UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

BENTHIC MACROFAUNAL BIOMASS OF SAN FRANCISCO BAY, CALIFORNIA: JANUARY/FEBRUARY AND AUGUST 1973

by

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ABSTRACT

Benthic macrofaunal biomass data from San Francisco Bay are presented for 43 stations which were sampled in January/February and August 1973. Biomass data for four major groups (Mollusca, Annelida, Athropoda, and a combination of remaining phyla) and for the groups combined are provided with relative rank at each station for each month. Ancillary data collected concurrently with the macrofaunal samples include water column salinity, temperature, and dissolved oxygen.

INTRODUCTION

Studies on the benthic invertebrates of San Francisco Bay have been localized, limited to one season, and/or have been non-quantitative. The baywide distribution of the benthic macrofauna has never been described using synoptic samples, although some studies have combined samples collected from different parts of the bay during different months and sometimes different years (see Nichols 1973 for a discussion of benthic studies on San Francisco Bay). Due to this lack of synoptic data, baywide seasonal changes in this distribution have never been described. Similarily macrofaunal biomass, an estimate of the organic carbon in these animals, has not been measured. The purpose of this study, therefore, was to estimate the macrofaunal biomass throughout the bay during summer and winter and to determine the extent of any seasonal changes in the biomass distribution and phylogenetic composition.

METHODS

Bottom samples were collected at 43 stations in January and February 1973 and at 42 of the same stations in August 1973 (figure 1, tables 1 and 2). Three replicates were collected at each station with a 0.1 m^2 van Veen grab from the U.S. Geological Survey research vessels Polaris at the deep water (>3 m) stations, and Gilbert at the shoal stations. Samples were washed through a 1.0 mm sieve, preserved in buffered formalin for a maximum of two weeks, and stored in 70% ethyl alcohol.

Animals were removed from the sediment and sorted into the major phyla (Mollusca, Annelida, Arthropoda, and all remaining phyla combined). The remaining phyla consisted primarily of coelenterates, echinoderms, and urochordates. If one species or phyla dominated this latter group it was

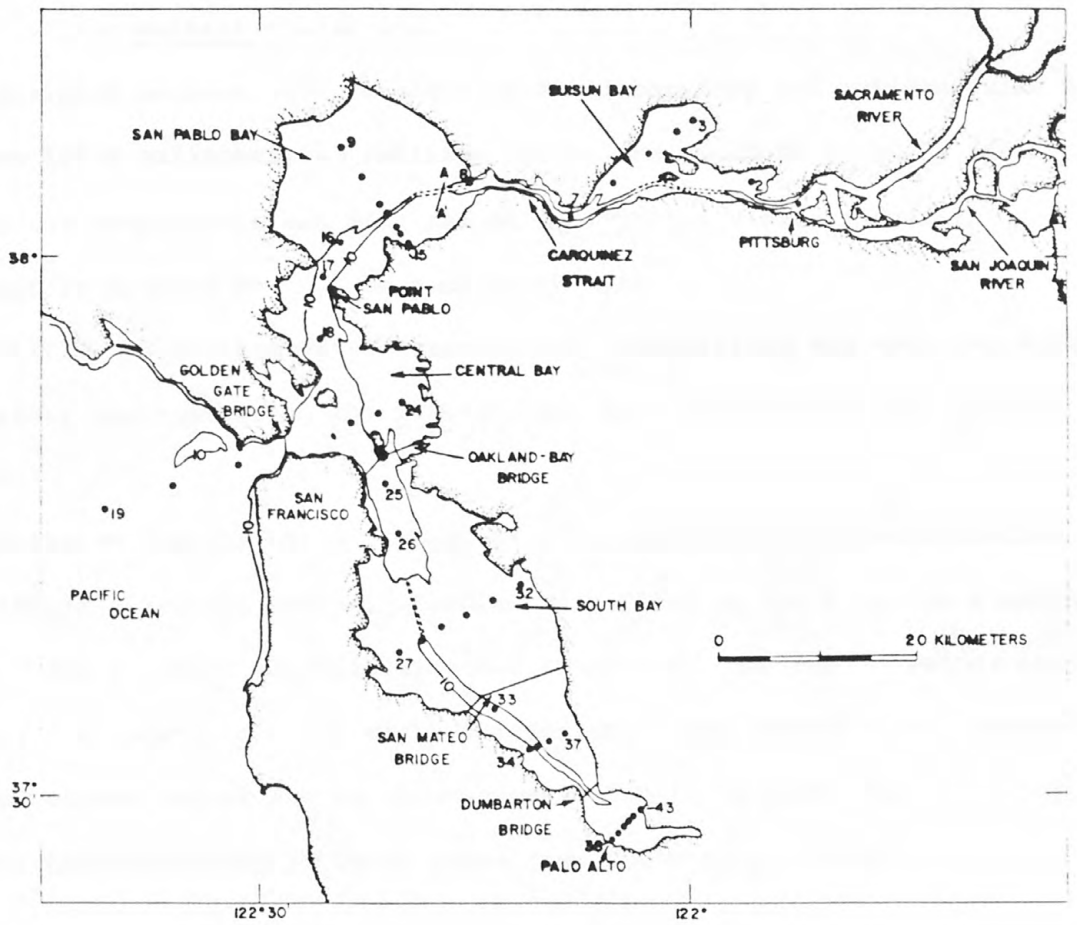

Figure 1. Station locations and 10 m depth contour.

recorded separately (table 10). Animals were air dried and blotted for 10 minutes to remove the surface water and then weighed.

Salinity, temperature, and dissolved oxygen, were measured at each station at the time of the benthic collection from water samples collected at a depth of 1 m with a pump mounted on the bow of the Polaris and from a Niskin bottle on the Gilbert (table 3).

Salinity samples were returned to the laboratory and analyzed with a Beckman RS7-B salinometer. Salinity values are accurate to ±0.05 °/oo.

Water temperature was measured on the Polaris using linearized thermistors mounted on the bow pump which were calibrated at ice point and at the anticipated maximum water temperature. Temperature was measured with a laboratory thermometer on the Gilbert, and both measurements are accurate to ±0.2 C.

Dissolved oxygen was analyzed using Carpenter's (1965) modification of the Winkler titration method. Samples were fixed in the basic form and held up to 2 hours before acidification and titration. The oxygen values are generally accurate to ±0.16 ml/L, however South Bay (south of the Oakland-Bay Bridge) oxygen values may be less accurate (up to 5% high) due to the high nitrate concentrations in these areas (see Smith et al. 1979).

ACKNOWLEDGEMENTS

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Nichols, Frederic H., 1973, A review of benthic faunal surveys in San Francisco Bay: U.S. Geological Survey Circular 677, 20 p.

Smith, Richard E., Herndon, Raynol E., and Harmon, Dana D., 1979, Physical and chemical properties of San Francisco Bay waters, 1969-1976: U.S. Geological Survey Open-File Report 79-511, 607 p.

Table 1. Station locations and water depth

Station	*Water Depth (m)	Latitude N	Longitude W	UTM x	UTM y	Geographical Location
1	13.0	38°03.05	121°52.85	598196	4211840	Sacramento R. near Pittsburg
2	3.0	38°04.10	121°56.05	593494	4213727	Honker Bay
3	2.5	38°07.85	122°00.65	586695	4220588	Grizzley Bay
4	3.2	38°07.05	122°01.70	585177	4219092	Grizzley Bay
5	7.0	38°05.85	122°03.25	582935	4216849	Suisun Bay off Garnet Pt.
6	10.0	38°04.05	122°05.90	579094	4213482	Suisun Bay off Reserve Fleet
7	14.5	38°02.00	122°08.85	574816	4209651	Carquinez Strait
8	17.0	38°03.80	122°15.90	564478	4212891	Off Mare Island
9	1.3	38°05.60	122°25.20	550859	4216124	N. San Pablo Bay
10	2.0	38°04.30	122°23.65	553140	4213734	Mid San Pablo Bay
11	4.0	38°02.85	122°22.25	555205	4211066	Mid San Pablo Bay
12	11.0	38°02.25	122°21.75	555944	4209962	San Pablo Bay near channel
13	5.0	38°01.40	122°21.10	556924	4205808	Off Point Pinole
14	1.6	38°01.05	122°20.75	557422	4207753	Off Point Pinole
15	1.0	38°00.55	122°20.40	557941	4206832	Off Point Pinole
16	13.0	38°00.50	122°24.90	551357	4206695	San Pablo Strait
17	24.0	37°58.50	122°26.25	549404	4202984	Off Point San Pablo
18	12.5	37°54.85	122°26.45	549152	4196234	Off Tiburon Peninsula
19	33.0	37°46.00	122°41.50	527157	4179766	Off San Francisco Lightship
20	12.0	37°46.85	122°36.85	533977	4181363	Off Fourfathom Bank

Table 1. Station locations and water depth (continued).

