RELATION WITH RANGE IN BOTTOM WATER TEMPERATURE

This section deals with the relationship of 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 40). The range of temperature that normally occurs in this region is quite wide, particularly in some of the shallow, inshore locations where the actual temperatures may dip slightly below $0^{o}C$ or rise above $24^{o}C$.

Ranges 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 temperature ranges were grouped into seven classes: (1) $0\text{-}3.9^{o}$; (2) $4.0\text{-}7.9^{o}$; (3) $8.0\text{-}11.9^{o}$; (4) $12.0\text{-}15.9^{o}$; (5) $16.0\text{-}19.9^{o}$; (6) $20.0\text{-}23.9^{o}$; (7) $24.0^{o}+$. All references to temperature in this section, therefore, pertain to ranges rather than to discrete measurements.

Information regarding 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 contained in figure 114 and Appendix table A-4. 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 the major portion of the continental shelf had an annual range in temperature from 12^{o} to $20^{o}C$. In contrast, the major portion of the continental shelf in Chesapeake Bight had a substantially wider annual range, from about 20^{o} to $24^{o}C$. In New York Bight the temperature was intermediate between these two extremes.

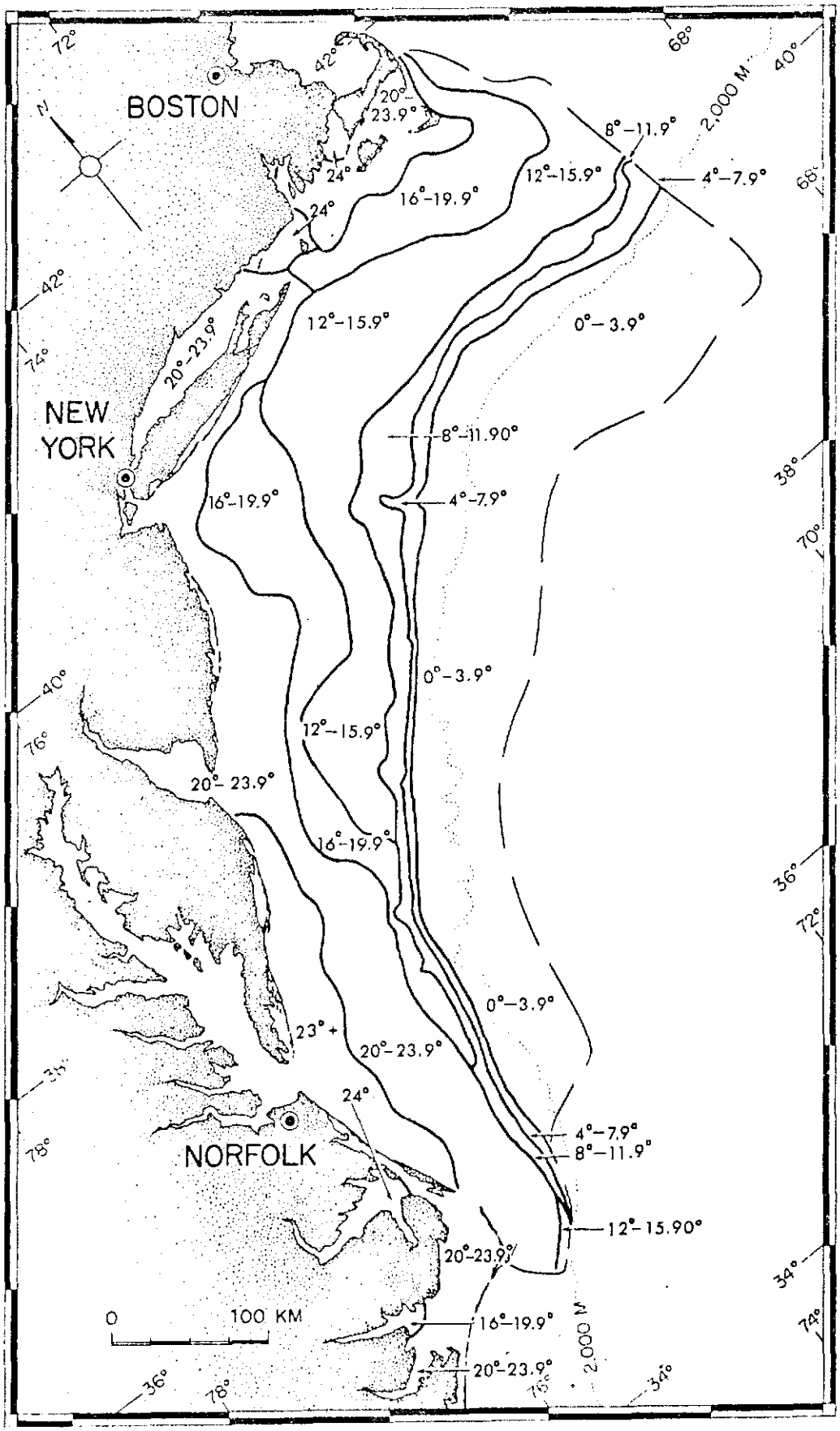

Figure 114.--Distribution of the range in bottom-water temperature for the Middle Atlantic Bight Region. Lines delimit areas of comparable temperature range; they are not isotherms.

The major effect on temperature range is that imparted by its distribution according to depth. Greatest temperature variations occurred in the shoalest water and least in the deep-water areas.

Total Macrobenthic Fauna--All Taxonomic Groups Combined

Entire Middle Atlantic Bight Region

The relation of density and biomass of all organisms to range in bottom water temperature in the Middle Atlantic Bight Region is listed in table 33 and illustrated in figures 115 and 116.

The mean density of all organisms throughout the entire Region tended to increase with increasing temperature range, 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/m^2) occurred where temperature varied least (0-3.9°C), increasing significantly as temperature range widened (591/m^2 in 4-7.9°C and 851/m^2 in 8-11.9°C), culminating in highest density (2,072/m^2) in the mid-range 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 vis-a-vis range in temperature showed a definite tendency of increasing as range broadened. Smallest biomass (10 g/m^2) occurred in the narrowest range (0-3.9°C), and largest values (303 and 290 g/m^2) occurred in the broadest ranges (20-23.9° and 24°+C, respectively). Biomass in the intermediate temperature ranges was from 40 to 240 g/m^2.

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 occurred in the 8-11.9°C class where density

Table 33.--Mean number of individuals and biomass of the macrobenthic invertebrate fauna, all taxonomic groups combined, in relation to range in bottom water temperature. Values are listed separately for each subarea and for the entire Middle Atlantic Bight Region.

Temperature range	Mean number of individuals				Mean biomass			
	SNE	NYB	CHB	Entire area	SNE	NYB	CHB	Entire area
°C	No./m^2	No./m^2	No./m^2	No./m^2	g/m^2	g/m^2	g/m^2	g/m^2
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

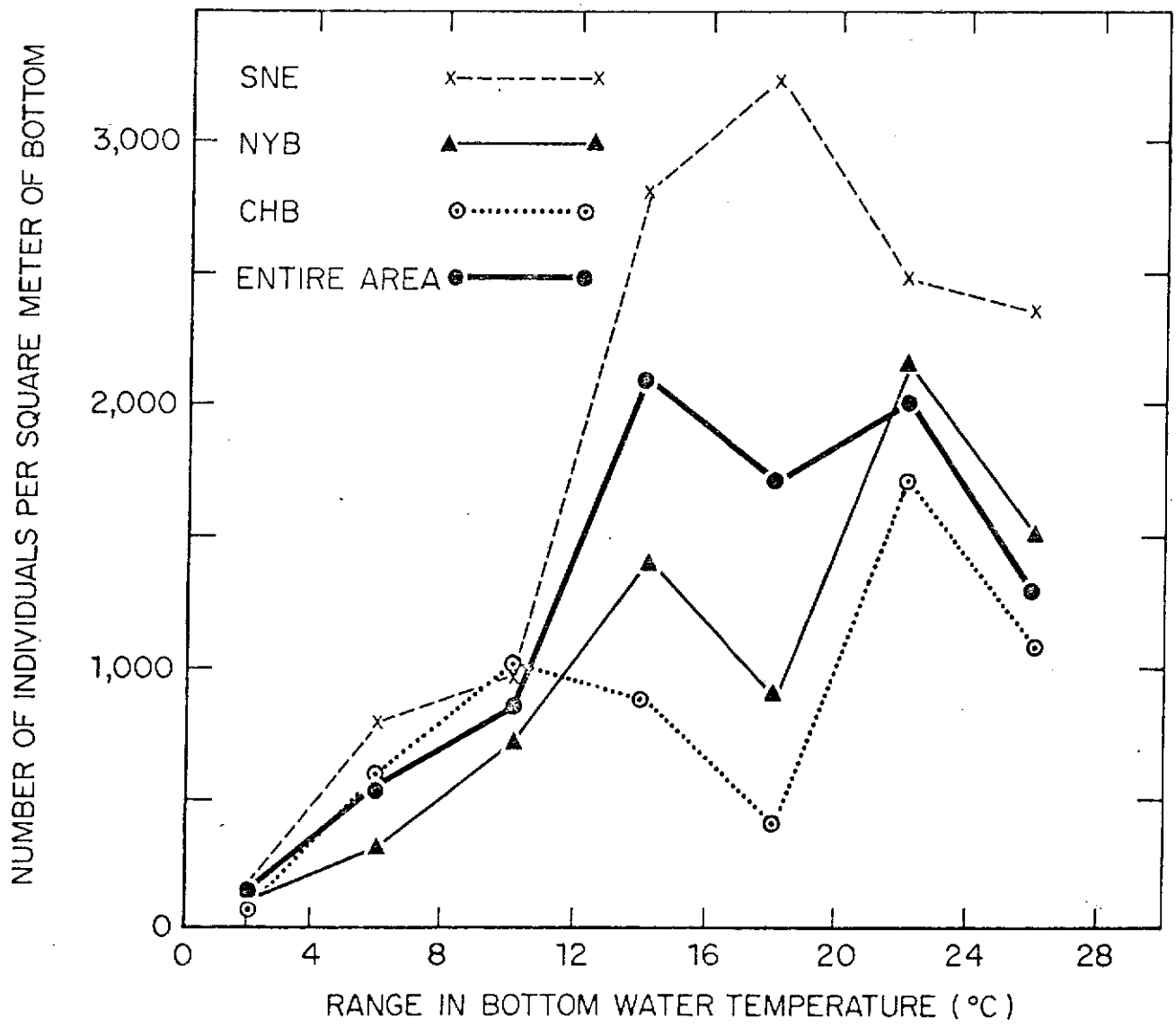

Figure 115.--Relation between number of individuals and range in bottom-water temperature. Values represent all taxonomic groups combined for each subarea and for the entire Middle Atlantic Bight Region.

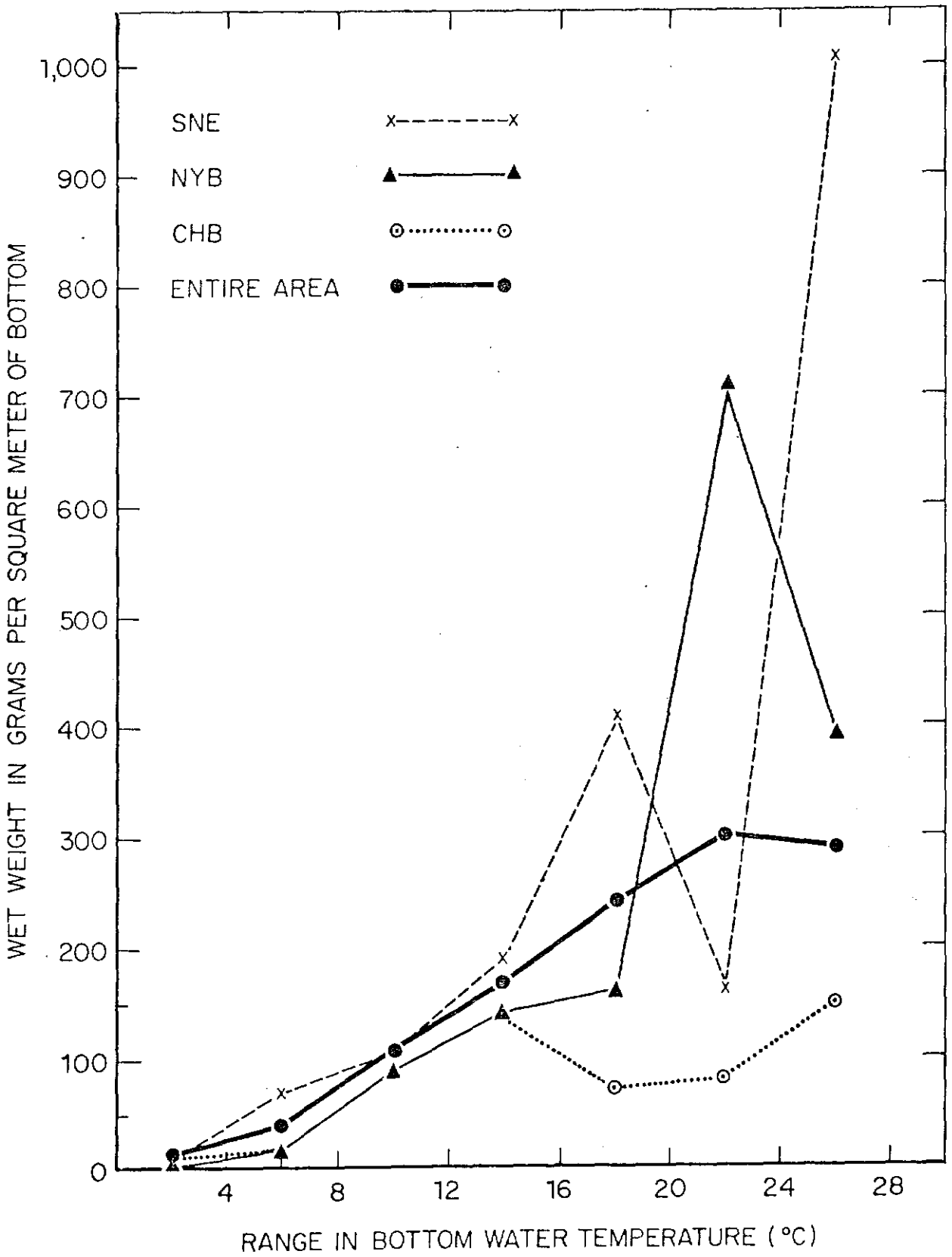

Figure 116.--Relation between biomass and range of bottom-water temperature. Values represent all taxonomic groups combined for each subarea and for the entire Middle Atlantic Bight Region.

in Chesapeake Bight slightly exceeded that in Southern New England (1,006 versus 960/m^2). The relation of density to broadening temperature range was also most consistent in this subarea. Mean values of density increased steadily (174, 769, 960, 2,797, and 3,235/m^2) with increasing range until 16-19.9°C was reached; values then declined slightly with broadening range (2,475/m^2 in 20-23.9°C, and 2,361/m^2 in 24°+C).

The mean biomass in Southern New England was also larger, in almost all temperature range classes, than 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/m^2) than Southern New England, but the greatest disparity, which may simply be due to sampling variability, occurred in the 20-23.9°C class, where the biomass in New York Bight was significantly larger than in Southern New England (704 versus 156 g/m^2). Except for the two cases just mentioned, mean biomass in Southern New England was generally larger than in New York Bight and Chesapeake Bight and tended to increase with broadening temperature range. Smallest average biomass (10 g/m^2) occurred in 0-3.9°C, and largest (1,011 g/m^2) in the 24°+C class. Biomasses ranging between 67 and 409 g/m^2 occurred in the intermediate classes, table 33.

