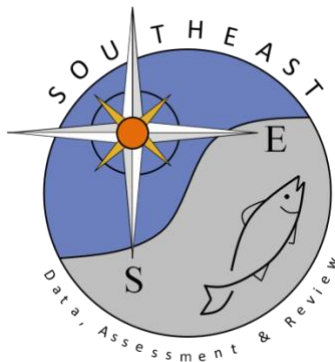


South Atlantic U.S. scamp (*Mycteroperca phenax*) age and length  
composition from the recreational fisheries

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

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101 Pivers Island Rd, Beaufort, NC 28516  
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## 1 Introduction

The SEDAR 68 data workshop developed raw length and age compositions for each of the recreational fisheries where sufficient data were available. 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, typically towards larger fish, because the selection process is rarely formally 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). This document describes how the length data were weighted and how these weightings are extended to the age data. Similar methods have been used in previous SEDAR assessments and completed between the data and assessment workshops.

## 2 Data Description

### 2.1 Lengths

#### *Stock Identification*

The SEDAR 68 Stock ID Workshop found that “Scamp are very difficult to distinguish from yellowmouth grouper, even for trained biologists, and thus much of the assessment data likely represent both species in unknown proportions”. It was recommended that the Scamp assessment “be conducted on both Scamp and Yellowmouth Grouper jointly, with the two species treated as a single complex” (SEDAR68-SID-05). As such, the recreational workgroup included both scamp and yellowmouth grouper when providing recreational data for this stock assessment.

#### *Headboat Survey Biological Sampling*

Lengths were collected from 1972 to 2018 by headboat dockside samplers (Table 1). From 1972 to 1975, only North Carolina and South Carolina were sampled whereas Georgia and northeast Florida were sampled beginning in 1976. The Southeast Region Headboat Survey conducted dockside sampling for the entire range of Atlantic waters along the southeast portion of the US from the NC-VA border through the Florida Keys beginning in 1978.

#### *MRFSS/MRIP Biological Sampling*

The MRFSS/MRIP angler intercept survey includes the sampling of fish lengths from the harvested (landed, whole condition) catch (Table 1). Up to 15 of each species landed per angler

interviewed are measured to the nearest millimeter (mm) along a center line (defined as tip of snout to center of tail along a straight line, not curved over body). Weights are typically collected for the same fish measured. When time is constrained a weight may be collected without a length measurement.

## 2.2 Ages

Aging structures and other biological samples are not collected during MRFSS/MRIP assignments because of concerns over the introduction of bias to survey data collection. Biological samples (scales, otoliths, spines, stomachs and gonads) are collected by the SRHS and processed for aging, diet studies, and maturity studies. Aging structures provided from the charter boat and private boat modes were collected ad hoc by MRFSS/MRIP state subcontractors and SRHS port agents.

Annual numbers of scamp sampled for age and the number of annual trips that were sampled from the recreational fishery are reported in Table 2.

## 3 Weighting methods

### 3.1 Lengths

A minimum of 30 fish per region was established to calculate a weighted length composition. The recreational landings estimates for SEDAR 68 were developed at the year and region (2 regions, NC/SC and GA/FL) level in order to consolidate the MRFSS/MRIP and SRHS landings estimates. Therefore, the finest scale to weight the length data was year and region data was by year and region. For each year, the region-specific length composition was multiplied by the proportion of landings from that region. The weighted region-specific length compositions were then combined and scaled to sum to one.

#### 3.1.1. Summary of length data treatment

- State/spatial strata cutoff: include region of 30 or more fish sampled
- Region assigned (NC/SC and GA/FL)
- Fleet assigned: 1. Recreational (SRHS and MRIP CH and PR modes)
- Range of lengths: 20 to 122 cm (3 cm bins)

### 3.2 Ages

A minimum of 10 fish per region was established to calculate a weighted age composition. For scamp age could not be determined, therefore the increment count was used and will hereafter be referred to as age. 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  $i$  for 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 (2009) in that the length composition is weighted by the landings.

### 3.2.1. Summary of age data treatment

- State/spatial strata cutoff: include region of 10 or more fish sampled
- Region assigned (NC/SC and GA/FL)
- Fleet assigned: 1. Recreational (SRHS and MRIP)
- Range of ages: 0 to 20 (1 increment bins)
- Range of lengths: 20 to 122 cm (3 cm bins)

## 4 Results

### 4.1 Lengths

The recreational length compositions (Figure 1) showed a wide range of fish (20 to 122 cm FL). In the early-to-mid 1970s fish sampled in the recreational fishery generally ranged from 50 to 100 cm FL, with a small number of samples outside of that range. In the late 1970s to 1980s the distribution shifted toward smaller fish (20 to 80 cm FL). Throughout the 1980s to early 1990s the distribution included greater numbers of smaller fish (30 to 60 cm FL). Once the 20 in size limit was put in place in 1992 the minimum size shifted toward 40 cm FL. Throughout the 1990s and 2000s the maximum length captured remained closer to 80 cm FL, before shifting toward 90 cm FL in early 2010s. In the mid-to-late 2010s the maximum size shifted slightly back towards 80 cm FL, with a few samples in the 95 cm FL range.

It's important to note that weighting had limited influence on the length composition (Figure 1), of the recreational fishery, in years that met the 30 fish minimum.

### 4.2 Ages

The weighted age compositions are very similar to the nominal age compositions (Figure 4). In the recreational fishery most fish sampled were between 3 and 10 years.