Station	*Water Depth (m)	Latitude N	Longitude W	UTM x	UTM y	Geographical Location
21	31.0	37°48.00	122°32.10	540938	4183522	Ship Channel off Pt. Benita
22	25.0	37°50.35	122°24.35	552282	4187931	Between Angel Is. & Treasure Is.
23	7.0	37°51.05	122°22.50	554986	4189244	Berkeley Pier (outer)
24	5.0	37°51.70	122°20.60	557763	4190465	Berkeley Pier (inner)
25	18.0	37°47.05	122°21.65	556283	4181856	Off China Basin
26	16.5	37°44.20	122°20.65	557787	4176596	Off Hunters Point
27	4.0	37°37.95	122°20.60	557942	4165039	Off San Francisco Airport
28	9.5	37°38.65	122°19.95	558889	4166340	Channel off San Francisco Airport
29	5.0	37°39.35	122°17.80	562040	4167658	San Bruno Shoal
30	5.0	37°40.00	122°15.75	565045	4168883	Off San Leandro Harbor
31	2.3	37°40.65	122°13.80	567901	4170108	Off San Leandro Harbor
32	3.0	37°41.50	122°12.30	570092	4171698	Off San Leandro Harbor
33	11.0	37°34.50	122°13.25	568804	4158743	Off Foster City
34	3.5	37°32.50	122°11.35	571632	4155068	Mouth off Redwood Creek
35	13.0	37°32.70	122°10.80	572439	4155446	Channel off Redwood Creek
36	2.5	37°33.00	122°10.00	573612	4156010	Off Redwood Creek
37	2.5	37°33.40	122°08.80	575372	4156766	Off Coyote Hills Slough
38	2.0	37°27.40	122°05.40	580484	4145718	Off Charleston Slough
39	2.0	37°27.80	122°04.95	581140	4146464	Off Charleston Slough

Table 1. Station locations and water depth (continued).

Station	*Water Depth (m)	Latitude N	Longitude W	UTM x	UTM y	Geographical Location
40	2.0	37°28.25	122°04.40	581943	4147304	Off Charleston Slough
41	9.0	37°28.45	122°04.15	582308	4147678	Channel off Mowry Slough
42	2.6	37°28.70	122°03.90	582672	4148144	Off Mowry Slough
43	2.2	37°29.15	122°03.40	583400	4148983	Off Mowry Slough

*Water depth at time of sample

Table 2. Cruise dates

Station	Date Sampled		Station	Date Sampled	
	Winter 1973	Summer 1973		Winter 1973	Summer 1973
1	12 February	14 August	28	31 January	13 August
2	13 February	22 August	29	14 February	13 August
3	13 February	22 August	30	14 February	13 August
4	13 February	22 August	31	14 February	none taken
5	12 February	14 August	32	14 February	21 August
6	12 February	14 August	33	31 January	13 August
7	13 February	15 August	34	16 February	21 August
8	2 February	15 August	35	31 January	13 August
9	13 February	22 August	36	15 February	21 August
10	13 February	22 August	37	16 February	21 August
11	2 February	15 August	38	15 February	24 August
12	2 February	15 August	39	15 February	24 August
13	2 February	15 August	40	15 February	24 August
14	13 February	22 August	41	31 January	24 August
15	13 February	22 August	42	15 February	24 August
16	2 February	15 August	43	15 February	24 August
17	2 February	14 August			
18	2 February	14 August			
19	1 February	14 August			
20	1 February	14 August			
21	1 February	14 August			
22	1 February	14 August			
23	1 February	14 August			
24	14 February	13 August			
25	31 January	13 August			
26	31 January	13 August			
27	14 February	13 August			

Table 3. Hydrographic data for January/February 1973 and August 1973

Station #	January/February 1973			August 1973		
	Salinity °/oo	Temp °C	O_2 mℓ/ℓ	Salinity °/oo	Temp °C	O_2 mℓ/ℓ
1	0.0	--	7.16	3.2	21.4	5.88
2	0.0	10.4	7.00	4.5	19.9	--
3	0.1	10.6	7.54	7.5	20.9	6.90
4	0.1	10.6	7.04	6.5	20.0	7.35
5	0.0	10.6	7.20	9.9	20.8	5.97
6	0.1	10.6	7.17	12.0	20.8	5.77
7	9.9	11.0	6.44	15.5	19.0	5.47
8	17.8	10.5	6.29	19.7	18.4	5.34
9	2.0	11.6	7.09	23.6	18.6	5.67
10	3.7	11.6	7.29	23.4	18.8	5.76
11	13.5	10.0	6.65	23.0	18.1	5.31
12	22.8	10.8	6.11	25.7	18.0	5.32
13	19.9	10.8	6.27	26.0	18.2	5.41
14	4.4	11.0	6.83	25.8	17.5	5.46
15	4.9	11.2	6.94	26.6	16.0	5.78
16	23.4	10.8	6.25	27.9	18.0	5.12
17	24.9	10.8	6.14	28.5	18.3	5.17
18	25.7	10.6	6.16	31.0	17.8	5.16
19	33.4	11.8	5.55	33.8	10.8	2.65
20	33.1	11.8	5.54	32.6	13.9	5.11
21	32.5	12.2	5.74	33.0	13.8	4.73
22	29.8	12.1	5.98	31.6	14.3	5.09
23	20.5	11.5	6.34	31.3	18.7	5.14
24	--	11.5	6.49	30.7	16.8	5.41
25	23.3	11.5	6.07	31.9	17.0	5.16
26	21.2	11.0	6.13	31.2	20.9	5.24
27	17.2	11.8	6.57	30.9	18.8	5.75
28	20.2	11.0	6.01	28.8	19.2	5.15
29	17.9	11.5	6.49	30.5	19.9	5.20

Table 3. Hydrographic data for January/February 1973 and August 1973 (cont.)

Station #	January/February 1973			August 1973		
	Salinity °/oo	Temp °C	O_2 mℓ/ℓ	Salinity °/oo	Temp °C	O_2 mℓ/ℓ
30	16.8	11.8	6.50	30.2	20.1	5.20
31	14.4	11.9	6.62	no samples taken		
32	11.5	12.1	6.71	30.5	18.6	4.64
33	18.4	10.6	6.22	29.6	19.2	4.68
34	16.3	13.0	6.23	29.6	19.4	4.90
35	19.6	10.5	5.78	29.6	18.4	4.79
36	15.0	12.4	6.25	29.7	19.7	5.08
37	14.4	12.0	6.36	30.5	18.6	5.30
38	9.6	12.0	6.23	27.0	20.3	4.49
39	10.8	12.6	6.22	26.5	20.2	4.69
40	11.4	13.0	6.01	28.6	21.7	--
41	16.7	10.4	6.26	27.4	19.8	4.62
42	13.9	11.9	6.21	27.1	21.4	4.66
43	12.6	12.0	5.58	28.1	20.6	4.37

Table 4. Biomass totals and percent of total biomass for phyla in the bay as whole and in each division of the bay

	Wet Weight (g)										% of Total Biomass							
	Total*		Mollusca		Annelida		Arthropoda		Remaining		Mollusca		Annelida		Arthropoda		Remaining	
	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug	Jan Feb	Aug
San Francisco Bay (All stations)	1284	1278	642	598	82	40	7	12	552	597	50	47	6	3	1	1	43	47
Suisun Bay (Stations 2-6)	15	6	13	4	3	1	<1	<1	<1	1	87	67	20	17	<1	<1	<1	17
San Pablo Bay (Stations 9-17)	40	64	36	56	2	1	<1	2	1	4	90	88	5	2	<1	3	2	6
Central Bay (Stations 18,22-24	59	42	41	6	7	13	1	2	9	21	70	14	12	31	2	5	15	50
Northern South Bay (Stations 25-37)	549	402	466	332	64	49	5	6	13	15	85	83	12	12	1	2	2	4
Southern South Bay (Stations 38-43)	88	207	81	191	6	8	<1	2	1	6	92	92	7	4	<1	1	1	3

*totals may not equal summation of following columns due to rounding errors

Table 5. Percent of total biomass contributed by each of the groups at each station for both sampling periods.

	January/February 1973				August 1973			
Station	Mollusca	Annelida	Arthropoda	Remaining	Mollusca	Annelida	Arthropoda	Remaining
1	1.4	89.6	8.9	0.0	28.6	16.3	55.1	0.0
2	14.3	82.0	3.7	0.0	2.6	90.8	2.5	4.1
3	65.1	34.9	0.1	0.0	1.9	96.5	1.6	0.0
4	65.8	32.8	1.5	0.0	51.4	48.3	0.3	0.0
5	98.6	1.3	0.1	0.0	95.3	4.8	0.0	0.0
6	88.1	10.9	0.8	0.2	66.7	4.8	9.2	19.3
7	96.9	3.0	0.1	0.0	73.6	16.0	10.4	0.5
8	94.8	5.1	0.1	0.0	99.3	0.7	0.0	0.0
9	85.8	14.1	0.04	0.0	95.0	3.3	1.7	0.0
10	95.4	4.2	0.4	1.0	98.9	0.7	0.4	0.0
11	93.8	5.5	0.02	0.7	65.0	1.0	1.7	32.4
12	85.8	1.7	0.0	2.5	56.8	20.5	6.0	16.7
13	97.2	1.3	0.1	1.5	72.3	10.2	16.3	1.2
14	95.1	4.4	0.5	0.0	86.3	4.6	9.2	0.0
15	13.5	53.1	30.2	3.2	96.1	1.3	2.6	0.03
16	77.0	3.0	8.5	11.5	29.3	29.2	0.8	40.8
17	0.8	8.8	0.1	90.3	61.1	33.3	5.5	0.0
18	97.1	0.7	0.04	2.1	0.0	34.4	65.6	0.0
19	72.3	19.6	2.2	6.0	54.4	43.8	0.6	1.3
20	0.01	0.0	0.0	99.9	0.1	0.0	0.05	99.9

Table 5. Percent of total biomass contributed by each of the groups at each station for both sampling periods (continued).

