

**FISHERY MANAGEMENT PLAN UPDATE
KING MACKEREL
AUGUST 2020**

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

Original FMP Adoption:	February 1983
Amendments:	Amendment 1 – September 1985 Amendment 3 – August 1989 Amendment 5 – August 1990 Amendment 6 – December 1992 Amendment 7 – November 1994 Amendment 8 – March 1998 Amendment 9 – April 2000 Amendment 10 – July 2000 Amendment 11 – December 1999 Amendment 12 – October 2000 Amendment 14 – July 2002 Amendment 15 – August 2005 Amendment 17 – June 2006 Amendment 18 – January 2012 Amendment 19 – July 2010 Amendment 20A – August 2014 Amendment 20B – March 2015 Amendment 22 – January 2014 Amendment 23 – August 2014 Amendment 26 – July 2016
Revisions:	None
Supplements:	None
Information Updates:	None
Schedule Changes:	None
Next Benchmark Review:	The most recent stock assessment was conducted in April 2020 (SEDAR 38 Update). The next benchmark assessment has not been scheduled.

The original Gulf and South Atlantic Fishery Management Councils' fishery management plan (FMP) for Coastal Migratory Pelagic Resources (mackerels and cobia) was approved in 1983

(South Atlantic Fishery Management Council (SAFMC) 1983). This plan treated king mackerel as one U.S. stock. Allocations were established for recreational and commercial fisheries, and the commercial allocation was divided between net and hook-and-line fishermen. The plan also established procedures for the Secretary of Commerce to act by regulatory amendment to resolve possible future conflicts in the fishery, such as establish fishing zones and local quotas to each gear or user group. Numerous amendments have been implemented since the first FMP.

Amendment 1 provided a framework for pre-season adjustment of total allowable catch (TAC), revised king mackerel maximum sustainable yield (MSY) downward, recognized separate Atlantic and Gulf migratory groups of king mackerel, and established fishing permits and bag limits for king mackerel (SAFMC 1985). Commercial allocations among gear users were eliminated.

Amendment 3 prohibited drift gill nets for coastal pelagics and purse seines and run-around gill nets for the overfished groups of mackerels (SAFMC 1998). The habitat section of the FMP was updated and vessel safety considerations were included in the plan. A new objective to minimize waste and bycatch in the fishery was added to the plan.

Amendment 5 extended the management area for the Atlantic groups of mackerels through Mid-Atlantic Fishery Management Council (MAFMC) jurisdiction (SAFMC 1990). The amendment revised problems in the fishery and plan objectives, revised the definition of "overfishing", and provided that the SAFMC will be responsible for pre-season adjustments of TACs and bag limits for the Atlantic migratory groups of mackerels. It redefined recreational bag limits as daily limits; created a provision specifying the bag limit catch of mackerel may be sold, provided guidelines for corporate commercial vessel permits, established a minimum size of 12 inches (30.5 cm.) fork length or 14 inches total length for king mackerel and included a definition of "conflict" to provide guidance to the Secretary.

Amendment 6 identified additional problems and an objective in the fishery, provided for rebuilding overfished stocks of mackerels within specific periods, provided for biennial assessments and adjustments, provided for more seasonal adjustment actions, including size limits, vessel trip limits, closed seasons or areas, and gear restrictions. It also changed commercial permit requirements to allow qualification in one of three preceding years, discontinued the reversion of the bag limit to zero when the recreational quota is filled, modified the recreational fishing year to the calendar year and changed the minimum size limit for king mackerel to 20 inches fork length (SAFMC 1992).

Amendment 7 equally divided the Gulf commercial allocation in the Eastern Zone at the Dade-Monroe County line in Florida (SAFMC 1994). The sub-allocation for the area from Monroe County through Western Florida was equally divided between commercial hook-and-line and net gear users.

Amendment 8 identified additional problems in the fishery, specified allowable gear, established a moratorium on new commercial king mackerel permits and provided for transferability of permits during the moratorium, and allowed retention of up to five damaged king mackerel on vessels with commercial trip limits (these fish cannot be sold, but do not count against the trip

limit) (SAMFC 1998). It also revised the seasonal framework procedures to: a) delete a procedure for subdividing the Gulf migratory group of king mackerel, b) request the stock assessment panel provide additional information on spawning potential ratios and mixing of king mackerel migratory groups, c) provide for consideration of public comment, d) redefine overfishing and allow for adjustment by framework procedure, f) allow setting zero bag limits, and g) allow gear regulation including prohibition.

Amendment 9 changed the percentage of the commercial allocation of TAC for the Florida east coast (North Area) and Florida west coast (South/West Area) of the Eastern Zone to 46.15 percent North and 53.85 percent South/West (previously, this allocation was split 50 percent to each zone); and allowed possession of cut-off (damaged) king mackerel that comply with the minimum size limits and the trip limits in the Gulf, Mid-Atlantic, or South Atlantic exclusive economic zone (EEZ) (sale of such cut-off fish is allowed and is in addition to the existing allowance for possession and retention of a maximum of five cut-off (damaged) king mackerel that are not subject to the size limits or trip limits, but that cannot be sold or purchased, nor counted against the trip limit) (SAMFC 2000).

