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Abundance, Size Composition and Recruitment of Sea Scallops in the USA Georges Bank and Mid-Atlantic Regions:

Results of the 1986 USA Sea Scallop Research Vessel Survey

by

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SUMMARY

The 1986 USA sea scallop research vessel survey was conducted from 29 July to 29 August 1986 using the R/V ALBATROSS IV to evaluate relative abundance, size composition, and recruitment patterns in the USA Georges Bank and Mid-Atlantic sea scallop resources. A total of 460 sampling tows were accomplished; 182 tows were completed on Georges Bank and 278 tows completed in the Mid-Atlantic. The 1986 survey sampling was the most intensive in the 12-year USA scallop survey time series.

The 1986 survey catch per tow results reveal that the marked improvement in sea scallop abundance that began in 1985 has continued. Resource recovery from the record-low 1983/1984 conditions has rapidly occurred due to widespread outstanding recruitment of the 1982 and 1983 year classes. In the USA sector of Georges Bank, survey abundance values were among the highest in the survey series. In the Mid-Atlantic region, the 1986 survey data indicate that scallop abundance has reached record-high levels. In both resource areas, current abundance is 3-4 fold greater than during 1983/1984.

Total stock biomass and harvestable biomass (<80 meat count scallops) have also markedly increased as a result of improved recruitment. However, the survey data indicate that potential long-term yield is still being lost due to short-term harvesting of smaller-sized scallops. This was most perceptible in the 1986 survey results from the South Channel region of Georges Bank where a large expected increase in harvestable biomass from the strong 1982 year class failed to materialize. "Mixing" of small scallops in the commercial landings is the apparent cause for this situation.

Distributions of harvestable biomass derived from the 1986 survey indicate that large scallops (<30 meat count) account for 63% of the harvestable resource in the USA portion of Georges Bank and 42% in the Mid-Atlantic. For both regions combined, 48% of the total harvestable biomass is accounted for by <30 count scallops.

Due to the prevalence of small scallops (particularly the 1983 year class) across all resource areas, there is likely to be strong incentive in the USA fishery to harvest juvenile scallops during 1987. Scallops from the outstanding 1983 year class, however, are not expected to attain a 30 count size until spring 1988. To the extent that fishing mortality on these small scallops is not effectively limited until then, long-term benefits from management of the USA sea scallop resource will be dissipated.

INTRODUCTION

Sea scallop research vessel surveys have been conducted by the National Marine Fisheries Service (NMFS) in 1975 and annually from 1977 onward to monitor and assess trends in abundance, population composition, and recruitment patterns of USA offshore (3-200 n. mi from the USA coastline) sea scallop resources. Together with commercial fisheries data, the survey results have been used to evaluate stock and fishery status and to forecast future resource conditions (Serchuk 1983, 1984; Serchuk and Wigley 1984, 1985, 1986). Scientific advice developed from the survey analyses has been regularly provided to resource managers (i.e., New England and Mid-Atlantic Fishery Management Councils) to enhance knowledge on the biological basis of the sea scallop fisheries.

This document presents the results of the 1986 NMFS sea scallop research vessel survey and provides an evaluation of current resource conditions, recruitment prospects, and abundance levels of the USA Georges Bank and Mid-Atlantic sea scallop populations.

METHODS

The 1986 survey was conducted from 29 July to 29 August using the R/V ALBATROSS IV. Areas sampled included Georges Bank and the Mid-Atlantic in depths between 28-110 meters (15 to 60 fathoms). Due to equipment problems and weather constraints, survey coverage in 1986 was less synoptic than in previous years. No sampling was conducted in Southern New England waters (sampling strata 37-44: Figure 1) or in Canadian waters on the Northern Edge and Peak east of the International Court of Justice (ICJ) boundary line. The lack of sampling in the Southern New England region, however, will not measurably alter the 1986 survey results since historically this region is one of low scallop production and of marginal importance to the USA fishery. The Northern Edge and Peak region east of the ICJ line is an area of high scallop productivity, but is managed by Canada, and is presently unaccessible to the USA scallop fleet. Canada conducts an annual sea scallop survey of this region, and provides copies of their survey data to NMFS. Although the 1986 results have yet to be received, they will be incorporated, upon receipt, into an overall evaluation of the Georges Bank resource.

Operational difficulties during the 1986 NMFS survey also hindered complete survey coverage of the South Channel region of Georges Bank. Four survey strata (Strata 47-48 and 55-56: Figure 1) were not sampled due to these impediments. Although these strata comprise 54% of the South Channel survey area, historically they have not been the most important. During 1981-1985, the average abundance of scallops in these strata was 58% lower than the aggregate average abundance value for the entire South Channel region. Similarly, the average 1981-1985 biomass level of scallops in the four strata was 38% lower than the corresponding South Channel average. Accordingly, the lack of 1986 survey sampling in these areas should impart little bias in the evaluation of South Channel resource conditions. If anything, the absence of the sampling data will result in the 1986 South Channel abundance indices being overestimated rather than underestimated. Hence, the 1986 evaluation

(relative to former years) will be liberal relative to abundance changes, rather than conservative.

Sampling and survey procedures in 1986 were identical to those in previous years. Sampling was performed using a 2.44 m (8 ft) wide commercial sea scallop dredge equipped with a 5.1 cm (2 in) ring bag and a 3.8 cm (1.5 in) polypropylene mesh liner to retain small scallops. Detailed specifications of this gear, used in all NMFS sea scallop surveys since 1979, are given in Serchuk and Smolowitz (1980).

A stratified sampling design was used with offshore scallop regions (15-60 fm) stratified into geographical zones (strata) based on water depth and latitude (Figure 1). Sampling stations were allocated to strata in proportion to stratum area, and assigned randomly within strata. For selected strata in which either commercial fishing activity or sea scallops concentrations were known to occur, additional randomly-selected stations were added prior to the survey to increase the precision of the survey abundance estimates. Sampling station positions occupied in the 1986 NMFS scallop survey are depicted in Appendix Figures 1-3. Individual station (tow) catch and LORAN-C location data are provided in Appendix Table 1.

Survey procedures in 1986 were identical to those used in previous scallop surveys. At each station, the survey dredge was towed for 15 minutes at 3.5 knots with a 3:1 wire scope. After each tow, the catch was sorted into biological and trash components. All live scallops were counted and shell height[1] measurements taken, by 5-mm interval, on all individuals. Occasionally, subsampling procedures were used when large quantities of scallops were captured. All by-catch of finfish and other invertebrates were also enumerated and measured. Trash components were measured by volume and substrate composition and type noted. Hydrographic and navigational data were documented for each tow including distance over bottom using a Doppler speed log. Following the catch processing, the survey dredge and liner were inspected, and repaired or replaced as necessary.

RESULTS

Sampling Intensity and Overall Catch

A total of 460 tows were performed during the 1986 sea scallop survey: 278 in the Mid-Atlantic and 182 on Georges Bank (Table 1). Sampling intensity (tows per sq n mile) averaged 1:65 in the Mid-Atlantic and 1:40 in the USA sector of Georges Bank (1:54 if the four unsampled South Channel strata are included). The 1986 sampling was the most intensive in any of the annual NMFS scallop surveys performed since 1975. Individual stratum sampling intensities varied from one tow per 10 sq n miles (Strata 7, 50, 651 and 661) to one tow per 543 sq n mile (Stratum 9) (see Figure 1 for strata locations and areas).

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[1]Shell height is the greatest distance from the hinge region to the shell margin.

Sea scallop catches ranged from 0 (85 tows) to 4,564 scallops per tow (Tow 50-15 in the South Channel region of Georges Bank). Over all areas sampled, a total of 64,981 scallops were taken: 33,092 in the Mid-Atlantic and 31,889 on Georges Bank.

Relative Abundance Indices

Survey indices of sea scallop relative abundance and biomass were calculated in terms of mean number and mean meat weight per tow[2] for each sampling stratum in the Georges Bank - Mid-Atlantic survey area (Table 1), and in terms of stratified mean catch per tow (numbers and meat weight) for principal scallop regions within the Georges Bank and Mid-Atlantic areas (Tables 1-4). Survey indices were derived for pre-recruit scallops (<70 mm shell height; >80 meat count), recruit or commercial-sized scallops (≥70 mm shell height; ≤80 meat count), and total scallops (all sizes) per tow (Tables 2-4; Figures 2-3). Size-related parameters (average shell height, average meat weight per scallop, and average meat count) were also calculated for each stratum and region (Tables 1-3) as well as on a tow-by-tow basis (Appendix Table 1).

Abundance indices (total number per tow) were also developed for each region within Georges Bank and the Mid-Atlantic using a logarithmic transformation (ln x+1) of individual tow catch data (Tables 5-6). This transformation tends to minimize the effect that extremely high but infrequent catches have on the mean abundance level. Retransformed abundance estimates, in original units, were subsequently derived from the transformed values.

Since current management measures in the USA sea scallop fishery are based on meat count (number of meats per pound), survey catch per tow data were further analyzed in terms of catch distributions among various meat count intervals. For each stratum, region, and area, percentage distributions of the number of scallops within five meat count categories (>80 count; 80-40 count; 40-35 count; 35-30 count; and <30 count) were calculated (Table 1). Because the survey gear was equipped with a mesh liner to retain small scallops normally not landed in the commercial fishery, survey meat count distributions of harvestable-sized scallops (≥70 mm shell height; ≤80 meat count) were also determined (in terms of both biomass and numbers) for the major scallop regions within Georges Bank and the Mid-Atlantic (Tables 7-14; Figures 4-6). Similar analyses were performed for individual tow data but only the percent of each station's catch ≤40 count is provided (Appendix Table 1).

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[2]Meat weight per tow values were derived by applying area-specific shell height - meat weight equations to survey shell height frequency distributions. See footnote 2 in Appendix Table 1.

Georges Bank

The 1986 Georges Bank survey catch per tow indices were among the highest in the survey time series indicating that the marked improvement in abundance that began in 1985 has continued. The survey results indicate that the strong 1982 year class has been followed by an even stronger 1983 cohort. Abundance patterns and resource conditions within each of the three principal scallop regions on Georges Bank (South Channel; Southeast Part; USA Northern Edge and Peak) are described below.

South Channel - In the South Channel region, all of the 1986 pre-recruit and total number and weight per tow survey indices were higher than in 1985 (Table 2). Abundance and biomass values for pre-recruit scallops (94.7 and 0.20, respectively) were the second highest in the 12-year time series and were triple the 1985 levels (Table 2; Figure 2). Record-high pre-recruit indices were obtained in two of the eight South Channel strata surveyed in 1986 (Strata 46 and 53, Table 1); in three other strata (Strata 50, 51 and 54), the 1986 pre-recruit values were near-record highs. Survey size frequency data (Figure 7) show that the marked increase in South Channel scallop abundance is due to an extremely strong 1983 year class. This cohort should provide outstanding recruitment to the South Channel fishery in late-1987 and during 1988 if it is not subjected to "mixing" or high fishing mortality before then.

Catch per tow indices of commercial-sized scallops in the South Channel region declined in 1986 (Table 2). This decline was marked; the aggregate indices presented in Table 2 belie this reduction since survey coverage in 1986 focused principally on the most productive South Channel sampling strata (see METHODS section). Comparison of abundance and biomass values between 1985 and 1986 using only the strata sampled in 1986 indicates that a 40% decline in commercial-sized scallops occurred between years (Table 3). The anticipated large increase in 1986 harvestable biomass from the strong 1982 year class (1985 survey pre-recruit index of 30.1, one of the highest in the series) was not realized. In fact, harvestable biomass declined by 39% (778 g in 1985 vs 474 g in 1986) during the past year, with reductions evident in all meat count intervals below 80 count (Table 3). These results imply that significant fishing mortality occurred on the 1982 cohort, presumably through "mixing" of these scallops in the commercial catch. A similar pattern of exploitation was observed in 1982 and 1983 on the outstanding 1979 year class (Serchuk 1984). For both cohorts, significant gains in yield per recruit and spawning potential seem to have been sacrificed for short-term yield despite the realization that intense harvesting of small scallops is inimical for attaining resource stability (Serchuk and Wigley 1986).

Meat count distributions of the South Channel scallop population derived from the 1986 survey (Tables 7-10) indicate that about 59% of the harvestable biomass (30% by number) is $\leq$30 count, the current management standard (Figure 4). However, since scallops larger than 70 mm shell height only account for 24%, by number, of the South Channel resource, there is likely to be continued economic incentive to harvest the more abundant, smaller-sized scallops from the population.

Southeast Part - Abundance and biomass levels of scallops on the Southeast Part of Georges Bank sharply increased in 1986 (Table 2; Figure 2). All of the survey catch per tow indices (pre-recruit, recruit, and total: numbers and weight) were higher than any during the past five years. Total abundance in 1986 was the second highest in the survey time series, while the 1986 pre-recruit abundance and biomass values were the highest on record. Improved resource conditions occurred throughout the Southeast Part region. Increases in total number per tow values were observed in all four sampling strata comprising the region; the 1986 pre-recruit and total number per tow indices in Strata 58 and 60 represented new highs (Table 1).

Growth of the 1982 year class during 1986 into the harvestable size range of the population resulted in a near-doubling of both the number and biomass per tow indices of commercial-sized compared with 1985 (Table 2). Increases were observed across virtually all meat count intervals (Tables 7 and 9). The 1986 survey percent frequency distributions of harvestable scallops (Tables 8 and 10) indicate that large scallops (<30 count) constitute 72% of the commercial biomass available in the Southeast Part region (Figure 4). In terms of numbers and weight, large scallops are presently more abundant than at any time since 1981.

The prominent shell height frequency mode between 47-62 mm (Figure 8) indicates strong recruitment of the 1983 year class in the Southeast Part of Georges Bank. Compared with previous cohorts, the 1983 cohort appears to be the strongest in the region since the 1977 year class. The 1986 survey size frequency data also suggest that the 1984 cohort may be strong as well although direct correspondence between survey age 2 catch per tow indices and subsequent year class strength is lacking.

Given the improved status of the Southeast Part scallop resource, and the prospects for excellent recruitment to the fishery during the next year, the USA fleet will likely focus more of its future activity in this region of Georges Bank.

USA Northern Edge and Peak - As in the Southeast Part of Georges Bank, all of the 1986 survey indices from the USA Northern Edge and Peak region increased from 1985 (Table 3). Although the abundance and biomass of commercial-sized scallops increased only modestly, the pre-recruit indices (both numbers and weight) doubled. Increases in pre-recruit values were recorded in nine of the ten sampling strata in the region indicating improved recruitment region-wide relative to 1985 (Table 1). Similar to the other two regions on Georges Bank, this improvement was due to the abundant 1983 year class (Figure 9).

The slight increase in the overall abundance of commercial-sized scallops in the USA sector of the Northern Edge and Peak during 1986 was not uniformly reflected among all sampling areas. Commercial-size survey indices increased in only half of the sampling strata; in the others, the 1986 indices were lower than in 1985. The largest declines occurred along the Northern Edge in Strata 651 and 661 (see Appendix Figure 3 for locations) where

abundance of commercial-sized scallops fell 73% and 39%, respectively. These areas were heavily fished by the USA fleet in both the latter half of 1985 and during 1986.

It is difficult to assess the relative strength of the 1983 year class relative to previous cohorts in the USA portion of the Northern Edge and Peak since, prior to 1985, survey abundance indices were calculated for the entirety of the Northern Edge and Peak region (i.e., Table 2 and Figures 2 and 9). Since the ICJ boundary line announced in October 1984 effectively transected four of the survey sampling strata, new sub-strata (Strata 621, 631, 651 and 661) were established in 1985 for evaluating trends in resource conditions in the USA sector of the region. The historic survey data (1975-1984), however, have not yet been reanalyzed relative to the ICJ line, and hence evaluation of current conditions in the USA portion relative to past status is problematic.

The 1986 survey distributions of harvestable-sized scallops (Tables 7-10) indicate that 62% of the harvestable biomass in the USA Northern Edge and Peak region is at or lower than 30 meat count in size (Table 8; Figure 4). The 1986 biomass is 17% larger than in 1985 due to growth in weight of larger-sized scallops (<30 count: Table 3), presumably of the 1981 year class (Figure 9).

Since the density and biomass of scallops in several of the USA Northern Edge and Peak sampling strata were among the highest obtained in any of the areas sampled in the 1986 Georges Bank survey (Table 1), the Northern Edge and Peak resource will continue to attract significant fishing effort by the USA scallop fleet.

Mid-Atlantic

In the Mid-Atlantic area, the 1986 survey results indicate that scallop abundance is currently at a record-high level. The 1986 total number per tow and pre-recruit number per tow indices (57.6 and 31.5, respectively) were the highest in the survey time series (Table 4; Figure 3), while the 1986 survey index of commercial scallop biomass (0.33 kg of meats per tow) was the highest since 1979 (Table 2). A succession of good year classes (Figure 10) have increased Mid-Atlantic population size four-fold from the record-low 1983 level and produced a doubling of stock biomass. Current resource conditions and survey results for the major Mid-Atlantic scallop regions (New York Bight; Delmarva; Virginia-North Carolina) are provided below.

New York Bight - Almost all of the 1986 survey catch per tow indices for the New York Bight region were record-setting values (Table 4). The 1986 total number per tow index (71.5) was 27% greater than the previous high for the region, while the 1986 pre-recruit abundance value (37.0) was the highest ever (Figure 3). Population biomass increased 42% (0.38 to 0.54 kg/tow) between 1985 and 1986 approaching the historically-high levels observed during 1975-1978.

Improvement in scallop abundance and biomass was widespread. Record-high pre-recruit values were recorded in six of the 16 sampling strata within the region (Table 1) reflecting significant recruitment across the entire expanse of the Bight. Relative to 1985, biomass indices in 1986 were higher in all but four strata.

Survey size frequency data (Figure 11) and pre-recruit indices (Table 4) indicate that the 1981-1983 year classes have all been strong ones, with the 1982 and 1983 cohorts the best on record. The 1986 data further indicate that the 1984 year class (modal size between 12-22 mm: Figure 11) may also be good, since it is nearly as abundant at age 2 as the 1983 year class was in 1985.

Due to the strong 1982 and 1983 cohorts, the New York Bight resource is currently dominated by small scallops; scallops less than 90 mm shell length (>40 meat count) constitute 82% of the population, by number, and 50% by weight. The 1982 year class (80-40 count scallops) presently dominates the harvestable stock accounting for 41% of the biomass (Tables 11 and 12; Figure 5) and 64% of the harvestable-sized individuals (Tables 13 and 14). As a consequence of this predominant cohort, larger scallops (<30 count) comprise less than half (42%) of the harvestable biomass in the region (Figure 5). This situation is unlikely to change during 1987 when the outstanding 1983 year class replaces the 1982 year class in the 80-40 count range.

Delmarva -Survey results from the Delmarva region indicated significant improvement in resource abundance, sustaining the recovery that began in 1985. All of the 1986 Delmarva survey indices increased from 1985 (Table 4). The 1986 total number per tow index (56.1), 58% higher than in 1985, was the second highest in the survey time series (Figure 3). Pre-recruit abundance and biomass in 1986 attained record-high values, while total biomass reached its highest level since 1979. The abundance of commercial-sized scallops doubled from 1985 (22.1 vs 11.4: Table 4) increasing to near the record 1977-1979 levels.

Large-scale increases in abundance appeared throughout the region. Record-high pre-recruit indices were obtained in four of the 12 Delmarva sampling strata (Table 1); two of these indices (Strata 10 and 11) were about an order of magnitude higher than in 1985. In three other strata (Strata 14, 19, and 20), abundance of commercial-sized scallops increased to an all-time high. Record biomass levels were recorded in two sampling strata (Strata 14 and 19) while in three others (Strata 10, 15, and 18), the 1986 biomass indices were three to four-fold higher than in 1985. As a result of these increases, present scallop densities in Delmarva are among the highest in the Mid-Atlantic.

As in the New York Bight, recruitment of the 1982 and 1983 year classes in Delmarva has been excellent (Figure 12). While both cohorts appeared to be equal in strength in the Bight region, the 1983 year class is clearly the stronger of the two in Delmarva. The 1986 survey size frequency data also suggest that the 1984 year class may be an important one.

Even more than in the New York Bight, small scallops (<90 mm shell height; >40 count) dominate the Delmarva resource, accounting for 87% of the population, by number, and 60%, by weight. The harvestable stock (<80 count scallops) is presently predominated by 80-40 count scallops. This group (primarily individuals from the 1982 cohort) comprises 44% of the harvestable biomass (67%, by number) in the Delmarva area (Tables 12 and 14; Figure 5). Proportionally, this is the most dominant that 80-40 count scallops have been as judged from the 1975-1986 survey time series.

Larger scallops (<30 count) account for only 32% of the current harvestable biomass in Delmarva (Figure 5); in 1985, however, larger scallops comprised 70% of the commercially-available biomass (Table 12). While a reduction in the proportional importance of larger scallops in the resource was expected in 1986 due to recruitment of the strong 1982 cohort into the harvestable component of the population, the 1986 reduction was far greater than anticipated due to a significant decline in the abundance of the largest-sized scallops. Both abundance and biomass of scallops <25 count in size declined by 50% between 1985 and 1986 (Tables 11 and 13), with the 1986 values the lowest on record. Since abundance and biomass of scallops in all other meat count intervals increased in 1986 (Tables 11 and 13), it seems unlikely that the reduction in the largest-sized scallops was due to unusually-high natural mortality. Rather, the magnitude of the decline suggests the USA fleet concentrated on large scallops to maintain yields and to "mix" with small scallops in order to comply with the meat count regulation standard.

Scallops in the 80-40 meat count interval are expected to again dominate the harvestable Delmarva resource in 1987 due to recruitment of the excellent 1983 year class into the harvestable size range.

Virginia-North Carolina - Unlike survey results in the more northerly Mid-Atlantic regions, all of the survey indices from the Virginia-North Carolina region declined in 1986 (Table 4). Total abundance and biomass values were the lowest ever obtained. Scallops were virtually non-existent in the region (Figure 13). The few scallops that were caught (68 individuals) were taken in Strata 6 and 7 (Table 1), and were small in size (mostly between 42-72 mm shell height).

As previously noted (Serchuk and Wigley 1984), the Virginia-North Carolina region is at the southernmost extremity of the distributional range for sea scallops. Abundance of scallops in the region is transitory and erratic. The norm is for population levels to be low and not self-sustaining. Since recruitment of individuals into the area is rare, it is unlikely that resource levels will significantly improve in the near future.

DISCUSSION

Results of the 1986 USA sea scallop research vessel survey indicate that a significant improvement in sea scallop abundance has occurred in the USA portion of Georges Bank and throughout the Mid-Atlantic region. Resource recovery from the record-low 1983-1984 levels has rapidly ensued due to outstanding recruitment of the 1982 and 1983 year classes in almost all resource areas. On Georges Bank, the 1986 survey abundance indices were among

the highest in the 12-year survey time series, while in the Mid-Atlantic survey abundance values in 1986 attained record-high levels. In both resource areas, current abundance levels are 3-4 fold greater than during 1983/1984.

Accompanying the improved recruitment has been a marked increase in resource biomass. Stock biomass doubled in the Mid-Atlantic between 1984 and 1986. A similar increase occurred in the Southeast Part of Georges Bank between 1985 and 1986. Since almost all of these increases are due to the 1982 and 1983 cohorts, rather than growth in weight of older scallops, biomass has recovered at a slower rate than abundance. Since scallops quadruple in meat weight between ages 3 and 5, resource biomass can often increase at a faster rate than abundance. This potential is sacrificed, however, when small scallops are caught before such gains in meat weight can be realized. In recent years, scallops too small to meet the prevailing fishery meat count standard have been "mixed" with larger-sized scallops in commercial catches to achieve an average meat count consistent with the regulatory standard. While this practice tends to maintain short-term yield, it hampers resource stability and increases dependence on incoming recruitment. The effects of "mixing" are subsequently seen in the resource surveys when expected increases in biomass due to recruitment are not observed. This was the case in the South Channel region of Georges Bank where the strong 1982 year class was expected in 1986 to generate a substantial increase in resource biomass from that observed in 1985. The 1986 survey results revealed, however, that biomass, rather than increasing, declined by 39%. Hence, the production of good recruitment, per se, does not insure that resource recovery will be sustained.

Although current resource levels are statistically much improved compared with recent years (Tables 5 and 6), small scallops are dominant in virtually all resource areas. In the Mid-Atlantic region, scallops between 80-40 count comprise 42% of the harvestable biomass while in the USA portion of Georges Bank they comprise 22% (presumably a smaller percentage because of "mixing" practices). Conversely, large scallops (<30 count) account for 40% of the harvestable biomass in the Mid-Atlantic and 63% on Georges Bank (Table 15). For both regions combined, 48% of the total harvestable biomass is accounted for <30 count scallops (Figure 6).

