GEOGRAPHIC DISTRIBUTION

It is generally recognized that before ecological communities or associations of a particular region can be ascertained the distribution of the important taxonomic groups in that region must be known.

The graphic presentation, in the form of charts, of the quantitative geographic distribution of various major taxonomic components of the benthic fauna is one of the more useful methods of expressing quantitative occurrence for the purpose of determining ecological communities. It permits the reader to visually integrate relationships with other organisms and with the numerous abiotic factors that may influence the occurrence of a particular species or faunal group. With these aspects in mind, we prepared two quantitative distribution charts for each major taxonomic group encountered in the Middle Atlantic Bight Region. One chart presents the number of individuals (density) and the second presents their weight (biomass), both are expressed in terms of one square meter of bottom area.

Geographic distributions are presented in three sub-sections: (1) distribution of the total macrobenthic fauna, that is, all taxonomic groups combined; (2) distribution of each major taxonomic component; and (3) distribution of a few selected genera and species.

Total Macrobenthic Fauna (All Taxonomic Groups Combined)

The density distribution of benthic animals, all taxonomic groups combined, in the Middle Atlantic Bight Region exhibited two major trends. One trend pertains to density in relation to inshore-offshore location. High densities generally occurred in the coastal areas, moderate densities prevailed on the continental shelf, and low densities were characteristic of the offshore, deep waters. A second trend in density distribution pertains to latitudinal differences. In the northern part of the Middle Atlantic Bight Region, especially those areas off southern Massachusetts and Rhode Island, there were extensive tracts where the density of benthic animals was high (greater than 1,000/m^2) or very high (greater than 5,000/m^2). Moreover, there were relatively few areas on the continental shelf where the density was low, less than 200/m^2. Conversely, in the southern region, off Delaware-Virginia-North Carolina, there were few areas where benthic animals occurred in very high density (greater than 5,000/m^2) and limited expanses of high density (greater than 1,000/m^2). Moderate to low density (less than 200/m^2) areas were not uncommon. The middle region--the New York-New Jersey region--located between the relatively high density northern area and the somewhat depauperate southern sector, was more or less intermediate in density. This north to south trend of decreasing density on the continental shelf is evident in figure 7, in which the density of all taxonomic groups combined is plotted. There were no detectable north-south differences in density of the fauna in deepwater (continental slope and rise) areas.

Biomass distribution (fig. 8) of the total macrobenthic fauna revealed patterns similar to that of density. Both the inshore-offshore and

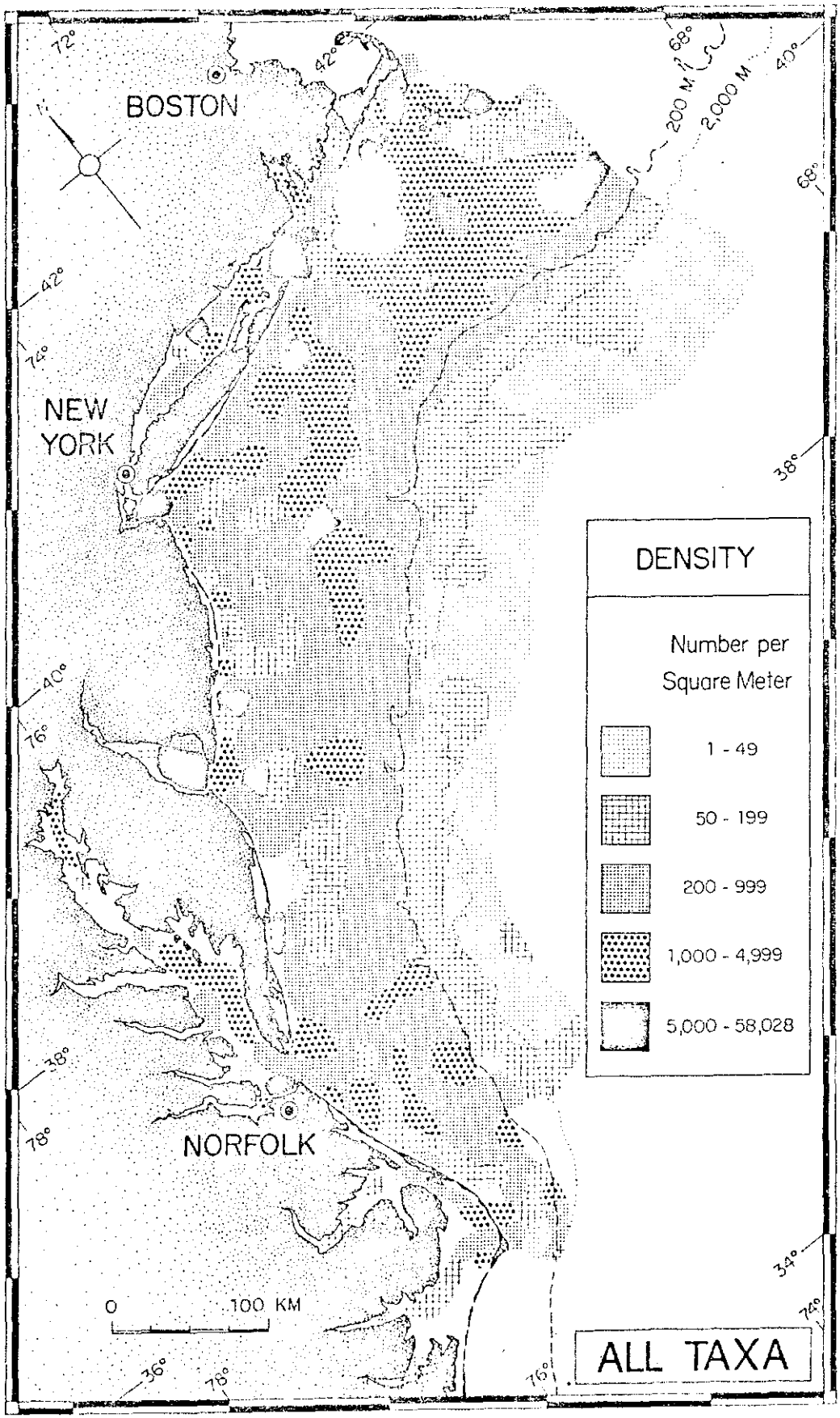

Figure 7.--Geographic distribution of the density of all taxonomic groups combined, expressed as number of individuals per square meter of bottom.

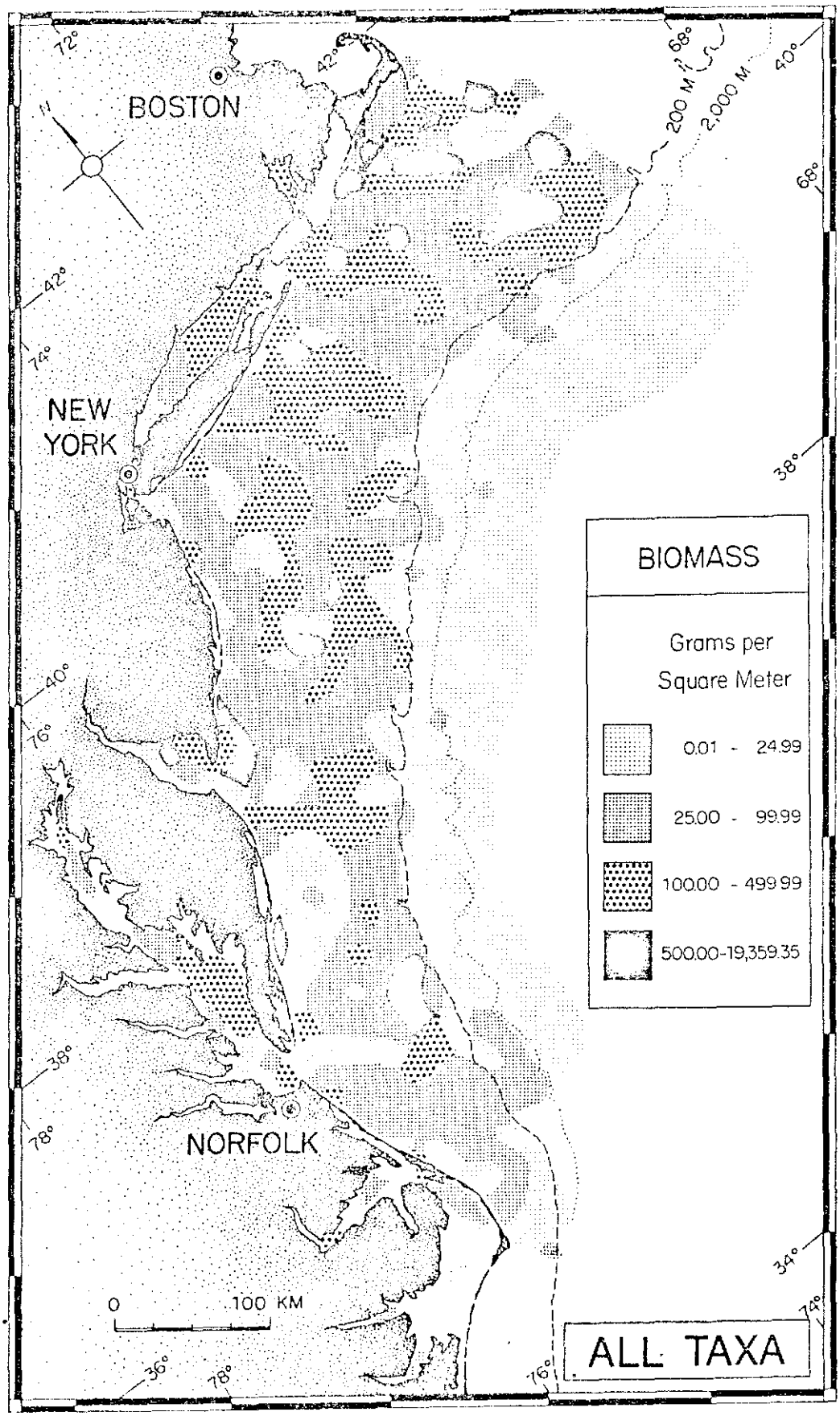

Figure 8.--Geographic distribution of the biomass of all taxonomic groups combined, expressed as damp weight per square meter of bottom.

north-south trends were clearly exhibited by this parameter. Throughout most of the Middle Atlantic Bight Region large biomasses (greater than 500 g/m^2) most commonly occurred along the inner continental shelf. Moderately large biomasses (100 to 500 g/m^2) were characteristic of central and offshore parts of the shelf, in addition to their presence inshore. Small and moderately small (less than 100 g/m^2) biomasses prevailed in the deepwater areas beyond the shelf break.

The north-south differences in biomass were very pronounced. On the inshore continental shelf off southern Massachusetts and Rhode Island there were moderately extensive areas of large biomasses (greater than 500 g/m^2). Throughout much of the shelf region there were substantial expanses of moderately large biomasses (100 to 500 g/m^2). Small quantities (less than 25 g/m^2) were limited to a relatively few tracts of small or moderate size. This general pattern contrasts sharply with that found off the Delaware-Virginia-North Carolina region. Large and moderately large biomasses were much less common and were more restricted in areal extent, also there were rather extensive areas where small biomasses (less than 25 g/m^2) prevailed. As with density, there were no important north-south differences in biomass in offshore deepwaters--continental slope and rise.

Major Taxonomic Components

Porifera (figs. 9 and 10) occurred in small areas widely scattered throughout the Region. A large proportion were located on the outer shelf, slope, and rise. Densities were predominantly between 1 and 24/m^2. At four localities situated inshore and at mid-shelf their density ranged between 25 and 75/m^2. Biomass was generally small, less than 0.5 g/m^2. At nine localities their biomass ranged between 0.5 and 11.5 g/m^2.

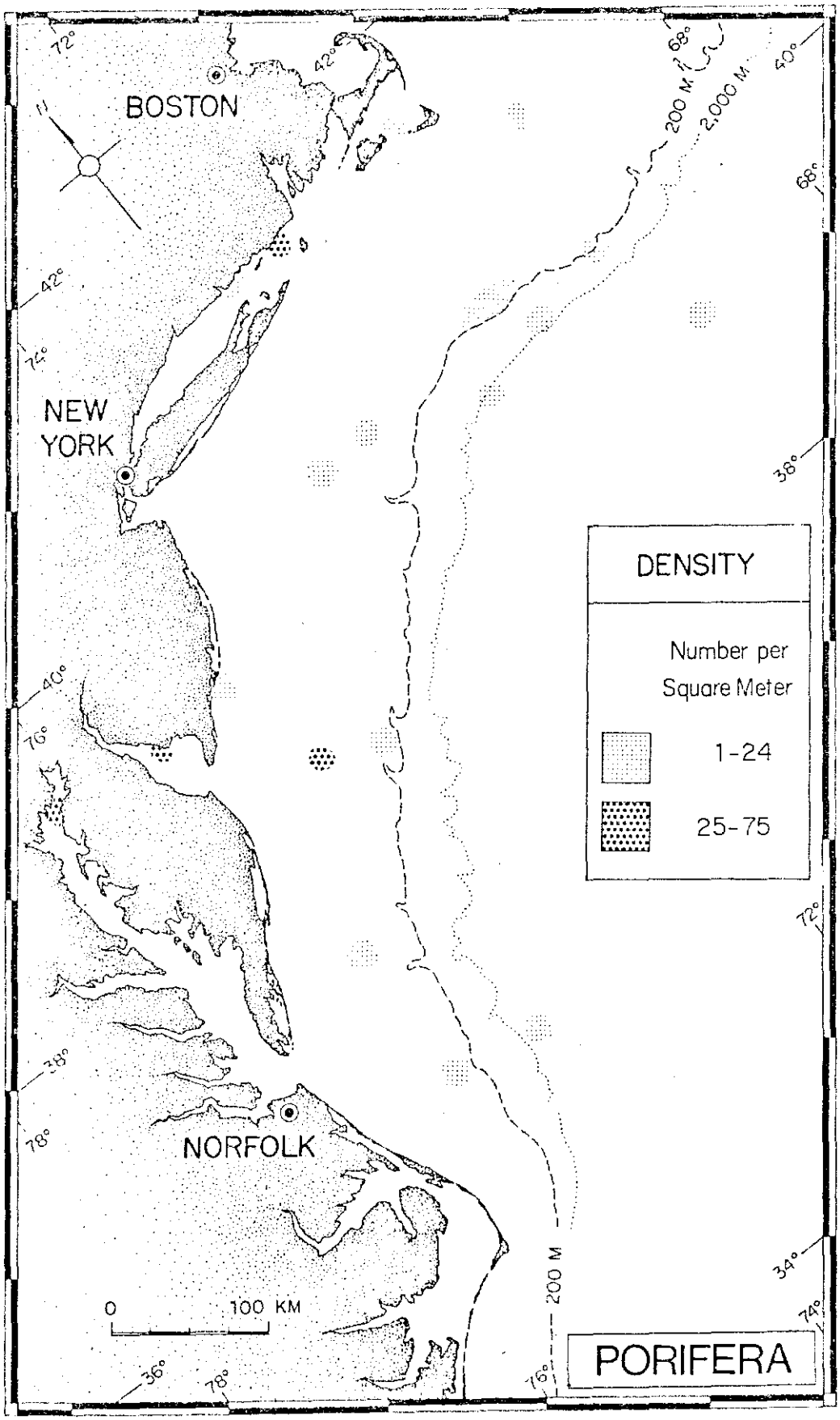

Figure 9.--Geographic distribution of the density of Porifera, expressed as number of individuals per square meter of bottom.

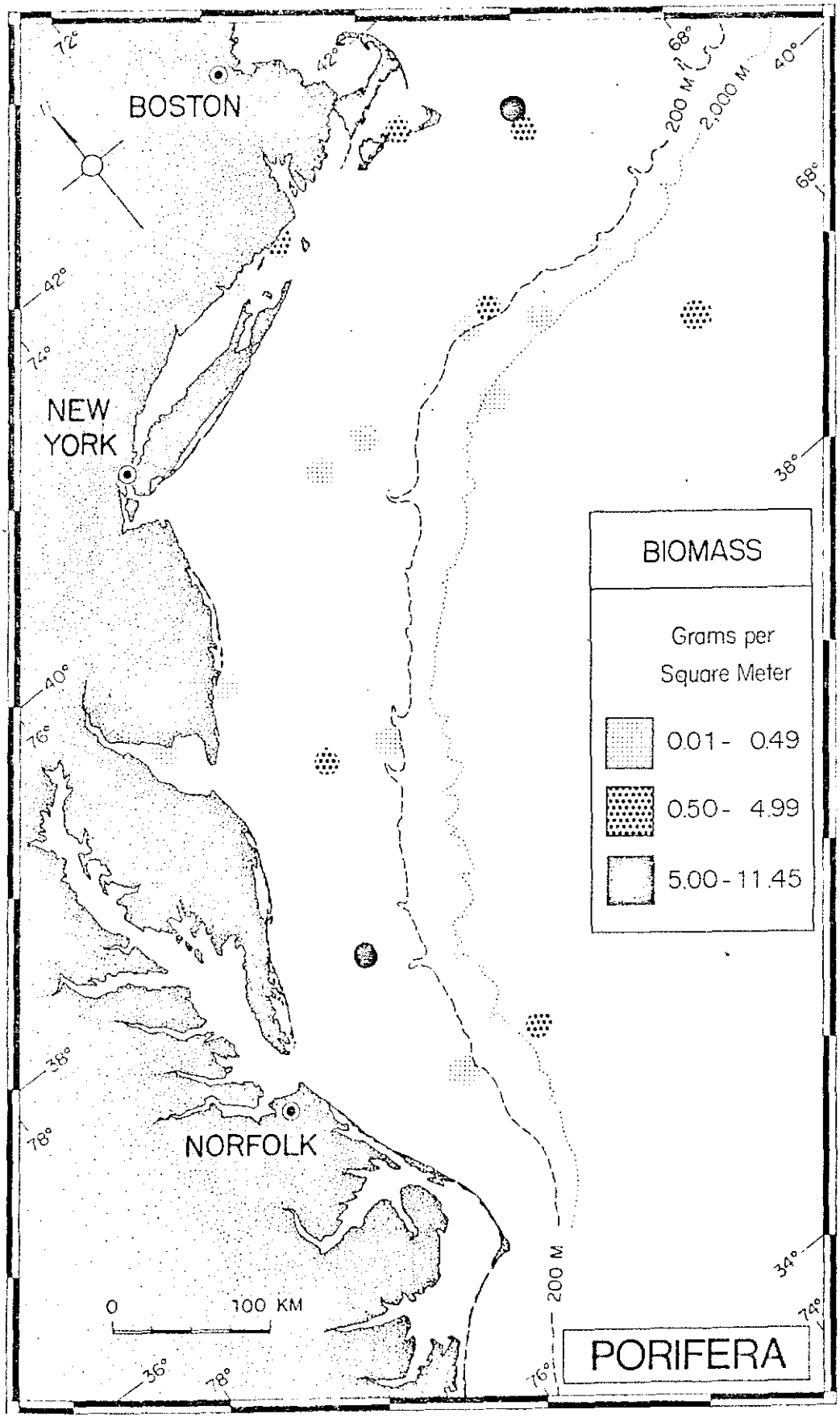

Figure 10.--Geographic distribution of the biomass of Porifera, expressed as damp weight per square meter of bottom.

Coelenterata (figs. 11 and 12) were broadly distributed throughout the Region. They were particularly widespread on the continental shelf and slope. Densities over most of their range were low, less than 25/m^2. Moderate densities (25 to 999/m^2) occurred in only a few small areas, and high densities (greater than 1,000/m^2) were rare. Biomass of coelenterates revealed a distribution pattern similar to density, except for the occurrence of moderate quantities (5 to 99 g/m^2) in rather extensive areas off southern New England. Biomasses of coelenterates throughout most of their range were less than 5 g/m^2.

Hydrozoa (figs. 13 and 14) exhibited a rather wide distribution in the Middle Atlantic Bight Region. Except for part of Southern New England, they were present in a broad band on the continental shelf extending from Cape Cod to Cape Hatteras. They were present in some of the northern bays, but were not encountered in central or southern bays. In a few locations they occurred on the continental slope. Densities over most of their range averaged between 1 and 49/m^2. They were present in moderate to high densities (50 to 1,071/m^2) in a few relatively small areas. Biomass was small (less than 0.5 g/m^2) over most of their range, but moderate to large quantities (0.5 to 47 g/m^2) were present in small areas, especially inshore and in the Cape Cod region and Chesapeake Bight.

Alcyonaria /Alcyonacea/ (figs. 15 and 16) were distributed in a narrow band in offshore waters along the outer continental shelf, the slope, and part of the continental rise. The band extended from the Cape Cod region southward to within 100 km of Cape Hatteras. Densities at all localities were low (less than 25/m^2) and were very low (less than 9/m^2) over much of

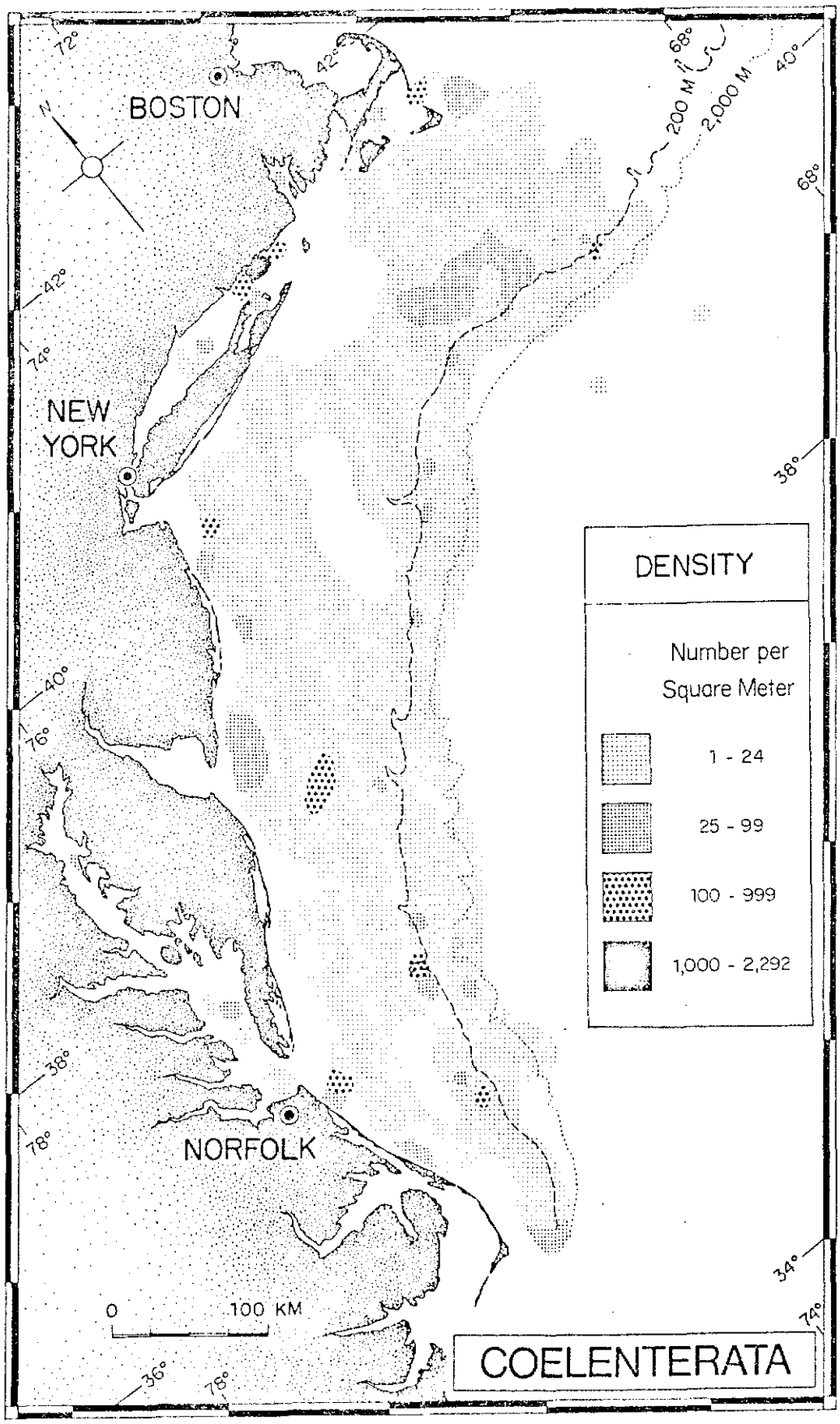

Figure 11.--Geographic distribution of the density of Coelenterata, expressed as number of individuals per square meter of bottom.

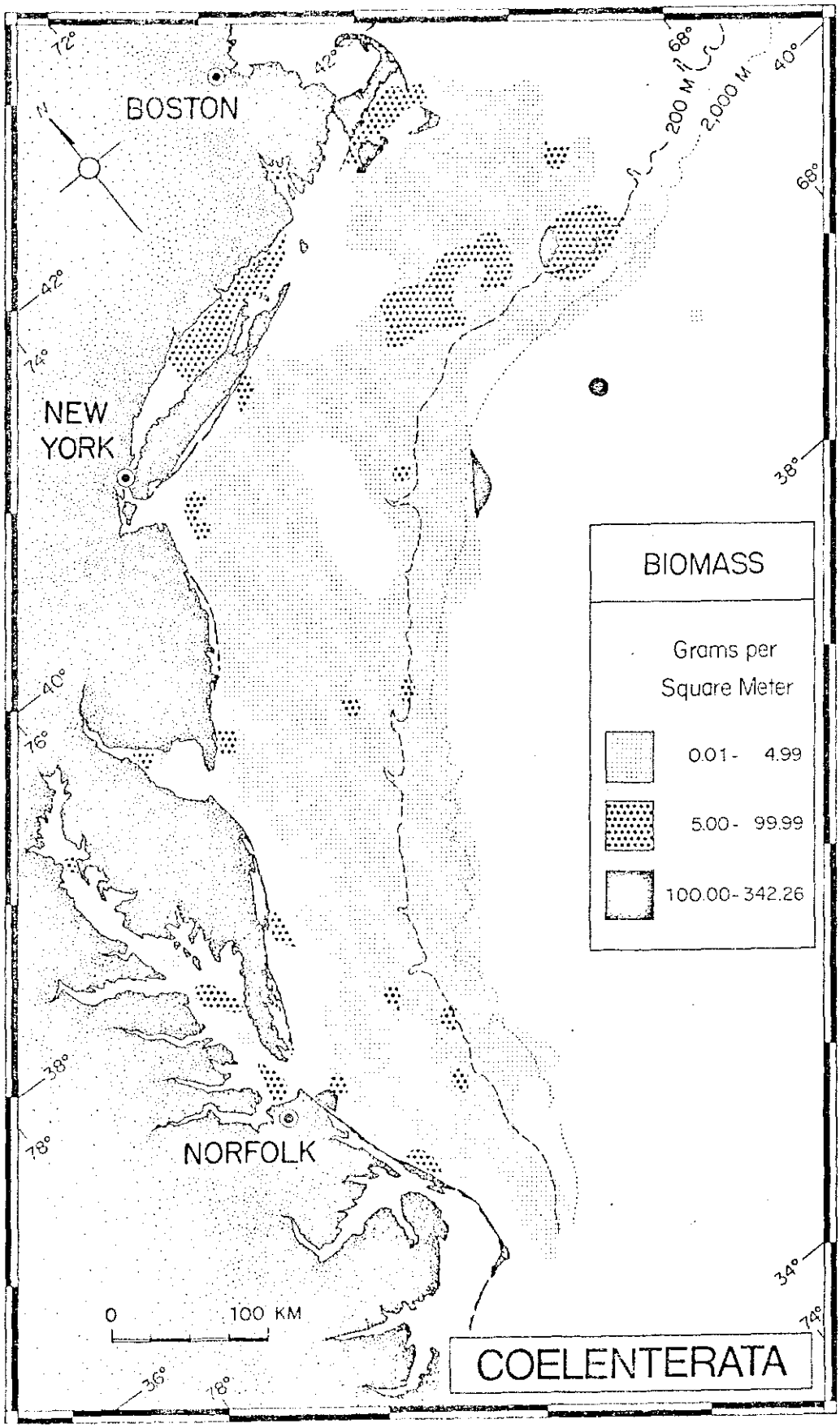

Figure 12.--Geographic distribution of the biomass of Coelenterata, expressed as damp weight per square meter of bottom.

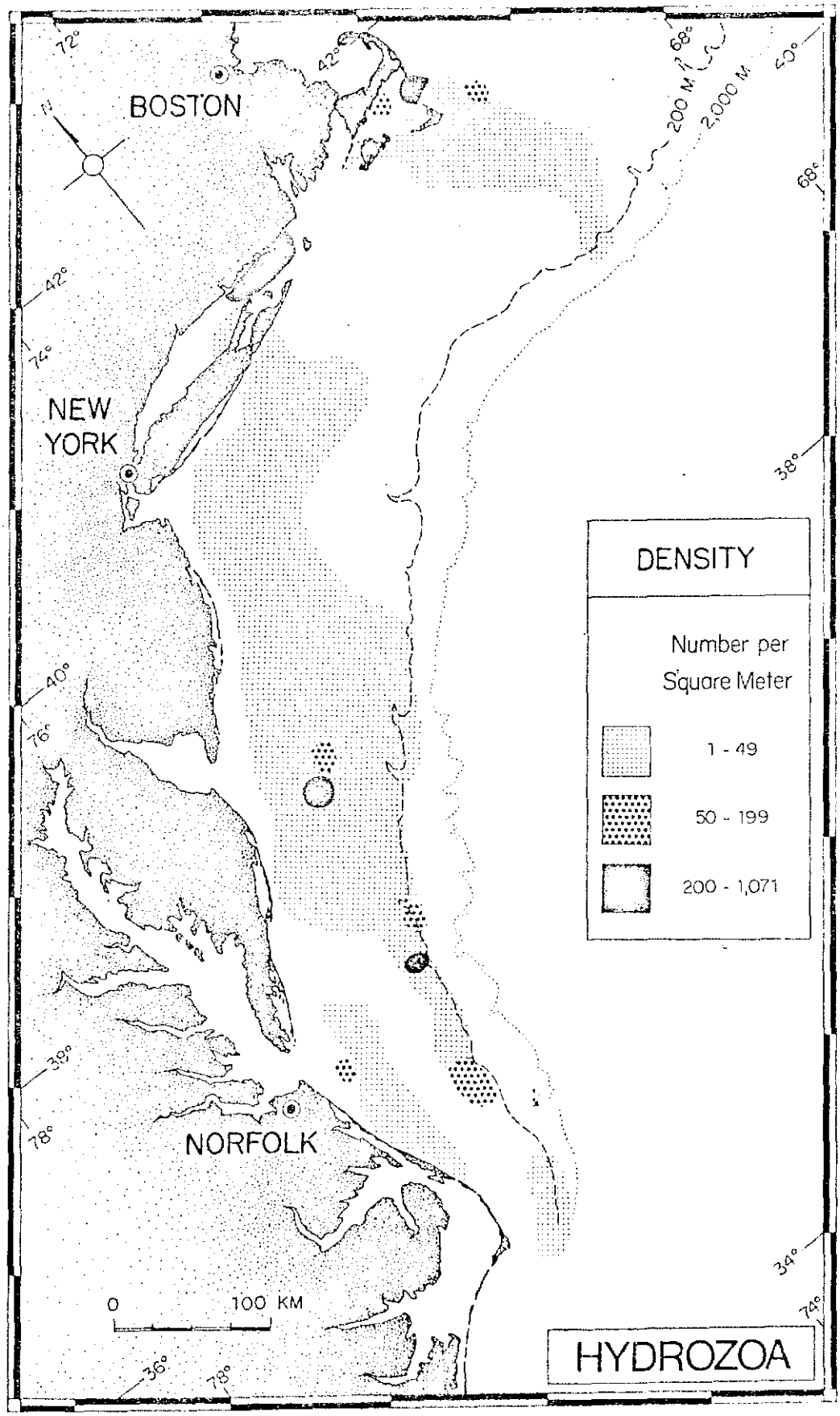

Figure 13.--Geographic distribution of the density of Hydrozoa, expressed as number of individuals per square meter of bottom.

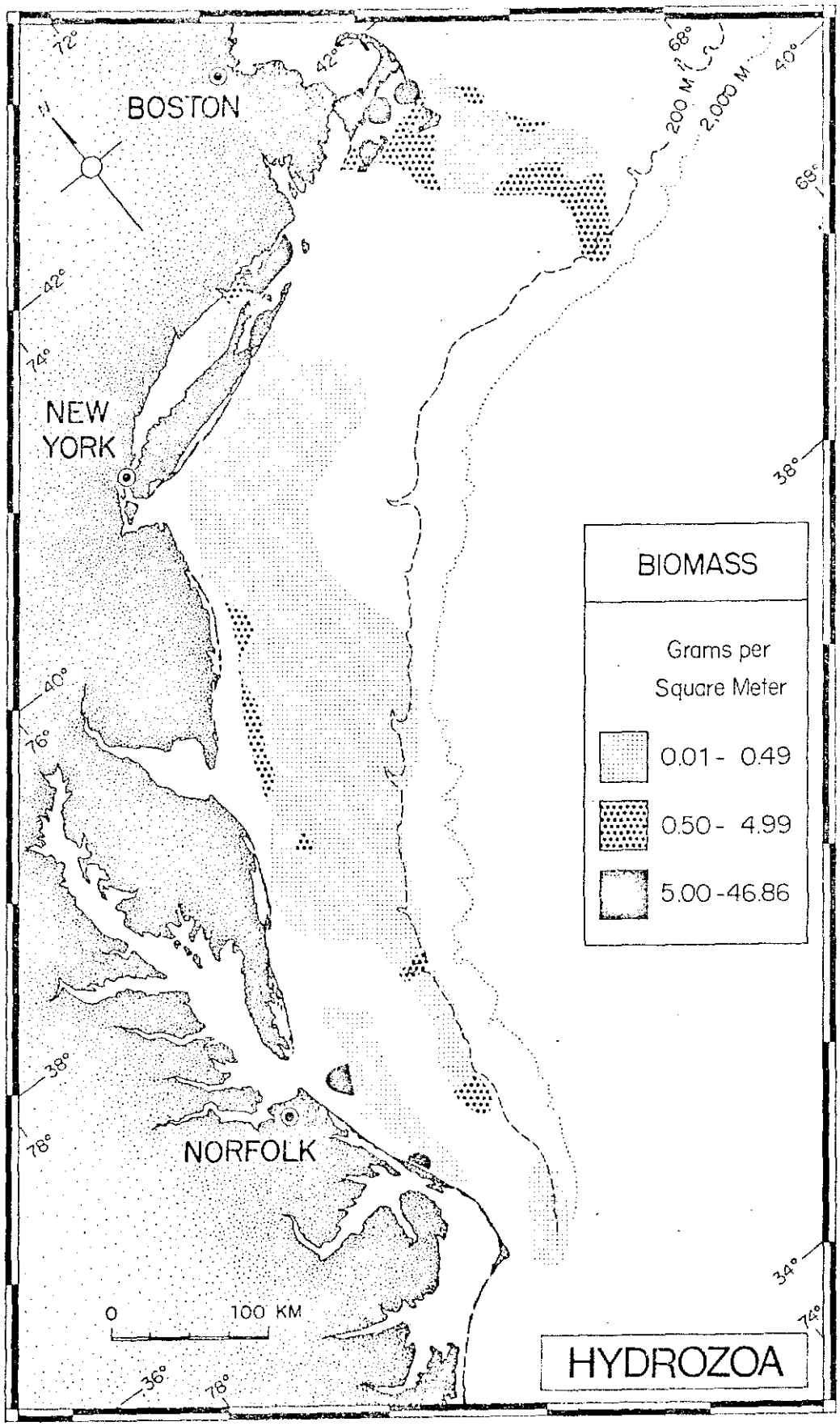

Figure 14.--Geographic distribution of the biomass of Hydrozoa, expressed as damp weight per square meter of bottom.

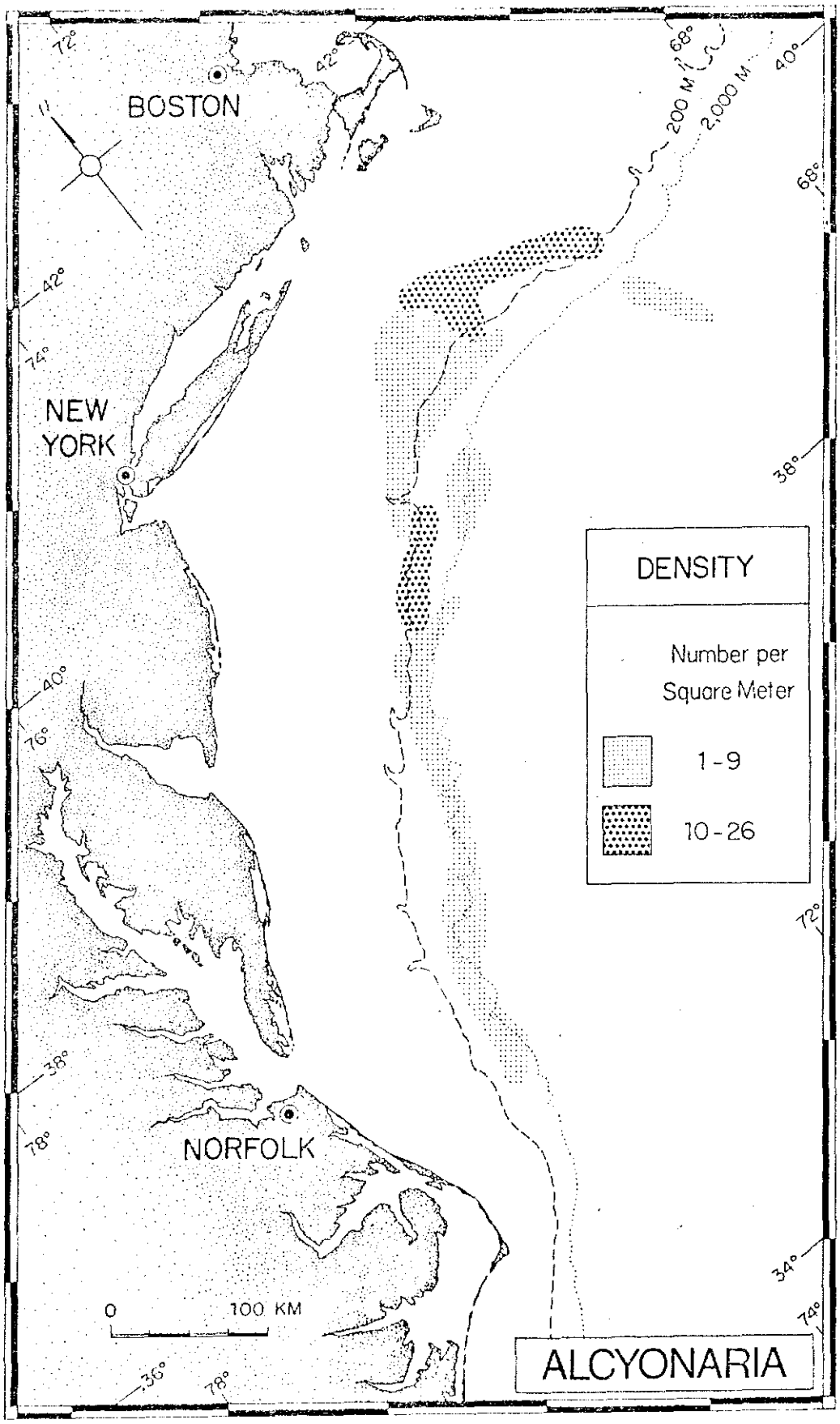

Figure 15.--Geographic distribution of the density of Alcyonaria, expressed as number of individuals per square meter of bottom.

