

**South Atlantic U.S. Blueline Tilefish (*Caulolatilus microps*) length composition
from the recreational fisheries**

Sustainable Fisheries Branch – NMFS (contact: Kelly Fitzpatrick)

SEDAR50-AW01

Submitted: 8 June 2017



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:

SFB-NMFS. 2017. South Atlantic U.S. Blueline Tilefish (*Caulolatilus microps*) length composition from the recreational fisheries. SEDAR50-AW01. SEDAR, North Charleston, SC. 34 pp.

Notice on SEDAR Working Papers

This information is distributed solely for the purpose of pre-dissemination peer review under applicable information quality guidelines. It has not been formally disseminated by NOAA Fisheries. It does not represent and should not be construed to represent any agency determination or policy.

South Atlantic U.S. blueline tilefish (*Caulolatilus microps*) length composition from the recreational fisheries

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

27 May 2017

1 Introduction

The SEDAR 50 data workshop developed raw length compositions for each of the recreational fisheries where sufficient data were available. The fishery-dependent data collection for lengths and may be biased due to sampling protocols, state-specific sampling effort, or other non-random methods. 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). For blueline tilefish, the number of samples available and time series do not meet the requirements for weighting the length composition; therefore only nominal length compositions are available.

2 Data Description

2.1 Lengths

Headboat Survey Biological Sampling

Lengths were collected from 1972 to 2015 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. The Gulf of Mexico was added to the SRHS in 1986 with the exception of Mississippi, which was added in 2010.

MRFSS/MRIP Biological Sampling

The MRFSS/MRIP angler intercept survey includes the sampling of fish lengths from the harvested (landed, whole condition) catch (Table 2). 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.

Old Dominion University

An Old Dominion University (ODU) study provided lengths of blueline tilefish landed in Virginia in the recreational fishery during 2007-2015 (Table 2). The carcasses were collected in

coolers or freezers at recreational ports or marinas. For this reason, trip information is not available. Due to low sample sizes of blueline tilefish lengths from the MRFSS/MRIP for the states north of North Carolina these data were considered for inclusion in the length composition.

Any available total length measurements were converted to fork length using the following equation derived for the combined South Atlantic stock by the Life History Working Group at the SEDAR 50 data workshop:

$$FL = 3.15 + 0.94 * TL$$

Any available weight measurements were converted to fork length using the following equation derived for the combined South Atlantic stock by the Life History Working Group at the SEDAR 50 data workshop:

$$FL = \text{weight}^{0.31} * 49.83$$

3 Results

The recreational length compositions showed a wide range of fish in both the SRHS (20 to 78 cm FL) and MRIP CH and PR modes (20 to 89 cm FL) (Figure 1). Lengths from the OCU study showed a slightly narrower range (27 to 84 cm FL) (Figure 2). Prior to the late 1980s fish sampled in the recreational fishery generally ranged from 25 cm to 70 cm FL. Available length samples decreased dramatically in the late 1980s to late 1990s. Based on preliminary analysis there was indication that fish captured north of Cape Hatteras, NC were smaller than fish captured south of the cape. However, it is difficult to determine due to low sample sizes and inconsistent time series north of Cape Hatteras, NC. The majority of all available length samples came from the headboat fishery in the 1970s to late 1980s and in the late 2000s to 2010s.

Due to low sample sizes, length data from the Gulf of Mexico were not included in any length compositions (Tables 1 and 2).

4 Discussion

Due to low sample size and inconsistent time series, weighted compositions are not recommended for use.

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.

Table 1. Annual number of fish measured and annual number of trips containing measured blueline tilefish in the headboat fishery from the SRHS.

Year	SRHS							
	Fish(N)			Trips(N)				
	FLW/AL	FLE	NCSCGA	FLW/AL	FLE	NCSCGA		
Year	HB	HB	HB	Total	HB	HB	HB	Total
1972		125	125			33	33	
1973		80	80			29	29	
1974		77	77			24	24	
1975		41	41			20	20	
1976		70	70			26	26	
1977		49	49			14	14	
1978		30	30			13	13	
1979	32	29	61		3	7	10	
1980	21	24	45		5	13	18	
1981	26	10	36		6	6	12	
1982		18	18			9	9	
1983		43	43			19	19	
1984	3	26	29		3	10	13	
1985	1	19	20		1	14	15	
1986	1	1	29	31	1	1	10	12
1987		9	9			8	8	
1988	2	6	8		2	3	5	
1989	10		10		3		3	
1990	5	1	6		1	1	2	
1991								
1992								
1993								
1994								
1995								
1996	1		2	3	1	1	2	
1997	26		2	28	5	2	7	
1998	6			6	4		4	
1999								
2000	36			36	4		4	
2001	15			15	2		2	
2002								
2003	6			6	4		4	
2004	7			7	2		2	
2005								
2006								
2007								
2008	2			2	2		2	
2009								
2010		42	42			6	6	
2011	8	37	45		2	4	6	
2012	1	161	162		1	8	9	
2013	187	183	370		7	9	16	
2014	112	222	334		9	10	19	
2015	2	165	167		1	10	11	

Table 2. Annual number of fish measured and annual number of trips containing measured blueline tilefish in the charter and private boat fisheries from MRIP and ODU.

Figure 1. Blueline tilefish nominal length compositions in the headboat and charter/private boat modes in the South Atlantic (North Carolina-FL Keys, 1972-2015).

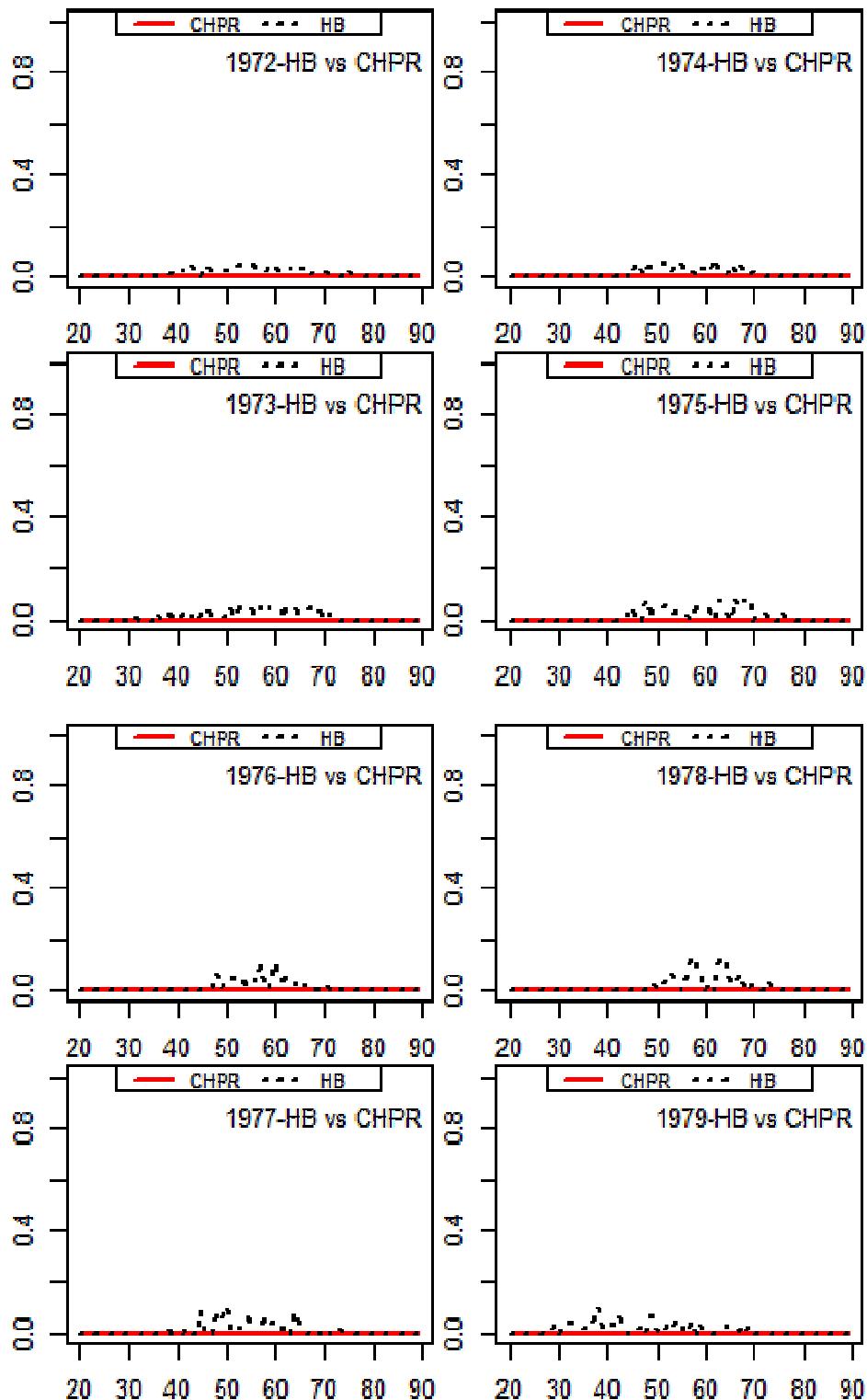


Figure 1. (cont.)

