S E D A R

Southeast Data, Assessment, and Review

SEDAR 19–AW03

Assessment Workshop Working Paper

Additions and Updates to Red Grouper data since the SEDAR 19 Data Workshop

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September 2009

SEDAR is a Cooperative Initiative of:
The Caribbean Fishery Management Council
The Gulf of Mexico Fishery Management Council
The South Atlantic Fishery Management Council
NOAA Fisheries Southeast Regional Office
NOAA Fisheries Southeast Fisheries Science Center
The Atlantic States Marine Fisheries Commission
The Gulf States Marine Fisheries Commission

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2 Data Input and Changes

Processing of data for the assessment is described in the SEDAR 19 Red Grouper Data Workshop Report. This section describes additional processing that occurred since the DW to format the data for use in assessment models. The data used as input to the model are provided in the Microsoft Excel workbook, RG_Input.xlsx.

2.1 Pooling of gears

Previous SEDAR assessments have routinely combined gears primarily in the commercial sector to overcome data limitations in the length or age compositions. We evaluated the efficacy of combining the commercial handline and longline gears by comparing the length compositions pooled over the years prior to and after the 1992 size limit of 20 inches (Fig. 1 panels A and B). The previously implemented 12 inch size limit did not appear to have an effect on the length compositions. Each years contribution to the multi–year length composition was weighted by annual sample size. Based on this analysis, commercial handline and longline gears were combined to overcome gaps in the composition data. We compared the descending portion of the length composition of MARMAP trap (predominantly 1992–2008)to commercial trap (predominantly 1986–1991) as one possible method of supporting the limited commercial trap composition data. Both series were truncated at the peak of the MARMAP survey (49 cm) and re–normalized to sum to 1. (Fig. 1 panel C).

2.2 Landings

Commercial fisheries were reduced to two gears: lines (commercial handlines and longlines) and miscellaneous (traps, pots, diving, and other). The DW–provided commercial landings in gutted weight were converted to whole weight using the weight–weight conversion provided by the life history group. Landings for the recreational data series were input as numbers of fish. The 1973–1975 headboat data, which did not include Southern Florida were omitted as input. Headboat discards were sampled in 2005—2008, but 2008 was in included as data because of a change in the sampling protocol. There was sufficient headboat discard data from 2005–2007. Other years headboat discards will be generated in the model. The commercial landings were taken back to 1976 even though the commercial working group provided data back to 1950. The decision to only take the model back to 1976 was based on the availability of composition data. Sufficient information was not available to get landings back to a virgin stock. Therefore there was no value in modelling landings prior to the first available composition data.

2.3 Discards

For headboat and commercial sectors, discards were believed to have occurred outside the years of data. In those years, the model applied an average fishing rate to predict discards, rather than fitting to ratio–generated estimates.

2.3.1 MRFSS–smoothing

As is usual with MRFSS, large fluctuations that are biologically implausible were observed in the landings and discard data provided. Both the landings time series and discard time series were smoothed using a cubic smoothing spline (smooth.spline function in R with smoothing parameter set to 0) weighted by the inverse of the annual CVs (Figure 2).

2.4 Age Compositions

Age compositions were pooled at age 16. This was only relevant for the general recreational and commercial handline ages which extended to 21 and 23 years respectively with very low values.

2.4.1 General recreational sample size – trips

The appropriate data fields to determine the number of trips were unavailable for the general recreational age compositions. For use in the assessment, the annual number of trips was assumed to be the ratio from MRFSS length comps of total trips (2001–2008) to total fish (2001–2008) applied to annual number of "general recreational" fish aged.

2.4.2 General recreational – Examination of potential bias in selecting fish to age

The age compositions for other sectors were adjusted by the DW for potential bias in selecting fish to age by weighting the age compositions by the length compositions. It is assumed that the general recreational age compositions follow the MRFSS sampling scheme and that adjustments to the age compositions are not necessary. We plotted the length composition of the general recreational aged fish against the corresponding MRFSS length composition to evaluate this potential bias (Figure 3). There does not seem to be a problem with bias in selecting fish to age.

2.5 Length Compositions

The 1-cm bins for length compositions developed during the SEDAR 19 DW were pooled to 3-cm bins for all gears. The commercial handline and longline gear length compositions were pooled annually by summing the sample-size weighted proportion at size for each 3-cm length bin for each gear. The combined commercial handline and longline compositions were then rescaled to sum to 1 annually. The comparison of 1-cm bins and 3-cm bins for the headboat (Figure 4), MRFSS (Figure 5),Commercial lines (Figure 6), Commercial pots and traps (Figure 7), and MARMAP (Figure 8) generally shows a smoother fit without losing the information. The 1-cm plots for all gears were scaled by the ratio of number of 1-cm bins to the number of 3-cm bins(3.029). The annual sample size for the combined commercial handline and longline is the sum of the two sample sizes. The commercial diving and other length compositions had inadequate sampling to be used as model input.

2.5.1 RVC length composition

The RVC survey length data were developed in fork length at the SEDAR 19 DW. The raw data were unavailable to make conversions to total length. One solution is to convert the bin labels in fork length to total length and then assign the 1-cm bins to the 3-cm bins. This causes artificial noise because sometimes the number of bins pooled after rounding is either 2 or 4 instead of 3 which causes artificial noise in the series. In addition the data set already contains considerable lumping of lengths at the 5-cm intervals, especially for larger fish. To smooth the RVC length compositions, we chose to model a distribution of raw length data by generating the population size at each annual bin as a normal distribution with a mean of the individual bin label in total length and with a standard deviation equivalent to a 5-cm spread(sd=5/2.575 where 2.575 is the z score that gives a 99% CI). Figure 9 shows the smoothed RVC length composition (solid line) and the version created by just converting the bin labels to total length and assigning to the 3-cm bin structure (dashed line). The length compositions are truncated at 15 cm TL to remove fish expected to be an age 0 (see indices section below).

2.6 Indices

2.6.1 RVC index-remove age 0 fish

The RVC index provided by the DW included age-0 fish which were not included in the assessment model. The index was recomputed with only the fish greater than 15cm TL, the size used to remove fish likely to be age 0 (Figure 10. The recomputed index is almost identical to the index computed by the DW with the exception of 1999 which was a year with many smaller fish observed (Compare figures 9 and 11).

2.7 Life History

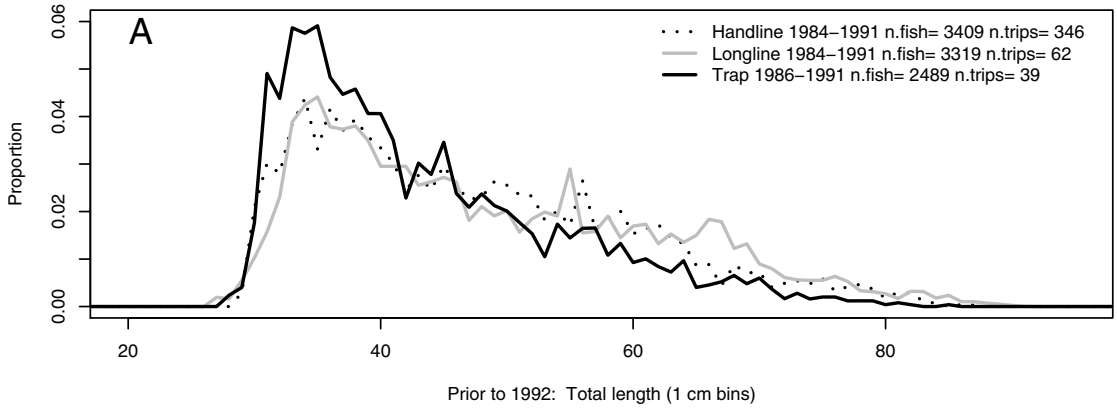
Generation time is not typically computed at the data workshop but may be required for stock projection. Generation time (G) was estimated from Eq. 3.4 in Gotelli (1998, p. 57).
$G = \sum l_x b_x x / \sum l_x b_x$
where summation was over ages x=1 through 100 (by which age cumulative survival is essentially zero), l_x is the number of fish at age starting with 1 fish at age 1 and decrementing based on natural mortality only, and b_x is per capita birth rate at age. Because biomass is used as a proxy for reproduction in our model, we substitute the product of $[P_{fx}M_{fx}+(1\text{-}P_{fx})M_{mx}]w_x$ for b_x in this equation, where P_{fx} is the proportion female at age, M_{mx} is the proportion of mature females at age, M_{mx} is the proportion of mature males at age and w_x is expected weight at age. This weighted average of age for mature biomass yields an estimate of 14 years (rounded up from 13.9 yrs.).

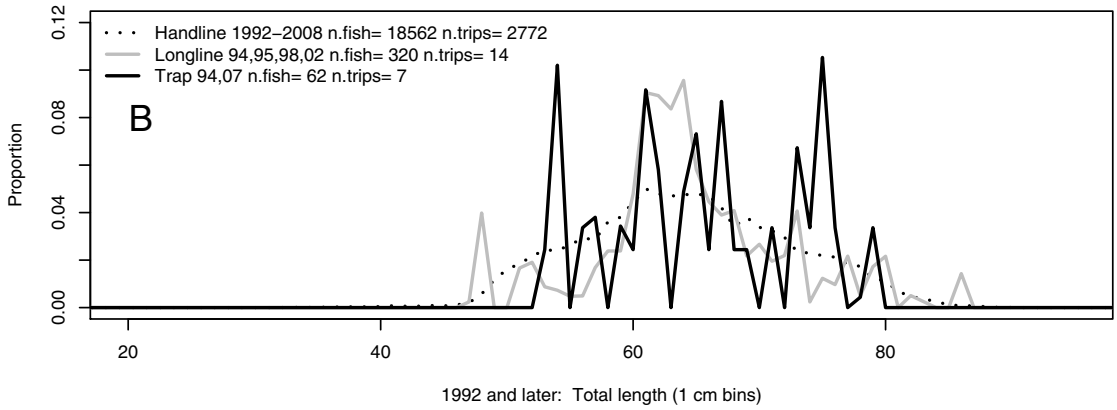
References

Gotelli, N. J. 1998. A Primer of Ecology 2nd Edition. Sinauer Associates, Inc., Sunderland, MA, 236p.