Amendment 10 designated Essential Fish Habitat (EFH) and EFH-Habitat Areas of Particular Concern for coastal migratory pelagics (SAFMC 1998).

Amendment 11 amended the FMP as required to make definitions of MSY, optimal yield (OY), overfishing and overfished consistent with National Standard Guidelines; identified and defined fishing communities and addressed bycatch management measures (SAFMC 1998).

Amendment 12 extended the commercial king mackerel permit moratorium from October 15, 2000 to October 15, 2005, or until replaced with a license limitation, limited access, and/or individual fishing quota or individual transferable quota system (ITQ), whichever occurs earlier (SAFMC 1999).

Amendment 13 established two marine reserves in the (EEZ) of the Gulf of Mexico near the Dry Tortugas, Florida known as Tortugas North and Tortugas South, in which fishing for coastal migratory pelagic species is prohibited (SAFMC 2002). This action complements previous actions taken under the National Marine Sanctuaries Act.

Amendment 14 established a three-year moratorium on the issuance of for-hire (charter vessel and head boat) permits for coastal migratory pelagic species in the Gulf of Mexico unless sooner replaced by a comprehensive effort limitation system. This resulted in separate for-hire permits for the Gulf and South Atlantic. The control date for eligibility was established as March 29, 2001 (SAFMC 2002). The amendment also includes other provisions for eligibility, application, appeals, and transferability of permits.

Amendment 15 established an indefinite commercial limited access program for king mackerel in the EEZ under the jurisdiction of the Gulf of Mexico, South Atlantic, and Mid-Atlantic fishery management councils (SAMFC 2005). This amendment also changed the fishing year to March 1 through February 28/29 for Atlantic group king and Spanish mackerels.

Amendment 17 (SAFMC 2006) established a permanent limited entry system for Gulf of Mexico coastal migratory pelagics for-hire (charter and head boat) permits, building on the moratorium established under Amendment 14.

Amendment 18 established Annual Catch Limits (ACLs), Annual Catch Targets (ACTs) and accountability measures (AMs) for king mackerel (SAFMC 2011) as required under the 2006 Magnuson-Stevens Reauthorization Act.

Amendment 19 updated existing EFH and HAPC designations for South Atlantic species and prohibited the use of certain gear types within Deepwater Coral Habitat Areas of Particular Concern (SAMFC 2009).

Amendment 20A prohibited the sale of king mackerel caught under the bag limit unless the fish are caught as part of a state-permitted tournament and the proceeds from the sale are donated to charity (SAFMC 2013). In addition, the rule removes the income qualification requirement for king mackerel commercial vessel permits.

Amendment 20B eliminated the 500-pound trip limit that is effective when 75 percent of the respective quotas are landed for king mackerel in the Florida west coast Northern and Southern Subzones; allows transit of commercial vessels with king mackerel through areas closed to king mackerel fishing, if gear is appropriately stowed; and creates Northern and Southern Zones for Atlantic migratory group king mackerel, each with separate quotas (SAFMC 2014). Each zone will close when the respective quota is met or expected to be met. The dividing line between the zones is at the North Carolina and South Carolina state line.

Amendment 22 modified head boat reporting regulations to require weekly electronic reporting of all South Atlantic Council managed species (SAFMC 2013a).

Amendment 23 (SAFMC 2013b) required dealers to possess a federal Gulf and South Atlantic universal dealer permit to purchase king and Spanish mackerel and required weekly electronic dealer reporting. It also required federally-permitted king and Spanish mackerel fishermen to sell only to a federally-permitted dealer.

The 2013 Framework Action (effective 2014) modified commercial king mackerel trip limits in the Florida East Coast subzone to optimize utilization of the resource.

Amendment 26 updates the Atlantic king mackerel annual catch limits and adjusts the mixing zone based on the results of the 2014 stock assessment (SAFMC 2016). The amendment allows limited retention and sale of Atlantic migratory group king mackerel incidentally caught in the small coastal shark gill net fishery.

Framework Amendment 6 (2018) modifies the commercial trip limit for Atlantic migratory group king mackerel in the exclusive economic zone from the North Carolina/South Carolina line to the Miami-Dade/Monroe county line (Atlantic Southern Zone).

To ensure compliance with interstate requirements, North Carolina also manages this species under the North Carolina Fishery Management Plan for Interjurisdictional Fisheries (IJ FMP). The goal of the IJ FMP is to adopt fishery management plans, consistent with N.C. law, approved by the MAFMC, SAFMC, or the Atlantic States Marine Fisheries Commission by reference and implement corresponding fishery regulations in North Carolina to provide compliance or compatibility with approved fishery management plans and amendments, now and in the future. The goal of these plans, established under the Magnuson-Stevens Fishery Conservation and Management Act (federal council plans) and the Atlantic Coastal Fisheries Cooperative Management Act (Atlantic States Marine Fisheries Commission plans) are like the goals of the Fisheries Reform Act of 1997 to “ensure long-term viability” of these fisheries (NCDMF 2015).

