SILVER HAKE FIGURES

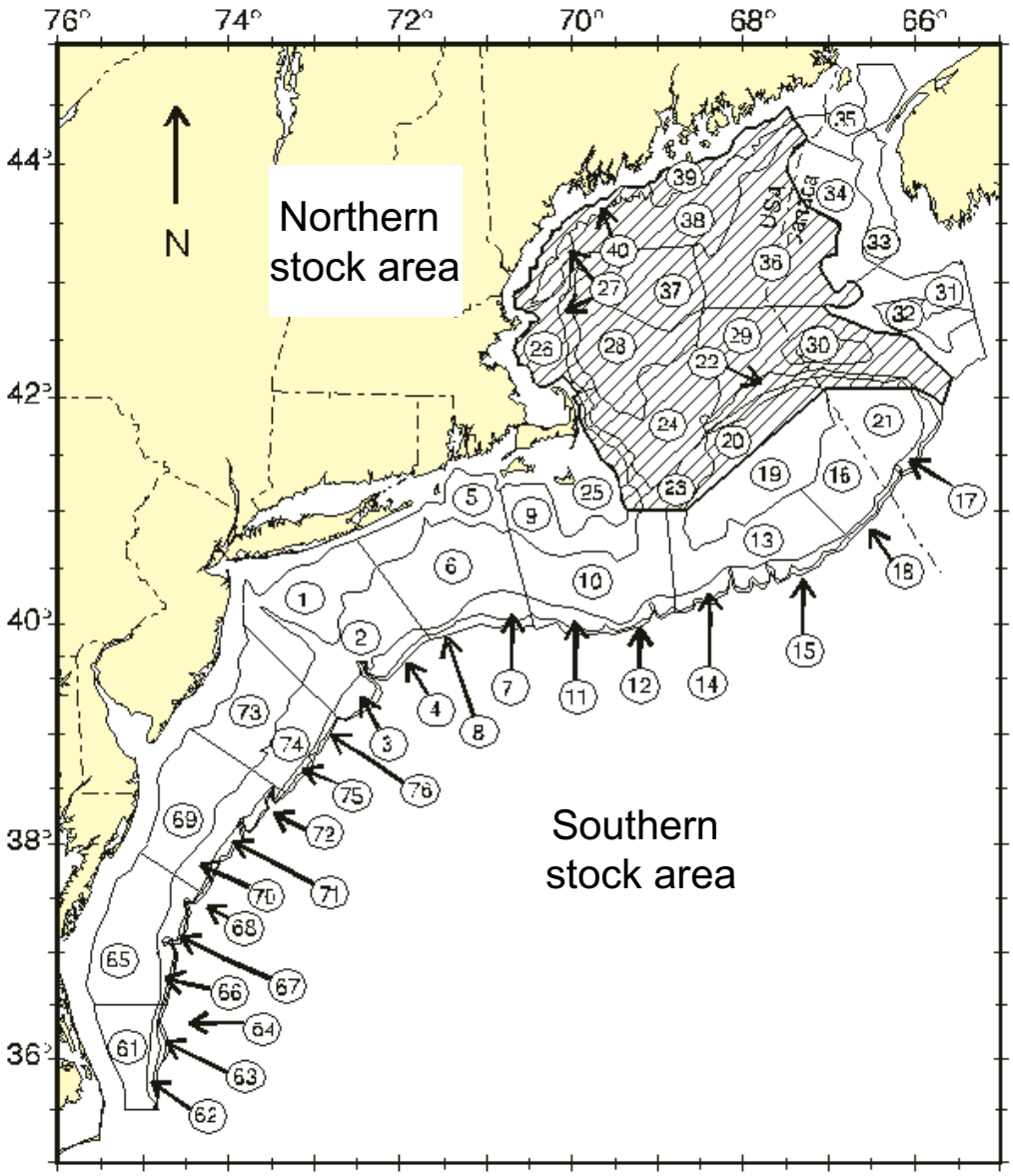


Figure A1. Silver hake stock areas in US waters with NEFSC offshore survey strata. The straum labeled "73" is, for example, stratum 01730. Numerous inshore survey strata, where silver hake also occur, are not shown. The northern stock area is shown by diagonal lines.

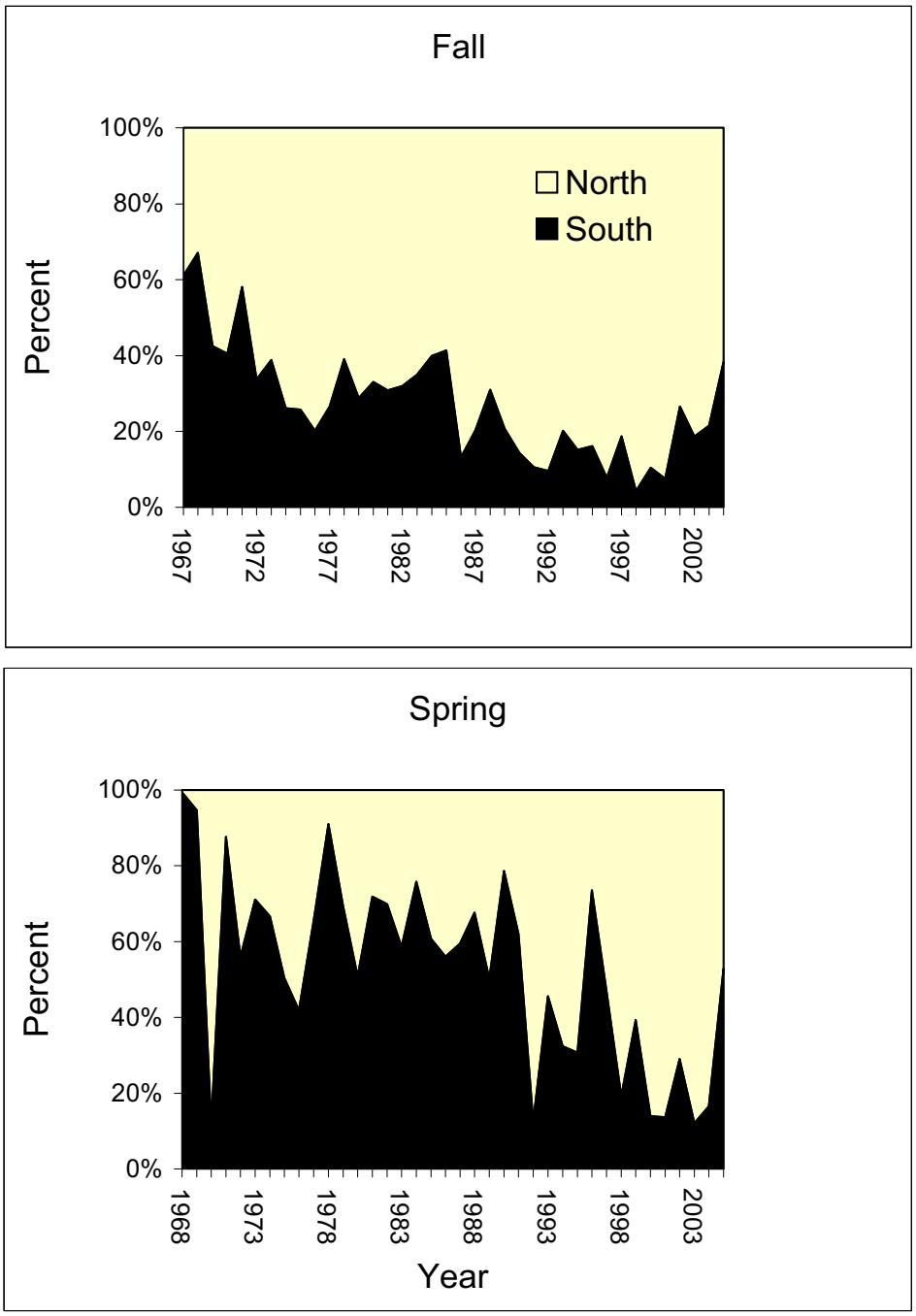


Figure A2. Percent of minimum swept area biomass in the northern and southern stock areas based on NEFSC fall surveys during 1967-2004 and NEFSC spring surveys during 1968-2005. Traditional (consistently occupied offshore strata) were used for survey data.

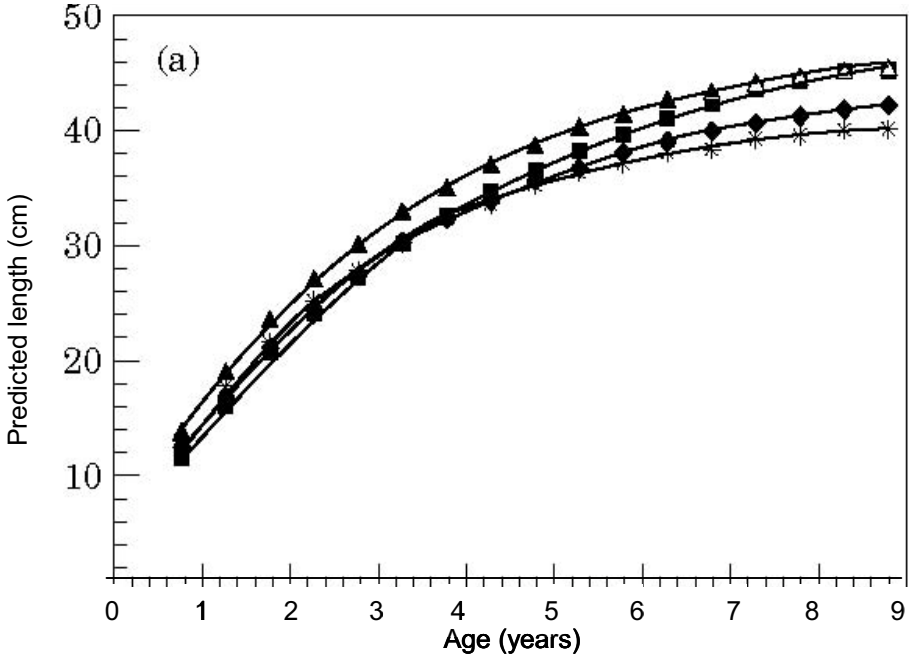


Figure A3. "Typical" growth curves for silver hake from NEFSC fall surveys along the northeast coast between the Gulf of Maine and Mid-Atlantic during 1975-1980 (from Helser 1996).

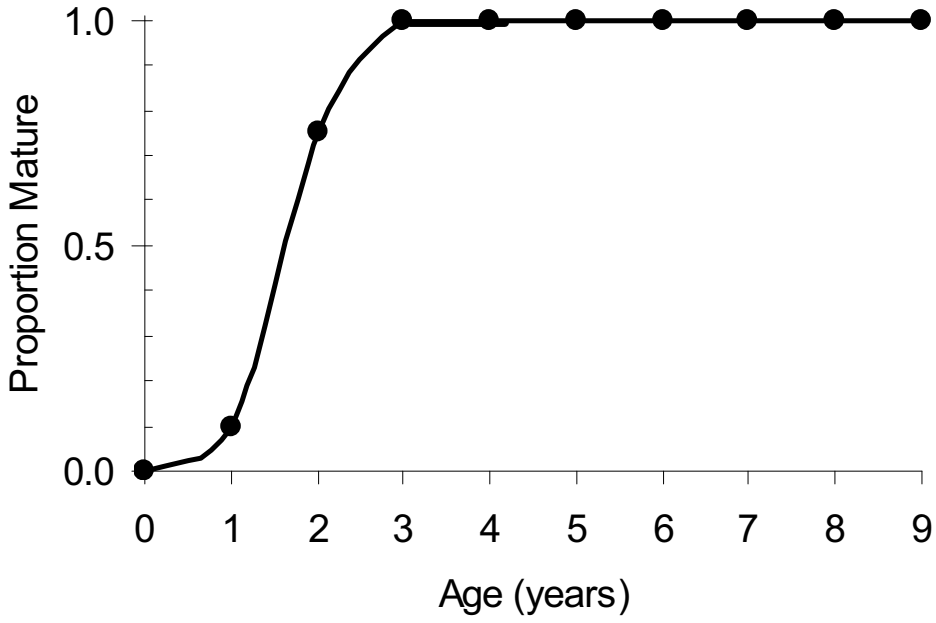


Figure A4. Maturity at age for silver hake from Brodziak et al. (2001).

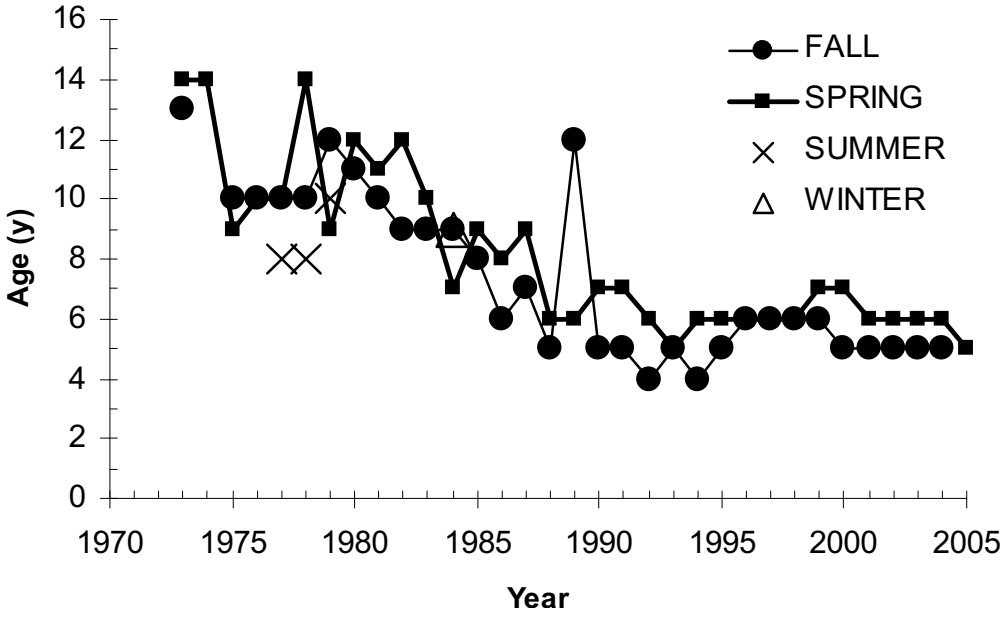


Figure A5. Maximum observed ages by year in NEFSC fall, spring, summer, and winter bottom trawl surveys. Silver hake in summer and winter surveys are not routinely aged. Silver hake age data are currently being audited and are preliminary.

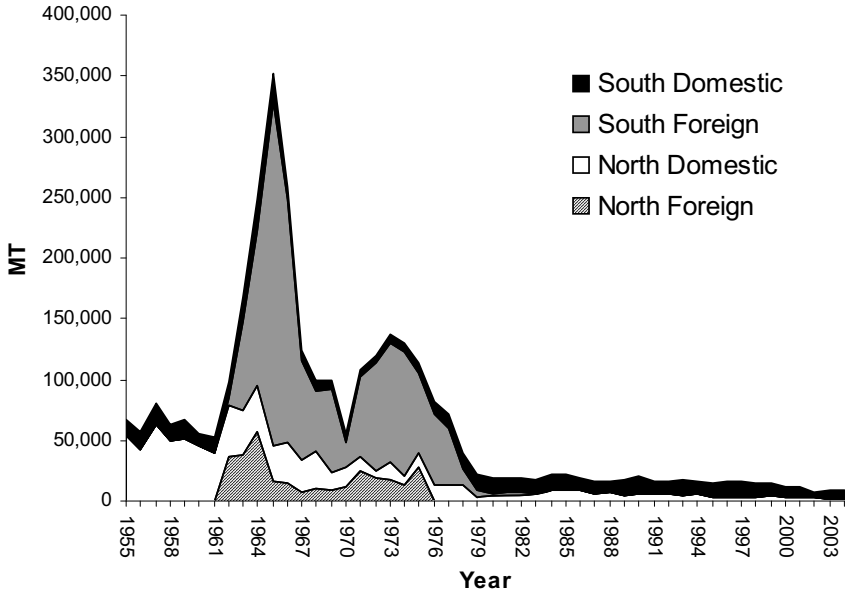


Figure A6. Silver hake landings (mt) by stock area during 1955-2004 for foreign and domestic fishing fleets.

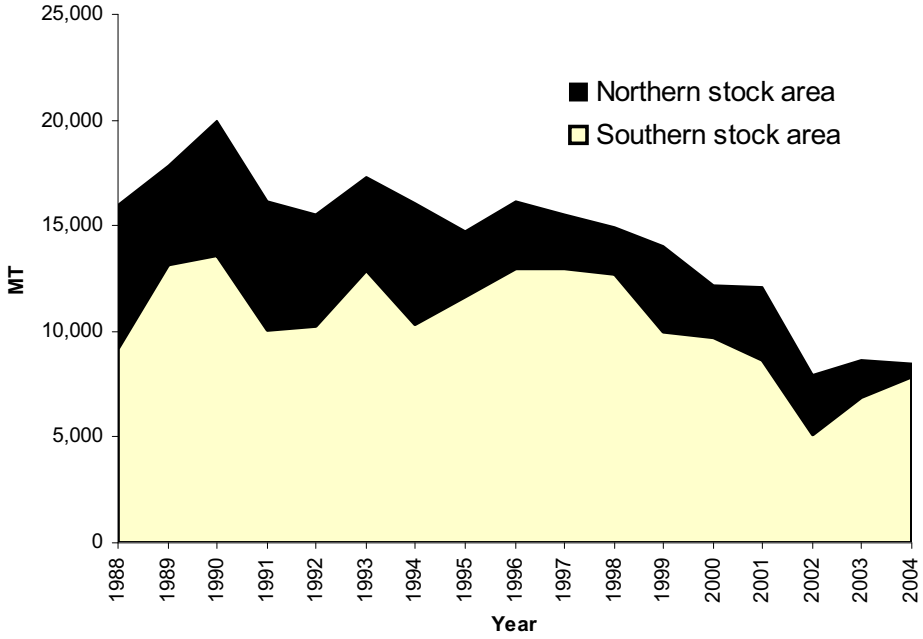


Figure A7. Silver hake landings (mt) in the US domestic fishery by stock area during 1988-2004.

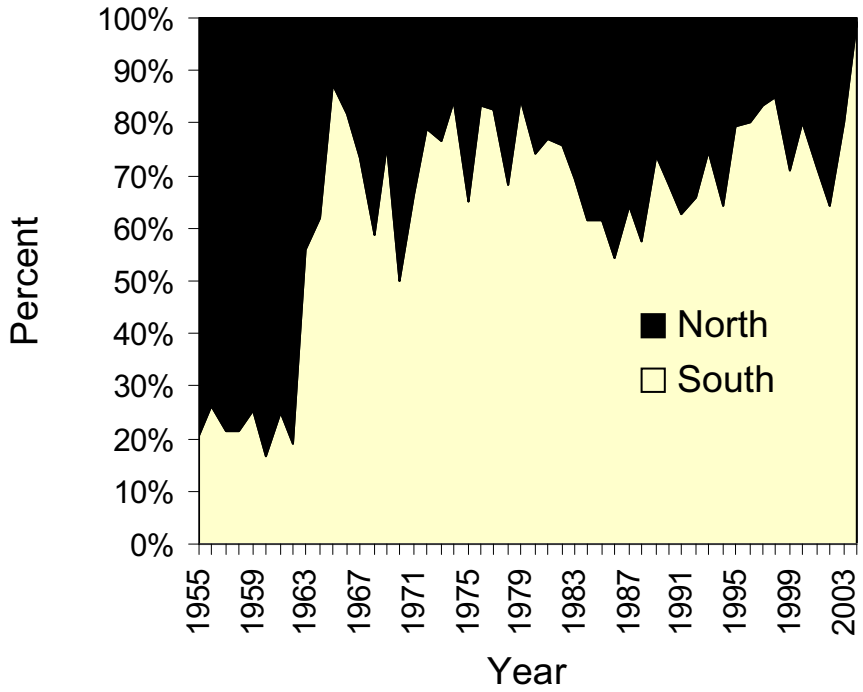


Figure A8. Percent of total silver hake landings (domestic + foreign) from the northern and southern stock areas during 1955-2004.

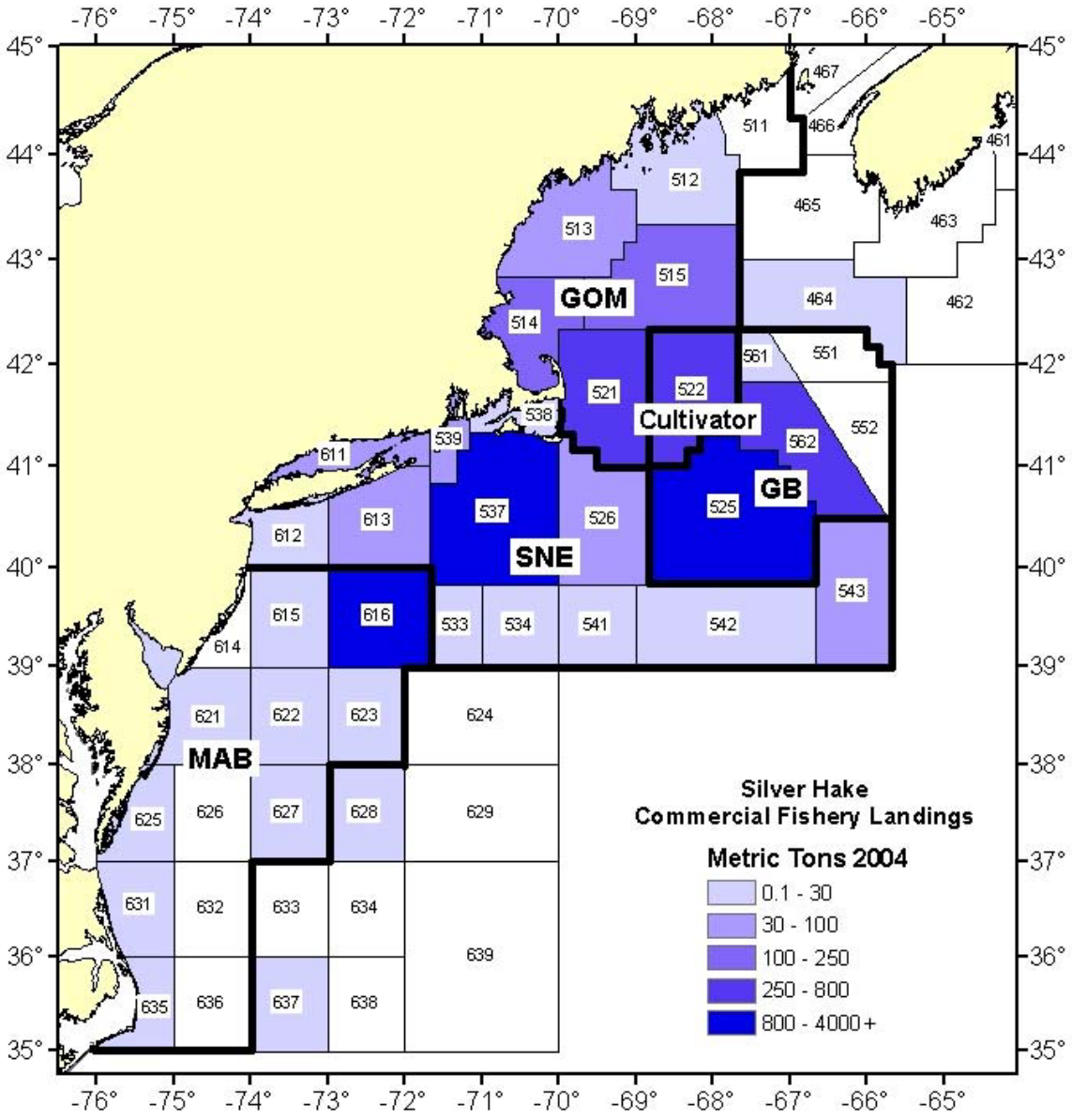


Figure A9. Landings by statistical area (identified by 3-digit numbers) and region during 2004, which was a typical year. Regions are the Gulf of Maine (GOM), Cultivator Shoals, Georges Bank (GB), Southern New England (SNE), and the Mid-Atlantic Bight (MAB).

