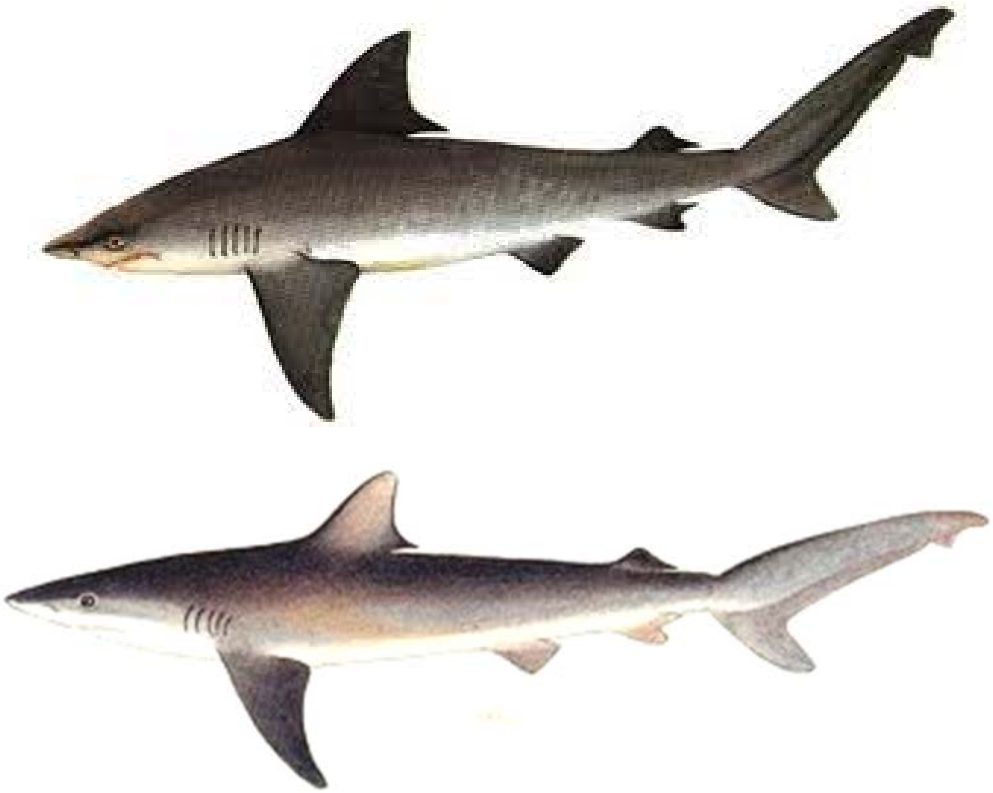
The North Carolina Sandbar (*Carcharhinus plumbeus*) and Dusky Shark (*Carcharhinus obscurus*) Commercial Fishery



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The North Carolina Sandbar (*Carcharhinus plumbeus*) and Dusky Shark (*Carcharhinus obscurus*) Commercial Fishery

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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ABSTRACT

Sharks have been commercially harvested in North Carolina since the early 1900s; however, the commercial fishery expanded during the 1980s and 1990s because of an increase in demand for shark meat, fins, and cartilage. The commercial harvest of sandbar and dusky sharks contributed to this growth. The management for the commercial shark fishery is very complicated and involves multiple agencies. The Southeast Data, Assessment, and Review (SEDAR) process is used to determine the population status for all shark stocks along the east coast. The population status for sandbar and dusky sharks were assessed through SEDAR 21. Both stocks are considered to be overfished and dusky sharks are still undergoing overfishing. Harvest of dusky sharks has been prohibited (commercially and recreationally) since 2000, although we still had some minor landings of dusky shark through 2003, and sandbar sharks were limited to a research fishery in 2007. Annual commercial landings of sandbar sharks were considerable from 1994 to 2006 ranging from 230,000 to 980,000 pounds per year. The dusky shark fishery was never as prominent as the sandbar shark fishery. Commercial landings in the dusky shark commercial fishery ranged from 10,000 to 80,000 pounds per year from 1994 to 2000. Longline was the primary gear type used to harvest both species. Most the fishery for both species occurred in Dare County during the winter (January through March) and summer months (July through September). Commercial fishermen who landed sandbar sharks also participated in a wide range of other commercial fisheries which allowed many of them to continue to commercially fish when the sandbar shark fishery was limited in 2007. Commercial fishermen who landed sandbar and dusky sharks shared similar demographic characteristics to other commercial fishermen in North Carolina.

1 INTRODUCTION

Sharks have been commercially harvested in North Carolina since the early 1900s and have been an important component of North Carolina's commercial fisheries since the late 1980s (accounting for over 600,000 pounds of harvest annually since 1988). Most North Carolina commercial shark landings are composed of spiny dogfish (*Squalus acanthias*) and smooth dogfish (*Mustelus canis*); however, these two species are managed under different strategies than the other species of shark commercially harvested in North Carolina. While most commercial shark landings are composed of the dogfish species, the rest of the commercial shark fishery is diverse, with over 20 different species of shark being landed in the state. Some of the more commercially important species include: sandbar shark (*Carcharhinus plumbeus*), shortfin mako (*Isurus oxyrinchus*), hammerhead sharks (Sphyrnidae), blacktip shark (*C. limbatus*), thresher shark (*Alopias* vulpinus) and dusky shark (*C. obscurus*). Two of these species, the sandbar and dusky sharks, are considered to be overfished by the National Marine Fisheries Service (NMFS) and have severe restrictions limiting their harvest. Dusky sharks are currently prohibited to commercial harvest while harvest of sandbar sharks is limited through a special research collection permit.

The management strategies for the various shark fisheries (excluding the dogfishes) is complicated and has varied over time. In North Carolina, the various shark fisheries are managed under three different agencies. The North Carolina Division of Marine Fisheries (NCDMF) manages sharks in all estuarine waters and in the coastal ocean zone from zero to three miles offshore primarily through the proclamation authority of the NCDMF Director. The NMFS manages sharks in open ocean waters along the entire coastline of the United States from three miles to 200 miles offshore through the Consolidated Highly Migratory Species (HMS) Fisheries Management Plan (FMP) (NMFS 2006). The Atlantic States Marine Fisheries Commission (ASMFC) also manages sharks that migrate across state boundaries within the zero to three-mile ocean coastal zone of the Atlantic coast and through estuarine waters via the Interstate Fishery Management Plan for Coastal Sharks (ASMFC 2008). While the three agencies have varying jurisdiction over these species, they do try to make their management strategies as consistent as possible to help reduce the amount of confusion.

The NMFS has organized the various shark species into eight management units called complexes. The eight management complexes are the aggregated large coastal, non-blacknose small coastal, pelagic, research, blacknose, smoothhound, hammerhead, and prohibited complexes. The species make up for each complex can vary over time if the NMFS determines that a species should be moved from one complex to another to make management less cumbersome. Appendix I contains the current composition by species for each management complex. Each complex is managed under a closely monitored quota (excluding the prohibited complex for which no harvest is allowed) as well as under various seasons, size limits, and trip limits. The NCDMF and ASMFC also attempt to mirror these organizational units to be as consistent as possible to try to make management of these species less confusing. Along with the various seasons, size limits, and trip limits a time/area closure, which protects spawning adults and pupping grounds off the North Carolina coast, has been in effect since 1 January 2005.

The time/area closure off North Carolina's coast has had the largest regulatory impact to shark fisheries in the state (Appendix 2).

Currently, the Southeast Data, Assessment, and Review (SEDAR) process is used to determine the health and status of various shark populations (excluding spiny dogfish). The SEDAR process consists of a series of workshops that include participants from the commercial fishing industry, recreational fishing industry, federal fisheries biologists, state fisheries biologists, and university researchers. The workshops are generally broken into three categories: data, assessment, and review. During this process, participants in the workshops review all available data for a stock assessment, develop the most appropriate stock assessment model and examine its results, and then review all the data inputs and assessment methodologies. The SEDAR process is cooperative and is sponsored by the South Atlantic Fisheries Management Council (SAFMC), Gulf of Mexico Fisheries Management Council (GMFMC), and the Caribbean Fisheries Management Council (CFMC) (SEDARa 2011).

The Atlantic and Gulf of Mexico populations of sandbar, dusky, and blacknose sharks (*C. acronotus*) were assessed through the SEDAR process during 2010 and 2011 (SEDAR 2011a, 2011b, 2011c). The Data Workshop was held in Charleston, South Carolina from June 21 to 25, 2010, the Assessment Workshop was held across multiple webinars from September 2010 to March 2011, and the Review Workshop was held in Annapolis, Maryland from April 18 to 22, 2011. The results of these analyses indicated that the blacknose shark population had two distinct stocks (Atlantic and Gulf of Mexico stocks) and that the sandbar shark, dusky shark, and Atlantic blacknose shark stocks were all overfished. The analysis also indicated that overfishing is still occurring in the dusky shark and Atlantic blacknose shark stocks. The dusky shark assessment was updated in 2016 (SEDAR 2016) with similar results and sandbar sharks are scheduled for another assessment in 2017.

1.1 GOALS AND OBJECTIVES

The goal of this report is to characterize the commercial shark fishery of North Carolina for sandbar and dusky sharks and to serve as a reference document for these species. This report has three main objectives:

1). Determine the overall trends of the commercial landings in North Carolina's commercial shark fishery overall and specifically for sandbar and dusky sharks;

2). Describe the characteristics of the sandbar and dusky shark fishery, the vessels used in the fishery, and the participants of the fishery; and

3). Describe what other fisheries commercial shark fishermen participate in and what fisheries they moved into when the sandbar and dusky shark fisheries were closed.

2 METHODS

2.1 STUDY AREA

The study area for this analysis included estuarine, coastal ocean, and offshore ocean waters of North Carolina (Figure 2.1). Commercial landings data were analyzed across all North Carolina waters and included landings from all counties. Commercial landings were also analyzed by district (northern, central, and southern), which are composed of groups of counties (Figure 2.2). Analysis of the license data for commercial fishermen and their vessels included those from North Carolina and from out of state.

2.2 COMMERCIAL LANDINGS DATA

Various sources of commercial landings data were analyzed to characterize the commercial shark fishery in North Carolina and to determine trends specifically for the sandbar and dusky shark fisheries. Six sources of data were analyzed that covered landings data from 1918 to 2015. The quality of the data collected within these programs improved over time with the most current data collection program having the most accurate and highest quality data available for analysis. The varying data collection programs and data sources are described below.

