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Distribution and abundance of the juveniles of fifteen selected fish species caught in the Northwest Atlantic, 1975-1979

by

Ray E. Bowman

National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole Laboratory
Woods Hole, Massachusetts 02543

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ABSTRACT

The relative distribution and abundance of the juveniles of 15 species of fish occurring in the Northwest Atlantic, from Cape Hatteras, N.C., to Nova Scotia, have been examined for the period 1975-1979. Southern New England and Georges Bank were important areas for silver hake (*Merluccius bilinearis*), Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius virens*), white hake (*Urophycis tenuis*), red hake (*Urophycis chuss*), yellowtail flounder (*Limanda ferruginea*), winter flounder (*Pseudopleuronectes americanus*), windowpane (*Scophthalmus aquosus*), and butterfish (*Peprilus triacanthus*). Spotted hake (*Urophycis regia*) and scup (*Stenotomus chrysops*) were caught mainly in the Middle Atlantic. American plaice (*Hippoglossoides platessoides*) and witch flounder (*Glyptocephalus cynoglossus*) were found principally in the Gulf of Maine. The largest redfish (*Sebastes marinus*) catches occurred in Western Nova Scotia. The number of fish caught per tow, and the number of species caught, tended to be greatest in regions close to shore.

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INTRODUCTION

The distribution of many Northwest Atlantic fish species has been established (Bigelow and Schroeder 1953, Leim and Scott 1966). Changes in the abundance of several species during recent years is noted in papers by Edwards and Bowman (1979), and Grosslein et al. (1980). Heavy fishing during the late 1960's and early 1970's reduced the estimated biomass of fishes by more than 50 percent from the level of the early 1960's. Fish caught in later years were much smaller in size and/or comprised of many juveniles. The distribution of the juveniles of many species is known to differ from that of adults (Bigelow and Schroeder 1953). In this paper I examine the relative distribution and abundance of the juveniles of 15 selected fish species caught in recent years.

METHODS

U.S. research vessel bottom trawl survey catch data gathered from the spring of 1975 through the spring of 1979 were analyzed. Sampling conducted during the surveys is based on a stratified random design and the strata sampled (Figure 1) constitute different depth zones within various geographic areas of the Northwest Atlantic (for a description of the bottom trawl survey program see Grosslein 1969). Details of the trawling methods and gear may be obtained from the Resource Surveys Investigation, Northeast Fisheries Center, Woods Hole Laboratory, National Marine Fisheries Service, NOAA, Woods Hole, Massachusetts 02543. A list of the cruises and corresponding cruise information represented by data presented in this paper is given in Table 1. A modified No. 41 Yankee trawl was used during spring surveys and a No. 36 Yankee on summer and

autumn cruises. A study by Sissenwine and Bowman (1978) established that a No. 41 Yankee generally catches larger quantities of fish than a No. 36 Yankee trawl. No adjustment has been made to the catch data to account for the difference in catchability between the two types of trawls.

For convenience, mean number of fish caught per tow calculations for each of the 15 species are based on the number of fish caught which were 15 cm or less in length [fork length (FL) unless tail without fork, then total length (TL)]. The species selected and the length measurements used are as follows (names after Robins 1980): silver hake, *Merluccius bilinearis*, FL; Atlantic cod, *Gadus morhua*, FL; haddock, *Melanogrammus aeglefinus*, FL; pollock, *Pollachius virens*, FL; white hake, *Urophycis tenuis*, FL; red hake, *Urophycis chuss*, FL; spotted hake, *Urophycis regia*, FL; American plaice, *Hippoglossoides platessoides*, TL; yellowtail flounder, *Limanda ferruginea*, TL; winter flounder, *Pseudopleuronectes americanus*, TL; witch flounder, *Glyptocephalus cynoglossus*, TL; windowpane, *Scophthalmus aquosus*, TL; butterfish, *Peprilus triacanthus*, FL; scup, *Stenotomus chrysops*, FL; and redfish, *Sebastes marinus*, FL. The species listed above reach maturity when 2 or 3 years old and all can be considered juveniles when 15 cm long, except redfish, butterfish, and American plaice. These three species are usually mature before they attain 15 cm. Species presented were chosen because they are of commercial and/or biological importance. In Tables 2-6 the mean number of each species caught per tow in individual strata (all cruises combined) is presented. These data are summarized separately by species for the entire sampling range in Figures 2-16.

Annual and seasonal observations on the catchability of juvenile fish within five geographic areas of the Northwest Atlantic are given in Tables 8-22. In the tables the mean fish length is indicated immediately below the mean number caught per tow within a particular area for each season and year. The number of tows made during each season and year within areas is given in Table 7. These data are useful in that they give some indication of the repetitiveness of the catches and size of fish caught during the survey cruises in each area.

RESULTS

The distribution and abundance of each species is considered separately in paragraphs below. Observations on the catches of individual species include: 1) areas of greatest catchability within the entire sampling region; 2) location(s) of the largest concentrations by strata and depth within each geographic area; and 3) seasonal and annual fluctuations in abundance (and mean length) within geographic regions. After the data for individual species have been presented, a comparison between species caught within each geographic area will be given.

Silver hake - the distribution of silver hake seems ubiquitous; they were caught throughout the sampling range (Figure 2 and Tables 2-6). The largest concentrations appear to be located in Southern New England (in decreasing order according to the mean number caught per tow, strata 1, 6, 9, and 5) and the northern part of the Middle Atlantic (stratum 73). Most small silver hake were caught when trawling at bottom depths less than 56 meters. The seasonal and annual catchability of silver hake, within the five geographic areas noted in Table 8, illustrate that this species can

usually be caught wherever or whenever one decides to bottom trawl (also note that catches are fairly consistently large in Southern New England). Finally, it can be seen in Table 8 that the mean length of fishes caught in autumn is less than that for those caught in spring (presumably because silver hake are summer spawners and all fish <15 cm FL are less than one year old).

Atlantic cod - the majority of juvenile cod were caught on Georges Bank (strata 23, 25, 19, and 20) and in stratum 42 of Western Nova Scotia (Figure 3 and Tables 2-6). No cod were caught in the Middle Atlantic, and only small numbers were obtained in Southern New England (mostly from strata 9 and 5). Small Atlantic cod are most abundant at bottom depths of 110 meters or less. Cod are not consistently caught in any particular area or season within the sampling region (Table 9). Likewise, the mean length (FL) of fishes caught seems to vary unpredictably between years, seasons, and areas (although all fish represented are age 0).

Haddock - the largest catches of haddock occurred in Western Nova Scotia strata 42, 32, and 41, and on Georges Bank (stratum 16). Small quantities were also caught in all Gulf of Maine strata except 30. The largest concentrations within the Gulf of Maine appear to be in strata 26 and 24. In Southern New England waters the mean number caught per tow was highest in strata 5 and 9 (Figure 4 and Tables 2-6). Juvenile haddock were caught mainly at bottom depths ranging from 56 through 185 meters. Trawling on Georges Bank and in Western Nova Scotia resulted in haddock catches during all years and seasons sampled, except in the spring of 1975 on Georges Bank. Finally, the mean number caught per tow tended to be greater during autumn than in springtime (Table 10).

Pollock - juvenile pollock were seldom caught within the sampling area. The only strata where pollock were caught were 5 in Southern New England, 16 and 25 on Georges Bank, and 39 in the Gulf of Maine (Figure 5 and Tables 2-6). All fish were obtained at bottom depths between 27 and 110 meters. Nothing can be determined about the annual or seasonal catchability of pollock within the sampling area, except that they are rarely caught (Table 11).

White hake - only small numbers of white hake were caught on the survey cruises. The largest quantities were found in the catches from stratum 38 in the Gulf of Maine and stratum 19 on Georges Bank. In the Southern New England area this species was only caught in strata 5 and 9. No white hake were identified in the trawl catches from the Middle Atlantic or Western Nova Scotia (Figure 6 and Tables 2-6). Juvenile white hake were captured at water depths ranging from 27 to >185 meters (i.e., at all depths sampled). White hake are not caught with regularity in the areas surveyed on an annual or seasonal basis (Table 12).

Red hake - the distribution of red hake extends throughout the sampling range. The catch per tow in stratum 20 (5.38) on Georges Bank indicates large concentrations of small red hake may occur in that area. Large numbers of red hake were also caught in strata 5 (2.20) and 1 (2.11) in Southern New England. Moderate numbers were caught in strata 70 and 73 (>1.00) of the Middle Atlantic but few (0.01-1.00) were obtained in the Gulf of Maine or Western Nova Scotia (Figure 7 and Tables 2-6). The largest numbers of this species were caught at bottom depths <56 meters. Juvenile red hake were seldom caught at depths >111 meters in the Middle Atlantic, Southern New England, or on the southern part of Georges Bank. On northern Georges

and in the Gulf of Maine, red hake were caught in all strata (including those where water depths are >111 meters). Red hake catches in Southern New England and on Georges Bank were rather consistently large regardless of year or season sampled (except during the summer of 1978 in Southern New England when none were caught). Catches in the other three areas were also fairly consistent, but fewer fish were obtained (Table 13). The mean lengths of red hake caught during autumn survey cruises were generally less than those for fish caught on spring cruises. Fish caught in the autumn and ranging from 3 to 6 cm FL (Table 13) were likely less than one year old (red hake are summer spawners).

Spotted hake - juvenile spotted hake were only caught in the Middle Atlantic (Figure 8 and Tables 2-6). Extremely large catches were obtained in strata 63 and 62 (94.56 and 55.60 per tow, respectively). This species apparently congregates at bottom depths between 56 and 185 meters in the southern portion of the sampling range. Spotted hake were caught during all years and seasons, except during the spring of 1975, in the Middle Atlantic area (Table 14). Fish caught in the spring tended to be smaller than those caught in autumn during all years; this tends to confirm reports that spotted hake spawn during the fall and winter months.

American plaice - large concentrations (>5.00 per tow) of juvenile plaice were found in strata 26 and 40 of the Gulf of Maine. Smaller quantities were caught in Western Nova Scotia (1.01-5.00 per tow) and on Georges Bank (0.01-1.00 per tow). No American plaice were caught in the Middle Atlantic or Southern New England areas (Figure 9 and Tables 2-6). The majority of plaice were caught at bottom depths ranging from 56 to 185

meters. However, this species was caught at all depths sampled. American plaice catches were fairly consistent on an annual and seasonal basis within the three areas they were caught (Table 15).

Yellowtail flounder - the largest yellowtail flounder catches were obtained in Southern New England strata 5 and 1 (2.43 and 1.35, respectively). Catches in strata 13, 16, and 25 of Georges Bank and stratum 32 of Western Nova Scotia ranged from 0.51 to 1.00 per tow (Figure 10 and Tables 2-6). Few juveniles of this species were caught in the Middle Atlantic or in the Gulf of Maine. The majority of juvenile yellowtail flounder were caught at water depths <110 meters. The annual and seasonal catchability of yellowtail was highly variable between the years 1975 and 1979, but overall the springtime catches tended to be somewhat greater than those in autumn (Table 16).

