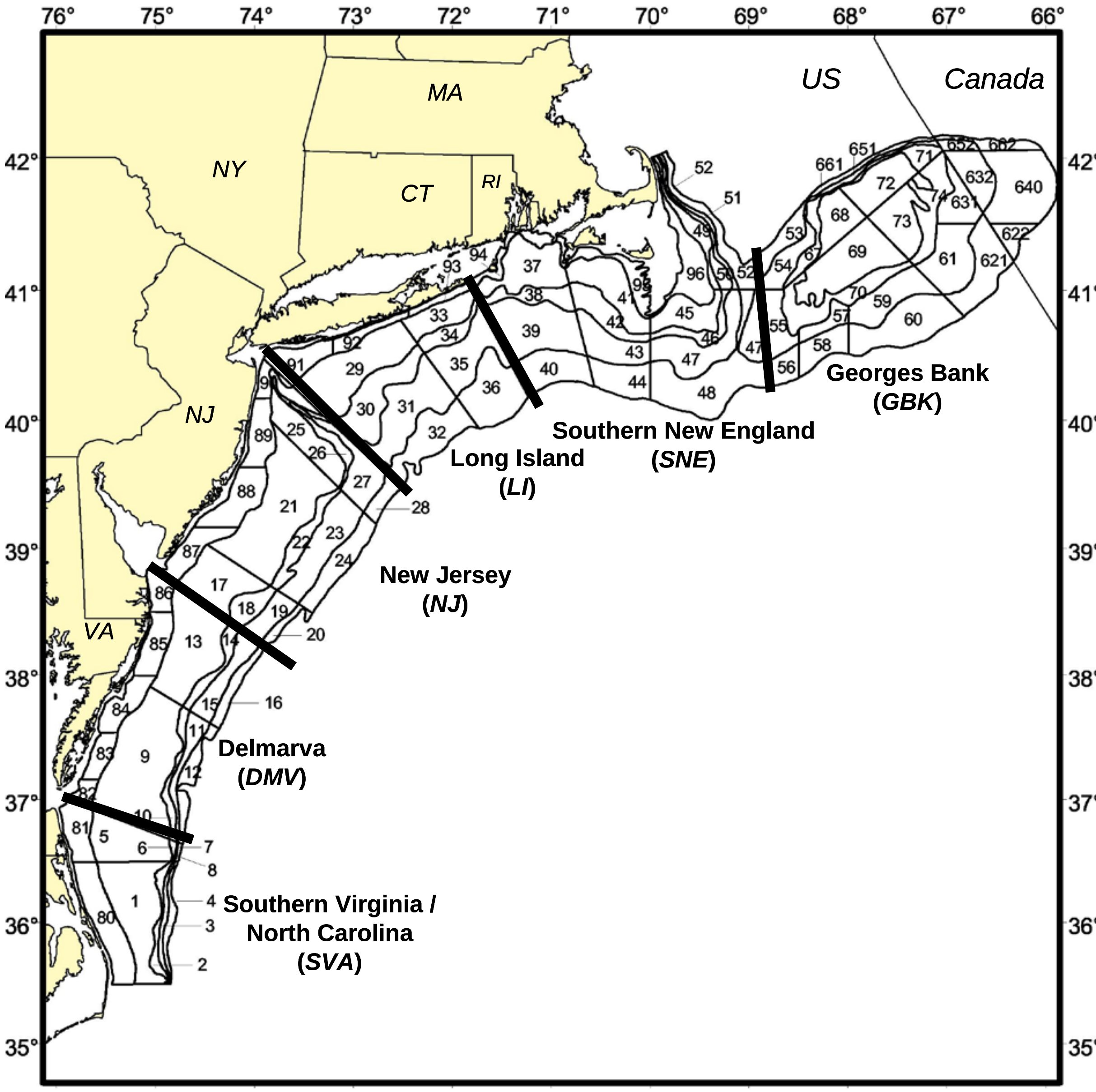

Figure 1.1. Current Northeast Fisheries Science Center shellfish strata boundaries and area/regions for surfclams and ocean quahogs established during the late 1970's.

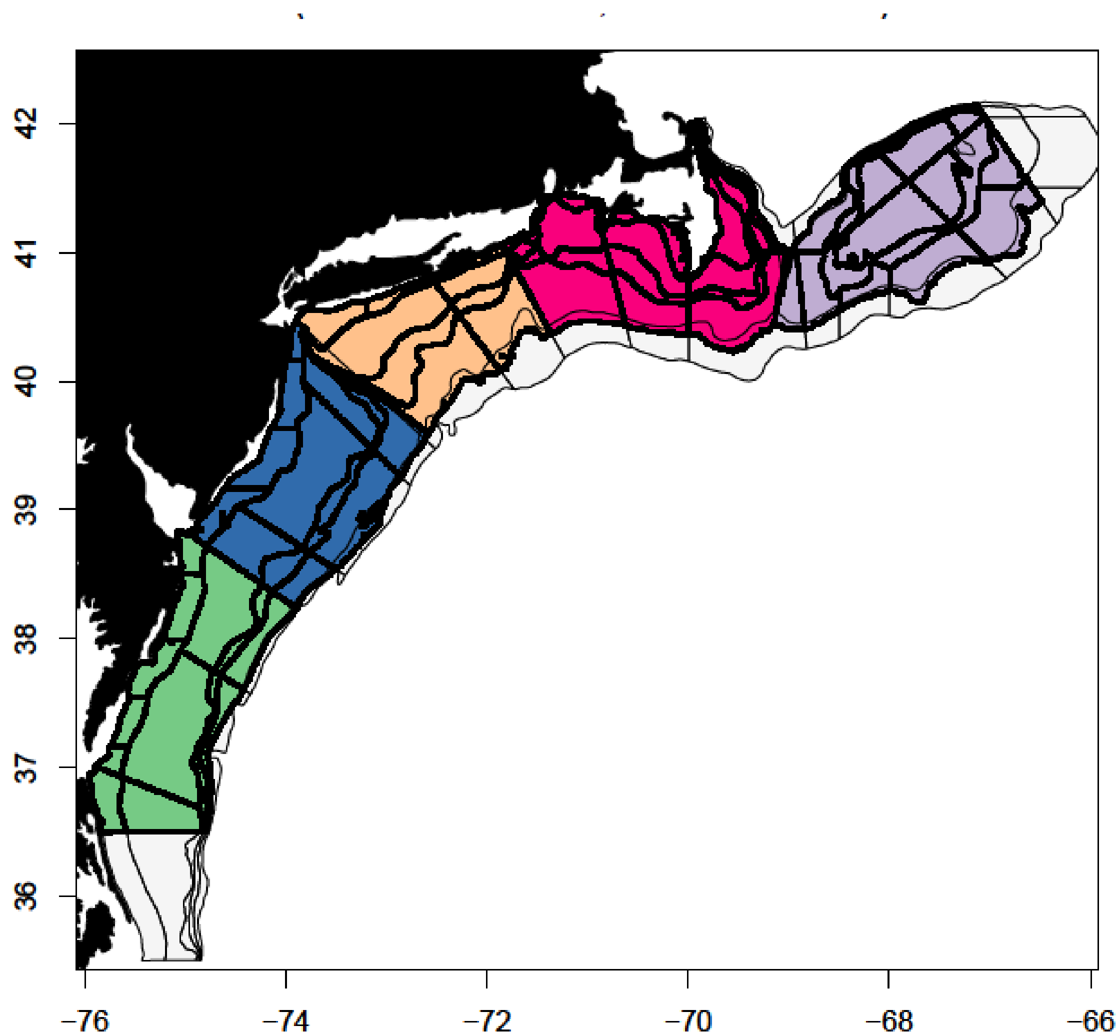

Figure 2.1. Dark lines show new building blocks for surfclams. Colors show regional divisions (GBK, SNE, LI, NJ and DMVSVA, from north to south). Current NEFSC shellfish strata boundaries are shown as light lines.

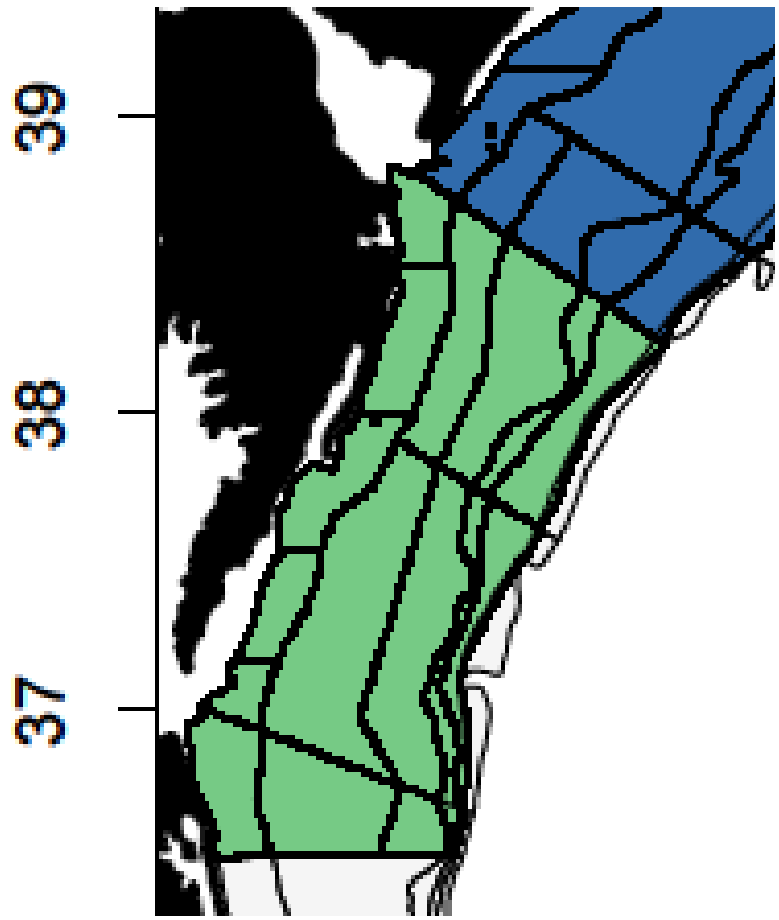

Figure 2.2. Dark lines show new building blocks for quahogs at the southern end of the NJ region (blue) and in the DMVSVA region (green) where ocean quahog and surfclam building blocks are different. Current NEFSC shellfish strata boundaries are shown as light lines.

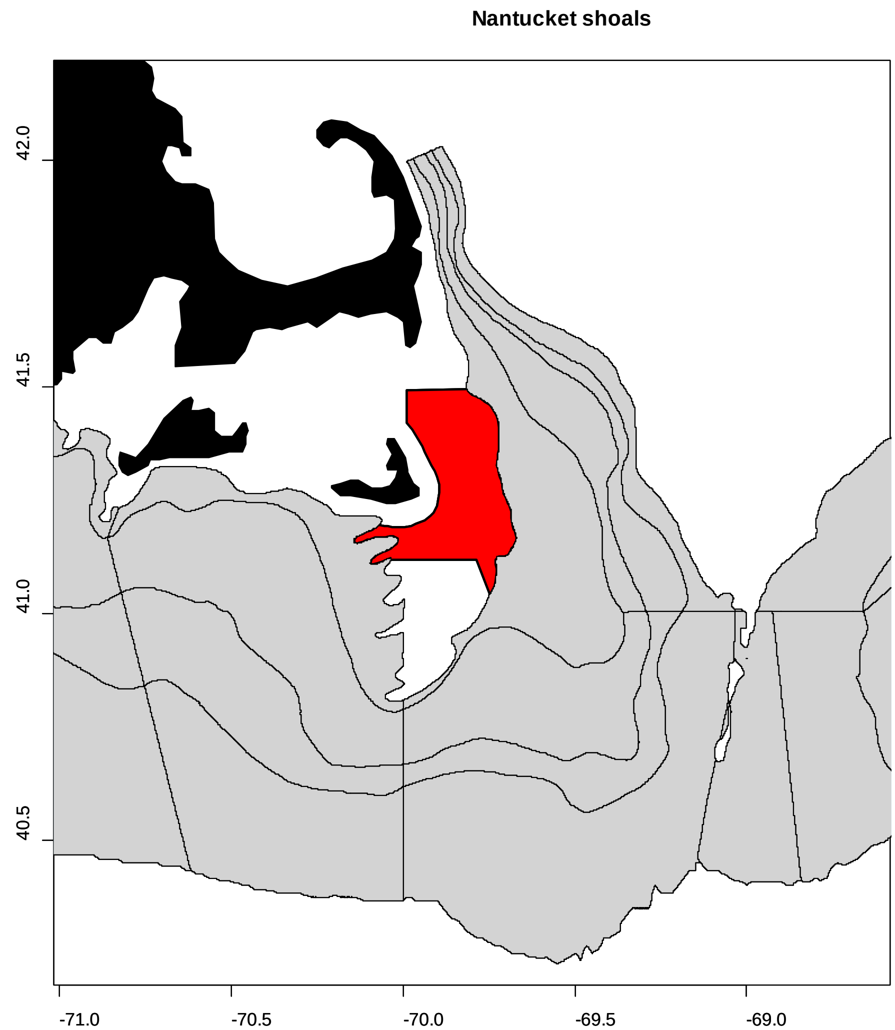

Figure 2.3. Nantucket shoals fishing grounds south of Cape Cod.

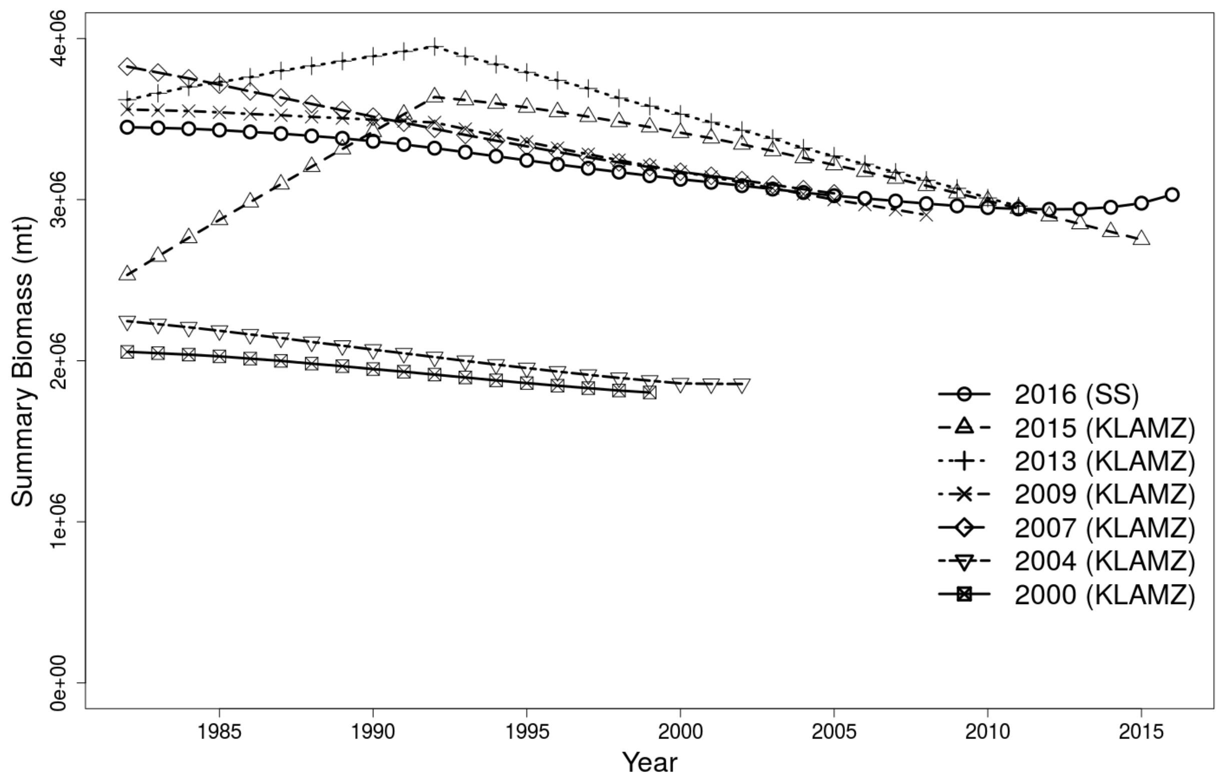

Figure 2.4. Estimated trends in ocean quahog biomass from seven previous stock assessments and two stock assessment models (the KLAMZ model and Stock Synthesis 3 or "SS").

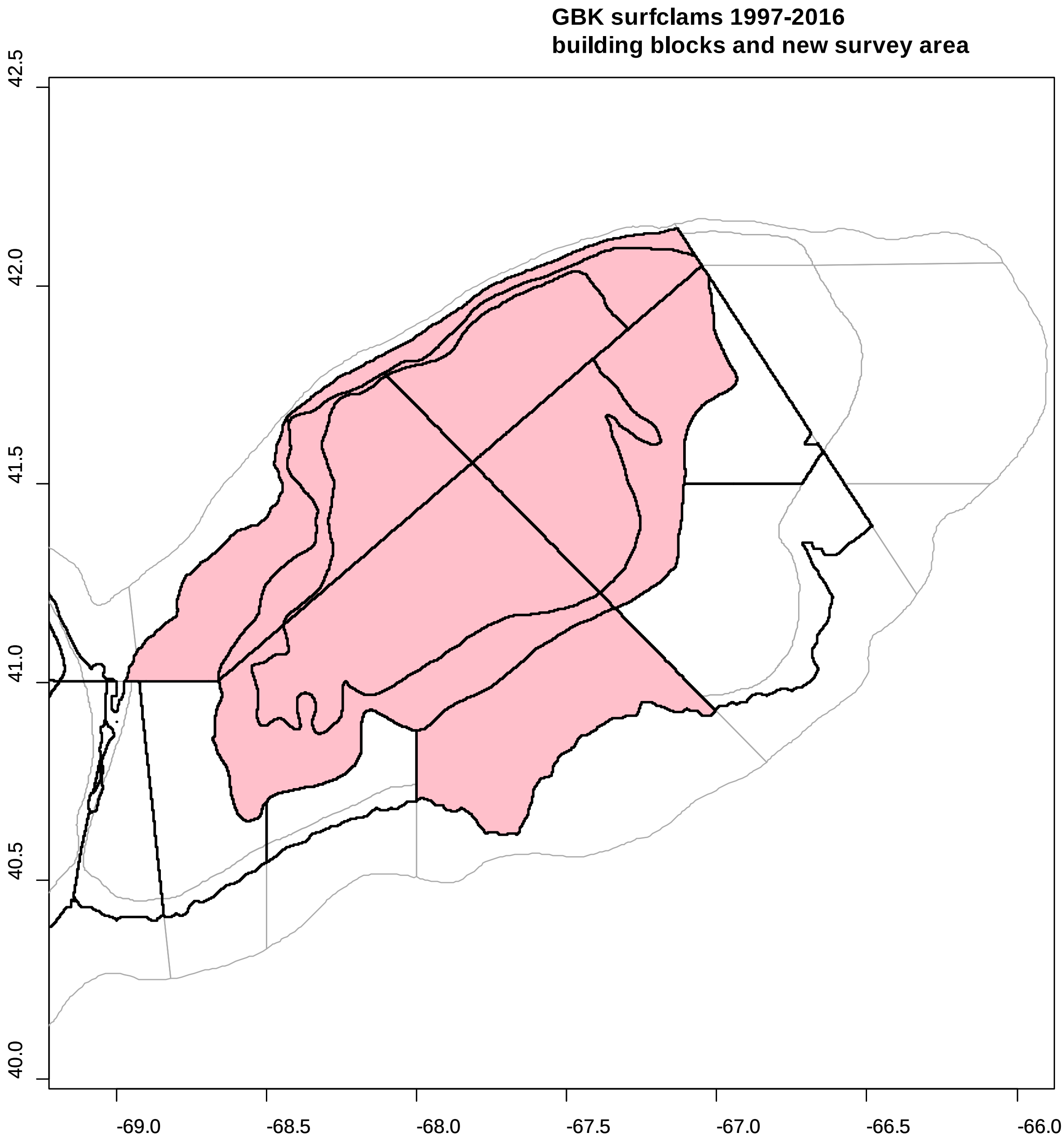

Figure 3.1. New building blocks (dark lines) and survey area based on the 1% rule for surfclams on GBK. Current survey strata boundaries are shown with the thin line.

