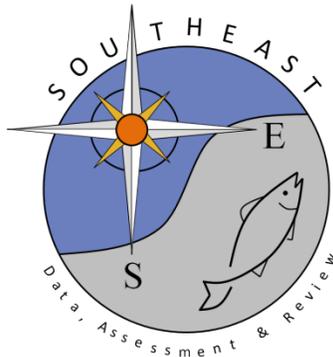


Weighted length and age compositions for South Atlantic Red Snapper (*Lutjanus campechanus*) from the recreational fishery

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SEDAR90-AW-01

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Weighted length and age compositions for South Atlantic Red Snapper (*Lutjanus campechanus*) from the recreational fishery

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Introduction

The recreational compositions presented in this Working Paper are the final length and age compositions that were provided for SEDAR 90 South Atlantic Red Snapper (*Lutjanus campechanus*). Since final recreational landings were not available prior to the data workshop, only nominal length and age compositions were previously provided. There were no changes to the recreational length and age data during the data workshop. Final nominal and weighted length and age compositions and mean length-at-age (MLAA) are provided below. A description of the length and age data and changes in sample sizes and methodologies from SEDAR 73 are provided in SEDAR 90-DW-12.

Nominal Length and Age Compositions

Nominal length and weighted length compositions were developed for SEDAR 90. Fish were assigned to 3 cm bins with bins ranging from 21 cm - 99 cm. The label represents the midpoint of the bin. The 21 and 99 cm bins are both aggregate bins and the 21 cm bin contains all fish ≤ 22 cm and the 99 cm bin contains all fish ≥ 98 cm. Fishery-dependent sampling is typically opportunistic and sampled lengths may not be representative of the true landings composition of recreational Red Snapper in the South Atlantic. Possible sampling bias in the collection of length samples are typically removed by weighting the length compositions with the associated landings at the finest spatial and temporal scale available without losing data. The landings used for weighting these compositions are the updated base landings that were recommended by the assessment panel during the first Red Snapper assessment webinar. For the private mode, landings in NC, SC, and GA were imputed to be in SRFS units based on their proportions in the MRIP data. FL private mode landings are in SRFS units from 2021-2024 and MRIP calibrated to SRFS units from 1981-2020. For the South Atlantic, the subregions defined for weighting are: (1) North Carolina and South Carolina (NCSC) and (2) Georgia and Florida (GAFL). Sample sizes, by each weighting subregion and fleet, are available in Table 4 of SEDAR 90-DW-12. It is recommended to exclude strata where the sample size is less than 30 fish and the majority of years for the NCSC weighting subregion does not meet this criteria for either fleet. In the early 1980s and most of the 1990s there are insufficient samples for weighting in the GAFL subregion

for the Gen Rec fleet while the Headboat fleet has sufficient samples most years for the GAFL subregion.

Comparisons of nominal and weighted length distributions are shown in Figures 1 and 2 for the Gen Rec and Headboat fleet, respectively. For most years, weighting had a minimal impact on the length compositions and nominal and weighted length distributions are very similar for both fleets. In the most recent years, the length distribution from Red Snapper from the Gen Rec fleet tends to skew larger than that from the Headboat fleet (Fig. 3). Comparisons of the weighted length distributions for SEDAR 73 and SEDAR 90 are also provided in Figures 4 (Gen Rec) and 5 (Headboat). The increase in sample sizes from including the lengths from the age data (SEDAR 90-DW-12) have resulted in smoother, less spikey compositions for SEDAR 90 compared to SEDAR 73, especially for the early 2000s Gen Rec fleet.

Nominal and Weighted Age Compositions

Nominal and weighted age compositions were calculated separately for each fleet. The age compositions are weighted to account for potential sampling biases associated with fishery-dependent data. The weighting method is adapted from Chih (2009) and a reweighting factor (RW) was estimated within year i and length bin j and corrects the composition of the age data to more closely represent the final length composition of landings. For each fleet and region combination, the reweighting factor $RW_{i,j}$ is calculated as

$$RW_{i,j} = \frac{LC_{i,j}}{a_{i,j}/a_i}$$

where $LC_{i,j}$ is the length composition from the length-only data, $a_{i,j}$ is the number of age samples in year i and length bin j , and a_i are the total number of age samples in year i . With this method, if there were age samples in $a_{i,j}$ not represented in $LC_{i,j}$ they are down-weighted to zero and effectively dropped from further analysis. The final weighted age compositions, for each fleet were estimated as

$$AC_{i,k} = \sum_j \left(RW_{i,j} * \frac{a_{i,j,k}}{a_i} \right)$$

where all length bins j within age class k were summed and then rescaled to sum to 1 across each year.

Red Snapper ranged in age from 0 -54 years old. The age 13 bin was treated as a plus group and contains all Red Snapper from 13-54 years old. Comparisons of nominal and weighted age distributions are shown in Figures 6 and 7 and bubble plots for the weighted age compositions are shown in Figures 8 and 9. Weighting did not have a large impact and nominal and weighted age distributions are very similar for most years. When there are observed differences, such as for the Headboat fleet in 2022 and 2023, the proportion of younger fish is down-weighted in the weighted age compositions. Comparisons of the weighted age compositions for the Gen Rec (Figure 10) and Headboat (Figure 11) fleets from SEDARs 73 and 90 show that the distributions are similar for most years for the Gen Rec fleet. The biggest difference is in 2019 for both fleets when more samples (200-300) were added for SEDAR 90.

Mean Length-at-Age

Mean length-at-age (MLAA) is the average length for each age and is calculated as

$$MLAA_{i,k} = \frac{\sum L_{i,k}}{a_{i,k}}$$

where L are lengths, a is the number of associated sample sizes, i is year, and k is age class. MLAA are provided to aide in model diagnostics and presented in Figures 12 and 13.

References

Binion-Rock, S.M. 2025. SEDAR 90-DW-12. South Atlantic Red Snapper (*Lutjanus campechanus*) length and age compositions from the recreational fishery. SEDAR, North Charleston, SC. 28 pp.

Chih, C.P. 2009. Evaluation of sampling efficiency of three otolith sampling methods for king mackerel fisheries. Transactions of the American Fisheries Society, 138: 990-999.

Figures

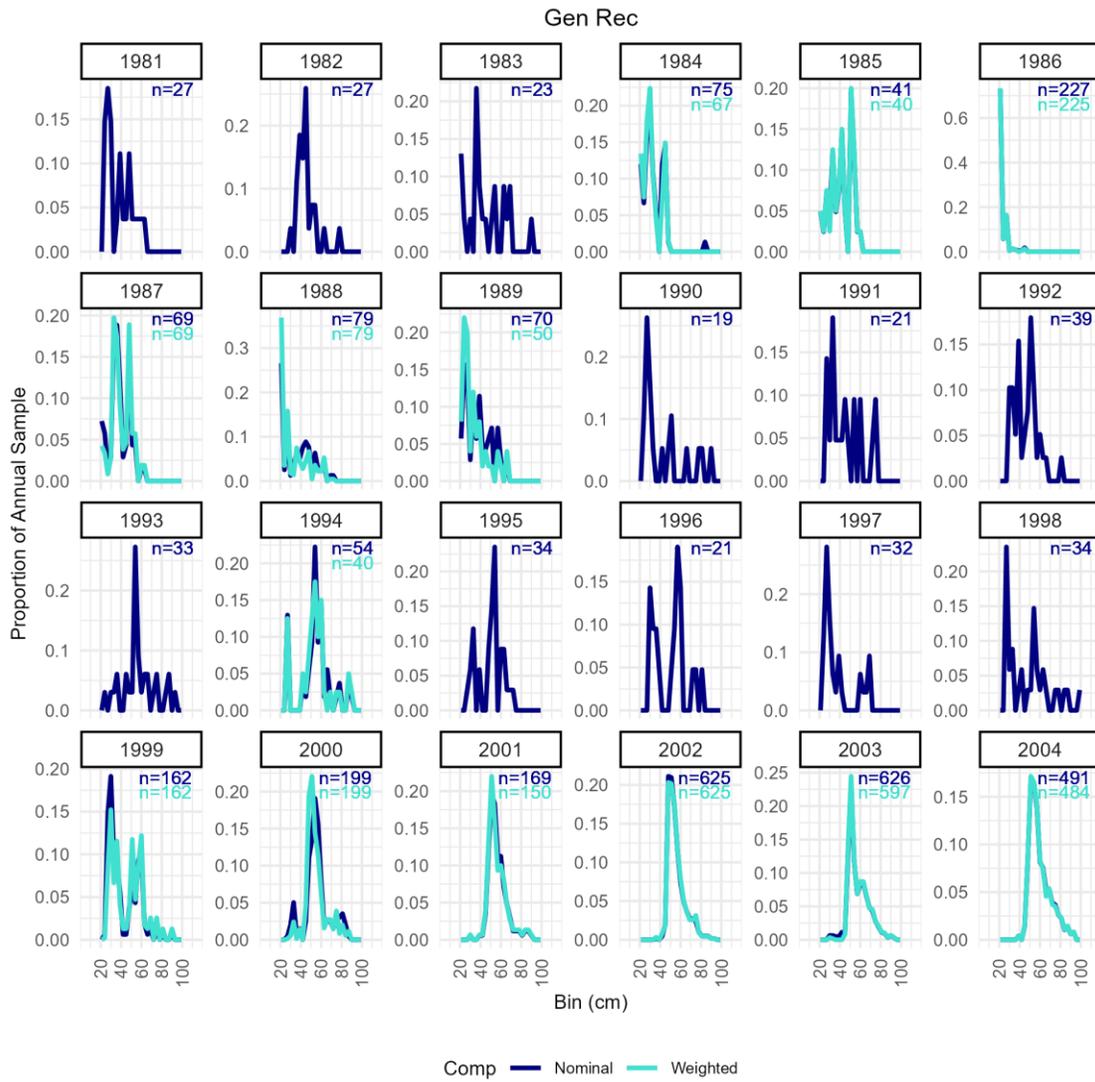
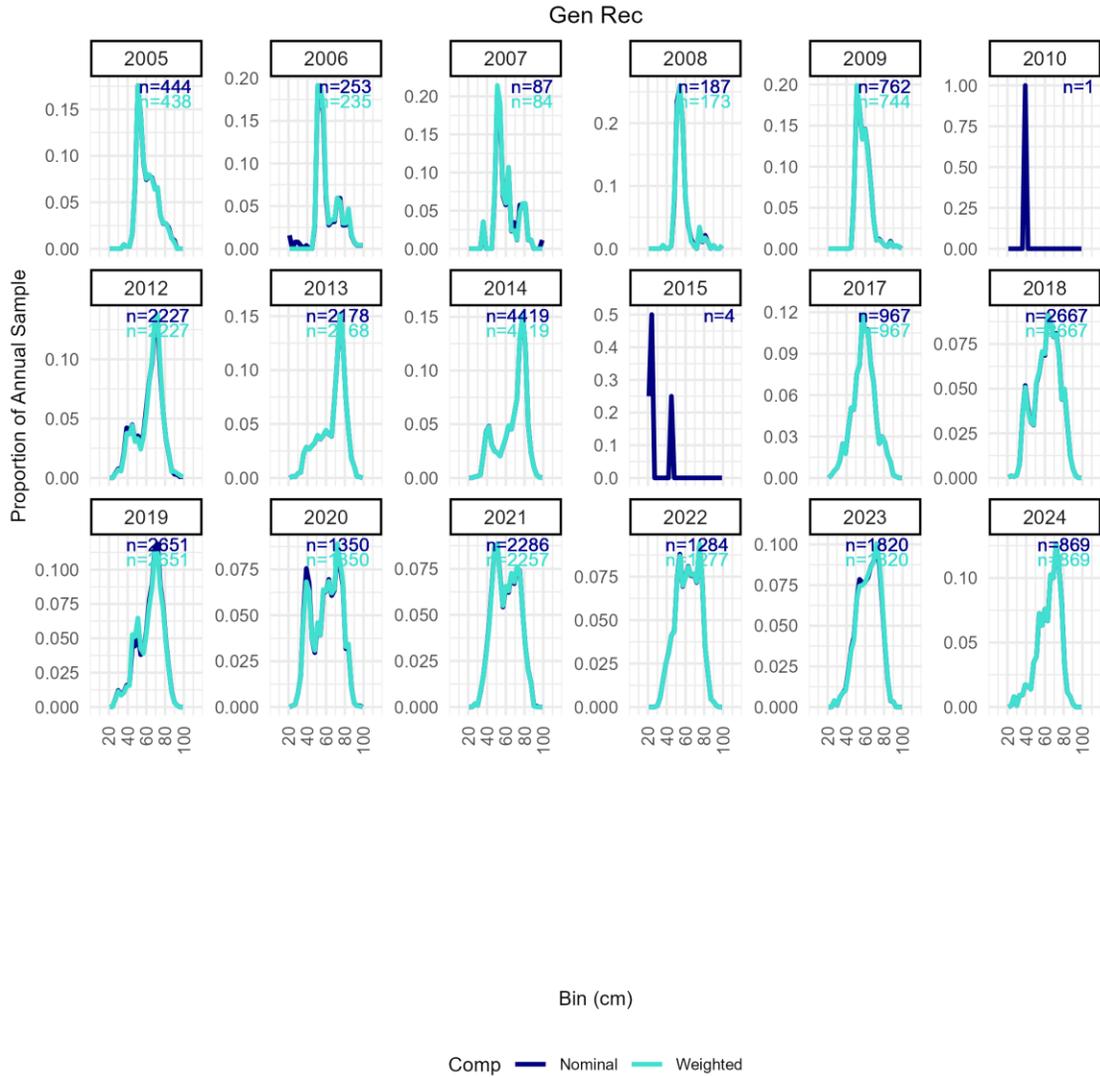


Figure 1. Nominal and weighted length compositions for Red Snapper sampled from the *Gen Rec* fleet from 1981-2004.



