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CLAM (*Spisula solidissima*) RESOURCE

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ABSTRACT

A survey of New Jersey's inshore surf clam (*Spisula solidissima*) resource was conducted during a three year period of study between August 1, 1997 to July 31, 2000. This report focuses mainly on the results of the 1999 segment of the study with comparisons to data collected in 1997 and 1998. In 1999, a total of 330 stations was sampled from June 2nd through August 12th. A commercial hydraulic clam dredge equipped with a 72-inch knife was used to determine clam abundance at each station. Surf clam population structure was determined by measuring clams from a one bushel subsample of the catch per station and constructing length frequency distributions. The general distribution of recently set *S. solidissima* was monitored by collecting a 0.1 meter Petersen grab sample from each station.

The total surf clam standing stock for New Jersey territorial waters from Shark River Inlet to Cape May in 1999 was 24,328,495 U.S. standard bushels. This represents an increase of 0.7% over 1998. The majority of the surf clam resource was distributed between Absecon Inlet and Shark River Inlet. However, the abundance of surf clams south of Great Egg Harbor Inlet has increased over the last few years. This is also reflected in the harvest data, which shows a considerable increase in harvest activities in this coastal region. Overall, coastal length frequency distributions have not changed dramatically, but the mean shell lengths have been steadily increasing since 1993. The mean shell length of surf clams found in 1993 was 99.5 mm and had steadily increased to a mean shell length of 122.1 mm in 1999. The most notable difference was the lack of clams collected in the dredge that measured less than 71 mm (2.7 inches) in the last several years. The total number of clams collected in the dredge that measured less than 71 mm was 67 in 1999, 276 in 1998, 5,778 in 1997 and 3,646 in 1996, as compared to 1994 and 1995 when 50,491 and 51,418 clams were collected, respectively.

A total of 318 Petersen grabs were taken in 1999. The mean number of juvenile clams collected in the benthic grab was 5.5 per 0.1-square meter, ranging from 0 - 139 individuals per grab. The largest number of juvenile *S. solidissima* collected in grab samples occurred within one mile of the coast off Cape May and Atlantic Counties.

Surf clam harvest records show that the majority of harvest activities occurred in the harvest zones north of Absecon Inlet. However, the harvest areas below Great Egg Harbor Inlet have become an important contributor to the State's harvest for the first time since the early 1970's. New Jersey vessels harvested a total of 699,649 industry bushels of surf clams from New Jersey's territorial waters during the 1999-2000 season.

INTRODUCTION

The surf clam fishery is currently the largest molluscan fishery in New Jersey, accounting for 67% (by weight) of the State's total molluscan commercial landings in 1999. New Jersey vessels harvested 595,492 industry¹ bushels of surf clams in calendar year 1999 (17.2% of the Mid-Atlantic and New England regions' total surf clam landings²) from New Jersey territorial waters. Historically, New Jersey leads all other states in surf clam landings because New Jersey vessels participate in fisheries in both state and federally controlled waters. For example, more than 84% of the total Mid-Atlantic and New England regions' surf clam harvest in 1999 was landed in New Jersey and had an ex-vessel value of over 29.0 million dollars.

The success of the New Jersey surf clam fishery is a result of a favorable habitat capable of supporting commercially viable concentrations of surf clams and the development of state management programs. The development and success of these programs is dependent on the availability of accurate and up to date information on the status of the resource. Current knowledge of stock size, population structure, and recruitment is especially important because of the tremendous harvesting power that presently exists within the industry and because the potential for over harvest is large in relation to the size and stability of the resource.

Knowledge of New Jersey's surf clam resource was at its lowest in the early 1970's. Dwindling stocks, caused by over harvest and recruitment failures, provided the impetus for the first statewide surf clam inventories. Information obtained by those and subsequent surveys, conducted annually by Rutgers University, was used successfully to manage the State's surf clam fishery. In 1987, the New Jersey Bureau of Shellfisheries assumed responsibility for the surf clam stock assessment with survey work commencing in 1988. Until 1994, the Bureau of Shellfisheries continued to use the sampling design and procedures employed by Rutgers University in order to facilitate the comparison of results with past surveys. Since then, as a result of recommendations from project review personnel, the sampling design has changed to stratified random sampling.

¹A U.S. standard bushel equals 1.24 cubic feet and an industry bushel equals 1.88 cubic feet. To convert U.S. standard bushels to industry bushels, multiply by 0.66.

²Mid-Atlantic and New England figures for 1999 landings are preliminary, from NOAA, NMFS, Northeast Fisheries Science Center, Woods Hole, Ma.

The three specific objectives for this project are: 1) to provide a current biological assessment of New Jersey's surf clam resource, 2) to provide a basic understanding of the population structure of New Jersey's surf clam population, and 3) to synthesize the information obtained through objectives 1 and 2 in order to assist fishery managers with the development and implementation of sound management practices. Fulfillment of these objectives will maximize fishery productivity and maintain a steady contribution from the fishery to the State's economy.

METHODS

A 65 ft. commercial surf clam vessel, the "Elizabeth C II," was chartered for the field work. A total of 330 stations were sampled from June 2, 1999 through August 12, 1999. Station locations are shown in Figures 1-5. Stations were chosen by stratified random sampling using optimum allocation based on data collected from 1994 to 1998. The New Jersey coast from the Shrewsbury Rocks to Cape May to three miles offshore was divided into fifteen, one mile wide strata. Figure 6 illustrates the strata that were sampled in 1999. The Geographic Information System (GIS) was used to calculate the total area of each stratum in square nautical miles. Each stratum was divided into blocks of approximately equal size. Blocks that could not be sampled due to inaccessible depth, surf zones, wrecks or obstructions (including sewer outfall pipes) and areas containing underwater communication cables were eliminated. The remaining blocks were numbered and selected randomly. LORAN C coordinates of block midpoints were given to the vessel captain for site location. Alternate stations were used when necessary to avoid fishing gear, especially in areas where numerous fish pots were set along runners throughout the survey area. At each station, the beginning and ending latitude and longitude coordinates were recorded using a *Northstar 951XD* DGPS receiver/chart plotter. The GPS coordinates were used to verify the actual station locations and to calculate distance towed with the dredge. The beginning and ending LORAN C coordinates were also recorded from the vessel's LORAN.

A commercial hydraulic clam dredge equipped with a 72-inch knife was used to determine clam abundance at each station. The floor of the dredge was lined with rebar containing two inch (51 mm) squares to retain smaller clams. Ring diameter of the metal bag at the codend of the dredge was three inches (72 mm). One five minute tow was taken per station. When tows were less than five minutes, all data were numerically standardized to five minutes. Live surf clam and shell trash were sorted from each

haul and their volumes recorded in U.S. standard bushels. Associated organisms (by catch) were identified and enumerated.

A one bushel subsample of clams was randomly selected from each station and measured to the nearest millimeter (mm) in order to construct length frequency distributions. When less than one bushel was caught, all live surf clams were measured. Lengths were combined into three millimeter groupings. The midpoints of each size grouping were plotted on the x-axis of size frequency distribution graphs to illustrate population structures. Composite graphs for the entire coast and of each strata were constructed by summing all clams measured in the stations comprising the particular region. To determine the total number of clams measuring 70 mm or less at each station, the number of clams in the subsample less than 71 mm was multiplied by the total number of bushels caught per standardized tow.

To aid in the determination of the distribution of recently set surf clams, a benthic sample was taken at each station with a 0.1 square meter Petersen grab sampler. Contents of the grab were washed through a sieve with a mesh size of 1.0 mm. The material retained on the sieve was preserved in 10% buffered formalin then later transferred to 70% ethanol. Laboratory analysis of the grab samples consisted of sorting all benthic fauna from the sediment, then counting and measuring the surf clams.

Before 1994, standing stocks were calculated using the "numbered area" method that is based on the area swept technique of Alverson and Pereyra (1969). This method determined stock estimates using specific, predetermined areas divided into zones. These areas were used for several years, which allowed for comparison of catches within harvest zones from year to year. This method differs from stratified random sampling in that the same stations were sampled each year. Also, confidence limits could not be calculated using the numbered area method since the stations were not randomly selected.

Standing stock estimates (S) using stratified random sampling techniques were determined by multiplying the mean bushel yield ($\bar{x}$) of each stratum by N_h (previously c , using "numbered area" method). This can be expressed as: $S = N_h \bar{x}$ where $N_h = A/a$. (A) is the area of the stratum and (a) is the average area swept by the dredge in square nautical miles. Summation of standing stocks within all strata yielded the total standing stock.

In 1999, the lengths of individual tows were determined by measuring the distance between the starting and ending way points saved on the DGPS receiver's chart plotter. All tow lengths were numerically standardized to five minutes, summed and multiplied by the dredge knife width.

The population estimate for stratified random sampling was calculated using the following notation from Cochran (1977):

N_h total number of potential tows in stratum h

n_h number of sampling tows in stratum h

y_{hi} total number of bushels collected in the i th tow in stratum h

$W_h = \frac{N_h}{N}$ stratum weight

$\bar{y}_h = \frac{\sum_{i=1}^{n_h} y_{hi}}{n_h}$ sample mean

$\bar{y}_{st} = \frac{\sum_{h=1}^L N_h \bar{y}_h}{N} = \sum_{h=1}^L W_h \bar{y}_h$ population mean per unit or weighted sample mean
where st for stratified and $N = N_1 + N_2 + \dots + N_L$

The variance of the estimate $\bar{y}_{st}$ when the sampling fractions n_h/N_h are negligible in all strata is:

$$s^2(\bar{y}_{st}) = \frac{1}{N^2} \sum \frac{N_h^2 s_h^2}{n_h} = \sum \frac{W_h^2 s_h^2}{n_h}$$

where s_h^2 are the sample variances: $s_h^2 = \frac{1}{n_h - 1} \sum_{i=1}^{n_h} (y_{hi} - \bar{y}_h)^2$

The formulas used for calculating 95% confidence limits are:

Population mean $\bar{y}_{st} \pm ts(\bar{y}_{st})$

Population total $N\bar{y}_{st} \pm tNs(\bar{y}_{st})$

where t is from the tables of Student's t , $p = 0.05$ and Satterthwaite's (from Cochran, 1977) approximate method of assigning degrees of freedom n_e is:

$$n_e = \frac{(\sum g_h s_h^2)^2}{\sum \frac{g_h^2 s_h^4}{n_h - 1}} \quad \text{where } g_h = \frac{N_h(N_h - n_h)}{n_h}$$

RESULTS AND DISCUSSION

Standing Stock

Station location, clam abundance, mean length and number of clams measured at each station (per five minute dredge tow) are presented in Table 1. Clam abundance is given in total U.S. standard bushels collected during a standardized five minute tow. The estimated number of clams collected in the dredge that measured less than 71 mm is also listed (standardized for five minute tows). Stock estimates are conservative because they assume 100% removal of all size classes of surf clams within the path of the dredge. Earlier investigations by Rutgers University showed a 70% to 80% removal rate to be likely (Haskin and Wagner 1985, 1986). Total surf clam standing stock for 1999 was estimated to be $24,328,495 \pm 5,566,656$ bushels at $\alpha = 0.05$. The results for the population estimates for 1997, 1998 and 1999 are summarized in Table 2. The total area of strata 4 - 15, as determined by GIS, was 282.03 nm². A total of 330 dredge tows was completed within the sampling area in 1999.

The average area covered by the dredge (ACD) for all strata combined totaled 461 yd² (.000112486 nm²) with an average tow speed of 1.4 knots. The ACD in 1999 decreased by 87 yd² from 1998 and 4 yd² from 1997. Prior to 1995, the lengths of the tows were determined by measuring plotter traces taken aboard the vessel. Only tows that were five minutes, not standardized, were used in the calculations which resulted in an increased area covered by the dredge estimate. In 1995 and 1996 the distances of all the standardized tows were used to determine the ACD by inputting the beginning and ending LORAN C coordinates into a *Voyager* LORAN receiver. The ACD in 1995 was 574 yd², averaging 1.7 knots and in 1996 the ACD was 608 yd², also with a mean tow speed of 1.7 knots. The lengths of tows in 1997 through 1999 were calculated by measuring the distance between the way points plotted on the *Northstar* DGPS receiver. Since the starting and ending latitude/longitude coordinates were recorded to thousandths of a minute, the degree of accuracy was greatly improved over previous methods employed. The minimum distance covered by the dredge in 1997 was 16 yards at 0.10 knots, 1998 was 52 yards at 0.31 knots and 1999 was 25 yards at 0.15 knots. The maximum distance and speed calculated in 1997, 1998 and 1999 was 523 yards at 3.1 knots, 506 yards at 3.0 knots and 441 yards at 2.6 knots, respectively.

A comparison of 1997, 1998 and 1999 results are given below:

1997 Mean bushels per dredge tow (*weighted sample mean*) = $\bar{y}_{st}$ = 10.6 bushels

1998 Mean bushels per dredge tow (*weighted sample mean*) = $\bar{y}_{st}$ = 11.6 bushels

1999 Mean bushels per dredge tow (*weighted sample mean*) = $\bar{y}_{st}$ = 9.7 bushels

1997 Variance of the estimated mean = $s^2(\bar{y}_{st})$ = .62 bushels²

1998 Variance of the estimated mean = $s^2(\bar{y}_{st})$ = 1.18 bushels²

1999 Variance of the estimated mean = $s^2(\bar{y}_{st})$ = 1.16 bushels²

1997 Confidence Limits of the population estimate (bushels) = $N\bar{y}_{(st)} = 26,184,815 \pm 3,852,013$
(df = 104) $t_{0.05}$ (±14.7%)

1998 Confidence Limits of the population estimate (bushels) = $N\bar{y}_{(st)} = 24,164,054 \pm 4,505,789$
(df = 113) $t_{0.05}$ (±18.7%)

1999 Confidence Limits of the population estimate (bushels) = $N\bar{y}_{(st)} = 24,328,495 \pm 5,566,656$
(df = 24) $t_{0.05}$ (±22.9%)

Overall, the 1999 sample means ranged from 3.86 bushels per tow in stratum 5 to 18.56 bushels per tow in stratum 7. The weighted sample mean was 9.7 bushels with a sample variance of 1.16 bushels². The weighted mean number of bushels collected per tow decreased by 1.9 bushels from 1998. However, standing stock estimates increased by 164,442 bushels in 1999. Although this represents a slight increase of 0.7% from 1998, it is not significantly different, as determined by substituting the *t* value with 1.5 and comparing the resulting intervals to determine if they overlap (Trout, 1996 and 1998, Personal Communication).

The results of the mean number of bushels collected in each stratum for 1998 and 1999 were analyzed using a two-sample t-test in SAS. The results of the individual t-tests are given in Appendix A. The t-test procedure in SAS tests the equality of the variances and gives the option of an approximate t-test that does not assume equal variances (listed as “Unequal” in Appendix A tables). The approximate t-test uses Satterthwaite’s approximation for the sum of two mean squares to calculate the significance probability Prob>|T|. The *F*-test given in the output is used to test the hypothesis of equal variances (Littell, Freund, and Spector, 1991). From the output in Appendix A, the number to the right of “Prob>F” is the p-value for the test of equal variances. According to Hatcher and Stepanski (1994), if this p-value is larger than 0.05, the exact two sample t-test is used. The p-value of 0.05 corresponds to a 95% significance level for the test of equal variances. “Unequal” results for the *F*-tests occurred in Strata 4, 10 and 14. Under the column

labeled “Variances” the row labeled “Equal” gives the results of an exact two-sample t-test, the row labeled “Unequal” gives the results of an approximate two-sample t-test. The column labeled “T” gives the value of the test statistic. To determine if there is a significant difference between the means, the appropriate p-value under the column labeled “Prob>|T|” is compared to 0.05. If the p-value is larger than 0.05 the two groups are not significantly different at the 95% significance level. These analyses failed to reveal a significant difference in the mean number of bushels collected in each stratum. However, Stratum 4 was marginal in not being significantly different with a p-value of 0.0532.

The mean number of bushels collected within each strata for the years 1994 through 1999 was compared using the Scheffe’s Multiple Contrasts Test (S-test) in SAS. This test allows for the comparison of two or more groups with unequal sample sizes. The advantage of the S-test is that it is known to be insensitive to violations of the assumption of normality and of equality of variance (Scheffe, 1959). At $\alpha = 0.05$, this test detects less differences (conservative) and is more likely to commit a type II error (Zar, 1984). However, by lowering the significance level to $\alpha = 0.1$, the test becomes less conservative. Scheffe (1959) stated that a guaranteed 90% confidence interval is preferable to a nominal 95% one if, as usually, we have no idea how far the true value falls below 95%. This test has two parts. The first part compares all α greater than the p-value or “Prob>F” to detect a significant difference between the means for each strata. If the p-value is greater than α , then there was no significant difference detected between the sample means for that particular stratum. If a significant difference was found, the test would proceed to the next step of comparing each year within the stratum with each other. The only significant difference detected at $\alpha = 0.1$ was found in Stratum 5 when comparing 1999 to 1996. The result of the S-test are given in Appendix B.

The observed variances occurred as a result of the strata containing various bottom conditions, such as both mud and sand bottoms, as well as the patchiness of surf clam distributions. In most cases, mud-clay bottoms resulted in fewer clams or zero catches due to the inability of the dredge’s knife to cut through the dense mud, as well as the fact that these conditions are generally not conducive to filter feeders such as surf clams. Typically, short tows were a result of mud filling the dredge, causing the dredge to stop. Variances tend to be high due to diverse benthic substrates that exist within each strata, the gregarious nature of surf clams and other factors such as harvest activity and recruitment. In most cases variances were generally consistent for each strata from year to year. However, there were cases when the variances for a strata fluctuated greatly, such as in Stratum 14.

The greatest percentage of change in the mean number of bushels per five minute tow between 1998 and 1999 occurred below Great Egg Harbor Inlet in Stratum 14 and above Barnegat Inlet in Stratum 4. The

mean number of bushels per five minute tow in Stratum 14 increased from 6.49 bushels in 1998 to 18.03 bushels in 1999. Stratum 4 decreased from 25.77 bushels per five minute tow in 1998 to 12.69 bushels per tow in 1999. However, in 1997, the mean number of bushels for Stratum 4 was 15.06 bushels.

Tables 3 and 4 provide the 1997, 1998 and 1999 surf clam standing stock estimates in U.S. standard and industry bushels for each stratum. The area of all strata combined totaled 282.03 nm² in 1999. A total standing stock estimate of 24,328,495 U.S. standard bushels (16,056,807 industry bushels) was calculated using the sample means for each stratum sampled in 1999.

New Jersey's commercial inshore surf clam season begins October 1 and extends to May 31 each year. The Commissioner of the Department of Environmental Protection, with the advice of the Atlantic Coast Section of the NJ Shellfisheries Council, the New Jersey Surf Clam Advisory Committee and the Bureau of Shellfisheries, establishes annually a season quota between 250,000 and 700,000 industry bushels of surf clams provided the quota does not exceed 10% of the estimated standing stock. The quota for the 1999-2000 NJ inshore surf clam harvest season was increased from the 1998-1999 quota of 600,000 to 700,000 industry bushels (the maximum allowed by regulation), which was 4.4% of the estimated standing stock for 1999. The quota was increased to capitalize on the demand for inshore surf clams due to the depleted inventories of ocean quahogs (*Arctica islandica*) at the processing plants. The season quota is the total amount of surf clams (excluding bait clams) that can be harvested by all surf clam license holders from State waters during the surf clam season. A total of 699,649 industry bushels was harvested during the 1999-2000 season. The majority of the surf clams were harvested between Absecon Inlet to Barnegat Inlet (71.45%). The harvest zones between Cape May Inlet to Great Egg Harbor Inlet yielded 14.49% of the harvest while Barnegat Inlet to Shark River Inlet contributed 11.48% of the harvest. Table 5 lists the catch for each harvest zone in industry bushels.

Table 6 provides a breakdown of New Jersey's surf clam resource in areas open to harvest, areas condemned to harvest and in conservation zones for 1997, 1998 and 1999. Before 1996, standing stocks in closed areas were calculated using the proportion of the closed area (condemned areas and conservation zones) to the total area of the stratum and multiplying that percentage by the total stock of the stratum. It is important to note that this method of calculation does not take into account the actual mean bushel yields collected within the closed areas. Therefore, yearly comparisons of stocks within closed areas are a reflection of changes that have occurred in the entire stratum. From 1996 to present, the standing stocks of the condemned areas and conservation zones were calculated using stratified random sampling techniques. The number of stations sampled in the closed areas was chosen based on data from previous years. The total number of bushels of surf clams in each closed area was determined using the same notation by

Cochran (1977), as described on page five of this report. When closed areas overlap into more than one stratum, the stock of each stratum within the closed area was determined as a percentage of its size. For example, the total stock of the Atlantic City condemned area was 509,287 bushels. Approximately 54.4% of the closed area occurred within Stratum 10 and 45.6% in Stratum 11. The percentages were multiplied by 509,287 bushels to obtain the standing stock estimate of the closed area within each stratum. In 1999, approximately 78.5% of the total stock of surf clams was located in open waters, 12.8% was in condemned waters, and 8.7% was found in conservation zones. In 1999, the conservation zone along Brigantine's inner mile contained 1,008,561 bushels of surf clams, while the Island Beach Conservation Zone accounted for 1,120,968 bushels of clams.

Only 67 clams measuring less than 71 mm were estimated for the entire survey area from the subsample of clams collected by the dredge in 1999. In 1998, 276 clams were estimated, while in 1997 the estimated number was 5,974 clams (Figure 14). These numbers are dramatically lower as compared to 1994 and 1995 when 51,418 and 50,491 clams less than 71 mm were estimated, respectively. The decline in the number of new recruits was seen in 1996 when only 3,646 clams were estimated. In 1999, dredge tows from Strata 6, 10, 11, 12, 13, 14 and 15 did not contain any clams measuring less than 71 millimeters. Dredge tows in Stratum 7 for 1999 contained the largest numbers of clams estimated in this size range ($n = 32$). Use of the surf clam dredge, however, cannot be used to accurately quantify standing stocks of young surf clams, since the sampling gear does not efficiently retain clams 51 mm or less with the two inch openings between the rebar mesh lining the dredge. However, the same could be said for clams measuring less than 71 mm since the rings used for the codend of the dredge are three inches in diameter. In 1999, only 2.4% (eight stations) of the total number of stations sampled with the dredge contained clams measuring less than 71 mm. In comparison, in 1995, 23% (74 stations) of the stations sampled with the dredge contained clams less than 71 mm.

Population Structure

In general, there was minimal overlap of size classes of clams captured in the dredge versus clams captured in the Petersen grab. In 1999, most of the clams collected by the dredge (99.95%) measured greater than 70 mm (99.97% in 1998 and 98.7% in 1997) with only 0.01% of the clams measuring less than 52 mm. Only one clam collected in the Petersen grab measured greater than 51 mm during the 1999 survey and none were found in 1997 and 1998. Length measurements of clams collected in the grab in 1999 ranged from 1.0 to 63.0 mm. The minimum size captured in the dredge in 1999 was 36 mm, 30 mm in 1998 and 21 mm in 1997. The likelihood of capturing greater quantities of clams measuring less than 52

mm in the dredge increases with density and abundance. Figure 15 illustrates the percent length frequency of surf clams measuring less than 71 mm collected in the dredge (all strata combined).

To give an overall description of the surf clam distribution collected by the dredge, a composite (the sum of all clams measured) length frequency distribution graph for the entire survey area for 1997, 1998 and 1999 is presented in Figure 13. A total of 16,746 surf clams was measured from the survey area in 1999, ranging from 36 to 192 mm in length, with a mean shell length of 122.1 mm. The mean shell length that was calculated was just below the desirable market size of five inches (127 mm). Of the total number of clams measured in 1999, less than 0.1% were less than 71 mm in length, 90.1% were greater than 103 mm (four inches) and 32.4% were 127 mm (five inches) or greater. In 1998, less than 0.1% of the clams measured were less than 71 mm in length, 87.1% were greater than 103 mm and 30.6% were 127 mm or greater. The length frequency distribution depicts minimal change in population structure with means of 113.3 mm in 1997, 121.0 mm in 1998 and 122.1 mm in 1999.

A length frequency graph for the Brigantine Conservation Zone for 1997, 1998 and 1999 is presented in Figure 7. A total of 1,003 clams were measured in 1999 with a mean length of 108.8 mm compared to 557 clams measured in 1998 with a mean length of 103.3 mm and 1,083 clams measured in 1997 with a mean length of 93.7 mm. Several peaks in the graph distinguishing each year class in 1997 were still evident in 1998 and 1999. As expected, the shell lengths of each year class shifted toward larger sizes each subsequent year. However, no new year classes were depicted throughout this sampling period indicating that the population structure has virtually remained unchanged. This is probably due to the prohibition of harvest and the lack of recruitment over the last several years within this area.

A length frequency graph for surf clams within the Island Beach Conservation Zone for 1997, 1998 and 1999 is presented in Figure 8. In 1999, a total of 1,149 surf clams were measured with a mean shell length of 122.4 millimeters as compared to 1,334 clams measured in 1998 with a mean length of 116.8 mm and 1,888 clams measured in 1997 with a mean length of 107.7 mm. Mean shell lengths have been steadily increasing each year since 1992. This area has not exhibited any large scale recruitment since 1991. While there was some recruitment depicted in a small peak in 1997 (40 mm), the year class was conspicuously absent in the 1998 and 1999 graphs. The same older year classes illustrated by the peaks in 1997 are still evident in 1998 and 1999. As with the Brigantine Conservation Zone, the population structure has remained virtually unchanged. Due to the mean shell lengths approaching and or exceeding the desirable market size of five inches within both of the conservation zones, the Bureau is considering abolishing these conservation areas and opening them to harvest for the 2000-2001 harvest season. The conservation zones

were originally established to protect large scale recruitment that occurred within these regions back in the mid-1980's.

Length frequency distributions for each one bushel subsample of clams measured at each station in 1999 were grouped by stratum and plotted in Appendix C. Mean lengths (x) and number of clams measured (n) are given in each graph. Length frequency distributions were not constructed for stations where less than 15 clams were collected. Composite length frequency graphs by stratum for 1997, 1998 and 1999 were constructed and illustrated in Figures 9, 10, 11 and 12. The mean lengths of clams measured by stratum for 1997, 1998 and 1999 is summarized in Table 7.

The population structure of surf clams from Barnegat Inlet to Shark River Inlet (Strata 4, 5 and 6) have typically differed from areas to the south by exhibiting a broader length frequency distribution. (Figure 9). There was minimal evidence of any new recruitment from the survey results within each stratum in 1997, 1998 and 1999. Recruitment that was depicted in Stratum 4 in 1997 was mostly from the Island Beach Conservation Zone, which is located in Stratum 4. Except for a slight decrease in the mean size in Stratum 6 in 1999, the mean shell lengths for each stratum in this region had been steadily increasing each year during this three year sampling period. The 1999 mean shell lengths for Strata 4, 5 and 6 were 125.7 mm, 137.6 mm and 144.5 mm, respectively. This region is 76.4 nm² and accounted for 18.0% of the total estimated standing stock in 1999 (Tables 3 and 4). During the 1999 - 2000 New Jersey inshore surf clam harvest season, a total of 80,288 industry bushels of surf clams (11.47% of the total harvest) were harvested from this region (Table 5). The majority of the harvest in this region occurred within the middle mile (Stratum 5).

The population structure of surf clams between Absecon Inlet to Barnegat Inlet (Strata 7, 8 and 9) differ between strata in overall size distribution (Figure 10). Strata 8 and 9 illustrate a similar broad size distribution with multiple peaks as compared to Stratum 7, which depicts a much narrower size distribution with a few distinct peaks. The narrow size distribution in Stratum 7 is mostly likely due to the large scale recruitment of surf clams within this stratum in the late 1980's to early 1990's. This large scale recruitment during the relatively small time frame created a dense surf clam population in this stratum. On average, the clams within Stratum 7 were smaller in size. Clams located in warm, shallow inshore waters exhibit slower growth rates than those clams located in deeper, cooler offshore waters. In addition, it had been reported that extremely dense populations of surf clams also exhibit retarded growth rates (Wagner, 1987). The mean size distribution for all three strata in this region exhibited increasing mean shell lengths during this sampling period. In addition, virtually no new recruitment was observed. The mean shell length of surf clams collected in this region for 1999 was 116.0 mm, 124.0 mm and 125.9 mm in Strata 7, 8 and 9,

respectively. This region is 85.9 nm² and accounted for 46.3% of the estimated standing stock in 1999 (Tables 3 and 4). During the 1999-2000 New Jersey inshore surf clam harvest season, this region was the top harvest area with 499,868 industry bushels of surf clams (71.44% of total harvest) harvested (Table 5). The majority of the clams harvested from this region occurred within the middle mile (Stratum 8).

The population structure of surf clams collected between Great Egg Harbor Inlet to Absecon Inlet (Strata 10, 11 and 12) depicts a more narrow size distribution than the strata located to the north (Figure 11). While the population of surf clams within these strata are generally similar in structure, Stratum 12 has the broadest distribution. Again, as in the strata located to the north, there was virtually no new recent recruitment observed except for a small peak illustrated around 35 mm in Stratum 10 in 1997. The mean shell length of the surf clams collected in Strata 10 and 11 increased steadily during this period. In Stratum 12, mean length decreased sharply in 1998 from the mean length found in 1997 and then increased again in 1999. The mean shell length of surf clams collected in this region for 1999 was 110.3 mm, 116.6 mm and 119.3 mm in Strata 10, 11 and 12, respectively. This region is 24.8 nm² and accounted for 10.9% of the estimated standing stock (Table 3 and 4). During the 1999-2000 New Jersey inshore harvest season, a total of 15,070 industry bushels of surf clams (2.15% of total harvest) were harvested from this area (Table 5).

The population structure of surf clams in Strata 13, 14 and 15, which are located in the region between Cape May Inlet to Great Egg Harbor Inlet, exhibit similar size distributions and growth patterns within each strata (Figure 12). The graphs illustrate a fairly narrow size distribution with a few peaks depicting the dominant year classes before dropping off abruptly. Surf clams were sparse within this region for decades until about 1996 when good numbers of clams were found. As with the regions to the north, virtually no recent recruitment was detected except for a small peak depicted in 1997 within Stratum 13. This is also reflected in the gradual increase in the mean shell lengths of the surf clams within this region. The only decrease in mean size was in Stratum 14 in 1999. After the mean size sharply increased from 1997 to 1998, there was a decline in the mean size in 1999. This was mainly due to the presence of surf clams in the 80 to 100 mm size range that were collected in 1997, absent from sampling in 1998 and again represented in the 1999 samples. The mean shell length of surf clams collected in 1999 was 121.1 mm, 113.9 mm and 129.1 mm in Strata 13, 14 and 15, respectively. This region is 94.9 nm² and accounted for 24.8% of the estimated standing stock in 1999 (Tables 3 and 4). During the 1999-2000 New Jersey inshore surf clam harvest season, a total of 101,408 industry bushels of surf clams (14.49% of the total harvest) were harvested from the region (Table 5). Most of the harvest in this region occurred within the middle and outer mile. This region has only recently made sufficient contributions to the overall State harvest after years of virtually no harvest.

Benthic Grab Results

The average number of juvenile surf clams collected in the Petersen grab can vary appreciably from year to year. In 1999, a mean of 5.5 juvenile surf clams per grab (0.1 m²) was collected, while in 1997 and 1998, the number averaged 2.1 and 18.4 surf clams per grab, respectively. A total of 1,755 juvenile surf clams was collected in 318 Petersen grab attempts, ranging from 0 to 139 clams per grab with Station 57 containing the greatest number collected. In contrast, no juvenile surf clams were found in the Petersen grab at 154 of the stations (48.4%). The area with the largest set of clams was located within the inner mile from Cape May Inlet to Great Egg Harbor Inlet (Stratum 13) and the inner mile from Great Egg Harbor Inlet to Absecon Inlet (Stratum 10) with an average of 30.0 and 29.7 clams per grab, respectively. Figure 16 illustrates the mean number of juvenile surf clams collected in the Petersen grab by stratum. In 1999, the Island Beach Conservation Zone averaged 0.29 clams per grab while the Brigantine Conservation Zone averaged 3.7 clams per grab. By comparison, in 1998, the Island Beach Conservation Zone averaged 20.8 clams per grab with the Brigantine Conservation Zone averaging 22 clams per grab. In 1997, the Island Beach Conservation Zone averaged 5.2 clams per grab, while no clams were found in the Brigantine Conservation Zone.

Length frequencies and mean lengths of the juvenile clams collected in the Petersen grab by stratum are illustrated in Figures 17, 18, 19 and 20 for 1997, 1998 and 1999, respectively. A total of 1,431 juvenile surf clams were measured in 1999 with a mean length of 5.8 millimeters. The mean length of clams collected for each Stratum ranged from 2.6 mm in Strata 8 and 12 to 11.0 mm in Stratum 13. Haskin and Wagner (1984a) stated that earlier work by Rutgers University pointed out that surf clams held in trays in Cape May Harbor grew an average of 1 mm per week, thus the presence of small juveniles (2 mm) from July through mid-August is usually indicative of a good set through the period. Approximately 18.0% of the total number of clams collected by the Petersen grab measured less than 2.1 mm in length in 1999. The composite length frequency of surf clams collected in the Petersen grab from all strata in 1997, 1998 and 1999 is presented in Figure 21.

Historically, the presence of large sets is not necessarily indicative of future recruitment to the fishery. Reports by Rutgers University have described extensive sets of surf clams, some as dense as 15,000 individuals per 0.1 square meter, during their summer surveys only to find no trace of survivors when the areas were revisited the following year (Haskin and Wagner 1984a). Such high mortality of young surf clams has been attributed to predation by a variety of vertebrate and invertebrate predators (Haskin and Wagner 1984a, Ropes 1980). Primary predators include horseshoe crabs (*Limulus*), spider crabs (*Libinia*), hermit crabs (*Pagurus*), blue crabs (*Callinectes*), Lady Crabs (*Ovalipes*), rock crabs (*Cancer*), two species

of moon snails (*Euspira* and *Neverita*), two species of whelks (*Busycon* and *Busycotypus*), sea stars (*Asterias*) and several species of demersal fish such as the summer flounder (*Paralichthys*), the windowpane flounder (*Scophthalmus*) and the sea robin (*Prionotus*). All of these are common to the New Jersey coast and typically occur as by catch in the surf clam dredge. It was not until significant numbers of these predators were killed in the anoxic event of 1976 that large scale recruitment occurred above Great Egg Harbor Inlet (Haskin and Wagner 1984b). In the absence of such large scale recruitment events, it is up to small scale recruitment over several years to re-establish and maintain populations of surf clams at harvestable levels.

CONCLUSION

In conclusion, the estimated standing stock of surf clams in New Jersey territorial waters from Cape May Inlet to Shark River Inlet was 24,328,495 US standard bushels. While this was an increase over the estimated standing stocks in 1997 and 1998, there were no significant differences between each year. Results of the 1999 surf clam stock assessment were presented to the New Jersey Surf Clam Advisory Committee. The Committee is comprised of various members of the industry including processors, fleet owners, and independent fisherman who, together with the Bureau of Shellfisheries, review information concerning New Jersey's inshore surf clam resource and recommend appropriate management measures to the New Jersey Shellfish Council and Commissioner of the Department of Environmental Protection. It was decided to increase the surf clam harvest quota from 600,000 to 700,000 industry bushels (1,061,290 U.S. standard bushels) for the 1999-2000 season, which is approximately 4.4% of the surf clam standing stock (5.6% of the standing stock in approved waters) and well below the 10% threshold stated in the regulations. The quota was increased to take advantage of the economic opportunity that came about due to the depleted inventories of ocean quahogs at the processing plants. If declines in the surf clam standing stock occur in subsequent surveys, the harvest quota would be lowered accordingly to remain at or below 10% of the total standing stock in open waters.

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Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels¹).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED ²	MEAN LENGTH(mm)
6-2-99	1	13	24	0.09	0	27116	42725	3	133.0
6-2-99	2	13	21	0.00	0	27114	43725	0	N/A
6-2-99	3	15	35	76.53	0	27089	42705	61	126.3
6-2-99	4	15	36	69.84	0	27087	42711	87	122.7
6-2-99	5	15	35	0.43	0	27088	42717	13	121.4
6-2-99	6	15	27	37.86	0	27084	42712	102	118.9
6-2-99	7	15	24	16.27	0	27083	42713	83	121.4
6-2-99	8	15	35	0.00	0	27083	42718	0	N/A
6-2-99	9	15	39	0.00	0	27085	42717	0	N/A
6-2-99	10	14	33	0.00	0	27087	42723	0	N/A
6-2-99	11	14	31	0.00	0	27085	42724	0	N/A
6-2-99	12	15	36	0.00	0	27078	42723	0	N/A
6-2-99	13	14	40	0.00	0	27091	42728	0	N/A
6-2-99	14	16	39	213.00	0	27089	42734	88	117.3
6-2-99	15	16	32	37.50	0	27085	42741	152	99.3
6-2-99	16	16	21	0.00	0	27092	42745	0	N/A
6-2-99	17	16	27	0.00	0	27088	42745	0	N/A
6-2-99	18	16	17	0.00	0	27085	42757	0	N/A
6-2-99	19	13	11	6.75	0	27079	42768	51	141.2

¹ US standard bushel = 1.24 cubic feet or 0.035092 cubic meters.

² If total bushels < 1, then N = total number of clams measured.

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
6-2-99	20	15	33	57.35	0	27063	42758	69	133.6
6-2-99	21	15	39	23.68	0	27058	42755	68	138.2
6-2-99	22	15	34	0.00	0	27062	42770	0	N/A
6-2-99	23	15	36	0.01	0	27060	42775	1	132.0
6-15-99	24	15	45	0.00	0	27062	42787	0	N/A
6-15-99	25	15	42	0.00	0	27055	42795	0	N/A
6-15-99	26	15	35	0.00	0	27055	42799	0	N/A
6-15-99	27	15	47	0.00	0	27061	42798	0	N/A
6-15-99	28	14	47	0.00	0	27062	42803	0	N/A
6-15-99	29	13	16	30.73	0	27074	42804	84	125.1
6-15-99	30	14	38	0.35	0	27064	42814	8	122.6
6-15-99	31	13	18	0.00	0	27065	42837	0	N/A
6-15-99	32	17	39	0.00	0	27059	42838	0	N/A
6-15-99	33	15	50	0.00	0	27050	42833	0	N/A
6-15-99	34	15	45	0.00	0	27041	42834	0	N/A
6-15-99	35	15	47	0.00	0	27045	42838	0	N/A
6-15-99	36	15	47	0.00	0	27045	42850	0	N/A
6-15-99	37	15	46	0.00	0	27047	42849	0	N/A
6-15-99	38	17	23	0.89	0	27059	42849	75	125.3
6-15-99	39	13	12	0.07	0	27063	42882	6	117.0
6-15-99	40	13	19	0.00	0	27062	42888	0	N/A
6-15-99	41	14	39	0.00	0	27051	42877	0	N/A

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
6-15-99	42	15	37	0.10	0	27046	42872	7	147.0
7-6-99	43	15	38	0.18	0	27047	42884	4	146.3
7-6-99	44	14	29	1.19	0	27050	42889	65	134.3
7-6-99	45	15	40	0.09	0	27041	42888	4	147.8
7-6-99	46	15	35	1.09	0	27039	42895	47	154.2
7-6-99	47	15	44	0.21	0	27035	42906	8	146.6
7-6-99	48	14	36	0.25	0	27047	42916	14	149.8
7-6-99	49	14	40	0.00	0	27044	42917	0	N/A
7-6-99	50	18	40	0.00	0	27043	42927	0	N/A
7-6-99	51	18	35	0.00	0	27042	42933	0	N/A
7-6-99	52	15	47	0.00	0	27035	42939	0	N/A
7-6-99	53	14	36	0.10	0	27038	42939	1	135.0
7-6-99	54	13	26	0.59	0	27044	42944	49	120.1
7-6-99	55	13	22	7.84	0	27046	42944	97	116.8
7-6-99	56	13	20	5.73	0	27045	42950	87	117.4
7-6-99	57	13	25	0.70	0	27041	42951	53	122.4
7-6-99	58	13	17	2.95	0	27047	42951	111	115.2
7-6-99	59	13	21	7.89	0	27041	42955	87	119.6
7-6-99	60	13	19	13.73	0	27033	42966	88	119.3
7-6-99	61	15	48	0.00	0	27018	42957	0	N/A
7-7-99	62	11	28	34.56	0	26977	43006	102	115.2
7-7-99	63	11	20	30.30	0	26981	43006	147	103.3

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-7-99	64	20	13	35.66	0	26984	43001	104	112.5
7-7-99	65	10	13	63.93	0	26987	42995	130	108.0
7-7-99	66	10	18	15.45	0	26986	42989	103	113.1
7-7-99	67	11	25	0.50	0	26991	42990	56	115.3
7-7-99	68	19	16	18.26	0	26996	42988	120	110.0
7-7-99	69	19	14	14.31	0	27001	42989	167	100.4
7-7-99	70	19	12	10.23	0	27007	42972	144	104.6
7-7-99	71	19	21	9.05	0	27005	42967	110	114.2
7-7-99	72	10	15	5.08	0	27011	43018	95	113.4
7-7-99	73	10	13	6.41	0	27013	43023	109	114.3
7-7-99	74	10	16	1.72	0	27015	43023	111	115.9
7-7-99	75	11	23	1.10	0	27011	43023	95	122.3
7-7-99	76	11	28	1.97	0	27009	43017	84	125.0
7-7-99	77	11	26	1.23	0	27013	43007	84	125.5
7-7-99	78	10	17	12.91	0	27024	43013	110	112.4
7-7-99	79	10	20	6.39	0	27021	43013	109	116.8
7-7-99	80	11	35	0.39	0	27019	43012	40	117.5
7-7-99	81	15	41	0.03	0	27018	43001	3	114.0
7-7-99	82	15	46	0.00	0	27018	42962	0	N/A
7-7-99	83	12	44	0.00	0	27014	42968	0	N/A
7-7-99	84	12	33	3.53	0	27003	42989	77	128.9
7-7-99	85	12	42	12.65	0	26996	42986	79	128.2

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-7-99	86	19	33	5.90	0	26999	42996	84	122.6
7-7-99	87	12	33	15.54	0	26995	42995	69	123.0
7-7-99	88	12	43	4.46	0	26981	43007	104	109.9
7-7-99	89	11	32	17.95	0	26980	43014	104	116.0
7-7-99	90	12	44	25.66	0	26971	43012	109	122.8
7-8-99	91	8	19	16.28	0	26979	43029	125	110.9
7-8-99	92	20	15	10.86	0	26984	43035	123	104.5
7-8-99	93	20	17	10.89	0	26980	43033	115	106.8
7-8-99	94	8	24	64.36	0	26973	43029	104	110.0
7-8-99	95	9	35	19.35	0	26965	43024	122	107.7
7-8-99	96	9	38	45.77	0	26963	43028	107	105.9
7-8-99	97	9	31	71.15	0	26965	43035	119	108.3
7-8-99	98	8	23	54.82	0	26969	43039	126	111.1
7-8-99	99	8	20	20.00	0	26967	43045	92	117.7
7-8-99	100	8	27	29.80	0	26964	43045	116	105.6
7-8-99	101	9	33	49.07	0	26962	43040	118	109.7
7-8-99	102	9	36	40.95	0	26956	43040	84	119.5
7-8-99	103	9	26	2.88	0	26960	43045	101	110.6
7-8-99	104	9	21	45.83	0	26958	43050	107	111.6
7-8-99	105	9	28	65.66	0	26955	43050	106	107.9
7-8-99	106	8	23	44.55	0	26959	43055	110	113.2
7-8-99	107	8	25	12.12	0	26960	43060	71	119.5

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-8-99	108	9	37	46.57	0	26950	43056	84	115.0
7-8-99	109	9	37	0.00	0	26951	43060	0	N/A
7-8-99	110	8	32	0.00	0	26955	43066	0	N/A
7-8-99	111	8	23	0.02	0	26957	43071	2	115.5
7-8-99	112	8	19	3.00	0	26961	43076	34	119.6
7-8-99	113	20	16	2.09	0	26968	43067	86	120.7
7-8-99	114	20	15	3.89	0	26971	43066	95	117.6
7-8-99	115	20	17	31.18	1	26973	43060	114	107.6
7-8-99	116	20	18	11.35	0	26972	43055	114	106.7
7-8-99	117	20	16	6.14	0	26974	43050	94	117.4
7-8-99	118	20	23	0.00	0	26976	43045	0	N/A
7-8-99	119	20	16	22.20	1	26980	43039	157	96.7
7-12-99	120	9	35	2.70	0	26945	43067	67	139.5
7-12-99	121	9	36	2.66	0	26950	43072	17	124.3
7-12-99	122	9	32	2.36	0	26951	43081	65	131.7
7-12-99	123	8	25	12.72	0	26958	43082	105	115.7
7-12-99	124	8	17	7.65	1	26959	43087	101	115.3
7-12-99	125	9	38	14.11	0	26941	43101	70	132.2
7-12-99	126	9	34	13.18	0	26941	43104	63	136.8
7-12-99	127	9	44	0.00	0	26944	43104	0	N/A
7-12-99	128	7	15	32.58	0	26958	43116	130	108.8
7-12-99	129	7	17	64.14	0	26957	43115	107	113.2

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-12-99	130	7	18	2.66	0	26957	43121	106	114.7
7-12-99	131	7	22	31.50	0	26957	43121	88	122.3
7-12-99	132	8	28	7.15	0	26949	43115	60	133.0
7-12-99	133	8	36	7.03	0	26946	43115	62	137.6
7-12-99	134	9	55	0.00	0	26936	43115	0	N/A
7-12-99	135	9	53	0.00	0	26973	43121	0	N/A
7-12-99	136	9	44	0.00	0	26941	43120	0	N/A
7-12-99	137	8	27	51.05	0	26948	43127	93	109.0
7-12-99	138	7	15	11.09	0	26955	43126	93	117.0
7-12-99	139	7	20	13.82	0	26953	43132	81	128.2
7-12-99	140	7	21	4.50	0	26950	43132	90	118.6
7-12-99	141	7	15	24.50	0	26954	43137	85	114.6
7-12-99	142	7	20	21.61	0	26952	43136	95	116.9
7-16-99	143	7	18	0.03	0	26952	43143	3	115.0
7-16-99	144	7	25	0.00	0	26949	43138	0	N/A
7-16-99	145	8	28	25.73	0	26947	43132	90	110.0
7-16-99	146	8	42	0.00	0	26942	43126	0	N/A
7-16-99	147	9	55	0.00	0	26935	43126	0	N/A
7-16-99	148	9	58	0.00	0	26933	43127	0	N/A
7-16-99	149	8	44	0.00	0	26941	43131	0	N/A
7-16-99	150	8	38	14.75	0	26942	43136	63	137.9
7-16-99	151	9	58	0.48	1	26926	43147	12	133.3

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-16-99	152	8	51	0.00	0	26935	43148	0	N/A
7-16-99	153	8	34	14.95	0	26941	43153	49	138.1
7-16-99	154	7	23	17.52	0	26947	43153	87	121.7
7-16-99	155	7	27	17.82	0	26945	43153	79	127.0
7-16-99	156	7	36	13.04	0	26939	43174	80	125.5
7-16-99	157	7	27	9.57	1	26943	43174	80	122.4
7-16-99	158	7	26	16.70	0	26943	43180	102	109.9
7-16-99	159	7	20	5.00	0	26940	43181	76	123.4
7-16-99	160	7	37	3.38	0	26938	43180	62	130.8
7-16-99	161	7	25	13.47	0	26941	43185	77	117.6
7-16-99	162	7	16	0.20	0	26938	43185	13	117.5
7-16-99	163	8	41	77.34	0	26934	43184	51	119.8
7-16-99	164	9	51	1.29	0	26923	43178	28	135.7
7-19-99	165	9	50	4.42	0	26917	43179	48	151.4
7-19-99	166	9	52	0.88	0	26918	43185	37	150.3
7-19-99	167	9	48	3.96	0	26920	43190	57	143.3
7-19-99	168	9	47	0.00	0	26922	43189	0	N/A
7-19-99	169	8	47	3.85	0	26926	43190	49	154.4
7-19-99	170	8	36	56.52	0	26932	43190	87	112.5
7-19-99	171	7	35	1.43	0	26937	43191	54	127.1
7-19-99	172	7	25	74.26	0	26939	43190	82	112.8
7-19-99	173	7	33	1.45	0	26937	43195	57	136.8

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHEL	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-19-99	174	7	38	0.00	0	26933	43195	0	N/A
7-19-99	175	7	29	3.70	0	26938	43199	63	122.4
7-19-99	176	7	30	2.10	0	26935	43205	62	127.4
7-19-99	177	21	39	3.44	0	26932	43205	55	131.2
7-19-99	178	7	43	0.00	0	26932	43200	0	N/A
7-19-99	179	8	51	0.98	0	26927	43194	57	145.5
7-19-99	180	9	51	2.38	0	26920	43195	49	148.2
7-19-99	181	9	52	2.29	0	26915	43199	43	149.1
7-19-99	182	8	49	2.38	1	26924	43210	46	147.4
7-19-99	183	21	50	0.00	0	26926	43210	0	N/A
7-20-99	184	21	18	15.59	0	26934	43216	80	121.4
7-20-99	185	21	27	16.61	0	26932	43216	101	106.5
7-20-99	186	7	35	37.65	0	26928	43217	89	118.3
7-20-99	187	7	19	21.78	0	26932	43221	91	114.4
7-20-99	188	7	26	19.80	0	26930	43220	91	109.7
7-20-99	189	7	37	20.00	0	26926	43221	99	115.4
7-20-99	190	7	17	74.26	0	26931	43225	83	114.7
7-20-99	191	7	26	69.08	0	26928	43226	99	110.2
7-20-99	192	8	43	3.36	0	26919	43216	61	139.5
7-20-99	193	9	54	0.74	0	26914	43210	39	148.0
7-20-99	194	9	52	3.26	0	26911	43210	53	147.2
7-20-99	195	9	31	1.88	0	26909	43221	50	142.0

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-20-99	196	9	49	4.82	0	26910	43226	62	141.9
7-20-99	197	8	49	0.00	0	26917	43225	0	N/A
7-20-99	198	8	49	1.37	0	26915	43230	54	140.4
7-20-99	199	8	43	1.39	0	26917	43232	52	154.6
7-21-99	200	8	36	4.47	0	26921	43231	63	135.7
7-21-99	201	7	21	56.98	0	26927	43247	88	120.0
7-21-99	202	7	31	1.62	0	26925	43247	61	130.2
7-21-99	203	8	33	2.98	0	26917	43247	43	150.4
7-21-99	204	7	35	0.00	0	26923	43253	0	N/A
7-21-99	205	7	27	0.30	0	26925	43253	19	135.3
7-21-99	206	7	30	0.00	0	26923	43258	0	N/A
7-21-99	207	7	33	12.22	0	26920	43258	60	138.7
7-21-99	208	8	39	0.48	0	26917	43262	19	128.6
7-21-99	209	7	30	67.83	0	26921	43262	93	116.9
7-21-99	210	7	24	13.37	0	26924	43263	97	115.2
7-21-99	211	7	20	9.07	0	26924	43267	101	114.7
7-21-99	212	7	24	32.50	0	26922	43267	128	104.2
7-21-99	213	7	28	23.84	0	26919	43268	72	118.1
7-21-99	214	7	33	69.31	0	26917	43269	74	120.4
7-21-99	215	7	31	18.14	0	26917	43272	122	105.9
7-26-99	216	9	53	0.89	0	26901	43246	44	147.2
7-26-99	217	9	50	0.74	0	26902	43251	39	143.5