2.2.1 Historical Commercial Landings Prior to 1950

Historical (prior to 1950) commercial landings data for North Carolina are very sparse and limited. Chestnut and Davis (1975) put together a synopsis of all available commercial landings that occurred in North Carolina from 1880 to 1973; compiling federal and state landings bulletins and reports into one document. Although the data spans back to 1880, data were not available for every year in the time series, this is most notable during war times (World War I, World War II, etc.). Also during this time, landings of shark were not identified to species level. Although annual trends for the commercial shark fishery cannot be illustrated with these data, it is still a good source of information to indicate when shark fishing first started to occur in the state and is the only source of data to show the magnitude of commercial harvest prior to 1950 in a single document.

2.2.2 Commercial landings (1950 to 1961)

Commercial landings data for North Carolina were collected by the NMFS (then known as the Bureau of Commercial Fisheries) from 1950 to 1961. North Carolina wholesale seafood dealers were surveyed monthly about their commercial landings and the fisheries they participated in. Surveys were conducted by mail-out forms and by on-site visits by a NMFS agent. The commercial landings in this dataset are summarized by year, gear, and species. All commercial landings of shark were marked as unclassified (not identified to a species level). The NCDMF received a copy of this dataset from NMFS in 2005.

2.2.3 Commercial landings (1962 to 1971)

The NMFS also collected commercial landings data for North Carolina from 1962 to 1971 with the same survey design. However, this dataset differs from the previous file in that it contains a more detailed breakdown of the state's commercial landings summarizing the data by year, gear, county, water body, and species. The commercial landings of shark are still unclassified. The NCDMF received an updated copy of this dataset from the NMFS in 2010.

2.2.4 Commercial landings (1972 to 1977)

The same survey design and technique was used by the NMFS while collecting commercial landings data for North Carolina from 1972 to 1977; however, the database was constructed differently from the two previous time periods. The data contained in this dataset summarized commercial landings data by year, month, gear, county, water body, and species. As with the two previous time periods, sharks were not identified to the species level.

2.2.5 NCDMF/NMFS Cooperative Statistics Program (1978 to 1993)

Beginning in 1978, a cooperative statistics program was initiated between the NMFS and states of the South Atlantic and Gulf of Mexico. The new cooperative program allowed the NCDMF to use its own port agents to survey fish dealers. This allowed more personnel to be in the field to survey the state's fish dealers which resulted in much more coverage than what the NMFS could provide previously. The survey design and methodology was not changed but the detail in the landings data and its resulting dataset became much better. The dataset from this program contains commercial landings summarized by year, month, gear, county, water body, species, and dealer. The identification to the species level of shark also began with the onset of this program with landings of the dogfishes first being split out from unclassified sharks in 1980 and other sharks being identified to species level starting in 1985.

2.2.6 North Carolina Trip Ticket Program (1994 to Present)

The North Carolina Trip Ticket Program (NCTTP) was implemented on 1 January 1994. The NCTTP was initiated to gather more accurate commercial landings data and to determine effort for the state's commercial fishery. The NCTTP is mandated through North Carolina State General Statute and thus all North Carolina seafood dealers are required to fill out trip tickets and submit them to NCDMF monthly. North Carolina seafood dealers can only purchase seafood from properly licensed commercial fishermen and commercial fishermen can only sell to properly licensed seafood dealers.

Unlike the previous commercial landings data collection programs, the data collected through this program are a complete census of all commercial landings for North Carolina as opposed to a survey. The NCTTP operates using trip ticket forms that are filled out by seafood dealers after each trip is completed by a commercial fisherman. Seafood dealers can complete paper trip ticket forms or they can choose to report their data electronically with a specially designed trip ticket software program. The paper forms and the trip ticket software program are free of charge and are distributed upon request or requirement. Seafood dealers are required to

submit completed trip tickets to NCTTP by the 10th of the following month (e.g., all January trip tickets would be due on February 10th).

Data collected on trip ticket forms include species landed by market grade and condition (whole, gutted, carcass, etc.), gear type used, water body where the commercial fishing occurred, license information for the seafood dealer, commercial fisherman, and commercial fishing vessel, the start and landing date of the trip, crew size, and the quantity landed for each species. Since the trip ticket program started in 1994, there have been a few modifications to the forms. For example, the starting date of a trip and the crew size fields were not added to the trip tickets until 1999. Seafood dealers are instructed to identify all species when they complete their trip ticket and thus landings of sharks can be reported to individual species levels. Due to changes in the regulations of sharks over time, the NCTTP has also added several species codes for sharks that were not commonly landed in North Carolina until recently. The following shark codes were added to the program in the years after 1994: whitetip shark (*C. longimanus*) in 2004; finetooth (*C. isodon*), silky (*C. falciformis*), spinner (*C. brevipinna*), and bonnethead (*Sphyrna tiburo*) sharks in 2009; blacknose (*C. acronotus*) and blue sharks (*Prionace glauca*) in 2010; and porbeagle (*Lamna nasus*), great hammerhead (*Sphyrna mokarran*), scalloped hammerhead (*S. lewini*), and smooth hammerhead sharks (*S. zygaena*) in 2012.

The data collected through the NCTTP is the most accurate and reliable commercial landings data available to describe the state's commercial fisheries. The dataset created through the NCTTP is much more extensive than any of the other datasets available. Landings of all species are recorded on a per trip basis and recorded down to the market grade and condition for each species. Analysis of the trip ticket data allows for summarization of the commercial landings of sharks to further detail than what was possible before. Not only can landings be summarized by year, month, gear, county, water body, species, and dealer, but landings can also be summarized down to market grade, vessel, commercial fisherman, day of landing, or to each individual trip that was landed. Using this data, the total number of trips, vessels, and commercial fishermen who participate in commercial shark fishing can be determined as well as the average crew size and average duration for commercial shark trips. Also, the average landings by trip can be calculated to illustrate trends in catch per unit effort over the years.

2.3 LICENSE DATA

North Carolina license data and structure have varied over the time frame of this analysis and cover two primary time frames: 1 January 1994 to 30 June 1999 and 1 July 1999 to present.

2.3.1 License data from 1 January 1994 to 30 June 1999

A new licensing system for the commercial fishing industry was implemented in 1994 along with the NCTTP. Two primary licenses were needed by commercial fishermen to harvest sharks from 1 January 1994 to 30 June 1999. These two licenses were called the Endorsement to Sell (ETS) License and the Vessel License. An ETS license was required to allow the sale of fish and shellfish in North Carolina and a commercial fisherman needed an ETS for every vessel used in their operation. An ETS was also necessary if a commercial fisherman didn't own or use

a vessel, but still wanted to sell any of their catch. The data collected from the issuance of an ETS license included name of the commercial fisherman or business, address, vessel license number, and date of birth. The ETS license number is the license number that was recorded on trip tickets. Due to the ability of a single commercial fisherman to own more than one vessel, just counting the number of licenses recorded in the trip ticket data is not an accurate count of the total number of commercial fishermen from 1 January 1994 to 30 June 1999. However, by combining the ETS data with the trip ticket data, a total number of commercial fishermen can be determined.

While the ETS license was required for a commercial fisherman to sell their catch to a seafood dealer, a second license was required to allow the use of commercial fishing gear from a vessel. The Vessel license was required for all vessels used in a commercial fishing operation. The data collected during the issuance of this license included vessel length, gross tons, crew size, horse power rating, fuel type, hull material, propulsion type, year built, and the amount of gear used on the vessel while commercial fishing. Due to commercial fishermen needing an ETS to sell their catch even without using a vessel, a count of the total number of licenses recorded in the trip ticket data would overestimate the number of vessels that operated in the fishery. However, by combining the ETS data with the Vessel license data and combining that result with the trip ticket data, the number of vessels operating in any fishery can be determined as well as trends by vessel characteristics from 1 January 1994 to 30 June 1999.

2.3.2 License data from 1 July 1999 to present

Starting on 1 July 1999, a new licensing structure was implemented because of the 1997 NC Fisheries Reform Act and is the current structure in place today. With the current license structure, a commercial fisherman needs to have one of the following licenses to legally sell their catch to a seafood dealer: Standard Commercial Fishing License (SCFL), Retired Standard Commercial Fishing License (RSCFL), Shellfish without a SCFL License, Land or Sell License, or Non-Resident Menhaden License. The SCFL and RSCFL allow commercial fishermen to sell their catches of all finfish and shellfish with the RSCFL being sold at a reduced price for retirees. The Shellfish w/out SCFL only allows commercial fishermen to sell catches of shellfish (does not include crustaceans such as blue crab or shrimp). A Land or Sell License allows for commercial fishermen who have vessels with a documented homeport in a coastal state other than NC to land and sell their catch in NC. Commercial fishermen with a Land or Sell License cannot catch or harvest fish from inside NC's state ocean or estuarine waters. For an out of state commercial fisherman to operate in NC's state ocean or estuarine waters they need to have a SCFL or RSCFL. A Land or Sell License only allows an out of state commercial fishermen to sell catch from the federal ocean waters. The Non-Resident Menhaden License allows out of state commercial fishermen to harvest Atlantic menhaden and thread herring in NC's state ocean or estuarine waters, and only Atlantic menhaden or thread herring are allowed for harvest. Thus, this new license structure, the primary licensing entity switched from the commercial fishing vessel to the commercial fisherman. The data collected from the issuances of these licenses include the name of the commercial fisherman or business, address, date of birth, gender, and race. Also, an economic survey is conducted for each commercial fisherman that buys a license that determines whether 50% or more of their income is derived from commercial fishing.

If a commercial fisherman is licensed under a SCFL, RSCFL, or Shellfish without a SCFL license and they intend to use a vessel, then those commercial fishermen must also obtain a Commercial Fishing Vessel Registration (CFVR). The CFVR replaced the old Vessel license and allows commercial fishermen to use their vessel in a commercial fishing operation. Commercial fishermen who are licensed under a Land or Sell or a Non-Resident Menhaden License are not required to obtain a CFVR. The data elements collected during the sale of a CFVR include the following: NCDMF vessel identification number (known as the P-number), year the vessel was built, horse power rating of the vessel, number of engines, gross tons, hull material type, carrying capacity, and propulsion type. The vessel length is a mandatory requirement for issuance of the CFVR while the other data elements are optional. These same data elements are also collected during the sale of a Land or Sell license or a Non-Resident Menhaden license.

Currently, when a seafood dealer fills out a trip ticket, the commercial fisherman's license number (SCFL, RSCFL, Shellfish w/out a SCFL, Land or Sell, or Non-Resident Menhaden) is recorded as well as the NCDMF vessel identification number. A simple count of licenses recorded in the NCTTP will not be an accurate count of commercial fishermen in the industry because a single fisherman can hold more than one license. However, the license numbers that are recorded on the trip ticket can be matched to those in the license database to allow for a more accurate count of commercial fishermen and allow for the determination of trends by fishermen characteristics (age, gender, race, etc.). The vessel identification numbers can also be linked back to the license data and similar trends for vessel characteristics can also be determined.