*Figure 1 (continued). Nominal and weighted length compositions for Red Snapper sampled from the **Gen Rec** fleet from 2005-2024.*

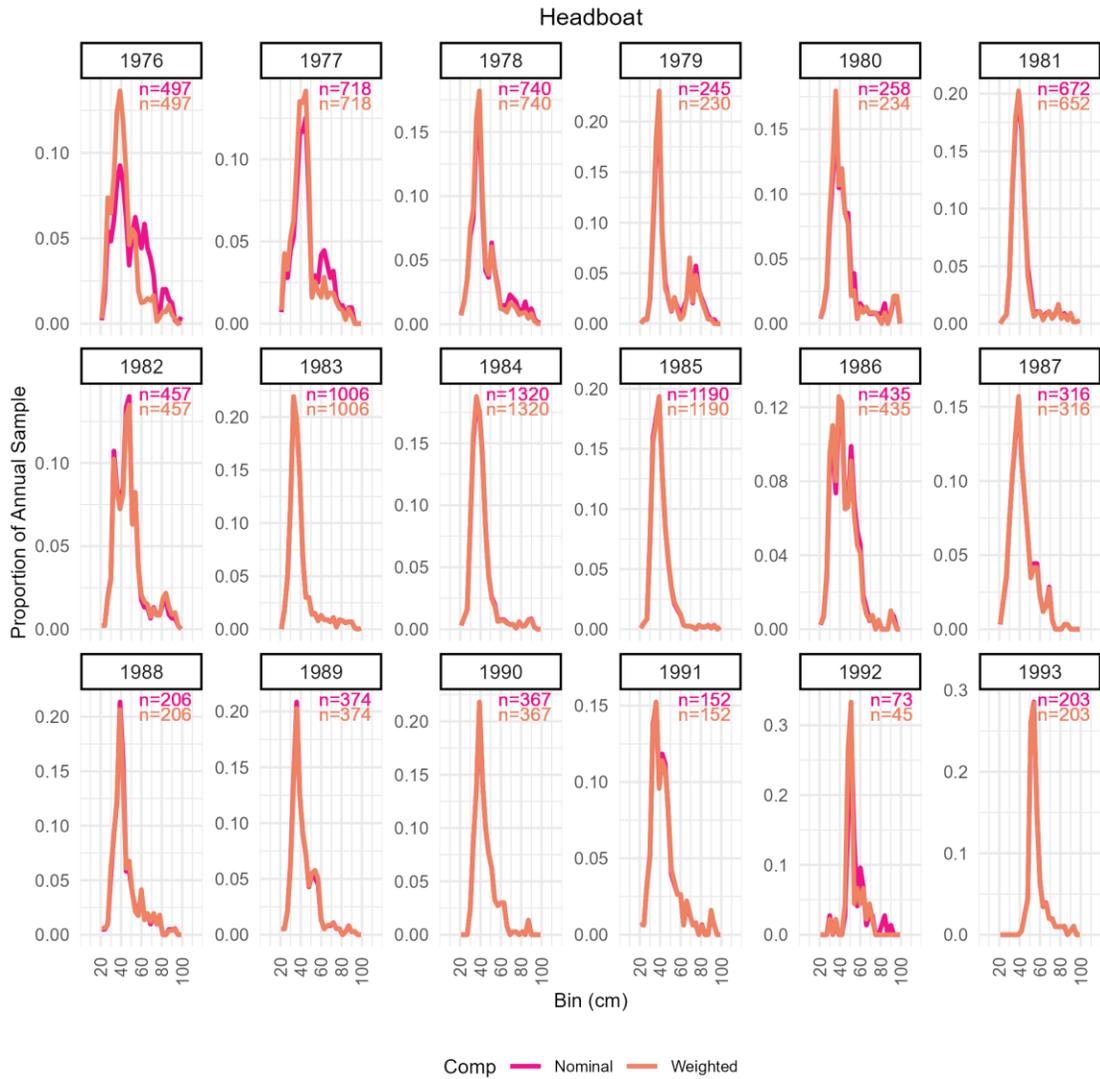


Figure 2. Nominal and weighted length compositions for Red Snapper sampled from the Headboat fleet from 1976-1993.

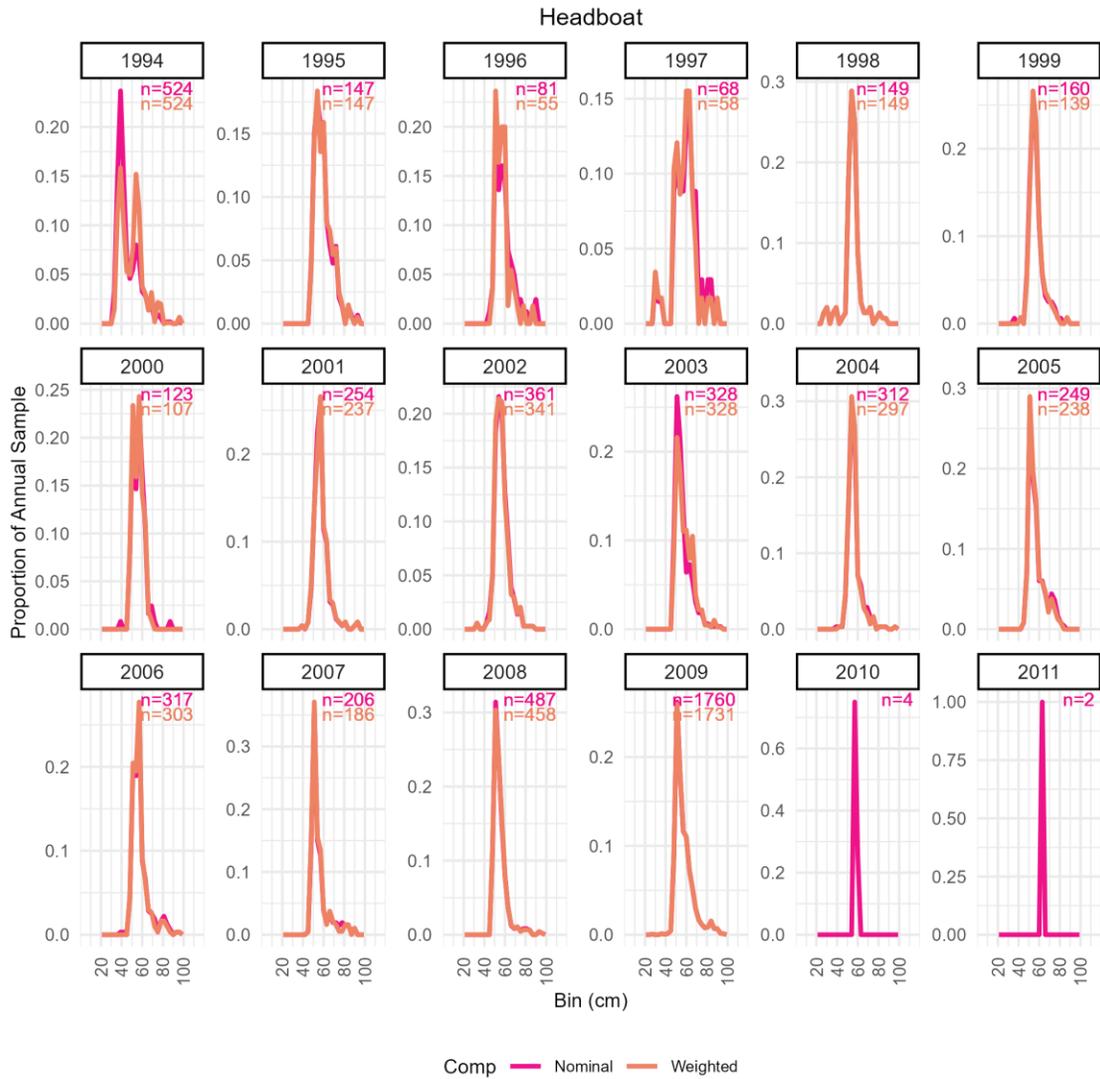
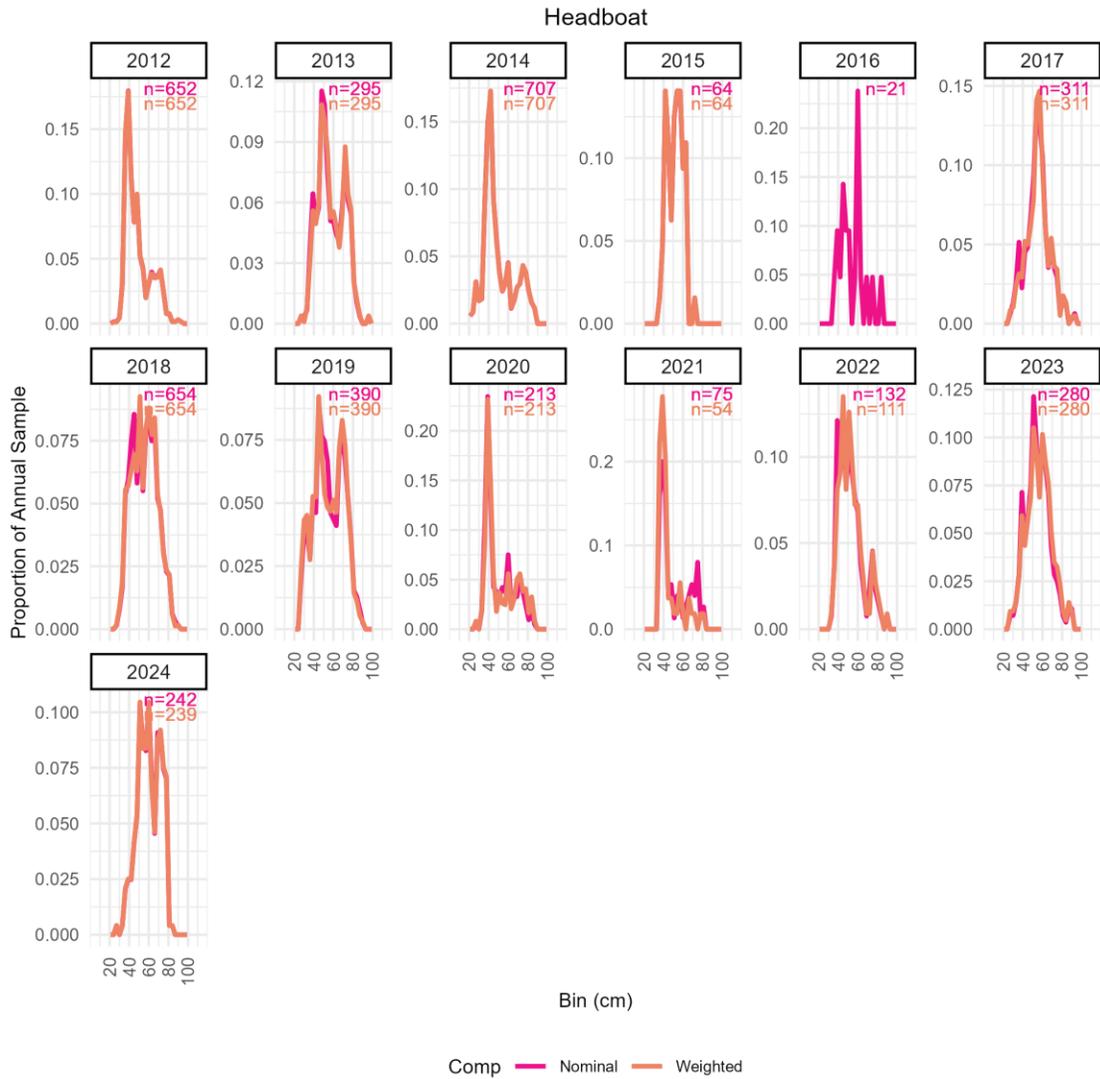


Figure 2 (continued). Nominal and weighted length compositions for Red Snapper sampled from the **Headboat** fleet from 1994-2011.



