

Exploratory Data Analyses of Atlantic Cobia (*Rachycentron canadum*) Sampled for Length from Federal Sampling Programs

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Introduction

This document provides exploratory data analyses (EDA) for Atlantic Cobia (*Rachycentron canadum*) sampled for length from federal sampling programs for the SEDAR 107 assessment. Retained fish lengths from the commercial sector were sampled by the Trip Interview Program (TIP, Beggerly *et al.* 2022), while the Marine Recreational Information Program (MRIP, SEDAR107-DW-01) and Southeast Region Headboat Survey (SRHS, SEDAR107-DW-02) sampled lengths from the recreational sector. From recreational headboats, lengths from discarded King Mackerel were obtained using MRIP sampling methodology.

Commercial Retained Fish Lengths

Commercial retained fish lengths for the southeast region are provided by the Trip Interview Program (TIP), and cover Florida through North Carolina. For the current assessment, only Georgia through North Carolina have been provided to align with the stock boundary at the Florida-Georgia line. Only exploratory data analyses are provided here, as the final compositions for commercial data will include additional data sources to be compiled by state partners.

Cobia length samples provided by TIP are available starting in 1983 through the terminal year of 2024. The data are recommended to be filtered to remove any biased sampling, any data coming from interviews that span multiple trips, and any Florida data. The sample sizes of the recommended dataset after filtering are shown by year and state in Table 1. The majority of available samples come from North Carolina (Figure 1) and from the handline fishery (Figure 2), although in recent years an increasing number of samples have come from the gillnet fishery (grouped into the “Other” category in Figure 2). The available lengths have a minimum of approximately 400 mm fork length (FL) and a maximum of approximately 1,600 mm FL and are relatively normally distributed (Figure 3). There were no size outliers removed from the dataset.

Recreational Retained Fish Lengths

Two federal surveys provided recreational Cobia length samples for SEDAR 107, MRIP (SEDAR107-DW-01) and SRHS (SEDAR107-DW-02; Table 2). MRIP (formerly known as the

Marine Recreational Fishing Statistics Survey, MRFSS) began in March 1981 and samples from charter (CB), private (PR), and shore (SH) modes from all Atlantic states, and headboat (HB) samples from Maine to Virginia. The access point angler survey (APAIS) component of MRIP collects information on recreational catch and fishing trip characteristics, including fish lengths and weights, from anglers at public marine fishing access sites (NMFS OST 2023). MRIP lengths were provided from Maine to Georgia for 1981-2024.

The SRHS program estimates landings and effort for headboat vessels. The SRHS program began in 1972 in North and South Carolina, expanded to Georgia and northeast Florida (Nassau-Indian River counties) in 1976, and to southeast Florida in (St. Lucie-Monroe counties) in 1978 (Fitzpatrick et al 2017). Biological samples (e.g. length, weight, and age structures) are collected as part of the SRHS dockside intercept sampling program (DISP) component of the SRHS program (Fitzpatrick et al. 2017). DISP sampling was temporarily suspended in March 2020 due to the COVID pandemic and no biological samples were collected. DISP biological sampling resumed in July 2021 once NMFS/SEFSC approved safety measures were approved (Cheshire et al. 2023). SRHS provided Atlantic Cobia headboat lengths from North Carolina to Florida for 1974-2025. SRHS samples from Florida were excluded prior to conducting EDA.

For intercepted angler trips where both fish length and weight are missing, MRIP uses hot and cold-deck imputation to impute lengths (NMFS OST 2023; Figure 4). Imputed lengths were excluded prior to combining the MRIP and SRHS data sets for EDA. Imputed lengths are not included in recreational length compositions produced by the Southeast Fisheries Science Center (SEFSC) due to concerns about smearing year classes and the inclusion of duplicated length samples.

During EDA, only four additional samples were flagged to be excluded from analyses. Two samples had fork lengths greater than 6,000 mm, which is unrealistic for Cobia. Two samples were flagged to be excluded because when evaluating their length-weight relationship, it suggests there is either a length or a weight error and it is not known which is the correct value (Figure 5). Final sample sizes of lengths recommended to be included in recreational length composition analyses are provided by state (Table 3, Figure 6) and mode (Table 4, Figure 7). The annual number of samples and trips recommended to be included in recreational length composition analyses are shown in Table 5. The nominal length distribution (years combined) for lengths sampled by MRIP and SRHS is shown in Figure 8.

Recreational Discard Fish Lengths

For SEDAR 107, lengths from discarded Cobia are only available from the HB mode. Discard lengths have routinely been sampled from Maine to Virginia since 2004 as part of MRIP APAIS at-sea sampling for headboats (ACCSP 2025). In 2004, at-sea headboat sampling for information on discards also began in North Carolina, South Carolina, and Georgia. While MRIP is not used in these states to produce catch and effort estimates, at-sea sampling in these states follows the MRIP APAIS sampling methodology for collecting biological information at-sea (Foster, pers comm). Headboat vessels that participate in the at-sea sampling are randomly selected each month from each sampling region. State biologists contact the operators from the selected headboats to schedule a trip. During the observed trip, the captain and mates make sure the biologist is able to observe the fish before it is either stored in the fish hold or released.

Biologists are allowed to assist with de-hooking the fish but are not allowed to provide guidance on whether to harvest or discard the fish. The biologist records the species, disposition (e.g. harvest, discard), and length (fork length in mm) for each fish (ACCSP 2025).

Only 50 discarded Cobia were sampled for length from 2004-2025 (Table 6). The majority of discard length samples are from NC and VA (Figure 9). No issues were identified during EDA and no samples were recommended to be excluded. The nominal discard length distribution (years combined) is shown in Figure 10.

References

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Tables

Table 1. Number of commercial Cobia length samples and trips by state, and total across states, for the Trip Interview Program (TIP).

