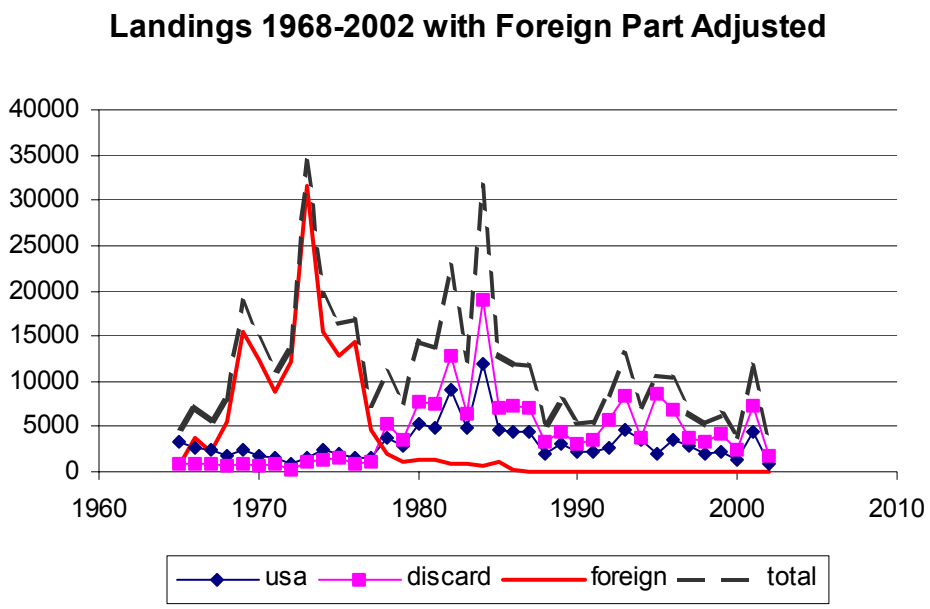


Figure B1. Landings and discards from the USA fishery, foreign landings, and total catch of butterfish during 1965-2002.

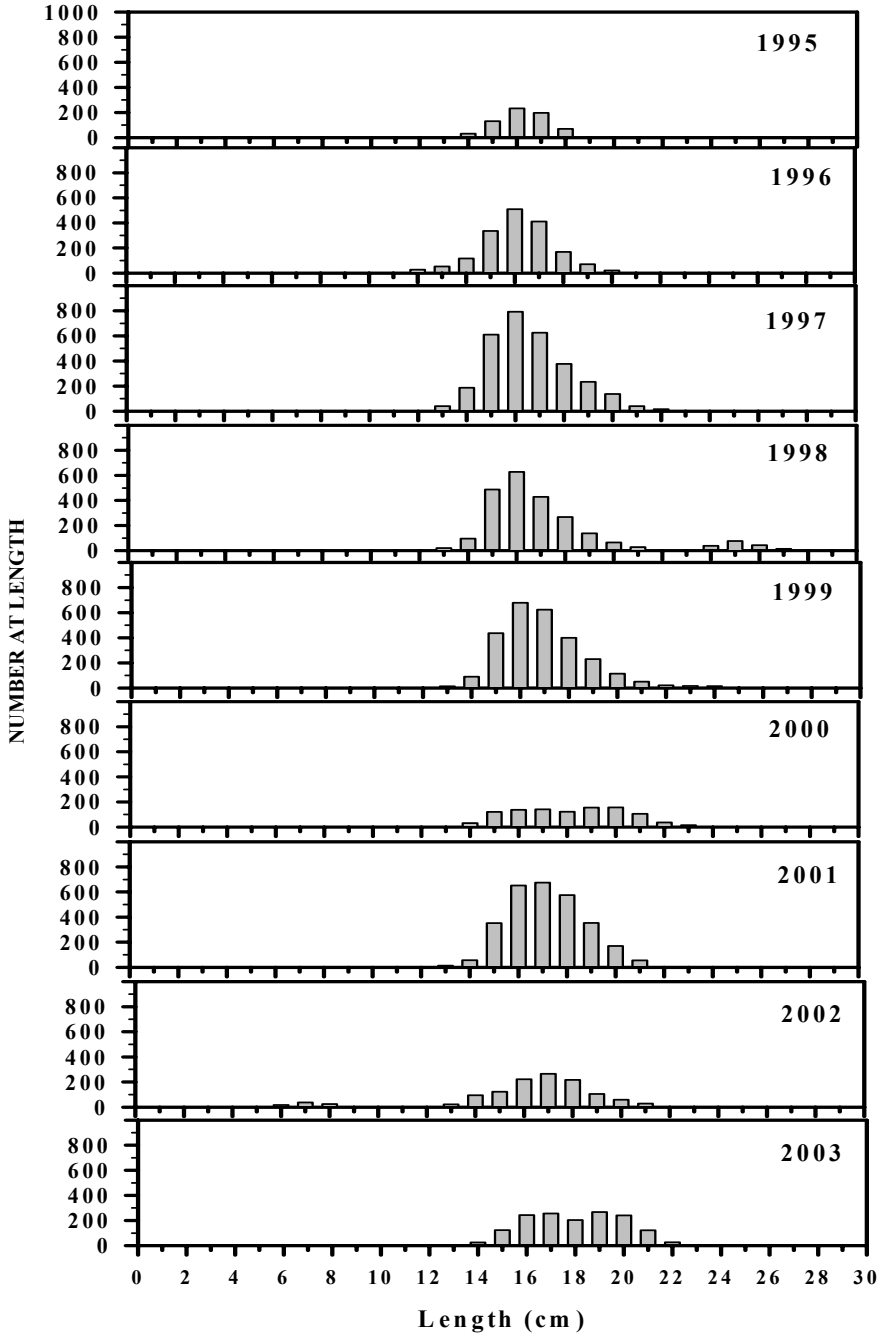


Figure B2. Size composition data from commercial landings of butterfish during 1995-2003.

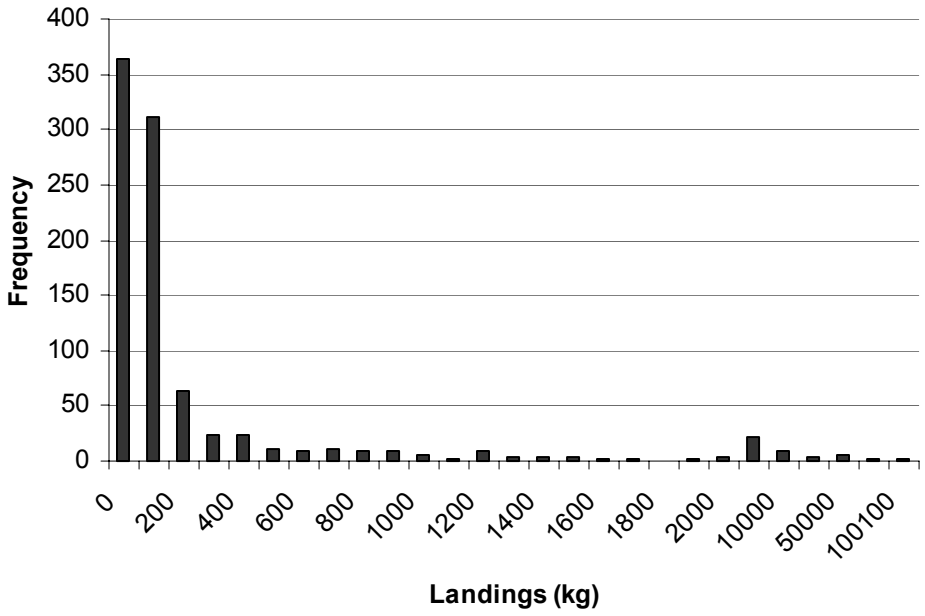


Figure B3. Distribution of landings of butterfish in otter trawls trips during 1989-2003.

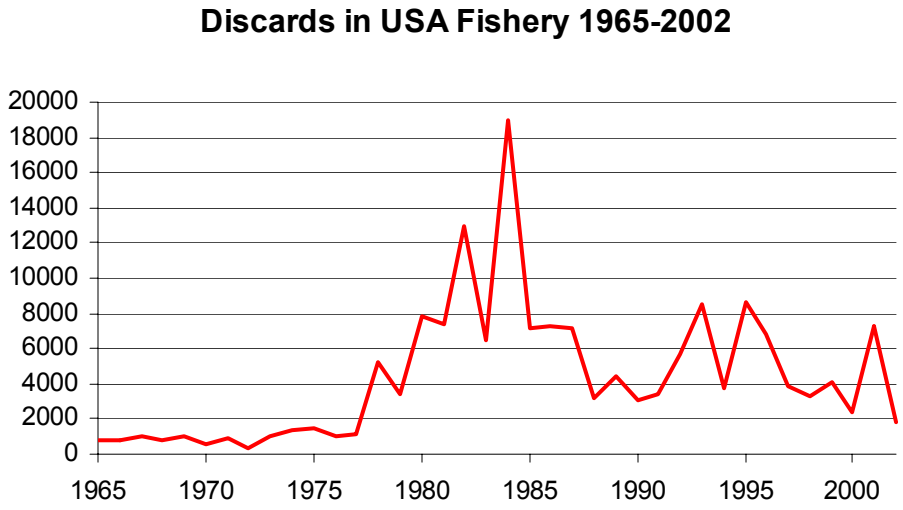


Figure B4. Estimated discards (mt) in the USA otter trawl fishery during 1965-2002.

