

Commercial age and length composition weighting for Southeast U.S.
scamp and yellowmouth grouper (*Mycteroperca phenax* and
Mycteroperca interstitialis)

Fisheries Ecosystems Branch, National Marine Fisheries Service,
Southeast Fisheries Science Center, Beaufort, NC

SEDAR68-DW-35

12 November 2020



This information is distributed solely for the purpose of pre-dissemination peer review. It does not represent and should not be construed to represent any agency determination or policy.

Please cite this document as:

Fisheries Ecosystems Branch, National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort, NC. 2020. Commercial age and length composition weighting for Southeast U.S. scamp and yellowmouth grouper (*Mycteroperca phenax* and *Mycteroperca interstitialis*). SEDAR68-DW35. SEDAR, North Charleston, SC. 15 pp.

Commercial age and length composition weighting for Southeast U.S. scamp and yellowmouth grouper (*Mycteroperca phenax* and *Mycteroperca interstitialis*)

Sustainable Fisheries Branch, National Marine Fisheries Service, Southeast Fisheries Science Center, 101 Pivers Island Rd., Beaufort, NC 28516

October 2020

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 had a high of 4,197 for handline gear in 1999 (Table 1).

All scamp and yellowmouth grouper lengths were converted to FL in mm using the formula provided by the SEDAR 68 Life History Group and binned into three centimeter intervals. The length data and landings data were initially grouped into two categories; 1) handlines and 2) other gear defined as longline, other and diving and spear.

Commercial Ages

Age samples of scamp and yellowmouth grouper from handline occurred between 1996 and 2018. The lowest numbers of trips sampled was in 1999. The highest number of trips sampled was in 2007. The number of commercial trips sampled for scamp and yellowmouth grouper 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 area. 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 other length compositions were similar in size spatially for most years (Figure 1a, Figure 1b and Figure 2). The weighting

of the length composition for the handline fishery had almost no influence. The commercial “other” lengths were not weighted due to low sample sizes by gear and strata. (Figure 3).

Ages

Commercial

The weighted age compositions are very similar to the nominal age compositions for both gears (Figure 4a., Figure 4b., and Figure 5).

Discussion

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

The commercial weighted length and composition for input into the model is given in Table 2 and Table 3.

Several factors were 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 15 years of age.

Tables

Table 1. Number of fish and trips sampled for lengths for scamp and yellowmouth grouper by year and gear for the commercial handline gears and other gears (diving/spear, longline, etc.).

Year	Handline							Other			
	NC.fish	SC.fish	FL.fish	NC.trip	SC.trip	FL.trip		Car.fish	Fl.fish	Car.trip	Fl.trip
1984	1311	1770	199	56	51	12		59	0	4	0
1985	1675	1512	159	93	53	32		97	10	5	5
1986	1318	831	145	78	29	20		86	2	5	1
1987	1899	1692	254	81	55	35		306	0	11	0
1988	1717	742	191	89	35	29		416	0	19	0
1989	2454	841	190	90	32	16		51	0	5	0
1990	2150	960	0	78	44	0		530	9	14	2
1991	1900	796	475	71	52	55		1007	1	31	1
1992	769	514	458	39	45	53		58	12	3	4
1993	1308	659	565	78	45	72		77	45	6	11
1994	1136	635	219	80	37	38		20	12	3	5
1995	1363	1068	869	95	56	75		73	30	2	9
1996	484	1975	391	48	99	48		16	2	2	2
1997	198	2044	309	20	115	47		1	28	1	5
1998	500	2435	362	44	114	46		0	22	0	3
1999	755	4197	862	57	121	63		0	113	0	7
2000	854	2949	874	104	118	63		0	125	0	12
2001	511	2582	390	71	128	41		0	56	0	5
2002	407	1920	295	57	93	27		0	61	0	2
2003	367	1866	419	48	113	38		1	37	1	10
2004	1032	1065	273	140	75	23		159	1	5	1
2005	802	1282	110	132	111	15		30	0	2	0
2006	795	1140	131	171	158	29		37	27	7	7
2007	1075	1233	261	223	176	43		23	19	1	6
2008	714	1150	0	183	178	0		27	5	2	1
2009	576	1506	117	130	183	14		168	1	12	1
2010	379	622	0	98	107	0		121	0	16	0
2011	439	623	0	124	110	0		161	1	19	1
2012	470	501	0	111	95	0		51	9	8	1
2013	246	229	62	70	67	17		146	32	25	6
2014	385	227	63	68	68	15		193	15	28	7
2015	248	171	0	62	54	0		84	7	14	5
2016	375	215	0	71	62	0		163	0	20	0
2017	194	153	0	47	45	0		195	7	23	2
2018	351	121	0	70	42	0		155	10	23	1

Table 2. Weighted length composition for commercial handline scamp and yellowmouth grouper.