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-26-99	218	9	48	0.59	0	26900	43256	28	148.3
7-26-99	219	9	46	0.00	0	26904	43262	0	N/A
7-26-99	220	8	39	13.07	0	26909	43262	48	151.6
7-26-99	221	8	40	4.97	0	26906	43267	46	147.8
7-26-99	222	9	45	2.99	0	26899	43267	69	135.9
7-26-99	223	9	44	6.35	1	26947	43272	67	129.8
7-26-99	224	9	43	5.54	0	26900	43273	78	125.1
7-26-99	225	9	42	0.20	0	26903	43273	11	138.0
7-26-99	226	9	40	4.75	0	26901	43277	77	123.0
7-26-99	227	9	40	1.15	0	26904	43277	6	132.0
7-26-99	228	8	38	0.20	0	26908	43277	10	148.2
7-27-99	229	7	36	27.00	0	26914	43278	76	124.0
7-27-99	230	22	21	0.25	0	26921	43289	7	128.6
7-27-99	231	22	28	0.02	0	26916	43287	2	135.0
7-27-99	232	5	44	2.93	0	26907	43288	57	144.8
7-27-99	233	5	42	0.20	0	26908	43294	10	135.6
7-27-99	234	5	37	10.30	0	26911	43294	53	135.8
7-27-99	235	22	24	28.71	0	26918	43294	85	122.7
7-27-99	236	22	21	0.23	0	26922	4330	9	119.7
7-27-99	237	22	30	22.88	0	26919	43298	93	114.7
7-27-99	238	6	48	4.32	0	26905	43298	54	137.2
7-27-99	239	6	47	0.92	0	26902	43298	49	139.5

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-3-99	240	6	53	0.95	0	26901	43314	17	147.0
8-3-99	241	6	52	0.00	0	26907	43308	0	N/A
8-3-99	242	5	40	4.50	0	26914	43310	77	126.2
8-3-99	243	22	35	21.61	0	26918	43309	92	117.1
8-3-99	244	22	30	59.80	0	26921	43310	90	115.0
8-3-99	245	22	27	21.93	0	26923	43315	87	119.7
8-3-99	246	22	31	12.62	0	26919	43315	78	126.1
8-3-99	247	22	30	32.11	0	26924	43320	72	119.9
8-3-99	248	6	58	3.97	0	26906	43319	56	145.7
8-3-99	249	5	49	4.74	0	26914	43325	58	142.9
8-3-99	250	22	34	0.72	0	26922	43324	24	133.4
8-3-99	251	22	31	9.93	0	26925	43326	75	119.3
8-4-99	252	22	38	0.00	0	26923	43330	0	N/A
8-4-99	253	22	28	8.57	0	26926	43331	69	130.2
8-4-99	254	22	24	27.92	0	26927	43336	68	129.8
8-4-99	255	22	38	88.57	0	26925	43336	72	126.2
8-4-99	256	5	47	0.00	0	26920	43336	0	N/A
8-4-99	257	5	54	6.98	0	26913	43335	59	137.0
8-4-99	258	5	53	0.00	0	26915	43340	0	N/A
8-4-99	259	22	44	0.00	0	26924	43340	0	N/A
8-4-99	260	22	23	29.70	0	26928	43341	89	121.0
8-4-99	261	22	19	4.88	0	26930	43348	64	127.5

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHEL	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-4-99	262	22	35	0.00	0	26927	43346	0	N/A
8-4-99	263	5	56	0.00	0	26920	43346	0	N/A
8-4-99	264	5	58	2.25	0	26916	43347	62	137.7
8-4-99	265	6	57	0.95	0	26909	43345	31	141.7
8-4-99	266	5	57	0.00	0	26921	43351	0	N/A
8-4-99	267	22	39	0.62	0	26928	43351	5	126.6
8-4-99	268	22	46	0.00	0	26926	43356	0	N/A
8-4-99	269	5	59	0.00	0	26918	43356	0	N/A
8-4-99	270	6	60	0.00	0	26911	43356	0	N/A
8-4-99	271	6	62	2.79	0	26909	43360	55	143.4
8-4-99	272	6	60	8.33	0	26914	43366	54	141.9
8-4-99	273	5	59	6.00	0	26920	43361	61	134.5
8-4-99	274	22	48	0.00	0	26927	43360	0	N/A
8-4-99	275	22	34	13.95	0	26931	43361	68	126.9
8-4-99	276	23	43	8.77	0	26931	43377	62	125.0
8-4-99	277	23	57	0.00	0	26927	43377	0	N/A
8-4-99	278	4	54	8.77	0	26928	43382	63	133.6
8-5-99	279	25	50	0.02	0	26942	43540	0	N/A
8-5-99	280	25	52	4.17	0	26938	43538	56	144.1
8-5-99	281	25	59	6.92	0	26936	43534	60	131.3
8-5-99	282	25	43	3.06	0	26941	43535	43	157.0
8-5-99	283	25	43	6.48	0	26944	43536	60	139.6

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-5-99	284	25	52	0.02	0	26935	43529	1	129.0
8-5-99	285	6	59	21.85	0	26927	43523	40	151.3
8-5-99	286	5	42	0.05	0	26931	43523	2	147.0
8-6-99	287	25	57	0.31	1	26937	43524	7	138.0
8-6-99	288	5	55	3.35	0	26935	43519	50	147.4
8-6-99	289	4	50	24.43	0	26940	43519	67	132.3
8-6-99	290	25	39	0.00	0	26944	43520	0	N/A
8-6-99	291	4	43	124.37	0	26942	43513	80	119.2
8-6-99	292	5	52	2.85	0	26937	43510	46	152.1
8-6-99	293	5	52	0.30	0	26933	43510	14	167.1
8-6-99	294	4	50	0.00	0	26938	43484	0	N/A
8-6-99	295	25	36	3.97	0	26941	43484	65	130.3
8-6-99	296	4	36	4.74	0	26941	43480	57	130.0
8-6-99	297	5	64	49.78	0	26930	43478	58	134.1
8-6-99	298	5	72	0.00	0	26928	43479	0	N/A
8-6-99	299	6	67	6.60	0	26918	43477	45	150.1
8-6-99	300	5	72	0.00	0	26929	43473	0	N/A
8-6-99	301	5	57	6.52	0	26935	43474	0	N/A
8-6-99	302	5	63	0.00	0	26934	43470	0	N/A
8-6-99	303	24	26	14.01	1	26942	43466	78	123.9
8-6-99	304	24	45	0.00	0	26938	43454	0	N/A
8-6-99	305	24	39	1.20	0	26938	42439	8	121.9

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DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-6-99	306	4	47	4.39	0	26936	43433	77	120.0
8-6-99	307	4	52	0.00	0	26934	43428	0	N/A
8-6-99	308	5	60	0.74	0	26931	43428	27	125.8
8-6-99	309	5	70	0.13	0	26925	43427	7	145.7
8-6-99	310	6	68	3.46	0	26913	43422	59	147.4
8-6-99	311	5	68	0.54	0	26923	43422	12	137.3
8-12-99	312	5	54	0.00	0	26930	43424	0	N/A
8-12-99	313	4	55	10.71	0	26933	43424	56	136.4
8-12-99	314	4	42	17.31	0	26936	43419	86	122.0
8-12-99	315	4	57	0.00	0	26932	43418	0	N/A
8-12-99	316	4	57	0.33	0	26932	43414	0	N/A
8-12-99	317	4	52	0.00	0	26933	43408	0	N/A
8-12-99	318	5	60	0.00	0	26929	43403	0	N/A
8-12-99	319	4	51	0.00	0	26932	43398	0	N/A
8-12-99	320	4	51	0.00	0	26930	43393	0	N/A
8-12-99	321	5	53	17.92	0	26926	43392	65	125.7
8-12-99	322	6	63	0.00	0	26916	43375	0	N/A
8-12-99	323	6	65	5.22	0	26913	43376	18	147.5
8-12-99	324	5	64	1.72	0	26919	43387	45	138.5
8-12-99	325	5	64	1.70	0	26920	43392	57	142.1
8-12-99	326	6	65	5.38	0	26918	43398	53	142.0
8-12-99	327	5	66	1.40	0	26920	43397	61	140.3

Table 1. 1999 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One-Bushel Subsample Collected by the Dredge Per Five-Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-12-99	328	5	64	3.06	0	26925	43403	29	140.6
8-12-99	329	6	66	1.80	0	26920	43406	63	140.9
8-12-99	330	6	63	3.79	0	26913	43407	48	153.6

Table 2. Results from 1997, 1998 and 1999 Sampling (Reported in U.S. Standard Bushels).

STRATUM	1997 n	1998 n	1999 n	1997 MEAN (yh)	1998 MEAN (yh)	1999 MEAN (yh)	AREA (nm ²)	1997 STOCK	1998 STOCK	1999 STOCK	1997 VARIANCE	1998 VARIANCE	1999 VARIANCE
4	40	41	49	15.06	25.77	12.69	25.65	3,202,888	4,059,208	2,538,696	393.409	1356.699	542.239
5	47	47	35	8.96	7.14	3.86	25.40	1,937,496	1,512,962	904,128	149.394	118.425	78.000
6	15	17	17	7.20	4.57	4.14	25.33	1,610,050	865,780	931,592	126.282	12.213	26.87
7	40	38	59	26.25	19.49	18.56	28.25	6,083,702	4,101,869	4,524,284	413.021	451.945	436.333
8	33	34	37	14.09	15.06	15.12	28.62	3,529,826	2,992,508	3,917,790	190.087	561.145	440.352
9	46	48	43	13.47	12.60	10.97	29.06	3,455,970	2,750,411	2,834,788	448.024	297.535	371.729
10	6	5	11	14.64	10.86	17.30	8.46	911,903	622,507	1,080,521	181.500	4.025	322.367
11	11	12	10	11.73	11.51	10.30	8.24	1,010,836	839,658	816,811	156.558	124.135	166.504
12	3	3	6	8.83	4.92	10.31	8.09	630,401	297,339	741,251	27.130	18.405	90.988
13	22	26	19	7.29	4.39	4.10	32.01	2,148,774	1,002,380	2,733,535	119.510	53.974	56.968
14	30	22	14	3.07	6.49	18.03	31.46	507,592	1,407,820	660,562	97.026	247.457	3248.216
15	29	30	30	4.16	15.78	9.46	31.46	1,155,377	3,711,611	2,644,537	129.574	885.975	469.01
Totals 4-15	322	323	330				282.03	26,184,815	24,164,053	24,328,495			

*Strata 1, 2, and 3 have not been sampled since 1995 due to dangerous bottom conditions.

Table 3. 1997, 1998, and 1999 New Jersey Inshore Surf Clam Standing Stock Estimates Reported in U.S. Standard Bushels By Stratum.*

	Inner Mile	Middle Mile	Outer Mile	Total
*Shrewsbury Rocks	1	2	3	
1997	Not Sampled	Not Sampled	Not Sampled	
1998	Not Sampled	Not Sampled	Not Sampled	
1999	Not Sampled	Not Sampled	Not Sampled	(area = 31.7 nm ²)
Shark River Inlet	4	5	6	
1997	3,202,888	1,937,496	1,610,050	6,750,434
1998	4,059,208	1,512,962	865,780	6,437,950
1999	2,538,696	904,128	931,592	4,374,416
				(area = 76.4 nm ²)
Barnegat Inlet	7	8	9	
1997	6,083,702	3,529,826	3,455,970	13,069,498
1998	4,101,869	2,992,508	2,750,411	9,844,788
1999	4,524,284	3,917,790	2,834,788	11,276,862
				(area = 85.9 nm ²)
Absecon Inlet	10	11	12	
1997	911,903	1,010,836	630,401	2,553,140
1998	622,507	839,658	297,339	1,759,504
1999	1,080,521	816,811	741,251	2,638,583
				(area = 24.8 nm ²)
Great Egg Harbor Inlet	13	14	15	
1997	2,148,774	507,592	1,155,377	3,811,743
1998	1,002,380	1,407,820	3,711,611	6,121,811
1999	2,733,535	660,562	2,644,537	6,038,634
				(area = 94.9 nm ²)
Cape May Inlet				
Total*				
1997	12,347,267	6,985,750	6,851,798	26,184,815
1998	9,785,964	6,752,948	7,625,141	24,164,053
1999	10,877,036	6,299,291	7,152,168	24,328,495

*No samples were taken in Strata 1, 2 and 3 due to dangerous bottom conditions since 1995.
(Most of this area is condemned for shellfishing).

Table 4. 1997, 1998, and 1999 New Jersey Inshore Surf Clam Standing Stock Estimates Reported in Industry Bushels by Stratum.*

	Inner Mile	Middle Mile	Outer Mile	Total
*Shrewsbury Rocks	1	2	3	
1997	Not Sampled	Not Sampled	Not Sampled	
1998	Not Sampled	Not Sampled	Not Sampled	
1999	Not Sampled	Not Sampled	Not Sampled	
				(area = 31.7 nm ²)
Shark River Inlet	4	5	6	
1997	3,371,639	2,042,783	1,610,050	4,455,286
1998	2,679,077	998,555	571,415	4,249,047
1999	1,675,539	596,724	614,851	2,887,115
				(area = 76.4 nm ²)
Barnegat Inlet	7	8	9	
1997	4,015,243	2,329,685	2,280,940	8,625,869
1998	2,707,234	1,975,055	1,815,271	6,497,560
1999	2,986,027	2,585,741	1,870,960	7,442,729
				(area = 85.9 nm ²)
Absecon Inlet	10	11	12	
1997	601,856	667,152	416,065	1,685,072
1998	410,855	554,174	196,244	1,161,273
1999	713,144	539,095	489,226	1,741,465
				(area = 24.8 nm ²)
Great Egg Harbor Inlet	13	14	15	
1997	1,418,191	335,011	762,549	2,515,750
1998	661,571	929,161	2,449,663	4,040,395
1999	1,804,133	435,971	1,745,394	3,985,498
				(area = 94.9 nm ²)
Cape May Inlet				
Total*				
1997	8,149,196	4,610,595	4,522,187	17,281,978
1998	6,458,736	4,456,946	5,032,593	15,948,275
1999	7,178,844	4,157,532	4,720,431	16,056,807

*No samples were taken in Strata 1, 2 and 3 due to dangerous bottom conditions since 1995.
(Most of this area is condemned for shellfishing).

Table 5. Inshore Surf Clam Harvest Records from New Jersey Harvest Zones 1-15 for 1999 - 2000 (Reported in Industry Bushels).

	Zone	Industry Bushel	Percent Total
Sandy Hook	1 Inner Mile	0	0.00
	2 Middle Mile	1,575	0.23
	3 Outer Mile	1,440	0.21
Shark River Inlet	4 Inner Mile	3,253	0.46
	5 Middle Mile	56,501	8.08
	6 Outer Mile	20,534	2.93
Barnegat Inlet	7 Inner Mile	58,144	8.31
	8 Middle Mile	268,828	38.42
	9 Outer Mile	172,896	24.71
Absecon Inlet	10 Inner Mile	0	0.00
	11 Middle Mile	12,318	1.76
	12 Outer Mile	2,752	0.39
Great Egg Harbor Inlet	13 Inner Mile	1,920	0.27
	14 Middle Mile	56,704	8.10
	15 Outer Mile	42,784	6.12
Cape May	Total	699,649	100.00

Table 6. Standing Stock Estimates for Areas Open to Harvest, Condemned Areas and Conservation Zones, in U.S. Standard Bushels from 1997 - 1999 from Shark River Inlet to Cape May Inlet

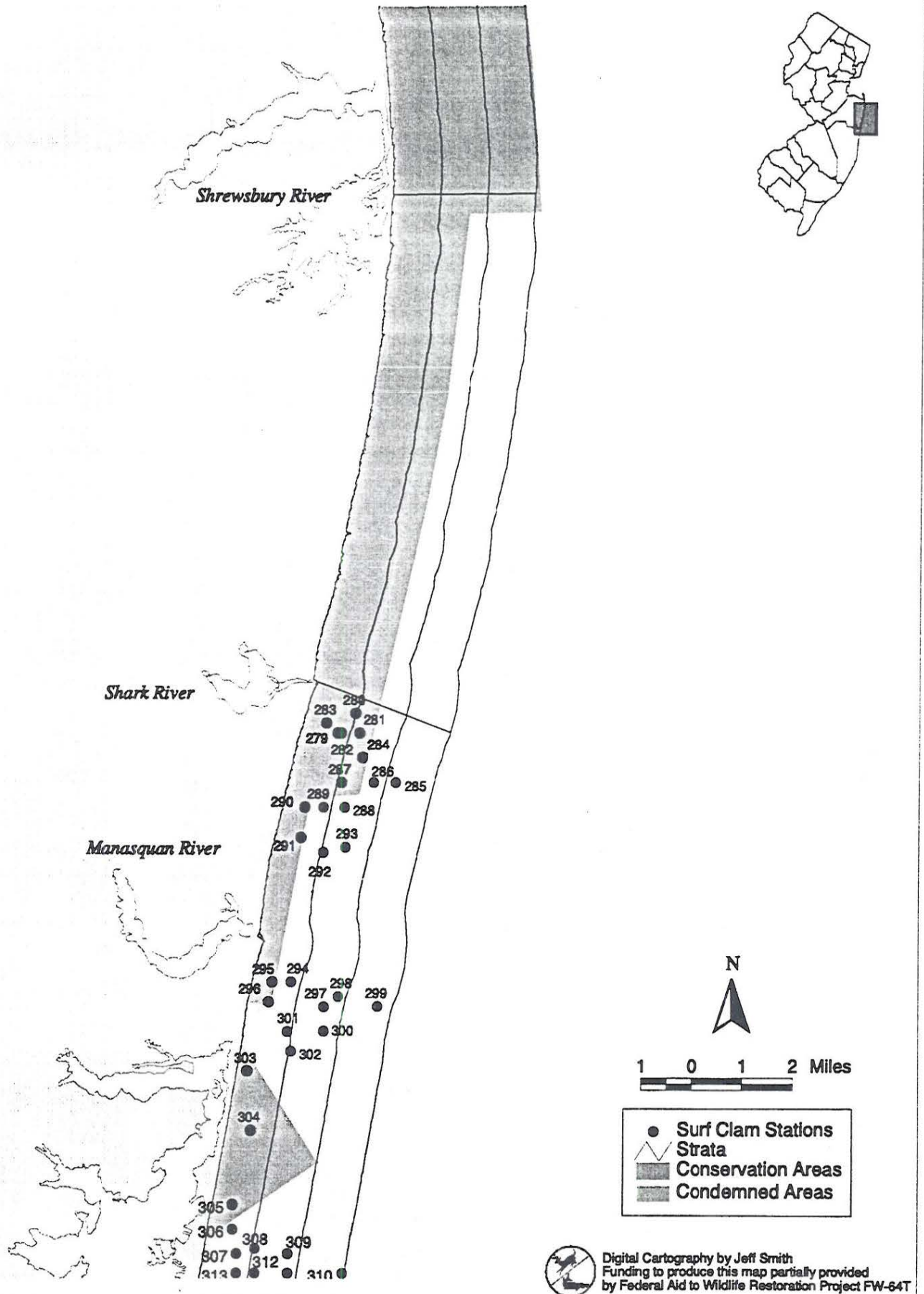
	1997	1998	1999
Condemned Areas	2,235,434	2,441,722	3,103,510
Island Beach Conservation Zone	1,532,163	1,856,898	1,120,968
Brigantine Conservation Zone	1,338,590	916,425	1,008,561
Open Area	21,078,628	18,949,008	19,095,456
Total	26,184,815	24,164,053	24,328,495

Table 7. Mean Length of Surf Clams Collected by the Dredge by Stratum, 1997, 1998 and 1999.

STRATUM	NO. OF CLAMS MEASURED	NO. OF CLAMS MEASURED	NO. OF CLAMS MEASURED	MEAN LENGTH (mm)	MEAN LENGTH (mm)	MEAN LENGTH (mm)
	1997	1998	1999	1997	1998	1999
4	2,704	2,348	2,007	113.1	118.5	125.7
5	2,627	1,896	978	129.9	134.8	137.6
6	655	751	642	136.5	145.6	144.5
7	4,634	2,739	4,532	107.3	113.9	116.0
8	2,621	2,216	2,083	114.0	120.1	124.0
9	3,083	2,930	2,182	119.6	121.5	125.9
10	1,243	602	1,302	96.2	109.1	110.3
11	1,052	1,000	906	114.9	116.4	116.6
12	225	169	438	128.6	116.4	119.3
13	2,085	1,219	791	101.1	116.1	121.1
14	709	633	328	102.7	118.1	113.9
15	851	892	557	110.5	123.8	129.1
Total	22,489	17,395	16,746			

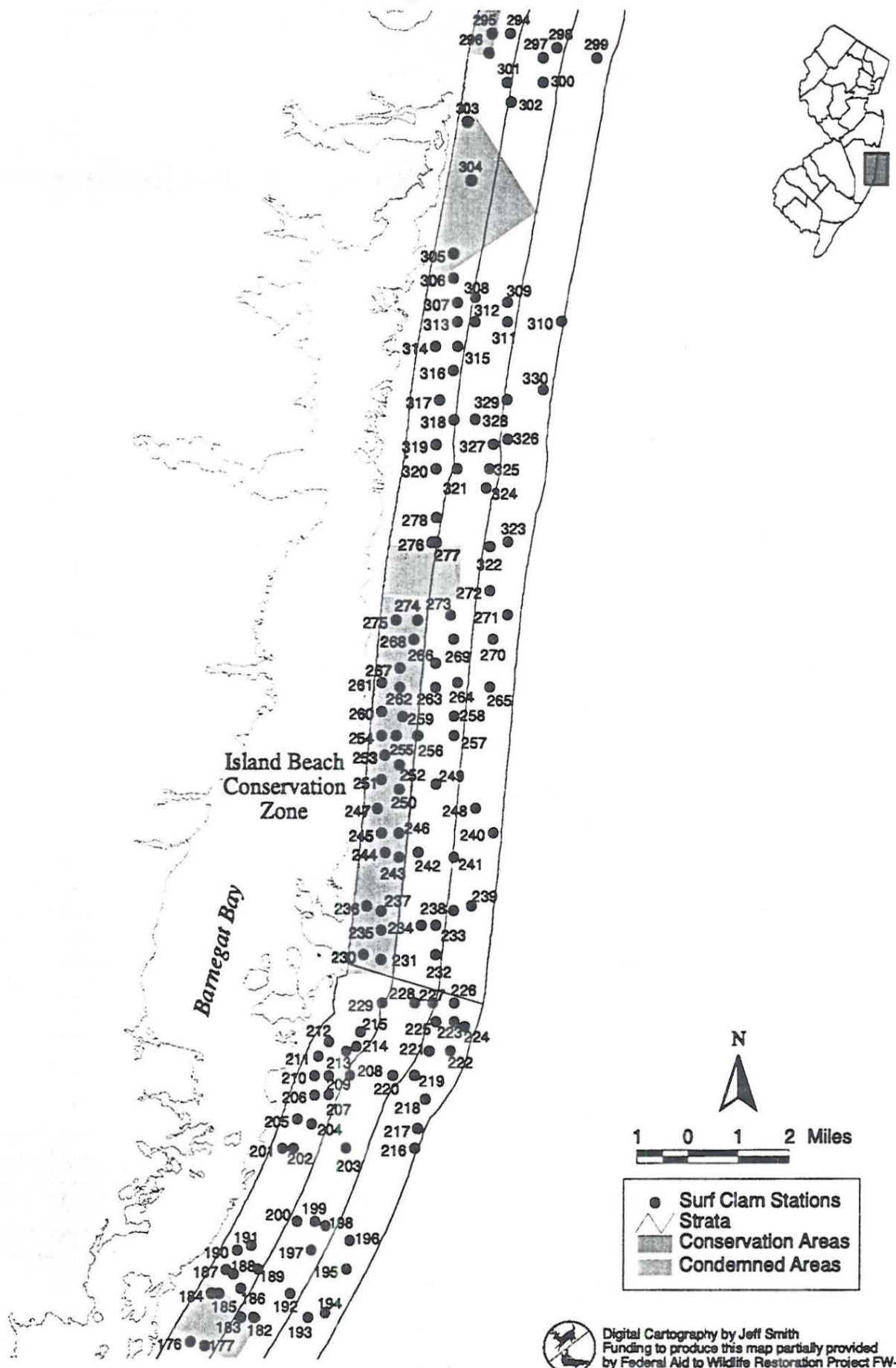
1999 SURF CLAM STATION LOCATIONS

Figure 1: Shrewsbury River to Mantoloking



1999 SURF CLAM STATION LOCATIONS

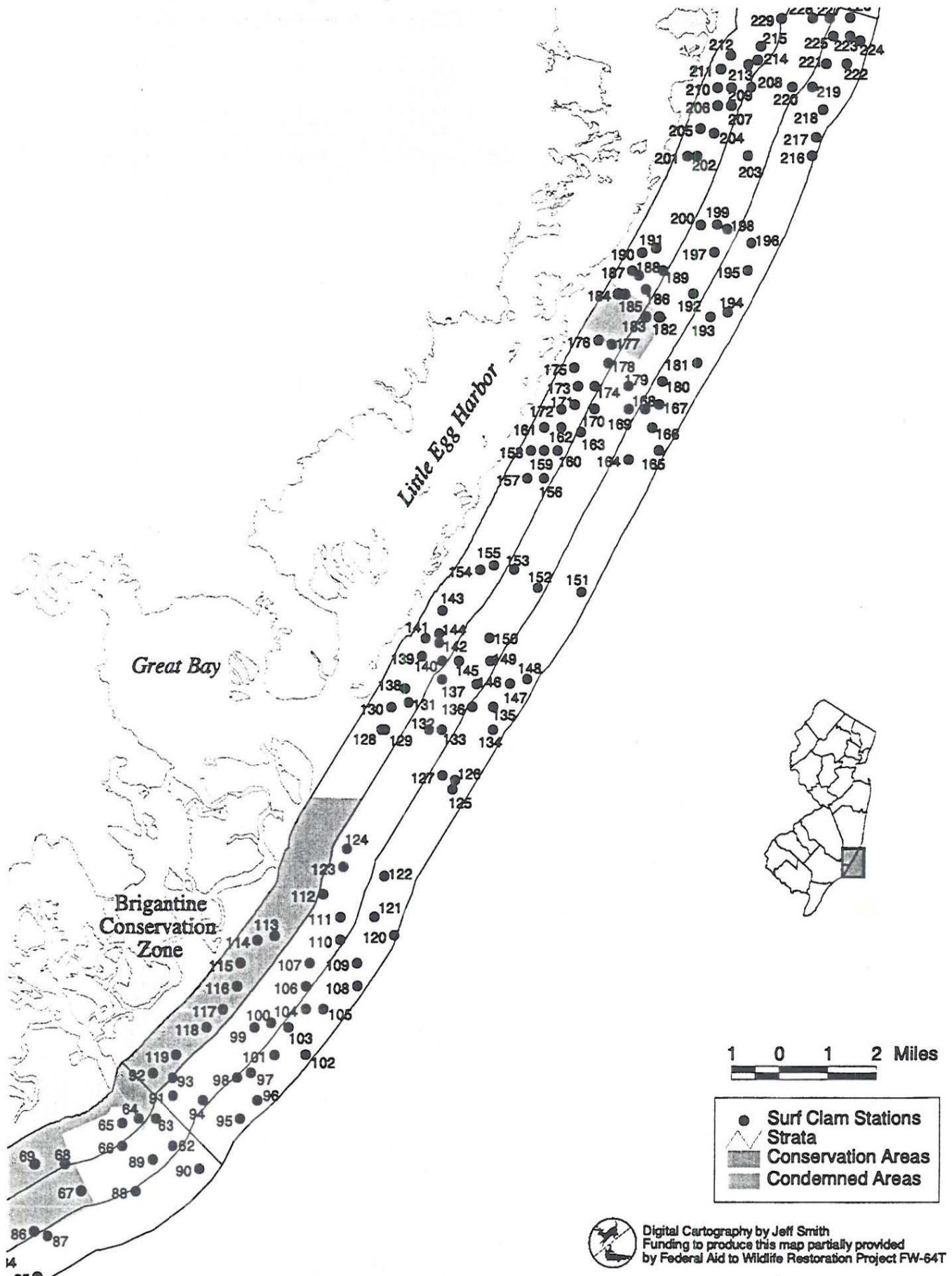
Figure 2: Mantoloking to Harvey Cedars



Digital Cartography by Jeff Smith
Funding to produce this map partially provided
by Federal Aid to Wildlife Restoration Project FW-64T

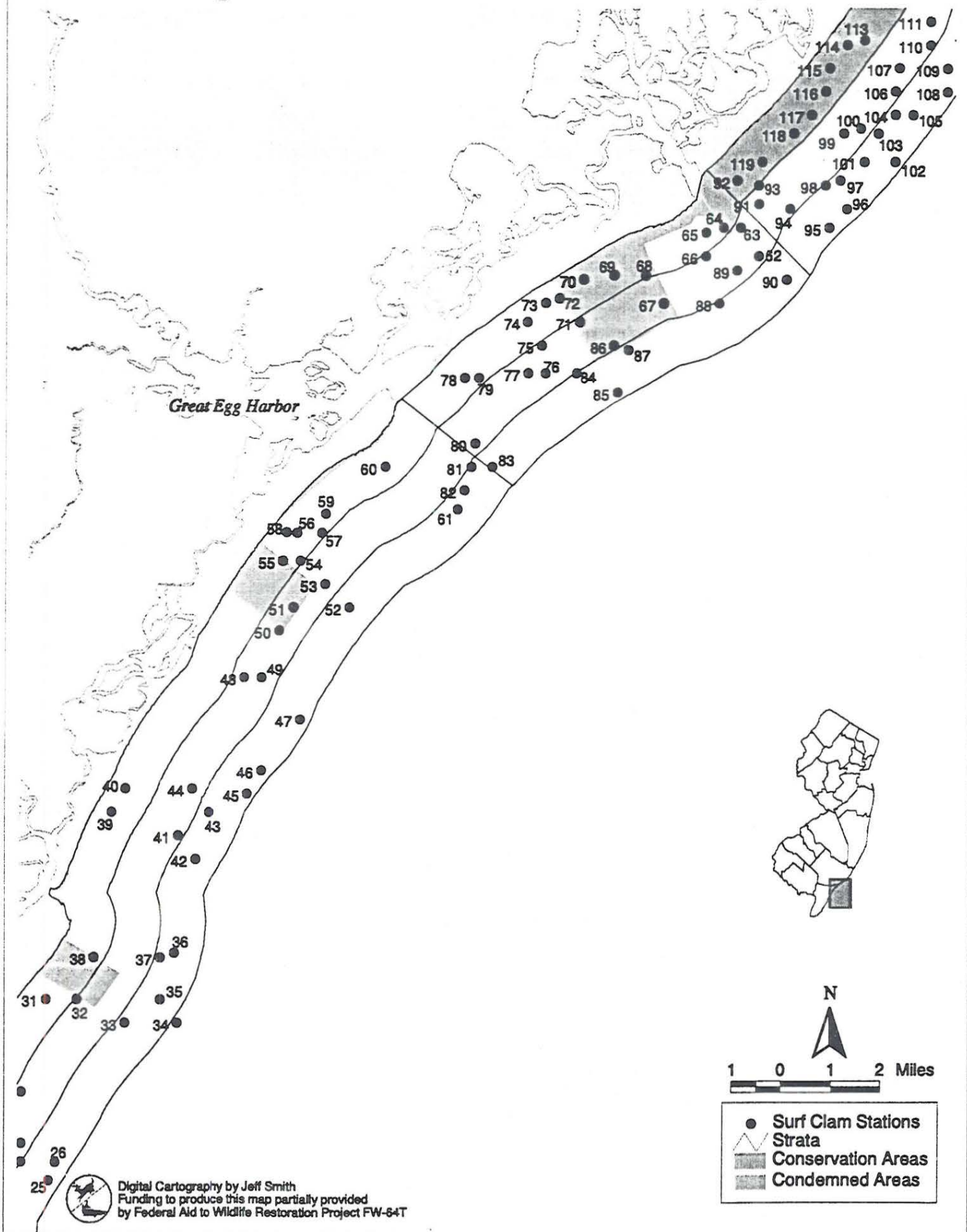
1999 SURF CLAM STATION LOCATIONS

Figure 3: Harvey Cedars to Absecon Inlet



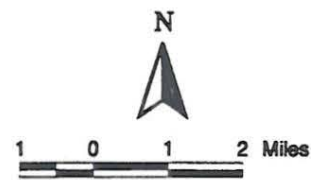
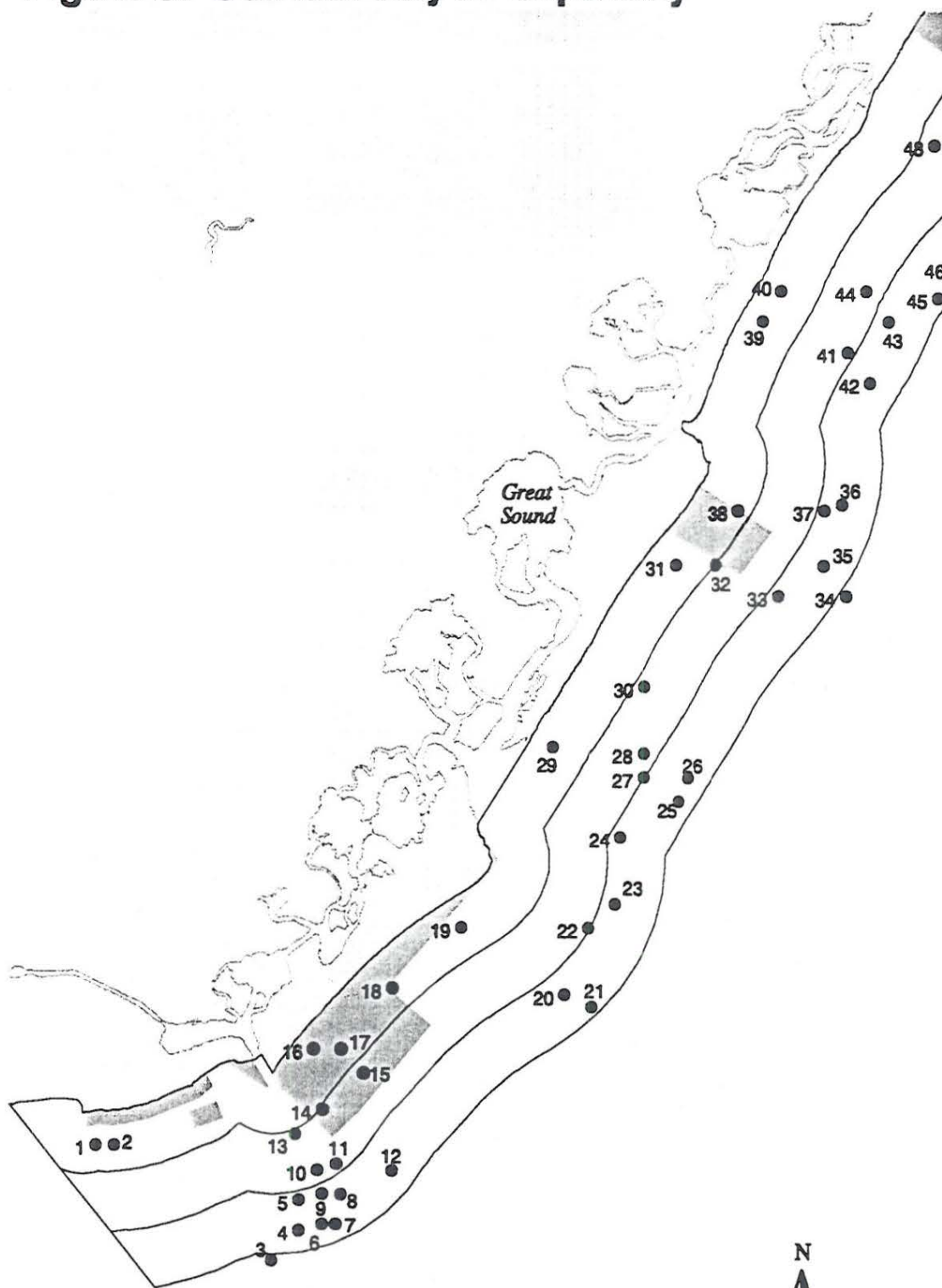
1999 SURF CLAM STATION LOCATIONS

Figure 4: Absecon Inlet to Sea Isle City



1999 SURF CLAM STATION LOCATIONS

Figure 5: Sea Isle City to Cape May



- Surf Clam Stations
- △ Strata
- Conservation Areas
- Condemned Areas



Digital Cartography by Jeff Smith
Funding to produce this map partially provided
by Federal Aid to Wildlife Restoration Project FW-64T

Figure 6. Strata Sampled in 1997, 1998 and 1999 for New Jersey Surf Clam Inventory.

	INNER MILE	MIDDLE MILE	OUTER MILE
Shark River Inlet	4	5	6
Barnegat Inlet	7	8	9
Absecon Inlet	10	11	12
Great Egg Harbor Inlet	13	14	15
Cape May Inlet			

Figure 7. Length Frequency of Surf Clams Collected by the Dredge for 1997, 1998 and 1999, Brigantine Conservation Zone

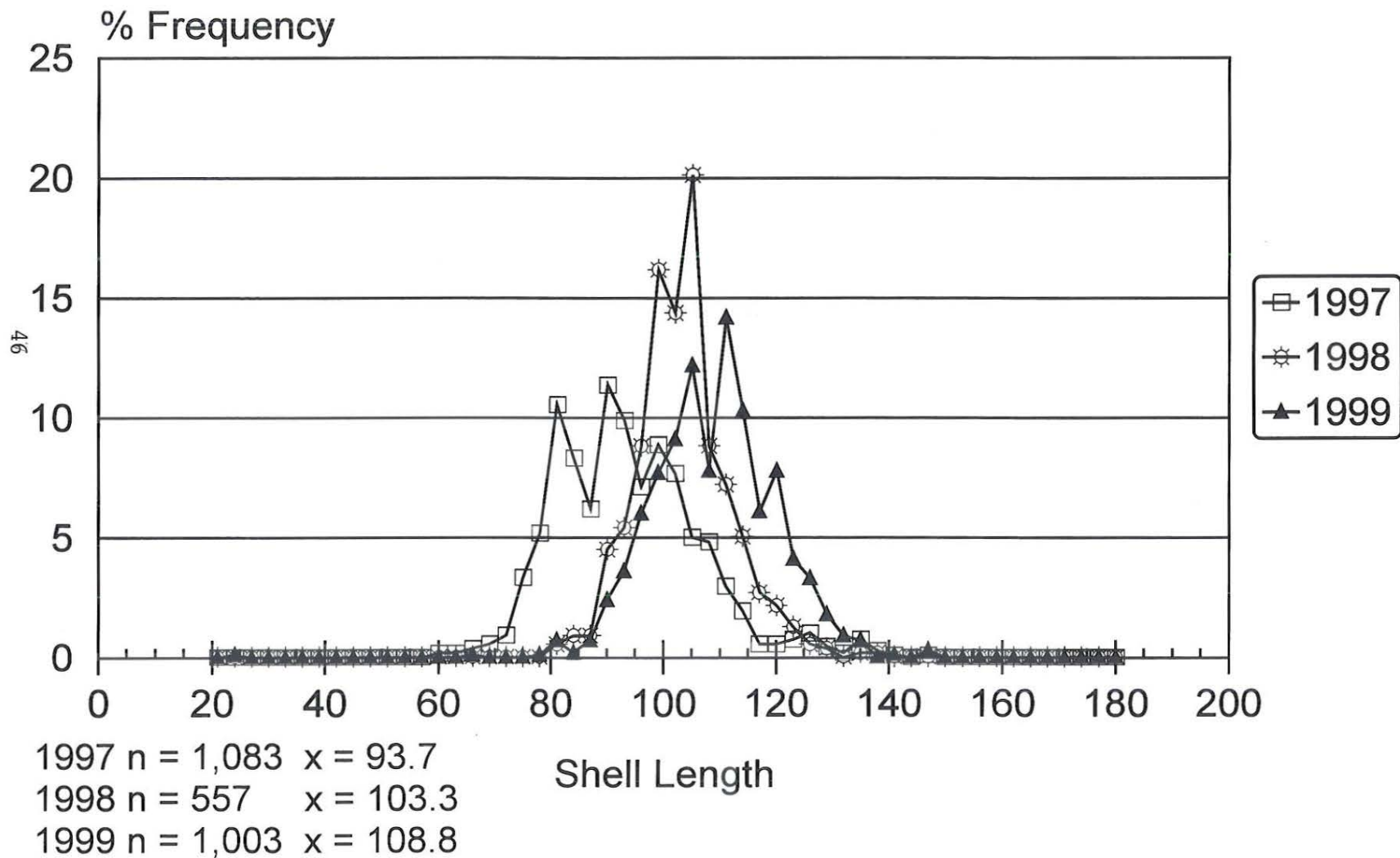
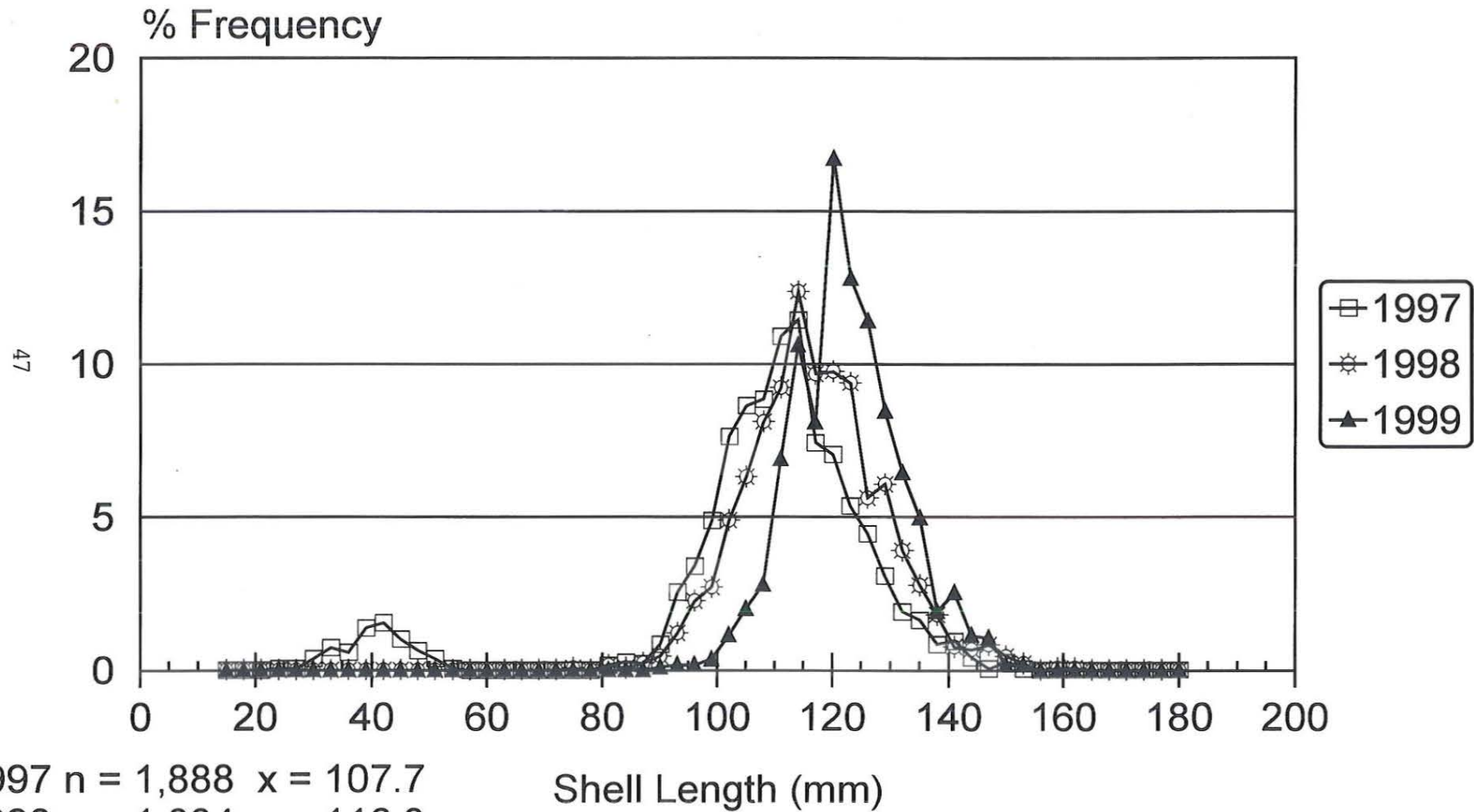


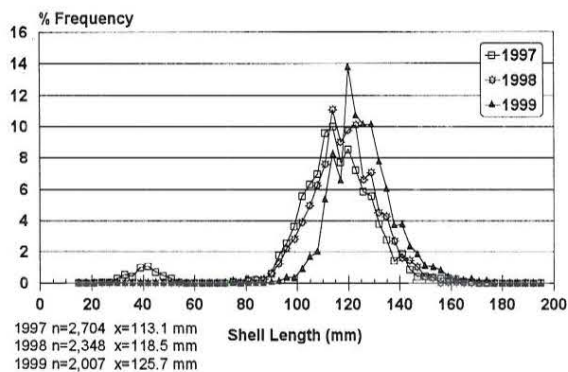
Figure 8. Length Frequency of Surf Clams Collected by the Dredge for 1997, 1998 and 1999, Island Beach Conservation Zone



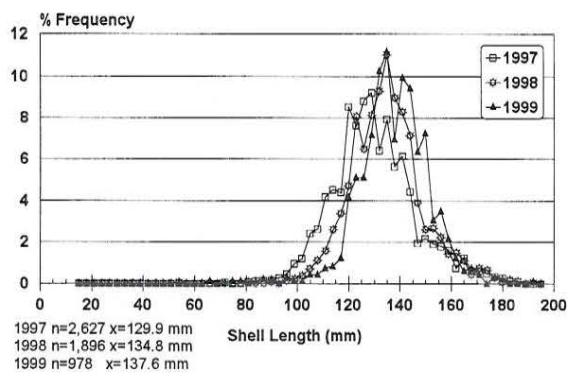
1997 n = 1,888 x = 107.7
 1998 n = 1,334 x = 116.8
 1999 n = 1,149 x = 122.4

Figure 9. Length Frequency of Surf Clams Collected by the Dredge for 1997, 1998, and 1999 in Strata 4, 5 and 6 (Barnegat Inlet to Shark River Inlet)

Stratum 4



Stratum 5



Stratum 6

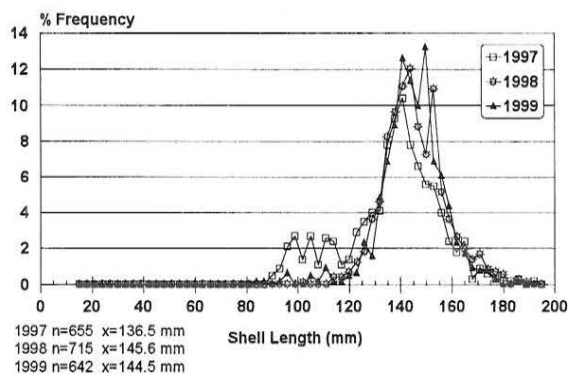
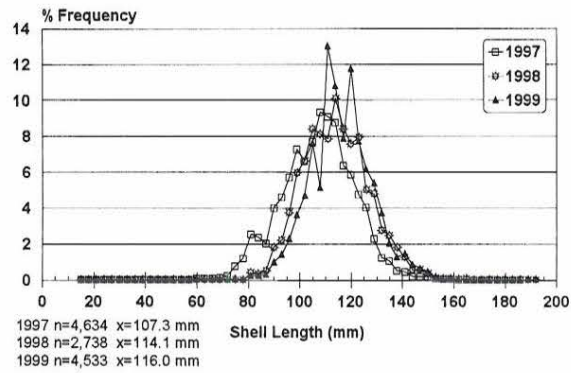
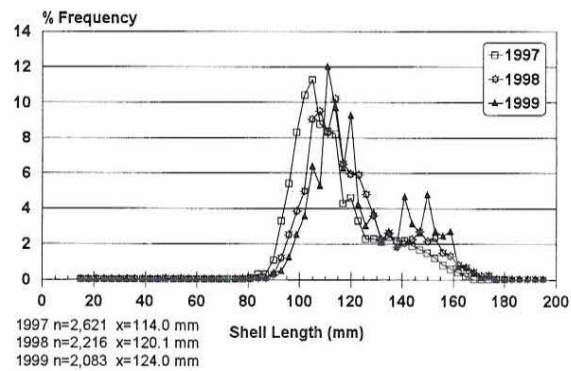


Figure 10. Length frequency of Surf Clams Collected by the Dredge for 1997, 1998, and 1999 in Strata 7, 8 and 9 (Absecon Inlet to Barnegat Inlet)

Stratum 7



Stratum 8



Stratum 9

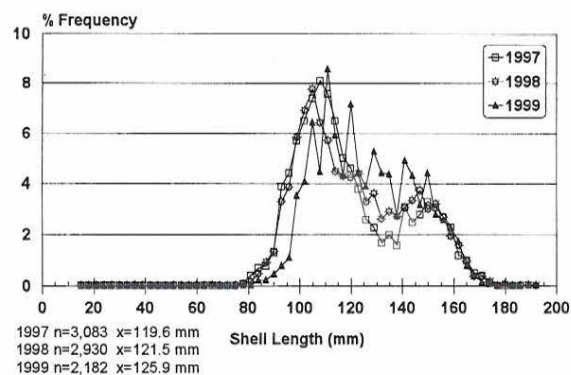
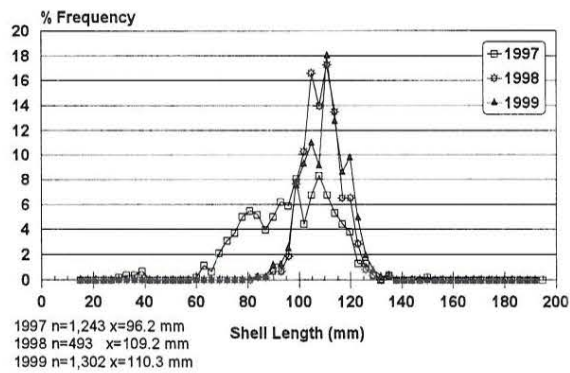
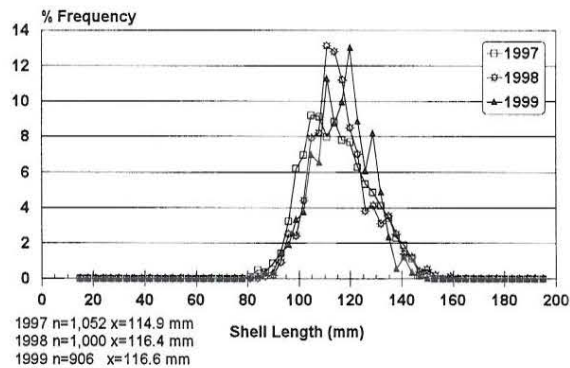


Figure 11. Length Frequency of Surf Clams Collected by the Dredge for 1997, 1998 and 1999 in Stata 10, 11 and 12 (Great Egg Harbor Inlet to Absecon Inlet)

Stratum 10



Stratum 11



Stratum 12

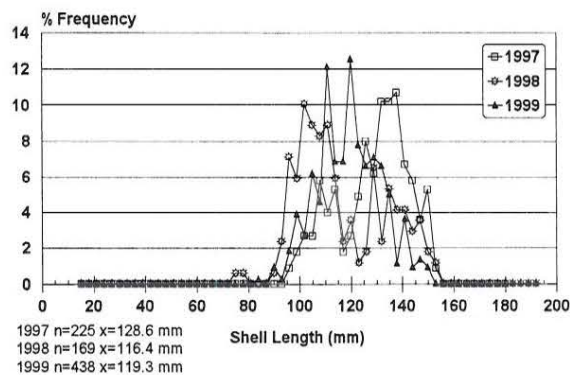
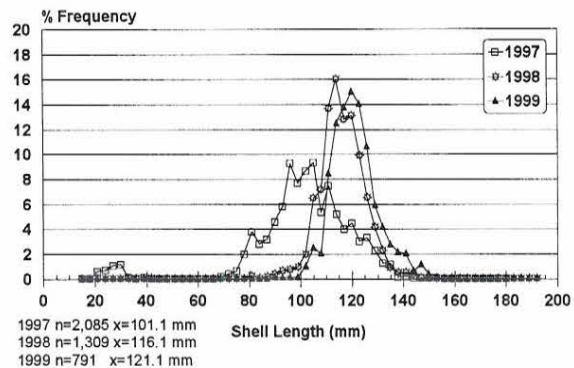
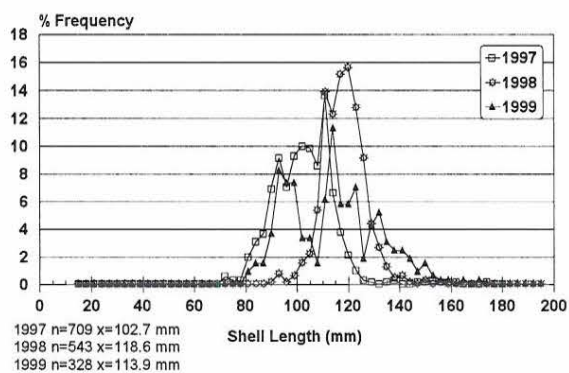


Figure 12. Length Frequency of Surf Clams Collected by the Dredge for 1997, 1998 and 1999 in Strata 13, 14 and 15 (Cape May Inlet to Great Egg Harbor Inlet)

Stratum 13



Stratum 14



Stratum 15

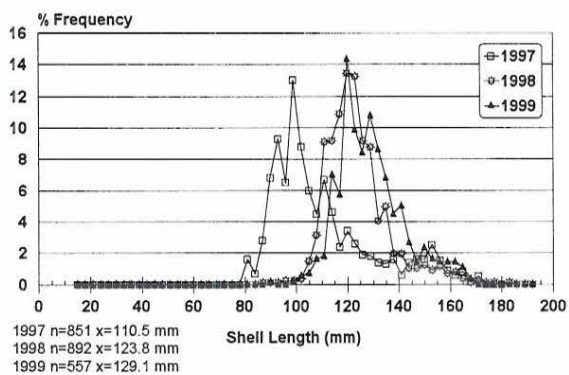


Figure 13. Length Frequency of Surf Clams Collected by the Dredge for 1997, 1998 and 1999, All Stations Combined.

