

**FISHERY MANAGEMENT PLAN UPDATE
SPINY DOGFISH
AUGUST 2020**

STATUS OF THE FISHERY MANAGEMENT PLAN

Fishery Management Plan History

MAFMC/NEFMC FMP Adoption:	January 2000 Framework 1 2006 Amendment 1 2007 Framework 2 2009 Amendment 2 2011 Amendment 3 2014 Amendment 4 2015 Amendment 5 2017 Framework 3 2018
ASMFC FMP Adoption:	November 2002 Addendum I November 2005 Addendum II October 2008 Addendum III April 2011 Addendum IV August 2012 Addendum V October 2014 Addendum VI October 2019
Amendments:	None
Revisions:	None
Supplements:	None
Information Updates:	None
Schedule Changes:	None
Next Benchmark Review:	2022

Spiny dogfish sharks are interjurisdictionally managed by the Mid-Atlantic and New England Fishery Management Councils (MAFMC/NEFMC) in federal waters and the Atlantic States Marine Fisheries Commission (ASMFC) in state waters. A fisheries management plan (FMP) was created for the stock in 2000 (MAFMC and NEFMC 2000). The FMP includes an annual commercial quota allocated for each fishing year (May 1-April 30).

The MAFMC/NEMFC spiny dogfish FMP has had five amendments since initiated in 2000. Amendment 1 required a standardized method to report by-catch, Amendment 2 established annual catch limits (ACLs) and Accountability Measures (AMs), Amendment 3 allowed for updates to essential habitat definitions, established provisions to maintain existing management measures (including quotas) in the event of delayed rulemaking, and eliminated the seasonal allocation of the coast-wide commercial quota, Amendment 4 implemented a standardized bycatch reporting methodology, and Amendment 5 implemented management measures to prevent the development of new, and the expansion of existing, commercial fisheries of certain forage species in the Mid-Atlantic. All amendments were approved by the National Oceanic and Atmospheric Association (NOAA). The MAFMC/NEMFC spiny dogfish FMP, associated amendment documents, and framework information can be found at <https://www.mafmc.org/dogfish>.

In state waters, the ASMFC 2002 Interstate FMP for spiny dogfish establishes the annual quota and possession limits (ASMFC 2002). The Spiny coast wide Management Board, Advisory Panel, Technical Committee, and Plan Review Team oversee the management of spiny dogfish in state waters. The management unit includes the U.S. Atlantic coast (Maine-Florida) distribution of spiny dogfish from the estuaries eastward to the inshore boundary of the exclusive economic zone.

There are no amendments to the ASMFC interstate FMP but there are six addenda. Addendum I allows the Spiny Dogfish Management Board to set multi-year specifications and Addendum II establishes regional allocation of the annual quota (58%) to states from Maine to Connecticut. Addendum III was added to create flexibility in quota shares for southern Atlantic States (New York to North Carolina). Addendum III allows for quota transfer between states, rollovers of up to five percent, state-specified possession limits, and includes a three-year reevaluation of the measures. North Carolina is allocated 14.036% of the quota. Addendum IV standardizes the definitions of overfishing between the three management agencies and adopts a fishing mortality threshold consistent with the federal FMP. Addendum V ensures consistency in spiny dogfish management with the Shark Conservation Act of 2010 by prohibiting processing at-sea, including the removal of fins. Addendum VI allows quota to be transferred between all regions and states to enable full utilization of the coastwide commercial quota and avoid quota overages. The ASMFC spiny dogfish FMP and associated addendum documents can be found at <http://www.asmfc.org/species/spiny-dogfish>.

To ensure compliance with interstate requirements, North Carolina (N.C.) also manages spiny dogfish 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 Mid-Atlantic Fishery Management Council, South Atlantic Fishery Management Council, or the ASMFC 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 (ASMFC plans) are like the goals of the Fisheries Reform Act of 1997 to “ensure long-term viability” of these fisheries (NCDMF 2015).

Management Unit

For spiny dogfish, the entire U.S Atlantic Coast from the estuaries eastward to the inshore boundary of the exclusive economic zone is considered a single stock which is managed by the ASMFC, NEFMC, and MAFMC. North Carolina is allotted a state specific share of the coastwide quota and allowed to specify possession limits in state waters.