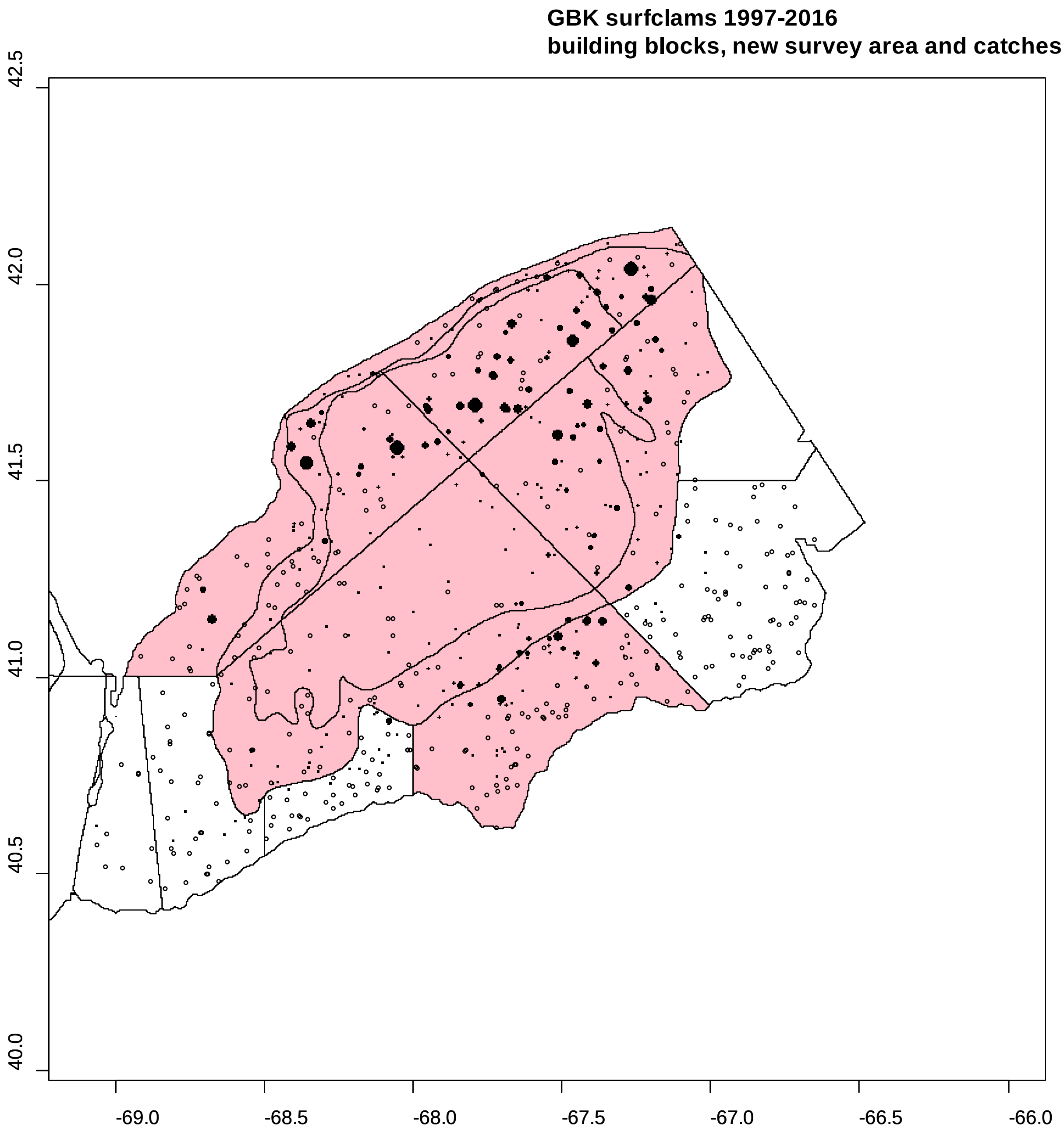

Figure 3.2. New building blocks (dark lines) and survey area based on the 1% rule for surfclams on GBK, with survey data from 1997-2016 (rescaled to same annual mean). Hollow symbols show stations with zero catch. Solid symbols show location amount and location of catches.

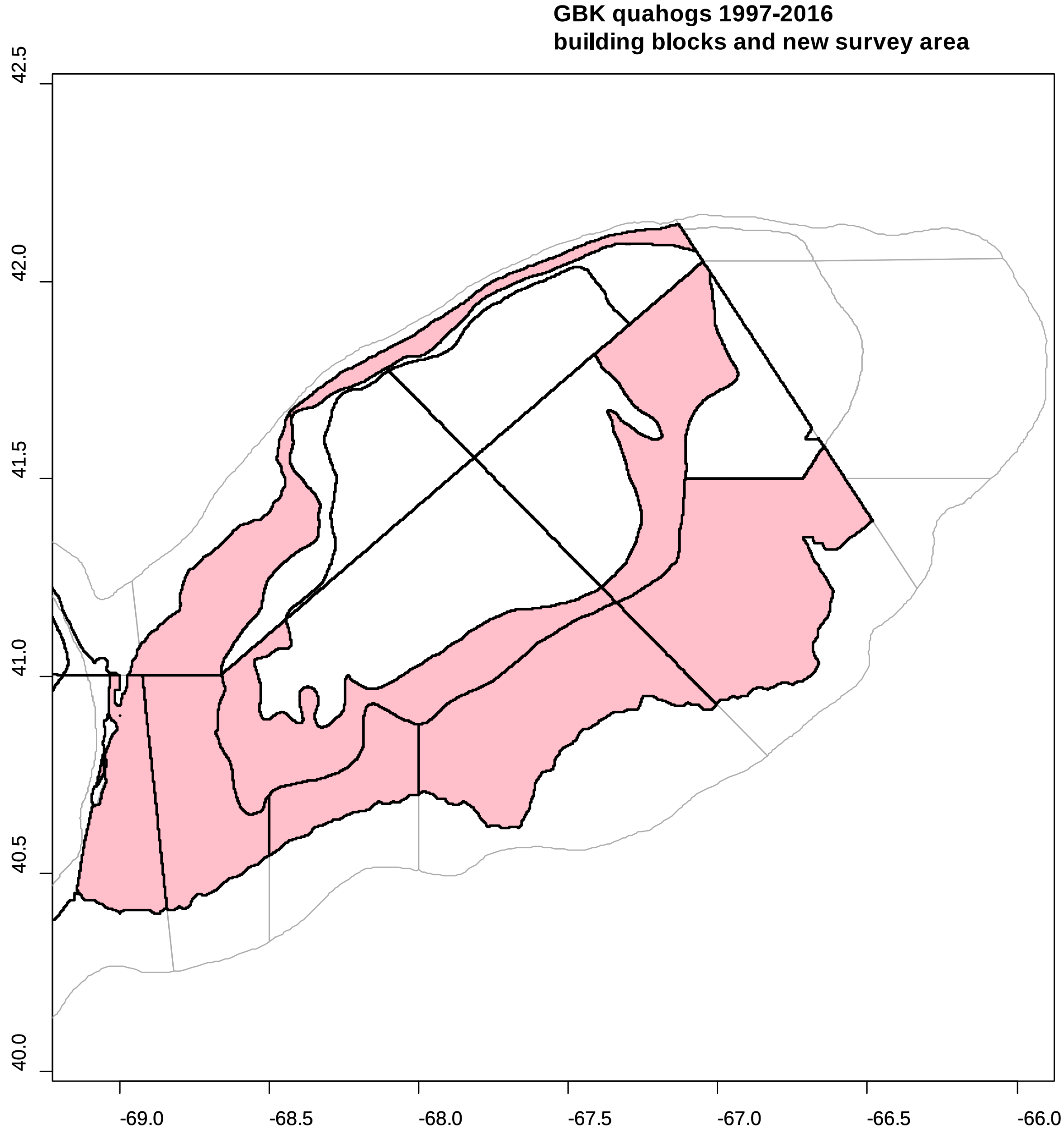

Figure 3.3. New building blocks (dark lines) and survey area based on the 1% rule for ocean quahogs on GBK. Current survey strata boundaries are shown with the thin line.

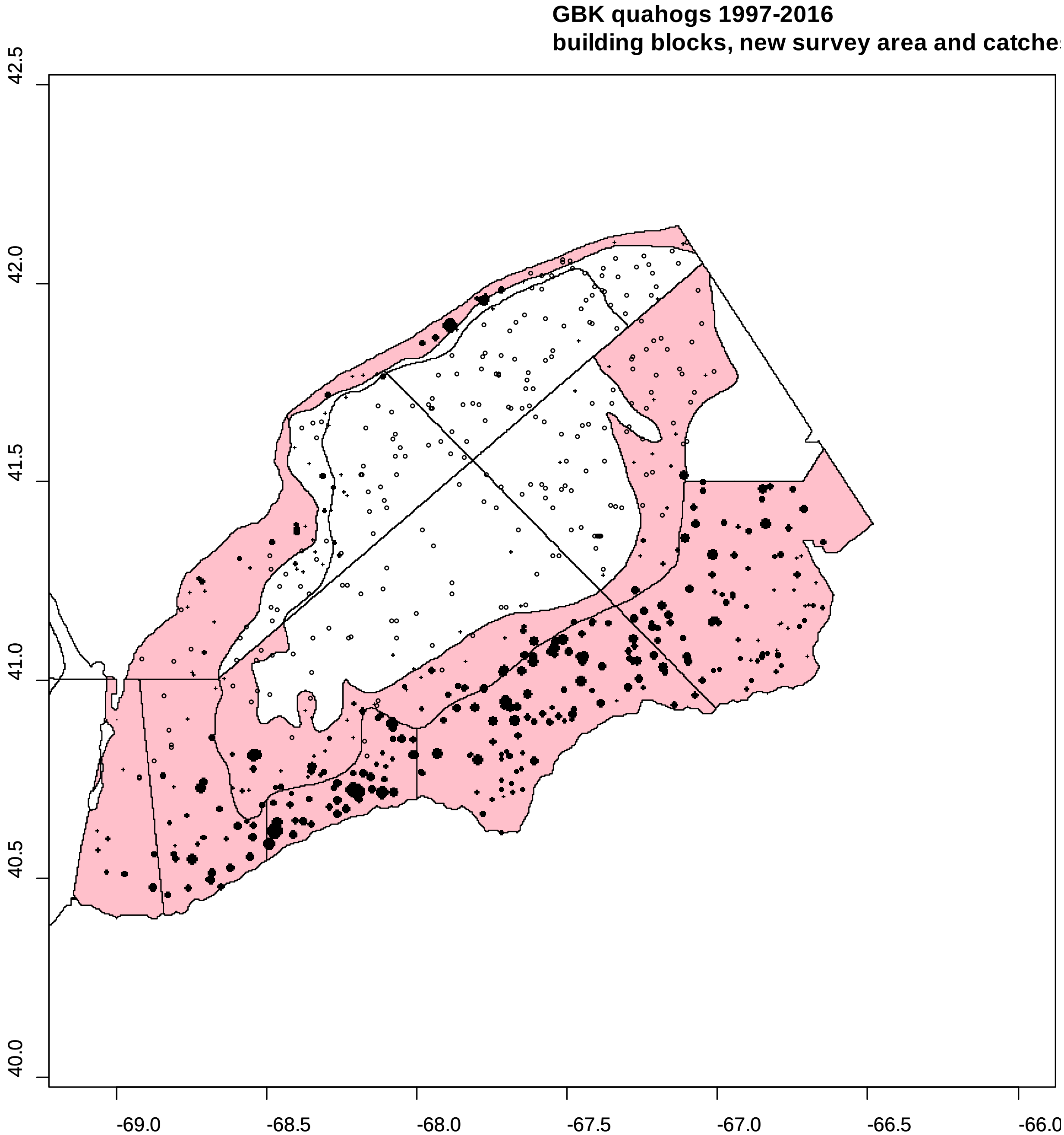

Figure 3.4. New building blocks (dark lines) and survey area based on the 1% rule for ocean quahogs on GBK, with survey data from 1997-2016 (rescaled to same annual mean). Hollow symbols show stations with zero catch. Solid symbols show location amount and location of catches.

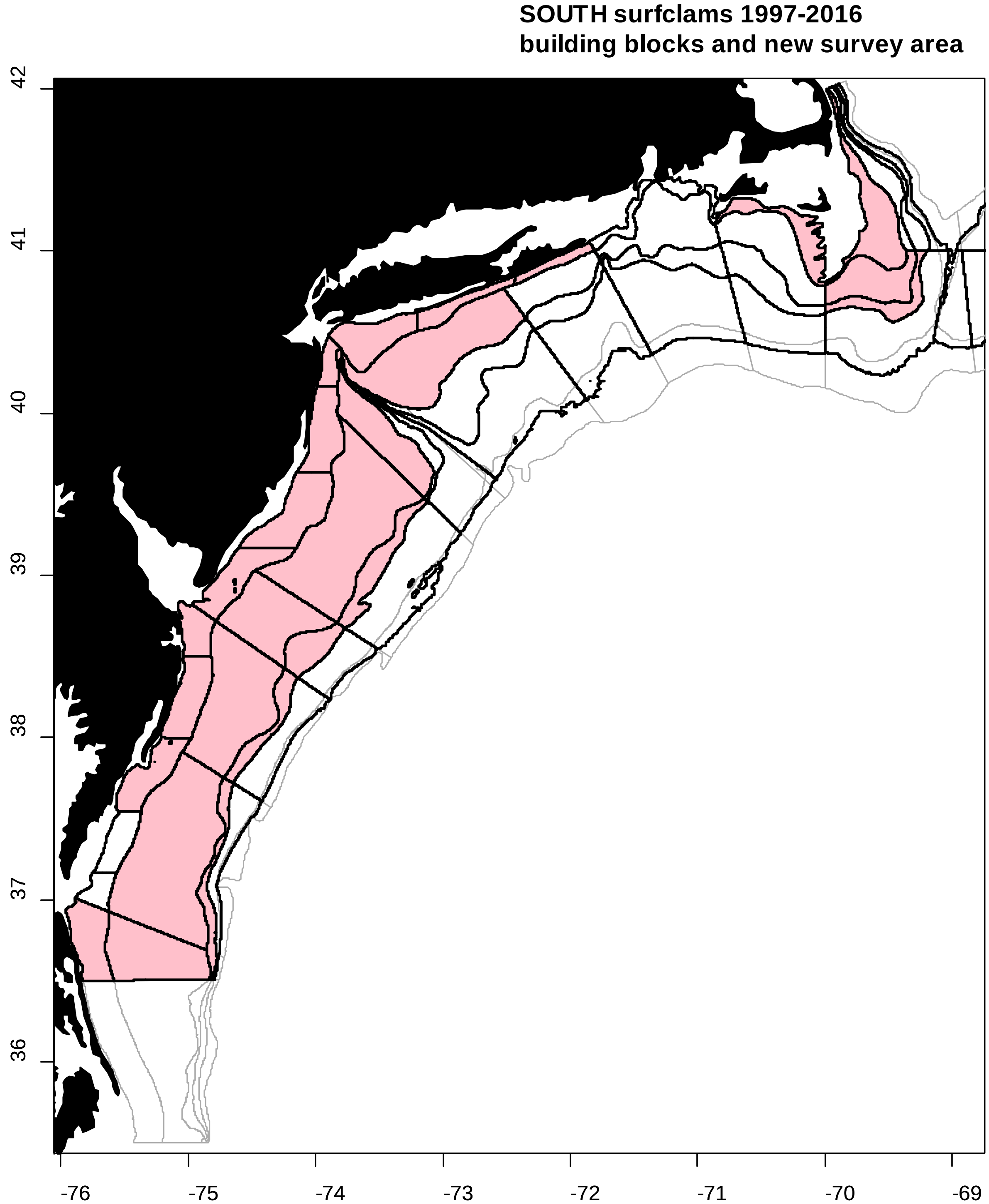

Figure 3.5. New building blocks (dark lines) and survey area based on the 1% rule for surfclams in the southern area. Current survey strata boundaries are shown with the thin line.

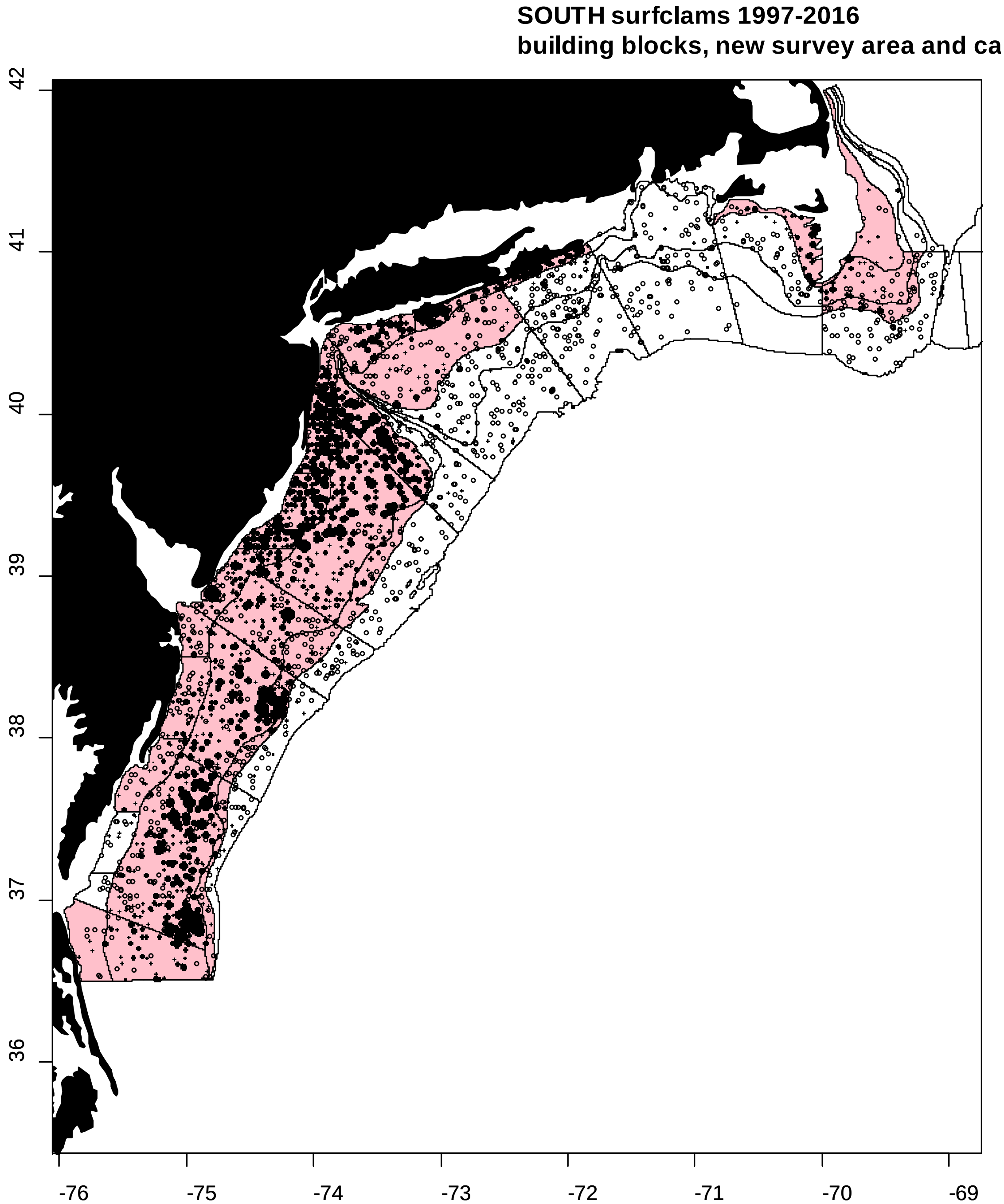

Figure 3.6. New building blocks (dark lines) and survey area based on the 1% rule for surfclams in the southern area, with survey data from 1997-2016 (rescaled to same annual mean). Hollow symbols show stations with zero catch. Solid symbols show location amount and location of catches.

