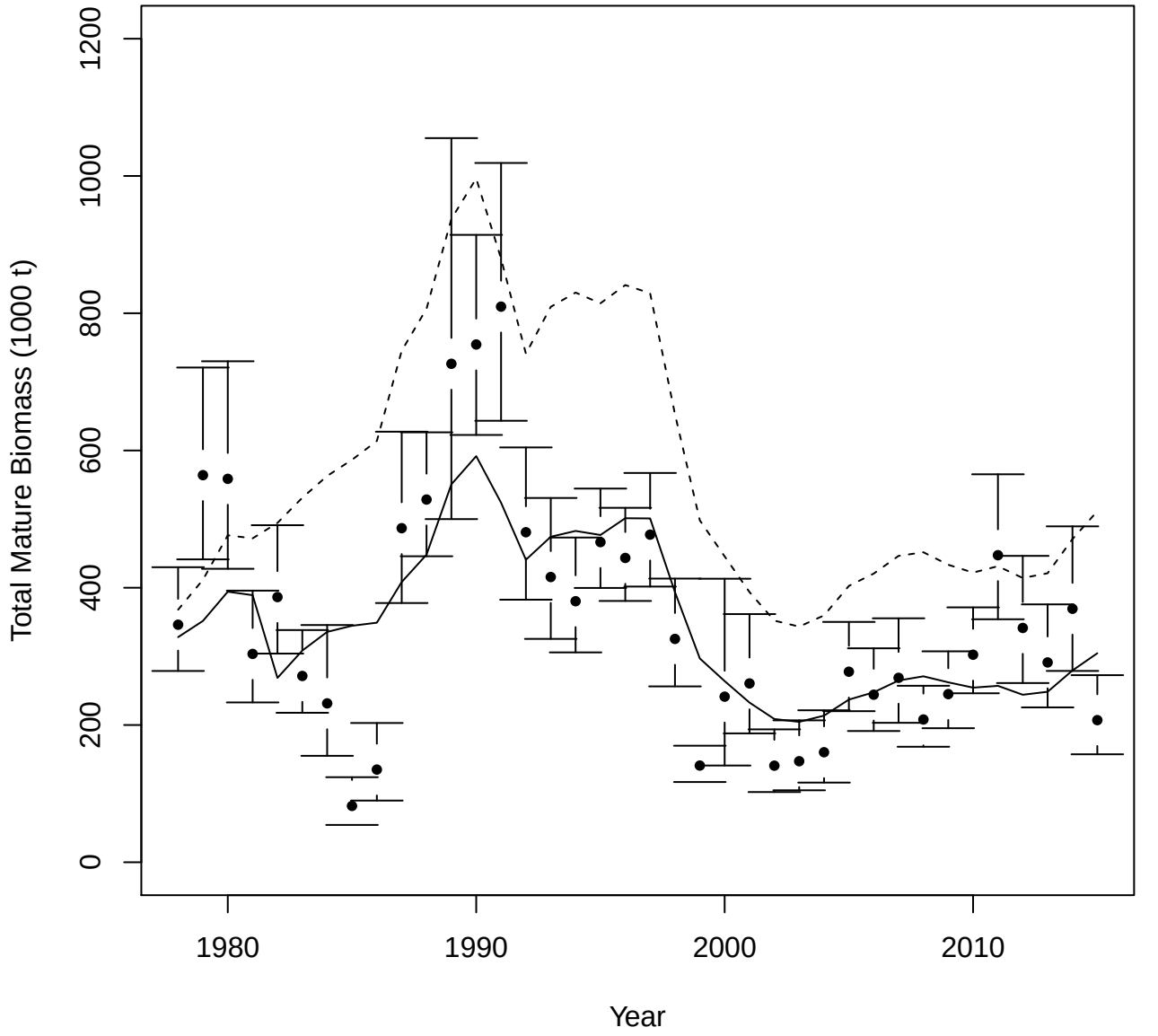
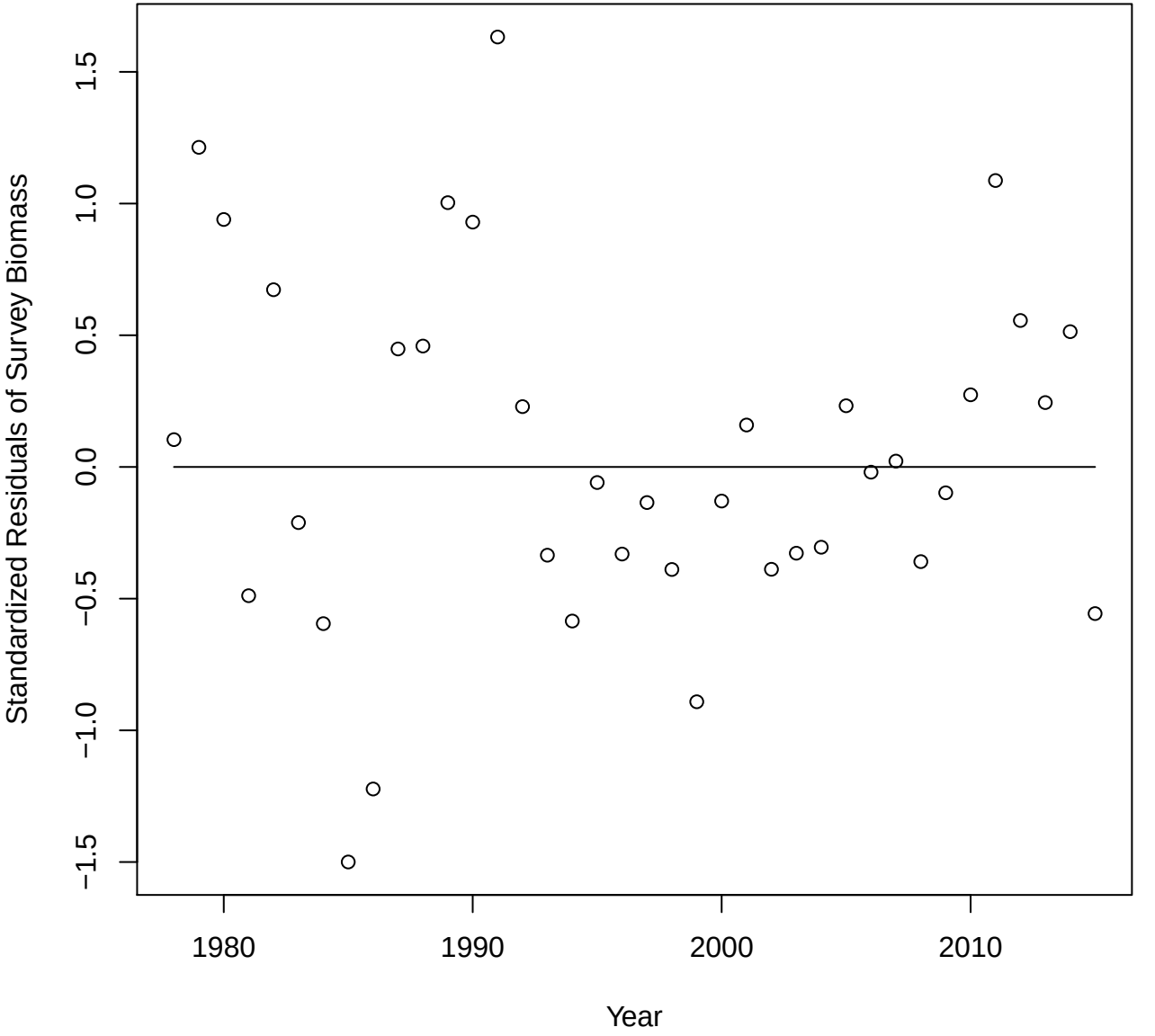
Figure 1. Population total mature biomass (millions of pounds, solid line),model estimate of survey mature biomass (dotted line) and observed survey mature biomass with approximate lognormal 95% confidence intervals.



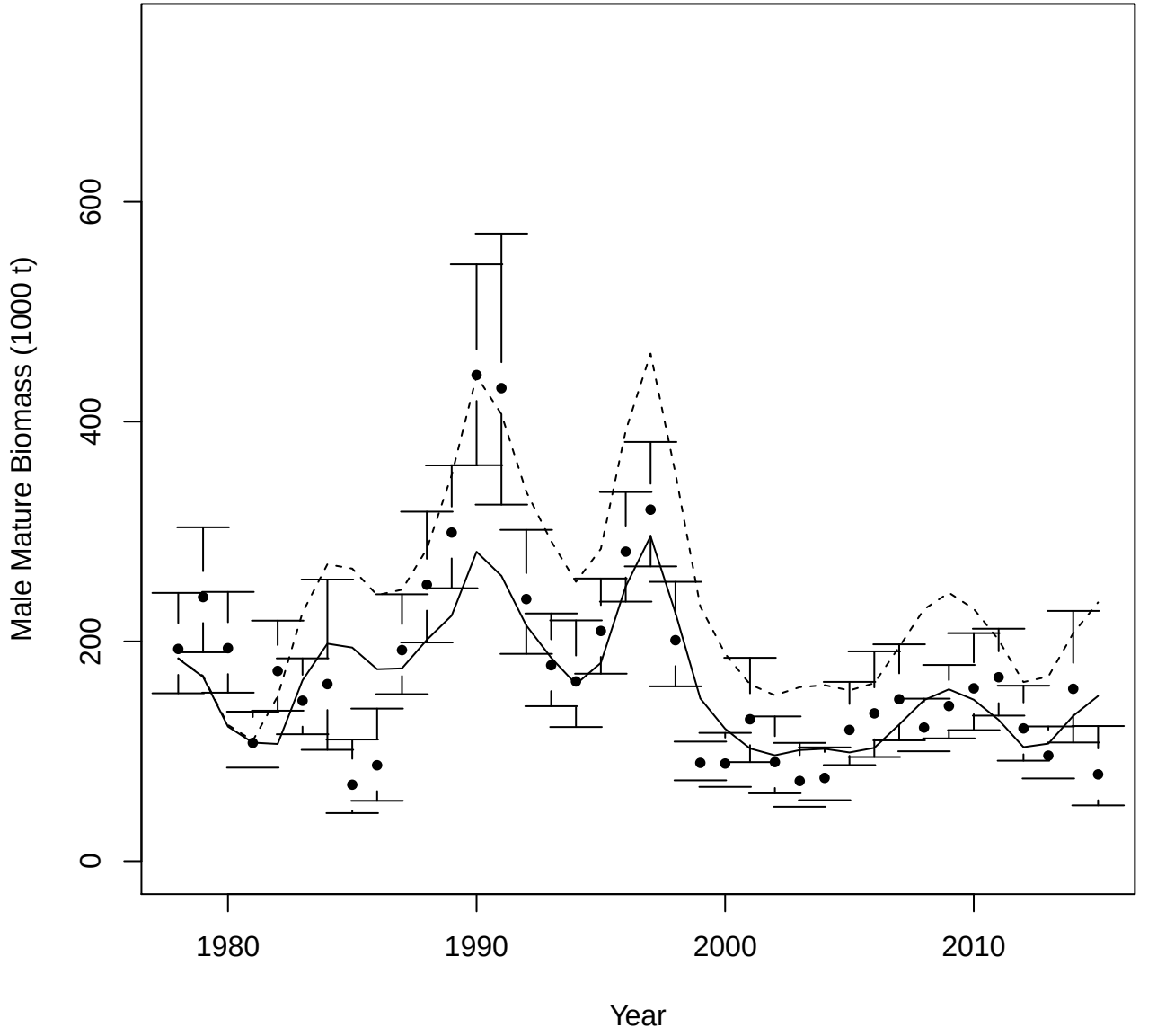
model 17b

Figure 2. Residuals for Population total mature biomass fit.



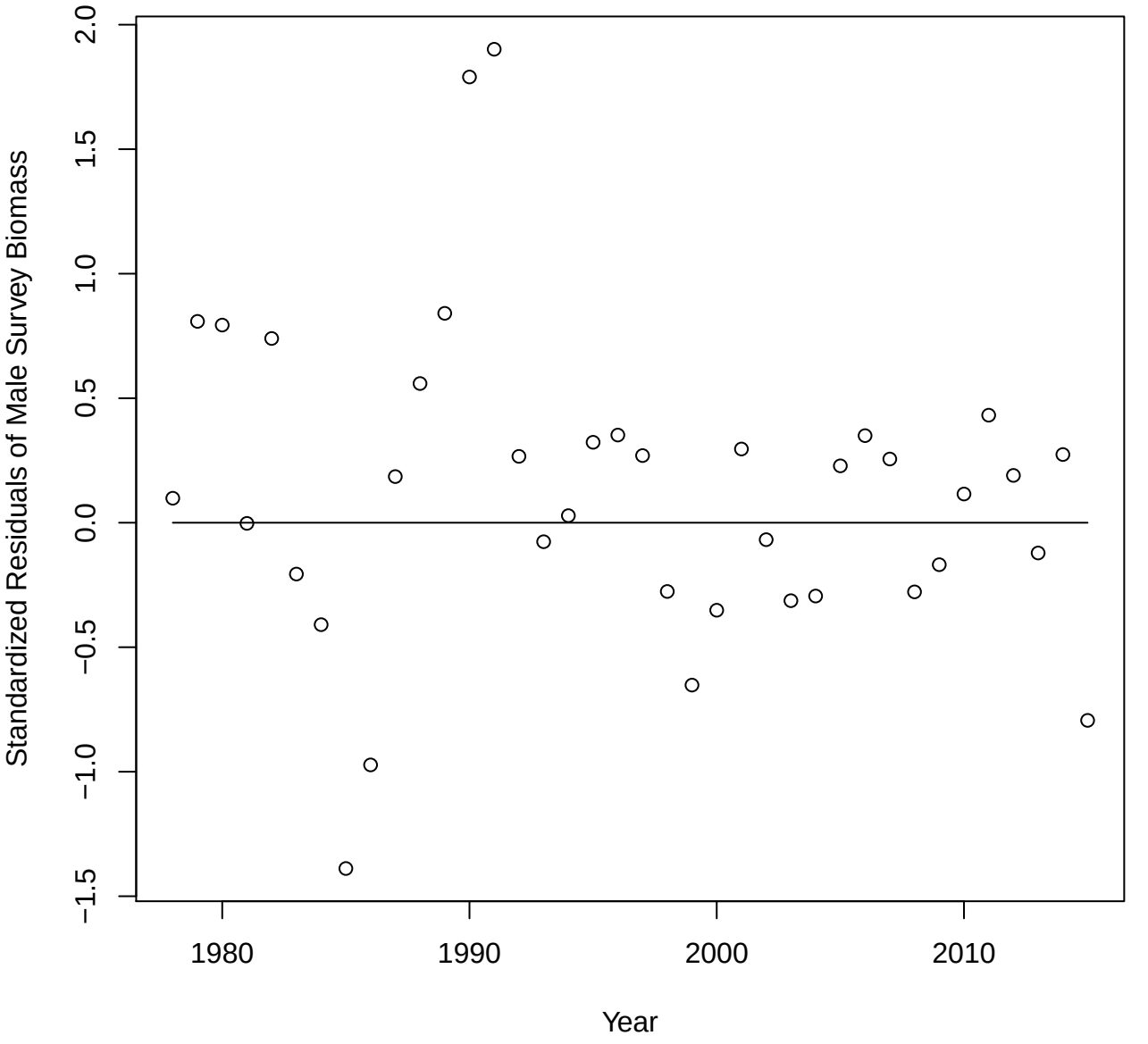
model 17b

Figure 3. Population male mature biomass (1000 t, dotted line), model estimate of survey male mature biomass (solid line) and observed survey male mature biomass with approximate lognormal 95% confidence intervals.



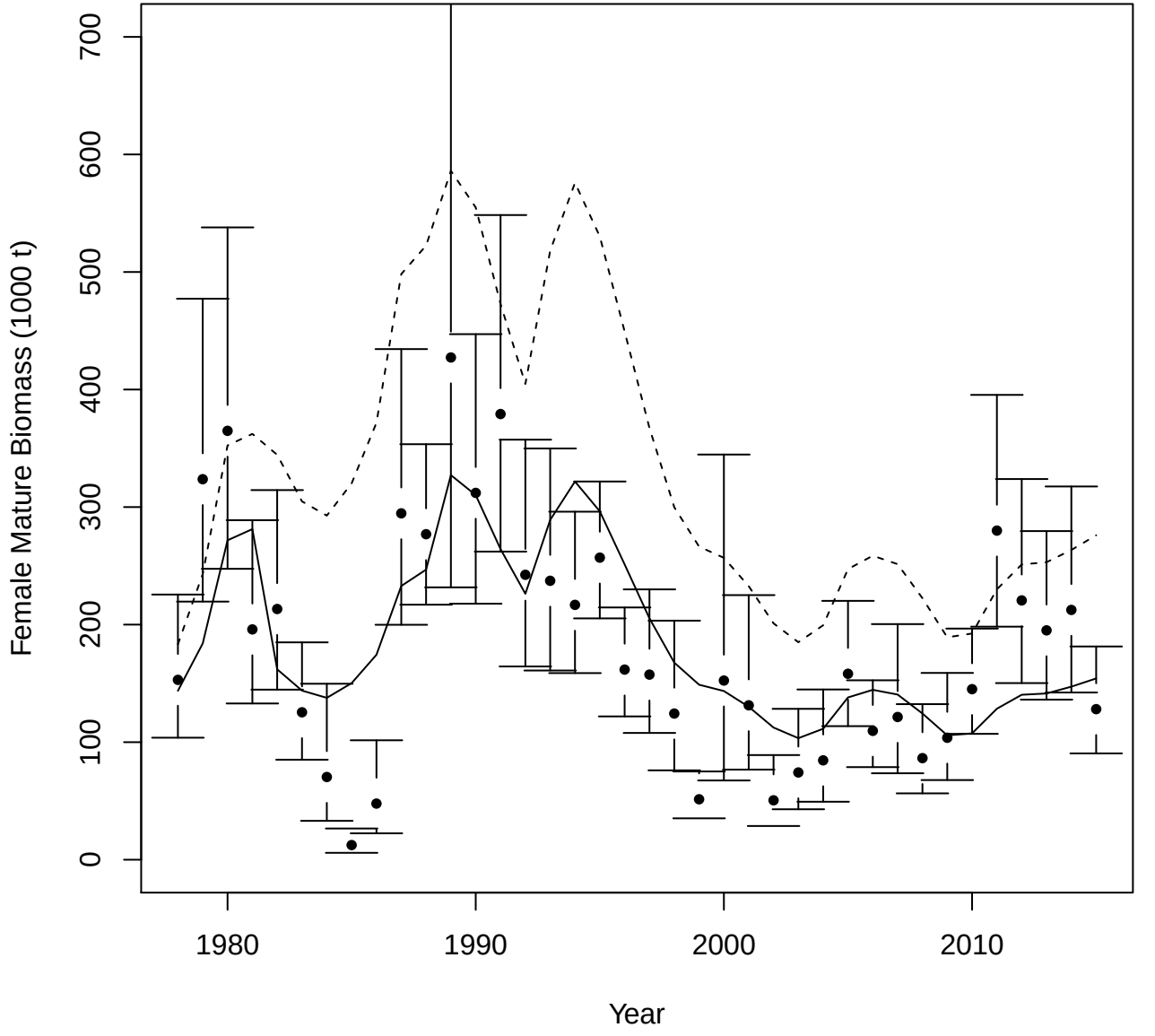
model 17b

Figure 4. Standardized Residuals for male mature biomass fit.



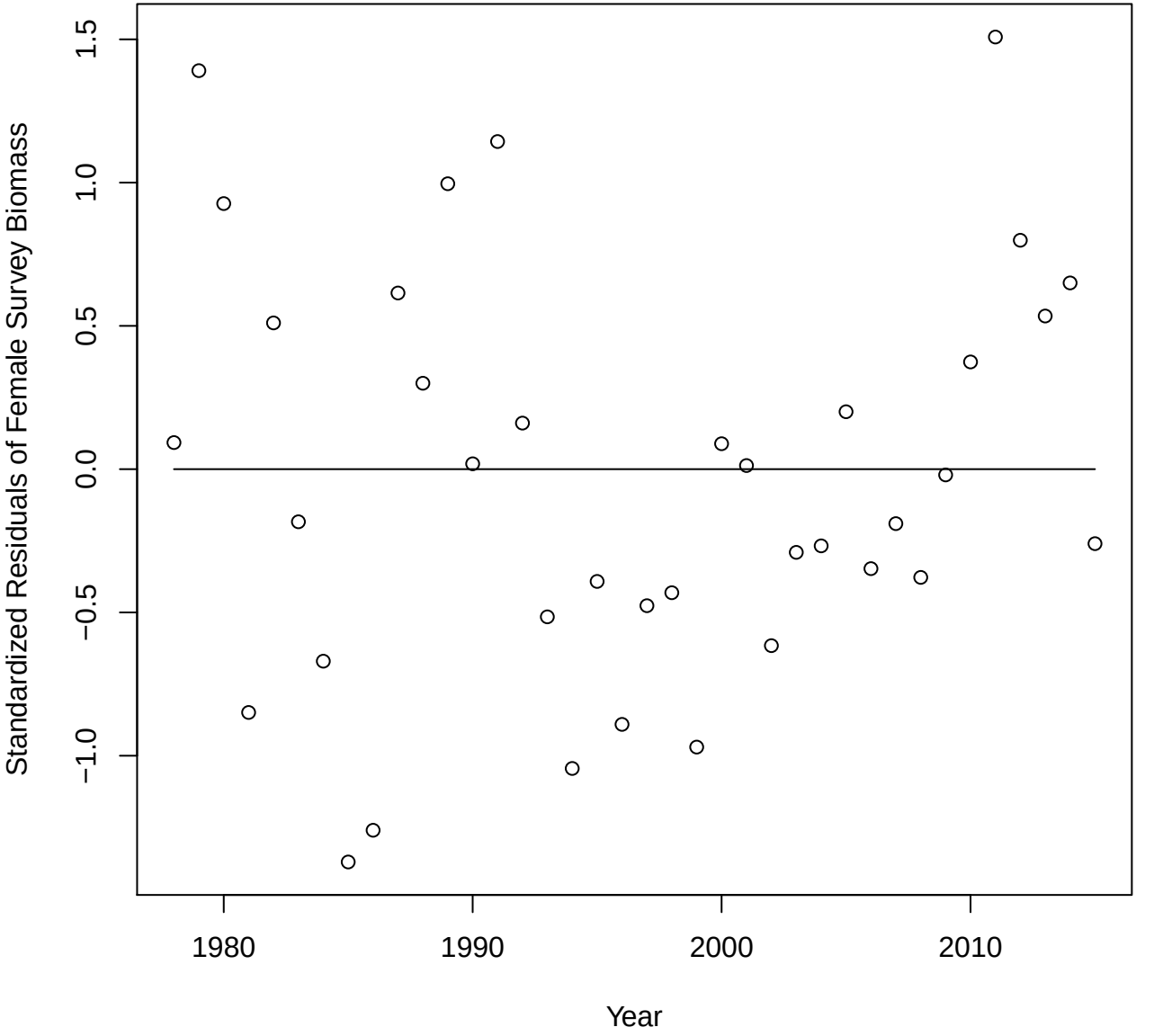
model 17b

Figure 5. Population female mature biomass (1000 t, dotted line), model estimate of survey female mature biomass (solid line) and observed survey female mature biomass with approximate lognormal 95% confidence intervals.



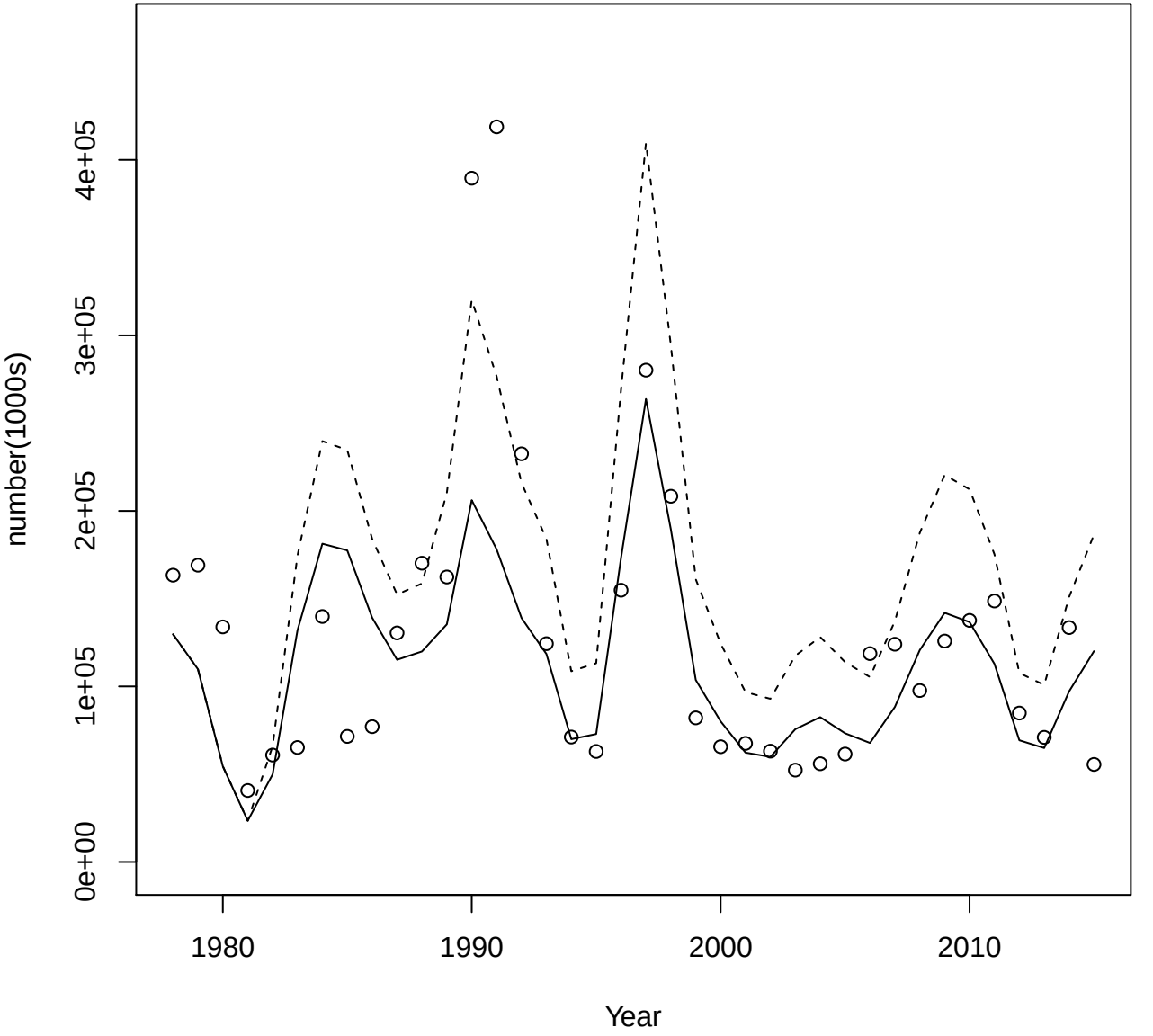
model 17b

Figure 6. Standardized Residuals for female mature biomass fit.