*Figure 2 (continued). Nominal and weighted length compositions for Red Snapper sampled from the **Headboat** fleet from 2012-2024.*

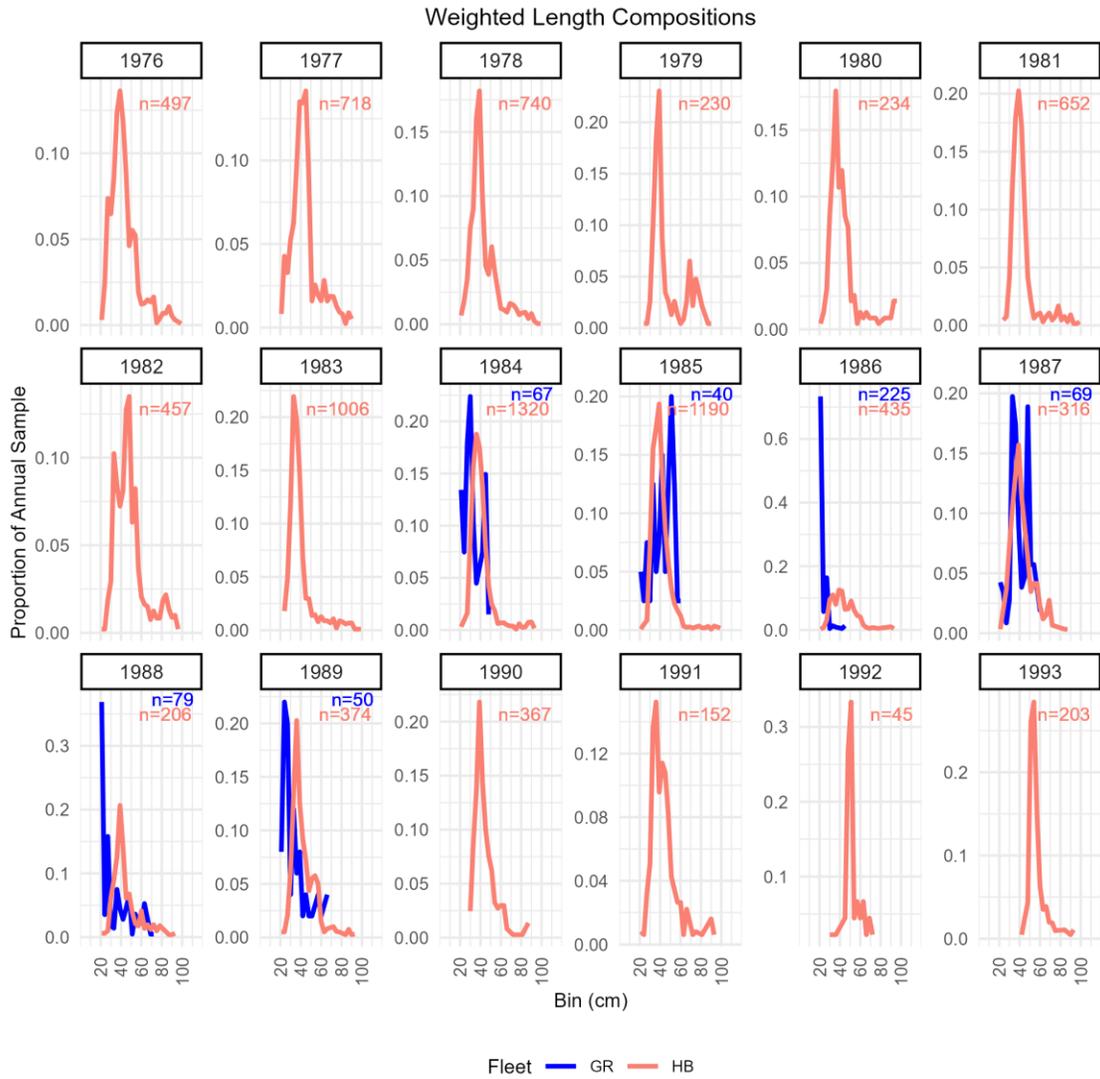


Figure 3. Weighted length distributions of Red Snapper sampled from the Gen Rec (GR) and Headboat (HB) fleets from 1976-1993.

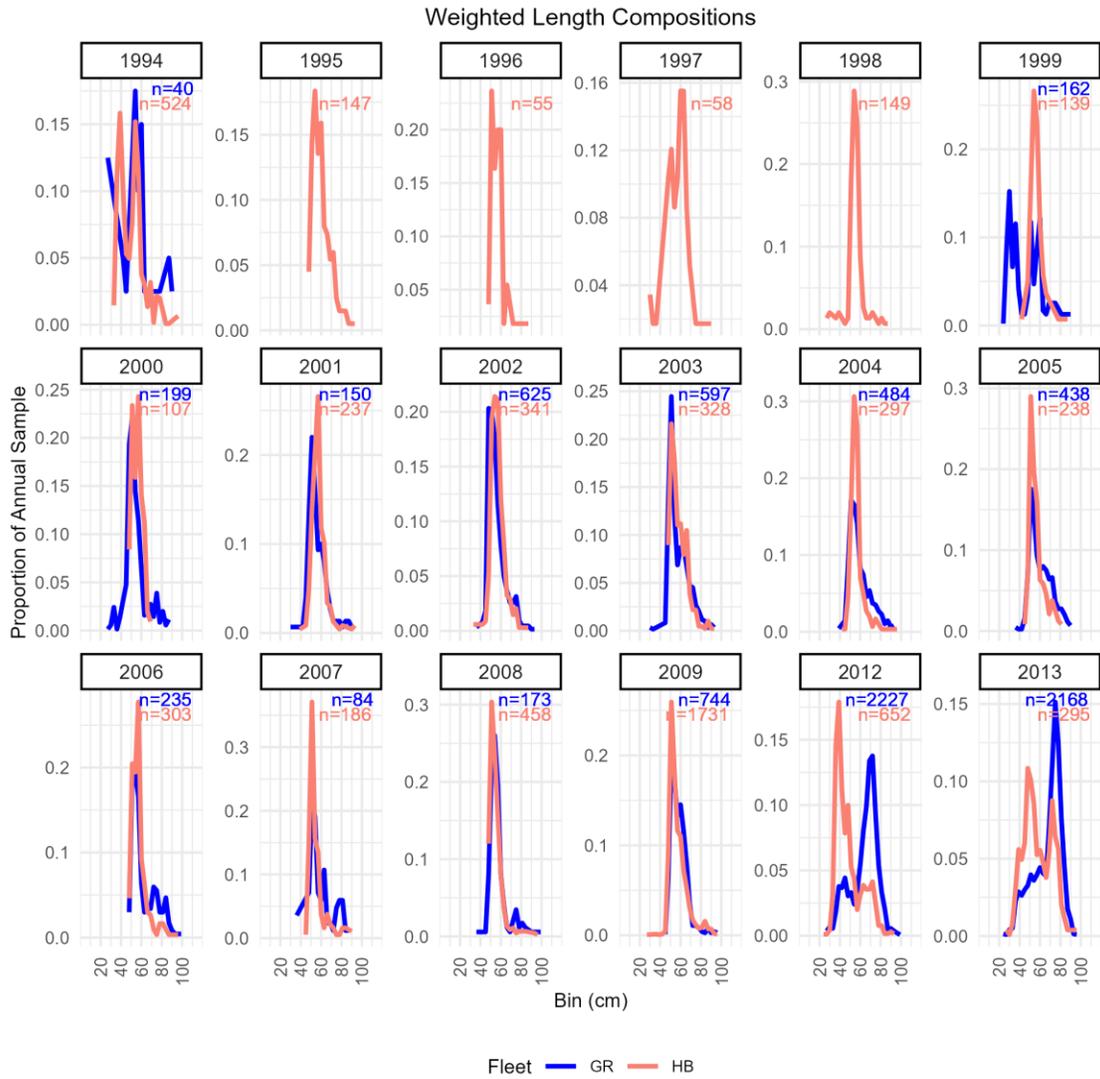


Figure 3 (continued). Weighted length distributions of Red Snapper sampled from the Gen Rec (GR) and Headboat (HB) fleets from 1994-2013.

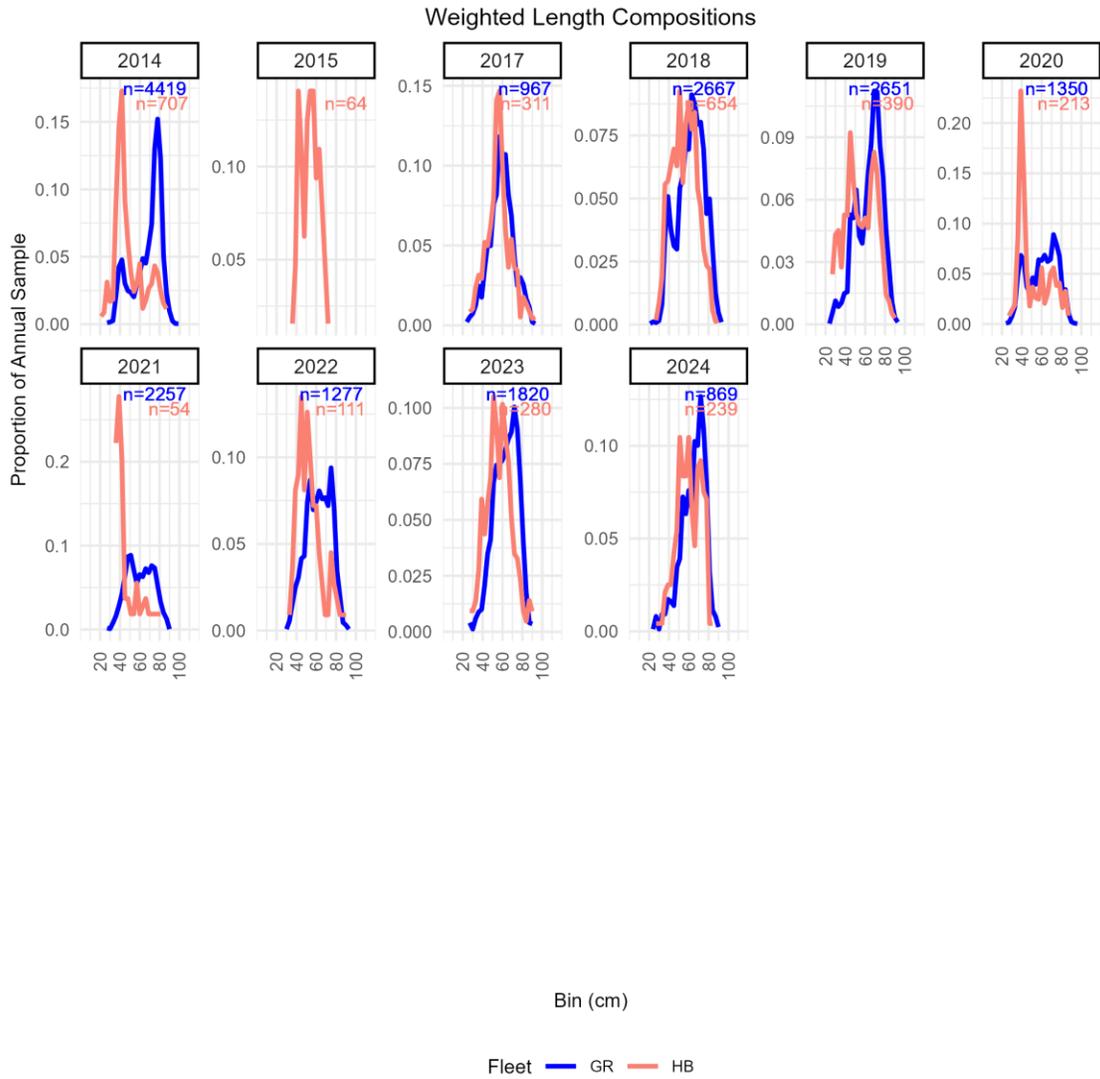


Figure 3 (continued). Weighted length distributions of Red Snapper sampled from the Gen Rec (GR) and Headboat (HB) fleets from 2014-2024.

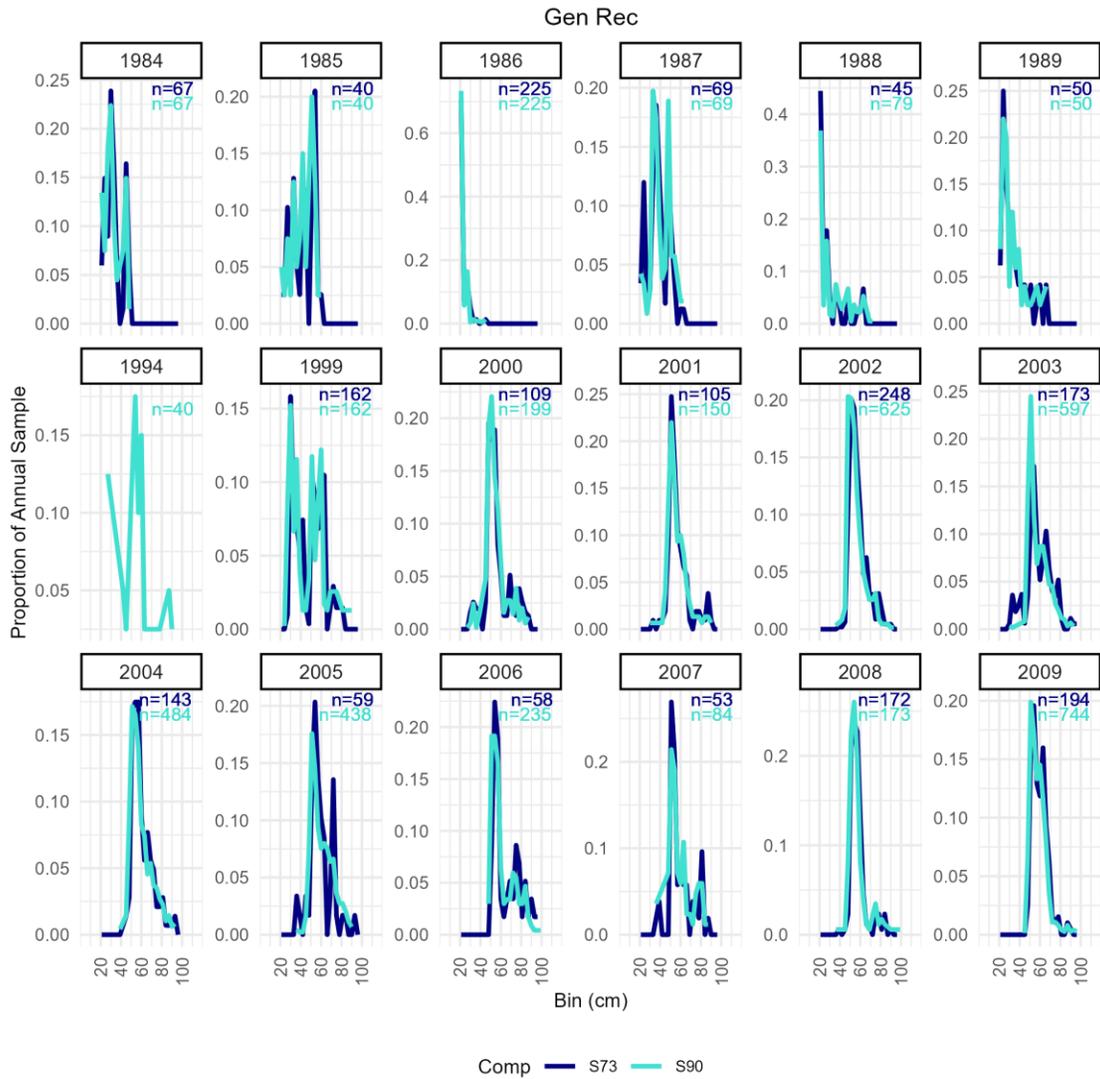


Figure 4. Weighted length distributions from SEDAR 73 and SEDAR 90 from Red Snapper sampled from the **Gen Rec** fleet from 1984-2009.