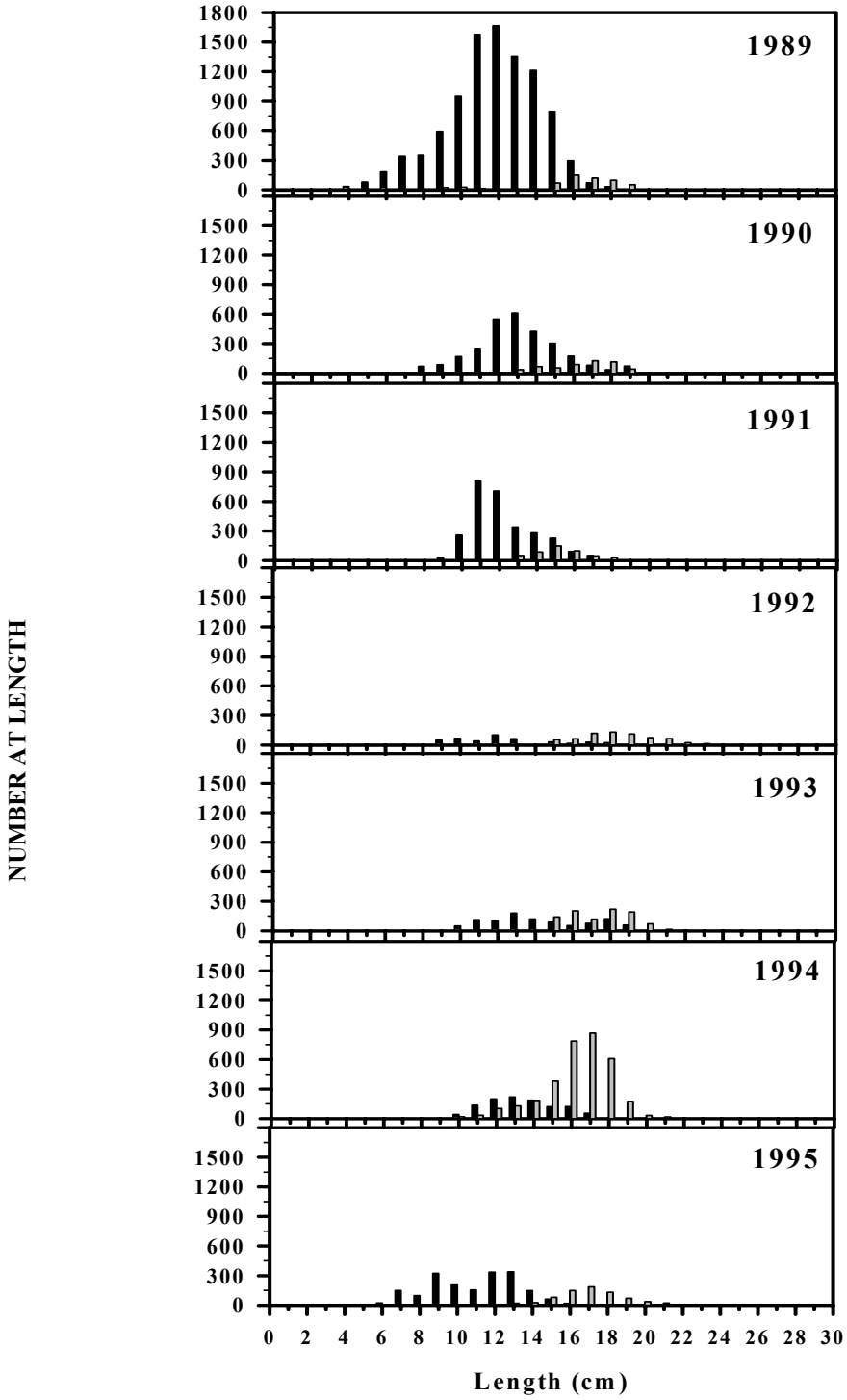
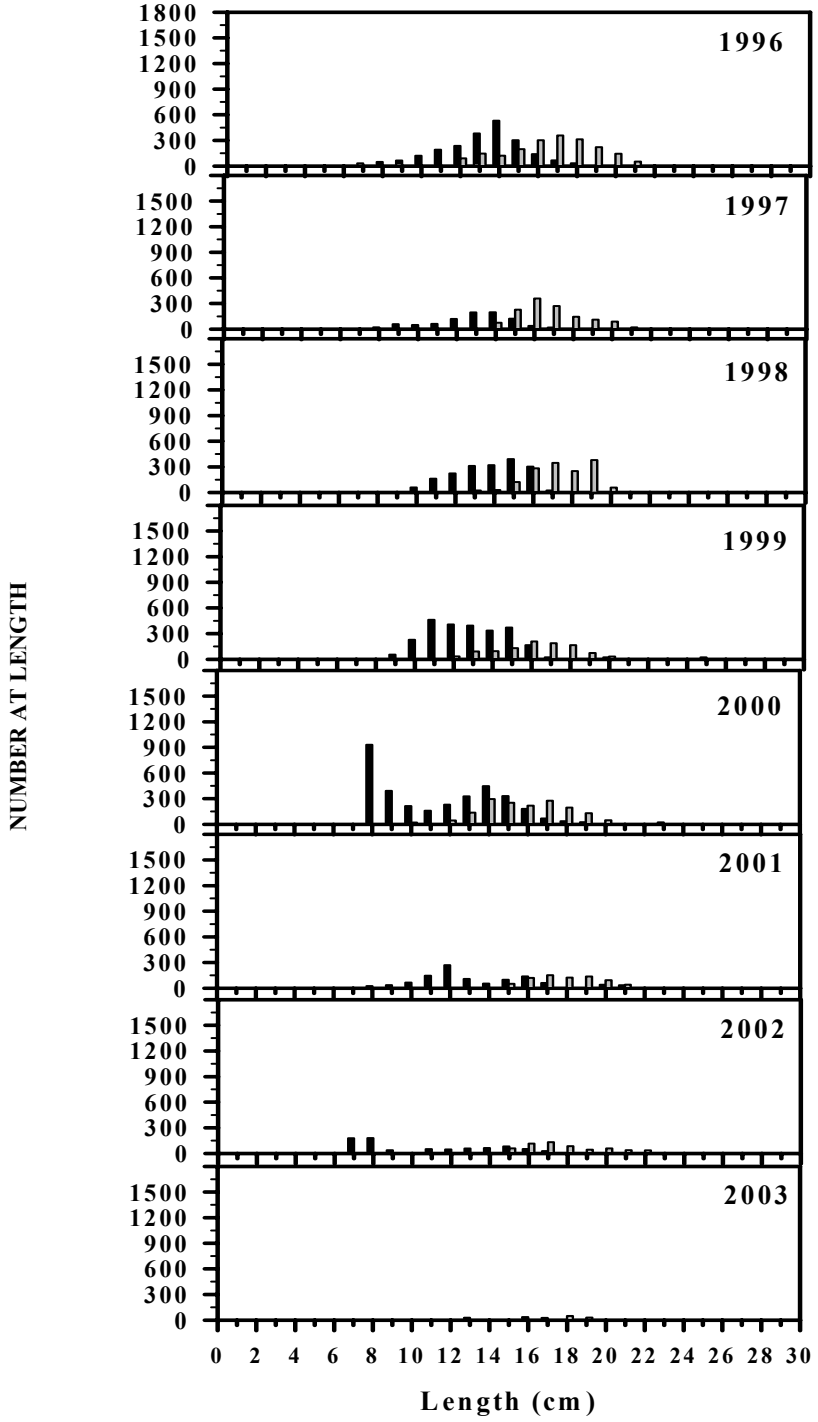


Figure B5. Length composition for NMFS Observer Program for butterfish during 1989-1995 with kept fish in gray and discard in black.

Figure B5. Continued, 1996-2003



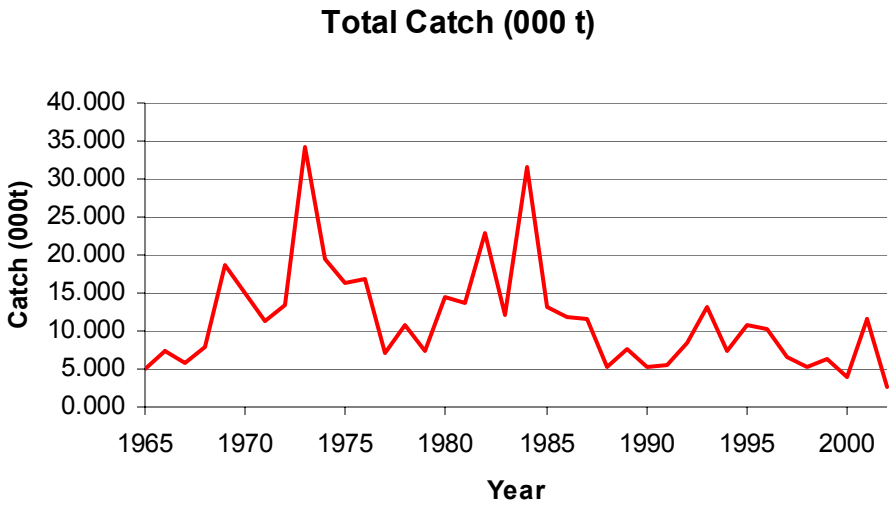


Figure B6. Total catch of butterfish during 1965-2002, includes USA landings, USA discards, and foreign landings.

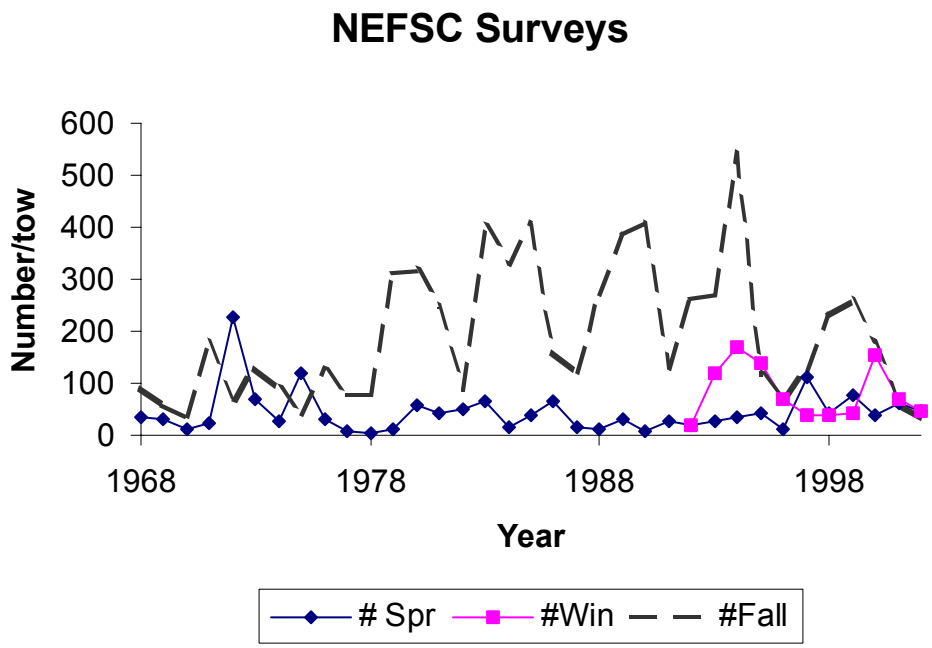


Figure B7. Research survey catch per tow in number for Winter 1994-2002, Spring 1968-2002, and Autumn 1968-2002 for NEFSC surveys for Strata 1-14, 16,19,23,25,61-76.

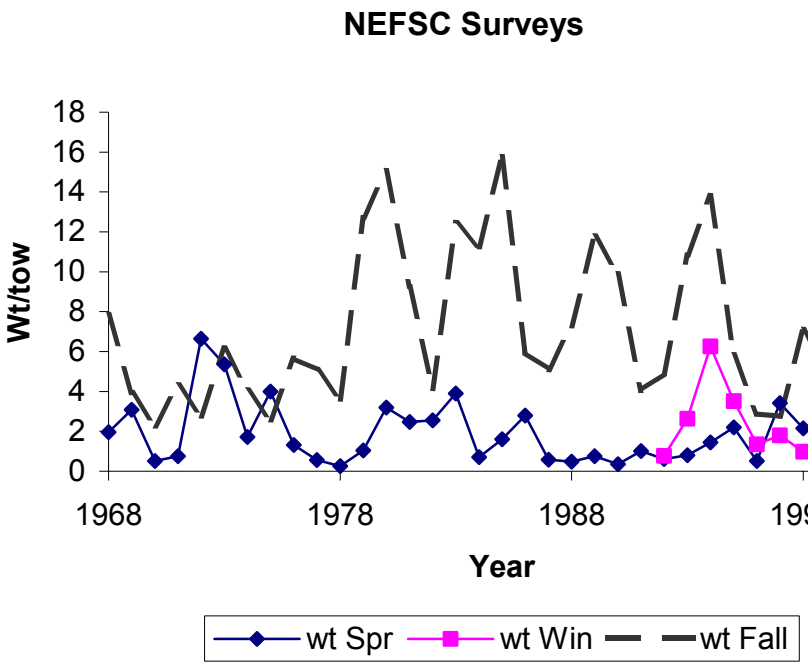


Figure B8. Research survey catch per tow (kg) for Winter 1994-2002, Spring 1968-2002, and Autumn 1968-2002 for NEFSC surveys for strata 1-14, 16,19,23,25,61-76.

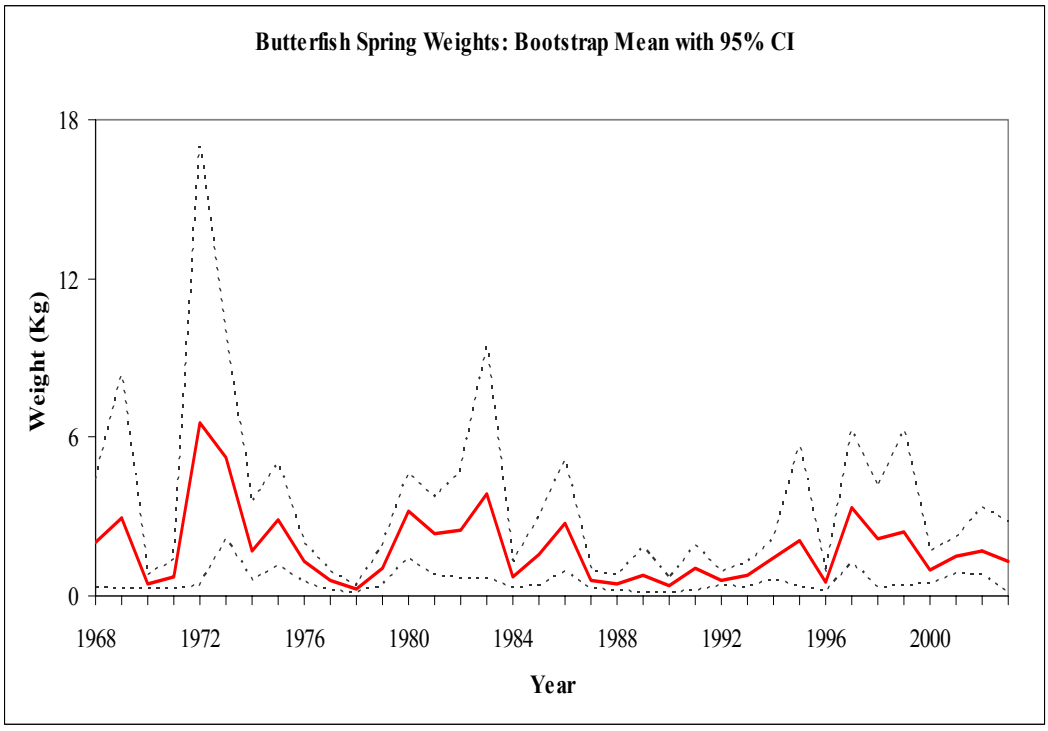


Figure B9. Catch in wt/tow and 95% confidence intervals (bootstrap analysis) for the spring NEFSC survey during 1968-2002.