Management Unit

The management unit is defined as king mackerel within U.S. waters of the South Atlantic, Mid-Atlantic and Gulf of Mexico. Current management defines two migratory units: Gulf Migratory Group and Atlantic Migratory Group.

Goal and Objectives

The goal of the FMP for Coastal Migratory Pelagics resources was to institute management measures necessary to prevent exceeding maximum sustainable yield (MSY), establish a mandatory statistical reporting system for monitoring catch, and to minimize gear and user conflicts (SAMFC 1983). Amendment 12 to the Gulf and South Atlantic fishery management councils’ FMP for Coastal Migratory Pelagics lists eight plan objectives:

1. The primary objective of the FMP is to stabilize yield at MSY, allow recovery of overfished populations, and maintain population levels sufficient to ensure adequate recruitment.
2. To provide a flexible management system for the resource which minimizes regulatory delay while retaining substantial Council and public input in management decisions and which can rapidly adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by areas.
3. To provide necessary information for effective management and establish a mandatory reporting system.
4. To minimize gear and user group conflicts.
5. To distribute the TAC of Atlantic migratory group Spanish mackerel between recreational and commercial user groups based on the catches that occurred during the early to mid-1970s, which is prior to the development of the deep-water run-around gill net fishery and when the resource was not overfished.
6. To minimize waste and bycatch in the fishery.
7. To provide appropriate management to address specific migratory groups of king mackerel.
8. To optimize the social and economic benefits of the coastal migratory pelagic fisheries.

STATUS OF THE STOCK

Life History

King mackerel are considered coastal pelagic, meaning they live in open ocean waters near the coast. They are found from North Carolina to southeast Florida, making inshore and offshore migrations that are triggered by water temperature and food supply. King mackerel prefer warm waters and seldom enter waters below 68 degrees Fahrenheit. In the winter, they gather just inside the Gulf Stream along the edge of the continental shelf. In the summer and fall, they move inshore along the beaches and near the mouths of inlets and rivers. King mackerel spawn from April to November, with males maturing between age 2 and 3 and females between age 3 and 4. King mackerel in North Carolina grow as large as 60 inches, but most recreational catches are between 35 and 45 inches. They feed on menhaden, mullet, thread herring, sardines and squid and may be seen leaping out of the water in pursuit of prey (Manooch 1984).

Stock Status

In 2020, the Atlantic king mackerel stock was assessed and peer reviewed through the Southeast Data, Assessment and Review (SEDAR 38 Update). The results of the assessment indicated the stock size and the rate of removals are sustainable and predicts Atlantic king mackerel are not overfished and overfishing is not occurring.

Stock Assessment

An integrated stock assessment approach, Stock Synthesis, was used to assess the stock (SEDAR 38) in a benchmark assessment (SEDAR 2014). This assessment was updated in 2020 (SEDAR 38 Update). The assessment model was constructed using fishery independent data from the Southeast Area Monitoring and Assessment Program Trawl Survey for the Atlantic, and fishery dependent information collected from National Oceanic and Atmospheric Administration Fisheries Service Marine Recreational Fisheries Statistics Survey, head boat and logbook surveys, as well as North Carolina Division of Marine Fisheries Trip Ticket landings information. The Stock Synthesis approach was used, which integrated fishery and life history indices into a statistical catch-at-age model to produce observed catch, size and age composition, and Catch Per Unit Effort indices. Total biomass and spawning stock biomass estimates increased steadily since 2013. All fishery indicators (fleet CPUEs and scientific survey) showed positive trends since SEDAR 38. Stock Synthesis estimated a recent period (2013 to 2016) of above average age-0 recruitments, contrasting the period prior (2008 to 2012) of below average recruitments first detected during SEDAR 38. Two particularly high recruitment years were estimated for 2015 and 2016, supported by the juvenile survey observations in 2016 (SEAMAP trawl survey), as well as fleet length compositions. Observations by stakeholders may help validate the model predictions, given the distinct change in signal from five-years of low recruitment up to SEDAR 38 to four years of recent high recruitment. The fish would have entered the fisheries beginning in fishing year 2015, with relatively high abundance beginning in fishing year 2017, particularly of fish between 24 and 36 inches fork length.

STATUS OF THE FISHERY

Current Regulations

The North Carolina Division of Marine Fisheries complements the management measures of the Coastal Migratory Pelagic FMP through rule (N.C. Marine Fisheries Commission Rule 15A NCAC 03M .0301) and proclamation authority (N.C. Marine Fisheries Commission Rule 15A NCAC 03M .0512). Current regulations include a recreational bag limit of three king mackerel per person per day and 24-inch fork length minimum size (commercial and recreational). Commercial regulations limit trips to 3,500 pounds and require a Federal vessel permit for commercial, charter and head boats. Sale of king mackerel caught under the bag limit are prohibited unless the fish are caught as part of a state-permitted tournament and the proceeds from the sale are donated to charity.