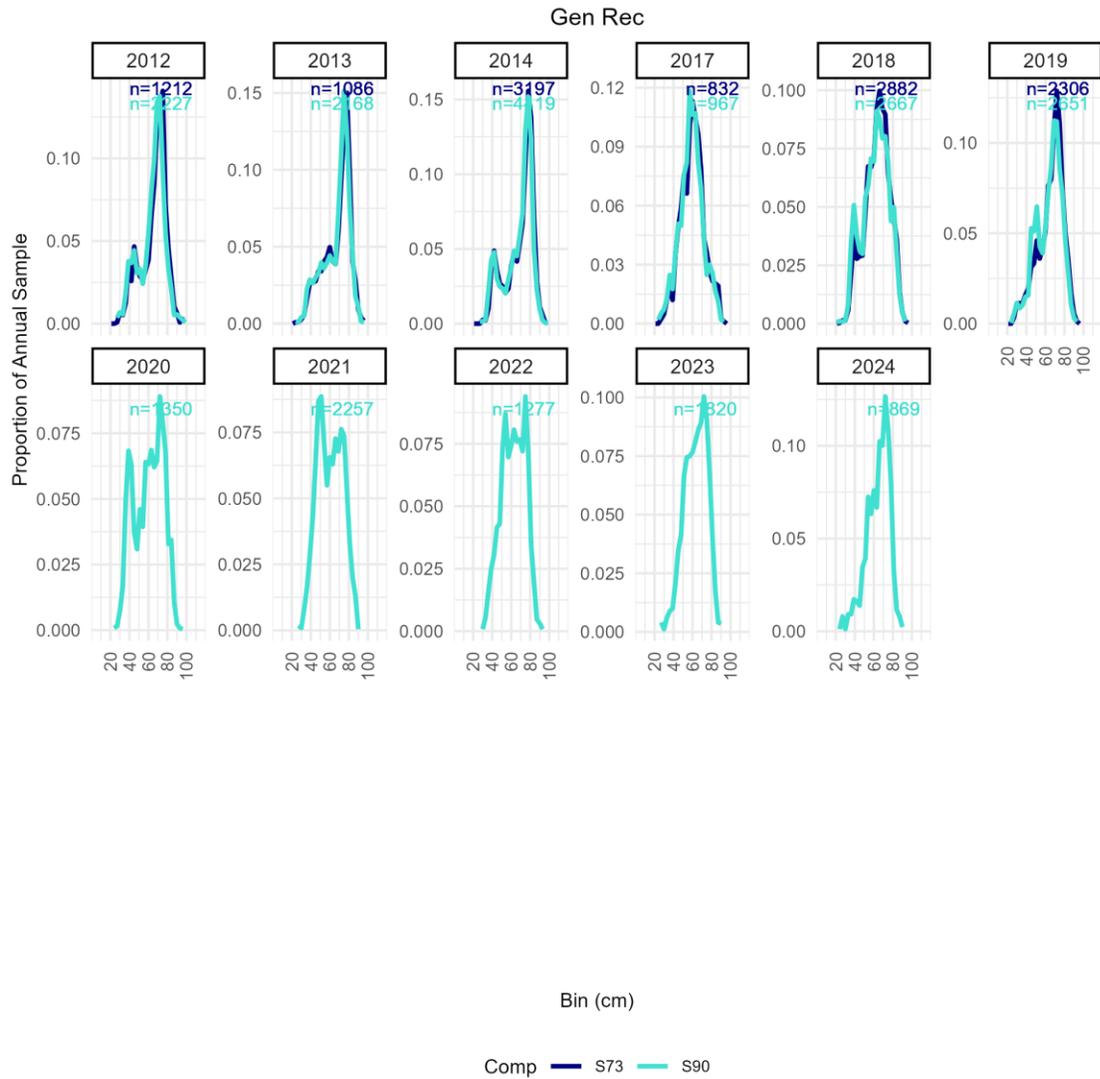


Figure 4 (continued). Weighted length distributions from SEDAR 73 and SEDAR 90 from Red Snapper sampled from the Gen Rec fleet from 2012-2024.

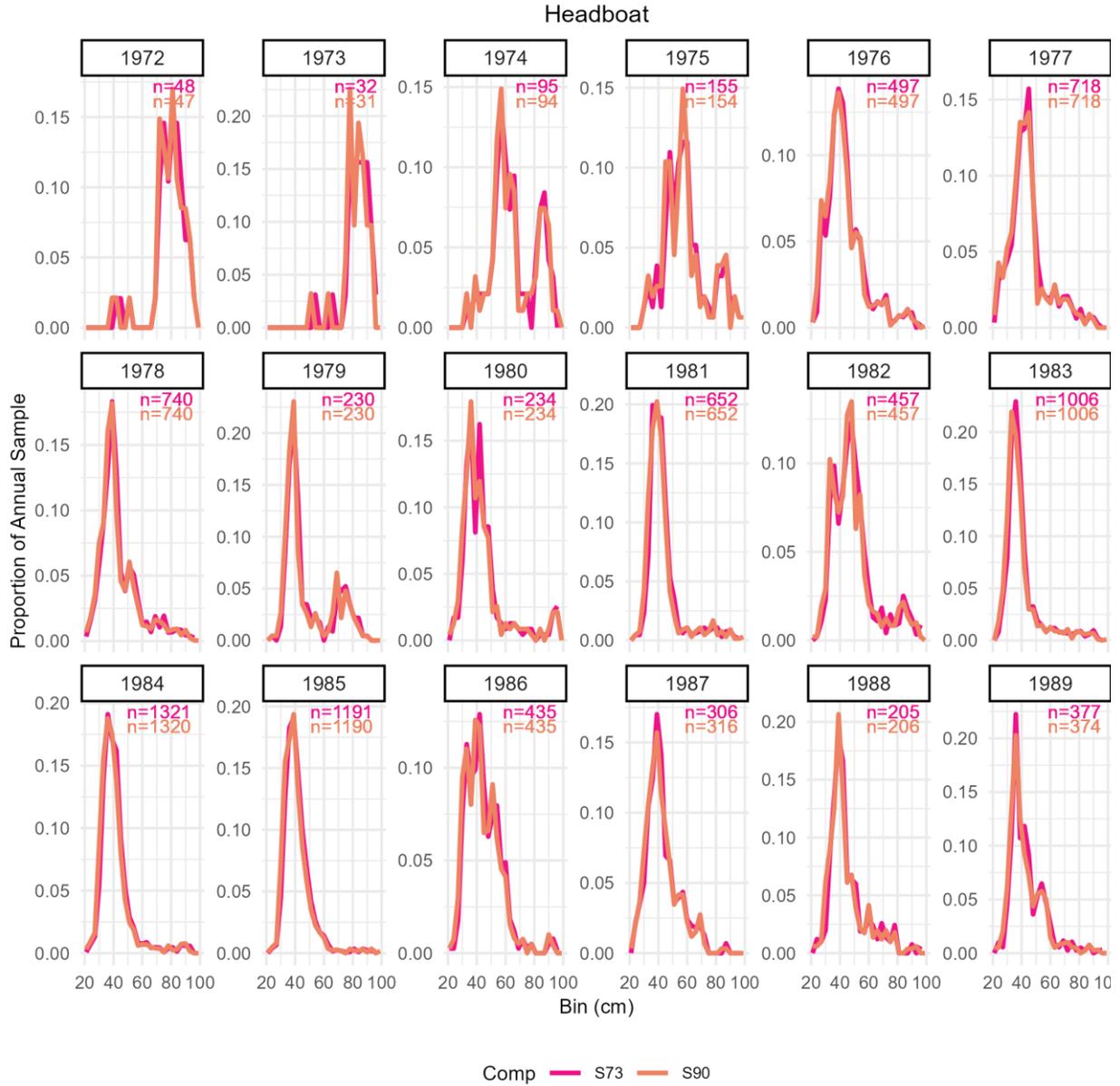


Figure 5. Weighted length distributions from SEDAR 73 and SEDAR 90 from Red Snapper sampled from the **Headboat** fleet from 1972-1989.

