Length and age distributions of Southeast U.S. Atlantic black sea bass (*Centropristis striata*) from commercial fisheries

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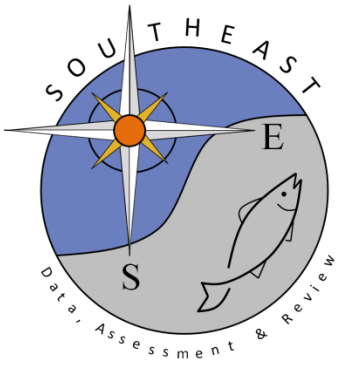

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Length and age distributions of Southeast U.S. Atlantic black sea bass (*Centropristis striata*) from commercial fisheries

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Introduction

The fishery-dependent data collection for lengths and ages may be biased due to sampling protocols, state-specific sampling effort, or other non-random methods. The selection of fish from which to collect ageing structures may be biased because the selection process is rarely randomized. One technique to overcome bias in the length sampling is to weight samples by the associated landings at a spatial and temporal scale at which the bias is expected. Usually this is unknown and samples are weighted at the finest scale available without losing data (e.g. length samples with no associated landings). In this document we describe how the length data were weighted and how these weightings are extended to the age data. These methods have been used in previous SEDAR assessments and completed between the data and assessment workshops.

Data Description

Commercial – general

Biological sample data were obtained from the NMFS/SEFSC Trip Interview Program (TIP). Data were filtered to eliminate those records: 1) that included a size or effort bias, 2) where lengths were collected using a non-random method, 3) were not from commercial trips, 4) were selected by quota sampling, or 5) the data was not collected shore-side. These data were further limited to those that could be assigned a year, gear, and state. Length samples were assigned a state based on landing location or sample location if there was no landing location assigned.

Commercial-Lengths

The number of fish sampled are listed in Table 1.

The length data and landings data were initially grouped into two categories; 1) handlines and 2) pots.

Commercial Ages

The number of commercial trips sampled for black sea bass ages can be found by year, gear, and state can be found in Table 1.

Weighting methods

The finest scale to weight the SEFSC-TIP length data was by year and state for each of the gear groupings (handline). For each year, the state-specific length composition was multiplied by the proportion of landings from that state. The weighted state-specific length compositions were then combined and scaled to sum to one.

The fishery-dependent age composition estimates were weighted to correct biases in age composition due to non-representative sampling. This weighting method was adapted from a technique to reduce bias associated with non-representative age sampling to produce unbiased growth curves (Chih, 2009) and has been previously used in SEDAR assessments. Lengths are recorded for each fish sampled for age. A reweighting value (RW) associated with the year (j) and length interval (i) of the age sample was assigned to each age sample by fishery as in the formula:

$$RW_{ij} = \frac{LC_{ij}}{OL_{ij}/TO_j}$$

where LC_{ij} is the weighted length composition value associated with the year j and length interval i of each aged fish, OL_{ij} is the number of aged samples in length interval i and year j , and $TO_j$is the total number of aged samples in year j. This weighting corrects for a potential sampling bias of age samples relative to length samples (Chih, 2009). The numerator in this method differs slightly from the method used by Chih in that the length composition is weighted by the landings. The minimum sample size cutoff for length and age compositions was 30 fish per area and 10 trips per ares. Due to low and inconsistent sample sizes the FL region was filtered for the weighting procedure for the age compositions from 2005-2018. Prior to 2005 there are no samples from the Carolinas and the nominal compositions from the FL region are the only age samples available for the handline fleet.

Results

Commercial Lengths

Following the minimum size in 1992, the commercial handline and pot length compositions were similar in size spatially for most years (Figure 1 and Figure 2). The weighting of the length composition for the handline fishery had almost no influence.

Ages

Commercial

The weighted age compositions are very similar to the nominal age compositions for both gears (Figure 3 and Figure 4).

Discussion

There is minimal influence when weighting the commercial length or age composition for black sea bass. However, the weighted compositions are recommended for use as a matter of protocol and to remove whatever minimal bias may be present.

Several factors where considered in determining the maximum age for the model including the growth, maturity, and fecundity. Based on these analyses a plus group is recommended at 10 years of age.

Tables

Table 1. Number of fish and trips sampled for lengths for black sea bass by year and gear for the commercial handline gears and pot gears.

	Handline (lengths)		Pot (lengths)		Handline (ages)		Pot (ages)	
Year	Fish (n)	Trips (n)	Fish (n)	Trips (n)	Fish (n)	Trips (n)	Fish (n)	Trips (n)
1984	1803	77	870	12				
1985	1105	64						
1986	1393	68						
1987	1274	74						
1988	981	61	1558	20				
1989	706	31						
1990	1283	54	944	17				
1991	1720	87	1290	30				
1992	1449	73	1508	19				
1993	1090	72	1048	20				
1994	996	55	1694	33				
1995	615	66	544	29				
1996	740	60	589	20				
1997	1072	72	1196	17				
1998	1662	100						
1999	1748	98	868	11			120	120
2000	1083	100						
2001	1897	121						
2002	1575	92	4264	611	76	67		
2003	1014	108	7753	1043	352	95		
2004	2328	149	1256	14	577	115		
2005	1603	145	712	17	799	126	425	21
2006	1701	161	1774	48	732	102	857	34
2007	1070	126	3032	88	762	113	2143	83
2008	657	117	2380	97	548	111	2100	101
2009	924	103	3271	119	683	102	2269	108
2010	834	100	2022	82	575	85	1851	74
2011	883	69	1568	53	457	46	1292	49
2012	1179	124	1933	50	1052	115	1137	40
2013	1570	180	1381	44	1237	155	844	34
2014	2432	229	747	37	1914	174	558	26
2015	2434	207	996	42	1838	173	611	32
2016	885	107	519	22	665	97	391	18
2017	1096	129	664	32	951	117	535	25
2018	991	109	862	34	802	99	586	26
2019	442	77	390	22	386	69	348	17
2020	279	51	467	14	157	28	244	10
2021	239	26	831	15	206	25		