Winter flounder - the greatest mean number of winter flounder caught per tow occurred in stratum 20 on Georges Bank (1.26 per tow). Catches were moderate (0.21 to 1.00 per tow) in stratum 19 on Georges Bank and in strata 1 and 5 in Southern New England. Very small catches were obtained in the Middle Atlantic and Gulf of Maine. No winter flounder were caught in Western Nova Scotia (Figure 11 and Tables 2-6). Almost all winter flounder catches occurred at bottom depths less than 56 meters (exceptions were the small numbers caught in strata 16 and 21 on Georges Bank and strata 26 and 37 in the Gulf of Maine). Springtime catches of winter flounder were obtained with some regularity for the years 1975-1979 in Southern New England and on Georges Bank (Table 17). However, of the five areas sampled, Georges Bank appeared to have the most consistent population of winter flounder; in this area they were caught during all seasons and years except the spring of 1979.

Witch flounder - the largest catches of witch flounder were obtained in strata 40 and 26 (0.93 and 0.43 per tow, respectively) within the Gulf of Maine (Figure 12 and Tables 2-6). This species was caught in the deeper water strata of all areas sampled (generally they were only found in waters >110 meters deep except in the Gulf of Maine). No juvenile witch flounder were caught in waters less than 56 meters deep. Witch flounder are not regularly caught during different seasons or years in any area except the Gulf of Maine (Table 18). The mean length of fish caught during the autumn tends to be less than that of fish caught in springtime.

Windowpane - the catches of this species were almost totally restricted to the Georges Bank and Southern New England areas (except for one fish caught in stratum 69 of the Middle Atlantic region). Strata where the highest mean numbers per tow were obtained were 19 and 20 on Georges Bank and 5 and 9 in Southern New England (Figure 13 and Tables 2-6). The largest concentrations of windowpane appear to occur at water depths <111 meters. During all spring and fall survey cruises, from 1975 through 1979, juvenile windowpane were identified in catches obtained on Georges Bank and in Southern New England (Table 19). Windowpane caught in the autumn on Georges Bank were consistently smaller than those caught in the spring.

Butterfish - butterfish were caught mainly (>200 per tow) in the Middle Atlantic (strata 75, 66, and 62) and Southern New England (stratum 3) areas. Catches were relatively light (0.01-7.51 caught per tow) in the other three regions, except for stratum 20 on Georges Bank in which 123.33 per tow were caught (Figure 14 and Tables 2-6). Butterfish were identified in the catches obtained from all bottom depths sampled; however, the largest

concentrations appear to be located in waters ranging from 56 to 185 meters in depth. During the spring, summer, and autumn, butterfish were caught during all years in the Middle Atlantic and Southern New England (Table 20). In the northern areas (i.e., Georges Bank, Gulf of Maine, and Western Nova Scotia) butterfish tended to be caught mostly during autumn months.

Scup - this species was caught exclusively in the Middle Atlantic and Southern New England regions. The greatest mean numbers caught per tow were observed in strata 62, 61, and 66 (>100 per tow in each) of the Middle Atlantic (Figure 15 and Tables 2-6). Moderate numbers were caught in strata 1 and 5 of Southern New England (between 25.01 and 100.00 per tow). The largest accumulations of scup appear to be located at bottom depths ranging from 27 to 110 meters, although some were identified in catches from deeper waters (e.g., strata 68 and 69 of the Middle Atlantic). Scup were caught with some regularity in the Middle Atlantic area during all seasons and years (Table 21). In the Southern New England region scup catches occurred mainly in autumn.

Redfish - redfish were principally caught in Western Nova Scotia (greater than 1.50 per tow in strata 42 and 41) and the Gulf of Maine (between 1.01 and 1.50 in strata 27 and 40). Small numbers were obtained in the deeper strata around the border of Georges Bank (strata 18, 17, 21, and 23) and in deep water stratum 12 of Southern New England (Figure 16 and Tables 2-6). No redfish were caught in the Middle Atlantic. Redfish catches were largest when trawling was conducted in water depths from 56 to 185 meters. No redfish were caught at bottom depths less than 56 meters and only small numbers at depths greater than 185 meters. Redfish occurred

in catches during all seasons and years sampled in the Gulf of Maine, and during most in Western Nova Scotia (exceptions being spring 1975 and autumn 1978). This species was not commonly caught during any season or year on Georges Bank or in Southern New England (Table 22).

GEOGRAPHIC SYNOPSIS AND DISCUSSION

A summary of the occurrence of each species by strata and within each geographic area is presented in Table 23. In the table, there is a "+" recorded for each stratum in which the mean number of a species caught per tow was ranked as being high (maximum relative abundance) when compared to all other strata throughout the sampling range for that species. The "+'s" essentially reiterate the information presented graphically in Figures 2-16, because each stratum which is cross-hatched in the figures is represented by a "+" in Table 23. In addition, the table condenses the information given in Tables 2-6 in the respect that the individual strata where the largest number of a particular species was caught per tow within each geographic area are identified (see "high three strata" columns). Thus, although a species may not be most abundant in a particular area (when the whole sampling range is considered) the stratum within that area where the fish are relatively abundant are identified (e.g., silver hake, the first species listed, are not as abundant on Georges Bank as in Southern New England, but on Georges Bank the largest quantities of silver hake are caught in strata 20, 22, and 19). Listed at the bottom of the table are the three strata within each geographic area which ranked highest in terms of how many species were caught in relatively high numbers within them (the number of species is presented immediately below each stratum).

Overall, the data presented in Table 23 shows that the Southern New England and Georges Bank areas are important to the juveniles of 10 of the 15 species selected. The exceptions were spotted hake (exclusively found in the Middle Atlantic), American plaice (principally caught in the Gulf of Maine), witch flounder (mainly found in the Gulf of Maine), scup (highest numbers caught in the Middle Atlantic) and redfish (largest catches in Western Nova Scotia). Also noteworthy is that the strata ranked as most important in terms of both the number of fish caught per tow, and the number of species caught within them, are for the most part strata located closest to shore (e.g., 65, 73, 1, 5, 9, 25, 26, 39, and 41) or the shoal areas on Georges Bank (strata 19 and 20) and in Western Nova Scotia (strata 32 and 42); this can be seen by locating the stratum listed at the bottom of Table 23 on Figure 1.

The importance of inshore areas, shoal areas, and estuaries as nursery grounds for the juveniles of many species of fish has previously been established (Pacheco 1973). Results of recent bottom trawl surveys conducted in Massachusetts coastal waters show that the juveniles of many species of commercial and recreational importance occur in large numbers in inshore areas (Howe et al. 1980). The relative distribution and abundance of species investigated for the present paper emphasizes how important these inshore areas are to juveniles.

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Table 1. List of cruises conducted by the Northeast Fisheries Center, and the corresponding cruise information, represented by data presented in this paper.

Vessel	Cruise	Comp Code	Tape No.	Date	Season	No. of stations	Area of Investigation	Trawl type	Speed knots
				1975					
Albatross IV	75-3	753	SVA6	4 Mar-12 May	Spring	235	Nova Scotia-Cape Hatteras	#41 Yankee	3.5
Alb. IV & Del. II	75-12,17	758	SVA6	15 Oct-18 Nov	Fall	304	Nova Scotia-Cape Hatteras	#36 Yankee	3.5
				1976					
Alb. IV & Del. II	76-02,05	762	SVA7	4 Mar- 8 May	Spring	300	Nova Scotia-Cape Hatteras	#41 Yankee	3.5
Albatross IV	76-09	767	SVA7	20 Oct-23 Nov	Fall	267	Nova Scotia-Cape Hatteras	#36 Yankee	3.5
				1977					
Alb. IV & Del. II	77-02,03	771	SVA7	19 Mar-20 May	Spring	284	Nova Scotia-Cape Hatteras	#41 Yankee	3.5
Alb. IV & Del. II	77-07,09	774	SVA7	27 Jul-31 Aug	Summer	158	Gulf of Maine-Cape Hatteras	#36 Yankee	3.5
Delaware II	77-12	778	SVA7	26 Sep-15 Dec	Fall	339	Nova Scotia-Cape Hatteras	#36 Yankee	3.5
				1978					
Albatross IV	78-04	783	SVA7	20 Mar-23 May	Spring	319	Nova Scotia-Cape Hatteras	#41 Yankee	3.5
Alb. IV & Del. II	78-09,05	787	SVA7	25 Jul-20 Aug	Summer	168	Gulf of Maine-Cape Hatteras	#36 Yankee	3.5
Delaware II	78-06	789	SVA7	5 Sep-22 Nov	Fall	435	Nova Scotia-Cape Hatteras	#36 Yankee	3.5
				1979					
Alb. IV & Del. II	79-03,04	793	SV01	21 Mar-12 May	Spring	348	Nova Scotia-Cape Hatteras	#41 Yankee	3.5

Table 2. Mean number of juveniles of each selected species of fish caught per tow in each stratum (all cruises combined) within the Middle Atlantic area during 1975-1979.

Species	MIDDLE ATLANTIC STRATA															
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
Silver hake	1.07	0.25	0.44	5.00	19.00	2.24	-	2.18	24.60	6.56	0.74	1.44	85.67	1.24	3.50	0.44
Atlantic cod	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haddock	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-
Pollock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White hake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red hake	0.02	-	-	0.07	0.35	0.26	-	1.00	0.86	1.91	-	0.06	1.32	0.17	-	-
Spotted hake	12.98	55.60	94.56	16.53	24.44	1.68	-	1.59	0.11	0.05	-	-	0.06	-	0.11	-
American plaice	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail flounder	-	-	-	-	-	-	-	-	-	-	-	-	0.14	-	-	-
Winter flounder	-	-	-	-	0.02	-	-	-	-	-	-	-	0.03	-	-	-
Witch flounder	-	0.05	-	0.08	-	-	-	0.18	-	-	-	-	-	-	-	-
Windowpane	-	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-
Butterfish	97.14	205.60	90.31	80.40	52.37	349.74	9.56	2.24	23.25	12.84	67.89	94.28	27.70	11.11	395.89	59.28
Scup	218.33	364.50	-	-	73.69	111.26	7.13	0.06	7.22	2.30	0.16	0.22	7.52	1.98	-	-
Redfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total number of tows	43	20	16	15	84	34	16	17	81	43	19	18	66	46	18	18

Table 3. Mean number of juveniles of each selected species of fish caught per tow in each stratum (all cruises combined) within the Southern New England area during 1975-1979.