2.8 Figures

Figure 1. Red Grouper in Atlantic: Comparison of commercial length composition prior to (panel A) and after (panel B) the 1992 size limit (20 inches). Panel C shows the comparison between the commercial trap (1986–1991) and MARMAP trap (1992–2008). These time periods represent the predominant time periods the data were collected. Both series were truncated to the right of the peak in the MARMAP length composition and normalized to sum to 1.





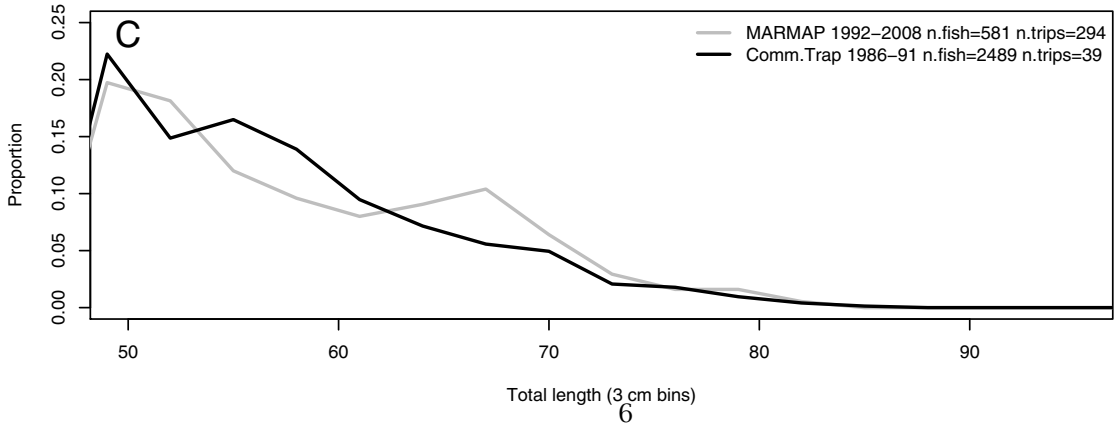


Figure 2. Red Grouper in Atlantic: Smoothing of MRFSS Landings and Discards.

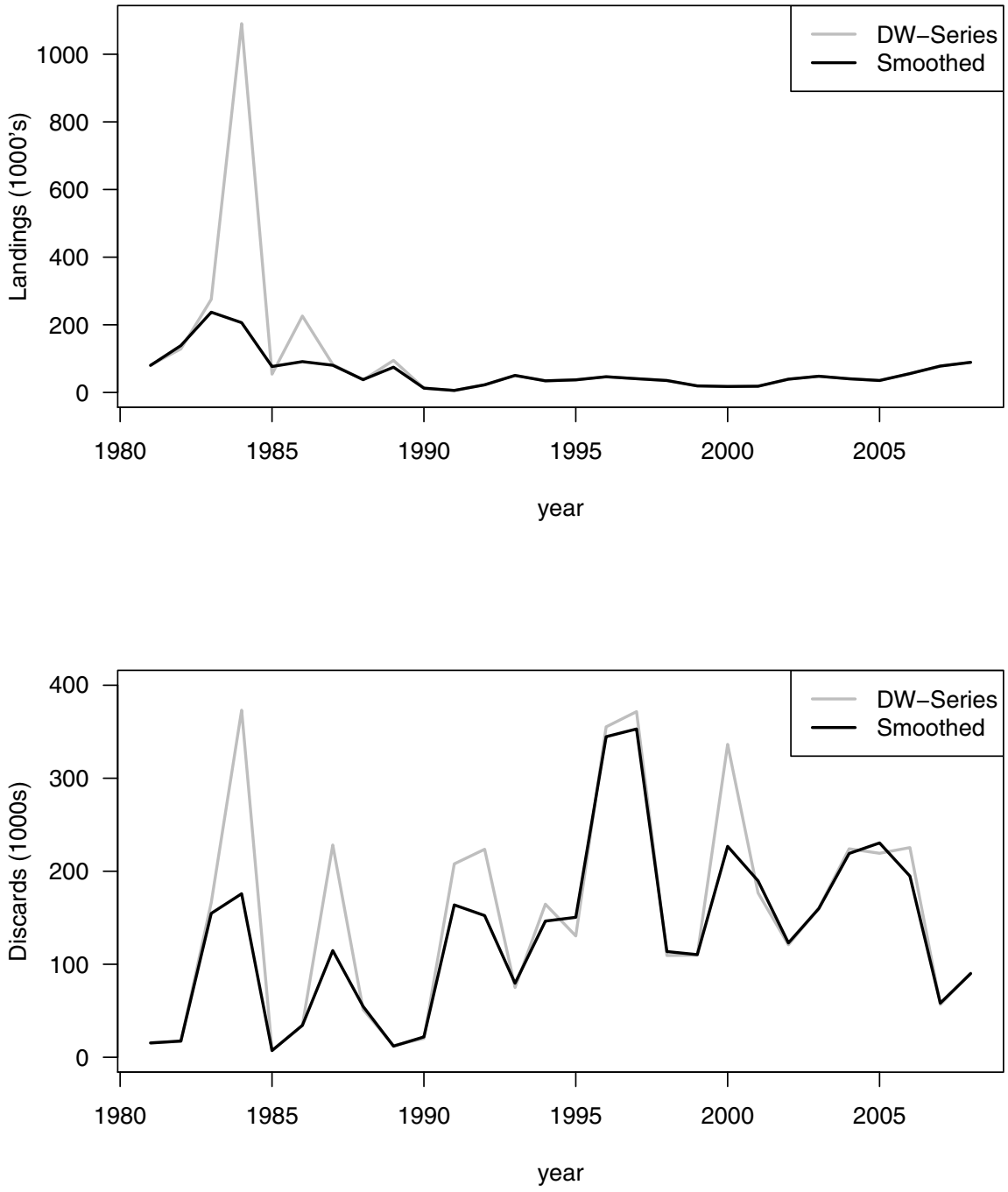


Figure 3. Red Grouper in Atlantic: Comparison of the length compositions of aged general recreational samples and MRFSS length compositions.

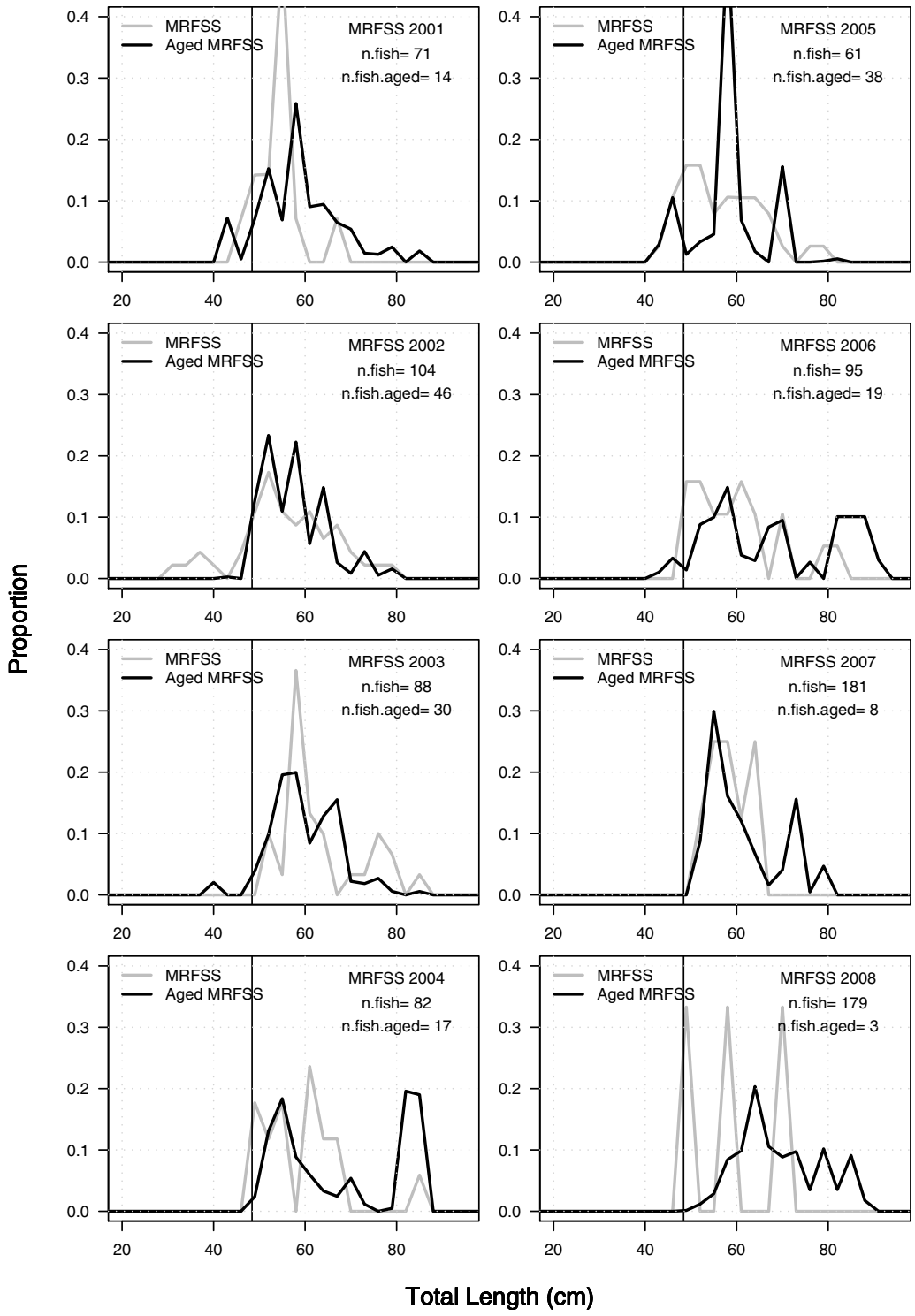


Figure 4. Red Grouper in Atlantic: Annual headboat length compositions plotted as the 1-cm DW bins and the 3-cm model input. The "y" after the year label indicates inclusion as model input. Years with "n" after the year will be dropped as input because of low sample sizes or other sampling issues. Vertical lines represent federal size limits.