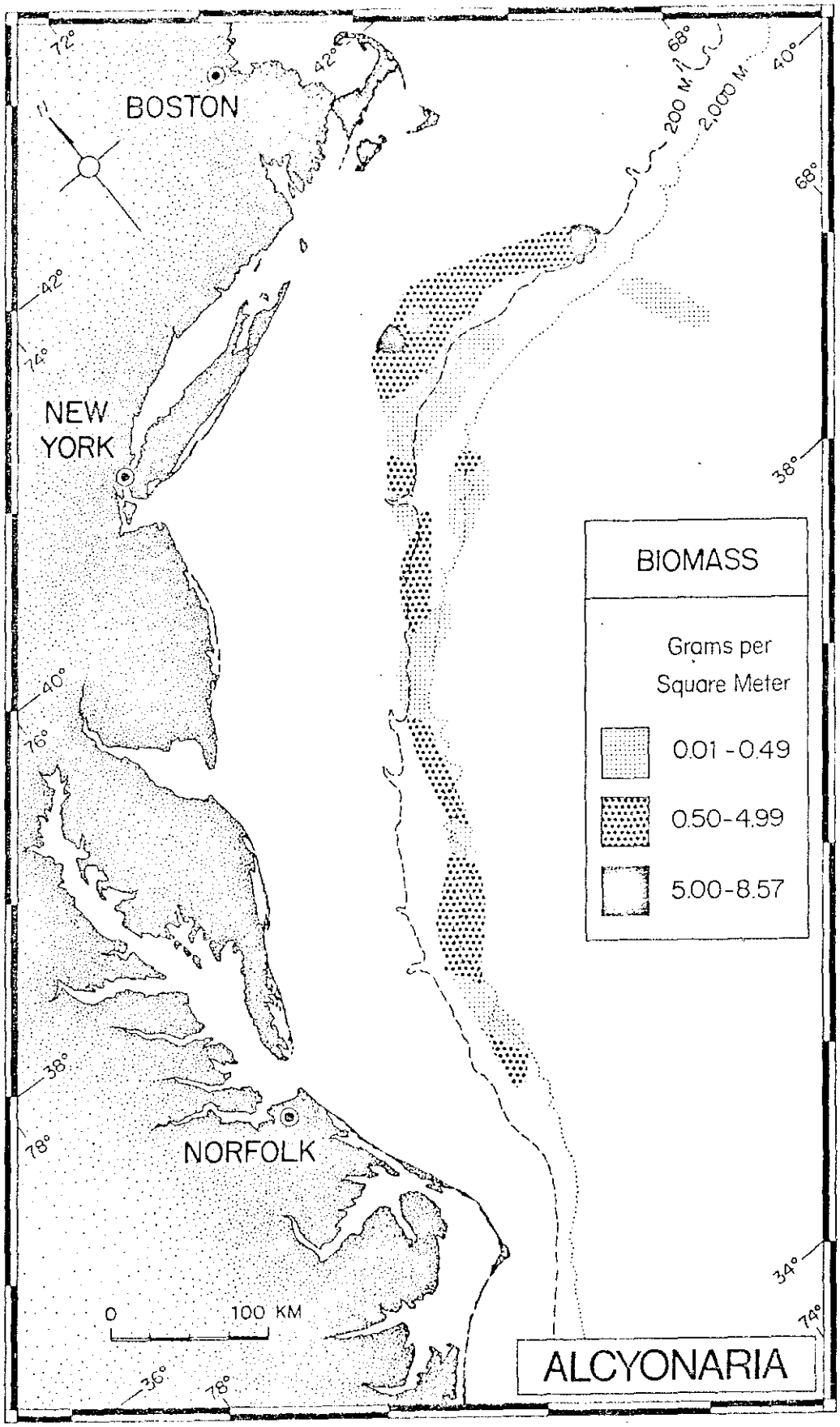

Figure 16.--Geographic distribution of the biomass of Alcyonaria, expressed as damp weight per square meter of bottom.

their range. Biomass was small to moderate over most of their range of occurrence (0.01 to 5 g/m^2) with two small areas south of Cape Cod containing between 5 and 9 g/m^2.

Zoantharia (figs. 17 and 18) were widely distributed in a somewhat scattered pattern throughout the Region. Their largest area of occurrence was in offshore Southern New England. Although they were taken in the bays, on the continental shelf, slope, and rise, they were most common on the outer continental shelf. Throughout most of their range they occurred at densities of less than 25/m^2. For a rather large area on the outer shelf of Southern New England their density ranged between 25 and 99/m^2. They were present in only three small areas at densities greater than 100/m^2. Biomass in about half their area of occurrence was less than 1 g/m^2, and between 1 and 25 g/m^2 in the other half. A few relatively small areas, most of which were in coastal or inshore locations, had biomasses ranging between 25 and 342 g/m^2.

Platyhelminthes (figs. 19 and 20) were distributed rather widely on the continental shelf throughout the region. For the most part they occurred in rather small patches. Densities were low (less than 25/m^2) at all locations except one. Biomass was small (less than 0.5 g/m^2) throughout their range, except at two localities.

Nemertea (figs. 21 and 22) were very common and were distributed over a large proportion of the Middle Atlantic Bight Region. Their density, however, was generally low, between 1 and 24/m^2. At only a few places in bays and on the continental shelf south of Cape Cod did their density average between 25 and 235/m^2. Nemertea were absent from most sampling

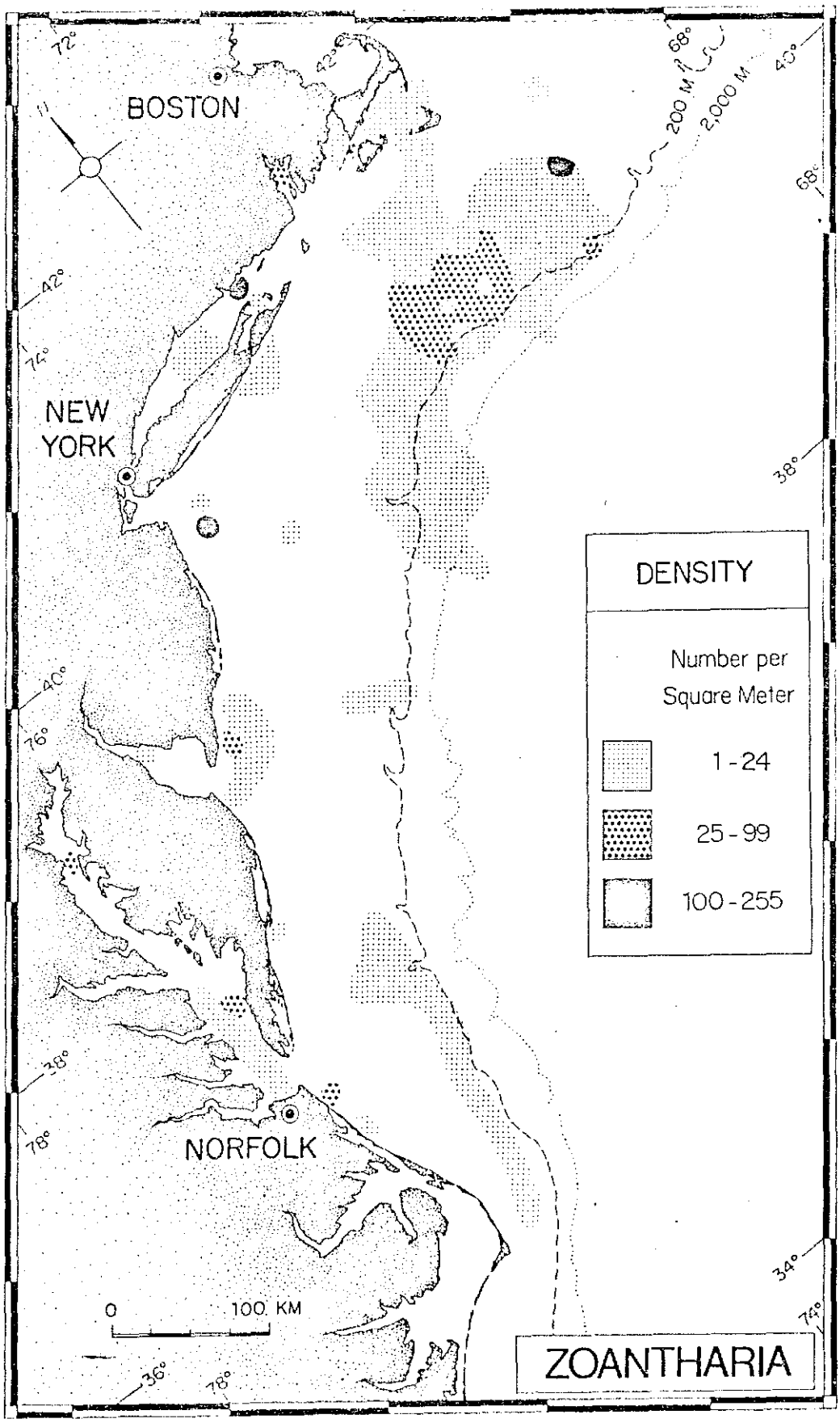

Figure 17.--Geographic distribution of the density of Zoantharia, expressed as number of individuals per square meter of bottom.

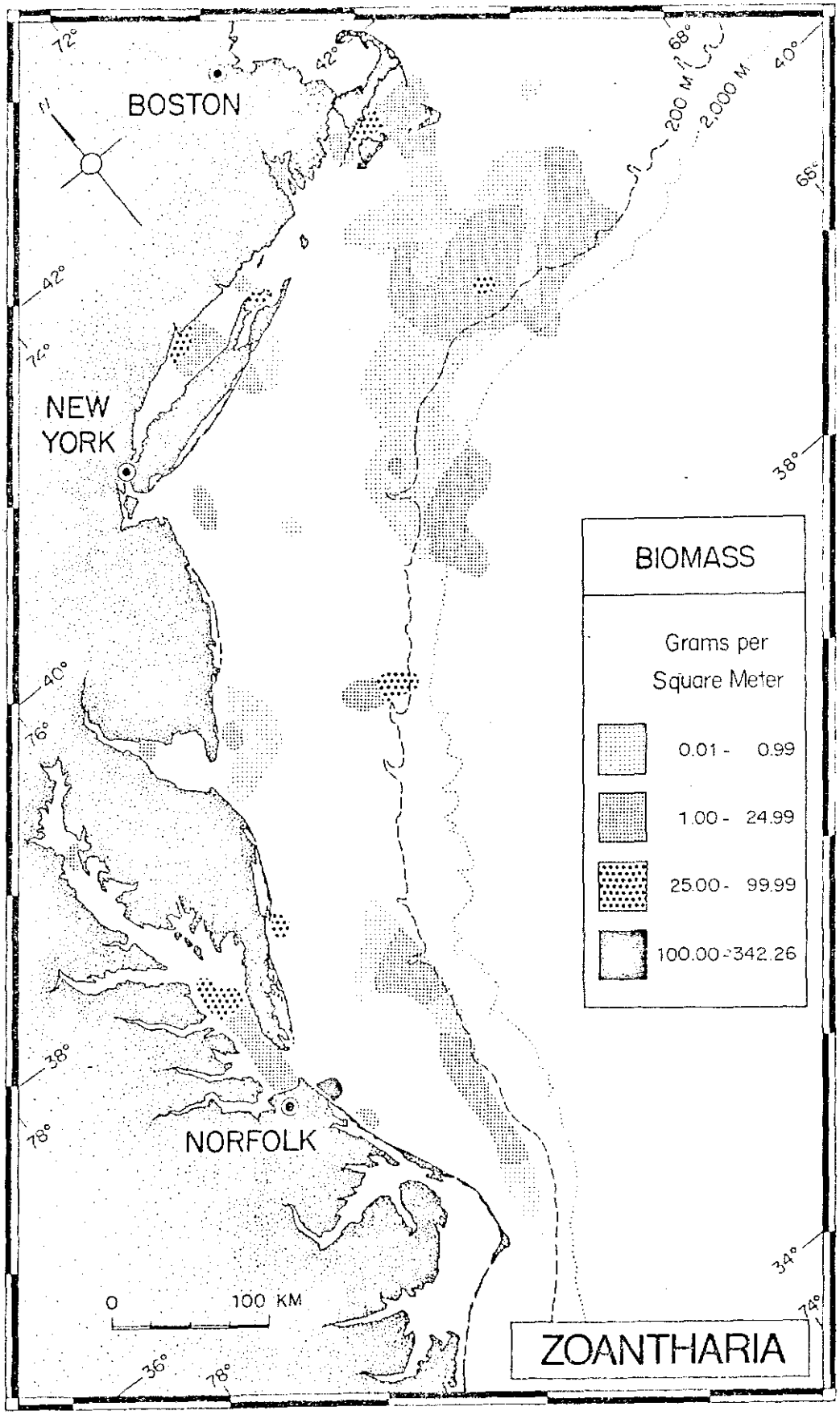

Figure 18.--Geographic distribution of the biomass of Zoantharia, expressed as damp weight per square meter of bottom.

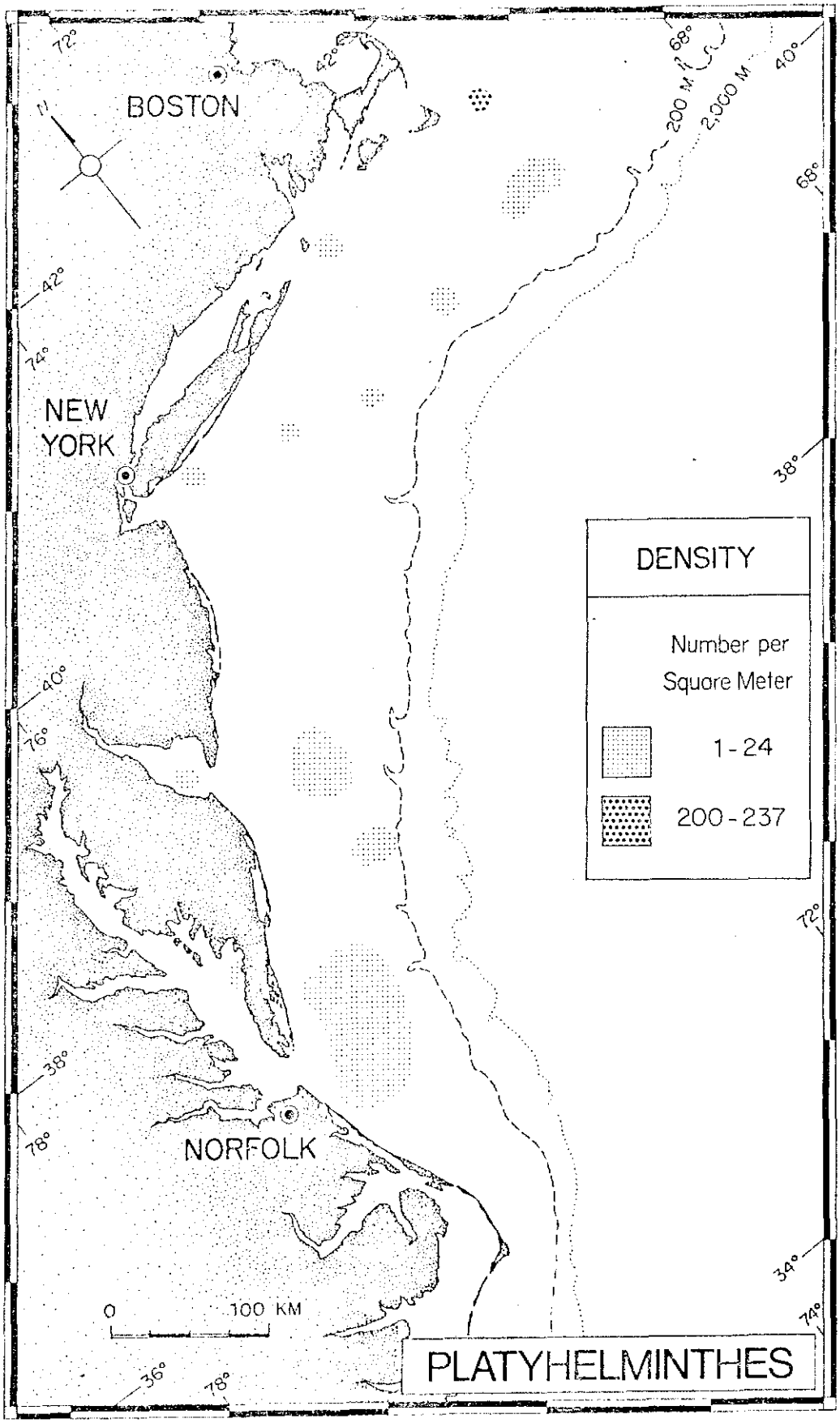

Figure 19.--Geographic distribution of the density of Platyhelminthes, expressed as number of individuals per square meter of bottom.

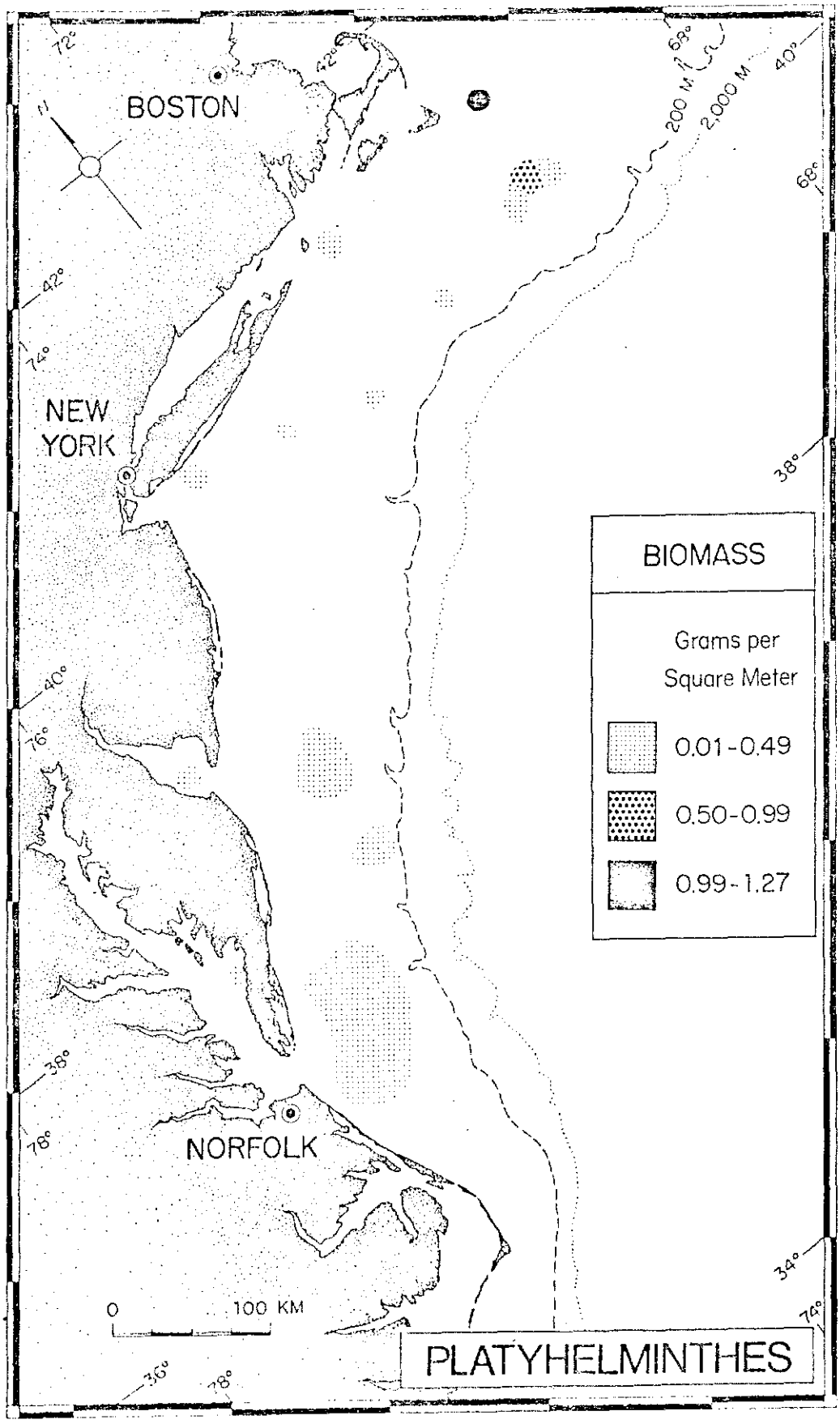

Figure 20.--Geographic distribution of the biomass of Platyhelminthes, expressed as damp weight per square meter of bottom.

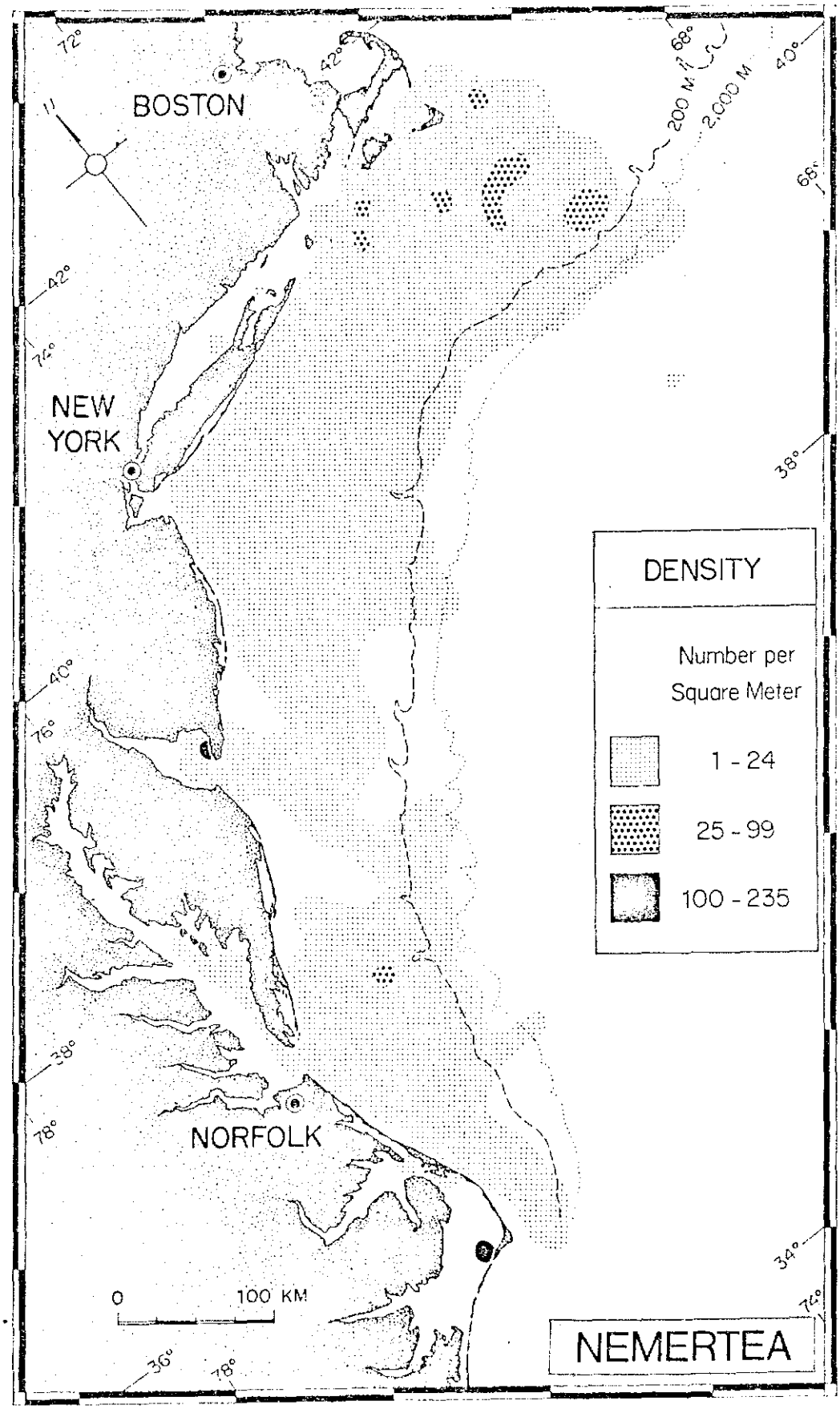

Figure 21.--Geographic distribution of the density of Nemertea, expressed as number of individuals per square meter of bottom.

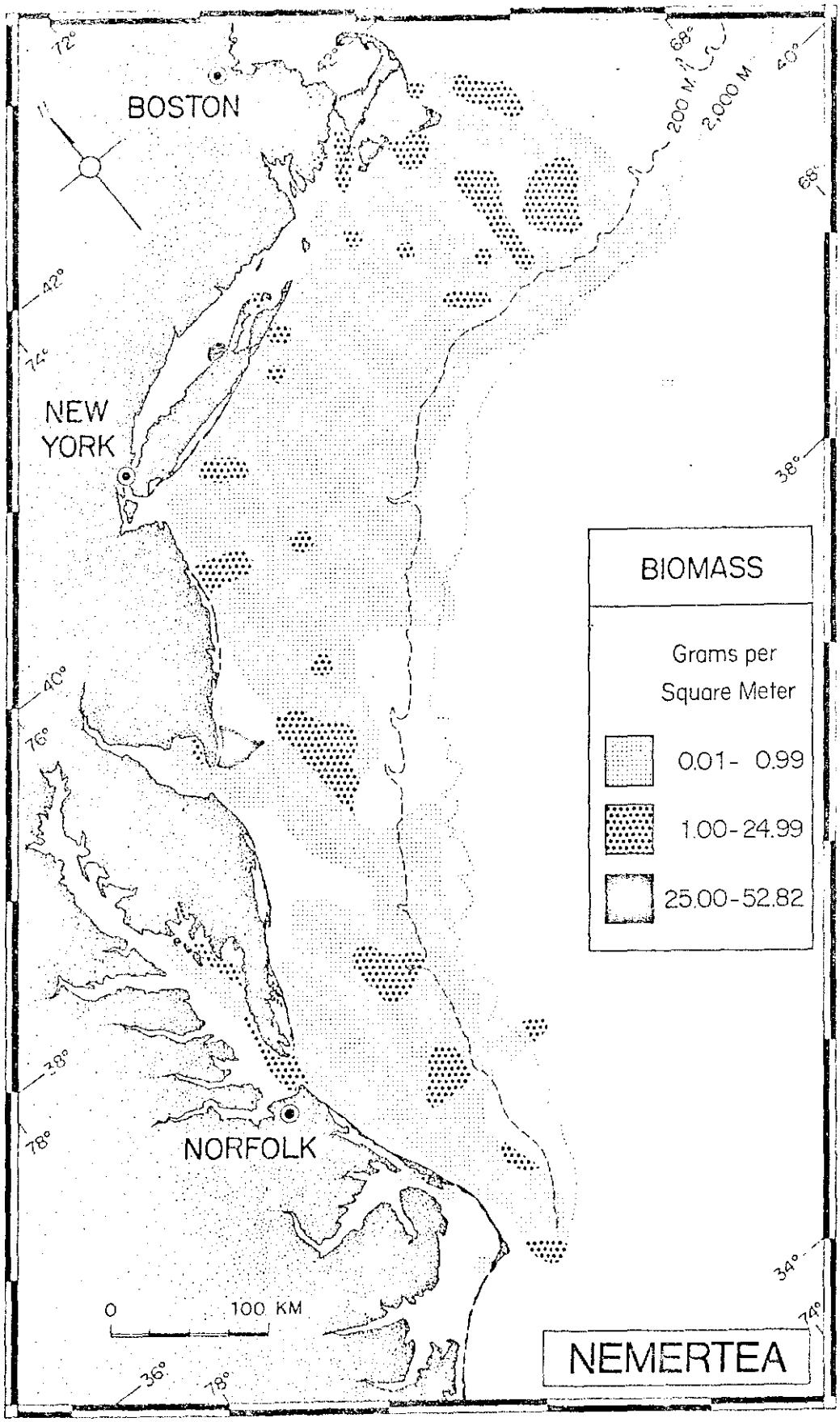

Figure 22.--Geographic distribution of the biomass of Nemertea, expressed as damp weight per square meter of bottom.

stations in the bays and on the continental rise. Nemerteans accounted for a small proportion of the Region's biomass. At most localities where they occurred their biomass was less than 1 g/m^2. Over a moderate proportion of their range, estimated at about ten percent, their biomass ranged between 1 and 25 g/m^2. At only two localities was their biomass greater than 25 g/m^2.

Nematoda (figs. 23 and 24) occurred in a moderate-sized area of the Region, somewhat scattered, but most common along the outer continental shelf, slope, and continental rise. Densities were generally low, ranging from 1 to 24/m^2. Moderate densities (25 to 627/m^2) were encountered in a few localities mainly on the continental shelf south of Cape Cod. Biomass was very small, less than 0.2 g/m^2 in most localities, and between 0.2 and 0.4 g/m^2 in one area located in the Chesapeake Bight subarea.

Annelida (figs. 25 and 26) were ubiquitous throughout the entire Middle Atlantic Bight Region. Densities were highest on the continental shelf. A particularly large area of moderately high density (500 to 1,999/m^2) occurred on the shelf south of Massachusetts. Moderate densities prevailed in the New York Bight subarea, and low densities (less than 25/m^2) were encountered in extensive areas in Chesapeake Bight. Low densities, also, were characteristic of the continental rise. Biomass reflected the same pattern as density. Over a very large portion of the continental shelf, extending from Long Island, New York, southward to Cape Hatteras, the biomass of Annelida ranged between 1 and 25 g/m^2. Off southern Massachusetts a large expanse contained between 25 and 200 g/m^2. Low biomasses (less than 1 g/m^2) were characteristic of the continental rise.

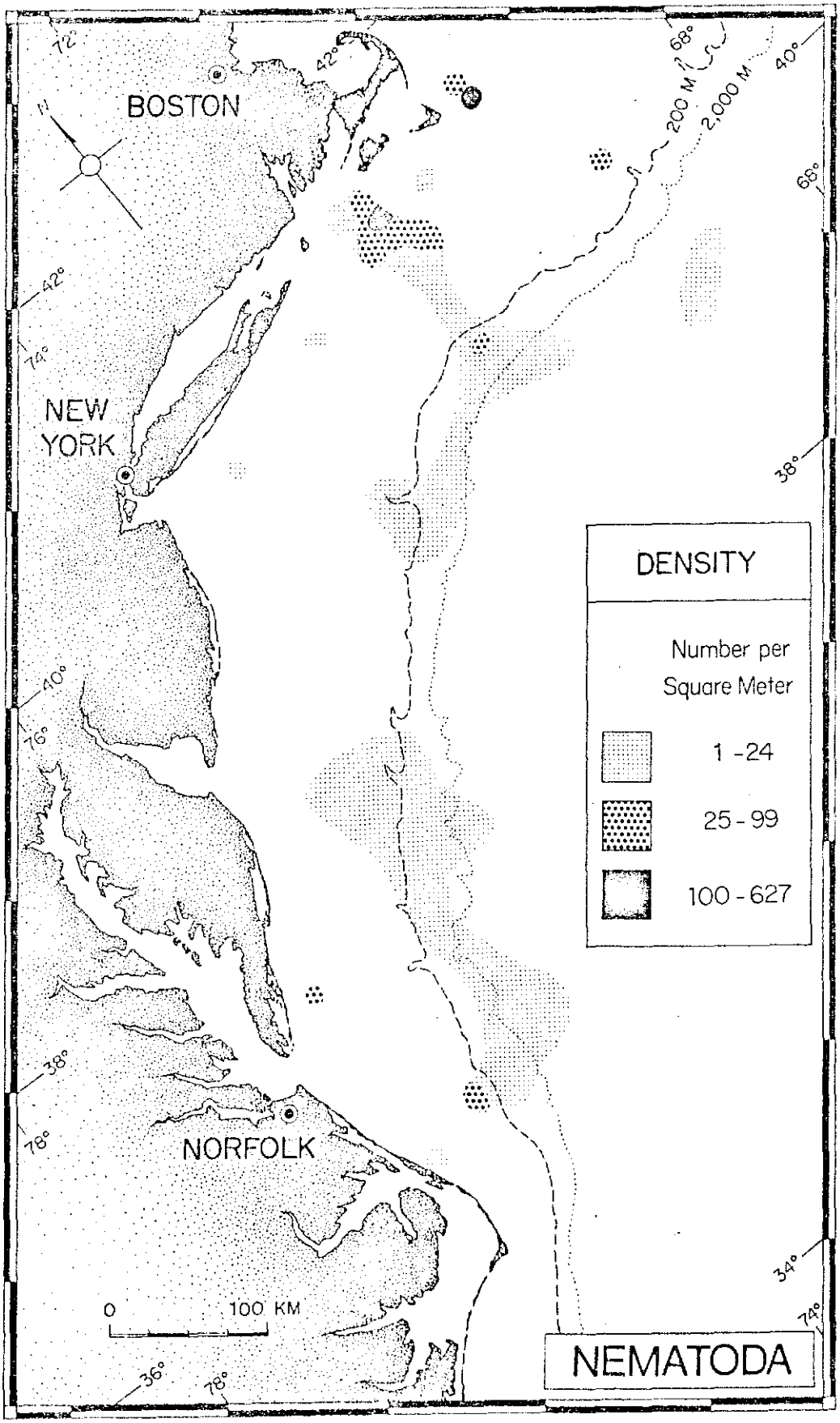

Figure 23.--Geographic distribution of the density of Nematoda, expressed as number of individuals per square meter of bottom.

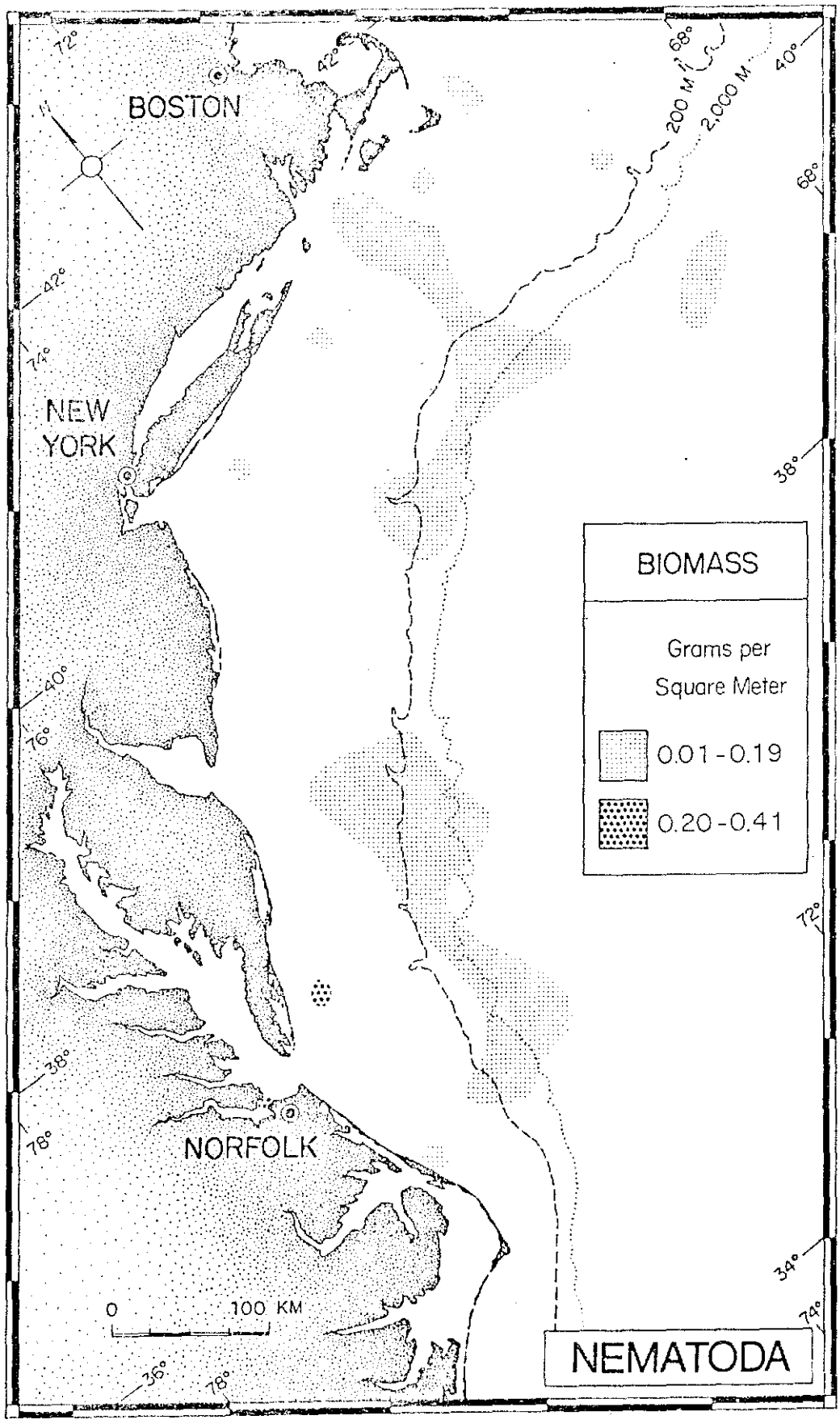

Figure 24.--Geographic distribution of the biomass of Nematoda, expressed as damp weight per square meter of bottom.