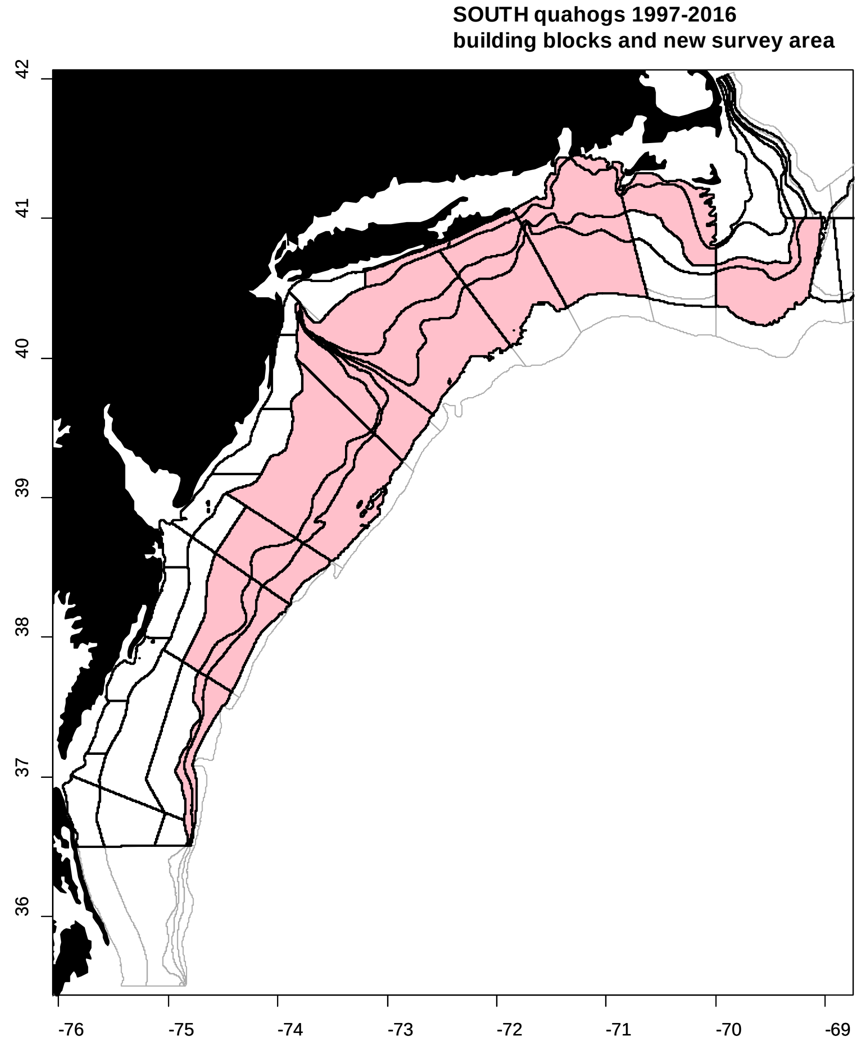

Figure 3.7. New building blocks (dark lines) and survey area based on the 1% rule for ocean quahogs in the southern area. Current survey strata boundaries are shown with the thin line.

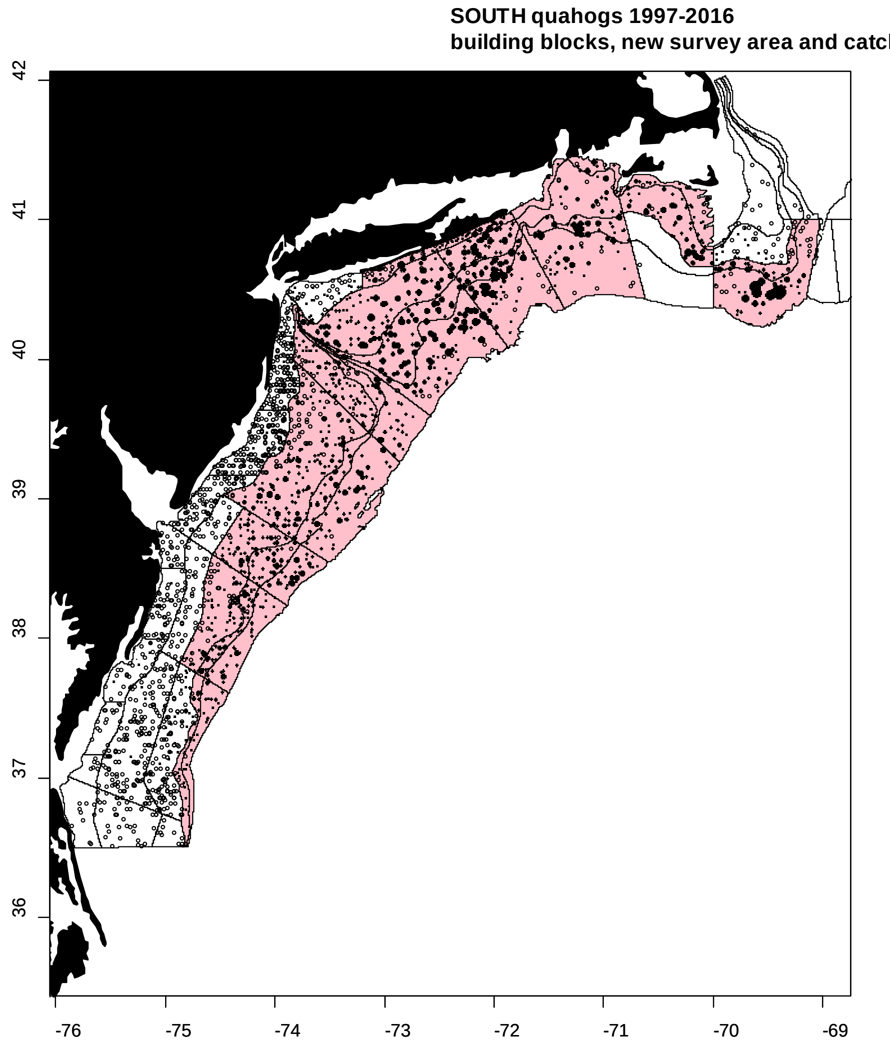

Figure 3.8. New building blocks (dark lines) and survey area based on the 1% rule for ocean quahogs in the southern area, with survey data from 1997-2016 (rescaled to same annual mean). Hollow symbols show stations with zero catch. Solid symbols show location amount and location of catches.

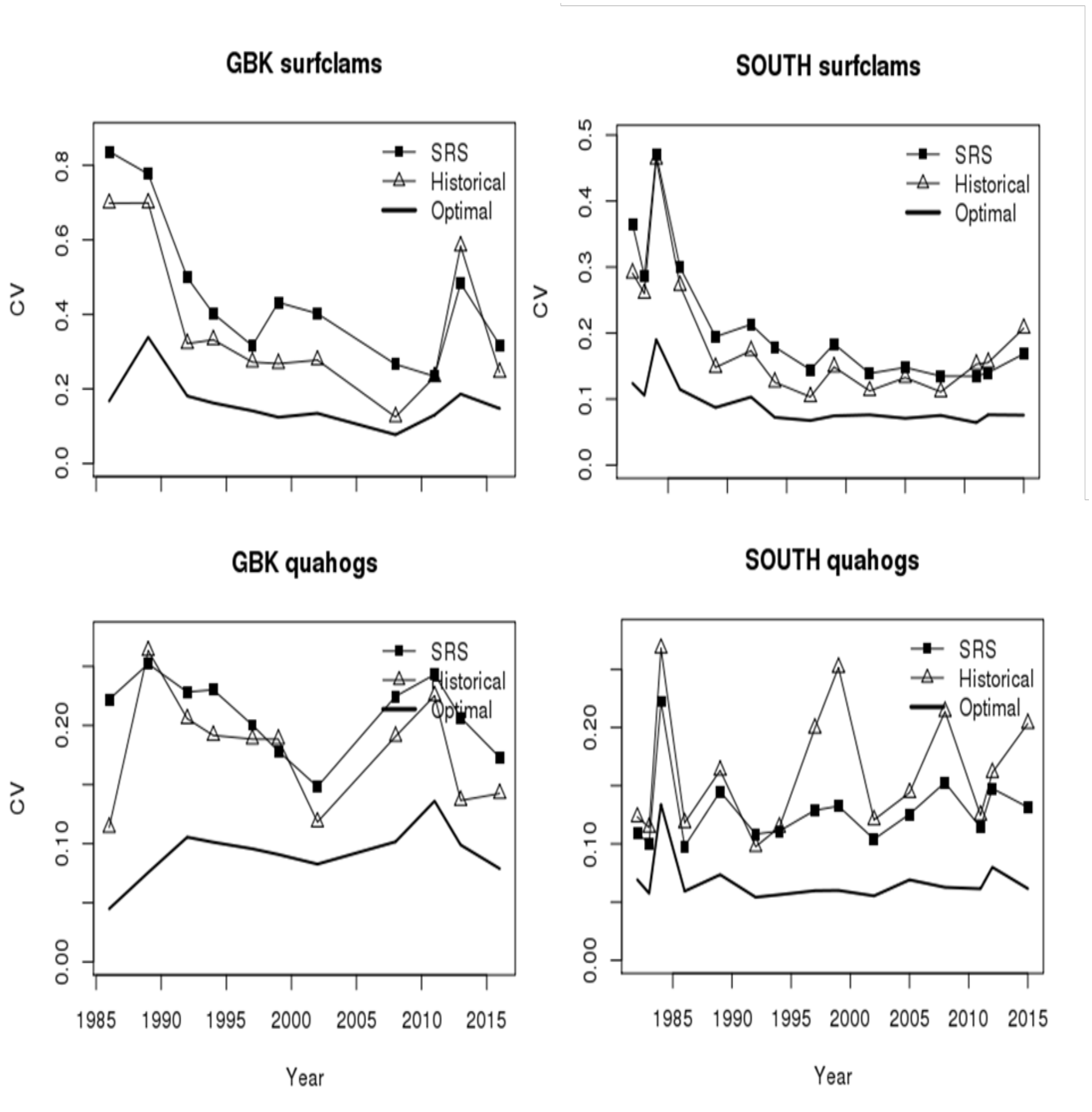

Figure 3.9 Historical analysis showing CVs for stratified mean catch density in NEFSC clam surveys based on the current design and CVs expected under random sampling and with optimal allocation. All three scenarios use the current stratification scheme.

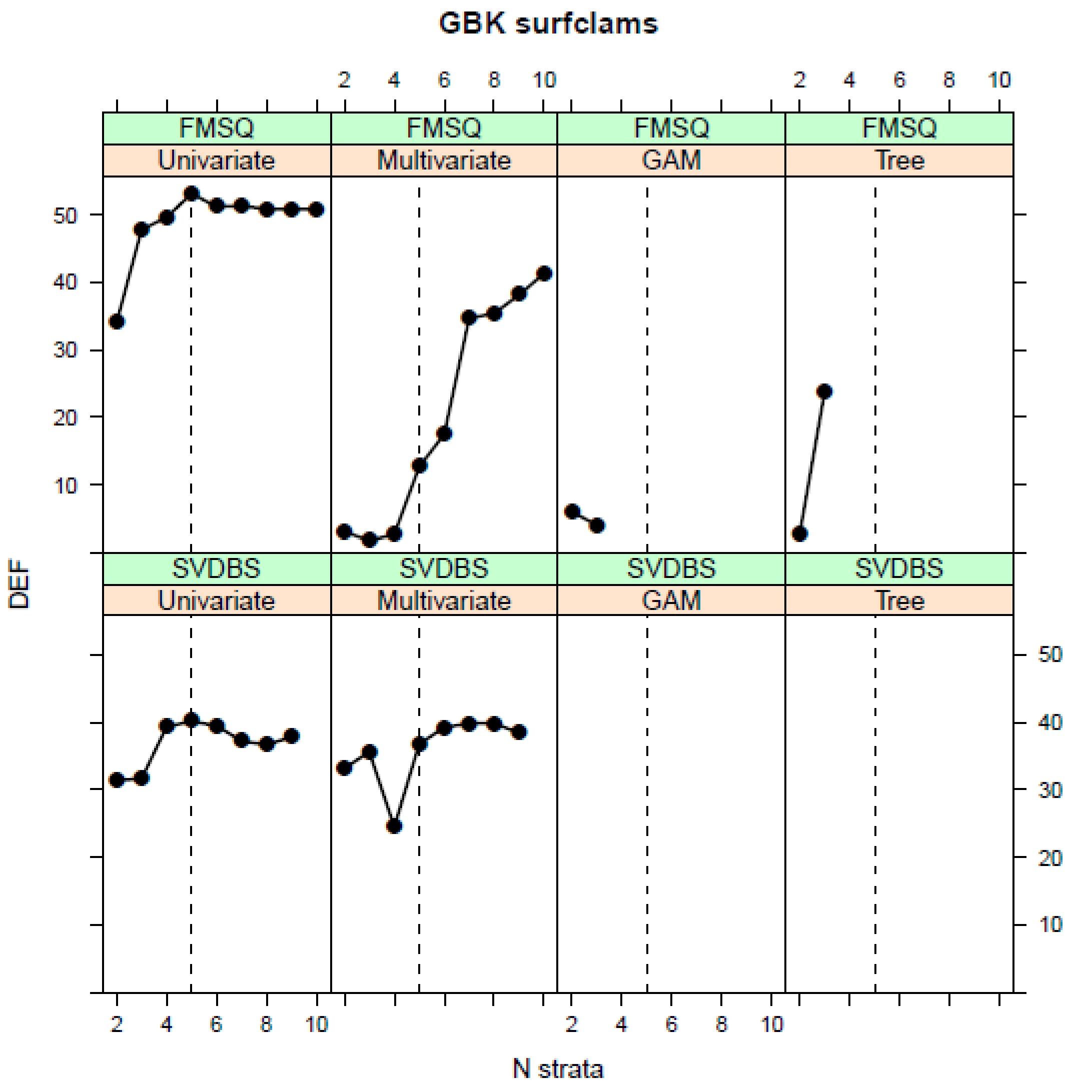

Figure 3.10. Median DEF results for surfclams on GBK from bootstrap analysis. Results are shown for two types of building blocks (FMSQ vs. SVDBS = current strata), four cluster methods and 2-10 potential new strata (clusters).

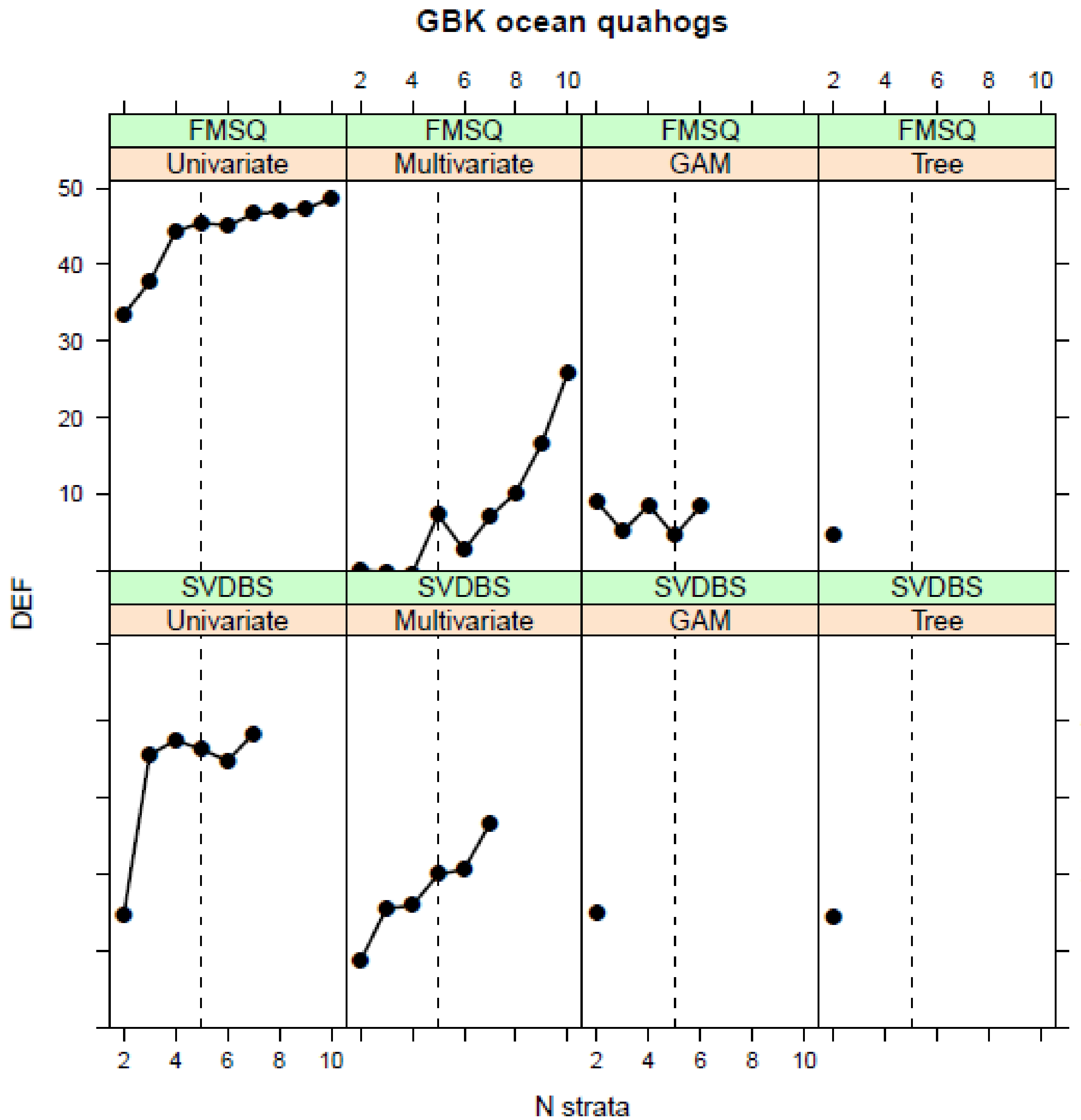

Figure 3.11. Median DEF results for ocean quahogs on GBK from bootstrap analysis. Results are shown for two types of building blocks (FMSQ vs. SVDBS = current strata), four cluster methods and 2-10 potential new strata (clusters).