Commercial Landings

In 2019, commercial landings were 698,229 pounds (Table 1 and Figure 1) and 88 percent of the king mackerel harvest was taken by hook and line while the remaining 12 percent was harvested in gill nets (Figure 2). The commercial fishery has declined since 2008, however the 2019 landings were higher than the 457,659 pound 10-year average (2010-2019).

Recreational Landings

Recreational landings of king mackerel are estimated from the Marine Recreational Information Program (MRIP). Recreational estimates across all years have been updated and are now based on the MRIP new Fishing Effort Survey-based calibrated estimates. For more information on MRIP see <https://www.fisheries.noaa.gov/topic/recreational-fishing-data>. Recreational anglers target king mackerel by trolling spoons and live baits both inshore and offshore. Anglers catch most king mackerel between August and October, once the water temperature has begun to cool from the summer heat. Anglers harvested 1,446,939 pounds of king mackerel in 2019 (Table 2 and Figure 1).

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Length-frequency information for the commercial king mackerel fishery in North Carolina is collected through Division sampling programs [programs 434 (Ocean Gill Net Fishery), 437 (Long Haul Seine Fishery), 438 (Offshore Live Bottom Fishery), 439 (Coastal Pelagic), and 461 (Estuarine Gill Net and Seine Sampling)]. Through these programs, 1,136 king mackerel were measured with a mean length of 29.5 inches (Table 4 and Figure 3). Ageing structures, otoliths, are collected from the commercial and recreational fishery as well as king mackerel fishing tournaments statewide and sent to the Southeast Fisheries Science Center in Panama City, Florida for processing and ageing (Table 5). Length and weight information for the recreational fishery are collected through the MRIP dockside sampling (Figure 4).

Fishery-Independent Monitoring

Currently, the division does not have any fishery-independent sampling programs that target or catch king mackerel in great numbers.

MANAGEMENT STRATEGY

King mackerel is included in the North Carolina Fishery Management Plan for Interjurisdictional Fisheries, which defers, to South Atlantic Fishery Management Council Fishery Management Plan compliance requirements. Current management measures were established under recent Amendments 20A (SAMFC 2014), 20B (SAMFC 2015), and 26 (SAMFC 2016) to the Coastal Migratory Pelagics Fishery Management Plan. Amendment 20A prohibits the sale of all bag-limit-caught king mackerel, except those harvested during a state-permitted tournament. Amendment 20B establishes separate commercial quotas of Atlantic king mackerel for a Northern Zone (north of North Carolina and South Carolina state line) and Southern Zone (south of North Carolina and South Carolina state line). The South Atlantic Fishery Management Council completed Amendment 26 (2016) to update the Atlantic king mackerel annual catch limits and adjust the mixing zone based on the results of the 2014 stock assessment, and to provide an incidental catch allowance of Atlantic king mackerel in the small coastal shark gillnet fishery. Current management strategies for king mackerel in South Atlantic waters are summarized in Table 6.

RESEARCH NEEDS

From SEDAR 38 (2014) and SEDAR 38 Update (2020):

- Develop a survey to obtain reliable age and size composition data and relative abundance of adult fish. This could be done using gill nets or handlines. The review panel recommends that the design of a scientific survey be peer reviewed.
- Determine most appropriate methods to deal with changing selectivity in fisheries over time, particularly changing selectivity related to management actions or targeting of specific cohorts. The review panel suggests that historical mark-recapture data be used to compare size composition of recaptures for different fishing gears to evaluate selectivity for historic periods.
- Determine stock mixing rates using otolith microchemistry and/or otolith shape analysis on a routine basis that would allow future stock assessments to capture the dynamic spatial and temporal nature of mixing of the Atlantic and Gulf of Mexico stocks, and consider evaluating stock mixing within integrated modeling approaches.
- More accurately characterize juvenile growth by increasing samples of age-0 and 1 fish. Further investigate two-phase growth models including different breakpoints and different growth models to better model size and age. Consider if there is temporal (annual and seasonal) variability in growth rates. Results of this analysis in terms of the best model will need to be implementable in SS3 to continue with the integrated modeling approach.
- Determine if female spawning periodicity varies by size or age.
- Expand the trawl survey below the Cape Canaveral area and potentially into deeper continental shelf waters.

- Consider conducting an extensive tagging program to: a) better understand migration patterns; b) provide additional and individual growth rate information; c) better understand fishery selectivity; d) provide fishery exploitation rates; and e) provide information about natural mortality rates. Fishery independent recapture information (i.e., use of acoustic and satellite tags) will assist with a). Age at capture information of tagged animals will assist with b). A multi-year tagging program will be required for e). The review panel recommends that a specific workshop be held to consider in detail the design of a tagging program.
- Research aimed at improving the documentation of data series formatting, including index standardization, for SS3 would improve modeling efficiency. This includes statistical coding for consistent database querying and data processing.
- Evaluation of alternative age references, or age-specific time series, for the SEAMAP fishery independent survey was recommended by the data providers and noted by the analyst for future assessments. An analysis of the effect of excluding sublegal fish size observations on the assessment should be undertaken. Information on the age-composition of discarded fish from all fleets is needed to validate the assumption of exclusively age-0 discards. The conditional age-at-length data had a significant influence on recent recruitment estimates.

