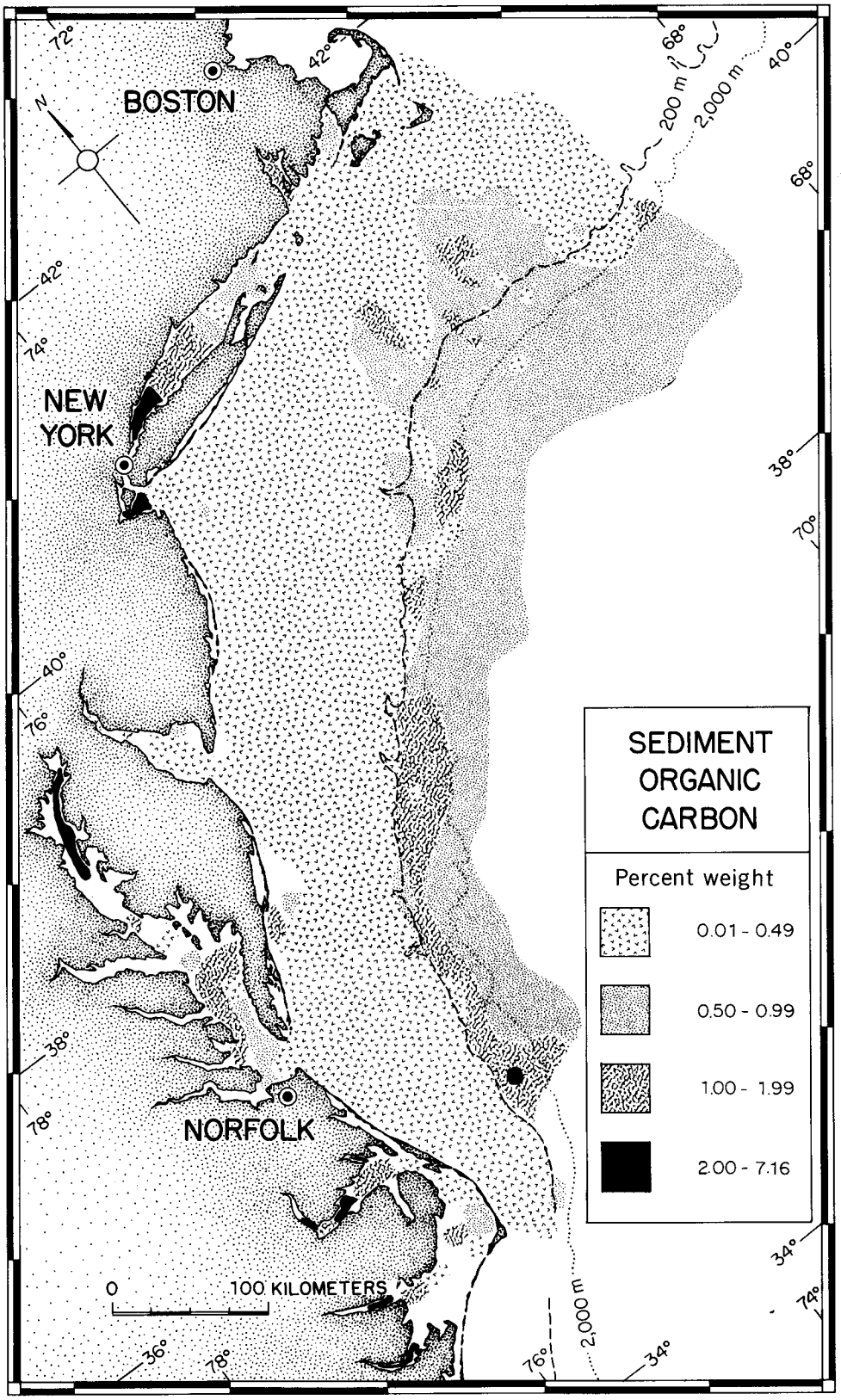

FIGURE 105.—Geographic distribution of organic carbon in the bottom sediments of the Middle Atlantic Bight region.

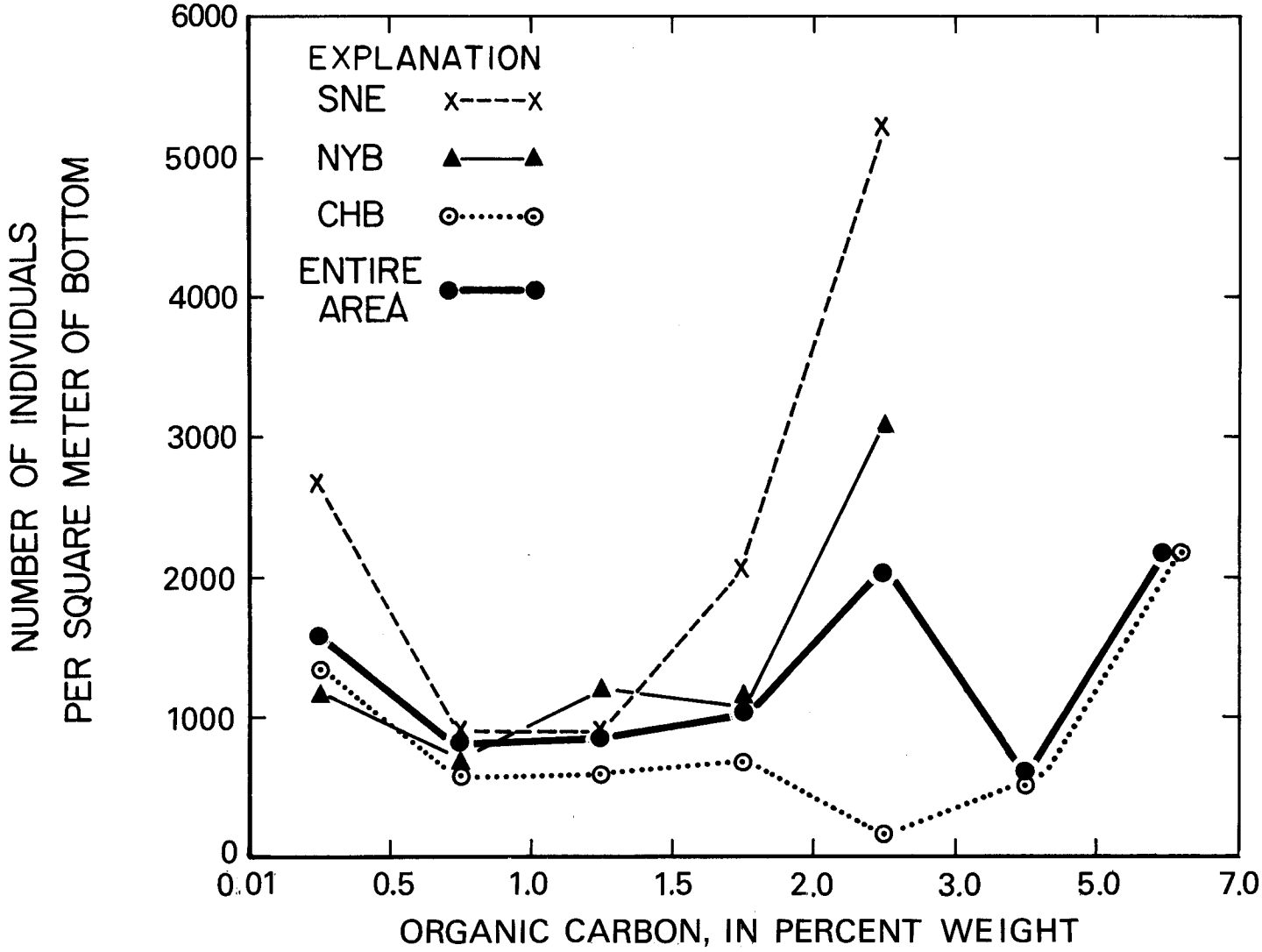

FIGURE 106.—Relation between number of individuals and sediment organic carbon. Values represent all taxonomic groups combined for each subarea and for the entire Middle Atlantic Bight region. Abbreviations: SNE, Southern New England; NYB, New York Bight; CHB, Chesapeake Bight.

Neither the density nor the biomass values correlated in a general way with the amount of sediment organic carbon. Most of the taxonomic groups showed erratic trends in both density and biomass in relation to carbon. However, a few individual groups revealed good correlations. The groups that showed a direct relation between density (table 32) and carbon were Porifera (fig. 108), Pycnogonida (fig. 110), and Copepoda (fig. 111); Nematoda (fig. 109) revealed an inverse relation. Cirripedia (fig. 111) showed a direct relation between biomass (table 33) and carbon, and Cumacea (fig. 111) and Echinoidea (fig. 113) showed an inverse relation. Where quantitative relationships between higher taxa (such as phyla, classes, and orders) from a broad geographical area and sediment organic carbon are evaluated, little evidence of interdependence is seen.

SOUTHERN NEW ENGLAND

The analysis in this section is based on the density and biomass of each major taxonomic group in the seven classes of sediment organic carbon for a much smaller geographic area. Density values are listed in table 34, and biomass values are listed in table 35. The range of values and their fluctuations resemble those described (tables 32 and 33) for the entire Middle Atlantic Bight region. In one group (Copepoda), a direct correlation between quantity of organic carbon and density was seen, and in two groups (Sipunculida and Amphipoda), an inverse relationship was seen. In the vast majority of taxonomic groups, however, the quantity of animals varied in irregular patterns in relation to carbon content. The wide fluctuations and inconsistencies between similar groups indicate that in this subarea, there is no general correlation between higher groups of macrobenthic animals and the quantity of organic carbon in the bottom sediments. Similar fluctuations and inconsistencies were apparent in the analyses of data from both the New York and the Chesapeake Bights.

TABLE 30.—*Number of samples for each class of sediment organic carbon in each subarea and for the entire Middle Atlantic Bight region*

Organic carbon (percent to nearest 0.1)	Subarea			Entire region
	Southern New England	New York Bight	Chesapeake	
0.01–0.4	93	139	117	349
0.5 –0.9	55	29	26	110
1.0 –1.4	14	9	17	40
1.5 –1.9	4	6	15	25
2.0 –2.9	1	4	4	9
3.0 –4.9	0	0	9	9
5.0 –7.2	0	0	1	1
No data	19	0	1	20
Total	186	187	190	563

RELATION TO RANGE IN BOTTOM WATER TEMPERATURE

This section deals with the relationship between faunal components and the annual range of bottom-water temperature in the Middle Atlantic Bight region. Inasmuch as the data base does not contain a time-series array of temperature measurements, we relied on published sources for these data (see page N12). The normal range of temperature in this region is rather wide, particularly in some of the shallow, inshore locations where the actual temperatures may dip slightly below 0°C or rise above 24°C (24°+ temperature range).