Goals and Objectives

The overall goal of the joint MAFMC/NEFMC FMP is to conserve spiny dogfish to achieve optimum yield from the resource. In support of this goal, the follow objectives were adopted:

1. Reduce fishing mortality to ensure that overfishing does not occur.
2. Promote compatible management regulations between state and council jurisdictions and the US and Canada.
3. Promote uniform and effective enforcement of regulations.
4. Minimize regulations while achieving the management objectives stated above.
5. Manage the spiny dogfish fishery to minimize the influences of the regulations on the prosecution of other fisheries, to the extent practicable.
6. Contribute to the protection of biodiversity and ecosystem structure and function.

The goal of the ASMFC FMP for spiny dogfish is to promote stock rebuilding and management of the spiny dogfish fishery in a manner that is biologically, economically, socially, and ecologically sound. In support of this goal, the following objectives are recommended:

1. Reduce fishing mortality and rebuild the female portion of the spawning stock biomass (SSB) to prevent recruitment failure and support a more sustainable fishery.
2. Coordinate management activities between state, federal, and Canadian agencies to ensure complementary regulations throughout the species range.
3. Minimize the regulatory discards and bycatch of spiny dogfish within state waters.
4. Allocate the available resource in biologically sustainable manner that is equitable to all the fishers.
5. Obtain biological and fishery related data from state waters to improve the spiny dogfish stock assessment that currently depends upon data from the federal bottom trawl survey.

STATUS OF THE STOCK

Life History

Spiny dogfish (*Squalus acanthias*) are found across the Atlantic Ocean in temperate and subarctic waters. In the northwest Atlantic, they range from Labrador, Canada to Florida but are most abundant from Nova Scotia, Canada to Cape Hatteras, North Carolina (Nammack et al. 1985). As seasonal migrants, spiny dogfish tend to select areas where water temperatures range from 45 to 55 degrees Fahrenheit and migrate to coastal waters of North Carolina in the winter and move north along the Atlantic Coast in the spring (Sulikowski et al. 2010). Spiny dogfish are a relatively long lived and slow growing species reaching a maximum size of approximately 4 feet (Campana et al. 2006). Males are mature at approximately 23.6-inches (6 years), while females mature at between 29.5 and 31.5-inches (12 years; Nammack et al. 1985). The maximum recorded age for males is 35 years and 40 years for females (Campana et al. 2006). The spiny dogfish gives birth to live young called pups. Spiny dogfish gestation is approximately 22 months with two to 15 pups produced (average of six) in each litter and offspring production (fecundity) increases with fish length (Ketchen 2011). Mating occurs during the fall and winter offshore in the mid-Atlantic and pups are born during the winter in the offshore wintering grounds (Campana et al. 2009).

Stock Status

The 2018 stock assessment update indicates that spiny dogfish are not overfished and overfishing is not occurring (Sosebee et al. 2018). The next stock assessment is tentatively scheduled for spring 2022.

Stock Assessment

The 2018 stock assessment update determined that the spiny dogfish SSB of 235 million pounds was slightly above the SSB threshold of 175 million pounds as of 2017. The 2018 stock assessment update used a fishing mortality (F) target of $F_{40\%}$ spawning potential ratio (SPR) of 0.202 and determined that the observed F was below this target ($F=0.2439$). However, stock biomass has declined in recent years which required a 46% reduction in the 2019-2020 commercial quota to ensure overfishing does not occur. A benchmark spiny dogfish stock assessment is scheduled for completion in 2022.

STATUS OF THE FISHERY

Current Regulations

Spiny dogfish are primarily harvested commercially with no recreational regulations in effect. Commercial harvest of spiny dogfish is quota managed with harvest periods and trip limits in federal waters and regional and state quota allocations in state waters. The ASMFC spiny dogfish board approved a 23,194,835-pound quota for the 2020-2021 fishing season. The quota is subdivided into a northern region (Maine to Connecticut) share of 58% of the coastwide quota and the southern region having state-specific shares (New York to North

Carolina) with North Carolina receiving 14.036% (3,255,627 lb) of the annual quota. The North Carolina Division of Marine Fisheries (NCDMF) limits harvest with a trip limit and the most recent proclamation allowed a trip limit of 20,000 lb effective from November 18, 2019 to April 30, 2020. The fishery is typically opened from November through April as the quota allows as this corresponds to the period when spiny dogfish are available in North Carolina waters.

