia clausi f.	18.1	.3	1.3	.9	.4	18.3	.8	9.3	38.6	11.1	2.3	0	2.1	24.0	33.5
" " m.	2.2	0	2.5	2.8	.3	5.0	.6	9.3	7.4	16.6	1.3	0	2.1	24.0	8.7
" " c.	9.4	0	0	.9	.1	19.9	.6	4.7	14.7	0	1.3	8.0	5.5	19.2	17.4
" " III	0	0	0	0	.3	0	.1	0	0	0	0	0	0	0	1.2
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	.9	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	5.0	0	0	0	.1	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	21.6	0	0	3.8	0	5.0	0	0	0	0	0	0	0	0	0
" " m.	8.6	0	0	3.8	0	1.7	.1	4.7	0	0	0	0	0	14.4	7.4
" " c.	15.1	0	0	3.8	0	0	0	0	0	0	0	0	0	4.8	12.4
" " III	3.6	0	0	.9	0	0	0	0	0	0	0	0	0	0	2.5
" " II	0	0	0	1.9	0	0	.1	0	0	0	0	0	0	0	1.2
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	3.6	0	0	13.2	0	6.6	.3	18.7	5.5	0	.4	2.7	.4	0	1.2
" " m.	0	0	0	5.6	0	1.7	0	23.3	20.2	22.1	.3	10.7	2.1	4.8	2.5
" " c.	18.0	0	0	8.5	.1	5.0	.6	46.7	5.5	60.8	1.7	21.4	26.5	9.6	9.9
" " III	.7	0	0	0	0	1.7	.1	18.7	0	0	0	0	0	4.8	5.0
" " II	0	0	0	0	0	0	.1	9.3	0	0	0	0	0	4.8	2.5
" " I	0	0	0	0	0	0	0	9.3	0	0	0	0	0	0	2.5
Acartia spp. c.	.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	.7	0	0	0	0	0	0	0	0	0	.1	2.7	0	9.6	6.2
" " II	0	0	0	0	0	0	0	0	0	0	0	5.4	0	4.8	0
" " I	0	0	0	.9	0	0	0	0	0	11.1	0	13.4	0	9.6	2.5
Calanus spp. f.	.7	0	1.3	10.3	0	1.7	0	0	0	5.5	0	0	0	0	0
" " m.	0	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0
" " c.	2.9	1.3	6.3	29.1	.1	3.3	.6	84.1	16.6	132.7	0	10.7	0	24.0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.2
Calocalanus styliremis f.	0	0	0	0	.1	1.7	0	0	1.8	5.5	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	2.2	0	0	.9	0	0	.1	4.7	3.7	0	0	0	2.5	4.8	5.0
Clausocalanus spp. f.	5.8	1.5	0	3.8	.8	11.6	0	14.0	3.7	0	0	0	0	0	0
" " m.	.7	.3	0	4.7	.6	3.3	0	14.0	1.8	0	0	0	0	0	0
" " c.	20.9	1.8	1.3	.9	.9	1.7	0	0	1.8	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	4.3	.5	0	.9	0	0	0	0	0	5.5	0	0	0	0	0
" " m.	.7	0	0	1.9	0	5.0	0	0	0	0	0	0	0	0	0
" " c.	15.1	1.0	0	11.3	.1	0	0	0	1.8	5.5	.1	0	0	0	0
" " III	.7	0	0	0	0	0	0	4.7	0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	0	0	0	0	0	0	0	0	0	0	5.1	0	1.3	0	3.7
" " m.	0	0	0	0	0	0	0	0	0	0	10.5	0	2.5	0	63.2
" " c.	0	0	0	0	.1	0	0	0	0	0	14.0	0	5.8	14.4	230.6
Metridia sp. f.	.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	5.5	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	.1	1.7	0	0	1.8	5.5	0	0	0	4.8	1.2
Paracalanus parvus f.	46.8	14.3	5.0	36.7	1.2	66.4	1.4	74.7	51.5	27.7	.5	2.7	2.1	0	0
" " m.	4.3	1.5	0	8.5	.4	16.6	0	4.7	3.7	0	.1	0	0	0	0
" " c.	45.4	19.3	6.3	24.4	3.4	36.5	.5	37.4	18.4	16.6	.8	0	6.3	0	1.2
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	2.2	.3	1.3	25.4	.1	11.6	.1	9.3	0	232.3	.9	5.4	0	28.8	0
" " m.	0	0	1.3	24.4	.3	31.5	0	0	3.7	71.9	.3	5.4	0	14.4	0
" " c.	10.1	.8	2.5	70.5	.3	28.2	2.7	70.0	51.5	486.6	3.2	56.3	6.7	148.8	9.9
" " III	.7	0	0	15.0	0	0	.1	0	0	0	0	0	0	0	0
" " II	0	0	0	.9	0	0	0	4.7	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" c.	.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" III	.7	1.0	0	.9	0	0	.1	4.7	0	16.6	0	0	0	0	0
" II	0	0	0	0	.1	0	0	0	0	5.5	0	8.0	0	0	3.7
" I	0	0	0	0	.1	0	0	0	1.8	0	0	0	0	0	8.7
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	0	0	0	1.9	.3	1.7	0	0	1.8	22.1	.1	0	0	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	3.7	0	0	0	0	0	0
Copepod nauplius	0	7.0	2.5	12.2	0	5.0	.4	210.1	40.5	66.4	.3	227.8	4.6	283.2	83.1
Corycaeus sp. f.	4.3	.8	0	1.9	0	11.6	0	0	5.5	0	.3	0	2.1	0	0
" " m.	4.3	1.0	0	.9	0	1.7	0	9.3	35.0	5.5	.1	2.7	1.7	0	1.2
" " c.	2.2	2.3	1.3	2.8	.3	6.6	.3	9.3	5.5	0	.5	0	.8	0	0
Oncaea sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	33.1	15.5	16.4	74.3	17.0	189.2	.3	280.2	294.4	1094.9	4.2	40.2	42.8	158.4	13.6
Oithona sp. m.	.7	0	0	11.3	.9	10.0	0	84.1	23.9	60.8	0	0	1.3	4.8	0
Oithona similis c.	0	0	0	0	0	19.9	0	270.9	18.4	370.5	0	10.7	.4	14.4	0
Oithona spinirostris f.	1.4	1.0	0	1.9	0	1.7	0	0	3.7	0	0	0	0	0	0
" " c.	.7	0	0	0	0	1.7	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	1.3	0	.5	5.0	0	0	0	0	.1	0	0	0	0
Harpacticoid copepod	.7	.5	2.5	1.9	8.3	1.7	.3	0	0	5.5	2.5	32.2	1.7	14.4	1.2

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 2 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 8, 1967, TO SEPTEMBER 8, 1968

Date	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
X factor	2.63	6.25	1.28	11.45	1.28	30.90	3.96	70.50	2.04	104.59	2.91	6.79	1.30	4.29
Arthropoda, Crustacea, Copepoda														
Acartia clausi f.	7.9	437.5	49.9	469.5	20.5	247.2	134.6	10786.5	20.4	11191.1	14.5	88.3	15.6	34.3
" " m.	2.6	531.3	20.5	927.4	25.6	216.3	788.0	9729.0	6.1	15688.5	154.2	54.3	10.4	30.0
" " c.	26.3	318.8	43.5	492.3	12.8	834.3	225.7	16638.0	10.2	5961.6	282.3	81.5	33.8	183.8
" " III	0	6.3	0	0	0	0	0	0	0	0	0	0	0	4.3
" " II	0	6.3	0	0	0	30.9	0	0	0	0	11.6	0	0	0
" " I	0	6.3	1.3	0	0	0	0	0	0	0	0	0	0	4.3
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	15.8	6.3	0	91.6	0	30.9	4.0	211.5	0	313.8	2.9	28.4	5.2	34.3
" " m.	10.5	56.3	2.6	320.6	0	896.1	11.9	0	0	418.4	11.6	20.4	5.2	38.6
" " c.	21.0	62.5	1.3	366.4	0	6736.2	4.0	423.0	0	104.6	26.2	47.5	15.6	68.6
" " III	23.7	0	0	22.9	0	3151.8	4.0	70.5	0	104.6	14.5	6.8	9.1	12.9
" " II	0	0	0	0	0	3553.5	4.0	0	0	0	29.1	6.0	5.2	8.6
" " I	0	0	0	0	0	927.0	0	0	0	0	0	0	0	8.6
Acartia tonsa f.	15.8	43.8	0	22.9	0	30.9	0	0	0	418.4	0	6.8	0	0
" " m.	13.1	12.5	1.3	11.5	0	30.9	4.0	0	0	313.8	0	20.4	1.3	8.6
" " c.	36.8	6.3	1.3	0	0	30.9	0	0	0	0	5.8	20.4	7.8	38.0
" " III	0	0	0	0	0	61.8	0	0	0	0	0	13.6	1.3	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	1.3	8.6
" " I	0	0	0	0	0	30.9	0	0	0	0	0	0	0	8.6
Acartia spp. c.	0	0	0	0	0	30.9	0	0	0	0	0	0	0	0
" " III	0	6.3	0	0	0	30.9	0	0	0	0	0	0	0	0
" " II	0	6.3	0	0	0	92.7	0	0	0	0	0	0	0	0
" " I	0	25.0	0	0	0	0	0	0	0	0	17.5	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	494.4	0	70.5	0	836.7	0	0	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	5.3	6.3	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	11.5	0	0	0	0	0	104.6	0	27.2	0	0
" " m.	0	0	0	0	0	0	0	70.5	0	0	0	20.4	0	0
" " c.	5.3	43.8	7.7	57.3	0	618.0	51.5	70.5	0	732.1	32.8	122.2	5.2	55.8
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	2.6	0	0	0	0	0	0	70.5	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. f.	0	0	0	0	0	30.9	0	0	0	104.6	2.9	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	4.3
Eurytemora sp. f.	0	0	60.2	0	33.3	0	0	0	16.3	0	0	0	0	0
" " m.	2.6	0	53.8	0	73.0	0	4.0	0	10.2	0	0	0	0	0
" " c.	0	0	176.6	0	199.7	0	35.6	0	118.3	0	0	0	0	0
Metridia sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0	4.3
" " c.	0	0	0	11.5	1.3	0	0	0	0	0	2.9	0	0	0
Paracalanus parvus f.	7.9	6.3	0	0	0	0	0	0	0	0	0	47.5	5.2	25.7
" " m.	0	0	0	0	0	0	0	0	0	0	0	20.4	0	0
" " c.	0	0	0	0	0	0	0	70.5	0	0	2.9	48.7	5.2	17.2
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	10.5	6.3	0	732.6	1.3	92.7	0	1833.0	0	2405.6	0	0	0	8.6
" " m.	2.6	6.3	0	91.6	0	0	0	0	0	209.2	0	0	1.3	0
" " c.	268.3	168.8	0	2015.2	7.7	1266.9	71.3	1974.0	0	4706.5	0	0	5.2	60.1
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	104.6	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" c.	2.6	0	0	0	0	0	0	0	0	0	2.9	0	0	0
" III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" II	0	0	0	0	0	0	19.8	0	0	0	0	0	0	0
" I	0	12.5	0	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	0	0	0	0	0	0	0	70.5	0	0	0	0	0	0
Elongated copepod nauplius	0	0	0	0	0	30.9	0	0	0	0	14.5	0	0	0
Copepod nauplius	0	37.5	0	22.9	0	123.6	110.9	1410.0	4.1	1882.6	14.5	0	1.3	42.9
Corycaeus sp. f.	10.5	0	0	0	0	0	0	0	0	0	0	13.6	5.2	4.3
" " m.	21.0	6.3	0	0	0	0	0	0	0	0	0	27.2	14.3	4.3
" " c.	0	0	0	0	0	0	0	0	0	0	0	13.6	7.8	17.2
Oncaea sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	270.9	108.0	2.6	11.5	2.6	30.9	15.8	211.5	0	0	0	27.2	49.4	68.6
Oithona sp. m.	15.8	0	0	0	0	0	0	0	0	0	0	0	2.6	0
Oithona similis c.	5.3	0	0	0	0	0	0	0	0	0	2.9	6.8	0	38.0
Oithona spinirostris f.	5.3	6.3	0	0	0	0	0	0	0	0	0	0	1.3	0
" " c.	2.6	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harpacticoid copepod	2.6	0	2.6	0	0	0	0	0	6.1	0	2.9	13.6	6.5	17.2

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 3 IN ALSEA BAY, OREGON
SEPTEMBER 1966 TO SEPTEMBER 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67	22JAN
Surface salinity (°/oo)		32.39	33.13	33.00	32.91	20.29	32.74	25.33	5.15	6.32	28.76	.11	.23	.56	.49
Bottom salinity (°/oo)		32.34	32.21	33.01	32.96	21.38	32.67	26.71	29.55	8.55	30.43	.09	22.66	1.17	25.47
Surface temperature (°C)		15.7	14.3	12.1	10.3	11.7	11.3	9.4	10.6	8.9	11.6	5.4	9.6	9.4	7.7
Bottom temperature (°C)		[illegible]	14.7	11.3	9.9	11.6	11.1	9.2	10.4	8.8	11.3	8.2	10.7	9.4	9.1
Surface sigma-t		23.8	23.5	25.0	25.4	15.3	25.0	19.6	3.7	4.8	21.5	-0.1	0	.2	.3
Bottom sigma-t		23.9	23.9	25.2	25.4	16.2	25.0	19.9	23.7	6.6	23.2	-0.1	17.3	.7	19.7
Surface dissolved oxygen (ml/L)															
Bottom dissolved oxygen (ml/L)															
Surface oxygen saturation (%)															
Bottom oxygen saturation (%)															
Tide level (ft)		7.9	4.3	5.5	6.8	1.2	7.5	1.7	7.9	3.2	7.5	1.1	6.9	3.1	3.0
Time of zooplankton tow (PST)		1500	1251	1417	1419	1638	1500	1448	1445	1247	1439	1513	1509	947	1319
Alsea River stream flow (ft³/sec)	54	108	67	67	67	143	109	112	2940	1050	654	6270	8180	2770	4420

Date	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR	6MAY	12MAY	22MAY
Surface salinity (°/oo)	.07	.07	10.75	.07	25.19	2.56	.26	28.11	.72	4.21	15.11	7.85	25.73	31.24	30.55	32.87
Bottom salinity (°/oo)	.09	.09	14.13	.08	28.12	2.37	.51	29.14	.74	25.55	21.15	29.67	26.74	31.49	30.93	33.85
Surface temperature (°C)	8.9	9.4	8.8	8.3	8.9	9.0	8.5	10.4	10.3	9.6	11.0	13.6	11.9	12.1	12.0	11.3
Bottom temperature (°C)	8.4	9.3	8.6	7.9	8.8	7.7	9.7	9.9	10.4	9.5	11.2	10.2	11.5		11.4	10.6
Surface sigma-t	-0.1	-0.2	3.3	-0.1	19.5	1.9	.1	21.7	-0.1	3.1	11.4	5.5	19.5	23.7	23.2	25.1
Bottom sigma-t	-0.1	-0.1	11.1	-0.1	21.8	1.8	.2	22.5	.3	19.7	16.0	22.8	20.3		24.7	25.2
Surface dissolved oxygen (ml/L)																
Bottom dissolved oxygen (ml/L)																
Surface oxygen saturation (%)																
Bottom oxygen saturation (%)																
Tide level (ft)	4.9	.6	5.4	2.7	8.2	.6	4.0	6.6	1.6	7.8	4.2	4.3	3.5	5.7	5.1	6.1
Time of zooplankton tow (PST)	1424	1313	951	1207	1001	1357	1518	1300	1513	1458	1534	1249	1527	1129	1414	1721
Alsea River stream flow (ft³/sec)	7060	3120	1360	3220	1740	1210	4930	2170	2040	1270	1780	1400	1010	725	608	415

Date	30MAY	12JUN	20JUN	26JUN	3JUL	13JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
Surface salinity (°/oo)	17.99	30.60	32.69	29.65	26.77	33.55	23.49	24.35	33.18	[illegible]	33.35
Bottom salinity (°/oo)	15.96	31.05	32.46	30.03	31.75	33.55	33.49	24.45	33.25	31.96	33.35
Surface temperature (°C)	15.8	14.2	11.4	13.0	17.3	11.2	11.0	19.2	11.6	[illegible]	12.8
Bottom temperature (°C)	15.1	13.5	11.2	12.9	13.3	11.0	10.8	15.5	11.2	[illegible]	12.7
Surface sigma-t	12.8	22.8	24.9	22.3	19.2	25.6	25.6	16.9	25.2	23.9	25.2
Bottom sigma-t	13.7	21.3	25.1	22.6	23.9	25.7	25.7	17.1	25.4	[illegible]	25.2
Surface dissolved oxygen (ml/L)	7.51	6.74	7.40	6.45	6.73	6.02	7.31	6.88	6.06	[illegible]	6.71
Bottom dissolved oxygen (ml/L)	7.19	7.00	7.33	6.37	6.75	5.99	7.39	6.94	6.12	[illegible]	6.75
Surface oxygen saturation (%)	121.1	113.5	118.8	105.2	117.9	95.8	117.0	123.1	98.2	108.9	111.6
Bottom oxygen saturation (%)	115.0	116.3	117.5	104.1	111.9	96.0	117.9	127.6	98.2	[illegible]	117.1
Tide level (ft)	2.0	4.3	4.8	4.1	3.4	5.9	4.7	2.9	5.8	[illegible]	6.9
Time of zooplankton tow (PST)	1451	1439	1405	1412	1333	1540	1632	1713	1314	1314	1424
Alsea River stream flow (ft³/sec)	425	276	205	198	156	138	112	105	85	62	60