Figures

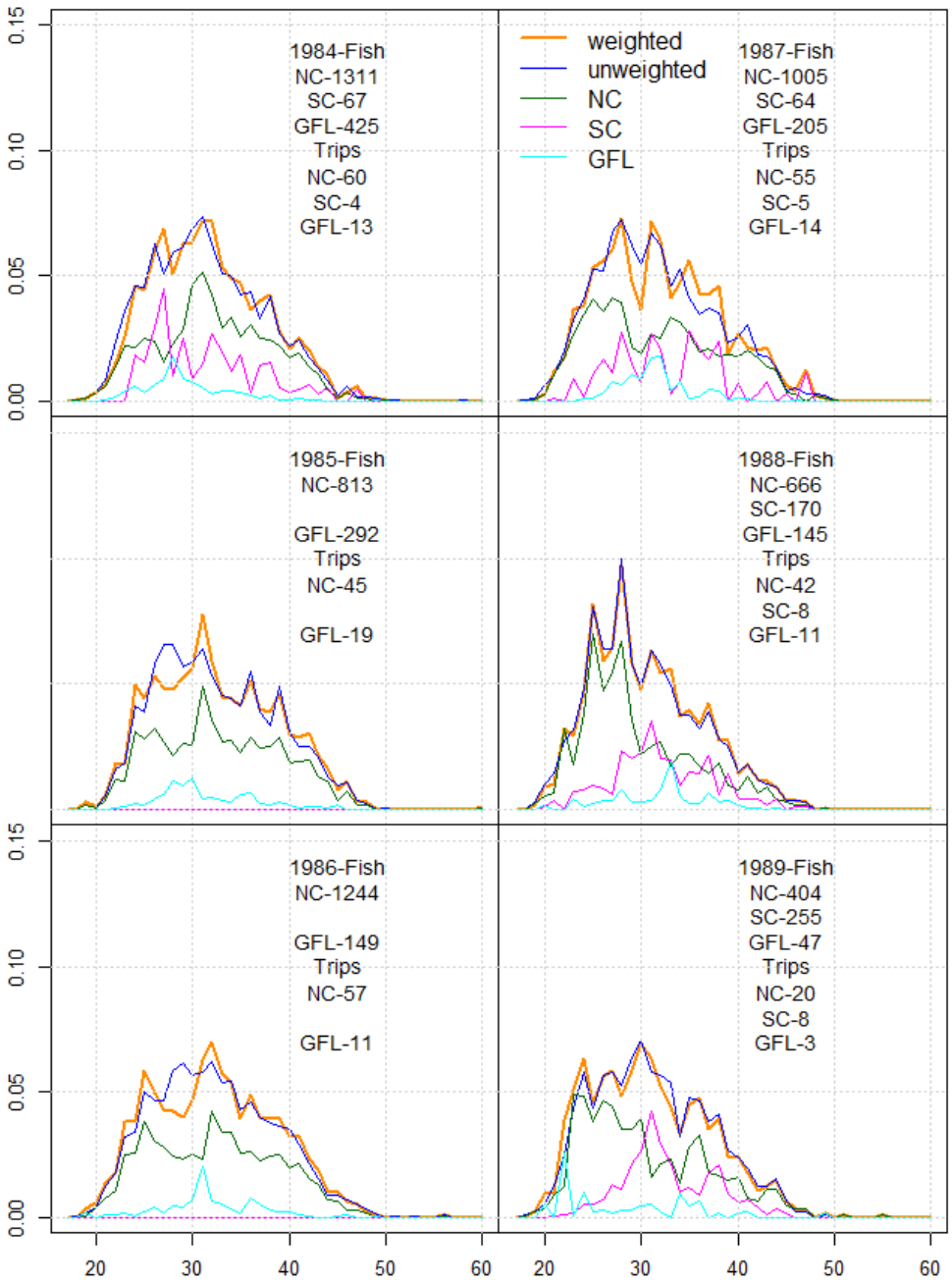
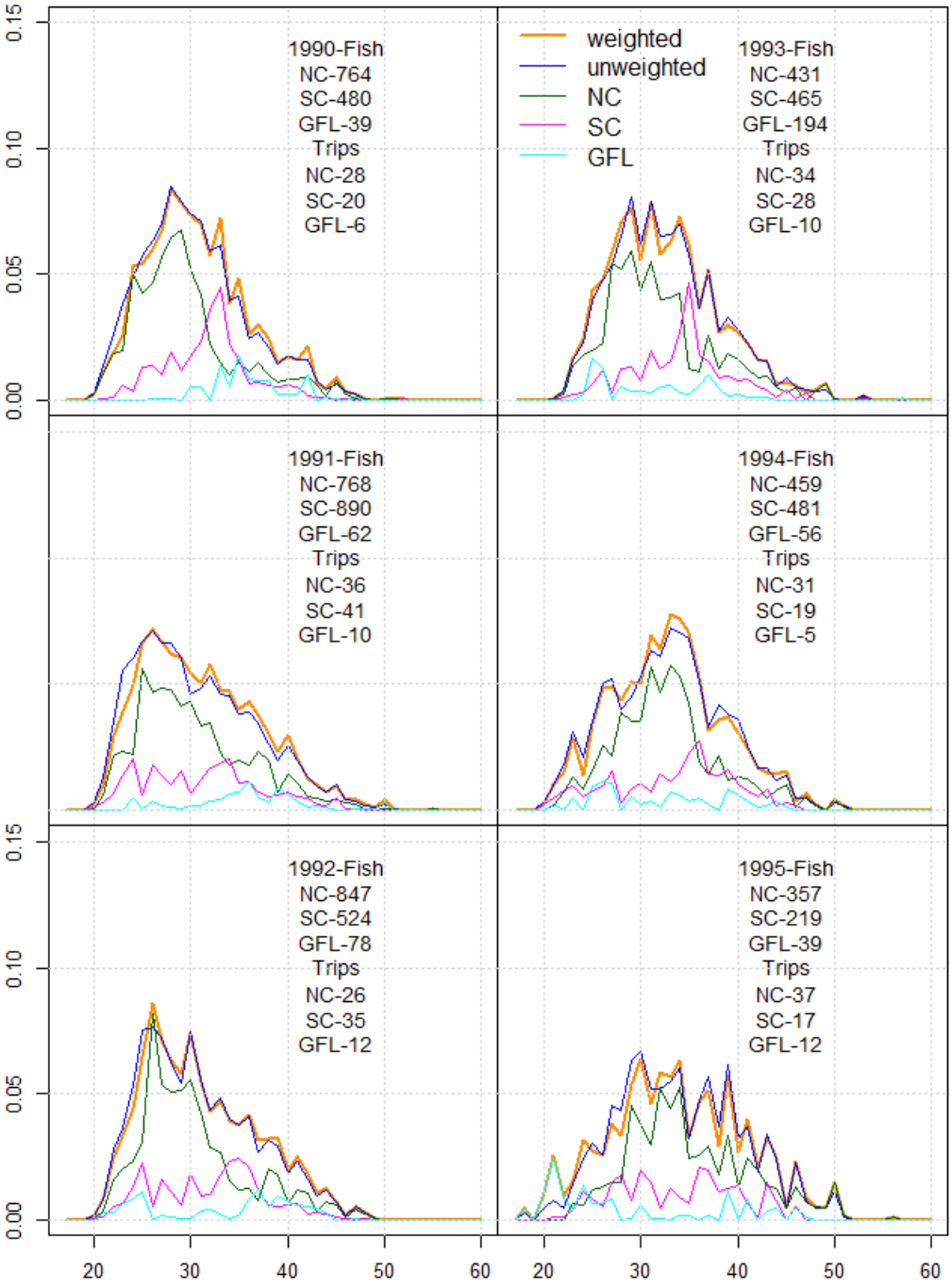


Figure 1. Weighted and un-weighted black sea bass length composition for handline gear by region by year.



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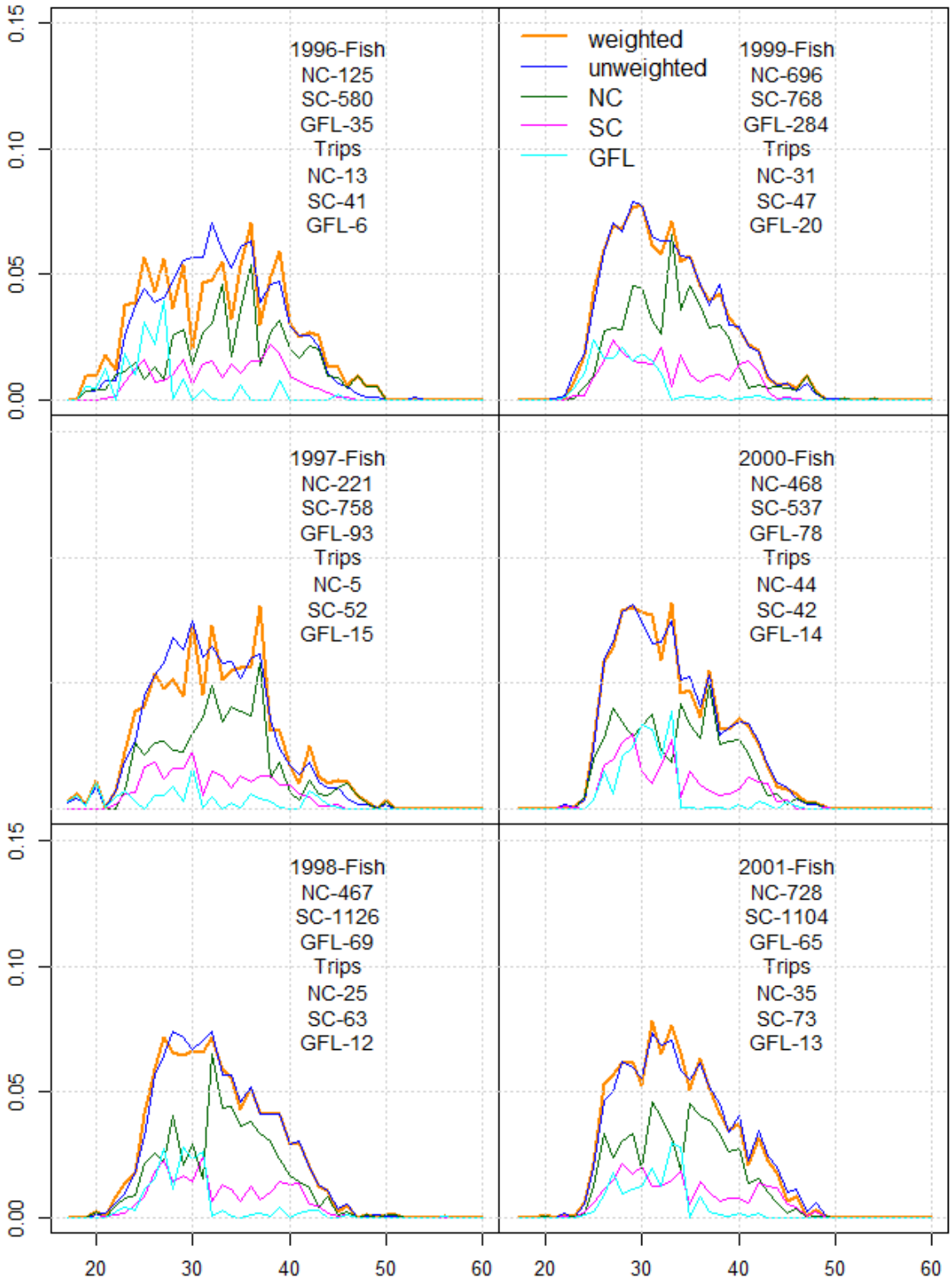