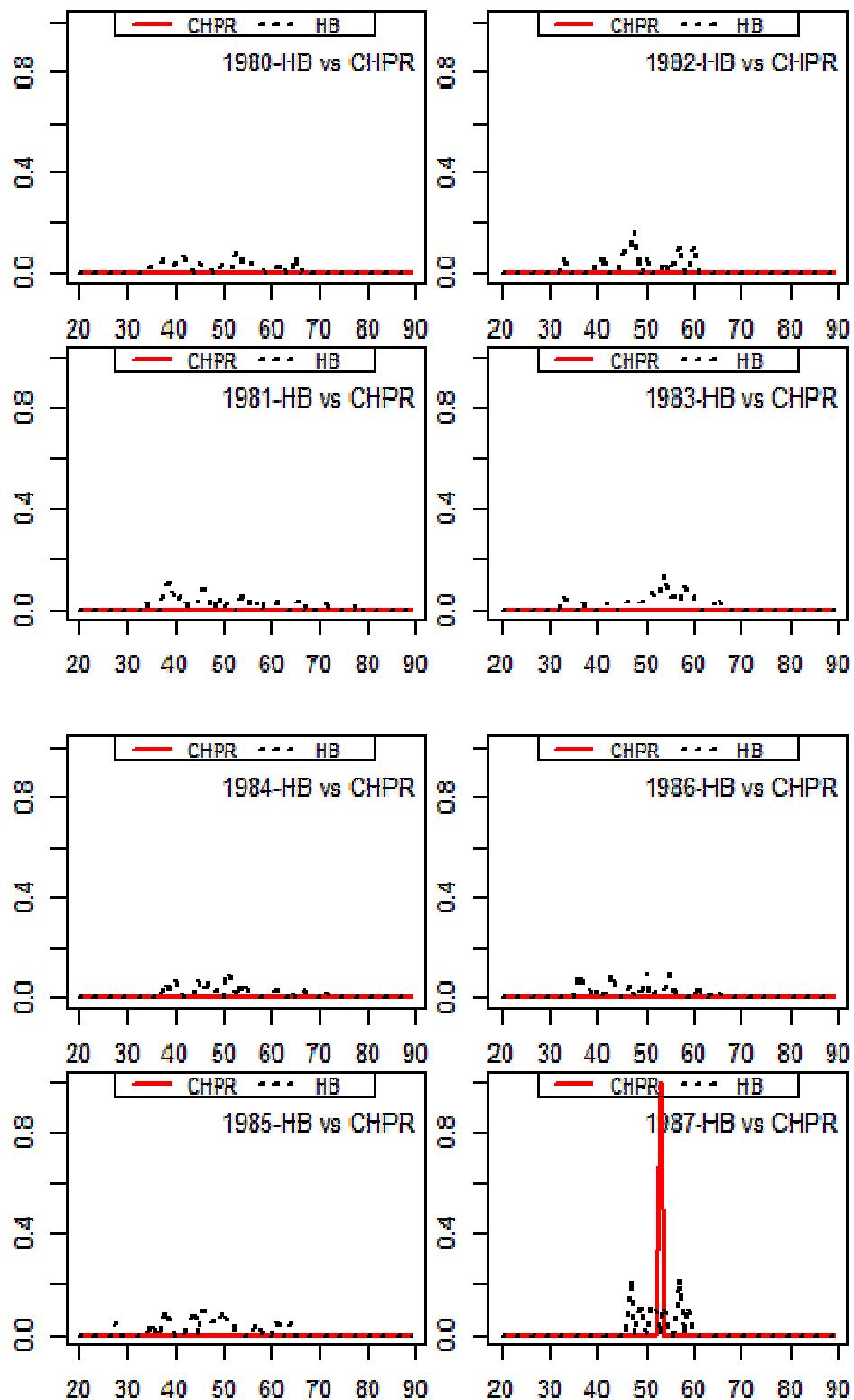


Figure 1. (cont.)

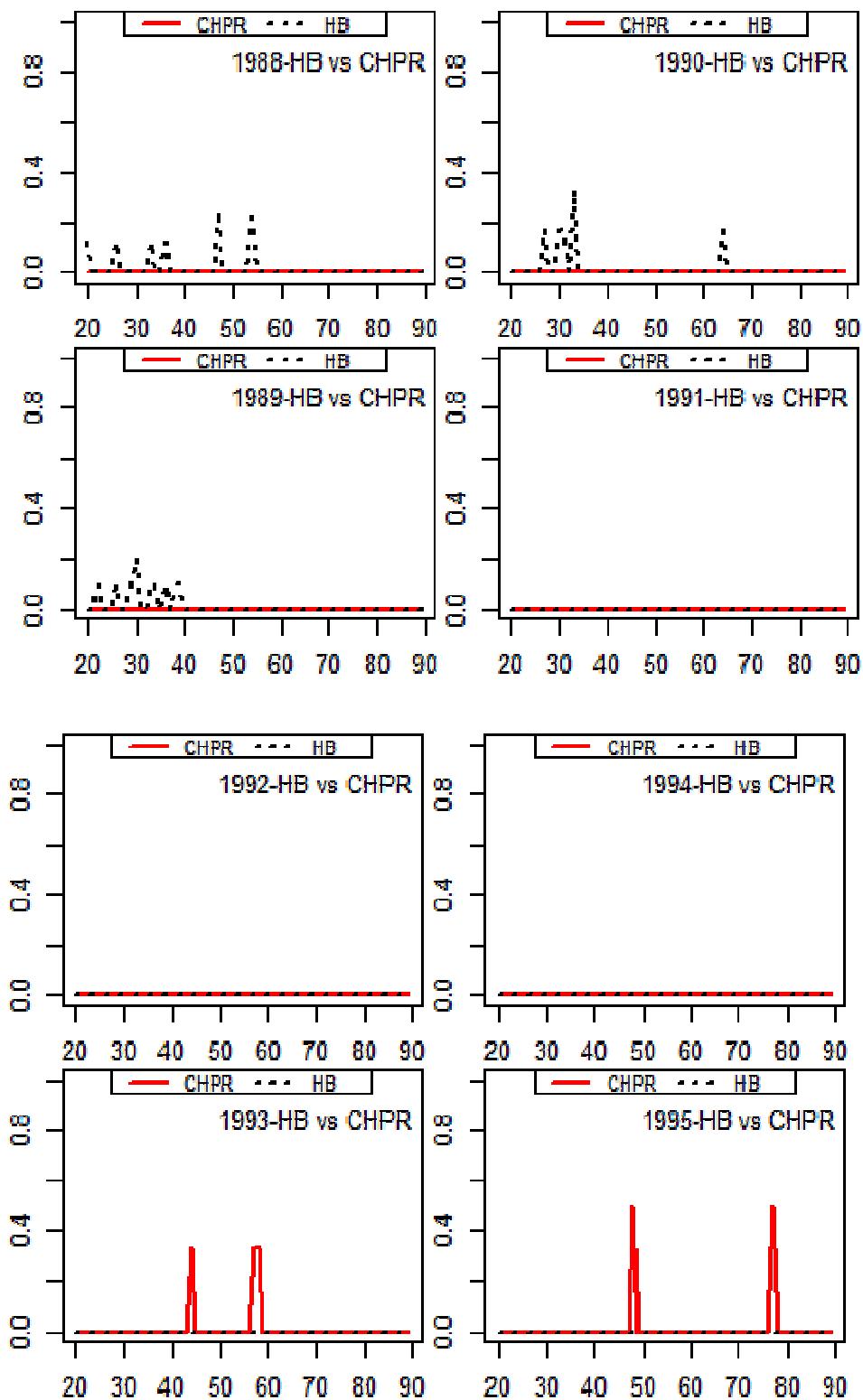


Figure 1. (cont.)