New York Bight

Although the general tendency of macrofaunal density in the New York Bight subarea was to increase with increasing temperature range and to be intermediate between that of Southern New England and Chesapeake Bight, some notable exceptions occurred. Density values increased in the first four temperature classes (0-3.9 to 12-15.9°C) from 124 to 1,408/m^2, dipped to 870/m^2 in the 16-19.9°C class, rose again to their highest point,

2,143/m^2, in the 20-23.9°C class, then decreased again to 1,471/m^2 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 among the three subareas, with Chesapeake Bight occupying the intermediate position, but in the remaining classes was intermediate between Southern New England and Chesapeake Bight.

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/m^2, was intermediate between Southern New England and Chesapeake Bight in both the 16-19.9° and 24°+C classes (161 and 392 g/m^2, respectively), but was largest (704 g/m^2) of any subarea in the 20-23.9°C class.

Chesapeake Bight

The mean density and biomass of all organisms in relation to range in temperature were least consistent and generally lowest in this subarea. Densities in the first three classes tended to increase (76, 612, and 1,006/m^2) with broadening range, culminating in the greatest density, in the 8-11.9°C class, of any of the subareas. Values between 398 to 1,692/m^2 occurred in the other temperature classes, but with no definite pattern, and were lower overall 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 quite closely both in terms of the general trend of increasing with broadening temperature range as well as magnitude, ranging from 11 to 137 g/m^2. However, in the broader classes both the trend and the magnitude of biomass values fell off drastically, except in 24°+C where the largest biomass (149 g/m^2) in this subarea occurred, see figure 115 and table 33.

Taxonomic Groups

Entire Middle Atlantic Bight Region

This section deals with the relation of the mean density and biomass of each taxonomic group in the entire Middle Atlantic Bight Region to the range in bottom water temperature. Densities of each taxonomic group for the appropriate temperature class are listed in table 34. Corresponding biomass values for each taxonomic group are listed in table 35. These data are illustrated in figures 117 through 122.

Porifera (fig. 117) were found in all temperature ranges, albeit disproportionately. Their density was, in general, moderately low ranging from $0.07/m^2$ in the narrowest temperature class to $1.8/m^2$ in the broadest. Other than at the extremes, there did not appear to be any definite temperature range preference since density values rose, fell, then rose again with an increase in temperature in the intermediate ranges. One striking instance is found in the 16-19.9°C class where, although the density is second lowest ($0.14/m^2$), the biomass of sponges is largest ($0.16\ g/m^2$). Next largest biomass ($0.07\ g/m^2$) occurred in the 24°+C range, as with density, while smallest biomass ($0.02\ g/m^2$) was found in the narrowest class, 0-3.9°C.

Coelenterata, as a group, occurred in all temperature ranges and were significant contributors to the overall faunal density and biomass throughout the study area. The general tendency among coelenterates, especially with regard to biomass, but also, to some degree, to density, was to increase in abundance as temperature range broadened. Details of density and biomass among the different classes will be discussed below for each coelenterate subcomponent.

Table 34.--Mean number of individuals of each taxonomic group listed by temperature range class, representing the entire Middle Atlantic Bight Region.

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

Table 35.--Mean biomass of each taxonomic group listed by temperature range class, representing the entire Middle Atlantic Bight Region.

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	0.295	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	0.026	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	1.203	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

Hydrozoa (fig. 117) were present in all temperature ranges and both density and biomass tended to increase with broadening range. Density values were moderate overall but high when compared to other coelenterate subcomponents. Indeed, hydroid biomass was the greatest of any subcomponent in three classes, between 12.0 and 23.9°C. Actual mean density values ranged from 0.02/m^2 in 0-3.9°C to 25/m^2 in 24°+C class. Biomass of hydroids, although moderate, did not contribute as significantly to overall coelenterate biomass as did their density; it ranged from only trace amounts in 0-3.9°C to 1.1 g/m^2 in the 24°+C class.

Anthozoa (fig. 117) were also present in all temperature classes and were major contributors to the overall coelenterate density and biomass. No clear-cut tendency of density or biomass vis-a-vis temperature range breadth was discernible. Anthozoan density was highest among the coelenterate subcomponents in classes 0-3.9°, 4.0-7.9°, 8.0-11.9°, and 24°+C. Values ranged from 2.3/m^2 in 16.0-19.9°C to 28/m^2 in the 24°+C class. Biomass of anthozoans, although moderate, led all other coelenterate subgroups in all temperature classes. Biomass ranged from 0.3 g/m^2 in class 16.0-19.9°C to 13 g/m^2 in the 8.0-11.9°C class.

Alcyonacea (Alcyonaria) (fig. 117) were restricted to low to moderate temperature range classes (0-3 to 15.9°C) only. Densities were moderate and tended to decrease as temperature range broadened, ranging from 0.8/m^2 in 12-15.9°C to 3/m^2 in the 4.0-7.9°C class. Biomass was moderately small and showed a general tendency of increasing as temperature range broadened. Largest biomass (0.3 g/m^2) occurred where temperature range was 8.0-11.9°C.

Zoantharia (fig. 117) were present in all temperature classes and were the major contributors to anthozoan density and biomass. Densities on the

whole were moderately high with greatest numbers occurring in the low to middle temperature classes (10 and 7/m^2 in the 4.0-7.9 and 12.0-15.9°C classes, respectively). Lower densities (between 2 and 4/m^2) were present in the other temperature ranges with lowest density (0.9/m^2) occurring in the 0-3.9°C class. Biomass of zoantharians was moderately large especially in the 8-11.9°C class, where nearly 13 g/m^2 occurred. Values between 1 and 5 g/m^2 occurred in the following classes: 4.0-7.9°, 12.0-15.9°, 10.0-23.9°, and 24°+C, whereas values under 1 g/m^2 were found where ranges of 0-3.9° and 16.0-19.9°C occurred.

Platyhelminthes (fig. 117) were found in regions where moderately low to high temperature ranges occurred but not in the two lowest classes. Mean densities in nearly all classes were less than 0.5/m^2, except in the 16.0-19.9°C class where 3/m^2 were found. Biomass was very small, varying from 0.004 to 0.02 g/m^2.

Nemertea (fig. 117) were found in moderate quantities in all temperature ranges of the Middle Atlantic Bight Region. Density values varied from 0.7 to 7.6/m^2, tending to increase with temperature to the mid-classes (16.0-19.9°C), then diminished as range broadened further. Biomass values paralleled those of density but were comparatively smaller, ranging from 0.07 to 10.2 g/m^2. Largest biomass occurred in the 20.0-23.9°C class and diminished in the 24.0°+C class.

Nematoda (fig. 118) occurred in all temperature ranges, and, as might be expected for this group of organisms, tended to be more important in terms of density than biomass. Generally densities were moderate (between 0.5 and 3/m^2) with some tendency to increase with broadening temperature range;

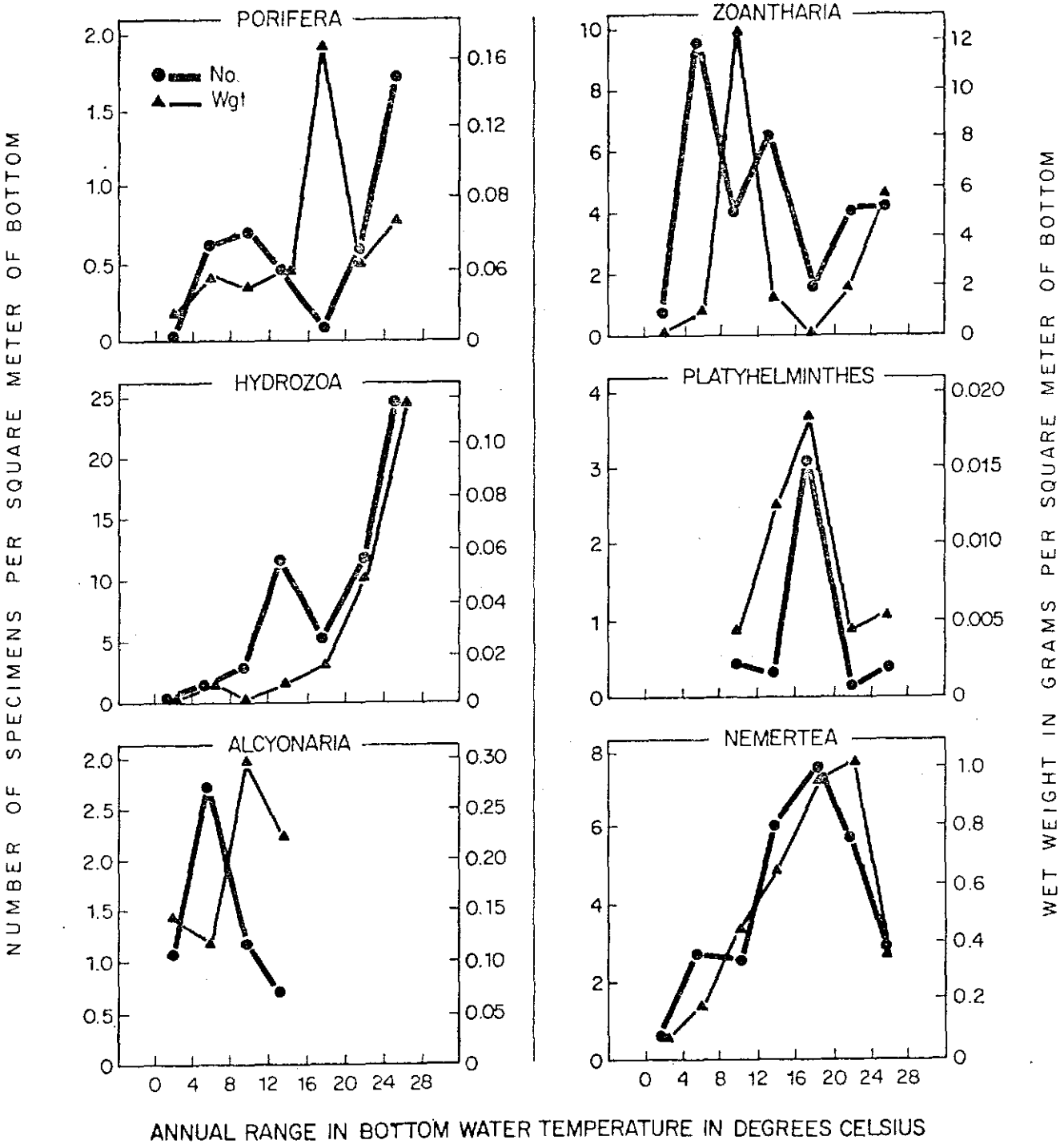

Figure 117.--Density and biomass in relation to range in bottom-water temperature in the entire Middle Atlantic Bight Region for: Porifera, Hydrozoa, Alcyonaria, Zoantharia, Platyhelminthes, and Nemertea.

however, the 16.0-19.9°C class contained a relatively high abundance, 11/m^2. Largest biomass (0.01 g/m^2) occurred in the broadest range. Values of biomass in the other classes were, for the most part, slightly above trace amounts.

Annelida (fig. 118) were ubiquitous with regard to temperature range in the Middle Atlantic Bight Region and were major contributors to the overall density and biomass of the macrofauna. Density of worms was high and, in two instances, in the 0-3.9°C and the 4.0-7.9°C classes, their density was the highest of any other single taxon, 53 and 238/m^2, respectively. The general tendency among annelids was for their density to increase with broadening temperature range (table 34 and fig. 118). Density values in other classes varied from 189/m^2 in the 8.0-11.9°C class to 470/m^2 in 20.0-23.9°C. The biomass of worms was also high, but did not contribute as significantly to the overall abundance as did their density. Biomasses also tended to rise with broadening temperature range. Smallest biomass (2.6 g/m^2) was found in the narrowest class (0-3.9°C) while largest weights (20 g/m^2) occurred in the mid-range class (12.0-15.9°C). Biomasses between 8 and 18 g/m^2 occurred in the other temperature classes.

Pogonophora (fig. 118) tended to prefer the more stable temperatures of the deeper waters. They were present in all temperature classes below 12.0-15.9°C inclusive, but were present only in the 20.0-23.9°C class above this. Densities were on the whole moderately high in the preferred areas (1 to 5/m^2) and low (0.04/m^2) in the broadest range they occupied. Biomass was small in all temperature classes, trace amounts in 20.0-23.9°C to 0.03 g/m^2 in both the 12.0-15.9°C and 0-3.9°C classes.

Sipunculida (Sipuncula) (fig. 118) occupied all temperature range classes in the region but seemed to prefer the narrower ranges to the broader ones. Densities were moderately high, generally greater than $4/m^2$ in most temperature classes, ranging from 4 to $11/m^2$, and lower in the two broadest classes, $0.5/m^2$ in 20.0-23.9°C and $2.2/m^2$ in 24.0°+C. Biomass of sipunculids was moderate to low with greatest weights, 1.8 and 1.1 g/m^2, respectively, occurring in the 0-3.9°C and 12.0-15.9°C classes. Lower values occurred in the other classes.

Echiura (fig. 118) were present in only two temperature classes, 0-3.9°C and 20.0-23.9°C, with densities fairly uniform at 0.4 and $0.3/m^2$ in each, and biomasses of 1 and 0.2 g/m^2, respectively.

Priapulida (fig. 118) were confined to the most stable temperature regions (0-3.9°C) and were present in small amounts, $0.07/m^2$ and 0.05 g/m^2 of density and biomass.

Mollusca were found in all temperature ranges in the Region and were major contributors to overall faunal abundance. In terms of ranking among the major taxonomic groups molluscan density was not as high as was their biomass. Molluscan density ranked first in only one temperature class, 20.0-23.9°C, and second in two others, 0-3.9°C and 4.0-7.9°C. The biomass of molluscs, however, ranked first in nearly all temperature classes, except the 4.0-7.9°C where it ranked third, and 0-3.9°C where it ranked seventh. Details of molluscan subcomponent relation with temperature follow.

Polyplacophora (fig. 119) were present in five of the seven temperature classes; they were absent in the 4-7.9°C and the 16.0-19.9°C classes. Densities were moderate to moderately low, varying from $0.04/m^2$ in 20.0-23.9°C to $1.3/m^2$ in the 24.0°+C class, whereas biomass was small, varying from 0.004 g/m^2 in both the 8.0-11.9°C and 20.0-23.9°C classes, to 1.2 g/m^2 in 24.0°+C.

