

# FISHERY SURVEY OF SOUTHERN COASTAL WATERS

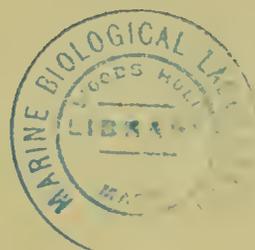


**SPECIAL SCIENTIFIC REPORT: FISHERIES No. 58**

UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE



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## Explanatory Note

The series embodies results of investigations, usually of restricted scope, intended to aid or direct management or utilization practices and as guides for administrative or legislative action. It is issued in limited quantities for the official use of Federal, State or cooperating agencies and in processed form for economy and to avoid delay in publication.

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A FISHERY SURVEY OF SOUTHERN COASTAL WATERS

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## PREFACE

This is the first of a series of reports, based on the work of the Albatross III, concerning hydrographic conditions of, and fishing operations in, southern coastal waters. Reports on hydrographic conditions encountered during the present survey 1/ and on the distribution of plankton will appear later.

The objectives of this survey were (1) to examine the possibilities of expanding local fishery resources in southern coastal waters, principally those of North Carolina between Cape Hatteras and Cape Fear, by exploring with an otter trawl the area outside the 20-fathom line, and (2) to obtain detailed data on the hydrography and plankton of the area covered by the survey.

The survey was conducted in May and June, 1949, under a cooperative agreement between the Institute of Fisheries Research of the University of North Carolina and the Fish and Wildlife Service of the United States Department of the Interior. The Institute gave financial assistance to the amount of \$4,000.00, supplied scientific personnel, and replaced Service-owned gear which was lost or became unserviceable. The Service furnished, operated, and maintained the research vessel Albatross III for the survey. The Woods Hole Oceanographic Institution lent hydrographic equipment and detailed two scientists to collect and interpret the hydrographic data.

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1/

Earlier hydrographic conditions have been reported on by Dean F. Bumpus and T. J. Wehe, "Coastal Water Circulation off the East Coast of the United States between Cape Hatteras and Florida", Technical Report No. 16, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.

## INTRODUCTION

The continental shelf in the region of Cape Hatteras is a submerged plain 20 to 75 miles broad, sloping gradually from the shore until a depth of 50 to 100 fathoms is reached. Beyond the 50 to 100 fathom zone there is a more abrupt drop in the ocean bed so that depths of 300 to 400 fathoms are recorded 5 to 10 miles beyond the edge of the shelf north of Cape Hatteras and 15 to 20 miles beyond the shelf south of Cape Hatteras. Beyond this is a region of still deeper water extending down to the great depths of the ocean.

The continental shelf from Cape Hatteras southward may harbor a supply of fish which is not fully utilized, especially since at least 60 percent of the shelf is unknown to the commercial fishermen of the area. Fishermen of North Carolina have been unwilling to risk trying new bottom beyond the narrow strip of the shelf within the 20-fathom line which is familiar to them. Consequently, these stocks of fish may be unwisely exploited - too much of it being taken near shore and none of it offshore.

The offshore grounds, however, have been partially explored. A winter trawl fishery for croakers in advance of the regular season led several New Jersey flounder draggers to Cape Hatteras in 1920. (Pearson, 1932).<sup>2/</sup> These small draggers, accompanied by several small, shallow-draft, oyster- or crab-dredge boats from Virginia, were unable to extend the fishery far out to sea because of their small capacity and their construction. By the winter of 1928-1929, however, several larger vessels from New England fishing ports, equipped to trawl in the deep offshore waters, were concentrating their fishing efforts in the vicinity of Cape Hatteras. The number of vessels engaged in this winter trawl fishery increased to about 50 in 1931 and to about 100 in 1934 (Nesbit and Neville, 1935).

During the winter of 1930-1931 this trawl fishery was concentrated in two areas (Pearson, 1932). The first, north of Cape Hatteras, extended roughly from latitudes  $35^{\circ} 50'$  to  $37^{\circ} N.$  and from longitudes  $74^{\circ} 50'$  to  $75^{\circ} 30' W.$  in depths ranging from 20 to 50 fathoms. The second area, south of Cape Hatteras, was enclosed on the north and south by latitudes  $34^{\circ} 50'$  to  $35^{\circ} 50' N.$  and on the east and west by longitudes  $75^{\circ} 20'$  to  $76^{\circ} 10' W.$  (Figure 1). These fishing grounds extended from 3 to 30 miles offshore in water from 10 to 30 fathoms

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<sup>2/</sup>

Publications referred to parenthetically by author and date are listed in the Literature Cited, page 20