Range of temperature, as opposed to discrete temperature observations made at the time of sample collection, serve as an index of annual change. For analysis purposes, the various annual temperature changes were grouped into seven classes: (1) 0°–3.9°; (2) 4.0°–7.9°; (3) 8.0°–11.9°; (4) 12.0°–15.9°; (5) 16.0°–19.9°; (6) 20.0°–23.9°; and (7) more than 24.0° change. All references to temperature in this section, therefore, pertain to ranges rather than to discrete measurements. A temperature range of 0°–3.9° indicates only that the water temperature variation is not more than 3.9° over the year.

TABLE 31.—*Mean number of individuals and biomass of the macrobenthic invertebrate fauna in relation to percent organic carbon in bottom sediments for each subarea and for the entire Middle Atlantic Bight region*

Organic carbon (Percent to nearest 0.1)	Mean number of individuals per square meter				Mean biomass in grams per square meter			
	SNE	NYB	CHB	Entire area	SNE	NYB	CHB	Entire area
0.01–0.4	2,643	1,226	1,372	1,653	326	130	77	164
.5 – .9	903	750	623	796	80	79	143	94
1.0 –1.4	902	1,208	596	841	65	2,223	66	551
1.5 –1.9	2,052	1,061	707	1,007	116	61	63	71
2.0 –2.9	5,236	3,126	182	2,052	218	2,657	14	1,211
3.0 –4.9	--	--	597	597	--	--	156	156
5.0+	--	--	2,244	2,244	--	--	555	555

TABLE 32.—*Mean number of individuals of each taxonomic group listed by sediment organic carbon content class, representing the entire Middle Atlantic Bight region*

[In number per square meter]

Taxonomic group	Sediment organic carbon content (percent)						
	0.01-0.4	0.5-0.9	1.0-1.4	1.5-1.9	2.0-2.9	3.0-4.9	5.0+
	No./m²	No./m²	No./m²	No./m²	No./m²	No./m²	No./m²
PORIFERA	0.65	0.17	0.12	-	-	1.22	32.00
COELENTERATA	12.59	43.41	8.00	7.56	-	10.78	-
Hydrozoa	8.09	22.99	-	0.08	-	-	-
Anthozoa	4.50	20.42	8.00	7.48	-	10.78	-
Alcyonacea	0.19	1.15	1.20	0.24	-	-	-
Zoantharia	2.32	6.64	6.08	5.28	-	10.78	-
Unidentified	1.99	12.63	0.72	1.96	-	-	-
PLATYHELMINTHES	0.89	0.05	0.52	-	-	-	-
Turbellaria	0.89	0.05	0.52	-	-	-	-
NEMERTEA	4.43	3.39	2.95	10.36	0.22	1.22	-
ASCHELMINTHES	2.99	2.11	1.50	0.68	0.44	-	-
Nematoda	2.99	2.11	1.50	0.68	0.44	-	-
ANNELIDA	355.38	204.20	139.12	137.48	135.22	36.56	548.00
POGONOPHORA	0.01	3.25	14.50	2.68	3.33	-	-
SIPUNCULIDA	3.75	5.58	2.22	0.84	0.22	-	-
ECHIURA	0.01	0.47	0.20	0.08	-	-	-
PRIAPULIDA	-	0.02	0.15	-	-	-	-
MOLLUSCA	362.00	147.63	485.02	656.24	909.33	403.33	730.00
Polyplacophora	0.44	0.35	0.62	0.24	1.22	-	-
Gastropoda	27.40	14.25	18.22	260.24	52.22	112.11	-
Bivalvia	333.36	129.13	463.98	394.60	853.67	291.22	730.00
Scaphopoda	0.79	2.28	2.20	1.16	2.22	-	-
Cephalopoda	0.01	1.63	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	823.82	308.14	88.62	123.64	994.78	94.22	537.00
Pycnogonida	0.36	0.39	0.28	-	3.11	5.33	-
Arachnida	0.07	-	-	-	-	-	-
Crustacea	823.39	307.74	88.35	123.64	991.67	88.89	537.00
Ostracoda	0.26	0.29	-	-	-	-	-
Cirripedia	10.90	46.32	-	-	885.11	-	-
Copepoda	0.03	0.05	0.12	-	-	-	-
Nebaliacea	0.02	0.01	-	-	-	-	-
Cumacea	19.54	3.12	3.05	0.44	1.22	-	-
Tanaidacea	0.02	0.23	-	-	-	-	-
Isopoda	14.36	4.70	0.40	28.72	10.11	12.11	140.00
Amphipoda	767.29	244.73	83.92	86.00	84.22	76.78	397.00
Mysidacea	2.56	1.89	-	2.20	-	-	-
Decapoda	8.42	6.40	0.85	6.28	11.00	-	-
BRYOZOA	8.98	1.45	3.80	60.00	-	-	-
BRACHIOPODA	0.01	-	-	-	-	-	-
ECHINODERMATA	53.02	56.26	80.82	2.72	0.67	-	-
Holothuroidea	1.62	3.36	4.02	2.28	-	-	-
Echinoidea	35.79	0.39	0.12	-	-	-	-
Ophiuroidea	14.85	51.93	75.48	0.36	0.67	-	-
Asteroidea	0.74	0.58	1.20	0.08	-	-	-
HEMICHORDATA	0.14	0.14	0.25	-	-	-	-
CHORDATA	18.64	11.00	7.00	0.44	6.33	-	-
Ascidiacea	18.64	11.00	7.00	0.44	6.33	-	-
UNIDENTIFIED	5.34	8.99	5.72	4.32	1.22	49.67	397.00

TABLE 33.—*Mean biomass of each taxonomic group listed by sediment organic carbon content class, representing the entire Middle Atlantic Bight region*

[In grams per square meter]

Taxonomic group	Sediment organic carbon content (percent)						
	0.01-0.4	0.5-0.9	1.0-1.4	1.5-1.9	2.0-2.9	3.0-4.9	5.0+
	g/m²	g/m²	g/m²	g/m²	g/m²	g/m²	g/m²
PORIFERA	0.056	0.007	0.002	-	-	0.012	0.110
COELENTERATA	2.175	5.252	4.687	3.050	-	0.620	-
Hydrozoa	0.403	0.225	-	0.001	-	-	-
Anthozoa	1.772	5.027	4.687	3.049	-	0.620	-
Alcyonacea	0.026	0.186	0.347	0.148	-	-	-
Zoantharia	1.643	4.375	4.274	2.847	-	0.620	-
Unidentified	0.103	0.466	0.066	0.054	-	-	-
PLATYHELMINTHES	0.009	<0.001	0.003	-	-	-	-
Turbellaria	0.009	<0.001	0.003	-	-	-	-
NEMERTEA	0.674	0.531	0.239	1.081	0.010	0.012	-
ASCHELMINTHES	0.004	0.006	0.006	0.006	0.004	-	-
Nematoda	0.004	0.006	0.006	0.006	0.004	-	-
ANNELIDA	12.449	15.851	11.415	14.018	18.834	3.023	9.770
POGONOPHORA	<0.001	0.022	0.094	0.009	0.007	-	-
SIPUNCULIDA	0.469	1.116	0.132	2.486	0.004	-	-
ECHIURA	0.005	0.883	0.471	0.695	-	-	-
PRIAPULIDA	-	0.031	0.039	-	-	-	-
MOLLUSCA	108.172	39.215	509.982	45.543	1164.252	151.494	540.870
Polyplacophora	0.225	0.012	0.022	0.004	0.004	-	-
Gastropoda	2.987	3.599	0.390	6.410	11.398	0.052	-
Bivalvia	104.948	35.532	509.534	39.113	1152.831	151.442	540.870
Scaphopoda	0.012	0.050	0.036	0.016	0.019	-	-
Cephalopoda	<0.001	0.022	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	10.299	8.568	0.567	1.550	26.347	0.462	2.250
Pycnogonida	0.002	0.002	0.006	-	0.031	0.027	-
Arachnida	<0.001	-	-	-	-	-	-
Crustacea	10.296	8.566	0.561	1.550	26.316	0.435	2.250
Ostracoda	0.002	0.003	-	-	-	-	-
Cirripedia	3.912	5.076	-	-	20.679	-	-
Copepoda	<0.001	<0.001	0.001	-	-	-	-
Nebaliacea	<0.001	<0.001	-	-	-	-	-
Cumacea	0.073	0.022	0.012	0.004	0.012	-	-
Tanaidacea	<0.001	0.002	-	-	-	-	-
Isopoda	0.393	0.099	0.004	0.074	0.076	0.109	1.500
Amphipoda	4.589	2.212	0.518	0.320	0.258	0.326	0.750
Mysidacea	0.015	0.014	-	0.004	-	-	-
Decapoda	1.312	1.137	0.026	1.148	5.291	-	-
BRYOZOA	0.219	0.020	0.071	2.080	-	-	-
BRACHIOPODA	<0.001	-	-	-	-	-	-
ECHINODERMATA	26.393	14.647	21.929	0.200	0.306	-	-
Holothuroidea	2.656	9.097	8.532	0.091	-	-	-
Echinoidea	21.102	1.805	0.825	-	-	-	-
Ophiuroidea	0.909	3.083	6.224	0.107	0.306	-	-
Asteroidea	1.726	0.662	6.348	0.002	-	-	-
HEMICHORDATA	0.034	0.024	0.039	-	-	-	-
CHORDATA	3.212	8.139	1.000	0.009	0.479	-	-
Ascidiacea	3.212	8.139	1.000	0.009	0.479	-	-
UNIDENTIFIED	0.255	1.920	0.376	0.125	1.062	0.229	1.830

TABLE 34.—*Mean number of individuals of each taxonomic group listed by sediment organic carbon content class, representing the Southern New England subarea*

[In grams per square meter]

