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The Mid-Atlantic Bight, a neglected marine gold mine : report of the Subcommittee on the Atlantic Bight

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APPENDIX NA-9

THE MID-ATLANTIC BIGHT: A NEGLECTED MARINE GOLD MINE

(Report of the Subcommittee on the Atlantic Bight)

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INTRODUCTION

The mid-Atlantic Bight is that area of the western north Atlantic bounded by Cape Hatteras on the south, Cape Cod on the north and the coast lines and fall lines of the various tributaries in the west, Figure 1. The eastern boundary is more difficult to define but might be considered as the Gulf Stream or even beyond. Neither of these boundaries is clearly defined except the shoreline; but even this clear demarcation is somewhat illusory because there are zones of transition on the beach. The land merges with the sea more gradually in the salt marshes than on the sandy beaches. Fall lines may be broached by determined anadromous and catafromous fishes. The salt lagoons, great bays and smaller estuaries are also part of the Bight. This is a large, complex geographical entity.

In this great silty, salty area there are many realms and niches where physical conditions vary considerably and in which huge aggregations of animals and plants, many edible and useful, abound. Minerals and, obviously, water are also plentiful. Despite the varied nature of the waters, marshes and sandy shores of the Bight, it is a continuum, a continuum in

which the various physical factors interact quickly and often thoroughly. And in this continuum the effects of the physical features of the environment, i.e., salinity, temperature, dissolved oxygen, are translated rapidly to the animals and plants. Thus, it can only be studied, understood and managed as a continuum, a complex, interacting natural environment.

Because of their proximity to land and their shallow nature, these waters are rich in nutrients. These waters are and will probably continue to be the most productive in terms of pounds of organic matter or food per cubic foot of water or bottom, etc. They also contain the greatest diversity of species and the most varied communities or groups of species. Certain animals are most readily available herein. Thus, these estuarine and Shelf waters deserve, from a practical (and basic) point of view, marine science's closest attention.

It is also important to remember that the Atlantic Bight is only a part of the larger American Continental Shelf and is, therefore, contiguous with the extensive shallow water areas extending from Cape Cod to Nova Scoita on the north and Cape Hatteras to Cape Canaveral on the south. It also merges with the deeper waters to the east of the Gulf Stream. Various water masses from these areas intrude into shallows of the Atlantic Bight; the Gulf Stream, bringing water from the Caribbean and the Gulf of Mexico, flows along its outer edges; and migratory fish move north and south into and out of the Bight area.

The entire Continental Shelf is a potential gold mine of water, fish and shellfish and other edible products, minerals and aesthetic values.

FISHERIES OF THE ATLANTIC BIGHT

Considering mainly the waters of the lower estuaries and those of the Continental Shelf the principal fisheries, classified according to gears employed, are:

1) The winter trawl fishery - mixed fish
2) The purse net fishery - menhaden
3) Pound nets - mixed fish
4) Gill nets, haul seines and fykes - mixed fish
5) Hydraulic dredging for surf clams
6) Pot fishery for Sea Bass

In the areas close to shore anglers take a large toll of many species of fish.

Species of Commercial and Game Fishing Important in Atlantic Bight Area (Exclusive of oysters, and soft clams)

Invertebrates

Molluscs:

Surf clams - Md., Del., & N.J.	Spisula solidissma
Hard clams - entire area	Mercenaria mercenaria
Scallops - N.J., north	Pecten gibbons

Molluscs:	
Conchs - mostly in south	Busycon spp.
Squid - entire area	Loligo pealei
Crustacea:	
Blue crabs - N.J., south	Callinectes sapidus
Lobsters - N.J., north	Homarus americanus
Vertebrates - Resident	
Menhaden	Brevoortia tyrannus
Weakfish	Cynoscion regalis
Croaker	Micropogon undulatus
Whiting	Menticirrhus spp.
Winter Flounder	Pseudopleuronectes americanus
Fluke (Summer Flounder)	Paralichthys dentatus
Scup	Stenotomus chrysops
Sea Bass	Centropristes striatus
Striped Bass	Roccus saxatilis
Butterfish	Poronotus triacanthus
Black Drum	Pogonias cromis
Vertebrates - Non-Resident	
Tunas	Thunnas, Euthynnus, etc.
Blue fish	Pomatomus saltatrix

Vertebrates - Non-Resident (cont'd)

Mackerel	Scomber, Scomberomous, etc.
Cobia	Rachycentron canadum
Dolphin	Coryphaena hippurus
Marlin	Makaira spp.