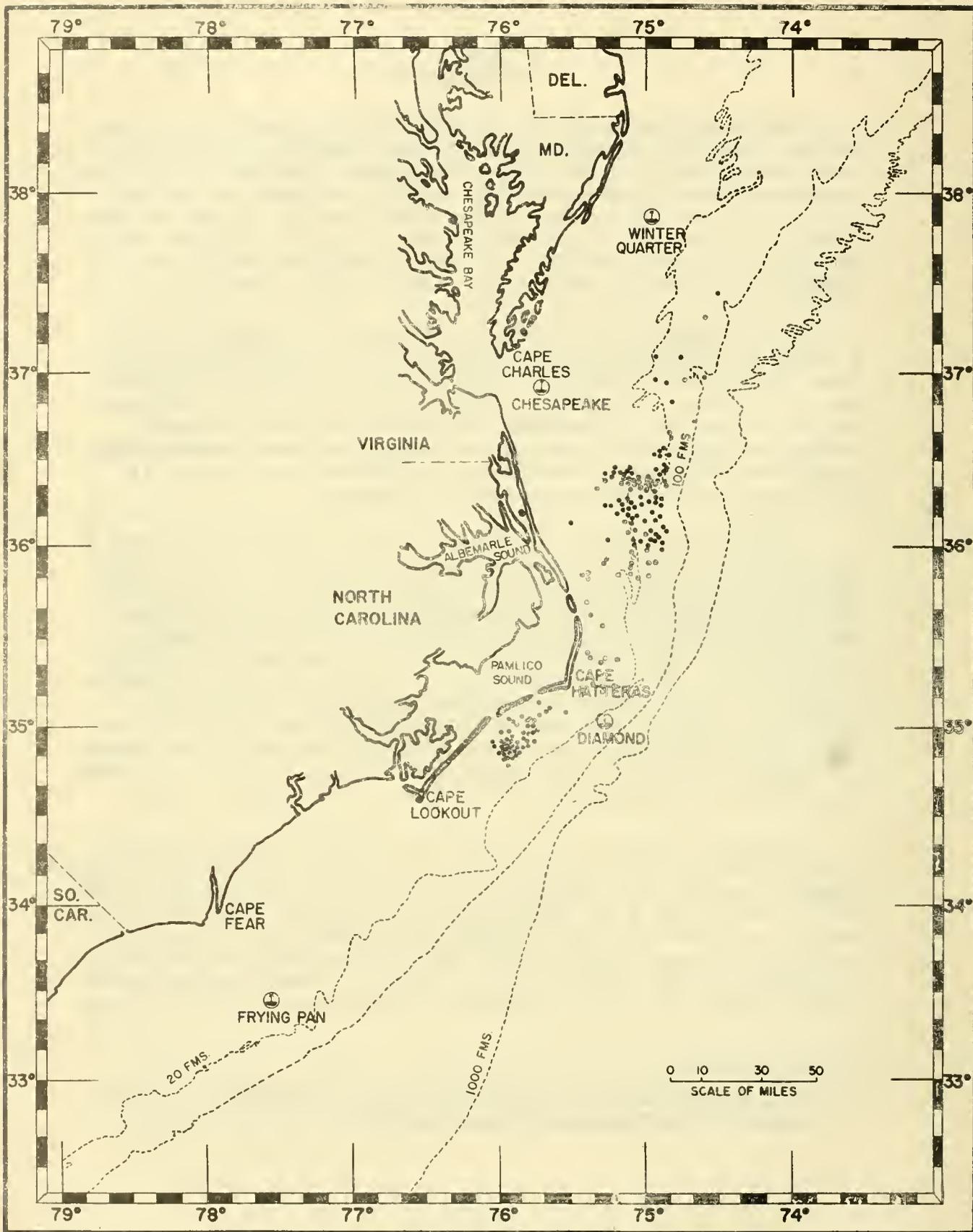


Figure 1—Location of winter trawl fishing grounds indicated roughly by dots which represent actual fish catches as reported by fishermen during 1930-1931 seasons.

in depth. The winter trawl fishery, as it now exists, is limited to the area from Cape Hatteras north to the Virginia Capes while much of the area outside 20 fathoms south of Cape Hatteras remains unfished.

In spite of the growth of this winter trawl fishery in the deeper waters off Cape Hatteras, the resident commercial fishermen of North Carolina have continued to exploit the fish populations indigenous to the shelf within the 20-fathom line. The Institute of Fisheries Research, cognizant of this limited fishery, sought ways to expand it, and as a result a survey was cooperatively undertaken by the Fish and Wildlife Service of the United States Department of the Interior and the Institute of Fisheries Research of the University of North Carolina.