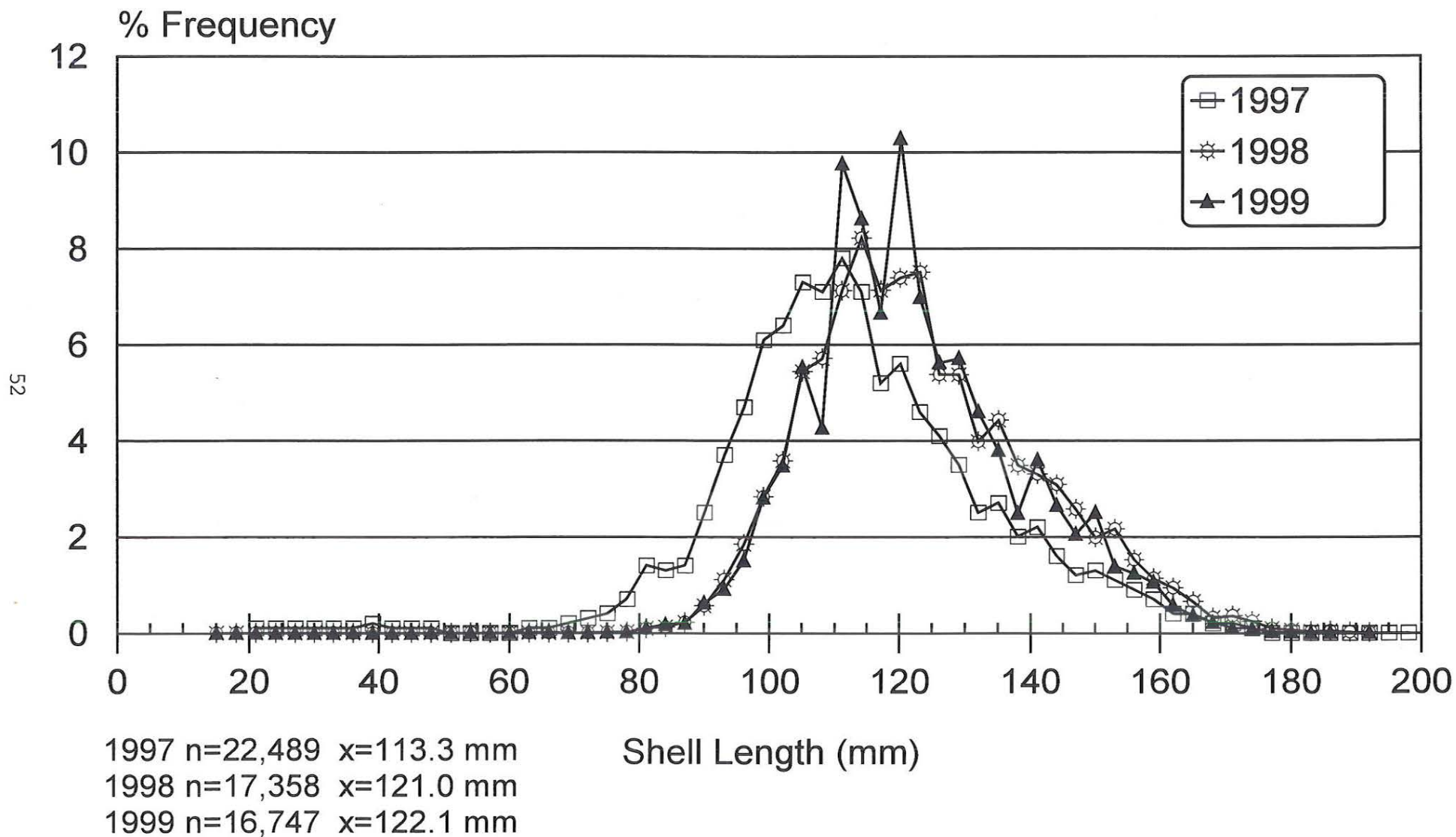
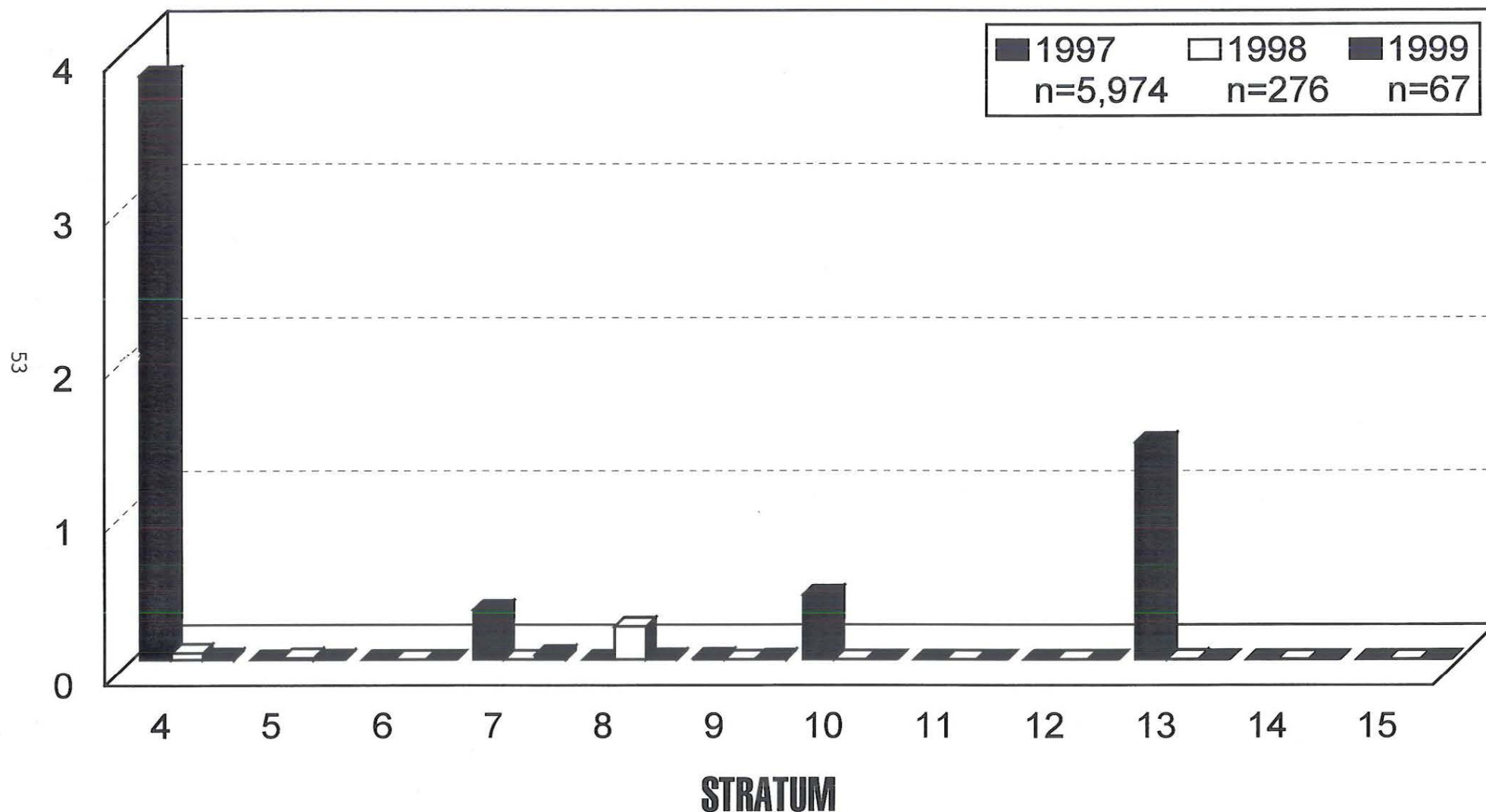


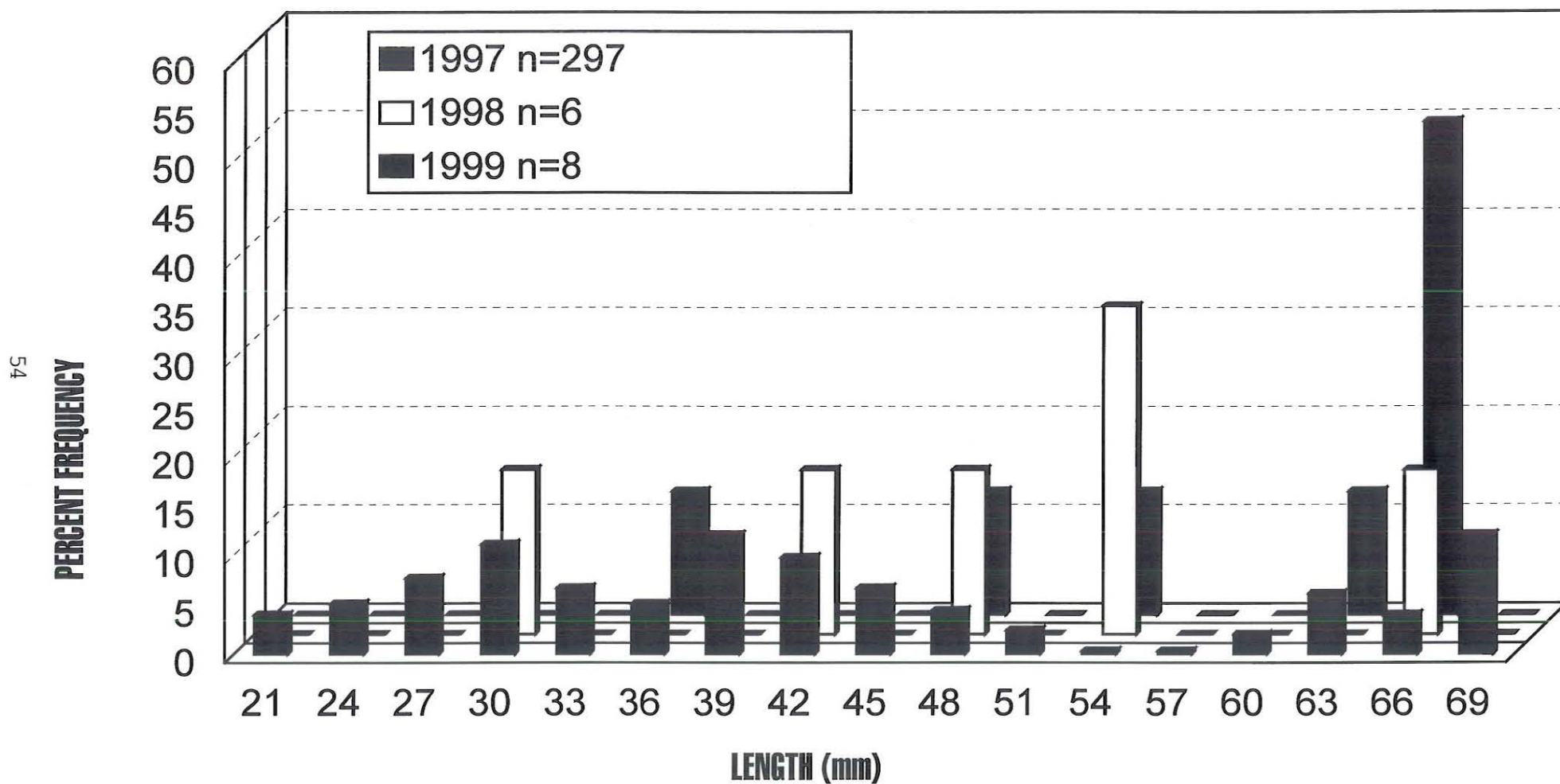
Figure 14. Estimated Number of Surf Clams with Shell Length < 71 mm Collected by the Dredge, by Stratum in 1997, 1998 and 1999¹.

Thousands



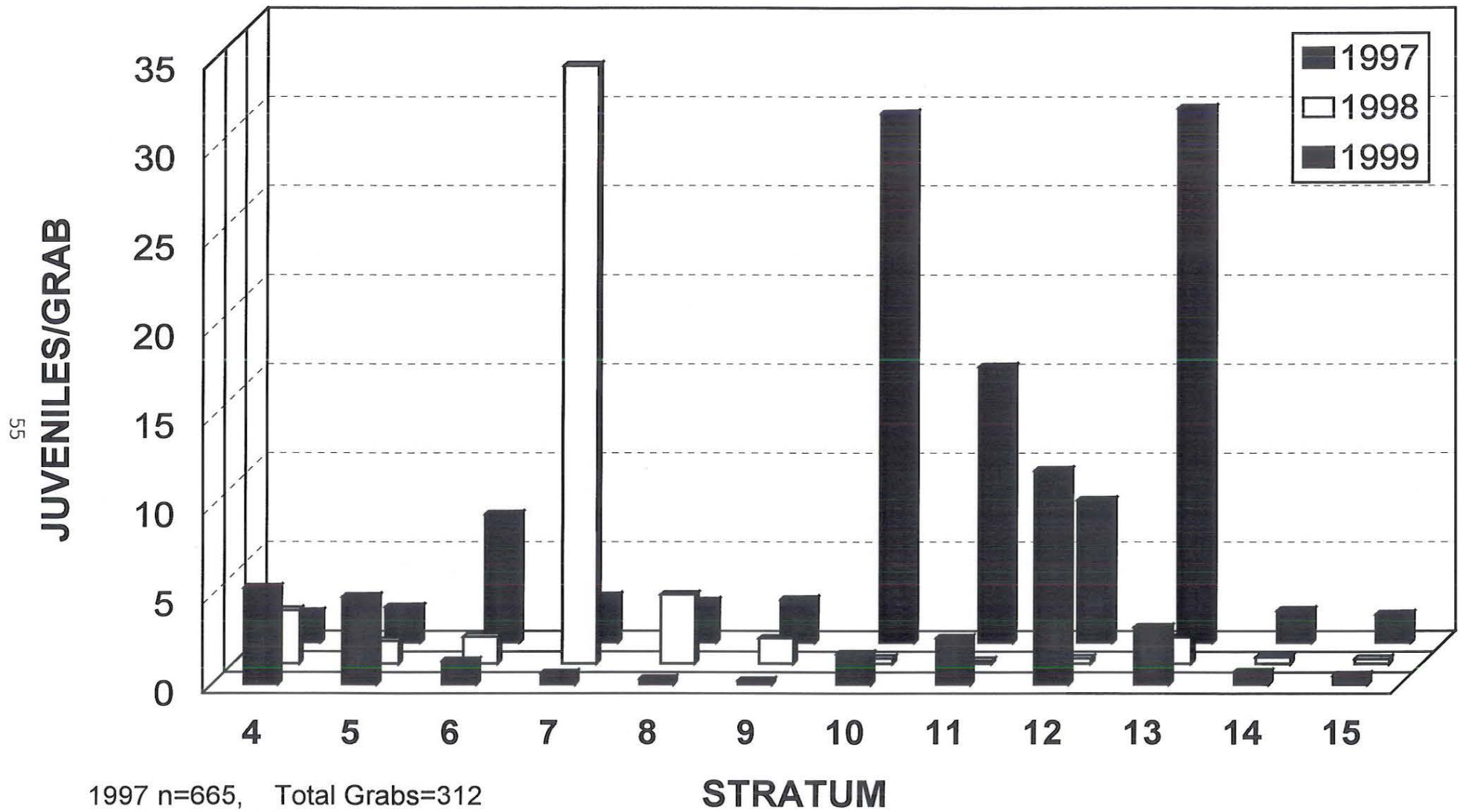
¹Calculated from the number of clams measured in a one bushel subsample, per five minute tow, at each station.

Figure 15. Percent Length Frequency of Surf Clams Measured with Shell Length <71 mm Collected by the Dredge in 1997, 1998 and 1999, All Strata Combined¹



¹Lengths grouped into three millimeter size-classes.

Figure 16. Average Number of Juvenile Surf Clams Collected in Petersen Grabs by Stratum, 1997, 1998 and 1999.



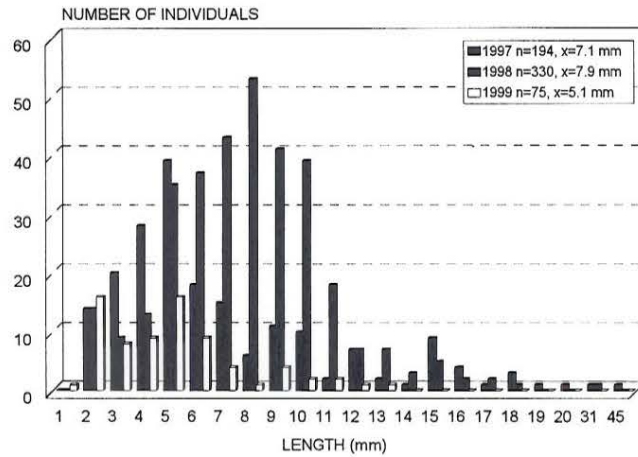
1997 n=665, Total Grabs=312

1998 n=5,828, Total Grabs=317

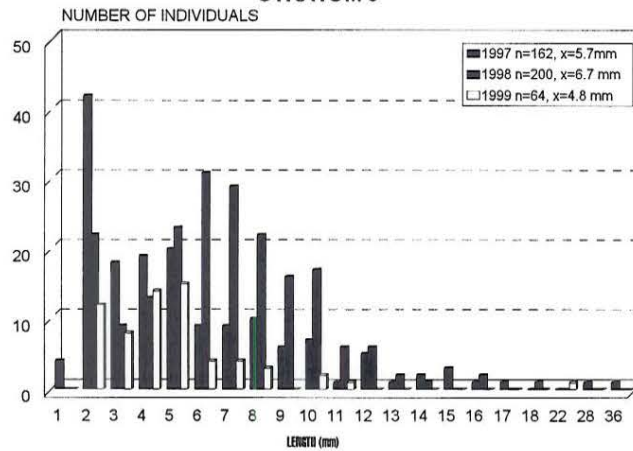
1999 n=1,755, Total Grabs=318

Figure 17. Length Frequency of Juvenile Surf Clams Collected in Petersen Grabs for 1997, 1998 and 1999 in Strata 4, 5 and 6, (Barnegat Inlet to Shark River Inlet)

STRATUM 4



STRATUM 5



STRATUM 6

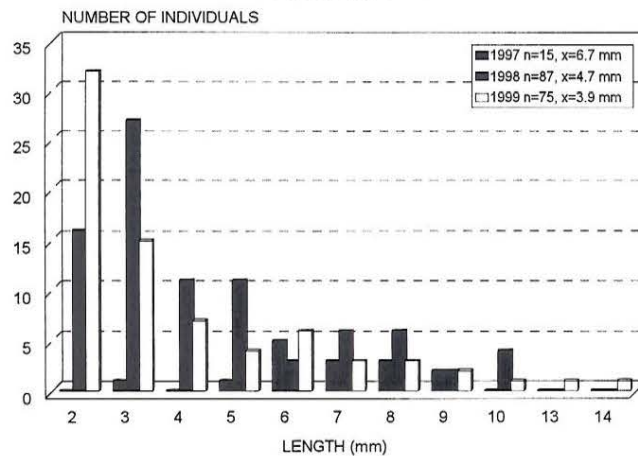


Figure 18. Length Frequency of Juvenile Surf Clams Collected in Petersen Grabs for 1997, 1998 and 1999 in Strata 7, 8 and 9, (Absecon Inlet to Barnegat Inlet)

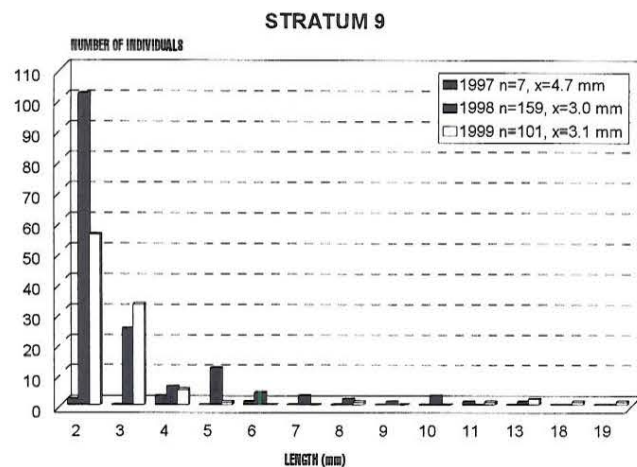
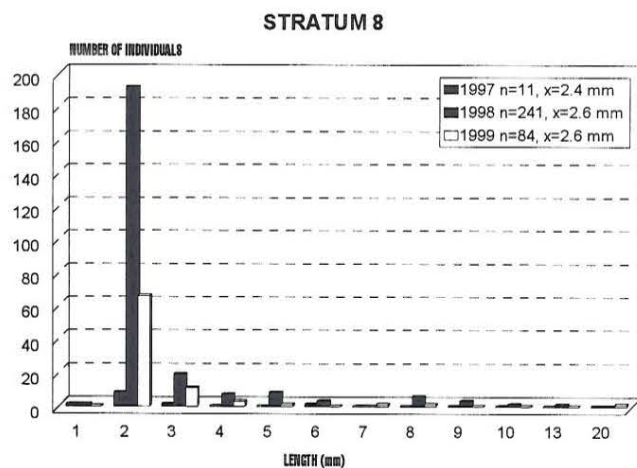
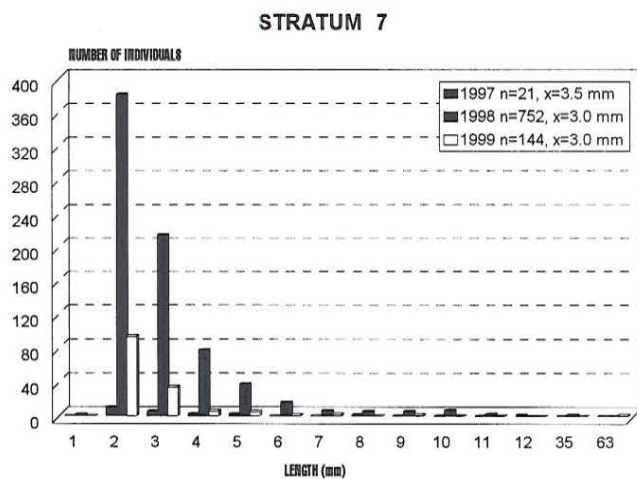


Figure 19. Length Frequency of Juvenile Surf Clams Collected in Petersen Grabs for 1997, 1998 and 1999 in Strata 10, 11 and 12, (Great Egg Harbor Inlet to Absecon

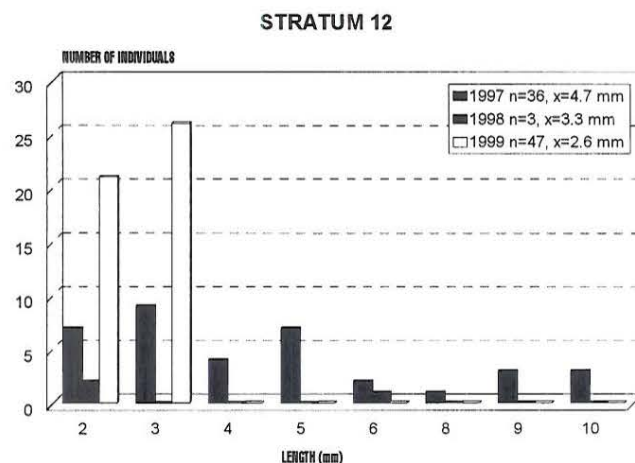
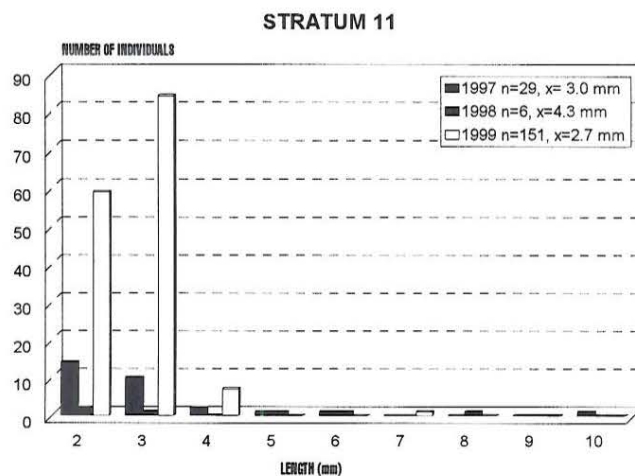
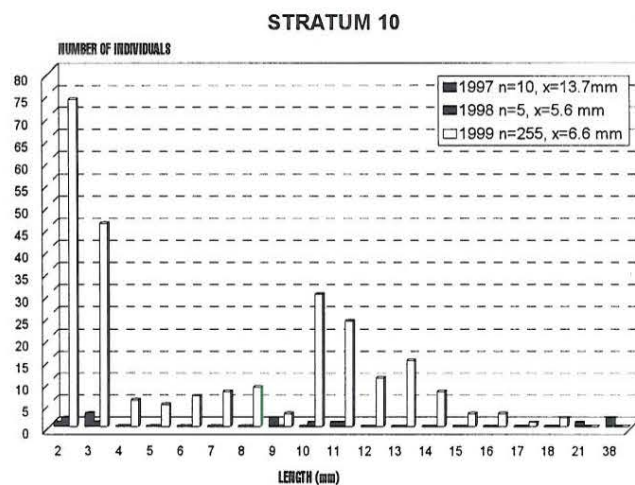


Figure 20. Length Frequency of Juvenile Surf Clams Collected in Petersen Grabs for 1997, 1998 and 1999 in Strata 13, 14 and 15, (Cape May Inlet to Great Egg Harbor Inlet)

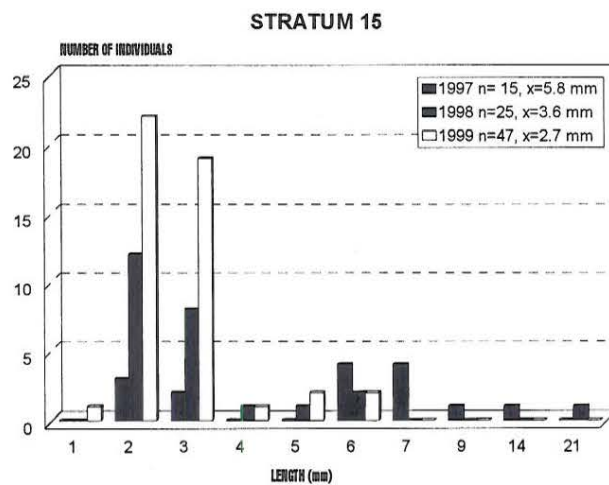
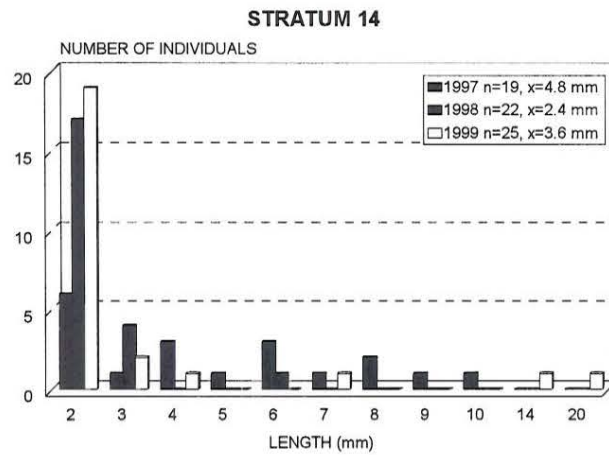
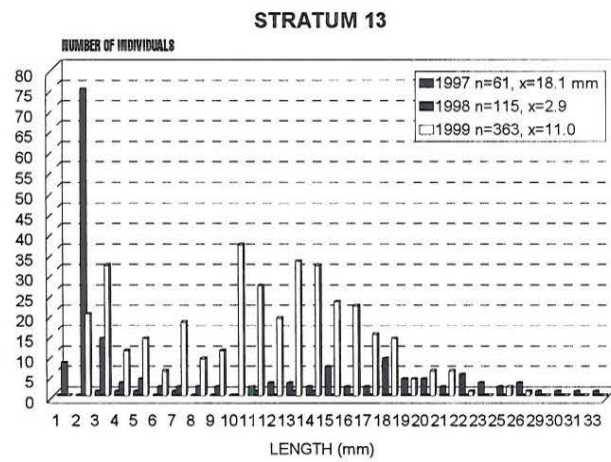
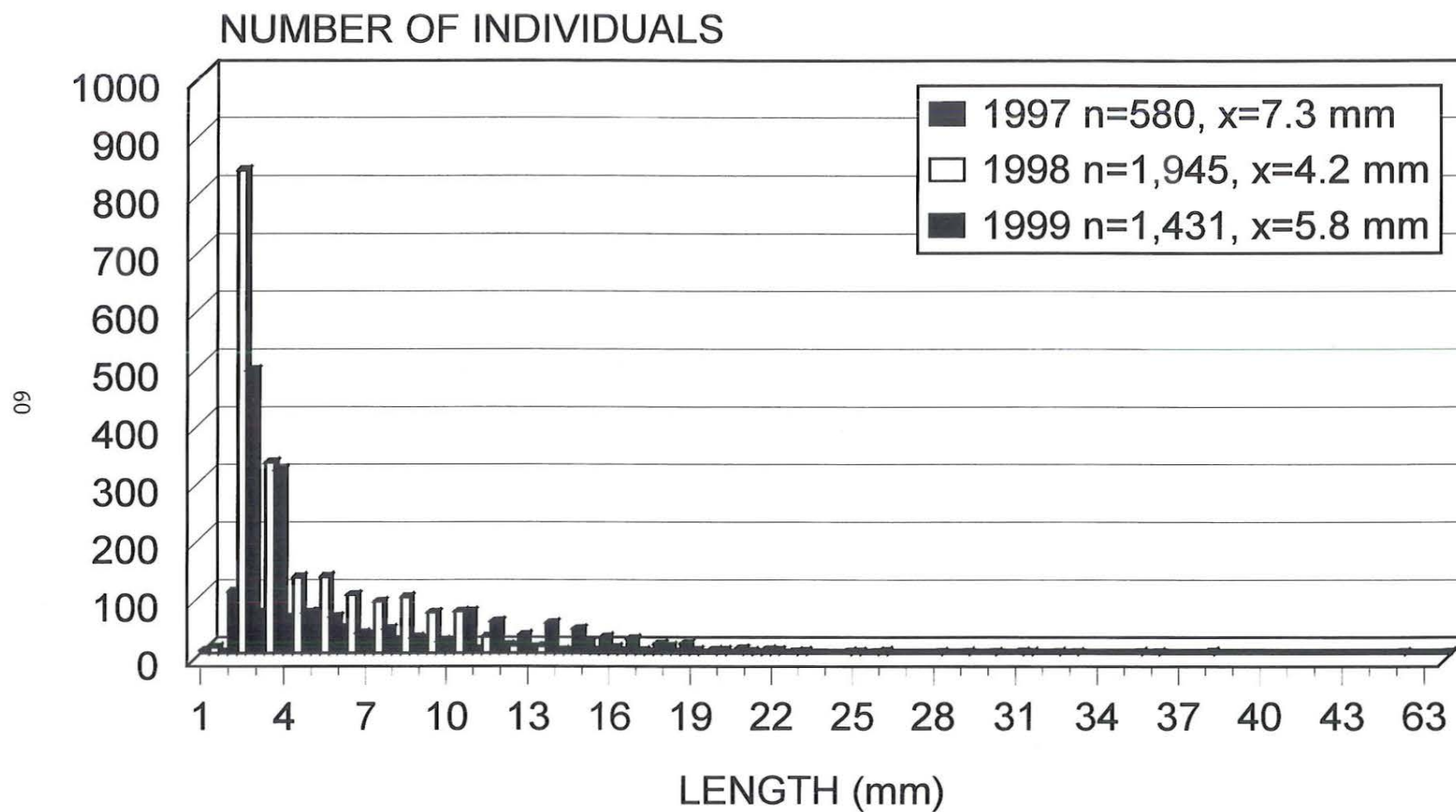


Figure 21. Length Frequency of Juvenile Surf Clams Collected in Petersen Grabs, All Strata Combined, 1997, 1998 and 1999.



APPENDIX A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

Interpreting Results from the Output

(taken from Schlotzhauer and Littell, *SAS System for Elementary Statistical Analysis*, 1988)

1. Look at the line labeled For H_0 : Variances are equal. At the end of this line, look at the probability after Prob>F' =. If this probability is greater than 0.10 (0.05), proceed with the assumption of equal variances. Otherwise, use the approximate t-test.
2. Look at the appropriate row depending on the results of the test for equal variances. The column labeled DF gives the degrees of freedom, and the column labeled Prob>|T| gives the p-value.
3. From the appropriate row of the final column, make conclusions about the differences between the two groups. To perform the test at the 5% significance level, you conclude the two groups are significantly different if the probability is less than 0.05. To perform the test at the 10% significance level, you conclude the two groups are significantly different if the probability is less than 0.10.

Appendix A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

***** STRATA=4 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	41	25.77121951	36.83333308	5.75240019	0	184.0900000
1999	49	12.68877551	23.28603530	3.32657647	0	124.3700000

Variances	T	DF	Prob> T
Unequal	1.9688	65.2	0.0532
Equal	2.0462	88.0	0.0437

For H0: Variances are equal, F' = 2.50 DF = (40,48) Prob>F' = 0.0026

***** STRATA=5 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	47	7.13893617	10.88170867	1.58726034	0	54.78000000
1999	35	3.86314286	8.83178344	1.49284387	0	49.78000000

Variances	T	DF	Prob> T
Unequal	1.5034	79.4	0.1367
Equal	1.4582	80.0	0.1487

For H0: Variances are equal, F' = 1.52 DF = (46,34) Prob>F' = 0.2065

Appendix A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

***** STRATA=6 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	17	4.57235294	3.49432492	0.84749828	0	10.54000000
1999	17	4.13705882	5.18434755	1.25738897	0	21.85000000

Variances	T	DF	Prob> T
Unequal	0.2871	28.1	0.7762
Equal	0.2871	32.0	0.7759

For H0: Variances are equal, F' = 2.20 DF = (16,16) Prob>F' = 0.1249

***** STRATA=7 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	38	19.49000000	21.25940097	3.44873024	0	80.00000000
1999	59	18.56033898	20.88859621	2.71946359	0	74.26000000

Variances	T	DF	Prob> T
Unequal	0.2117	78.1	0.8329
Equal	0.2125	95.0	0.8322

For H0: Variances are equal, F' = 1.04 DF = (37,58) Prob>F' = 0.8888

Appendix A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

***** STRATA=8 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	34	15.05941176	23.68884624	4.06260361	0	107.3700000
1999	37	15.11729730	20.98455962	3.44984035	0	77.3400000

Variances	T	DF	Prob> T
Unequal	-0.0109	66.2	0.9914
Equal	-0.0109	69.0	0.9913

For H0: Variances are equal, F' = 1.27 DF = (33,36) Prob>F' = 0.4768

***** STRATA=9 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	48	12.59854167	17.24970872	2.48978099	0	59.3100000
1999	43	10.97302326	19.28027731	2.94021472	0	71.1500000

Variances	T	DF	Prob> T
Unequal	0.4219	84.8	0.6742
Equal	0.4245	89.0	0.6722

For H0: Variances are equal, F' = 1.25 DF = (42,47) Prob>F' = 0.4572

Appendix A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

***** STRATA=10 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	5	10.85600000	2.00730665	0.89769483	7.89000000	12.91000000
1999	11	17.30454545	17.95458847	5.41351211	1.72000000	63.93000000

Variances	T	DF	Prob> T
Unequal	-1.1751	10.5	0.2659
Equal	-0.7859	14.0	0.4450

For H0: Variances are equal, F' = 80.01 DF = (10,4) Prob>F' = 0.0007

***** STRATA=11 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	12	11.50416667	11.14178903	3.21635745	0.22000000	33.98000000
1999	10	10.29500000	12.90363536	4.08048778	0.39000000	34.56000000

Variances	T	DF	Prob> T
Unequal	0.2327	18.0	0.8186
Equal	0.2360	20.0	0.8158

For H0: Variances are equal, F' = 1.34 DF = (9,11) Prob>F' = 0.6360

Appendix A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

***** STRATA=12 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	3	4.91666667	4.29006216	2.47686854	1.00000E-02	7.96000000
1999	6	10.30666667	9.53874136	3.89417485	0.00000E+00	25.66000000

Variances	T	DF	Prob> T
Unequal	-1.1679	7.0	0.2811
Equal	-0.9095	7.0	0.3933

For H0: Variances are equal, F' = 4.94 DF = (5,2) Prob>F' = 0.3535

***** STRATA=13 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	26	4.39115385	7.34631463	1.44073083	0	28.09000000
1999	19	4.10315789	7.54770904	1.73156321	0	30.73000000

Variances	T	DF	Prob> T
Unequal	0.1279	38.3	0.8989
Equal	0.1284	43.0	0.8984

For H0: Variances are equal, F' = 1.06 DF = (18,25) Prob>F' = 0.8837

Appendix A. Results of Two-Sample T-Tests Comparing the Mean Number of Bushels Collected in 1998 and 1999 by Stratum.

***** STRATA=14 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	22	6.49272727	15.73113721	3.35388972	0	64.2900000
1999	14	18.02785714	56.99312390	15.23205307	0	213.0000000

Variances	T	DF	Prob> T
Unequal	-0.7396	14.3	0.4716
Equal	-0.9034	34.0	0.3727

For H0: Variances are equal, F' = 13.13 DF = (13,21) Prob>F' = 0.0000

***** STRATA=15 *****

Variable: Y

YEAR	N	Mean	Std Dev	Std Error	Minimum	Maximum
1998	30	15.78233333	29.76567401	5.43444370	0	108.0900000
1999	30	9.45566667	21.65680871	3.95397422	0	76.5300000

Variances	T	DF	Prob> T
Unequal	0.9414	53.0	0.3508
Equal	0.9414	58.0	0.3504

For H0: Variances are equal, F' = 1.89 DF = (29,29) Prob>F' = 0.0922

APPENDIX B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum

Interpreting Results from the Output

1. Find the first $\text{Pr}>F$ value. If this value is greater than $\alpha = 0.1$, than no significant difference between the means was found for68 that stratum..
2. If a significant difference was detected between the means, go to the next page which provides an output for Scheffe's Test. This output provides a breakdown of the comparisons for each year. Comparisons in which a significant difference was found is noted with the symbol "***".

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 4 *****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_4 95_4 96_4 97_4 98_4 99_4

Number of observations in data set = 275

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	4814.7883181	962.9576636	1.45	0.2072
Error	269	178833.0491168	664.8068740		
Corrected Total	274	183647.8374349			

R-Square	C.V.	Root MSE	Y Mean
0.026218	138.4069	25.783849	18.629018

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	4814.7883181	962.9576636	1.45	0.2072

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	4814.7883181	962.9576636	1.45	0.2072

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 5 *****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_5 95_5 96_5 97_5 98_5 99_5

Number of observations in data set = 267

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	6435.3694604	1287.0738921	4.28	0.0009
Error	261	78398.9552101	300.3791387		
Corrected Total	266	84834.3246704			

R-Square	C.V.	Root MSE	Y Mean
0.075858	147.7725	17.331449	11.728464

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	6435.3694604	1287.0738921	4.28	0.0009

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	6435.3694604	1287.0738921	4.28	0.0009

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

General Linear Models Procedure

Scheffe's test for variable: Y

NOTE: This test controls the type I experimentwise error rate but generally has a higher type II error rate than Tukey's for all pairwise comparisons.

Alpha= 0.1 Confidence= 0.9 df= 261 MSE= 300.3791
Critical Value of F= 1.86947

Comparisons significant at the 0.1 level are indicated by '***'.

STRATYR Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
96_5 - 95_5	-9.640	1.651	12.943	
96_5 - 94_5	-8.541	2.164	12.870	
96_5 - 97_5	-2.301	8.517	19.336	
96_5 - 98_5	-0.481	10.338	21.156	
96_5 - 99_5	1.887	13.614	25.341	***
95_5 - 96_5	-12.943	-1.651	9.640	
95_5 - 94_5	-10.778	0.513	11.804	
95_5 - 97_5	-4.533	6.866	18.265	
95_5 - 98_5	-2.712	8.686	20.085	
95_5 - 99_5	-0.302	11.962	24.226	
94_5 - 96_5	-12.870	-2.164	8.541	
94_5 - 95_5	-11.804	-0.513	10.778	
94_5 - 97_5	-4.466	6.353	17.171	
94_5 - 98_5	-2.645	8.173	18.992	
94_5 - 99_5	-0.278	11.449	23.176	
97_5 - 96_5	-19.336	-8.517	2.301	
97_5 - 95_5	-18.265	-6.866	4.533	
97_5 - 94_5	-17.171	-6.353	4.466	
97_5 - 98_5	-9.110	1.820	12.751	
97_5 - 99_5	-6.734	5.096	16.927	
98_5 - 96_5	-21.156	-10.338	0.481	
98_5 - 95_5	-20.085	-8.686	2.712	
98_5 - 94_5	-18.992	-8.173	2.645	
98_5 - 97_5	-12.751	-1.820	9.110	
98_5 - 99_5	-8.555	3.276	15.106	
99_5 - 96_5	-25.341	-13.614	-1.887	***
99_5 - 95_5	-24.226	-11.962	0.302	
99_5 - 94_5	-23.176	-11.449	0.278	

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 6*****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_6 95_6 96_6 97_6 98_6 99_6

Number of observations in data set = 116

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	214.52432087	42.90486417	0.84	0.5267
Error	110	5643.66266534	51.30602423		
Corrected Total	115	5858.18698621			

R-Square	C.V.	Root MSE	Y Mean
0.036620	116.4752	7.1628224	6.1496552

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	214.52432087	42.90486417	0.84	0.5267

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	214.52432087	42.90486417	0.84	0.5267

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

*****STRATA 7*****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_7 95_7 96_7 97_7 98_7 99_7

Number of observations in data set = 290

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2657.3199844	531.4639969	1.29	0.2696
Error	284	117302.9642739	413.0386066		
Corrected Total	289	119960.2842583			

R-Square	C.V.	Root MSE	Y Mean
0.022152	100.0184	20.323351	20.319621

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	2657.3199844	531.4639969	1.29	0.2696

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	2657.3199844	531.4639969	1.29	0.2696

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 8*****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	7	94_8 95_8 96_8 97_8 98_8 99_8 99_9

Number of observations in data set = 234

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	861.66886895	143.61147816	0.49	0.8185
Error	227	67079.30484259	295.50354556		
Corrected Total	233	67940.97371154			
	R-Square	C.V.	Root MSE	Y Mean	
	0.012683	134.7101	17.190217	12.760897	

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	6	861.66886895	143.61147816	0.49	0.8185
Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	6	861.66886895	143.61147816	0.49	0.8185

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 9*****

General Linear Models Procedure

Class Level Information

Class	Levels	Values
STRATYR	6	94_9 95_9 96_9 97_9 98_9 99_9

Number of observations in data set = 271

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2065.0769848	413.0153970	1.16	0.3300
Error	265	94465.8444550	356.4748847		
Corrected Total	270	96530.9214399			

R-Square	C.V.	Root MSE	Y Mean
0.021393	141.0324	18.880542	13.387380

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	2065.0769848	413.0153970	1.16	0.3300

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	2065.0769848	413.0153970	1.16	0.3300

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 10*****

General Linear Models Procedure

Class Level Information

Class	Levels	Values
STRATYR	6	94_10 95_10 96_10 97_10 98_10 99_10

Number of observations in data set = 58

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	224.85056709	44.97011342	0.22	0.9507
Error	52	10456.69773119	201.09034098		
Corrected Total	57	10681.54829828			

R-Square	C.V.	Root MSE	Y Mean
0.021050	98.95885	14.180633	14.329828

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	224.85056709	44.97011342	0.22	0.9507

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	224.85056709	44.97011342	0.22	

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 11*****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_11 95_11 96_11 97_11 98_11 99_11

Number of observations in data set = 59

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	153.10352873	30.62070575	0.23	0.9491
Error	53	7146.98193907	134.84871583		
Corrected Total	58	7300.08546780			

R-Square	C.V.	Root MSE	Y Mean
0.020973	109.9416	11.612438	10.562373

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	153.10352873	30.62070575	0.23	0.9491

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	153.10352873	30.62070575	0.23	0.9491

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

*****STRATA 12*****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_12 95_12 96_12 97_12 98_12 99_12

Number of observations in data set = 27

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	153.83812630	30.76762526	0.87	0.5162
Error	21	740.68563667	35.27074460		
Corrected Total	26	894.52376296			

R-Square	C.V.	Root MSE	Y Mean
0.171978	79.21687	5.9389178	7.4970370

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	153.83812630	30.76762526	0.87	0.5162

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	153.83812630	30.76762526	0.87	0.5162

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 13 *****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_13 95_13 96_13 97_13 98_13 99_13

Number of observations in data set = 87

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	197.02485345	39.40497069	0.48	0.7927
Error	81	6696.71807299	82.67553177		
Corrected Total	86	6893.74292644			

R-Square	C.V.	Root MSE	Y Mean
0.028580	177.5581	9.0926086	5.1209195

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	197.02485345	39.40497069	0.48	0.7927

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	197.02485345	39.40497069	0.48	0.7927

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 14*****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_14 95_14 96_14 97_14 98_14 99_14

Number of observations in data set = 85

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2874.7632083	574.9526417	0.86	0.5087
Error	79	52528.2028929	664.9139607		
Corrected Total	84	55402.9661012			

R-Square	C.V.	Root MSE	Y Mean
0.051888	377.8451	25.785926	6.8244706

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	2874.7632083	574.9526417	0.86	0.5087

Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	2874.7632083	574.9526417	0.86	0.5087

Appendix B. Results of Scheffe's Multiple Comparison Tests Comparing the Mean Number of Bushels Collected from 1994-1999 by Stratum.

