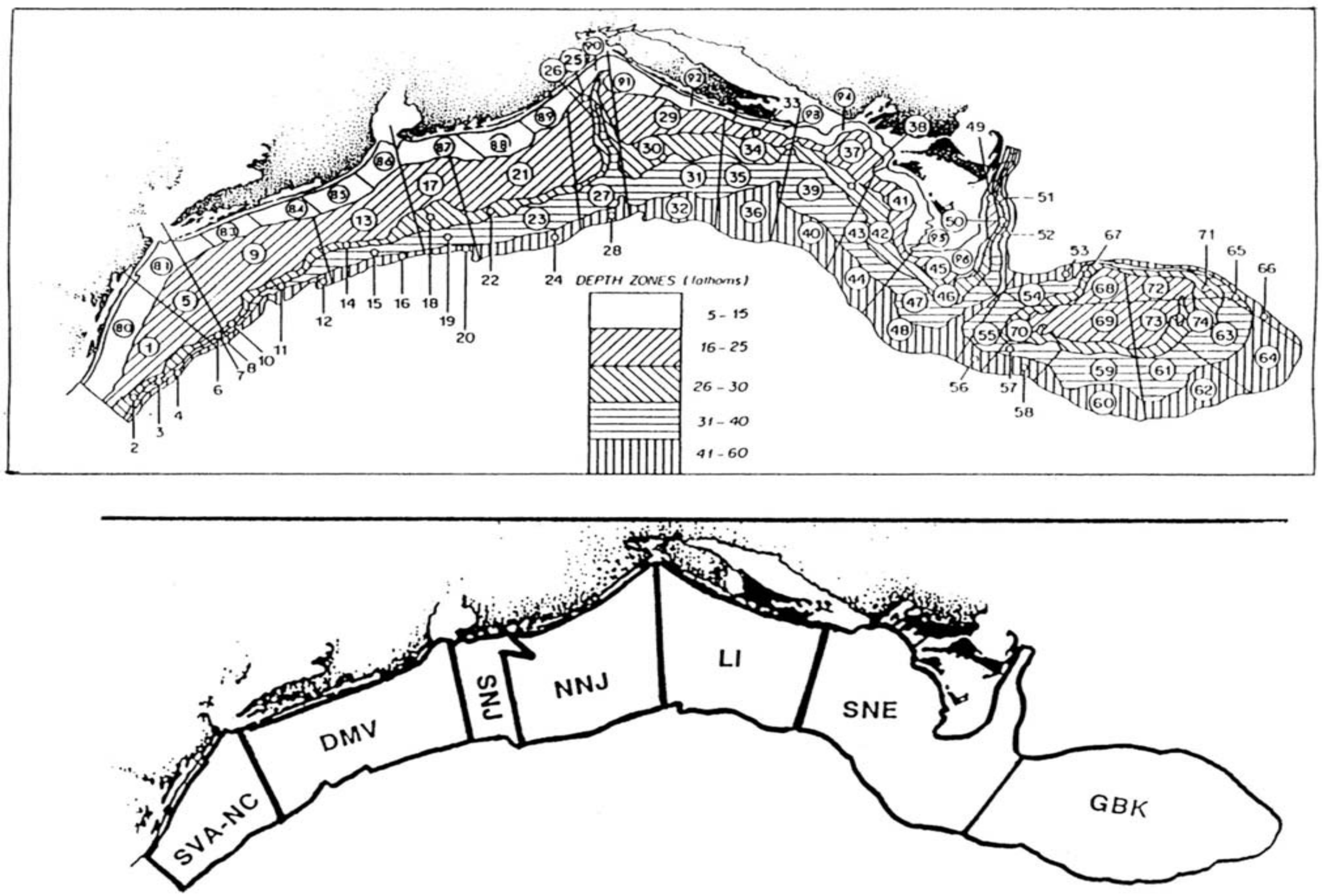



Figure C1. Clam strata and regions.

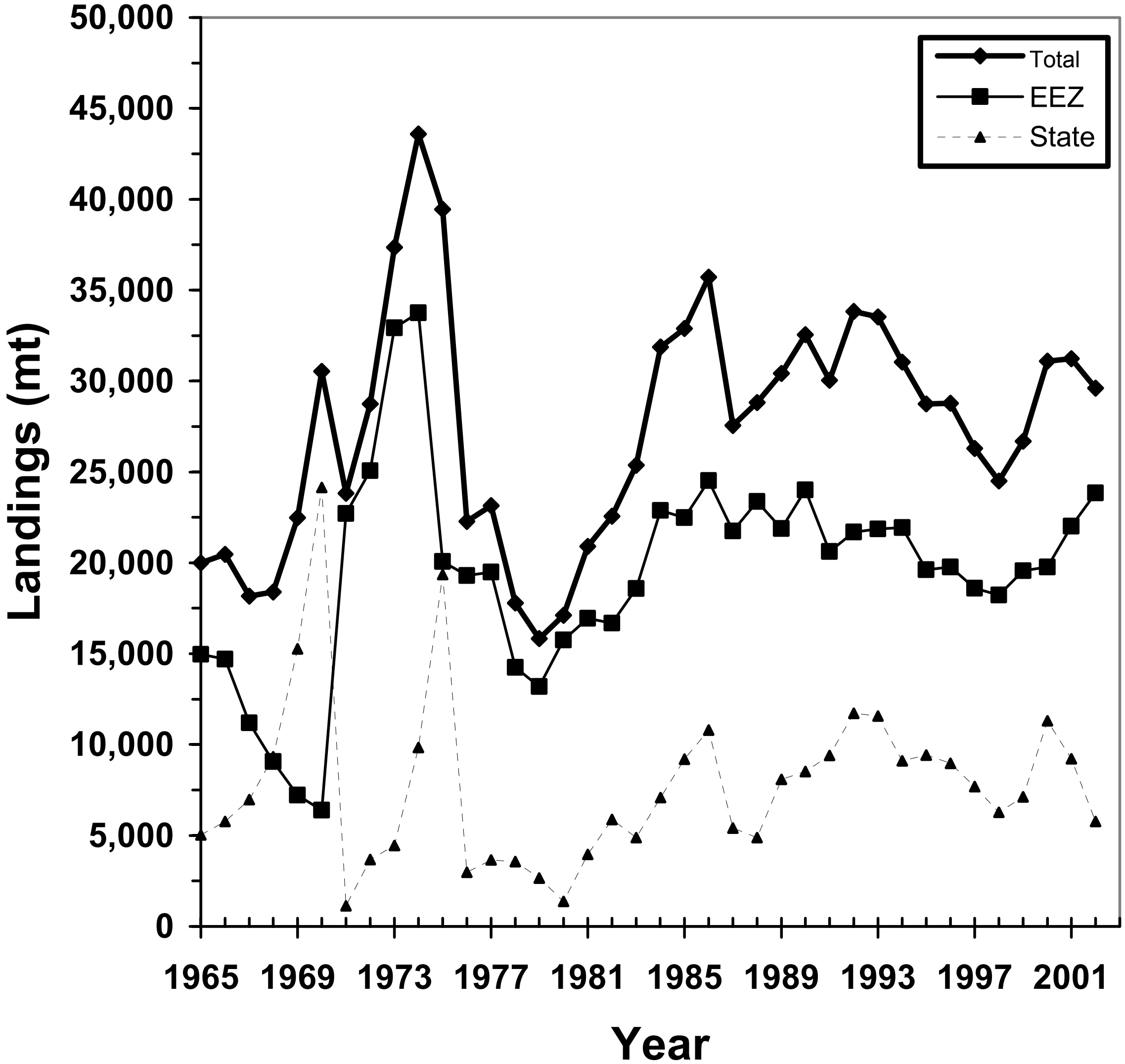



Figure C2. Landings of surfclams, 1965 - 2002. Data are for all areas (total), Exclusive Economic Zone (EEZ, 3 - 200 miles from the coast, and state (inshore) waters. EEZ data source: Logbooks.

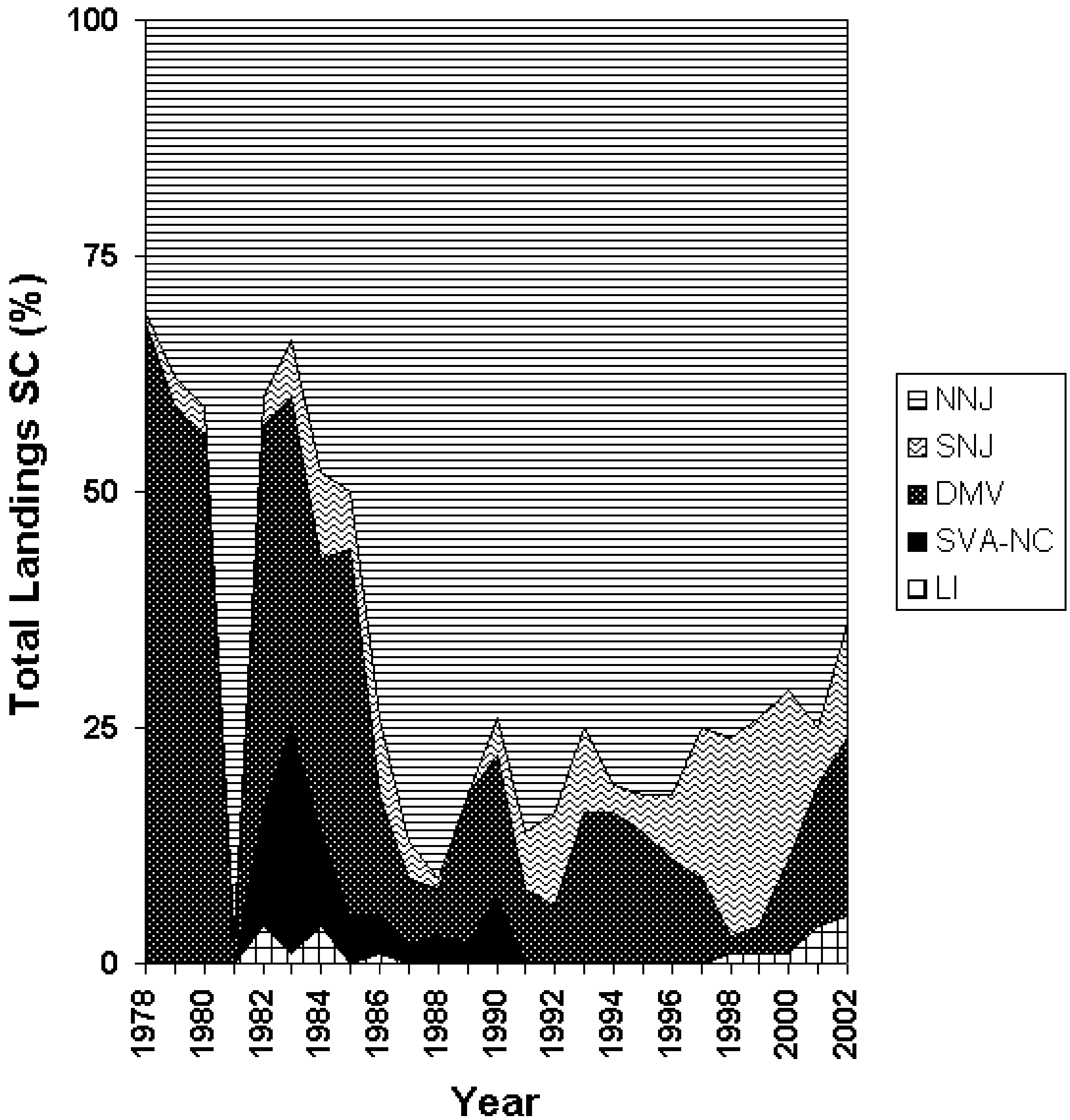



Figure C3. Proportion of surfclam landings in the Mid-Atlantic region, by area and year, 1978- 2002.

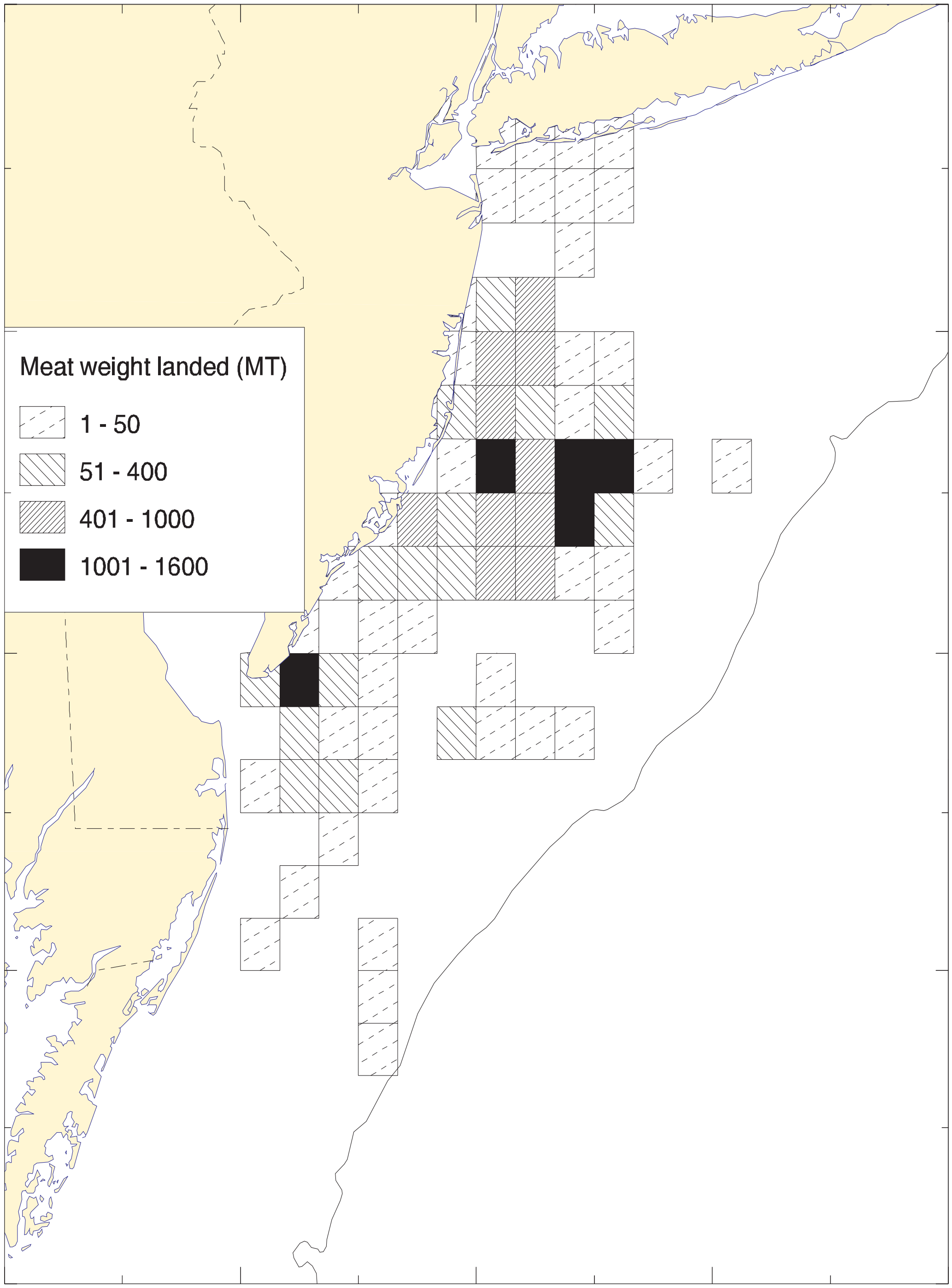



Figure C4. Distribution of surfclam landings during 1999(sclnd832002b) by ten-minute square.

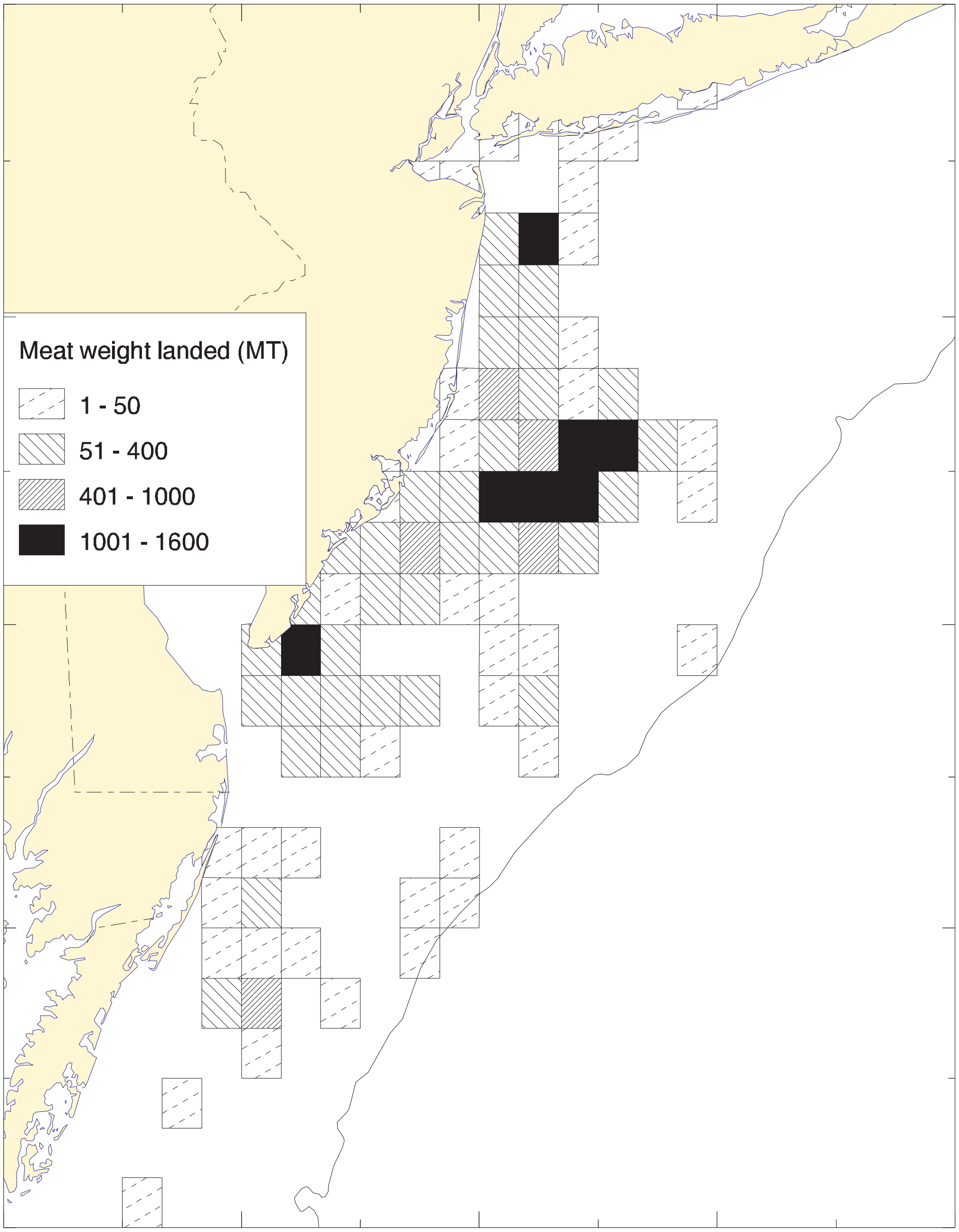



Figure C5. Distribution of surfclam landings during 2000(sclnd832002b) by ten-minute square.

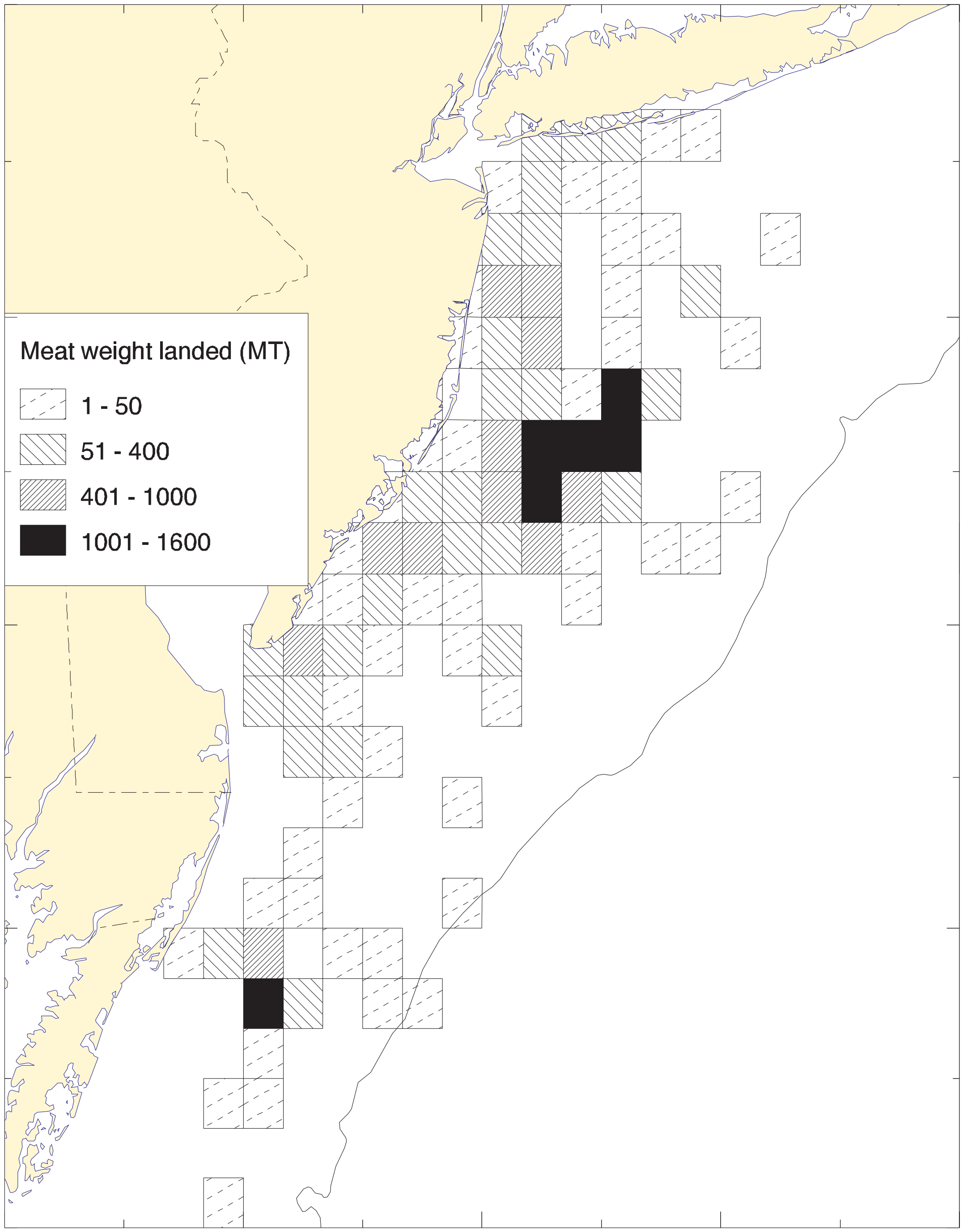



Figure C6. Distribution of surfclam landings during 2001(sclnd832002b) by ten-minute square.

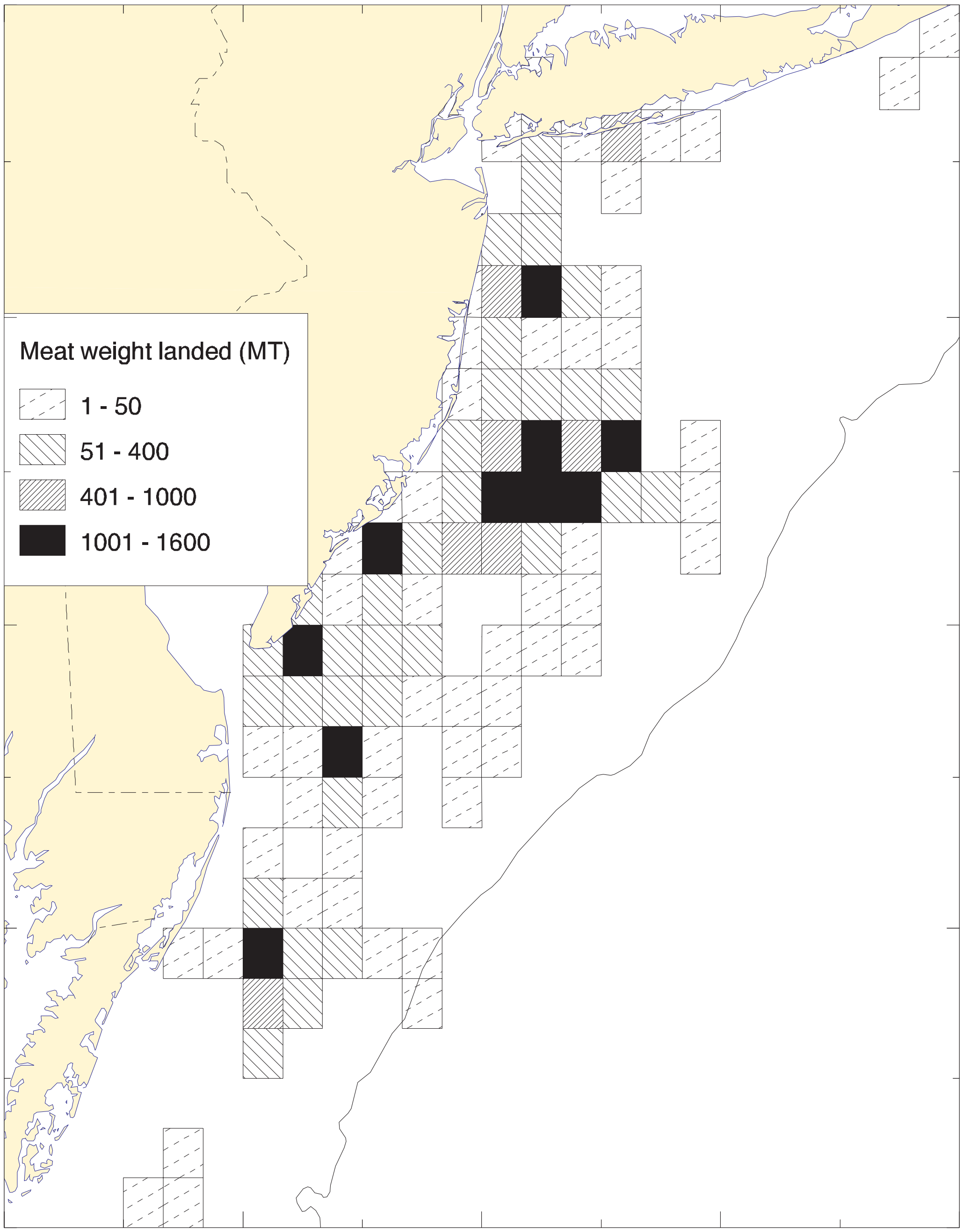



Figure C7. Distribution of surfclam landings during 2002(sclnd832002b) by ten-minute square.