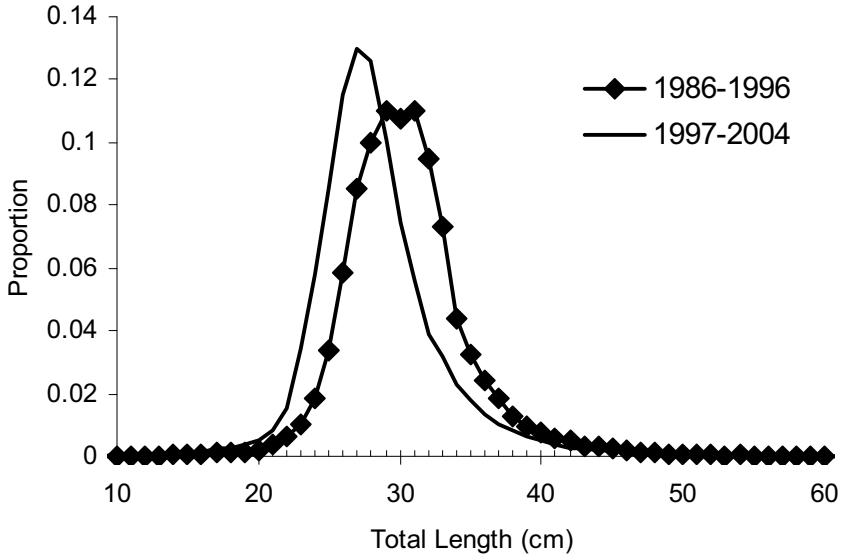


Figure A10. Commercial length composition data for silver hake during 1986-1996 and 1997-2004.

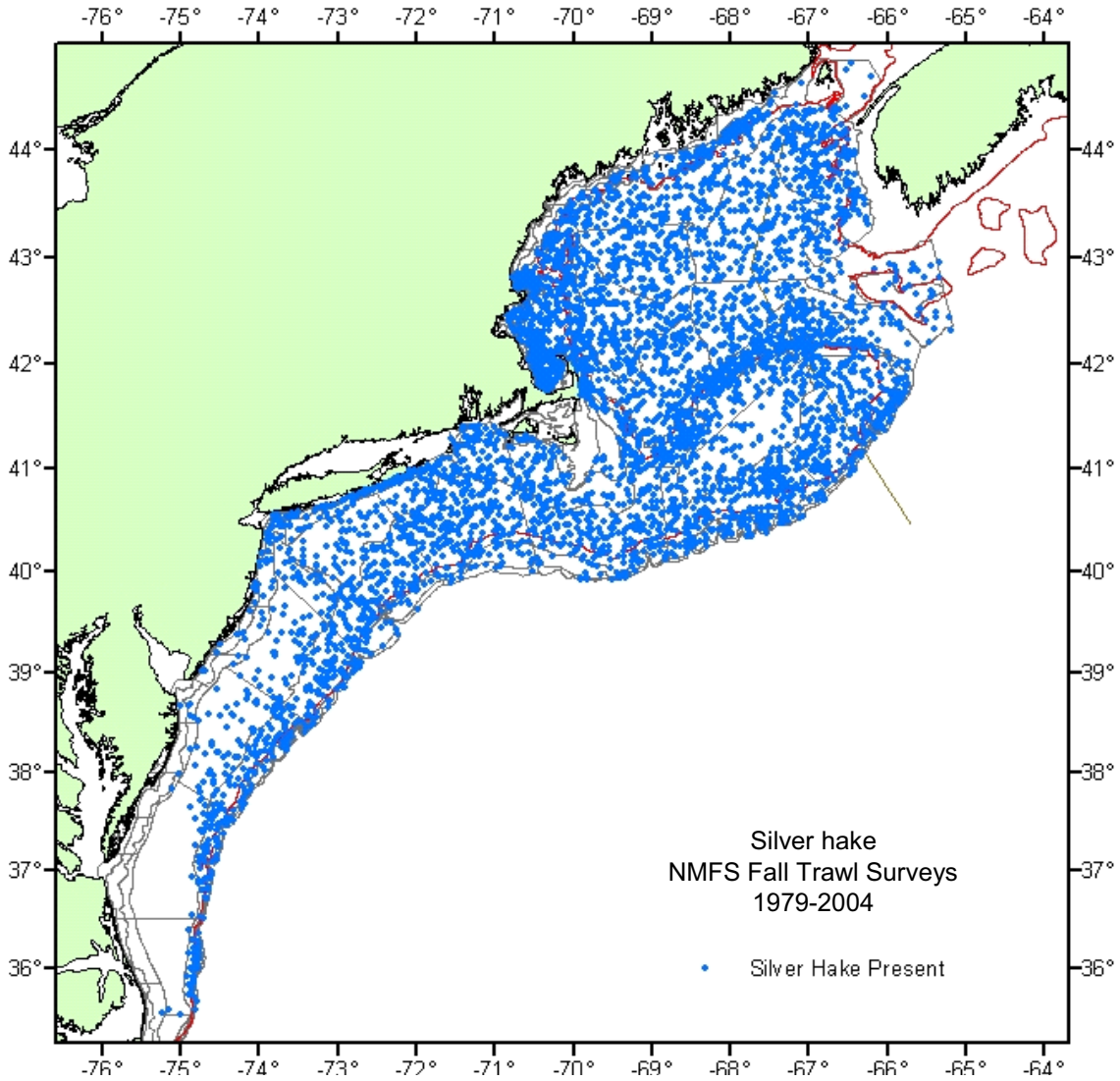


Figure A11. Locations of NEFSC fall bottom trawl survey tows that caught at least one silver hake during 1979-2004, based on all inshore and offshore strata that were sampled.

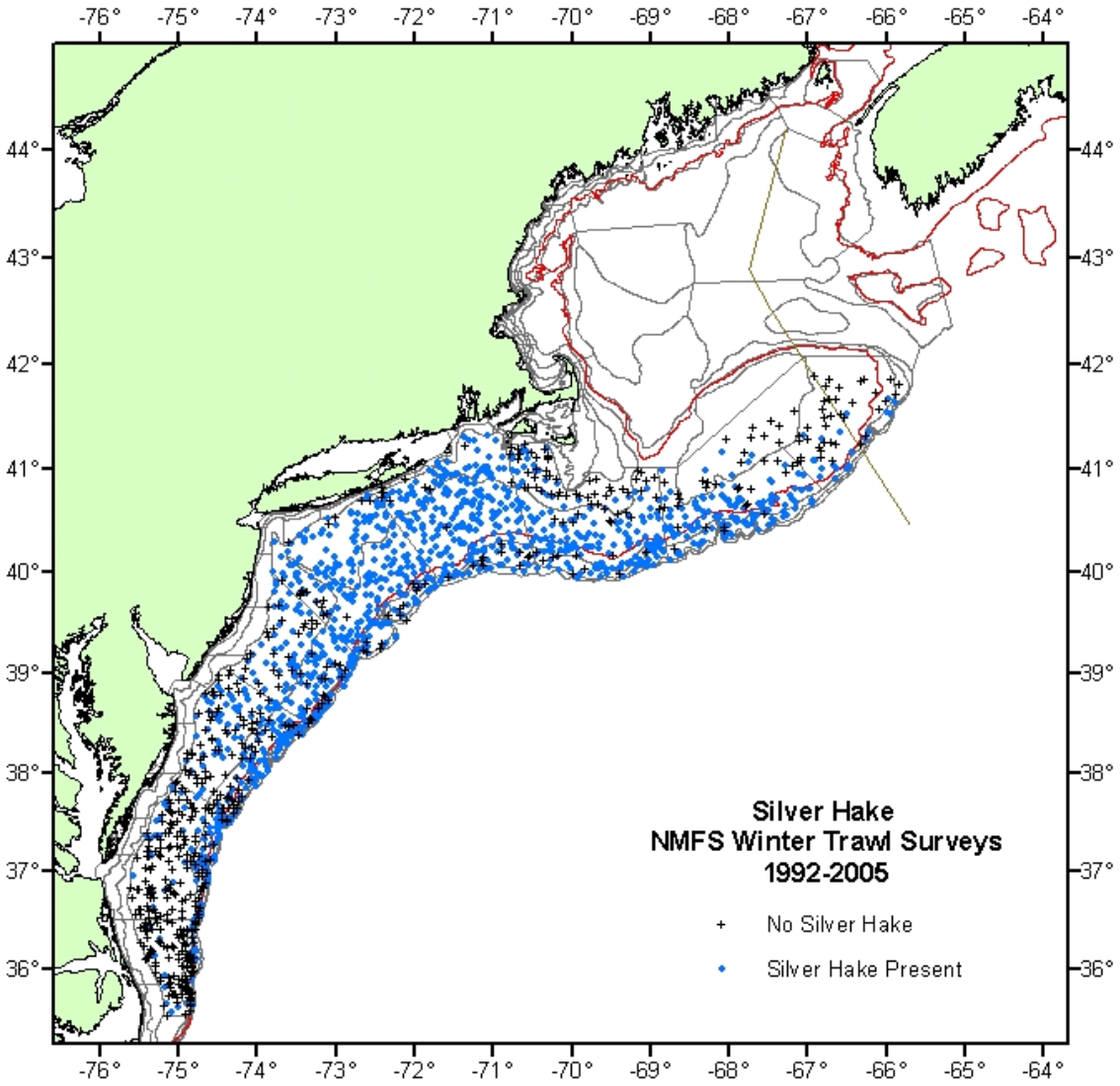


Figure A12. Locations of NEFSC winter bottom trawl survey tows with and without silver hake during 1992-2002, based on all offshore strata that were sampled. The winter survey does not cover strata above southern Georges Bank or inshore strata.

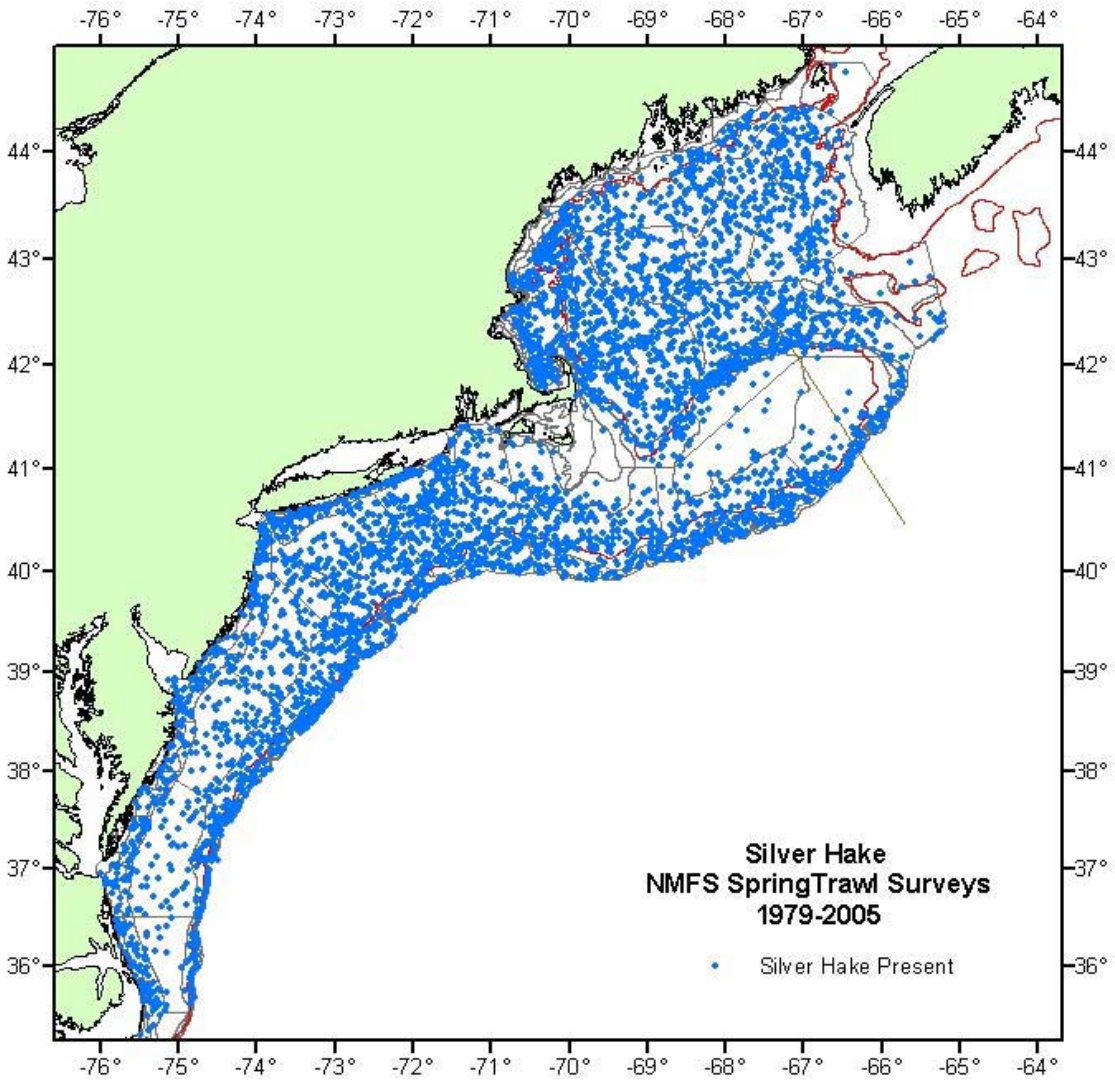


Figure A13. Locations of NEFSC spring bottom trawl survey tows that caught at least one silver hake during 1979-2004, based on all inshore and offshore strata that were sampled.

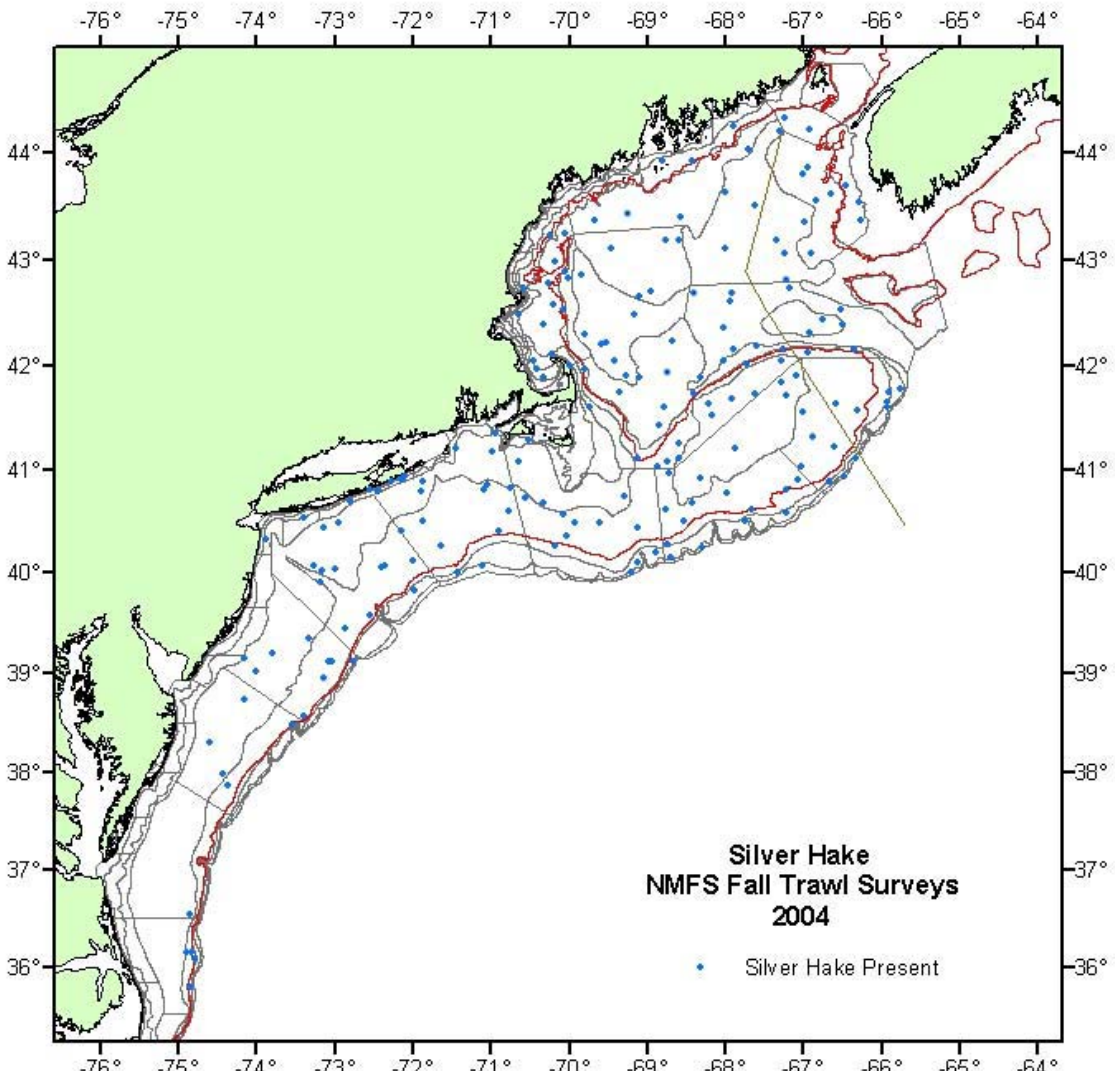


Figure A14. Locations of NEFSC fall bottom trawl survey tows that caught at least one silver hake during 2004, based on all inshore and offshore strata that were sampled.

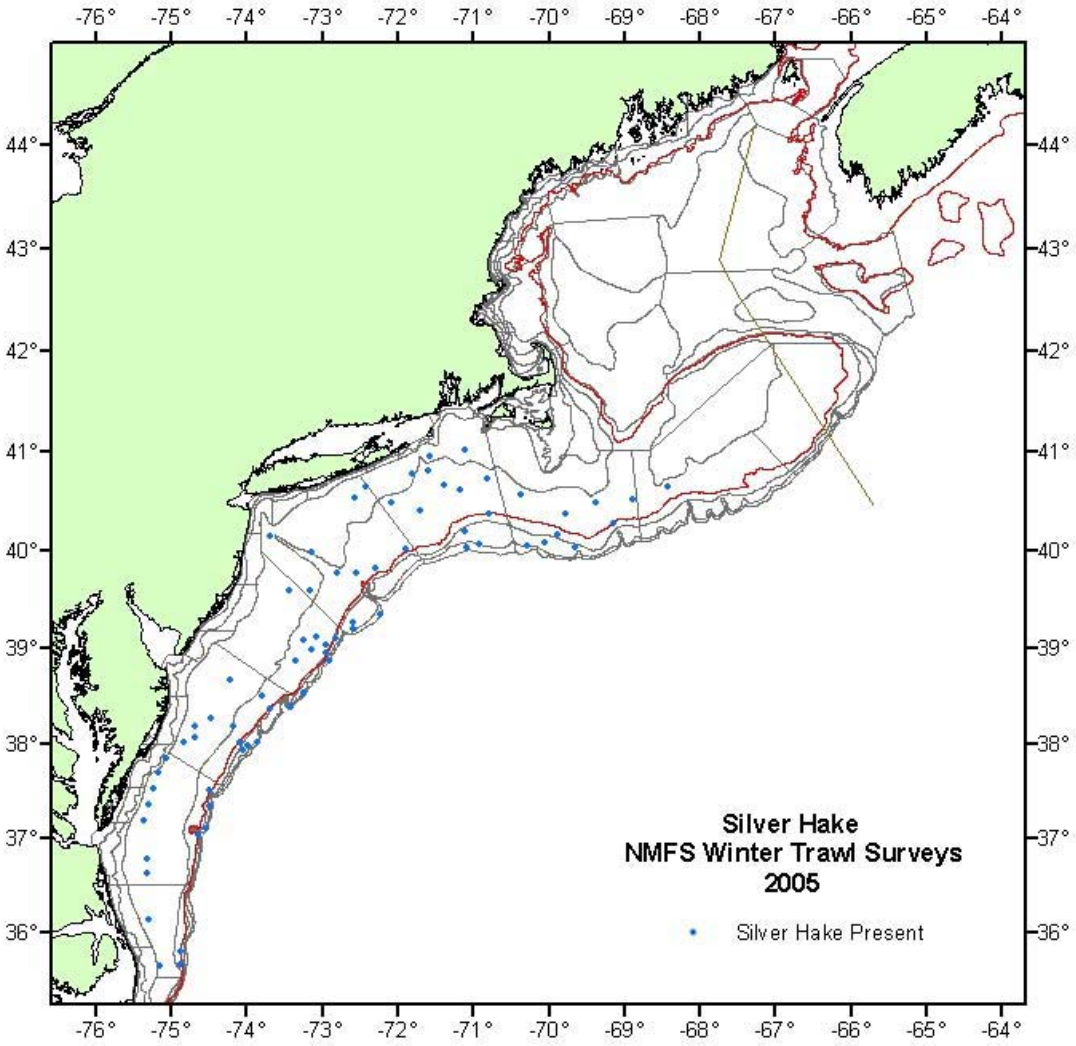


Figure A15. Locations of NEFSC winter bottom trawl survey tows that caught at least one silver hake during 2005, based on all offshore strata that were sampled. The winter survey does not cover strata above southern Georges Bank or inshore strata.