Taxonomic group	Sediment organic carbon content (percent)						
	0.01-0.4	0.5-0.9	1.0-1.4	1.5-1.9	2.0-2.9	3.0-4.9	5.0+
	No./m²	No./m²	No./m²	No./m²	No./m²	No./m²	No./m²
PORIFERA	1.13	0.07	0.36	-	-	-	-
COELENTERATA	24.02	48.58	16.43	22.00	-	-	-
Hydrozoa	17.11	19.58	-	-	-	-	-
Anthozoa	6.92	29.00	16.43	22.00	-	-	-
Alcyonacea	0.36	1.11	1.00	-	-	-	-
Zoantharia	5.54	4.20	14.93	22.00	-	-	-
Unidentified	1.02	23.70	0.50	-	-	-	-
PLATYHELMINTHES	2.61	0.09	-	-	-	-	-
Turbellaria	2.61	0.09	-	-	-	-	-
NEMERTEA	6.04	4.38	6.00	-	-	-	-
ASCHELMINTHES	9.17	1.96	3.71	-	-	-	-
Nematoda	9.17	1.96	3.71	-	-	-	-
ANNELIDA	375.12	264.82	219.79	345.25	131.00	-	-
POGONOPHORA	0.06	3.05	3.71	-	-	-	-
SIPUNCULIDA	10.64	9.58	2.36	-	-	-	-
ECHIURA	-	0.18	0.43	-	-	-	-
PRIAPULIDA	-	0.04	0.29	-	-	-	-
MOLLUSCA	160.92	87.40	200.98	1078.25	5094.00	-	-
Polyplacophora	1.59	0.31	0.71	-	-	-	-
Gastropoda	53.10	17.31	21.48	217.00	33.00	-	-
Bivalvia	105.74	65.11	178.64	861.25	5061.00	-	-
Scaphopoda	0.44	1.42	0.14	-	-	-	-
Cephalopoda	0.05	3.25	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	1908.70	381.66	195.28	217.25	11.00	-	-
Pycnogonida	-	0.78	-	-	-	-	-
Arachnida	-	-	-	-	-	-	-
Crustacea	1908.70	380.87	195.28	217.25	11.00	-	-
Ostracoda	0.37	0.47	-	-	-	-	-
Cirripedia	40.48	0.38	-	-	-	-	-
Copepoda	0.06	0.11	0.36	-	-	-	-
Nebaliacea	-	-	-	-	-	-	-
Cumacea	36.57	3.82	8.00	2.75	-	-	-
Tanaidacea	0.09	0.24	-	-	-	-	-
Isopoda	13.91	2.76	0.86	6.25	-	-	-
Amphipoda	1804.69	368.36	185.35	182.00	11.00	-	-
Mysidacea	0.80	2.18	-	13.75	-	-	-
Decapoda	11.73	2.55	0.71	12.50	-	-	-
BRYOZOA	15.90	0.16	-	375.00	-	-	-
BRACHIOPODA	-	-	-	-	-	-	-
ECHINODERMATA	68.91	79.20	225.50	13.75	-	-	-
Holothuroidea	4.26	4.29	11.07	13.75	-	-	-
Echinoidea	14.64	0.56	0.36	-	-	-	-
Ophiuroidea	48.57	73.33	213.07	-	-	-	-
Asteroidea	1.44	1.02	1.00	-	-	-	-
HEMICHORDATA	0.28	0.27	0.71	-	-	-	-
CHORDATA	55.87	5.93	17.43	-	-	-	-
Ascidiacea	55.87	5.93	17.43	-	-	-	-
UNIDENTIFIED	3.77	15.45	8.57	0.50	-	-	-

TABLE 35.—*Mean biomass of each taxonomic group listed by sediment organic carbon content class, representing the Southern New England subarea*

[In grams per square meter]

Taxonomic group	Sediment organic carbon content (percent)						
	0.01-0.4	0.5-0.9	1.0-1.4	1.5-1.9	2.0-2.9	3.0-4.9	5.0+
	g/m²	g/m²	g/m²	g/m²	g/m²	g/m²	g/m²
PORIFERA	0.090	<0.001	0.007	-	-	-	-
COELENTERATA	2.962	8.334	2.994	3.458	-	-	-
Hydrozoa	1.030	0.348	-	-	-	-	-
Anthozoa	1.932	7.986	2.994	3.458	-	-	-
Alcyonacea	0.063	0.200	0.704	-	-	-	-
Zoantharia	1.774	7.102	2.185	3.458	-	-	-
Unidentified	0.095	0.684	0.105	-	-	-	-
PLATYHELMINTHES	0.014	<0.001	-	-	-	-	-
Turbellaria	0.014	<0.001	-	-	-	-	-
NEMERTEA	0.956	0.599	0.378	-	-	-	-
ASCHELMINTHES	0.008	0.005	0.014	-	-	-	-
Nematoda	0.008	0.005	0.014	-	-	-	-
ANNELIDA	18.383	14.718	9.650	45.445	37.440	-	-
POGONOPHORA	<0.001	0.027	0.014	-	-	-	-
SIPUNCULIDA	1.139	2.032	0.196	-	-	-	-
ECHIURA	-	0.079	0.366	-	-	-	-
PRIAPULIDA	-	0.062	0.038	-	-	-	-
MOLLUSCA	241.154	26.045	4.883	44.446	180.130	-	-
Polyplacophora	0.843	0.004	0.051	-	-	-	-
Gastropoda	6.246	1.073	0.043	5.888	1.960	-	-
Bivalvia	234.057	24.776	4.785	38.558	178.170	-	-
Scaphopoda	0.008	0.017	0.004	-	-	-	-
Cephalopoda	<0.001	0.175	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	26.777	2.723	1.415	8.501	0.110	-	-
Pycnogonida	-	0.004	-	-	-	-	-
Arachnida	-	-	-	-	-	-	-
Crustacea	26.777	2.719	1.415	8.501	0.110	-	-
Ostracoda	0.002	0.005	-	-	-	-	-
Cirripedia	14.674	0.008	-	-	-	-	-
Copepoda	<0.001	<0.001	0.004	-	-	-	-
Nebaliacea	-	-	-	-	-	-	-
Cumacea	0.124	0.027	0.028	0.028	-	-	-
Tanaidacea	<0.001	0.002	-	-	-	-	-
Isopoda	0.248	0.122	0.010	0.062	-	-	-
Amphipoda	10.344	2.368	1.369	1.278	0.110	-	-
Mysidacea	0.002	0.024	-	0.008	-	-	-
Decapoda	1.382	0.162	0.004	7.125	-	-	-
BRYOZOA	0.434	0.001	-	13.000	-	-	-
BRACHIOPODA	-	-	-	-	-	-	-
ECHINODERMATA	23.653	19.749	43.389	0.548	-	-	-
Holothuroidea	8.467	13.620	22.195	0.548	-	-	-
Echinoidea	10.847	1.167	2.356	-	-	-	-
Ophiuroidea	2.830	4.918	15.930	-	-	-	-
Asteroidea	1.509	0.044	2.908	-	-	-	-
HEMICHORDATA	0.055	0.048	0.111	-	-	-	-
CHORDATA	9.428	4.599	1.461	-	-	-	-
Ascidiacea	9.428	4.599	1.461	-	-	-	-
UNIDENTIFIED	0.544	0.280	0.156	0.538	-	-	-

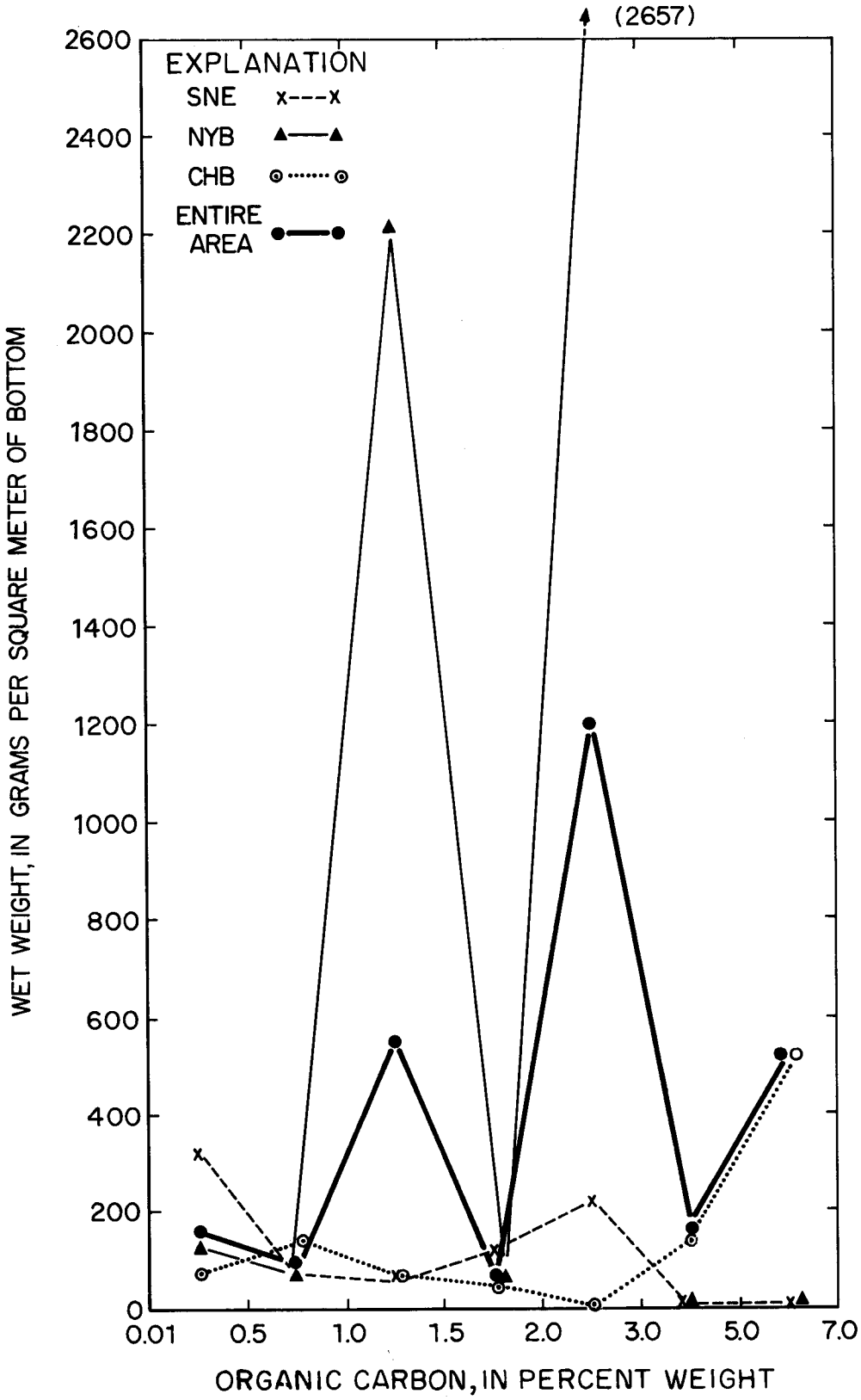

FIGURE 107.—Relation between biomass and sediment organic carbon. Values represent all taxonomic groups combined for each subarea and for the entire Middle Atlantic Bight region. Abbreviations: SNE, Southern New England; NYB, New York Bight; CHB, Chesapeake Bight.