	January/February 1973				August 1973			
Station	Mollusca	Annelida	Arthropoda	Remaining	Mollusca	Annelida	Arthropoda	Remaining
21	6.6	7.9	0.0	85.5	21.8	76.9	0.01	0.0
22	39.8	33.0	0.6	62.4	6.5	11.0	0.2	82.3
23	81.1	9.7	1.0	2.8	26.1	65.1	8.2	0.6
24	5.5	31.3	63.1	0.0	42.6	40.3	16.3	0.8
25	56.6	17.3	23.9	2.2	42.5	54.5	3.0	0.0
26	0.7	36.2	10.6	52.4	2.0	88.7	2.9	6.4
27	63.1	29.4	0.1	7.3	45.6	31.2	0.6	22.6
28	95.2	2.4	0.1	2.3	86.5	10.0	0.2	3.4
29	68.0	23.4	8.6	0.0	86.6	11.5	1.4	0.6
30	44.2	55.8	0.01	0.0	70.7	24.0	1.5	3.8
31	82.1	17.3	0.6	0.0		no sample taken		
32	81.3	9.5	9.2	0.0	86.2	11.1	2.7	0.0
33	86.9	13.1	0.01	0.0	71.6	17.8	9.2	1.2
34	66.7	31.0	2.4	0.0	48.9	26.3	17.0	7.9
35	98.4	1.6	1.0	0.0	96.2	3.3	0.3	2.2
36	6.9	88.9	4.3	0.0	47.7	3.3	12.8	36.2
37	44.3	42.4	13.3	0.0	18.4	69.6	12.0	0.08
38	96.3	3.7	0.01	0.0	96.9	2.5	0.6	0.0
39	90.6	9.1	0.4	0.0	93.1	5.8	1.1	0.0

Table 5. Percent of total biomass contributed by each of the groups at each station for both sampling periods (continued).

	January/February 1973				August 1973			
Station	Mollusca	Annelida	Arthropoda	Remaining	Mollusca	Annelida	Arthropoda	Remaining
40	85.0	14.2	0.8	0.04	91.7	3.3	0.6	4.5
41	81.8	11.0	0.9	6.2	86.1	6.8	2.8	4.3
42	98.4	1.2	0.4	0.0	91.9	2.5	1.2	4.4
43	94.2	5.7	0.04	0.0	98.1	1.5	0.3	0.1

Table 6. Total biomass at each station for January/February and August 1973

	January/February 1973				August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
1	20	3	525.3	204.8	20	3	548.8	387.1
2	35	3	187.6	48.2	35	3	197.8	196.9
3	28	3	151.1	37.2	40	3	88.4	50.8
4	33	3	71.4	94.8	28	3	61.0	28.3
5	30	3	38.0	29.9	30	3	44.2	19.1
6	23	3	34.7	14.1	27	3	29.7	9.7
7	27	3	31.4	13.6	41	3	28.6	18.5
8	43	3	20.2	0.8	43	3	27.1	1.6
9	32	3	18.6	7.0	22	3	25.8	10.5
10	41	3	17.1	8.2	10	3	24.7	0.8
11	31	3	16.4	10.1	39	3	23.4	1.1
12	38	3	16.4	2.0	38	3	22.8	3.0
13	42	3	14.7	2.5	32	3	19.3	4.4
14	26	3	14.3	11.7	42	3	16.6	2.8
15	18	3	12.3	10.8	33	3	14.2	8.9
16	34	3	11.0	6.9	23	3	14.0	0.5
17	13	3	10.6	16.2	15	3	13.3	7.2
18	22	3	10.0	10.6	11	3	12.3	4.1
19	40	3	10.0	3.6	29	3	11.8	6.0
20	39	3	9.9	2.2	36	3	8.4	4.2
21	14	3	8.4	8.5	37	3	7.5	1.7
22	11	3	8.2	4.6	8	3	6.6	4.0
23	5	3	6.9	3.8	9	3	5.6	0.6
24	9	3	4.5	1.3	26	3	3.9	3.2
25	12	3	4.4	3.0	14	3	3.6	0.6
26	6	3	3.4	1.9	6	3	3.4	1.2
27	7	3	3.3	2.2	34	3	3.4	0.4
28	37	3	3.0	4.0	13	3	2.9	4.0
29	4	3	2.4	1.2	24	3	1.9	0.7
30	36	3	2.3	1.2	19	3	1.8	0.6

Table 6. Total biomass at each station for January/February and August 1973 (continued).

January/February 1973					August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
31	10	3	2.1	0.1	5	3	1.3	0.5
32	19	3	1.9	0.5	12	3	1.1	0.3
33	29	3	1.9	0.3	4	3	0.6	0.5
34	3	2	1.7	--	25	3	0.4	0.1
35	24	3	1.6	0.3	18	3	0.4	0.4
36	21	3	1.5	2.1	2	3	0.4	0.2
37	25	3	1.4	0.8	21	3	0.2	0.2
38	8	3	0.8	0.8	17	3	0.1	0.1
39	2	3	0.8	0.4	7	3	0.1	0.2
40	15	3	0.7	0.2	16	3	0.1	<0.1
41	17	3	0.4	0.2	1	3	0.1	<0.1
42	16	3	0.4	0.6	3	3	0.1	0.1
43	1	3	<0.1	<0.1				