The present condition of the various populations of exploited or exploitable marine animals, i.e., fish and shellfish, is difficult to determine due to the lack of reliable population data for most species. In addition, the lack of adequate catch records makes it hard to calculate whether the sport and/or commercial fisheries have had any noticeable effect on those fluctuations which have occurred.

Judging from the regional reports of the members of this sub-committee it would seem that those fisheries which are experiencing greatest trouble are: 1) Weakfish, 2) Croaker, 3) Sea Bass (?). The species which are probably being fished near their limits are: Menhaden, Butterfish and Flukes, because according to some recent reports they are exhibiting signs of distress. The others listed above could probably be fished more heavily. It must be emphasized that the pressure on these species does not all come from the commercial fisheries. On the contrary, from Chesapeake Bay northward the sport fishery is heavily involved with the food species. For this reason both fishing industries must be considered in any attempt to

determine the role of fishing mortalities in the fluctuations in populations of fishery stocks. In addition, the effects of engineering projects, and of industrial, domestic and agricultural pollution must be considered.

Though overfishing may be involved in the decline of certain of these species, this has not, except perhaps in the case of the weakfish, been clearly indicated. In most we know so little about natural causes of mortality, migrations, distribution and spawning that it is impossible to determine cause and effect. Therefore, the need for study of all factors acting on the various valuable organisms is apparent. Before we can determine the cause of a downward trend, or in some cases even if there has been a real downward trend, in any of the populations we are considering, or before the possibilities of management can be considered, it will be necessary to study thoroughly the many factors affecting the fishes themselves.

Due to problems existing in the coastal estuaries the offshore trawl fishery is taking an ever increasing percentage of the total catch. From this point of view the importance of the Continental Shelf to the states involved in this Commission is assured. In addition, it is obvious that Shelf waters interact with and affect estuarine waters. Because many of the important estuarine fishes spend significant portions of their lives in the ocean over the Continental Shelf the importance of that area to society is further amplified. However, perhaps an even greater necessity for research

to obtain knowledge of the biology, chemistry, geology and physics of the Continental Shelf stems from the extreme likelihood that we will be forced into greater utilization of its biological, chemical and geological resources. To get the most out of the sea it will be necessary for us to understand the currents, winds, waves, and tides and their effects on plants, animals, and sediments. We must also know the effects of pollution of all types, e.g., radioactive, industrial, domestic and agricultural, on the waters, plants and animals of the Shelf and estuaries.

Thus, there are many strong economic reasons for the Atlantic States Marine Fisheries Commission to urge that state, federal and private marine scientists turn their attention to the waters, bottoms and life in the Continental Shelf.

For various reasons marine science has concentrated mainly on the waters of the deep seas and the estuaries. As a result, very little attention has been given to the Shelf itself. For example, only one small research ship, PATHFINDER of the Virginia marine laboratory, is operating a regular pattern of stations in the mid-Atlantic Bight at this time. Continued neglect of this actually and potentially productive area is foolish. On several counts, therefore, it is necessary that a program of research on America's Continental Shelf be mounted. This should be coordinated with intensified studies of the biology, chemistry, geology and physics of estuaries.

Several qualified bodies have given general and specific attention in the last few years to the scientific questions which should be considered in any program of research in the estuarine and Continental Shelf areas. Their recommendations have been used as guide lines for the proposals now being presented to this Commission. From studies of these documents and proposals and consideration of problems peculiar to the Atlantic Bight or the Continental Shelf it is possible to make the following recommendations for research on the Atlantic coast.

In general it is obvious that several types of information are necessary. These are:

1. Relation of estuarine and coastal species to their environment.

2. Physiological responses of estuarine and coastal species to various environmental factors.

3. Long-term studies of the physical, chemical, geological and meterological characteristics of the estuarine and Shelf waters.

This should include recording, fixed and buoyed, manned or unmanned stations, survey and research ships, and advanced data storage and processing capabilities.