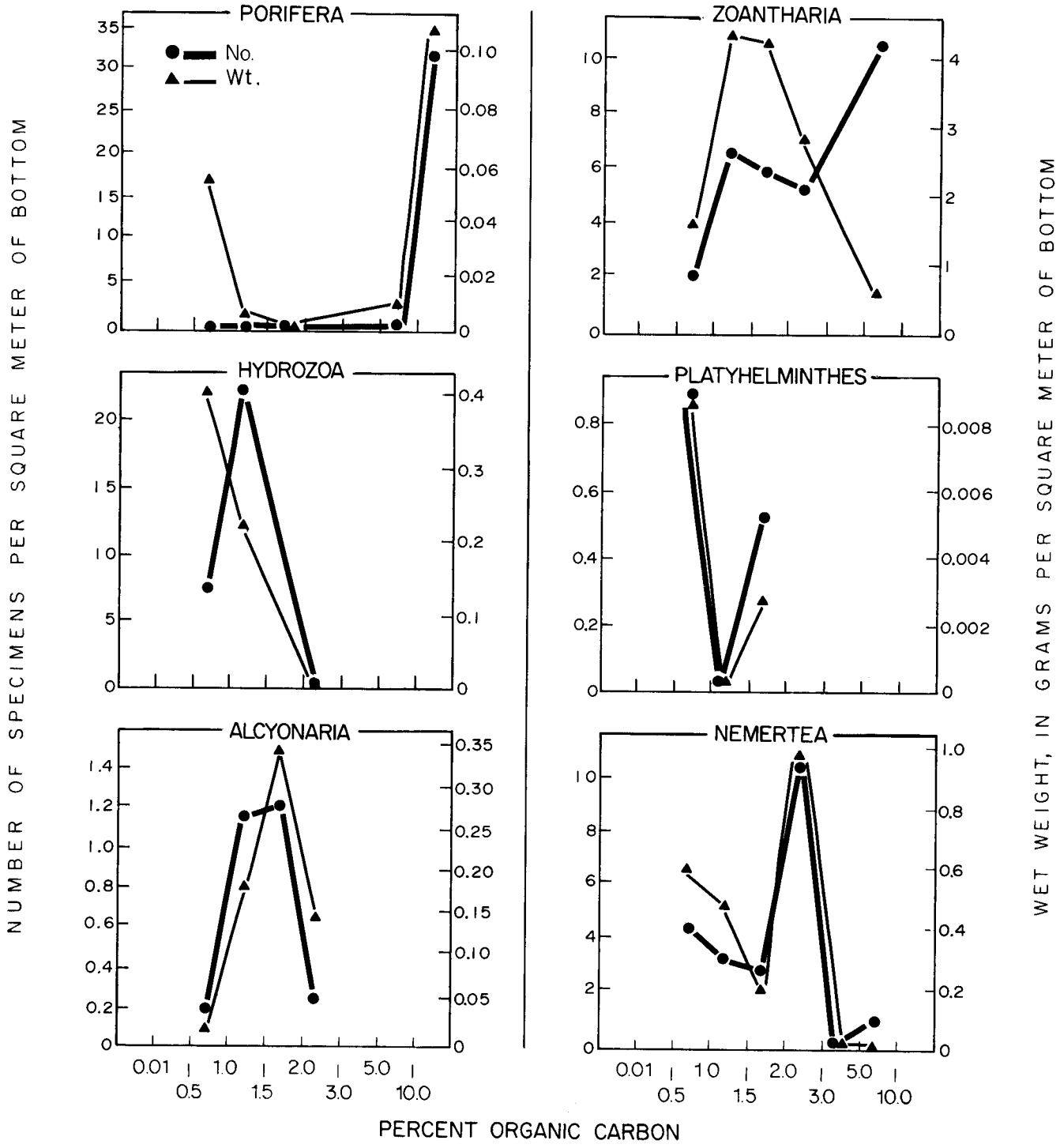

FIGURE 108.—Density (No.) and biomass (wt.) in relation to sediment organic carbon in the entire Middle Atlantic Bight region for Porifera, Hydrozoa, Alcyonaria, Zoantharia, Platyhelminthes, and Nemertea.

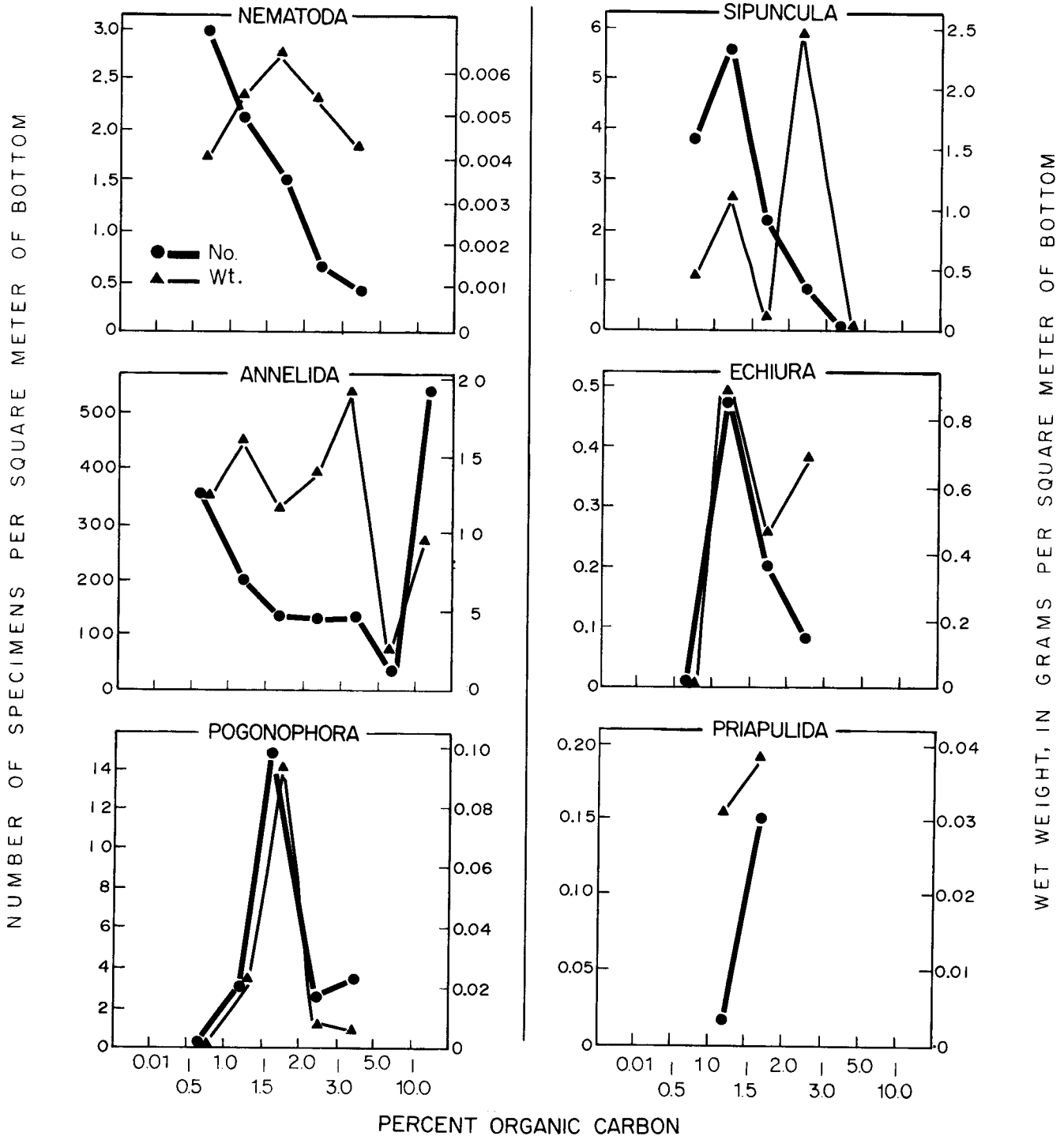

FIGURE 109.—Density (No.) and biomass (wt.) in relation to sediment organic carbon in the entire Middle Atlantic Bight region for Nematoda, Annelida, Pogonophora, Sipuncula, Echiura, and Priapulida.

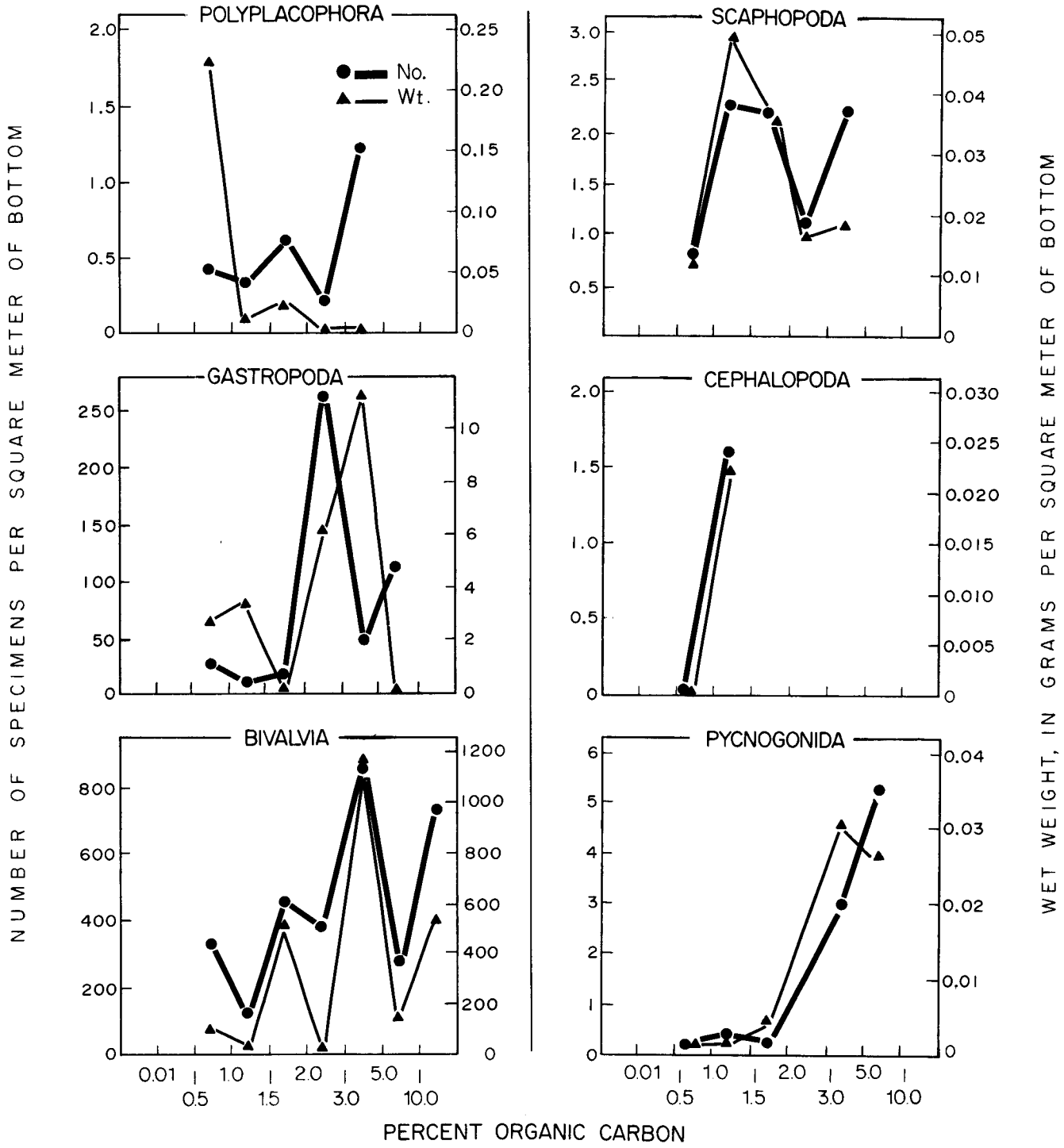

FIGURE 110.—Density (No.) and biomass (wt.) in relation to sediment organic carbon in the entire Middle Atlantic Bight region for Polyplacophora, Gastropoda, Bivalvia, Scaphopoda, Cephalopoda, and Pycnogonida.