Year	NC		SC		GA		Total	
	# of fish	# of trips	# of fish	# of trips	# of fish	# of trips	# of fish	# of trips
1983	2	1					2	1
1984	20	17	8	5			28	22
1985	35	22					35	22
1986	21	11			3	3	24	14
1987	42	23			1	1	43	24
1988	52	25	20	11	4	3	76	39
1989	26	17			4	2	30	19
1990	76	12					76	12
1991	19	8			11	10	30	18
1992	19	8			7	3	26	11
1993	8	6			3	2	11	8
1994	4	4			10	7	14	11
1995	14	8			1	1	15	9
1996	5	3			1	1	6	4
1997	1	1					1	1
1999	7	6			1	1	8	7
2000	4	4			4	3	8	7
2001	7	7			1	1	8	8
2002	5	5	5	4			10	9
2003	10	6	42	28	1	1	53	35
2004	17	9	5	5	3	3	25	17
2005	15	10	5	4	1	1	21	15
2006	21	13	3	3			24	16
2007	22	17	1	1			23	18
2008	19	12	12	12			31	24
2009	6	4	10	10			16	14
2010	19	7	3	3			22	10
2011	6	6	3	3			9	9
2012	9	9	1	1			10	10
2013	10	8	1	1			11	9
2014	33	19	2	2			35	21
2015	31	17	1	1			32	18
2016	44	22	4	4			48	26
2017	19	14	1	1			20	15
2018	10	9					10	9
2019	26	20	1	1			27	21
2020	13	12	2	1			15	13
2021	9	5	3	3			12	8

2022	24	14				24	14
2023	38	25	2	2		40	27
2024	59	33	6	6		65	39

Table 2. Number of retained fish (nfish) and trips (ntrip) prior to data filtering sampled for length by MRIP and SRHS. Note, imputed MRIP lengths are included.

Year	MRIP		SRHS	
	nfish	ntrip	nfish	ntrip
1974	0	0	3	3
1975	0	0	0	0
1976	0	0	0	0
1977	0	0	0	0
1978	0	0	1	1
1979	0	0	25	22
1980	0	0	16	16
1981	2	2	32	28
1982	6	6	31	27
1983	2	1	33	31
1984	10	9	53	47
1985	43	25	32	28
1986	33	30	46	41
1987	39	35	52	41
1988	28	25	41	31
1989	51	45	43	34
1990	55	42	49	39
1991	39	34	38	30
1992	46	37	64	42
1993	24	17	66	46
1994	33	27	32	28
1995	37	32	32	26
1996	61	36	17	13
1997	31	24	28	24
1998	50	26	40	33
1999	28	22	33	31
2000	20	15	19	16
2001	29	25	39	34
2002	32	24	53	41
2003	42	34	46	29
2004	42	26	35	23
2005	46	26	20	18

Year	MRIP		SRHS	
	nfish	ntrip	nfish	ntrip
2006	26	22	49	31
2007	39	32	51	34
2008	33	21	44	31
2009	39	37	42	35
2010	123	76	85	43
2011	49	33	56	43
2012	43	30	69	47
2013	112	68	98	75
2014	93	60	112	81
2015	159	102	78	55
2016	112	86	86	60
2017	62	43	63	47
2018	191	141	43	26
2019	135	110	70	50
2020	236	191	13	10
2021	131	110	0	0
2022	86	67	20	17
2023	56	45	28	22
2024	69	50	29	22
2025	0	0	17	16

Table 3. Number of retained fish sampled for length, by state, from MRIP and SRHS. Note, imputed MRIP lengths are excluded.

Year	CT	NJ	NY	MD	VA	NC	SC	GA
1974	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	1	0	0
1979	0	0	0	0	0	2	0	0
1980	0	0	0	0	0	1	0	0
1981	0	0	0	0	1	2	0	0
1982	0	0	0	0	0	4	2	3
1983	0	0	0	0	0	4	0	2
1984	0	0	0	0	0	5	5	2
1985	0	0	0	1	11	6	6	6
1986	0	0	0	2	10	11	4	3
1987	0	0	0	0	1	19	1	12
1988	0	0	0	0	0	12	8	1
1989	0	0	0	1	5	26	10	1
1990	0	0	0	0	4	31	5	1
1991	0	0	0	1	5	25	4	0
1992	0	0	0	0	10	30	5	1
1993	0	0	0	0	4	20	0	0
1994	0	0	0	0	10	20	1	0
1995	0	0	0	0	5	31	2	0
1996	0	0	0	0	5	39	3	1
1997	0	0	0	0	4	25	3	1
1998	0	0	0	0	4	31	4	0
1999	0	0	0	1	5	9	8	0
2000	0	0	0	0	6	11	0	0
2001	0	0	0	0	11	18	0	0
2002	0	0	0	0	3	21	0	2
2003	0	0	0	1	3	21	9	1
2004	0	0	0	0	3	30	5	1
2005	0	0	0	0	6	35	0	0
2006	0	0	0	0	5	14	1	1

Year	CT	NJ	NY	MD	VA	NC	SC	GA
2007	0	0	0	0	12	8	0	5
2008	0	0	0	0	3	7	2	8
2009	0	0	0	0	11	8	5	2
2010	0	0	0	1	11	61	5	4
2011	0	0	0	0	2	27	0	5
2012	0	1	0	0	1	11	3	5
2013	0	0	0	0	14	40	8	2
2014	0	0	0	0	6	51	3	3
2015	0	0	0	0	10	63	11	3
2016	0	0	0	1	23	50	14	0
2017	0	0	0	0	10	26	0	1
2018	1	0	0	4	62	65	4	7
2019	0	0	0	0	56	31	5	1
2020	0	0	0	2	4	13	3	1
2021	0	0	0	7	39	13	3	6
2022	0	1	2	0	23	25	10	0
2023	0	0	0	0	19	11	6	4
2024	0	1	0	1	8	16	5	4
2025	0	0	0	0	0	1	0	0

Table 4. Number of retained fish sampled for length by, mode, from MRIP and SRHS. Note, imputed MRIP lengths are excluded.