4. Adequate statistical studies of the estuarine and Shelf commercial and sport fisheries.

5. Exploratory fishing and gear development.

6. Certain aspects of the economic and technological problems relating to the processing, storage and marketing of fishery products should be studied at the same time.

It is impossible to determine the causes of fluctuation in abundance of fishery organisms without being able to distinguish between fishing mortality, i.e., the numbers of fishes taken or otherwise destroyed by man in his fishing activities, and natural mortality, i.e., population reductions due to natural causes such as disease and parasitism, predation, adverse water climate and old age, etc. It is further necessary to be able to recognize losses due to the effects of man's non-fishing efforts, i.e., industrial, agricultural, and domestic pollution, deforestation, and engineering changes. Unless we can distinguish between these effects we can neither know the causes of population reductions (shortages in fishery stocks), nor can meaningful remedies be devised. This seems simple, straightforward and apparent. Achieving the necessary level of scientific knowledge is another matter. To do so will require a long, arduous and extensive effort because the problems themselves are extremely complex.

Outline of General Areas of Study to be Undertaken
on Continental Shelf and Estuarine Fish and Shellfish

I. Catch Records

At the present time the only expedient way to follow changes and trends in abundance is by means of commercial catch records. Thus, an essential part of any major fishery investigation must contain a valid catch record program. In the mid-Atlantic Bight this should include the winter trawl fishery, the summer inshore fishery and possibly, in addition, the estuarine and coastal sport fisheries.

This catch record program must be conducted in such a fashion that the following information can be derived:

1) Catch/unit effort by species

2) Size composition by species

3) Age composition by species

II. Basic Scientific Studies

A. Biological Studies

1) Life History Investigations

To include:

a. spawning sites

b. location and characterization of nursery areas

c. mechanisms of dispersal of larvae

d. migration routes of juveniles and adults

e. reproductive potential, survival, etc.

f. food studies of life states and fluctuations in food supply

2) Population: Distribution and Dynamics

a. definition of population or sub-population limits

b. tagging studies to determine total mortality and fishing mortality and exploitation rates.

c. influence of fishing on population trends.

3) Natural Mortality Studies

a. determine tolerance to and effect of natural environmental variables.

b. investigate role of disease and parasitism in population fluctuations.

c. determine tolerance levels of the several ontogenetic stages to industrial and domestic pollutants.

B. Hydrographic Studies

1) Seasonal patterns of Continental Shelf, and estuarine, circulation.

2) Seasonal pattern of temperatures, salinity, and other physical parameters to be decided upon.

3) Studies of sediments with particular attention to their role in bringing in and recycling nutrient fertilizers to the estuarine and Shelf waters.

4) Influence of Gulf Stream on coastal hydrography.

Until this point, this discussion, though necessary, has been largely a repetition of earlier considerations. In the past, however, no attempts have been made to study research resources and compare them with the projects that must be done in order to determine whether they are adequate or whether additional capabilities are necessary. Though the efforts of this committee to do this are not complete, they constitute a beginning. Perhaps the best way to learn what is needed is to compile statistics on the research capabilities of the various agencies in the Bight area and--assuming they are being used to capacity--see what is being accomplished. By contrasting current research programs and their rates of progress with the foreseeable needs an estimate of additional effort needed should be obtainable. In a limited way this procedure has been followed.

A survey of the research facilities and programs of the institutions located in the mid-Atlantic Bight area reveals that most are concerned with estuarine and close inshore work. With the exceptions of the Virginia Institute of Marine Science, no organization makes regular research cruises over the Continental Shelf. As far as can be determined--of all the laboratories private or public in the mid-Atlantic Bight area--only the Virginia laboratory attempts to fulfill a regular schedule of Continental Shelf Cruises. This is an interesting fact.

The survey yielded the following details:

MID-ATLANTIC BIGHT RESEARCH FACILITIES

A. North Carolina[1] -- Institute for Fisheries Research at Moorehead City, and U. S. Fish and Wildlife Service, Beaufort Biological Laboratory.