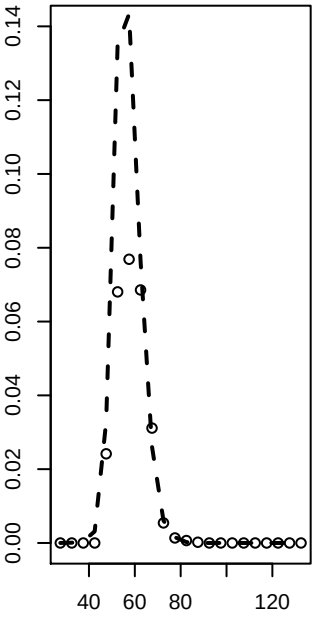
model 17b

Figure 7. Observed survey numbers of males >101mm (circles), model estimates of the population number of males > 101mm (solid line) and model estimates of survey numbers of males >101 mm (dotted line).

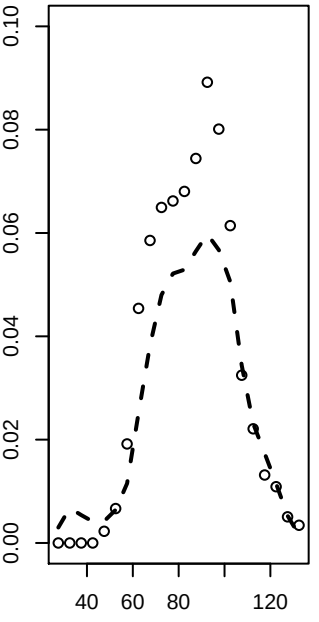


model 17b

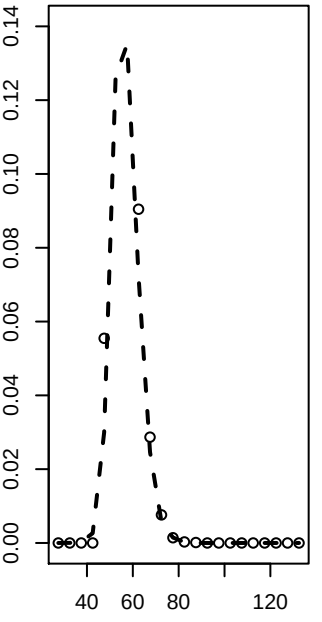
Figure 8. 2009 BSFRF F



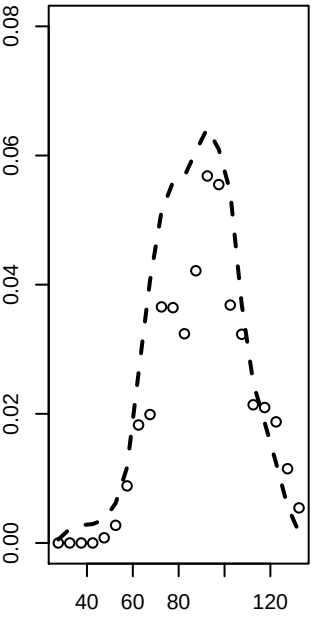
2009 BSFRF M



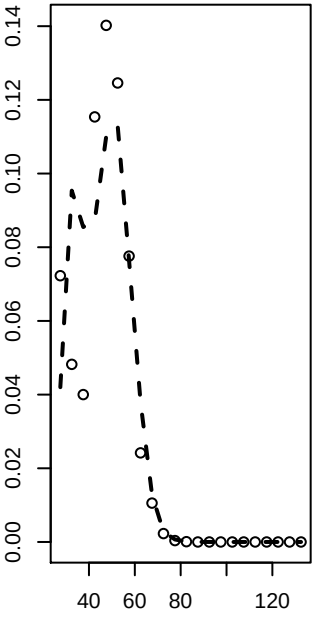
2009 NMFS F



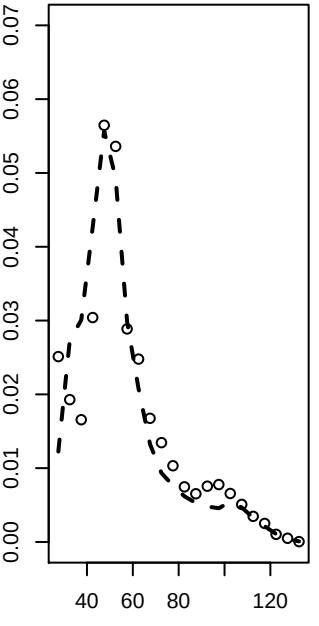
2009 NMFS M



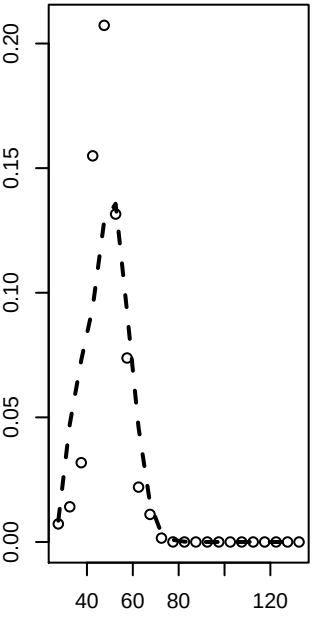
2010 BSFRF F



2010 BSFRF M



2010 NMFS F



2010 NMFS M

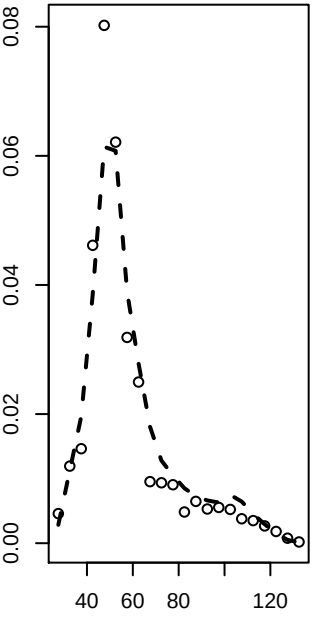


Figure 9. Fits to 2009 study area mature biomass by sex for BSFRF and NMFS data.

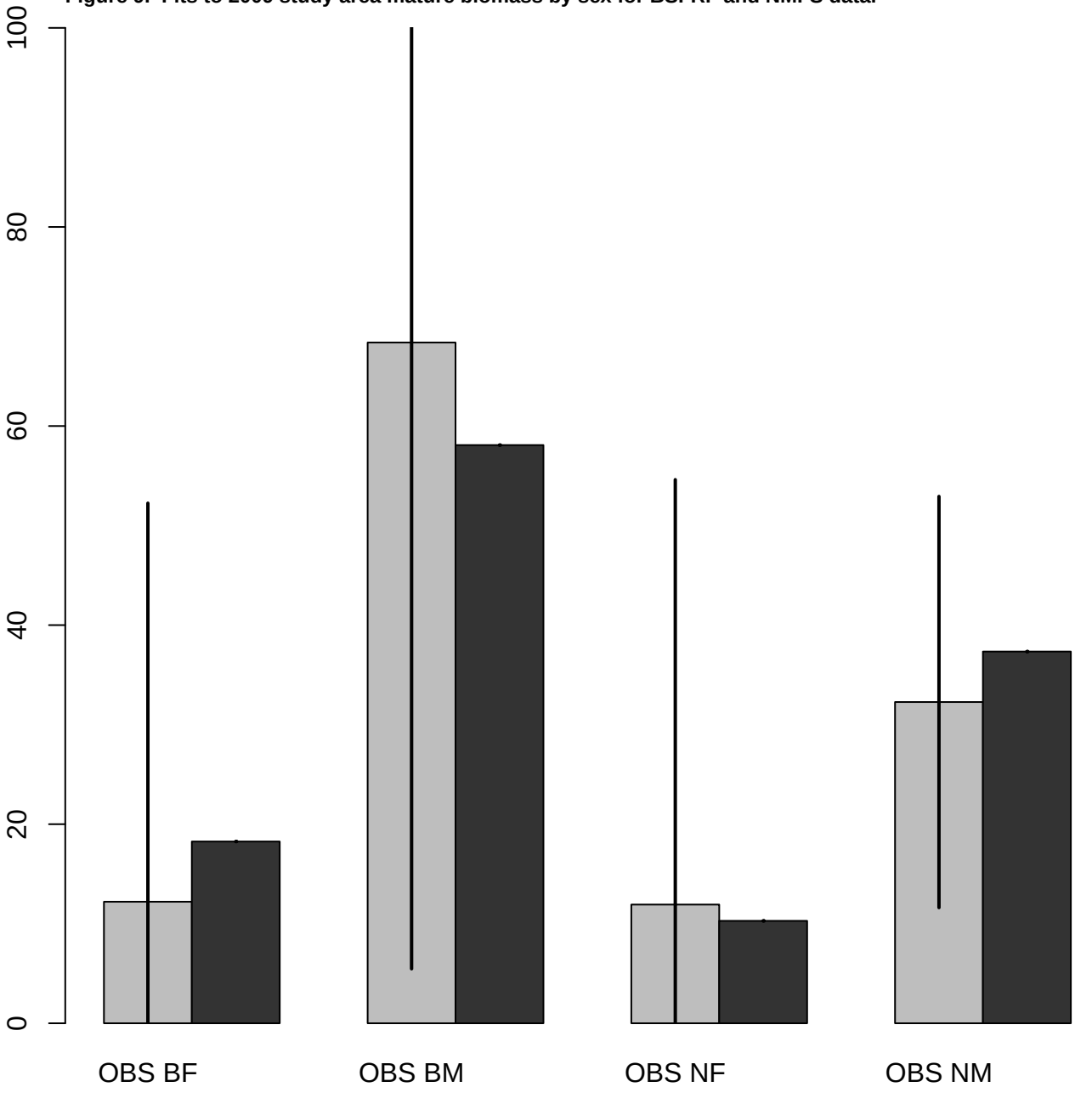


Figure 10. Fits to 2010 study area mature biomass by sex for BSFRF and NMFS data.

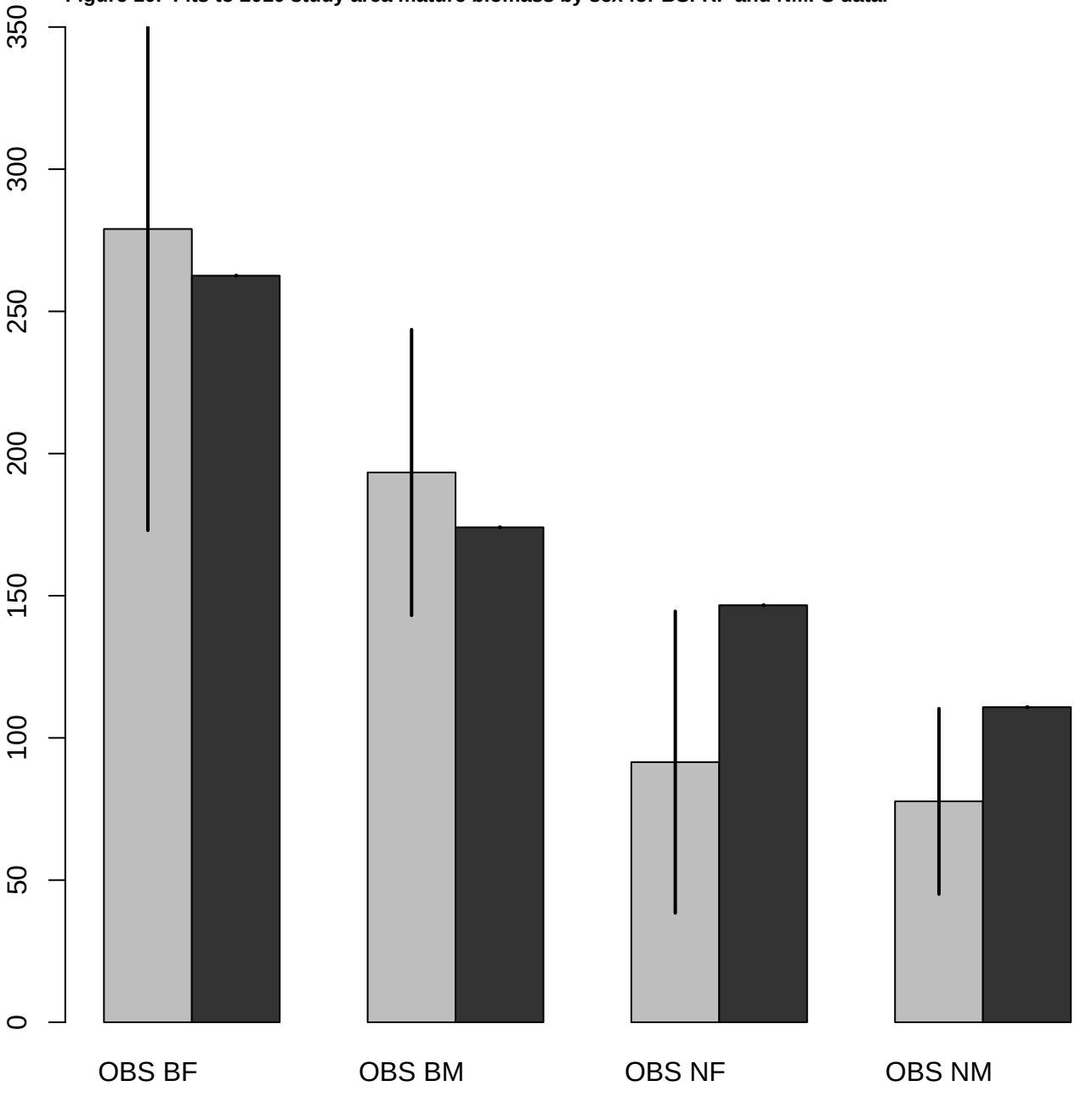


Figure 11. Model fit to the survey female size frequency data. Circles are observed survey data. Solid line is the model fit.

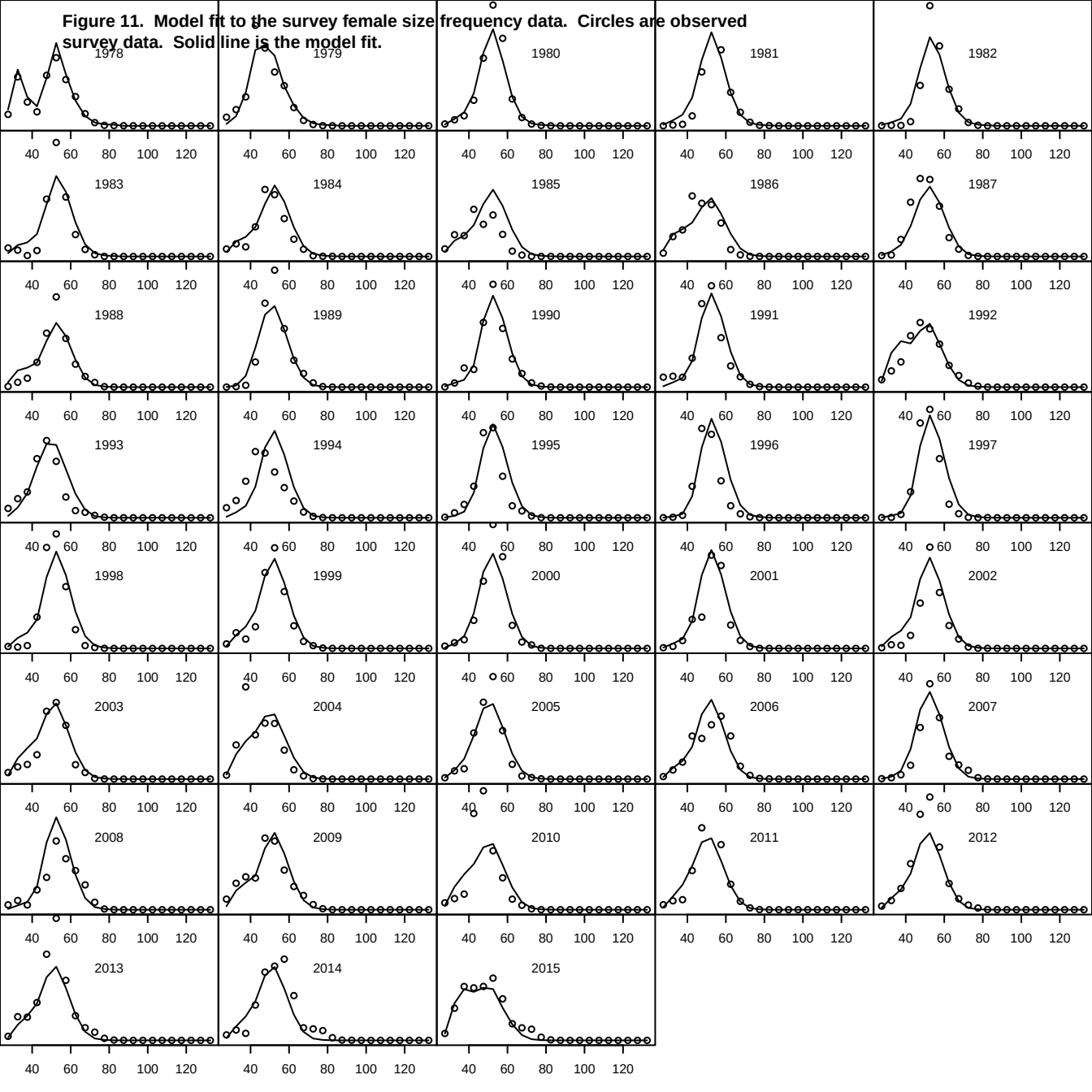


Figure 12. Residuals of fit to survey female size frequency. Filled circles are negative residuals.

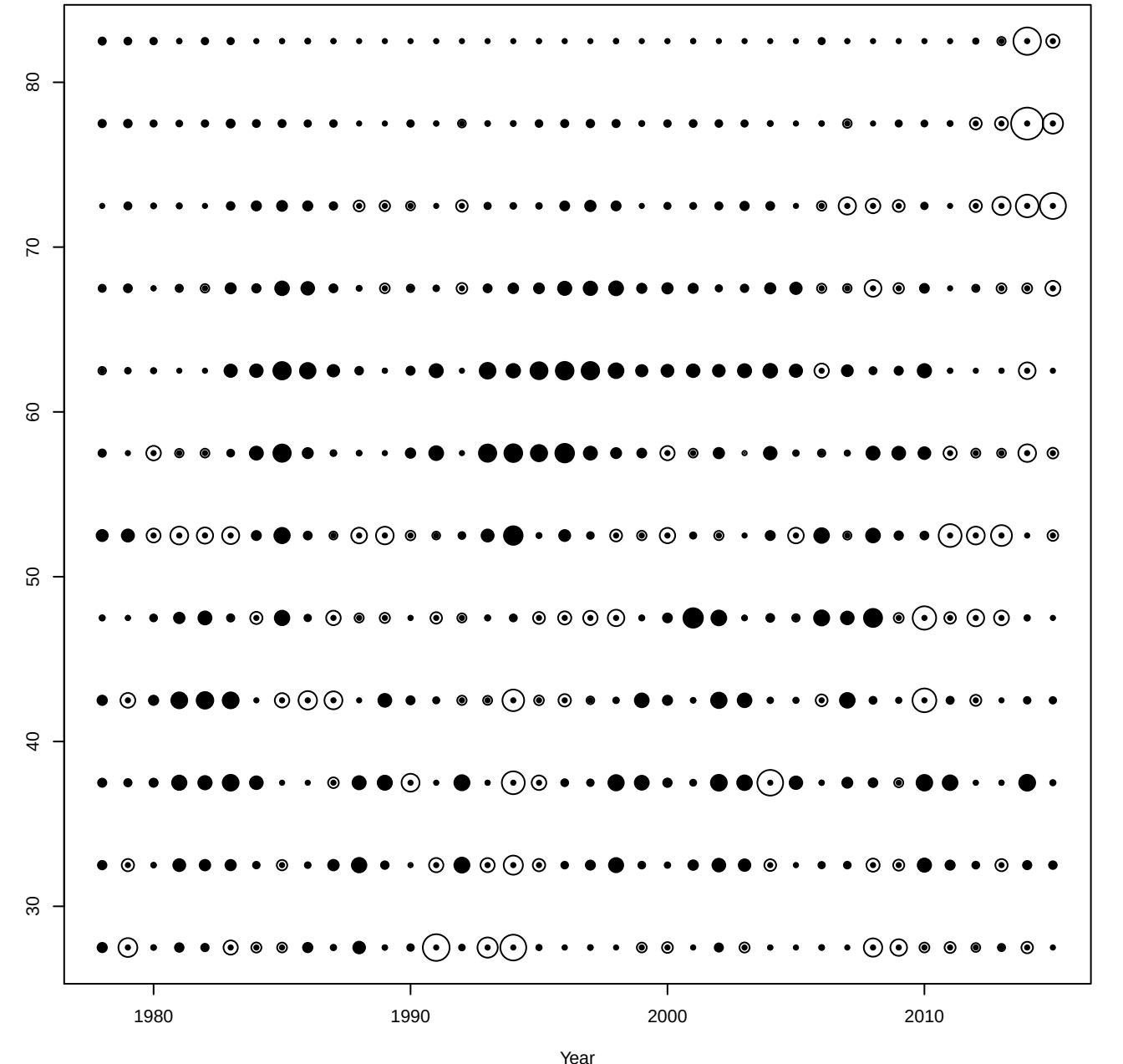
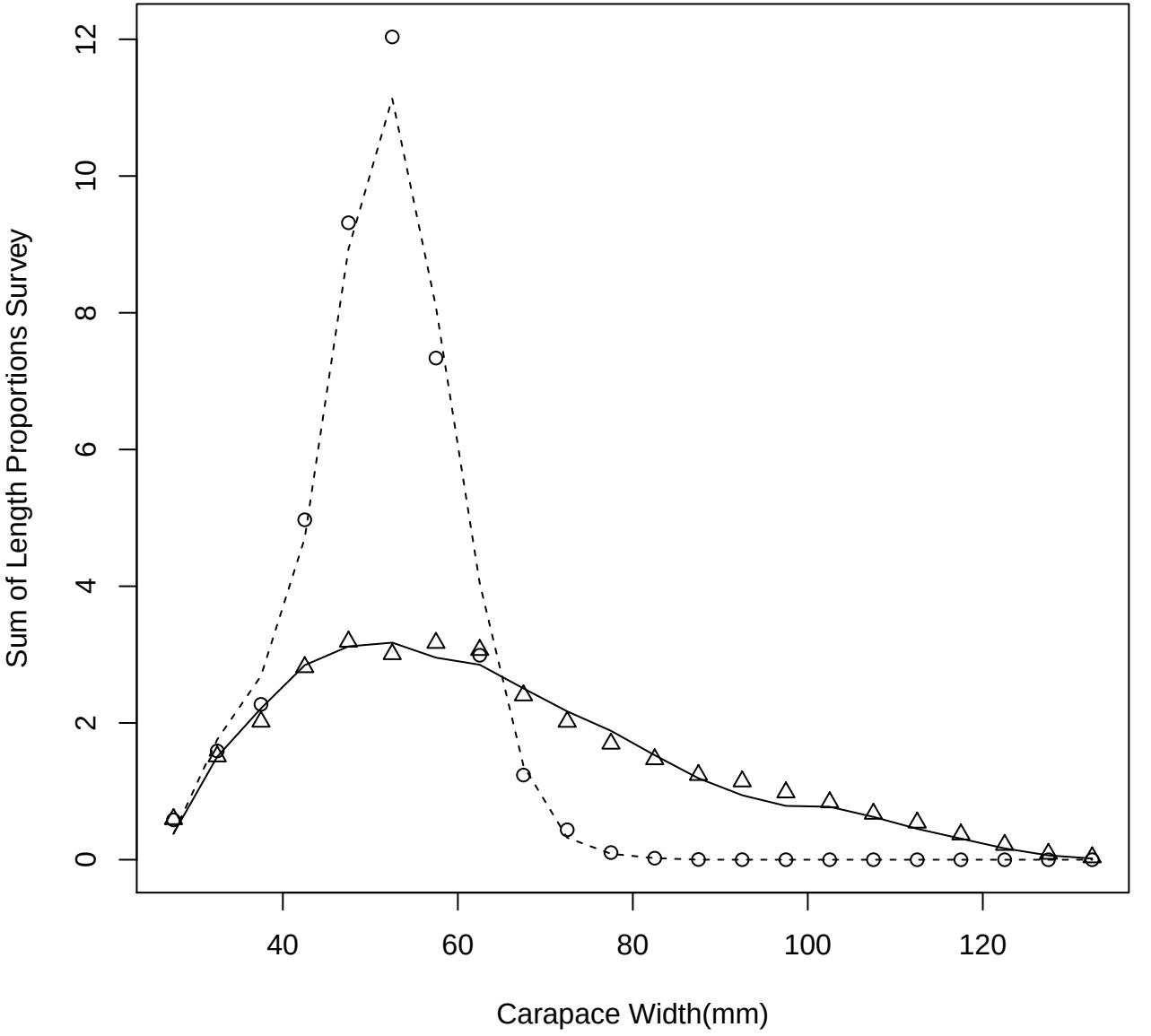


Figure 13. Summary over years of fit to survey length frequency data by sex. Dotted line is fit for females, circles are observed. Solid line is fit for males, triangles are observed.