### THE SURVEY VESSEL

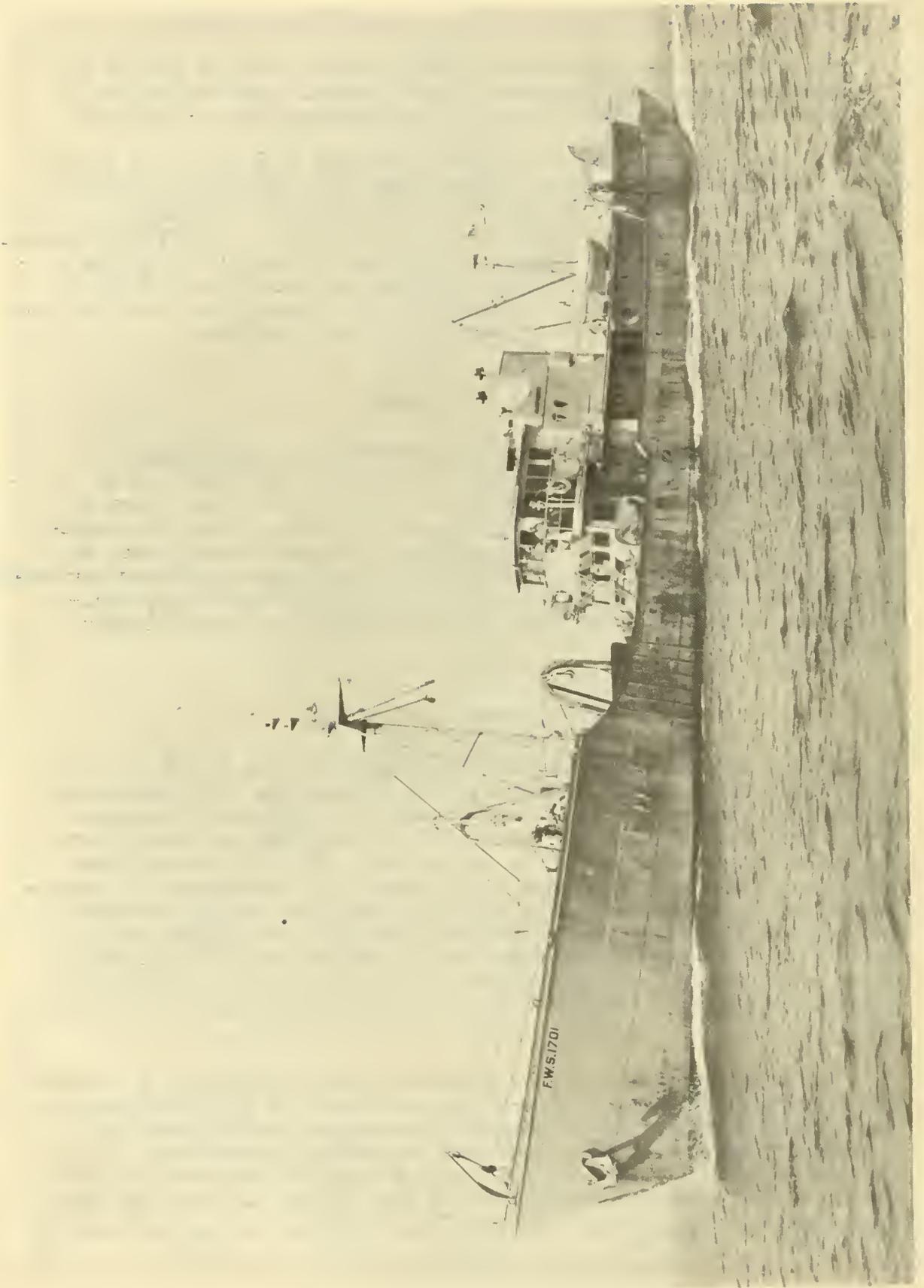
The United States Fish and Wildlife Service research vessel Albatross III (Figure 2) was used in the survey. The vessel is of steel construction throughout, is about 180 feet long, has a beam of about 24 feet and a draft of 12 feet, and is powered by an 805 horsepower diesel engine. It is equipped with full-size trawling gear of the type used by New England trawlers, and the latest electronic devices—Sonic Depth Recorders, Loran Receiver, Radio Direction Finder, etc.—which assure continuous depth and position recordings during fishing operations.

### TRAWLING GEAR AND METHODS

Otter trawling was carried on from May 16 to June 9 with a slightly modified No. 1-1/2 Iceland trawl (Figure 3). The dimensions of the trawl are as follows: 78-foot head-rope; 114-foot foot-rope; 6-inch mesh in the wings and square; 5-inch, tapering to 4-inch, mesh in the belly; and 4-inch mesh in the cod end. The cod end and upper belly were lined with 1-1/2-inch mesh twine. The entire net is approximately 100 feet long, and was attached to the doors by rope pennants 30 feet long. The doors were fastened directly to the towing warps. Part of the foot-rope was equipped with wooden rollers—the largest of which were about 18 inches in diameter and 4 to 6 inches in width—to permit trawling on the expected coral bottom without tearing or losing entire nets.

The trawl and oceanographic instruments were operated in a standard manner during the survey. Upon arrival on station a bathythermograph was lowered to obtain the bottom and intermediate temperatures. A thermometer was also lowered to record the surface temperature. While the fishermen were "shooting" the trawl, a Loran fix was obtained to establish the starting position for the two. After the trawl had been

Figure 2.—The United States Fish and Wildlife Service  
research vessel Albatross III.