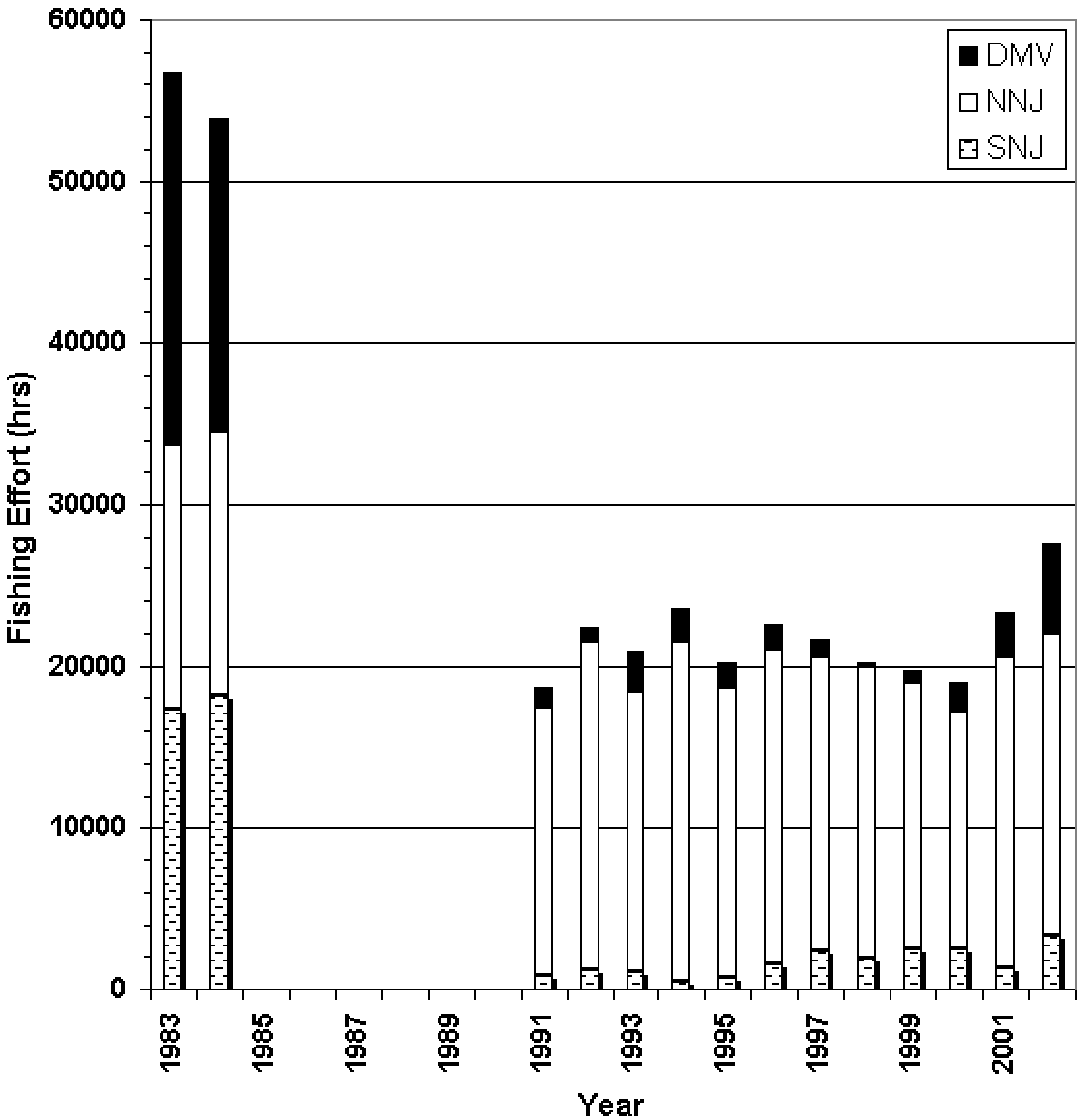
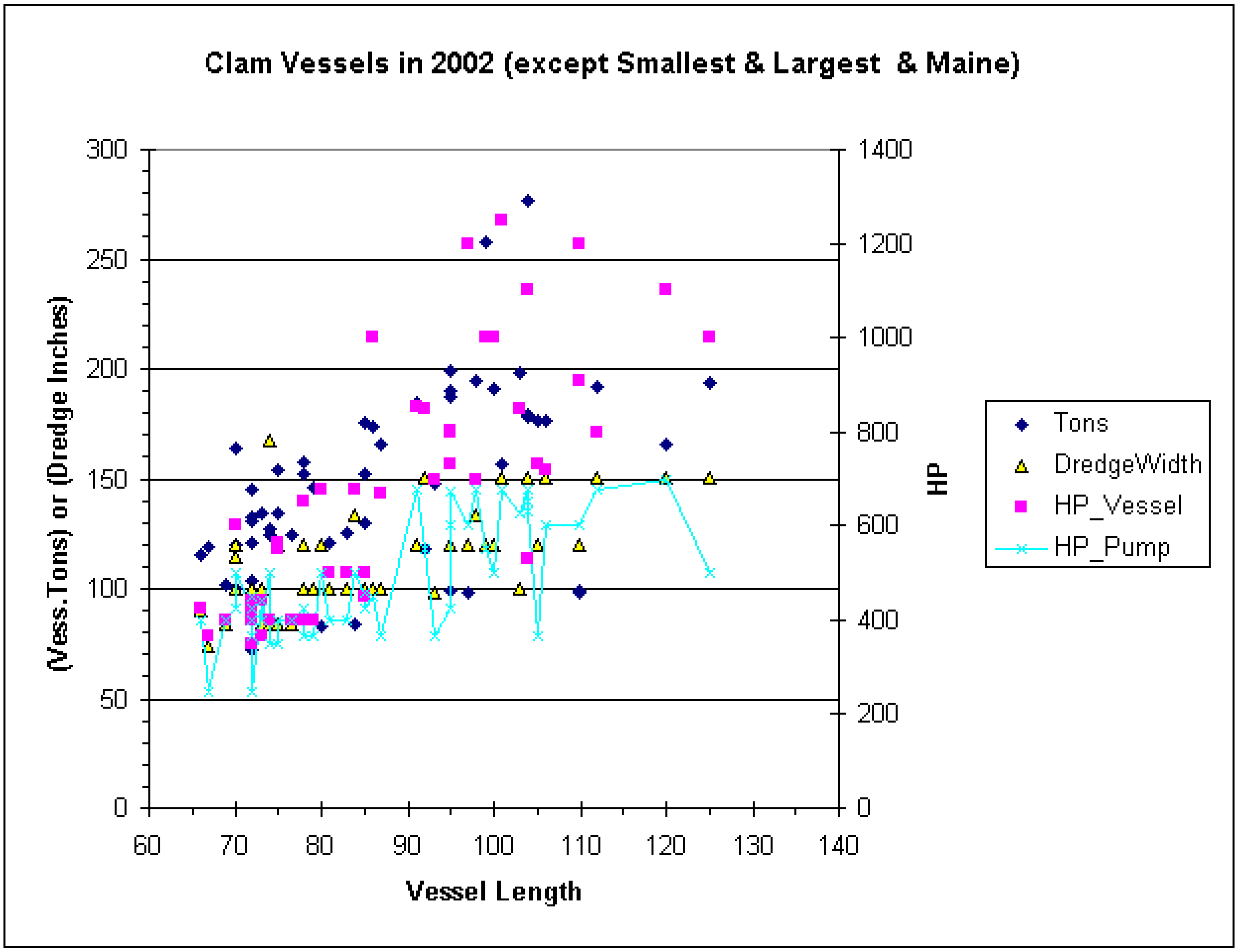



Figure C8. Total reported hours fishing during surfclam trips, by region year. Effort was not reported accurately from 1985 - 1990.




**All 2002 Clam Vessels (Except from Maine) :**

| Var1 | Var2 | Corr. Coef. (r) | Significance |
|---|---|---|---|
| Length | Tons | 0.718 | ** |
| HP Vessel | Tons | 0.318 | * |
| Dredge W | Tons | 0.404 | ** |
| HP Pump | Tons | 0.439 | ** |

**for v=n-2; n=55 :**

| Significance Level | Critical Value |
|---|---|
| * (p=.05) | 0.26 |
| ** (p=.01) | 0.34 |

Figure C9. Correlations between physical characteristics of commercial clam vessels.

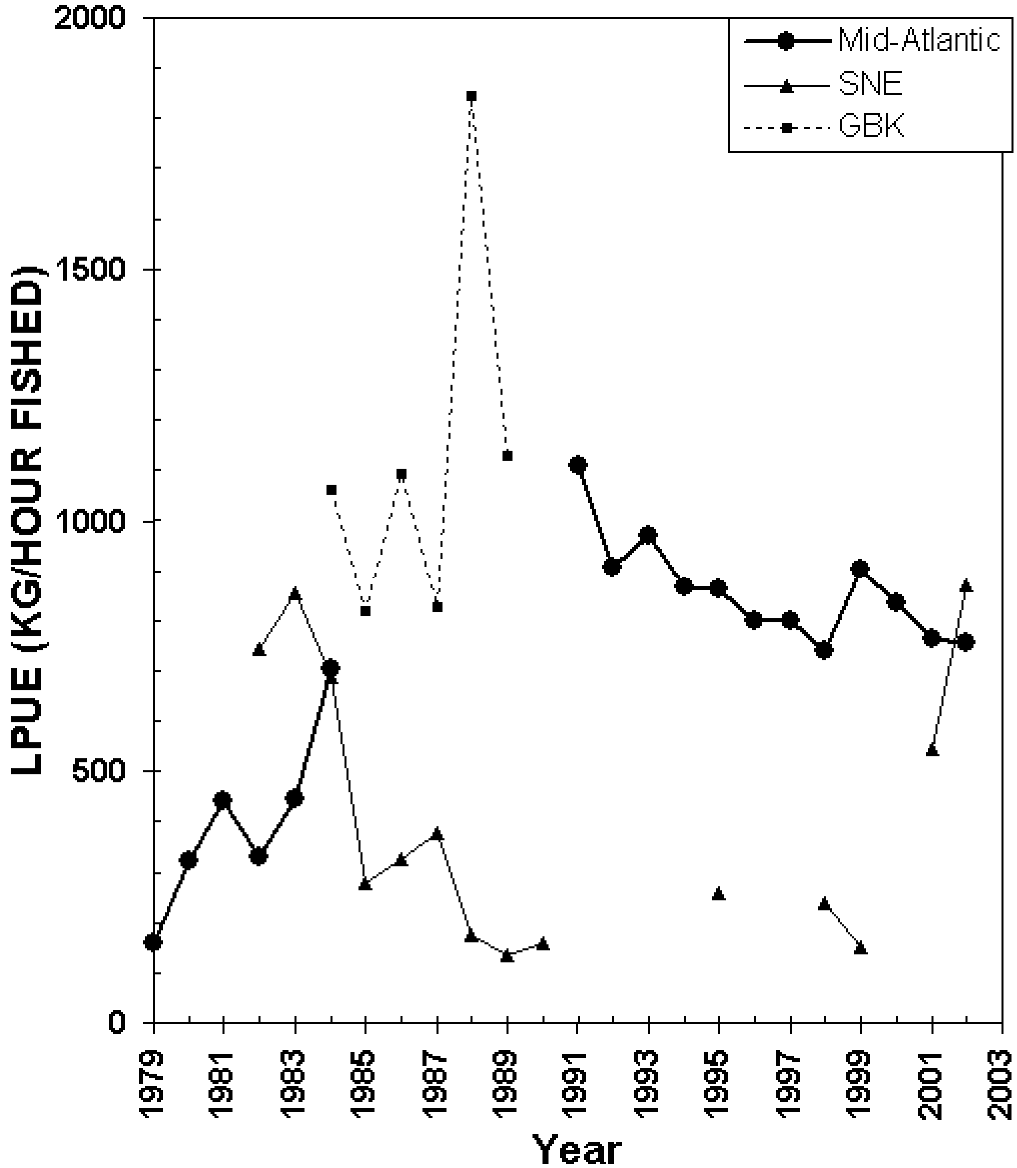



Figure C10. Landings per unit effort of surfclams by Class 3 vessels (105 + GRT) by region, 1979 - 2002. Data source: Logbooks (SfyyyVR).

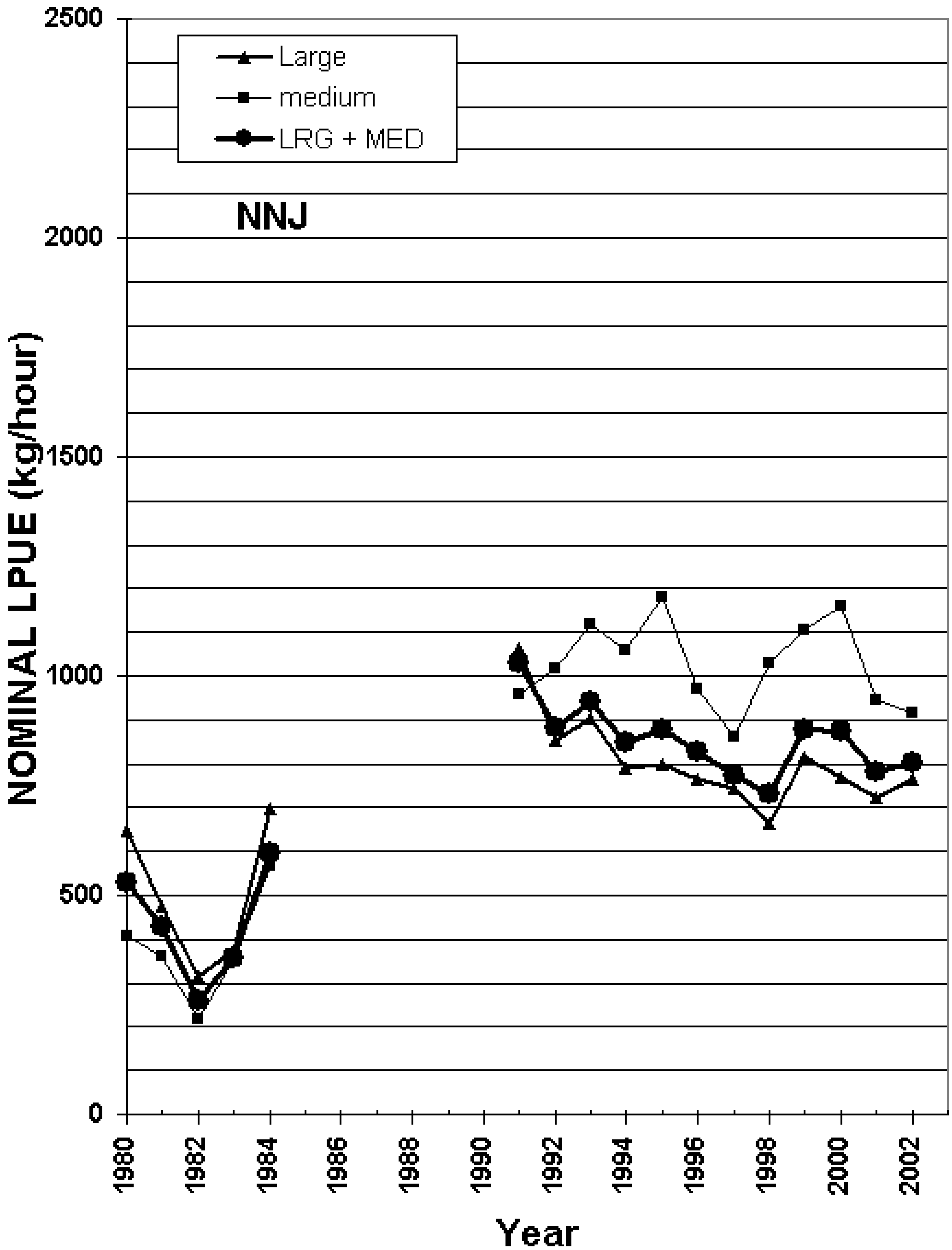



Figure C11. Nominal landings per unit effort for N. New Jersey, by vessel class (Medium: 51-104 GRT; Large: 105 GRT+).

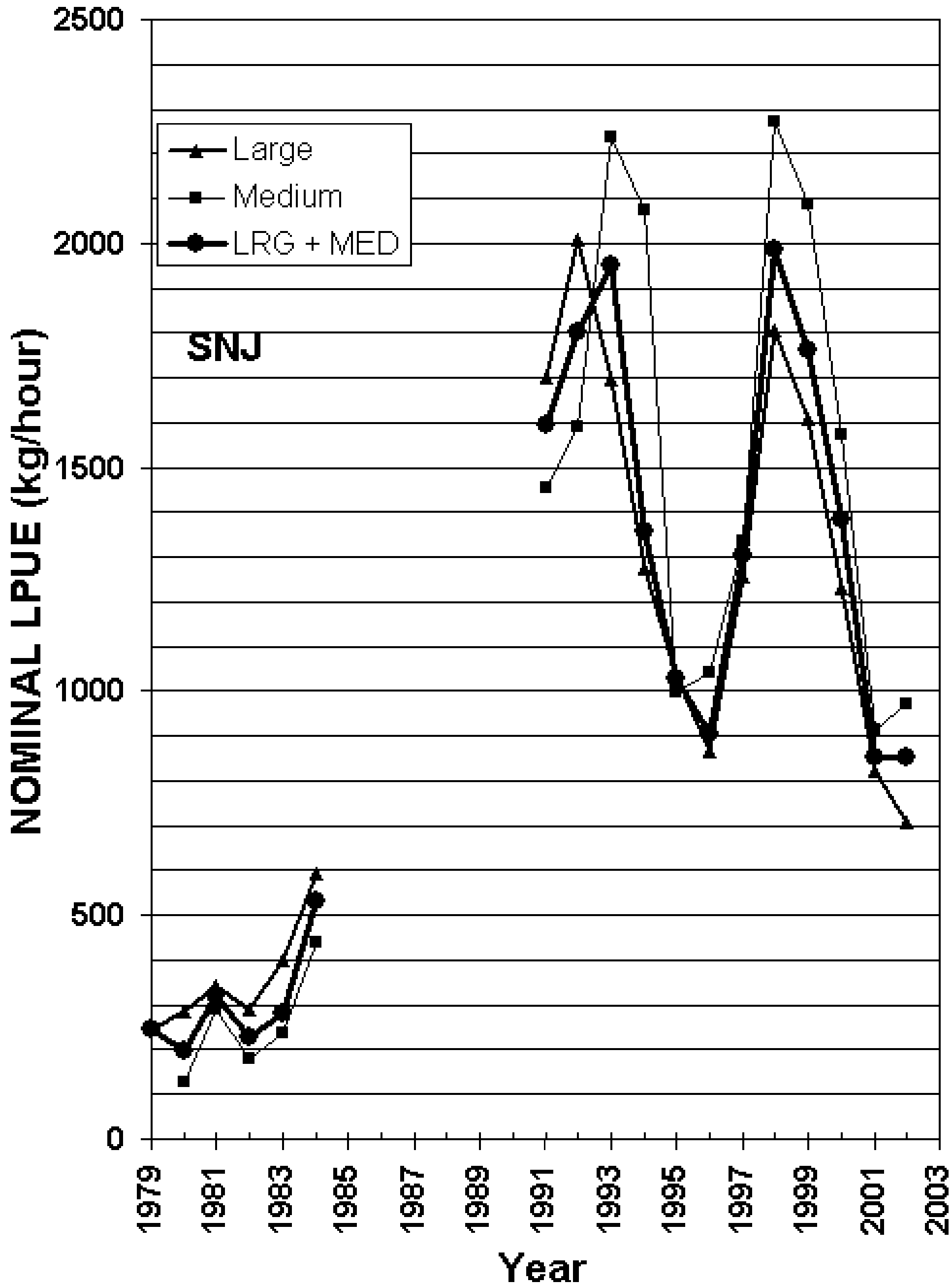



Figure C12. Nominal landings per unit effort for S. New Jersey, by vessel class (Medium: 51-104 GRT; Large: 105 GRT+).

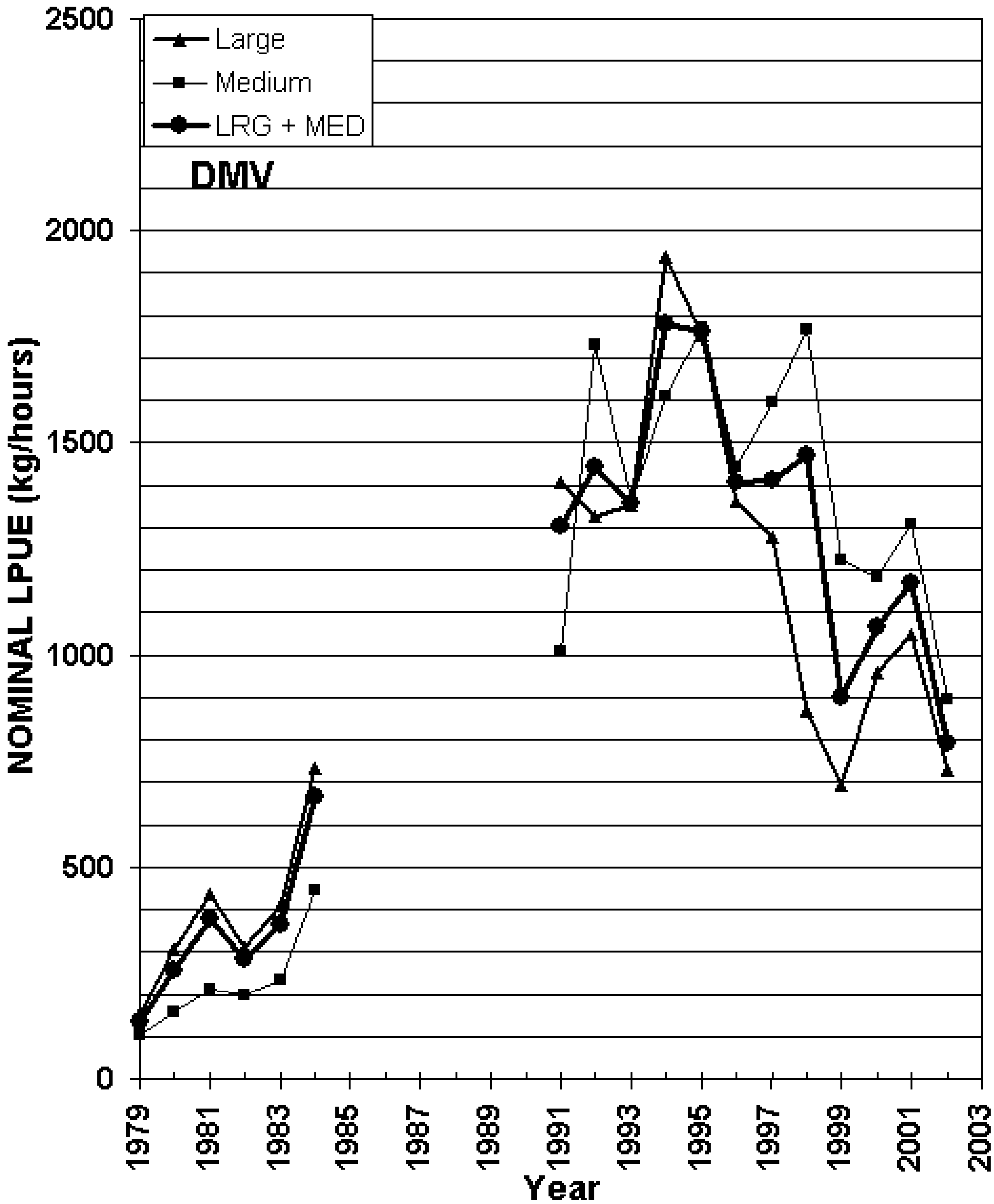



Figure C13. Nominal landings per unit effort for Delmarva, by vessel class (Medium: 51-104 GRT; Large: 105 GRT+).

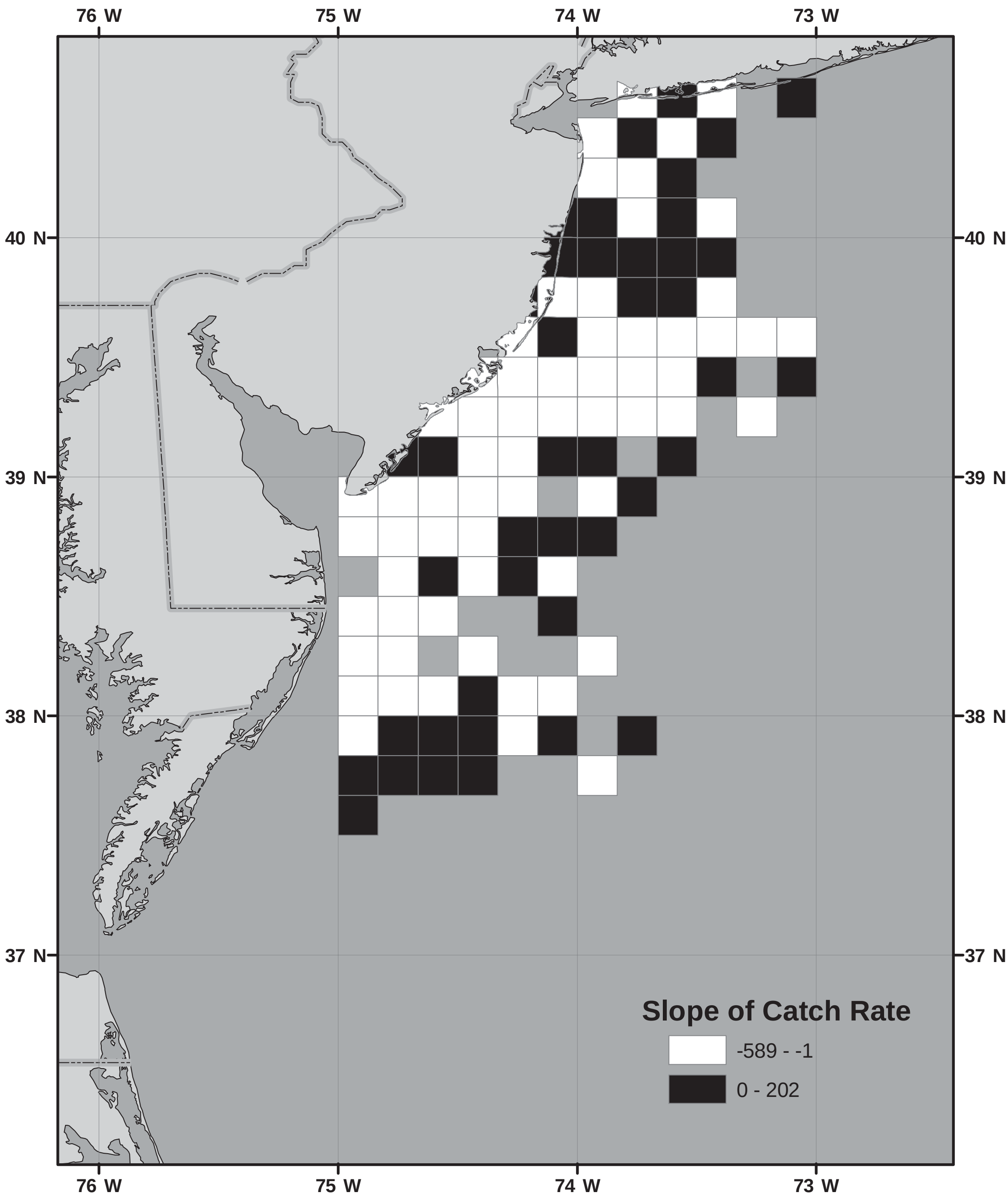



Figure C14. Spatial analysis, by ten minute square (TNMS), of trends in commercial catch rate from 1991-2002. For each TNMS, the slope of LPUE vs time was computed. If the slope was positive the TNMS was filled with black. If the slope was negative, the TNMS was filled with white.

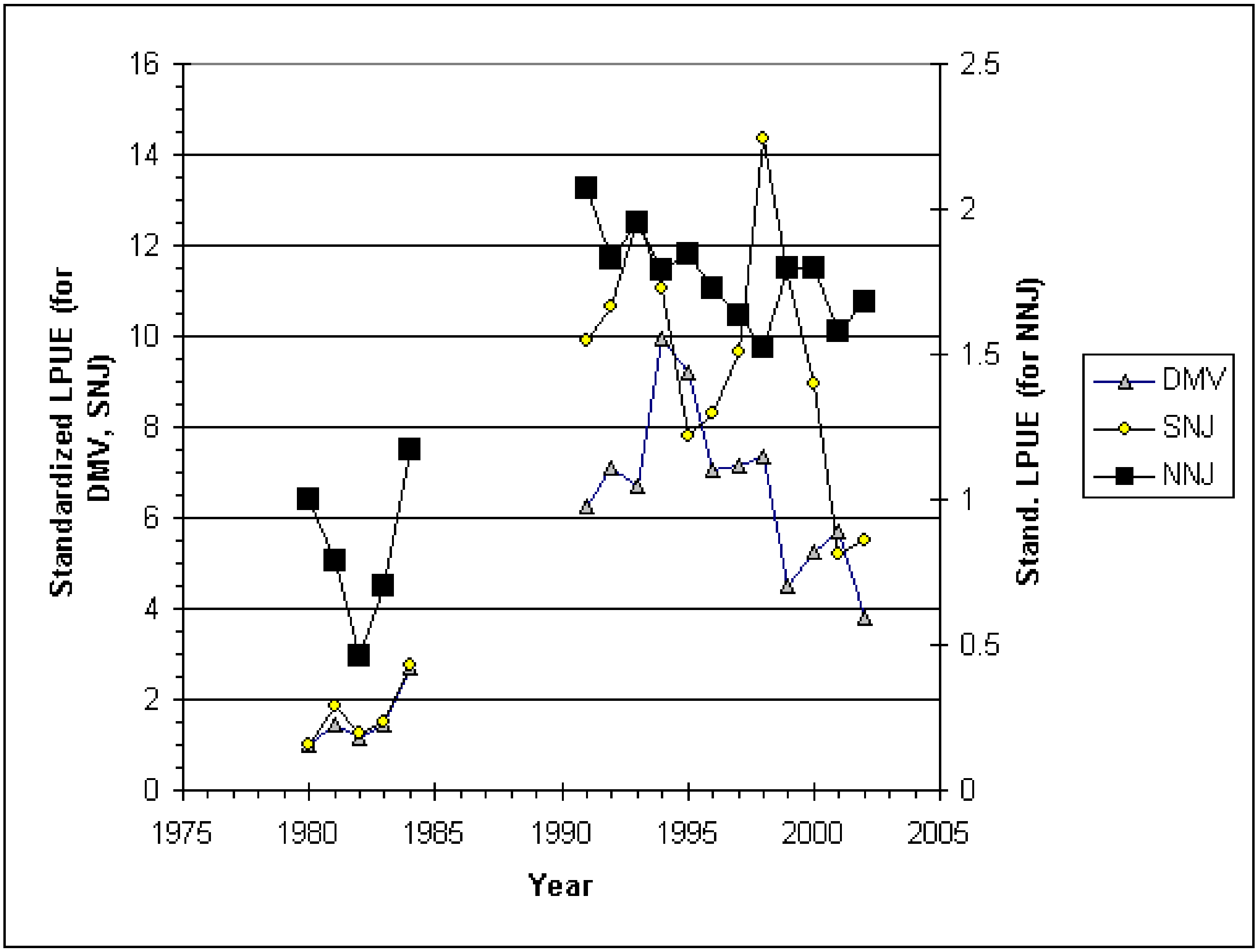



Figure C15. Standardized LPUE for surfclams, analyzed with a general linear model including Year and Subregion. A separate model was run for each region.

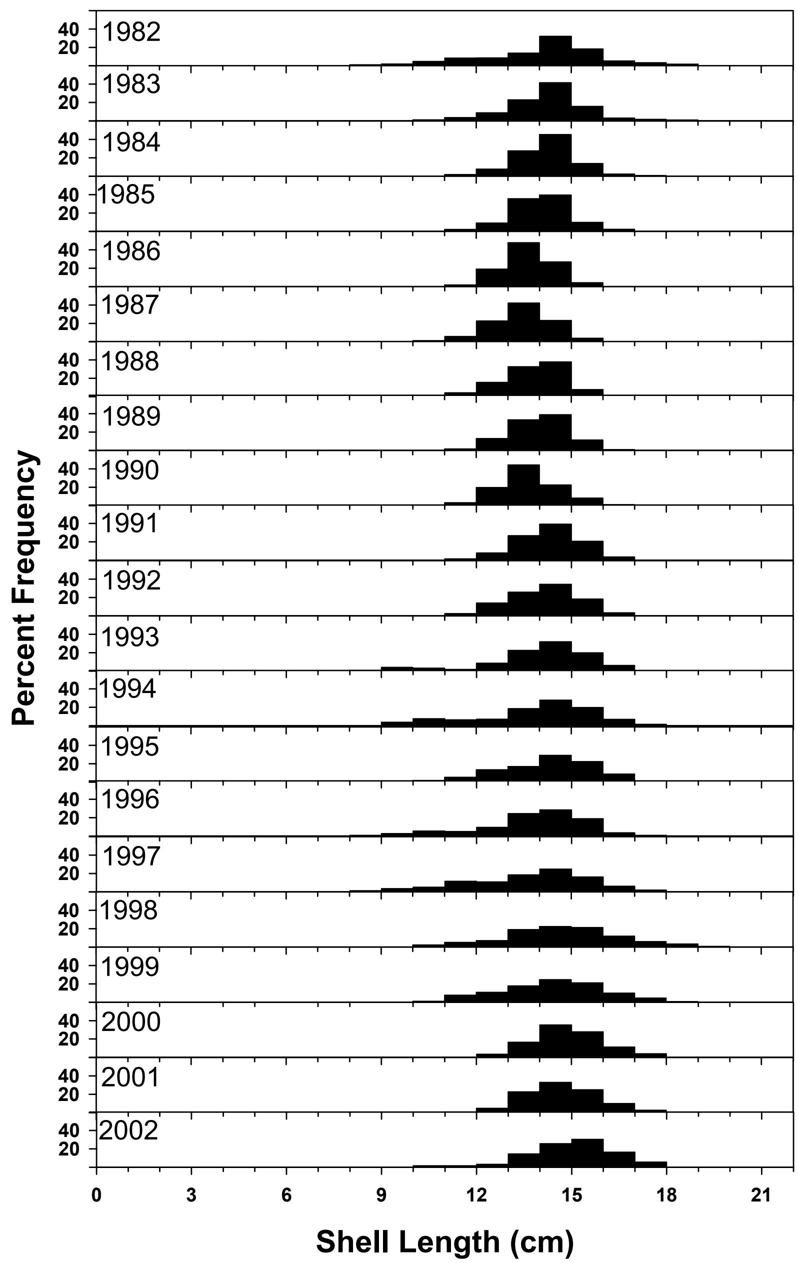



Figure C16. Surfclam commercial length frequency distributions based on port samples. Region : **New Jersey**.