	20	23	26	29	32	35	38	41	44	47	50	53	56	59	62	65	68	71	74	77	80	83	86	89	92	95	98	101	104
1984	0.000	0.000	0.000	0.000	0.002	0.007	0.019	0.054	0.064	0.078	0.079	0.113	0.109	0.122	0.083	0.099	0.071	0.041	0.030	0.019	0.004	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1985	0.000	0.000	0.000	0.001	0.004	0.011	0.023	0.049	0.076	0.099	0.097	0.107	0.083	0.112	0.088	0.087	0.052	0.050	0.028	0.020	0.005	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1986	0.000	0.000	0.000	0.002	0.002	0.012	0.021	0.043	0.059	0.091	0.111	0.147	0.089	0.096	0.070	0.094	0.053	0.046	0.018	0.024	0.015	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000
1987	0.000	0.000	0.000	0.002	0.006	0.018	0.033	0.050	0.071	0.134	0.098	0.138	0.098	0.096	0.068	0.060	0.051	0.035	0.018	0.013	0.005	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1988	0.000	0.000	0.001	0.003	0.008	0.029	0.053	0.101	0.082	0.105	0.084	0.118	0.096	0.094	0.056	0.053	0.052	0.028	0.015	0.010	0.008	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.001
1989	0.000	0.000	0.000	0.002	0.007	0.022	0.048	0.105	0.123	0.141	0.110	0.114	0.084	0.085	0.052	0.040	0.029	0.016	0.014	0.005	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1990	0.000	0.000	0.000	0.002	0.005	0.031	0.083	0.123	0.129	0.135	0.097	0.111	0.074	0.064	0.043	0.041	0.023	0.014	0.010	0.006	0.003	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000
1991	0.000	0.000	0.000	0.004	0.007	0.030	0.055	0.121	0.133	0.153	0.107	0.108	0.065	0.067	0.043	0.039	0.026	0.016	0.008	0.008	0.006	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1992	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.048	0.230	0.196	0.168	0.098	0.100	0.066	0.038	0.014	0.014	0.013	0.007	0.002	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000
1993	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.038	0.203	0.190	0.190	0.116	0.093	0.057	0.043	0.024	0.015	0.013	0.006	0.003	0.002	0.001	0.001	0.000	0.000	0.001	0.000	0.000
1994	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.031	0.202	0.169	0.135	0.129	0.109	0.074	0.058	0.032	0.029	0.017	0.006	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1995	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.027	0.240	0.189	0.169	0.110	0.079	0.054	0.054	0.035	0.021	0.009	0.005	0.002	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.000
1996	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.004	0.057	0.234	0.191	0.165	0.098	0.085	0.058	0.043	0.034	0.015	0.006	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.005	0.051	0.226	0.182	0.134	0.091	0.085	0.074	0.052	0.038	0.032	0.013	0.008	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1998	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010	0.075	0.241	0.203	0.156	0.089	0.075	0.043	0.041	0.026	0.018	0.011	0.006	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.036	0.238	0.228	0.188	0.105	0.073	0.042	0.037	0.020	0.014	0.009	0.006	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.016	0.187	0.233	0.198	0.134	0.091	0.053	0.035	0.021	0.014	0.010	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.005	0.016	0.135	0.189	0.174	0.127	0.114	0.079	0.064	0.040	0.025	0.016	0.010	0.002	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002	0.004	0.000	0.000	0.004	0.005	0.004	0.004	0.005	0.020	0.144	0.182	0.163	0.118	0.113	0.088	0.056	0.042	0.020	0.016	0.007	0.001	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.031	0.149	0.172	0.185	0.127	0.099	0.070	0.072	0.031	0.021	0.011	0.006	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.018	0.024	0.184	0.182	0.153	0.112	0.101	0.055	0.056	0.035	0.032	0.019	0.017	0.003	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.033	0.197	0.167	0.141	0.102	0.105	0.066	0.066	0.043	0.033	0.013	0.006	0.005	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000
2006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.011	0.157	0.176	0.162	0.113	0.099	0.072	0.061	0.050	0.047	0.022	0.015	0.006	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000
2007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.011	0.133	0.188	0.162	0.134	0.110	0.081	0.064	0.037	0.038	0.015	0.009	0.005	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000
2008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.006	0.099	0.172	0.172	0.151	0.113	0.096	0.070	0.039	0.039	0.019	0.012	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000
2009	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.010	0.087	0.152	0.167	0.162	0.124	0.089	0.069	0.042	0.037	0.031	0.012	0.008	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2010	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.003	0.092	0.125	0.160	0.149	0.130	0.123	0.079	0.046	0.037	0.027	0.012	0.009	0.004	0.001	0.002	0.000	0.000	0.000	0.000	0.000
2011	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.002	0.004	0.089	0.132	0.155	0.147	0.142	0.120	0.089	0.058	0.030	0.011	0.012	0.004	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2012	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.064	0.135	0.165	0.137	0.130	0.106	0.101	0.070	0.042	0.020	0.013	0.006	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.044	0.143	0.144	0.162	0.108	0.113	0.089	0.069	0.051	0.034	0.017	0.013	0.002	0.005	0.001	0.000	0.000	0.000	0.000	0.000
2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.022	0.064	0.103	0.115	0.109	0.131	0.137	0.114	0.098	0.029	0.032	0.028	0.004	0.004	0.007	0.000	0.000	0.000	0.000	0.000
2015	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.004	0.005	0.092	0.105	0.126	0.084	0.133	0.084	0.113	0.084	0.087	0.021	0.018	0.030	0.004	0.001	0.000	0.001	0.000	0.000	0.000	0.000
2016	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.003	0.003	0.086	0.098	0.139	0.132	0.124	0.095	0.098	0.088	0.059	0.037	0.022	0.013	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2017	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.073	0.090	0.149	0.134	0.095	0.095	0.112	0.070	0.075	0.048	0.037	0.008	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.037	0.091	0.137	0.155	0.105	0.147	0.091	0.065	0.070	0.052	0.029	0.008	0.011	0.000	0.001	0.000	0.000	0.000	0.000	0.000