Species	SOUTHERN NEW ENGLAND STRATA											
	1	2	3	4	5	6	7	8	9	10	11	12
Silver hake	104.34	9.74	4.65	0.43	68.90	102.29	10.26	2.04	71.35	14.77	0.33	2.35
Atlantic cod	-	-	-	-	0.33	-	-	-	0.44	0.22	0.04	-
Haddock	0.02	-	-	-	0.27	0.01	-	-	0.07	0.06	-	-
Pollock	-	-	-	-	0.03	-	-	-	-	-	-	-
White hake	-	-	-	-	0.01	-	-	-	0.01	-	-	-
Red hake	2.11	0.68	0.04	-	2.20	0.29	-	-	1.29	0.99	-	-
Spotted hake	-	-	-	-	-	-	-	-	-	-	-	-
American plaice	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail flounder	1.35	-	-	-	2.43	0.03	-	-	0.15	0.73	-	-
Winter flounder	0.31	-	-	-	0.21	-	-	-	0.03	-	-	-
Witch flounder	-	-	-	-	-	-	-	0.13	-	-	-	-
Windowpane	0.08	-	-	-	1.56	0.05	-	-	1.22	0.38	-	-
Butterfish	9.89	26.75	239.12	0.62	99.64	49.95	19.74	7.63	53.50	14.51	82.22	0.27
Scup	26.89	0.29	-	-	49.56	0.05	-	-	8.39	0.44	-	-
Redfish	-	-	-	-	-	-	-	-	-	-	-	0.04
Total number of tows	83	73	26	21	70	93	27	24	72	98	27	26

Table 4. Mean number of juveniles of each selected species of fish caught per tow in each stratum (all cruises combined) within the Georges Bank area during 1975-1979.

Species	GEORGES BANK STRATA											
	13	14	15	16	17	18	19	20	21	22	23	25
Silver hake	8.35	1.34	0.15	4.13	2.17	0.32	25.91	43.33	4.06	30.86	13.34	0.54
Atlantic cod	0.05	-	-	0.19	0.12	-	0.59	0.53	0.27	-	1.22	1.15
Haddock	1.39	0.05	-	11.23	0.21	-	3.56	5.85	2.82	0.20	1.51	6.19
Pollock	-	-	-	0.01	-	-	-	-	-	-	-	0.02
White hake	0.04	-	-	0.01	-	-	0.18	0.03	-	-	0.08	0.06
Red hake	1.67	-	0.21	1.78	0.81	0.24	1.94	5.38	0.94	0.60	2.61	0.54
Spotted hake	-	-	-	-	-	-	-	-	-	-	-	-
American plaice	0.01	-	-	-	0.07	0.12	-	0.08	0.16	0.36	0.50	0.04
Yellowtail flounder	0.68	-	-	0.58	0.10	0.08	0.19	0.03	0.25	-	0.24	0.54
Winter flounder	-	-	-	0.01	-	-	0.29	1.26	0.02	-	-	0.13
Witch flounder	0.01	0.03	-	-	-	-	-	-	-	0.10	-	-
Windowpane	0.57	-	-	0.73	-	0.04	14.23	1.41	0.04	-	0.66	-
Butterfish	2.62	2.24	-	0.24	-	-	7.51	123.33	0.02	-	3.53	0.10
Scup	-	-	-	-	-	-	-	-	-	-	-	-
Redfish	-	-	-	-	0.10	0.12	-	-	0.04	-	0.01	-
Total number of tows	119	38	27	151	42	25	120	80	51	50	74	48

Table 5. Mean number of juveniles of each selected species of fish caught per tow in each stratum (all cruises combined) within the Gulf of Maine area during 1975-1979.

Species	GULF OF MAINE STRATA										
	24	26	27	28	29	30	36	37	38	39	40
Silver hake	16.30	23.74	10.47	19.77	27.74	7.36	14.34	26.11	9.37	6.38	21.20
Atlantic cod	0.03	0.18	-	-	0.01	-	0.01	0.13	0.02	0.45	0.07
Haddock	0.77	0.84	0.02	0.02	0.23	-	0.24	0.06	0.01	0.20	0.04
Pollock	-	-	-	-	-	-	-	-	-	0.02	-
White hake	0.03	0.04	0.04	-	0.08	-	-	-	0.25	0.02	-
Red hake	0.40	0.48	0.05	0.58	0.71	0.18	0.14	0.06	0.09	0.12	0.07
Spotted hake	-	-	-	-	-	-	-	-	-	-	-
American plaice	1.02	10.86	3.65	0.86	0.19	-	0.10	1.10	0.53	0.82	7.33
Yellowtail flounder	-	0.24	-	-	-	-	-	0.01	-	-	-
Winter flounder	-	0.07	-	-	-	-	-	-	-	0.07	-
Witch flounder	0.03	0.43	0.13	0.09	0.03	-	0.04	0.03	0.08	0.17	0.93
Windowpane	-	-	-	-	-	-	-	-	-	-	-
Butterfish	0.01	0.99	-	-	0.03	0.11	0.01	-	0.05	0.15	0.07
Scup	-	-	-	-	-	-	-	-	-	-	-
Redfish	0.05	0.17	1.33	0.03	0.10	-	0.11	0.23	0.10	0.20	1.16
Total number of tows	101	120	55	90	80	28	106	70	93	60	45

Table 6. Mean number of juveniles of each selected species of fish caught per tow in each stratum (all cruises combined) within the Western Nova Scotia area during 1975-1979.

Species	WESTERN NOVA SCOTIA STRATA						
	31	32	33	34	35	41	42
Silver hake	10.43	28.51	2.03	11.32	1.89	28.19	0.17
Atlantic cod	0.05	0.47	0.13	-	0.07	0.07	3.92
Haddock	8.40	15.60	1.88	0.06	0.07	15.57	21.67
Pollock	-	-	-	-	-	-	-
White hake	-	-	-	-	0.04	-	-
Red hake	0.32	0.12	0.19	0.13	0.21	0.01	-
Spotted hake	-	-	-	-	-	-	-
American plaice	1.62	0.26	0.13	0.83	0.11	1.94	1.58
Yellowtail flounder	0.03	0.53	-	-	-	0.03	-
Winter flounder	-	-	-	-	-	-	-
Witch flounder	-	-	-	0.02	-	0.03	-
Windowpane	-	-	-	-	-	-	-
Butterfish	-	-	0.06	0.06	-	-	-
Scup	-	-	-	-	-	-	-
Redfish	0.10	0.12	-	0.06	-	2.00	3.13
Total number of tows	60	43	32	53	28	67	24

Table 7. Total number of tows made during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
Number of tows	34	55	61	62	62	27	62	53	36	50	52
Southern New England											
Number of tows	60	60	61	61	59	23	57	62	41	84	72
Georges Bank											
Number of tows	65	66	63	62	64	53	89	70	45	133	115
Gulf of Maine											
Number of tows	58	72	70	60	74	55	83	75	46	143	84
Western Nova Scotia											
Number of tows	18	51	45	22	26	0	48	59	0	25	25

Table 8. Mean number of juvenile silver hake caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	23.91	11.04	30.48	11.71	1.50	0.41	81.05	12.45	0.28	1.18	1.46
Mean fork length(cm)	7	5	10	6	10	10	6	13	15	6	7
Southern New England											
No./tow	64.90	47.75	27.64	125.75	8.73	1.35	76.51	5.69	0.32	103.04	30.50
Mean fork length(cm)	10	5	10	7	10	13	5	11	6	6	11
Georges Bank											
No./tow	24.62	56.05	2.68	10.10	1.25	0.08	9.88	0.71	0.02	26.53	4.20
Mean fork length(cm)	13	7	13	8	12	14	5	12	6	8	13
Gulf of Maine											
No./tow	129.31	3.10	28.16	7.12	11.05	0.29	4.18	9.95	2.74	6.06	21.33
Mean fork length(cm)	13	9	12	9	14	14	7	12	14	8	13
Western Nova Scotia											
No./tow	19.77	4.57	34.20	7.23	6.04	No	0.75	7.81	No	50.36	11.16
Mean fork length(cm)	13	7	14	10	12	tows	12	12	tows	5	10

Table 9. Mean number of juvenile Atlantic cod caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Southern New England											
No./tow	0.02	-	-	-	-	0.13	0.02	0.79	0.05	-	0.31
Mean fork length(cm)	12	-	-	-	-	9	10	4	10	-	5
Georges Bank											
No./tow	0.02	1.97	0.08	-	-	0.17	0.10	1.83	0.96	0.22	0.10
Mean fork length(cm)	14	8	8	-	-	8	13	5	9	10	8
Gulf of Maine											
No./tow	0.22	0.04	-	-	-	0.15	0.04	-	0.09	0.24	0.05
Mean fork length(cm)	12	10	-	-	-	8	2	-	13	11	12
Western Nova Scotia											
No./tow	-	0.27	1.87	-	-	No	0.31	0.02	No	0.12	0.44
Mean fork length(cm)	-	10	12	-	-	tows	7	5	tows	12	8

Table 10. Mean number of juvenile haddock caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

	YEAR AND SEASON										
	1975		1976		1977			1978			1979
Areas	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	-	-	-	-	0.03	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	10	-	-
Southern New England											
No./tow	-	0.07	0.02	-	-	0.04	-	-	0.46	0.10	-
Mean fork length(cm)	-	14	14	-	-	8	-	-	8	13	-
Georges Bank											
No./tow	-	11.59	0.03	2.19	0.03	0.04	0.02	0.01	27.69	8.81	0.02
Mean fork length(cm)	-	13	13	13	14	9	13	14	8	14	15
Gulf of Maine											
No./tow	-	1.56	0.07	1.57	0.20	-	0.02	0.01	-	0.10	-
Mean fork length(cm)	-	12	15	13	14	-	13	14	-	11	-
Western Nova Scotia											
No./tow	0.11	7.86	21.20	11.41	0.19	No	14.19	6.80	No	4.20	0.44
Mean fork length(cm)	14	14	15	13	15	tows	12	15	tows	13	14

Table 11. Mean number of juvenile pollock caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Southern New England											
No./tow	-	-	-	-	-	-	-	-	0.05	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	15	-	-
Georges Bank											
No./tow	-	0.02	-	-	-	-	-	-	-	0.01	-
Mean fork length(cm)	-	7	-	-	-	-	-	-	-	7	-
Gulf of Maine											
No./tow	-	-	0.01	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	15	-	-	-	-	-	-	-	-
Western Nova Scotia											
No./tow	-	-	-	-	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	-	-	-	tows	-	-	tows	-	-