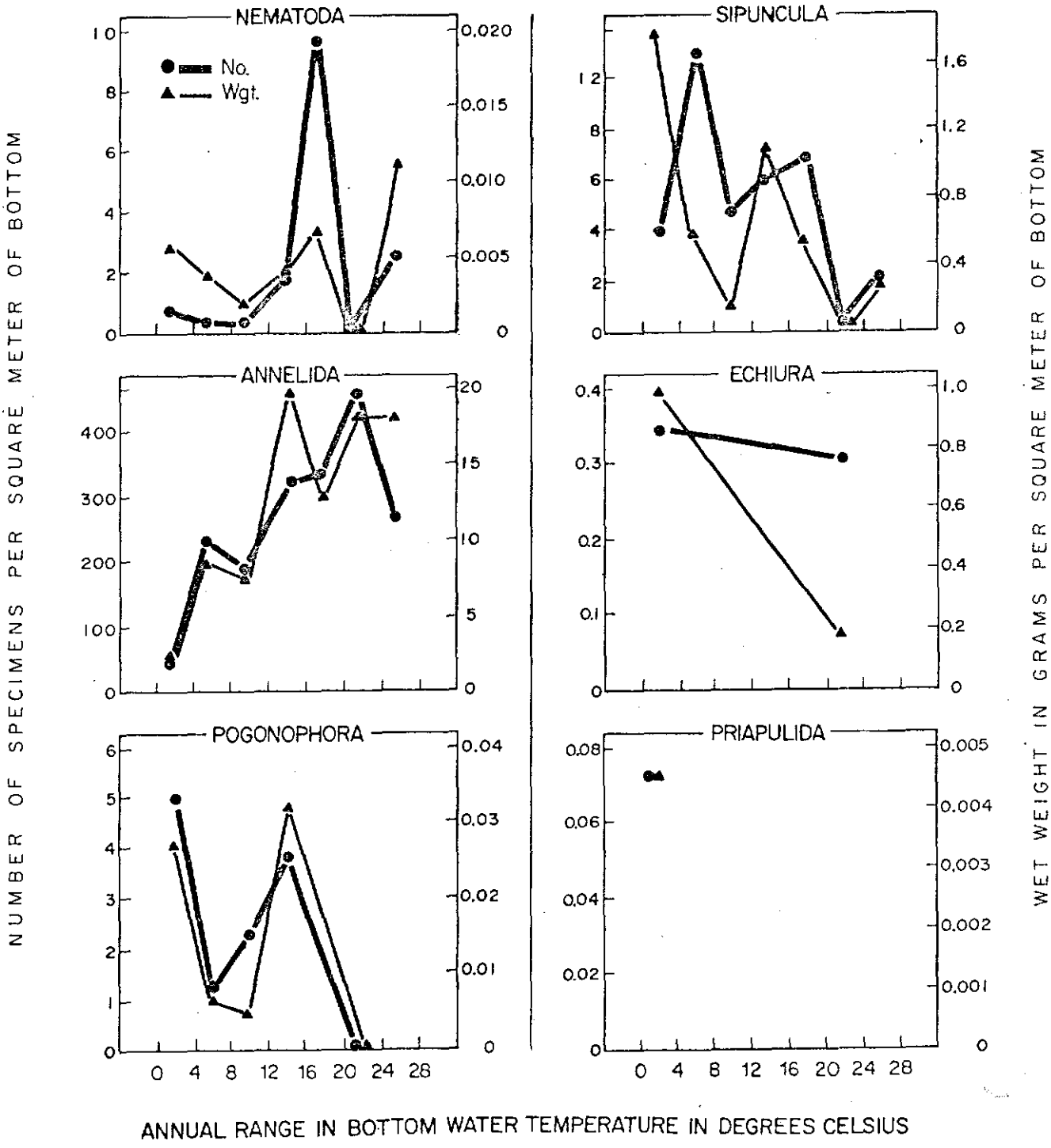

Figure 118.--Density and biomass in relation to range in bottom-water temperature in the entire Middle Atlantic Bight Region for: Nematoda, Annelida, Pogonophora, Sipuncula, Echiura, and Priapulida.

Gastropoda (fig. 119) were present in all temperature classes. Densities were generally high with a tendency for the highest values to occur in the broadest temperature ranges. The range of density was from 3/m^2 in 4.0-7.9°C to 93/m^2 in 20.0-23.9°C; next highest concentration (36/m^2) occurred in the 24.0°+C class. Densities were significantly lower in the other classes, not exceeding 14/m^2. Biomass of gastropods was comparatively small. Largest biomass (6 g/m^2) occurred in 20.0-23.9°C, dropping to 5 and 3 g/m^2 in the 12.0-15.9°C and 24.0°+C classes, respectively. All other temperature classes contained less than 1 g/m^2.

Bivalvia (fig. 119) were the leaders among the molluscs, in terms of both density and biomass. Density was very high to high with a fairly wide range (37 to 740/m^2) of values occurring in the different temperature classes. Greatest average numbers occurred in 20.0-23.9°C and fewest organisms were found in the narrowest range, 0-3.9°C. Densities between 100 and 385/m^2 occurred in the other temperature classes. Bivalve biomass ranged from small to very large and showed a definite tendency to increase with broadening temperature range. Smallest biomass (0.5 g/m^2) was encountered in the narrowest temperature class (0-3.9°C), and largest (236 and 235 g/m^2) in the two broadest (20.0-23.9°C and 24.0°+C, respectively). Biomasses between 2 and 149 g/m^2 occurred in the other temperature classes.

Scaphopoda (fig. 119) occurred in all temperature ranges except the broadest. The curves for both density and biomass were nearly identical (fig. 119), both showing, at first, an increase in the first two classes, then a general decline as temperature range broadened. Densities were low to moderate (0.3 to 4.1/m^2) and biomasses were small (less than 0.001 to 0.06 g/m^2).

Cephalopoda (fig. 119) eggs were found only in the 4.0-7.9°C and 8.0-11.9°C classes, in low density and small biomass.

Arthropoda, as a group, were found in all temperature ranges and were significant contributors, especially in terms of density, to the total macrofauna. Arthropod density ranked first, among all taxonomic groups, in four temperature classes, 8.0-11.9°C, 12.0-15.9°C, 16.0-19.9°C, and 24.0°+C; second in the 20.0-23.9°C class; and third in the two lowest classes. The contribution of arthropods in terms of biomass to the total fauna was substantially less than was that of density, being only moderate to moderately high. Detailed treatment of the arthropod subcomponents follows.

Pycnogonida (fig. 119) were found only in the middle to upper temperature ranges and both density and biomass were low, but showed a definite increase in values with broadening temperature range.

Arachnida were present in only one temperature class, 20.0-23.9°C; density was 0.17/m^2 with biomass only a trace amount.

The statements above for Arthropods apply equally to Crustacea and need not be repeated.

Ostracods (fig. 120) were present only in the narrowest (0-3.9°C), the middle (12.0-15.9°C), and two broadest (20.0-23.9°C and 24.0°+C) temperature ranges. Both density and biomass were low (0.05 to 0.47/m^2, and less than 0.001 to 0.004 g/m^2).

Cirripedia (fig. 120) were present in the moderate to broad temperature ranges, 12.0-24.0°+C. Both density and biomass were low (0.2 to 0.3/m^2 and 0.004 to 0.006 g/m^2) in the narrowest and broadest ranges in which they were found. Significantly higher values of density and biomass were found in the other two classes (16.0-19.9°C and 20.0-23.9°C) where 45/m^2 and 17 g/m^2, and 86/m^2 and 5 g/m^2 occurred.

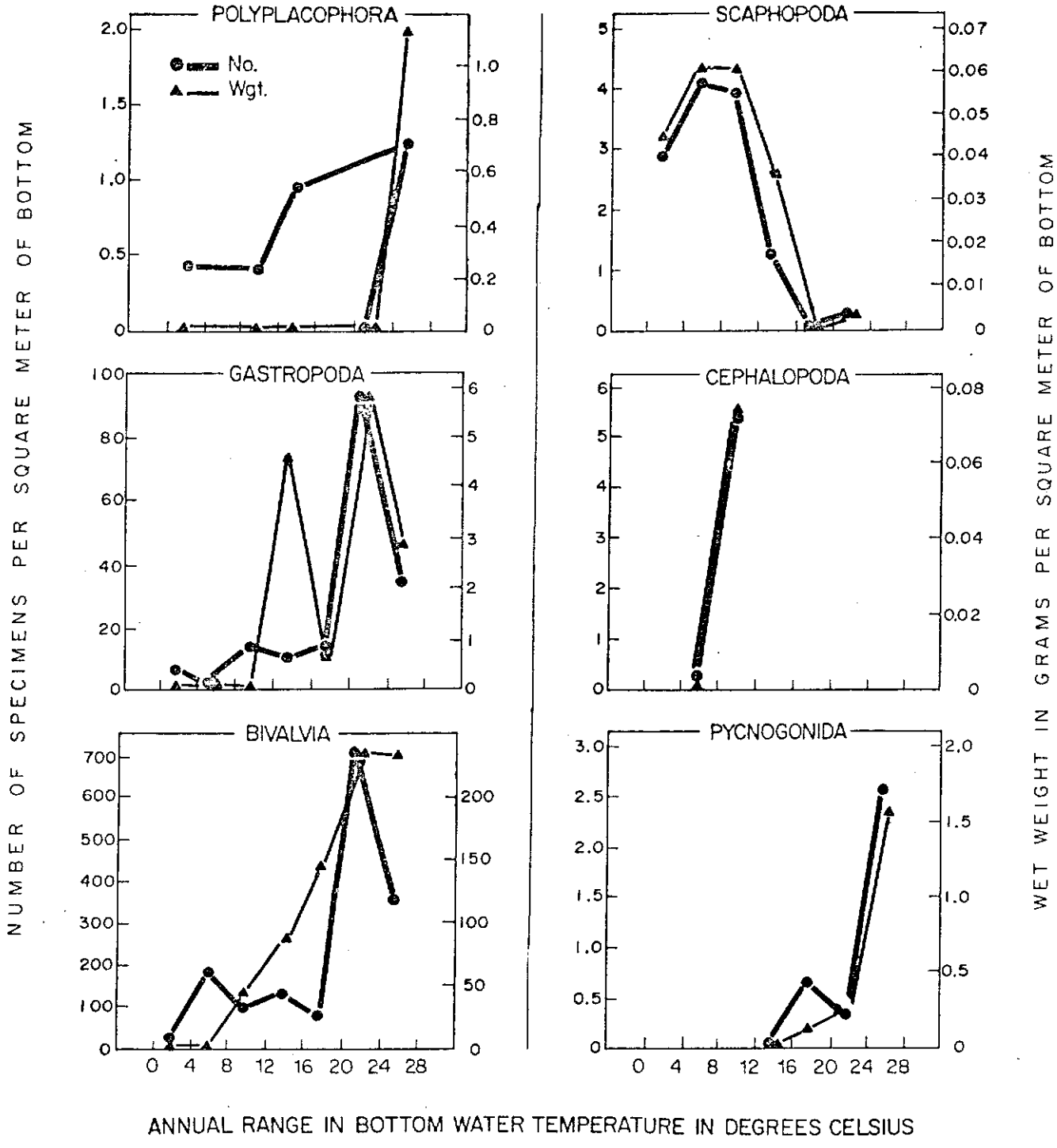

Figure 119.--Density and biomass in relation to range in bottom-water temperature in the entire Middle Atlantic Bight Region for: Polyplacophora, Gastropoda, Bivalvia, Scaphopoda, Cephalopoda, and Pycnogonida.

Copepoda (fig. 120) were found in only three temperature classes, 0-3.9°C, 8.0-11.9°C, and 12.0-15.9°C. Densities were low, ranging from 0.06 to 0.12/m^2, and biomass constituted only trace amounts.

Nebaliacea (fig. 120) also occurred in only three temperature classes, 0-3.9°C, 16.0-19.9°C, and 20.0-23.9°C, with low (0.01 to 0.05/m^2) density and only trace amounts of biomass.

Cumacea (fig. 120) were ubiquitous with regard to temperature but showed some preference for the mid-ranges (12.0-19.9°C) (fig. 120). Both density and biomass were highest in middle ranges and declined in both narrower and broader ranges. Density varied from 1 to 35/m^2 and biomass from 0.005 to 0.2 g/m^2.

Tanaidacea (fig. 120) were found only in the narrowest temperature range (0-3.9°C). Density was moderately low (0.30/m^2) and biomass was low (0.002 g/m^2).

Isopoda (fig. 121) occurred in all temperature classes but showed a preference for 16.0-19.9°C (fig. 121). Greatest density was 27/m^2, in the preferred class, and declined on either side of this; lowest density (0.5/m^2) was in the 0-3.9°C class. On the whole density was moderately high. Biomass was distributed similarly to density. Biomass in the preferred class was 0.8 g/m^2, with smallest biomass (0.02 g/m^2) occurring, as did density, in the 0-3.9°C class.

Amphipoda (fig. 121) which occurred in all temperature classes, was the single most important crustacean component in terms of both density and biomass. Although density was relatively high in all temperature classes, it was exceptionally high in two, 12.0-15.9°C and 16.0-19.9°C, where densities of 1,353 and 1,019/m^2 occurred. In the other classes density values were considerably lower but increased steadily with

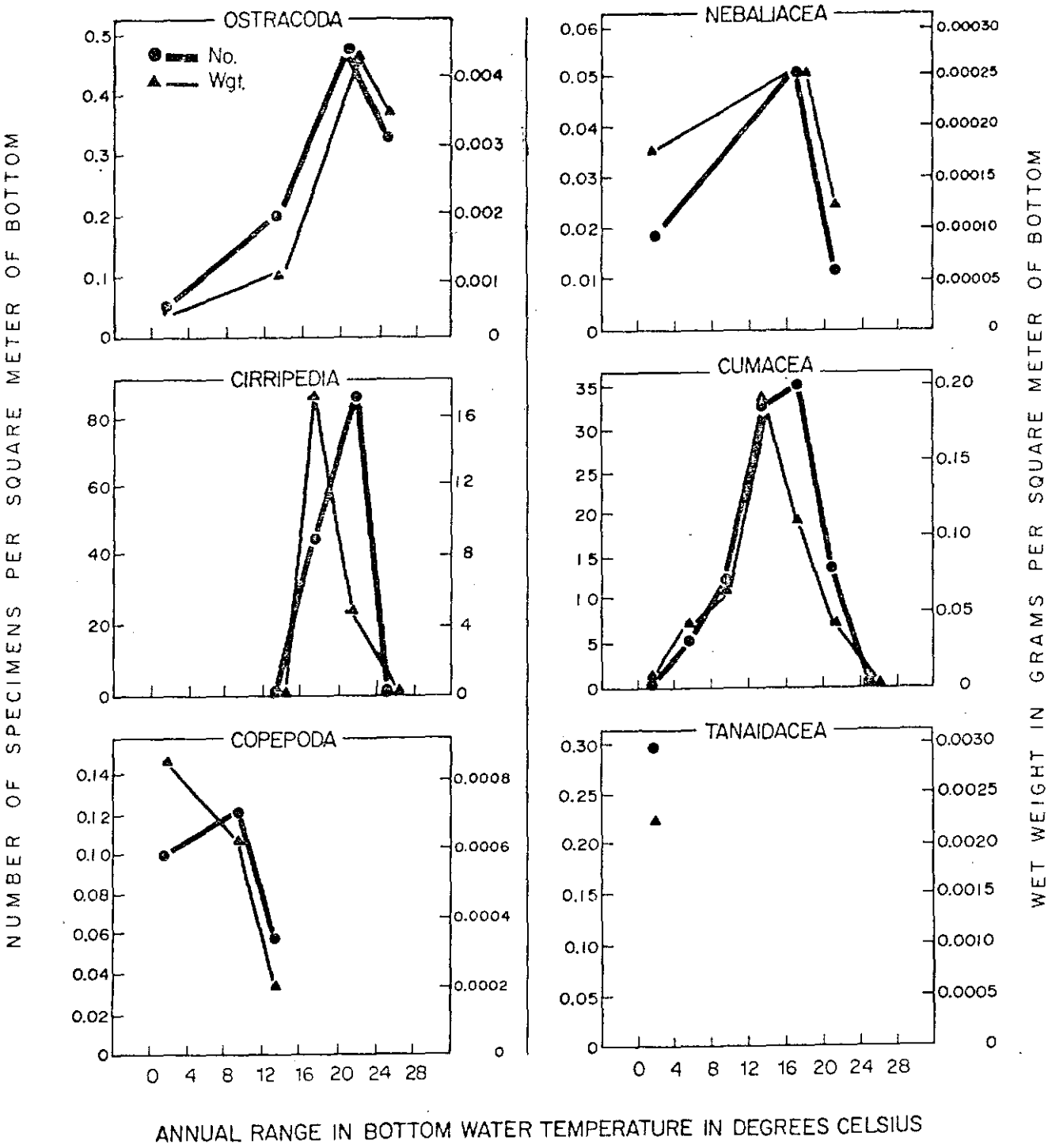

Figure 120.--Density and biomass in relation to range in bottom-water temperature in the entire Middle Atlantic Bight Region for: Ostracoda, Cirripedia, Copepoda, Nebaliacea, Cumacea, and Tanaidacea.

broadening temperature range, from 5 to 424/m^2. Amphipod biomass was the largest of any other group of crustaceans in four temperature classes, 0-3.9°C, 8.0-11.9°C, 12.0-15.9°C, and 24.0°+C. Also, as with density, significantly larger biomasses (6 and 9 g/m^2) occurred in the 12.0-15.9°C and 16.0-19.9°C classes, respectively. In the other classes the trend for biomass was similar to that for density, generally increasing with broadening temperature range, 0.03 to 3.2 g/m^2.