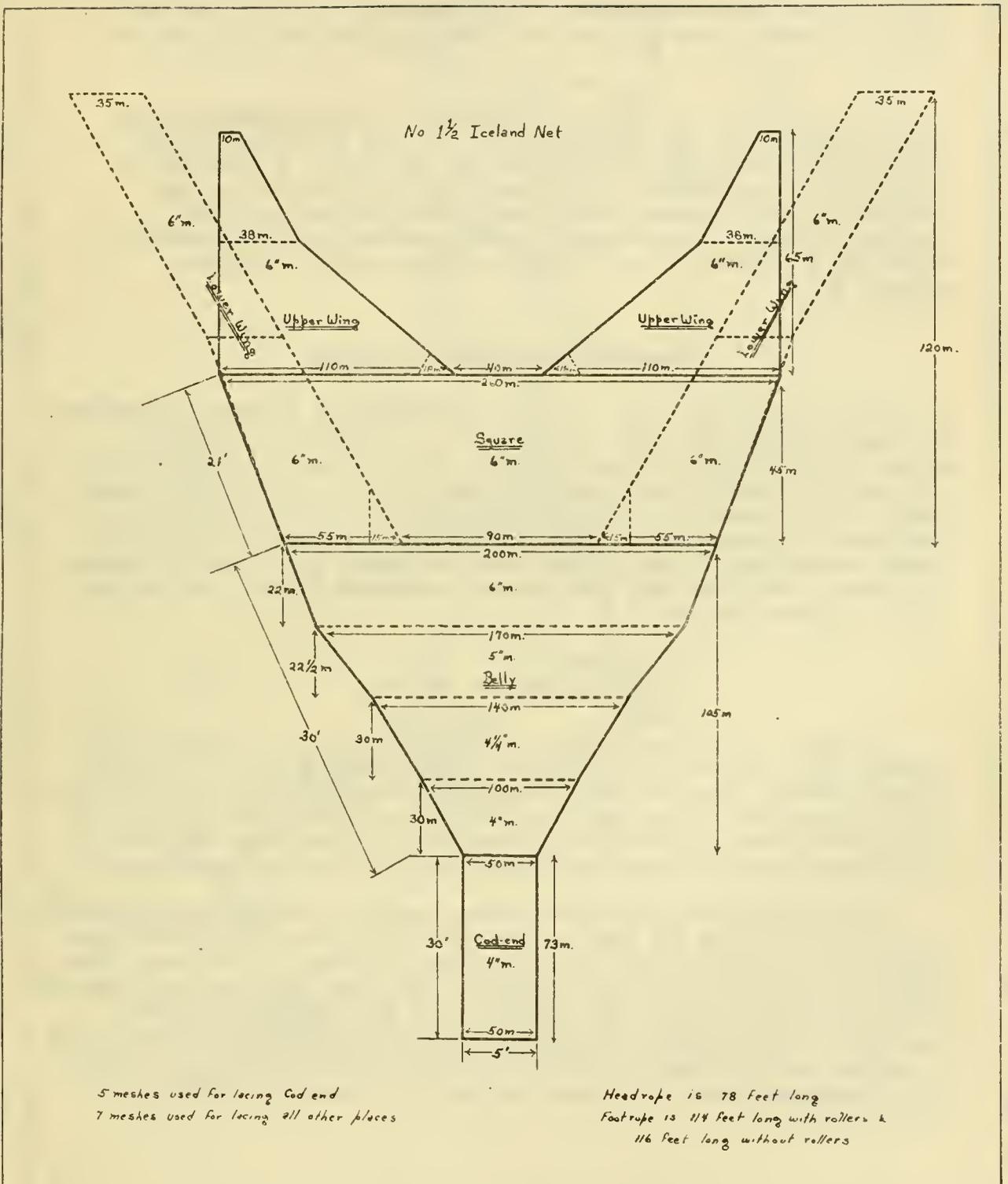


Figure 3.—Diagram of the No. 1-1/2 Iceland otter trawl used in the North Carolina fishery survey.

set and the towing warps had been hooked up, the Loran position and time of hook-up were recorded on the fathometer tape. At the end of the tow a second Loran fix was taken to obtain the end position for the tow.

During most of the trawling operations (excluding hang-ups) the trawl was towed for half an hour, from the time of hook-up to the start of haul-back, at a towing speed of 4.5 knots. A total of 42 half-hour tows was made at 30 randomly selected stations on the continental shelf between Charleston, South Carolina and Cape Henlopen, Delaware. Locations of these stations are illustrated in Figure 4. A complete log of these operations may be found in Appendix B.

### LIMITATIONS OF TRAWLING GEAR USED

The trawling gear used to make this survey had certain limitations. The heavy rollers and total weight of the net caused it to hug the bottom to the extent that large numbers of those species normally taken with balloon trawls probably escaped capture. In a like manner, the large rollers raised the foot-rope off the bottom and presumably permitted the escapement of some fish--flatfishes especially. Despite these limitations, it is believed that sufficient quantities of butterfish, scup, and flatfishes were caught to provide a fair index of the supply of these species.

### DISCUSSION OF RESULTS

The catch figures presented in Appendix B are not impressive when compared with the trawl catches from fishing grounds in the Northwest Atlantic Ocean. They are representative, however, of the size of trawl catch which might be expected from randomly selected stations in southern coastal waters at this time of the year. It is known that many of the resident species migrate northward during the early summer months.

For the purposes of analyzing these catch figures, it was found convenient to divide the area surveyed with the otter trawl into three depth zones--10-50 fathoms, 51-100 fathoms, and over 100 fathoms. The productivity of the area, as measured by the otter trawl catches, varied with these depth zones. The composition of the catch and relative abundance of each species also varied in a distinct pattern from station to station and with depth. Owing to these marked variations in each of the three depth zones, it became desirable to analyze the results by depth zones.