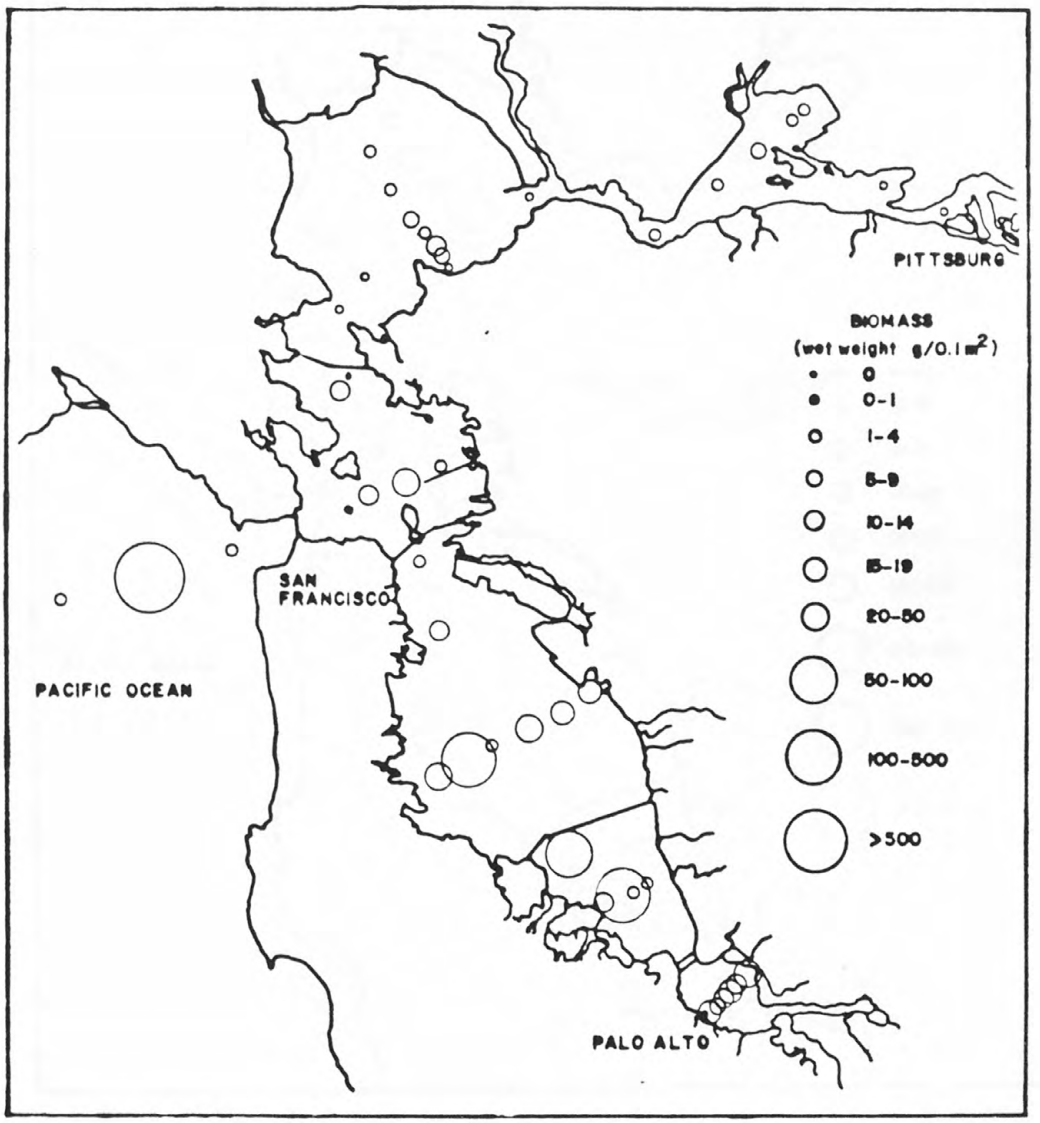

Figure 2. Total biomass in January/February 1973

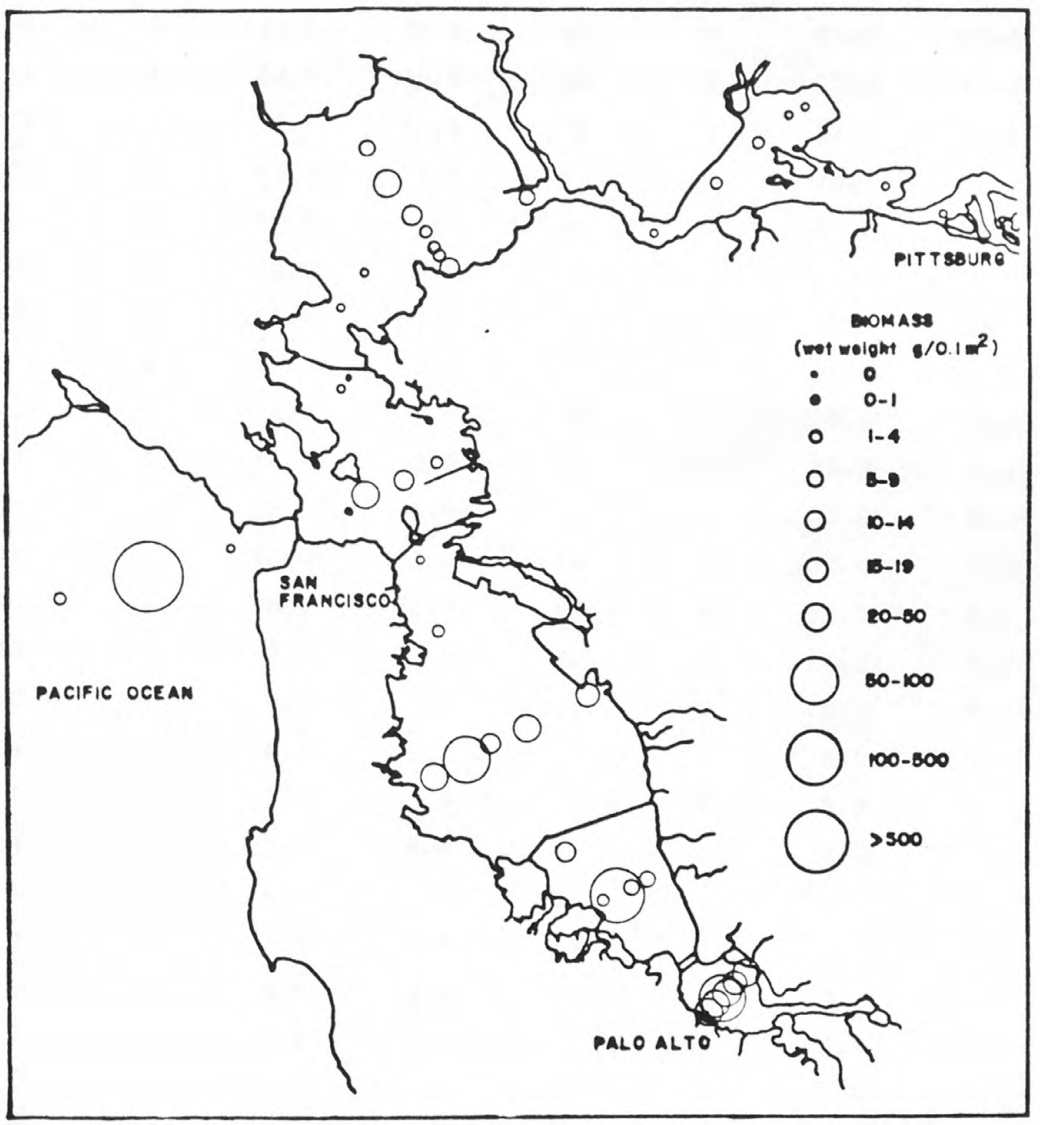

Figure 3. Total biomass in August 1973

Table 7. Molluscan biomass at each station for January/February and August 1973.

	January/February 1973				August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
1	35	3	184.6	48.8	35	3	190.3	193.6
2	28	3	143.5	36.6	40	3	81.0	50.5
3	33	3	62.0	95.9	28	3	52.8	28.7
4	23	3	28.1	13.3	30	3	31.2	23.6
5	27	3	19.8	11.9	43	3	26.6	1.5
6	43	3	19.0	0.5	41	3	24.6	17.8
7	30	3	16.8	9.7	10	3	24.4	0.7
8	38	3	15.8	1.6	38	3	22.1	2.6
9	32	3	15.2	6.6	39	3	21.8	2.3
10	42	3	14.4	2.5	32	3	16.6	4.3
11	41	3	14.0	9.7	42	3	15.3	2.3
12	31	3	13.5	5.9	27	3	13.6	9.0
13	18	3	12.0	11.0	15	3	12.8	7.2
14	13	3	10.3	16.0	29	3	10.2	5.5
15	39	3	9.0	2.1	33	3	10.2	8.3
16	40	3	8.5	3.1	11	3	8.0	0.5
17	14	3	8.0	8.1	8	3	6.5	3.9
18	11	3	17.7	4.3	9	3	5.3	0.8
19	34	3	7.4	5.6	36	3	4.0	1.4
20	5	3	6.8	3.7	23	3	3.6	2.7
21	9	3	3.9	1.8	14	3	3.1	0.9
22	12	3	3.7	3.0	6	3	2.3	1.7
23	7	3	3.2	2.2	13	3	2.1	3.6
24	6	3	3.0	2.4	22	3	1.7	1.2
25	10	3	2.0	0.1	34	3	1.7	0.7
26	4	3	1.6	1.3	37	3	1.4	1.2
27	19	3	1.4	0.4	5	3	1.2	0.6
28	37	3	1.4	2.3	19	3	1.0	0.6
29	29	3	1.3	0.4	24	3	0.8	0.3

Table 7. Molluscan biomass at each station for January/February and August 1973 (continued).

	January/February 1973				August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
30	3	2	1.1	--	12	3	0.6	0.5
31	25	3	0.8	1.3	20	3	0.5	0.6
32	8	3	0.8	0.8	4	3	0.3	0.3
33	22	3	0.4	0.6	25	3	0.2	0.2
34	16	3	0.3	0.5	7	3	0.1	0.1
35	36	3	0.2	0.3	17	3	0.1	0.1
36	2	3	0.1	0.1	26	3	0.1	0.1
37	26	3	0.1	0.1	21	3	<0.1	<0.1
38	21	3	0.1	0.1	16	3	<0.1	<0.1
39	15	3	0.1	<0.1	1	3	<0.1	<0.1
40	24	3	0.1	<0.1	2	3	<0.1	<0.1
41	20	3	<0.1	<0.1	3	3	0.0	0.0
42	17	3	0.0	0.0	18	3	0.0	0.0
43	1	3	0.0	0.0				