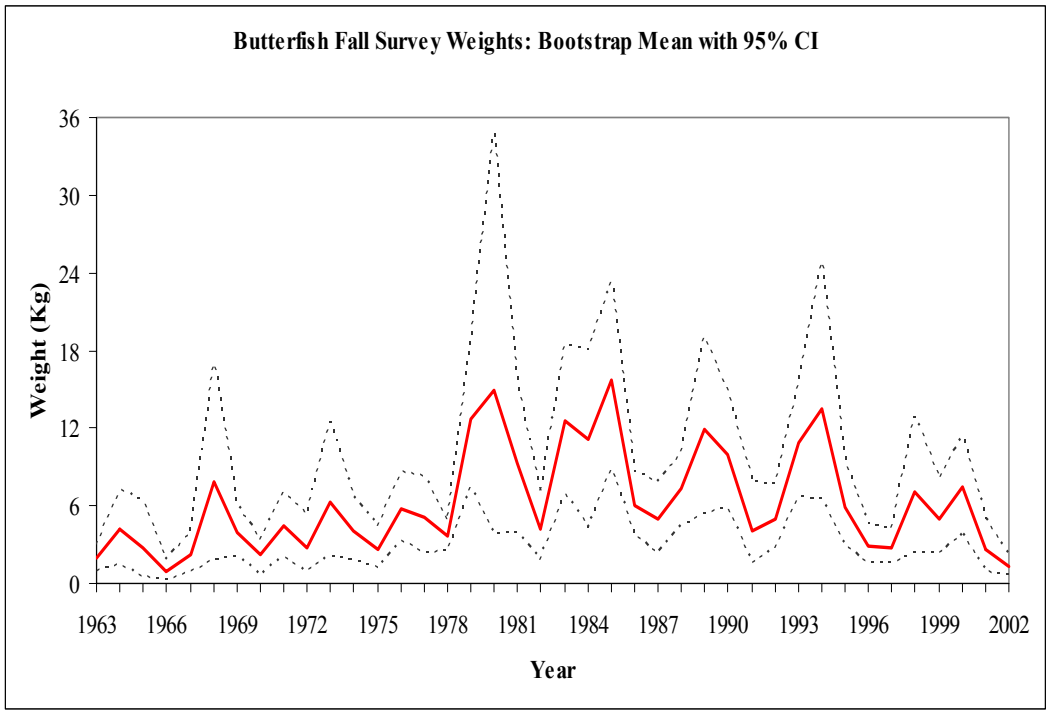


Figure B10. Catch in wt/tow and 95% confidence intervals (bootstrap analysis) for the fall NEFSC survey during 1968-2002.

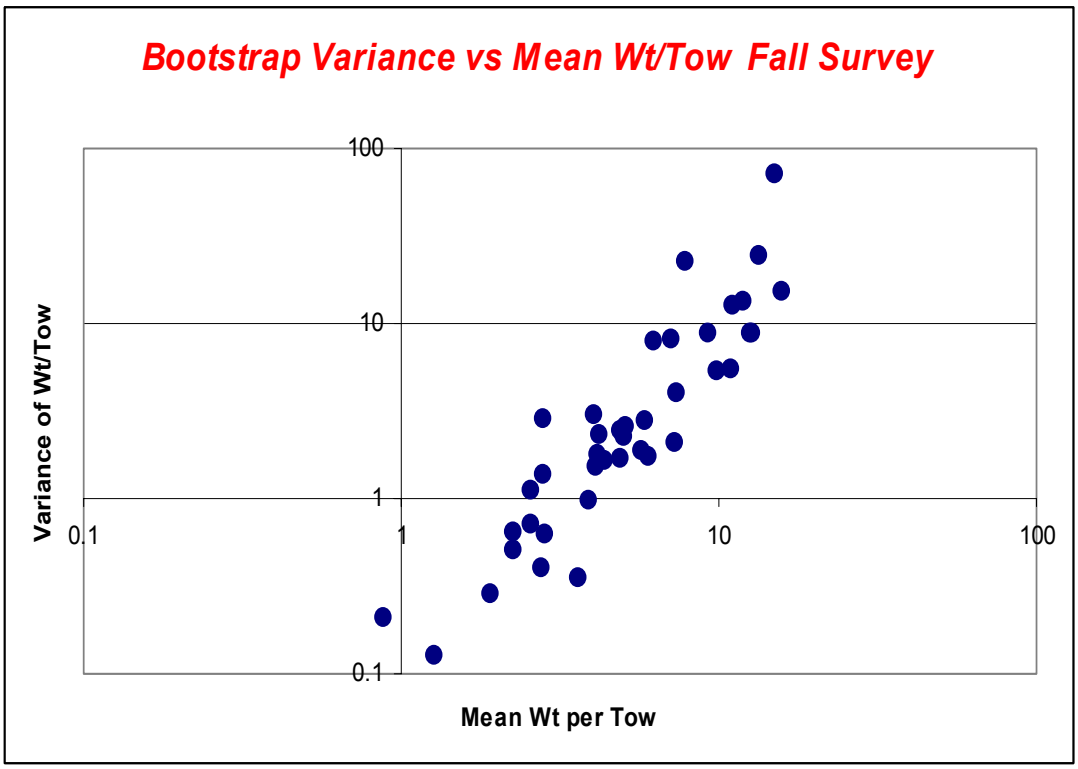


Figure B11. Relationship between fall survey wt/tow and variance in wt/tow during 1968-2002.

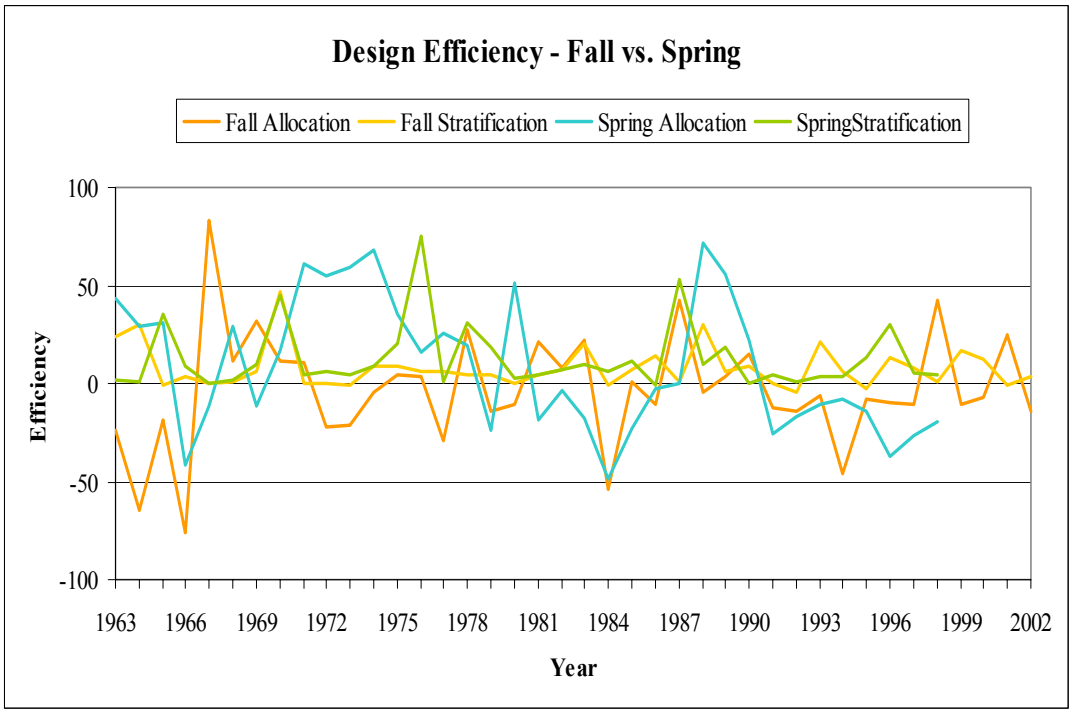


Figure B12. Design efficiency for stratification and allocation for the spring and fall NEFSC survey during 1963-2002.

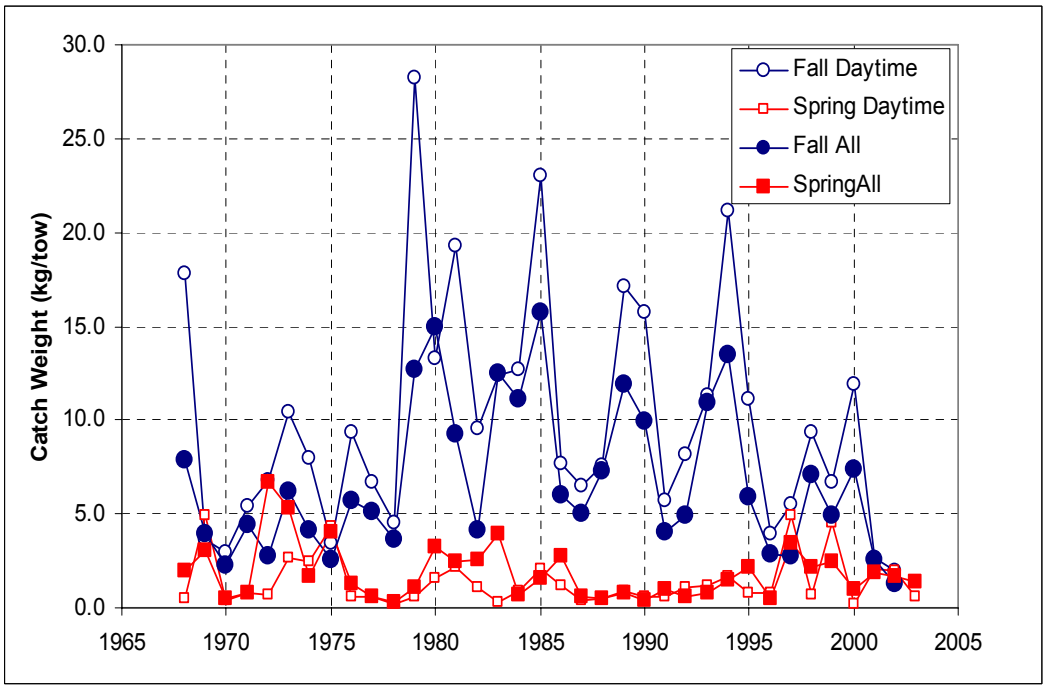


Figure B13. Spring and fall daytime and total wt/tow indices during 1968-2002.

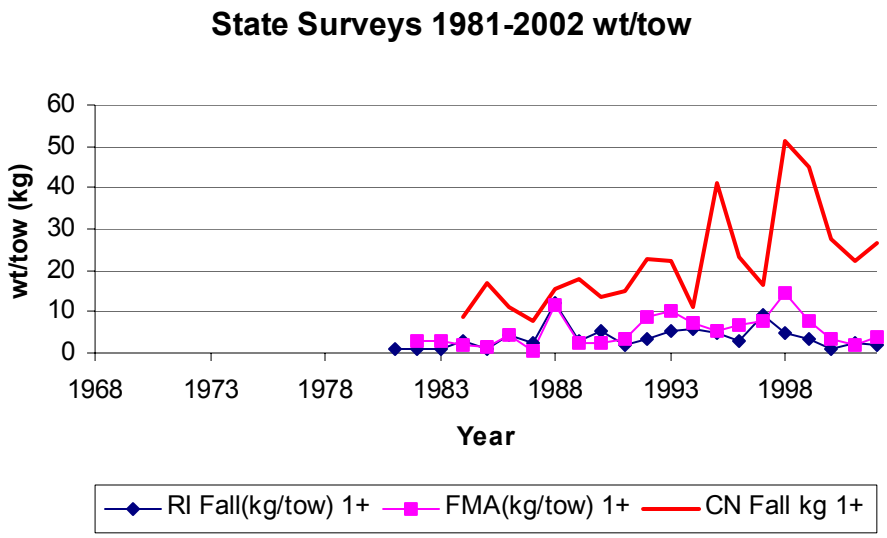


Figure B14. Catch-per-tow in weight for Rhode Island (1981-2002), Massachusetts (1982-2002), and Connecticut (1984-2002) bottom trawls surveys.