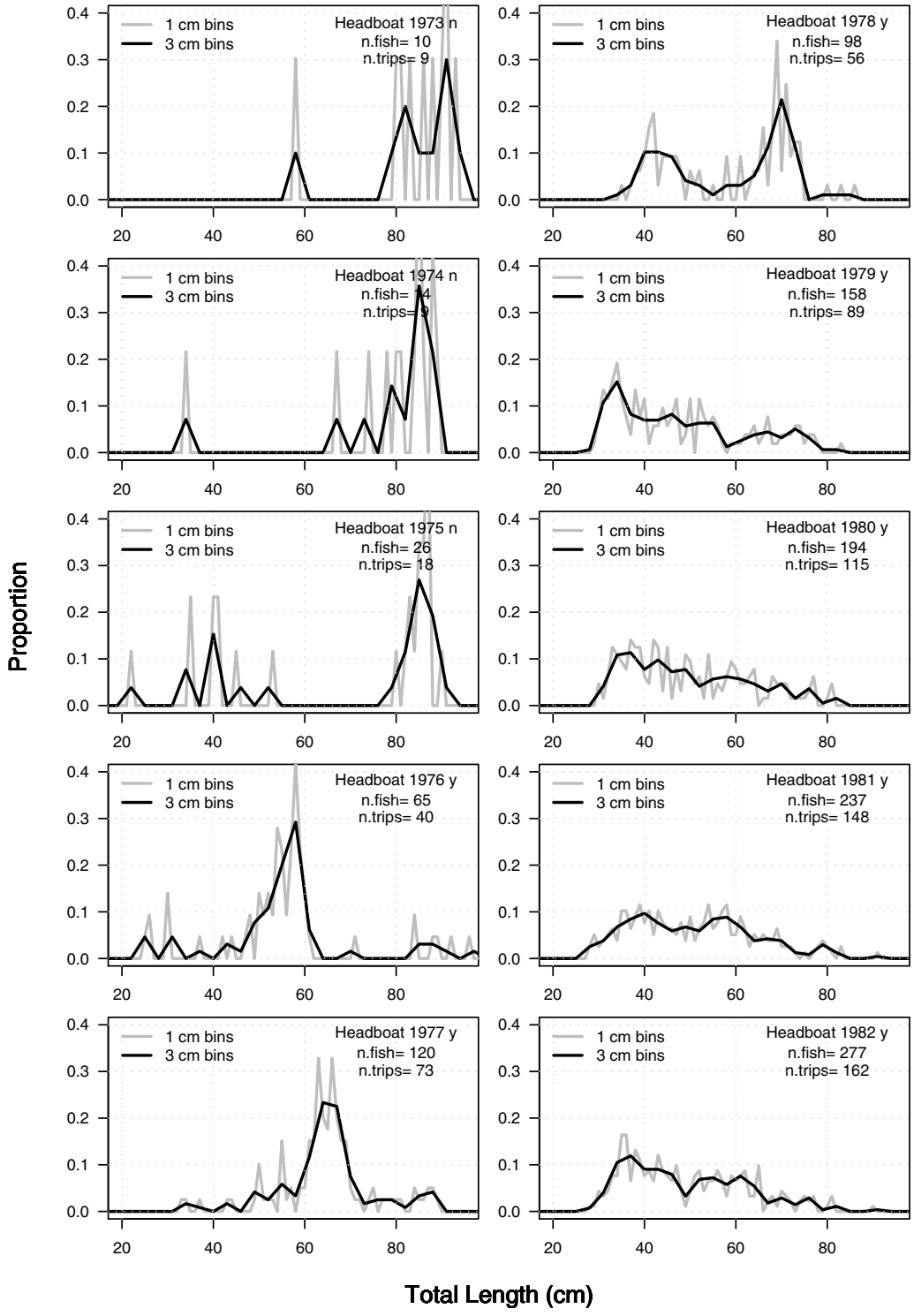


Figure 4. Continued.

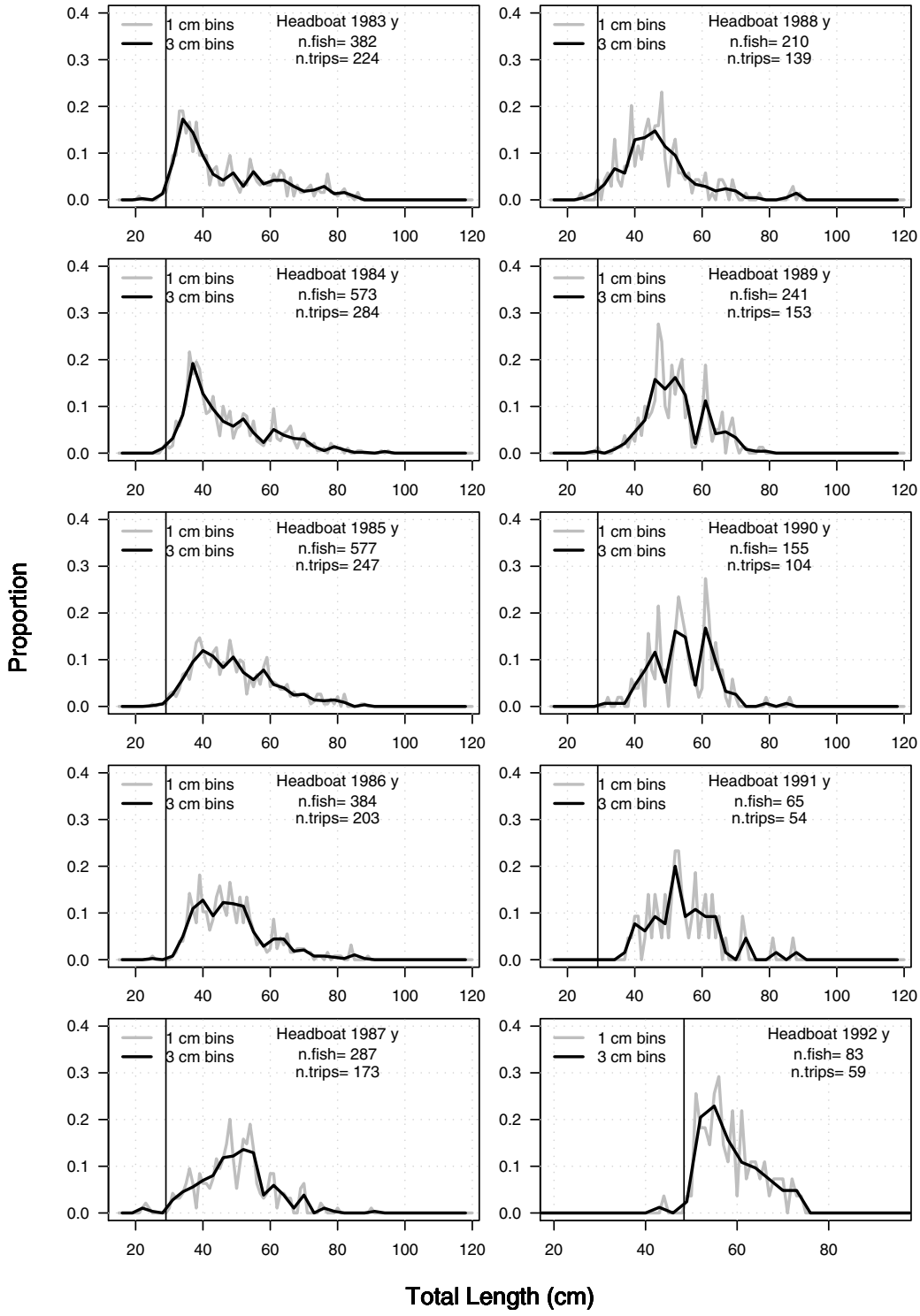
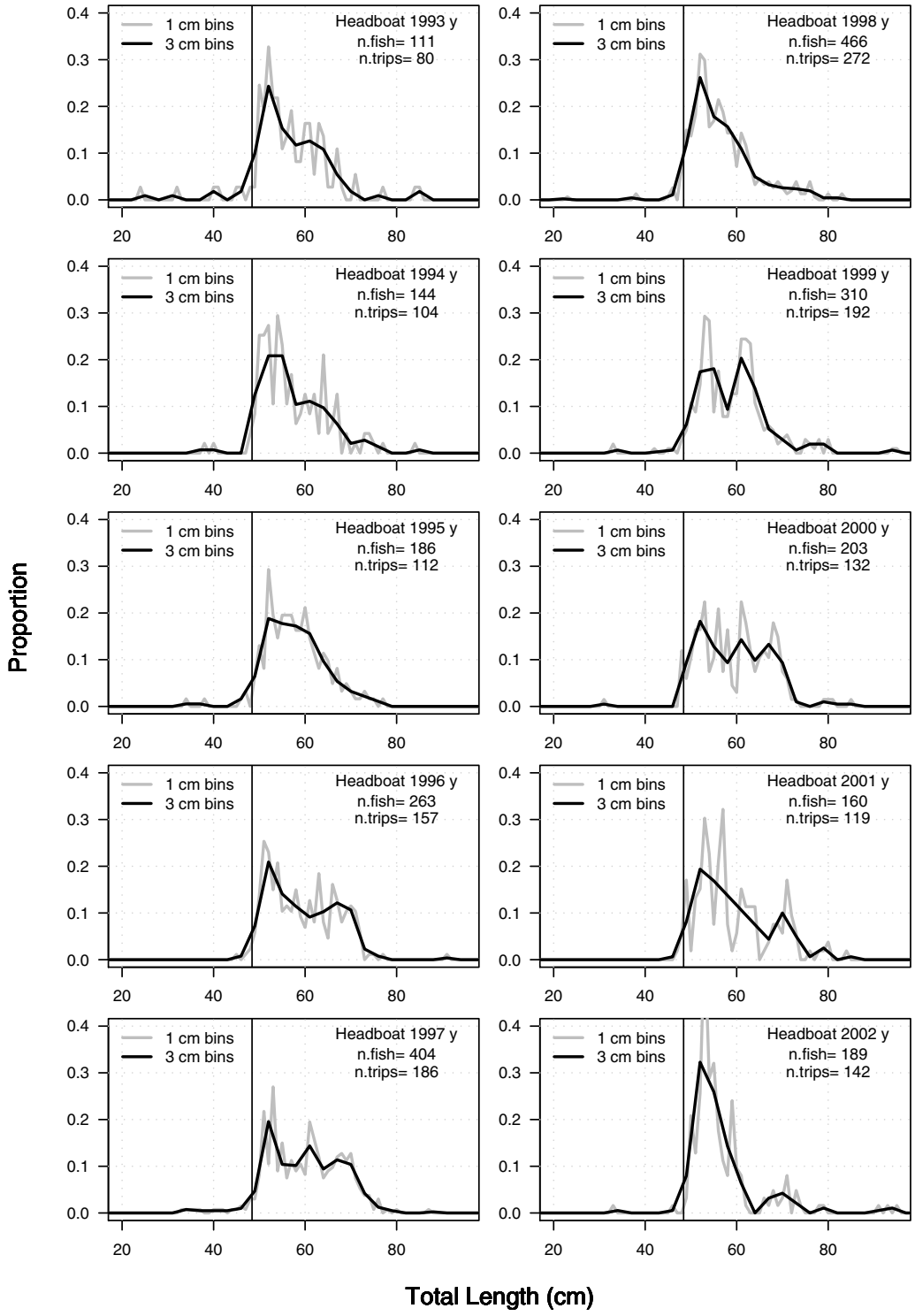