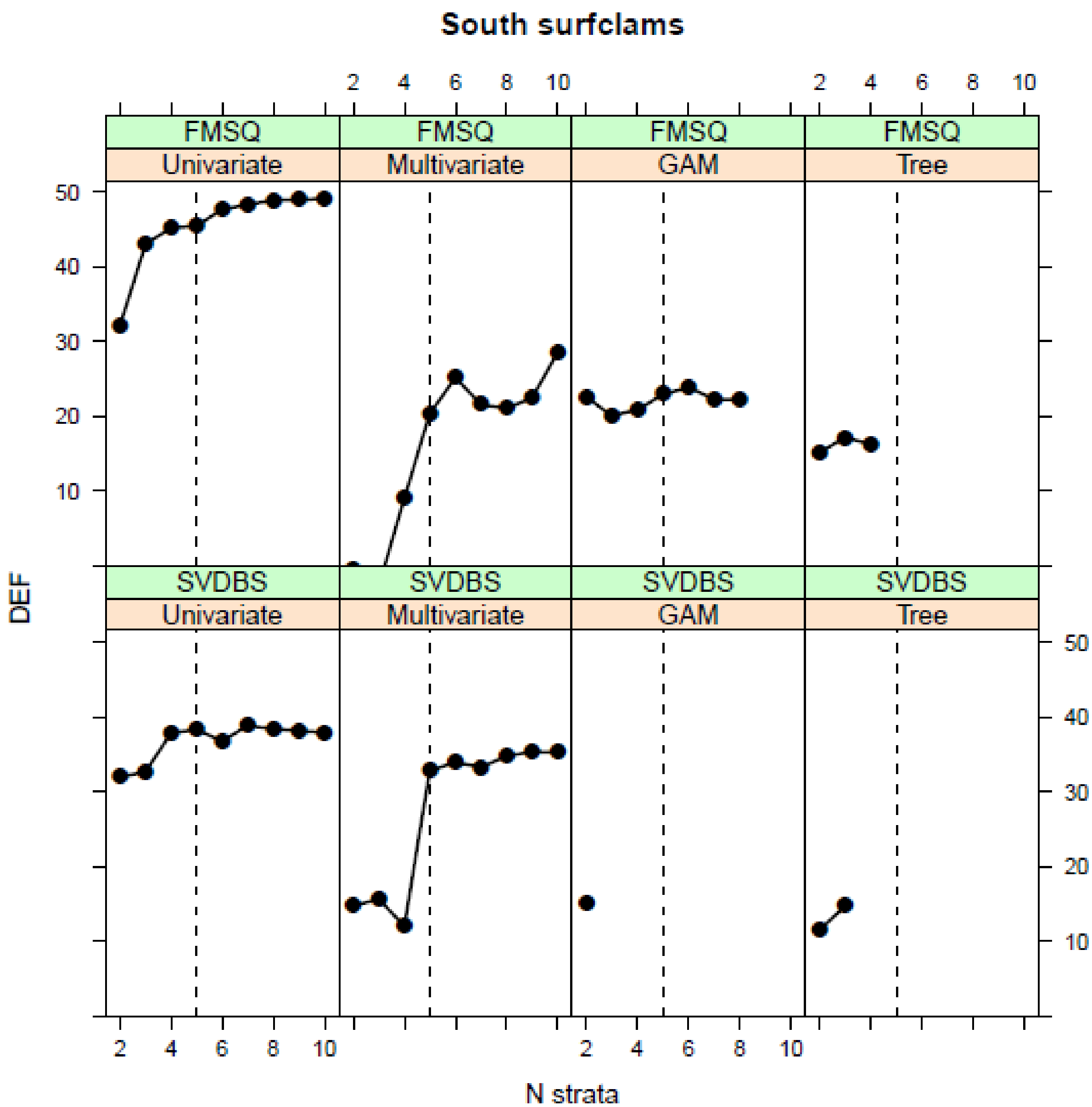

Figure 3.12. Median DEF results for southern surfclams from bootstrap analysis. Results are shown for two types of building blocks (FMSQ vs. SVDBS = current strata), four cluster methods and 2-10 potential new strata (clusters).

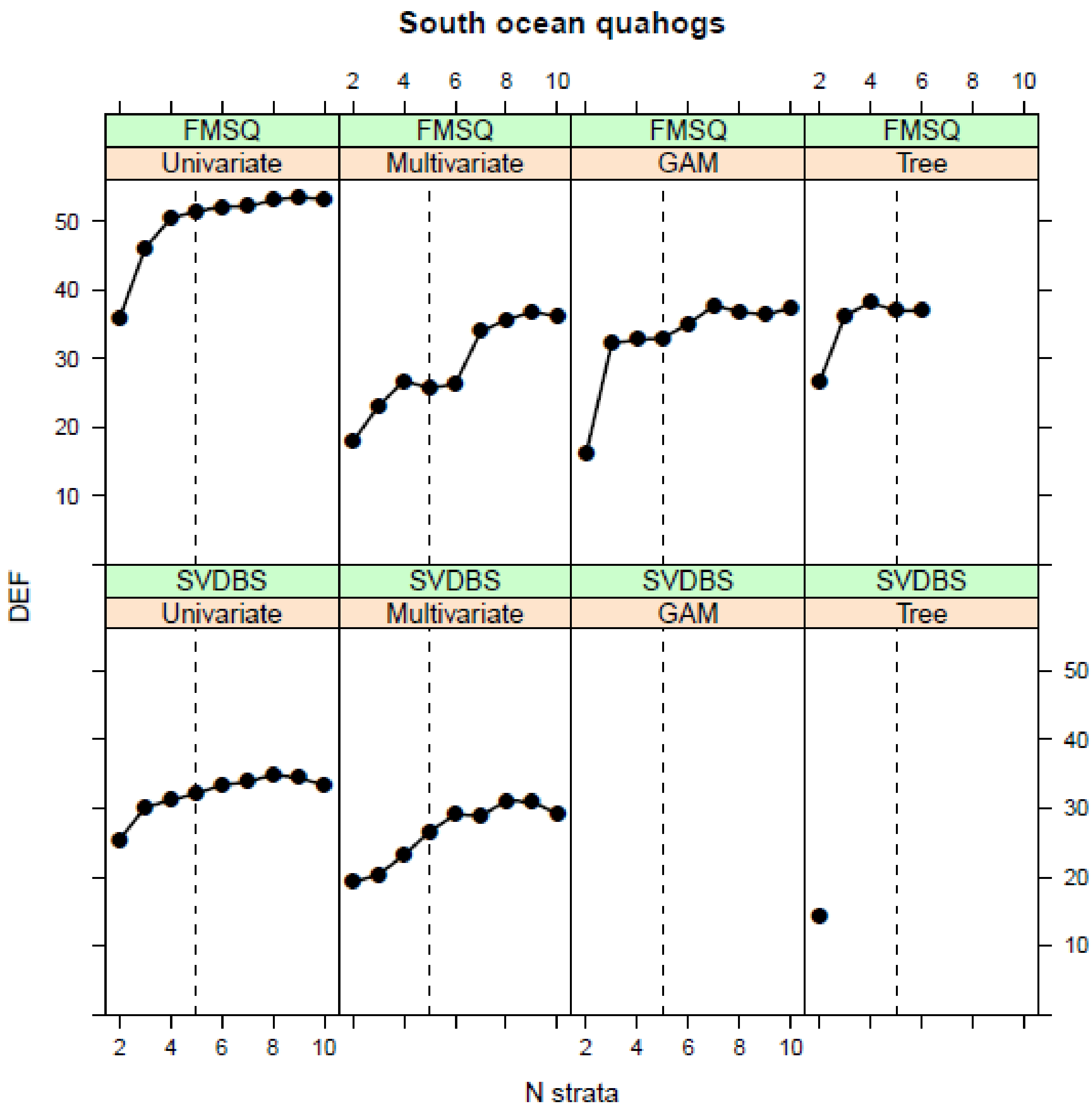

Figure 3.13. Median DEF results for southern ocean quahogs from bootstrap analysis. Results are shown for two types of building blocks (FMSQ vs. SVDBS = current strata), four cluster methods and 2-10 potential new strata (clusters).

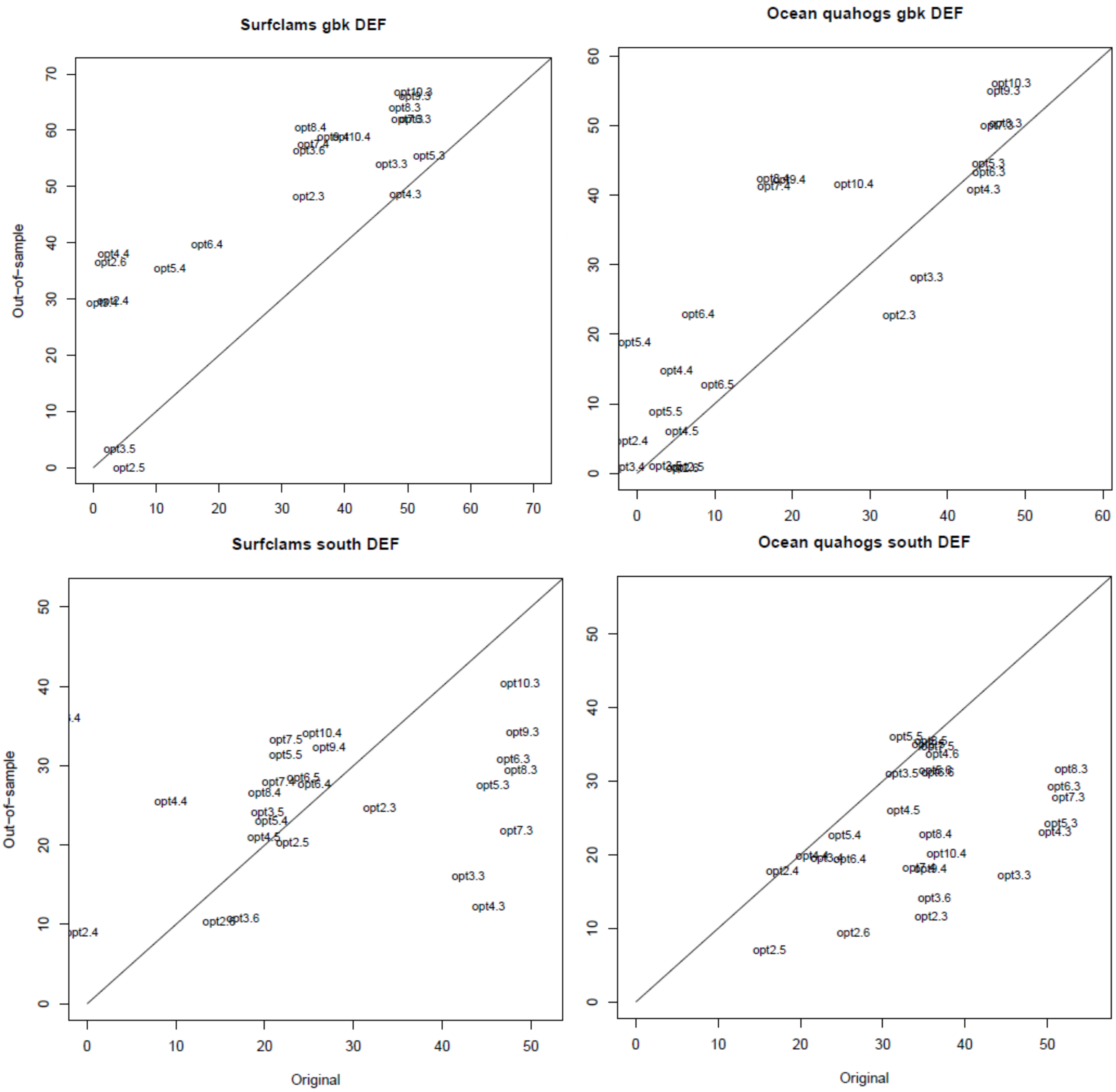

Figure 3.14. Median DEF scores from in-sample (x-axis) and out-of-sample (y-axis) bootstrap analyses using FMSQ as building blocks and preliminary data.

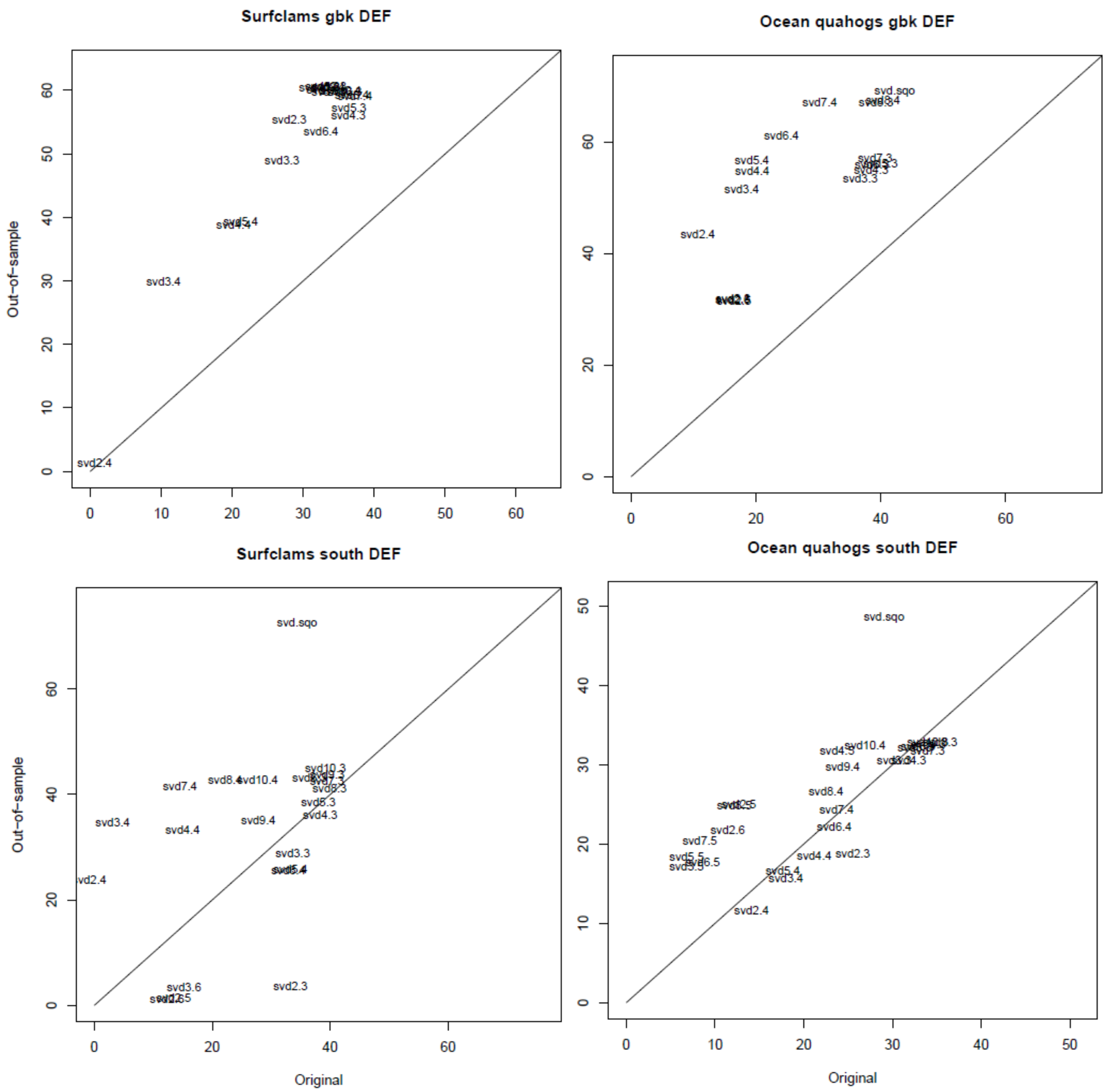

Figure 3.15. Median DEF scores from in-sample (x-axis) and out-of-sample (y-axis) bootstrap analyses using current strata as building blocks and preliminary data.

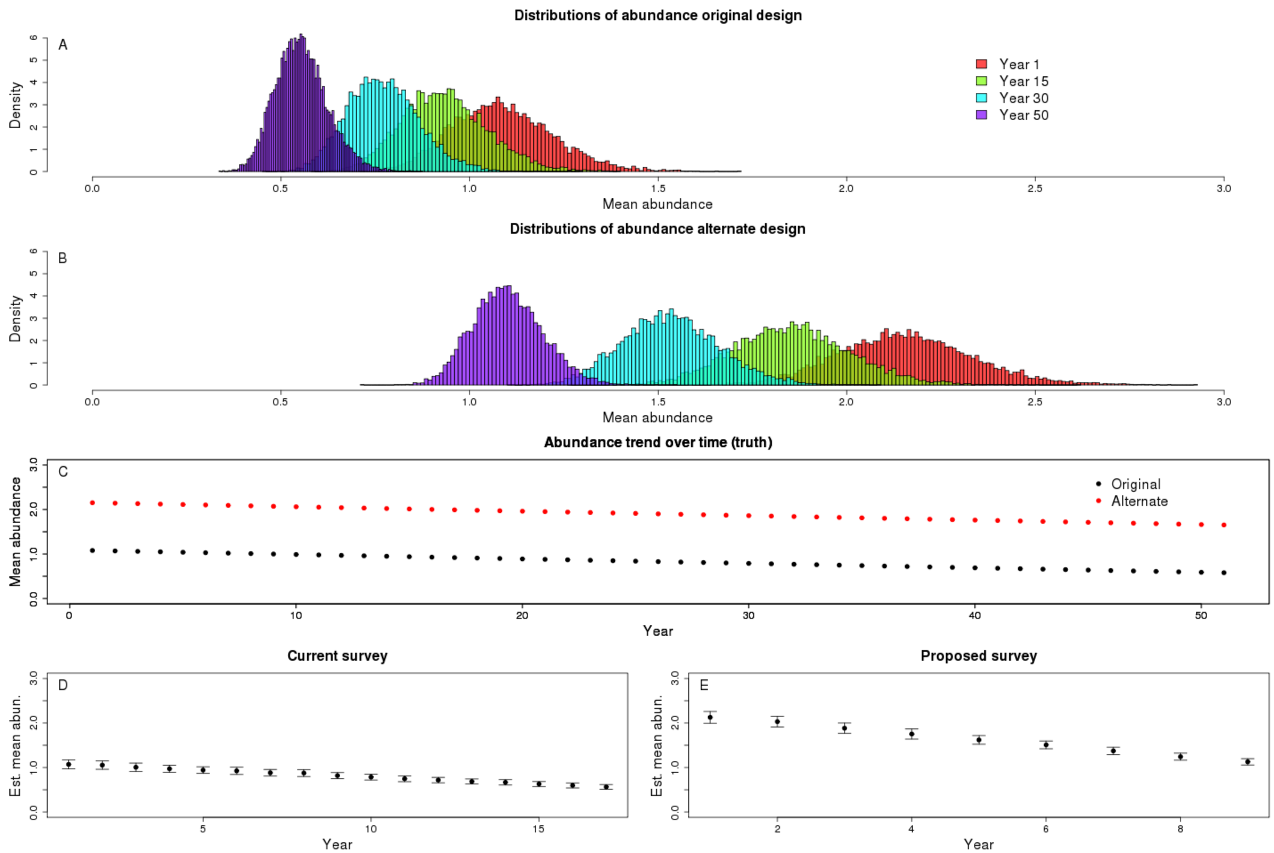

Figure 3.16. *A and B.* Distributions for simulated ocean quahog abundance estimates (stratified mean catch density or swept area abundance) in selected years for the original (top) and a preliminary recommended design (bottom). *C*. Annual mean survey abundance, showing the decreasing trend. *D*. Survey samples taken every 3 years as in the current survey from the distributions depicted in the panel A. *E*. Survey samples taken every 6 years as proposed. The standard errors in panels D and E have been inflated to illustrate the differences between surveys. Parameters are for the southern area. DAN, WHAT AREA ARE THESE AND CHECK THE ERROR BARS IN D/E WHICH LOOK TOO SMALL.