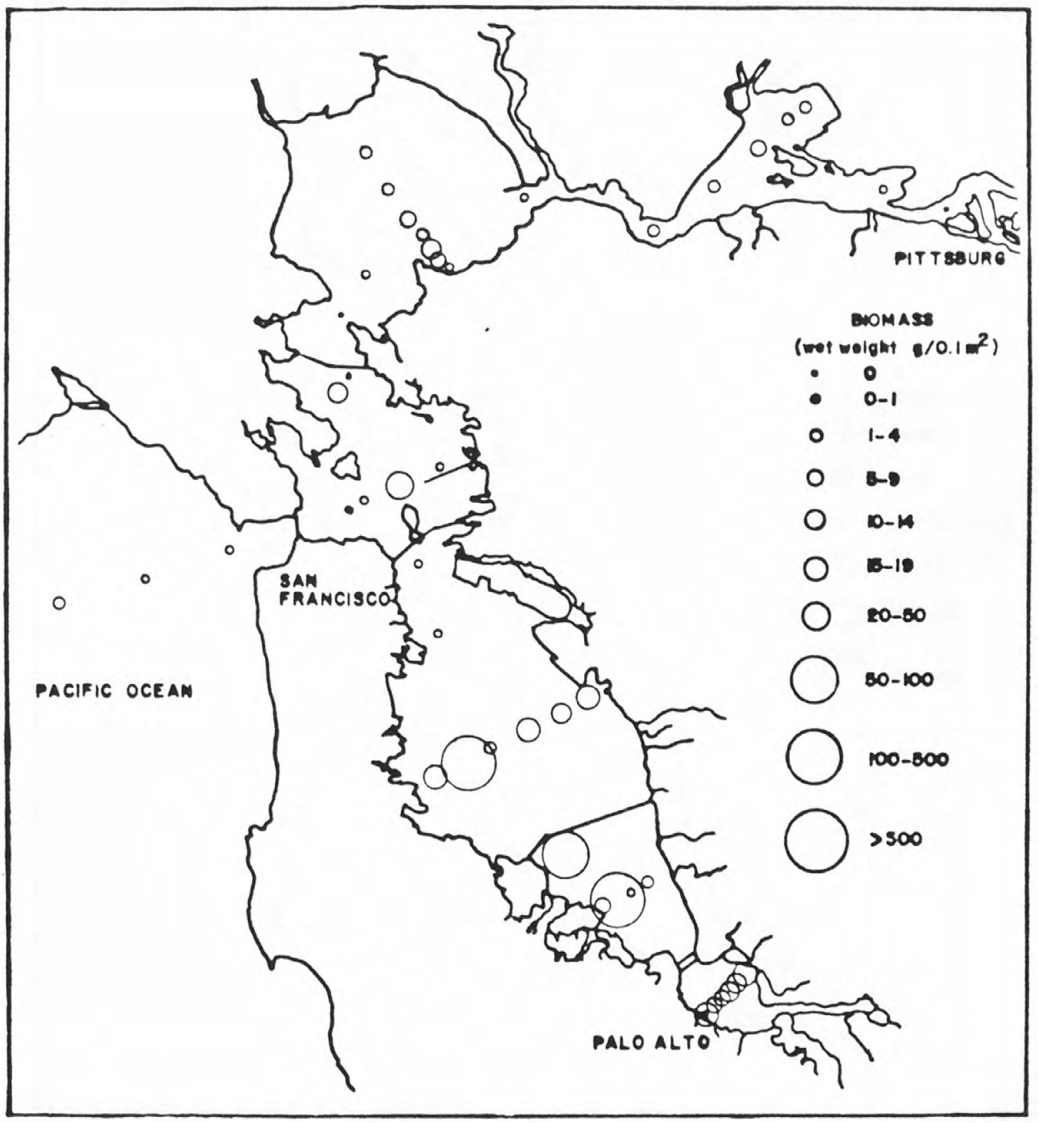

Figure 4. Molluscan biomass in January/February 1973

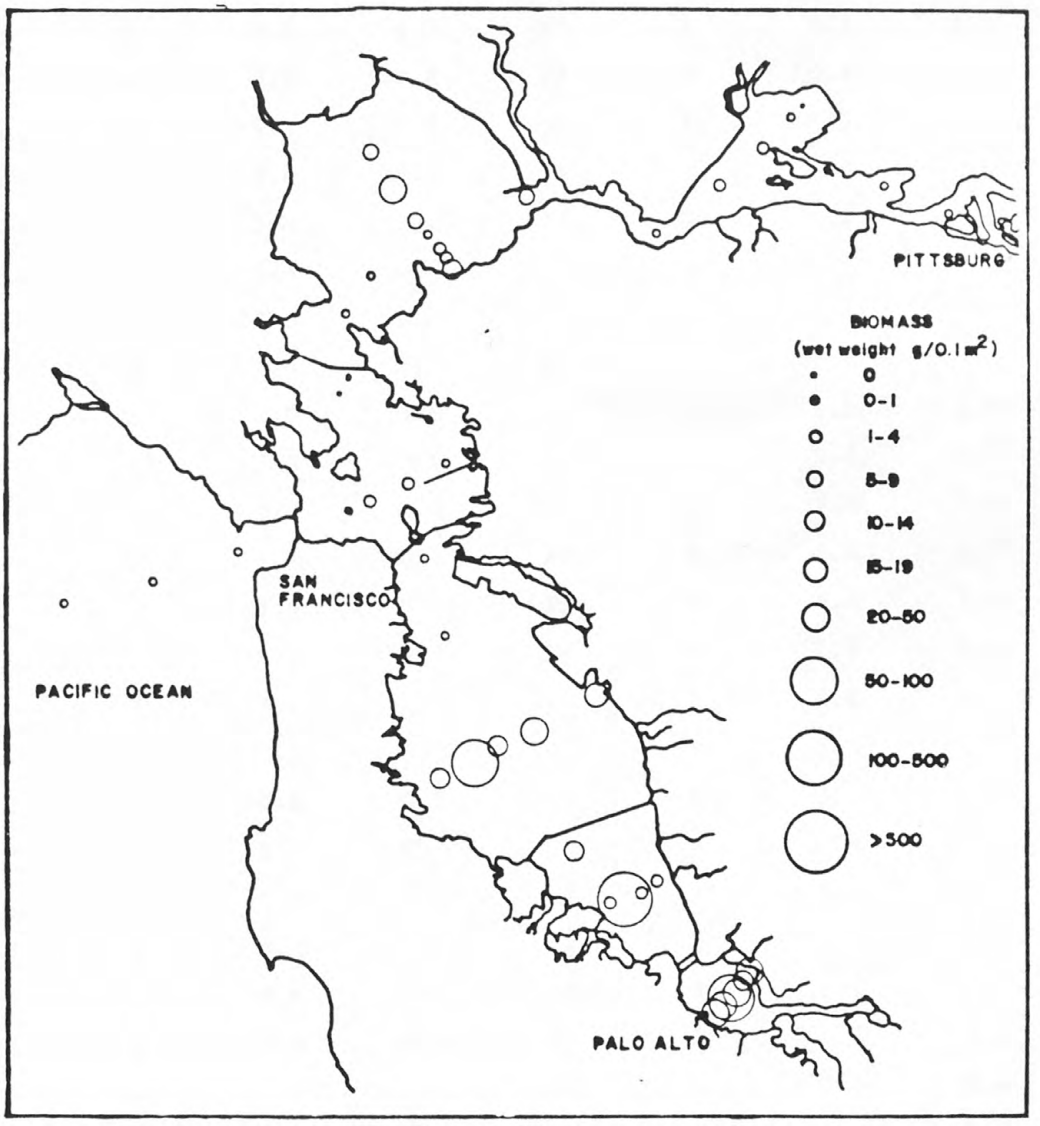

Figure 5. Molluscan biomass in August 1973

Table 8. Annelid biomass at each station for January/February and August 1973.

January/February 1973					August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
1	30	3	21.2	20.3	30	3	10.6	5.3
2	33	3	9.4	4.7	27	3	9.3	2.8
3	27	3	9.2	1.8	23	3	9.1	2.8
4	26	3	5.2	2.5	35	3	6.6	3.7
5	28	3	3.6	4.0	28	3	6.1	3.8
6	34	3	3.4	2.4	37	3	5.2	2.9
7	23	3	3.4	0.8	26	3	3.5	3.3
8	22	3	3.3	3.0	40	3	2.9	0.9
9	35	3	3.0	1.3	22	3	2.8	2.7
10	31	3	2.8	1.6	33	3	2.6	2.0
11	36	3	2.1	1.0	32	3	2.1	1.5
12	41	3	1.9	2.0	41	3	1.9	0.6
13	32	3	1.8	0.5	39	3	1.4	0.2
14	40	3	1.4	0.4	29	3	1.4	1.0
15	37	3	1.3	1.4	34	3	0.9	0.6
16	43	3	1.2	0.4	19	3	0.8	0.4
17	39	3	0.9	0.2	24	3	0.8	0.5
18	4	3	0.8	0.2	38	3	0.6	0.4
19	2	3	0.7	0.3	42	3	0.4	0.2
20	9	3	0.6	0.4	43	3	0.4	0.2
21	38	3	0.6	0.5	2	3	0.3	0.3
22	3	2	0.6	--	4	3	0.3	0.2
23	24	3	0.5	0.2	13	3	0.3	0.3
24	11	3	0.4	0.3	36	3	0.3	0.2
25	29	3	0.4	0.2	25	3	0.2	0.2
26	15	3	0.4	0.2	12	3	0.2	0.1
27	6	3	0.4	0.5	9	3	0.2	<0.1
28	19	3	0.4	0.2	10	3	0.2	0.1
29	14	3	0.4	0.4	15	3	0.2	0.1

Table 8. Annelid biomass at each station for January/February and August 1973 (continued).

January/February 1973					August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
30	25	3	0.2	0.2	6	3	0.2	0.2
31	42	3	0.2	<0.1	14	3	0.2	0.2
32	13	3	0.1	0.1	18	3	0.2	0.2
33	21	3	0.1	<0.1	21	3	0.2	0.2
34	7	3	0.1	0.1	11	3	0.1	0.1
35	10	3	0.1	0.1	3	3	0.1	0.1
36	18	3	0.1	<0.1	5	3	0.1	0.1
37	5	3	0.1	<0.1	8	3	<0.1	<0.1
38	12	3	0.1	0.1	17	3	<0.1	<0.1
39	8	3	<0.1	0.1	16	3	<0.1	<0.1
40	17	3	<0.1	<0.1	7	3	<0.1	<0.1
41	1	3	<0.1	<0.1	1	3	<0.1	<0.1
42	16	3	<0.1	<0.1	20	3	0.0	0.0
43	20	3	<0.1	<0.1				