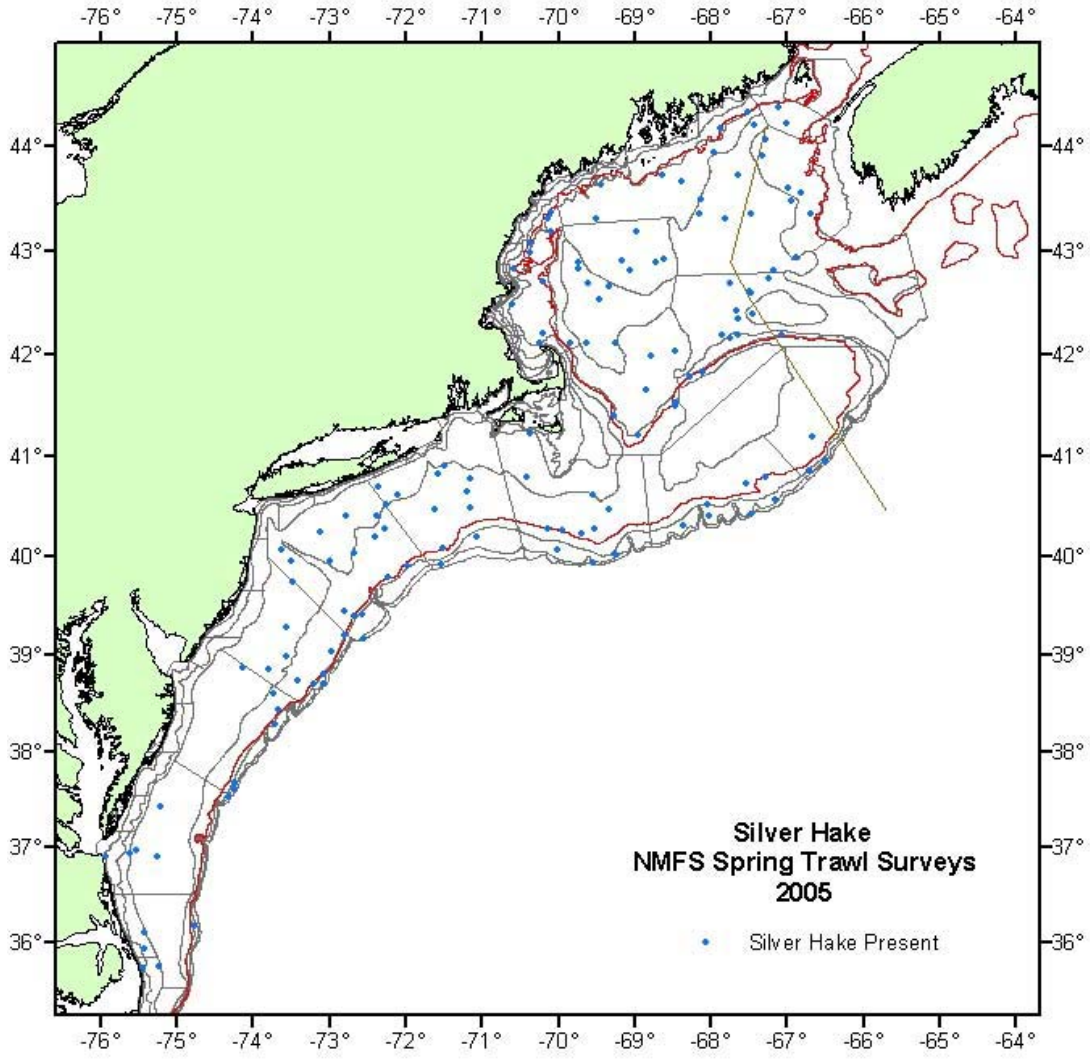


Figure A16. Locations of NEFSC spring bottom trawl survey tows that caught at least one silver hake during 1979-2004, based on all inshore and offshore strata that were sampled.

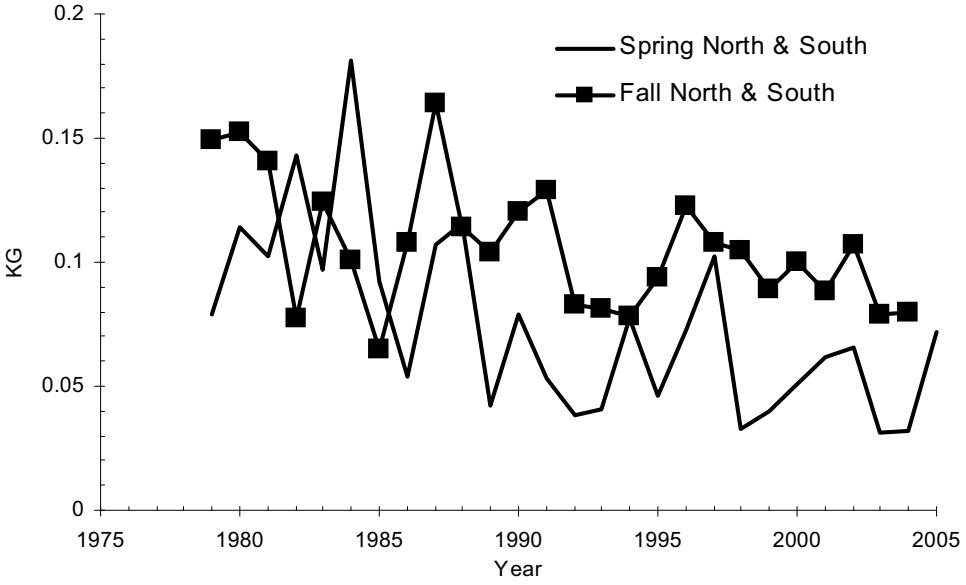


Figure A17. Trends in mean body weight for silver hake in NEFSC surveys during 1979-2005 (special strata set, north and south stock areas combined).

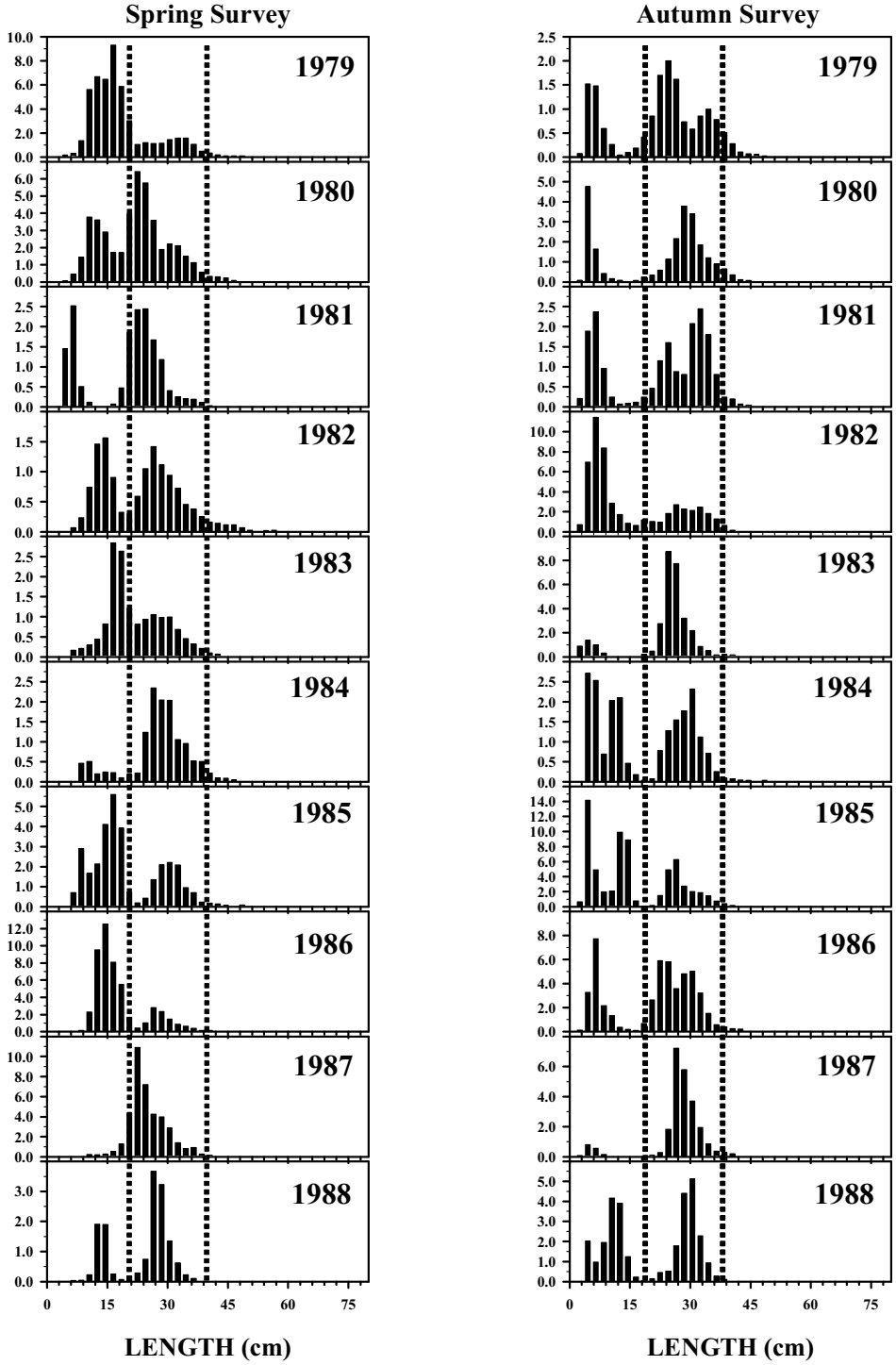


Figure A18. Silver hake length composition from the NEFSC spring and autumn bottom trawl surveys in the combined inshore and offshore regions, 1979-1988 (special strata set). Vertical lines are at approximately 20 cm and 40 cm TL.

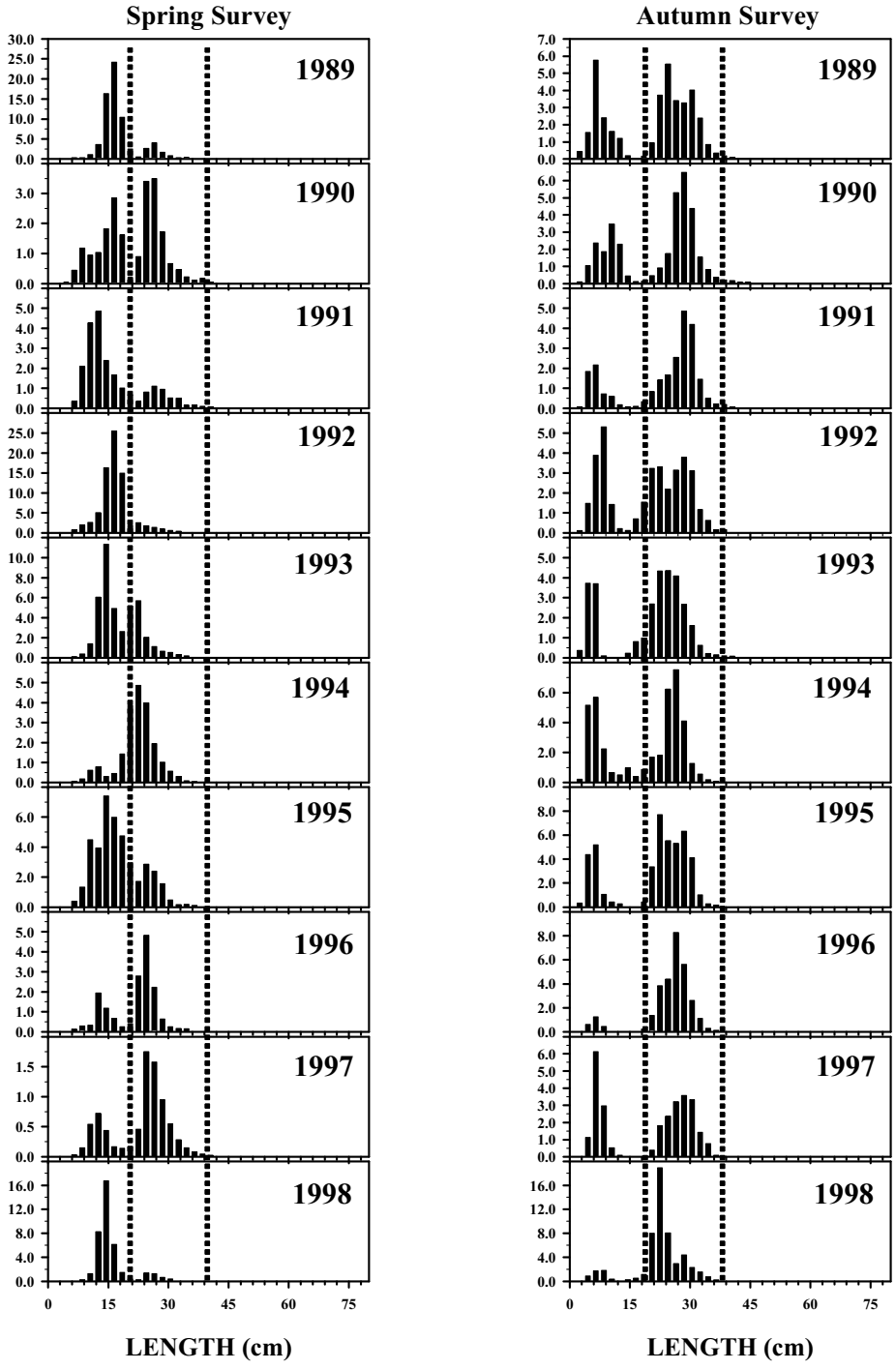


Figure A18. (cont.)

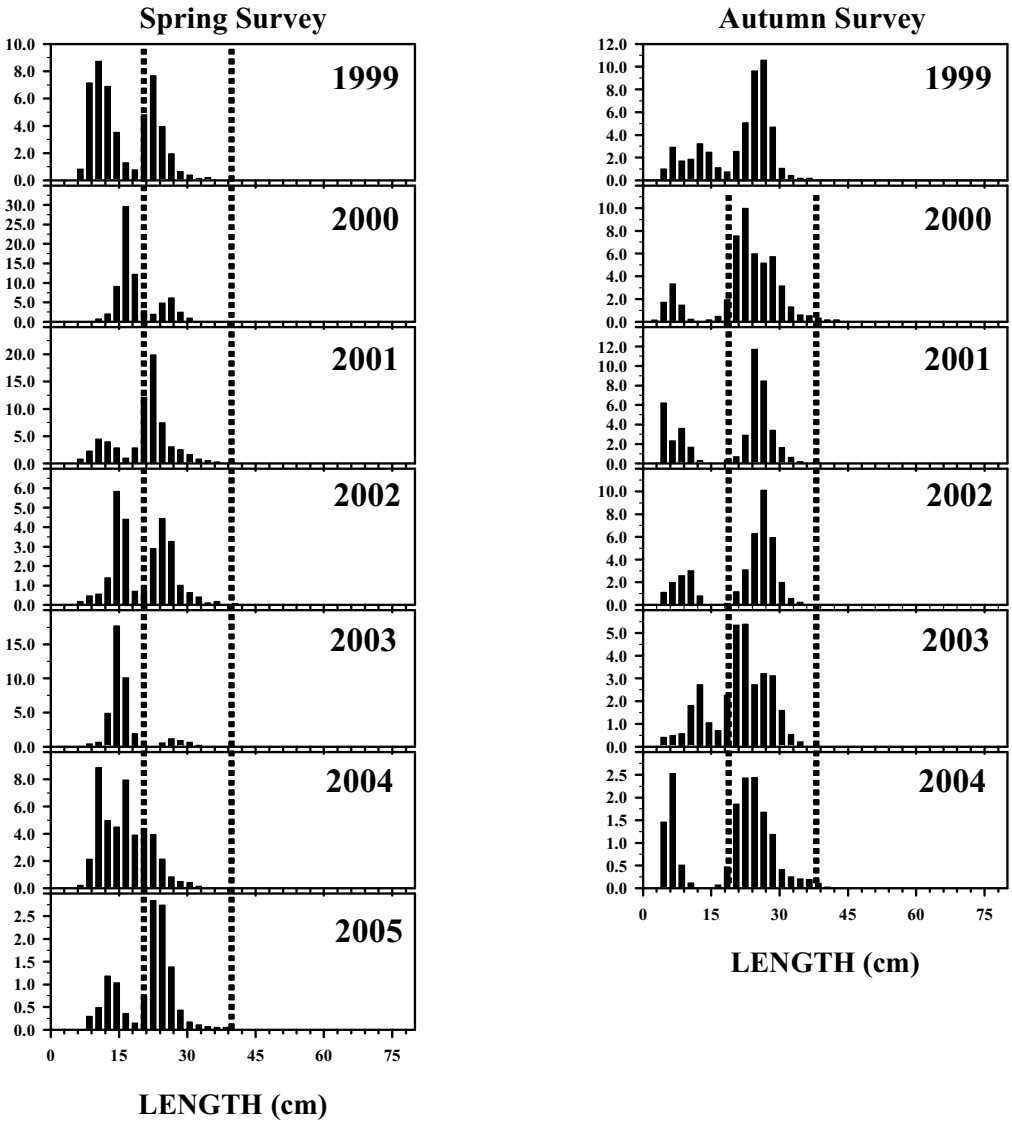


Figure A18. (cont.)

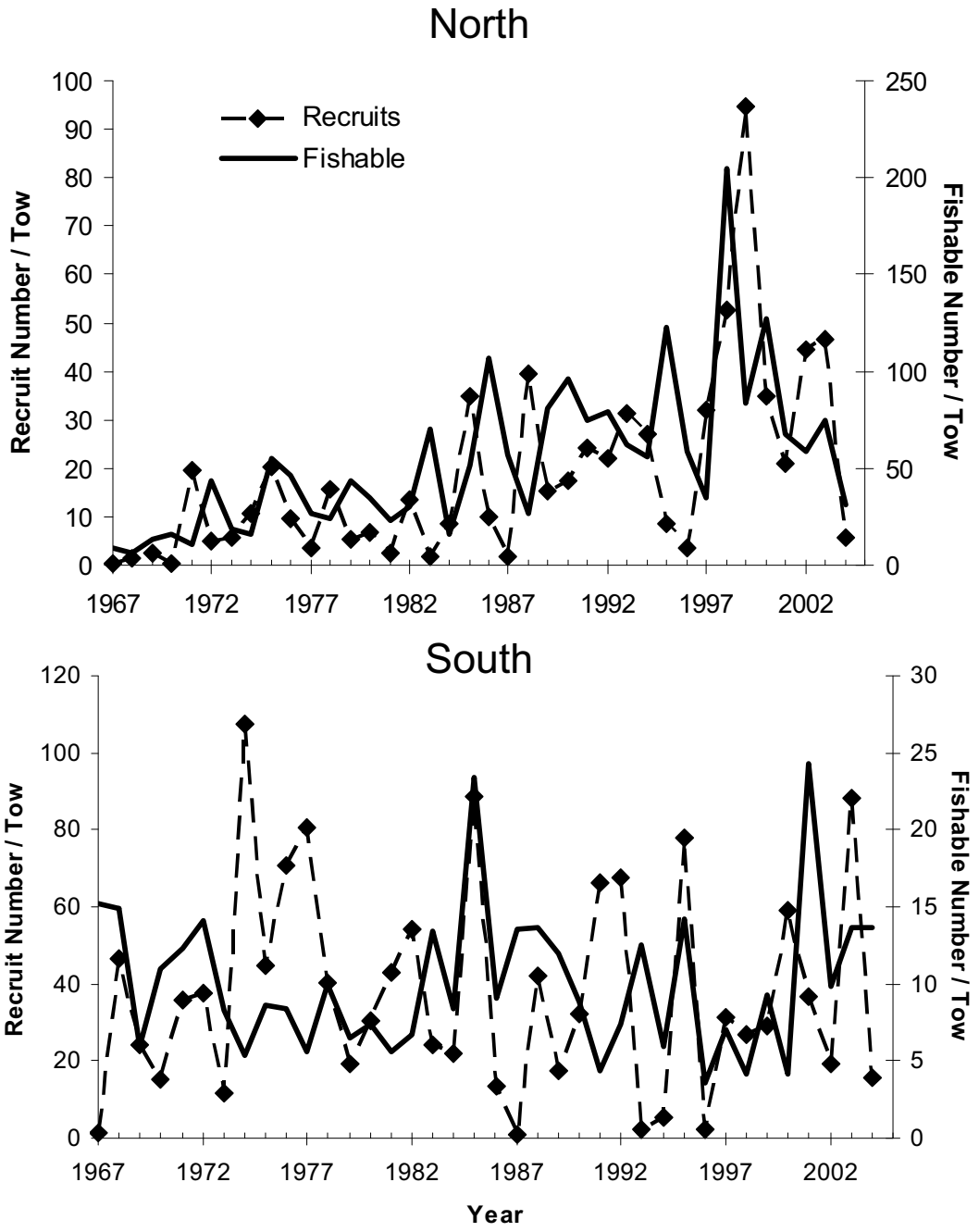


Figure A19. Trends in abundance for recruit (< 20 cm TL) and fishable (= 20 cm TL) silver hake in NEFSC fall surveys.

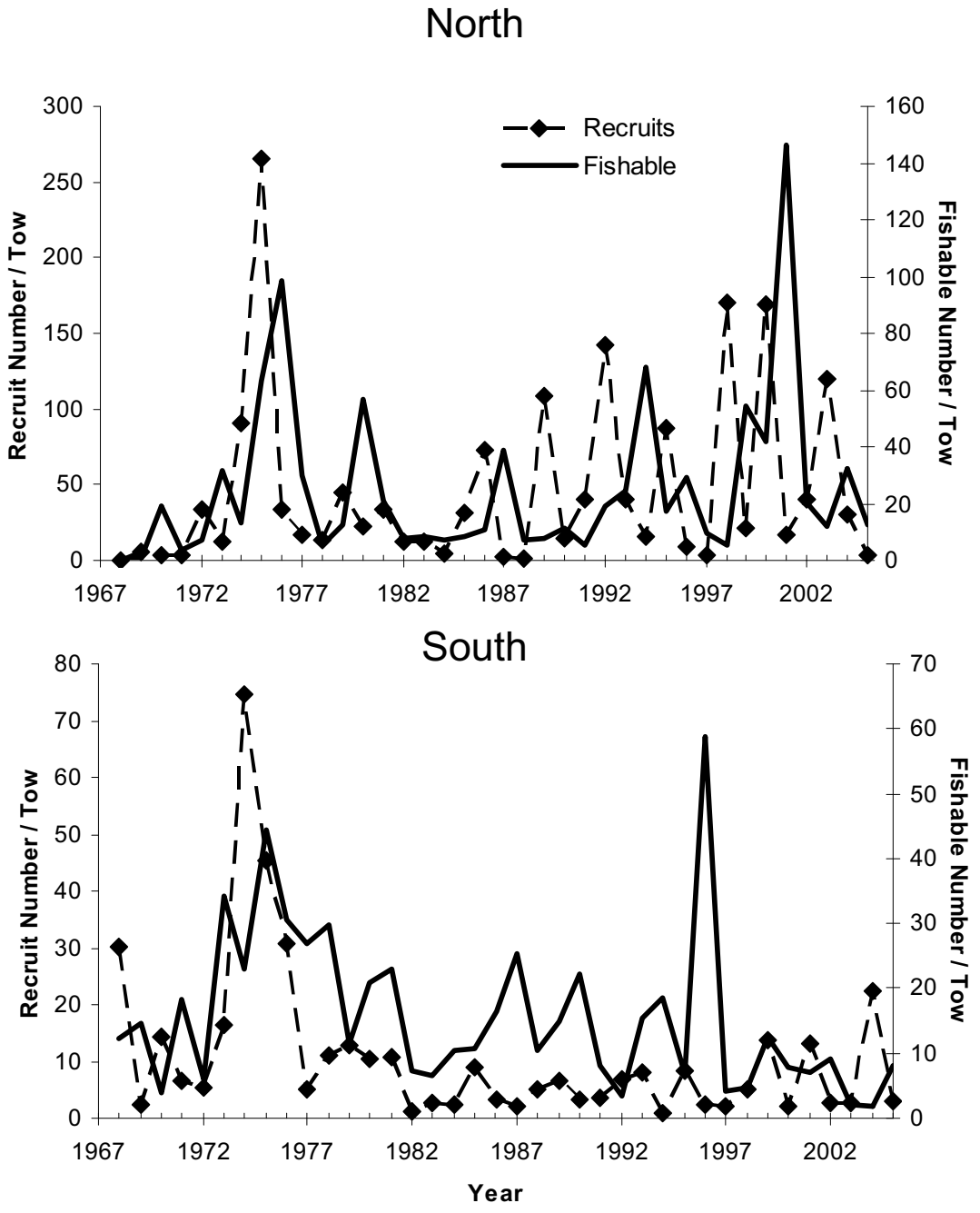


Figure A20. Trends in abundance for recruit (< 20 cm TL) and fishable (= 20 cm TL) silver hake in NEFSC spring surveys.