Year	HB	PR	CB	SH
1974	3	0	0	0
1975	0	0	0	0
1976	0	0	0	0
1977	0	0	0	0
1978	1	0	0	0
1979	2	0	0	0
1980	1	0	0	0
1981	1	2	0	0
1982	3	6	0	0
1983	4	2	0	0
1984	5	7	2	0
1985	8	20	3	0
1986	8	21	3	1
1987	10	10	14	3
1988	7	12	6	1
1989	7	30	5	3
1990	9	30	8	0
1991	14	16	5	8
1992	11	25	10	2
1993	13	9	10	1
1994	9	24	5	2
1995	14	15	14	4
1996	6	17	28	1
1997	9	16	11	1
1998	9	12	23	1
1999	5	15	3	1
2000	1	10	7	0
2001	6	17	5	1
2002	6	11	6	4
2003	3	19	13	1
2004	4	19	16	0
2005	4	25	9	3
2006	4	15	4	0

Year	HB	PR	CB	SH
2007	7	16	9	0
2008	3	12	4	2
2009	2	17	8	1
2010	8	37	43	1
2011	2	12	17	4
2012	4	10	10	1
2013	11	48	10	0
2014	22	29	25	1
2015	2	49	31	7
2016	4	42	42	3
2017	1	18	18	0
2018	15	75	63	2
2019	6	48	43	2
2020	0	10	13	0
2021	0	47	21	0
2022	1	34	26	1
2023	9	28	11	1
2024	2	14	21	0
2025	3	0	0	0

Table 5. Number of fish (nfish) and trips (ntrip) sampled for length by from MRIP and SRHS that are recommended for inclusion in length composition analyses.

Year	nfish	ntrip
1974	3	3
1975	0	0
1976	0	0
1977	0	0
1978	1	1
1979	2	2
1980	1	1
1981	3	3
1982	9	9
1983	6	5
1984	14	13
1985	31	26
1986	33	30
1987	37	31
1988	26	25
1989	45	41
1990	47	39
1991	43	42
1992	48	39
1993	33	28
1994	40	32
1995	47	41
1996	52	35
1997	37	30
1998	45	28
1999	24	19
2000	18	13
2001	29	25
2002	27	22
2003	36	31
2004	39	26
2005	41	24
2006	23	20

Year	nfish	ntrip
2007	32	29
2008	21	17
2009	28	26
2010	89	62
2011	35	25
2012	25	16
2013	69	45
2014	77	53
2015	89	67
2016	91	71
2017	37	28
2018	155	121
2019	99	78
2020	23	21
2021	68	59
2022	62	50
2023	49	37
2024	37	28
2025	3	3

Table 6. Number of discarded fish (nfish) and trips (ntrip) sampled at-sea for length from the headboat mode.

Year	nfish	ntrip
2004	2	2
2005	0	0
2006	1	1
2007	7	6
2008	0	0
2009	1	1
2010	2	1
2011	1	1
2012	4	4
2013	1	1
2014	1	1
2015	1	1
2016	3	3
2017	6	6
2018	9	3
2019	4	4
2020	0	0
2021	2	2
2022	4	4
2023	0	0
2024	0	0
2025	1	1

Figures

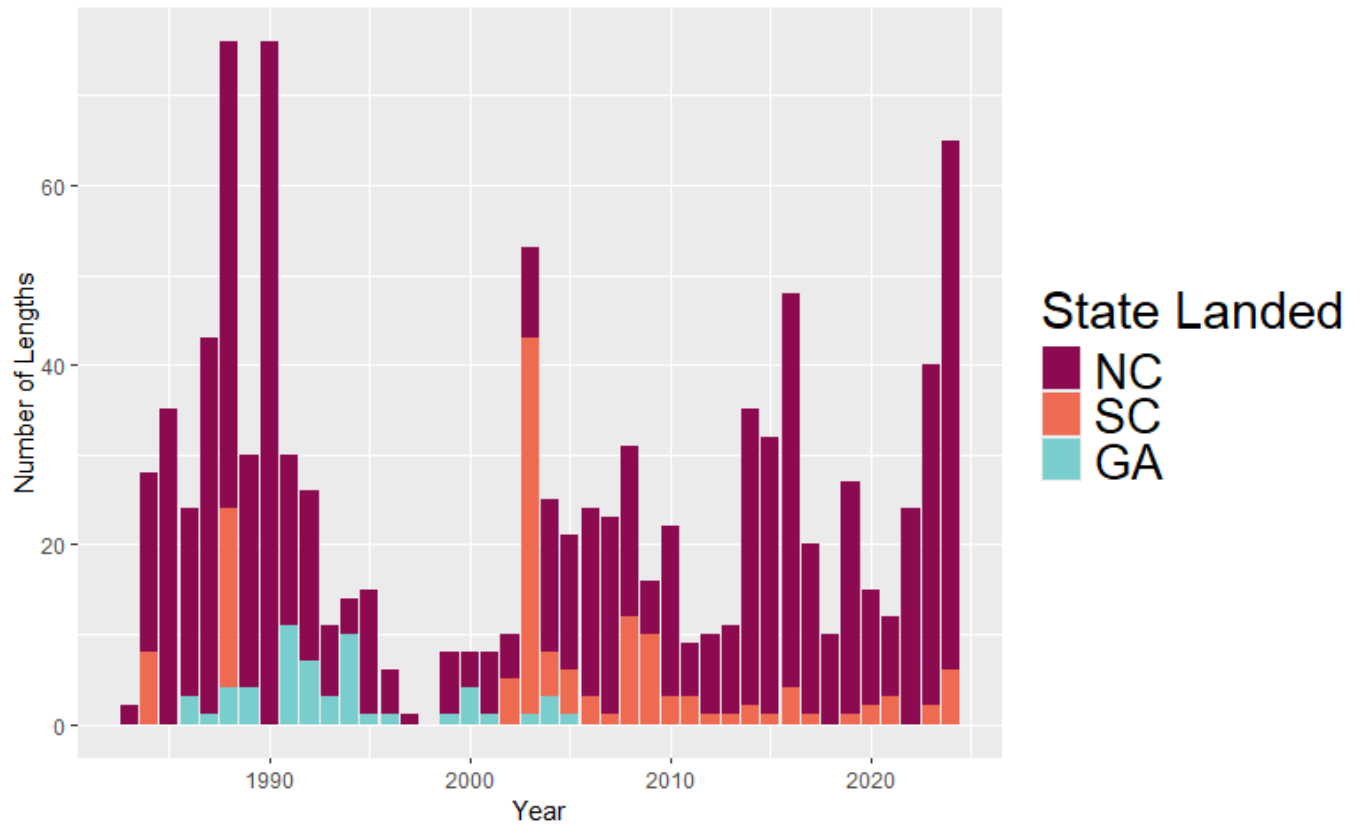


Figure 1. Number of commercial length samples available from the Trip Interview Program by year and state for the Atlantic Cobia fishery.

