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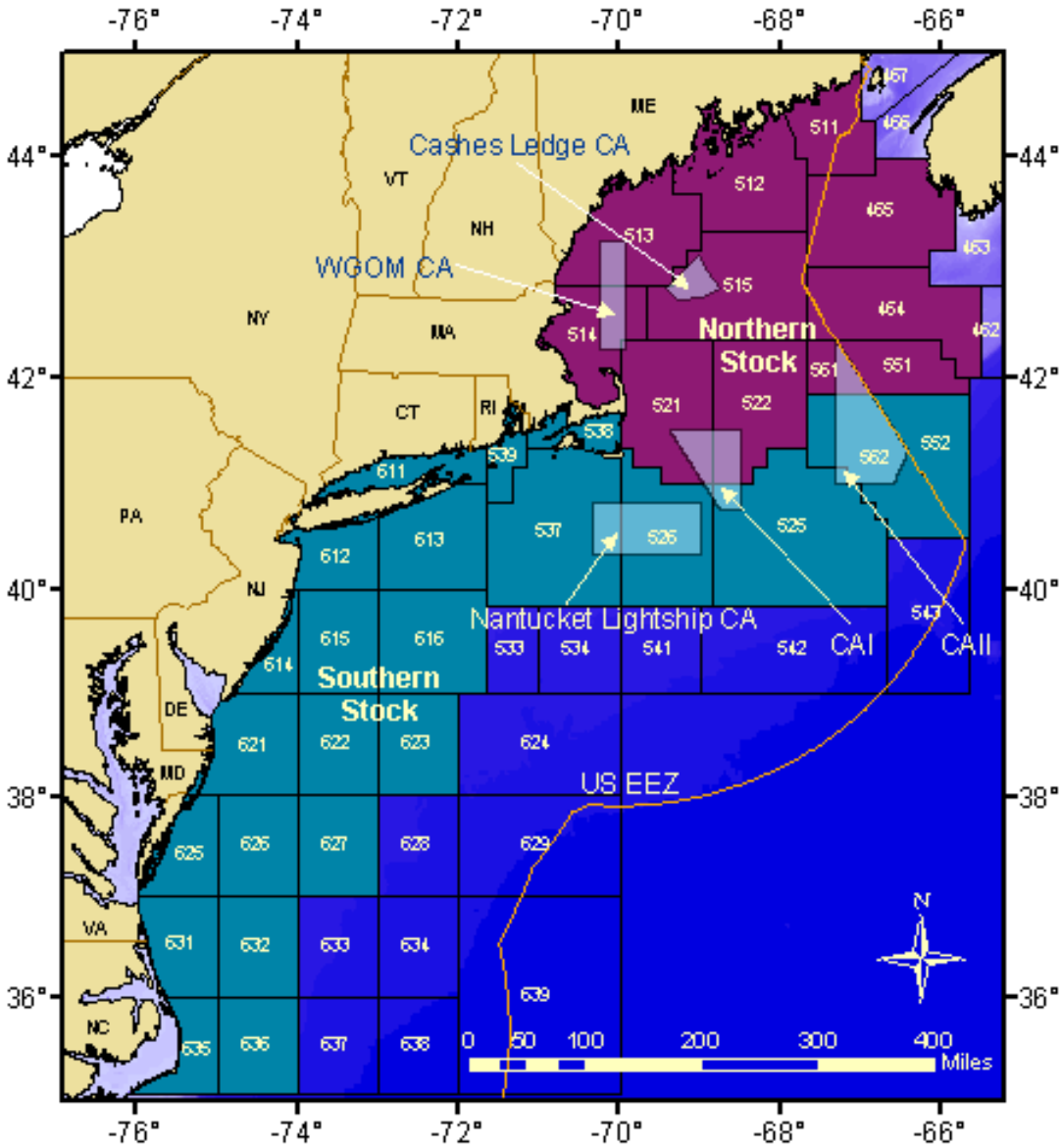


Figure 1. Fishery statistical areas used to define northern and southern monkfish management areas.

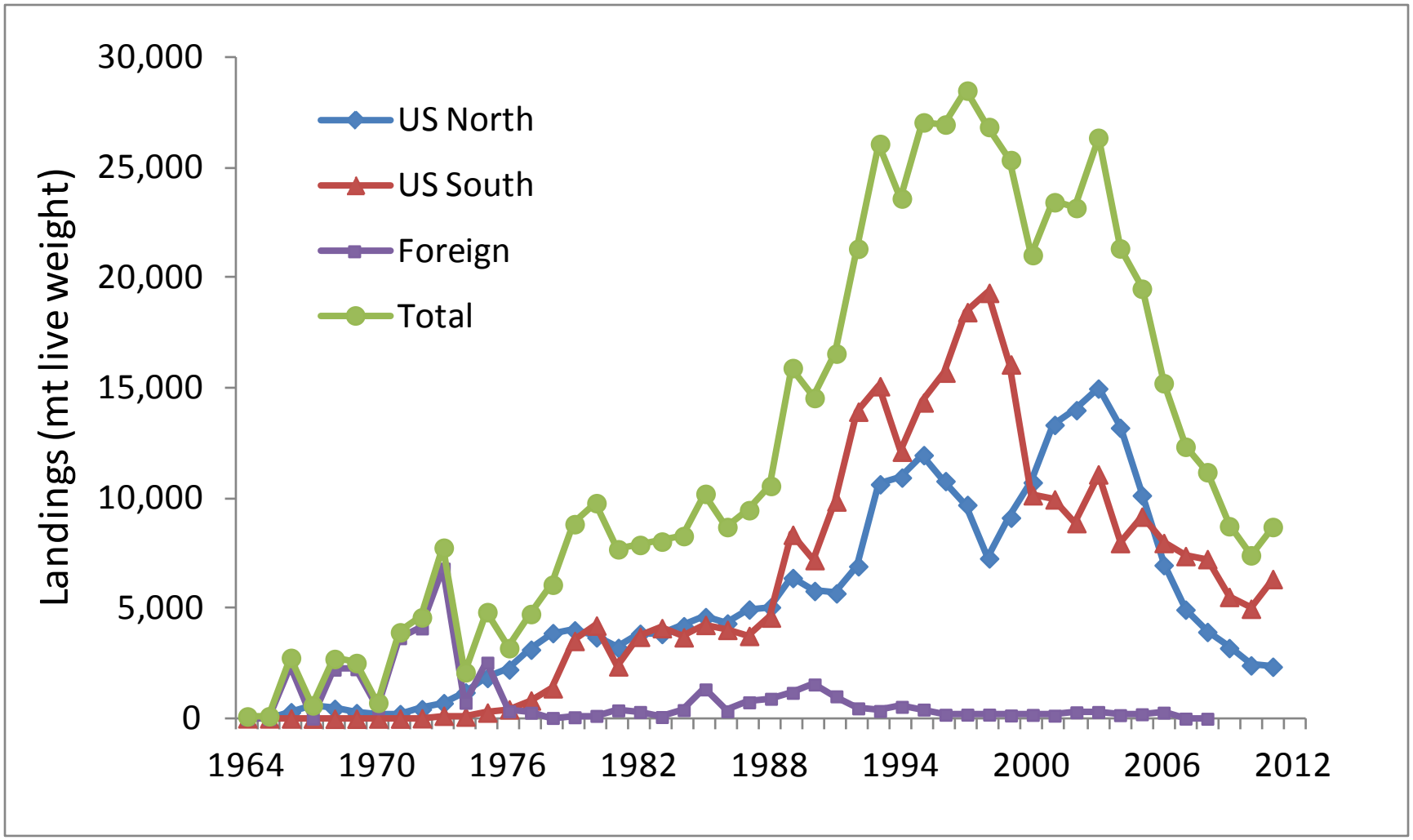


Figure 2 . Monkfish landings by management area and combined areas, 1964-2011.

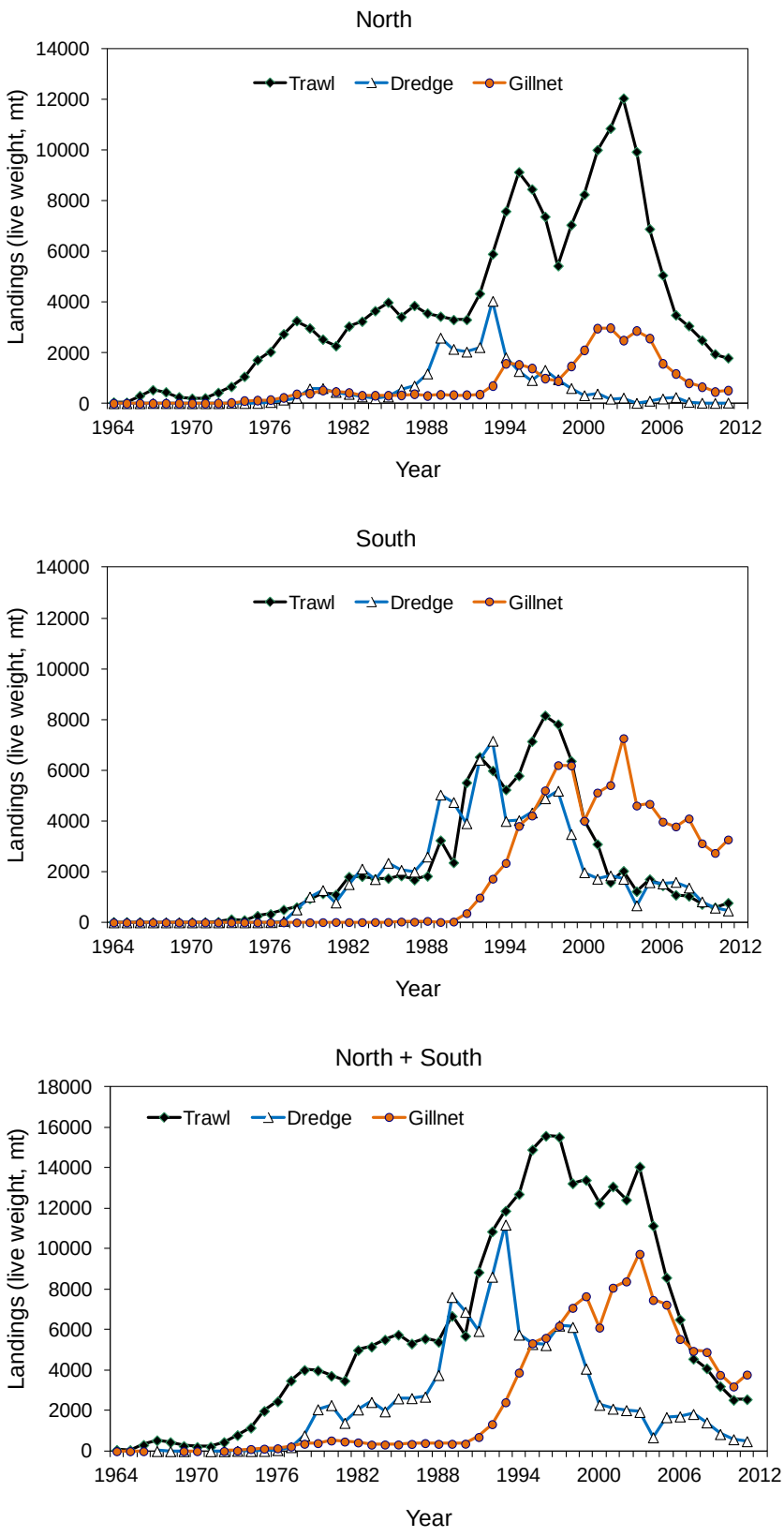
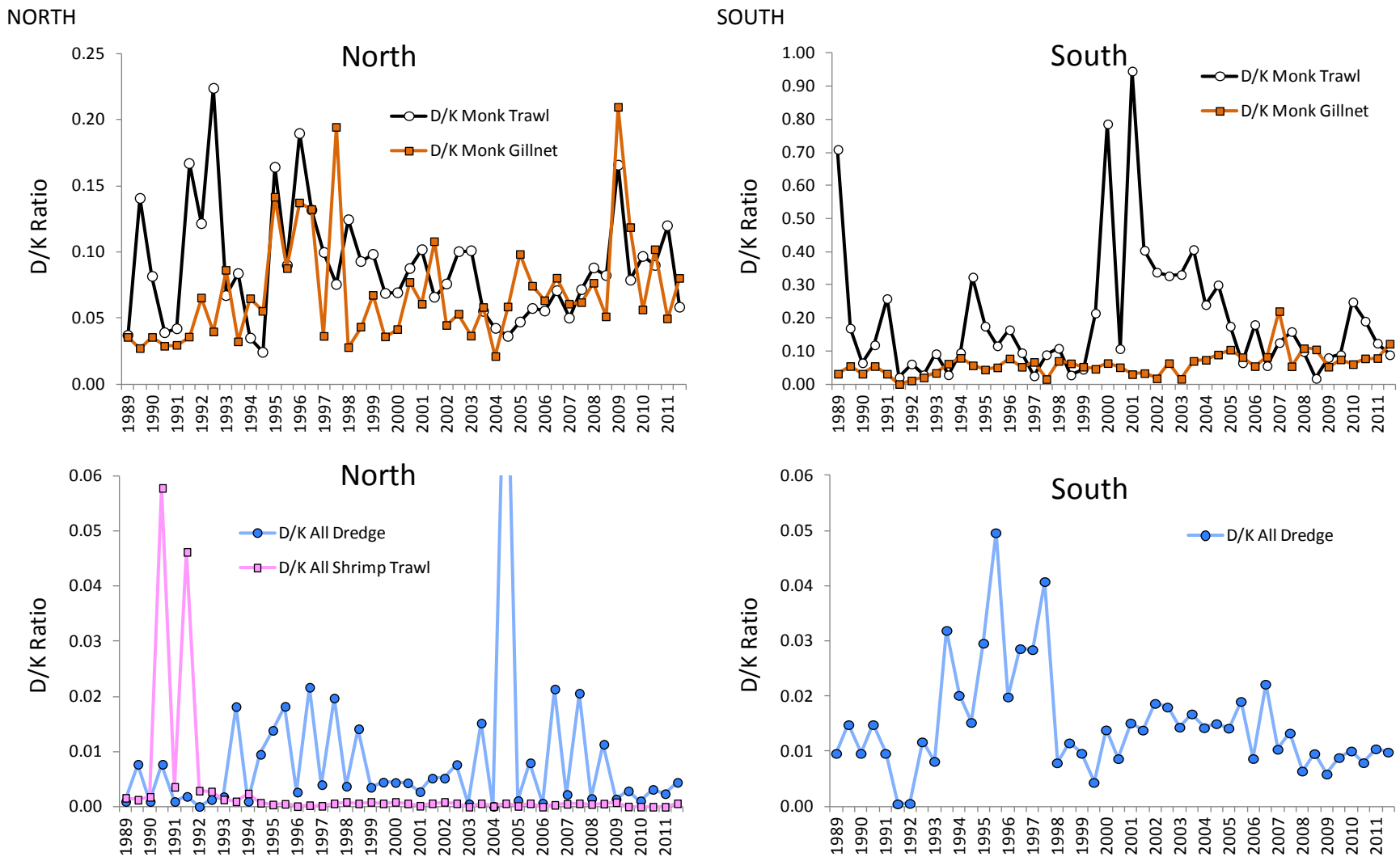


Figure 3. Commercial landings of monkfish by gear type and management region.



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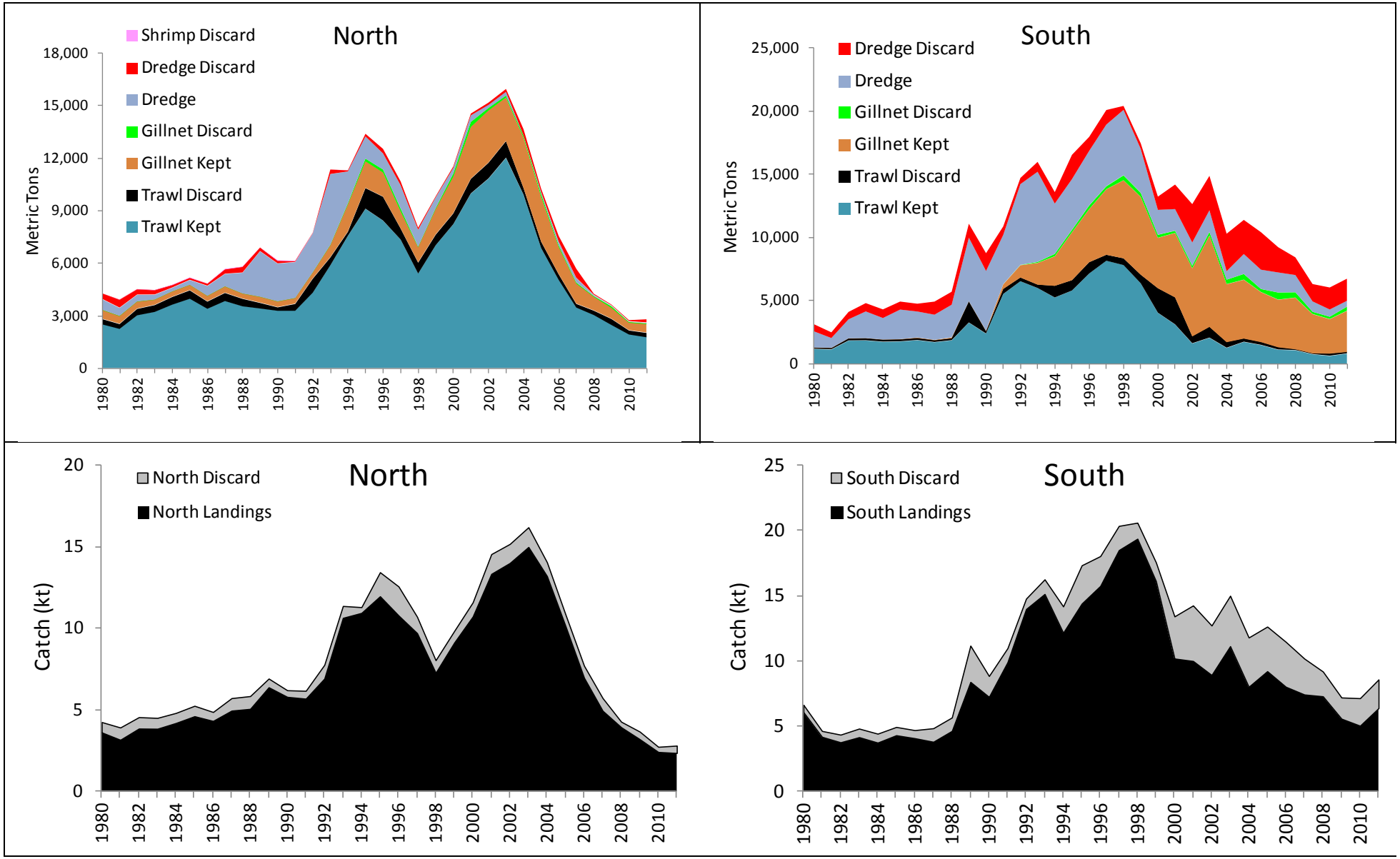


Figure 5. Monkfish landings and discard by gear type (top panels) and total (bottom panels) for North (left) and South (right).

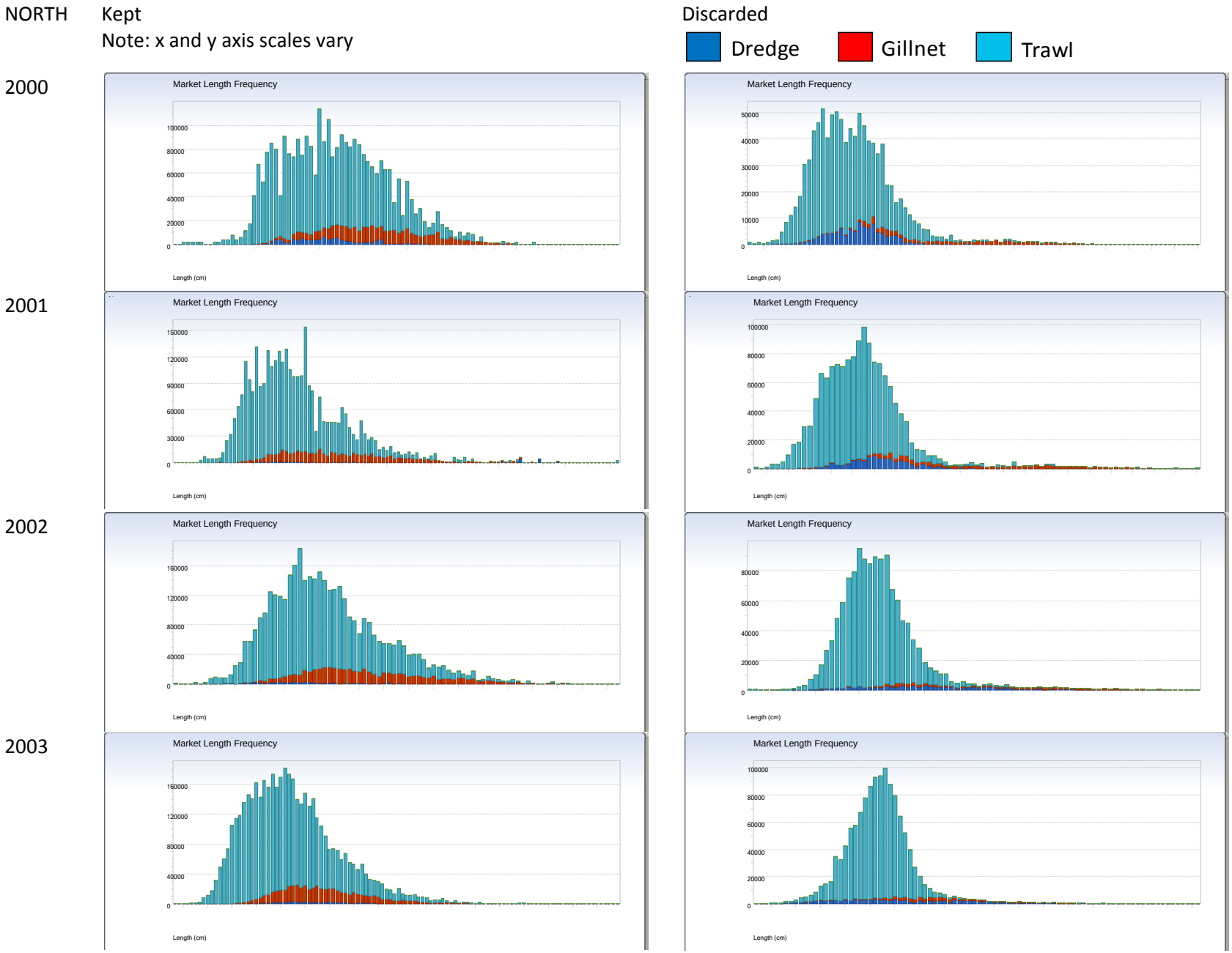


Figure 6. Estimated length composition of kept and discarded monkfish in the North, by gear type.

NORTH

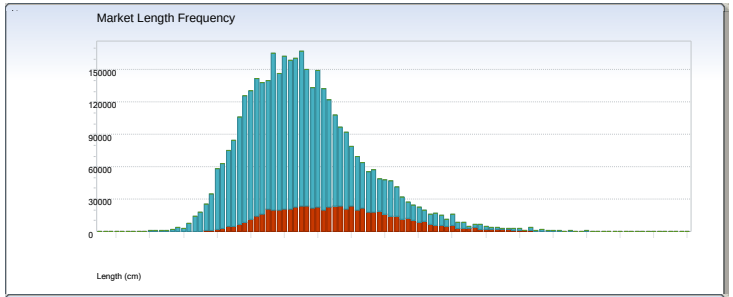
Kept

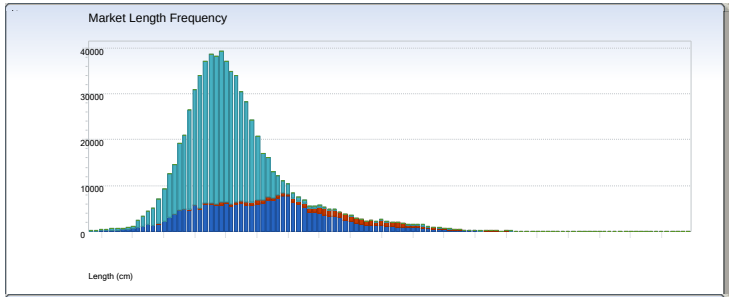
Note: x and y axis scales vary

Discarded

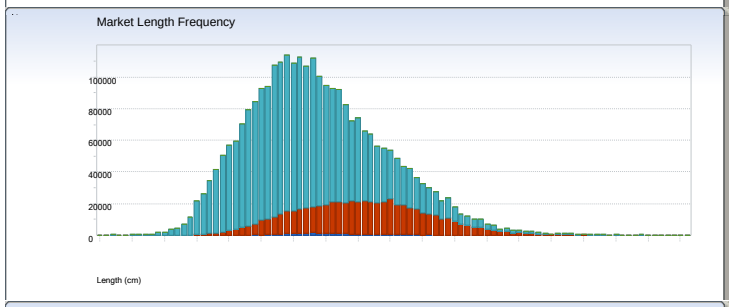
Dredge Gillnet Trawl

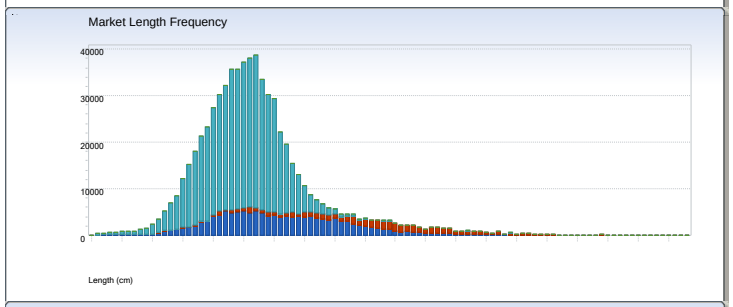
2004





2005





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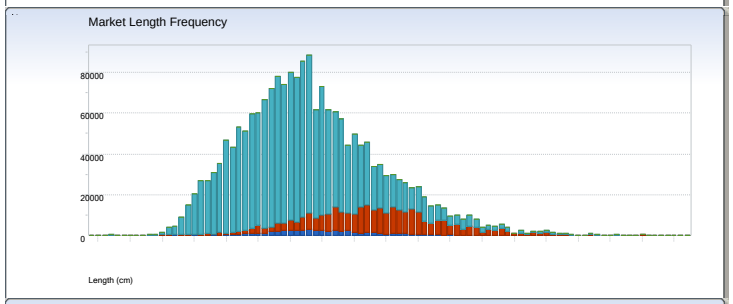
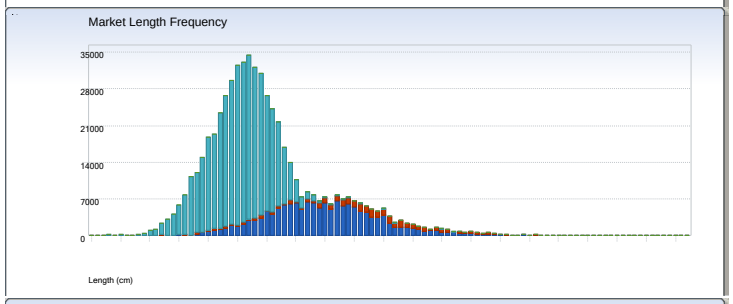
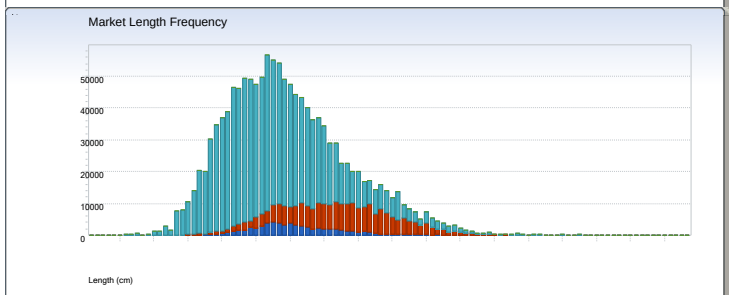