Due to the widespread abundance of the 1983 year class across all resource areas, there will be a strong economic incentive to harvest (i.e., "mix") this cohort during 1987. Scallops from this year class, however, are not expected to attain a 30 count size until spring 1988. If exploitation on these small scallops is not effectively minimized until then, long-term benefits from management of the USA sea scallop resource will be dissipated.

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Table 1. Summary of 1986 NMFS sea scallop research vessel survey data for sea scallops, by sampling stratum. Shell height data are in mm (25.4 mm = 1 inch); meat weight data are in grams (453.6 g = 1 pound); meat count refers to numbers of meats per pound. Area mean number and mean weight per tow values represent stratified means weighted by stratum area.

Stratum or Area	Depth Range (fm)	No. of Tows	Mean Number Per Tow: Number <70 mm Per Tow	Mean Number Per Tow: Number >70 mm Per Tow	Mean Number Per Tow: Total Number Per Tow	All Scallops Average Calculated[1]: Shell Height	All Scallops Average Calculated[1]: Meat Count	Average Meat Weight (g) Per Tow	Percent Distribution of Catch in Numbers: >80 Count	80-40 Count	40-35 Count	35-30 Count	<30 Count
1	15-25	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
2	25-30	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
3	30-40	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
4	40-60	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
5	15-25	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
6	25-30	5	9.2	1.4*	10.6	65	69	70*	86.8	5.7	0.0	0.0	7.5
7	30-40	5	0.8	2.2*	3.0	90	29	46*	26.7	13.3	0.0	6.7	53.3
8	40-60	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
Virginia-No. Carolina (1-8)	15-60	28	0.3	0.1*	0.4*	69	56	3*	76.3	7.0	0.0	1.2	15.5
9	15-25	4	5.8	2.0	7.8	65	68	52	74.2	12.9	6.5	3.2	3.2
10	25-30	8	181.1**	47.0	228.1**	63	89	1167	79.4	11.7	2.8	1.9	4.2
11	30-40	8	225.7**	21.1	246.8**	58	127	883	91.4	5.2	0.7	0.3	2.4
12	40-60	4	0.7	0.8	1.5	70	77	9	50.0	50.0	0.0	0.0	0.0
13	15-25	4	0.3	0.0	0.3	57	168	1	100.0	0.0	0.0	0.0	0.0
14	25-30	12	128.6	139.2**	267.8**	71	67	1824**	48.1	41.0	3.6	2.8	4.5
15	30-40	12	101.4**	93.2	194.6**	71	64	1376	52.1	30.4	6.1	4.4	7.0
16	40-60	8	1.1	3.9	5.0	75	59	38	22.5	67.5	5.0	2.5	2.5
17	15-25	3	9.0**	2.7	11.7	42	113	47	77.1	14.3	0.0	2.9	5.7
18	25-30	10	61.7	65.5	127.2**	73	59	980	48.5	32.4	4.0	5.8	9.3
19	30-40	12	89.8	113.7**	203.5	73	62	1479**	44.1	36.2	7.4	5.9	6.4
20	40-60	3	1.0	5.0**	6.0	78	57	48	16.6	66.7	11.1	5.6	0.0
Delmarva (9-20)	15-60	88	34.0**	22.1	56.1	68	73	350	60.8	26.2	4.3	3.4	5.3
21	15-25	4	0.0	0.3	0.3*	132	11	10	0.0	0.0	0.0	0.0	100.0
22	25-30	8	17.1**	8.8	25.9	56	55	212	66.2	14.0	1.9	3.9	14.0
23	30-40	16	109.0**	76.6	185.6**	62	77	1100	58.7	31.2	4.3	2.4	3.4
24	40-60	6	0.3*	1.0*	1.3*	75	64	9*	25.0	62.5	12.5	0.0	0.0
25	15-25	4	4.8	10.0	14.8	97	21	324	32.2	5.1	3.4	3.4	55.9
26	25-30	14	17.2	48.7	65.9	83	40	756	26.1	36.5	6.6	8.1	22.7
27	30-40	20	124.6	141.4	266.0**	68	71	1705	46.9	42.7	5.6	2.6	2.2
28	40-60	10	2.0	17.0	19.0	81	50	174	10.5	73.7	8.4	3.2	4.2
29	15-25	6	33.0**	17.2	50.2**	71	48	473	65.8	7.0	1.3	2.0	23.9
30	25-30	15	52.2**	31.9	84.1	71	59	652	62.0	18.5	2.6	2.4	14.5
31	30-40	24	82.7	112.4**	195.1	73	59	1493	42.4	42.3	6.2	3.5	5.6
32	40-60	4	0.0	2.3	2.3	89	31	33	0.0	77.8	0.0	0.0	22.2
33	15-25	7	21.2	35.4	56.6	81	43	595	37.4	27.5	5.0	6.1	24.0
34	25-30	13	133.1**	72.4	205.5	69	65	1428	64.8	13.3	3.8	4.3	13.8
35	30-40	9	54.4**	38.2	92.6	69	60	700	58.7	13.3	3.3	5.2	15.5
36	40-60	2	0.0	0.0	0.0	-	-	-	-	-	-	-	-
New York Bight (21-36)	15-60	162	37.0**	34.5	71.5**	70	60	544	51.7	30.7	4.6	3.3	9.7
Mid-Atlantic (1-36)	15-60	278	31.5**	26.1	57.6**	69	63	412	54.7	29.2	4.5	3.3	8.3

Table 1 (continued).

Stratum or Area	Depth Range (fm)	No. of Tows	Mean Number Per Tow: Number <70 mm Per Tow	Number >70 mm Per Tow	Total Number Per Tow	All Scallops: Average Shell Height	Calculated[1] Meat Count	Average Meat Weight (g) Per Tow	Percent Distribution of Catch in Numbers: >80 Count	80-40 Count	40-35 Count	35-30 Count	<30 Count
45	15-25	3	0.0	0.0	0.0	-	-	-	-	-	-	-	-
46	25-30	6	20.2**	9.0	29.2	68	72	183	69.1	16.0	4.0	2.9	8.0
47	30-40	NS	-------Not Sampled------			NS	NS	NS	----------Not Sampled----------				
48	40-60	NS	-------Not Sampled------			NS	NS	NS	----------Not Sampled----------				
49	15-25	9	29.8	13.2	43.0	65	55	355	69.3	14.2	2.8	1.8	11.9
50	25-30	15	721.1	149.0	870.1	54	133	2964	82.9	13.3	1.3	0.9	1.6
51	30-40	12	417.1	64.2	481.3	51	152	1436	86.7	8.7	0.6	0.6	3.4
52	40-60	12	13.5	29.9	43.4	87	32	614	31.1	23.4	11.3	5.6	28.6
53	40-60	7	28.6**	29.1	57.7	83	32	821	49.5	9.4	4.0	3.7	33.4
54	30-40	7	50.9	41.1	92.0	77	44	945	55.4	18.6	3.1	5.4	17.5
55	30-40	NS	-------Not Sampled------			NS	NS	NS	----------Not Sampled----------				
56	40-60	NS	-------Not Sampled------			NS	NS	NS	----------Not Sampled----------				
South Channel (45-46, 49-54)	15-60	71	94.7	30.4	125.1	59	84	674	75.7	13.1	2.1	1.8	7.3
57	30-40	3	0.7	2.3	3.0	103	19	71	22.2	22.2	0.0	0.0	55.6
58	40-60	8	30.5**	4.8	35.3**	33	162	99	86.5	8.5	0.0	1.1	3.9
59	30-40	12	20.6	19.9	40.5	80	30	616	50.9	14.4	1.2	1.4	32.1
60	40-60	12	33.8**	26.8	60.6**	67	55	496	55.7	22.7	4.4	3.0	14.2
So. East Part (57-60)	30-60	35	26.1**	18.7	44.8	66	48	424	58.1	18.7	3.0	2.3	17.9
61	30-40	8	17.9**	13.6	31.5**	81	35	406	56.7	13.5	0.4	2.0	27.4
621	40-60	12	97.2	73.7	170.9	68	62	1257	56.8	22.4	6.6	4.9	9.3
631	30-40	7	22.6	23.0	45.6	79	44	466	49.6	18.2	3.4	7.2	21.6
651	30-40	12	259.8	50.0	309.8	65	86	1633	83.8	10.7	1.2	0.9	3.4
661	40-60	12	133.8	60.9*	194.7	64	75	1183	68.7	17.3	1.8	2.1	10.1
71	25-30	6	71.3	36.4	107.7	71	47	1030	66.3	10.1	2.6	2.9	18.1
72	15-25	6	4.5	8.5	13.0	89	27	216	34.6	9.0	2.6	6.4	47.4
73	15-25	6	0.7	0.3	1.0	59	112	4	66.7	33.3	0.0	0.0	0.0
74	25-30	7	0.0	3.1	3.1	117	15	95	0.0	13.6	0.0	0.0	86.4
USA No. Edge & Peak (61-661,71-74)	15-60	76	38.7	24.3	63.0	70	55	517	61.3	17.5	4.0	3.8	13.4
USA Georges Bank (45-46, 49-54, 57-661, 71-74)	15-60	182	52.4	24.7	77.1	64	65	540	67.9	15.5	2.9	2.6	11.1

[1]Derived by applying shell height-meat weight equations to shell height frequency distributions.
*Lowest value obtained in 1975-1986 survey time series.
**Highest value obtained in 1975-1986 survey time series.

Table 2. USA sea scallop research survey relative abundance indices (standardized stratified mean number and mean weight per tow) (meats only, kg), mean shell height (mm), mean meat weight (g) per scallop, and average meat weight (number of scallop meats per pound) of sea scallops from NMFS surveys on Georges Bank, 1975, 1977-1986. Data are presented by principal scallop regions on Georges Bank. Survey indices are presented for pre-recruit (<70 mm shell height), recruit (≥70 mm shell height), and total scallops per tow[1].

		Standardized Stratified Mean Number Per Tow			Standardized Stratified Mean Weight (kg) Per Tow					
Area	Year	Number <70 mm Per Tow	Number ≥70 mm Per Tow	Total Number Per Tow	Weight <70 mm Per Tow	Weight ≥70 mm Per Tow	Total Weight Per Tow	Mean Shell Height	Mean[2] Meat Weight	Average[3] Meat Count
South Channel	1975	30.2	26.3	56.5	0.07	0.77	0.84	81.9	14.8	30.6
	1977	3.9	53.0	56.9	0.01	1.15	1.16	101.1	20.4	22.2
	1978	5.2	33.2	38.4	0.02	0.76	0.78	101.2	20.4	22.2
	1979	4.5	56.5	61.0	0.01	0.98	0.99	93.1	16.2	28.0
	1980	51.2	19.3	70.5	0.08	0.35	0.43	58.2	6.1	74.6
	1981	9.9	24.0	33.9	0.02	0.43	0.45	81.2	13.3	34.0
	1982	139.3	41.9	181.2	0.32	0.60	0.92	60.7	5.1	89.4
	1983	15.2	37.0	52.2	0.04	0.52	0.56	79.6	10.7	42.3
	1984	10.2	17.9	28.1	0.02	0.35	0.37	81.2	13.3	34.1
	1985	30.1	33.1	63.2	0.08	0.53	0.61	74.2	9.6	47.1
	1986	94.7	30.4	125.1	0.20	0.47	0.67	59.5	5.4	84.2
Southeast Part	1975	1.8	38.4	40.2	<0.01	1.02	1.02	110.3	25.5	17.8
	1977	2.9	24.7	27.6	0.01	0.62	0.63	103.9	22.8	19.9
	1978	2.1	24.8	26.9	0.01	0.86	0.87	117.5	32.2	14.1
	1979	6.9	19.2	26.1	0.01	0.64	0.65	99.4	24.9	18.2
	1980	19.4	37.4	56.8	0.03	0.63	0.66	78.2	11.7	38.8
	1981	1.3	17.4	18.7	<0.01	0.42	0.42	102.5	22.2	20.5
	1982	0.7	8.8	9.5	<0.01	0.28	0.28	113.5	29.9	15.2
	1983	10.2	8.4	18.6	0.02	0.23	0.25	78.7	13.7	33.2
	1984	4.2	12.1	16.3	0.01	0.22	0.23	86.6	14.4	31.4
	1985	8.2	10.9	19.1	0.02	0.21	0.23	76.0	11.8	38.4
	1986	26.1	18.7	44.8	0.05	0.37	0.42	66.4	9.5	48.0
Northern Edge and Peak	1975	86.8	120.6	207.4	0.23	1.81	2.04	77.0	9.8	46.2
	1977	66.1	384.8	450.9	0.24	5.06	5.30	85.3	11.8	38.6
	1978	178.6	372.0	550.6	0.31	7.56	7.87	84.9	14.3	31.7
	1979	64.3	234.9	299.2	0.18	4.03	4.21	87.2	14.1	32.2
	1980	598.6	129.3	727.9	0.82	1.85	2.67	52.4	3.7	123.9
	1981	277.4	405.7	683.1	0.63	3.79	4.42	68.9	6.5	70.1
	1982	37.0	58.8	95.8	0.11	0.85	0.96	78.1	10.0	45.2
	1983	43.4	33.4	76.8	0.07	0.60	0.67	68.2	8.7	51.9
	1984	264.2	48.6	312.8	0.27	0.75	1.02	46.7	3.3	139.2
	1985	76.1	173.2	249.3	0.23	1.67	1.90	73.9	7.6	59.4
	1986[4]	38.7	24.3	63.0	0.11	0.41	0.52	70.3	8.2	55.3
Georges Bank (All Areas)	1975	46.3	62.8	109.1	0.12	1.19	1.31	80.2	12.0	37.8
	1977	27.9	176.4	204.3	0.10	2.57	2.67	87.6	13.1	34.7
	1978	66.5	152.5	219.0	0.12	3.21	3.33	87.0	15.2	29.8
	1979	28.8	121.7	150.5	0.08	2.14	2.22	88.6	14.8	30.7
	1980	305.3	74.7	380.0	0.42	1.11	1.53	53.5	4.0	112.6
	1981	76.4	120.1	196.5	0.17	1.29	1.46	70.7	7.4	61.2
	1982	73.2	43.9	117.1	0.18	0.66	0.84	67.5	7.1	63.5
	1983	26.5	30.9	57.4	0.05	0.51	0.56	73.0	9.7	46.6
	1984	118.6	30.1	148.7	0.13	0.50	0.63	50.1	4.2	107.2
	1985	46.4	89.9	136.3	0.13	0.97	1.10	74.0	8.1	56.0
	1986[4]	52.4	24.7	77.1	0.12	0.42	0.54	64.5	7.0	64.7

[1] Relative abundance indices for the Northern Edge and Peak, 1978-1981, were derived from Canadian research vessel survey data standardized to USA tow distance.

[2] Mean meat weight derived by applying the 1978-1982 USA Georges Bank research survey sea scallop shell height-meat weight equation,

$$\ln \text{Meat Weight (g)} = -11.7656 + 3.1693 \ln \text{Shell Height (mm)} \quad (n = 5863,\ r = 0.98)$$

to each shell height in the survey frequency distribution, multiplying by the frequency at height, summing the products, and dividing by the total number of scallops in the frequency distribution.

[3] Average meat count derived by dividing the calculated mean meat weight into 453.6 grams (1 pound).

[4] USA sector only (west of ICJ boundary line).

Table 3. Comparison of USA sea scallop survey results for 1985 and 1986 for South Channel strata sampled in 1986 (Strata 45-46, 49-54) and for the USA Northern Edge and Peak region (Strata 61, 621-661, and 71-74).

Area	Year	Standardized Stratified Mean Number Per Tow			Standardized Stratified Mean Weight (kg) Per Tow			Harvestable[1] Biomass Per Tow(g)	Meat Weight(g, meat) Per Tow			
									Meat Count Interval[2]			
		Number <70 mm Per Tow	Number >70 mm Per Tow	Total Number Per Tow	Weight <70 mm Per Tow	Weight >70 mm Per Tow	Total Weight Per Tow		80-40	40-35	35-30	<30
South Channel	1985	31.8	50.3	82.1	0.06	0.78	0.84	778	191	58	106	423
	1986	94.7	30.4	125.1	0.20	0.47	0.67	474	126	35	34	279
USA Northern Edge and Peak	1985	18.5	23.2	41.7	0.05	0.35	0.40	348	106	26	22	194
	1986	38.7	24.3	63.0	0.11	0.41	0.52	408	87	33	36	252

[1]Stratified mean weight (g, meat) per tow for scallops ≥70 mm, ≤80 count.
[2]Meat count is expressed as number of meats per pound.

Table 4. USA sea scallop research survey relative abundance indices (standardized stratified mean number and mean weight per tow), (meats only, kg), mean shell height (mm), mean meat weight (g) per scallop, and average meat count (number of scallop meats per pound) of sea scallops from NMFS surveys in the Mid-Atlantic, 1975, 1977-1986. Data are presented by principal scallop regions in the Mid-Atlantic. Survey indices are presented for pre-recruit (≤70 mm shell height), recruit (≥70 mm shell height) and total scallops per tow.

		Standardized Stratified Mean Number Per Tow			Standardized Stratified Mean Weight (kg) Per Tow					
Area	Year	Number <70 mm Per Tow	Number ≥70 mm Per Tow	Total Number Per Tow	Weight < 70 mm Per Tow	Weight > 70 mm Per Tow	Total Weight Per Tow	Mean Shell Height	Mean[1] Meat Weight	Average[2] Meat Count
New York Bight	1975	27.3	23.8	51.1	0.07	0.43	0.50	75.3	9.6	47.1
	1977	1.1	39.7	40.8	<0.01	0.72	0.72	98.5	17.7	25.7
	1978	2.5	36.7	39.2	0.01	0.80	0.81	102.6	20.6	22.0
	1979	3.9	13.7	17.6	0.01	0.35	0.36	95.3	20.2	22.4
	1980	10.7	10.8	21.5	0.02	0.25	0.27	75.7	12.4	35.6
	1981	13.1	13.5	26.6	0.02	0.21	0.23	68.2	8.6	52.5
	1982	7.9	15.1	23.0	0.02	0.24	0.26	78.5	11.1	40.8
	1983	8.0	9.9	17.9	0.02	0.20	0.22	80.6	12.5	36.2
	1984	13.0	13.9	26.9	0.02	0.23	0.25	70.3	9.4	48.3
	1985	34.0	22.1	56.1	0.07	0.31	0.38	65.7	6.8	66.5
	1986	37.0	34.5	71.5	0.08	0.46	0.54	69.9	7.6	59.6
Delmarva	1975	25.2	16.1	41.3	0.09	0.24	0.33	72.1	7.9	57.7
	1977	2.9	24.2	27.1	0.01	0.60	0.62	103.9	22.7	20.0
	1978	8.3	26.2	34.5	0.03	0.62	0.65	95.7	18.9	24.1
	1979	30.8	39.3	70.1	0.05	0.60	0.65	73.7	9.3	48.9
	1980	23.4	13.3	36.7	0.04	0.27	0.31	66.8	8.4	54.3
	1981	2.8	5.9	8.7	0.01	0.15	0.16	90.1	18.0	25.2
	1982	5.5	8.0	13.5	0.02	0.18	0.20	85.2	14.5	31.3
	1983	7.8	5.4	13.2	0.03	0.13	0.16	78.7	11.8	38.4
	1984	5.4	6.9	12.3	0.01	0.15	0.16	75.8	12.8	35.5
	1985	24.0	11.4	35.4	0.04	0.18	0.22	57.1	6.3	72.1
	1986	34.0	22.1	56.1	0.10	0.25	0.35	67.7	6.2	72.7
Virginia-No. Carolina	1975	47.7	11.0	58.7	0.17	0.14	0.31	66.0	5.3	86.2
	1977	0.2	0.3	0.5	<0.01	0.01	0.01	88.7	14.2	31.9
	1978	15.7	7.3	23.0	0.06	0.09	0.15	68.7	6.4	71.2
	1979	4.6	6.5	11.1	0.01	0.10	0.11	75.3	9.9	45.9
	1980	0.8	4.6	5.4	<0.01	0.07	0.07	87.9	13.5	33.7
	1981	0.4	0.8	1.2	<0.01	0.02	0.02	95.2	18.5	24.5
	1982	1.0	0.3	1.3	<0.01	0.01	0.01	67.3	7.5	60.2
	1983	4.7	2.0	6.7	0.01	0.07	0.08	74.7	11.6	39.0
	1984	0.1	0.8	0.9	<0.01	0.02	0.02	95.3	17.4	26.1
	1985	2.9	2.3	5.2	0.01	0.03	0.04	70.8	7.5	60.2
	1986	0.3	0.1	0.4	<0.01	<0.01	<0.01	69.1	8.1	55.9
Mid-Atlantic (All Areas)	1975	29.0	19.6	48.6	0.08	0.33	0.41	73.0	8.5	53.4
	1977	1.6	30.3	31.9	<0.01	0.61	0.61	100.0	19.0	23.8
	1978	6.0	29.7	35.7	0.02	0.66	0.68	97.8	18.9	23.9
	1979	13.9	22.9	36.8	0.02	0.43	0.45	79.9	12.4	36.6
	1980	14.8	11.3	26.1	0.02	0.25	0.27	71.3	10.4	43.8
	1981	8.6	10.0	18.6	0.01	0.18	0.19	72.0	10.3	44.2
	1982	6.2	10.9	17.1	0.01	0.19	0.20	80.2	12.0	37.9
	1983	7.6	7.4	15.0	0.02	0.16	0.18	79.7	12.3	37.0
	1984	8.8	10.0	18.8	0.01	0.18	0.19	71.6	10.2	44.5
	1985	26.8	16.1	42.9	0.06	0.23	0.29	63.4	6.7	67.8
	1986	31.5	26.1	57.6	0.08	0.33	0.41	69.0	7.2	63.4

[1]Mean meat weight derived by applying the 1977-1982 USA Mid-Atlantic research survey sea scallop shell height-meat weight equation.

$$\ln \text{Meat Weight (g)} = -12.1628 + 3.2539 \ln \text{Shell Height (mm)} \quad (n = 11943,\ r = 0.98)$$

to each shell height in the survey frequency distribution, multiplying by the frequency at height, summing the products, and dividing by the total number of scallops in the frequency distribution.

[2]Average meat count derived by dividing the calculated mean meat weight into 453.6 grams (1 pound).

Table 5. Standardized stratified mean catch (number) per tow of sea scallops from USA sea scallop research vessel surveys on Georges Bank, 1975, 1977-1986[1]. Standard deviation of the mean (S.D.), coefficient of variation (C.V.: 100 S.D./Mean), and 95% confidence limits are provided as indices of variability. Data are summarized by the three principal sea scallop regions on Georges Bank and for the entire Georges Bank area.