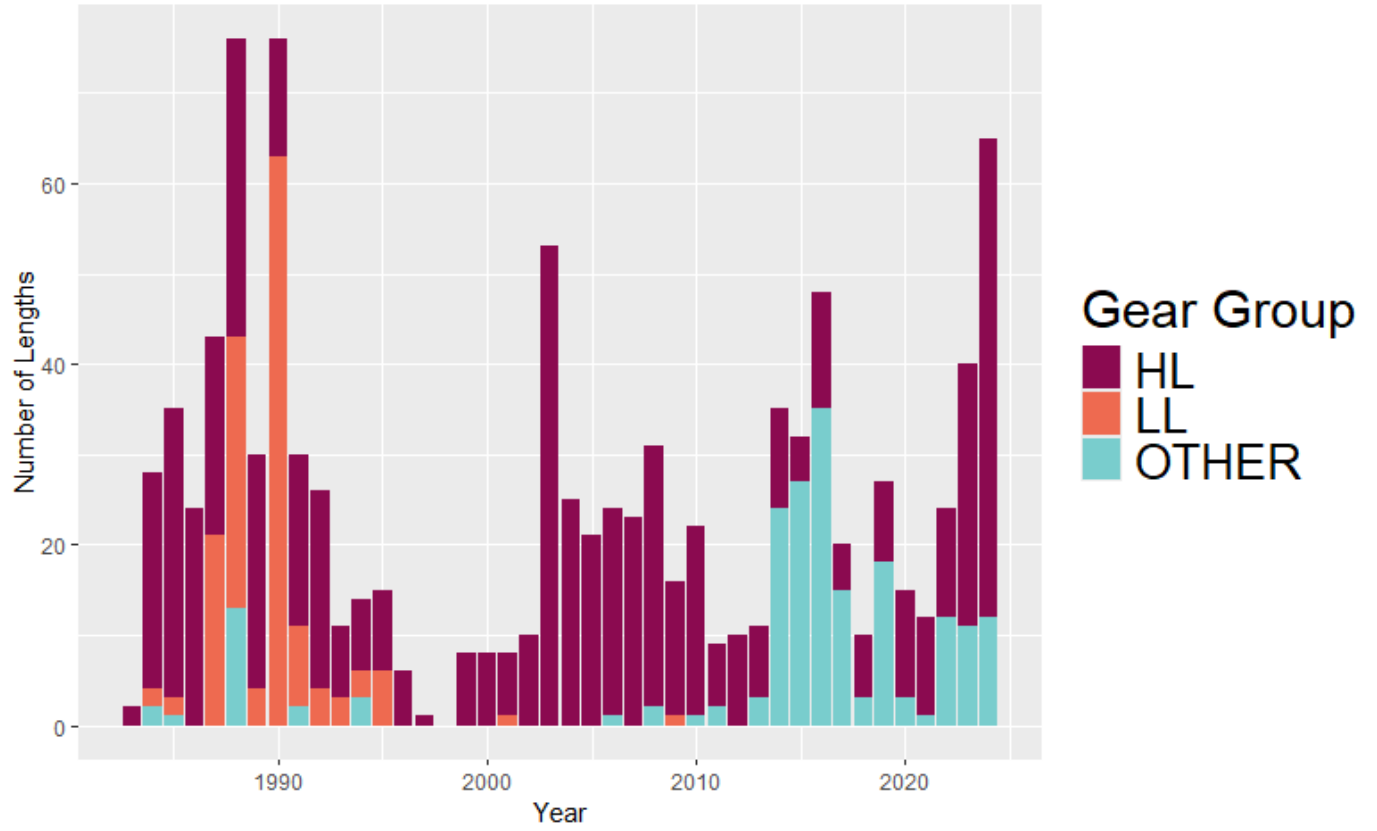


Figure 2. Number of commercial length samples available from the Trip Interview Program by year and gear for the Atlantic Cobia fishery.