Table 12. Mean number of juvenile white hake caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Southern New England											
No./tow	-	-	-	-	-	0.04	0.02	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	13	13	-	-	-	-
Georges Bank											
No./tow	-	-	-	0.05	-	-	0.09	-	0.02	0.21	-
Mean fork length(cm)	-	-	-	9	-	-	12	-	13	10	-
Gulf of Maine											
No./tow	0.48	0.01	0.06	0.02	-	-	-	-	-	0.04	-
Mean fork length(cm)	14	15	12	15	-	-	-	-	-	12	-
Western Nova Scotia											
No./tow	-	-	0.02	-	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	15	-	-	tows	-	-	tows	-	-

Table 13. Mean number of juvenile red hake caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	0.12	2.05	0.51	0.08	0.73	1.07	0.24	0.23	0.86	0.02	0.35
Mean fork length(cm)	6	4	10	3	10	15	5	10	15	15	5
Southern New England											
No./tow	1.72	1.58	1.26	1.44	0.90	0.35	0.61	1.39	-	0.55	0.08
Mean fork length(cm)	10	5	11	6	9	13	5	10	-	6	13
Georges Bank											
No./tow	1.57	3.59	0.41	4.47	0.16	0.04	1.25	0.43	0.07	4.77	0.38
Mean fork length(cm)	11	7	9	6	10	14	6	11	8	7	9
Gulf of Maine											
No./tow	0.86	0.04	1.13	0.92	0.53	0.04	0.02	0.15	-	0.02	0.08
Mean fork length(cm)	13	14	13	9	12	14	8	13	-	8	13
Western Nova Scotia											
No./tow	0.33	0.10	-	0.59	0.42	No	-	0.02	No	0.36	0.12
Mean fork length(cm)	13	10	-	9	11	tows	-	13	tows	9	12

Table 14. Mean number of juvenile spotted hake caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	0.16	33.89	0.98	3.58	34.44	25.95	0.02	2.17	11.38	0.73
Mean fork length(cm)	-	15	6	15	8	14	15	11	14	15	9
Southern New England											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Georges Bank											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Gulf of Maine											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Western Nova Scotia											
No./tow	-	-	-	-	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	-	-	-	tows	-	-	tows	-	-

Table 15. Mean number of juvenile American plaice caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Southern New England											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Georges Bank											
No./tow	0.08	0.08	0.05	0.05	0.19	0.11	0.01	0.07	0.09	0.15	0.12
Mean fork length(cm)	12	14	10	14	14	13	13	10	12	13	11
Gulf of Maine											
No./tow	3.64	2.50	5.74	2.57	5.73	2.47	1.92	1.07	2.28	1.87	1.27
Mean fork length(cm)	12	13	12	13	13	12	13	13	13	12	14
Western Nova Scotia											
No./tow	2.39	1.47	2.49	0.27	0.23	No	0.50	0.51	No	0.60	0.64
Mean fork length(cm)	13	13	13	12	10	tows	13	12	tows	14	12

Table 16. Mean number of juvenile yellowtail flounder caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	0.11	0.44	-	0.02	-	-	-
Mean fork length(cm)	-	-	-	-	8	14	-	8	-	-	-
Southern New England											
No./tow	0.37	-	0.02	-	1.36	0.22	0.02	3.21	-	-	0.83
Mean fork length(cm)	9	-	9	-	9	15	6	8	-	-	9
Georges Bank											
No./tow	0.51	0.44	0.92	-	0.03	0.04	0.26	0.89	0.11	0.06	0.30
Mean fork length(cm)	10	9	8	-	10	10	13	9	12	9	8
Gulf of Maine											
No./tow	0.21	-	0.13	0.03	-	-	-	-	0.04	0.03	-
Mean fork length(cm)	13	-	11	15	-	-	-	-	15	12	-
Western Nova Scotia											
No./tow	0.11	0.08	0.11	0.05	0.19	No	0.19	-	No	-	0.04
Mean fork length(cm)	13	14	14	5	12	tows	13	-	tows	-	12

Table 17. Mean number of juvenile winter flounder caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	0.03	-	-	-	0.06	-	-
Mean fork length(cm)	-	-	-	-	15	-	-	-	15	-	-
Southern New England											
No./tow	0.07	0.02	0.10	-	0.27	-	-	0.15	-	-	0.10
Mean fork length(cm)	13	15	9	-	13	-	-	12	-	-	14
Georges Bank											
No./tow	0.09	1.23	0.14	0.06	0.03	0.02	0.25	0.21	0.07	0.01	-
Mean fork length(cm)	12	7	13	13	13	5	10	13	14	9	-
Gulf of Maine											
No./tow	0.07	-	0.03	-	0.04	-	-	-	-	-	0.04
Mean fork length(cm)	10	-	15	-	12	-	-	-	-	-	13
Western Nova Scotia											
No./tow	-	-	-	-	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	-	-	-	tows	-	-	tows	-	-

Table 18. Mean number of juvenile witch flounder caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	0.08	-	0.02	-	-	0.19	-	-	-
Mean fork length(cm)	-	-	11	-	15	-	-	7	-	-	-
Southern New England											
No./tow	-	-	-	-	-	-	-	0.05	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	12	-	-	-
Georges Bank											
No./tow	-	0.08	-	-	-	-	-	0.01	-	-	0.01
Mean fork length(cm)	-	5	-	-	-	-	-	9	-	-	6
Gulf of Maine											
No./tow	0.22	0.11	0.31	0.08	0.27	0.13	0.14	0.32	0.02	0.10	0.14
Mean fork length(cm)	11	7	12	9	13	10	8	10	9	12	12
Western Nova Scotia											
No./tow	-	-	0.04	0.05	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	14	6	-	tows	-	-	tows	-	-

Table 19. Mean number of juvenile windowpane caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	0.02	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	3	-	-	-	-	-	-	-	-
Southern New England											
No./tow	0.82	0.07	0.67	0.10	0.20	-	0.49	0.94	-	0.19	0.44
Mean fork length(cm)	13	11	13	13	14	-	9	13	-	14	14
Georges Bank											
No./tow	0.58	7.14	0.35	2.23	0.06	0.06	1.69	0.10	4.38	7.42	0.30
Mean fork length(cm)	11	3	9	6	14	2	9	10	2	6	7
Gulf of Maine											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Western Nova Scotia											
No./tow	-	-	-	-	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	-	-	-	tows	-	-	tows	-	-

Table 20. Mean number of juvenile butterfish caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	185.12	11.60	110.59	104.76	27.81	245.19	42.87	22.19	106.06	105.90	36.75
Mean fork length(cm)	12	12	11	13	14	12	11	12	12	12	14
Southern New England											
No./tow	9.17	54.92	40.62	186.38	1.37	14.48	53.14	3.85	70.24	44.95	11.26
Mean fork length(cm)	13	11	12	12	13	14	11	12	11	11	12
Georges Bank											
No./tow	1.03	0.62	-	2.47	-	0.02	26.25	-	9.64	63.30	0.14
Mean fork length(cm)	15	13	-	9	-	15	8	-	7	8	14
Gulf of Maine											
No./tow	0.02	-	-	2.05	-	-	0.16	-	-	0.04	-
Mean fork length(cm)	14	-	-	12	-	-	13	-	-	12	-
Western Nova Scotia											
No./tow	-	-	-	0.14	-	No	0.04	-	No	-	-
Mean fork length(cm)	-	-	-	5	-	tows	15	-	tows	-	-

Table 21. Mean number of juvenile scup caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	4.82	18.85	3.85	234.26	21.37	0.19	12.11	117.15	-	-	72.92
Mean fork length(cm)	12	10	11	12	12	9	11	11	-	-	10
Southern New England											
No./tow	-	45.58	0.02	5.54	-	-	33.23	-	0.10	16.69	-
Mean fork length(cm)	-	9	12	12	-	-	8	-	8	9	-
Georges Bank											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Gulf of Maine											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Western Nova Scotia											
No./tow	-	-	-	-	-	No	-	-	No	-	-
Mean fork length(cm)	-	-	-	-	-	tows	-	-	tows	-	-

Table 22. Mean number of juvenile redfish caught per tow during each season from 1975 through 1979 within five geographic areas of the Northwest Atlantic.

Areas	YEAR AND SEASON										
	1975		1976		1977			1978			1979
	Spring	Autumn	Spring	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Middle Atlantic											
No./tow	-	-	-	-	-	-	-	-	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	-	-	-	-
Southern New England											
No./tow	-	-	-	-	-	-	-	0.02	-	-	-
Mean fork length(cm)	-	-	-	-	-	-	-	10	-	-	-
Georges Bank											
No./tow	0.05	0.03	0.02	-	-	-	0.01	-	-	0.02	-
Mean fork length(cm)	15	13	15	-	-	-	12	-	-	5	-
Gulf of Maine											
No./tow	0.59	0.64	1.17	0.10	0.04	0.04	0.08	0.11	0.02	0.05	0.17
Mean fork length(cm)	14	15	12	14	14	15	14	15	13	11	6
Western Nova Scotia											
No./tow	-	0.65	0.69	0.23	0.08	No	2.96	0.85	No	-	0.12
Mean fork length(cm)	-	12	9	12	10	tows	13	14	tows	-	11

Table 23. Summary of the occurrence of the juveniles of 15 species of fish caught while bottom trawling in particular stratum and geographic areas of the Northwest Atlantic during the period 1975-1979.

Species	Middle Atlantic		Southern New England		Georges Bank		Gulf of Maine		Western Nova Scotia	
	Max. Rel. abundance	High three[1] strata	Max. Rel. abundance	High three[1] strata	Max. Rel. abundance	High three[1] strata	Max Rel. abundance	High three[1] strata	Max. Rel. abundance	High three[1] strata
Silver hake	+	73,69,65	++++	1,6,9		20,22,19		29,37,26		32,41,34
Atlantic cod		-		9,5,10	++++	23,25,19		39,26,37	+	42,32,33
Haddock		74		5,9,10	+	16,25,20		26,24,36	+++	42,32,41
Pollock		-	+	5	++	16,25	+	39		-
White hake		-		5,9	+	19,23,25	+	38,29,26		35
Red hake		70,73,68	++	5,1,9	++	20,23,19		29,28,26		31,35,33
Spotted hake	++	63,62,65		-		-		-		-
American plaice		-		-		23,22,21	++	26,40,27		41,31,42
Yellowtail flounder		73	++	5,1,10		13,16,25		26,37		32,41,31
Winter flounder		73,65		1,5,9	+	20,19,25		26,39		-
Witch flounder		68,64,62		8		22,14,13	++	40,26,39		41,34
Windowpane		69	++	5,9,10	++	19,20,16		-		-
Butterfish	+++	75,66,62	+	3,5,11		20,19,23		26,39,30		34,33
Scup	+++	62,61,66		5,1,9		-		-		-
Redfish		-		12		18,17,21		27,40,37	++	42,41,32
Top three strata ranked by occurrence of species[2]	62	73 65	5	9 1	19	20 25	26	39 37	41	32 42
Number of species occurring within individual stratum	4	4 3	10	8 5	7	6 6	10	5 4	6	5 4

[1]High three strata in descending order by the mean number of fish caught per tow within each stratum.