		Linear				Ln(x+1)				Re-transformed	
Region	Year	Mean	S.D.	C.V.	Confidence limits	Mean	S.D.	C.V.	Confidence limits	Mean	Confidence limits
South Channel	1975	56.5	17.0	30.1	23.2 - 89.9	2.5674	0.2183	8.5	2.1398-2.9950	52.9	34.1 - 81.6
	1977	56.9	14.9	26.2	27.7 - 86.1	1.5169	0.2555	16.8	1.0160-2.1078	32.9	19.6 - 55.0
	1978	38.4	7.8	20.4	23.0 - 53.8	1.4171	0.1689	11.9	1.0862-1.7480	25.4	18.0 - 35.8
	1979	61.0	37.6	61.6	-12.7 -134.8	1.5418	0.1857	12.0	1.1777-1.9059	21.5	14.6 - 31.3
	1980	70.5	29.9	42.4	12.0 -129.0	1.5690	0.2096	13.4	1.1583-1.9797	25.7	16.7 - 39.3
	1981	33.9	10.0	29.4	14.3 - 53.5	1.6711	0.2366	14.2	1.2073-2.1349	26.5	16.3 - 42.8
	1982	181.2	80.3	44.3	23.7 -338.6	1.9410	0.4140	21.3	1.1296-2.7524	78.9	34.5 -178.8
	1983	52.2	14.5	27.8	23.7 - 80.7	1.9681	0.3038	15.4	1.3726-2.5636	40.2	21.7 - 73.7
	1984	28.1	8.7	30.9	11.1 - 45.1	1.8669	0.3126	16.7	1.2543-2.4795	31.9	16.8 - 59.7
	1985	63.2	13.2	20.8	37.4 - 89.0	2.2143	0.2470	11.2	1.7302-2.6984	80.2	49.0 -130.7
	1986	125.1	32.2	25.8	61.9 -188.2	2.4225	0.2167	8.9	1.9976-2.8474	118.1	76.9 -181.1
Southeast Part	1975	40.2	9.4	23.4	21.7 - 58.6	2.9255	0.3011	10.3	2.3352-3.5158	53.2	29.0 - 96.8
	1977	27.6	8.7	31.5	10.5 - 44.6	1.9997	0.3155	15.8	1.3811-2.6183	35.4	18.6 - 66.6
	1978	26.9	4.5	16.9	18.0 - 35.8	2.7908	0.1762	6.3	2.4452-3.1364	29.1	20.3 - 41.5
	1979	26.1	6.7	25.6	13.0 - 39.2	2.4192	0.3009	12.4	1.8292-3.0092	34.3	18.6 - 62.7
	1980	56.8	21.8	38.3	14.2 - 99.5	2.2990	0.4307	18.7	1.4548-3.1432	84.4	35.7 -197.7
	1981	18.7	4.1	22.0	10.6 - 26.8	2.2330	0.2278	10.2	1.7865-2.6795	23.6	14.8 - 37.5
	1982	9.5	2.6	27.4	4.4 - 14.6	1.6546	0.2279	13.8	1.2077-2.1015	10.7	6.5 - 17.3
	1983	18.6	6.2	33.5	6.4 - 30.8	2.0634	0.2884	14.0	1.4980-2.6288	19.8	10.8 - 35.6
	1984	16.3	6.2	38.4	4.0 - 28.5	1.6776	0.3210	19.1	1.0486-2.3066	15.8	8.0 - 30.5
	1985	19.1	3.8	20.1	11.6 - 26.7	2.4347	0.2110	8.7	2.0212-2.8482	23.1	15.0 - 35.5
	1986	44.8	12.2	27.3	20.8 - 68.8	2.8469	0.2469	8.7	2.3628-3.3310	55.2	33.7 - 90.2
Northern Edge and Peak	1975	207.4	70.7	34.1	68.9 -345.9	3.5373	0.3785	10.7	2.7956-4.2790	446.2	212.0 -937.8
	1977	450.9	91.2	20.2	272.2 -629.7	3.8416	0.2272	5.9	3.3964-4.2868	1269.5	813.0-1982.1
	1978[1]	550.6	64.5	11.7	424.0 -677.2	5.7736	0.1112	1.9	5.5553-5.9919	559.5	449.6 -696.2
	1979[1]	299.2	27.6	9.2	245.0 -353.4	4.8503	0.1853	3.8	4.4873-5.2133	418.8	291.0 -602.5
	1980[1]	727.9	119.2	16.4	494.2 -961.6	4.0011	0.1184	3.0	3.7692-4.2330	2201.5	1745.6-2776.4
	1981[1]	683.1	116.5	17.1	454.7 -911.5	4.7078	0.2198	4.7	4.2770-5.1386	1906.7	1239.0-2933.8
	1982	95.8	17.7	18.5	61.1 -130.5	2.7888	0.1900	6.8	2.4164-3.1612	141.5	97.2- 205.8
	1983	76.8	17.6	22.9	42.2 -111.3	2.4856	0.2026	8.2	2.0882-2.8830	105.9	70.9 -158.1
	1984	312.8	99.3	31.8	118.1 -507.5	3.1559	0.2011	6.4	2.7619-3.5499	418.3	281.8 -620.7
	1985	249.3	45.6	18.3	160.0 -338.6	3.2053	0.1644	5.1	2.8832-3.5274	451.1	326.6 -622.8
	1986[2]	63.0	17.1	10.8	41.8 - 84.1	2.1288	0.2105	9.9	1.7163-2.5413	93.4	61.5 -141.7
Georges Bank (all areas)	1975	109.1	27.1	24.9	56.0 -162.3	2.9822	0.1796	6.0	2.6299-3.3345	124.3	87.1 -177.3
	1977	204.3	36.6	17.9	132.5 -276.1	2.5088	0.1518	6.1	2.2116-2.8060	243.5	180.6 -328.1
	1978	219.0	23.3	10.7	173.2 -264.7	3.2682	0.1113	3.4	3.0499-3.4865	626.9	503.8 -780.0
	1979	150.5	19.7	13.1	111.9 -189.1	3.0133	0.1211	4.0	2.7757-3.2509	248.3	195.6 -315.2
	1980	380.0	57.7	15.2	267.0 -493.0	2.8509	0.1194	4.2	2.6173-3.0845	487.0	385.4 -615.4
	1981	196.5	15.4	7.8	166.0 -266.7	2.5633	0.1467	5.7	2.2759-2.8507	175.0	131.0 -233.6
	1982	117.1	33.9	28.9	50.8 -183.5	2.2623	0.1925	8.5	1.8848-2.6398	80.8	55.1 -118.4
	1983	57.4	9.7	16.9	38.4 - 76.4	2.2059	0.1590	7.2	1.8941-2.5177	55.2	40.1 - 75.7
	1984	148.7	42.9	28.8	64.6 -232.8	2.3914	0.1630	6.8	2.0717-2.7111	106.8	77.3 -147.5
	1985	136.3	20.3	14.9	96.4 -176.1	2.6757	0.1282	4.8	2.4247-2.9267	153.1	118.9 -197.0
	1986[2]	77.1	11.3	14.6	55.0 - 99.1	2.3979	0.1303	5.4	2.1423-2.6535	90.2	69.6 -116.7

[1]Stratified mean catch (number) per tow indices for the Northern Edge and Peak, 1978-1981, were derived from Canadian sea scallop research survey data post-stratified into USA sampling strata and standardized for differences in tow distance between USA and Canadian standard survey tows.

[2]Only USA sector (west of ICJ boundary line).

Table 6. Standardized stratified mean catch (number) per tow of sea scallops from USA sea scallop research vessel surveys in the Mid-Atlantic, 1975, 1977-1986. Standard deviation of the mean (S.D.), coefficient of variation (C.V.: 100 S.D./Mean), and 95% confidence limits are provided as indices of variability. Data are summarized by the three principal sea scallop regions in the Mid-Atlantic and for the entire Mid-Atlantic area.

		Linear				Ln (x+1)				Re-transformed	
Region	Year	Mean	S.D.	C.V.	Confidence limits	Mean	S.D.	C.V.	Confidence limits	Mean	Confidence limits
New York Bight	1975	51.1	10.0	19.5	31.6 - 70.7	2.1907	0.2197	10.0	1.7599-2.6215	62.4	40.2 - 96.6
	1977	40.8	3.5	8.7	33.8 - 47.7	2.1368	0.1485	6.9	1.8461-2.4275	71.3	53.0 - 95.6
	1978	39.2	3.6	8.8	32.4 - 46.0	2.2003	0.1251	5.7	1.9457-2.4459	61.6	48.0 - 79.1
	1979	17.6	2.1	11.8	13.5 - 21.7	2.0713	0.1153	5.6	1.8453-2.2973	19.5	15.4 - 24.7
	1980	21.5	2.6	11.9	16.4 - 26.5	1.9366	0.1175	6.1	1.7064-2.1668	24.4	19.2 - 31.0
	1981	26.6	4.9	18.5	17.0 - 36.3	1.8141	0.1197	6.6	1.5797-2.0485	22.5	17.6 - 28.7
	1982	23.0	2.8	12.3	17.4 - 28.5	1.8876	0.1092	5.8	1.6638-2.0914	20.3	16.2 - 25.4
	1983	17.9	1.8	10.2	14.3 - 21.5	1.6250	0.1029	6.3	1.4232-1.8268	17.1	13.8 - 21.2
	1984	26.9	3.3	12.3	20.4 - 33.4	2.1194	0.1771	8.4	1.7721-2.4667	34.1	23.8 - 48.7
	1985	56.1	7.0	12.5	42.3 - 64.9	2.5033	0.1654	6.6	2.1789-2.8277	72.3	52.0 -100.4
	1986	71.5	7.0	9.8	57.8 - 85.2	2.4547	0.1163	2.5	2.2270-2.6824	111.6	88.7 -140.4
Delmarva	1975	41.3	11.0	26.6	19.7 - 62.9	2.7166	0.3022	11.1	2.1244-3.3088	50.2	27.3 - 91.6
	1977	27.1	3.6	13.4	20.0 - 34.2	2.6288	0.2540	9.7	2.1310-3.1266	39.9	23.8 - 66.2
	1978	34.5	3.4	9.9	27.8 - 41.2	2.0714	0.2233	10.9	1.6336-2.5092	50.1	32.0 - 78.2
	1979	70.1	26.1	37.2	19.0 -121.2	2.2576	0.2585	15.9	1.5547-2.9605	110.5	54.2 -224.1
	1980	36.7	7.0	19.0	23.1 - 50.4	2.0951	0.2377	11.3	1.6292-2.5610	38.9	24.0 - 62.6
	1981	8.7	2.4	27.3	4.1 - 13.4	1.3413	0.2161	16.1	0.9177-1.7649	8.5	5.2 - 13.5
	1982	13.5	2.8	20.7	8.0 - 19.0	1.5072	0.1877	12.5	1.1395-1.8749	12.1	8.0 - 17.9
	1983	13.2	2.3	17.1	8.8 - 17.7	1.3159	0.2095	15.9	0.9052-1.7266	11.1	7.0 - 17.2
	1984	12.3	2.3	18.8	7.7 - 16.8	1.3747	0.2149	15.6	0.9534-1.7960	10.6	6.6 - 16.7
	1985	35.4	8.9	25.0	18.0 - 52.8	1.8730	0.3616	19.3	1.1641-2.5819	33.9	16.2 - 69.9
	1986	56.1	6.4	11.3	43.6 - 68.5	1.9519	0.3147	16.1	1.3349-2.5689	56.1	29.8 -104.9
Virginia-No. Carolina	1975	58.7	0.7	1.2	57.3 - 60.1	0.5630	0.1004	17.8	0.3660-0.7600	6.8	5.4 - 8.4
	1977	0.5	0.2	36.1	0.1 - 0.8	0.1935	0.0981	50.7	0.0015-0.3855	0.4	0.1 - 0.7
	1978	23.0	14.0	60.8	-4.4 - 50.3	1.4280	0.5539	38.8	0.3424-2.5136	24.4	7.6 - 74.3
	1979	11.1	2.3	20.9	6.5 - 15.6	1.2907	0.3482	27.0	0.6081-1.9733	11.0	5.1 - 22.7
	1980	5.4	0.4	7.5	4.6 - 6.2	0.5469	0.0810	14.8	0.3877-0.7061	2.6	2.0 - 3.2
	1981	1.2	0.4	36.4	0.4 - 2.1	0.3542	0.1167	32.9	0.1256-0.5828	0.9	0.5 - 1.4
	1982	1.3	0.7	53.2	-0.1 - 2.6	0.5249	0.3060	58.3	-0.0751-1.1249	1.3	0.2 - 3.1
	1983	6.7	2.4	35.9	2.0 - 11.4	0.7370	0.2274	30.9	0.2913-1.1827	4.5	2.5 - 7.6
	1984	0.9	0.1	16.1	0.6 - 1.2	0.2256	0.0298	13.2	0.1668-0.2844	0.5	0.4 - 0.6
	1985	5.2	4.6	87.4	-3.7 - 14.1	0.7886	0.5824	73.9	-0.3529-1.9301	4.9	0.9 - 17.5
	1986	0.4	0.2	44.7	0.1 - 0.7	0.0730	0.0192	26.3	0.0388-0.1122	0.2	0.1 - 0.2
Mid-Atlantic (all areas)	1975	48.6	6.6	13.5	35.8 - 61.5	2.1812	0.1580	7.2	1.8713-2.4911	54.5	39.7 - 74.6
	1977	31.9	2.3	7.3	27.3 - 36.4	2.0851	0.1184	5.7	1.8532-2.3170	48.1	38.0 - 60.9
	1978	35.7	2.8	7.7	30.3 - 41.1	2.0661	0.1210	5.9	1.8293-2.3029	52.0	40.8 - 66.1
	1979	36.8	9.7	26.4	17.7 - 55.8	2.1101	0.1496	7.1	1.8168-2.4034	36.5	27.0 - 49.3
	1980	26.1	2.9	11.3	20.4 - 31.9	1.9168	0.1101	5.7	1.7012-2.1324	27.2	21.7 - 34.0
	1981	18.6	3.0	16.0	12.8 - 24.4	1.5529	0.1044	6.7	1.3483-1.7575	14.5	11.6 - 18.0
	1982	17.1	1.8	10.5	13.6 - 20.6	1.5869	0.0943	5.9	1.4020-1.7718	13.9	11.4 - 16.9
	1983	15.0	1.3	8.6	12.5 - 17.5	1.4119	0.0941	6.7	1.2270-1.5968	13.1	10.7 - 16.0
	1984	18.8	3.8	10.4	15.0 - 22.6	1.6363	0.0144	7.3	1.4011-1.8715	18.9	14.7 - 24.1
	1985	42.9	4.9	11.4	33.4 - 52.4	2.0807	0.1672	8.0	1.7533-2.4081	46.3	33.1 - 64.7
	1986	57.6	4.3	7.5	49.1 - 66.1	1.9934	0.1234	6.2	1.7518-2.2350	66.1	51.7 - 84.5

Table 7. Distribution of standardized stratified mean weight (g, meat) per tow among various meat count intervals for sea scallops from NMFS sea scallop research vessel surveys on Georges Bank, 1975, 1977-1986.

		Meat Weight (g, meat) Per Tow						
				Meat Count Interval[3]				
Area	Year	Total Biomass Per Tow(g)	Harvestable[2] Biomass Per Tow(g)	80-40	40-35	35-30	30-25	<25
South Channel	1975	839	766	28	17	25	33	663
	1977	1161	1149	94	61	129	130	735
	1978	785	769	34	30	50	79	576
	1979	989	982	304	91	29	24	534
	1980	428	354	82	9	8	14	241
	1981	452	436	106	25	20	18	267
	1982	919	595	197	42	43	36	277
	1983	560	522	204	44	35	34	205
	1984	374	353	54	31	32	23	213
	1985	609	529	121	38	68	81	221
	1986	674	474	126	35	34	31	248
Southeast Part	1975	1023	1018	16	20	36	67	879
	1977	629	620	51	27	26	22	494
	1978	869	863	17	10	14	12	810
	1979	650	640	31	6	12	12	579
	1980	665	636	220	46	23	11	336
	1981	415	412	49	27	23	14	299
	1982	285	284	8	8	10	7	251
	1983	254	231	12	4	11	17	187
	1984	235	224	57	26	11	9	121
	1985	226	209	41	14	13	18	123
	1986	424	373	71	17	16	12	257
Northern Edge and Peak	1975	2037	1812	471	247	180	142	772
	1977	5299	5064	1826	522	621	531	1564
	1978	7875	7567	632	468	746	817	4904
	1979	4211	4028	934	233	206	229	2426
	1980	2665	1846	560	212	205	146	723
	1981	4417	3788	2565	244	221	157	601
	1982	961	855	265	85	88	93	324
	1983	671	601	115	51	59	58	318
	1984	1019	753	204	67	58	59	365
	1985	1902	1670	1157	118	93	84	218
	1986[4]	517	408	87	33	36	28	224
Georges Bank (All Areas)	1975	1307	1190	188	102	84	78	738
	1977	2667	2569	758	233	300	266	1012
	1978	3329	3211	245	182	291	330	2163
	1979	2222	2144	511	133	97	104	1299
	1980	1531	1111	333	112	104	76	486
	1981	1457	1287	722	81	72	53	359
	1982	836	657	196	55	57	56	293
	1983	559	510	135	40	42	42	251
	1984	629	505	119	46	40	36	264
	1985	1105	969	555	68	70	72	204
	1986[4]	540	419	94	29	31	25	240

[1]Meat weight values derived from shell height values using 1978-1982 USA research survey equation,

$$\ln \text{Meat Weight(g)} = -11.7656 + 3.1693 \ln \text{Shell Height (mm)} \quad (n = 5863,\ r = 0.98).$$

[2]Stratified mean weight (g, meat) per tow for sea scallops $\geq$70 mm, $\leq$80 count.

[3]Meat count is expressed as number of meats per pound.

[4]USA sector only (west of ICJ boundary line).

Table 8. Percentage distribution of harvestable biomass (meat weight) of Atlantic sea scallops on Georges Bank, within various meat count intervals. Harvestable biomass is defined as all sea scallops >70 mm shell height. Data derived from distribution of standardized stratified mean meat weight per tow in NMFS sea scallop research vessel surveys on Georges Bank, 1975, 1977-1986.

		Percent of Harvestable Biomass					
		Meat Count Interval[1]					
Area	Year	80-40	40-35	35-30	30-25	<30	<25
South Channel	1975	3.7	2.2	3.3	4.3	90.9	86.6
	1977	8.2	5.3	11.2	11.3	75.3	64.0
	1978	4.4	3.9	6.5	10.3	85.2	74.9
	1979	31.0	9.3	3.0	2.4	56.8	54.4
	1980	23.2	2.5	2.3	4.0	72.0	68.1
	1981	24.3	5.7	4.6	4.1	65.4	61.2
	1982	33.1	7.1	7.2	6.1	52.6	46.6
	1983	39.1	8.4	6.7	6.5	45.8	39.3
	1984	15.3	8.8	9.1	6.5	66.9	60.3
	1985	22.9	7.2	12.8	15.3	57.1	41.8
	1986	26.6	7.4	7.2	6.5	58.8	52.3
Southeast Part	1975	1.6	2.0	3.5	6.6	92.9	86.3
	1977	8.2	4.4	4.2	3.5	83.2	79.7
	1978	2.0	1.2	1.6	1.4	95.2	93.9
	1979	4.8	0.9	1.9	1.9	92.3	90.5
	1980	34.6	7.2	3.6	1.7	54.6	52.8
	1981	11.9	6.6	5.6	3.4	76.0	72.6
	1982	2.8	2.8	3.5	2.5	90.8	88.4
	1983	5.2	1.7	4.8	7.4	88.3	81.0
	1984	25.4	11.6	4.9	4.0	58.0	54.0
	1985	19.6	6.7	6.2	8.6	67.5	58.9
	1986	19.0	4.6	4.3	3.2	72.1	68.9
Northern Edge and Peak	1975	26.0	13.6	9.9	7.8	50.4	42.6
	1977	36.1	10.3	12.3	10.5	41.4	30.9
	1978	8.4	6.2	9.9	10.8	75.6	64.8
	1979	23.2	5.8	5.1	5.7	65.9	60.2
	1980	30.3	11.5	11.1	7.9	47.1	39.2
	1981	67.7	6.4	5.8	4.1	20.0	15.9
	1982	31.0	9.9	10.3	10.9	48.8	37.9
	1983	19.1	8.5	9.8	9.7	62.6	52.9
	1984	27.1	8.9	7.7	7.8	56.3	48.5
	1985	69.3	7.1	5.6	5.0	18.0	13.0
	1986[2]	21.3	8.1	8.8	6.9	61.8	54.9
Georges Bank (All Areas)	1975	15.8	8.6	7.1	6.6	68.6	62.0
	1977	29.5	9.1	11.7	10.4	49.7	39.4
	1978	7.6	5.7	9.1	10.3	77.6	67.4
	1979	23.8	6.2	4.5	4.9	65.4	60.6
	1980	30.0	10.1	9.4	6.8	50.6	43.7
	1981	56.1	6.3	5.6	4.1	32.0	27.9
	1982	29.8	8.4	8.7	8.5	53.1	44.6
	1983	26.5	7.8	8.2	8.2	57.5	49.2
	1984	23.6	9.1	7.9	7.1	59.4	52.3
	1985	57.3	7.0	7.2	7.4	28.5	21.1
	1986[2]	22.4	6.9	7.4	6.0	63.3	57.3

[1]Meat count is expressed as number of meats per pound.

[2]Only USA sector (west of ICJ boundary line).

Table 9. Distribution of standardized mean number per tow among various meat count intervals for sea scallops from NMFS sea scallop research vessel surveys on Georges Bank, 1975, 1977-1986.

		Stratified Mean Number of Scallops Per Tow						
		Total Number	Harvestable	Meat Count Interval				
Area	Year	Per Tow	Number Per Tow	80-40	40-35	35-30	30-25	<25
South Channel	1975	56.5	26.3	3.3	1.3	1.7	1.8	18.2
	1977	56.9	53.0	11.2	4.7	8.4	7.2	21.5
	1978	38.4	33.2	3.6	2.3	3.2	4.4	19.7
	1979	61.0	56.6	30.7	7.0	1.9	1.3	15.7
	1980	70.5	19.3	10.2	0.7	0.5	0.8	7.1
	1981	33.9	24.0	12.2	1.9	1.3	1.0	7.6
	1982	181.2	41.9	26.2	3.2	2.8	2.0	7.7
	1983	52.2	37.0	23.6	3.4	2.3	1.9	5.8
	1984	28.1	17.9	6.1	2.4	2.1	1.3	6.0
	1985	63.2	33.1	14.9	2.9	4.4	4.5	6.4
	1986	125.1	30.4	16.4	2.7	2.2	1.7	7.4
Southeast Part	1975	40.1	38.4	1.8	1.5	2.3	3.7	29.1
	1977	27.6	24.7	5.5	2.1	1.7	1.2	14.2
	1978	26.9	24.9	1.8	0.7	0.9	0.7	20.8
	1979	26.1	19.2	3.6	0.5	0.8	0.7	13.6
	1980	56.8	37.5	23.3	3.6	1.5	0.6	8.5
	1981	18.7	17.4	5.2	2.1	1.5	0.8	7.8
	1982	9.5	8.8	0.8	0.6	0.6	0.4	6.4
	1983	18.6	8.4	1.4	0.3	0.7	1.0	5.0
	1984	16.3	12.0	5.8	2.0	0.7	0.5	3.0
	1985	19.1	10.9	4.8	1.1	0.8	1.0	3.2
	1986	44.8	18.7	8.4	1.3	1.0	0.7	7.3
Northern Edge and Peak	1975	207.4	120.6	54.3	19.0	11.7	7.9	27.7
	1977	450.9	384.8	220.5	40.1	40.3	29.5	54.4
	1978	550.6	372.0	71.0	35.9	48.5	45.3	171.3
	1979	299.2	234.9	113.5	17.9	13.4	12.7	77.4
	1980	727.9	129.3	67.8	16.3	13.3	8.1	23.8
	1981	683.1	405.7	343.4	18.7	14.4	8.7	20.5
	1982	95.8	58.8	30.7	6.5	5.7	5.2	10.7
	1983	76.8	33.4	12.6	3.9	3.8	3.2	9.9
	1984	312.8	48.6	25.4	5.2	3.8	3.3	10.9
	1985	249.3	173.2	146.4	9.0	6.1	4.7	7.0
	1986[1]	63.0	24.3	11.0	2.5	2.4	1.5	6.9
Georges Bank (All Areas)	1975	109.1	62.8	21.7	7.8	5.4	4.4	23.5
	1977	204.3	176.4	91.3	17.9	19.5	14.7	33.0
	1978	219.0	152.5	27.3	14.0	18.9	18.3	74.0
	1979	150.5	121.7	59.3	10.2	6.3	5.8	40.1
	1980	380.0	74.7	39.8	8.6	6.8	4.2	15.3
	1981	196.5	120.1	95.3	6.2	4.7	2.9	11.0
	1982	117.1	43.9	24.1	4.2	3.7	3.1	8.8
	1983	57.4	30.9	15.4	3.1	2.7	2.3	7.4
	1984	148.7	30.2	14.4	3.5	2.6	2.0	7.7
	1985	136.3	89.9	69.9	5.3	4.6	4.0	6.1
	1986[1]	77.1	24.7	12.0	2.2	2.0	1.4	7.1

[1]Only USA sector (west of ICJ boundary line).

Table 10. Percentage distribution of harvestable number of Atlantic sea scallops on Georges Bank, within various meat count intervals. Harvestable scallops are defined as all sea scallops ≥70 mm shell height. Data derived from distribution of standardized stratified mean number per tow of scallops in NMFS sea scallop research vessel surveys on Georges Bank, 1975, 1977-1986.