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ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – KING MACKEREL

TABLES

Table 1. North Carolina commercial harvest of king mackerel with landings in pounds by gear type, 1994-2019.

Year	Gear Type			Total
	Hook and Line	Gill Net	Other	
1994	782,796	61,648	5,465	849,909
1995	954,958	58,104	257	1,013,319
1996	738,562	53,211	1,761	793,534
1997	1,388,933	167,973	1,533	1,558,439
1998	1,076,494	65,460	1,388	1,143,342
1999	1,042,517	40,148	28	1,082,693
2000	939,435	105,504	616	1,045,554
2001	790,925	47,517	665	839,107
2002	696,160	81,933	334	778,427
2003	738,129	26,168	534	764,831
2004	829,056	125,826	120	955,002
2005	1,012,598	232,681	810	1,246,089
2006	1,010,909	174,573	52	1,185,534
2007	883,514	175,570	24	1,059,107
2008	821,059	215,793	0	1,036,852
2009	668,150	109,347	88	777,585
2010	235,965	92,739	102	328,806
2011	357,375	50,748	38	408,162
2012	248,979	48,444	0	297,423
2013	311,321	33,856	0	345,177
2014	461,424	88,557	0	549,981
2015	323,686	67,629	0	391,315
2016	337,016	83,794	59	420,869
2017	557,374	72,284	38	629,696
2018	444,047	62,814	72	506,933
2019	616,273	81,944	13	698,229

ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – KING MACKEREL

Table 2. North Carolina recreational harvest of king mackerel with landings in number of fish, pounds, and number released, 1981-2019. Percent Standard Error (PSE) is given for each.

Year	Harvest Number (A+B1, MRIP)	PSE (Num)	Weight (lb), (A+B1, MRIP)	PSE (lb)	Number Released (MRIP)	PSE
1981	191,655	53.8	2,040,176	50.0	-	.
1982	177,616	26.4	1,477,554	24.8	-	.
1983	115,637	47.5	738,215	48.3	-	.
1984	131,026	36.8	1,228,325	39.8	-	.
1985	273,004	41.7	2,695,124	42.8	-	.
1986	173,390	28.9	1,593,772	31.2	102	103.8
1987	199,521	18.1	1,767,178	23.9	13,526	80.6
1988	162,764	15.1	521,744	26.7	8,186	50.4
1989	113,376	16.6	1,163,894	15.4	5,225	59.6
1990	273,144	22.3	2,502,999	25.9	4,295	71.1
1991	258,306	17.6	2,590,951	20.4	8,856	47.9
1992	165,568	13.8	1,435,826	15.2	2,933	39.6
1993	121,704	15.7	1,224,744	16.2	3,607	68.6
1994	177,608	20.7	1,709,740	17.4	5,792	55.8
1995	135,796	14.3	1,240,901	14.5	7,544	43.5
1996	119,418	23.2	1,097,226	19.6	15,465	48.8
1997	206,601	13.1	1,797,936	14.4	57,739	25.5
1998	112,383	17.5	1,163,739	18.2	9,155	43.0
1999	104,483	18.6	1,034,465	19.5	120,296	34.9
2000	196,979	20.8	2,250,512	17.9	26,009	41.1
2001	145,290	12.8	2,046,022	16.2	12,381	41.8
2002	104,631	40.7	1,242,058	42.4	20,811	49.1
2003	153,339	17.1	1,388,145	17.3	33,774	27.5
2004	191,584	17.7	2,276,035	22.9	184,384	38.7
2005	175,070	16.0	1,349,536	15.9	101,507	26.2
2006	177,369	17.9	1,805,814	22.3	45,568	29.1
2007	339,278	15.2	3,099,801	15.5	53,549	29.4
2008	164,719	18.7	1,379,450	19.0	41,283	43.9
2009	168,558	17.5	1,822,673	18.4	23,639	33.2
2010	58,311	23.8	580,505	23.4	9,734	36.0
2011	31,589	36.3	367,896	31.3	851	72.9
2012	55,529	24.5	613,903	25.3	6,385	38.1
2013	48,000	23.3	521,153	25.2	8,868	54.2
2014	72,288	22.7	1,213,096	22.9	35,075	92.8
2015	95,705	37.2	1,168,255	52.5	16,877	52.4
2016	108,151	43.4	963,139	41.7	43,909	31.6
2017	110,339	22.6	1261775	31.8	94655	28.6
2018	102,675	19.0	1,018,459	30.1	75,614	32.6
2019	184,962	23.7	1,446,939	24.8	115,350	42.1
Average	151,215		1,457,428		31,101	

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Table 3. Total number measured, mean, minimum, and maximum fork length (inches) of king mackerel measured by MRIP sampling in North Carolina, 1981-2019.

