

Figure 1. The Division 4TVW haddock management unit, including the location of the closed area.

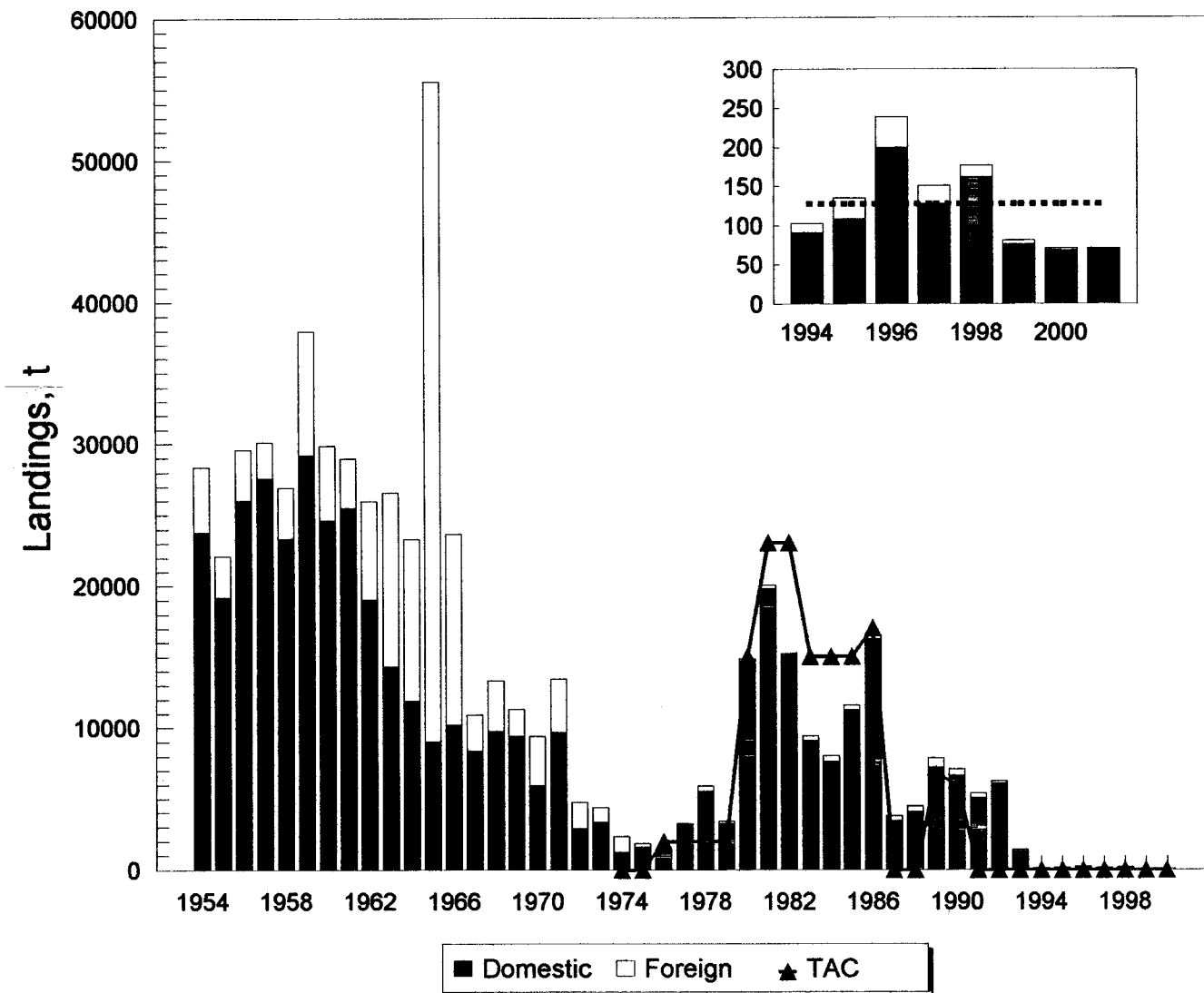


Figure 2. Domestic and foreign landings of haddock, from 1954 to present, in Div. 4TVW. Insert shows landings since 1994. Note: 2001 landings are incomplete.

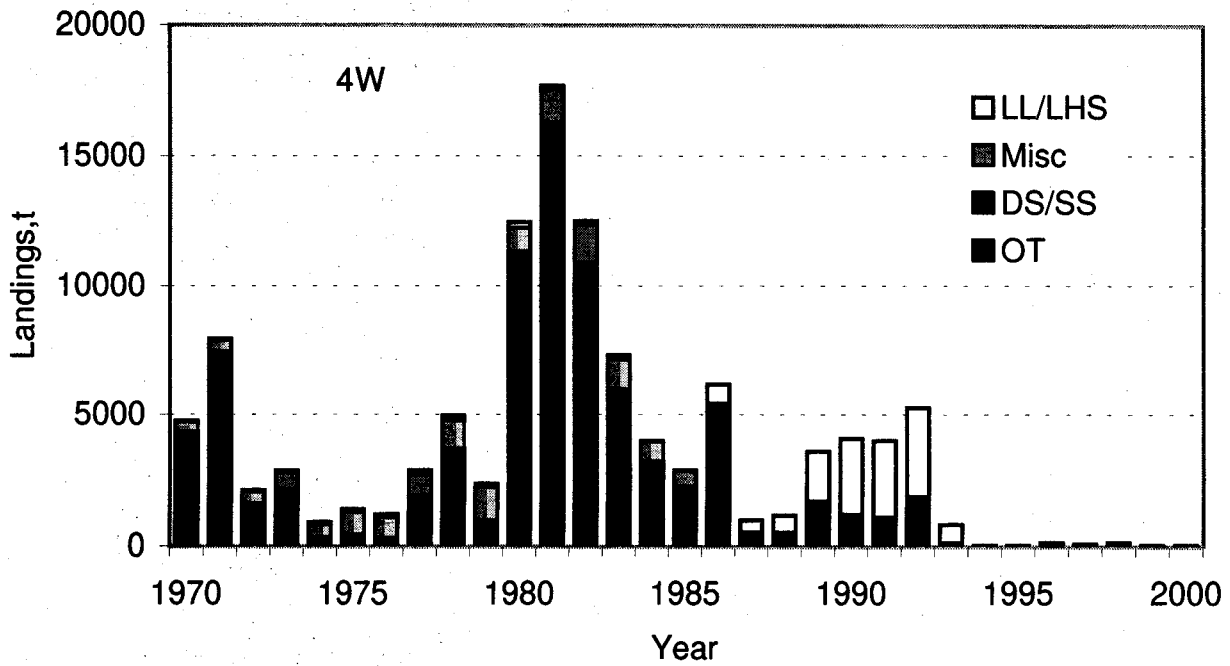
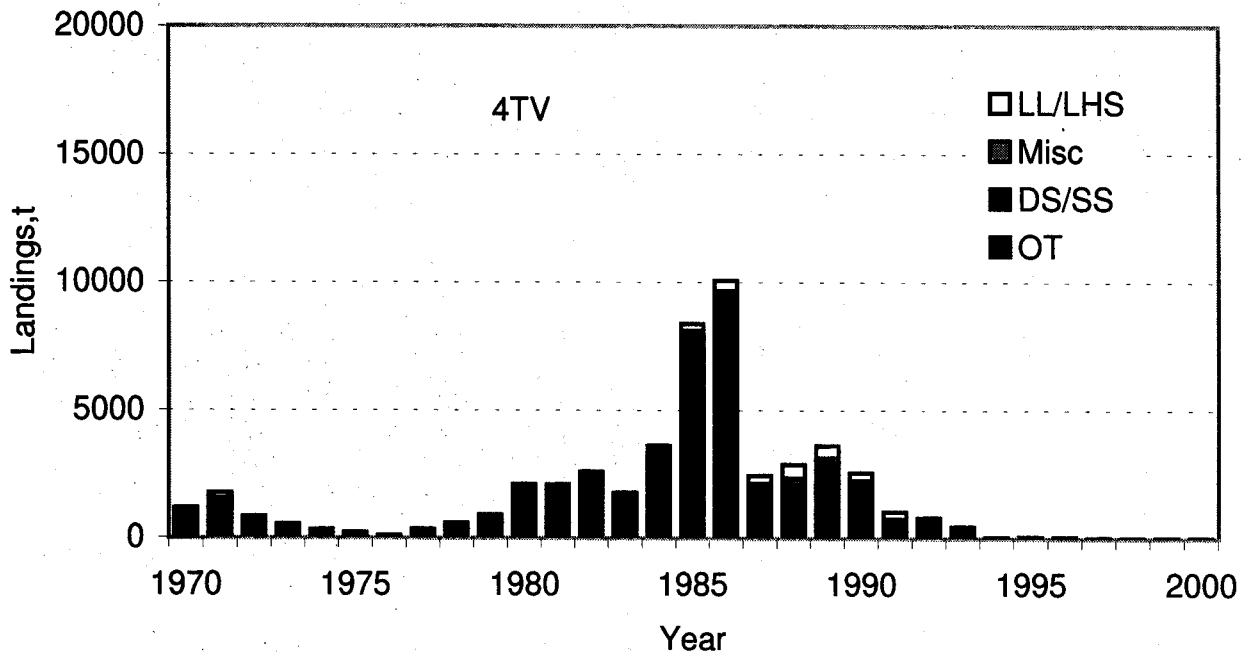
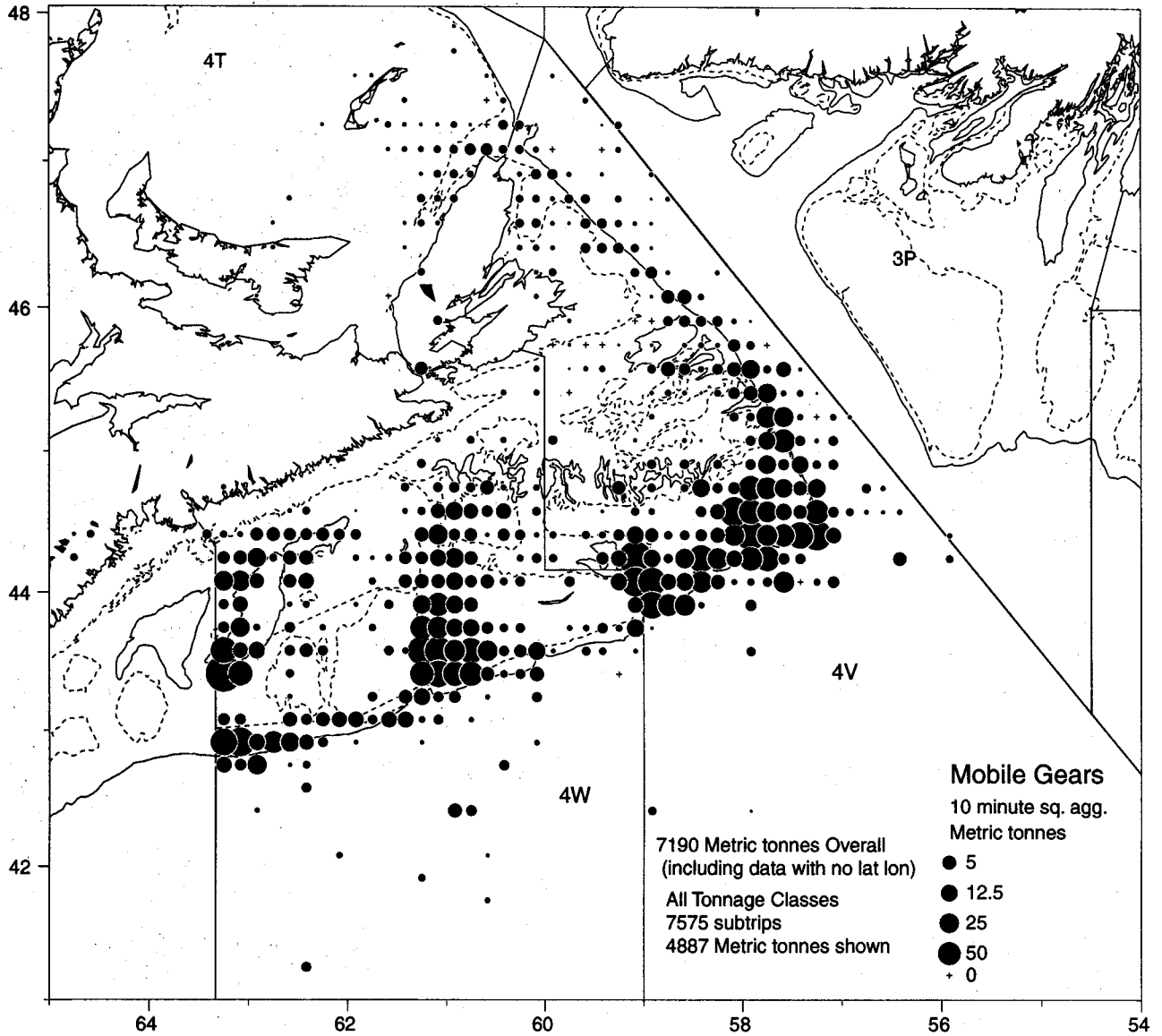


Figure 3. Canadian landings,t by gear in Div. 4TV and 4W.

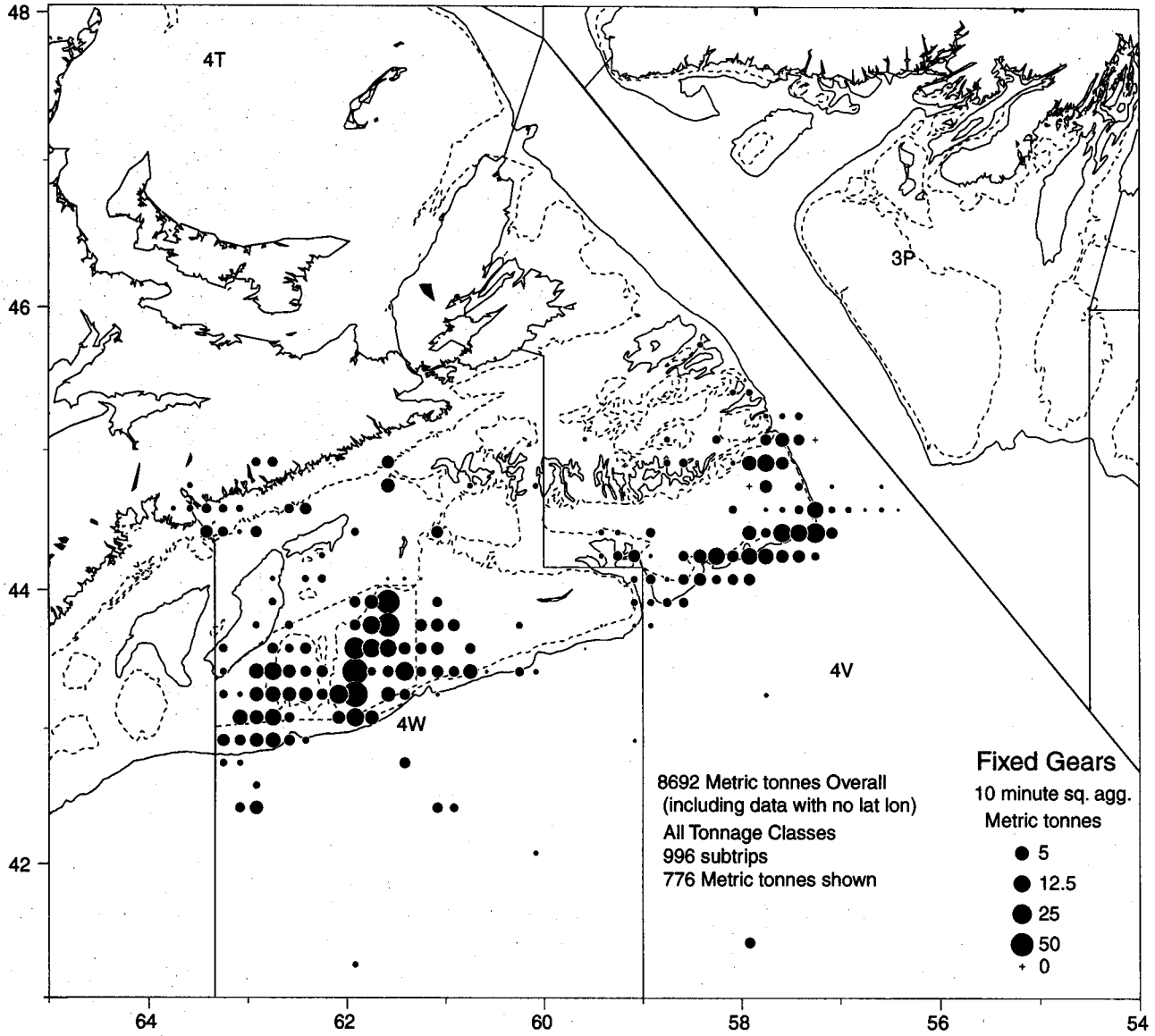
4T 4VN 4VS 4W Haddock, Landed JAN-DEC 1990-1993  
 Live\_Wt (All Regions) from ZIF Data



Note: 19 trips with 11,598 kg shown have incorrect position data

Figure 4. Reported landings, t of haddock in Div. 4TVW from 1990-93 by mobile gears.

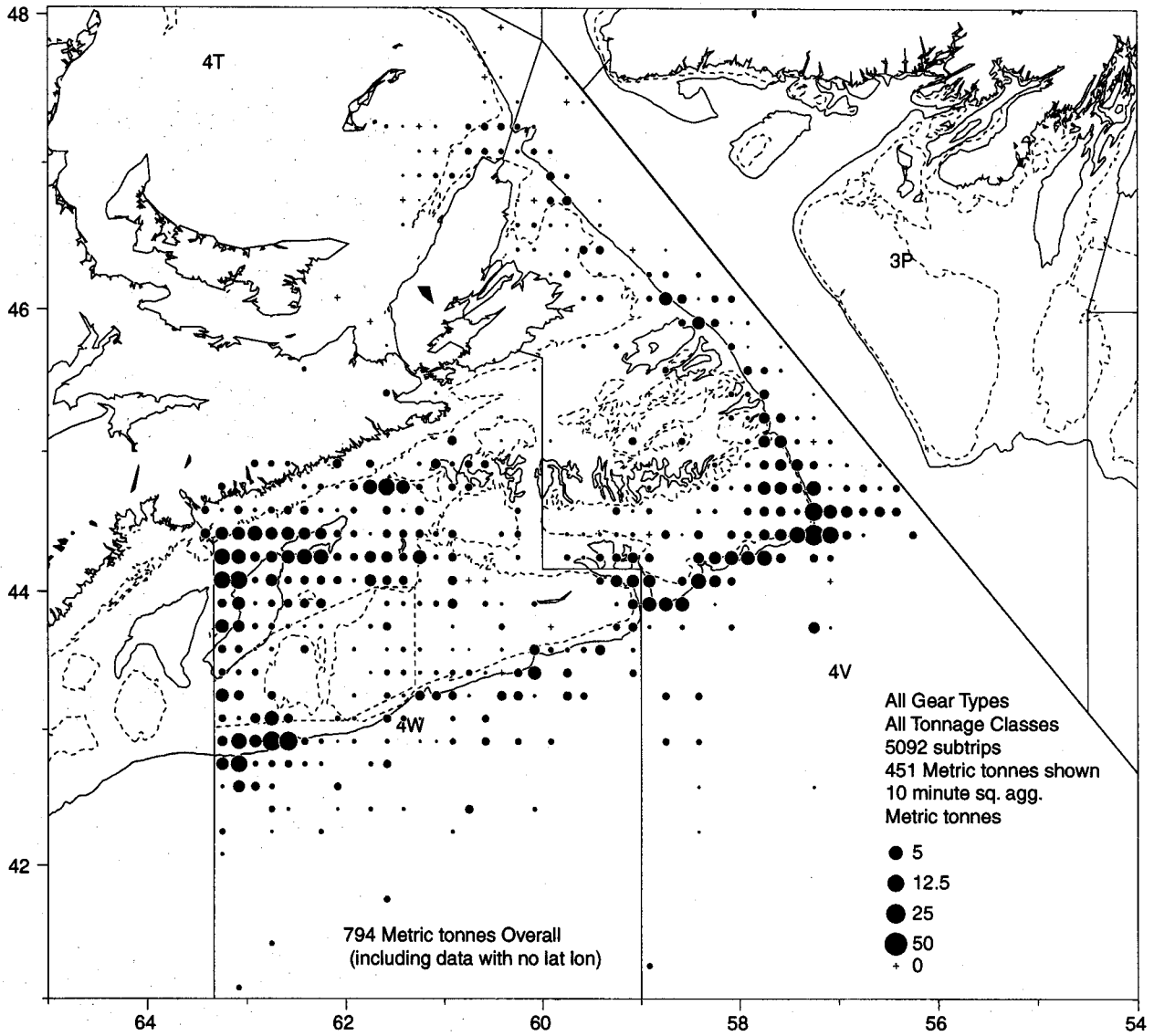
4T 4VN 4VS 4W Haddock, Landed JAN-DEC 1990-1993  
 Live\_Wt (All Regions) from ZIF Data



Note: 18 trips with 13,101 kg. shown have incorrect position data

Figure 5. Reported landings, t of haddock in Div. 4TVW from 1990-93 by fixed gears.

4TVW Haddock, Landed JAN-DEC 1994-2000  
 Live\_Wt (All Regions) from ZIF Data



Note 40 trips with 4,427 kg. have incorrect position data

Figure 6. Reported landings, t of haddock in Div 4TVW from 1994-2000 by all gears.