## 5 Discussion

There is minimal influence when weighting the recreational length or age compositions for scamp in the recreational fishery in years with adequate sample size. However, the weighted compositions are recommended for use as a matter of protocol and to remove whatever minimal bias may be present.

**Literature Cited**

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

SEDAR 68 Stock ID Panel. 2020. Gulf of Mexico and Atlantic Scamp Stock ID Process Final Report. SEDAR68-SID-05. SEDAR, North Charleston, SC. 42 pp.

Table 1. Annual number of fish measured and annual number of trips containing measured scamp in the recreational fishery. A minimum of 30 length measurements was required.

Year	SRHS		MRIP	
	Fish (n)	Trips (n)	Fish (n)	Trips (n)
1972	376	108		
1973	381	136		
1974	395	115		
1975	474	131		
1976	851	166		
1977	461	131		
1978	313	112		
1979	184	84		
1980	176	81		
1981	128	79	2	1
1982	262	125	2	2
1983	449	204	11	2
1984	492	221	3	2
1985	485	213	3	3
1986	427	207	4	2
1987	565	264	12	8
1988	476	223	46	6
1989	363	156	38	23
1990	339	135	59	23
1991	409	134	26	14
1992	279	106	50	26
1993	339	126	38	18
1994	342	105	52	35
1995	370	114	2	2
1996	282	102	15	15
1997	360	117	12	7
1998	393	123	24	15
1999	347	94	30	29
2000	223	99	44	33
2001	141	69	40	33
2002	138	60	99	49
2003	209	87	75	42
2004	74	41	69	35
2005	68	35	23	20
2006	92	56	54	35
2007	131	68	67	28
2008	77	40	47	29
2009	92	42	43	21
2010	59	30	61	25
2011	14	13	24	11
2012	66	30	18	7
2013	115	44	26	12
2014	60	33	15	11
2015	43	21	5	4
2016	82	41	13	12
2017	36	24	11	6
2018	44	21	11	8

Table 2. Annual numbers of scamp sampled for age and the number of annual trips containing aged scamp in the recreational fishery. A minimum of 10 aged fish was required.

Year	SRHS		MRIP	
	Fish (n)	Trips (n)	Fish (n)	Trips (n)
1979	5	3	-	-
1980	41	24	-	-
1981	56	35	-	-
1982	5	5	-	-
1983	7	5	-	-
1984	1	1	-	-
1989	5	3	-	-
1991	1	1	-	-
1993	1	1	-	-
1995	12	3	-	-
1996	125	47	-	-
1997	2	1	-	-
2000	1	1	-	-
2001	1	1	6	4
2002	4	3	44	22
2003	1	1	60	33
2004	3	3	87	42
2005	15	12	86	42
2006	33	33	59	17
2007	46	44	15	5
2008	23	22	-	-
2009	59	37	9	3
2010	42	28	11	4
2011	9	9	1	1
2012	46	26	-	-
2013	61	34	2	1
2014	42	26	1	1
2015	29	17	-	-
2016	55	31	2	1
2017	25	17	3	3
2018	27	16	5	4



Figure 1: Scamp nominal and weighted length composition from the recreational fishery.