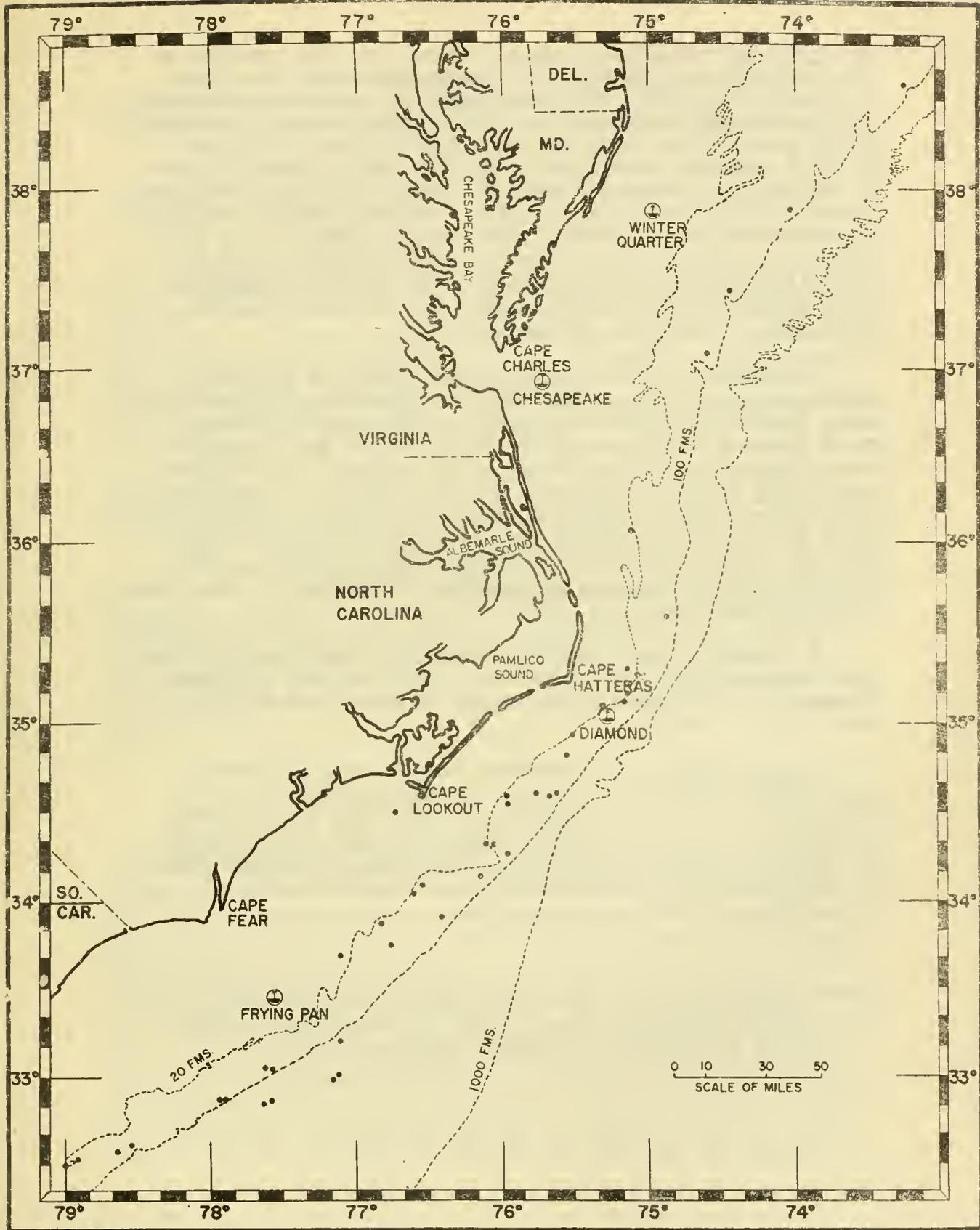


Figure 4.—Locations of trawl stations, indicated by dots, completed during the exploratory fishery survey in southern coastal waters in May and June, 1949.

10-50 FATHOMS:--Eighteen productive tows (tear-ups occurred on two tows) were made in these depth zones with the otter trawl previously described. Fish were caught at an estimated average of 87 pounds per half-hour tow. The greatest catch, approximately 720 pounds in one tow, was made in 19 fathoms at latitude 33° 40' N. and longitude 77° 06.5' W. (Station 8, Figure 4). Most of the catch of commercial species taken in this depth zone consisted of soup, butterfish, pigfish, tomtate, pinfish, goatfish, and white-bone porgy. These, plus smaller numbers of sea bass, spot, red porgy, and vermillion snapper, accounted for about one-half of the trawl catch in this depth zone; the remainder was a mixture of non-commercial species, including filefish, round scad, lizard fish, and snake fish.

The absence of large quantities of shrimp in the trawl catches was surprising, since the local fisherman are known to catch them with small shrimp trawls in less than 20 fathoms. The 1 1/2-inch mesh liner of the trawl net was small enough to retain shrimp, and at the outset of the survey it was expected that shrimp would be reasonably abundant offshore. Apparently, at this time of year, they are confined to those estuarine in-shore waters fed directly by the rivers and creeks which drain into the ocean along the coasts of the southern states. Only six coral shrimp, Sicyonia brevirostris (Stimpson) <sup>3/</sup>, were taken in this depth zone.

In regard to the mechanics of operation, only two tear-ups were encountered in this depth zone. The first was attributed to coral, and the cause of the second (a minor tear along the foot-rope) is unknown.

51-100 FATHOMS:--Ten tows were made in this relatively narrow depth zone resulting in an estimated average catch of 55 pounds of fish per half-hour tow. More than three-fourths of the trawl catches in this zone were composed of non-commercial species, including snake-fish, boar-fish, and spotted hake. The small catch of commercial species consisted largely of butterfish, red grouper, and hogfish.

<sup>3/</sup> Identifications of the shrimp caught during the North Carolina fishery survey were made by Dr. Fenner Chace of the United States National Museum, Washington, D. C.

About one-half pint of shrimp, Hymenopenaeus tropicalis (Bouvier), were taken in this depth zone. This shrimp, a non-commercial species, was formerly unknown north of the West Indies.

Large limestone rocks, in the vicinity of Diamond Shoals Lightship, were responsible for the only tear-up in this depth zone.

Over 100 FATHOMS:--Twelve tows were made in this depth zone with an estimated average catch of 58 pounds of fish per half-hour tow. Commercial species, principally red groupers and butterfish, accounted for 60 percent of the catch in this area. Twelve red grouper, weighing a total of 346 pounds, were caught at latitude 33°11.5' N. and longitude 77°07' W. in 152 fathoms (Station 7, Figure 4). Small numbers of 30 non-commercial species--chiefly boar-fish, spotted hake, lantern fish, Stearn's sea robin, cardinal fish, and snake-fish--were caught in this depth zone. Three non-commercial species of shrimp--Hymenopenaeus tropicalis (Bouvier), Parapenaeus longirostris (Lucas), and Panaeopsis megalops (Smith)--were also taken in the trawl catches.