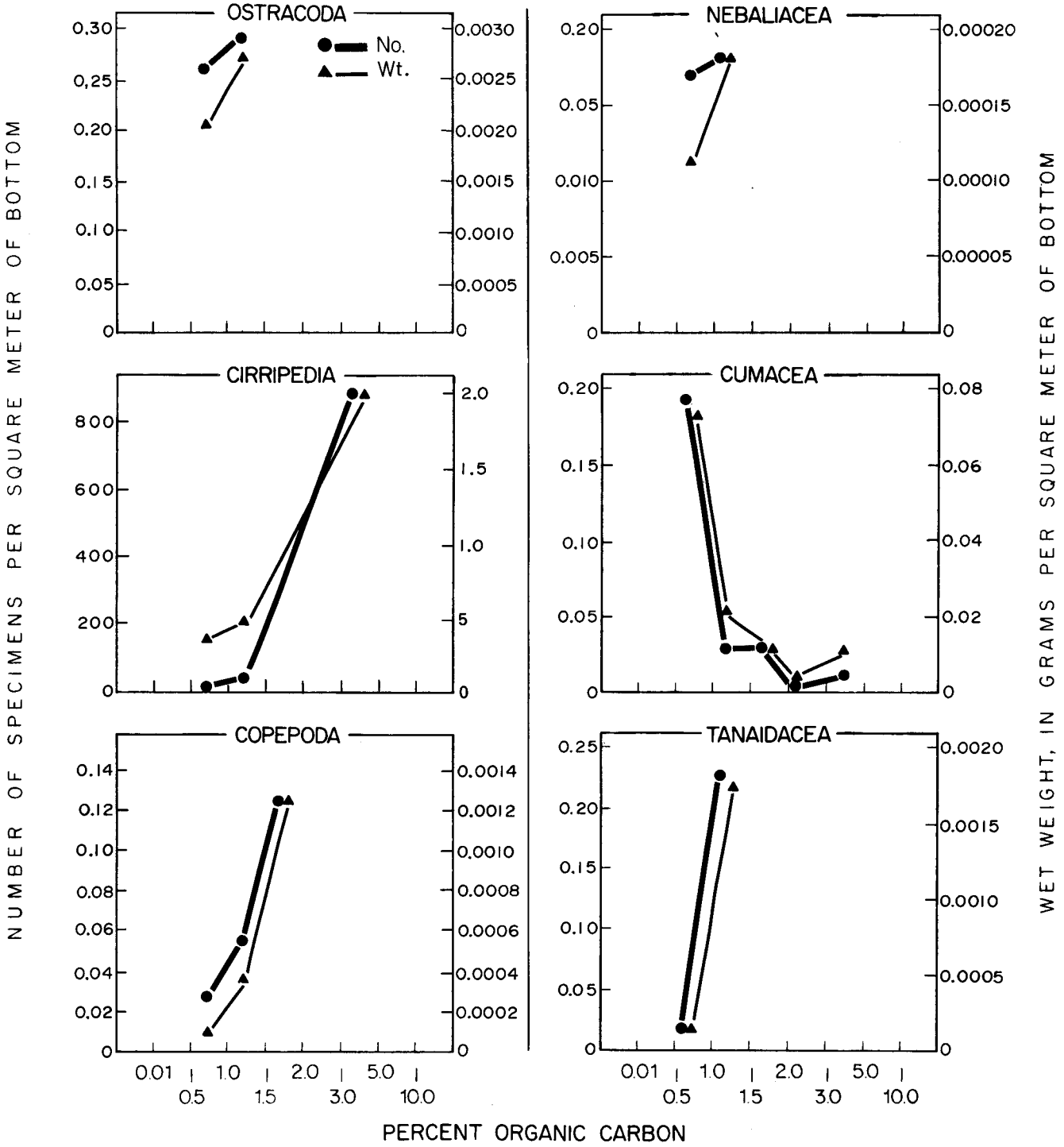

FIGURE 111.—Density (No.) and biomass (wt.) in relation to sediment organic carbon in the entire Middle Atlantic Bight region for Ostracoda, Cirripedia, Copepoda, Nebaliacea, Cumacea, and Tanaidacea.

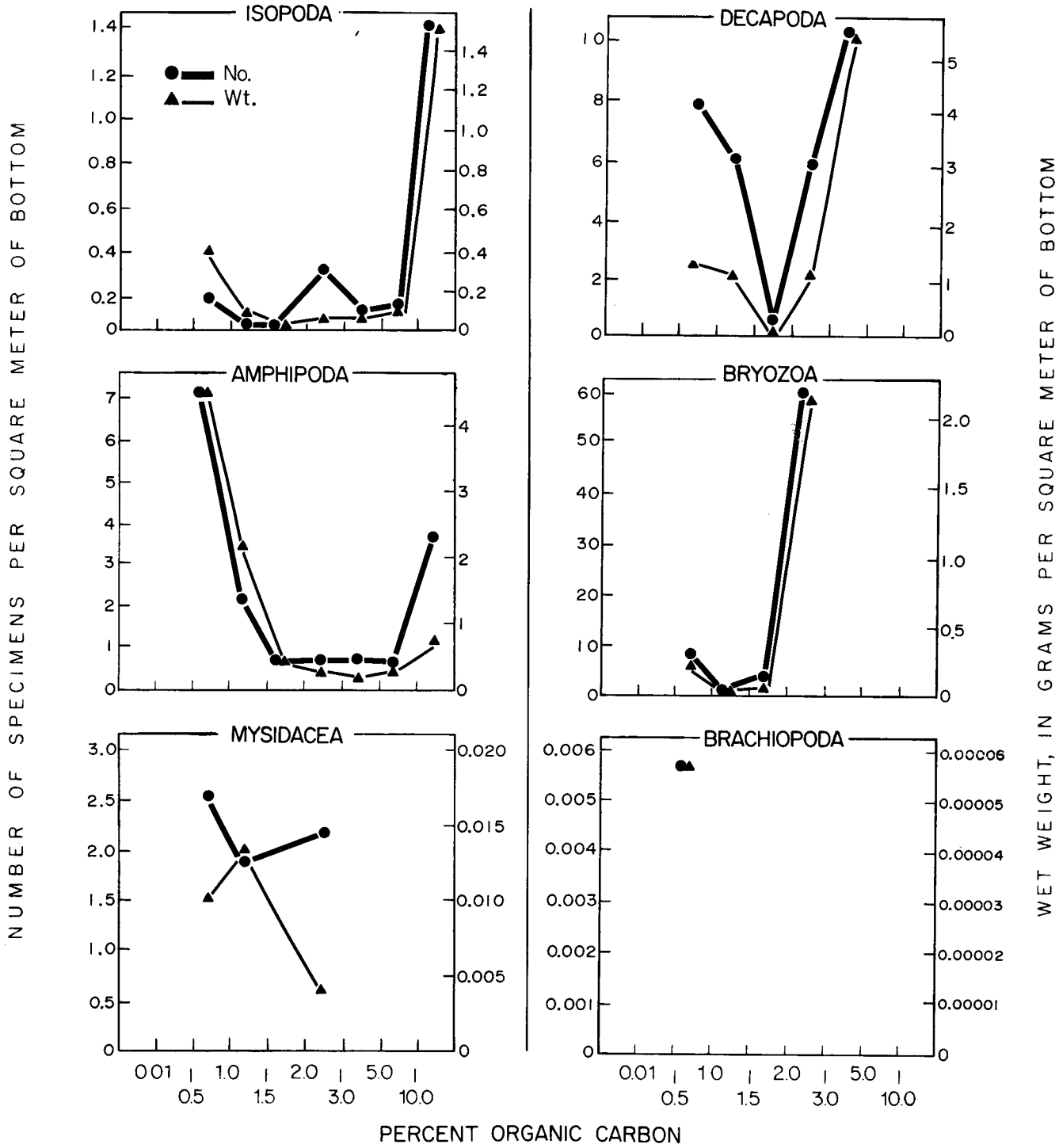

FIGURE 112.—Density (No.) and biomass (wt.) in relation to sediment organic carbon in the entire Middle Atlantic Bight region for Isopoda, Amphipoda, Mysidacea, Decapoda, Bryozoa, and Brachiopoda.