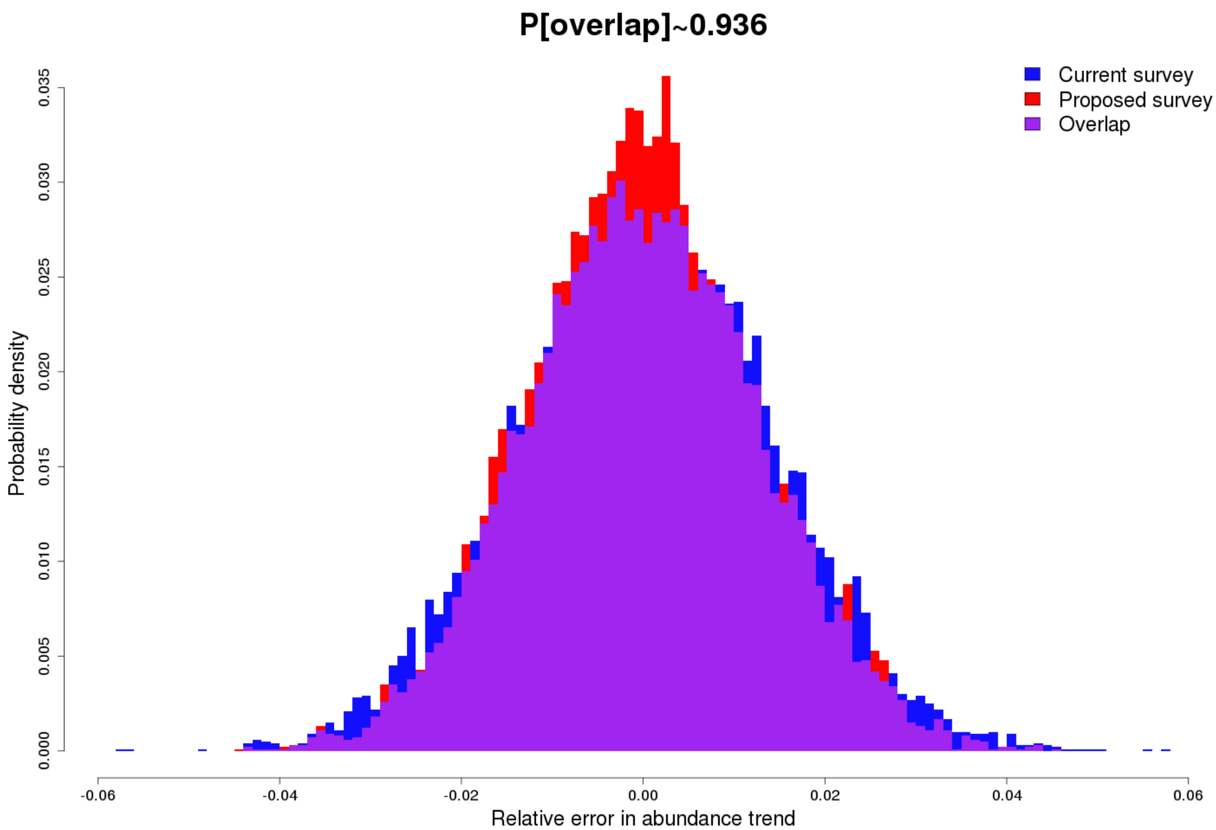

Figure 3.17. Distributions (n=10,000) for relative errors in the population trend (slope) parameter δ the estimated by weighted linear regression, for the current and preliminarily recommended survey designs.

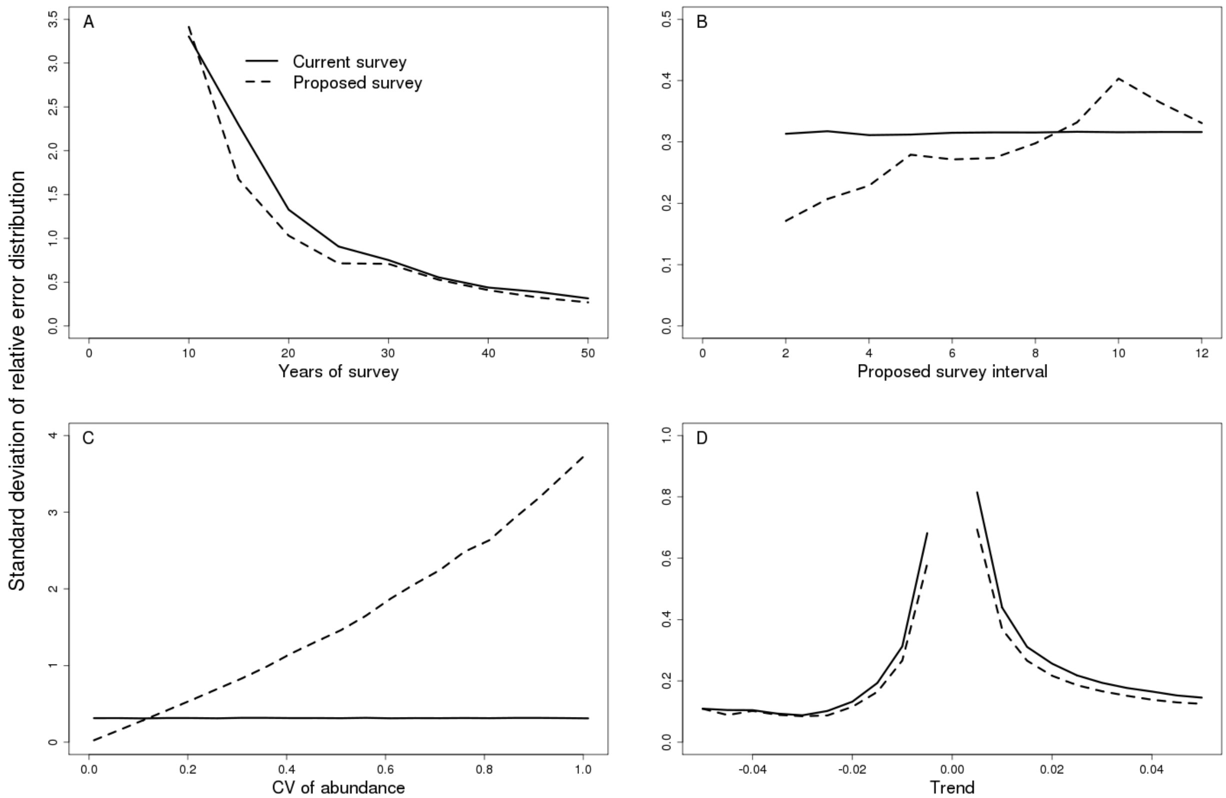

Figure 3.18. Sensitivity testing for potentially important population parameters for GBK ocean quahogs. The *y*-axis in each case shows the standard deviation of the distribution of the relative errors shown in Figure 3.16. The dashed line represents the proposed survey and the solid line represents the current survey.

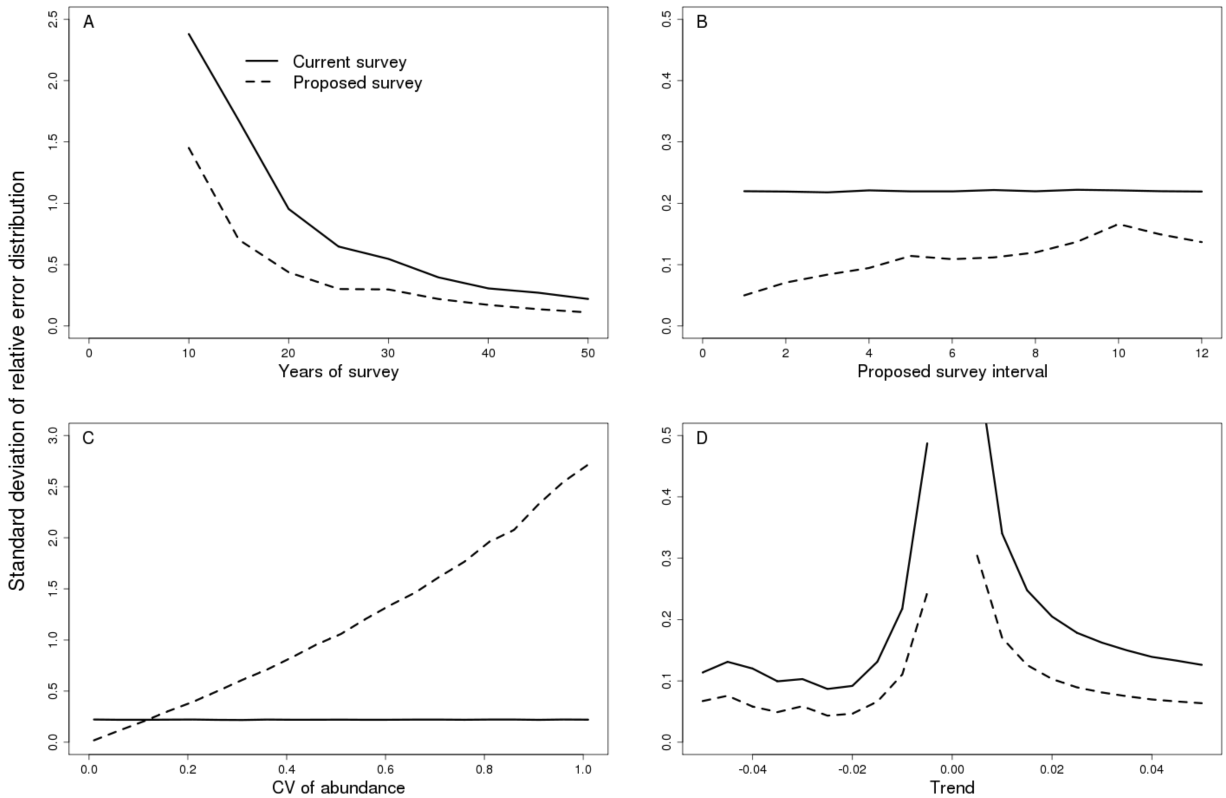

Figure 3.19. Sensitivity testing for potentially important population parameters for ocean quahogs in the south. The *y*-axis in each case shows the standard deviation of the distribution of the relative errors shown in Figure 3.16. The dashed line represents the proposed survey and the solid line represents the current survey.

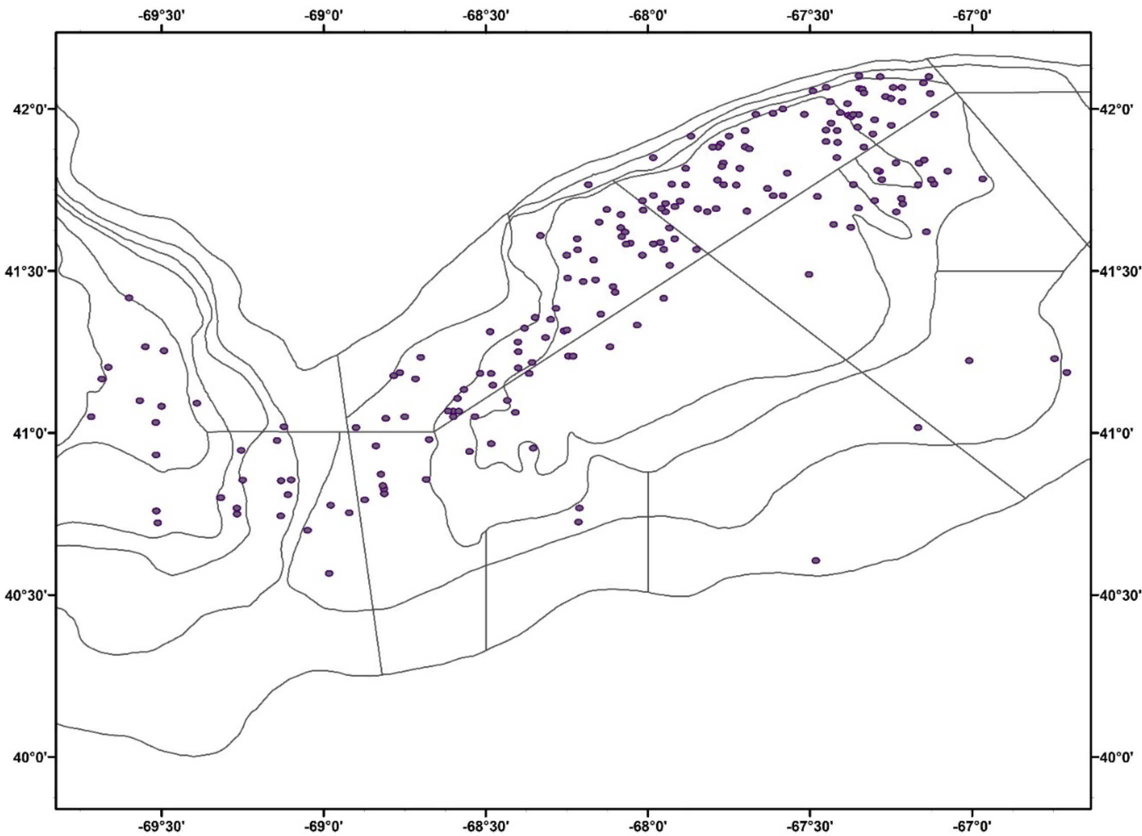

Figure 3.20. NEFSC clam survey stations locations that identify untowable ground. Each location is surrounded by a circle one nautical mile in diameter.

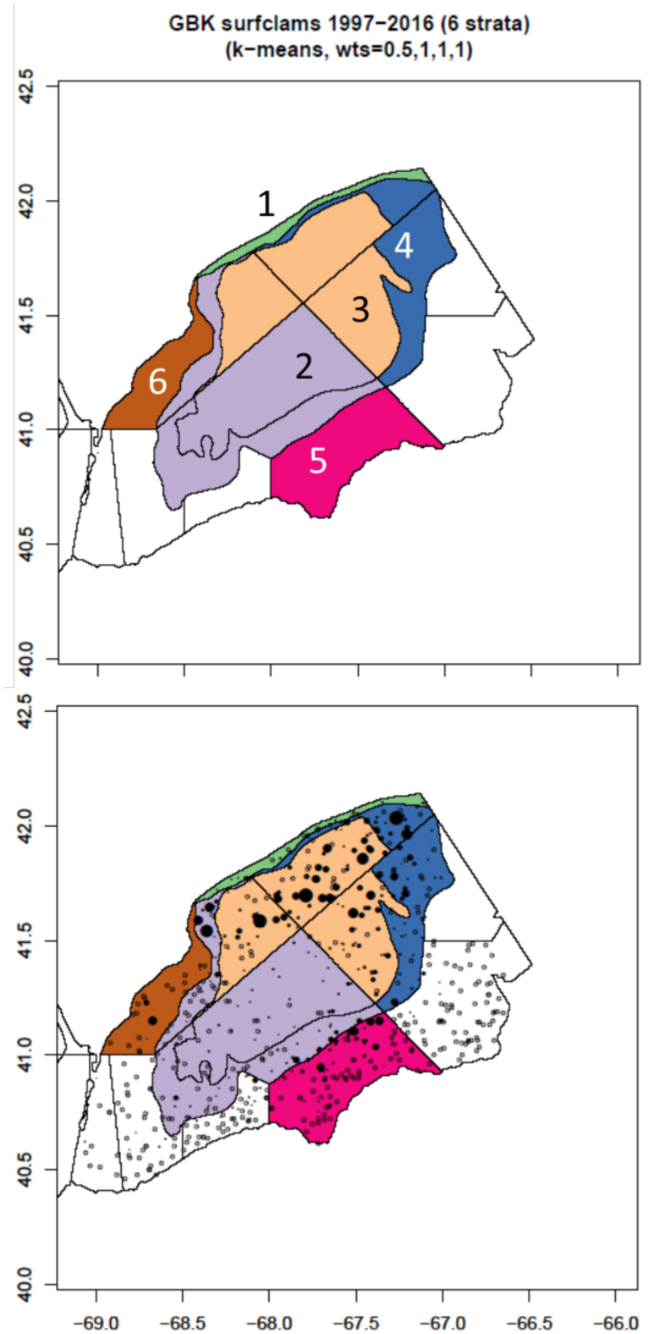

Figure 4.1. Top: Recommended strata for GBK surfclams based on cluster and bootstrap analyses with final data, with new stratum ID numbers. Bottom: Recommended strata with survey data used in analyses. Figures are numbered as in Table 4.3.

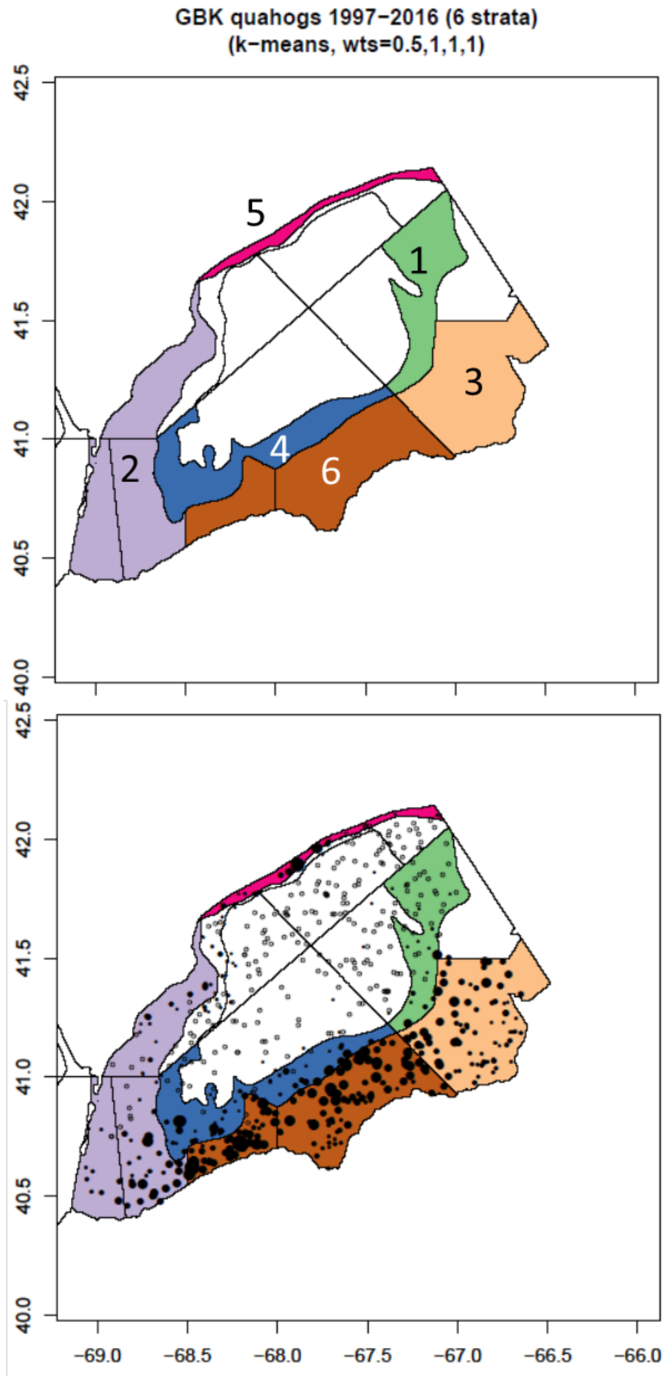

Figure 4.2. Top: Recommended strata for GBK surfclams based on cluster and bootstrap analyses with final data with final data, with new stratum ID numbers. Bottom: Recommended strata with survey data used in analyses. Figures are numbered as in Table 4.3.