Year	Number Measured	Mean Length	Minimum Length	Maximum Length
1981	47	38.5	25.0	46.0
1982	90	33.9	15.7	44.1
1983	33	30.1	5.7	36.0
1984	71	31.1	12.2	44.3
1985	67	32.9	22.0	42.5
1986	257	33.1	19.7	48.9
1987	1,041	31.4	12.6	55.9
1988	646	13.5	14.2	58.5
1989	765	33.8	12.2	53.9
1990	1,169	31.3	12.2	59.5
1991	1,057	31.8	10.1	57.9
1992	1,037	31.1	14.6	57.9
1993	772	32.3	12.8	58.3
1994	829	32.2	20.1	65.4
1995	959	31.2	14.6	53.5
1996	670	31.3	20.1	56.0
1997	1,814	30.5	12.6	54.6
1998	1,062	32.4	13.9	57.8
1999	452	32.9	18.3	50.2
2000	831	33.7	19.3	69.6
2001	800	37.0	22.4	59.1
2002	218	34.6	22.7	54.2
2003	268	32.8	20.2	55.0
2004	247	32.2	13.2	55.5
2005	277	29.6	21.7	53.3
2006	269	32.0	19.2	59.2
2007	320	31.1	21.3	49.3
2008	317	30.1	20.6	47.9
2009	168	32.7	21.0	46.9
2010	83	32.5	25.0	50.0
2011	36	34.1	28.0	51.0
2012	74	32.9	23.5	51.0
2013	38	32.6	23.5	54.8
2014	106	38.7	23.9	53.1
2015	93	33.3	22.2	52.9
2016	213	30.4	12.2	60.0
2017	278	31.9	13.4	48.9

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2018	365	30.3	14.6	60.4
2019	369	29.7	10.2	49.8

Table 4. Mean, minimum, and maximum fork lengths (inches) and total number measured of king mackerel from fishery dependent sampling programs in North Carolina, 1997-2019.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	30.3	21.9	47.2	152
1998	30.0	20.9	42.3	240
1999	30.1	16.3	50.4	722
2000	30.4	16.7	48.8	872
2001	31.8	20.3	51.2	729
2002	33.0	24.0	46.5	217
2003	29.2	21.3	44.1	204
2004	31.5	22.0	45.3	448
2005	29.5	19.7	47.2	397
2006	31.0	21.5	49.4	277
2007	29.3	13.6	48.0	331
2008	27.6	22.2	49.8	1,676
2009	28.4	15.1	55.1	1,005
2010	33.8	23.2	52.6	193
2011	33.1	23.4	48.8	643
2012	32.4	23.1	53.0	313
2013	34.1	24.1	45.5	89
2014	29.8	18.1	47.6	420
2015	32.8	14.7	46.9	229
2016	29.4	20.3	54.3	360
2017	28.4	13.6	53.3	994
2018	28.8	22.6	43.3	459
2019	29.5	16.0	49.8	1,136

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Table 5. Mean, minimum, and maximum fork lengths (inches) and total number sampled of king mackerel collected by NCDMF for ageing by the NOAA Southeast Fisheries Science Center, 1997-2018.

Year	Mean Length	Minimum Length	Maximum Length	Total Number Measured
1997	35.4	12.6	54.1	363
1998	37.6	21.7	60.2	458
1999	37.4	14.8	57.1	477
2000	38.7	24.3	56.1	541
2001	38.0	25.8	55.7	547
2002	38.2	23.8	54.9	477
2003	37.0	23.3	57.3	488
2004	38.0	13.5	56.7	467
2005	37.3	19.6	55.1	444
2006	37.7	17.0	54.1	435
2007	37.9	19.2	54.7	507
2008	34.3	23.4	53.7	450
2009	36.0	24.2	55.1	415
2010	37.9	23.2	57.2	386
2011	37.4	23.4	57.0	429
2012	37.6	23.1	55.9	597
2013	40.2	24.1	56.3	413
2014	40.0	4.6	59.1	388
2015	39.1	4.4	54.4	446
2016	35.2	13.3	54.3	482
2017	35.8	15.4	56.3	663
2018	36.3	11.0	54.3	568
2019	35.5	17.5	56.3	695

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Table 6. Management strategies and rules for king mackerel in North Carolina.