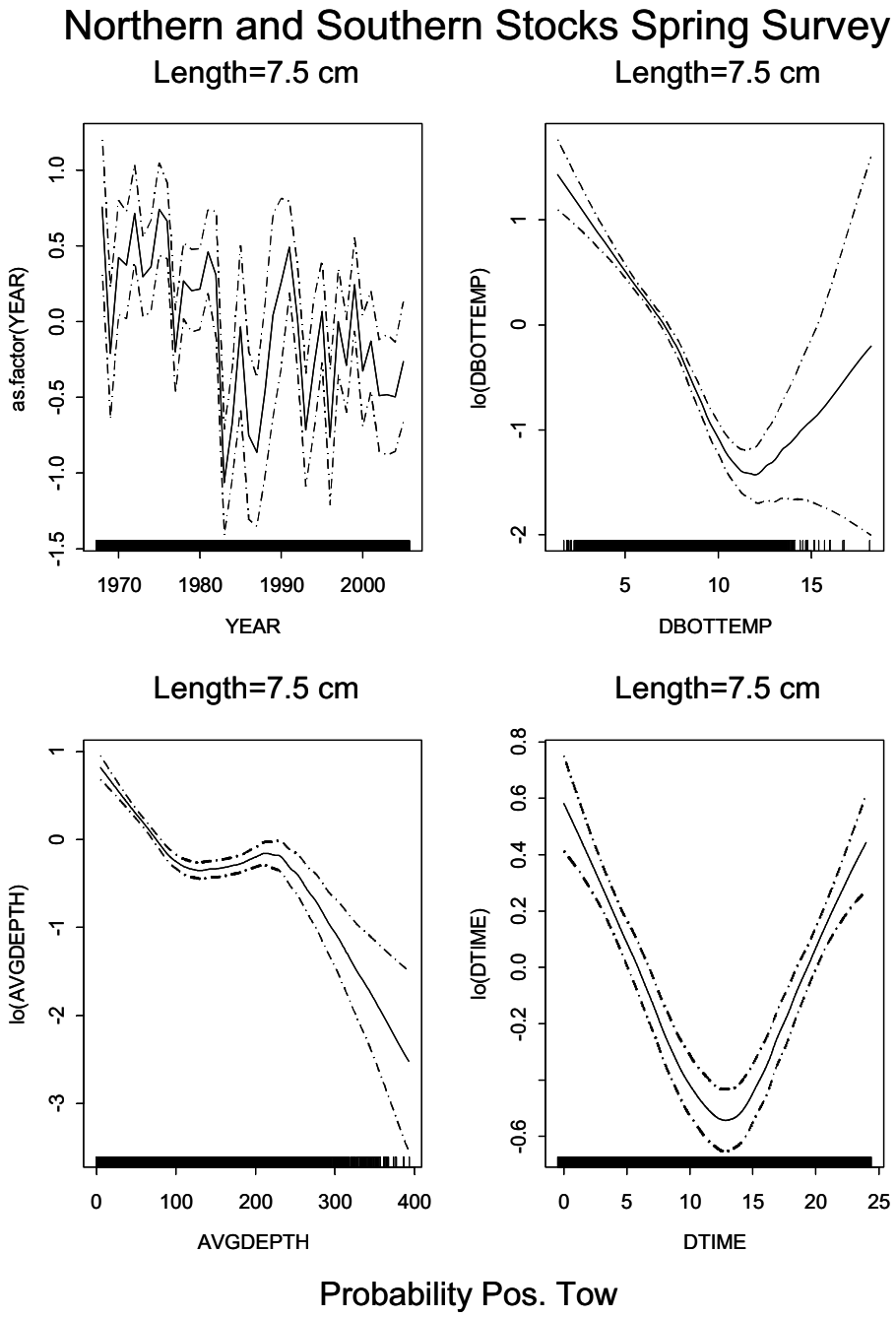


Figure A21. GAM results (partial residual plots for the probability of a positive tow) for silver hake 5-9.9 cm TL in the NEFSC spring survey during 1979-2005 (north and south stock areas combined). The y-axis gives standardized logit-scale residuals. Trends are shown for all terms that were statistically significant based on the AIC criteria.

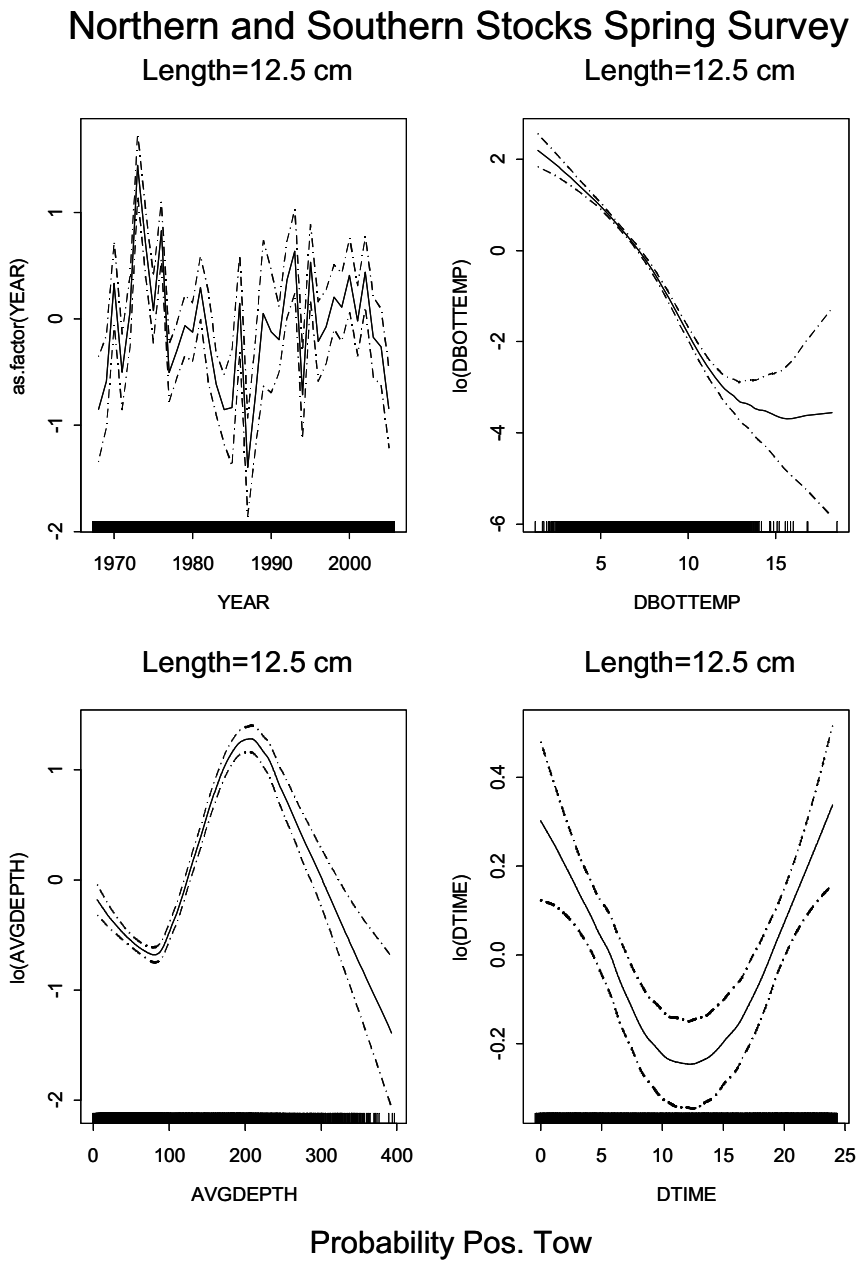


Figure A22. GAM results (partial residual plots for the probability of a positive tow) for silver hake 10-14.9 cm TL in the NEFSC spring survey during 1979-2005 (north and south stock areas combined). The y-axis gives standardized logit-scale residuals. Trends are shown for all terms that were statistically significant based on the AIC criteria.

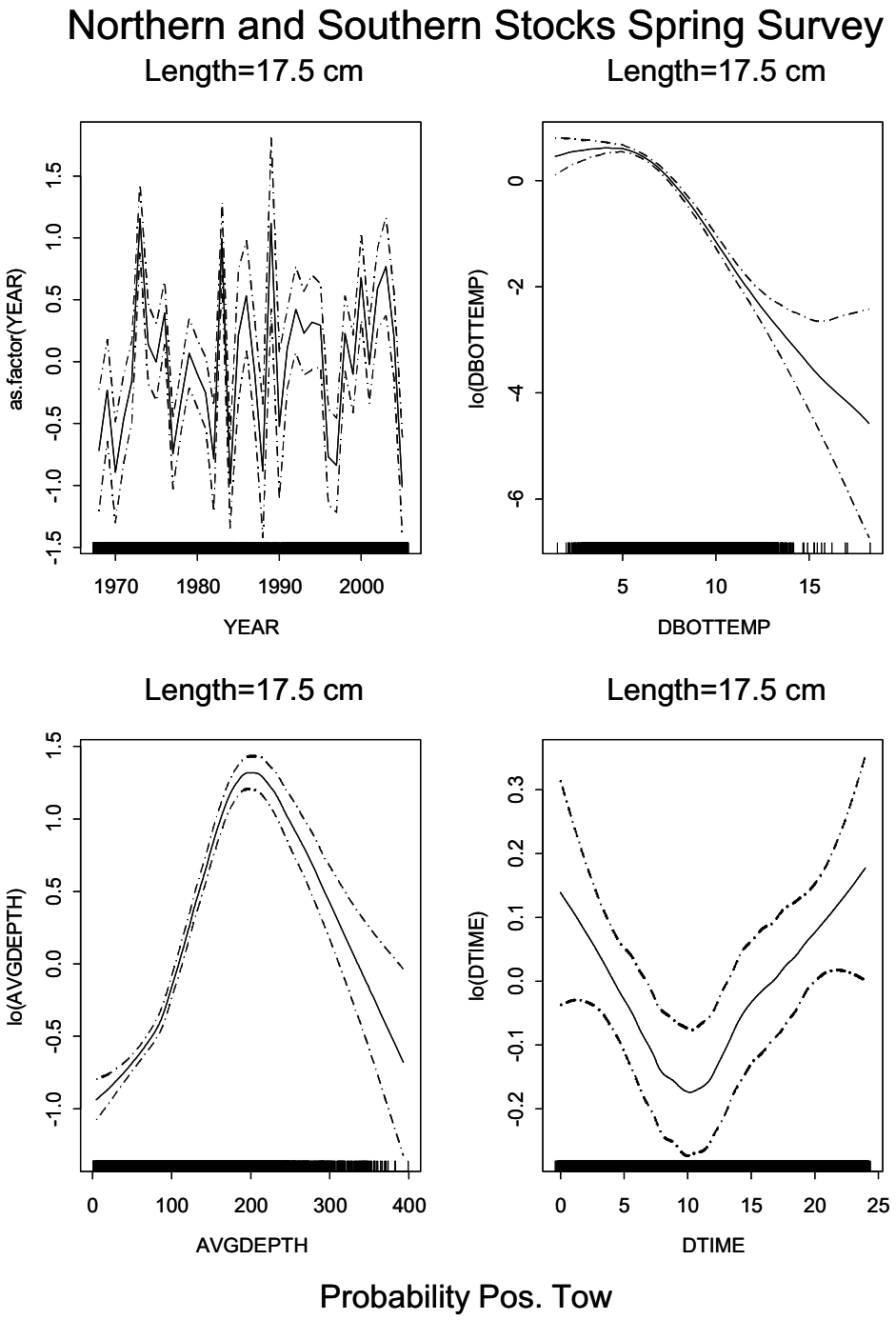


Figure A23. GAM results (partial residual plots for the probability of a positive tow) for silver hake 15-19.9 cm TL in the NEFSC spring survey during 1979-2005 (north and south stock areas combined). The y-axis gives standardized logit-scale residuals. Trends are shown for all terms that were statistically significant based on the AIC criteria.

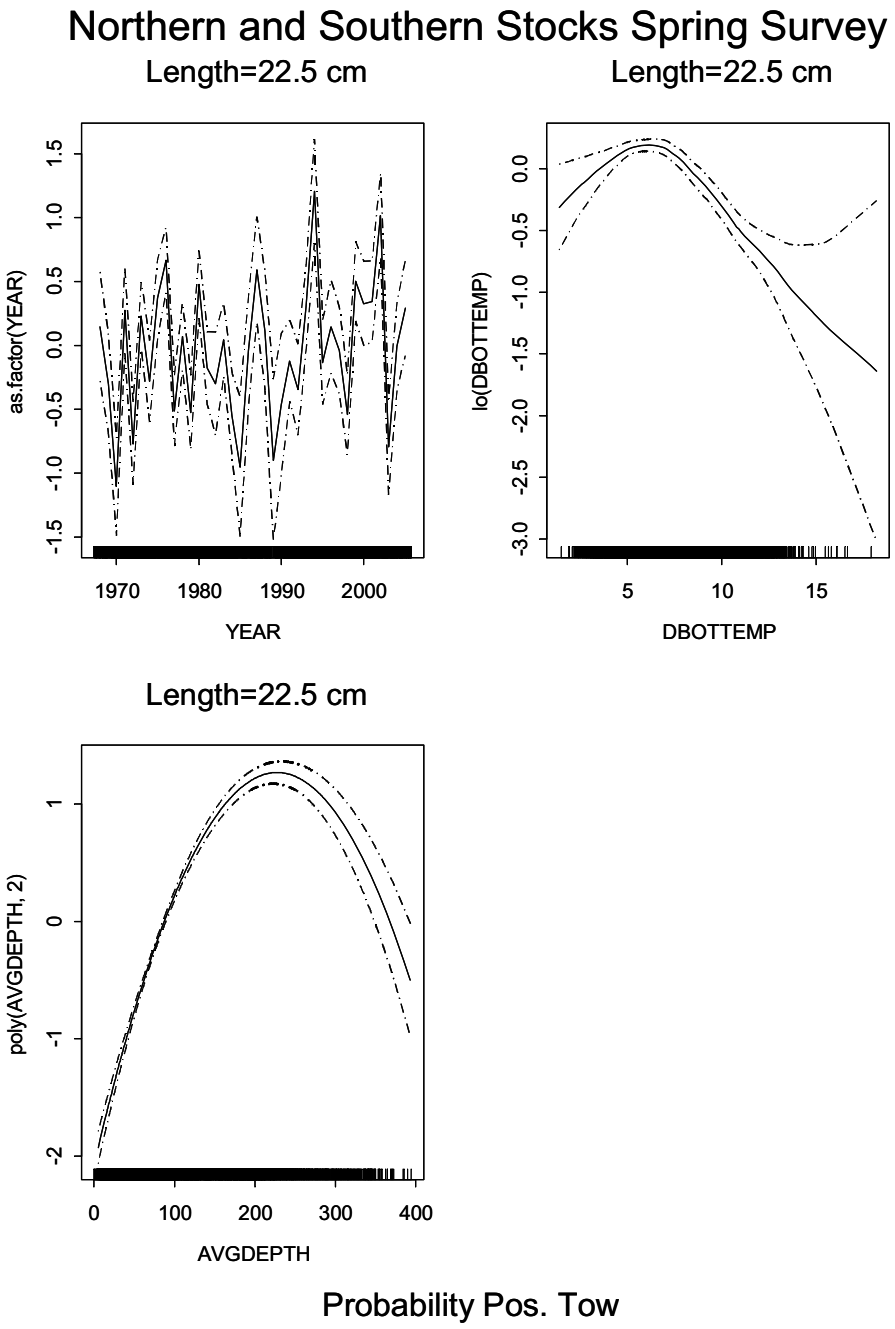


Figure A24. GAM results (partial residual plots for the probability of a positive tow) for silver hake 20-24.9 cm TL in the NEFSC spring survey during 1979-2005 (north and south stock areas combined). The y-axis gives standardized logit-scale residuals. Trends are shown for all terms that were statistically significant based on the AIC criteria.

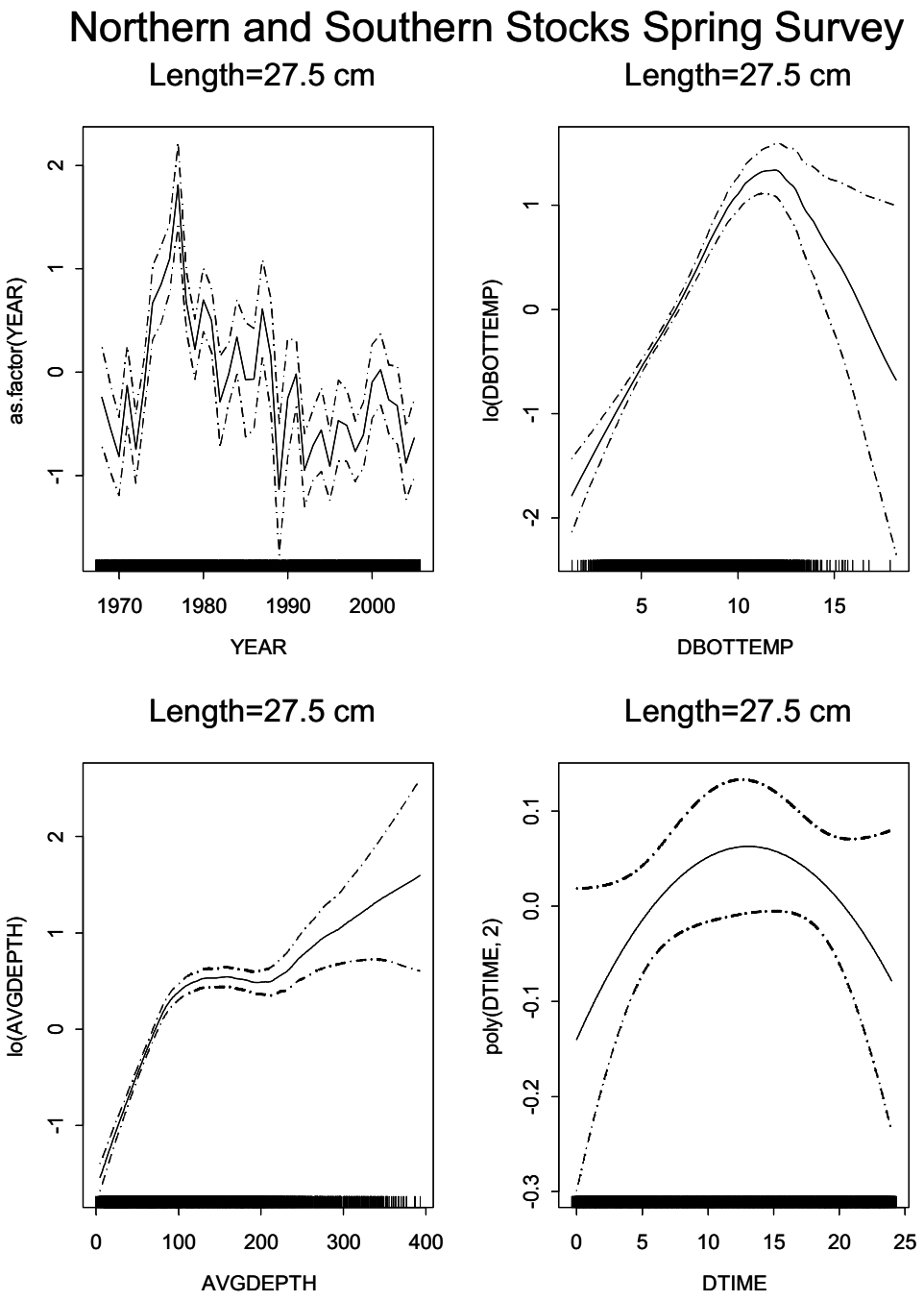


Figure A25. GAM results (partial residual plots for the probability of a positive tow) for silver hake 25+ cm TL in the NEFSC spring survey during 1979-2005 (north and south stock areas combined). The y-axis gives standardized logit-scale residuals. Trends are shown for all terms that were statistically significant based on the AIC criteria.