2.4 ANALYSIS

The commercial landings and license data sets are stored in various locations on the NCDMF computer network. The individual commercial landings datasets covering the years prior to 1994 are stored as separate dataset files. The ETS and Vessel license data are stored in an old license database that was in use prior to 1 July 1999. Data gathered from the NCTTP and from the current license program are entered and stored into the NCDMF's Fisheries Information Network (FIN). The FIN is also the database currently used to issue licenses and permits to commercial fishermen and seafood dealers. To analyze, combine, and summarize these various data sets, the statistical and data management software package SAS® was used (SAS® 2004). The Data step and PROC SQL procedures were used to combine the various data sources and the Proc Means procedure was used to summarize the data accordingly (SAS® 2004). Once the summarized results were calculated, they were exported and graphed in Microsoft Excel® (Microsoft® 2013).

Commercial statistics were analyzed to illustrate trends in annual landings, value, and effort. Analysis includes the calculations of average statistics covering the time periods when shark species were initially identified in the landings and when reporting programs were modified; years with no recorded landings or effort are also accounted for. When calculating the average statistics for the dusky shark fishery, data after 2003 were excluded because the fishery was closed. Trends were broken down by area (district, county, and port), by gear (grouped by

type), by vessel size (in 10 feet increments), and by market grade. The numbers of participants, vessels, trips, days at sea, crew size, and average catch per trip were used to illustrate trends in effort from 1994 to 2015. The number of participants only included properly licensed commercial fishermen and did not include crew size. Days at sea and crew size could only be analyzed from 1999 to 2015 because data was not collected on trip tickets until July 1999. The landings of participants who had recorded dusky and sandbar sharks were analyzed to see what other fisheries these fishermen participated in and moved into when those respective fisheries were closed or limited in the case of sandbar sharks.

Commercial fishermen and vessel characteristics were summarized for both fisheries. Commercial fishermen and vessels that operated in these fisheries, as determined by having landings of sandbar or dusky sharks, were identified through the trip ticket program. The data collected through the license program was then summarized for those fishermen and vessels that operated in the sandbar and dusky shark fisheries. In some instances, the entity that held the commercial license (Land or Sell, SCFL, or RSCFL) was a business instead of an individual. In these instances, the vessel master was identified and their data were used to help characterize the commercial fishermen that operated in these fisheries. The following demographic information was determined for commercial fishermen: average age, number by gender, and number by race. The demographic analysis for gender and race was limited to the period when the current license structure was started (July 1999). Also, reported are the results of an economic survey question that is asked during license renewals (as mentioned above). The following vessel characteristics were determined: average age of vessels operating in the fisheries, average horse power rating, average number of engines, average gross tons, average length, number of vessels by hull material type, and number of vessels by propulsion type. The average age of commercial fishermen and vessels were calculated on an annual basis and then the average of those results were calculated to determine the average age of commercial fishermen and vessels over the entire time series. This calculation was necessary to account for those fishermen and vessels that did not operate during the entire time frame, accounting for fishermen that dropped out of the fishery, and those fishermen who entered the fishery in later years.

3 RESULTS

3.1 ANNUAL LANDINGS, EFFORT AND VALUE

Commercial landings of sharks first appeared in North Carolina in 1918 with nearly 20,000 pounds landed. Commercial landings then remained relatively low until the late 1930s when over 200,000 pounds of sharks were landed in 1937 and over 600,000 pounds of sharks in 1938. The dramatic increase in landings primarily occurred in Carteret County but it is unclear as to why it occurred. From1938 through 1980, the commercial landings of sharks remained low with landings ranging from zero to 21,000 pounds. The commercial shark fishery in North Carolina then began to flourish through the early 1980s with landings steadily increasing with landings well over 100,000 pounds since 1981. Starting in 1988, the commercial shark landings increased to over 600,000 pounds to a maximum of 15.5 million pounds in 1996. After the peak in 1996, the total landings of sharks decreased steadily until 2001. Commercial landings of

sharks remained relatively constant from 2001 to 2008 ranging from 1.1 million pounds to just over 2.2 million pounds per year. The commercial shark landings then increased steadily from 2009 to 2014 increasing to 3 million pounds in 2009 and then again to 7 million pounds in 2014 (Table 3.1; Figures 3.1 and 3.2).

A very large component of the commercial shark fishery is made up of harvest of dogfish sharks (both spiny and smooth). Commercial landings in the dogfish fisheries increased dramatically in the late 1980s and early 1990s. By 1996 the landings of dogfish reached a maximum of 13.6 million pounds. Heavy regulations on spiny dogfish, due to the stock being overfished, were implemented in the early 2000s and the landings of dogfish sharks dropped to 500,000 pounds in 2001. Landings have since increased steadily the population of spiny dogfish has recovered, and management restrictions have eased resulting in the redistribution of the spiny dogfish quota to allow for more commercial harvest in North Carolina (Table 3.1; Figures 3.1 and 3.2).

3.2 DUSKY SHARKS

The dusky shark fishery did not start until the mid to late 1980s and early 1990s. Landings of dusky shark first appear in the data in 1985 at around 6,000 pounds. However, it is likely that dusky sharks did occur prior to this, but their landings were being incorporated into the "unclassified" shark category. Landings of dusky sharks increased from nearly 40,000 pounds in 1992 to almost 90,000 pounds in 1995. Landings of dusky sharks then declined and ranged from nearly 11,000 to 30,000 pounds per year from 1996 to 2000. After 2000, landings of dusky sharks declined sharply as the stock was declared overfished and dusky shark was placed on the prohibited shark species list. From 1991 to 2000, dusky shark landings accounted for 0.13% to 3% of the total shark landings (excluding dogfish sharks) (Table 3.1; Figure 3.2).

The ex-vessel value also increased during the early 1990s. The ex-vessel value for the dusky shark fishery hit nearly $18,000 in 1995 and then declined overall after that point until the fishery closed (Figure 3.3).

The number of trips reporting landings of dusky sharks varied over time. Trips landing dusky sharks ranged from zero in the most recent years because of the fishery closing after 2000 to 103 in 1995. The number of participants, vessels, and seafood dealers for the dusky shark fishery showed similar trends to the number of trips. The number of all entities declined overall from 1994 to 2003. The number of participants and vessels ranged from zero to 23 while the number of seafood dealers ranged from zero to nine (Table 3.2; Figures 3.4 and 3.5).

3.2.1 Landings and effort by area

Most of the dusky shark commercial harvest occurred in the Atlantic Ocean waters greater than three miles from shore. However, commercial landings occurred in all three districts of the state. Two counties accounted for much of the commercial landings, Dare and Carteret. The trends in landings, value, and trips by district, county, and port are described below.

3.2.1.1 Landings and effort by district

Commercial landings of dusky sharks occurred in all three districts; however, most commercial landings (over 90%) and ex-vessel value (89%) occurred in the northern district. The northern district also accounted for 93% of the total number of trips from 1994 to 2015. The central district ranked second for commercial landings (5%), ex-vessel value (10%), and total number of trips (4%) while the southern district ranked third in all categories (Table 3.3; Figure 3.6).

The annual trends in landings, value, and effort by district are depicted in Tables 3.4 to 3.6 and Figures 3.7 to 3.12.

3.2.1.2 Landings and effort by county

The dusky shark commercial fishery was mainly concentrated in Dare County which is in the northern district. Dare County accounted for 87% of the commercial landings and 82% of the ex-vessel value from 1985 to 2015 and for 84% of the number of trips from 1994 to 2015 (Table 3.7; Figure 3.13).

The annual trends in landings, value, and effort by county are depicted in Tables 3.8 to 3.9 and Figures 3.14 to 3.19.

3.2.1.3 Landings and effort by port (dealer city)

Commercial landings and effort trends for dusky sharks were examined by port (dealer city) by using the data collected from the NCTTP which began in 1994. The ports were grouped into three categories: 1). Bodie/Hatteras/Ocracoke Islands, 2). Wanchese/Manteo, and 3). "Other". The ports of Hatteras, Avon, Rodanthe, Kill Devil Hills, and Ocracoke were included in the Bodie/Hatteras/Ocracoke Islands designation. Wanchese and Manteo were the only ports used in the Wanchese/Manteo designation. Landings in other ports were grouped into the "Other" category.

Dusky sharks were primarily harvested in two ports from 1994 to 2003: Bodie/Hatteras/Ocracoke Islands and Wanchese/Manteo; two of the largest port areas in Dare County. Within these two port areas, 92% of the commercial landings and value occurred and these two areas also accounted for 91% of the total number of trips landing dusky sharks (Table 3.10; Figure 3.20).

The annual trends in landings, value, and effort by port are depicted in Tables 3.11 to 3.12 and Figures 3.21 to 3.26 (annual trends for "Other" Ports are confidential and therefore not presented).

3.2.2 Landings and effort by gear

Dusky sharks are primarily harvested commercially by longline gears. Approximately 90% of the commercial dusky shark landings from 1985 to 2003 were harvested using longlines.

Only two other gears accounted for a noticeable amount of the commercial landings: gillnets and handlines. These two gears each accounted for 4% of the commercial dusky shark landings (Table 3.13; Figure 3.27). Longlines accounted for most the ex-vessel value from 1994 to 2003 for dusky sharks. The ex-vessel value for gillnet and other gears never exceeded $1,000 for any year during 1994 to 2003 for dusky sharks (Tables 3.14, 3.16, 3.18, and 3.20; Figures 3.28 and 3.29).

Participation and effort trends by gear followed the same pattern as the trends seen for landings by gear. Longline gear accounted for the clear majority of the participation and trips for dusky sharks from 1994 to 2003. The number of vessels operating in the fishery also showed a similar pattern. The number of seafood dealers reporting landings of dusky sharks from longline gears ranged from one to seven over the 1994 to 2003 period (Tables 3.14, 3.16, 3.18, and 3.20; Figures 3.30-3.33).

The trends in the average catch per trip by gear type for dusky sharks also showed that most effort occurred in the longline fishery. Average trip duration measured in days can also be calculated from the trip ticket program. Unfortunately, the data for trip duration was not collected until July 1999 and the dusky shark fishery was closed shortly after. However, for the few years where these data were collected, trips occurring in the longline fishery averaged between 1.0 and 2.8 days in length. The average crew size for vessels landing dusky shark across all gears was between 2 to 4 people between 1999 and 2002. The average catch per day was also greatest for longline gears (Tables 3.15, 3.17, and 3.19; Figures 3.34-3.38).