Commercial Landings

In North Carolina, spiny dogfish commercial landings peaked in 1996 and declined sharply through 2001. Landings remained low through 2008 and then steadily increased from 2009 through 2014. Landings have decreased from 2014 to 2019 (Table 1, Figure 1). Most of the spiny dogfish were landed from the ocean gill net fishery, but they also have been landed from estuarine gill nets, beach seines, ocean trawls, and hook and line gears. In 2019, 99% of spiny dogfish were caught in ocean gill nets and 1% were caught in estuarine gill nets (Figure 2). No spiny dogfish were caught using any other method in 2019.

Recreational Landings

Recreational estimates across all years have been updated and are now based on the NOAA Marine Recreational Information Program (MRIP) new Fishing Effort Survey-based calibrated estimates. For more information on MRIP, please see <https://www.fisheries.noaa.gov/topic/recreational-fishing-data>. Total annual North Carolina recreational landings, obtained from the NOAA Marine Recreational Information Program, have been diminutive for since 1994 (Table 1, Table 2, Figure 1).

MONITORING PROGRAM DATA

Fishery-Dependent Monitoring

Fishery-dependent monitoring programs for beach seine, estuarine gill net, ocean gill net, and ocean trawl sampled spiny dogfish from 1994 to 2019. Sampling was minimal and sex was not recorded prior to 1999, therefore, length data presented in this report includes the years 1999 through 2019. Samples were taken at fish packing houses while the catches were offloaded. Fishing captain or crew members were interviewed to obtain information including area fished, gear specifications, and water depth. For each collected sample, length was taken (total and fork) to the nearest mm, aggregate weight was recorded (nearest kg), and sex was determined by the presence/absence of external claspers. Total catch weight for spiny dogfish was collected from the fish house dealer's trip ticket report. From 1999 through 2019, sampled spiny dogfish total length (TL) has averaged 33 inches and ranged between 19 to 43 inches (Table 3). The total number of spiny dogfish measured in 2019 was 580 (Table 3). Generally, female spiny dogfish are encountered more often during sampling events most likely due to their relatively higher abundance in near shore areas where fishing occurs (Table 4). Like many elasmobranch species, spiny dogfish collected in fish house sampling exhibited sexual dimorphism with males generally having a smaller average body size than females (Table 5).

Fishery-Independent Monitoring

The NCDMF initiated a fisheries Independent Gill Net Survey of Pamlico Sound in 2001 (P915). The objective of this project is to provide annual, independent, relative-abundance indices for key estuarine species in the near shore Pamlico Sound. The survey employs a stratified random sampling design and utilizes multiple mesh gill nets (3.0-inch to 6.5-inch stretched mesh, by ½-inch increments). A total of 936 spiny dogfish were measured in the Pamlico Sound independent gill net study from 2001 to 2019. Total length ranged from 20 to 40 inches and averaged 32 inches during the total survey period (Table 6).

MANAGEMENT STRATEGY

To set the annual spiny dogfish quotas, an annual joint meeting between the ASMFC Technical Committee and MAFMC Monitoring Committee is held. The Technical and Monitoring committees make quota recommendations after considering discards, Canadian landings, and management uncertainty. To ensure effective management, quota recommendations are formed using fisheries data collected from the previous fishing season. These quota recommendations are then communicated to the Spiny Dogfish Management Board and MAFMC for approval. Current management targets and thresholds are below:

- $F_{msy} = 0.2439$
- $SSB_{target} = 351.2$ million pounds (159,288 metric tons); level of biomass that would maximize recruitment to the population (100% SSB_{max}).
- $SSB_{threshold} = 175.6$ million pounds (79,644 metric tons); 50% of SSB_{target}

RESEARCH NEEDS

Research needs from the ASMFC’s 2019 FMP review are provided below.

Fishery-Dependent Priorities (High)

- Determine area, season, and gear specific discard mortality estimates coastwide in the recreational, commercial, and non-directed (bycatch) fisheries.
- Characterize and quantify bycatch of spiny dogfish in other fisheries.
- Increase the biological sampling of dogfish in the commercial fishery and on research trawl surveys.
- Further analyses of the commercial fishery are also warranted, especially with respect to the effects of gear types, mesh sizes, and market acceptability on the mean size of landed spiny dogfish.

Fishery-Independent Priorities

- Conduct experimental work on NEFSC trawl survey gear performance, with focus on video work to study the fish herding properties of the gear for species like dogfish and other demersal groundfish.

- Investigate the distribution of spiny dogfish beyond the depth range of current NEFSC trawl surveys, possibly using experimental research or supplemental surveys.
- Continue to analyze the effects of environmental conditions on survey catch rates.