***** STRATA 15 *****

General Linear Models Procedure
Class Level Information

Class	Levels	Values
STRATYR	6	94_15 95_15 96_15 97_15 98_15 99_15

Number of observations in data set = 99

General Linear Models Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2621.0952654	524.2190531	1.11	0.3591
Error	93	43814.6392700	471.1251534		
Corrected Total	98	46435.7345354			

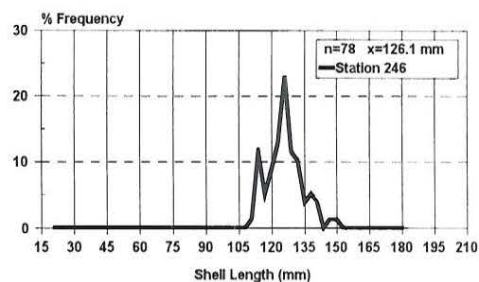
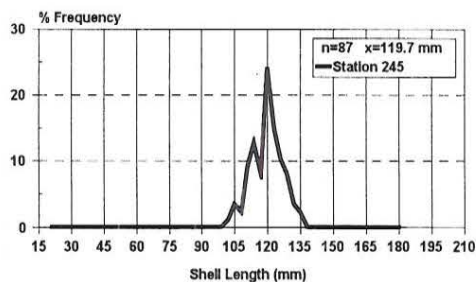
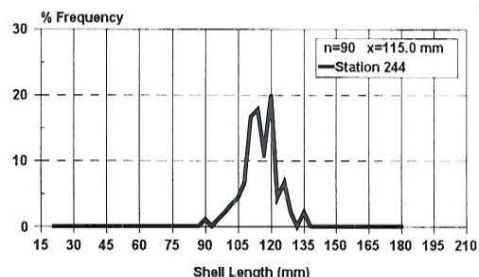
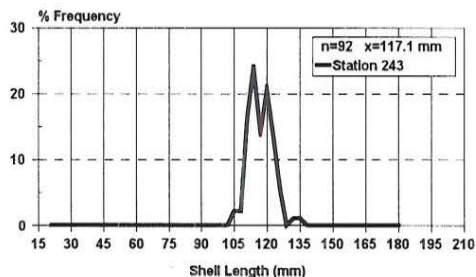
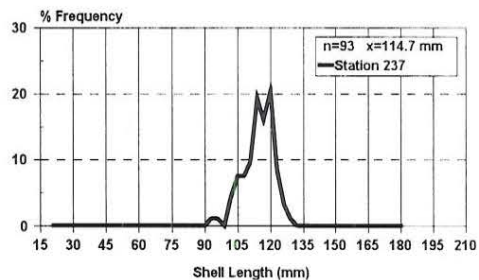
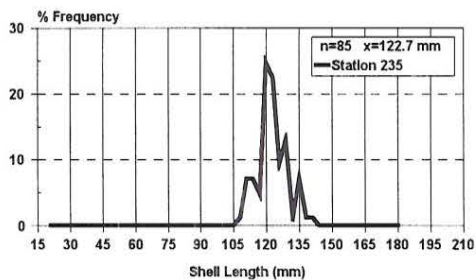
R-Square	C.V.	Root MSE	Y Mean
0.056446	234.4483	21.705418	9.2580808

Source	DF	Type I SS	Mean Square	F Value	Pr > F
STRATYR	5	2621.0952654	524.2190531	1.11	0.3591

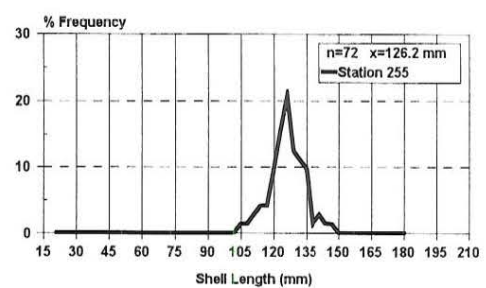
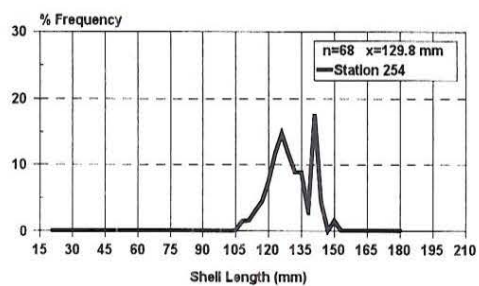
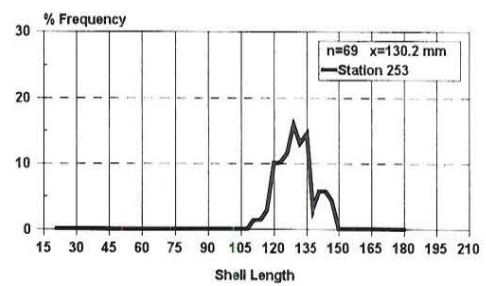
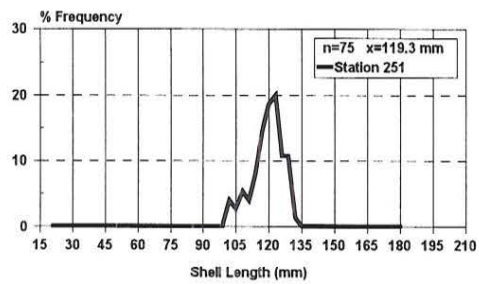
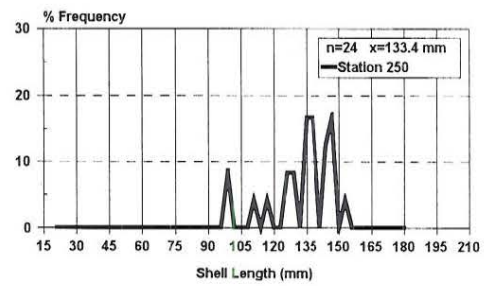
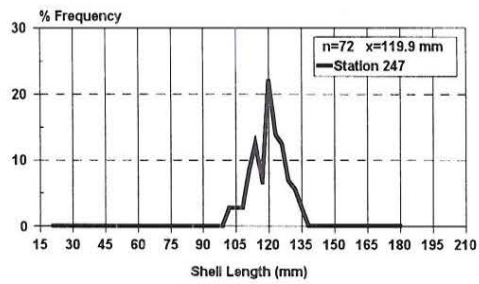
Source	DF	Type III SS	Mean Square	F Value	Pr > F
STRATYR	5	2621.0952654	524.2190531	1.11	0.3591

APPENDIX C. Length Frequency Distributions of Surf Clams from Stations Sampled in 1999. (n=Number of Clams Measured, $\bar{x}$ = Mean Shell Length in mm)

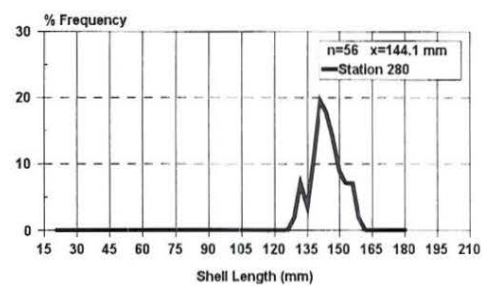
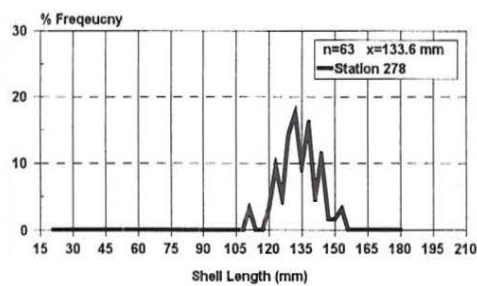
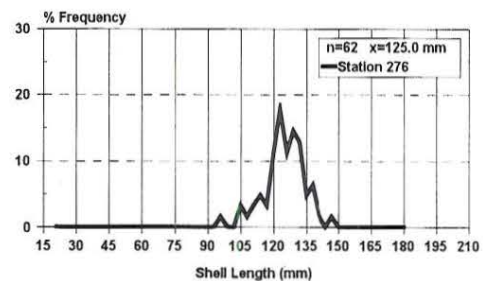
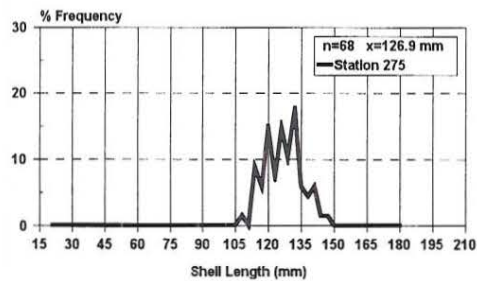
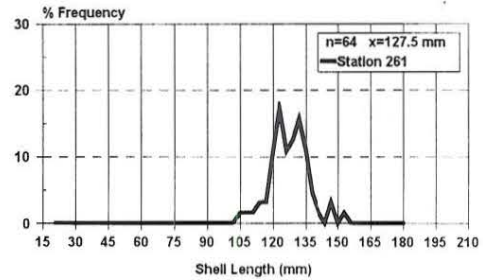
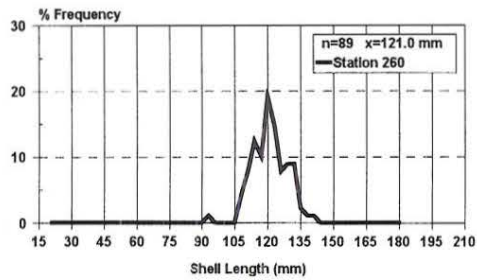
STRATUM 4 INNER MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999



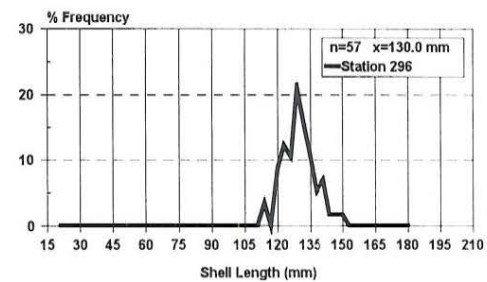
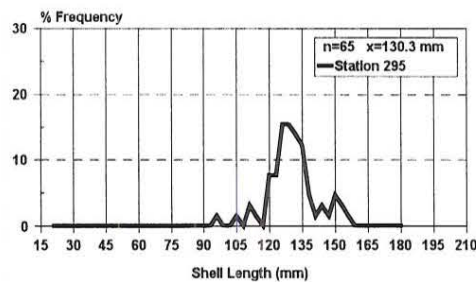
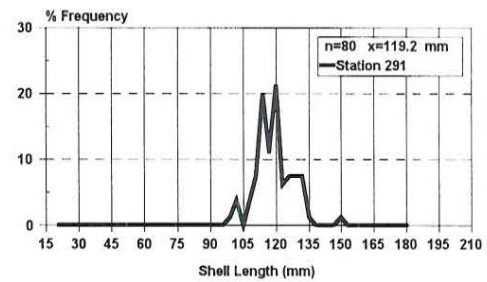
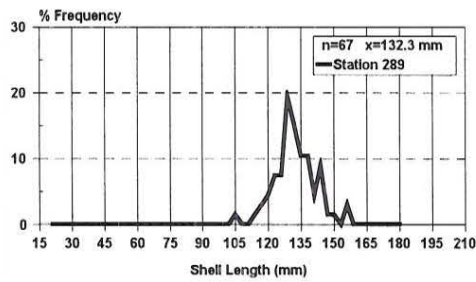
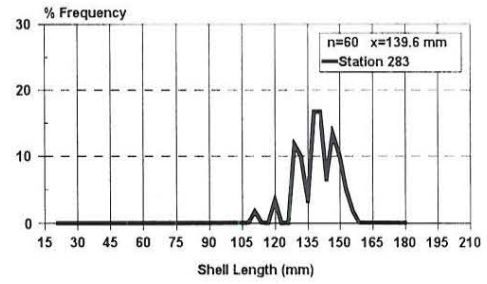
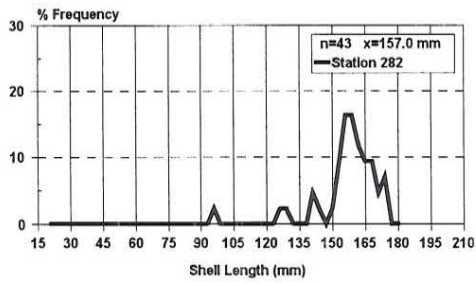
STRATUM 4 INNER MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999



STRATUM 4 INNER MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999

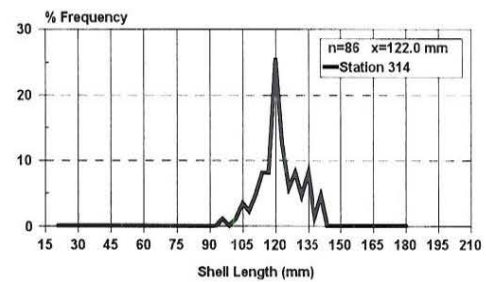
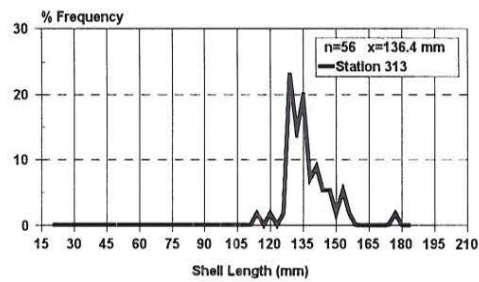
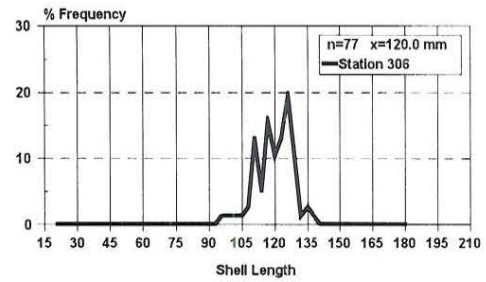
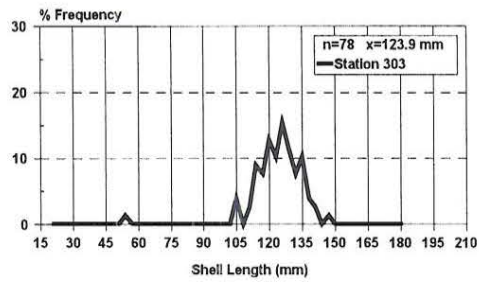


STRATUM 4 INNER MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999

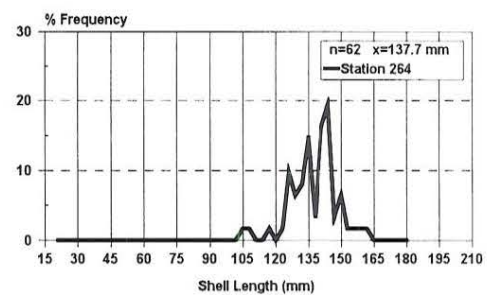
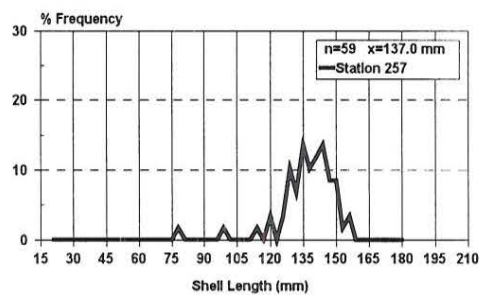
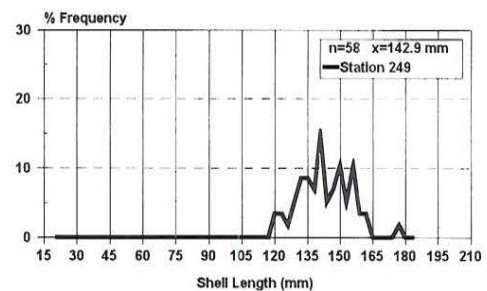
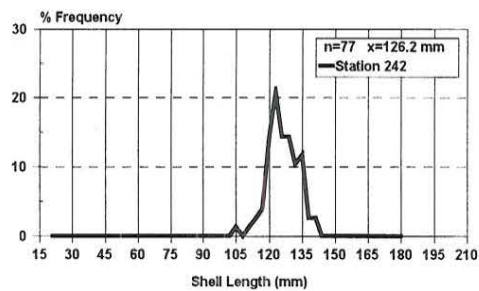
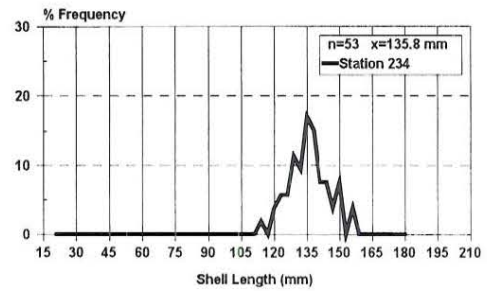
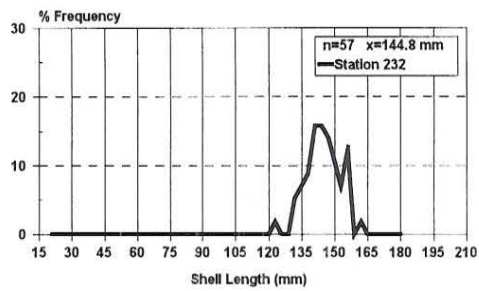


STRATUM 4 INNER MILE

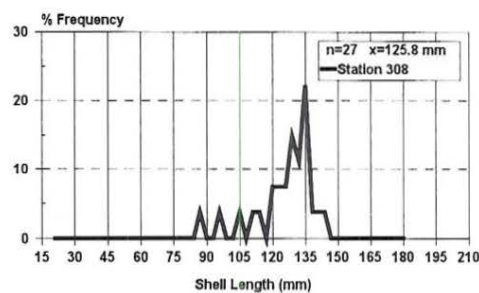
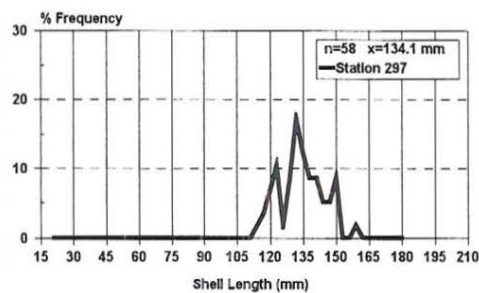
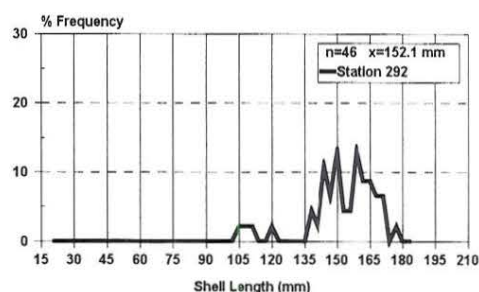
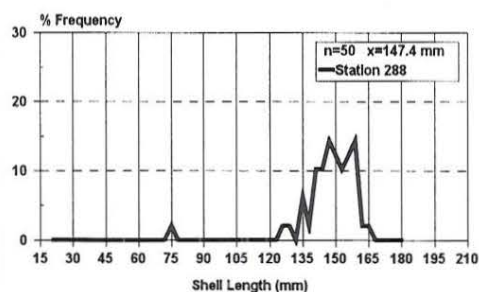
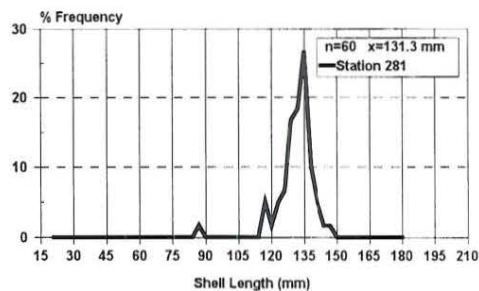
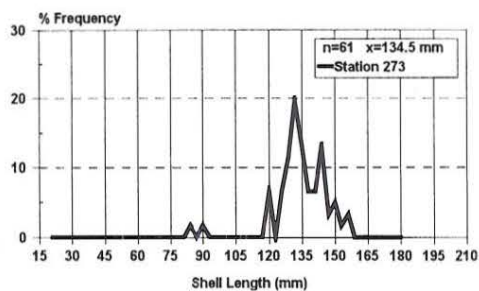
BARNEGAT INLET TO SHARK RIVER INLET, 1999



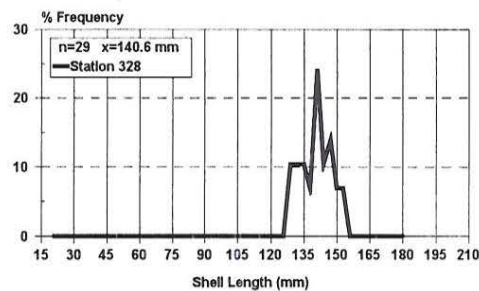
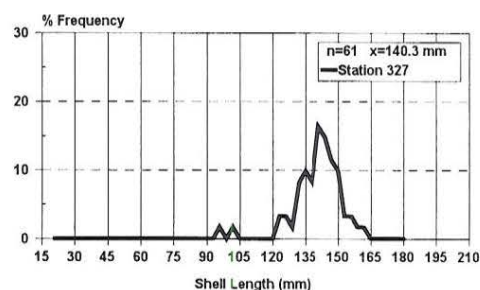
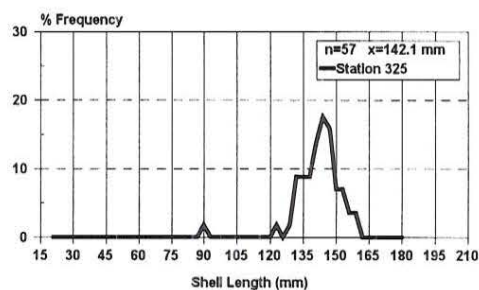
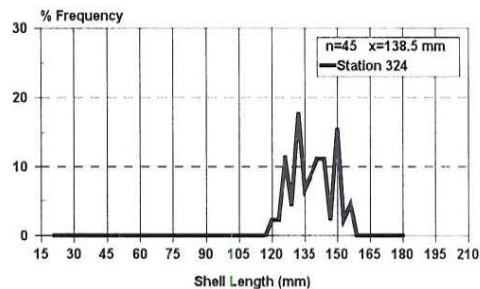
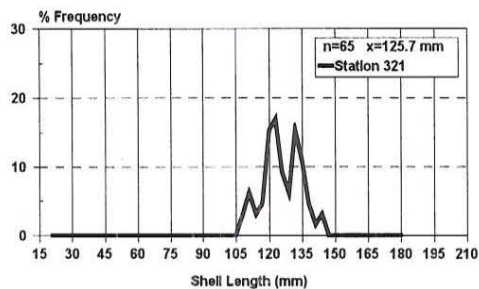
STRATUM 5 MIDDLE MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999



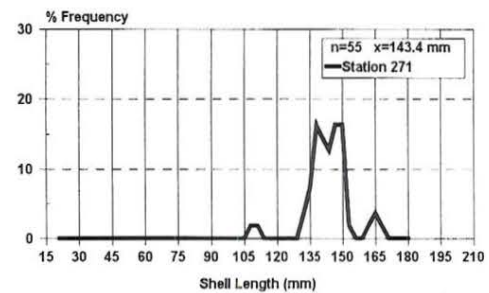
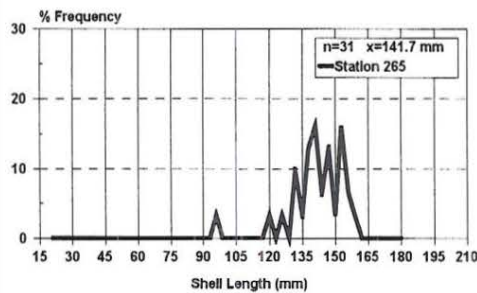
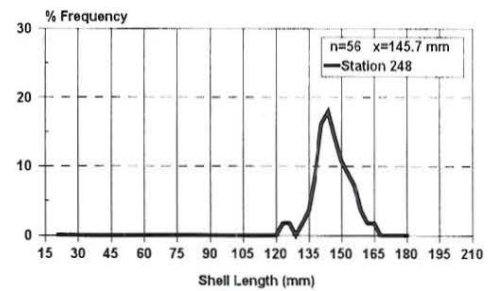
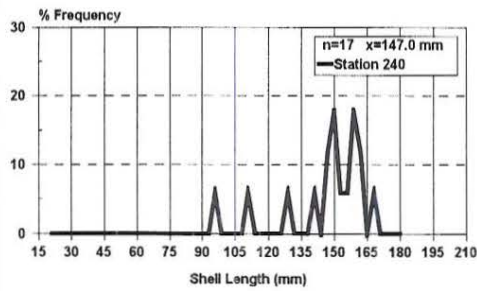
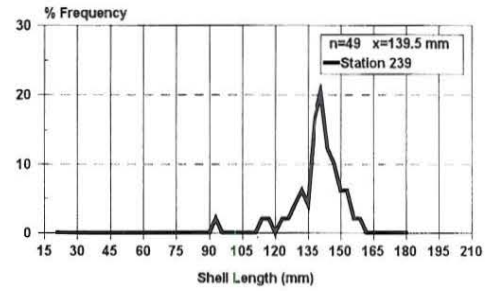
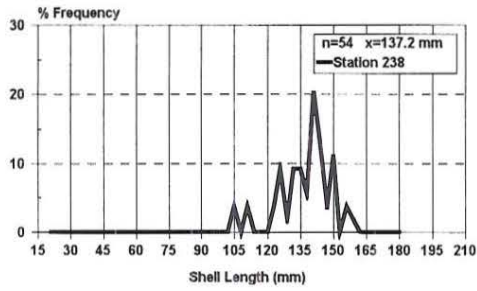
STRATUM 5 MIDDLE MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999



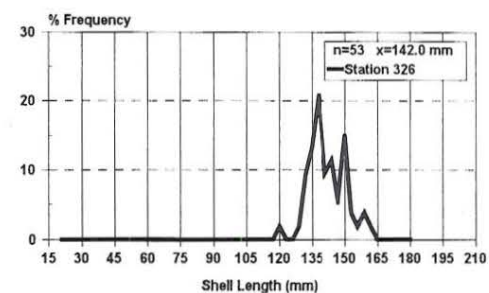
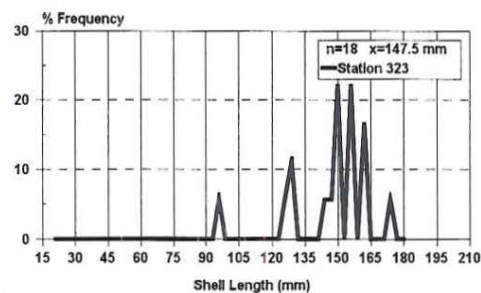
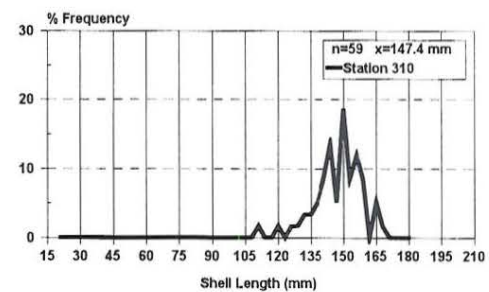
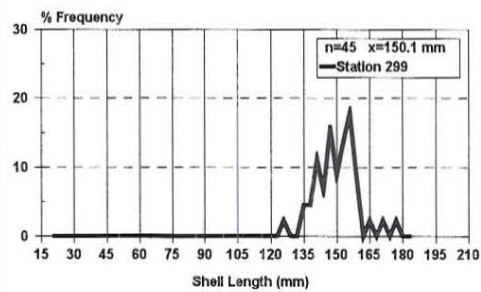
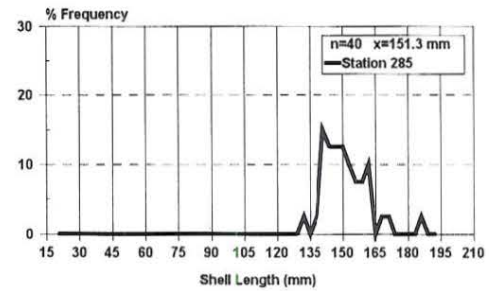
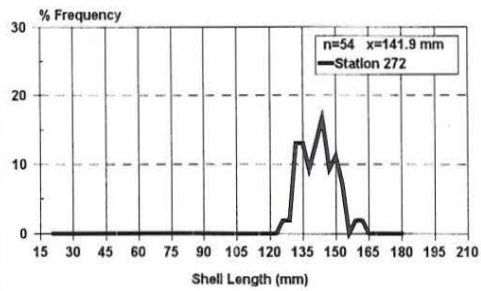
STRATUM 5 MIDDLE MILE BARNEGAT INLET TO SHARK RIVER INLET, 1999



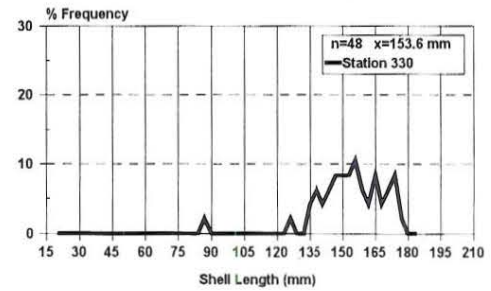
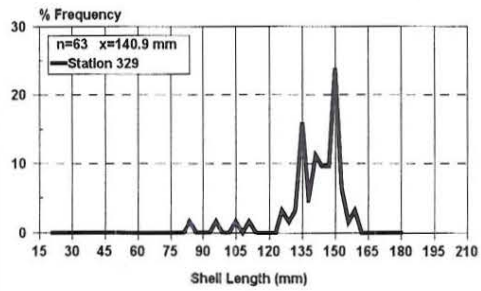
STRATUM 6 OUTER MILE BARNEGAT INLET TO SHARK RIVER INLET. 1999



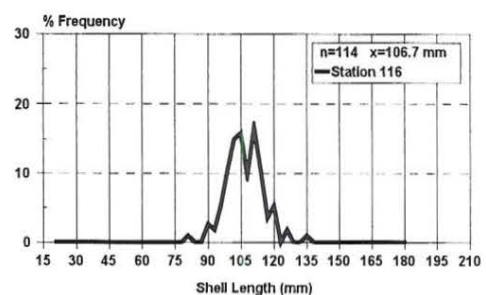
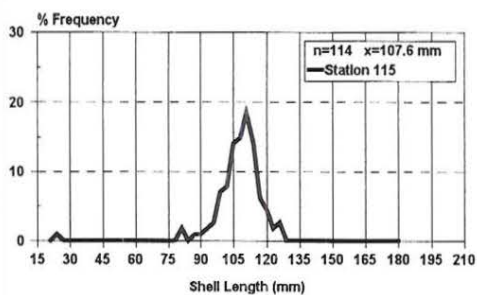
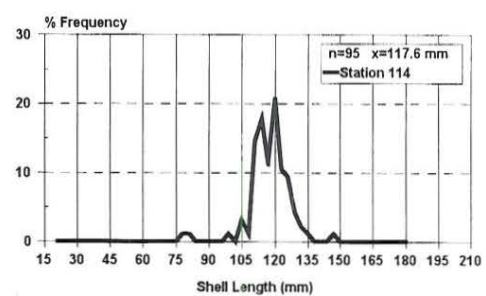
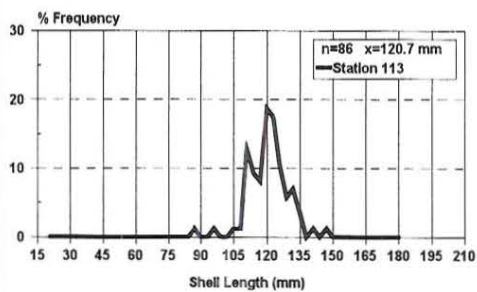
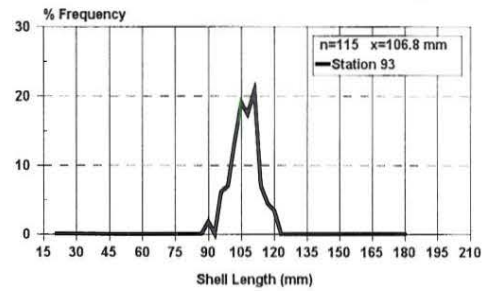
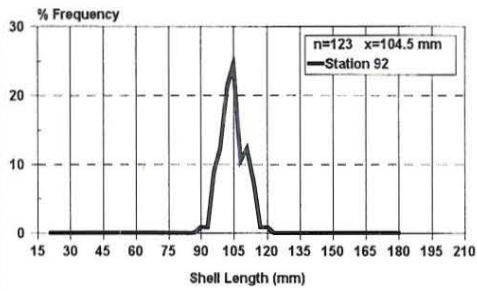
STRATUM 6 OUTER MILE BARNEGAT INLET TO SHARK RIVER INLET. 1999



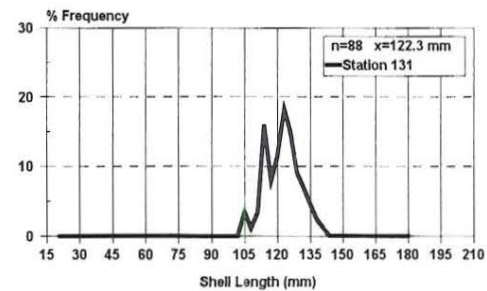
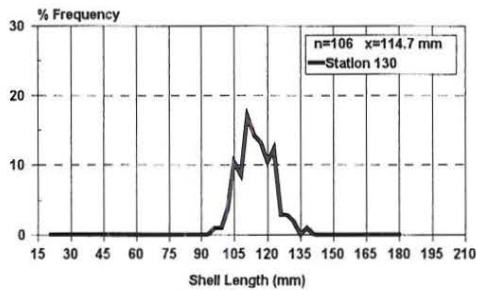
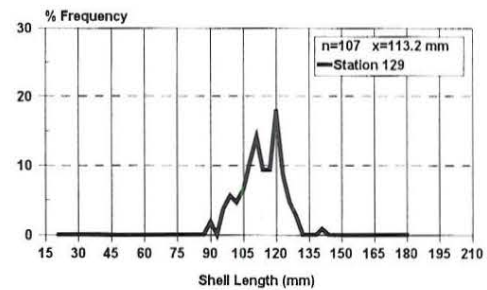
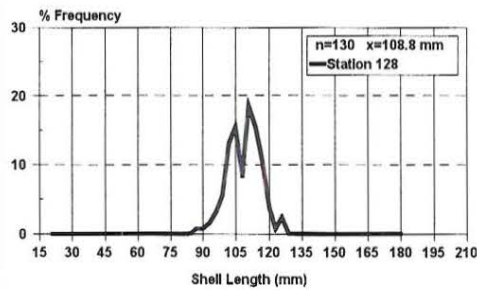
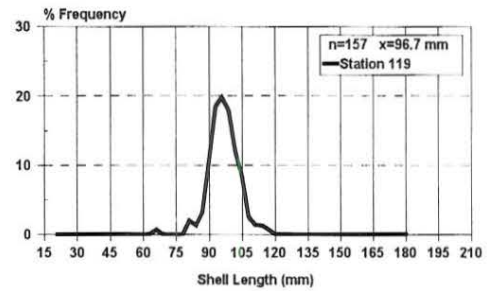
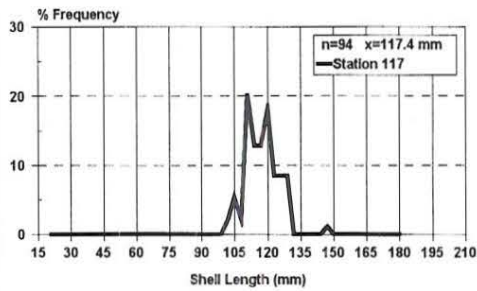
STRATUM 6 OUTER MILE BARNEGAT INLET TO SHARK RIVER INLET. 1999



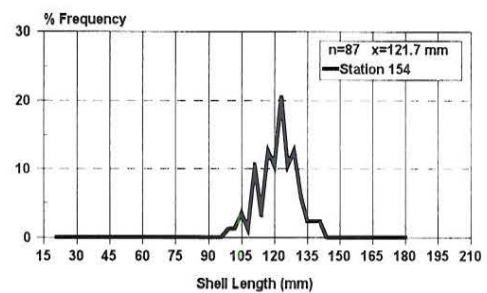
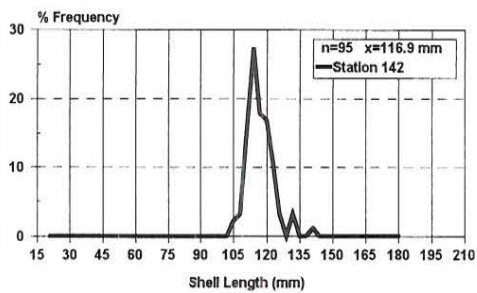
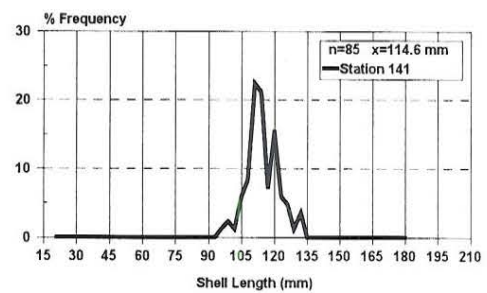
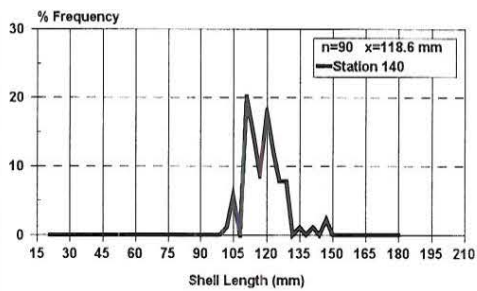
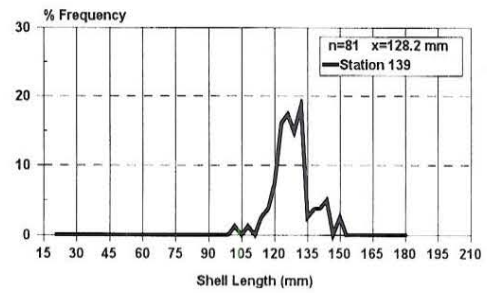
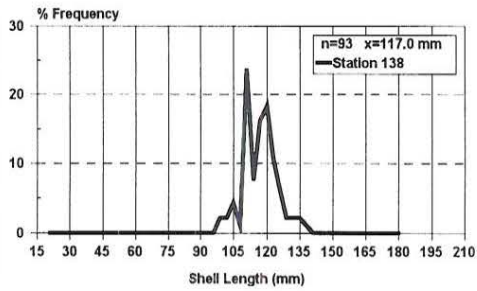
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



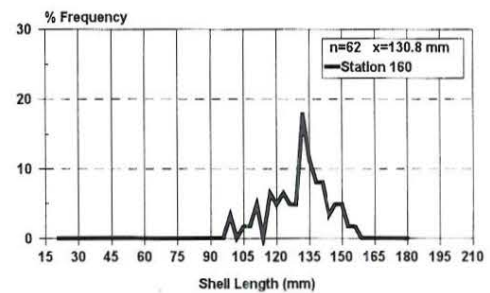
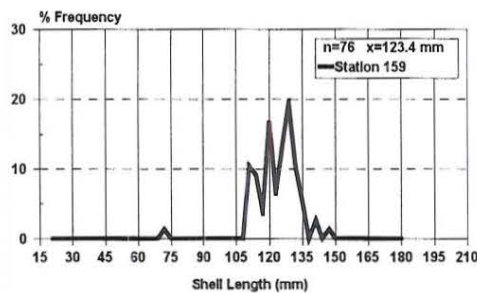
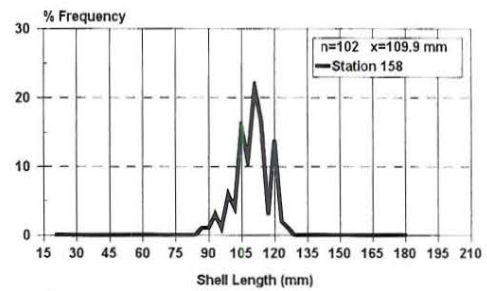
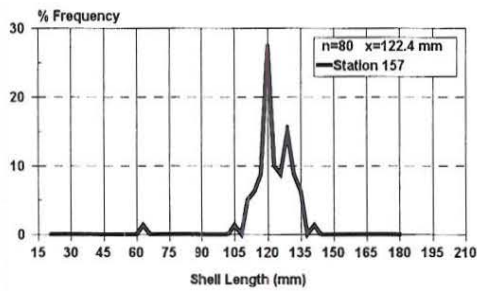
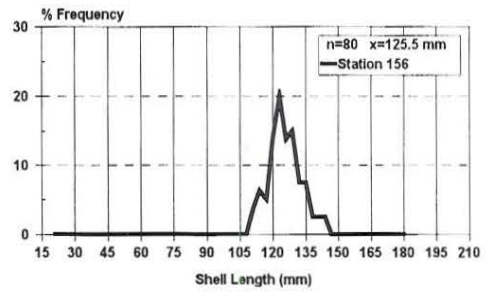
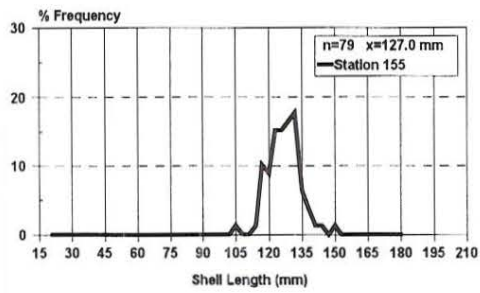
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



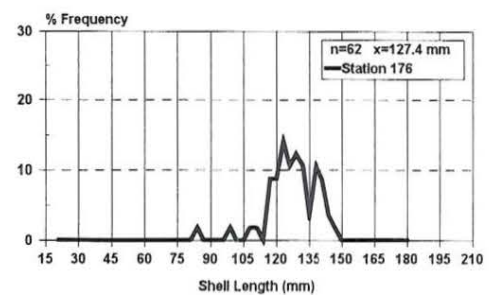
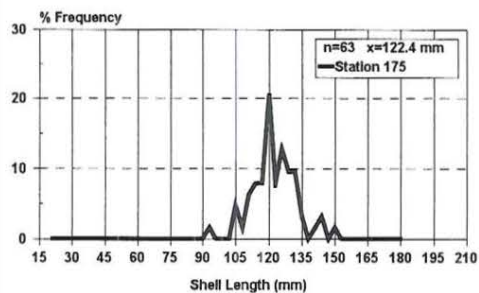
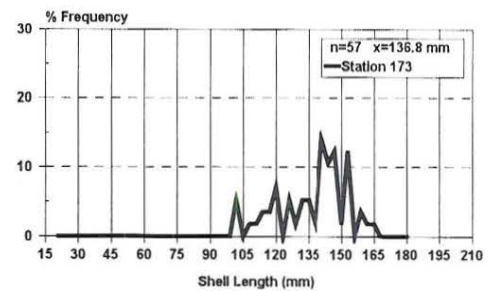
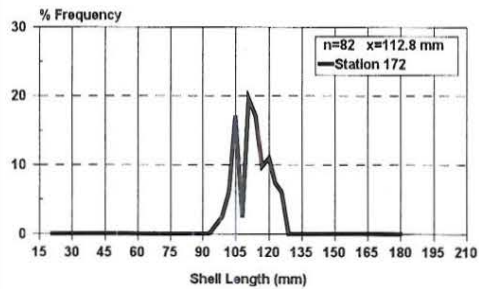
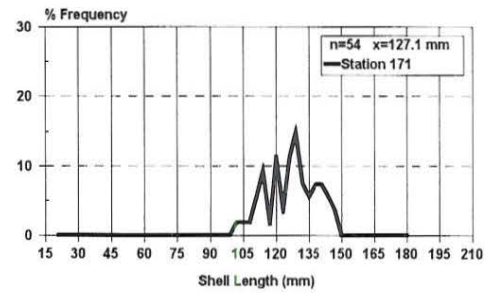
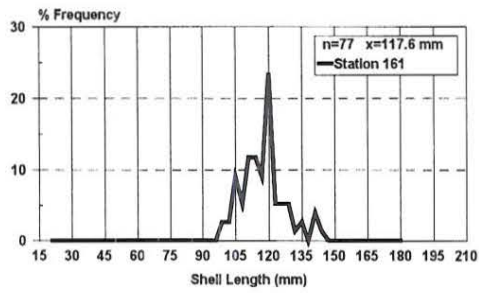
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



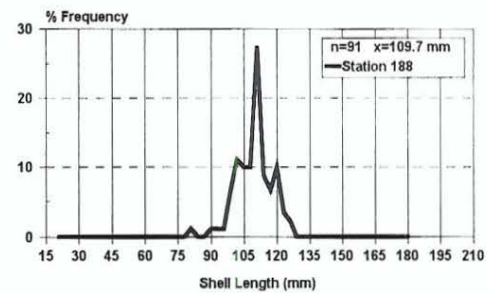
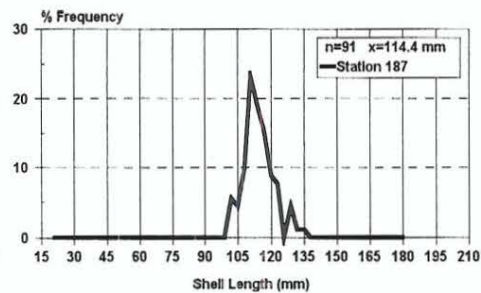
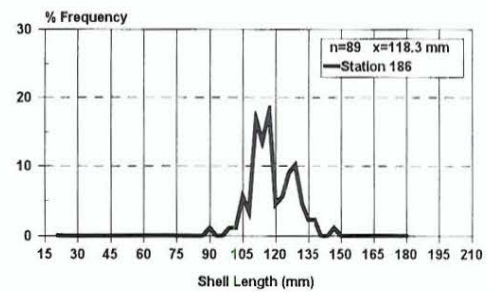
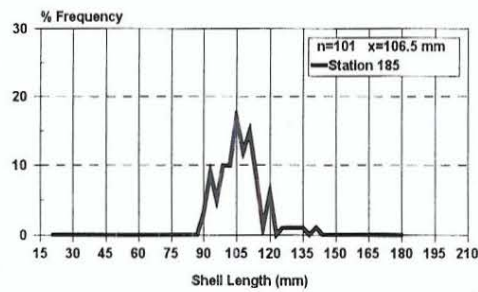
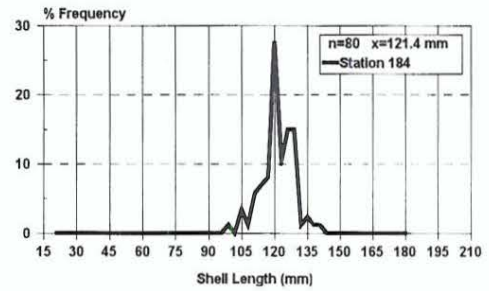
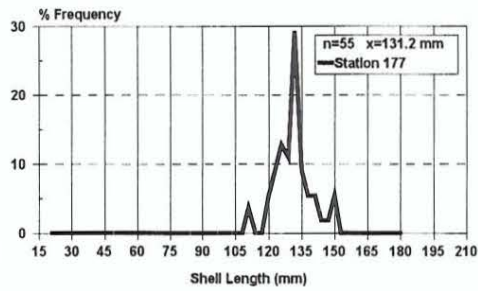
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



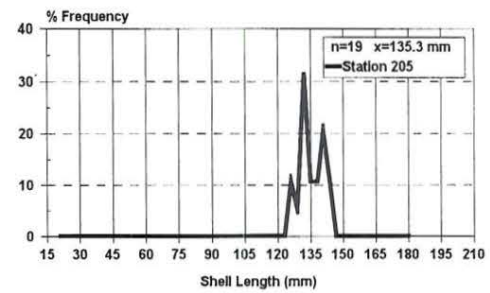
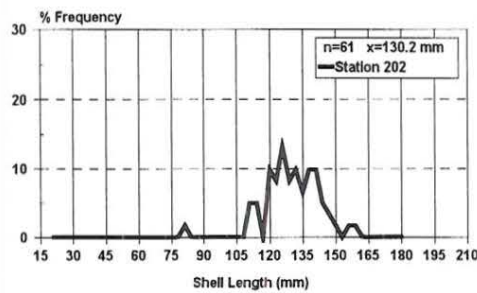
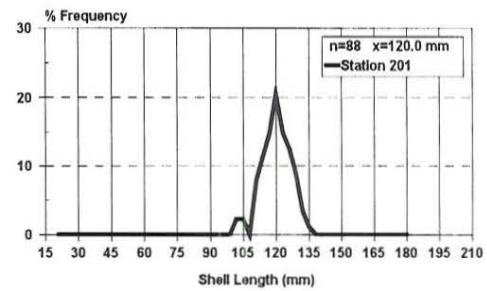
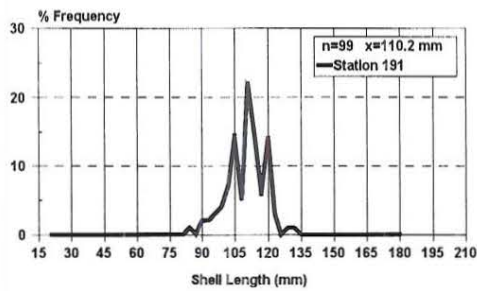
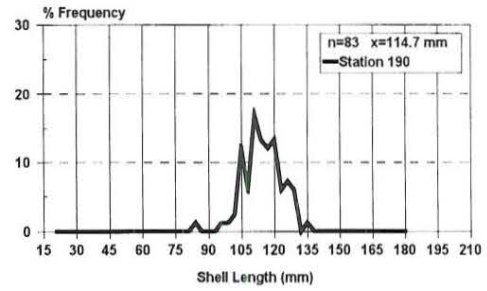
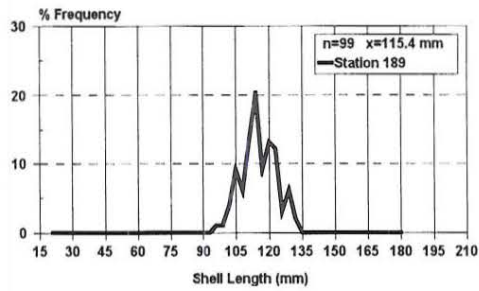
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



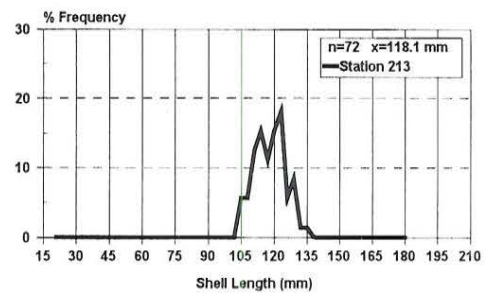
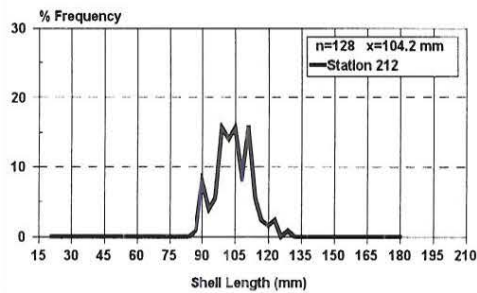
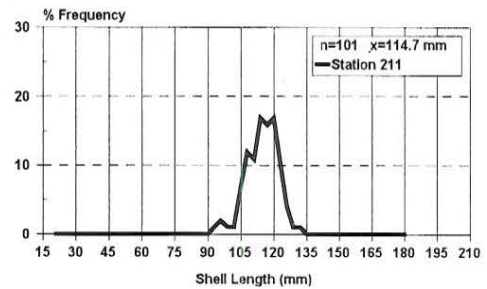
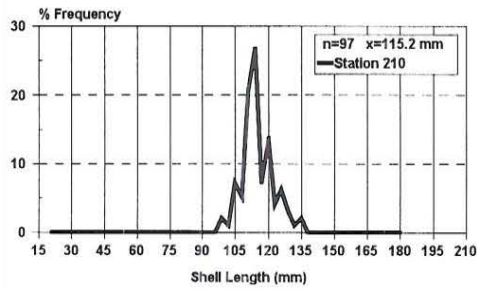
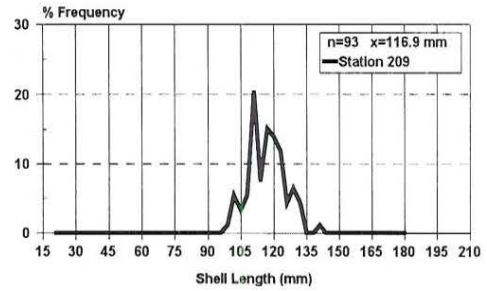
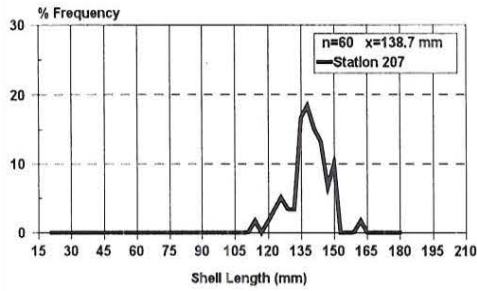
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