model 17b

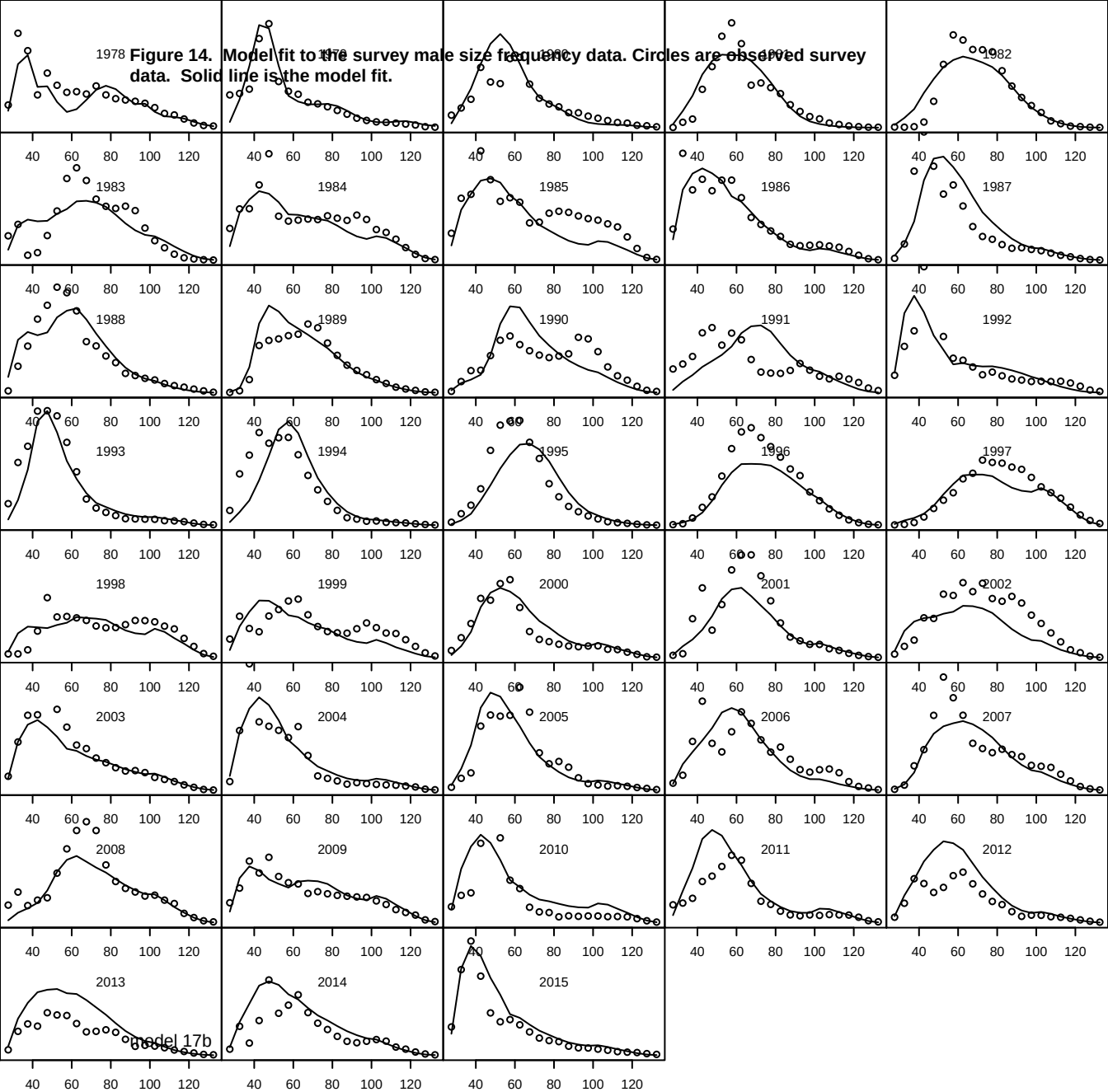
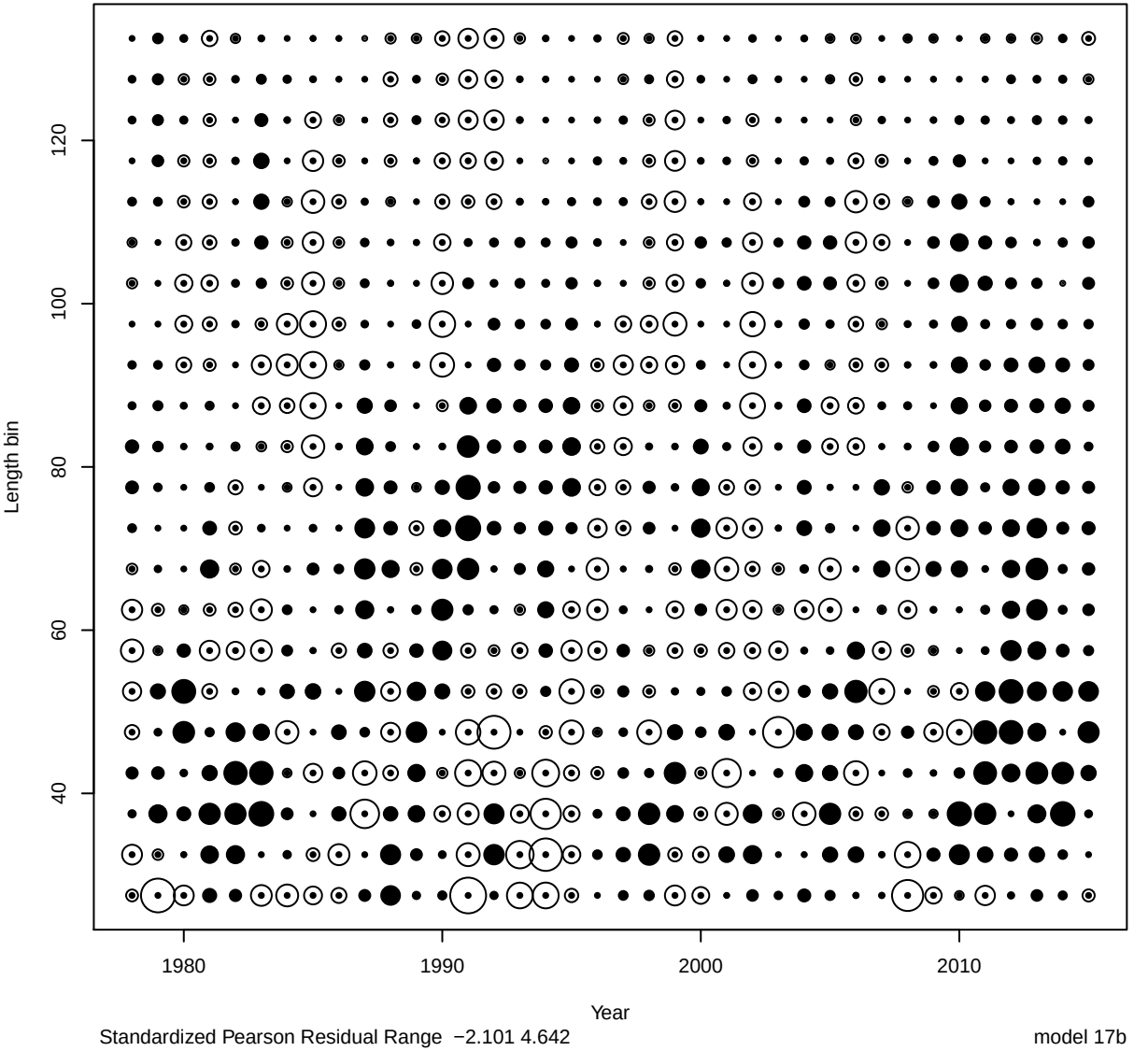


Figure 14. Model fit to the survey male size frequency data. Circles are observed survey data. Solid line is the model fit.

Figure 15. Residuals for fit to survey male size frequency. Filled circles are negative residuals (predicted higher than observed).



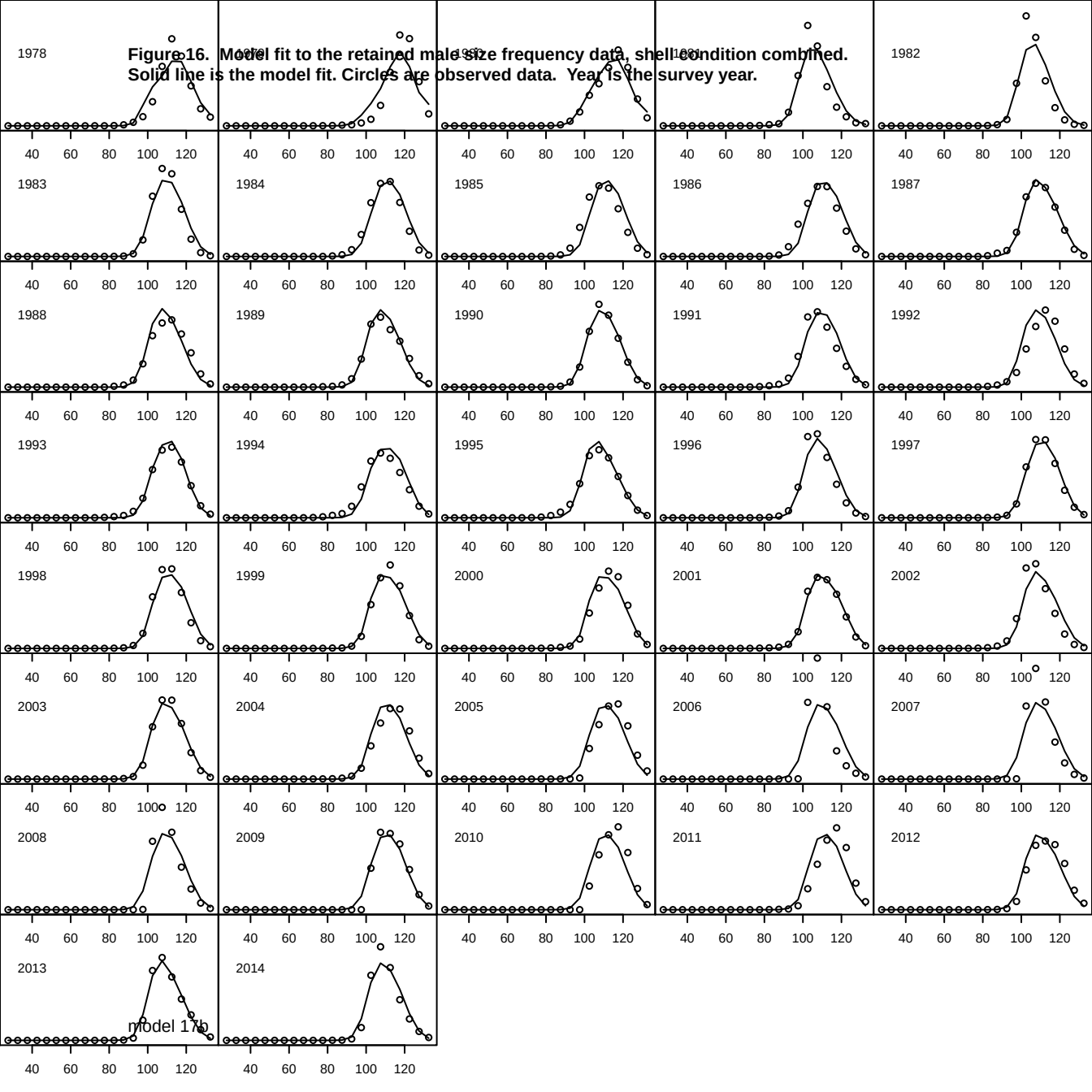
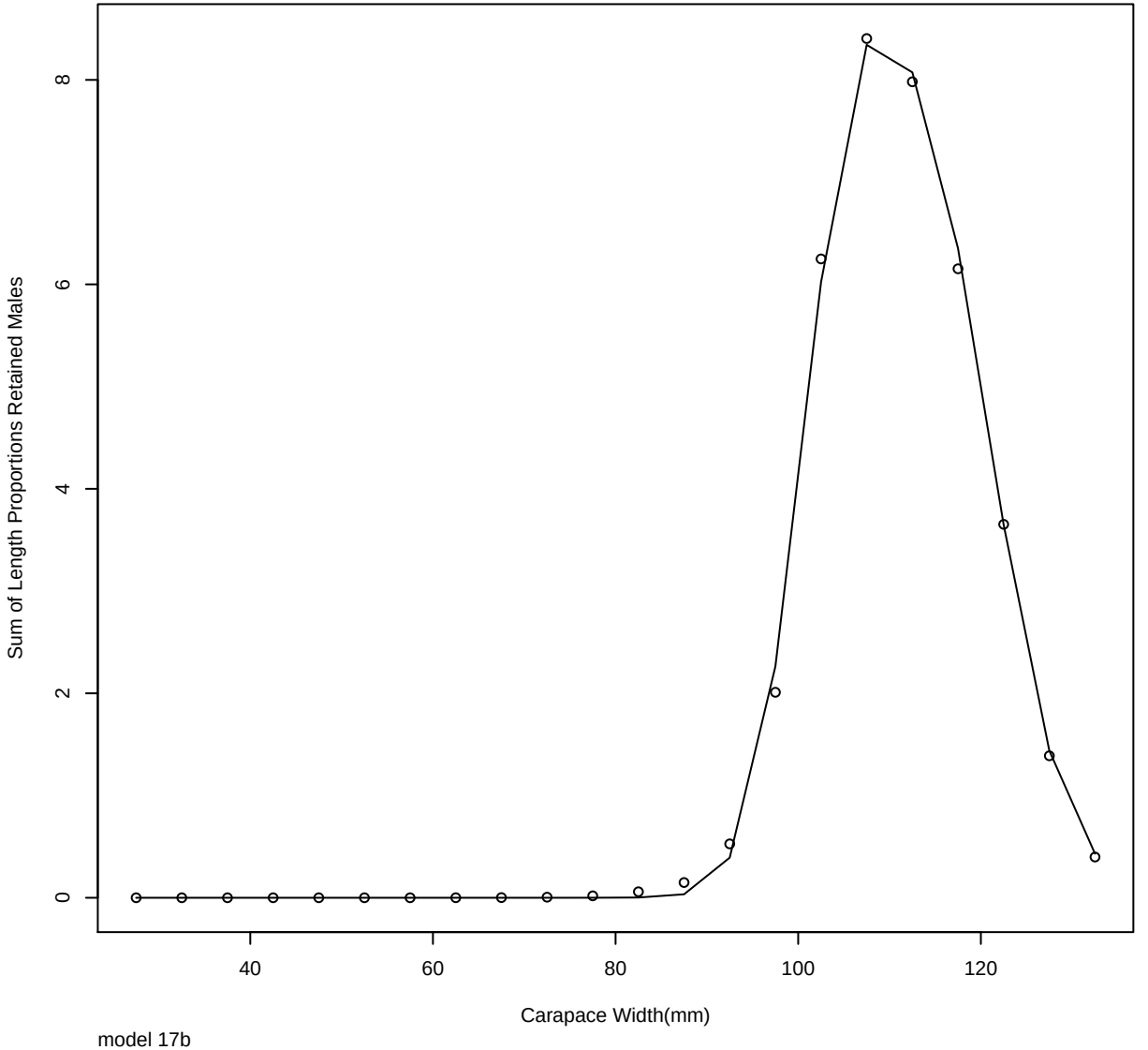


Figure 16. Model fit to the retained male size frequency data, shell condition combined. Solid line is the model fit. Circles are observed data. Year is the survey year.

Figure 17. Summary fit to retained male length.



model 17b

Figure 18. Residuals for fit to retained male size frequency. Filled circles are negative residuals (predicted higher than observed).

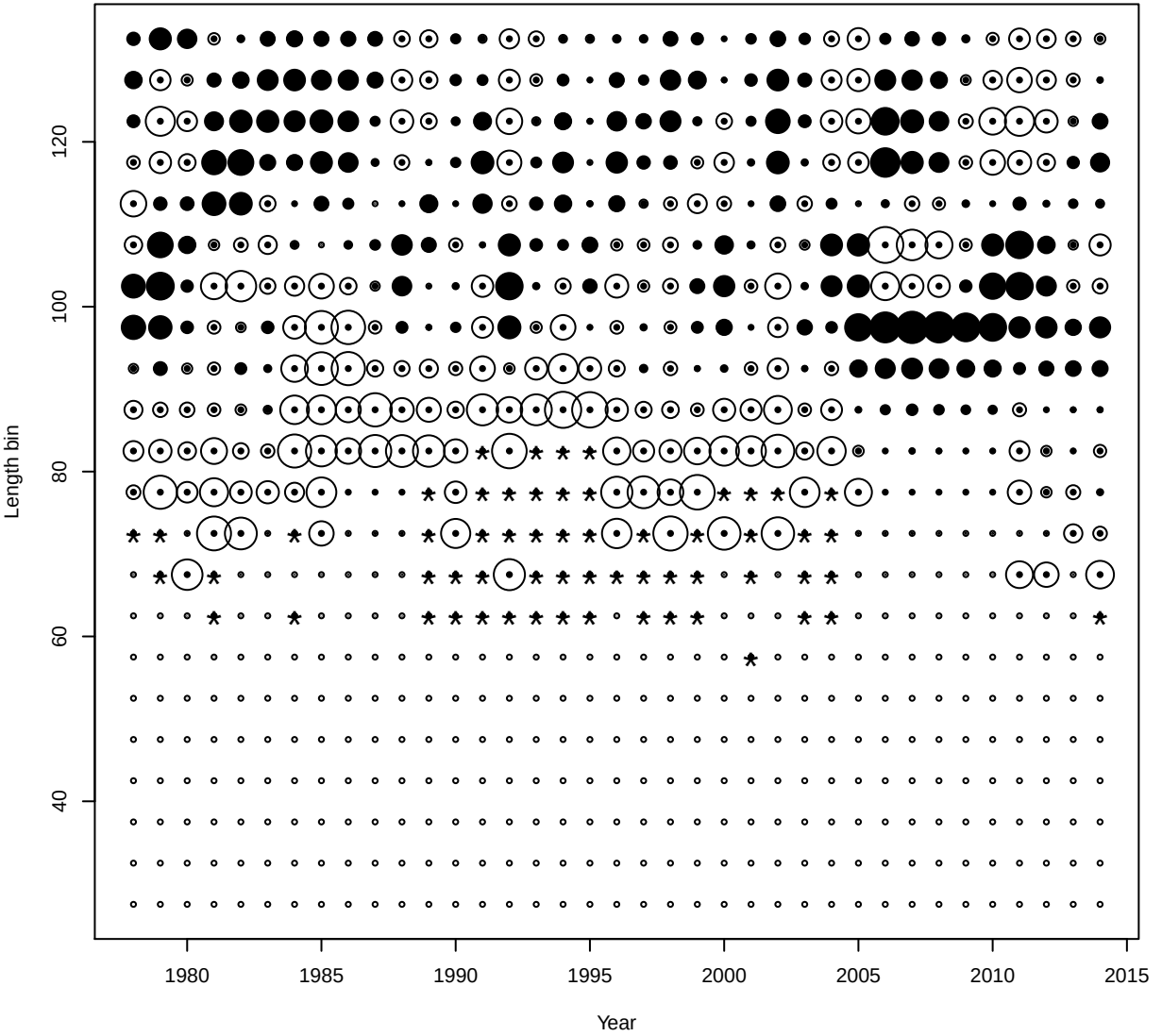


Figure 19. Model fit to the total (discard plus retained) male size frequency data, shell condition combined. Solid line is the model fit. Circles are observed data. Year is the survey year.

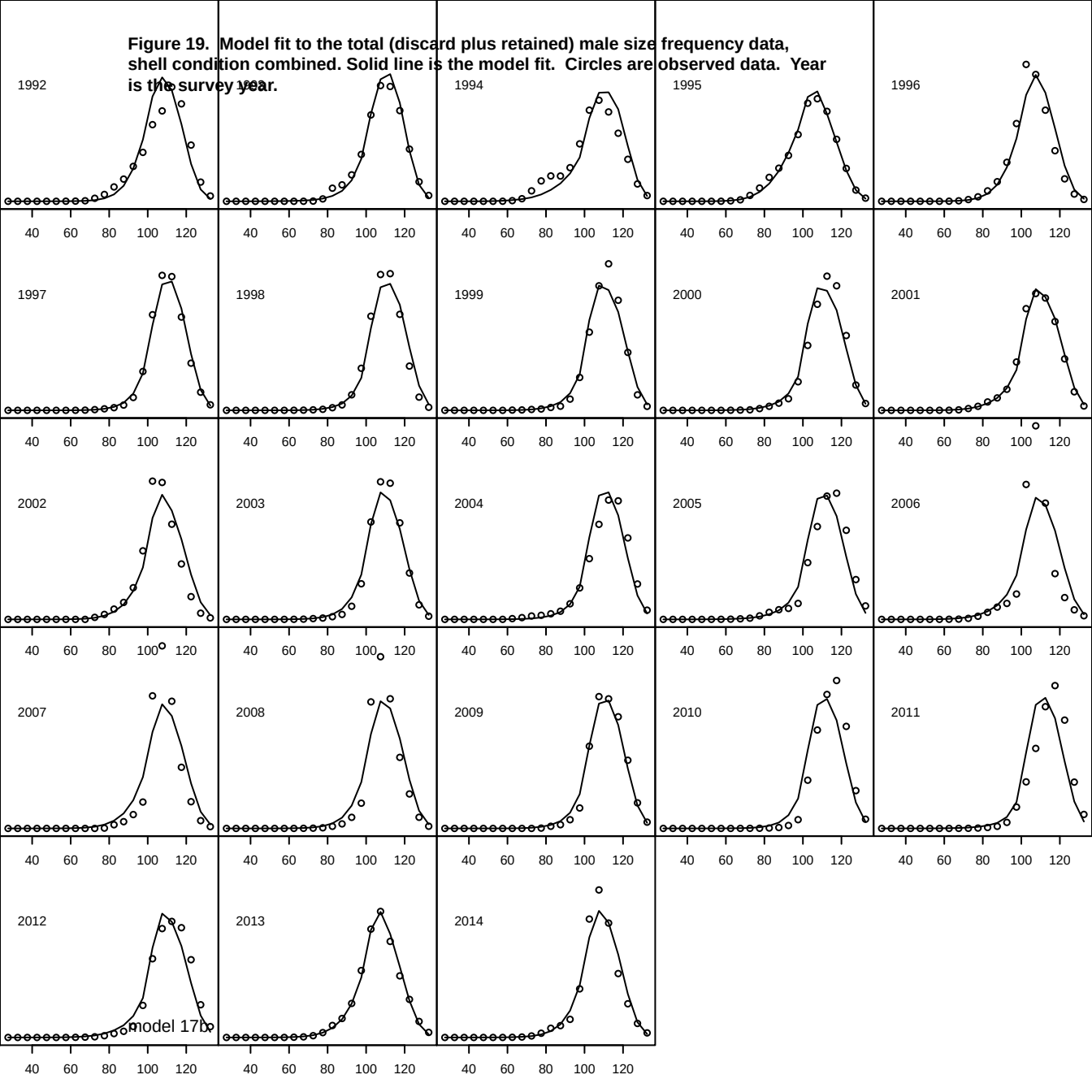
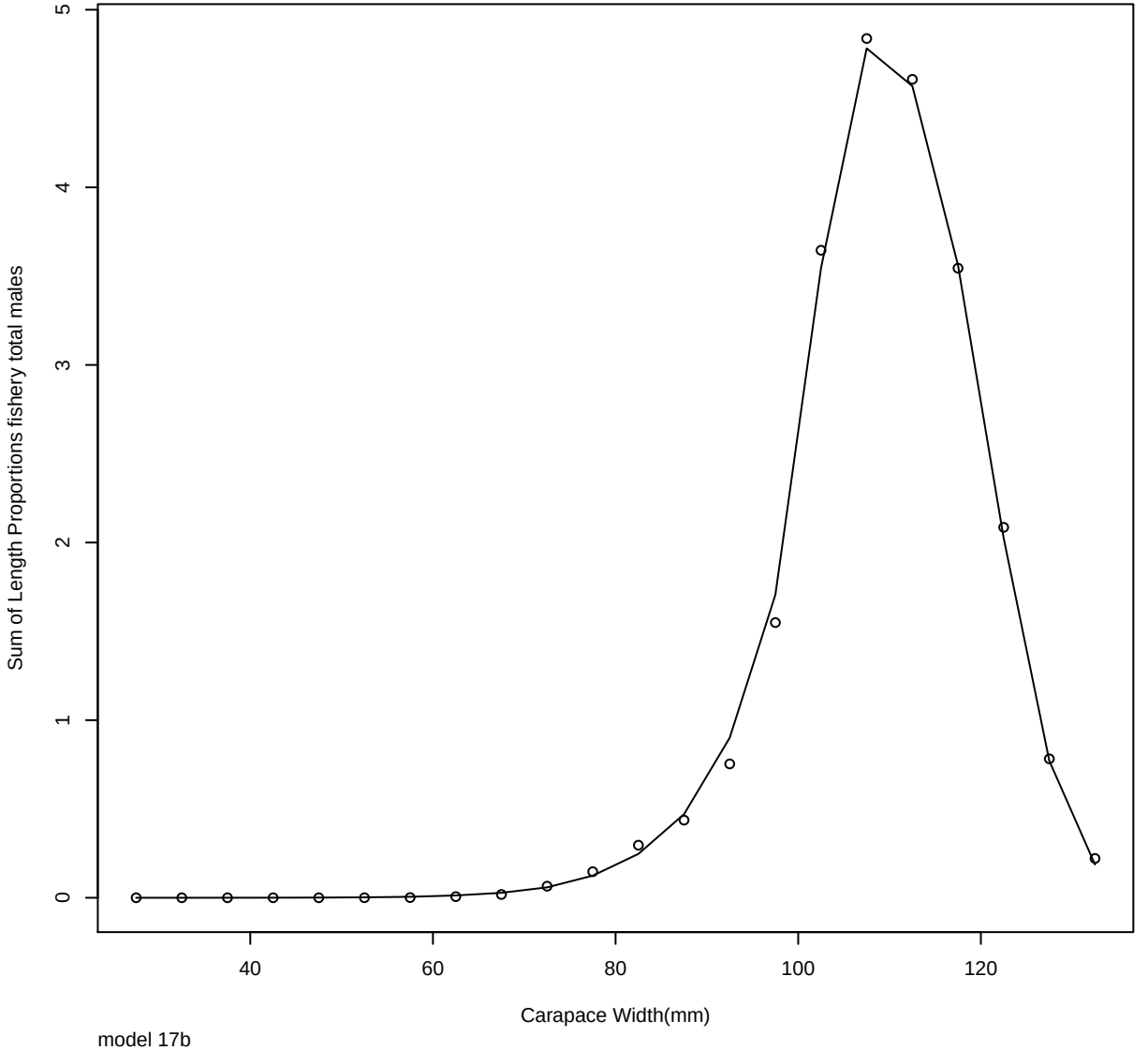


Figure 20. Summary fit to total fishery length frequency male catch.



model 17b

Figure 21. Residuals for fit to total fishery male size frequency. Filled circles are negative residuals (predicted higher than observed).