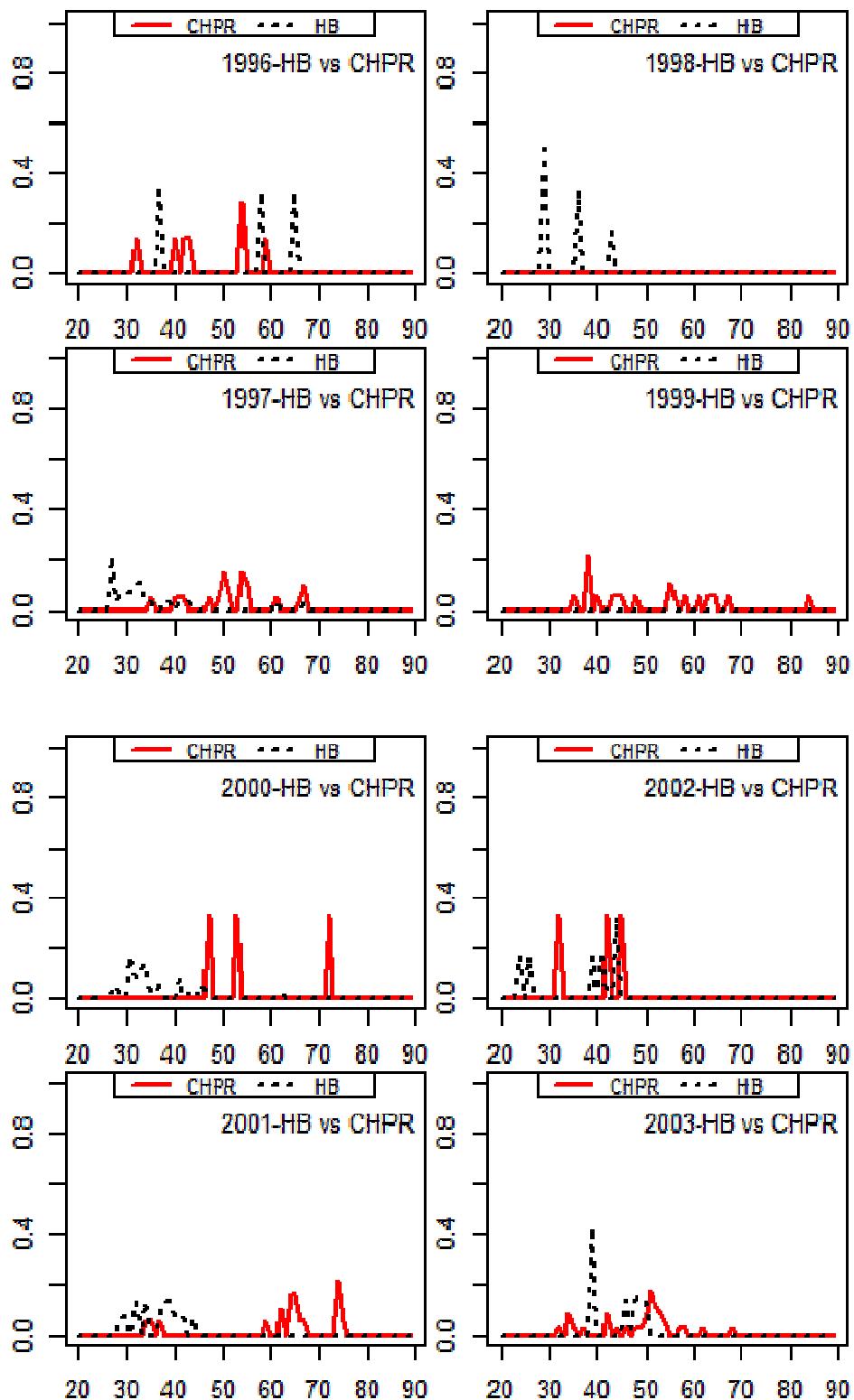


Figure 1. (cont.)

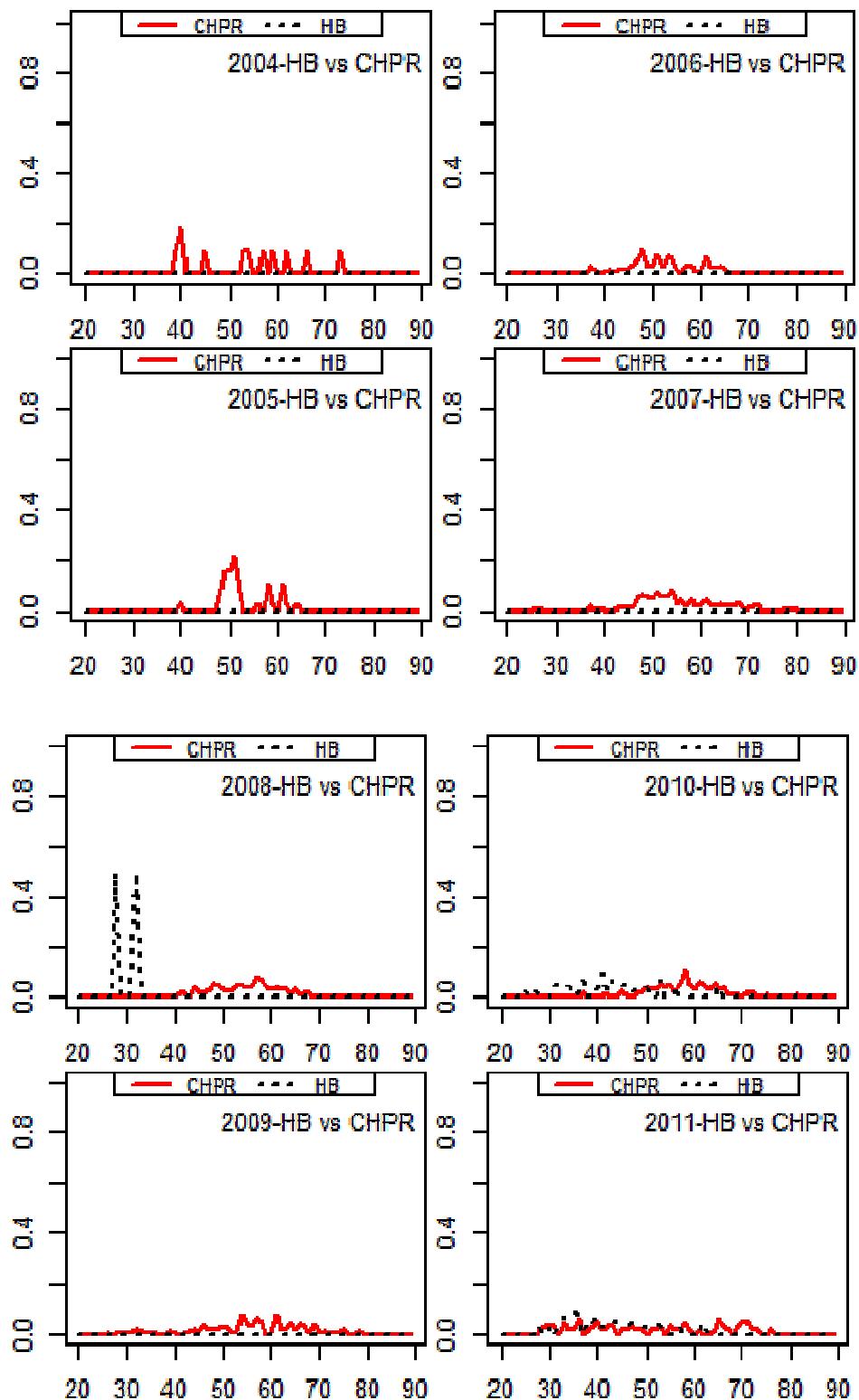


Figure 1. (cont.)

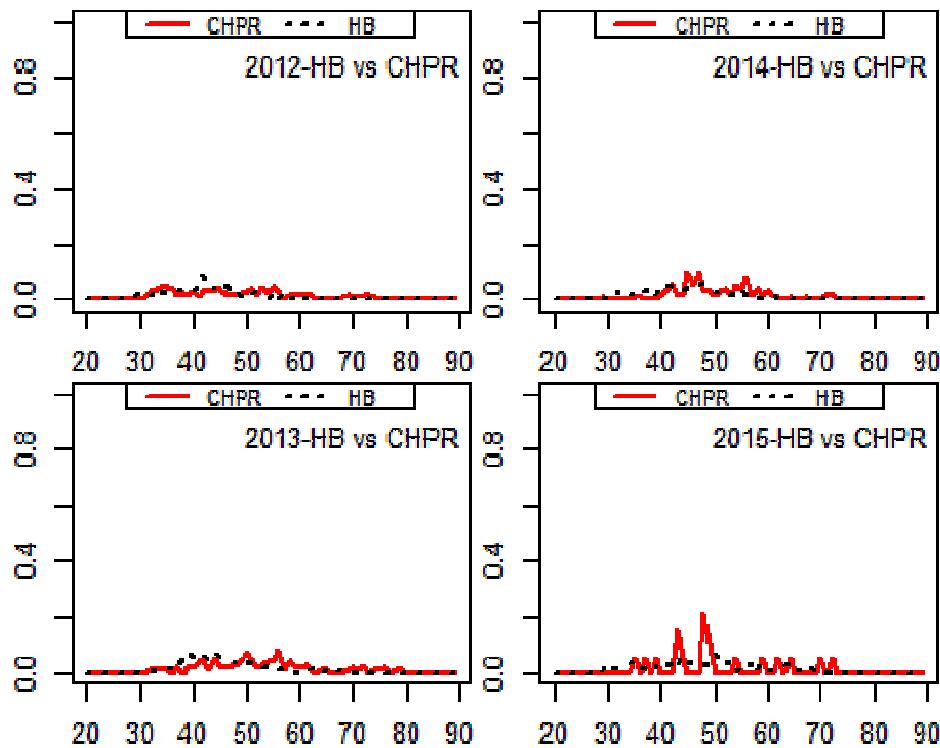


Figure 2. Blueline tilefish nominal length compositions in the charter and private boat modes from MRIP in North and South Carolina and from ODU in Virginia, 2008-2015.