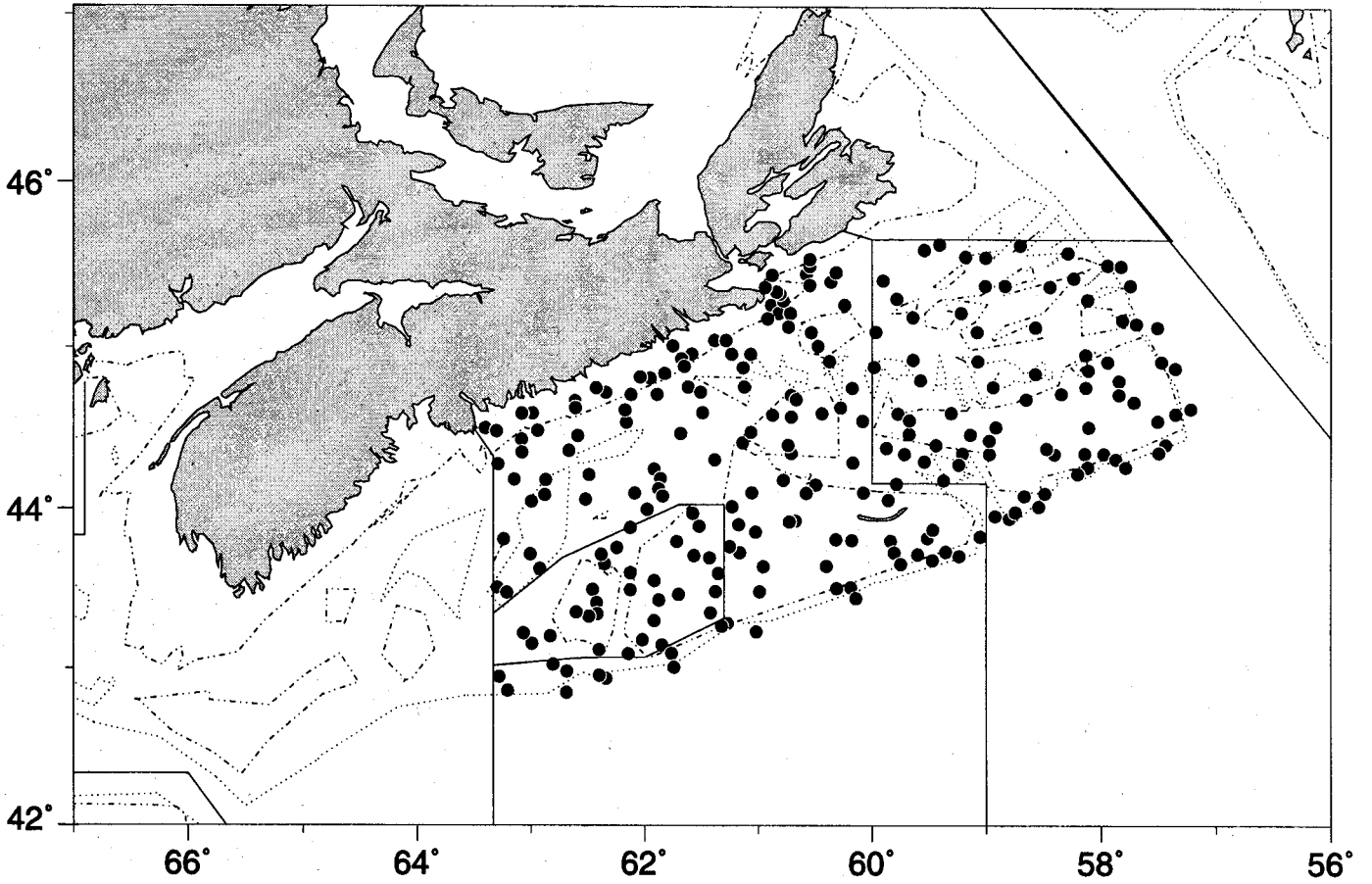


Figure 7. Set locations in the year 2000 for the fixed gear Sentinel Survey in Div. 4VsW.

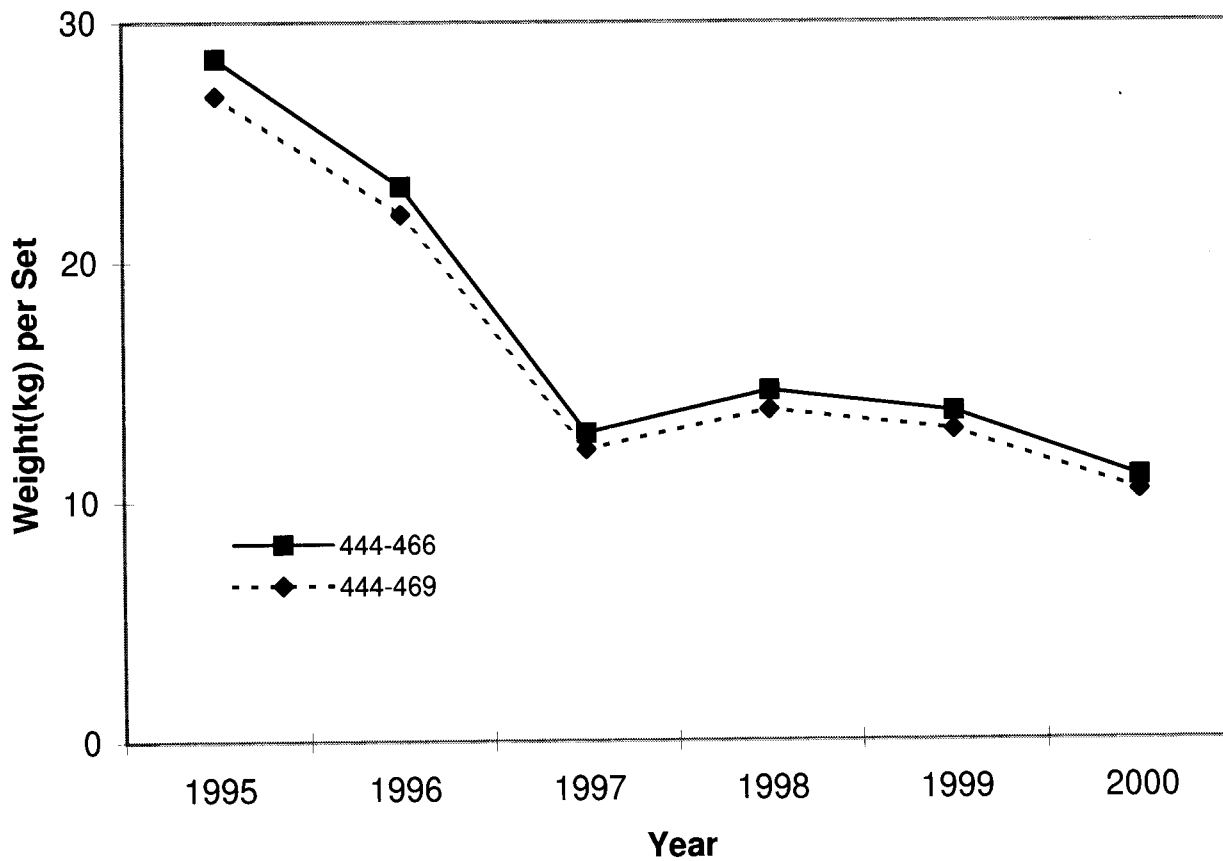


Figure 8. Stratified mean catch rate of haddock (kg per 1500 hooks) for the Div. 4VsW Sentinel Survey. Strata 444-466 corresponds to Div. 4VsW, while strata 444-469 includes the three inshore strata.



# Sentinel Survey

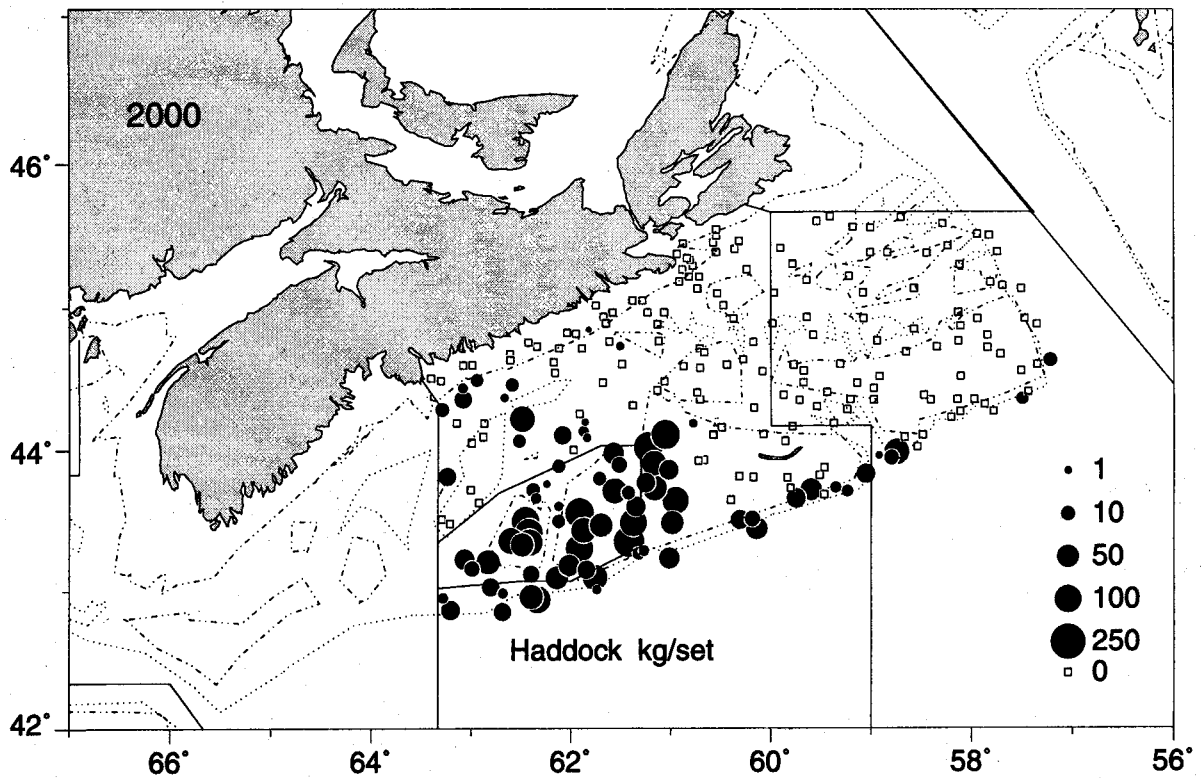
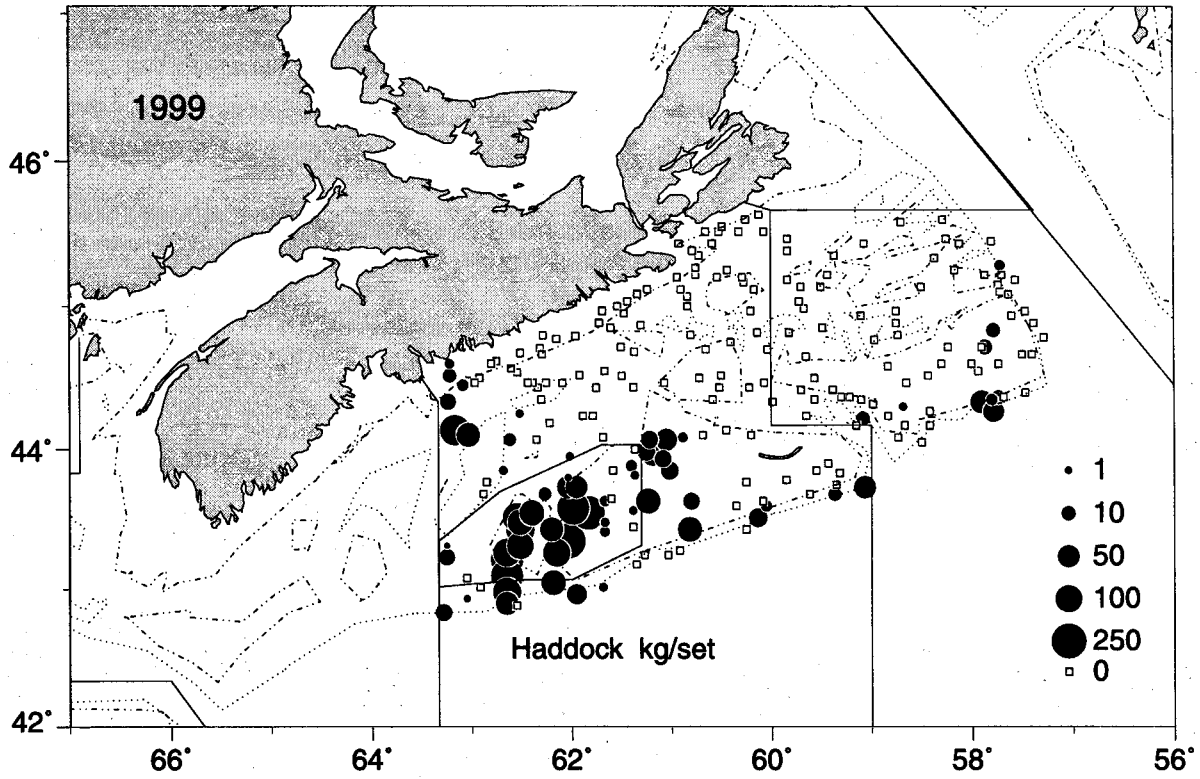


Figure 9. Expanding symbol plots of Sentinel Survey catch rates of haddock in 1999 and 2000. Outline of the closed area is shown.

# Sentinel Survey

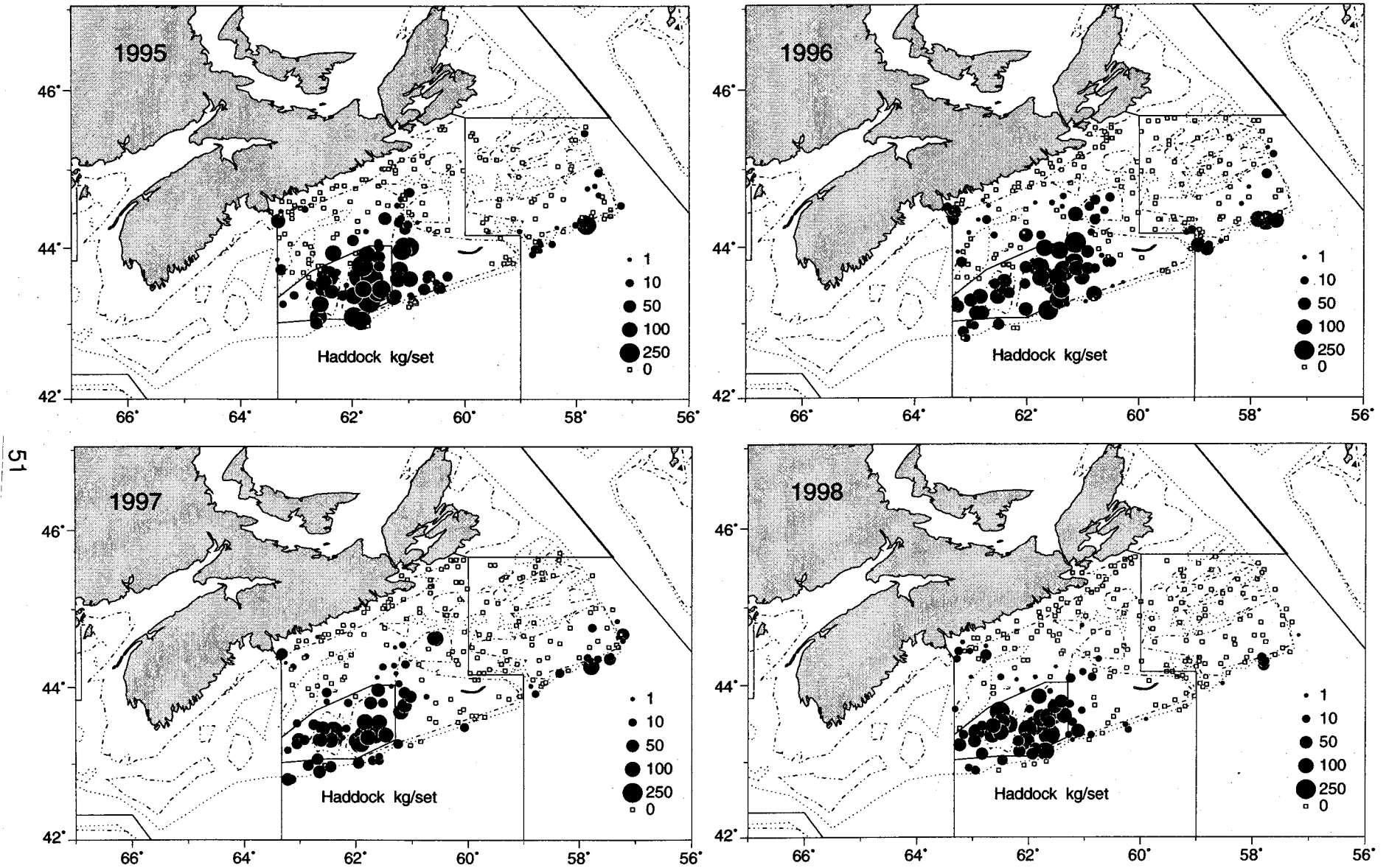


Figure 10. Expanding symbol plots of Sentinel Survey catch rates of haddock from 1995 to 1998. Outline of the closed area is shown in each panel.

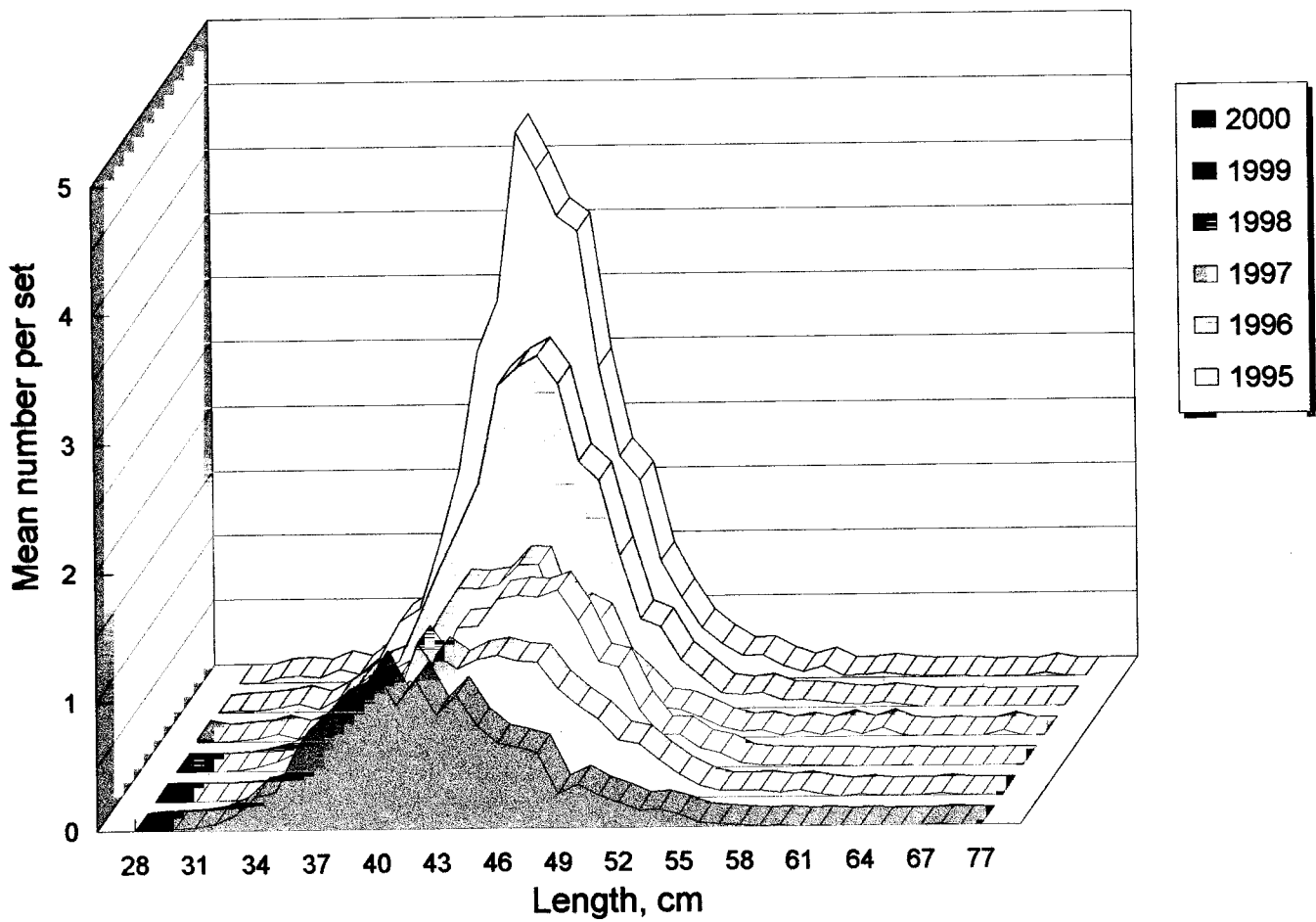


Figure 11. Length composition of Div. 4VsW haddock from the fixed gear Sentinel Survey.