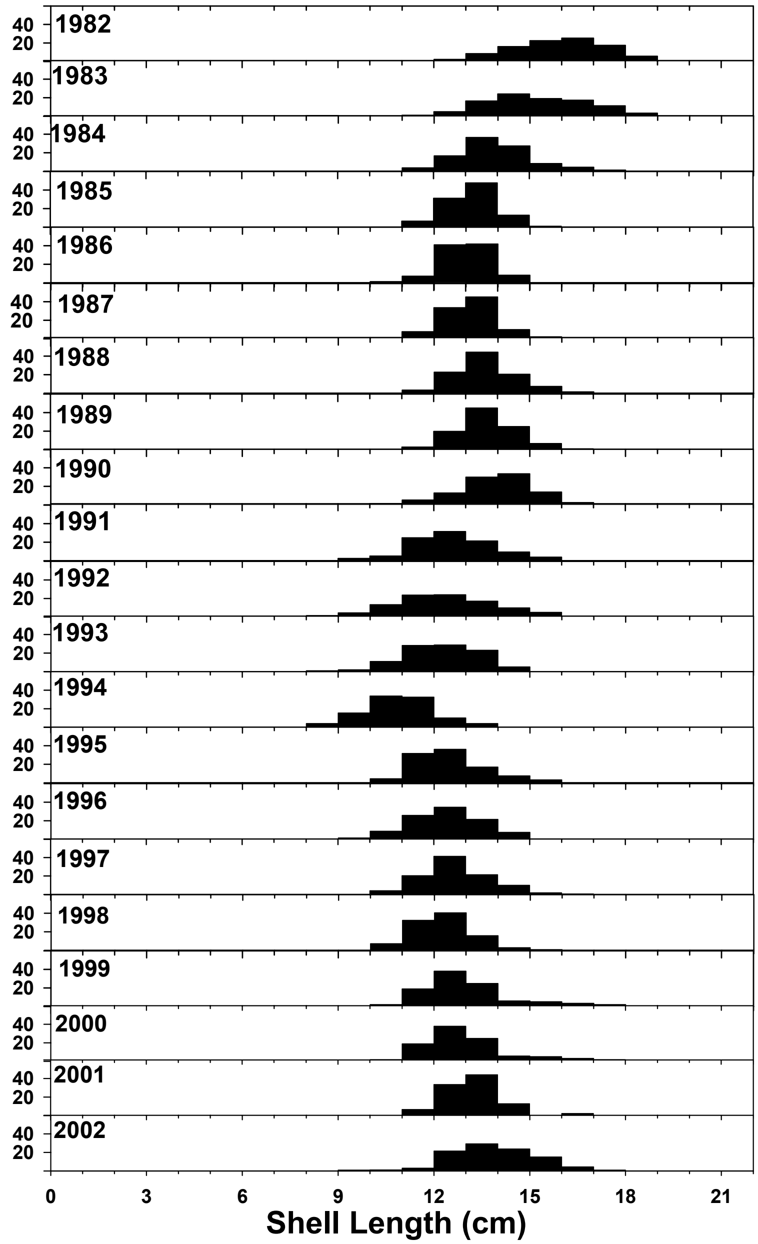



Figure C17. Surfclam commercial length frequency distributions based on port samples. Region : **Delmarva**.

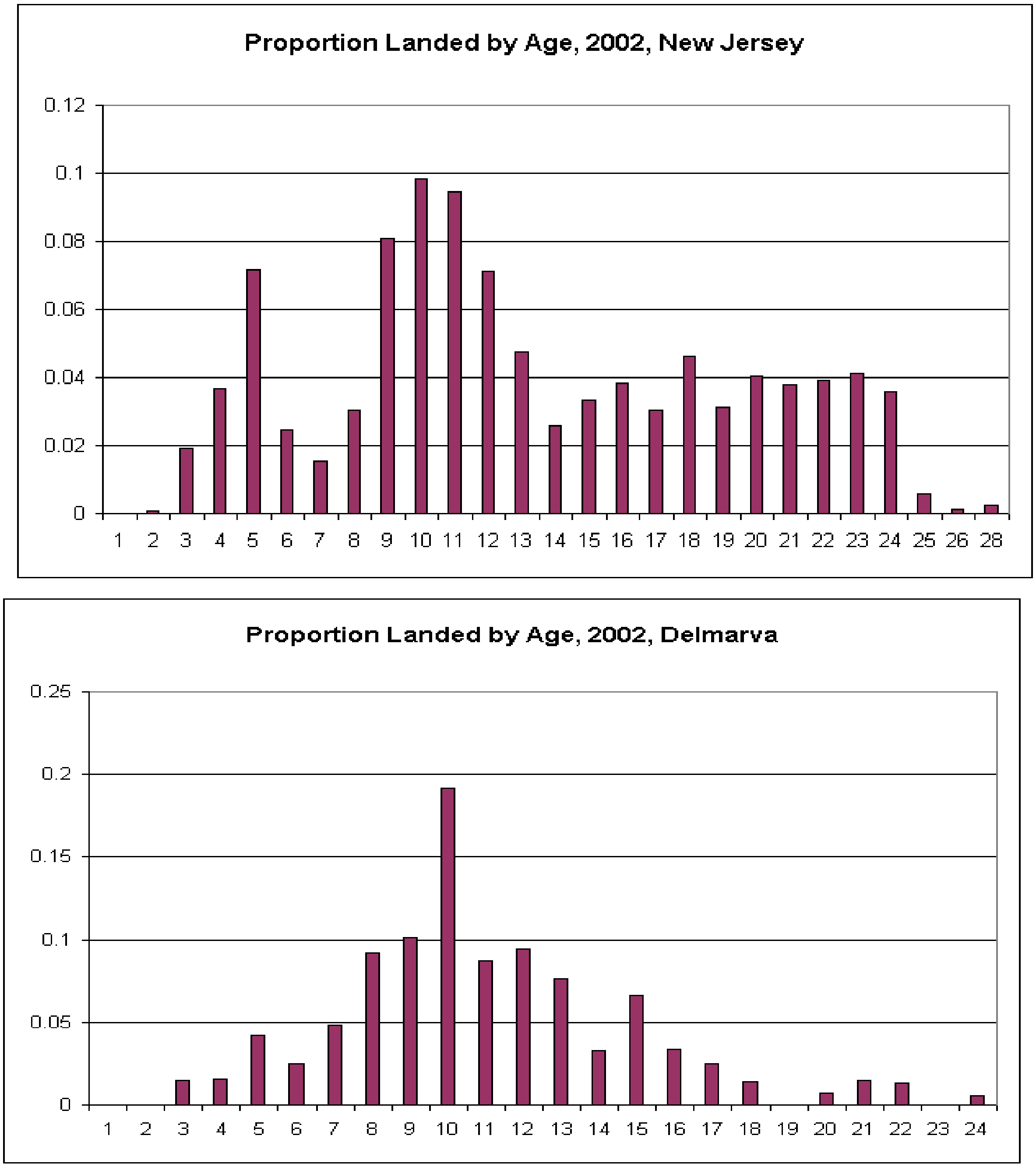



**Figure C18. Proportion of surfclams landed in 2002, by region and age (years). Source data: Commer. Port samples.**

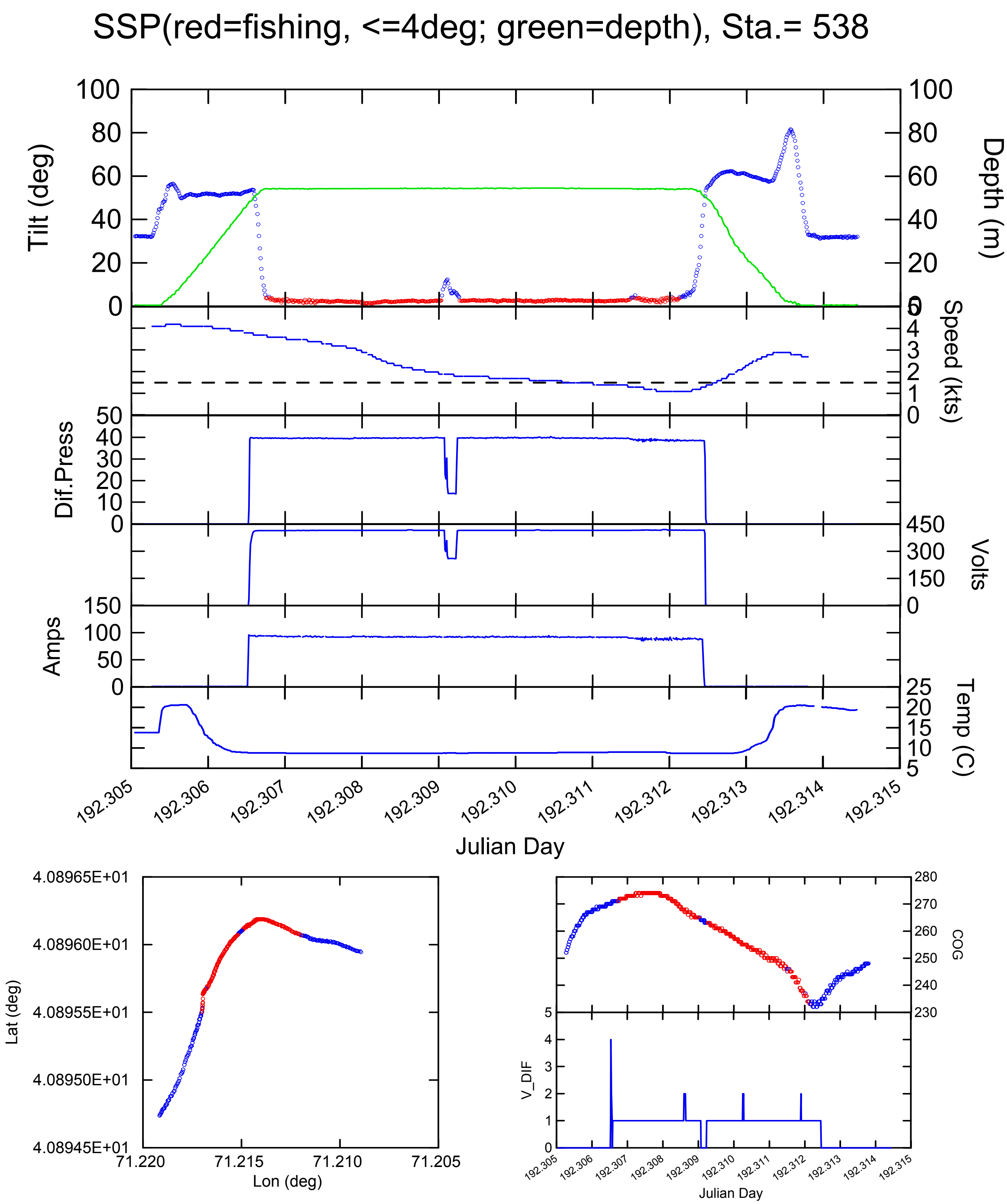



Figure C19. Example of sensor data collected at each DE-II station during the 2002 clam survey.

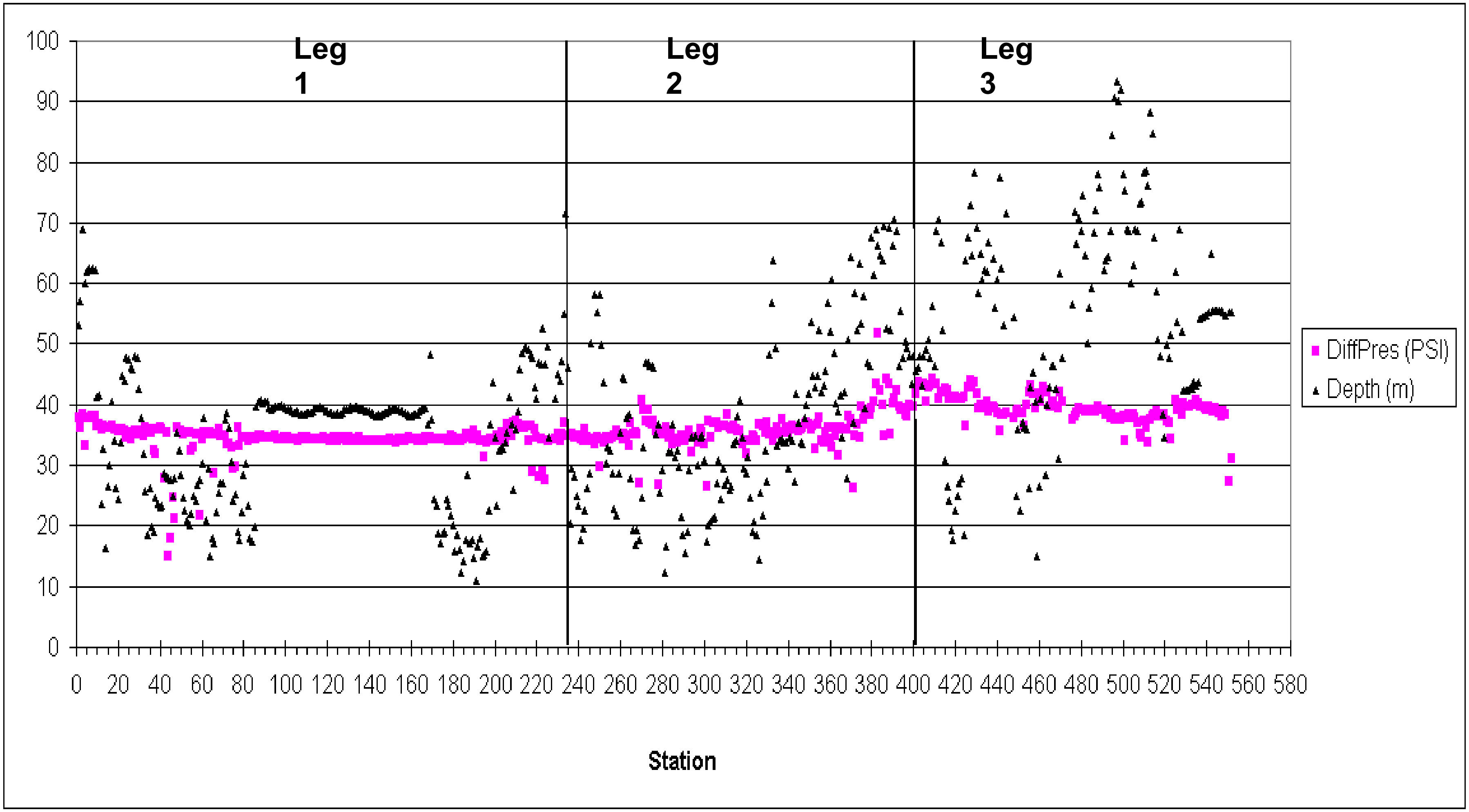
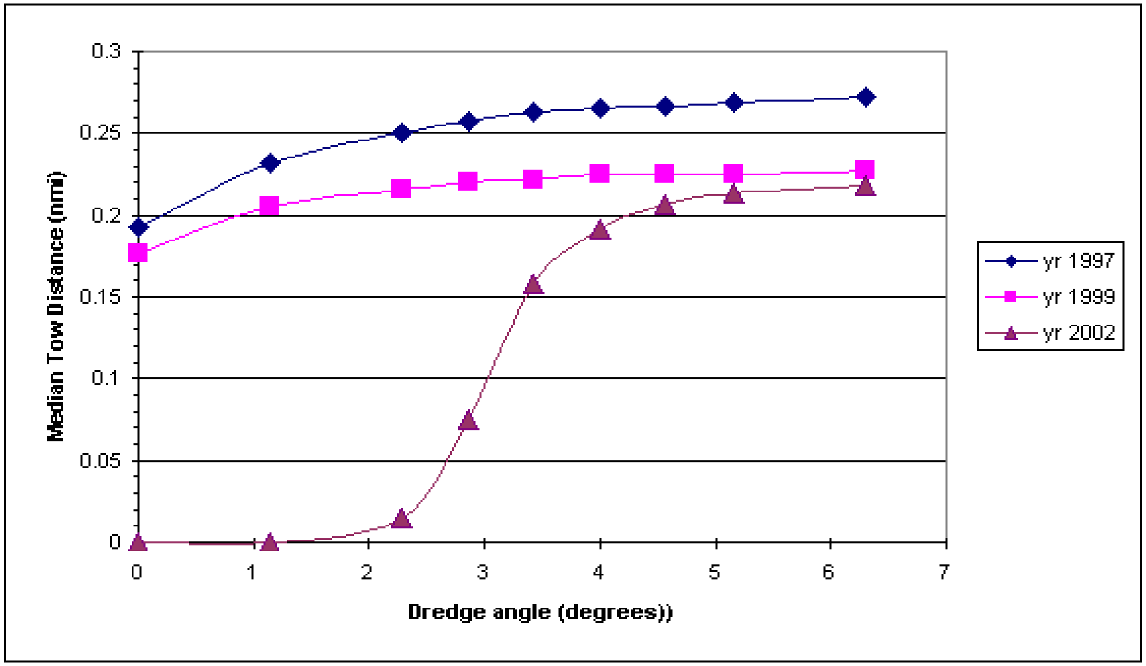



**Figure C20. Delaware II differential pressure (psi) and station depth (m) measured by the Survey Sensor Package, 2002 NMFS Clam Survey, Cruise 200206.**

**Figure C21.**
**Examination of tow distance, computed from sensor data, as a function of dredge angle, in 1997, 1999, and 2002. Calculation includes all good survey tows.**

| | Median Tow Distance (nmi) | | | Fraction of Distance at Asymptote | | |
|---|---|---|---|---|---|---|
| Dredge Angle (degrees) | yr 1997 | yr 1999 | yr 2002 | **yr 1997** | **yr 1999** | **yr 2002** |
| 6.3 | 0.272 | 0.227 | 0.218 | 1.000 | 1.000 | 1.000 |
| 5.2 | 0.269 | 0.225 | 0.213 | 0.989 | 0.991 | 0.977 |
| 4.6 | 0.267 | 0.225 | 0.206 | 0.982 | 0.991 | 0.945 |
| 4.0 | 0.265 | 0.225 | 0.191 | 0.974 | 0.991 | 0.876 |
| 3.4 | 0.263 | 0.222 | 0.158 | 0.967 | 0.978 | 0.725 |
| 2.9 | 0.257 | 0.22 | 0.075 | 0.945 | 0.969 | 0.344 |
| 2.3 | 0.25 | 0.216 | 0.015 | 0.919 | 0.952 | 0.069 |
| 1.1 | 0.232 | 0.205 | 0 | 0.853 | 0.903 | 0.000 |
| 0.0 | 0.193 | 0.176 | 0 | 0.710 | 0.775 | 0.000 |



| | Used | By Drawing | Measured |
|---|---|---|---|
| Knife Pivot Fwd of Dredge End (Inches): | 72 | 71.75 | 72 |
| Knife Edge Fwd of Pivot (Inches): | 32.5 | 32 | 32.5 |
| Knife Edge Fwd of Dredge End (Inches): | 104.5 | 103.75 | |
| Knife Edge Below Dredge Runner (Inches): | 8 | 8 | |
| Manifold Center Fwd of Dredge End (Inches): | 138.5 | 138.5 | 138.5 |
| Manifold Nozzle Aft of Manifold Center (Inches): | 3.1 | 3.1 | |
| Manifold Nozzle Fwd of Dredge End (Inches): | 135.4 | 135.4 | |
| Manifold Nozzle Above Dredge Runner (Inches): | 1.5 | 1.5 | |
| Manifold Nozzle Angle to Runner (Degrees): | 45 | 45 | |

| Dredge Angle To Bottom Deg | Manifold Nozzle Vert Height Above Bottom Inches | Manifold Angle To Bottom Degrees | Water Jet Travel To Bottom Inches |
|---|---|---|---|
| 6.00 | 15.73 | 51.00 | 20.24 |
| 5.50 | 14.54 | 50.50 | 18.84 |
| 5.00 | 13.35 | 50.00 | 17.42 |
| 4.50 | 12.16 | 49.50 | 15.99 |
| 4.00 | 10.97 | 49.00 | 14.53 |
| 3.50 | 9.78 | 48.50 | 13.06 |
| 3.00 | 8.60 | 48.00 | 11.57 |
| 2.50 | 7.41 | 47.50 | 10.05 |
| 2.00 | 6.23 | 47.00 | 8.52 |
| 1.50 | 5.05 | 46.50 | 6.96 |
| 1.00 | 3.86 | 46.00 | 5.37 |
| 0.50 | 2.68 | 45.50 | 3.76 |
| 0.00 | 1.50 | 45.00 | 2.12 |
| | NH | NA | WL |
| Dredge Angle | Nozzle Abv Bttm | | Water Jet Travel |

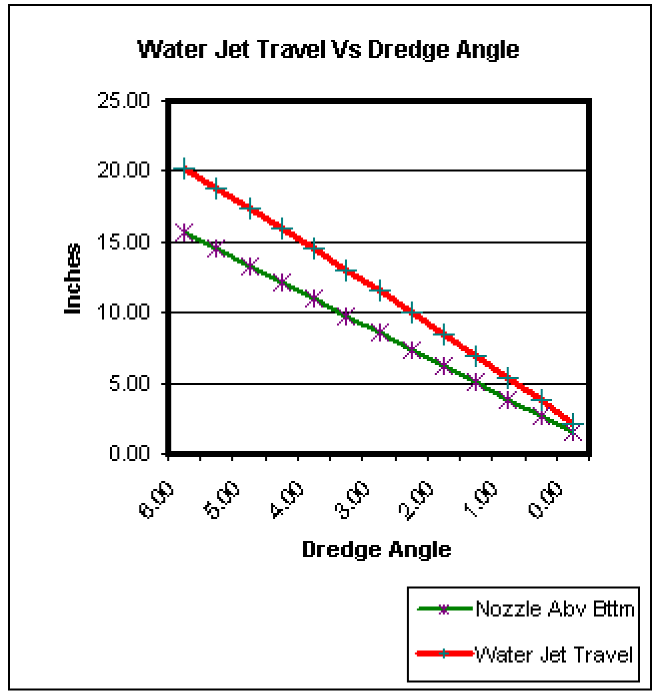



Figure C22.
Relationship between NMFS clam dredge angle and water jet travel distance to bottom. From J. Womack, 5/2003.

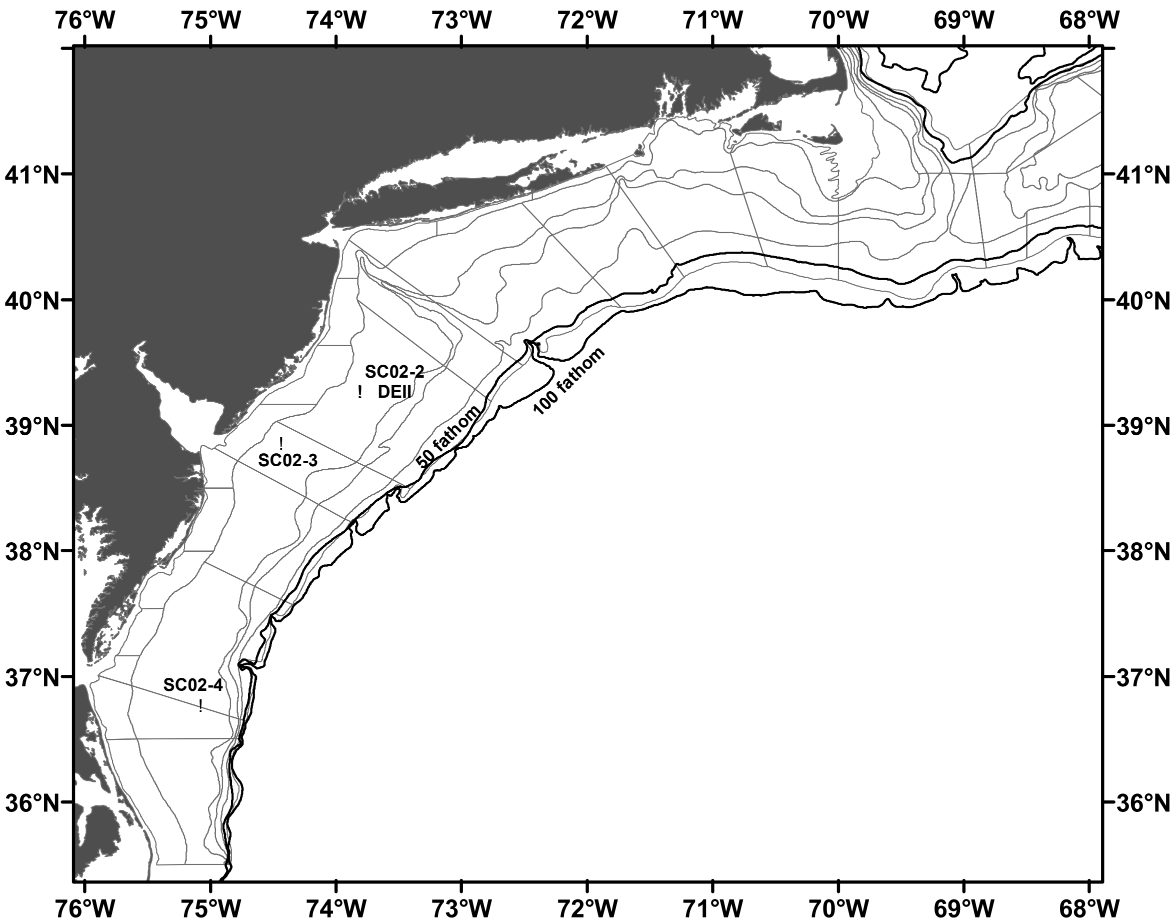



Figure C23. Locations of dredge efficiency experiments with surfclams in 2002.
Vessels : R/V Delaware II and F/V Jersey Girl.

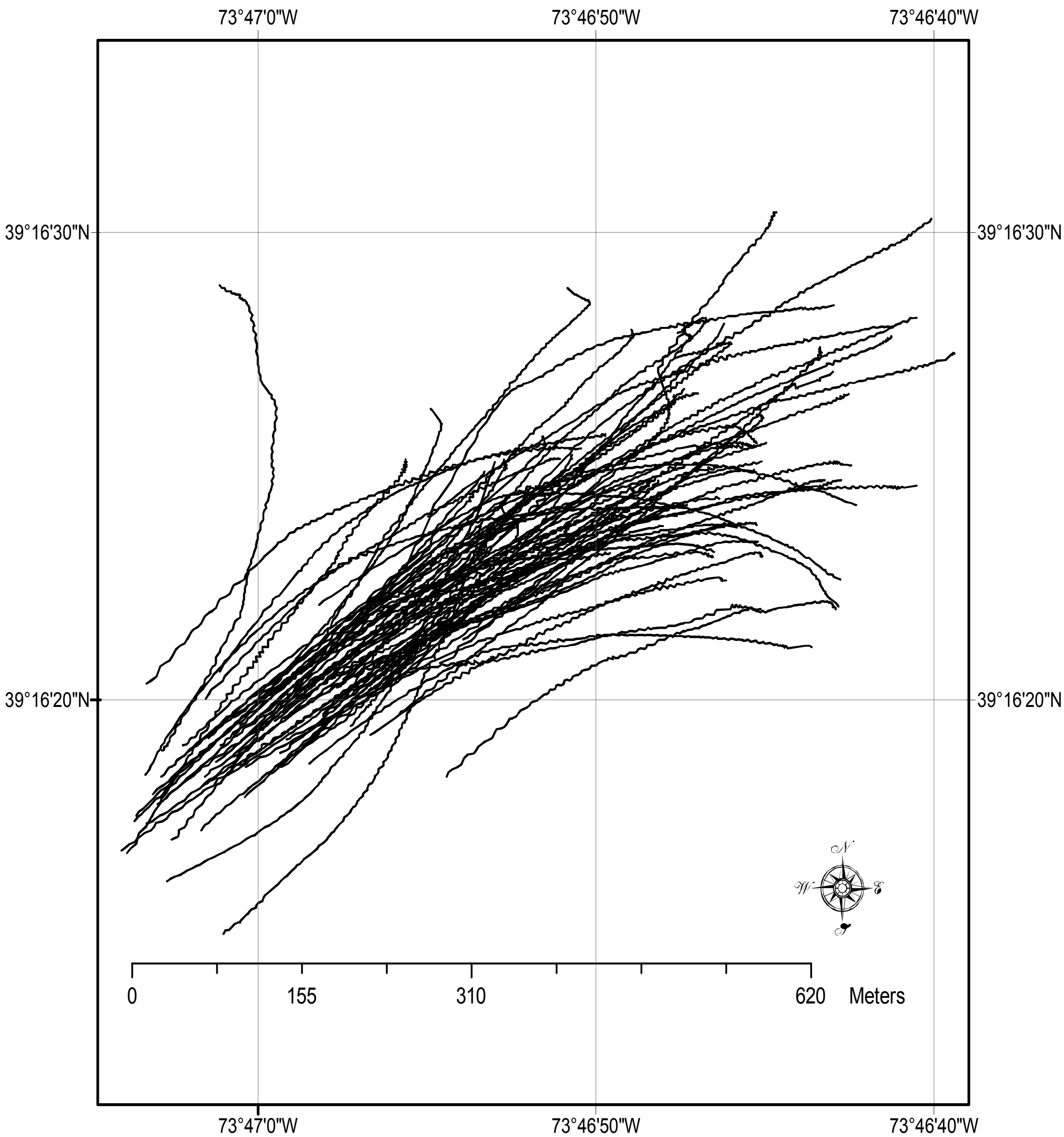



Fig. C24. *R/V Delaware-II* dredge calibration experiment on surfclams off NJ in June, 2002.