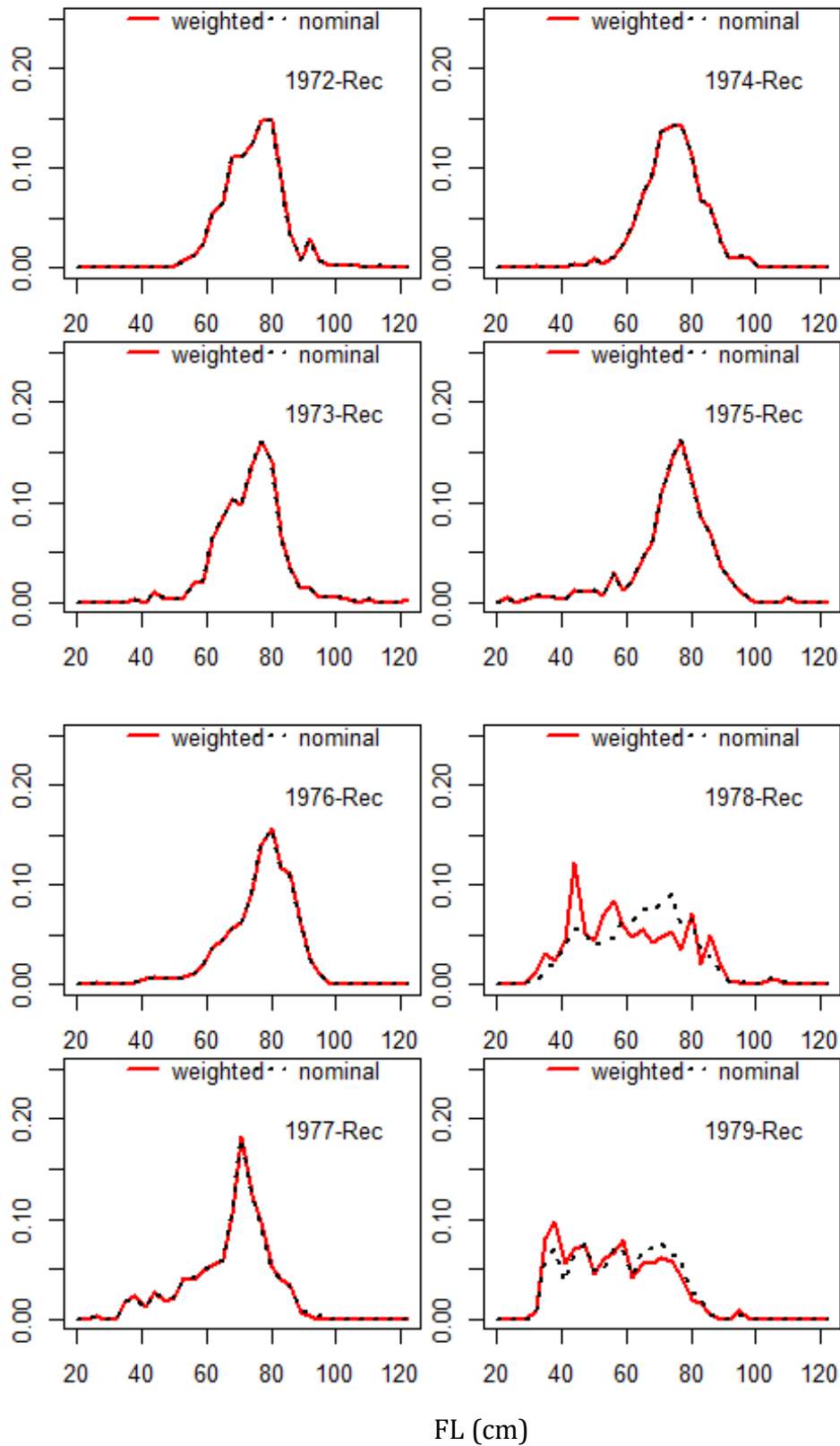


Figure 1: Continued.