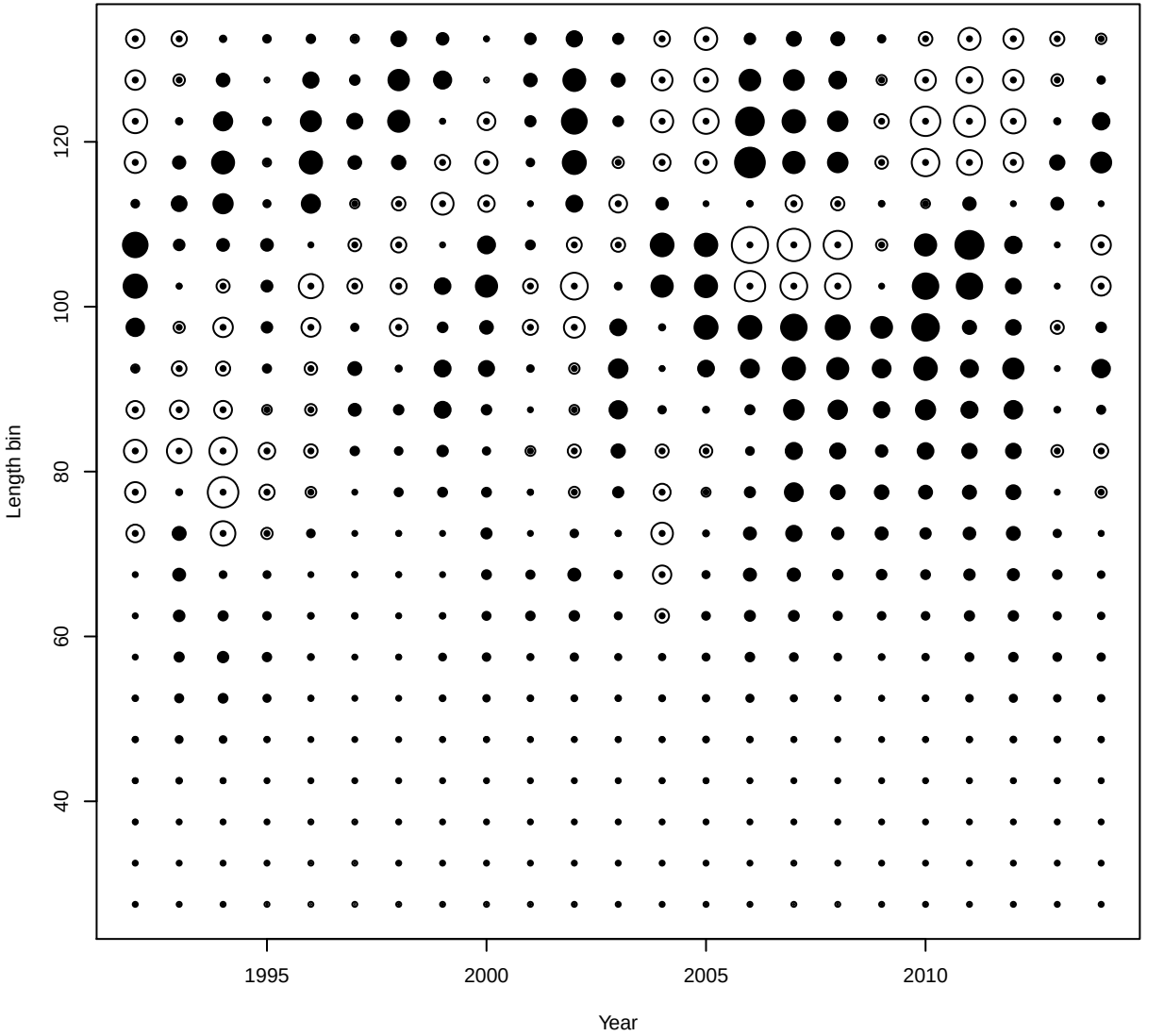


Figure 22. Model fit to the discard female size frequency data. Solid line is the model fit. Circles are observed data. Year is the survey year.

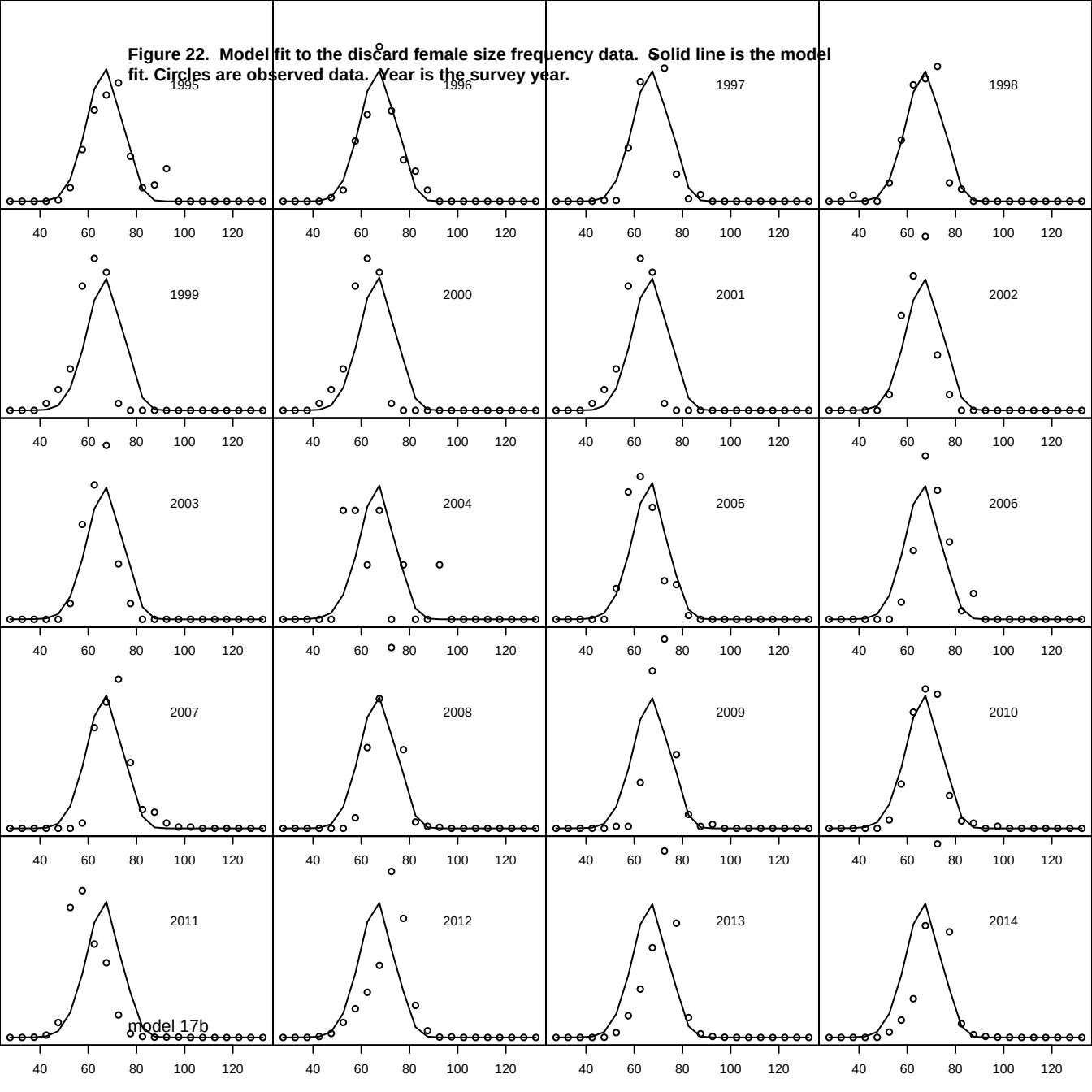
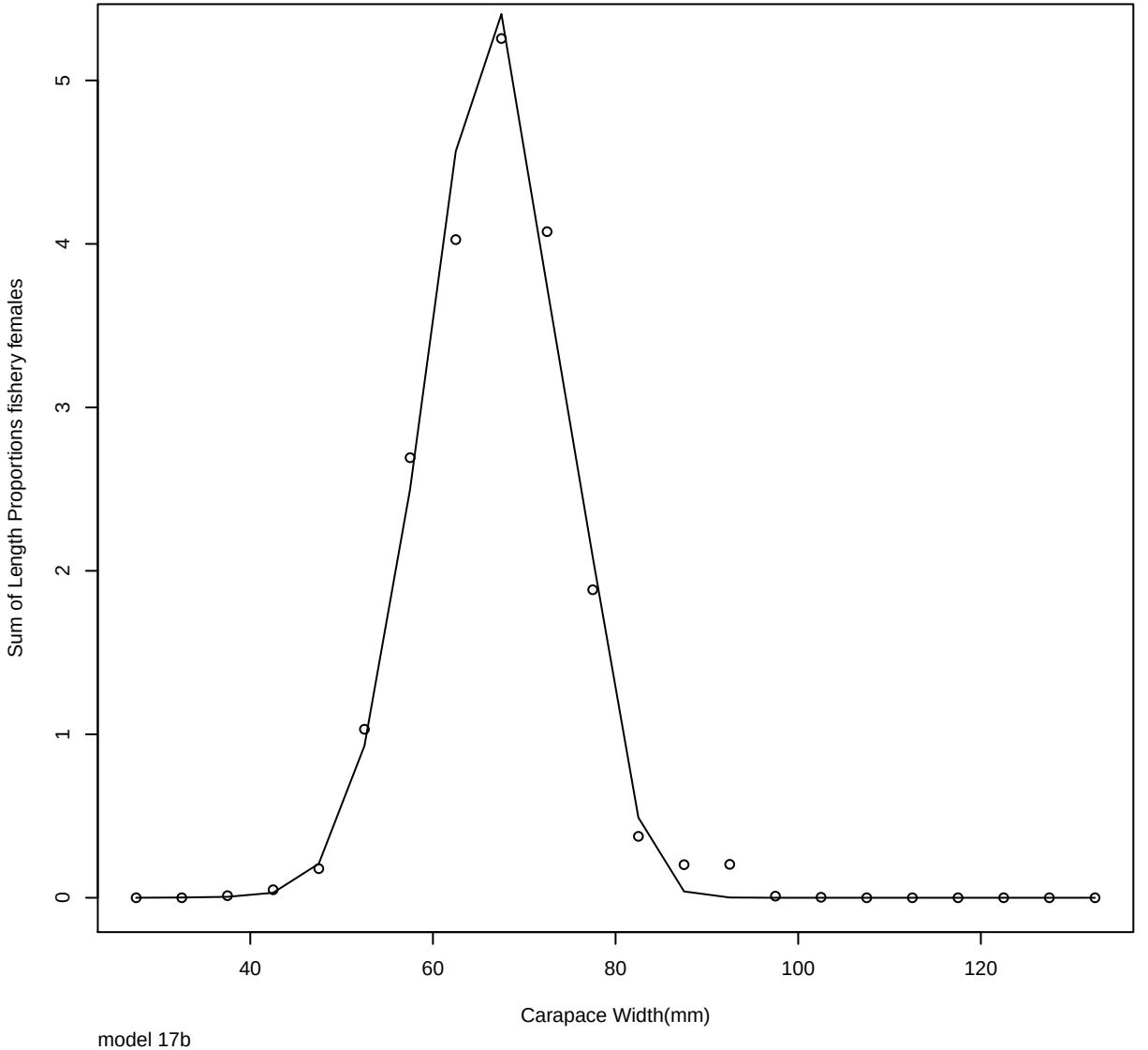


Figure 23. Summary fit to directed fishery female discards.



model 17b

Figure 24. Model fit to the groundfish trawl discard female size frequency data. Solid line is the model fit. Circles are observed data. Year is the survey year.

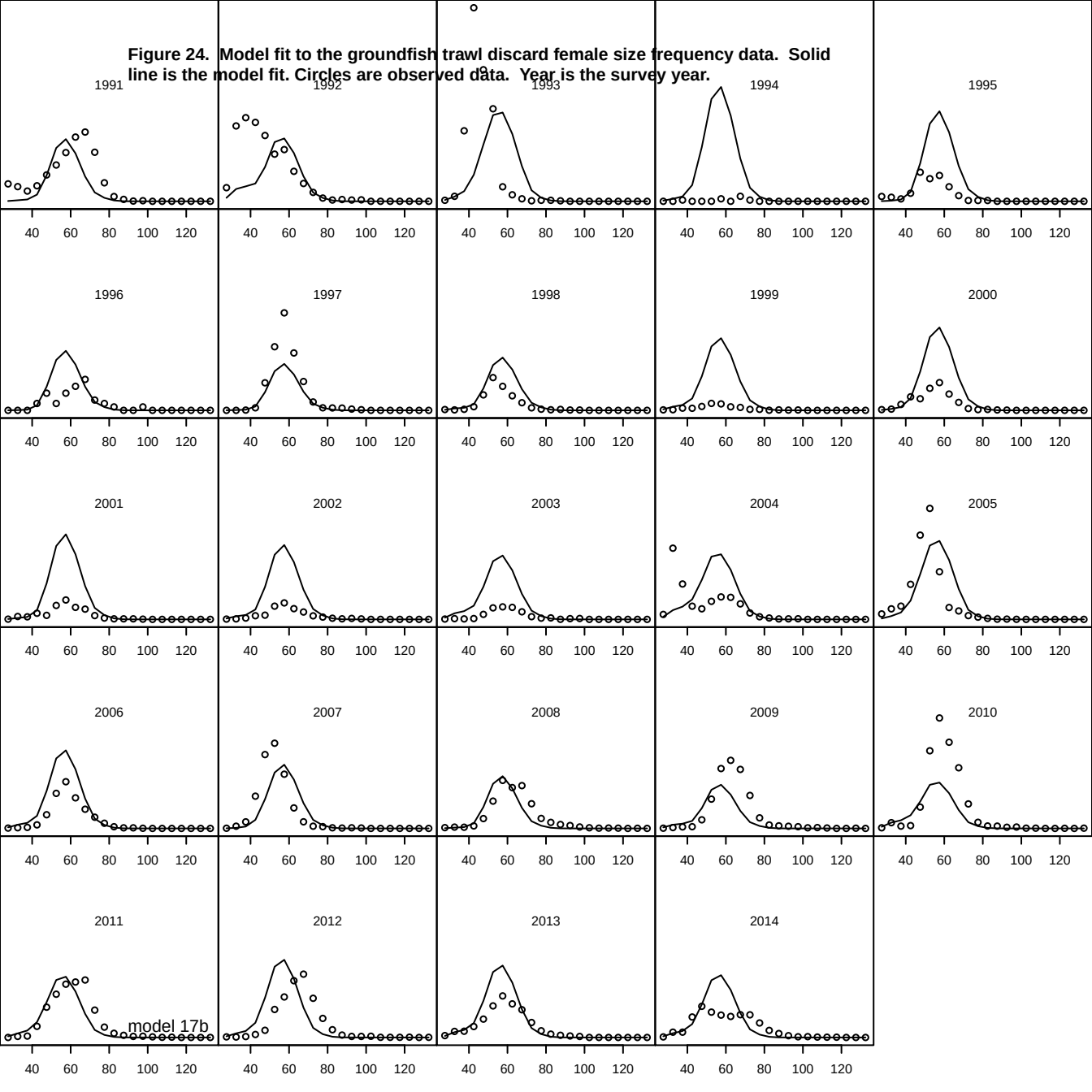


Figure 25. Model fit to the groundfish trawl discard male size frequency data. Solid line is the model fit. Circles are observed data. Year is the survey year.

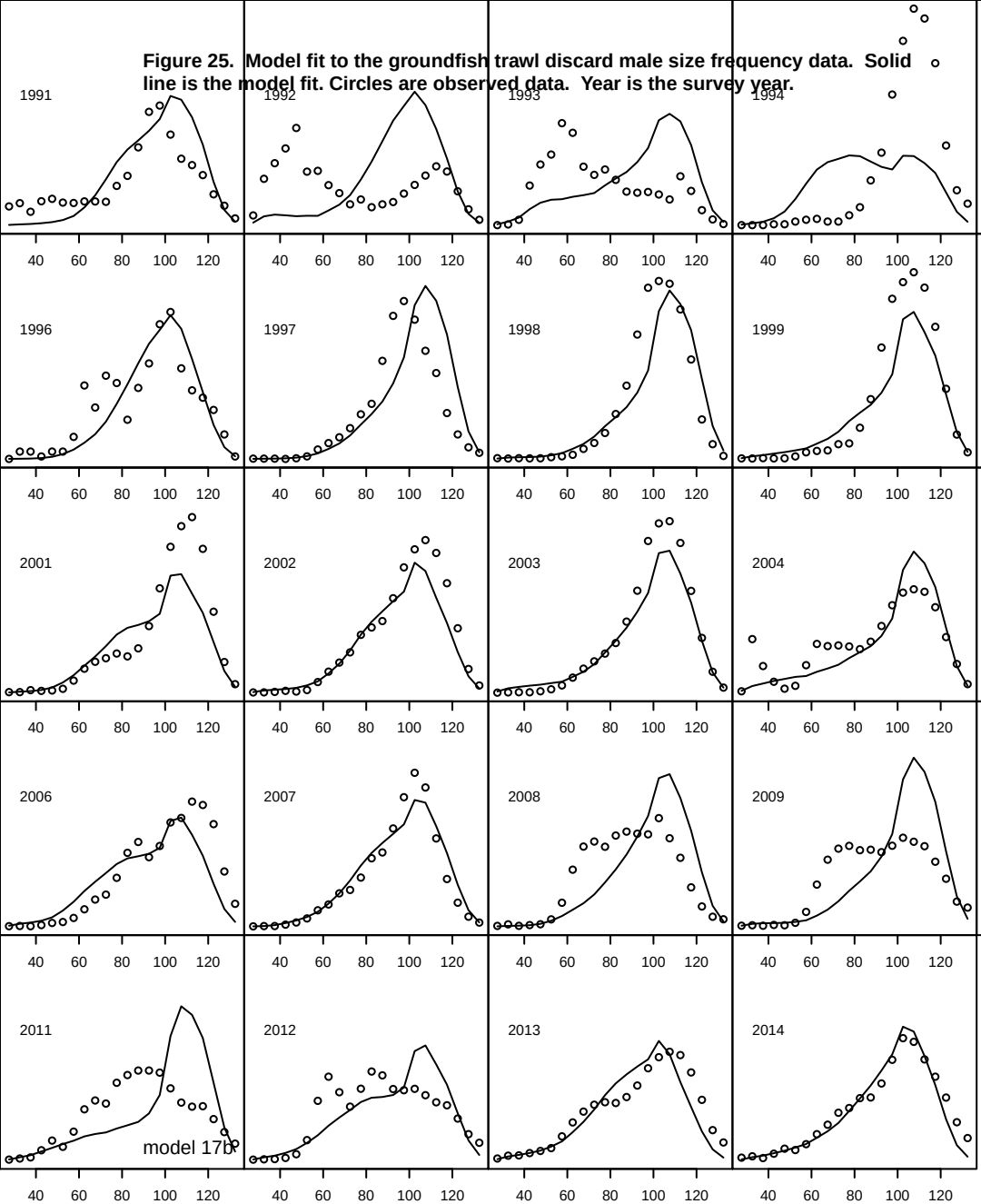
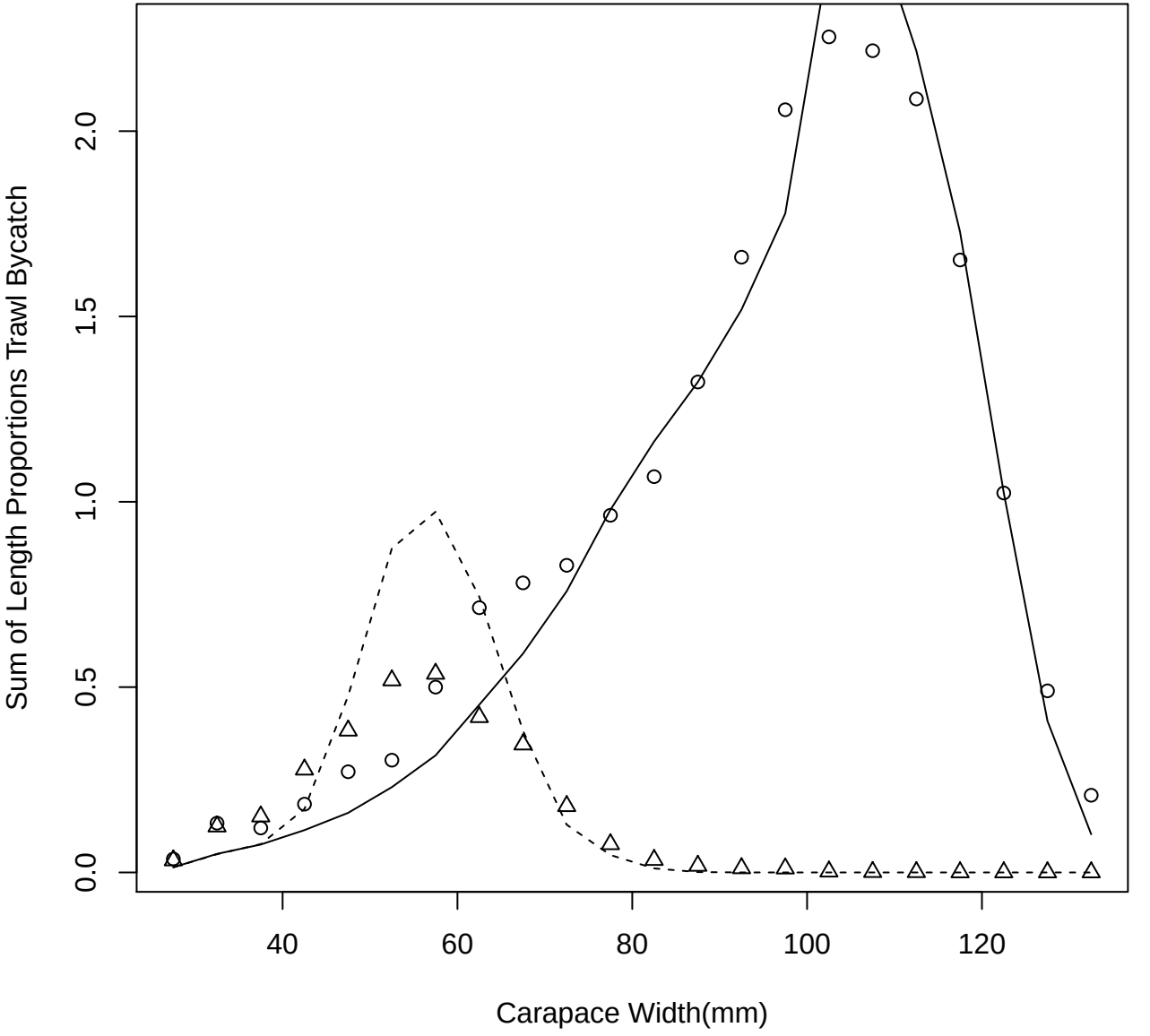
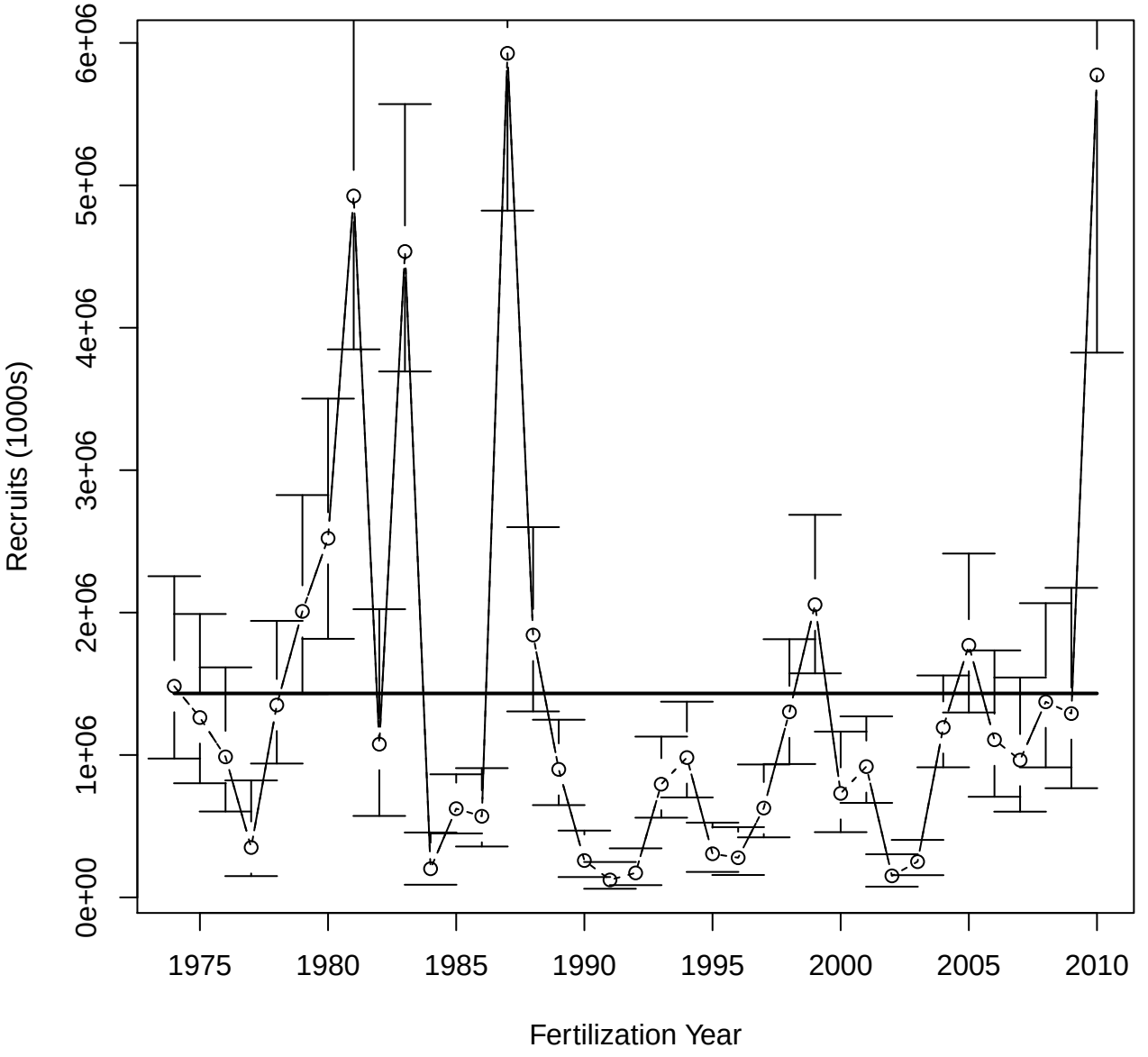


Figure 26. Summary fit to groundfish length frequency.



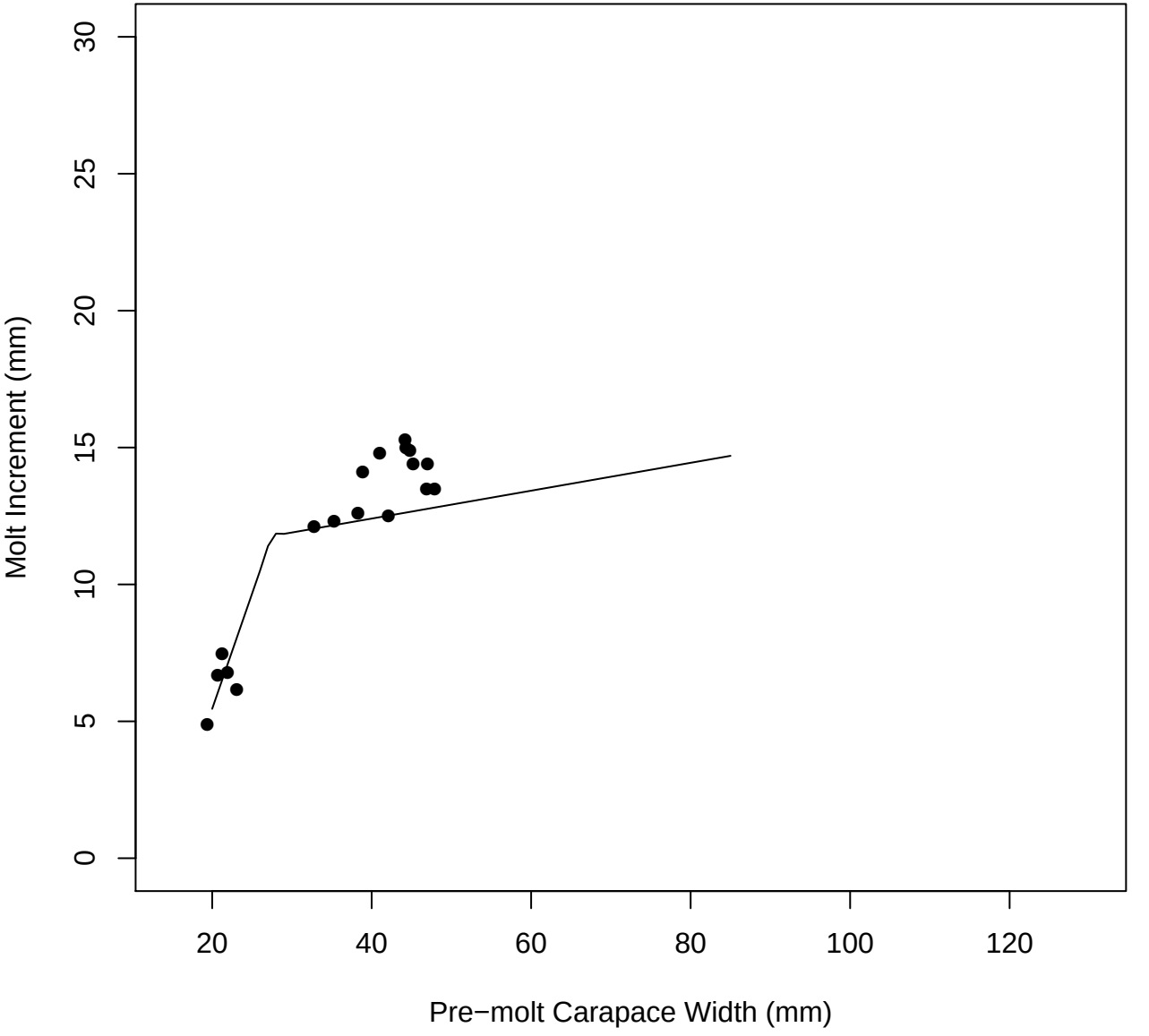
model 17b

Figure 27. Recruitment to the model for crab 25 mm to 50 mm. Total recruitment is 2 times recruitment in the plot. Male and female recruitment fixed to be equal. Solid horizontal line is average recruitment. Error bars are 95% C.I.