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 1966 TO SEPTEMBER 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67	22JAN
X factor		4.19	7.57	4.49	13.27	5.82	16.15	4.93	6.26	.12	1.54	6.58	1.14	.11	1.11
Protista															
Volvox sp.		0	0	0	0	0	0	0	0	0	0	0	1.1	0	1.1
Foraminifera		8.4	0	0	0	5.8	0	0	0	0	0	26.3	0	0	0
Radiolaria		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata															
Medusa		12.6	30.3	22.7	13.3	0	16.3	0	0	.1	0	0	0	0	0
Siphonophora		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda		0	0	0	26.5	0	0	0	0	.1	0	0	8.0	.2	1.1
Annelida															
Adult		0	0	0	0	0	0	0	6.3	0	0	0	0	0	0
Larva		29.3	7.6	85.3	39.8	5.8	516.8	4.9	31.3	1.3	4.6	0	0	0	0
Arthropoda															
Crustacea															
Podon leuckarti		12.6	15.1	49.4	79.6	69.8	80.8	0	0	.2	0	0	0	0	0
Podon polyphemoides		16.8	45.4	35.9	26.5	81.5	16.2	0	0	0	0	0	0	0	0
Evadne sp.		4.2	45.4	0	0	0	0	0	93.9	0	1.5	0	0	0	0
Fresh water Cladocera		0	0	0	0	0	0	0	0	.1	0	0	8.0	.8	4.4
Ostracoda		0	0	0	0	0	0	0	0	0	0	0	0	.1	0
Barnacle nauplius		339.4	1498.9	314.3	663.5	11.6	355.3	0	18.8	.1	4.6	0	0	0	0
Barnacle cypris		75.4	98.4	247.0	1273.9	209.5	1938.0	44.4	1402.2	6.0	46.2	0	2.3	0	0
Mysidacea		0	0	0	0	0	0	0	0	.2	0	0	0	0	0
Cumacea		0	0	0	0	0	0	14.8	0	.5	1.5	0	0	0	0
Tanaidacea		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda		0	0	0	0	5.8	0	0	0	0	0	0	0	0	0
Amphipoda		0	0	0	13.3	0	0	0	0	.8	0	6.6	9.1	1.1	1.1
Euphausiacea		0	0	0	0	0	16.2	0	12.5	0	0	0	0	0	0
Shrimp adult		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upogebia larva		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea		0	0	9.0	0	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva		0	0	0	0	0	0	0	0	0	0	6.4	0	0	0
Larva		0	0	0	0	0	0	0	0	0	0	6.4	0	.4	1.1
Arachnida, Mite		0	0	0	0	0	0	4.9	0	0	0	0	0	0	0
Mollusca															
Gastropoda		16.8	0	26.9	13.3	29.1	177.6	4.9	6.3	.1	1.5	0	0	0	0
Gastropod egg case		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda		33.5	189.3	233.5	358.3	267.7	791.3	197.2	93.9	.2	64.7	0	0	0	0
Ectoprocta, Cyphonautes larva		0	7.6	0	0	0	96.9	0	0	0	0	0	0	0	0
Chaetognatha		0	0	9.0	0	0	0	0	0	0	0	0	0	0	0
Phoronidea, Actinotroch (larva)		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata															
Larva		41.9	280.1	0	0	0	0	0	0	0	0	0	0	0	0
Adult Asteroidea		0	0	9.0	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea		150.8	552.6	31.4	13.3	5.8	129.2	4.9	0	0	4.6	0	0	0	0
Thaliacea		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish egg		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish larva		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified															
Egg		37.7	0	22.5	26.5	5.8	113.1	9.9	0	.1	1.5	0	1.1	3.5	8.9
"A"		0	0	0	39.8	0	0	0	0	0	0	0	0	0	0
"B"		0	0	0	0	0	0	4.9	0	0	0	0	0	0	0
Miscellaneous		8.4	7.6	0	13.3	0	32.3	0	0	.2	1.5	6.4	0	.2	0
Nauplius		0	0	0	0	0	0	0	0	.1	0	0	1.1	0	0
Total zooplankton/m³, computer		1487.4	3277.8	2595.5	4803.7	3625.9	8317.4	2760.8	2303.7	44.6	948.6	72.4	80.9	9.1	31.1
Total zooplankton count, computer		355.0	433.0	578.0	362.0	623.0	515.0	560.0	368.0	372.0	616.0	11.0	71.0	83.0	28.0
Total zooplankton count		355.0	431.0	578.0	362.0	623.0	515.0	560.0	368.0	372.0	616.0	11.0	71.0	83.0	28.0
Total zooplankton/m³		1487.4	3277.8	2595.2	4803.7	3625.9	8317.3	2760.8	2303.7	44.6	948.6	72.4	80.9	9.1	31.1

Date	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR	6MAY	12MAY	22MAY
X factor	.13	7.09	.65	4.04	2.57	6.30	.13	10.08	.14	3.78	.56	7.03	.36	15.58	20.58	1.56
Protista																
Volvox sp.	0	0	0	0	0	0	.1	0	0	4.1	0	0	0	0	0	0
Foraminifera	0	0	.6	0	0	6.3	0	0	0	0	0	0	7.0	0	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata																
Medusa	0	0	0	0	7.7	0	0	0	0	0	3.8	10.1	35.2	1.8	0	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0	0	.7	0	0
Ctenophora	0	0	0	0	.3	0	0	0	0	0	0	0	0	0	0	0
Nematoda	0	0	.6	0	0	0	0	0	.4	0	0	.6	7.0	0	15.6	0
Annelida																
Adult	0	21.3	0	4.0	0	0	.1	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	7.7	0	0	10.1	0	0	0	2.2	21.1	0	0	329.3
Arthropoda																
Crustacea																
Podon leuckarti	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresh water Cladocera	.8	0	0	0	0	0	1.9	0	.4	.6	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	0	0	3.9	0	10.3	0	0	40.3	0	.8	37.8	5.0	84.4	.4	451.8	5927.0
Barnacle cypris	0	0	0	0	0	0	0	4001.8	.4	0	0	0	7.0	0	0	20.6
Mysidacea	0	0	0	0	0	0	0	0	.1	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	6.3	0	0	0	0	3.8	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphipoda	.9	21.3	9.8	8.1	12.9	258.3	.1	0	.4	.4	30.2	0	28.1	.7	15.6	0
Euphausiacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	329.3
Shrimp adult	0	0	0	0	0	0	0	0	0	0	0	0	7.0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	10.1	0	0	0	0	0	.4	0	0
Callianassa larva	0	0	0	0	0	0	0	0	0	0	22.7	1.7	0	0	15.6	0
Upogebia larva	0	0	0	0	0	0	0	0	0	.1	7.6	.6	0	0	0	0
Crab zoea	0	0	0	0	0	0	0	0	0	0	7.4	1.1	7.0	.7	0	20.6
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	.1	0	.1	0	0	0	0	0	0	0
Larva	.4	0	0	0	0	0	.5	0	.3	0	0	0	0	0	0	0
Arachnida, Mite	0	0	1.3	0	0	0	0	10.1	.1	0	3.8	0	0	0	0	0
Mollusca																
Gastropoda	0	0	0	0	5.1	0	0	0	0	0	7.6	0	7.0	1.4	0	20.6
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	3.8	0	0	0	0	0
Pelecypoda	0	0	5.8	0	56.5	0	0	292.3	0	.4	52.9	11.2	112.5	1.4	46.7	164.6
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetognatha	0	0	0	0	2.6	0	0	0	0	0	0	0	7.0	.4	0	0
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	.4	0	0
Echinodermata																
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.6	0
Adult Asteroidea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	.6	0	5.1	0	0	10.1	0	0	0	5.4	1152.9	5.4	451.8	20.6
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	.6	0	0	0	0
Fish egg	0	0	.6	0	0	0	0	10.1	0	0	0	0	0	0	0	0
Fish larva	0	0	0	0	0	0	.4	0	.1	1.1	0	0	0	.4	0	0
Unidentified																
Egg	0	7.1	80.6	0	169.6	6.3	.1	40.3	1.0	.8	22.7	1.1	274.2	.4	732.3	288.1
"A"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	0	0	0	8.1	2.6	0	0	0	.7	.1	0	5.0	7.0	1.4	15.6	82.3
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	115.3	78.0	240.5	28.3	1161.9	302.4	18.8	5382.7	37.9	93.1	1795.5	234.6	1564.2	171.4	6200.8	10166.5
Total zooplankton count, computer	887.0	11.0	370.0	7.0	452.0	48.0	145.0	534.0	270.0	665.0	475.0	419.0	507.0	476.0	398.0	494.0
Total zooplankton count	887.0	11.0	370.0	7.0	452.0	48.0	145.0	534.0	270.0	665.0	475.0	419.0	507.0	476.0	398.0	494.0
Total zooplankton/m³	115.3	78.0	240.5	28.3	1161.6	302.4	18.8	5382.7	37.8	93.1	1795.5	234.6	1564.2	171.4	6200.8	10166.5

Date	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	1.56	3.45	1.51	9.03	1.38	8.98	5.70	4.16	13.86	1.08	20.72
Protista											
Volvox sp.	0	0	1.5	0	0	0	0	0	0	0	0
Foraminifera	1.6	3.5	0	0	0	0	0	0	0	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0
Coelenterata											
Medusa	0	31.0	4.5	9.0	0	0	11.4	4.2	27.7	7.4	22.3
Siphonophora	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	0
Nematoda	1.6	0	0	0	0	0	0	0	13.9	0	0
Annelida											
Adult	0	0	0	0	0	0	0	0	0	0	0
Larva	1.6	17.3	18.1	27.1	0	9.0	68.4	20.8	69.3	0	20.7
Arthropoda											
Crustacea											
Podon leuckarti	1.6	0	0	0	1.4	0	0	0	55.4	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	34.2	8.3	180.2	0	0
Fresh water Cladocera	3.1	0	6.0	9.0	0	0	11.4	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	87.4	82.8	34.7	884.9	208.4	18.0	216.6	220.5	485.1	9.7	1472.5
Barnacle cypris	1.6	89.7	1.5	18.1	4.1	18.0	17.1	25.0	249.5	4.3	20.7
Mysidacea	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	0	1.5	9.0	0	0	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	1.5	0	0	0	5.7	0	0	0	0
Amphipoda	4.7	3.5	3.0	0	0	0	0	4.2	0	0	20.7
Euphausiacea	0	58.7	0	0	0	0	22.8	4.2	0	0	0
Shrimp adult	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	4.5	0	12.4	0	5.7	4.2	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	1.6	0	3.0	0	1.4	9.0	0	0	0	14.0	41.5
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	0	0	9.0	5.7	0	0	0	0
Mollusca											
Gastropoda	1.6	20.7	7.6	9.0	0	0	0	0	0	0	20.7
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	1.6	124.2	40.8	767.6	5.5	26.9	393.3	29.1	1011.8	3.2	0
Ectoprocta, Cyphonautes larva	0	3.5	0	0	0	0	0	0	13.9	0	0
Chaetognatha	0	3.5	0	0	0	0	0	0	0	0	0
Phoronidea, Actinotroch (larva)	0	13.8	0	0	0	0	0	0	0	0	0
Echinodermata											
Larva	0	186.3	0	0	0	0	0	0	0	0	0
Adult Asteroidea	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	1.6	44.9	0	0	0	0	0	0	0	0	0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	3.5	1.5	0	2.8	0	0	0	0	0	0
Fish larva	6.2	3.5	0	0	0	0	0	4.2	0	0	0
Unidentified											
Egg	32.8	0	12.1	0	2.8	18.0	176.7	0	0	2.2	0
"A"	0	0	0	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	3.1	10.4	0	9.0	0	0	39.9	.1	13.9	0	0
Nauplius	1.6	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	645.8	1455.9	854.7	4415.7	822.5	4786.3	3157.8	1406.2	5724.2	424.4	10496.0
Total zooplankton count, computer	414.0	422.0	566.0	489.0	696.0	533.0	554.0	339.0	413.0	393.0	506.0
Total zooplankton count	414.0	422.0	566.0	489.0	696.0	533.0	554.0	339.0	413.0	393.0	506.0
Total zooplankton/m³	645.8	1455.9	854.7	4415.7	822.5	4786.3	3157.8	1406.1	5724.2	424.4	10496.4

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 1966 TO SEPTEMBER 1967

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67
X factor	0	4.19	7.57	4.49	13.27	5.82	16.15	4.93	6.26	.12	1.54	6.58	1.14	.11
Arthropoda, Crustacea, Copepoda														
Acartia clausi f.		117.3	151.4	269.4	451.2	587.8	177.6	261.3	187.8	.8	4.6	0	0	0
" " m.		79.6	113.5	327.8	530.8	1076.7	48.4	402.9	62.6	.6	0	0	0	0
" " c.		37.7	53.0	143.7	252.1	1111.6	96.9	1533.2	31.3	2.4	0	0	0	.1
" " III		0	0	0	26.5	0	80.8	0	0	0	0	0	0	0
" " II		0	0	0	26.5	0	16.2	0	0	0	0	0	0	0
" " I		0	0	0	13.3	0	48.4	0	0	0	0	0	0	0
" " h.		0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " III		0	0	0	0	0	0	0	0	0	0	0	0	0
" " II		0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.		41.9	7.6	4.5	26.5	11.6	0	14.8	6.3	.5	7.7	0	0	0
" " m.		8.4	15.1	4.5	0	0	16.2	0	6.3	.4	9.2	0	0	0
" " c.		46.1	22.7	0	0	0	113.1	0	6.3	.5	35.4	0	0	0
" " III		8.4	7.6	0	0	0	145.4	0	0	0	10.8	0	0	0
" " II		0	0	0	0	0	181.5	0	0	0	0	0	0	0
" " I		0	0	0	0	0	80.8	0	0	0	0	0	0	0
" " h.		0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.		0	0	0	0	0	0	0	0	0	1.5	0	0	0
" " m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	0	0	9.2	0	0	0
" " III		0	0	0	0	0	0	0	0	0	0	0	0	0
" " II		0	0	0	0	0	0	0	0	0	0	0	0	0
" " I		0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " III		0	0	0	0	0	0	0	0	.2	0	0	1.1	0
" " II		4.2	0	0	0	0	0	0	0	.4	1.5	0	0	0
" " I		4.2	0	0	0	0	0	0	6.3	0	0	0	0	0
Calanus spp. f.		0	0	0	0	0	0	0	0	0	4.6	0	0	0
" " m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		4.2	0	0	0	0	0	0	37.6	.5	0	0	0	0
"Calanus-type" c.		0	0	0	0	0	0	0	0	0	16.9	0	0	0
Calocalanus styliremis f.		0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.		8.4	0	0	0	0	0	0	0	0	0	0	0	0
" " m.		4.2	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		71.2	0	18.0	26.5	0	32.3	4.9	0	0	0	0	0	0
Clausocalanus spp. f.		0	0	0	0	0	0	0	0	0	1.5	0	0	0
" " m.		0	0	0	0	0	0	0	0	0	1.5	0	0	.1
" " c.		0	0	0	0	0	0	0	0	0	7.7	0	0	.1
" " III		0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.		0	0	0	0	0	0	0	0	.1	1.5	0	2.3	.1
" " m.		0	0	0	0	0	0	0	6.3	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	6.3	.4	0	0	17.1	.3
" " III		0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites c.		0	0	4.5	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.		0	0	0	0	0	0	0	0	0	1.5	0	0	0
Eurytemora sp. f.		0	0	0	0	0	0	0	0	1.6	0	0	0	0
" " m.		0	7.6	0	0	5.8	0	0	0	.6	0	0	0	.1
" " c.		0	0	4.5	0	52.4	0	0	0	1.3	0	0	0	0
Metridia sp. c.		0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus parvus f.		167.6	30.3	94.3	26.5	34.9	145.4	14.8	6.3	1.3	235.6	0	4.6	.8
" " m.		16.8	0	35.9	0	0	16.2	0	0	.1	29.3	0	0	0
" " c.		21.0	15.1	85.3	26.5	0	678.3	14.8	18.8	2.4	194.0	0	2.3	.1
" " III		0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.		0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.		0	0	18.0	106.2	0	0	4.9	0	.6	4.6	0	0	0
" " m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		37.7	0	103.3	106.2	0	48.4	39.4	6.3	.5	43.1	0	0	0
" " III		0	0	0	0	0	0	0	0	0	0	0	0	0
" " II		0	0	0	0	0	0	0	0	0	0	0	0	0
" " I		0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.		0	0	0	0	0	0	0	0	0	0	0	0	0
" c.		0	0	0	0	0	16.2	0	12.5	0	7.7	0	0	0
" III		0	0	0	0	0	193.8	4.9	6.3	.1	0	0	0	0
" II		4.2	0	0	0	0	242.3	0	0	0	0	0	0	0
" I		0	0	4.5	0	0	226.1	0	0	0	0	0	0	0
Rhincalanus sp. c.		0	0	0	0	0	0	0	6.3	0	0	0	0	0
Unidentified calanoid m.		0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	0	0	0	0	0	0	0	0	0
Elongated copepod nauplius		0	0	0	0	0	0	0	6.3	0	3.1	0	0	0
Copepod nauplius		0	15.1	4.5	13.3	0	484.5	4.9	37.6	0	4.6	0	2.3	0
Corycaeus sp. f.		0	0	4.5	0	0	0	0	12.5	3.0	9.2	0	0	.1
" " m.		0	0	4.5	0	0	16.2	0	6.3	.8	26.2	0	0	0
" " c.		0	0	9.0	0	0	0	4.9	12.5	5.5	115.5	0	6.8	.3
Oncaea sp. m.		0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.		12.6	45.4	332.3	491.0	5.8	258.4	19.7	106.4	6.0	21.6	0	0	0
Oithona sp. m.		0	0	9.0	0	0	16.2	0	0	0	0	0	0	0
Oithona similis c.		0	7.6	4.5	13.3	5.8	662.2	9.9	0	0	1.5	0	0	0
Oithona spinirostris f.		0	0	4.5	13.3	0	0	0	0	0	0	0	0	0
" " c.		0	0	0	0	5.8	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod		0	0	0	13.3	0	0	0	6.3	0	0	6.6	4.6	.2
Harpacticoid copepod		4.2	7.6	9.0	39.8	29.1	16.2	34.5	37.6	3.6	4.6	13.2	9.1	.3