The annual trends in landings, value, and effort by gear are depicted in Tables 3.14 to 3.20 and Figures 3.28 to 3.38.

3.2.3 Landings and effort by vessel size

An analysis of the trip ticket data showed that much of the landings and value for dusky sharks came from vessels that were 30 ft in length or larger. These vessels also accounted for most trips and typically had the longest number of days at sea. For dusky sharks, peaks in landings, value, trips, and days at sea occurred in vessels that ranged from 40 to 50 ft in length (Table 3.21; Figures 3.39-3.43).

The annual trends in crew size and days per trip across the various vessel sizes did not fluctuate widely for dusky sharks. The average crew size typically ranged around two to three fishermen per trip for each vessel size per year and the average number of days at sea was generally around 1 to 3, although there was one instance of 17 days at sea for vessels greater than 50 feet in 2003; however, this was only from one trip and likely was not a true representation of what occurs in the fishery. These trends are limited by the rather short time series for dusky sharks because these data were not collected until 1999 and the dusky shark fishery was closed in 2002. The average catch per trip by vessel size for dusky sharks did not show any consistent trends from 1994 to 2003. In the earlier part of the time series, the larger vessels tended to have a higher catch per trip however by 1998, the mid-size vessels (30-40 ft) tended to have a higher average catch per trip. All trends in catch per trip tended to decline after 1998 (Figures 3.44-3.49).

The annual trends in the number of vessels, crew size, days per trip, average catch per day, and average days per trip are plotted in Figures 3.40 to 3.49.

3.2.4 Landings by market grade

All landings for dusky sharks were in the mixed market grade category during 1994 to 2003.

3.2.5 Landings and trips by month

Most the dusky shark commercial harvest and effort occurred during the winter (January through March) and summer months (July through September). This is likely due to the various management strategies in place to determine the opening and closing of the large coastal shark quotas by NMFS.

During the winter months, dusky shark landings ranged on average from 2,000 to 8,000 pounds while in the summer months' landings averaged from 2,000 to 10,000 pounds. Ex-vessel value averaged from $500 to $1,500 in the winter and in the summer ranged from $250 to $2,000. The trends in number of trips also follow this pattern. During the winter months, the number of trips landing dusky sharks averaged from two to 10 while in summer the number of trips ranged from two to 12 (Figures 3.50 and 3.51).

3.2.6 Vessel characteristics

Vessels characteristics for the dusky shark fishery are shown in Table 3.22. Vessels used in the dusky shark fishery had an average age of 15 years, an average horsepower rating of 381, typically had one engine, averaged 39 gross tons, and had an average length of 44 ft. Hull material type of vessels used in this fishery varied; with 63 vessels having fiberglass, 23 vessels having wood, 12 unknown, and seven with steel. The majority (n=87) of these vessels also used an inboard motor for propulsion, with eight vessels using an outboard motor, and 10 vessels with an unknown type of propulsion (Figure 3.52).

3.2.7 Fisherman characteristics

The average age of commercial fishermen for the dusky shark fishery was approximately 44. All the participants were men and Caucasian. Results of an economic survey issued during license sales showed that many commercial fishermen who operated in this fishery generated more than 50% of their income from commercial fishing (Tables 3.23 and 3.24).

3.3 SANDBAR SHARKS

Recorded landings in the sandbar shark fishery began in 1988. The first year where landings were substantial was in 1991 with 17,000 pounds. However, it is likely that sandbar sharks did occur prior to this, but their landings were being incorporated into the "unclassified" shark category. The commercial landings of sandbar sharks began to rise in the mid-1990s and

reached nearly 1,000,000 pounds in 2002. Commercial landings then steadily declined after 2002 and eventually the fishery was closed in 2007 due to the stock of sandbar sharks being classified as overfished. A special permit was developed after 2007 that allowed qualifying fishermen to land sandbar sharks under a very limited quota. Sandbar shark landings started to reappear again in North Carolina in 2010 and have continued to occur through 2015 with one of North Carolina's commercial fishermen participating in the research fishery. From 1991 to 2007, landings of sandbar sharks accounted for 3% to 57% of all sharks landed annually (excluding dogfish sharks). After the institution of the restricted federal permit, sandbar shark landings have ranged between 20,000 and 70,000 pounds (Table 3.1; Figure 3.2).

The ex-vessel value also increased during the early 1990s, with oscillating peaks reaching $200,000 and declines to $100,000 from 1994 to 2006. The ex-vessel value then declines sharply as the sandbar shark fishery was declared overfished and measures were put in to protect the stock. After 2009 the ex-vessel value for the sandbar shark fishery has not exceeded $30,000 (Figure 3.53)

The number of trips landing sandbar sharks ranged from 46 to 385 during the 1994 to 2007 period. After hitting a peak in the number of trips in 1995, the effort in the sandbar shark fishery declined and remained relatively stable from 1996 to 2006. Since 2010, the number of trips ranged from eight to 38; a result of the limited fishing permit. The number of participants, vessels, and seafood dealers for the sandbar shark fishery showed similar trends to the number of trips. The number of all entities declined overall from 1994 to 2007. The number of participants ranged from 19 to 64 while the number of vessels ranged 20 to 66. The number of seafood dealers ranged from eight to 20 prior to the fishery going through stricter management measures. Since 2010, the number of vessels and participants has numbered from one to three. The number of seafood dealers also declined to a range of one to three. (Table 3.25; Figures 3.54 and 3.55).

3.3.1 Landings and effort by area

Most the sandbar shark commercial harvest occurred in the Atlantic Ocean waters greater than three miles from shore. Commercial landings occurred in all three districts of the state. Two counties accounted for much of the commercial landings, Dare and Carteret. The trends in landings, value, and trips by district, county, and port are described below.

3.3.1.1 Landings and effort by district

Like dusky shark, sandbar shark commercial landings occurred in all three districts with most landings (90%) and ex-vessel value (90%) occurring in the northern district. The northern district also accounted for 92% of the total number of trips from 1994 to 2007. The central district ranked second for commercial landings (7%) and ex-vessel value (7%). The southern district ranked last in commercial landings and ex-vessel value. The central and southern district each accounted for 4% of the total number of trips (Table 3.26; Figure 3.56).

The annual trends in landings, value, and effort by district are depicted in Tables 3.27 to 3.29 and Figures 3.57 to 3.62.

3.3.1.2 Landings and effort by county

Sandbar sharks were primarily landed in two counties, Dare and Carteret. Dare County accounted for 89 to 90% of the landings and ex-vessel value from 1988 to 2015 and 87% of the total number of trips from 1994 to 2015. Carteret County accounted for 6 to 7% of the landings and value from 1988 to 2015 and 4% of the total number of trips from 1994 to 2015 (Table 3.30; Figure 3.63).

The annual trends in landings, value, and effort by county are depicted in Tables 3.31 to 3.33 and Figures 3.64 to 3.69.

3.3.1.3 Landings and effort by port (dealer city)

Like the dusky shark analysis, the commercial landings and effort trends for sandbar sharks were examined by port (dealer city) by using the data collected from the NCTTP. The ports were grouped into six categories: 1) Bodie/Hatteras/Ocracoke Islands, 2) Wanchese/Manteo, 3) Beaufort/Morehead City, 4) Wilmington Area, 5) Englehard/Swan Quarter and 6) "Other Ports". The ports of Hatteras, Avon, Rodanthe, Kill Devil Hills, and Ocracoke were included in the Bodie/Hateras/Ocracoke Islands designation. Wanchese and Manteo were the only ports used in the Wanchese/Manteo designation. Similarly, the only ports used for the Beaufort/Morehead City designation were Beaufort and Morehead City. The Wilmington area included the ports of Carolina Beach, Hampstead, Southport, Supply, Wilmington, and Wrightsville Beach. The next area included the landings from Englehard and Swan Quarter only. All other landings were grouped into the "Other" category.

These ports/areas (excluding "Other Ports") accounted for most of the landings and effort. They accounted for over 99% of the total landings and value for the sandbar shark fishery from 1994 to 2015 and 98% of the total number of trips (Table 3.34; Figure 3.70).

The annual trends in landings, value, and effort by port are depicted in Tables 3.35 to 3.39 and Figures 3.71 to 3.76.

3.3.2 Landings and effort by gear

Sandbar sharks are primarily harvested commercially by longline gears. Nearly 92% of the commercial sandbar landings from 1988 to 2015 were attributed to longlines. Only two other gears accounted for a noticeable amount of the commercial landings: gillnets and hand lines. These two gears accounted for 7% and 1% of the commercial sandbar shark landings (Table 3.40; Figures 3.77-3.78). Longlines also accounted for most of the ex-vessel value for sandbar sharks from 1988 to 2015. The ex-vessel value from gillnet gears was well over $1,000 per year for most of the time series. Handline gears ranked third in ex-vessel value and the ex-vessel value in other gears (which included some landings in beach seines, haul seines, and fish trawls) was minor and typically never exceeded $500 a year from 1988 to 2015 (Tables 3.41-3.44; Figures 3.77 and 3.79).

Unlike the dusky shark fishery, effort and participation in the sandbar shark fishery was more distributed between the various gear types, even though the clear majority of the landings occurred in the longline fishery. The number of participants operating in the gillnet fishery ranged from zero in 2008 and 2009 to 39 in 1994. The number of vessels operating in the gillnet fishery ranged from a low of zero in 2008 and 2009 to a high of 41 in 1994, trending in a similar fashion to the number of participants. The number of seafood dealers reporting landings of sandbar sharks from gillnet gears ranged from zero to 13. The number of gillnet trips for sandbar sharks ranged from a low of zero in 2008 and 2009 to a high of 154 in 1994. The number of participants and vessels in the handline portion of the sandbar fishery ranged from zero after 2007 to a high of 23 in 2000. Likewise, the number of trips with handline gears ranged from zero after 2007 to a high of 44 in 1994. The number of seafood dealers reporting landings of sandbar sharks from handline gears ranged from zero to 12 but for most the time frame less than 10 dealers had landings from handline gears. The primary fishery for sandbar sharks, prior to the implementation of the research fishery, is the longline fishery and participation in this fishery is more consistent from 1994 to 2007. The number of participants that operated in this fishery ranged from 10 to 29 and number of vessels ranged from 10 to 27. The number of trips conducted in the longline fishery ranged from 22 to 265, with most years having well over 100 trips. The number of seafood dealers ranged from four to 11 with most years having at least seven dealers reporting landings. Once the research fishery was instituted, the effort and participation in the longline fishery declined substantially with the number of participants and vessels ranging from zero to two. Participation and effort in the sandbar shark fishery from other gears was minor (Tables 3.41-3.44; Figures 3.80-3.83).