2007



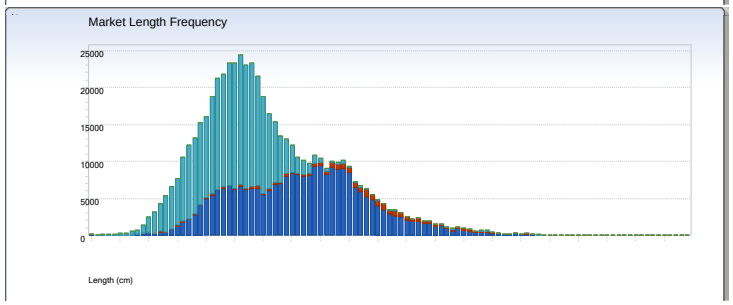


Figure 6, continued

NORTH

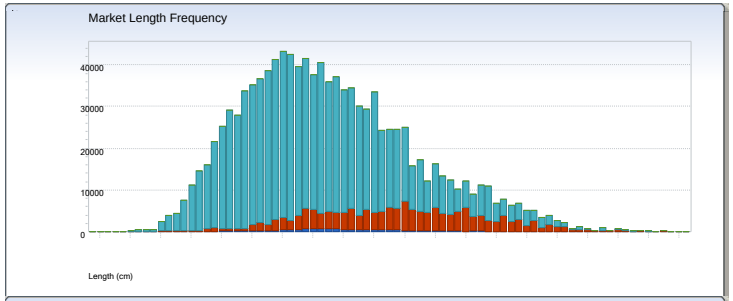
Kept

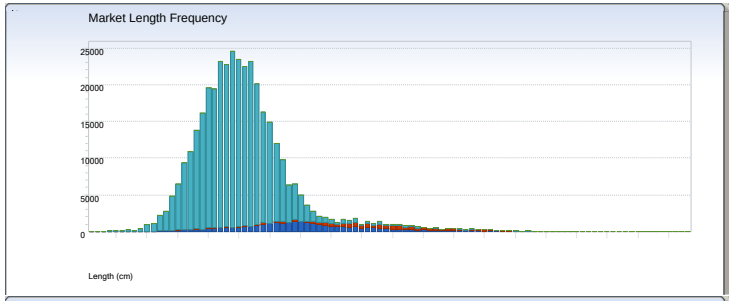
Note: x and y axis scales vary

Discarded

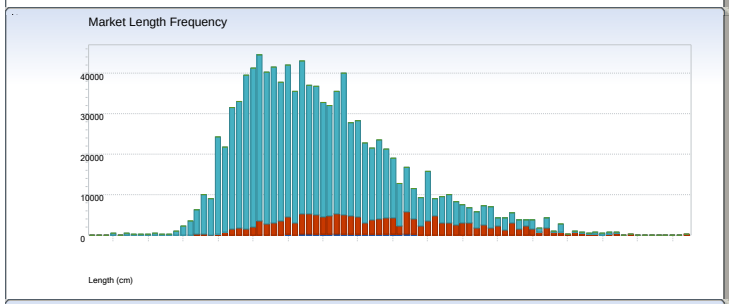
Dredge Gillnet Trawl

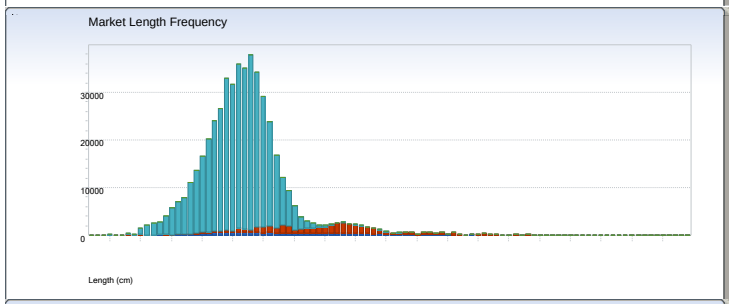
2008



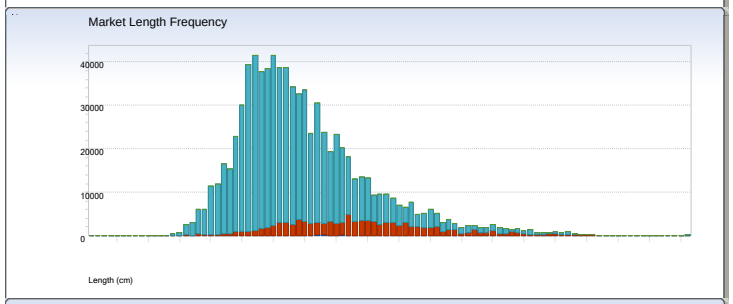


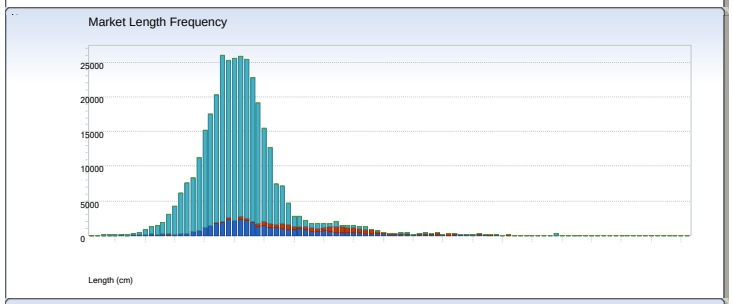
2009



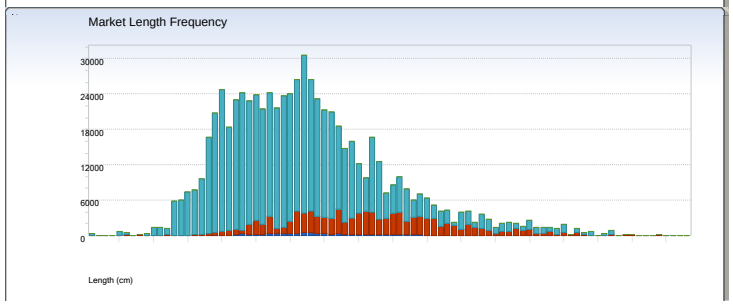


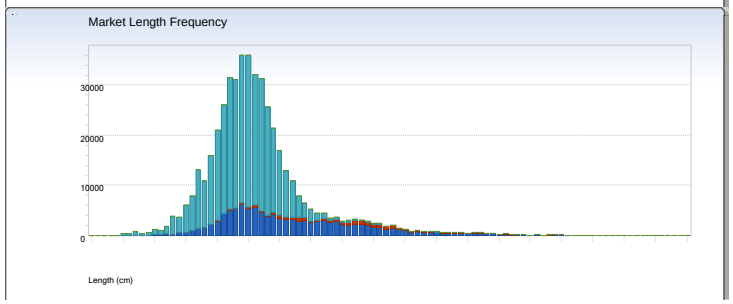
2010





2011





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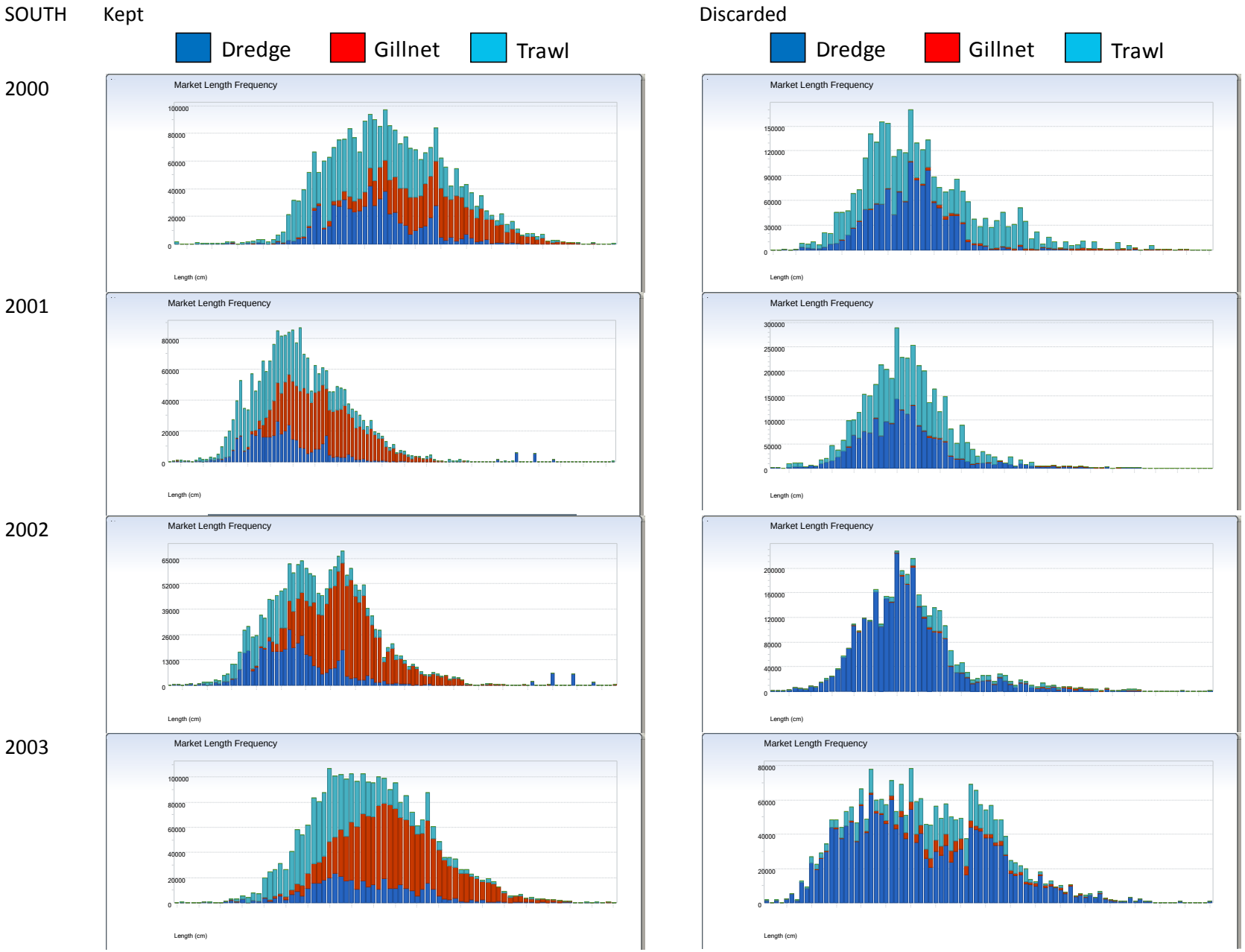


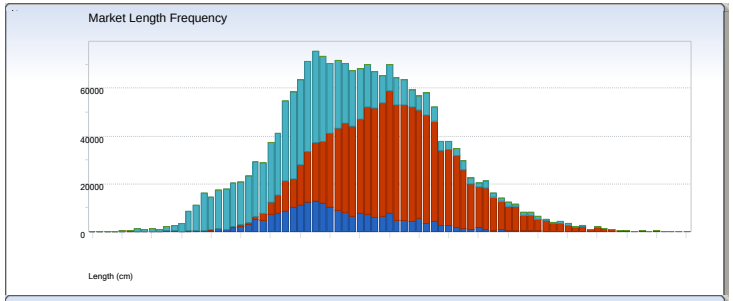
Figure 7. Estimated length composition of kept and discarded monkfish in the South, by gear type.

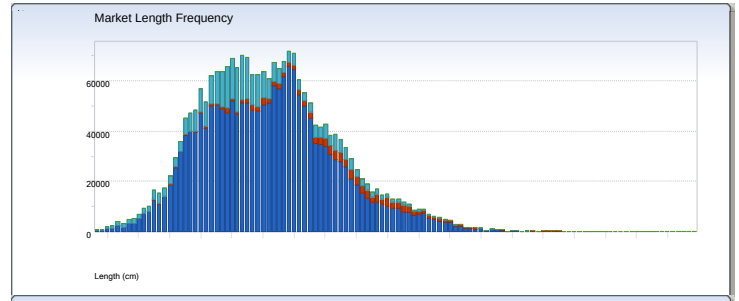
SOUTH Kept Discarded

Dredge Gillnet Trawl

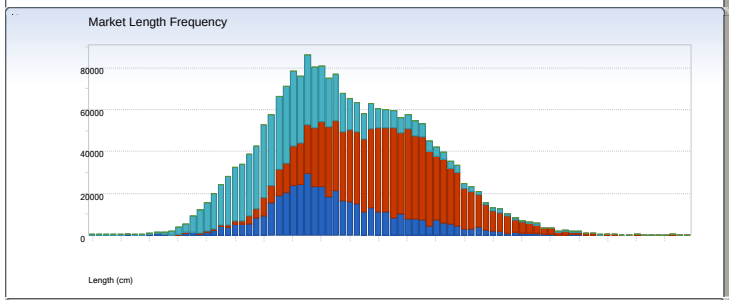
Dredge Gillnet Trawl

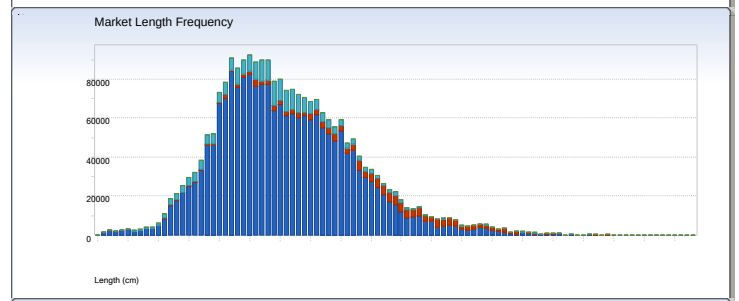
2004



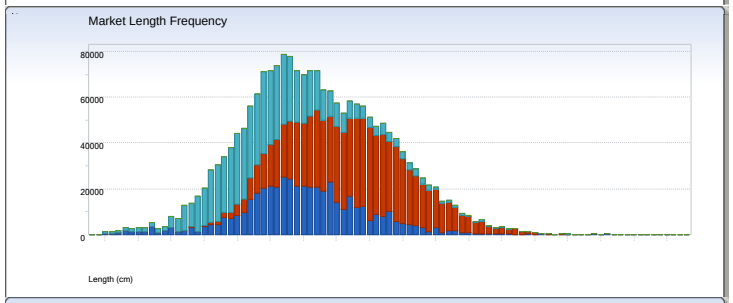


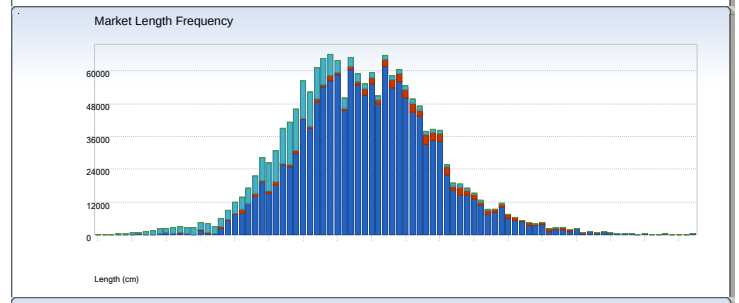
2005





2006





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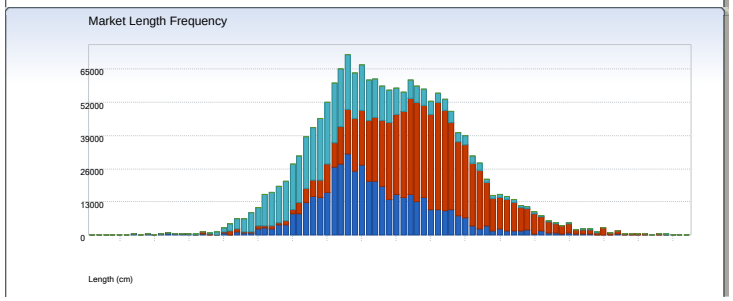

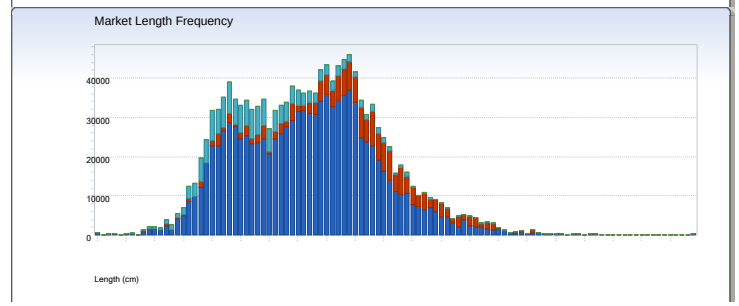

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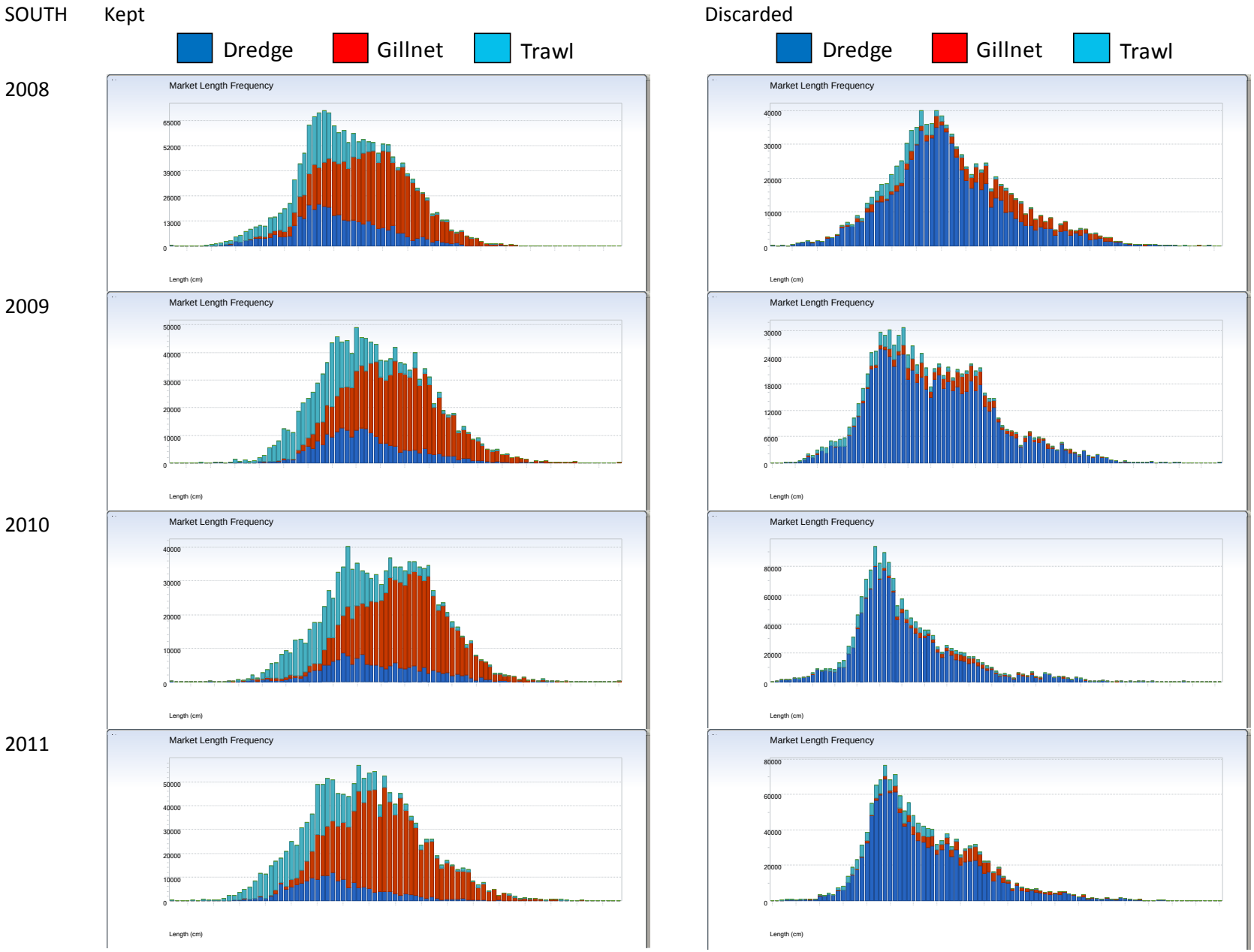

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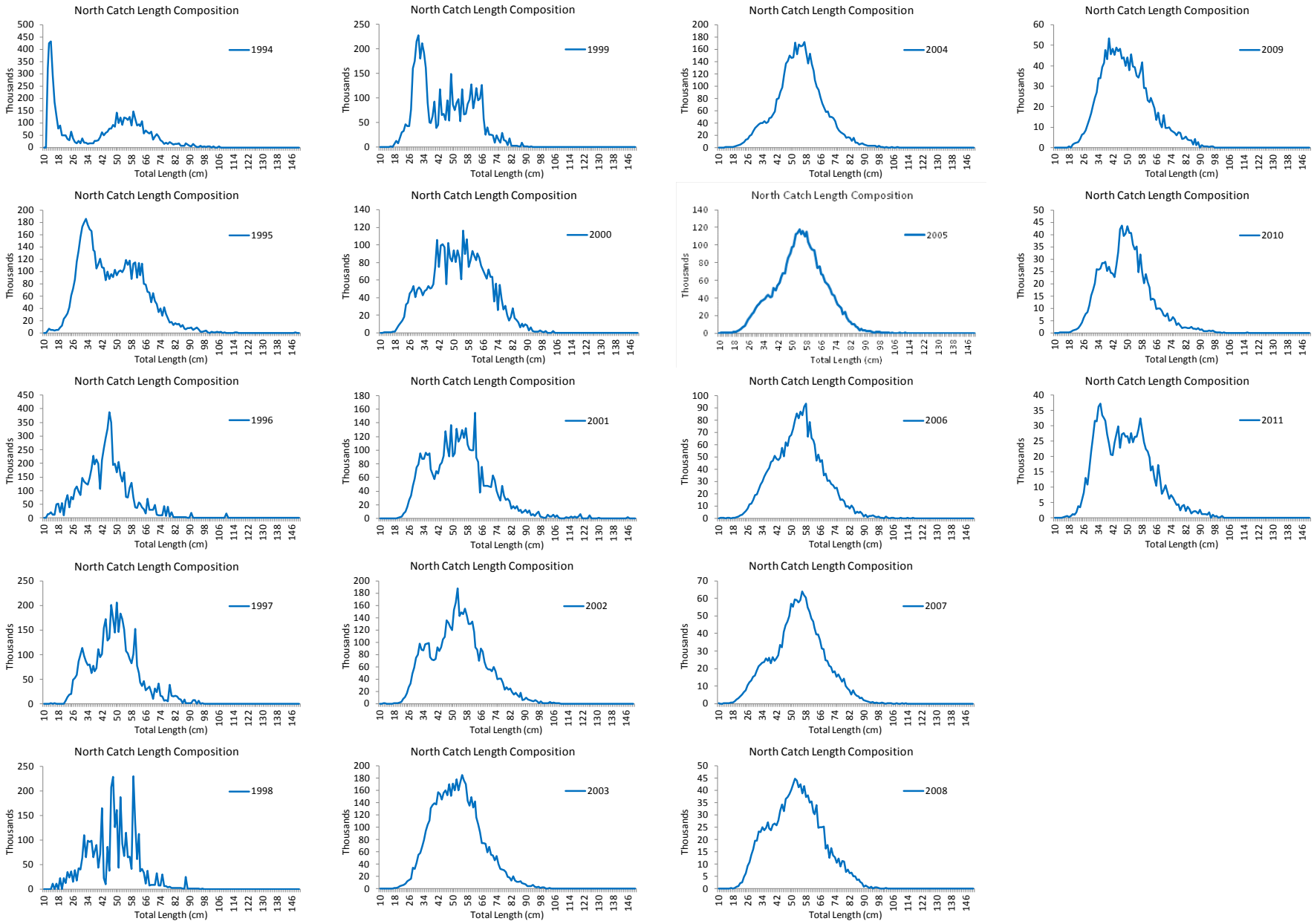


Figure 8. Length composition of monkfish commercial catch estimated using length frequency data collected by fishery observers in the northern management region.

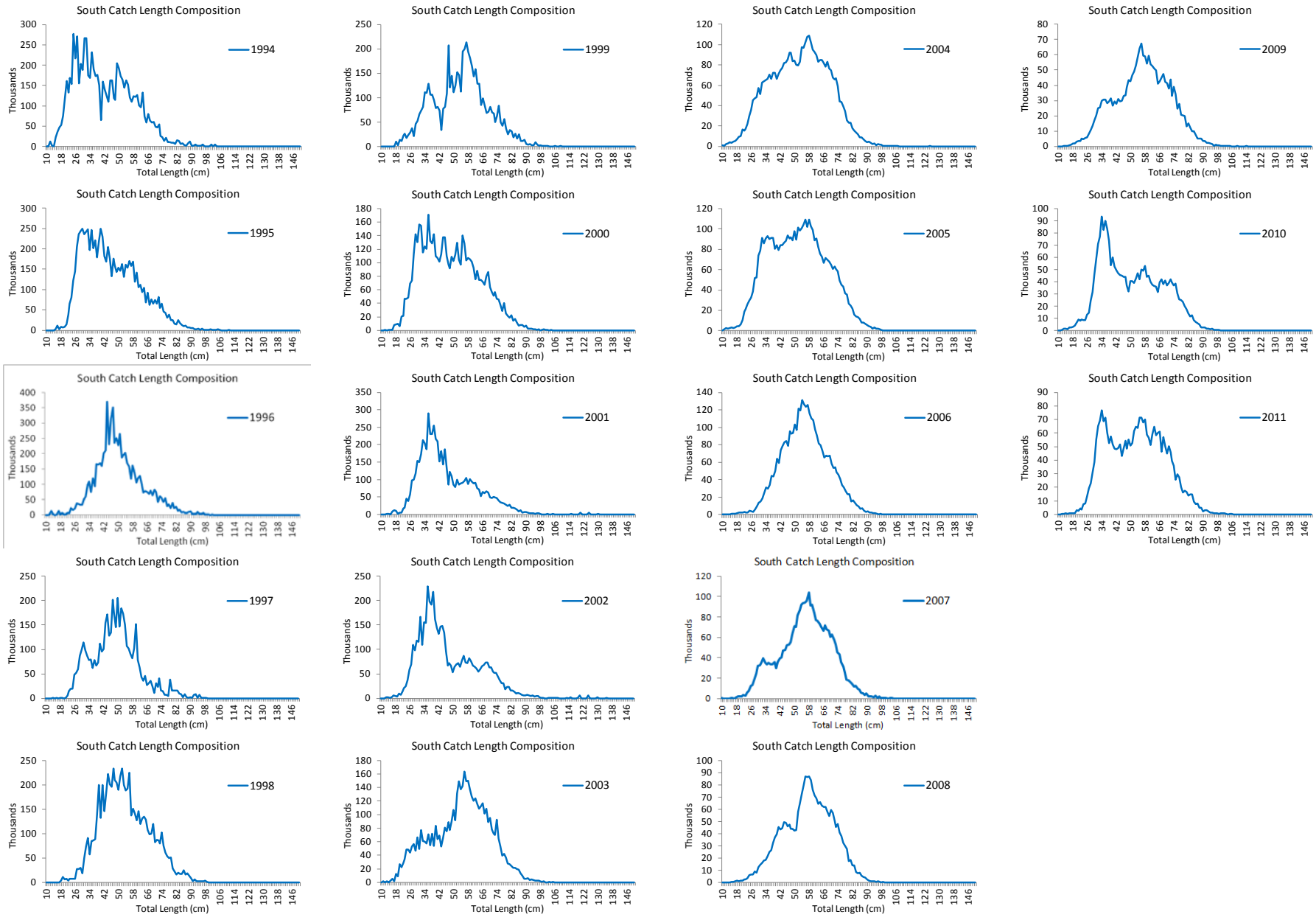


Figure 9. Length composition of monkfish commercial catch estimated using length frequency data collected by fishery observers in the southern management region.