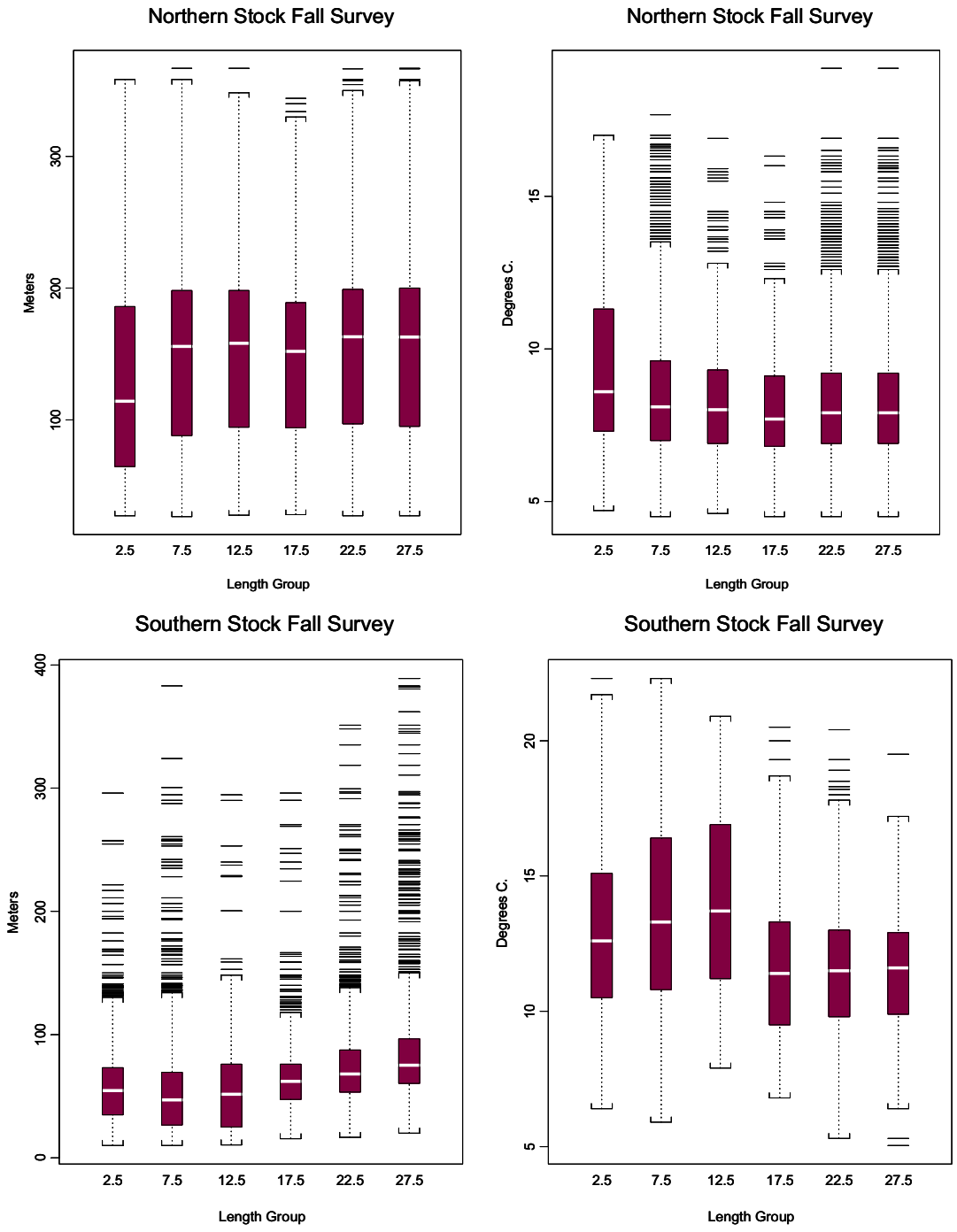


Figure A26. Distributions of depths and bottom temperatures by size and stock for tows that took silver hake in NEFSC fall bottom trawl surveys.

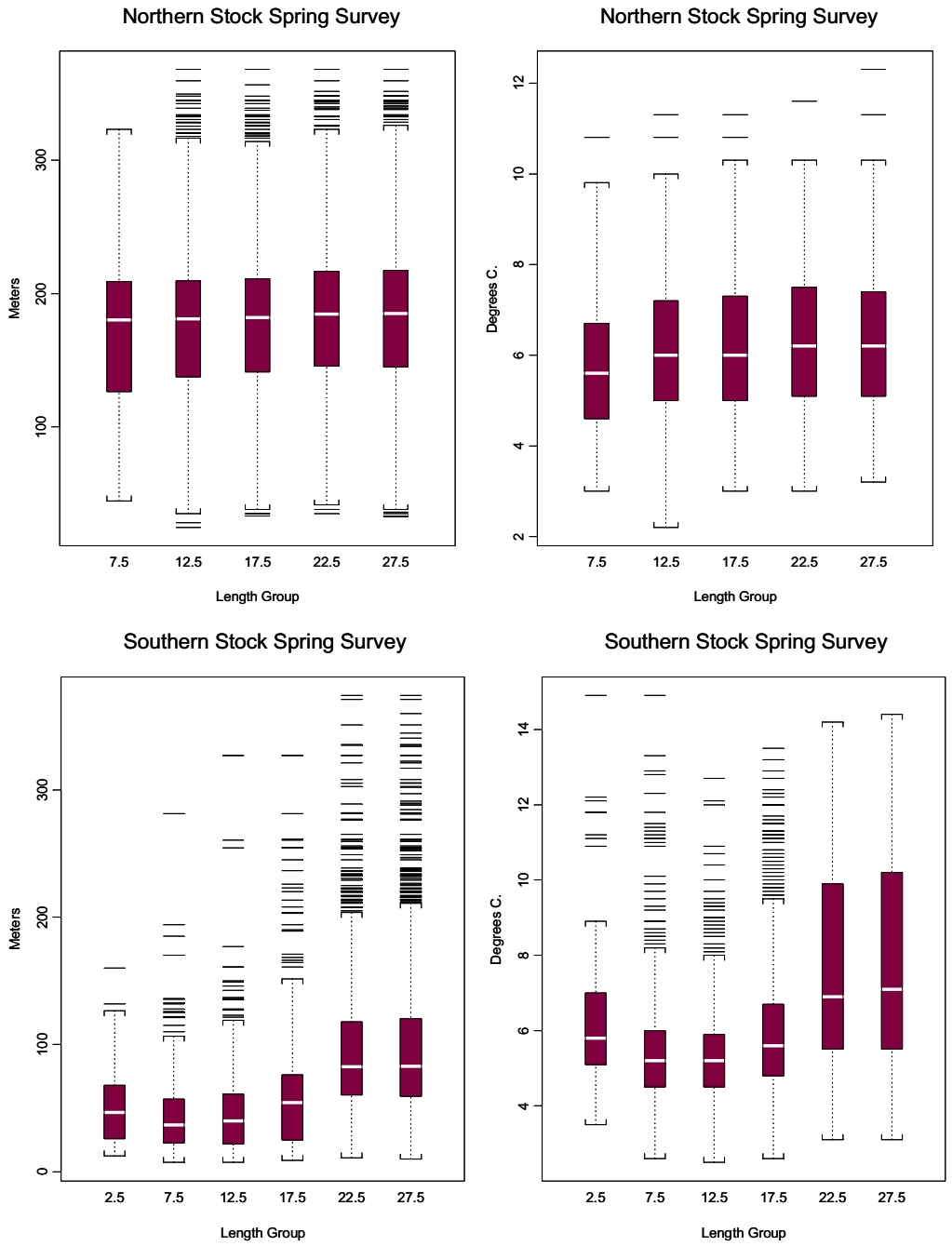


Figure A27. Distributions of depths and bottom temperatures by size and stock for tows that took silver hake in NEFSC spring bottom trawl surveys.

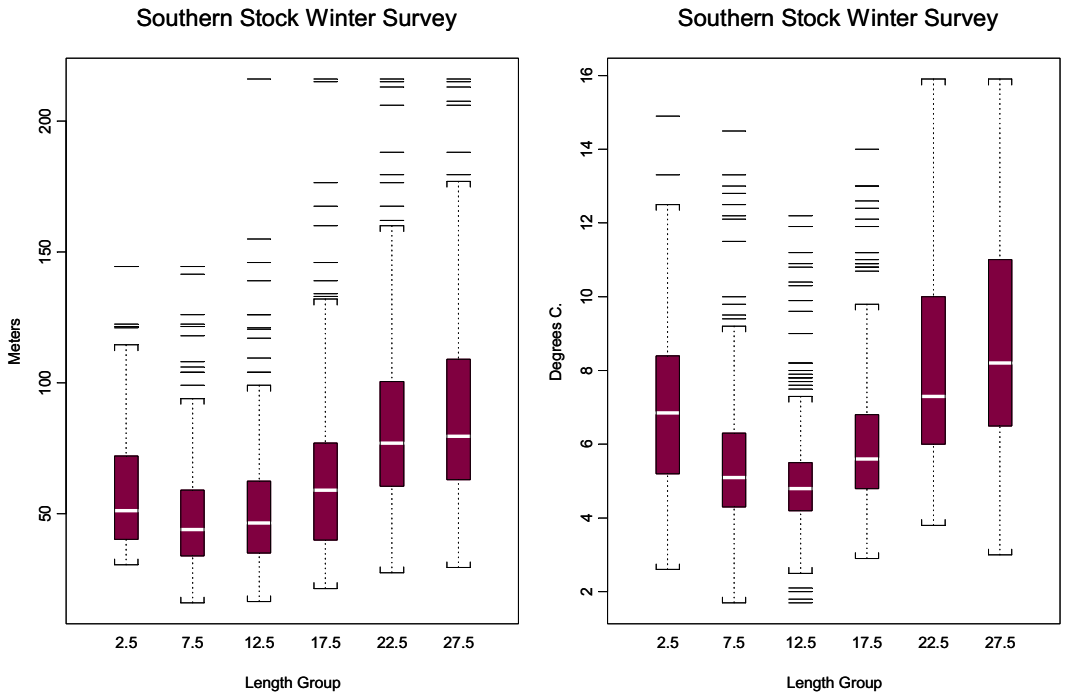


Figure A28. Distributions of depths and bottom temperatures by size and stock for tows that took silver hake in NEFSC winter bottom trawl surveys.

Figure A29. Average position (latitude in left panel and longitude in right) for silver hake in fall bottom trawl surveys in the northern stock area, by size group. Averages are for tows, weighted by catch of the appropriate size group.

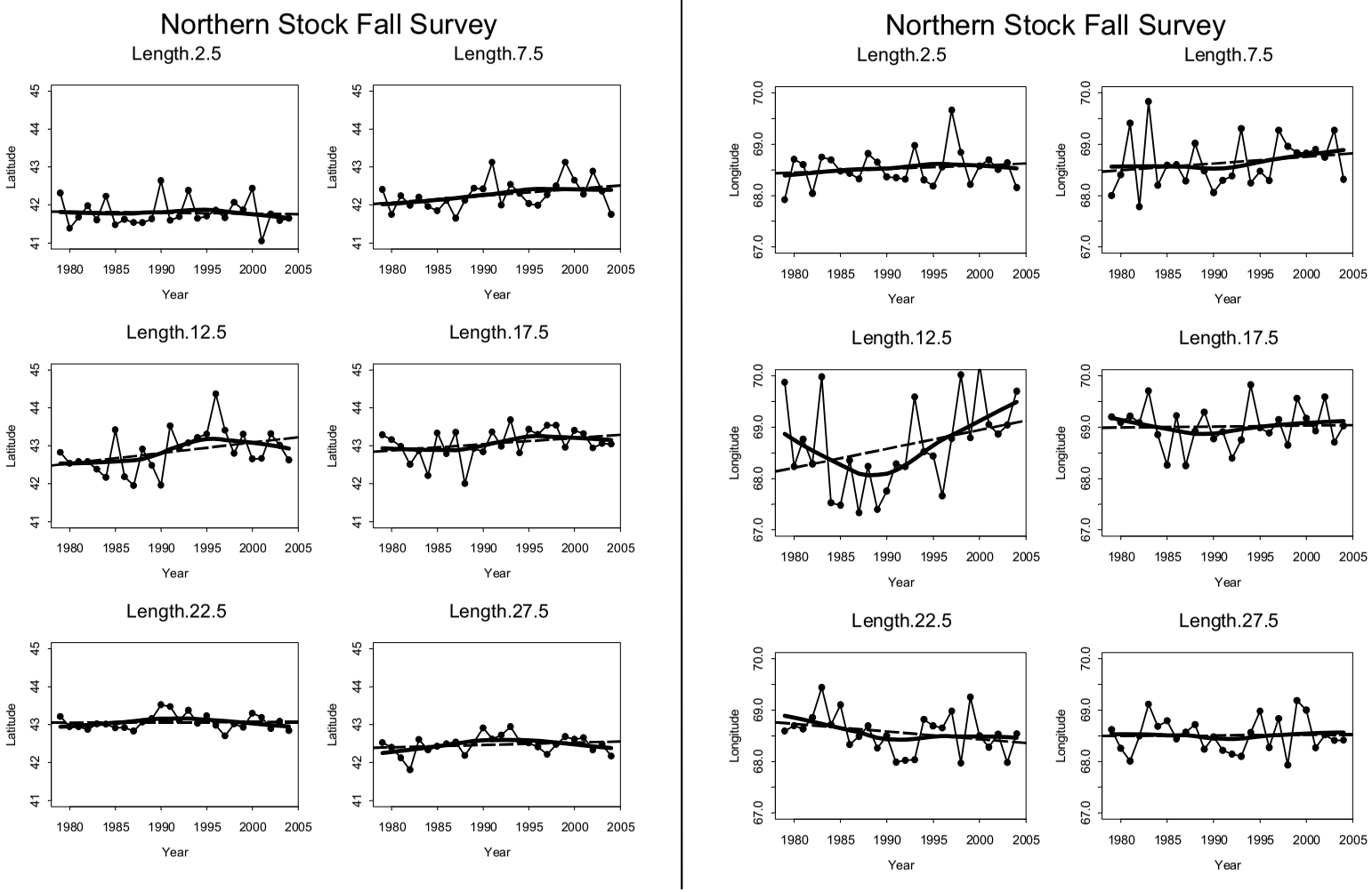


Figure A30. Average position (latitude in left panel and longitude in right) for silver hake in fall bottom trawl surveys in the southern stock area, by size group. Averages are for tows, weighted by catch of the appropriate size group.

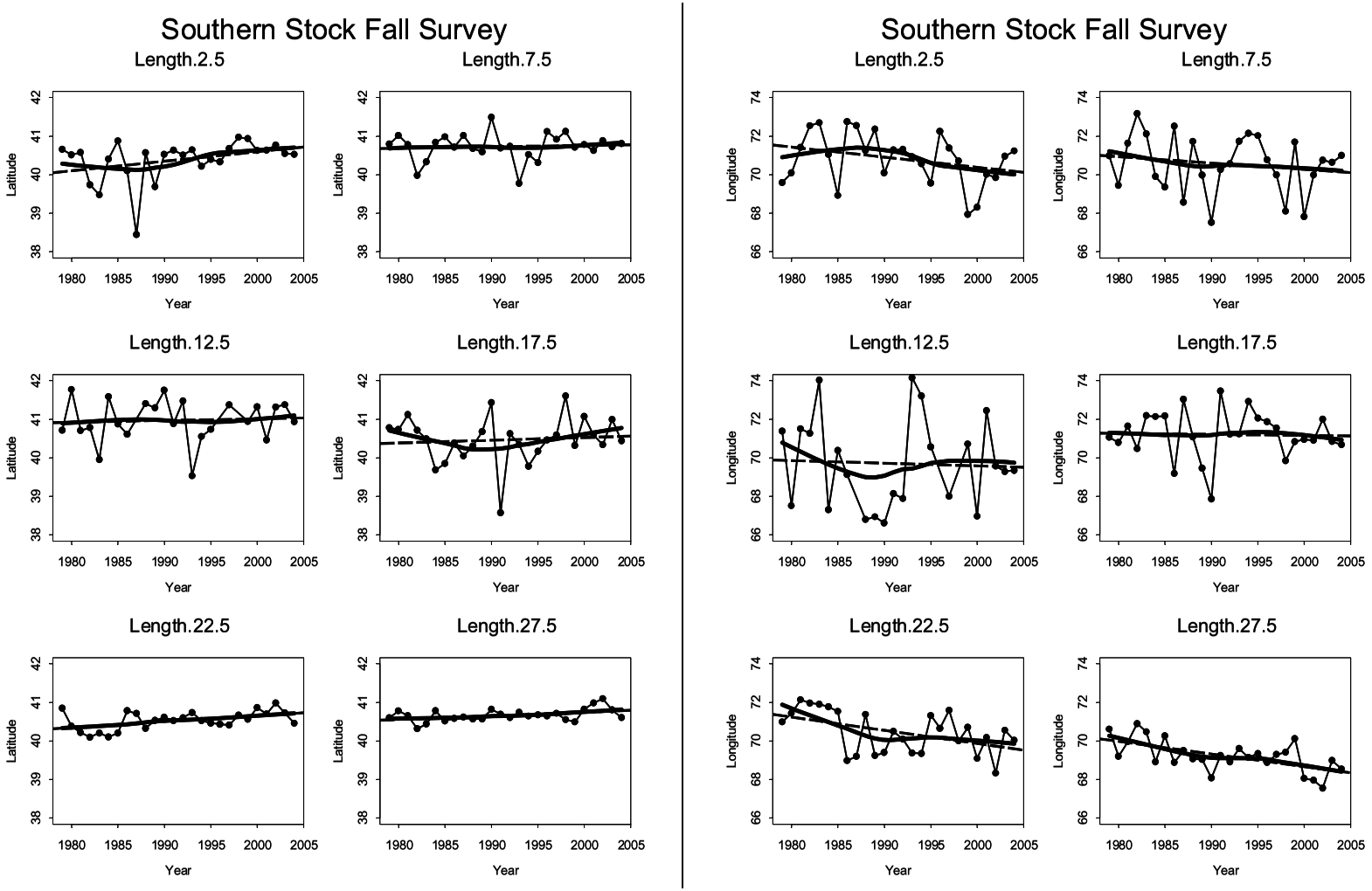


Figure A31. Average position (latitude in left panel and longitude in right) for silver hake in fall bottom trawl surveys in the combined northern and southern stock areas, by size group. Averages are for tows, weighted by catch of the appropriate size group.

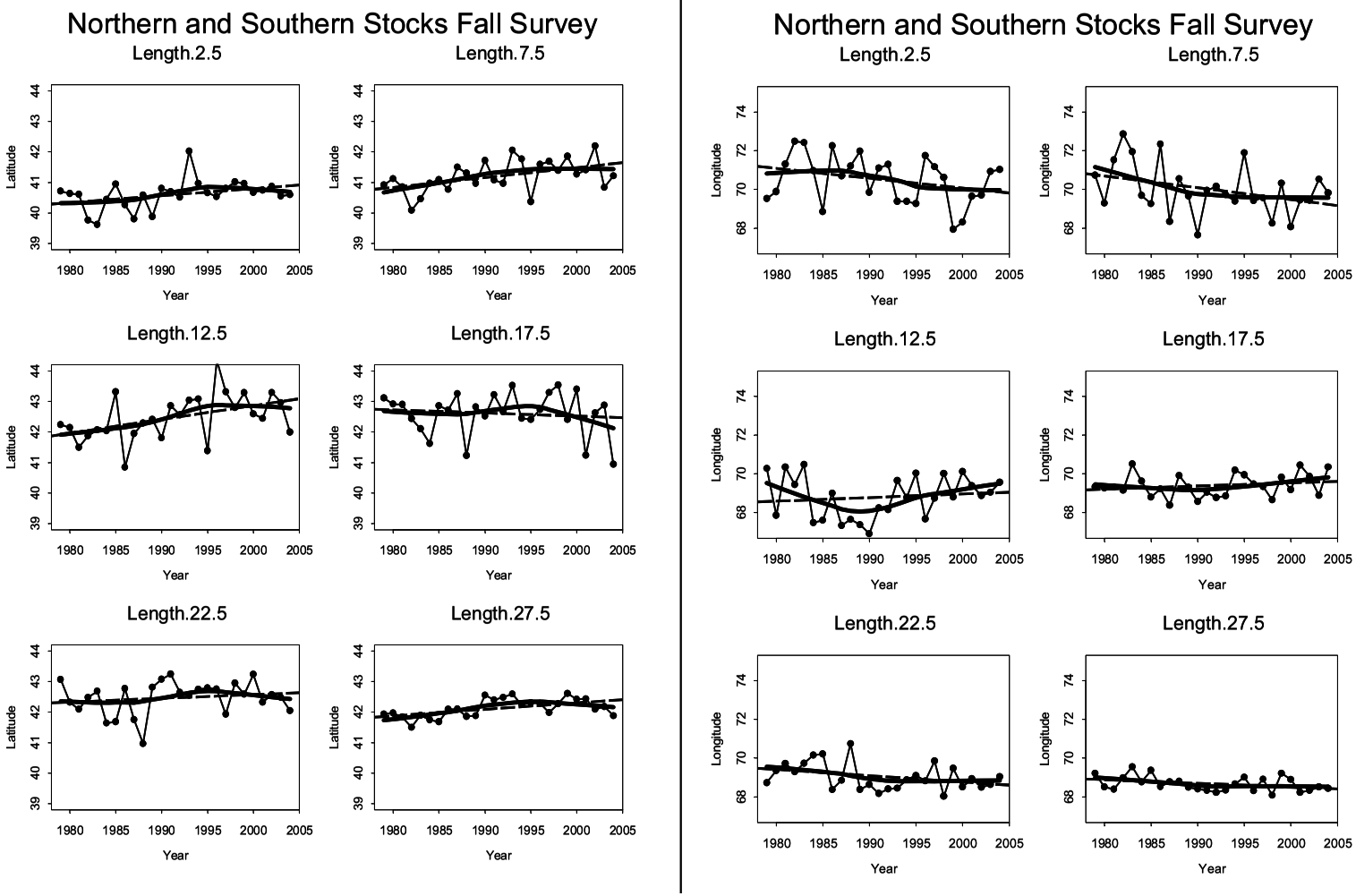


Figure A32. Average position (latitude in left panel and longitude in right) for silver hake in spring bottom trawl surveys in the northern stock area, by size group. Averages are for tows, weighted by catch of the appropriate size group.

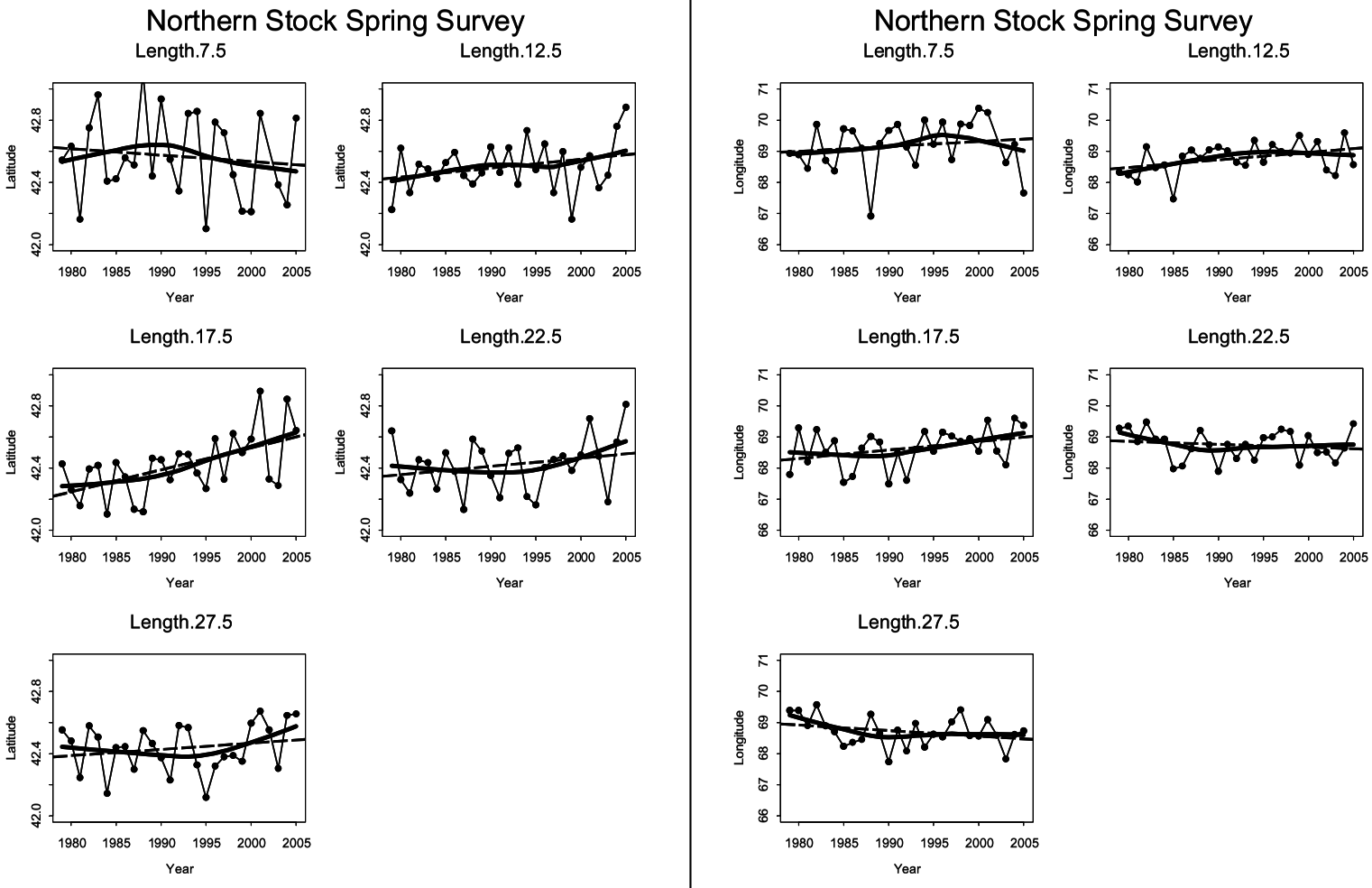


Figure A33. Average position (latitude in left panel and longitude in right) for silver hake in spring bottom trawl surveys in the southern stock area, by size group. Averages are for tows, weighted by catch of the appropriate size group.