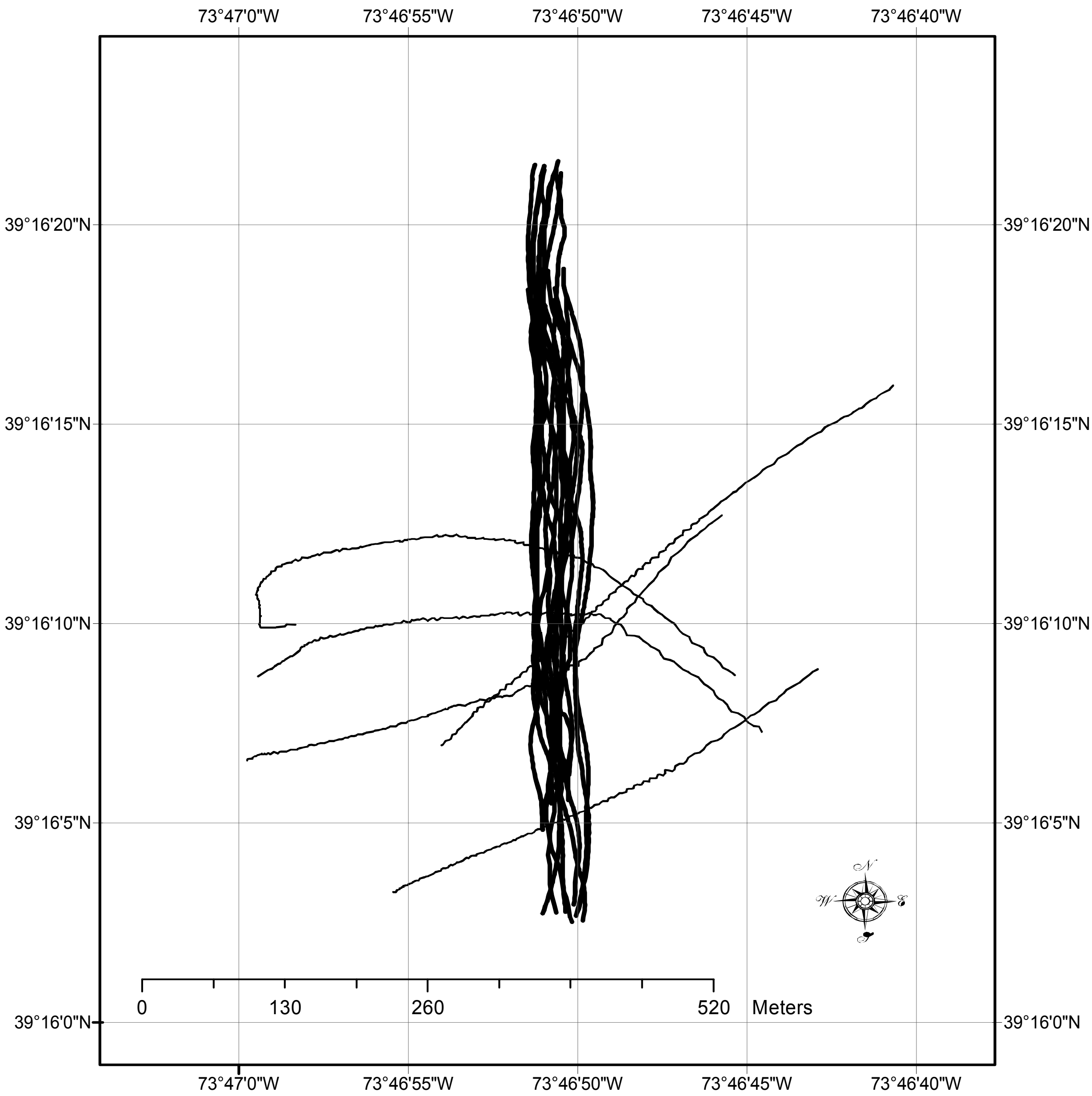



Fig. C25. Towpaths by the *R/V Delaware-II* setup tows (lighter lines) and the *F/V Jersey Girl* (darker lines), 2002, off NJ at site: sc02-2.

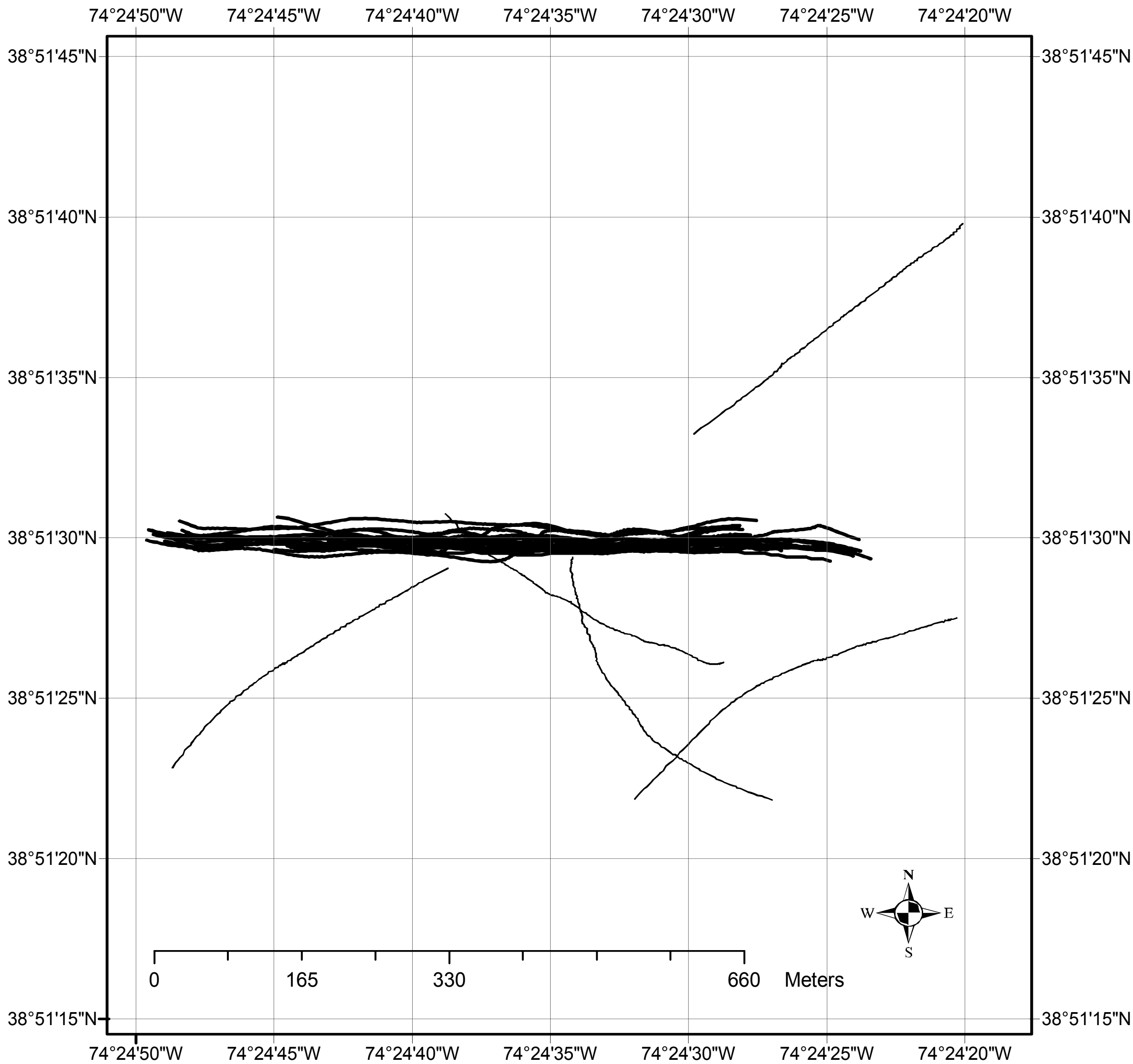



Fig. C26. Towpaths by the *R/V Delaware-II* setup tows (lighter lines) and the *F/V Jersey Girl* (darker lines), 2002, off SNJ at site: sc02-3.

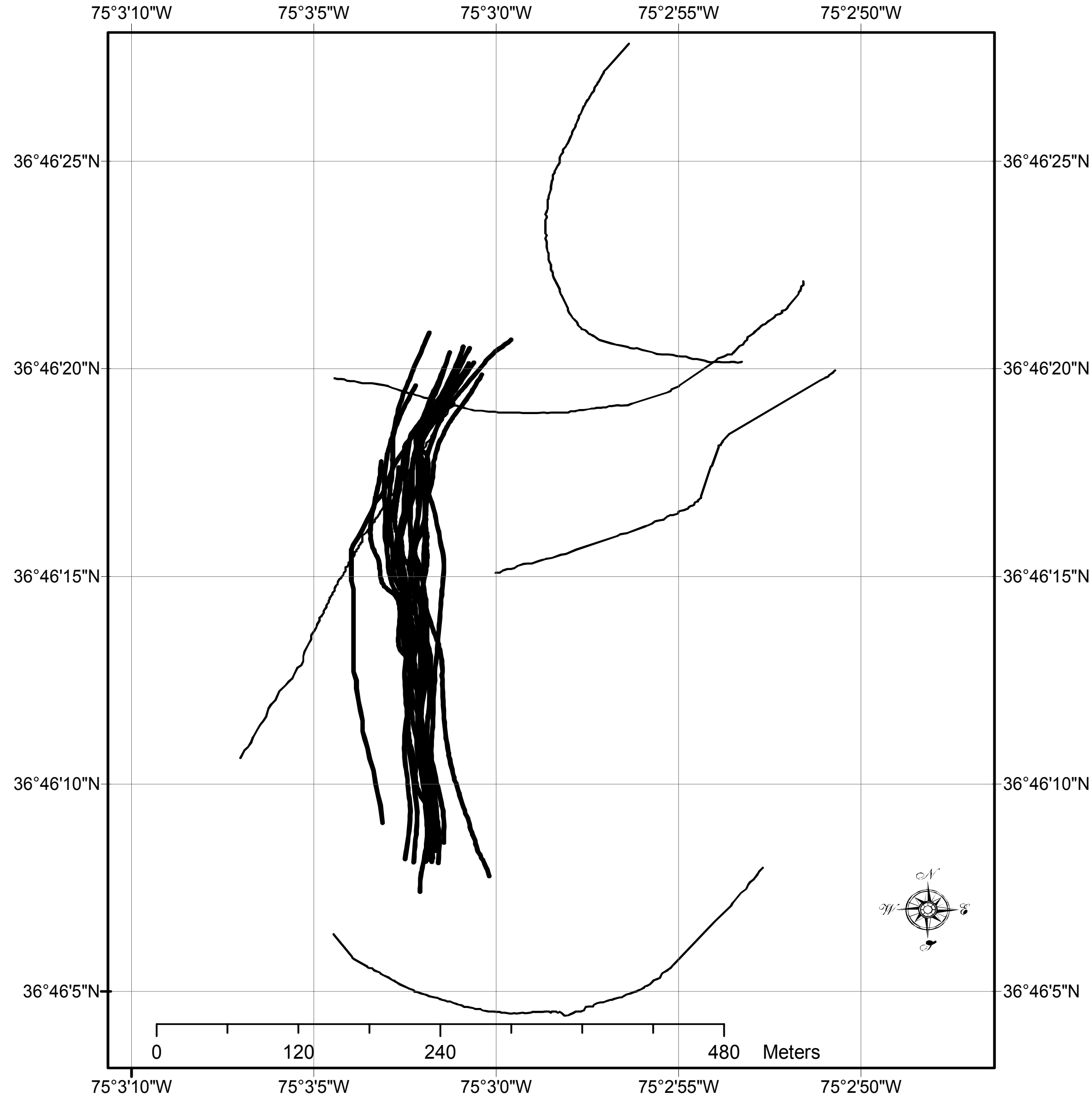
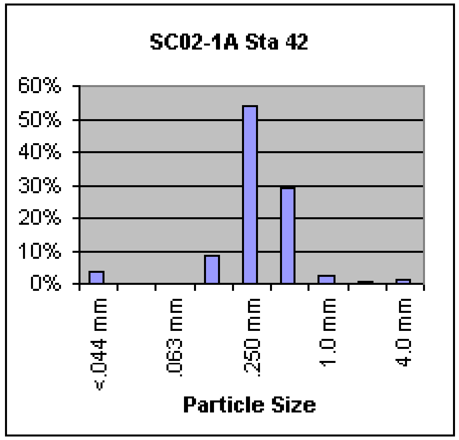
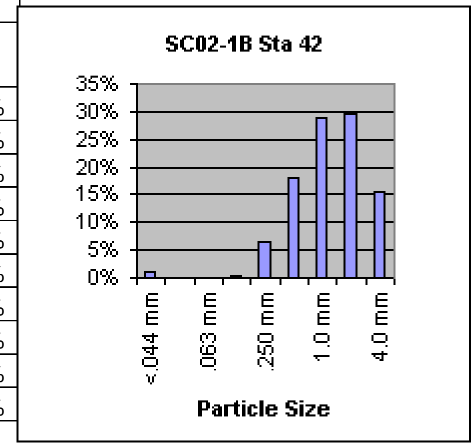



Fig. C27. Towpaths by the *R/V Delaware-II* setup tows (lighter lines) and the *F/V Jersey Girl* (darker lines), 2002, off Delmarva at site: sc02-4.

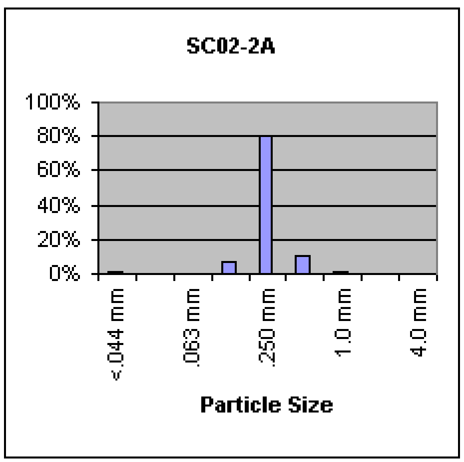
| | SC02-1A Sta 42 | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 18.006 | 3.7% |
| .044 mm | 0.148 | 0.0% |
| .063 mm | 1.275 | 0.3% |
| .125 mm | 40.163 | 8.3% |
| .250 mm | 262.128 | 54.0% |
| .500 mm | 140.714 | 29.0% |
| 1.0 mm | 10.940 | 2.3% |
| 2.0 mm | 4.341 | 0.9% |
| 4.0 mm | 7.283 | 1.5% |
| Total Mass | 484.998 | 100.0% |




| | SC02-1B Sta 42 | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 4.576 | 0.9% |
| .044 mm | 0.174 | 0.0% |
| .063 mm | 0.209 | 0.0% |
| .125 mm | 2.504 | 0.5% |
| .250 mm | 31.274 | 6.4% |
| .500 mm | 87.430 | 17.9% |
| 1.0 mm | 141.734 | 29.0% |
| 2.0 mm | 145.375 | 29.8% |
| 4.0 mm | 75.190 | 15.4% |
| Total Mass | 488.466 | 100.0% |




| | SC02-2A | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 8.946 | 1.4% |
| .044 mm | 0.209 | 0.0% |
| .063 mm | 1.816 | 0.3% |
| .125 mm | 44.037 | 6.7% |
| .250 mm | 530.024 | 80.2% |
| .500 mm | 70.101 | 10.6% |
| 1.0 mm | 4.004 | 0.6% |
| 2.0 mm | 1.611 | 0.2% |
| 4.0 mm | 0.229 | 0.0% |
| Total Mass | 660.977 | 100.0% |




| | SC02-2B | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 15.037 | 2.4% |
| .044 mm | 0.171 | 0.0% |
| .063 mm | 2.495 | 0.4% |
| .125 mm | 128.341 | 20.9% |
| .250 mm | 434.518 | 70.7% |
| .500 mm | 21.290 | 3.5% |
| 1.0 mm | 2.036 | 0.3% |
| 2.0 mm | 0.698 | 0.1% |
| 4.0 mm | 10.294 | 1.7% |
| Total Mass | 614.880 | 100.0% |

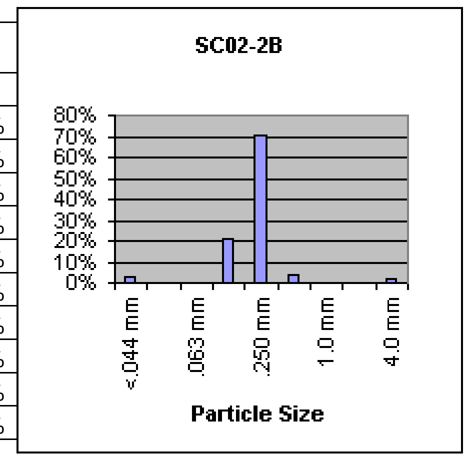
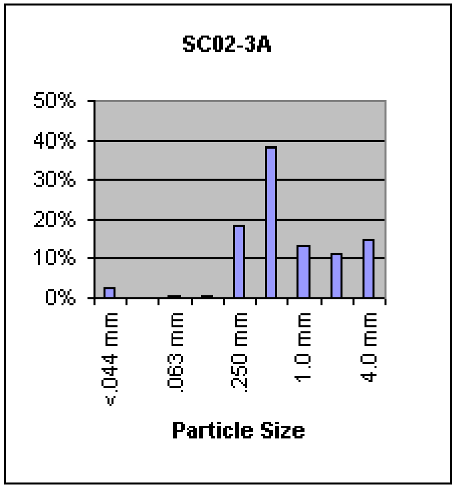


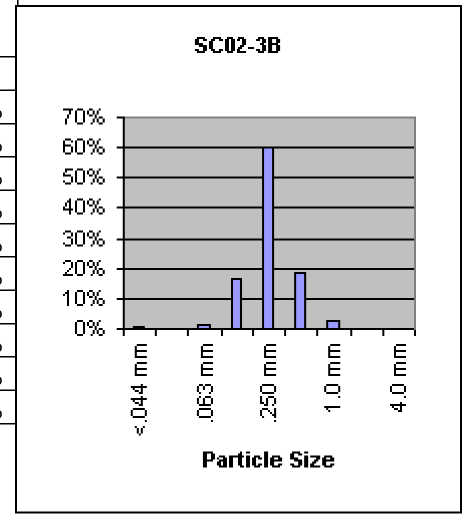

**Fig. C28. (1 of 3)**

**Figure C28. (2 of 3)**

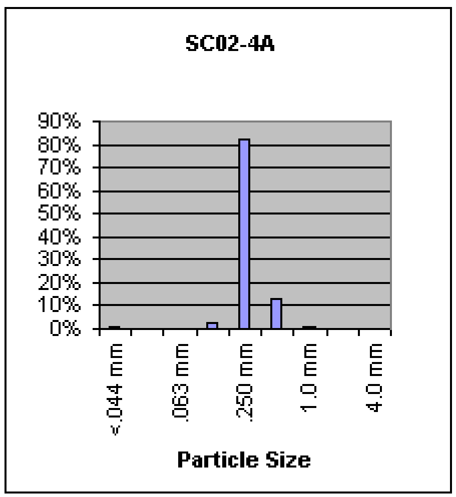
| | SC02-3A | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 14.598 | 2.8% |
| .044 mm | 0.201 | 0.0% |
| .063 mm | 2.909 | 0.6% |
| .125 mm | 2.999 | 0.6% |
| .250 mm | 97.978 | 18.6% |
| .500 mm | 200.921 | 38.2% |
| 1.0 mm | 69.133 | 13.1% |
| 2.0 mm | 59.626 | 11.3% |
| 4.0 mm | 77.995 | 14.8% |
| Total Mass | 526.360 | 100.0% |



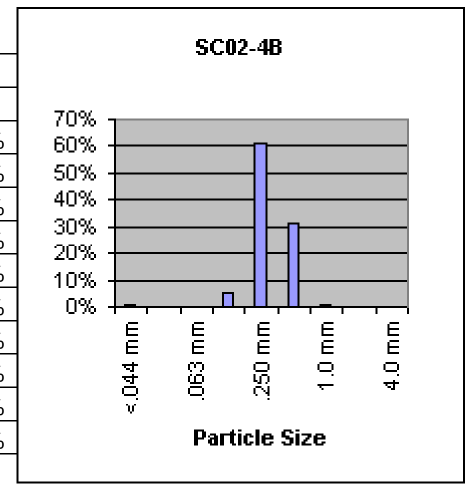

| | SC02-3B | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 3.377 | 0.6% |
| .044 mm | 0.239 | 0.0% |
| .063 mm | 6.529 | 1.1% |
| .125 mm | 92.925 | 16.4% |
| .250 mm | 342.799 | 60.4% |
| .500 mm | 105.890 | 18.6% |
| 1.0 mm | 13.707 | 2.4% |
| 2.0 mm | 1.568 | 0.3% |
| 4.0 mm | 0.937 | 0.2% |
| Total Mass | 567.971 | 100.0% |



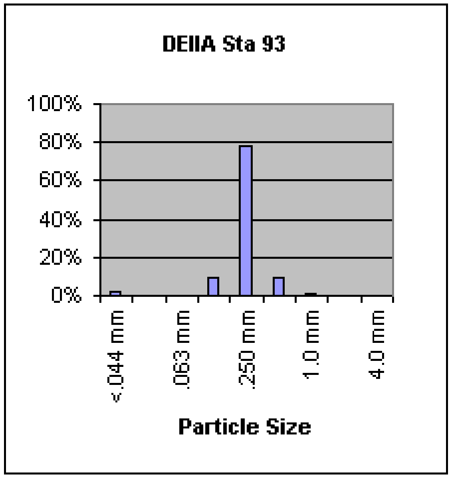

| | SC02-4A | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 6.310 | 1.2% |
| .044 mm | 0.203 | 0.0% |
| .063 mm | 0.572 | 0.1% |
| .125 mm | 14.138 | 2.7% |
| .250 mm | 429.034 | 81.9% |
| .500 mm | 67.660 | 12.9% |
| 1.0 mm | 2.962 | 0.6% |
| 2.0 mm | 1.149 | 0.2% |
| 4.0 mm | 1.653 | 0.3% |
| Total Mass | 523.681 | 100% |




| | SC02-4B | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 3.273 | 0.8% |
| .044 mm | 0.059 | 0.0% |
| .063 mm | 0.580 | 0.1% |
| .125 mm | 22.292 | 5.2% |
| .250 mm | 263.903 | 61.4% |
| .500 mm | 135.534 | 31.5% |
| 1.0 mm | 2.354 | 0.5% |
| 2.0 mm | 0.815 | 0.2% |
| 4.0 mm | 1.233 | 0.3% |
| Total Mass | 430.043 | 100.0% |



| | DE-IIA Sta 93 | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 11.636 | 1.9% |
| .044 mm | 0.368 | 0.1% |
| .063 mm | 1.684 | 0.3% |
| .125 mm | 53.740 | 8.9% |
| .250 mm | 469.458 | 78.1% |
| .500 mm | 54.801 | 9.1% |
| 1.0 mm | 5.605 | 0.9% |
| 2.0 mm | 2.127 | 0.4% |
| 4.0 mm | 1.483 | 0.2% |
| Total Mass | 600.902 | 100.0% |




| | DE-IIB Sta 93 | |
|---|---|---|
| Particle Size | Mass | Percent |
| <.044 mm | 1.522 | 0.3% |
| .044 mm | 0.054 | 0.0% |
| .063 mm | 1.285 | 0.3% |
| .125 mm | 51.258 | 11.5% |
| .250 mm | 360.867 | 80.8% |
| .500 mm | 24.147 | 5.4% |
| 1.0 mm | 1.329 | 0.3% |
| 2.0 mm | 0.322 | 0.1% |
| 4.0 mm | 5.892 | 1.3% |
| Total Mass | 446.676 | 100.0% |

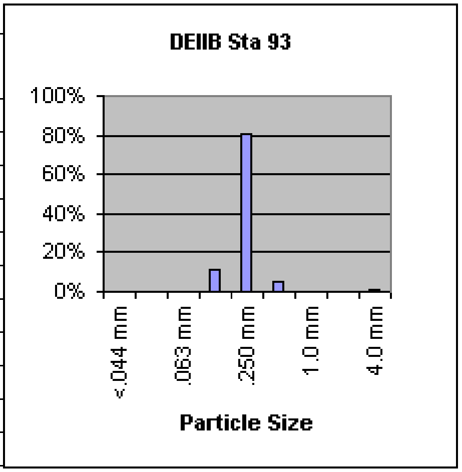



Figure C28 (3 of 3).

Figure C29. Sizes of surfclams captured at several locations by the RV Delaware II and FV Jersey Girl, summer of 2002.

***NJ- Repeats***

model: S(L) = 1/(1+exp(alpha+beta * L))

| alpha | beta | L50%ile |
|---|---|---|
| 10.442 | -0.084 | 124.3 |

**FV *Jersey Girl* Relative to RV *Delaware-II*, Surfclams, Summer 2002**

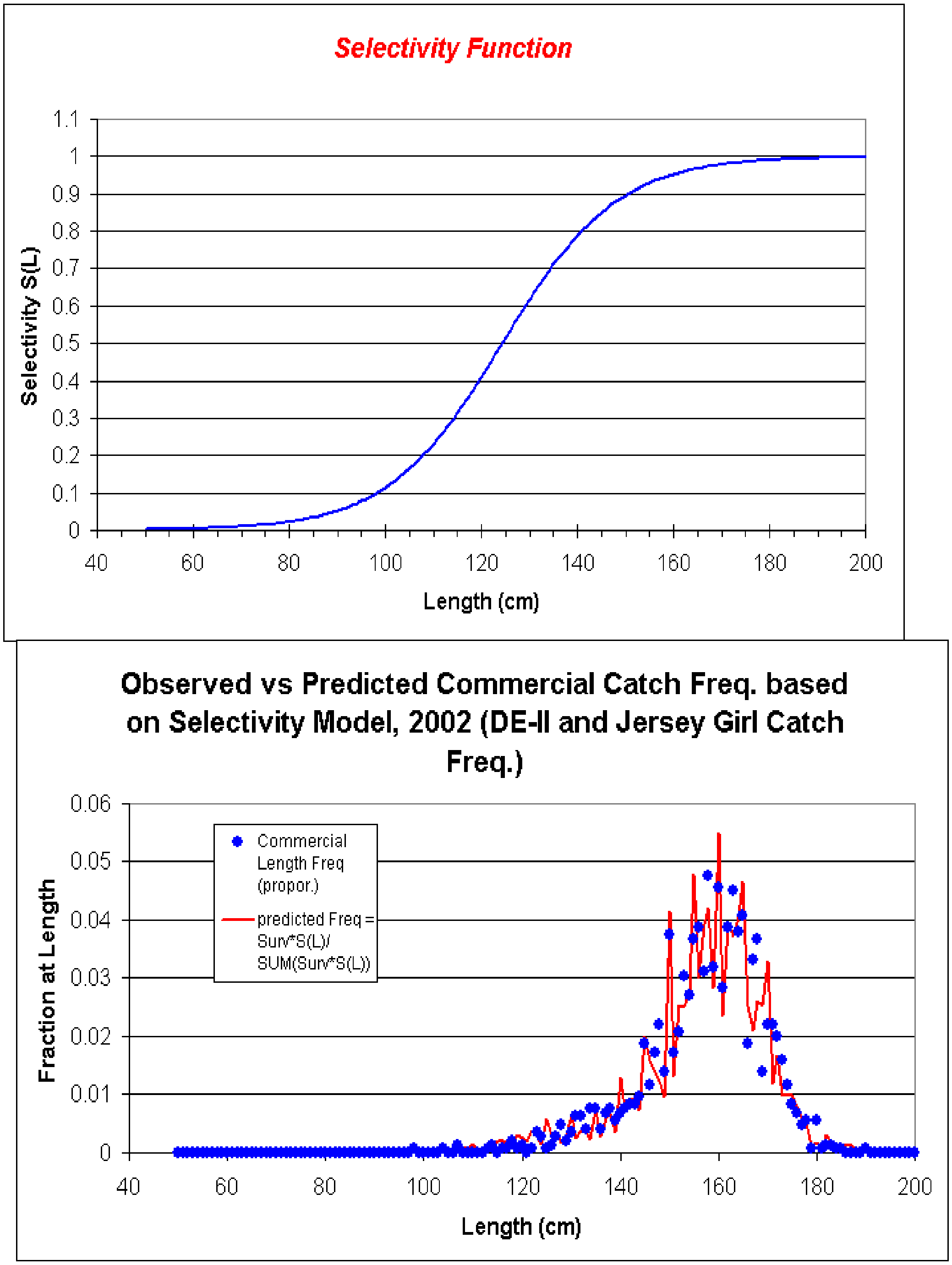
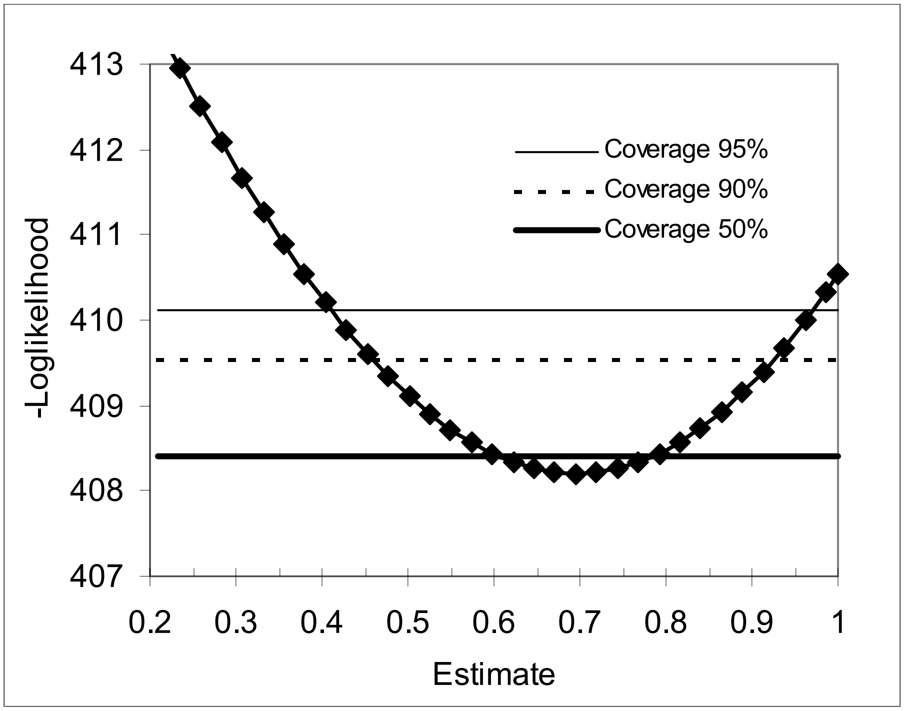



Figure C30. Example of program used to estimate relative selectivity of surfclam lengths between vessels. Data shown are from 9 "repeat" stations off New Jersey, 2002.