[2]Top three strata ranked by number of species which occurred in high three strata.

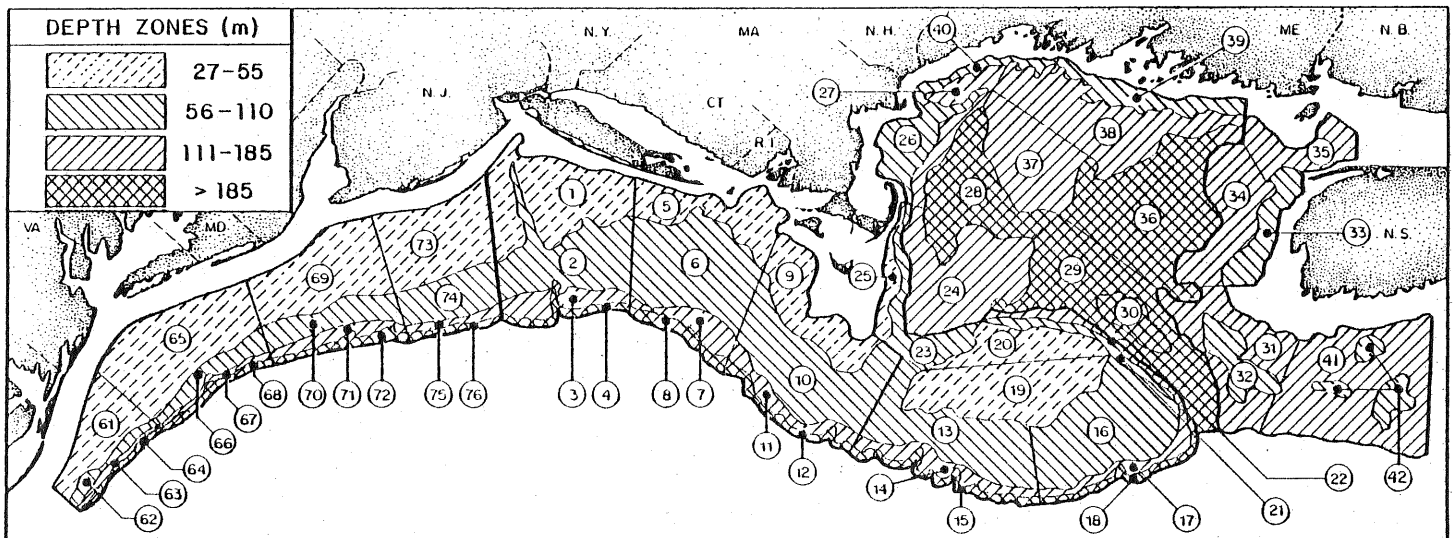

Figure 1. Northwest Atlantic bottom trawl survey sampling strata broken down by depth zones and geographic areas.

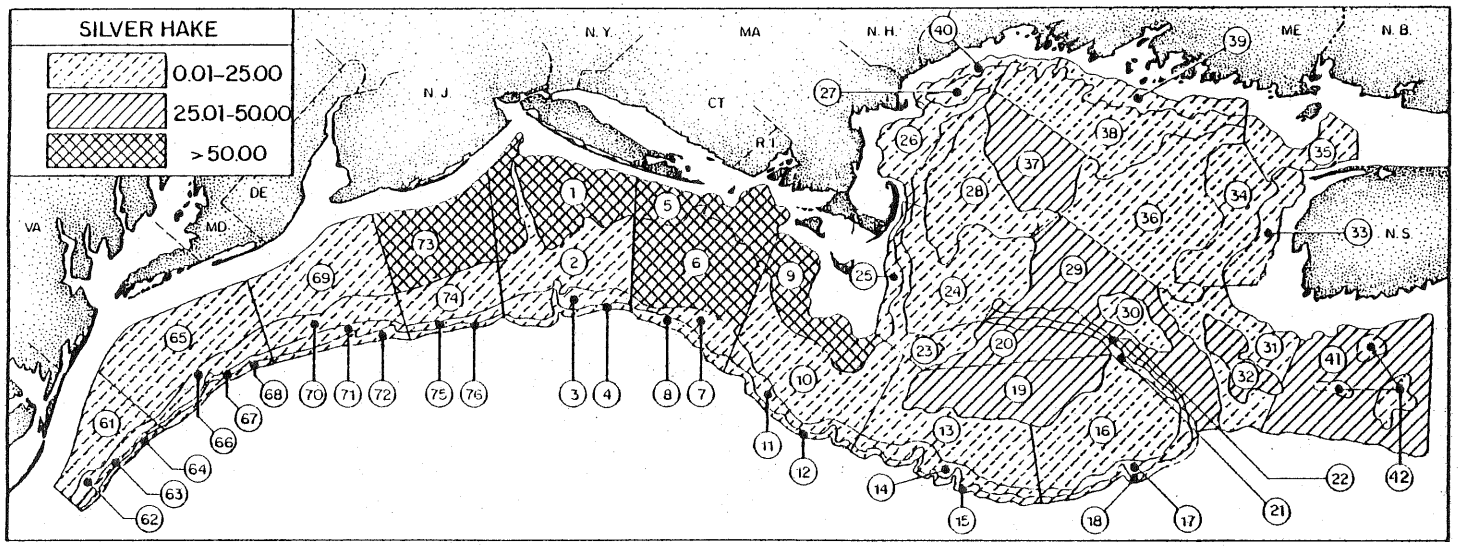

Figure 2. Depiction of juvenile silver hake relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

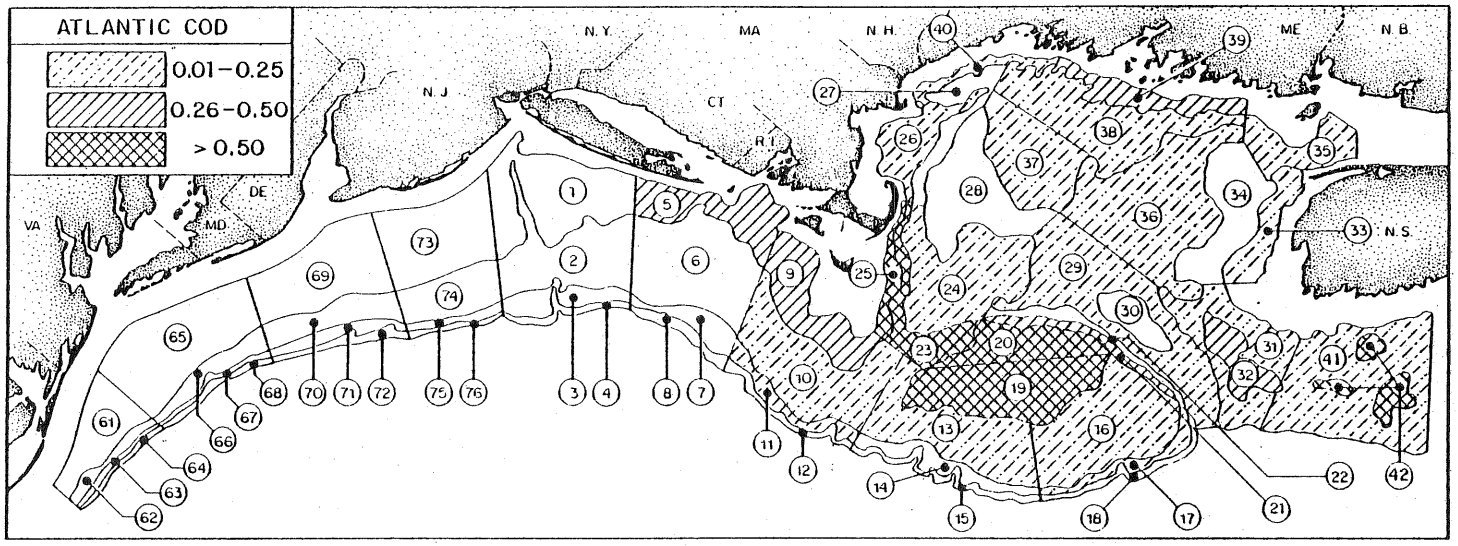

Figure 3. Depiction of juvenile Atlantic cod relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

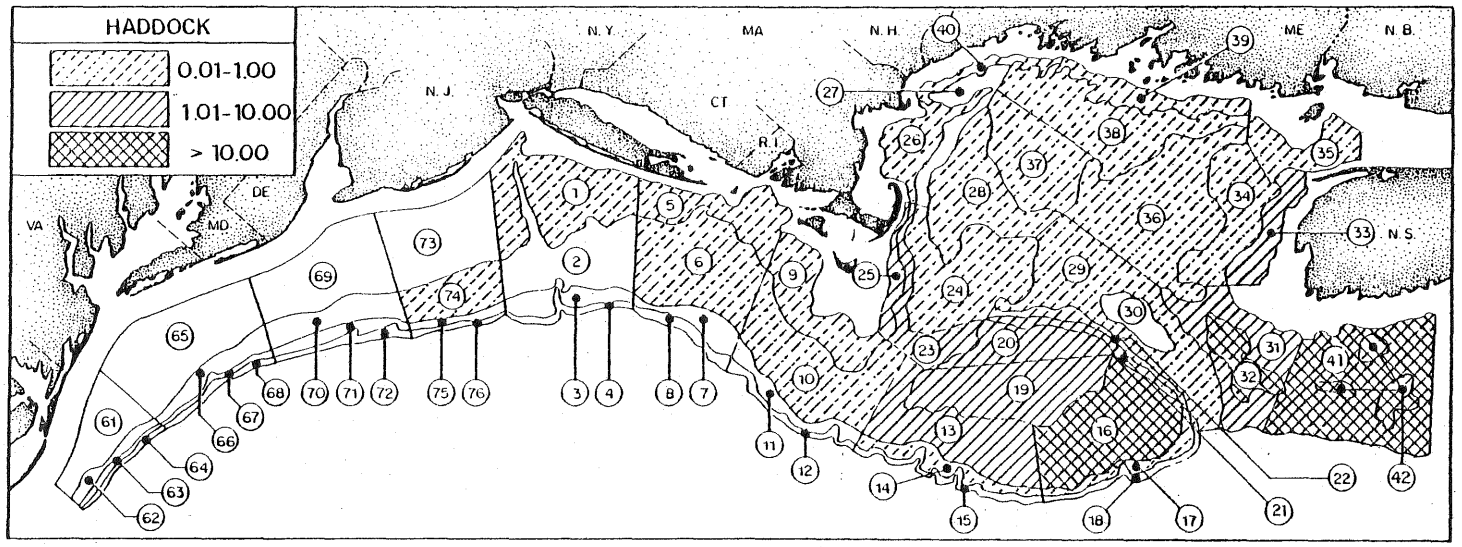

Figure 4. Depiction of juvenile haddock relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