Table 3. Weighted age composition for commercial handline scamp and yellowmouth grouper.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2004	0	0	0.027017	0.154422	0.148708	0.210238	0.228356	0.065163	0.062264	0.045704	0.018128	0.01115	0	0.01547	0.02885
2005	0	0	0.002256	0.145273	0.23582	0.197177	0.14044	0.103378	0.086212	0.039415	0.026027	0.006638	0.015145	0.000772	0.002218
2006	0	0.002253	0.007765	0.079457	0.238201	0.203339	0.116231	0.092038	0.076677	0.040818	0.045559	0.033696	0.021942	0.007688	0.042025
2007	0	0	0.001126	0.025032	0.167976	0.259177	0.170705	0.129868	0.082014	0.035341	0.037866	0.033097	0.026294	0.009988	0.031505
2008	0	0	0.005316	0.028773	0.13322	0.264514	0.214161	0.111294	0.072594	0.048525	0.0404	0.031511	0.019447	0.010859	0.030245
2009	0	0	0.001242	0.035229	0.147794	0.250592	0.280677	0.144363	0.065321	0.024154	0.013684	0.019554	0.005079	0.001832	0.012312
2010	0	0.00104	0.007677	0.061297	0.133576	0.195635	0.25474	0.175705	0.069939	0.038714	0.032901	0.012581	0.006564	0.001082	0.00963
2011	0	0	0.006464	0.116438	0.167268	0.199949	0.209873	0.146806	0.071578	0.033816	0.019822	0.007022	0.007645	0.004821	0.013317
2012	0	0	0.005744	0.072764	0.21461	0.176164	0.148705	0.121023	0.103596	0.065549	0.032885	0.025522	0.01623	0.003677	0.017207
2013	0	0.001545	0.001545	0.07148	0.185639	0.186542	0.174516	0.126902	0.104197	0.074118	0.036931	0.01561	0.011848	0	0.009128
2014	0	0	0.010296	0.024911	0.181439	0.222944	0.148766	0.162471	0.109868	0.068942	0.031187	0.022822	0.009043	0.001019	0.00731
2015	0	0	0.021453	0.127916	0.08938	0.072482	0.11138	0.124335	0.115885	0.052956	0.082392	0.077837	0.051292	0.050321	0.072693
2016	0	0	0.018538	0.123063	0.166198	0.113769	0.11803	0.120183	0.118335	0.067061	0.056484	0.051104	0.021405	0.013167	0.02583
2017	0	0	0.020366	0.096374	0.159753	0.22282	0.08557	0.043768	0.107416	0.069312	0.023699	0.024624	0.066389	0.029324	0.079911
2018	0	0	0.010376	0.061467	0.216095	0.228823	0.101701	0.068566	0.08647	0.058781	0.018479	0.011819	0.02506	0.037765	0.112363

Figures

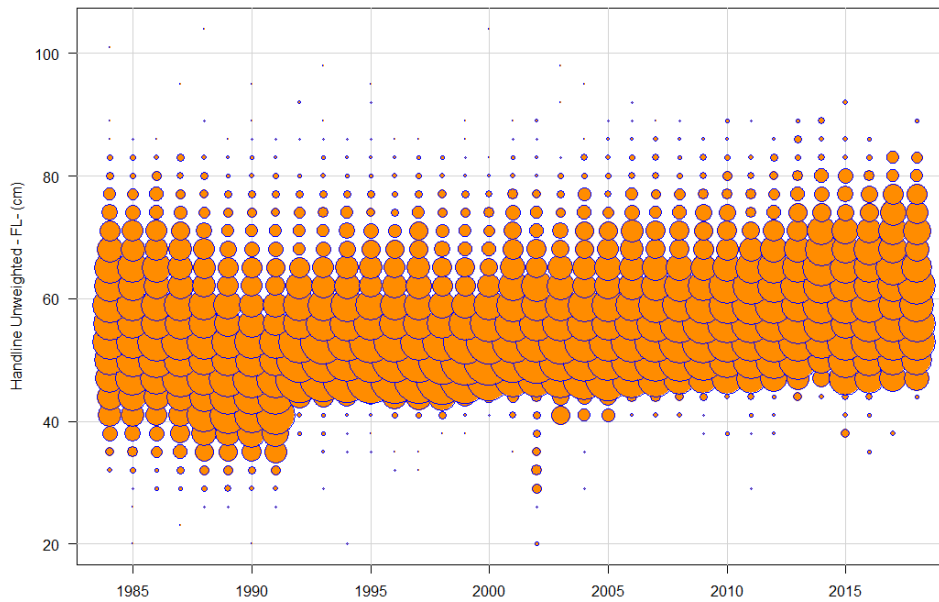


Figure 1a. Nominal scamp and yellowmouth grouper length composition for handline gear by region by year.