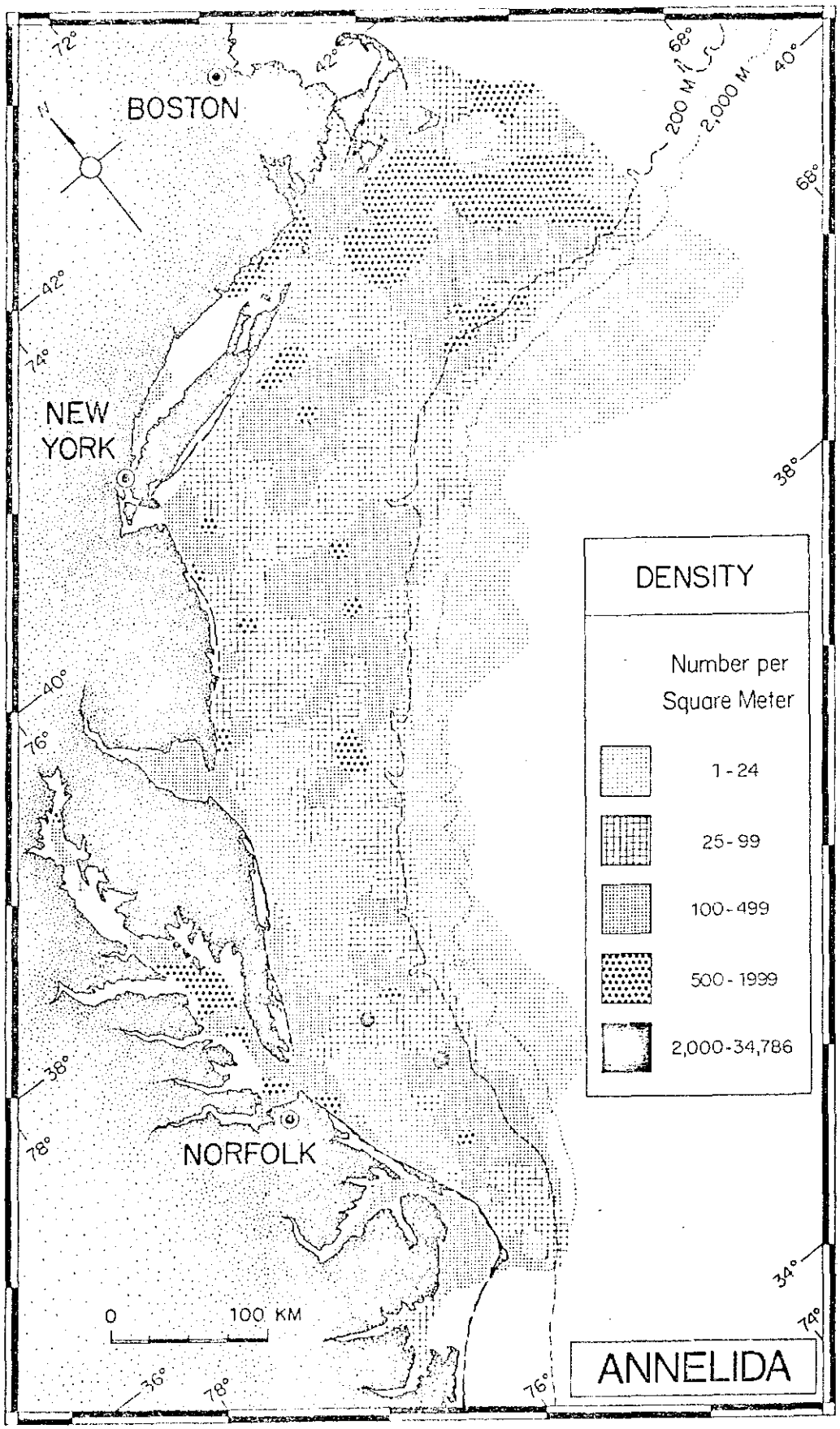

Figure 25.--Geographic distribution of the density of Annelida, expressed as number of individuals per square meter of bottom.

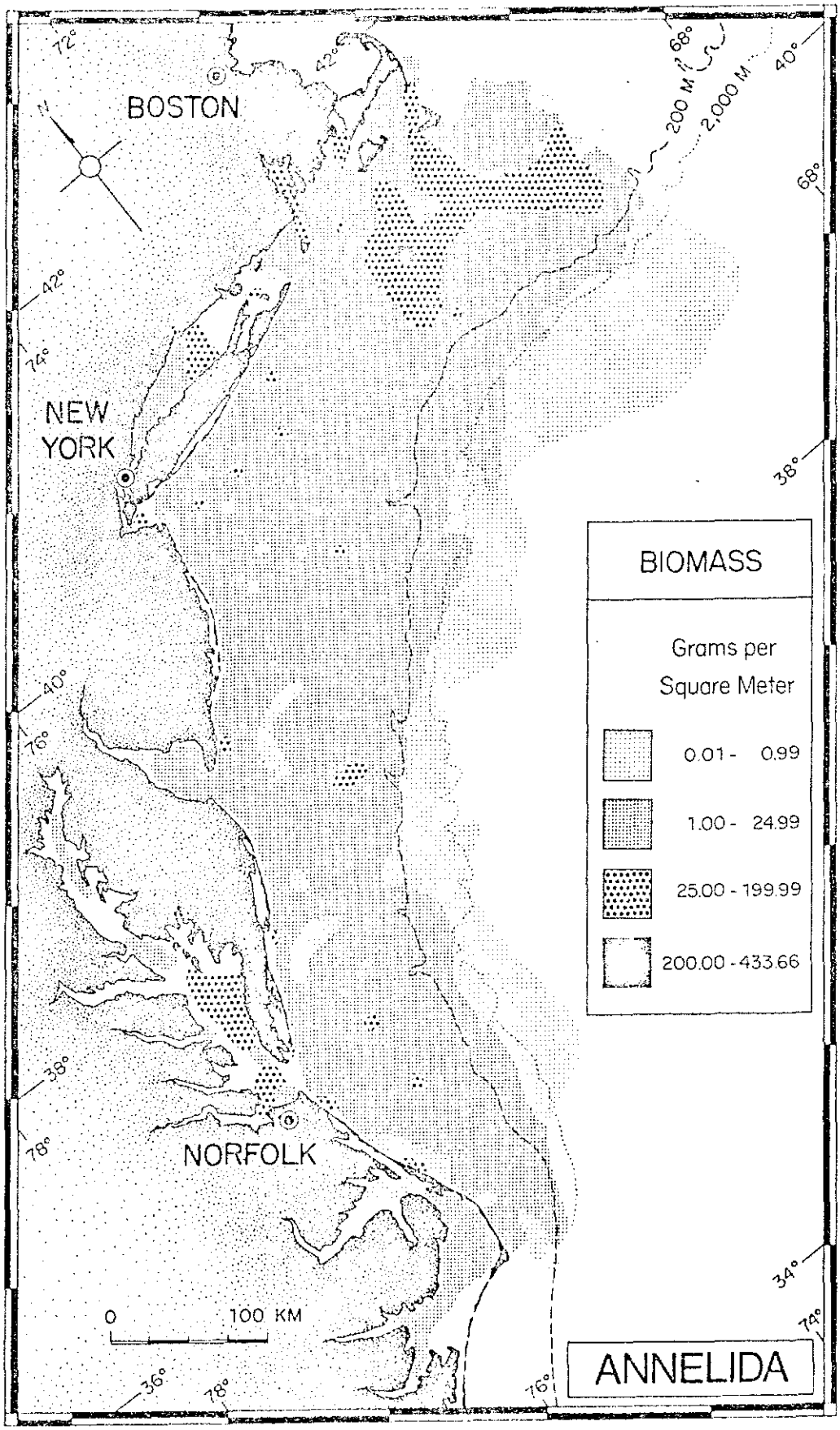

Figure 26.--Geographic distribution of the biomass of Annelida, expressed as damp weight per square meter of bottom.

Pogonophora (figs. 27 and 28) were present throughout the entire deep-water area between Cape Cod and Cape Hatteras. Their primary area of occurrence was on the continental slope and rise, plus several localities on the outer continental shelf. They were present in rather low densities (to 24/m^2), throughout most of their area of occurrence. Moderate densities (25 to 99/m^2) occurred in several localized areas along the continental slope. In only one locality were densities high (100 to 335/m^2). Biomass was small, less than 0.5 g/m^2, in all localities except two, where their biomass ranged between 0.5 and 2.9 g/m^2.

Sipuncula [=Sipunculida] (figs. 29 and 30) occurred over a wide geographic area, extending from the Cape Cod region southward to Cape Hatteras. Their occurrence was centered primarily on the continental shelf and slope, with moderate occurrences on the continental rise but only limited occurrences in the bays and sounds. In the northern sector they occurred in shallow waters, whereas in the middle and southern sectors they were absent from the inner and middle shelf regions. Their density was less than 24/m^2 throughout most of their range, but in several localities in the northern shelf area their density ranged between 25 and 99/m^2. At only one location, a northern inshore area off Rhode Island, did they occur in high density (100 and 311/m^2). Biomass over roughly half their area of occurrence was less than 1 g/m^2. At somewhat less than half their area of occurrence the biomass ranged between 1 and 24 g/m^2. They constituted a large biomass (25 to 85 g/m^2) in only two areas, both on the continental slope and rise.

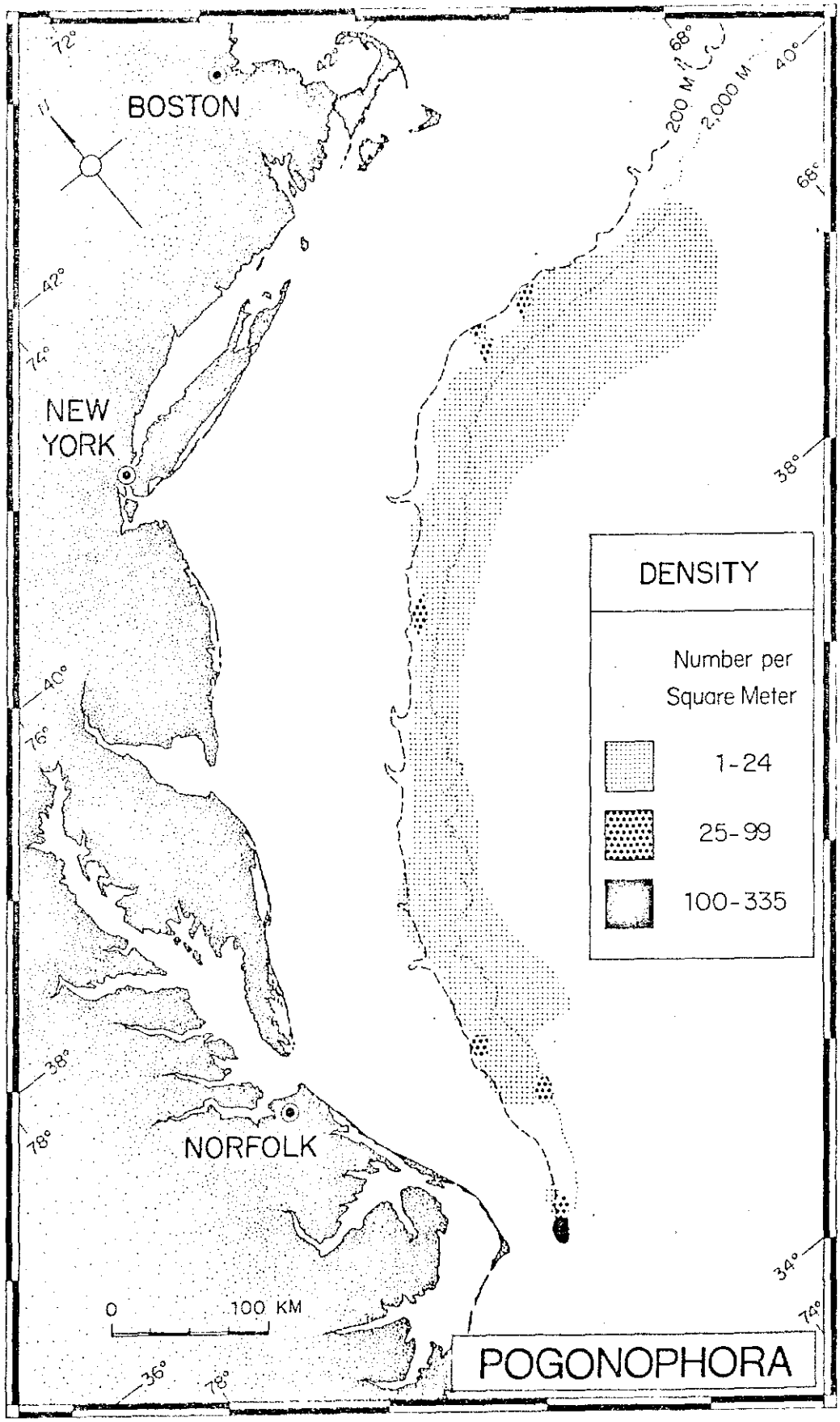

Figure 27.--Geographic distribution of the density of Pogonophora, expressed as number of individuals per square meter of bottom.

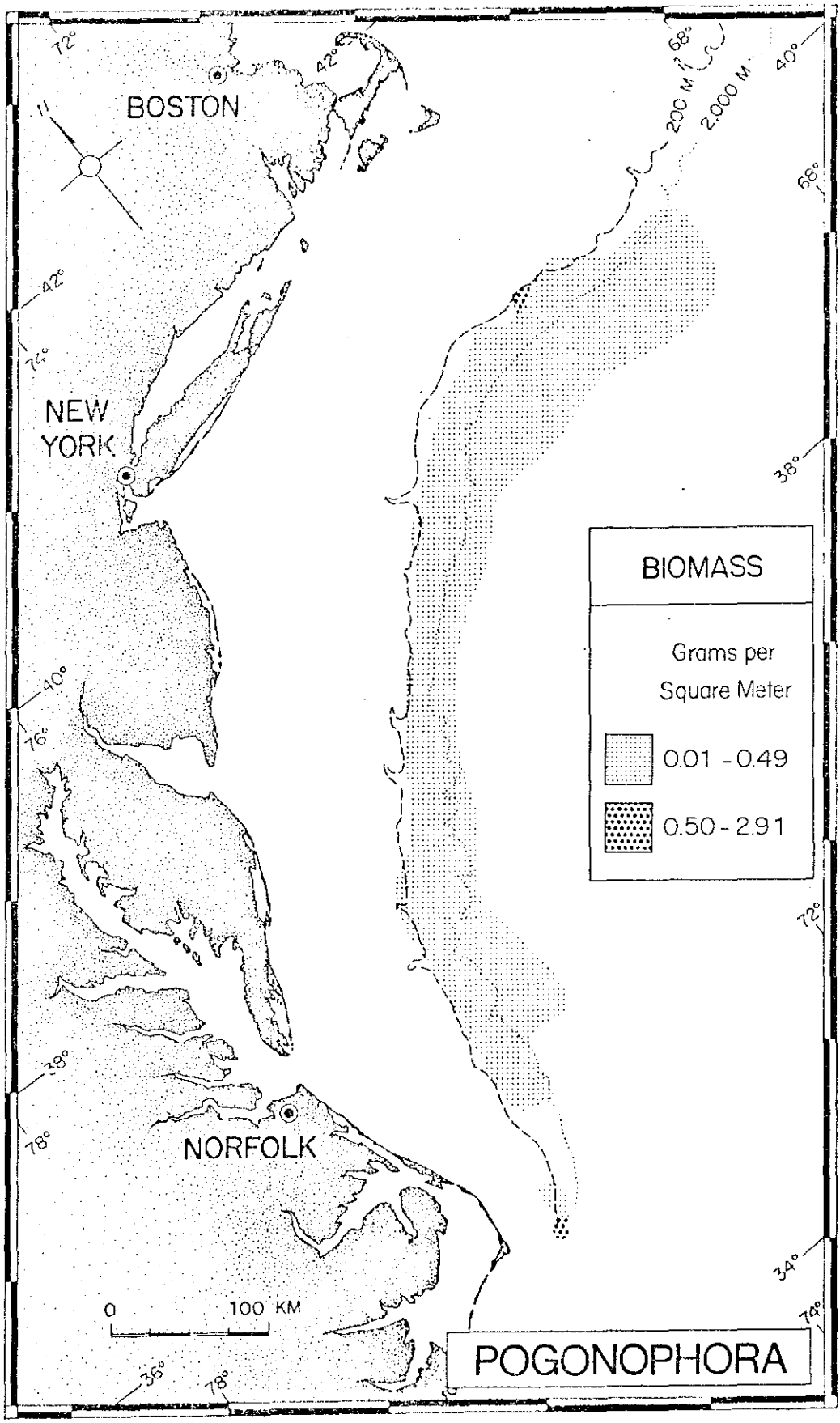

Figure 28.--Geographic distribution of the biomass of Pogonophora, expressed as damp weight per square meter of bottom.

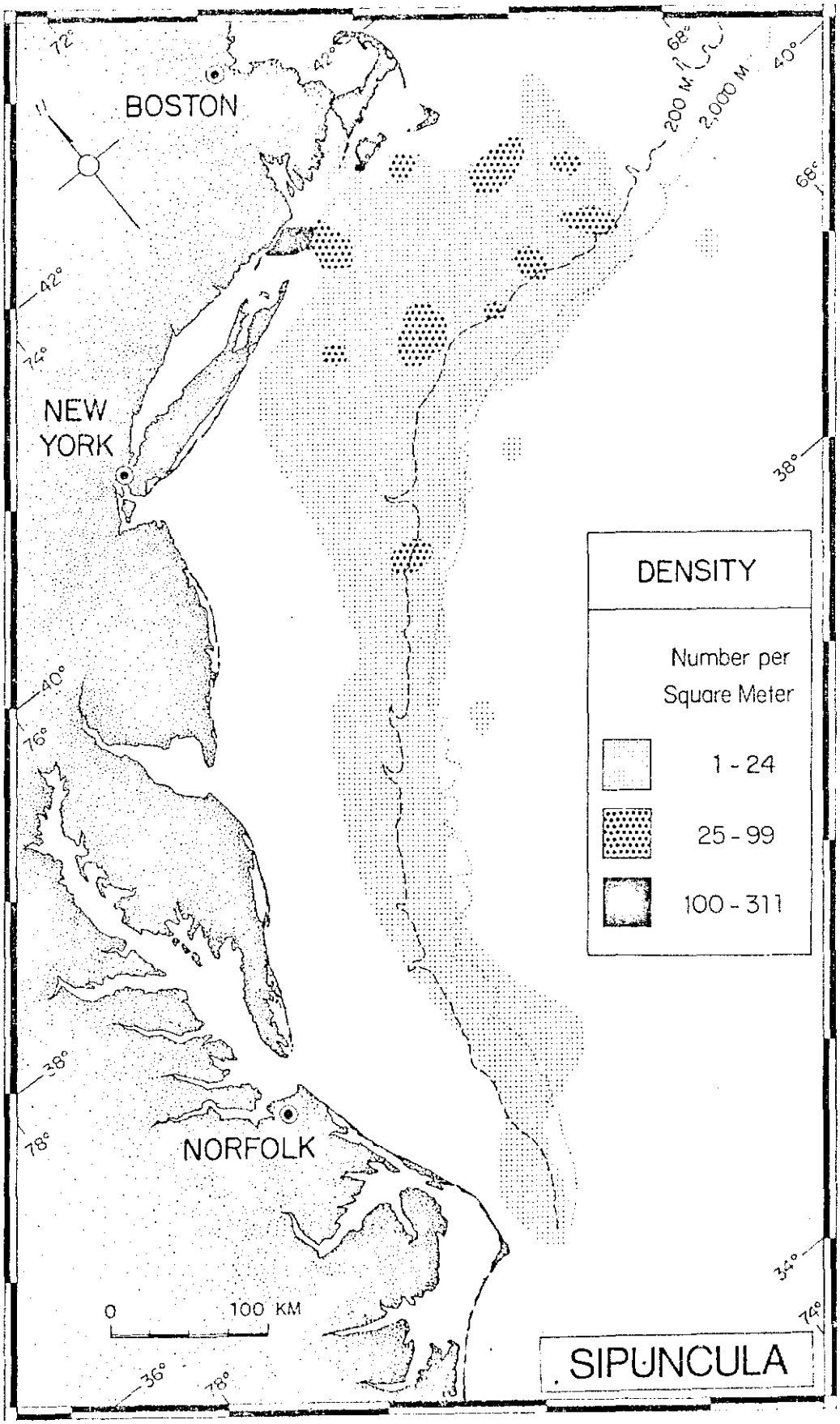

Figure 29.--Geographic distribution of the density of Sipuncula, expressed as number of individuals per square meter of bottom.

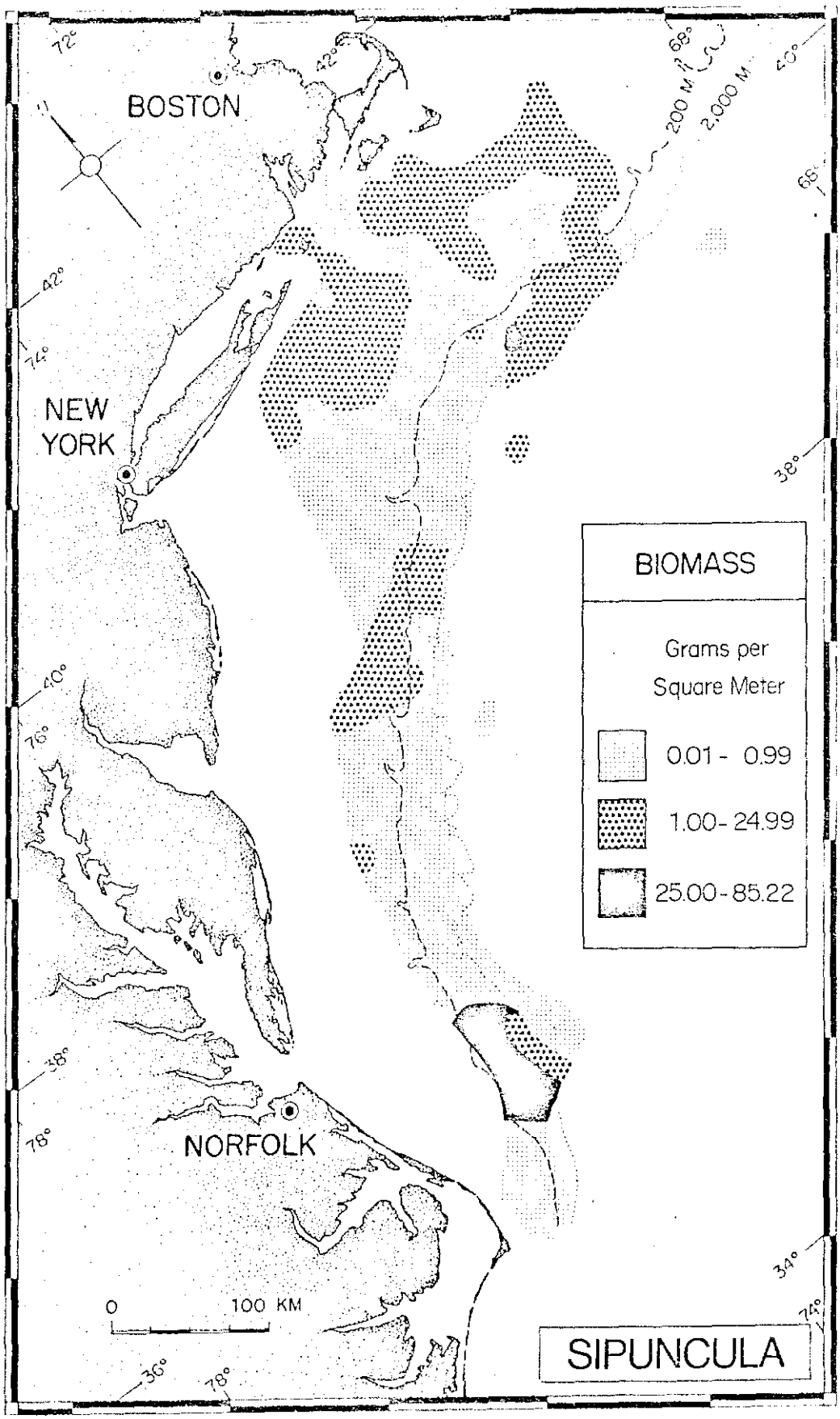

Figure 30.--Geographic distribution of the biomass of Sipuncula, expressed as damp weight per square meter of bottom.

Echiura (figs. 31 and 32) were sparsely distributed in the Region and occurred most commonly on the continental rise. One small patch occurred on the mid-continental shelf off Delaware and two small patches were found in inshore waters at the tip of Long Island, N.Y., and in Pamlico Sound, N.C. Density ranged from 1 to 21/m^2 and biomass ranged from a low of 0.01 g/m^2 to a high of 27 g/m^2.

Priapulida (figs. 31 and 32) were found only at two localities on the continental slope and one on the continental rise. Quantities were very low at all localities.

Mollusca (figs. 33 and 34) occurred at virtually all sampling stations in the Middle Atlantic Bight Region, thus their geographical distribution was exceptionally broad. Density ranged up to over 58,000/m^2. From an overall view, there were four density bands extending north to south roughly parallel to the coast throughout most of the Region. The first band was located in the bays and sounds and includes the entire continental shelf. This is a high-density (large areas with densities greater than 50/m^2) band. The second band, parallel to the first, occupied the approximate middle of the continental shelf; this was a low-density (mostly less than 50/m^2) band. The third band was located along the outer continental shelf and upper slope. This was a high density (mostly greater than 50/m^2) band with a broad northern end. The fourth band, located along the lower continental slope and continental rise, was a low-density (fewer than 50/m^2) band. Biomass of mollusks ranged up to more than 9,555 g/m^2. Exceptionally large areas of large biomass (greater than 100 g/m^2) occurred on the continental shelf, particularly between Cape Cod and Delaware Bay. Moderate quantities (5 to 99 g/m^2) also prevailed in extensive areas in this region. In the Chesapeake Bight subarea the biomass of mollusks was typically less than 5 g/m^2, except in some inner shelf areas and along the shelf break.

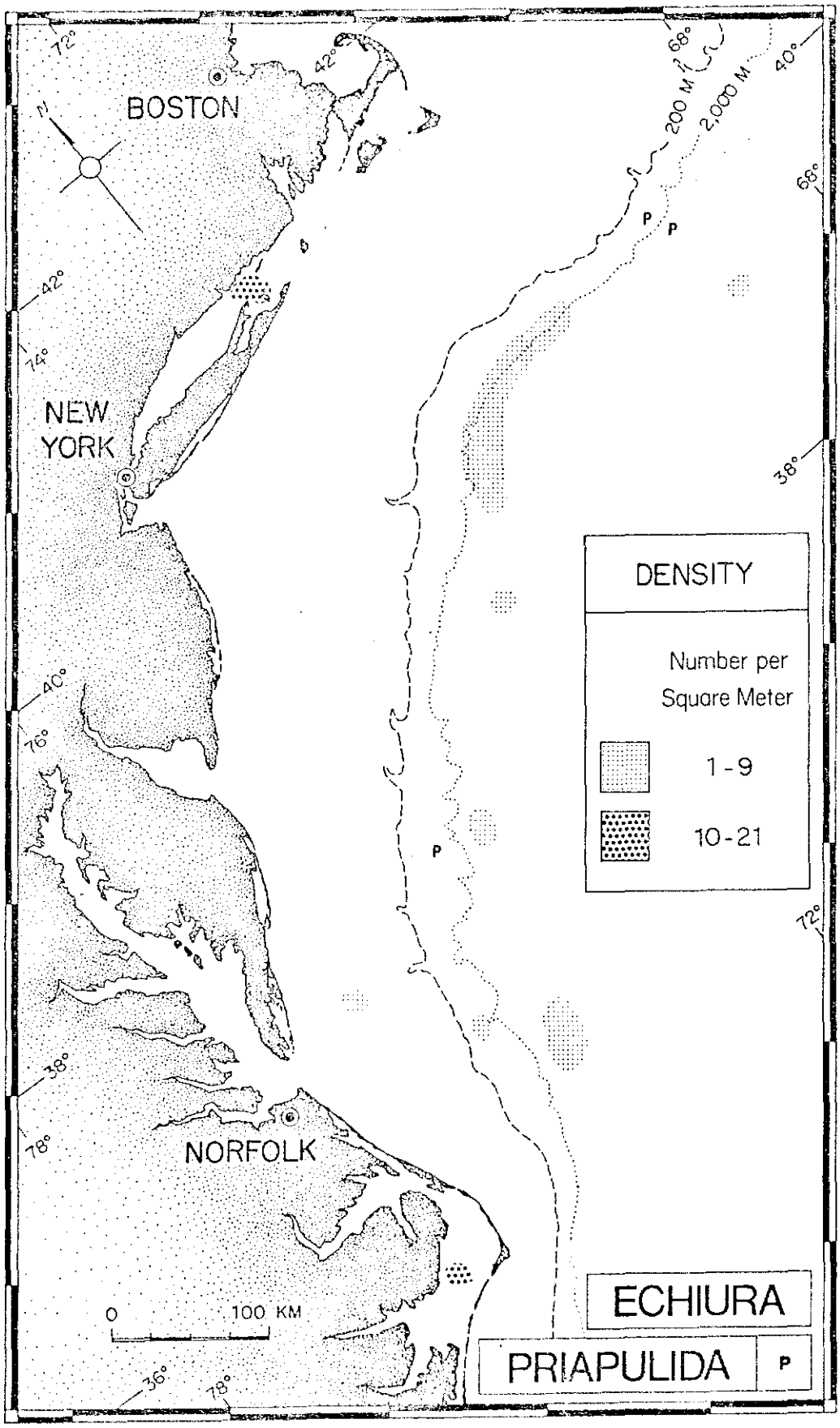

Figure 31.--Geographic distribution of the density of Echiura and Priapulida, expressed as number of individuals per square meter of bottom.

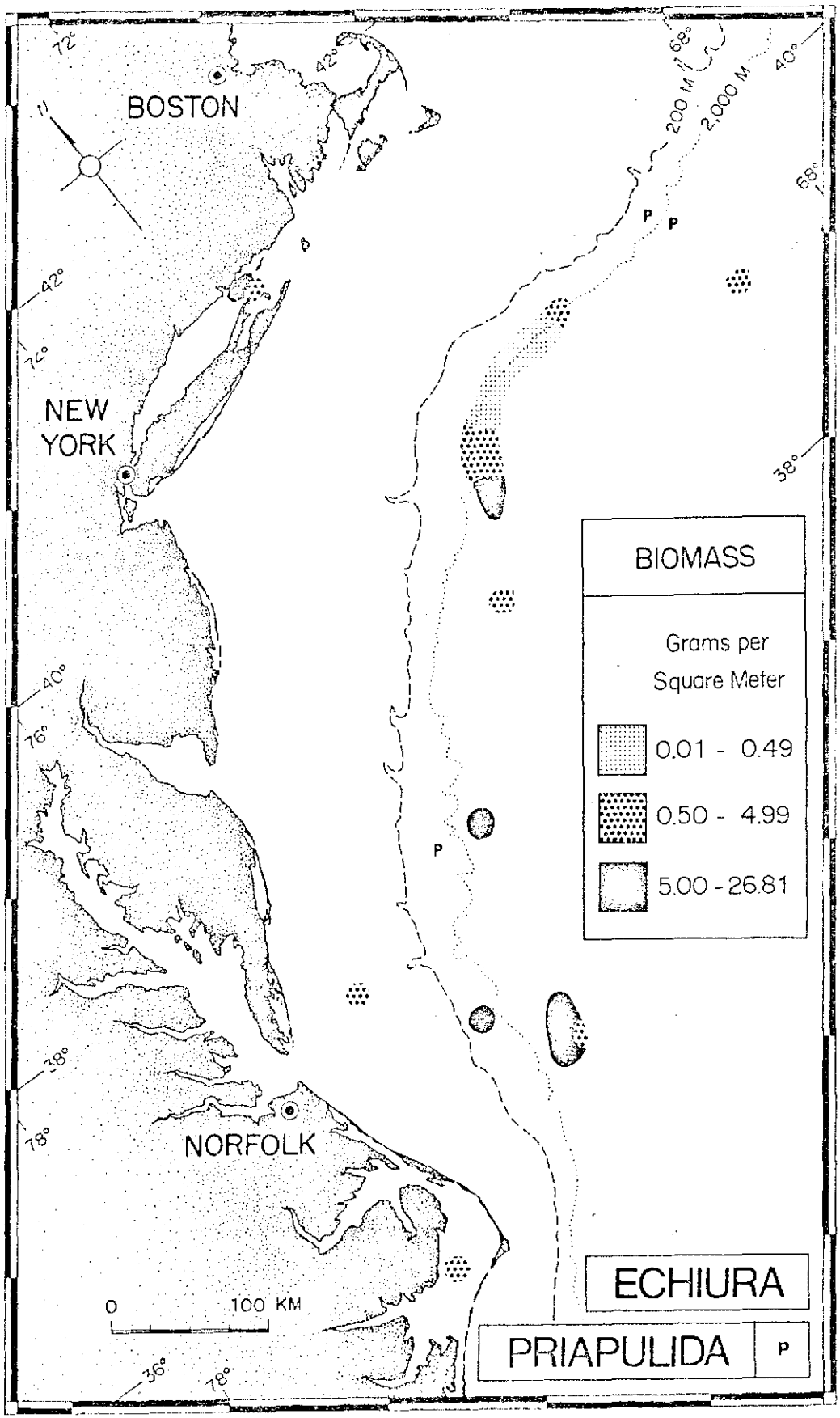

Figure 32.--Geographic distribution of the biomass of Echiura and Priapulida, expressed as damp weight per square meter of bottom.

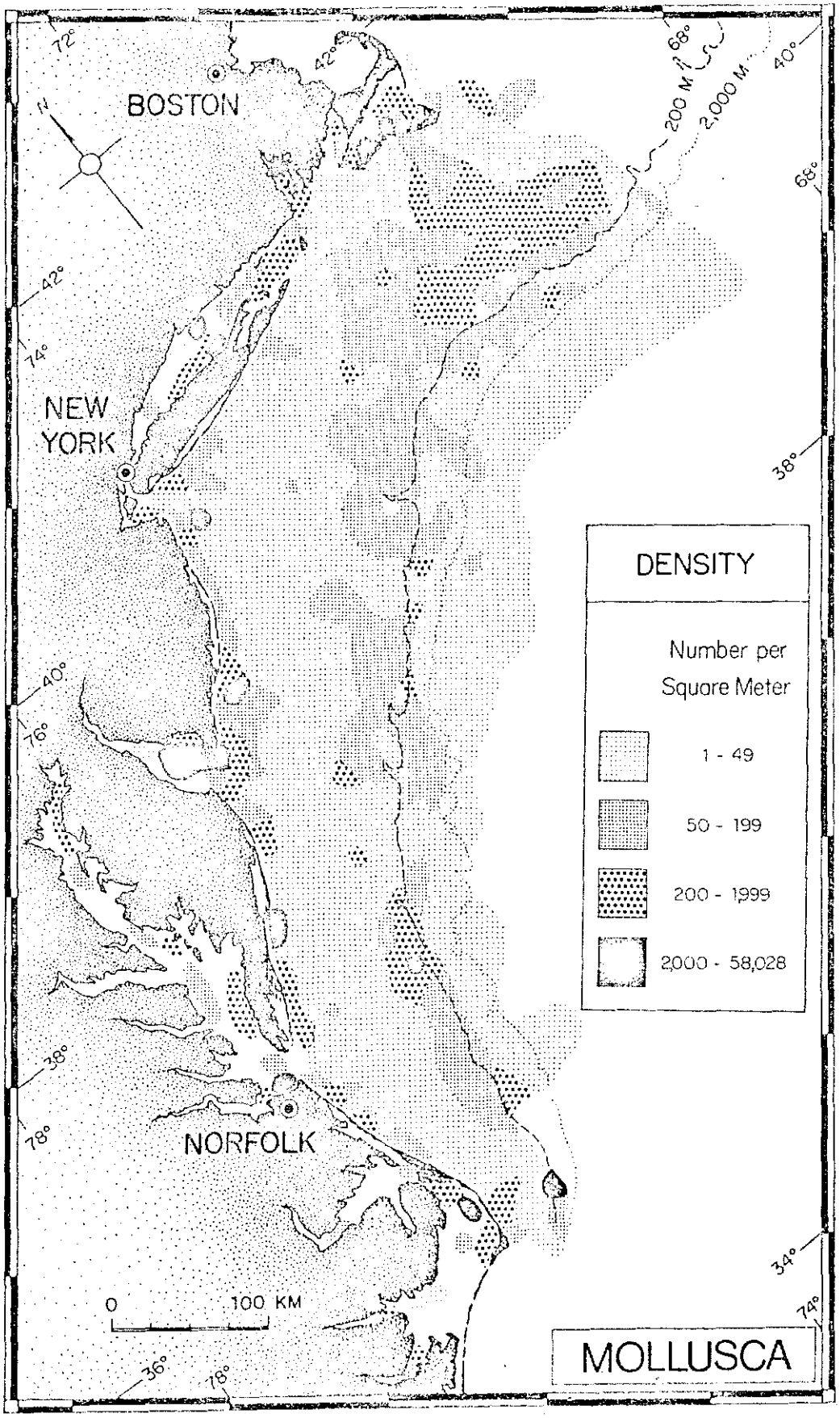

Figure 33.--Geographic distribution of the density of Mollusca, expressed as number of individuals per square meter of bottom.