Figure 4. Continued.



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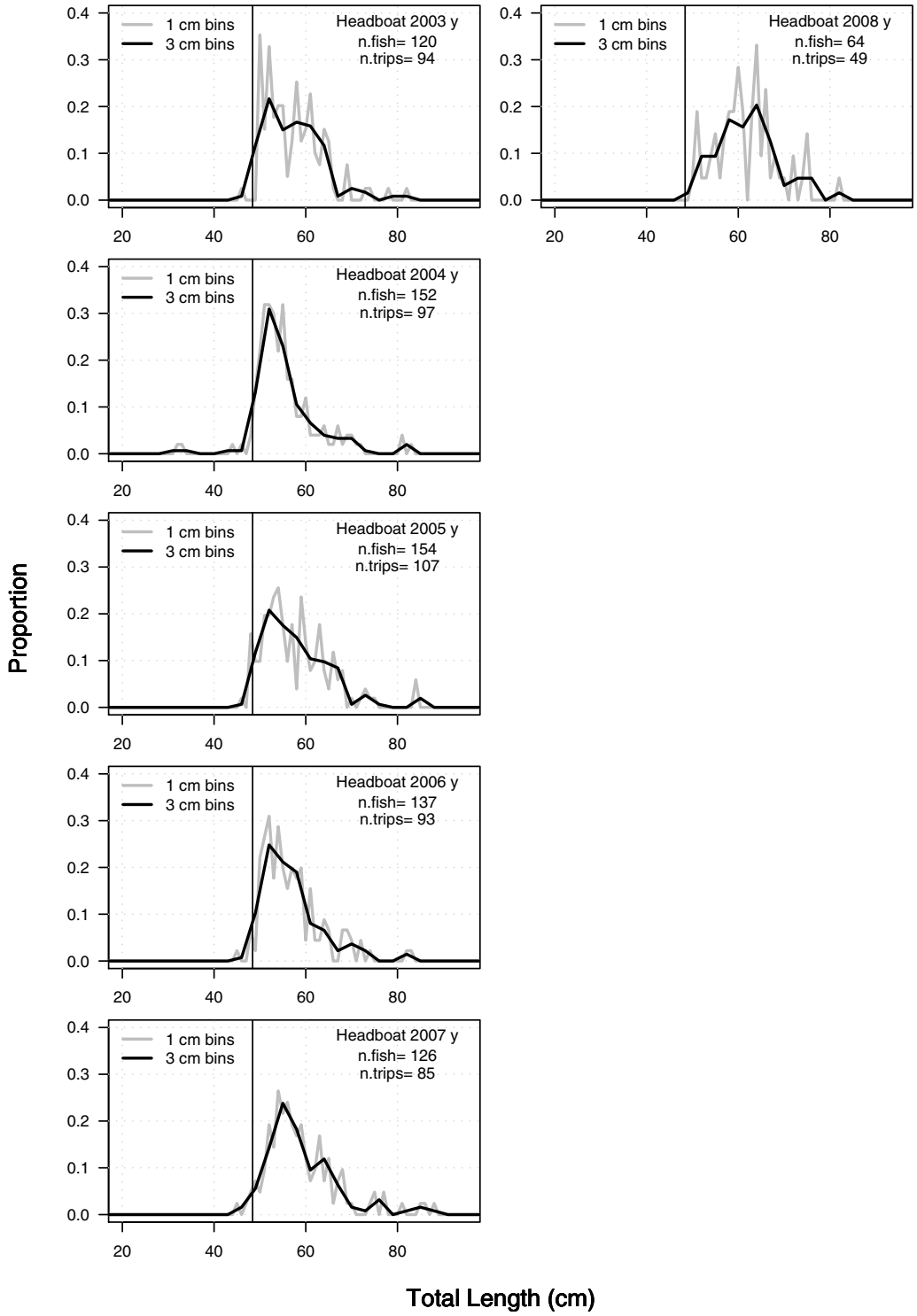
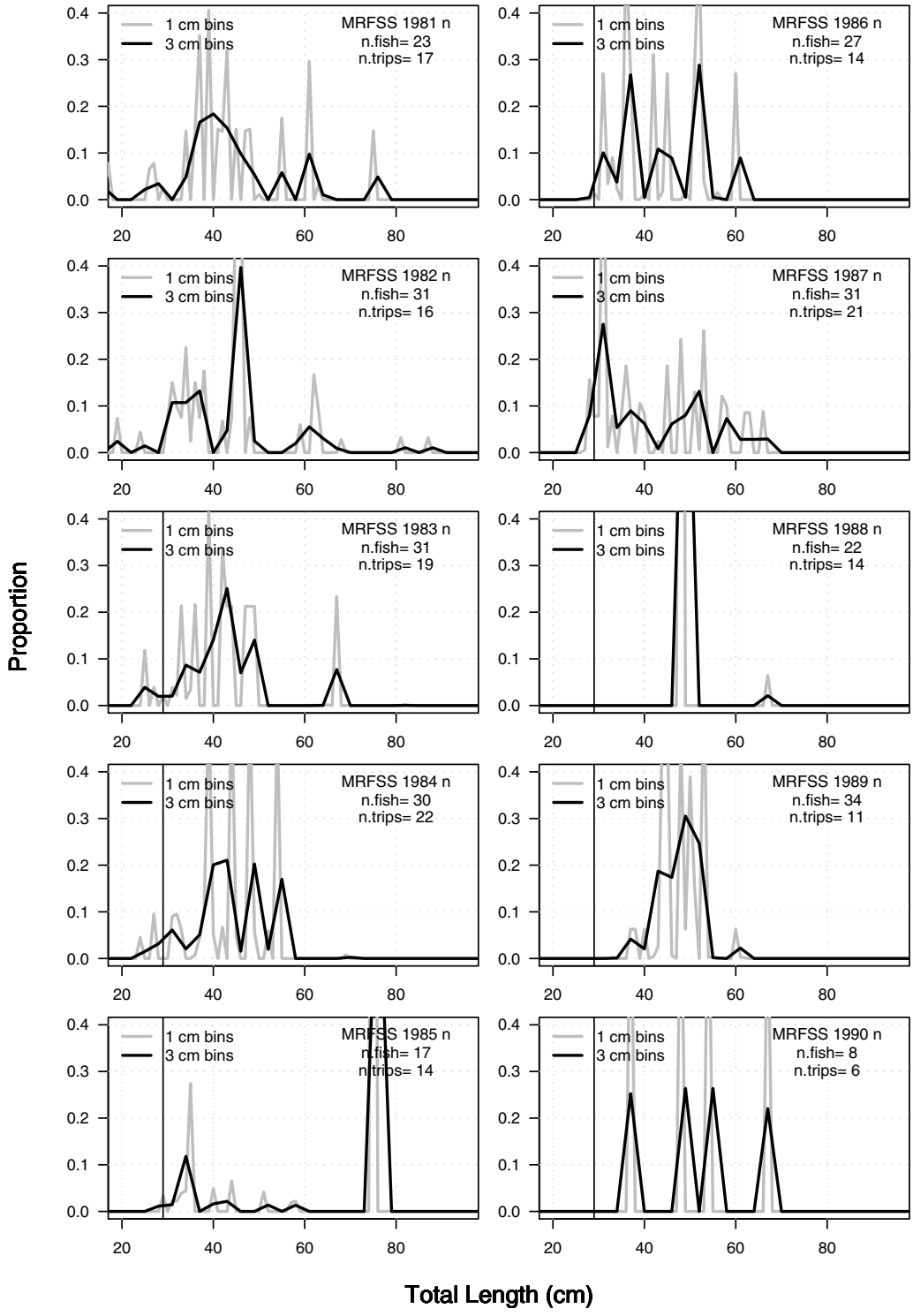


Figure 5. Red Grouper in Atlantic: Annual MRFSS length compositions plotted as the 1-cm DW bins and the 3-cm model input. The "y" after the year label indicates inclusion as model input. Years with "n" after the year will be dropped as input because of low sample sizes or other sampling issues. Vertical lines represent federal size limits.