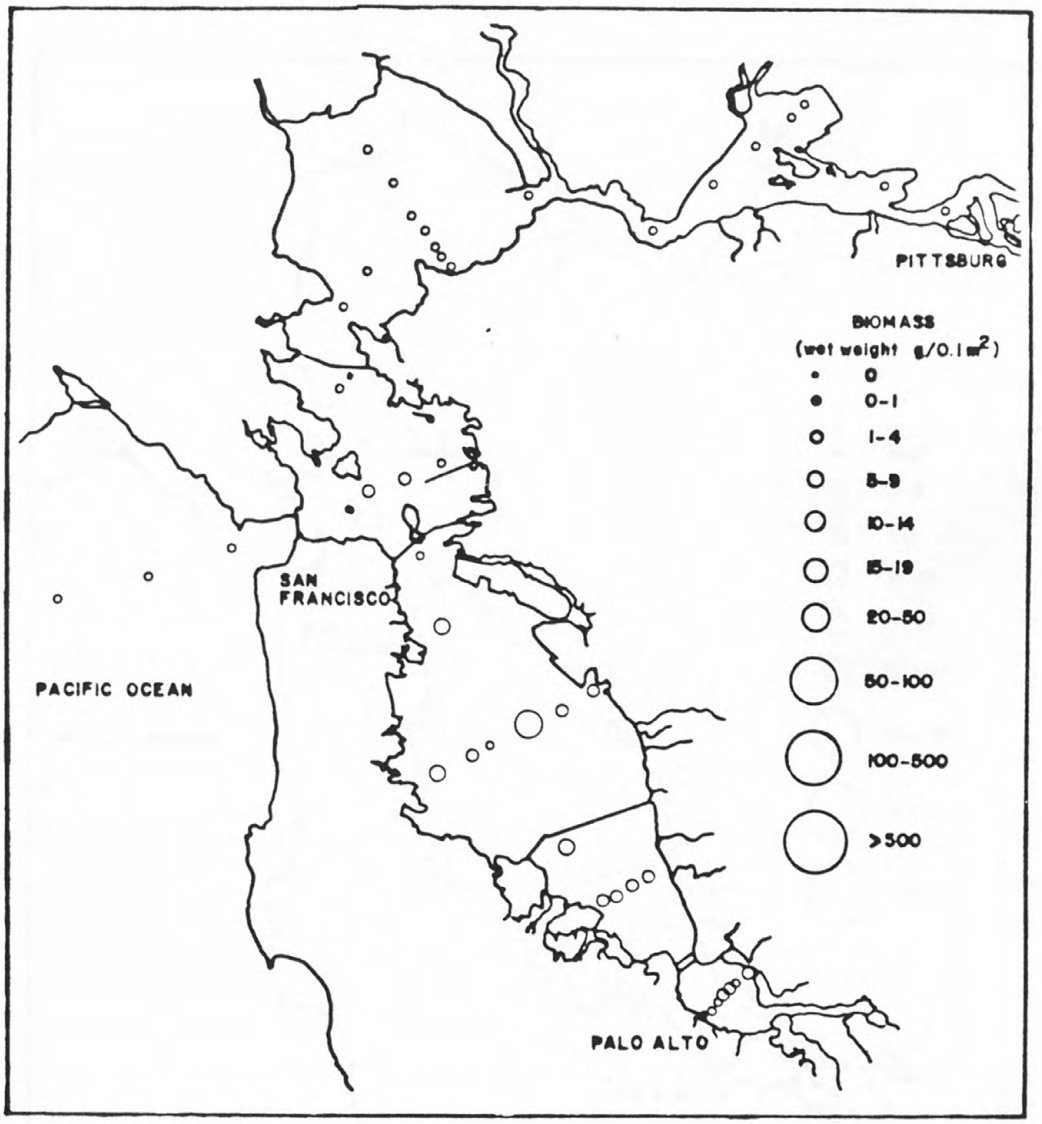

Figure 6. Annelid biomass in January/February 1973

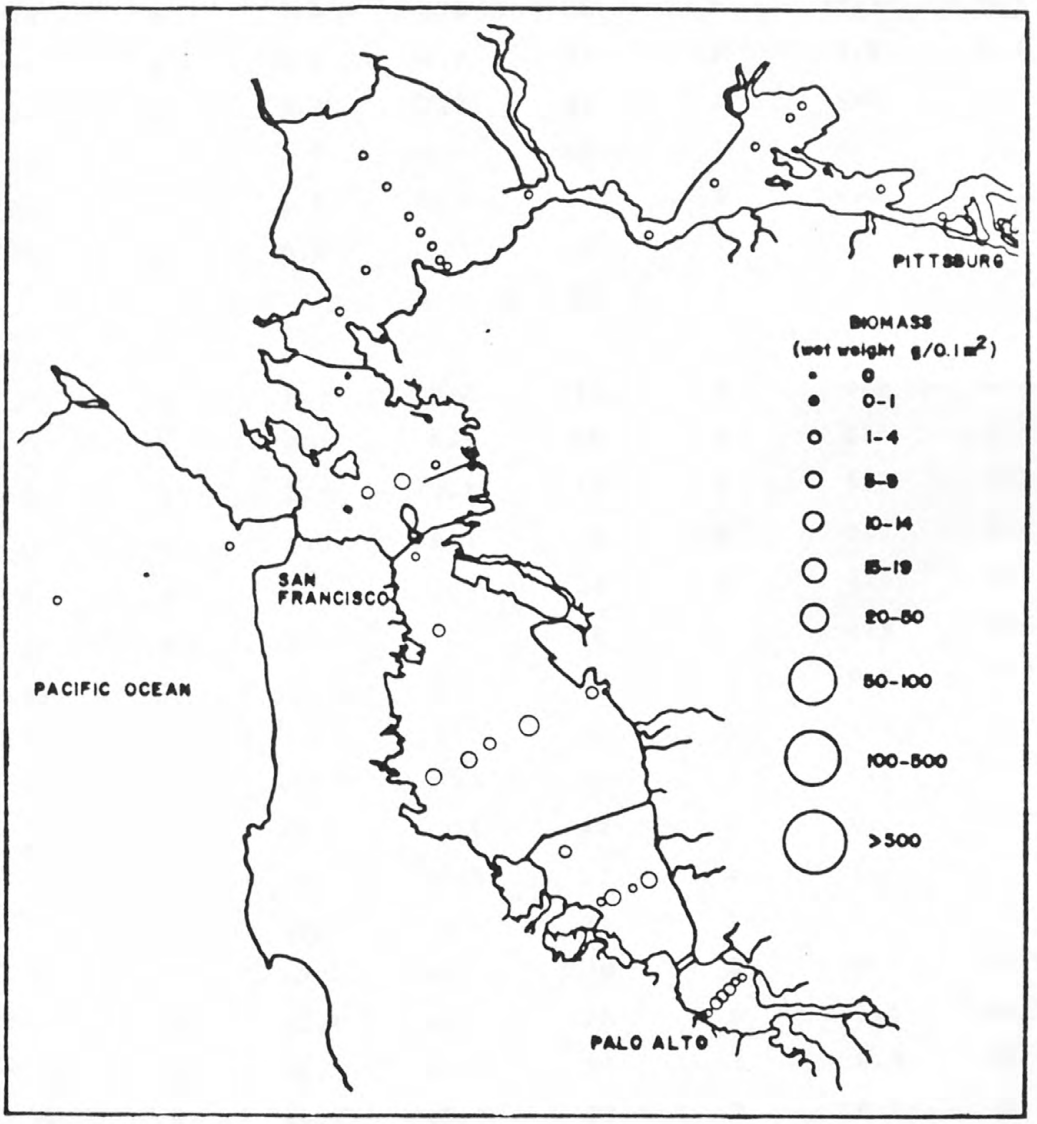

Figure 7. Annelid biomass in August 1973

Table 9. Arthropod biomass at each station for January/February and August 1973.

	January/February 1973				August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
1	32	3	1.7	0.1	33	3	1.3	1.7
2	26	3	1.5	1.0	23	3	1.1	0.3
3	24	3	1.0	0.4	36	3	1.1	0.3
4	37	3	0.4	0.2	37	3	0.9	0.2
5	25	3	0.3	0.5	41	3	0.8	0.5
6	23	3	0.3	0.3	30	3	0.7	0.2
7	34	3	0.3	0.4	34	3	0.6	0.2
8	15	3	0.2	0.1	35	3	0.6	0.8
9	29	3	0.2	0.2	32	3	0.5	0.2
10	41	3	0.2	0.1	40	3	0.5	0.1
11	35	3	0.1	0.2	13	3	0.5	<0.1
12	31	3	0.1	0.1	15	3	0.3	0.1
13	36	3	0.1	<0.1	14	3	0.3	0.2
14	40	3	0.1	0.1	6	3	0.3	0.4
15	28	3	0.1	0.1	24	3	0.3	0.1
16	22	3	0.1	0.1	18	3	0.3	0.5
17	42	3	0.1	<0.1	39	3	0.3	0.1
18	14	3	<0.1	<0.1	20	3	0.2	0.2
19	19	3	<0.1	<0.1	11	3	0.2	0.1
20	27	3	<0.1	<0.1	42	3	0.2	0.1
21	4	3	<0.1	<0.1	29	3	0.2	0.2
22	39	3	<0.1	<0.1	27	3	0.2	0.1
23	16	3	<0.1	<0.1	38	3	0.1	<0.1
24	2	3	<0.1	<0.1	26	3	0.1	<0.1
25	6	3	<0.1	<0.1	10	3	0.1	<0.1
26	33	3	<0.1	<0.1	28	3	0.1	0.1
27	10	3	<0.1	<0.1	9	3	0.1	0.2
28	5	3	<0.1	<0.1	43	3	0.1	<0.1
29	43	3	<0.1	<0.1	12	3	0.1	0.1
30	13	3	<0.1	<0.1	22	3	<0.1	<0.1

Table 9. Arthropod biomass at each station for January/February and August 1973 (continued).