Figure C31. Likelihood profile analysis and asymptotic confidence intervals for dredge efficiency and initial density of surfclam in the DE02 depletion study (no indirect effects assumed, 130+ mm).



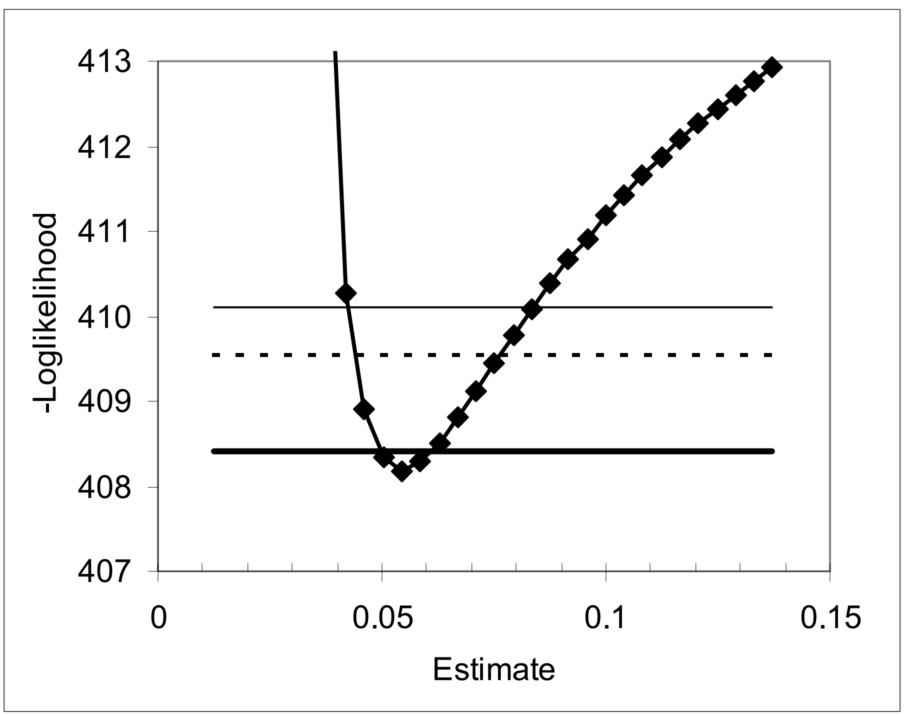
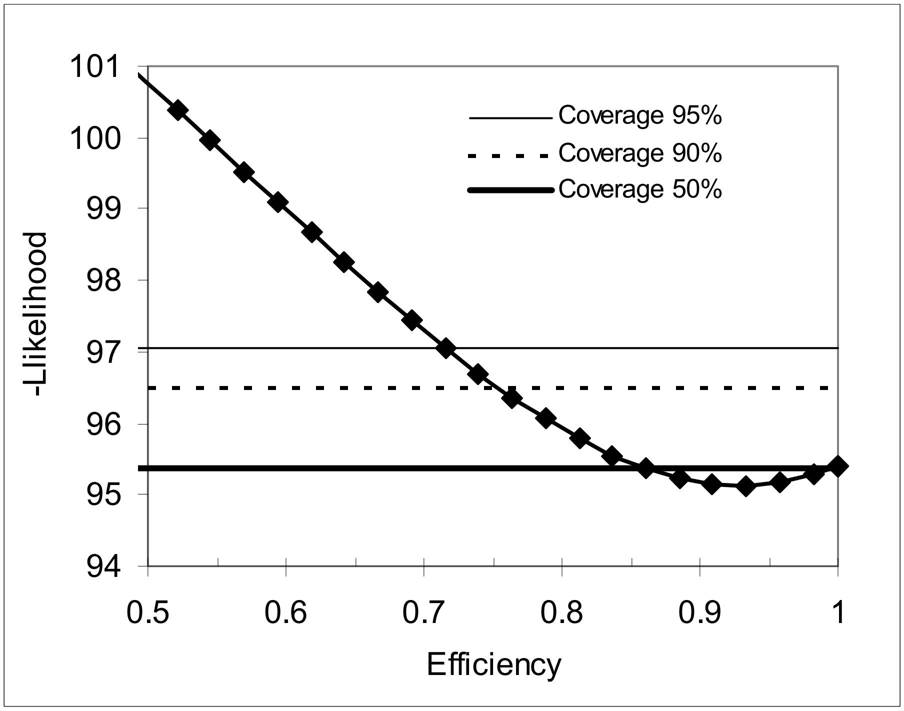



Figure C32. Likelihood profile analysis and asymptotic confidence intervals for dredge efficiency and initial density of surfclam in the JG02 depletion study (no indirect effects assumed, all sizes).



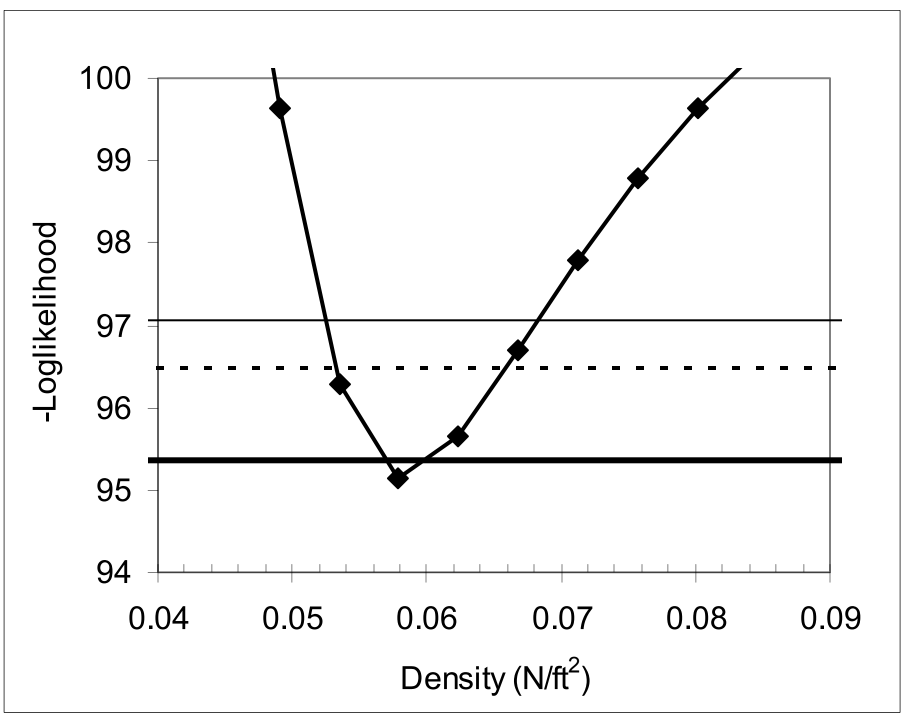
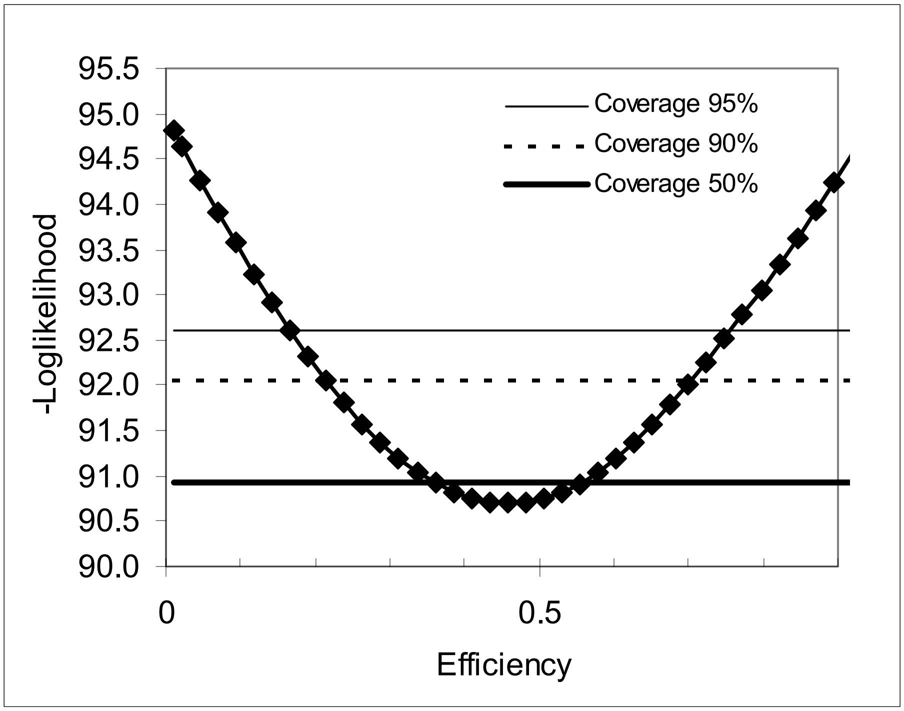



Figure C33. Likelihood profile analysis and asymptotic confidence intervals for dredge efficiency and initial density of surfclam in the JG03 depletion study (no indirect effects assumed, 130+ mm).



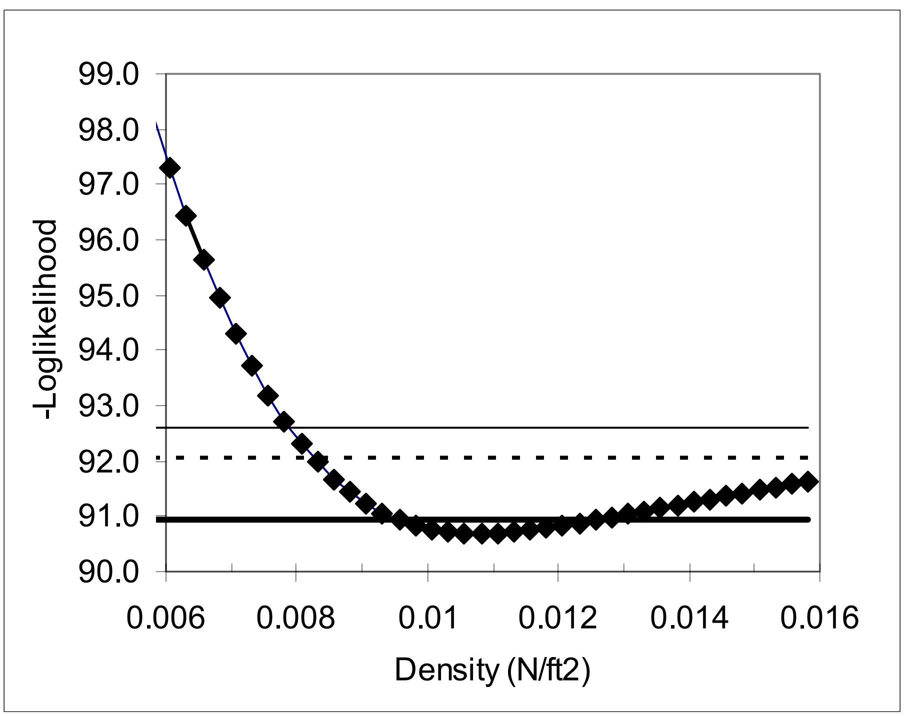
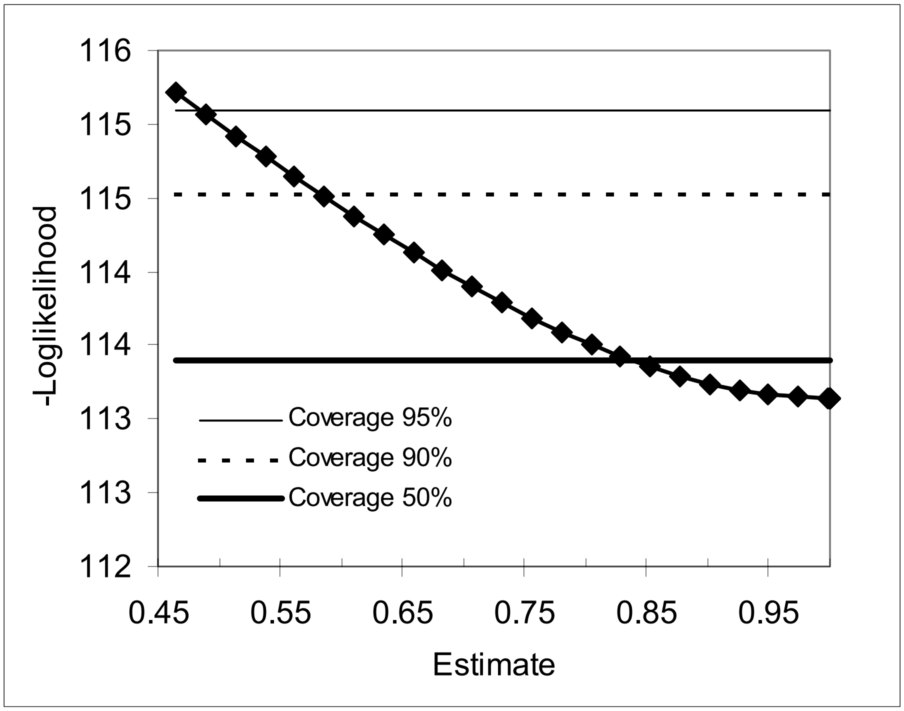
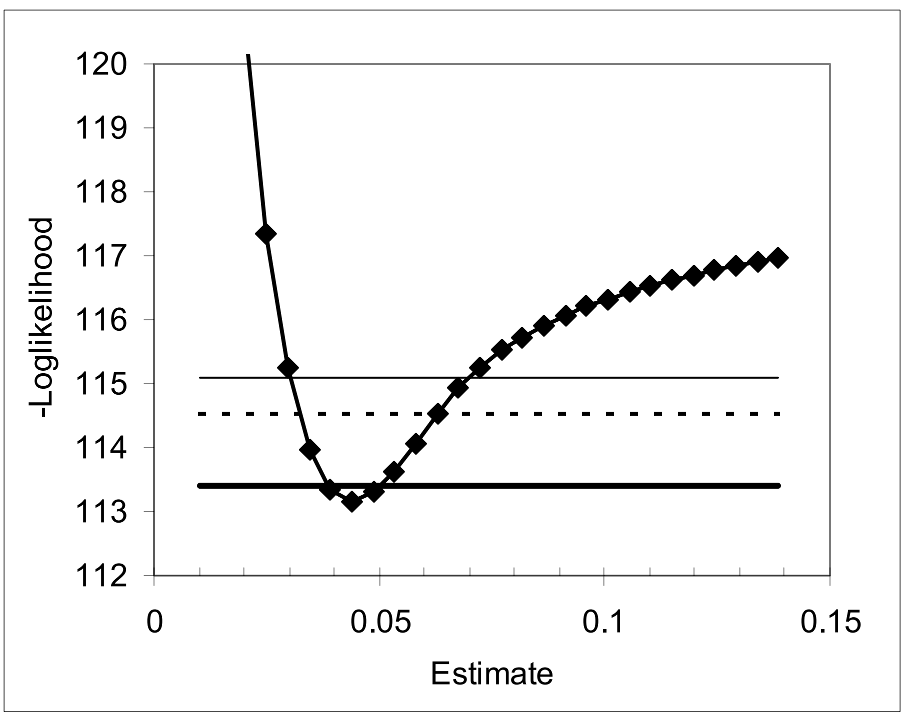



Figure C34. Likelihood profile analysis and asymptotic confidence intervals for dredge efficiency and initial density of surfclam in the JG04 depletion study (no indirect effects assumed, 130+ mm).



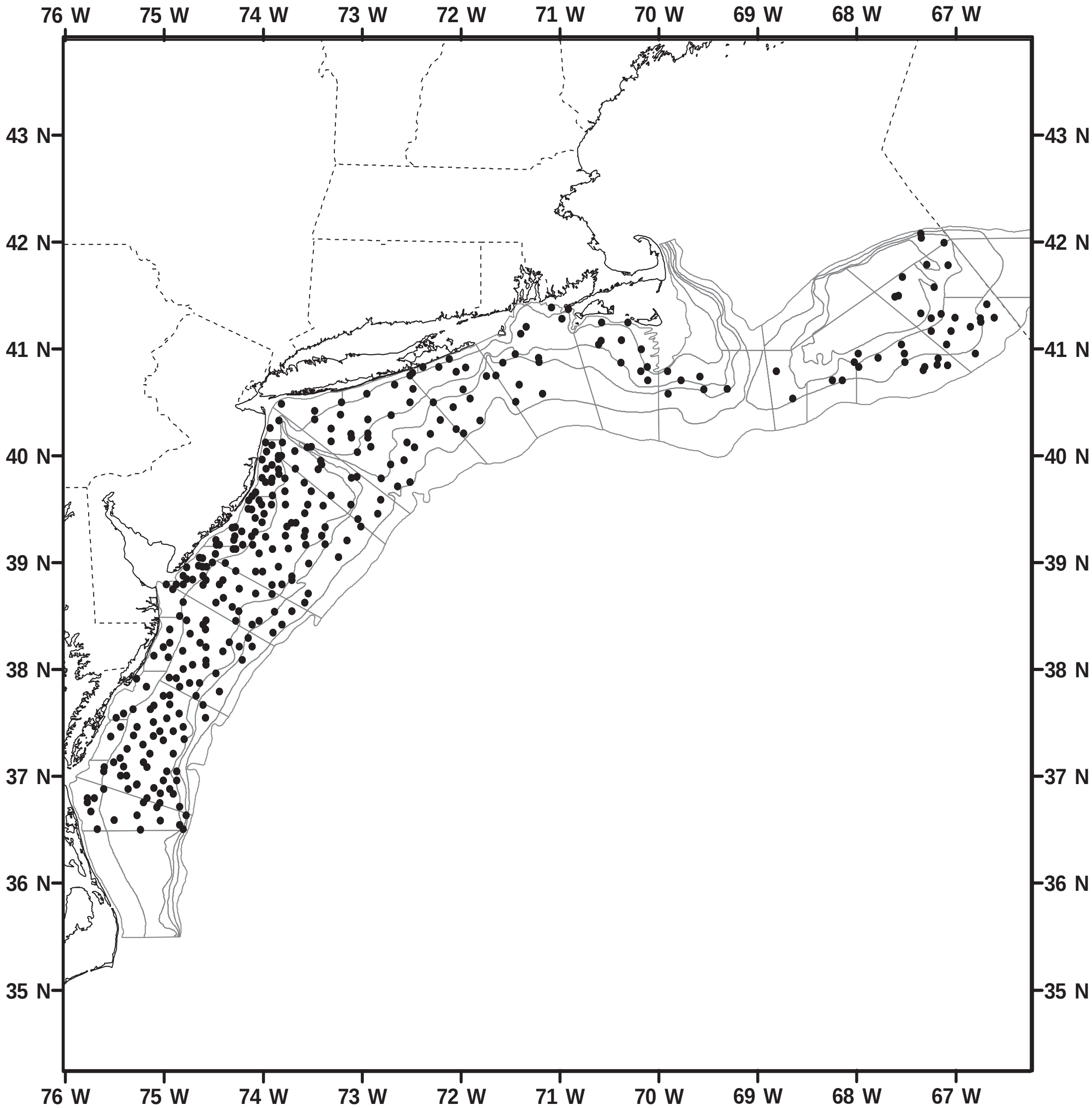



Figure C35.
Station locations from the 2002 NEFSC surfclam/ocean quahog survey.

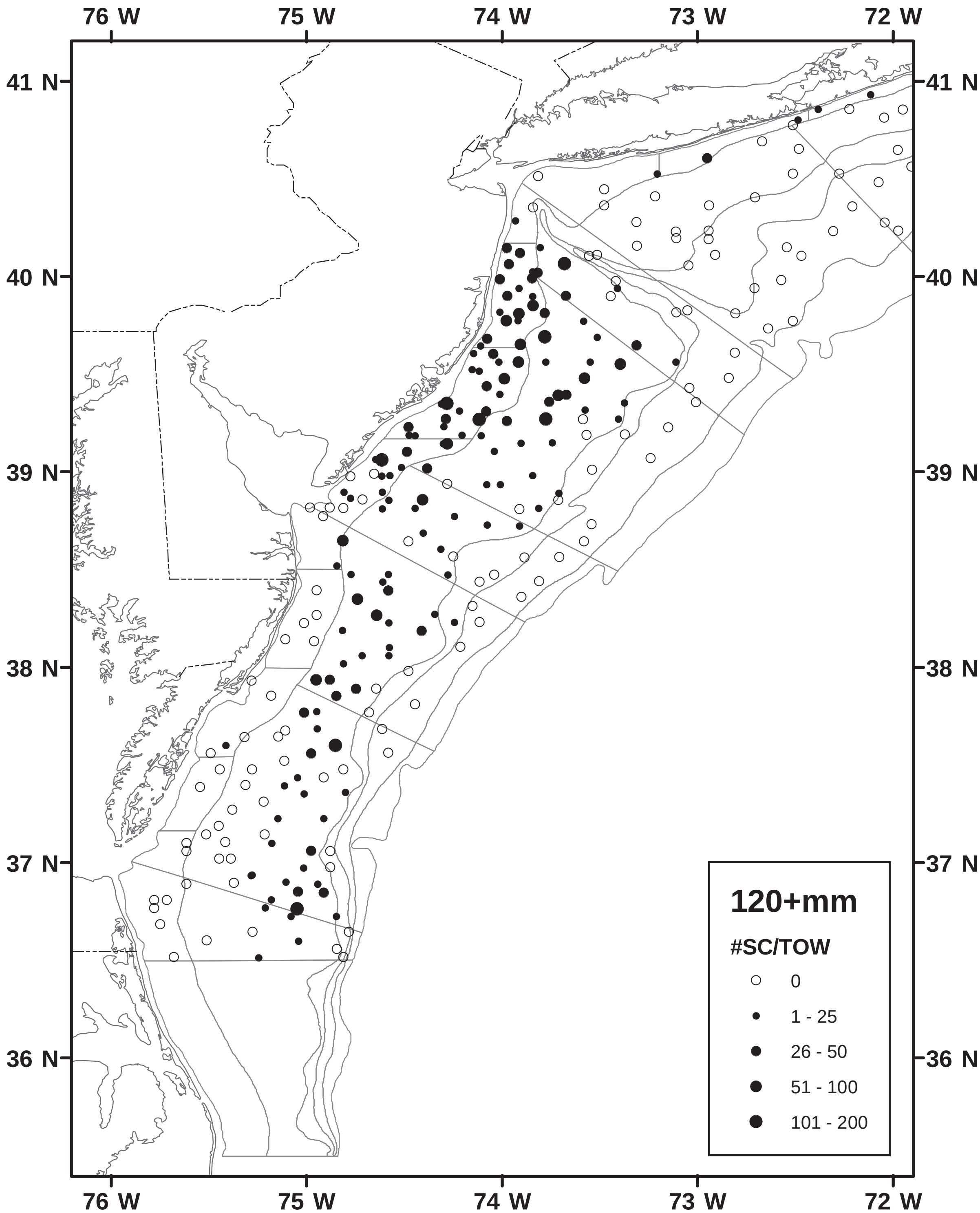



Figure C36.
Surfclam abundance per tow (>= 120mm) adjusted to 0.15 n. mi. tow distance with SSP sensor data, 2002 survey.

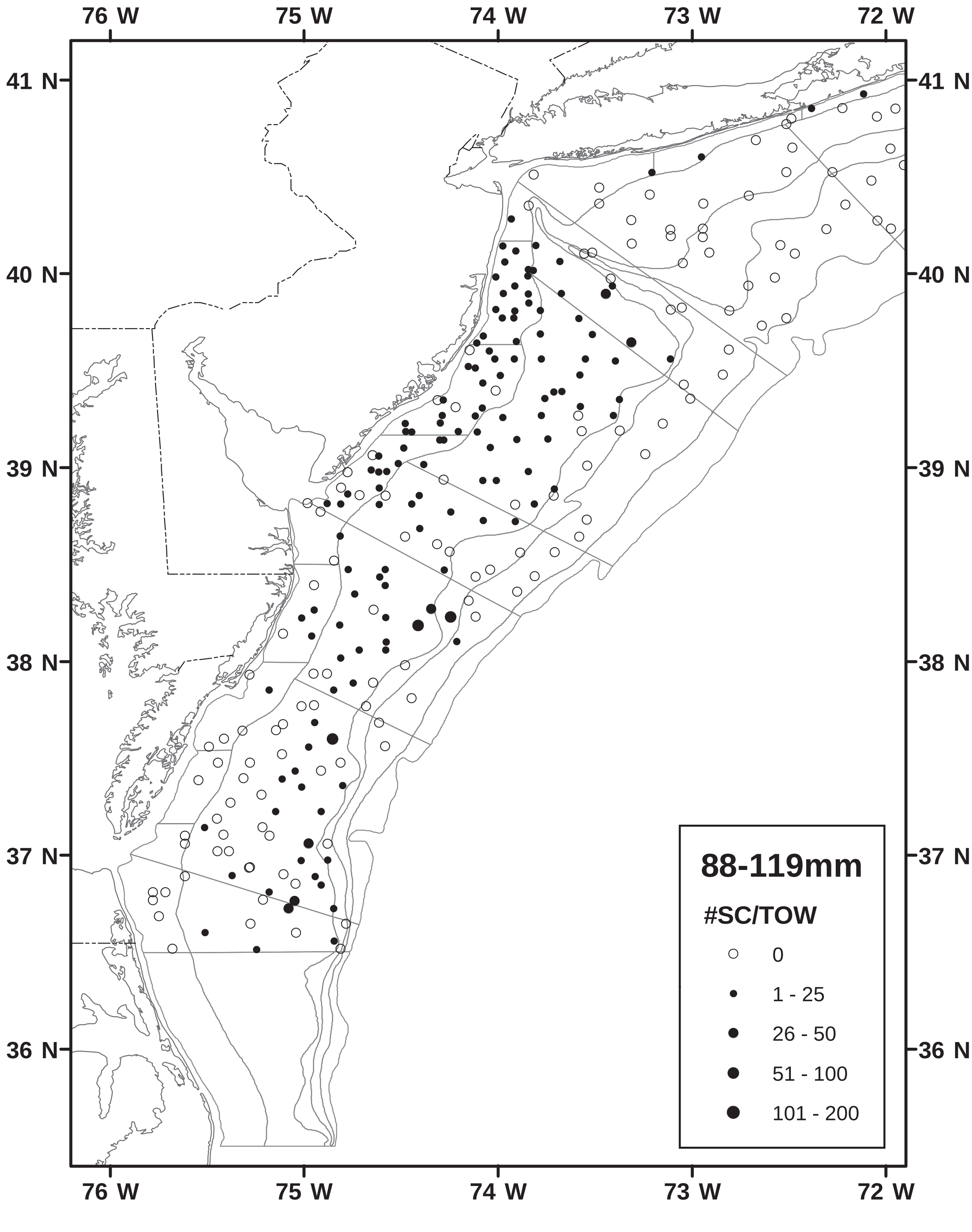



Figure C37.
Surfclam abundance per tow (88-119)mm) adjusted to 0.15 n. mi. tow distance with SSP sensor data, 2002 survey.