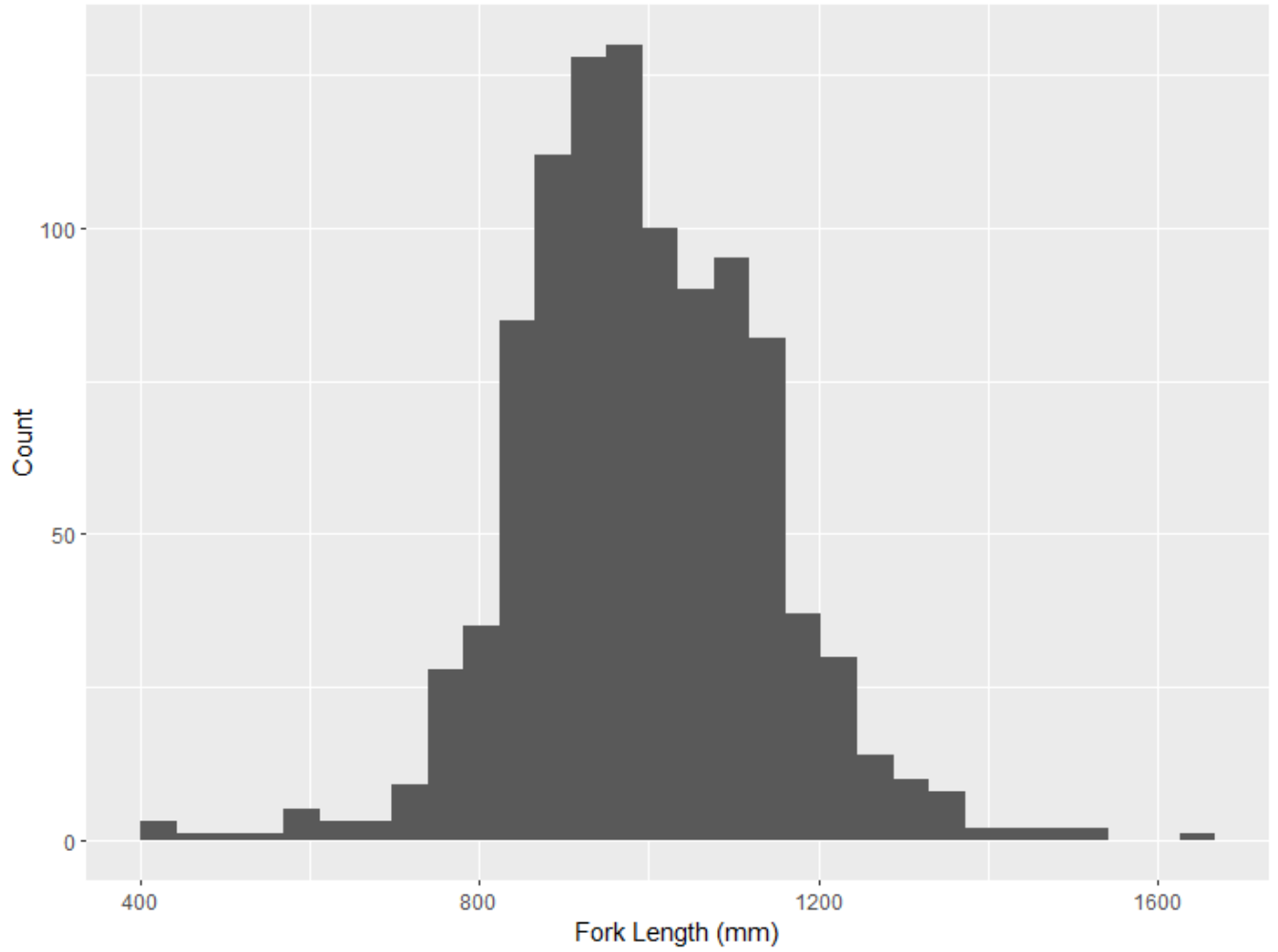


Figure 3. Nominal distribution of commercial Cobia lengths (fork length, mm) from the Trip Interview program.

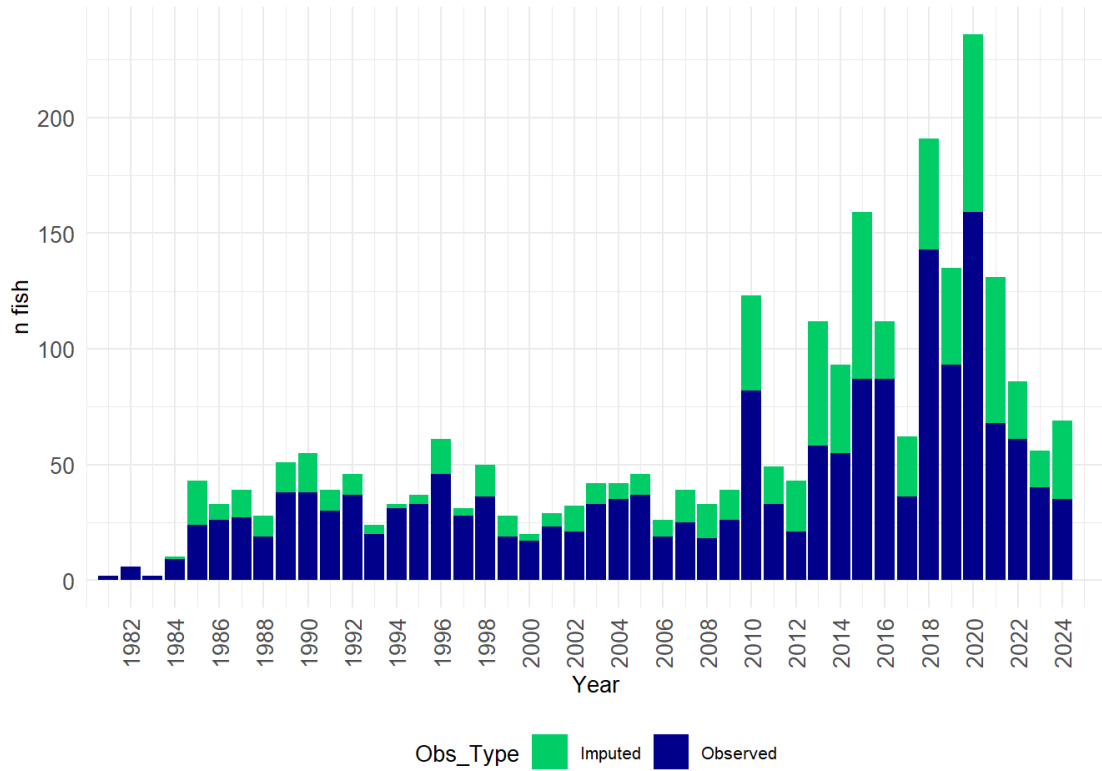


Figure 4. Number of observed (blue) and imputed (green) Cobia lengths, by year, from MRIP.