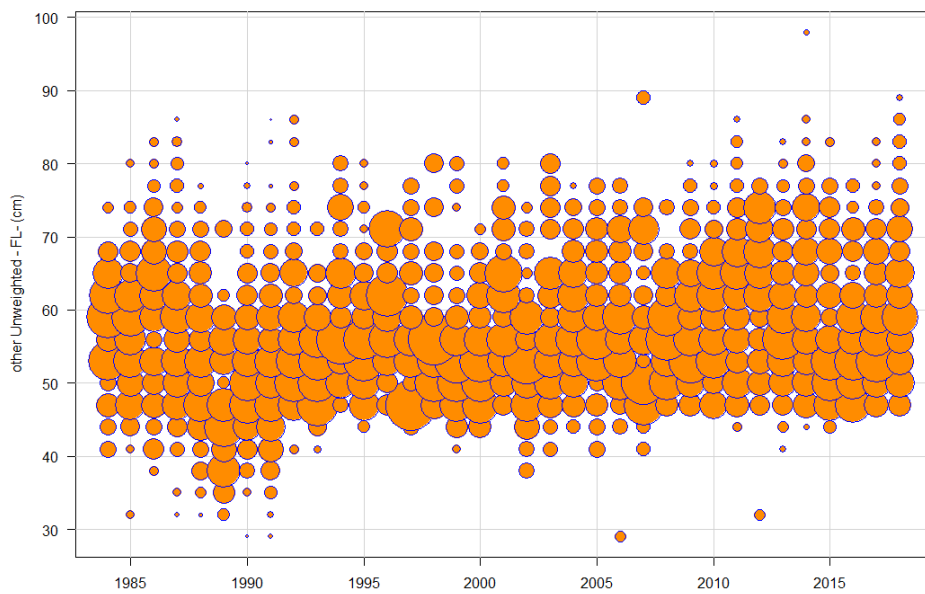


Figure 1b. Nominal scamp and yellowmouth grouper length composition for other gear by region by year.

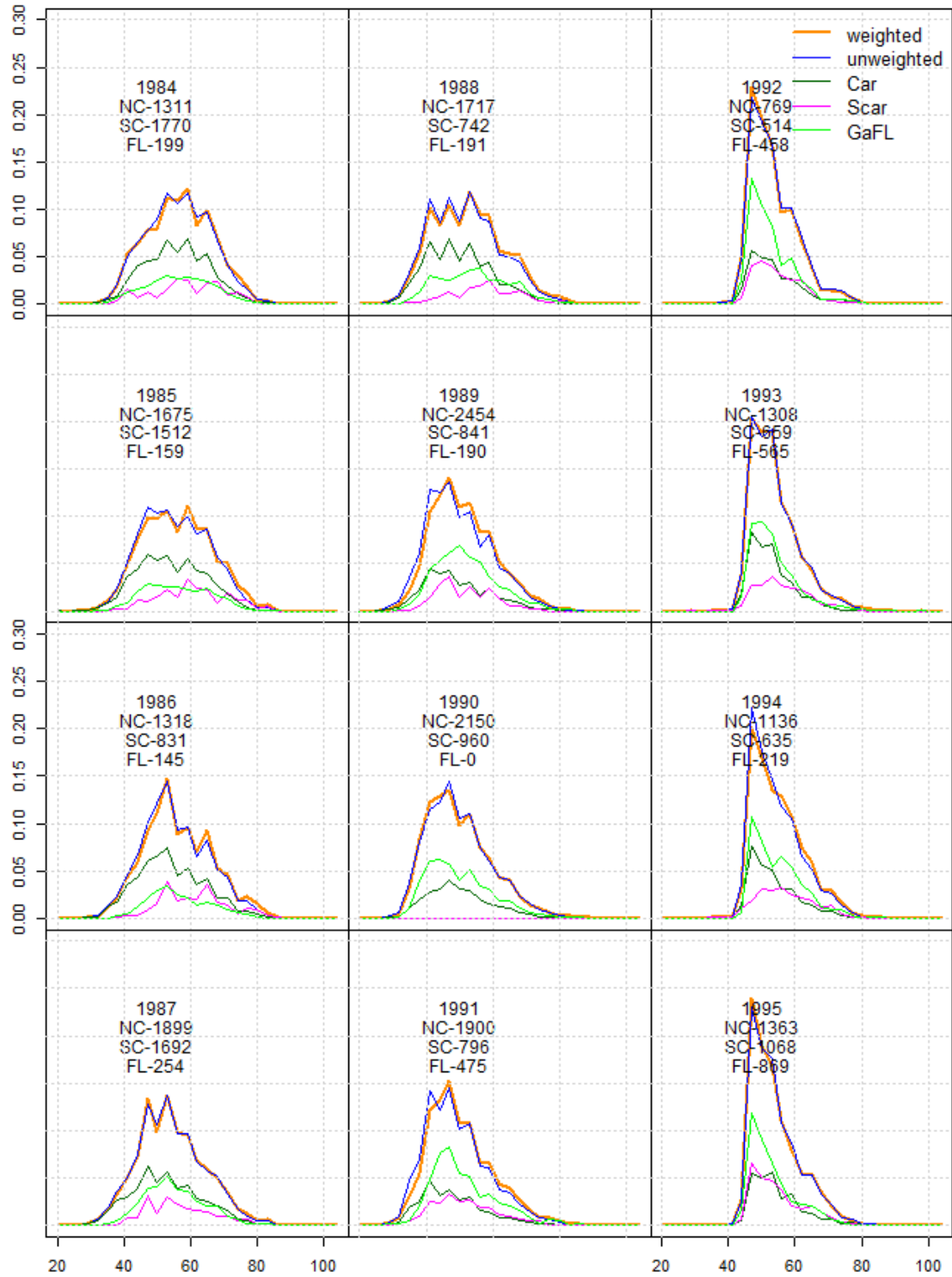


Figure 2. Weighted and un-weighted scamp and yellowmouth grouper length composition for handline gear by region by year.