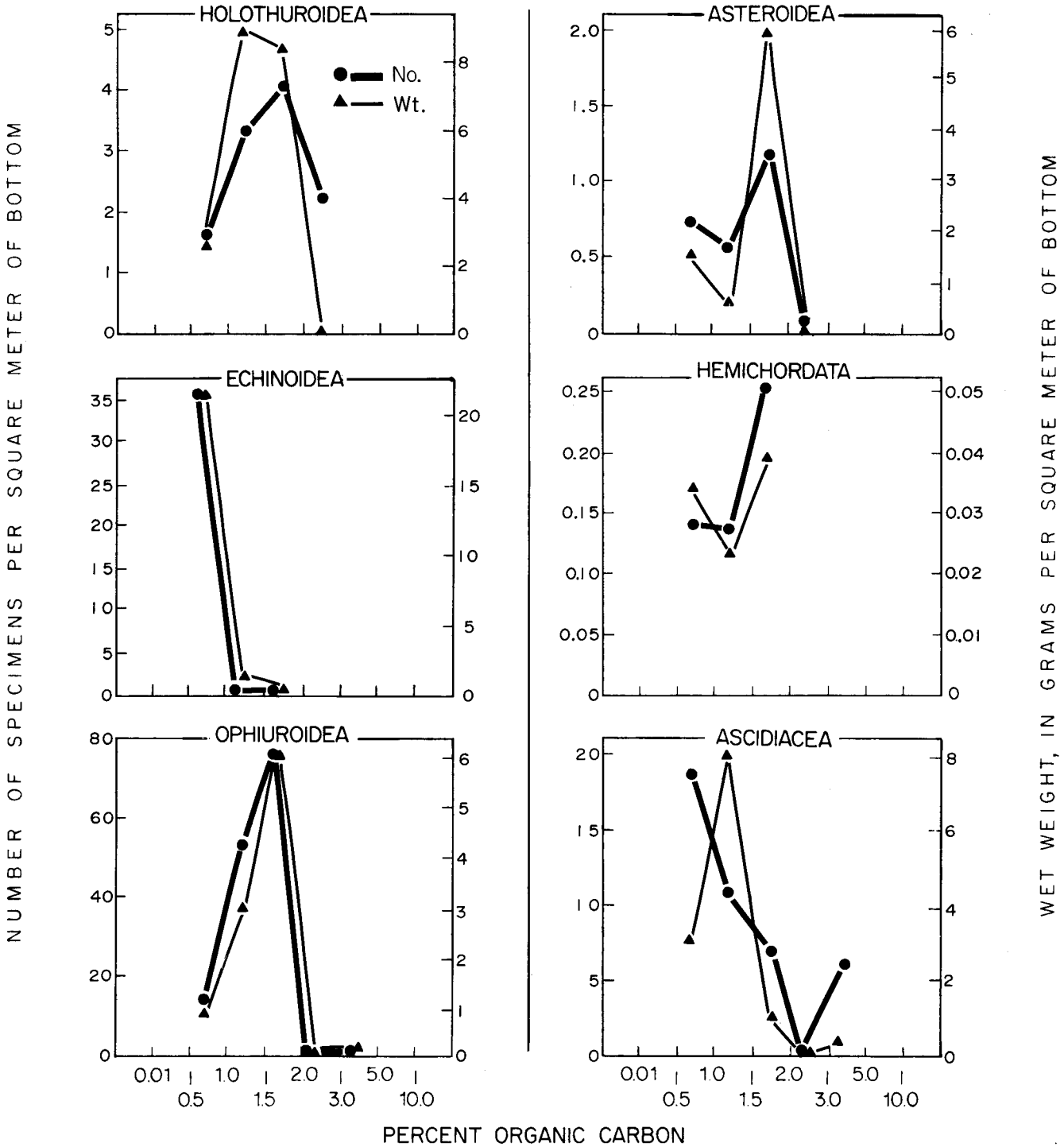

FIGURE 113.—Density (No.) and biomass (wt.) in relation to sediment organic carbon in the entire Middle Atlantic Bight region for Holothuroidea, Echinoidea, Ophiuroidea, Asteroidea, Hemichordata, and Ascidiacea.

The areal distribution of temperature ranges and the distribution of samples within each temperature-range class for each subarea and the entire Middle Atlantic Bight region is shown in figure 114 in table 36. Although each temperature-range class was represented in each subarea, there were striking differences in the annual temperature regime. This broad range was especially pronounced on the Continental Shelf. In Southern New England, most of the Continental Shelf had an annual range in temperature (or degrees difference between high and low temperatures) from 12° to 24°C. In contrast, most of the Continental Shelf in Chesapeake Bight had a substantially wider annual range, from about 20° to 24°C. In New York Bight, the temperature was between these two extremes.

Depth has the major effect on temperature range. Greatest temperature variations were found in the shoalest water and least in the deepwater areas.

TABLE 36.—*Number of samples within each water temperature range class in each subarea and for the entire Middle Atlantic Bight region*

Temperature range (degrees Celsius to nearest 0.1°)	Subarea			Entire region
	Southern New England	New York Bight	Chesapeake Bight	
0– 3.9	46	36	28	110
4.0– 7.9	7	5	5	17
8.0–11.9	12	16	5	33
12.0–15.9	52	42	8	102
16.0–19.9	31	32	16	79
20.0–23.9	28	52	74	154
24.0+	10	4	54	68
Total	186	187	190	563

TOTAL MACROBENTHIC FAUNA OF ALL TAXONOMIC GROUPS

ENTIRE MIDDLE ATLANTIC BIGHT REGION

The relationship between range in bottom-water temperature in the region and density and biomass of all organisms is listed in table 37 and illustrated in figures 115 and 116.

The mean density of all organisms throughout the entire region tended to increase as temperature range increased, at least until values of 12° to 15.9°C were attained. Where temperature ranges were higher, 16°–24°+C, mean densities, although high, tended to fluctuate more. Lowest mean density (133/m²) was found where temperature varied least (0°–3.9°C), increasing significantly as temperature range widened (591/m² in 4°–7.9°C and 851/m² in 8°–11.9°C), culminating in highest density (2,072/m²) in the midrange class of 12°–15.9°C. In the broader temperature classes (16°–24°C), mean densities, although high, did not show any definite trends.

The mean biomass of all organisms in the region showed a definite tendency of increasing as the temperature range broadened. Smallest biomass (10 g/m²) was found in the narrowest range (0°–3.9°C), and largest values (303 and 290 g/m²) in the broadest ranges (20°–23.9° and 24°+C, respectively). Biomass in the intermediate temperature ranges was from 40 to 240 g/m².

TABLE 37.—*Mean number of individuals and biomass of the macrobenthic invertebrate fauna, all taxonomic groups combined, in relation to range in bottom-water temperature*

Temperature range	Mean number of individuals				Mean biomass			
	SNE	NYB	CHB	Entire area	SNE	NYB	CHB	Entire area
°C	No./m²	No./m²	No./m²	No./m²	g/m²	g/m²	g/m²	g/m²
0.0-3.9	174	124	76	133	10	8	11	10
4.0-7.9	769	321	612	591	67	19	24	40
8.0-11.9	960	721	1,006	851	105	102	91	101
12.0-15.9	2,797	1,408	854	2,072	189	143	137	166
16.0-19.9	3,235	870	398	1,702	409	161	68	240
20.0-23.9	2,475	2,143	1,692	1,987	156	704	78	303
24.0+	2,361	1,471	1,061	1,276	1,011	392	149	290

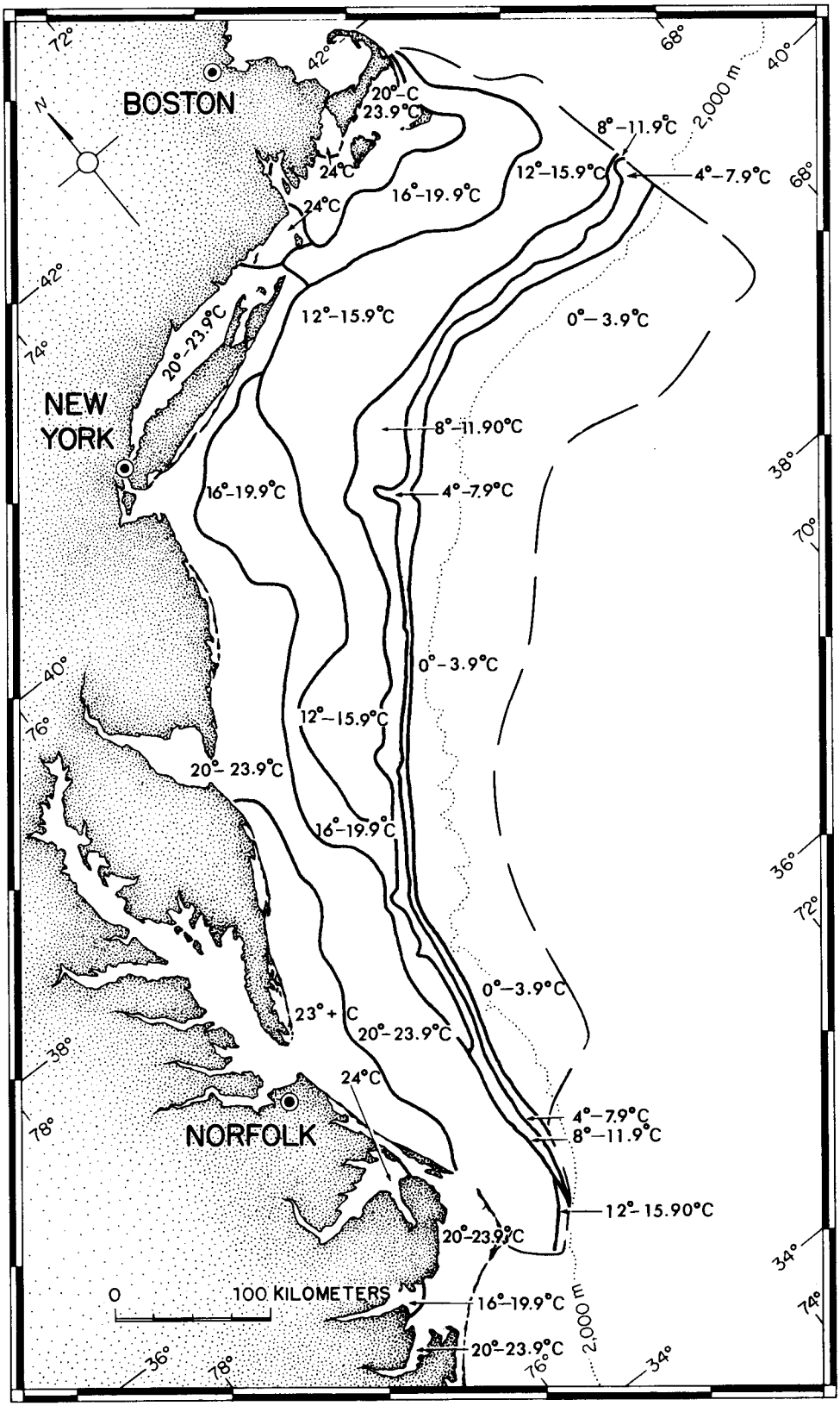

FIGURE 114.—Distribution of the range in bottom-water temperature (in degrees Celsius) the Middle Atlantic Bight region. Lines delimit areas of comparable temperature range; they are not isotherms. Dashed line shows boundary of sampling area.