The possibilities of expanding the otter trawl fishery in depths over 100 fathoms off the coast of North Carolina seem more encouraging than in the other depth zones surveyed. The relative abundance of commercial species as compared with non-commercial species (as indicated by the trawl catches) is much greater in this depth zone than in the others. It is encouraging that no tear-ups were encountered in these depths, an important consideration in profitable commercial fishing.

#### TOPOGRAPHY OF THE SHELF

It is apparent, from the small number of tear-ups--3 in 42 tows--that trawling operations may be carried on outside the 20-fathom contour in southern coastal waters with the type of gear used in the survey without undue loss of gear. The recording depthfinder was in constant use during the four-week period the Albatross III operated, except for a 24-hour period when electrical difficulties were experienced. An analysis of these traces made on courses which were parallel to the outer edge of the shelf (100-200 fathoms) shows no gullies, such as are common north of Cape Hatteras, which would endanger commercial trawling operations. Likewise, fathometer traces made on courses across the shelf show places where the slope declines gradually out to, and often beyond, the 200-fathom line. Near Cape Hatteras, however, the slope of the shelf beyond 100 fathoms is very steep.

In general then, the topography of the shelf underlying southern coastal waters off North Carolina and South Carolina, as indicated by the fathometer traces, is much less irregular than was suspected. The United States Coast and Geodetic Survey charts for this region have few soundings, and a special series of charts--which depict bottom types--show large, broad expanses of coral covering the shelf south of Cape Hatteras. This coral is either a low growing form, or occurs infrequently, for only small amounts were encountered during the trawl survey. Furthermore, the frequency of tear-ups was inconsequential when compared with those occurring during fishing operations on some of the major Northwest Atlantic fishing banks. If the coral were as profuse as the charts indicate, and if the lack of soundings were indicative of rough bottom, then many more tear-ups almost certainly would have occurred.

### CONCLUSIONS

The results of this survey of the deeper waters of the continental shelf south of Cape Hatteras indicate that otter trawling can be pursued without undue loss of gear. Trawling operations in these deeper waters by the existing fleet, however, would require the modification of present gear to include larger winches, which have a greater towing-wire capacity, and probably rollers on the foot-ropes to permit trawling on the slightly irregular bottom.

The results were not encouraging with respect to increasing North Carolina's fishery resources. The catches of commercially important species--or all species for that matter--were, in most instances, very small. These poor catches may be attributed either to the season, or to the possibility that the fish populations frequenting the continental shelf in the vicinity of Cape Hatteras are quite limited.

Since it is known that many of the species found off Cape Hatteras migrate northward during the summer months, a survey during the winter might provide significantly larger catches. Unless this can be substantiated, however, the feasibility of establishing commercial operations on a large scale in this region appears remote. The catches of butterfish, scup, tom-tate, grunts, hog-fish, pinfish, and pig-fish indicate that these species might support a limited commercial fishery in depths less than 100 fathoms. The moderate number of red grouper taken in deeper water indicates that these valuable food fish may be abundant enough to support a small fishery.

## APPENDIX A

### List of the fishes and larger crustaceans caught during the fishery survey of southern coastal waters.

The following comprises a list of all the fishes and larger crustaceans captured during fishing operations off the coasts of South and North Carolina and of Virginia in May and June 1949. All but five of the species presented in this list were taken with the otter trawl or shrimp trawl. Four of the species (marked with asterisks) were not captured with trawls but were caught while trolling feathered jigs either while steaming between stations or while going to and from port. One species, Seriola dumerili, was taken with the otter trawl and by trolling. Several flyingfish (Cypselurus heterurus) flew aboard the Albatross III and were picked up off the deck.

Most of the species included here will be found described in Fishes of North and Middle America by Jordan and Evermann (1896-1900). These volumes and several others, including Goode and Bean (1895), Breder (1929), Hildebrand and Schroeder (1928), and Longley and Hildebrand (1941) were used for identification of these fishes. Norman (1934) was used for identifying the flatfishes, Beebe and Tee-Van (1936) for the black-finned tuna, and Bigelow and Schroeder (1948) for the sharks.

Many of the field identifications were made by Isaac Ginsburg, Ichthyologist, Fish and Wildlife Service, who was assigned to the Albatross III for the first half of the trawl survey. Fishes caught during the remainder of the survey were tentatively identified by personnel of the Fish and Wildlife Service and of the Institute of Fisheries Research. These field identifications were later checked at the U.S. National Museum by Ginsburg and the author. Unpublished keys prepared by Ginsburg were used for identifying the following groups of fishes: sea basses (Serranidae), porgies (Sparidae), scorpion fishes (Scorpaenidae), and sea robins (Triglidae). The nomenclature for this list, which is presented in natural sequence, is based on Jordan, Evermann and Clark (1928) or on more recent revisions by the authors cited above. Dr. L. P. Schultz and Dr. E. A. Lachner, Division of Fishes, U. S. National Museum, also assisted in identifying the fishes listed below. W. A. Ellison, Jr., Director of the Institute of Fisheries Research of the University of North Carolina, assisted in planning the survey and has reviewed and given his approval to this report on the investigation. Without the assistance of Mr. Ellison, the members of his staff, and of those members of the Fish and Wildlife Service who took part in the survey, this work could not have been accomplished.

Family Scyliorhinidae. Cat sharks

Scyliorhinus retifer

Family Carcharhinidae.

Carcharhinus milberti

Family Squalidae. Dogfishes

Squalus fernandinus<sup>1/</sup>

Family Rajidae. Skates and rays

Raja eglanteria

Raja diaphanes

Family Congridae (Leptocephalidae). Conger eels

Leptocephalus conger

Family Ophichthyidae. Snake eels

Mystriophis intertinctus

Family Muraenidae. Morays

Gymnothorax ocellatus

Family Synodontidae. Lizardfishes

Trachinocephalus myops

Synodus foetens

Synodus intermedius

Saurida normani

Family Chlorophthalmidae.