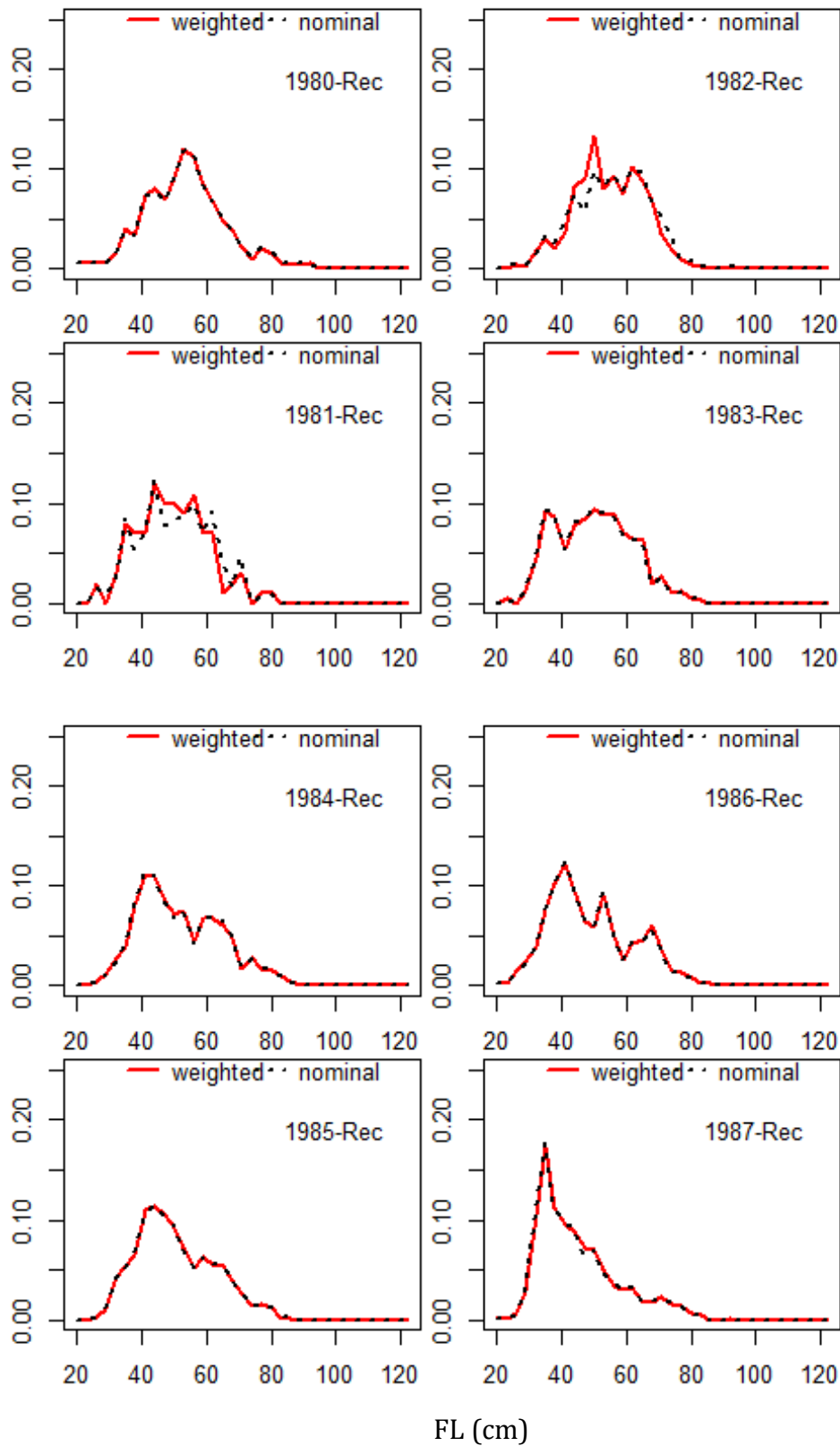


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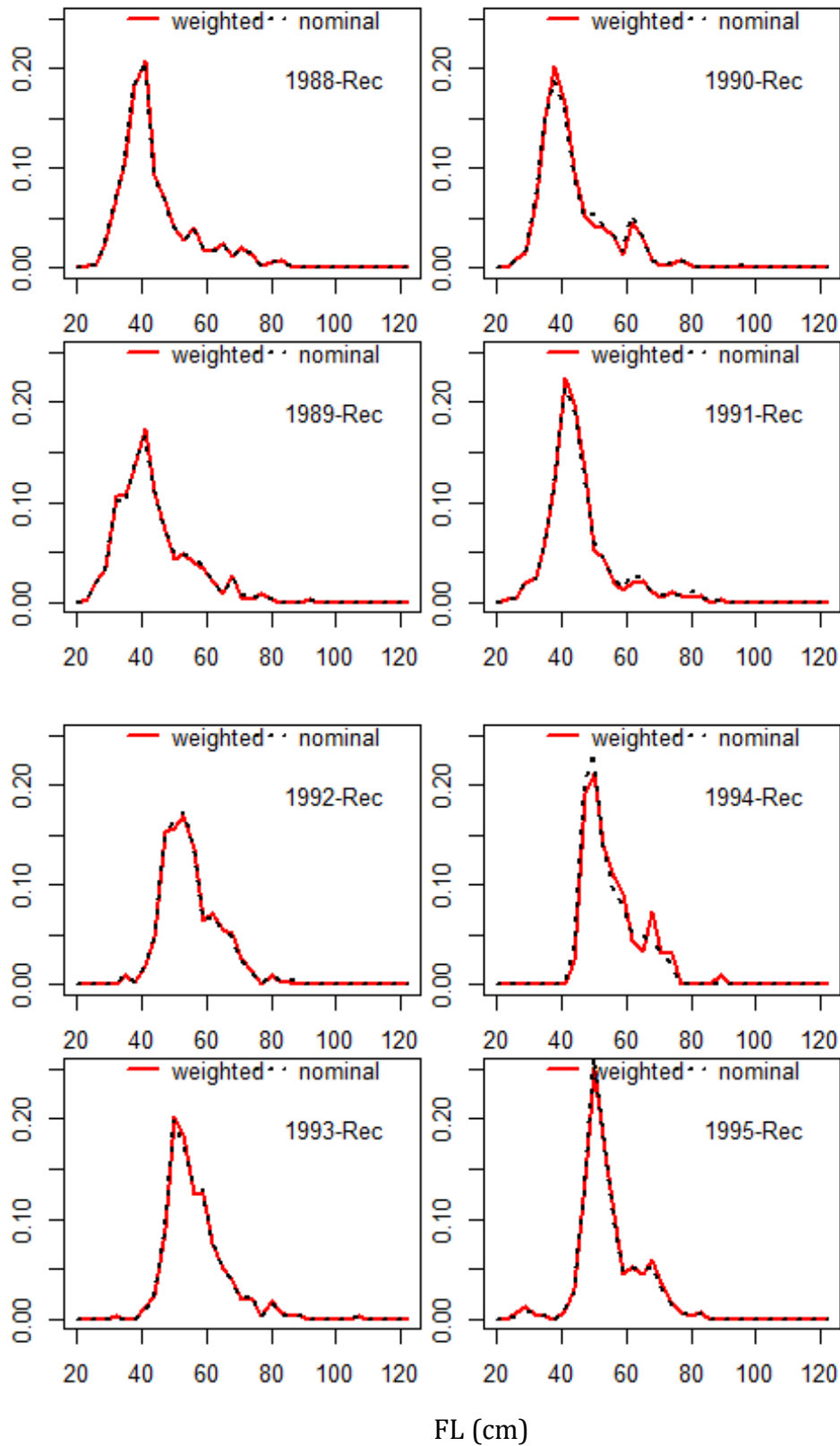