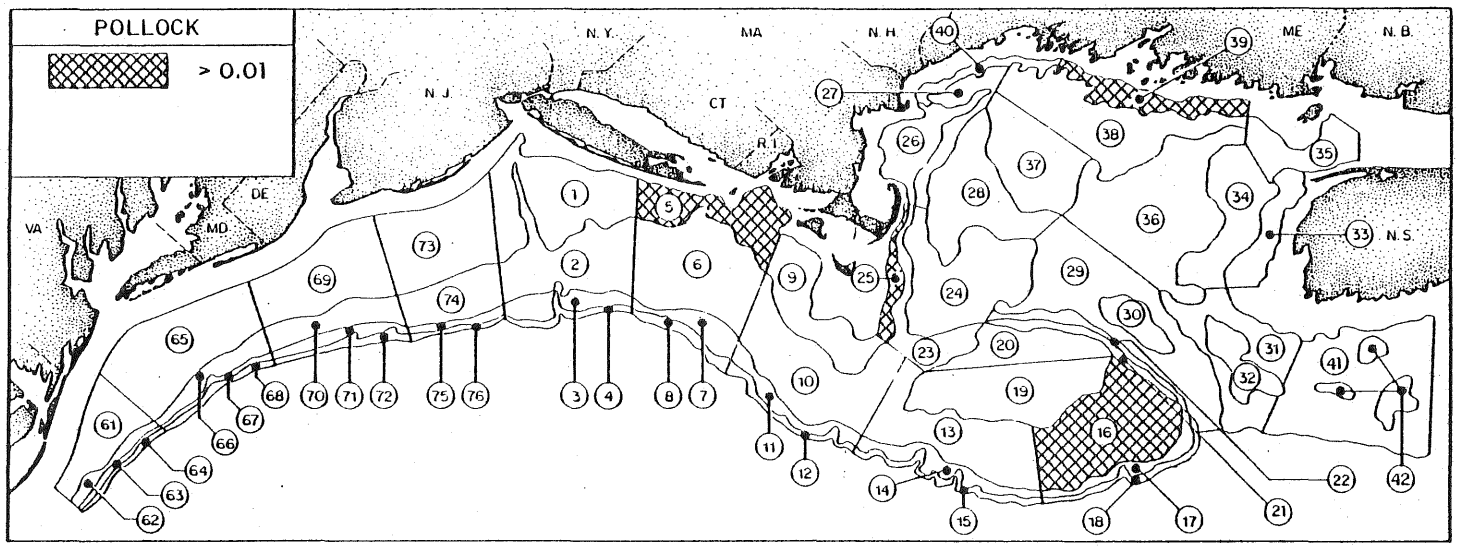

Figure 5. Depiction of juvenile pollock relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

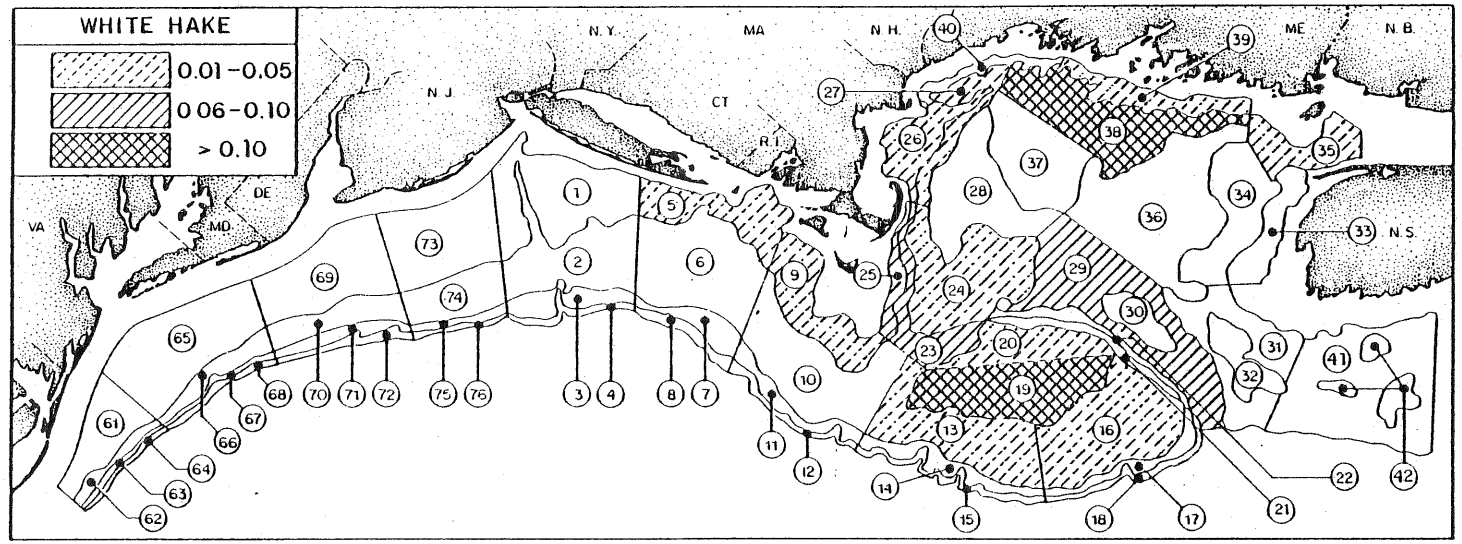

Figure 6. Depiction of juvenile white hake relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

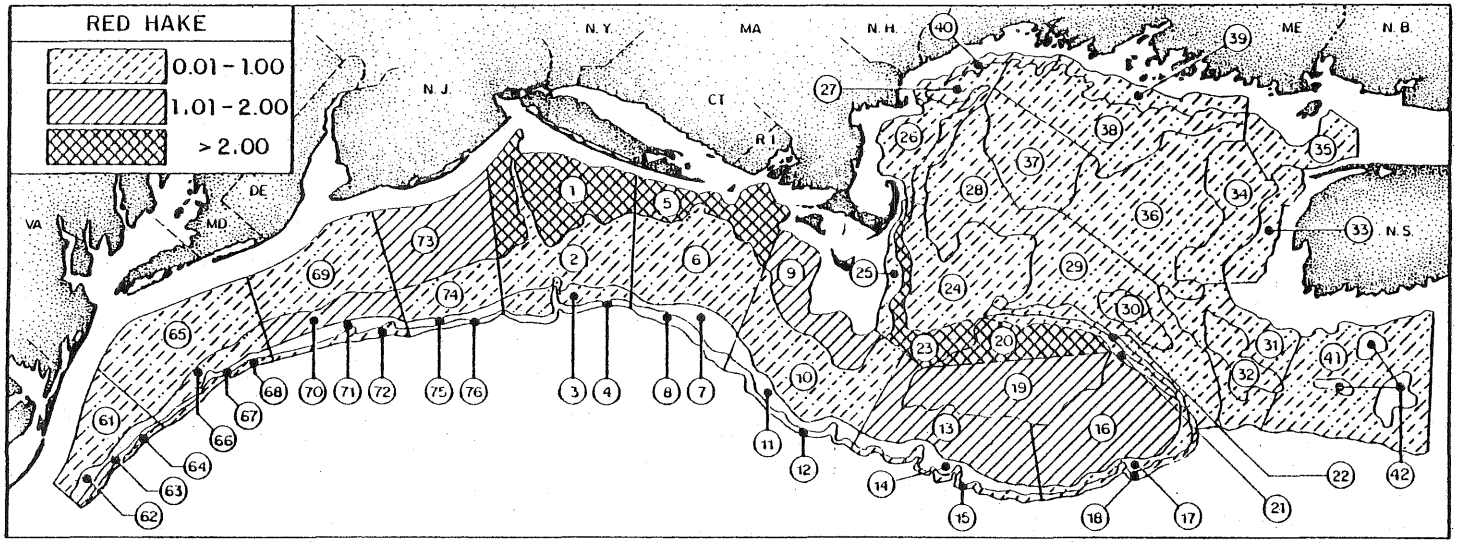

Figure 7. Depiction of juvenile red hake relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

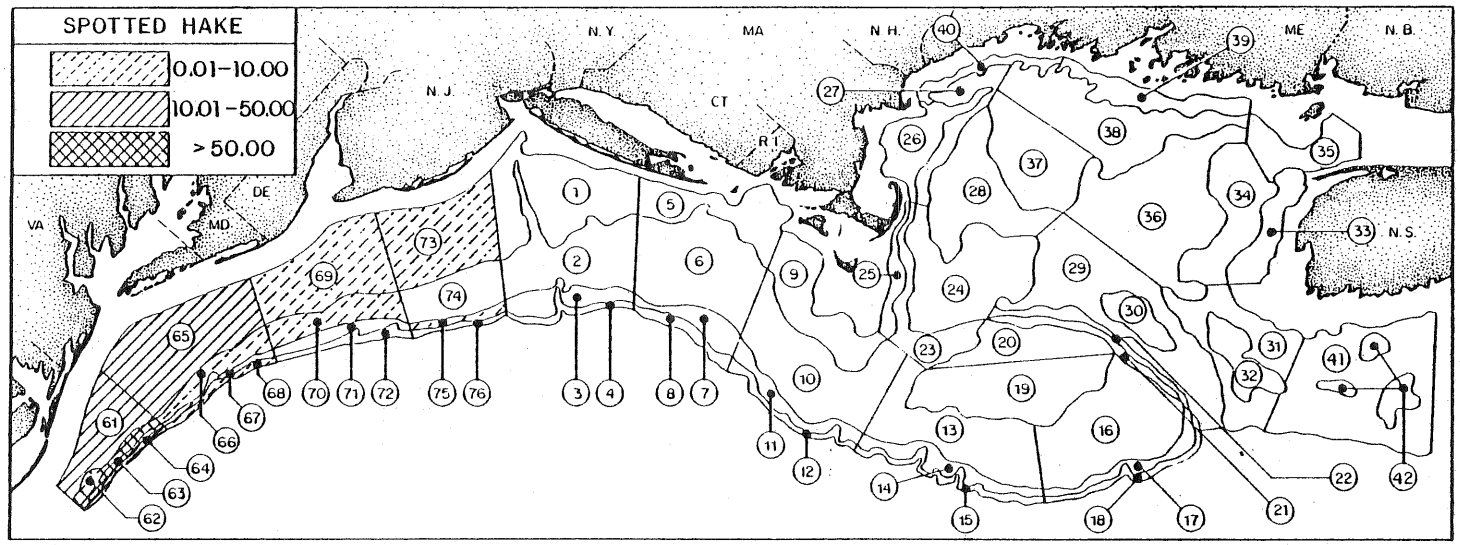

Figure 8. Depiction of juvenile spotted hake relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