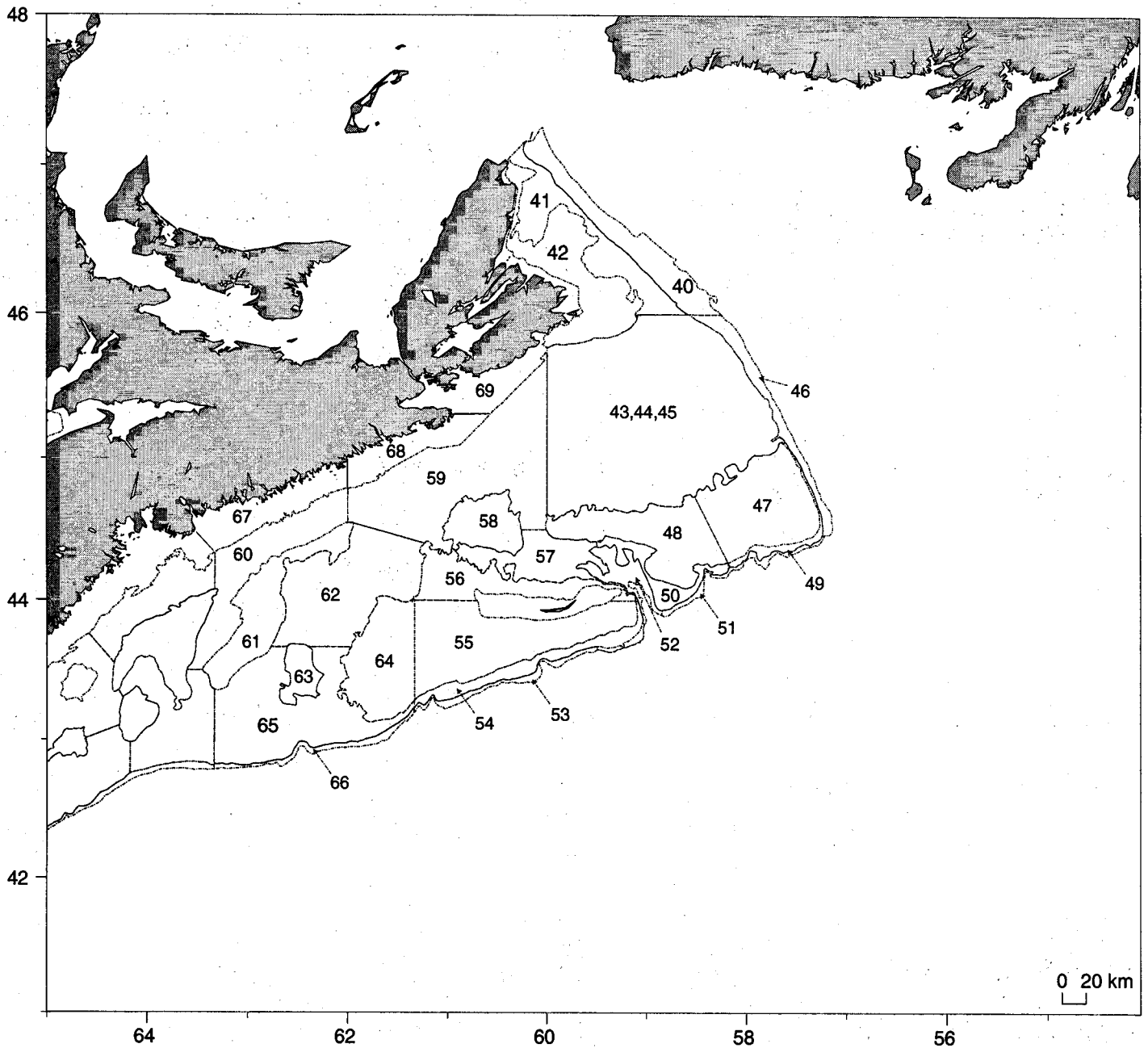


Figure 12. Stratification scheme for the summer RV survey. Note addition of three inshore strata (67-69) used in the fixed gear Sentinel Survey.

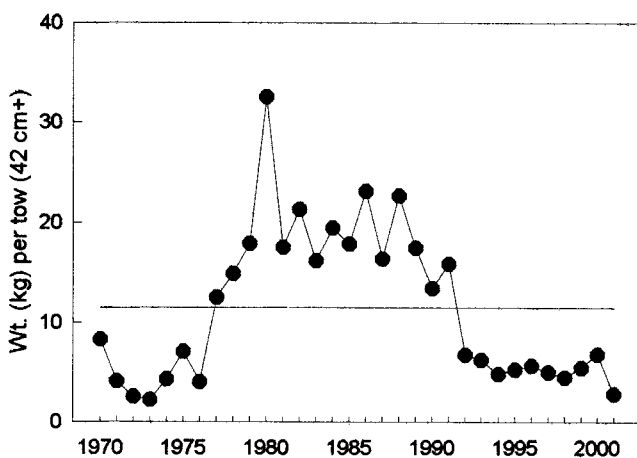
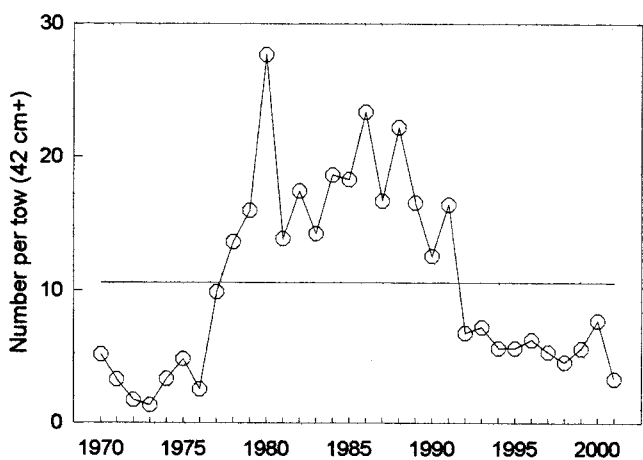
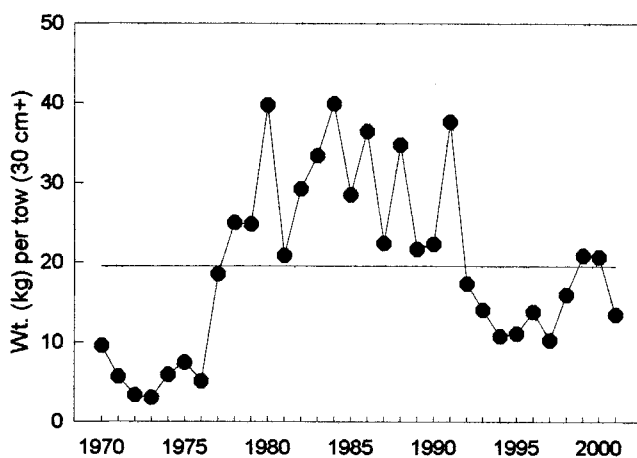
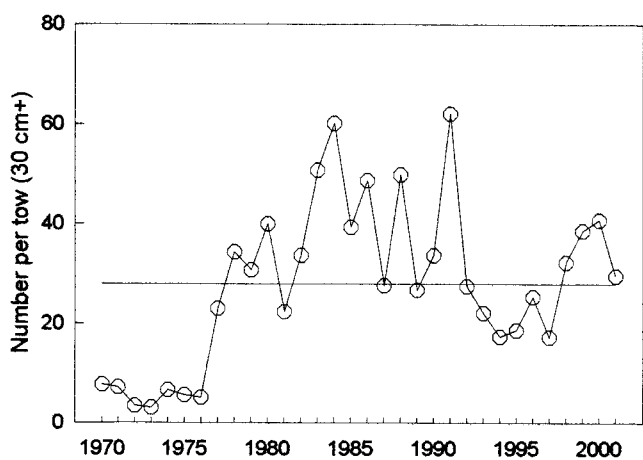
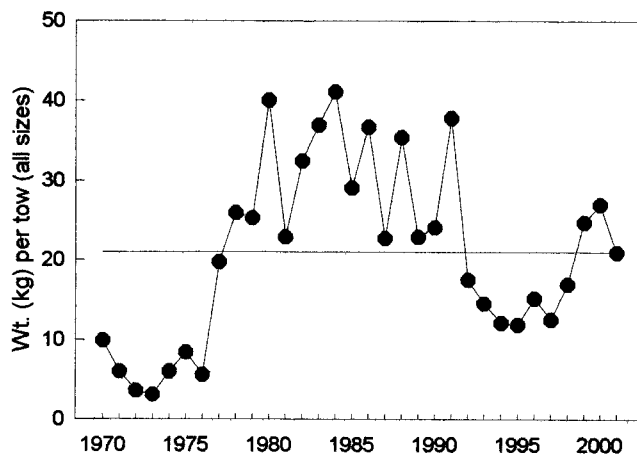
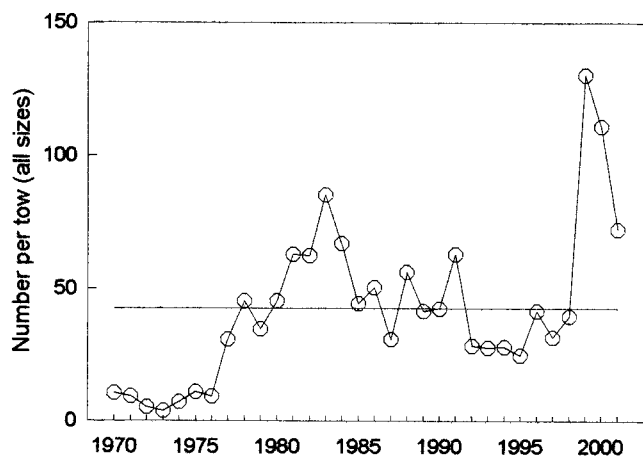


Figure 13. Number and weight (kg) per tow of Div. 4VW haddock from the summer RV survey from 1970-2001.

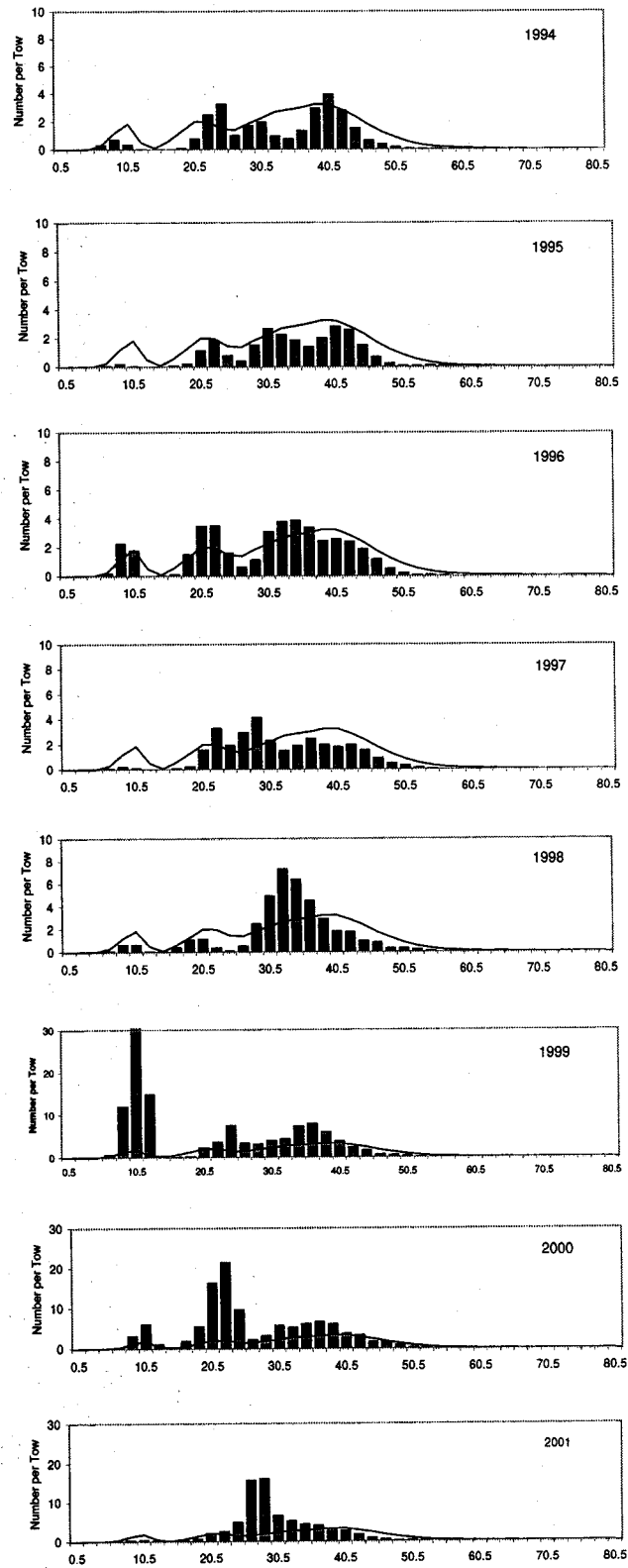


Figure 14. Length composition of haddock for 1994-2001 from the summer RV survey. The long-term average (1970-2001) is shown as a thin line on each panel.  
 Note: for 1999 the height of the bar at 10.5 cm extends to 44 fish per set.

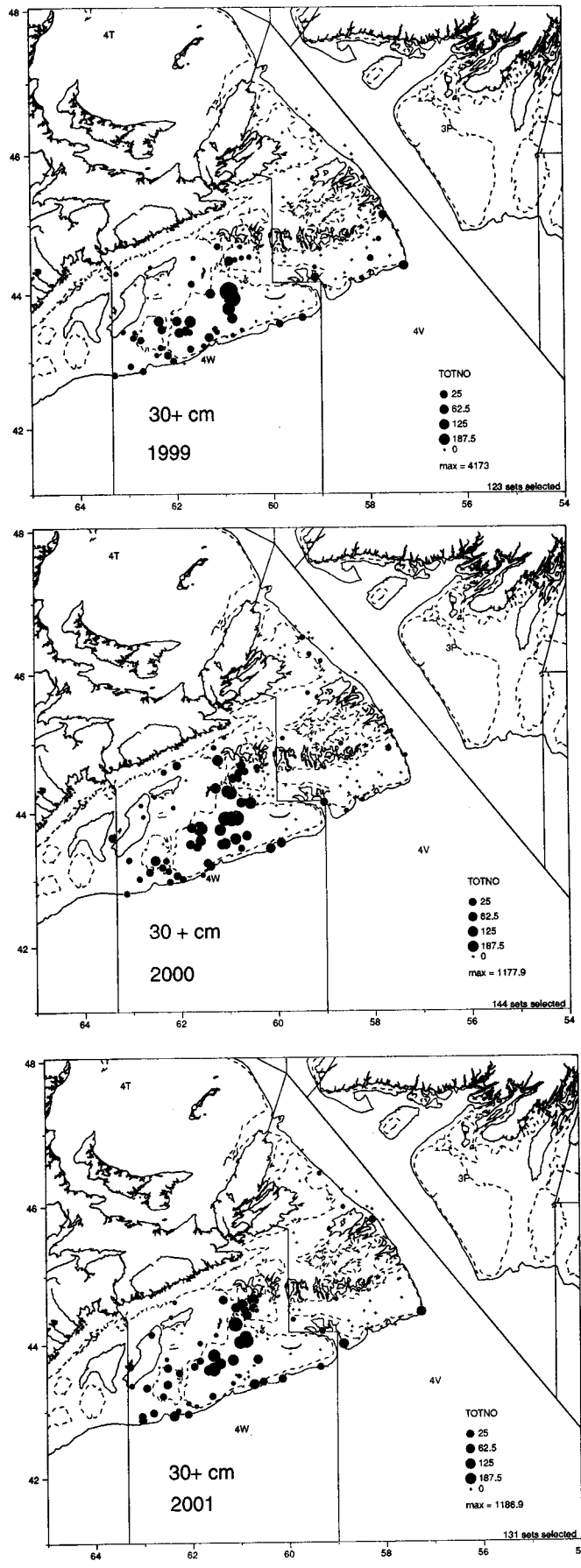


Figure 15. Expanding symbol plots of the 1999 to 2001 summer RV survey catch rates of 30+ cm haddock in Div. 4VW.

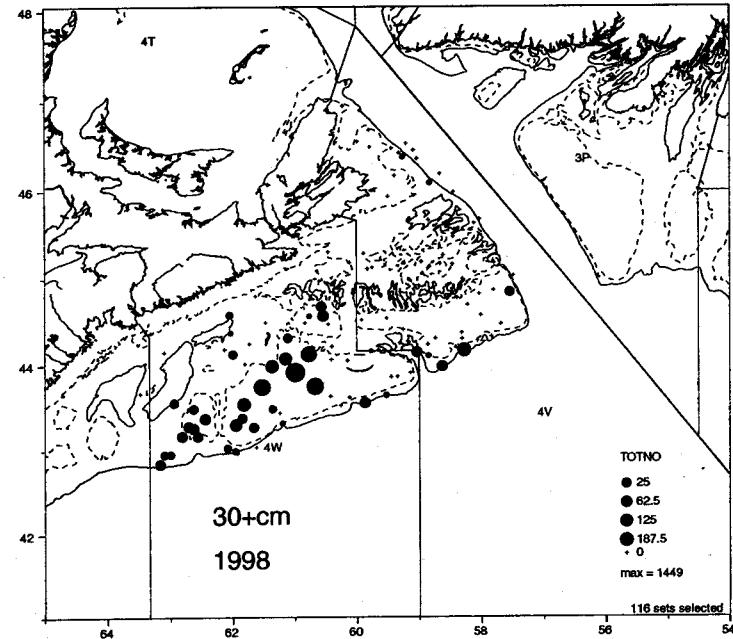
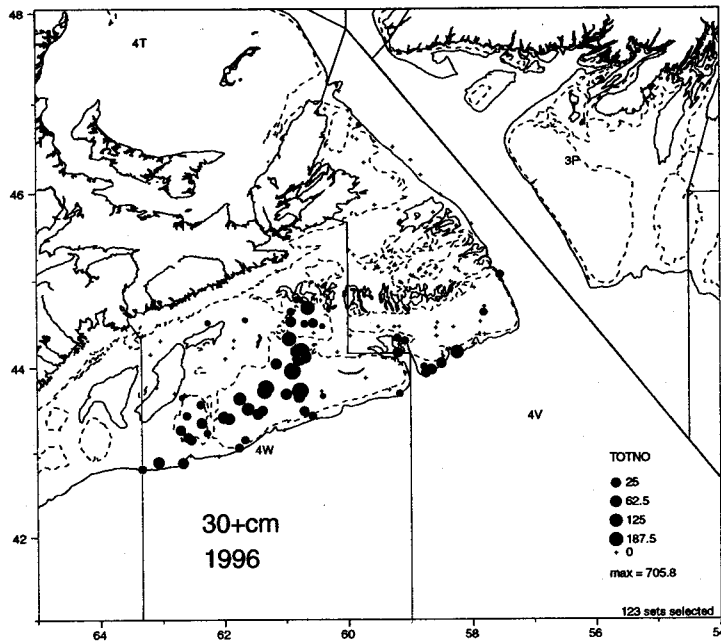
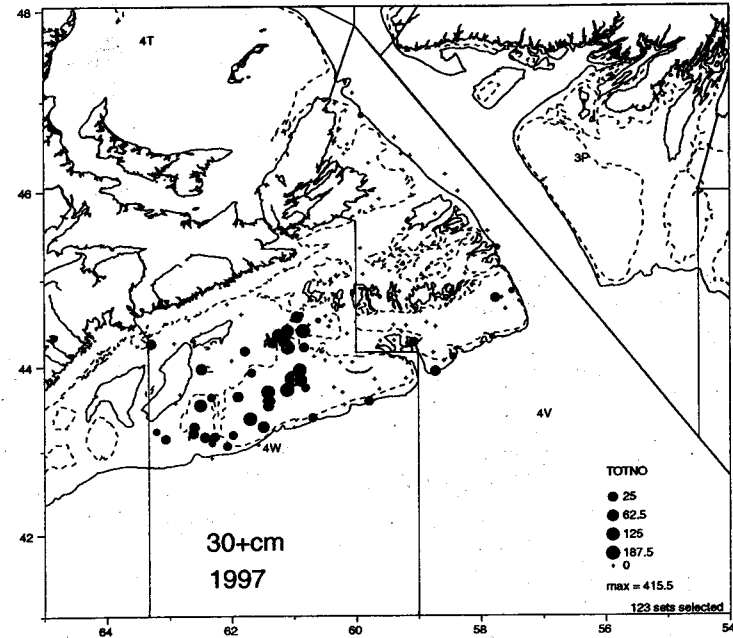
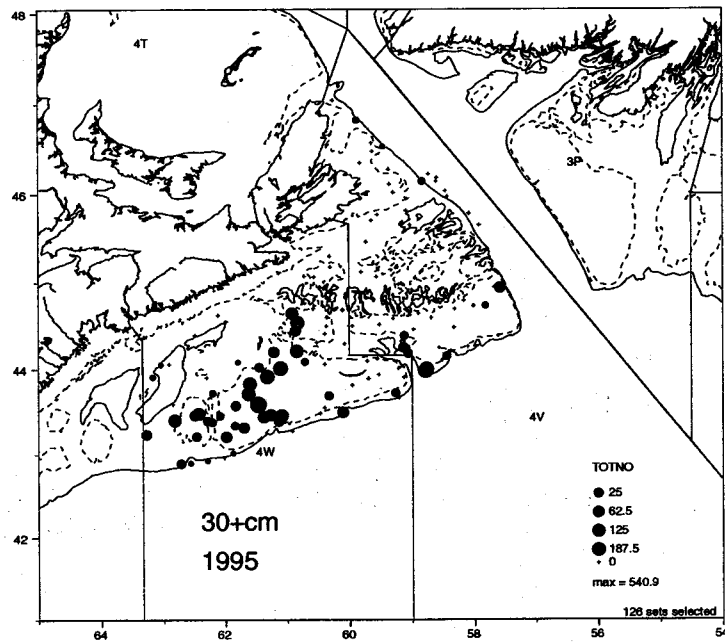


Figure 16. Expanding symbol plots of the 1995 to 1998 summer RV survey catch rates of 30+cm haddock in Div. 4VW.