Mysidacea (fig. 121) were present in nearly all temperature ranges in the region, being absent only in the 4.0-7.9°C and 8.0-11.9°C classes. Density values were low (0.02 to 0.06/m^2) in the narrow to middle ranges (0-3.9°C to 16.0-19.9°C) but substantially higher (5 to 7/m^2) in the two broadest ranges. Biomass was small (0.002 g/m^2) in the 12.0-15.9°C class and in trace amounts in the 0-3.9°C and 16.0-19.9°C classes, but was moderately large (0.02 and 0.03 g/m^2) in the two broadest classes.

Decapoda (fig. 121) were ubiquitous with regard to temperature range in the Middle Atlantic Bight Region, contributing moderately to the overall density and biomass of the macrofauna. The general tendency within each parameter was to increase with broadening temperature range (fig. 121). Densities ranged from 0.1/m^2 in the 0-3.9°C class to 15/m^2 in the 20.0-23.9°C class. Biomass values paralleled those of density; smallest (0.01 g/m^2) in the 0-3.9°C class and largest (2.3 g/m^2) in the 20.0-23.9°C class.

Bryozoa (fig. 121) were present in the moderately narrow to broad temperature ranges but absent in the two narrowest (0-3.9°C and 4.0-7.9°C). Density of these organisms was highest (27/m^2) in the 16.0-19.9°C class and diminished in both narrower and broader ranges. Lowest density (2/m^2) occurred in the 12.0-15.9°C class. Biomass was moderate to small and trends with temperature range paralleled those of density. The largest biomass

(0.9 g/m^2) occurred in the 16.0-19.9°C class and smallest (0.03 g/m^2) in the 12.0-15.9°C class.

Brachiopoda (fig. 121) were present only in the 16.0-19.9°C temperature class; their density was low (0.02/m^2) and only a trace amount of biomass was obtained.

Echinodermata occurred in all temperature ranges and, as a group with several subcomponents, were major contributors to overall macrofaunal abundance. Densities, which were moderate to moderately high in the different temperature classes, did not have the same impact on total abundance as did their biomass. The highest ranking density in this group occurred in the 8.0-11.9°C class and was ranked third. Echinoderm biomass ranked first in two classes, 0-3.9°C and 4.0-7.9°C; second in three classes, 8.0-11.9°C, 16.0-19.9°C, and 20.0-23.9°C; and third in one class, 12.0-15.9°C.

Holothuroidea (fig. 122) were present in all temperature ranges in moderate amounts. Both density and biomass values were highest in the mid-range (12.0-15.9°C) class and tended to diminish in both narrowing and broadening temperature ranges. Highest density was 7/m^2 in the aforementioned class, and lowest (0.07/m^2) in the broadest class, 24.0°+C. Substantially higher values occurred in the narrower ranges than in the broader ones. Biomass values paralleled those of density in that the largest quantity (21 g/m^2) was in the mid-range class (12.0-15.9°C) and lowest quantities (0.4 and 0.05 g/m^2) in the two broadest classes (20.0-23.9°C and 24.0°+C, respectively). Biomasses between 1 and 6 g/m^2 occurred in the other classes.

Echinoidea (fig. 122) occurred in moderately high abundance in all temperature ranges of the region. Densities were highest (14, 27 and 58/m^2, respectively) in three of the broader classes, 12.0-15.9°C, 16.0-19.9°C,

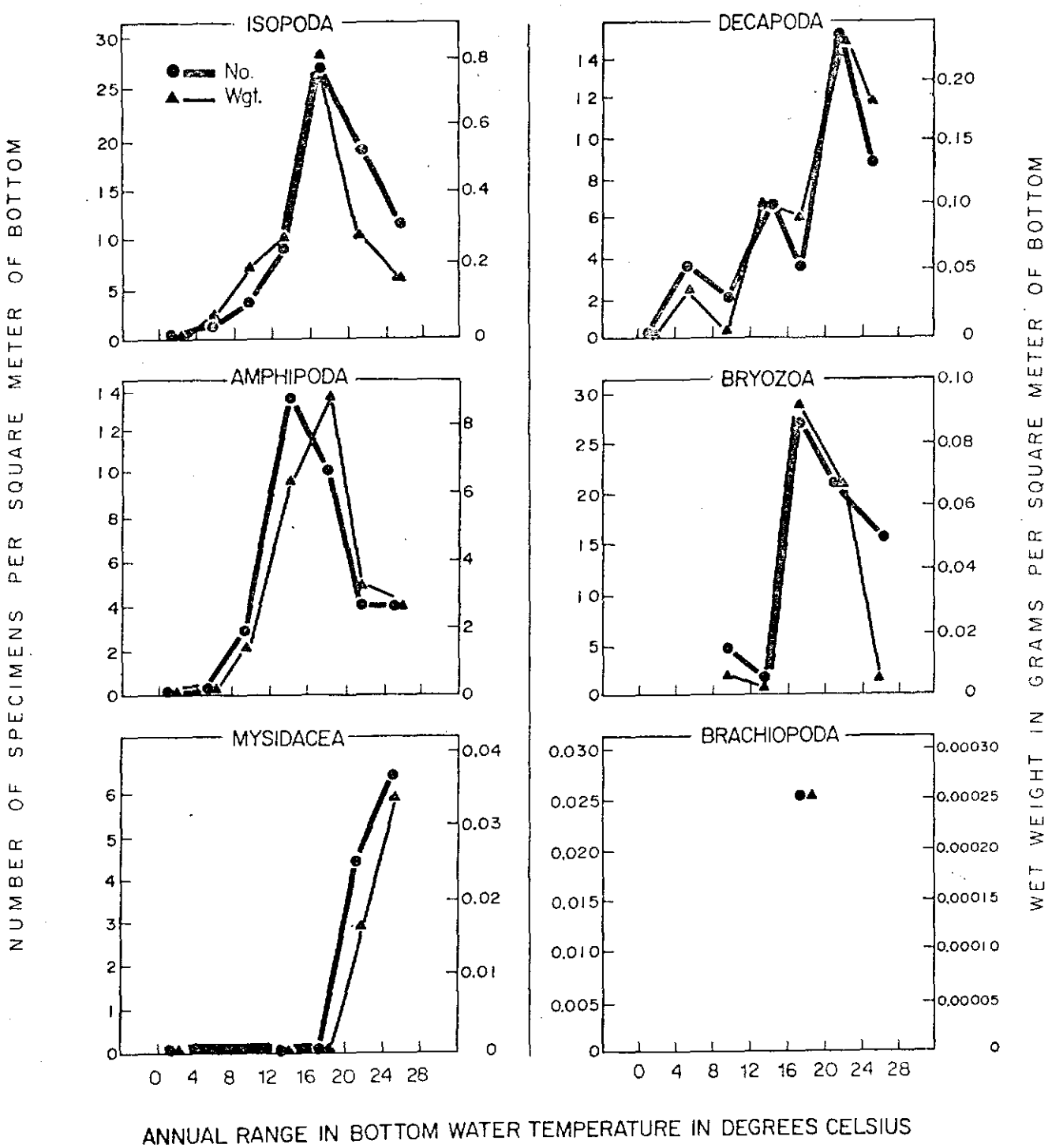

Figure 121.--Density and biomass in relation to range in bottom-water temperature in the entire Middle Atlantic Bight Region for: Isopoda, Amphipoda, Mysidacea, Decapoda, Bryozoa, and Brachiopoda.

and 20.0-23.9°C, but were substantially lower (between 0.1 and 5/m^2) in the other classes. The distribution of biomass among the various classes was somewhat different than that of density. Smallest biomasses (0.2 and 0.4 g/m^2) occurred in the extreme temperature classes, 0-3.9°C and 24.0°+C, respectively; next smallest (7 g/m^2) in the mid-range class, 12.0-15.9°C; and the largest biomass (39 g/m^2) occurred in the 16.0-19.9°C class. Intermediate biomasses, ranging from 12 to 20 g/m^2, were present in the other temperature classes.

Ophiuroidea (fig. 122) occurred in all temperature ranges in the region showing a decided preference for the middle to lower ranges. Density was highest (164/m^2) in the 8.0-11.9°C class by a substantial margin, and diminished in both narrower and broader classes (table 34) with lowest density (0.6/m^2) occurring in the 20.0-23.9°C class. Other classes with substantial amounts were the 12.0-15.9°C class with 91/m^2 and the 4.0-7.9°C class with 40/m^2. Biomass paralleled density in distribution among the various temperature range classes (table 35). Largest biomass was 10 g/m^2 in 8.0-11.9°C and smallest 0.02 g/m^2 in 16.0-19.9°C. Moderately small biomasses (0.7, 0.2, and 0.3 g/m^2) occurred in the 0-3.9°C, 20.0-23.9°C, and 24.0°+C classes, but were substantially higher (7.8 and 3.9 g/m^2) in the 4.0-7.9°C and 12.0-15.9°C classes, respectively.

Asteroidea (fig. 122) were found in all temperature ranges in the region. Density was, on the whole moderate, with greatest numbers occurring in the three classes between 8.0 and 19.9°C, where between 2 and 3/m^2 were found, but fewer than 1/m^2 occurred in the other classes. Biomass was also moderate, with the largest quantities (8 and 5 g/m^2) occurring in the two classes between 8.0 and 15.9°C. The 20.0-23.9°C class contained 2 g/m^2, but biomasses in all other classes were below 0.5 g/m^2.

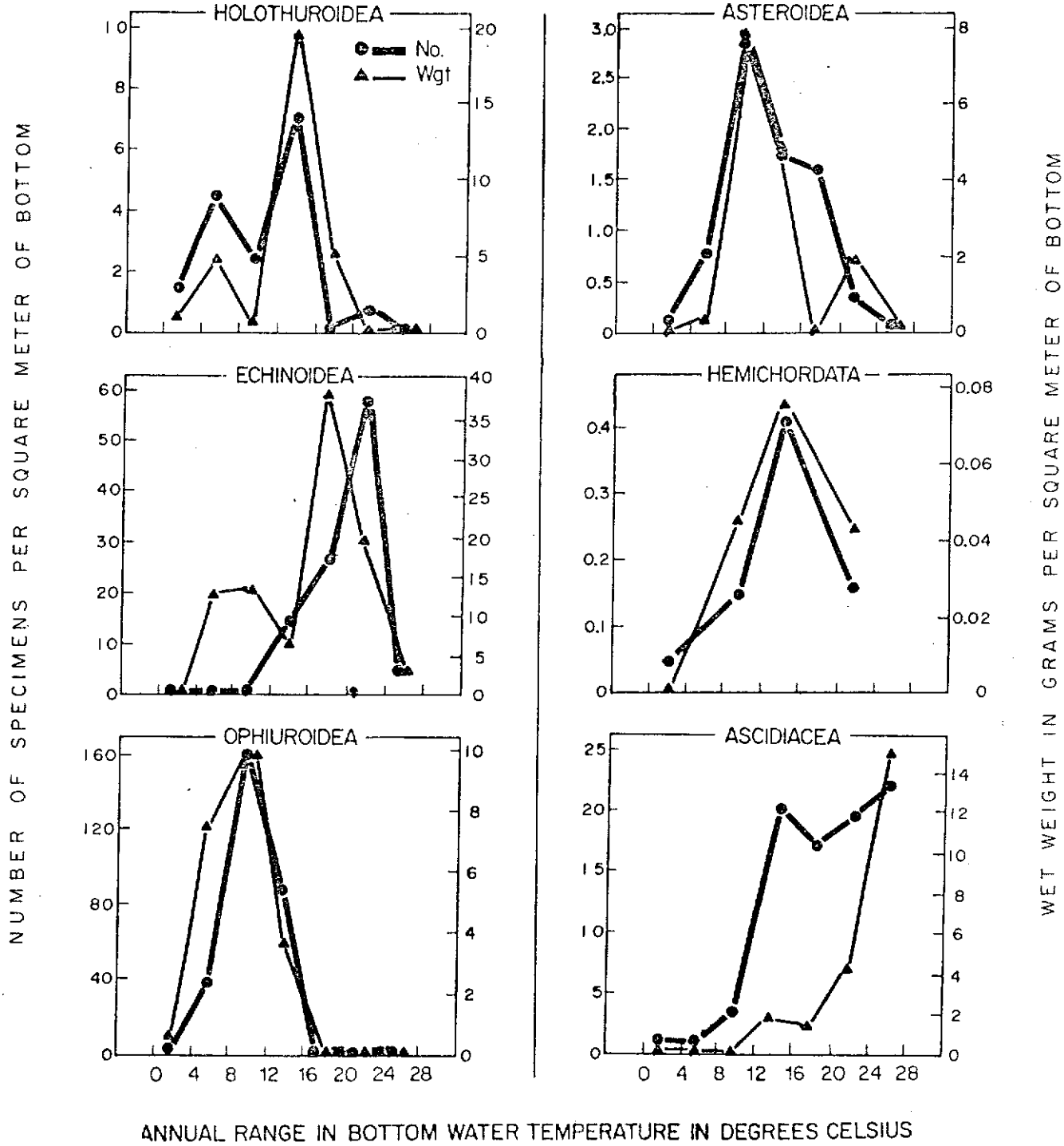

Figure 122.--Density and biomass in relation to range in bottom-water temperature in the entire Middle Atlantic Bight Region for: Holothuroidea, Echinoidea, Ophiuroidea, Asteroidea, Hemichordata, and Ascidiacea.

Hemichordata (fig. 122) were found in only four temperature ranges, 0-3.9°C, 8.0-11.9°C, 12.0-15.9°C, and 20.0-23.9°C. Density values ranged from 0.05 to 0.4/m^2 and biomass ranged from trace amounts to 0.08 g/m^2. In each case the lowest values were in the 0-3.9°C class and highest in the 12.0-15.9°C class.

Ascidiacea (fig. 122) were present in all temperature ranges. Their density was moderate to moderately high, varying from 1 to 22/m^2 in the 4.0-7.9°C and 24.0°+C classes, respectively. Substantially higher densities, 17/m^2 or greater, occurred in the broader ranges (greater than 12.0°C) than in the narrower ones (0-11.9°C) where densities did not exceed 4/m^2. Biomass was moderate ranging from 0.07 g/m^2 in the 4.0-7.9°C class to 4.4 g/m^2 in the 20.0-23.9°C class. Ascidians constituted a high biomass (16 g/m^2) in only one , the 24.0°+C, class.

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 in the Middle Atlantic Bight Region. Density data listed by temperature range class are presented separately for each subarea in tables 36, 37, and 38; corresponding biomass values are listed in tables 39, 40, and 41.

Porifera in the Southern New England subarea occurred in all temperature classes except 12.0°-15.9°C. They occurred in four classes in New York Bight being found only in 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 to 7.5/m^2 in Southern New

Table 36.--Mean number of individuals of each taxonomic group listed by temperature range class, representing the Southern New England subarea.