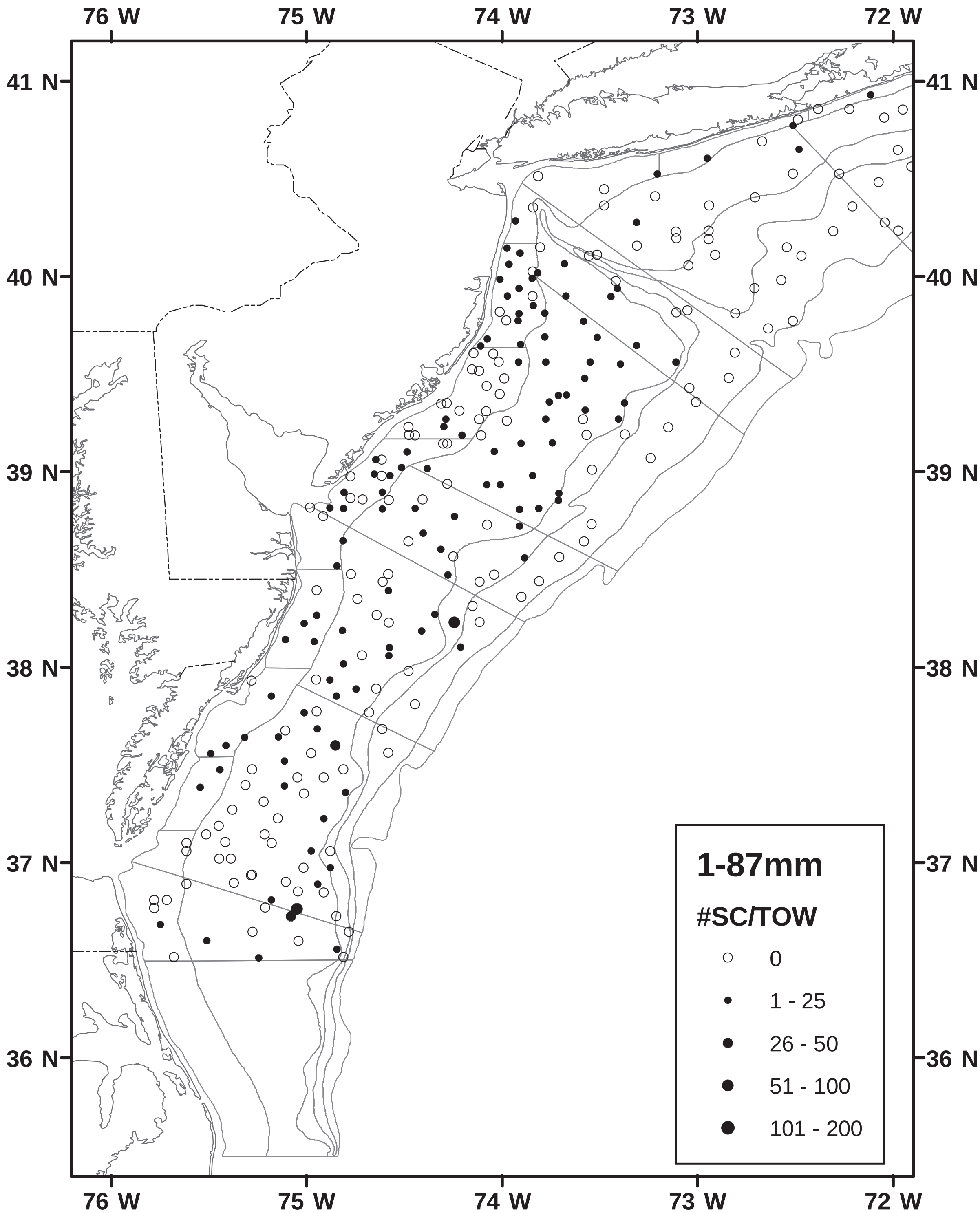



Figure C38.
Surfclam abundance per tow (1-87mm) adjusted to 0.15 n. mi. tow distance with SSP sensor data, 2002 survey.

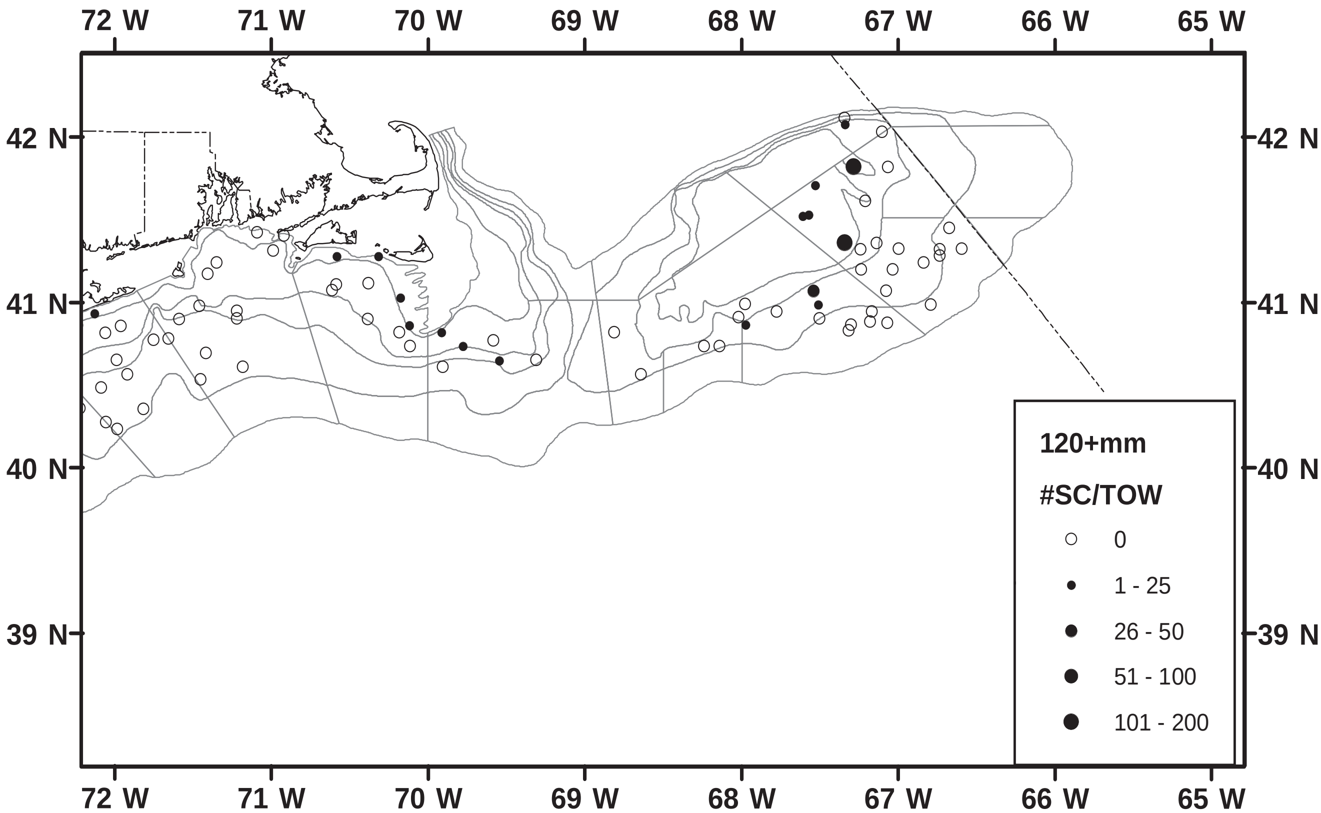



Figure C39.
Surfclam abundance per tow (>=120mm) adjusted to 0.15 n. mi. tow distance with SSP sensor data, 2002 survey.

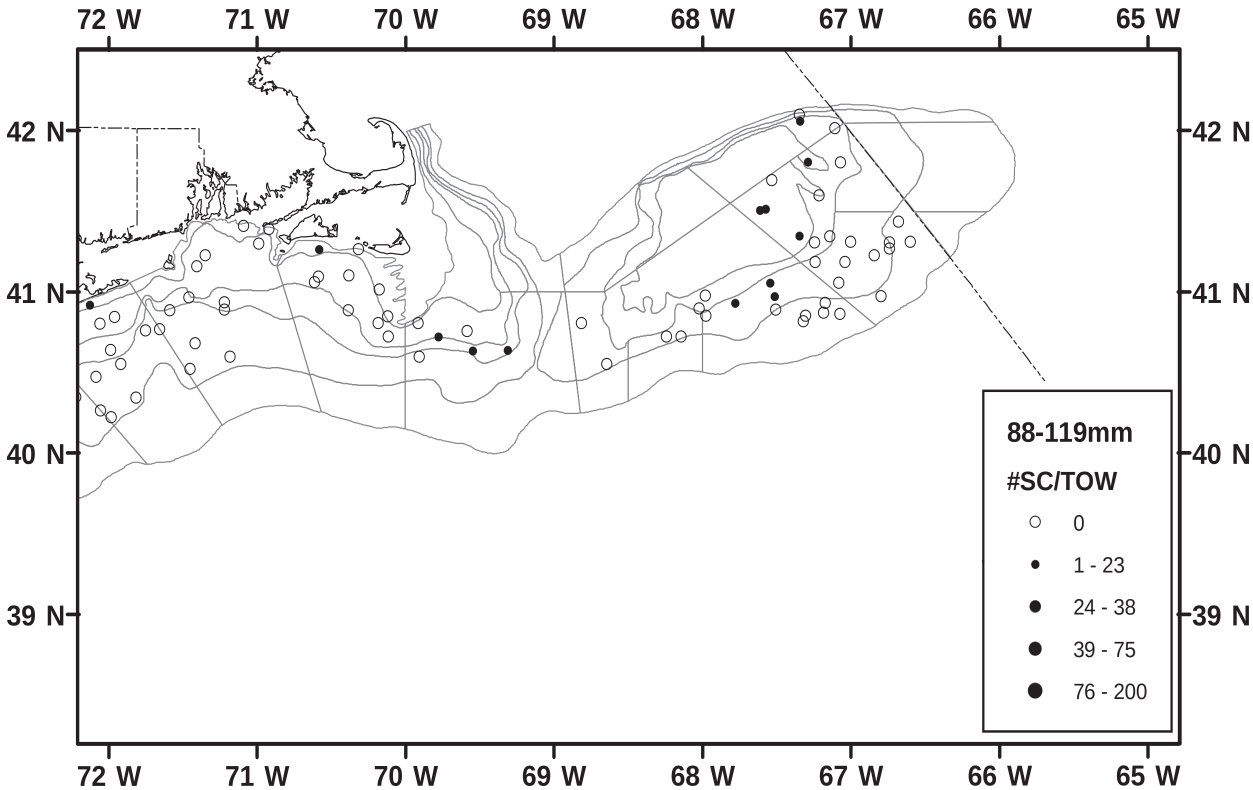



Figure C40.
Surfclam abundance per tow (88-119 mm) adjusted to 0.15 n. mi. tow distance with SSP sensor data, 2002 survey.

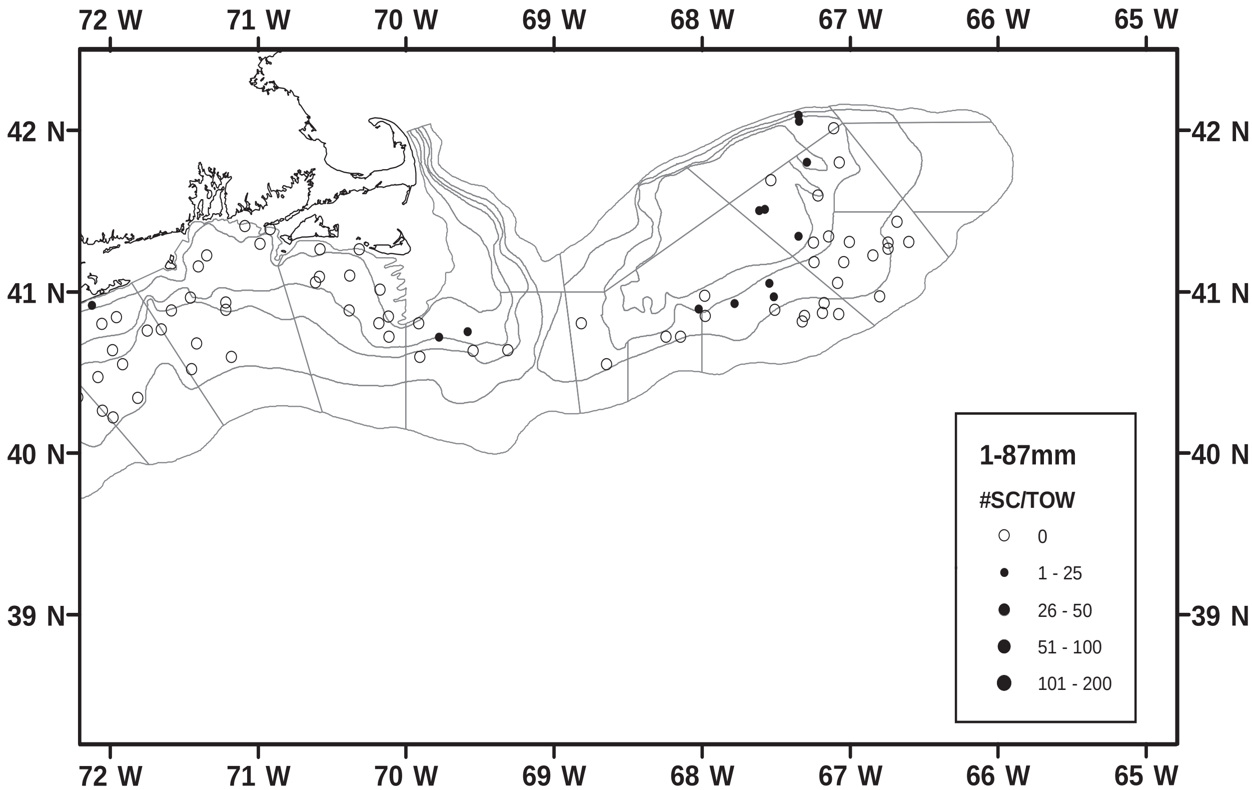



Figure C41.
Surfclam abundance per tow (1-87 mm) adjusted to 0.15 n. mi. tow distance with SSP sensor data, 2002 survey.

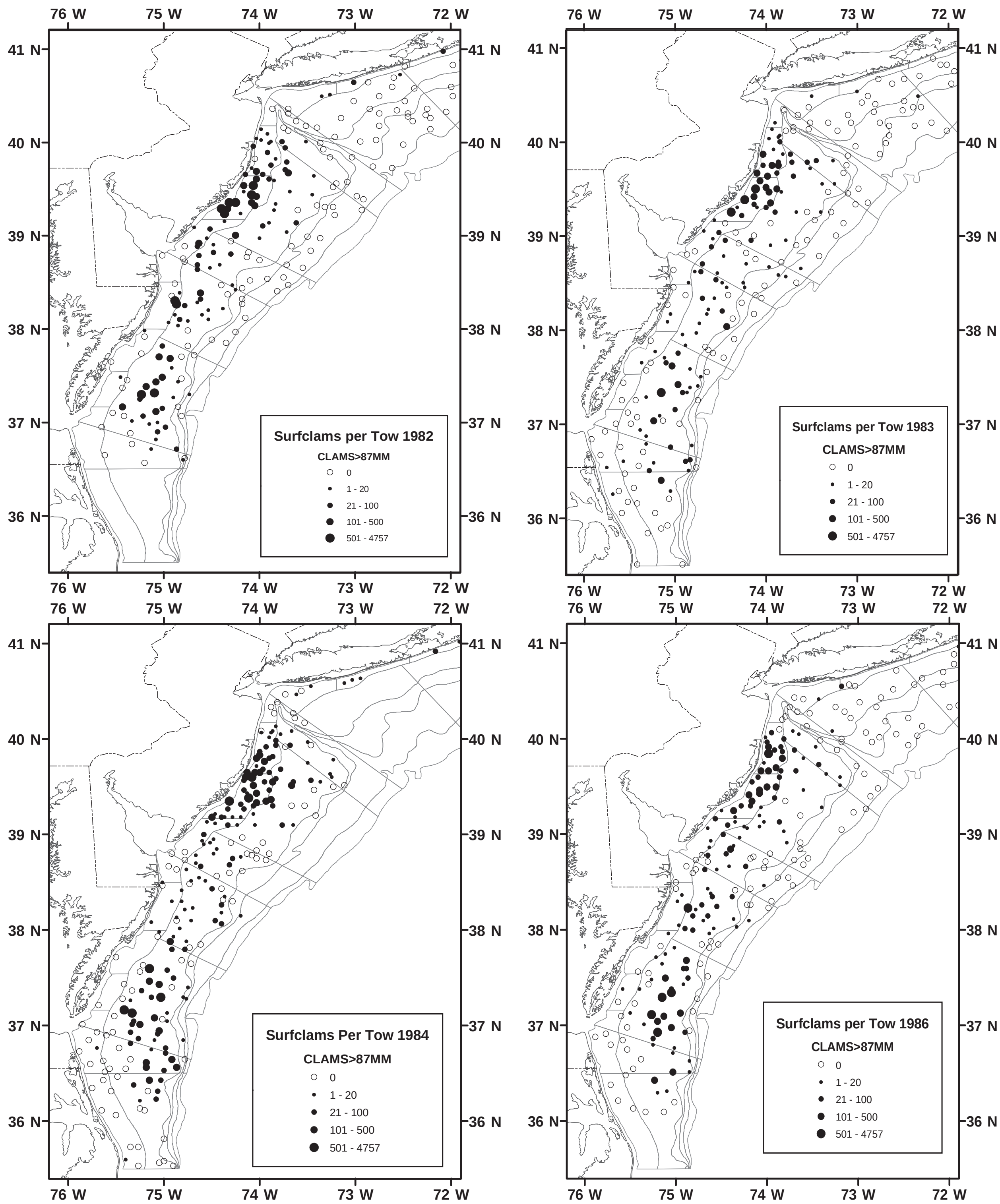



Figure C42.
Number of surfclams (88mm+), by station, in NMFS clam surveys, 1982-1986. Catch was not adjusted for distance. Only includes random stations without gear problems.

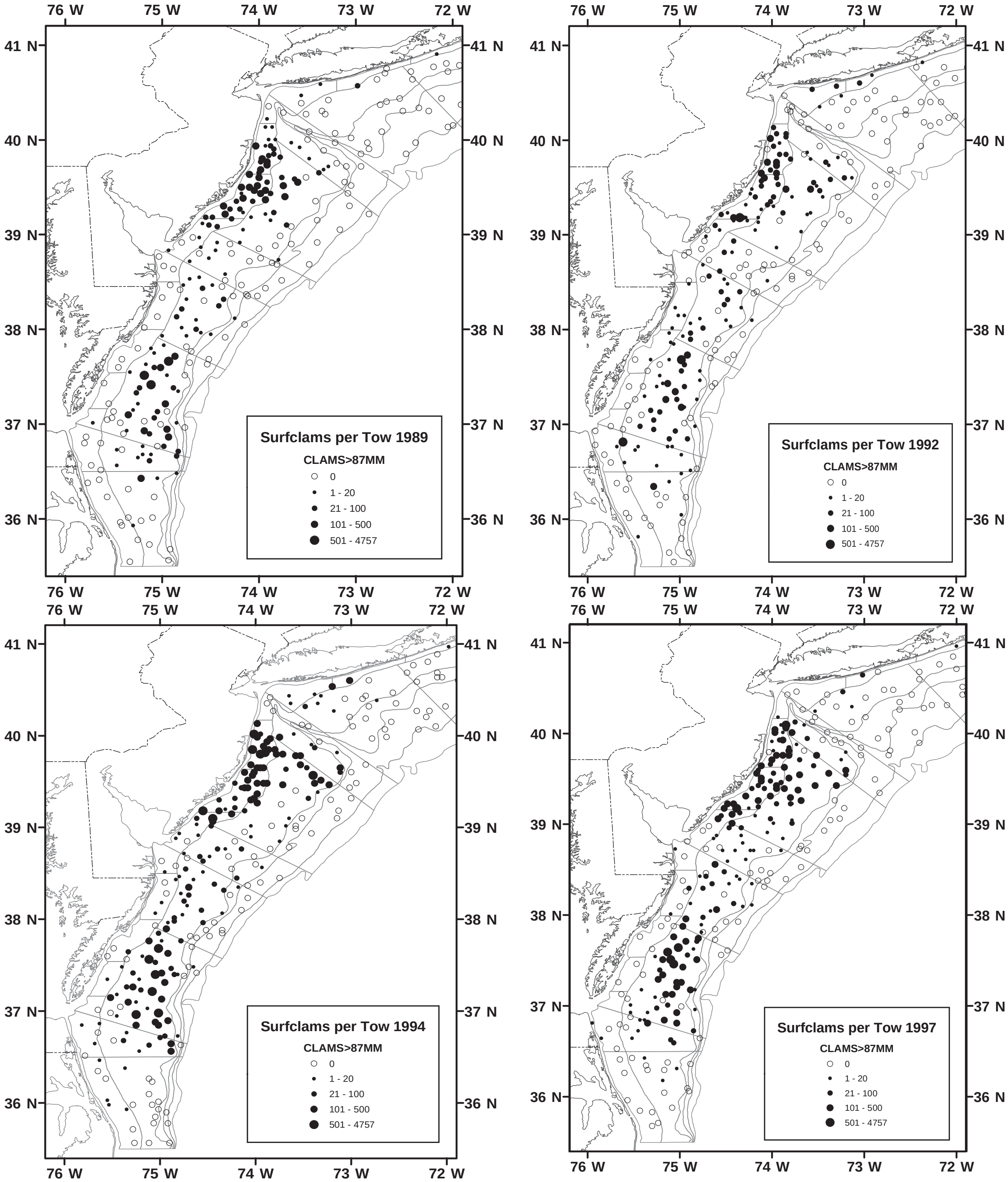



Figure C43.
Number of surfclams (88mm+), by station, in NMFS clam surveys, 1989-1997. Catch was not adjusted for distance. Only includes random stations without gear problems.

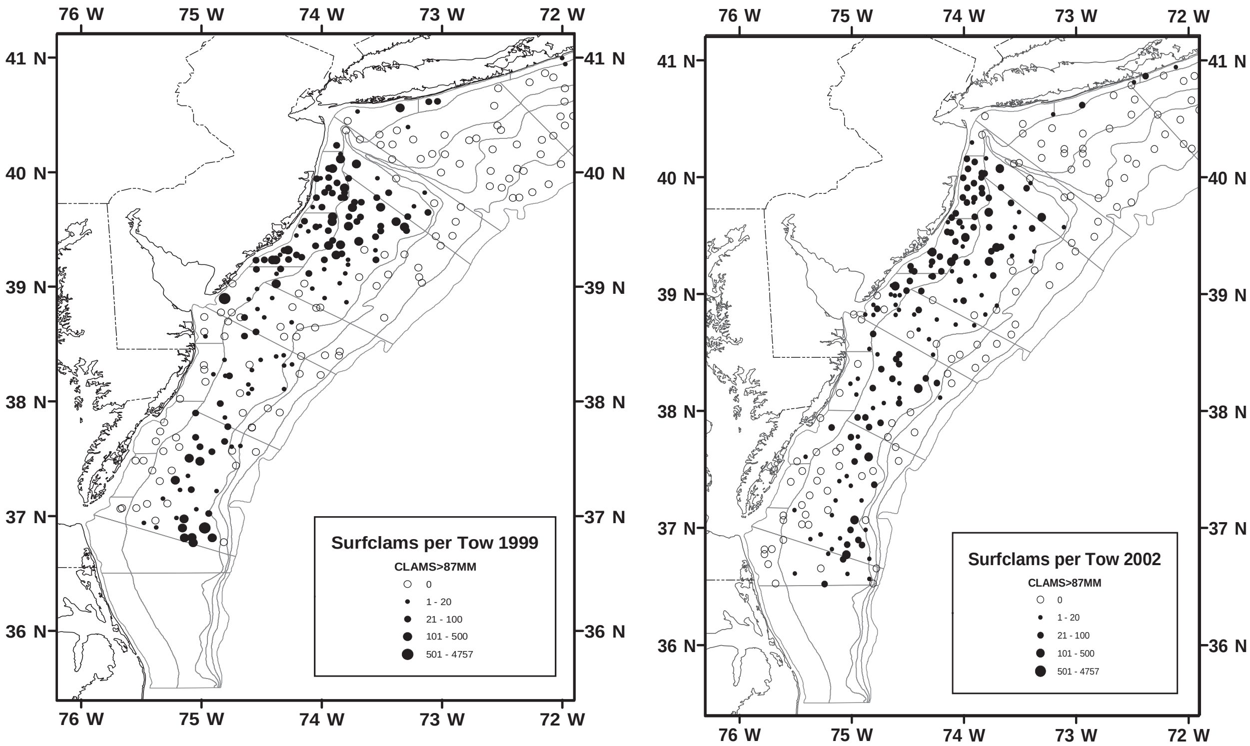



Figure C44.
Number of surfclams (88mm+), by station, in NMFS clam surveys, 1999-2002. Catch was not adjusted for distance. Only includes random stations without gear problems.

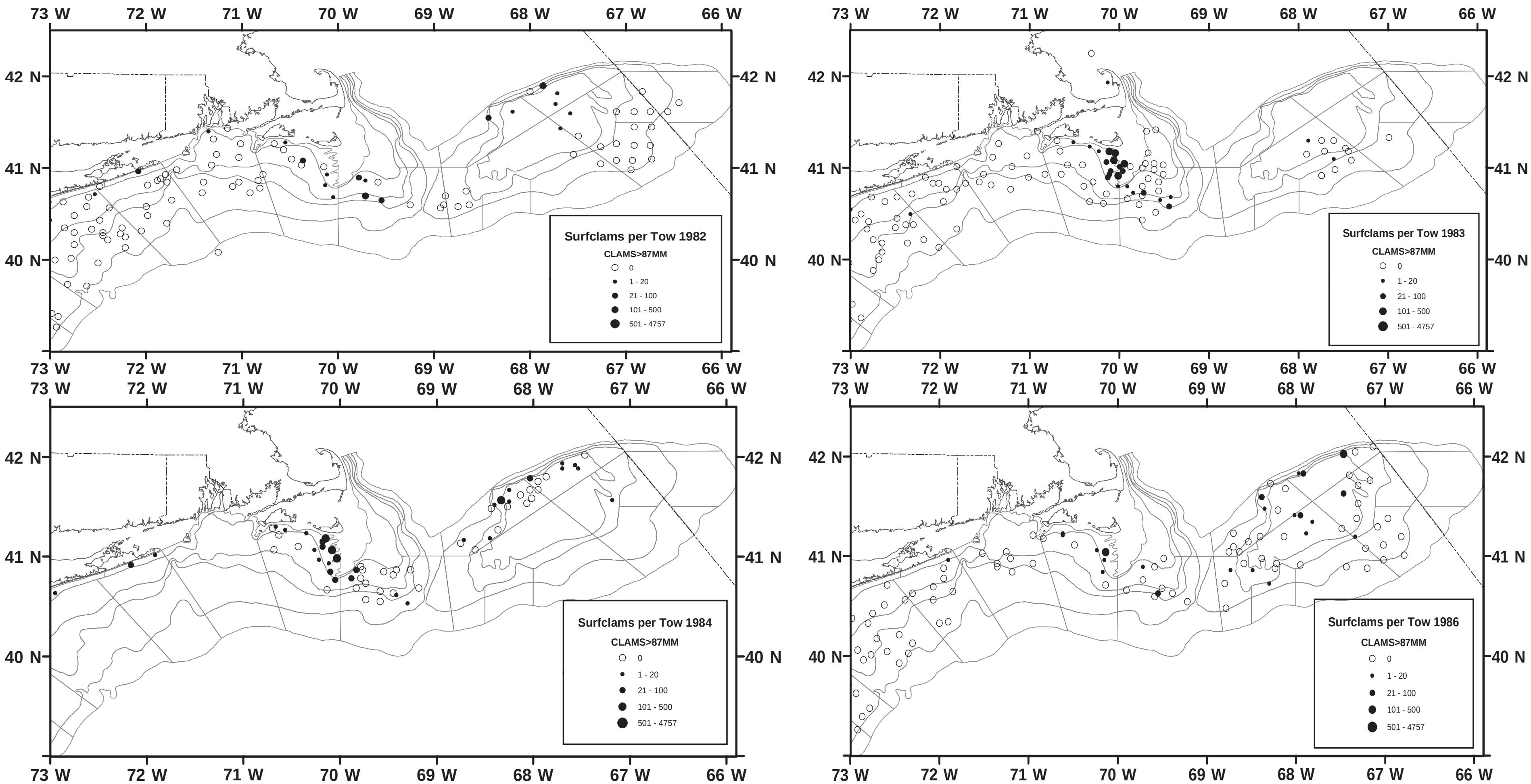



Figure C45.
Number of surfclams (88mm+), by station, in NMFS clam surveys, 1982-1986. Catch was not adjusted for distance. Only includes random stations without gear problems.

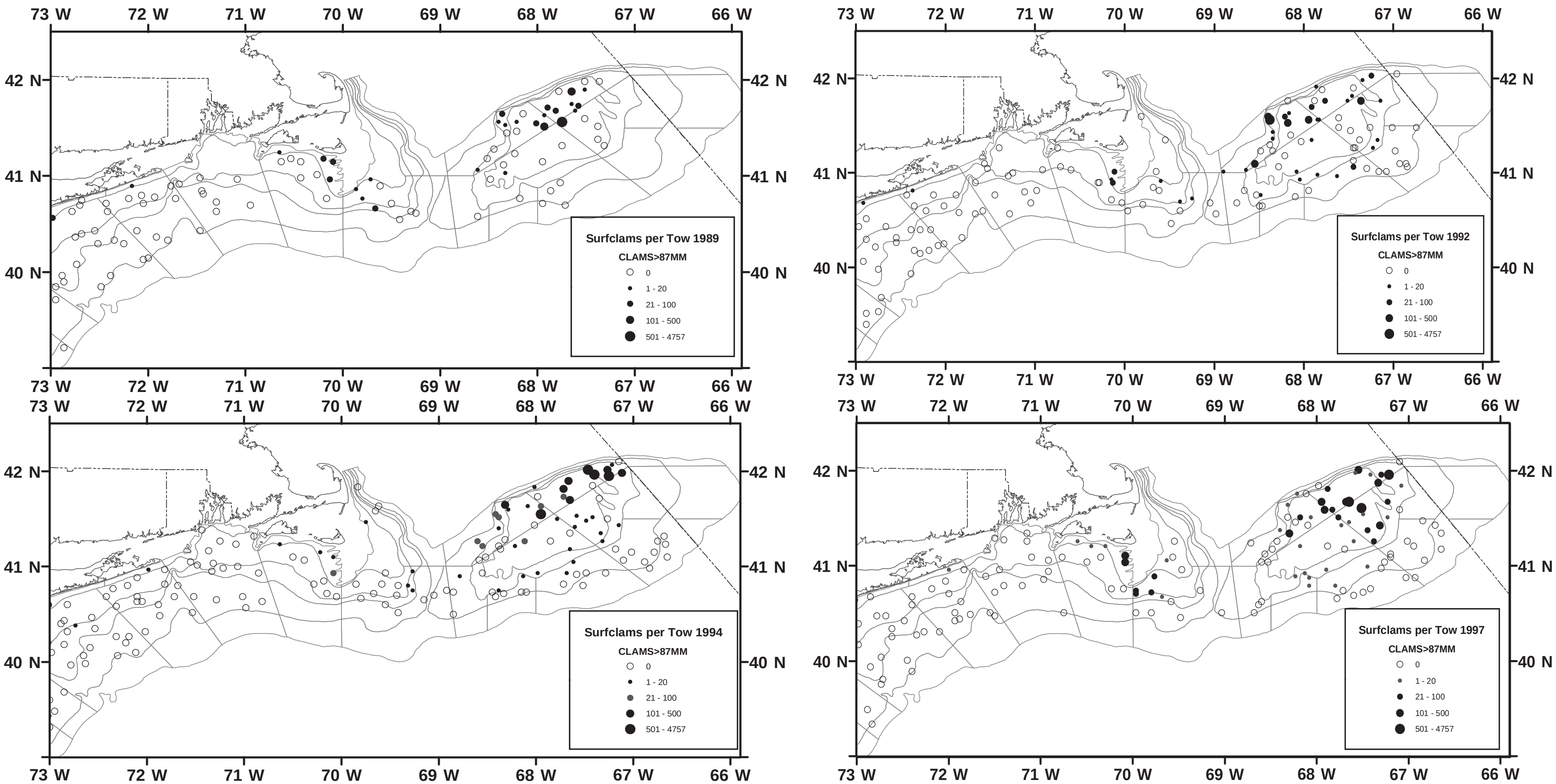



Figure C46.
Number of surfclams (88mm+), by station, in NMFS clam surveys, 1989-1997. Catch was not adjusted for distance. Only includes random stations without gear problems.