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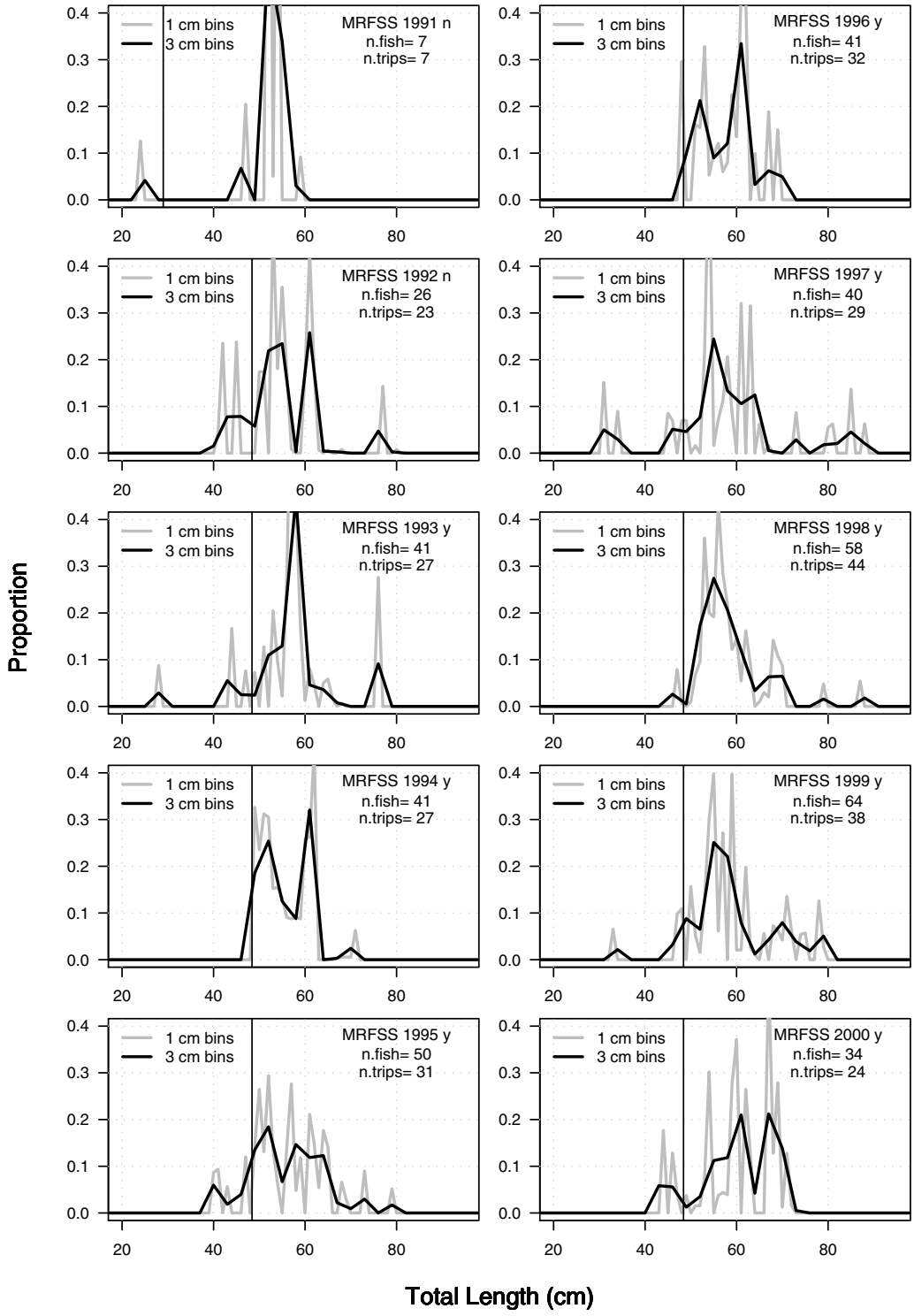

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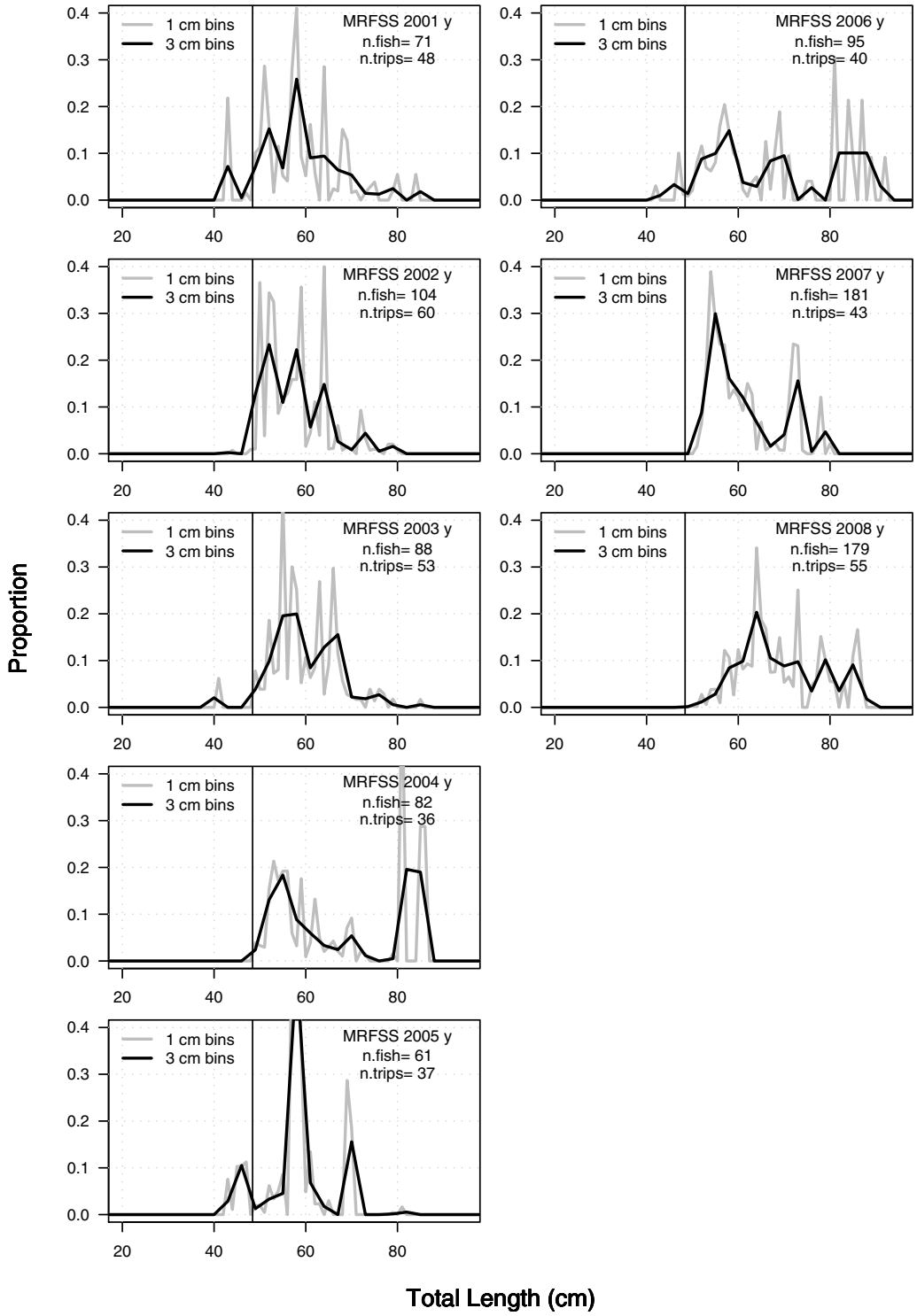
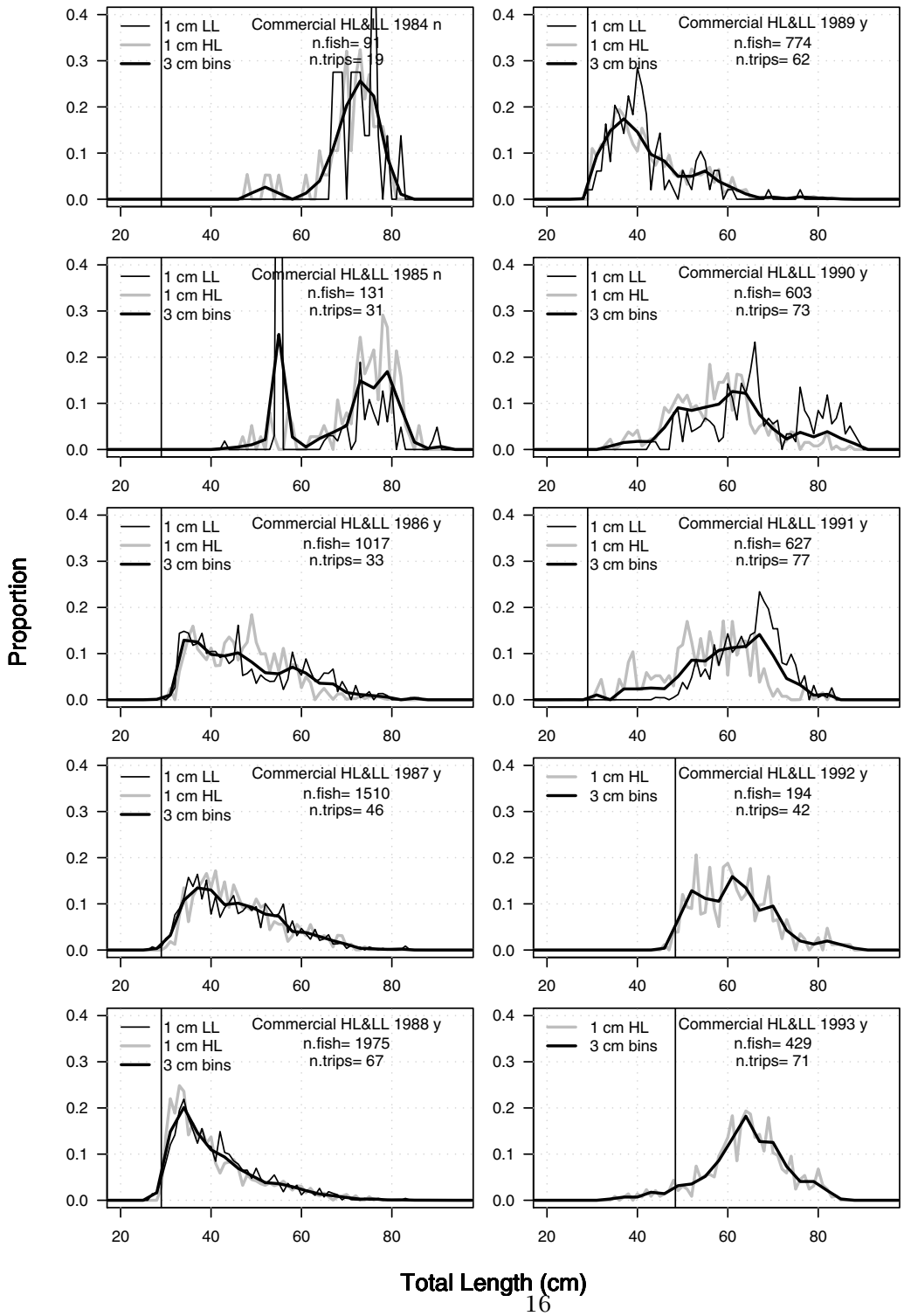