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	0.13	1.57	1.67	-	0.36	0.57	7.50
COELENTERATA	3.12	29.86	14.00	16.88	5.03	40.28	275.80
Hydrozoa	-	4.71	-	1.17	3.90	34.21	152.70
Anthozoa	3.12	25.14	14.00	15.71	1.13	6.07	123.10
Alcyonacea	0.66	1.57	2.17	1.52	-	-	-
Zoantharia	0.91	22.86	10.83	12.75	0.94	5.00	1.00
Unidentified	1.54	0.71	1.00	1.44	0.19	1.07	122.10
PLATYHELMINTHES	-	-	-	0.54	7.64	0.21	-
Turbellaria	-	-	-	0.54	7.64	0.21	-
NEMERTEA	1.06	3.00	5.00	9.00	14.00	2.04	2.60
ASCHELMINTHES	1.46	0.71	0.92	3.94	26.90	0.18	-
Nematoda	1.46	0.71	0.92	3.94	26.90	0.18	-
ANNELIDA	84.76	384.29	314.92	413.15	668.90	223.86	511.30
POGONOPHORA	5.15	-	-	-	-	-	-
SIPUNCULIDA	6.46	21.00	8.83	7.94	18.19	1.89	15.20
ECHIURA	0.35	-	-	-	-	-	-
PRIAPULIDA	0.13	-	-	-	-	-	-
MOLLUSCA	45.17	133.14	143.33	204.38	121.29	544.61	165.70
Polyplacophora	0.24	-	0.50	1.92	-	0.21	7.50
Gastropoda	5.70	1.43	2.17	15.50	30.94	174.36	44.80
Bivalvia	37.11	127.14	123.42	184.92	90.36	369.50	113.40
Scaphopoda	2.13	3.86	2.33	-	-	0.54	-
Cephalopoda	-	0.71	14.92	-	-	-	-
Unidentified	-	-	-	2.04	-	-	-
ARTHROPODA	11.20	95.28	93.50	1910.58	2226.74	1476.25	1221.90
Pycnogonida	-	-	-	0.23	1.19	-	4.30
Arachnida	-	-	-	-	-	-	-
Crustacea	11.20	95.28	93.50	1910.34	2225.55	1476.25	1217.60
Ostracoda	-	-	-	0.40	-	0.64	2.10
Cirripedia	-	-	-	0.38	115.74	7.04	2.10
Copepoda	0.24	-	-	0.12	-	-	-
Nebaliacea	-	-	-	-	-	-	-
Cumacea	1.50	1.71	3.08	42.86	83.71	15.79	1.00
Tanaidacea	0.46	-	-	-	-	-	-
Isopoda	0.74	1.57	1.50	7.36	34.90	9.07	3.30
Amphipoda	8.06	92.00	88.08	1855.94	1986.68	1405.75	1192.80
Mysidacea	-	-	-	-	-	4.96	1.10
Decapoda	0.20	-	0.83	3.27	4.52	33.00	15.20
BRYOZOA	-	-	0.42	0.21	65.03	68.32	97.90
BRACHIOPODA	-	-	-	-	-	-	-
ECHINODERMATA	7.59	92.28	358.58	195.56	31.22	9.78	3.30
Holothuroidea	2.43	5.29	4.25	12.12	0.16	2.21	0.20
Echinoidea	0.17	1.57	2.25	15.21	27.00	6.46	-
Ophiuroidea	4.85	84.57	349.00	165.15	0.16	1.00	2.70
Asteroidea	0.13	0.86	3.08	3.08	3.90	0.11	0.40
HEMICHORDATA	0.11	-	0.42	0.79	-	-	-
CHORDATA	1.52	2.29	10.75	26.23	35.64	104.89	35.50
Ascidiacea	1.52	2.29	10.75	26.23	35.64	104.89	35.50
UNIDENTIFIED	5.83	5.29	7.33	8.14	13.87	2.00	14.00

Table 37.--Mean number of individuals of each taxonomic group listed by temperature range class, representing the New York Bight subarea.

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	-	-	0.25	1.17	-	0.67	3.00
COELENTERATA	4.64	9.00	4.75	4.64	5.06	19.35	-
Hydrozoa	0.06	-	1.88	4.24	1.50	10.94	-
Anthozoa	4.58	9.00	2.88	0.40	3.56	8.40	-
Alcyonacea	1.83	7.00	0.94	-	-	-	-
Zoantharia	1.44	0.40	0.50	0.24	3.31	7.77	-
Unidentified	1.31	1.60	1.44	0.17	0.25	0.64	-
PLATYHELMINTHES	-	-	-	0.24	-	0.04	-
Turbellaria	-	-	-	0.24	-	0.04	-
NEMERTEA	0.17	2.00	1.25	3.52	3.78	3.43	3.25
ASCHELMINTHES	0.47	-	0.25	0.05	0.06	-	-
Nematoda	0.47	-	0.25	0.05	0.06	-	-
ANNELIDA	40.33	196.60	102.00	277.40	147.06	961.90	700.00
POGONOPHORA	4.39	-	-	-	-	-	-
SIPUNCULIDA	2.64	7.40	3.44	4.45	-	-	-
ECHIURA	0.28	-	-	-	-	0.46	-
PRIAPULIDA	-	-	-	-	-	-	-
MOLLUSCA	56.33	37.40	109.56	54.62	87.75	585.33	360.75
Polyplacophora	0.17	-	0.38	-	-	-	-
Gastropoda	10.58	1.20	25.56	5.86	3.38	56.55	6.25
Bivalvia	40.94	33.00	77.88	48.21	84.38	528.77	354.50
Scaphopoda	4.64	3.20	5.75	0.55	-	-	-
Cephalopoda	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	6.33	48.60	401.31	1023.31	582.97	439.71	347.25
Pycnogonida	-	-	-	-	-	0.21	-
Arachnida	-	-	-	-	-	0.50	-
Crustacea	6.33	48.60	401.31	1023.31	582.97	439.00	347.25
Ostracoda	-	-	-	-	-	1.02	-
Cirripedia	-	-	-	0.07	-	250.77	-
Copepoda	-	-	0.25	-	-	-	-
Nebaliacea	0.06	-	-	-	-	-	-
Cumacea	0.94	13.40	14.50	24.69	3.09	2.60	-
Tanaidacea	0.11	-	-	-	-	-	-
Isopoda	0.53	2.80	4.88	12.14	25.66	10.08	3.00
Amphipoda	4.58	20.20	379.62	974.29	550.00	153.50	329.50
Mysidacea	0.06	-	-	0.14	0.12	3.19	-
Decapoda	0.06	12.20	2.06	11.98	4.09	17.85	14.75
BRYOZOA	-	-	10.56	2.74	0.12	10.23	25.50
BRACHIOPODA	-	-	-	-	-	-	-
ECHINODERMATA	4.39	18.20	81.75	16.90	35.66	109.94	31.50
Holothuroidea	1.78	-	1.81	0.40	0.06	0.94	-
Echinoidea	-	1.20	0.25	15.74	35.59	107.46	31.50
Ophiuroidea	2.56	15.40	76.19	0.38	-	0.54	-
Asteroidea	0.06	1.60	3.50	0.38	-	1.00	-
HEMICHORDATA	-	-	-	-	-	0.25	-
CHORDATA	1.17	0.80	0.12	16.38	6.97	1.10	-
Ascidiacea	1.17	0.80	0.12	16.38	6.97	1.10	-
UNIDENTIFIED	3.17	1.20	5.44	2.67	0.78	10.67	-

Table 38.--Mean number of individuals of each taxonomic group listed by temperature range class, representing the Chesapeake Bight subarea.

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	-	-	-	-	0.61	0.59
COELENTERATA	3.36	3.80	18.00	124.50	20.69	6.99	15.78
Hydrozoa	-	-	14.80	122.50	18.62	4.66	3.00
Anthozoa	3.36	3.80	3.20	2.00	2.06	2.32	12.80
Alcyonacea	0.82	-	-	-	-	-	-
Zoantharia	-	-	-	-	0.38	1.28	5.32
Unidentified	2.54	3.80	3.20	2.00	1.69	1.04	7.48
PLATYHELMINTHES	-	-	3.00	-	0.25	0.34	0.57
Turbellaria	-	-	3.00	-	0.25	0.34	0.57
NEMERTEA	0.79	3.40	1.40	2.12	2.75	8.85	3.06
ASCHELMINTHES	1.29	0.80	-	0.25	0.94	0.77	3.65
Nematoda	1.29	0.80	-	0.25	0.94	0.77	3.65
ANNELIDA	15.71	73.60	162.60	69.38	97.69	216.55	197.52
POGONOPHORA	6.21	4.40	15.40	50.38	-	0.08	-
SIPUNCULIDA	2.18	1.20	-	2.88	0.25	0.24	-
ECHIURA	0.43	-	-	-	-	0.31	-
PRIAPULIDA	0.07	-	-	-	-	-	-
MOLLUSCA	36.63	502.00	168.80	395.50	148.88	1114.54	473.80
Polyplacophora	1.14	-	0.40	-	-	-	0.20
Gastropoda	3.61	8.20	4.00	8.50	1.06	86.78	36.46
Bivalvia	29.89	488.40	162.60	372.88	147.19	1027.32	437.13
Scaphopoda	1.98	5.40	1.80	14.12	0.62	0.43	-
Cephalopoda	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	2.04	13.62	631.40	85.09	101.88	279.11	319.37
Pycnogonida	-	-	-	-	1.00	0.70	2.46
Arachnida	-	-	-	-	-	-	-
Crustacea	2.04	13.62	631.40	85.09	100.88	278.40	316.91
Ostracoda	0.21	-	-	-	-	0.03	0.04
Cirripedia	-	-	-	-	-	0.47	-
Copepoda	-	-	-	-	-	-	-
Nebaliacea	-	-	-	-	0.25	0.03	-
Cumacea	0.14	4.40	29.40	8.84	4.44	21.55	1.13
Tanaidacea	0.29	-	-	-	-	-	-
Isopoda	0.21	0.40	6.40	3.88	12.88	23.70	13.68
Amphipoda	1.18	8.42	589.20	71.38	81.06	216.03	288.74
Mysidacea	-	-	-	-	-	5.40	6.11
Decapoda	-	0.40	6.40	1.00	2.25	6.19	7.20
BRYOZOA	-	-	-	7.88	8.00	11.40	-
BRACHIOPODA	-	-	-	-	0.12	-	-
ECHINODERMATA	3.32	9.20	4.60	103.12	14.12	44.14	5.30
Holothuroidea	0.36	7.60	-	10.00	0.38	0.20	0.06
Echinoidea	-	-	1.40	2.50	10.06	43.36	4.09
Ophiuroidea	2.61	1.60	2.80	90.12	3.19	0.50	1.07
Asteroidea	0.36	-	0.40	0.50	0.50	0.07	0.07
HEMICHORDATA	-	-	-	-	-	0.15	-
CHORDATA	0.96	-	-	2.75	1.88	0.65	21.35
Ascidiacea	0.96	-	-	2.75	1.88	0.65	21.35
UNIDENTIFIED	3.39	-	0.80	11.00	0.38	7.38	20.13

Table 39.--Mean biomass of each taxonomic group listed by temperature range class, representing the Southern New England subarea.

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	0.029	0.084	0.085	-	0.416	0.023	0.450
COELENTERATA	0.563	2.869	30.689	4.564	0.337	6.140	7.257
Hydrozoa	-	0.163	-	0.102	0.267	2.079	4.314
Anthozoa	0.663	2.706	30.689	3.544	0.070	4.061	2.943
Alcyonacea	0.042	0.039	0.442	0.446	-	-	-
Zoantharia	0.321	2.660	30.185	2.900	0.050	3.992	0.351
Unidentified	0.200	0.007	0.062	0.198	0.020	0.069	2.593
PLATYHELMINTHES	-	-	-	0.018	0.041	0.003	-
Turbellaria	-	-	-	0.018	0.041	0.003	-
NEMERTEA	0.046	0.219	0.961	0.965	1.423	1.134	0.406
ASCHELMINTHES	0.007	0.007	0.004	0.007	0.015	0.002	-
Nematoda	0.007	0.007	0.004	0.007	0.015	0.002	-
ANNELIDA	2.069	9.734	9.136	29.241	24.401	22.209	37.169
POGONOPHORA	0.038	-	-	-	-	-	-
SIPUNCULIDA	2.534	0.804	0.366	1.231	1.388	0.021	2.052
ECHIURA	0.206	-	-	-	-	-	-
PRIAPULIDA	0.086	-	-	-	-	-	-
MOLLUSCA	0.669	3.586	4.521	85.263	279.812	86.146	926.886
Polyplacophora	0.003	-	0.005	0.028	-	0.024	7.725
Gastropoda	0.042	0.014	0.018	8.496	1.791	4.407	2.593
Bivalvia	0.596	3.479	4.256	76.731	278.021	81.710	916.569
Scaphopoda	0.028	0.086	0.038	-	-	0.005	-
Cephalopoda	-	0.007	0.204	-	-	-	-
Unidentified	-	-	-	0.008	-	-	-
ARTHROPODA	0.082	0.465	0.342	9.312	64.580	11.604	10.664
Pycnogonida	-	-	-	0.002	0.002	-	0.021
Arachnida	-	-	-	-	-	-	-
Crustacea	0.082	0.465	0.342	9.310	64.578	11.604	10.639
Ostracoda	-	-	-	0.002	-	0.006	0.021
Cirripedia	-	-	-	0.008	43.464	0.603	0.043
Copepoda	0.002	-	-	<0.001	-	-	-
Nebaliacea	-	-	-	-	-	-	-
Cumacea	0.015	0.017	0.021	0.276	0.258	0.054	0.010
Tanaidacea	0.004	-	-	-	-	-	-
Isopoda	0.020	0.179	0.101	0.212	0.728	0.112	0.035
Amphipoda	0.037	0.269	0.212	8.574	18.260	6.933	9.417
Mysidacea	-	-	-	-	-	0.013	0.121
Decapoda	0.004	-	0.008	0.238	1.868	3.883	0.993
BRYOZOA	-	-	0.004	0.046	2.357	2.284	2.694
BRACHIOPODA	-	-	-	-	-	-	-
ECHINODERMATA	3.280	49.097	56.991	54.862	30.305	2.707	2.693
Holothuroidea	2.332	5.864	2.674	37.909	14.702	0.115	0.031
Echinoidea	0.262	25.983	27.111	2.378	15.497	2.374	-
Ophiuroidea	0.656	17.241	25.008	7.465	0.002	0.057	1.701
Asteroidea	0.030	0.009	2.198	7.110	0.104	0.161	0.930
HEMICHORDATA	0.001	-	0.126	0.150	-	-	-
CHORDATA	0.148	0.097	1.418	3.137	3.850	23.102	22.997
Ascidacea	0.148	0.097	1.418	3.137	3.850	23.102	22.997
UNIDENTIFIED	0.183	0.280	0.101	0.684	0.261	0.980	0.286

Table 40.--Mean biomass of each taxonomic group listed by temperature range class, representing the New York Bight subarea.

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	-	-	0.004	0.106	-	0.007	0.030
COELENTERATA	0.563	0.572	3.944	0.223	0.381	2.909	-
Hydrozoa	<0.001	-	0.016	0.030	0.029	0.184	-
Anthozoa	0.563	0.572	3.928	0.193	0.352	2.725	-
Alcyonacea	0.154	0.362	0.284	-	-	-	-
Zoantharia	0.243	0.004	3.429	0.180	0.318	2.628	-
Unidentified	0.166	0.206	0.215	0.013	0.034	0.097	-
PLATYHELMINTHES	-	-	-	0.009	-	0.002	-
Turbellaria	-	-	-	0.009	-	0.002	-
NEMERTEA	0.003	0.138	0.081	0.264	0.920	1.839	0.065
ASCHELMINTHES	0.003	-	0.002	<0.001	<0.001	-	-
Nematoda	0.003	-	0.002	<0.001	<0.001	-	-
ANNELIDA	3.277	5.290	5.452	11.390	6.523	29.611	11.482
POGONOPHORA	0.023	-	-	-	-	-	-
SIPUNCULIDA	0.279	0.714	0.081	1.089	-	-	-
ECHIURA	0.800	-	-	-	-	0.459	-
PRIAPULIDA	-	-	-	-	-	-	-
MOLLUSCA	0.886	1.032	65.235	104.818	77.520	604.364	373.000
Polyplacophora	0.004	-	0.004	-	-	-	-
Gastropoda	0.115	0.020	0.099	1.284	0.208	6.652	6.875
Bivalvia	0.679	0.974	65.049	103.522	77.312	597.712	366.125
Scephopoda	0.088	0.038	0.083	0.012	-	-	-
Cephalopoda	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	0.094	1.460	2.379	7.436	5.139	21.060	1.327
Pycnogonida	-	-	-	-	-	0.004	-
Arachnida	-	-	-	-	-	0.002	-
Crustacea	0.094	1.460	2.379	7.435	5.139	21.054	1.327
Ostracoda	-	-	-	-	-	0.009	-
Cirripedia	-	-	-	<0.001	-	14.308	-
Copepoda	-	-	0.001	-	-	-	-
Nebaliacea	<0.001	-	-	-	-	-	-
Cumacea	0.008	0.088	0.076	0.115	0.020	0.019	-
Tanaidacea	0.001	-	-	-	-	-	-
Isopoda	0.018	0.016	0.348	0.422	0.785	0.336	0.030
Amphipoda	0.038	0.060	1.872	4.565	3.843	2.445	0.715
Mysidacea	<0.001	-	-	0.004	0.001	0.015	-
Decapoda	0.028	1.296	0.082	2.329	0.490	3.922	0.582
BRYOZOA	-	-	0.146	0.012	0.001	0.305	0.128
BRACHIOPODA	-	-	-	-	-	-	-
ECHINODERMATA	2.227	9.336	24.745	16.669	70.033	42.436	5.582
Holothuroidea	1.456	-	0.599	0.496	0.218	0.116	-
Echinoidea	-	5.688	6.686	13.105	69.815	36.202	5.582
Ophiuroidea	0.702	2.238	2.879	0.006	-	0.385	-
Asteroidea	0.069	1.410	14.581	3.062	-	5.733	-
HEMICHORDATA	-	-	-	-	-	0.020	-
CHORDATA	0.182	0.104	0.024	1.061	0.226	0.083	-
Ascidiacea	0.182	0.104	0.024	1.061	0.226	0.083	-
UNIDENTIFIED	0.113	0.816	0.073	0.192	0.411	0.363	-

Table 41.--Mean biomass of each taxonomic group listed by temperature range class, representing the Chesapeake Bight subarea.