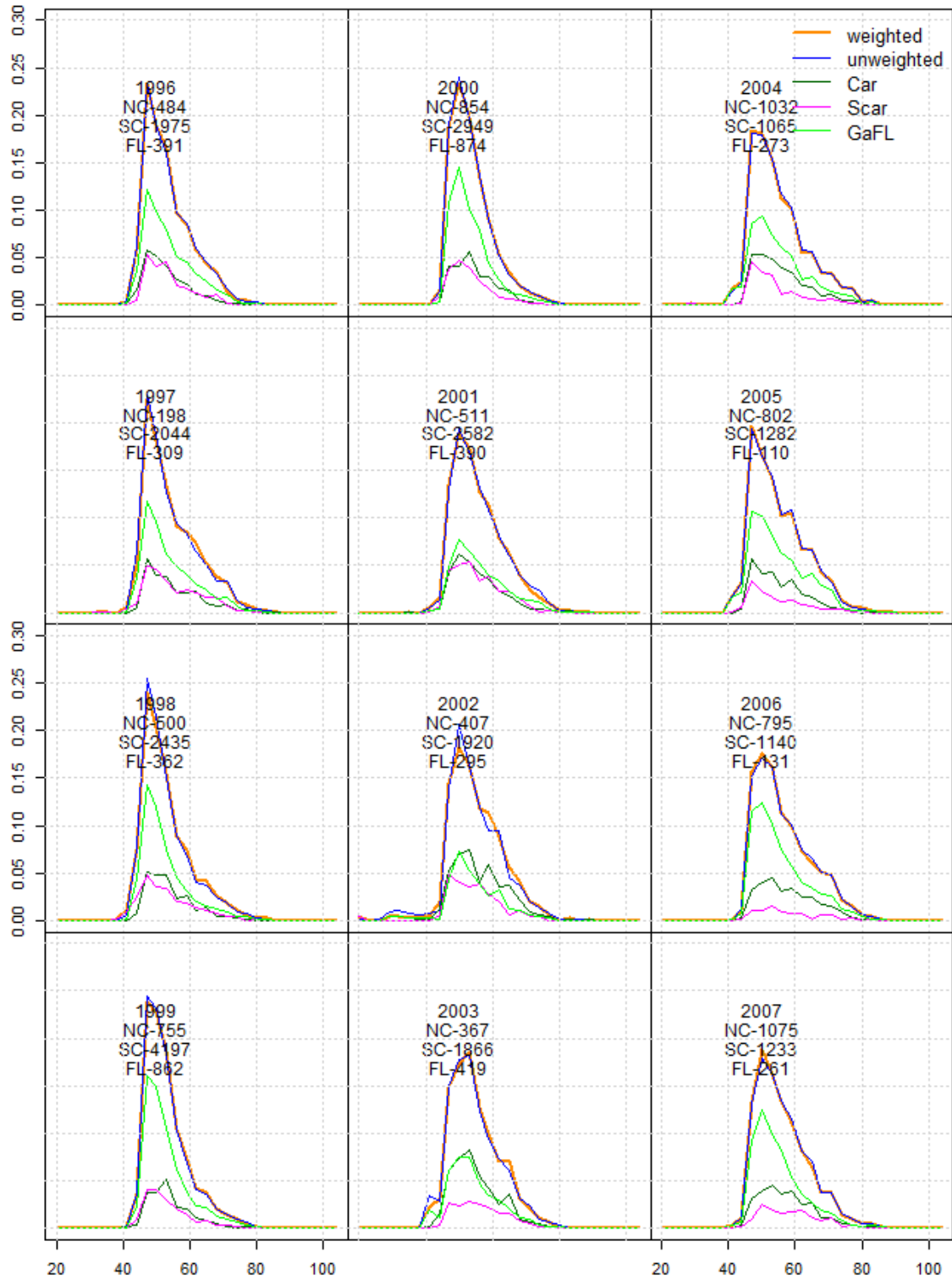


Figure 2 (continued).