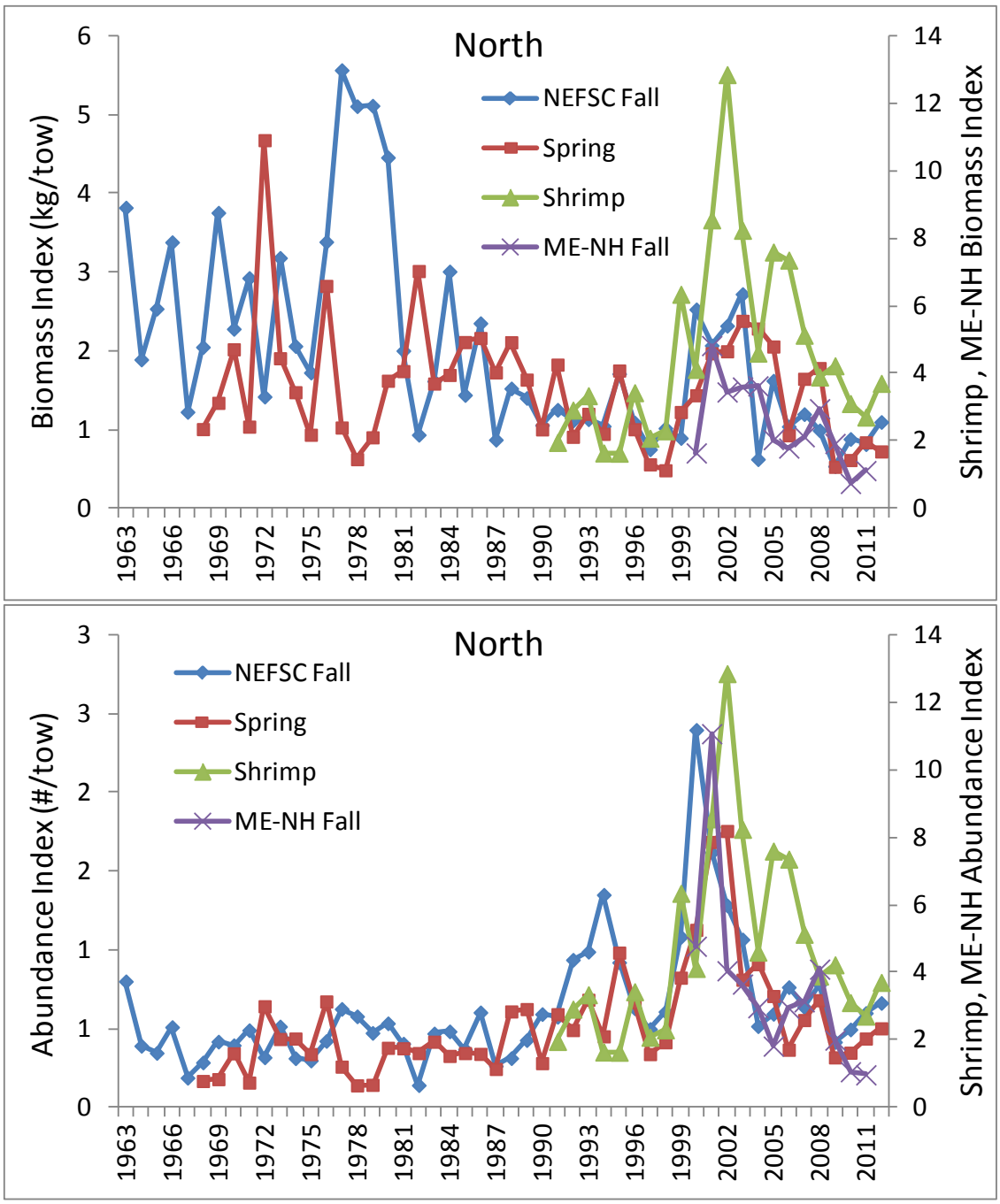
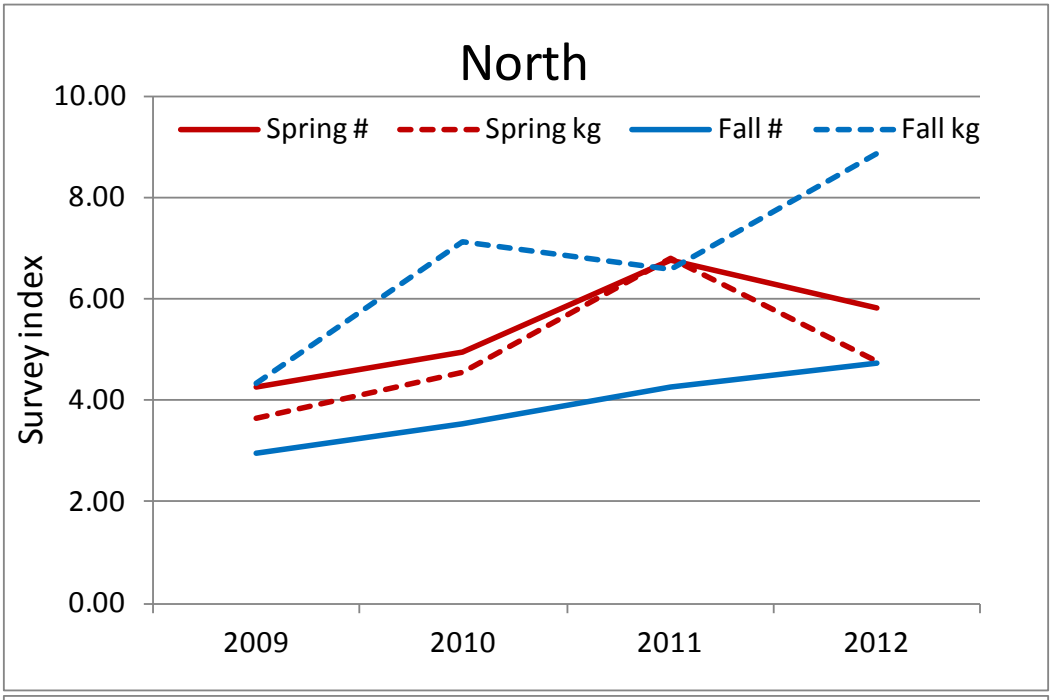


Figure 10. Survey indices for monkfish in the northern management area. Top panel biomass, bottom panel abundance.

North



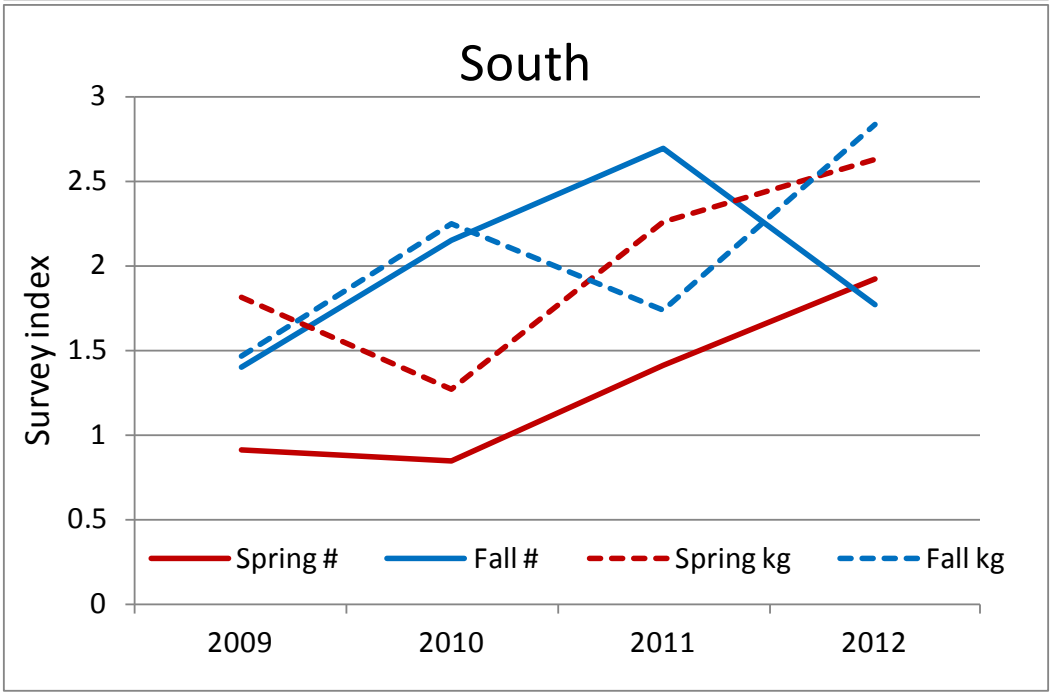


Figure 11. NEFSC autumn and spring survey indices for monkfish in the northern and southern management areas for 2009-2012, not converted to Albatross units.

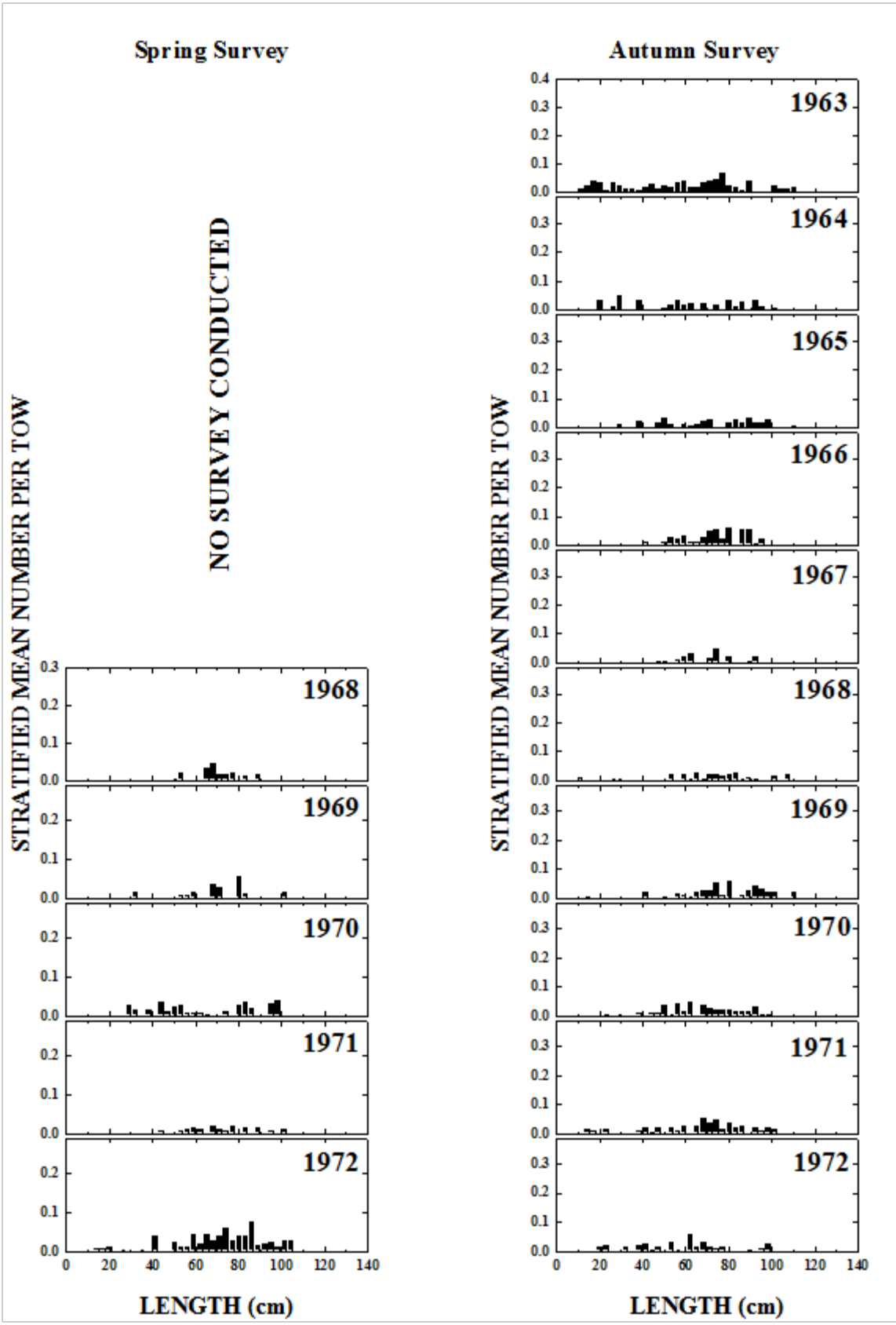


Figure 12. Goosefish length composition from the NEFSC spring and autumn bottom trawl surveys in the northern management region.

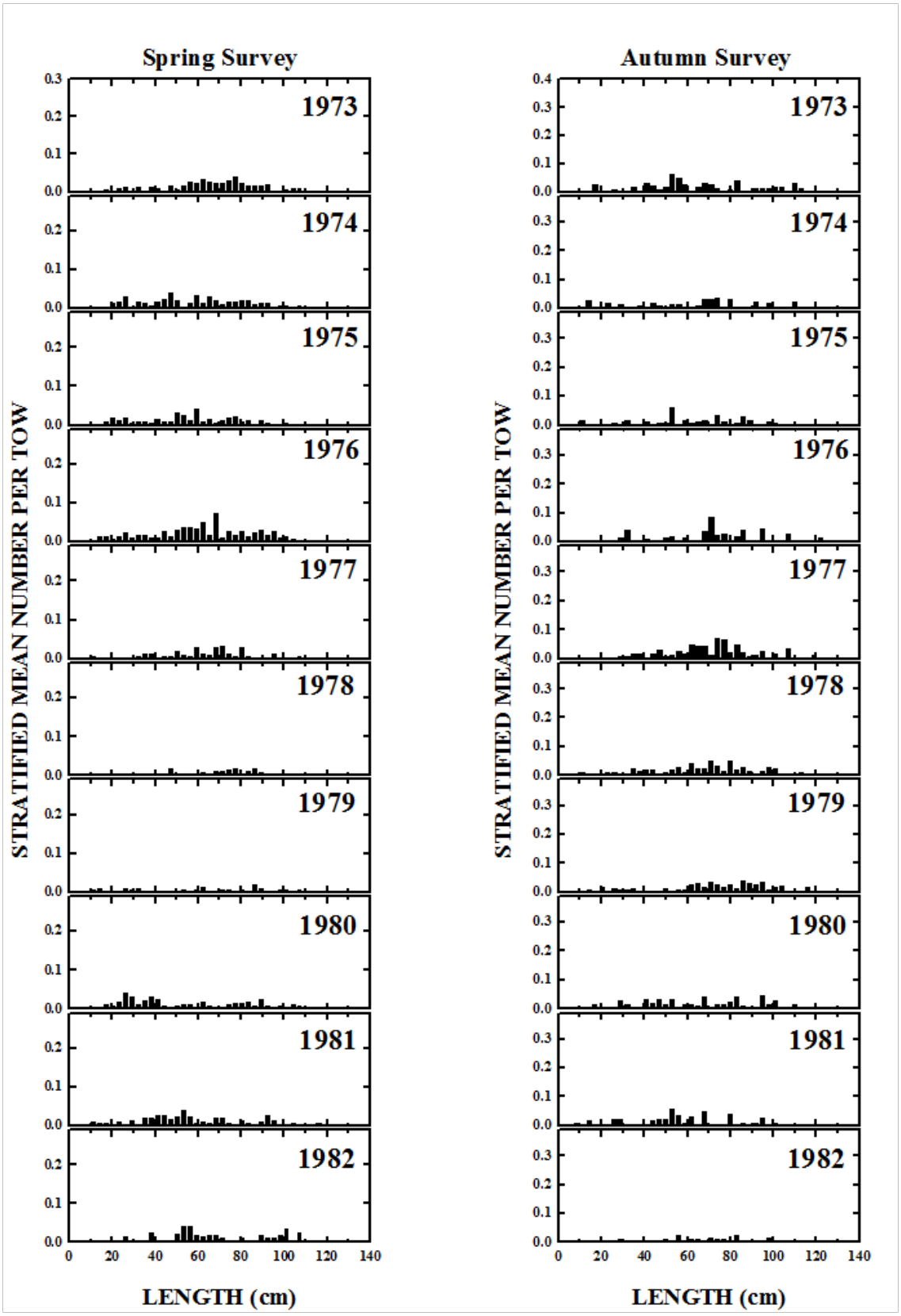


Figure 12, continued. Goosefish length composition from the NEFSC spring and autumn bottom trawl surveys in the northern management region.

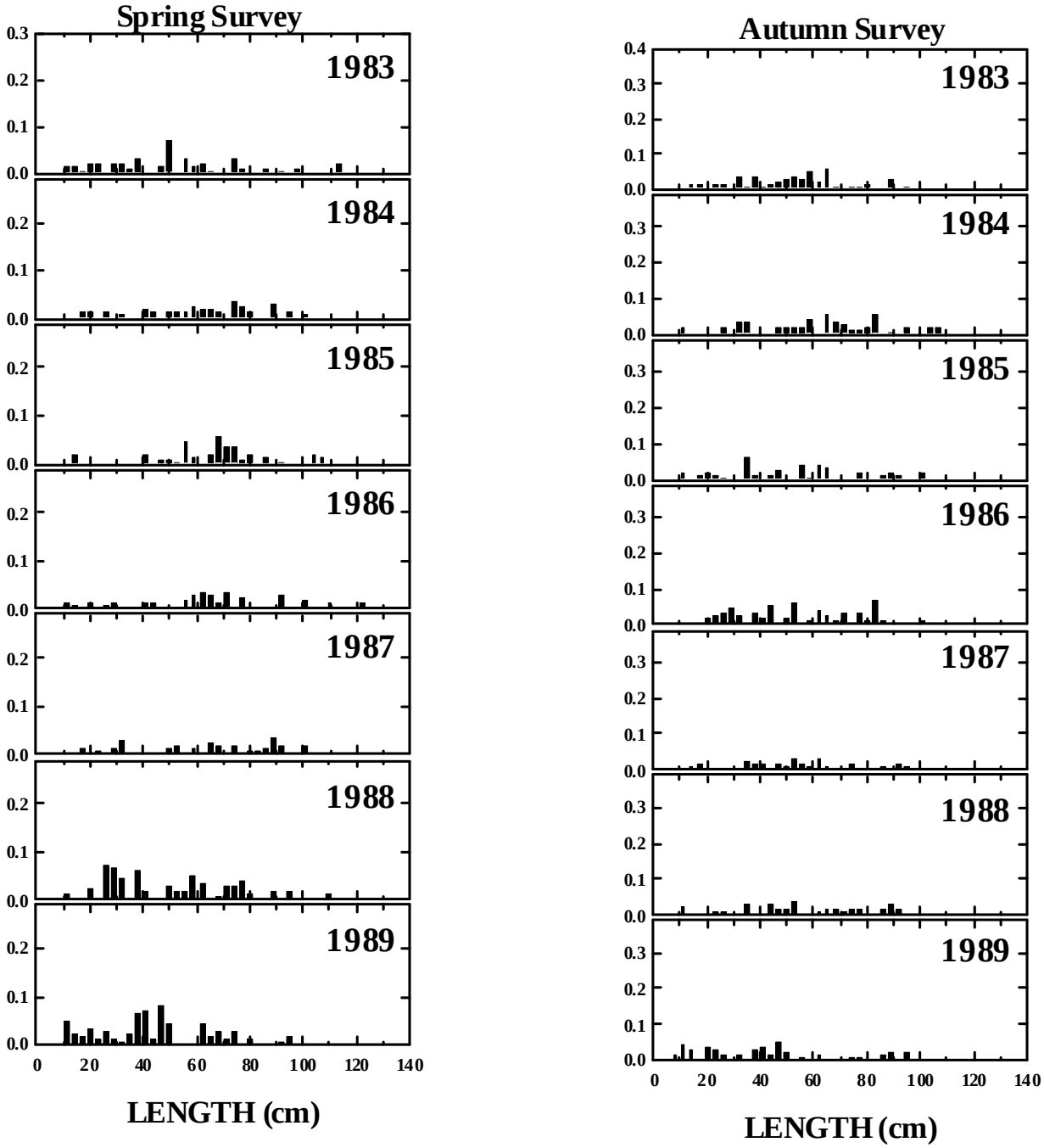


Figure 12, continued. Goosefish length composition from the NEFSC spring and autumn bottom trawl surveys in the northern management region.

NOTE: Y-AXIS SCALE CHANGES ON THIS PAGE

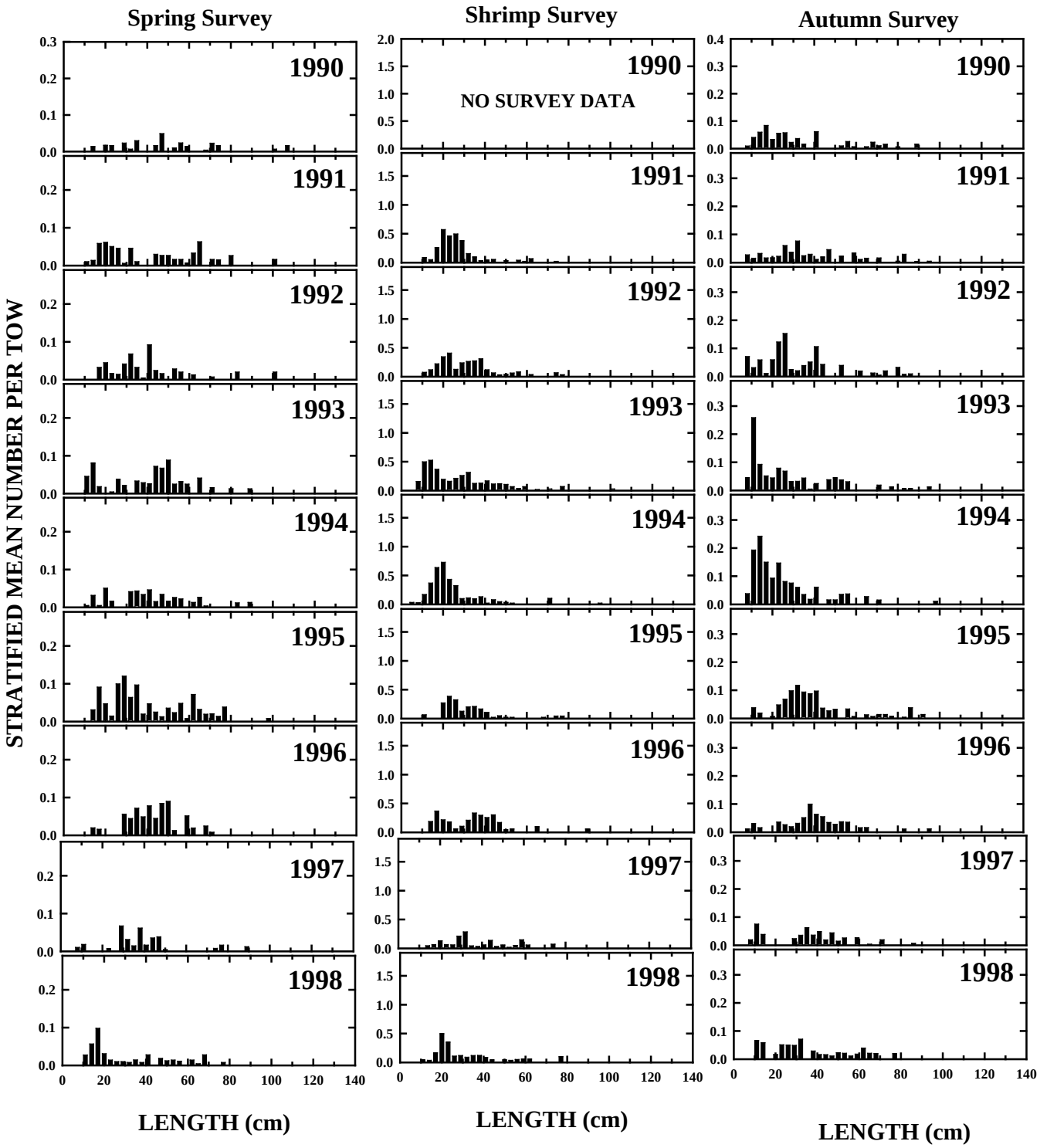


Figure 12, continued. Goosefish length composition from the NEFSC spring and autumn bottom trawl survey, and ASMFC summer shrimp survey in the northern management region.

NOTE: Y-AXIS SCALE CHANGES ON THIS PAGE

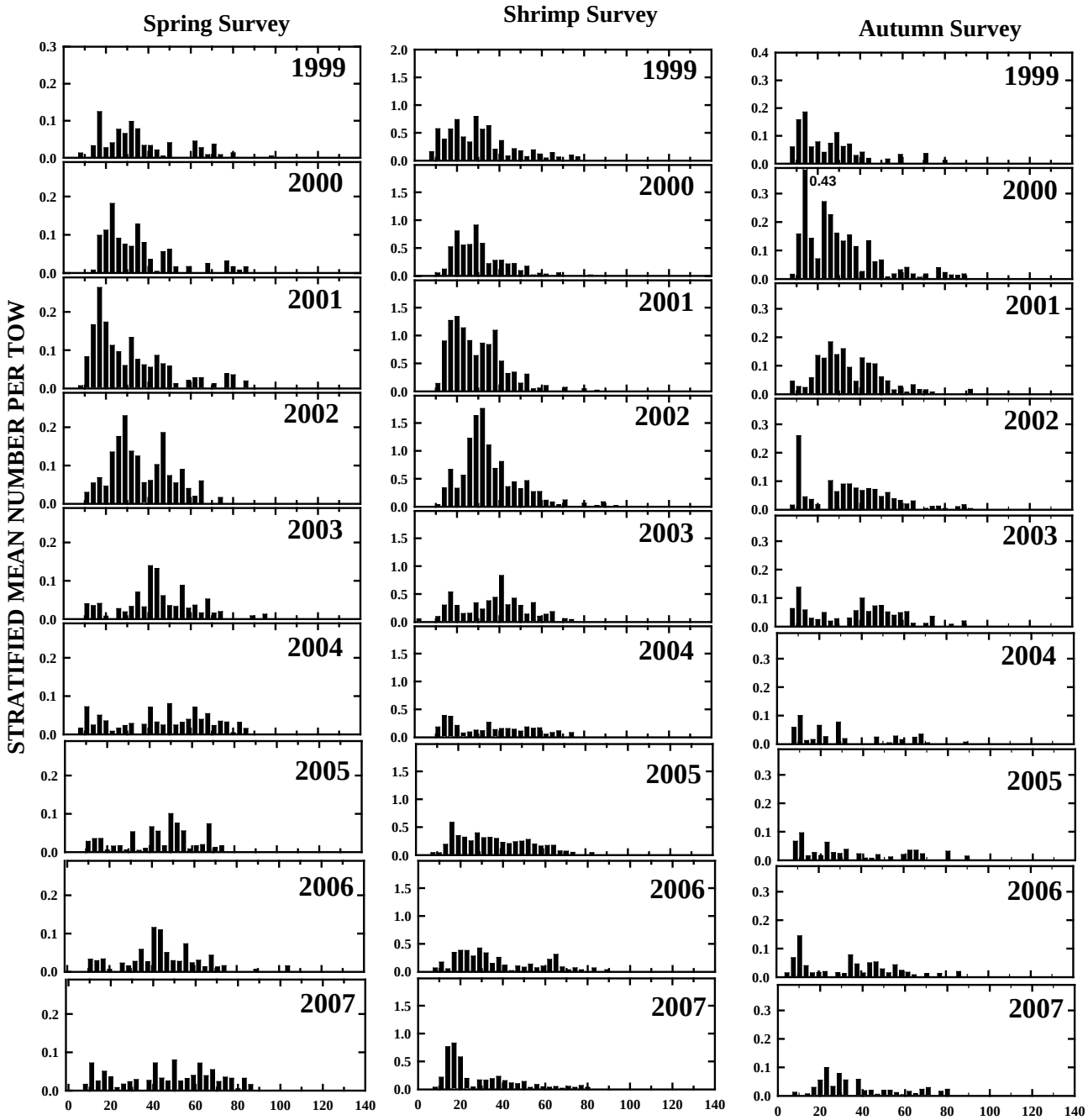
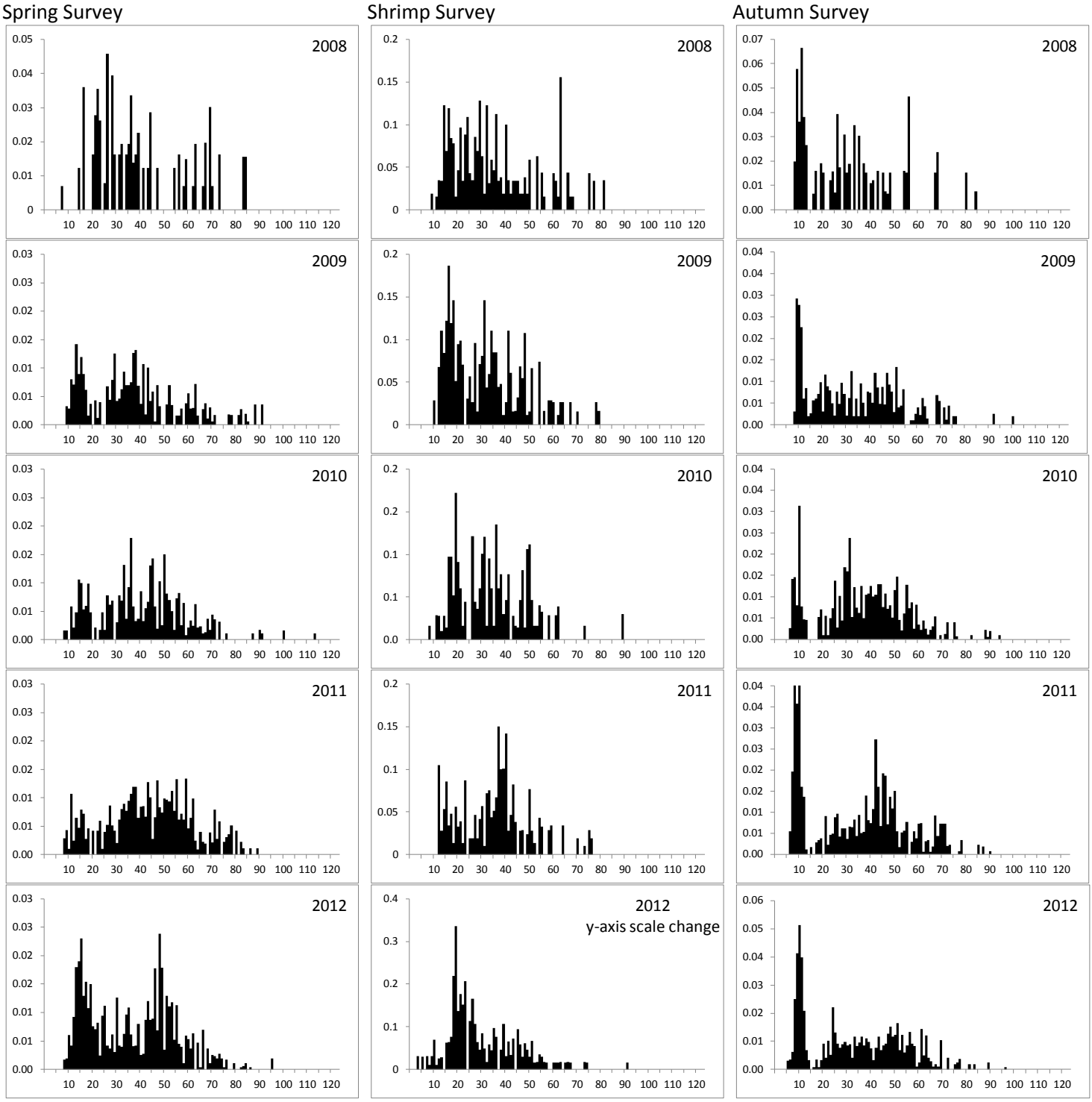


Figure 12, continued. Goosefish length composition from the NEFSC spring and autumn bottom trawl survey, and ASMFC summer shrimp survey in the northern management region.