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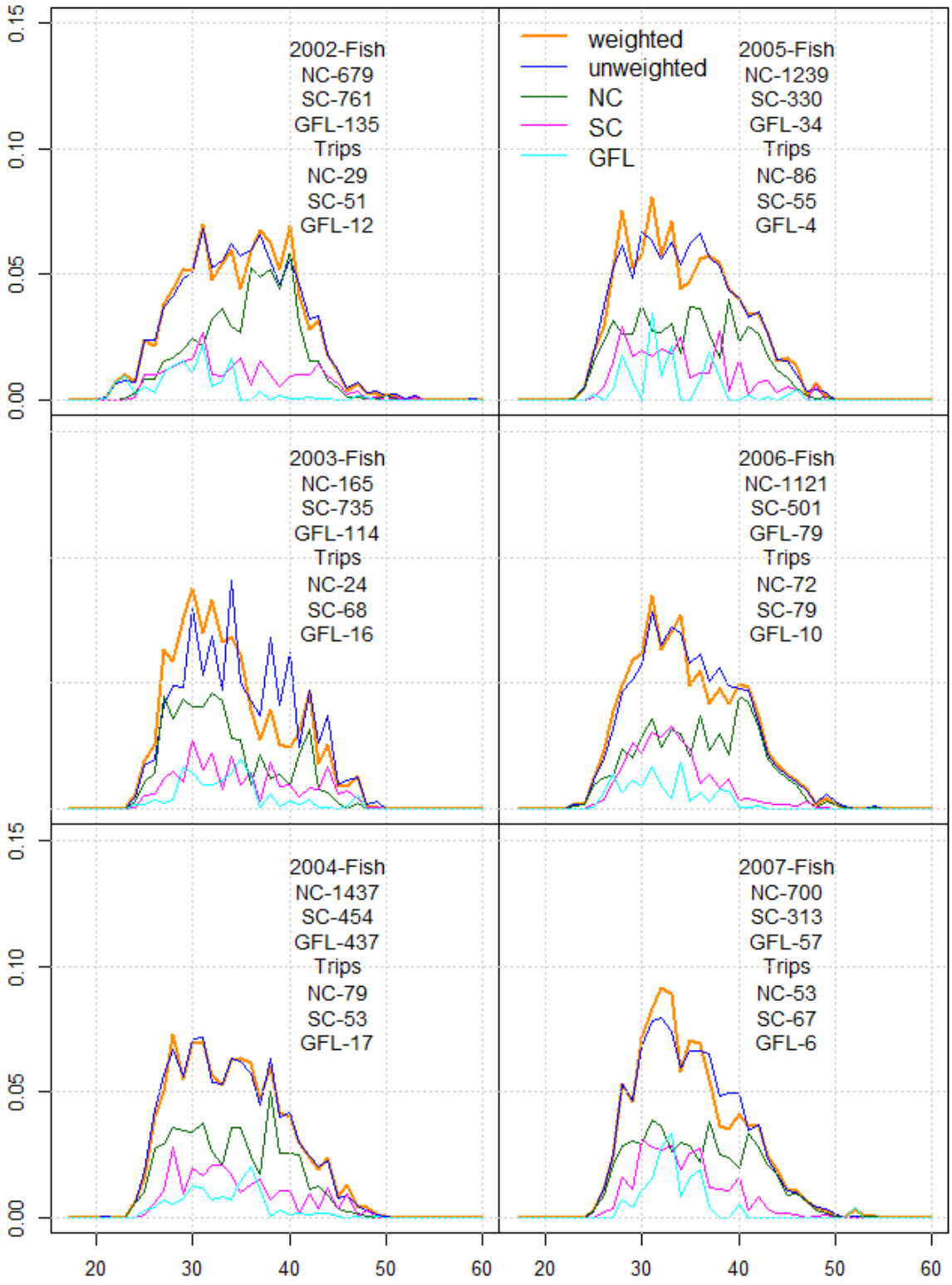

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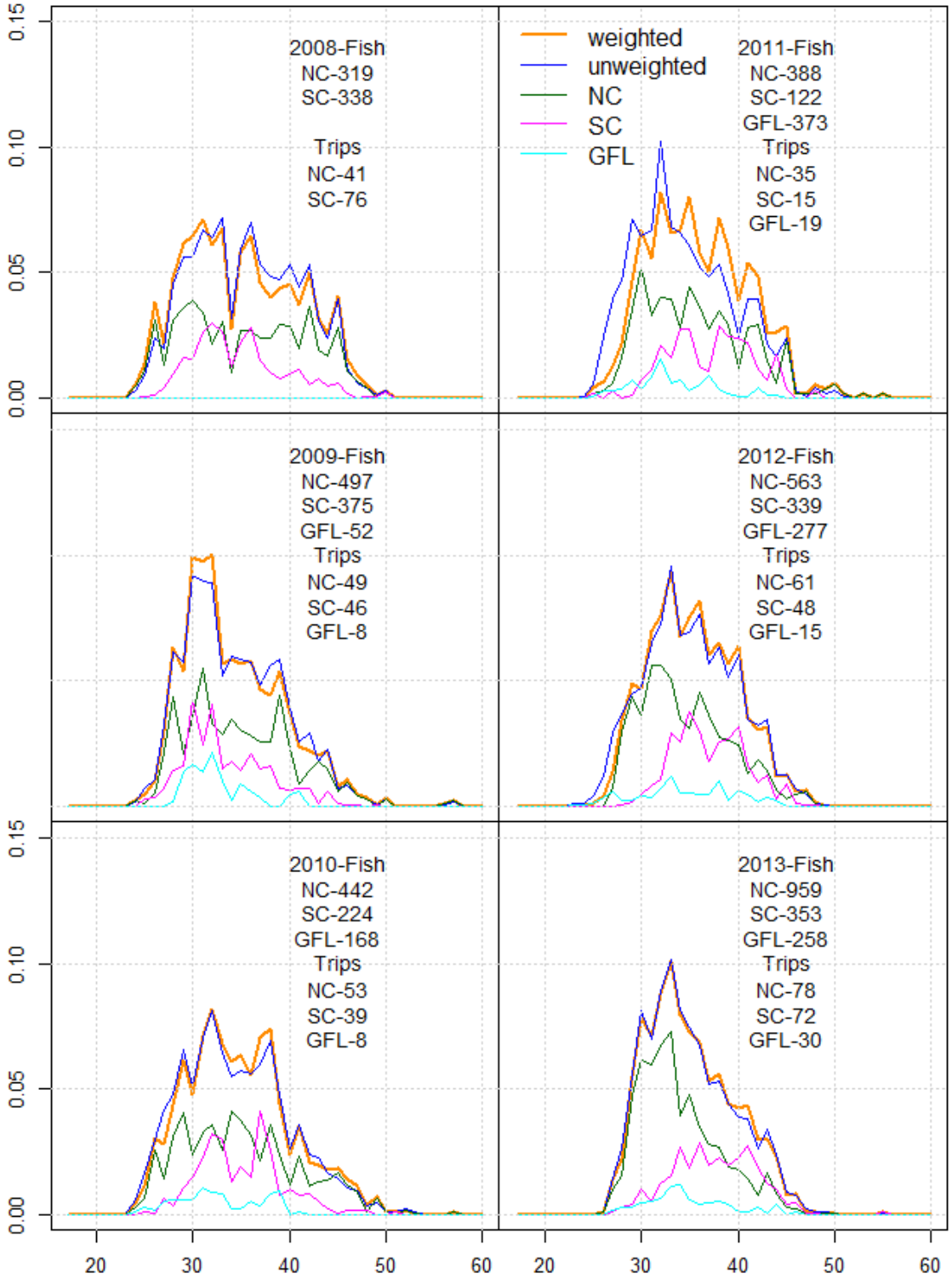