Like dusky sharks and primary to the research fishery, the trends in the average catch per trip by gear type for sandbar sharks showed that most effort occurred in the longline fishery. The average catch per trip for the longline fishery ranged from 1,137 pounds per trip in 2007 to 4,491 pounds per trip in 2000. In the gillnet fishery, the average catch per trip typically ranged from 150 pounds per trip to 500 pounds per trip, except for the years of 2002, 2003, and 2004 when the average catch per trip ranged from 600 to 1,000 pounds per trip. Average catch per trip in the handline fishery was more variable and ranged from 49 pounds per trip in 1998 to 2,078 pounds in 1996. The average catch per trip in other gears was also highly variable, ranging from 35 pounds per trip in 1995 to over 6,000 pounds per trip in 2000 (Tables 3.45-3.48; Figure 3.84).

The average trip duration for the gillnet fishery was typically one day per trip. The average trip duration for the handline fishery was more variable than that for the gillnet fishery and ranged from 1.0 to 2.3 days per trip. The average trip duration for the longline fishery was typically longer than the other gears and ranged from 1.3 to 2.7 days per trip. In the other gear category, the average trip duration ranged from one to six days per trip (Tables 3.45-3.48; Figure 3.88).

Average catch per day in the gillnet fishery shows the same trends as the average catch per trip for sandbar sharks because most those trips were single day trips. The average catch per day in the handline fishery was more variable, ranging from 51 pounds per day in 2003 pounds to 1,923 pounds per day in 2005. In the longline fishery, the average catch per day remained somewhat constant, ranging from approximately 1,200 pounds per day in 2005 to over 3,000 pounds per day in 1999 except for 2007 when only 481 pounds per day were recorded. In the

other gear category, the average catch per day was widely variable reaching over 2,000 pounds per day in 2000 and only 235 pounds per day in 2002. The average crew size for all gears typically ranged from two to three individuals per trip from 2000 to 2015. Gillnet and handline vessels typically had an average crew size of two individuals while longline and other gear vessels normally had an average crew size of three individuals (Tables 3.45-3.48; Figures 3.85-3.87).

The annual trends in landings, value, and effort by gear are depicted in Tables 3.41 to 3.48 and Figures 3.78 to 3.88.

3.3.3 Landings and effort by vessel size

An analysis of the trip ticket data showed that most landings and value for sandbar sharks came from vessels that were 30 ft in length or larger. These vessels also accounted for most trips and typically had the longest number of days at sea. For sandbar sharks, vessels in the 40 to 50 ft range and greater than 50 ft had almost equal amounts of landings and value (Table 3.49; Figures 3.89-3.94).

The average crew size for the sandbar shark fishery varied based on the size of the vessel. Vessels that ranged from 11 to 20 ft were usually crewed by a single person. Vessels from the 20 to 30 ft and 30 to 40 ft range were primarily manned by two crew members. Vessels in the 40 to 50 ft range were typically operated by crews of two or three members while vessels larger than 50 ft were typically crewed by three or four members. All vessels had an average trip duration of one to two days from 1999 through 2015 except for those vessels larger than 50 ft. Vessels larger than 50 ft typically had average trip durations lasting longer than two days and in some years were around four or more days long. The average catch per trip across vessel size varied widely from 1994 to 2015. Likewise, the average catch per day was highly variable from 1999 to 2015. The average number of days per trip was typically two or less except for vessels that were larger than 50 feet from 1999 to 2015 (Figures 3.95-3.99).

The annual trends in crew size, average trip duration, average catch per trip, average catch per day and average days per trips are shown in Figures 3.95 to 3.99.

3.3.4 Landings by market grade

Much of the landings for sandbar sharks were in the mixed market grade category during 1994 to 2015. However, some landings of sandbar sharks were divided into other market categories. Approximately 90% of the sandbar shark landings were classified as mixed, 4% were classified as large, another 4% were classified as medium, and 1% were classified as small (Table 3.50).

3.3.5 Landings and trips by month

Much of the sandbar shark commercial harvest and effort occurred during the winter (January through March) and summer months (July through September). This is likely due to the various management strategies in place to determine the opening and closing of the large coastal

shark quotas by NMFS. The average landings of sandbar sharks during the winter months from 1994 to 2015 ranged from 60,000 to 120,000 pounds and during the summer months from 14,000 pounds to 95,000 pounds. The total ex-vessel value trends followed the same patterns, since the value is closely related to the landings. The ex-vessel value during the winter months ranged from $500 to $1,500 and during the summer the ex-vessel value ranged from $200 to $2,000. The total number of trips also peaked during the winter and summer months for sandbar sharks. Trips ranged from three to 10 trips in winter months and from nine to 36 trips during the summer (Figures 3.100-3.101).

3.3.6 Vessel characteristics

The vessels characteristics for the sandbar shark fishery were like those of the dusky shark fishery. This isn't surprising since many of the fishermen who operated in the dusky shark fishery also participated in the sandbar shark fishery. Vessels employed in the sandbar shark fishery had an average age of 15 years, an average horsepower rating of 342, typically had one engine, an average gross tonnage of 34 tons, and an average length of 37 ft. The large majority of these vessels had hulls made of fiberglass (417 vessels), 102 vessels had hulls made of wood, 64 vessels had unknown hulls, 24 vessels had steel hulls, and two vessels were reported with aluminum hulls. Most these vessels used inboard motors (447 vessels). Ninety-four vessels reported using an outboard motor while 67 vessels had an unknown propulsion type. One vessel was reported to have an inboard and outboard motor (Table 3.51; Figure 3.102).

3.3.7 Fisherman characteristics

The average age of commercial fishermen in the sandbar shark fishery was 43. Most fishermen were Caucasian (99%) and men (98%) (Table 3.52). Results of an economic survey issued during license sales showed that most commercial fishermen who operated in the fishery generated more than 50% of their income from commercial fishing (Table 3.53).

3.4 COMMERCIAL FISHING HARVEST DIVERSITY

Participants who had commercial landings of dusky and sandbar sharks also participated in a wide array of other fisheries. The average landings, across all species, for participants who had landings of dusky and sandbar sharks was 15.4 million pounds from 1994 to 2015. The average number of species commercially harvested by dusky and sandbar shark fishermen was 135 from 1994 to 2015. The species recorded ranged from blue crab (*Callinectes sapidus*) to various tuna species. The diversity of species that ranked in the top 10 based on pounds landed varied over the years, with 19 different species occurring in the top 10 species throughout the 1994 to 2015 period (Table 3.54). Blue crab, Atlantic croaker (*Micropogonias undulates*), and bluefish (*Pomatomus saltatrix*) were in the top 10 in each year from 1994 to 2015, while yellowfin tuna (*Thunnus albacares*) was in the top 10 in 21 years. Dogfish sharks (spiny and smooth combined) and flounders made the top 10 in 20 years. Although the ranking of the species varied from year to year, the species composition was similar from 1994 to 1999 and then began to diverge more after 1999. After 1999, smooth dogfish, shrimp, and squid appeared more often in the top ten species showing some of these fishermen moving into some of the ocean trawl fisheries and other ocean gillnet fisheries.

The dusky shark fishery closed in 2000. The number of participants who had landings of dusky shark in 1999 was 14. The landings of the participants from 1999 was tracked through 2015 to determine how many of them continued to operate in North Carolina's commercial fisheries and to see what fisheries they participate in. The original number of participants in 1999 steadily declined through 2015. In 2015, only four of the 14 participants still had any commercial landings. Some of this attrition may have been due to participants getting to old to commercial fish. The top ten species in landings for the original participants from 1999 to 2015 is shown in Table 3.55. The diversity ranged from open ocean pelagic species such other shark species and yellowfin tuna to more inshore and estuarine species such as bluefish and Atlantic croaker and included hard crab and shrimp in some years.

A similar analysis was done with sandbar sharks. In 2007, heavy restrictions were put in place that impacted the sandbar shark fishery and eventually a limited scientific fishery was established. Therefore, the landings for participants who landed sandbar shark in 2006 were tracked through 2015. Twenty-five participants had landings of sandbar sharks in 2006. Like what occurred with the dusky shark fishery, the number of these participants that continued to operate in North Carolina's commercial fishery declined over time. By 2015, only 15 of the original 25 participants still had commercial landings. The top ten species in landings for the original participants from 2006 to 2015 is shown in Table 3.56. The top species in many years was diverse, ranging from swordfish (*Xiphias gladius*) and tuna species to blue crab and shrimp. One notable fishery was the development of the blueline (grey) tilefish (*Caulolatilus microps*) fishery, which several these participants moved into, starting in 2006.

4 DISCUSSION

The commercial shark fishery in North Carolina largely developed during the late 1980s and early 1990s. The commercial harvest of dusky and sandbar sharks contributed to the development of this fishery. During this time frame, sandbar sharks accounted for 26% to 57% of the total commercial landings of all sharks (excluding the dogfish species) until commercial harvest of sandbar sharks was essentially closed in 2007 (restricted to only participants in the special research fishery). The dusky shark fishery never reached effort and landings levels comparable to the sandbar shark fishery and was prohibited from harvest in 2000 when the stock was deemed to be overfished. The highest amount of effort generally occurred during the late 1990s in both fisheries. The average crew size for vessels harvesting dusky and sandbar sharks typically ranged from one to four crew members and the average commercial trip harvesting dusky and sandbar sharks lasted typically from one to three days.

Dusky and sandbar sharks were primarily harvested with longline gears; over 90% of all landings occurring from that gear type. The commercial fishery for dusky and sandbar sharks occurred in the coastal ocean waters off North Carolina greater than three miles from shore. Although commercial landings for both species occurred in all three districts, many the landings for both species occurred in the northern district within Dare County. The Wanchese/Manteo area was the primary hub for both species, with sandbar sharks also occurring in large quantities in the Bodie/Hatteras/Ocracoke Islands area. Seasonally, most the commercial fishery occurred

during the mid-summer (July) and early winter (January-March) months, which was primarily driven by season openings by the NMFS. Dusky sharks were typically not graded into various market sizes while sandbar sharks were occasionally graded into small, medium, and large/jumbo categories.