Figure 6. Red Grouper in Atlantic: Annual commercial handline and longline length compositions plotted as the 1-cm DW bins for longline and handline and the 3-cm combined model input composition. The "y" after the year label indicates inclusion as model input. Years with "n" after the year will be dropped as input because of low sample sizes or other sampling issues. Vertical lines represent federal size limits.



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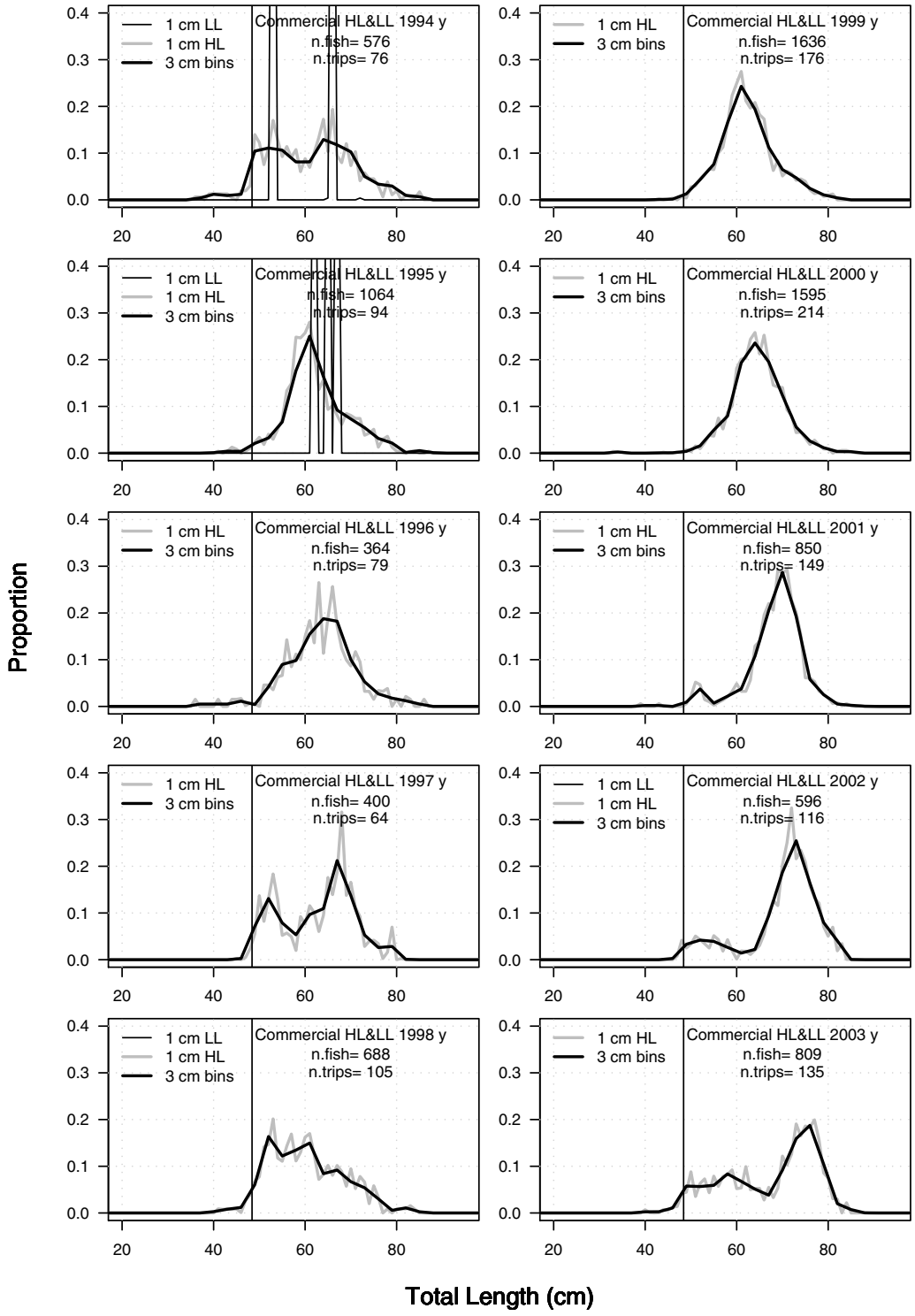

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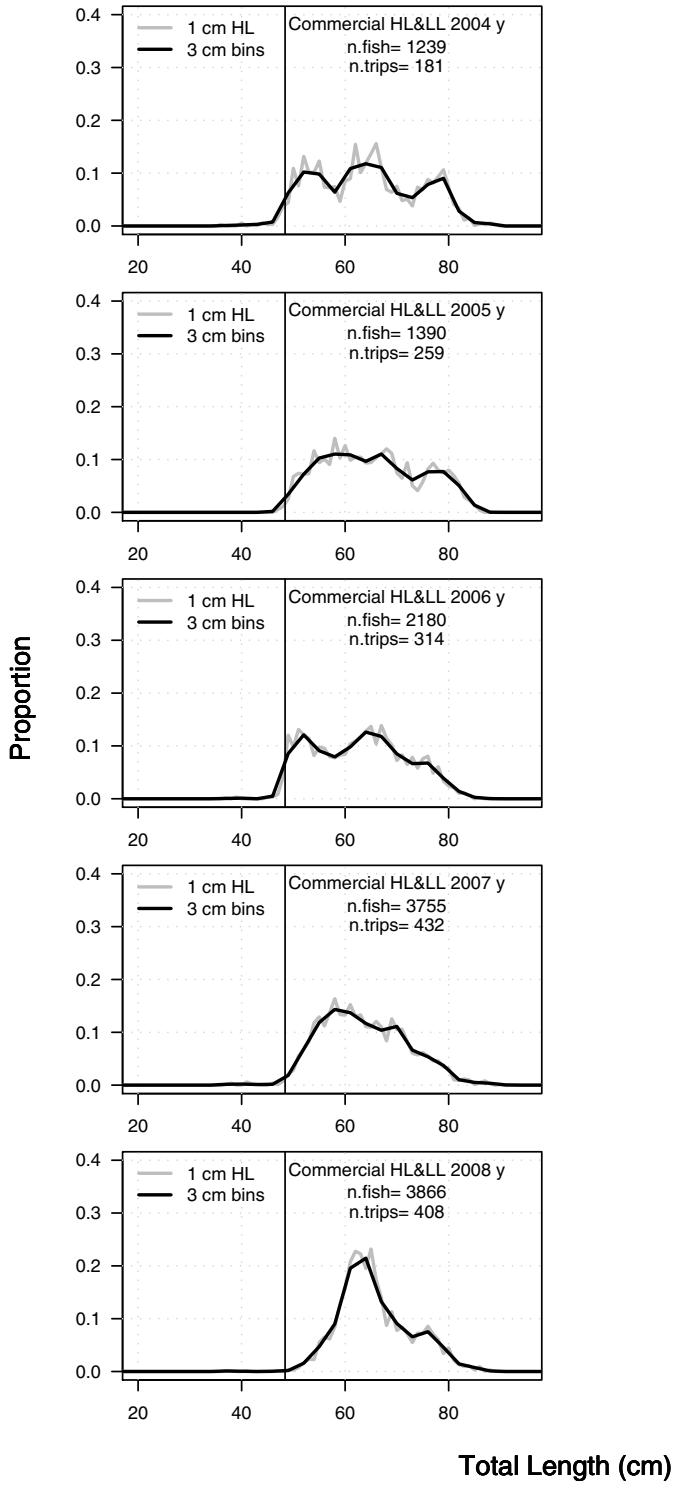


Figure 7. Red Grouper in Atlantic: Annual commercial pot and trap length compositions plotted as the 1-cm DW bins and the 3-cm model input composition. The "y" after the year label indicates inclusion as model input. Years with "n" after the year will be dropped as input because of low sample sizes or other sampling issues. Vertical lines represent federal size limits.