1. Personnel - 33

   a. Senior Scientists - 11
   b. Junior Scientists - 22

2. Laboratory Space - 24,700 sq. ft.

   a. Biological Laboratory - 24,700
   b. Radiobiological - 4,700
   c. Storage Space - 5,000
   d. Visitors housing - 320 (4-6 people)*

   *(Institute for Fisheries Research space not included)

3. Vessels

   a. Large

      (1) 50' Diesel Trawler, conversion, Hydro. winch. Trawl, dredge, core. (IFR)

   b. Small

      (1) 26' Inboard. Plankton tows, light hydro. (BCF)
      (2) Outboards 11

4. Equipment Special

   a. Excellent Radiobiological Equipment (BCF)

5. General Nature of Programs

   a. Scientific Scope
      (1) Biological and fishery research
      (2) Limited hydrographic research

b. Geographical Range

(1) Estuaries, sounds, inshore oceanic areas near beaches, little oceanic work out of sight of land.

6. Future

Plans for expansion but not in immediate offing (IFR)

1--Duke University Marine Laboratory not included.

B. Chesapeake Bay[1] -- Va. Institute of Marine Science, Gloucester Point and Chesapeake Biological Laboratory, Solomons, Md.

1. Personnel - 75

a. Senior Scientists - 33
b. Junior Scientists - 25
c. Technicians - 17 (data from VIMS only)

2. Laboratory Space - 32,491 sq. ft. (CBI not included - no data available)

a. Biological Laboratory - 29,556
b. Maintenance & Storage - 2,935
c. Housing - 3,118

3. Vessels

a. Large (40+)

(1) Pathfinder 55', especially designed.
a. Hydraulic winch, trawl, dredge, core

(2) Langley 80' x 32' x 5', converted passenger ferry
a. Hydraulic winch, trawl, dredge, core

(3) Cobia, 42', conversion
a. Hydraulic winch, dredge, core

(4) Ryder, 42', conversion, dredge, core

(5) Anomia 40', conversion, all tasks

(6) Maury 63', esp. designed, all tasks

(7) No name 40', ?

b. Small

(1) Observer, 27', inboard, converstion, lt. hydro. core, dredge

(2) Perca 22', inboard, lt. hydro and dredging

(3) Dumbo, 22 ', inboard, lt. hydro. and dredging

(4) Lydia Louise 30', inboard, lt. oceanographic

(5) Outboards - 12

4. Special Equipment

a. Microbiology building (VIMS)

b. Controlled conditions laboratories, chemostats

c. Analytical equipment, spectrophotometers, climatographic equipment

d. Fluorescent and phase microscopes

e. Radiobiology and chemistry laboratories

f. Electronic shops and gears

g. Edo depth sounders

h. Pathology and Parasitology equipment.

5. General Nature of Programs

a. Scientific Scope

Mostly biological (CBL, VIMS), physical and chemical (CBI), and geological (VIMS, CBI)

b. Geographical Range

Estuaries, bay lagoons, Continental Shelf (VIMS, CBI)

6. Future

Expansion needed and planned, some in immediate offing, (VIMS, CBI)

1--Neither FWS Oxford Laboratory nor Maryland Tidewater Fisheries Department included.

C. Delaware, New Jersey and New York[1] -- University of Delaware Marine Laboratory; New Jersey Marine Fisheries Laboratory, Long Island; F. W. S. Sandy Hook Marine Laboratory; and, N. Y. Division of Fish and Game, Freeport.

1. Personnel - 48

a. Senior Scientists 19
b. Junior Scientists 26
c. Technicians - 3 (Univ. Del. - all students)

2. Laboratory Space - 9,825

a. Research 9,200
b. Maintenance & Storage 625
(24,000 sq. ft. available at Sandy Hook)

3. Vessels - (Sandy Hook marine laboratory has no ship)

a. Large (40+)

(1) Ketch 50', lt. hydro. (Univ. Del.)

(2) Trawler 40', dredge, core, trawl, lt. hydro

(3) Survey vessel 40', lt. hydro

b. Small

(1) Elizabeth C 35', lt. hydro

(2) Anne II 35', trawl, dredge, core

(3) Kathleen 24', lt. hydro

(4) Hariette 24', lt. hydro

(5) Dory 21', (?)

(6) Outboards 11

4. Special Equipment

a. Bendix Computer (Univ. Del.)
b. Electron Microscope (Univ. Del.)