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	0.022	-	-	-	-	0.085	0.002
COELENTERATA	0.457	0.092	0.138	0.283	0.877	1.389	7.857
Hydrozoa	-	-	0.038	0.114	0.163	0.050	0.574
Anthozoa	0.457	0.092	0.100	0.169	0.714	1.339	7.283
Alcyonacea	0.304	-	-	-	-	-	-
Zoantharia	-	-	-	-	0.116	1.216	7.267
Unidentified	0.153	0.092	0.100	0.169	0.598	0.123	0.016
PLATYHELMINTHES	-	-	0.030	-	0.013	0.007	0.007
Turbellaria	-	-	0.030	-	0.013	0.007	0.007
NEMERTEA	0.198	0.134	0.442	0.606	0.072	0.398	0.389
ASCHELMINTHES	0.009	0.004	-	0.002	0.004	<0.001	0.014
Nematoda	0.009	0.004	-	0.002	0.004	<0.001	0.014
ANNELIDA	2.415	10.114	11.968	5.719	3.453	8.442	15.287
POGONOPHORA	0.016	0.026	0.034	0.416	-	<0.001	-
SIPUNCULIDA	2.460	0.164	-	0.075	0.009	0.031	-
ECHIURA	2.544	-	-	-	-	0.093	-
PRIAPULIDA	0.036	-	-	-	-	-	-
MOLLUSCA	0.386	2.448	74.814	102.282	40.568	47.532	101.399
Polyplacophora	0.010	-	0.004	-	-	-	0.016
Gastropoda	0.091	0.066	0.030	0.066	0.136	6.605	2.805
Bivalvia	0.268	2.334	74.740	101.804	40.428	40.921	98.578
Scaphopoda	0.017	0.048	0.040	0.412	0.004	0.006	-
Cephalopoda	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-
ARTHROPODA	0.011	0.162	3.354	0.744	1.501	3.374	4.029
Pycnogonida	-	-	-	-	0.004	0.003	0.016
Arachnida	-	-	-	-	-	-	-
Crustacea	0.011	0.162	3.354	0.744	1.497	3.371	4.013
Ostracoda	0.001	-	-	-	-	<0.001	<0.001
Cirripedia	-	-	-	-	-	0.007	-
Copepoda	-	-	-	-	-	-	-
Nebaliacea	-	-	-	-	0.001	<0.001	-
Cumacea	0.001	0.044	0.150	0.032	0.019	0.065	0.005
Tanaidacea	0.001	-	-	-	-	-	-
Isopoda	0.002	0.004	0.064	0.248	1.003	0.355	0.216
Amphipoda	0.006	0.030	3.014	0.454	0.412	2.329	1.642
Mysidacea	-	-	-	-	-	0.020	0.019
Decapoda	-	0.084	0.126	0.010	0.063	0.594	2.130
BRYZOA	-	-	-	0.034	0.022	0.286	-
BRACHIOPODA	-	-	-	-	0.001	-	-
ECHINODERMATA	1.951	10.514	0.178	26.493	21.229	15.801	4.193
Holothuroidea	1.015	10.356	-	23.266	0.094	0.743	0.054
Echinoidea	-	-	0.132	0.849	20.504	15.012	4.057
Ophiuroidea	0.930	0.158	0.038	1.966	0.082	0.040	0.082
Asteroidea	0.006	-	0.008	0.412	0.549	0.006	<0.001
HEMICHORDATA	-	-	-	-	-	0.078	-
CHORDATA	0.071	-	-	0.074	0.093	0.268	15.254
Ascidiacea	0.071	-	-	0.074	0.093	0.268	15.254
UNIDENTIFIED	0.058	-	0.004	0.274	0.008	0.058	0.322

England, from 0.25 to 3.0/m^2 in New York Bight, and from 0.07 to 0.6/m^2 in Chesapeake Bight. There did not appear to be any increase in density with broadening temperature range except perhaps that the highest densities in the two northern subareas occurred in the broadest temperature range class. Biomass of sponges was small in all three subareas.

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

Hydrozoa in Southern New England were present in nearly all classes; they were absent in the 0-3.9° and 8.0-11.9°C classes. In New York Bight their presence was detected in nearly all classes, but in this case was absent from the 4.0-7.9°C and the 24.0°+C classes. In Chesapeake Bight they were present in all the broader range classes but were absent in the two narrowest (0-3.9° and 4.0-7.9°C). Among the three subareas mean densities were highest in Southern New England and Chesapeake Bight and somewhat lower in New York Bight. In Southern New England the range of densities was from a low of 1.2/m^2 in the 12.0-15.9°C class to a high of 153/m^2 in the broadest class, 24.0°+C. In New York Bight the lowest density value (0.06/m^2) was in the 0-3.9° class and the highest (11/m^2) was in the 20.0-23.9°C class. Chesapeake Bight contained relatively high densities, ranging from a low of 3/m^2 in the broadest temperature range to a high of 123/m^2 at mid-range. In both Southern New England and New York Bight density values were highest in the broader ranges, whereas in Chesapeake Bight highest values occurred in the mid-range classes. Biomass values for

hydroids paralleled those of density in that they were higher in both Southern New England and Chesapeake Bight than in New York Bight. Mean biomass in Southern New England was smallest (0.1 g/m^2) in the 12.0-15.9^{o}C class and largest (4.3 g/m^2) in the broadest class. In New York Bight biomass ranged from trace amounts in the 0-3.9^{o} class to 0.2 g/m^2 in the 20.0-23.9^{o}C class. Chesapeake Bight biomass of hydroids had a general tendency of increasing as temperature range broadened, going from 0.04 g/m^2 in the 8.0-11.9^{o}C class to 0.57 g/m^2 in the 24.0^{o}+C class.

Anthozoa were present in all of the temperature range classes in both the Southern New England and Chesapeake Bight subareas and in all but the 24.0^{o}+C class in New York Bight. Densities were quite similar in both Chesapeake Bight and New York Bight but were considerably higher in Southern New England. Range of densities in Southern New England was from 1/m^2 in the 16.0-19.9^{o}C class to a high of 123/m^2 in the 24.0^{o}+C class. Densities in New York Bight ranged from a low of 0.4/m^2 in the 12.0-15.9^{o}C class to a high of 9/m^2 in 4.0-7.9^{o}C. In Chesapeake Bight the range of density was from 2/m^2 in the 12.0-15.9^{o}C class to 13/m^2 in the 24.0^{o}+C class. As with density, average biomass was larger in Southern New England than in the other two subareas, ranging from a low of 0.07/m^2 in the 16.0-19.9^{o}C class to a high of 31 g/m^2 in the 8.0-11.9^{o}C class; intermediate values occurred in the other classes. In New York Bight the smallest biomass (0.19 g/m^2) occurred in the 12.0-15.9^{o}C class and largest (4 g/m^2) was in the 8.0-11.9^{o}C class. In Chesapeake Bight the smallest biomass (0.9 g/m^2) occurred in the 4.0-7.9^{o}C class and the highest, 7.2 g/m^2, in the broadest temperature range.

Alcyonacea were most prevalent in Southern New England where they occurred in four of the seven temperature classes. They occurred in only three classes in New York Bight, and in only one class in Chesapeake Bight. Densities and biomasses of alcyonaceans were moderate to moderately low. Their density in Southern New England ranged from $0.7/m^2$ in the $0\text{-}3.9^oC$ class to a high of $2/m^2$ in the $8.0\text{-}11.9^oC$ class, whereas in New York Bight slightly higher densities occurred ranging from $0.9/m^2$ in the $8.0\text{-}11.9^oC$ class to a high of $7/m^2$ in the $4.0\text{-}7.9^oC$ class. In Chesapeake Bight alcyonaceans were found only in the $0\text{-}3.9^oC$ class, where their density was $0.8/m^2$. Biomass was moderately low, ranging between 0.04 to 0.4 g/m^2 in all three subareas.

Zoantharia were found in all temperature range classes in Southern New England, in all but the broadest class in the New York Bight, but were present in only three classes in the Chesapeake Bight ($16.9\text{-}19.9^o$, $20.0\text{-}23.9^o$, and 24.0^o+C). Highest densities occurred in Southern New England where the average density ranged from nearly 1 to $23/m^2$, whereas in New York Bight they ranged from 0.2 to $8/m^2$. Chesapeake Bight contained the fewest number of individuals; densities ranged from 0.4 to $5/m^2$. Biomass was parallel to density in that largest biomasses occurred in Southern New England, were intermediate in New York Bight, and moderately low in Chesapeake Bight. Biomass values in Southern New England ranged from 0.05 to 30 g/m^2, those in New York Bight from a low of 0.004 to a high of 3.4 g/m^2, and in Chesapeake Bight the range was from 0.1 to 7 g/m^2. In Southern New England and New York Bight the largest biomass occurred in the mid-range class, $8.0\text{-}11.9^oC$. However, in Chesapeake Bight the zoantharians were restricted to the broader range categories.

Platyhelminthes distribution with regard to temperature range in each of the three subareas was slightly different. In Southern New England they were found in three classes, from 12.0 to 23.9°C; in New York Bight they were found in only two classes, 12.0-15.9° and 20.0-23.9°C; and in Chesapeake Bight they occurred in four classes, 8.0-11.9°C and the three broader range classes from 16.0-24.0°+C. Densities were low to moderate (0.04 to 8/m^2) with higher densities occurring in both Southern New England and Chesapeake Bight than in New York Bight. Biomass in the three subareas was small (0.002 to 0.04 g/m^2) with both Southern New England and Chesapeake Bight containing larger biomasses, comparatively, than New York Bight.

Nemertea were ubiquitous with regard to temperature range in each of the subareas of the Middle Atlantic Bight Region. Densities of these organisms were generally higher in Southern New England than in the other two subareas, although, among the various temperature ranges in all areas, the distribution of density values was quite equitable. Biomass values were comparatively low in all three subareas. Biomass was largest in Southern New England, intermediate in New York Bight, and smallest in Chesapeake Bight. Biomass ranged from 0.05 g/m^2 to 1.4 g/m^2 in Southern New England, 0.003 g/m^2 to 1.8 g/m^2 in New York Bight, and from 0.07 g/m^2 to 0.6 g/m^2 in Chesapeake Bight. Generally biomass was slightly larger in the broader range classes than in the narrower ones in each of the subareas.

Nematoda were most widely distributed in Southern New England and Chesapeake Bight where they occurred in all temperature ranges except one; in Southern New England they were absent in the 20°+C class, while in

Chesapeake Bight they were absent in the 8.0-11.9°C class. In New York Bight they occurred in only four of the classes; 0-3.9°C, 8.0-11.9°C, 12.0-15.9°C, and 16.0-19.9°C. Southern New England contained the greatest density of nematodes, followed by Chesapeake Bight, and lowest densities occurred in New York Bight. Density values in Southern New England ranged from 0.2 to 27/m^2. New York Bight contained the lowest overall density, range was from 0.05 to 0.5/m^2. Chesapeake Bight density values for nematodes ranged from 0.3 to 3.7/m^2. The contribution of nematodes in terms of biomass is quite small. Biomass in Southern New England ranged from 0.002 to 0.02 g/m^2. In New York Bight biomass ranged from trace amounts to only 0.003 g/m^2, while in Chesapeake Bight the range of values was from trace amounts to 0.01 g/m^2.

Annelida were ubiquitous with regard to temperature range in each of the subareas of the Middle Atlantic Bight Region and were major contributors in terms of both density and biomass to the overall macrobenthic fauna. Overall densities tended to diminish, although not substantially, in a southerly direction through the subareas. Also, in the three subareas, there was a slight tendency for greater densities to occur in the broader temperature range groupings than in the narrower ones. Density values in Southern New England ranged from 85/m^2 in the narrowest class to 669/m^2 in the 16.0-19.9°C class. In the other classes the average density ranged from greater than 200 to slightly over 500/m^2. In the New York Bight lowest density was in the 0-3.9°C class where 40/m^2 were found, with a high of 962/m^2 in the 20.0-23.9°C class. Another significantly high density occurred in the broadest range class in this region, 700/m^2 occurring in the 24.0°+C class. Considerably lower values occurred in the other classes

in this subarea, ranging from 102 to nearly 200/m^2. Density values in Chesapeake Bight were lowest in the narrowest temperature range (15.7/m^2) and were highest, at 217/m^2, in the 20.0-23.9°C range. Two other classes contained densities in excess of 100/m^2, the 8.0-11.9°C and the 24.0°+C, while under 100/m^2 occurred in the 4.0-7.9°C, 12.0-15.9°C, and 16.0-19.9°C classes. Biomass of annelids also tended to diminish as one proceeded southerly across the shelf and slope with greatest overall values occurring in Southern New England where the range of biomass was from 2.1 to 37 g/m^2, occurring in the extremes of the temperature ranges. In this subarea biomass tended to increase with broadening temperature range. In New York Bight biomass of annelids behaved somewhat similarly to that in Southern New England in that the smallest biomasses occurred in the narrowest class and largest ones in the broadest (3 to 30 g/m^2). Annelid biomass in Chesapeake Bight ranged from 2 g/m^2 in the narrowest class to 15 g/m^2 in the broadest. Biomasses between 3 and 11 g/m^2 occurred in the other classes.

Pogonophora definitely preferred the southernmost reaches of the Middle Atlantic Bight Region, being most abundant in Chesapeake Bight, in terms of both density and biomass. In each of the other two subareas, they only occurred in the narrowest temperature range class. Density of pogonophorans in Southern New England was 5/m^2, and was 4/m^2 in the New York Bight. Highest densities occurred in Chesapeake Bight with average densities ranging from 4/m^2 in the 4.0-7.9°C class to 50/m^2 in the midpoint class of 12.0-15.9°C. In the 0-3.9°C and the 8.0-11.9°C classes, density values were 6 and 15/m^2, respectively. The biomass of pogonophorans in Southern New England was 0.04 g/m^2 and in New York Bight 0.02 g/m^2. In Chesapeake Bight biomass ranged from trace amounts in the 20.0-23.9°C

class to 0.4 g/m^2 in the 12.0-15.9^{o}C class. In the narrower classes biomass ranged from 0.02 to 0.03 g/m^2.