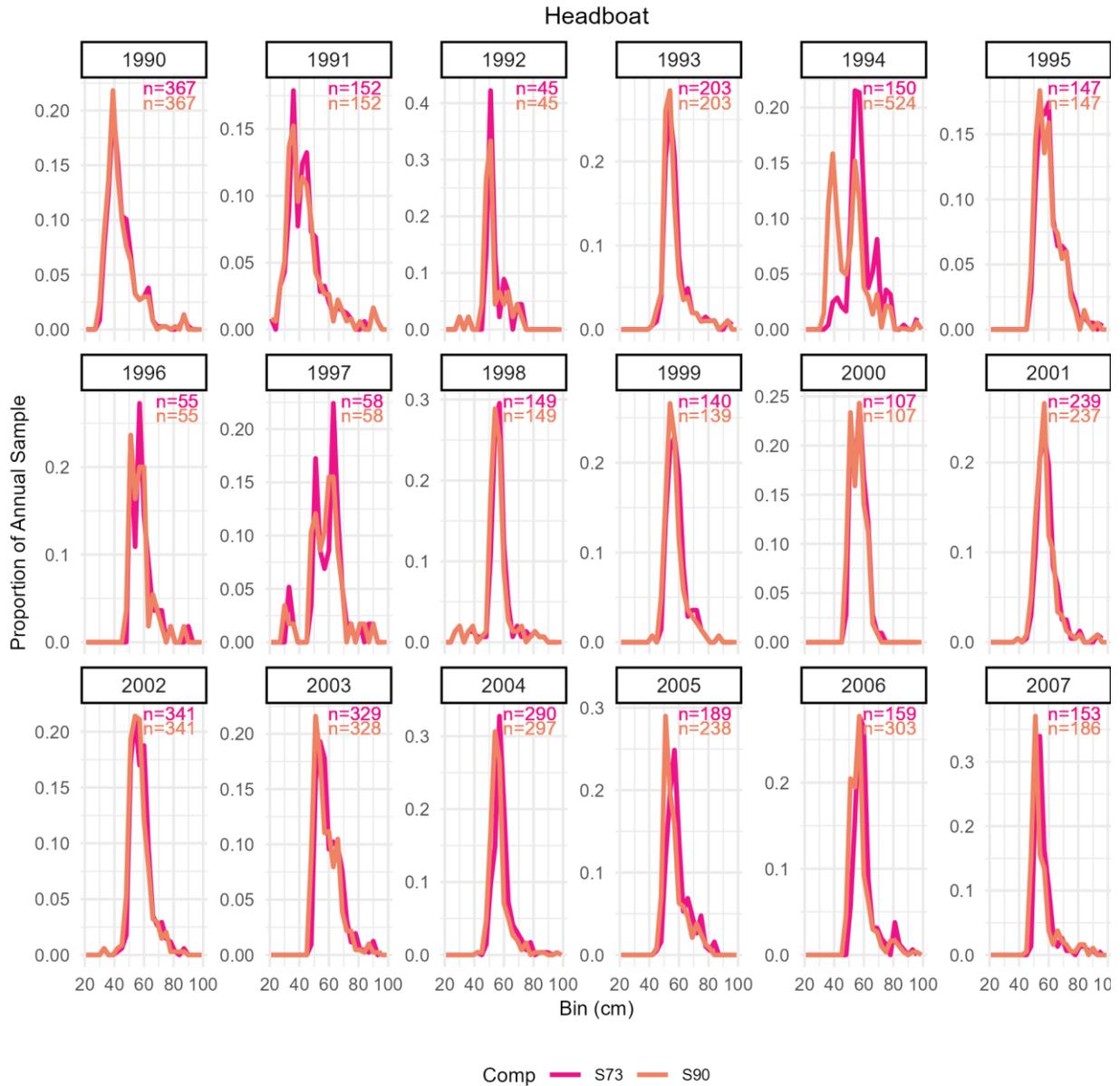
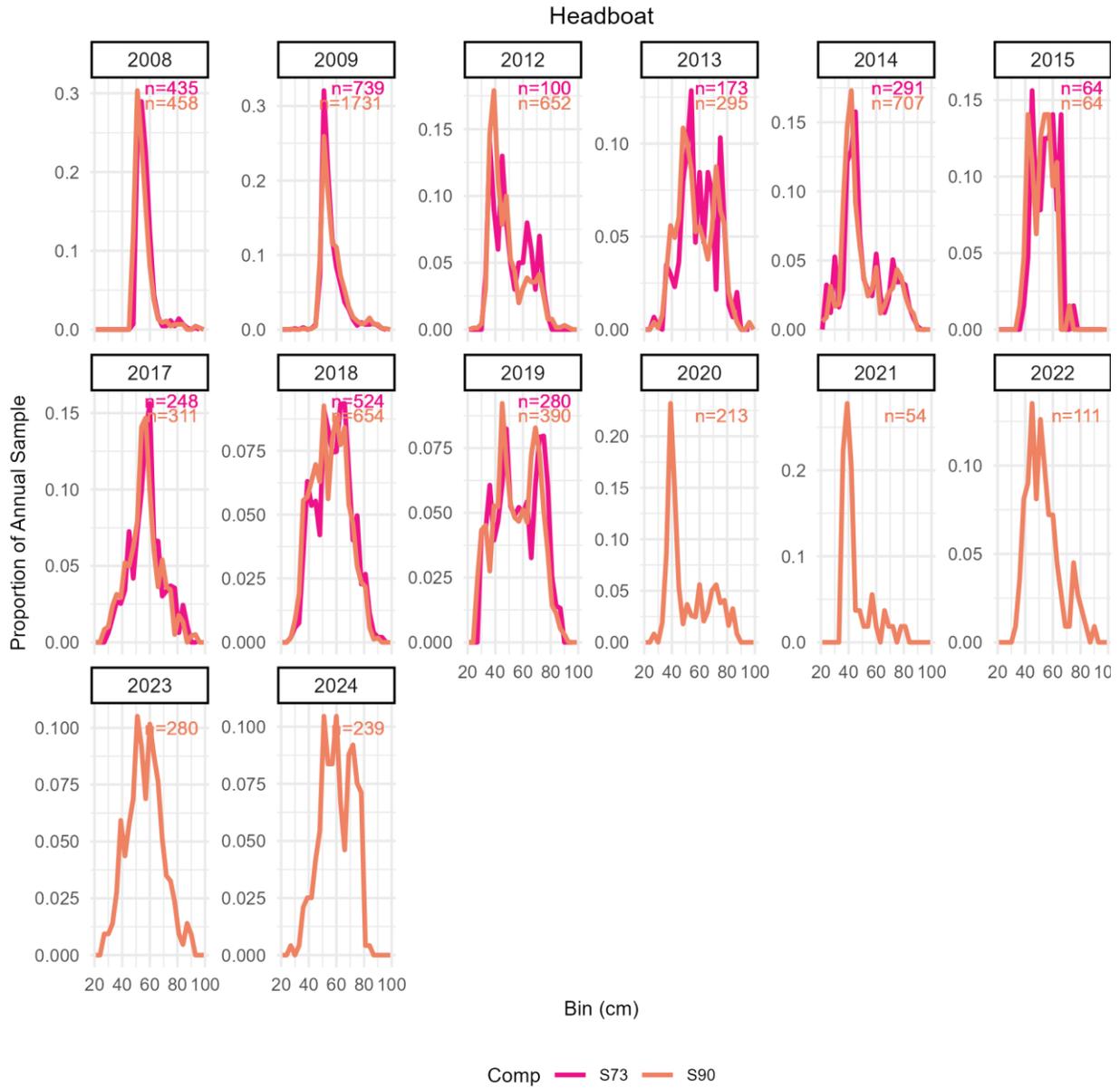
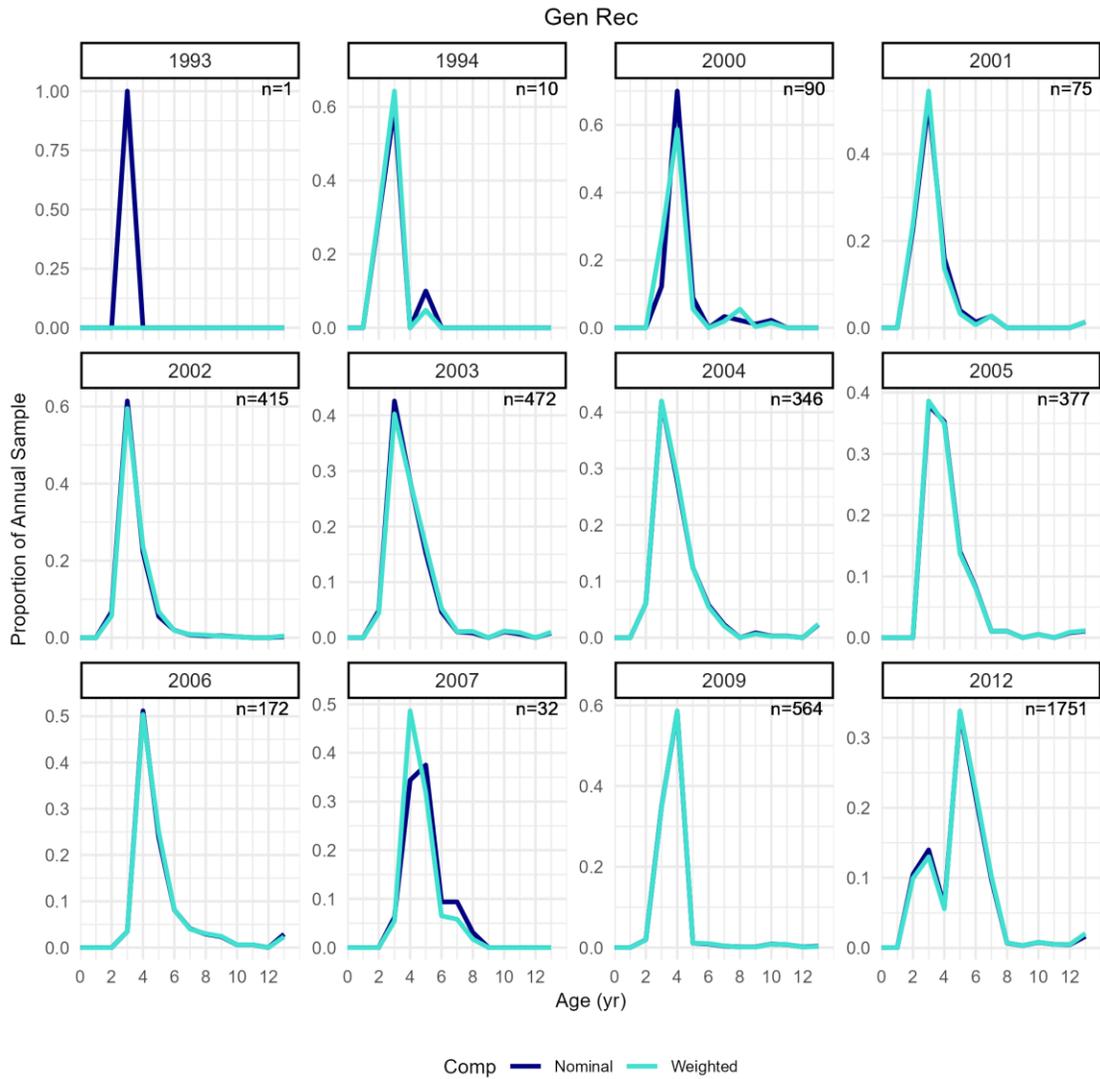


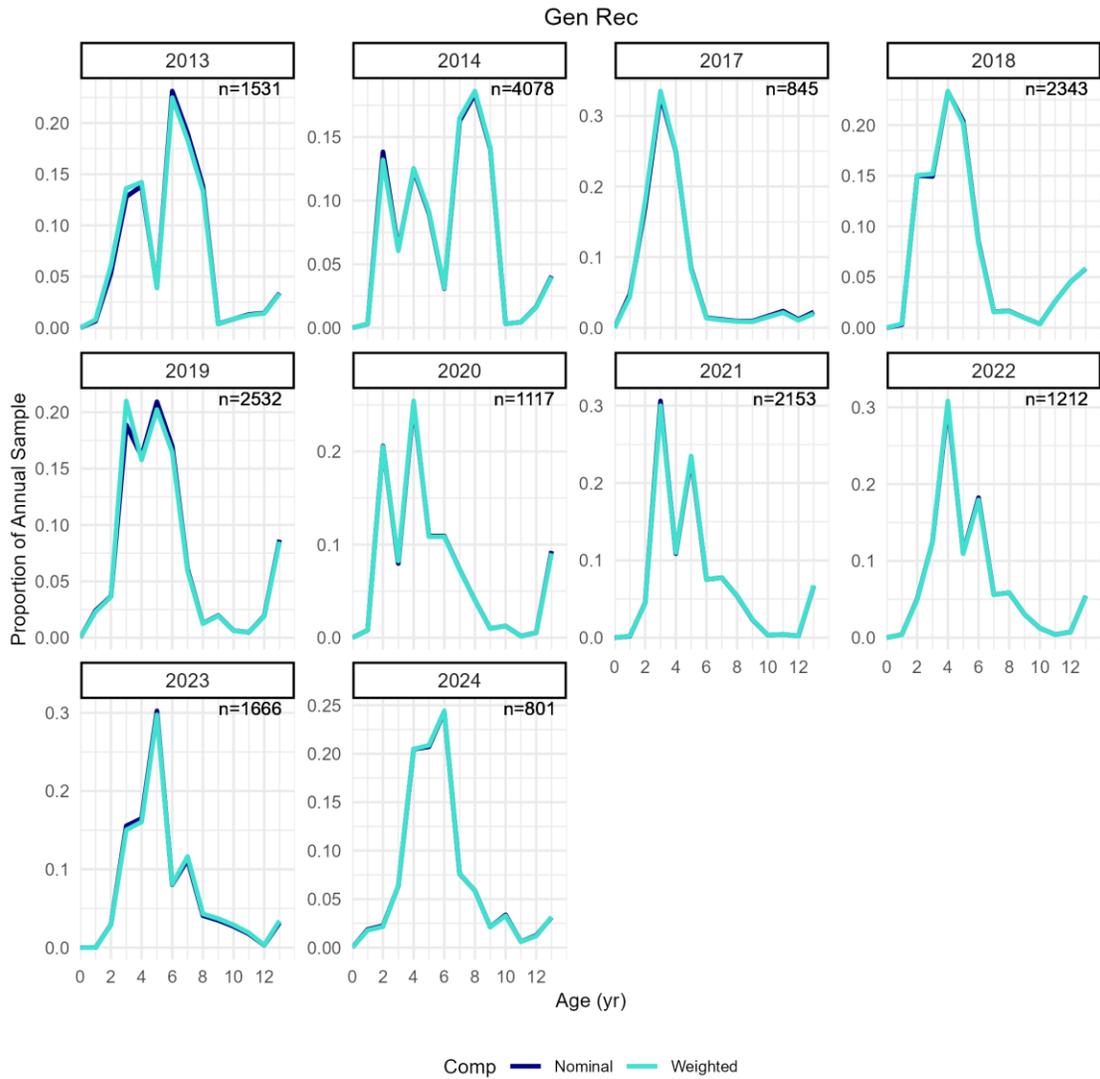
Figure 5 (continued). Weighted length distributions from SEDAR 73 and SEDAR 90 from Red Snapper sampled from the **Headboat** fleet from 1990-2007.



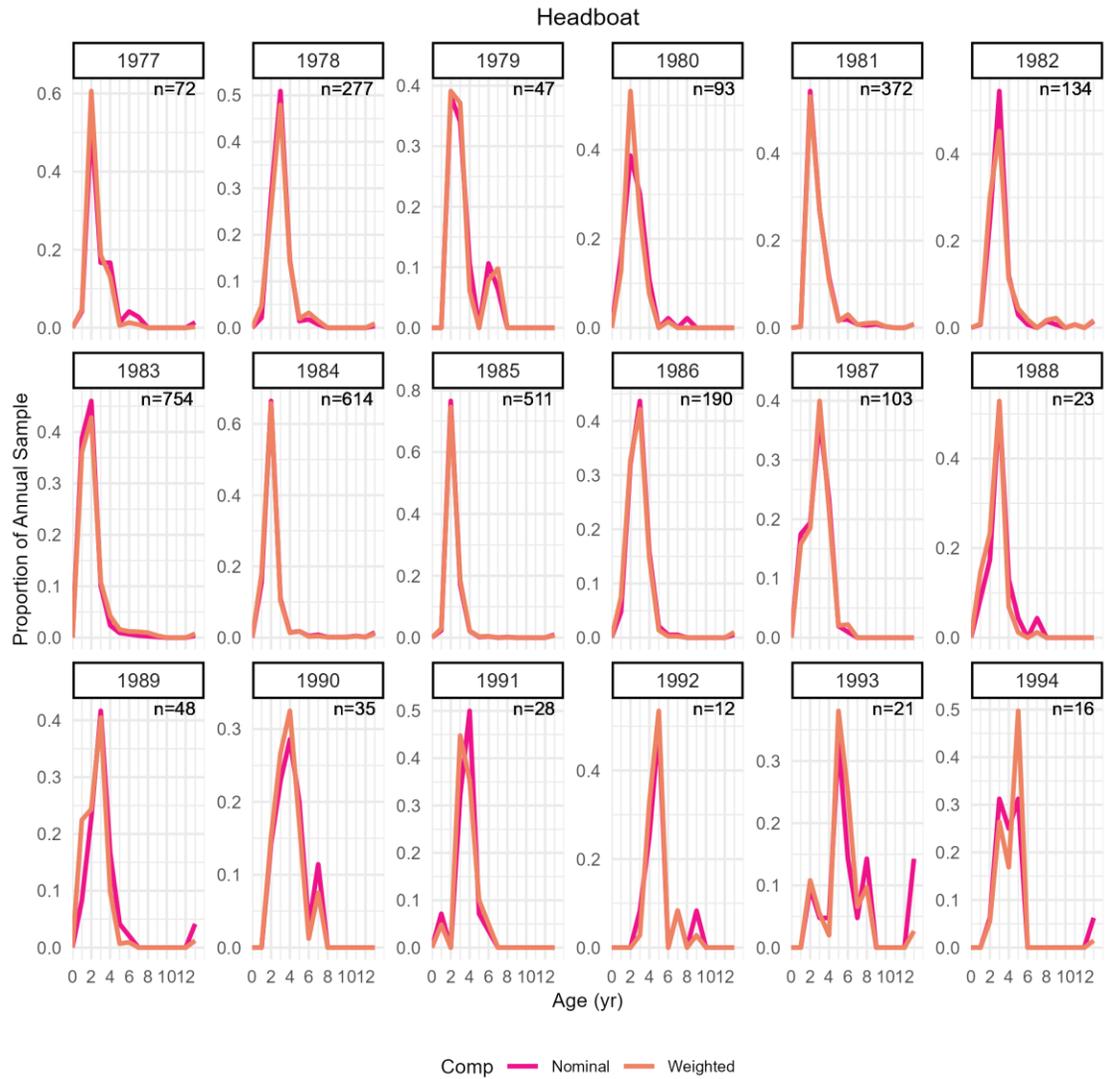
*Figure 5 (continued). Weighted length distributions from SEDAR 73 and SEDAR 90 from Red Snapper sampled from the **Headboat** fleet from 2008-2024.*