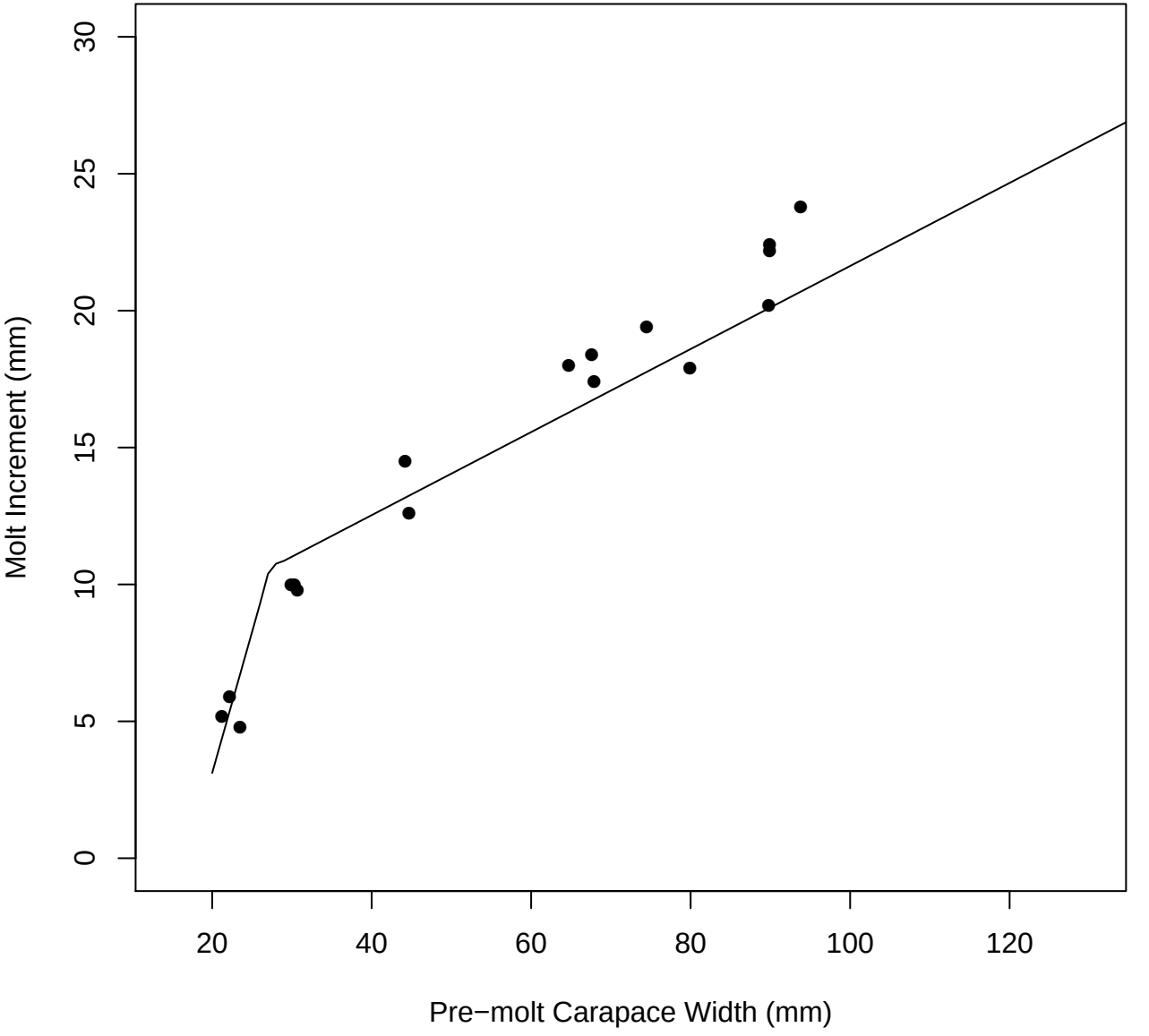
model 17b

Figure 28. Estimated growth curve for female snow crab with 2011 growth study data.



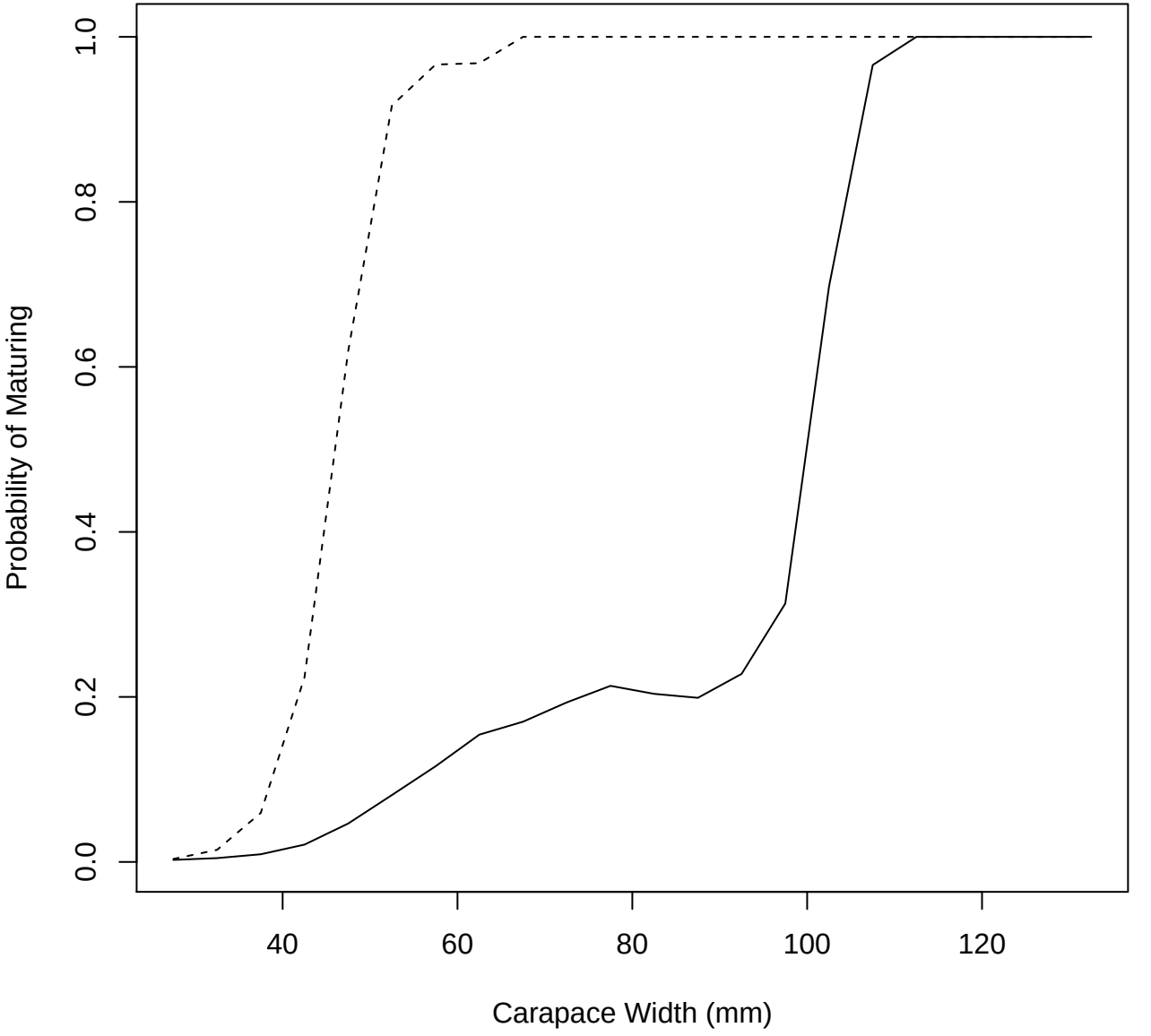
model 17b

Figure 29. Estimated growth curve for male snow crab with 2011 growth study data.



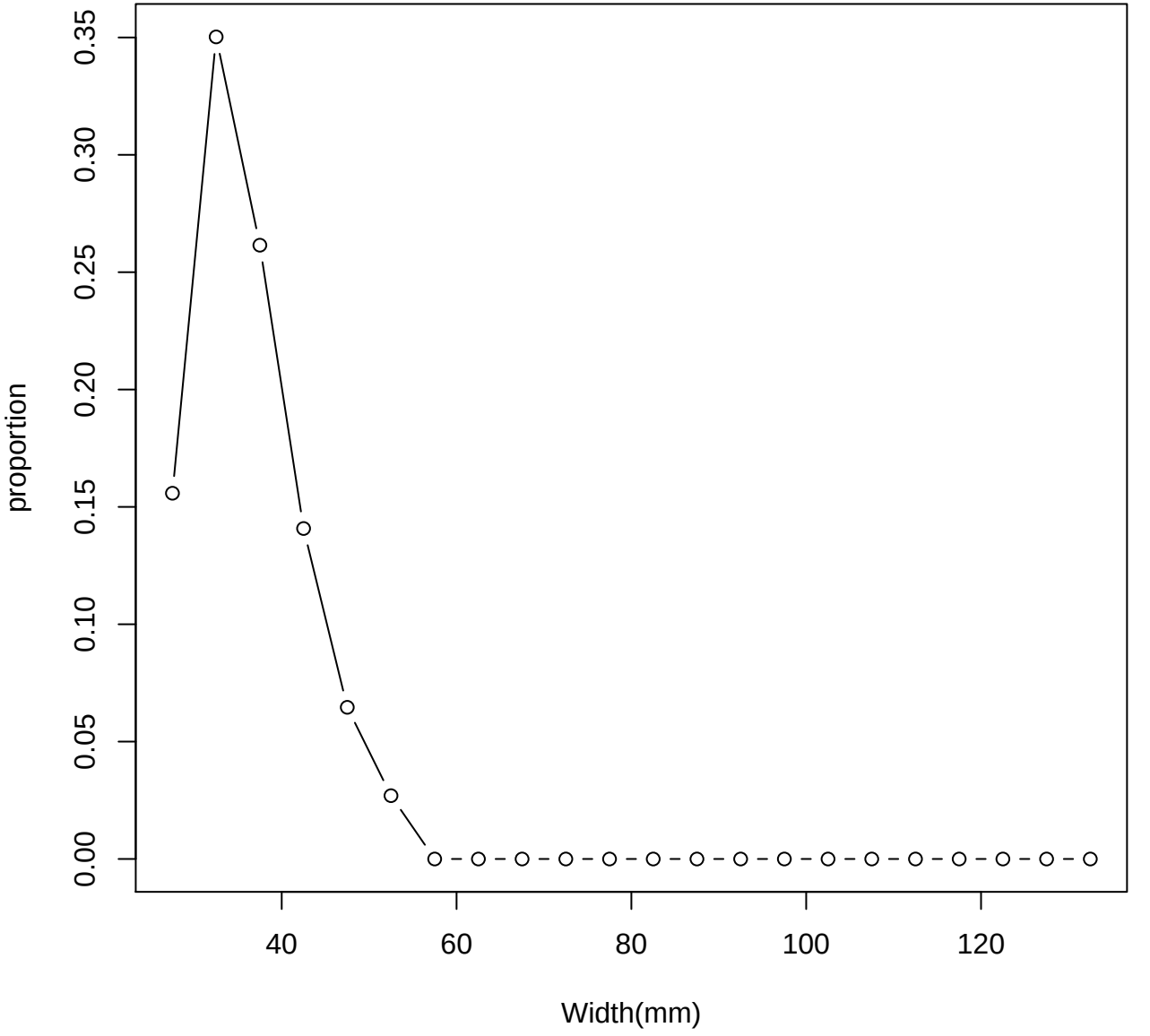
model 17b

Figure 30. Probability of maturing by size estimated in the model for male(solid line) and female (dashed line) snow crab (not the average fraction mature). Triangles are values for females used in the 2009 assessment. Circles are values for males used in the 2009 assessment.



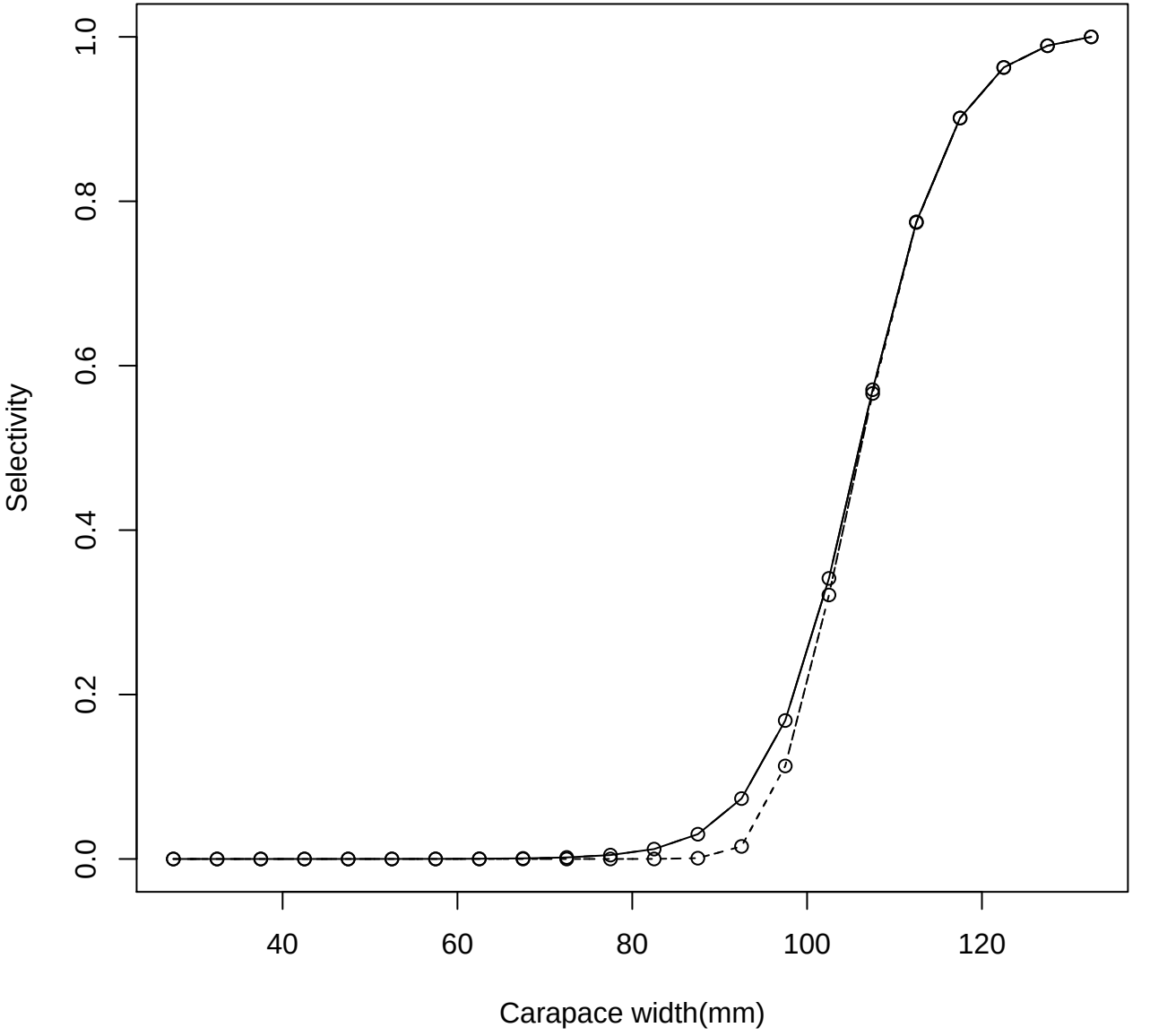
model 17b

Figure 31. Distribution of recruits to length bins estimated by the model.



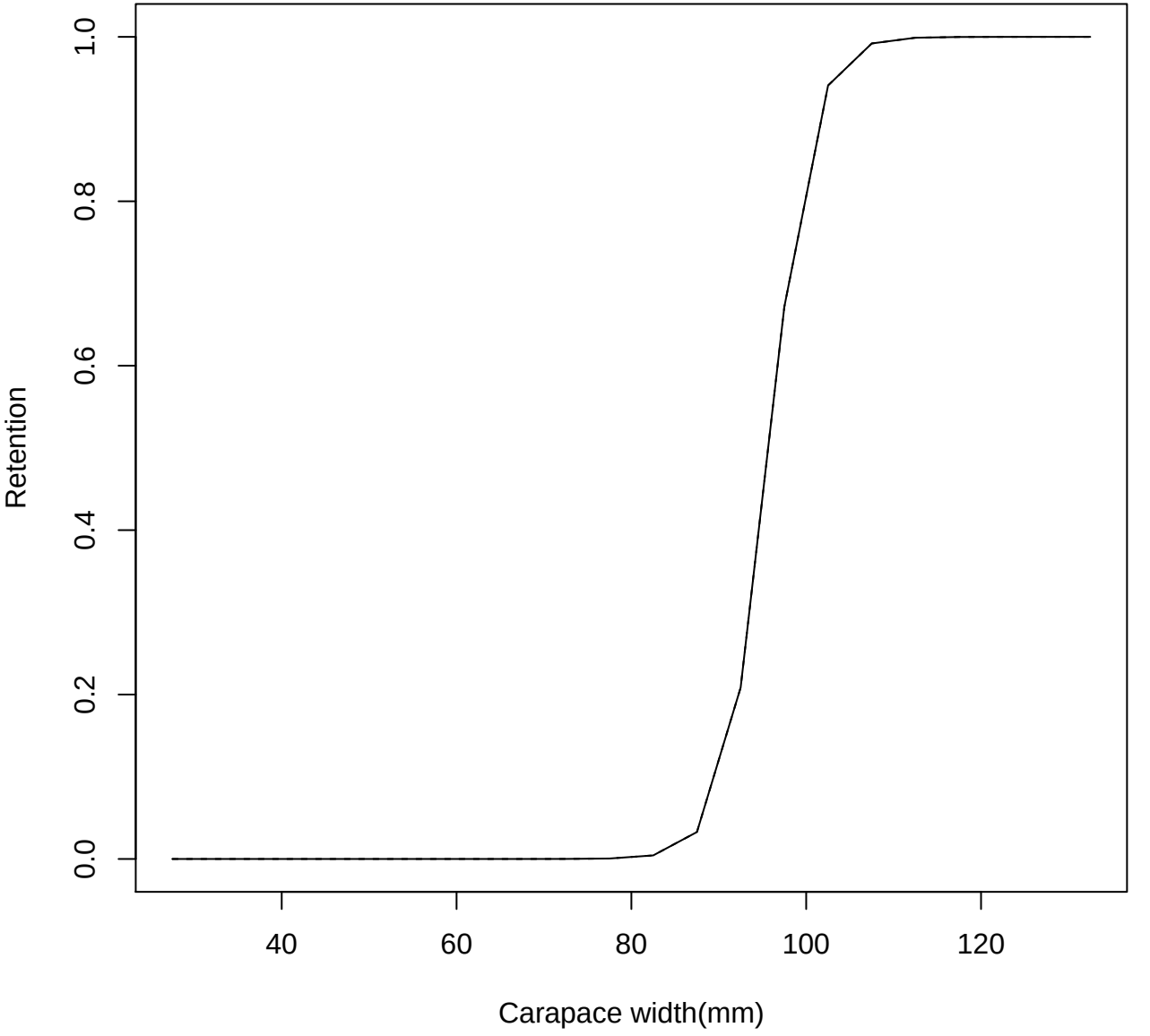
model 17b

Figure 32. Selectivity curve for total catch (discard plus retained, solid line) and retained catch (dotted line) for combined shell condition male snow crab.



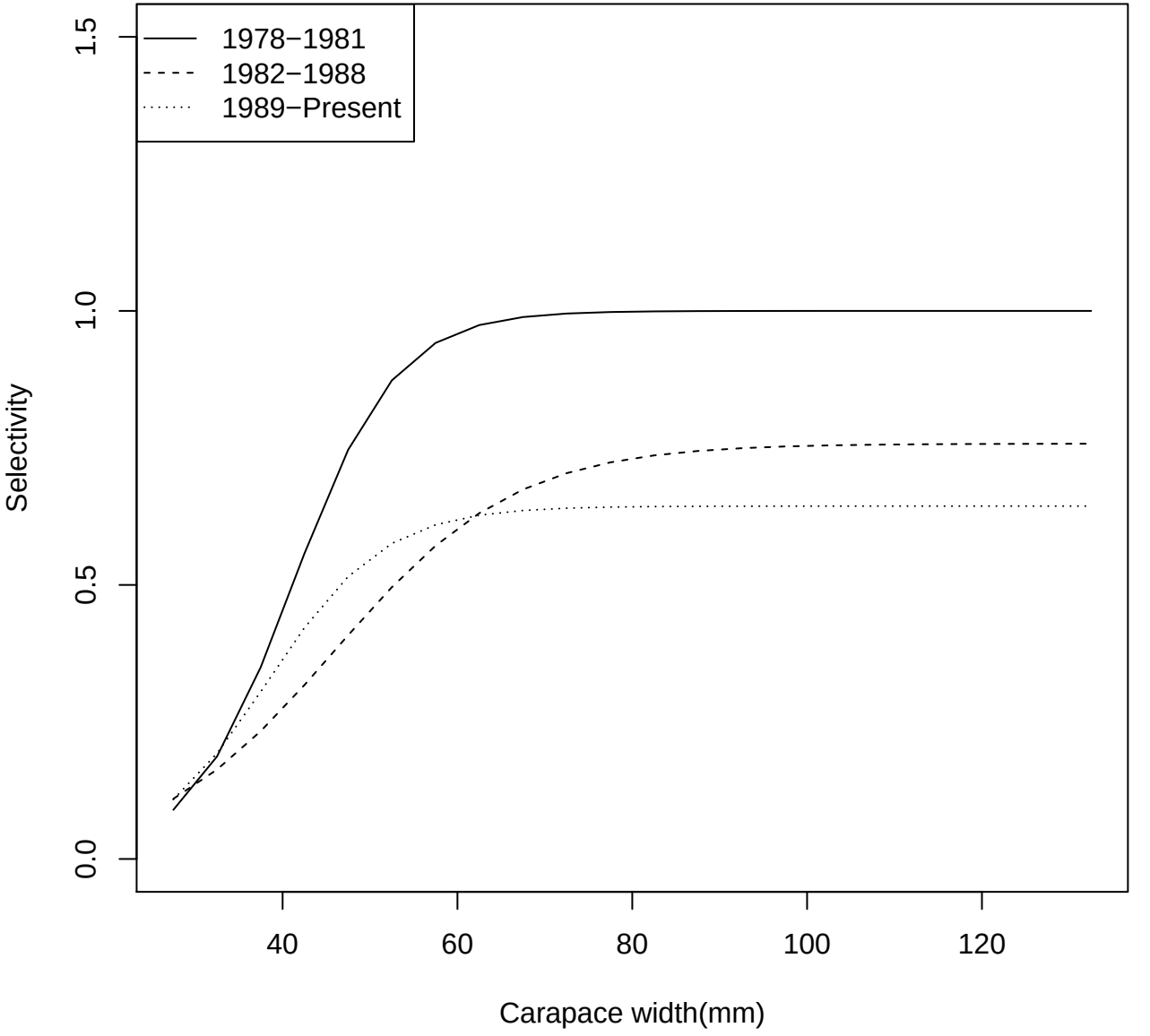
model 17b

Figure 33. Retention curve males.