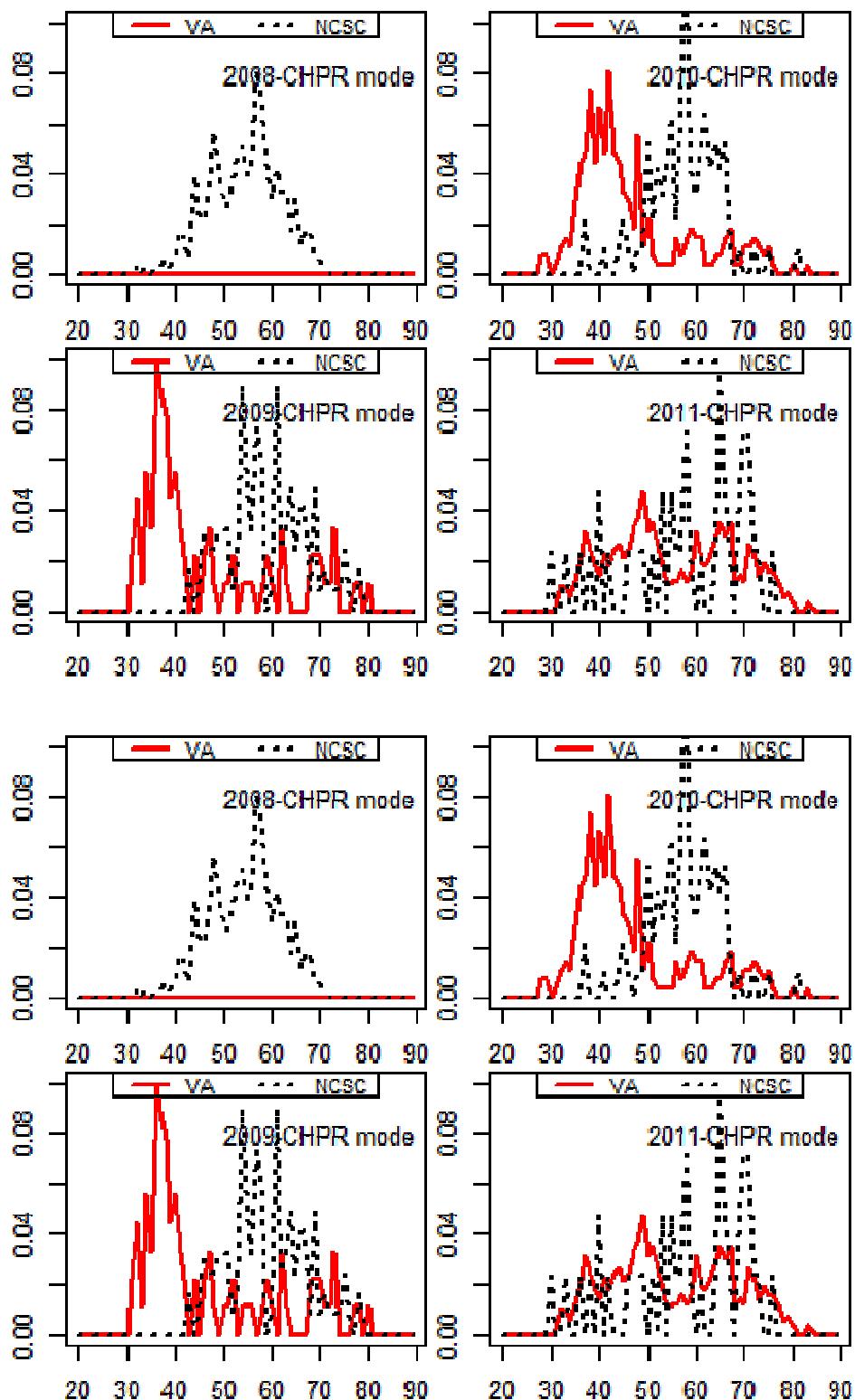


Figure 3. Combined nominal blueline tilefish length compositions from the recreational fishery for the VA/NC state line-N. Cape Hatteras, NC and S. Cape Hatteras, NC to the FL Keys, 1972-2015.

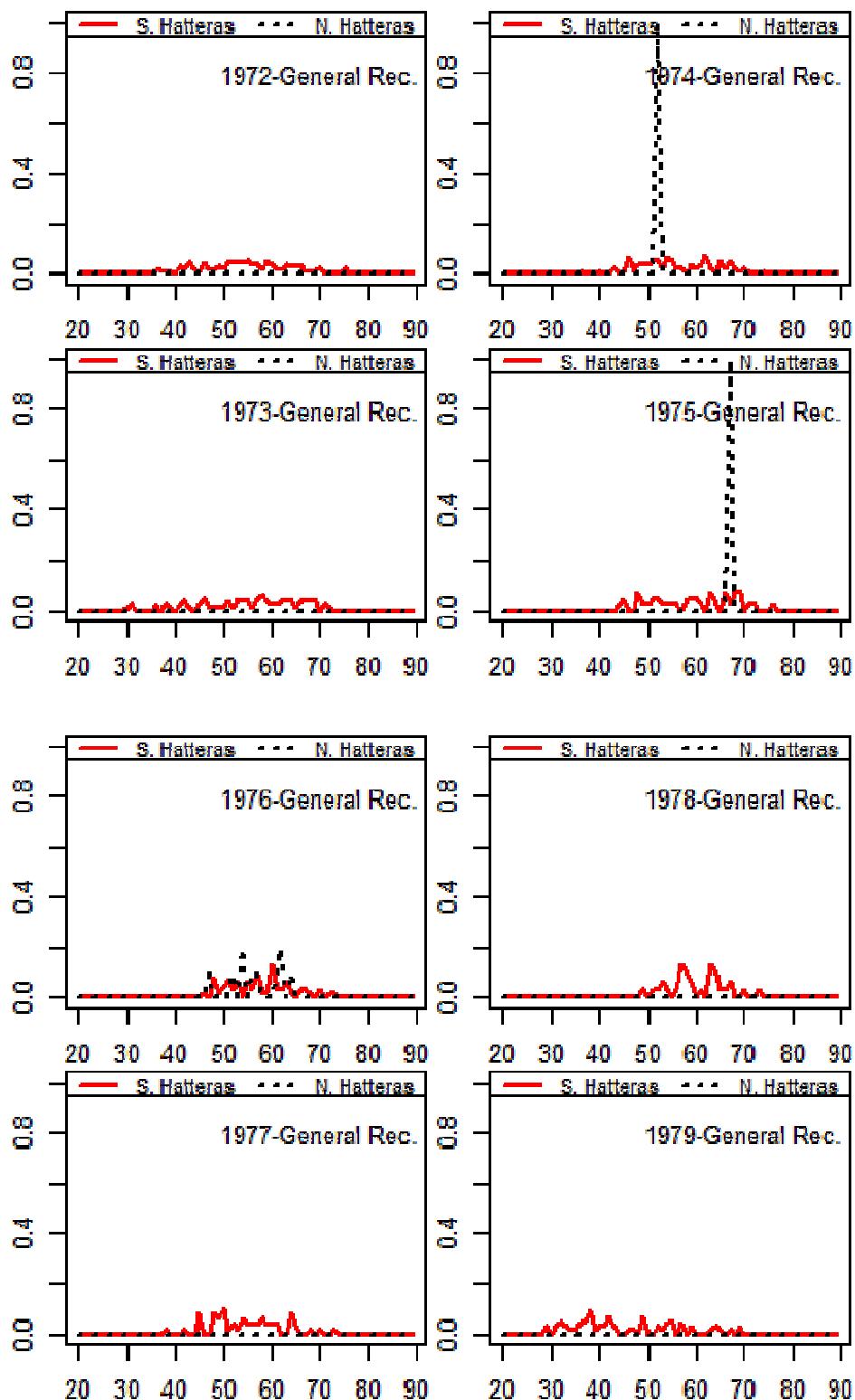


Figure 3. (cont.)

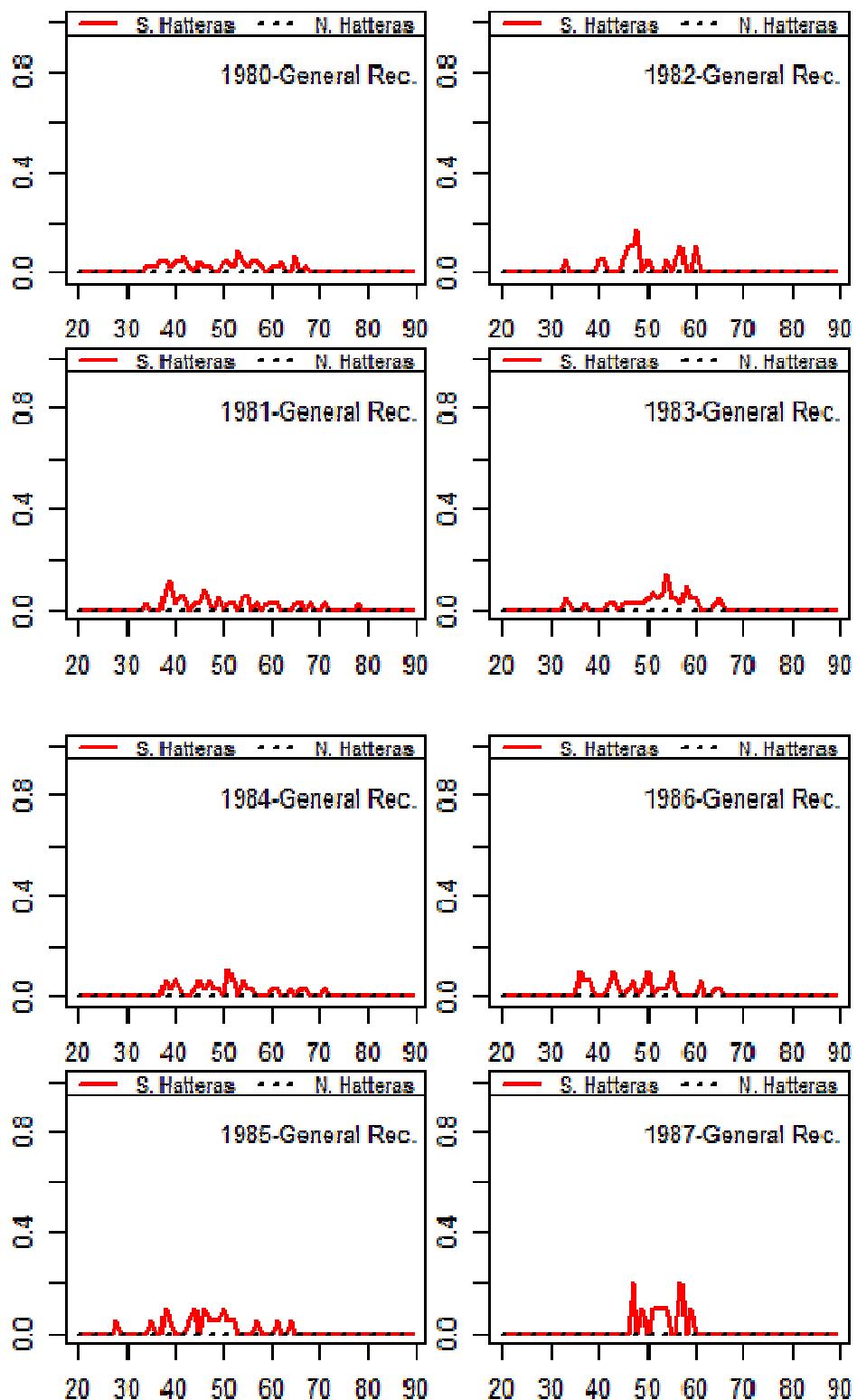


Figure 3. (cont.)