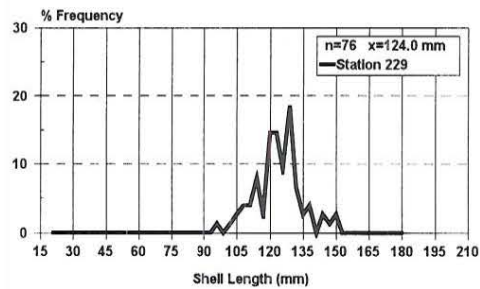
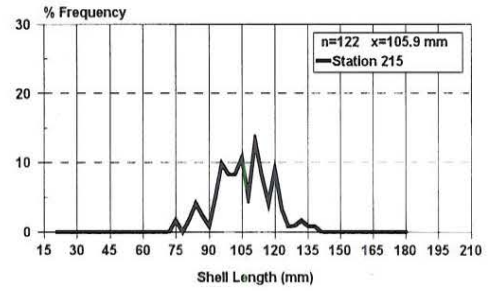
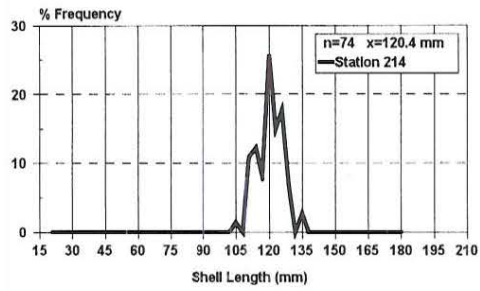
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



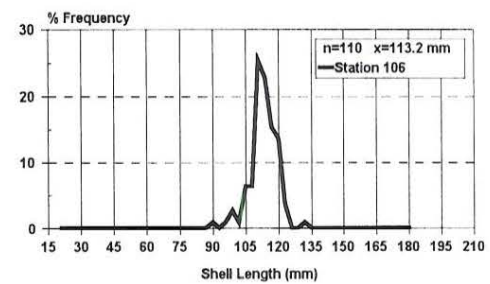
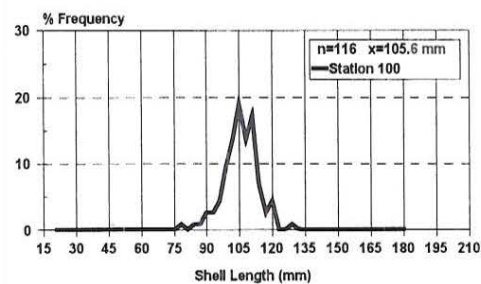
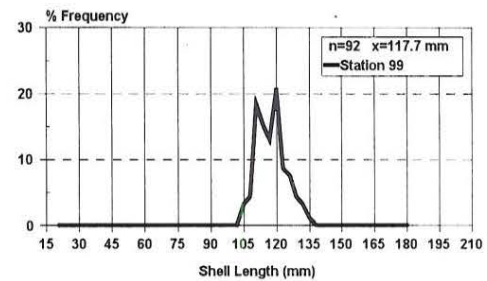
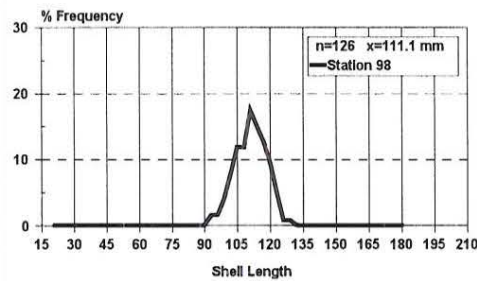
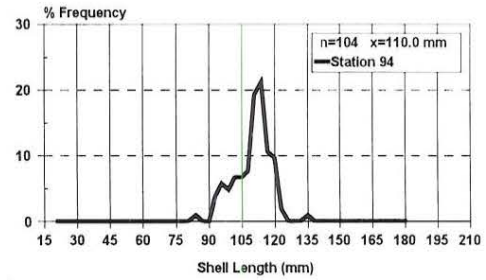
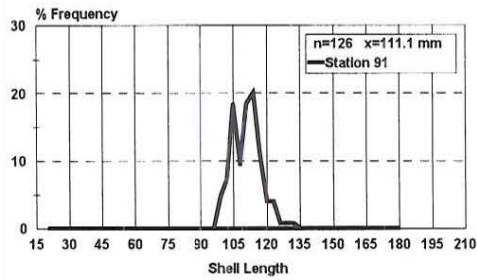
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



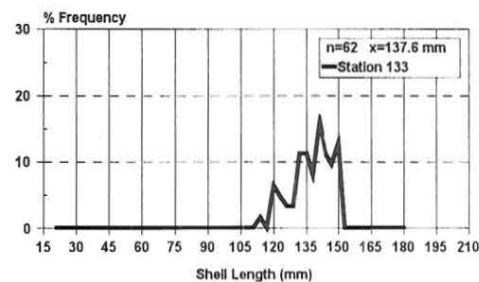
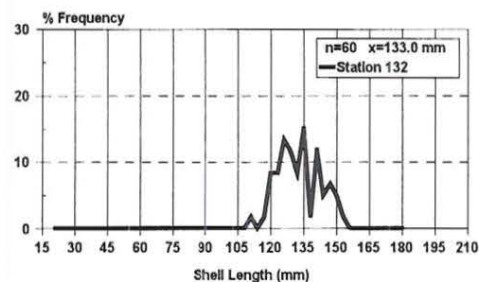
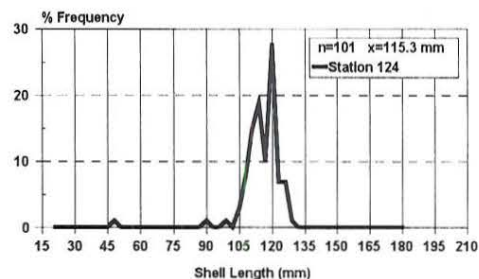
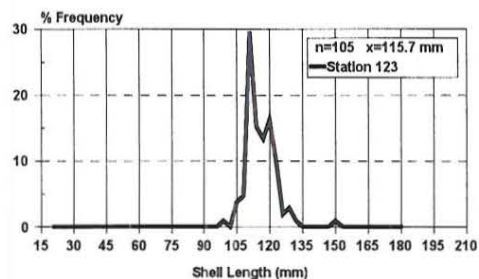
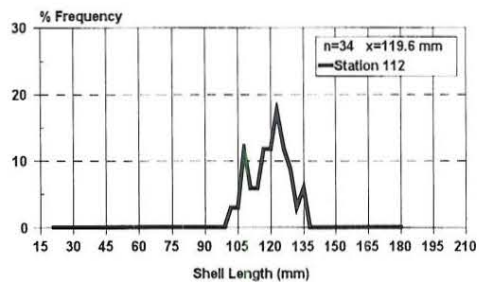
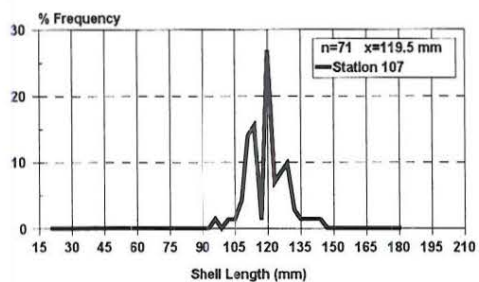
STRATUM 7 INNER MILE ABSECON INLET TO BARNEGAT INLET, 1999



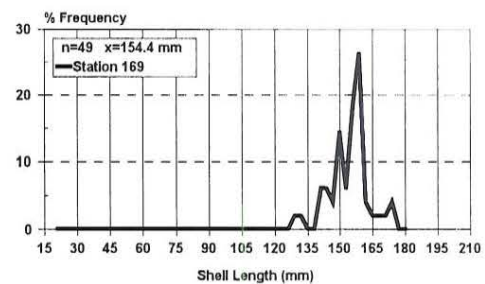
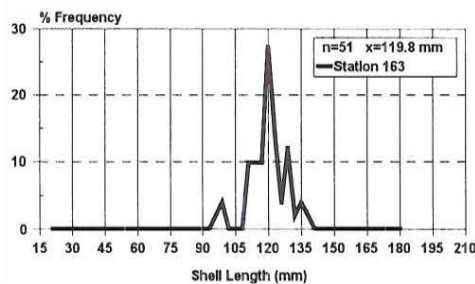
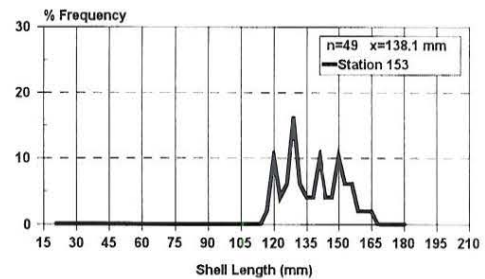
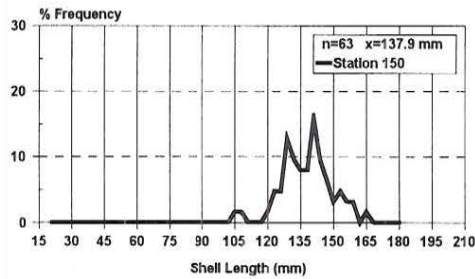
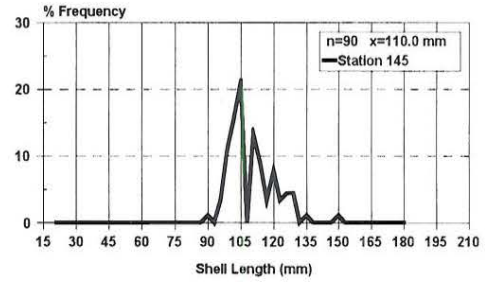
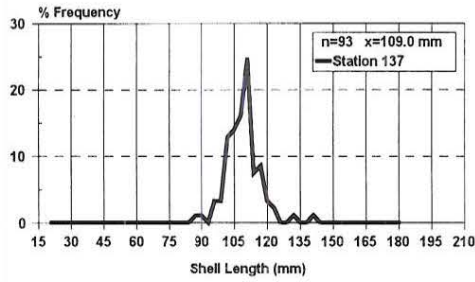
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET. 1999



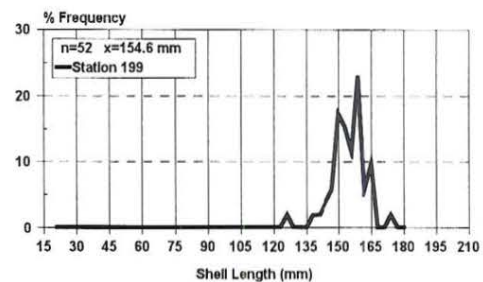
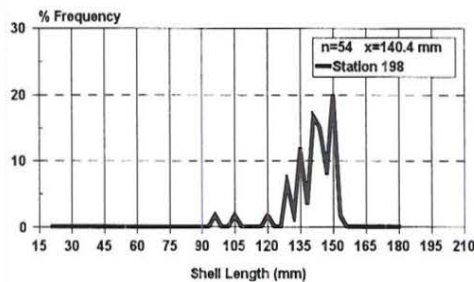
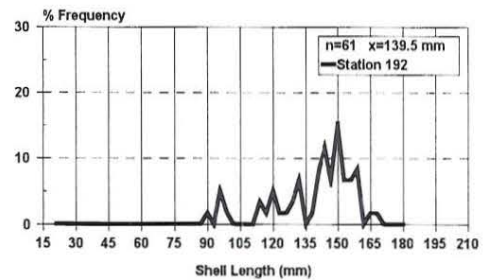
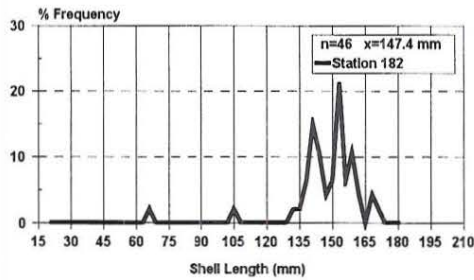
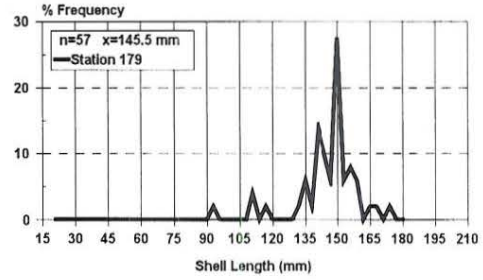
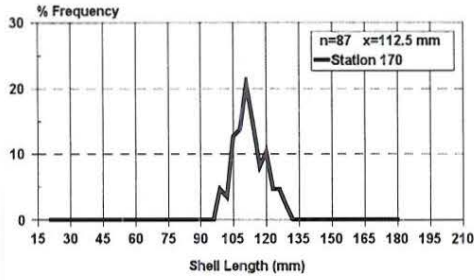
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET. 1999



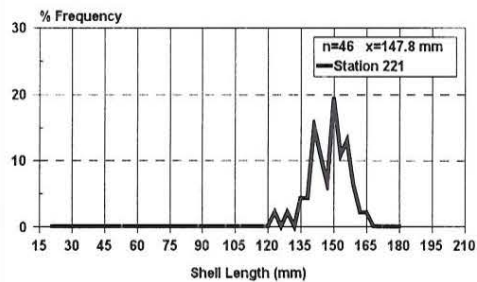
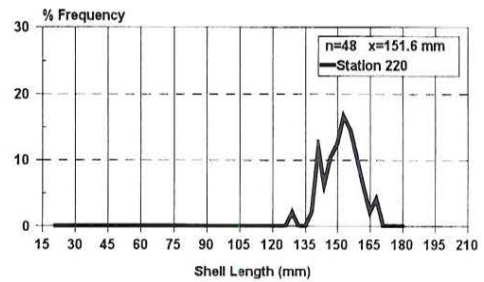
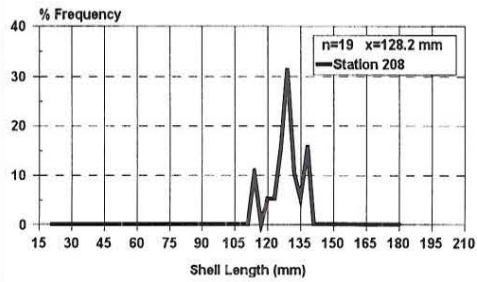
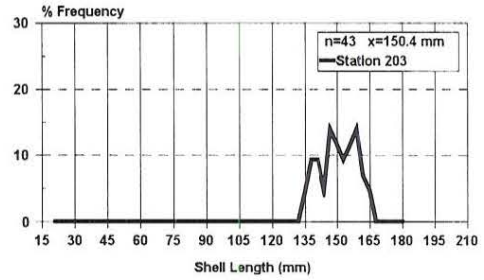
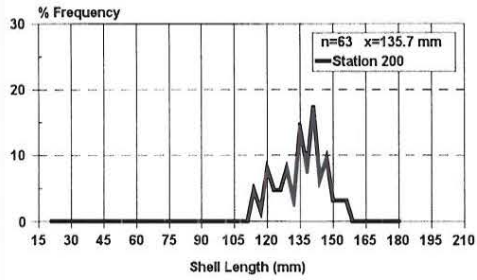
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET. 1999



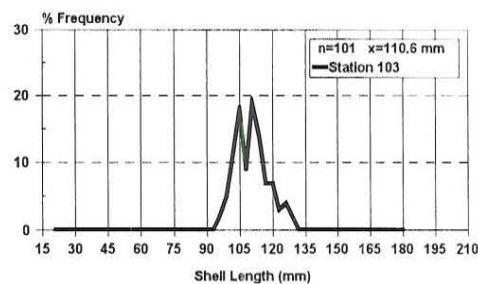
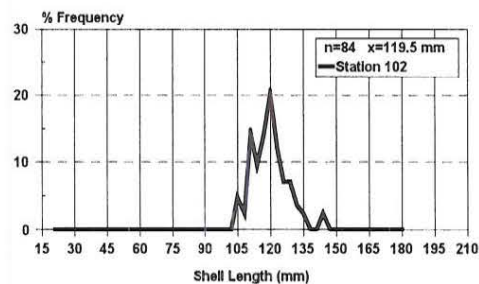
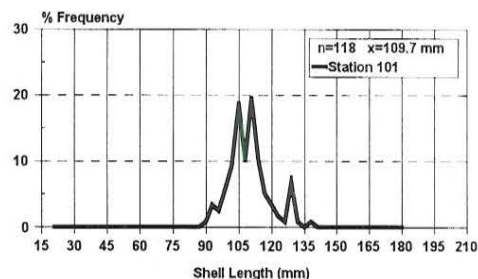
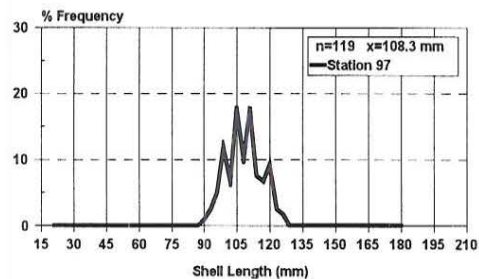
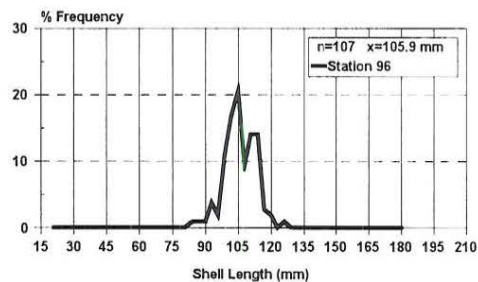
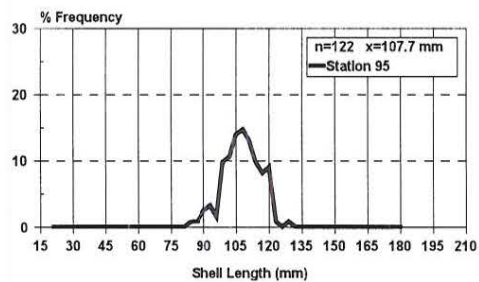
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET. 1999



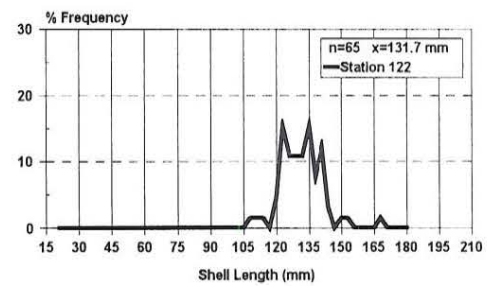
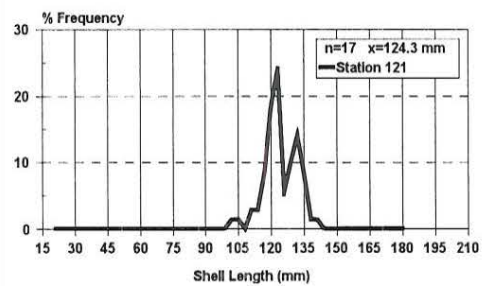
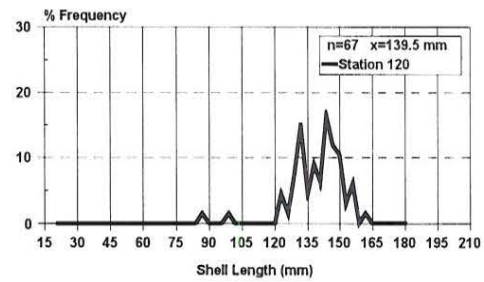
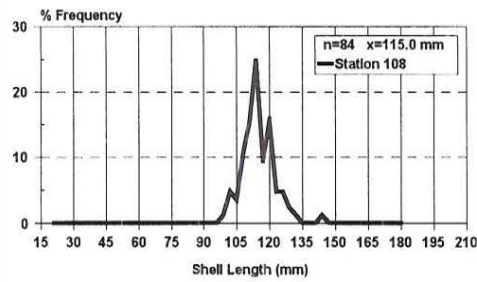
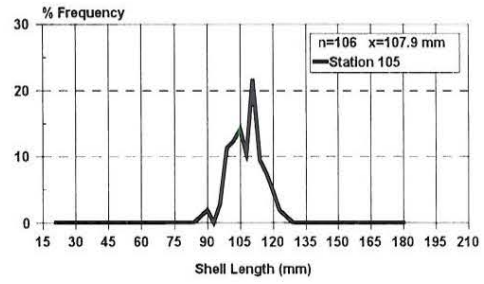
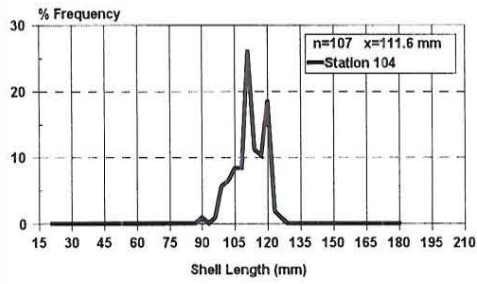
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET. 1999



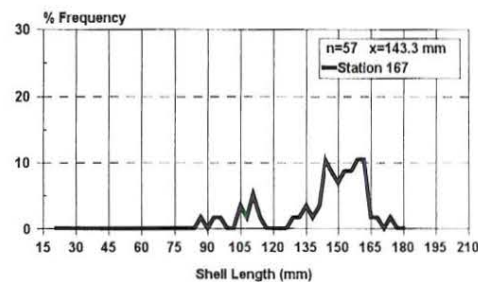
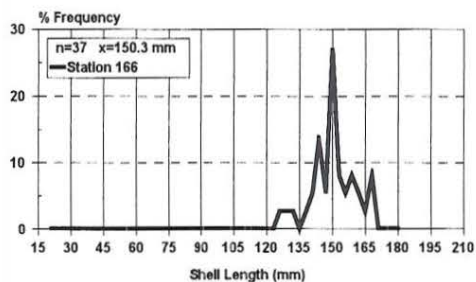
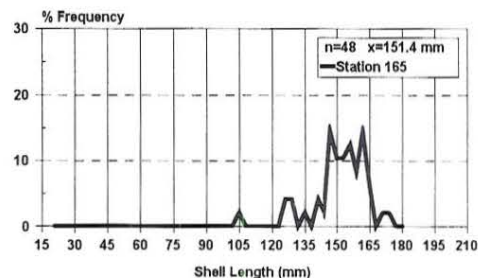
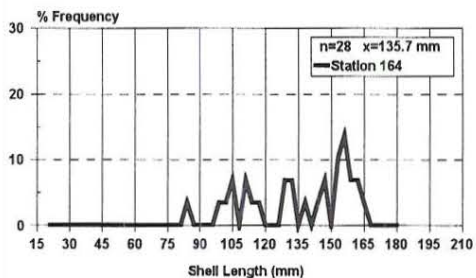
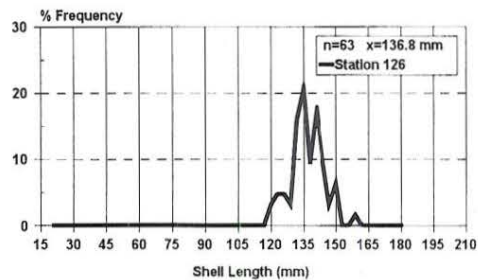
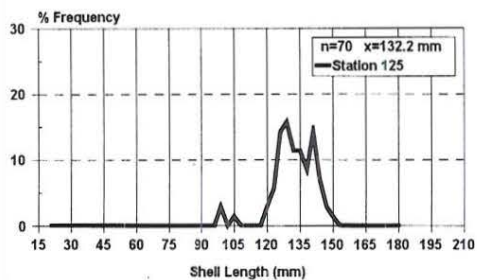
STRATUM 9 OUTER MILE ABSECON INLET TO BARNEGAT INLET, 1999



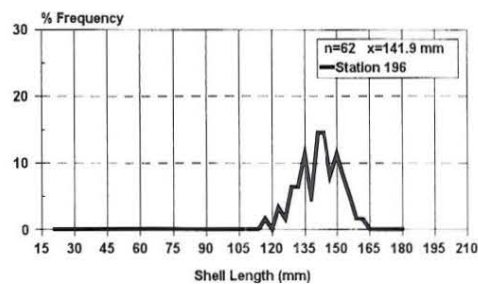
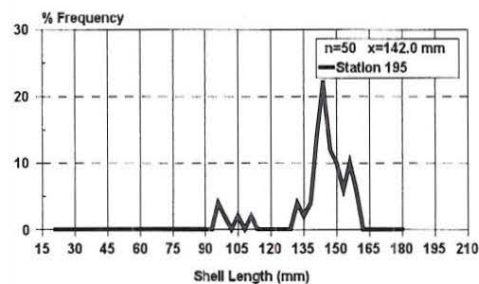
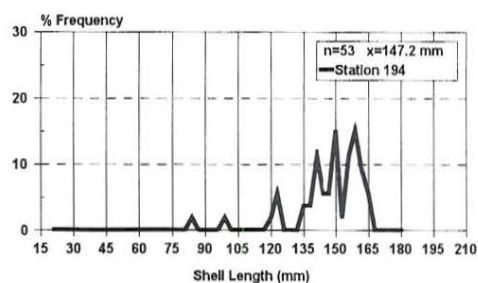
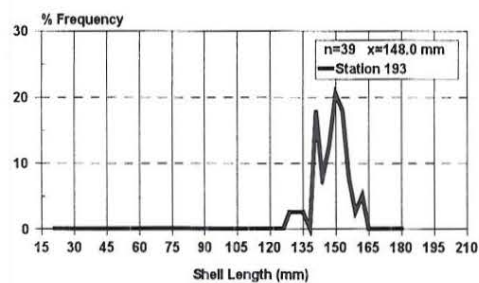
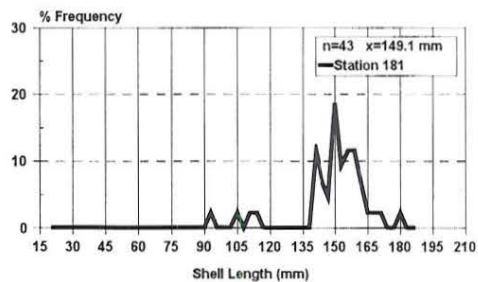
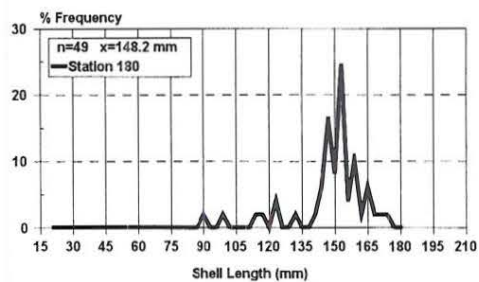
STRATUM 9 OUTER MILE ABSECON INLET TO BARNEGAT INLET, 1999



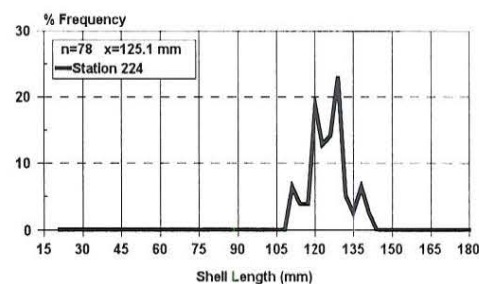
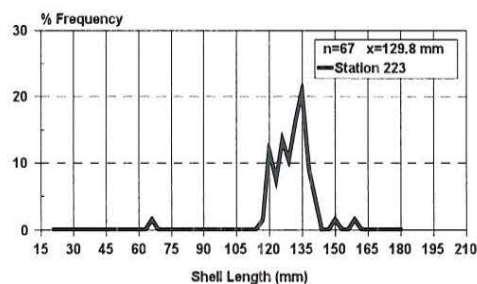
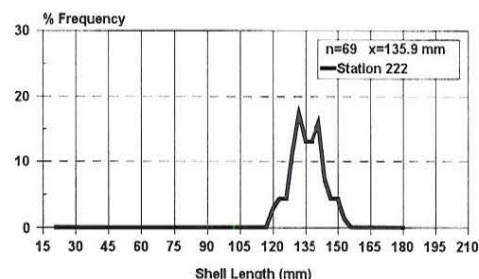
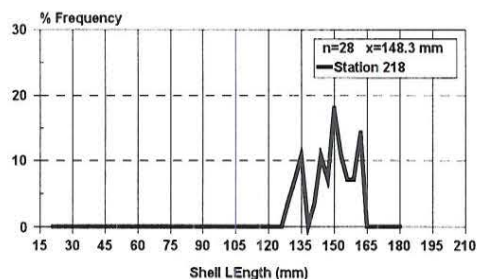
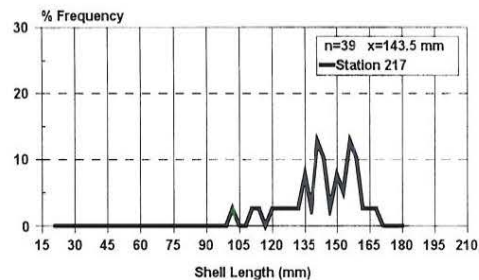
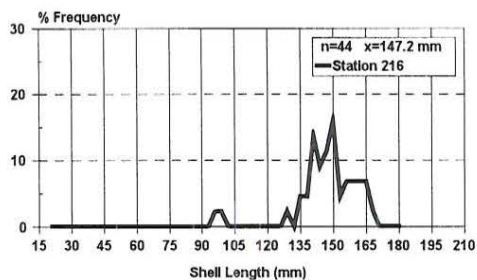
STRATUM 9 OUTER MILE ABSECON INLET TO BARNEGAT INLET, 1999



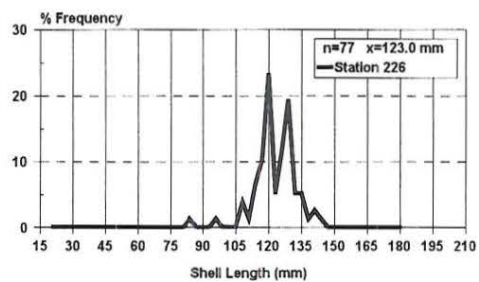
STRATUM 9 OUTER MILE ABSECON INLET TO BARNEGAT INLET, 1999



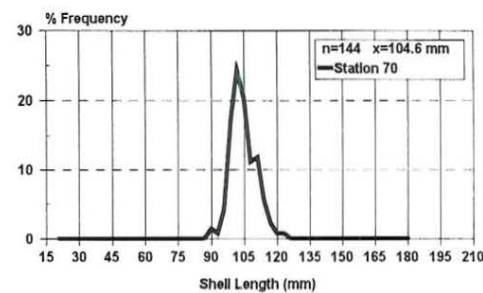
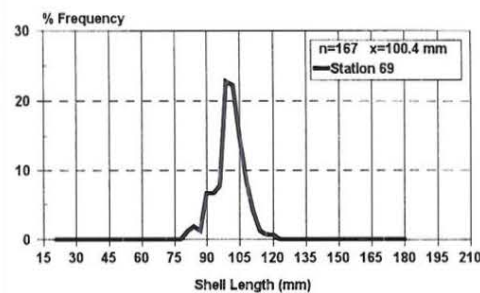
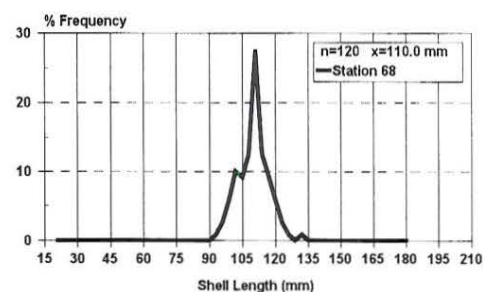
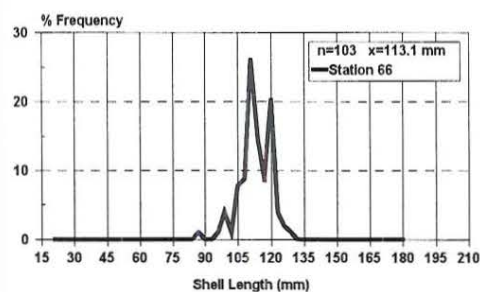
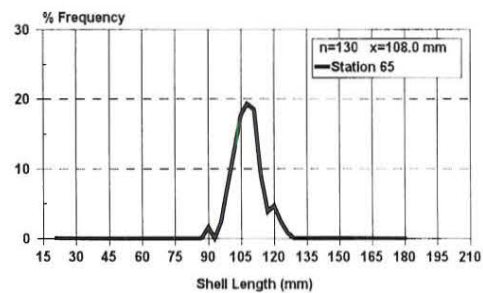
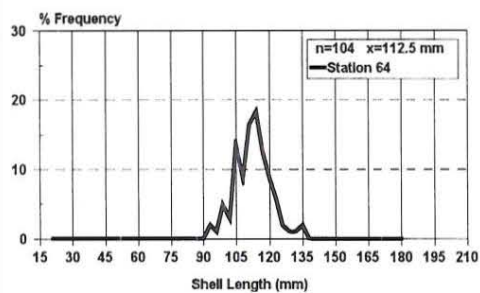
STRATUM 9 OUTER MILE ABSECON INLET TO BARNEGAT INLET, 1999



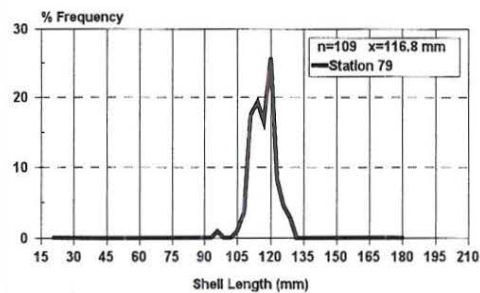
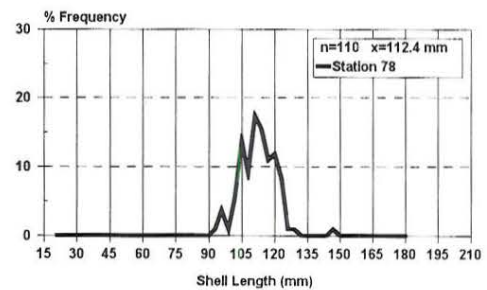
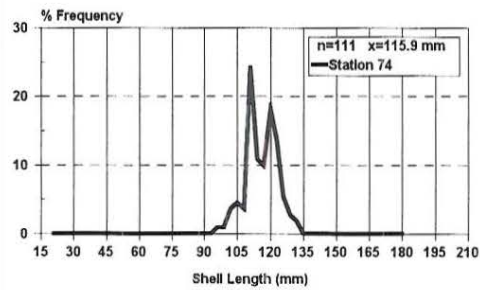
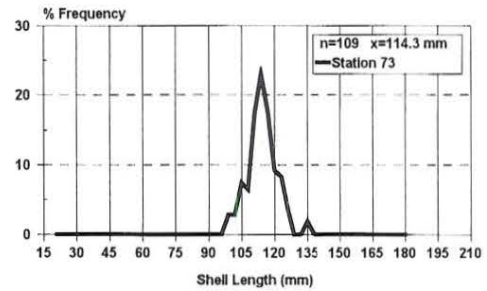
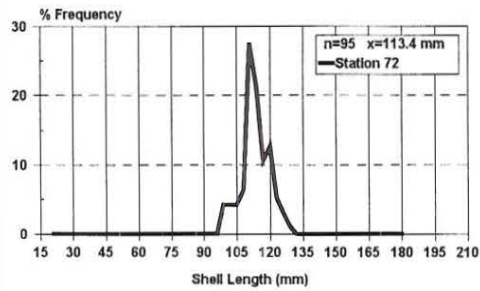
STRATUM 9 OUTER MILE ABSECON INLET TO BARNEGAT INLET, 1999



STRATUM 10 INNER MILE GREAT EGG HARBOR INLET TO ABSECON INLET, 1999

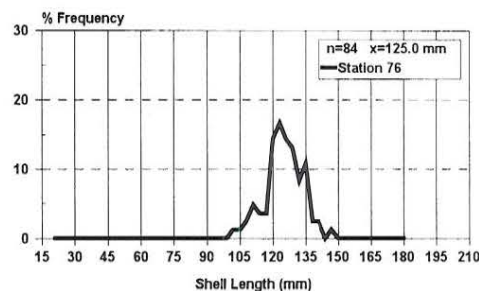
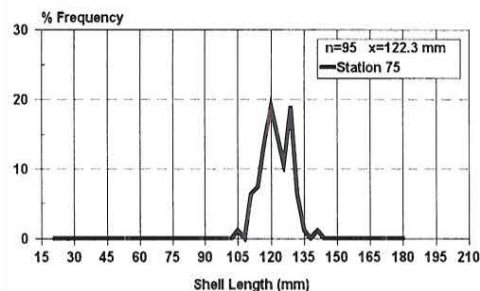
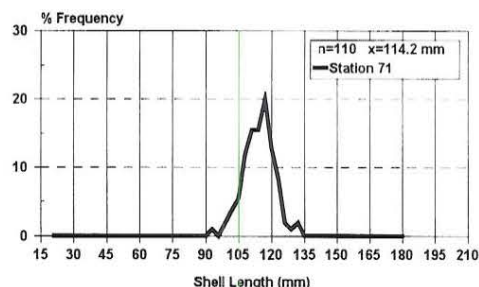
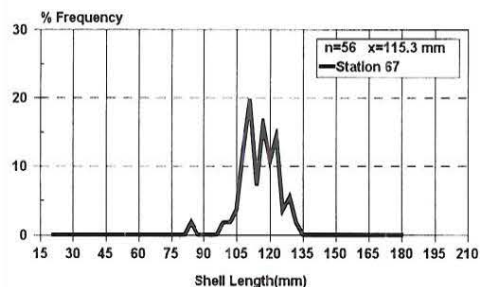
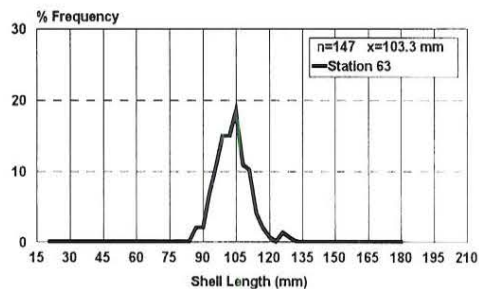
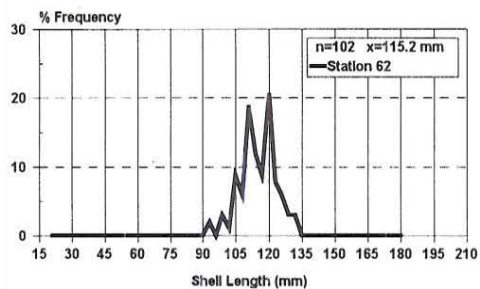


STRATUM 10 INNER MILE GREAT EGG HARBOR INLET TO ABSECON INLET, 1999

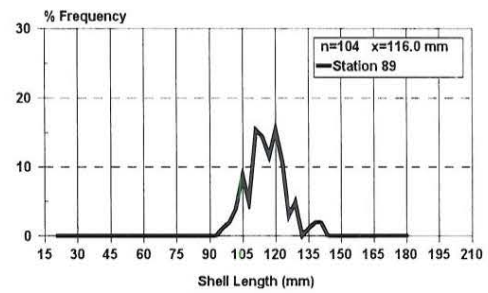
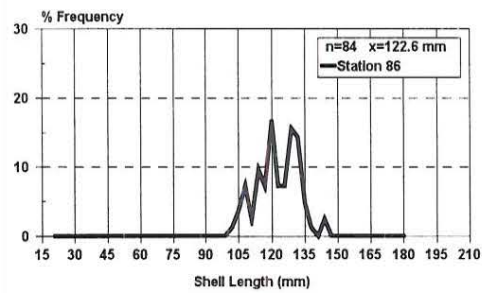
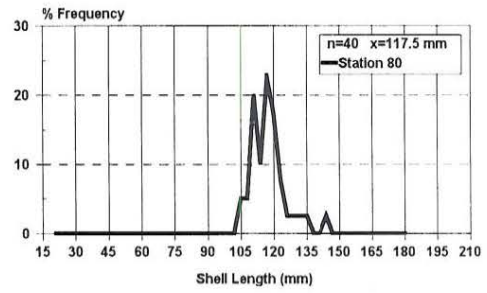
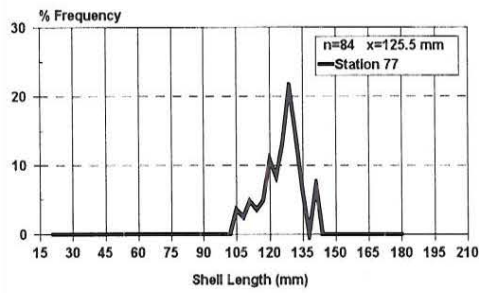


STRATUM 11 MIDDLE MILE

GREAT EGG HARBOR INLET TO ABSECON INLET, 1999

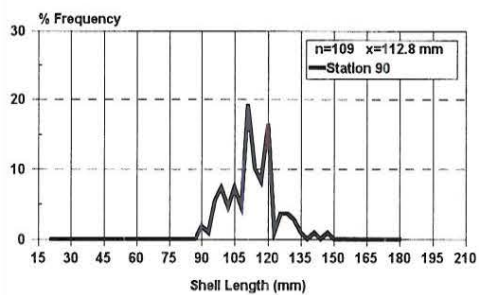
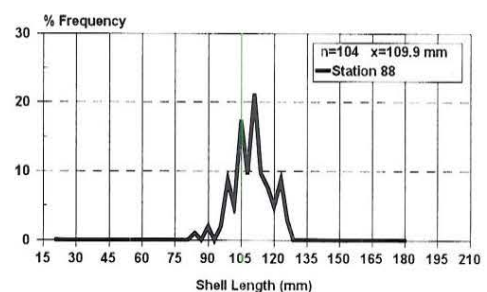
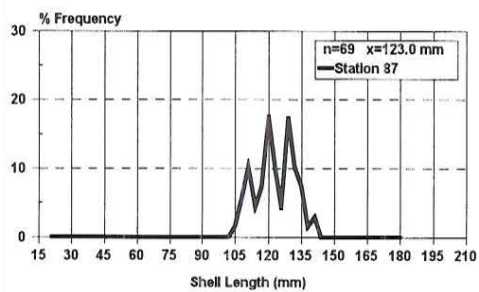
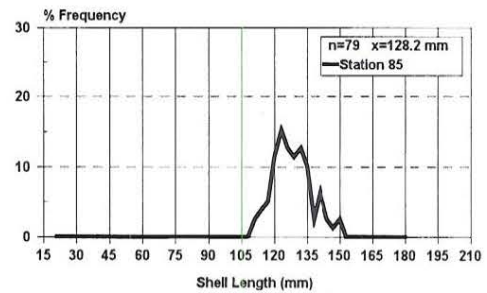
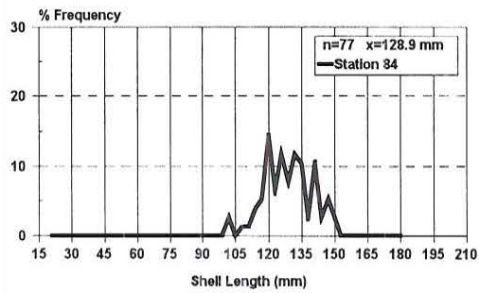


STRATUM 11 MIDDLE MILE GREAT EGG HARBOR INLET TO ABSECON INLET, 1999

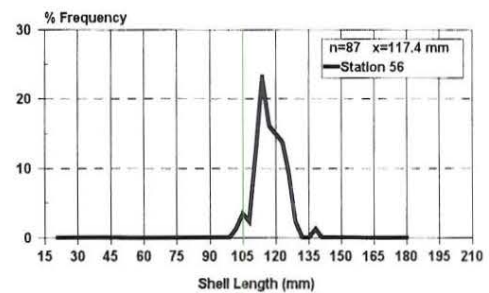
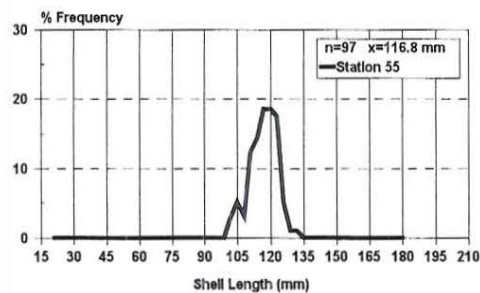
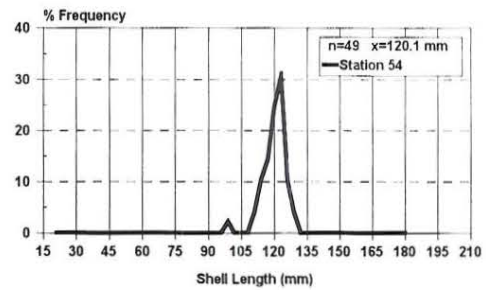
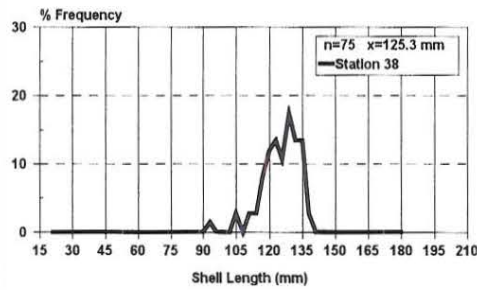
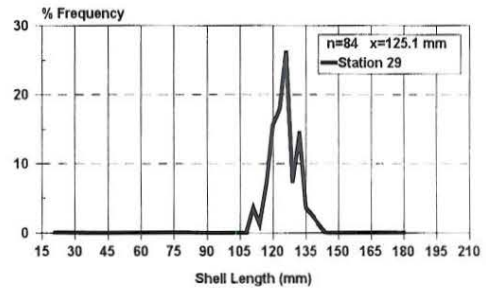
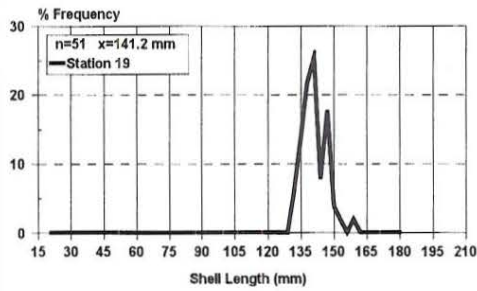


STRATUM 12 OUTER MILE

GREAT EGG HARBOR INLET TO ABSECON INLET, 1999

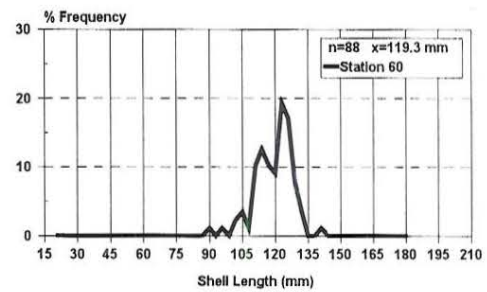
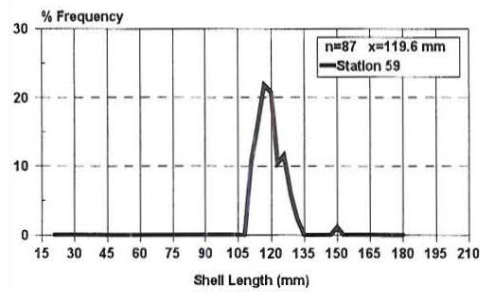
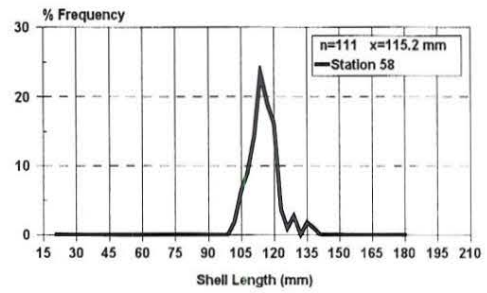
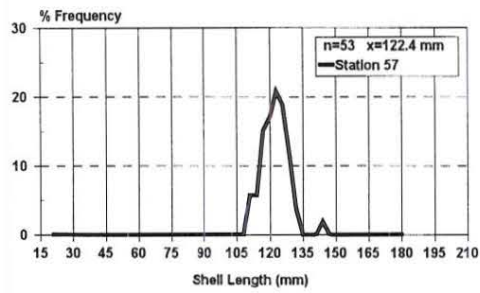


STRATUM 13 INNER MILE CAPE MAY INLET TO EGG HARBOR INLET, 1999



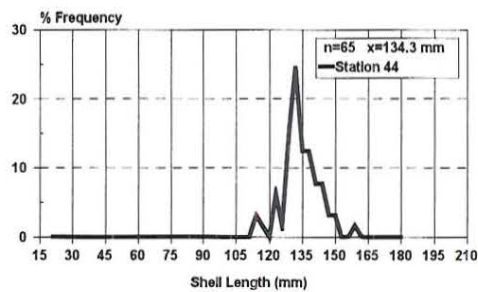
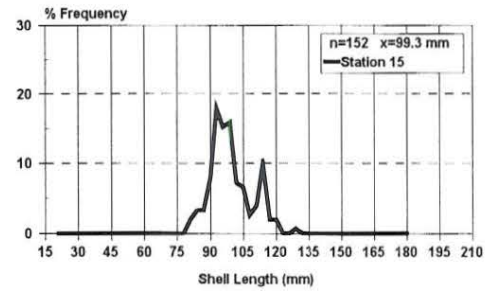
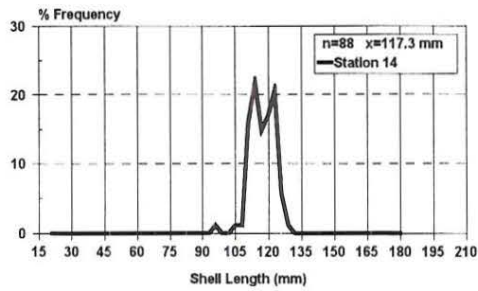
STRATUM 13 INNER MILE

CAPE MAY INLET TO EGG HARBOR INLET, 1999



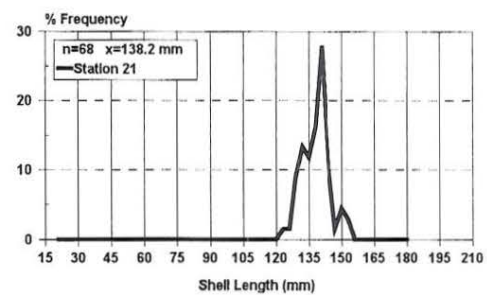
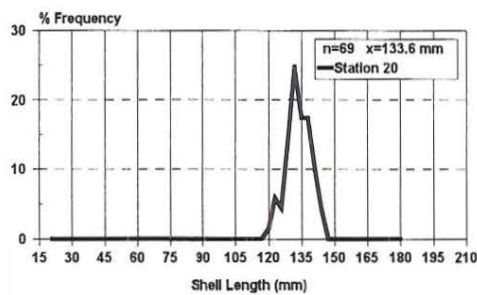
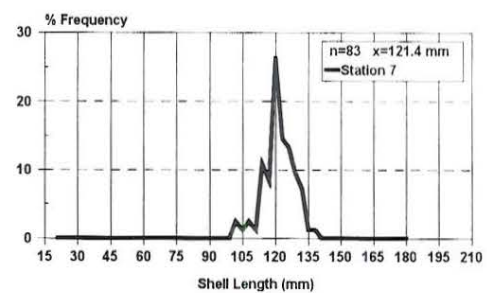
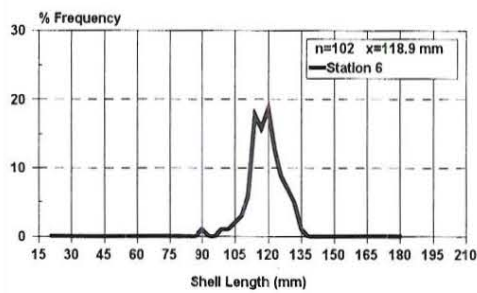
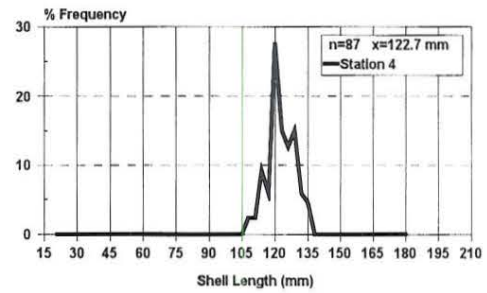
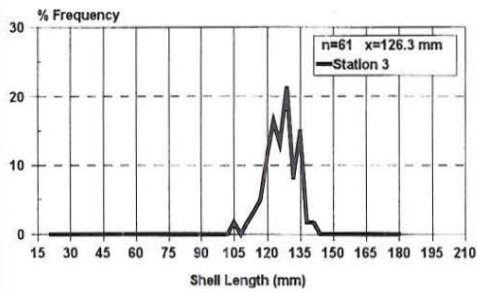
STRATUM 14 MIDDLE MILE

CAPE MAY INLET TO GREAT EGG HARBOR INLET, 1999

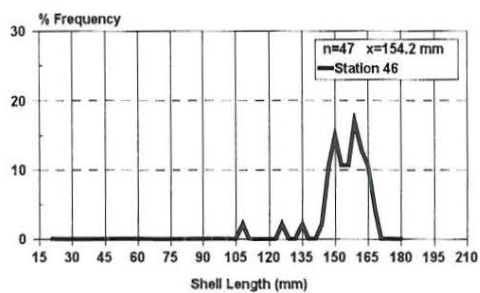


STRATUM 15 OUTER MILE

CAPE MAY INLET TO GREAT EGG HARBOR INLET, 1999



STRATUM 15 OUTER MILE CAPE MAY INLET TO GREAT EGG HARBOR INLET, 1999



APPENDIX D. Supplemental Information for 1998 New Jersey Surf Clam Inventory

1. Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five minute Tow (Reported in U.S. Standard Bushels).
2. Figures 1-5. 1998 Surf Clam Station Locations.
3. Length Frequency Distribution of Surf Clams from Stations Sampled in 1998 (n = Number of Clams Measured, $\bar{x}$ = Mean Shell Length in mm).