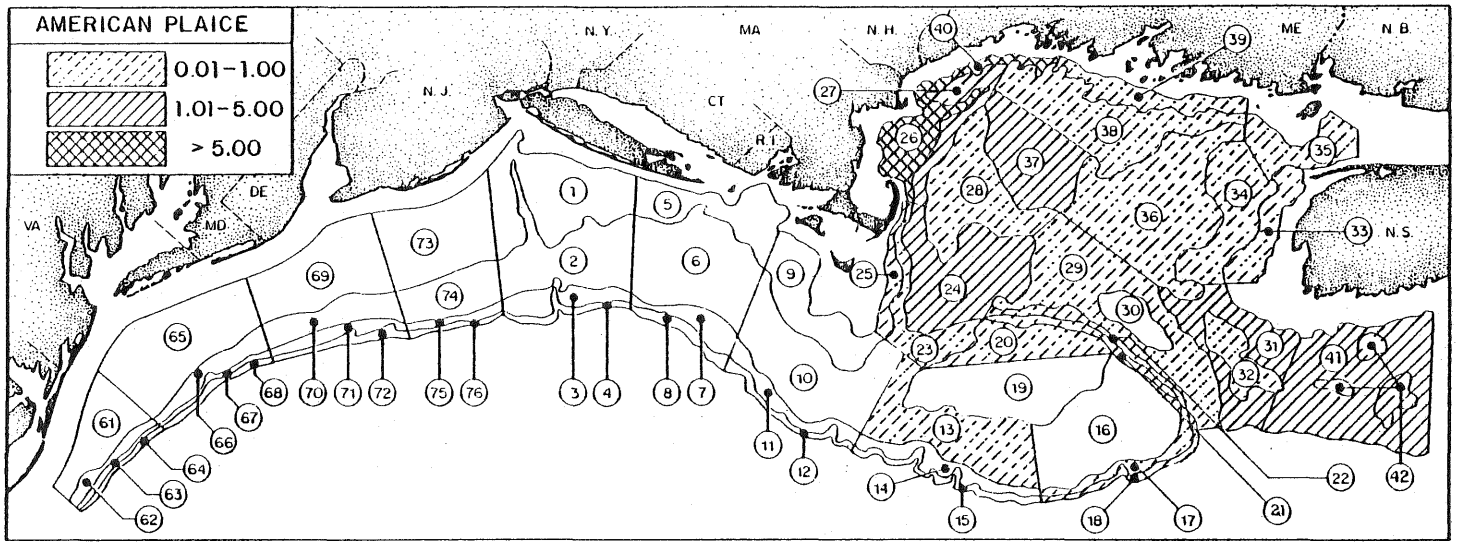

Figure 9. Depiction of juvenile American plaice relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

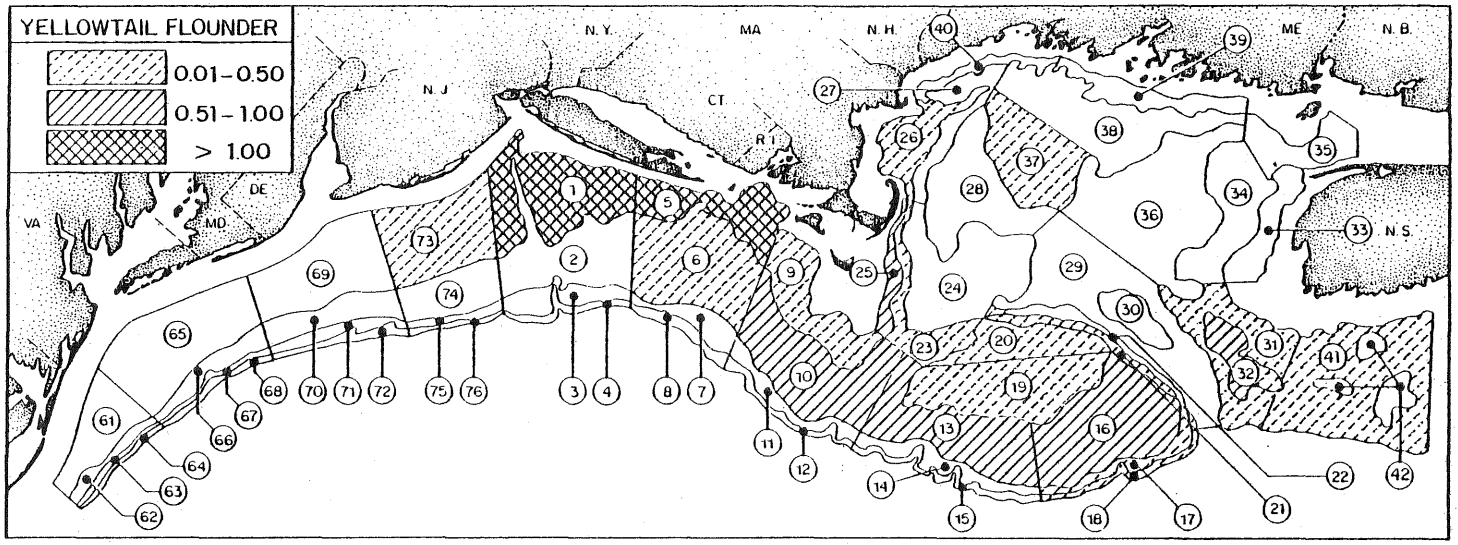

Figure 10. Depiction of juvenile yellowtail flounder relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

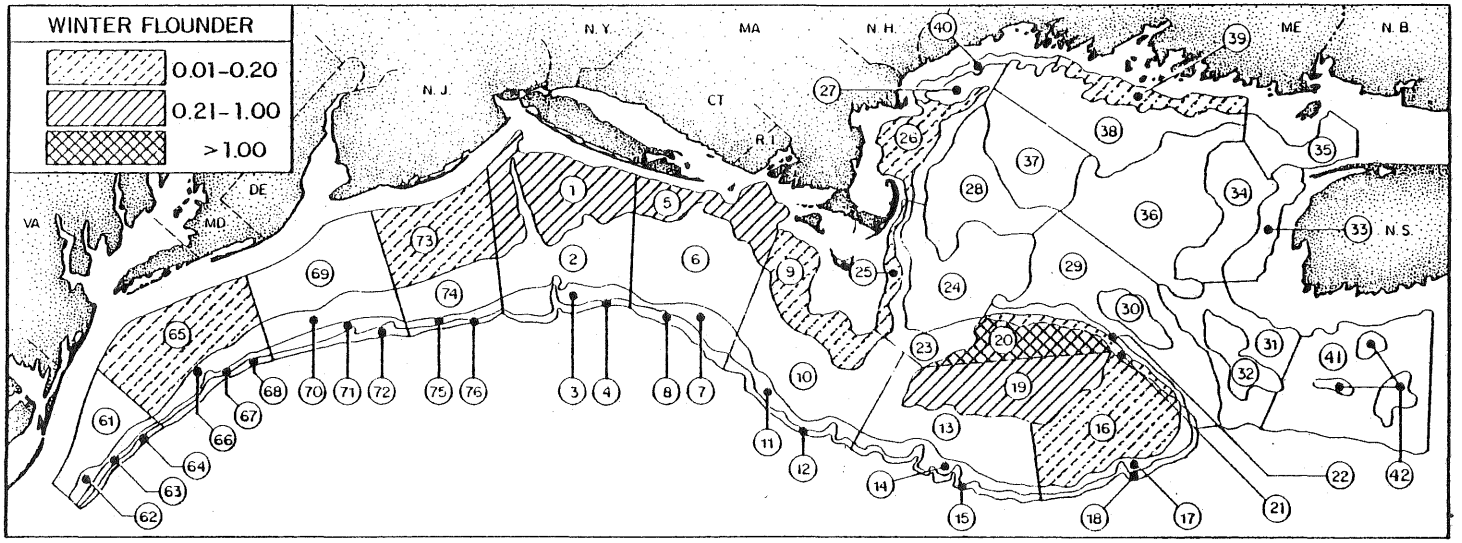

Figure 11. Depiction of juvenile winter flounder relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

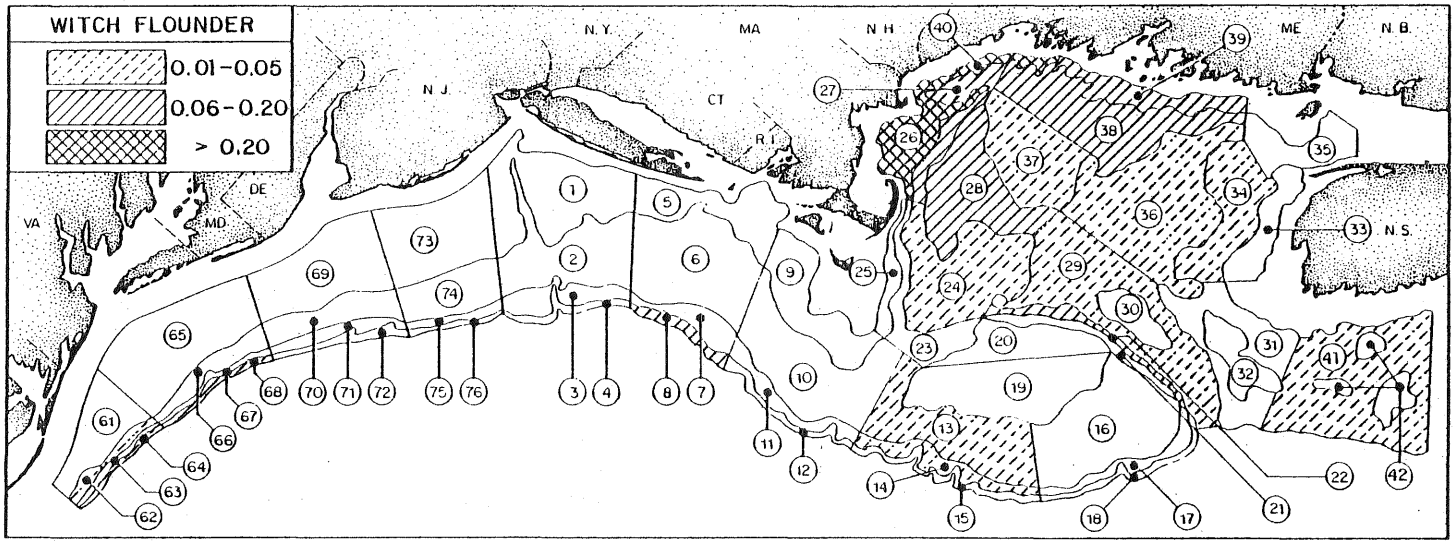

Figure 12. Depiction of juvenile witch flounder relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