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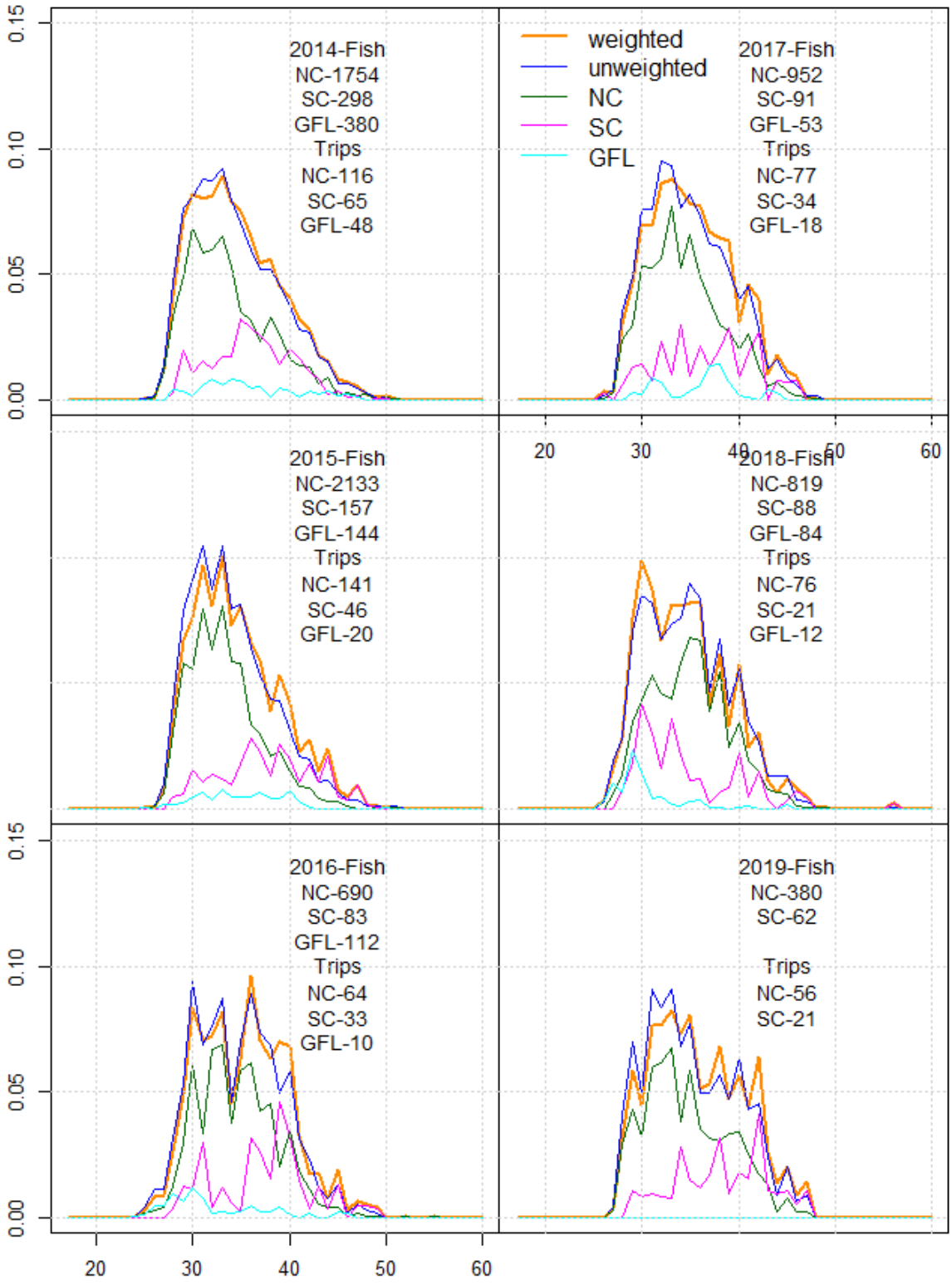

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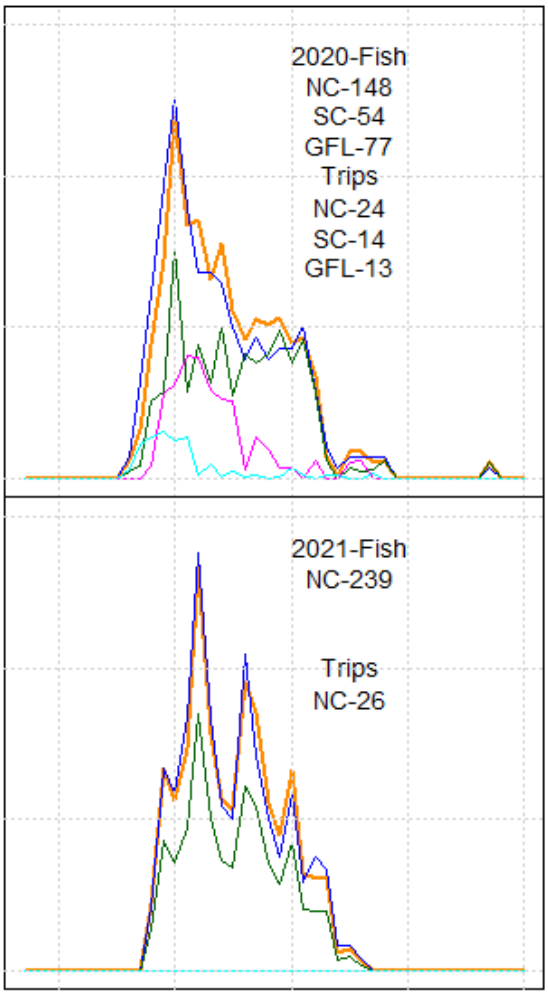