	January/February 1973				August 1973			
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Station	n	mean wt. (g/0.1 m^2)	SD
31	30	3	<0.1	<0.1	1	3	<0.1	<0.1
32	18	3	<0.1	<0.1	25	3	<0.1	<0.1
33	1	3	0.0	0.0	7	3	<0.1	<0.1
34	7	3	0.0	0.0	19	3	<0.1	<0.1
35	9	3	0.0	0.0	2	3	<0.1	<0.1
36	38	3	0.0	0.0	17	3	<0.1	<0.1
37	11	3	0.0	0.0	21	3	0.0	0.0
38	20	3	0.0	0.0	4	3	0.0	0.0
39	3	2	--	0.0	3	3	0.0	0.0
40	17	3	0.0	0.0	16	3	0.0	0.0
41	8	3	0.0	0.0	8	3	0.0	0.0
42	21	3	0.0	0.0	5	3	0.0	0.0
43	12	3	0.0	0.0				

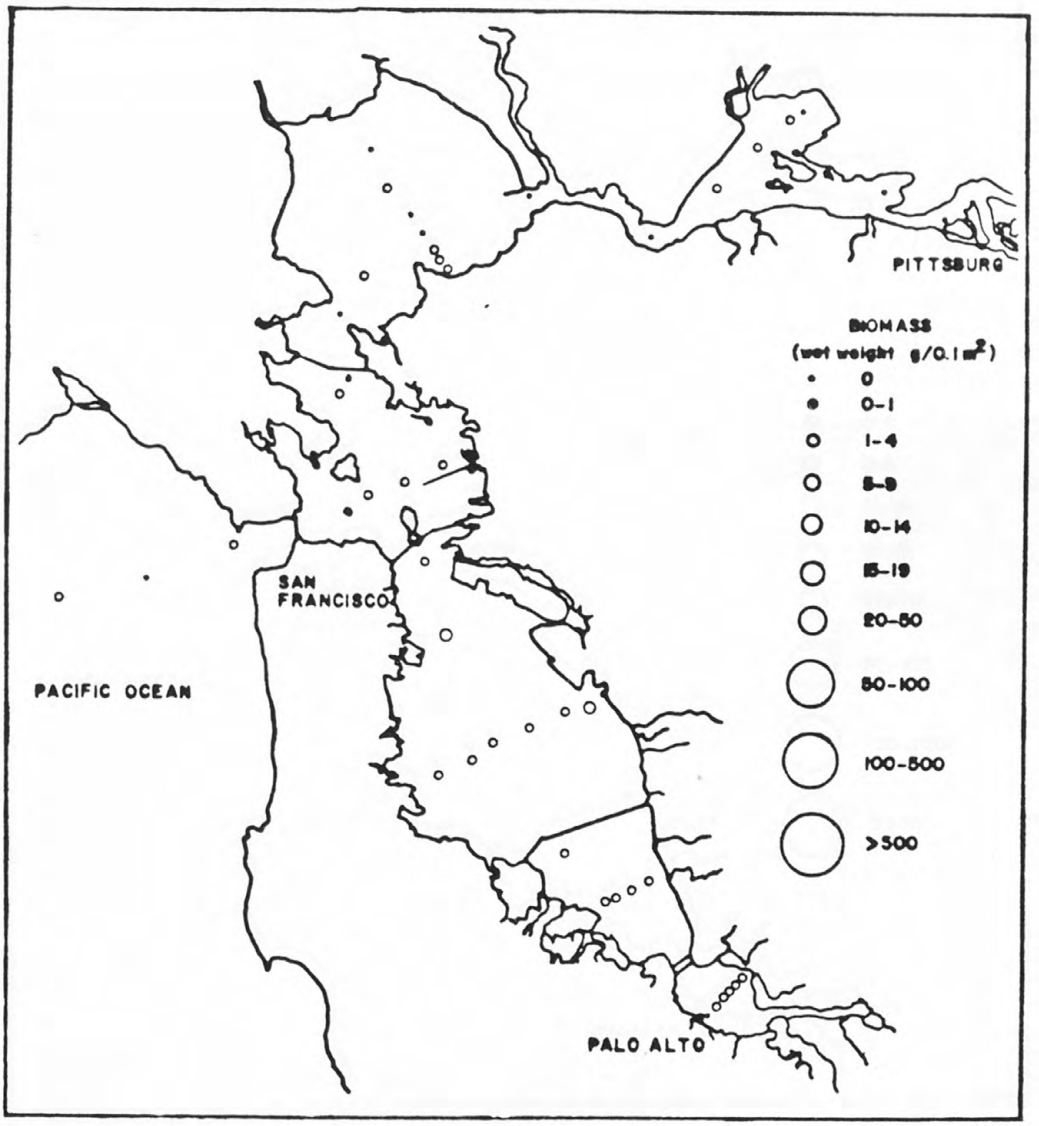

Figure 8. Arthropod biomass in January/February 1973

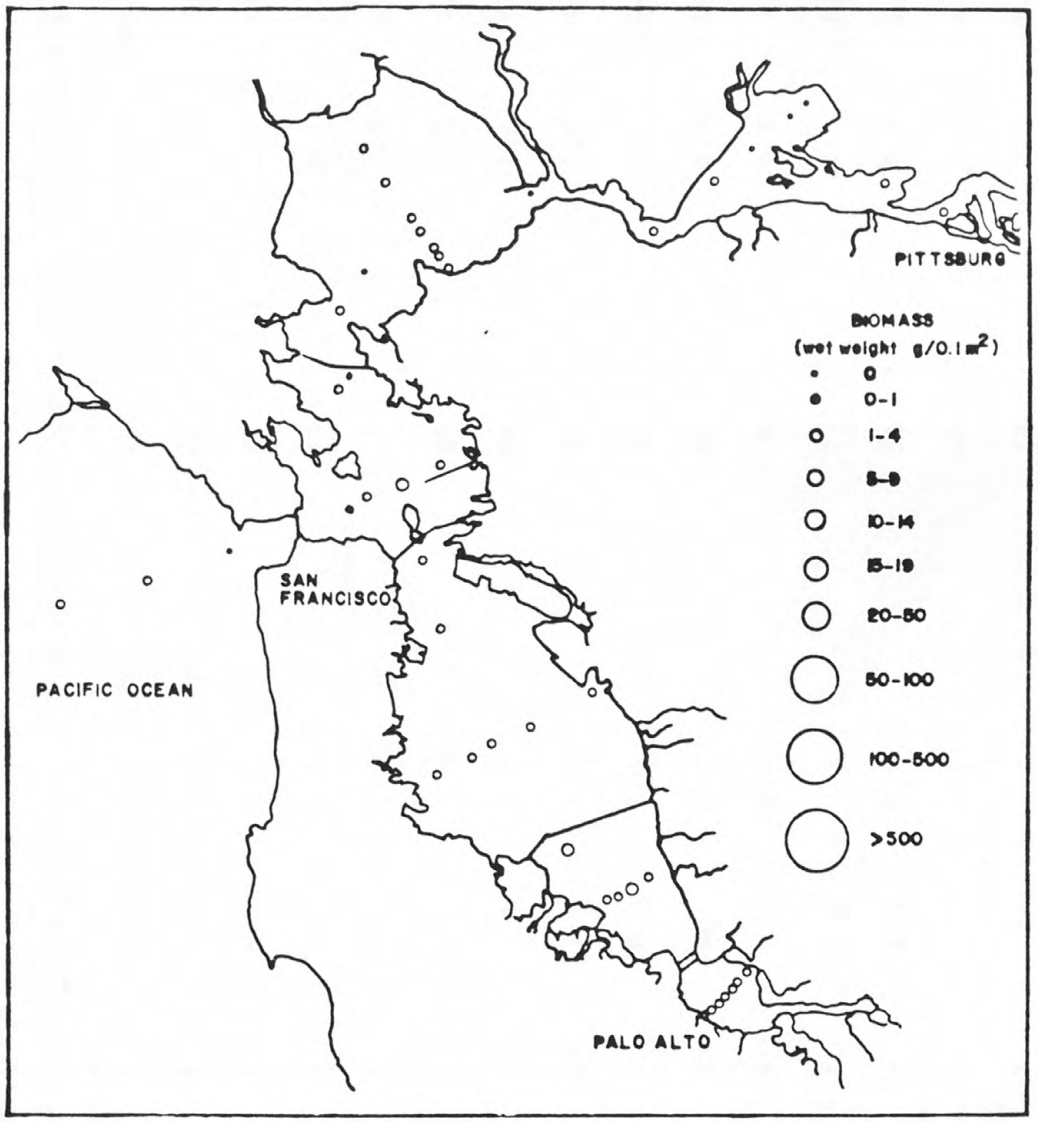

Figure 9. Arthropod biomass in August 1973

Table 10. Remaining phyla biomass at each station for January/February and August 1973

January/February 1973						August 1973				
Rank	Station	n	mean wt. ($g/0.1\ m^2$)	SD	Major Group	Station	n	mean wt. ($g/0.1\ m^2$)	SD	Major Group
1	20	3	525.3	204.8	*Dendraster excentricus*	20	3	548.0	386.7	*Dendraster excentricus*
2	26	3	7.5	12.8	Anthozoa	22	3	21.3	11.2	*Stylatula elongata*
3	22	3	6.3	7.2		27	3	6.7	3.4	Urochordata
4	28	3	3.5	1.7	Anthozoa Urochordata	11	3	4.0	3.9	Urochordata
5	23	3	2.9	1.2	*Stylatula elongata*	40	3	4.0	6.2	Urochordata
6	27	3	2.3	3.6		36	3	3.0	2.5	Urochordata
7	21	3	1.3	2.0		28	3	2.0	1.2	Anthozoa Urochordata
8	41	3	1.1	0.5		30	3	1.7	1.1	Anthozoa Urochordata
9	12	3	0.6	0.1		41	3	1.2	0.7	Anthozoa Urochordata
10	17	3	0.3	0.2		42	3	0.7	0.8	
11	18	3	0.3	0.4		6	3	0.7	1.2	
12	13	3	0.2	0.2		35	3	0.3	0.3	
13	19	3	0.1	0.1		34	3	0.3	0.4	
14	11	3	0.1	0.1		26	3	0.2	0.2	
15	16	3	<0.1	<0.1		12	3	0.2	0.2	

Table 10. Remaining phyla biomass at each station for January/February and August 1973 (continued).