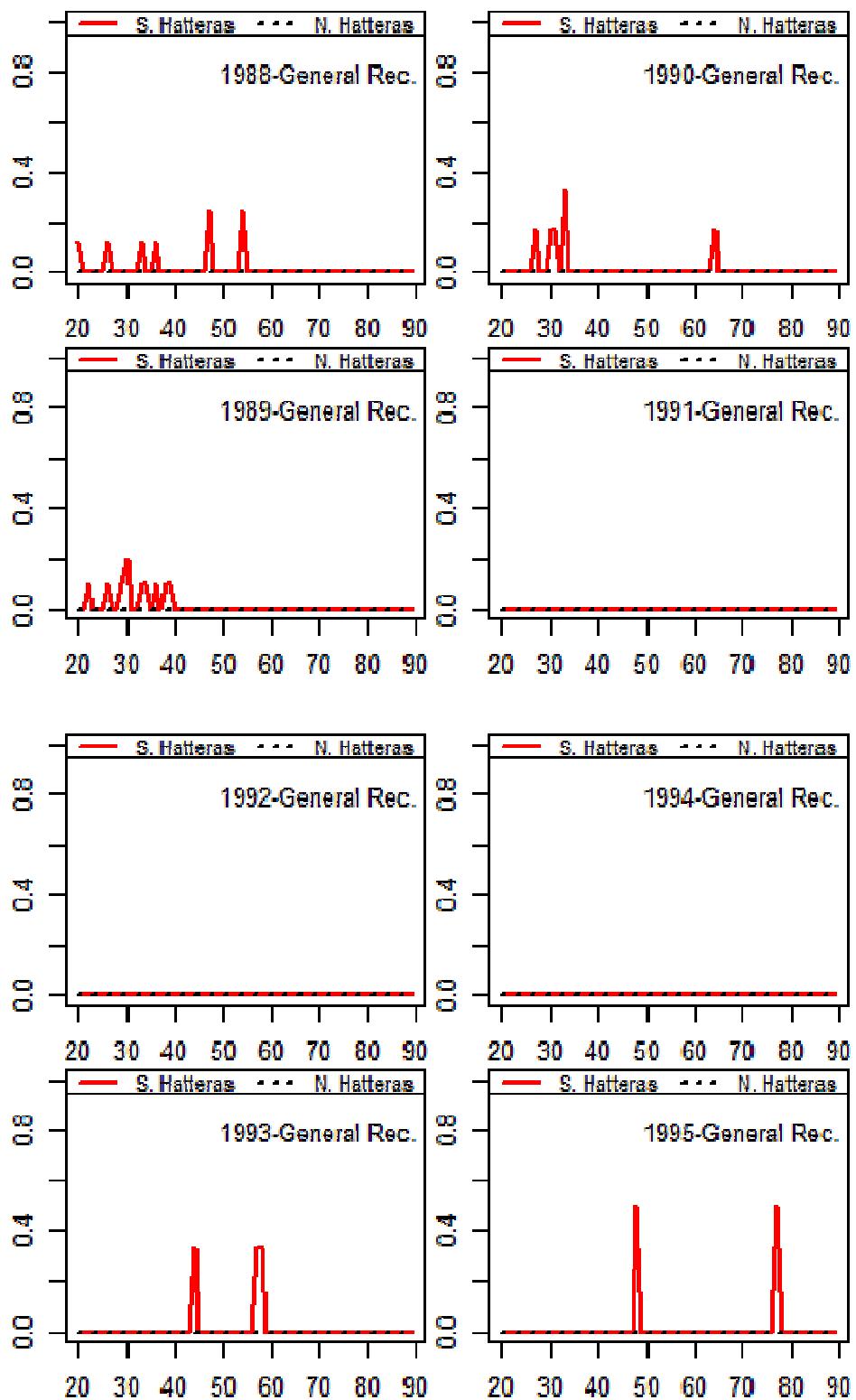


Figure 3. (cont.)

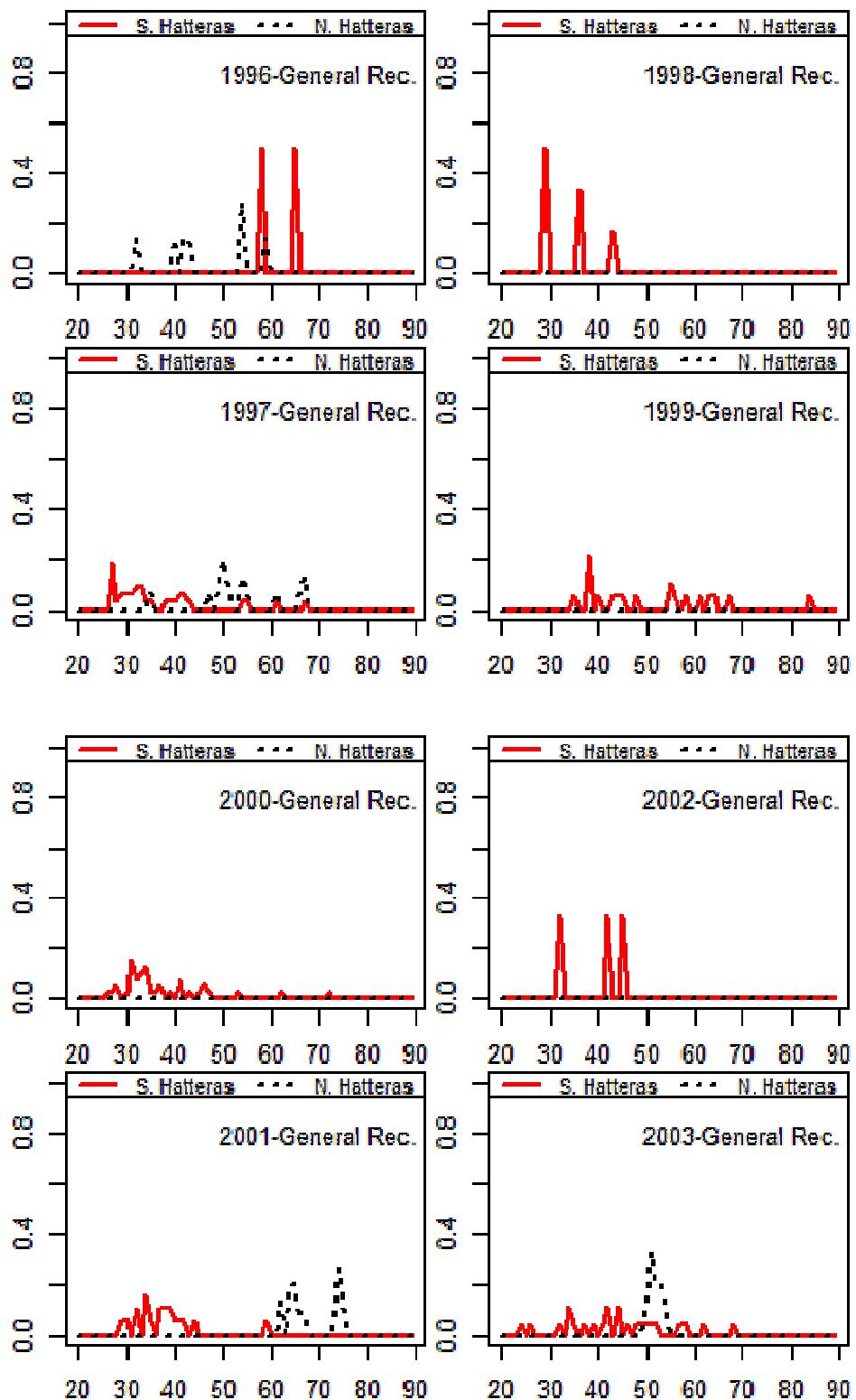


Figure 3. (cont.)