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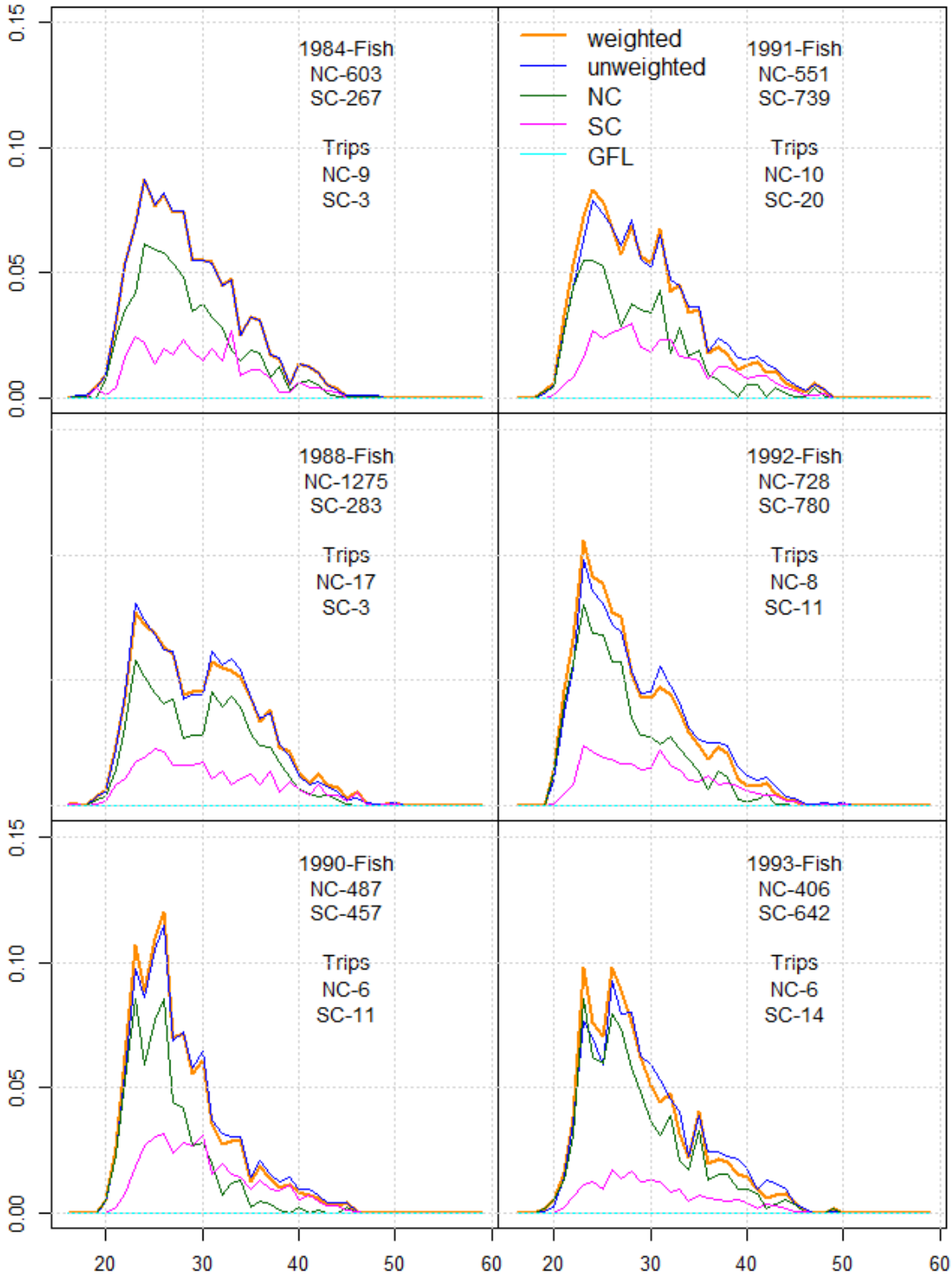
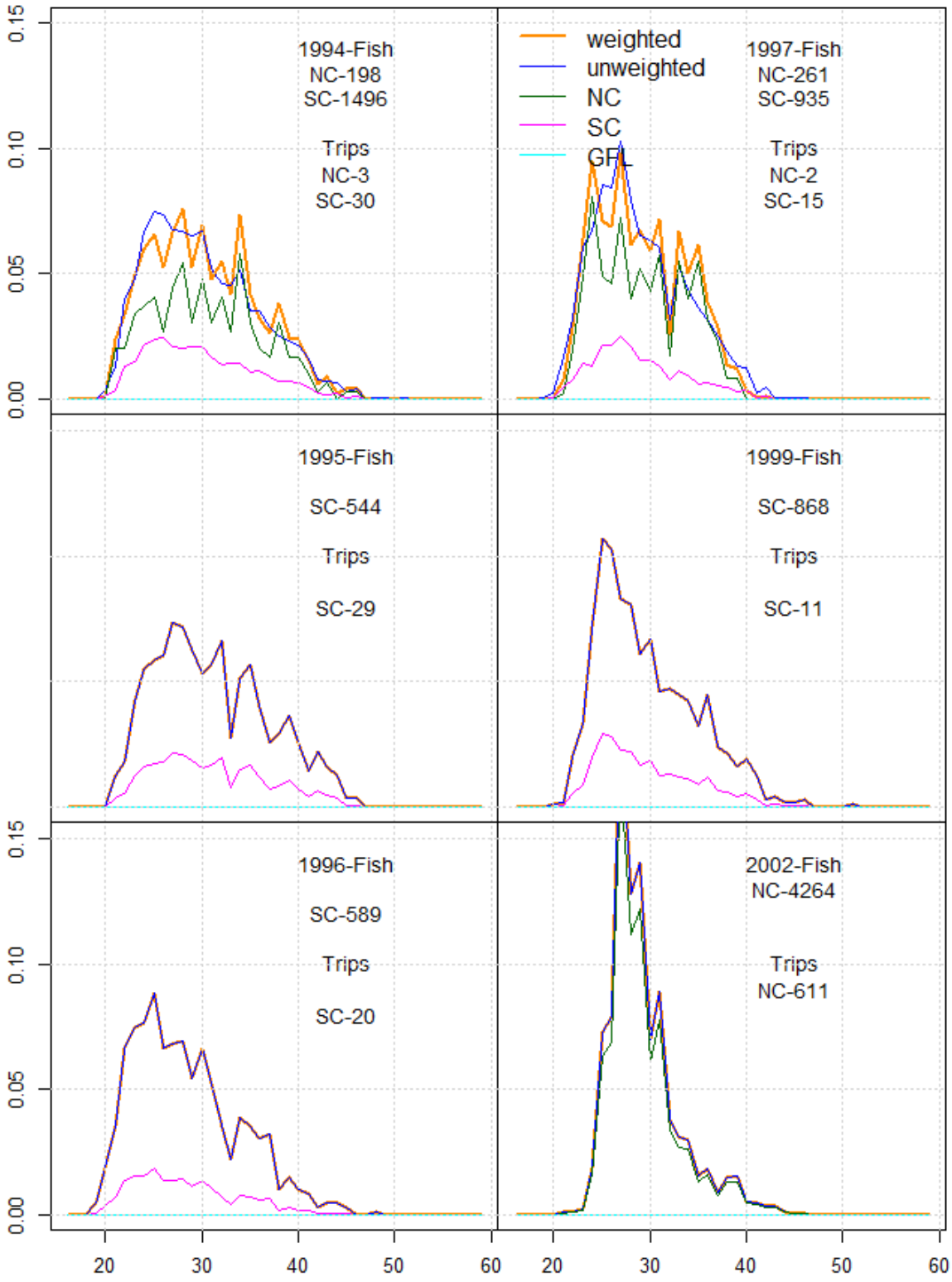


Figure 2. Weighted and un-weighted black sea bass length composition for pot gear by region by year.



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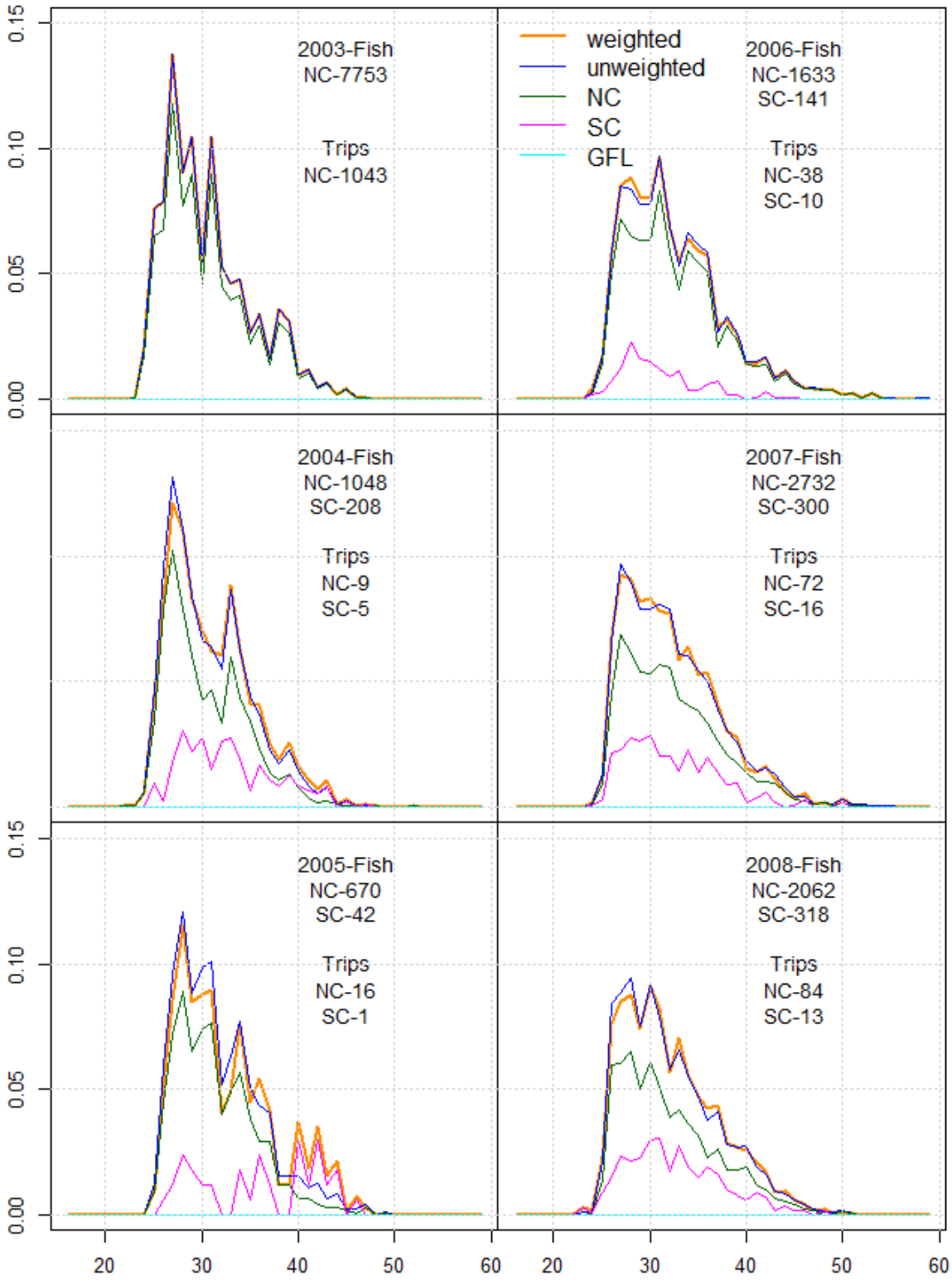