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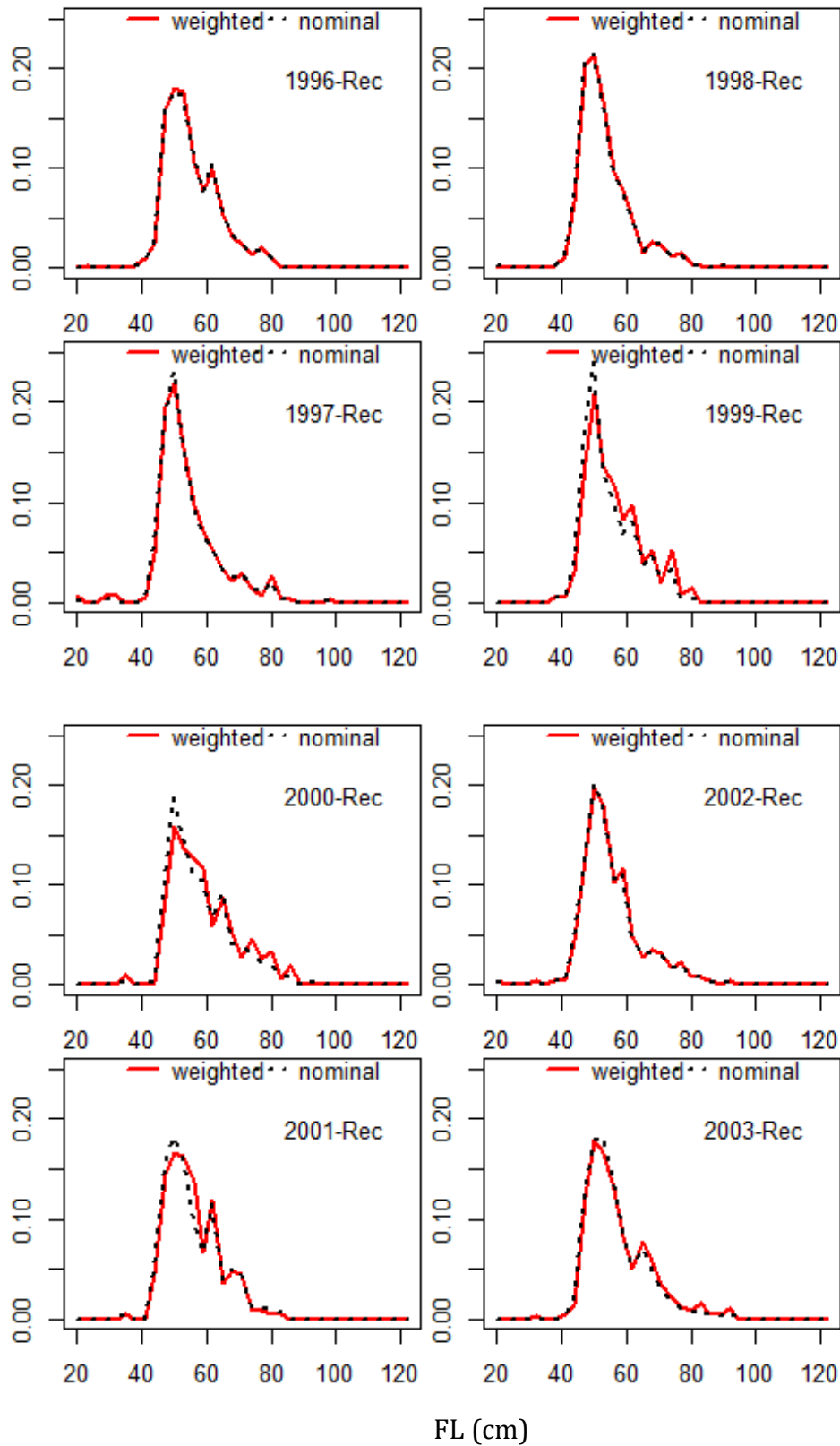