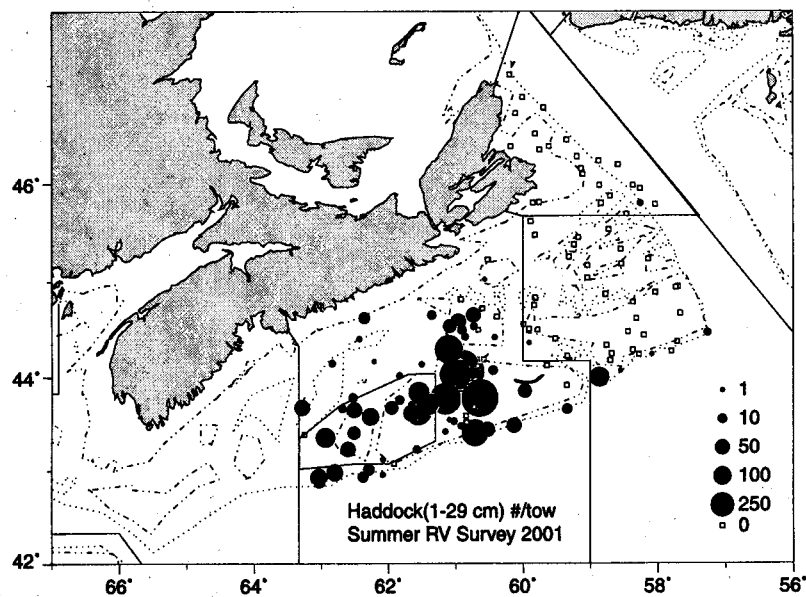
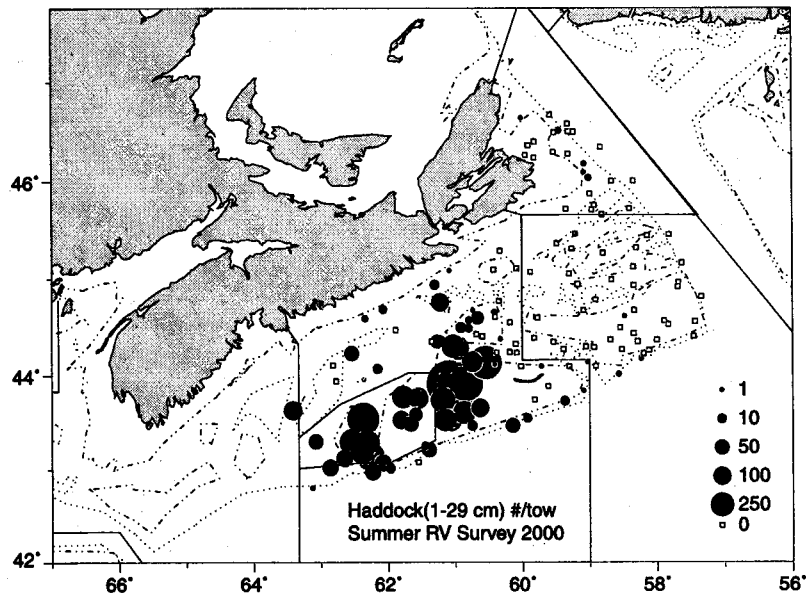
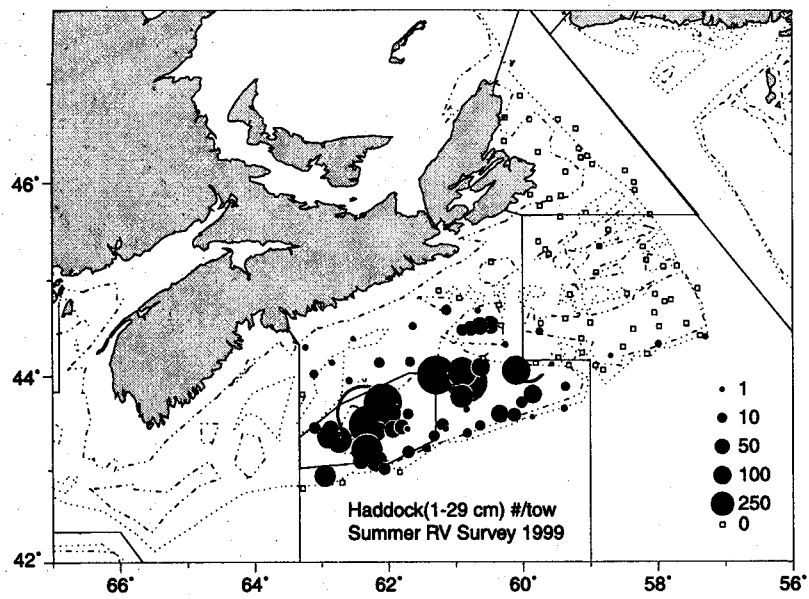


Figure 17. Expanding symbol plots of the 1999 to 2001 summer RV survey catch rates of 1-29 cm haddock in Div. 4VW.

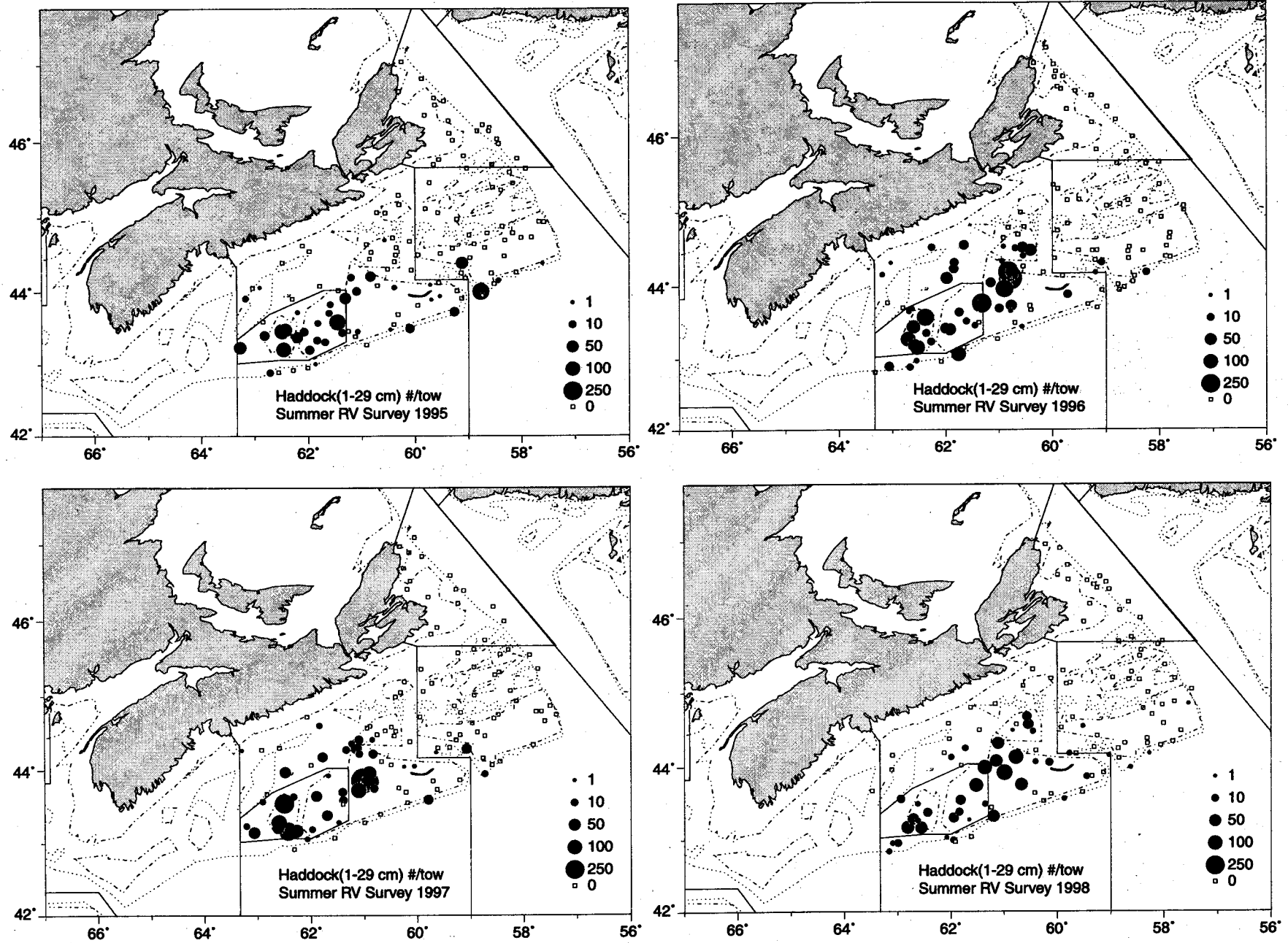


Figure 18. Expanding symbol plots of the 1995 to 1998 summer RV catch rate of 1-29 cm haddock in Div. 4VW.

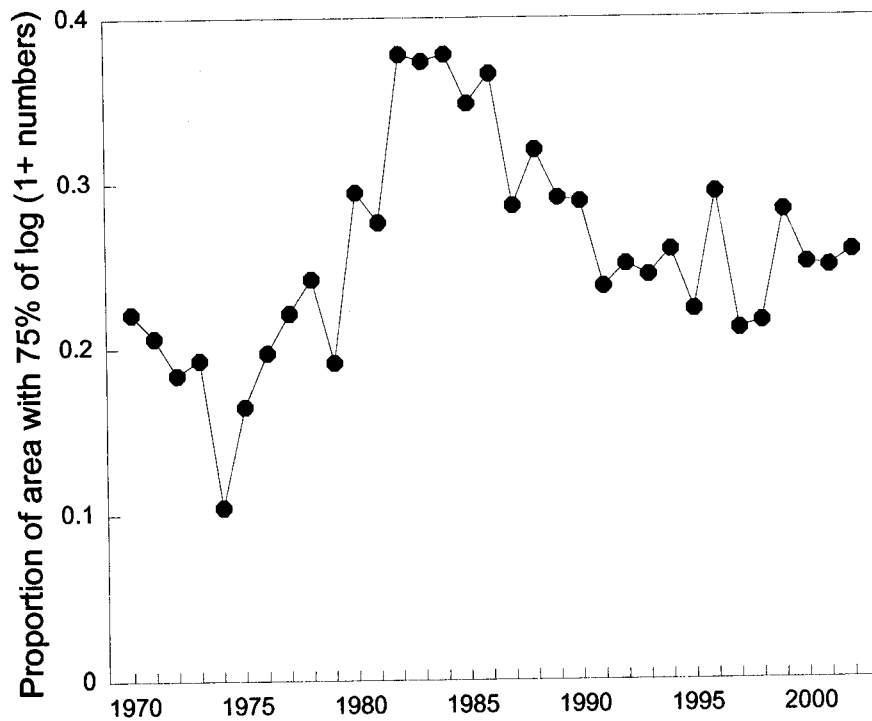
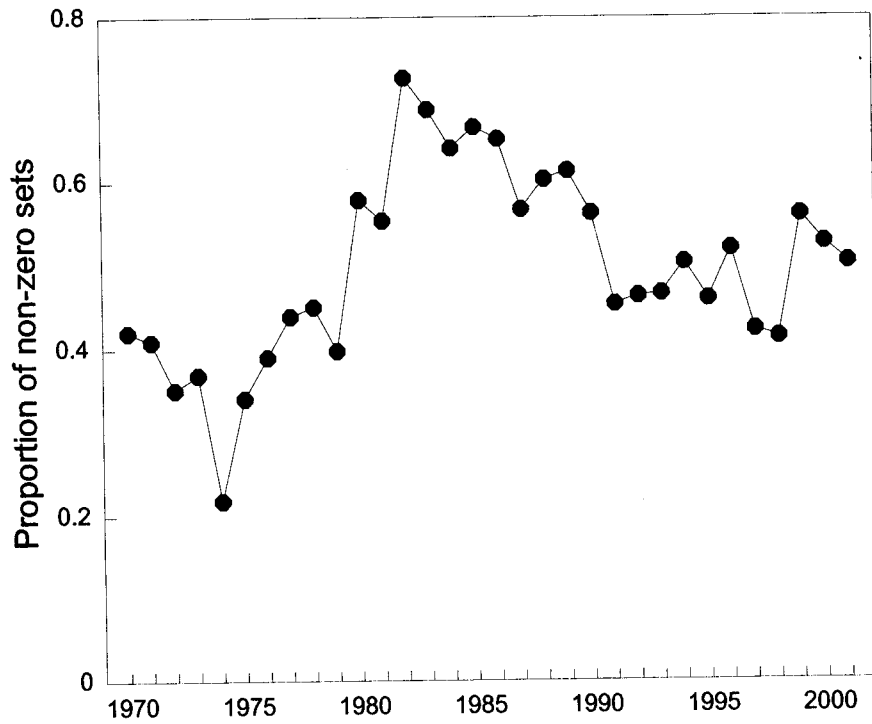


Figure 19. Indices of geographic range (top panel) and resource concentration (bottom panel) for Div. 4VW haddock from the summer RV survey (strata 440-466).

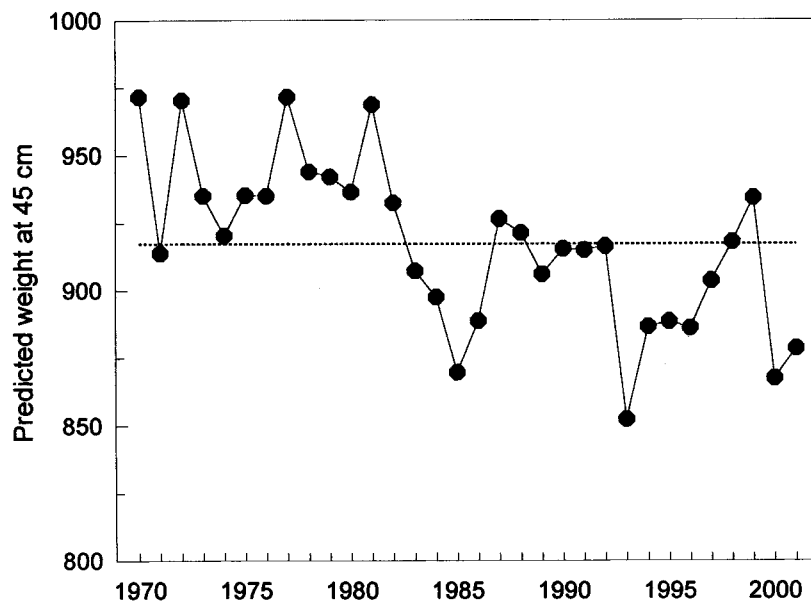
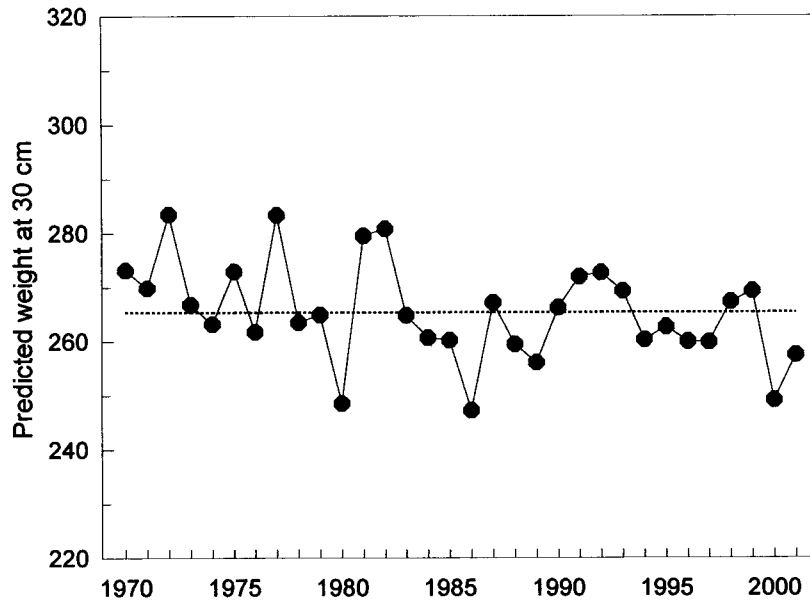


Figure 20. Predicted weight (g) of 30 and 45 cm haddock from the summer RV survey from 1970-2001 for Div. 4VW

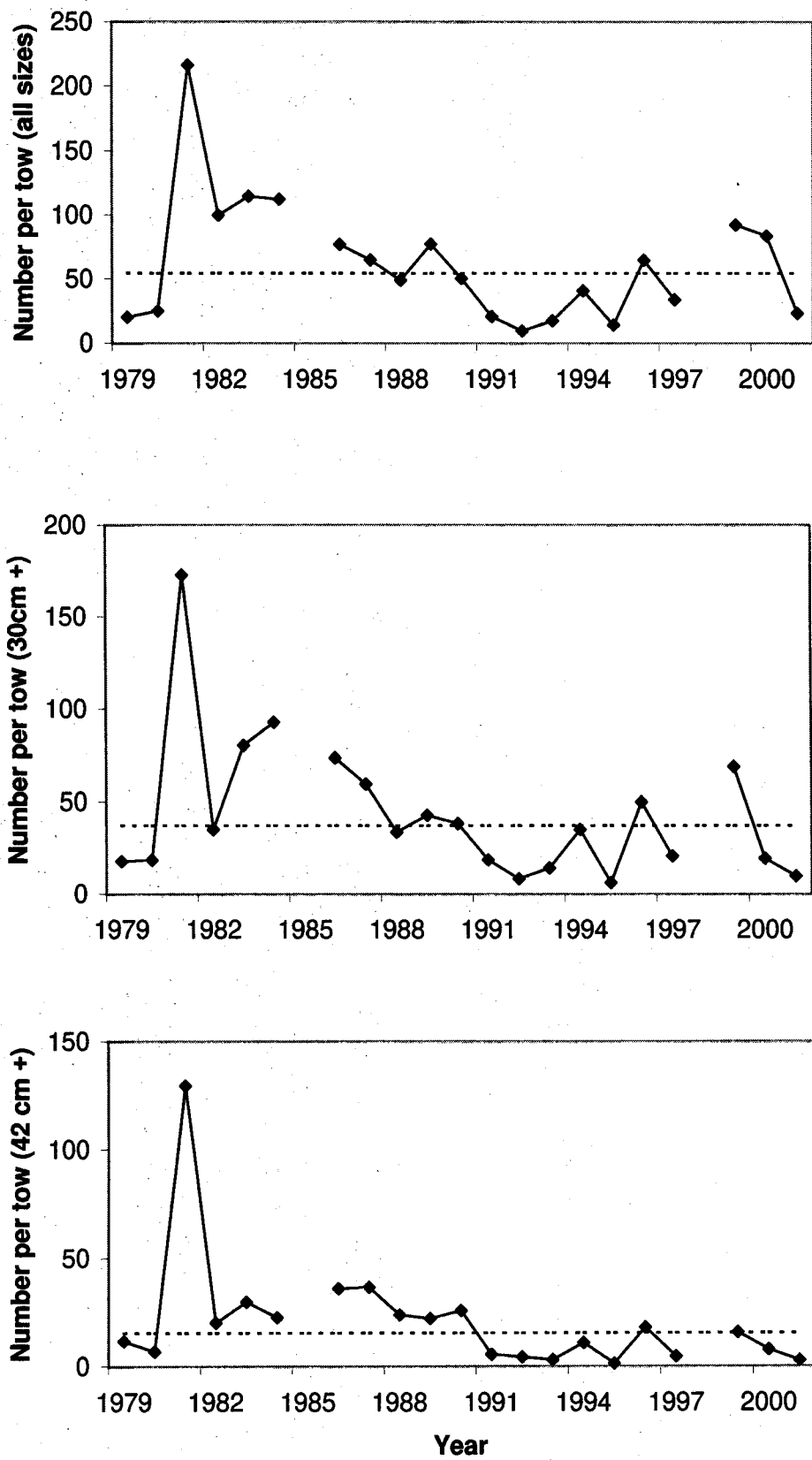


Figure 21. Number per tow of haddock from the March RV survey, 1979-2001. Horizontal line shows the long-term average excluding the 1981 data point. Top panel shows all sizes, middle panel shows 30 cm + and bottom panel shows 42 cm+.