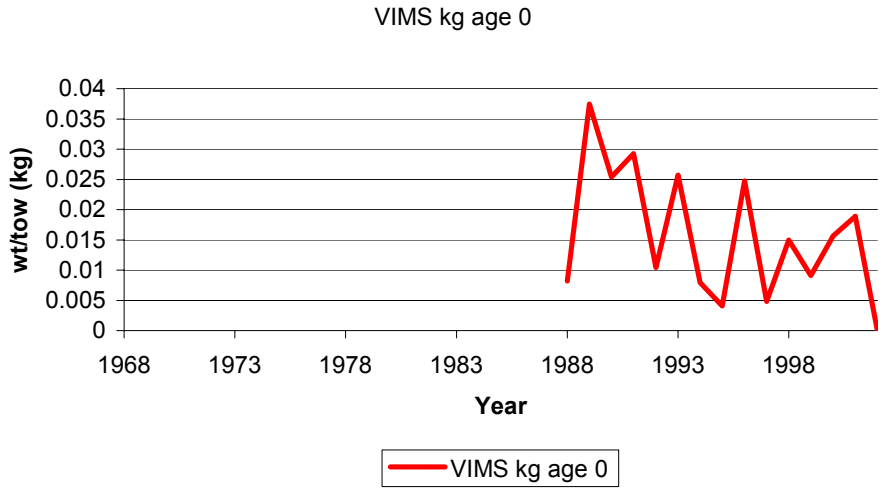


Figure B15. Catch-per-tow in weight for the VIMS bottom trawl survey age 0 during 1988-2001.

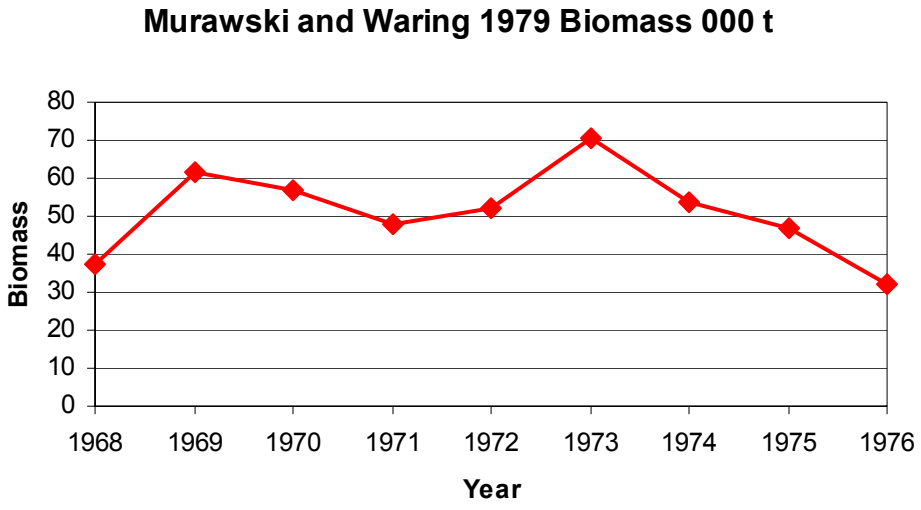


Figure B16. Estimates of butterfish biomass during 1968-1976 from VPA.

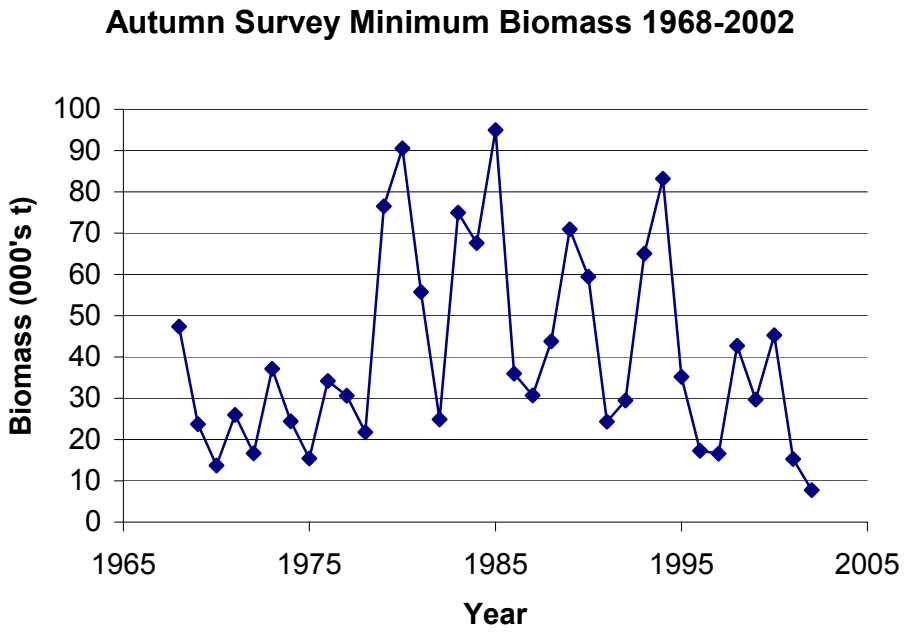


Figure B17. Autumn survey minimum swept area biomass during 1968-2002.

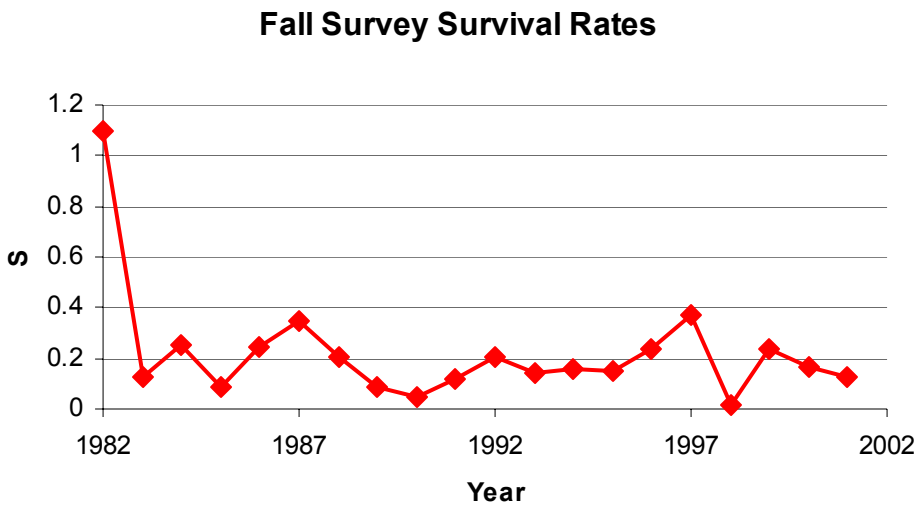


Figure B18. Survival estimates from autumn survey number/tow indices during 1982-2002.

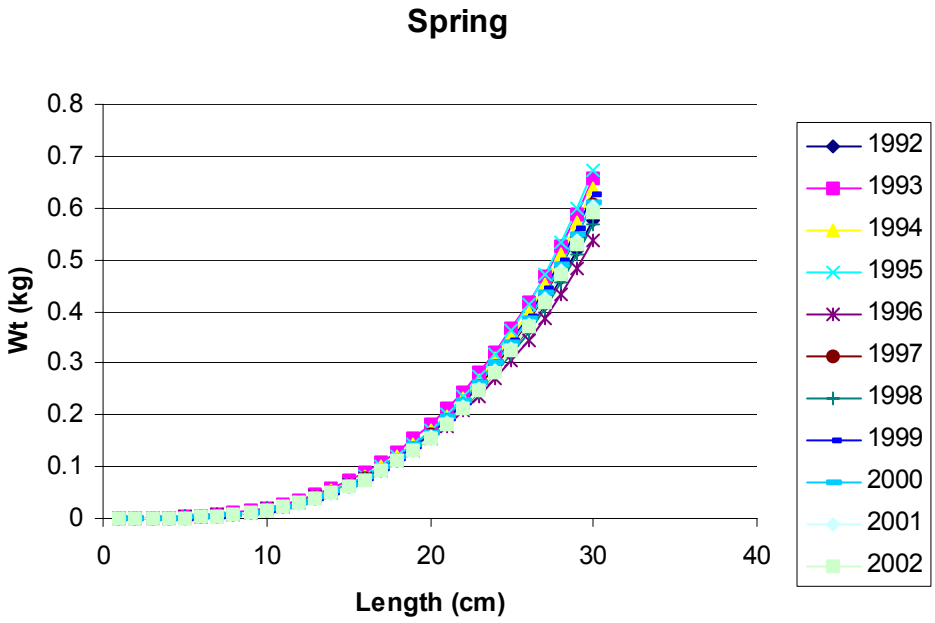


Figure B19. Length-Weight relationships for butterfish from spring bottom trawl surveys during 1992-2002.

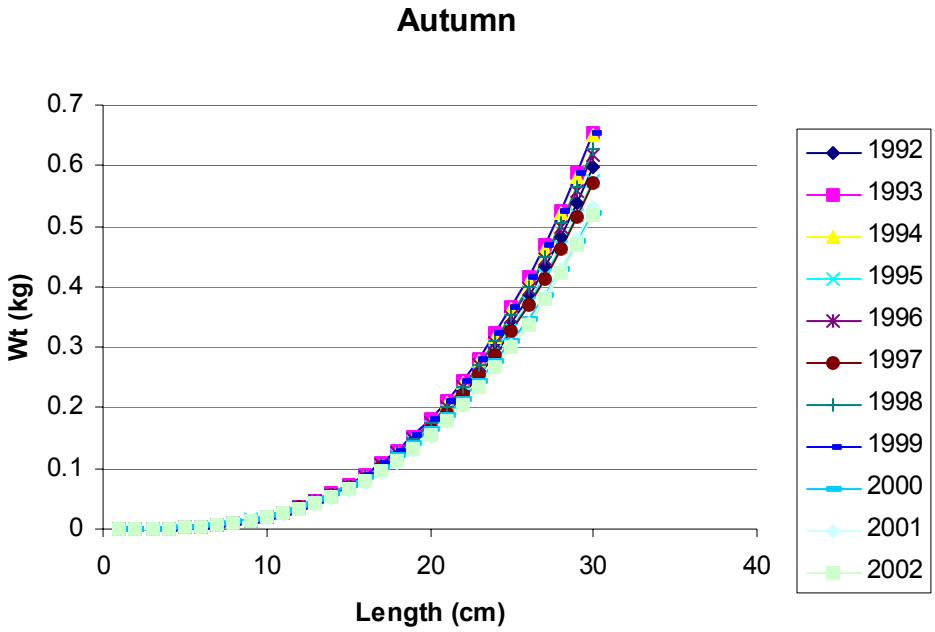


Figure B20. Length-Weight relationships for butterfish from autumn bottom trawl surveys during 1992-2002.

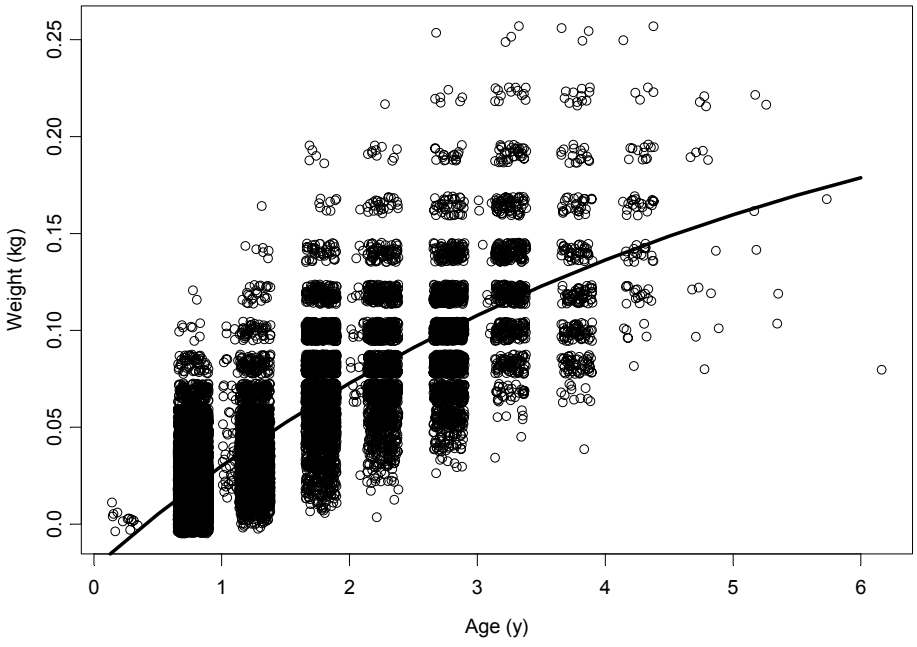


Figure B21. Von-Bertalanffy growth model fit to winter, spring, and Autumn NEFSC survey data from 1992-2003.