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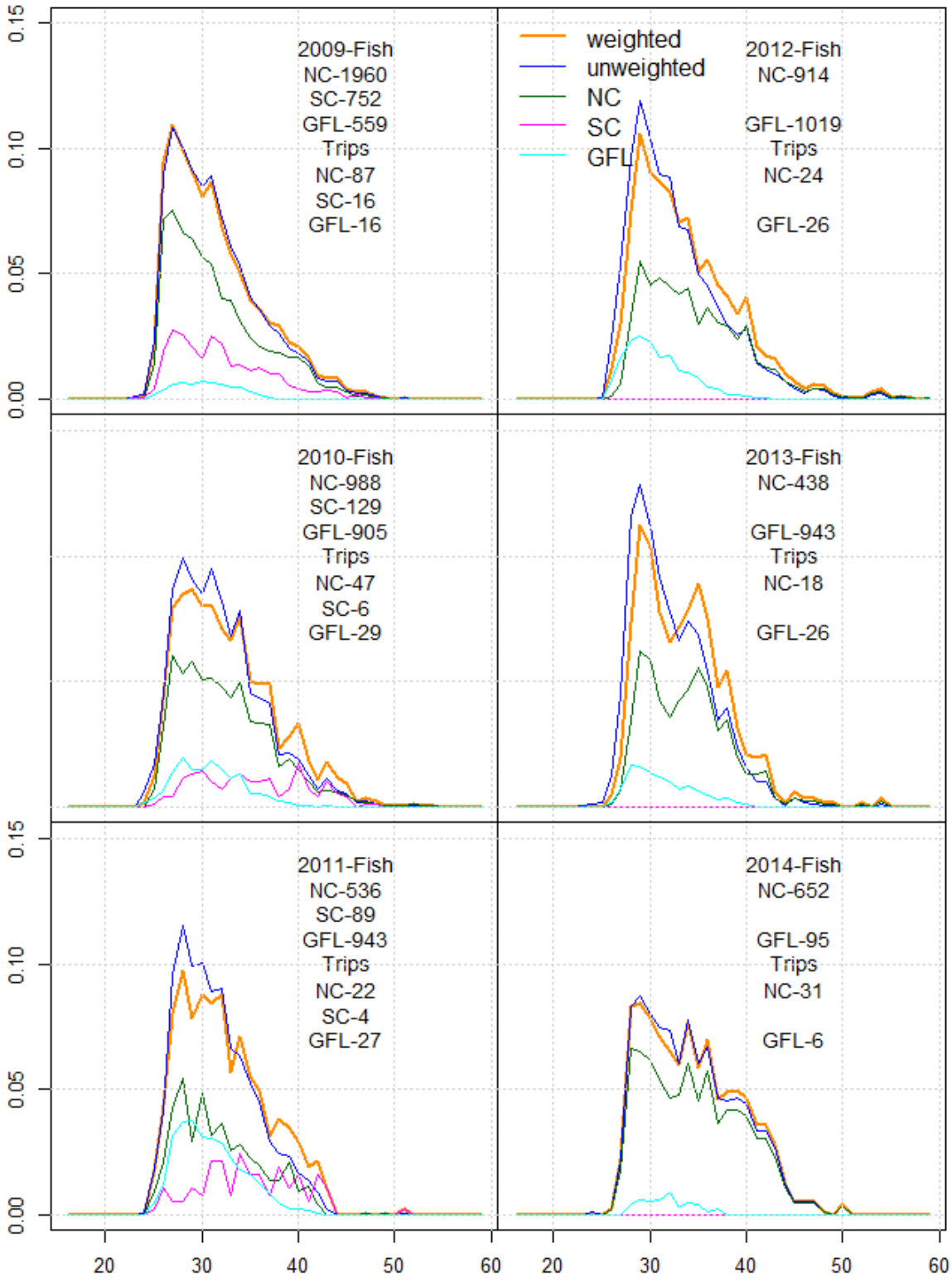

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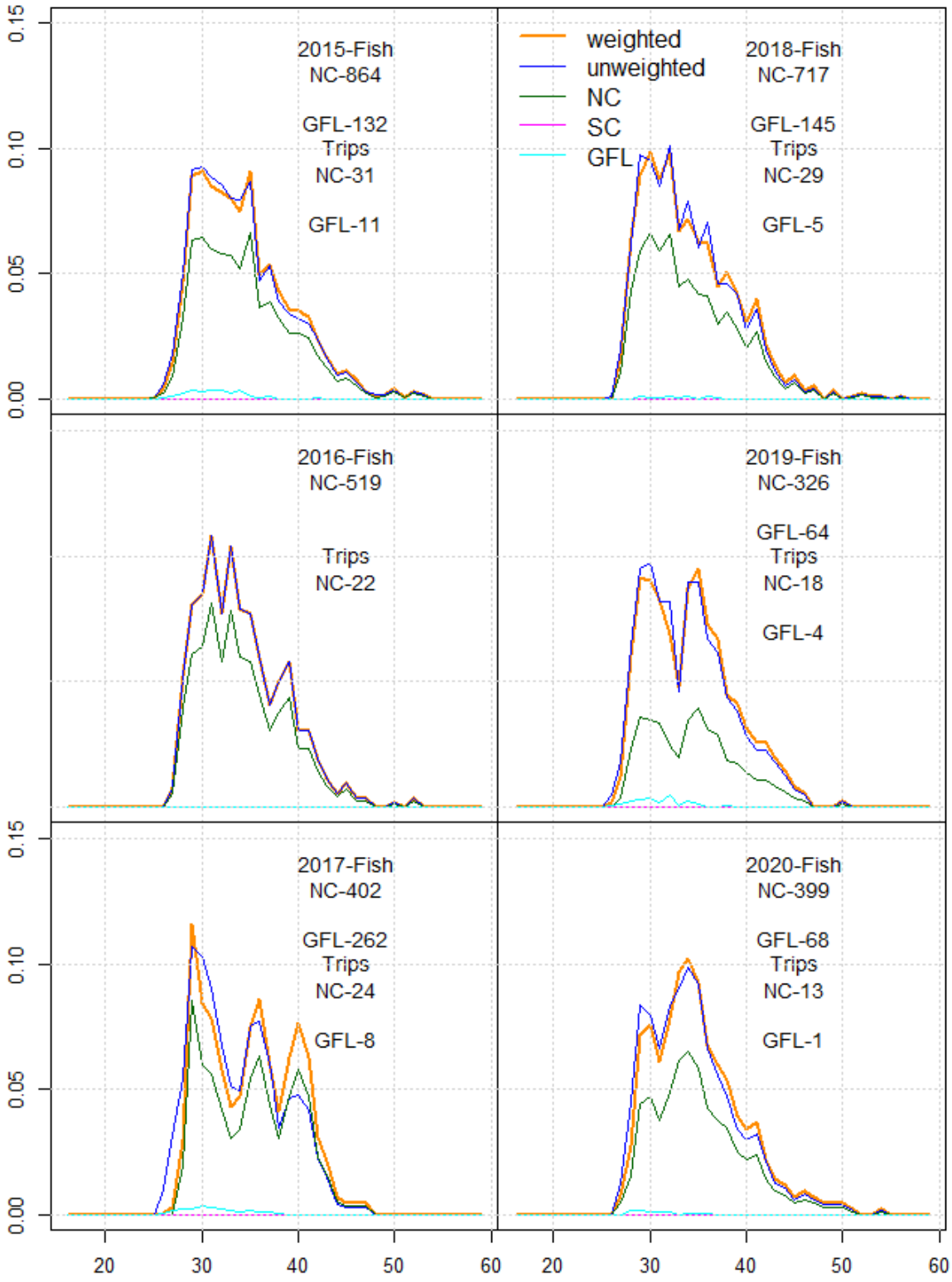