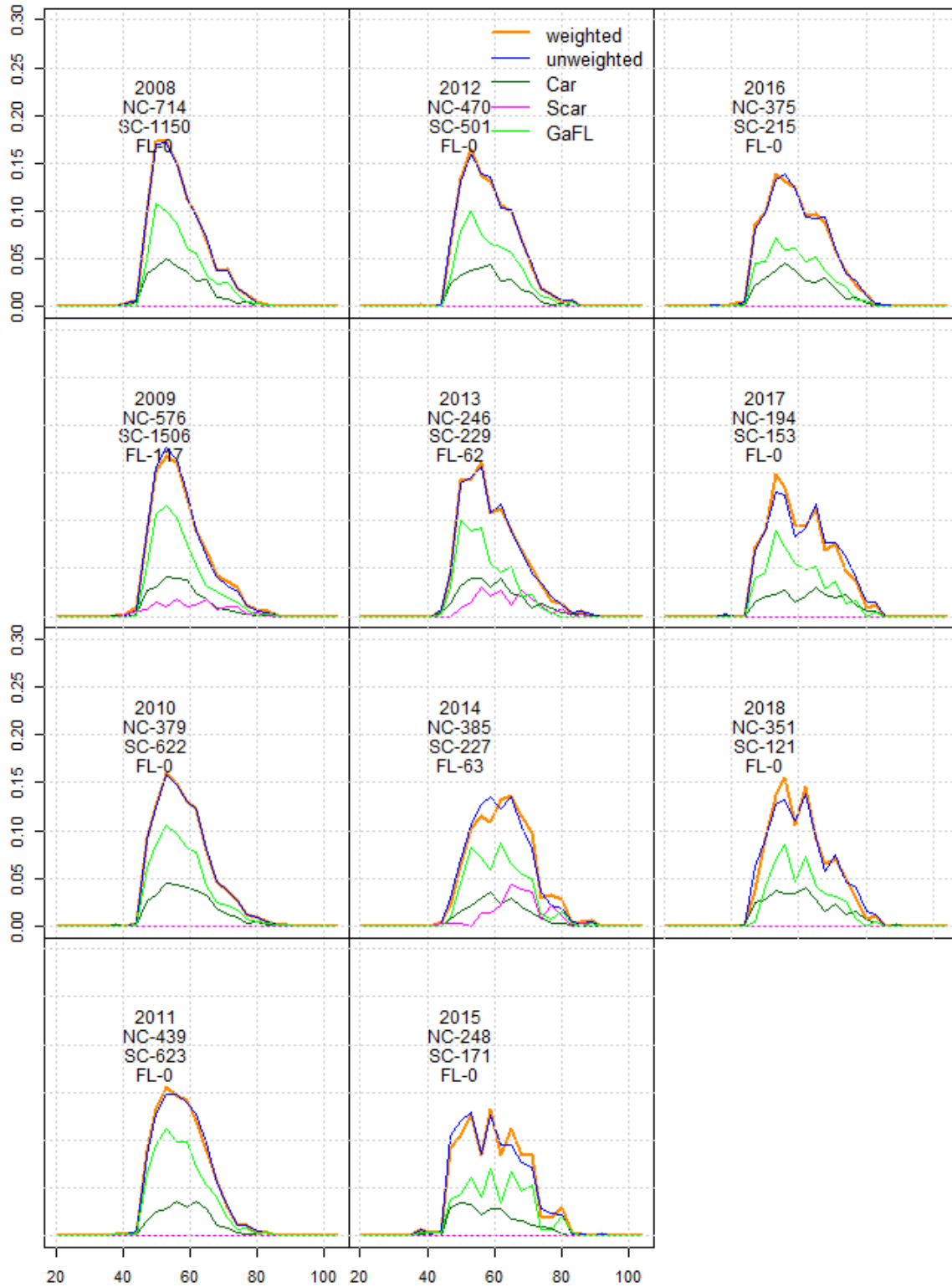


Figure 2 (continued).