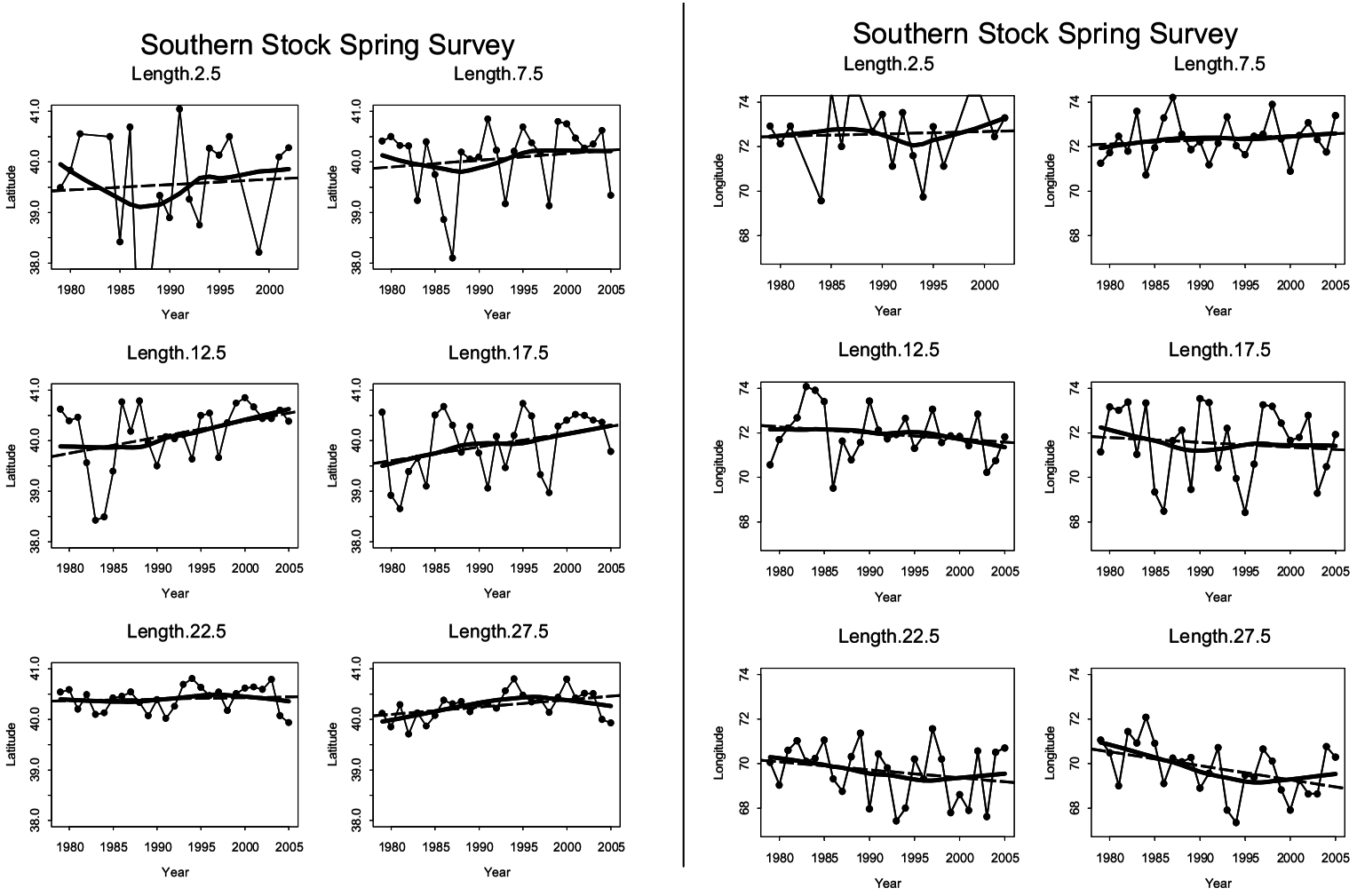
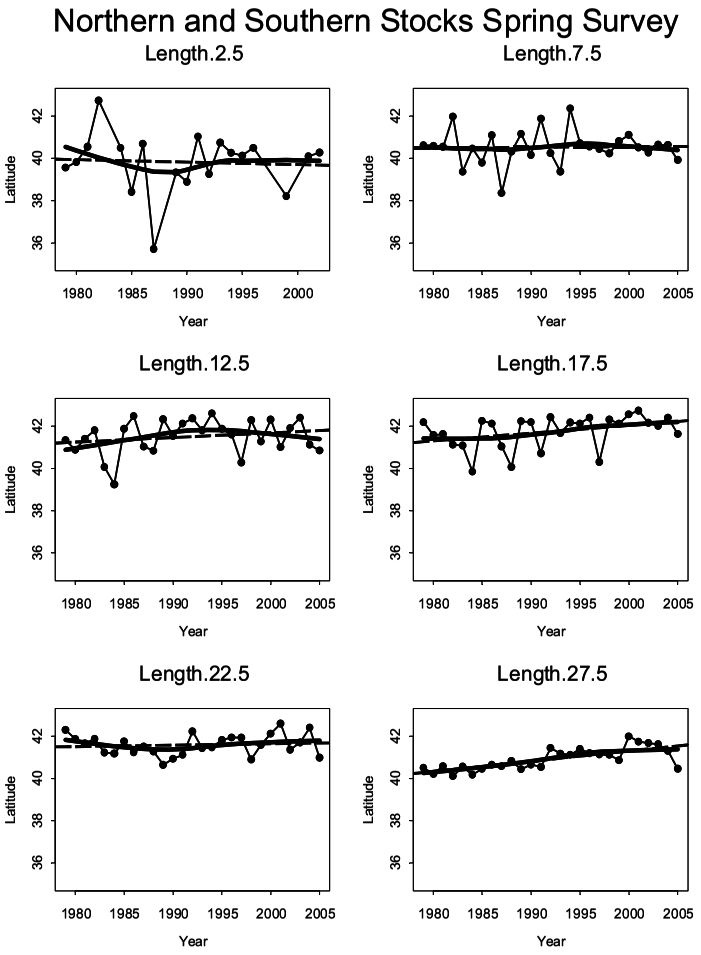


Figure A34. Average position (latitude in left panel and longitude in right) for silver hake in spring bottom trawl surveys in the combined northern and southern stock areas, by size group. Averages are for tows, weighted by catch of the appropriate size group.



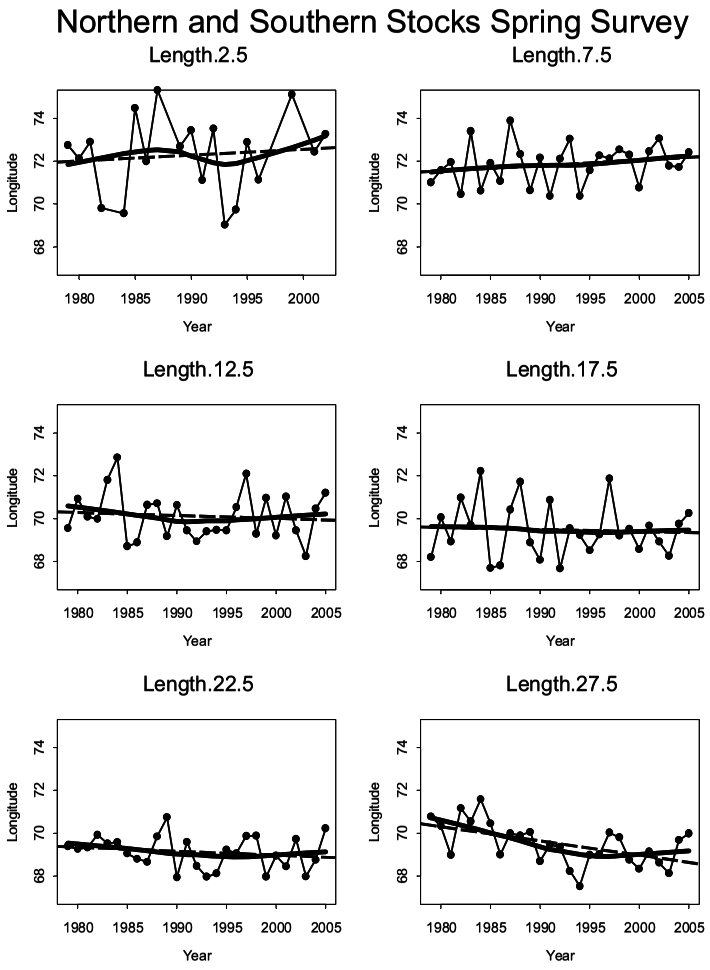
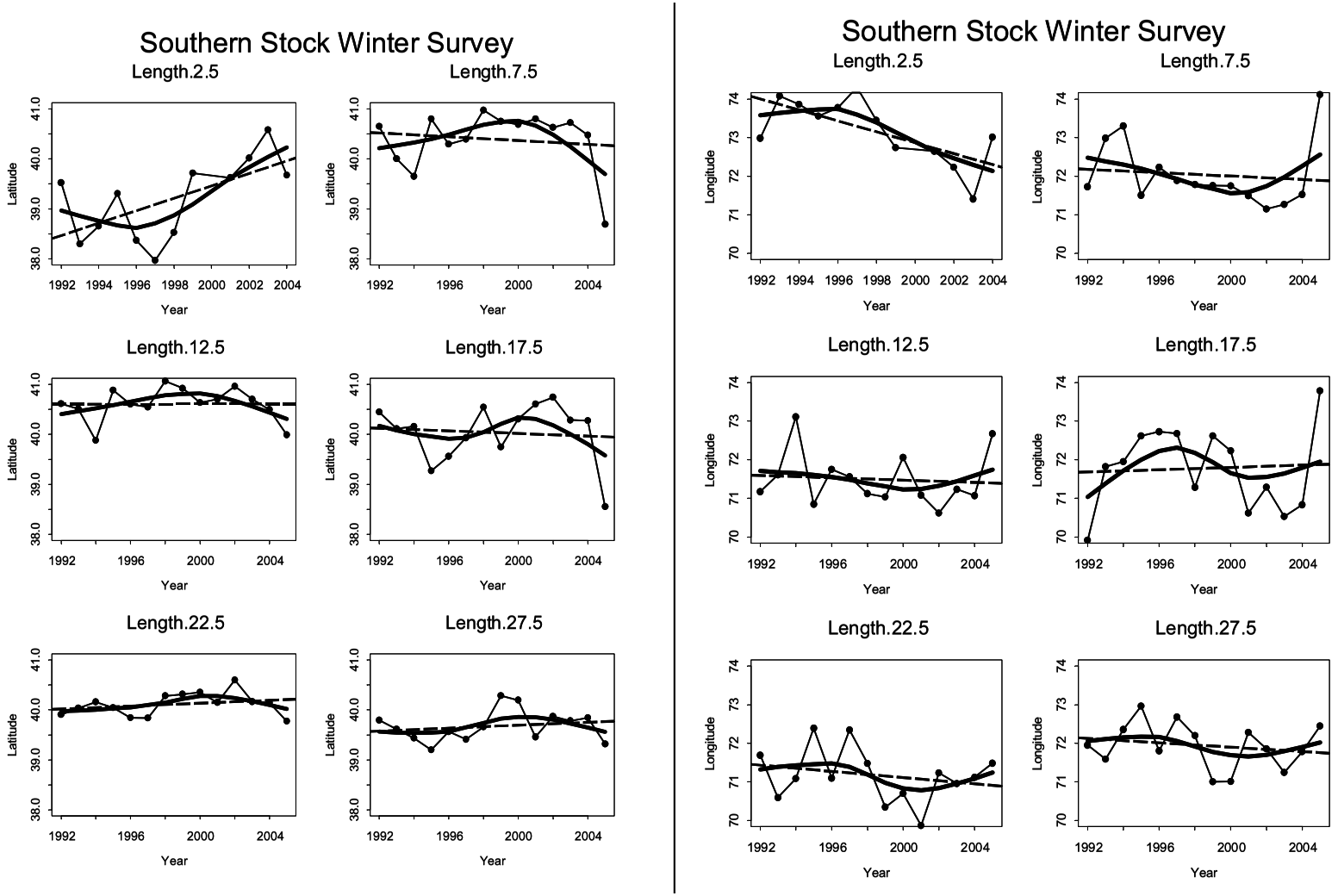


Figure A35. Average position (latitude in left panel and longitude in right) for silver hake in winter bottom trawl surveys in the southern stock area, by size group. Averages are for tows, weighted by catch of the appropriate size group.



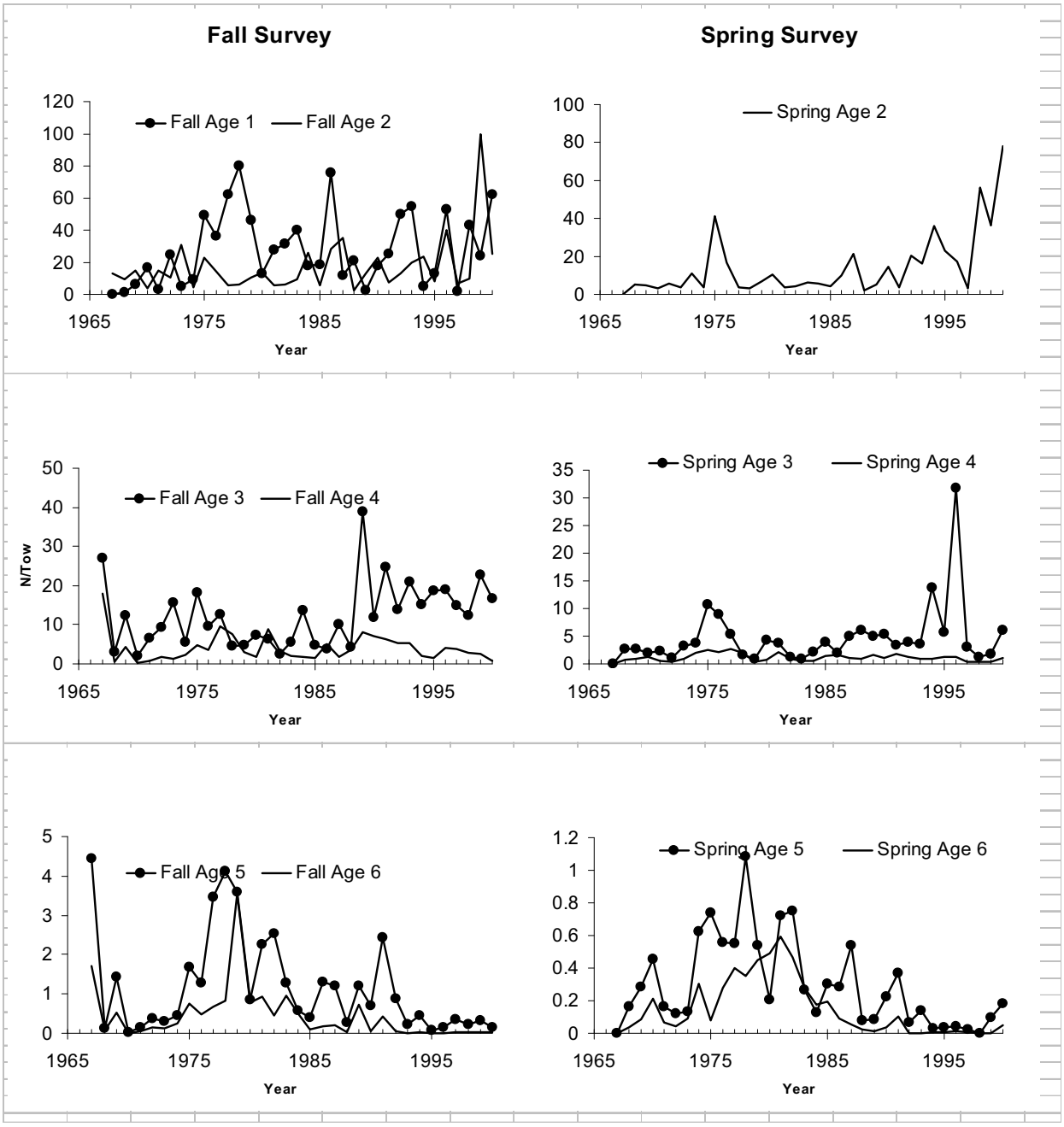


Figure A36. Relative abundance data from Brodziak et al. (2001) for silver hake ages 1-6+ in NEFSC fall and spring surveys. Data for years prior to 1973 were calculated using average age-length keys for spring and fall surveys during 1973-1975.

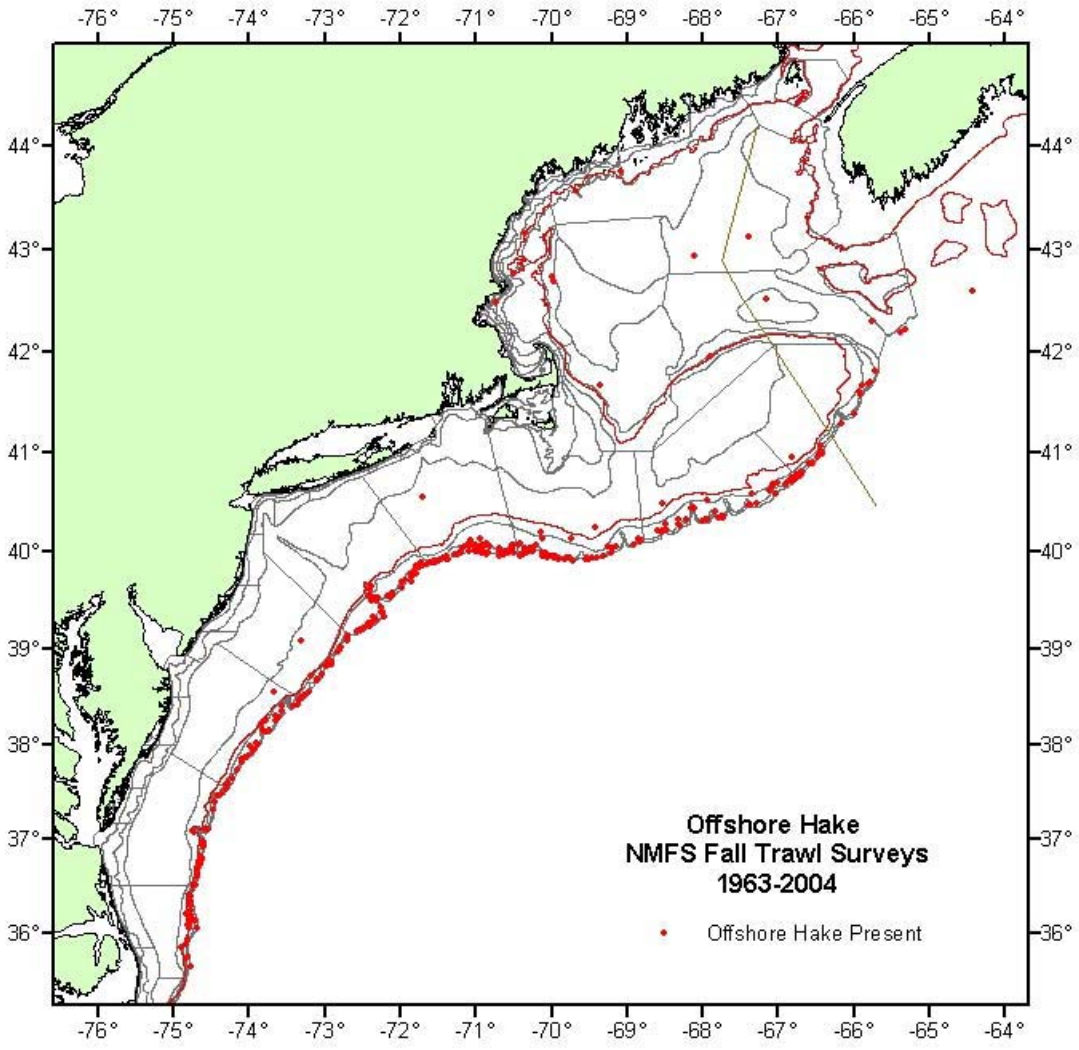


Figure A37. Locations of NEFSC fall bottom trawl survey tows that caught at least one offshore hake during 1963-2004, based all strata that were sampled.