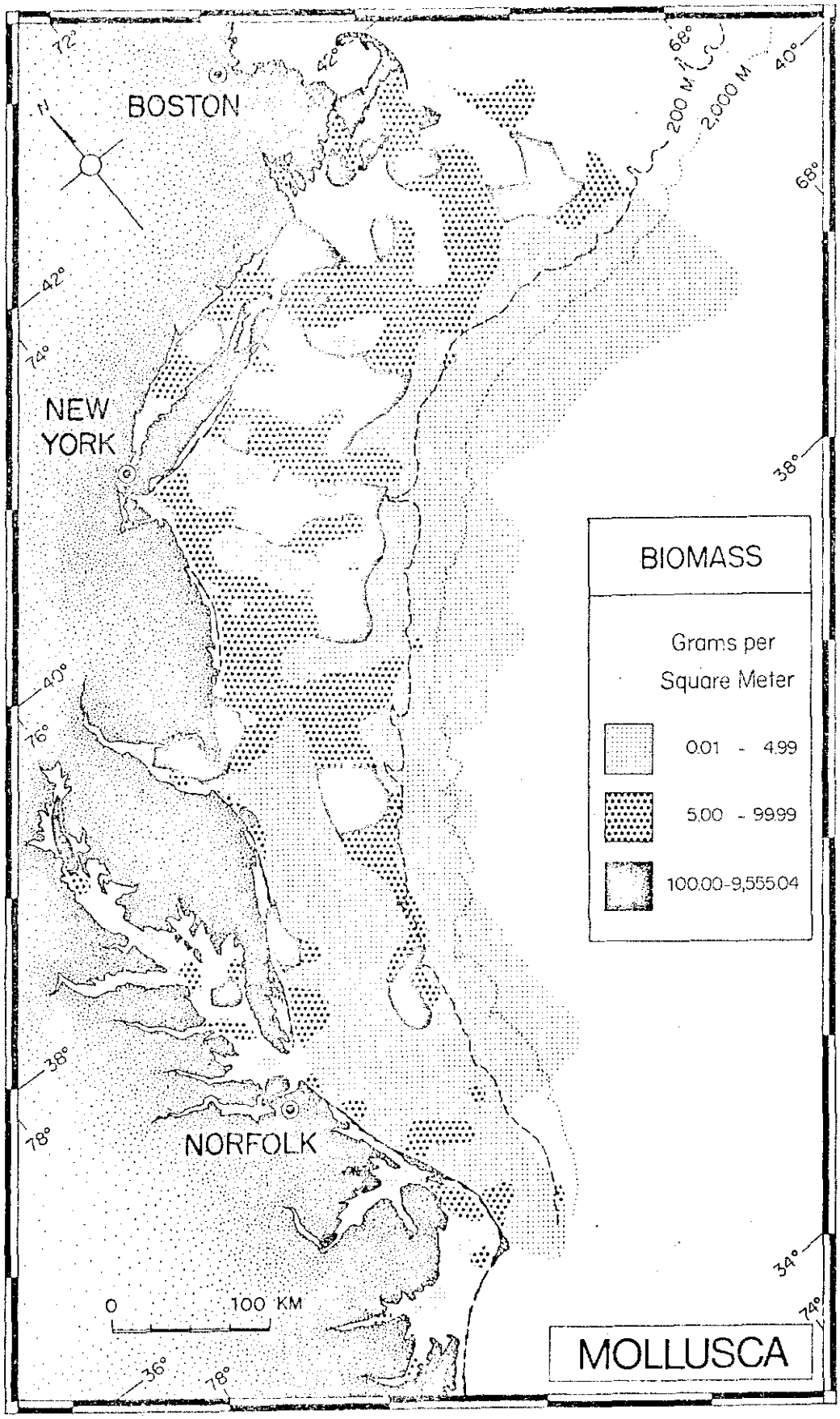

Figure 34.--Geographic distribution of the biomass of Mollusca, expressed as damp weight per square meter of bottom.

Polyplacophora (figs. 35 and 36) were distributed in small, rather widely separated patches, primarily on the outer continental shelf, slope, and rise. They occurred in only two localities in inshore waters. Density throughout most of their area of occurrence was less than 24/m^2, and biomass was typically smaller than 0.5 g/m^2.

Gastropoda (figs. 37 and 38) were distributed over extensive areas extending from the northern to southern boundaries of the Region and from inshore waters to the outermost areas sampled. In addition to their occurrence in the bays and sounds, their distribution generally formed bands parallel to the coastline. A moderately high density (10 to 99/m^2) band was present along the coast. Just seaward of this high density band was a low density (less than 10/m^2) band. In the central and outer portions of the continental shelf gastropods were absent, except in the area south of Rhode Island and Massachusetts where a density of 10 to 999/m^2 occurred. Along the upper continental slope they occurred in moderately high density, with low density bands on either side. Biomass was small to moderate (0.01 to 5 g/m^2) over the major portion of gastropod distribution. Intermediate (5 to 25 g/m^2) biomasses were patchily distributed primarily along the inner shelf areas and in bays and sounds, but a few patches occurred in the mid-shelf regions south of Cape Cod and southeast of Long Island. Large biomasses (25 to 394 g/m^2) were restricted almost exclusively to bays and sounds, except for one small area in mid-shelf depths south of Nantucket Island.

Bivalvia (figs. 39 and 40) were ubiquitous throughout the Middle Atlantic Bight Region. Their pattern of density formed bands more or less parallel to the coastline. A narrow band of moderate density (50 to

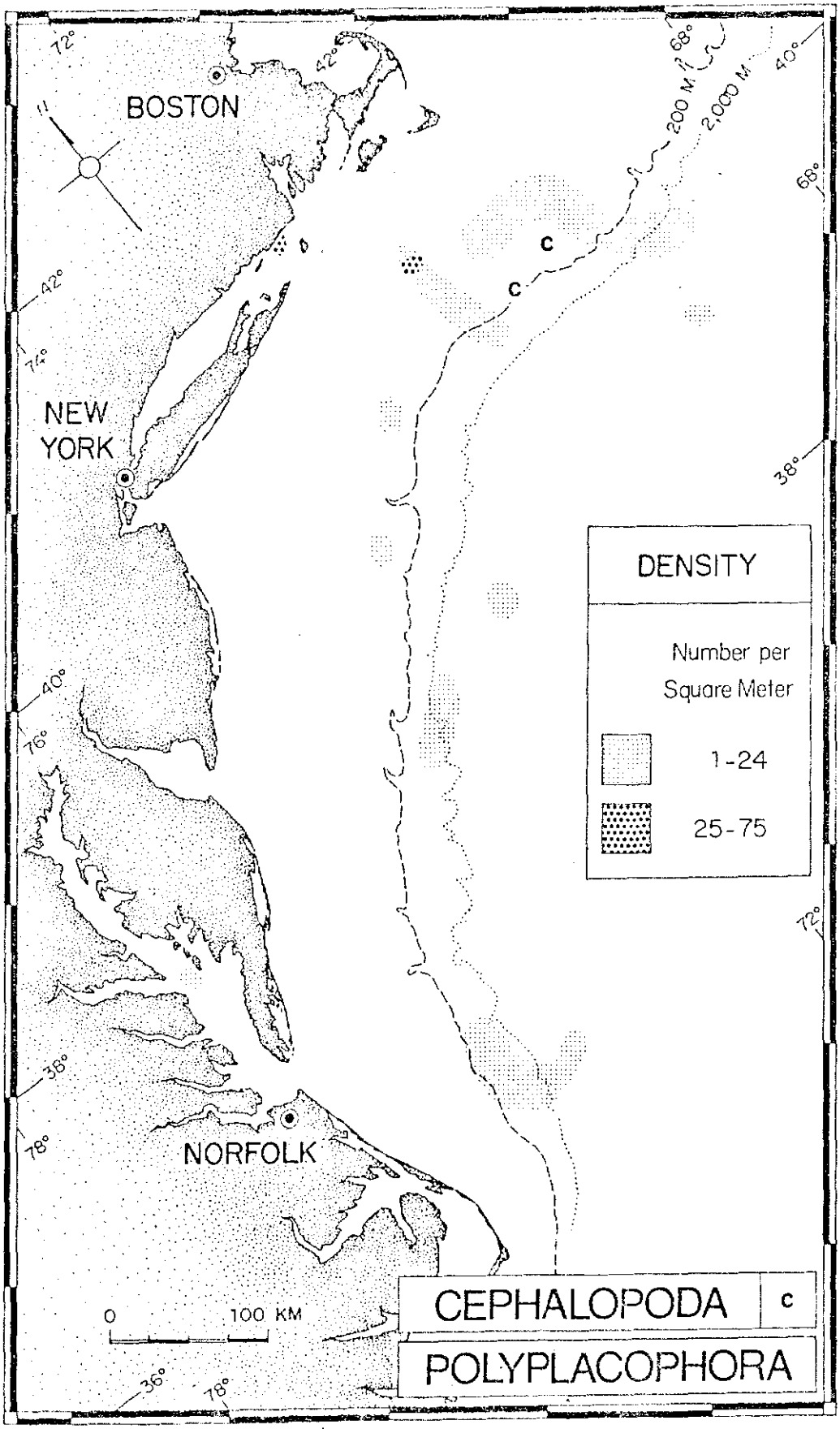

Figure 35.--Geographic distribution of the density of Cephalopoda and Polyplacophora, expressed as number of individuals per square meter of bottom.

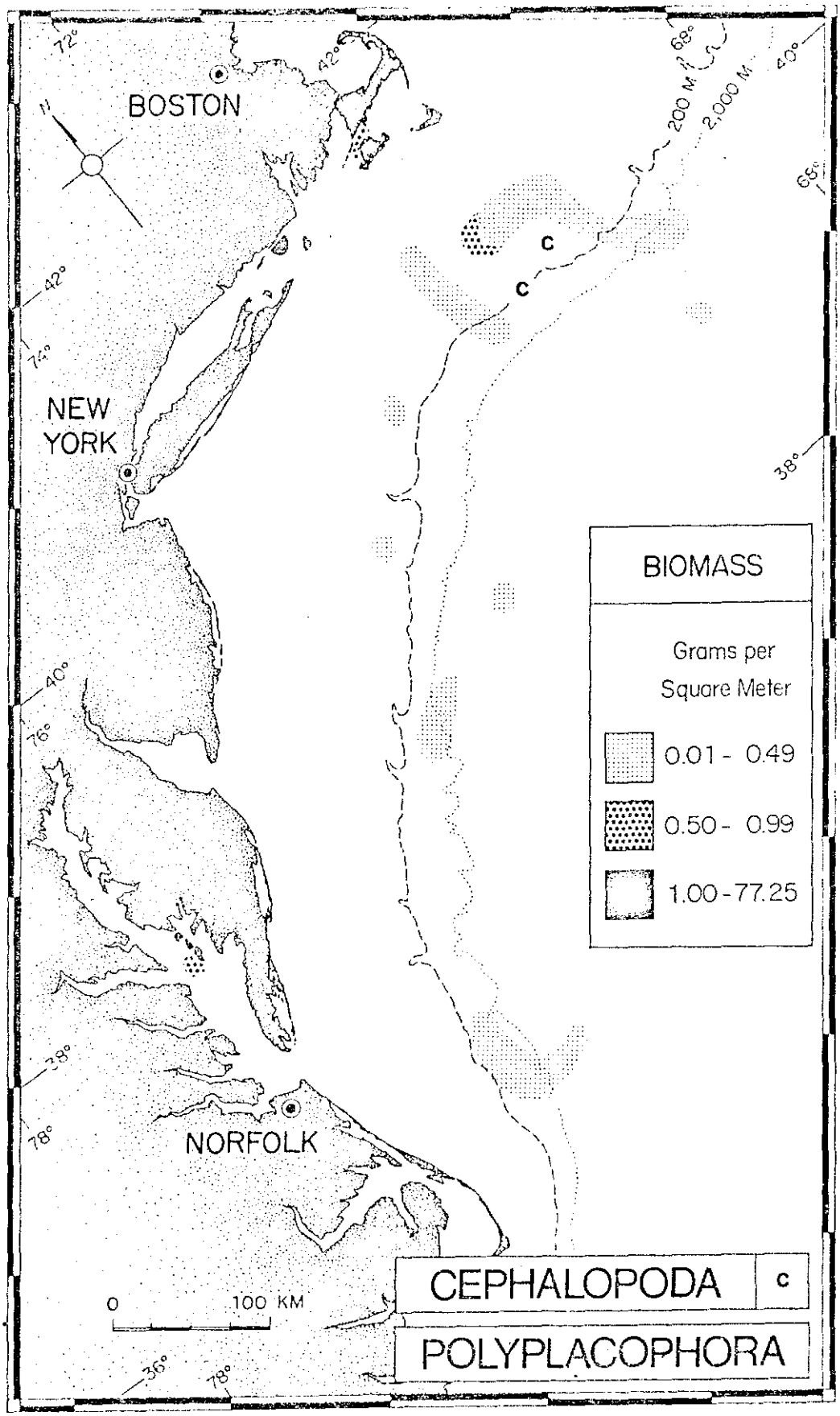

Figure 36.--Geographic distribution of the biomass of Cephalopoda and Polyplacophora, expressed as damp weight per square meter of bottom.

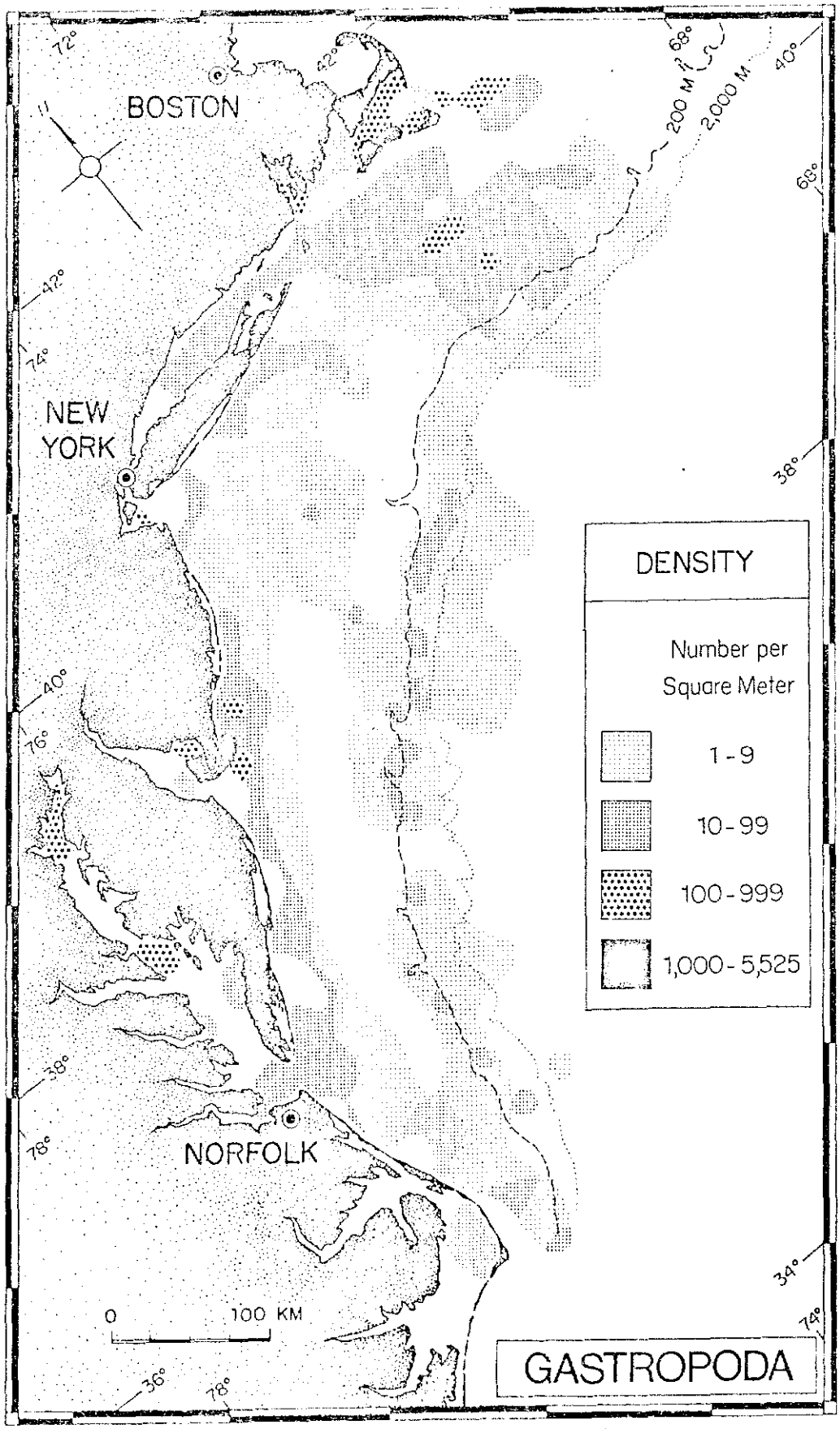

Figure 37.--Geographic distribution of the density of Gastropoda, expressed as number of individuals per square meter of bottom.

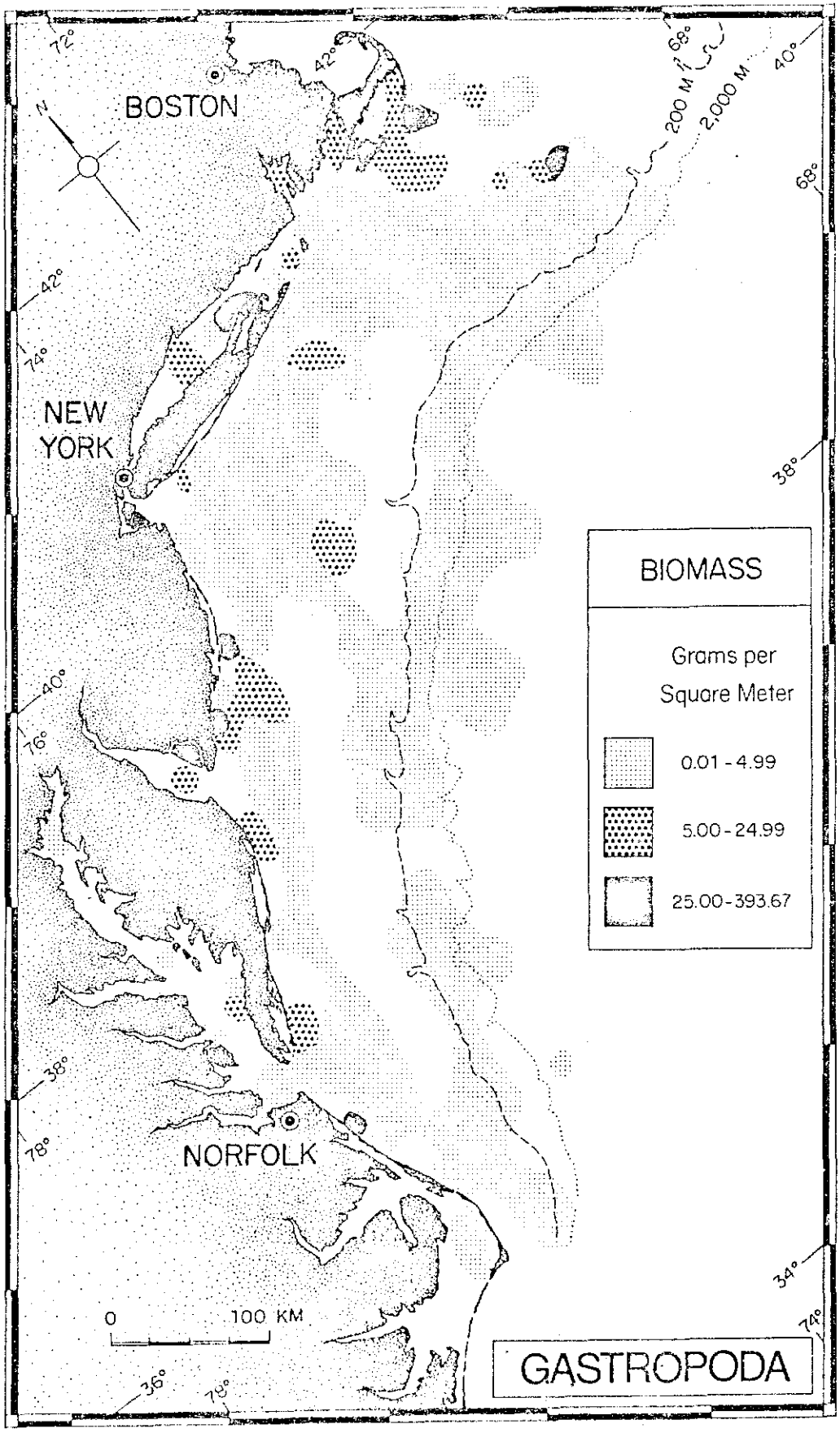

Figure 38.--Geographic distribution of the biomass of Gastropoda, expressed as damp weight per square meter of bottom.

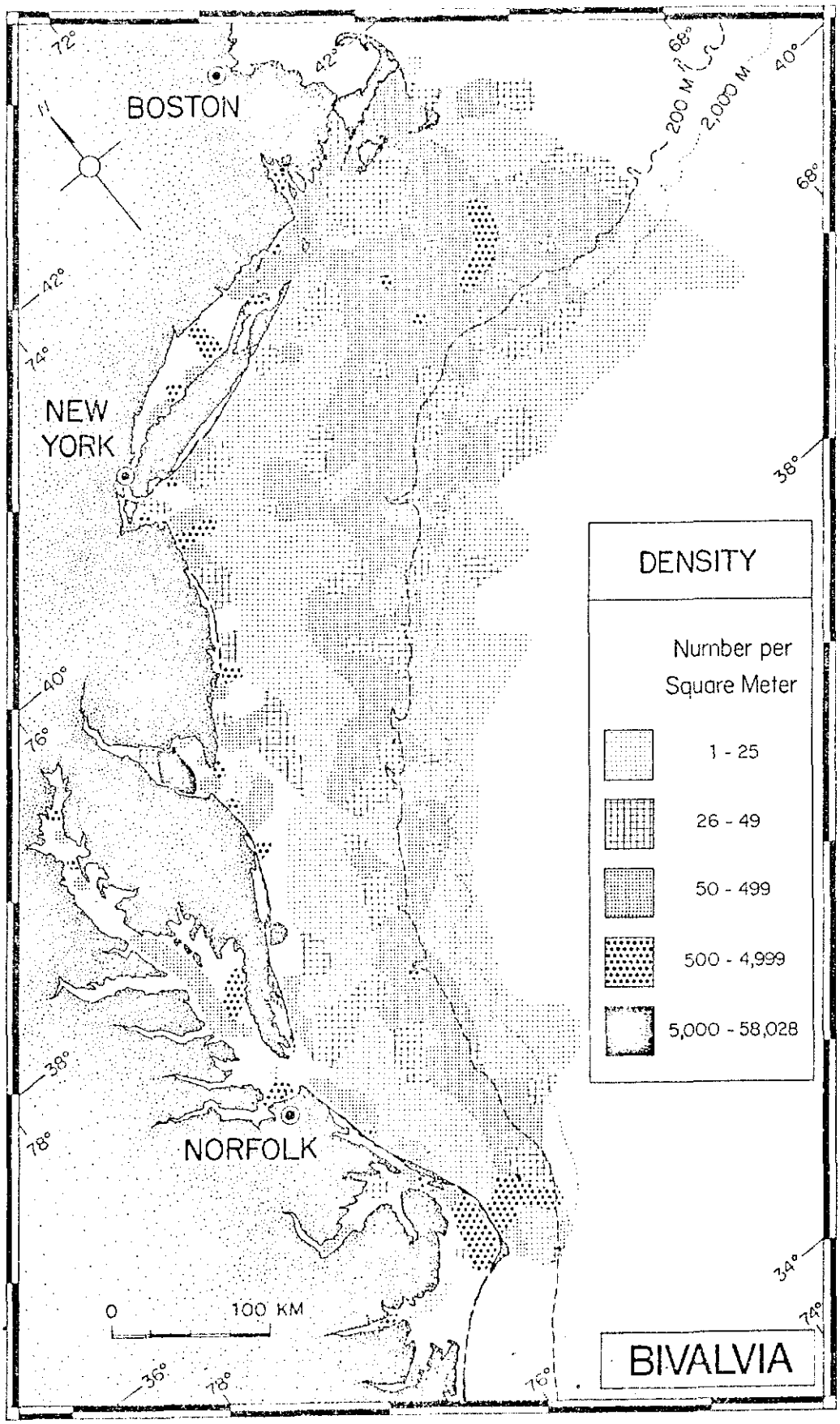

Figure 39.--Geographic distribution of the density of Bivalvia, expressed as number of individuals per square meter of bottom.

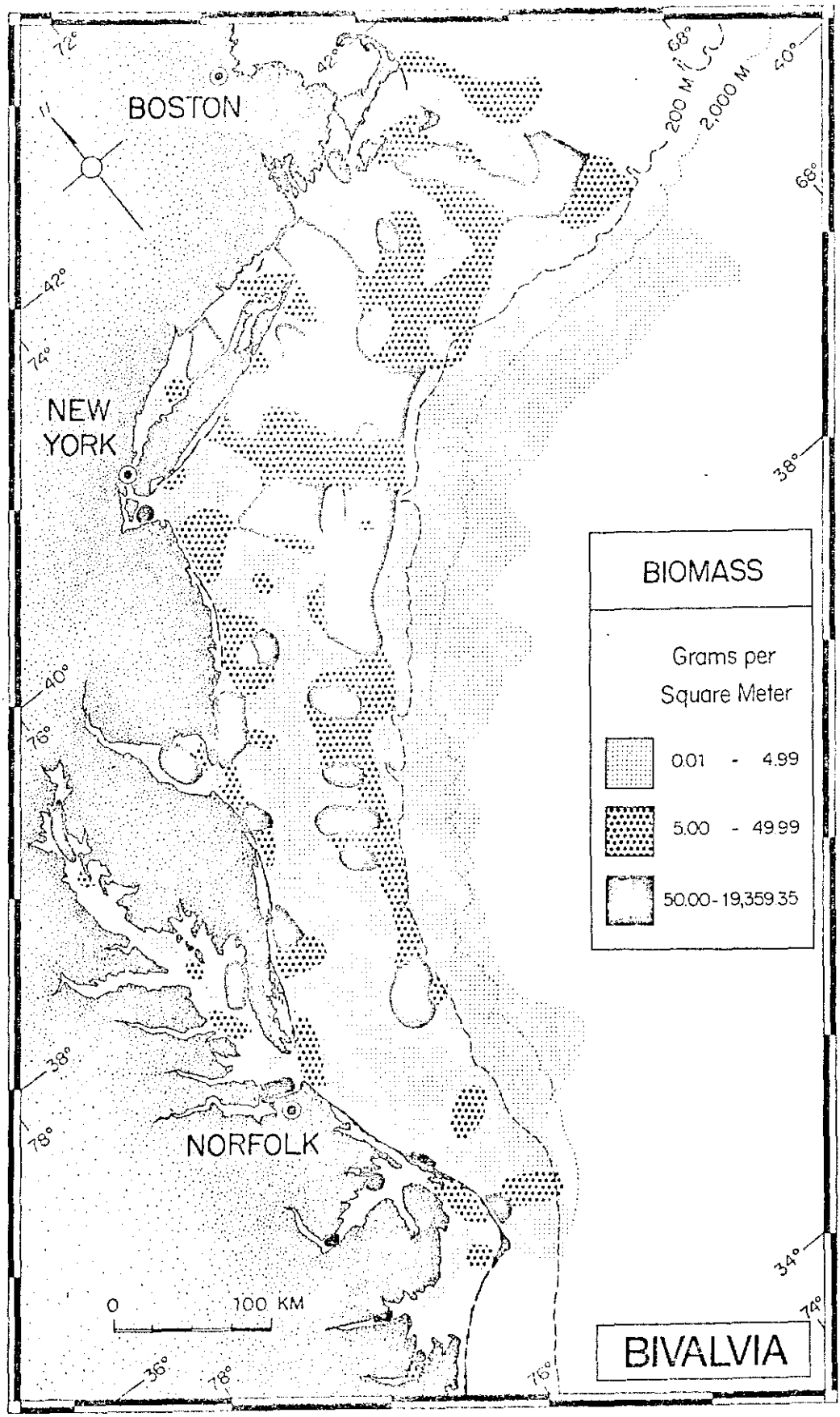

Figure 40.--Geographic distribution of the biomass of Bivalvia, expressed as damp weight per square meter of bottom.

500/m^2) occurred along the coast. A somewhat broader band of low density (less than 25/m^2) was distributed through the central part of the shelf. Another band of moderate density, very broad in the Southern New England area and narrower in the southern section, extended the entire length of the Region. Biomass patterns were essentially similar to those of density. Two bands of small biomass (0.01 to 5 g/m^2) occurred, one offshore beginning on the upper part of the continental shelf and extending to the deepest depths sampled; the other occupied the mid-shelf regions east of Long Island and below New York City. Two bands of moderate biomasses (5 to 50 g/m^2) were situated on the inner and outer continental shelf. Patches of large biomasses (50 to 19,300+ g/m^2) occurred in bays and sounds throughout the entire Region and on the middle to outer shelf region of Southern New England and New York Bight. Large offshore biomasses in the more southerly regions were confined to the outer shelf.

Scaphopoda (figs. 41 and 42) were distributed in a narrow (25 to 50/Km) band along the outer continental shelf and slope extending the entire length of the Middle Atlantic Bight Region. Density was low (less than 24/m^2) throughout this band, except at four localized areas where their density ranged between 25 to 77/m^2. Biomass was small, (less than 0.5 g/m^2), throughout most of this band, and reached a maximum of only 2.5 g/m^2.

Cephalopoda (figs. 35 and 36) were represented entirely by eggs. They occurred in moderately small quantities at only two localities on the outer continental shelf off southern Massachusetts.

Arthropoda (figs. 43 and 44) were nearly ubiquitous throughout the entire Region. They were one of the most common taxonomic groups

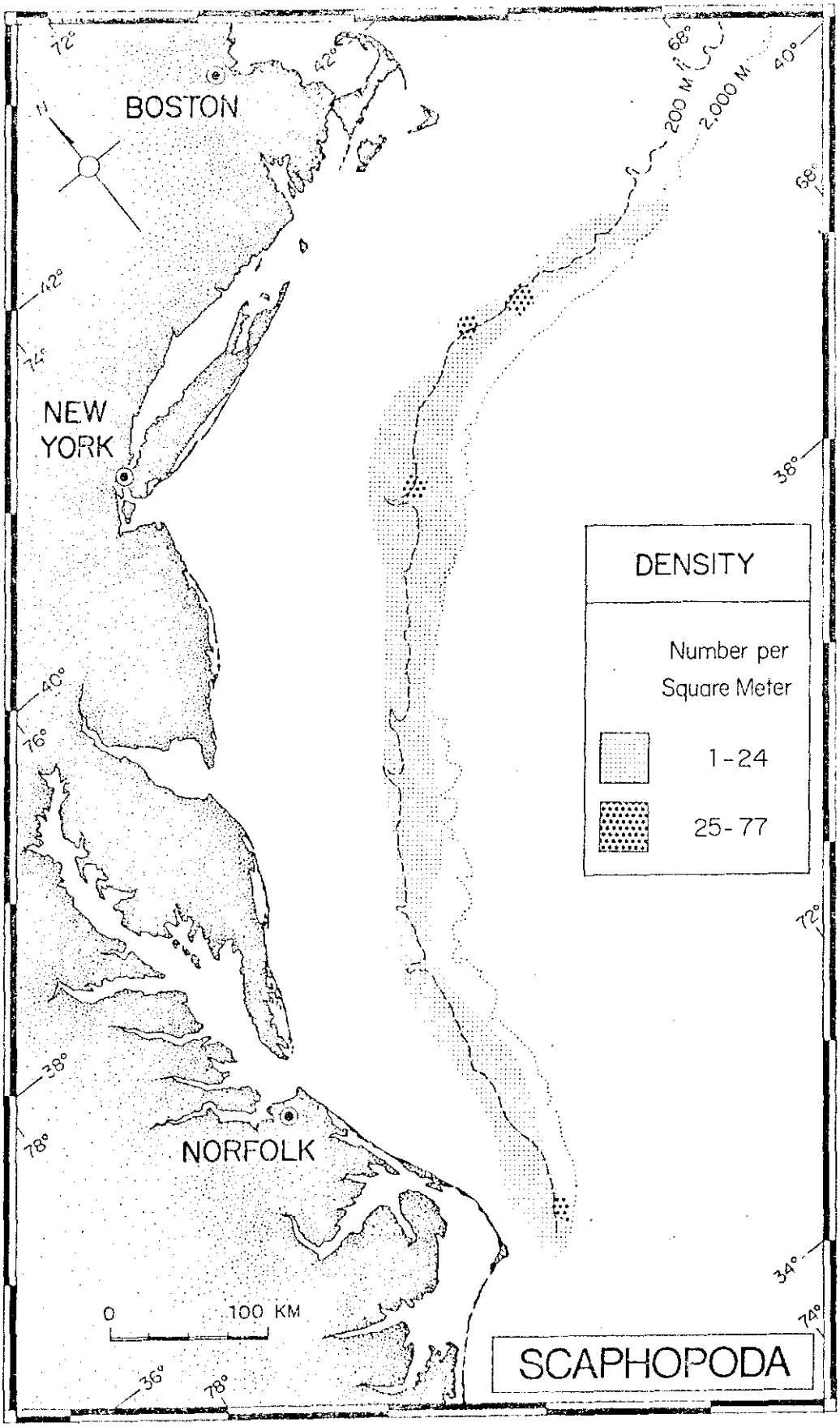

Figure 41.--Geographic distribution of the density of Scaphopoda, expressed as number of individuals per square meter of bottom.

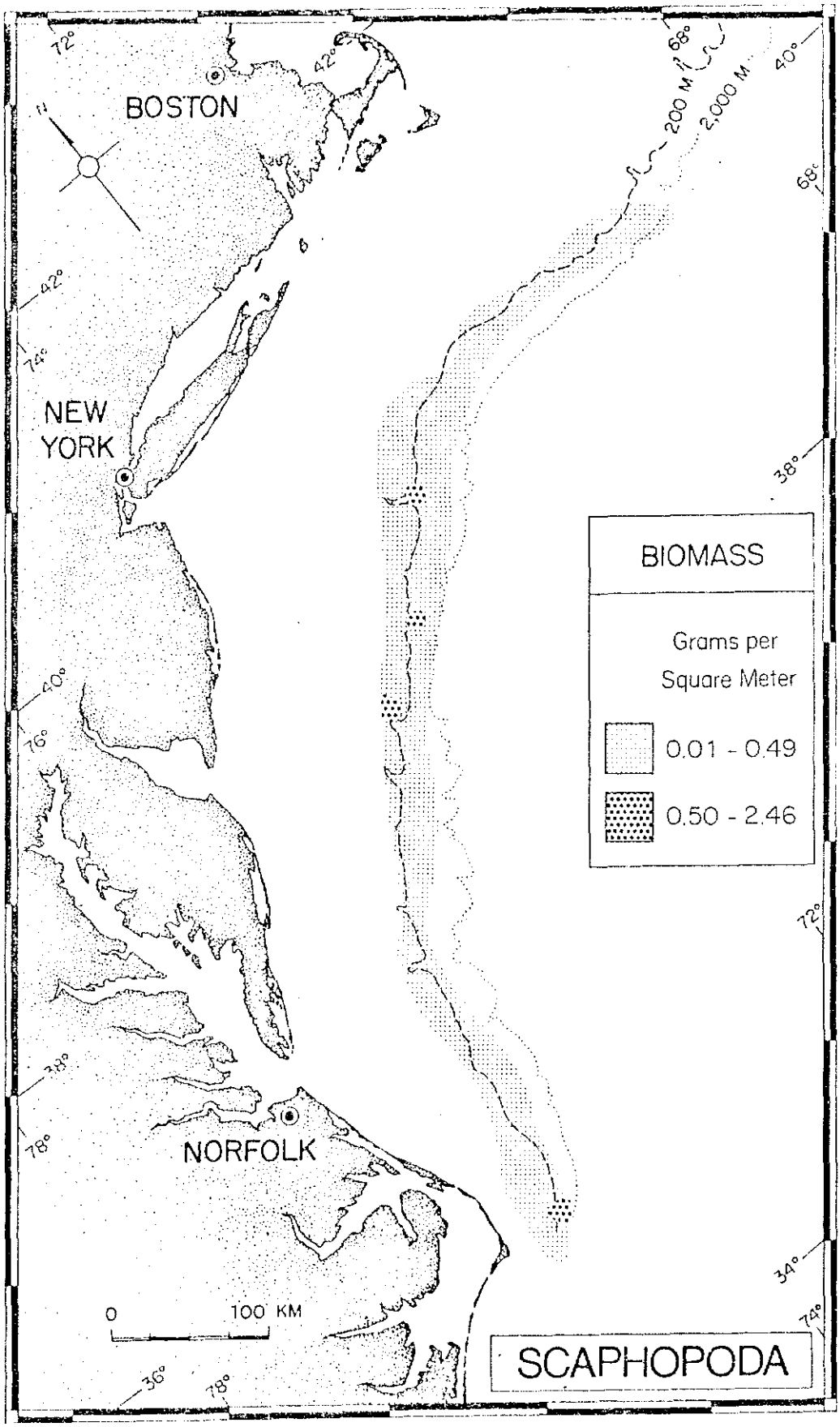

Figure 42.--Geographic distribution of the biomass of Scaphopoda, expressed as damp weight per square meter of bottom.

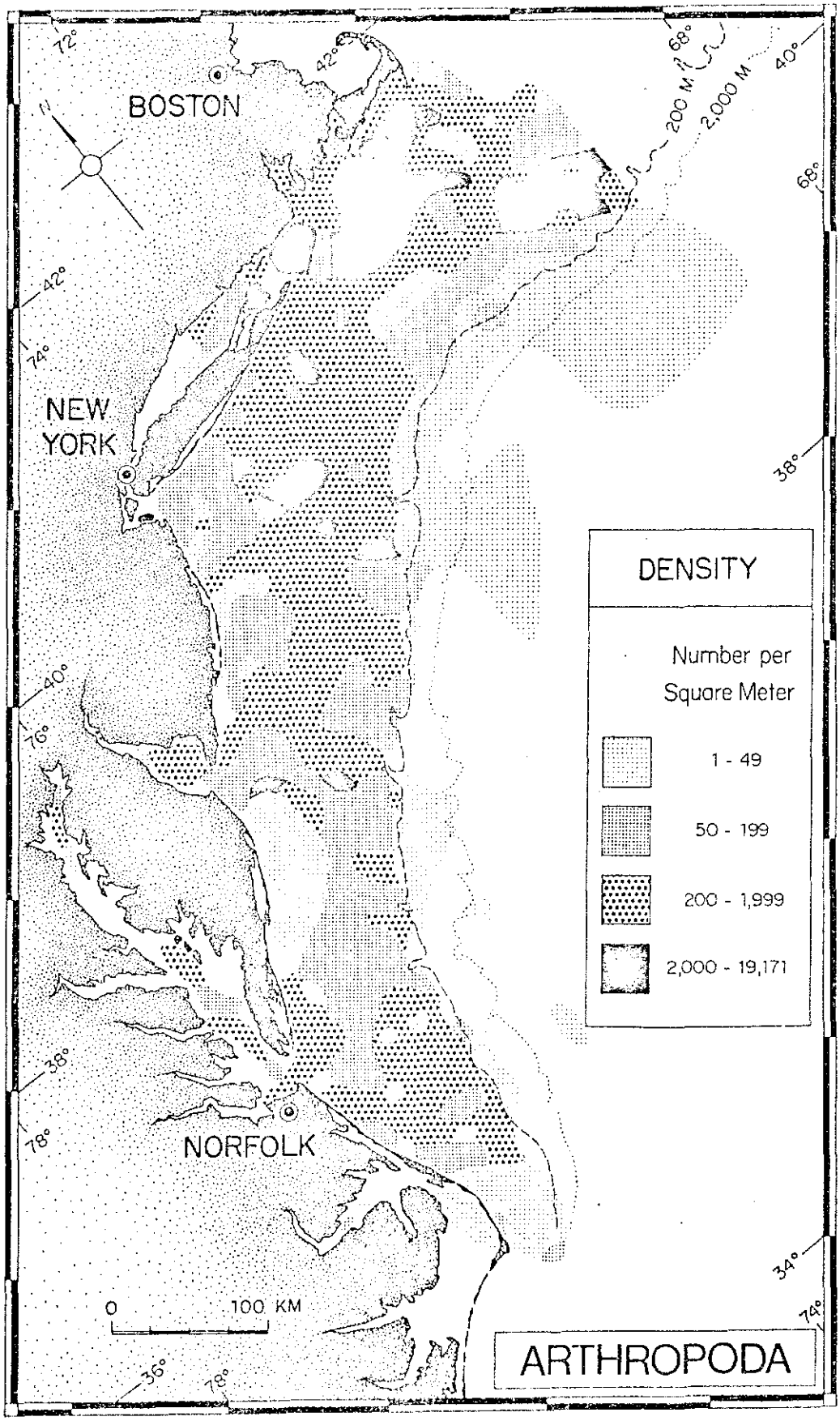

Figure 43.--Geographic distribution of the density of Arthropoda, expressed as number of individuals per square meter of bottom.