Sipunculida were ubiquitous in Southern New England but not in the other two subareas. In New York Bight they were only present in the first four classes, while in Chesapeake Bight they were present in all but two of the classes, absent in 8.0-11.9^{o}C and 24.0^{o}+C. Overall, in each of the three subareas, sipunculid density was moderate. In Southern New England density values ranged from 2 to 21/m^2, while in New York Bight substantially lower quantities occurred, ranging from 3 to 7/m^2; in Chesapeake Bight even lower values occurred, from 0.24 to 3/m^2. Biomass was essentially similar to density in its distribution among the subareas, largest in Southern New England, intermediate in Chesapeake Bight, and smallest in New York Bight. Biomass ranged from 0.02 to 3 g/m^2 in Southern New England, was 0.08 to 1 g/m^2 in New York Bight, and 0.009 to 3 g/m^2 in Chesapeake Bight. No definite trend was discernible with narrowing or broadening temperature range.

Echiura were not common in any of the subareas of the Middle Atlantic Bight Region occurring in only one temperature class in Southern New England, the narrowest, where 0.3/m^2 weighing 0.2 g/m^2 occurred. In New York Bight they were found in only two classes, the narrowest where density was 0.3/m^2 and biomass 0.8 g/m^2, and in the 20.0-23.9^{o} class where density was 0.5/m^2 and biomass 0.5 g/m^2. In Chesapeake Bight they were present in the same classes as they were in New York Bight and in roughly the same magnitudes; 0.4/m^2 weighing 2.5 g/m^2 occurred in the narrowest class and 0.3/m^2 weighing 0.09 g/m^2 occurred in the broader class.

Priapulida were neither broadly distributed nor plentiful in any of the subareas in the Middle Atlantic Bight Region. They occurred only in the narrowest temperature range in Southern New England, were absent entirely in the New York Bight, and occurred only in the narrowest temperature range in Chesapeake Bight.

Mollusca occurred in all temperature classes in each of the subareas of the Middle Atlantic Bight Region. As a group, molluscs were most abundant in Chesapeake Bight; Southern New England was second, followed by New York Bight. Since molluscs are made up of several subcomponents, detailed analysis will be found among the several contributors to the total molluscan fauna.

Polyplacophora were found more plentifully and regularly in Southern New England than in the other two subareas in the Middle Atlantic Bight Region. In Southern New England they occurred in five temperature classes, in two classes in New York Bight, and in three classes in Chesapeake Bight. In Southern New England the trend of increasing density with broadening temperature range was discernible. The highest density ($8/m^2$) occurred in the broadest class and the lowest ($0.2/m^2$) occurred in the narrowest, 0-3.9°C, as well as in the 20.0-23.9°C class. In New York Bight in the 0-3.9°C and 8.0-11.9°C classes, polyplacophoran densities were 0.2 and $0.4/m^2$, respectively, while in Chesapeake Bight their density ranged from 0.2 to $1/m^2$, with a tendency of increasing with narrowing temperature range. In this case, the lowest density occurred in 20.0-23.9°C and the highest occurred in the narrowest temperature range. Chiton biomass in the Southern New England subarea tended to follow the pattern established for density in that the smallest biomass ($0.003\ g/m^2$) occurred in the narrowest range,

and the largest biomass (8 g/m^2) occurred in the broadest range. In New York Bight, in both classes in which chitons occurred, the biomass was similar at 0.004 g/m^2. Chiton biomass in Chesapeake Bight did not establish any trends with broadening or narrowing temperature range in that both the broadest and narrowest ranges had nearly identical biomasses; 0.01 g/m^2 in the narrowest, and 0.02 g/m^2 in the broadest. In mid-range the biomass was 0.004 g/m^2.

Gastropoda were found in all temperature range classes in each of the subareas of the Middle Atlantic Bight Region. Both density and biomass tended to decrease with decreasing latitude, with greatest values of both occurring in Southern New England, intermediate values in New York Bight, and lowest in Chesapeake Bight. No definite trend or pattern was discernible with regard to broadening or narrowing temperature range in any of the subareas. Gastropod density in Southern New England ranged from 1/m^2 in the 4.0-7.9^{o}C class to 174/m^2 in 20.0-23.9^{o}C. In this instance generally lower densities occurred in the narrower ranges and higher densities in the broader ranges (see table 36). In New York Bight gastropod density ranged from 1/m^2 in the 4.0-7.9^{o}C class to 57/m^2 in 20.0-23.9^{o}C. Here moderately high density values occurred at both ends of the temperature range spectrum. Density values in Chesapeake Bight ranged from 1/m^2 in the 16.0-19.9^{o}C class to 87/m^2 in the adjacent class, 20.0-23.9^{o}C. Intermediate values, tending on the lower side, were present in the other classes. Overall gastropod biomass values were comparatively low and in Southern New England ranged from 0.01 g/m^2 in the 4.0-7.9^{o}C and 8.0-11.9^{o}C classes, to 9 g/m^2 in 12.0-15.9^{o}C. In New York Bight gastropod biomass ranged from 0.02 g/m^2 in the 4.0-7.9^{o}C class to 7 g/m^2 in the two broadest classes. Biomasses of 1 g/m^2 or less occurred in the other classes. In Chesapeake Bight, which contained on the whole the smallest biomass of gastropods, values ranged from 0.03 g/m^2 in the 8.0-11.9^{o}C class, to 7 g/m^2 in 20.0-23.9^{o}C.

Only one other class, 24.0°+C, contained biomasses in excess of 2 g/m^2. Values in all other classes were below 1 g/m^2.

Bivalvia were the largest contributors of molluscan abundance and occurred in all temperature range classes in each of the subareas of the Middle Atlantic Bight Region. Greatest overall densities of bivalves were found in Chesapeake Bight and Southern New England. The single largest average density occurred in the 20.0-23.9°C class in Chesapeake Bight, where 1,027/m^2 were found. The next highest density occurred in the same class in the New York Bight. However, in this subarea, other density values were below those of similar classes in either of the two other subareas. In Southern New England bivalve density ranged from 37/m^2 in the 0-3.9°C class to 370/m^2 in 20.0-23.9°C. Values below 100/m^2 occurred in the 16.0-19.9°C class but in all other classes density values were between 100 and 200/m^2. In New York Bight, which contained the lowest overall values, density exceeded 100/m^2 in only the two broadest classes, the previously mentioned high of 528/m^2 in the 20.0-23.9°C class and 354/m^2 in 24.0°+C. Density values ranging from 33 to 84/m^2 occurred in the other classes in this subarea. The density of bivalves in Chesapeake Bight was 30/m^2 in 0-3.9°C and, in all other classes, was in excess of 100/m^2; 147 and 163/m^2 occurred in the 16.0-19.9°C, and 8.0-11.9°C classes, respectively, and was in excess of 370/m^2 in the remaining three classes. A considerably different picture unfolds when considering biomass among the three subareas in the Middle Atlantic Bight Region. New York Bight, on the whole, had a higher biomass than any of the other two subareas, with Southern New England second. The biomass in Chesapeake Bight, notwithstanding its leadership in terms of density, was lowest among the three subareas. Average biomass

in Southern New England ranged from 0.6 g/m^2 in the 0-3.9^{o}C class to 917 g/m^2 in the broadest, the 24.0^o+C, class. In this subarea the tendency was for increasing biomass with broadening temperature range but the actual values were widely divergent. In New York Bight average bivalve biomass ranged from 0.7 g/m^2 to 597 g/m^2 occurring in the 0-3.9^{o}C class and the 20.0-23.9^{o}C class, respectively. However, a greater portion of the remaining classes contained values that approximated or exceeded 100 g/m^2, whereas, in Southern New England the tendency was for considerably smaller biomasses to occur. The biomass of bivalves in Chesapeake Bight ranged from 0.3 g/m^2 in the 0-3.9^{o}C class to 102 g/m^2 in the 12.0-15.9^{o}C class. The remaining classes contained less than 100 g/m^2.

Scaphopoda were most prevalent in Chesapeake Bight occupying six of the seven temperature classes, being absent only in the broadest class. In New York Bight they occupied the narrower to mid-range classes and were absent from the broader range classes (16.0-24.0^o+C), and in Southern New England occupied the three narrower range classes (0-11.9^{o}C), were absent in the next two between 12.0 and 19.9^{o}C, were present in the 20.0-23.9^{o}C range, and absent in the broadest range, 24.0^o+C. Density values were highest in Chesapeake Bight, where mean densities ranged from 0.4/m^2 to 14/m^2. In New York Bight where densities were intermediate between the other two subareas, the range of density was from 0.6/m^2 to 6/m^2. Scaphopod densities in Southern New England ranged from 0.5/m^2 to 4/m^2. On the whole, scaphopod biomass values were largest in the Chesapeake Bight subarea. Biomass ranged from 0.004 g/m^2 to 0.4 g/m^2. In New York Bight biomass values ranged from 0.01 g/m^2 to 0.08 g/m^2. Biomass of tusk shells

in Southern New England was somewhat comparable to that in the New York Bight. Smallest biomass was 0.005 g/m^2 in the 20.0-23.9^{o}C class; in the other three classes in which tusk shells were present in Southern New England values ranged between 0.03 and 0.09 g/m^2.

Cephalopoda were found only in Southern New England and only in two of the classes in this region, the 4.0-7.9^{o}C, and the 8.0-11.9^{o}C classes. Density values were high, 0.7 and 15/m^2 in the two classes, respectively, whereas biomass values were comparatively lower, 0.007 and 0.2 g/m^2, respectively.

Arthropoda density and biomass values are summations of the subcomponents of this phylum so a detailed analysis will not be considered here since the overall density and biomass of the arthropods is reflected in the crustacean abundances which will be given below.

Pycnogonida occurred in each of the subareas of the Middle Atlantic Bight Region but were restricted in each of them to only a relatively few temperature classes. In Southern New England pycnogonids occurred in three classes, the 12.0-15.9^o, the 16.0-19.9^o, and the 24.0^o+C, whereas in New York Bight they were found only in the 20.0-23.9^{o}C class, and in Chesapeake Bight were found in the three broad-range categories between 16.0+, and 24.0^o+C. Overall density was highest in Southern New England ranging from 0.2 to 4/m^2, lowest in New York Bight where only 0.2/m^2 was found and intermediate in Chesapeake Bight with a range of densities from 0.7 to 3/m^2. Pycnogonid biomass was on the whole quite low, in Southern New England the range of biomass was from 0.002 to 0.02 g/m^2. In New York Bight 0.004 g/m^2 occurred and in Chesapeake Bight the range was from 0.003 to 0.02 g/m^2.

Arachnida were very sparsely distributed, occurring only in the New York Bight subarea and in only one temperature class, 20.0-23.9°C. Density was 0.5/m^2 and biomass 0.002 g/m^2.

Crustacea were major contributors to the macrofauna in the Middle Atlantic Bight Region, occurring in all temperature range classes in each of the subareas and, generally, both density and biomass diminished with southerly latitudes so that greatest abundances occurred in Southern New England, intermediate ones in New York Bight and lower abundances in Chesapeake Bight. In Southern New England crustacean densities were highest in the mid-range classes and fell off both with narrowing and broadening temperature range. The fall-off was more pronounced in the narrower classes than the broader ones where substantial densities occurred. Range of density in Southern New England was from 11/m^2 to 2,226/m^2. In the three broadest classes (from 12°C to 24°+C), density values in Southern New England were in excess of 1,000/m^2, whereas in the narrower classes they were below 100/m^2. In the New York Bight essentially the same conditions prevailed with lowest density (6/m^2) occurring in the narrowest class, to 1,023/m^2 in the 12.0-15.9°C class. In the classes between 8°C and 24°+C, excluding 12.0-15.9°C, density values were between 300 and 600/m^2. Crustacean density in Chesapeake Bight ranged from 2/m^2 in the narrowest class to 631/m^2 in the 8.0-11.9°C class. Crustacean biomass behaved similarly to density in that largest amounts occurred in Southern New England, intermediate in New York Bight, and lowest in Chesapeake Bight. Biomass ranged from 0.08 g/m^2 in 0-3.9°C to 65 g/m^2 in 16.0-19.9°C in Southern New England, with somewhat smaller biomasses (10-11/m^2) occurring in the two broadest classes diminishing sharply as temperature range narrowed. In New

York Bight essentially the same conditions prevailed with a general tendency of increasing biomass with broadening temperature range. Smallest biomass occurred in the 0-3.9°C class with 0.09 g/m^2, and largest, 21 g/m^2, in the 20.0-23.9°C class. The 24.0°+C class biomass dropped, significantly, to 1 g/m^2. In the remaining classes biomass varied from 1 to 7 g/m^2. Crustacean biomass in Chesapeake Bight was moderately small ranging from 0.01 g/m^2 in the narrowest class to 4 g/m^2 in 24.0°+C. Values of less than 1 g/m^2 occurred in the 4.0-7.9° and the 12.0-15.9°C classes and ranged from 2 to 3 g/m^2 in the other three classes.

Ostracoda occurred in each of the subareas with their distribution within each rather limited. They occurred in only three temperature classes in Southern New England, primarily the two broadest categories and the mid-point; in New York Bight they were relegated to one temperature class, 20.0-23.9°C; and the two broadest classes of Chesapeake Bight contained ostracods. As with other groups greatest densities and biomass occurred in Southern New England and tapered off in each of the succeeding subareas. In all cases the values of biomass and density were relatively low, especially in Chesapeake Bight where only traces were found in terms of biomass and very low values in terms of density.

Cirripedia although not widely distributed in terms of temperature range, contained significant amounts, especially in Southern New England and New York Bight, in terms of both density and biomass but were relatively unimportant in the Chesapeake Bight. In Southern New England barnacles were found in temperature ranges from 12.0-24.0°+C but were relegated to two classes in New York Bight, 12.0-15.9°C and the 20.0-23.9°C; in Chesapeake Bight they only occurred in the 20.0-23.9°C class where both density and

biomass were low. Highest individual density of barnacles (251/m^2) occurred in New York Bight in the 20.0-23.9^0 class. In the 12.0-15.9^{0}C class, however, the density values were quite low 0.07/m^2. In Southern New England densities ranged from 0.4 to 116/m^2 in the 12.0-15.9^{0}C and the 16.0-19.9^{0}C classes, respectively. Lower values occurred in the two broadest classes where the density ranged between 2 and 7/m^2. Southern New England contained the single largest biomass of barnacles, 43 g/m^2 in the 16.0-19.9^{0}C class. In the remaining three classes less than 1 g/m^2 occurred. In New York Bight 14 g/m^2 of barnacles occurred in 20.0-23.9^{0}C and only trace amounts were found in 12.0-15.9^{0}C.

Copepoda did not contribute greatly to the total macrofauna of the Middle Atlantic Bight Region and were sparsely distributed in two of the subareas, occurring only in Southern New England and New York Bight. In Southern New England they occurred in the narrowest temperature range class, and in the 12.0-15.9^{0}C class in low densities and small biomasses. In New York Bight they were relegated to one class, 8.0-11.9^{0}C, and occurred in low abundance.

Nebaliacea were present only in New York Bight and Chesapeake Bight in low abundances. In New York Bight they occurred only in the 0-3.9^{0}C class with density of 0.06/m^2 and trace amounts of biomass. In Chesapeake Bight they occurred in two classes, 16.0-19.9^{0}C and 20.0-23.9^{0}C, where densities of 0.25 and 0.03/m^2 and biomasses of 0.001 and <0.001 g/m^2 were found.

Cumacea occurred in all temperature classes in both Southern New England and Chesapeake Bight subareas but were absent from the 24.0^0+C class in New York Bight. Density values in each of the three subareas were moderate to moderately high, whereas biomass values were moderate to

moderately low. On the whole, cumaceans tended to favor the middle ranges over the narrower and broader ranges and in Southern New England the average density ranged from $1/m^2$ to $84/m^2$. Densities in New York Bight were lower than they were in Southern New England ranging from 0.9 to $25/m^2$. In Cheaspeake Bight density ranged from $0.1/m^2$ to $29/m^2$. As previously stated the biomass of cumaceans was moderate to moderately low, being greatest in Southern New England and tapering off to the south. Average biomass in Southern New England ranged from 0.01 g/m^2 to 3 g/m^2. In New York Bight smallest biomass was 0.01 g/m^2 and the largest biomass was 0.1 g/m^2. In Chesapeake Bight, which contained the lowest biomass of cumaceans, the range was between 0.001 g/m^2 and 0.2 g/m^2.