*Figure 6. Nominal and weighted age distributions for Red Snapper sampled from the **Gen Rec** fleet from 1993-2012.*



*Figure 6 (continued). Nominal and weighted age distributions for Red Snapper sampled from the **Gen Rec** fleet from 2013-2024.*



*Figure 7. Nominal and weighted age distributions for Red Snapper sampled from the **Headboat** fleet from 1977-1994.*

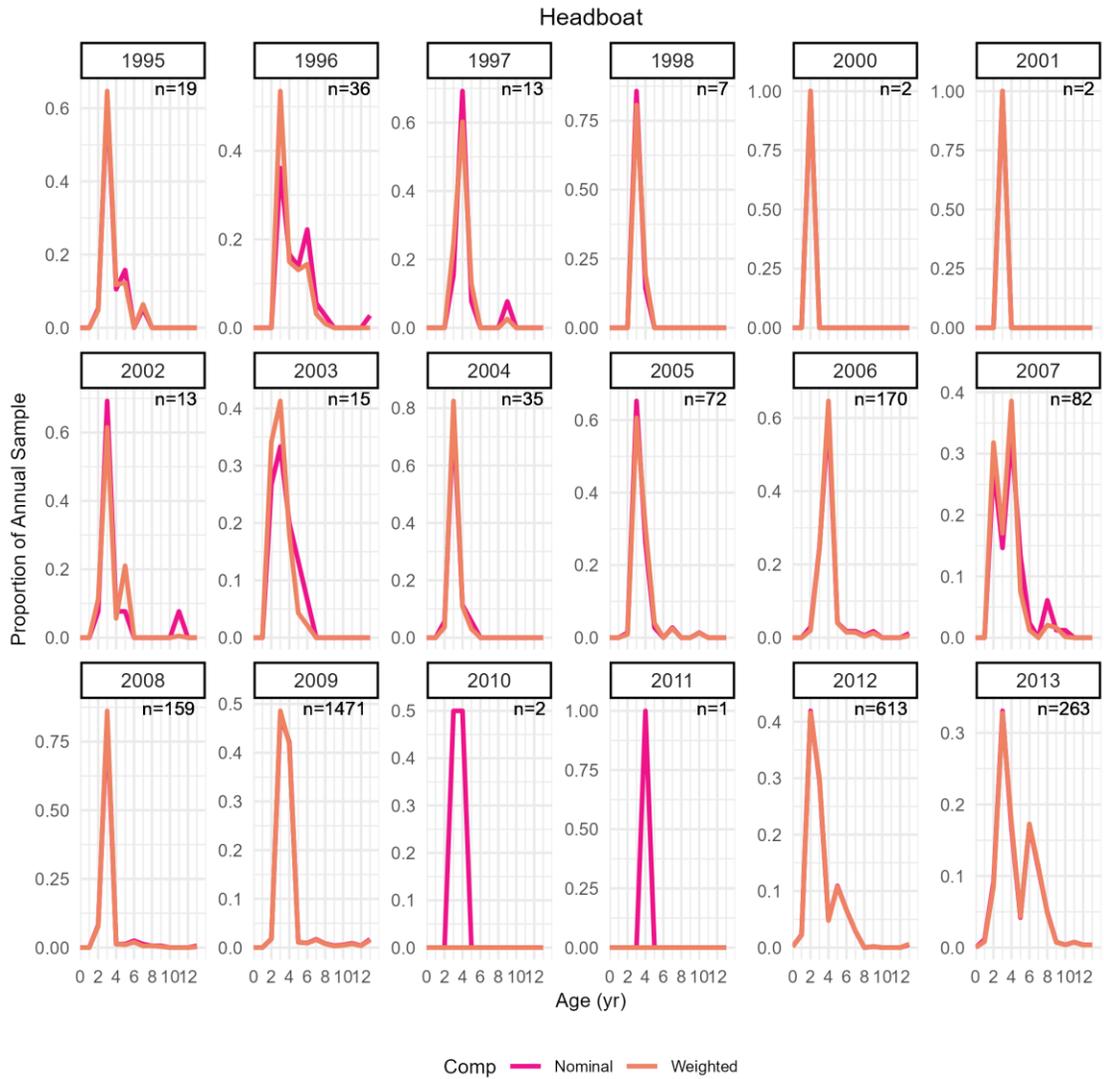
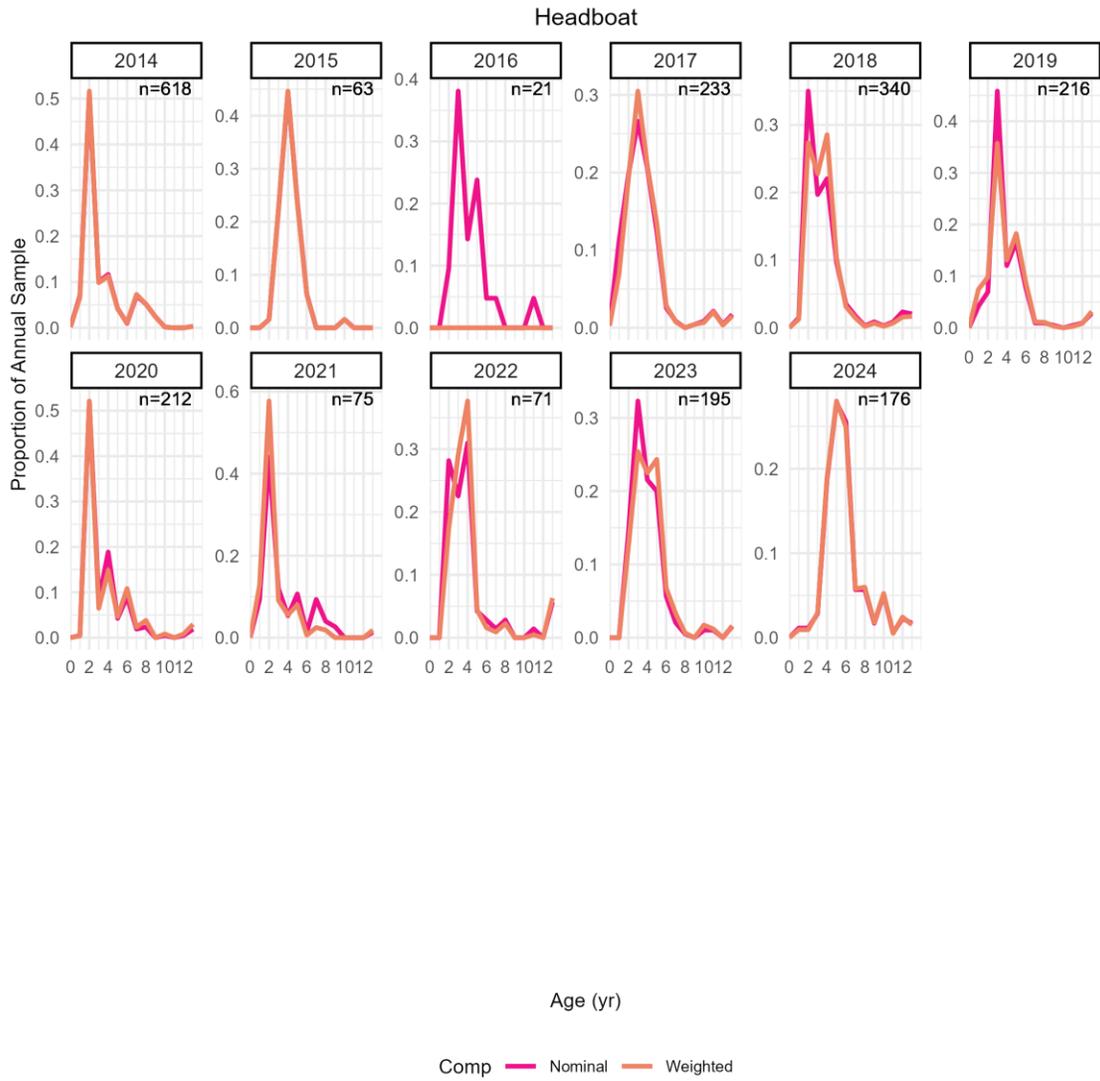


Figure 7 (continued). Nominal and weighted age distributions for Red Snapper sampled from the **Headboat** fleet from 1995-2013.



*Figure 7 (continued). Nominal and weighted age distributions for Red Snapper sampled from the **Headboat** fleet from 2014-2024.*

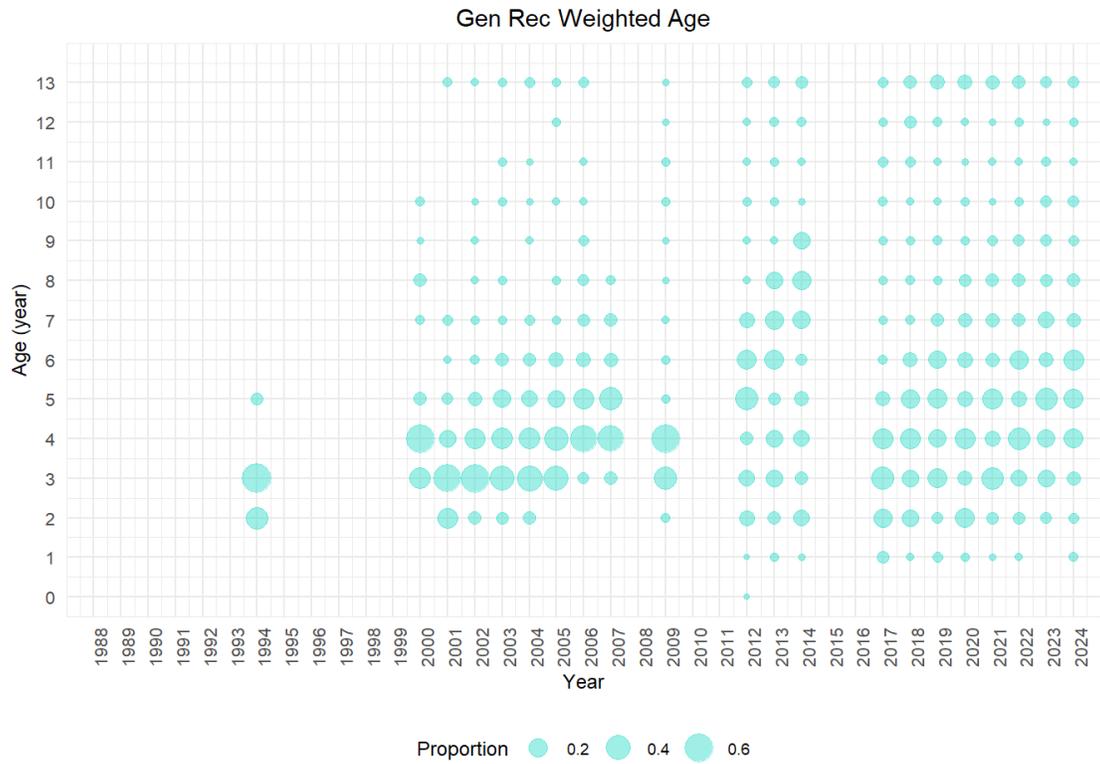


Figure 8. Weighted age compositions for Red Snapper sampled from the **Gen Rec** fleet.

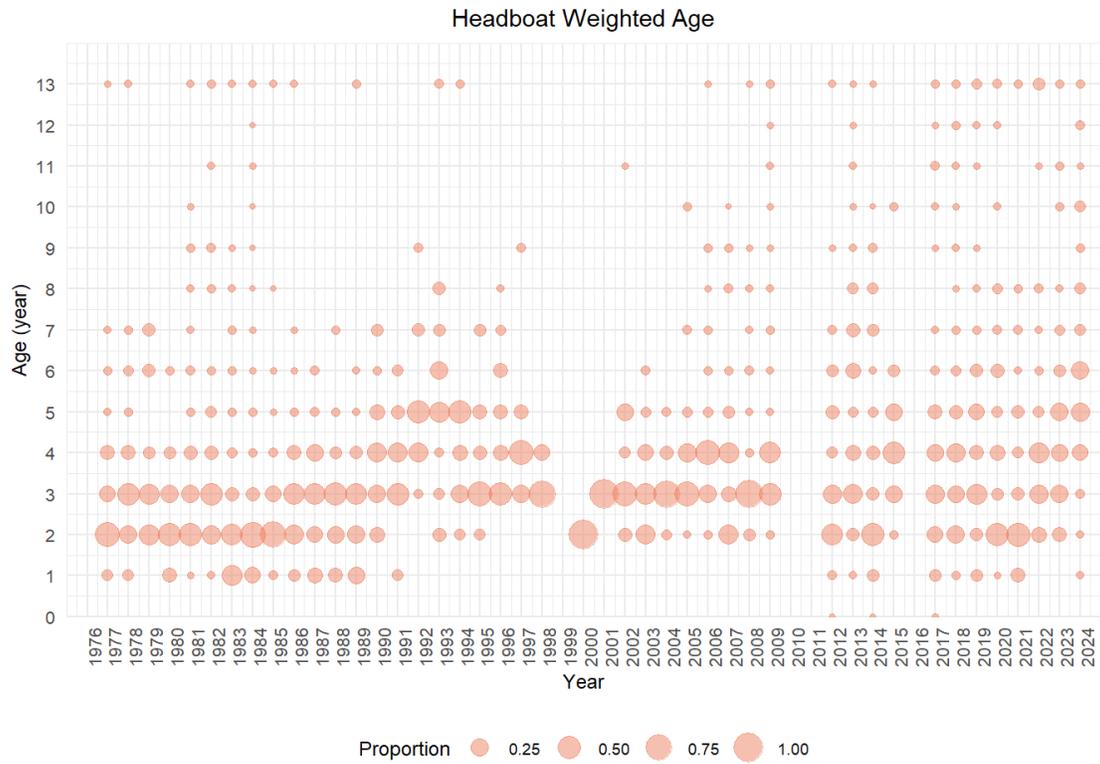


Figure 9. Weighted age compositions for Red Snapper sampled from the **Headboat** fleet.