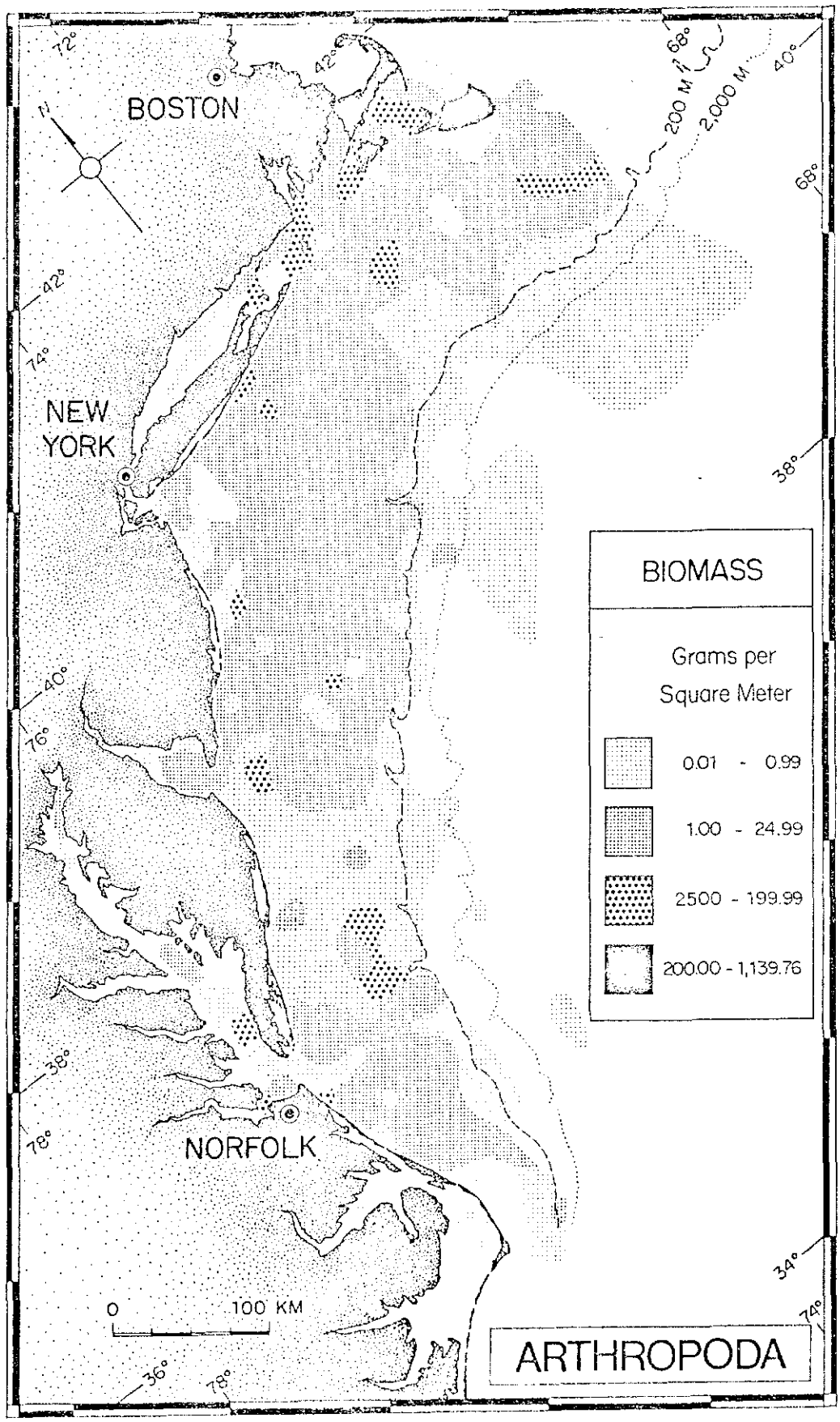

Figure 44.--Geographic distribution of the biomass of Arthropoda, expressed as damp weight per square meter of bottom.

encountered; maximum density was 19,171/m^2. High densities (greater than 2,000/m^2) were prevalent in large areas of the continental shelf in the Southern New England subarea and the northern half of the New York Bight. Moderately high densities (200 to 1,999/m^2) occurred over extensive areas in inshore waters and on the continental shelf throughout the Region. Low densities (less than 50/m^2) prevailed in the offshore deepwaters. Biomass exhibited a somewhat similar pattern of distribution. Large (greater than 200 g/m^2) and moderately large (25 to 199 g/m^2) biomasses were most common on the continental shelf in Southern New England. Moderate quantities (1 to 25 g/m^2) occurred over extensive areas of the continental shelf. Small quantities (less than 1 g/m^2) were prevalent in the Chesapeake Bight subarea and in offshore deepwater.

Pycnogonida, Arachnida, Ostracoda, and Nebaliacea (fig. 45) were encountered in only a few scattered localities. Densities varied in magnitude from one group to another, but generally they were low, and the biomass of all groups was very small.

Cirripedia (figs. 46 and 47) occurred in only a few localities, primarily on the continental shelf. They were encountered most frequently and in highest density (500 to 7,932/m^2) in the area from New York northward to Cape Cod. Biomass was distributed in a similar pattern and reached quantities ranging between 500 and 1,104 g/m^2 at localities of highest density.

Cumacea (figs. 48 and 49) were widely distributed throughout the Region, particularly on the continental shelf. They occurred all the way from shallow inshore waters to offshore deepwaters, and from Cape Cod to Cape Hatteras. High densities (greater than 500/m^2) and moderately high densities (100 to 499/m^2) were common on the central continental shelf off Southern New England, and along the outer margin of the continental shelf

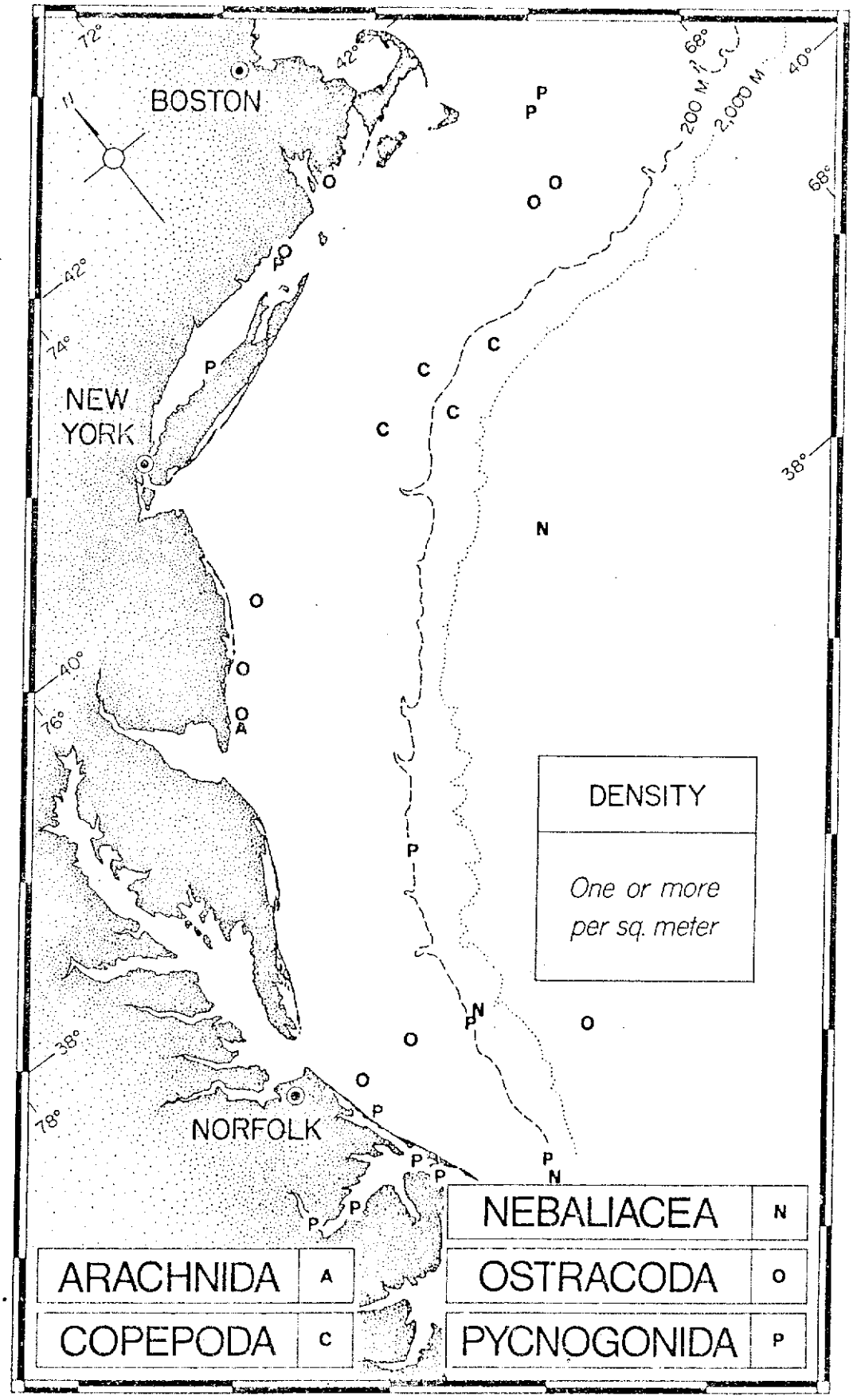

Figure 45.--Geographic distribution of the density of Arachnida, Copepoda, Nebaliacea, Ostracoda, and Pycnogonida, expressed as number of individuals per square meter of bottom

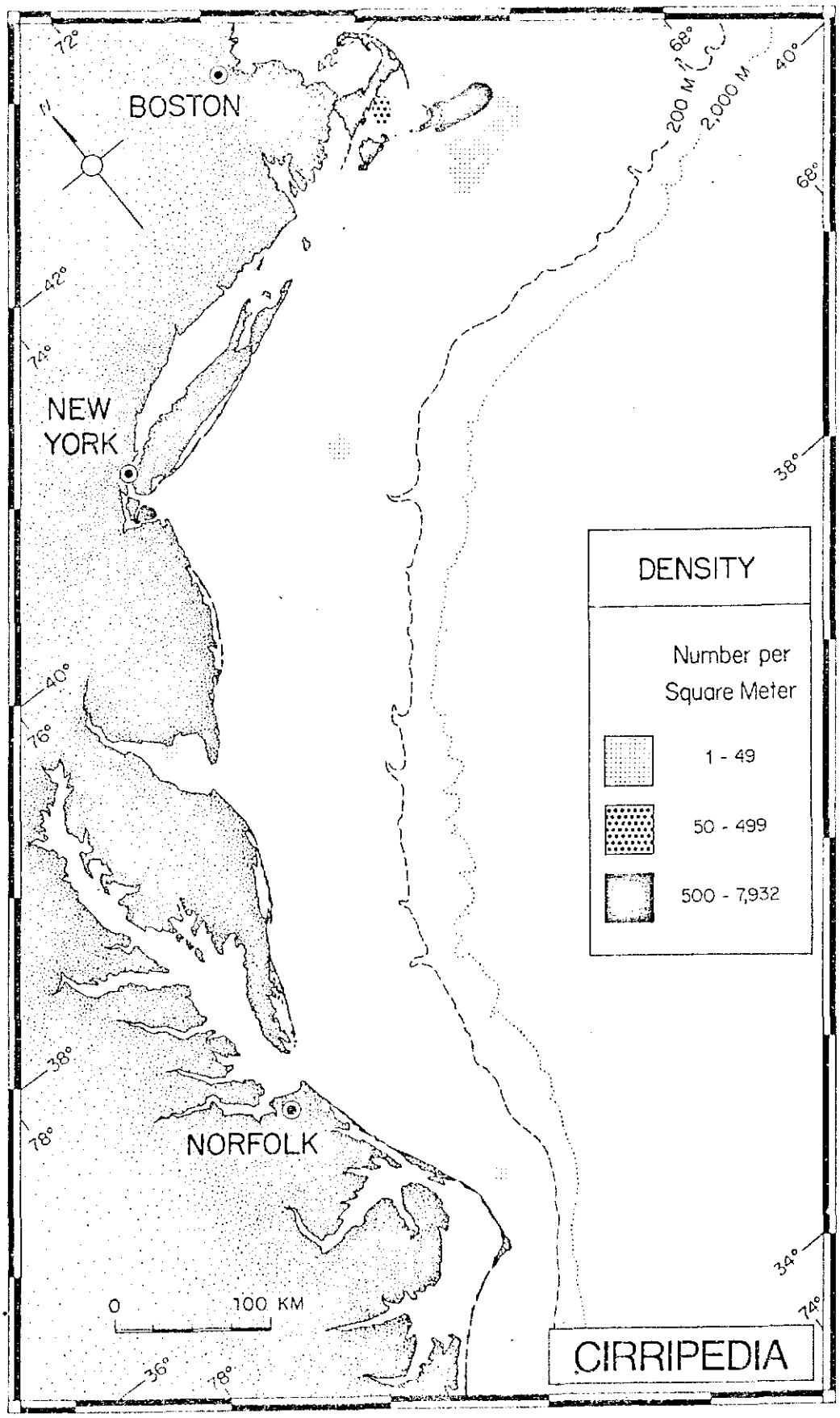

Figure 46.--Geographic distribution of the density of Cirripedia, expressed as number of individuals per square meter of bottom.

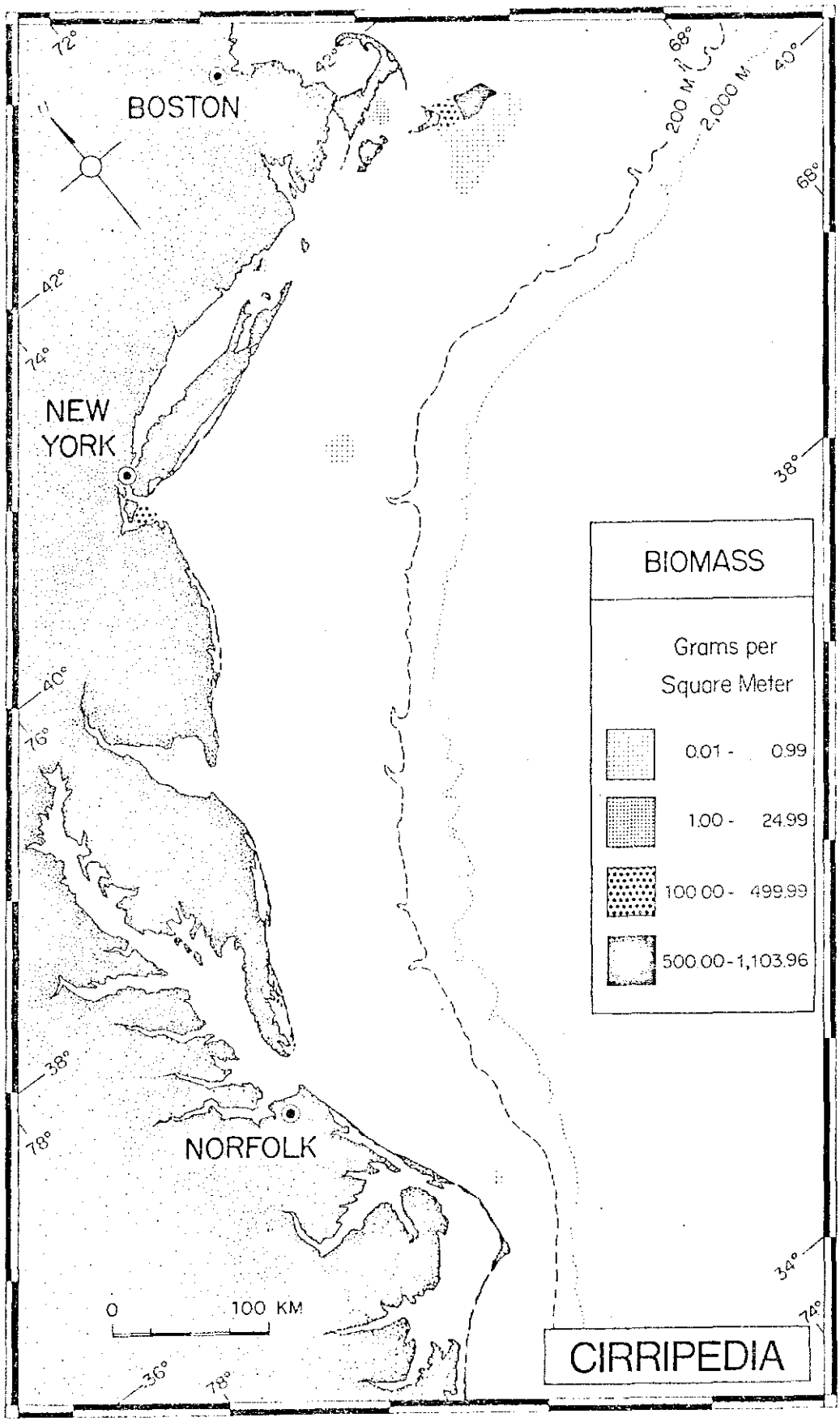

Figure 47.--Geographic distribution of the biomass of Cirripedia, expressed as damp weight per square meter of bottom.

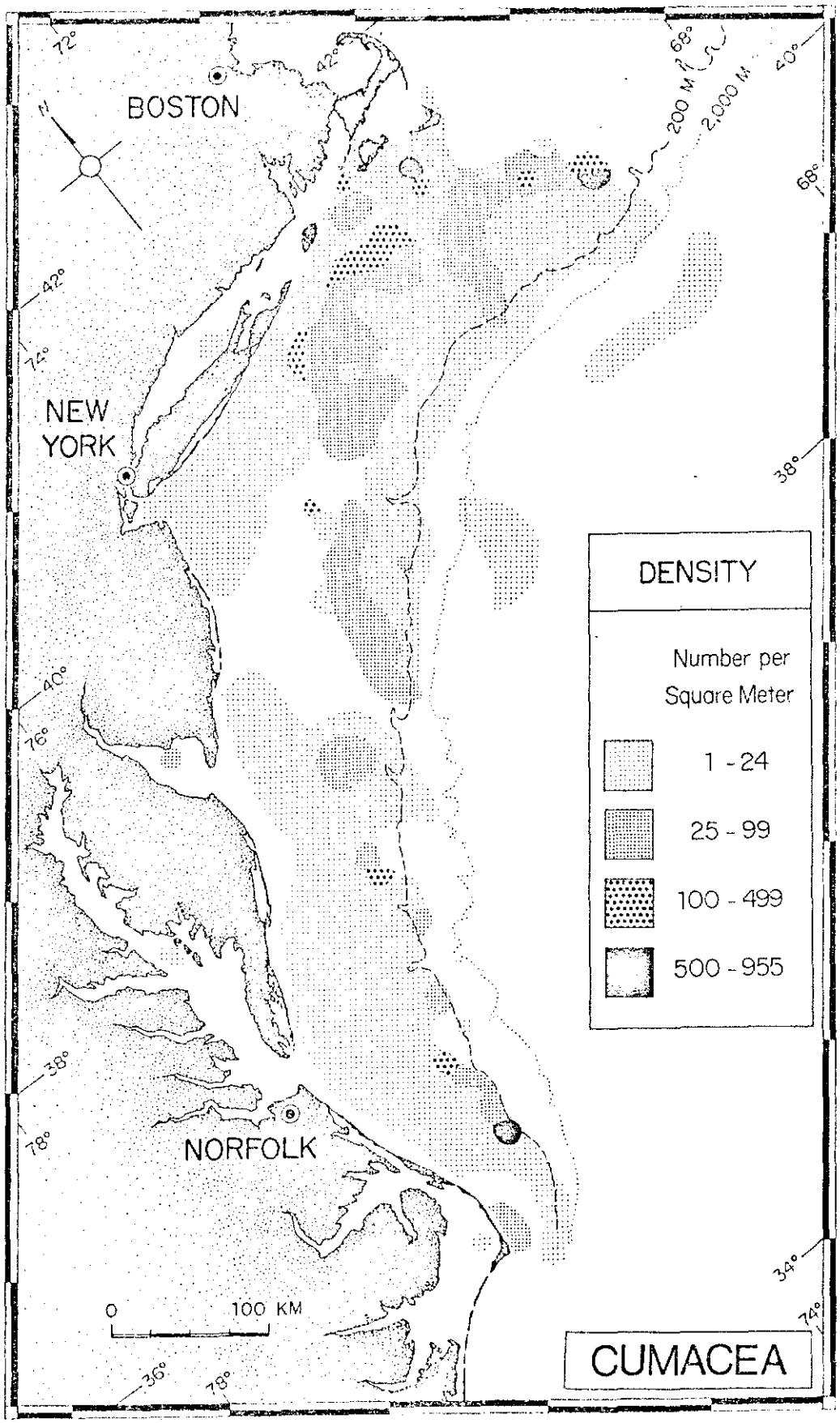

Figure 48.--Geographic distribution of the density of Cumacea, expressed as number of individuals per square meter of bottom.

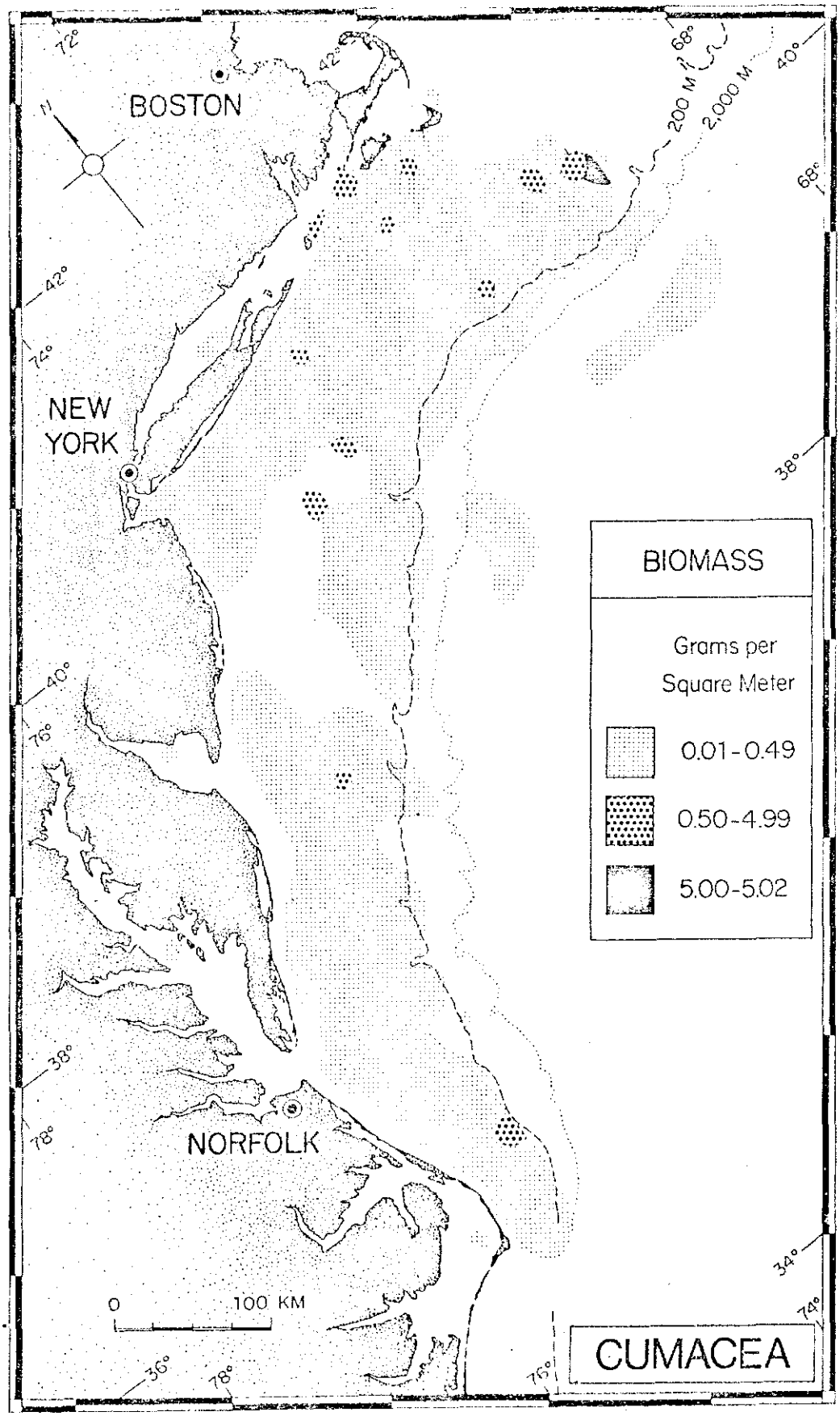

Figure 49.--Geographic distribution of the biomass of Cumacea, expressed as damp weight per square meter of bottom.

in the Chesapeake Bight subarea. Low densities (less than 25/m^2) prevailed for most of their area of occurrence on the continental shelf, and in all deepwater areas. Biomass was small (less than 0.5 g/m^2) except for widely scattered patches of limited size.

Tanaidacea (figs. 50 and 51) occurred only in deepwater. They were found in small, widely separated areas on the continental slope and rise ranging from offshore Cape Cod to the offshore Chesapeake Bay region. In all localities their density was low, less than 6/m^2, and their biomass was small, less than 0.05 g/m^2.

Isopoda (figs. 52 and 53) were widely dispersed over the continental shelf throughout the Region at densities ranging between 1 and 24/m^2. Moderate-size areas, more or less equally distributed over the continental shelf, contained populations between 25 and 199/m^2. High densities (200 to 1,053/m^2) were restricted to small geographic areas, limited chiefly to bays and the inner continental shelf. Biomass throughout most of their area of occurrence was less than 0.5 g/m^2. Some moderately large areas, rather evenly scattered throughout the Region, contained biomasses between 0.5 and 5.0 g/m^2. In a few small areas along the middle and inner shelf between New Jersey and Virginia, they were present in relatively large quantities, 5 to 12.6 g/m^2.

Amphipoda (figs. 54 and 55) were ubiquitous in the Middle Atlantic Bight Region with densities ranging from 10 to over 19,000/m^2. Lowest densities were most closely associated with the deep water below the shelf break and in patches along the coastline. Moderate densities (50 to 500/m^2) predominated on the continental shelf below the eastern tip of Long Island. Higher densities (500 to 5,000/m^2) were distributed in

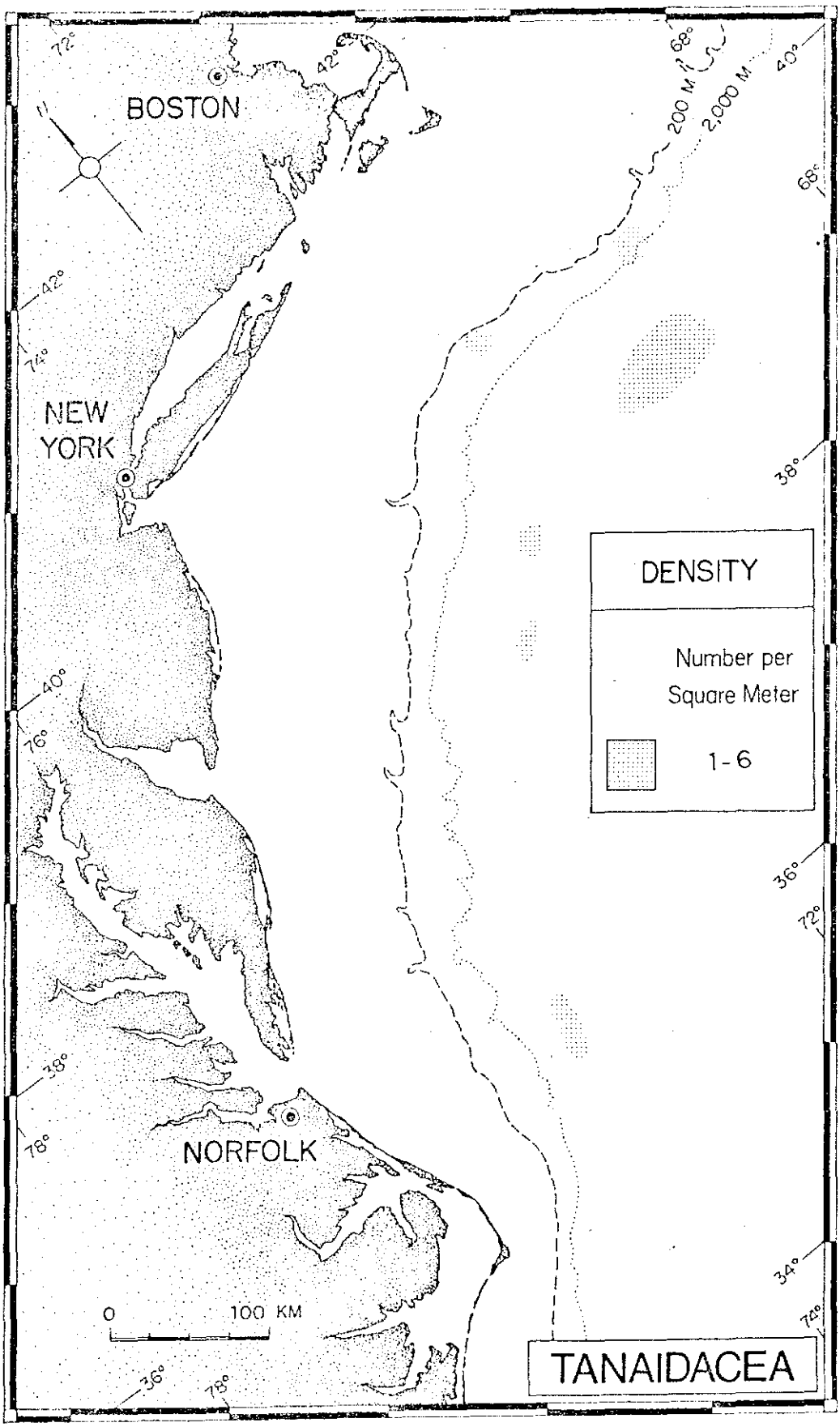

Figure 50.--Geographic distribution of the density of Tanaidacea, expressed as number of individuals per square meter of bottom.

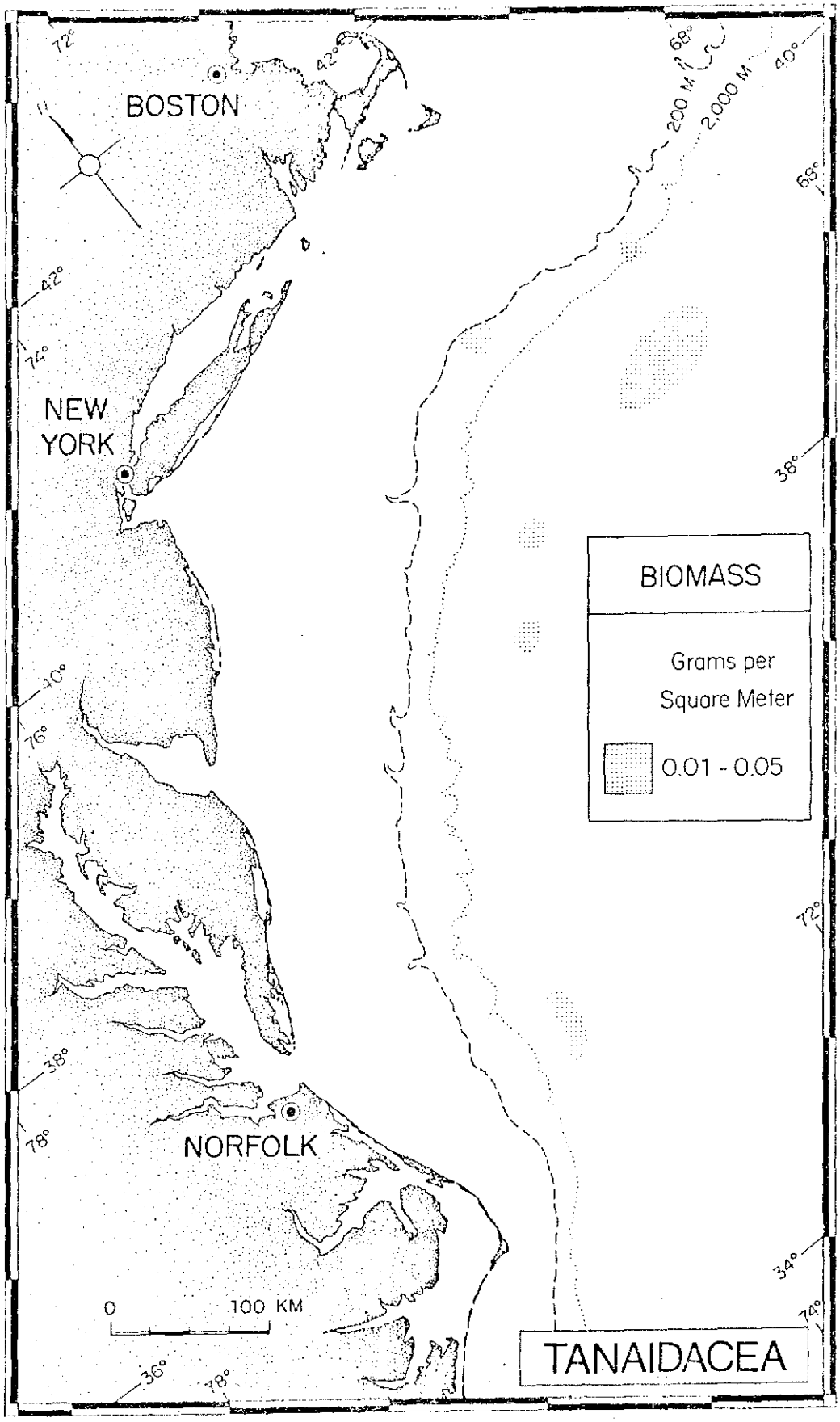

Figure 51.--Geographic distribution of the biomass of Tanaidacea, expressed as damp weight per square meter of bottom.

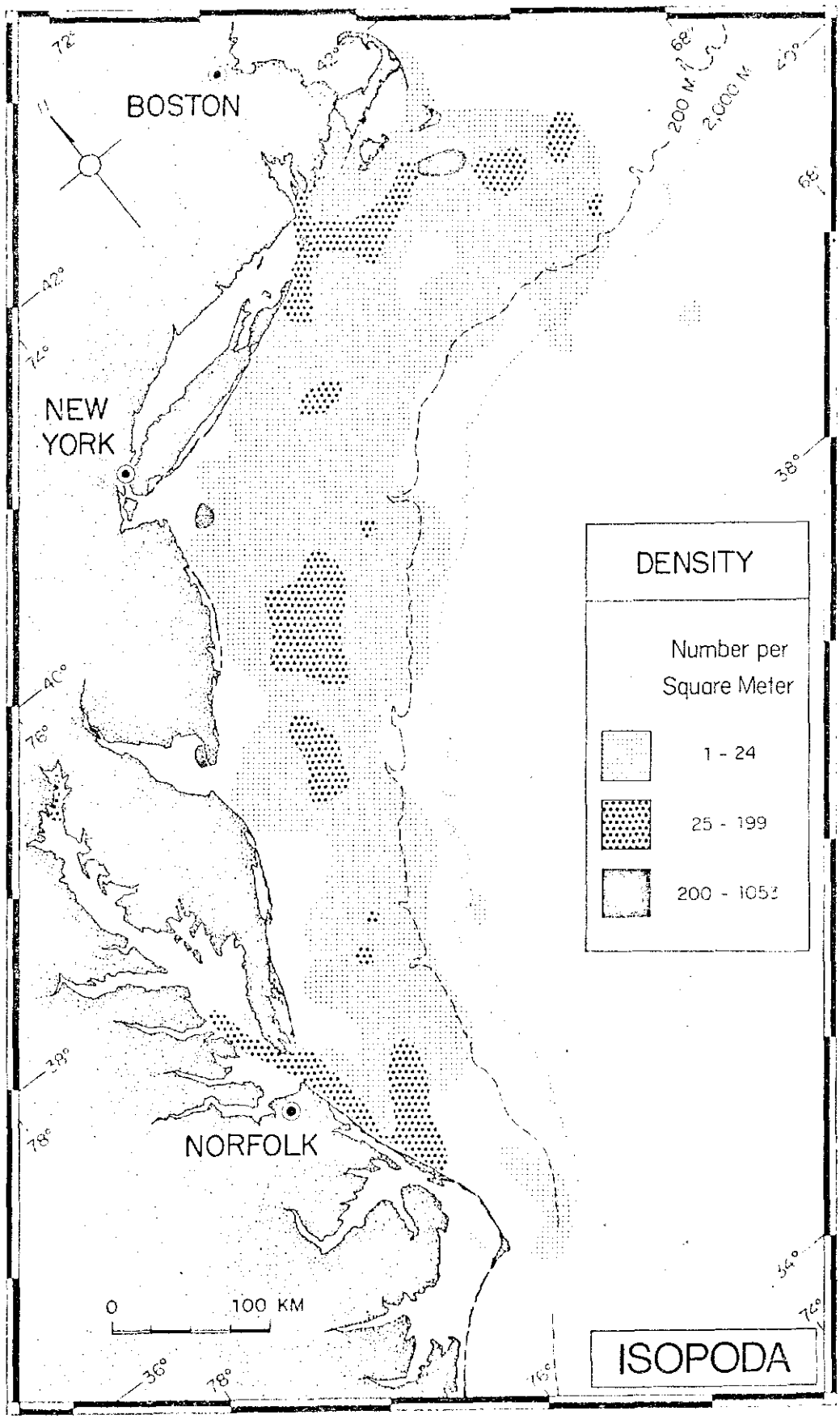

Figure 52.--Geographic distribution of the density of Isopoda, expressed as number of individuals per square meter of bottom.