Date	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR
X factor	1.11	.13	7.09	.65	4.04	2.57	6.30	.13	10.08	.14	.14	3.78	.56	7.03
Arthropoda, Crustacea, Copepoda														
Acartia clausi f.	0	0	0	0	0	2.6	0	0	20.2	0	.3	11.3	9.5	49.2
" " m.	0	0	0	.6	0	10.3	0	0	20.2	0	.3	0	5.0	63.3
" " c.	0	0	0	.6	0	12.9	0	0	0	0	.3	0	1.1	56.2
" " III	0	0	0	0	0	5.1	0	0	0	0	0	0	0	7.0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	0	0	0	2.6	0	23.1	0	0	20.2	0	.4	26.5	9.0	168.7
" " m.	0	0	0	3.9	0	2.6	0	0	10.1	0	2.0	37.8	4.5	91.4
" " c.	0	0	0	2.6	0	30.8	0	0	30.2	0	.7	26.5	1.7	56.2
" " III	0	0	0	2.0	0	7.7	0	0	30.2	0	0	0	0	14.1
" " II	0	0	0	0	0	0	0	0	10.1	0	0	0	0	112.5
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	14.1
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	0	0	.6	0	0	0	0	0	0	0	7.6	.6	7.0
" " m.	0	0	0	0	0	0	0	0	0	0	.3	3.8	0	28.1
" " c.	0	0	0	1.3	0	0	0	0	0	0	.4	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	3.8	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	.6	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	42.2
Calanus spp. f.	0	0	0	0	0	25.7	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	5.1	0	0	0	.6	0	0	0	0
" " c.	0	0	0	4.5	0	20.6	0	0	40.3	.4	.8	52.9	1.1	14.1
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	12.9	0	0	0	0	0	3.8	.6	14.1
Clausocalanus spp. f.	1.1	0	0	.6	0	77.1	0	0	60.5	0	0	0	0	0
" " m.	0	0	0	0	0	5.1	0	0	0	0	0	3.8	0	0
" " c.	1.1	0	0	2.6	0	41.1	0	0	20.2	0	0	3.8	0	0
" " III	0	0	0	0	0	2.6	0	0	10.1	0	0	0	0	0
Ctenocalanus vanus f.	3.3	0	0	.6	0	38.5	0	0	10.1	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	1.1	0	0	2.0	0	25.7	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	2.6	0	0	0	0	0	0	0	0
Epilabidocera amphitrites c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	50.4	0	.1	0	0	0
Eurytemora sp. f.	0	0	0	0	0	0	0	0	0	.1	5.2	143.6	2.2	7.0
" " m.	0	0	0	0	0	0	0	0	0	.4	10.6	355.3	3.4	14.1
" " c.	0	0	0	0	0	0	6.3	0	10.1	.1	51.0	362.9	1.1	14.1
Metridia sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus parvus f.	0	0	0	12.4	0	36.0	0	0	50.4	0	1.5	121.0	29.7	35.2
" " m.	0	0	0	0	0	2.6	0	0	0	0	.3	0	3.9	0
" " c.	0	0	0	33.8	0	15.4	0	0	20.2	0	.1	34.0	3.4	7.0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	.6	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	0	0	0	2.6	0	10.3	0	0	20.2	.1	0	26.5	6.2	28.1
" " m.	0	0	0	.6	0	2.6	0	0	0	0	1.7	7.6	1.7	21.1
" " c.	1.1	0	0	12.4	0	20.6	0	0	30.2	0	1.4	64.3	7.8	49.2
" " III	0	0	0	0	0	5.1	0	0	0	0	.4	11.3	0	21.1
" " II	0	0	0	0	0	0	0	0	0	0	.3	0	0	42.2
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	14.1
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" c.	0	0	0	.6	0	0	0	0	0	0	0	0	.6	0
" III	0	0	0	0	0	0	0	0	0	0	0	15.1	.6	7.0
" II	0	0	0	.6	0	0	0	0	0	0	0	0	0	0
" I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	1.3	0	2.6	0	0	0	0	0	0	1.1	7.0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	141.1	0	.4	0	0	0
Copepod nauplius	1.1	0	0	14.9	0	110.5	0	0	100.8	0	0	22.7	13.4	225.0
Corycaeus sp. f.	0	0	0	0	0	2.6	0	0	0	0	.1	3.8	0	7.0
" " m.	0	0	0	0	0	2.6	0	0	0	0	0	3.8	.6	7.0
" " c.	0	0	0	1.3	0	2.6	0	0	0	0	.3	7.6	1.7	0
Oncaea sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	0	0	0	7.1	0	287.8	0	.4	231.8	0	4.9	189.0	64.4	330.4
Oithona sp. m.	0	0	0	0	0	0	0	0	0	0	.1	0	9.0	0
Oithona similis c.	0	0	0	4.5	0	0	0	0	0	0	0	0	0	0
Oithona spinirostris f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	.5	0	0	0	0	0	.3	0	.1	0	0	.6	0
Harpacticoid copepod	4.4	112.7	28.4	19.5	8.1	28.3	18.9	14.7	20.2	31.8	.6	41.6	4.5	225.0

Date	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	.36	15.58	20.58	1.56	3.45	1.51	9.03	1.38	8.98	5.70	4.16	13.86	1.08	20.74
Arthropoda, Crustacea, Copepoda														
Acartia clausi f.	16.9	15.6	473.3	12.5	6.9	64.9	171.6	17.9	1176.4	672.6	407.7	803.9	47.5	1161.4
" " m.	14.4	15.6	555.7	3.1	10.4	119.3	117.4	48.3	2065.4	695.4	249.6	1108.8	154.4	4459.1
" " c.	14.8	31.2	349.9	7.8	34.5	78.5	144.5	26.2	844.1	153.9	124.8	956.3	111.2	373.3
" " III	0	0	123.5	1.6	0	6.0	18.1	1.4	0	0	0	166.3	0	0
" " II	0	0	41.2	0	0	0	9.0	0	0	0	0	27.7	0	0
" " I	0	0	102.9	0	0	0	0	0	0	0	0	55.4	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	20.7
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	2.9	46.7	0	0	3.5	4.5	0	0	0	68.4	25.0	27.7	1.1	83.0
" " m.	2.9	0	0	1.6	6.9	1.5	9.0	0	18.0	68.4	8.3	13.9	0	248.9
" " c.	2.5	15.6	0	4.7	0	3.0	0	0	0	0	29.1	27.7	0	622.2
" " III	.4	0	0	0	0	0	0	0	0	5.7	0	0	0	788.1
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	725.9
" " I	0	15.6	0	0	0	0	0	0	0	0	0	0	0	83.0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	.4	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	15.6	0	0	0	0	0	0	9.0	0	0	0	0	0
" " II	0	15.6	41.2	0	0	0	0	0	0	0	0	0	0	0
" " I	0	15.6	0	3.1	0	0	9.0	0	0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	1.6	75.9	1.5	18.1	0	0	0	4.2	13.9	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	.4	0	0	0	6.9	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	1.4	0	0	0	0	0	0
" " c.	.4	0	0	1.6	10.4	15.1	9.0	11.0	89.8	0	29.1	27.7	0	41.5
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	3.0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	.7	0	0	14.0	6.9	0	54.2	2.8	0	5.7	4.2	13.9	1.1	0
" " m.	2.5	0	0	18.7	17.3	3.0	487.6	35.9	0	34.2	33.3	13.9	6.5	0
" " c.	1.4	15.6	0	49.9	17.3	25.7	487.6	400.2	0	51.3	120.6	13.9	30.2	20.7
Metridia sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. m.	0	0	0	0	0	0	0	0	0	5.7	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	5.7	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus parvus f.	6.1	0	0	0	0	0	0	0	0	0	0	0	1.1	0
" " m.	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	4.0	62.3	20.6	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	1.4	155.8	0	0	0	0	0	0	0	11.4	0	0	0	0
" " m.	2.5	109.1	0	0	0	1.5	0	0	9.0	17.1	0	0	0	0
" " c.	13.0	1838.4	102.9	0	182.9	22.7	63.2	22.1	125.7	57.0	0	69.3	19.4	41.5
" " III	1.1	1028.3	0	0	38.0	18.1	144.5	4.1	0	68.4	0	0	0	0
" " II	0	327.2	0	0	27.6	9.1	0	0	107.8	34.2	0	0	0	0
" " I	0	93.5	0	0	10.4	1.5	0	0	0	5.7	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" c.	0	15.6	0	0	0	0	0	0	9.0	0	0	27.7	0	0
" III	.4	0	0	0	0	0	9.0	0	0	0	0	27.7	0	0
" II	0	0	0	0	0	0	72.2	1.4	0	0	8.3	27.7	2.2	0
" I	0	0	0	0	0	0	90.3	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	15.6	0	0	0	0	0	0	0	0	0	0	0	0
Elongated copepod nauplius	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
Copepod nauplius	.4	140.2	699.7	332.3	207.6	21.1	307.0	2.8	71.8	74.1	20.8	152.5	0	41.5
Corycaeus sp. f.	1.4	0	0	0	0	0	0	0	9.0	0	0	0	0	0
" " m.	6.8	31.2	0	0	0	1.5	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oncaea sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	47.9	358.3	411.6	0	27.6	119.3	108.4	5.5	62.9	85.5	4.2	0	7.6	165.9
Oithona sp. m.	3.2	0	0	0	0	1.5	0	1.4	0	0	0	0	0	0
Oithona similis c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona spinirostris f.	.4	0	0	0	0	1.5	9.0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	1.1	0	0	3.1	3.5	0	18.1	0	0	5.7	0	0	0	0
Harpacticoid copepod	1.1	62.3	41.2	37.4	58.7	188.8	116.0	1.4	80.8	22.8	12.5	27.7	1.1	0

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 3 IN ALSEA BAY, OREGON

SEPTEMBER 1967 TO SEPTEMBER 1968

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC
Surface salinity (°/oo)	32.00	32.44	32.81	23.22	12.09	32.07	26.64	12.28	30.74	10.03	31.18	17.87	6.39	5.25
Bottom salinity (°/oo)	32.87	32.63	32.93	25.08	12.40	32.34	28.99	20.32	31.08	19.01	31.52	19.00	24.96	26.86
Surface temperature (°C)	14.4	12.3	12.3	13.8	13.2	13.6	12.7	12.2	13.0	12.1	11.4	8.4	4.8	9.8
Bottom temperature (°C)	13.1	12.4	12.2	13.6	13.1	13.4	12.7	12.4	12.8	12.3	11.4	8.4	7.5	9.8
Surface sigma-t	23.9	24.6	24.9	17.2	8.7	24.0	20.0	9.0	23.1	7.3	23.8	13.9	5.1	3.9
Bottom sigma-t	24.7	24.7	25.0	18.6	9.0	24.3	21.8	15.2	23.4	14.2	24.0	14.7	19.5	20.7
Surface dissolved oxygen (ml/L)	6.12	5.00	6.62	6.03	5.84	6.27	6.10	4.76	6.10	6.63	6.35	6.90	8.48	7.51
Bottom dissolved oxygen (ml/L)	6.27	6.15	6.62	6.03	5.77	6.25	6.06	6.44	6.13	6.32	6.35	6.86	6.96	6.66
Surface oxygen saturation (%)	104.3	81.8	106.5	96.3	85.9	104.4	97.1	97.4	100.2	94.0	101.1	94.4	98.5	97.9
Bottom oxygen saturation (%)	104.7	101.0	108.3	97.1	84.9	104.7	97.9	98.2	100.5	95.3	101.4	94.6	97.6	99.7
Tide level (ft)	5.2	4.9	5.4	2.3	-0.6	6.1	6.5	2.3	6.8	2.1	7.1	.9	5.6	5.0
Time of zooplankton tow (PST)	1120	1149	1217	1852	2246	1339	1341	1445	1408	1516	1237	1448	1409	1241
Alsea River stream flow (ft³/sec)	75	59	78	260	260	154	685	667	285	815	422	367	1380	1610

Date	14JAN68	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY
Surface salinity (°/oo)	3.96	1.70	16.35	.09	5.05	3.22	29.92	26.98	11.59	2.83	31.33	8.60	31.75	7.60
Bottom salinity (°/oo)	25.22	8.76	32.08	.10	28.64	16.02	30.16	30.61	31.71	2.85	31.82	23.73	31.98	8.14
Surface temperature (°C)	9.1	9.6	4.9	8.0	6.9	11.2	10.6	11.1	11.0	10.3	10.9	13.2	10.5	15.2
Bottom temperature (°C)	9.2	9.5	8.2	8.1	8.2	11.2	10.5	10.9	10.1	10.2	10.7	11.5	10.3	15.2
Surface sigma-t	2.9	1.1	13.0	0	4.0	2.2	22.9	22.1	8.7	2.0	24.0	6.1	24.3	5.0
Bottom sigma-t	19.5	6.3	25.0	0	22.3	12.1	23.1	23.4	24.4	2.0	24.4	18.0	24.6	5.4
Surface dissolved oxygen (ml/L)	7.64	7.69	7.57	8.21	7.86	7.25	6.63	6.37	6.46	7.71	6.41	6.99	6.67	7.58
Bottom dissolved oxygen (ml/L)	6.67	7.39	6.62	8.16	6.45	6.53	6.67	6.35	6.44	7.71	6.73	6.21	6.75	7.55
Surface oxygen saturation (%)	97.2	97.8	94.2	99.4	95.4	96.4	103.0	99.5	99.3	100.1	101.1	100.7	104.7	111.3
Bottom oxygen saturation (%)	97.5	97.6	101.5	99.0	94.3	94.2	103.6	99.7	101.2	100.0	105.8	94.8	105.6	111.3
Tide level (ft)	3.8	2.6	8.2	3.3	4.0	1.5	7.6	4.5	5.5	-0.5	4.7	1.0	4.8	.3
Time of zooplankton tow (PST)	1444	943	849	1615	721	1339	1126	1506	1325	1208	1230	942	1138	1238
Alsea River stream flow (ft³/sec)	3280	2350	1320	4860	1480	1310	2680	1800	942	742	616	485	409	353