Modeling / Quantitative Priorities

- Continue work on the change-in-ratio estimators for mortality rates and suggest several options for analyses.
- Examine observer data to calculate a weighted average discard mortality rate based on an assumption that the rate increased with catch size.

Life History, Biological, and Habitat Priorities

- Conduct a coastwide tagging study to explore stock structure, migration, and mixing rates.
- Standardize age determination along the entire East Coast. Conduct an ageing workshop for spiny dogfish, encouraging participation by NEFSC, NCDMF, Canada DFO, other interested agencies, academia, and other international investigators with an interest in dogfish ageing.
- Identify how spiny dogfish abundance and movement affect other organisms.

Management, Law Enforcement, and Socioeconomic Priorities

- Monitor the changes to the foreign export markets for spiny dogfish and evaluate the potential to recover lost markets or expand existing ones.
- Update on a regular basis the characterization of fishing communities involved in the spiny dogfish fishery, including the processing and harvesting sectors, based upon Hall-Arber et al. (2001) and McCay and Cieri (2000).
- Characterize the value and demand for spiny dogfish in the biomedical industry on a state by state basis.
- Characterize the spiny dogfish processing sector

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ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – SPINY DOGFISH

TABLES

Table 1. Spiny dogfish recreational harvest and number released (NOAA Marine Recreational Information Program) and commercial harvest (North Carolina Trip Ticket Program) for 1994-2019. All weights are in pounds. Note: * represents confidential data.

Year	Recreational		Landed	Commercial Weight (lb)	Total Weight (lb)
	Landed	# Released			
1994	0	1,842	0	1,234,931	1,234,931
1995	107	1,911	1,071	7,174,803	7,175,874
1996	0	2,453	0	13,210,735	13,210,735
1997	0	0	0	7,608,426	7,608,426
1998	1,645	3,229	11,308	4,961,379	4,972,687
1999	0	51,303	0	3,718,622	3,718,622
2000	0	0	0	3,549,939	3,549,939
2001	0	7,866	0	*	*
2002	0	12,167	0	*	*
2003	2,701	1,429	0	*	*
2004	0	40,336	0	522,576	522,576
2005	0	3,928	0	18,865	18,865
2006	1,402	72,255	5,718	11,574	17,292
2007	0	78,188	0	149,543	149,543
2008	0	40,842	0	158,727	158,727
2009	0	94,509	0	1,416,362	1,416,362
2010	3,613	167,231	16,556	1,708,437	1,724,993
2011	11,422	175,993	83,637	2,557,923	2,641,560
2012	1,365	176,126	9,538	2,728,882	2,738,420
2013	48,603	2,006,275	79,537	3,010,958	3,090,495
2014	1,992	598,268	11,978	5,650,285	5,662,263
2015	7,302	657,373	36,376	4,247,213	4,283,589
2016	22,611	52,562	173,584	2,299,256	2,472,840
2017	683	44,038	5,616	393,085	398,701
2018	7,514	157,394	43,732	1,168,247	1,211,979
2019	6,106	261,322	43,551	1,124,291	1,167,842
Average	4,503	181,109	20,085	2,639,442	2,659,527

ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – SPINY DOGFISH

Table 2. Spiny dogfish length (total length, inches) data from NOAA Marine Recreational Information Program recreational samples, 1994-2019.

Year	Mean Total Length (in)	Minimum Total Length (in)	Maximum Total Length (in)	Total Number Measured
1994	0	0	0	0
1995	33	33	33	1
1996	0	0	0	0
1997	0	0	0	0
1998	31	21	32	4
1999	0	0	0	0
2000	0	0	0	0
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	33	30	35	4
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	28	25	31	2
2011	31	30	33	3
2012	33	31	33	1
2013	22	21	31	1
2014	35	12	40	1
2015	27	16	40	2
2016	35	31	38	2
2017	33	31	34	5
2018	30	25	38	11
2019	35	32	38	28

ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – SPINY DOGFISH

Table 3. Spiny dogfish length (total length, inches) data from commercial fish house samples, 1999-2019.