Note: axis scales change from previous page

Figure 12, continued. Goosefish length composition from the NEFSC spring and autumn bottom trawl survey, and ASMFC summer shrimp survey in the northern management region. 2009-2012 indices have been converted to *Albatross* units. Note axis changes this page due to plotting options (bars are 3-cm groups in previous plots, 1-cm groups here).

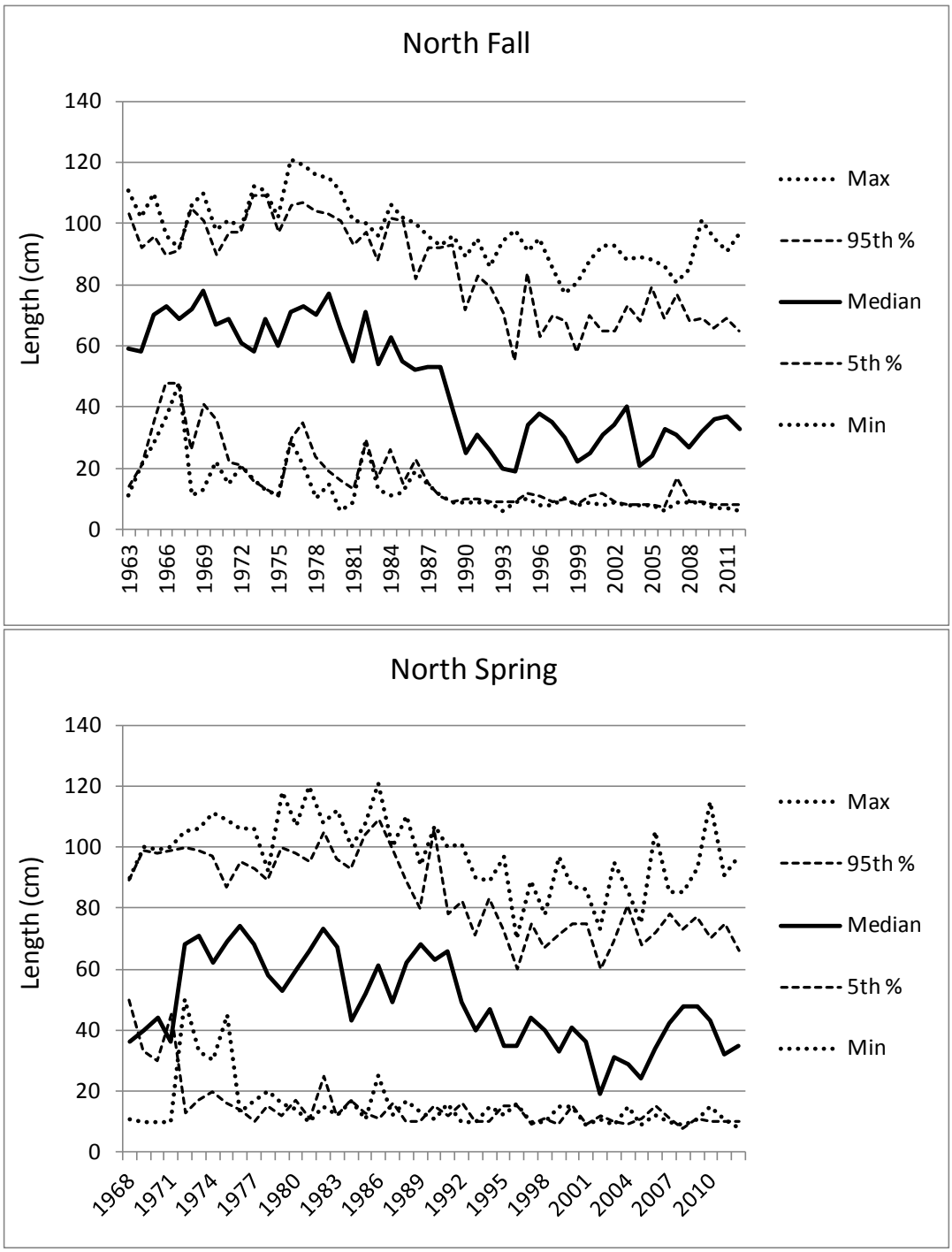


Figure 13. Length quantiles for monkfish over time from NEFSC autumn and spring surveys.

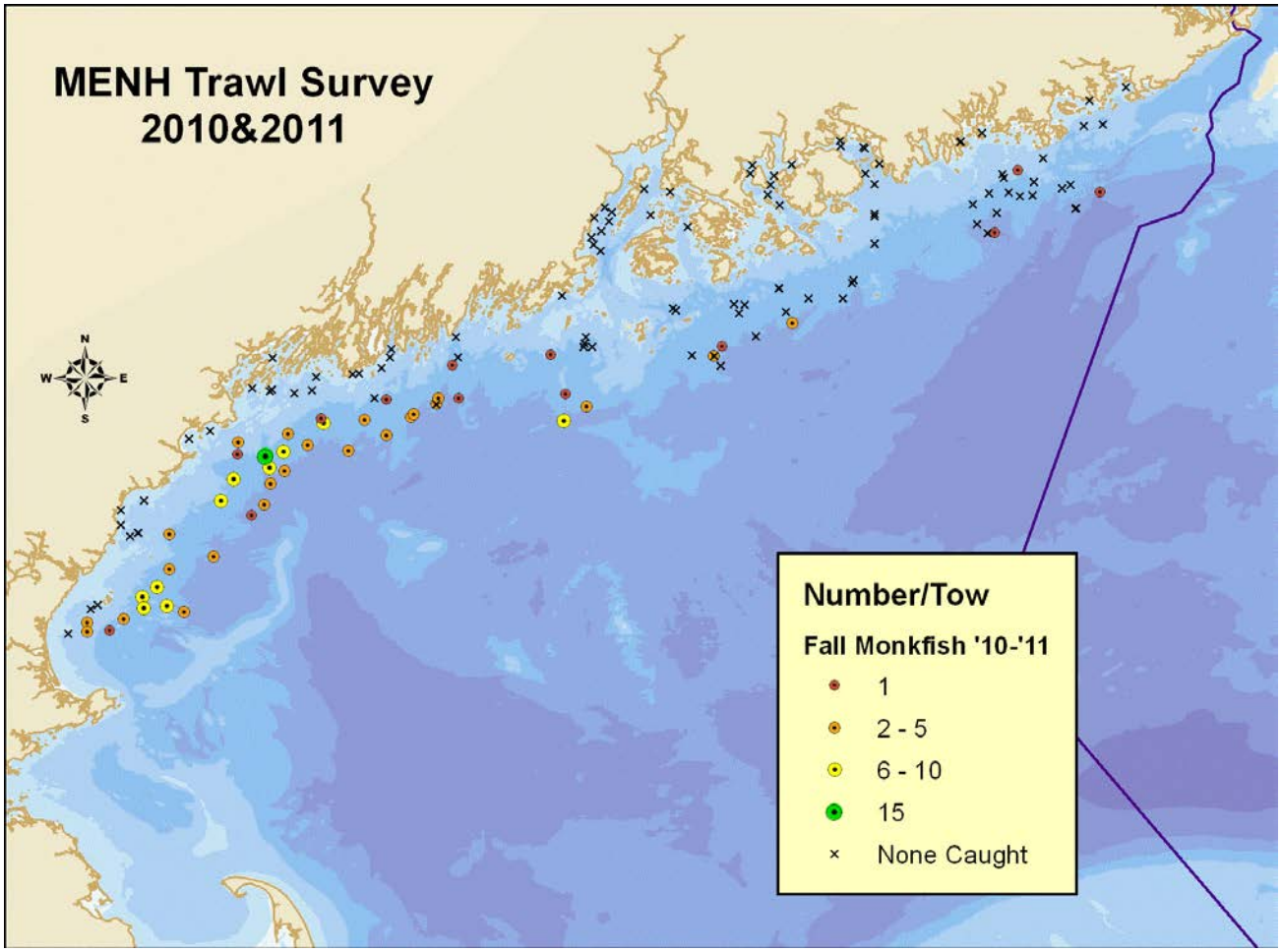


Figure 14. Distribution of monkfish in ME-NH fall survey, 2010-2011.

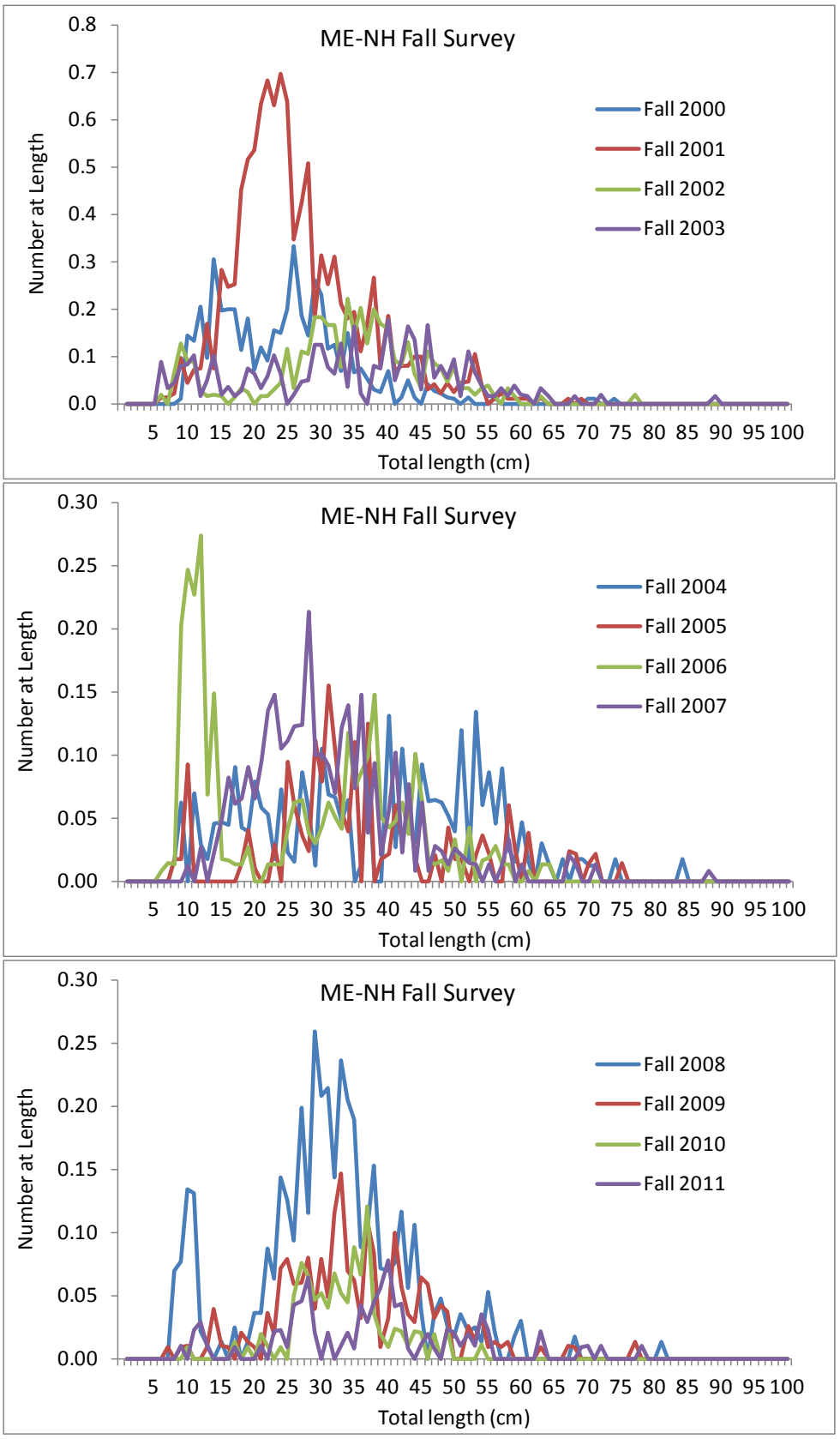


Figure 15. Length frequencies from Maine-New Hampshire fall inshore survey, 2000-2011.

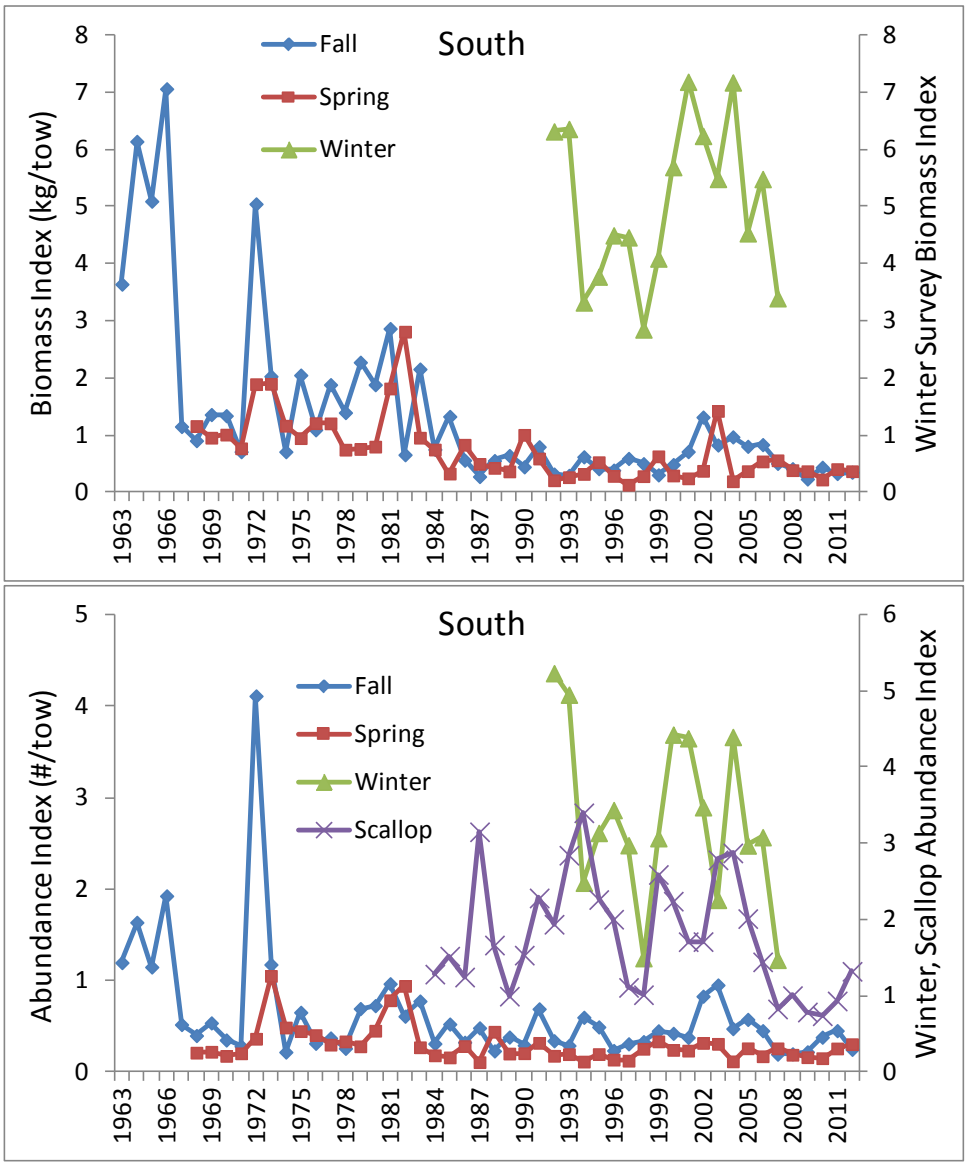


Figure 16. Survey indices for monkfish in the southern management area. Top panel biomass, bottom panel abundance.

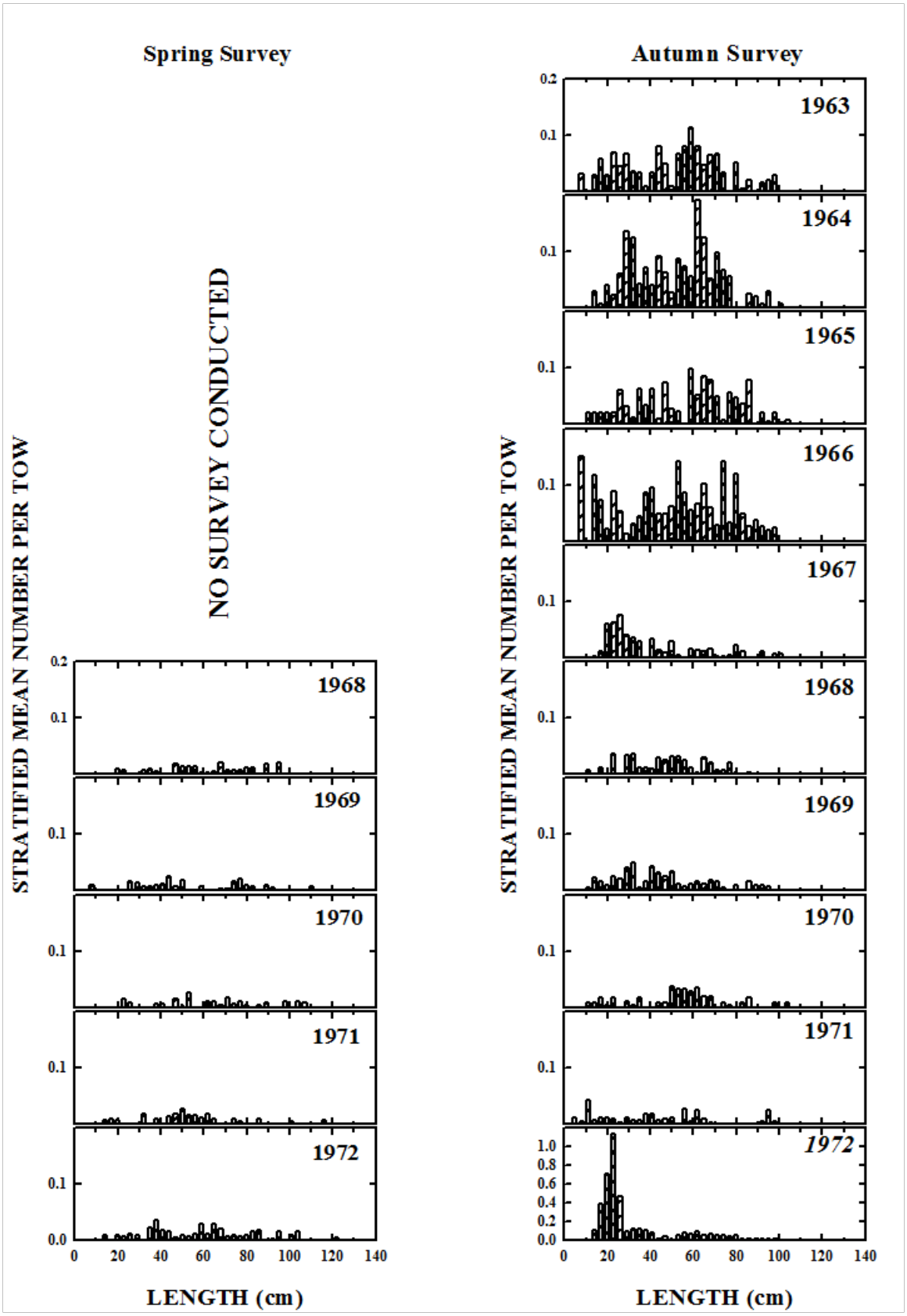


Figure 17. Goosefish length composition from the NEFSC spring bottom trawl (March-April), winter flatfish (February), summer scallop (July-August), and autumn (September-October) bottom trawl surveys in the southern management region, 1963-2009. Note: 1963-1966 sampled reduced strata set.

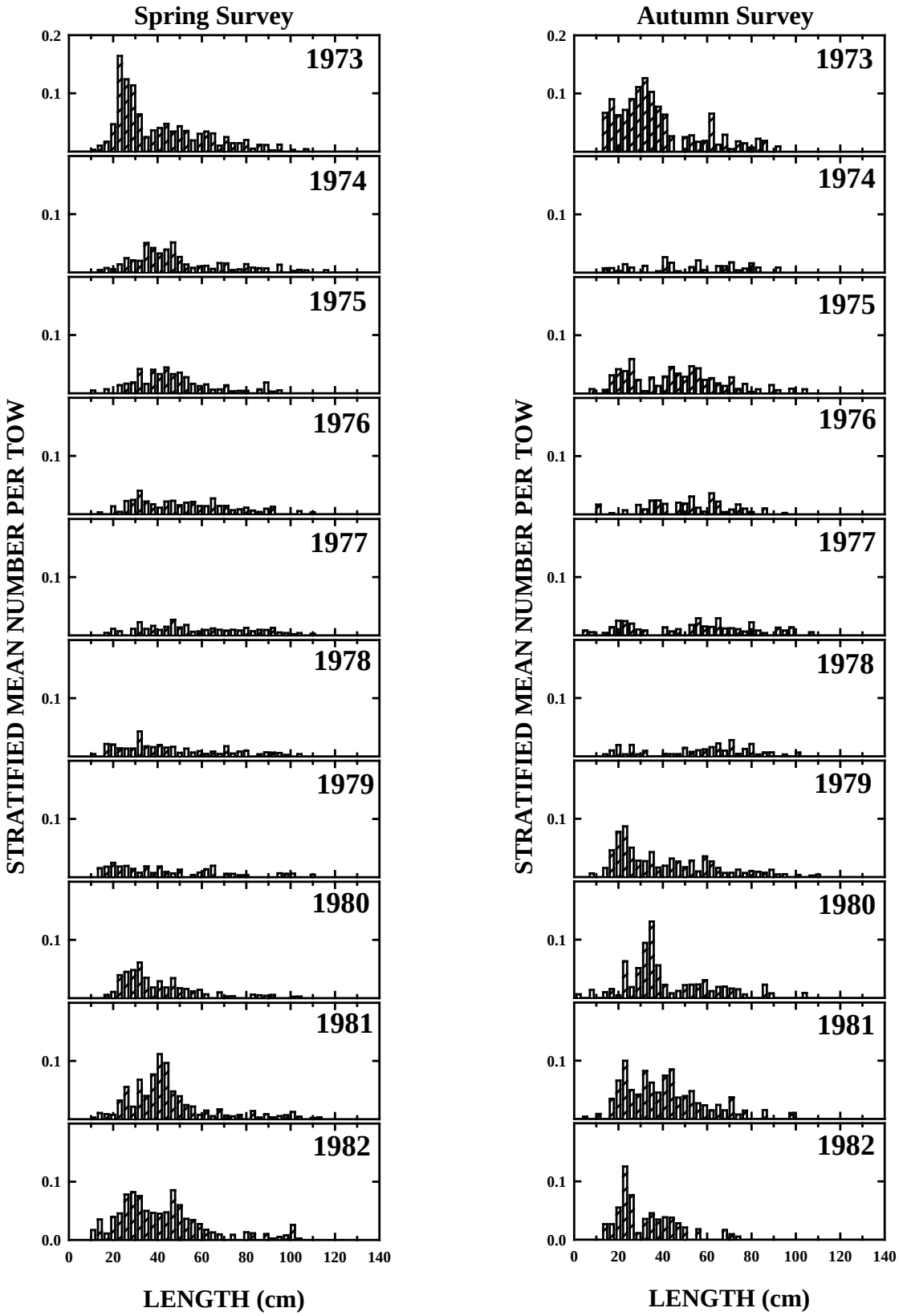


Figure 17, continued (South).