Date	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
Surface salinity (°/oo)	27.56	27.72	6.75	26.91	12.19	32.20	27.66	33.12	14.36	33.33	29.73	31.30	25.85	32.38
Bottom salinity (°/oo)	30.53	30.32	6.78	32.34	12.29	32.36	30.72	33.31	14.50	33.34	32.26	31.41	30.38	32.39
Surface temperature (°C)	12.0	12.2	18.2	14.1	18.8	15.7	15.6	10.9	18.2	11.9	15.1	14.9	17.7	14.2
Bottom temperature (°C)	10.9	11.1	18.0	12.1	18.6	15.2	13.6	10.5	17.9	11.6	13.9	14.8	15.3	14.1
Surface sigma-t	20.9	20.9	3.8	20.0	7.5	23.7	20.2	25.4	9.6	25.3	21.9	23.2	19.4	24.1
Bottom sigma-t	23.3	23.1	3.8	24.5	7.9	23.9	23.0	25.6	9.7	25.4	24.1	23.3	22.4	24.2
Surface dissolved oxygen (ml/L)	5.99	5.40	6.35	5.72	5.75	6.06	7.36	5.59	5.30	6.17	6.12	5.98	6.35	6.17
Bottom dissolved oxygen (ml/L)	5.85	5.21	6.37	6.68	5.73	6.26	7.27	5.42	5.28	6.15	6.10	5.98	6.50	6.25
Surface oxygen saturation (%)	94.6	85.9	100.6	94.1	94.9	106.1	125.2	89.2	87.5	100.6	104.4	102.6	111.2	105.1
Bottom oxygen saturation (%)	92.3	82.2	100.2	108.8	94.2	108.7	121.2	85.9	86.4	99.7	103.1	102.4	111.9	106.1
Tide level (ft)	3.8	3.7	-0.4	3.4	-0.2	5.6	3.2	5.5	.1	4.7	3.9	5.6	4.6	5.1
Time of zooplankton tow (PST)	1217	733	830	651	847	1641	1631	1438	548	1625	1525	1233	1348	1409
Alsea River stream flow (ft³/sec)	781	416	322	267	215	213	172	151	136	114	177	762	243	160

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON

NON-COPEPODS, SEPTEMBER 1967 TO SEPTEMBER 1968

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC
X factor	1.59	3.51	6.39	1.92	10.43	1.91	1.34	.68	.79	.14	.36	2.12	1.19	.12
Protista														
Volvox sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	.1
Foraminifera	4.8	0	0	0	0	0	0	0	0	.7	0	4.2	0	0
Radiolaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata	22.3	66.7	32.0	1.9	0	45.8	21.4	4.9	3.2	0	1.4	0	0	0
Medusa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	0	0	12.8	0	0	0	1.3	2.0	0	.4	0	0	2.4	0
Annelida														
Adult	0	0	0	17.4	0	0	0	0	0	0	0	0	1.3	.1
Larva	0	0	12.8	19.2	0	32.5	13.4	7.5	.8	.1	.7	2.1	0	0
Arthropoda														
Crustacea														
Podon leuckarti	0	0	19.2	9.6	0	0	0	.7	0	0	0	0	0	0
Podon polyphemoides	0	0	0	5.8	0	0	0	2.7	.8	0	0	2.1	0	0
Evadne sp.	0	0	12.8	9.6	0	3.8	0	2.7	1.6	0	0	0	0	0
Fresh water Cladocera	0	0	0	0	0	0	0	0	0	0	0	0	0	.1
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0
Barnacle nauplius	111.3	112.3	626.2	51.8	31.3	13.4	18.8	.7	3.9	0	0	0	0	0
Barnacle cypris	22.3	10.5	25.6	42.2	0	338.1	119.3	5.4	3.2	4.5	13.3	2.1	0	0
Mysidacea	0	0	0	95.5	22.3	0	0	0	0	.4	0	4.2	1.2	0
Cumacea	0	0	0	0	31.3	0	0	0	0	.7	0	0	0	0
Tanaidacea	0	0	0	0	0	1.9	0	0	0	0	0	0	0	0
Isopoda	0	7.0	0	1.9	0	3.8	1.3	.7	0	0	0	2.1	0	.1
Amphipoda	0	0	0	6.2	20.9	0	1.3	0	0	.6	.7	2.1	3.6	.4
Euphausiacea	3.2	0	12.8	7.7	0	0	0	0	0	0	0	0	0	0
Shrimp adult	0	0	0	.1	0	0	0	0	0	0	0	0	.1	0
Unidentified decapod larva	0	0	6.4	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	14.3	3.5	6.4	1.9	0	0	0	0	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	1.9	0	1.9	0	0	0	0	0	0	3.6	0
Mollusca														
Gastropoda	4.8	0	32.0	15.4	0	3.6	4.0	1.4	.8	.1	1.8	0	0	0
Gastropod egg case	0	3.5	0	7.7	10.4	0	1.3	0	.8	.6	0	0	0	0
Pelecypoda	54.1	21.1	32.0	44.2	10.4	85.9	24.1	111.5	4.7	11.9	12.2	2.1	0	.1
Ectoprocta, Cyphonautes larva	1.6	3.5	0	0	0	0	0	0	0	0	0	0	0	0
Chaetognatha	0	0	0	0	0	1.9	0	0	1.6	2.5	1.8	0	0	0
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata														
Larva	6.4	0	0	0	0	0	6.7	0	.8	0	0	0	0	0
Adult Asteroidea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	46.1	0	83.1	11.5	10.4	3.8	4.0	10.9	22.9	0	0	0	3.6	.4
Thaliacea	0	0	0	13.4	0	0	0	6.8	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	0	0	0	0	0	0	0	.2
Fish larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified														
Egg	3.2	14.0	6.4	3.8	0	3.8	1.3	17.7	0	3.2	4.7	4.2	0	1.8
"A"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	4.8	0	6.4	5.8	0	2.0	1.3	.7	1.7	.1	.7	4.2	1.2	0
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	636.0	1425.1	2894.7	852.6	4820.1	951.3	494.1	325.9	437.0	98.7	155.2	205.6	95.5	64.1
Total zooplankton count, computer	400.0	406.0	453.0	441.0	462.0	498.0	518.0	479.0	553.0	705.0	431.0	97.0	80.0	534.0
Total zooplankton count	400.0	406.0	453.0	441.0	462.0	498.0	518.0	479.0	553.0	705.0	431.0	97.0	80.0	534.0
Total zooplankton/m³	636.0	1425.1	2894.7	846.7	4818.7	951.2	494.1	325.7	436.9	98.7	155.2	205.6	95.2	64.1

Date	14JAN68	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY
X factor	.48	2.05	.57	.13	.48	.14	3.54	2.07	5.33	.59	1.97	.80	9.13	.75
Protista														
Volvox sp.	.5	0	0	.5	0	0	0	0	0	0	0	0	0	0
Foraminifera	.5	0	0	0	0	0	0	0	0	1.2	0	0	9.1	0
Radiolaria	.4	0	0	0	0	0	0	22.8	26.6	0	0	0	0	0
Coelenterata	0	0	.6	0	0	0	31.9	53.8	32.0	0	13.8	1.6	91.3	0
Medusa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonophora	0	0	0	0	0	0	0	4.1	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	.5	2.1	.6	.3	0	.1	0	0	0	3.5	0	0	0	.8
Annelida														
Adult	.5	0	0	.1	0	0	0	0	0	7.1	0	.8	0	0
Larva	0	0	1.1	0	0	0	14.2	31.0	26.6	.6	21.7	4.0	82.2	0
Arthropoda														
Crustacea														
Podon leuckarti	0	0	0	0	0	0	0	0	0	0	2.0	0	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresh water Cladocera	0	2.1	0	2.3	0	0	10.6	0	0	.6	0	.8	0	0
Ostracoda	.5	0	0	.3	0	0	0	0	0	2.4	0	2.4	0	0
Barnacle nauplius	0	0	0	0	.4	2.8	251.3	93.1	229.2	1.2	120.2	34.4	420.0	15.0
Barnacle cypris	.5	0	1.1	0	1.4	0	0	0	53.3	14.8	84.7	5.4	136.9	.8
Mysidacea	4.3	0	0	0	0	.3	0	0	0	5.3	0	0	0	0
Cumacea	0	2.1	0	0	.5	0	0	0	0	24.2	0	10.4	9.1	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	2.1	0	0	0	.8	0	0
Amphipoda	1.0	2.1	0	.1	2.4	.1	0	0	0	38.9	2.0	0	18.3	0
Euphausiacea	0	0	0	0	0	0	10.4	6.2	26.6	0	31.5	0	146.1	0
Shrimp adult	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	3.8	.7	0	6.2	0	1.2	0	5.6	9.1	0
Upogebia larva	0	0	0	0	.5	.3	3.5	4.1	0	0	0	0	0	0
Crab zoea	0	7.4	0	0	0	0	0	2.1	0	0	0	0	0	0
Porcelain crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	.8	0	0	0	0	0	0	0	0	0	.8
Larva	0	4.1	0	0	0	0	0	0	0	0	0	0	0	.8
Arachnida, Mite	.5	0	0	0	0	0	0	0	0	.6	0	0	0	0
Mollusca														
Gastropoda	0	0	0	0	0	0	7.1	8.3	10.7	0	23.6	.8	54.8	0
Gastropod egg case	1.4	0	0	0	0	0	0	0	0	.6	0	0	0	0
Pelecypoda	12.5	0	13.7	0	22.6	.1	21.2	62.1	53.3	1.8	55.2	25.6	410.8	0
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0	0	2.0	1.4	0	0
Chaetognatha	.5	0	.6	0	1.0	0	3.5	0	48.0	0	9.9	.8	0	.8
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata														
Larva	0	0	0	0	0	0	0	0	5.3	0	15.8	0	45.7	0
Adult Asteroidea	0	0	0	0	0	0	0	0	0	0	0	.8	0	0
Chordata, Larvacea and larval Ascidacea	2.9	0	1.7	0	1.0	0	131.0	103.5	271.8	0	51.2	1.6	283.0	0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	3.5	0	0	0	0	0	0	0
Fish larva	.5	0	1.1	0	.5	0	0	0	0	1.8	0	0	9.1	3.0
Unidentified														
Egg	7.7	10.3	5.1	.5	5.3	32.2	49.6	0	0	6.5	27.6	16.8	483.9	3.8
"A"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	1.4	0	1.1	0	0	0	3.5	2.1	0	1.8	5.9	16.0	18.3	0
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	236.2	41.0	245.1	11.7	226.6	57.1	1702.7	1179.9	2227.9	230.7	827.4	324.8	3569.8	327.8
Total zooplankton count, computer	492.0	20.0	430.0	90.0	472.0	408.0	481.0	470.0	418.0	391.0	420.0	406.0	391.0	437.0
Total zooplankton count	492.0	20.0	430.0	90.0	472.0	408.0	481.0	470.0	418.0	391.0	420.0	406.0	391.0	437.0
Total zooplankton/m³	236.2	41.0	245.1	11.7	226.6	57.1	1702.7	1179.9	2227.9	230.7	827.4	324.8	3569.8	327.8

Date	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
X factor	3.20	9.42	.45	10.73	1.33	2.26	.67	16.51	3.28	20.44	.87	7.06	.98	7.37
Protista														
Volvox sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	7.4
Foraminifera	0	0	0	0	0	0	0	0	0	0	0	7.1	0	7.4
Radiolaria	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata	0	1.6	0	0	0	2.3	10.1	0	0	7.6	1.7	0	2.1	7.7
Medusa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonophora	0	0	0	0	0	0	0	0	0	0	0	0	0	2.3
Ctenophora	0	0	.9	0	0	0	0	16.5	0	0	0	0	0	0
Nematoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annelida														
Adult	0	0	1.4	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	1.8	0	0	0	.7	33.0	13.1	40.9	0	28.2	1.0	7.4
Arthropoda														
Crustacea														
Podon leuckarti	172.8	612.3	.4	21.5	0	2.3	.7	0	0	0	30.5	105.9	71.5	59.0
Podon polyphemoides	0	131.9	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	4.5	0	0	0	81.8	1.7	0	13.7	81.1
Fresh water Cladocera	0	0	1.4	0	17.3	0	0	0	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplius	12.8	819.5	36.5	160.9	492.1	27.1	52.3	33.0	1394.0	408.8	132.2	804.8	65.7	574.9
Barnacle cypris	249.6	37.7	0	0	5.3	0	5.4	49.5	0	20.4	2.6	275.3	26.5	14.7
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanaidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	10.7	0	0	0	0	0	0	0	7.1	0	0
Amphipoda	0	0	1.8	0	2.7	0	0	0	0	0	0	7.1	0	0
Euphausiacea	0	0	0	0	0	11.3	0	0	0	20.4	0	0	0	0
Shrimp adult	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	3.2	0	0	32.2	0	0	1.3	0	0	0	0	7.1	1.0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	0	0	0	0	1.3	0	0	0	0	20.4	2.6	0	0	14.7
Porcelain crab zoea	0	0	0	10.7	0	0	0	16.5	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida, Mite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca														
Gastropoda	8.4	9.4	0	21.5	0	0	.7	0	0	102.2	1.7	7.1	2.0	29.5
Gastropod egg case	3.2	0	0	0	0	0	0	0	0	0	0	21.2	0	0
Pelecypoda	195.2	179.0	.9	42.9	0	24.9	7.4	16.5	0	592.8	36.5	381.2	21.6	44.2
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	.7	0	0	0	0	0	0	0
Chaetognatha	3.2	37.7	0	21.5	0	0	7.4	0	0	0	0	0	0	44.2
Phoronidea, Actinotroch (larva)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata														
Larva	0	0	0	0	0	576.3	0	0	0	0	1.7	649.5	5.0	22.1
Adult Asteroidea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	0	0	0	0	0	0	0	0	.9	183.4	1.0	1135.0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish larva	0	0	2.7	0	0	0	0	0	0	0	0	7.1	0	0
Unidentified														
Egg	3.2	9.4	5.8	0	0	0	4.0	115.6	0	81.8	3.5	0	1.0	44.7
"A"	0	0	0	0	1.3	0	0	0	0	0	0	0	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	0	0	.4	0	2.7	4.5	.7	16.5	9.8	40.9	1.7	21.2	2.0	7.7
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	1417.6	3590.7	256.9	4978.7	453.6	1428.3	363.8	10219.7	1469.4	9798.3	404.5	3473.5	460.7	3999.5
Total zooplankton count, computer	443.0	381.0	571.0	464.0	491.0	632.0	543.0	419.0	448.0	479.0	465.0	492.0	470.0	489.0
Total zooplankton count	443.0	381.0	571.0	464.0	491.0	632.0	543.0	419.0	448.0	479.0	465.0	492.0	470.0	489.0
Total zooplankton/m³	1417.6	3589.0	256.9	4978.7	453.0	1428.3	363.8	10219.7	1469.4	9790.8	404.5	3473.5	440.4	3995.6

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC
I factor	1.59	3.51	6.39	1.92	10.43	1.91	1.34	.68	.79	.14	.36	2.12	1.19
Arthropoda, Crustacea, Copepoda													
Acartia clausi f.	15.9	115.8	383.4	57.6	2889.1	45.8	42.9	25.8	83.7	5.9	17.6	38.2	1.2
" " m.	22.3	133.4	568.7	88.3	1011.7	22.9	36.2	25.2	84.5	3.9	9.4	48.8	1.2
" " c.	90.6	98.3	645.4	61.4	542.4	26.7	22.8	27.2	57.7	7.8	9.7	42.4	1.2
" " III	31.8	0	70.3	11.5	0	0	0	1.4	0	.1	.4	0	0
" " II	4.8	0	19.2	3.8	10.4	1.9	0	0	0	0	0	0	0
" " I	0	0	12.8	1.9	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	1.9	0	0	0	0	0	2.1	0
Acartia danae f.	0	0	0	0	0	0	0	0	6.3	.1	0	0	8.3
" " m.	0	0	0	1.9	0	0	0	0	4.7	0	.4	0	0
" " c.	0	0	0	0	0	0	2.7	0	13.4	.1	.7	0	0
" " III	0	0	0	1.9	0	0	0	0	.8	0	0	0	1.2
" " II	0	0	0	0	0	0	0	0	.8	0	0	0	0
Acartia longiremis f.	12.7	0	0	5.8	0	9.6	4.0	2.7	0	.3	0	0	0
" " m.	27.0	7.0	12.8	3.8	0	3.8	8.0	.7	0	.3	.4	0	0
" " c.	60.4	0	44.7	0	0	11.5	5.4	0	0	.3	0	0	0
" " III	7.9	0	6.4	5.8	0	0	2.7	0	0	0	0	0	0
" " II	3.2	0	19.2	5.8	0	1.9	0	0	0	0	0	0	0
" " I	0	0	19.2	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	6.4	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
" " m.	0	0	0	0	0	0	0	.7	0	0	0	0	0
" " c.	0	0	0	3.8	0	1.9	0	0	0	0	.4	0	1.2
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	1.9	0	0	0	0	0	0	0	0	0
" " c.	1.6	0	0	0	0	0	0	1.4	.8	0	0	0	0
" " III	0	14.0	0	0	0	0	0	.7	0	.3	.4	0	0
" " II	0	0	0	0	0	1.9	0	.7	0	0	.4	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	1.9	0	1.9	0	0	0	.1	0	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
Centropages mcmurrichi f.	1.6	0	6.4	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	3.2	28.1	19.2	5.8	0	9.6	5.4	.7	0	0	.4	0	0
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	0	2.4	0	0	0	1.2
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
" " c.	0	0	0	0	0	0	0	0	1.6	0	.7	0	1.2
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites c.	0	0	0	1.9	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	0	59.7	0	7.7	62.6	0	2.7	1.4	0	1.7	0	2.1	0
" " m.	0	172.0	0	1.9	62.6	0	10.7	2.7	0	2.7	0	0	0
" " c.	0	273.8	0	17.3	52.2	0	13.4	6.1	.8	7.8	.4	8.5	0
Metridia sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
Microcalanus sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	.1	0	0	0
" " c.	1.6	0	0	0	0	0	1.3	0	0	.3	0	0	0
Paracalanus parvus f.	6.4	17.6	0	21.1	0	78.3	42.9	8.8	12.6	4.1	15.5	4.2	8.3
" " m.	3.2	10.5	0	3.8	0	19.1	20.1	1.4	3.9	.3	3.2	2.1	7.1
" " c.	1.6	35.1	0	15.4	0	129.9	52.3	12.9	35.5	4.9	12.2	2.1	13.1
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	.1	0	0	0
Pseudocalanus sp. f.	0	7.0	0	1.9	0	0	0	0	0	0	.4	0	0
" " m.	0	0	0	3.8	0	1.9	0	0	0	0	0	0	0
" " c.	3.2	56.2	0	0	0	1.9	0	0	0	0	0	0	0
" " III	0	7.0	0	0	0	0	0	0	0	0	0	0	0
" " II	1.6	3.5	0	1.9	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	1.2
" c.	0	0	0	0	0	0	0	.7	0	0	0	0	1.2
" III	0	0	0	0	0	0	0	0	0	0	.4	2.1	0
" II	0	0	0	0	0	0	0	0	0	0	0	0	0
" I	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid m.	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	1.9	0	0	0	0	0	0	0
Elongated copepod nauplius	0	0	0	7.7	0	0	1.3	.7	0	0	0	0	0
Copepod nauplius	14.3	0	19.2	3.8	0	3.8	0	0	0	0	0	0	0
Corycaeus sp. f.	0	3.5	0	0	0	1.9	88.4	4.1	15.8	2.8	11.2	0	4.8
" " m.	1.6	0	0	5.8	0	5.7	79.1	8.8	19.0	4.1	11.2	2.1	0
" " c.	1.6	0	0	3.8	0	9.6	24.1	6.8	21.3	10.1	11.5	0	2.4
Oncaea sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	4.8	108.8	108.6	76.8	20.9	5.7	8.0	4.1	12.6	10.1	4.0	4.2	14.3
Oithona sp. m.	0	0	0	7.7	0	0	0	0	1.6	0	.4	0	0
Oithona similis c.	3.2	10.5	6.4	1.9	0	5.7	0	0	3.2	0	0	0	0
Oithona spinirostris f.	0	0	0	0	0	0	0	0	0	.1	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	1.1	0	0
Unidentified cyclopoid copepod	1.6	14.0	0	15.4	31.1	1.9	0	2.7	.8	.4	.7	4.2	1.2
Harpacticoid copepod	7.9	7.0	0	23.0	0	0	0	1.4	5.5	3.9	3.6	12.7	0