Tanaidacea were restricted to the narrowest range class in each of the three subareas of the Middle Atlantic Bight Region. Greatest abundance occurred in Southern New England with the next greatest occurring in Chesapeake Bight and lowest overall abundance in New York Bight. Densities (maximum $0.46/m^2$) and biomass (maximum 0.004 g/m^2) were low in all subareas.

Isopoda occurred in all of the temperature range classes throughout the Middle Atlantic Bight Region with greatest abundance in Southern New England, next highest in Chesapeake Bight, and lowest in New York Bight. Densities of isopods in Southern New England ranged from $0.7/m^2$ to $35/m^2$. Values of density on either side of the mid-temperature range diminished significantly, more so in the narrower ranges than in the broader ones. In New York Bight the range of density values was from $0.5/m^2$ to $26/m^2$. Decrease in density also occurred as temperature range narrowed. In Chesapeake Bight the same trends prevailed. Lowest density was $0.2/m^2$ and the highest was

29/m^2. As temperature range narrowed density values decreased. As opposed to density, largest overall biomass values occurred in Chesapeake Bight, were second largest in Southern New England, and smallest in New York Bight. Largest recorded biomass occurred in the 16.0-19.9°C class in Chesapeake Bight where 1 g/m^2 of organisms was found. Smallest biomass in this subarea occurred in the 0-3.9°C class where only 0.002 g/m^2 was found. In the New York Bight smallest biomass (0.02 g/m^2) occurred in 0-3.9°C and 4.0-7.9°C. Largest biomass in this subarea (0.8 g/m^2) occurred in the 16.0-19.9°C class. In Southern New England smallest biomass occurred, as in the others, in the 0-3.9°C class where 0.02 g/m^2 of isopods was recorded. The largest biomass of isopods in Southern New England occurred in 16.0-19.9°C, where 0.7 g/m^2 was found.

Amphipoda were ubiquitous with regard to temperature range in each of the subareas of the Middle Atlantic Bight Region. Further, especially in terms of density, amphipods were the single most numerous group among the crustaceans. Highest densities occurred in Southern New England followed by New York Bight and Chesapeake Bight. Density values in Southern New England ranged from 8/m^2 in the narrowest temperature class, to 1,987/m^2 in the 16.0-19.9°C class. In this subarea the broader classes contained considerably higher densities of amphipods than did the narrower ones. Densities in the New York Bight ranged from 5/m^2 in 0-3.9°C to 974/m^2 in the 12.0-15.9°C class. Densities in other classes ranged from 20 to 379/m^2. Density of amphipods in Chesapeake Bight was lowest in 0-3.9°C where 1/m^2 was found and highest in 8.0-11.9°C where 589/m^2 were found. Although

amphipod biomasses were moderately high, they did not contribute as significantly to overall faunal abundance as did their densities. In Southern New England biomass ranged from 0.04 g/m^2 in 0-3.9^{o}C to 18 g/m^2 in 16.0-19.9^{o}C. As with density, in this subarea, larger biomasses occurred in the broader range classes. Biomass in New York Bight ranged from 0.4 g/m^2 in the narrowest class to 5 g/m^2 in the 12.0-15.9^{o}C class. In the remaining classes amphipod biomass in Chesapeake Bight was lower than in the other two subareas, ranging from 0.006 g/m^2 in the narrowest to 3 g/m^2 in the 8.0-11.9^{o}C class. Biomasses exceeding 1 g/m^2 occurred in only two of the other classes, 20.0-23.9^{o}C, and 24.0^o+C. In the remaining classes biomasses were less than 1 g/m^2.

Mysidacea occurrence in each of the subareas within the Middle Atlantic Bight Region was relegated to the broader temperature ranges; in Southern New England they occurred in only the two broadest ranges. In New York Bight they occurred in three temperature classes, 12.0-15.9^{o}C, 16.0-19.9^{o}C, and 20.0-23.9^{o}C, and in Chesapeake Bight, again as in Southern New England, in the two broadest classes; in addition, in New York Bight, they also occurred in the narrowest class. Mysid density in Southern New England was moderately high, 1 to 5/m^2. In New York Bight mysid density ranged from 0.06/m^2 in the narrowest class, and in the remaining three classes averaged from 0.1/m^2 in the two narrower ones to 3/m^2 in the broadest. In Chesapeake Bight mysid density in the two broadest classes was 5 and 6/m^2. Biomass of mysids was moderately low in all subareas, and in Southern New England, in the two classes in which they occurred, was 0.01 and 0.1 g/m^2. In New York Bight smallest biomass occurred in the narrowest class where only trace amounts were found and in the remaining three classes

ranged from 0.001 to 0.02 g/m^2. In Chesapeake Bight moderately small biomasses occurred in the two broadest classes, 0.02 g/m^2 in each.

Decapoda with respect to temperature range were ubiquitous only in the New York Bight subarea; in both Southern New England and Chesapeake Bight they were absent in one class in each. Average densities were moderately high in all subareas; overall densities were highest in Southern New England, next highest in New York Bight and lowest in Chesapeake Bight. Decapod density in Southern New England ranged from 0.2/m^2 to 33/m^2. In the New York Bight subarea lowest density was 0.06/m^2, and highest 18/m^2. Chesapeake Bight density ranged from 0.4/m^2 to 7/m^2. With regard to biomass the New York Bight subarea just edged out Southern New England containing the largest overall biomass of any of the subareas. In Southern New England biomass ranged from 0.004 g/m^2 to 4 g/m^2. In New York Bight the situation was better, but only slightly so. Smallest biomass, 0.03 g/m^2, occurred in the narrowest class and largest biomass, 4 g/m^2, occurred in the 20.0-23.9^{o}C class. In Chesapeake Bight smallest biomass occurred in the 12.0-15.9^{o}C class with 0.01 g/m^2 and largest biomass, in 24.0^{o}+C, was 2.1 g/m^2.

Bryozoa were present in five temperature classes in both Southern New England and New York Bight. The classes in which they occurred were between 8.0 and 24.0^{o}+C, being absent from the two narrowest classes, and in Chesapeake Bight were present in three of the classes between 12.0 and 23.9^{o}C. Densities decreased with decreasing southerly latitudes. Densities in Southern New England tended to increase with broadening temperature range except in the two narrow classes where lowest densities occurred,

0.2/m^2; highest density was 98/m^2. In New York Bight lowest density (0.1/m^2) occurred at the mid-point, 16.0-19.9°C, of the five classes in which bryozoans were found. Values increased disproportionately on either side of this class. Density values in Chesapeake Bight increased with broadening temperature range in the three classes in which they occurred. Densities were 8/m^2 in both the 12.0-15.9°C and 16.0-19.9°C classes and 11/m^2 in the 20.0-23.9°C class. Biomass of bryozoans in the three subareas of the Middle Atlantic Bight Region was moderately small and in only one of the subareas, Southern New England, did biomass values exceed 1 g/m^2. Biomass ranged from 0.004 g/m^2 to 3 g/m^2 in this subarea. Biomasses in the New York Bight subarea ranged from 0.001 g/m^2 to 0.3 g/m^2. In the three classes in Chesapeake Bight in which bryozoans occurred their biomasses ranged from 0.02 to 0.3 g/m^2.

Brachiopoda occurred in only one temperature class (16.0-19.9°C) in Chesapeake Bight and were absent in each of the other two subareas. Both density and biomass of brachiopods were low, with 0.1/m^2 weighing 0.001 g/m^2.

Echinodermata as a group were significant contributors to the overall macrofauna of the Middle Atlantic Bight Region and were ubiquitous with regard to temperature range in each of the subareas. As a group, echinoderms were most plentiful in terms of density in Southern New England and diminished in importance as one proceeded south so that lower values were encountered in New York Bight and still lower ones in Chesapeake Bight. However, larger biomasses occurred in New York Bight than in either of the two adjacent subareas with Southern New England biomass values being second and Chesapeake Bight third. The detailed analysis of the subcomponents of the echinoderms follows.

Holothuroidea were ubiquitous with regard to temperature range in Southern New England but not so in the other two subareas. In New York Bight they occurred in five of the seven temperature classes being absent in the 4.0-7.9°C and the 24.0°+C classes; in Chesapeake Bight they occurred in six of the seven, being absent in the 8.0-11.9°C class. Density values were highest in Southern New England, intermediate in Chesapeake Bight and lowest in New York Bight. In Southern New England density ranged from $0.2/m^2$ to $12/m^2$. In New York Bight densities ranged from $0.06/m^2$ to $2/m^2$. In Chesapeake Bight densities ranged from $0.06/m^2$ to $10/m^2$. The biomass of holothurians paralleled the distribution of density values in that largest biomasses occurred in Southern New England, then in Chesapeake Bight, and were smallest in New York Bight. Biomasses ranging from 0.03 g/m^2 to 38 g/m^2 occurred in Southern New England. In New York Bight there was only one class which contained greater than 1 g/m^2 biomass, that was 0-3.9°C where 2 g/m^2 occurred. The range of values in the remaining temperature classes increased with narrowing temperature range going from a low of 0.1 g/m^2 to a high of 0.6 g/m^2. Biomass of holothurians in Chesapeake Bight was largest in the 12.0-15.9°C class with 23 g/m^2, and lowest in the 24.0°+C class with a biomass of 0.05 g/m^2.

Echinoidea occurred in nearly all temperature range classes in each of the subareas, being absent only from the 24.0°+C class in Southern New England, the 0-3.9°C class in New York Bight, and the 0-3.9°C and 4.0-7.9°C classes in Chesapeake Bight. Overall densities were highest in New York Bight, intermediate in Chesapeake Bight, and lowest in Southern New England. Highest density occurring in New York Bight was $108/m^2$ in the 20.0-23.9°C class. Next highest density in this class occurred in Chesapeake Bight

with 43/m^2, whereas Southern New England density for this class was only 7/m^2. The next highest density of echinoids occurred in the 16.0-19.9°C class in New York Bight where 36/m^2 were recorded; in Chesapeake Bight in the same class, 10/m^2 were found, whereas 27/m^2 were recorded in Southern New England. Lowest overall value occurred in the 0-3.9°C class in Southern New England where 0.2/m^2 was found. Biomasses of echinoids shifted somewhat in that, again as with density, greatest amounts occurred in New York Bight, but the second greatest amounts occurred in Southern New England, and smallest in Chesapeake Bight. Largest biomass occurred in the 16.0-19.9°C class in New York Bight where 70 g/m^2 were found. Comparatively, 21 and 16 g/m^2 occurred in the same class in Chesapeake Bight and Southern New England, respectively. The second largest biomass occurred in the 8.0-11.9°C class in Southern New England where 27 g/m^2 of organisms occurred. In the same class in New York Bight biomass was 7 g/m^2 but in Chesapeake Bight it had diminished to 0.1 g/m^2.

Ophiuroidea were found in all temperature range classes in both Southern New England and Chesapeake Bight but in only five classes in New York Bight, being absent from 16.0-19.9°C and 24.0°+C there. Highest densities by a substantial margin occurred in Southern New England where 349 and 165/m^2 were found in the 8.0-11.9°C and 12.0°-15.9°C classes, respectively. In the comparable classes in Chesapeake Bight the values were 3 and 90/m^2 and in New York Bight were 76 and 0.4/m^2, respectively. High density also occurred in the 4.0-7.9°C class in Southern New England where 85/m^2 were recorded. The distribution of brittle star biomass was similar to that of density in that largest biomasses occurred in Southern

New England, second largest in New York Bight, and smallest amounts in Chesapeake Bight. Largest biomass occurred in the 8.0-11.9°C class in Southern New England where 25 g/m^2 were found and 17 g/m^2 were found in the 4.0-7.9°C class in the same subarea. In the comparable classes in New York Bight the values were 3 and 2 g/m^2, respectively, while in Chesapeake Bight the values were 0.04 and 0.2 g/m^2.

Asteroidea were present in all temperature ranges in Southern New England which also contained the highest densities of sea stars; whereas, in New York Bight they were present in five of the seven classes, being absent from the 16.0-19.9°C and the 24.0°+C classes; in Chesapeake Bight they were present in six classes being absent from the 4.0-7.9°C class. Highest densities occurred in the mid-temperature classes in Southern New England where 3.9/m^2 occurred in 16.0-19.9°C and 3.1/m^2 occurred in 8.0-11.9°C and 12.0-15.9°C. The remaining classes contained fewer than 1/m^2. Second highest density was in New York Bight, occurring in 8.0-11.9°C where 3.5/m^2 were found and in the 4.0-7.9°C and 20.0-23.9°C classes, where 1.6 and 1/m^2 occurred, respectively. Fewer than 1/m^2 occurred in the other classes. Chesapeake Bight contained the lowest overall density of sea stars and in no temperature class did the density exceed .5/m^2. Sea star biomass was largest in the New York Bight subarea, followed by Southern New England and Chesapeake Bight. Largest biomass, 15 g/m^2, occurred in the 8.0-11.9°C class in New York Bight. Next largest biomass, 7 g/m^2, occurred in Southern New England 12.0-15.9°C. In Southern New England only one other temperature range class, 8.0-11.9°C, contained a moderately large biomass, 2.2 g/m^2. All other classes in this subarea had biomasses smaller than 1 g/m^2. In New York Bight three classes contained biomass in

excess of 1 g/m^2, these were 4.0-7.9°C, 12.0-15.9°C, and 20.0-23.9°C where 1, 33, and 6 g/m^2 occurred, respectively; 0.07 g/m^2 occurred in the 0-3.9°C class in this subarea. Chesapeake Bight biomasses were quite small. Largest in this subarea was 0.6 g/m^2 in 16.0-19.9°C and 0.4 g/m^2 in the 12.0-15.9°C class. In the remaining temperature classes the biomass ranged from trace amounts to 0.008 g/m^2.

Hemichordata were sparsely distributed throughout the Middle Atlantic Bight Region. They occurred in only three temperature classes in Southern New England, with moderately low densities and biomass. Densities ranged from 0.1 to 0.8/m^2 and biomass ranged from 0.001 to 0.15 g/m^2. In New York Bight subarea hemichordates were found in only one temperature class, 20.0-23.9°C, where 0.25/m^2 weighing 0.02 g/m^2 were found. In Chesapeake Bight hemichordates were found in only the 20.0-23.9°C class with a density of 0.2/m^2 weighing 0.08 g/m^2.

Ascidiacea occurred in all temperature ranges in Southern New England and in nearly all ranges in New York Bight, being absent only in the broadest, 24.0°+C; they were present in five classes in Chesapeake Bight, being absent from the 4.0-7.9°C and 8.0-11.9°C classes. Greatest densities and biomass occurred in Southern New England with next greatest in Chesapeake Bight and lowest in New York Bight. Average densities in Southern New England ranged from 2/m^2 in 0-3.9°C to 105/m^2 in 20.0-23.9°C. On the whole, in this subarea density increased with broadening temperature range to the 20.0-23.9°C class and then dropped to 36/m^2 in the 24.0°+C class. In Chesapeake Bight density ranged from 0.65/m^2 to 21/m^2. In New

York Bight densities ranged from 0.1/m^2 to 16/m^2. No definite trend was discernible with regard to temperature range in New York Bight. Ascidian biomass in Southern New England ranged from 0.1 g/m^2 in both the 0-3.9^{o}C and 4.0-7.9^{o}C classes to 23 g/m^2 in both the 20.0-23.9^{o}C and 24.0^{o}+C classes. In this subarea an increase in biomass with broadening temperature range was apparent. In Chesapeake Bight the same occurred, biomass increased with broadening temperature range with lowest biomass occurring in the narrowest range class, 0.07 g/m^2, to 15 g/m^2 in the broadest class. Ascidian biomass in New York Bight ranged from 0.02 g/m^2 to 1 g/m^2.