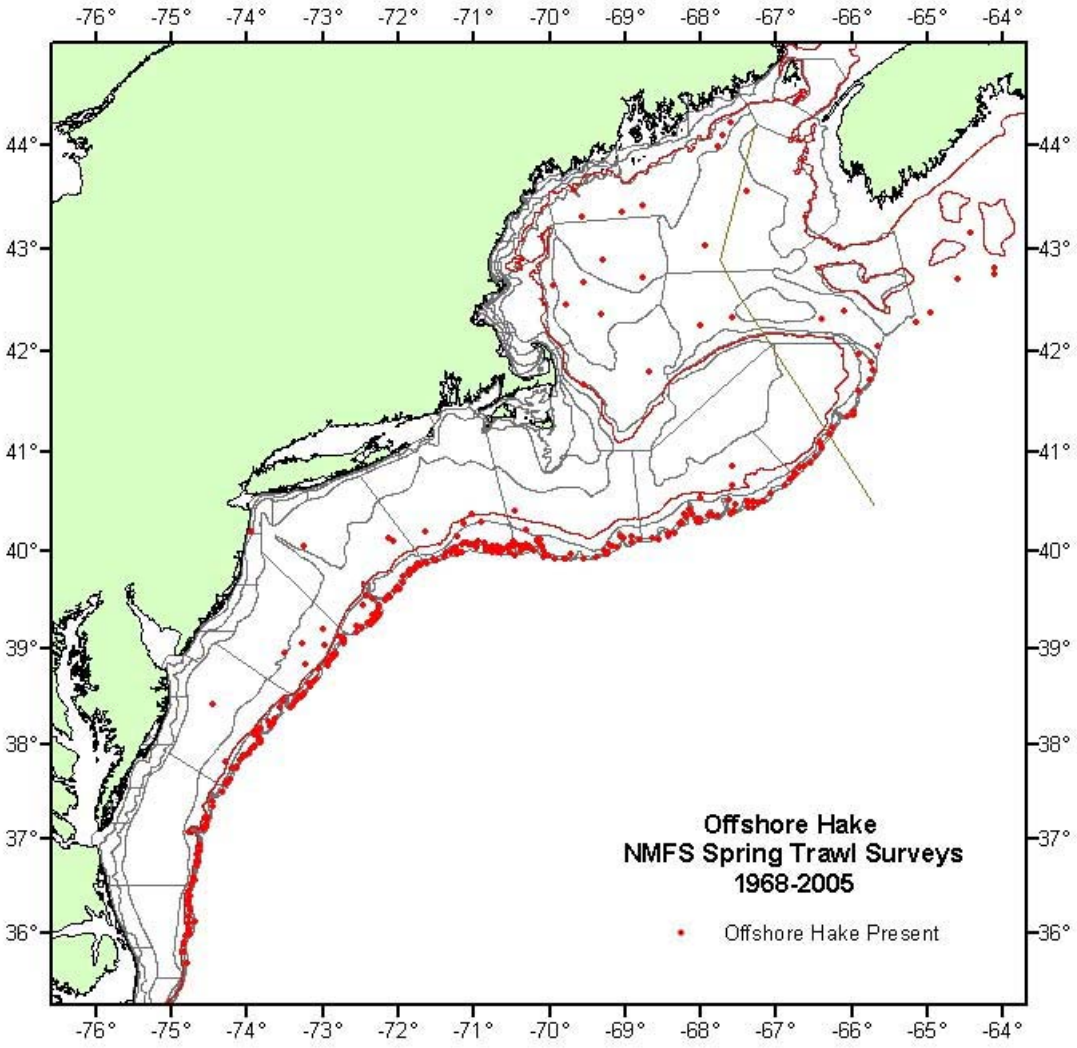


Figure A38. Locations of NEFSC spring bottom trawl survey tows that caught at least one offshore hake during 1963-2004, based all strata that were sampled.

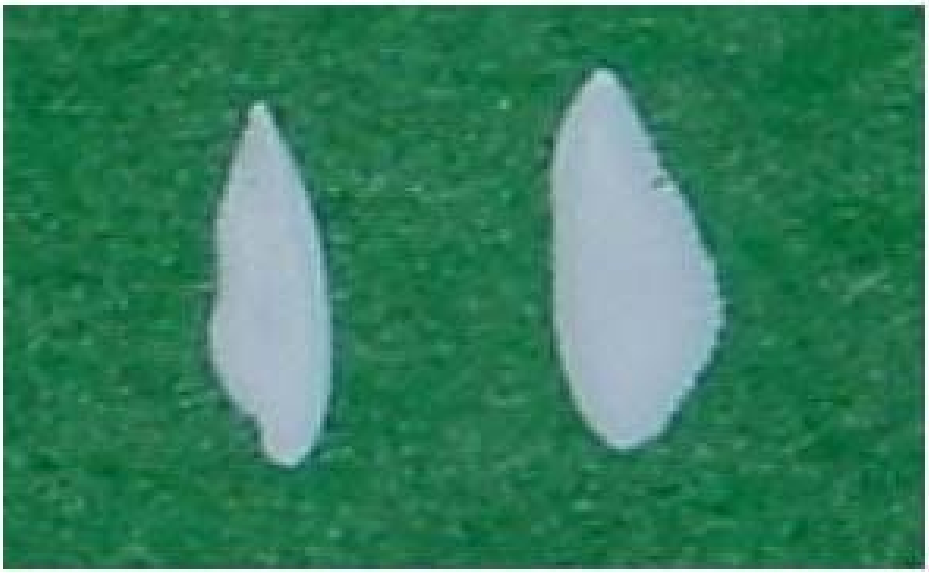


Figure A39. Otoliths from a silver hake (left) and an offshore hake (right). Both specimens were 35 cm TL.

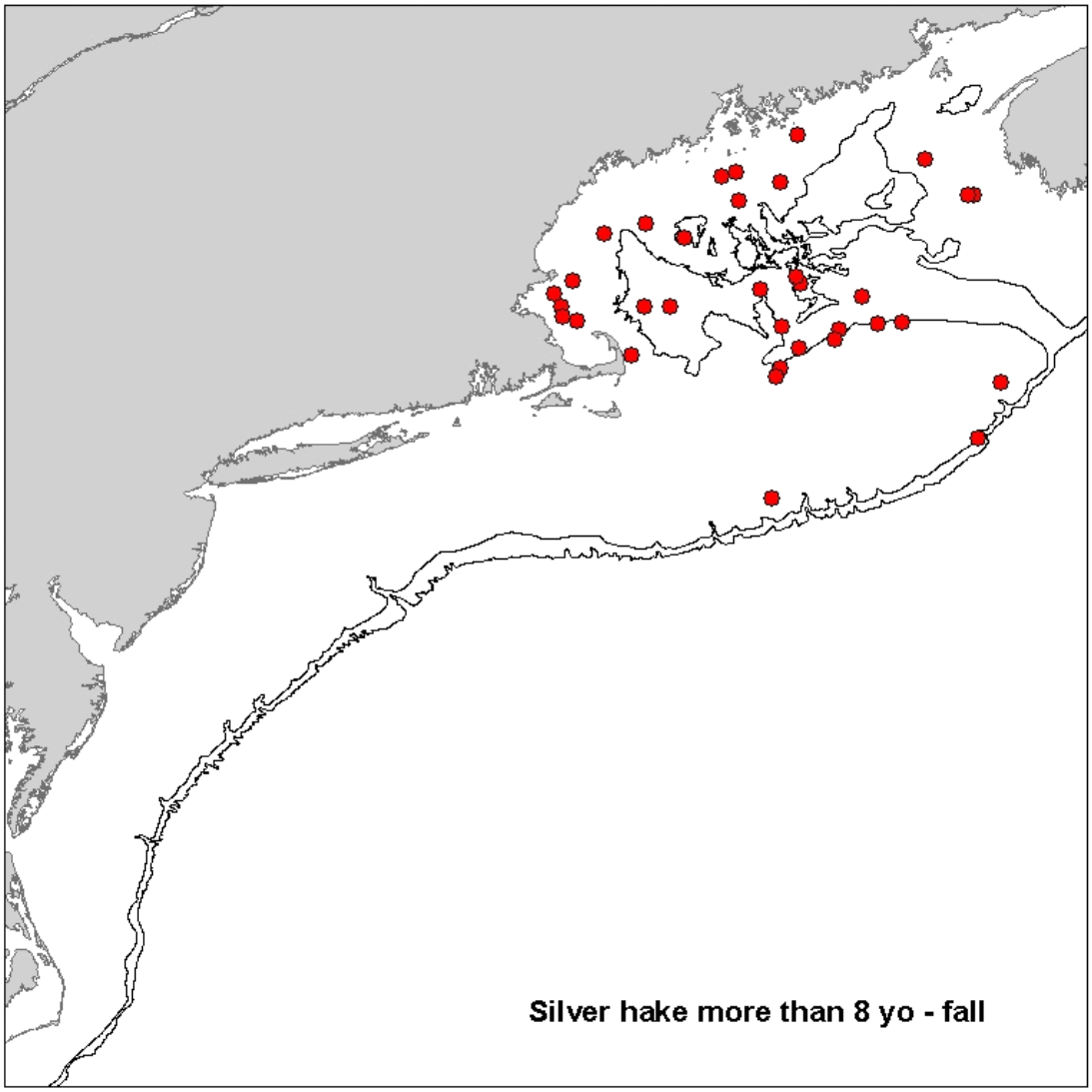


Figure A40. Catch locations for silver hake 8+ y captured during NEFSC fall surveys since 1973.

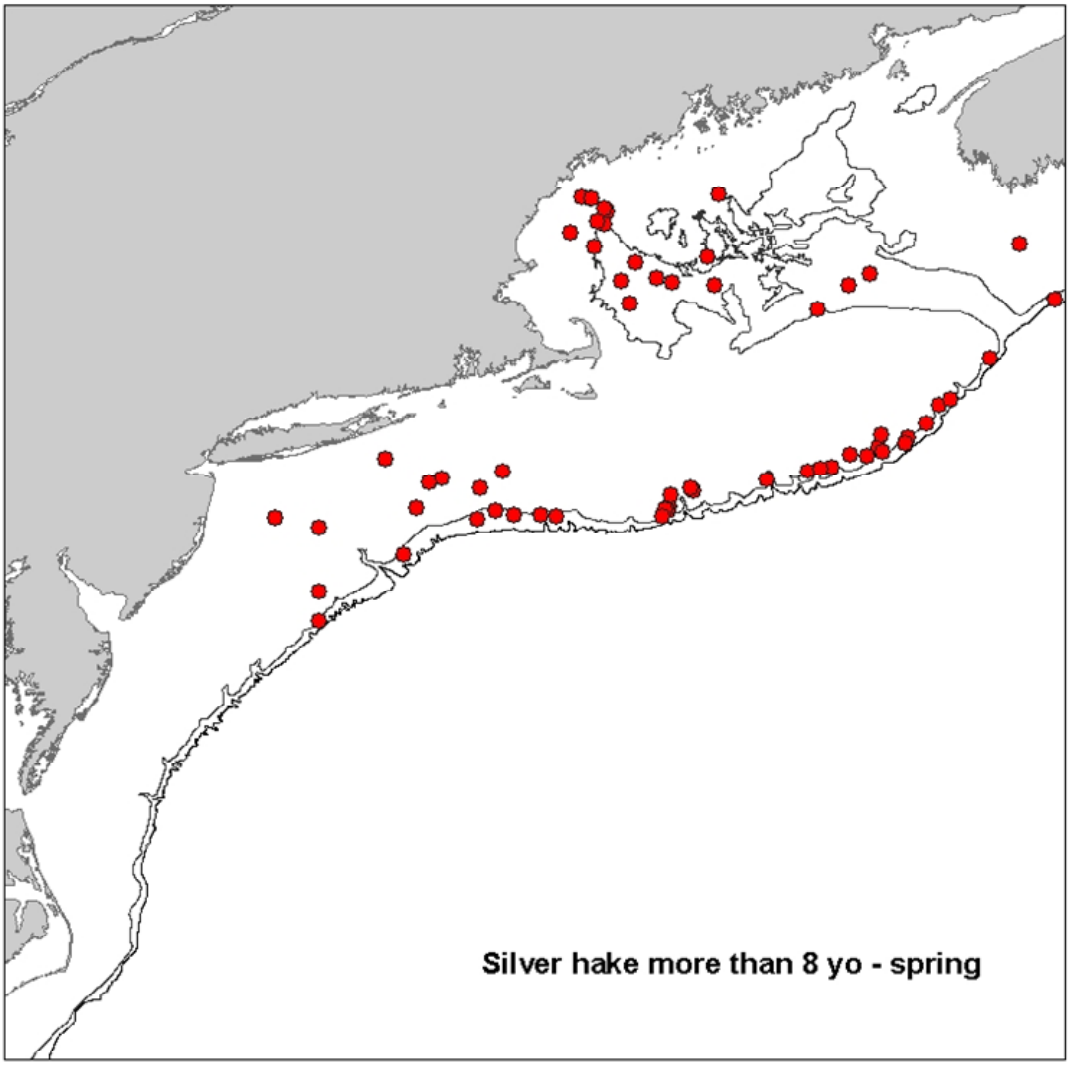


Figure A41. Catch locations for silver hake 8+ y captured during NEFSC spring surveys since 1973.

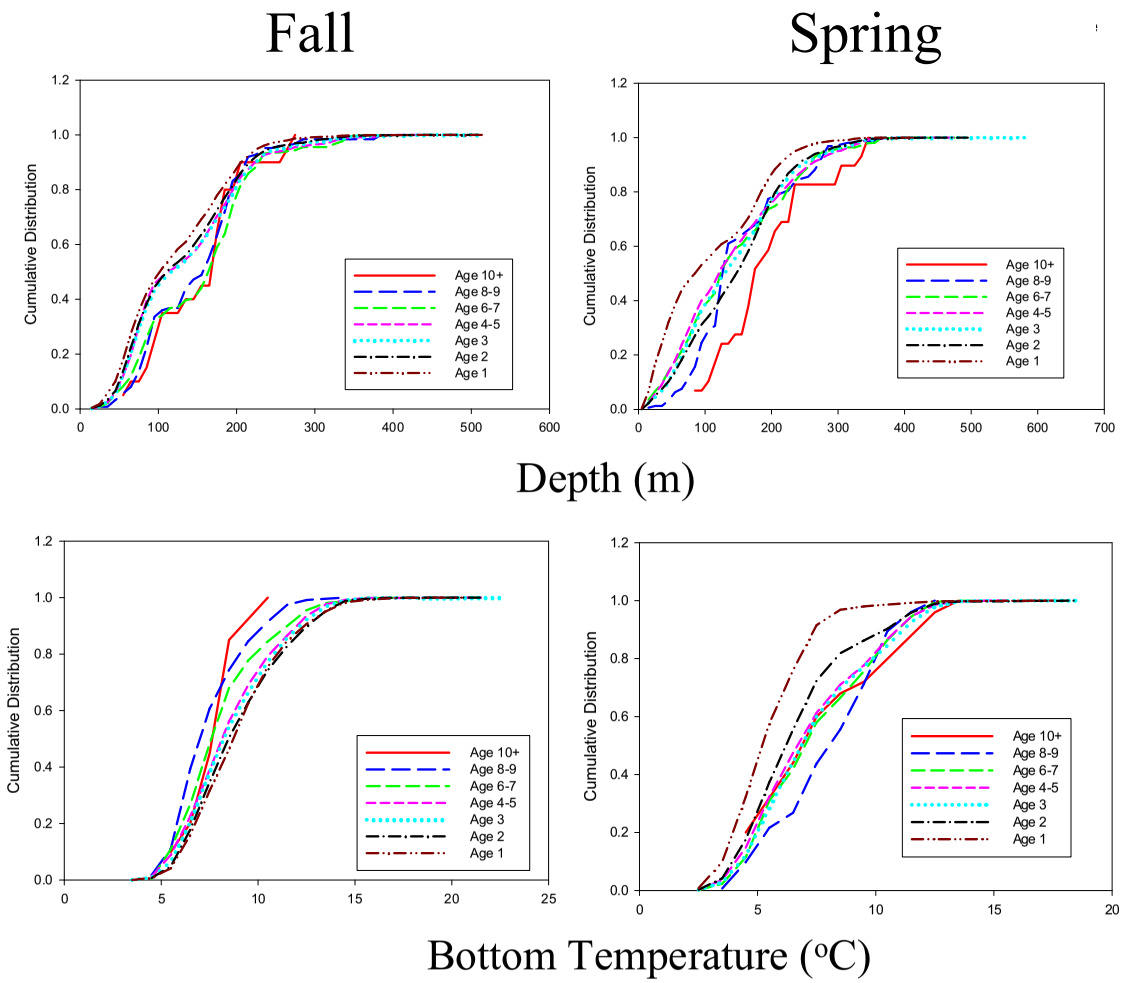


Figure A42. Cumulative depth and bottom temperature distributions for silver hake ages 1-10+ in NEFSC fall and spring bottom trawl surveys.

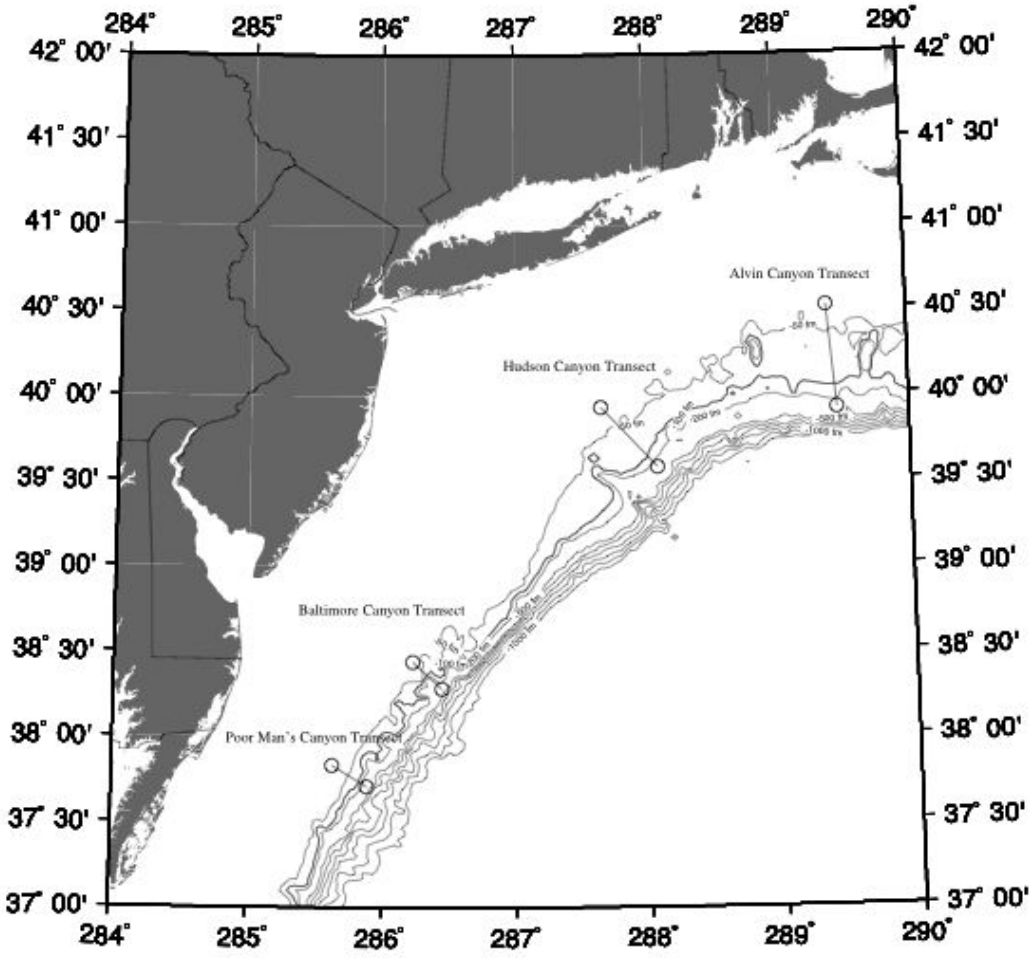


Figure A43. Location of transects for Supplemental Survey sampling. Data from the Baltimore and Hudson canyon transects at depths ≤ 274 m (150 fathoms) were used for silver hake.

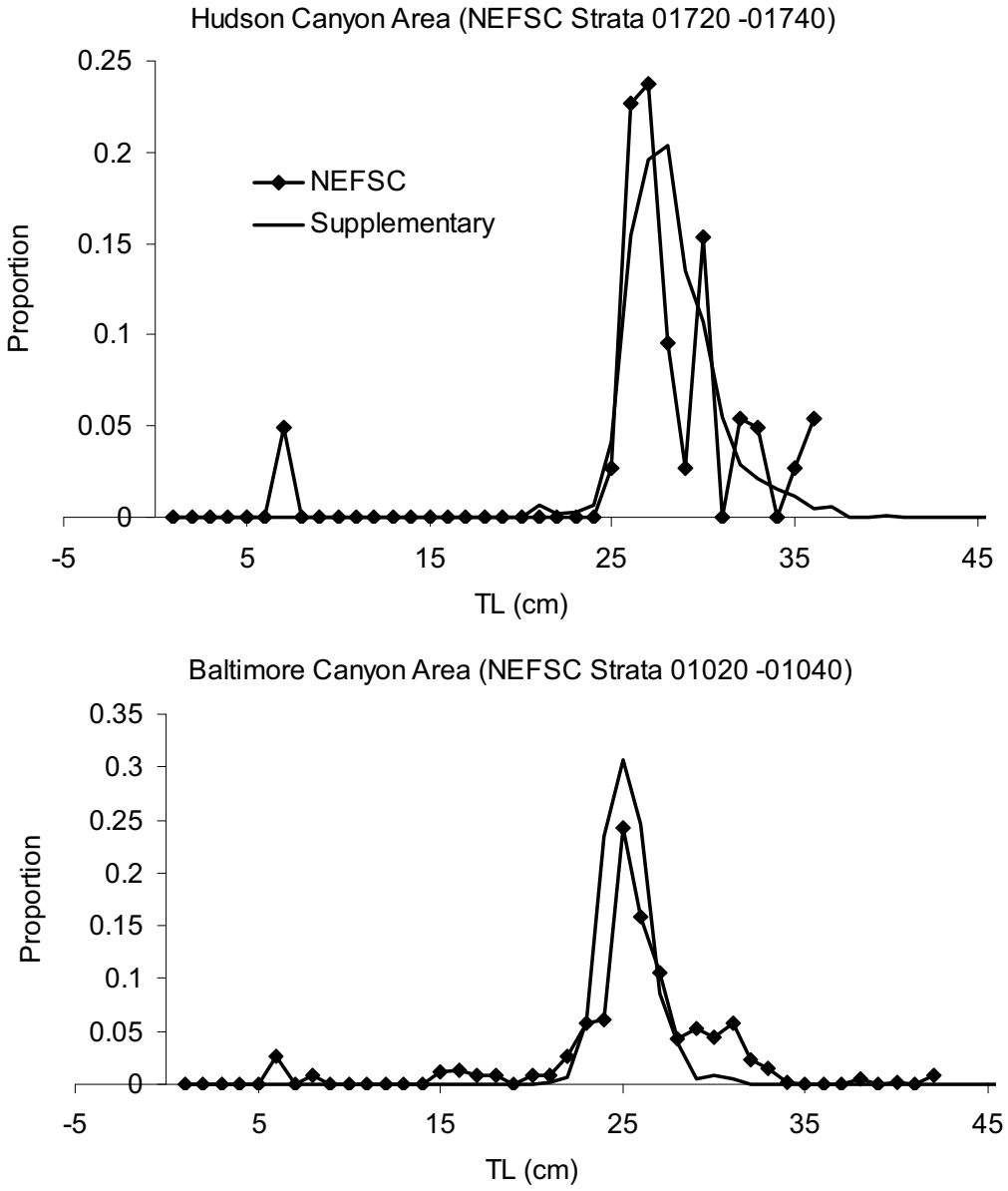


Figure A44. Length composition data for NEFSC and Supplemental surveys during 2004-2005 in the Hudson and Baltimore canyon areas. Data are for 12 tows in each area for the Supplemental survey (both fixed and adaptive stations during day or night were used). NEFSC data are for 14 tows in the Baltimore canyon area and 20 tows in the Hudson canyon area.