Chlorophthalmus chalybeius

Family Myctophidae. Lanternfishes

Lampanyctus sp.

Diaphus sp.

Family Scomberesocidae.

Scomberesox saurus

Family Exocoetidae. Flyingfishes

<sup>1/</sup> Verified by W. C. Schroeder, Museum of Comparative Zoology,  
Harvard University

Gypselurus heterurus

Family Gadidae. Codfishes

Gadella maraldi

Urophycis regius

Urophycis tenuis

Laemonema barbatulum

Family Merlucciidae. Hakes

Merluccius bilinearis

Family Bothidae. Flounders

Ancylopsetta dilecta

Syacium micrurum

Bothus ocellatus

Citharichthys arcitifrons

Citharichthys unicornis

Monolene sessilicauda

Paralichthys dentatus

Hippoglossina oblonga

Paralichthys lethostigmus

Cyclosetta chittendeni

Family Zeidae. John dories

Zenopsis ocellata

Family Holocentridae. Soldierfishes; Squirrelfishes

Holocentrus ascensionis

Family Fistulariidae. Cornetfishes

Fistularia tabacaria

Family Macrorhamphosidae. Snipefishes

Macrorhamphosus scolopax

Family Scombridae. Mackerels

Scomber scombrus  
\*Euthynnus alletteratus  
\*Sarda sarda  
\*Parathunnus atlanticus

Family Gempylidae. Snake mackerel

Nesiarchus nasutus

Family Coryphaenidae. Dolphins

\*Coryphaena hippurus

Family Stromateidae. Butterfishes

Poronotus triacanthus

Family Nomeidae. Man-of-war fishes

Cubiceps sp.

Family Carangidae. Cavallas

Decapterus punctatus

Family Seriolidae.

\*\*Seriola dumerili

Family Pomatomidae. Bluefishes

Pomatomus saltatrix

Family Cheilodipteridae.

Apogon pseudomaculatus

Synagrops bella

Family Epinephelidae. Groupers

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\* Caught by trolling near surface.

\*\* Caught both by trolling near surface and in otter trawl.

Epinephelus niveatus

Epinephelus morio

Family Serranidae. Sea bass

Centropristes striatus

Centropristes ogyrus

Diplectrum fornosus

Prionodes phoebe

Anthias sp.

Family Priacanthidae. Big-eyes

Pseudopriacanthus altus

Family Lutjanidae. Snappers

Lutianus blackfordii

Rhomboplites aurorubens

Family Haemulidae. Grunts

Haemulon macrostomum

Haemulon plumieri

Bathystoma aureolineatum rimator

Orthonristis chrysopterus

Family Pomacentridae.

Chromis enchrysurus

Family Labridae.

Lachnolaimus maximus

Decodon pueiliaris

Family Coridae.

Xyrichtys psittacus

Family Sparisomidae.

Sparisoma flavescens

Family Uranoscopidae. Stargazers

Astroscopus y-graecum

Kathetostoma albigutta

Family Ophidiidae.

Lepophidium cervinum  
Ophidion sp.

Family Triacanthidae.

Triacanthodes lineatus

Family Balistidae. Triggerfishes.

Balistes capriscus

Family Monacanthidae. Filefishes

Monacanthus hispidus  
Ceratacanthus schoepfii

Family Ostraciidae. Trunkfishes

Lactophrys tricornis

Family Tetraodontidae. Puffers

Sphoeroides dorsalis  
Sphoeroides spengleri

Family Diodontidae. Porcupinefishes

Chilomycterus atinga

Family Sparidae. Porgies

Stenotomus chrysops  
Calamus calamus  
Calamus leucosteus  
Pagrus pagrus  
Lagodon rhomboides

Family Gerridae. Mojarras

Eucinostomus gula

Family Mullidae. Surmulletts

Mullus auratus

Family Sciaenidae. Croakers

Leiostomus xanthurus  
Menticirrhus saxatilis  
Equetus lanceolatus  
Equetus acuminatus

Family Antigoniidae.

Antignia capros

Family Chaetodontidae. Butterflyfishes.

Chaetodon bimaculatus  
Chaetodon sedentarius  
Angelichthys isabelita

Family Acanthuridae. Surgecnfishes

Acanthurus bahianus

Family Scorpaenidae. Rockfishes and scorpionfishes

Scorpaena tortugae  
Scorpaena brasiliensis  
Pontinus longispinis  
Pontinus rathbuni

Family Triglidae. Sea robins

Prionotus stearnsi  
Prionotus alatus  
Prionotus carolinus  
Prionotus scitulus  
Bellator militaris

Family Lophiidae. Fishing frogs

Lophius piscatorius

Family Antennaridae. Frogfishes

Antennarius ocellatus

Family Ogcocephalidae. Batfishes

Ogcocephalus nasutus  
Ogcocephalus radiatus  
Halieutichthys aculeatus

LARGER CRUSTACEANS

Family Scyllaridae

Scyllarus americanus<sup>2/</sup>

Family Penaeidae. Shrimp<sup>3/</sup>

Hymenopenaeus tropicalis

Parapenaeus longirostris

Parapenaeus megalops

Sycionia brevirostris

Family Homaridae. Lobster

Homarus americanus

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<sup>2/</sup> Identified by Dr. I. E. Gray, Zoology Department, Duke University.