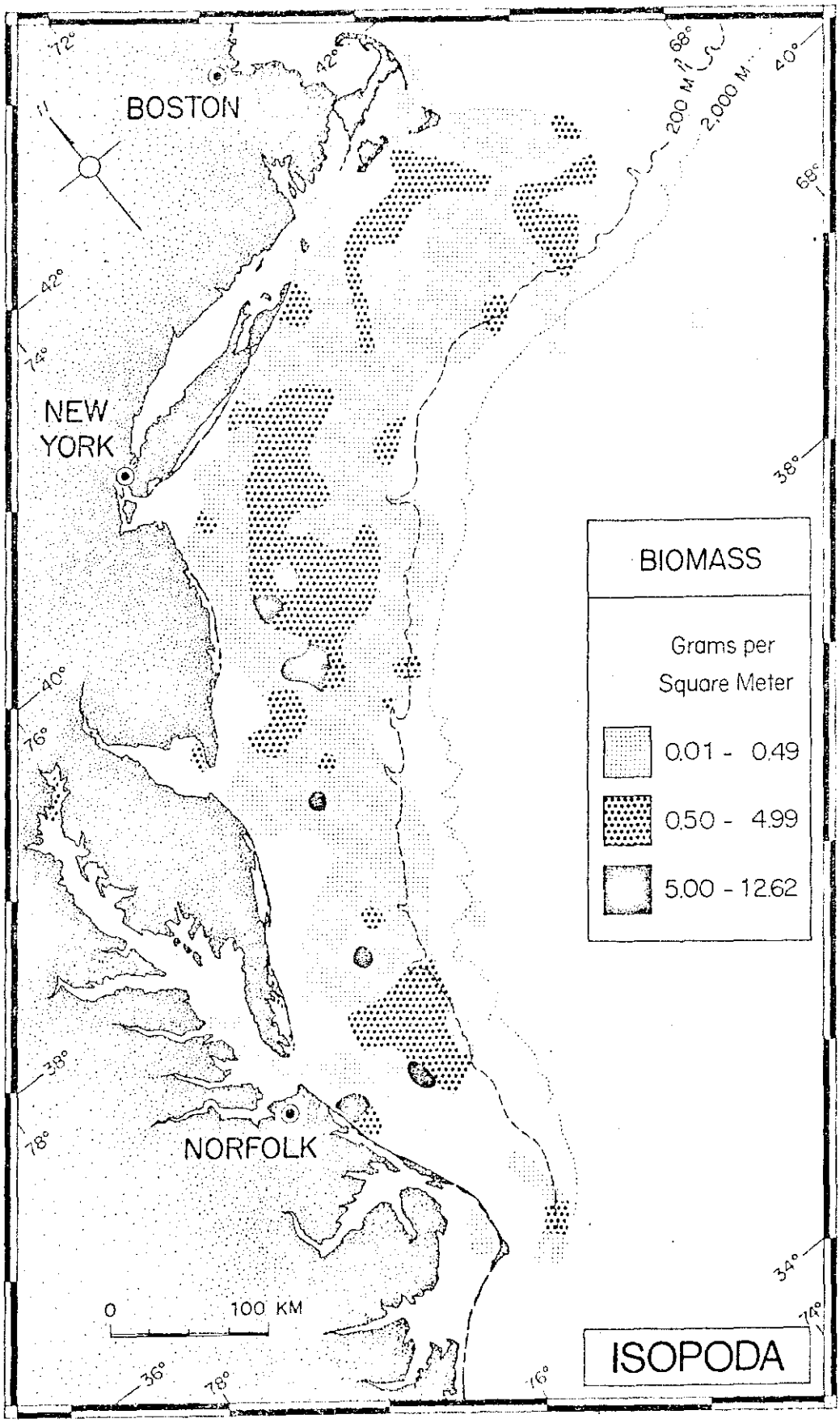

Figure 53.--Geographic distribution of the biomass of Isopoda, expressed as damp weight per square meter of bottom.

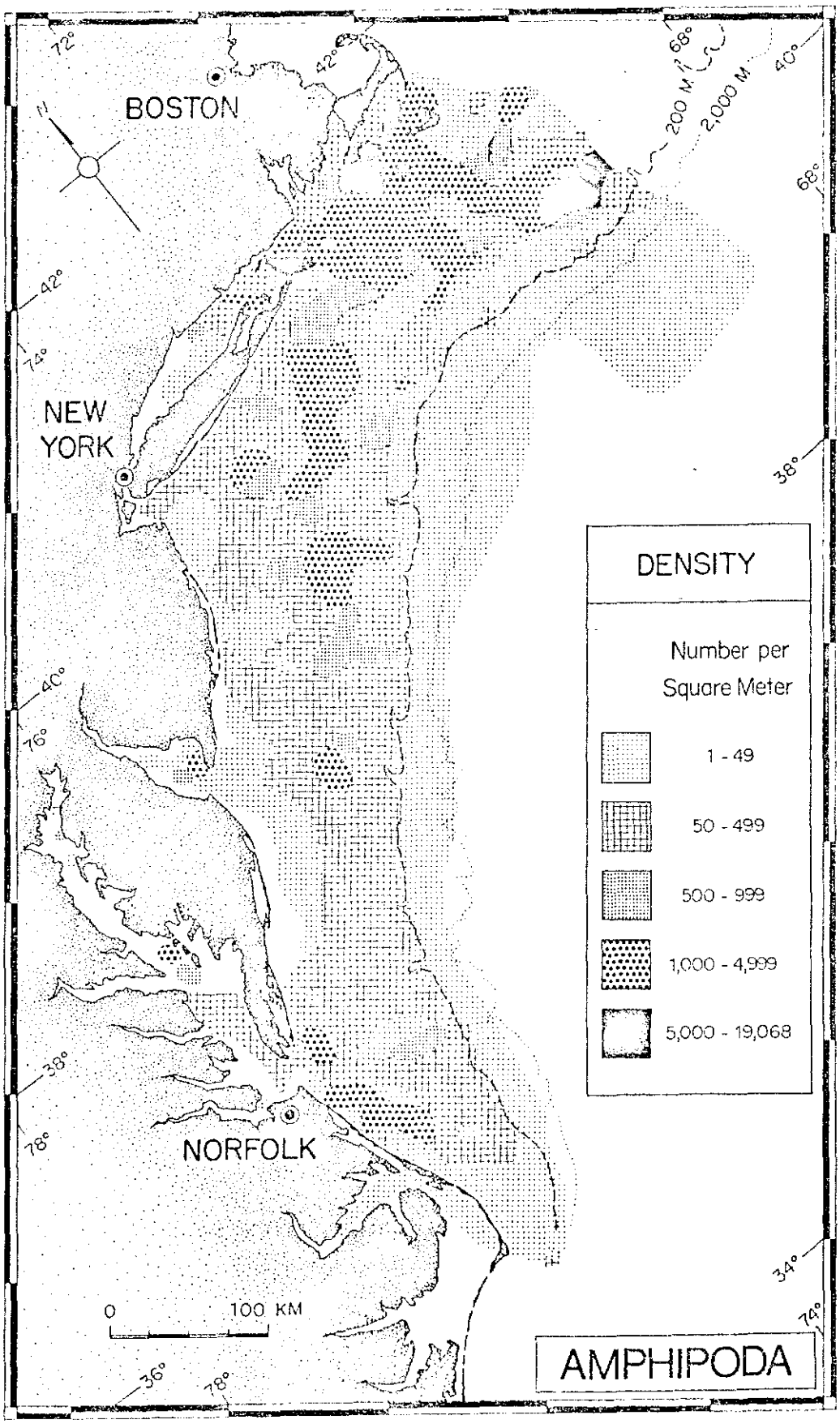

Figure 54.--Geographic distribution of the density of Amphipoda, expressed as number of individuals per square meter of bottom.

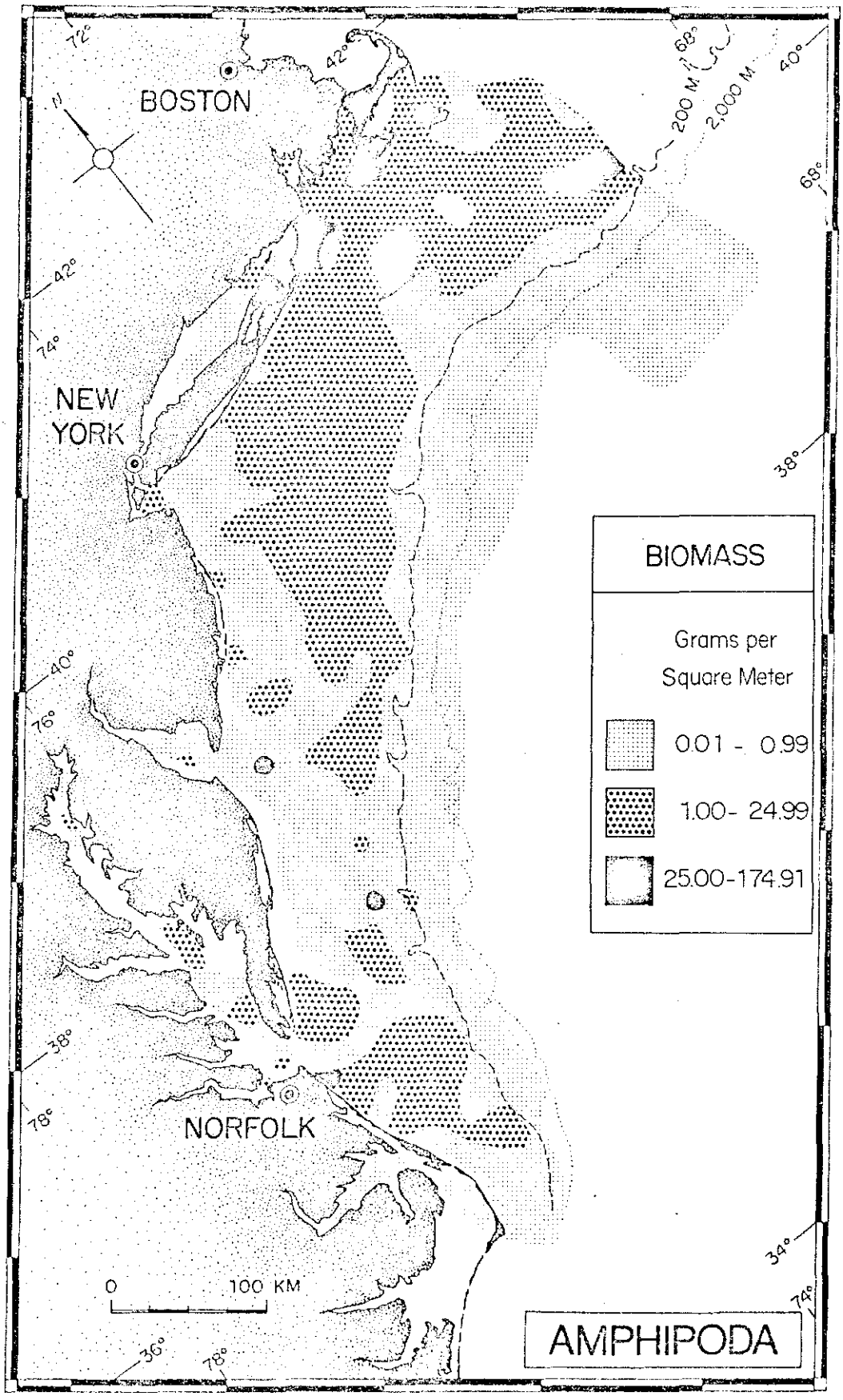

Figure 55.--Geographic distribution of the biomass of Amphipoda, expressed as damp weight per square meter of bottom.

relatively large areas off Southern New England, somewhat smaller ones in the New York Bight region, and were smallest in the more southerly reaches of the study area. Highest densities (5,000 to 19,000/m^2) occurred only in comparatively small patches in the Southern New England region. Biomass ranged from 0.01 to 175 g/m^2. Largest biomasses (25 to 175 g/m^2) were, like density, most prevalent in the northern sectors of the study area with a few discrete patches in the south. Intermediate biomasses (1-25 g/m^2) were present over large portions of the Southern New England and New York Bight continental shelves, and in smaller areas farther south. Generally the inshore and offshore areas contained the smallest (0.01 to 1 g/m^2) biomasses.

Mysidacea (figs. 56 and 57) were present in scattered localities from Cape Cod to Cape Hatteras. All records except one, were from the continental shelf, primarily in coastal areas and the inner continental shelf. Densities were low (less than 25/m^2) in about half their area of occurrence and moderate density (25 to 385/m^2) in the remaining half. Biomass of mysids was small (less than 1.4 g/m^2) at all localities.

Decapoda (figs. 58 and 59) occurred over a large portion of the Middle Atlantic Bight. They were broadly distributed on the continental shelf, extending from Cape Cod to Cape Hatteras. Densities over most of this expanse were low (less than 25/m^2). Moderate (25 to 99/m^2) and high (100 to 395/m^2) densities occurred in rather small scattered patches in all sections. Biomass was distributed somewhat differently in that the largest quantities tended to occur on the inner and middle continental shelf and with smaller quantities on the outer shelf.

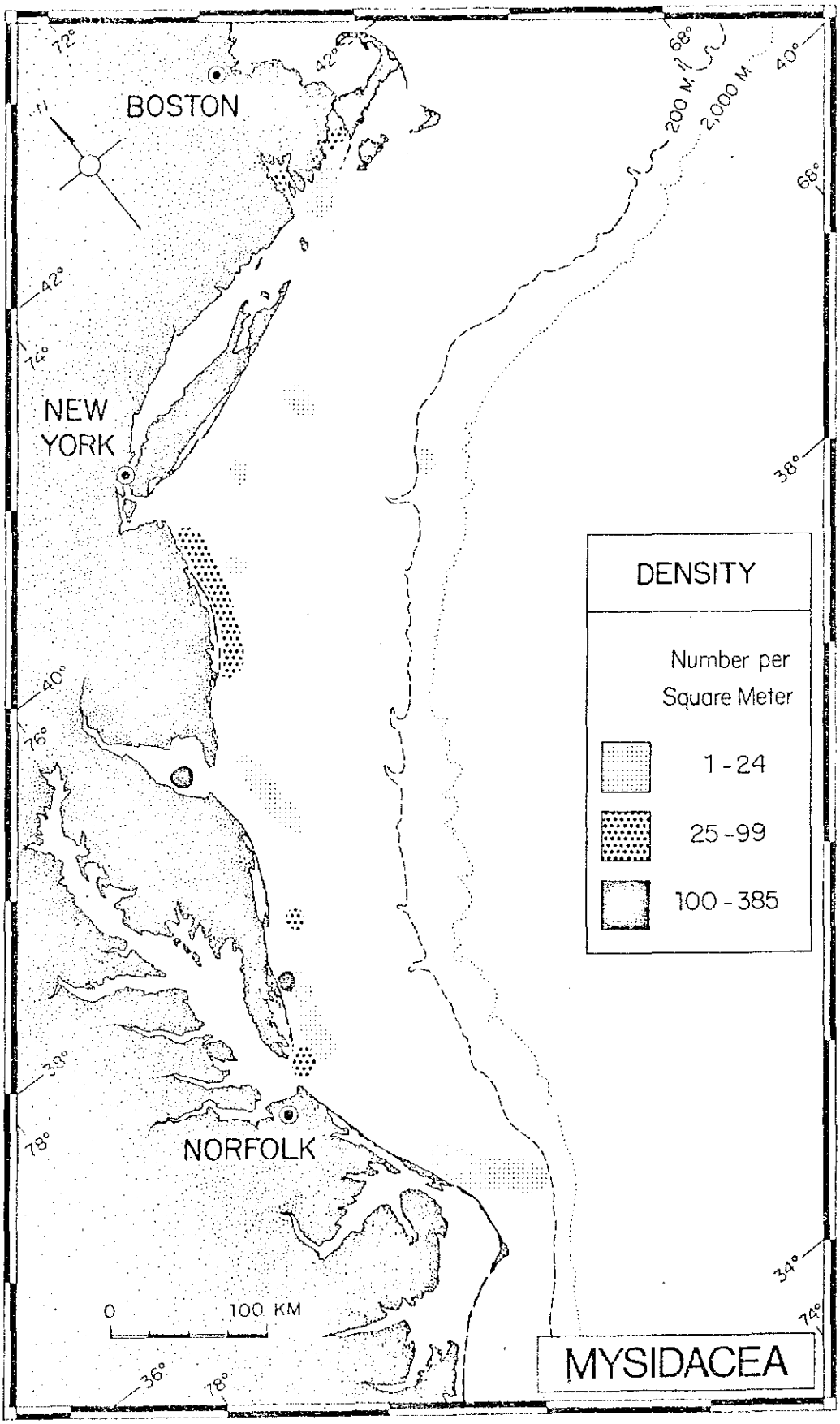

Figure 56.--Geographic distribution of the density of Mysidacea, expressed as number of individuals per square meter of bottom.

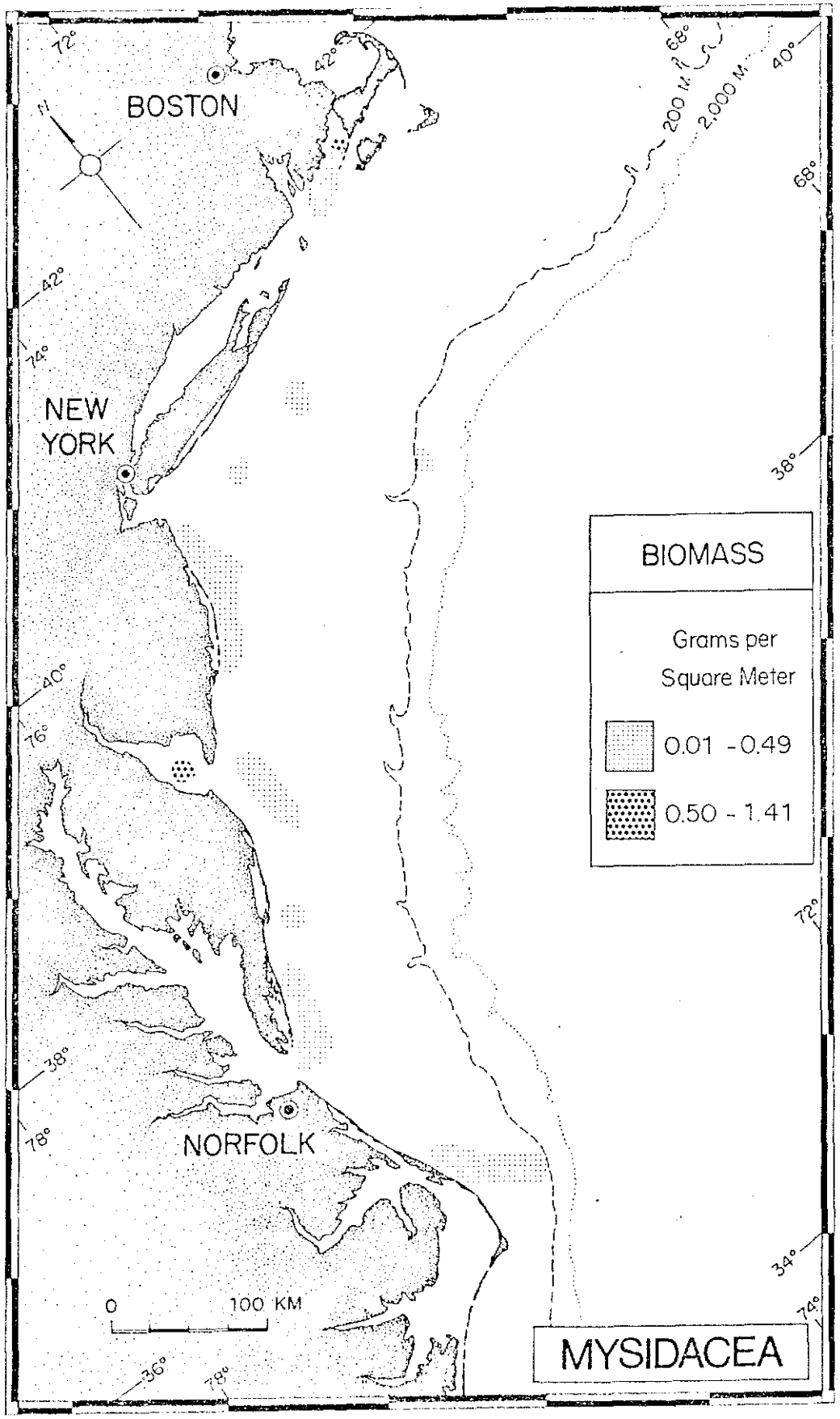

Figure 57.--Geographic distribution of the biomass of Mysidacea, expressed as damp weight per square meter of bottom.

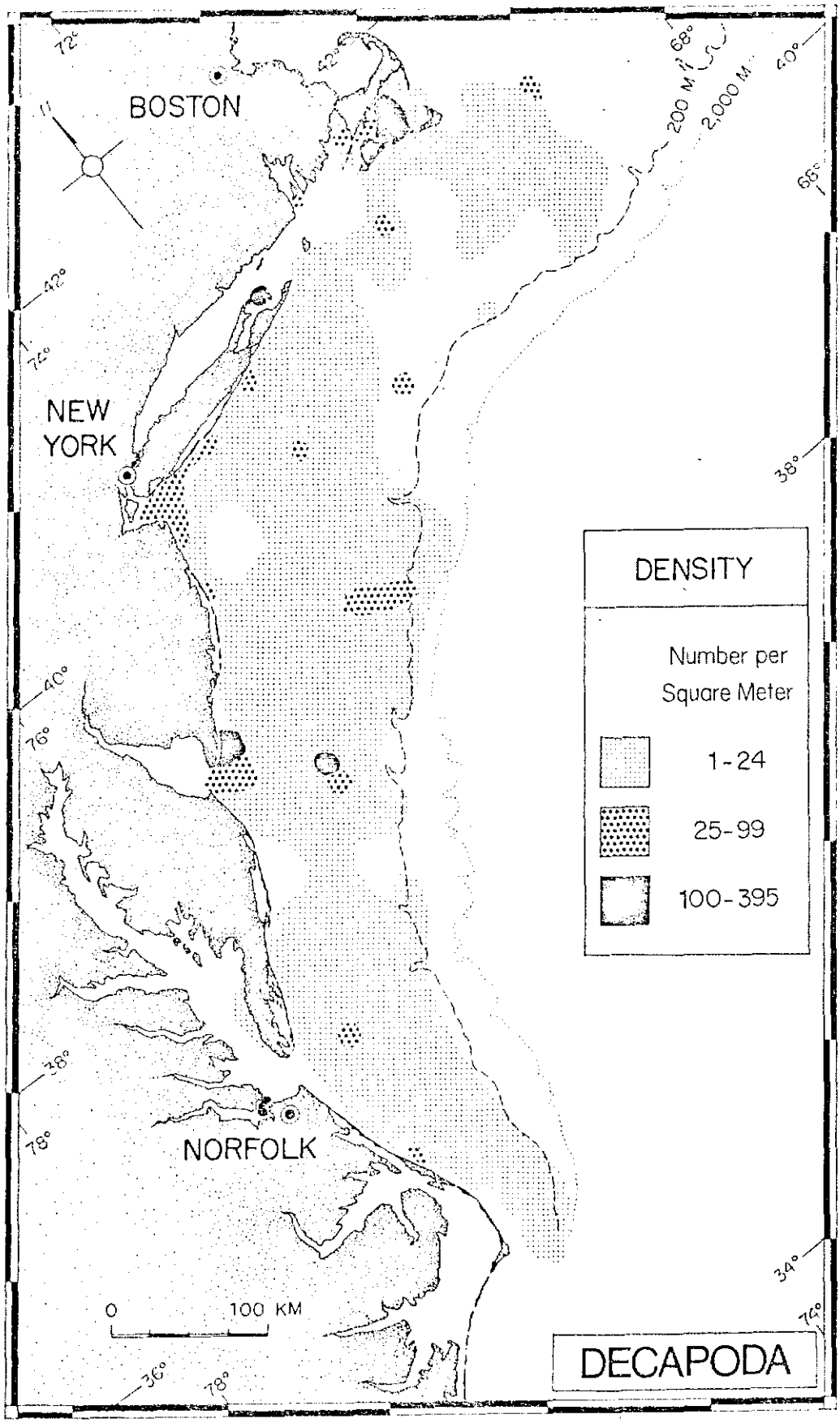

Figure 58.--Geographic distribution of the density of Decapoda, expressed as number of individuals per square meter of bottom.

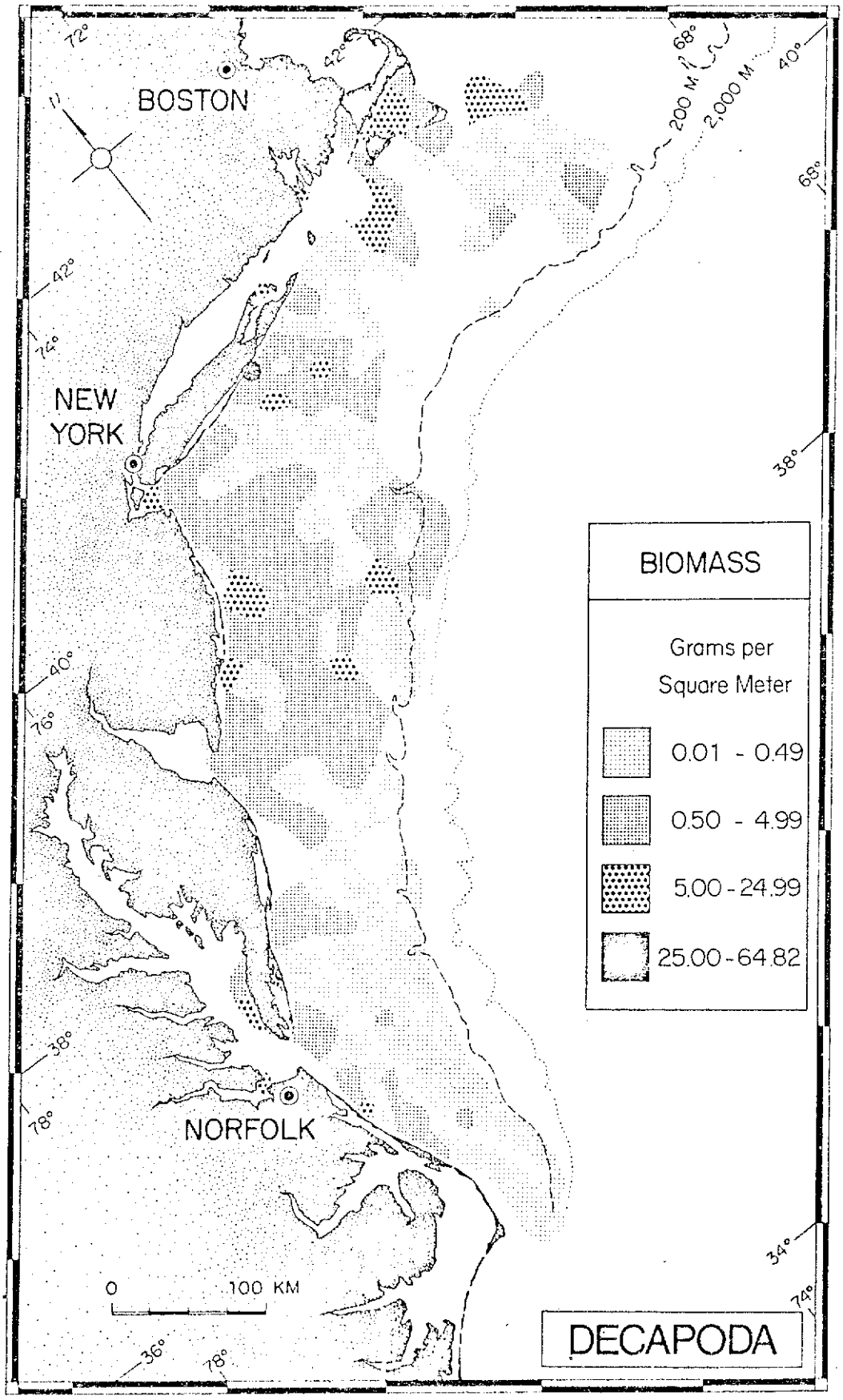

Figure 59.--Geographic distribution of the biomass of Decapoda, expressed as damp weight per square meter of bottom.

Bryozoa (figs. 60 and 61) were distributed in moderate-sized patches in the study area. Densities, for the most part, were rather low (1 to 24/m^2) over the majority of their range of occurrence with higher densities occupying smaller, discrete patches on the periphery. Biomass, similarly, was moderately small (0.01 to 1.0 g/m^2) over most of their range, again with larger biomass (1 to 52 g/m^2) occurring only in small isolated patches.

Brachiopoda (figs. 60 and 61) were distributed only in a relatively small area on the outer continental shelf north of Cape Hatteras and southeast of Norfolk, Virginia. Densities ranged between 1 and 99/m^2 and biomass was less than 1 g/m^2.

Echinodermata (figs. 62 and 63) were widely distributed throughout the Region. High densities (greater than 200/m^2) and moderately high densities (25 to 199/m^2) occurred on the outer continental shelf in Southern New England, along the inner shelf in New York Bight, and on the central shelf in Chesapeake Bight. Echinoderms were present in low densities (less than 25/m^2) in most of the bays and sounds, over substantial parts of the shelf, and in the deepwater beyond the continental shelf. The biomass distribution was somewhat similar to that of density, but considerably more irregular. Large (5 and 99 g/m^2) and very large (100 and 855 g/m^2) biomasses were common over large expanses of the continental shelf and in several localities on the slope and rise.

Holothuroidea (figs. 64 and 65) were distributed in a broad irregular area centered along the outer continental shelf extending from Cape Cod to Chesapeake Bay. Densities over most of this area were relatively low (less than 25/m^2). In a few areas, particularly off southern Massachusetts

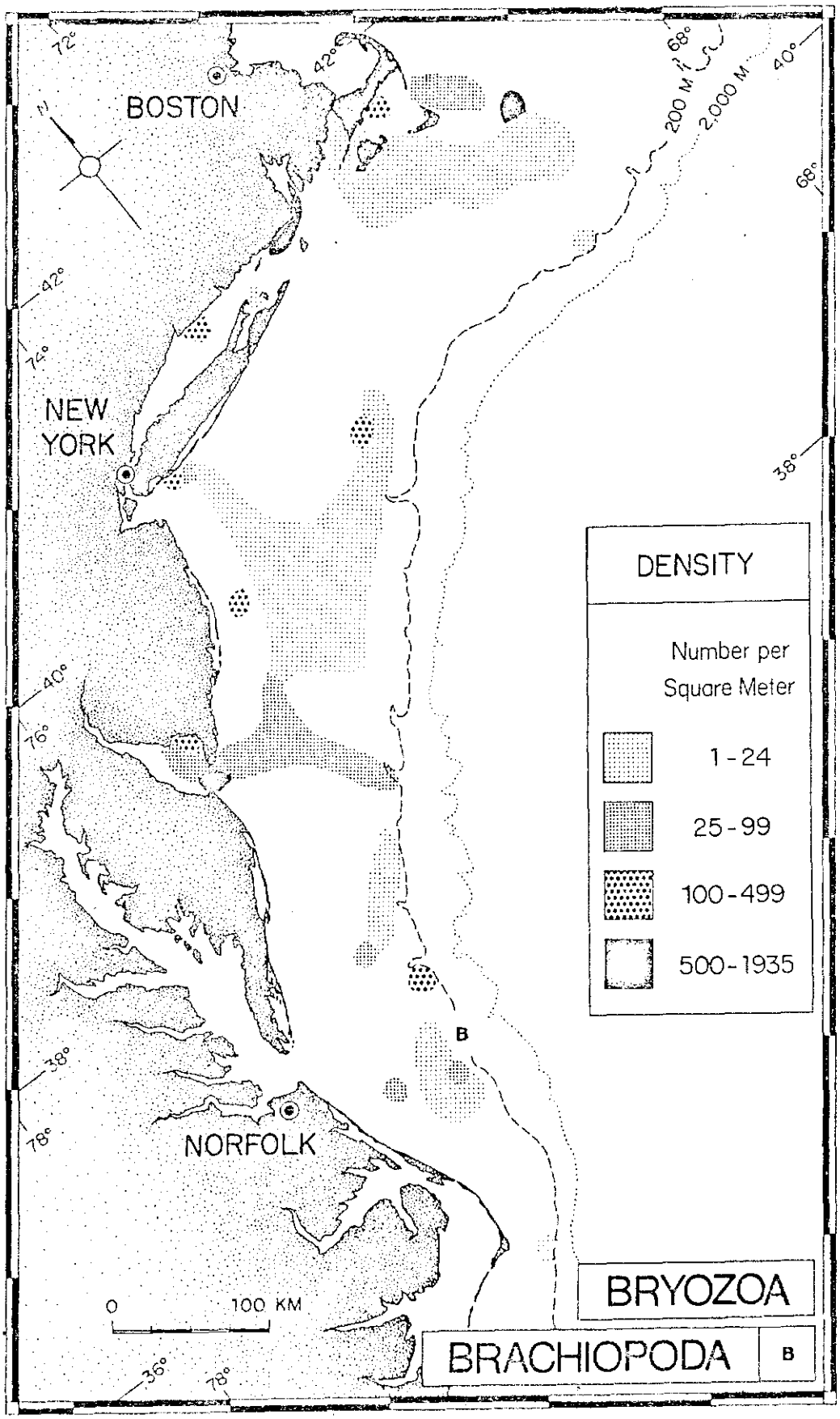

Figure 60.--Geographic distribution of the density of Bryozoa and Brachiopoda, expressed as number of individuals per square meter of bottom.

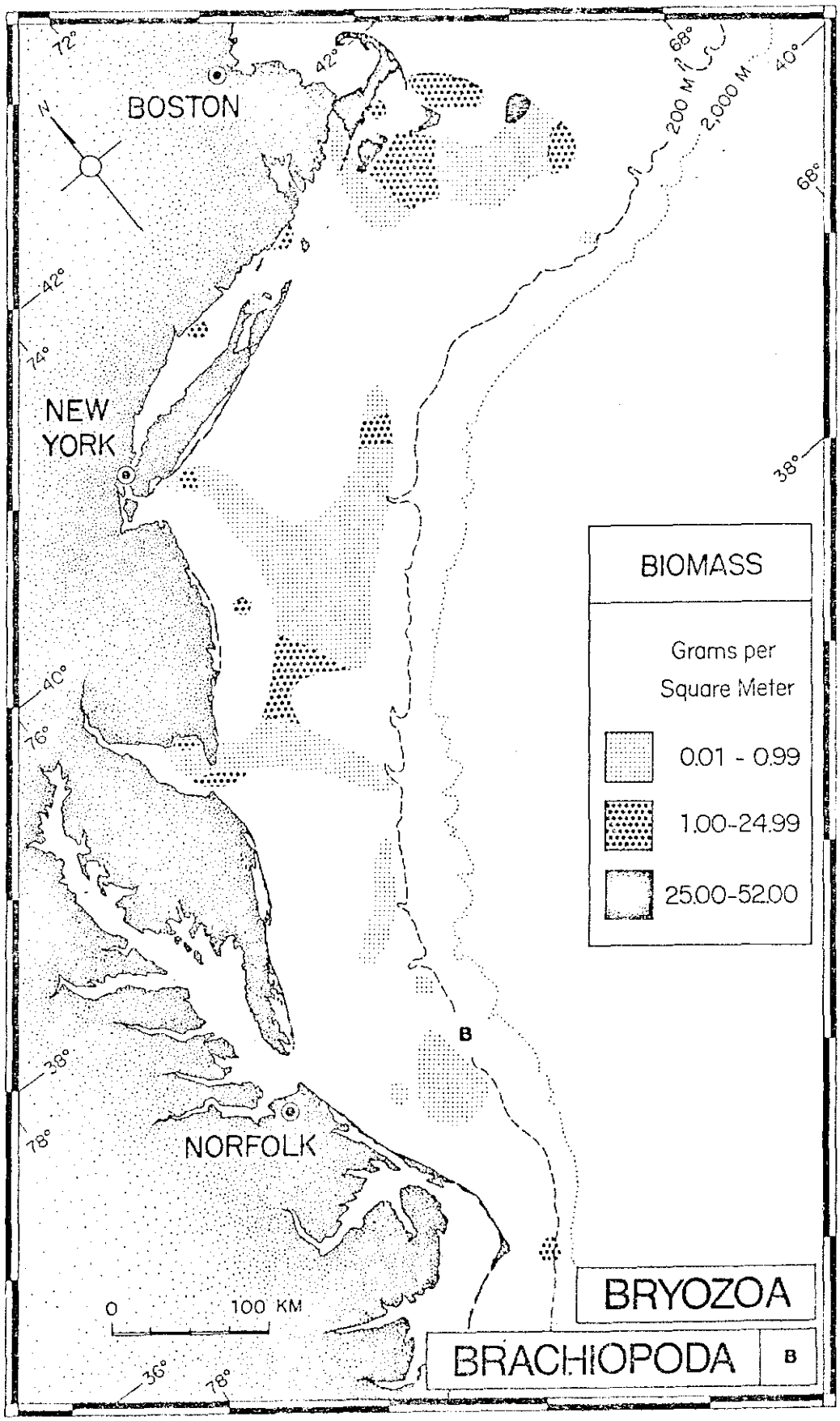

Figure 61.--Geographic distribution of the biomass of Bryozoa and Brachiopoda, expressed as damp weight per square meter of bottom.