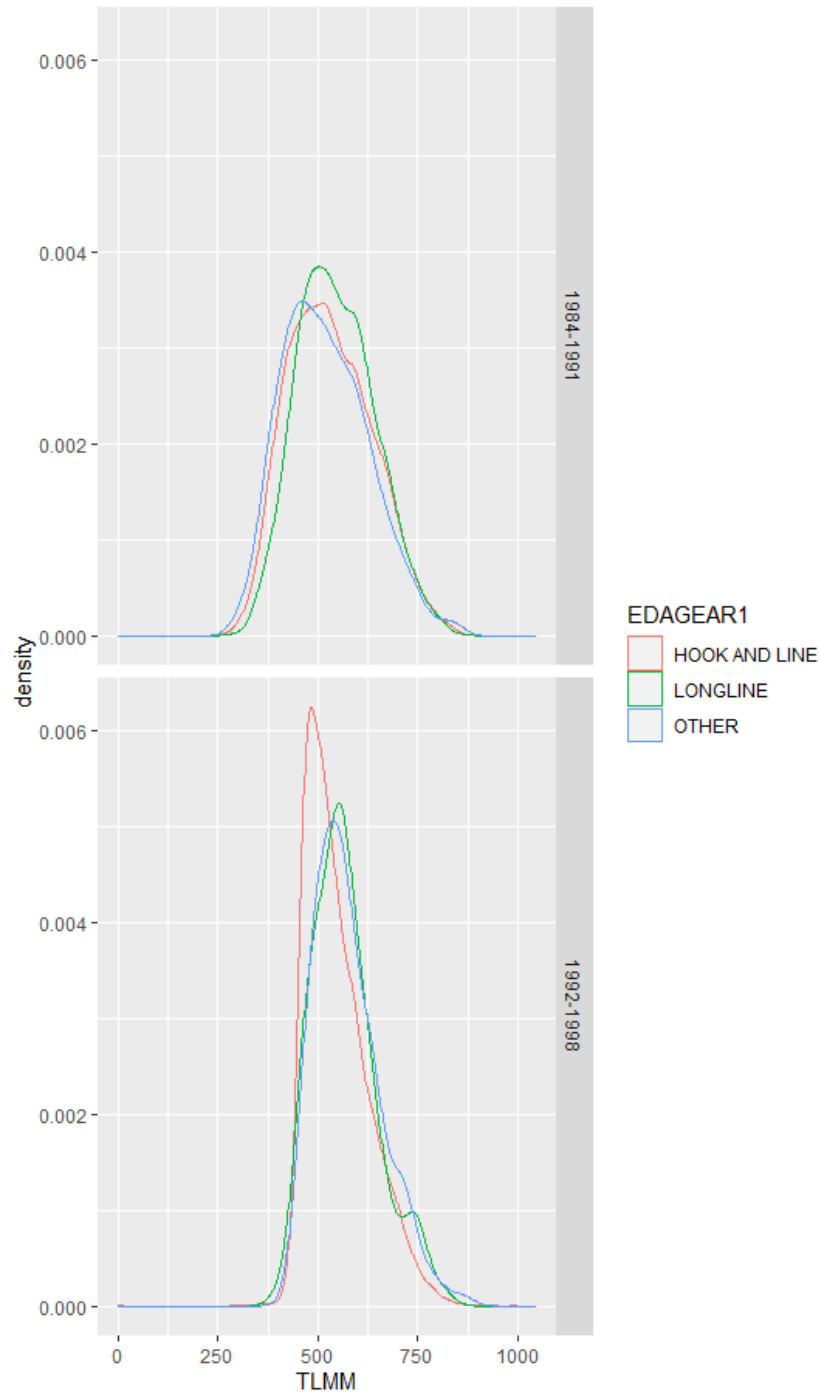


Figure 3. Scamp and yellowedge grouper length composition for various gears combined across years.



Figure 4a. Nominal scamp and yellowmouth grouper age composition for handline gear.

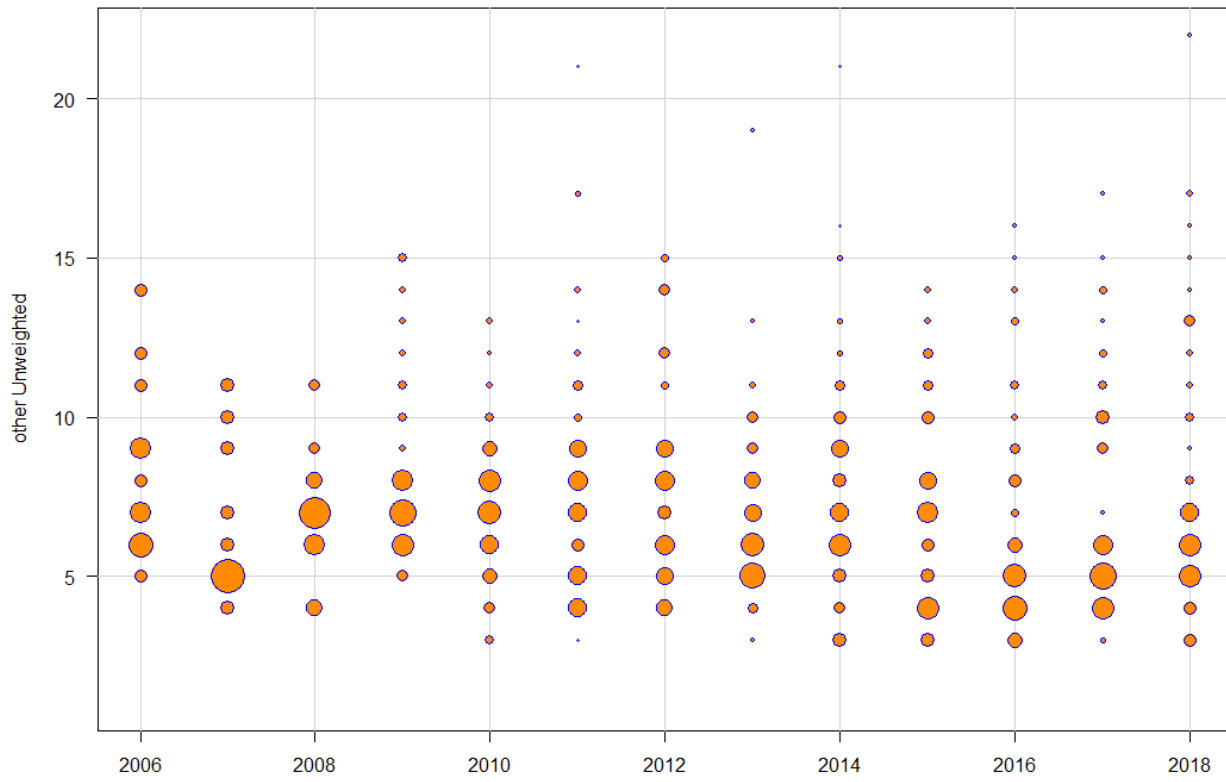


Figure 4b. Nominal scamp and yellowmouth grouper age composition for other gear.