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 1967 TO SEPTEMBER 1968

Date	20DEC	4JAN68	21JAN	27JAN	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY
I factor	.12	.48	2.05	.57	.13	.48	.14	3.54	2.07	5.33	.59	1.97	.80	9.13
Arthropoda, Crustacea, Copepoda														
Acartia clausi f.	.2	0	0	5.7	0	3.4	1.4	7.1	53.8	37.3	1.8	2.0	2.4	27.4
" " m.	0	0	0	3.4	0	.5	1.1	3.5	16.6	10.7	0	2.0	2.4	18.3
" " c.	.4	0	0	1.1	0	.5	1.4	14.2	26.9	5.3	.6	7.9	8.8	9.1
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	3.5	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	.2	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	0	0	0	14.3	0	4.3	0	0	0	0	0	0	0	0
" " m.	.7	0	0	8.0	0	.5	0	0	0	0	0	0	0	18.3
" " c.	.5	0	0	7.4	0	0	0	0	0	0	0	0	0	9.1
" " III	0	0	0	.6	0	0	0	0	0	0	0	0	0	27.4
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	27.4
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	9.1
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	.2	0	0	6.8	0	3.4	.1	17.7	16.6	16.0	0	3.9	0	0
" " m.	.1	0	0	1.1	0	1.4	.1	17.7	6.2	26.6	0	7.9	0	0
" " c.	.1	0	0	1.7	0	1.0	1.0	49.6	6.2	37.3	0	7.9	6.4	45.7
" " III	0	0	0	.6	0	.5	.1	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	5.9	0	0
" " II	0	0	0	0	0	0	0	0	0	5.3	0	11.8	0	0
" " I	0	0	0	0	0	0	0	3.5	0	5.3	0	7.9	0	0
Calanus spp. f.	[illegible]	0	0	1.7	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	.6	0	0	0	0	0	0	0	0	0	0
" " c.	[illegible]	1.0	0	9.7	0	1.4	1.0	92.0	22.8	42.6	0	5.9	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus styliremis f.	[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	[illegible]	[illegible]	0	0	0	1.0	0	0	4.1	0	0	2.0	.8	27.4
Clausocalanus spp. f.	[illegible]	0	0	1.1	0	1.4	.1	7.1	2.1	0	0	0	0	0
" " m.	[illegible]	0	0	0	0	0	0	7.1	0	0	0	0	0	0
" " c.	[illegible]	0	0	0	0	1.0	0	3.5	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	[illegible]	0	0	1.7	0	.5	0	0	0	0	0	0	0	0
" " m.	[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	2.9	0	0	2.8	0	.5	0	7.1	2.1	0	0	2.0	0	0
" " III	.1	0	0	0	0	0	0	3.5	0	0	0	0	0	0
Epilabidocera amphitrites c.	.1	0	0	0	0	0	0	0	0	0	0	0	0	9.1
Eucalanus sp. c.	0	0	0	0	0	0	0	3.5	0	0	0	0	0	0
Eurytemora sp. f.	0	0	0	0	0	0	.1	0	0	14.2	0	0	7.2	27.4
" " m.	0	0	0	0	.1	0	.1	0	0	28.5	0	0	30.4	18.3
" " c.	0	.5	0	.6	0	0	.7	0	0	38.3	0	0	72.0	36.5
Metridia sp. c.	.1	0	0	.6	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	3.5	0	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	6.2	5.3	0	0	0	0
Paracalanus parvus f.	8.0	52.3	2.1	26.8	0	52.3	.1	63.7	68.3	5.3	.6	3.9	2.4	0
" " m.	2.5	8.2	0	8.5	0	11.0	.1	0	18.6	0	0	0	.8	0
" " c.	20.0	73.0	0	17.1	0	20.7	.6	38.0	31.0	37.3	0	2.0	3.2	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	.2	0	0	6.8	0	5.8	0	21.2	35.2	69.3	0	3.9	0	0
" " m.	0	0	0	8.5	0	3.4	0	3.5	6.2	21.3	0	0	.8	18.3
" " c.	.7	1.0	0	13.7	0	7.7	1.1	67.3	35.2	207.9	0	13.8	.8	146.1
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" f.	[illegible]	0	0	1.7	0	1.0	0	0	0	0	0	0	0	0
" c.	[illegible]	0	0	2.8	0	0	0	0	0	0	0	0	0	0
" III	[illegible]	0	0	.6	0	0	0	0	0	0	0	5.9	.6	9.1
" II	0	0	0	0	0	0	0	0	0	0	0	7.9	.8	9.1
" I	0	0	0	0	0	0	0	3.5	0	0	0	3.9	.8	18.3
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	.6	0	0	0	0	0	0	0	0	0	0
Elongated copepod nauplius	1.3	0	4.1	1.7	0	0	0	0	0	0	0	0	0	18.3
Copepod nauplius	[illegible]	8.6	0	0	0	2.0	1.4	123.9	14.5	32.0	3.5	195.0	6.4	365.2
Corycaeus sp. f.	1.3	7.2	0	0	0	1.9	0	7.1	8.3	0	0	2.0	1.6	0
" " m.	1.2	3.8	0	2.3	0	0	1.3	10.6	4.1	0	0	0	0	0
" " c.	[illegible]	12.5	0	0	0	0	0	3.5	6.2	21.3	.6	0	1.6	0
Oncaea sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	4.7	25.0	6.1	35.9	0	39.4	3.2	148.7	325.0	586.3	3.5	31.5	26.4	283.0
Oithona sp. m.	0	0	0	2.3	0	2.0	0	60.2	37.3	26.6	0	0	0	18.3
Oithona similis c.	.1	0	0	0	0	0	0	350.5	14.5	218.5	0	2.0	.8	9.1
Oithona spinirostris f.	0	0	0	0	0	0	0	3.5	0	0	0	0	0	9.1
" " c.	.4	1.0	0	.6	0	1.0	0	0	2.1	5.3	0	0	0	0
Unidentified cyclopoid copepod	.1	1.0	0	0	.1	0	0	0	0	5.3	.6	0	0	0
Harpacticoid copepod	1.8	2.9	6.1	7.4	5.3	12.5	2.1	10.6	8.3	10.7	26.5	21.7	16.8	109.6

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 3 IN ALSEA BAY, OREGON

Date	17MAY	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
I factor	.75	3.20	9.42	.45	10.73	1.33	2.26	.67	16.51	3.28	20.44	.87	7.06	.98	7.37
Arthropoda, Crustacea, Copepoda															
Acartia clausi f.	6.0	28.8	273.2	3.1	1888.5	12.0	0	24.1	809.0	9.8	960.7	7.0	70.6	23.5	51.6
" " m.	2.3	48.0	602.9	1.4	1373.4	5.3	24.9	87.8	3483.6	0	4108.4	39.1	56.5	30.4	95.8
" " c.	10.5	25.6	197.8	11.3	482.8	6.6	27.1	11.4	3566.2	19.7	960.7	60.0	141.2	52.9	205.4
" " III	1.5	0	0	.4	10.7	0	0	0	0	0	0	0	0	0	22.1
" " II	1.5	0	0	0	0	0	0	0	0	0	0	.9	14.1	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	0	3.2	0	0	128.8	1.3	2.3	1.3	33.0	0	20.4	0	7.1	0	95.8
" " m.	.8	16.0	28.3	.4	85.8	0	58.8	3.3	99.1	0	81.8	1.7	7.1	2.0	110.6
" " c.	.8	9.6	28.3	0	64.4	0	203.4	1.3	0	0	81.8	23.5	28.2	9.8	162.1
" " III	1.5	16.0	0	0	0	0	169.5	0	16.5	0	20.4	13.9	14.1	1.0	7.4
" " II	0	0	9.4	0	0	0	108.5	.7	0	0	20.4	4.3	0	3.9	14.7
" " I	0	0	0	0	0	0	33.9	.7	0	0	0	4.3	0	0	14.7
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	9.6	18.8	0	53.7	0	2.3	0	0	0	20.4	0	0	0	0
" " m.	.8	22.4	28.3	0	32.2	0	4.5	0	0	0	40.9	.9	14.1	1.0	14.7
" " c.	4.5	41.6	0	0	10.7	0	0	2.0	0	0	0	.9	7.1	10.8	81.1
" " III	2.3	0	0	0	0	0	0	0	0	0	0	0	0	2.0	0
" " II	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	.8	0	0	0	0	0	0	0	0	0	0	0	0	1.0	14.7
Acartia spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	10.7	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	.4	0	0	0	.7	0	0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	54.2	0	16.5	0	286.2	0	0	1.0	0
"Calanus-type" c.	.8	0	0	0	0	0	0	1.3	0	0	0	0	0	0	0
Calocalanus styliremis f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi f.	0	0	0	0	10.7	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	3.2	28.3	.4	10.7	0	18.1	31.5	132.1	0	0	6.1	63.5	3.9	95.8
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilabidocera amphitrites c.	0	0	0	0	0	0	2.3	0	0	0	0	.9	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	10.5	3.2	18.8	8.6	0	2.7	0	4.0	0	0	0	0	14.1	1.0	0
" " m.	27.0	6.4	18.8	27.9	10.7	13.3	0	10.1	16.5	3.3	0	2.6	7.1	6.9	0
" " c.	196.5	6.4	56.5	107.1	21.5	51.9	2.3	61.0	33.0	3.3	40.9	8.7	49.4	29.4	0
Metridia sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microcalanus sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	61.3	0	0	0	7.4
Paracalanus parvus f.	.8	3.2	0	0	0	0	0	0	16.5	0	0	0	77.7	2.9	0
" " m.	0	0	0	0	0	0	0	0	33.0	0	0	0	21.2	0	22.1
" " c.	1.5	6.4	0	0	0	0	0	0	66.0	0	0	0	42.4	2.0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	0	6.4	0	0	64.4	0	2.3	.7	33.0	0	0	0	0	0	0
" " m.	0	9.6	9.4	0	10.7	0	0	.7	16.5	0	0	0	0	0	0
" " c.	7.5	172.8	188.4	.4	364.8	8.0	38.4	12.7	181.6	0	633.6	.9	7.1	1.0	66.3
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.4
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	20.4	0	0	0	0
"Pseudocalanus-type" f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" III	.8	0	0	0	0	0	0	.7	0	0	0	0	0	0	0
" II	1.5	0	0	0	0	0	0	0	16.5	0	0	0	0	0	29.5
" I	.8	0	0	0	0	0	0	.7	0	0	40.9	0	0	0	7.4
Rhincalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	0	0	0	3.5	0	0	7.4
Copepod nauplius	16.5	6.4	28.3	1.8	0	12.0	13.6	9.4	1040.1	0	899.4	7.0	0	0	0
Corycaeus sp. f.	0	3.2	0	0	0	0	0	0	0	0	0	0	35.3	0	29.5
" " m.	0	6.4	0	0	0	0	0	0	0	0	0	0	77.7	8.8	14.7
" " c.	0	6.4	0	0	0	0	0	0	0	0	0	0	70.6	5.9	117.9
Oncaea sp. m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oithona similis f.	.8	252.8	216.7	.4	10.7	0	4.5	4.7	181.6	0	61.3	.9	21.2	40.2	176.9
Oithona sp. m.	0	3.2	0	0	0	0	0	0	16.5	0	0	0	0	1.0	0
Oithona similis c.	0	6.4	0	0	10.7	0	0	0	0	0	0	0	0	0	14.7
Oithona spinirostris f.	0	6.4	0	0	0	0	0	0	16.5	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified cyclopoid copepod	0	0	0	.4	0	0	0	0	0	0	0	0	7.1	0	0
Harpacticoid copepod	2.1	32.0	0	38.7	0	17.3	4.5	.7	99.1	16.4	20.4	0	105.9	2.9	7.4

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 4 IN ALSEA BAY, OREGON
SEPTEMBER 1966 TO SEPTEMBER 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67
Surface salinity (°/oo)			19.74	21.36	30.65		11.17	11.23	.09	.66	3.34	.07	.07	.06
Bottom salinity (°/oo)			24.42	28.45	32.14		26.30	24.31	12.73	.65	24.17	.06	.05	.05
Surface temperature (°C)			16.6	17.8	10.0		12.8	9.2	10.5	8.8	9.9	8.4	9.3	9.4
Bottom temperature (°C)			14.8	15.7	9.8		11.8	9.2	10.2	8.6	10.8	8.2	9.4	9.3
Surface sigma-t			14.0	15.0	23.6		8.1	8.6	-0.2	.4	2.4	-0.1	-0.2	-0.2
Bottom sigma-t			17.7	20.8	24.4		19.9	18.9	9.3	.4	18.4	-0.1	-0.2	-0.2
Surface dissolved oxygen (ml/L)														
Bottom dissolved oxygen (ml/L)														
Surface oxygen saturation (%)														
Bottom oxygen saturation (%)														
Tide level (ft)			3.2	3.4	6.1		5.3	.9	6.3	3.4	5.7	1.3	6.6	3.3
Time of zooplankton tow (PST)			1406	1524	1508		1614	1543	1532	1312	1516	1417	1430	957
Alsea River stream flow (ft³/sec)	54	108	67	67	67	143	108	112	2540	1050	654	6270	8180	2770

Date	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR
Surface salinity (°/oo)	.06	.04	.06	.06	.05	.24	.07	.07	.06	.05	.06	.05	3.34	.58
Bottom salinity (°/oo)	.04	.04	.05	.05	.04	.50	2.96	.04	.05	.05	.05	.14	24.17	.91
Surface temperature (°C)	7.5	8.6	9.2	8.1	8.1	7.3	7.4	8.5	8.8	8.9	9.6	8.5	9.6	9.9
Bottom temperature (°C)	7.3	8.3	8.9	7.8	7.8	7.1	7.3	8.3	8.5	8.6	9.3	8.5	9.3	9.6
Surface sigma-t	0	-0.1	-0.2	-0.1	-0.1	.1	0	.1	-0.1	-0.1	-0.2	-0.1	2.4	.2
Bottom sigma-t	-0.1	-0.1	-0.1	-0.1	-0.1	.3	2.3	.2	-0.1	-0.1	-0.2	0	18.7	.5
Surface dissolved oxygen (ml/L)														
Bottom dissolved oxygen (ml/L)														
Surface oxygen saturation (%)														
Bottom oxygen saturation (%)														
Tide level (ft)	1.6	2.4	1.1	4.0	2.9	6.5	1.0	2.7	4.7	.5	1.6	2.5	3.5	2.0
Time of zooplankton tow (PST)	1406	1352	1245	918	1130	915	1316	1443	1540	1430	1533	1444	1326	1446
Alsea River stream flow (ft³/sec)	4820	7060	3120	1360	3220	1740	1210	4930	2170	2840	1270	1780	1400	1510