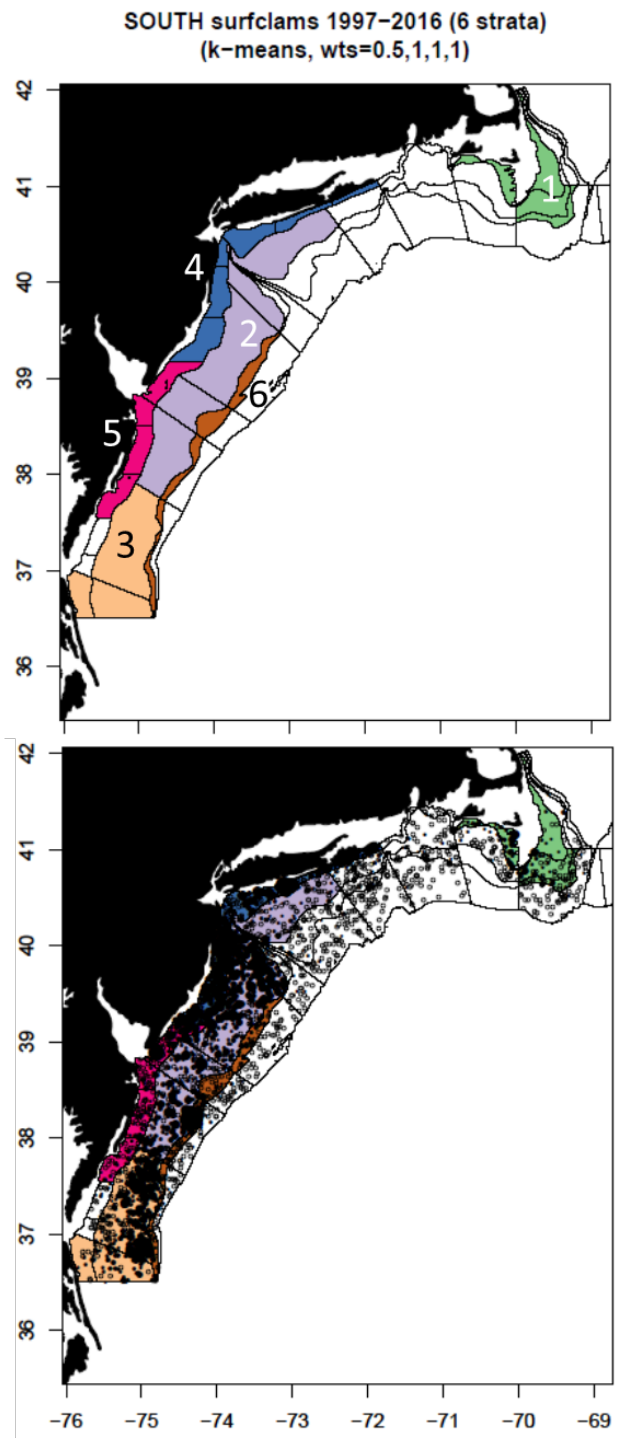

Figure 4.3. Top: Recommended strata for surfclams in the southern area based on cluster and bootstrap analyses with final data, with new stratum ID numbers. Bottom: Recommended strata with survey data used in analyses. Figures are numbered as in Table 4.3.

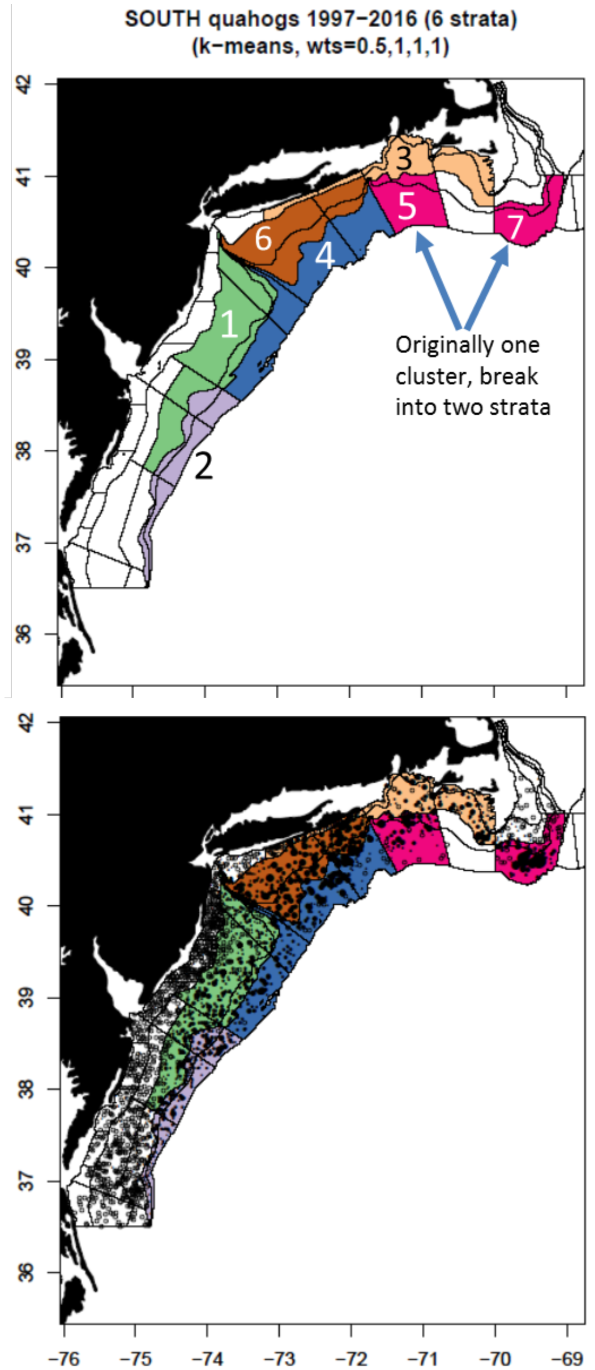

Figure 4.4. Top: Recommended strata for ocean quahogs based on cluster and bootstrap analyses with final data, with new stratum ID numbers. Bottom: Recommended strata with survey data used in analyses. Note recommendation to break one of the strata identified analytically into two new strata based on logistic considerations. Figures are numbered as in Table 4.3.

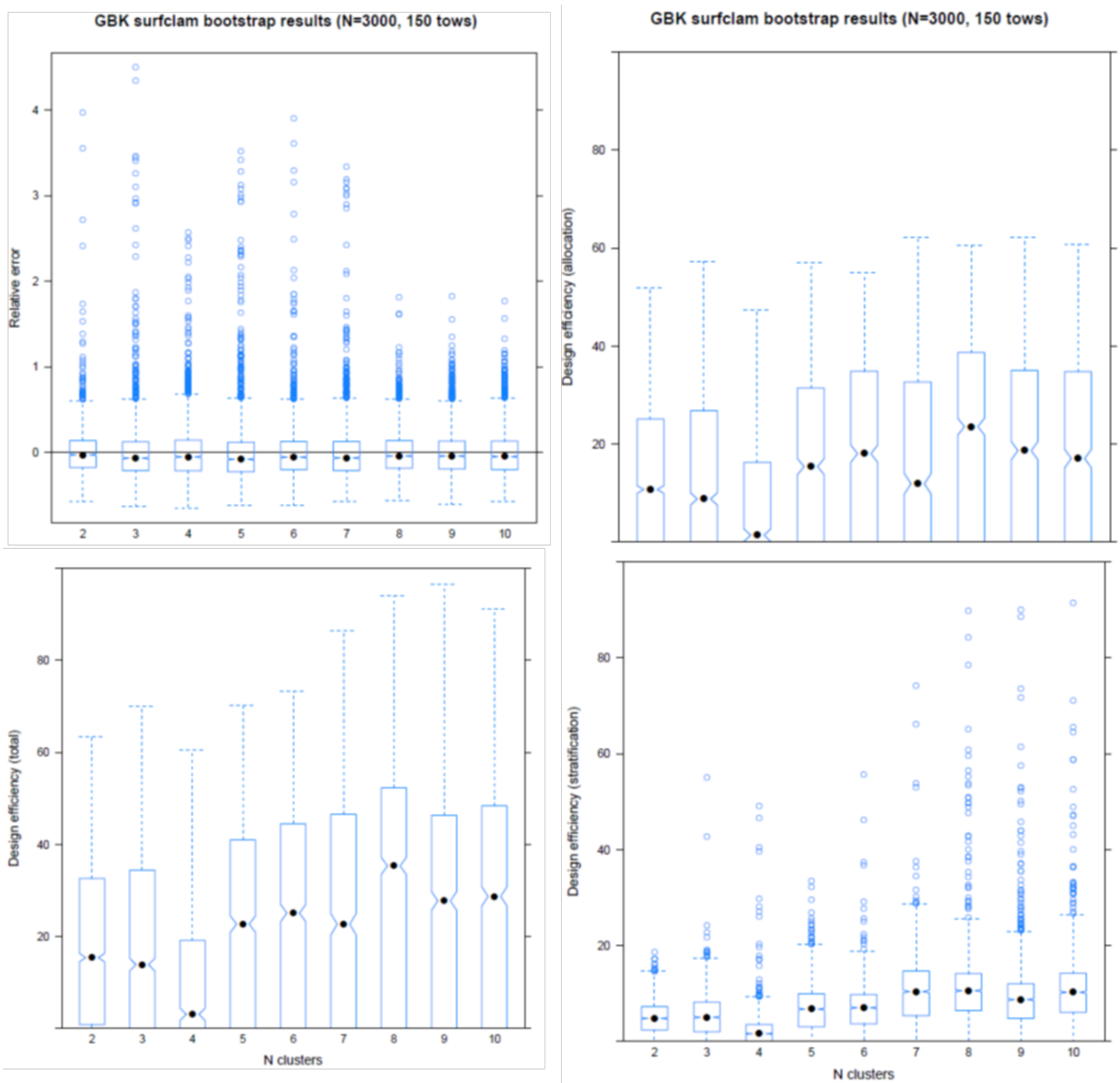

Figure 4.5. Bootstrap results (3000 iterations) for GBK surfclams and 2-10 new strata (clusters) based on final data. Top left: Relative errors. Top right: *DEF* (total). Bottom left: $DEF_{Efficiency}$. Bottom right: $DEF_{Allocation}$. Only positive DEF values are shown for clear presentation. Black dots show medians and notched portion of figures shows approximate 95% confidence intervals for the medians.

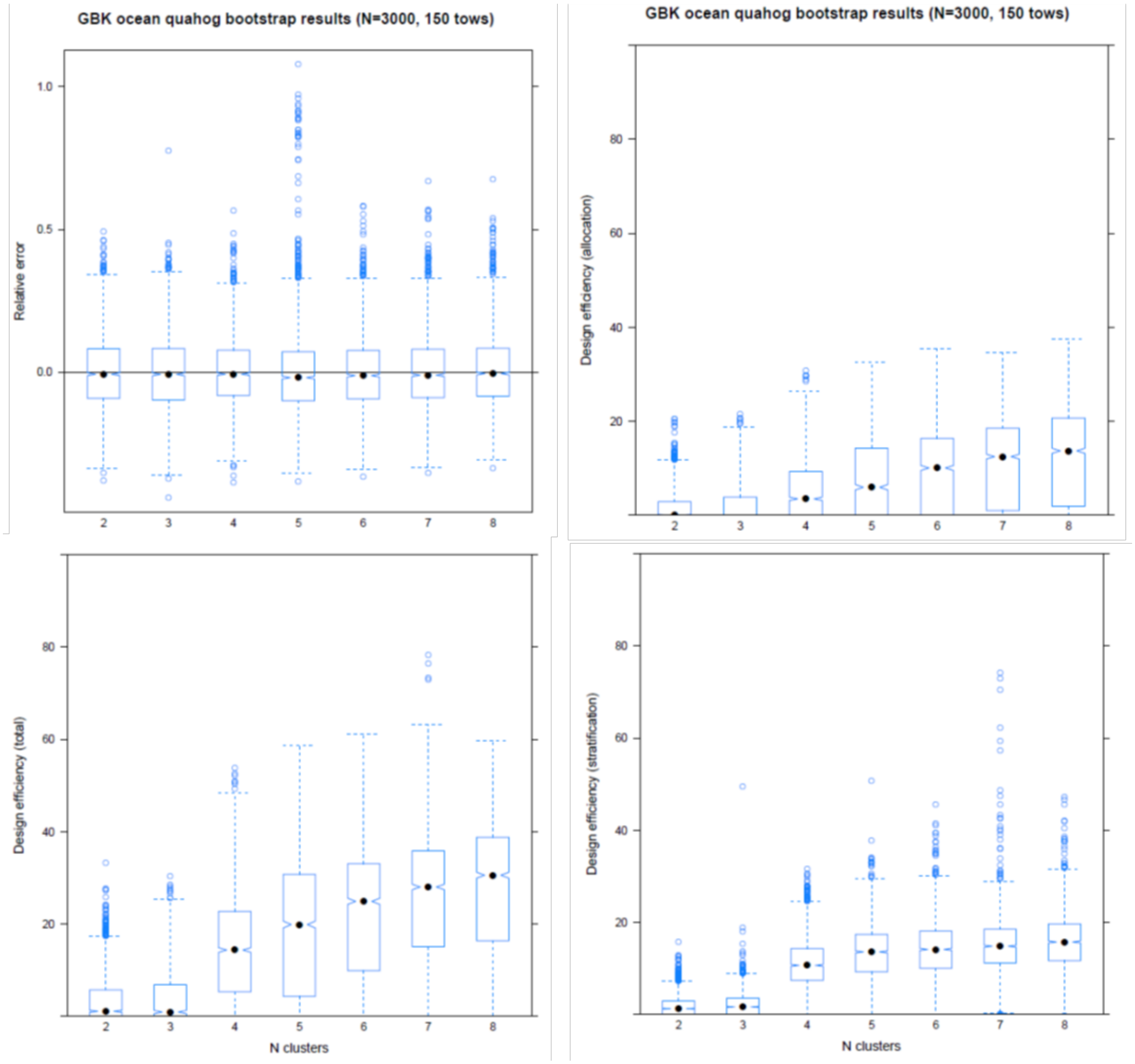

Figure 4.6. Bootstrap results (3000 iterations) for GBK ocean quahogs and 2-10 new strata (clusters) based on final data. Top left: Relative errors. Top right: *DEF* (total). Bottom left: $DEF_{Efficiency}$. Bottom right: $DEF_{Allocation}$. Only positive DEF values are shown for clear presentation. Black dots show medians and notched portion of figures shows approximate 95% confidence intervals for the medians.

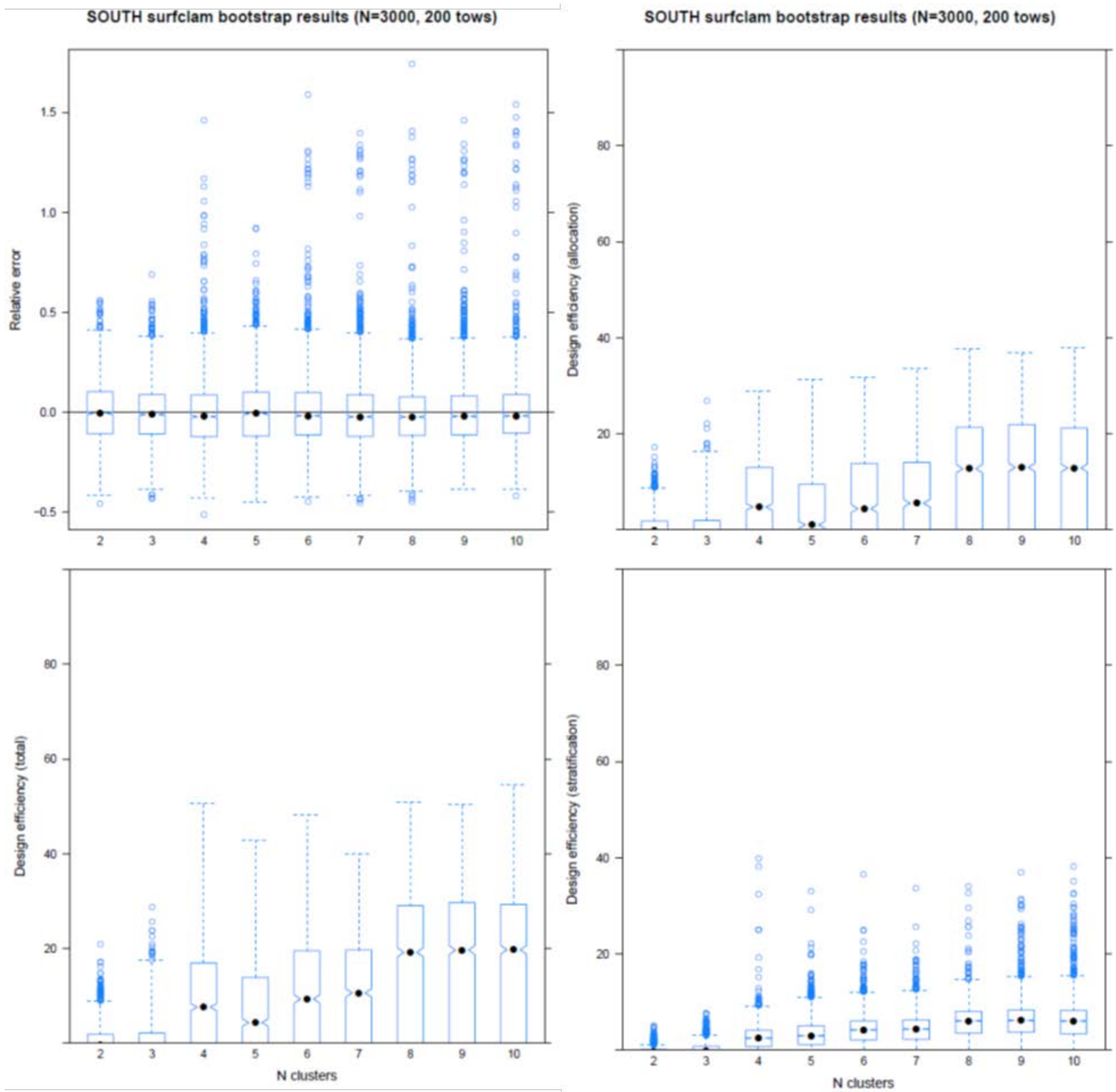

Figure 4.7. Bootstrap results (3000 iterations) for surfclams in the southern area and 2-10 new strata (clusters) based on final data. Top left: Relative errors. Top right: *DEF* (total). Bottom left: $DEF_{Efficiency}$. Bottom right: $DEF_{Allocation}$. Only positive DEF values are shown for clear presentation. Black dots show medians and notched portion of figures shows approximate 95% confidence intervals for the medians.