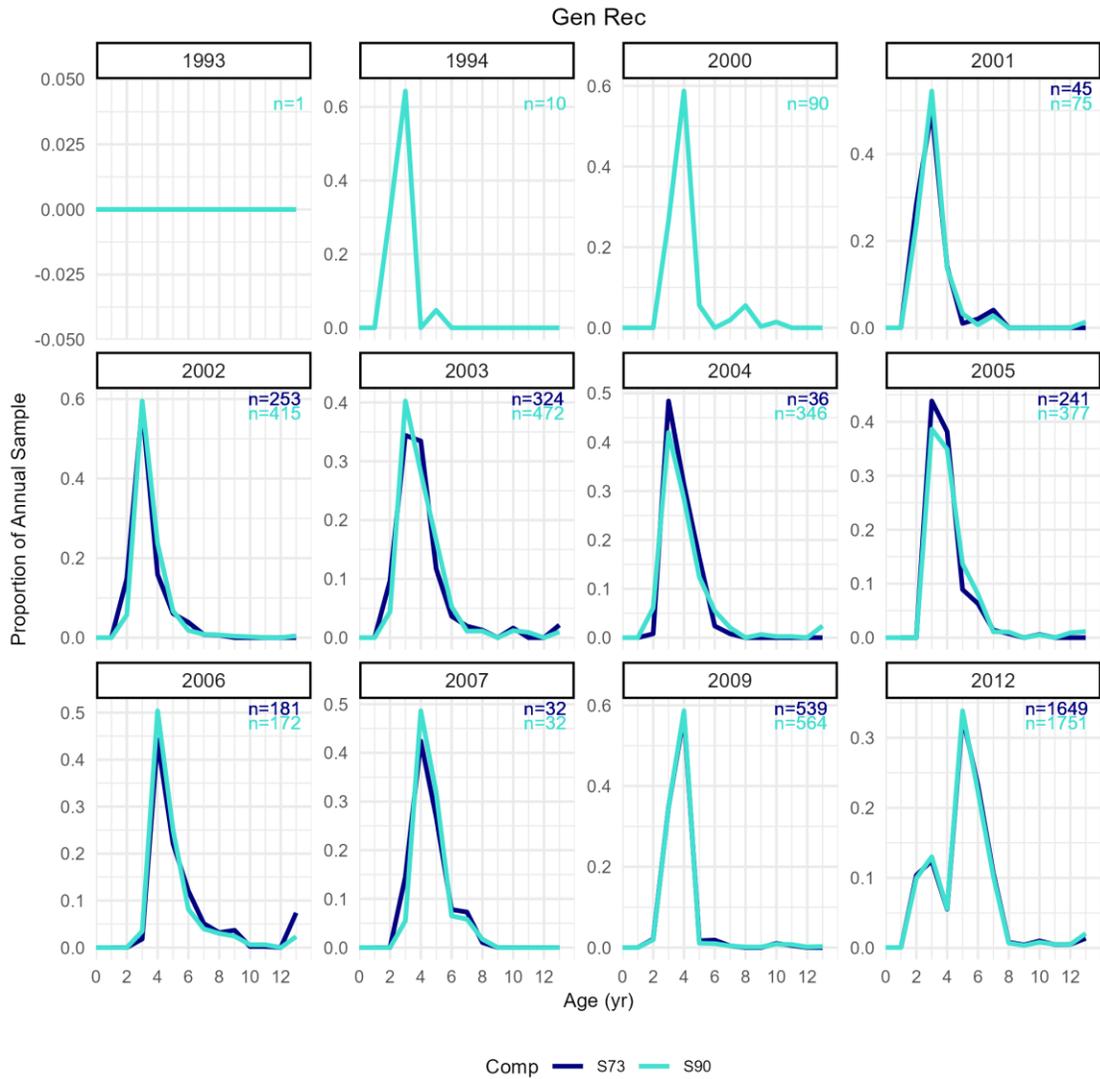


Figure 10. Weighted age distributions from SEDAR 73 and SEDAR 90 for Red Snapper sampled from the **Gen Rec** fleet from 1993-2012.

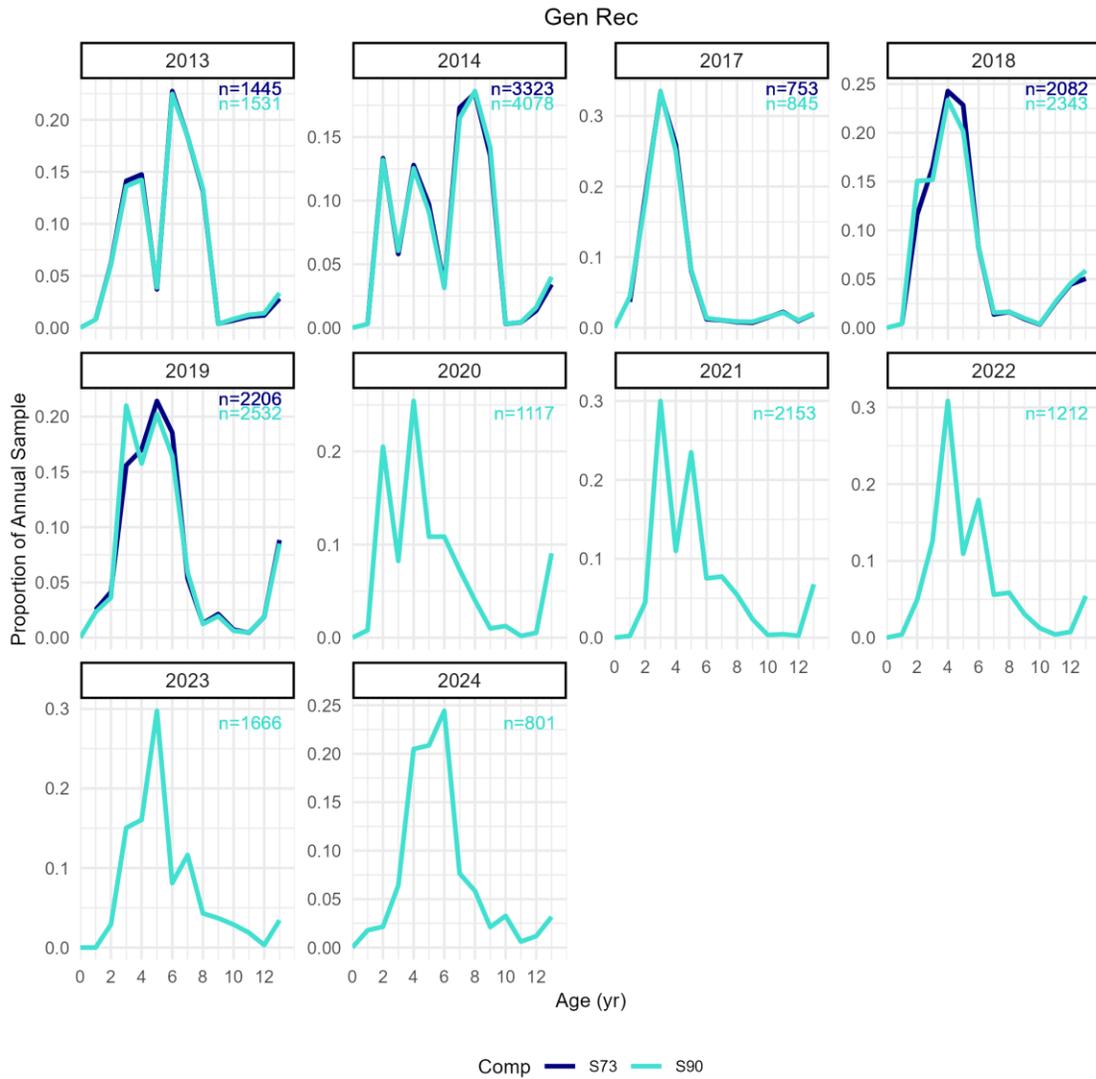


Figure 10 (continued). Weighted age distributions from SEDAR 73 and SEDAR 90 for Red Snapper sampled from the **Gen Rec** fleet from 2013-2024.

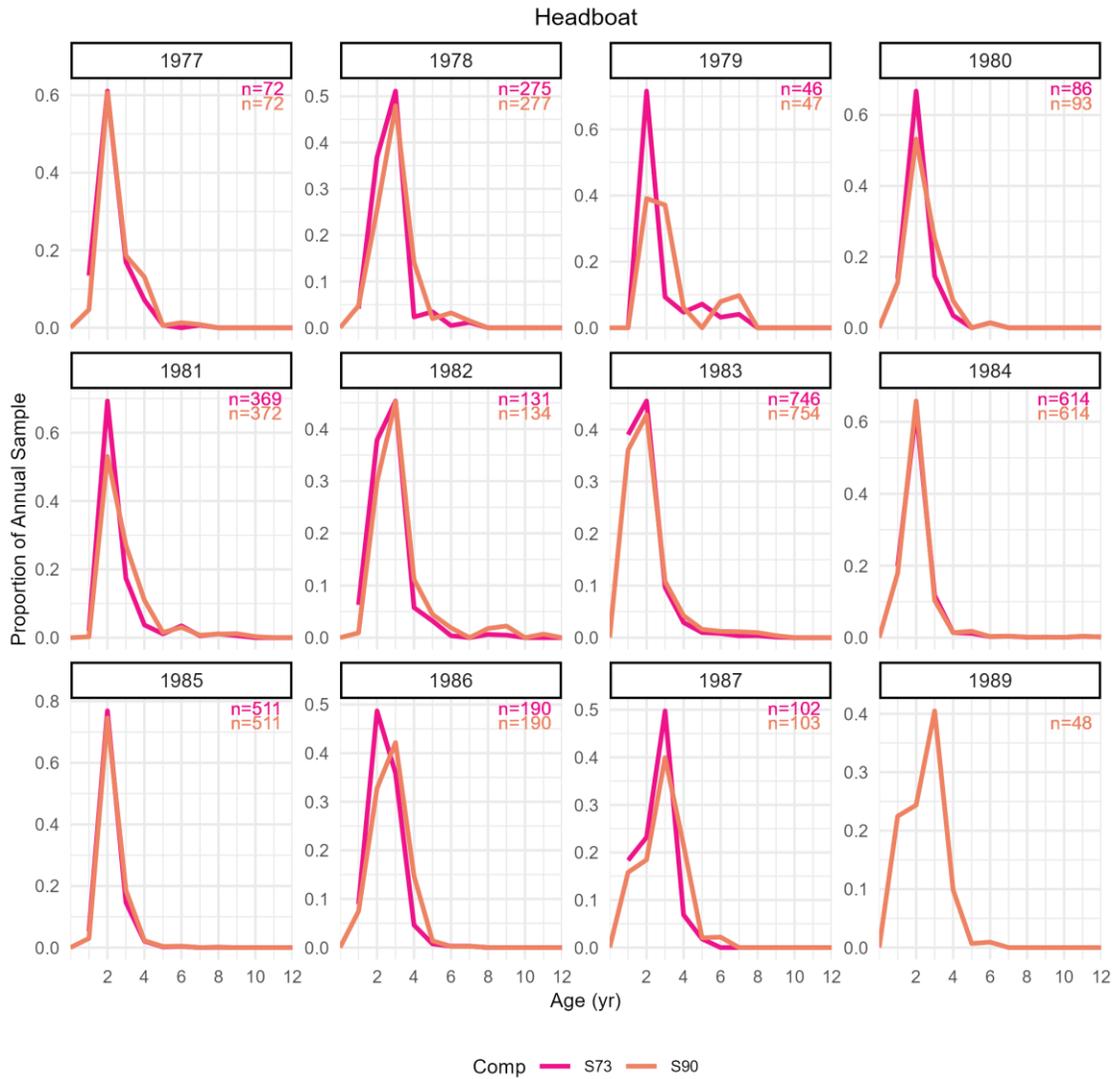


Figure 11. Weighted age distributions from SEDAR 73 and SEDAR 90 for Red Snapper sampled from the **Headboat** fleet from 1977-1989.