5. General Nature of Programs

a. Scientific Scope

Mostly biological, lt. hydro., geological

b. Geographical Range

Estuaries, bays, lagoons, occasionally Continental Shelf (only Sandy Hook Marine Laboratory)

6. Future

Expansion needed or planned, not in immediate offing.

1--Rutgers University, New York University, Columbia CC. New York and laboratories on North Shore of Long Island Sound not included.

Since no one but the Virginia group is regularly studying the Continental Shelf it might be assumed, on the one hand, that none has the facilities or personnel, or, on the other, only one institution has the inclination to do Continental Shelf research. Because of the almost unanimous interest on the part of the scientists in the Bight area it is likely that the first two and not the last are the main factors responsible for neglect of this important area.

Of scientific facilities the most obvious lack is adequate vessels. Needed for synoptic, scheduled cruises over the Shelf are all weather research vessels which are adequate to the jobs. With the exception of Virginia's research vessel LANGLEY, a converted ferry boat, incapable of operating outside the Bay, there are no vessels over 65' LOA among all the organizations polled in the entire region from Cape Hatteras to Massachusetts. Of the 40' plus vessels, one one, Virginia's trawler design PATHFINDER, operates regularly over the Shelf. Thus, the chief lack is adequate vessels. In fact, there is not really an adequate research vessel operating on a regular basis in the entire area.

What will be needed in the way of vessel capabilities? According to one estimate to occupy a grid of stations 20 miles apart covering the Continental Shelf in anything approaching synoptic fashion, at least three to four 120' - 140' LOA ships for the inshore areas with one to two 165-190' LOA to cover the deeper offshore waters will be needed. These vessels must be

fast, sea-worthy, realtively comfortable and well-equipped, and they will have to be operated on as near a continuous basis as possible. Nothing less in vessel capability will be adequate.

While it might be possible, given adequate vessels, to direct some personnel from present projects to Continental Shelf projects, this is not the best way to make progress. In fact, it can be flatly stated that all worthy current, long-range research programs must be continued. Therefore, addition of new personnel in all laboratories will be necessary to carry out research over the Shelf. Obviously additional shore-based facilities, buildings and equipment, will be necessary to service the added vessels and personnel, personnel to tabulate and process the increasing data and house the biological collections. Systematic help must also be forthcoming.

It appears, therefore, that a doubling of present working facilities and staff will be needed in all laboratories along the coast. In institutions where current programs are relatively small, e.g., Institute for Fisheries Research and the New Jersey and New York marine laboratories, staffs may have to be increased as much as five to seven or more times.

In summary, this subcommittee is convinced that the estuarine and Continental Shelf areas are by far the most important areas of all the seas and that the marine resources available here are of tremendous economic value. It is equally convinced that the entire area has been badly neglected by science. The subcommittee is certain that increased research by the state and federal

laboratories will result in economic and social benefits worth many hundreds of times the cost of the research. Thus, marine research is easily justifiable on purely economic grounds.

In these days of warfare by swift surface and submersibles; industrial, domestic and radioactive contamination, increasing population pressures, it seems somewhat incongruous that the American government can more easily mount projects to the moon and to the Antarctic or Indian Oceans than to its own Continental Shelf which contains so much mystery and practical benefits and is so close to home.

The subcommittee recommends that the ASMFC continue the subcommittee, that it urge expansion of research activities over the Continental Shelf in the mid-Atlantic Bight area, and that this interest be expanded to include the entire Atlantic Continental Shelf off North America.

To implement establishment of a more satisfactory coastal research program, the subcommittee recommends passage by ASMFC of the following resolution:

CHESAPEAKE BAY

"WHEREAS, The importance of the waters, bottoms and marine organisms of the Continental Shelf to the fisheries and other maritime activities of several states bordering the mid-Atlantic Bight (and to all other coastal states) has been clearly demonstrated, and

"WHEREAS, This area has long been neglected by the scientific agencies serving these states,

"BE IT THEREFORE RESOLVED, That this Commission endorses expansion of research activities of the member states and the U. S. Fish and Wildlife Service and such other state, private, and federal agencies as may be pertinent to include complete studies of the physical, chemical, and biological characteristics of the Continental Shelf, and

"BE IT FURTHER RESOLVED, That the mid-Atlantic Bight Committee be continued."