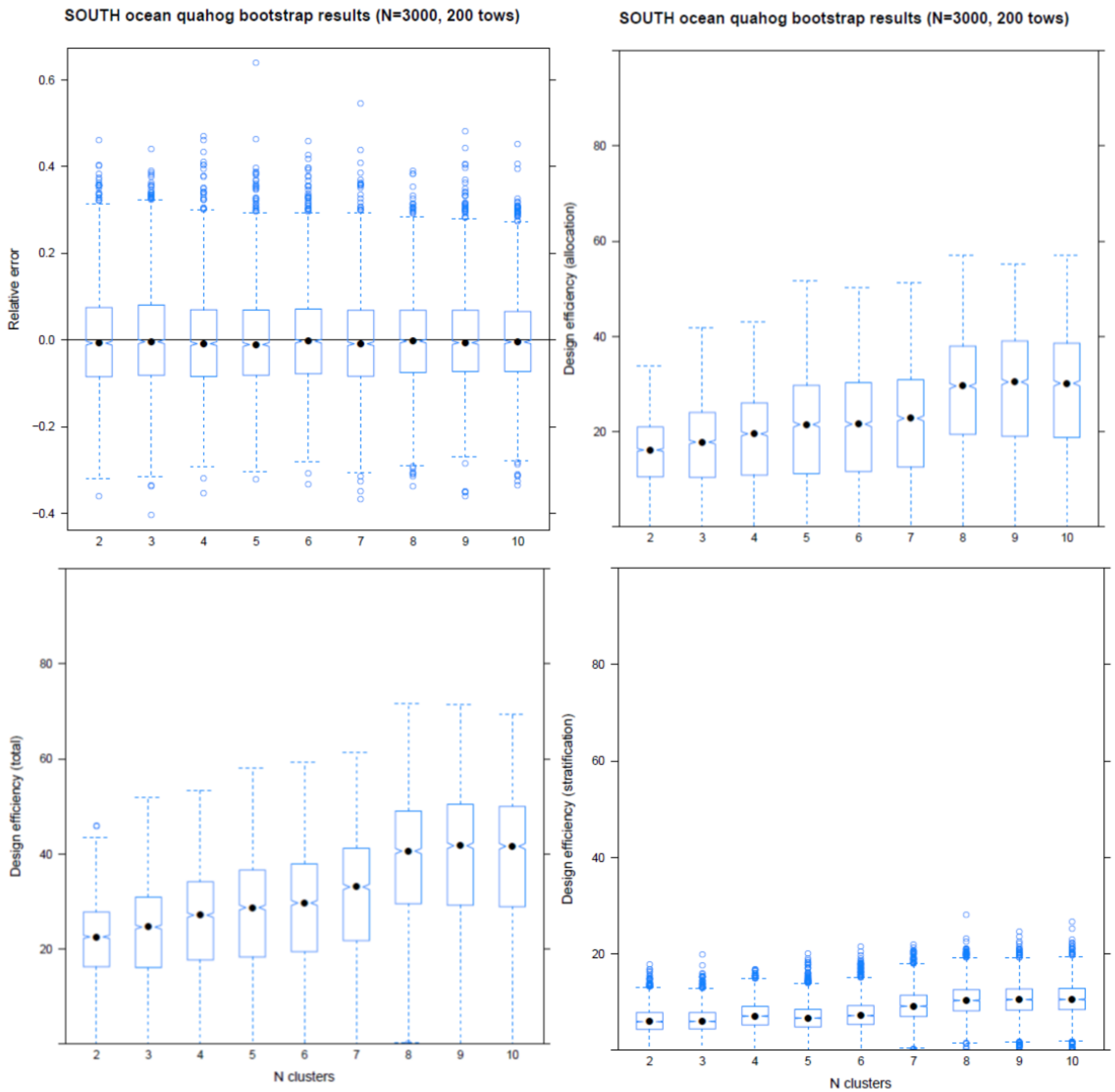

Figure 4.8. Bootstrap results (3000 iterations) for ocean quahogs in the southern area and 2-10 new strata (clusters) based on final data. Top left: Relative errors. Top right: *DEF* (total). Bottom left: $DEF_{Efficiency}$. Bottom right: $DEF_{Allocation}$. Only positive DEF values are shown for clear presentation. Black dots show medians and notched portion of figures shows approximate 95% confidence intervals for the medians.

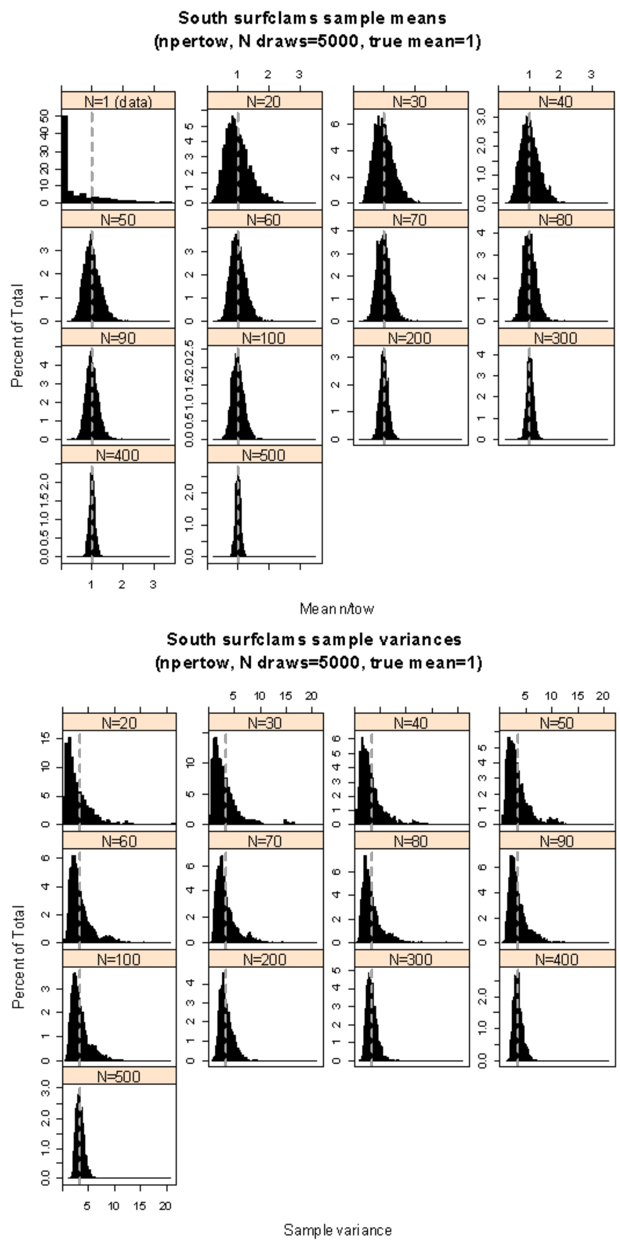

Figure 4.9. Simulation illustrating relatinship between sample size and the precision of estimated means and variances in simple random sampling. Each panel shows the distribution of 5000 estimated means and variances for samples of the size indicated at the top of the panel (e.g. N=20 means 20 tows were sampled 5000 times). The data were for surfclams in the southern area during 1997-2016 in building blocks selected based on the 1% rule. The selected data were scaled to a mean on one in each year to avoid exaggerating variance. Vertical lines in each panel show the simulated true population statistic.

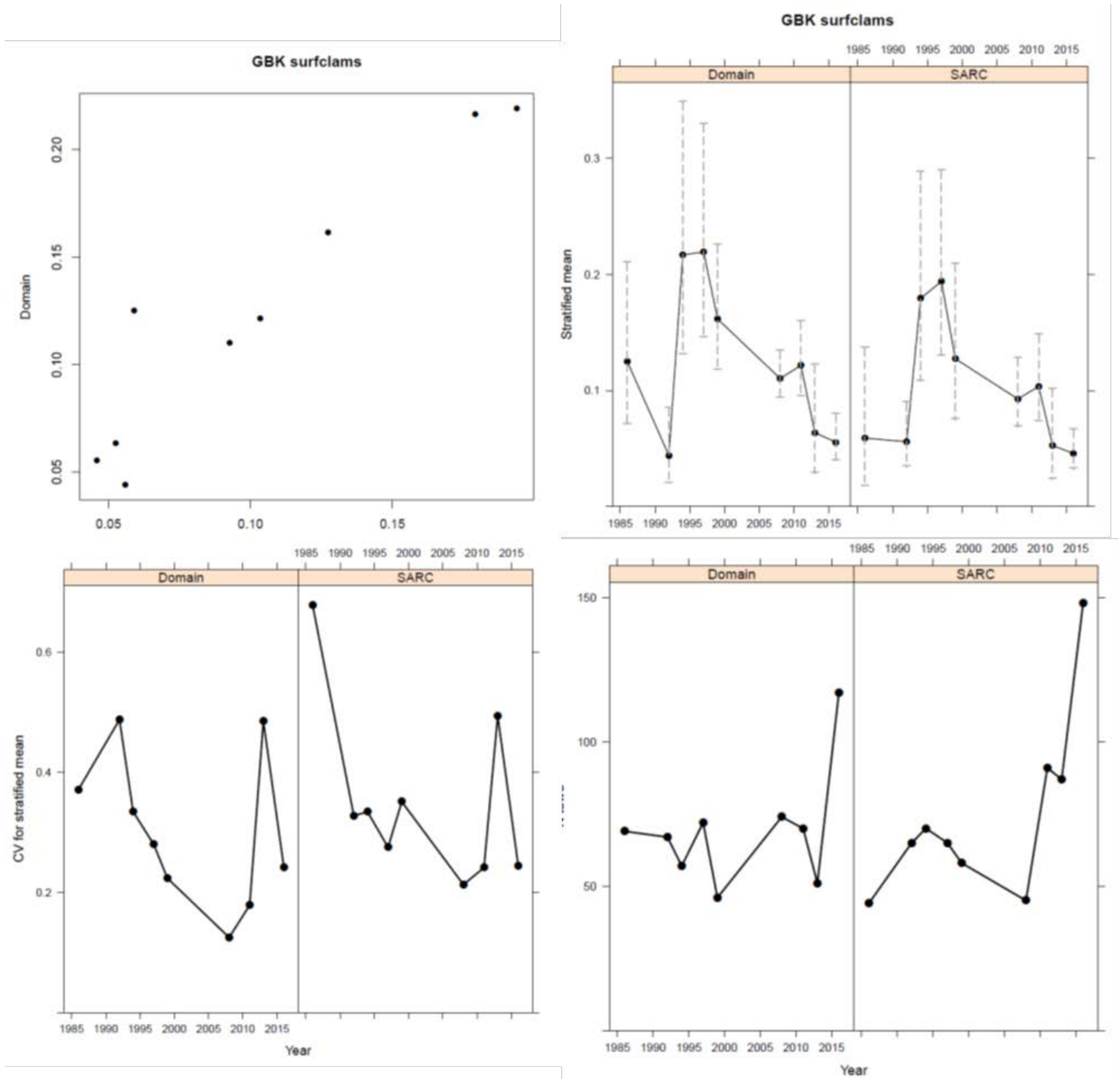

Figure 4.10 Post-stratfified means, 95% confidence intervals and CVs based on domain variance calculations and sample size (N tows) for GBK surfclams calculated using recommended (Domain) and current (SARC) stratification schemes.

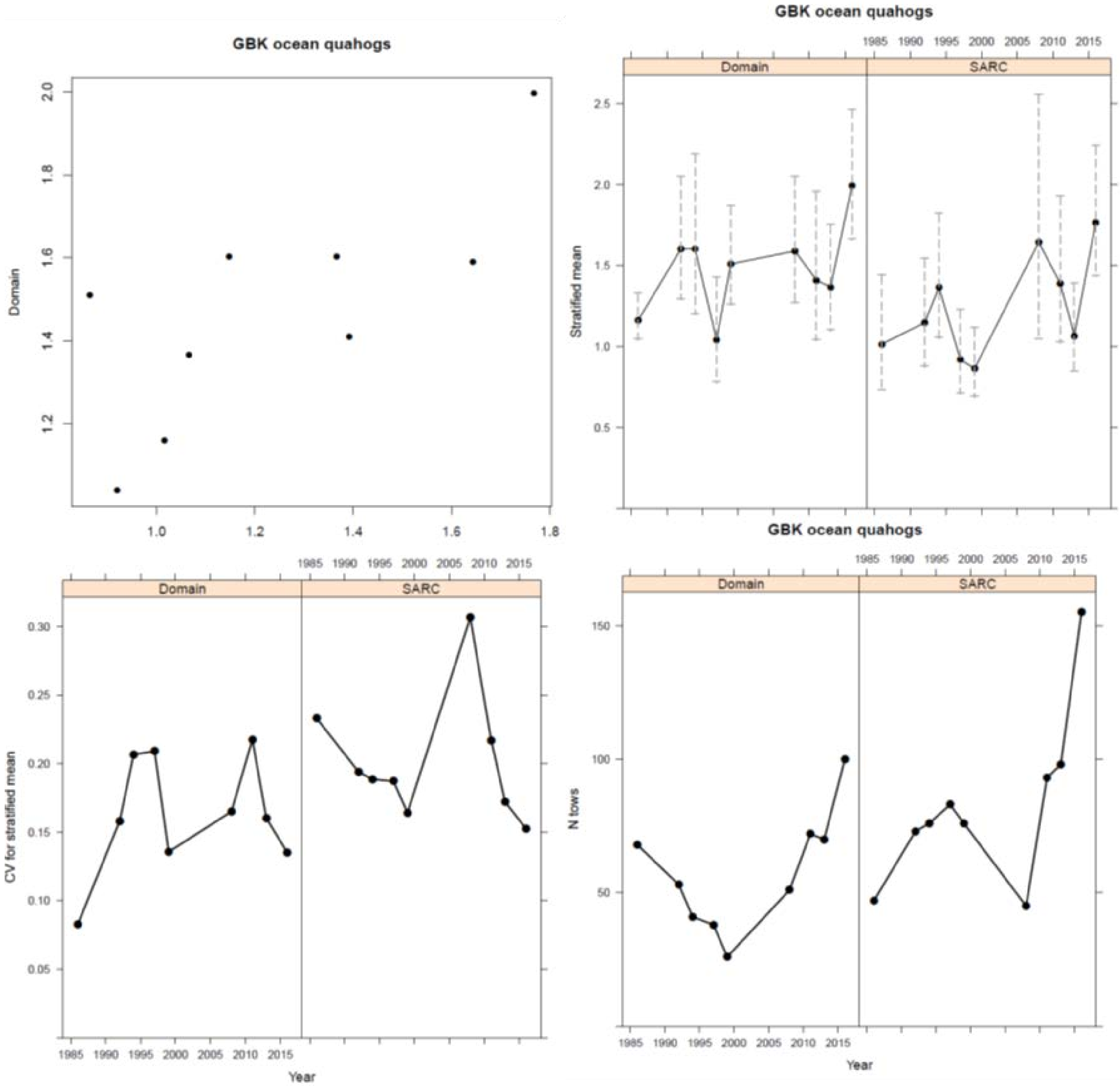

Figure 4.11 Post-stratfified means, 95% confidence intervals and CVs based on domain variance calculations and sample size (N tows) for GBK ocean quahogs calculated using recommended (Domain) and current (SARC) stratification schemes.

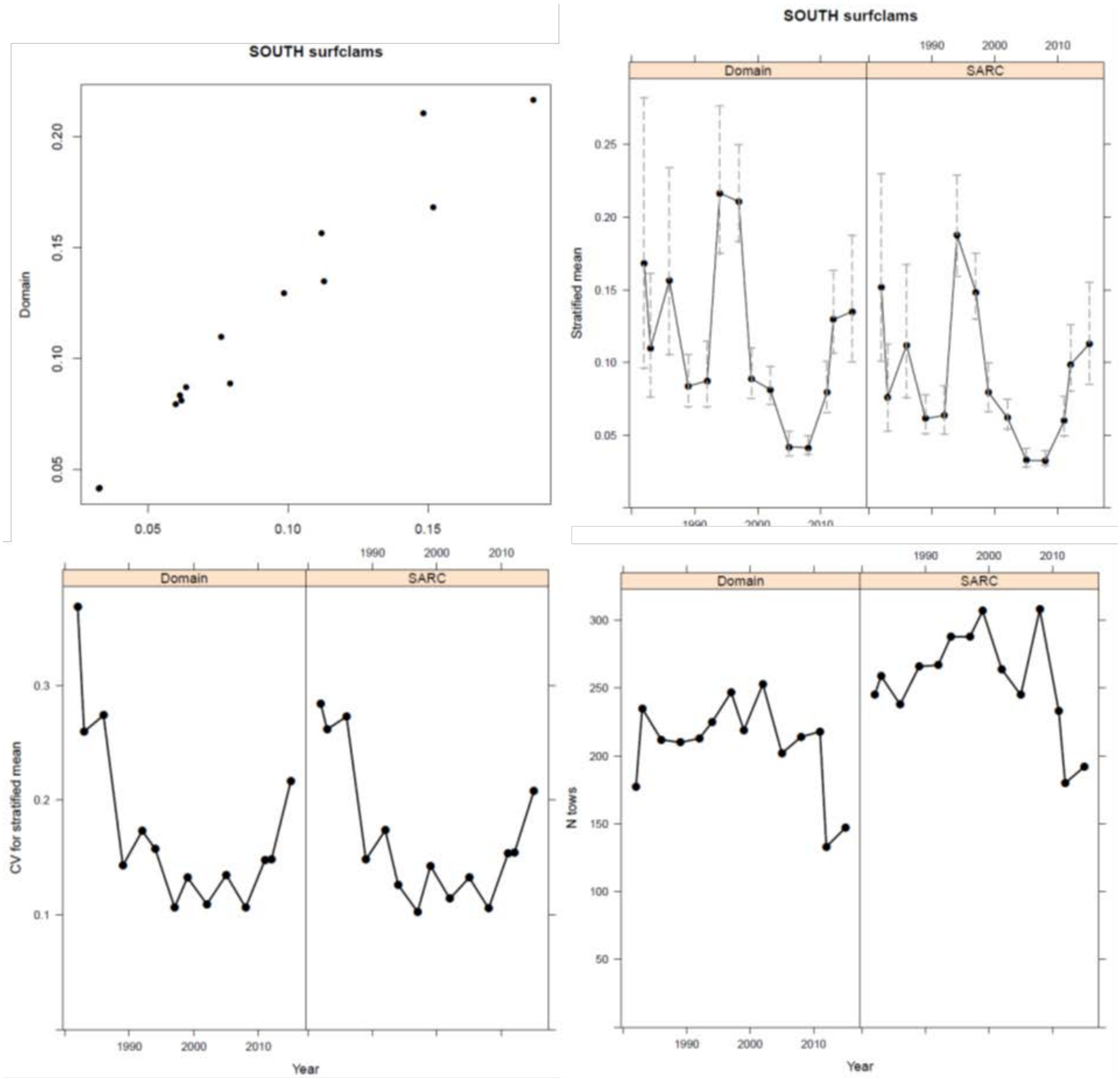

Figure 4.12. Post-stratified means, 95% confidence intervals and CVs based on domain variance calculations and sample size (N tows) for surfclams in the southern area calculated using recommended (Domain) and current (SARC) stratification schemes.