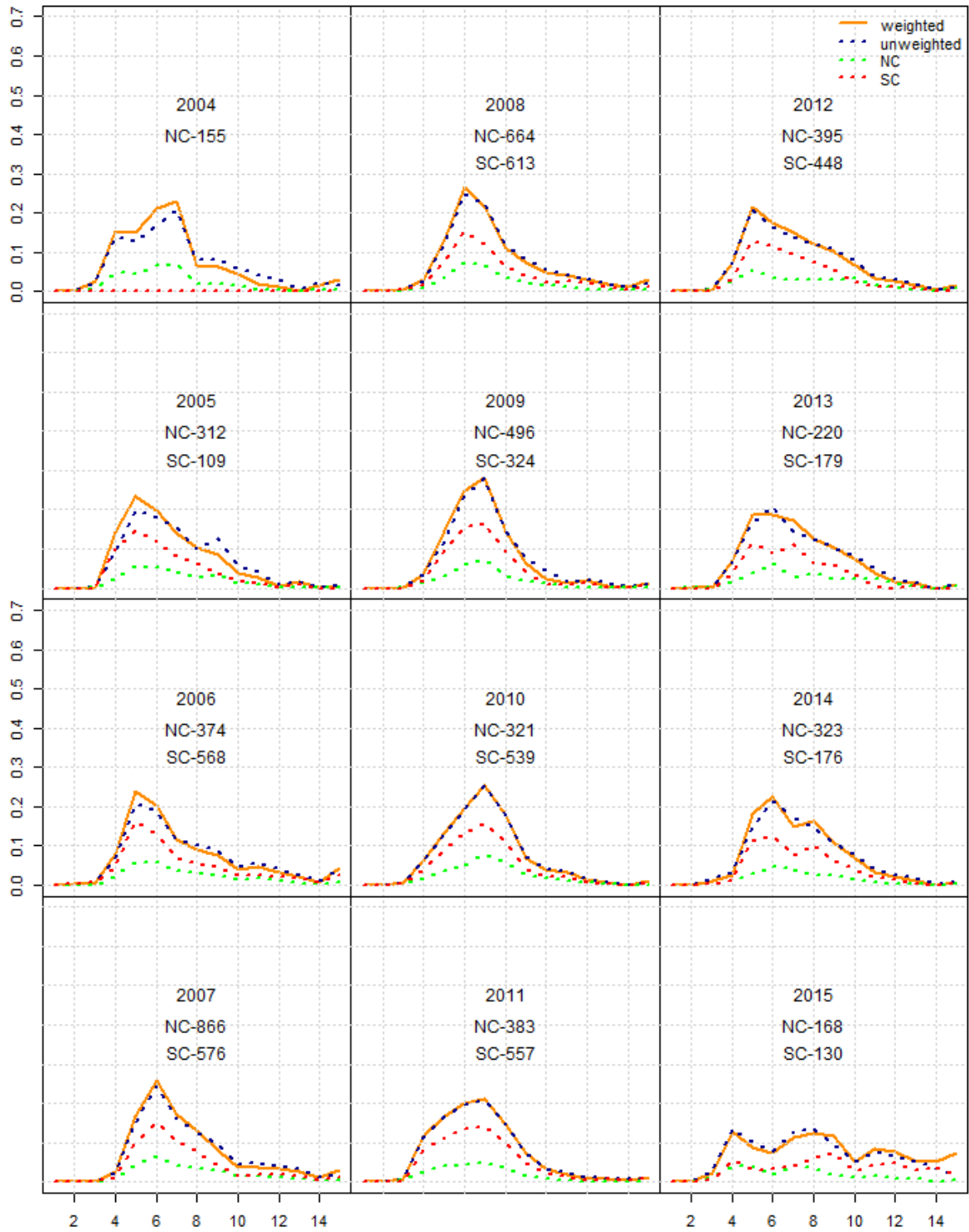


Figure 5. Weighted and un-weighted scamp and yellowmouth grouper age composition for handline and longline gear by region by year.

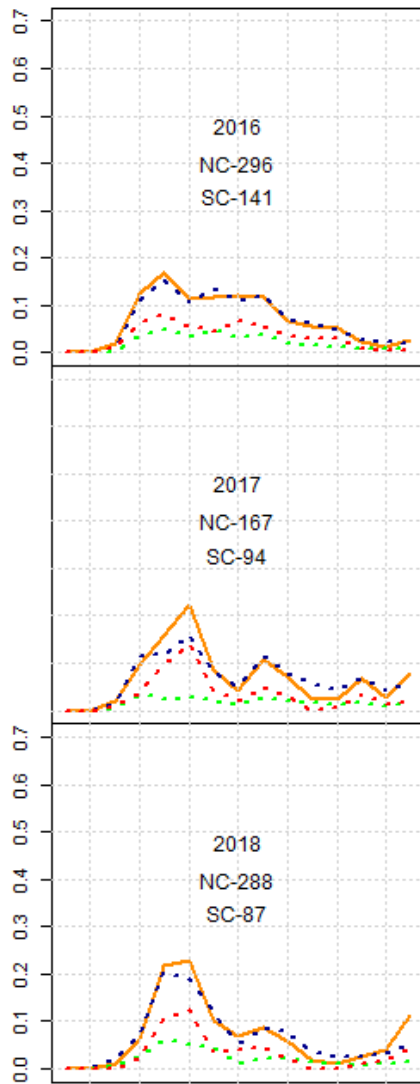


Figure 5. (Continued).