The commercial shark fishery has been subjected to an array of management changes over the years, including changes in quota allocations, movement of species into different management units, gear restrictions, and area/seasonal closures. These management measures have had different impacts on the commercial sandbar and dusky shark fisheries. The management measure that had the greatest impact to the commercial shark fishery in North Carolina was a time and area closure from Oregon Inlet to Cape Fear from January to July established in 2005. This time and area closure effectively closed the commercial shark fishery for half the year between 2005 and 2007. The time and area closure, the dusky shark prohibition, and the sandbar shark fishery moving to an extremely limited research fishery resulted in a dramatic decline in commercial harvest for both species. The commercial landings of all shark species (excluding dogfish sharks) showed a 61% reduction from 2005 to 2009. Commercial landings of dusky shark have been minimal or zero since 2003 and sandbar shark landings have been minimal or zero since 2008.

Commercial fishermen who participated in the sandbar and dusky shark fisheries shared similar demographic characteristics with other commercial fishermen in North Carolina. The NCDMF has been conducting standardized socioeconomic surveys since 2000 (Diaby 2000, 2002; Cheuvront 2002, 2003; Cheuvront and Neal 2004; Crosson 2007a, 2007b, 2009, 2010). These surveys are conducted and rotated by area. Commercial fishermen who operate in the Albemarle and Pamlico sounds were mostly Caucasian (94%), men (95%) and used vessels ranging from 16 to 50 feet in length (Crosson 2007a). Two-thirds of the commercial fishermen surveyed from the Albemarle and Pamlico Sound areas reported that much of their income came from commercial fishing. In the Core Sound area, Crosson (2007b) reported that the mean age for commercial fishermen was 50 with the majority being Caucasian (99%), and men (96%). Vessels used in Core Sound ranged from 16 to 43 ft and two-thirds of the survey respondents reported that they were full-time commercial fishermen. Commercial fishermen operating in the southern half of the state (from Beaufort Inlet to the NC/SC state line) were also mostly Caucasian (95%), men (96%), had an average age of 55 with 52% reporting they fished commercially full-time and used vessels ranging from 16 to 44 ft (Crosson 2010).

Currently, there are two studies that describe the socioeconomic characteristics for North Carolina's commercial ocean fisheries, Crosson (2009) and Cheuvront (2004). Crosson (2009) surveyed commercial fishermen who participated in fisheries in the Atlantic Ocean off the North Carolina shore, which is where most the commercial shark fishery occurs. Results from that survey showed that all the respondents were men, the majority were Caucasian (98%), they used vessels ranging from 17 to 55 ft, 60% of them considered themselves to be full time commercial fishermen, and they had an average age of 50. Cheuvront (2004) surveyed snapper-grouper commercial fishermen who operated south of Cape Hatteras. Results of that survey indicated that snapper-grouper fishermen were primarily men (98%), Caucasian (98%), used vessels ranging from 17 to 43 ft in length, and 60% indicating that fishing was their sole source of income, and had an average age of 47. When comparing the results of these studies to the data

gathered in this report for sandbar and dusky sharks, the results are very similar except for the average age, where sandbar and dusky shark commercial fishermen tended to be younger. The average vessel size for sandbar and dusky shark participants was between 42 and 44 ft which is in the high end of the vessel ranges reported in various socioeconomic surveys. Most sandbar and dusky shark commercial fishermen indicated they generate more than 50% of their income from commercial fishing.

The geographic location of North Carolina allows commercial fishermen to participate in a wide array of fisheries, which also happen to vary seasonally. Commercial fishermen who landed sandbar and dusky shark generally harvested a wide array of other species as well. Much of the other species landed included other shark species, other pelagic species (king mackerel (*Scomberomorus cavalla*), tunas, swordfish) and species typically caught in ocean and estuarine gillnet fisheries (bluefish, Atlantic croaker, Spanish mackerel (*Scomberomorus maculatus*)). Participation in the estuarine blue crab fishery was also prominent. Those commercial fishermen who landed dusky sharks in 1999 and sandbar sharks in 2006 tended to move to other oceanic gillnet fisheries (sea mullet (*Menticirrhus* spp.), Spanish mackerel), the blueline (grey) tilefish fishery, the blue crab fishery, or other shark fisheries in later years when the dusky shark fishery was closed and the sandbar shark fishery was limited to a research fishery. Ten participants from those who landed dusky sharks in 1999 and ten participants who landed sandbar sharks in 2006 dropped out completely from commercial fishing by 2015; possibly because of changing management in these shark fisheries.

The results of this study are based on determining all participants who had commercial landings of sandbar or dusky sharks. Thus, it will include more than just those participants who targeted sandbar and/or dusky sharks and was a factor that impacted the species diversity trends. Those fishermen who landed sandbar or dusky shark incidentally in the earlier years were still included in the diversity analysis in the later years to account for all the possible trends in diversity. The target species for a commercial fishing trip is not reported through the NCTTP, so some other criteria would need to be used to select for only those participants who targeted sandbar and dusky sharks (e.g., minimal poundage per trip of target species). However, in recent years the commercial shark fishery (including the fisheries for sandbar and dusky sharks) has been heavily regulated and federally permitted which lessens the impact of those participants who harvested these species incidentally and this can be seen when looking at the trends for those participants who landed sandbar shark in 2006 and tracking their landings to 2015.

5 CONCLUSION

The North Carolina commercial shark fishery flourished in the middle to late 1980s and through the 1990s. Commercial harvest of sandbar and dusky sharks contributed to this fishery, with sandbar sharks accounting for 32% on average of all sharks landed (excluding the dogfish species) over 1985 to 2007. These fisheries have been subjected to several management strategies. Currently, the commercial harvest of dusky sharks is prohibited, while the commercial harvest of sandbar sharks is limited to a special research fishery. The results of SEDAR 21 indicate that both stocks are overfished and experiencing overfishing. Commercial

fishermen who participated in these fisheries show the same general characteristics as those of other fishermen across the state. These fishermen also diversified their effort, taking advantage of North Carolina's geographic location to participate in other oceanic fisheries as well as a variety of estuarine fisheries. This diversity is a unique feature of North Carolina and allows commercial fishermen to participate in fishing despite harvest closures of some species due to management concerns.

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7 TABLES

Table 3.1. Total commercial landings of all sharks by species category in North Carolina from 1918 to 2015, note that the landings from 1918 to 1950 were not collected annually.

Year	Sandbar	Dusky	Dogfish	Other	Unclassified	Total	Total w/out Dogfish	% Sandbar	% Dusky
1918	-	-	-	-	19,125	19,125	19,125	0.00	0.00
1936	-	-	-	-	1,100	1,100	1,100	0.00	0.00
1937	-	-	-	-	241,800	241,800	241,800	0.00	0.00
1938	-	-	-	-	608,400	608,400	608,400	0.00	0.00
1945	-	-	-	-	1,200	1,200	1,200	0.00	0.00
1950	-	-	-	-	5,500	5,500	5,500	0.00	0.00
1951	-	-	-	-	6,600	6,600	6,600	0.00	0.00
1952	0	0	0	0	0	0	0	0.00	0.00
1953	0	0	0	0	0	0	0	0.00	0.00
1954	0	0	0	0	0	0	0	0.00	0.00
1955	0	0	0	0	0	0	0	0.00	0.00
1956	0	0	0	0	0	0	0	0.00	0.00
1957	0	0	0	0	0	0	0	0.00	0.00
1958	-	-	-	-	4,200	4,200	4,200	0.00	0.00
1959	-	-	-	-	12,900	12,900	12,900	0.00	0.00
1960	-	-	-	-	2,300	2,300	2,300	0.00	0.00
1961	-	-	-	-	2,200	2,200	2,200	0.00	0.00
1962	-	-	-	-	2,600	2,600	2,600	0.00	0.00
1963	-	-	-	-	4,100	4,100	4,100	0.00	0.00
1964	-	-	-	-	13,900	13,900	13,900	0.00	0.00
1965	-	-	-	-	2,100	2,100	2,100	0.00	0.00
1966	-	-	-	-	2,600	2,600	2,600	0.00	0.00
1967	-	-	-	-	5,400	5,400	5,400	0.00	0.00
1968	-	-	-	-	5,600	5,600	5,600	0.00	0.00
1970	-	-	-	-	2,800	2,800	2,800	0.00	0.00

Table 3.1 (continued). Total commercial landings of all sharks, by species category, in North Carolina from 1918 to 2015, note that the landings from 1918 to 1950 were not collected annually.

Year	Sandbar	Dusky	Dogfish	Other	Unclassified	Total	Total w/out Dogfish	% Sandbar	% Dusky
1971	-	-	-	-	2,000	2,000	2,000	0.00	0.00
1972	0	0	0	0	0	0	0	0.00	0.00
1973	0	0	0	0	0	0	0	0.00	0.00
1974	0	0	0	0	0	0	0	0.00	0.00
1975	0	0	0	0	0	0	0	0.00	0.00
1976	0	0	0	0	0	0	0	0.00	0.00
1977	0	0	0	0	0	0	0	0.00	0.00
1978	-	-	-	-	10,031	10,031	10,031	0.00	0.00
1979	-	-	-	-	13,036	13,036	13,036	0.00	0.00
1980	-	-	2,866	-	20,891	23,757	20,891	0.00	0.00
1981	-	-	4,506	-	96,434	100,940	96,434	0.00	0.00
1982	-	-	6,405	-	94,580	100,985	94,580	0.00	0.00
1983	-	-	90	-	136,612	136,702	136,612	0.00	0.00
1984	-	-	0	-	202,952	202,952	202,952	0.00	0.00
1985	0	6,898	1,029	106	116,662	124,695	123,666	0.00	5.58
1986	0	0	0	158	131,376	131,534	131,534	0.00	0.00
1987	0	0	0	984	263,317	264,301	264,301	0.00	0.00
1988	34	0	301,768	27,132	302,372	631,306	329,538	0.01	0.00
1989	0	0	0	71,393	960,139	1,031,532	1,031,532	0.00	0.00
1990	0	0	41,446	83,920	819,539	944,905	903,459	0.00	0.00
1991	17,652	776	1,463,221	82,580	508,865	2,073,094	609,873	2.89	0.13
1992	65,614	38,665	8,634,923	236,094	931,840	9,907,136	1,272,213	5.16	3.04
1993	60,210	27,883	8,806,064	715,347	1,517,737	11,127,241	2,321,177	2.59	1.20
1994	235,905	30,107	9,877,658	435,616	2,445,509	13,024,795	3,147,137	7.50	0.96
1995	818,774	86,749	9,357,602	520,370	1,301,407	12,084,903	2,727,300	30.02	3.18
1996	551,108	37,258	13,673,758	468,865	813,972	15,544,960	1,871,203	29.45	1.99
1997	391,937	13,626	8,135,923	530,477	551,630	9,623,592	1,487,669	26.35	0.92

Table 3.1 (continued). Total commercial landings of all sharks, by species category, in North Carolina from 1918 to 2015, note that the landings from 1918 to 1950 were not collected annually.