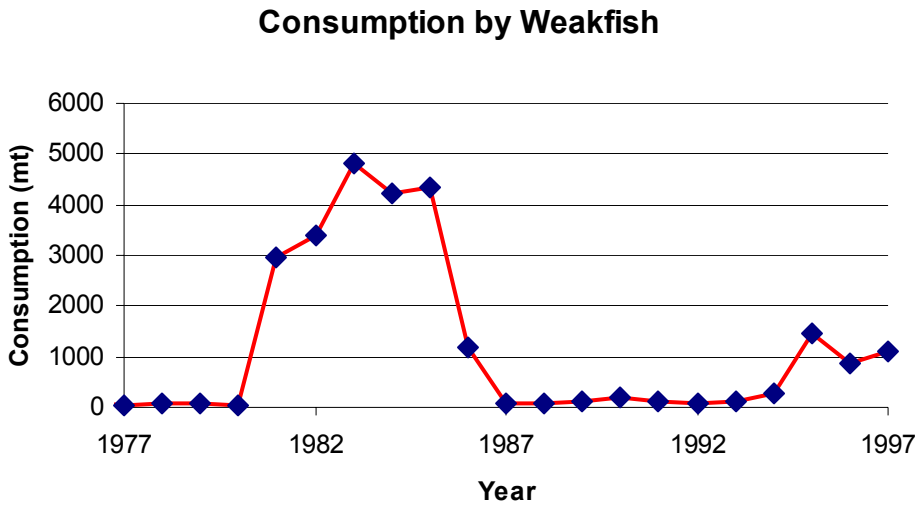


Figure B22. Consumption of butterfish (tonnes) by weakfish during 1977-1997.

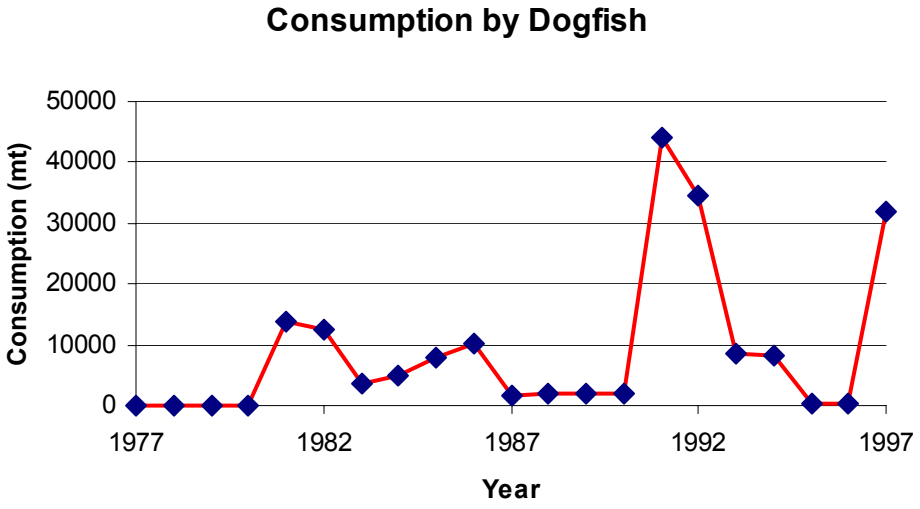


Figure B23. Consumption of butterfish (tonnes) by Spiny Dogfish during 1977-1997.

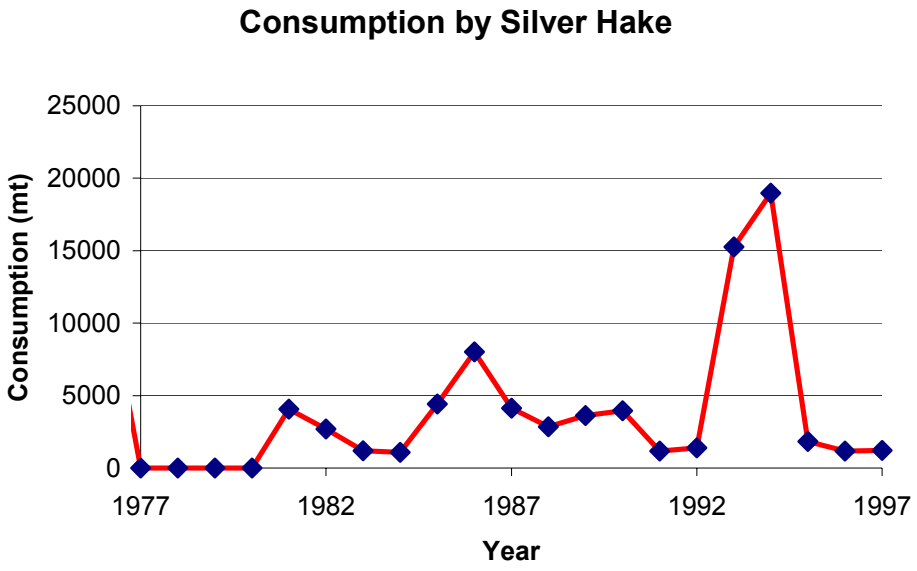


Figure B24. Consumption of butterfish (tonnes) by Silver Hake during 1977-1997.

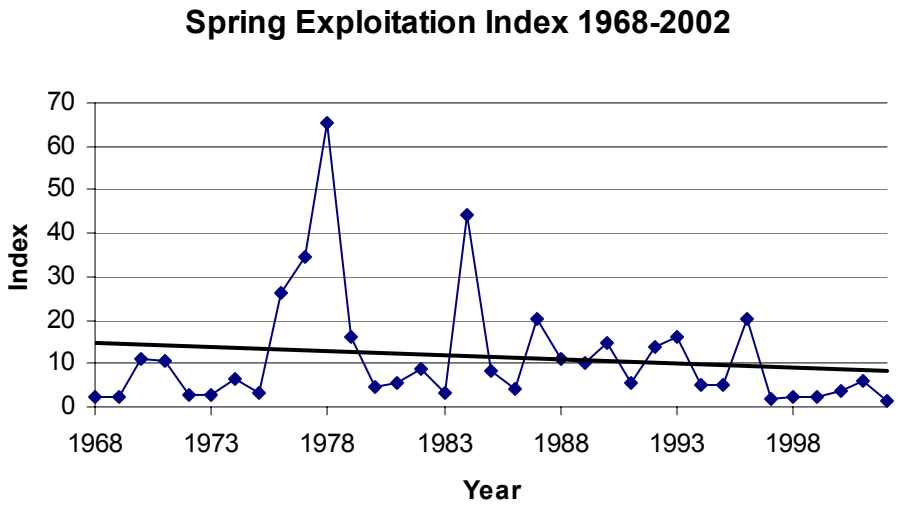


Figure B25. Exploitation indices for butterfish from the NEFSC Spring bottom trawl survey and catch during 1968-2002.

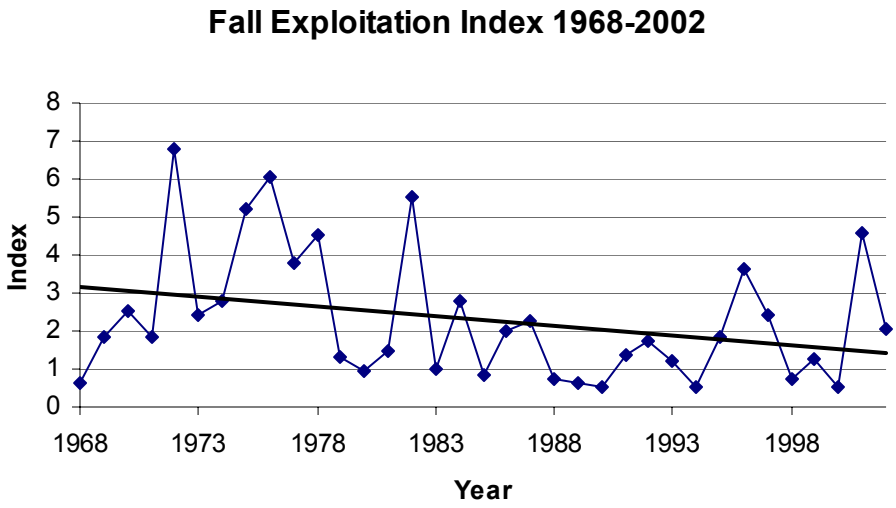


Figure B26. Exploitation indices for butterfish from the NEFSC Autumn bottom trawl survey and catch during 1968-2002.

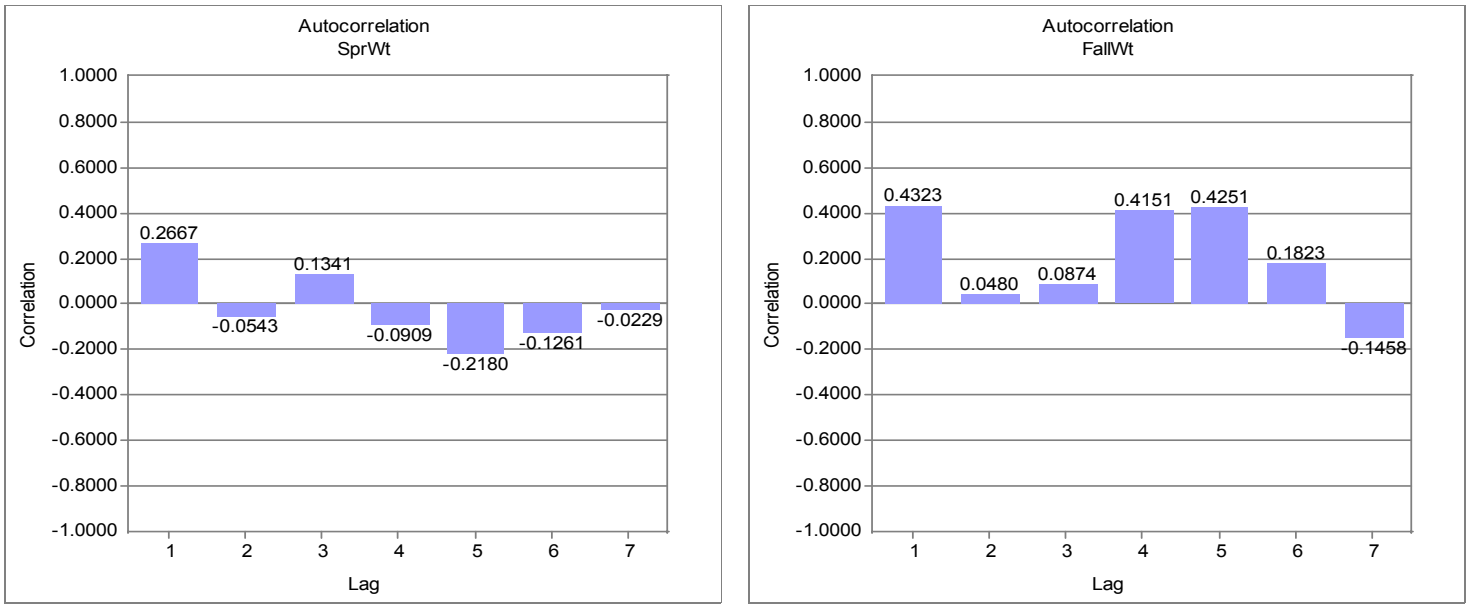


Figure B27. Autocorrelation plots for relationship between the replacement ratio and relative F for the spring and fall NEFSC surveys during 1968-2002.

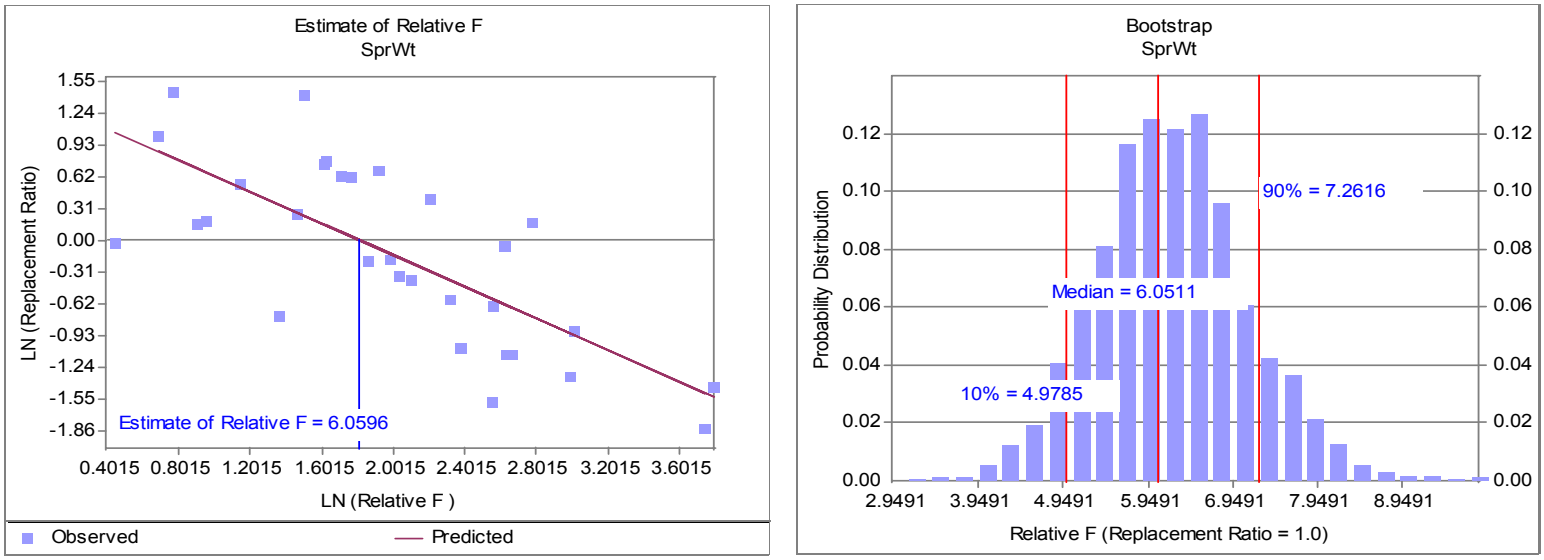


Figure B28. Plots of relative F and replacement ratio and bootstrap distribution of relative F for butterfish from the spring NEFSC survey during 1968-2002.