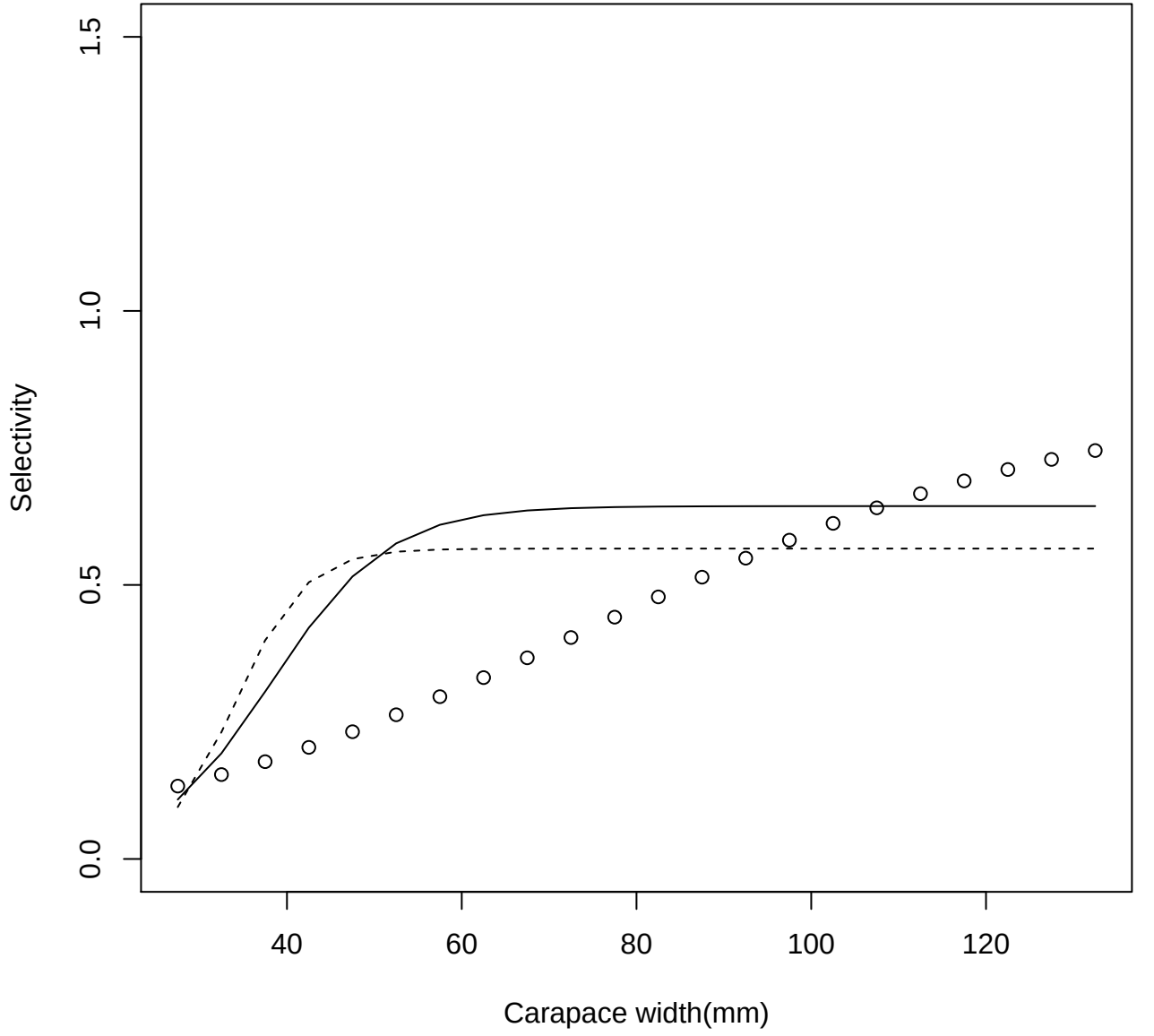
model 17b

Figure 34. Survey selectivity for male snow crab estimated for three periods: 1) 1978−1981, 2) 1982−1988 and 3) 1989−Present.



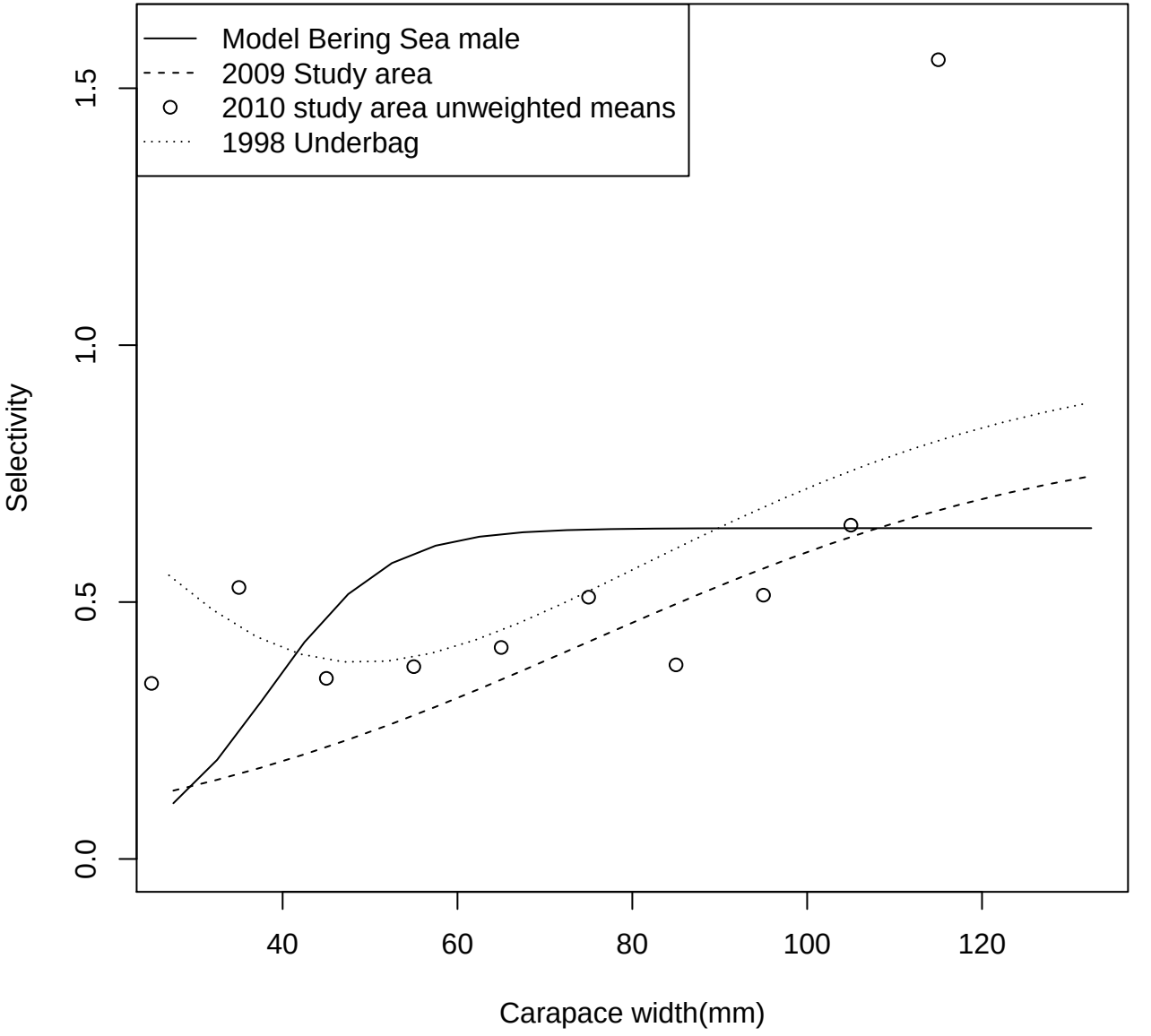
model 17b

Figure 35. Survey selectivity curves for female (dotted lines) and male snow crab (solid lines) estimated by the model for 1989 to present. Survey selectivities estimated by Somerton from 2009 study area data (2010) are the circles.



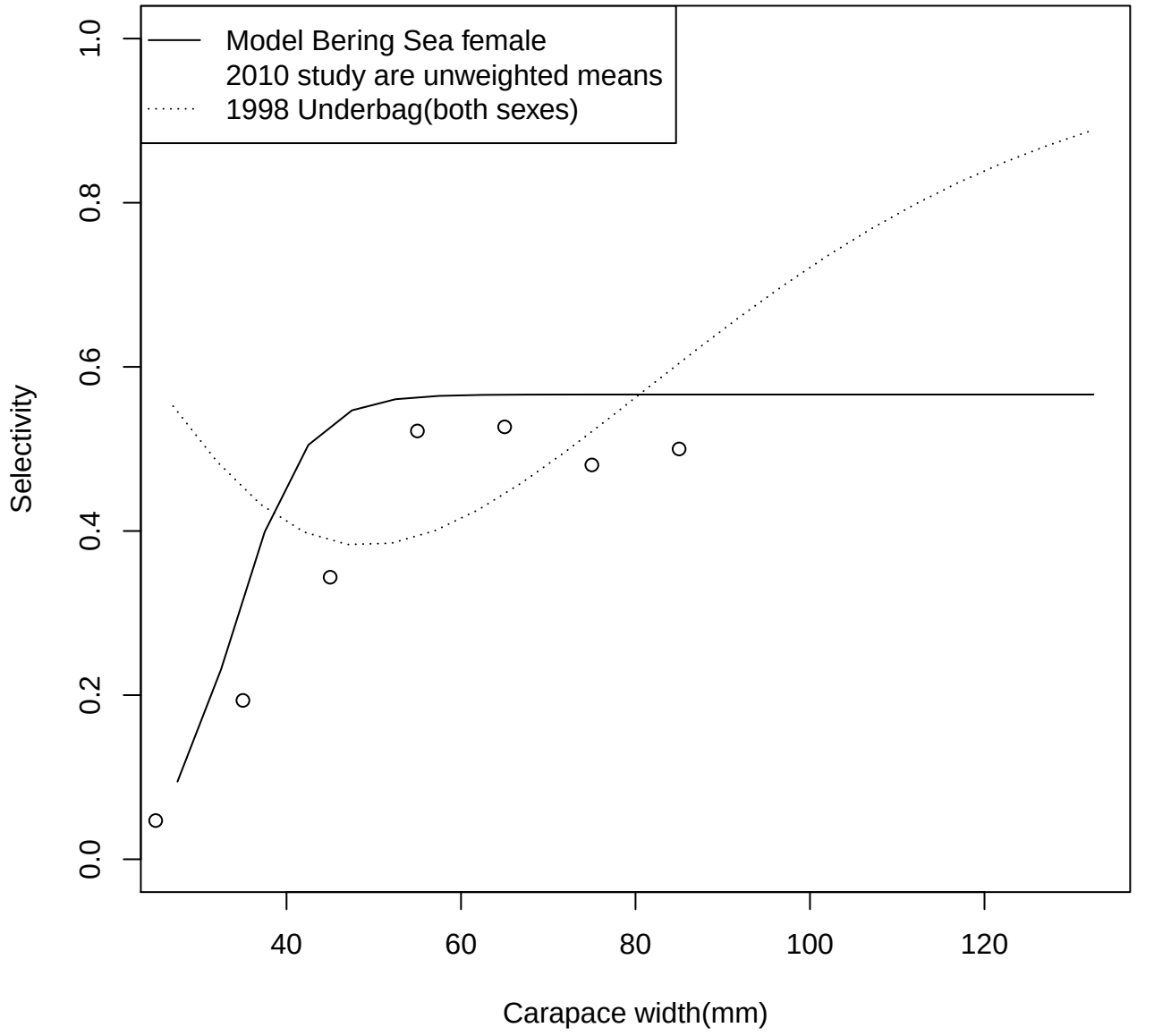
model 17b

Figure 36. Survey selectivity for male crab 1989− present (Model Bering Sea male), with selectivity curves estimated outside the model. 2009 study area is the curve estimated by Somerton from the 2009 study area data.



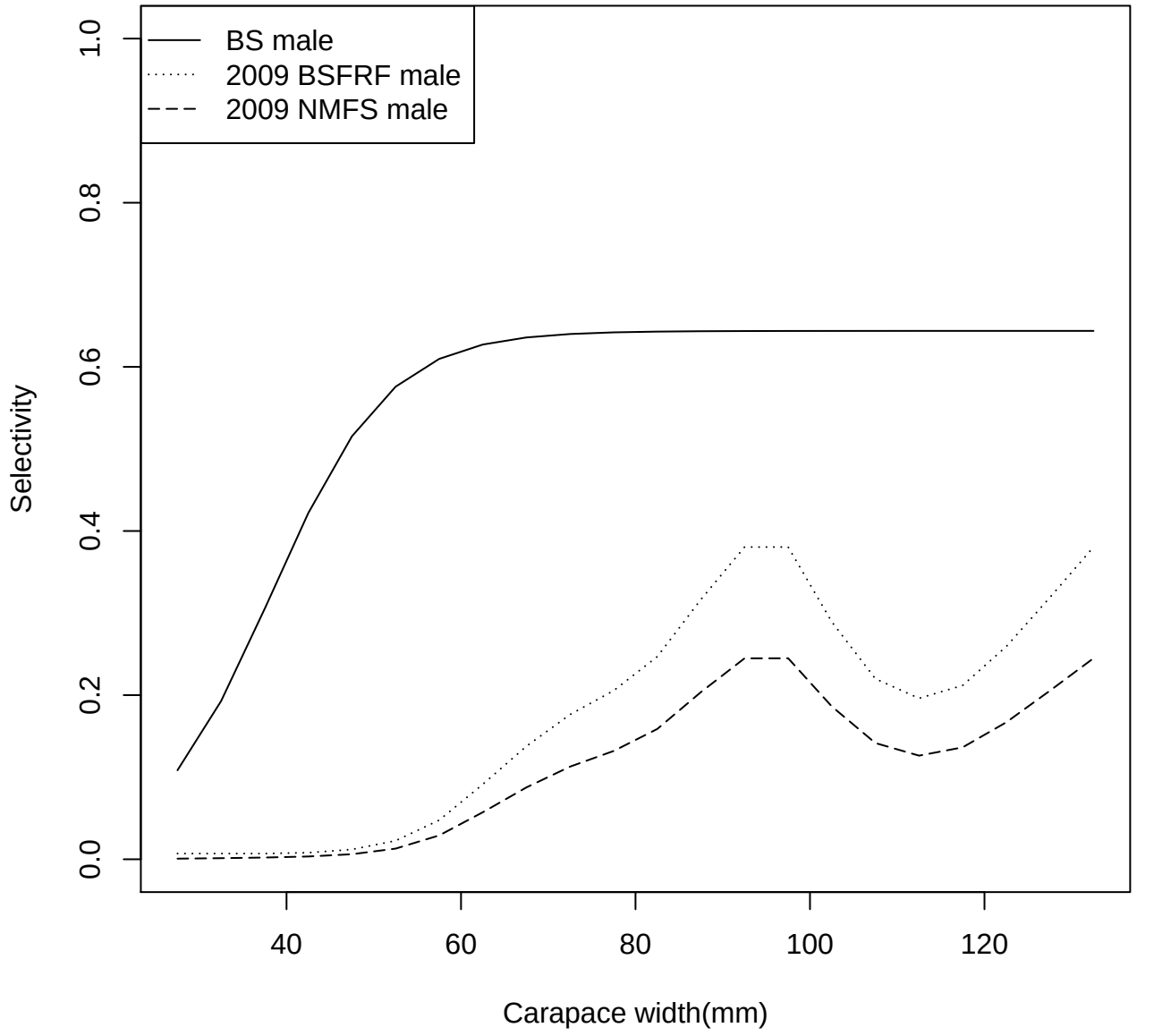
model 17b

Figure 37. Survey selectivity for female crab 1989− present (Model Bering Sea female).



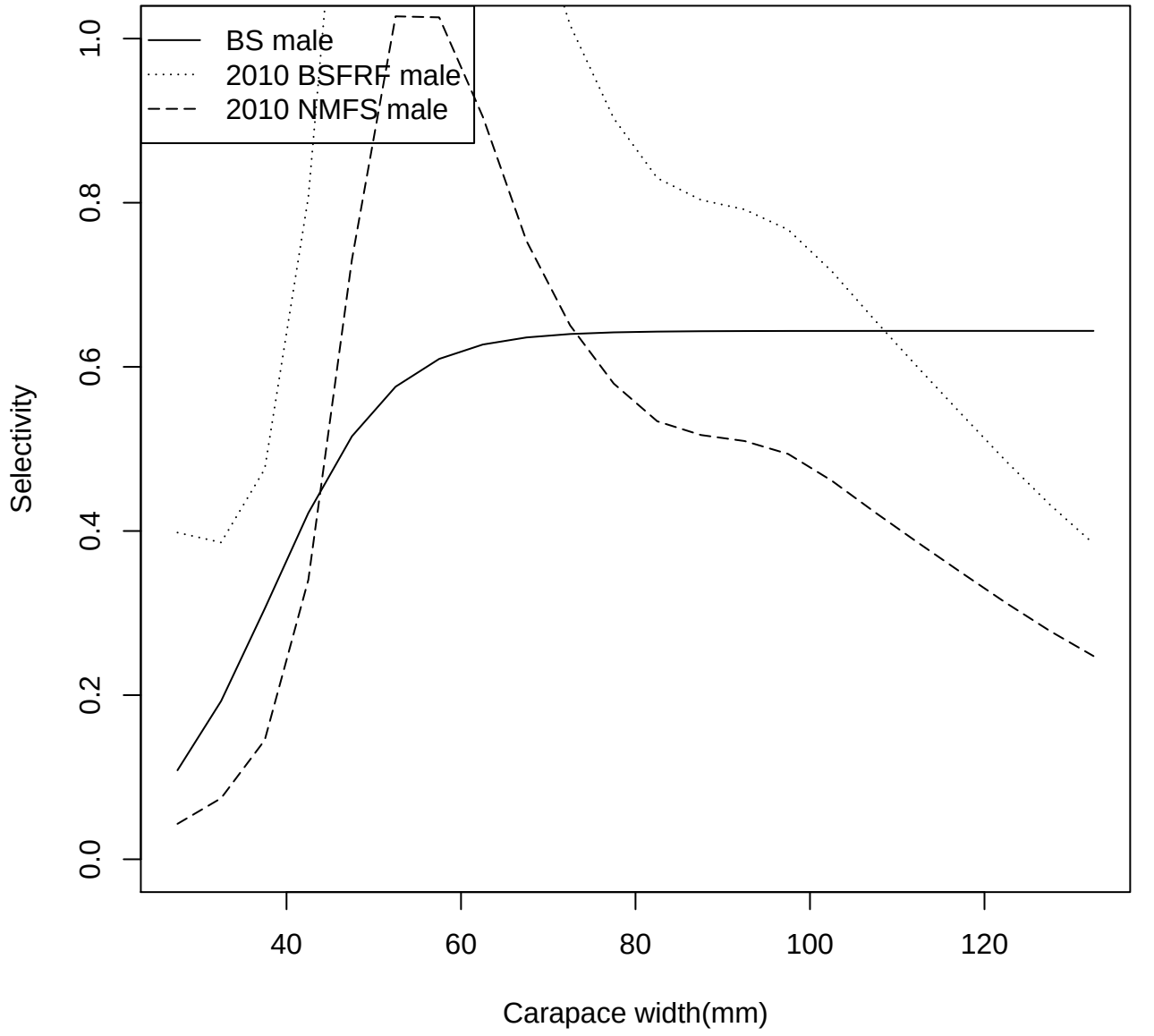
model 17b

Figure 38. Survey selectivity curves for male crab in the entire Bering Sea 1989−present (BS male), 2009 study area BSFRF male and 2009 study area NMFS male.



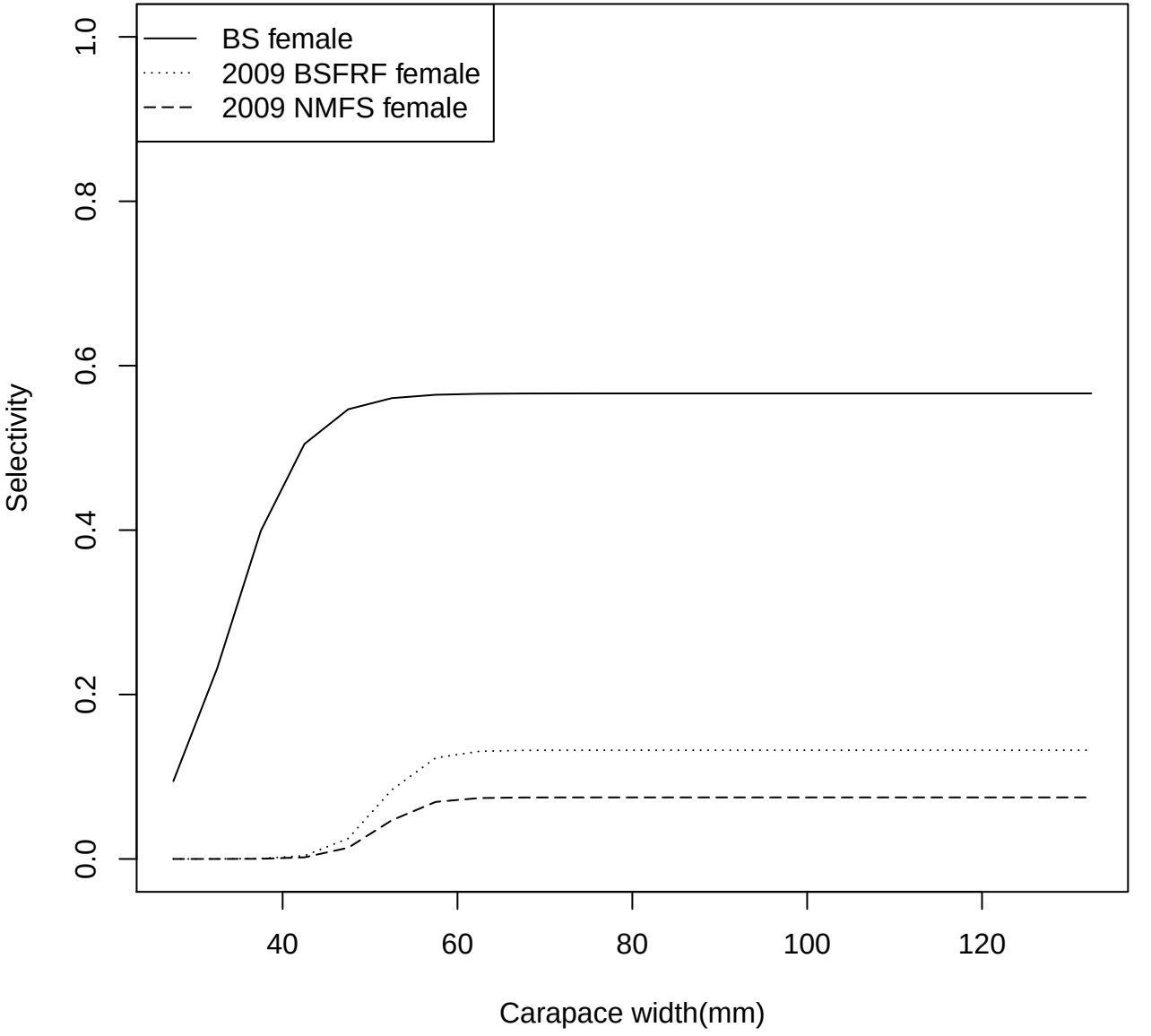
model 17b

Figure 39. Survey selectivity curves for male crab in the entire Bering Sea 1989−present (BS male), 2010 study area BSFRF male and 2010 study area NMFS male.



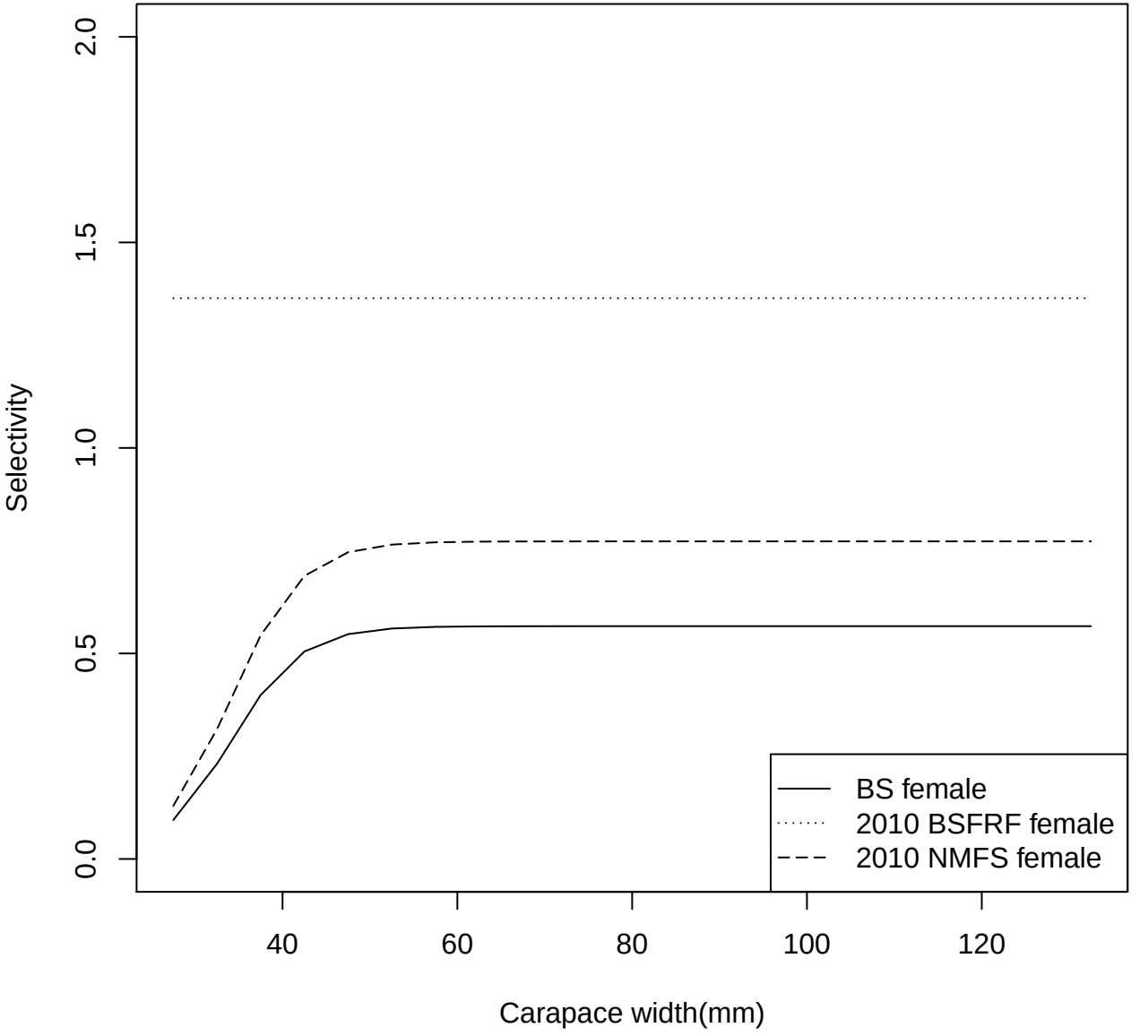
model 17b

Figure 40. Survey selectivity curves for female crab in the entire Bering Sea 1989−present (BS female), 2009 study area BSFRF female and 2009 study area NMFS female.