Year	Sandbar	Dusky	Dogfish	Other	Unclassified	Total	Total w/out Dogfish	% Sandbar	% Dusky
1998	381,094	22,204	5,451,610	395,518	368,420	6,618,846	1,167,236	32.65	1.90
1999	824,230	34,798	4,224,232	317,618	490,009	5,890,888	1,666,655	49.45	2.09
2000	685,090	10,774	3,885,221	324,418	440,427	5,345,931	1,460,709	46.90	0.74
2001	471,260	0	510,756	325,890	341,918	1,649,824	1,139,068	41.37	0.00
2002	982,451	4,386	341,722	322,854	397,495	2,048,908	1,707,186	57.55	0.26
2003	629,982	618	373,078	346,122	297,441	1,647,241	1,274,163	49.44	0.05
2004	520,264	0	1,146,273	367,304	192,249	2,226,090	1,079,817	48.18	0.00
2005	619,734	0	666,443	417,100	138,710	1,841,986	1,175,544	52.72	0.00
2006	445,762	0	621,821	306,974	82,679	1,457,235	835,415	53.36	0.00
2007	32,254	0	788,449	243,412	73,051	1,137,166	348,717	9.25	0.00
2008	0	0	985,001	303,498	165,371	1,453,870	468,869	0.00	0.00
2009	0	0	2,637,512	416,270	31,135	3,084,917	447,405	0.00	0.00
2010	<75,000	0	3,323,280	618,139	11,282	3,952,701	629,421	***	0.00
2011	<75,000	0	3,799,175	558,368	25,870	4,383,413	584,238	***	0.00
2012	<75,000	0	3,709,205	659,641	42,235	4,411,081	701,876	***	0.00
2013	<75,000	0	3,794,011	533,548	20,118	4,347,676	553,665	***	0.00
2014	<75,000	0	6,149,189	998,394	7,463	7,155,046	1,005,858	***	0.00
2015	<75,000	0	4,515,642	791,624	4,207	5,311,473	795,831	***	0.00

***Landings for sandbar shark in 2010 through 2015 were combined with the other identified shark landings to protect confidentiality.

Table 3.2. Annual number of trips, dealers, participants, and vessels recording landings of dusky shark from 1994 to 2015.

Year	Trips	Dealers	Participants	Vessels
1994	50	9	17	18
1995	103	6	23	23
1996	49	6	17	14
1997	24	6	11	11
1998	22	6	9	9
1999	61	7	15	17
2000	17	4	10	11
2001	0	0	0	0
2002	9	2	3	3
2003	2	2	2	2
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

Table 3.3. Average landings and ex-vessel value of dusky shark from 1985 to 2003 and number of trips from 1994 to 2003 by district.

District	Pounds	Ex-Vessel Value	Trips
Central	821	$360	1
Northern	15,484	$3,193	32
Southern	260	$54	1

Table 3.4. Landings, ex-vessel value, trips, participants, vessels, and dealers and for dusky sharks in the northern district from 1985 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1985	6,898	$729	-	-	-	-
1986	0	$0	-	-	-	-
1987	0	$0	-	-	-	-
1988	0	$0	-	-	-	-
1989	0	$0	-	-	-	-
1990	0	$0	-	-	-	-
1991	776	$143	-	-	-	-
1992	38,572	$4,969	-	-	-	-
1993	22,135	$6,473	-	-	-	-
1994	29,423	$6,656	7	47	15	15
1995	86,749	$17,583	6	103	23	23
1996	36,834	$8,987	5	48	16	13
1997	13,626	$2,896	6	24	11	11
1998	22,014	$4,403	5	21	9	9
1999	25,596	$5,546	6	50	13	15
2000	6,576	$1,348	3	11	9	10
2001	0	$0	0	0	0	0
2002	1,000 to 5,000	$500 to $1,000	2	9	3	3
2003	500 to 1,000	< $500	2	2	2	2
2004	0	$0	0	0	0	0
2005	0	$0	0	0	0	0
2006	0	$0	0	0	0	0
2007	0	$0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.5. Landings, ex-vessel value, trips, participants, vessels, and dealers for dusky sharks in the central district from 1985 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1985	0	0	-	-	-	-
1986	0	0	-	-	-	-
1987	0	0	-	-	-	-
1988	0	0	-	-	-	-
1989	0	0	-	-	-	-
1990	0	0	-	-	-	-
1991	0	0	-	-	-	-
1992	93	$56	-	-	-	-
1993	5,748	$4,672	-	-	-	-
1994	500 to 1,000	<$500	1	2	2	2
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	5,000 to 10,000	$1,000 to $5,00	1	11	5	5
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	$0	0	0	0	0
2005	0	$0	0	0	0	0
2006	0	$0	0	0	0	0
2007	0	$0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.6. Landings, ex-vessel value, trips, participants, vessels, and dealers for dusky sharks in the southern district from 1985 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1985	0	0	-	-	-	-
1986	0	0	-	-	-	-
1987	0	0	-	-	-	-
1988	0	0	-	-	-	-
1989	0	0	-	-	-	-
1990	0	0	-	-	-	-
1991	0	0	-	-	-	-
1992	0	0	-	-	-	-
1993	0	0	-	-	-	-
1994	< 500	<$500	1	1	1	1
1995	0	0	0	0	0	0
1996	<500	<$500	1	1	1	1
1997	0	0	0	0	0	0
1998	<500	<$500	1	1	1	1
1999	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	$0	0	0	0	0
2005	0	$0	0	0	0	0
2006	0	$0	0	0	0	0
2007	0	$0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.7. Average landings and ex-vessel value of dusky sharks from 1985 to 2003 and number of trips from 1994 to 2003 by county.

County	Pounds	Ex-Vessel Value	Trips
Dare	14,413	$2,958	28
Other	2,153	$650	5

Table 3.8. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for dusky sharks in Dare County from 1985 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1985	6,898	$729	-	-	-	-
1986	0	$0	-	-	-	-
1987	0	$0	-	-	-	-
1988	0	$0	-	-	-	-
1989	0	$0	-	-	-	-
1990	0	$0	-	-	-	-
1991	776	$143	-	-	-	-
1992	38,572	$4,969	-	-	-	-
1993	22,135	$6,473	-	-	-	-
1994	21,981	$4,946	6	34	13	12
1995	81,785	$16,590	5	96	20	20
1996	32,884	$8,024	4	44	15	12
1997	13,626	$2,896	6	24	11	11
1998	22,014	$4,403	5	21	9	9
1999	25,596	$5,546	6	50	13	15
2000	6,576	$1,348	3	11	9	10
2001	0	$0	0	0	0	0
2002	< 500	<$500	1	1	1	1
2003	500 to 1,000	<$500	2	2	2	2
2004	0	$0	0	0	0	0
2005	0	$0	0	0	0	0
2006	0	$0	0	0	0	0
2007	0	$0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.9. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for dusky sharks in other counties from 1985 to 2003.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1985	0	$0	-	-	-	-
1986	0	$0	-	-	-	-
1987	0	$0	-	-	-	-
1988	0	$0	-	-	-	-
1989	0	$0	-	-	-	-
1990	0	$0	-	-	-	-
1991	0	$0	-	-	-	-
1992	93	$56	-	-	-	-
1993	5,748	$4,672	-	-	-	-
1994	8,126	$1,864	3	16	5	6
1995	1,000 to 5,000	$500 to $1,000	1	7	5	5
1996	1,000 to 5,000	$1,000 to $5,000	2	5	2	2
1997	0	$0	0	0	0	0
1998	< 500	<$500	1	1	1	1
1999	5,000 to 10,000	$1,000 to $5,000	1	11	5	5
2000	1,000 to 5,000	$500 to $1,000	1	6	3	3
2002	1,000 to 5,000	$500 to $1,000	1	8	2	2
2003	0	$0	0	0	0	0
2004	0	$0	0	0	0	0
2005	0	$0	0	0	0	0
2006	0	$0	0	0	0	0
2007	0	$0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.10. Average landings, ex-vessel value, and trips of dusky sharks from 1994 to 2003 by port.

Port	Pounds	Ex-Vessel Value	Trips
Bodie/Hatteras/Ocracoke Islands	4,044	$883	7
Other ports	1,870	$395	3
Wanchese/Manteo	18,138	$3,872	23

Table 3.11. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for dusky sharks from 1994 to 2003 for Bodie/Hatteras/Ocracoke Islands.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	12,963	$2,952	26	9	9	5
1995	8,792	$1,765	13	10	9	4
1996	5,000 to 10,000	$1,000 to $5,000	9	3	4	2
1997	698	$148	9	4	4	3
1998	5,000 to 10,000	$1,000 to $5,000	5	2	2	3
1999	3,804	$824	10	4	4	3
2002	< 500	<$500	1	1	1	1

Table 3.12. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for dusky sharks from 1994 to 2003 for Wanchese/Manteo.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	10,000 to 20,000	$1,000 to $5,000	21	7	6	2
1995	50,000 to 100,000	$10,000 to $25,000	90	17	17	2
1996	29,858	$7,285	39	14	10	3
1997	12,928	$2,747	15	7	7	3
1998	10,000 to 20,000	$1,000 to $5,000	16	7	7	2
1999	21,792	$4,722	40	11	12	3
2000	6,576	$1,348	11	9	10	3
2003	500 to 1,000	<$500	2	2	2	2

Table 3.13. Average landings, ex-vessel value, and trips of dusky shark by gear from 1985 to 2003.

Gear	Pounds	Ex-Vessel Value	Trips
Gillnets	665	$103	2
Hand Lines	741	$741	1
Longlines	14,957	$14,957	29
Other	202	$38	<1

Table 3.14. Annual landings, ex-vessel value, trips, participants, vessels and dealers for dusky sharks from gillnets from 1994 to 2003.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	528	$119	3	3	3	3
1995	398	$126	4	4	4	4
1996	Less than 500 Pounds	Less than $500	1	1	1	1
1997	Less than 500 Pounds	Less than $500	1	1	1	1
1998	0	0	0	0	0	0
1999	Less than 500 Pounds	Less than $500	1	1	1	1
2000	Less than 500 Pounds	Less than $500	1	1	1	1
2001	0	0	0	0	0	0
2002	1,000 to 5,000 Pounds	$500 to $1,000	8	2	2	1
2003	0	0	0	0	0	0

Table 3.15. Pounds per trip, pounds per day, average crew size, trip duration (days), and average trip duration (days) for dusky shark using gill nets gears from 1994 to 2003 (***confidential data).