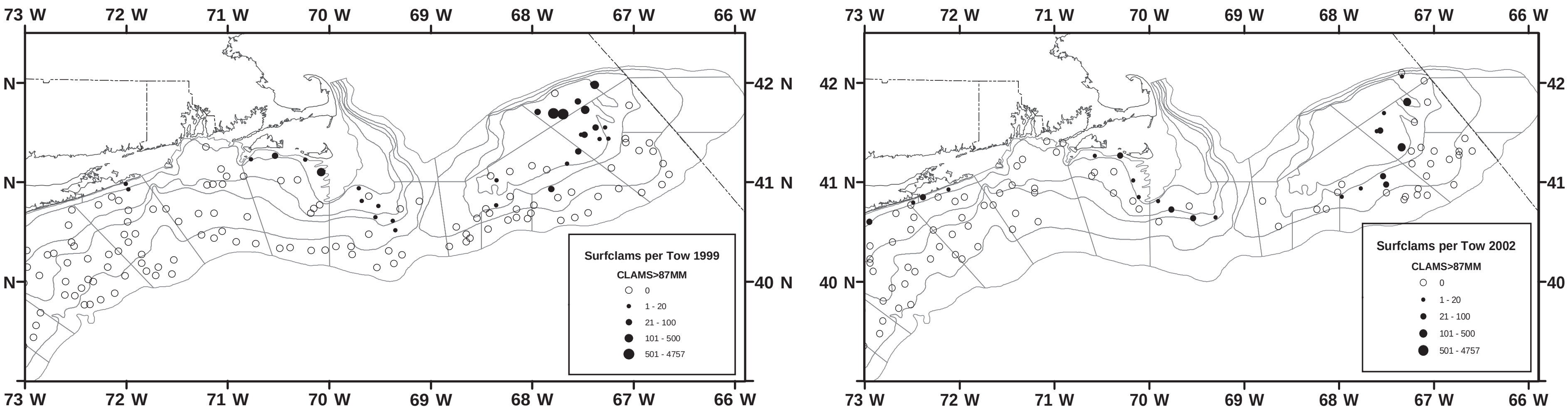



Figure C47.
Number of surfclams (88mm+), by station, in NMFS clam surveys, 1999-2002. Catch was not adjusted for distance. Only includes random stations without gear problems.

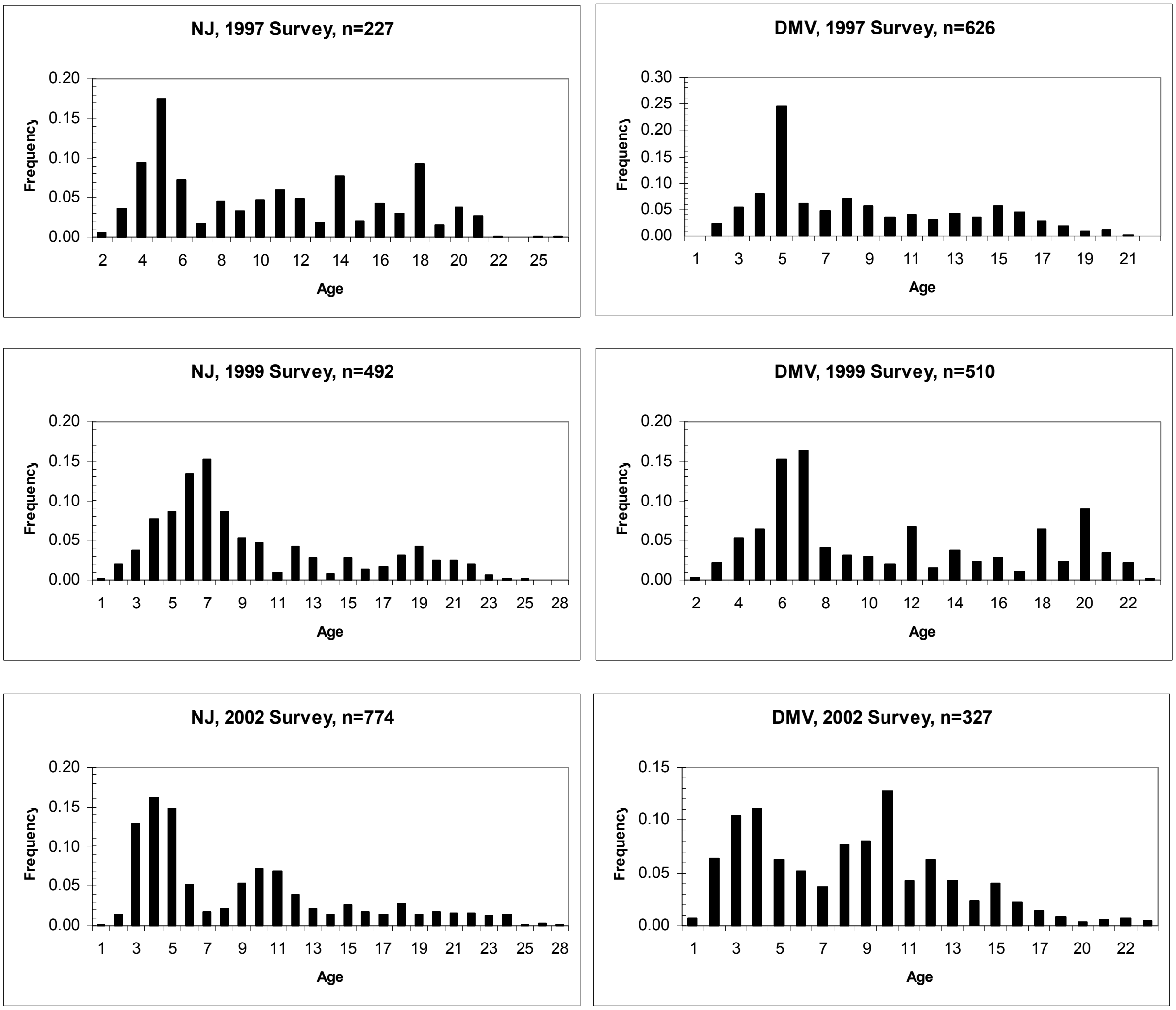
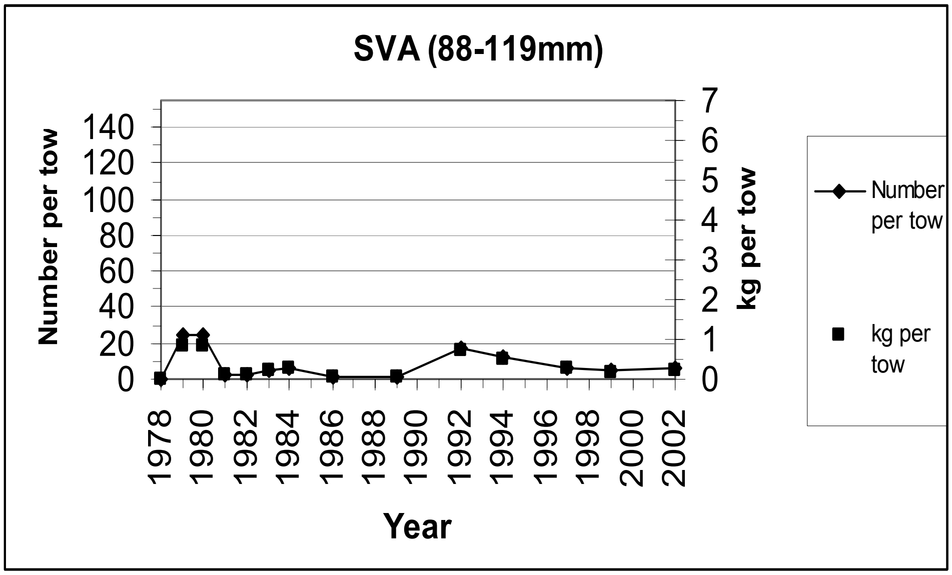



Figure C48.
Age-structure of surfclams in the New Jersey (NJ) and Delmarva (DMV) regions, by year. Results are based on NMFS survey data on surfcalm shell length and age. “n”= number of surfclams that were aged and used to estimate an age-length key.



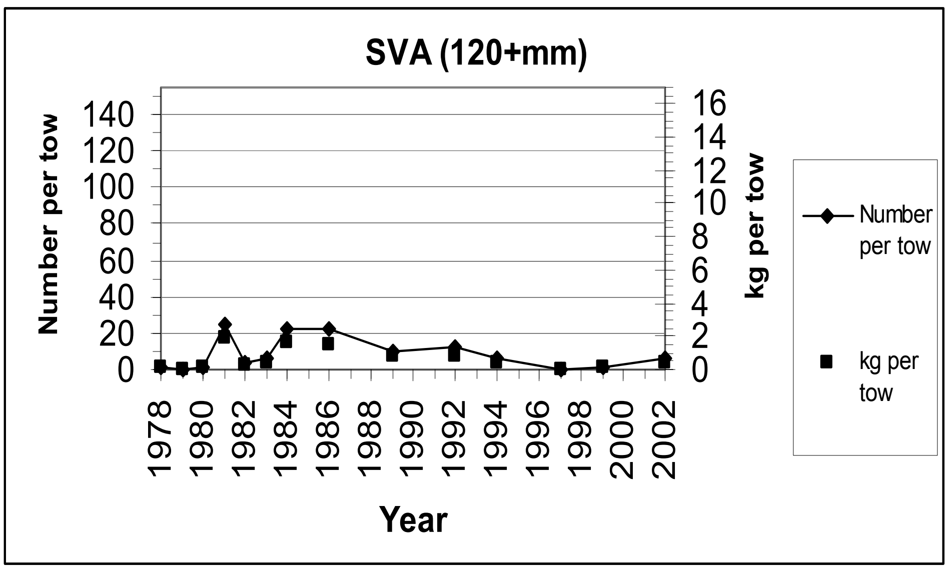




Figure C49.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: S. Virginia/N. Carolina (SVA).

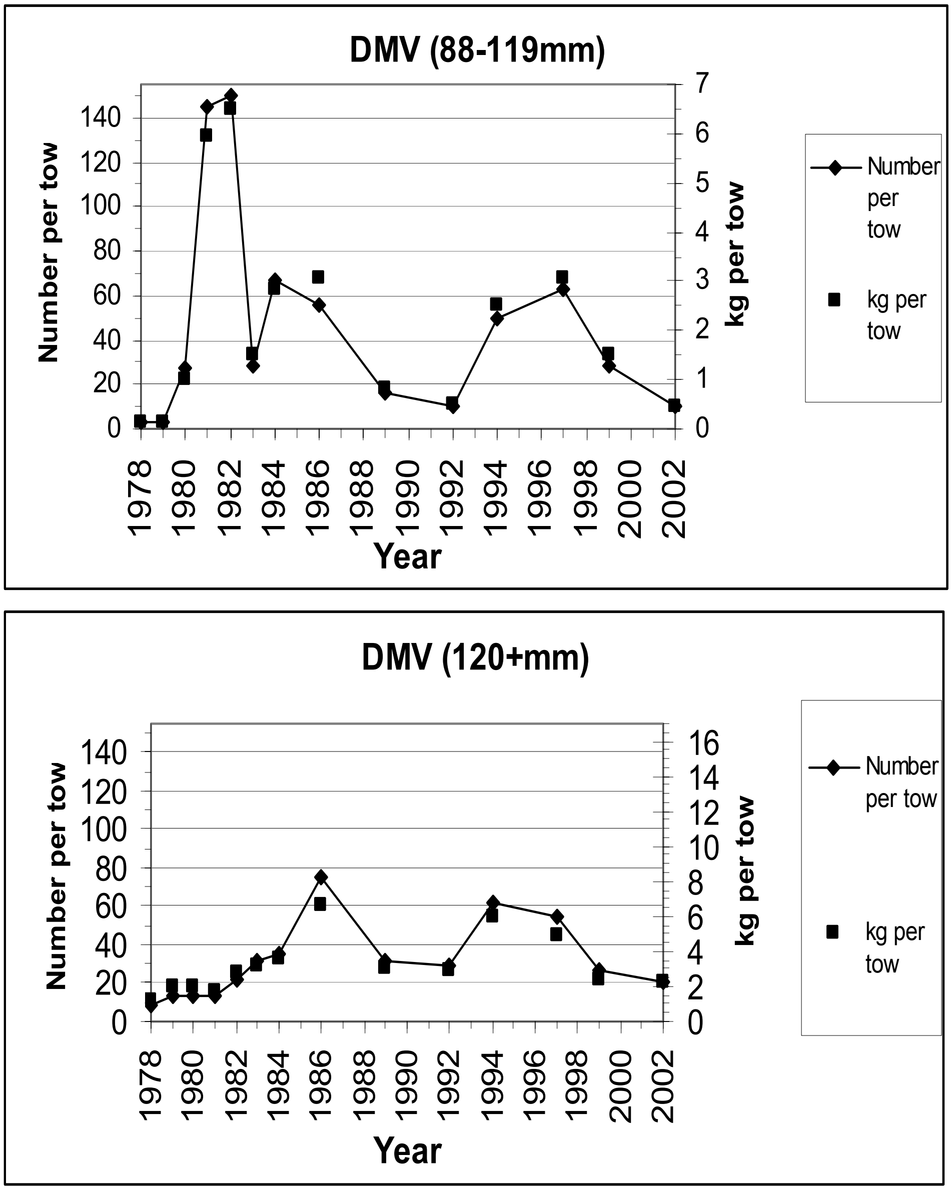
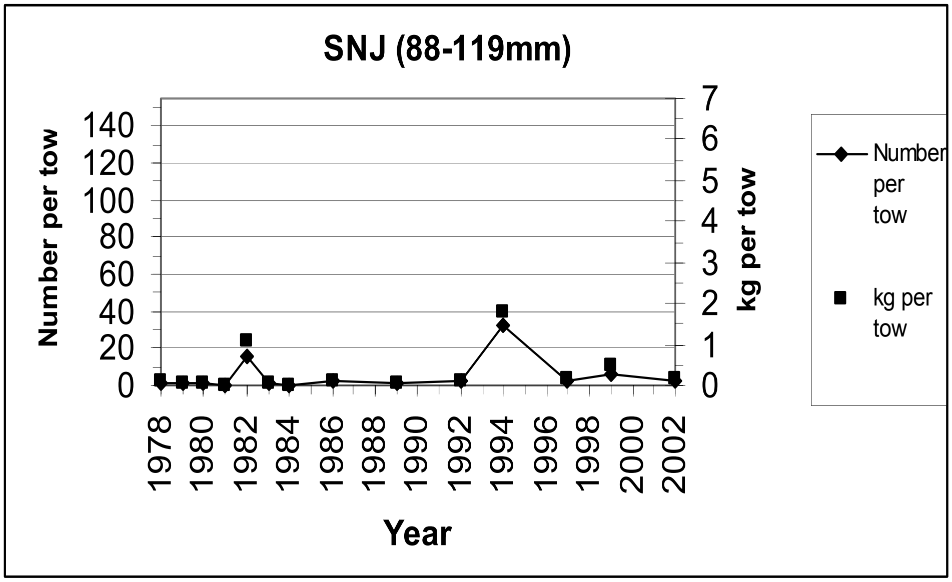



Figure C50.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: Delmarva (DMV).



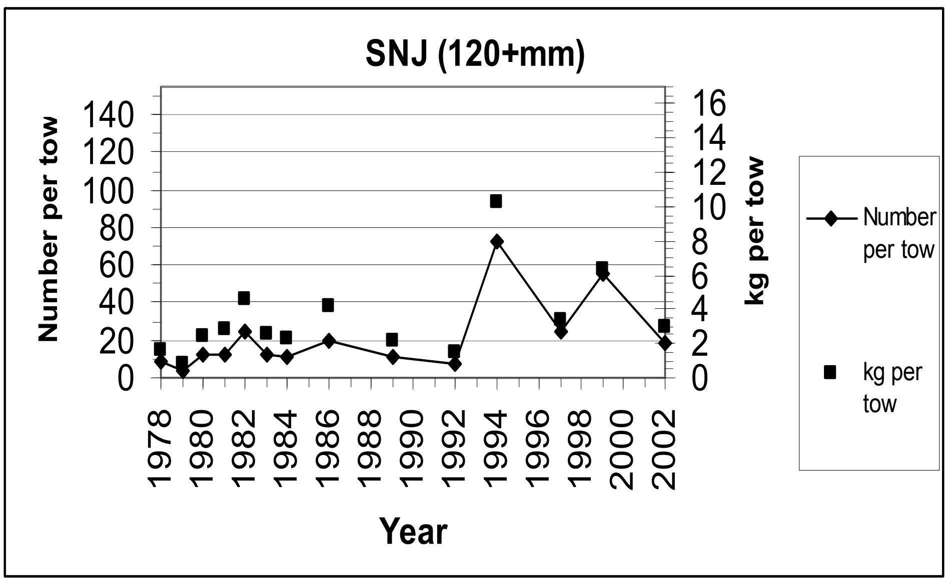
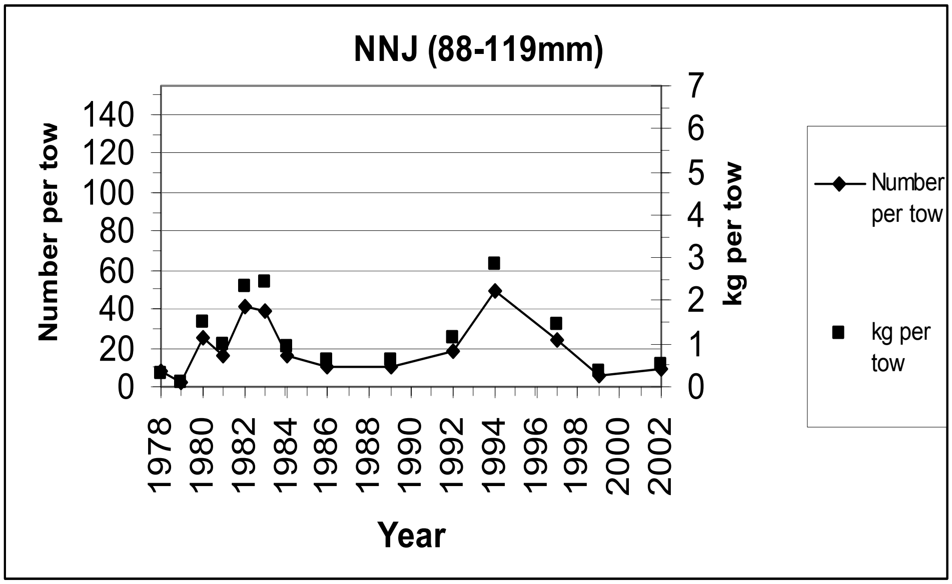




Figure C51.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: S. New Jersey (SNJ).



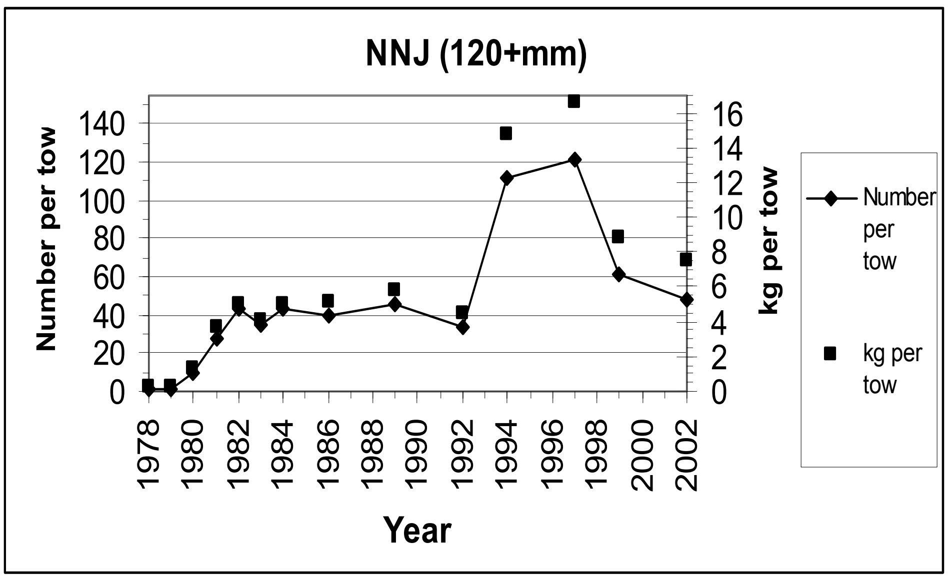
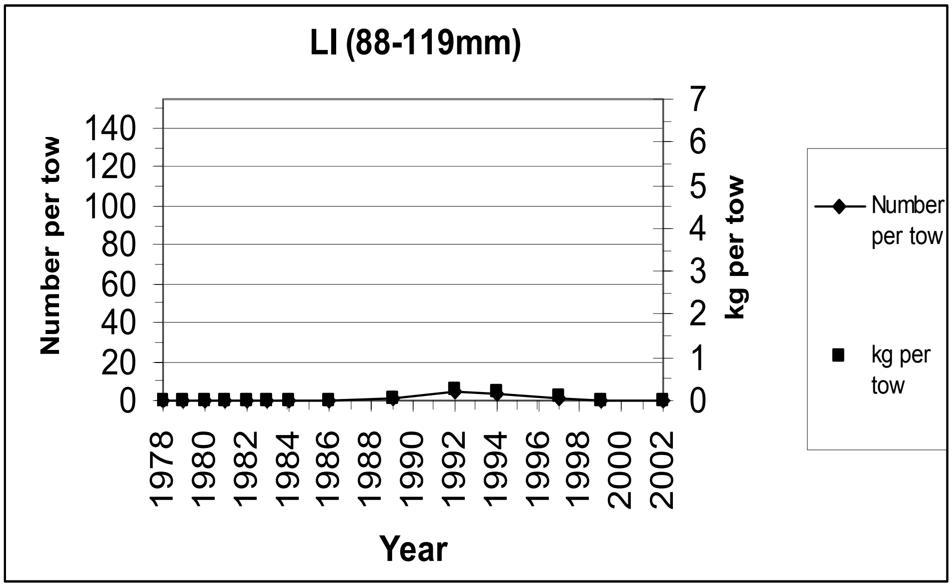




Figure C52.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: N. New Jersey (NNJ).



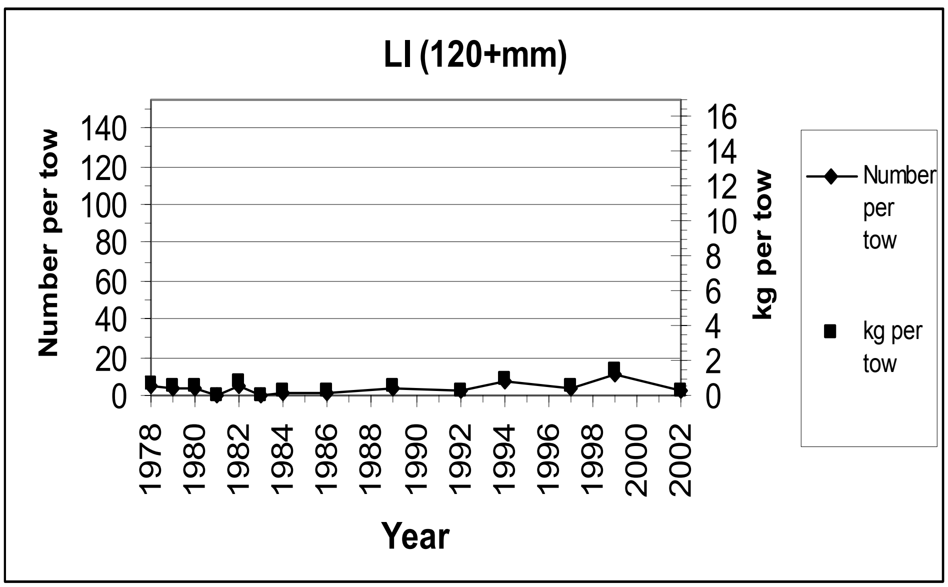
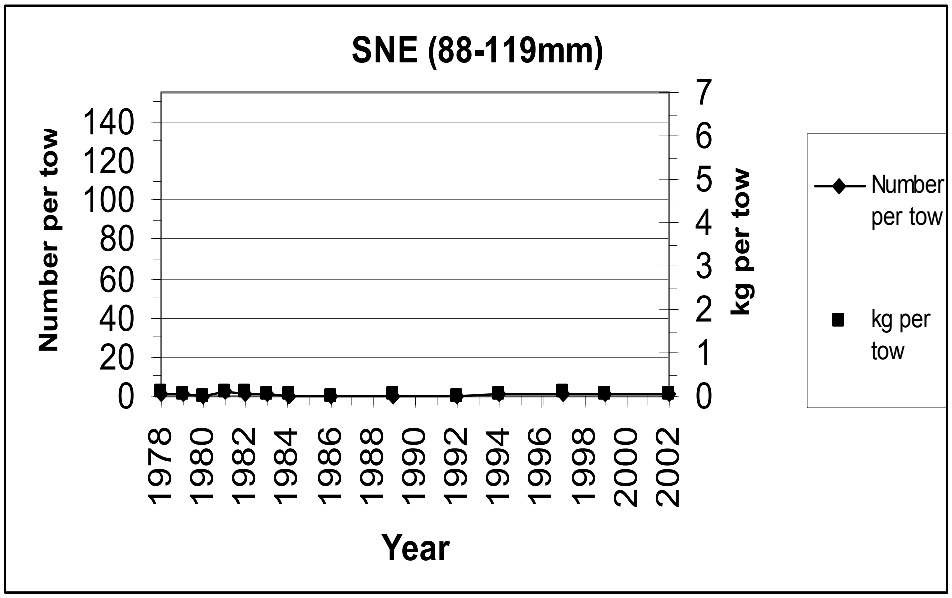




Figure C53.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: Long Island (LI).



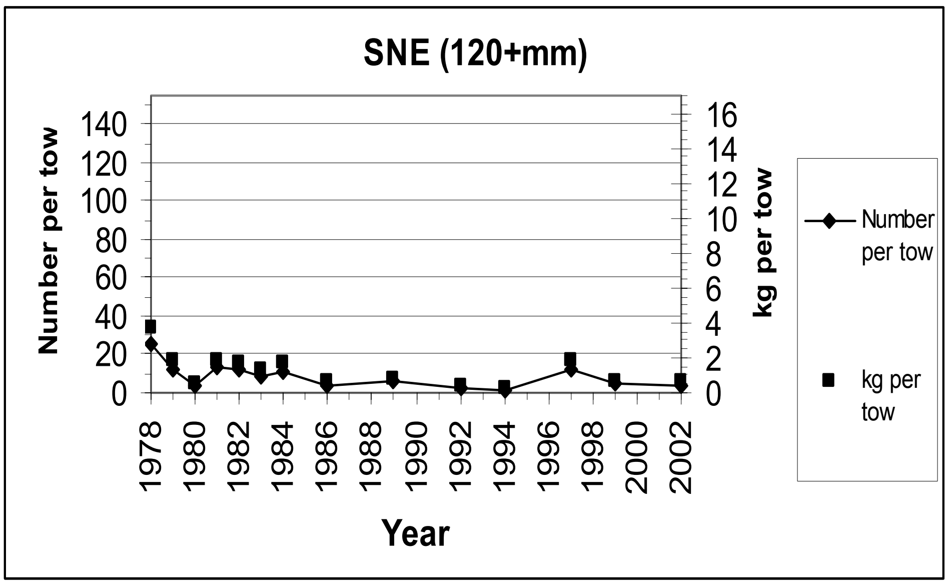
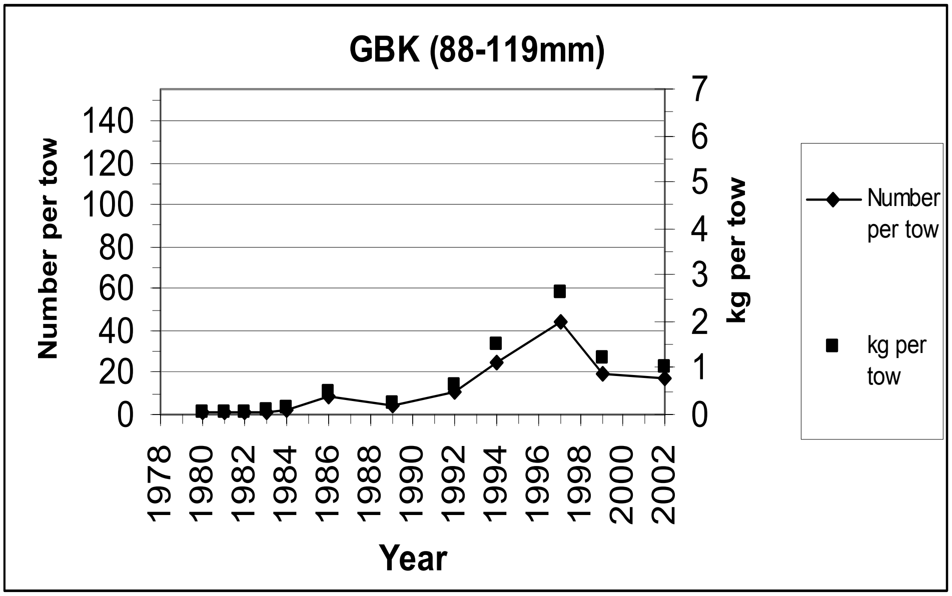




Figure C54.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: S. New England (SNE).