Year	Mean Total Length (in)	Minimum Total Length (in)	Maximum Total Length (in)	Total Number Measured
1999	33	22	41	255
2000	33	25	41	2,636
2001	32	29	35	12
2002	30	26	32	10
2003	0	0	0	0
2004	34	27	41	1,323
2005	30	27	32	7
2006	35	30	41	92
2007	34	27	40	1,201
2008	34	29	39	545
2009	34	28	43	1,048
2010	34	28	40	843
2011	33	28	40	686
2012	34	26	42	2,461
2013	35	27	41	2,373
2014	35	26	42	2,168
2015	34	19	40	1,365
2016	34	25	40	795
2017	33	24	39	67
2018	34	27	40	380
2019	34	24	39	580

ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – SPINY DOGFISH

Table 4. Female spiny dogfish length (total length, inches) data from commercial fish house samples, 1999-2019.

Year	Mean Total Length (in)	Minimum Total Length (in)	Maximum Total Length (in)	Total Number Measured
1999	33	22	41	235
2000	33	25	41	2,464
2001	33	31	35	7
2002	31	28	32	8
2003	0	0	0	0
2004	34	27	41	1,295
2005	30	27	32	4
2006	35	30	41	91
2007	34	29	40	1,017
2008	34	29	39	527
2009	34	28	43	994
2010	34	28	40	794
2011	34	26	394	647
2012	35	27	42	2,373
2013	35	26	41	2,285
2014	35	19	42	2,094
2015	35	25	40	1,281
2016	35	24	40	727
2017	34	29	39	53
2018	35	27	40	343
2019	34	25	39	523

ASMFC AND FEDERALLY-MANAGED SPECIES WITHOUT N.C. INDICES – SPINY DOGFISH

Table 5. Male spiny dogfish length (total length, inches) data from commercial fish house samples, 1999-2019.

Year	Mean Total Length (in)	Minimum Total Length (in)	Maximum Total Length (in)	Total Number Measured
1999	30	23	32	20
2000	30	27	38	172
2001	31	29	33	5
2002	27	26	28	2
2003	0	0	0	0
2004	31	28	36	28
2005	30	29	31	3
2006	30	30	30	1
2007	30	27	37	184
2008	31	29	37	18
2009	31	28	37	54
2010	31	28	35	49
2011	30	28	33	34
2012	30	28	35	87
2013	31	26	35	88
2014	31	25	33	74
2015	31	25	38	84
2016	30	26	35	68
2017	30	27	32	14
2018	30	27	35	37
2019	30	24	35	47

Table 6. Spiny dogfish length (total length, inches) data from P915 (Pamlico Sound Independent Gill Net Survey) samples, 2001-2019.

Year	Mean Total Length (in)	Minimum Total Length (in)	Maximum Total Length (in)	Total Number Measured
2001-2019	32	20	40	936