(NOTE: The resolution was passed unanimously by the Commission.)

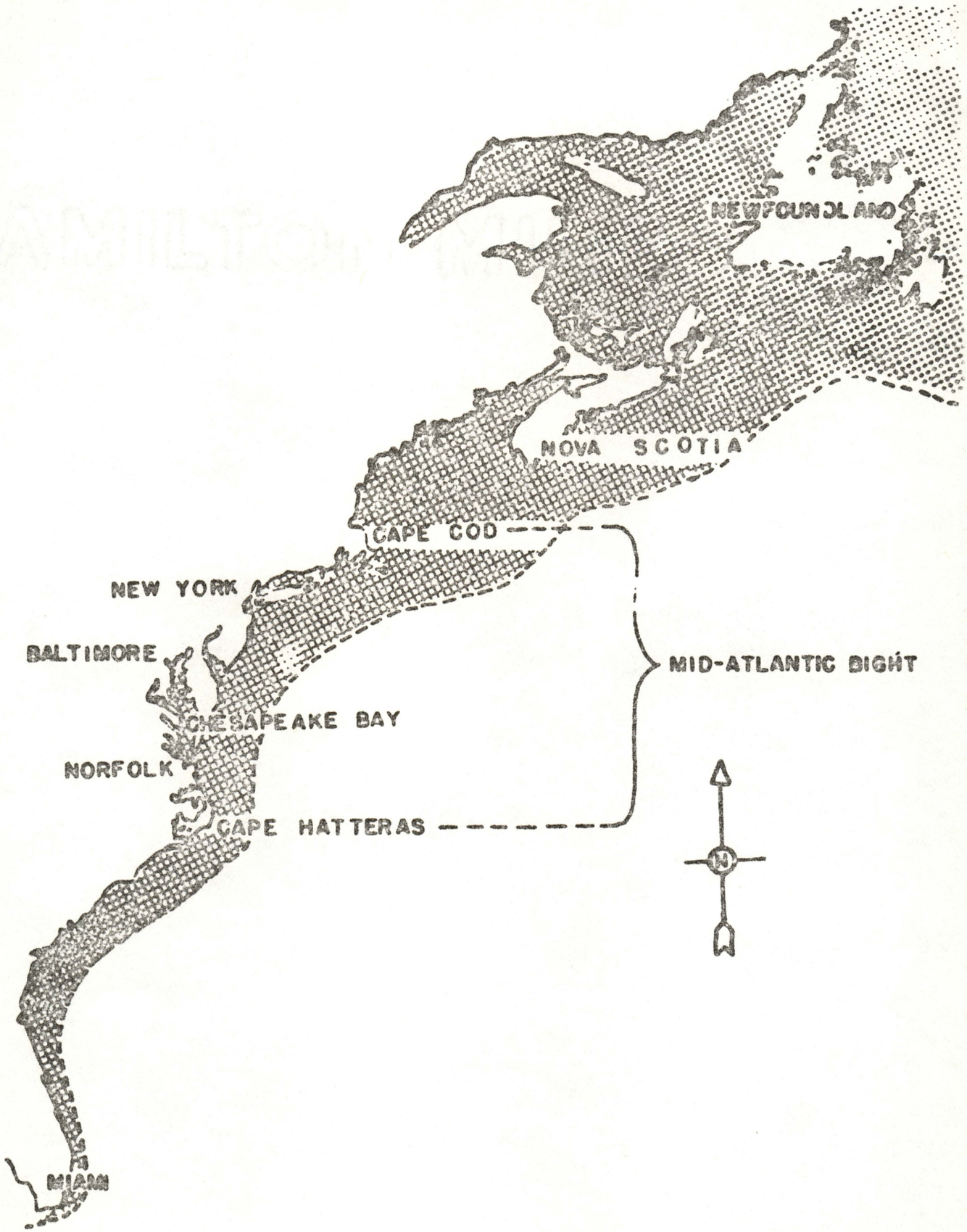
NEWFOUNDLAND
NOVA SCOTIA
CAPE COD
NEW YORK
BALTIMORE
CHESAPEAKE BAY
NORFOLK
CAPE HATTERAS
MIAMI
MID-ATLANTIC BIGHT
N

FIGURE 1