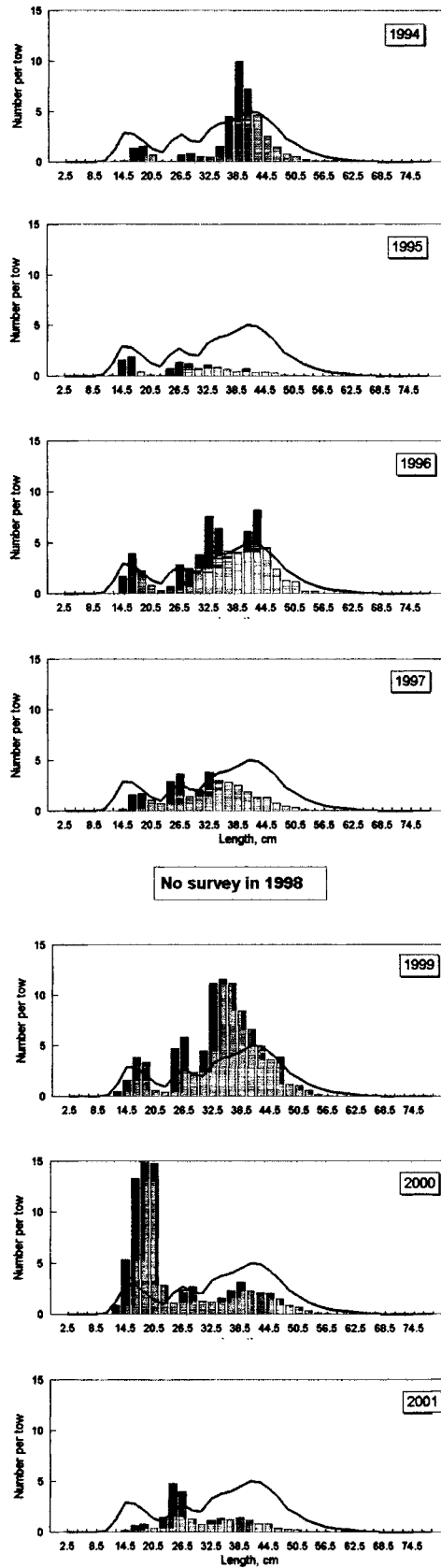


Figure 22. Length composition of haddock from 1994-2001 from the spring RV survey. Long-term average (1979-2001) is shown as a thin line on each panel. Note: for 2000, the height of the bar at 18.5 cm extends to 22 fish per tow.

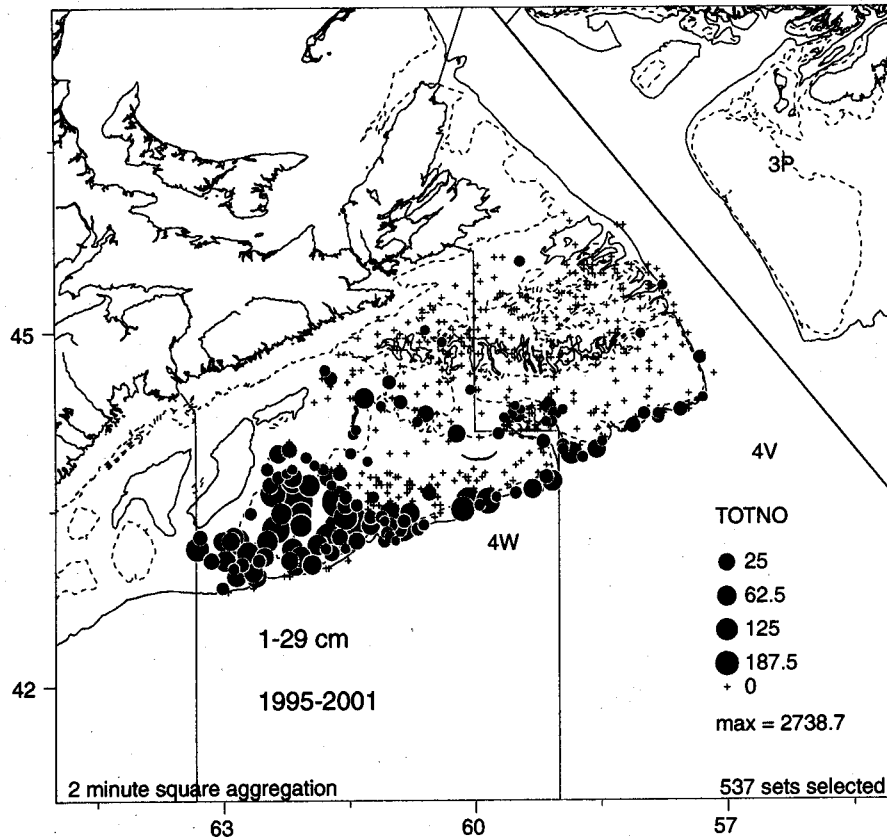
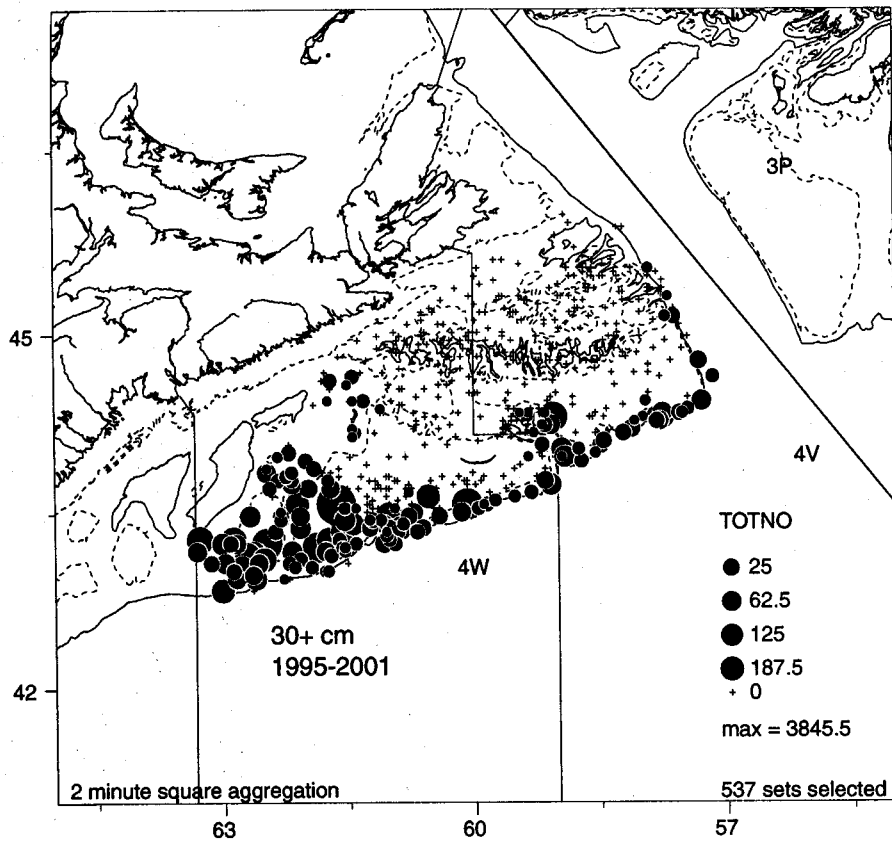


Figure 23. Expanding symbol plots of haddock catch rates from the March RV survey. Data from all years were combined from 1995-2001. Top panel shows haddock 30 cm+ and the bottom panel shows haddock 1-29cm.

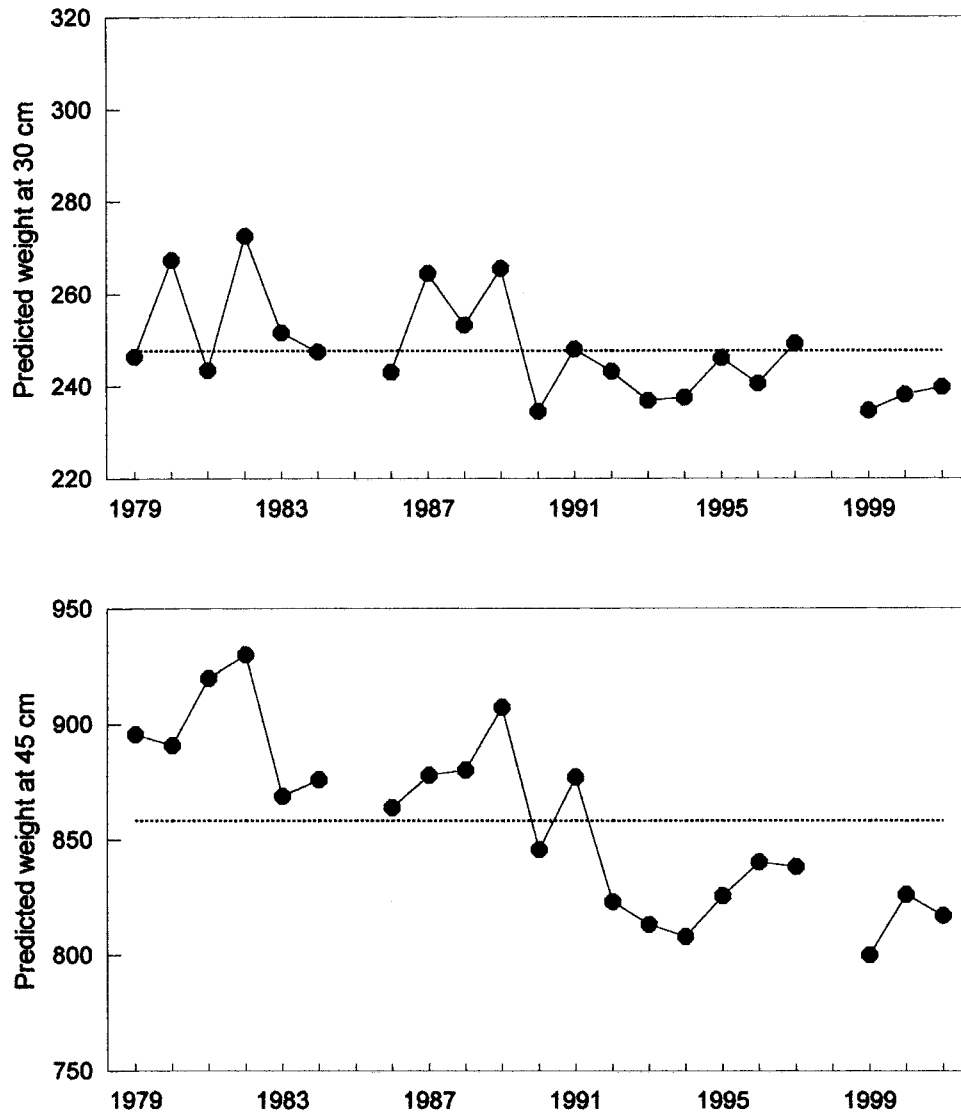


Figure 24. Predicted weight (g) of 30 and 45 cm Div. 4VW haddock from the March RV survey.



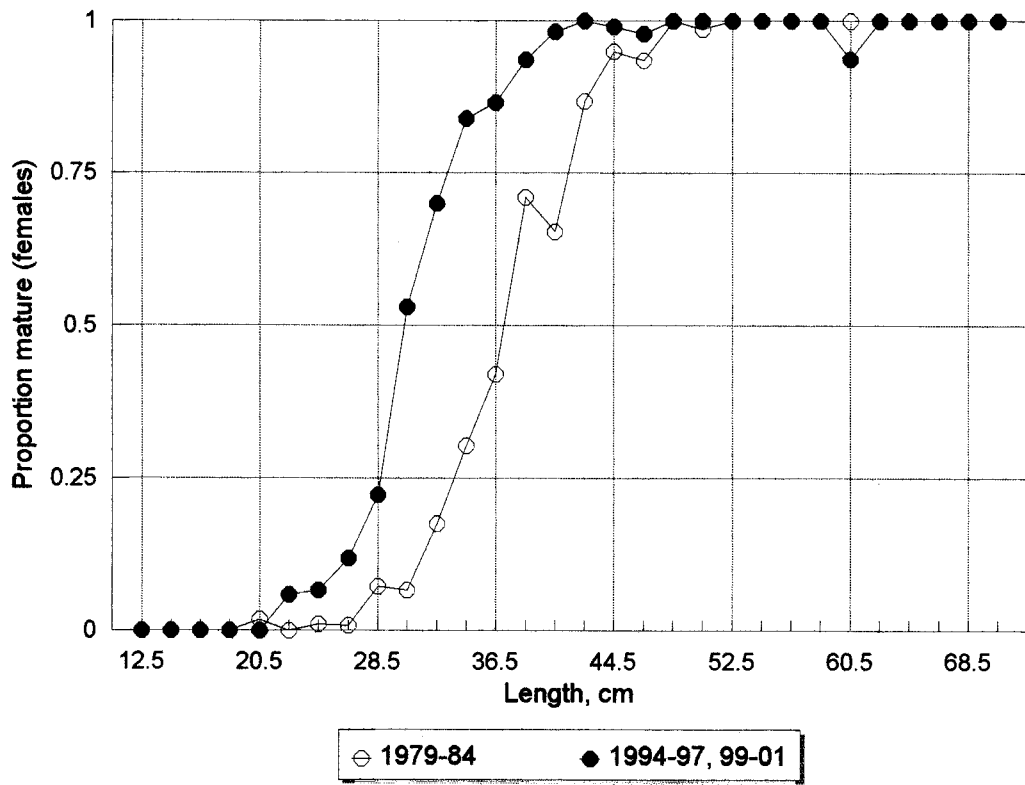


Figure 25. Proportion of female haddock mature at length averaged over two time periods from the spring RV survey.

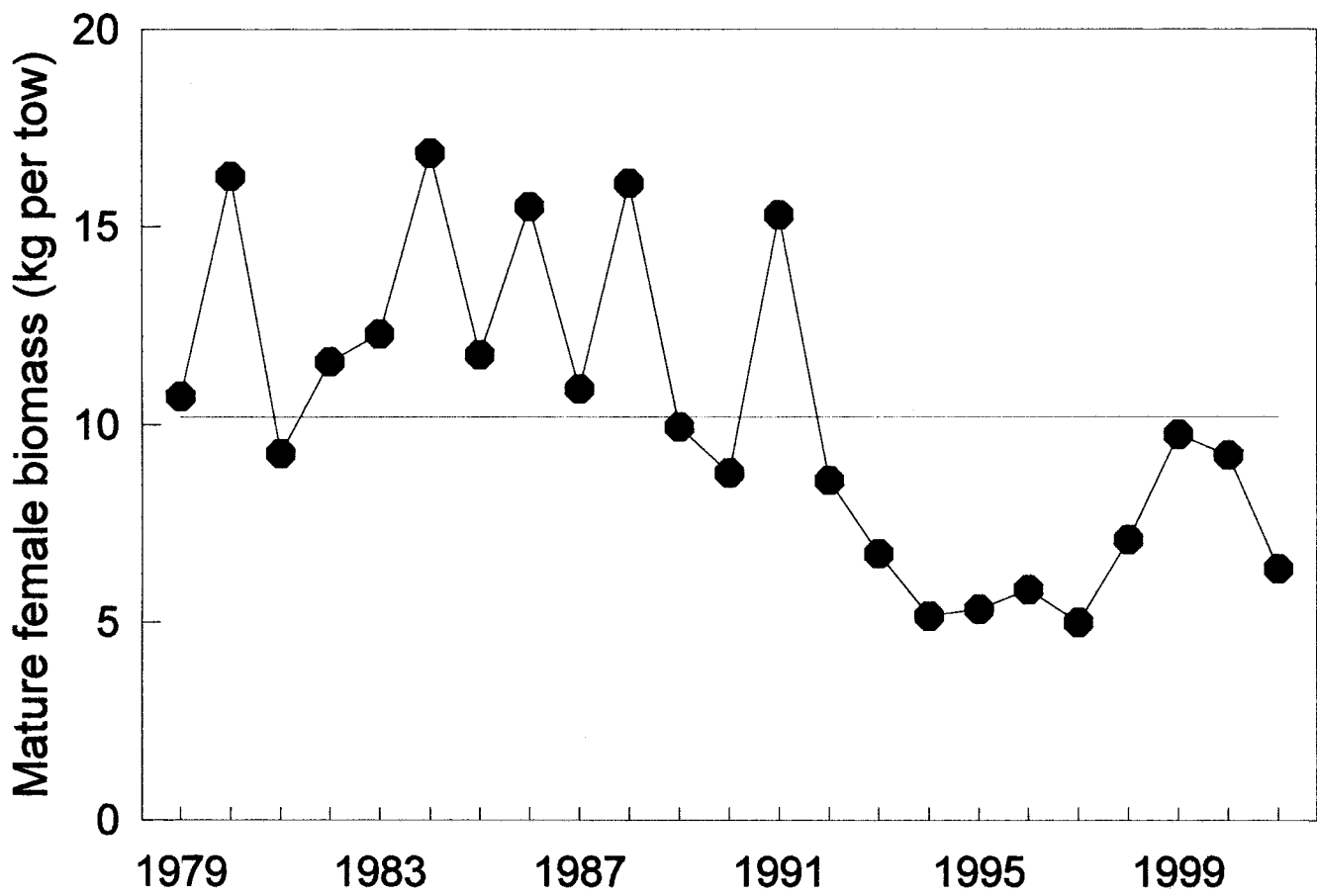


Figure 26. Mature biomass of female haddock in Div. 4VW from the summer RV survey.

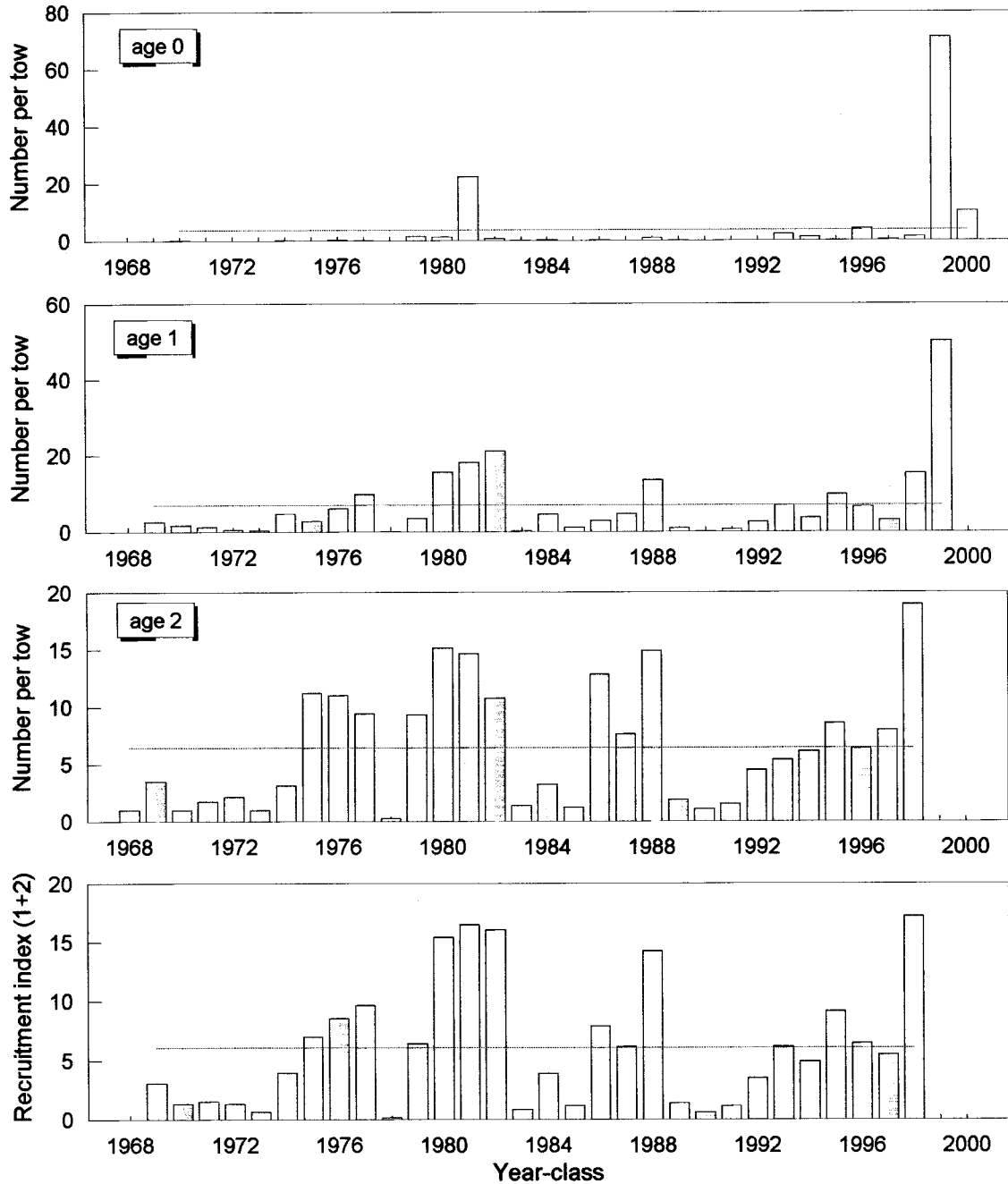


Figure 27. Indices of year-class strength for Div. 4VW haddock from the summer RV survey. Number per tow at age 0,1,2 and the average of ages 1+2 are shown. Horizontal line shows the long-term average.