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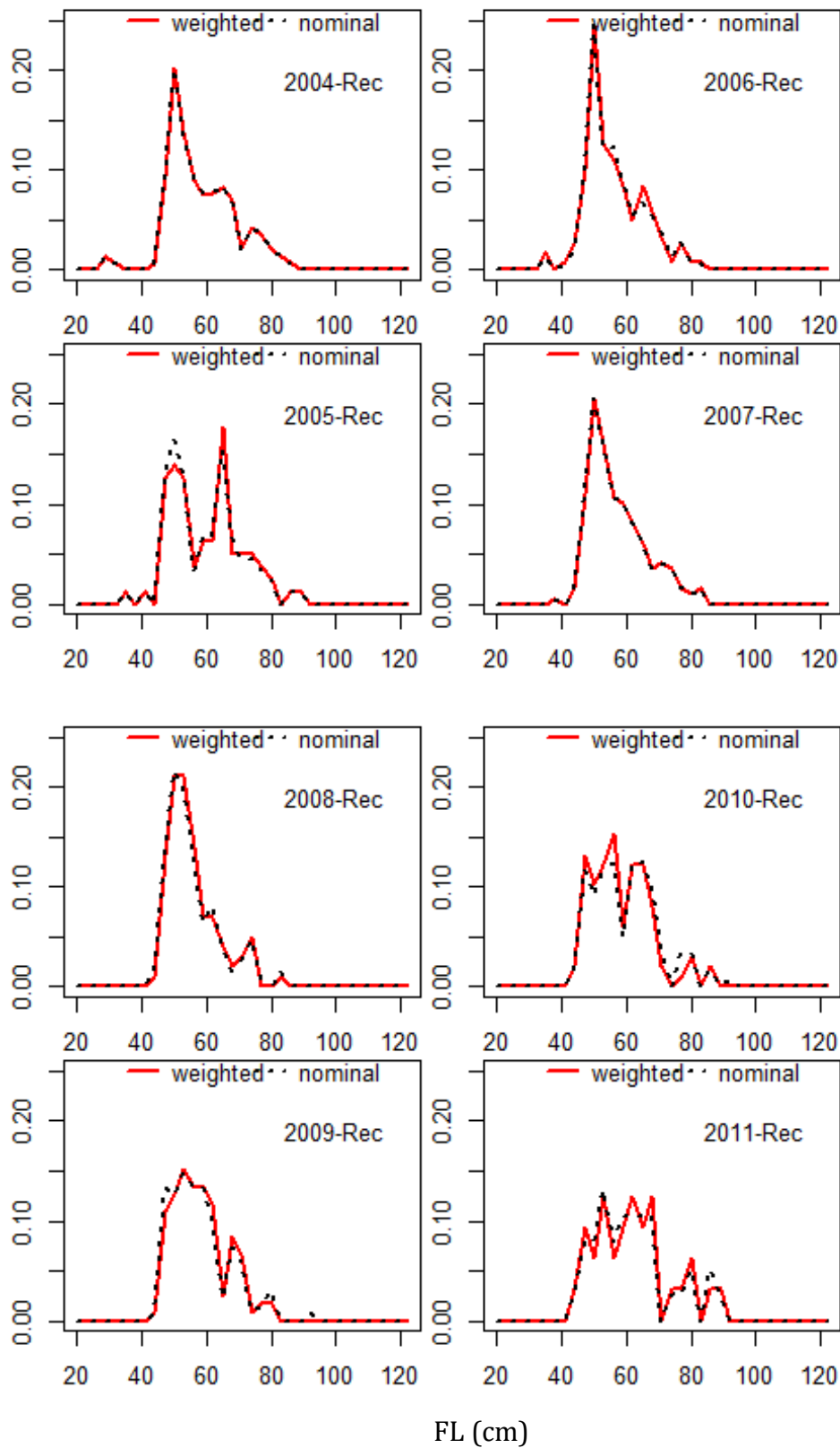
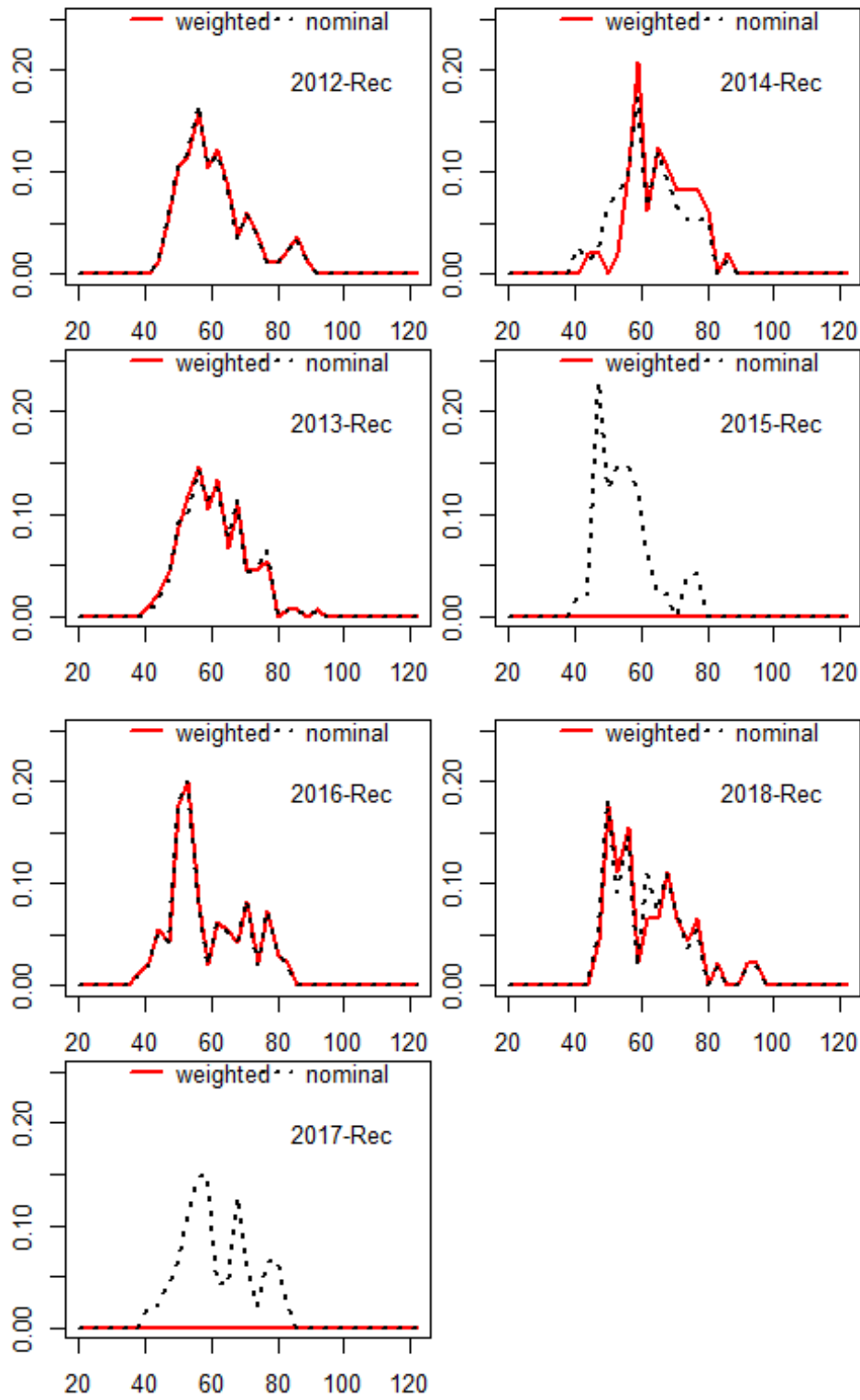


Figure 1: Continued.



FL (cm)

Figure 2: Scamp nominal age composition from the recreational fishery.