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels¹).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED ²	MEAN LENGTH(mm)
6-18-98	1	14	33	0.16	0	27099	42722	6	114.0
6-18-98	2	13	27	0.08	1	27102	42728	3	88.0
6-18-98	3	13	23	0.00	0	27104	42727	0	N/A
6-18-98	4	14	30	0.00	0	27105	42721	0	N/A
6-18-98	5	14	28	0.00	0	27107	42721	0	N/A
6-18-98	6	13	17	0.00	0	27110	42726	0	N/A
6-18-98	7	14	20	0.00	0	27110	42709	0	N/A
6-18-98	8	15	23	0.00	0	27103	42709	0	N/A
6-18-98	9	14	29	0.00	0	27103	42715	0	N/A
6-18-98	10	15	30	0.00	0	27101	42710	0	N/A
6-18-98	11	15	26	0.02	0	27099	42711	1	111.0
6-18-98	12	15	30	90.22	0	27090	42706	88	120.4
6-18-98	13	15	23	108.09	0	27085	42712	83	116.2
6-18-98	14	15	33	77.29	0	27079	42712	76	124.7
6-18-98	15	15	20	29.59	0	27081	42718	83	116.1
6-18-98	16	15	35	0.00	0	27078	42724	0	N/A
6-18-98	17	16	39	38.35	0	27089	42740	90	115.1
6-18-98	18	16	22	0.00	0	27091	42740	0	N/A
6-18-98	19	16	24	2.18	0	27084	42746	46	126.7

¹ US standard bushel = 1.24 cubic feet or 0.035092 cubic meters.

² If total bushels < 1, then N = total number of clams measured.

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
6-18-98	20	16	33	0.00	0	27084	42751	0	N/A
6-18-98	21	16	20	0.00	0	27086	42756	0	N/A
6-18-98	22	16	13	28.09	0	27087	42761	74	128.2
6-18-98	23	16	13	0.04	0	27083	42766	4	135.0
6-18-98	24	14	31	64.29	0	27072	42758	117	113.2
6-18-98	25	14	40	0.20	0	27079	42752	2	126.0
6-18-98	26	15	38	53.10	0	27075	42748	76	125.1
6-19-98	27	15	40	8.94	0	27071	42742	66	130.0
6-19-98	28	15	29	34.09	0	27068	42758	83	122.6
6-19-98	29	15	29	39.97	0	27065	42758	75	126.0
6-19-98	30	15	32	0.26	0	27063	42766	21	126.9
6-19-98	31	14	43	0.00	0	27068	42769	0	N/A
6-19-98	32	14	46	0.00	0	27066	42775	0	N/A
6-19-98	33	15	34	0.00	0	27061	42772	0	N/A
6-19-98	34	15	41	0.01	0	27062	42788	1	126.0
6-19-98	35	14	29	0.03	0	27070	42797	2	117.0
6-19-98	36	13	13	0.00	0	27073	42810	1	111.0
6-19-98	37	13	17	0.01	0	27072	42810	1	111.0
6-19-98	38	13	26	0.00	0	27069	42810	0	N/A
6-19-98	39	13	29	0.00	0	27067	42814	0	N/A
6-19-98	40	13	14	0.00	0	27071	42821	0	N/A
6-19-98	41	17	13	0.62	0	27066	42837	60	118.1

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
6-19-98	42	17	19	10.58	0	27059	42853	97	116.8
6-19-98	43	17	39	0.38	0	27057	42848	5	112.8
6-19-98	44	15	47	0.00	0	27048	42847	0	N/A
6-19-98	45	14	41	0.14	0	27061	42820	1	108.0
6-19-98	46	15	45	0.00	0	27056	42815	0	N/A
6-19-98	47	15	33	0.00	0	27051	42816	0	N/A
6-19-98	48	15	42	0.01	0	27055	42809	1	138.0
6-19-98	49	15	43	0.00	0	27057	42803	0	N/A
6-19-98	50	15	41	0.00	0	27059	42797	0	N/A
7-27-98	51	14	38	0.39	0	27051	42867	29	120.4
7-27-98	52	13	23	0.23	0	27061	42872	23	116.2
7-27-98	53	13	21	0.95	0	27060	42878	84	121.6
7-27-98	54	14	34	0.99	0	27058	42878	92	119.1
7-27-98	55	14	29	19.54	0	27054	42879	92	117.2
7-27-98	56	15	42	0.10	0	27047	42878	9	133.7
7-27-98	57	15	43	0.00	0	27047	42884	0	N/A
7-27-98	58	14	31	9.50	0	27055	42890	77	119.1
7-27-98	59	13	24	0.00	0	27062	42889	0	N/A
7-27-98	60	13	19	5.15	0	27059	42889	90	121.2
7-27-98	61	13	27	2.39	0	27058	42900	97	113.4
7-27-98	62	13	15	0.78	0	27059	42907	84	112.8
7-27-98	63	13	12	0.96	0	27058	42911	129	111.8

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-27-98	64	14	35	6.49	0	27049	42902	63	121.9
7-27-98	65	15	34	1.97	0	27040	42896	54	154.8
7-27-98	66	15	47	0.00	0	27036	42907	0	N/A
7-27-98	67	13	23	11.60	0	27051	42923	101	114.6
7-27-98	68	13	24	8.82	0	27049	42928	73	121.6
7-27-98	69	13	20	18.81	0	27051	42928	96	111.1
7-27-98	70	18	37	0.00	0	27044	42928	0	N/A
7-27-98	71	15	33	28.81	0	27039	42924	107	113.6
7-27-98	72	13	17	16.67	0	27045	42951	109	109.7
7-28-98	73	20	15	10.89	0	26983	43029	109	108.6
7-28-98	74	11	15	9.41	0	26984	43018	92	112.4
7-28-98	75	11	22	22.20	0	26986	43012	117	111.9
7-28-98	76	11	18	27.63	0	26992	43012	117	109.2
7-28-98	77	19	22	3.50	0	26995	43007	97	114.1
7-28-98	78	19	25	0.22	0	26994	43001	10	139.2
7-28-98	79	19	24	6.68	0	26997	43001	58	127.6
7-28-98	80	19	23	5.41	0	27003	43001	101	114.2
7-28-98	81	19	23	17.27	0	27005	43001	109	112.0
7-28-98	82	10	21	7.89	0	27009	43002	105	111.3
7-28-98	83	10	21	12.46	0	27012	43001	103	112.9
7-28-98	84	10	14	10.13	0	27023	42995	155	105.6
7-28-98	85	10	21	12.91	0	27022	42989	130	109.0

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-28-98	86	11	19	33.98	0	27023	42978	96	118.8
7-28-98	87	13	17	8.39	0	27034	42967	93	116.8
7-28-98	88	14	36	0.20	0	27037	42940	11	130.6
7-28-98	89	15	47	0.00	0	27030	42940	0	N/A
7-28-98	90	15	42	0.00	0	27032	42944	0	N/A
7-28-98	91	15	46	0.80	0	27020	42953	58	123.9
7-28-98	92	15	44	0.20	0	27019	42963	10	145.2
7-28-98	93	12	41	6.78	0	27009	42975	55	137.3
7-28-98	94	11	29	0.89	0	27014	42986	67	120.4
7-28-98	95	11	30	3.19	0	27007	42989	71	126.3
7-29-98	96	19	27	7.67	0	27001	42996	65	125.5
7-29-98	97	12	33	0.01	0	26984	43002	1	114.0
7-29-98	98	12	43	7.96	0	26978	43007	113	106.2
7-29-98	99	9	24	22.93	0	26968	43020	111	108.5
7-29-98	100	9	38	30.39	0	26964	43029	158	101.4
7-29-98	101	9	28	7.92	0	26961	43029	95	107.6
7-29-98	102	9	31	34.48	0	26966	43035	120	105.5
7-29-98	103	9	35	26.66	0	26963	43039	138	100.5
7-29-98	104	9	28	59.31	0	26959	43040	117	107.6
7-29-98	105	9	26	49.84	0	26961	43045	154	96.2
7-29-98	106	9	30	49.67	0	26956	43051	143	104.6
7-29-98	107	9	39	48.20	0	26951	43052	115	107.5

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-29-98	108	9	40	54.46	0	26949	43052	139	105.0
7-29-98	109	9	35	30.00	0	26954	43057	106	109.5
7-29-98	110	9	40	6.16	0	26954	43061	96	115.5
7-29-98	111	9	33	3.80	0	26948	43061	74	124.4
7-29-98	112	9	34	46.35	0	26949	43068	80	117.2
7-29-98	113	9	37	17.82	0	26952	43067	56	131.5
7-29-98	114	9	31	1.23	0	26953	43072	65	124.7
7-29-98	115	9	36	4.62	0	26952	43078	53	133.9
7-29-98	116	9	43	0.03	0	26948	43076	2	132.0
7-29-98	117	9	33	1.29	0	26951	43081	54	137.1
7-29-98	118	8	19	13.16	0	26959	43082	123	105.8
7-29-98	119	8	25	1.35	0	26957	43076	76	126.3
7-29-98	120	8	22	0.02	0	26956	43071	4	114.0
7-29-98	121	8	33	3.20	0	26956	43066	84	122.9
7-29-98	122	8	21	8.73	0	26961	43065	89	118.3
7-29-98	123	8	25	22.60	0	26960	43060	91	116.6
7-29-98	124	8	23	0.23	0	26966	43059	13	114.9
7-29-98	125	20	16	3.98	0	26971	43060	154	101.4
7-30-98	126	8	19	6.00	0	26967	43055	105	118.0
7-30-98	127	8	17	27.33	0	26979	43029	100	112.0
7-30-98	128	20	14	26.90	0	26980	43034	138	103.9
7-30-98	129	8	17	21.50	0	26977	43033	99	109.4

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
7-30-98	130	8	17	31.69	0	26972	43040	130	105.6
7-30-98	131	8	20	14.75	0	26972	43047	122	104.3
7-30-98	132	20	19	19.74	0	26977	43046	0	N/A
7-30-98	133	20	12	11.03	0	26976	43050	156	101.1
7-30-98	134	8	19	26.73	0	26969	43084	134	105.5
7-30-98	135	7	13	43.96	0	26959	43115	135	106.5
7-30-98	136	8	19	19.93	0	26955	43110	81	120.2
7-30-98	137	8	24	3.30	0	26952	43110	74	130.8
7-30-98	138	8	38	0.82	0	26949	43108	0	N/A
7-30-98	139	8	40	3.72	0	26946	43115	58	136.7
7-30-98	140	9	48	0.00	0	26944	43109	0	N/A
7-30-98	141	9	37	9.84	0	26941	43101	63	130.5
7-30-98	142	9	34	13.48	0	26940	43104	58	135.8
7-30-98	143	9	49	0.00	0	26943	43110	0	N/A
7-30-98	144	9	50	0.00	0	26940	43115	0	N/A
7-30-98	145	9	51	0.00	0	26936	43110	0	N/A
7-30-98	146	9	53	0.00	0	26936	43115	0	N/A
7-30-98	147	9	55	0.00	0	26937	43120	0	N/A
7-30-98	148	9	56	0.00	0	26936	43126	0	N/A
7-30-98	149	9	59	0.00	0	26936	43126	0	N/A
7-30-98	150	7	N/A	0.00	0	26932	43126	0	N/A
8-4-98	151	7	18	13.20	0	26955	43126	85	121.5

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-4-98	152	7	17	11.49	0	26957	43121	122	111.5
8-4-98	153	7	23	4.55	0	26955	43121	78	124.8
8-4-98	154	7	24	26.74	0	26950	43132	93	115.8
8-4-98	155	7	27	12.54	0	26942	43174	71	128.2
8-4-98	156	7	33	15.89	0	26940	43174	81	124.4
8-4-98	157	8	44	0.00	0	26935	43173	0	N/A
8-4-98	158	7	32	12.29	0	26938	43180	67	129.6
8-4-98	159	7	21	20.61	0	26940	43180	81	123.5
8-4-98	160	7	16	5.94	0	26942	43180	85	117.7
8-4-98	161	7	27	2.88	0	26940	43185	0	N/A
8-4-98	162	7	16	0.02	0	26937	43185	2	133.5
8-4-98	163	7	25	80.00	0	26939	43190	121	107.1
8-10-98	164	8	49	1.00	0	26930	43181	50	153.7
8-10-98	165	8	48	1.41	0	26927	43179	24	149.5
8-10-98	166	9	51	12.67	0	26924	43179	57	148.4
8-10-98	167	9	49	1.78	0	26924	43185	58	148.6
8-10-98	168	8	50	4.86	0	26926	43190	52	153.6
8-10-98	169	8	50	0.85	0	26930	43190	34	142.0
8-10-98	170	8	38	35.64	0	26932	43190	103	109.0
8-10-98	171	7	35	0.05	0	26936	43191	5	121.2
8-10-98	172	7	40	0.00	0	26934	43195	0	N/A
8-10-98	173	7	37	0.00	0	26935	43200	0	N/A

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-10-98	174	7	31	6.17	0	26935	43205	74	119.0
8-10-98	175	21	42	64.29	0	26929	43210	100	108.4
8-10-98	176	21	29	2.88	0	26932	43216	40	118.4
8-10-98	177	7	21	35.51	0	26932	43221	94	113.6
8-10-98	178	7	27	30.50	0	26930	43221	98	108.3
8-10-98	179	7	19	42.02	0	26931	43226	95	119.8
8-10-98	180	7	29	49.05	0	26927	43226	153	100.2
8-10-98	181	8	35	5.62	0	26920	43230	57	131.5
8-10-98	182	8	46	0.56	0	26914	43230	26	141.5
8-10-98	183	9	50	4.39	0	26908	43230	57	143.3
8-10-98	184	9	36	1.08	0	26909	43220	59	141.4
8-11-98	185	9	49	2.19	1	26920	43190	51	150.8
8-11-98	186	9	55	4.04	0	26916	43190	58	149.7
8-11-98	187	9	48	4.21	0	26917	43196	50	152.8
8-11-98	188	9	52	0.00	0	26914	43200	0	N/A
8-11-98	189	9	55	5.69	0	26916	43205	48	152.1
8-11-98	190	8	45	3.52	0	26918	43216	54	149.1
8-11-98	191	9	53	5.36	0	26913	43210	53	147.9
8-11-98	192	9	56	2.68	0	26908	43216	50	152.0
8-11-98	193	8	32	2.72	0	26912	43248	45	154.1
8-11-98	194	8	33	69.08	0	26917	43248	72	119.9
8-11-98	195	7	31	11.45	0	26924	43249	66	132.4

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-11-98	196	7	19	29.51	0	26927	43247	84	124.4
8-11-98	197	7	31	23.15	0	26924	43254	72	117.5
8-11-98	198	7	37	0.00	0	26922	43253	0	N/A
8-12-98	199	7	32	0.24	0	26919	43253	13	138.7
8-12-98	200	8	45	1.86	0	26913	43252	77	124.5
8-12-98	201	9	39	8.66	0	26907	43251	44	151.4
8-12-98	202	9	40	0.15	0	26905	43252	9	142.0
8-12-98	203	9	51	2.24	0	26902	43251	57	146.4
8-12-98	204	9	44	3.01	0	26904	43257	56	146.6
8-12-98	205	9	39	2.78	0	26906	43255	51	150.8
8-12-98	206	8	43	0.00	0	26917	43257	0	N/A
8-12-98	207	7	33	0.00	0	26922	43257	0	N/A
8-12-98	208	7	32	0.80	0	26924	43257	40	142.1
8-12-98	209	7	27	21.22	0	26924	43263	81	114.9
8-12-98	210	8	40	107.37	2	26918	43262	88	109.9
8-12-98	211	8	40	0.03	0	26912	43262	3	131.0
8-12-98	212	8	40	8.15	0	26909	43262	48	148.7
8-12-98	213	9	45	0.00	0	26905	43262	0	N/A
8-12-98	214	7	32	77.92	0	26917	43268	96	122.4
8-17-98	215	22	23	81.82	0	26920	43299	152	102.6
8-17-98	216	22	28	75.68	0	26921	43305	104	112.1
8-17-98	217	22	30	49.18	0	26918	43310	113	110.8

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-17-98	218	5	36	14.00	0	26915	43310	96	116.4
8-17-98	219	22	29	43.41	0	26920	43316	83	123.4
8-17-98	220	22	25	58.63	0	26922	43315	103	113.5
8-17-98	221	22	26	115.00	0	26925	43320	106	111.6
8-17-98	222	22	26	21.43	0	26926	43326	86	116.8
8-17-98	223	5	43	0.00	0	26919	43330	0	N/A
8-17-98	224	5	49	6.73	0	26916	43330	60	138.2
8-17-98	225	22	51	0.00	0	26923	43346	0	N/A
8-17-98	226	22	37	13.47	0	26927	43346	65	136.1
8-17-98	227	22	19	61.48	0	26930	43347	79	122.6
8-17-98	228	22	38	0.00	0	26927	43351	0	N/A
8-17-98	229	22	50	11.54	0	26924	43351	67	128.0
8-17-98	230	5	56	0.00	0	26920	43350	0	N/A
8-17-98	231	5	55	9.24	0	26918	43351	65	135.6
8-17-98	232	22	35	0.34	0	26929	43357	10	146.7
8-18-98	233	6	52	7.65	0	26924	43518	39	164.3
8-18-98	234	6	39	0.40	0	26927	43525	19	147.9
8-18-98	235	6	58	3.31	0	26922	43524	42	153.8
8-18-98	236	6	50	0.89	0	26920	43529	33	158.5
8-18-98	237	5	53	2.79	0	26929	43533	45	161.8
8-18-98	238	5	59	0.00	0	26933	43534	0	N/A
8-18-98	239	25	57	0.00	0	26936	43534	0	N/A

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-18-98	240	25	48	4.80	0	26937	43538	55	142.6
8-18-98	241	25	48	0.00	0	26942	43540	0	N/A
8-18-98	242	25	26	184.09	0	26945	43540	86	118.2
8-18-98	243	25	41	6.67	0	26943	43535	27	130.9
8-18-98	244	25	43	0.00	0	26940	43535	0	N/A
8-18-98	245	25	60	0.00	0	26935	43529	0	N/A
8-18-98	246	25	54	0.40	0	26938	43529	4	135.0
8-20-98	247	4	53	0.00	0	26938	43485	0	N/A
8-20-98	248	4	57	4.17	0	26937	43490	0	N/A
8-20-98	249	4	57	0.00	0	26939	43490	0	N/A
8-20-98	250	4	52	30.41	0	26940	46520	69	130.9
8-20-98	251	25	37	36.29	0	26944	43526	89	120.5
8-20-98	252	5	52	8.46	0	26932	43518	46	157.1
8-20-98	253	5	56	7.02	0	26928	43517	39	158.0
8-20-98	254	5	49	0.40	0	26931	43513	16	169.5
8-20-98	255	5	53	7.95	0	26931	43509	43	160.0
8-20-98	256	6	63	8.56	0	26924	43504	44	155.0
8-20-98	257	5	64	37.67	0	26928	43484	55	138.4
8-20-98	258	5	72	0.00	0	26928	43479	0	N/A
8-20-98	259	5	69	37.50	0	26930	43479	0	N/A
8-20-98	260	5	60	54.78	0	26933	43479	74	129.9
8-20-98	261	4	51	0.00	0	26937	43480	0	N/A

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-20-98	262	4	39	43.93	1	26940	43479	89	117.1
8-20-98	263	5	63	16.42	0	26932	43473	77	124.6
8-20-98	264	4	26	14.93	0	26942	43468	86	116.1
8-20-98	265	24	34	0.00	0	26939	43460	0	N/A
8-20-98	266	24	52	0.00	0	26936	43459	0	N/A
8-20-98	267	24	57	9.78	0	26927	43449	60	141.4
8-20-98	268	5	59	11.69	1	26927	43439	80	130.4
8-20-98	269	4	42	13.85	0	26936	43434	75	115.6
8-20-98	270	4	52	34.03	0	26933	43434	71	128.8
8-20-98	271	5	61	3.82	0	26926	43433	76	132.4
8-20-98	272	6	67	0.00	0	26921	43427	0	N/A
8-20-98	273	5	65	0.00	0	26925	43427	0	N/A
8-20-98	274	5	62	5.24	0	26927	43428	75	128.8
8-20-98	275	5	65	1.80	0	26923	43422	44	128.8
8-20-98	276	5	59	0.00	0	26930	43423	0	N/A
8-21-98	277	4	52	25.44	0	26933	43423	62	134.8
8-21-98	278	4	34	37.87	0	26937	43423	133	100.7
8-21-98	279	5	60	5.65	0	26929	43417	71	134.1
8-21-98	280	4	54	2.78	0	26932	43413	0	N/A
8-21-98	281	5	67	0.00	0	26925	43412	0	N/A
8-21-98	282	6	66	4.07	0	26920	43407	69	136.1
8-21-98	283	6	68	6.89	0	26916	43406	59	144.8

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

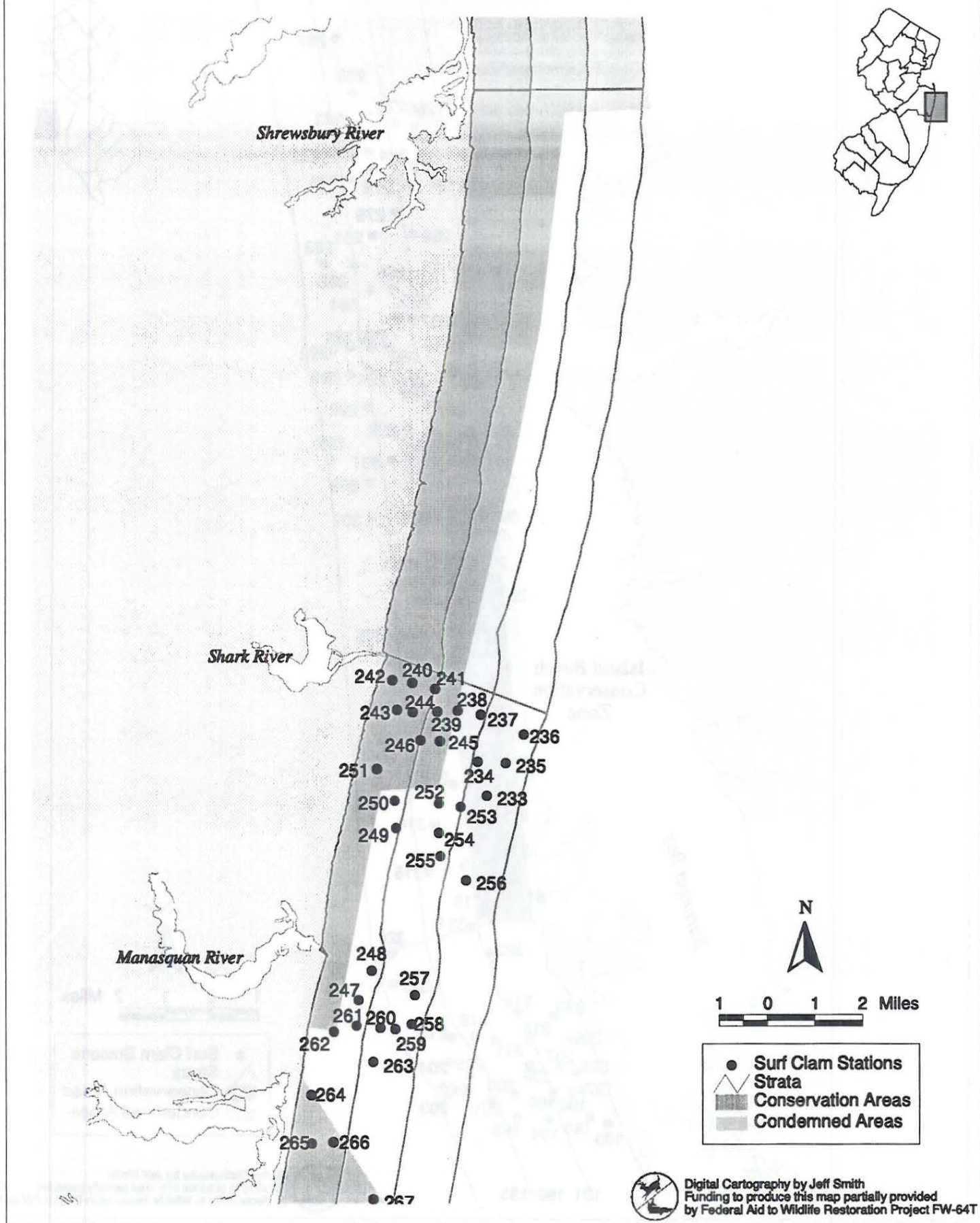
DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELS	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-21-98	284	5	66	6.53	0	26922	43402	68	137.9
8-21-98	285	5	61	3.64	0	26925	43403	61	133.1
8-21-98	286	5	62	10.65	0	26925	43397	84	123.9
8-21-98	287	5	58	0.00	0	26927	43397	0	N/A
8-21-98	288	4	50	21.75	0	26930	43392	74	126.0
8-21-98	289	5	61	5.89	0	26923	43391	67	135.0
8-21-98	290	5	62	5.93	0	26919	43391	57	140.1
8-21-98	291	6	61	4.49	0	26916	43391	59	145.1
8-21-98	292	6	61	2.49	0	26913	43390	59	145.7
8-21-98	293	6	62	5.39	0	26915	43386	61	140.3
8-21-98	294	5	60	4.77	0	26918	43387	58	138.9
8-21-98	295	5	57	6.28	0	26925	43386	73	127.6
8-21-98	296	4	29	28.56	0	26933	43388	75	127.4
8-21-98	297	4	50	2.59	0	26928	43382	74	128.6
8-21-98	298	6	57	8.05	0	26917	43380	59	138.9
8-21-98	299	23	58	18.22	0	26922	43377	74	133.2
8-21-98	300	23	53	0.00	0	26927	43376	0	N/A
8-21-98	301	5	55	0.00	0	26918	43370	0	N/A
8-21-98	302	6	57	6.79	0	26908	43370	49	148.3
8-21-98	303	6	58	8.10	0	26913	43365	58	140.6
8-22-98	304	22	32	15.40	0	26930	43361	72	127.3
8-22-98	305	22	47	4.91	0	26927	43361	69	123.9

Table 1. 1998 Station Locations, Surf Clam Abundance, Mean Length and Number of Clams Measured in a One Bushel Subsample Collected by the Dredge Per Five Minute Tow (Reported in U.S. Standard Bushels).

DATE	STATION	STRATA	DEPTH (ft.)	TOTAL BUSHELs	NUMBER OF <i>Spisula</i> < 71 mm	LORAN X	LORAN Y	N MEASURED	MEAN LENGTH(mm)
8-22-98	306	5	56	0.00	0	26923	43360	0	N/A
8-22-98	307	6	60	10.54	0	26913	43359	63	140.1
8-22-98	308	6	60	0.11	0	26907	43334	2	133.5
8-22-98	309	5	56	14.06	0	26913	43334	71	132.5
8-22-98	310	5	54	0.00	0	26911	43325	0	N/A
8-22-98	311	5	47	0.00	0	26913	43319	0	N/A
8-22-98	312	5	52	2.95	0	26910	43319	57	122.3
8-22-98	313	6	57	0.00	0	26906	43314	0	N/A
8-22-98	314	5	40	6.48	0	26911	43302	71	132.3
8-22-98	315	5	42	3.60	0	26908	43293	34	138.6
8-22-98	316	22	25	14.57	0	26918	43294	97	117.9
8-22-98	317	22	24	1.80	0	26920	43289	114	111.1
8-22-98	318	22	26	0.20	0	26916	43288	14	129.4
8-31-98	319	9	43	11.23	0	26897	43272	83	127.7
8-31-98	320	9	45	14.09	0	26898	43277	92	122.3
8-31-98	321	5	36	0.79	0	26912	43283	44	135.8
8-31-98	322	7	27	59.02	0	26915	43278	99	119.5
8-31-98	323	7	23	39.37	0	26922	43267	159	100.7

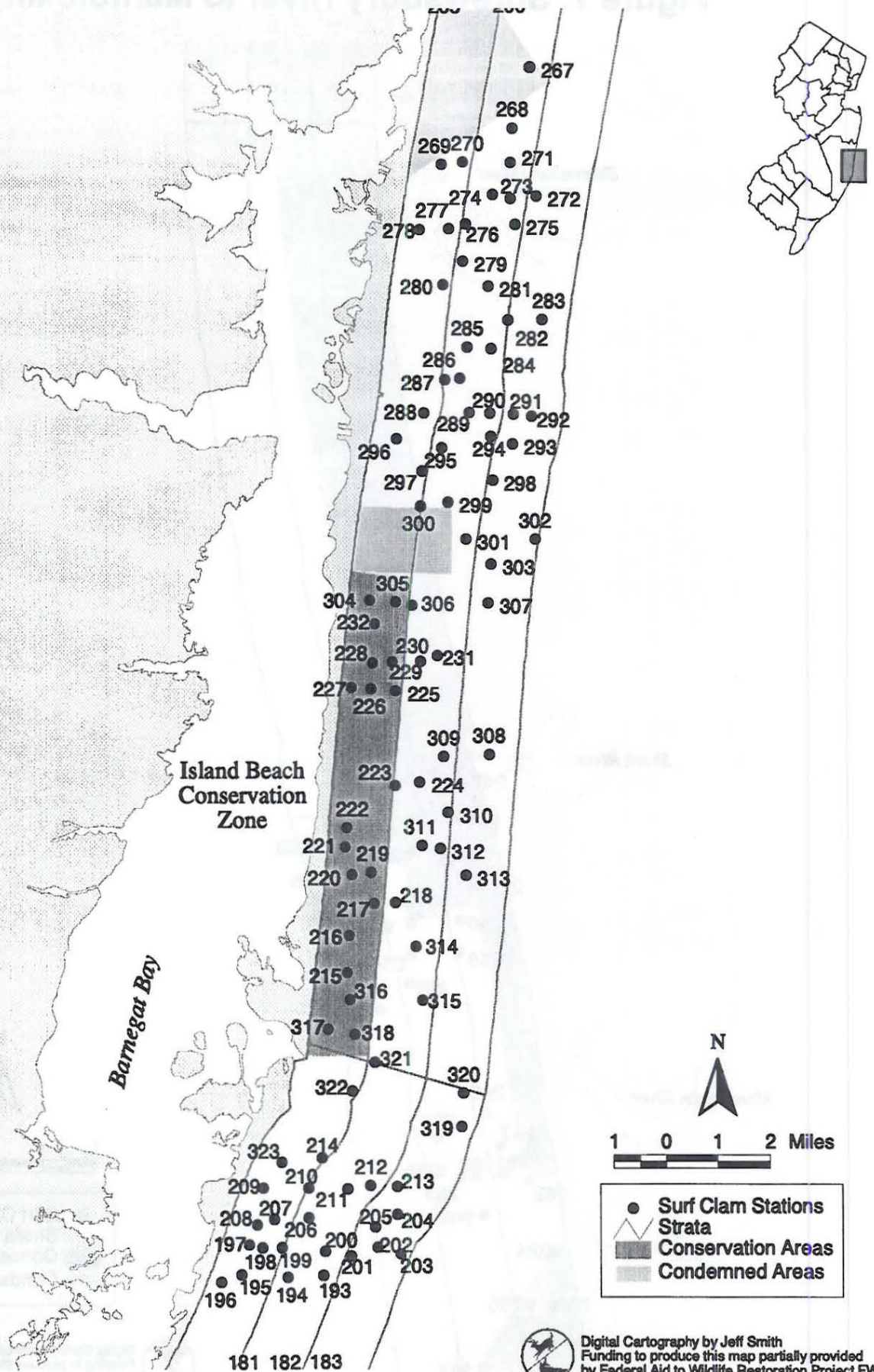
1998 SURF CLAM STATION LOCATIONS

Figure 1: Shrewsbury River to Mantoloking



1998 SURF CLAM STATION LOCATIONS

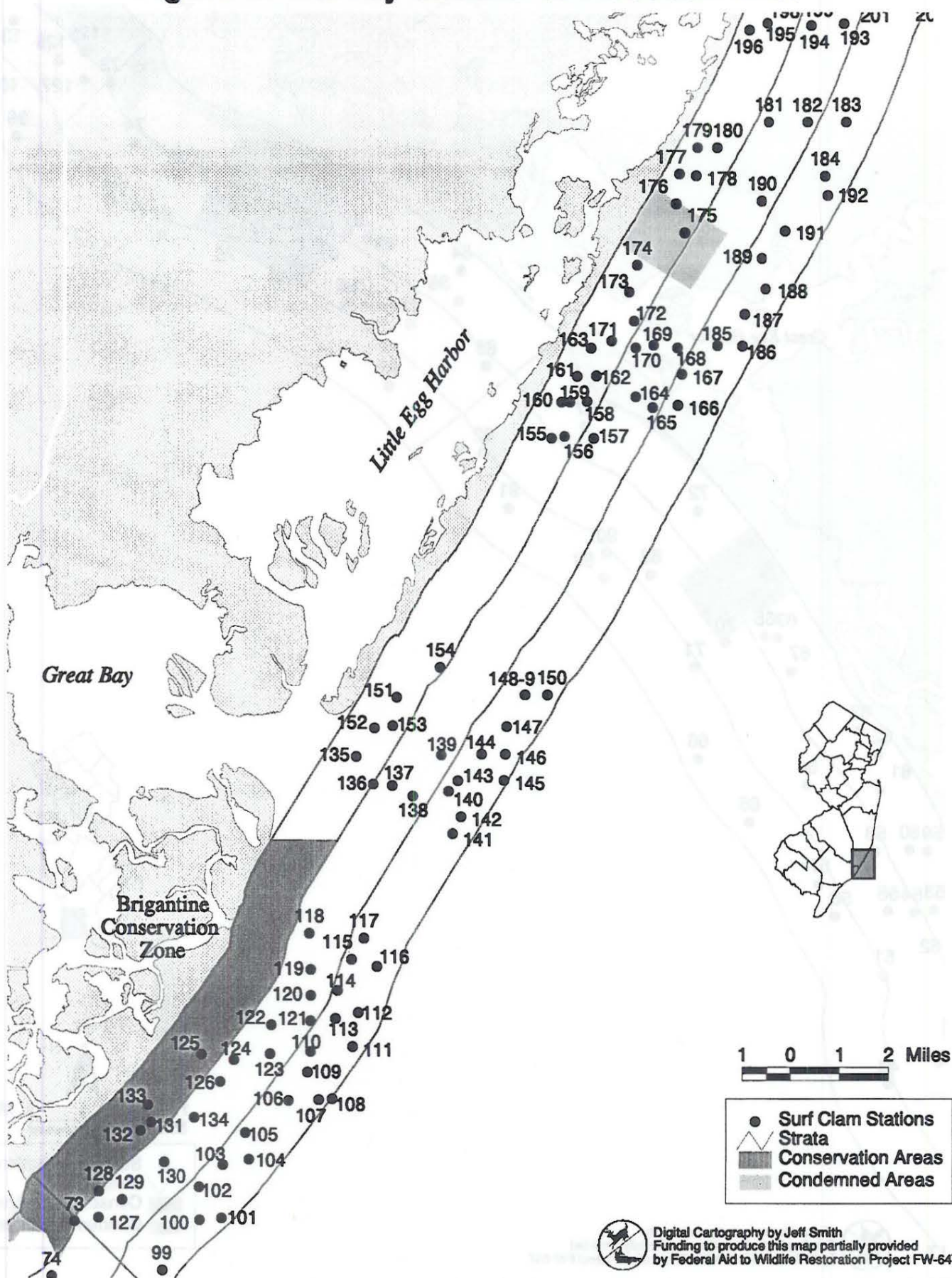
Figure 2: Mantoloking to Harvey Cedars



Digital Cartography by Jeff Smith
Funding to produce this map partially provided
by Federal Aid to Wildlife Restoration Project FW-64T

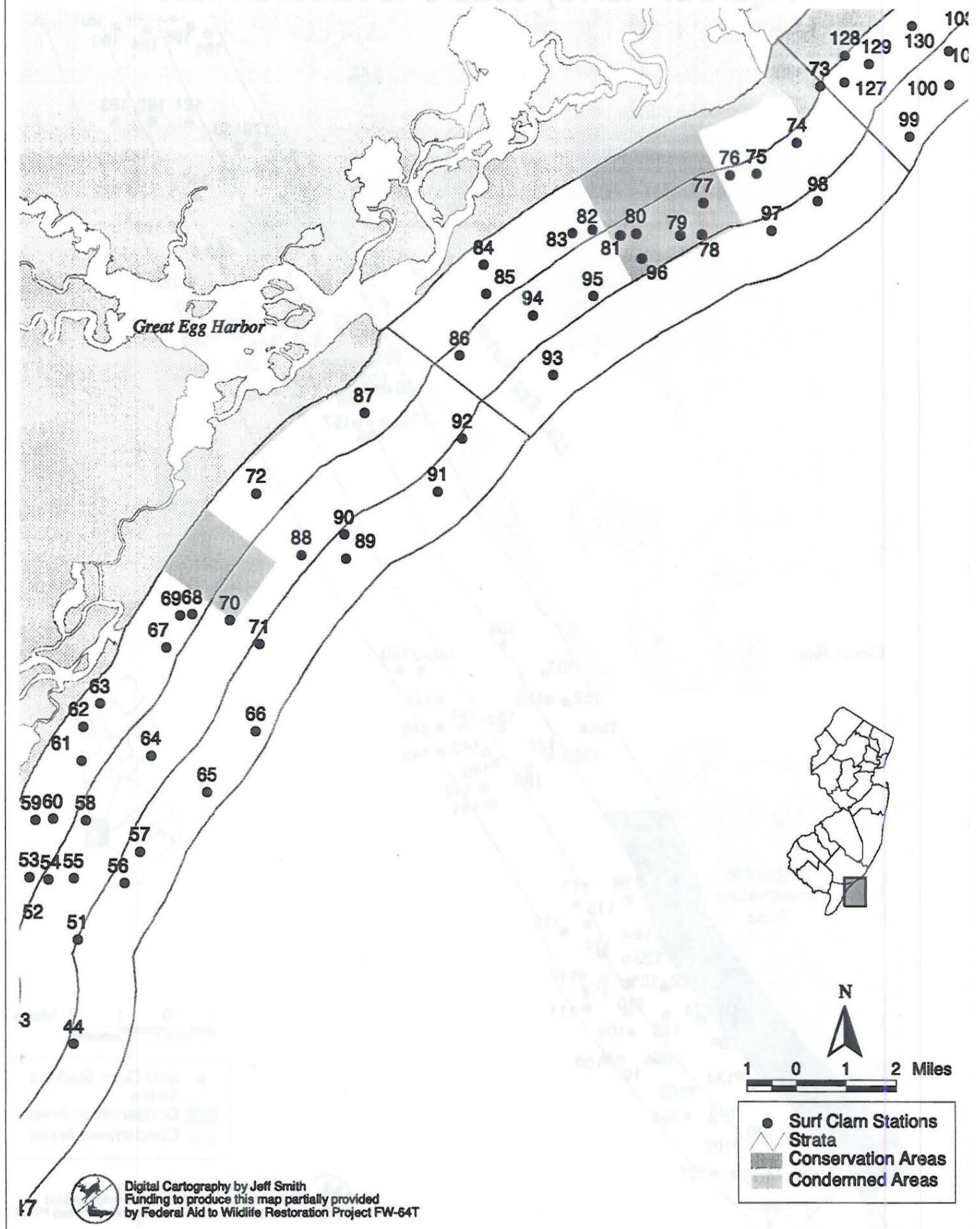
1998 SURF CLAM STATION LOCATIONS

Figure 3: Harvey Cedars to Absecon Inlet



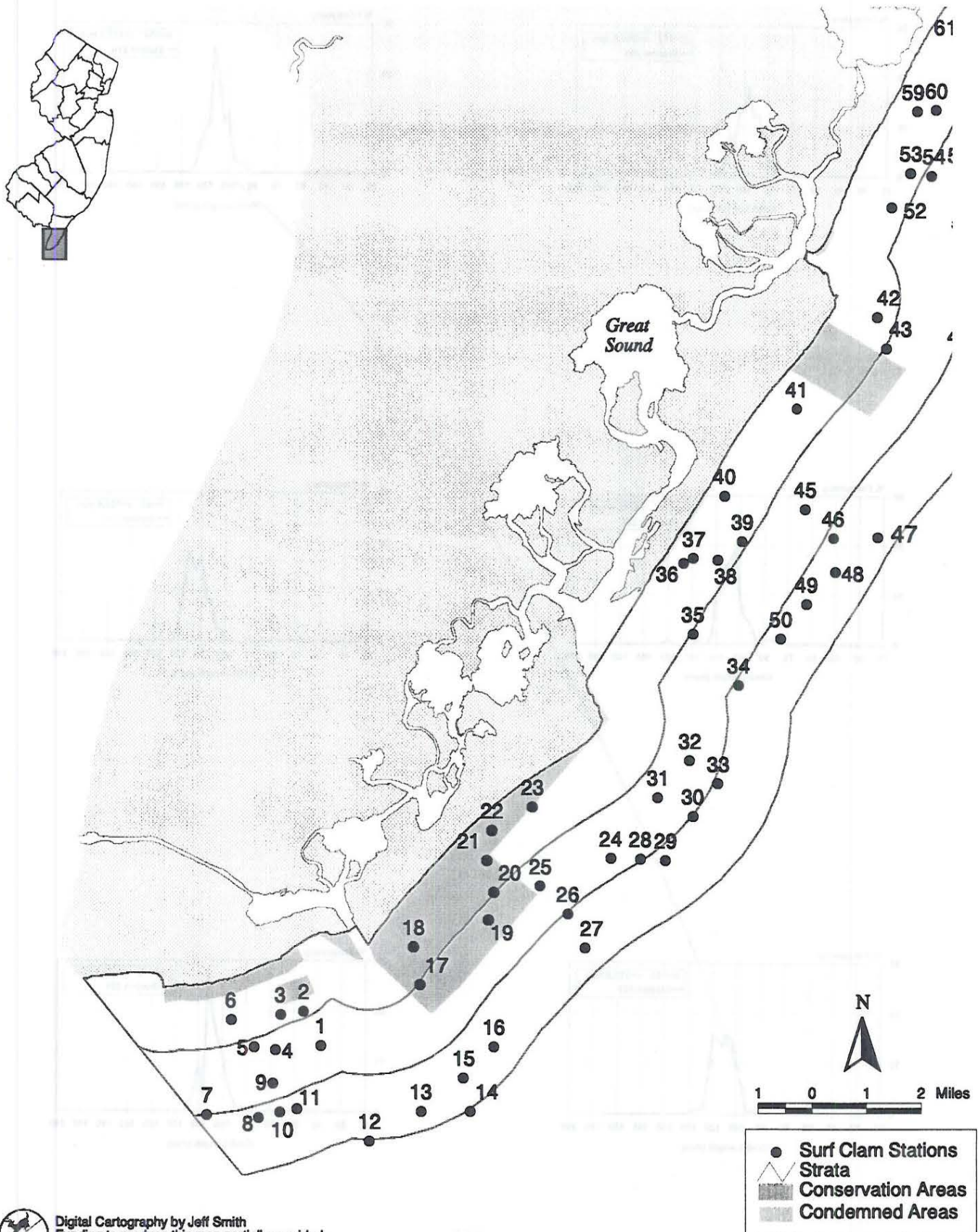
1998 SURF CLAM STATION LOCATIONS

Figure 4: Absecon Inlet to Sea Isle



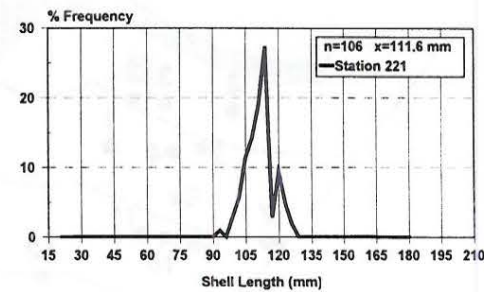
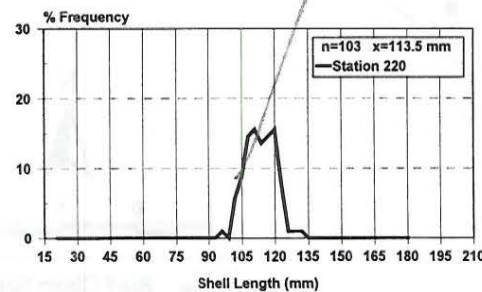
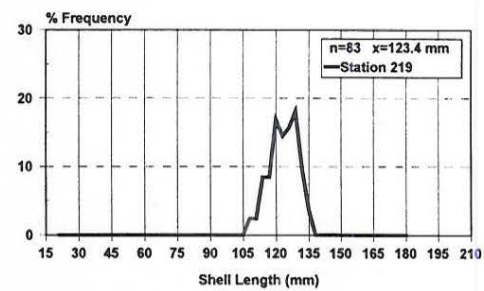
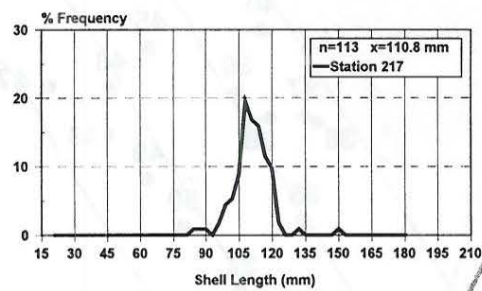
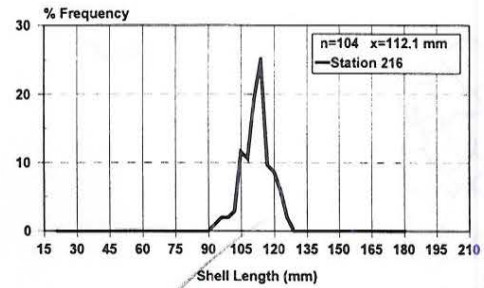
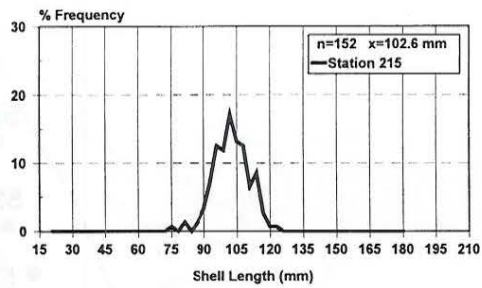
1998 SURF CLAM STATION LOCATIONS

Figure 5: Sea Isle to Cape May

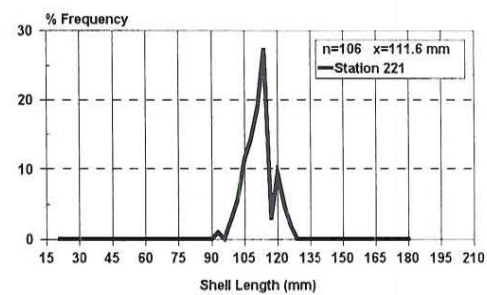
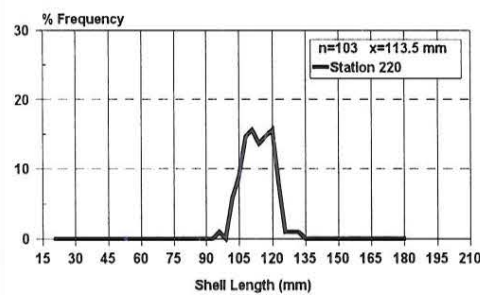
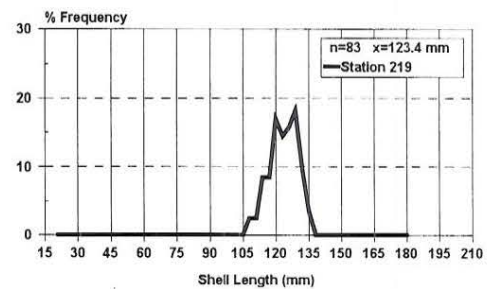
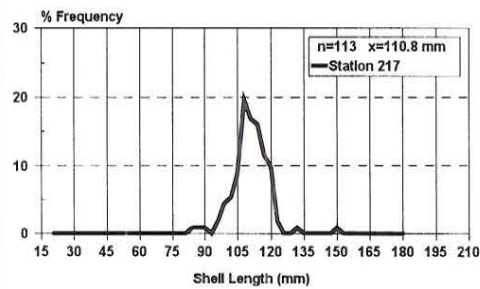
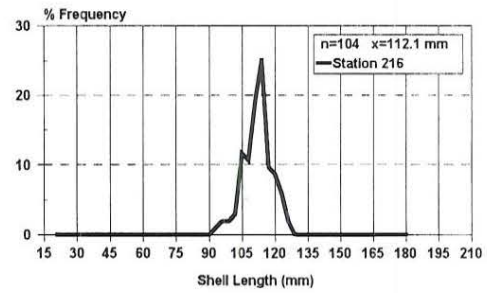
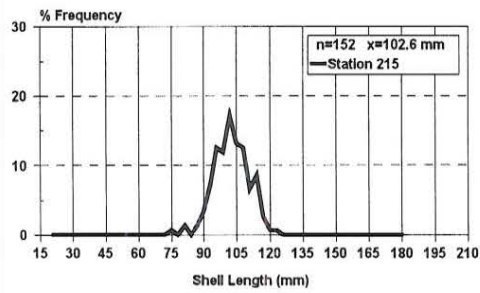