<sup>3/</sup> Identified by Dr. Fenner Chace, U. S. National Museum.

APPENDIX B.

TABLE 1.—Log of fishing operations in southern coastal waters during 1942

Station number	Tow number	Date 1949	Starting North latitude	Position East longitude	Direction of tow	Depth fathoms	Bottom temperature, °F.	Total number of fish	Number of commercial fish	Number of commercial fish over 5 inches	Catch	Principal commercial species in order of decreasing numbers	Estimated total weight of catch (pounds)
1	1	May 26	32°30'	79°00'	C60° T	21	72.6	1	1	1	---	---	---
2	1	May 26	32°22'	78°57.5'	060° T	21	---	9	9	---	---	---	---
3	1	May 27	32°34'	78°39'	065° T	25	67.1	6	6	---	---	---	5
2	1	May 27	32°34'	78°34'	045° T	36	67.7	---	---	---	---	---	---
3	1	May 27	32°27'	78°34'	045° T	93	67.7	---	---	---	---	---	---
2	1	May 27	32°52'	77°57'	070° T	95	60.0	131	65	76	69	hogfish, groupers	360
3	1	May 27	32°52'	77°55'	060° T	102	---	228	141	37	19	hogfish, groupers, southern flounder	170
4	1	May 27	32°52.5'	77°53'	045° T	133	51.0	19	17	2	---	hogfish	16
4	1	May 27	32°52.5'	77°36.5'	045° T	134	50.5	16	16	---	---	---	6
5	1	May 27	33°03.5'	77°38'	090° T	97	50.0	12	12	---	---	---	3
2	1	May 27	33°03.5'	77°36'	045° T	105	---	132	132	---	---	---	40
6	1	May 28	33°53'	77°10'	050° T	200	49.0 (22 fm)	90	92	2	3	white hake, silver hake	30
6	2	May 28	33°00.5'	77°07.5'	045° T	205	---	8	8	---	---	---	5
7	1	May 28	33°11.5'	77°07'	045° T	182	49.0 (134 fm)	28	16	12	12	groupers	360
8	1	May 29	33°40'	77°06.5'	050° T	19	73.5	2,019	176	1,843	1,448	tomato, scup, pinfish, pigfish, white grunt	720
9	1	May 29	33°43'	76°45'	030° T	28	74.0	70	70	52	36	scup, pinfish, red porgy, tomato	30
10	1	May 29	33°52'	76°49.5'	045° T	20	75.4	1,494	80	1,404	1,204	scup, tomato	540
11	1	May 29	34°02.5'	76°37'	045° T	20	76.4	55	26	27	22	scup, tomato	16
12	1	May 29	34°06.5'	76°33'	090° T	21	---	16	14	2	2	scup	6
13	1	June 3	35°03'	75°06.5'	040° T	20	55.3	97	95	2	2	silver hake	15
13	2	June 3	35°17.5'	75°08'	180° T	18	76.5	87	---	---	---	---	20
14	1	June 3	35°15.5'	75°03'	045° T	48	---	14	---	---	---	---	5
15	1	June 3	34°56'	75°31'	270° T	27	72.9	28	26	12	2	scup, sea bass	90
16	1	June 7	34°29.5'	75°44'	190° T	48	70.3	35	33	3	2	red porgy, red snapper	5
17	1	June 8	33°54'	76°26.5'	045° T	84	61.3 (81 fm)	1,471	1,202	268	1	scup, mackerel, spot	90
18	1	June 8	34°08'	76°10'	040° T	156	57.3 (83 fm)	15	11	4	4	butterfish	20
19	1	June 8	34°18'	76°07'	090° T	28	74.3	28	28	---	---	---	5
20	1	June 8	34°18'	76°03'	100° T	32	---	---	---	---	---	---	---
21	1	June 8	34°15'	75°58'	035° T	125	50.5	784	3	781	24	butterfish	90
21	2	June 8	34°22'	75°58'	045° T	23	75.5	36	16	17	---	butterfish	10
22	1	June 8	34°34'	75°58'	045° T	26	---	17	17	---	---	---	5
23	1	June 8	34°36'	75°46'	045° T	68	57.1	2	2	---	---	---	---
23	2	June 8	34°34'	75°34'	050° T	114	51.3	4	4	---	---	---	---
23	3	June 8	34°36'	75°37.5'	020° T	124	---	26	22	3	3	silver hake	60
24	1	June 8	35°05'	75°18'	045° T	80	56.5	147	146	1	1	groupers	46
25	1	June 9	35°09'	75°08'	000° T	60	76.5 (60 fm)	3	2	1	1	sea bass	---
26	2	June 9	35°07'	75°09'	065° T	80	83.7 (76 fm)	22	14	8	4	butterfish, grouper, amberjack	40
26	1	June 9	35°35'	74°52'	000° T	35	80.3	57	25	32	3	butterfish	15
27	1	June 15	37°08'	74°35'	045° T	78	64.8	70	14	56	51	butterfish, lobster	60
28	1	June 15	37°26.5'	74°26.5'	090° T	60	53.0 (93 fm)	7	1	6	4	lobster	5
29	1	June 15	37°53'	74°01'	045° T	108	---	10	4	6	4	lobster	10
30	1	June 15	38°24'	73°16'	045° T	55	---	16	8	8	6	butterfish	16

1 Commercial species are defined as species which are listed as marketable in Fishery Statistics of the United States, and the tomato which is sold occasionally in North Carolina as the "red mouth".

2 Southern markets commonly accept fish larger than this size.

3 Includes 8 legal-size lobsters.

4 Includes 4 legal-size lobsters.

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