		Percent of Harvestable Scallops					
		Meat Count Interval					
Area	Year	80-40	40-35	35-30	30-25	<30	<25
South Channel	1975	12.6	4.9	6.5	6.8	76.0	69.2
	1977	21.1	8.9	15.8	13.6	54.2	40.6
	1978	10.9	6.9	9.6	13.3	72.6	59.3
	1979	54.2	12.4	3.4	2.3	30.0	27.7
	1980	52.9	3.6	2.6	4.1	40.9	36.8
	1981	50.8	7.9	5.4	4.2	35.9	31.7
	1982	62.5	7.6	6.7	4.8	23.2	18.4
	1983	63.8	9.2	6.2	5.1	20.8	15.7
	1984	34.1	13.4	11.7	7.3	40.8	33.5
	1985	45.0	8.8	13.3	13.6	32.9	19.3
	1986	54.0	8.9	7.2	5.6	29.9	24.3
Southeast Part	1975	4.7	3.9	6.0	9.6	85.4	75.8
	1977	22.3	8.5	6.9	4.8	62.3	57.5
	1978	7.2	2.8	3.6	2.8	86.4	83.6
	1979	18.8	2.6	4.2	3.6	74.4	70.8
	1980	62.1	9.6	4.0	1.6	24.3	22.7
	1981	29.9	12.1	8.6	4.6	49.4	44.8
	1982	9.1	6.8	6.8	4.5	77.3	72.7
	1983	16.7	3.6	8.3	11.9	71.4	59.5
	1984	48.3	16.7	5.8	4.2	29.2	25.0
	1985	44.0	10.1	7.3	9.2	38.6	29.4
	1986	44.9	7.0	5.3	3.8	42.8	39.0
Northern Edge and Peak	1975	45.0	15.8	9.7	6.5	29.5	23.0
	1977	57.3	10.4	10.5	7.7	21.8	14.1
	1978	19.1	9.7	13.0	12.2	58.2	46.0
	1979	48.3	7.6	5.7	5.4	38.4	33.0
	1980	52.4	12.6	10.3	6.3	24.7	18.4
	1981	84.6	4.6	3.6	2.1	7.2	5.1
	1982	52.2	11.1	9.7	8.8	27.0	18.2
	1983	37.7	11.7	11.4	9.6	39.2	29.6
	1984	52.3	10.7	7.8	6.8	29.2	22.4
	1985	84.5	5.2	3.5	2.7	6.8	4.1
	1986[1]	45.2	10.3	9.9	6.2	34.6	28.4
Georges Bank (All Areas)	1975	34.6	12.4	8.6	7.0	44.4	37.4
	1977	51.8	10.1	11.1	8.3	27.0	18.7
	1978	17.9	9.2	12.4	12.0	60.5	48.5
	1979	48.7	8.4	5.2	4.8	37.7	32.9
	1980	53.3	11.5	9.1	5.6	26.1	20.5
	1981	79.3	5.2	3.9	2.4	11.6	9.2
	1982	54.9	9.6	8.4	7.1	27.1	20.0
	1983	49.8	10.0	8.7	7.5	31.5	24.0
	1984	47.7	11.6	8.6	6.6	32.1	25.5
	1985	77.8	5.9	5.1	4.4	11.2	6.8
	1986[1]	48.6	8.9	8.1	5.7	34.4	28.7

[1]Only USA sector (west of ICJ boundary line).

Table 11. Distribution of standardized stratified mean weight (g, meat) per tow among various meat count intervals for sea scallops from NMFS sea scallop research vessel surveys in the Mid-Atlantic, 1975, 1977-1986[1].

		Meat Weight (g, meat) Per Tow						
				Meat Count Interval[3]				
Area	Year	Total Biomass Per Tow(g)	Harvestable[2] Biomass Per Tow(g)	80 - 40	40 - 35	35 - 30	30 - 25	<25
New York Bight	1975	493	426	65	36	44	44	237
	1977	720	717	115	48	67	99	388
	1978	808	803	40	32	64	99	568
	1979	357	350	21	6	11	15	297
	1980	266	251	24	9	11	11	196
	1981	230	210	61	11	10	10	118
	1982	255	239	67	17	16	17	122
	1983	224	205	24	13	14	17	137
	1984	253	234	63	23	14	11	123
	1985	383	310	101	29	28	29	123
	1986	544	457	187	42	35	30	163
Delmarva	1975	325	240	66	13	16	19	126
	1977	614	606	43	23	21	24	495
	1978	650	624	55	21	24	33	491
	1979	650	597	192	80	54	34	237
	1980	307	270	38	6	14	23	189
	1981	158	152	15	3	4	4	126
	1982	195	178	19	7	12	10	130
	1983	157	130	13	7	4	3	103
	1984	157	145	18	13	13	12	89
	1985	223	182	44	6	5	14	113
	1986	350	250	110	31	29	23	57
Virginia-North Carolina	1975	309	141	47	-	1	3	90
	1977	7	7	1	1	<1	<1	4
	1978	146	92	36	2	2	6	46
	1979	109	102	35	9	12	4	42
	1980	73	72	22	3	3	7	37
	1981	23	21	<1	1	1	2	17
	1982	10	7	1	<1	1	<1	5
	1983	78	64	4	3	1	<1	56
	1984	16	16	2	2	3	1	8
	1985	39	29	11	<1	1	1	16
	1986	3	2	<1	-	<1	<1	2
Mid-Atlantic (All Areas)	1975	413	329	63	24	29	31	182
	1977	607	603	79	35	45	63	381
	1978	676	658	45	25	43	65	480
	1979	456	432	85	33	27	22	265
	1980	270	247	28	7	12	15	185
	1981	191	178	41	8	7	7	115
	1982	205	190	43	11	13	12	111
	1983	184	163	18	10	9	10	116
	1984	191	178	41	17	12	10	98
	1985	287	232	71	18	17	20	106
	1986	412	331	138	33	29	24	107

[1]Meat weight values derived from shell height values using 1977-1982 USA research survey equation,

$$\ln \text{Meat Weight (g)} = -12.1628 + 3.2539 \ln \text{Shell Height (mm)} \quad (n = 11943,\ r = 0.98)$$

[2]Stratified mean weight (g, meat) per tow for sea scallops $\geq$70 mm; $\leq$80 count.

[3]Meat count is expressed as number of meats per pound.

Table 12. Percentage distribution of harvestable biomass (meat weight) of Atlantic sea scallops in the Mid-Atlantic region, within various meat count intervals. Harvestable biomass is defined as all sea scallops ≥70 mm shell height. Data derived from distribution of standardized stratified mean meat weight per tow in NMFS sea scallop research vessel surveys in the Mid-Atlantic, 1975, 1977-1986.

		Percent of Harvestable Biomass					
		Meat Count Interval[1]					
Area	Year	80 - 40	40 - 35	35 - 30	30 - 25	<30	<25
New York Bight	1975	15.3	8.5	10.3	10.3	66.0	55.6
	1977	16.0	6.7	9.3	13.8	67.9	54.1
	1978	5.0	4.0	8.0	12.3	83.1	70.7
	1979	6.0	1.7	3.1	4.3	89.1	84.9
	1980	9.6	3.6	4.4	4.4	82.5	78.1
	1981	29.0	5.2	4.8	4.8	61.0	56.2
	1982	28.0	7.1	6.7	7.1	58.2	51.0
	1983	11.7	6.3	6.8	8.3	75.1	66.8
	1984	26.9	9.8	6.0	4.7	57.3	52.6
	1985	32.6	9.4	9.0	9.4	49.0	39.7
	1986	40.9	9.2	7.7	6.5	42.2	35.7
Delmarva	1975	27.5	5.4	6.7	7.9	60.4	52.5
	1977	7.1	3.8	3.5	4.0	85.6	81.7
	1978	8.8	3.4	3.8	5.3	84.0	78.7
	1979	32.2	13.4	9.0	5.7	45.4	39.7
	1980	14.1	2.2	5.2	8.5	78.5	70.0
	1981	9.9	2.0	2.6	2.6	85.5	82.9
	1982	10.7	3.9	6.7	5.6	78.7	73.0
	1983	10.0	5.4	3.1	2.3	81.5	79.2
	1984	12.4	9.0	9.0	8.3	69.7	61.4
	1985	24.2	3.3	2.7	7.7	69.8	62.1
	1986	44.0	12.4	11.6	9.2	32.0	22.8
Virginia-North Carolina	1975	33.3	-	0.7	2.1	66.0	63.8
	1977	13.8	11.2	5.6	6.6	69.3	62.7
	1978	39.1	2.2	2.2	6.5	56.5	50.0
	1979	34.3	8.8	11.8	3.9	45.1	41.2
	1980	30.6	4.2	4.2	9.7	61.1	51.4
	1981	1.8	5.4	4.2	7.4	88.6	81.2
	1982	9.8	2.6	10.5	1.8	77.1	75.3
	1983	5.5	5.4	2.1	0.3	87.0	86.7
	1984	12.5	12.5	18.8	6.3	56.3	50.0
	1985	37.1	0.8	1.9	3.0	60.2	57.2
	1986	9.1	0.0	3.0	6.9	87.9	81.0
Mid-Atlantic (All Areas)	1975	19.1	7.3	8.8	9.4	64.7	55.3
	1977	13.1	5.8	7.5	10.4	73.6	63.2
	1978	6.8	3.8	6.5	9.9	82.8	72.9
	1979	19.7	7.6	6.3	5.1	66.4	61.3
	1980	11.3	2.8	4.9	6.1	81.0	74.9
	1981	23.0	4.5	3.9	3.9	68.5	64.6
	1982	22.6	5.8	6.8	6.3	64.7	58.4
	1983	11.0	6.1	5.5	6.1	77.3	71.2
	1984	23.0	9.6	6.7	5.6	60.7	55.1
	1985	30.6	7.8	7.3	8.6	54.3	45.7
	1986	41.7	10.0	8.8	7.2	39.5	32.3

[1]Meat count is expressed as number of meats per pound.

Table 13. Distribution of standardized mean number per tow among various meat count intervals for sea scallops from NMFS sea scallop research vessel surveys in the Mid-Atlantic, 1975, 1977-1986.

		Stratified Mean Number of Scallops Per Tow						
				Meat Count Interval				
Area	Year	Total Number Per Tow	Harvestable Number Per Tow	80-40	40-35	35-30	30-25	<25
New York Bight	1975	51.1	23.8	7.4	2.8	2.9	2.5	8.2
	1977	40.8	39.7	12.2	3.8	4.4	5.5	13.8
	1978	39.2	36.7	4.7	2.5	4.2	5.5	19.8
	1979	17.6	13.7	2.7	0.5	0.7	0.8	9.0
	1980	21.5	10.7	2.8	0.7	0.7	0.6	5.9
	1981	26.6	13.6	8.0	0.8	0.7	0.5	3.6
	1982	23.0	15.1	8.1	1.3	1.0	0.9	3.8
	1983	17.9	9.9	2.9	1.0	0.9	0.9	4.2
	1984	26.9	13.9	7.0	1.8	0.9	0.6	3.6
	1985	56.1	22.2	12.6	2.3	1.9	1.6	3.8
	1986	71.5	34.5	21.9	3.3	2.3	1.7	5.3
Delmarva	1975	41.3	16.1	9.5	1.0	1.0	1.1	3.5
	1977	27.1	24.2	4.7	1.8	1.4	1.3	15.0
	1978	34.5	26.2	6.4	1.7	1.6	1.8	14.7
	1979	70.1	39.3	21.1	6.2	3.5	1.9	6.6
	1980	36.7	13.4	4.7	0.5	0.9	1.3	6.0
	1981	8.7	5.9	1.6	0.2	0.3	0.2	3.6
	1982	13.5	8.0	2.5	0.6	0.8	0.5	3.6
	1983	13.2	5.4	1.8	0.5	0.3	0.2	2.6
	1984	12.3	6.9	2.1	1.1	0.9	0.7	2.1
	1985	35.4	11.4	6.5	0.4	0.3	0.8	3.4
	1986	56.1	22.1	14.7	2.4	1.9	1.3	1.8
Virginia-North Carolina	1975	58.7	11.0	7.8	-	0.1	0.1	3.0
	1977	0.5	0.3	0.1	0.1	0.0	0.0	0.1
	1978	23.0	7.3	5.5	0.2	0.2	0.3	1.1
	1979	11.1	6.5	3.7	0.7	0.8	0.2	1.1
	1980	5.4	4.7	2.5	0.3	0.2	0.4	1.3
	1981	1.2	0.8	0.0	0.1	0.1	0.1	0.5
	1982	1.3	0.3	0.1	0.0	0.0	0.0	0.2
	1983	6.7	2.0	0.4	0.3	0.1	0.0	1.2
	1984	1.0	0.8	0.2	0.2	0.2	0.1	0.1
	1985	5.2	2.3	1.8	0.0	0.0	0.1	0.4
	1986	0.4	0.1	<0.1	0.0	<0.1	<0.1	<0.1
Mid-Atlantic (All Areas)	1975	49.6	19.7	8.1	1.9	1.9	1.7	6.1
	1977	31.9	30.3	8.4	2.7	2.9	3.5	12.8
	1978	35.7	29.7	5.4	1.9	2.9	3.7	15.8
	1979	36.8	22.9	9.5	2.6	1.7	1.2	7.9
	1980	26.1	11.4	3.5	0.6	0.8	0.8	5.7
	1981	18.6	10.0	5.2	0.6	0.5	0.4	3.3
	1982	17.1	10.9	5.2	0.9	0.8	0.7	3.3
	1983	15.0	7.4	2.2	0.7	0.6	0.6	3.3
	1984	18.8	10.0	4.5	1.4	0.8	0.6	2.7
	1985	42.9	16.1	9.2	1.4	1.1	1.1	3.3
	1986	57.6	26.1	16.8	2.6	1.9	1.3	3.5

Table 14. Percentage distribution of harvestable numbers of Atlantic sea scallops in the Mid-Atlantic region, within various meat count intervals. Harvestable scallops are defined as all scallops ≥70 mm shell height. Data derived from distribution of standardized stratified mean number per tow of scallops in NMFS sea scallop research vessel surveys in the Mid-Atlantic, 1975, 1977-1986.

		Percent of Harvestable Scallops					
		Meat Count Interval					
Area	Year	80-40	40-35	35-30	30-25	<30	<25
New York Bight	1975	31.0	11.8	12.2	10.5	45.0	34.5
	1977	30.7	9.6	11.1	13.8	48.6	34.8
	1978	12.8	6.8	11.4	15.0	68.9	54.0
	1979	19.7	3.7	5.1	5.8	71.5	65.7
	1980	26.2	6.5	6.5	5.6	60.7	55.2
	1981	58.8	5.9	5.1	3.7	30.1	26.5
	1982	53.6	8.6	6.6	6.0	31.1	25.2
	1983	29.3	10.1	9.1	9.1	51.5	42.4
	1984	50.4	12.9	6.5	4.3	30.2	25.9
	1985	56.7	10.4	8.6	7.2	24.3	17.1
	1986	63.5	9.5	6.7	4.9	20.3	15.4
Delmarva	1975	59.0	6.2	6.2	6.8	28.6	21.8
	1977	19.4	7.4	5.8	5.4	67.4	62.0
	1978	24.4	6.5	6.1	6.9	63.0	56.1
	1979	53.7	15.8	8.9	4.8	21.6	16.8
	1980	35.1	3.7	6.7	9.7	54.5	44.8
	1981	27.1	3.4	5.1	3.4	64.4	61.0
	1982	31.2	7.5	10.0	6.3	51.3	45.0
	1983	33.3	9.3	5.6	3.7	51.9	48.1
	1984	30.5	15.9	13.0	10.2	40.6	30.4
	1985	57.0	3.5	2.6	7.0	36.9	29.9
	1986	66.5	10.9	8.6	5.9	14.0	8.1
Virginia-North Carolina	1975	70.9	-	0.9	0.9	28.2	27.3
	1977	33.4	33.3	0.0	0.0	33.3	33.3
	1978	75.4	2.7	2.7	4.1	19.2	15.1
	1979	56.9	10.8	12.3	3.1	20.0	16.9
	1980	53.2	6.4	4.2	8.5	36.2	27.2
	1981	0.0	12.5	12.5	12.5	75.0	62.5
	1982	33.3	0.0	0.0	0.0	66.7	66.7
	1983	20.0	15.0	5.0	0.0	60.0	60.0
	1984	25.0	25.0	25.0	12.5	25.0	12.5
	1985	78.3	0.0	0.0	4.3	21.7	17.4
	1986	29.6	0.0	4.9	9.8	65.5	55.7
Mid-Atlantic (All Areas)	1975	41.1	9.7	9.6	8.6	39.6	31.0
	1977	27.7	8.9	9.6	11.6	53.8	42.2
	1978	18.2	6.4	9.7	12.5	65.7	53.2
	1979	41.5	11.4	7.4	5.2	39.7	34.5
	1980	30.7	5.3	7.0	7.0	57.0	50.0
	1981	52.0	6.0	5.0	4.0	37.0	33.0
	1982	47.7	8.3	7.3	6.4	36.7	30.3
	1983	29.7	9.5	8.1	8.1	52.7	44.6
	1984	45.0	14.0	8.0	6.0	33.0	27.0
	1985	57.2	8.7	6.8	6.8	27.3	20.5
	1986	64.4	9.9	7.3	5.0	18.4	13.4

Table 15. 1986 percentage distribution of harvestable biomass (meat weight) of Atlantic sea scallops in the USA Georges Bank and Mid-Atlantic regions, within various meat count intervals. Harvestable biomass is defined as all sea scallops ≥70 mm shell height (≤80 count). Data derived from distribution of standardized stratified mean meat weight per tow in NMFS 1986 research vessel sea scallop survey.

	Percent Harvestable Biomass			
	Meat Count Interval			
Area	80-40	40-35	35-30	<30
South Channel	26.6	7.4	7.2	58.8
Southeast Part	19.0	4.6	4.3	72.1
USA No. Edge & Peak	21.3	8.1	8.8	61.8
USA GEORGES BANK	22.4	6.9	7.4	63.3
New York Bight	40.9	9.2	7.7	42.2
Delmarva	44.0	12.4	11.6	32.0
Virginia-No. Carolina	9.1	-	3.0	87.9
MID-ATLANTIC	41.7	10.0	8.8	39.5
USA TOTAL GEORGES BANK AND MID-ATLANTIC AREAS	35.2	9.0	8.3	47.5

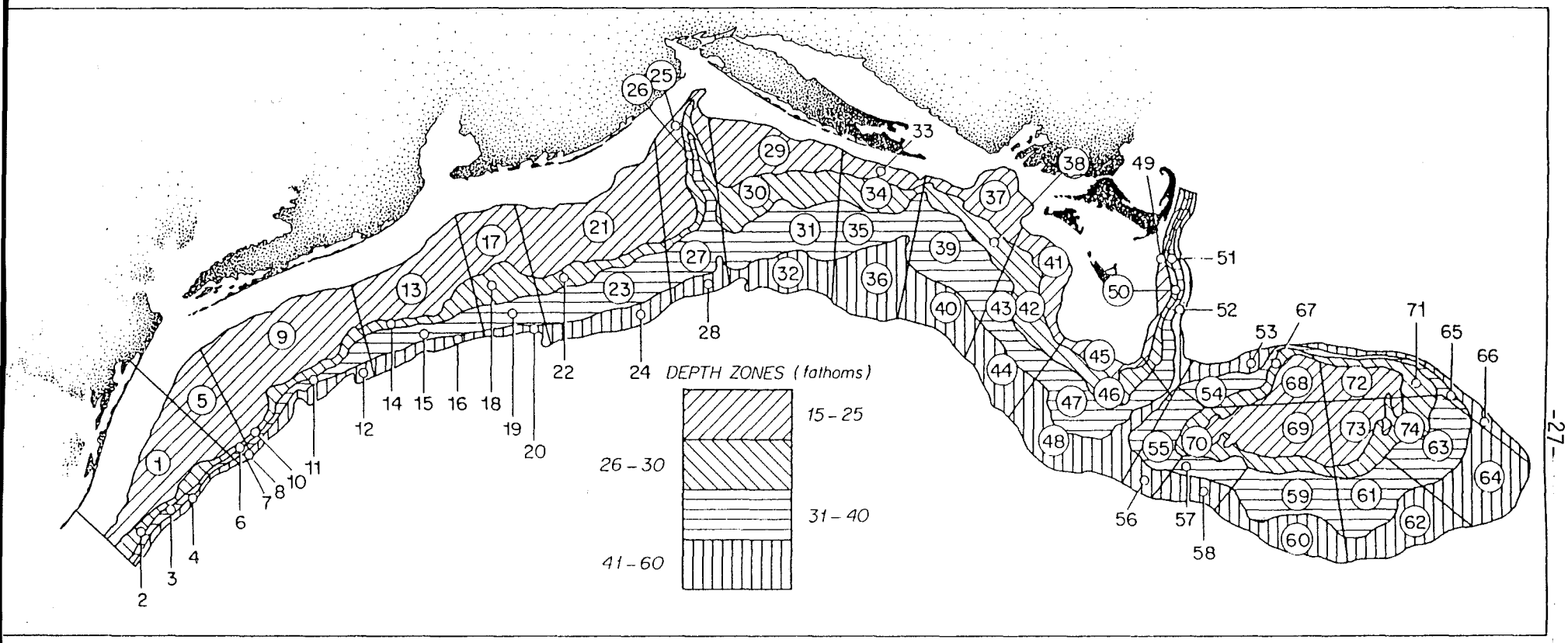

Figure 1. USA (Northeast Fisheries Center) sea scallop research vessel survey sampling strata in the Northwest Atlantic, Georges Bank to Cape Hatteras, used in annual surveys since 1979. For analytical purposes, survey strata are grouped by major fishing regions: Virginia-North Carolina (Strata 1-8); Delmarva (Strata 9-20); New York Bight (Strata 21-36); Southern New England (Strata 37-44); South Channel (Strata 45-56); Southeast Part (Strata 57-60); and Northern Edge and Peak (Strata 61-66, 71-74).

USA SEA SCALLOP RELATIVE ABUNDANCE INDICES

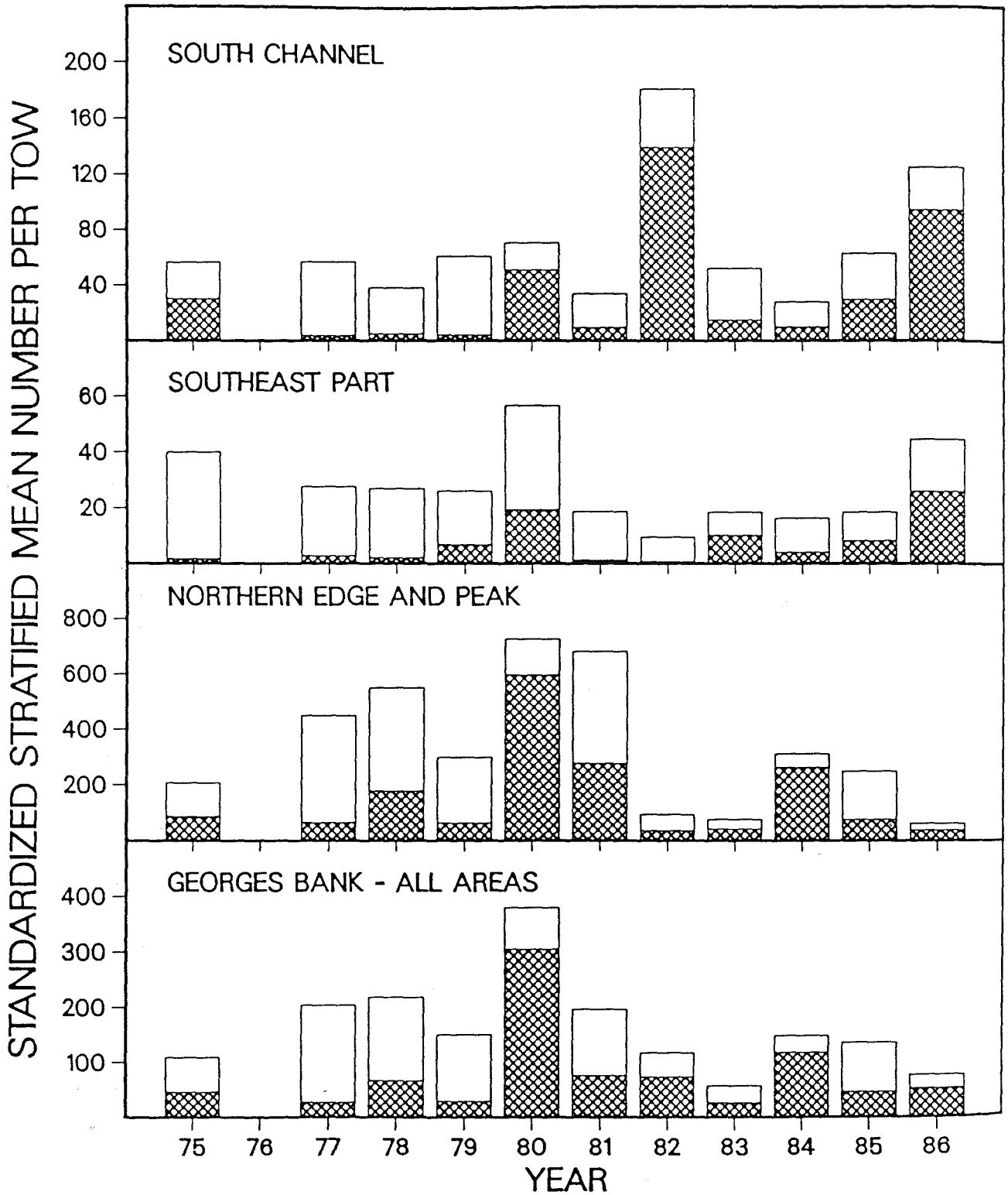

Figure 2. USA sea scallop relative abundance indices (standardized stratified mean number per tow), by principal scallop regions on Georges Bank from USA sea scallop research vessel surveys of Georges Bank conducted during 1975 and 1977-1986 (Note: Unlike previous years the 1986 indices for the Northern Edge and Peak and Georges Bank only refer to scallop abundance in the USA sector, west of the ICJ boundary line). The shaded portion of each bar represents the relative abundance of pre-recruit scallops (<70 mm shell height); the upper, non-shaded portion of each bar represents the relative abundance of recruit or commercial-size scallops (≥70 mm shell height).