Management Strategy	Implementation Status
24 inch minimum size limit	Rule 15A NCAC 03M .0301(b)(1)
Three fish creel limit	Rule 15A NCAC 03M .0301(b)(2)
Commercial Vessel Permit requirements	Rule 15A NCAC 03M .0301(b)(3)(A) Rule 15A NCAC 03M .0301(b)(3)(B)
Unlawful to use gill nets south of Cape Lookout for more than three king mackerel	Rule 15A NCAC 03M .0501(b)(4)
Charter vessels or head boats with Commercial Vessel Permit must comply with possession limits when fishing with more than three persons	Rule 15A NCAC 03M .0512
Commercial trip limit of 3,500 pounds of king, Spanish, or aggregate	Rule 15A NCAC 03M .0301(d))
Prohibits Purse Gill Nets when taking king or Spanish mackerel	Rule 15A NCAC 03M .0512
Unlawful for vessels with both a valid Federal Commercial Directed Shark Permit and a valid Federal King Mackerel Permit, when engaged in directed shark fishing with gill nets south of Cape Lookout, to possess and sell more than three king mackerel per crew member.	Proclamation FF-21-2017

FIGURES

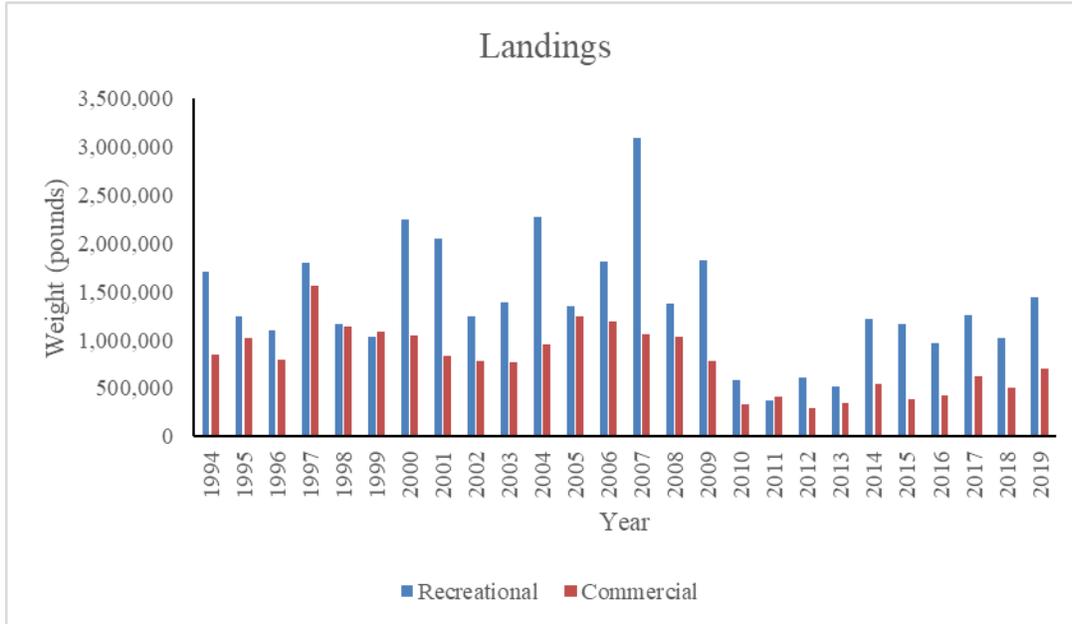


Figure 1. Annual commercial (1994-2019) and recreational (1994-2019) landings in pounds for king mackerel in North Carolina.

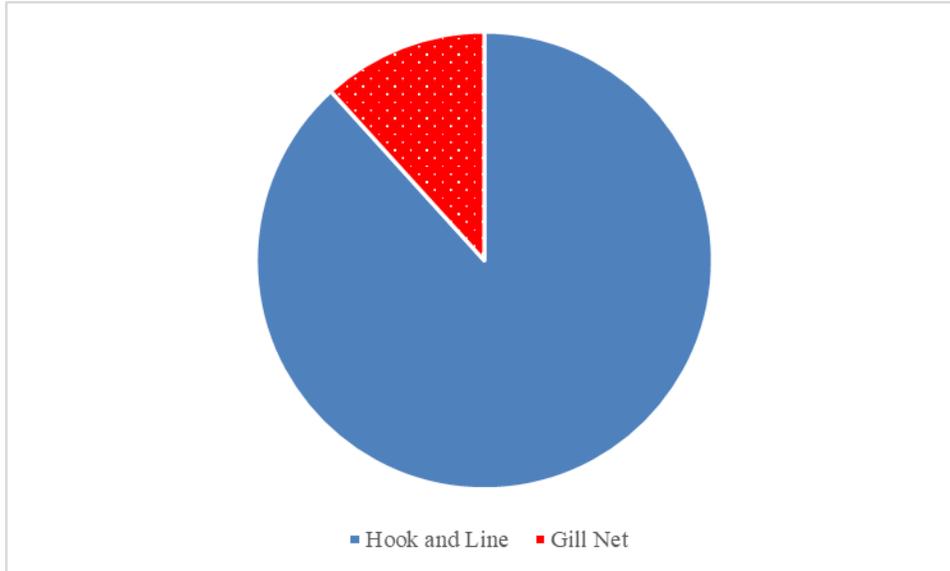


Figure 2. Commercial harvest of king mackerel by gear, 2019.