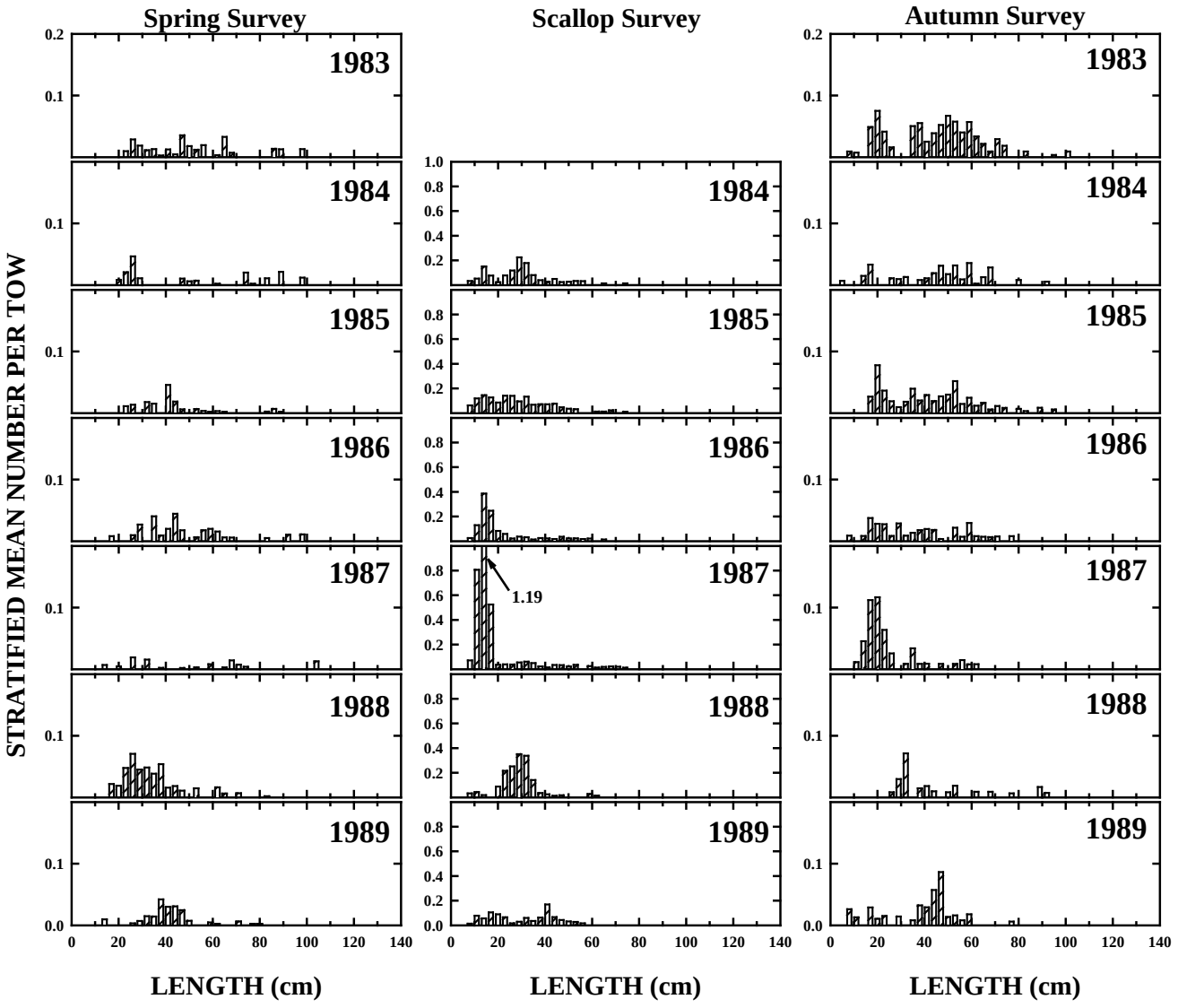


Figure 17, continued (South).

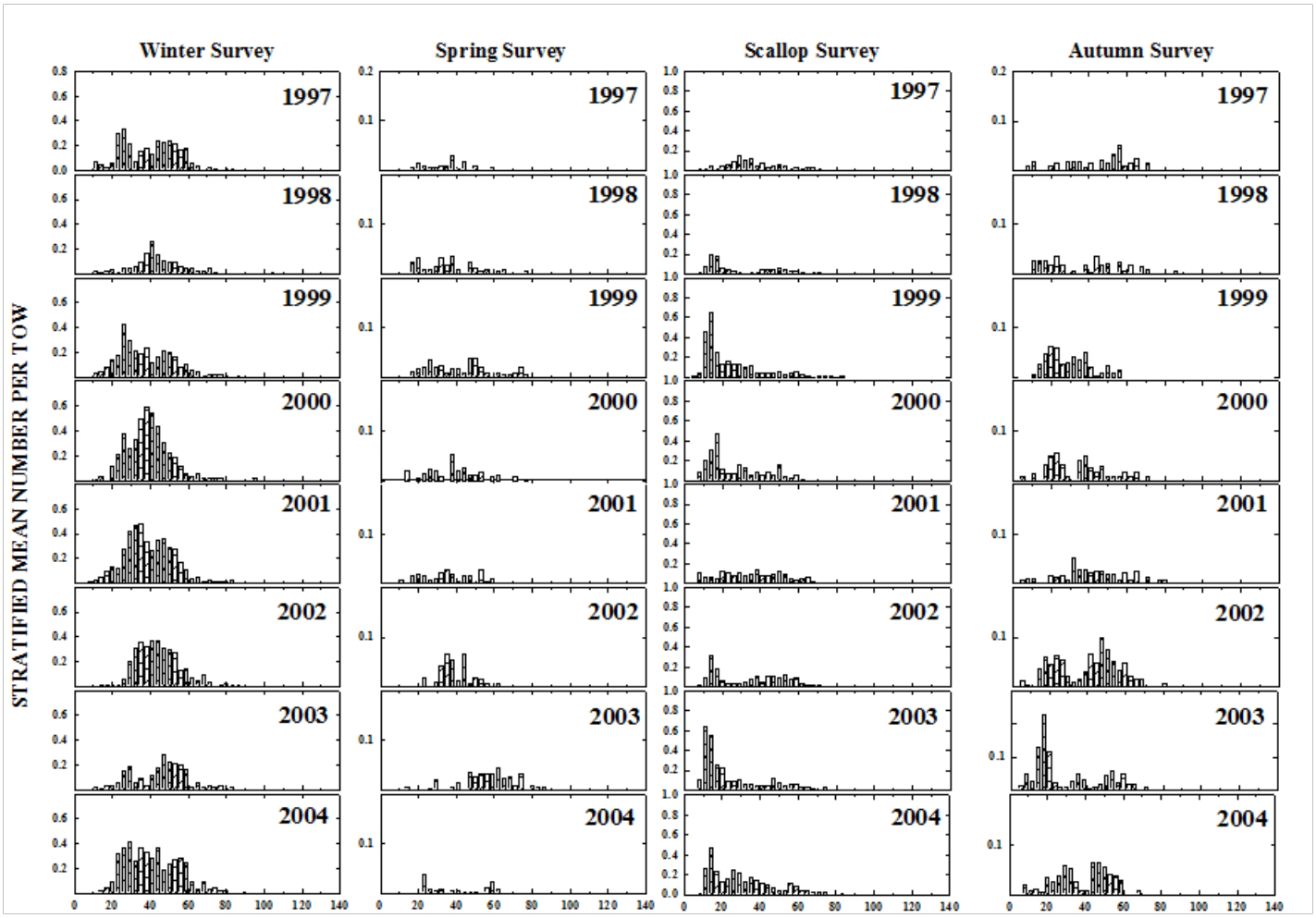


Figure 17, continued (South).

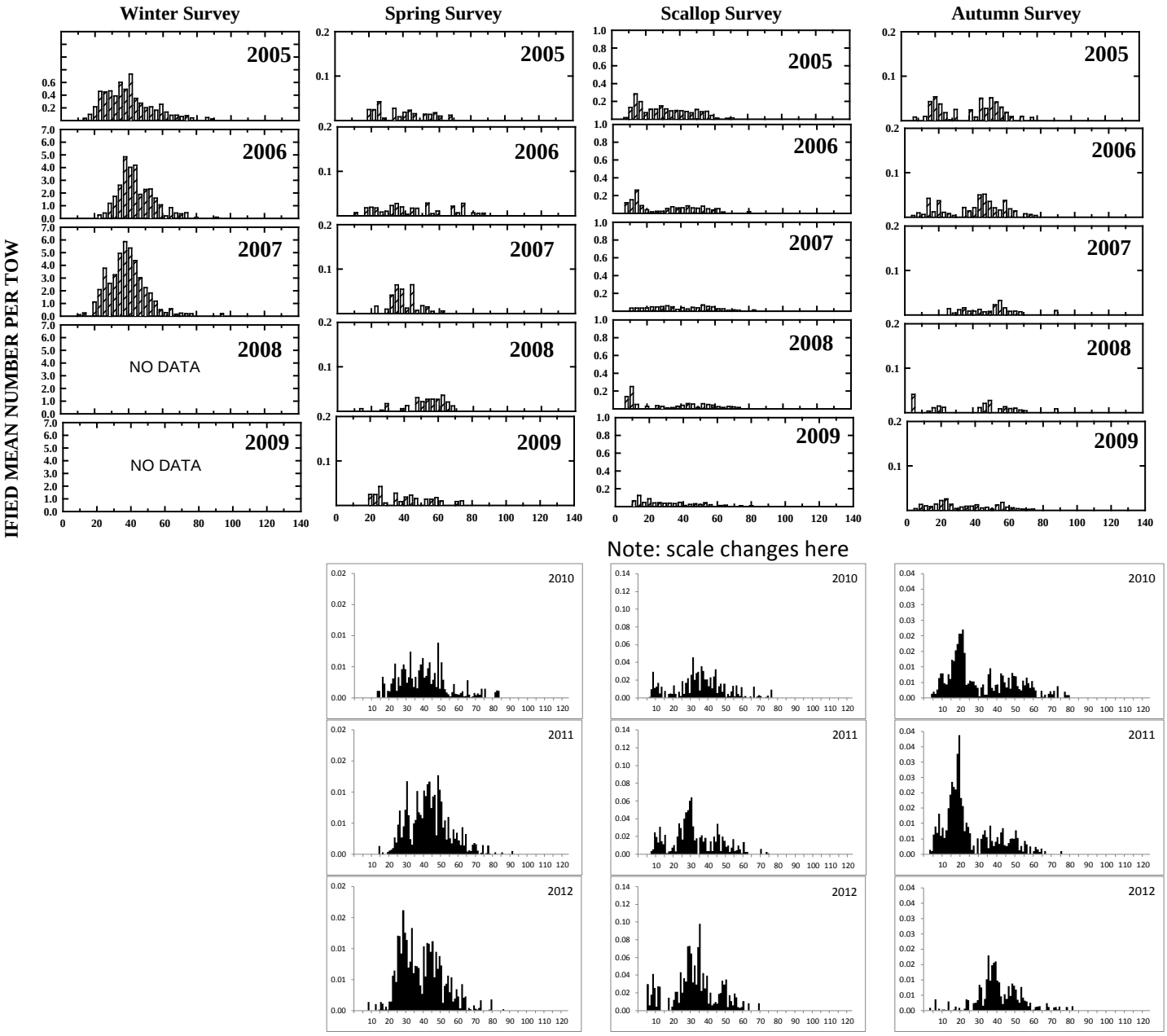
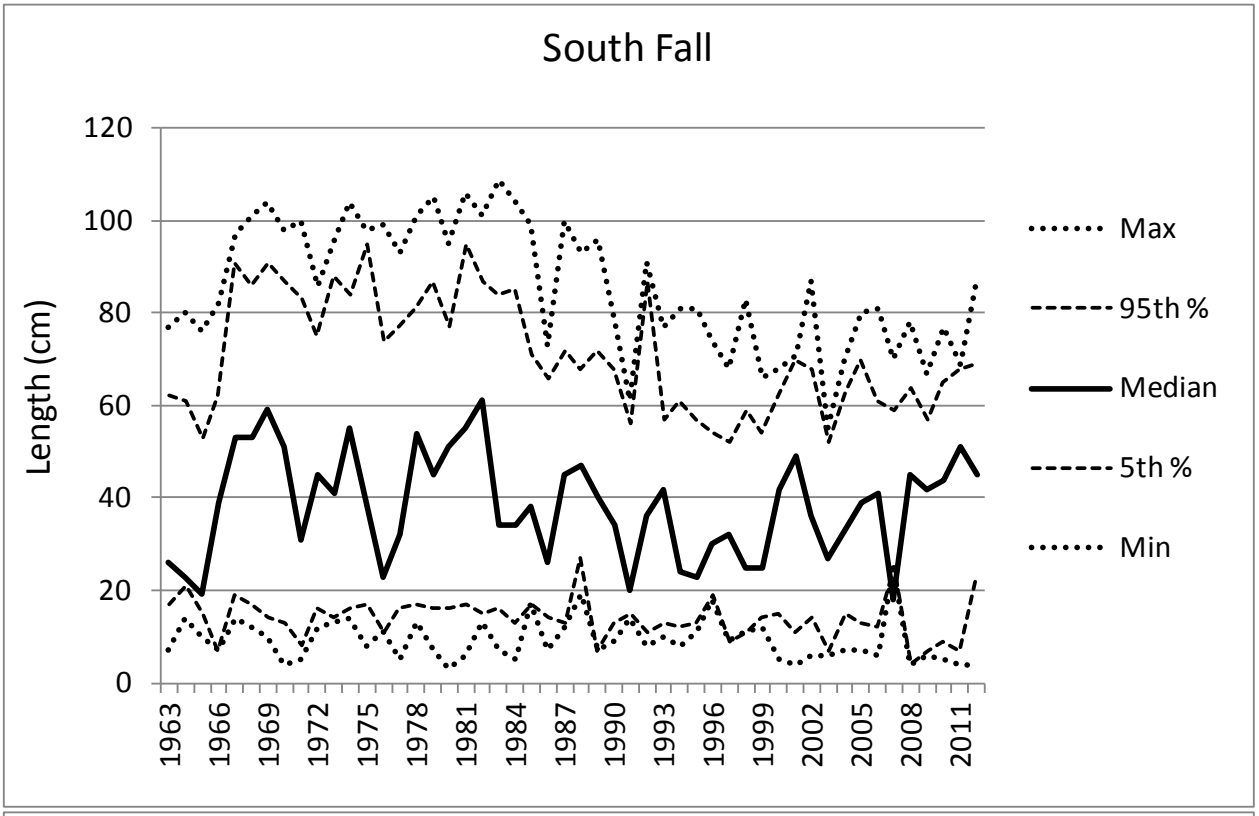


Figure 17, continued (South).



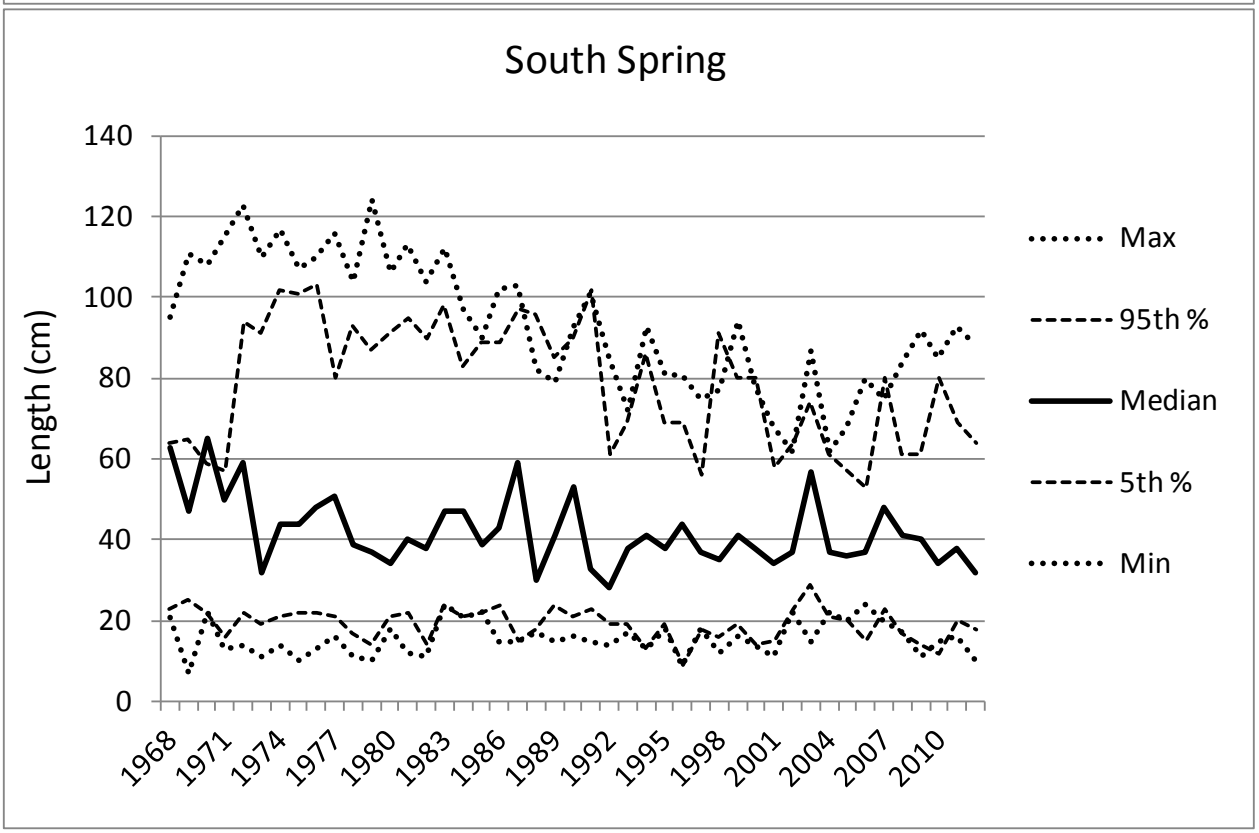


Figure 18. Length quantiles for monkfish over time from NEFSC autumn and spring surveys.

North SCALE- survey inputs

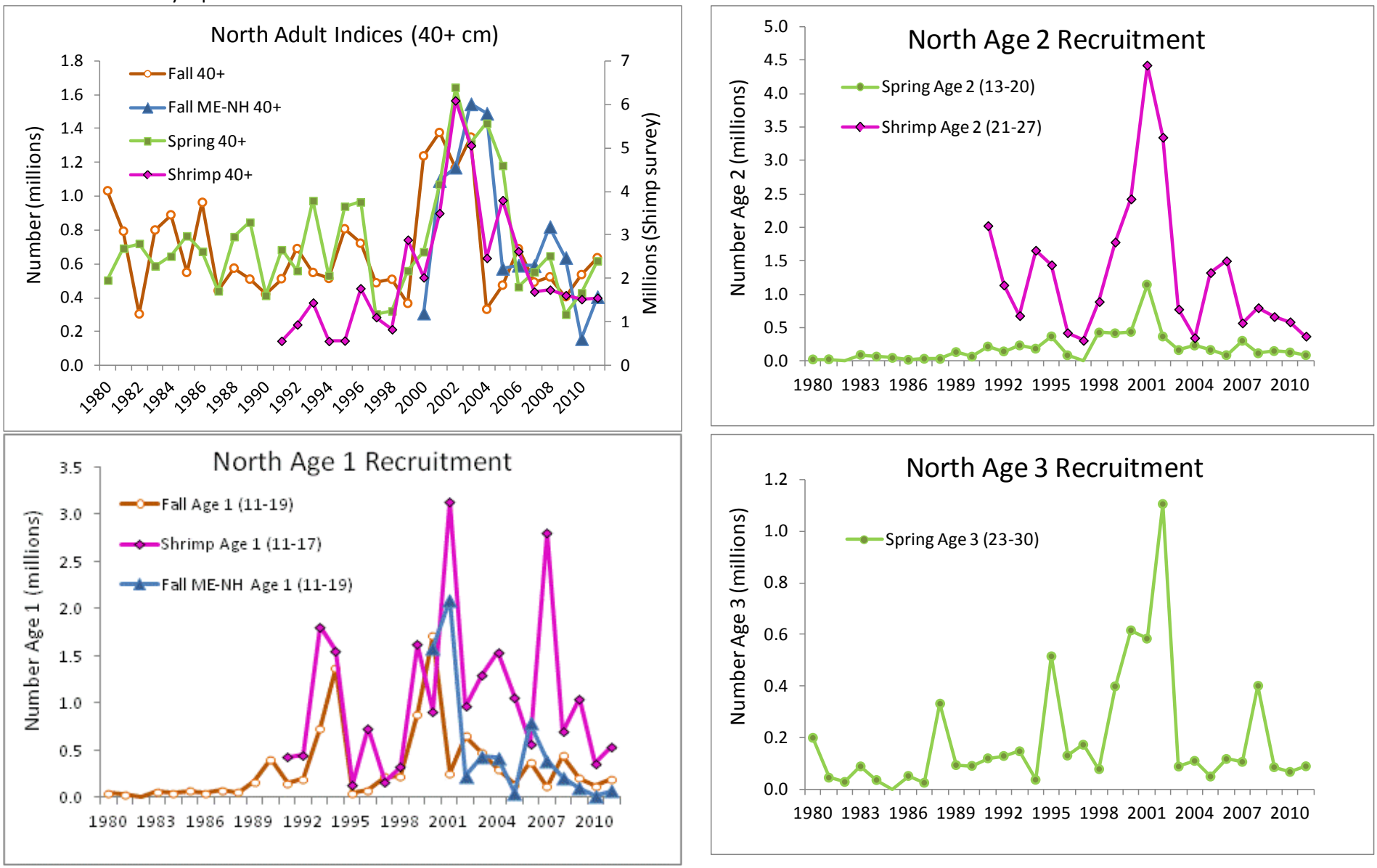


Figure 19. Survey inputs for the SCALE model for the northern management region.

South SCALE- survey inputs

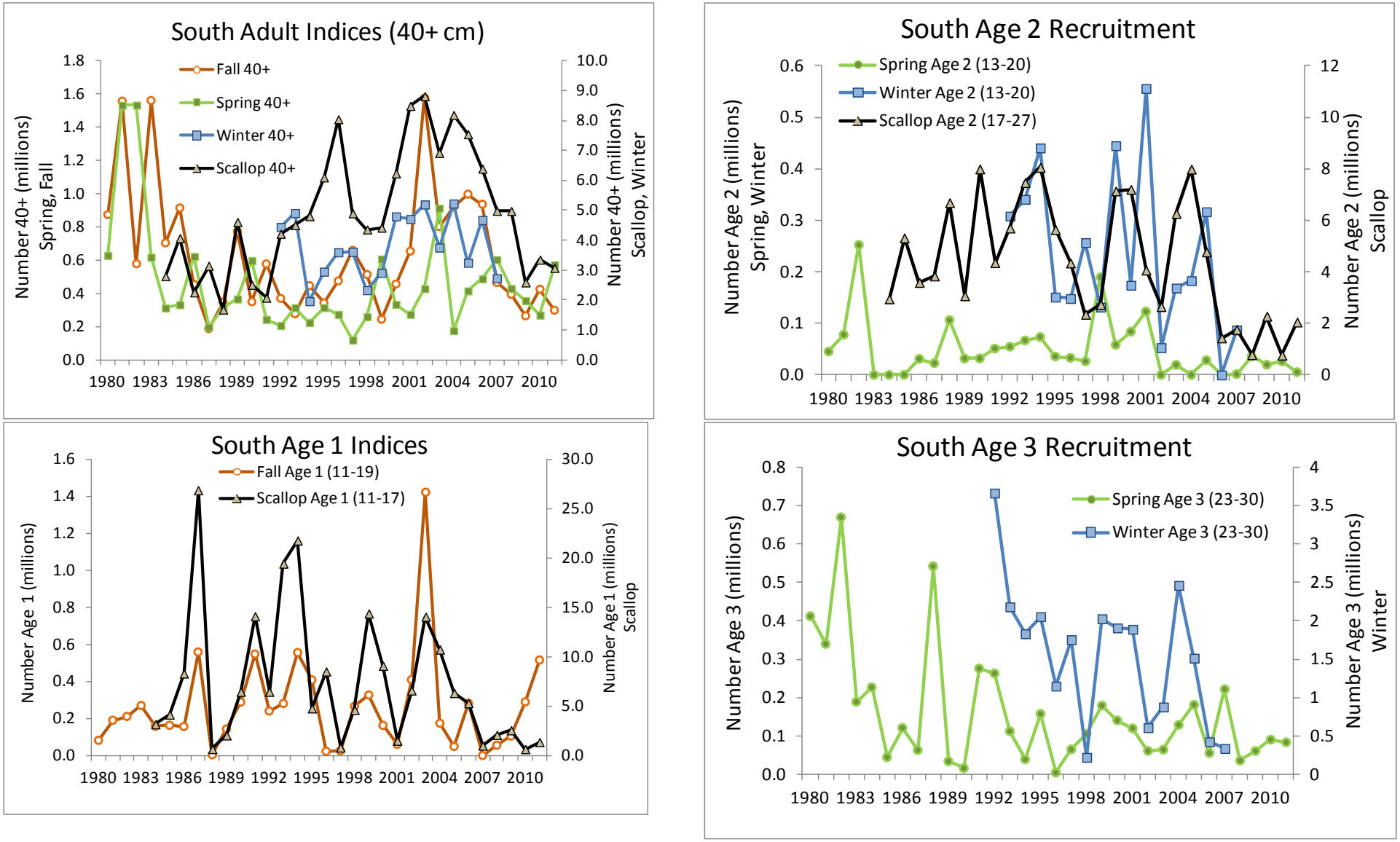


Figure 20. Survey inputs for the SCALE model for the southern management region.

North Run 1 – Revised Data, 1980-2009

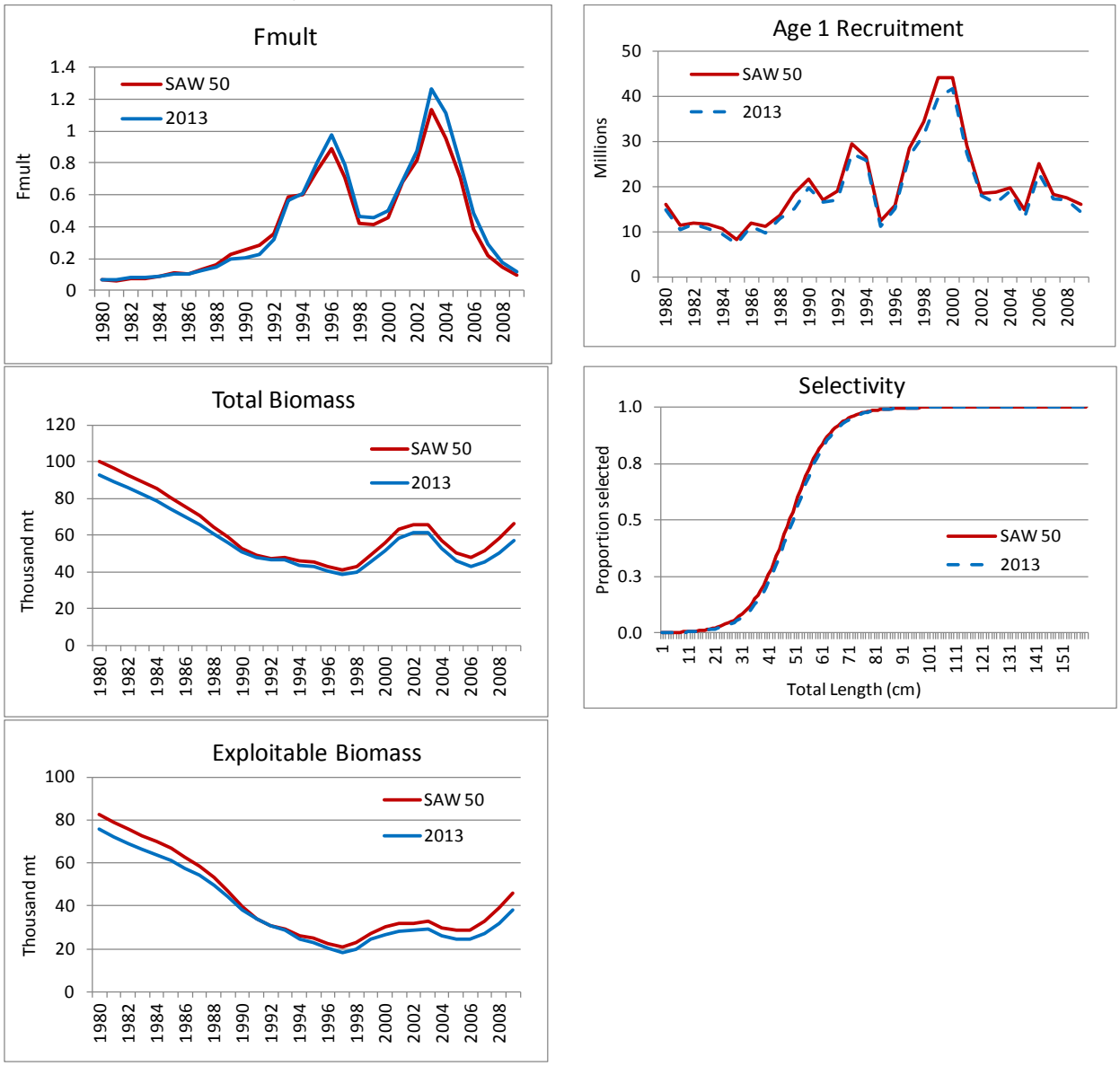


Figure 21. Comparison of SAW 50 SCALE model results for the North with results of same model using revised data for 1980-2009.