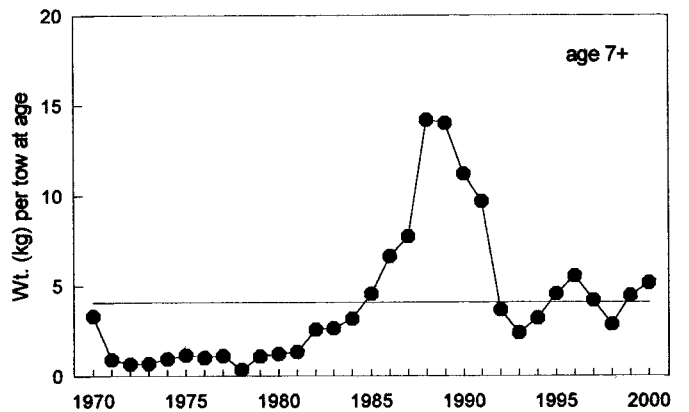
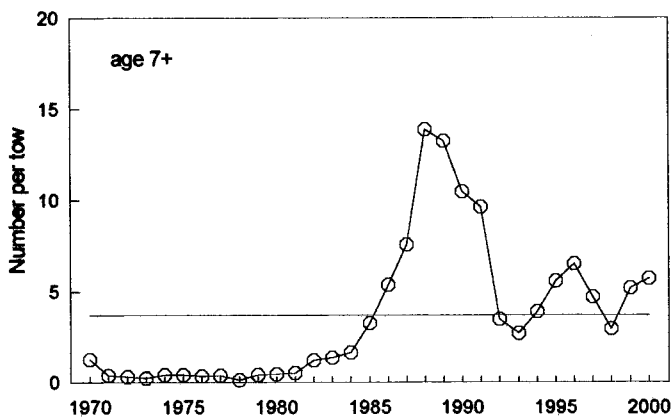
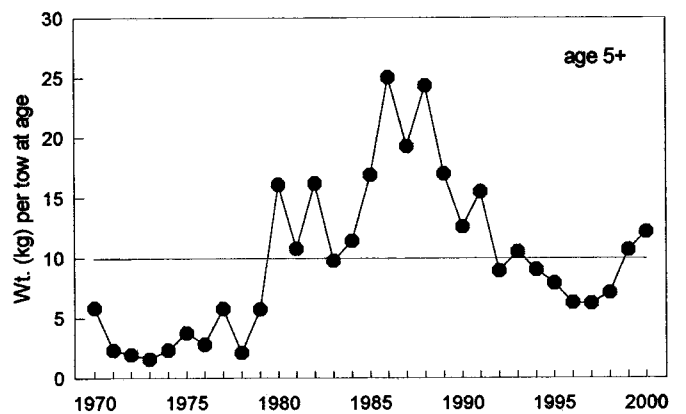
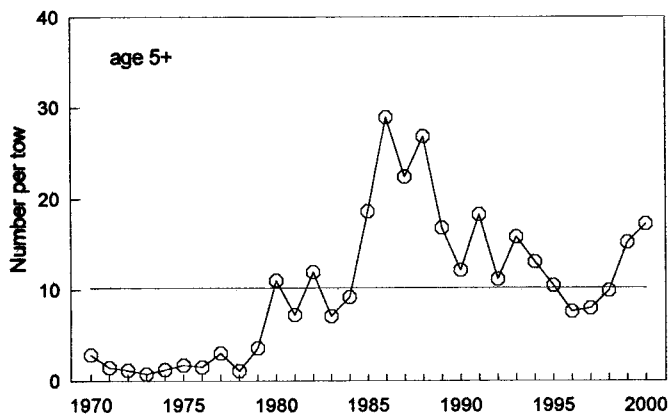
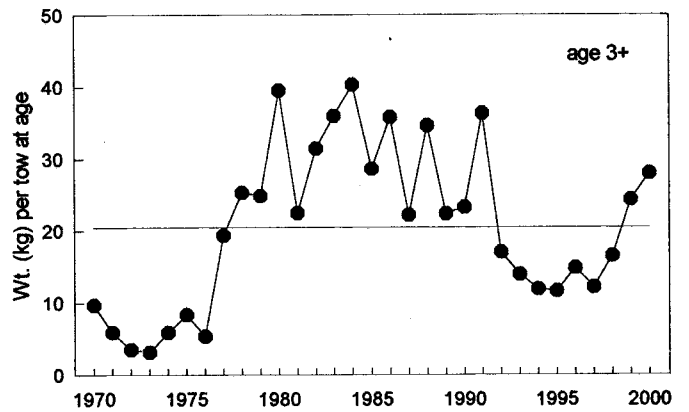
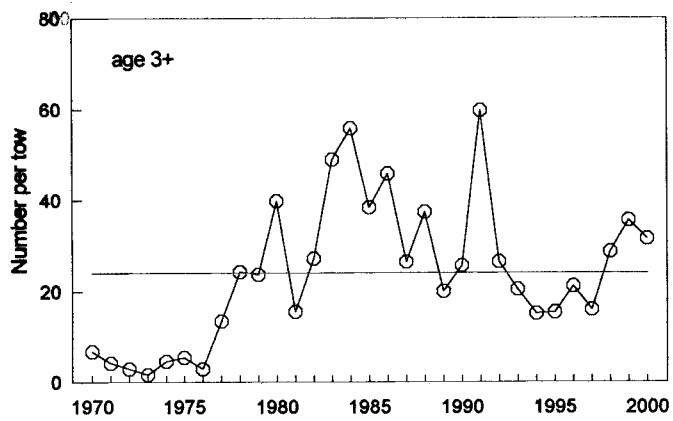


Figure 28. Stratified mean number and weight (kg.) per tow at age from the summer RV survey.

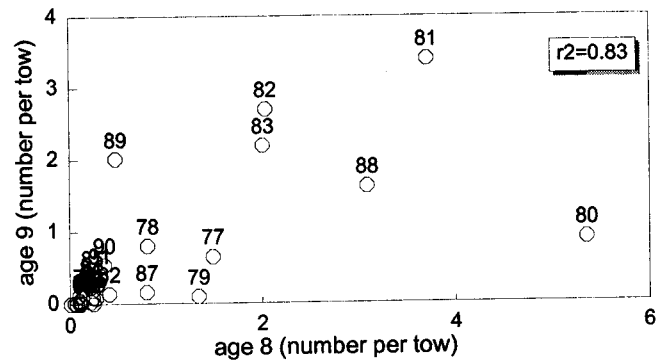
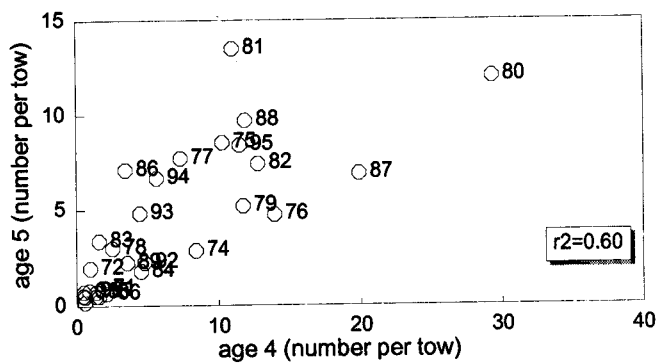
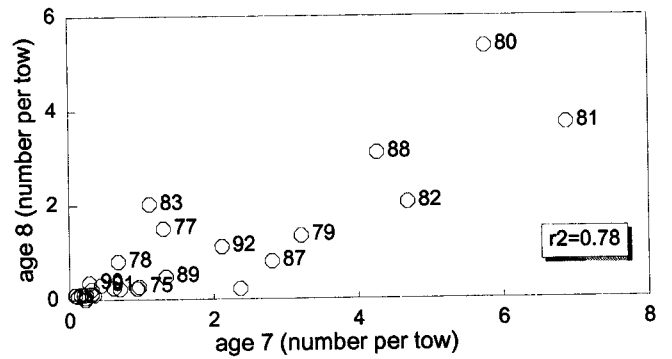
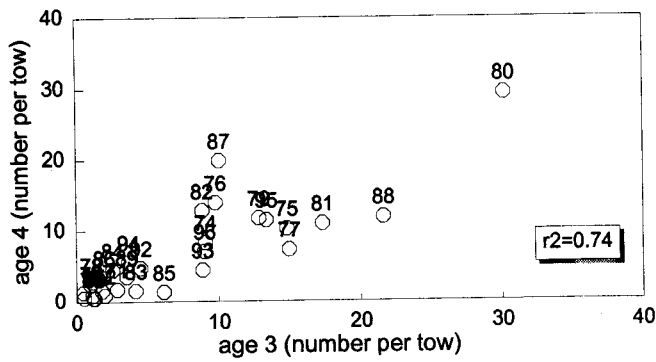
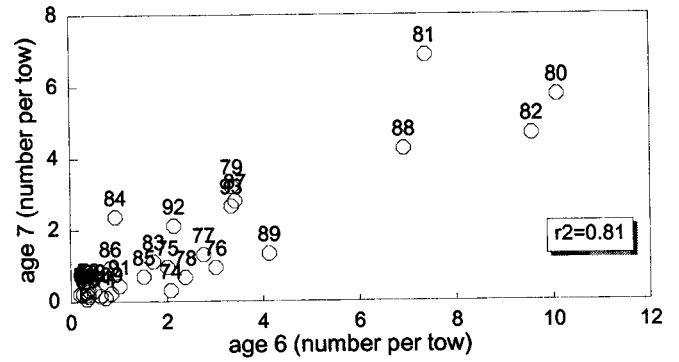
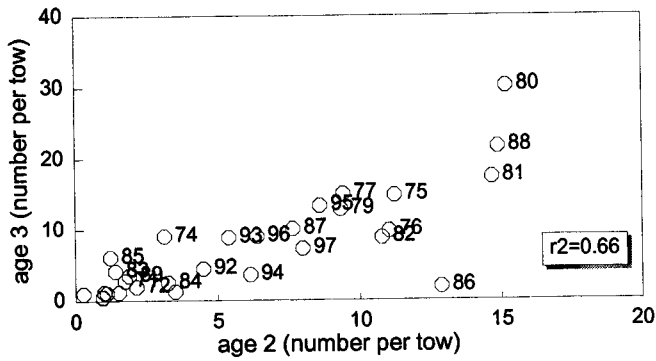
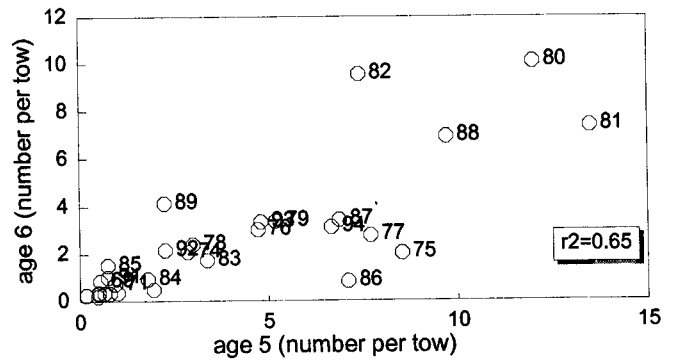
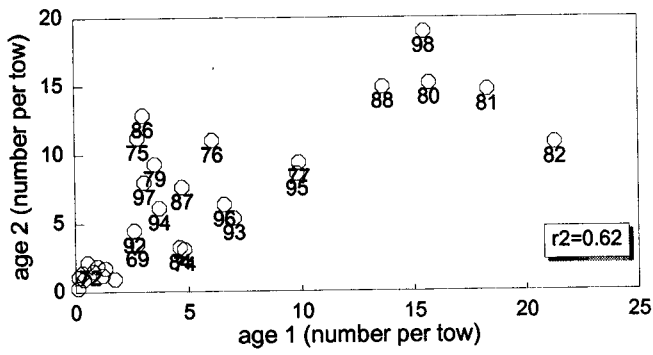


Figure 29. Relationship between year-class estimates at successive ages in the summer RV survey for ages 1 and 2, ages 2 and 3, ages 3 and 4 and so on. Strength of correlation ( $r^2$ ) is shown for each relationship.

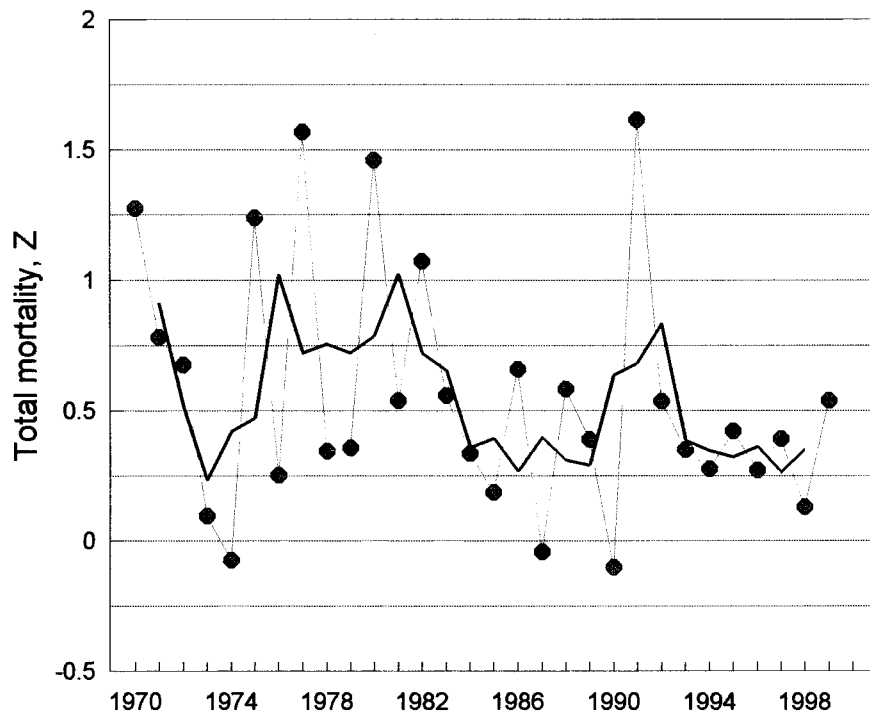


Figure 30. Total mortality rate of Div. 4VW haddock from the summer RV survey estimates as a logarithm of the ratio of ages 5-10 in year  $t$  to ages 6-11 in year  $t+1$ .

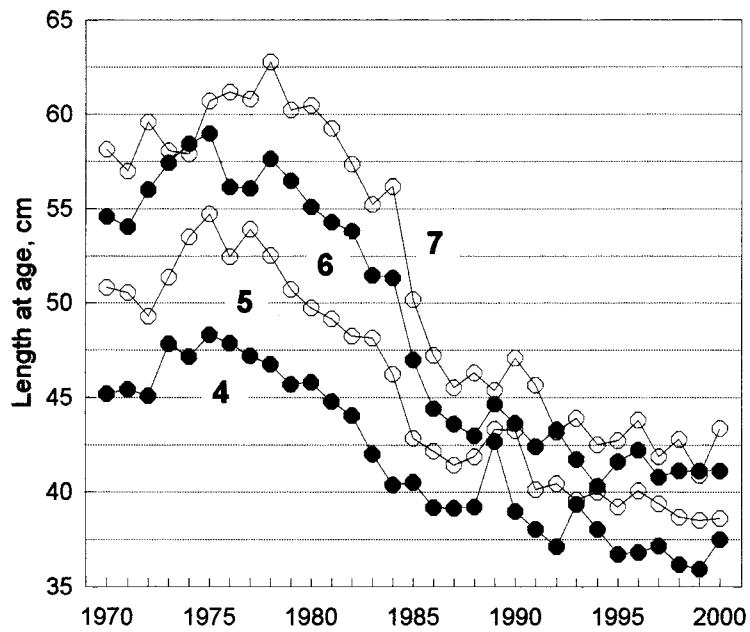
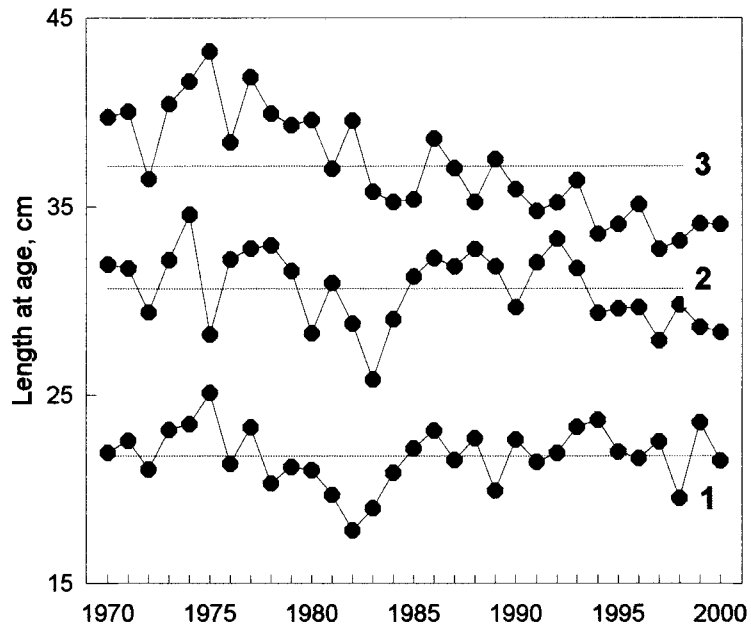


Figure 31. Mean length at age of Div. 4VW haddock from the summer RV survey.

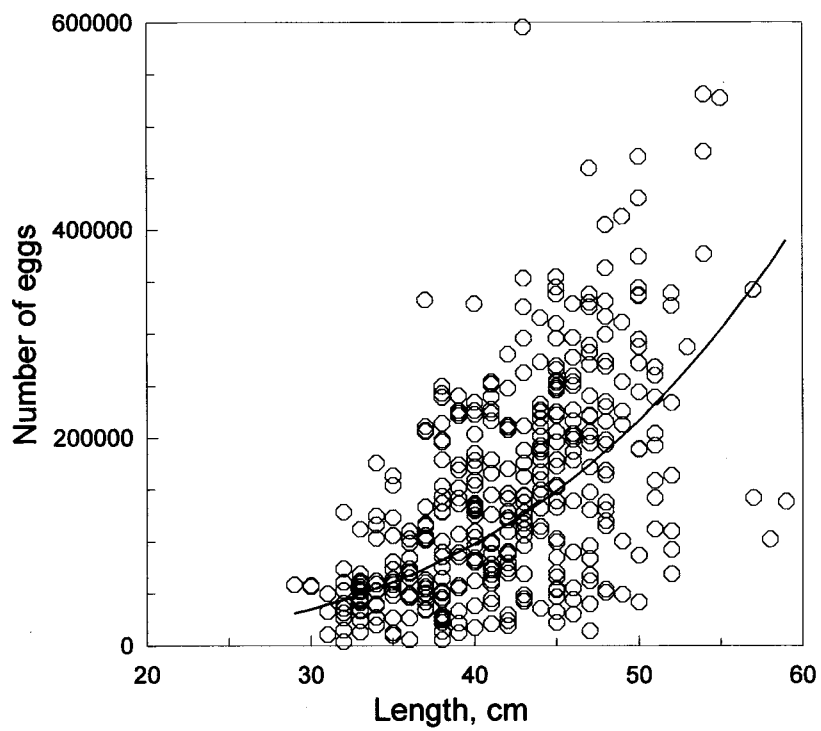


Figure 32. Relationship between number of eggs and body size (length) of Div. 4VW haddock. Data was compiled from three spawning seasons, 1997 to 1999.



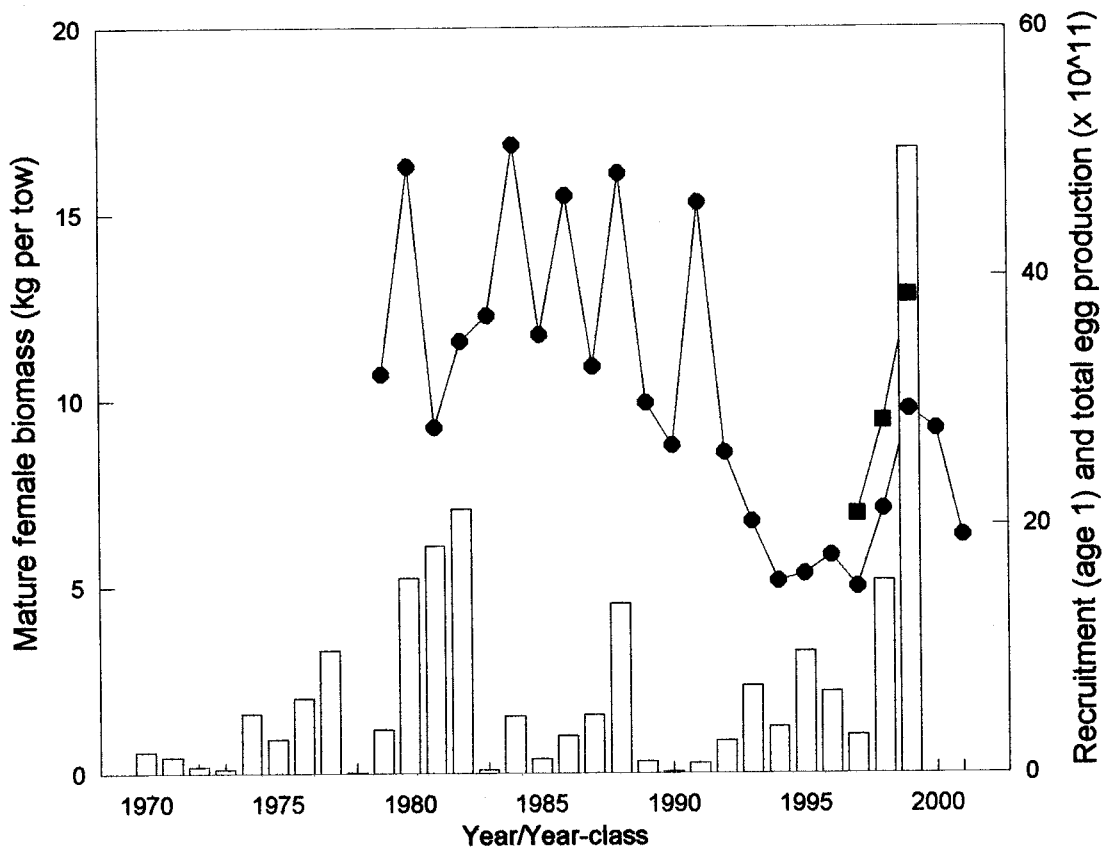


Figure 33. Trends in recruitment (histograms), spawning biomass ( closed circles) and total egg production (closed squares) of Div. 4VW haddock.