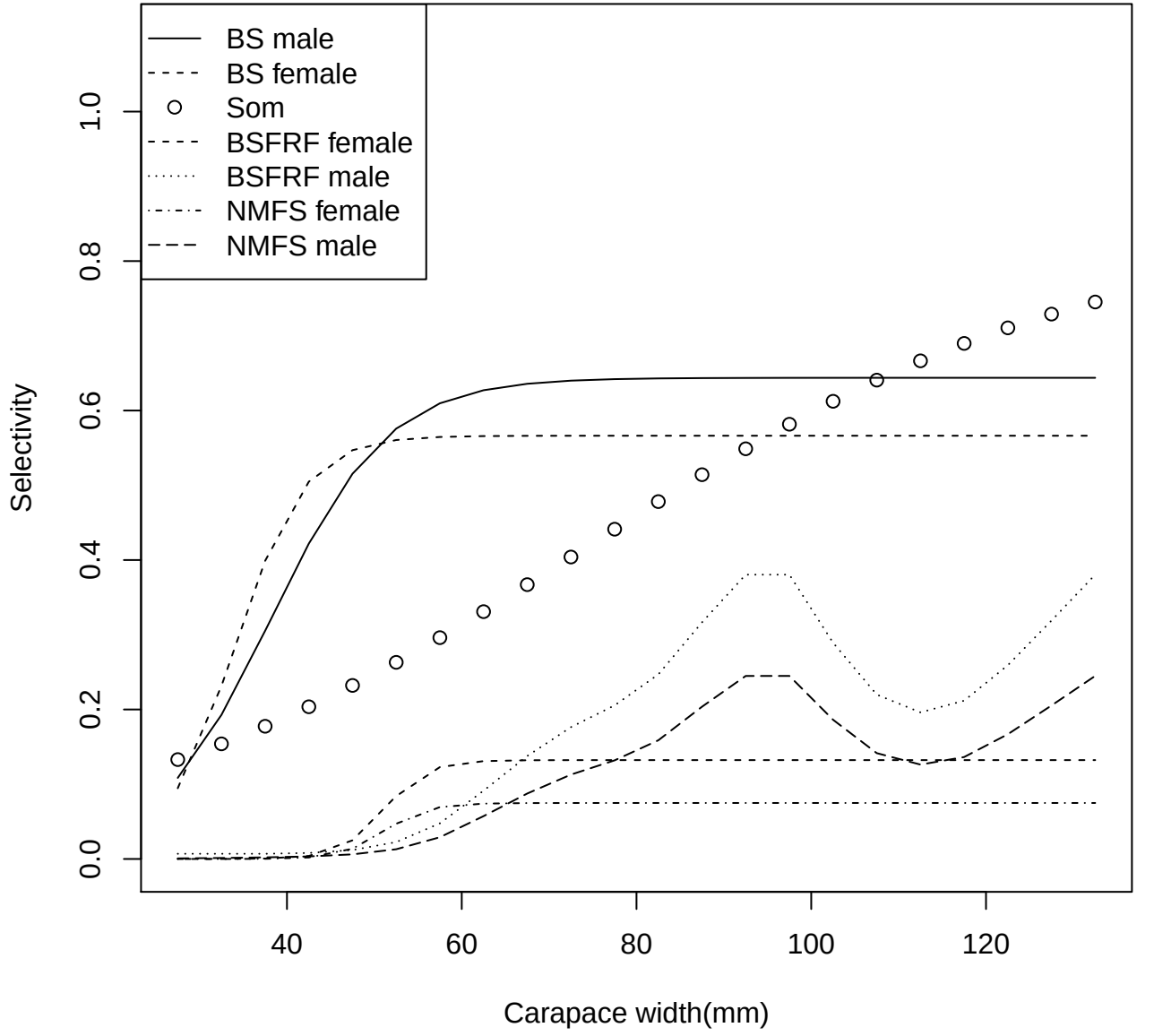
model 17b

Figure 41. Survey selectivity curves for female crab in the entire Bering Sea 1989−present (BS female), 2010 study area BSFRF female and 2010 study area NMFS female.



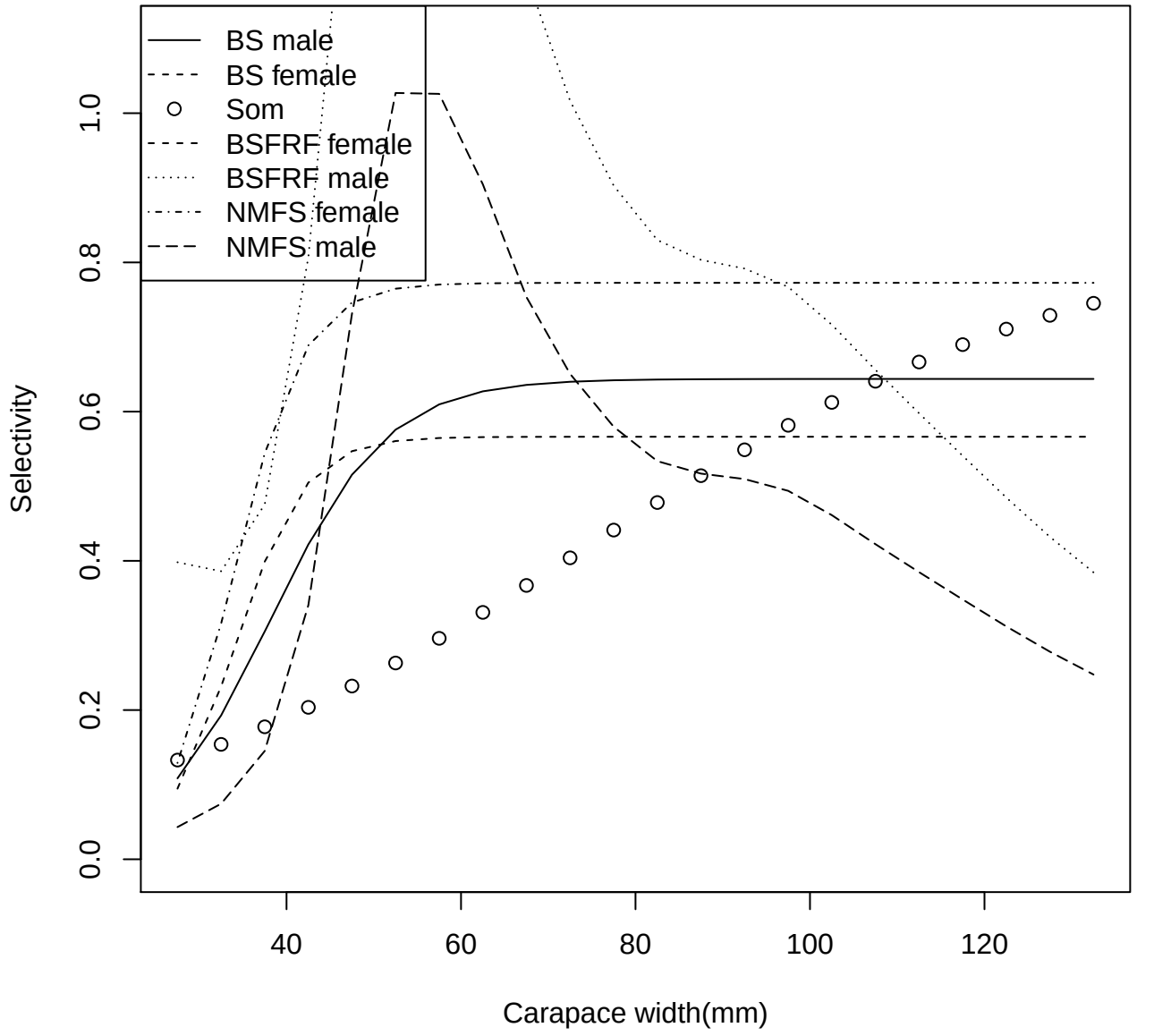
model 17b

Figure 42. Survey selectivity curves entire Bering Sea survey for female (upper dashed line) and male snow crab (solid lines) estimated by the model for 1989 to present. Survey selectivities estimated by Somerton(2010) from 2009 study area data are the circles. Lower lines are survey selectivities in the study area for BSFRF male and female crab and NMFS male and female crab.



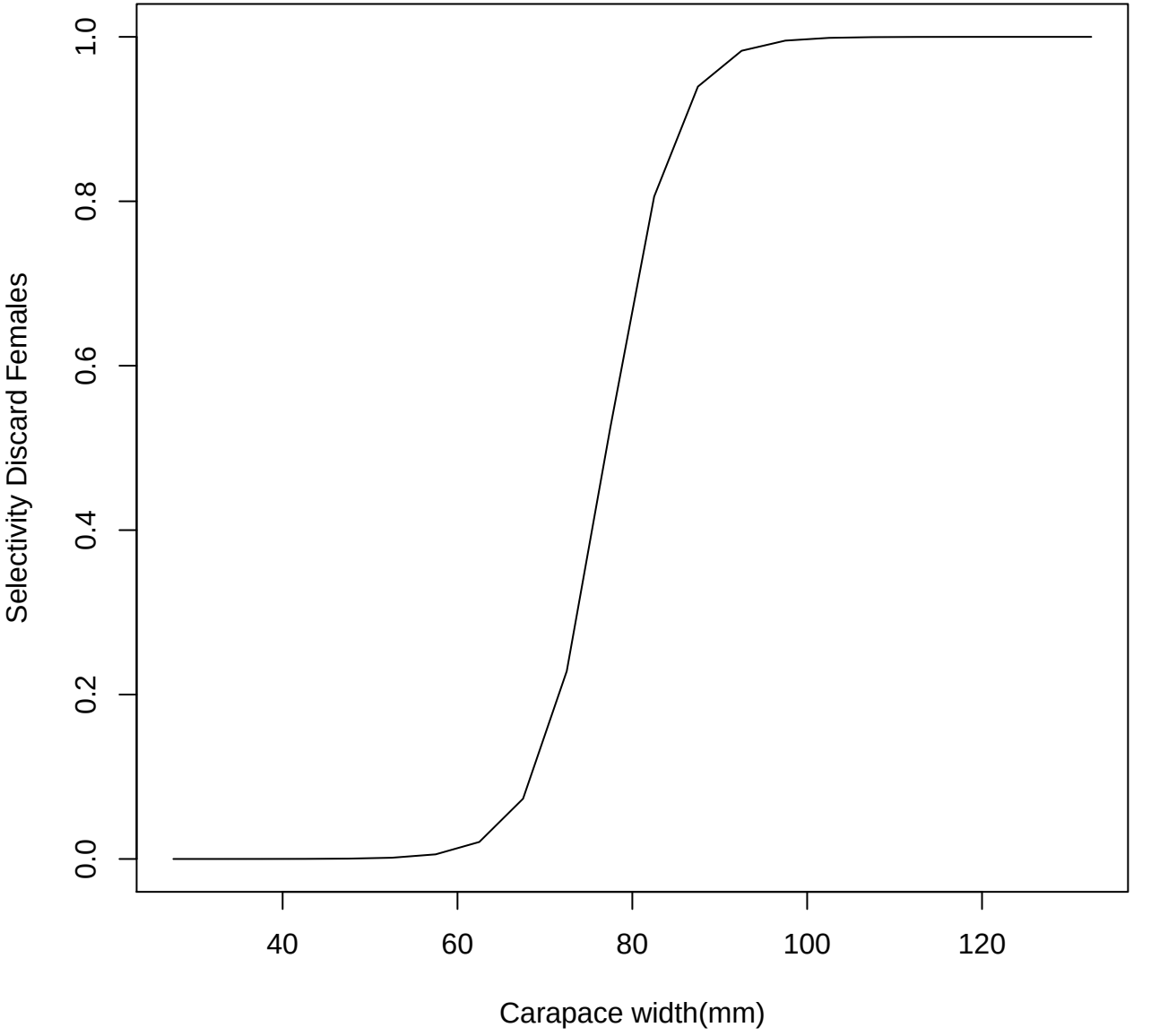
model 17b

Figure 43. 2010 study area survey selectivity curves (BSFRF and NMFS). BS are survey selectivity curves for the entire Bering Sea. Som is the selectivity curve estimated by Somerton from the 2009 study area data.



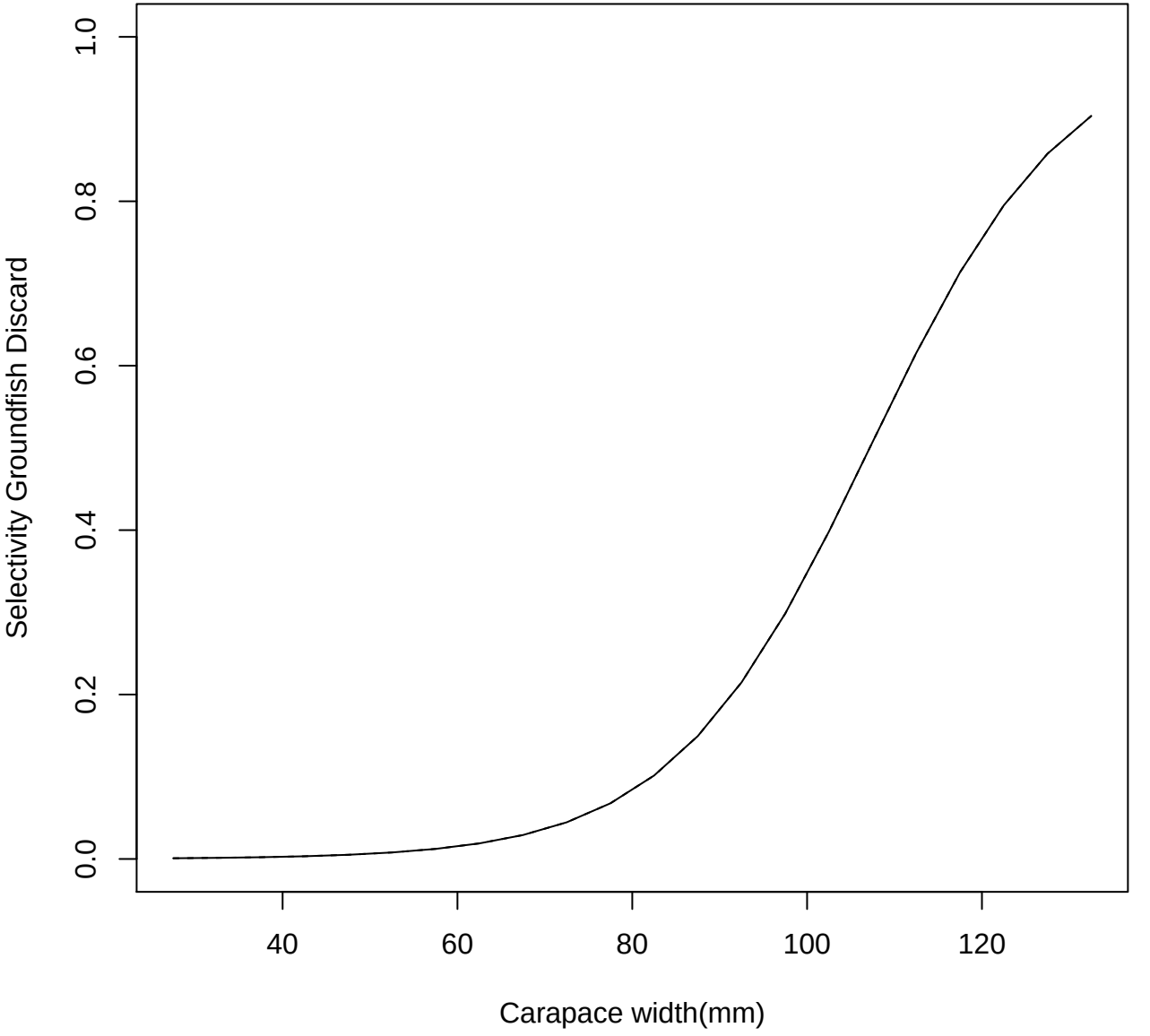
model 17b

Figure 44. Selectivity curve estimated by the model for female bycatch in the directed fishery.



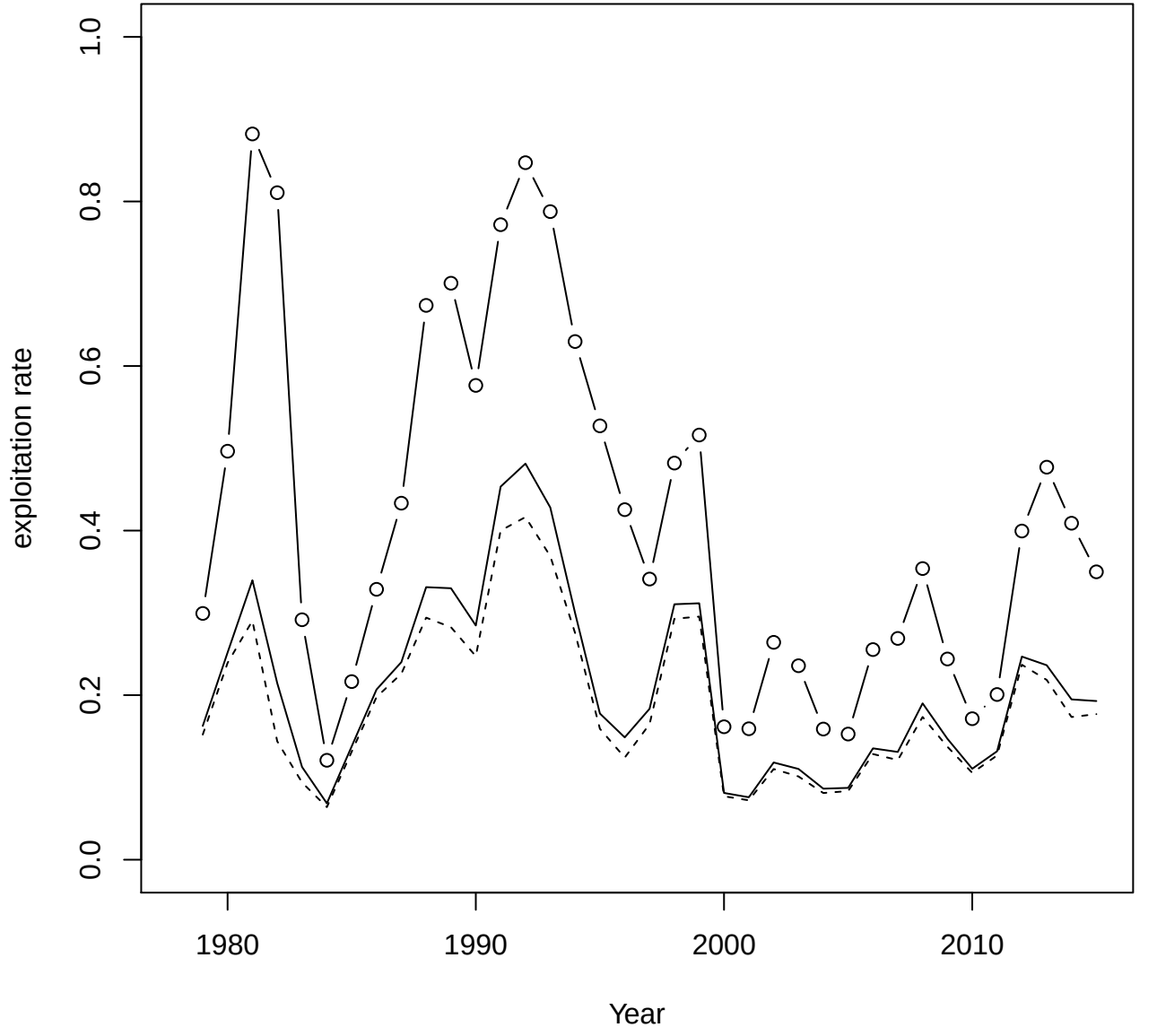
model 17b

Figure 45. Selectivity curve estimated by the model for bycatch in the groundfish trawl fishery for females and males.



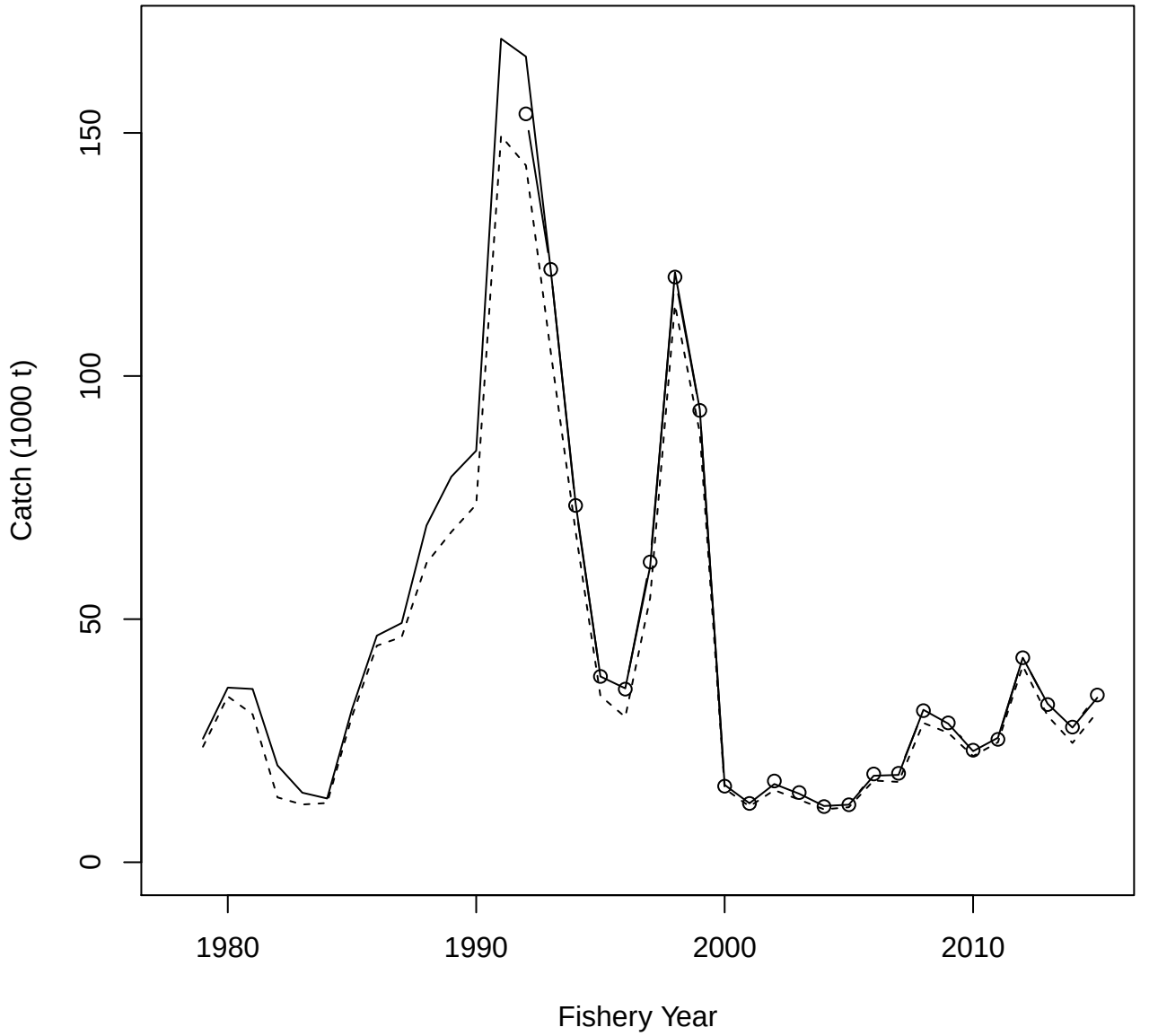
model 17b

Figure 46. Exploitation fraction estimated as the catch biomass (total or retained) divided by the mature male biomass from the model at the time of the fishery (solid line is total and dotted line is retained). The exploitation rate for total catch divided by the male biomass greater than 101 mm is the solid line with dots. Year is the year of the fishery.



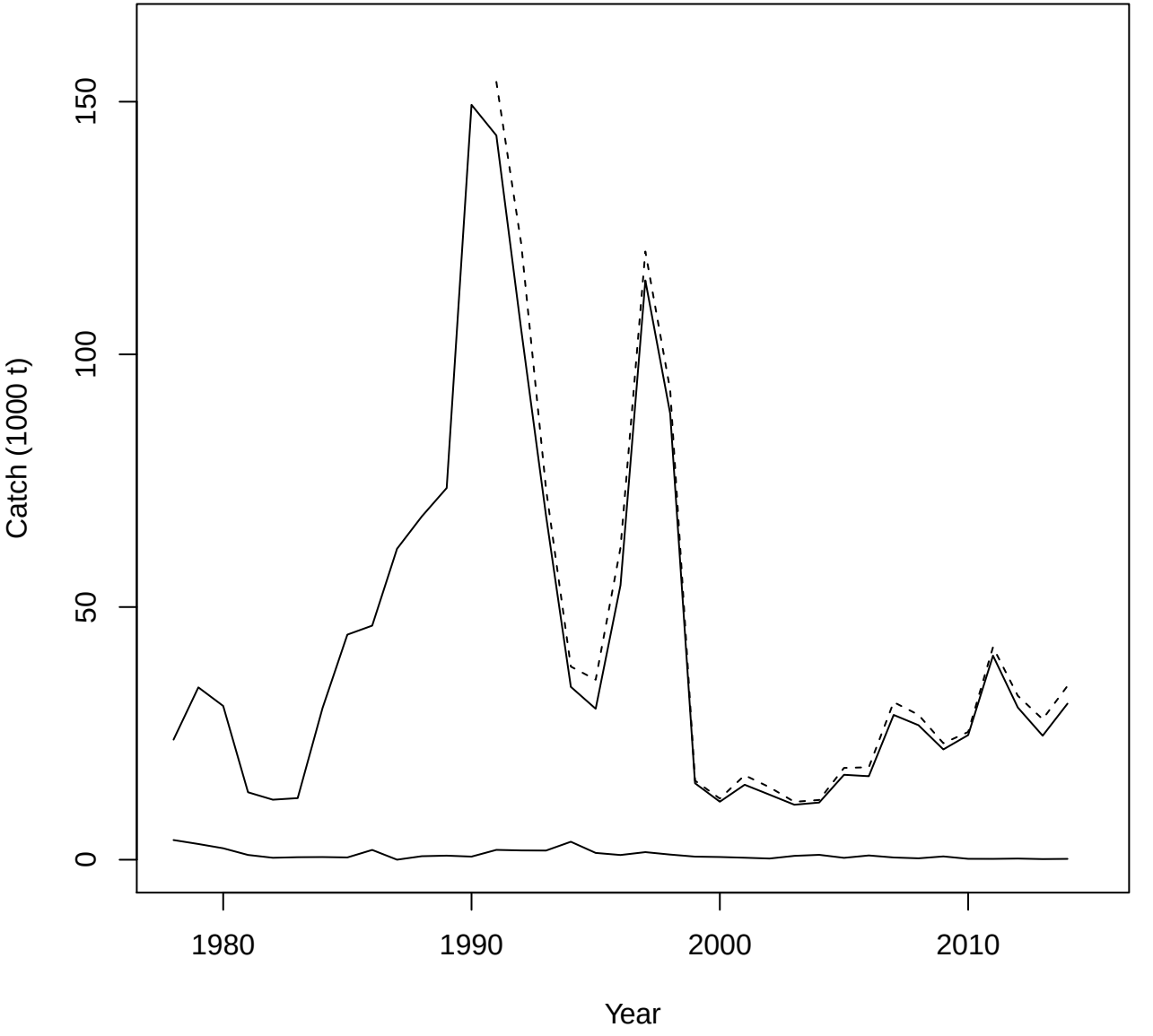
model 17b

Figure 47. Estimated total catch (discard + retained) (solid line), observed total catch (solid line with circles) (assuming 30% mortality of discarded crab) and observed retained catch (dotted line).