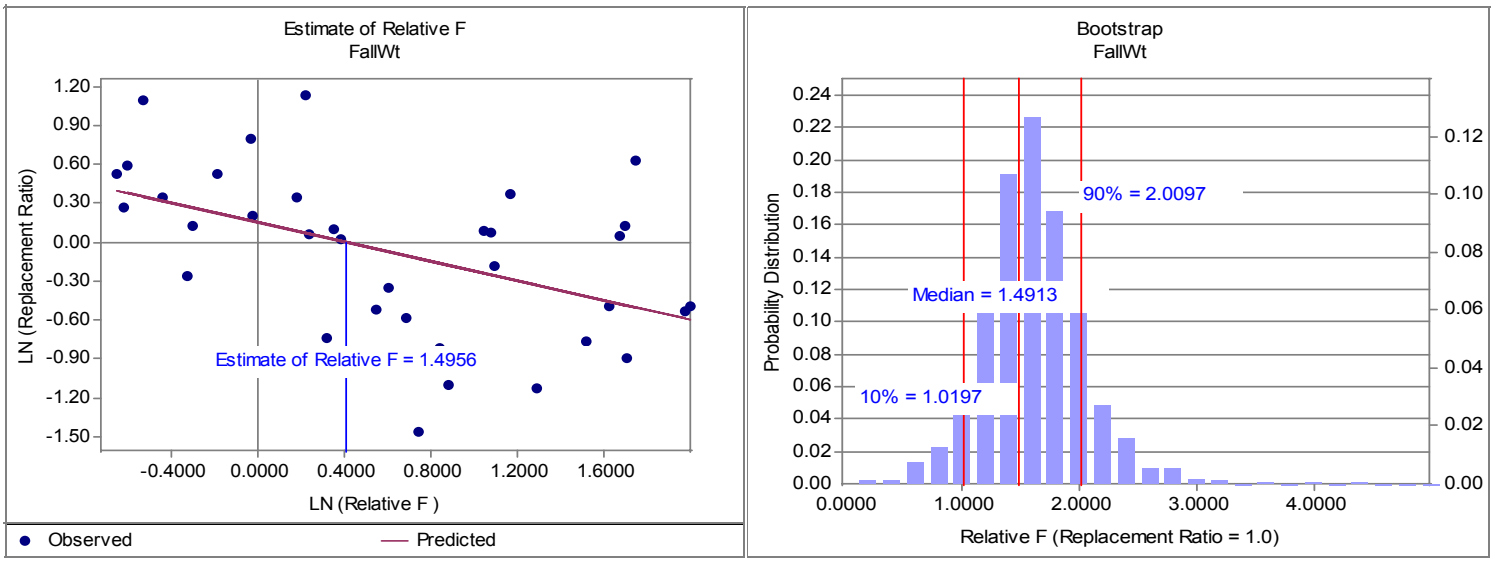


Figure B29. Plots of relative F and replacement ratios and bootstrap distribution of relative F for butterfish from the fall NEFSC survey during 1968-2002.

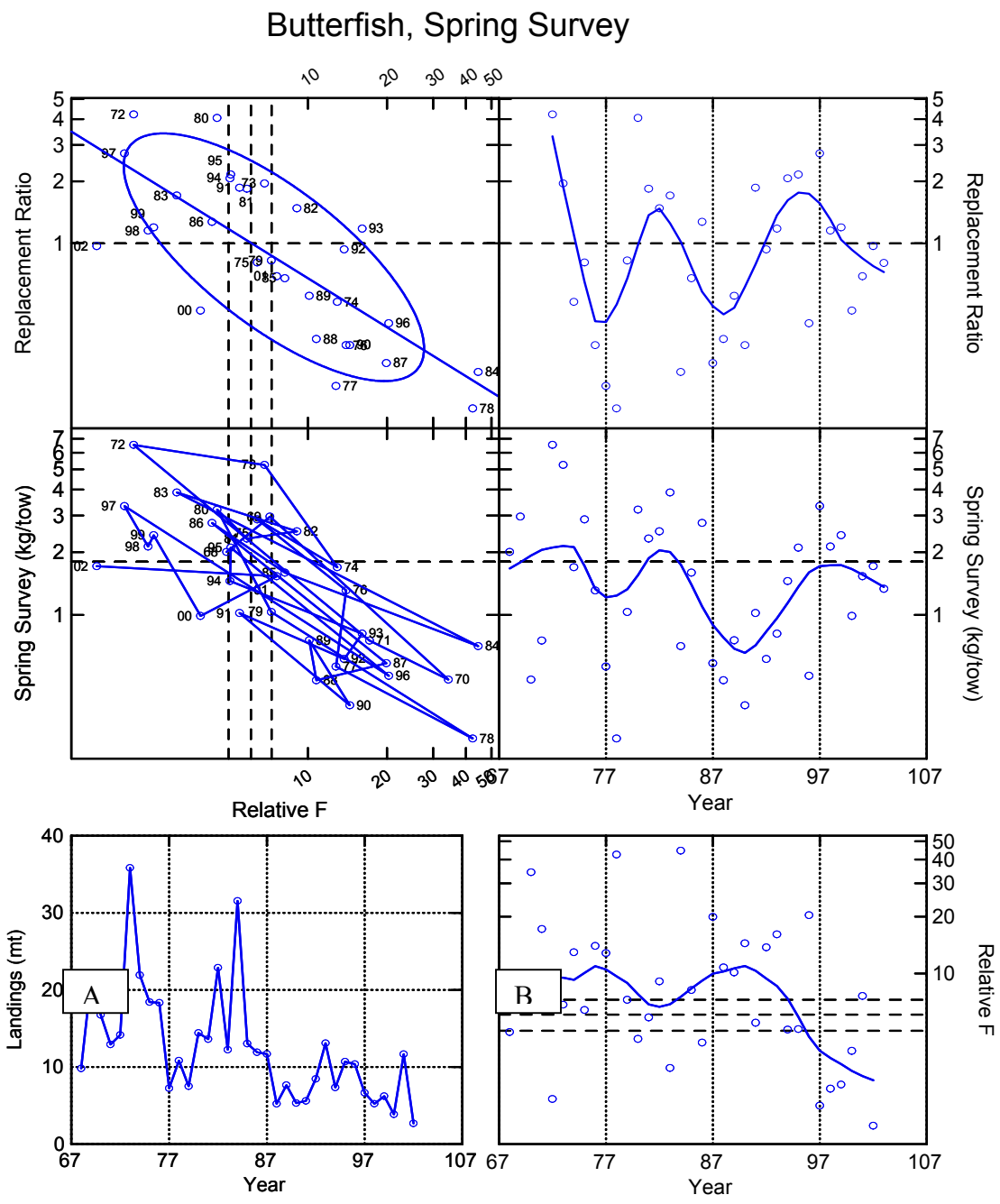


Figure B30. Six panel plot depicting trends in relative biomass, landings, relative fishing mortality rate (landings/abundance index) and replacement ratios for butterfish using NMFS spring bottom trawl survey. Lowess smooth lines are based on a tension factor of 0.3. Vertical dashed lines in panel A and C represent the point and 80% CI of relative F at replacement. Horizontal dashed lines in panel F represents same quantities. The horizontal line in panels C and D represent the arithmetic average of fall survey weight per tow (6.23 kg/tow).

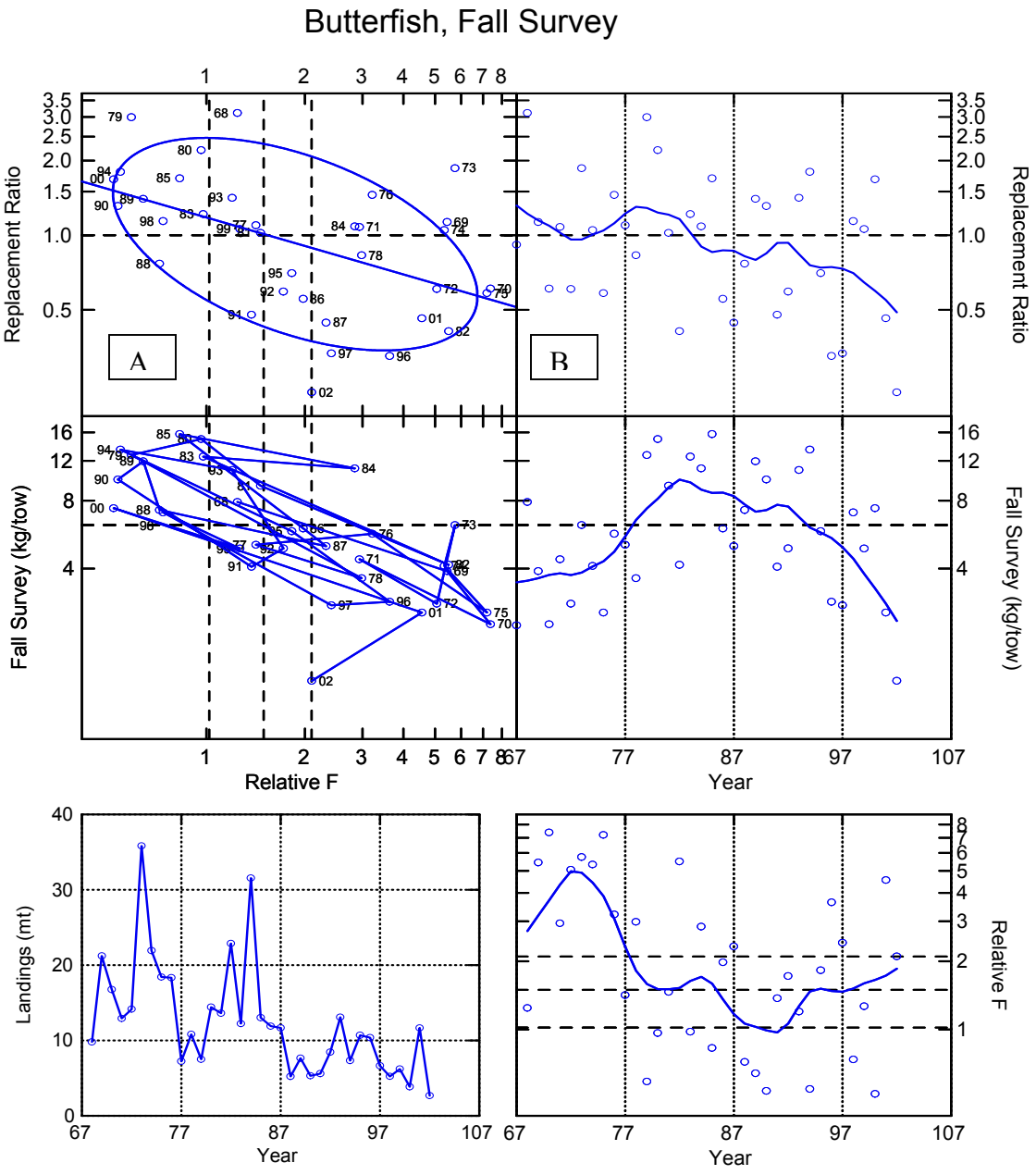


Figure B31. Six panel plot depicting trends in relative biomass, landings, relative fishing mortality rate (landings/abundance index) and replacement ratios for butterfish using NMFS fall bottom trawl survey. Lowess smooth lines are based on a tension factor of 0.3. Vertical dashed lines in panel A and C represent the point and 80% CI of relative F at replacement. Horizontal dashed lines in panel F represents same quantities. The horizontal line in panels C and D represent the arithmetic average of fall survey weight per tow (6.23 kg/tow).