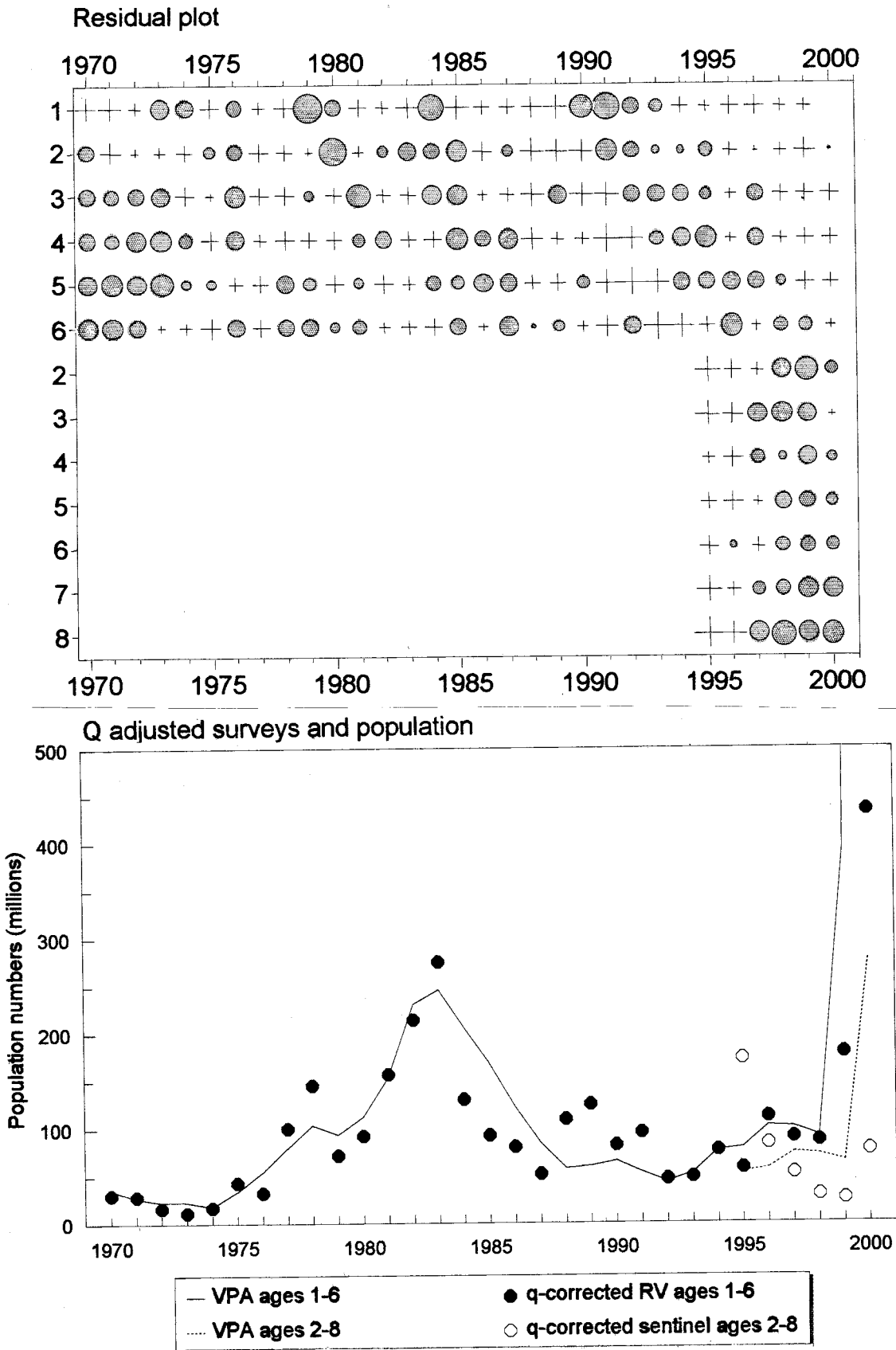


Figure 34. Goodness of fit diagnostics for the Dv. 4TVW haddock stock.

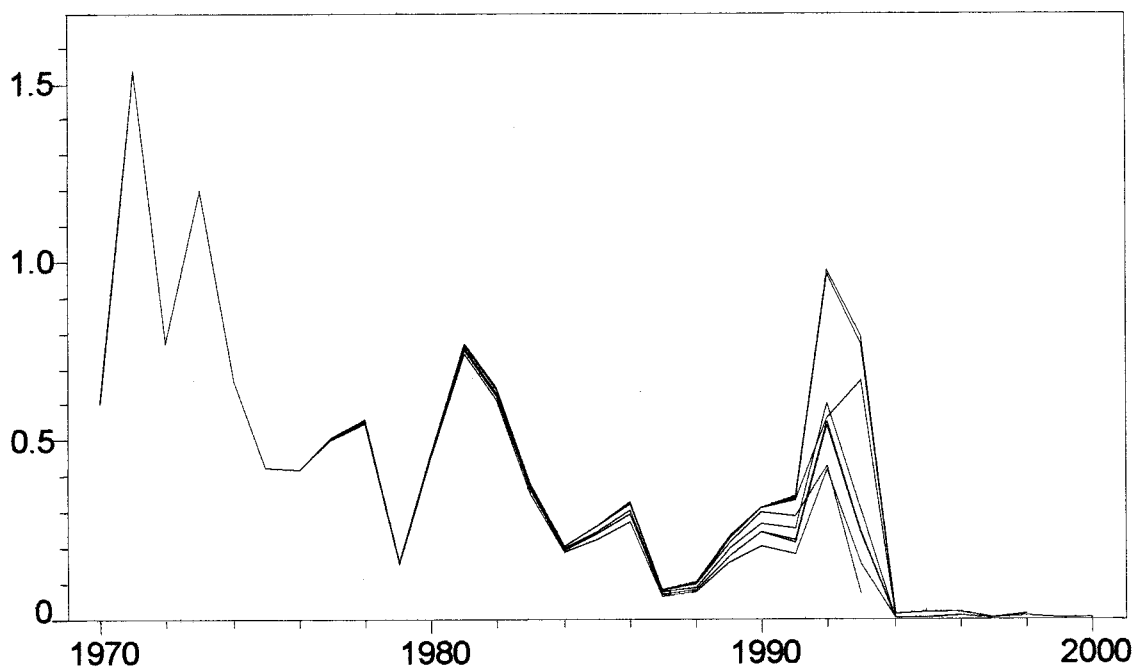
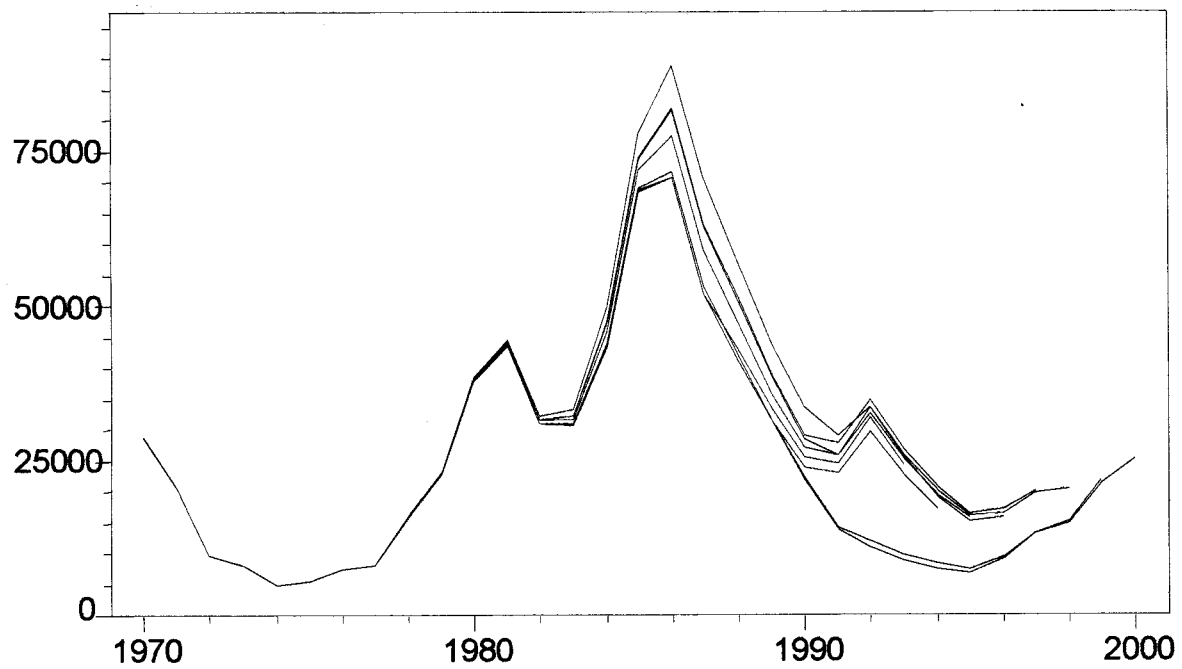


Figure 35. Retrospective plots of biomass (3+) and average F (ages 5-7) for the Div. 4TVW haddock stock.

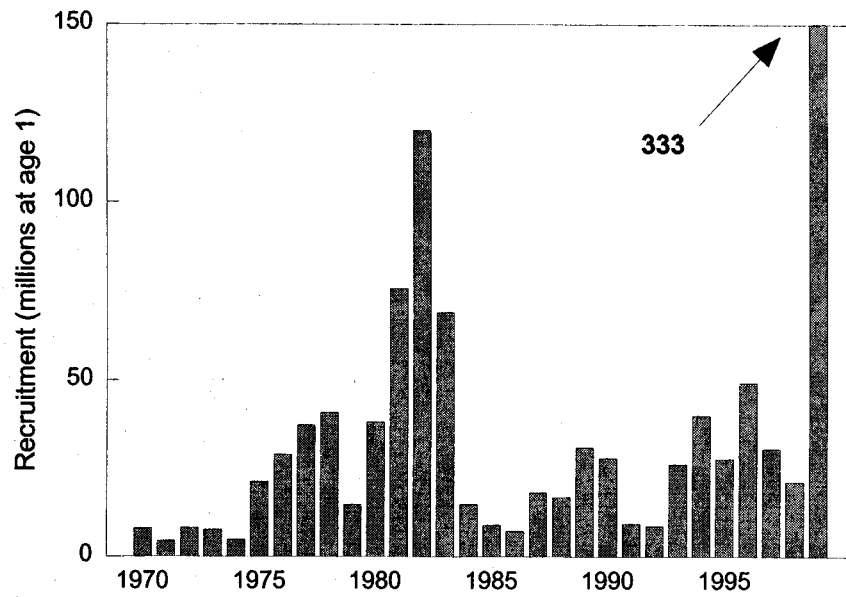


Figure 36. Recruitment at age 1 of the Div. 4VW haddock as estimated by the SPA. The 1999 estimate at age 1 (1998 yc) is high.

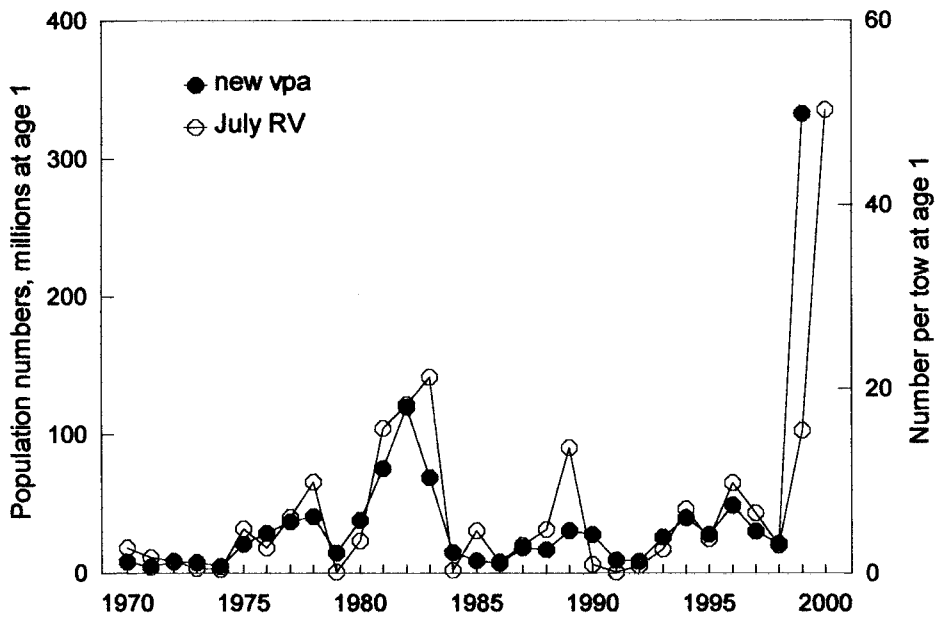
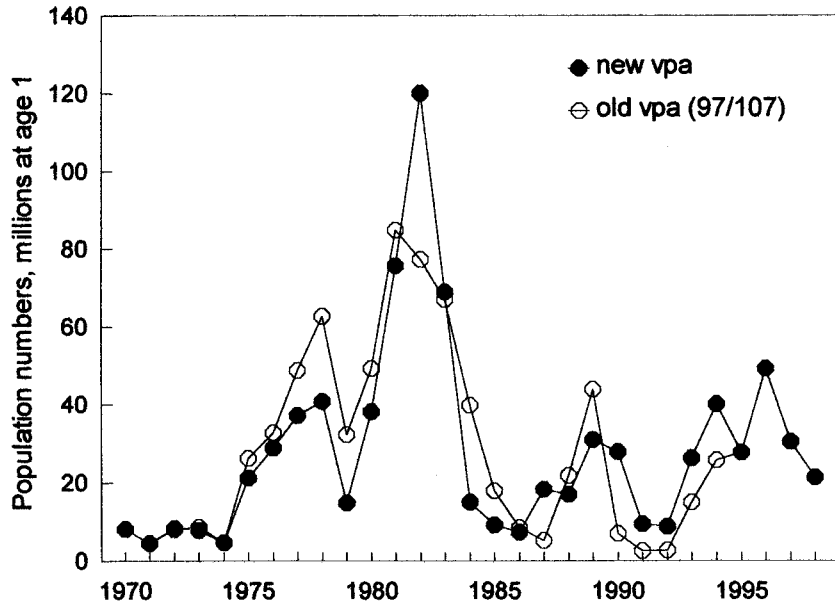


Figure 37. Comparison of recent SPA recruitment estimates to 1997 estimates and the summer RV survey.

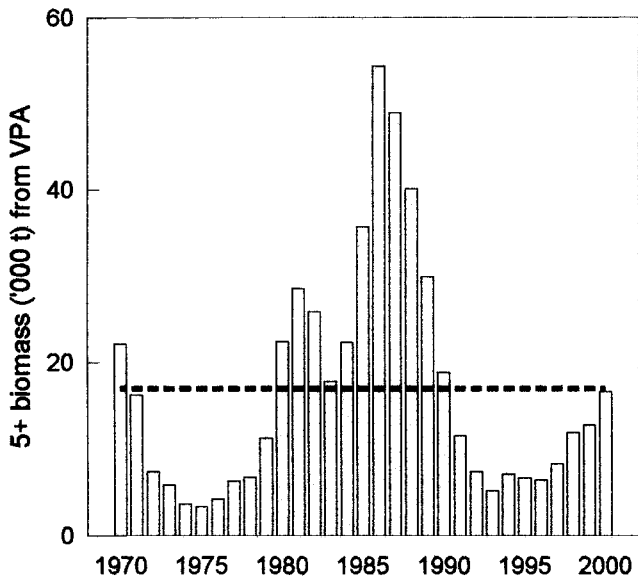
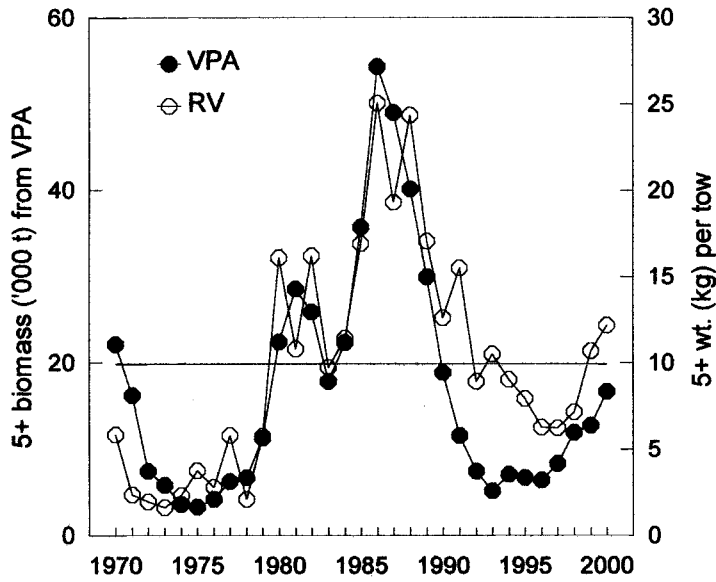


Figure 38. Comparison of VPA and summer RV survey biomass (ages 5+) estimates.

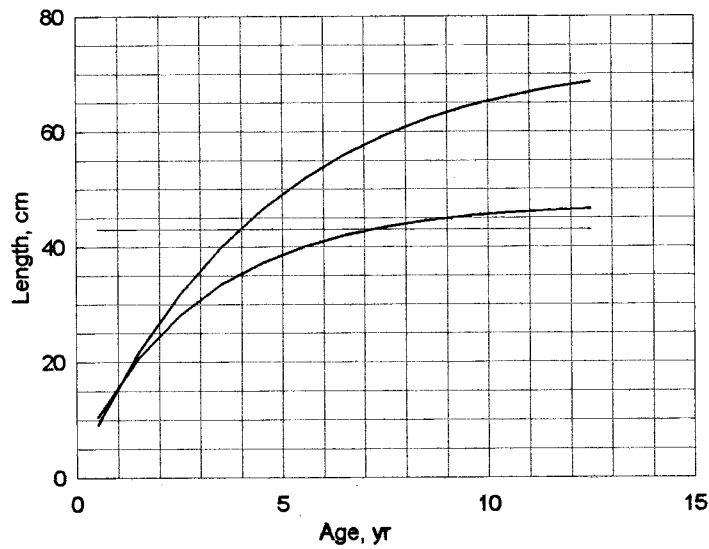
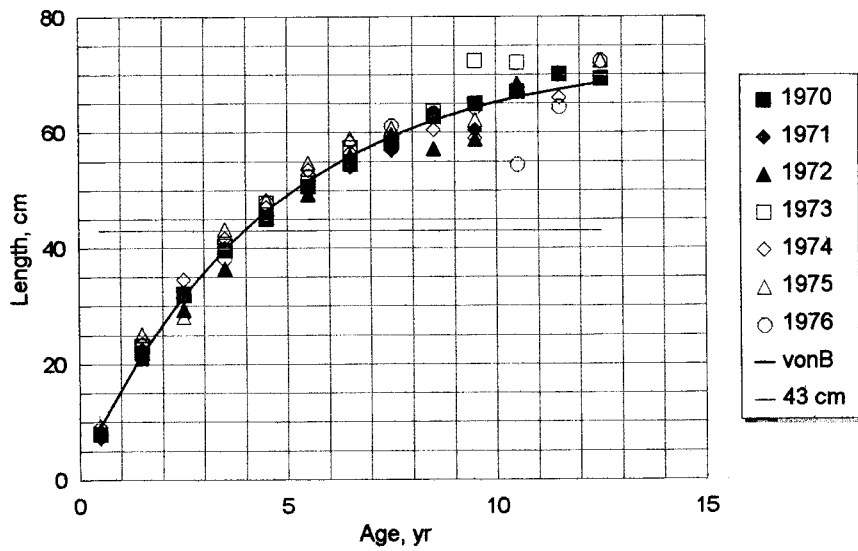
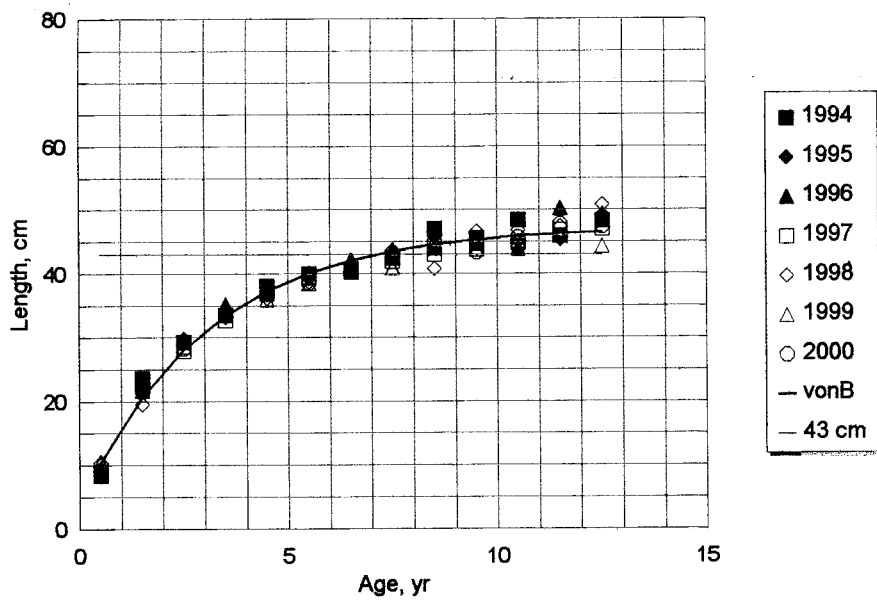


Figure 39. Comparison of two growth models of haddock based on length at age from the 1970-1976 and 1994-2000 time periods. The horizontal line shows the intersection of 43cm with a corresponding age.