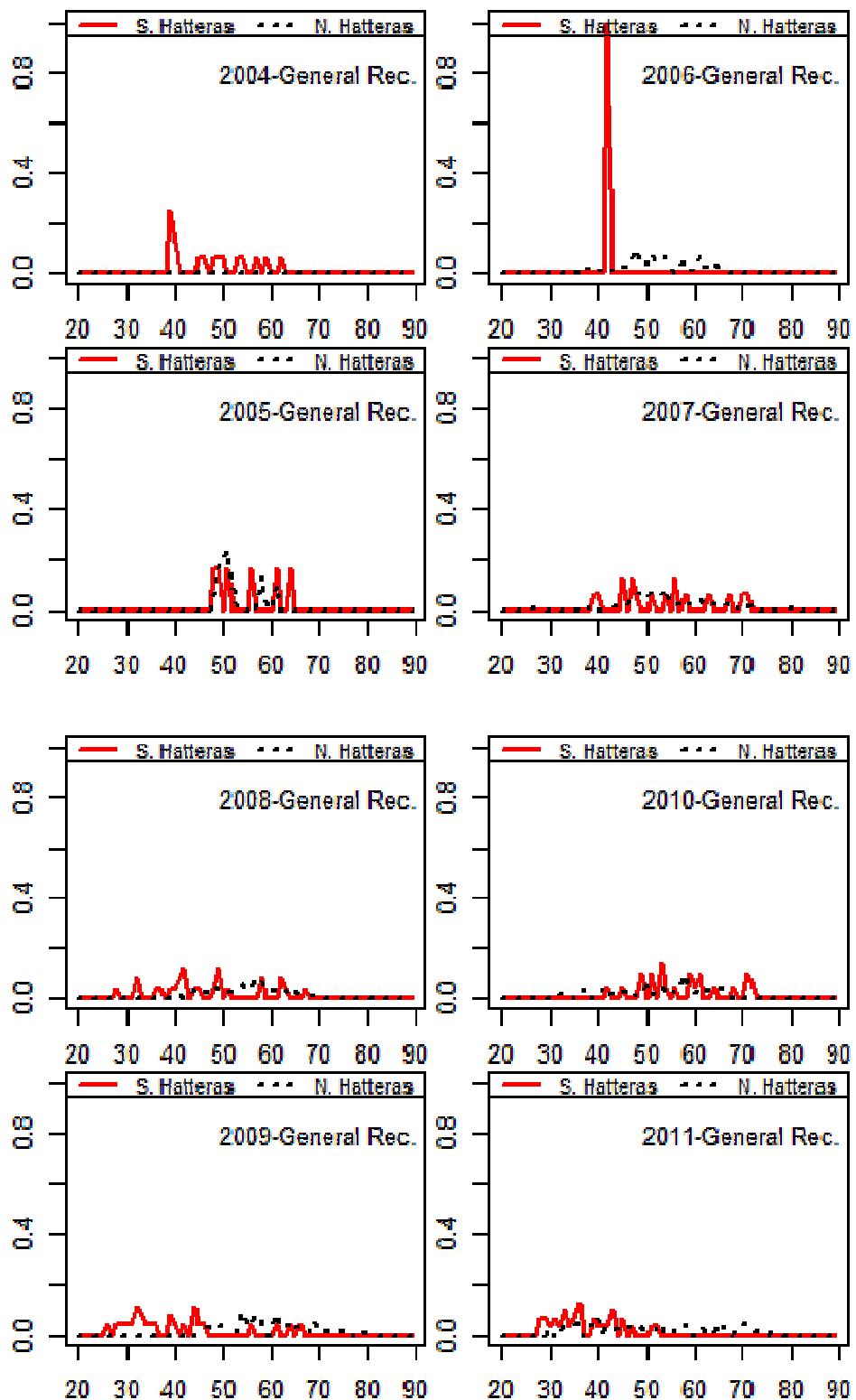
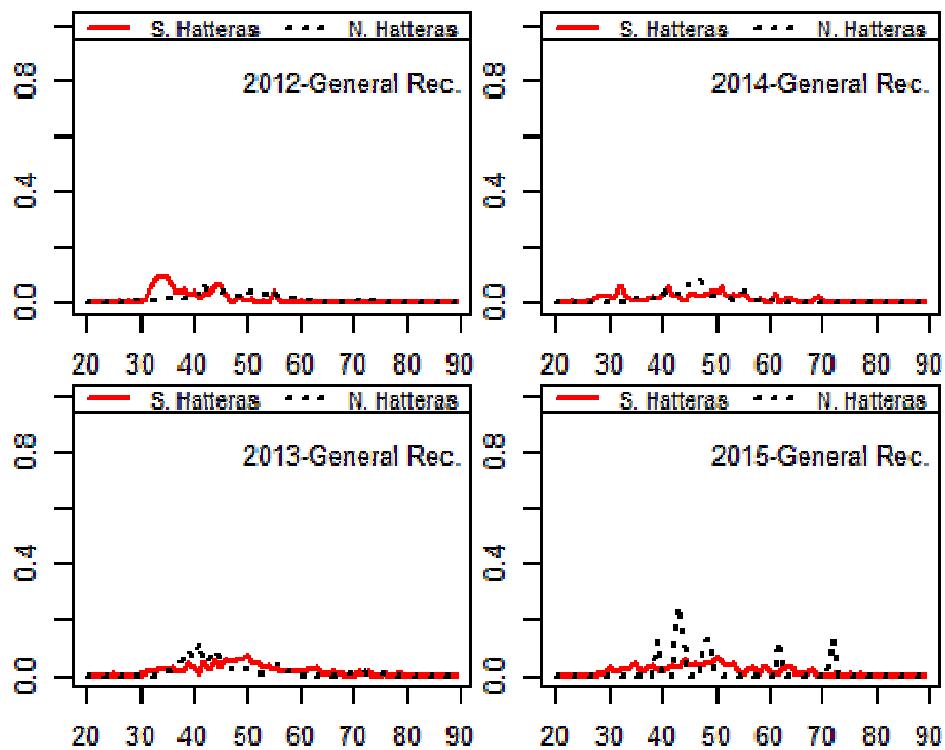


Figure 3. (cont.)



Appendix 1: Combined nominal length composition of blueline tilefish in the recreational fishery from the VA/NC state line to north of Cape Hatteras, NC, 1972-2015.

Appendix 1: (continued).

Year	30	31	32	33	34	35	36
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0.142857143	0	0	0	0
1997	0	0	0	0	0	0.0666666667	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0.012195122
2007	0	0	0	0	0	0	0.003533569
2008	0	0	0	0	0.003164557	0	0
2009	0	0	0	0	0	0	0
2010	0	0.01459854	0.01459854	0.01459854	0.01459854	0	0.00729927
2011	0.025316456	0	0	0.037974684	0.037974684	0.037974684	0.037974684
2012	0.018587361	0.011152416	0.011152416	0.018587361	0.014869889	0.018587361	0.033457249
2013	0.004310345	0	0	0	0	0.00862069	0.017241379
2014	0.003278689	0	0.009836066	0.006557377	0.016393443	0.016393443	0.032786885
2015	0	0	0	0	0	0	0

Appendix 1: (continued).

Year	37	38	39	40	41	42	43
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0.142857143	0	0.142857143	0.142857143
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0.030487805	0.018292683	0.006097561	0.012195122	0.018292683	0.006097561	0.018292683
2007	0.017667845	0.003533569	0	0.003533569	0	0	0.010600707
2008	0	0.006329114	0	0.003164557	0.015822785	0.006329114	0.006329114
2009	0	0	0	0	0	0	0.008264463
2010	0.03649635	0	0.00729927	0.00729927	0.03649635	0.00729927	0.02189781
2011	0	0.037974684	0.025316456	0.063291139	0.012658228	0.037974684	0.012658228
2012	0.018587361	0.018587361	0.029739777	0.026022305	0.033457249	0.066914498	0.040892193
2013	0.025862069	0.060344828	0.090517241	0.064655172	0.11637931	0.064655172	0.047413793
2014	0.026229508	0.019672131	0.013114754	0.036065574	0.052459016	0.055737705	0.032786885
2015	0	0	0.125	0	0	0	0.25

Appendix 1: (continued).

Year	44	45	46	47	48	49	50
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0	0	0.1	0	0	0
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0
1997	0	0	0	0.0666666667	0	0.0666666667	0.2
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0.1333333333
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0.0333333333	0.1666666667	0.2
2006	0.018292683	0.024390244	0.042682927	0.06097561	0.097560976	0.030487805	0.036585366
2007	0.014134276	0.003533569	0.021201413	0.049469965	0.06360424	0.060070671	0.049469965
2008	0.037974684	0.022151899	0.022151899	0.034810127	0.056962025	0.041139241	0.03164557
2009	0	0.008264463	0.033057851	0.024793388	0.024793388	0.033057851	0.033057851
2010	0.02919708	0.02919708	0.02189781	0.00729927	0.01459854	0.01459854	0.051094891
2011	0.025316456	0.012658228	0.025316456	0.037974684	0.025316456	0.025316456	0.012658228
2012	0.029739777	0.037174721	0.040892193	0.029739777	0.029739777	0.018587361	0.040892193
2013	0.090517241	0.064655172	0.043103448	0.017241379	0.017241379	0.017241379	0.025862069
2014	0.042622951	0.068852459	0.068852459	0.08852459	0.059016393	0.032786885	0.019672131
2015	0.125	0	0	0	0.125	0.125	0

Appendix 1: (continued).

Year	51	52	53	54	55	56	57
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	1	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0.1	0	0.2	0	0.1	0.1
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0.285714286	0	0	0
1997	0.133333333	0	0	0.133333333	0.066666667	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0.333333333	0.2	0.2	0.133333333	0	0	0
2004	0	0	0	0	0	0	0
2005	0.233333333	0.1	0	0	0	0	0
2006	0.079268293	0.036585366	0.067073171	0.06097561	0.018292683	0.006097561	0.036585366
2007	0.067137809	0.056537103	0.060070671	0.081272085	0.024734982	0.03180212	0.017667845
2008	0.025316456	0.037974684	0.050632911	0.053797468	0.041139241	0.044303798	0.085443038
2009	0.033057851	0.008264463	0.016528926	0.090909091	0.049586777	0.033057851	0.074380165
2010	0.01459854	0.02919708	0.04379562	0.02919708	0.04379562	0.02189781	0.04379562
2011	0.012658228	0.025316456	0.037974684	0	0.025316456	0.012658228	0.025316456
2012	0.037174721	0.029739777	0.040892193	0.022304833	0.037174721	0.022304833	0.018587361
2013	0.021551724	0.004310345	0.012931035	0.012931035	0.030172414	0.038793103	0.00862069
2014	0.019672131	0.032786885	0.013114754	0.042622951	0.039344262	0.039344262	0.02295082
2015	0	0	0	0	0	0	0

Appendix 1: (continued).