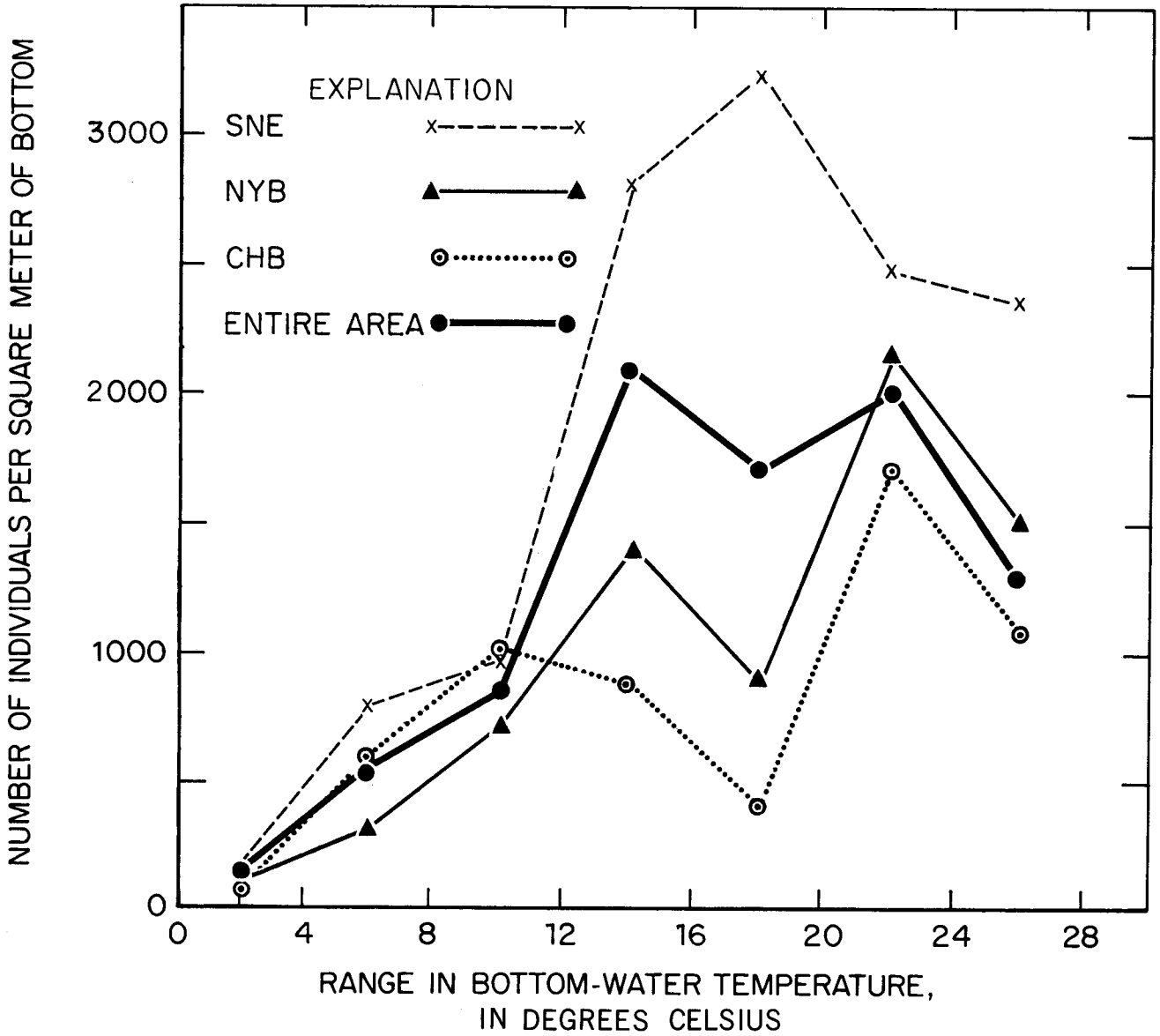

FIGURE 115.—Relation between number of individuals and range in bottom-water temperature. Values represent all taxonomic groups combined for each subarea and for the entire Middle Atlantic Bight region. Abbreviations: SNE, Southern New England; NYB, New York Bight; CHB, Chesapeake Bight.

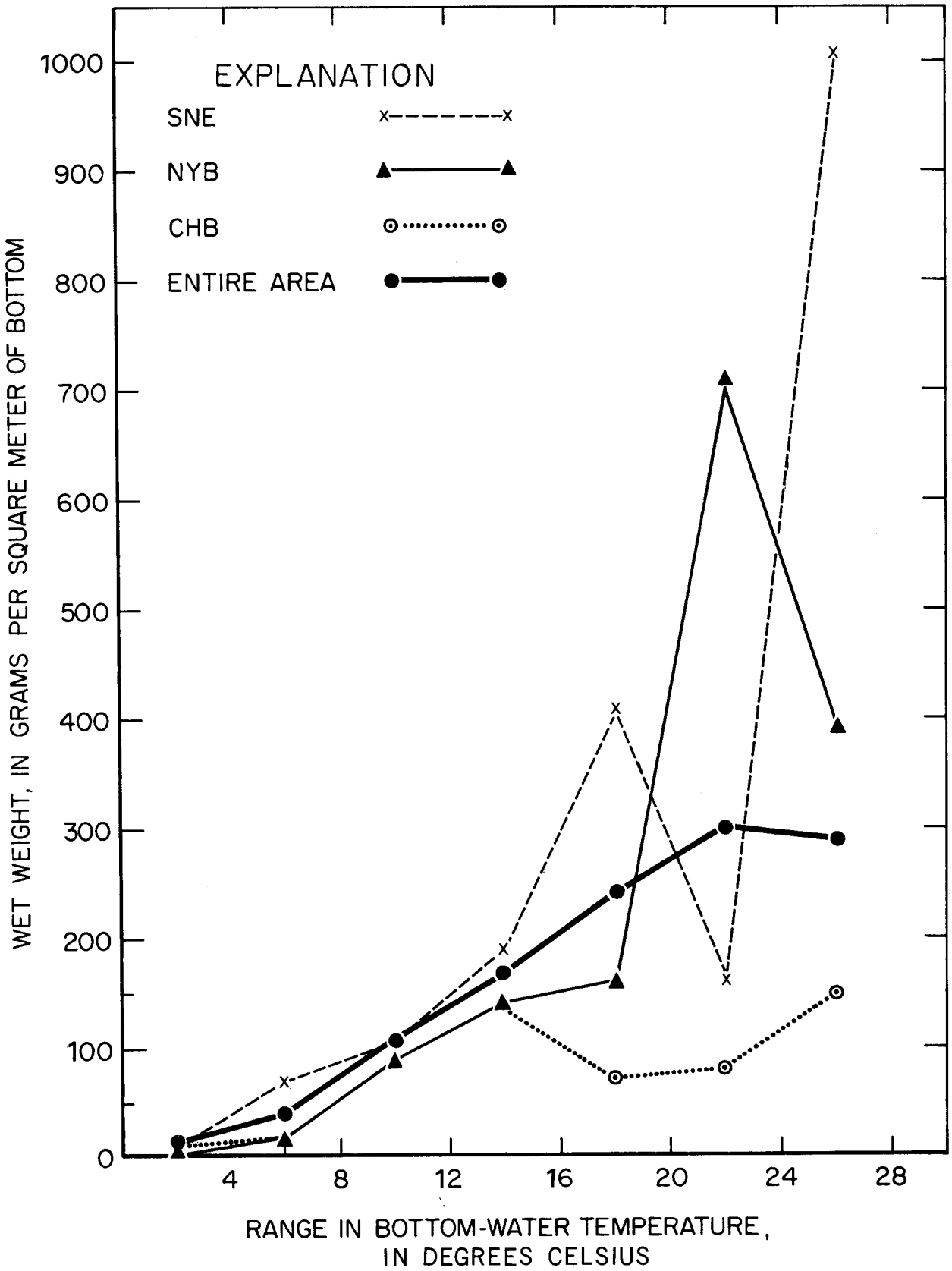

FIGURE 116.—Relation between biomass and range in bottom-water temperature. Values represent all taxonomic groups combined for each subarea and for the entire Middle Atlantic Bight region. Abbreviations: SNE, Southern New England; NYB, New York Bight; CHB, Chesapeake Bight.

SUBAREAS

SOUTHERN NEW ENGLAND

The mean density of all organisms in each temperature-range class, except one, was higher in Southern New England than in the two other subareas. The exception was in the 8°–11.9°C class, where density in Chesapeake Bight slightly exceeded that in Southern New England (1,006/m² versus 960/m²). The relationship between density and broadening temperature range was also most consistent in this subarea. Mean values of density increased steadily (174/m², 769/m², 960/m², 2,797/m², and 3,235/m²) as temperature range widened until 16°–19.9°C was reached; values then declined slightly (2,475/m² in 20°–23.9°C, and 2,361/m² in 24°+C).

In almost all temperature-range classes, the mean biomass was larger than those in either New York Bight or Chesapeake Bight. In the 0°–3.9°C class, Chesapeake Bight had a slightly larger biomass (11 versus 10 g/m²) than Southern New England, but the greatest disparity, which may simply be due to sampling variability, was found in the 20°–23.9°C class, where the biomass in New York Bight was significantly larger than that in Southern New England (704 versus 156 g/m²). Except for the two examples just mentioned, mean biomass in Southern New England was generally larger than those in New York Bight and Chesapeake Bight and tended to increase as temperature range broadened. Smallest average biomass (10 g/m²) was found in 0°–3.9°C class, and largest (1,011 g/m²) in the 24°+C class. Biomasses ranging from 67 to 409 g/m² were found in the intermediate classes, table 37.

NEW YORK BIGHT

Although the general tendencies of macrofaunal density in the New York Bight subarea were to increase as temperature range increased and to fall between those of Southern New England and Chesapeake Bight, some notable exceptions were seen. Density values increased in the first four temperature classes (0°–3.9° to 12°–15.9°C) from 124/m² to 1,408/m²; dipped to 870/m² in the 16°–19.9°C class; rose again to their highest point, 2,143/m², in the 20°–23.9°C class; then decreased again to 1,471/m² in the broadest range. Comparatively, the mean density of organisms in New York Bight in the first three temperature classes (0°–3.9° to 8°–11.9°C) was the lowest of the three subareas, and Chesapeake Bight occupied the intermediate position; but in the remaining classes, the density of New York Bight fell between the densities of Southern New England and Chesapeake Bight.

The average biomass of all organisms in New York Bight was very similar to that of Chesapeake Bight in the narrow to moderate temperature classes (0°–3.9° to 12°–15.9°C), ranging from 8 to 143 g/m²; was between those of Southern New England and Chesapeake Bight in both the 16°–19.9° and 24°+C classes (161 and 392 g/m², respectively); but was largest (704 g/m²) of any subarea in the 20°–23.9°C class.

CHESAPEAKE BIGHT

The relationship between mean density and biomass of all organisms and range in temperature was least consistent and generally lowest in this subarea. Densities in the first three classes tended to increase (76/m², 612/m², and 1,006/m²) as range broadened, culminating in the greatest density in the 8°–11.9°C class of any of the subareas. Values between 398/m² and 1,692/m² were found in the other temperature classes, but showed no definite pattern, and, overall, were lower than in the other subareas.

Biomass values in the first four temperature classes (0°–3.9° to 12°–15.9°) paralleled those of Southern New England and New York Bight very closely both in the general trend of increasing as temperature range broadened and in amount, which ranged from 11 to 137 g/m². However, in the broader classes, both the trend and the mean of biomass values fell drastically, except in the 24°+C range, where the largest biomass (149 g/m²) in this subarea was recorded. See figure 116 and table 37.