USA SEA SCALLOP RELATIVE ABUNDANCE INDICES

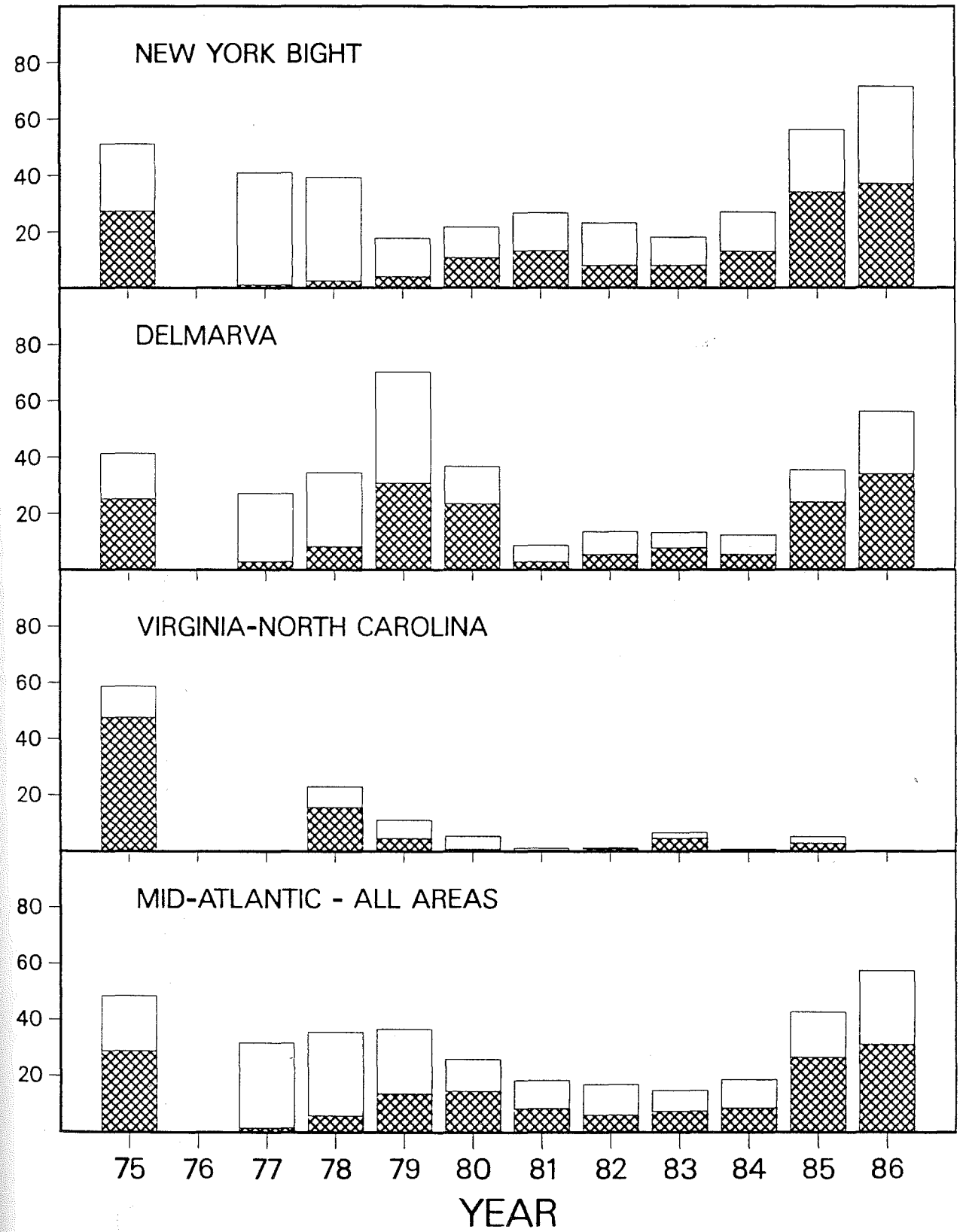

Figure 3. USA sea scallop relative abundance indices (standardized stratified mean number per tow), by principal scallop regions in the Middle Atlantic, from USA sea scallop research vessel surveys in the Middle Atlantic conducted during 1975 and 1977-1986. The shaded portion of each bar represents the relative abundance of pre-recruit scallops (<70 mm shell height); the upper, non-shaded portion of each bar represents the relative abundance of recruit or commercial-size scallops (≥70 mm shell height).

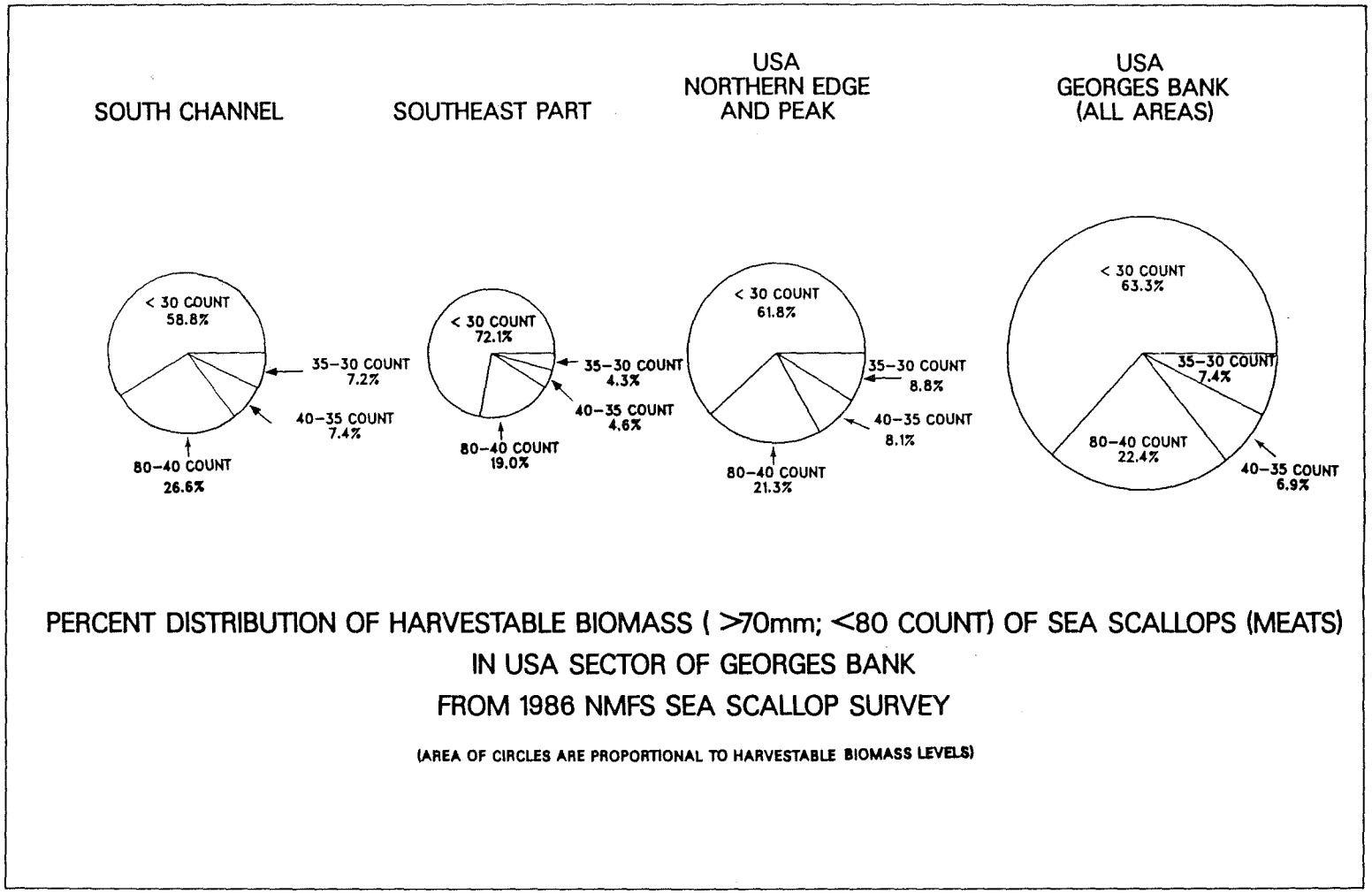

Figure 4. Percentage distribution of harvestable biomass (meat weight) of Atlantic sea scallops, within various meat count intervals (number of meats per pound), from the 1986 USA sea scallop research vessel survey in the USA portion of Georges Bank. Harvestable biomass is defined as all sea scallops ≥70 mm shell height. Data derived from 1986 survey distributions of standardized stratified mean meat weight per tow.

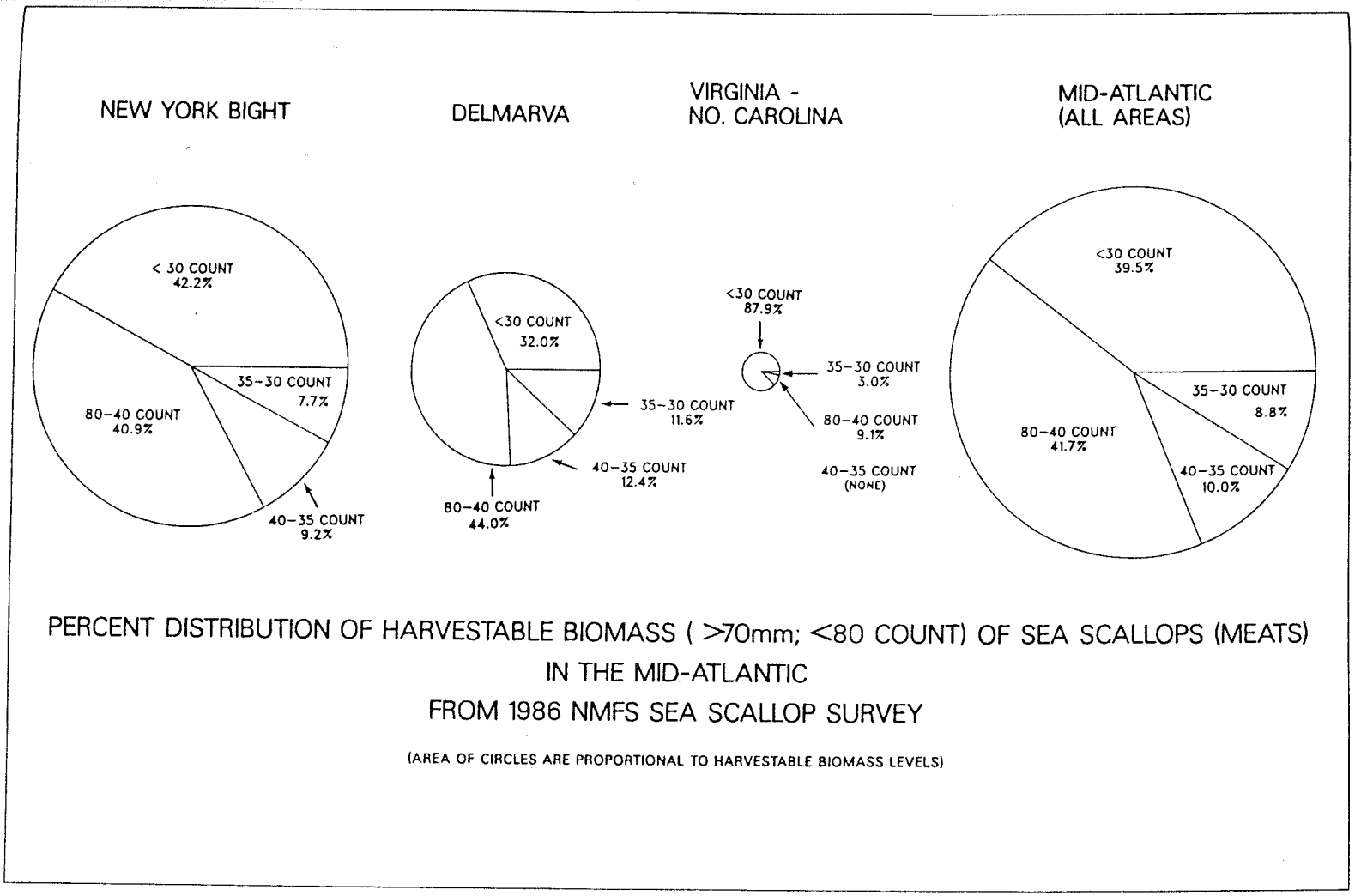

Figure 5. Percentage distribution of harvestable biomass (meat weight) of Atlantic sea scallops, within various meat count intervals (number of meats per pound), from the 1986 USA sea scallop research vessel survey in the Mid-Atlantic region. Harvestable biomass is defined as all sea scallops ≥70 mm shell height. Data derived from 1986 survey distributions of standardized stratified mean meat weight per tow values.

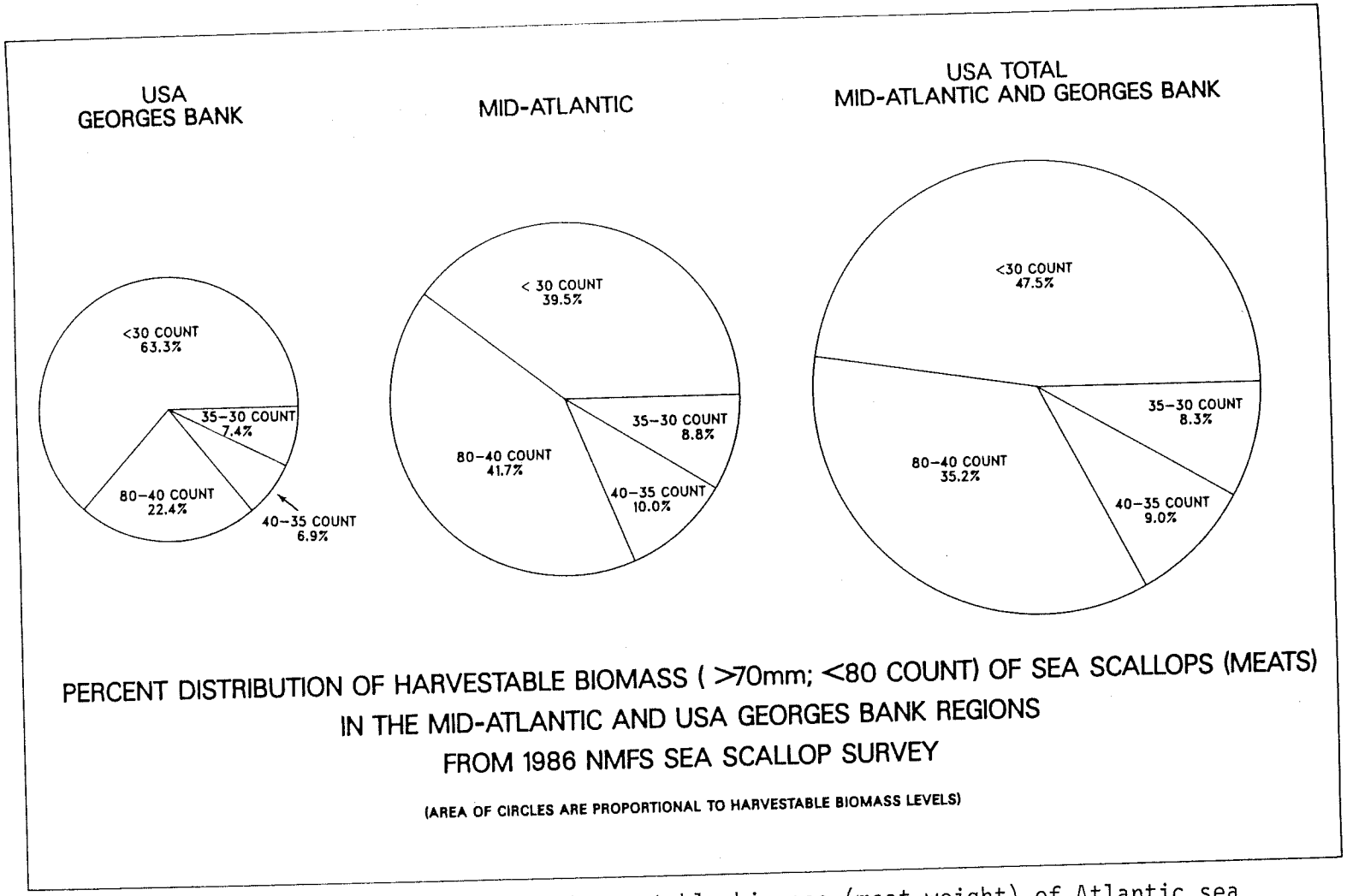

Figure 6. Percentage distribution of harvestable biomass (meat weight) of Atlantic sea scallops, within various meat count intervals (number of meats per pound), from the 1986 USA sea scallop research vessel survey in the Mid-Atlantic region and in the USA portion of Georges Bank. Harvestable biomass is defined as all sea scallops $\geq$70 mm shell height. Data derived from 1986 survey distributions of standardized stratified mean meat weight per tow.

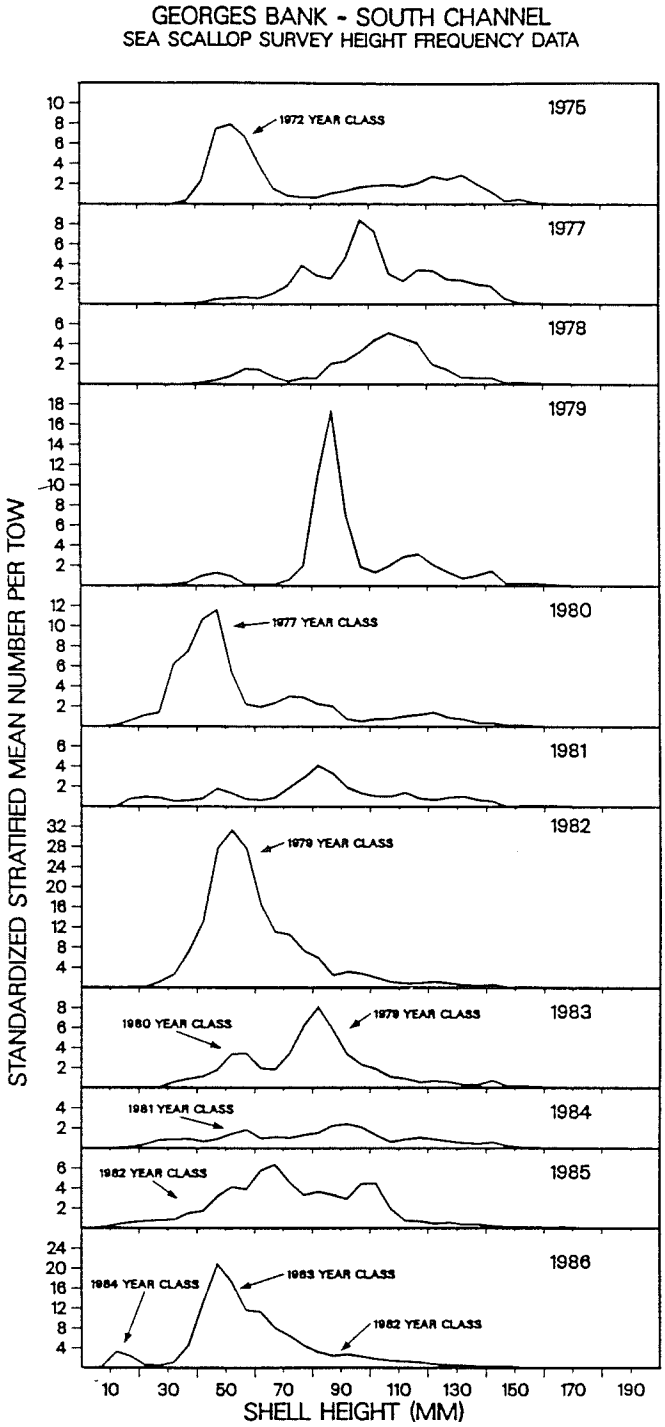

Figure 7. USA sea scallop research vessel survey shell height frequency distributions of sea scallops from the South Channel region (Strata 45-56) of Georges Bank, 1975, 1977-1986.

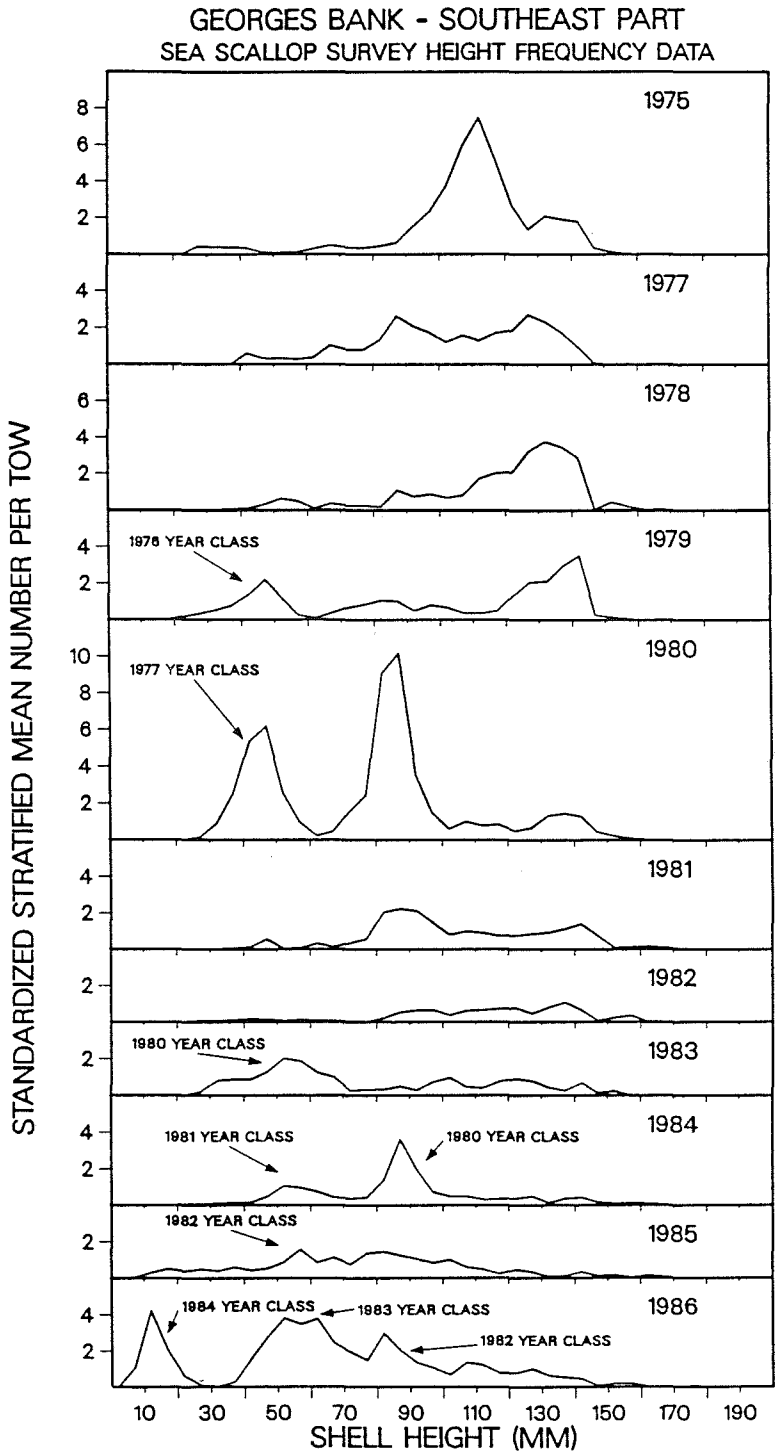

Figure 8. USA sea scallop research vessel survey shell height frequency distributions of sea scallops from the Southeast Part region (Strata 57-60) of Georges Bank, 1975, 1977-1986.