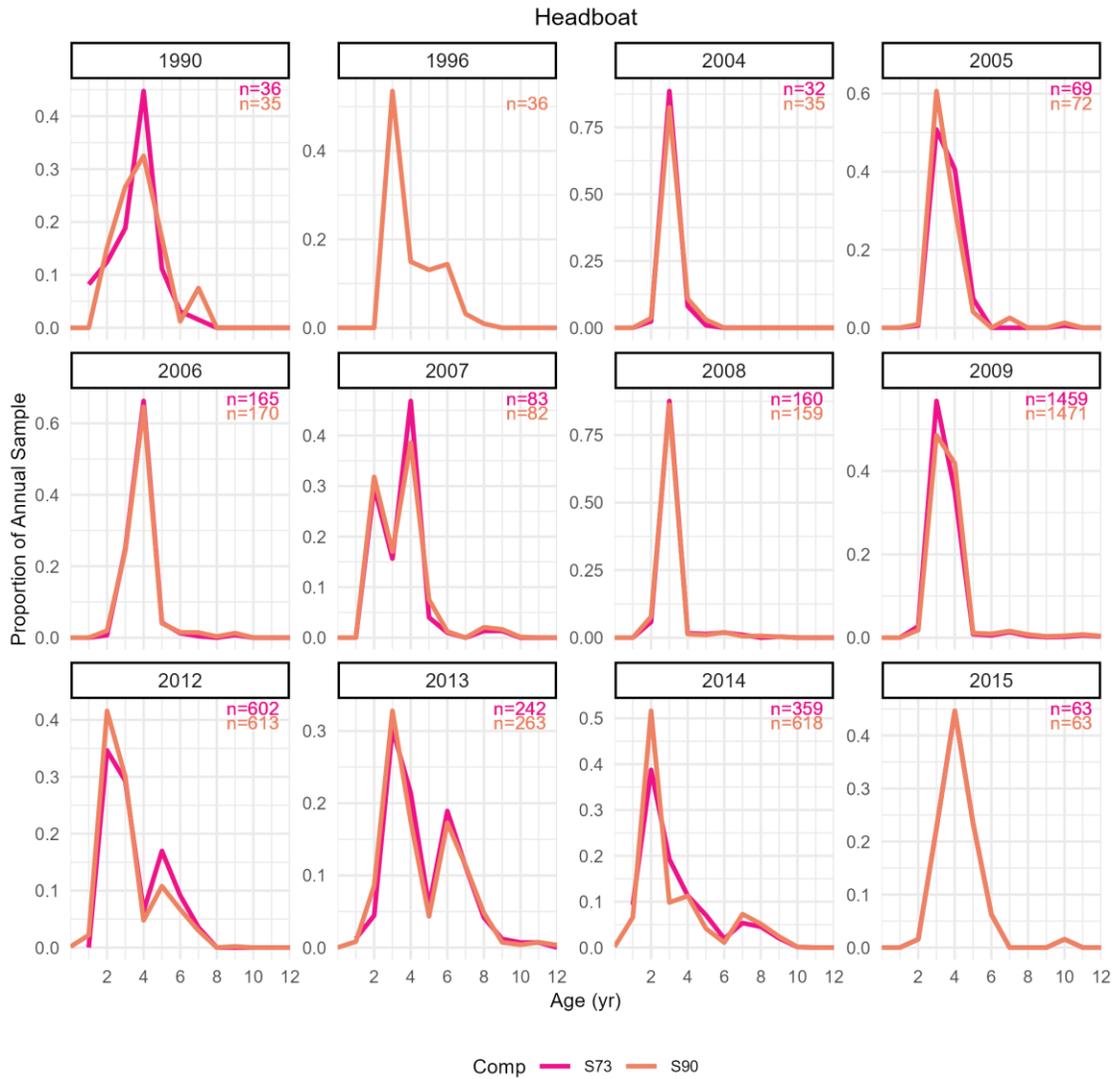
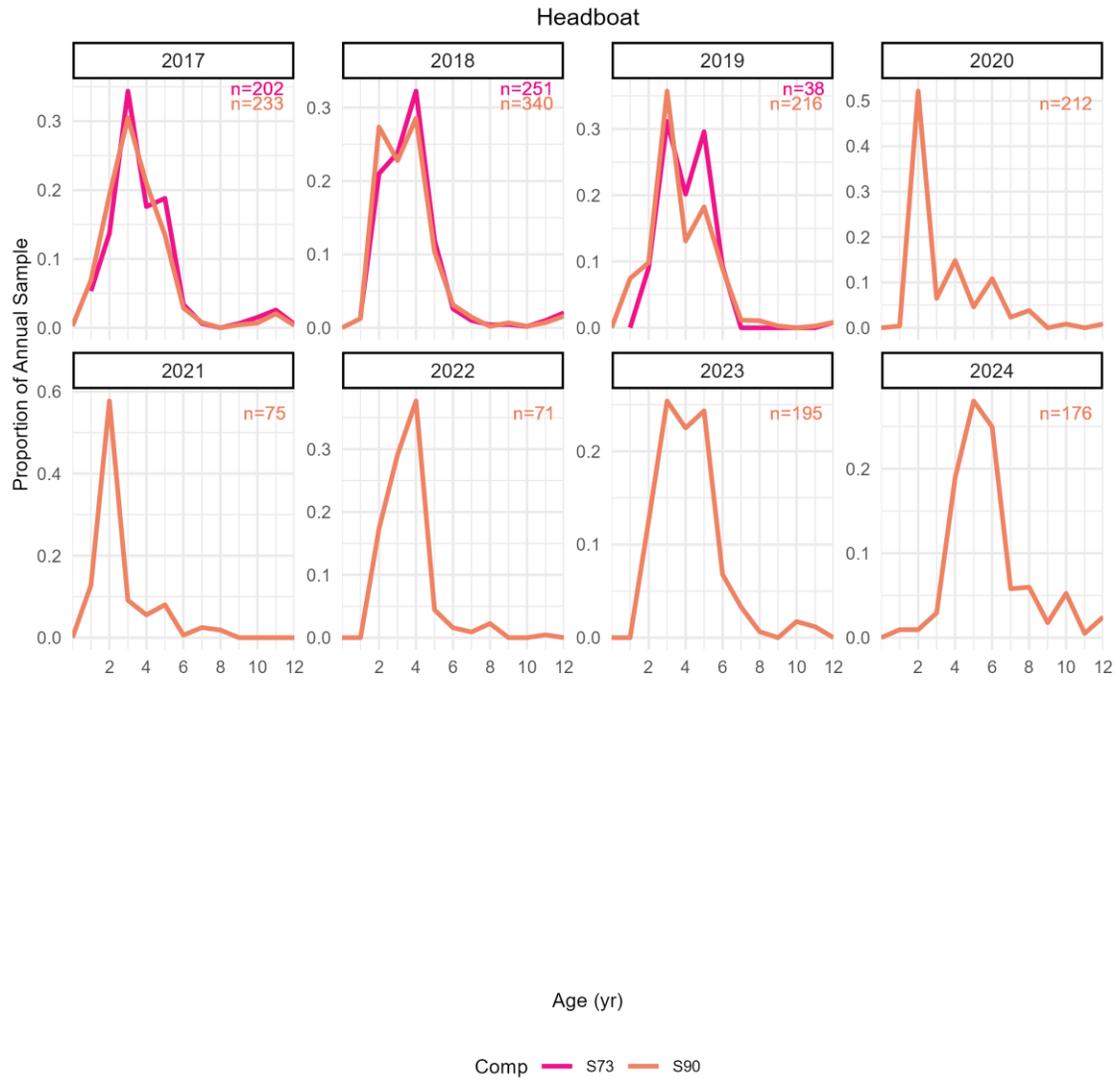


Figure 11 (continued). Weighted age distributions from SEDAR 73 and SEDAR 90 for Red Snapper sampled from the **Headboat** fleet from 1990-2015.



*Figure 11 (continued). Weighted age distributions from SEDAR 73 and SEDAR 90 for Red Snapper sampled from the **Headboat** fleet from 2017-2024.*

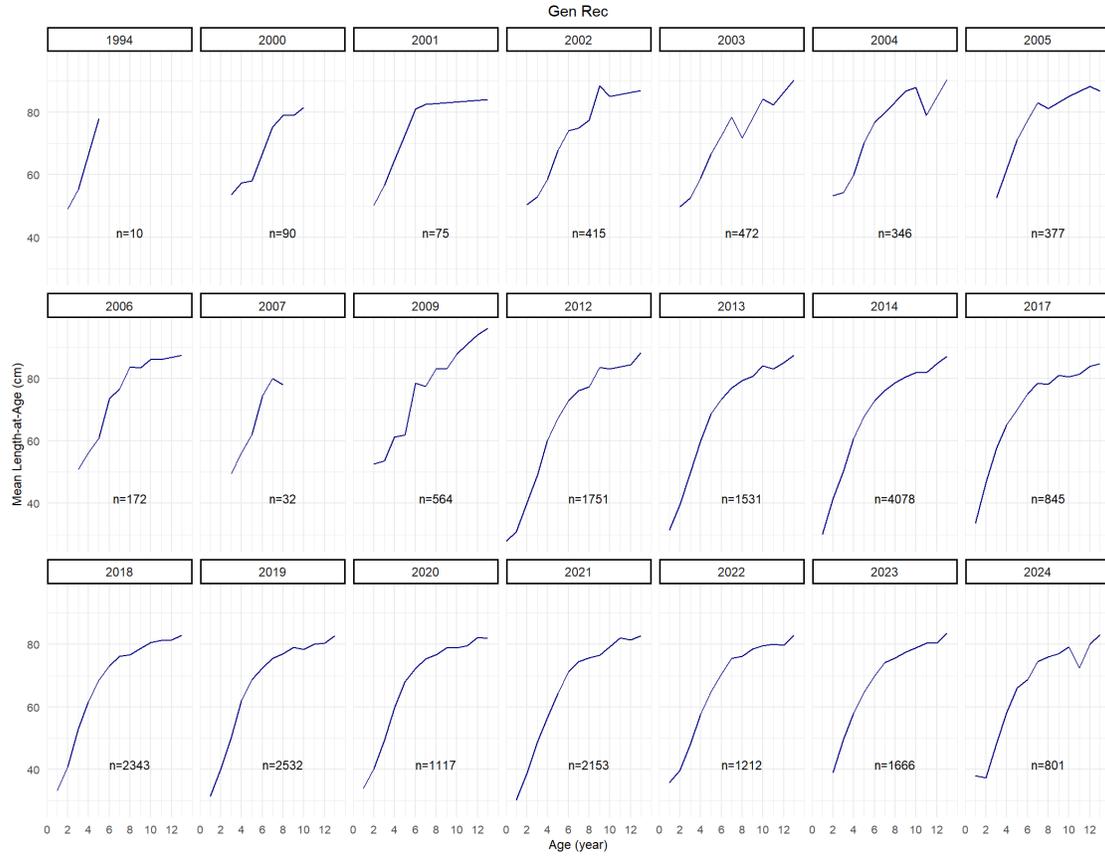


Figure 12. Mean length-at-age (MLAA) for Red Snapper sampled from the **Gen Rec** fleet.

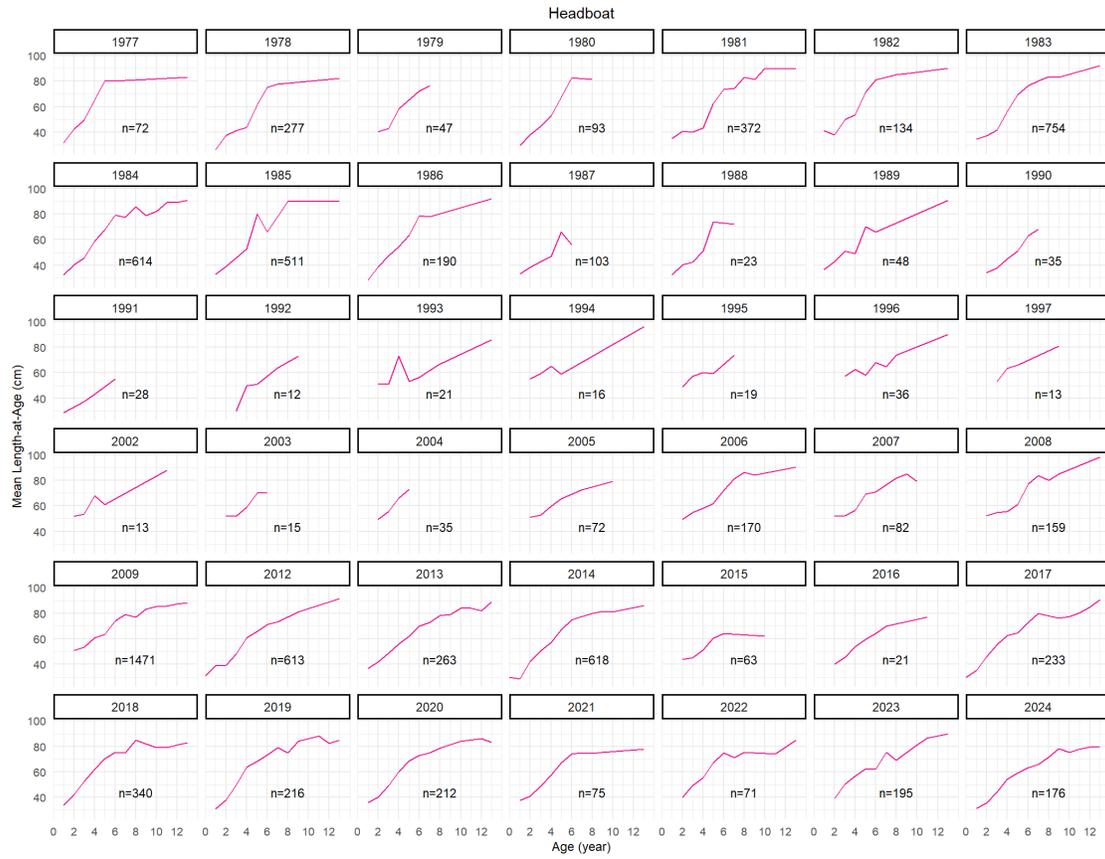


Figure 13. Mean length-at-age (MLAA) for Red Snapper sampled from the **Headboat** fleet.