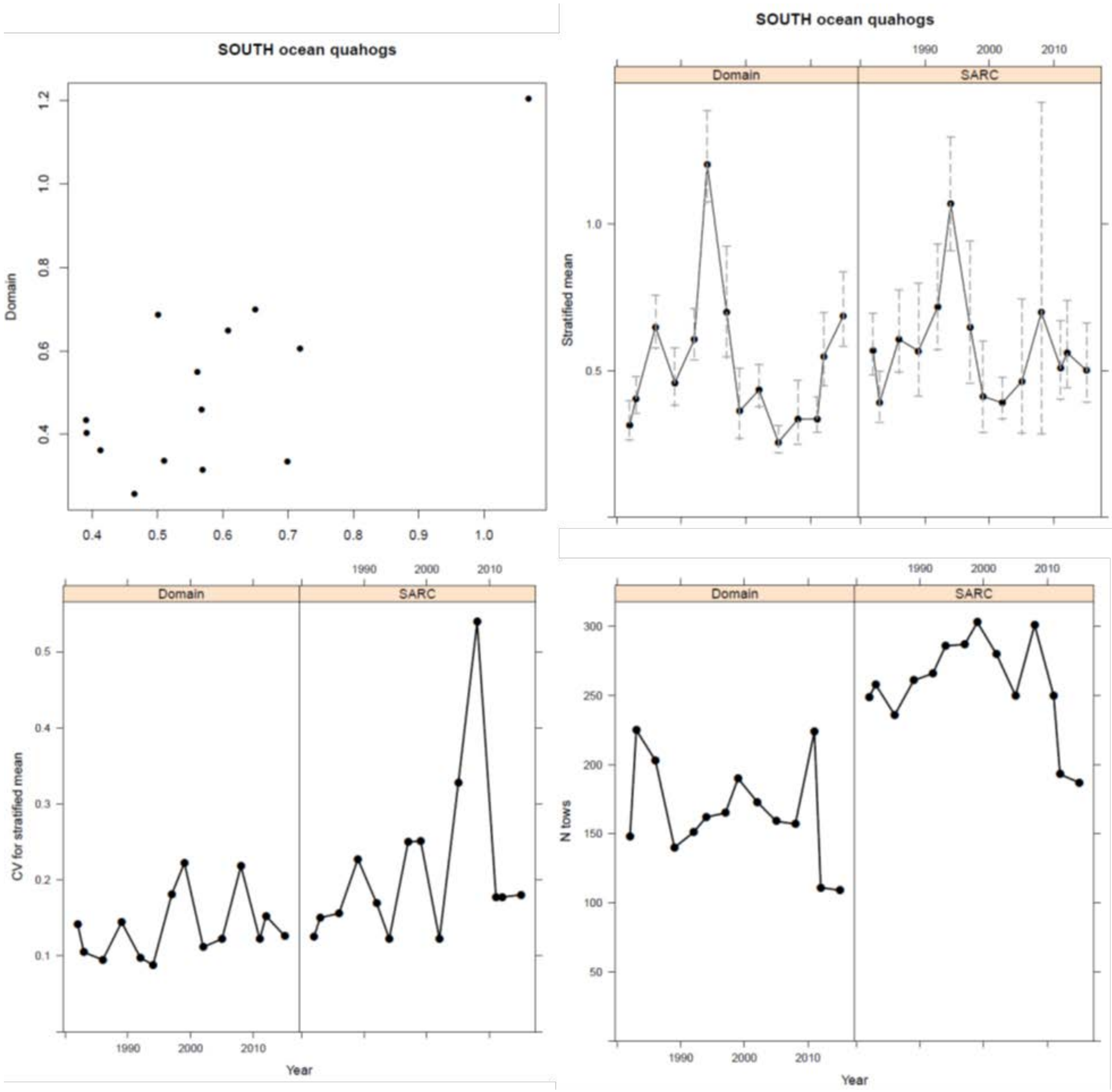

Figure 4.13. Post-stratfified means, 95% confidence intervals and CVs based on domain variance calculations and sample size (N tows) for ocean quahogs in the southern area calculated using recommended (Domain) and current (SARC) stratification schemes.

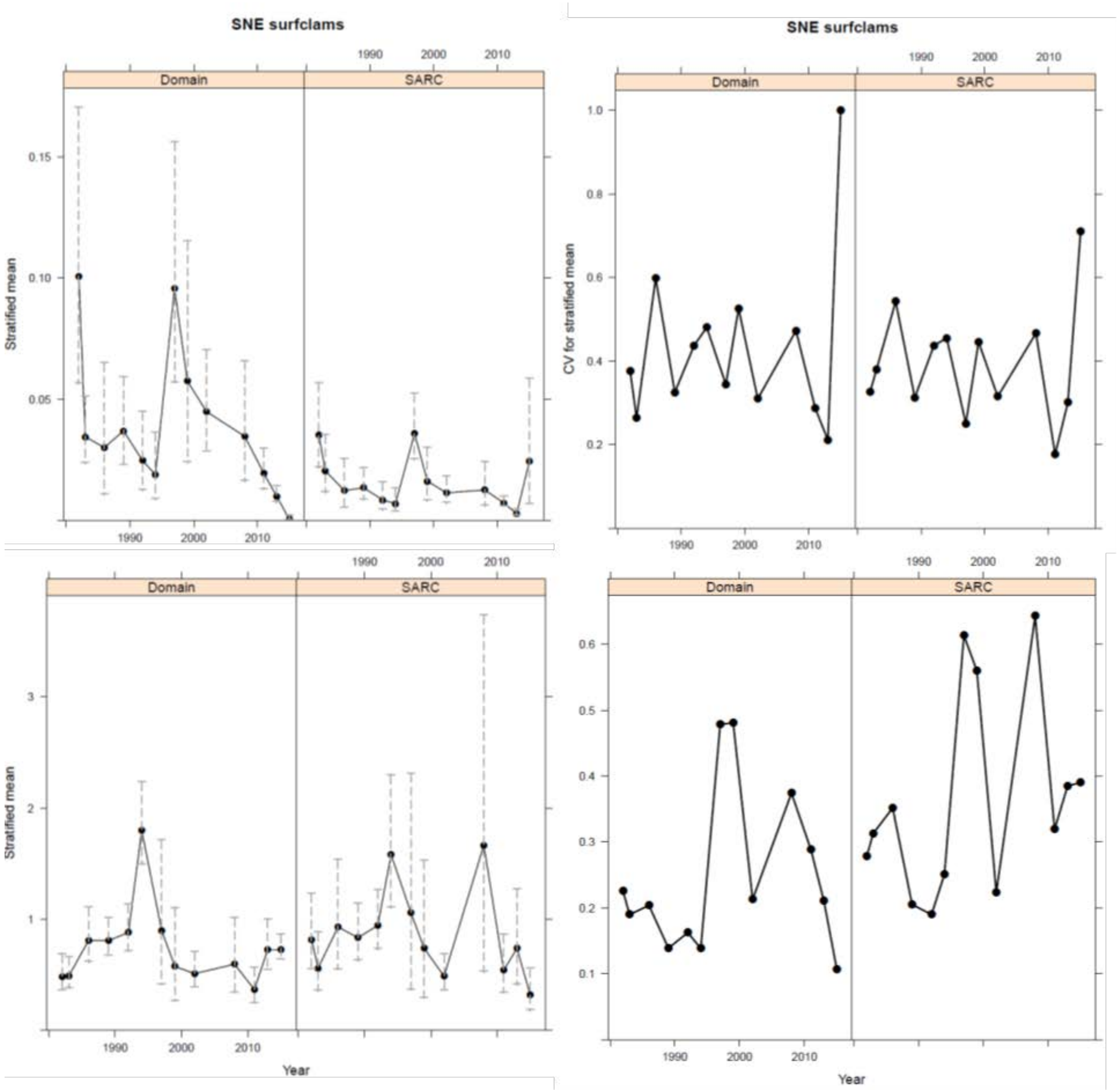

Figure 4.14. Post-stratfified means with 95% confidence intervals and CVs based on domain variance calculations for surflclams (top) and ocean quahogs (bottom) in the SNE region calculated using recommended (Domain) and current (SARC) stratification schemes.

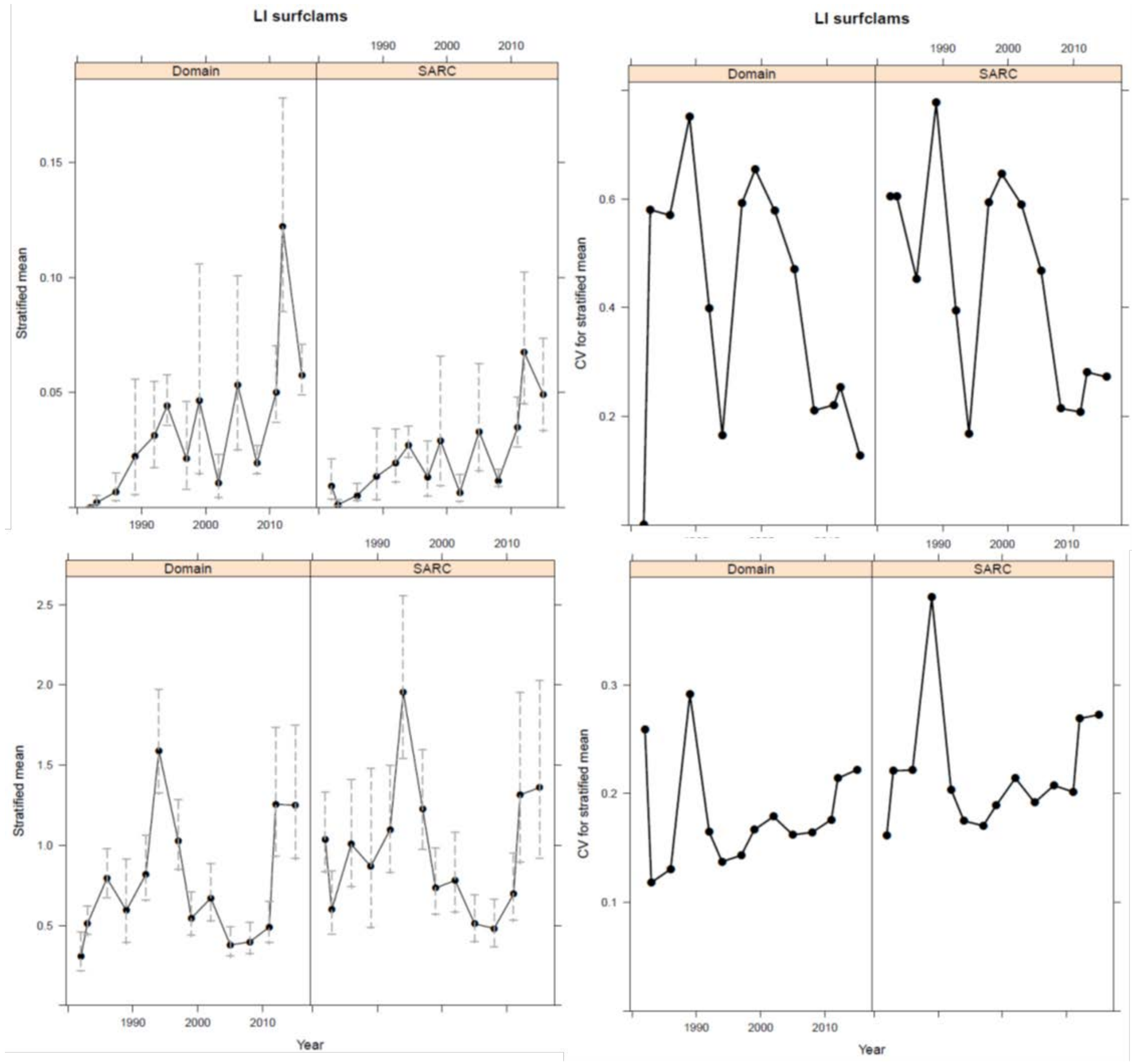

Figure 4.15. Post-stratfified means with 95% confidence intervals and CVs based on domain variance calculations for surflclams (top) and ocean quahogs (bottom) in the LI region calculated using recommended (Domain) and current (SARC) stratification schemes.

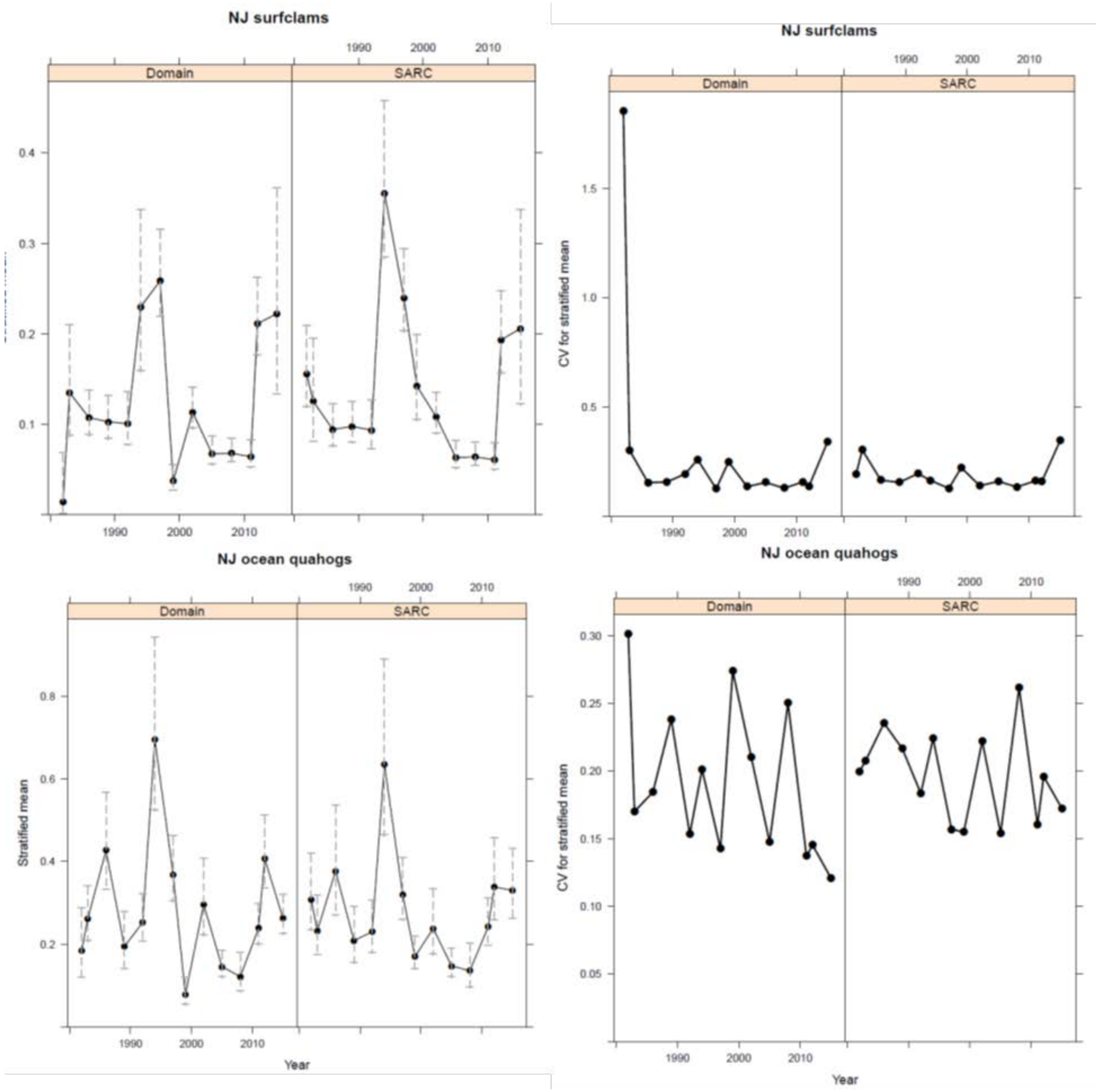

Figure 4.16. Post-stratfified means with 95% confidence intervals and CVs based on domain variance calculations for surflclams (top) and ocean quahogs (bottom) in the NJ region calculated using recommended (Domain) and current (SARC) stratification schemes.

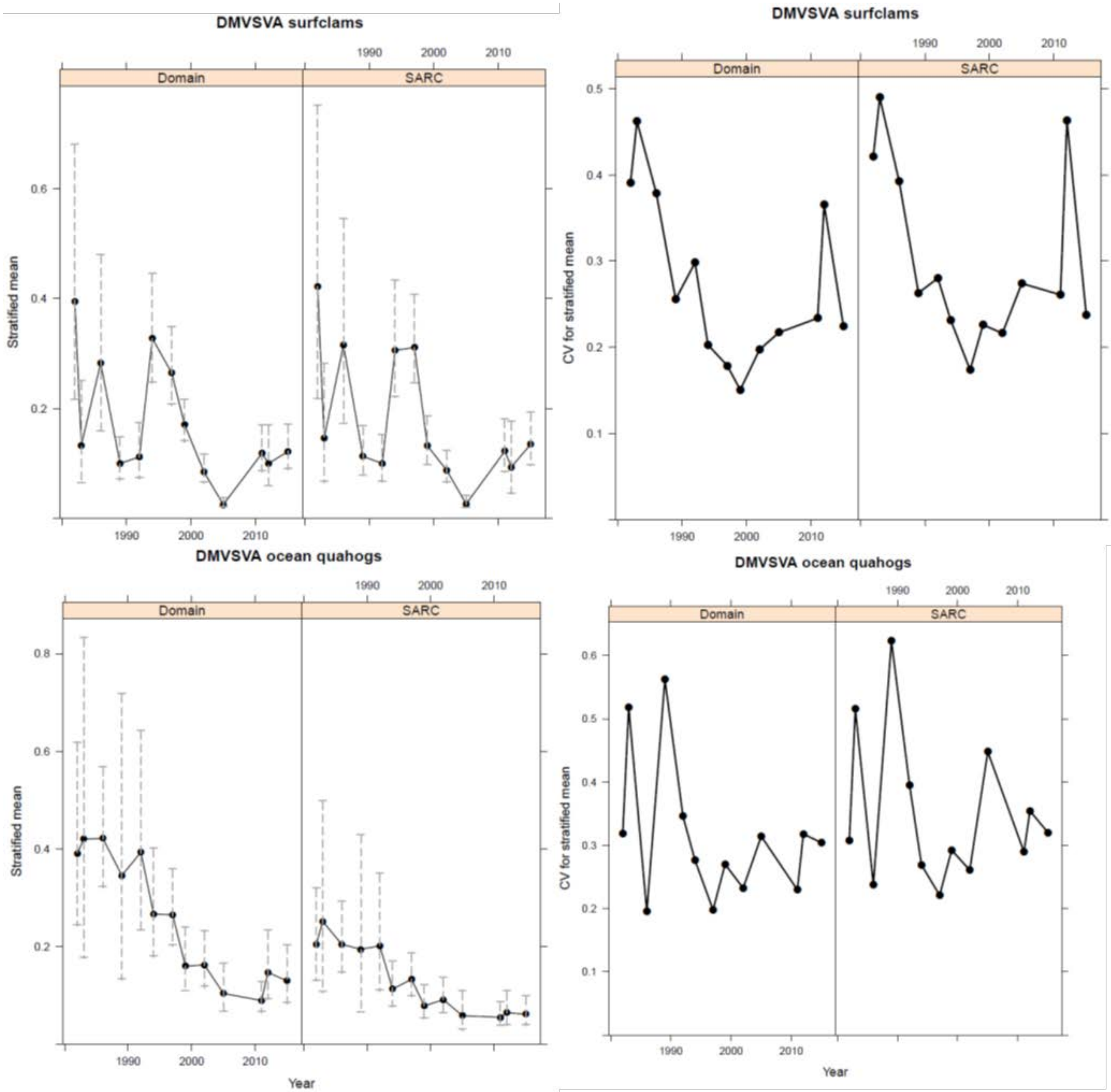

Figure 4.17. Post-stratfified means with 95% confidence intervals and CVs based on domain variance calculations for surflclams (top) and ocean quahogs (bottom) in the DMVSVA region calculated using recommended (Domain) and current (SARC) stratification schemes.