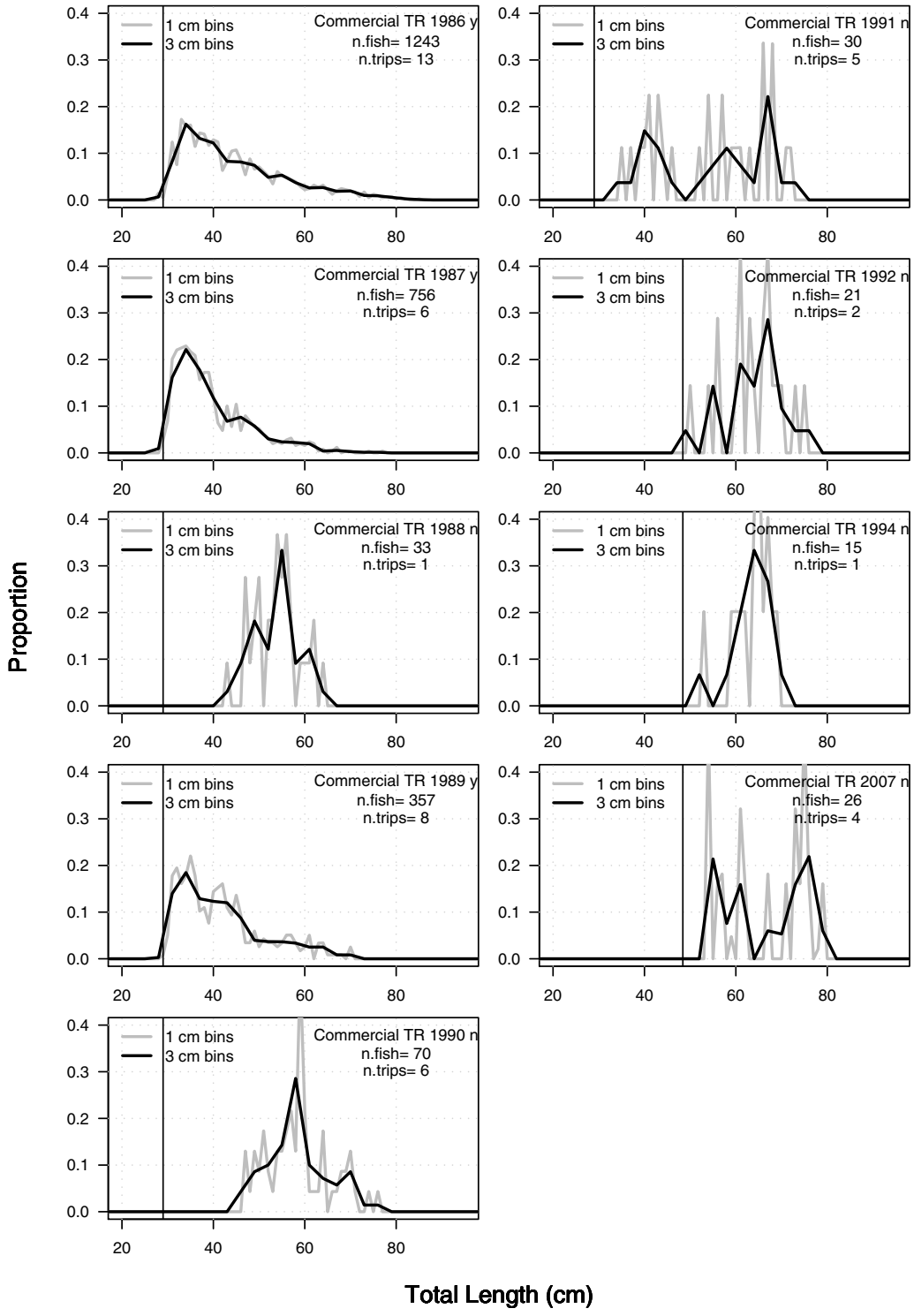
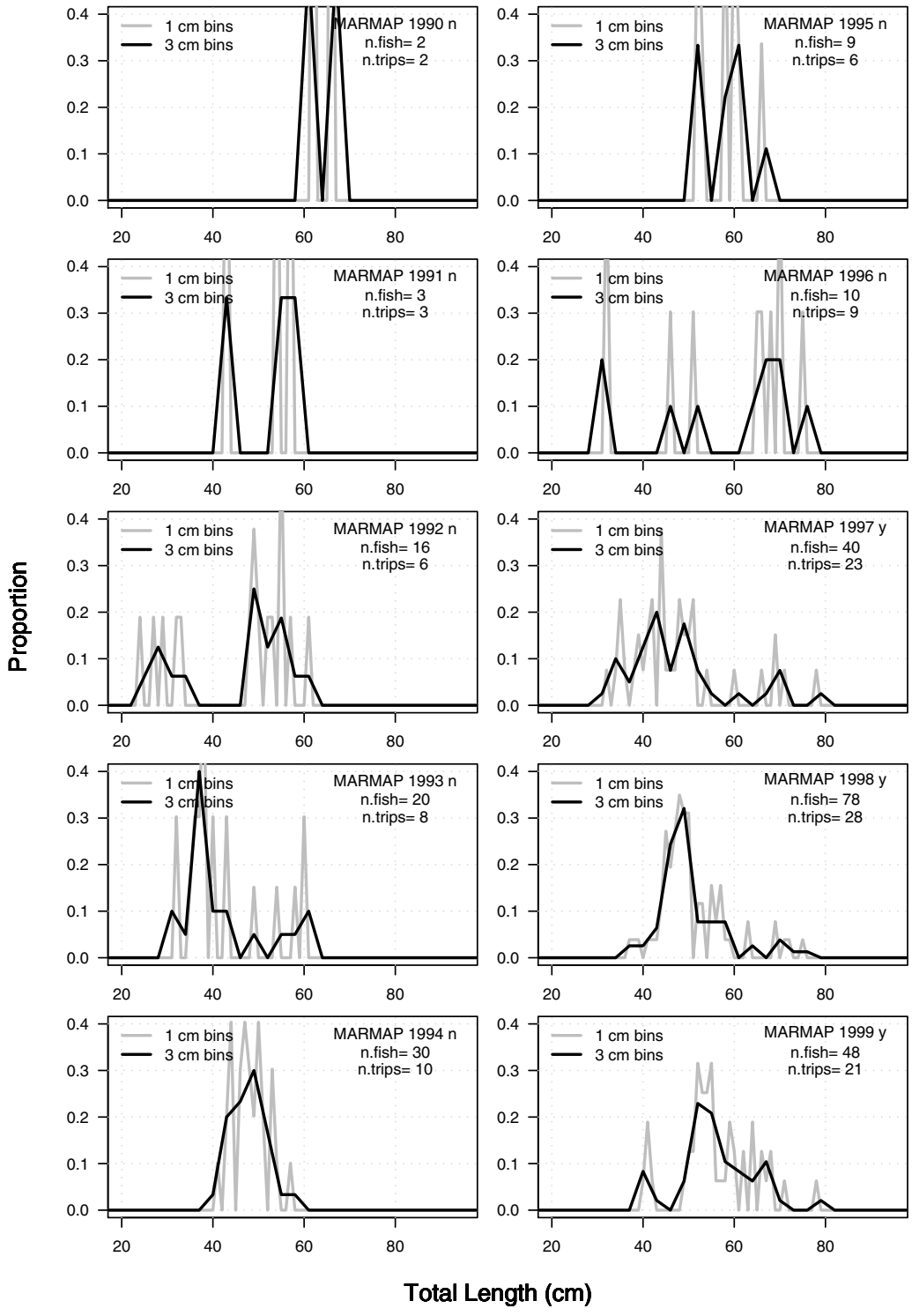


Figure 8. Red Grouper in Atlantic: Annual MARMAP length compositions plotted as the 1-cm DW bins and the 3-cm model input composition. The "y" after the year label indicates inclusion as model input. Years with "n" after the year will be dropped as input because of low sample sizes or other sampling issues.