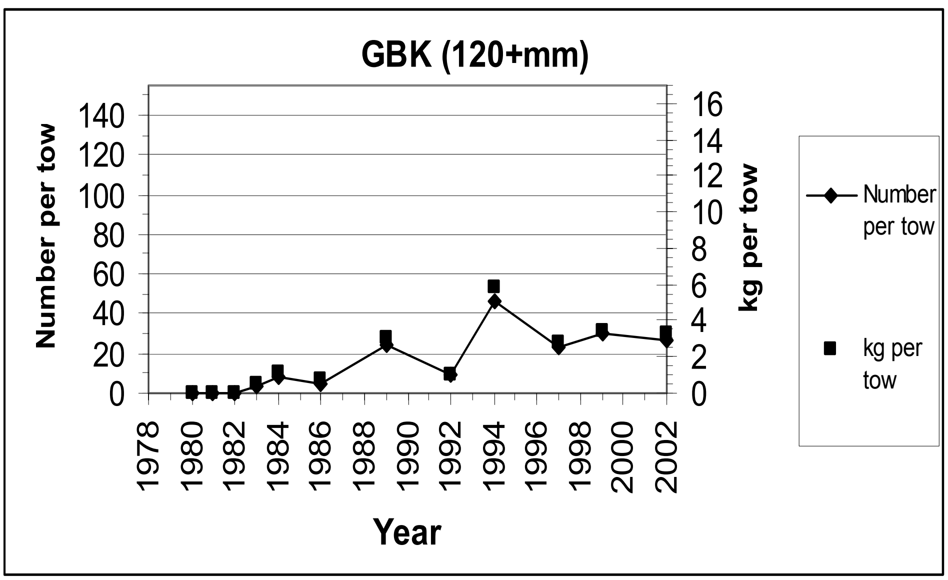




Figure C55.
Number and meat weight (kg) of surfclams per tow for NMFS surveys, 1978-2002. Data are presented for two size groups. Standardized to a tow distance of 0.15 n. mi. based on doppler distance, and assuming length/weights from Sarc-30 (NEFSC, 2000a).
Region: Georges Bank (GBK).

Figure C56. Parametric bootstrap distributions (8000 iterations) depicting uncertainty in efficiency corrected swept area biomass estimates for surfclam during 2002. Biomass (1000 mt) is for 120+ mm surfclam in NNJ and SNJ and for 100+ mm surfclam in other regions.

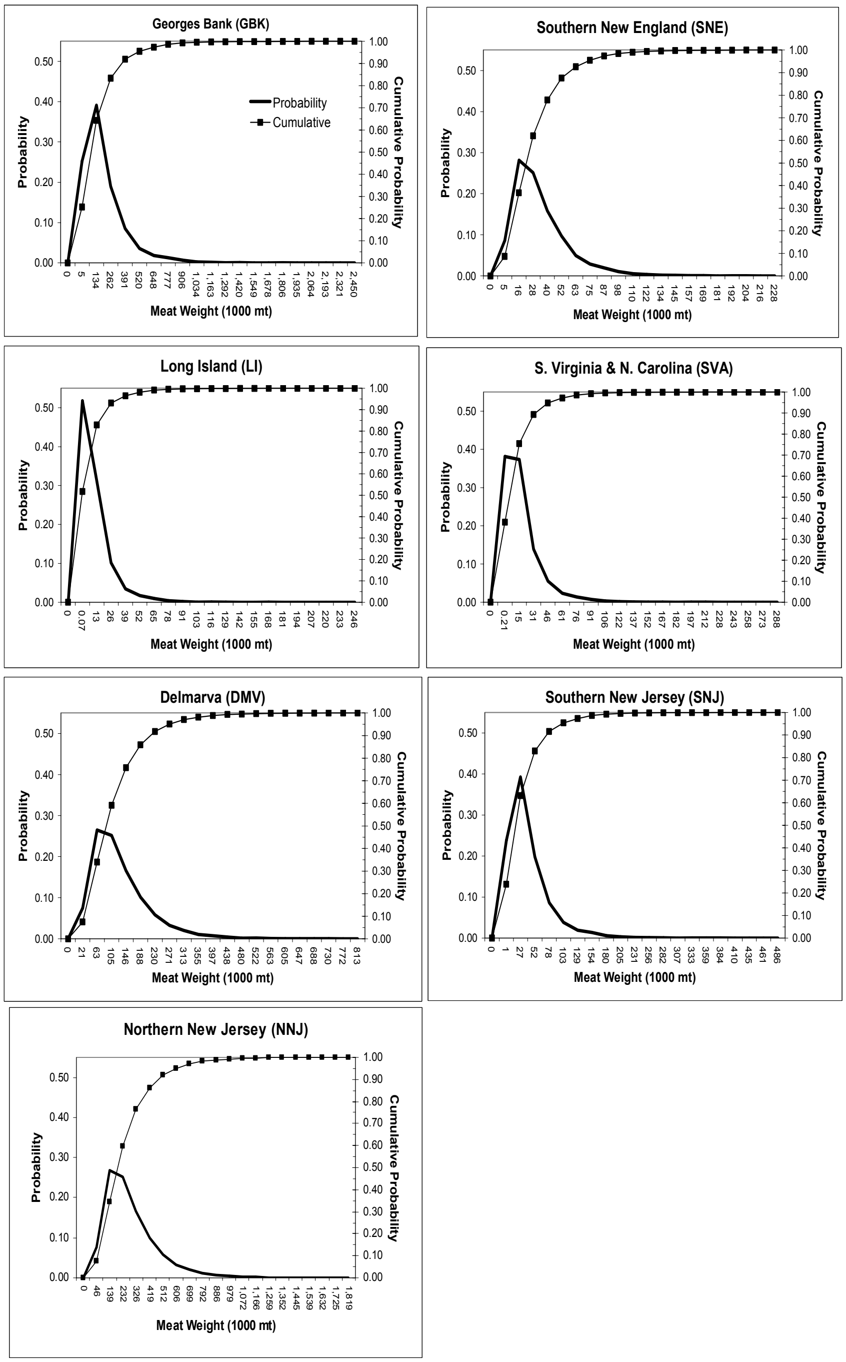


Figure C57. Summary of KLAMZ model results for DMV surfclam.

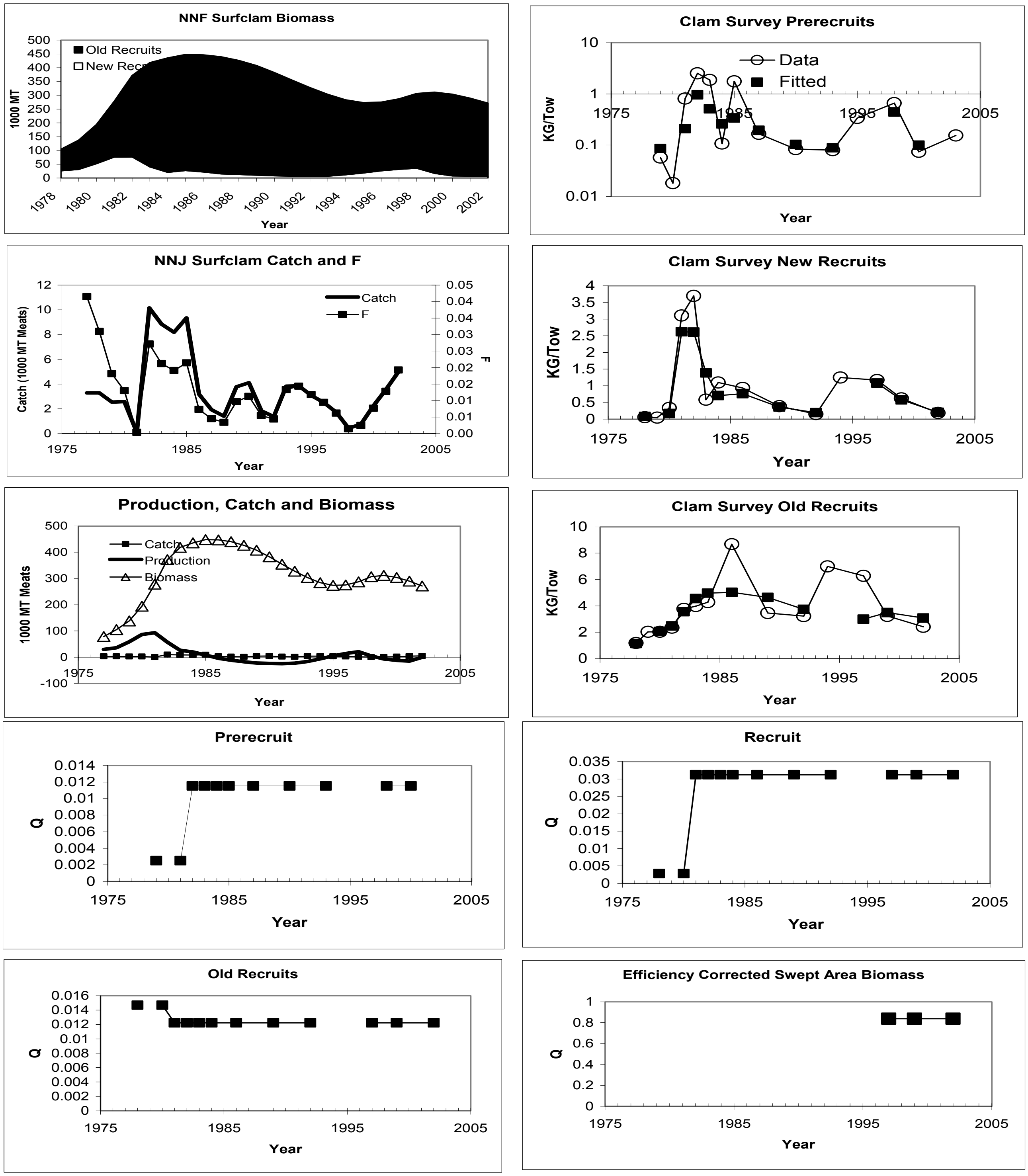


Figure C58. Biomass estimates and 80% bootstrap confidence intervals for DMV surfclam.

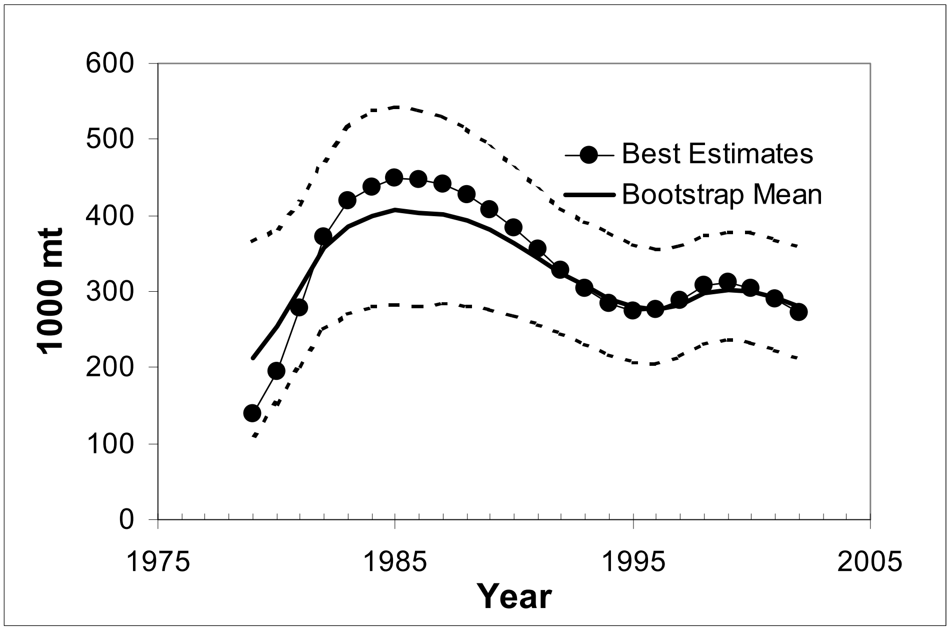



Figure C59. Retrospective analysis for DMV surfclam biomass estimates.

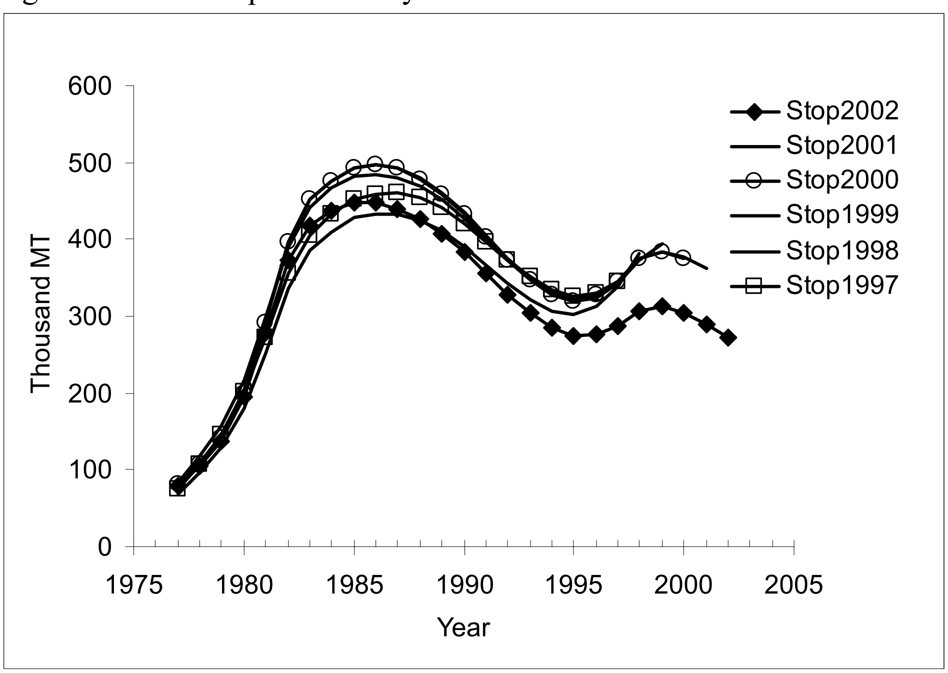


Figure C60. Sensitivity of DMV biomass estimates to recruitment assumptions.

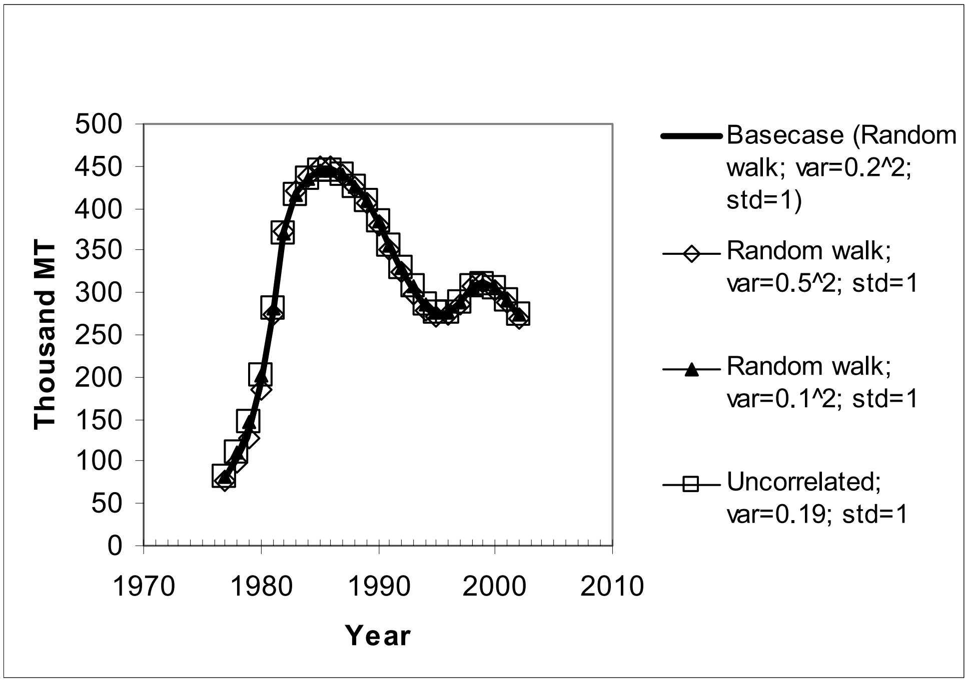



Figure C61. Sensitivity of DMV recruitment estimates to recruitment assumptions.

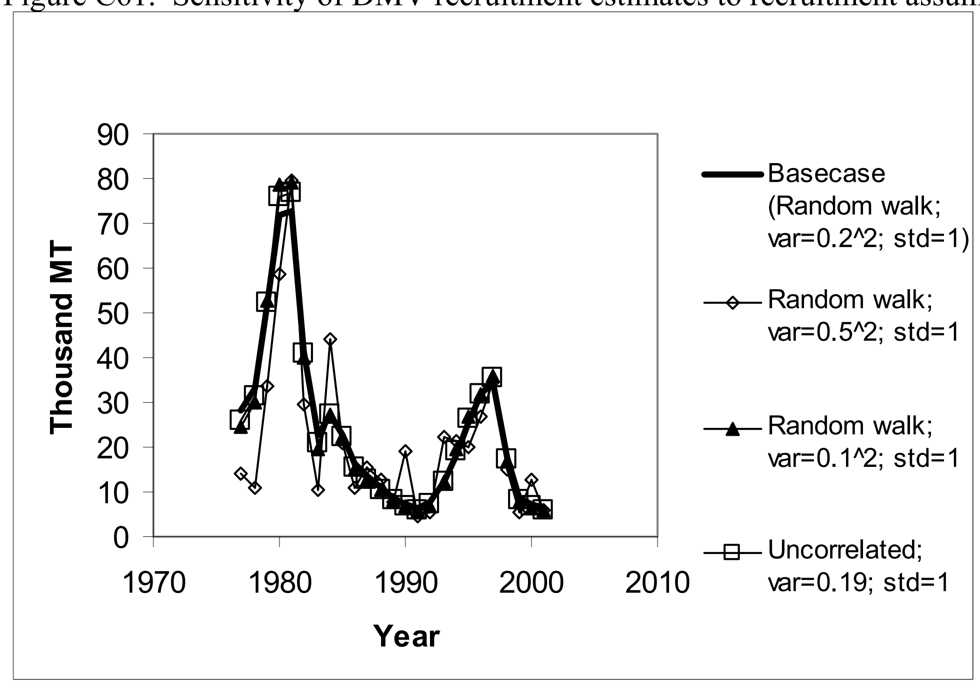


Figure C62. Survey data, efficiency corrected swept area biomass estimates used as data, biomass and recruitment estimates for Delmarva (DMV) surfclam from the KLAMZ model used in this assessment (and in the previous assessment (NEFSC 2000a). Y-axes are not labeled for pre-, new- and old recruit data because only the trends are important.

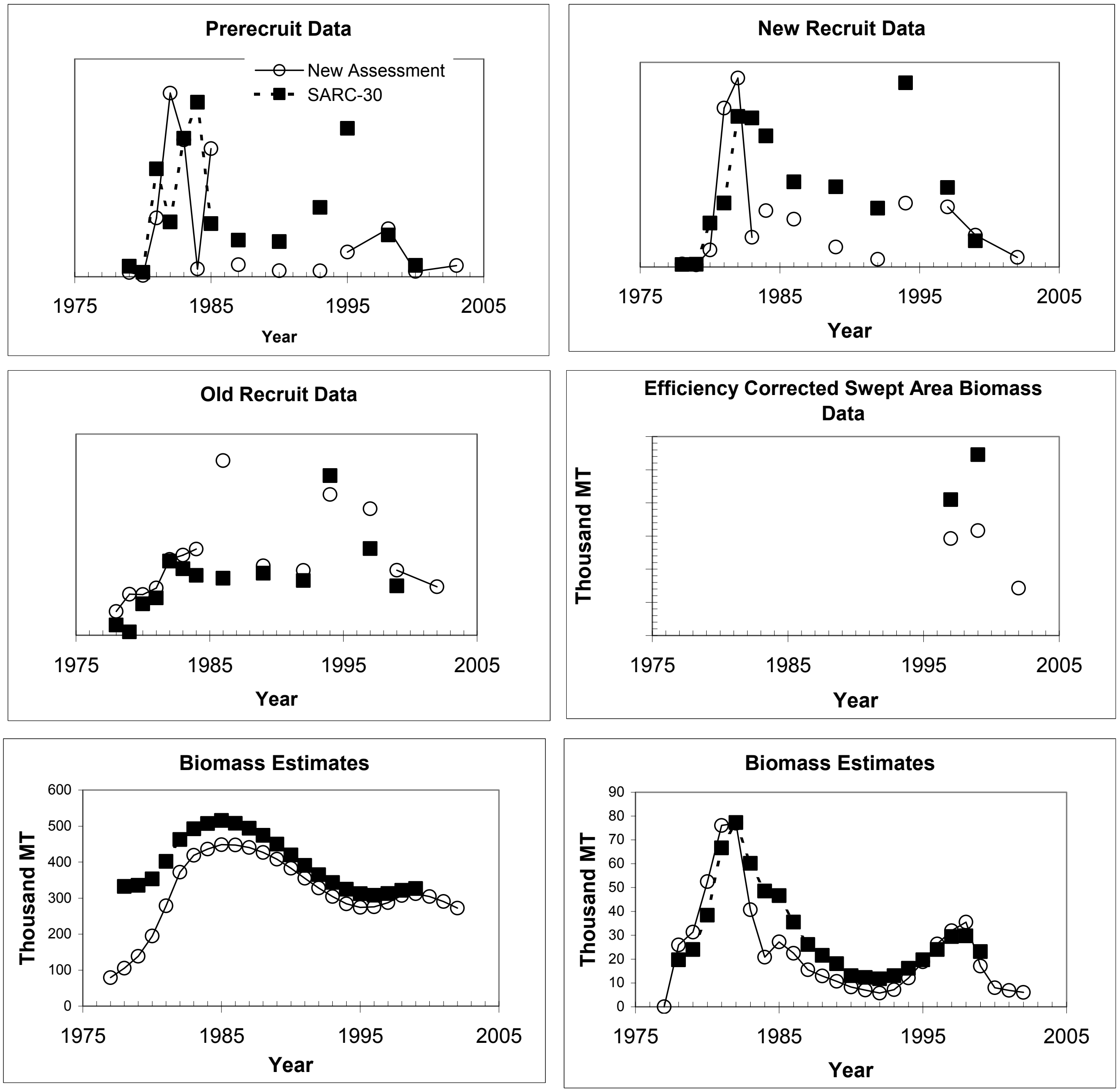


Figure C63. Residual plots for the final KLAMZ model for NNJ surfclam (not reliable enough for use by managers)

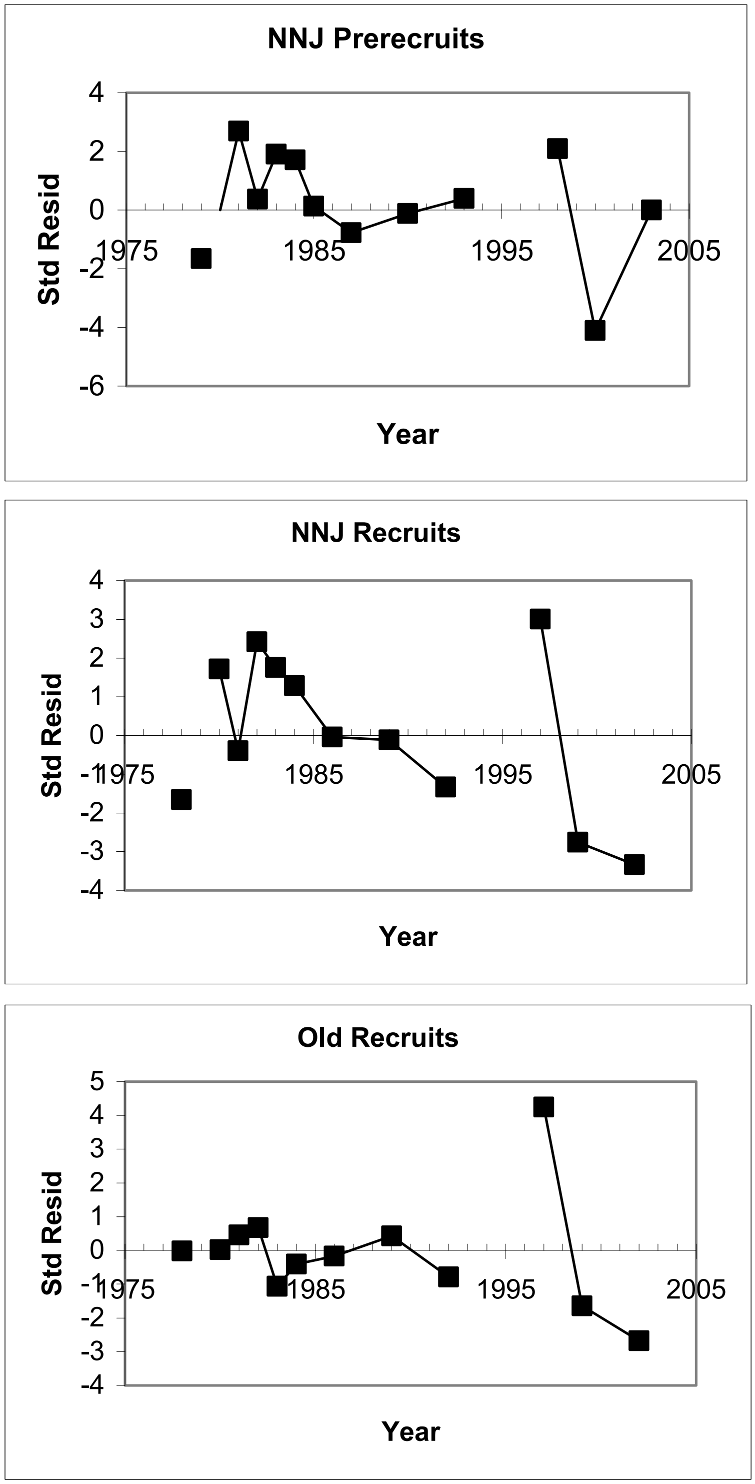


Figure C64. Summary of KLAMZ model results for NNJ surfclam (not reliable enough for use by managers).

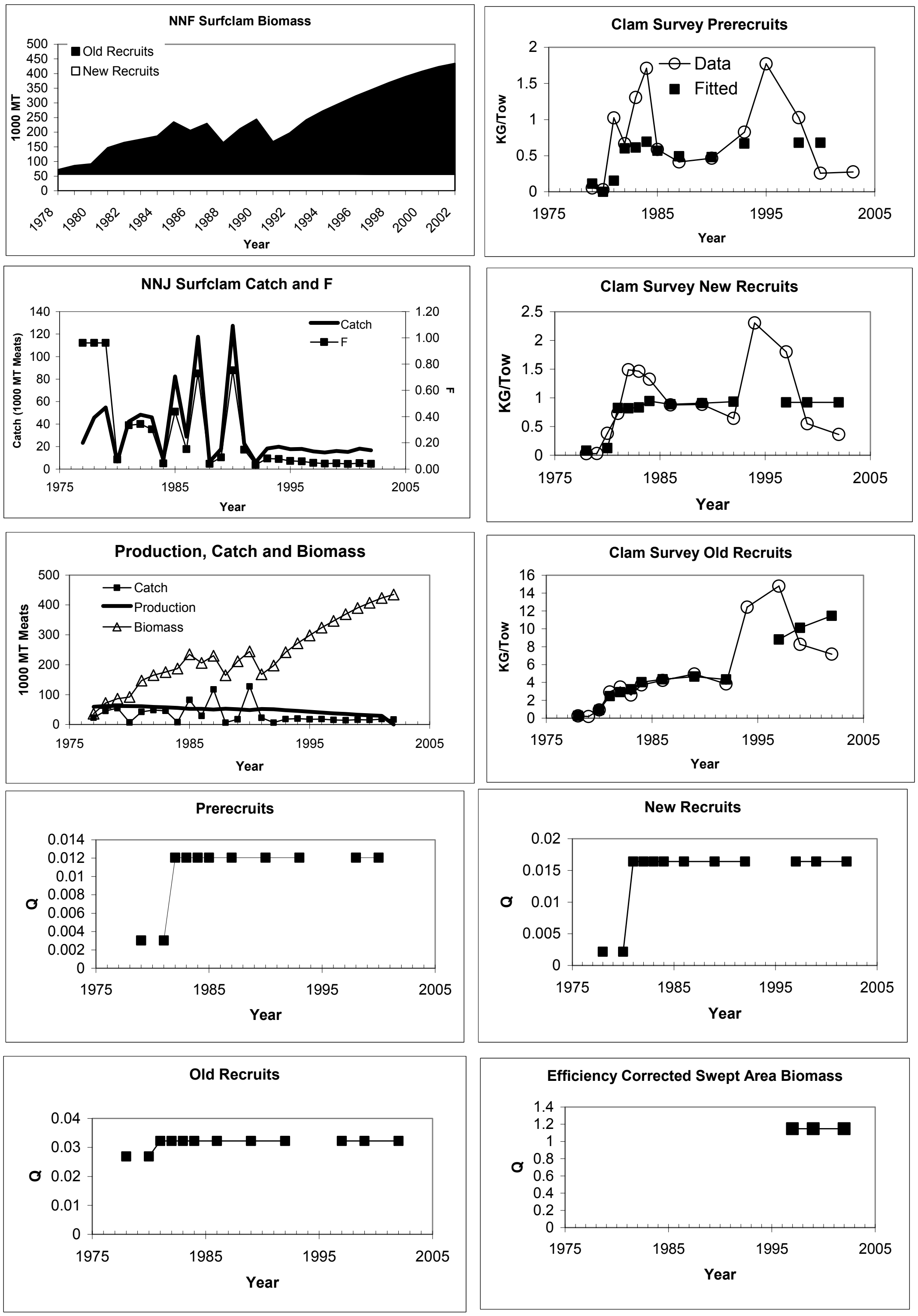


Figure C65. Efficiency corrected swept area biomass estimates for the EEZ surfclam stock.