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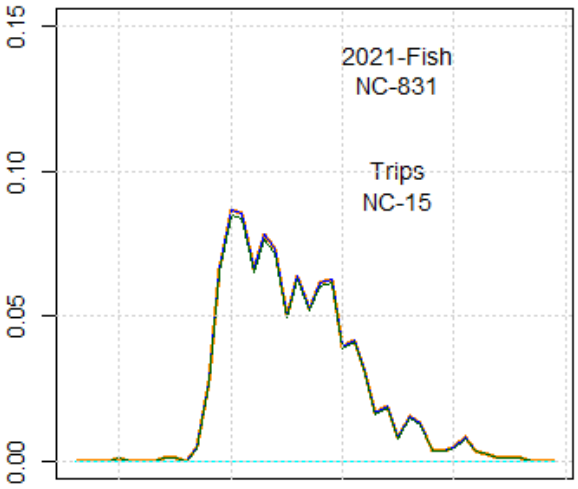

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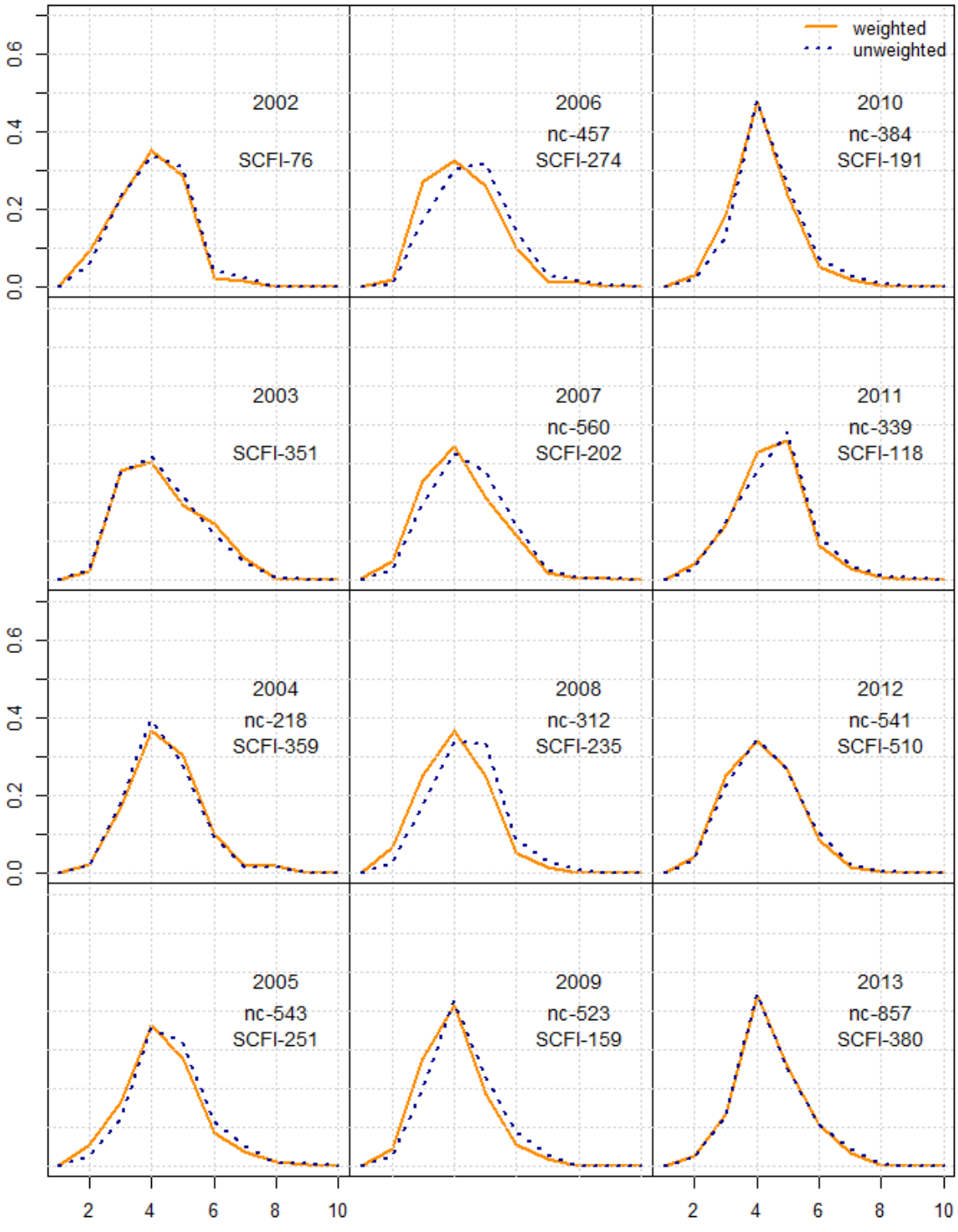
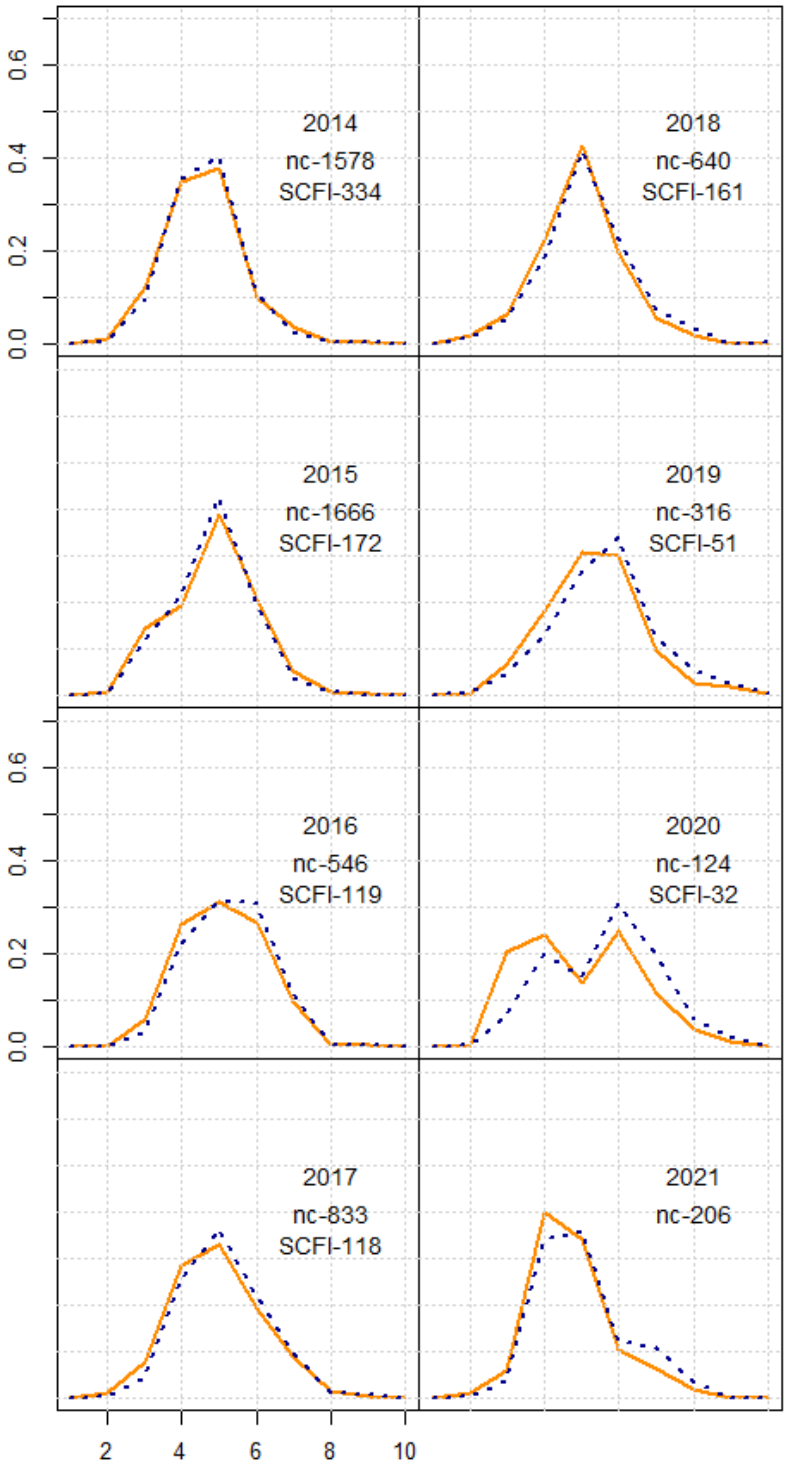


Figure 3. Weighted and un-weighted black sea bass age composition for handline gear.