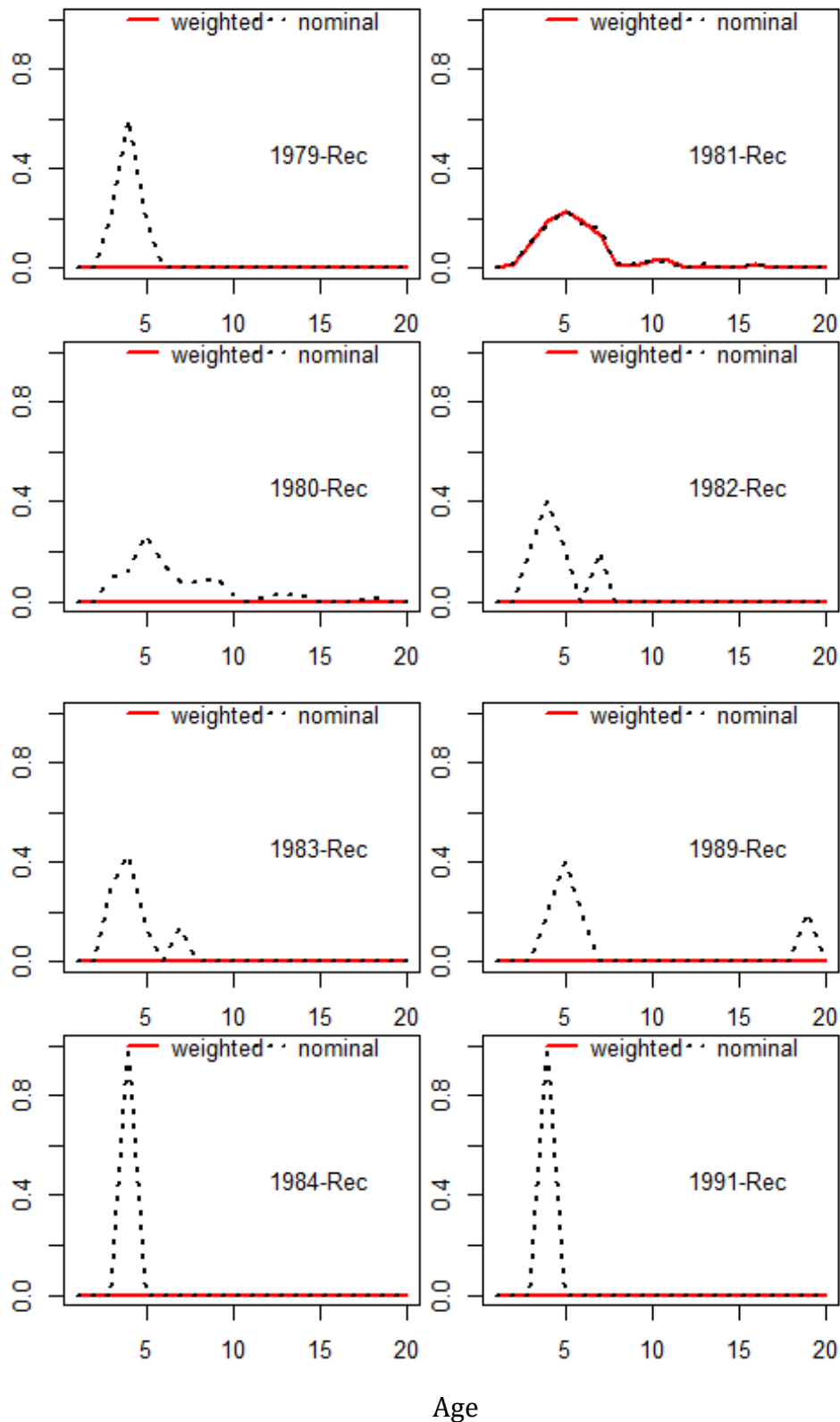


Figure 2: Continued.