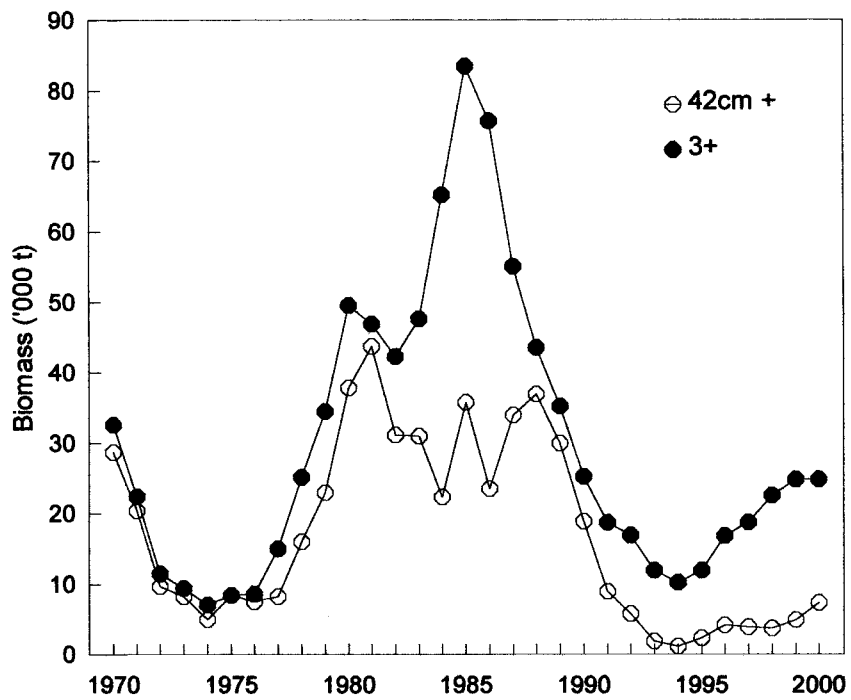


Figure 40. Biomass of Div. 4VW haddock 42 cm and larger and ages 3 and older estimated by the SPA.



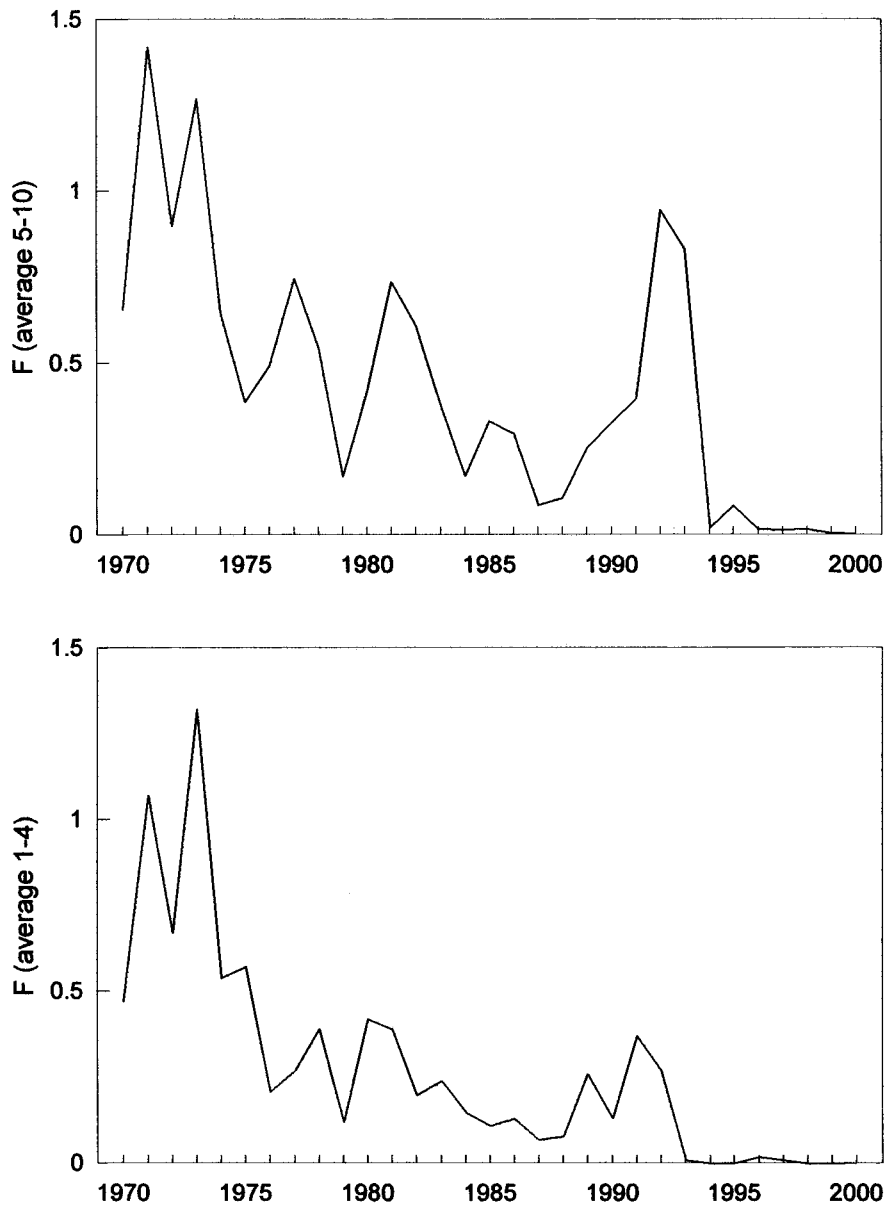


Figure 41. Temporal pattern of fishing mortality for ages 5-10 and ages 1-4 from the SPA.

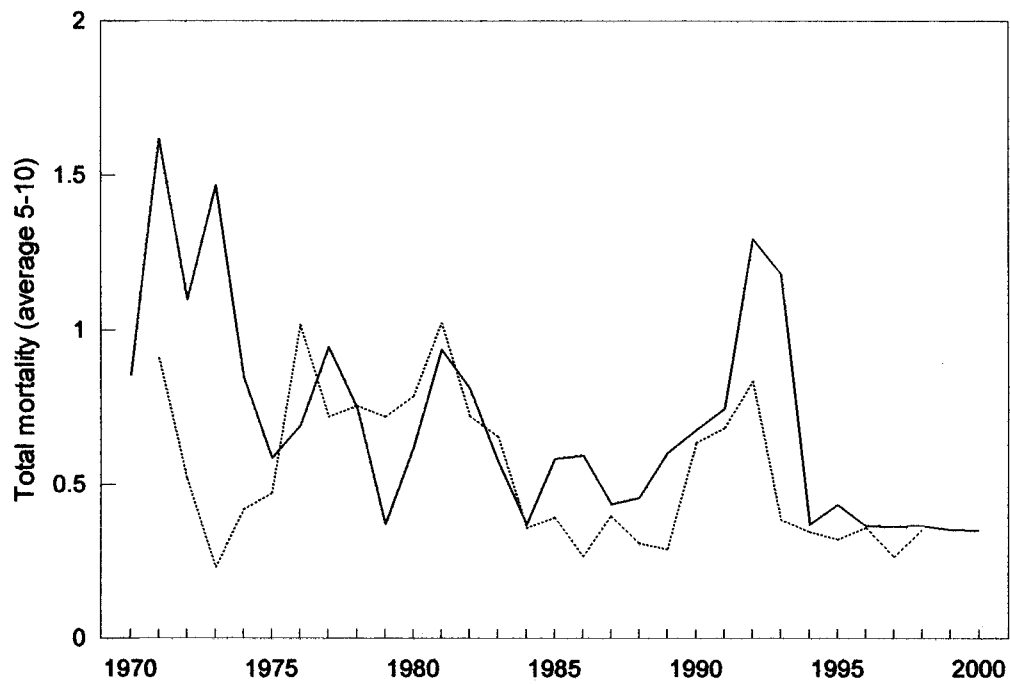


Figure 42. Comparison of total mortality trends from the SPA and the summer RV survey.

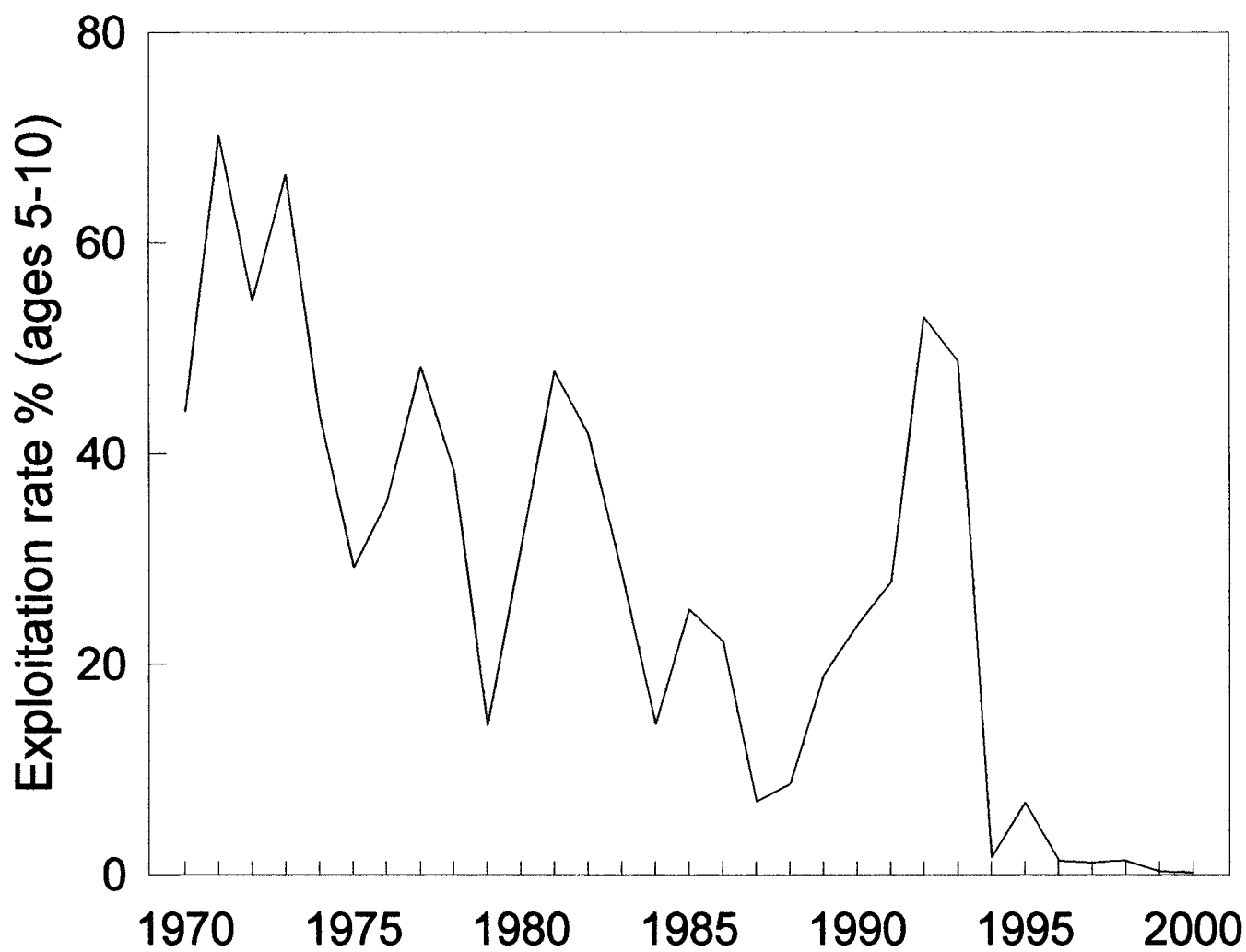


Figure 43. Exploitation rate of Div. 4TVW haddock

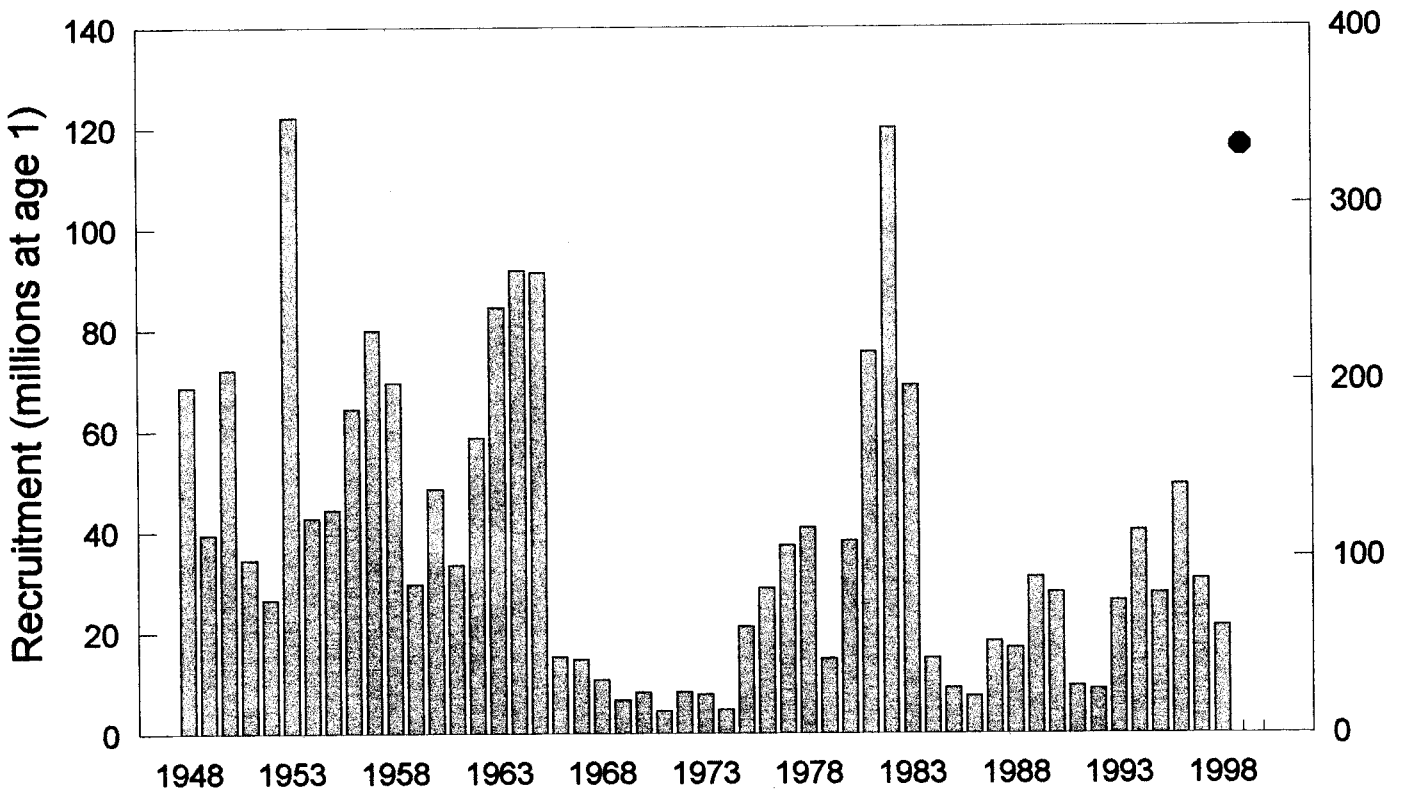
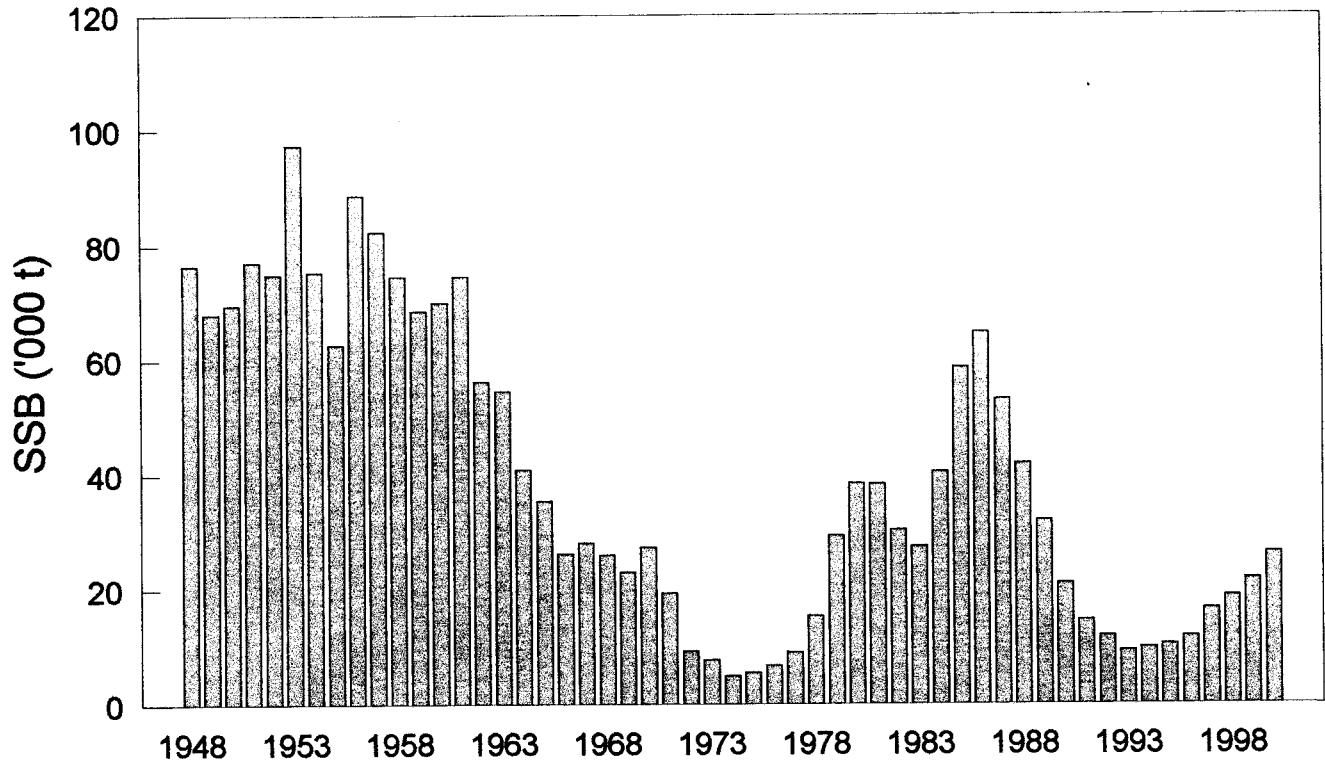


Figure 44. Long-term temporal patterns of spawning stock biomass (SSB) and recruitment at age 1.

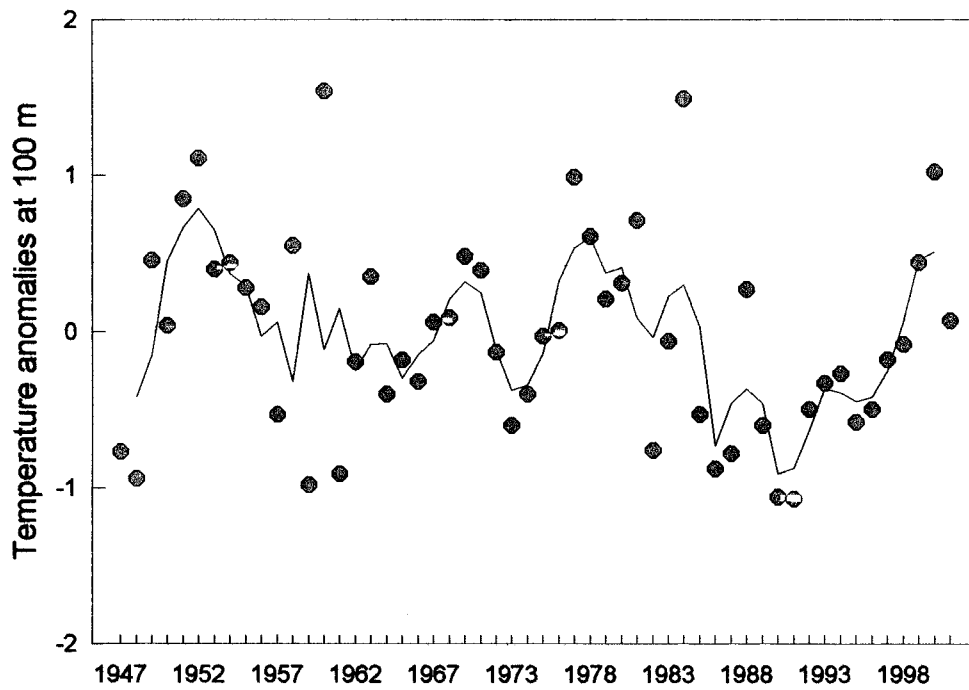


Figure 45. Annual temperature anomalies at 100 m from the Misaine Bank region.