North Run 2 (Final run) – Revised + New Data (1980-2011)

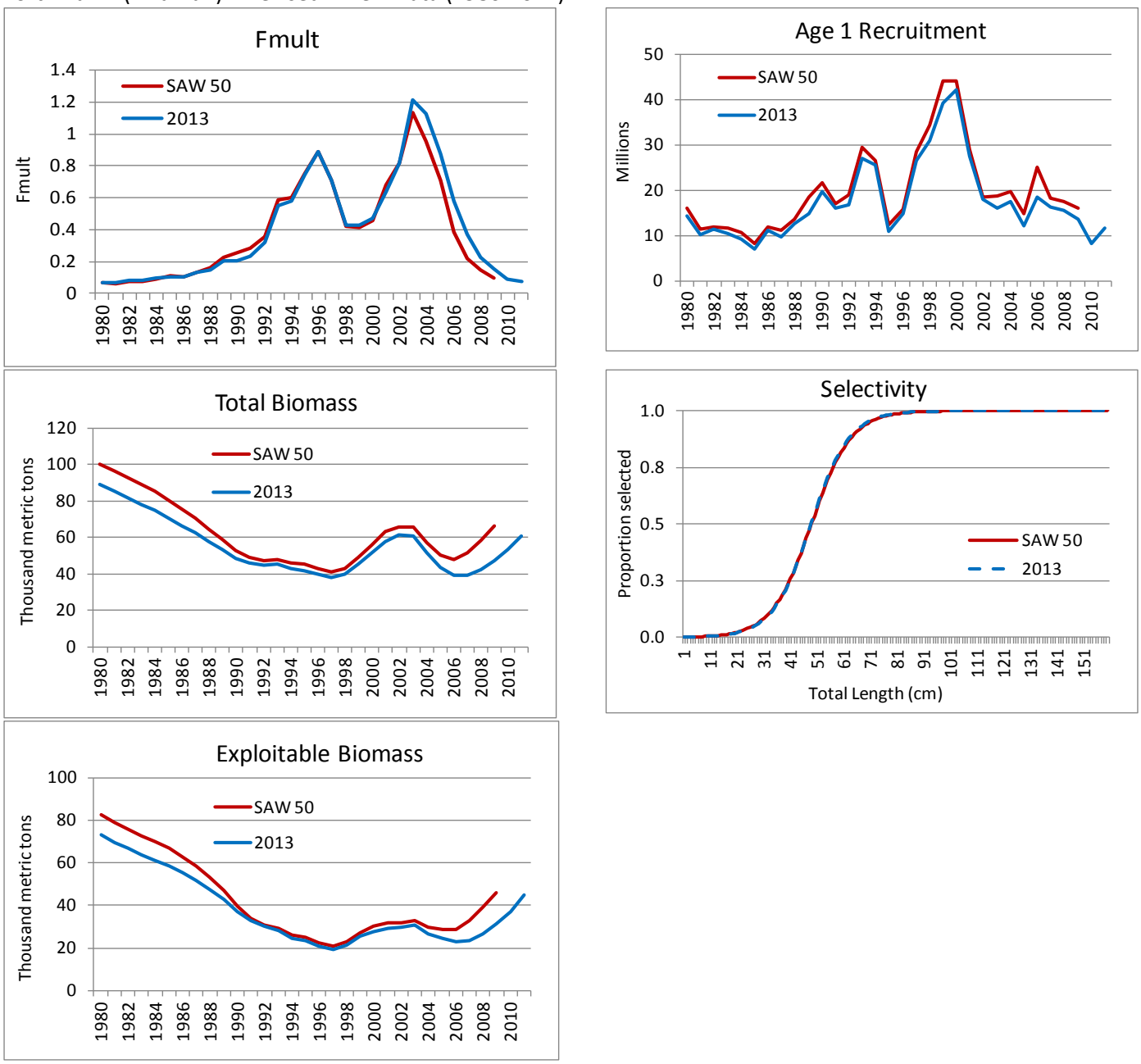


Figure 22. Comparison of SAW 50 SCALE model results for the North with results of same model using revised data (1980-2009) plus two additional years of data (2010-2011, final model for the North).

North

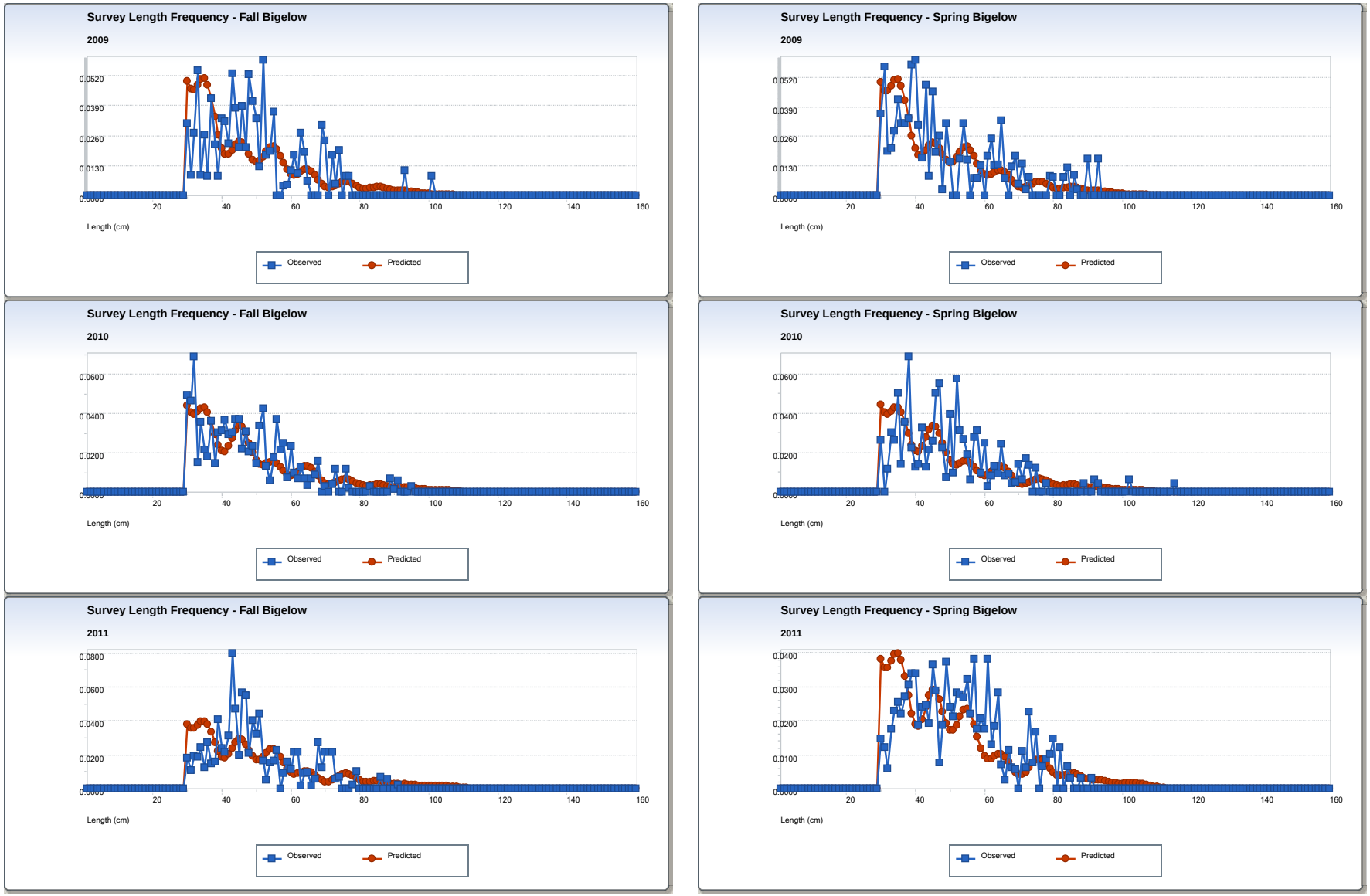


Figure 23. North SCALE final model fits to Bigelow survey length frequencies, 2009-2011.

North

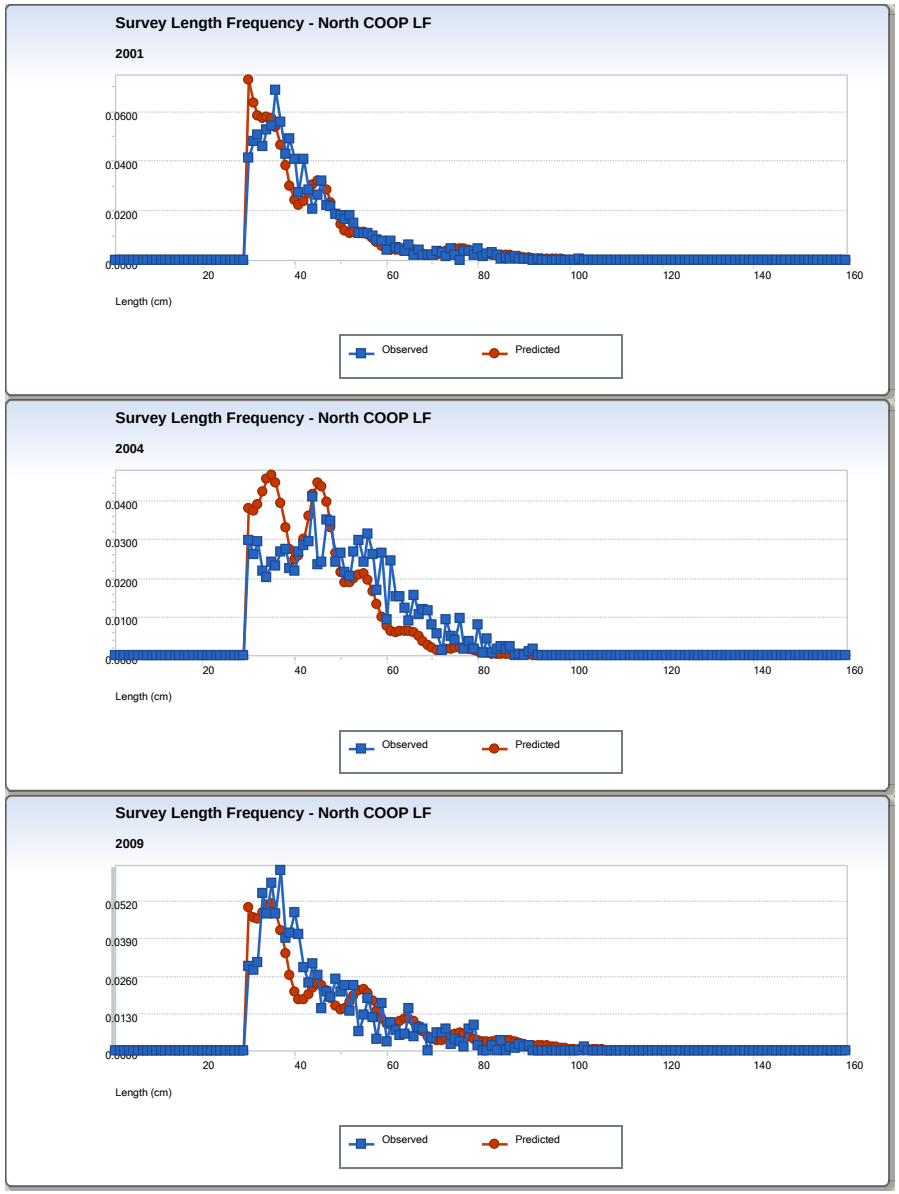


Figure 24. North SCALE model fits to Cooperative Monkfish Survey length frequencies, 2001, 2004, 2009.

North

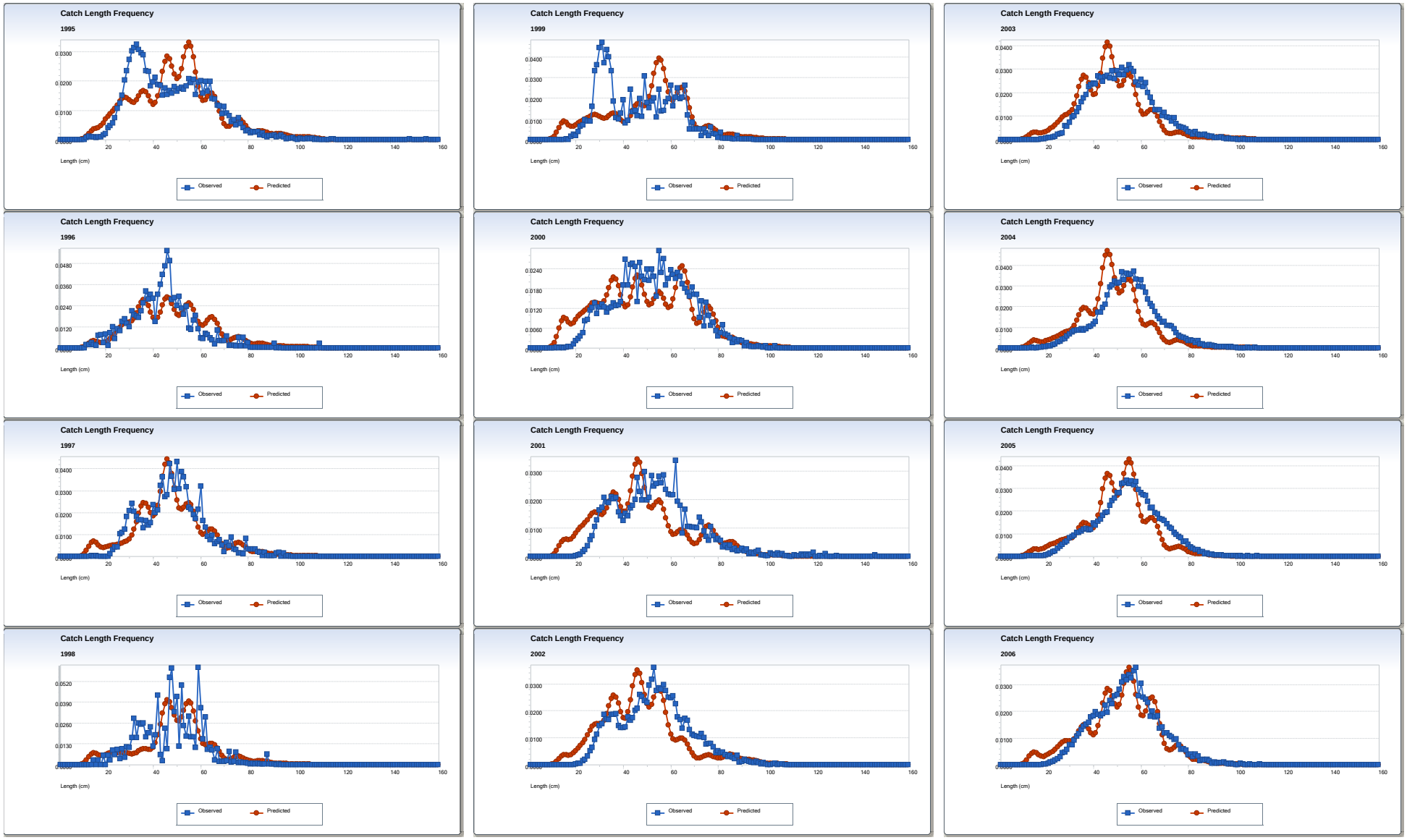


Figure 25. North SCALE model fits to catch length frequencies, 1994-2011.

North

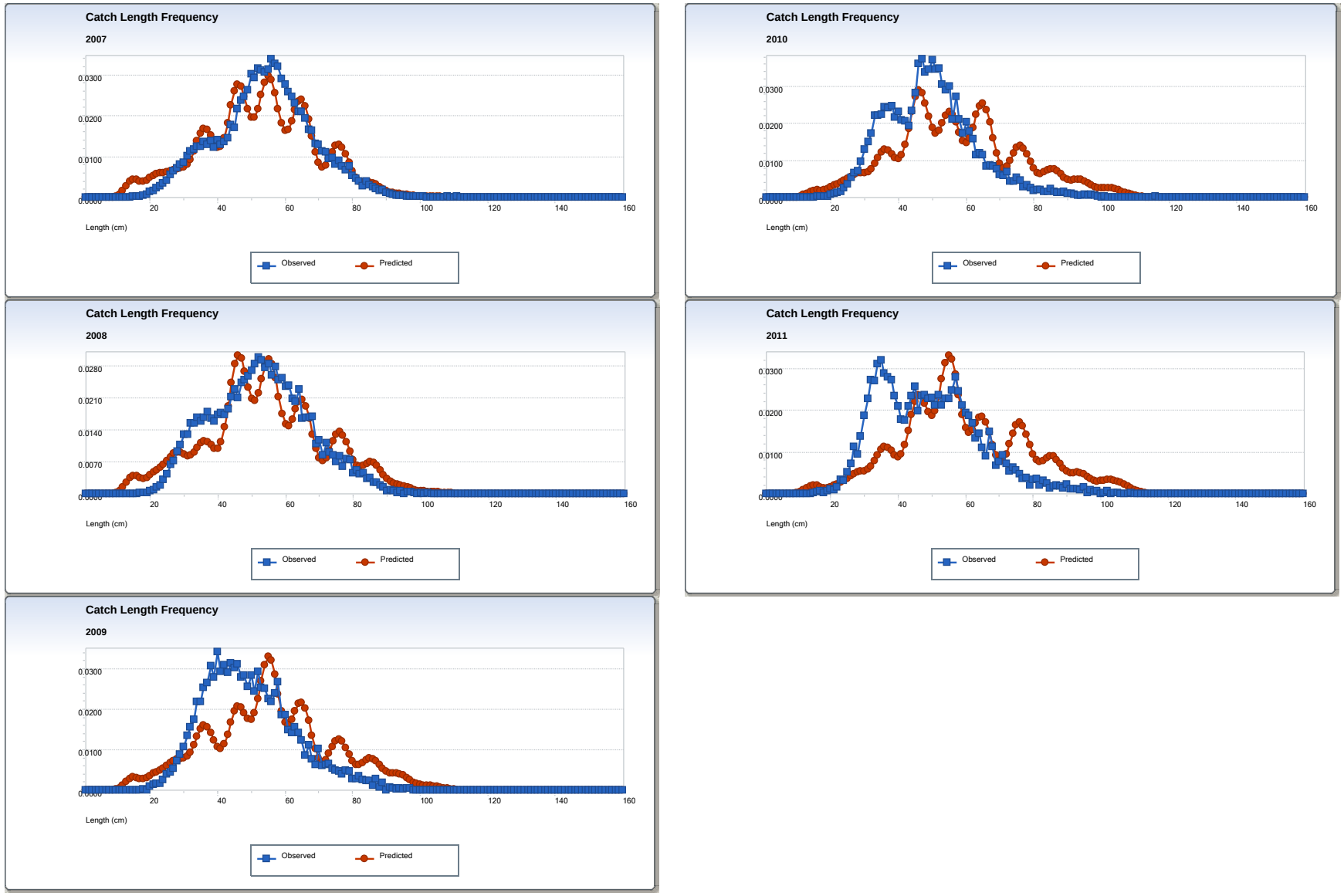


Figure 25, continued.

North Final Run Retrospective Patterns

Relative Retrospective

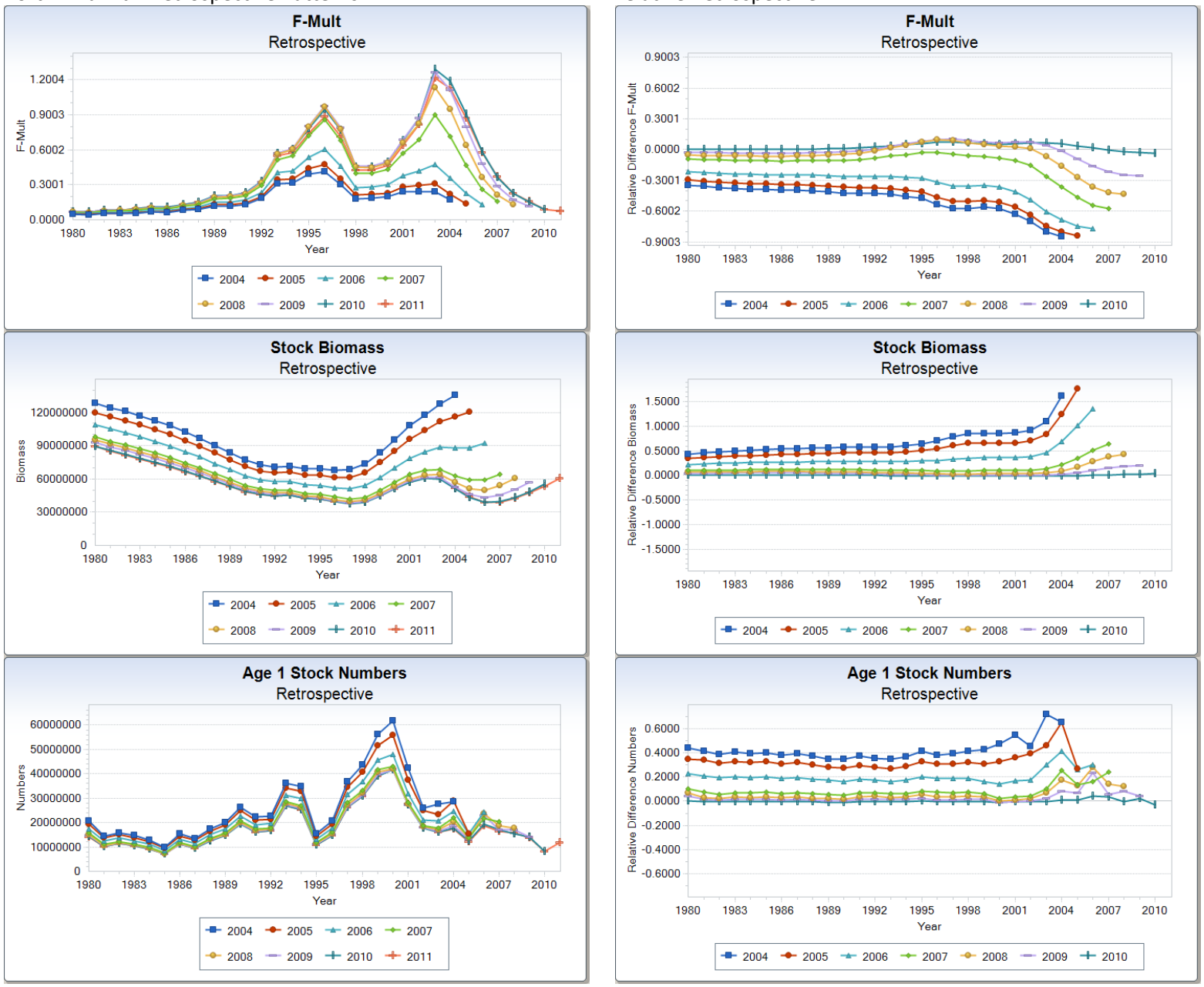


Figure 26. Retrospective patterns in final SCALE model for the north, 7 peels.

South Run 1–SAW 50 model using revised data (1980-2009)

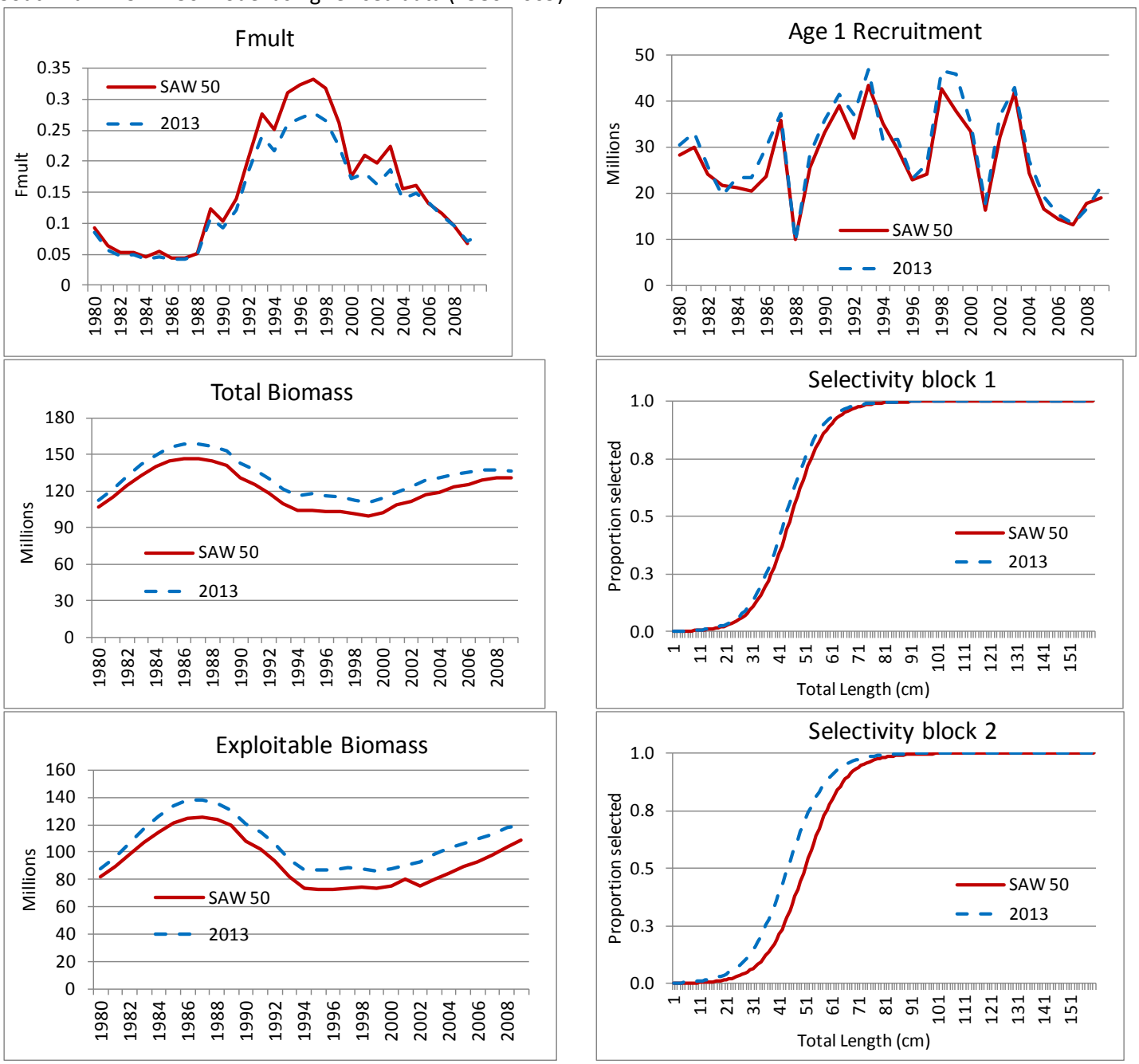


Figure 27. Comparison of SAW 50 SCALE model results for the South with results of same model using revised data for 1980-2009.