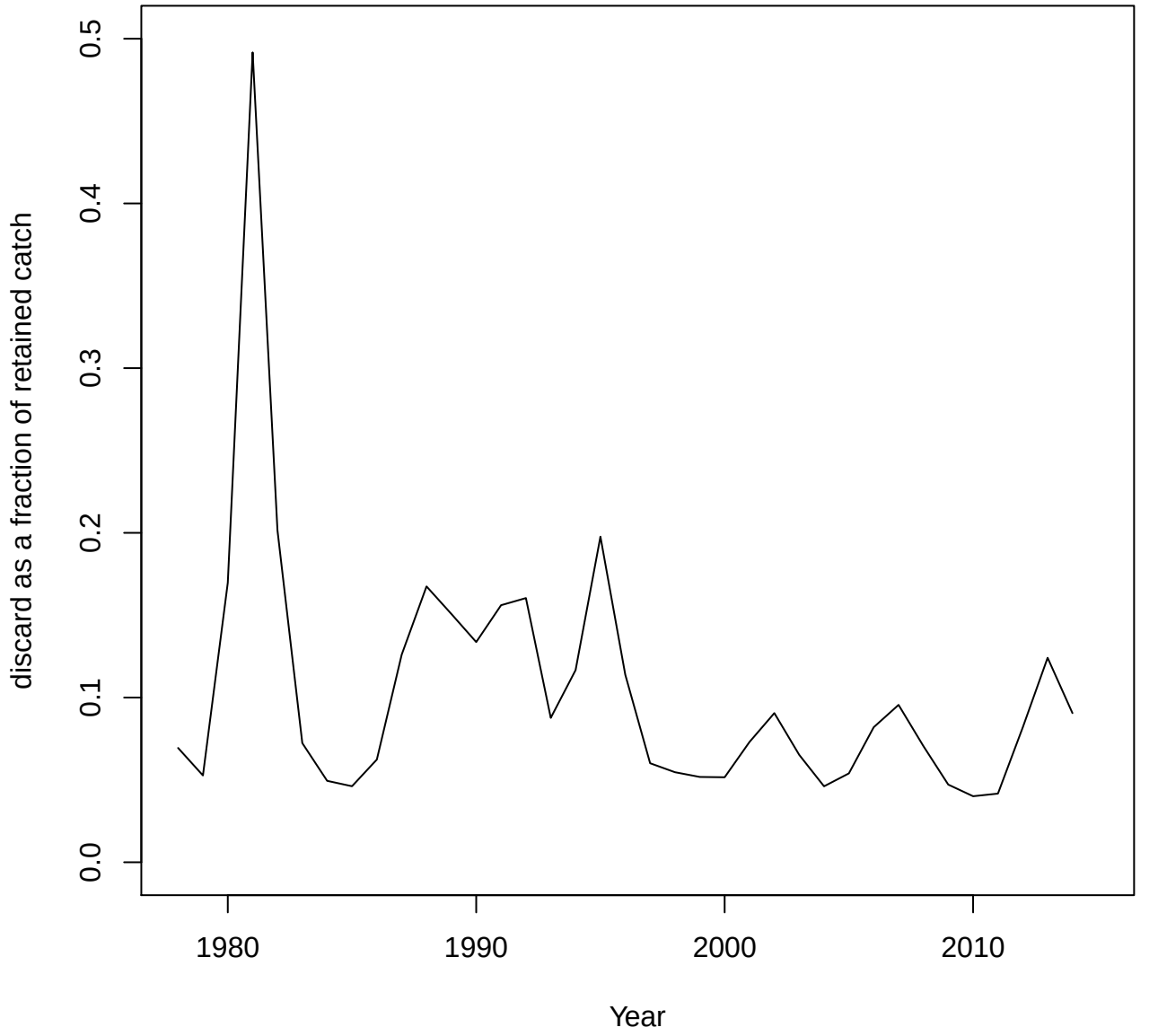
model 17b

Figure 48. Catch (1000 t) from the directed snow crab pot fishery and groundfish trawl bycatch. Total catch (dashed line) is retained catch (solid line) plus discarded catch after 30% discard mortality was applied. Trawl bycatch (lower solid line) is male and female bycatch from groundfish trawl fisheries with 80% mortality applied.



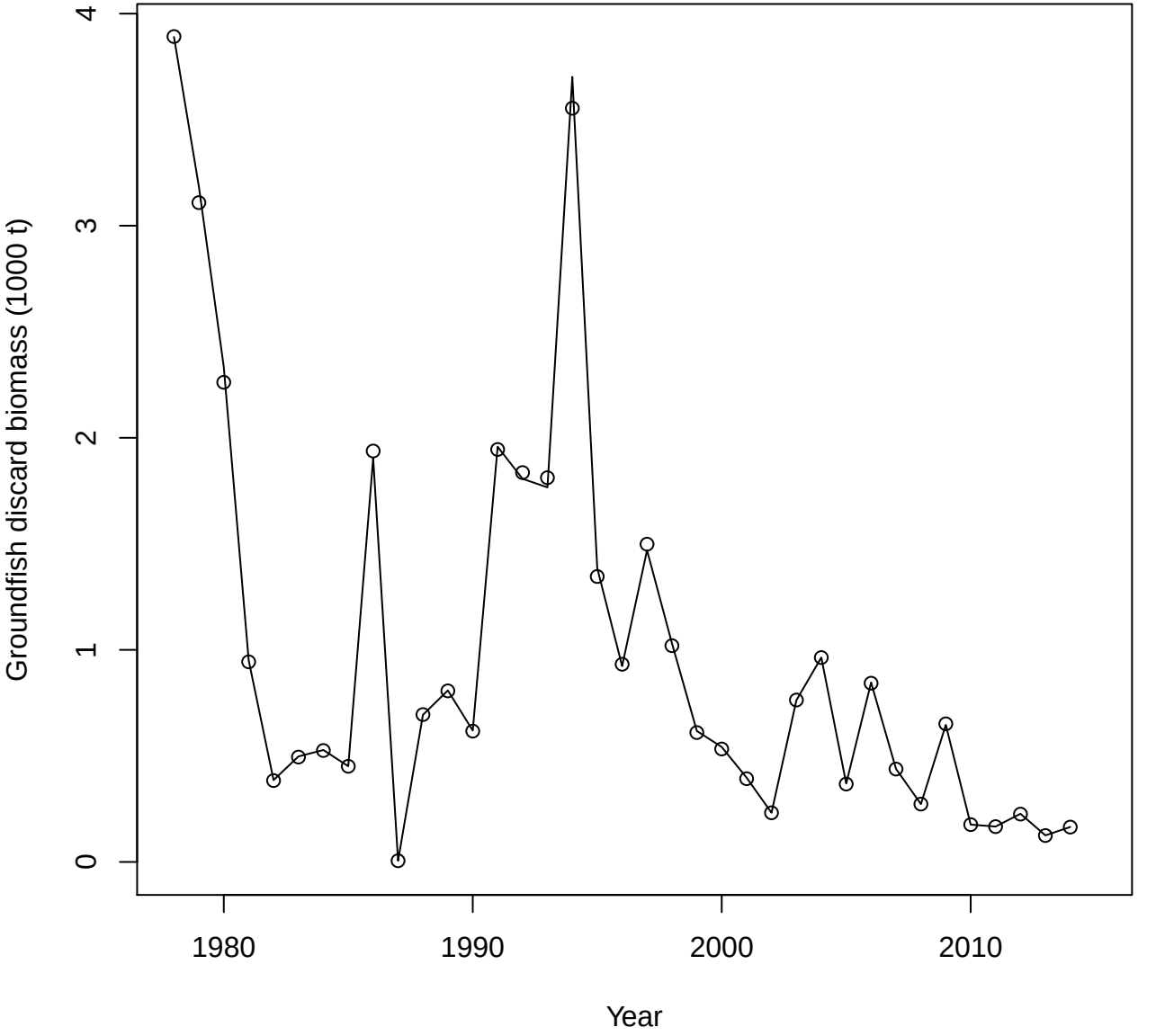
model 17b

Figure 49. Discard catch as a fraction of retained catch by year.



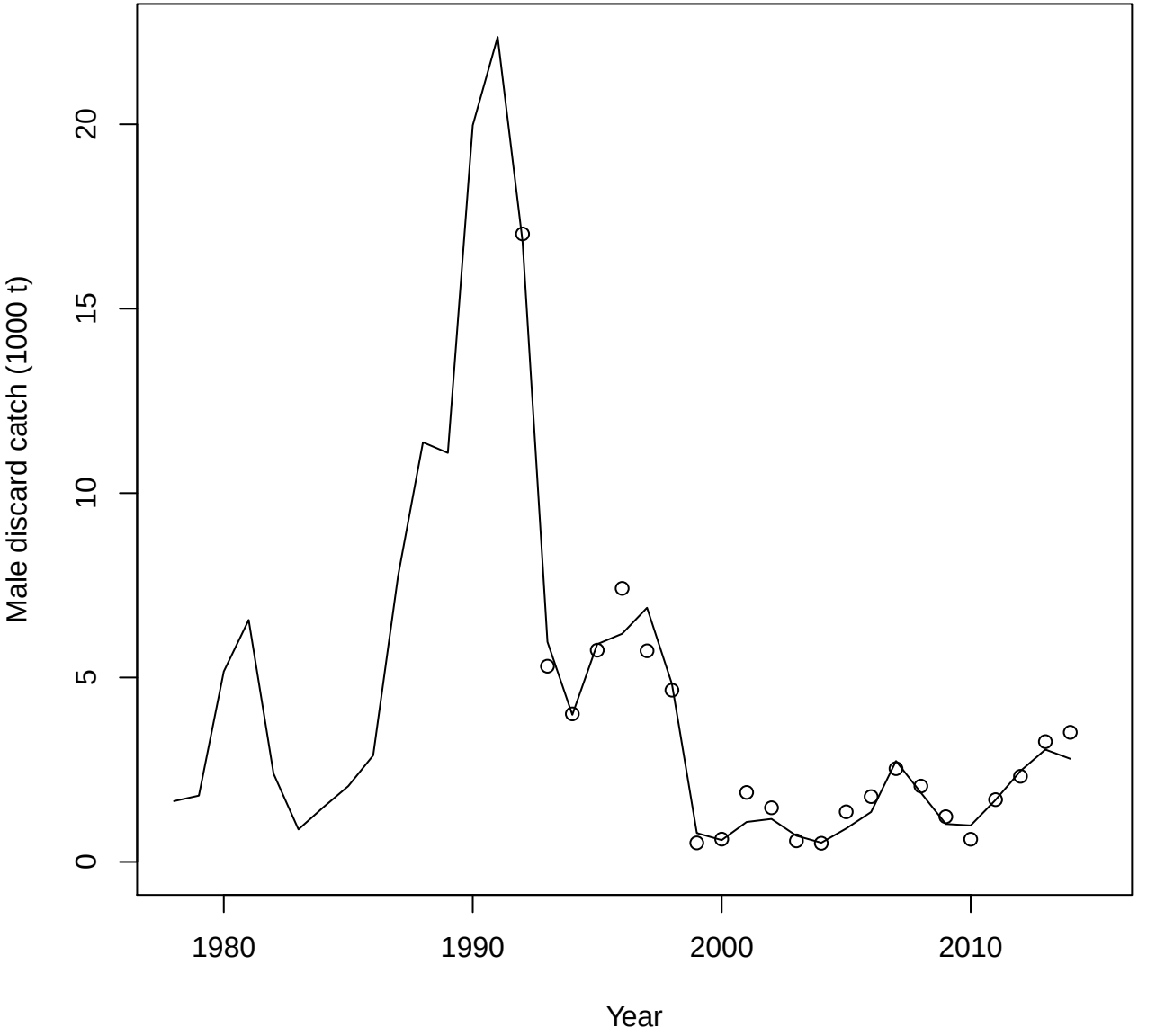
model 17b

Figure 50. Model fit to groundfish bycatch. Circles are observed catch, line is model estimate.



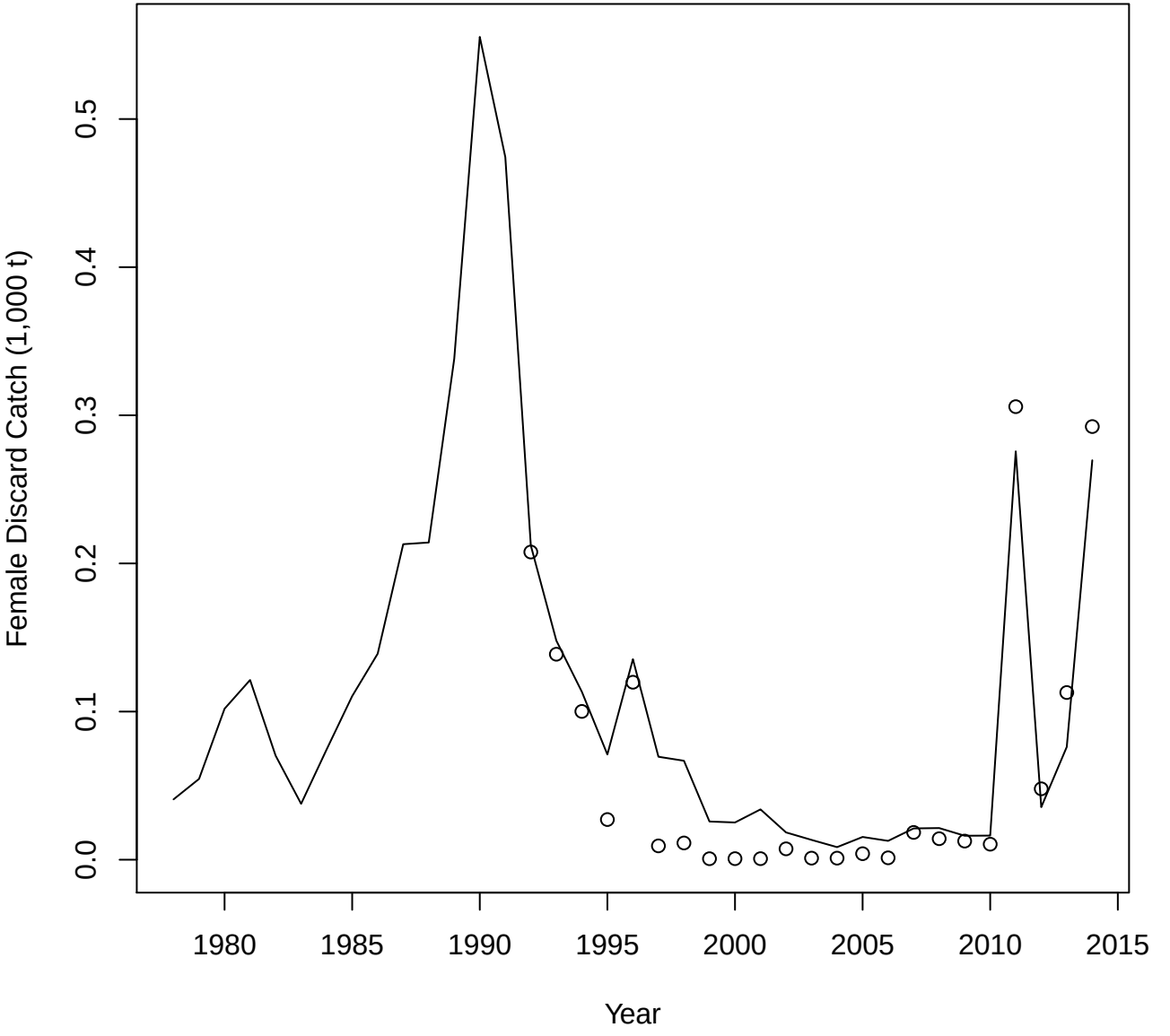
model 17b

Figure 51. Model fit to male directed discard catch for 1992/93 to 2014/15 and estimated male discard catch from 1978 to 1991.



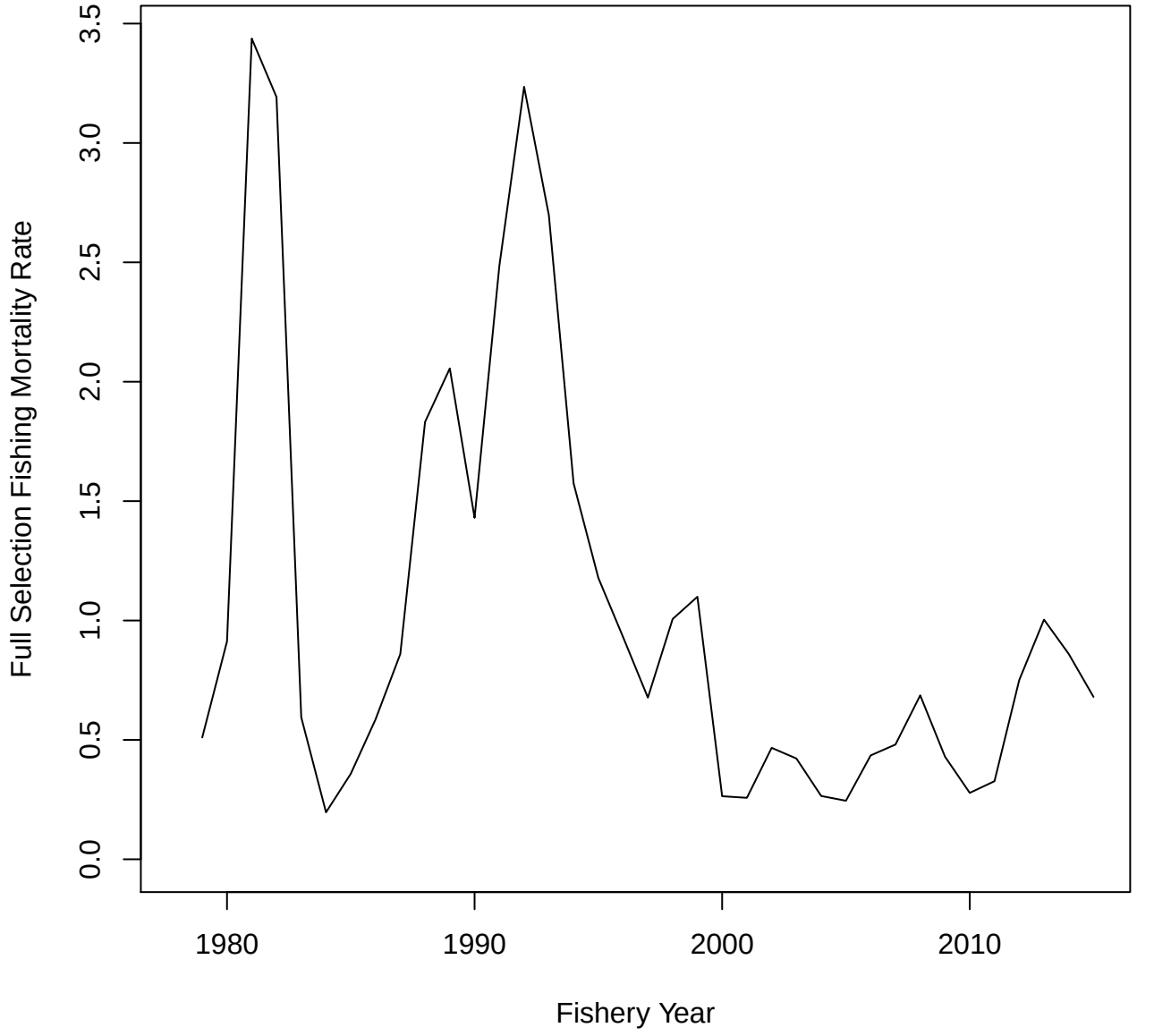
model 17b

Figure 52. Model fit to female discard bycatch in the directed fishery from 1992/93 to 2014/15 and model estimates of discard from 1978 to 1991.



model 17b

Figure 53. Full selection fishing mortality estimated in the model.

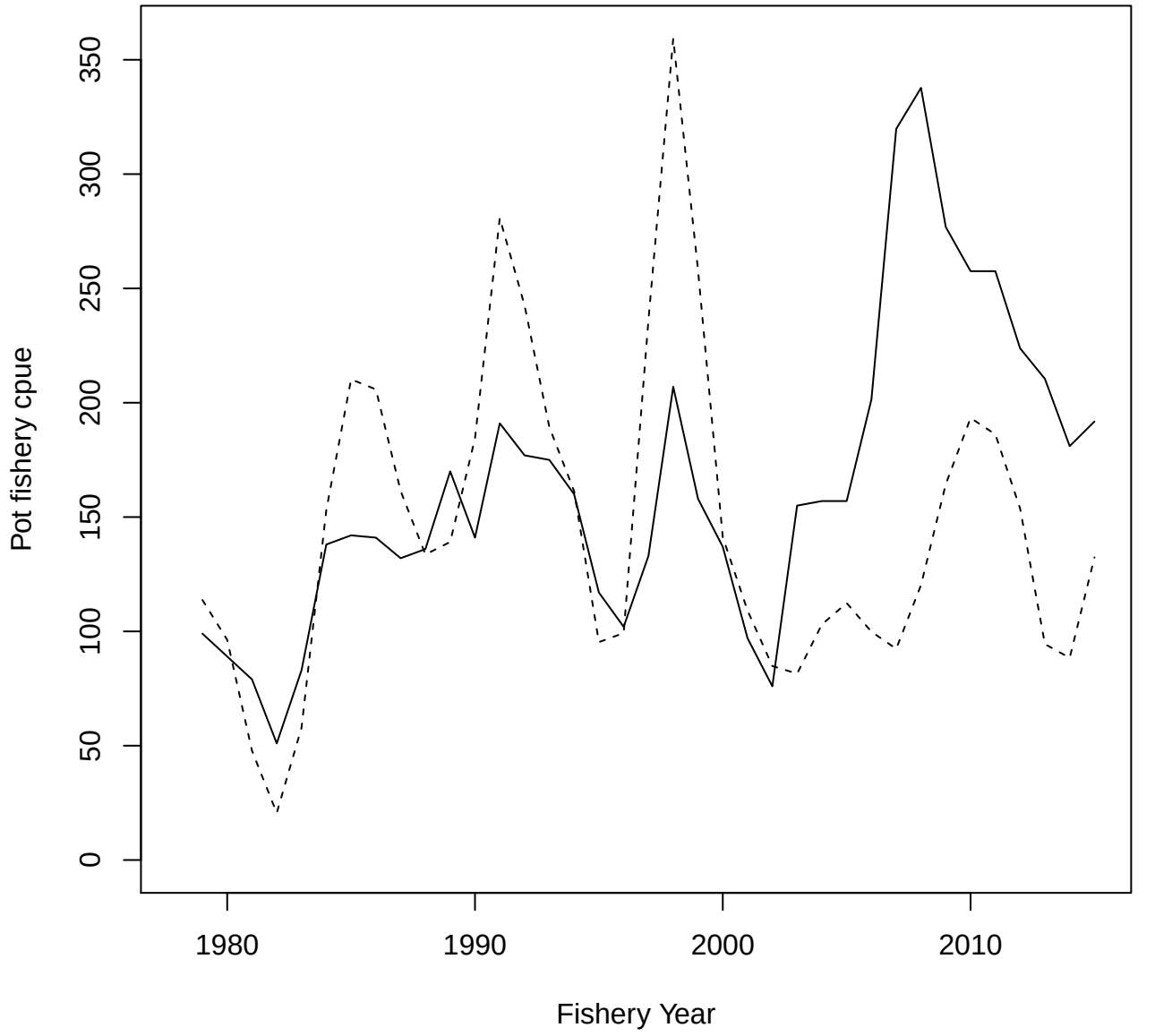


model 17b

Figure 54. Female full selection fishing mortality estimated in the model.

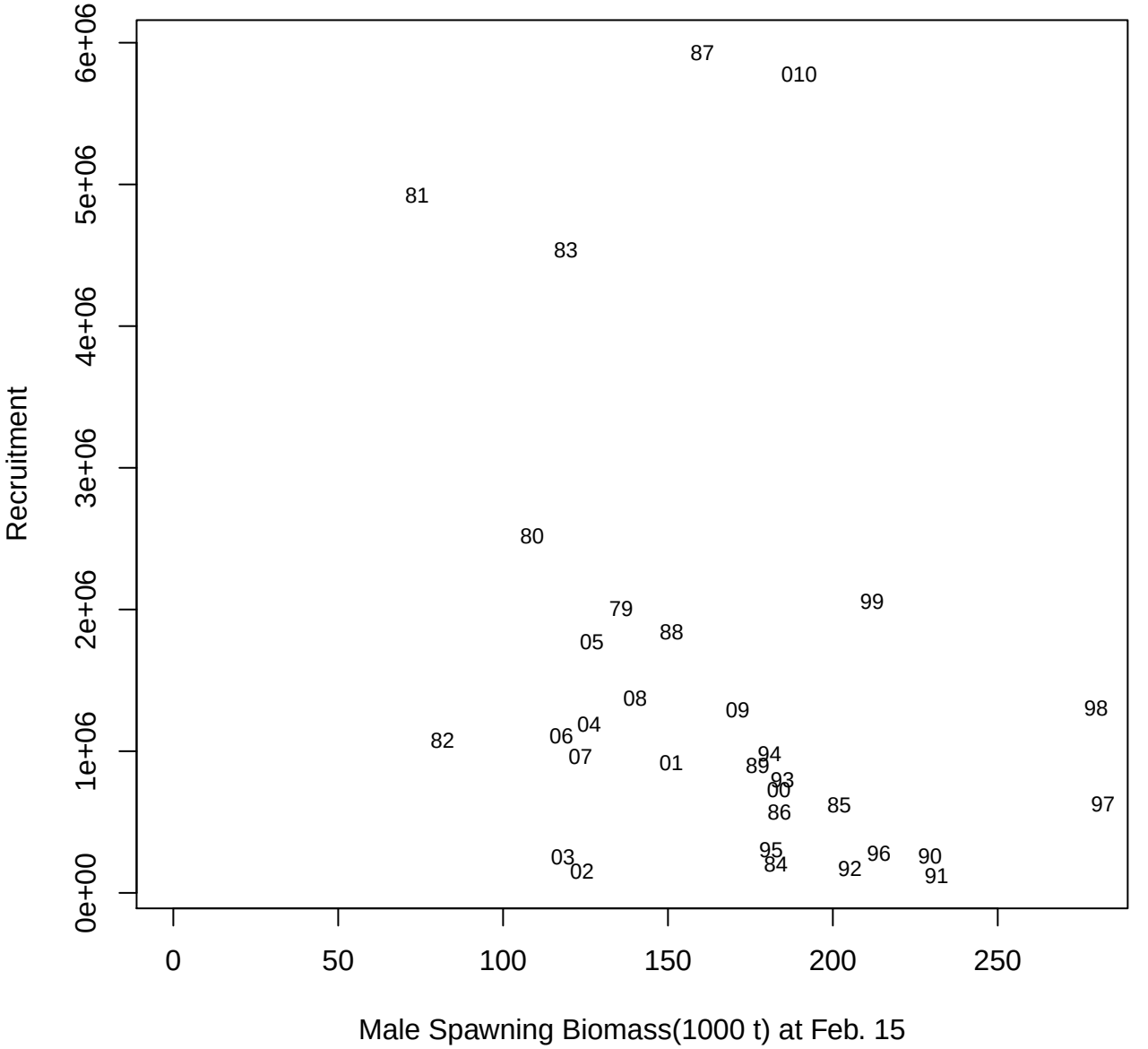
model 17b

Figure 55. Directed pot fishery cpue and model predicted fish cpue (fixed scalar − not estimated in model).



model 17b

Figure 56. Spawner recruit estimates using male mature biomass at time of mating (1000t). Numbers are fertilization year assuming a lag of 5 years. Recruitment is half total recruits in thousands of crab.



model 17b