Digital Cartography by Jeff Smith
Funding to produce this map partially provided
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STRATUM 4 INNER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998

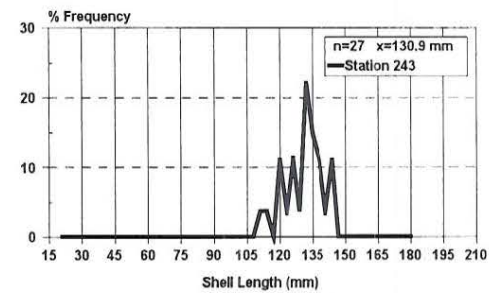
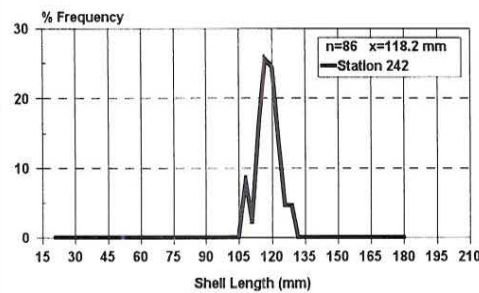
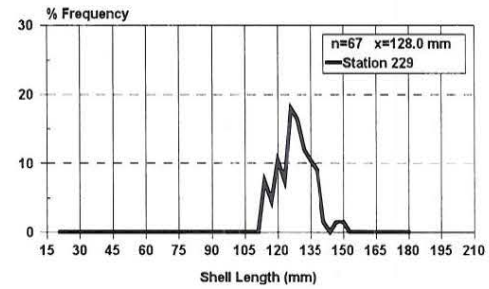
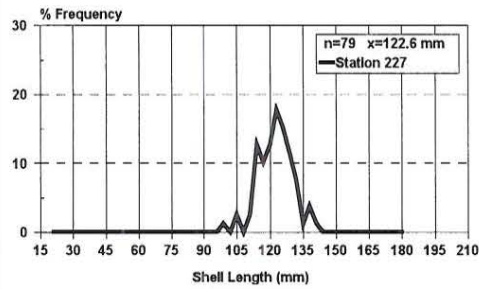
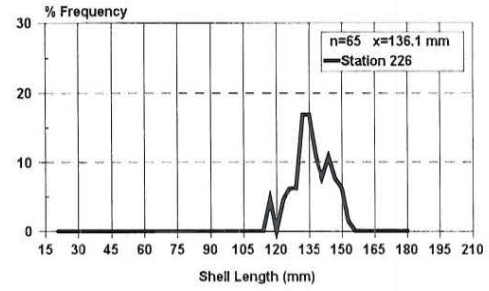
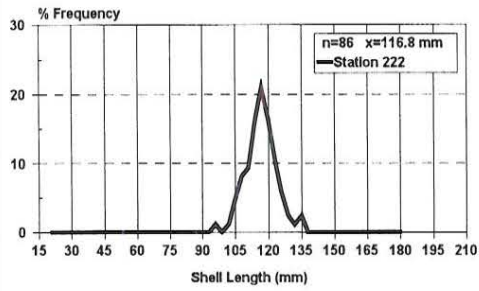


STRATUM 4 INNER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



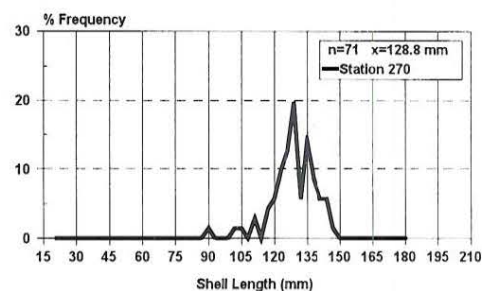
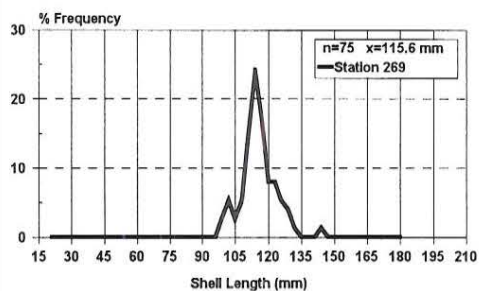
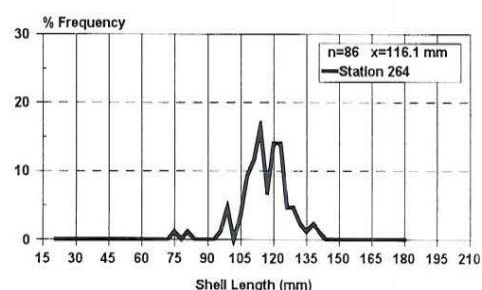
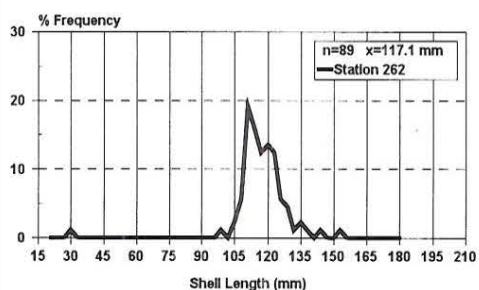
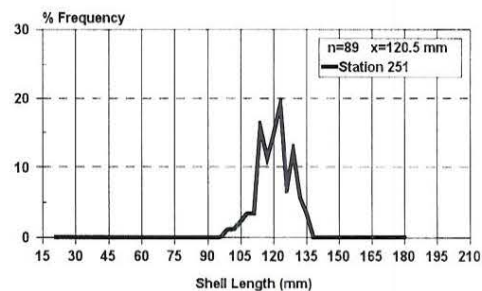
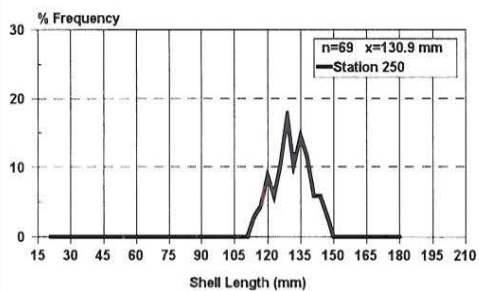
STRATUM 4 INNER MILE

SHARK RIVER INLET TO BARNEGAT INLET, 1998

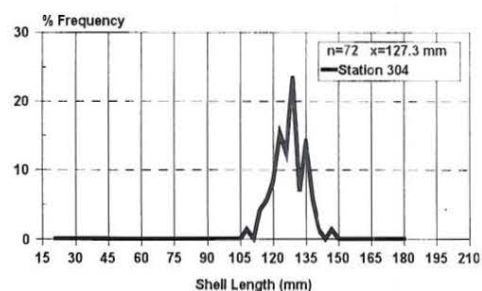
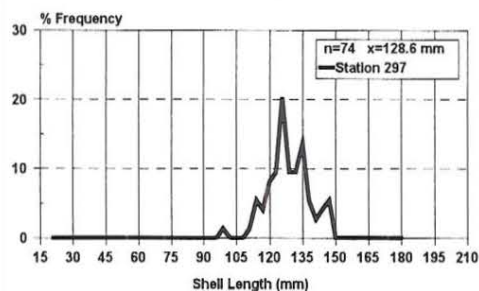
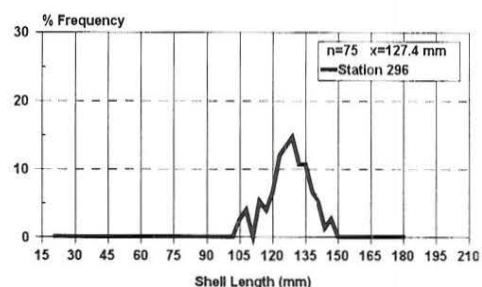
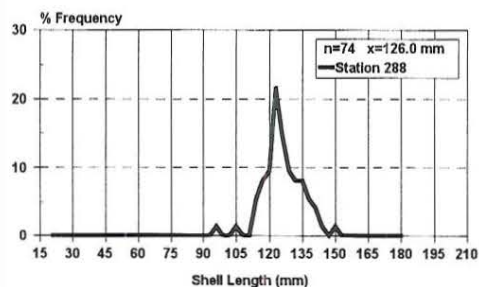
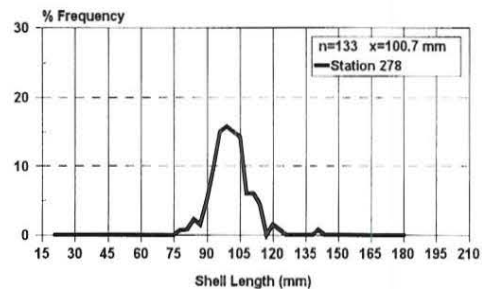
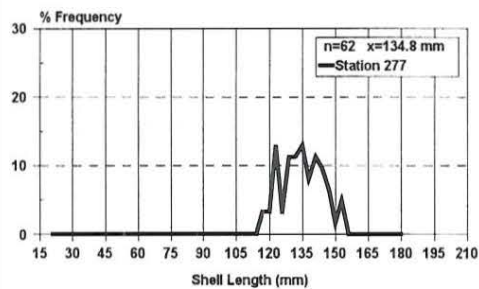


STRATUM 4 INNER MILE

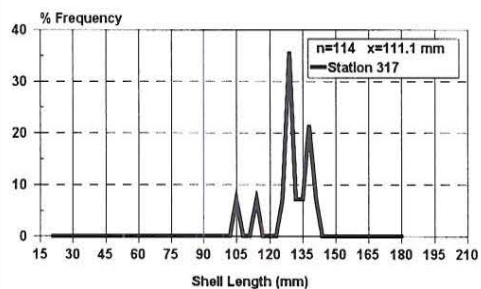
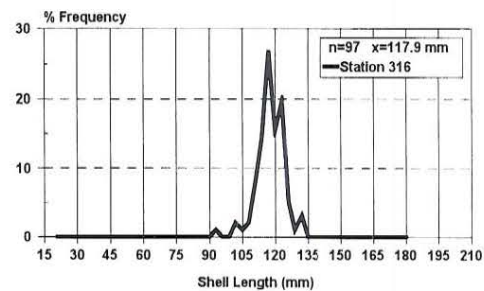
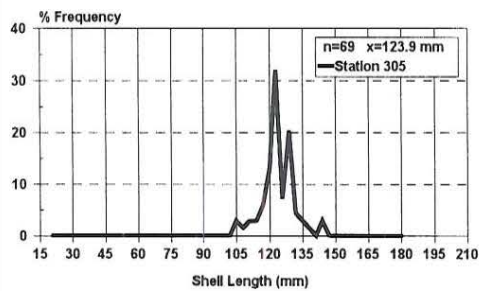
SHARK RIVER INLET TO BARNEGAT INLET, 1998



STRATUM 4 INNER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998

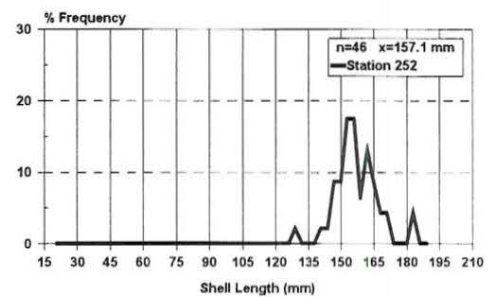
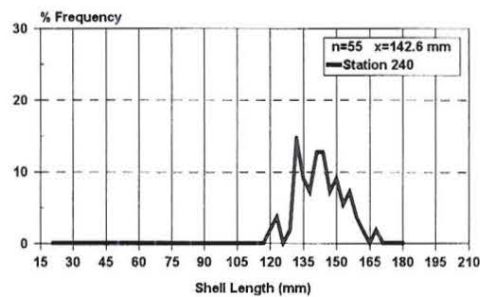
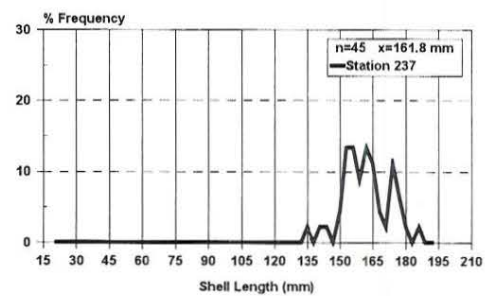
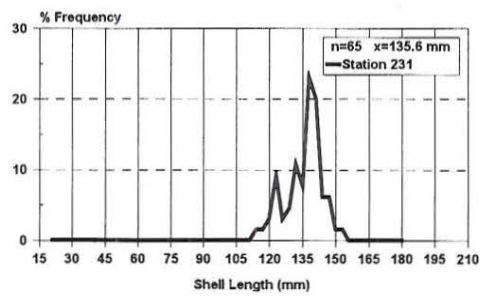
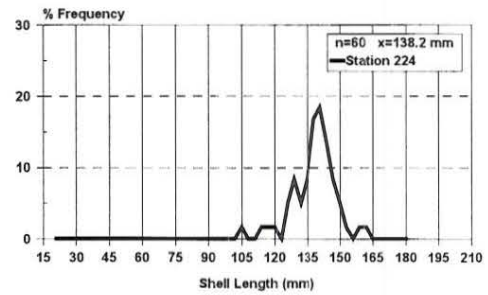
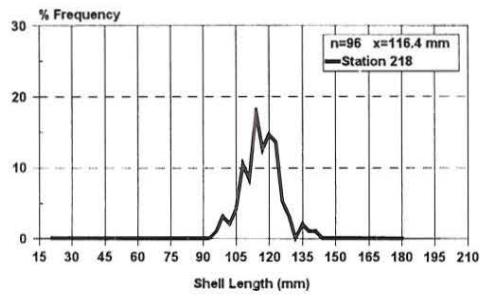


STRATUM 4 INNER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998

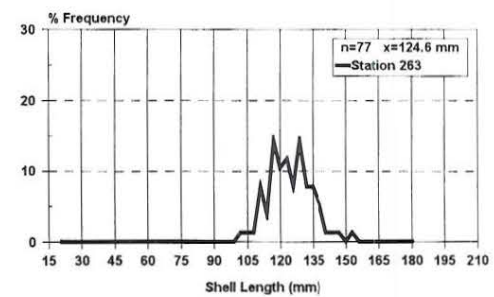
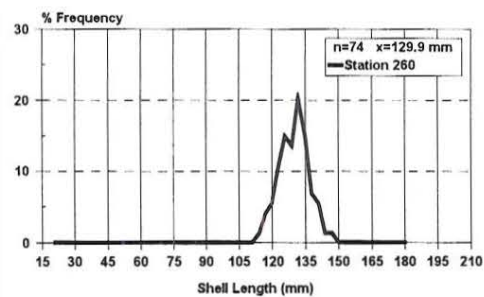
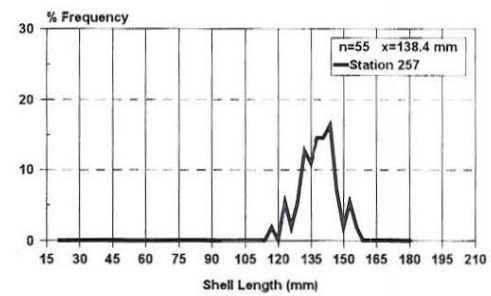
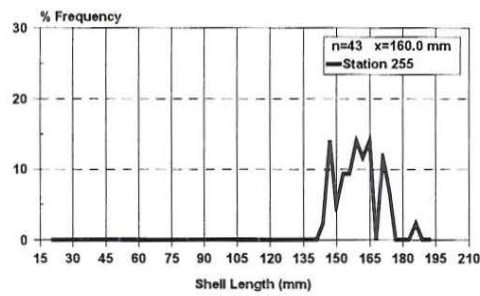
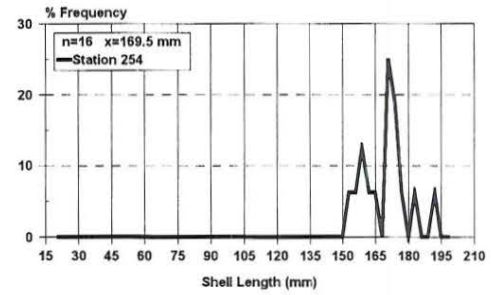
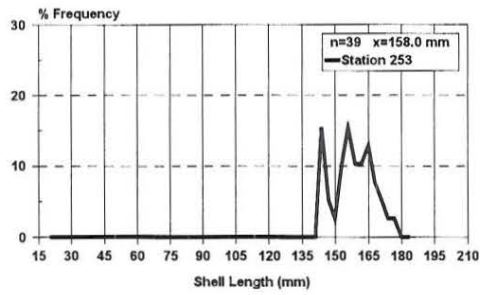


SIRATUM 5 MIDDLE MILE

SHARK RIVER INLET TO BARNEGAT INLET, 1998

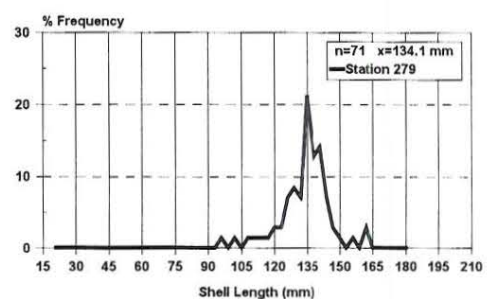
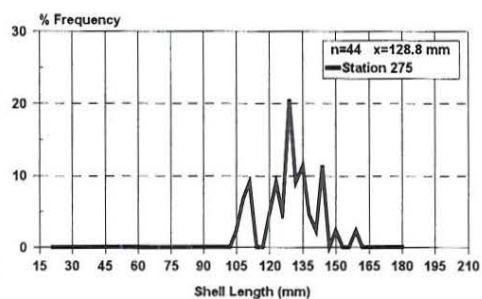
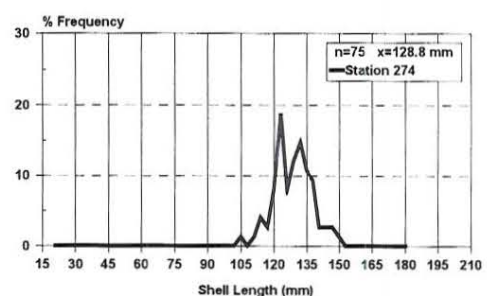
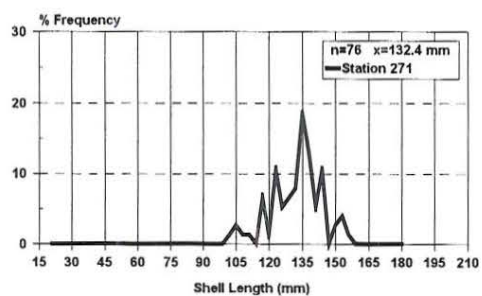
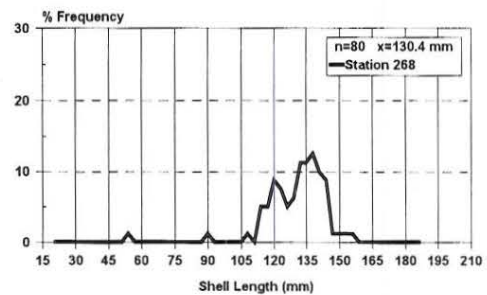
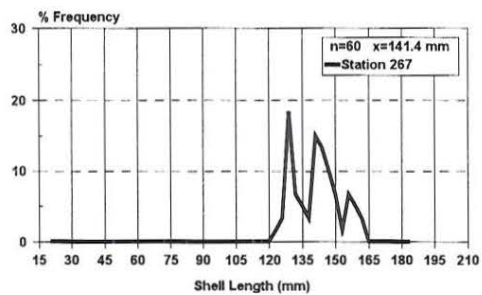


SIRATUM 5 MIDDLE MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998

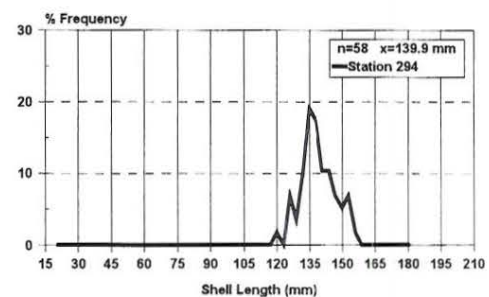
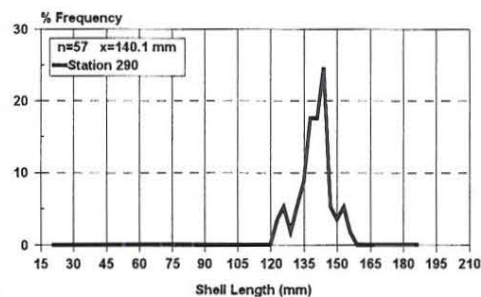
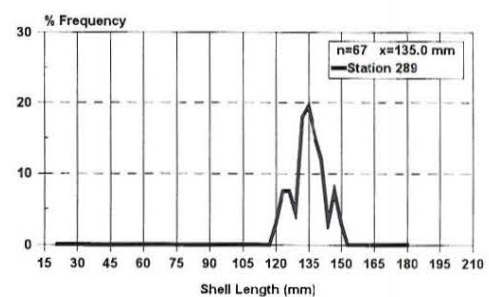
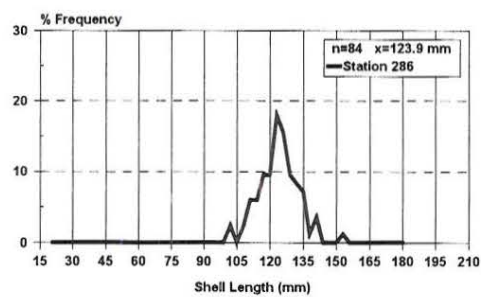
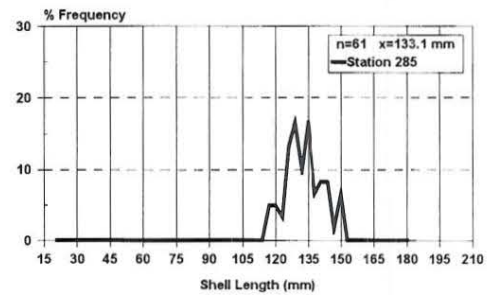
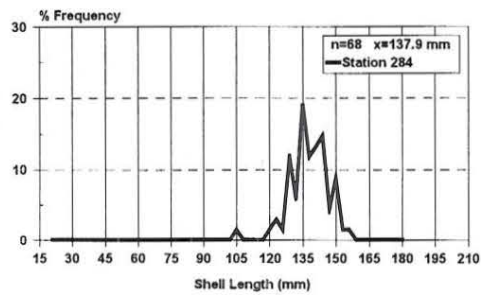


SIRATUM 5 MIDDLE MILE

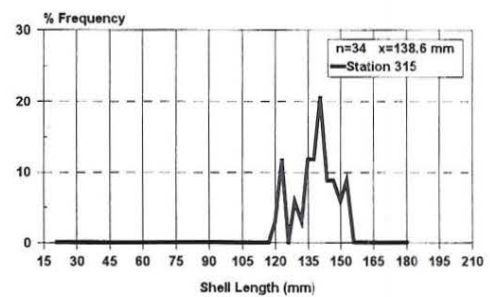
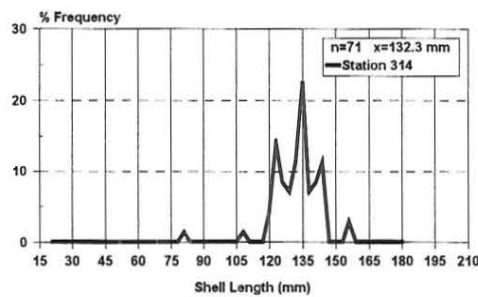
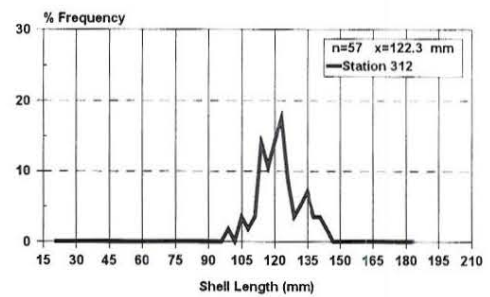
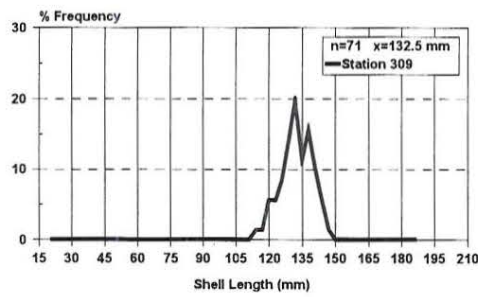
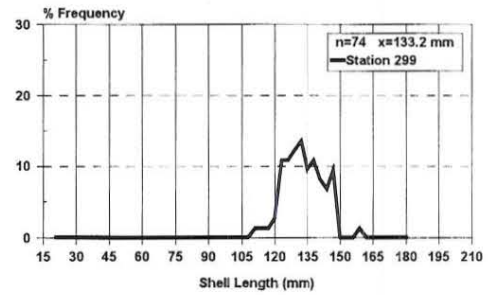
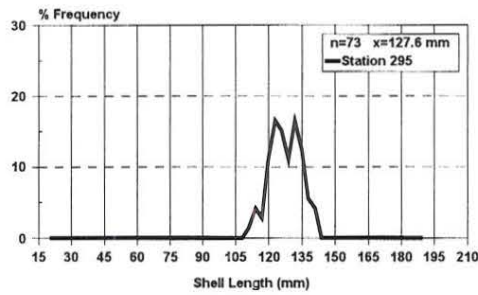
SHARK RIVER INLET TO BARNEGAT INLET, 1998



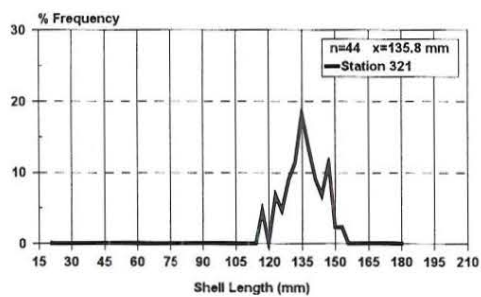
SIRATUM 5 MIDDLE MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



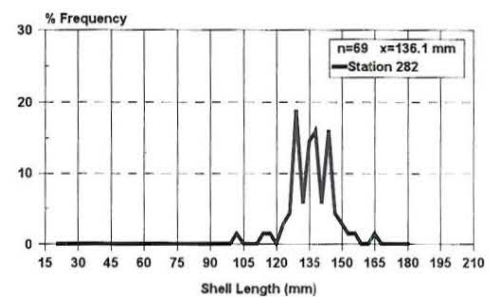
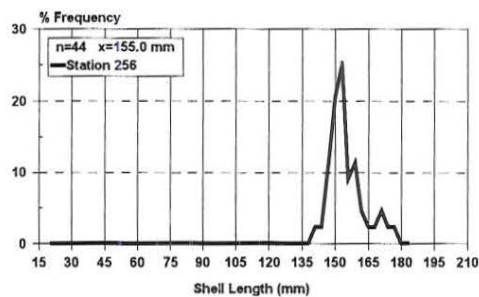
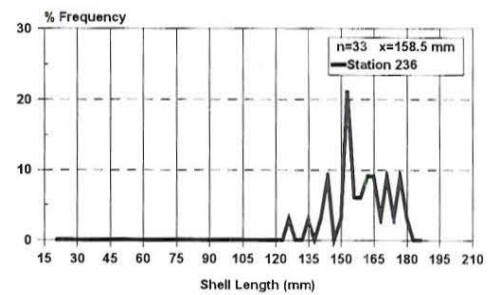
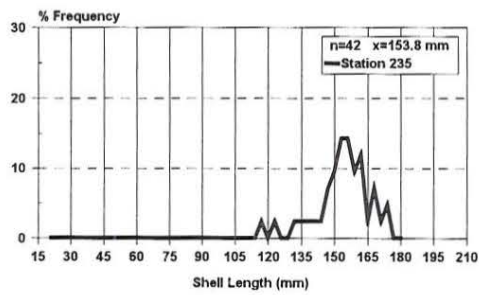
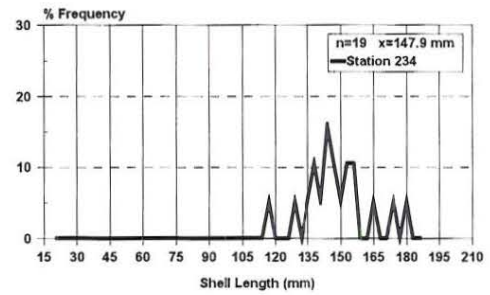
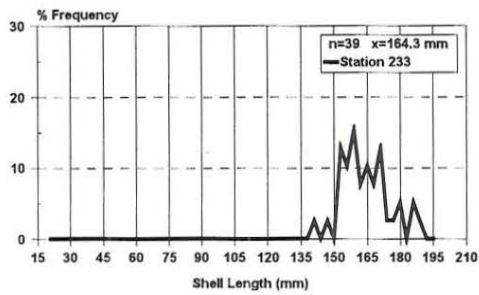
SIRATUM 5 MIDDLE MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



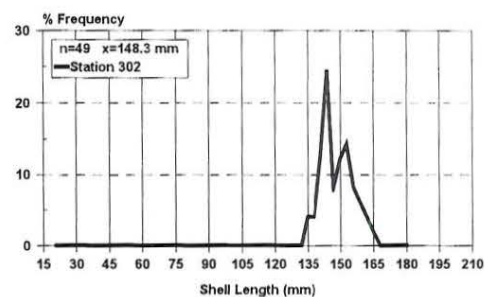
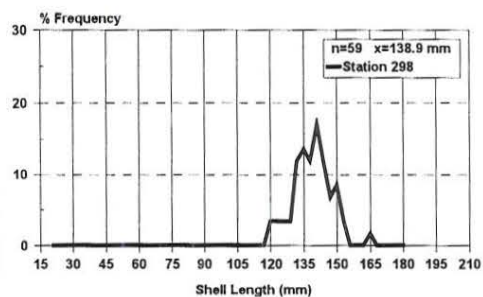
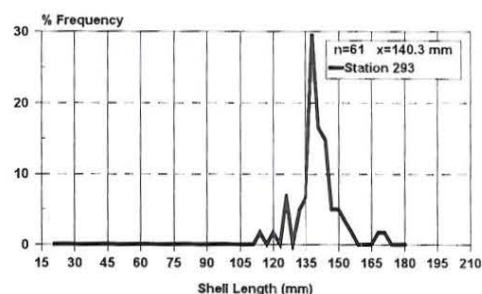
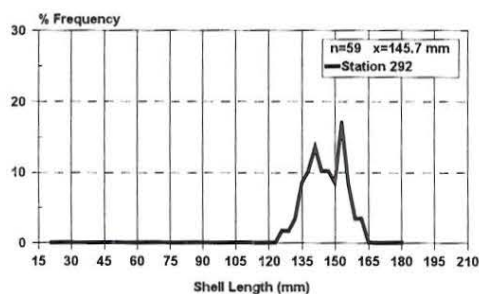
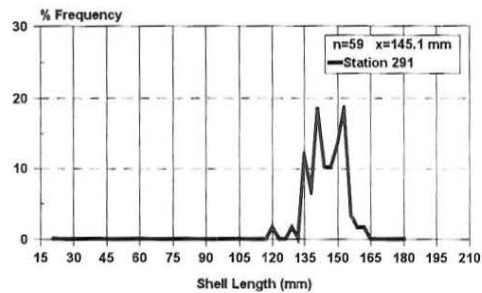
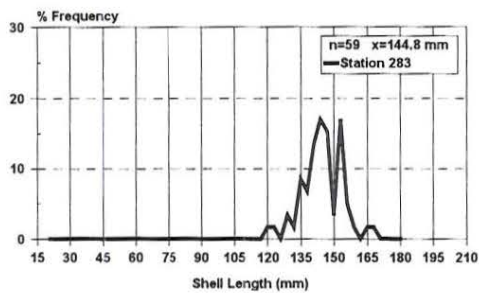
STRATUM 5 MIDDLE MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



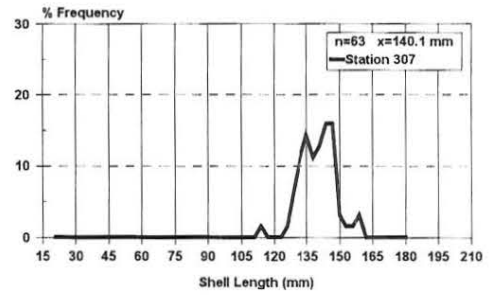
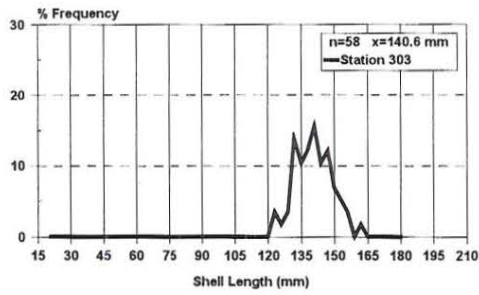
STRATUM 6 OUTER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



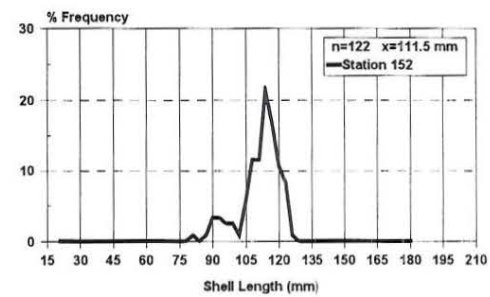
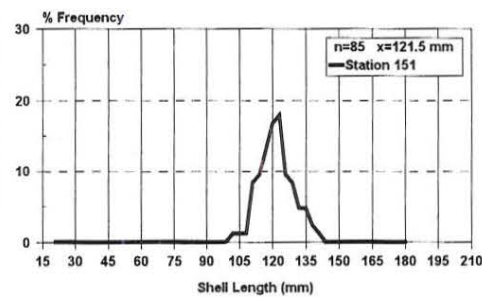
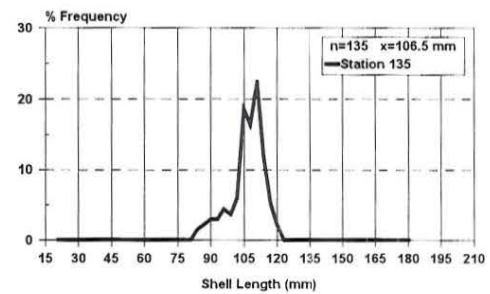
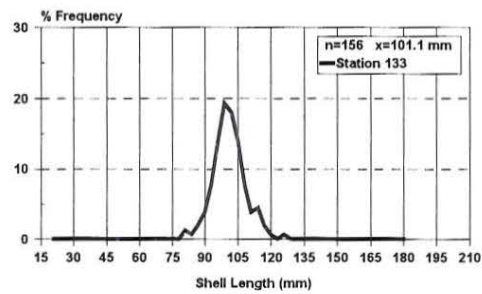
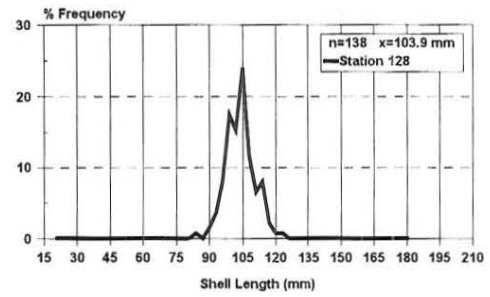
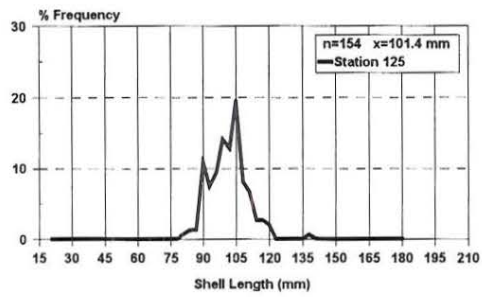
STRATUM 6 OUTER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



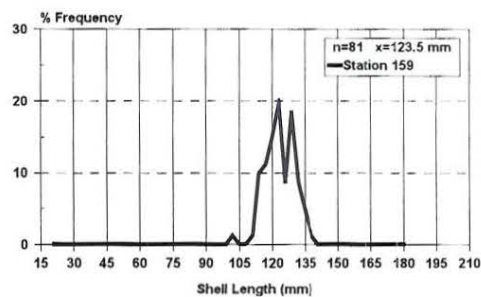
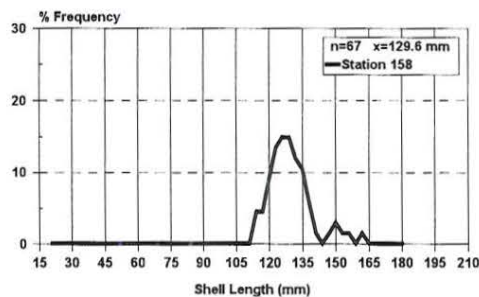
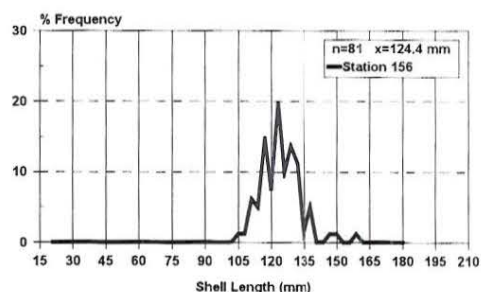
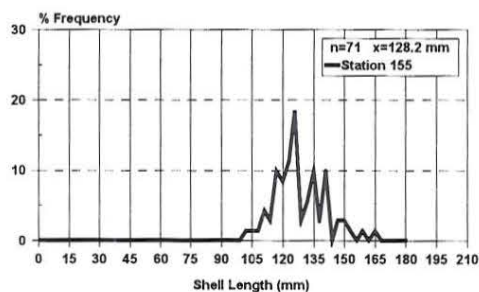
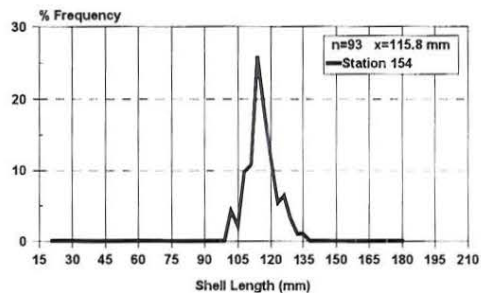
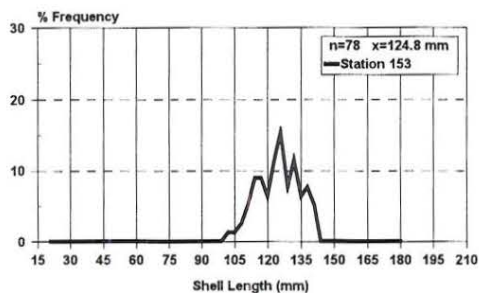
STRATUM 6 OUTER MILE SHARK RIVER INLET TO BARNEGAT INLET, 1998



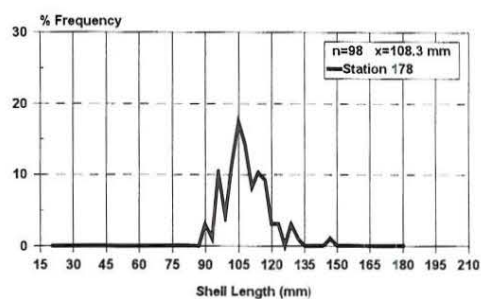
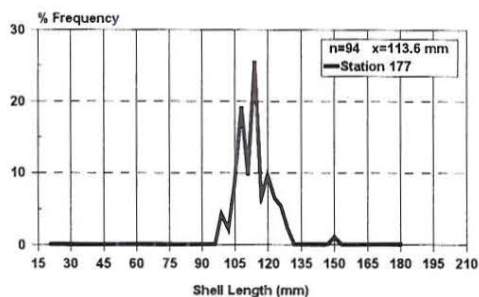
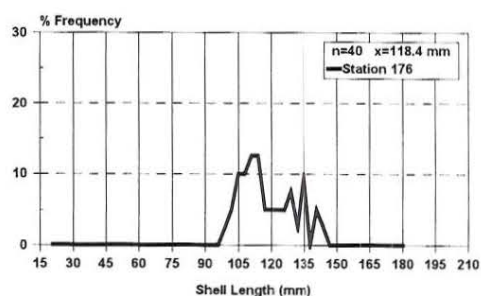
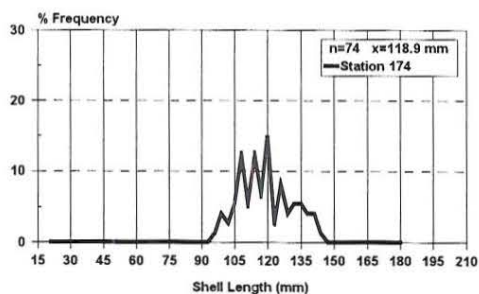
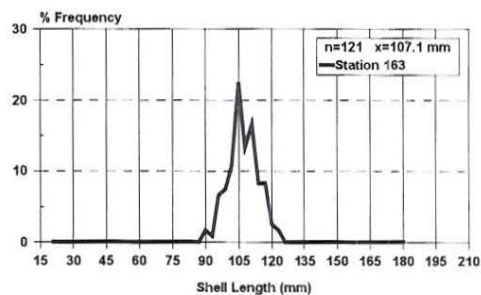
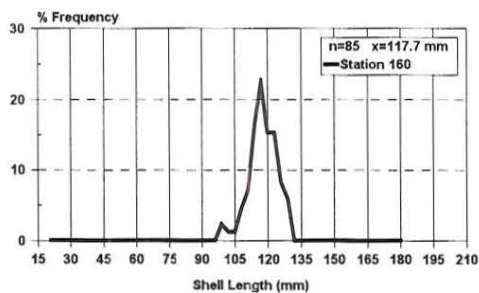
STRATUM 7 INNER MILE BARNEGAT INLET TO ABSECON INLET, 1998



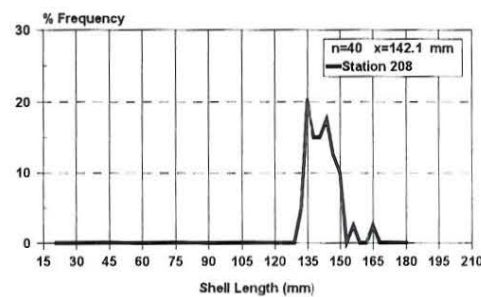
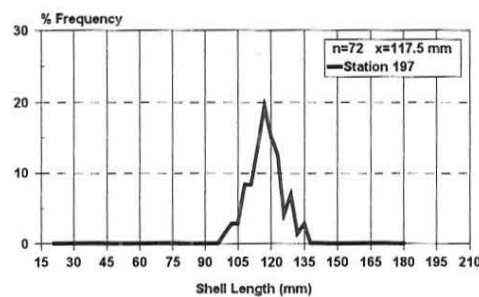
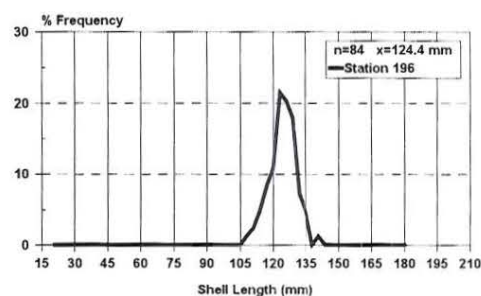
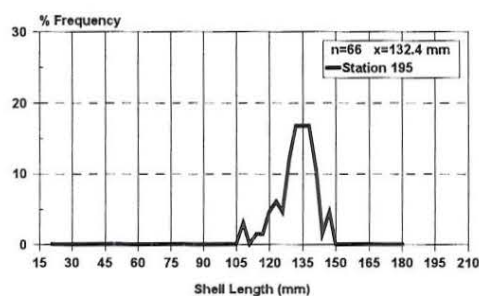
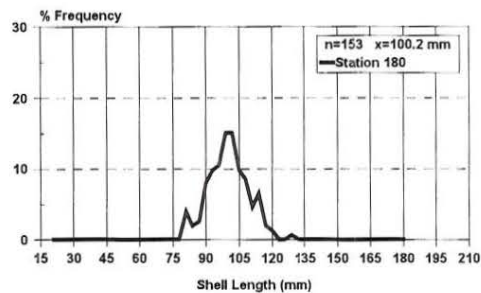
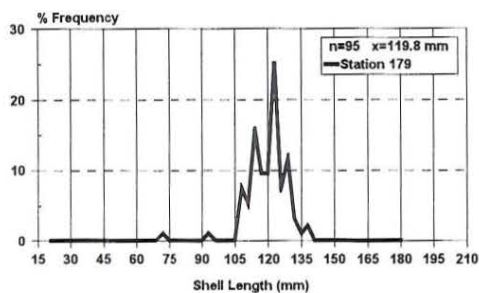
STRATUM 7 INNER MILE BARNEGAT INLET TO ABSECON INLET, 1998



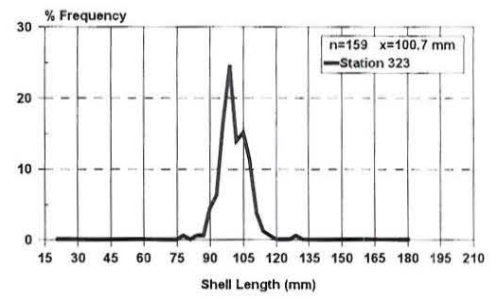
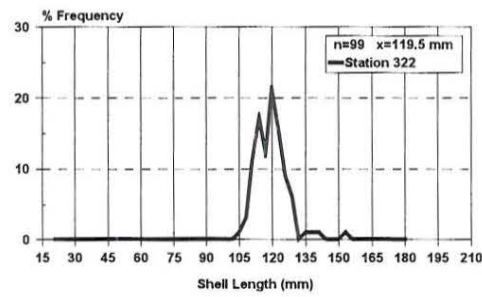
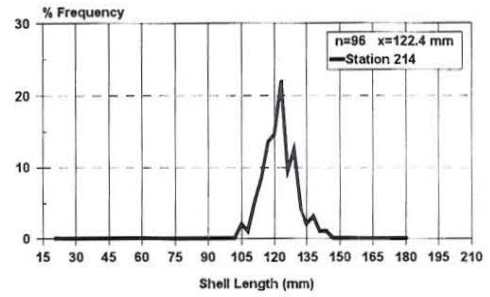
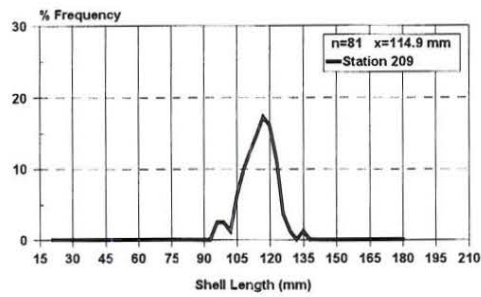
STRATUM 7 INNER MILE BARNEGAT INLET TO ABSECON INLET, 1998



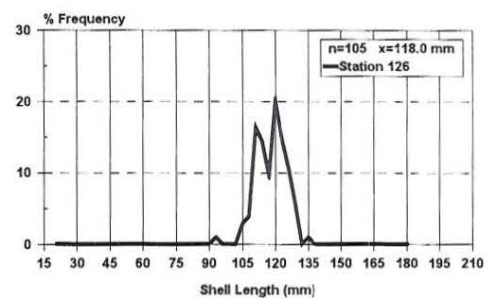
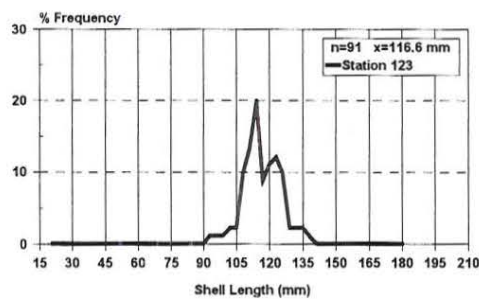
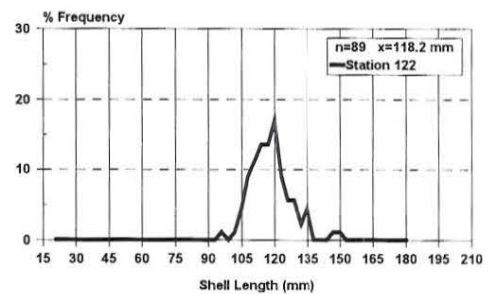
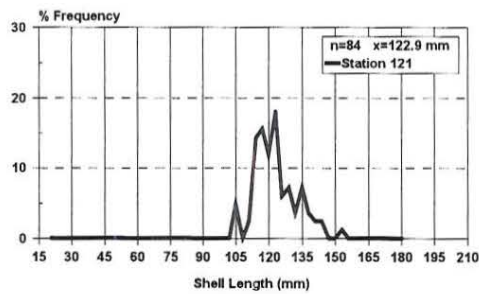
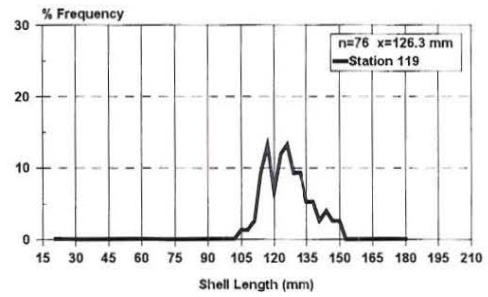
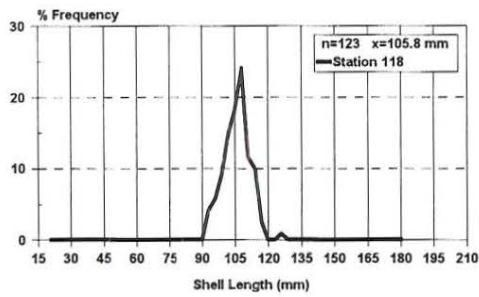
STRATUM 7 INNER MILE BARNEGAT INLET TO ABSECON INLET, 1998