Year	58	59	60	61	62	63	64
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0	0	0.1	0.2	0	0.1
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0.142857143	0	0	0	0	0
1997	0	0	0	0.066666667	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0.133333333	0	0.2
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0.133333333	0.033333333	0	0.1	0	0	0
2006	0.042682927	0.012195122	0.018292683	0.067073171	0.030487805	0.018292683	0.036585366
2007	0.042402827	0.021201413	0.024734982	0.038869258	0.028268551	0.014134276	0.024734982
2008	0.066455696	0.047468354	0.03164557	0.044303798	0.03164557	0.034810127	0.018987342
2009	0.05785124	0	0.008264463	0.082644628	0.024793388	0.033057851	0.049586777
2010	0.094890511	0.02919708	0.02189781	0.03649635	0.04379562	0.02919708	0.03649635
2011	0.037974684	0.012658228	0	0.012658228	0.025316456	0	0.012658228
2012	0.022304833	0.014869889	0.022304833	0.014869889	0.011152416	0.007434944	0.003717472
2013	0.012931035	0.012931035	0	0.012931035	0.004310345	0	0.004310345
2014	0.013114754	0.016393443	0.019672131	0.006557377	0.003278689	0.003278689	0.003278689
2015	0	0	0	0	0.125	0	0

Appendix 1: (continued).

Year	65	66	67	68	69	70	71
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	1	0	0	0	0
1976	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0
1997	0	0.066666667	0.133333333	0	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0.2	0.066666667	0.066666667	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0.024390244	0.006097561	0.006097561	0	0	0	0
2007	0.021201413	0.017667845	0.021201413	0.024734982	0.003533569	0.010600707	0.014134276
2008	0.03164557	0.012658228	0.018987342	0.018987342	0.006329114	0.006329114	0.003164557
2009	0.024793388	0.041322314	0.041322314	0.008264463	0.049586777	0.008264463	0.016528926
2010	0.04379562	0.03649635	0.00729927	0	0.00729927	0	0
2011	0.050632911	0.025316456	0.012658228	0	0.025316456	0.037974684	0.037974684
2012	0.003717472	0.003717472	0.003717472	0.007434944	0.011152416	0.011152416	0.007434944
2013	0.004310345	0	0	0	0.004310345	0.00862069	0.004310345
2014	0	0	0.003278689	0.003278689	0	0	0.006557377
2015	0	0	0	0	0	0	0

Appendix 1: (continued).

Year	72	73	74	75	76	77	78
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0.2666666667	0.0666666667	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0
2007	0.017667845	0	0	0	0	0.007067138	0.007067138
2008	0	0	0	0	0	0	0
2009	0.008264463	0.008264463	0.008264463	0.024793388	0.008264463	0	0.016528926
2010	0.00729927	0	0	0.00729927	0	0	0
2011	0.012658228	0.012658228	0	0	0.012658228	0	0
2012	0.014869889	0.011152416	0.007434944	0	0.003717472	0	0
2013	0.012931035	0	0.004310345	0.004310345	0.004310345	0	0
2014	0.006557377	0	0	0	0	0	0
2015	0.125	0	0	0	0	0	0

Appendix 1: (continued).

Appendix 2: Combined nominal length composition of blueline tilefish in the recreational fishery from south of Cape Hatteras, NC to the FL Keys, 1972-2015.

Appendix 2: (continued).

Year	29	30	31	32	33	34	35	36	37	38
1972	-	-	-	-	-	-	0.0160	0.0160	0.0080	
1973	-	0.0125	0.0250	-	-	-	0.0250	-	0.0250	
1974	-	-	-	-	-	-	0.0132	-	-	
1975	-	-	-	-	-	-	-	-	-	
1976	-	-	-	-	-	-	-	-	-	
1977	-	-	-	-	-	-	-	-	0.0204	
1978	-	-	-	-	-	-	-	-	-	
1979	0.0328	-	0.0328	0.0492	0.0328	0.0164	0.0164	0.0492	0.0492	0.0984
1980	-	-	-	-	-	0.0222	0.0222	0.0222	0.0444	0.0444
1981	-	-	-	-	-	0.0278	-	-	-	0.0833
1982	-	-	-	-	0.0556	-	-	-	-	
1983	-	-	-	-	0.0465	0.0233	-	-	0.0233	-
1984	-	-	-	-	-	-	-	-	-	0.0690
1985	-	-	-	-	-	-	0.0500	-	-	0.1000
1986	-	-	-	-	-	-	-	0.1000	0.0667	0.0667
1987	-	-	-	-	-	-	-	-	-	
1988	-	-	-	-	0.1250	-	-	0.1250	-	
1989	0.1000	0.2000	-	-	0.1000	0.1000	-	0.1000	-	0.1000
1990	-	0.1667	0.1667	-	0.3333	-	-	-	-	
1991	-	-	-	-	-	-	-	-	-	
1992	-	-	-	-	-	-	-	-	-	
1993	-	-	-	-	-	-	-	-	-	
1994	-	-	-	-	-	-	-	-	-	
1995	-	-	-	-	-	-	-	-	-	
1996	-	-	-	-	-	-	-	-	-	
1997	0.0606	0.0606	0.0606	0.0909	0.0909	0.0303	0.0303	-	-	0.0303
1998	0.5000	-	-	-	-	-	-	0.3333	-	-
1999	-	-	-	-	-	-	0.0526	-	-	0.2105
2000	-	0.0256	0.1538	0.0769	0.1026	0.1282	0.0256	0.0256	0.0513	-
2001	0.0526	0.0526	-	0.1053	-	0.1579	0.0526	-	0.1053	0.1053
2002	-	-	-	0.3333	-	-	-	-	-	
2003	-	-	-	0.0385	-	0.1154	0.0385	-	0.0385	-
2004	-	-	-	-	-	-	-	-	-	
2005	-	-	-	-	-	-	-	-	-	
2006	-	-	-	-	-	-	-	-	-	
2007	-	-	-	-	-	-	-	-	-	
2008	-	-	-	0.0800	-	-	-	0.0400	0.0400	-
2009	0.0385	0.0385	0.0385	0.1154	0.0769	0.0385	0.0385	0.0385	-	-
2010	-	-	-	-	-	-	-	-	-	
2011	0.0645	0.0323	0.0645	0.0323	0.0968	0.0323	0.0645	0.1290	-	-
2012	-	0.0101	0.0202	0.0606	0.0909	0.0909	0.0909	0.0606	0.0404	0.0505
2013	-	0.0041	0.0124	0.0083	0.0207	0.0207	0.0165	0.0248	0.0124	0.0165
2014	0.0238	0.0238	0.0159	0.0635	0.0238	0.0159	0.0079	0.0079	0.0159	0.0238
2015	0.0057	0.0287	0.0115	0.0172	0.0172	0.0287	0.0402	0.0115	0.0230	0.0345

Appendix 2: (continued).

Year	39	40	41	42	43	44	45	46	47	48	49
1972	0.0080	-	0.0320	0.0240	0.0480	0.0160	-	0.0480	0.0160	0.0160	0.0320
1973	0.0125	-	0.0250	0.0375	0.0125	-	0.0250	0.0500	0.0125	0.0125	0.0125
1974	-	0.0132	-	-	0.0263	-	-	0.0658	0.0132	0.0395	0.0395
1975	-	-	-	-	-	0.0250	0.0500	-	-	0.0750	0.0250
1976	-	-	-	-	-	-	-	0.0167	-	0.0833	0.0167
1977	-	-	-	0.0204	-	-	0.0816	-	-	0.0816	0.0612
1978	-	-	-	-	-	-	-	-	-	-	0.0333
1979	0.0164	0.0328	0.0328	0.0656	0.0328	-	-	0.0164	0.0164	-	0.0656
1980	0.0222	0.0444	0.0444	0.0667	0.0222	-	0.0444	0.0222	0.0222	-	-
1981	0.1111	0.0278	0.0556	0.0556	-	0.0278	0.0278	0.0833	0.0278	-	0.0556
1982	-	0.0556	0.0556	-	-	-	0.0556	0.1111	0.1111	0.1667	-
1983	-	-	-	0.0233	0.0233	-	0.0233	0.0233	0.0233	0.0233	0.0233
1984	0.0345	0.0690	0.0345	-	-	0.0345	0.0690	0.0345	0.0690	0.0345	0.0345
1985	0.0500	-	-	-	0.0500	0.1000	-	0.1000	0.0500	0.0500	0.0500
1986	-	-	-	0.0333	0.1000	0.0333	-	0.0333	0.0667	-	0.0333
1987	-	-	-	-	-	-	-	-	0.2000	-	0.1000
1988	-	-	-	-	-	-	-	-	0.2500	-	-
1989	0.1000	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	0.3333	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	-	0.5000	-
1996	-	-	-	-	-	-	-	-	-	-	-
1997	0.0303	0.0303	0.0606	0.0606	0.0303	-	-	-	-	-	-
1998	-	-	-	-	0.1667	-	-	-	-	-	-
1999	-	0.0526	-	-	0.0526	0.0526	0.0526	-	-	0.0526	-
2000	0.0256	-	0.0769	-	0.0256	-	0.0256	0.0513	0.0256	-	-
2001	0.1053	0.0526	0.0526	0.0526	-	0.0526	-	-	-	-	-
2002	-	-	-	0.3333	-	-	0.3333	-	-	-	-
2003	0.0385	-	0.0385	0.1154	-	0.1154	-	0.0385	-	0.0385	0.0385
2004	0.2500	0.1250	-	-	-	-	0.0625	0.0625	-	0.0625	0.0625
2005	-	-	-	-	-	-	-	-	-	0.1667	0.1667
2006	-	-	-	1.0000	-	-	-	-	-	-	-
2007	0.0625	0.0625	-	-	-	-	0.1250	-	0.1250	0.0625	-
2008	0.0400	0.0400	0.0800	0.1200	-	0.0400	0.0400	-	-	0.0400	0.1200
2009	0.0769	0.0385	-	0.0385	-	0.1154	0.0385	0.0385	-	-	-
2010	-	-	-	0.0476	-	-	0.0476	-	-	-	0.0952
2011	0.0645	0.0323	0.0323	0.0323	0.0968	-	0.0645	-	0.0323	-	-
2012	0.0303	0.0404	0.0202	0.0303	0.0404	0.0606	0.0606	0.0303	-	0.0202	0.0202
2013	0.0372	0.0289	0.0041	0.0455	0.0207	0.0537	0.0289	0.0537	0.0496	0.0579	0.0579
2014	0.0159	0.0317	0.0556	0.0317	0.0238	0.0079	0.0317	0.0317	0.0238	0.0317	0.0397
2015	0.0172	0.0115	0.0230	0.0345	0.0230	0.0517	0.0345	0.0402	0.0345	0.0402	0.0402