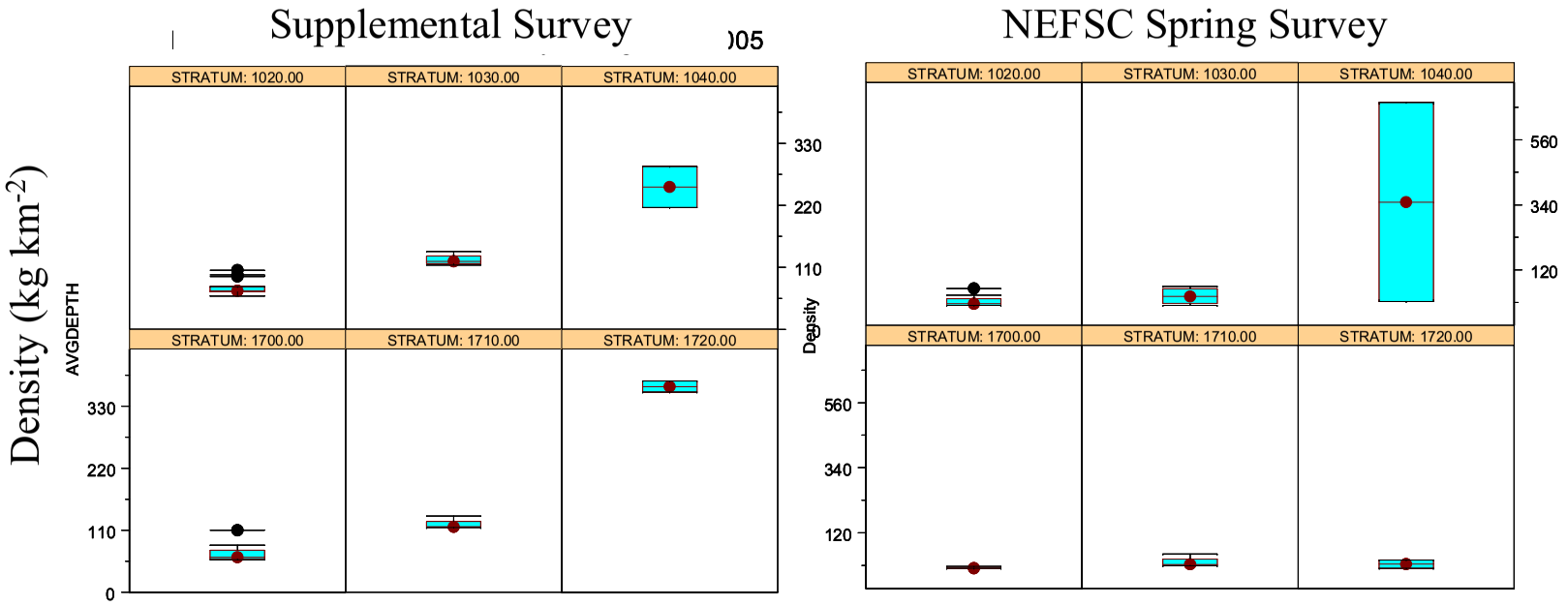


Figure A45. Densities of silver hake measured by the Supplemental and NEFSC spring bottom trawl surveys during March, 2004-2005. Y-axis are the same in all panels.

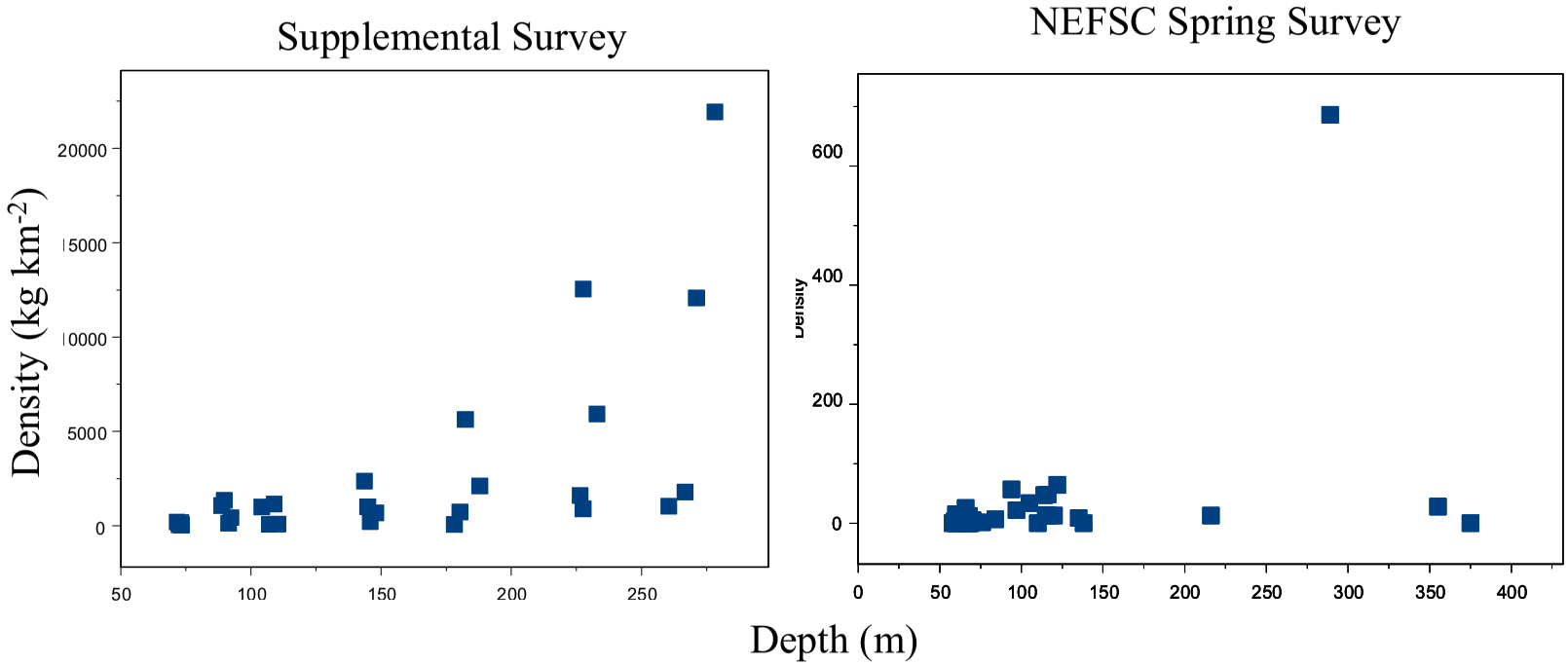


Figure A46. Densities of silver hake measured by the Supplemental and NEFSC spring bottom trawl surveys during March, 2004-2005.

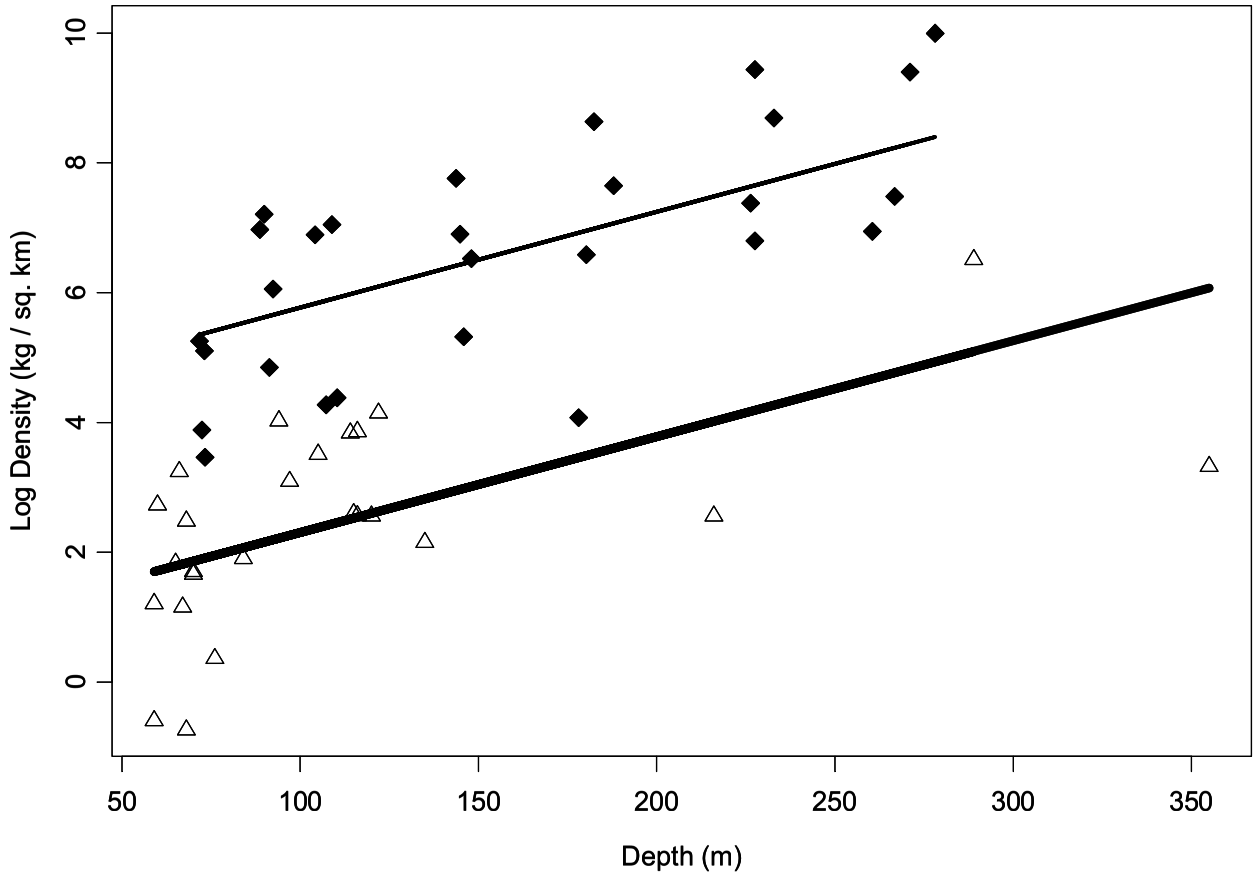


Figure A47. Densities of silver hake measured by the Supplemental (solid diamonds) and NEFSC (open triangles) spring bottom trawl surveys during March, 2004-2005. Lines from the best analysis of covariance model are also shown.

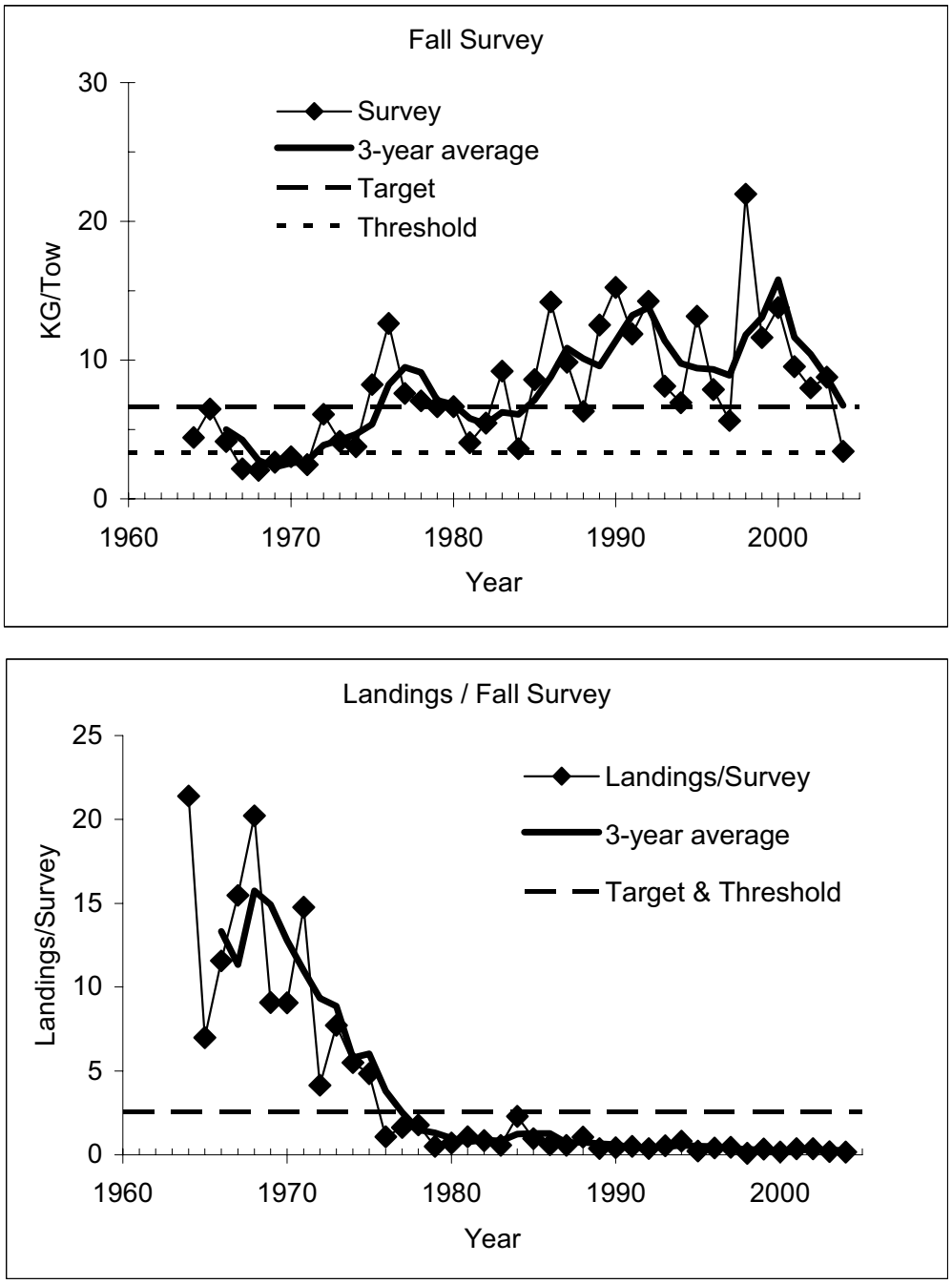
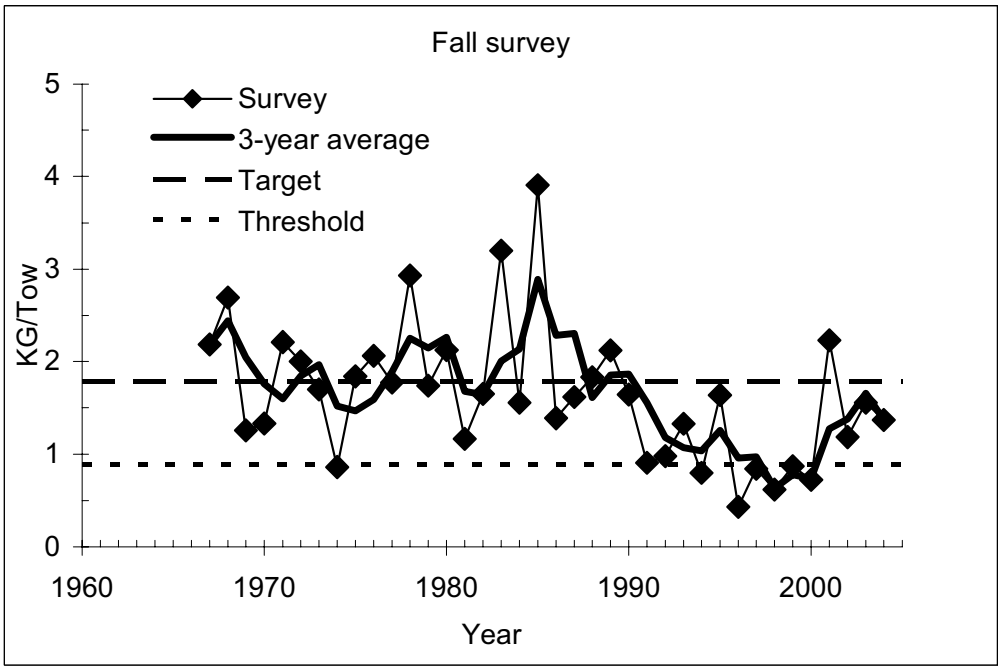


Figure A48. Abundance and exploitation indices for the northern stock of silver hake. Top: fall survey abundance index (delta mean kg/tow, based on consistently occupied offshore strata starting in 1964) with 3-year running average and current reference points for biomass. Bottom: landings/survey (exploitation index) and current reference points.



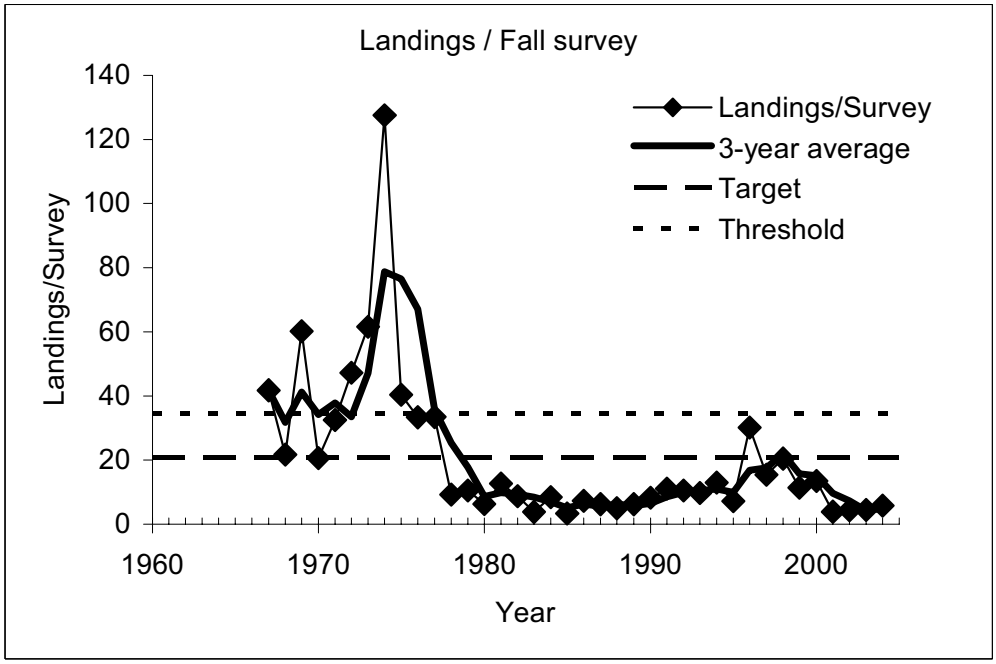


Figure A49. Abundance and exploitation indices for the southern stock of silver hake. Top: fall survey abundance index (delta mean kg/tow, based on consistently occupied offshore strata starting in 1967) with 3-year running average and current reference points for biomass. Bottom: landings/survey (exploitation index) and current reference points.

Figure A50. Lower bounds for fishable biomass and upper bounds for fishing mortality in the northern stock of silver hake during 1964-2004 based on historical landings and fall survey data.

(EDITOR'S NOTE: THIS FIGURE FROM THE WORKING GROUP REPORT HAS BEEN OMITTED. IT WAS NOT ACCEPTED BY THE REVIEW PANEL.)

Figure A51. Lower bounds for fishable biomass and upper bounds for fishing mortality in the northern stock of silver hake during 1964-2004 based on historical landings and fall survey data.

(EDITOR'S NOTE: THIS FIGURE FROM THE WORKING GROUP REPORT HAS BEEN OMITTED. IT WAS NOT ACCEPTED BY THE REVIEW PANEL.)

Estimated fishing mortality and spawning biomass for combined area silver hake from best fit ADAPT model.

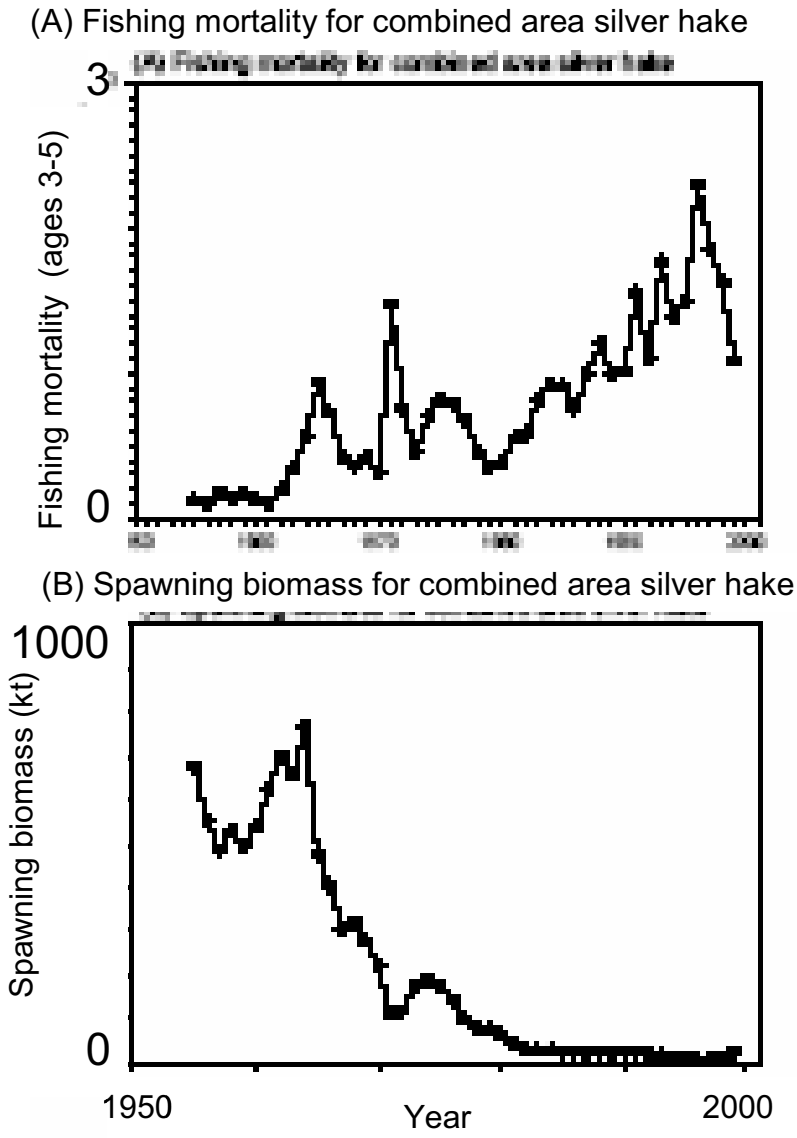


Figure 52. Fishing mortality and spawning biomass estimates for silver hake (northern and southern stock area) from the age structured stock assessment mode in NEFSC (2001).