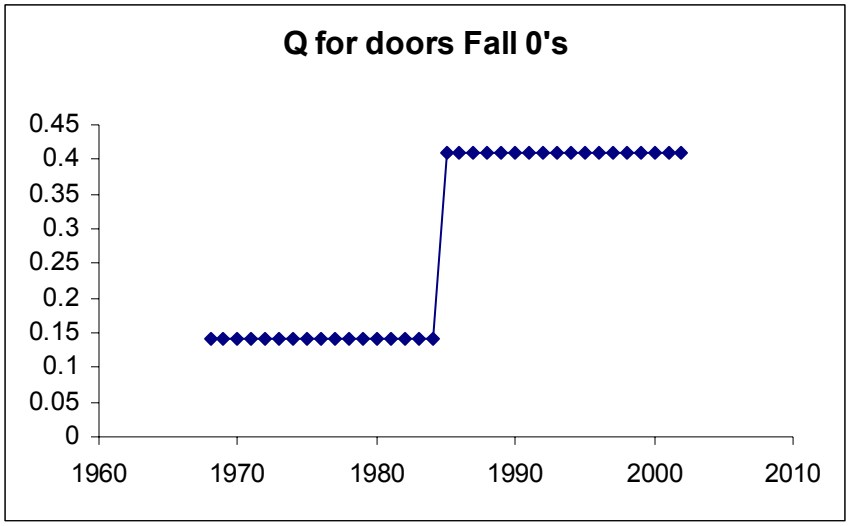


Figure B32. Q for the door adjustment that was estimated from a covariate that was added for the door conversion in 1985 for the fall age 0 index.

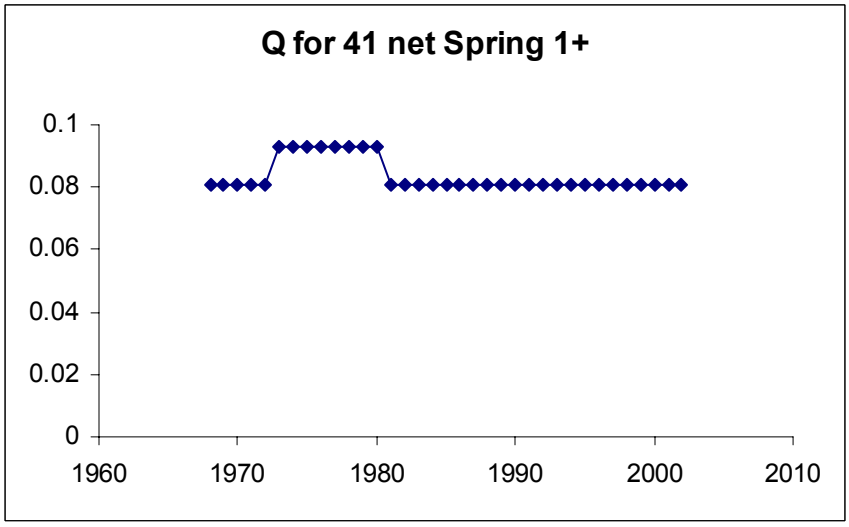


Figure B33. Q for the net adjustment that was estimated from a covariate that was added for the change in net that occurred during 1977-1981 for the spring age 1+ index.

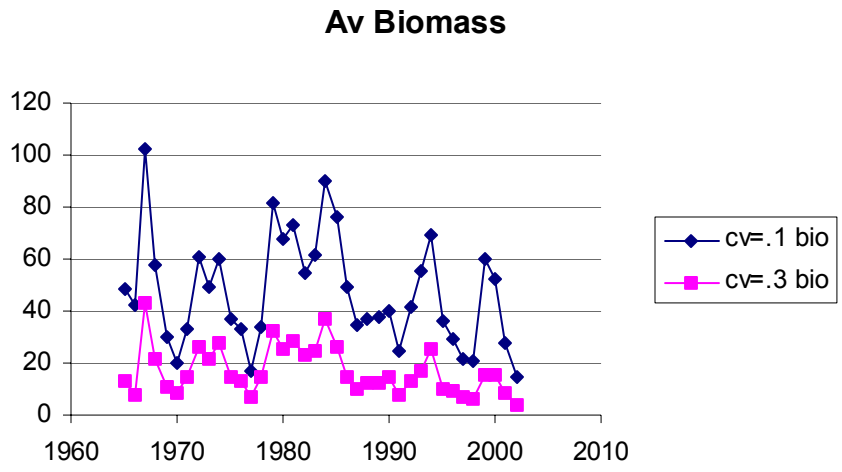


Figure B34. Average biomass for catch CV's of 0.1 and 0.3 during 1965-2002.

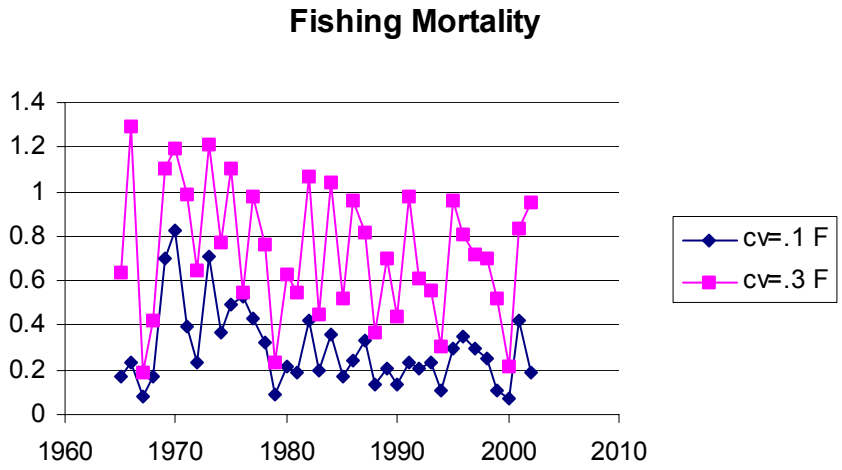


Figure B35. Fishing Mortality for catch CV's of 0.1 and 0.3 during 1965-2002.

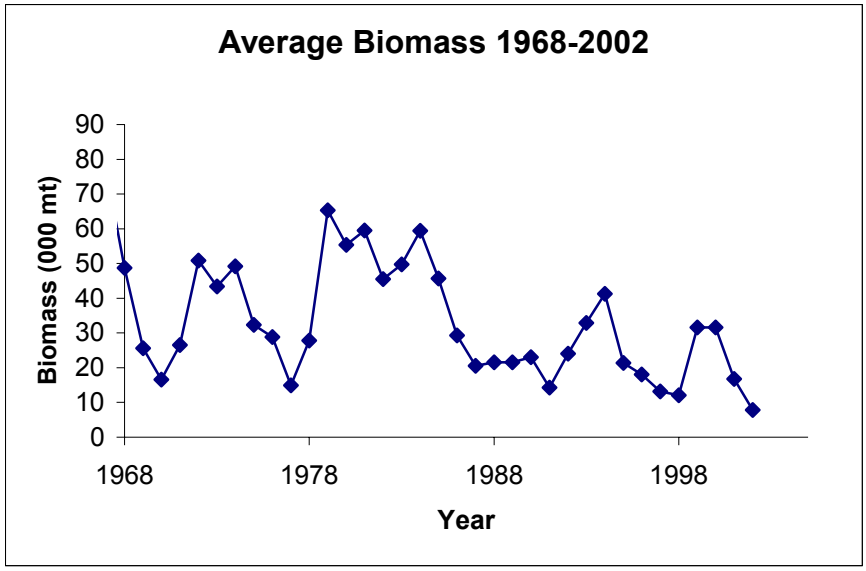


Figure B36. Average biomass of butterfish during 1968-2002.

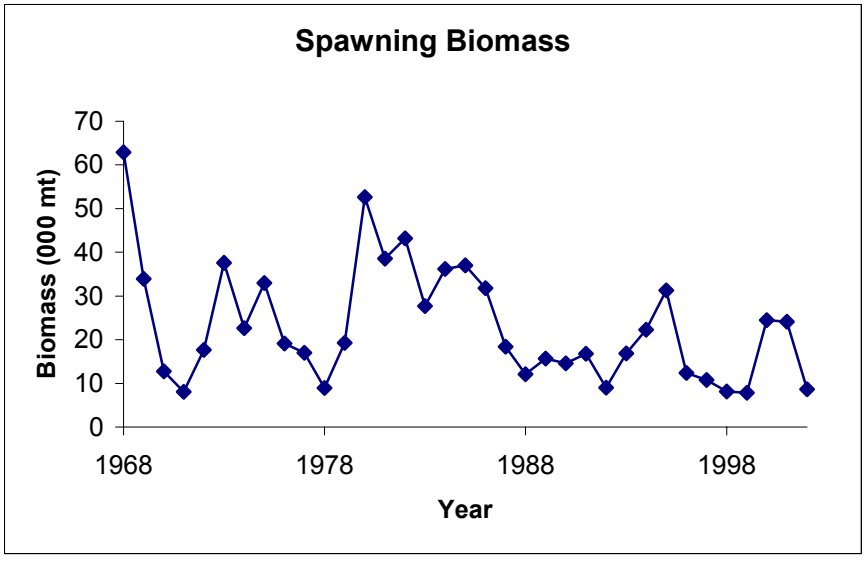


Figure B37. Spawning biomass of butterfish during 1968-2002

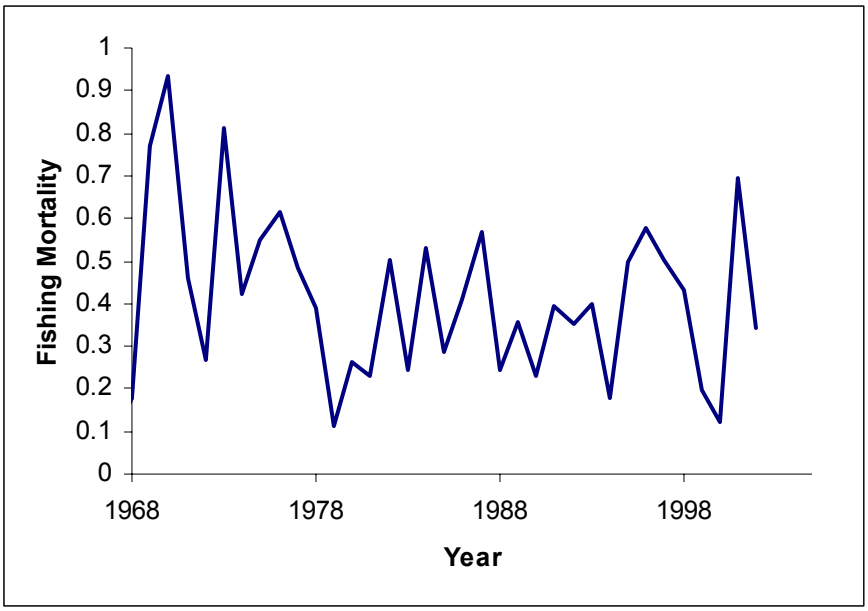


Figure B38. Fishing mortality rates on the butterfish stock during 1968-2002.

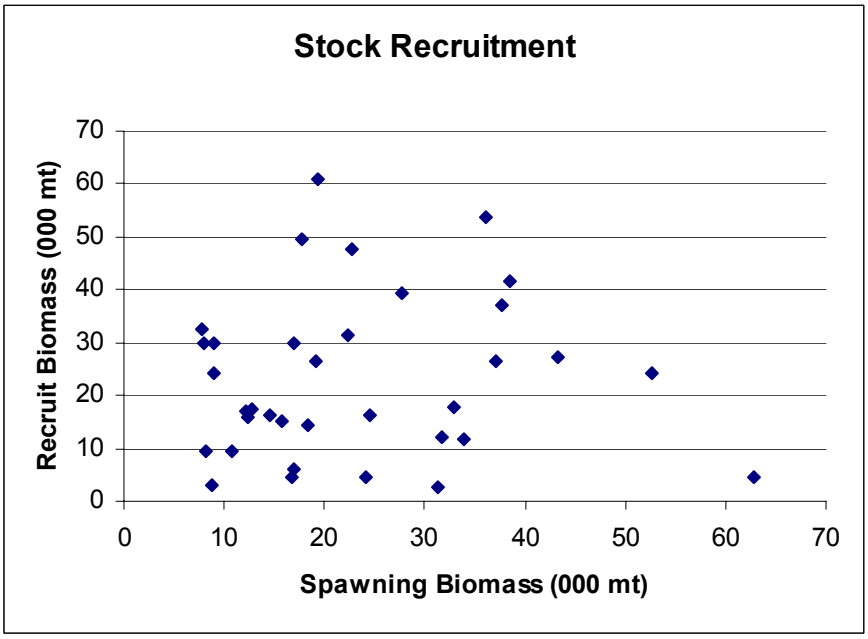


Figure B39. Spawning stock biomass and recruitment biomass (000's t) during 1968-2002.