Appendix 2: (continued).

Year	50	51	52	53	54	55	56	57	58	59
1972	0.0240	0.0480	0.0480	0.0480	0.0480	0.0560	0.0400	0.0400	0.0160	0.0560
1973	0.0125	0.0375	0.0125	0.0500	0.0375	0.0375	0.0125	0.0500	0.0625	0.0375
1974	0.0395	0.0526	0.0526	0.0263	0.0658	0.0526	0.0263	0.0263	-	0.0395
1975	0.0250	0.0500	0.0500	0.0250	0.0250	0.0250	0.0250	-	0.0500	0.0500
1976	0.0500	0.0667	0.0333	0.0667	-	0.0667	0.0333	0.1000	0.0167	0.0167
1977	0.1020	0.0204	0.0408	0.0204	0.0612	0.0408	0.0408	0.0408	0.0612	0.0408
1978	-	0.0333	0.0333	0.0667	0.0333	-	0.0333	0.1333	0.1000	0.0667
1979	-	-	0.0328	0.0164	0.0492	0.0492	-	0.0492	-	0.0328
1980	0.0444	0.0444	0.0222	0.0889	0.0444	0.0222	0.0444	0.0444	0.0222	-
1981	-	0.0278	0.0278	-	0.0556	0.0556	-	0.0278	-	0.0278
1982	0.0556	-	-	-	0.0556	-	0.0556	0.1111	-	-
1983	0.0465	0.0698	0.0465	0.0698	0.1395	0.0465	0.0465	0.0233	0.0930	0.0465
1984	-	0.1034	0.0690	-	0.0690	0.0345	0.0345	-	-	-
1985	0.1000	0.0500	0.0500	-	-	-	-	0.0500	-	-
1986	0.1000	-	0.0333	0.0333	0.0333	0.1000	0.0333	-	-	-
1987	-	0.1000	0.1000	0.1000	0.1000	-	-	0.2000	-	0.1000
1988	-	-	-	-	0.2500	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	0.3333	0.3333	-
1994	-	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-	-	0.5000	-
1997	-	-	-	0.0303	0.0303	-	-	-	-	-
1998	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	0.1053	0.0526	-	0.0526	-	-
2000	-	-	-	0.0256	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	0.0526
2002	-	-	-	-	-	-	-	-	-	-
2003	0.0385	0.0385	0.0385	-	-	-	-	0.0385	0.0385	-
2004	0.0625	-	-	0.0625	0.0625	-	-	0.0625	-	0.0625
2005	-	0.1667	-	-	-	-	0.1667	-	-	-
2006	-	-	-	-	-	-	-	-	-	-
2007	-	0.0625	-	-	0.0625	-	0.1250	-	0.0625	-
2008	-	0.0400	-	-	-	-	-	-	0.0800	-
2009	-	-	-	-	-	0.0385	-	-	-	-
2010	-	0.0952	-	0.1429	0.0476	-	0.0476	-	-	0.0952
2011	-	0.0323	0.0323	-	-	-	-	-	-	-
2012	0.0101	0.0202	-	0.0101	-	0.0404	0.0202	-	-	-
2013	0.0702	0.0455	0.0413	0.0289	0.0331	0.0165	0.0165	0.0083	0.0124	0.0083
2014	0.0397	0.0556	0.0238	0.0317	0.0238	0.0397	0.0238	0.0079	0.0159	0.0079
2015	0.0632	0.0460	0.0345	0.0402	0.0172	0.0057	0.0172	0.0287	0.0057	0.0345

Appendix 2: (continued).

Year	60	61	62	63	64	65	66	67	68	69	70
1972	0.0400	0.0160	0.0160	0.0400	0.0320	0.0320	0.0400	0.0080	0.0080	0.0160	0.0240
1973	0.0250	0.0250	0.0375	0.0375	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	-
1974	0.0263	0.0395	0.0789	0.0263	0.0132	0.0526	0.0263	0.0526	0.0263	0.0132	0.0263
1975	0.0500	0.0250	-	0.0750	0.0250	-	0.0750	0.0250	0.0750	0.0750	-
1976	0.1333	0.0333	0.0333	0.0667	0.0167	-	0.0333	0.0333	0.0167	-	0.0333
1977	0.0408	0.0408	-	-	0.0816	0.0408	-	-	0.0204	-	0.0204
1978	-	0.0333	-	0.1333	0.1000	0.0333	0.0333	0.0667	-	-	0.0333
1979	-	-	-	0.0164	0.0328	0.0164	-	0.0164	-	0.0328	-
1980	0.0222	0.0222	0.0444	-	-	0.0667	-	0.0222	-	-	-
1981	0.0278	0.0278	-	-	-	0.0278	0.0278	-	0.0278	-	-
1982	0.1111	-	-	-	-	-	-	-	-	-	-
1983	0.0465	-	-	-	0.0233	0.0465	-	-	-	-	-
1984	0.0345	0.0345	-	-	0.0345	-	0.0345	0.0345	-	-	-
1985	-	0.0500	-	-	0.0500	-	-	-	-	-	-
1986	-	0.0667	-	-	0.0333	0.0333	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	0.1667	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	-	-	-
1996	-	-	-	-	-	0.5000	-	-	-	-	-
1997	-	0.0303	-	-	-	-	-	0.0303	-	-	-
1998	-	-	-	-	-	-	-	-	-	-	-
1999	-	0.0526	-	0.0526	0.0526	-	-	0.0526	-	-	-
2000	-	-	0.0256	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	0.0385	-	-	-	-	-	0.0385	-	-
2004	-	-	0.0625	-	-	-	-	-	-	-	-
2005	-	0.1667	-	-	0.1667	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	-	0.0625	-	-	-	0.0625	-	-	0.0625
2008	-	-	0.0800	0.0400	-	-	-	0.0400	-	-	-
2009	-	0.0385	-	-	0.0385	-	0.0385	-	-	-	-
2010	0.0476	0.0952	-	-	0.0476	-	-	-	0.0476	-	-
2011	-	-	-	-	-	-	-	-	-	-	-
2012	0.0101	-	-	-	-	-	-	-	-	-	-
2013	0.0083	0.0207	0.0165	0.0289	0.0041	0.0041	0.0124	0.0041	0.0041	-	-
2014	-	0.0397	-	0.0159	0.0159	0.0079	-	-	0.0079	0.0238	0.0159
2015	0.0115	0.0057	0.0115	0.0230	0.0230	0.0057	0.0057	0.0115	0.0172	-	-

Appendix 2: (continued).

Year	71	72	73	74	75	76	77	78	79	80	81
1972	-	-	-	-	0.0240	-	-	-	-	-	-
1973	0.0250	0.0125	-	-	-	-	-	-	-	-	-
1974	0.0132	-	-	0.0132	-	-	-	-	-	-	-
1975	0.0250	0.0250	-	-	-	0.0250	-	-	-	-	-
1976	-	0.0167	0.0167	-	-	-	-	-	-	-	-
1977	-	-	0.0204	-	-	-	-	-	-	-	-
1978	-	-	0.0333	-	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-
1981	0.0278	-	-	-	-	-	-	0.0278	-	-	-
1982	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-
1984	0.0345	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	0.5000	-	-	-	-
1996	-	-	-	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2000	-	0.0256	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-	-	-
2007	0.0625	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	-	-	-
2010	0.0952	0.0476	-	-	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-
2013	0.0083	0.0041	0.0083	-	0.0041	0.0041	-	0.0041	0.0041	-	-
2014	-	-	-	-	-	-	-	-	-	-	-
2015	-	0.0057	-	-	0.0057	-	0.0057	-	-	-	-

Appendix 2: (continued).