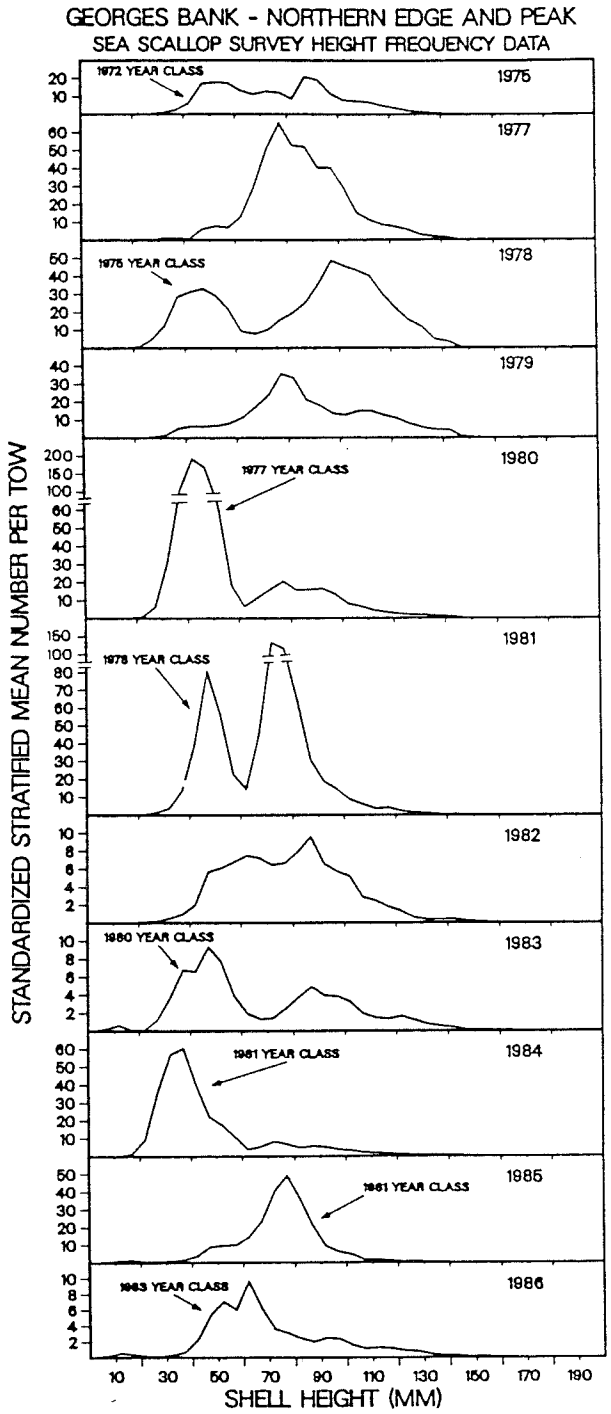

Figure 9. Sea scallop research vessel survey shell height frequency distributions of sea scallops from the Northern Edge and Peak region (Strata 61-66 and 71-74) of Georges Bank, 1975, 1977-1986. Frequency distributions for 1975, 1977, and 1982-1986 were derived from USA research vessel surveys. Frequency distributions for 1978-1981 were derived from Canadian research vessel surveys. (Note: Unlike previous years, the 1986 frequency distributions refer only to the USA sector of the Northern Edge and Peak region, west of the ICJ boundary line.)

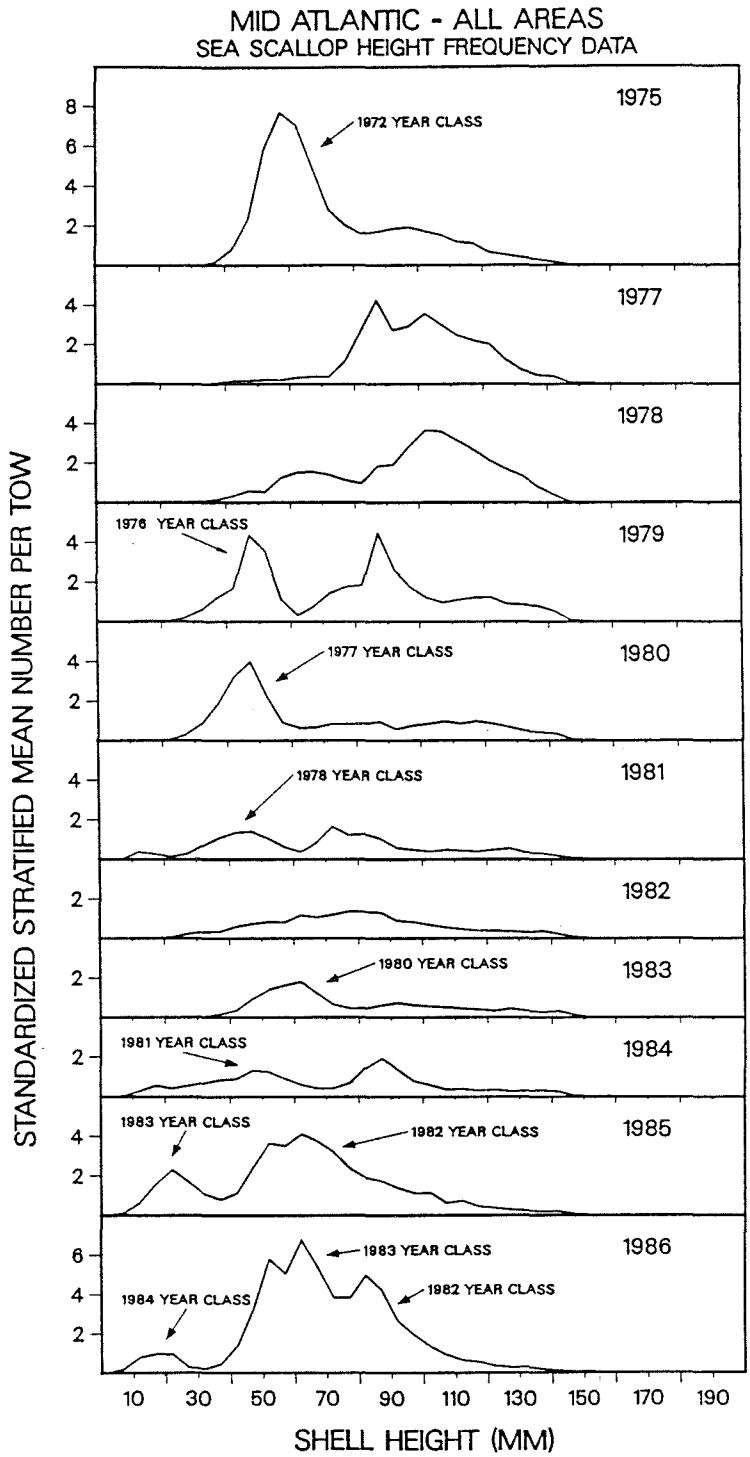

Figure 10. USA sea scallop research vessel survey shell height frequency distributions of sea scallops from the Mid-Atlantic area (Strata 1-36), 1975, 1977-1986.

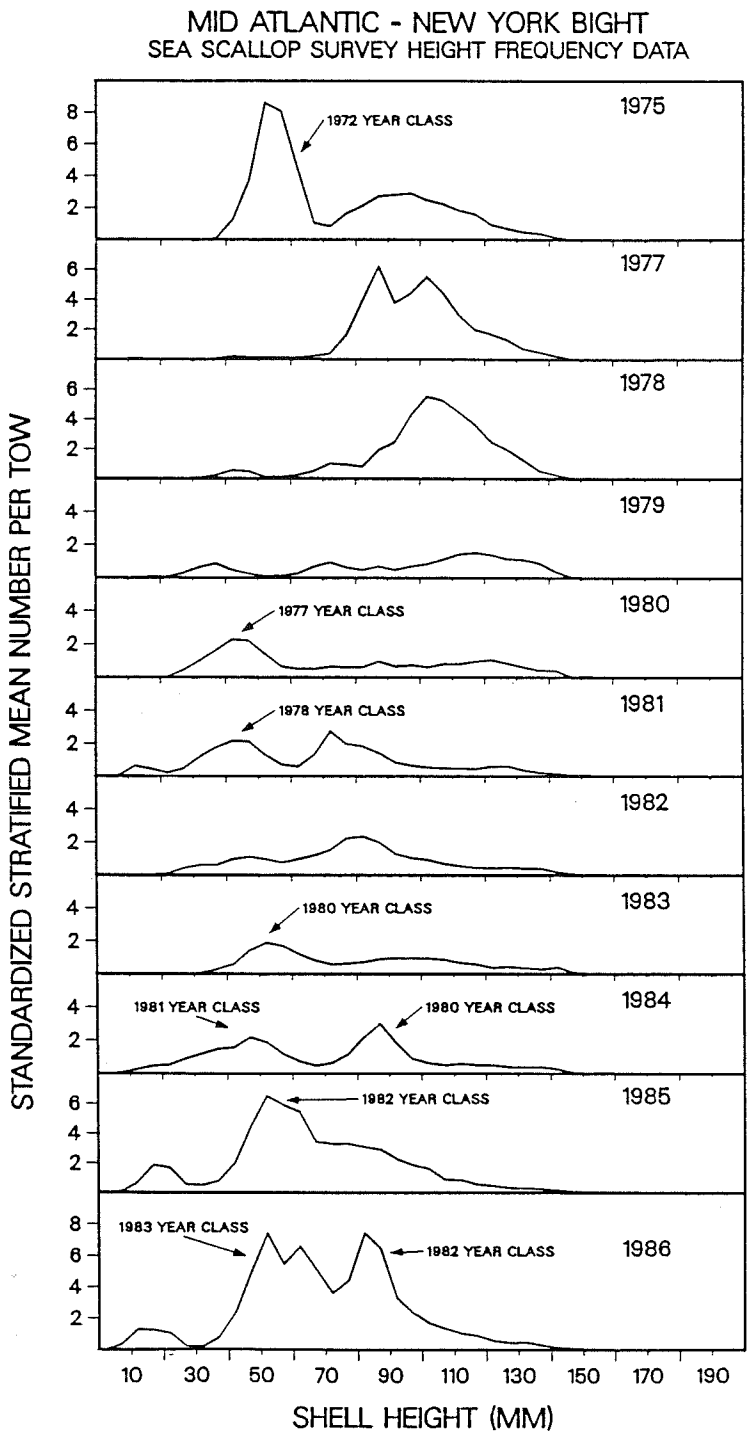

Figure 11. USA sea scallop research vessel survey shell height frequency distributions of sea scallops from the New York Bight region (Strata 21-36) of the Middle Atlantic, 1975, 1977-1986.

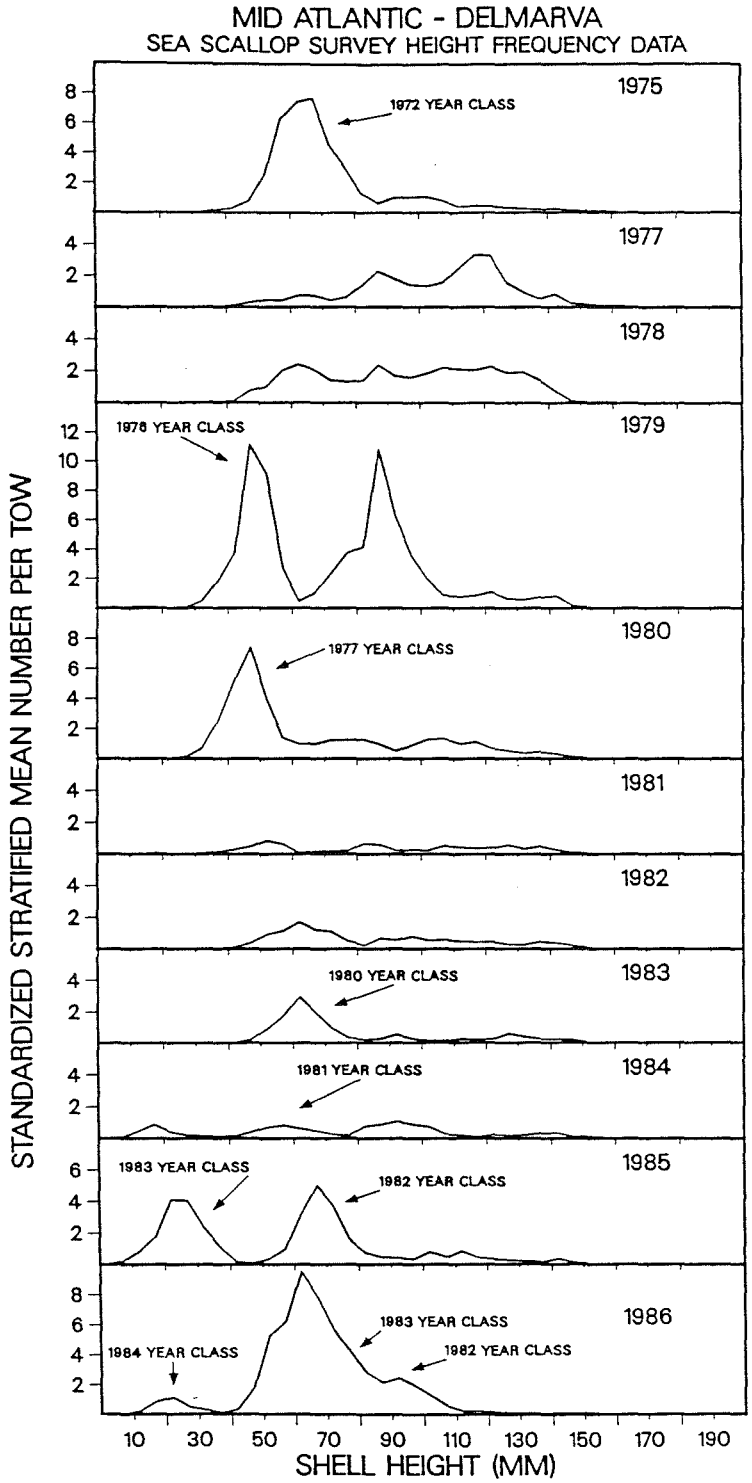

Figure 12. USA sea scallop research vessel survey shell height frequency distributions of sea scallops from the Delmarva region (Strata 9-20) of the Middle Atlantic, 1975, 1977-1986.

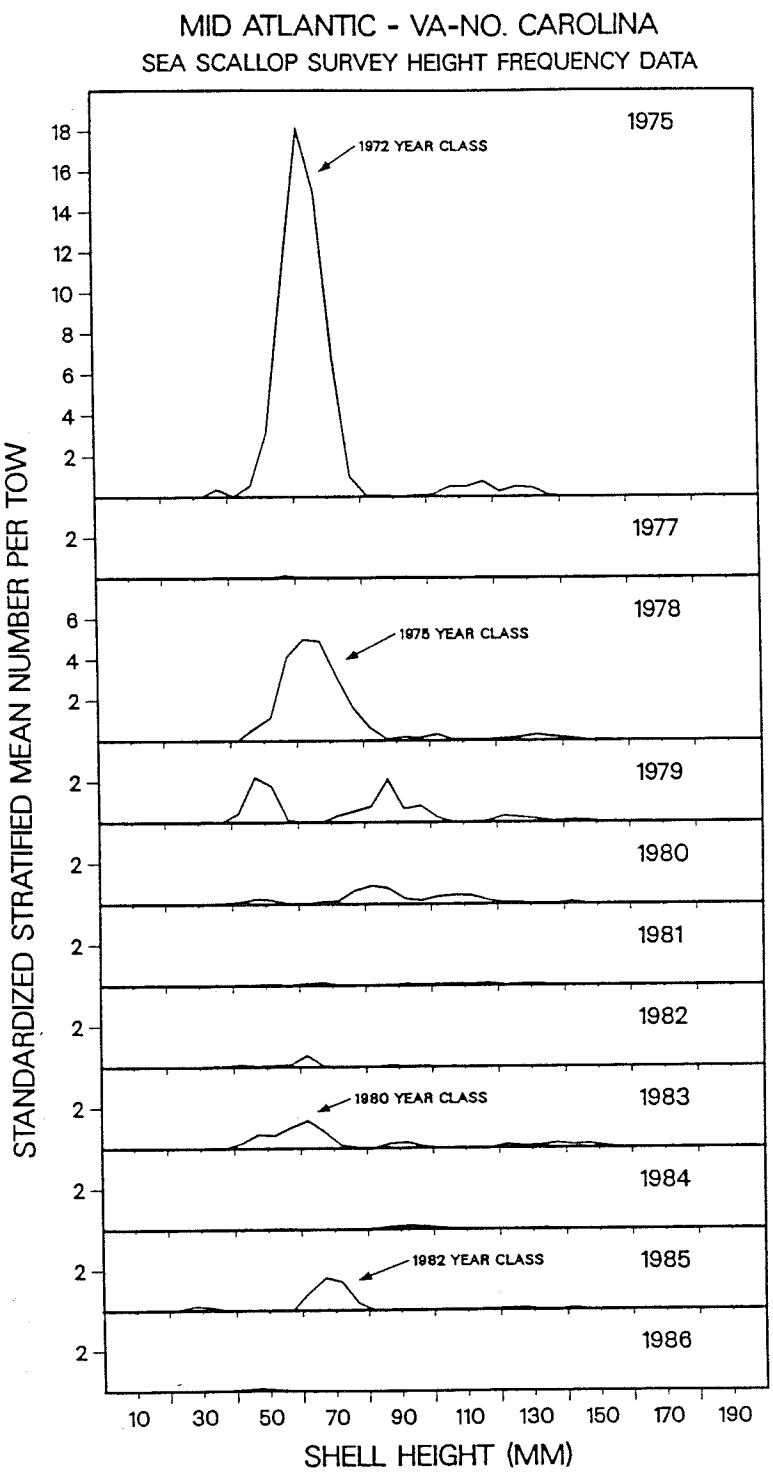

Figure 13. USA sea scallop research vessel survey shell height frequency distributions of sea scallops from the Virginia-North Carolina region (Strata 1-8) of the Middle Atlantic, 1975, 1977-1986.

APPENDIX

Appendix

Table 1. Summary of 1986 NMFS sea scallop research vessel sampling data from the Mid-Atlantic and Georges Bank, by individual tow.

Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% of Catch ≤40 Count By Number	% of Catch ≤40 Count By Weight	Depth (fm)	Loran C Bearings Start X	Loran C Bearings Start Y	Loran C Bearings End X	Loran C Bearings End Y	Date
Mid-Atlantic (Tows 1-1 to 36-2)												
1-1	0	-	-	-	-	-	26	26850	40693	26849	40684	8/4
1-2	0	-	-	-	-	-	16	26989	40928	26989	40938	8/5
1-3	0	-	-	-	-	-	19	26870	40525	26871	40534	8/5
2-1	0	-	-	-	-	-	22	26868	41011	26864	41014	8/4
2-2	0	-	-	-	-	-	28	26825	40618	26828	40610	8/4
2-3	0	-	-	-	-	-	25	26861	41074	26863	41065	8/4
3-1	0	-	-	-	-	-	44	26838	40801	26836	40792	8/4
3-2	0	-	-	-	-	-	36	26825	40793	26823	40785	8/4
3-3	0	-	-	-	-	-	40	26837	40796	26836	40786	8/4
4-1	0	-	-	-	-	-	46	26826	40759	26824	40750	8/4
4-2	0	-	-	-	-	-	50	26827	40827	26826	40818	8/4
4-3	0	-	-	-	-	-	48	26836	41010	26834	41002	8/4
5-1	0	-	-	-	-	-	16	26993	41094	26995	41106	8/6
5-2	0	-	-	-	-	-	24	26874	41193	26869	41191	8/4
5-3	0	-	-	-	-	-	13	27021	41230	27023	41240	8/6
6-1	0	-	-	-	-	-	28	26858	41247	26857	41237	8/4
6-2	28	61	94	135	3.6	43.6	32	26849	41237	26849	41227	8/4
6-3	3	80	29	46	33.3	89.8	27	26846	41182	26847	41171	8/4
6-4	20	65	72	126	5.0	46.6	30	26847	41206	26852	41207	8/4
6-5	2	97	22	41	50.0	88.9	28	26856	41227	26854	41218	8/4
7-1	0	-	-	-	-	-	42	26840	41178	26840	41189	8/4
7-2	8	90	31	118	50.0	80.0	42	26841	41210	26841	41200	8/4
7-3	2	47	302	3	0.0	0.0	38	26842	41163	26842	41154	8/4
7-4	4	106	22	82	100.0	100.0	43	26841	41236	26841	41226	8/4
7-5	1	117	16	28	100.0	100.0	44	26840	41200	26840	41210	8/4
8-1	0	-	-	-	-	-	48	26835	41174	26834	41165	8/4
8-2	0	-	-	-	-	-	49	26834	41231	26835	41220	8/4
8-3	0	-	-	-	-	-	50	26834	41193	26833	41184	8/4
9-1	0	-	-	-	-	-	15	27003	41620	27002	41631	8/6
9-2	25	66	88	129	12.0	31.8	26	26918	41476	26916	41466	8/3
9-3	0	-	-	-	-	-	16	27003	41743	26098	41747	8/6
9-4	6	65	35	78	16.7	84.5	21	26892	41375	26889	41367	8/4
10-1	186	64	92	917	3.8	29.0	30	26888	41803	26893	41809	8/7
10-2	157	65	89	796	5.1	22.9	30	26880	41390	26881	41399	8/4
10-3	286	62	75	1729	23.4	62.3	25	26904	41896	26905	41806	8/7
10-4	164	61	110	675	2.4	19.0	26	26906	41481	26911	41479	8/3
10-5	65	72	55	531	20.0	60.5	28	26907	41830	26907	41840	8/7
10-6	232	66	81	1304	9.1	37.2	28	26907	41925	26908	41934	8/7
10-7	341	61	116	1337	2.6	19.5	34	26876	41631	26881	41635	8/3
10-8	394	62	87	2047	8.4	42.9	31	26875	41415	26874	41405	8/3

Appendix

Table 1. Summary of 1986 NMFS sea scallop research vessel sampling data from the Mid-Atlantic and Georges Bank, by individual tow.

Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count		Depth (fm)	Loran C Bearings				Date
					By Number	By Weight		Start		End		
								X	Y	X	Y	
11-1	1456	55	161	4089	1.5	15.3	34	26876	41714	26878	41704	8/3
11-2	156	66	91	779	1.9	13.0	32	26863	41777	26866	41769	8/3
11-3	10	78	35	130	30.0	85.7	35	26887	41540	26883	41533	8/3
11-4	249	57	128	881	2.4	14.7	36	26844	41808	26849	41803	8/3
11-5	21	82	35	268	28.6	72.2	37	26839	41863	26837	41854	8/3
11-6	71	74	47	682	26.8	68.9	34	26842	41892	26842	41882	8/3
11-7	2	115	16	57	100.0	100.0	37	26872	41497	26882	41493	8/3
11-8	9	99	23	175	55.6	80.5	39	26850	41324	26847	41319	8/4
12-1	0	-	-	-	-	-	52	26817	41817	26822	41815	8/3
12-2	2	75	68	13	0.0	0.0	53	26835	41597	26836	41587	8/3
12-3	0	-	-	-	-	-	66	26846	41549	26851	41548	8/3
12-4	4	68	82	22	0.0	0.0	48	26835	41293	26839	41286	8/4
13-1	0	-	-	-	-	-	18	26948	42488	26954	42496	8/8
13-2	0	-	-	-	-	-	15	26985	42144	26983	42154	8/7
13-3	1	57	168	3	0.0	0.0	19	26959	42262	26954	42254	8/7
13-4	0	-	-	-	-	-	21	26925	42072	26931	42078	8/7
14-1	311	69	84	1671	3.2	9.3	29	26884	42022	26881	42030	8/7
14-2	328	67	63	2367	12.5	25.1	30	26826	42290	26824	42299	8/7
14-3	875	70	77	5176	8.5	22.2	31	26822	42347	26821	42358	8/7
14-4	81	80	50	736	9.9	28.5	21	26798	42240	26800	42250	8/4
14-5	323	80	48	3037	19.2	39.7	31	26804	42374	26797	42371	8/7
14-6	55	64	69	359	5.5	36.3	28	26859	42119	26854	42125	8/7
14-7	160	75	51	1437	12.5	44.8	28	26879	42059	26885	42061	8/7
14-8	88	74	63	633	12.5	32.2	27	26799	42291	26806	42289	8/7
14-9	150	75	52	1304	12.7	41.2	28	26873	42090	26871	42099	8/7
14-10	487	63	99	2242	4.3	23.8	30	26892	41948	26891	41958	8/7
14-11	4	87	35	51	50.0	82.2	30	26828	42159	26824	42163	8/7
14-12	352	76	56	2869	22.7	47.9	31	26820	42366	26823	42375	8/7
15-1	10	99	22	209	70.0	93.2	39	26737	42325	26731	42329	8/2
15-2	591	67	75	3552	16.4	44.1	32	26850	42001	26852	41993	8/3
15-3	235	67	73	1461	15.3	38.9	38	26829	41991	26835	41994	8/3
15-4	455	78	54	3851	23.3	44.9	34	26775	42349	26769	42345	8/2
15-5	7	101	20	160	42.9	77.6	39	26794	42132	26797	42124	8/3
15-6	525	65	97	2461	4.6	19.7	32	26868	41942	26865	41934	8/3
15-7	47	72	65	329	21.3	44.3	36	26780	42296	26777	42305	8/7
15-8	253	76	59	1930	16.6	33.4	36	26819	42043	26813	42043	8/3
15-9	51	92	29	798	56.9	80.8	40	26758	42218	26757	42209	8/3
15-10	14	59	90	70	0.0	0.0	31	26814	42158	26812	42166	8/7
15-11	72	83	38	868	45.8	77.8	35	26826	42064	26826	42055	8/3
15-12	75	84	41	827	28.0	56.0	30	26789	42227	26787	42236	8/4

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Table 1. Summary of 1986 NMFS sea scallop research vessel sampling data from the Mid-Atlantic and Georges Bank, by individual tow.

Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count		Depth (fm)	Loran C Bearings				Date
					By Number	By Weight		Start		End		
								X	Y	X	Y	
16-1	4	91	37	49	50.0	56.7	46	26796	41989	26796	41979	8/3
16-2	0	-	-	-	-	-	57	26758	42107	26764	42110	8/3
16-3	21	72	72	132	4.8	9.7	44	26716	42281	26715	42271	8/2
16-4	0	-	-	-	-	-	47	26759	42181	26759	42171	8/3
16-5	6	85	36	75	16.7	48.9	45	26789	42042	26790	42033	8/3
16-6	9	70	83	49	0.0	0.0	56	26717	42250	26723	42245	8/2
16-7	0	-	-	-	-	-	57	26782	41945	26782	41936	8/3
16-8	0	-	-	-	-	-	50	26797	41922	26802	41930	8/3
17-1	29	34	257	51	3.4	29.8	22	26885	42672	26884	42683	8/8
17-2	0	-	-	-	-	-	11	27022	42610	27016	42614	8/8
17-3	6	82	30	89	33.3	82.4	25	26844	42535	26850	42531	8/8
18-1	290	71	68	1921	8.3	28.4	29	26722	42497	26723	42491	8/2
18-2	124	78	46	1226	43.5	72.2	31	26784	42506	26778	42511	8/8
18-3	117	84	43	1245	30.8	51.9	31	26727	42536	26726	42532	8/8
18-4	295	70	72	1847	13.9	40.8	30	26746	42460	26748	42450	8/2
18-5	17	76	54	144	23.5	51.2	30	26780	42541	26786	42546	8/8
18-6	58	66	58	454	10.3	50.7	28	26708	42593	26709	42584	8/8
18-7	31	67	81	173	6.5	20.9	28	26802	42554	26809	42551	8/8
18-8	169	74	61	1256	18.9	43.7	33	26780	42410	26777	42418	8/7
18-9	58	72	59	445	25.9	59.6	31	26777	42459	26778	42468	8/8
18-10	113	78	47	1088	25.7	49.2	29	26796	42427	26798	42419	8/7
19-1	236	73	63	1708	17.8	41.9	33	26661	42529	26663	42539	8/2
19-2	168	81	47	1614	40.5	63.5	34	26689	42458	26692	42450	8/2
19-3	69	84	43	726	43.5	65.9	36	26750	42373	26756	42369	8/2
19-4	11	72	69	72	9.1	21.1	40	26632	42486	26628	42479	8/2
19-5	23	93	29	355	60.9	78.6	37	26704	42394	26710	42392	8/2
19-6	171	80	46	1678	34.5	63.2	32	26668	42552	26675	42549	8/2
19-7	329	72	68	2184	14.3	29.5	37	26660	42497	26665	42503	8/2
19-8	318	73	64	2237	19.2	42.3	34	26707	42438	26706	42446	8/2
19-9	610	67	85	3245	9.2	27.2	32	26744	42435	26738	42436	8/2
19-10	383	72	67	2608	16.4	40.5	32	26697	42537	26701	42530	8/2
19-11	88	83	48	840	26.1	36.5	40	26702	42344	26696	42347	8/2
19-12	36	90	34	483	47.2	68.2	37	26664	42459	26662	42469	8/2
20-1	15	76	61	111	13.3	25.2	44	26590	42524	26597	42524	8/2
20-2	0	-	-	-	-	-	65	26676	42337	26682	42333	8/2
20-3	3	87	42	32	33.3	39.7	46	26628	42468	26635	42465	8/2
21-1	0	-	-	-	-	-	17	26769	43244	26774	43252	8/10
21-2	1	132	11	41	100.0	100.0	23	26720	42762	26719	42753	8/8
21-3	0	-	-	-	-	-	13	26853	42914	26846	42909	8/8
21-4	0	-	-	-	-	-	14	26898	42811	26895	42818	8/8

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Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count		Depth (fm)	Loran C Bearings				Date
					By Number	By Weight		Start		End		
								W	Y	W	Y	
22-1	36	41	94	174	13.9	77.1	30	X26564	42954	X26553	42959	8/9
22-2	46	40	73	286	19.6	95.8	31	X26599	42875	X26591	42875	8/9
22-3	3	119	11	119	66.7	95.1	25	X26667	42749	X26660	42752	8/8
22-4	28	68	35	364	42.9	94.1	30	X26560	43032	X26552	43035	8/9
22-5	5	48	77	29	20.0	95.0	26	X26626	42772	X26623	42780	8/8
22-6	28	40	61	207	14.3	97.1	28	X26575	42922	X26575	42932	8/9
22-7	40	72	70	261	7.5	20.1	27	X26684	42653	X26679	42659	8/8
22-8	21	81	37	259	23.8	71.3	30	X26643	42668	X26645	42677	8/8
23-1	43	67	70	280	14.0	51.1	37	15345	42823	15350	42817	8/1
23-2	415	71	60	3148	13.7	31.0	38	15262	42920	15260	42912	8/1
23-3	286	63	103	1264	3.8	15.3	33	15385	42730	15388	42721	8/1
23-4	184	64	97	860	3.3	17.6	37	15409	42652	15413	42646	8/1
23-5	220	20	373	268	2.7	71.8	32	X26563	42875	X26569	42881	8/9
23-6	15	61	107	63	6.7	24.0	40	15383	42663	15378	42665	8/2
23-7	128	56	79	740	10.9	56.7	34	X26521	42926	X26529	42928	8/9
23-8	15	102	15	441	46.7	92.7	31	15395	42766	15392	42758	8/1
23-9	529	77	57	4224	11.5	20.2	40	X26593	42580	X26591	42572	8/2
23-10	22	57	96	104	9.1	32.0	32	X26519	43045	X26522	43054	8/9
23-11	269	60	95	1282	6.7	36.0	37	15323	42874	15327	42866	8/1
23-12	323	66	67	2173	19.8	45.7	34	15248	43023	15242	43024	8/1
23-13	97	45	63	700	20.6	85.1	32	X26537	42976	X26539	42986	8/9
23-14	36	86	42	388	27.8	41.7	41	15251	42899	15254	42891	8/1
23-15	297	69	83	1625	5.1	13.6	38	15298	42875	15304	42874	8/1
23-16	91	18	871	47	1.1	77.2	32	X26550	42923	X26543	42926	8/9
24-1	0	-	-	-	-	-	57	15357	42573	15359	42564	8/2
24-2	1	92	35	13	100.0	100.0	43	15355	42630	15355	42621	8/2
24-3	0	-	-	-	-	-	46	15250	42828	15250	42820	8/1
24-4	4	67	97	19	0.0	0.0	45	15302	42803	15303	42812	8/1
24-5	3	80	55	25	0.0	0.0	46	15199	42947	15205	42945	8/1
24-6	0	-	-	-	-	-	46	15336	42659	15340	42652	8/2
25-1	13	81	24	244	30.8	93.0	16	X26811	43413	X26814	43422	8/10
25-2	7	82	28	115	28.6	86.3	21	X26750	43518	X26743	43510	8/10
25-3	14	108	17	363	78.6	95.8	20	X26796	43474	X26783	43472	8/10
25-4	25	102	18	574	80.0	96.1	25	X26549	43274	X26558	43276	8/9

Appendix

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Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count		Depth (fm)	Loran C Bearings				Date
					By Number	By Weight		Start		End		
								X	Y	X	Y	
26-1	65	88	31	937	44.6	79.3	28	26505	43270	26514	43271	8/9
26-2	50	94	25	901	60.0	89.9	30	26586	43351	26593	43359	8/9
26-3	49	98	24	931	77.6	96.0	28	26489	43238	26494	43246	8/9
26-4	51	92	28	841	51.0	80.9	29	26472	43239	26479	43237	8/9
26-5	19	92	30	287	63.2	89.5	27	26472	43179	26472	43187	8/9
26-6	85	83	37	1035	45.9	79.0	29	26624	43363	26631	43371	8/9
26-7	130	77	52	1134	27.7	49.3	26	26683	43424	26674	43418	8/10
26-8	270	79	49	2510	26.7	53.0	28	26564	43331	26574	43334	8/9
26-9	4	90	26	69	50.0	90.9	32	26472	43148	26464	43153	8/9
26-10	176	81	46	1741	31.8	54.2	28	26520	43288	26515	43294	8/9
26-11	0	-	-	-	-	-	28	26794	43514	26798	43523	8/10
26-12	14	57	105	61	7.1	34.6	27	26467	43208	26460	43213	8/9
26-13	10	78	33	137	40.0	91.8	28	26612	43418	26619	43426	8/10
26-14	0	-	-	-	-	-	27	26829	43544	26821	43537	8/10
27-1	3	70	80	17	0.0	0.0	40	26408	43239	26412	43247	8/9
27-2	0	-	-	-	-	-	36	26689	43437	26697	43441	8/10
27-3	298	70	71	1911	9.1	22.7	37	W15156	43172	W15155	43181	8/1
27-4	364	77	57	2918	12.6	21.7	39	W15166	43074	W15168	43082	8/1
27-5	2	100	27	33	100.0	100.0	37	26607	43392	26614	43401	8/9
27-6	471	81	51	4174	8.5	14.3	40	W15181	43045	W15184	43036	8/1
27-7	444	59	104	1940	7.2	23.6	35	W15196	43166	W15183	43160	8/1
27-8	3	105	21	65	66.7	86.4	40	26412	43249	26419	43246	8/9
27-9	508	61	94	2459	8.5	27.4	34	W15240	43043	W15244	43034	8/1
27-10	451	75	61	3327	7.5	14.3	37	W15167	43136	W15164	43144	8/1
27-11	24	73	60	183	12.5	39.9	37	26492	43315	26497	43324	8/9
27-12	468	74	59	3601	24.8	51.9	36	W15187	43113	W15186	43104	8/1
27-13	207	46	142	660	5.3	27.8	38	26457	43119	26461	43128	8/9
27-14	558	79	53	4770	13.3	22.7	39	W15194	43065	W15199	43067	8/1
27-15	590	78	56	4767	14.1	25.2	37	W15205	43044	W15199	43045	8/1
27-16	255	55	104	1109	8.6	31.5	36	26440	43162	26448	43166	8/9
27-17	610	48	144	1923	2.5	14.3	34	W15220	43084	W15224	43076	8/1
27-18	1	87	42	11	0.0	0.0	30	26768	43501	26775	43503	8/10
27-19	0	-	-	-	-	-	35	26558	43347	26564	43352	8/9
27-20	62	57	122	230	6.5	29.1	38	W15168	43198	W15173	43192	8/1

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Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count		Depth (fm)	Loran C Bearings				Date
					By Number	By Weight		Start		End		
								W	Y	W	Y	
28-1	1	82	51	9	0.0	0.0	50	15151	43025	15151	43028	7/31
28-2	0	-	-	-	-	-	52	15108	43089	15114	43089	7/31
28-3	8	82	48	75	37.5	54.3	46	15107	43128	15108	43119	7/31
28-4	3	80	54	25	0.0	0.0	45	15179	42993	15181	42985	8/1
28-5	5	74	69	33	0.0	0.0	46	15146	43063	15147	43053	7/31
28-6	124	83	46	1227	20.2	34.5	40	15190	43014	15187	43001	8/1
28-7	13	80	54	109	7.7	11.7	45	15161	43044	15162	43052	7/31
28-8	2	77	63	14	0.0	0.0	50	15183	42966	15180	42959	8/1
28-9	33	76	64	234	3.0	6.5	45	15133	43092	15138	43084	7/31
28-10	1	87	42	11	0.0	0.0	51	15179	42946	15185	42944	8/1
29-1	14	108	16	409	71.4	97.4	23	X26639	43466	X26648	43472	8/10
29-2	190	65	65	1319	22.1	76.7	15	X26677	43650	X26679	43658	8/10
29-3	15	105	18	382	80.0	99.0	22	X26601	43501	X26595	43493	8/10
29-4	63	72	65	443	15.9	46.0	22	X26286	43646	X26297	43651	8/11
29-5	18	87	29	283	44.4	85.9	21	X26407	43706	X26406	43714	8/11
29-6	1	62	128	4	0.0	0.0	18	X26344	43738	X26333	43737	8/11
30-1	47	70	53	400	21.3	71.1	30	X26401	43385	X26406	43392	8/10
30-2	103	85	29	1591	47.6	90.2	31	15099	43424	15101	43432	7/31
30-3	7	120	14	220	100.0	100.0	26	X26454	43470	X26446	43472	8/11
30-4	180	71	66	1238	17.2	48.1	27	X26211	43635	X26205	43628	8/11
30-5	148	62	101	663	7.4	32.2	30	X26450	43332	X26441	43325	8/10
30-6	260	66	89	1331	5.0	20.0	30	X26403	43332	X26410	43338	8/10
30-7	184	70	66	1273	19.6	57.1	26	X26261	43613	X26264	43622	8/11
30-8	8	88	32	114	62.5	92.5	27	X26428	43520	X26419	43519	8/11
30-9	66	65	79	377	16.7	51.5	30	X26380	43511	X26371	43512	8/11
30-10	6	80	50	55	50.0	74.6	27	X26530	43393	X26521	43387	8/10
30-11	14	118	15	419	100.0	100.0	26	X26482	43425	X26479	43432	8/11
30-12	42	81	40	476	47.6	83.5	30	X26317	43544	X26311	43549	8/11
30-13	161	68	73	1003	9.3	39.8	29	X26427	43352	X26436	43359	8/10
30-14	20	77	38	241	35.0	85.7	28	X26413	43394	X26417	43402	8/11
30-15	16	106	19	377	87.5	98.1	28	X26433	43422	X26442	43422	8/11
31-1	9	84	22	188	44.4	91.6	38	14935	43441	14942	43443	7/30
31-2	381	77	50	3423	15.2	38.0	34	15035	43399	15036	43390	7/31
31-3	35	77	48	328	17.1	42.4	38	15028	43345	15023	43351	7/31
31-4	42	77	50	381	31.0	54.4	39	15113	43209	15120	43211	7/31
31-5	259	61	111	1057	7.3	31.5	33	14899	43523	14907	43523	7/30
31-6	342	69	67	2304	27.2	60.8	32	X26167	43593	X26158	43595	8/11
31-7	23	81	41	257	26.1	59.3	40	14905	43397	14912	43400	7/30
31-8	8	111	15	243	62.5	92.6	39	14999	43379	14993	43375	7/31
31-9	35	81	31	504	40.0	90.1	31	14970	43508	14979	43506	7/30
31-10	239	74	63	1725	5.9	14.9	34	15068	43388	15075	43388	7/31

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Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count By Number	% Catch ≤40 Count By Weight	Depth (fm)	Loran C Bearings Start W	Start Y	End W	End Y	Date
31-11	93	77	46	912	22.6	51.7	37	15045	43340	15039	43335	7/31
31-12	680	67	77	4001	8.5	28.2	32	15093	43384	15088	43380	7/31
31-13	403	80	49	3701	16.4	27.3	36	14869	43454	14862	43450	7/30
31-14	0	-	-	-	-	-	39	14980	43382	14977	43375	7/31
31-15	195	80	49	1807	18.5	34.5	35	14908	43482	14903	43477	7/30
31-16	167	71	66	1154	11.4	32.5	33	15020	43442	15018	43451	7/31
31-17	649	81	49	6019	18.2	29.4	39	14856	43427	14863	43421	7/30
31-18	27	77	37	334	33.3	82.2	33	X26496	43350	X26487	43348	8/10
31-19	75	76	45	749	25.3	65.9	33	15027	43432	15031	43425	7/31
31-20	11	118	12	402	72.7	96.0	37	14957	43465	14961	43471	7/30
31-21	293	55	90	1469	12.3	40.7	37	15089	43250	15093	43242	7/31
31-22	6	105	16	168	50.0	88.8	38	X26437	43297	X26429	43292	8/10
31-23	267	67	73	1657	13.1	44.1	34	15019	43469	15019	43460	7/31
31-24	443	73	66	3056	12.9	28.1	37	15053	43285	15058	43289	7/31
32-1	2	130	11	81	100.0	100.0	44	14960	43352	14954	43349	7/31
32-2	7	78	60	53	0.0	0.0	48	15075	43144	15081	43149	7/31
32-3	0	-	-	-	-	-	47	14954	43397	14960	43393	7/31
32-4	0	-	-	-	-	-	50	14876	43314	14884	43321	7/31
33-1	0	-	-	-	-	-	19	X26270	43745	X26262	43739	8/11
33-2	48	93	30	731	58.3	83.7	24	X26089	43743	X26093	43750	8/12
33-4	55	80	43	586	20.0	56.8	22	X26015	43735	X26014	43742	8/12
33-5	3	99	28	49	100.0	100.0	21	X26090	43784	X26084	43788	8/12
33-6	105	77	50	953	38.1	70.3	24	X26146	43732	X26136	43733	8/12
33-7	116	78	48	1091	28.4	63.6	24	X26209	43700	X26199	43698	8/11
33-9	69	82	41	755	34.8	70.1	24	X26069	43724	X26078	43723	8/12
34-2	305	70	64	2177	24.3	62.8	28	X26092	43677	X26084	43680	8/11
34-3	94	84	35	1215	48.9	86.2	28	X25996	43670	X25986	43669	8/11
34-4	92	81	44	955	38.0	72.1	26	X26052	43709	X26057	43704	8/12
34-5	132	77	49	1217	44.7	77.2	29	X26064	43676	X26053	43673	8/11
34-6	390	63	94	1875	9.7	40.3	26	X26173	43691	X26168	43683	8/11
34-7	480	64	84	2590	12.7	39.7	27	X26174	43649	X26180	43656	8/11
34-8	112	68	62	824	18.8	66.9	28	X26031	43672	X26021	43673	8/11
34-9	491	61	93	2402	13.8	47.4	28	X26128	43661	X26132	43655	8/11
34-10	31	90	26	538	41.9	83.6	27	X25972	43706	X25980	43702	8/12
34-11	58	90	31	853	51.7	84.2	27	X26020	43791	X26019	43798	8/12
34-12	98	73	51	869	29.6	76.8	29	X26004	43662	X26002	43668	8/11
34-13	150	75	55	1234	28.0	63.9	26	X26071	43699	X26082	43701	8/12
34-14	238	70	60	1812	29.4	71.0	27	X26145	43665	X26136	43664	8/11
35-2	244	68	63	1758	25.8	74.3	32	X26082	43600	X26073	43602	8/11
35-3	11	97	28	176	81.8	93.0	32	X25932	43663	X25936	43671	8/12
35-4	113	85	38	1360	36.3	63.2	35	14846	43498	14850	43504	7/30
35-5	0	-	-	-	-	-	39	14657	43624	14665	43622	7/29
35-6	107	70	53	913	28.0	73.5	36	14815	43524	14821	43519	7/30
35-7	0	-	-	-	-	-	40	14619	43555	14617	43554	7/30

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Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count By Number	% Catch ≤40 Count By Weight	Depth (fm)	Loran C Bearings Start W	Start Y	End W	End Y	Date
35-8	90	78	45	902	22.2	57.4	35	14859	43520	14866	43520	7/30
35-9	0	-	-	-	-	-	41	14769	43522	14776	43523	7/30
35-10	268	57	102	1189	13.8	55.2	30	X26149	43623	X26142	43616	8/11
36-1	0	-	-	-	-	-	53	14678	43347	14685	43350	7/30
36-2	0	-	-	-	-	-	45	14783	43397	14782	43404	7/30
Georges Bank (Tows 45-1 to 74-8)												
45-1	0	-	-	-	-	-	24	13868	43615	13860	43617	8/20
45-2	0	-	-	-	-	-	25	13911	43594	13906	43600	8/20
45-3	0	-	-	-	-	-	23	14023	43583	14017	43583	8/19
46-1	1	137	10	46	100.0	100.0	28	13964	43525	13958	43525	8/20
46-2	0	-	-	-	-	-	27	13992	43553	13987	43549	8/20
46-3	170	67	79	981	13.5	41.9	30	13803	43624	13803	43630	8/20
46-4	1	67	95	5	0.0	0.0	28	14043	43862	14036	43862	8/19
46-5	3	105	20	69	66.7	89.3	24	13865	43545	13861	43547	8/20
46-6	0	-	-	-	-	-	28	13912	43732	13904	43733	8/20
49-1	70	67	62	511	11.4	49.8	20	13756	43820	13765	43819	8/21
49-2	4	62	120	15	0.0	0.0	22	13755	44030	13752	44035	8/21
49-3	31	96	22	646	61.3	94.9	21	13769	43882	13765	43888	8/21
49-4	63	59	84	340	4.8	51.1	24	13803	43693	13796	43696	8/20
49-5	4	50	231	8	0.0	0.0	21	13745	43853	13750	43857	8/21
49-6	154	66	52	1355	20.1	71.0	21	13755	43881	13754	43886	8/21
49-7	5	45	294	8	0.0	0.0	22	13739	43835	13736	43841	8/21
49-8	21	45	45	212	14.3	94.4	18	13796	43936	13798	43941	8/21
49-9	35	55	154	103	0.0	0.0	16	13782	43831	13783	43836	8/21
50-1	376	62	100	1711	3.7	14.0	30	13789	43656	13794	43659	8/20
50-2	41	80	46	408	19.5	42.8	30	13750	43695	13750	43687	8/20
50-3	0	-	-	-	-	-	28	13732	43867	13731	43862	8/21
50-4	571	53	186	1392	0.7	4.6	27	13782	43707	13780	43713	8/20
50-5	2740	45	173	7169	2.5	15.2	28	13769	43913	13773	43917	8/21
50-7	279	74	49	2585	25.4	66.6	32	13751	43668	13753	43662	8/20
50-8	2592	54	128	9180	4.8	21.4	28	13729	43794	13730	43791	8/22
50-9	648	64	98	3006	0.6	5.3	22	13787	43961	13784	43966	8/21
50-10	610	72	60	4617	21.5	55.0	33	13775	43662	13780	43654	8/20
50-11	141	61	103	624	7.8	29.5	29	13788	43676	13787	43681	8/20
50-12	94	14	6757	6	0.0	0.0	29	13740	44052	13741	44057	8/21
50-13	6	37	626	4	0.0	0.0	26	13723	43848	13729	43843	8/21
50-14	343	53	150	1041	3.5	23.3	27	13758	43711	13761	43705	8/20
50-15	4564	53	167	12387	1.1	7.2	28	13774	43724	13769	43729	8/20
50-16	46	61	63	330	15.2	74.6	27	13775	43738	13776	43743	8/21

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Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count		Depth (fm)	Loran C Bearings				Date
					By Number	By Weight		Start		End		
								W	Y	W	Y	
51-1	158	104	22	3233	77.0	90.0	39	13728	43778	13732	43773	8/22
51-2	20	68	49	185	35.0	88.2	30	13756	43742	13760	43737	8/20
51-3	2144	48	243	4003	0.3	4.0	33	13749	43897	13745	43893	8/21
51-4	16	32	991	7	0.0	0.0	33	13709	43843	13710	43849	8/21
51-5	1	32	991	1	0.0	0.0	31	13719	43867	13725	43869	8/21
51-6	2	110	10	88	50.0	97.6	40	13760	43992	13764	43986	8/21
51-7	1	117	16	28	100.0	100.0	37	13733	44034	13735	44028	8/21
51-8	3228	48	200	7308	1.2	9.7	34	13712	43808	13716	43802	8/22
51-9	158	87	35	2046	48.7	75.6	39	13738	43675	13737	43669	8/20
51-10	4	47	288	6	0.0	0.0	34	13736	43713	13735	43717	8/20
51-11	36	74	59	279	27.8	54.5	37	13754	43645	13751	43641	8/20
51-12	7	66	65	48	14.3	65.6	32	13770	43936	13766	43932	8/21
52-1	10	78	34	133	40.0	84.9	55	13711	43688	13705	43694	8/20
52-2	0	-	-	-	-	-	52	13697	43891	13692	43887	8/21
52-3	35	105	20	797	85.7	98.7	39	13745	43909	13742	43905	8/21
52-4	13	119	12	476	76.9	95.4	44	13729	43642	13726	43638	8/20
52-5	10	88	28	160	50.0	89.9	44	13729	43762	13727	43757	8/22
52-6	10	95	27	165	70.0	92.6	50	13708	43792	13715	43787	8/22
52-7	185	85	42	1995	38.4	52.1	57	13669	43698	13662	43699	8/22
52-8	3	37	600	2	0.0	0.0	60	13700	43700	13698	43695	8/22
52-9	60	105	20	1336	81.7	94.9	50	13710	43739	13709	43734	8/22
52-10	22	82	30	333	50.0	87.3	45	13691	43820	13698	43815	8/22
52-11	32	104	17	838	65.6	94.3	54	13706	43673	13704	43676	8/20
52-12	141	72	56	1133	20.6	60.3	45	13685	43650	13687	43645	8/23
53-1	4	82	21	88	50.0	98.7	42	13510	43729	13502	43732	8/23
53-2	240	72	57	1923	21.7	61.1	43	13652	43663	13659	43659	8/22
53-3	23	110	17	623	82.6	97.4	56	13639	43696	13637	43692	8/22
53-4	17	83	27	280	41.2	86.5	54	13447	43777	13440	43781	8/23
53-5	40	89	24	762	47.5	91.6	41	13410	43786	13406	43792	8/23
53-6	28	115	14	939	78.6	97.5	54	13506	43755	13510	43749	8/23
53-7	52	104	21	1132	86.5	98.2	55	13585	43721	13578	43725	8/23
54-1	31	111	16	905	71.0	94.4	34	13466	43715	13458	43720	8/23
54-2	51	102	19	1211	72.5	95.4	35	13554	43662	13561	43663	8/23
54-3	71	67	91	355	1.4	7.8	36	13576	43686	13572	43692	8/23
54-4	61	89	27	1029	41.0	81.8	34	13673	43637	13680	43636	8/23
54-5	0	-	-	-	-	-	34	13411	43749	13415	43752	8/23
54-6	430	72	63	3116	19.3	48.8	38	13623	43656	13615	43655	8/23
54-7	0	-	-	-	-	-	34	13433	43423	13428	43429	8/23
57-1	0	-	-	-	-	-	31	13529	43522	13536	43519	8/28
57-2	8	98	22	162	50.0	83.1	40	13631	43466	13637	43467	8/28
57-3	1	142	9	51	100.0	100.0	34	13489	43537	13483	43539	8/28

Appendix

Table 1. Summary of 1986 NMFS sea scallop research vessel sampling data from the Mid-Atlantic and Georges Bank, by individual tow.

Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count By Number	% Catch ≤40 Count By Weight	Depth (fm)	Loran C Bearings Start W	Loran C Bearings Start Y	Loran C Bearings End W	Loran C Bearings End Y	Date
58-1	24	21	686	16	0.0	0.0	53	13646	43417	13643	43423	8/28
58-2	19	29	88	98	15.8	99.7	41	13511	43577	13511	43481	8/28
58-3	20	20	245	37	5.0	97.6	49	13627	43449	13625	43444	8/28
58-4	88	43	184	218	2.3	14.1	51	13675	43421	13673	43427	8/29
58-5	109	29	254	194	1.8	25.1	54	13555	43436	13558	43438	8/28
58-6	6	48	37	73	33.3	99.9	46	13567	43468	13561	43472	8/28
58-7	0	-	-	-	-	-	55	13632	43416	13626	43420	8/28
58-8	16	48	47	154	25.0	90.3	43	13524	43486	13521	43483	8/28
59-1	20	110	13	679	65.0	93.7	34	13259	43575	13252	43577	8/27
59-2	7	131	11	293	100.0	100.0	33	13302	43581	13308	43579	8/26
59-3	73	76	36	925	35.6	80.2	41	13277	43545	13282	43540	8/27
59-4	36	127	12	1380	94.4	98.6	36	13329	43562	13335	43561	8/27
59-5	27	125	12	1014	96.3	99.1	33	13365	43560	13371	43557	8/27
59-6	27	111	16	789	74.1	94.5	40	13440	43477	13435	43476	8/28
59-7	1	82	50	9	0.0	0.0	31	13248	43599	13255	43596	8/27
59-8	4	150	7	246	100.0	100.0	33	13391	43548	13397	43544	8/27
59-9	0	-	-	-	-	-	33	13216	43584	13220	43586	8/27
59-10	13	114	16	363	92.3	98.7	37	13405	43519	13412	43517	8/27
59-11	269	60	92	1321	6.7	31.7	42	13229	43541	13232	43536	8/27
59-12	9	128	11	369	100.0	100.0	39	13460	43512	13460	43509	8/28
60-1	15	39	225	30	0.0	0.0	54	13258	43468	13261	43470	8/27
60-2	53	74	49	490	30.2	70.9	45	13264	43526	13268	43521	8/27
60-3	2	87	42	22	0.0	0.0	53	13355	43433	13361	43431	8/28
60-4	17	119	14	545	94.1	99.7	50	13287	43493	13281	43497	8/27
60-5	136	74	52	1194	20.6	45.1	43	13468	43480	13465	43477	8/28
60-6	4	55	182	10	0.0	0.0	54	13395	43430	13396	43434	8/28
60-7	35	97	21	748	74.3	97.9	47	13247	43510	13240	43514	8/27
60-8	60	20	583	47	1.7	52.0	56	13521	43416	13525	43419	8/28
60-9	277	57	115	1095	3.2	18.4	51	13188	43486	13183	43490	8/27
60-10	99	86	37	1228	46.5	69.2	42	13363	43504	13360	43501	8/28
60-11	4	116	16	111	100.0	100.0	46	13375	43476	13372	43481	8/28
60-12	25	90	26	430	44.0	81.6	49	13342	43476	13348	43473	8/28
61-1	75	80	41	827	30.7	72.0	41	13168	43531	13174	43529	8/27
61-2	0	-	-	-	-	-	34	13092	43647	13087	43646	8/26
61-3	63	81	36	783	33.3	78.1	40	13086	43565	13085	43561	8/27
61-4	0	-	-	-	-	-	34	13133	43616	13128	43620	8/26
61-5	8	138	9	388	100.0	100.0	36	13145	43596	13139	43597	8/26
61-6	16	122	12	616	81.3	97.7	41	13017	43654	13021	43650	8/26
61-7	0	-	-	-	-	-	34	13068	43676	13065	43673	8/26
61-8	90	70	64	633	11.1	46.0	39	13088	43586	13089	43581	8/27
621-1	182	75	53	1570	26.4	52.8	49	13115	43519	13116	43514	8/27
621-2	509	60	98	2351	9.0	37.6	51	12994	43585	12998	43581	8/26
621-3	146	69	63	1059	17.8	58.1	43	13089	43554	13090	43550	8/27
621-4	114	72	51	1012	35.1	72.4	49	13037	43563	13040	43565	8/26

Appendix

Table 1. Summary of 1986 NMFS sea scallop research vessel sampling data from the Mid-Atlantic and Georges Bank, by individual tow.

Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count By Number	% Catch ≤40 Count By Weight	Depth (fm)	Loran C Bearings Start W	Loran C Bearings Start Y	Loran C Bearings End W	Loran C Bearings End Y	Date
621-5	73	72	54	616	19.2	62.8	41	13058	43578	13060	43581	8/26
621-6	126	72	62	928	13.5	43.7	45	12959	43650	12963	43645	8/26
621-7	158	62	96	748	1.3	4.2	51	13042	43543	13042	43547	8/26
621-8	164	66	51	1463	38.4	84.1	51	12968	43606	12974	43602	8/26
621-9	75	82	33	1022	28.0	77.2	42	13035	43508	13030	43512	8/26
621-10	169	78	44	1740	42.6	76.3	48	13168	43509	13174	43508	8/27
621-11	112	57	103	493	4.5	18.0	53	13154	43490	13153	43495	8/27
621-12	223	76	49	2085	32.3	62.4	48	13133	43516	13134	43511	8/27
631-1	0	-	-	-	-	-	36	12986	43713	12992	43709	8/25
631-2	1	62	122	4	0.0	0.0	33	12949	43739	12956	43737	8/25
631-3	0	-	-	-	-	-	39	12949	43719	12955	43715	8/25
631-4	263	78	48	2510	31.2	65.1	31	12890	43858	12896	43858	8/25
631-5	8	76	55	66	12.5	31.8	34	12925	43803	12933	43800	8/25
631-6	0	-	-	-	-	-	31	13037	43715	13041	43717	8/25
631-7	47	87	31	680	42.6	81.9	36	12932	43767	12938	43766	8/25
651-1	6	142	8	359	83.3	98.7	29	13065	43884	13063	43880	8/24
651-2	12	122	12	462	75.0	95.8	35	13247	43851	13239	43851	8/23
651-3	190	58	112	771	6.3	29.2	29	12955	43890	12961	43891	8/24
651-4	2394	63	109	9955	2.3	9.2	28	12894	43878	12902	43876	8/25
651-5	8	138	9	392	100.0	100.0	33	13171	43860	13164	43862	8/23
651-6	548	69	78	3206	9.1	25.8	31	12889	43868	12896	43866	8/25
651-7	132	53	178	336	0.0	0.0	30	12911	43890	12916	43891	8/25
651-8	5	100	19	119	40.0	82.2	31	13292	43840	13285	43840	8/23
651-9	33	68	53	284	15.2	69.0	40	13112	43879	13108	43885	8/24
651-10	3	155	7	205	100.0	100.0	31	13205	43851	13198	43854	8/23
651-11	17	108	16	478	58.8	87.6	32	13138	43868	13145	43866	8/23
651-12	370	71	55	3034	12.4	55.6	28	13003	43886	13002	43885	8/24
661-1	35	90	29	541	42.9	76.8	48	13133	43881	13125	43879	8/23
661-2	92	64	97	431	3.3	9.0	43	12889	43894	12894	43895	8/25
661-3	46	90	26	814	54.3	90.7	39	13064	43892	13066	43887	8/24
661-4	25	86	28	402	44.0	89.5	36	13016	43893	13013	43890	8/24
661-5	9	111	17	235	88.9	99.1	47	13232	43861	13239	43860	8/23
661-6	27	101	22	565	74.1	94.0	48	13158	43874	13151	43876	8/23
661-7	258	80	46	2542	32.6	58.1	45	12971	43899	12977	43898	8/24
661-8	1408	56	127	5042	5.4	25.3	40	12933	43897	12927	43895	8/25
661-9	2	150	7	127	100.0	100.0	39	13321	43841	13313	43842	8/23
661-10	81	77	37	991	33.3	84.1	45	13202	43864	13195	43865	8/23
661-11	78	81	35	999	34.6	78.1	46	13103	43886	13101	43883	8/24
661-12	275	63	83	1505	10.5	49.5	43	13035	43894	13028	43892	8/24
71-1	32	102	23	635	81.3	92.3	23	12952	43865	12957	43866	8/24
71-2	2	140	9	97	100.0	100.0	30	13150	43862	13154	43857	8/23
71-3	279	64	59	2135	21.9	68.5	30	12948	43848	12955	43845	8/24
71-4	9	101	21	195	55.6	83.4	26	12984	43854	12983	43858	8/24

Appendix

Table 1. Summary of 1986 NMFS sea scallop research vessel sampling data from the Mid-Atlantic and Georges Bank, by individual tow.

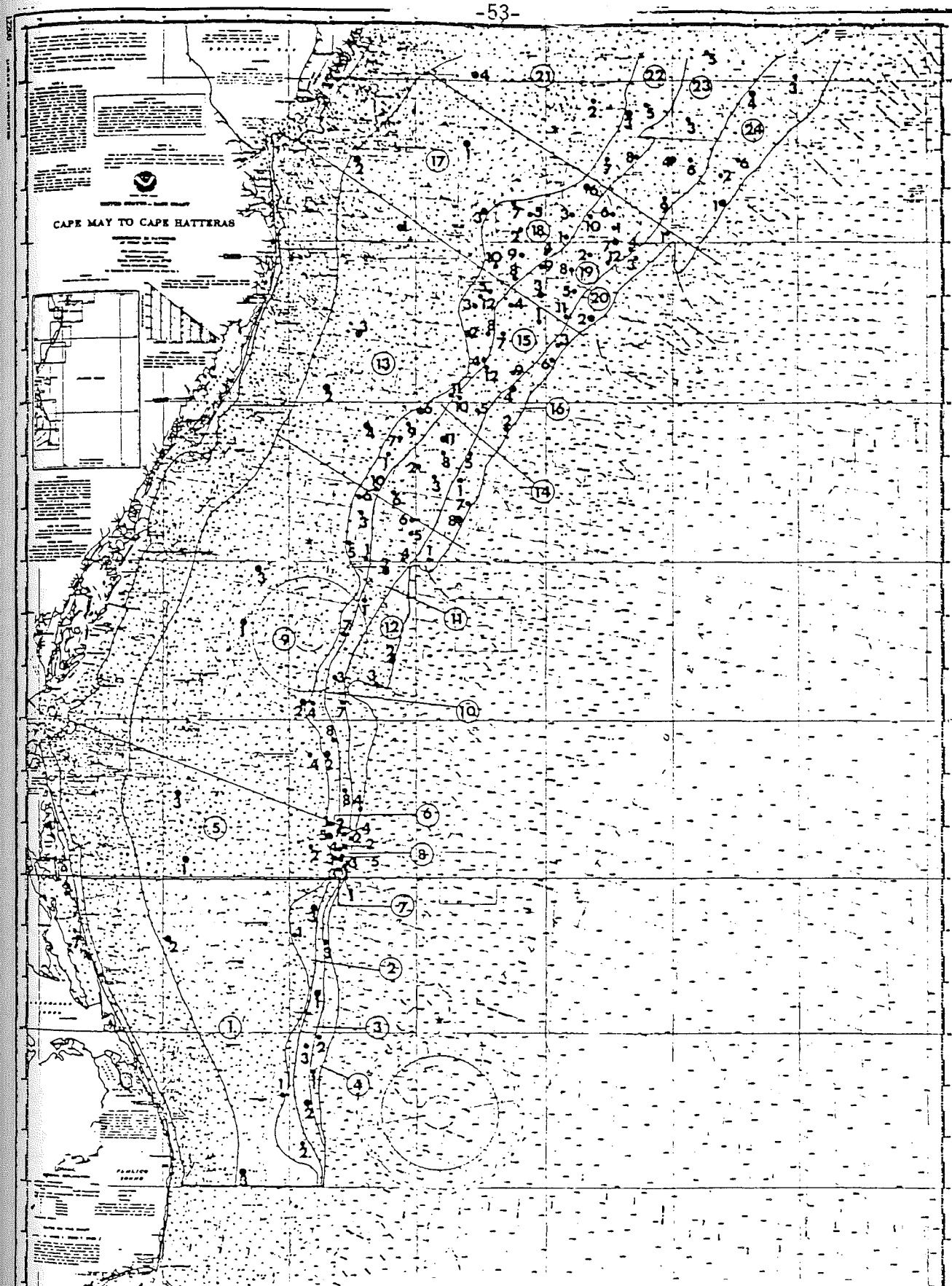
Strata Tow Number[1]	No. of Sea Scallops Caught	Mean Shell Height (mm)	Calculated Meat Count[2]	Meat Weight (g) Per Tow	% Catch ≤40 Count By Number	% Catch ≤40 Count By Weight	Depth (fm)	Loran C Bearings Start W	Loran C Bearings Start Y	Loran C Bearings End W	Loran C Bearings End Y	Date
71-5	6	81	33	83	16.7	69.5	24	13063	43877	13069	43877	8/24
71-6	318	73	47	3037	18.2	65.8	27	12904	43862	12909	43862	8/25
72-1	0	-	-	-	-	-	19	13121	43829	13121	43824	8/24
72-2	0	-	-	-	-	-	18	13048	43841	13053	43843	8/24
72-3	0	-	-	-	-	-	17	13178	43826	13170	43828	8/24
72-4	0	-	-	-	-	-	16	13074	43813	13074	43818	8/24
72-5	3	115	12	112	66.7	97.4	26	13095	43874	13094	43870	8/24
72-6	75	88	29	1187	56.0	90.6	24	13018	43872	13017	43867	8/24
73-1	0	-	-	-	-	-	21	13210	43692	13215	43689	8/26
73-2	0	-	-	-	-	-	25	13122	43684	13123	43688	8/26
73-3	0	-	-	-	-	-	19	13060	43810	13057	43806	8/24
73-4	0	-	-	-	-	-	26	13154	43664	13155	43668	8/26
73-5	0	-	-	-	-	-	24	13133	43720	13141	43716	8/26
73-6	6	59	112	24	0.0	0.0	24	13083	43772	13078	43770	8/26
74-2	9	119	14	286	88.9	97.4	29	13036	43801	13039	43804	8/24
74-3	0	-	-	-	-	-	29	13146	43641	13149	43636	8/26
74-4	13	115	16	377	84.6	95.5	26	12991	43822	12985	43826	8/24
74-5	0	-	-	-	-	-	28	13078	43753	13071	43754	8/25
74-6	0	-	-	-	-	-	31	13106	43659	13104	43655	8/26
74-7	0	-	-	-	-	-	32	12966	43790	12972	43788	8/25
74-8	0	-	-	-	-	-	30	12953	43772	12948	43770	8/25

[1]See Appendix Figures 1-3 for tow locations.

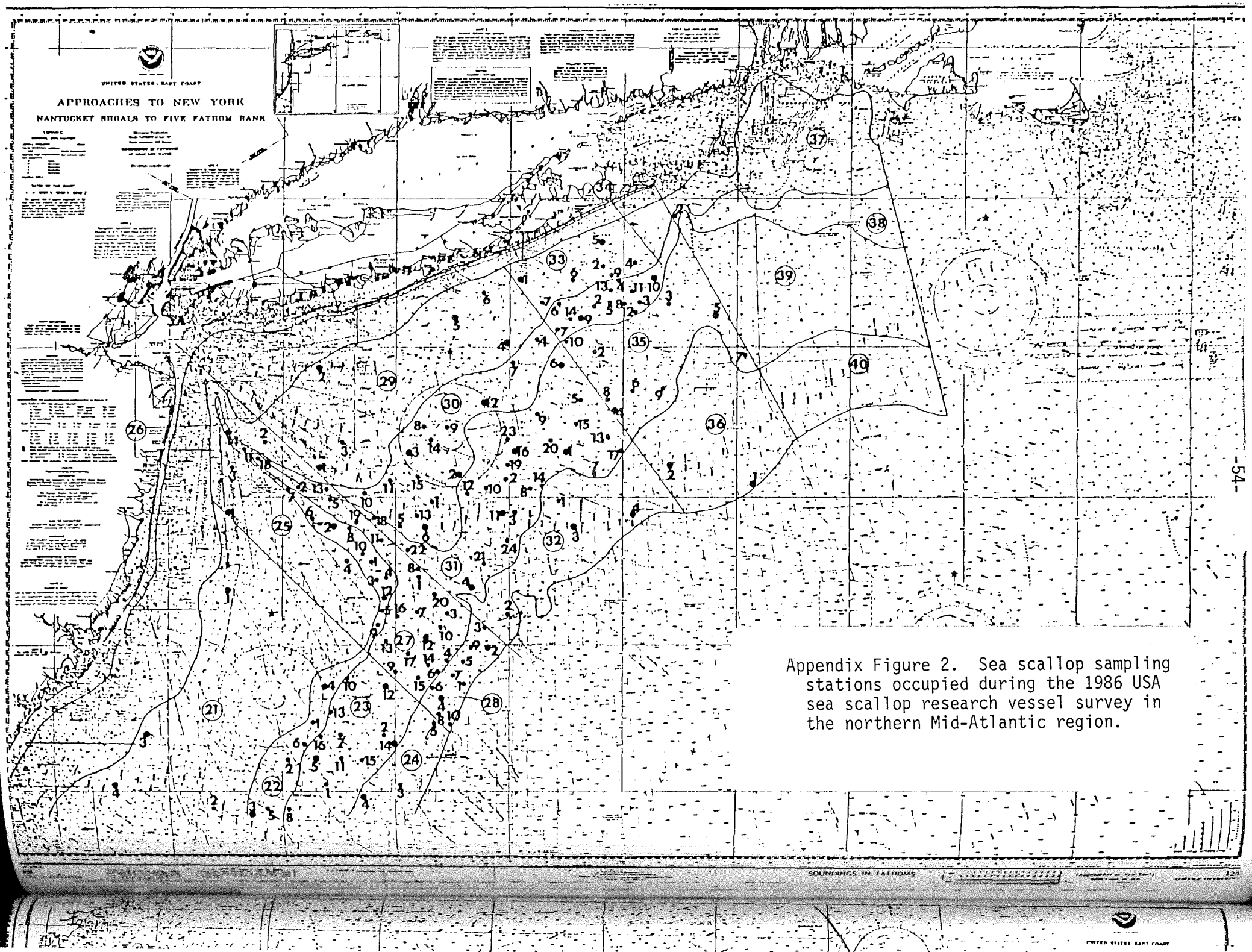
[2]Number of meats per pound. Calculated by applying shell height-meat weight equation to survey shell height frequencies to obtain average meat weight per scallop and dividing this value into 453.6 grams (1 pound). Shell height-meat weight equations utilized were:

Mid-Atlantic: $\ln \text{Meat Weight(g)} = -12.1628 + 3.2539 \ln \text{Shell Height (mm)}$ (n=11943, r=0.98)

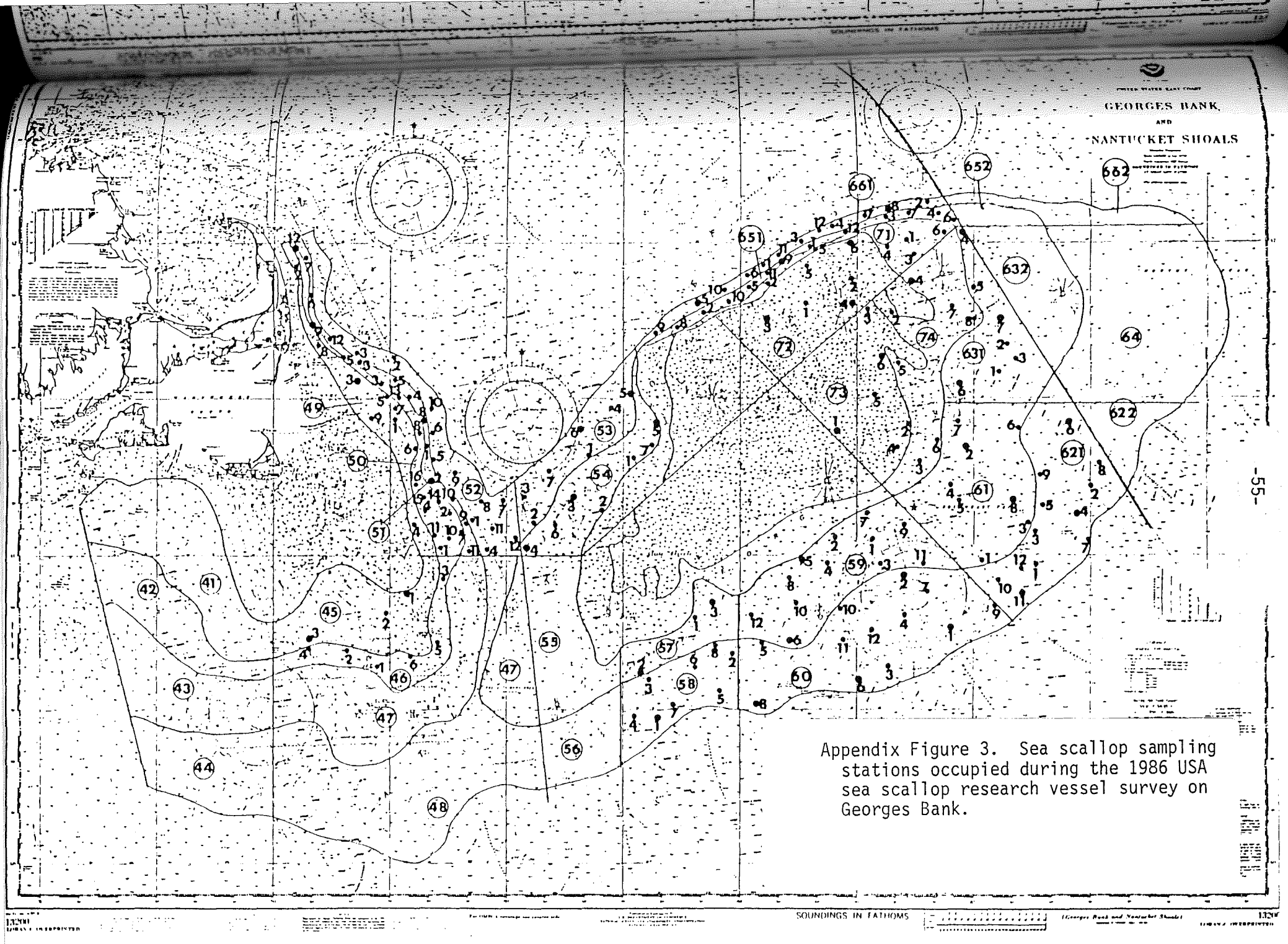
Georges Bank: $\ln \text{Meat Weight(g)} = -11.7656 + 3.1693 \ln \text{Shell Height (mm)}$ (n=5863, r=0.98)



Appendix Figure 1. Sea scallop sampling stations occupied during the 1986 USA sea scallop research vessel survey in the Mid-Atlantic region.



Appendix Figure 2. Sea scallop sampling stations occupied during the 1986 USA sea scallop research vessel survey in the northern Mid-Atlantic region.



Appendix Figure 3. Sea scallop sampling stations occupied during the 1986 USA sea scallop research vessel survey on Georges Bank.