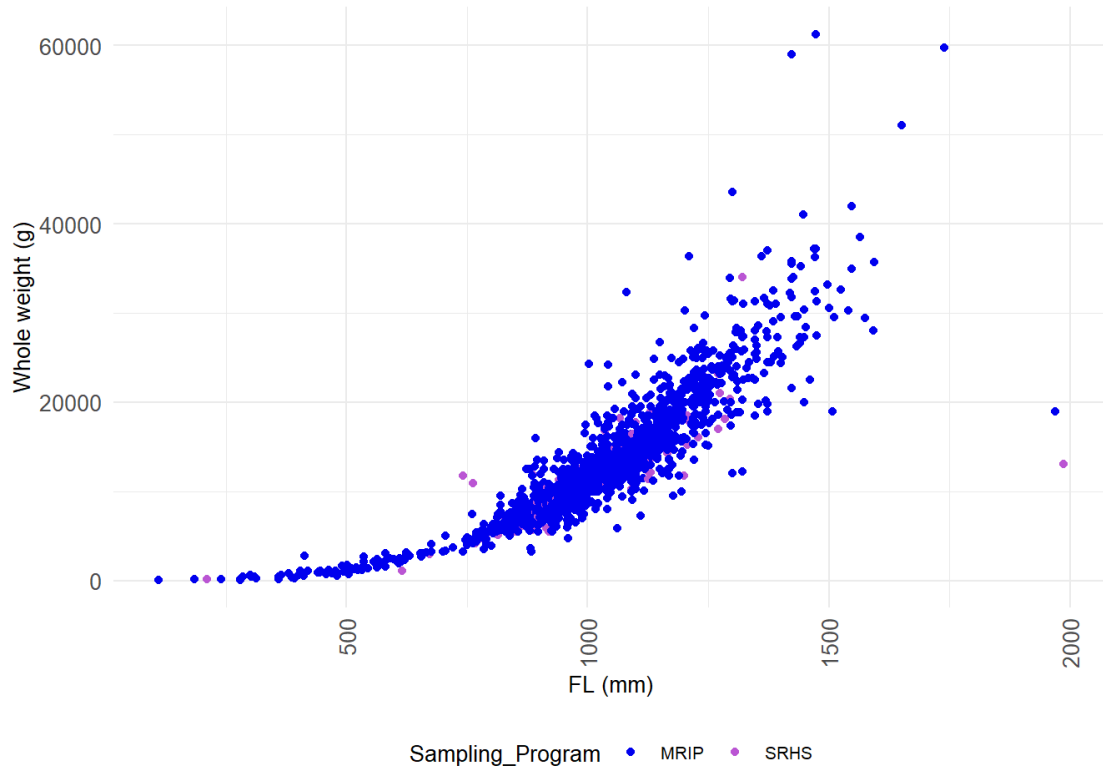


Figure 5. Comparison of fork length (FL, mm) and whole weight (g) of Cobia sampled from MRIP and SRHS. Imputed MRIP samples are excluded.

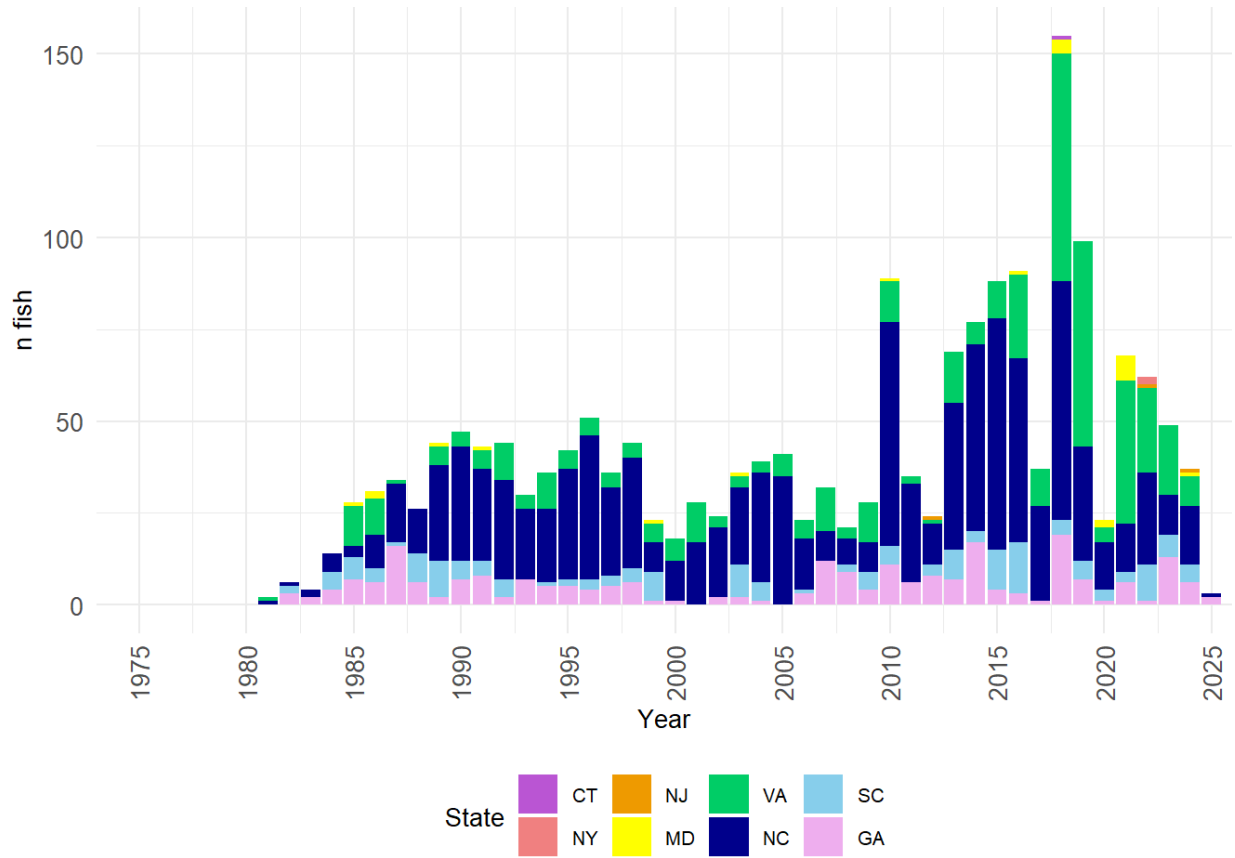


Figure 6. Number of retained fish sampled for length, by state, from MRIP and SRHS. Imputed MRIP lengths are excluded.