Date	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
Surface salinity (°/oo)	.44	2.14	13.15	3.48	8.11	11.41	6.71	10.40	24.46		11.40	26.88	18.78	32.00
Bottom salinity (°/oo)	.86	3.01	25.42	22.78	11.56	27.18	27.38	21.78	30.44		25.13	29.68	25.62	32.75
Surface temperature (°C)	13.1	14.5	17.2	15.4	18.4	18.2	19.2	22.2	18.6		20.9	18.2	19.0	14.8
Bottom temperature (°C)		13.6	13.8	14.7	17.2	14.2	13.7	18.5	14.5		17.4	15.4	16.1	13.8
Surface sigma-t	-0.2	.9	8.8	1.8	4.8	7.3	3.5	5.6	17.1		6.7	19.1	12.7	23.7
Bottom sigma-t		1.7	18.9	16.7	7.6	20.2	20.4	15.1	22.6		17.9	21.8	18.6	24.5
Surface dissolved oxygen (ml/L)				7.22	6.77	6.89	6.75	6.64	7.62		6.43	7.14	7.29	6.52
Bottom dissolved oxygen (ml/L)				8.84	6.85	6.74	7.46	6.46	6.82		6.75	6.99	5.39	6.79
Surface oxygen saturation (%)				105.4	108.3	111.9	108.7	115.9	134.9		110.1	127.0	125.7	112.2
Bottom oxygen saturation (%)				143.2	109.1	111.2	121.9	112.5	115.4		117.4	119.9	91.5	114.9
Tide level (ft)	5.7	3.5	4.6	.9	2.5	3.1	1.9	2.4	4.4		2.1	4.5	3.2	5.1
Time of zooplankton tow (PST)	1051	1338	1257	1412	1400	1507	1317	1421	1719		1236	1353	1237	1503
Alsea River stream flow (ft³/sec)	725	608	418	425	276	205	198	156	138	112	105	85	62	60

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 1966 TO SEPTEMBER 1967

Date	10SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67
X factor	0	0	5.11	19.56	8.00	0	3.71	.39	.13	.12	.43	3.29	5.16	1.71
Protista														
Volvox sp.			0	0	0		0	0	0	0	0	0	0	0
Foraminifera			0	0	0		0	0	0	.2	0	0	0	0
Coelenterata														
Medusa			0	0	0		0	0	0	0	0	0	0	0
Ctenophora			0	0	0		0	0	0	0	0	0	0	0
Nematoda			0	0	8.0		0	0	.8	0	0	9.9	10.3	1.7
Annelida														
Adult			0	0	0		0	0	0	0	0	0	0	0
Larva			15.3	39.1	120.0		7.4	0	0	.1	0	0	0	0
Arthropoda														
Crustacea														
Podon leuckarti			10.2	0	216.0		29.7	.8	0	0	.4	0	0	0
Podon polyphemoides			0	0	32.0		18.6	0	0	0	0	0	0	0
Evadne sp.			0	0	16.0		7.4	0	0	0	0	0	0	0
Fresh water Cladocera			0	0	0		0	0	5.5	0	0	6.6	10.3	3.4
Ostracoda			0	0	0		0	0	1.6	0	0	0	5.2	0
Barnacle nauplius			1435.9	1075.8	2008.0		14.8	4.7	0	0	.9	0	0	0
Barnacle cypris			5.1	19.6	560.0		37.1	0	.1	.4	4.3	0	0	0
Mysidacea			0	0	0		0	0	0	0	0	0	0	0
Cumacea			0	0	0		0	.8	0	0	0	0	0	0
Isopoda			0	0	0		0	0	0	0	0	0	0	0
Amphipoda			0	0	0		0	0	4.2	1.9	0	3.3	5.2	0
Euphausiacea			0	0	0		0	0	0	0	0	0	0	0
Unidentified decapod larva			0	0	0		0	0	0	0	0	0	0	0
Callianassa larva			0	0	0		0	0	0	0	0	0	0	0
Upogebia larva			0	0	0		0	0	0	0	0	0	0	0
Crab zoea			0	0	0		0	0	0	0	0	0	0	0
Insecta, Post-larva			0	0	0		0	0	0	0	0	0	0	0
Larva			0	0	0		0	0	1.0	.1	0	6.6	5.2	3.4
Arachnida, Mite			0	0	0		0	0	0	.1	0	0	0	0
Mollusca														
Gastropoda			0	39.1	64.0		0	0	0	0	0	0	0	0
Gastropod egg case			0	0	8.0		0	0	0	0	0	0	0	0
Pelecypoda			0	19.6	400.0		0	67.1	.1	0	3.4	0	0	0
Ectoprocta, Cyphonautes larva			0	0	8.0		0	0	0	0	0	0	0	0
Chaetognatha			0	0	8.0		0	0	0	0	.4	0	0	0
Echinodermata														
Larva			5.1	0	0		0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea			15.3	0	8.0		3.7	0	0	0	0	0	0	0
Thaliacea			0	0	0		0	0	0	0	0	0	0	0
Fish egg			0	0	0		0	0	0	0	0	0	0	0
Fish larva			0	0	0		0	0	0	0	0	0	0	0
Unidentified														
Egg			0	0	0		0	0	1.2	.1	0	0	5.7	0
"B"			0	19.6	0		0	0	0	0	0	0	0	0
Miscellaneous			5.1	0	24.0		0	0	.6	0	0	3.3	15.5	0
Nauplius			0	0	0		0	0	0	0	0	0	0	0
Total zooplankton/m³, computer			3520.8	9173.6	5272.0		1643.5	219.2	42.8	8.2	171.1	62.5	77.4	10.3
Total zooplankton count, computer			689.0	469.0	659.0		443.0	562.0	329.0	68.0	398.0	19.0	15.0	5.0
Total zooplankton count			689.0	469.0	659.0		443.0	562.0	329.0	68.0	399.0	19.0	15.0	5.0
Total zooplankton/m³			3520.8	9173.6	5272.0		1643.5	219.2	42.8	8.2	171.1	62.5	77.4	10.3

Date	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR
X factor	3.76	8.18	3.93	.13	3.29	.13	.11	.13	1.07	.14	.14	.11	.94	.13
Protista														
Volvox sp.	0	0	0	0	0	0	0	1.7	1.1	.7	.6	.1	1.6	0
Foraminifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coelenterata														
Medusa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	3.8	8.2	3.9	.4	0	.9	.2	.4	0	.3	.1	.1	1.9	.3
Annelida														
Adult	0	0	7.9	0	0	0	0	0	0	0	0	0	0	0
Larva	0	0	0	0	0	0	0	0	0	0	.1	0	0	0
Arthropoda														
Crustacea														
Podon leuckarti	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresh water Cladocera	3.8	0	0	.3	0	.1	0	.6	1.1	.4	.1	.6	2.8	.1
Ostracoda	0	0	0	0	0	0	0	.8	0	0	0	.1	0	.1
Barnacle nauplius	0	0	0	0	0	0	0	0	0	0	0	0	1.9	0
Barnacle cypris	0	0	0	0	0	0	0	0	2.1	0	0	0	0	0
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphipoda	3.8	0	3.9	0	0	.1	0	0	0	0	.4	.1	.9	.1
Euphausiacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	.3	0	0	0	0	.1	0	0	.1
Larva	3.8	16.4	3.9	.1	0	.3	0	.8	1.1	.3	.4	.1	3.8	.3
Arachnida, Mite	0	0	0	0	0	0	0	.1	0	0	0	0	0	0
Mollusca														
Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	0	0	0	0	0	0	0	0	0	0	0	0	.9	0
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetognatha	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata														
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	8.2	0	0	0	0	0	0	0	0	0	0	0	0
Fish larva	0	0	0	.1	0	0	.3	0	0	.4	1.5	1.0	1.9	.3
Unidentified														
Egg	0	8.2	0	.1	3.3	3.4	0	.9	0	.6	.1	0	1.9	.6
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	0	0	7.9	.1	0	.1	0	.1	0	.3	.3	.3	1.9	1.0
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	15.0	49.1	31.4	1.3	6.6	6.1	.6	6.1	6.4	2.9	4.5	2.5	32.0	22.1
Total zooplankton count, computer	4.0	6.0	8.0	10.0	2.0	47.0	5.0	47.0	6.0	21.0	32.0	23.0	34.0	170.0
Total zooplankton count	4.0	6.0	8.0	10.0	2.0	47.0	5.0	47.0	6.0	21.0	32.0	23.0	34.0	170.0
Total zooplankton/m³	15.0	49.1	31.4	1.3	6.6	6.1	.6	6.1	6.4	2.9	4.5	2.5	32.0	22.1

Date	6MAY	12MAY	22MAY	30MAY	12JUN	20JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	.14	.60	1.26	.17	3.45	2.30	2.96	6.33	2.49	0	5.59	5.70	21.79	3.66
Protista														
Volvox sp.	0	0	0	0	0	0	0	0	0		0	0	0	0
Foraminifera	0	0	0	0	0	0	0	0	0		0	0	0	0
Coelenterata														
Medusa	0	0	0	0	0	0	0	0	10.0		0	28.5	0	11.3
Ctenophora	0	0	0	0	0	0	0	0	0		0	0	0	0
Nematoda	0	1.2	0	0	3.5	0	0	0	0		0	0	0	0
Annelida														
Adult	0	0	0	0	3.5	0	0	0	0		0	0	0	0
Larva	0	0	1.3	0	0	0	0	0	7.5		11.2	34.2	108.9	0
Arthropoda														
Crustacea														
Podon leuckarti	0	0	0	.3	0	6.9	11.8	0	2.5		0	11.4	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0		0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0		0	102.4	0	0
Fresh water Cladocera	0	0	0	0	3.5	0	115.4	0	0		0	0	0	0
Ostracoda	0	63.6	3.8	1.4	34.5	0	0	0	0		0	0	0	0
Barnacle nauplius	0	0	457.4	1.7	31.0	230.0	811.0	3525.8	151.9		2739.1	1168.5	5665.4	157.4
Barnacle cypris	0	0	0	0	3.5	6.9	11.8	278.5	10.0		16.8	51.3	21.8	7.3
Mysidacea	0	0	0	0	0	0	0	0	0		0	0	0	0
Cumacea	0	0	0	0	0	0	0	0	0		0	0	0	0
Isopoda	0	0	0	0	0	2.3	0	0	2.5		0	0	21.8	0
Amphipoda	.3	0	0	.2	3.5	0	0	0	0		0	0	0	3.7
Euphausiacea	0	0	0	.3	0	0	0	0	0		0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	2.5		0	0	0	3.7
Callianassa larva	0	0	0	0	0	0	0	0	0		0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0		0	0	0	0
Crab zoea	0	0	1.3	0	0	0	0	6.3	5.0		0	0	0	0
Insecta, Post-larva	.4	0	0	.2	0	0	0	0	0		0	0	0	0
Larva	0	1.2	1.3	.3	0	0	0	0	0		0	0	0	0
Arachnida, Mite	.1	.6	0	.2	3.5	0	0	0	0		0	0	0	0
Mollusca														
Gastropoda	0	0	2.5	0	0	0	0	0	0		0	5.7	0	0
Gastropod egg case	0	0	0	0	0	0	0	0	0		0	0	0	0
Pelecypoda	0	0	11.3	0	55.2	0	35.5	0	12.5		0	91.2	0	14.6
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0		0	0	0	0
Chaetognatha	0	0	0	0	0	0	0	0	0		0	0	0	0
Echinodermata														
Larva	0	0	0	0	0	0	0	0	0		0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	0	0	0	0	0	0	0		0	0	0	7.3
Thaliacea	0	0	0	0	0	0	0	0	0		0	0	0	0
Fish egg	0	0	0	.2	0	0	0	0	2.5		0	0	0	0
Fish larva	.6	3.0	0	0	3.5	0	0	19.0	0		0	0	0	0
Unidentified														
Egg	0	0	2.5	1.7	17.3	0	3.0	6.3	0		0	17.1	0	0
"B"	0	0	0	0	0	0	0	0	0		0	0	0	0
Miscellaneous	.6	9.6	2.5	.5	6.9	0	3.0	0	5.0		0	11.4	0	0
Nauplius	0	0	0	.2	0	0	0	0	0		0	0	0	0
Total zooplankton/m³, computer	37.9	306.6	631.3	105.1	1704.3	1587.0	1577.7	4513.3	1282.3		3873.9	2838.6	16712.9	1742.4
Total zooplankton count, computer	271.0	511.0	501.0	618.0	494.0	690.0	533.0	713.0	515.0		693.0	498.0	767.0	476.0
Total zooplankton count	271.0	511.0	501.0	618.0	494.0	690.0	533.0	713.0	515.0		693.0	498.0	767.0	475.0
Total zooplankton/m³	37.9	306.6	631.3	105.1	1704.3	1587.0	1577.7	4513.3	1282.4		3873.9	2838.6	16712.9	1742.2

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 1966 TO SEPTEMBER 1967

S PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON

Date	15SEP66	19SEP	24SEP	30SEP	19OCT	28OCT	2NOV	9NOV	16NOV	23NOV	30NOV	7DEC	14DEC	15JAN67	22JAN	31JAN	3FEB	10FEB	19FEB	23FEB	5MAR	17MAR	27MAR	1APR	7APR	15APR	22APR	29APR	6MAY	1JUN	26JUN	3JUL	10JUL	22JUL	28JUL	4AUG	27AUG	5SEP67
X factor	0	0	5.11	19.56	8.00	0	3.71	.39	.13	.12	.43	3.29	5.16	1.71	3.78	8.18	3.93	.13	3.29	.13	.11	.13	1.07	.14	.14	.11	.94	.13	.14	.30	2.96	6.33	2.49	0	5.59	5.70	21.79	3.64
Arthropoda, Crustacea, Copepoda																																						
Acartia clausi f.			1022.0	1251.4	232.0		411.8	8.6	0	0	6.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.3	133.2	234.2	246.5		637.3	498.9	4441.9	161.[illegible]
" " m.			674.5	2053.4	328.0		322.8	19.1	0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.6	88.8	202.6	104.6		201.2	188.1	4684.9	281.[illegible]
" " c.			245.3	4342.3	328.0		634.4	72.0	0	0	4.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.4	23.7	50.6	39.8		178.9	102.6	1438.1	51.7
" " III			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
" " II			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
" " I			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
" " h.			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
Acartia danae f.			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
" " c.			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
" " III			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
Acartia longiremis f.			0	0	0		0	0	0	0	2.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	22.8	0	113.[illegible]
" " m.			5.1	0	16.0		0	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.0		0	22.8	0	69.[illegible]
" " c.			5.1	0	0		7.4	0	0	0	11.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5		0	5.7	0	51.7
" " III			0	0	0		0	0	0	0	3.9	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
" " II			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
" " I			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
Acartia tonsa f.			0	0	0		0	0	0	0	.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
" " m.			0	0	0		0	0	0	0	.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
" " c.			5.1	0	0		0	0	0	0	2.2	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
" " III			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
" " II			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
Acartia spp. c.			0	0	0		3.7	0	0	0	.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	83.[illegible]
" " III			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	14.6
" " II			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
" " I			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
Calanus spp. f.			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
" " c.			0	0	0		0	0	0	0	.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
"Calanus-type" c.			0	0	0		0	0	0	0	8.6	0	0	0	0	0	0	0	0	.1	0	0	0	0	0	0	0	0	0	0	0	0	0		5.6	11.4	0	7.[illegible]
Centropages mcmurrichi m.			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
" " c.			5.1	19.6	16.0		11.1	0	0	0	.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.9		11.2	11.4	0	0
Clausocalanus spp. f.			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
" " m.			0	0	0		0	0	0	0	.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
Ctenocalanus vanus f.			0	0	0		0	0	0	0	.9	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
" " m.			0	0	0		0	0	0	0	.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
" " c.			0	0	0		0	0	0	0	1.3	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
Epilabidocera amphitrites m.			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
" " c.			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
Eucalanus sp. c.			0	0	0		0	0	0	0	.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
Eurytemora sp. f.			0	0	0		3.7	2.0	0	.4	.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.9	39.0	29.6	19.0	57.3		5.6	74.1	0	14.6
" " m.			5.1	0	24.0		7.4	2.3	0	.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	6.3	78.2	56.2	38.0	104.6		11.2	125.4	0	139.1
" " c.			35.8	130.9	24.0		29.7	14.8	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	6.5	25.1	283.2	186.5	120.3	410.8		33.5	228.0	108.9	351.4
Microcalanus sp. f.			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	2.5		0	0	0	0
Tortanus discaudatus c.			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
Paracalanus parvus f.			10.2	19.6	40.0		22.3	.4	.1	0	45.2	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
" " m.			10.2	0	16.0		7.4	0	0	0	3.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5		0	0	0	0
" " c.			5.1	0	24.0		44.5	3.1	0	0	23.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14.9		0	0	0	0
" " III			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
" " h.			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
Pseudocalanus sp. f.			0	19.6	16.0		0	0	0	0	1.7	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	3.7
" " m.			0	0	8.0		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
" " c.			0	19.6	288.0		0	0	0	0	3.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	57.0	0	3.7
" " III			0	0	8.0		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
"Pseudocalanus-type" c.			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
" III			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
" II			0	0	8.0		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
" I			0	0	0		0	.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
Unidentified calanoid c.			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	3.0	0	0		0	0	0	0
Elongated copepod nauplius			0	0	0		0	0	0	0	.4	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
Copepod nauplius			0	0	80.0		3.7	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.1	0	4.6	14.8	6.3	2.5		22.4	22.8	21.8	3.7
Corycaeus sp. f.			0	0	0		0	0	0	0	.9	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
" " m.			0	0	16.0		0	0	0	0	2.2	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
" " c.			0	0	0		0	0	0	0	23.2	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
Oithona similis f.			0	58.7	240.0		3.7	.4	0	0	2.2	0	0	0	0	0	0	0	0	0	0	.1	0	0	0	0	0	0	0	6.9	5.9	0	29.9		0	0	0	142.7
Oithona sp. m.			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
Oithona similis c.			0	0	48.0		3.7	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
Oithona spinirostris f.			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
" " c.			0	0	16.0		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
Unidentified cyclopoid copepod			0	0	0		0	0	.3	0	0	3.3	5.2	1.7	0	0	0	0	3.3	0	0	.3	0	0	.1	0	.9	0	.1	0	20.7	0	2.5		0	0	0	0
Harpacticoid copepod			0	39.1	16.0		7.4	20.7	27.3	3.1	7.7	29.6	15.5	0	0	8.2	3.9	.1	0	.6	0	.3	1.1	0	.4	.1	8.5	11.7	.6	20.7	23.7	6.3	19.9		0	5.7	0	47.6