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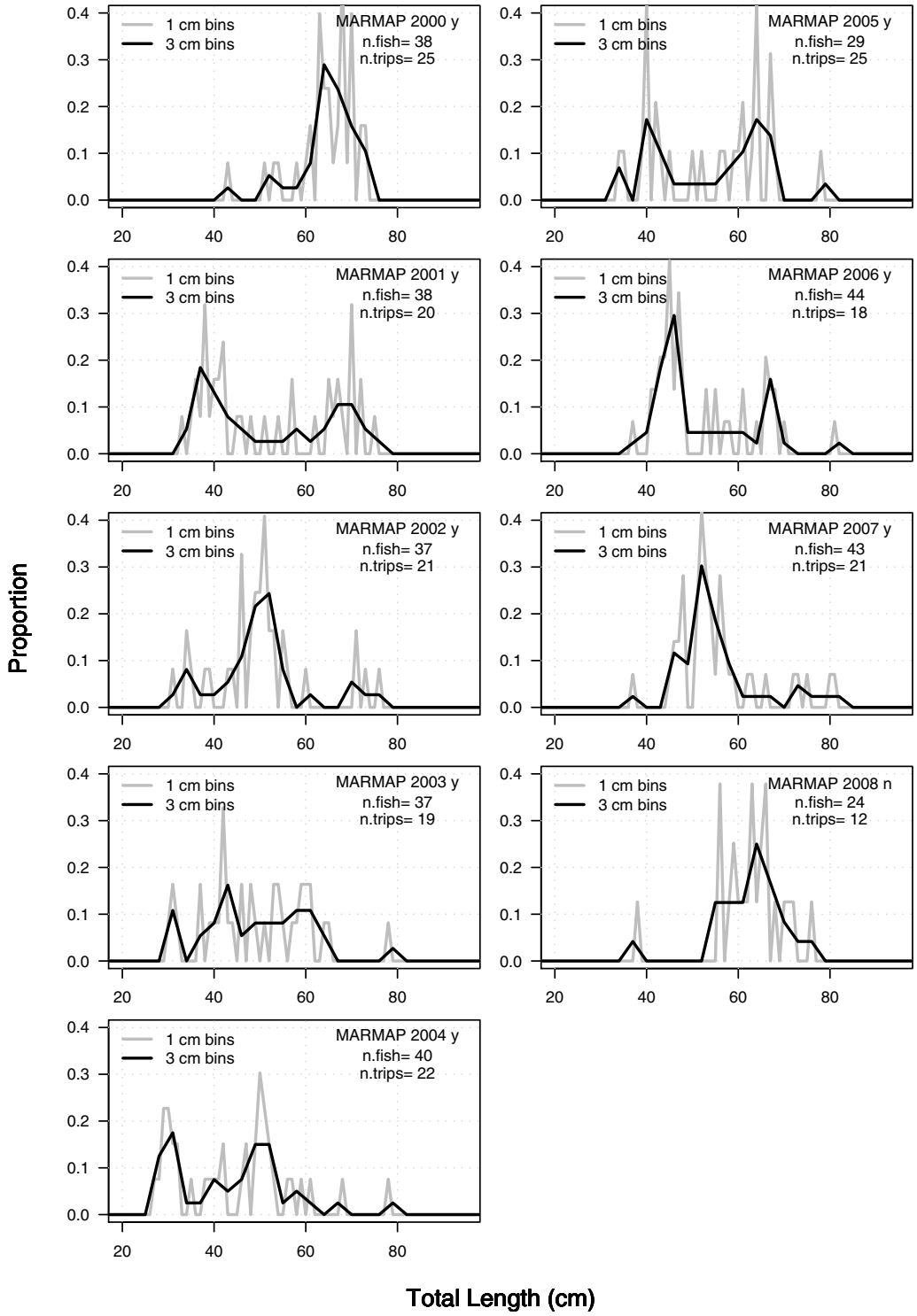
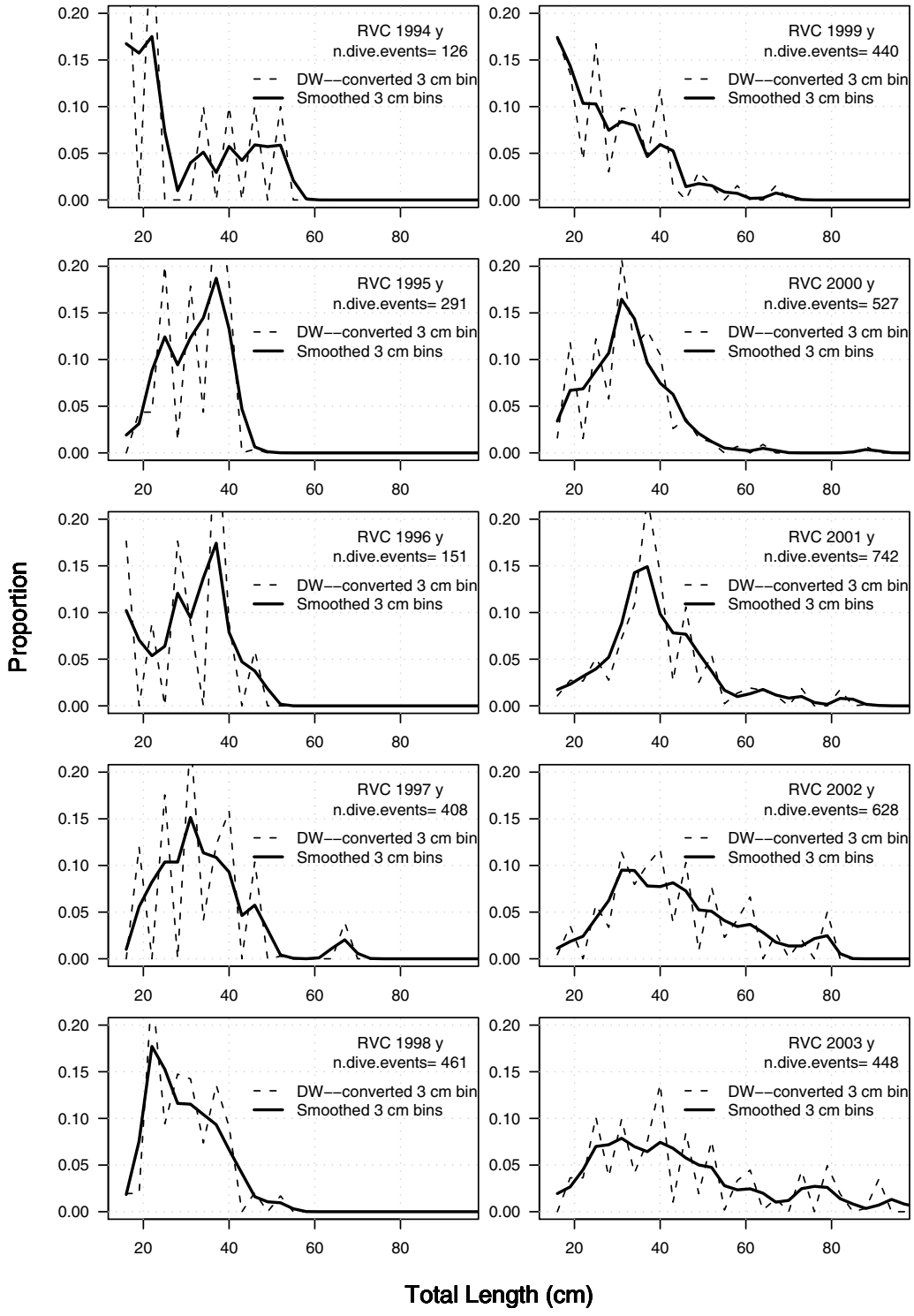


Figure 9. Red Grouper in Atlantic: Annual RVC length compositions plotted as the 3-cm bins converted from DW input and the 3-cm simulated model input composition. The "y" after the year label indicates inclusion as model input. Years with "n" after the year will be dropped as input because of low sample sizes or other sampling issues.



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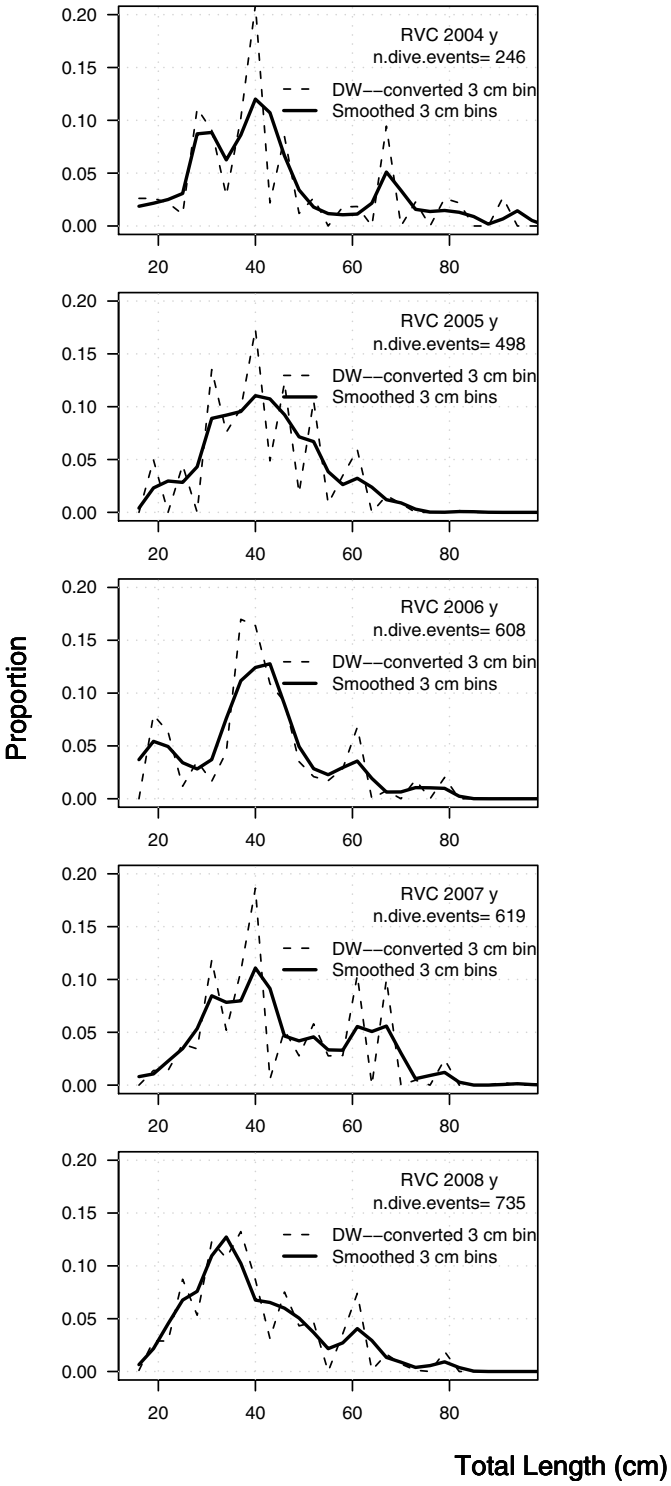

Figure 10. Red Grouper in Atlantic: vonBertalanffy estimates of expected lengths of age 0 and age 1 fish.

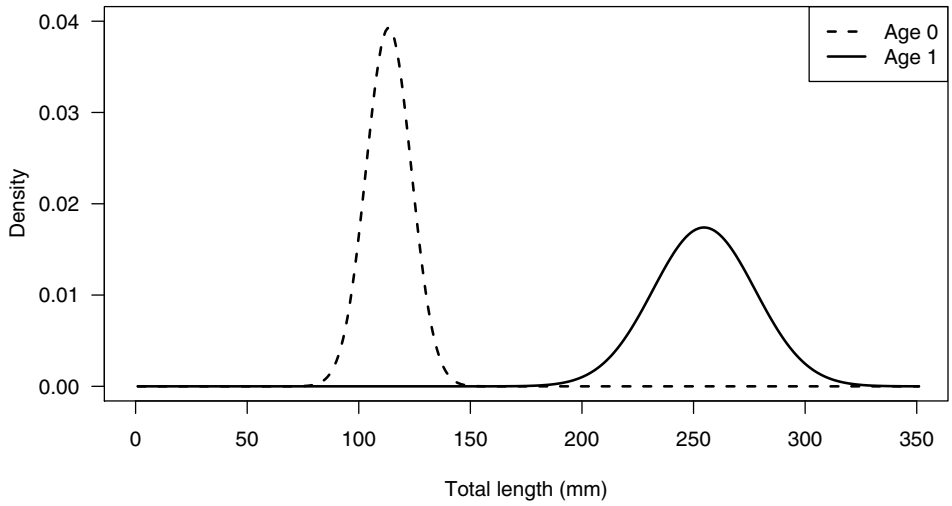

Figure 11. Red Grouper in Atlantic: RVC index comparison with and without the age-0 fish.