FIGURES

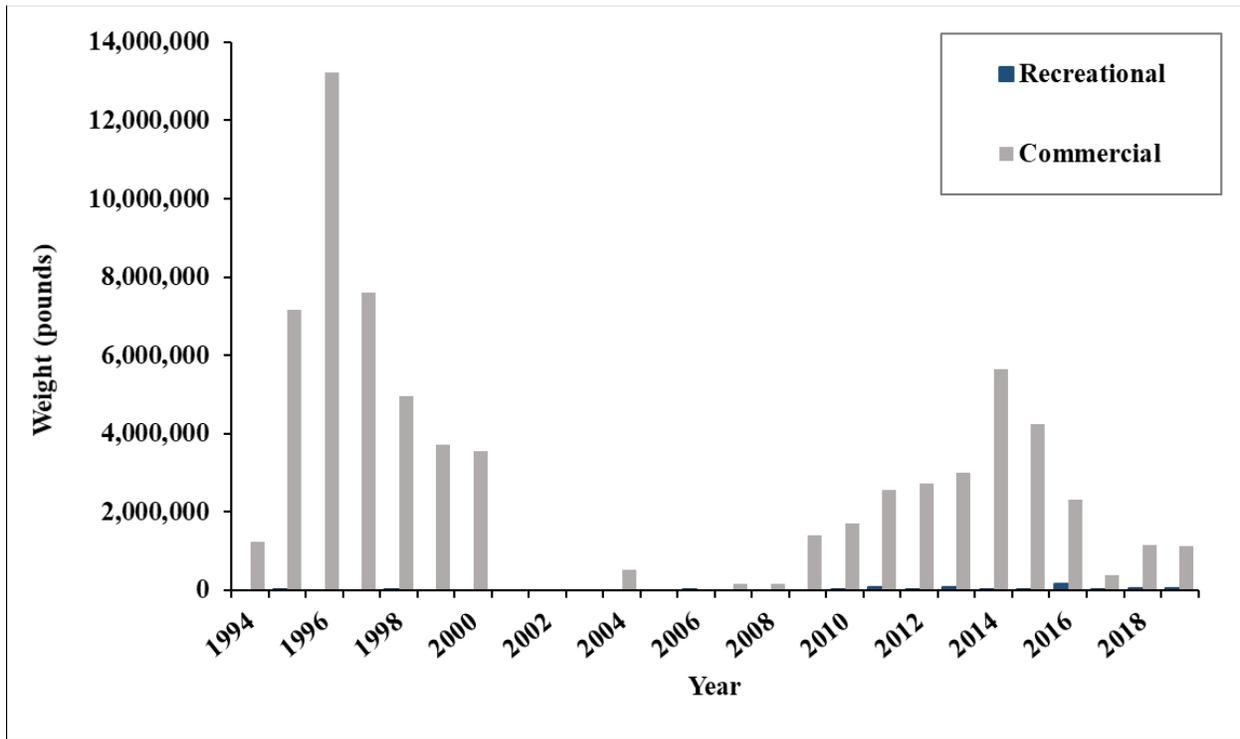


Figure 1. Annual commercial and recreational landings in pounds for spiny dogfish in North Carolina from 1994-2019.

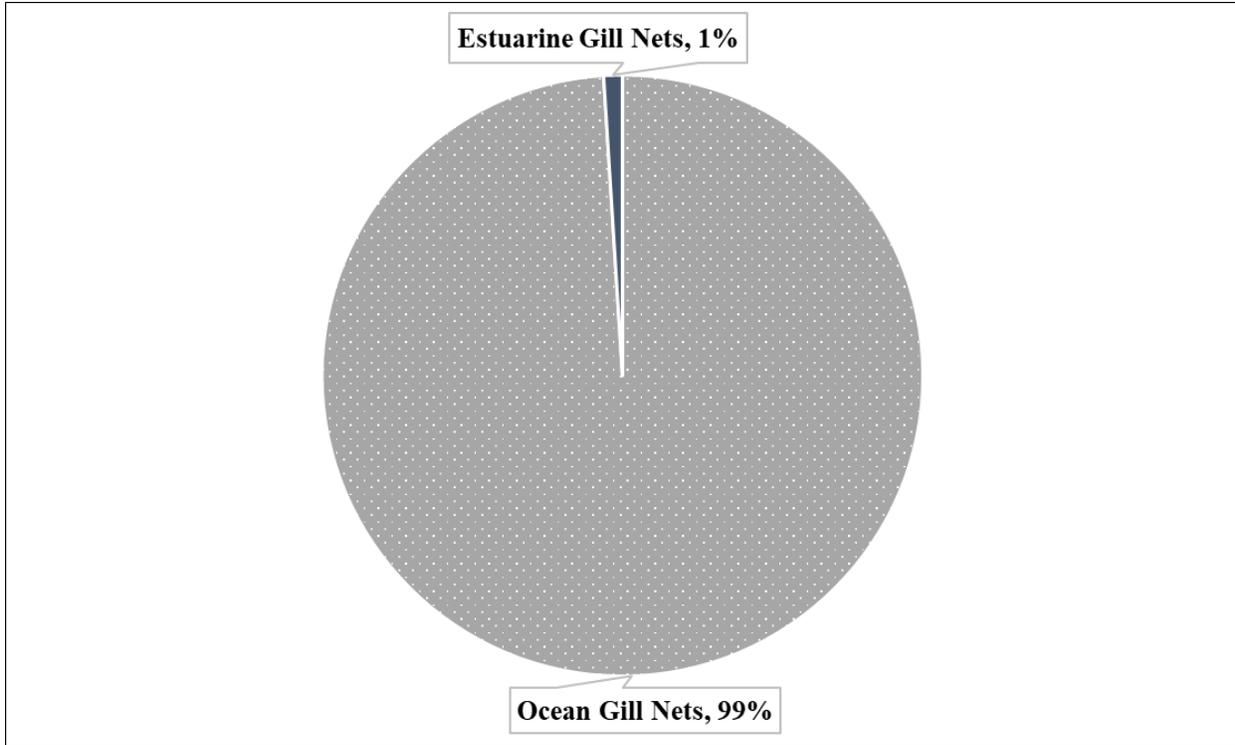


Figure 2. Commercial harvest of spiny dogfish in North Carolina by gear type in 2019.