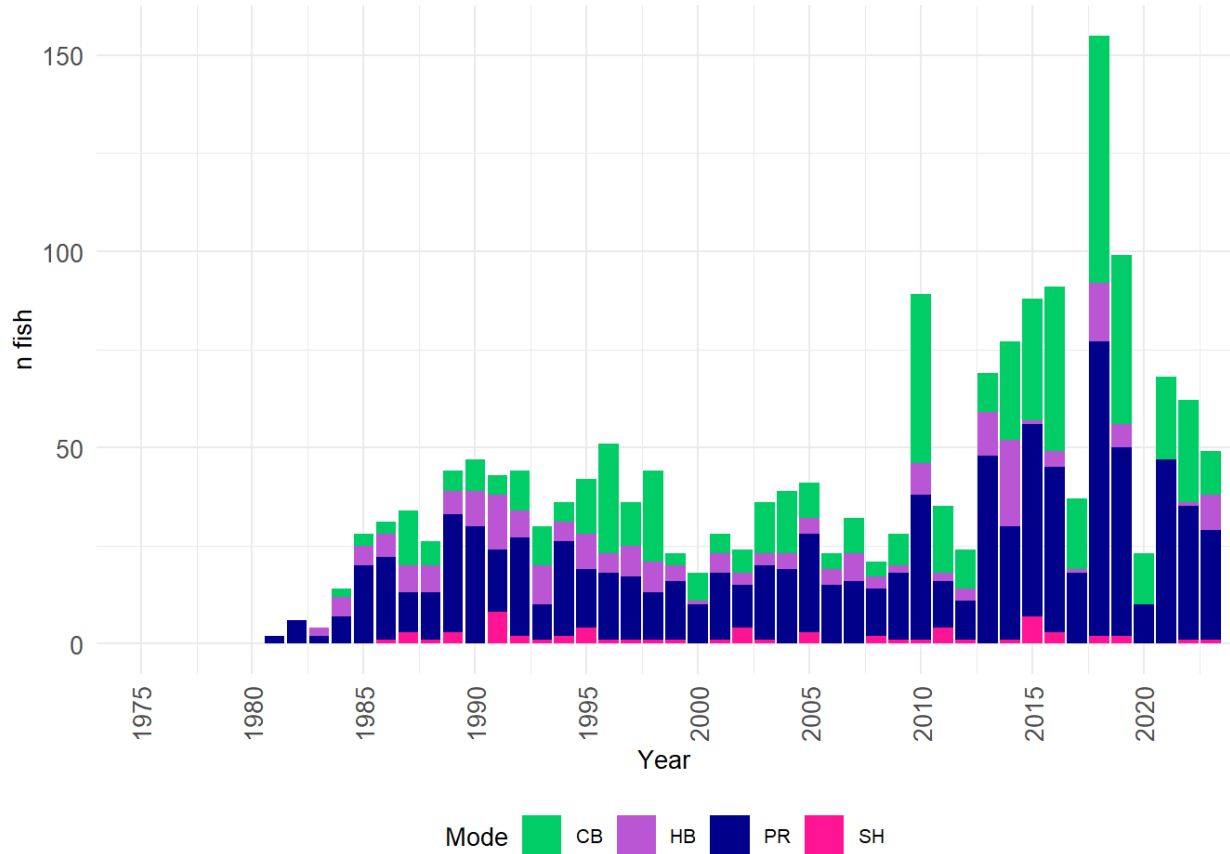


Figure 7. Number of retained fish sampled, by mode, for length from MRIP and SRHS. Imputed MRIP lengths are excluded. CB = charter, HB = headboat, PR = private, and SH = shore.

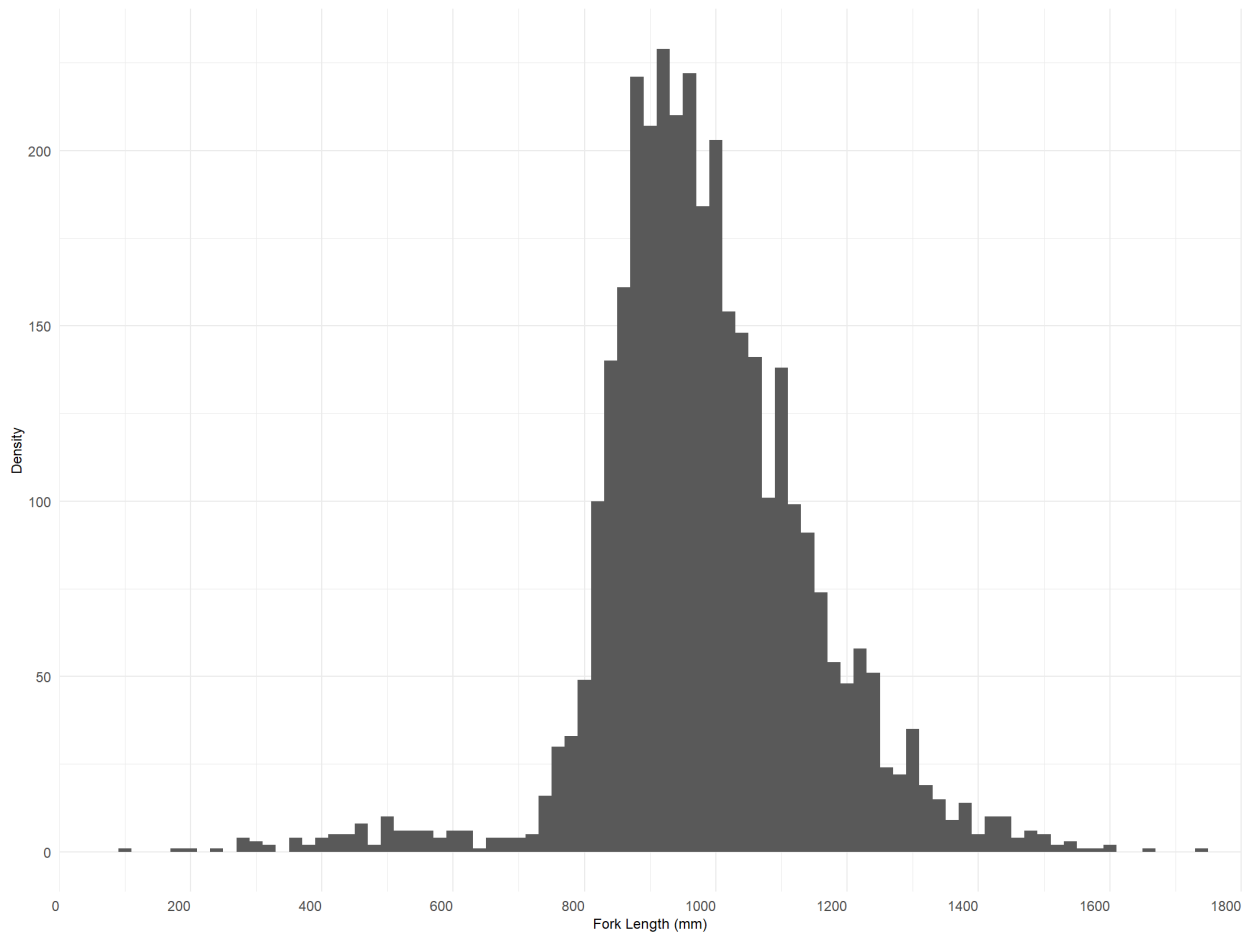


Figure 8. Nominal distribution of recreational Cobia lengths (fork length, mm) from MRIP and SRHS.