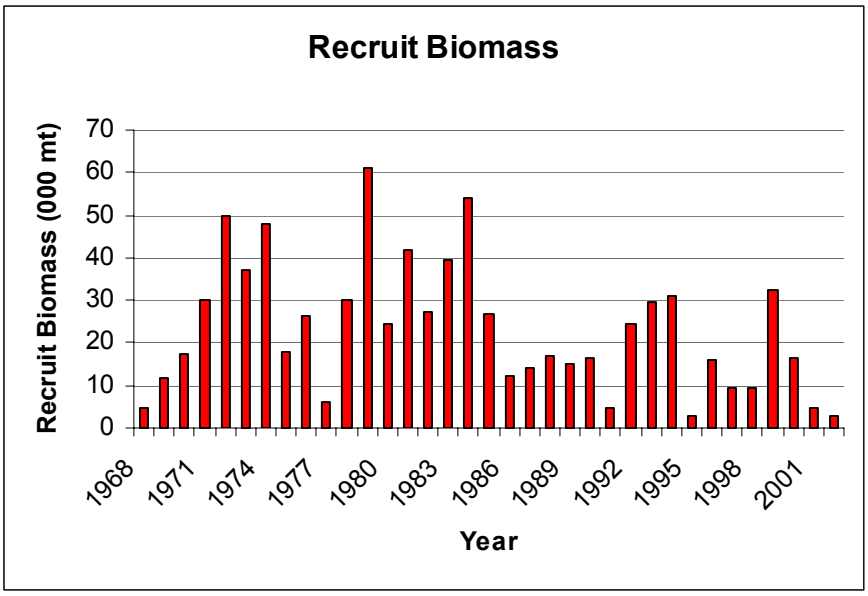


Figure B40. Recruit biomass of butterfish during 1968-2002.

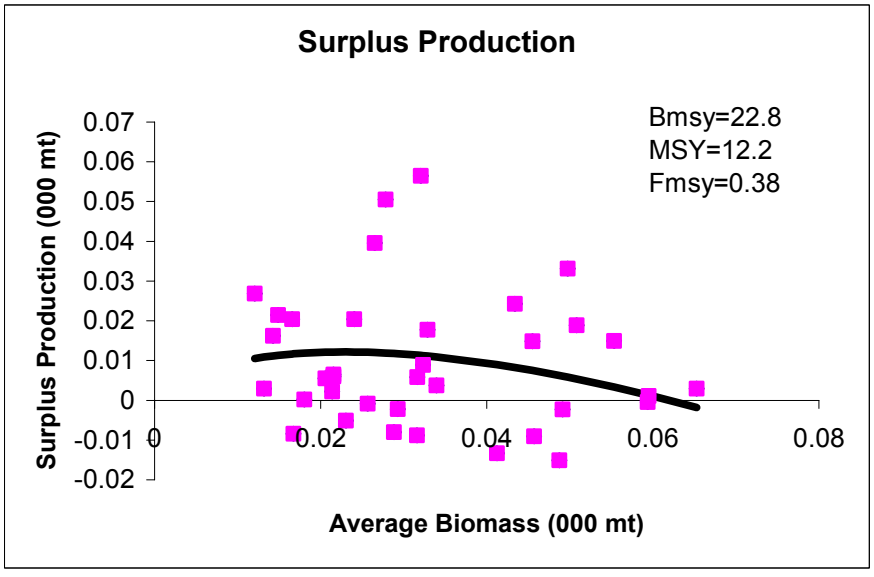


Figure B41. Average biomass and surplus production for butterfish during 1968-2002.

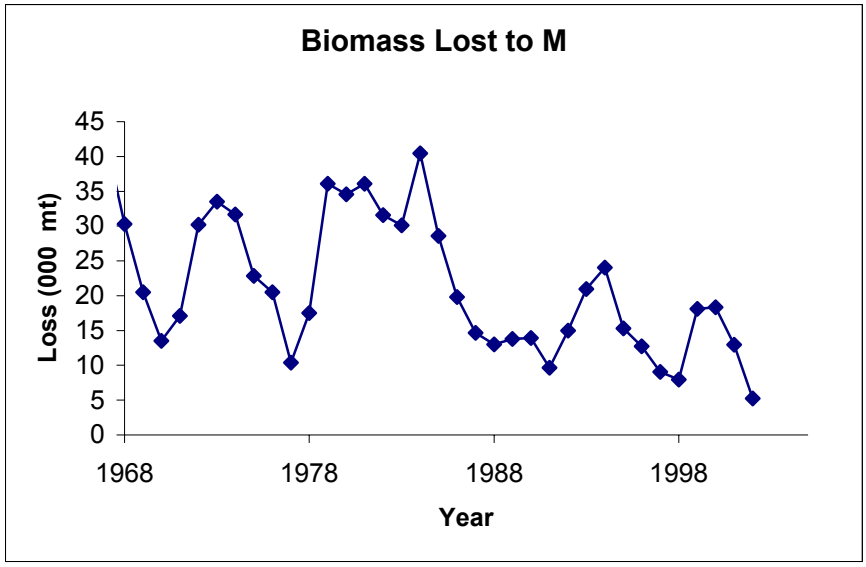


Figure B42. Biomass lost to natural mortality, all sources, during 1968-2002.

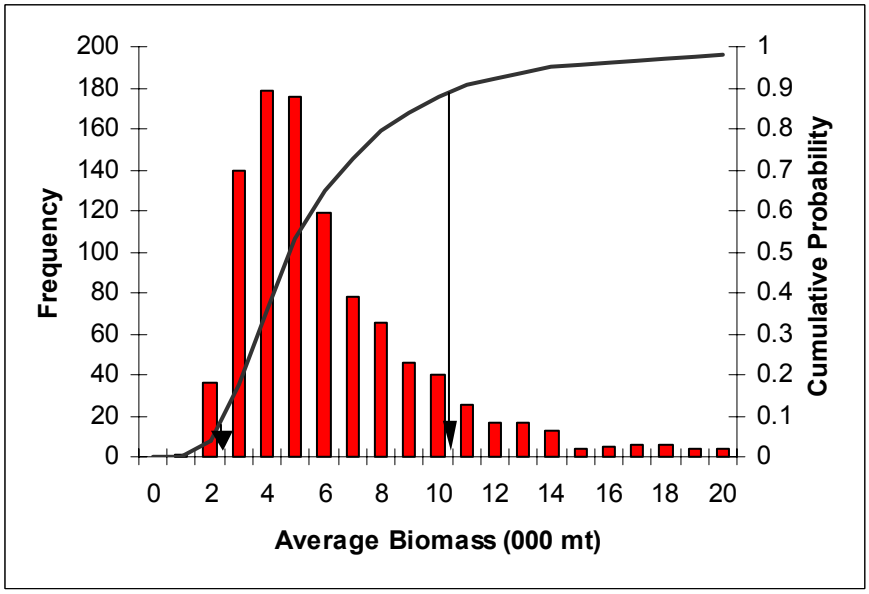


Figure B43. Estimates of precision and 80% CI of average biomass in 2002.

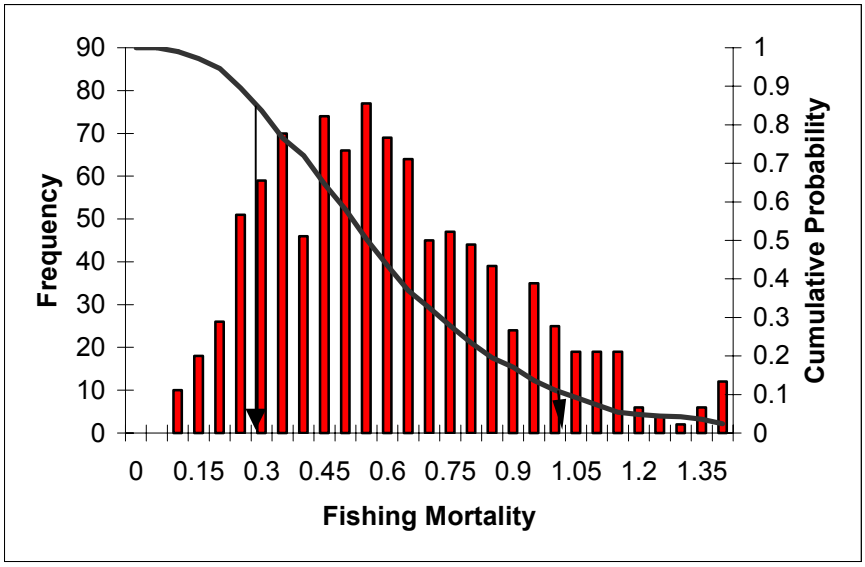


Figure B44. Estimates of precision and 80 % CI of Fishing Mortality I.

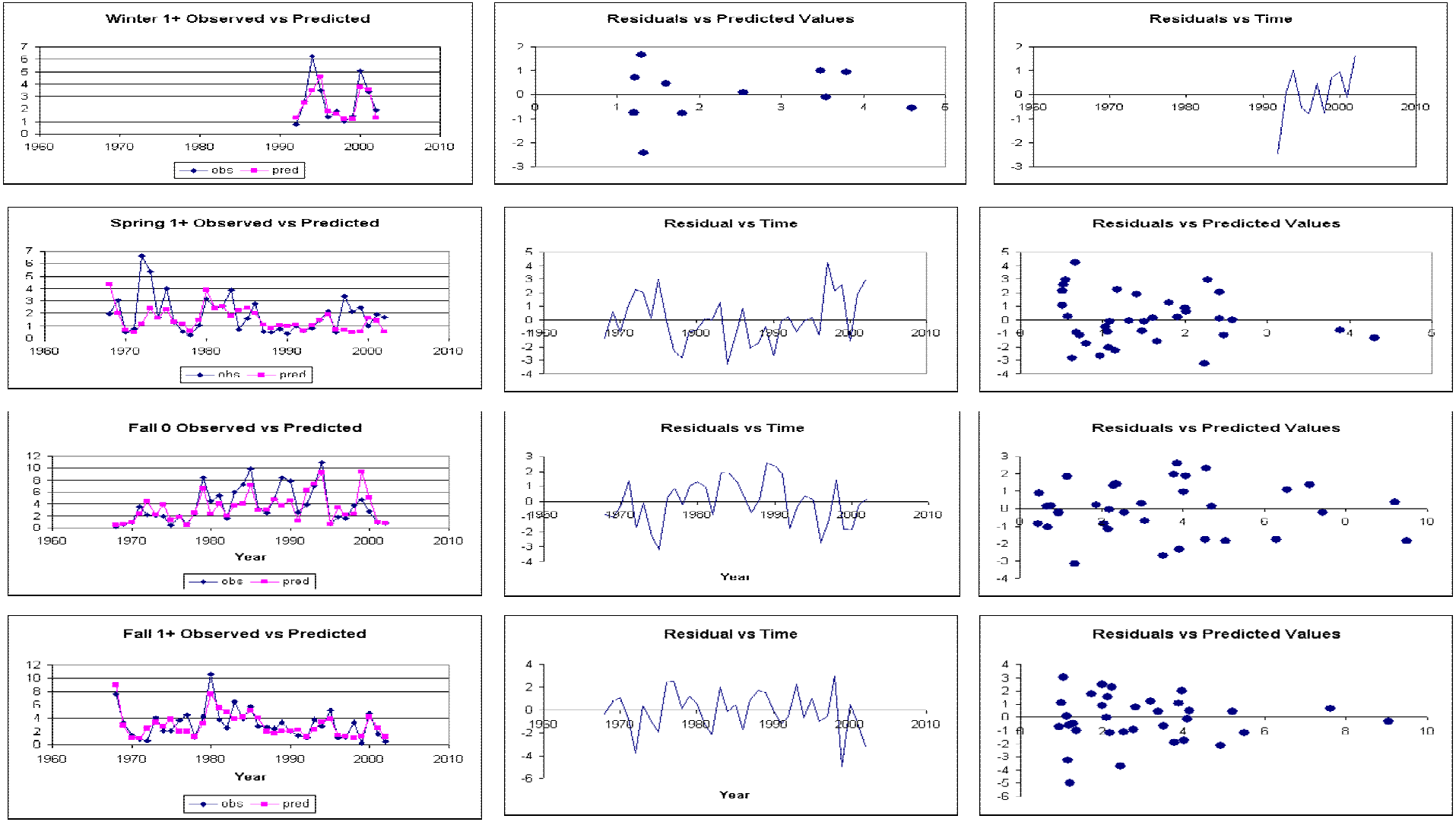


Figure B45. Plots of observed vs. predicted, residual vs. time, and residuals vs. predicted for winter 1+, spring 1+, and fall 0 and 1+ during 1968-2002.