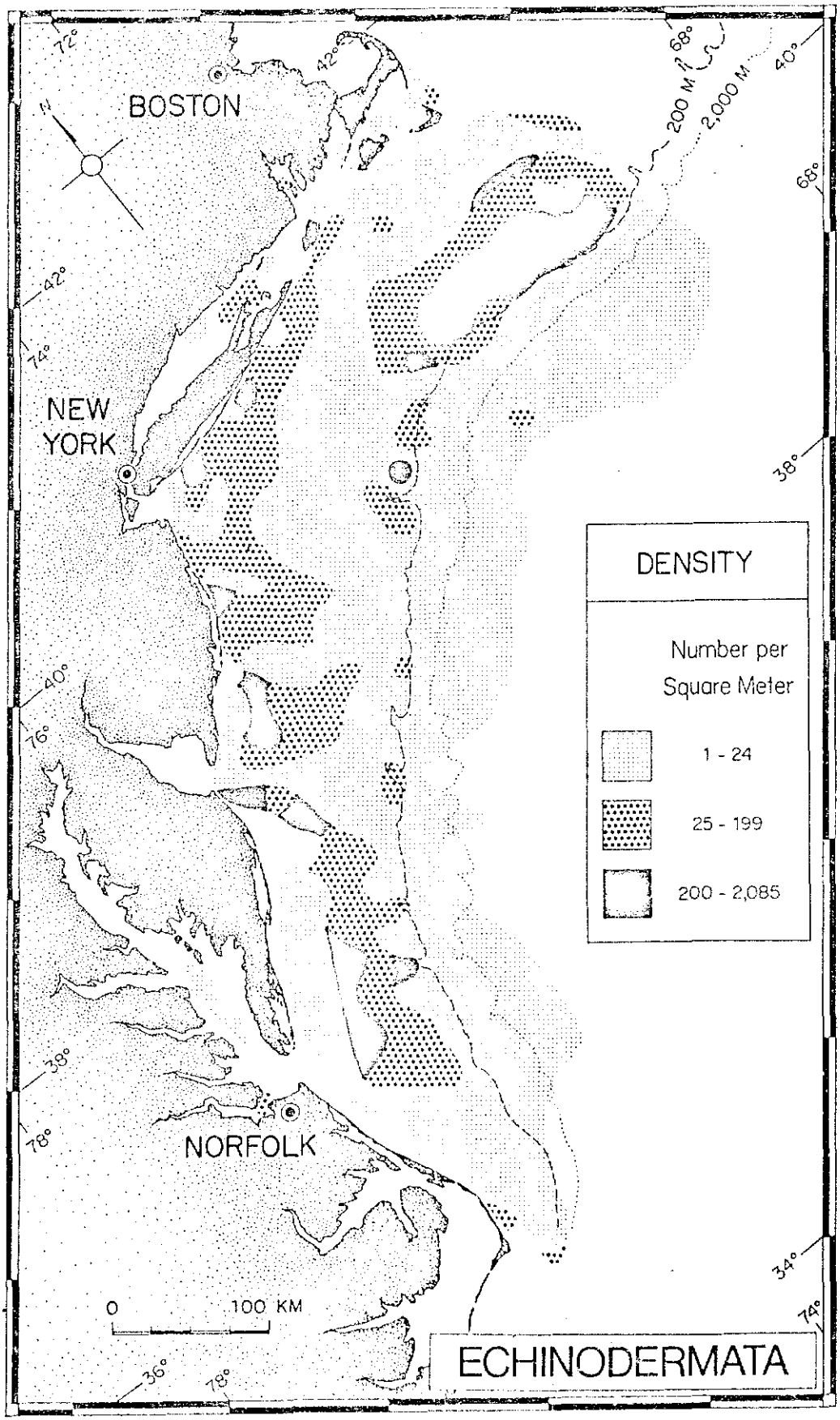

Figure 62.--Geographic distribution of the density of Echinodermata, expressed as number of individuals per square meter of bottom.

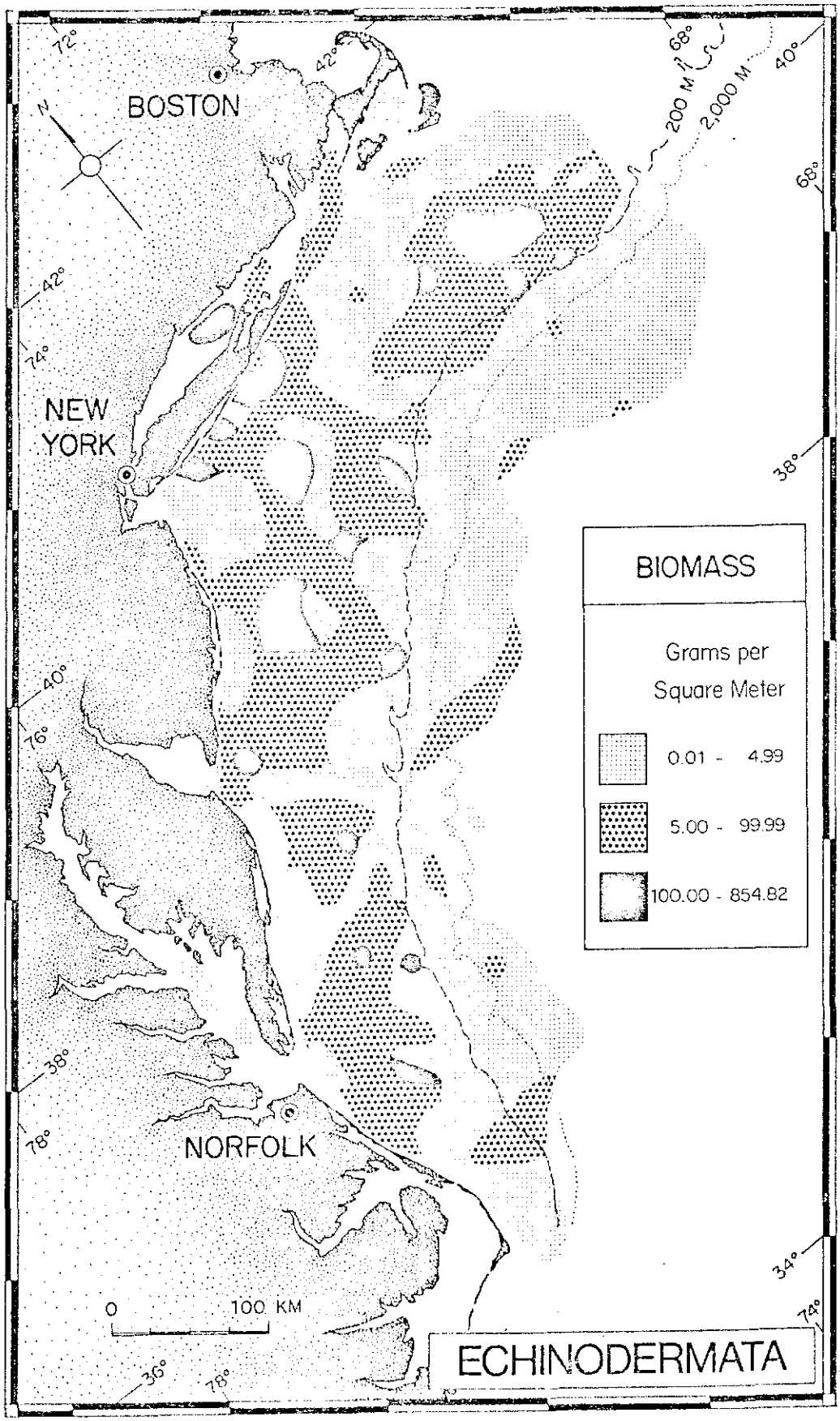

Figure 63.--Geographic distribution of the biomass of Echinodermata, expressed as damp weight per square meter of bottom.

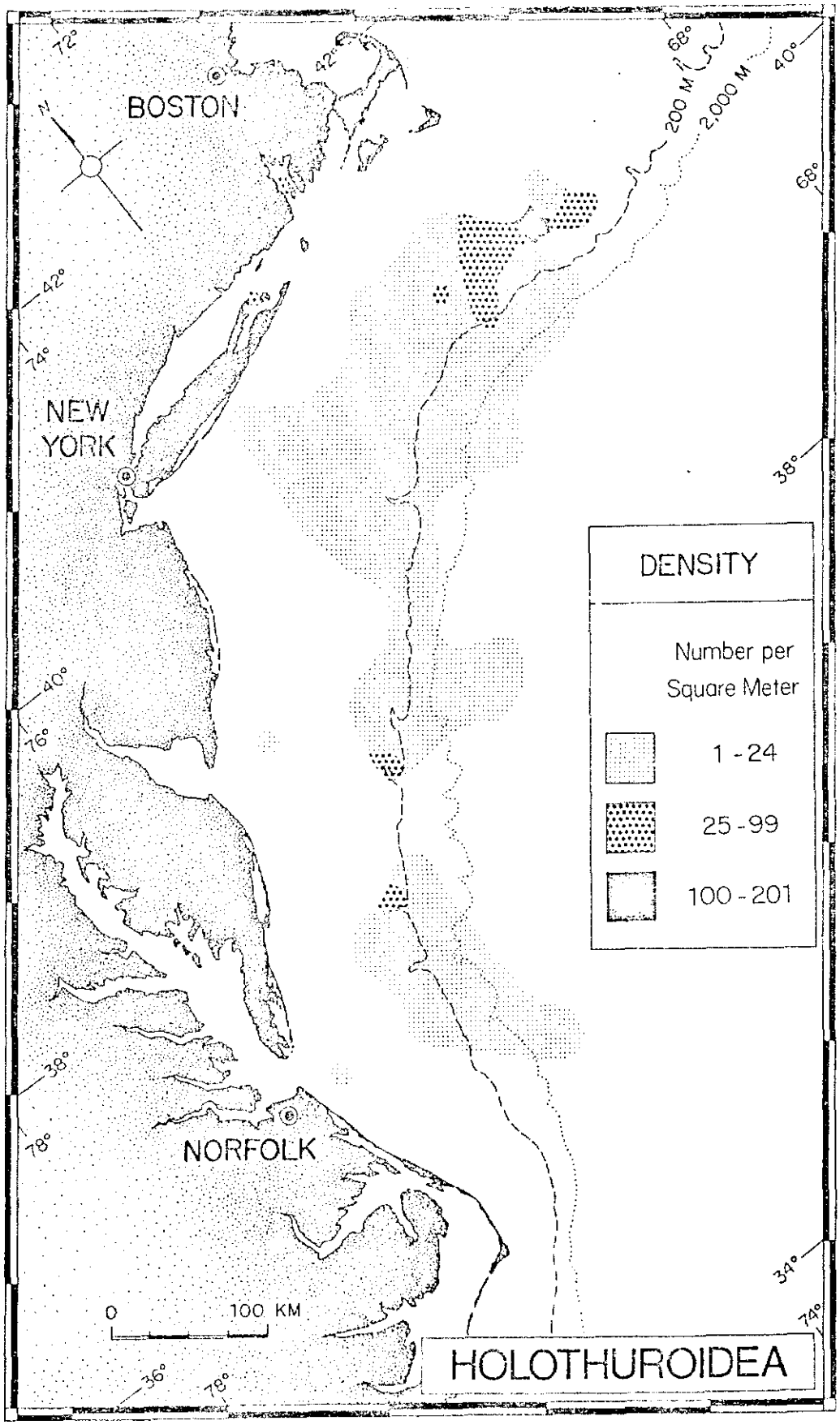

Figure 64.--Geographic distribution of the density of Holothuroidea, expressed as number of individuals per square meter of bottom.

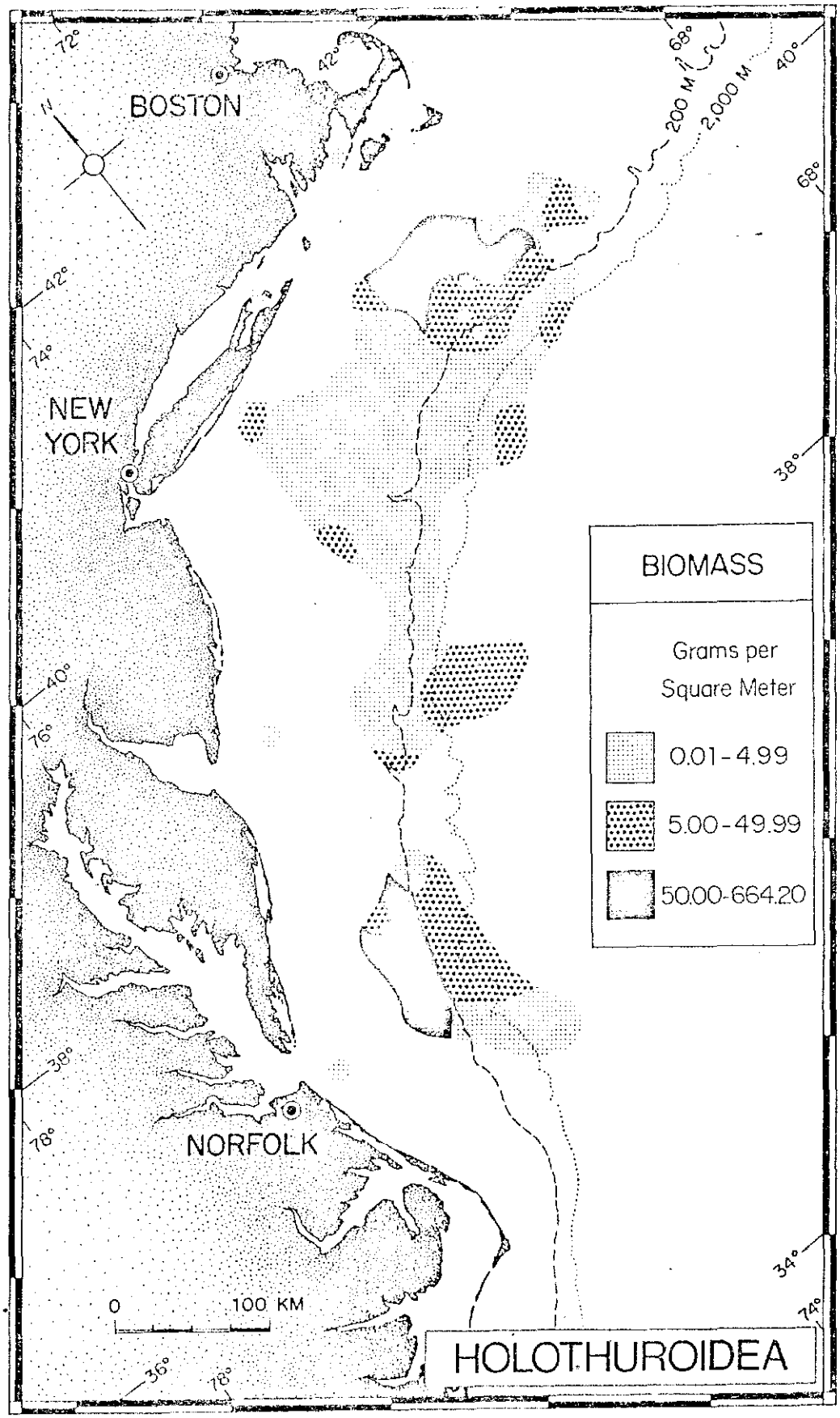

Figure 65.--Geographic distribution of the biomass of Holothuroidea, expressed as damp weight per square meter of bottom.

the density ranged from 25 to 201/m^2. Biomass was small to moderately small (0.01 to 5 g/m^2) over most of their range except in two fairly extensive areas on the outer continental shelf, one south of Cape Cod and the other east of Norfolk, Virginia, where biomasses between 5 and 664 g/m^2 occurred.

Echinoidea (figs. 66 and 67) occurred over much of the continental shelf throughout the entire Region. They were absent in the bays and sounds (with one exception in outer Long Island Sound) and were present on the continental slope and rise only in this northern region. Densities in a little over half their area of occurrence were less than 25/m^2. Along the inner shelf in the northern and central sections and in mid-shelf in the Chesapeake Bight region they were present in densities ranging between 25 and 500/m^2 and in a few limited areas in the New York-Delaware sector, they occurred at densities between 500 and 2,083/m^2. Echinoids constituted a rather substantial biomass. In most of their range their biomass averaged between 0.01 and 25 g/m^2. In roughly ten percent of their range biomass averaged between 25 and 100 g/m^2. In roughly one twentieth of their area of occupancy, including a large area on the outer continental shelf off Cape Cod, their biomass ranged between 100 and 855 g/m^2.

Ophiuroidea (figs. 68 and 69) were distributed along the entire length of the Middle Atlantic Bight Region, primarily in deep water (100 m or greater) but extending inshore in Southern New England and a few localities farther south. Densities were moderately low (less than 25/m^2) over most of their range. Moderate and high (25 to 1,018/m^2) concentrations occurred in a rather broad band along the outer continental shelf between

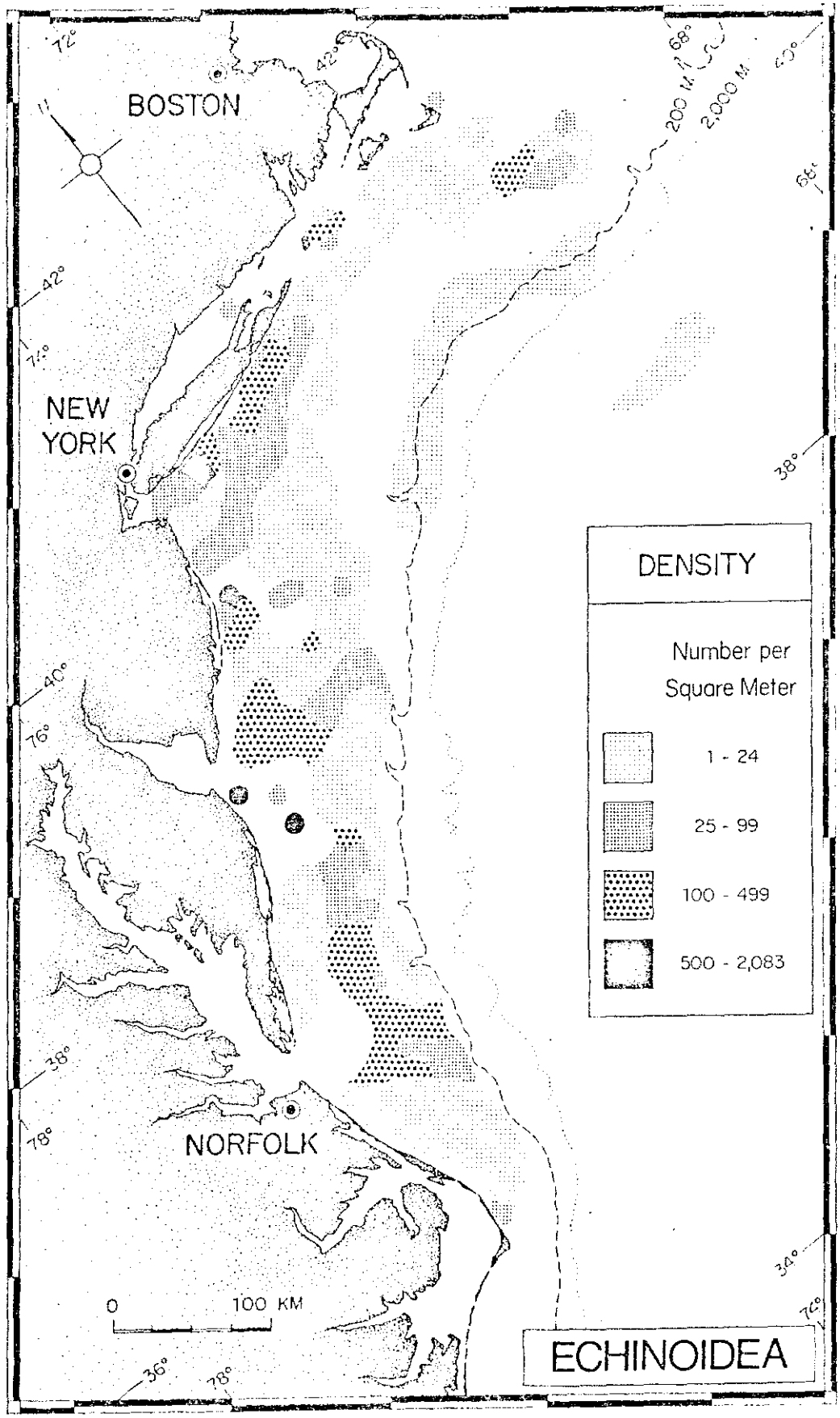

Figure 66.--Geographic distribution of the density of Echinoidea, expressed as number of individuals per square meter of bottom.

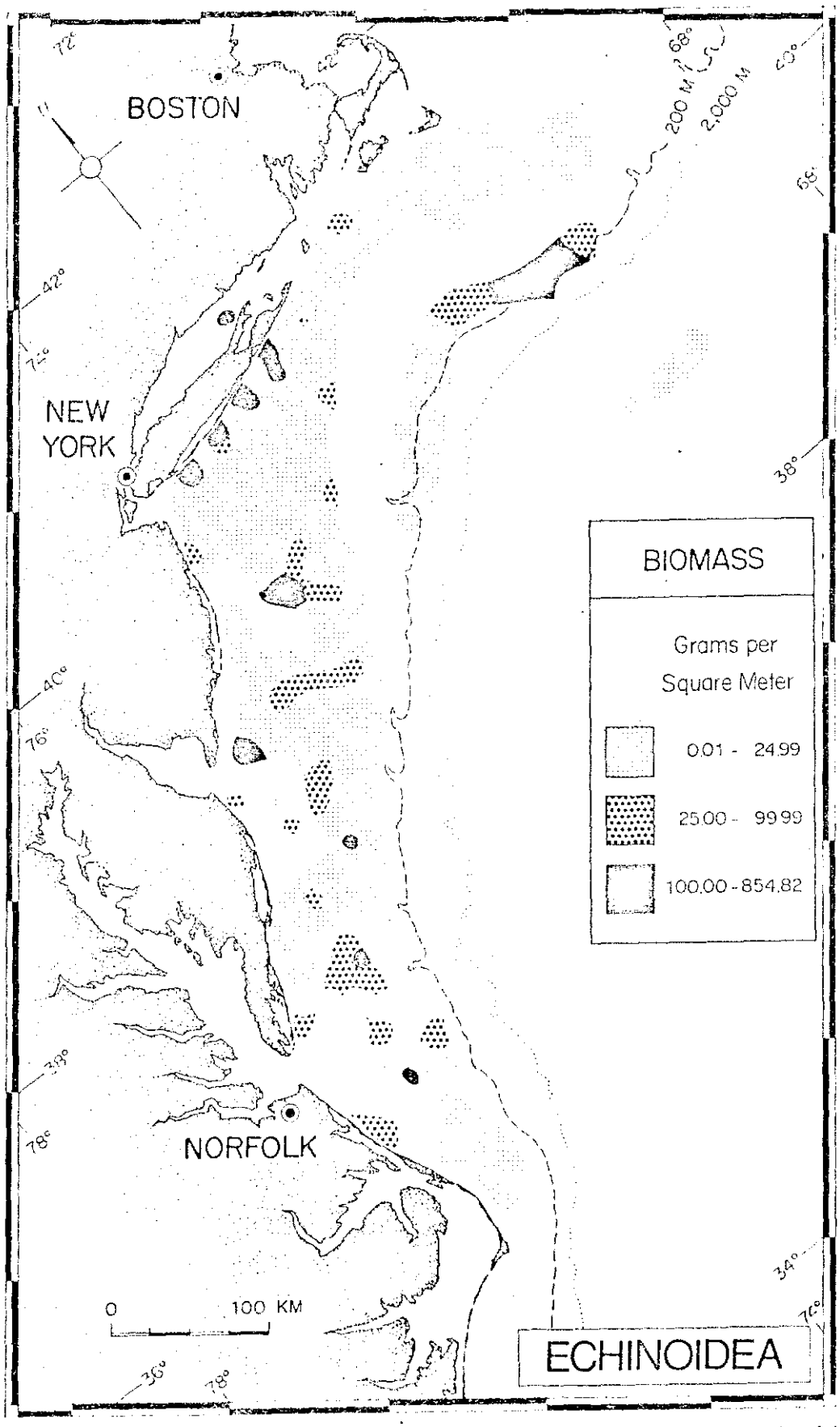

Figure 67.--Geographic distribution of the biomass of Echinoidea, expressed as damp weight per square meter of bottom.

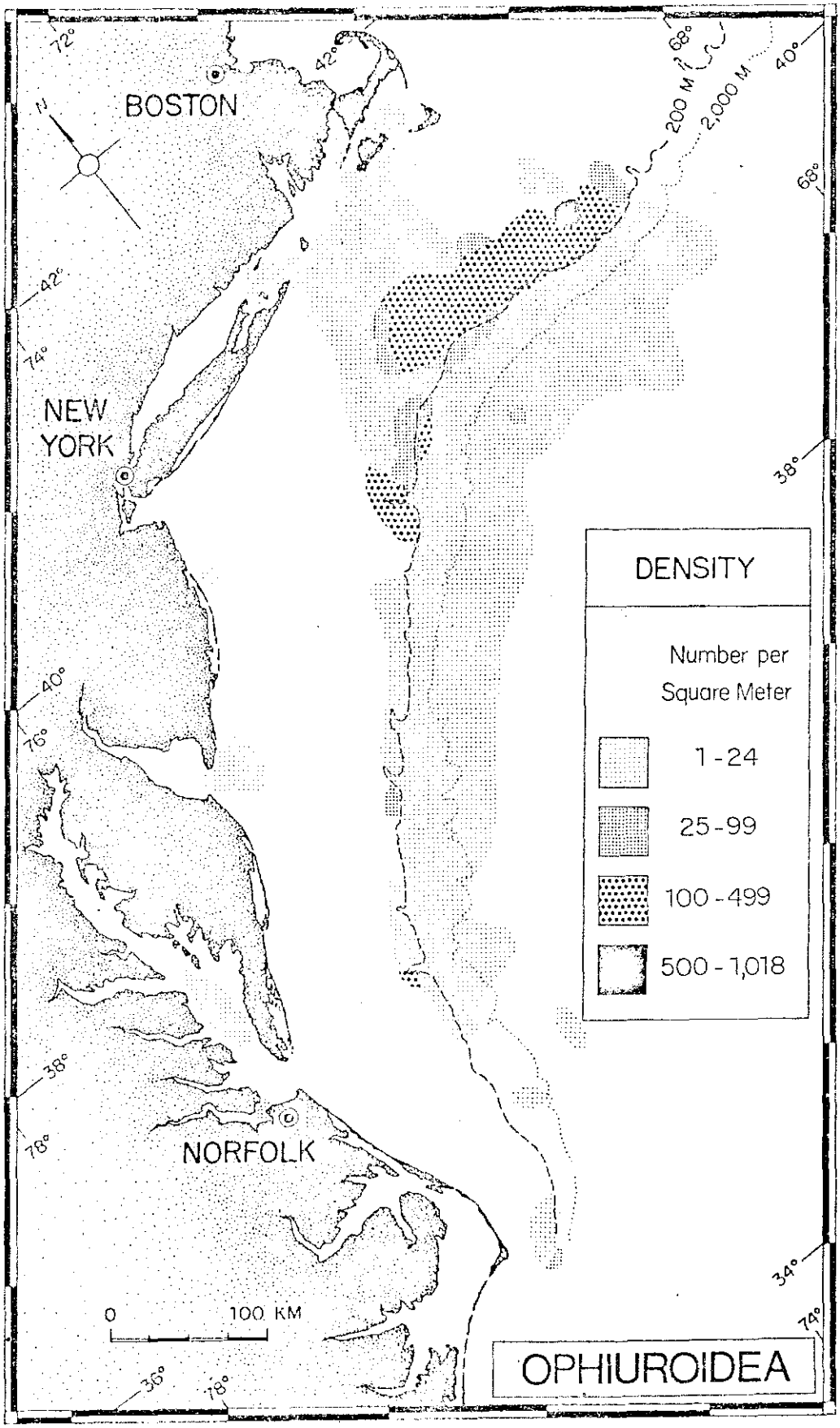

Figure 68.--Geographic distribution of the density of Ophiuroidea, expressed as number of individuals per square meter of bottom.

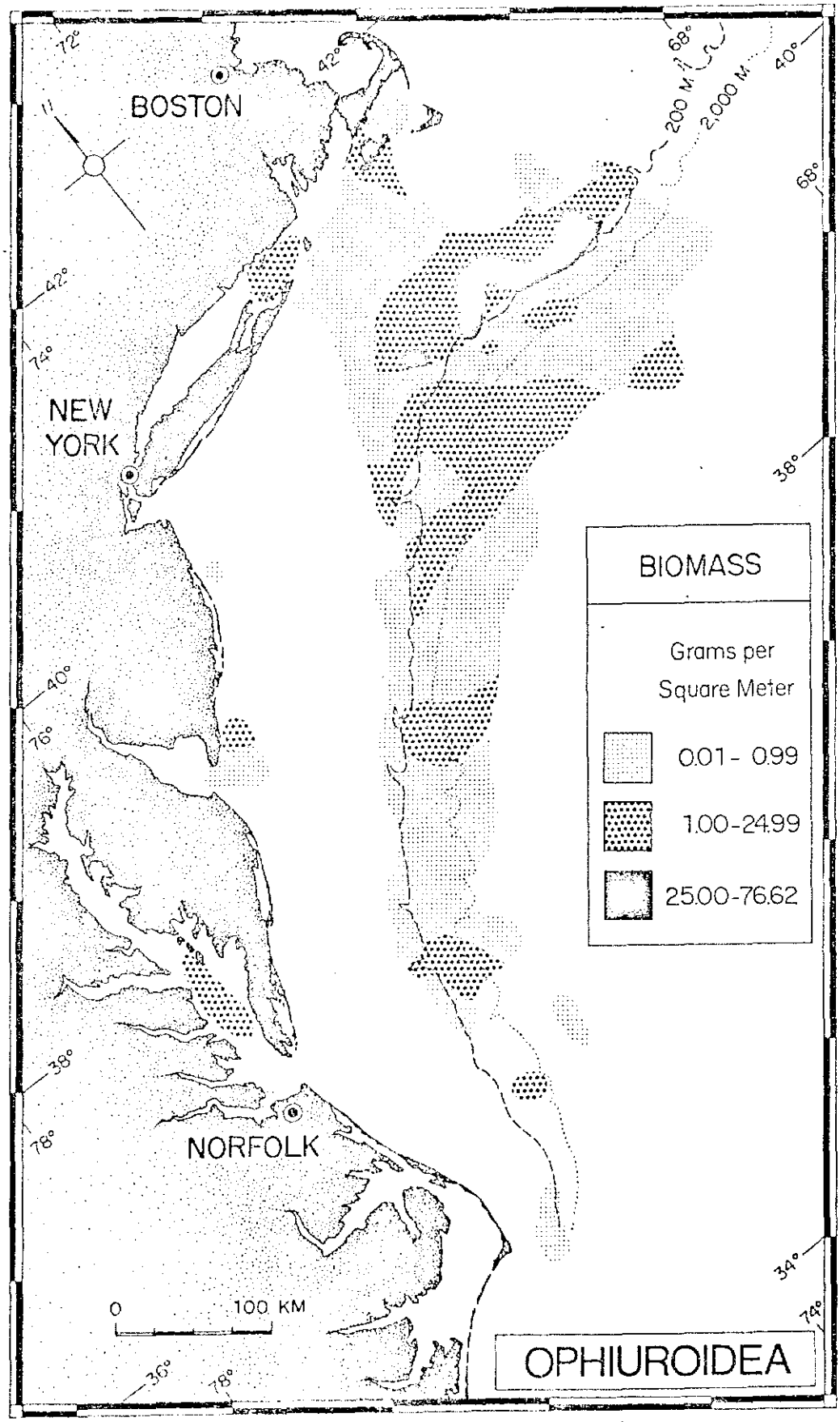

Figure 69.--Geographic distribution of the biomass of Ophiuroidea, expressed as damp weight per square meter of bottom.

offshore New York and Cape Cod. The pattern of biomass was somewhat different from that of density. Moderately small biomass (less than 1 g/m^2) occurred over roughly one half of its range, and moderate (1 to 25 g/m^2) to high (25 to 77 g/m^2) biomass occurred over extensive patches throughout their area of occupancy.

Asteroidea (figs. 70 and 71) occurred over a rather extensive area between Cape Cod and Cape Hatteras. Their occurrence was more common and density was highest in the New England region. In most localities their density ranged between 1 and 9/m^2. In the New England area (and at one locality in New York Bight) their density in a rather large area ranged between 10 and 48/m^2. Their occurrence in the Chesapeake Bight region was primarily in deepwater areas extending from the outer shelf to the continental rise. Biomass of starfishes over most of their range averaged between 5 and 50 g/m^2. At a few localities in the Southern New England-New York Bight area their biomass ranged between 50 and 210 g/m^2. In the Chesapeake Bight subarea, asteroids occurred mainly on the continental slope and rise and constituted a small biomass, commonly less than 0.5 g/m^2.

Hemichordata (figs. 72 and 73) were encountered at only four localities, three were located on the outer continental shelf and slope south of Rhode Island and at one locality along the coast at Cape May, New Jersey. Quantities at all localities were very small.

Ascidiacea (figs. 72 and 73) were distributed in rather patchy areas over a large part of the Middle Atlantic Bight Region. They were common in the bays and sounds in the northern section and in Chesapeake Bay. In the Southern New England subarea they occurred in low (less than 25/m^2) to high (500 to 2,640/m^2) density on the shelf, and in low density on the

slope and rise. In New York Bight their density was commonly lower, 100/m^2. In Chesapeake Bight their density was generally low on the continental shelf, but ranged up to 100 to 499/m^2 in Chesapeake Bay. The pattern of biomass was similar to that for density. Biomass in most areas was less than 5 g/m^2. In substantial areas in Southern New England, and in a few small areas farther south, the biomass averaged between 5 and 528 g/m^2.

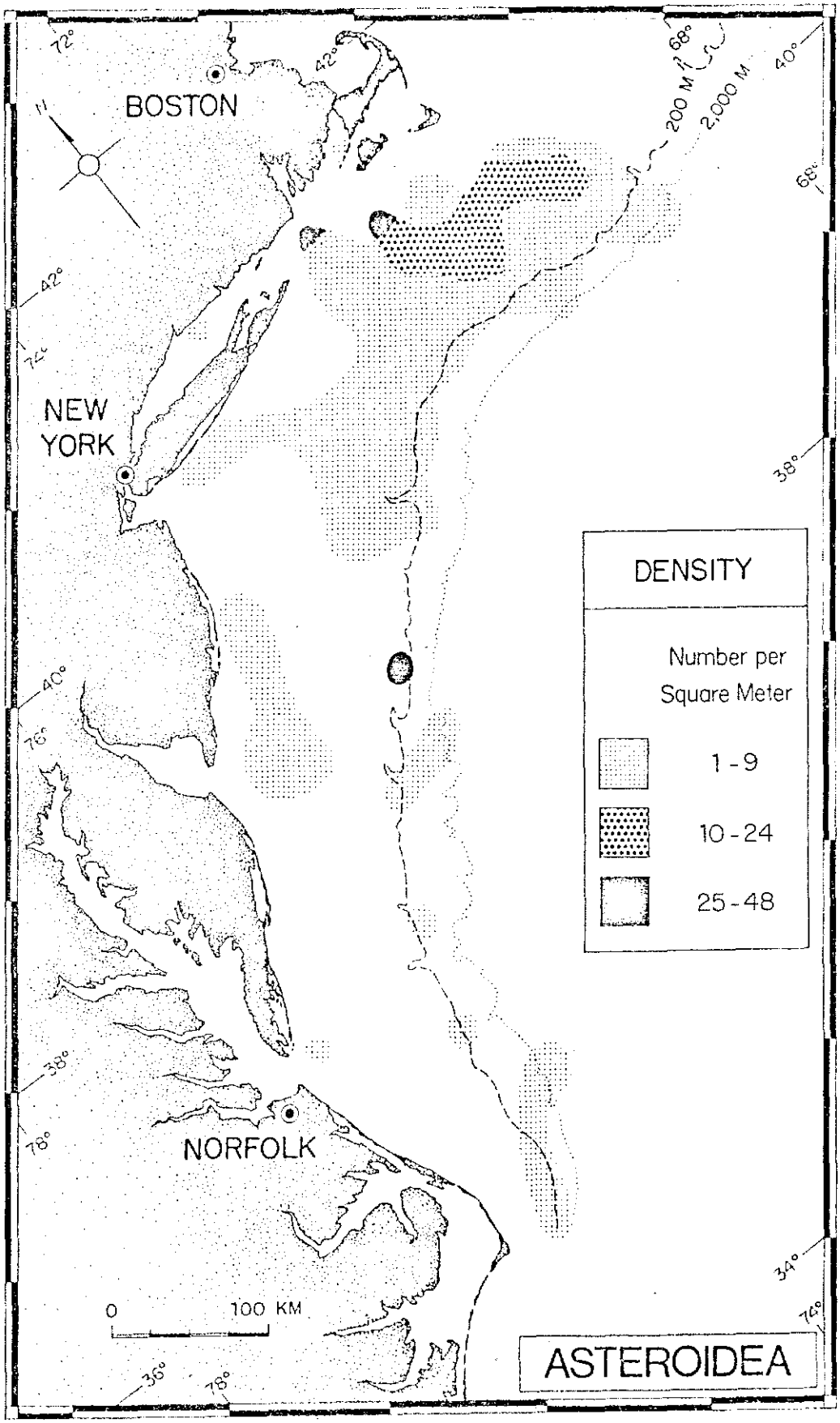

Figure 70.--Geographic distribution of the density of Asteroidea, expressed as number of individuals per square meter of bottom.