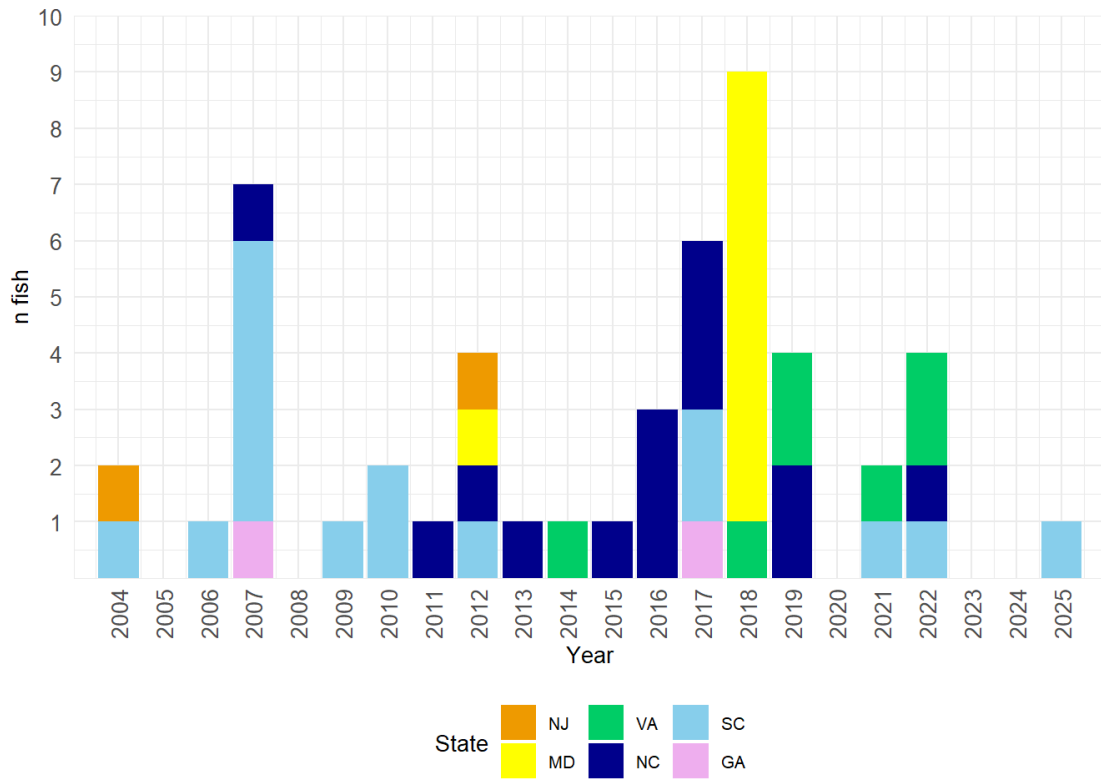


Figure 9. Number of discarded fish, by state, sampled at-sea for length.

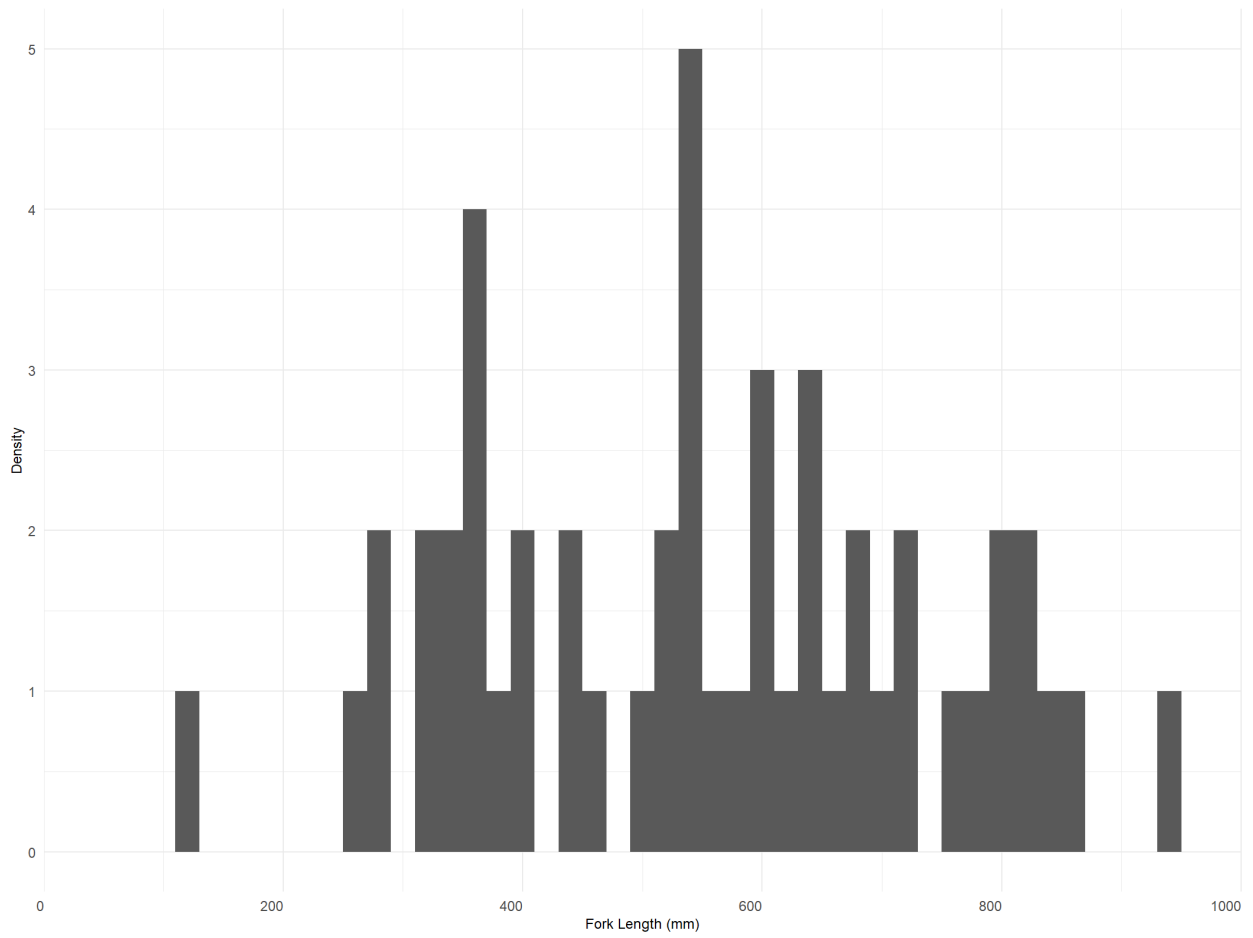


Figure 10. Nominal distribution of discarded recreational Cobia lengths (fork length, mm) sampled at-sea from headboats using MRIP APAIS sampling methodology.