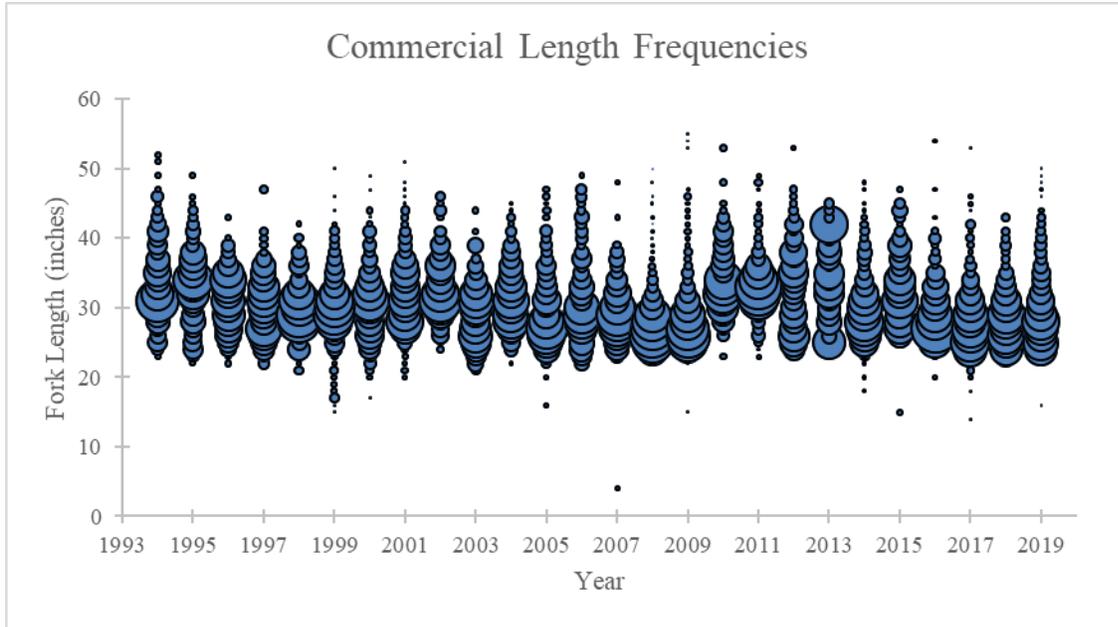


Figure 3. Commercial length frequency (fork length, inches) of king mackerel from 1994 to 2019. Bubbles represents fish harvest at length and the size of the bubble represents the proportion of fish at that length in that year.

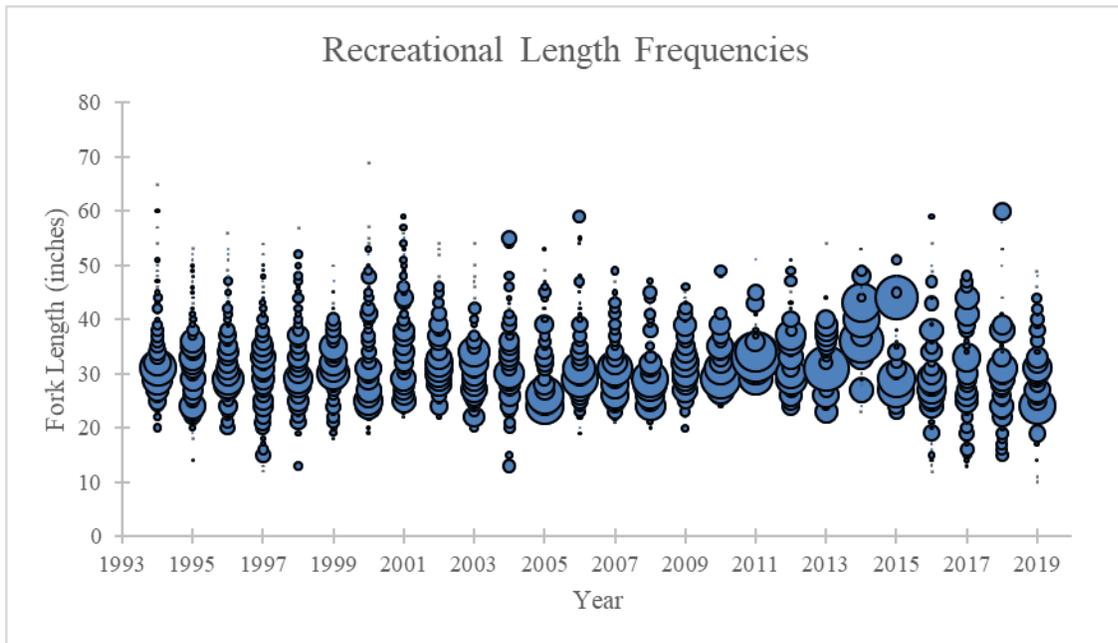


Figure 4. Recreational length frequency (fork length, inches) of king mackerel from 1994 to 2019. Bubbles represents fish harvest at length and the size of the bubble represents the proportion of fish at that length in that year.