TAXONOMIC GROUPS

ENTIRE MIDDLE ATLANTIC BIGHT REGION

This section deals with the relationship between the mean density and biomass of each taxonomic group in the entire Middle Atlantic Bight region and the range in bottom-water temperature. Densities of each taxonomic group by temperature class are listed in table 38. Corresponding biomass values for each taxonomic group are listed in table 39. These data are illustrated in figures 117 through 122.

SUBAREA DIFFERENCES IN DISTRIBUTION OF TAXONOMIC GROUPS

This section deals with the relation of temperature range to each taxonomic group within each of the three subareas. Density data listed by temperature-range class are presented separately for each subarea in tables 40, 41, and 42; corresponding biomass values are listed in tables 43, 44, and 45.

TABLE 38.—*Mean number of individuals of each taxonomic group listed by temperature-range class, representing the entire Middle Atlantic Bight region*

[In number per square meter]

Taxonomic group	Range in bottom water temperature (°C)						
	0°-3.9°	4.0°-7.9°	8.0°-11.9°	12.0°-15.9°	16.0°-19.9°	20.0°-23.9°	24.0°+
	No./m²	No./m²	No./m²	No./m²	No./m²	No./m²	No./m²
PORIFERA	0.07	0.65	0.73	0.48	0.14	0.62	1.75
COELENTERATA	3.69	16.06	10.12	20.28	8.22	17.21	53.10
Hydrozoa	0.02	1.94	3.15	11.95	5.91	12.16	24.84
Anthozoa	3.67	14.12	6.97	8.33	2.30	5.06	28.26
Alcyonacea	1.10	2.71	1.24	0.77	-	-	-
Zoantharia	0.85	9.53	4.18	6.60	1.78	4.15	4.37
Unidentified	1.72	1.88	1.55	0.96	0.52	0.91	23.90
PLATYHELMINTHES	-	-	0.45	0.37	3.05	0.21	0.46
Turbellaria	-	-	0.45	0.37	3.05	0.21	0.46
NEMERTEA	0.70	2.82	2.64	6.21	7.58	5.78	3.00
ASCHELMINTHES	1.09	0.53	0.45	2.50	10.77	0.40	2.90
Nematoda	1.09	0.53	0.45	2.50	10.77	0.40	2.90
ANNELIDA	52.65	237.71	188.61	330.29	341.84	469.56	273.22
POGONOPHORA	5.17	1.29	2.33	3.95	-	0.04	-
SIPUNCULIDA	4.12	11.18	4.88	6.11	7.19	0.46	2.24
ECHIURA	0.35	-	-	-	-	0.30	-
PRIAPULIDA	0.07	-	-	-	-	-	-
MOLLUSCA	46.64	213.47	130.82	157.70	113.29	832.22	421.84
Polyplacophora	0.45	-	0.42	0.98	-	0.04	1.26
Gastropoda	6.76	3.35	13.79	10.98	13.72	92.50	35.91
Bivalvia	36.53	205.71	107.27	143.37	99.44	739.38	384.66
Scaphopoda	2.90	4.12	3.91	1.33	0.13	0.30	-
Cephalopoda	-	0.29	5.42	-	-	-	-
Unidentified	-	-	-	1.04	-	-	-
ARTHROPODA	7.27	57.53	324.24	1402.02	1130.56	551.00	455.19
Pycnogonida	-	-	-	0.12	0.67	0.41	2.59
Archnida	-	-	-	-	-	0.17	-
Crustacea	7.27	57.53	324.24	1401.90	1129.89	550.42	452.60
Ostracoda	0.05	-	-	0.21	-	0.47	0.34
Cirripedia	-	-	-	0.22	45.42	86.18	0.31
Copepoda	0.10	-	0.12	0.06	-	-	-
Nebaliacea	0.02	-	-	-	0.05	0.01	-
Cumacea	0.97	5.94	12.61	32.68	35.00	14.10	1.04
Tanaidacea	0.30	-	-	-	-	-	-
Isopoda	0.54	1.59	3.88	9.06	26.70	18.84	11.53
Amphipoda	5.17	46.29	305.36	1352.94	1018.78	411.23	424.09
Mysidacea	0.02	-	-	0.06	0.05	4.58	6.47
Decapoda	0.10	3.71	2.27	6.68	3.89	15.00	8.82
BRYOZOA	-	-	5.27	1.85	27.19	21.36	15.90
BRACHIOPODA	-	-	-	-	0.02	-	-
ECHINODERMATA	5.46	46.07	171.09	114.75	29.56	60.11	6.54
Holothuroidea	1.69	4.42	2.42	7.13	0.16	0.82	0.07
Echinoidea	0.07	1.00	1.52	14.43	27.05	58.30	5.10
Ophiuroidea	3.53	39.82	164.27	91.42	0.71	0.60	1.25
Asteroidea	0.16	0.82	2.88	1.76	1.63	0.39	0.12
HEMICHORDATA	0.05	-	0.15	0.40	-	0.16	-
CHORDATA	1.26	1.18	3.97	20.33	17.19	19.75	22.17
Ascidiacea	1.26	1.18	3.97	20.33	17.19	19.75	22.17
UNIDENTIFIED	4.34	2.53	5.42	6.11	5.84	7.51	18.04

Porifera in the Southern New England subarea occurred in all temperature classes except 12.0°–15.9°C. They were found in only four classes in New York Bight: the 8.0°–11.9°, 12.0°–15.9°, 20.0°–23.9°, and 24.0°+C classes. In Chesapeake Bight, they were found in only three of the temperature classes: 0°–3.9°C, 20.0°–23.9°, and 24.0°+C. The density of sponges in each of the subareas in the Middle Atlantic Bight region was moderate to moderately low, ranging from 0.13/m² to 7.5/m² in Southern New England, from 0.25/m² to 3.0/m² in New York Bight, and from 0.07/m² to 0.6/m² in Chesapeake Bight. No increase in density was apparent as temperature range broadened, although the highest densities in the two northern subareas were found in the broadest temperature-range class. The biomass of sponges was small in all three subareas.

TABLE 39.—*Mean biomass of each taxonomic group listed by temperature-range class, representing the entire Middle Atlantic Bight region*

[In grams per square meter]

Taxonomic group	Range in bottom water temperature (°C)						
	0°-3.9°	4.0°-7.9°	8.0°-11.9°	12.0°-15.9°	16.0°-19.9°	20.0°-23.9°	24.0°+
	g/m²	g/m²	g/m²	g/m²	g/m²	g/m²	g/m²
PORIFERA	0.018	0.035	0.033	0.044	0.163	0.047	0.069
COELENTERATA	0.536	1.376	13.093	1.972	0.465	2.766	7.306
Hydrozoa	<0.001	0.067	0.014	0.073	0.150	0.464	1.090
Anthozoa	0.536	1.309	13.079	1.899	0.315	2.302	6.216
Alcyonacea	0.145	0.122	0.298	0.227	-	-	-
Zoantharia	0.214	1.096	12.639	1.552	0.172	2.198	5.822
Unidentified	0.177	0.091	0.142	0.120	0.143	0.104	0.394
PLATYHELMINTHES	-	-	0.004	0.013	0.019	0.004	0.006
Turbellaria	-	-	0.004	0.013	0.019	0.004	0.006
NEMERTEA	0.070	0.170	0.456	0.648	0.945	1.018	0.372
ASCHELMINTHES	0.006	0.004	0.002	0.004	0.007	<0.001	0.012
Nematoda	0.006	0.004	0.002	0.004	0.007	<0.001	0.012
ANNELIDA	2.553	8.539	7.778	20.046	12.917	18.093	18.281
POGONOPHORA	0.028	0.008	0.005	0.033	-	<0.001	-
SIPUNCULIDA	1.777	0.589	0.172	1.082	0.546	0.019	0.302
ECHIURA	0.995	-	-	-	-	0.200	-
PRIAPULIDA	0.045	-	-	-	-	-	-
MOLLUSCA	0.668	2.500	44.608	94.656	149.427	242.580	238.765
Polyplacophora	0.005	-	0.004	0.014	-	0.004	1.149
Gastropoda	0.078	0.031	0.059	4.865	0.815	6.221	3.013
Bivalvia	0.540	2.405	44.411	89.736	148.611	236.351	234.603
Scaphopoda	0.045	0.061	0.060	0.037	<0.001	0.004	-
Cephalopoda	-	0.003	0.074	-	-	-	-
Unidentified	-	-	-	0.004	-	-	-
ARTHROPODA	0.068	0.668	1.816	7.867	27.728	10.865	4.842
Pycnogonida	-	-	-	0.001	0.002	0.003	0.016
Arachnida	-	-	-	-	-	<0.001	-
Crustacea	0.068	0.668	1.816	7.866	27.726	10.861	4.826
Ostracoda	<0.001	-	-	0.001	-	0.004	0.003
Cirripedia	-	-	-	0.004	17.055	4.944	0.006
Copepoda	<0.001	-	<0.001	<0.001	-	-	-
Nebaliacea	<0.001	-	-	-	<0.001	<0.001	-
Cumacea	0.009	0.046	0.067	0.191	0.113	0.048	0.005
Tanaidacea	0.002	-	-	-	-	-	-
Isopoda	0.015	0.079	0.215	0.301	0.807	0.304	0.178
Amphipoda	0.029	0.137	1.441	6.286	8.806	3.205	2.730
Mysidacea	<0.001	-	-	0.002	<0.001	0.017	0.034
Decapoda	0.011	0.406	0.092	1.081	0.944	2.339	1.870
BRYOZOA	-	-	0.072	0.031	0.930	0.656	0.074
BRACHIOPODA	-	-	-	-	<0.001	-	-
ECHINODERMATA	2.678	26.076	32.712	36.910	44.558	22.415	0.861
Holothuroidea	1.710	5.461	1.263	21.355	5.876	0.417	0.048
Echinoidea	0.190	12.372	13.120	6.675	38.513	19.870	0.355
Ophiuroidea	0.741	7.825	10.459	3.962	0.017	0.160	0.317
Asteroidea	0.037	0.418	7.870	4.918	0.152	1.968	0.141
HEMICHORDATA	<0.001	-	0.046	0.076	-	0.044	-
CHORDATA	0.139	0.071	0.527	2.042	1.621	4.357	15.495
Ascidiacea	0.139	0.071	0.527	2.042	1.621	4.357	15.495
UNIDENTIFIED	0.128	0.142	0.073	0.450	0.270	0.310	0.297

Coelenterata were found in each of the three subareas in all temperature-range classes except the 24.0°+C class in New York Bight. Since the coelenterates are made up of several subcomponents, a detailed analysis will be given under the separate components. Coelenterates, as a group, were significant contributors to the overall macrofauna in all three subareas in both density and biomass.

Hydrozoa in Southern New England were present in all classes except the 0°–3.9° and 8.0°–11.9°C