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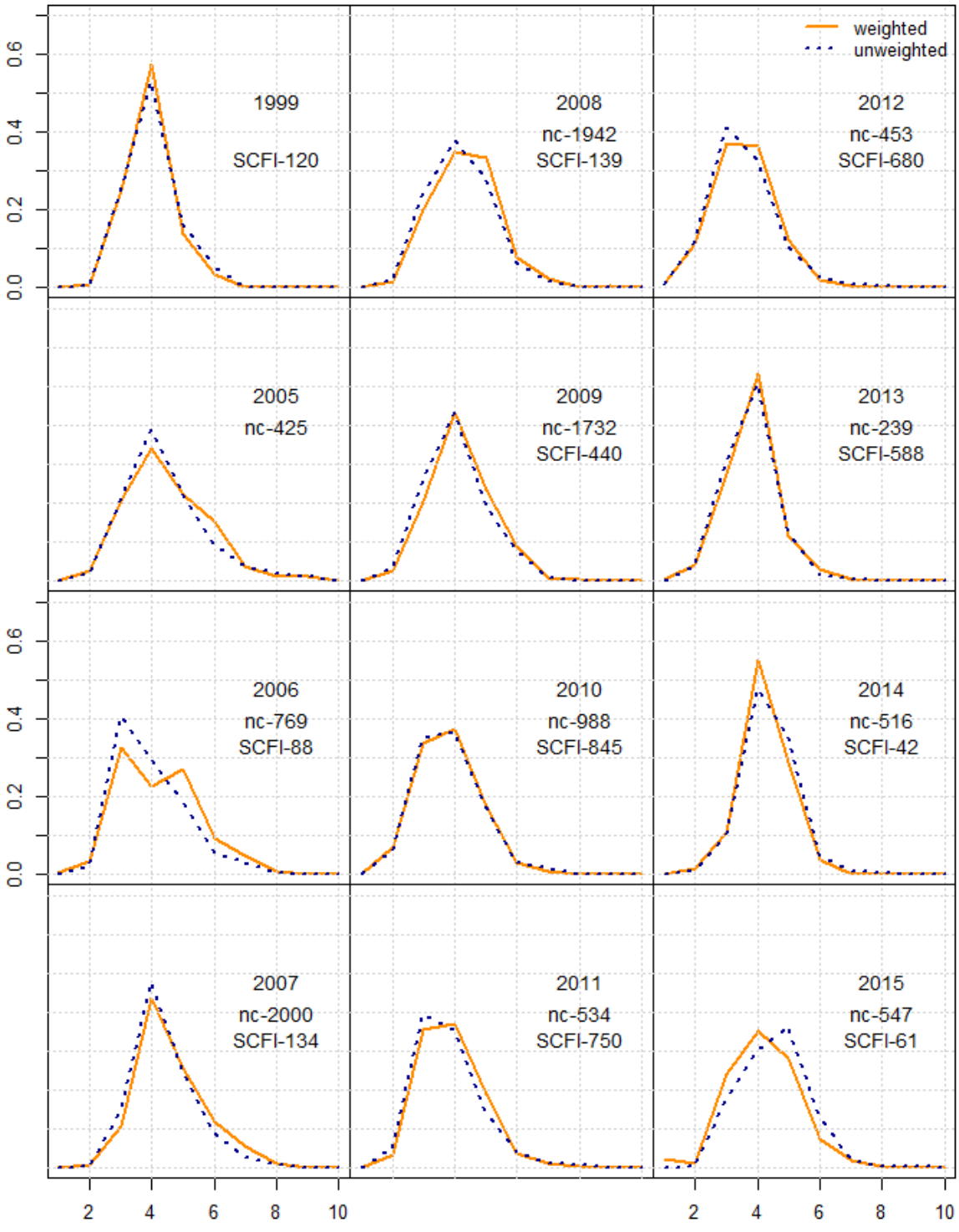
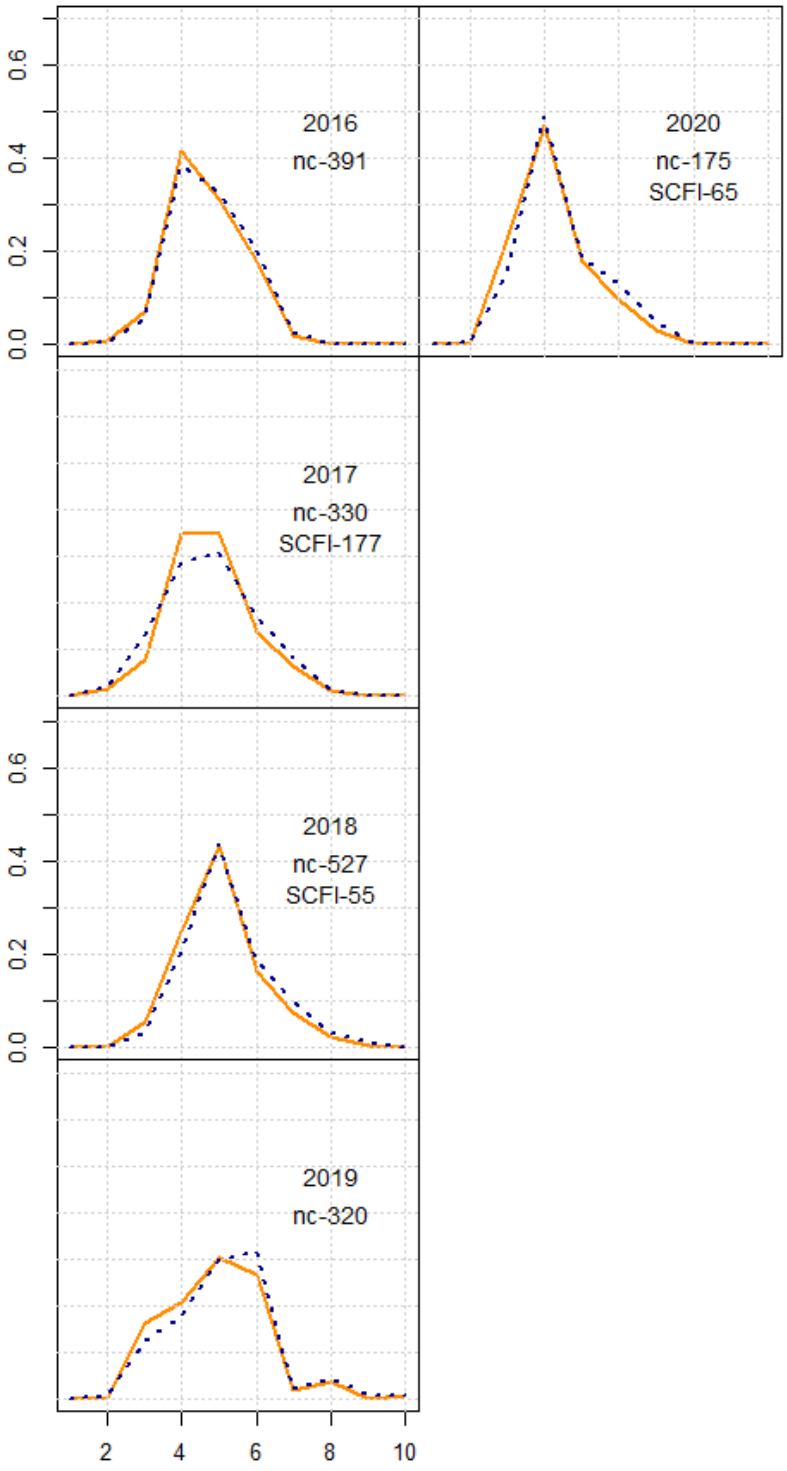


Figure 4. Weighted and un-weighted black sea bass age composition for pot gear.



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