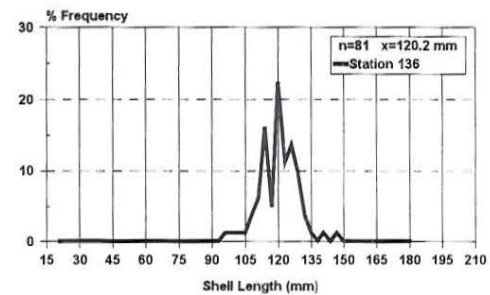
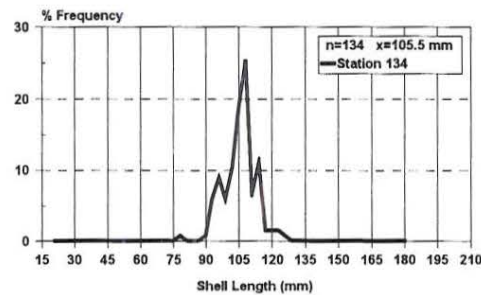
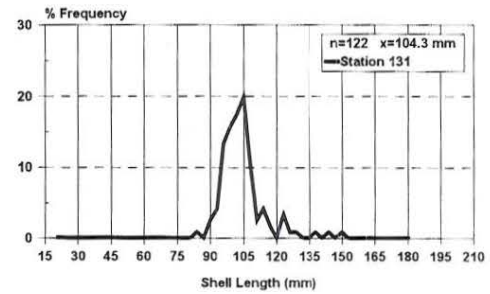
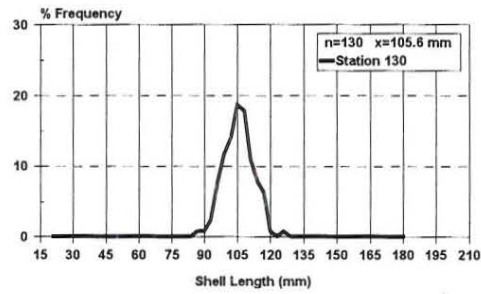
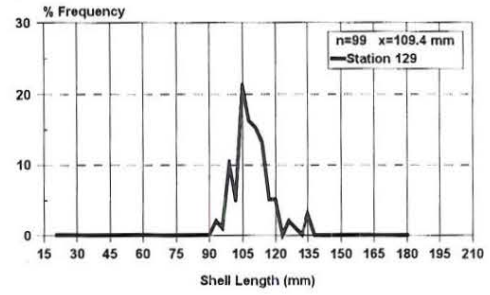
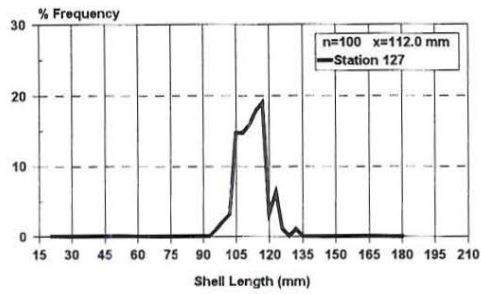
STRATUM 7 INNER MILE BARNEGAT INLET TO ABSECON INLET, 1998



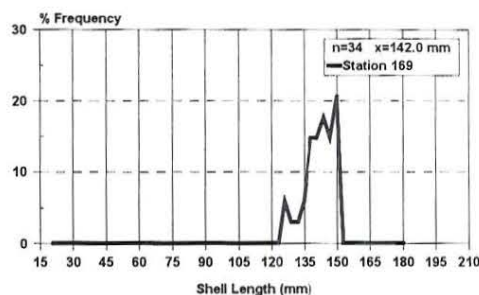
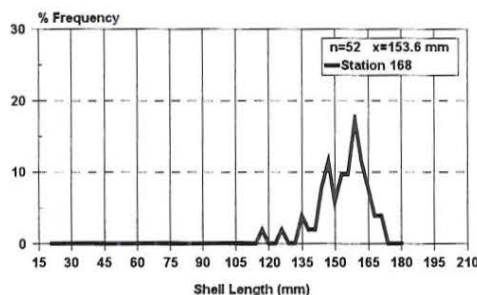
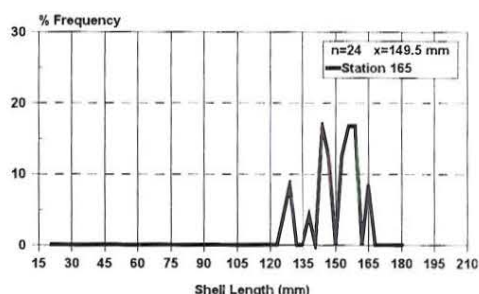
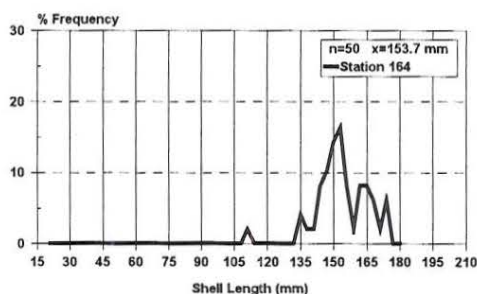
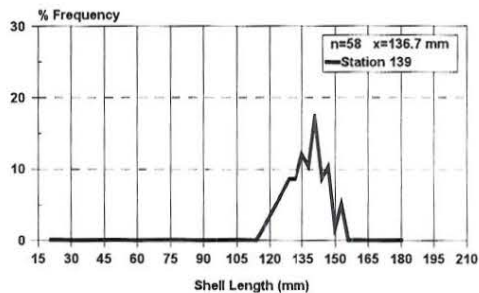
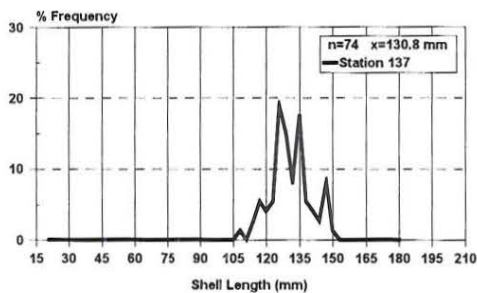
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET, 1998



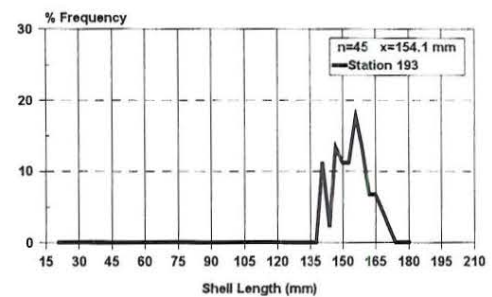
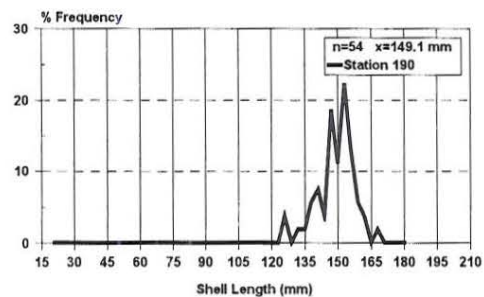
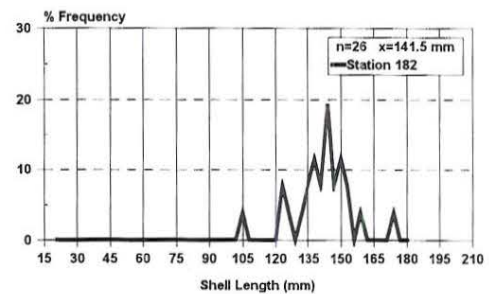
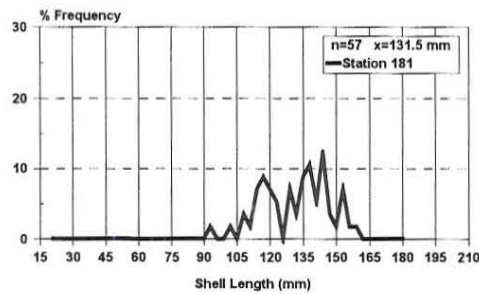
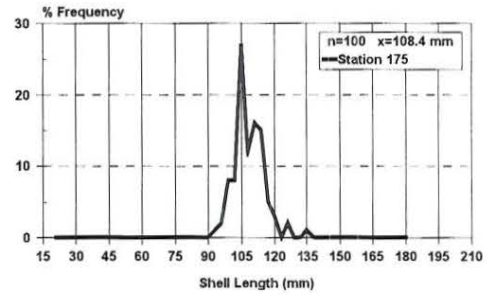
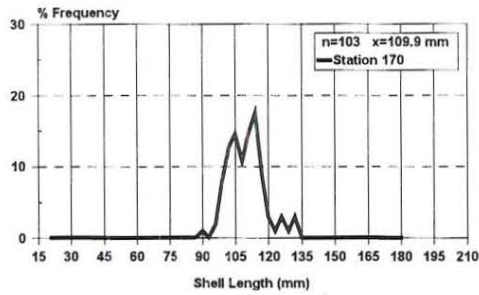
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET, 1998



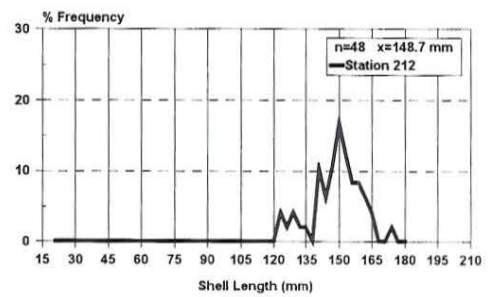
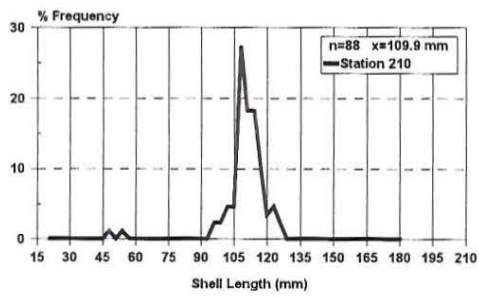
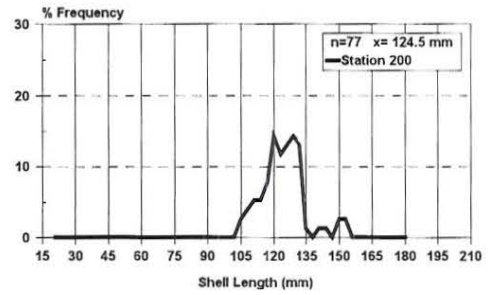
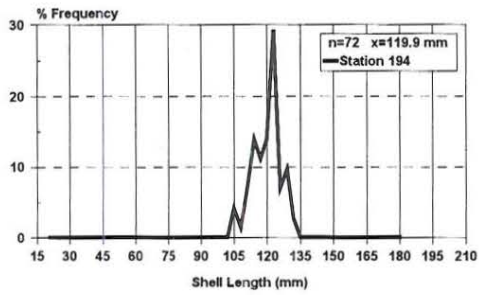
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET, 1998



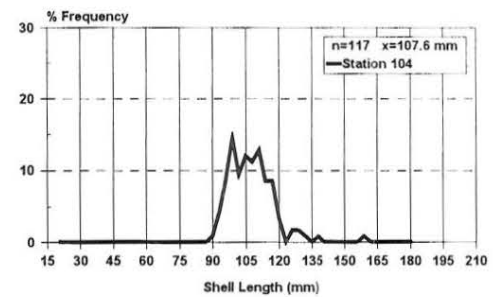
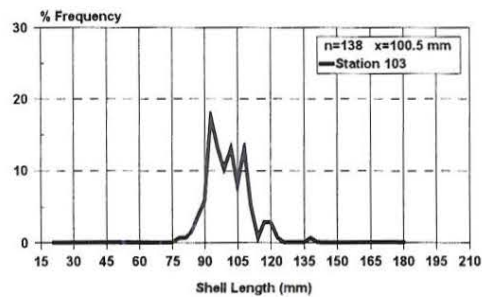
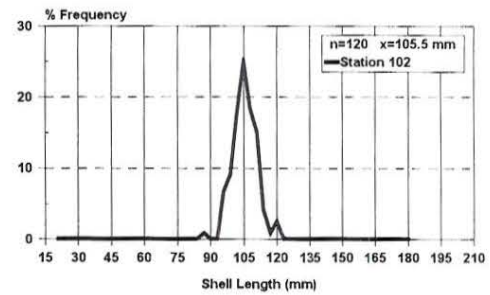
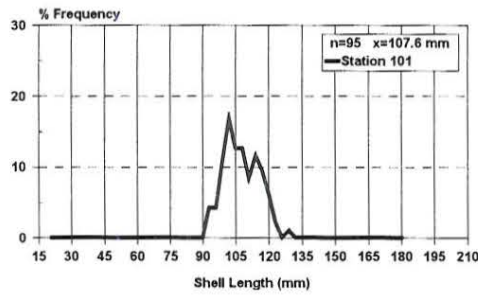
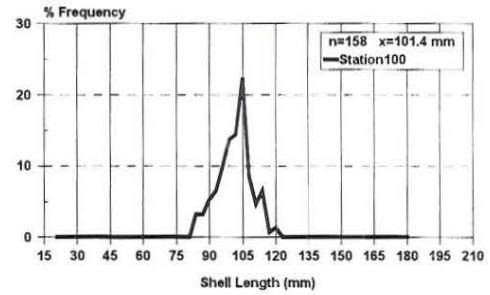
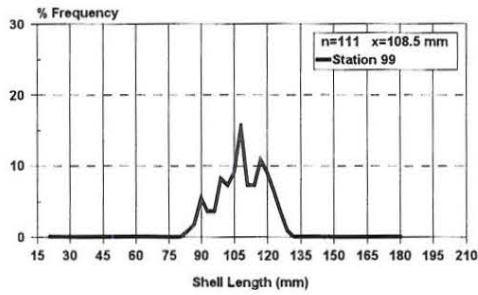
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET, 1998



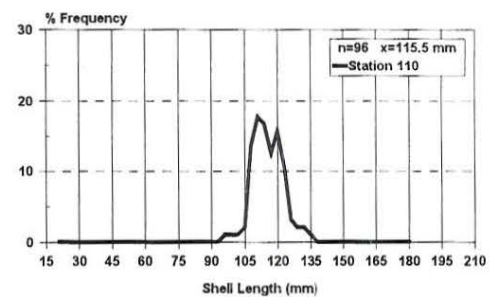
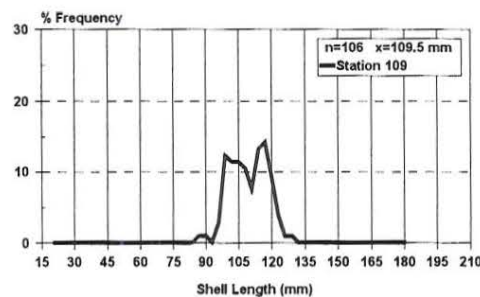
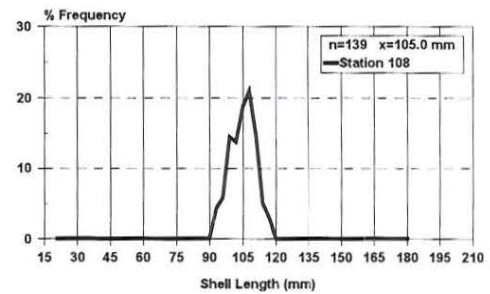
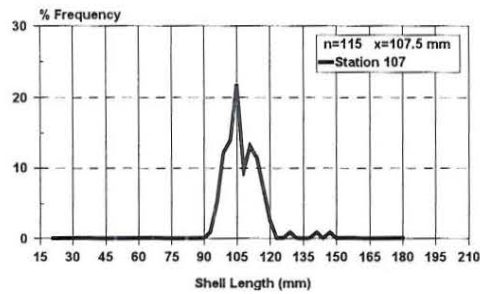
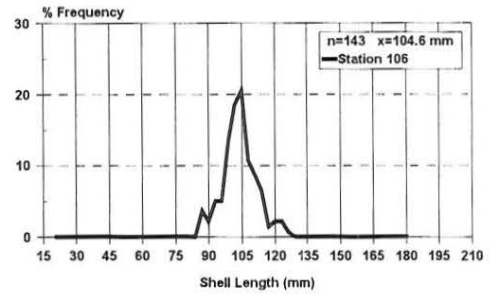
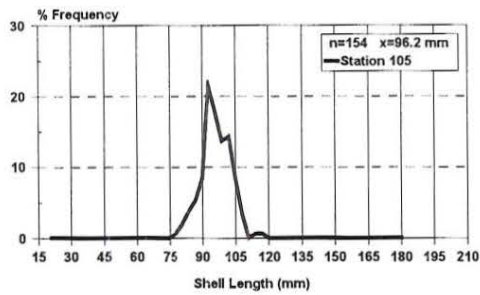
STRATUM 8 MIDDLE MILE ABSECON INLET TO BARNEGAT INLET, 1998



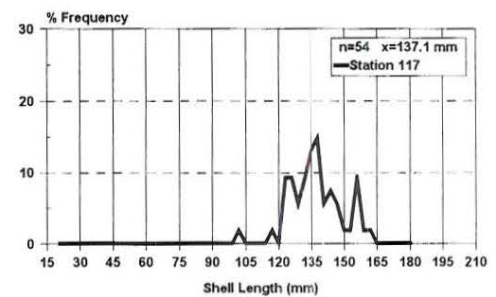
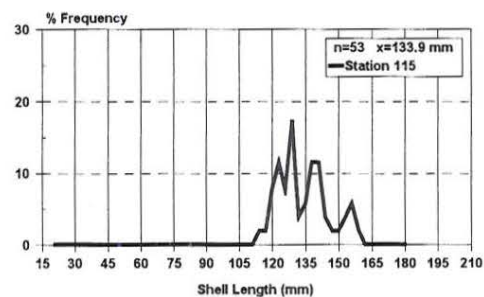
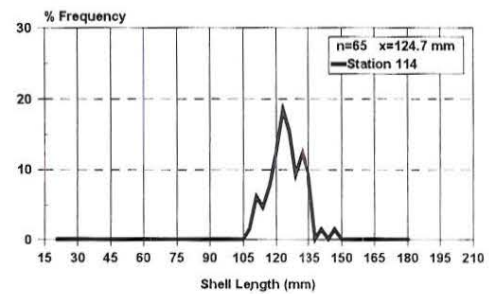
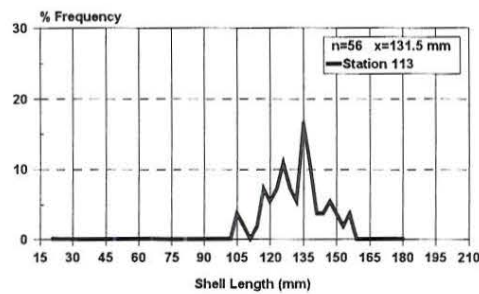
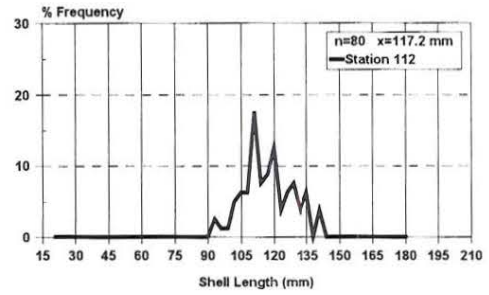
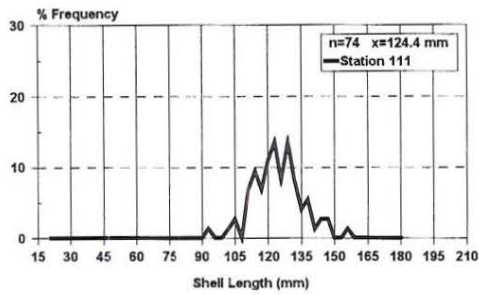
STRATUM 9 OUTER MILE BARNEGAT INLET TO ABSECON INLET, 1998



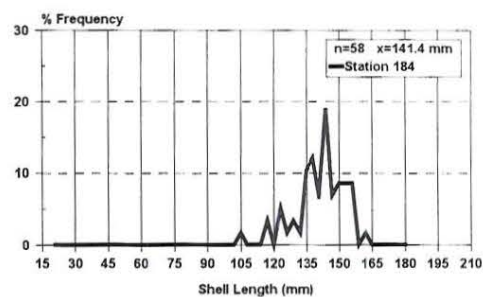
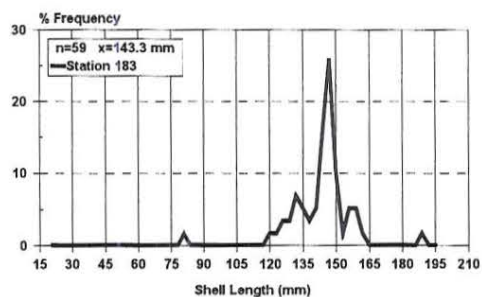
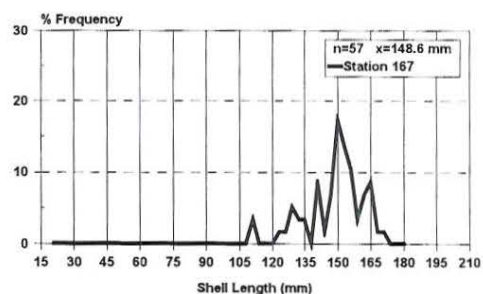
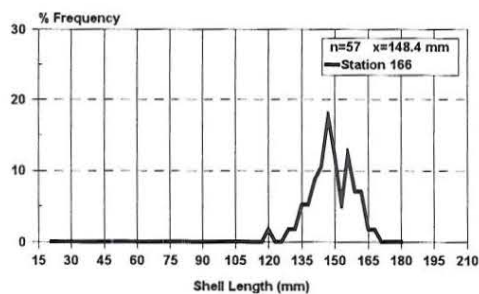
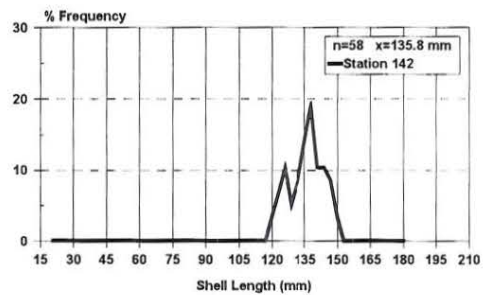
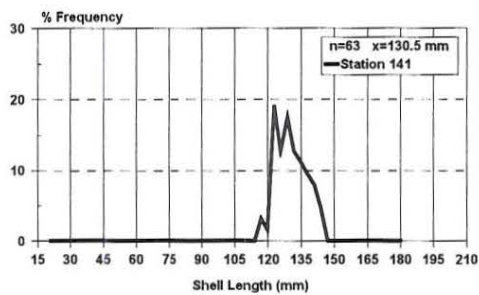
STRATUM 9 OUTER MILE BARNEGAT INLET TO ABSECON INLET, 1998



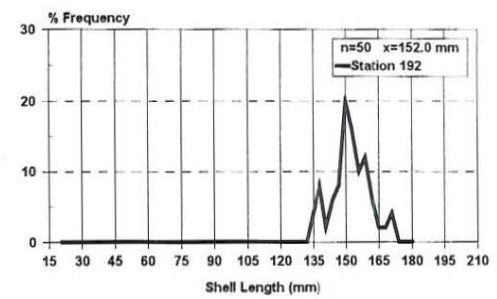
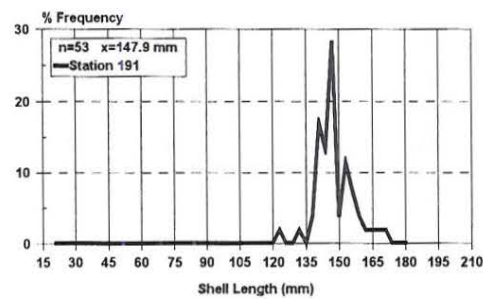
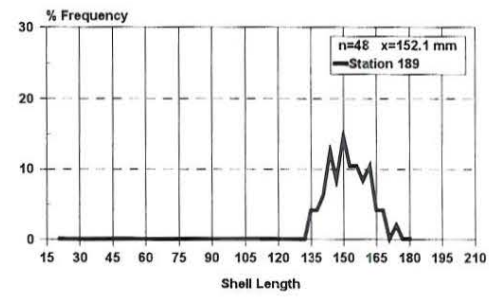
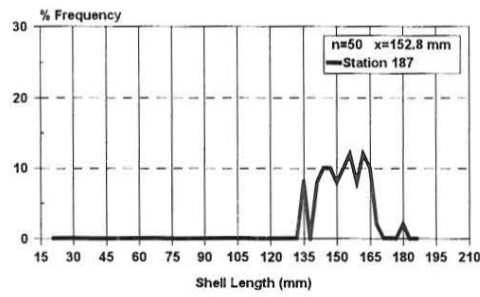
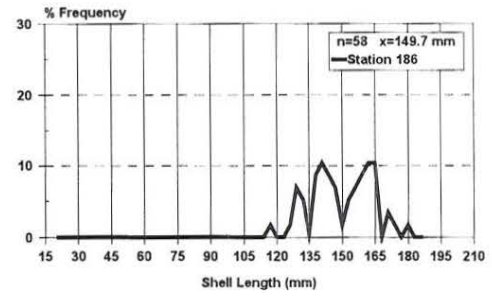
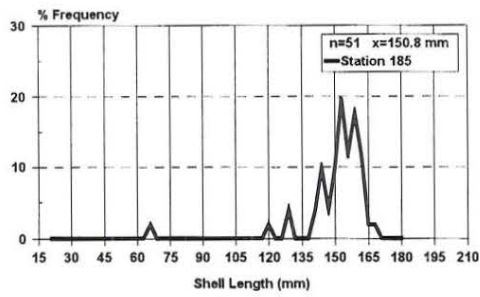
STRATUM 9 OUTER MILE BARNEGAT INLET TO ABSECON INLET, 1998



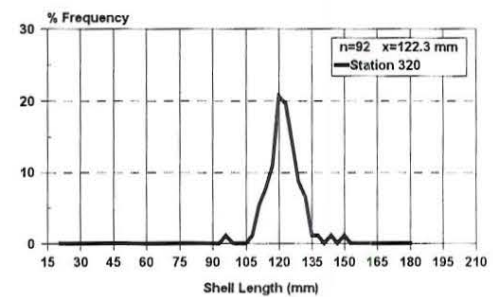
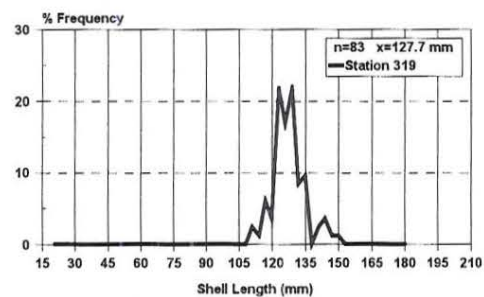
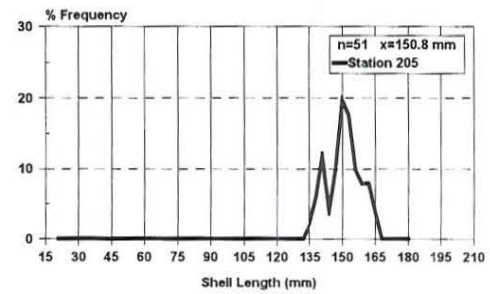
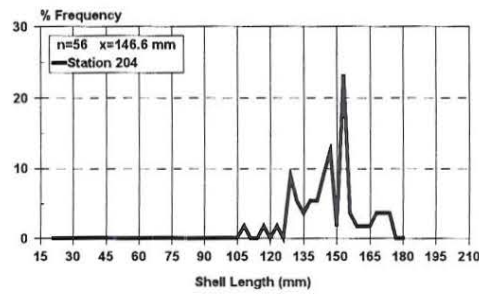
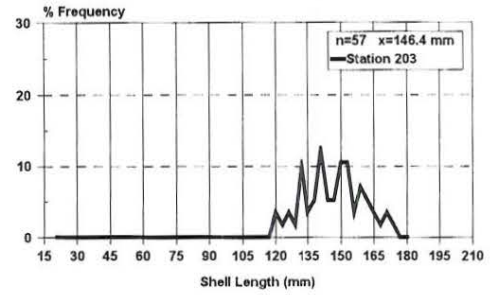
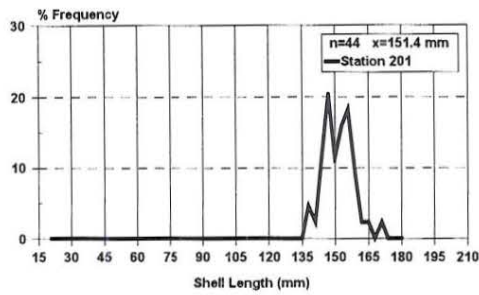
STRATUM 9 OUTER MILE BARNEGAT INLET TO ABSECON INLET, 1998



STRATUM 9 OUTER MILE BARNEGAT INLET TO ABSECON INLET, 1998

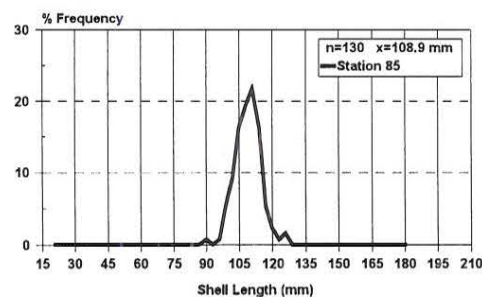
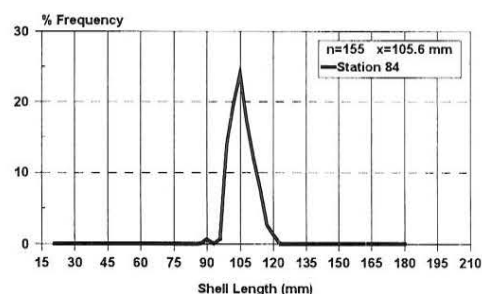
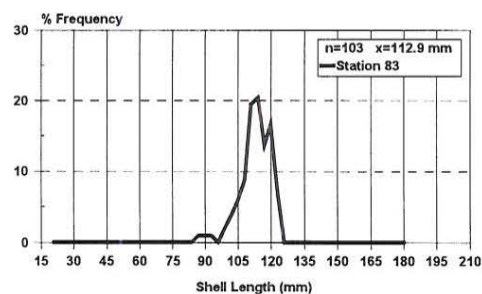
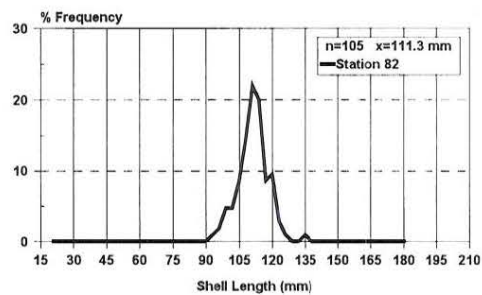
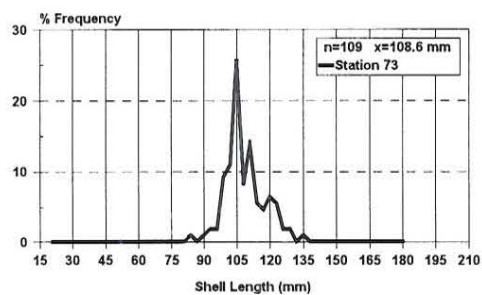


STRATUM 9 OUTER MILE BARNEGAT INLET TO ABSECON INLET, 1998



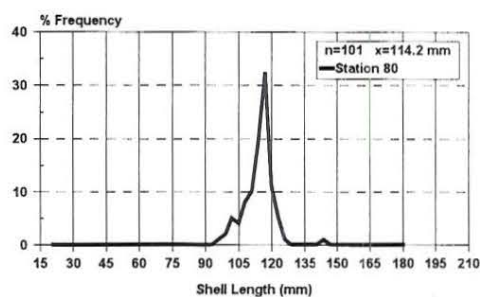
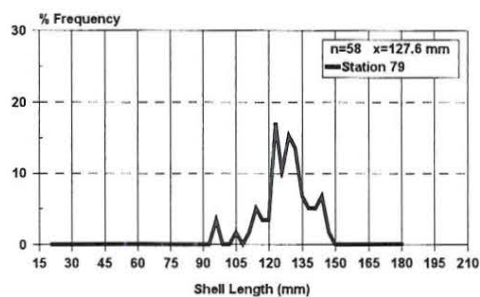
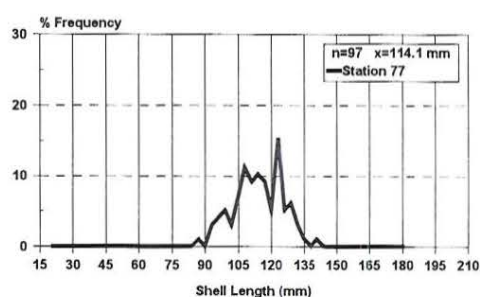
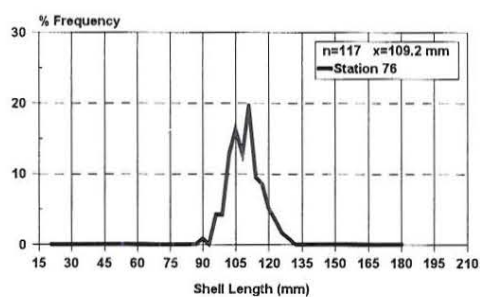
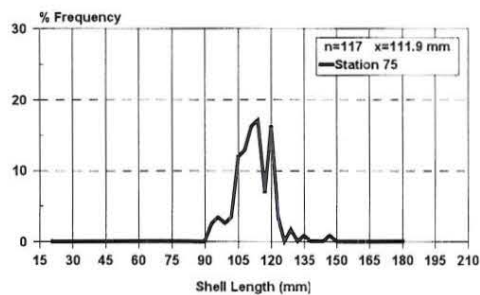
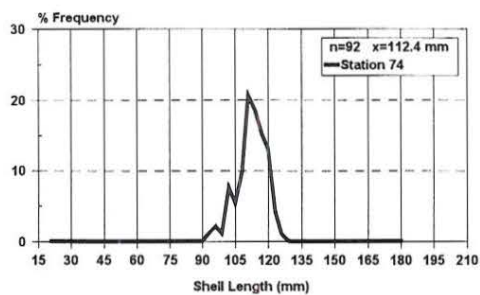
STRATUM 10 INNER MILE

GREAT EGG HARBOR INLET TO ABSECON INLET, 1998

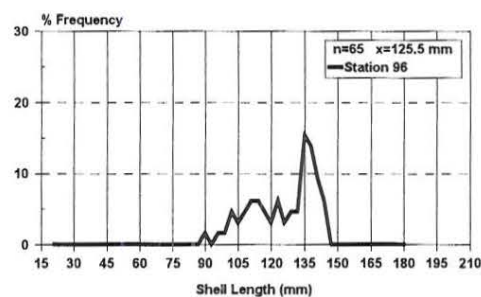
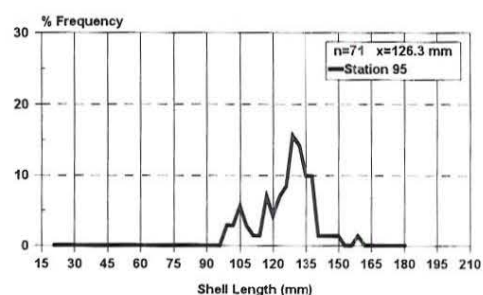
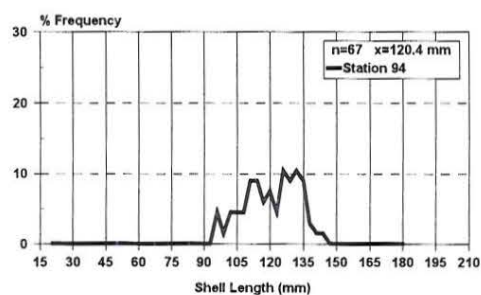
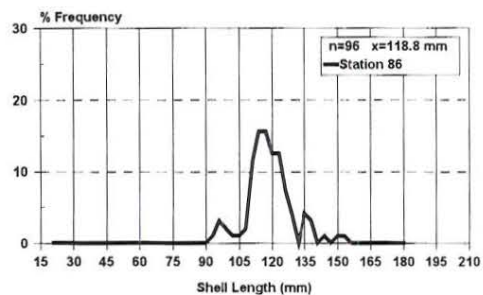
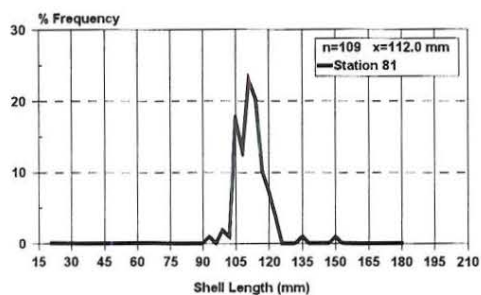


STRATUM 11 MIDDLE MILE

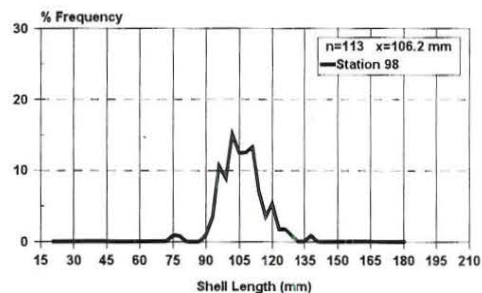
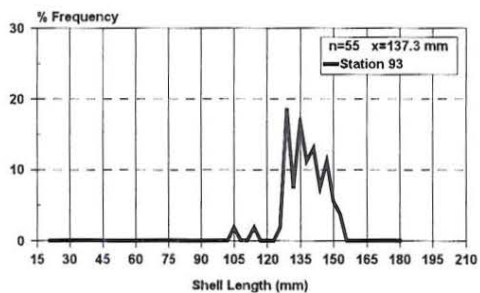
ABSECON INLET TO GREAT EGG HARBOR INLET, 1998



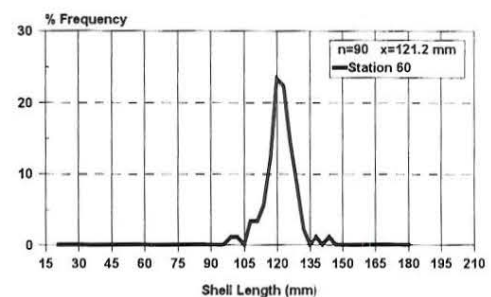
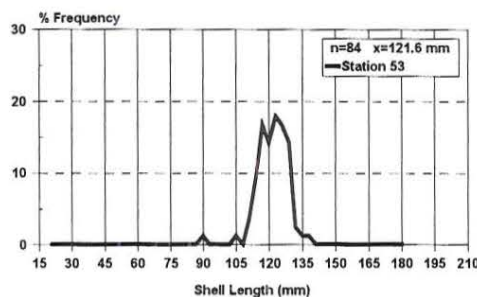
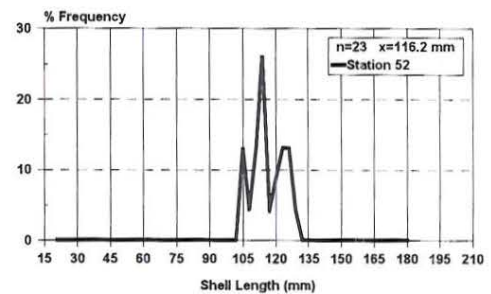
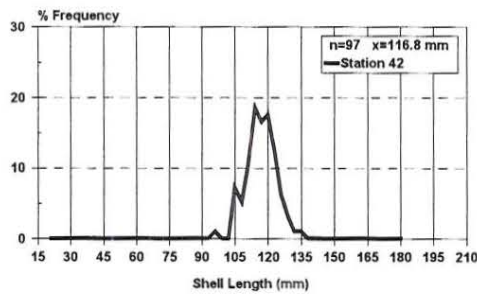
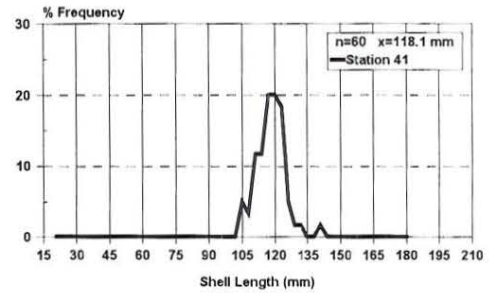
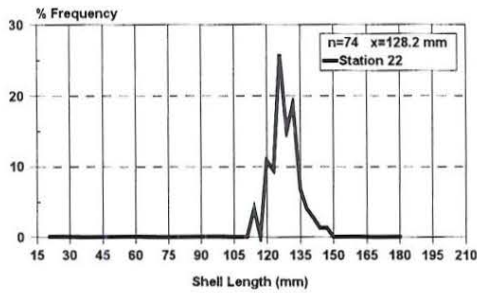
STRATUM 11 MIDDLE MILE ABSECON INLET TO GREAT EGG HARBOR INLET, 1998



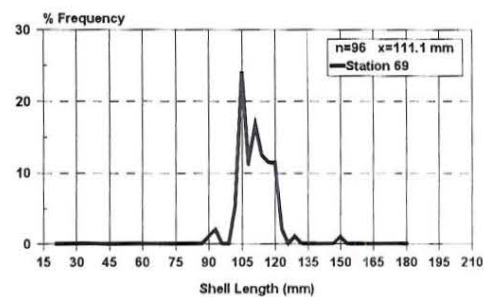
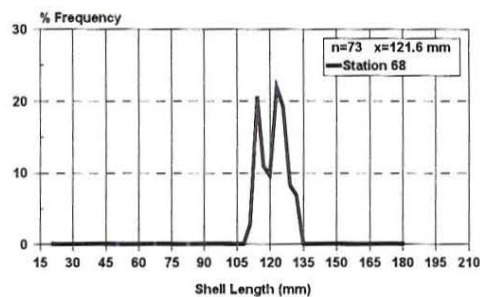
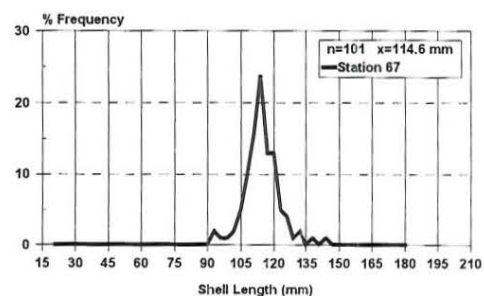
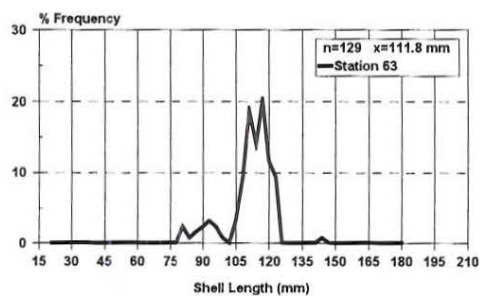
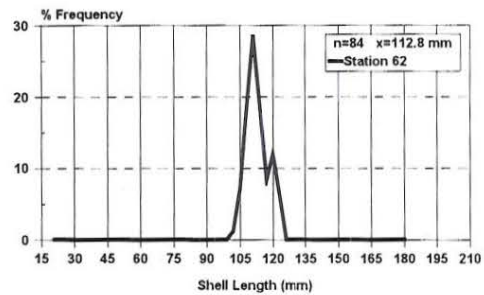
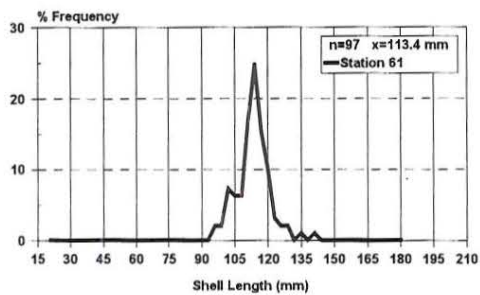
STRATUM 12 OUTER MILE ABSECON INLET TO GREAT EGG HARBOR INLET, 1998



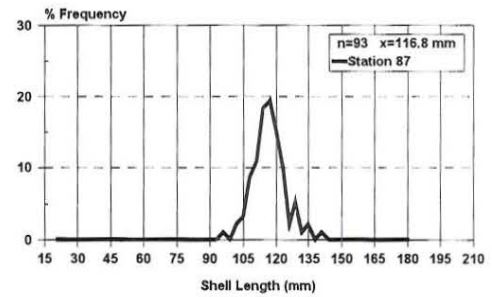
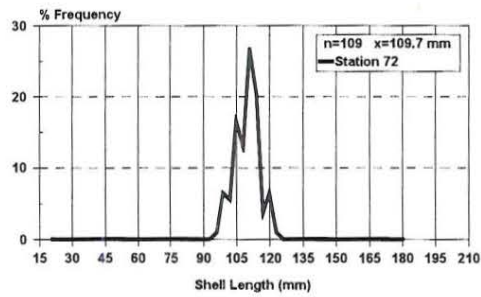
STRATA 13 INNER MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998



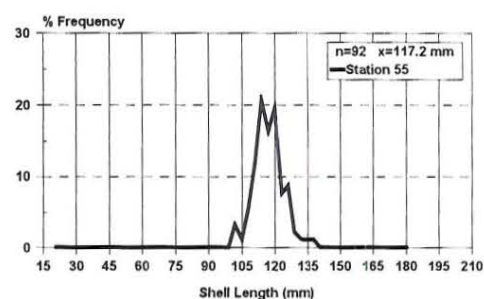
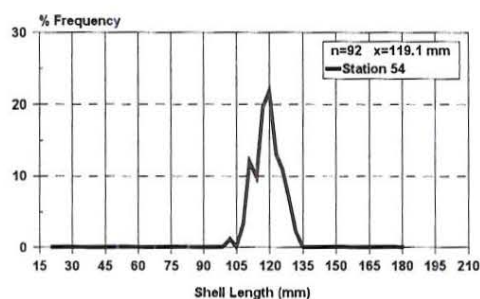
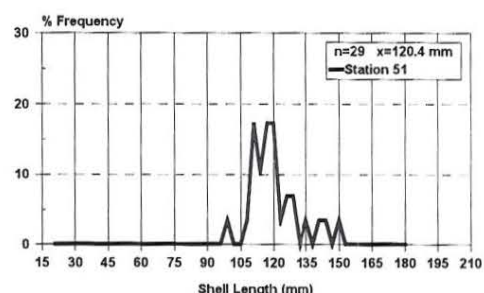
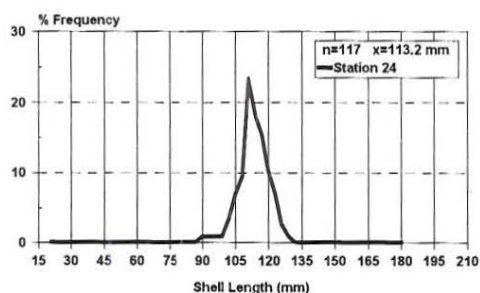
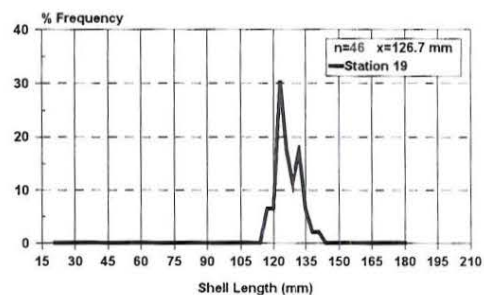
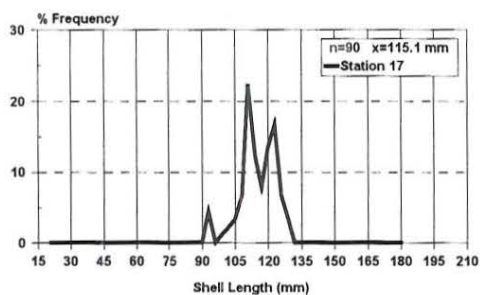
STRATA 13 INNER MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998



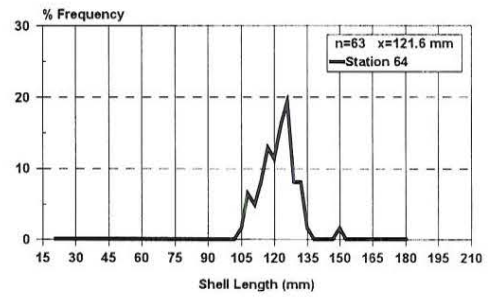
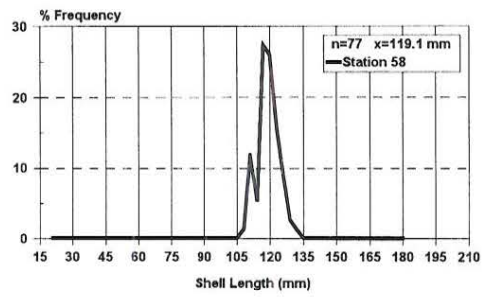
STRATA 13 INNER MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998



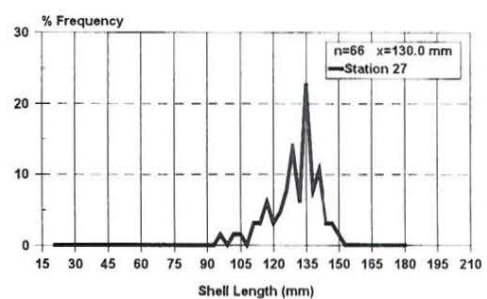
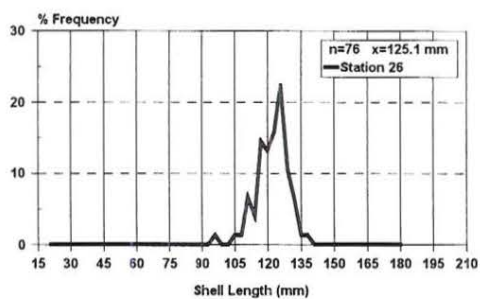
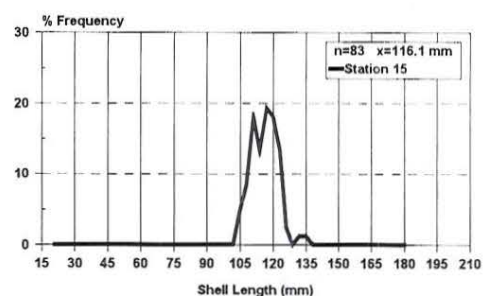
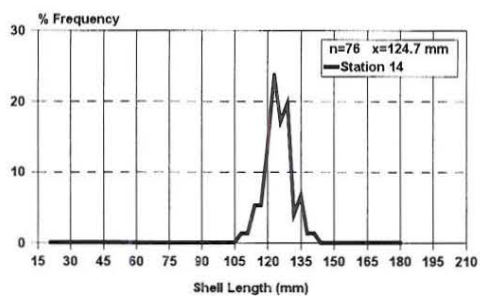
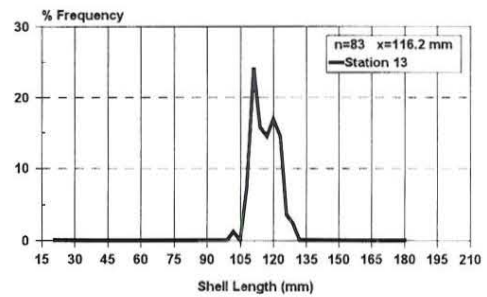
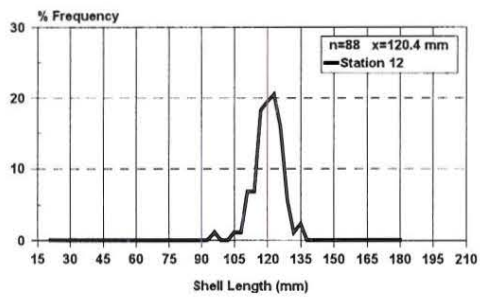
STRATUM 14 MIDDLE MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998



STRATUM 14 MIDDLE MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998



STRATUM 15 OUTER MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998



STRATUM 15 OUTER MILE GREAT EGG HARBOR INLET TO CAPE MAY, 1998