South Run 2 – Revised + New Data (1980-2011)

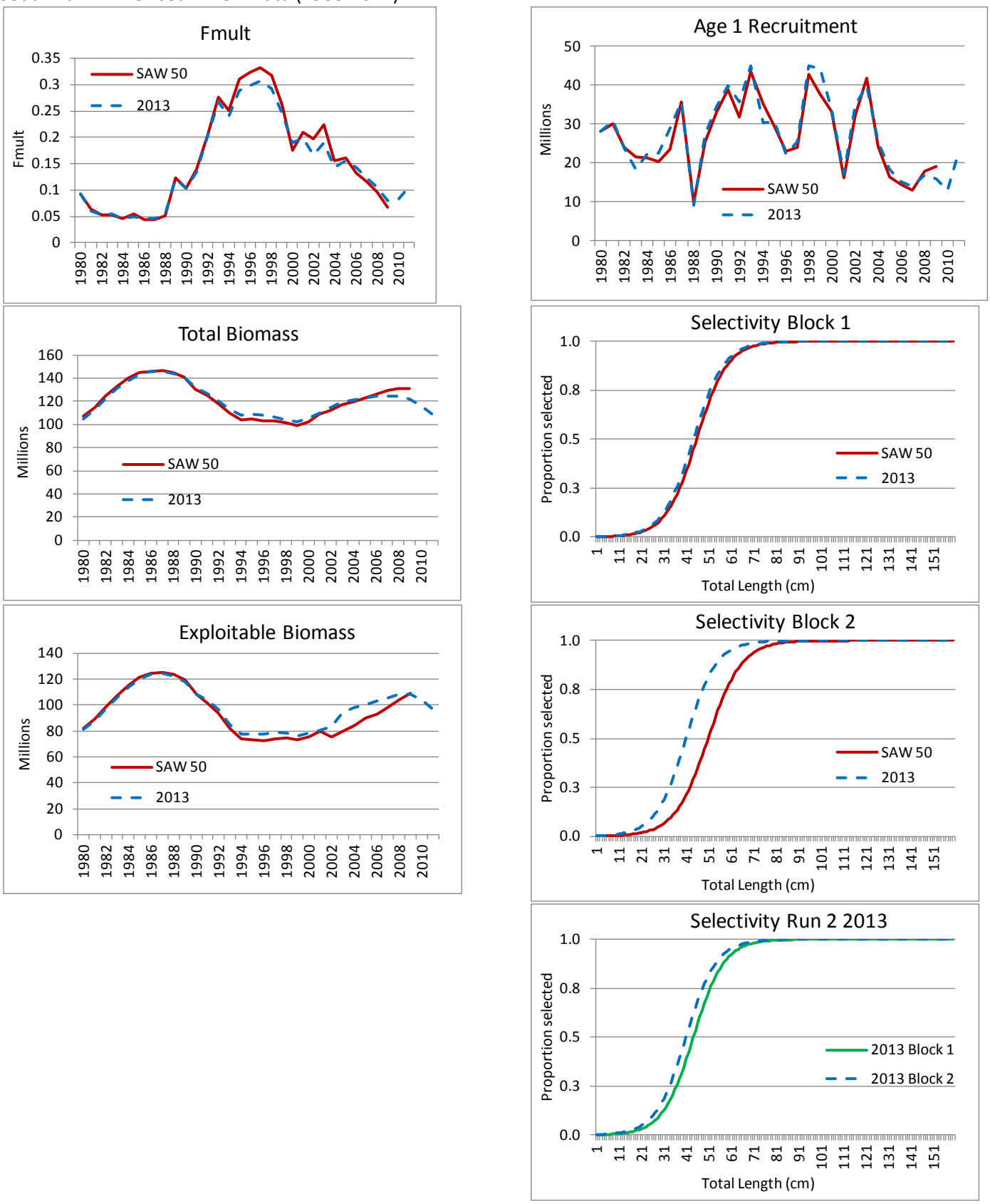


Figure 28. Comparison of SAW 50 SCALE model results for the South with results of same model using revised data (1980-2009) plus new data (2010-2011).

South Run 3 (Final) – 1 Selectivity Block, 1980-2011

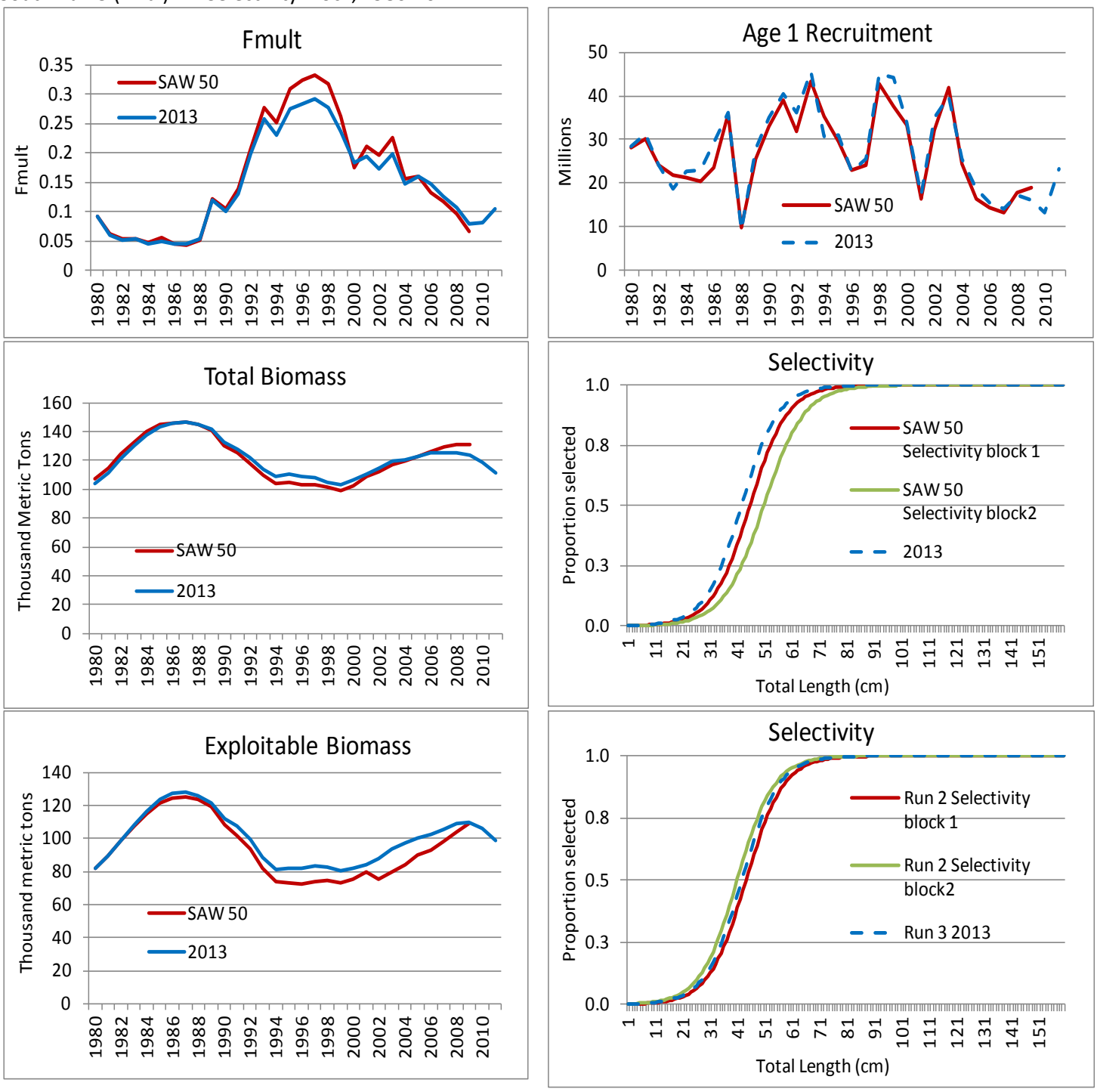


Figure 29. Comparison of SAW 50 SCALE model results for the South with results using revised data (1980-2009) plus new data (2010-2011) using only one selectivity block (final run for 2013 south).

South

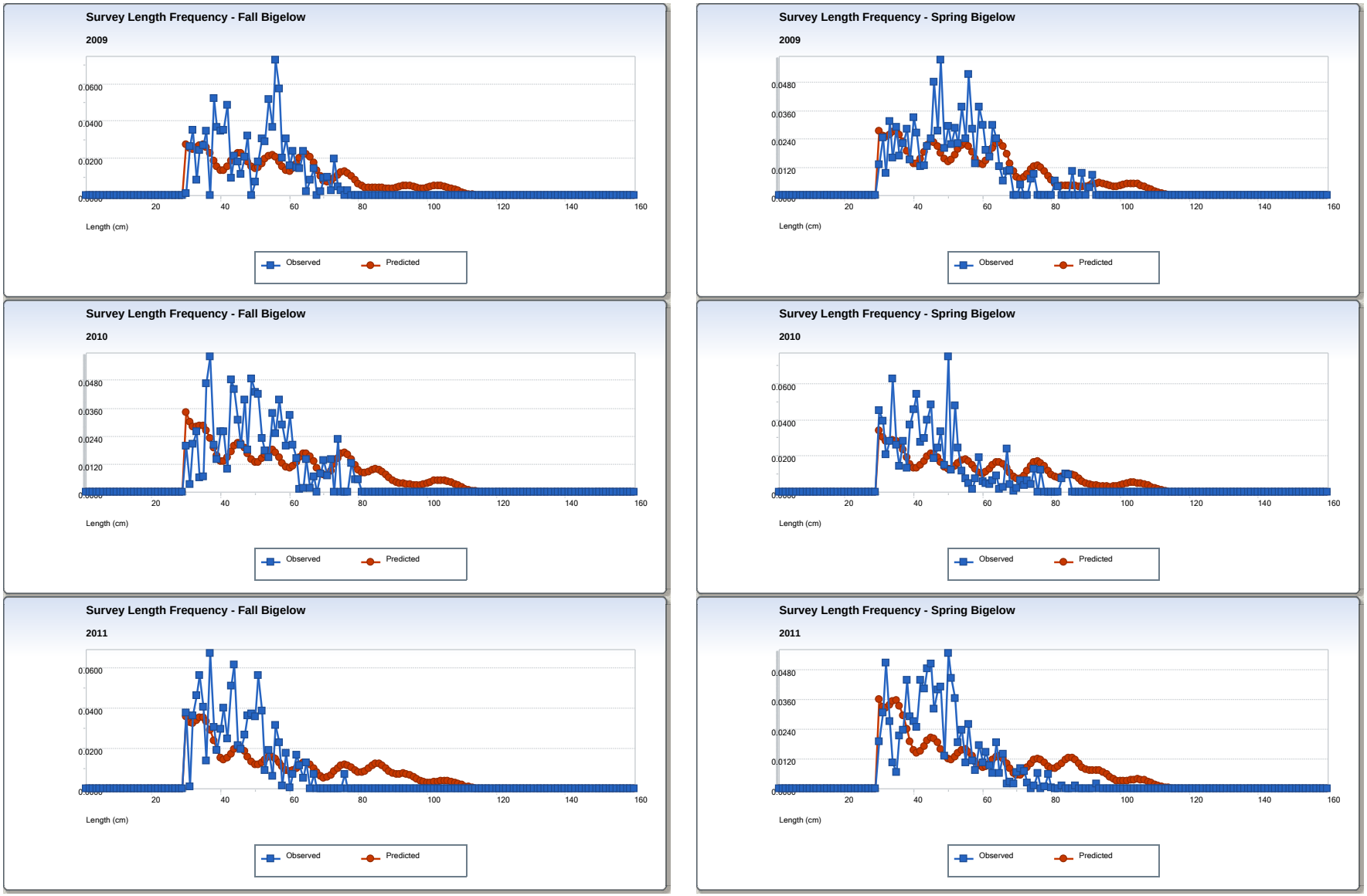


Figure 30. South SCALE final model fits to Bigelow survey length frequencies, 2009-2011

South

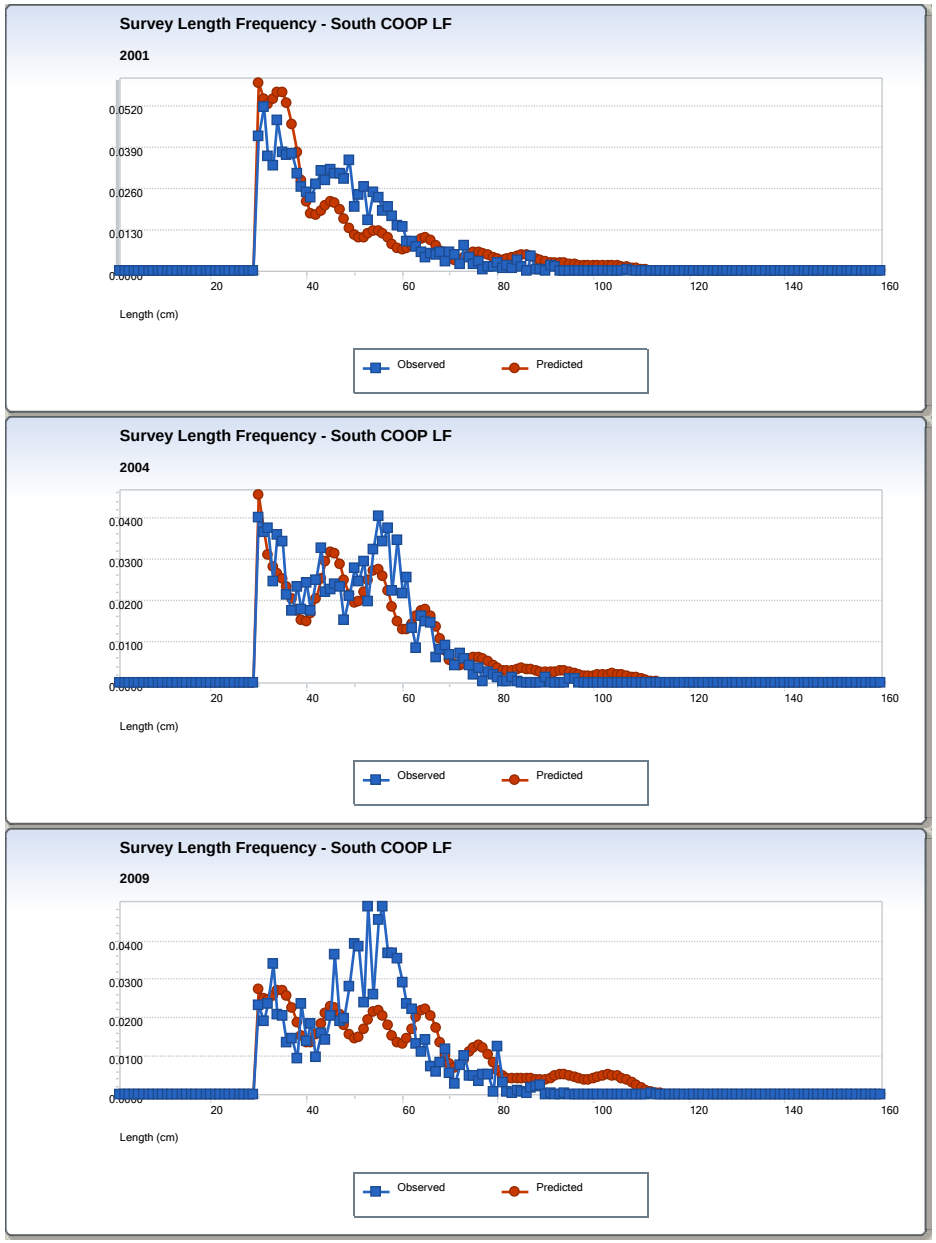


Figure 31. South SCALE model fits to Cooperative Monkfish Survey length frequencies, 2001, 2004, 2009.

South

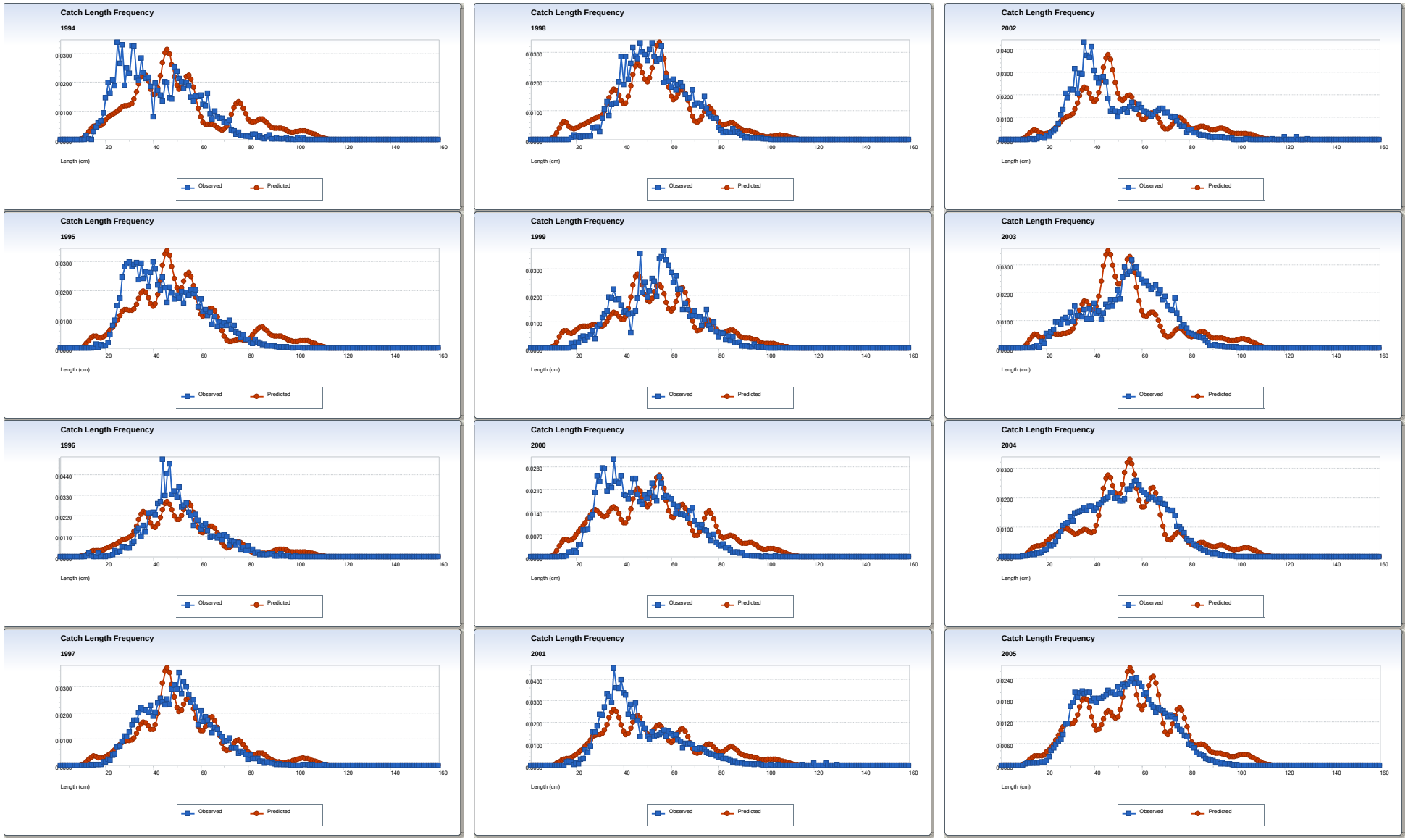
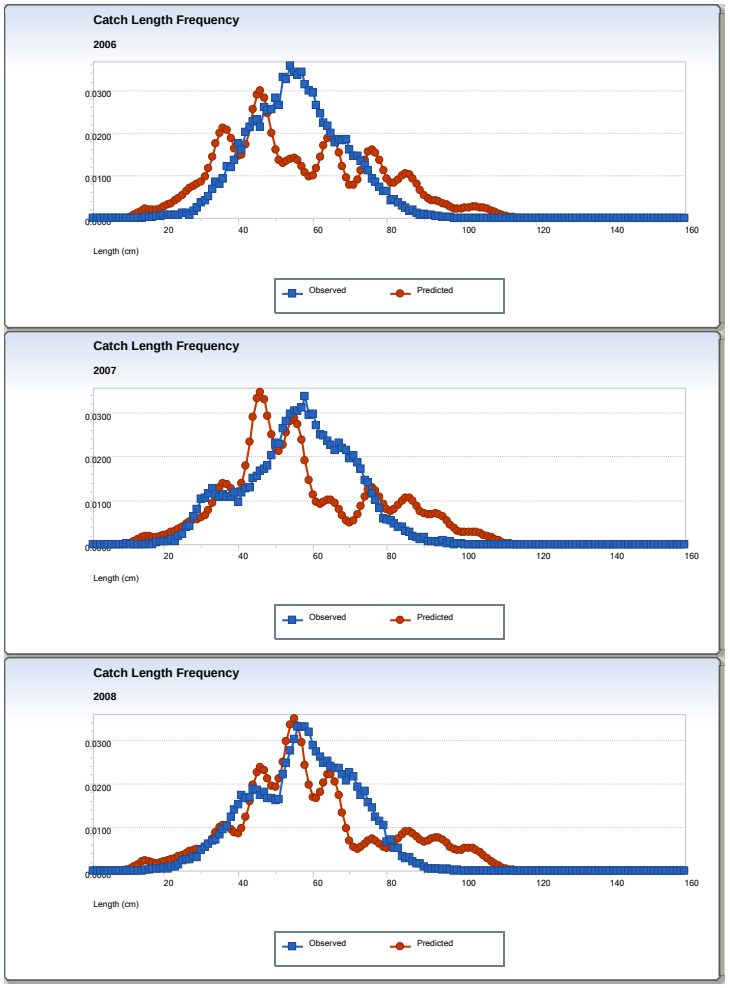


Figure 32. South SCALE final model fits to catch length frequencies, 1994-2011.

South



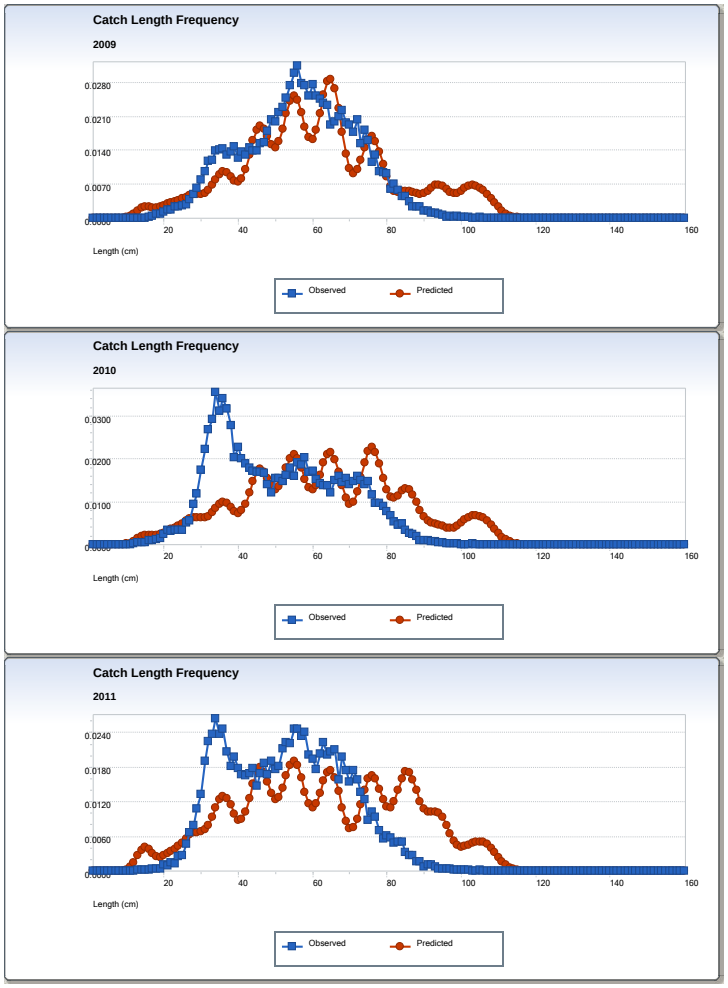


Figure 32, continued.

South Final Run Retrospective Patterns

Relative Retrospective

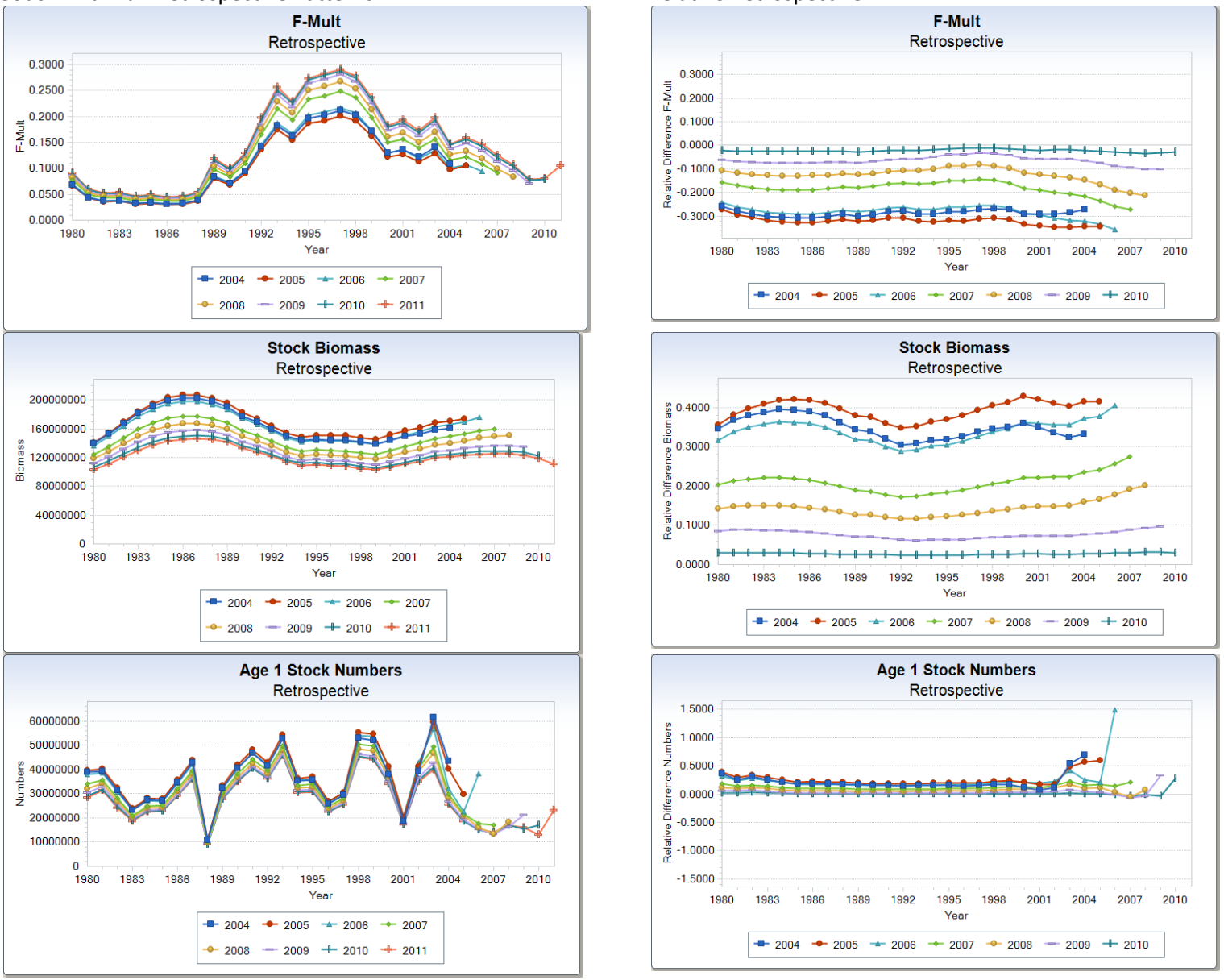


Figure 33. Retrospective patterns in the final SCALE model for the south, 7 peels.