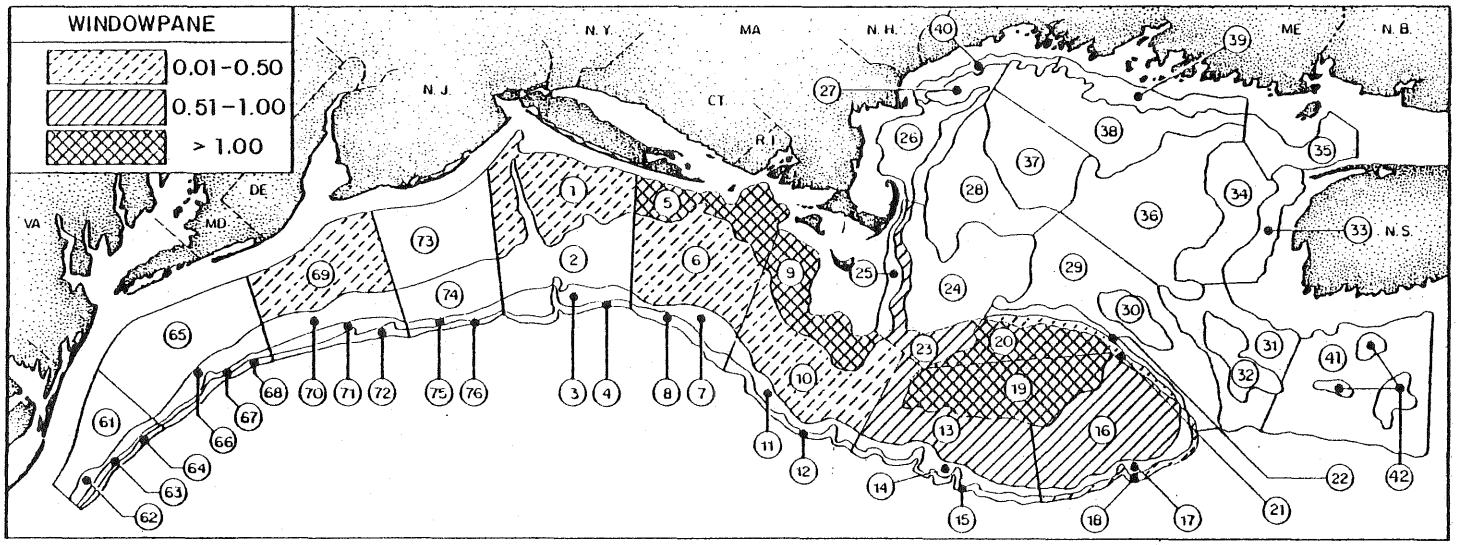

Figure 13. Depiction of juvenile windowpane relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

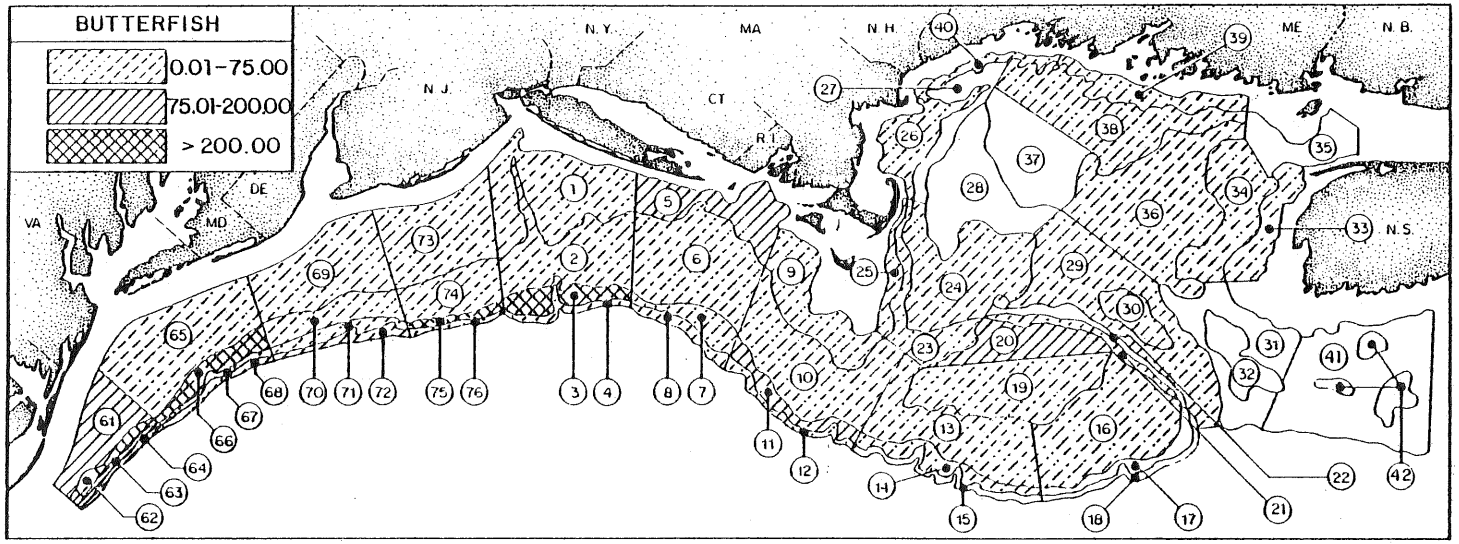

Figure 14. Depiction of juvenile butterfish relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

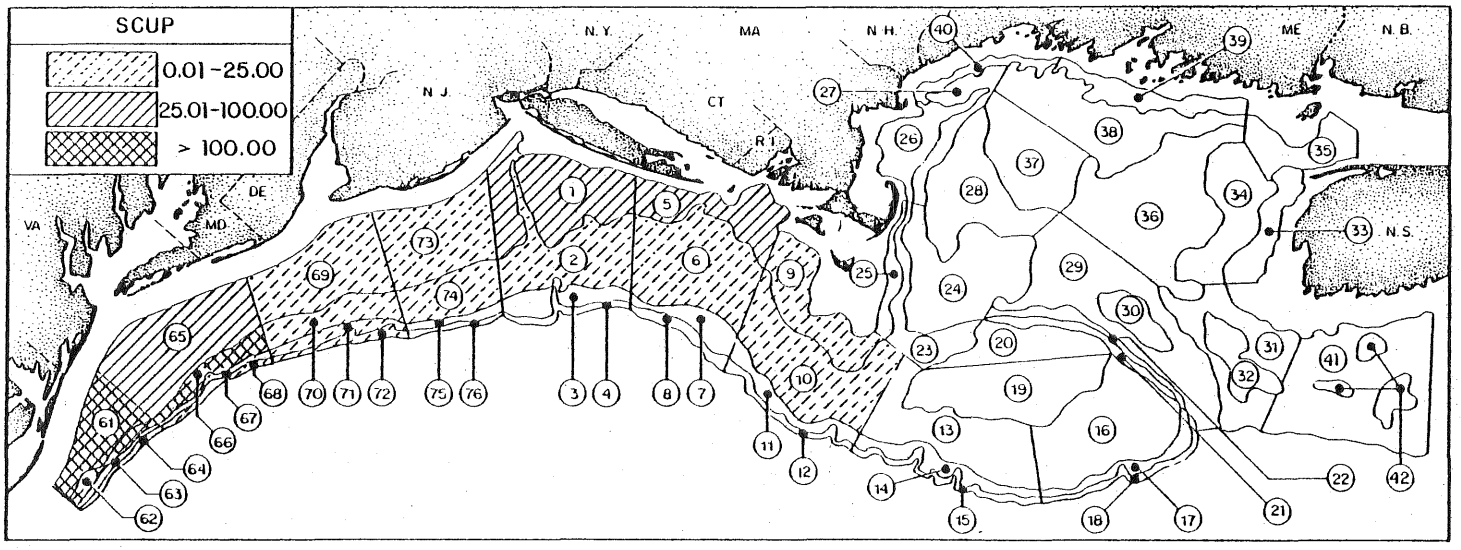

Figure 15. Depiction of juvenile scup relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.

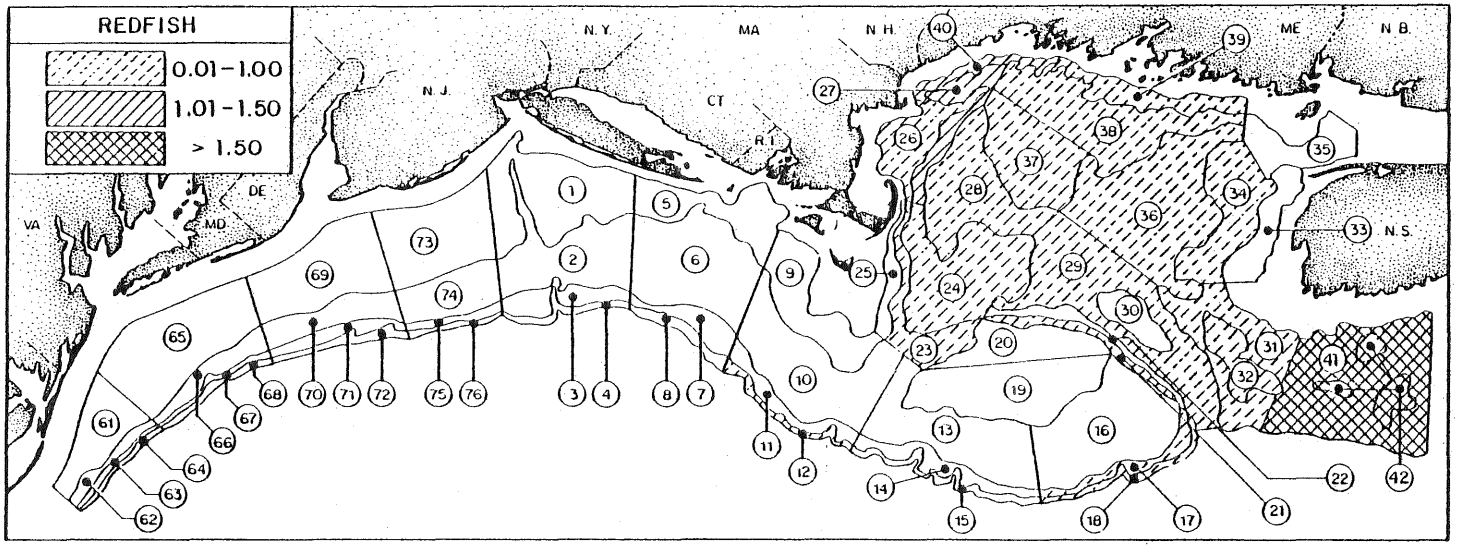

Figure 16. Depiction of juvenile redfish relative distribution and abundance in Northwest Atlantic bottom trawl survey sampling strata during the period 1975-1979. Mean number caught per tow legend inserted at upper left in figure.