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 4 IN ALSEA BAY, OREGON

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC	14JAN68	21JAN	27JAN
Surface salinity (°/oo)	21.34	20.70	23.51	10.39	3.27	15.47	3.02	1.66	9.67	.91	10.73	5.30	.08	.36	.07	.03	2.74
Bottom salinity (°/oo)	29.26	28.91	29.66	15.77	30.88	29.72	22.99	28.51	25.35	18.15	26.36	30.56	18.95	.06	10.45	.04	21.56
Surface temperature (°C)	16.7	16.9	15.1	13.6	17.0	13.8	11.8	10.4	10.4	11.4	8.8	6.8	4.3	9.2	8.6	9.6	6.9
Bottom temperature (°C)	15.3	15.4	13.5	13.5	13.3	13.4	12.4	12.5	11.8	12.0	10.3	9.5	6.3	9.5	8.9	9.6	6.9
Surface sigma-t	15.7	14.6	17.1	7.4	2.0	11.2	1.9	1.0	7.3	.3	8.3	4.2	.1	-0.2	-0.1	-0.2	2.2
Bottom sigma-t	21.5	21.2	22.2	11.5	23.2	22.0	17.3	21.5	19.6	18.6	20.2	23.6	14.9	-0.2	8.0	-0.2	16.9
Surface dissolved oxygen (ml/L)	6.02	6.10	6.05	5.76	6.38	6.13	7.03	7.34	7.00	6.97	7.23	7.68	8.42	7.86	7.59	7.66	9.33
Bottom dissolved oxygen (ml/L)	5.84	4.57	5.43	5.71	4.61	6.11	5.88	6.02	6.25	5.96	6.26	6.48	7.34	7.83	7.14	7.68	7.05
Surface oxygen saturation (%)	100.4	102.2	99.0	84.6	84.5	97.1	94.5	95.1	95.1	91.8	95.6	93.4	97.2	97.9	93.1	97.0	94.6
Bottom oxygen saturation (%)	99.7	78.0	96.0	86.5	76.3	100.5	91.0	96.6	97.4	88.8	94.4	98.6	96.2	98.1	94.4	97.1	95.7
Tide level (ft)	3.9	3.6	4.9	.6	.5	4.5	5.5	1.3	5.2	1.3	5.5	.4	3.5	-2.7	2.1	3.0	6.6
Time of zooplankton tow (PST)	1159	1114	1253	1935	2408	1413	1306	1522	1325	1555	1154	1526	1459	1335	1522	909	810
Alsea River stream flow (ft³/sec)	75	59	79	260	260	154	685	667	285	815	422	367	1390	1610	3280	2350	1720

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 4 IN ALSEA BAY, OREGON
SEPTEMBER 1967 TO SEPTEMBER 1968

Date	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY
Surface salinity (°/oo)	.04	.04	.32	.75	.17	.54	.33	2.72	1.31	5.47	2.69
Bottom salinity (°/oo)	.04	19.30	20.47	5.50	.17	7.47	7.35	10.27	26.32	8.52	23.76
Surface temperature (°C)	7.7	6.1	10.0	8.6	9.4	11.0	9.6	12.1	11.9	13.1	15.8
Bottom temperature (°C)	7.8	7.8	11.3	8.5	9.5	10.9	9.6	11.5	11.9	12.9	14.6
Surface sigma-t	-0.1	0	0	.5	-0.2	.1	0	1.7	.6	3.7	1.2
Bottom sigma-t	-0.1	15.1	15.5	4.2	-0.2	5.5	5.5	7.6	19.9	6.0	17.2
Surface dissolved oxygen (ml/L)	8.27	8.31	7.61	7.73	8.00	7.57	7.92	6.72	7.20	7.31	7.57
Bottom dissolved oxygen (ml/L)	8.30	6.89	5.80	7.31	8.02	6.90	7.99	6.65	6.40	7.16	6.91
Surface oxygen saturation (%)	99.3	96.0	96.7	95.4	101.0	95.6	99.7	90.9	96.1	102.8	109.1
Bottom oxygen saturation (%)	99.9	93.7	86.2	92.8	100.6	93.6	105.7	93.0	90.8	102.0	112.2
Tide level (ft)	2.3	3.3	1.6	5.9	4.6	5.6	-0.1	4.7	2.2	3.8	1.0
Time of zooplankton tow (PST)	1535	644	1411	1051	1539	1359	1348	1312	908	1100	1354
Alsea River stream flow (ft³/sec)	4860	1480	1310	2680	1809	942	742	616	485	409	353

PHYSICAL-CHEMICAL AND OTHER DATA FOR STATION 4 IN ALSEA BAY, OREGON

Date	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
Surface salinity (°/oo)	.74	3.30	1.53	4.70	2.11	16.20	12.35	16.62	5.36	28.00	9.38	8.51	4.24	19.42
Bottom salinity (°/oo)	1.32	19.73	26.39	29.73	25.30	20.48	27.45	18.74	29.04	29.53	24.94	10.97	11.57	28.5[illegible]
Surface temperature (°C)	13.6	14.6	19.1	17.8	19.2	20.6	20.8	19.9	18.5	16.9	18.1	16.2	23.3	17.7
Bottom temperature (°C)	13.4	17.1	15.1	13.9	15.4	19.8	14.9	19.4	15.4	15.0	16.1	16.0	17.6	16.[illegible]
Surface sigma-t	-0.1	1.1	-0.4	2.3	0	10.4	7.6	10.9	2.7	18.7	5.8	5.5	4.5	13.[illegible]
Bottom sigma-t	.4	13.9	19.2	22.2	18.4	13.8	20.2	12.6	21.3	21.1	18.0	7.4	13.6	20.[illegible]
Surface dissolved oxygen (ml/L)	6.99	5.97	6.04	5.92	5.94	6.53	7.33	6.45	5.01	5.85	8.44	6.47	5.47	5.9[illegible]
Bottom dissolved oxygen (ml/L)	6.89	5.70	5.02	5.94	5.83	6.58	7.07	6.47	5.49	5.57	5.63	5.91	5.91	5.9[illegible]
Surface oxygen saturation (%)	96.4	93.0	94.1	91.6	97.1	114.6	124.0	111.8	79.9	101.7	135.0	99.2	137.5	101.[illegible]
Bottom oxygen saturation (%)	95.4	95.5	85.1	99.0	93.1	116.9	118.4	112.3	93.7	94.7	95.3	91.6	100.2	102.[illegible]
Tide level (ft)	3.6	3.5	-0.4	3.4	-0.2	5.0	3.4	4.6	.1	4.6	3.9	4.2	4.6	4.7
Time of zooplankton tow (PST)	1307	651	926	726	922	1605	1556	1358	627	1708	1603	1144	1430	1537
Alsea River stream flow (ft³/sec)	781	416	322	267	215	213	172	151	136	114	177	762	243	157

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 1967 TO SEPTEMBER 1968

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	28DEC	14JAN68	21JAN	27JAN
X factor	14.24	13.51	14.16	3.87	8.03	8.30	1.63	1.57	.48	.66	.55	.62	1.12	.12	1.43	.12	.13
Protista																	
Volvox sp.	0	0	0	0	0	0	0	0	0	0	0	0	1.1	1.0	0	1.1	0
Foraminifera	0	0	0	0	0	0	0	4.7	0	0	0	3.1	0	0	0	.1	0
Coelenterata																	
Medusa	28.5	0	0	0	0	16.6	1.6	0	0	0	0	0	0	0	0	0	0
Ctenophore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	0	0	0	0	0	0	0	7.9	0	1.3	0	0	1.1	.1	0	0	.1
Annelida																	
Adult	0	0	0	8.2	0	0	0	1.6	0	0	0	0	3.4	0	0	0	0
Larva	0	27.0	0	3.9	0	8.3	6.5	1.6	0	0	0	0	0	0	0	0	0
Arthropoda																	
Crustacea																	
Podon leuckarti	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	8.0	0	0	0	.5	0	0	0	0	0	0	0	0
Fresh water Cladocera	0	0	0	0	0	0	0	1.6	0	0	0	0	3.4	.5	2.9	1.2	0
Ostracoda	0	0	0	0	0	0	0	1.6	0	0	0	0	1.1	0	0	0	0
Barnacle nauplius	413.0	2181.6	283.2	42.6	120.4	91.3	66.8	1.6	.5	0	0	0	0	0	0	0	.1
Barnacle cypris	14.2	40.5	0	0	0	33.2	17.9	6.3	1.0	.7	8.8	1.2	0	0	0	0	.4
Mysidacea	0	0	0	.3	0	0	0	0	0	0	.6	.6	0	0	0	0	0
Cumacea	0	0	0	54.2	0	0	0	1.6	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	1.6	0	0	.7	0	0	0	0	0	0	0
Amphipoda	0	0	0	39.4	24.1	0	0	6.3	0	0	0	1.2	0	.2	1.4	0	1.0
Euphausiacea	0	0	14.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.9
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.3
Crab zoea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.6
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0	0	1.1	.2	1.4	.2	.1
Larva	0	0	0	0	0	0	0	0	0	0	0	.6	0	.1	1.4	.6	0
Arachnida, Mite	0	0	0	0	0	0	0	0	0	0	0	.6	1.1	.1	0	.1	.1
Mollusca																	
Gastropoda	0	0	0	0	0	8.3	3.3	1.6	0	0	0	0	0	0	0	0	.1
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.1
Pelecypoda	0	0	0	23.2	0	0	1.6	6.3	0	0	1.1	0	0	0	0	0	.1
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetognatha	0	0	0	0	0	0	0	0	1.0	0	1.7	0	0	0	0	0	0
Echinodermata																	
Larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	170.9	0	0	0	0	0	0	7.9	1.4	0	0	.6	0	0	0	0	0
Thaliacea	0	0	0	0	0	0	0	4.7	0	0	0	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified																	
Egg	0	0	0	11.6	0	0	0	9.4	.5	2.6	1.1	1.9	0	.1	0	0	1.7
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	0	0	0	0	8.0	0	3.3	6.3	0	0	0	1.2	2.2	.4	16.0	.7	.4
Nauplius	0	13.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	9646.5	17711.6	7419.8	2149.4	4223.8	4349.2	1026.9	701.8	212.6	25.1	239.3	255.6	59.4	10.1	25.7	6.0	49.0
Total zooplankton count, computer	677.0	1311.0	524.0	555.0	526.0	524.0	630.0	447.0	443.0	38.0	435.0	412.0	53.0	84.0	18.0	50.0	377.0
Total zooplankton count	677.0	1311.0	524.0	555.0	526.0	524.0	630.0	447.0	443.0	38.0	435.0	412.0	53.0	84.0	18.0	50.0	377.0
Total zooplankton/m³	9660.5	17711.6	7419.8	2147.9	4223.8	4349.2	1026.9	701.8	212.6	25.1	239.3	255.6	59.4	10.1	25.7	6.0	49.0

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 1967 TO SEPTEMBER 1968

Date	6FEB	13FEB	6MAR	14MAR	31MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY
X factor	2.95	.13	.14	.14	.13	.13	.14	.13	.43	3.07	.99
Protista											
Volvox sp.	3.0	.1	0	0	0	0	0	0	0	0	0
Foraminifera	0	0	0	0	0	0	0	0	0	0	0
Coelenterata											
Medusa	0	0	0	0	0	0	0	0	0	15.4	0
Ctenophore	0	0	0	0	0	0	0	0	0	0	0
Nematoda	11.8	.4	0	.4	.6	.1	.3	0	0	27.6	0
Annelida											
Adult	3.0	0	0	0	.1	0	0	0	0	30.7	0
Larva	0	0	0	.1	0	0	.3	0	.4	15.4	3.0
Arthropoda											
Crustacea											
Podon leuckarti	0	0	0	0	0	0	0	0	.4	0	0
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	0	0	0	0	0	0
Fresh water Cladocera	3.0	.1	0	.7	2.1	0	.3	0	0	0	0
Ostracoda	0	0	0	.3	0	0	0	0	.6	3.1	0
Barnacle nauplius	0	.1	13.4	.6	0	.1	.3	.1	19.4	254.8	57.4
Barnacle cypris	.4	0	.4	0	0	.5	.3	.5	1.3	18.4	0
Mysidacea	0	0	0	0	0	0	0	0	0	3.1	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	0	0	6.1	0
Amphipoda	0	0	.1	.3	0	0	0	.1	0	3.1	0
Euphausiacea	0	0	0	0	0	0	0	0	0	9.2	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	.1	0	0	0	0	0	3.0	0	0
Upogebia larva	0	0	0	0	.3	0	0	0	0	0	0
Crab zoea	0	0	.8	.3	0	0	0	0	0	0	0
Insecta, Post-larva	3.0	0	.1	.3	.1	0	0	0	0	0	0
Larva	5.9	.1	0	.3	0	.1	.1	.3	.4	0	0
Arachnida, Mite	0	0	0	0	0	0	0	0	0	3.1	0
Mollusca											
Gastropoda	0	0	0	0	0	0	0	0	.4	0	0
Gastropod egg case	0	0	0	.3	0	0	0	0	0	0	0
Pelecypoda	0	0	.1	.1	.1	0	0	0	3.9	24.4	1.0
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	.4	0	0
Chaetognatha	0	0	0	0	0	0	.1	0	0	0	0
Echinodermata											
Larva	0	0	0	0	0	0	0	0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	0	0	0	0	0	0	0	0	0
Thaliacea	0	0	0	0	0	0	0	0	0	0	0
Fish egg	0	0	0	0	0	0	0	0	0	6.1	0
Fish larva	0	.8	1.0	1.1	.8	.3	.1	.9	1.7	6.1	0
Unidentified											
Egg	3.0	.1	10.2	2.5	1.8	0	.1	.1	1.1	27.8	0
"B"	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	3.0	.4	0	.1	.4	0	0	.1	0	30.7	0
Nauplius	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	44.3	3.2	99.7	37.7	7.3	3.5	9.2	14.3	214.1	1488.0	418.8
Total zooplankton count, computer	15.0	25.0	712.0	269.0	56.0	27.0	66.0	110.0	498.0	485.0	423.0
Total zooplankton count	15.0	25.0	712.0	269.0	56.0	27.0	66.0	110.0	498.0	485.0	423.0
Total zooplankton/m³	44.3	3.2	99.7	37.7	7.3	3.5	9.2	14.3	214.1	1489.0	418.8

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON
NON-COPEPODS, SEPTEMBER 1967 TO SEPTEMBER 1968