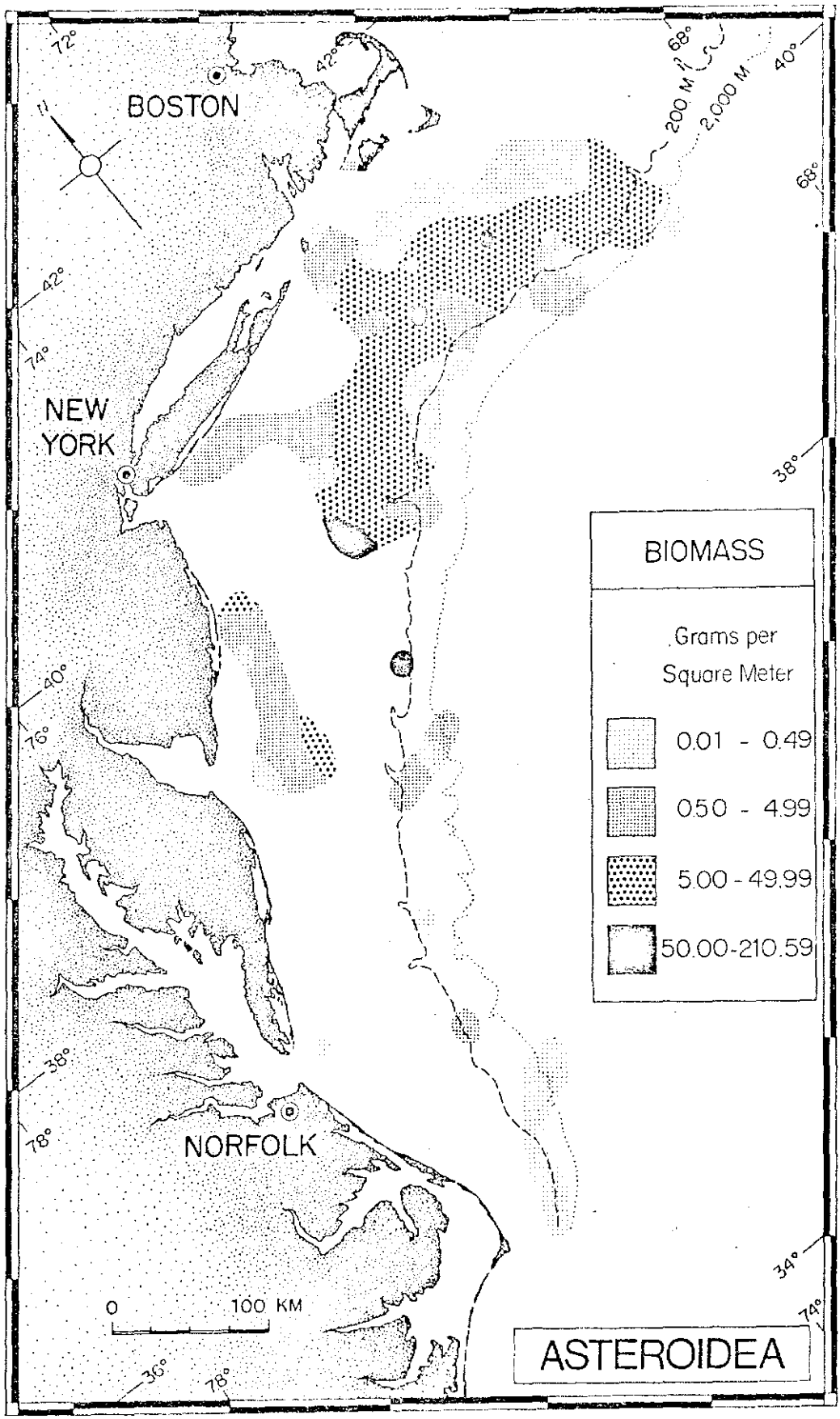

Figure 71.--Geographic distribution of the biomass of Asteroidea, expressed as damp weight per square meter of bottom.

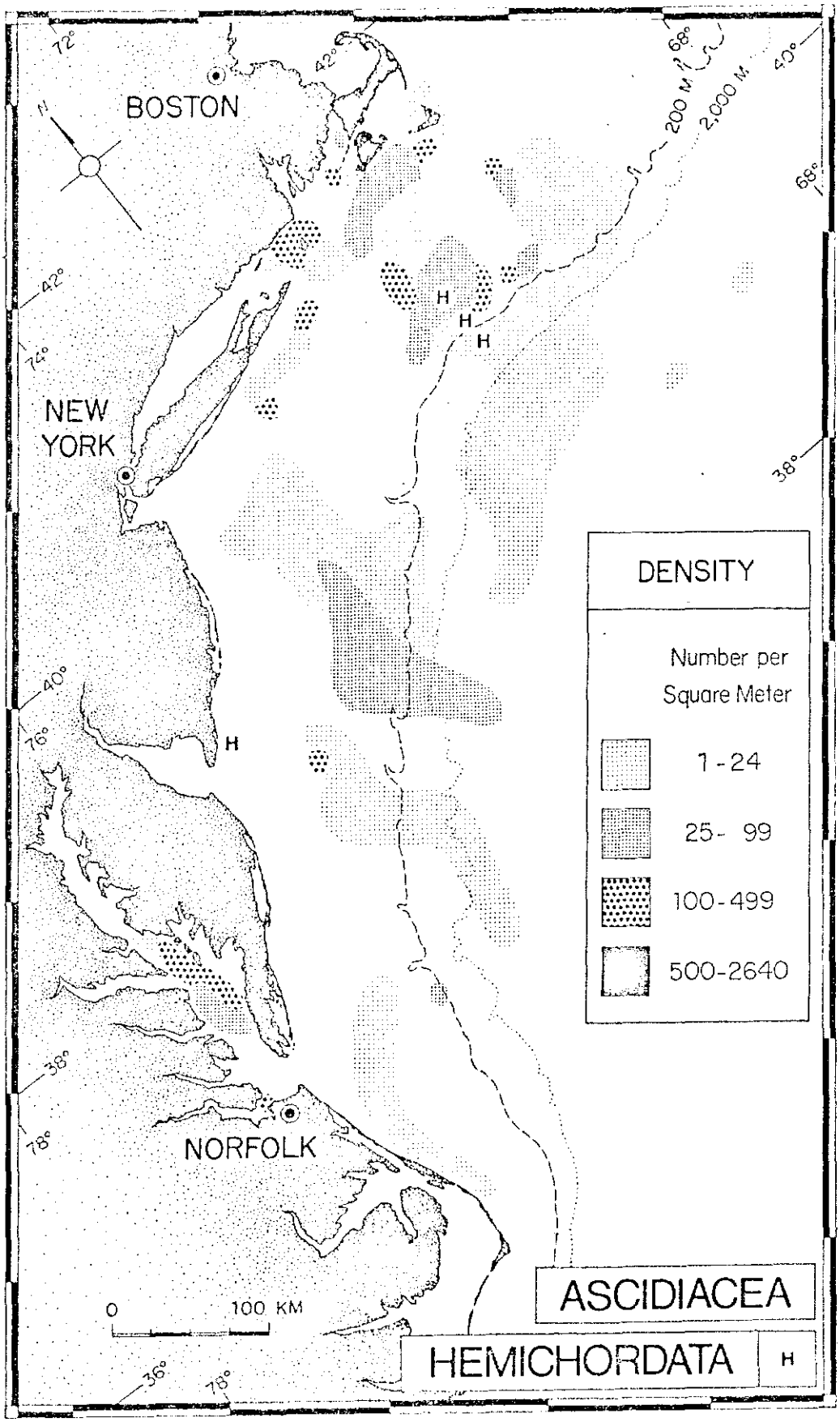

Figure 72.--Geographic distribution of the density of Ascidiacea and Hemichordata, expressed as number of individuals per square meter of bottom.

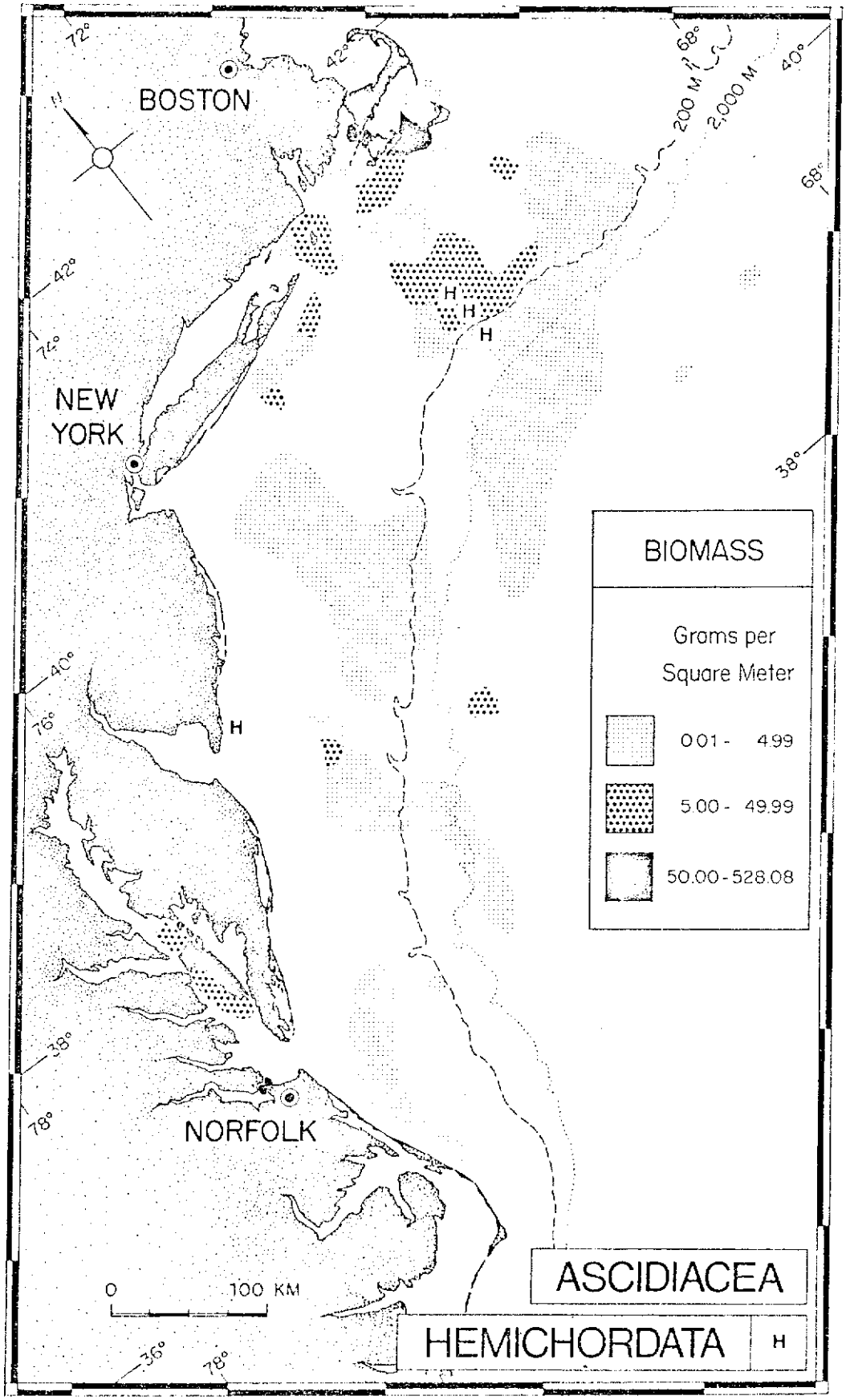

Figure 73.--Geographic distribution of the biomass of Ascidiacea and Hemichordata, expressed as damp weight per square meter of bottom.

Selected Genera and Species

This section deals with the geographic distribution of 24 selected genera and species of macrobenthic invertebrates. These particular forms were selected because of their common occurrence and, in some cases, their distinctive distribution. Their occurrence in our samples is illustrated in six figures, figures 74-79.

The species and genera illustrated, listed by phylum, are as follows:

Phylum Annelida

Sternaspis scutata (Renier)--figure 74--a moderately small (1 cm), stout, burrowing polychaete of the family Sternaspidae. It commonly inhabits silty sediments.

Hyalinoecia tubicola (Müller)--figure 74--a large (10-25 cm), tube-dwelling polychaete of the family Onuphidae. This is an active, epibenthic species that is characteristic of deep water.

Scalibregma inflatum (Rathke)--figure 74--a medium-size polychaete of the family Scalibregmidae. This species, which commonly occurs in silty sand, is an important food of demersal fish.

Phylum Pogonophora

Siboglinum ekmani (Jagerston)--figure 74--a small (5 cm), slender pogonophoran of the family Siboglinidae. This is a tube-dwelling species characteristic of a deepwater environment.

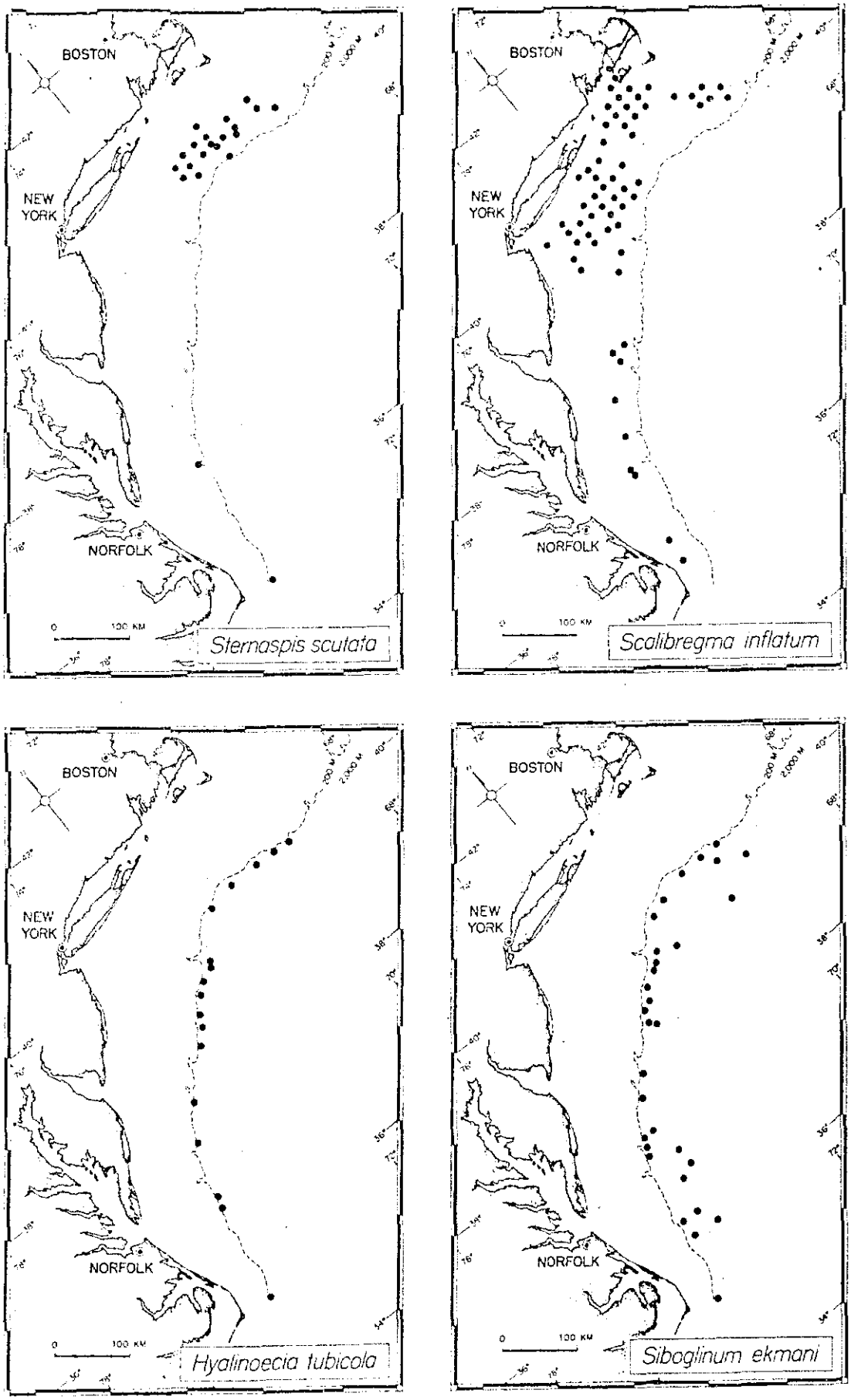

Figure 74.--Geographic distribution of three selected species of Annelida and of one Pogonophora (lower right).

Phylum Mollusca

Arctica islandica (Linnaeus)--figure 75--a rather large (8-15 cm) bivalve of the family Arcticidae. This is a slow-growing continental shelf species that is very abundant in some localities. It usually inhabits silty sand sediments.

Cerastoderma pinnulatum (Conrad)--figure 75--a moderately small (1 cm) bivalve of the family Cardiidae. This small cockle has been taken in a wide variety of bottom sediments.

Thyasira spp.--figure 75--represented in our samples by five species of small (less than 1 cm) bivalves of the family Thyasiridae. The species represented are: ferruginosa, flexuosa, ovata, pygmaea, and trisinuata. These bivalves are most commonly found in offshore waters and in fine-grained bottom sediments.

Cyclocardia borealis (Conrad)--figure 75--a medium-size (3-5 cm) bivalve of the family Carditidae. Although it is more common in boreal waters, in our samples it had a broad distribution in the Middle Atlantic Bight Region.

Lucinoma blakeana (Stimpson)--figure 76--a moderately large (5-7 cm) bivalve of the family Lucinidae. This thin-shelled species is most common in the outer continental shelf waters.

Ensis directus (Conrad)--figure 76--a large (10-17 cm) bivalve of the family Solenidae. This is a very active, sand-dwelling species that also inhabits shallow inshore waters, as well as the offshore continental shelf.

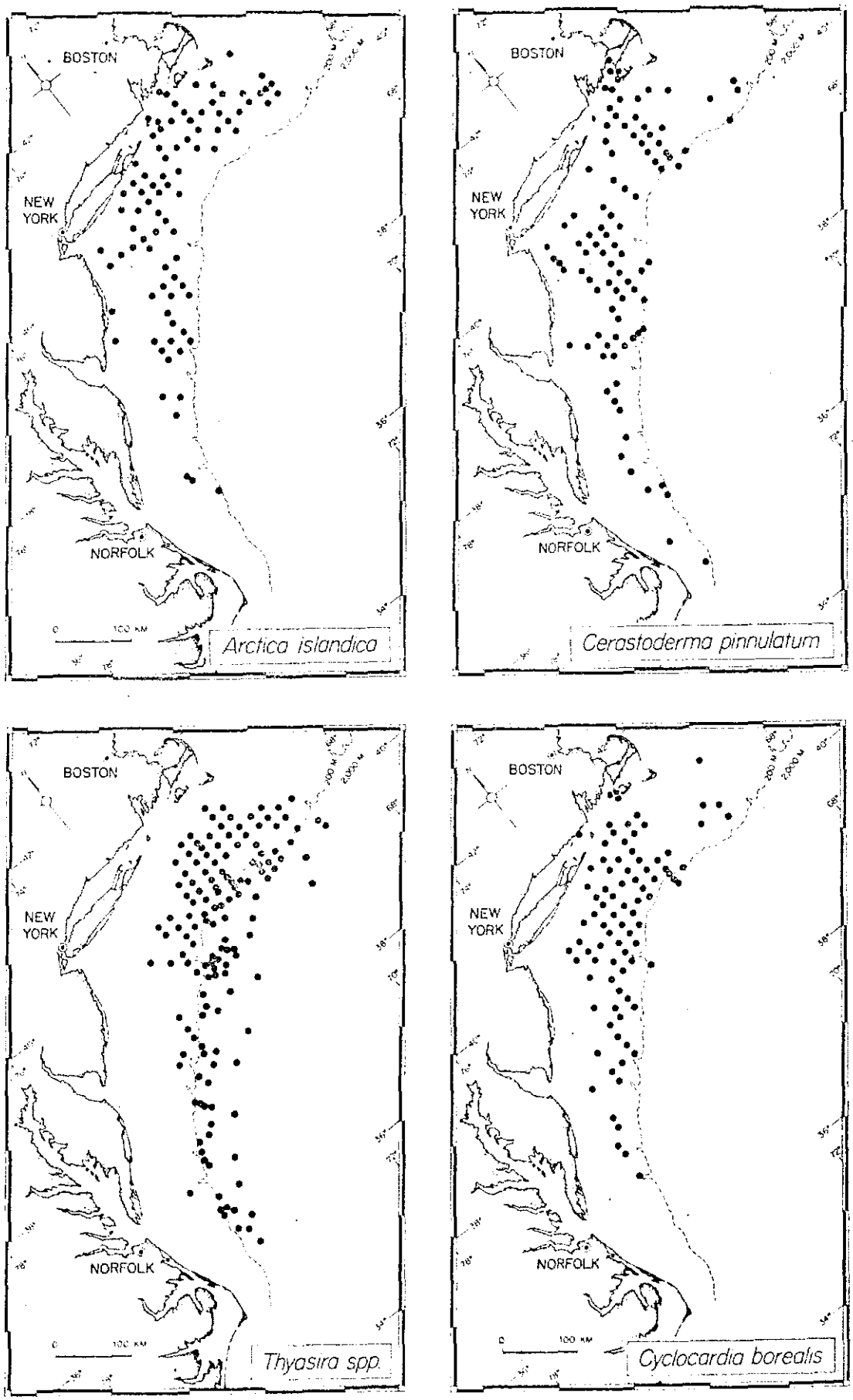

Figure 75.--Geographic distribution of selected bivalves, phylum Mollusca.

Polinices spp.--figure 76--represented in our samples by two species, P. duplicatus and P. immaculatus. These species of carnivorous gastropods, family Naticidae, are typically found on sandy sediments.

Alvania spp.--figure 76--represented in our samples by at least two species, A. brychia and A. carinata. These small (less than 5 mm) gastropods, family Rissoidae, are usually associated with silt-clay bottom sediments.

Phylum Arthropoda

Ampelisca spp.--figure 77--this genus of gammaridean amphipods is represented in our samples by six species: abdita, aequicornis, agassizi, macrocephala, vadorum, and verrilli. They are medium-size (4-7 mm) to moderately large (20 mm) tube-dwelling species. This is a common genus with representatives distributed in inshore and offshore waters; very abundant in some localities.

Leptocheirus pinguis (Stimpson)--figure 77--a moderately large (10-17 mm) gammaridean amphipod, family Aoridae, that typically occurs in continental shelf sand and silty sand habitats. This species is a very important food of demersal fish.

Phoxocephalus holbolli (Kröyer)--figure 77--a moderately small (5-7 mm) member of the family Phoxocephalidae. This species characteristically inhabits bottom sediments composed of fine sand.

Trichophoxus epistomus (Shoemaker)--figure 77--a medium-size (6-8 mm), burrowing amphipod of the family Phoxocephalidae. It is a widely distributed species that inhabits sand and silty sand sediments.

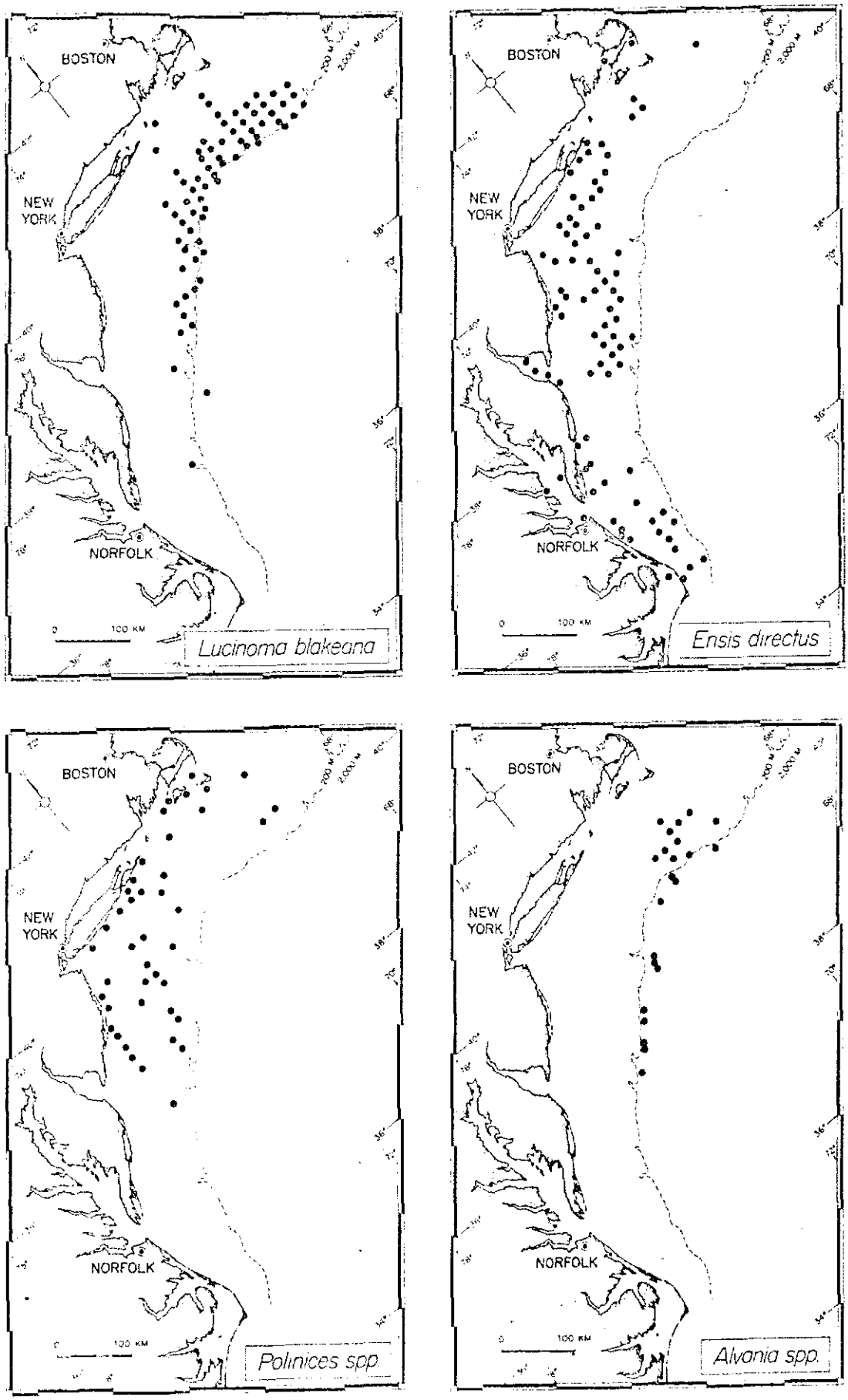

Figure 76.--Geographic distribution of selected bivalves (top) and gastropods (bottom), phylum Mollusca.

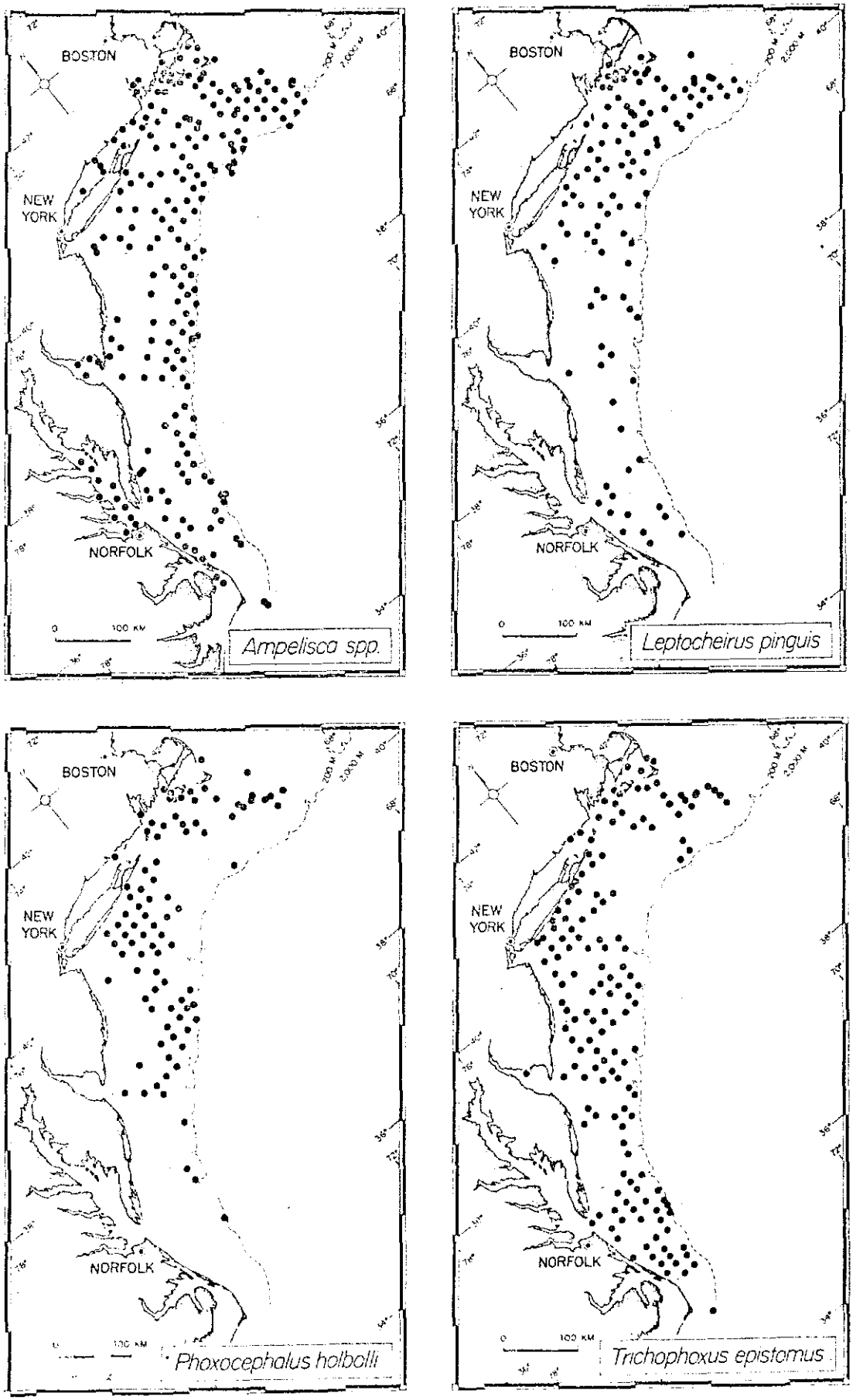

Figure 77.--Geographic distribution of selected amphipods, phylum Arthropoda.

Cirolana spp.--figure 78--a medium-size (1-2 cm) member of the Isopoda, family Cirolanidae. It is represented chiefly by C. polita (Stimpson), but at least one additional species is included. This is a common and widely distributed genus in the Middle Atlantic Bight Region.

Crangon septemspinosa (Say)--figure 78--a moderately small (5-8 cm) caridean shrimp, order Decapoda. Typically, it inhabits sandy sediments, and is distributed throughout the Region in both inshore waters and over much of the continental shelf.

Pagurus spp.--figure 78--medium-size (5-10 cm) members of the order Decapoda, family Paguridae. They are represented in our samples by three species: P. acadianus, P. arcuatus, and P. pubescens. The most common and broadly distributed species is acadianus.

Cancer spp.--figure 78--a rather large (5-15 cm), heavy-shelled brachyuran crab, order Decapoda, family Cancridae. This genus was represented by two species: C. borealis and C. irroratus. Both species inhabit a variety of different bottom sediments and occur throughout the Middle Atlantic Bight Region.

Phylum Echinodermata

Echinarachnius parma (Lamarck)--figure 79--a moderately large (5-8 cm) member of the class Echinoidea, family Scutellidae. This is a very common species and is characteristic of sandy bottom sediments.

Echinocardium cordatum (Pennant)--figure 79--a rather large (5-10 cm) member of the class Echinoidea, family Spatangidae. This is a burrowing species that usually inhabits sand sediments in moderately shallow water. It occurs only in the southern part of the Region.

Astropecten spp.--figure 79--moderately small (8-12 cm) members of the subclass Asteroidea, family Astropectinidae. This genus is represented by two species: A. americanus (Verrill), and A. articulatus (Say). These are carnivorous, burrowing species that are common in silty sand bottom sediments on the outer continental shelf.

Amphilimna olivacea (Lyman)--figure 79--a long-armed species of moderate size (10 mm disc) that belongs to the subclass Ophiuroidea, family Ophiocanthidae. It is a moderately deepwater inhabitant that was taken in our samples only in the northern sector of the Region along the outer continental shelf and upper slope.

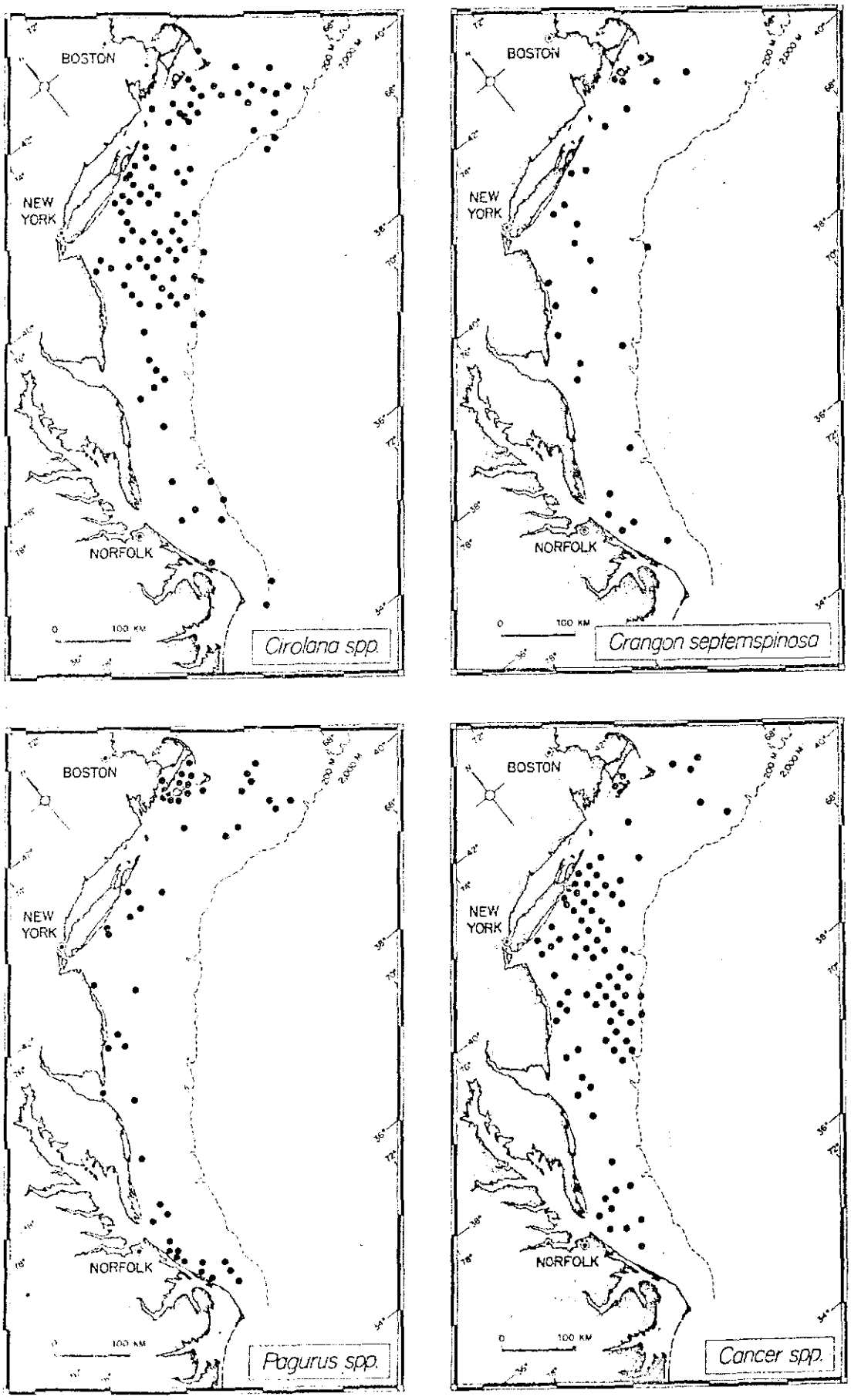

Figure 78.--Geographic distribution of a selected isopod (upper left) and decapods, phylum Arthropoda.

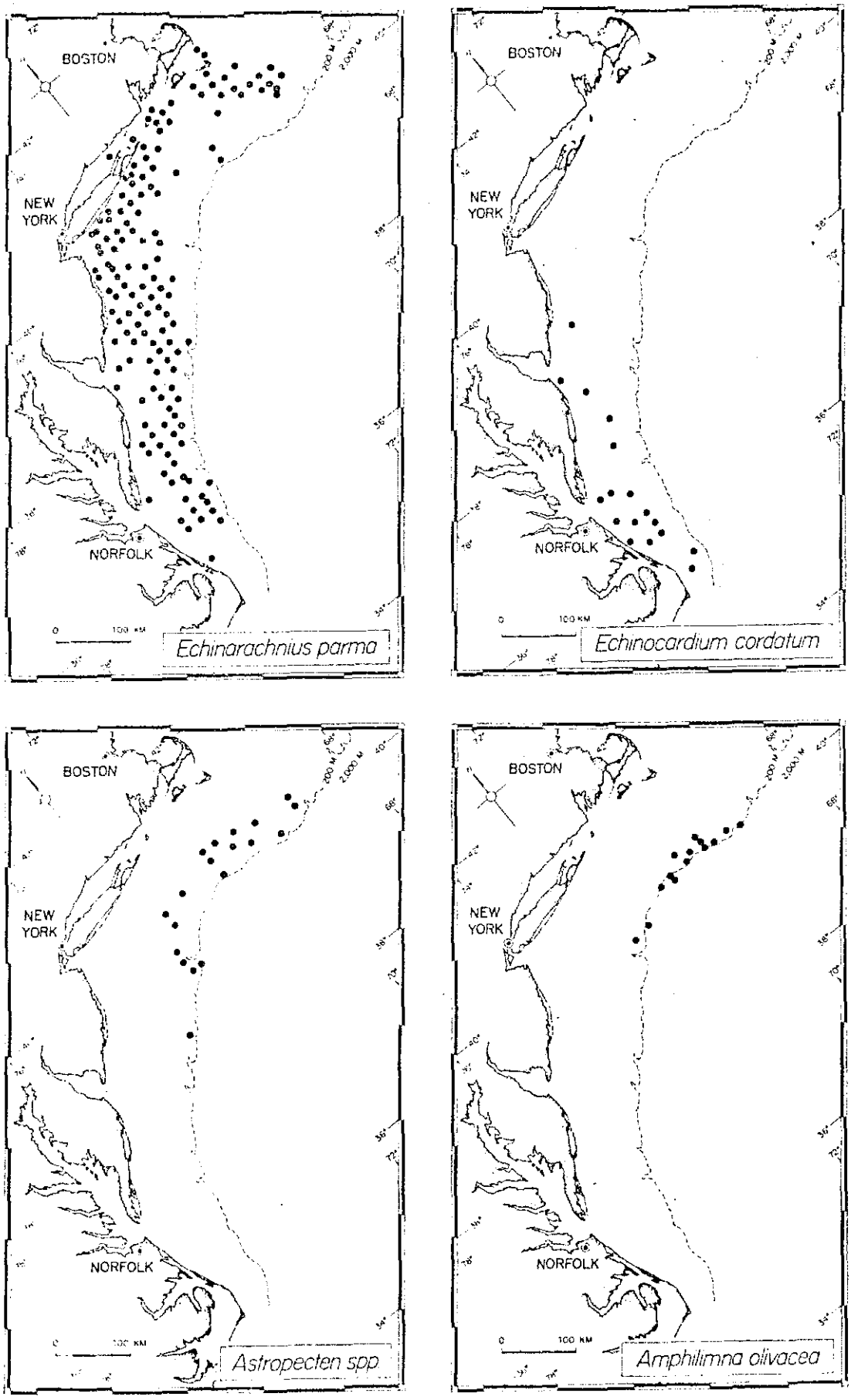

Figure 79.--Geographic distribution of selected echinoids (top), asteroids (lower left), and ophiuroids (lower right), phylum Echinodermata.