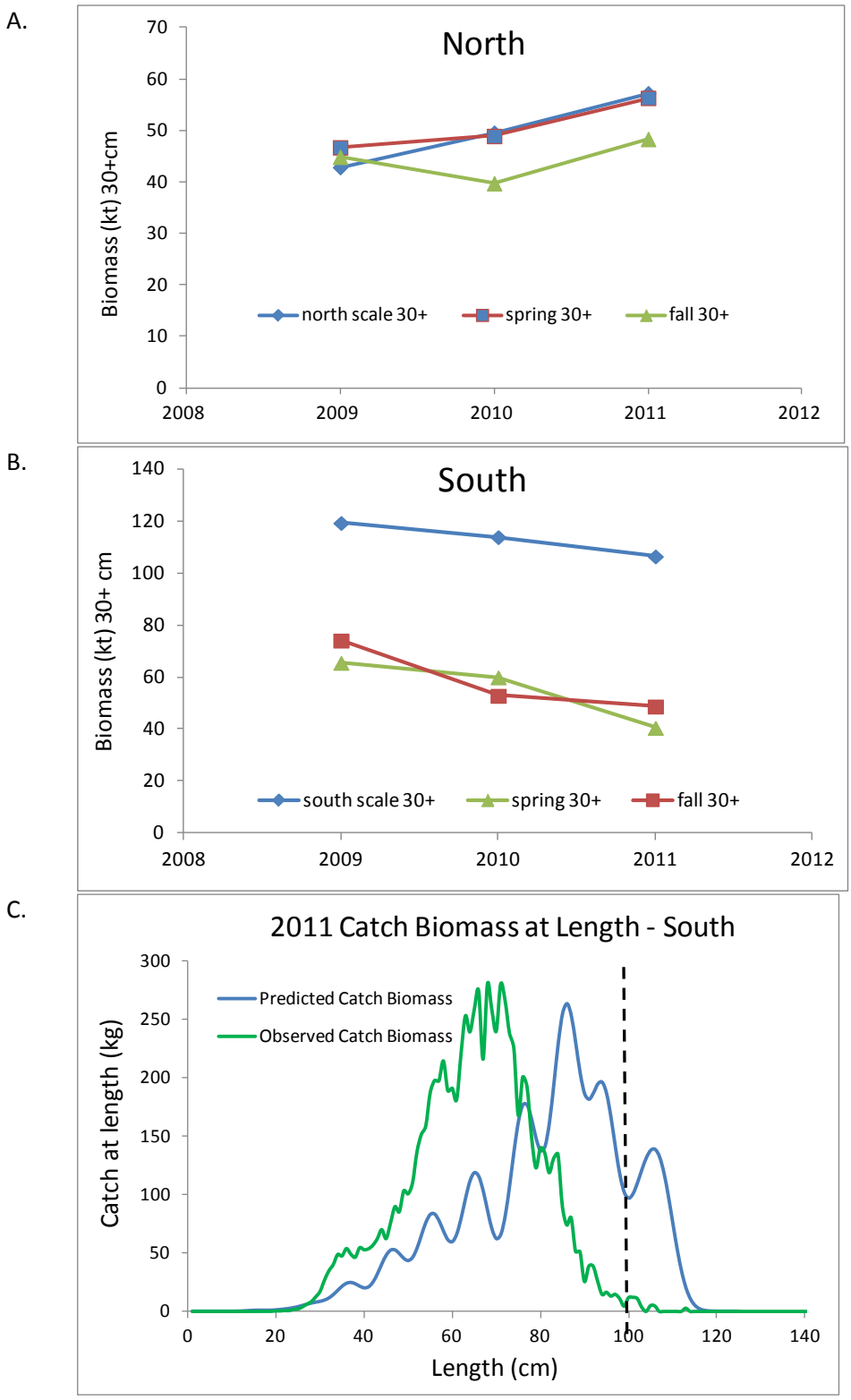


Figure 34. Estimates of total biomass at length (from converting SCALE output numbers at length (30+ cm) to biomass) compared with biomass at length estimated from length composition from NEFSC surveys applied to the estimated total number (30+) from SCALE and converted to biomass (A, B). (C) similar analysis comparing predicted and observed catch weight by length for 2011 in the southern management region. Vertical line indicates approximate maximum size in observed catch

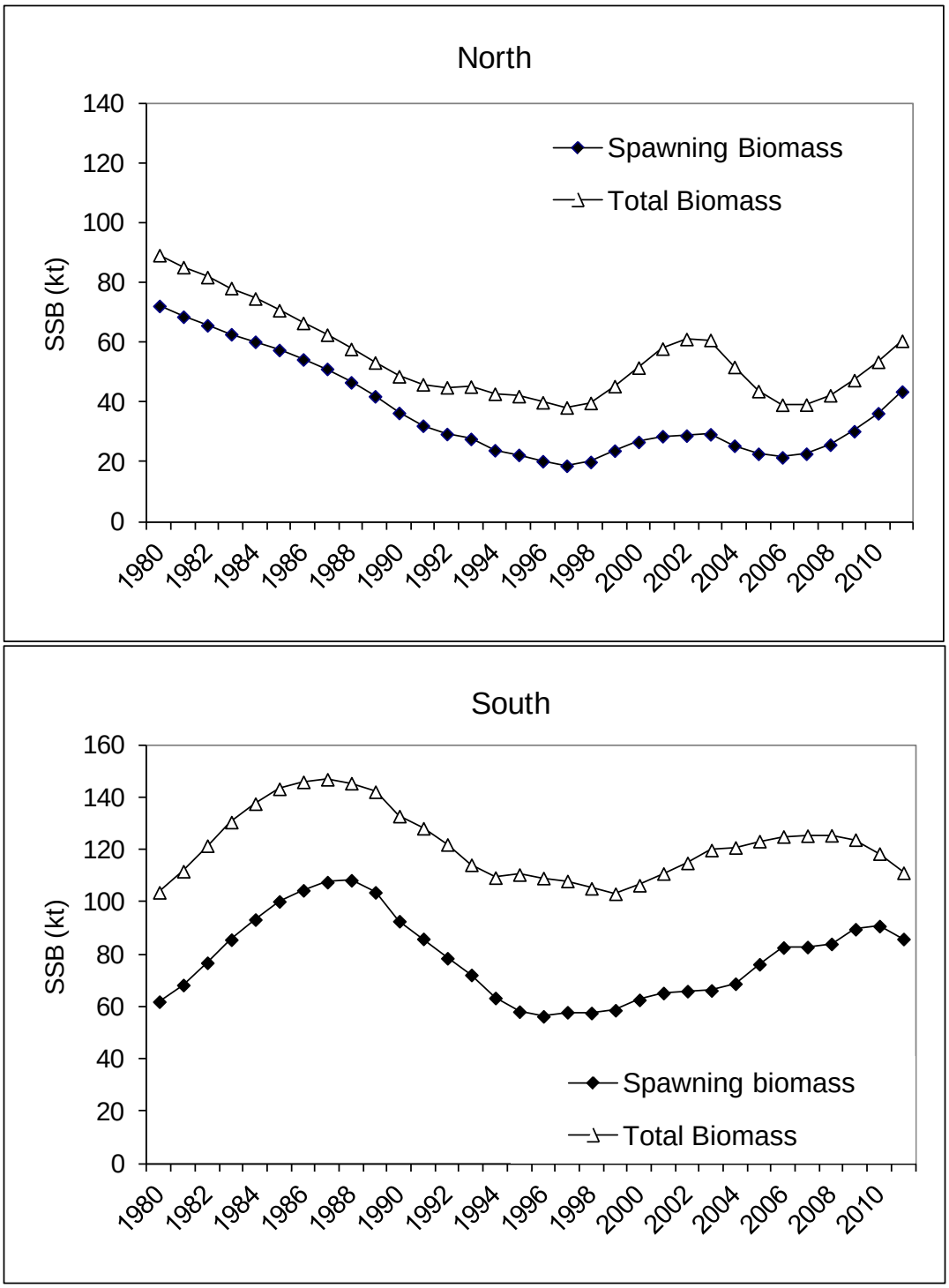
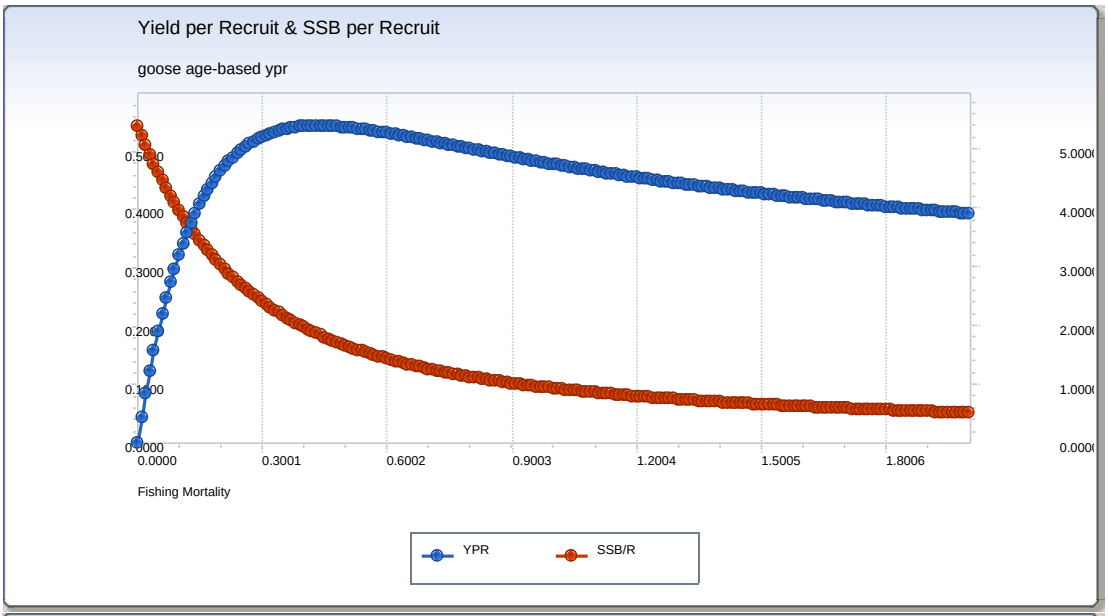


Figure 35. Trends in spawning stock biomass estimated from SCALE output of numbers at length as described in the text.

North



South

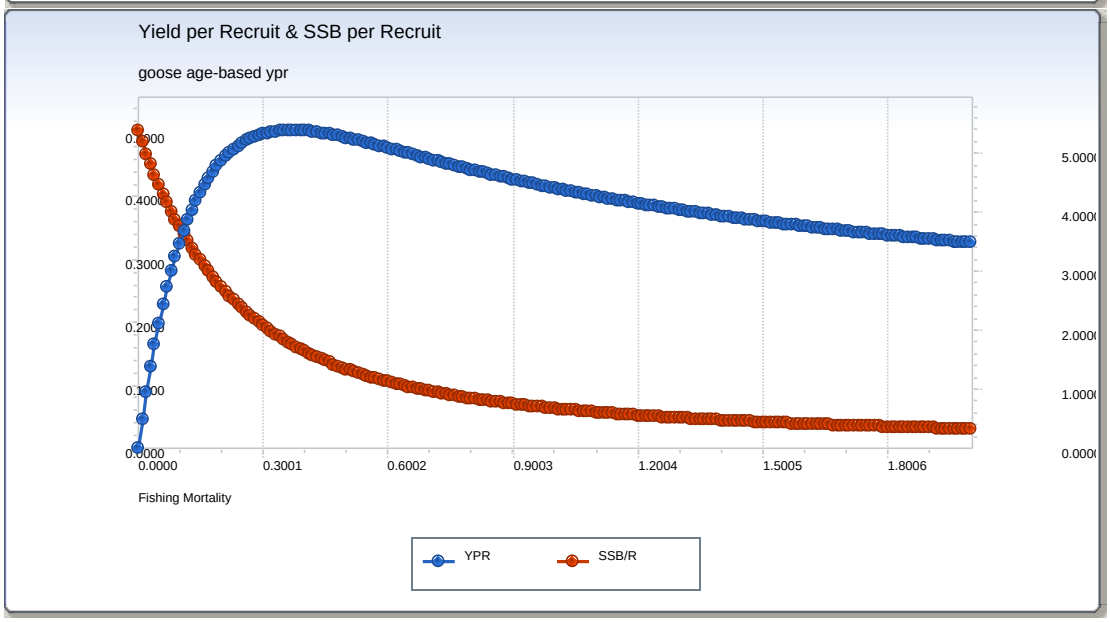


Figure 36. Yield per recruit and spawning stock biomass per recruit curves using selectivity patterns from 2013 SCALE models for north (top) and south (bottom).

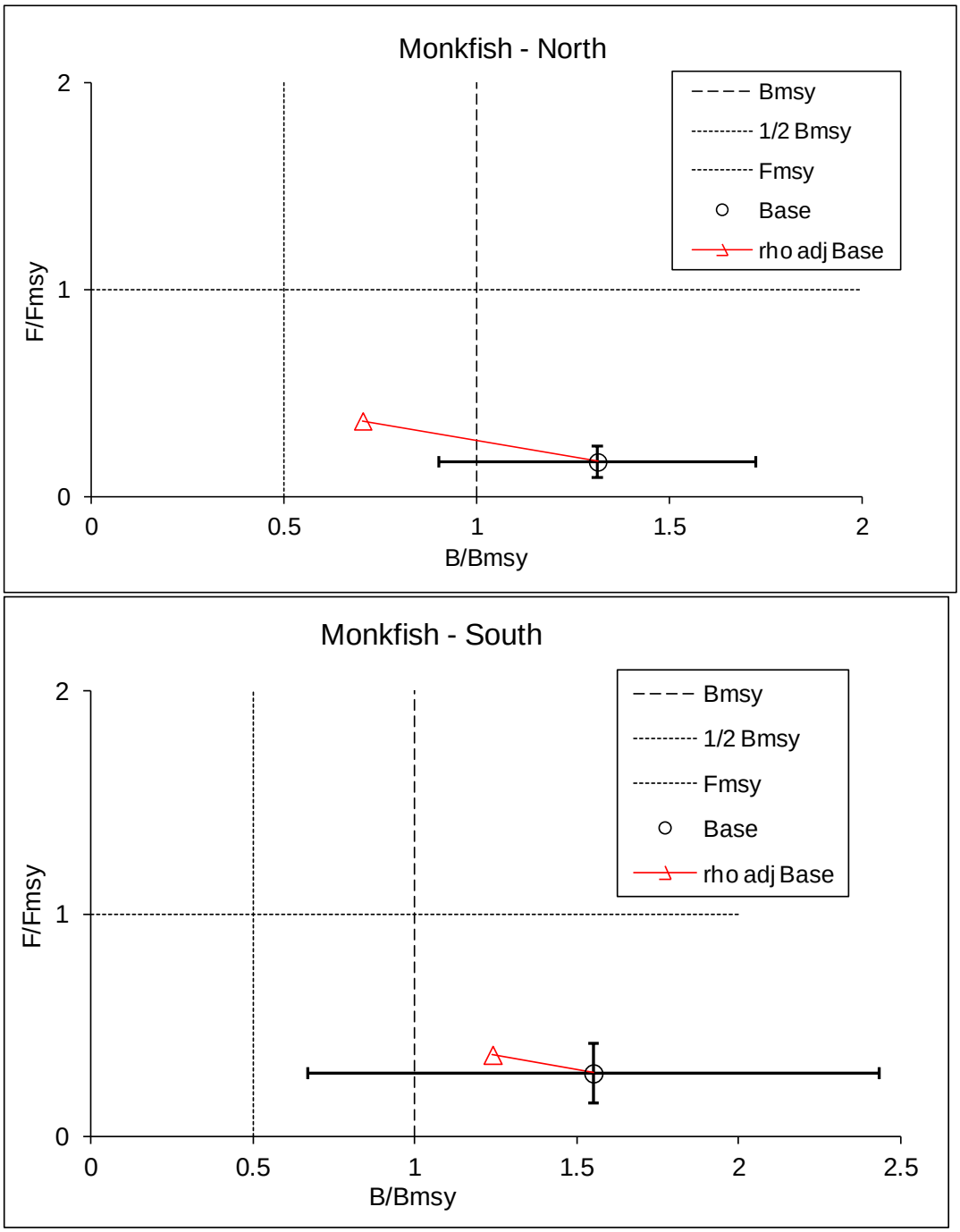


Figure 37. Current stock status evaluation for monkfish in the northern and southern management areas. Error bars are +/- 1 standard error, biomass standard error is weighted mean coefficient of variation of predicted numbers at age converted to biomass (weighting factor).

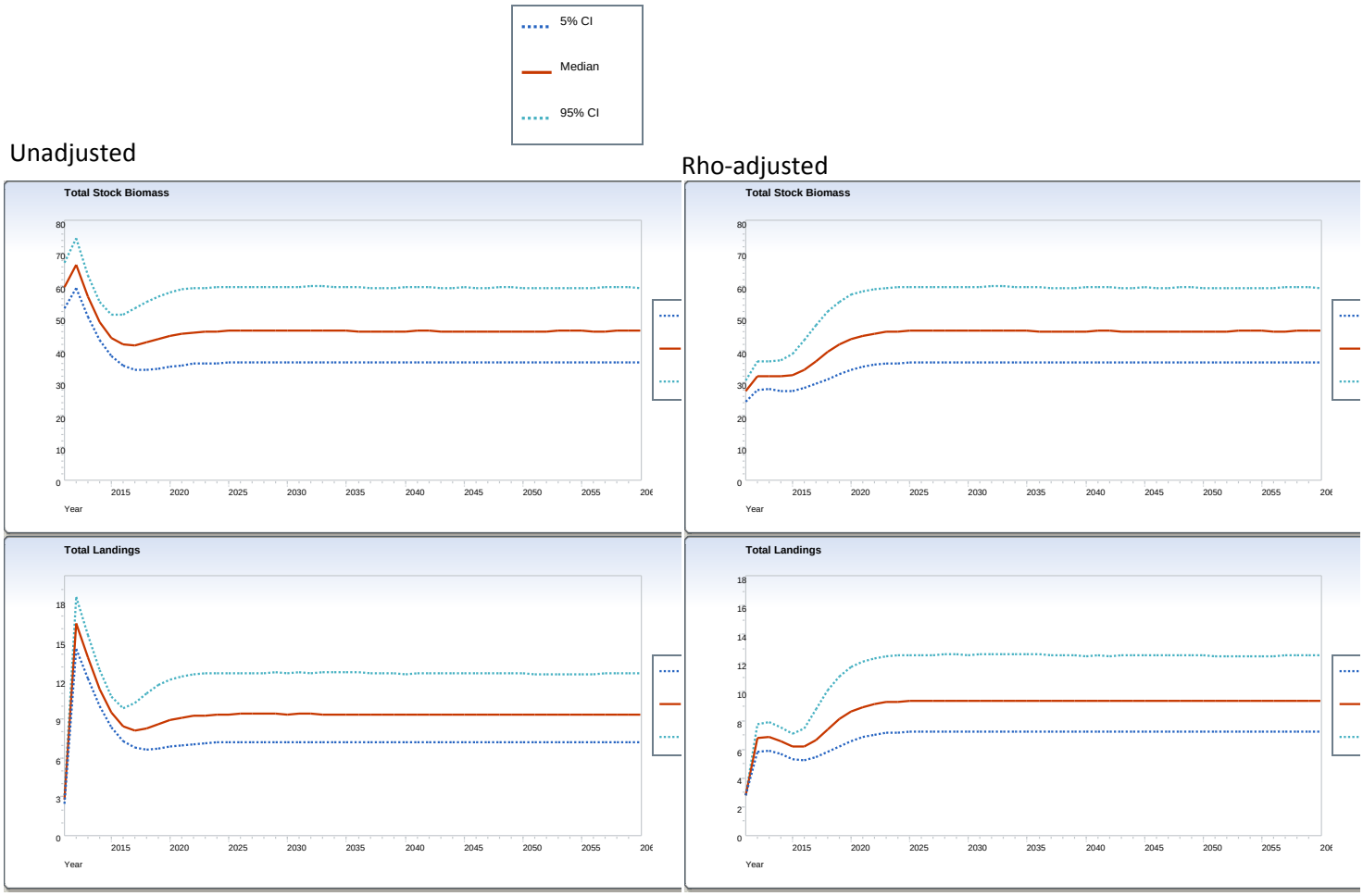


Figure 38. Northern management area projected total biomass (top) and catch (bottom) under the Fmax scenario, unadjusted (left) and adjusted for age-specific retrospective patterns (right).

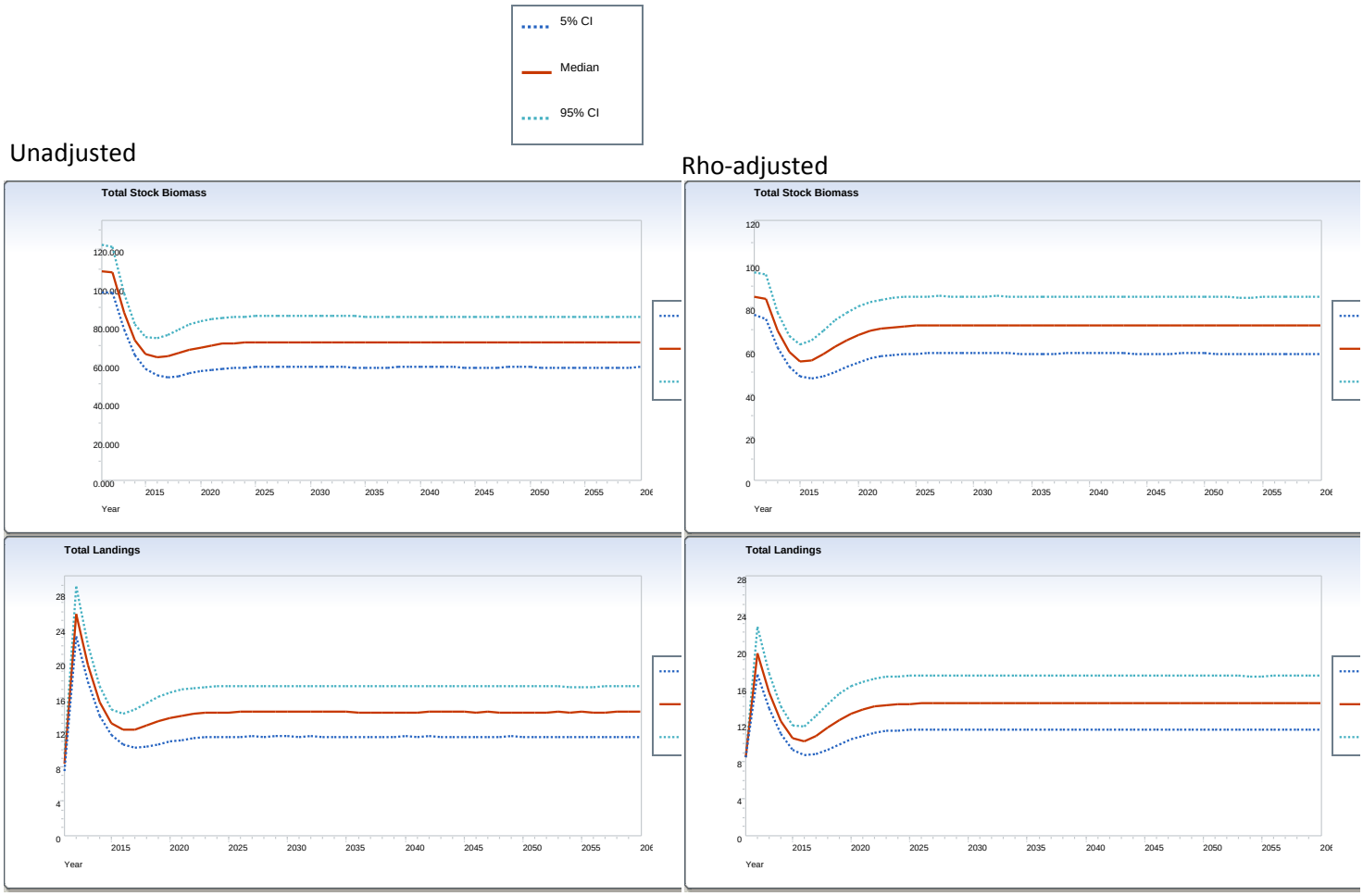


Figure 39. Southern management area projected total biomass (top) and catch (bottom) under the Fmax scenario, unadjusted (left) and adjusted for age-specific retrospective patterns (right).

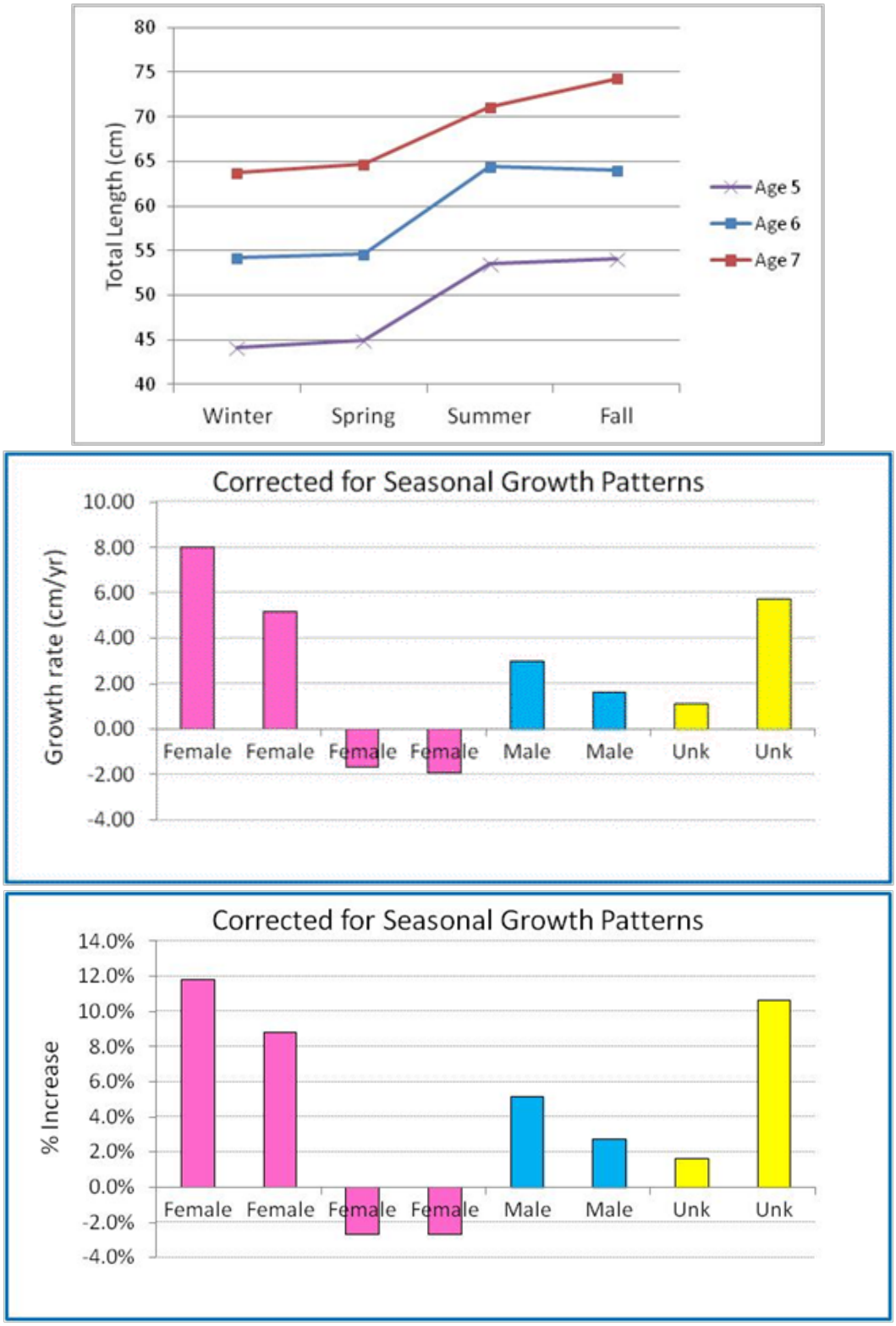


Figure 40. (A) Seasonal variation in growth based on survey length at age data (from Richards et al. 2008), (B) Annual growth increment of recaptured fish adjusted for seasonal growth rates while fish was at large, (C) Annual growth increment as percent of length at release. Unk = sex unknown. Source: Richards et al. (2012).