January/February 1973						August 1973				
Rank	Station	n	mean wt. ($g/0.1m^2$)	SD	Major Group	Station	n	mean wt. ($g/0.1m^2$)	SD	Major Group
16	25	3	<0.1	<0.1		33	3	0.2	0.2	
17	15	3	<0.1	<0.1		23	3	0.1	0.1	
18	10	3	<0.1	<0.1		29	3	0.1	0.1	
19	6	3	<0.1	<0.1		16	3	<0.1	<0.1	
20	40	3	<0.1	<0.1		13	3	<0.1	<0.1	
21	43	3	0.0	0.0		43	3	<0.1	<0.1	
22	42	3	0.0	0.0		19	3	<0.1	<0.1	
23	39	3	0.0	0.0		24	3	<0.1	<0.1	
24	38	3	0.0	0.0		2	3	<0.1	<0.1	
25	37	3	0.0	0.0		37	3	<0.1	<0.1	
26	36	3	0.0	0.0		15	3	<0.1	<0.1	
27	35	3	0.0	0.0		9	3	0.0	0.0	
28	34	3	0.0	0.0		8	3	0.0	0.0	
29	33	3	0.0	0.0		7	3	0.0	0.0	
30	32	3	0.0	0.0		5	3	0.0	0.0	

Table 10. Remaining phyla biomass at each station for January/February and August 1973 (continued).

January/February 1973						August 1973				
Rank	Station	n	mean wt. (g/0.1 m^2)	SD	Major Group	Station	n	mean wt. (g/0.1 m^2)	SD	Major Group
31	31	3	0.0	0.0		4	3	0.0	0.0	
32	30	3	0.0	0.0		39	3	0.0	0.0	
33	29	3	0.0	0.0		38	3	0.0	0.0	
34	24	3	0.0	0.0		32	3	0.0	0.0	
35	14	3	0.0	0.0		3	3	0.0	0.0	
36	9	3	0.0	0.0		25	3	0.0	0.0	
37	8	3	0.0	0.0		21	3	0.0	0.0	
38	7	3	0.0	0.0		18	3	0.0	0.0	
39	5	3	0.0	0.0		17	3	0.0	0.0	
40	4	3	0.0	0.0		14	3	0.0	0.0	
41	3	2	0.0	--		10	3	0.0	0.0	
42	2	3	0.0	0.0		1	3	0.0	0.0	
43	1	3	0.0	0.0						

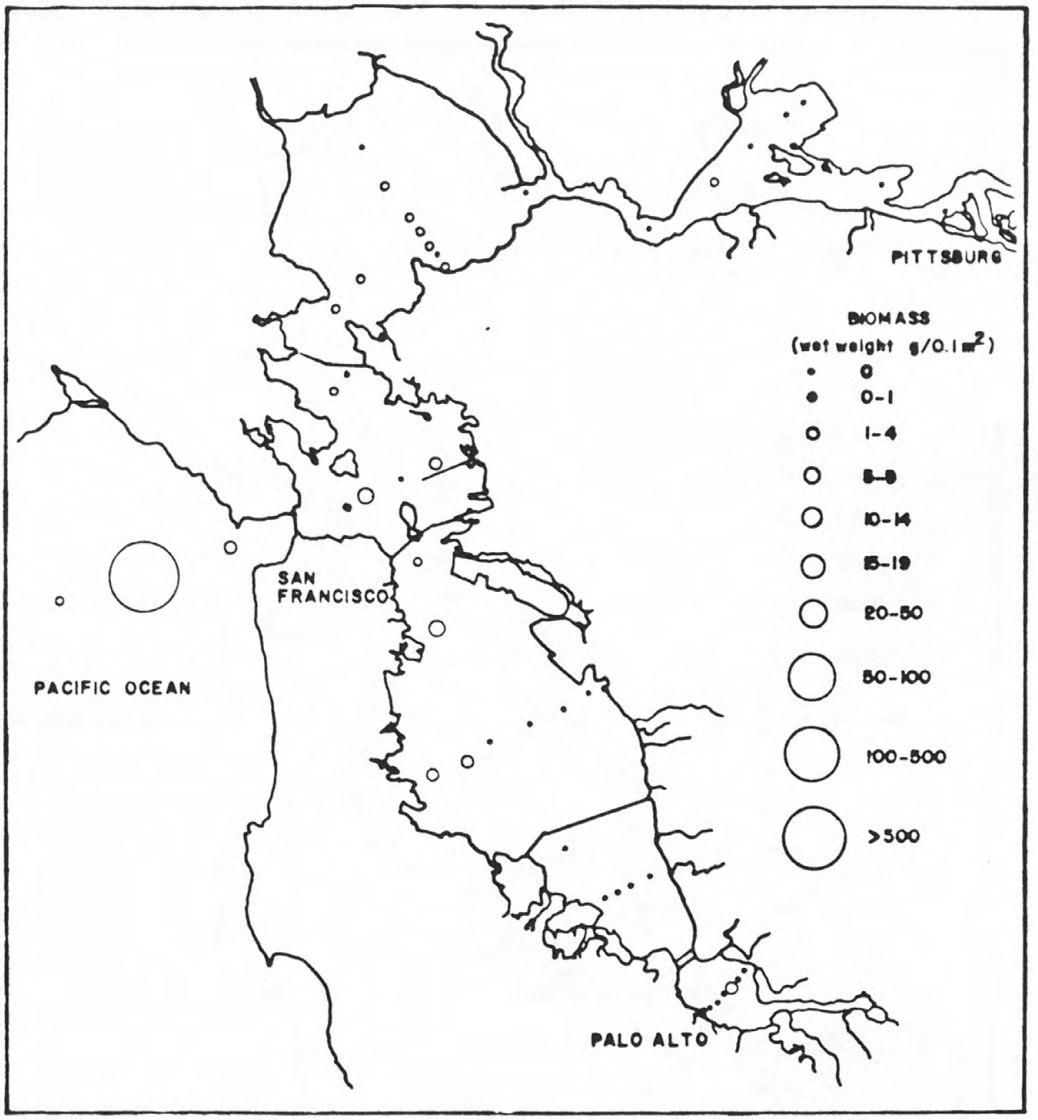

Figure 10. Remaining phyla biomass in January/February 1973

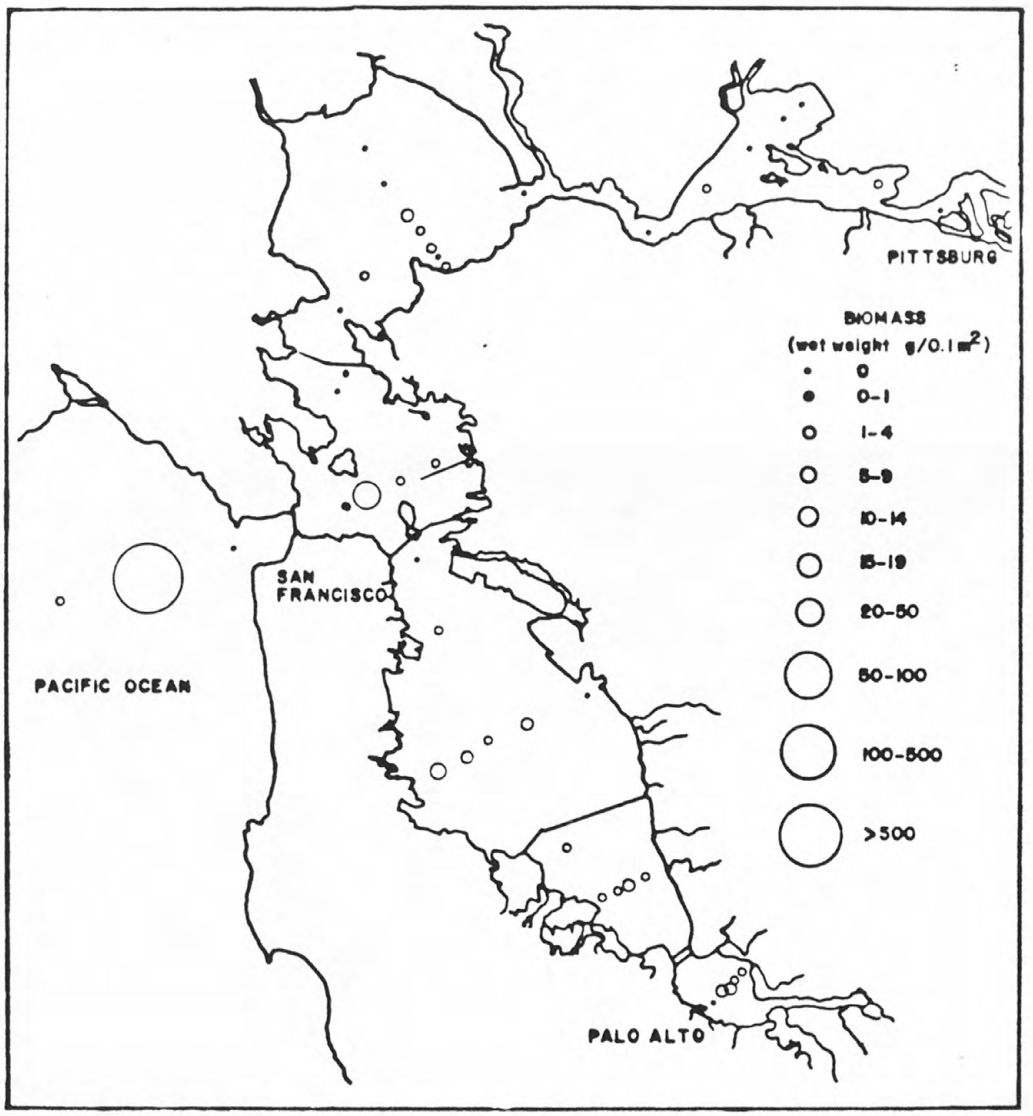

Figure 11. Remaining phyla biomass in August 1973