Date	8JUN	19JUN	26JUN	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
X factor	2.63	.62	.40	2.51	7.76	2.22	7.98	3.78	6.75	2.06	4.35	5.04	5.23	7.1[illegible]
Protista														
Volvox sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foraminifera	0	0	.4	0	0	0	0	7.6	0	0	0	5.0	0	0
Coelenterata														
Medusa	0	0	0	0	0	0	0	0	0	2.1	4.4	.3	5.2	7.4
Ctenophore	0	0	0	0	0	0	0	0	0	0	0	0	0	.1
Nematoda	15.8	1.9	0	0	0	0	0	0	0	0	0	0	0	0
Annelida														
Adult	0	0	0	0	0	0	0	0	0	0	0	5.0	0	0
Larva	0	0	0	0	0	2.2	0	79.4	0	33.0	4.4	131.0	10.5	170.4
Arthropoda														
Crustacea														
Podon leuckarti	2.6	3.1	.4	0	0	2.2	0	0	0	0	0	20.2	10.5	7.4
Podon polyphemoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evadne sp.	0	0	0	0	0	2.2	0	0	0	0	0	5.0	0	7.4
Fresh water Cladocera	15.8	0	.4	0	0	2.2	0	0	0	0	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	34.0	0	0	0	15.1	0	0
Barnacle nauplius	0	29.8	131.6	775.6	5651.8	777.0	4301.2	1062.2	4954.5	179.2	1619.2	1985.8	1820.0	815.1
Barnacle cypris	10.5	.6	.8	0	7.8	8.9	8.0	3.8	0	4.1	4.4	10.1	10.5	22.2
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumacea	0	0	0	0	0	0	0	0	0	0	0	5.0	0	0
Isopoda	0	0	0	0	0	0	0	0	0	2.1	0	0	0	0
Amphipoda	7.9	0	0	0	0	0	0	15.1	0	0	0	10.1	0	0
Euphausiacea	0	0	0	0	0	0	0	0	0	4.1	0	0	0	0
Unidentified decapod larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callianassa larva	0	0	.8	10.0	0	0	0	0	0	0	0	0	0	0
Upogebia larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crab zoea	0	0	0	0	0	0	0	0	0	4.1	0	0	0	0
Insecta, Post-larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larva	2.6	0	0	0	0	0	0	3.8	0	0	0	0	0	0
Arachnida, Mite	0	0	.4	0	0	0	0	0	0	0	0	0	0	0
Mollusca														
Gastropoda	0	0	.8	0	0	0	0	0	0	2.1	0	0	0	0
Gastropod egg case	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	2.6	0	1.6	0	0	4.4	0	3.8	0	210.1	0	50.4	10.5	14.8
Ectoprocta, Cyphonautes larva	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetognatha	0	0	4.0	0	0	0	0	0	0	14.6	0	0	0	0
Echinodermata														
Larva	0	0	0	0	0	6.7	0	0	0	4.1	0	0	0	0
Chordata, Larvacea and larval Ascidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	74.1
Thaliacea	0	0	0	0	0	0	0	0	0	0	0	0	0	44.5
Fish egg	0	0	0	0	0	0	0	0	0	2.1	0	0	0	0
Fish larva	5.3	1.9	2.0	0	7.8	2.2	0	7.6	0	0	0	0	0	0
Unidentified														
Egg	0	9.3	0	0	0	0	0	7.6	0	10.3	0	15.1	0	0
"B"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	2.6	0	.4	0	7.8	4.4	0	0	6.8	0	0	0	0	14.4
Nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total zooplankton/m³, computer	917.9	230.6	215.6	926.2	5253.5	1274.3	4676.3	1787.9	5008.5	988.8	1726.9	2747.1	2562.7	2949.[illegible]
Total zooplankton count, computer	349.0	372.0	539.0	369.0	677.0	574.0	586.0	473.0	742.0	480.0	397.0	545.0	490.0	398.0
Total zooplankton count	349.0	372.0	539.0	369.0	677.0	574.0	586.0	473.0	742.0	480.0	397.0	545.0	490.0	398.0
Total zooplankton/m³	917.9	230.6	215.6	926.2	5253.5	1274.3	4676.3	1787.9	5008.5	988.8	1726.9	2746.9	2562.7	2949.2

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON

Date	13SEP67	23SEP	30SEP	7OCT	7OCT	17OCT	24OCT	31OCT	7NOV	14NOV	21NOV	28NOV	16DEC	29DEC	14JAN68	21JAN
K factor	14.24	13.51	14.16	3.87	8.03	8.30	1.63	1.57	.48	.66	.55	.62	1.12	.12	1.43	.12
Arthropoda, Crustacea, Copepoda																
Acartia clausi f.	1694.6	3809.8	934.6	847.5	2794.4	730.4	136.9	12.6	41.8	1.3	45.1	13.0	0	0	0	0
" " m.	2463.5	4647.4	1557.6	445.0	666.5	680.6	161.4	4.7	27.4	.7	30.3	13.0	0	0	0	0
" " c.	4143.8	5998.4	3879.8	197.4	369.4	2149.7	466.2	6.3	30.7	.7	39.0	12.4	1.1	0	0	0
" " III	42.7	256.7	169.9	7.7	0	74.7	11.4	0	0	0	2.2	0	0	0	0	0
" " II	42.7	67.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	14.2	27.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	1.6	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	0	.5	0	0	.6	0	0	0	0
" " c.	0	0	0	3.9	0	0	0	0	1.0	0	0	.6	0	0	0	0
" " III	0	0	0	0	0	0	1.6	0	0	0	.6	0	0	0	0	0
Acartia longiremis f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	8.3	4.9	0	.5	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	3.3	0	.5	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	0	0	0	0	0	0	0	0	0	0	0	0	1.1	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	1.1	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia spp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	3.1	0	0	0	0	0	0	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropages mcmurrichi m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	.5	0	0	0	0	0	0	.1
Clausocalanus spp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	1.2	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	14.2	216.2	28.3	181.9	88.3	8.3	6.5	47.1	.5	1.3	3.3	8.1	1.1	0	1.4	0
" " m.	42.7	67.6	141.6	139.3	40.2	91.3	22.8	65.9	9.1	1.3	22.0	25.4	3.4	0	0	0
" " c.	498.4	283.7	354.0	81.3	64.2	373.5	37.5	307.4	36.5	8.6	47.3	130.8	10.1	.1	0	0
Microcalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tortanus discaudatus c.	0	0	0	0	0	0	0	0	1.4	0	.6	0	0	0	0	0
Paracalanus parvus f.	0	0	0	0	8.0	8.3	6.5	15.7	10.1	0	12.6	11.8	4.5	0	0	0
" " m.	0	0	0	0	0	16.6	0	3.1	1.4	0	1.1	1.2	1.1	0	0	0
" " c.	0	13.5	0	0	0	33.2	11.4	20.4	20.2	0	9.9	3.7	11.2	.2	0	0
" " III	0	0	0	0	0	0	0	1.6	0	0	.6	.6	0	0	0	0
" " h.	0	0	0	0	0	0	1.6	0	0	0	0	0	0	0	0	0
Pseudocalanus sp. f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	28.3	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Pseudocalanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	.6	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified calanoid c.	28.5	13.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elongated copepod nauplius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepod nauplius	14.2	27.0	14.2	0	0	8.3	0	0	0	0	0	0	0	0	0	0
Corycaeus sp. f.	0	0	0	0	0	0	4.9	14.1	4.8	0	.6	1.9	0	0	0	0
" " m.	0	13.5	0	0	0	0	4.9	1.6	2.9	0	1.1	3.7	0	0	0	0
" " c.	0	0	0	0	0	0	34.2	34.5	5.3	0	4.9	1.9	0	0	0	0
Oithona similis f.	0	13.5	0	3.9	0	0	1.6	3.1	8.2	0	1.1	3.7	0	0	0	0
Oithona sp. m.	0	0	0	0	0	0	0	0	0	0	0	.6	0	0	0	0
Oithona similis c.	0	0	0	0	0	0	0	0	1.0	0	0	0	0	0	0	0
Oithona spinirostris f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	.6	1.1	0	0	0
Unidentified cyclopoid copepod	0	0	0	7.7	8.0	0	1.6	1.6	0	0	0	.6	1.1	.2	1.4	.1
Harpacticoid copepod	14.2	13.5	14.2	50.3	24.1	8.3	3.3	28.3	3.8	5.9	4.9	8.1	7.8	6.7	5.7	1.7

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON
COPEPODS, SEPTEMBER 1967 TO SEPTEMBER 1968

Date	27JAN	6FEB	13FEB	6MAR	14MAR	21MAR	10APR	19APR	26APR	5MAY	12MAY	17MAY	8JUN	19JUN	26JUN
K factor	.13	2.95	.13	.14	.14	.13	.13	.14	.13	.43	3.07	.99	2.63	.62	.40
Acartia clausi f.	3.0	0	0	.6	.1	0	0	0	1.4	9.5	3.1	5.9	0	1.2	8.0
" " m.	1.4	0	0	.8	0	0	0	0	.3	10.8	3.1	2.0	0	1.2	6.0
" " c.	2.9	0	0	0	0	0	.1	0	.6	4.3	12.3	4.0	0	0	10.0
" " III	.1	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " h.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia danae f.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia longiremis f.	.4	0	.1	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	.1	0	.1	0	0	0	0	0	0	0	0	1.0	0	0	1.2
" " c.	.1	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acartia tonsa f.	2.1	0	0	2.2	0	0	0	0	0	0	0	0	0	0	0
" " m.	.4	0	0	0	0	0	0	0	0	1.3	0	0	0	0	1.6
" " c.	.8	0	0	5.6	0	0	0	0	0	5.6	3.1	2.0	0	0	.8
" " III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0
Acartia spp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " III	.6	0	0	0	0	0	0	0	0	0	0	4.0	0	0	0
" " II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calanus spp. f.	.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	1.2	0	0	.6	0	0	0	0	0	0	0	0	0	0	0
"Calanus-type" c.	0	0	0	0	0	0	0	0	0	0	0	2.0	0	0	0
Centropages mcmurrichi m.	.1	0	0	0	0	0	0	0	0	.4	0	0	0	0	0
" " c.	0	0	0	.1	0	0	0	0	0	0	0	0	0	0	1.2
Clausocalanus spp. f.	.1	0	0	0	0	0	0	0	0	.6	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus f.	.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	.1	0	0	.3	0	.1	0	0	0	.4	3.1	0	0	0	0
Epilabidocera amphitrites m.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
" " c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus sp. c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurytemora sp. f.	[illegible]	[illegible]	[illegible]	[illegible]	1.3	[illegible]	.1	.1	.3	2.2	39.9	0	26.3	8.7	1.2
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	1.0	[illegible]	[illegible]	[illegible]	1.3	13.8	104.4	14.9	86.8	20.5	2.8
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.7	87.7	577.2	182.2	570.7	124.0	21.2
Microcalanus sp. f.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tortanus discaudatus c.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Paracalanus parvus f.	3.8	[illegible]	[illegible]	31.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	.1	[illegible]	[illegible]	.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	3.2	[illegible]	[illegible]	2.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " h.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pseudocalanus sp. f.	[illegible]	[illegible]	[illegible]	1.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	7.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
"Pseudocalanus-type" c.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	2.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " II	[illegible]	[illegible]	[illegible]	.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " I	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Unidentified calanoid c.	[illegible]	[illegible]	[illegible]	.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Elongated copepod nauplius	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Copepod nauplius	[illegible]	[illegible]	[illegible]	10.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Corycaeus sp. f.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	.1	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	6.0	[illegible]	[illegible]	1.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona similis f.	.4	[illegible]	[illegible]	1.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona sp. m.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona similis c.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona spinirostris f.	.1	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Unidentified cyclopoid copepod	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Harpacticoid copepod	10.7	8.9	.4	.7	19.2	.8	.4	1.1	1.6	.4	239.5	3.0	68.4	3.1	1.6

ZOOPLANKTON NUMBERS PER CUBIC METER AT STATION 4 IN ALSEA BAY, OREGON

Date	3JUL	10JUL	16JUL	23JUL	29JUL	5AUG	11AUG	18AUG	25AUG	31AUG	7SEP68
K factor	2.51	7.76	2.22	7.98	3.78	6.75	2.06	4.35	5.04	5.23	7.41
Acartia clausi f.	2.5	31.6	77.7	55.0	102.1	20.3	45.3	4.7	131.0	224.9	111.2
" " m.	5.0	15.5	64.4	55.0	105.8	0	113.3	33.5	85.7	172.4	133.7
" " c.	7.5	38.8	37.7	39.9	83.2	20.3	49.4	13.0	55.4	139.8	265.8
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22.2
" " II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.4
" " I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " h.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Acartia danae f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Acartia longiremis f.	[illegible]	[illegible]	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	6.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	64.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	40.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " II	[illegible]	[illegible]	28.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " I	[illegible]	[illegible]	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Acartia tonsa f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Acartia spp. c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Calanus spp. f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
"Calanus-type" c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Centropages mcmurrichi m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Clausocalanus spp. f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ctenocalanus vanus f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Epilabidocera amphitrites m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eucalanus sp. c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eurytemora sp. f.	7.5	0	0	0	11.3	0	2.1	0	20.2	0	37.0
" " m.	37.7	46.6	13.3	47.9	34.0	0	6.2	13.0	15.1	15.7	274.2
" " c.	75.3	38.8	95.5	127.7	30.2	0	51.5	13.0	35.3	141.2	715.8
Microcalanus sp. f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tortanus discaudatus c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Paracalanus parvus f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " h.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pseudocalanus sp. f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
"Pseudocalanus-type" c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Unidentified calanoid c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Elongated copepod nauplius	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Copepod nauplius	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Corycaeus sp. f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona similis f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona sp. m.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona similis c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oithona spinirostris f.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" " c.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Unidentified cyclopoid copepod	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Harpacticoid copepod	0	0	2.2	0	117.2	6.8	14.4	0	126.0	0	7.4

Extraneous physical-chemical data, taken when there was no zooplankton tow (January 8, 1967, and February 21, 1968) or taken both before and after zooplankton tow (September 7, 1968).

	8 Jan. 67	21 Feb. 68	7 Sept. 68 (before)	7 Sept. 68 (after)
Station 1				
Surface salinity (°/oo)	18.58	15.18	32.41	32.30
Bottom salinity (°/oo)	--	27.98	32.63	32.57
Surface temperature (°C)	9.0	10.5	13.3	14.4
Bottom temperature (°C)	--	10.5	13.2	13.4
Surface dissolved oxygen (ml/L)	--	7 11	5.74	6.22
Bottom dissolved oxygen (ml/L)	--	6.68	6.26	6.08
Surface oxygen saturation (%)	--	100.6	95.8	106.1
Bottom oxygen saturation (%)	--	102.3	104.3	102.0
Tide level (ft)	4.7	2.6	6.9	7.1
Time of water sample (PST)	1315	1617	1218	1250
Alsea River stream flow (ft^3/sec)	2480	8460	160	160
Station 2				
Surface salinity (°/oo)	15.67	.34	32.59	32.54
Bottom salinity (°/oo)	19.19	.47	32.59	32.59
Surface temperature (°C)	8.9	10.1	13.5	14.0
Bottom temperature (°C)	8.9	10.1	13.4	13.5
Surface dissolved oxygen (ml/L)	--	7.51	6.28	6.26
Bottom dissolved oxygen (ml/L)	--	7.43	6.35	6.36
Surface oxygen saturation (%)	--	95.8	105.5	106.1
Bottom oxygen saturation (%)	--	94.6	106.4	106.7
Tide level (ft)	4.4	2.3	7.1	7.0
Time of water sample (PST)	1326	1602	1310	1335
Station 3				
Surface salinity (°/oo)	4.90	.05	32.38	32.36
Bottom salinity (°/oo)	26.26	.06	32.38	32.37
Surface temperature (°C)	8.0	9.8	14.2	14.7
Bottom temperature (°C)	9.4	9.7	14.1	14.5
Surface dissolved oxygen (ml/L)	--	7.57	6.17	6.27
Bottom dissolved oxygen (ml/L)	--	7.56	6.25	6.25
Surface oxygen saturation (%)	--	95.6	105.1	107.9
Bottom oxygen saturation (%)	--	95.2	106.1	107.2
Tide level (ft)	3.9	2.0	6.7	6.3
Time of water sample (PST)	1344	1548	1359	1425
Station 4				
Surface salinity (°/oo)	.06	.02	19.42	16.40
Bottom salinity (°/oo)	.05	.02	28.59	26.95
Surface temperature (°C)	7.6	9.6	17.7	18.0
Bottom temperature (°C)	7.4	9.6	16.0	16.3
Surface dissolved oxygen (ml/L)	--	7.57	5.98	6.00
Bottom dissolved oxygen (ml/L)	--	7.89	5.94	5.79
Surface oxygen saturation (%)	--	95.1	101.0	100.0
Bottom oxygen saturation (%)	--	99.1	102.4	99.5
Tide level (ft)	3.9	0.8	6.4	5.9
Time of water sample (PST)	1414	1515	1459	1524

APPENDIX II

COSINE-LANCZOS FILTER-TAPER FOR ANALYSIS OF WIND DATA

Time (hr) M	Taper weighting function F(M)
0	1.000
3	.943
6	.787
9	.570
12	.331

Normalization factor
6.262

T (hr)	Frequency response function F(σ)
100	.92000
80	.87709
60	.78916
48	.68535
36	.49335
24	.13822
12	.01405
6	.03354