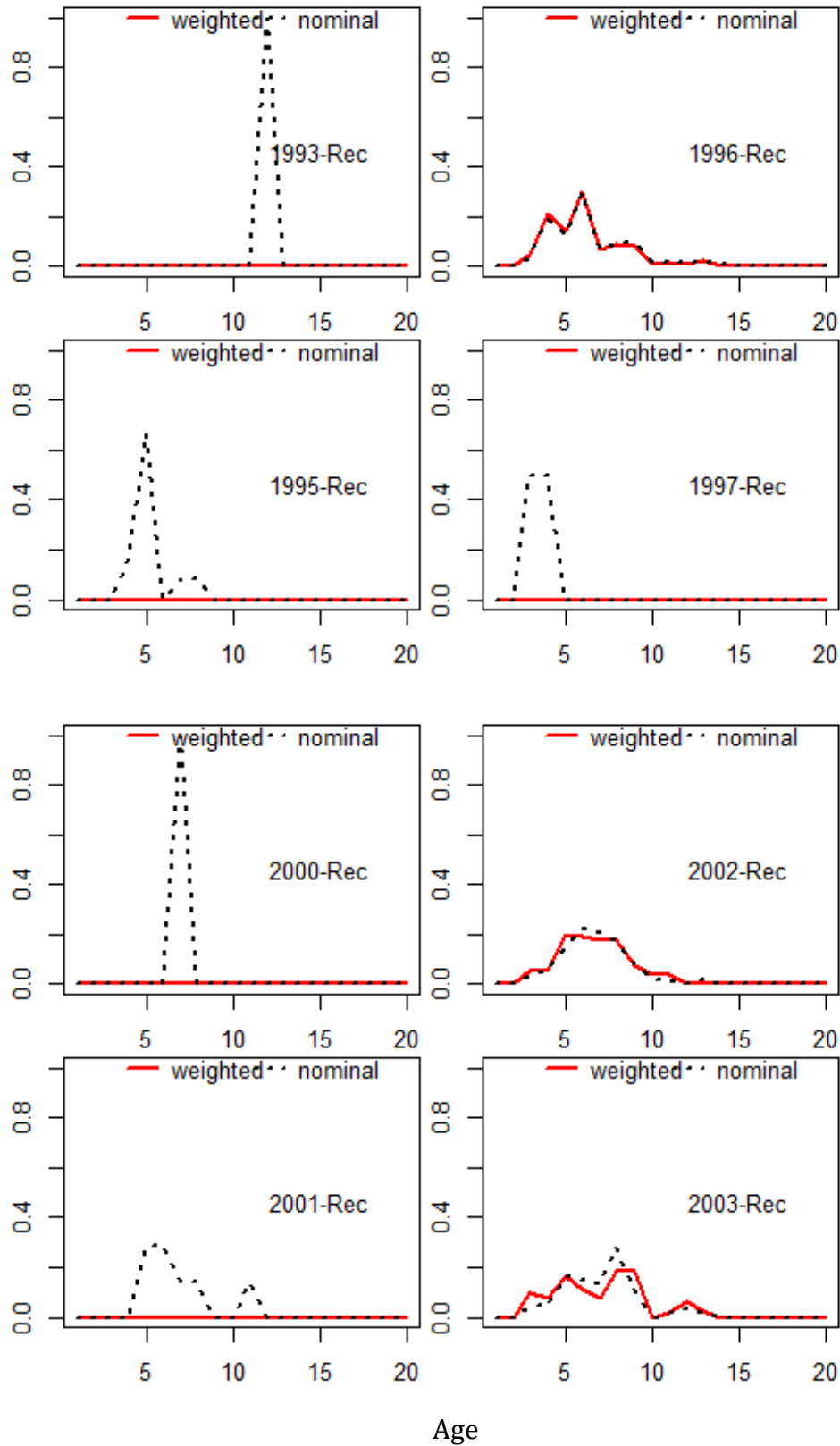




Figure 2: Continued.

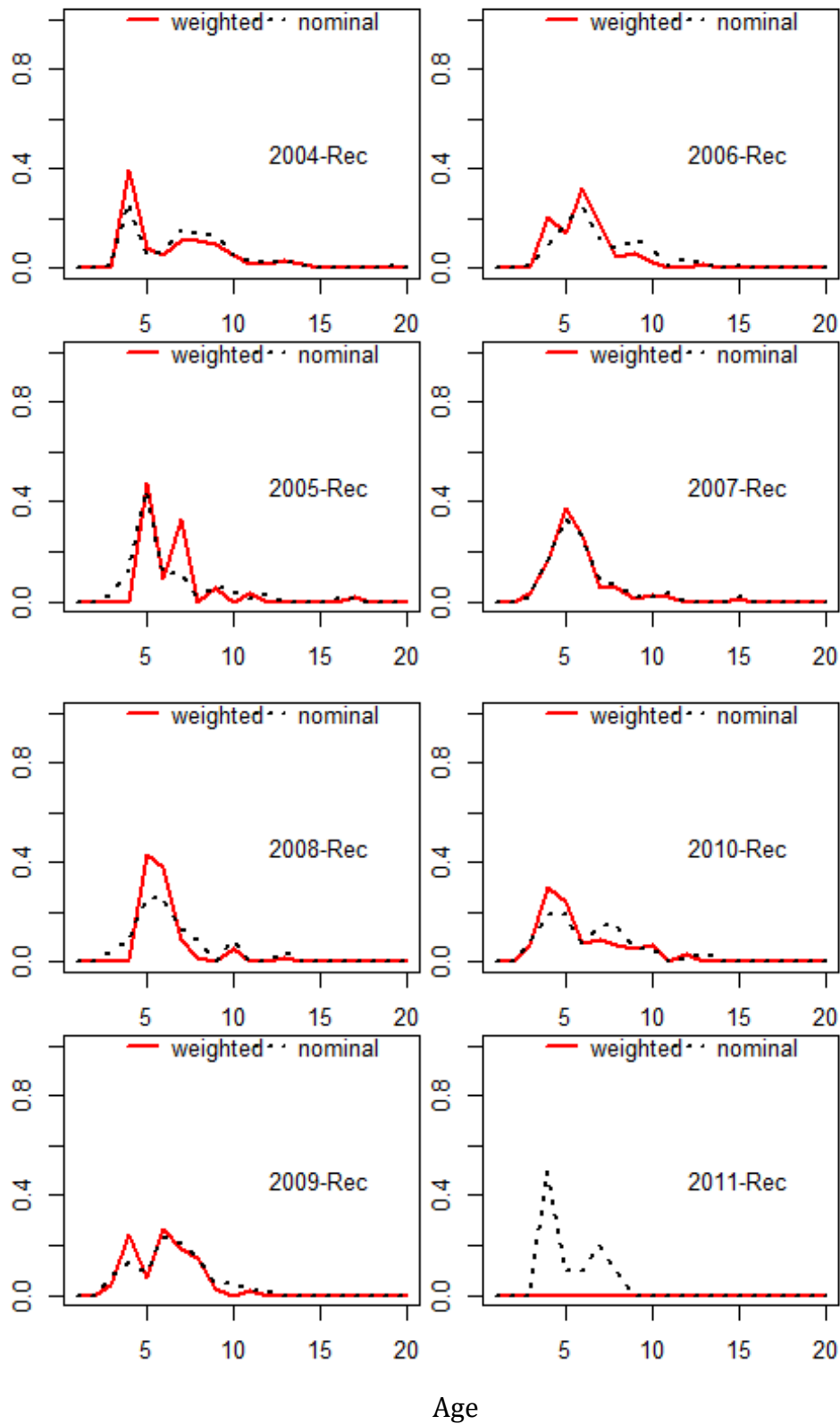


Figure 2: Continued.