Year	Pounds / Trip	Pounds / Day	Crew Size	Trip Duration	Average Trip Duration
1994	176.0	-	-	-	-
1995	99.5	-	-	-	-
1996	***	-	-	-	-
1997	***	-	-	-	-
1998	0	0	0	0	0
1999	***	***	2.0	1	1.0
2000	***	***	2.0	1	1.0
2001	0	0	0	0	0
2002	***	***	3.0	8	1.0
2003	0	0	0.0	0	0.0

Table 3.16. Annual landings, ex-vessel value, trips, participants, vessels and dealers for dusky sharks from handlines from 1994 to 2003.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	5,608	$1,262	15	6	6	5
1995	5,364	$1,073	3	3	3	3
1996	1,000 to 5,000 Pounds	$500 to $1,000	2	1	1	1
1997	500 to 1,000 Pounds	Less than $500	8	3	3	2
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	Less than 500 Pounds	Less than $500	1	1	1	1

Table 3.17. Pounds per trip, pound per day, average crew size, trip duration (days), and average trip duration (days) for dusky shark using handline gears from 1994 to 2003 (***confidential data).

Year	Pounds / Trip	Pounds / Day	Crew Size	Trip Duration	Average Trip Duration
1994	373.9	-	-	-	-
1995	1,788.0	-	-	-	-
1996	***	-	-	-	-
1997	***	-	-	-	-
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	***	***	4.0	17	17.0

Table 3.18. Annual landings, ex-vessel value, trips, participants, vessels and dealers for dusky sharks from longlines from 1994 to 2003.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	23,946	$5,423	30	9	9	4
1995	80,987	$16,384	96	20	20	4
1996	34,874	$8,509	46	17	13	6
1997	10,128	$2,152	14	6	6	3
1998	22,204	$4,441	22	9	9	6
1999	34,324	$7,437	60	15	17	7
2000	10,744	$2,203	16	9	10	3
2001	0	$0	0	0	0	0
2002	Less than 500 Pounds	Less than $500	1	1	1	1
2003	500 to 1,000 Pounds	Less than $500	1	1	1	1

Table 3.19. Pounds per trip, pounds per day, average crew size, trip duration (days), and average trip duration (days) for dusky shark using longline gears from 1994 to 2003 (***confidential data).

Year	Pounds / Trip	Pounds / Day	Crew Size	Trip Duration	Average Trip Duration
1994	798.2	-	-	-	-
1995	843.6	-	-	-	-
1996	758.1	-	-	-	-
1997	723.4	-	-	-	-
1998	1,009.3	-	-	-	-
1999	572.1	483.4	2.0	71	1.2
2000	671.5	238.8	3.0	45	2.8
2001	0.0	0	0	0	0
2002	***	***	2.0	1	1.0
2003	***	***	3.0	1	1.0

Table 3.20. Annual landings, ex-vessel value, trips, participants, vessels and dealers for dusky sharks from other gears.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	Less than 500 Pounds	Less than $500	2	2	2	2
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	1,000 to 5,000 Pounds	$500 to $1,000	1	1	1	1
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0

Table 3.21. Average landings, ex-vessel value, and trips from 1994 to 2003 and trip duration (days at seas) from 1999 to 2003 by vessel length range for dusky shark.

Length	Pounds	Ex-Vessel Value	Trips	Trip Duration
11 to 20 Feet	146	$30	1	0
20 to 30 Feet	291	$60	1	1
30 to 40 Feet	4,370	$948	8	2
40 to 50 Feet	9,159	$1,962	14	10
Greater than 50 Feet	6,809	$1,450	6	6
Unknown	3,630	$701	4	0

Table 3.22. Average vessel characteristics for vessels used in the dusky shark commercial fishery.

Vessel Characteristic		Vessels
Average Age	15	89
Average Horse Power Rating	381	76
Average Number of Engines	1	16
Average Gross Tons	39	90
Average Length	44	90

Table 3.23. Demographic characteristics for commercial fishermen in the dusky shark commercial fishery.

Demographic Characteristic	Result	Number of Fishermen
Average Age	44	52
Gender	Male	22
Race	Caucasian	21

Table 3.24. Economic survey results for fishermen that participated in the dusky shark commercial fishery.

Survey Question	Fishermen
Less Than 50%	1
More than 50%	12

Table 3.25. Number of trips, dealers, participants, and vessels recording landings of sandbar sharks from 1994 to 2015.

Year	Trips	Dealers	Participants	Vessels
1994	274	13	62	66
1995	385	18	57	53
1996	231	13	53	48
1997	172	12	44	39
1998	154	16	43	42
1999	258	16	46	53
2000	258	19	64	66
2001	229	20	50	53
2002	285	15	43	43
2003	246	19	44	45
2004	171	8	25	26
2005	196	9	20	22
2006	162	14	25	27
2007	46	9	19	20
2008	0	0	0	0
2009	0	0	0	0
2010	28	3	3	3
2011	38	3	3	3
2012	12	2	1	1
2013	8	3	2	2
2014	28	2	1	1
2015	13	1	1	1

Table 3.26. Average landings and ex-vessel value of sandbar shark from 1988 to 2015 and number of trips from 1994 to 2015 by district.

District	Pounds	Ex-Vessel Value	Trips
Central	19,400	$4,282	6
Northern	259,021	$61,220	133
Southern	7,805	$1,717	6

Table 3.27. Landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks in the northern district from 1988 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1988	34	$7	-	-	-	-
1989	0	0	-	-	-	-
1990	0	0	-	-	-	-
1991	17,652	$4,516	-	-	-	-
1992	65,614	$7,191	-	-	-	-
1993	60,210	$16,276	-	-	-	-
1994	231,902	$52,329	10	269	59	63
1995	818,772	$196,743	17	384	57	52
1996	550,840	$170,082	12	230	52	47
1997	391,814	$102,682	10	163	41	35
1998	370,704	$86,496	6	120	28	25
1999	628,382	$137,806	10	201	36	42
2000	426,508	$96,429	12	189	49	51
2001	444,848	$99,755	13	218	44	47
2002	964,045	$195,395	12	280	42	42
2003	558,132	$135,171	12	228	40	41
2004	406,926	$84,369	5	147	21	22
2005	605,684	$130,581	7	190	18	20
2006	397,958	$83,198	9	146	21	23
2007	31,896	$9,079	6	43	16	17
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
2010	58,746	$25,196	3	28	3	3
2011	61,166	$19,167	3	38	3	3
2012	10,000 to 20,000	$5,000 to $10,000	2	12	1	1
2013	20,000 to 30,000	$5,000 to $10,000	2	7	1	1
2014	50,000 to 100,000	$25,000 to $50,000	2	28	1	1
2015	30,000 to 50,000	$10,000 to $20,000	1	13	1	1

Table 3.28. Landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks in the central district from 1988 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1988	0	0	-	-	-	-
1989	0	0	-	-	-	-
1990	0	0	-	-	-	-
1991	0	0	-	-	-	-
1992	0	0	-	-	-	-
1993	0	0	-	-	-	-
1994	1,000 to 5,000	$500 to $1,000	1	2	2	2
1995	0	0	0	0	0	0
1996	< 500	<$500	1	1	1	1
1997	0	0	0	0	0	0
1998	<500	<$500	1	1	1	1
1999	195,324	$42,264	4	39	10	10
2000	199,414	$45,180	3	41	11	11
2001	1,348	$303	3	3	3	3
2002	10,000 to 20,000	$1,000 to $5,000	2	4	2	2
2003	43,142	$10,426	5	11	4	4
2004	50,000 to 100,000	$10,000 to $20,000	2	15	5	5
2005	10,000 to 20,000	$1,000 to $5,000	2	6	4	4
2006	5,000 to 10,000	$1,000 to $5,000	2	6	2	2
2007	Less than 500	Less than $500	2	2	2	2
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
2012	0	0	0	0	0	0
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0

Table 3.29. Landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks in the southern district from 1988 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1988	0	0	-	-	-	-
1989	0	0	-	-	-	-
1990	0	0	-	-	-	-
1991	0	0	-	-	-	-
1992	0	0	-	-	-	-
1993	0	0	-	-	-	-
1994	Less than 500	Less than $500	2	3	2	2
1995	Less than 500	Less than $500	1	1	1	1
1996	0	0	0	0	0	0
1997	Less than 500	Less than $500	2	9	4	5
1998	10,286	$2,394	9	33	17	18
1999	500 to 1,000	<$500	2	18	7	7
2000	59,168	$13,405	4	28	9	9
2001	25,064	$5,639	4	8	8	8
2002	Less than 500	Less than $500	1	1	1	1
2003	20,000 to 40,000	$5,000 to $10,000	2	7	2	2
2004	40,000 to 75,000	$10,000 to $20,000	1	9	2	2
2005	0	0	0	0	0	0
2006	39,720	$8,271	3	10	5	5
2007	Less than 500	Less than $500	1	1	1	1
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
2012	0	0	0	0	0	0
2013	Less than 500	Less than $500	1	1	1	1
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0

Table 3.30. Average landings and ex-vessel value of sandbar sharks from 1988 to 2015 and number of trips from 1994 to 2015 by county.

County	Pounds	Ex-Vessel Value	Trips
Carteret	19,391	$4,280	6
Dare	255,178	$60,302	127
Other	11,657	$2,637	12

Table 3.31. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks in Dare County from 1988 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1988	34	$7	-	-	-	-
1989	0	$0	-	-	-	-
1990	0	$0	-	-	-	-
1991	17,652	$4,516	-	-	-	-
1992	65,614	$7,191	-	-	-	-
1993	59,743	$16,108	-	-	-	-
1994	227,978	$51,446	9	266	57	61
1995	818,052	$196,568	14	380	54	49
1996	538,840	$166,377	8	211	41	35
1997	387,834	$101,639	8	149	35	29
1998	369,910	$86,311	5	117	25	22
1999	624,360	$136,793	8	189	31	35
2000	418,674	$94,654	10	181	44	46
2001	433,626	$97,231	9	173	33	36
2002	943,435	$191,367	10	274	39	39
2003	516,852	$125,195	10	204	29	29
2004	406,926	$84,369	5	147	21	22
2005	605,684	$130,581	7	190	18	20
2006	397,714	$83,147	7	144	19	21
2007	31,628	$9,002	5	42	15	16
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	50,000 to 60,000	$20,000 to $30,000	2	27	2	2
2011	61,166	$19,167	3	38	3	3
2012	10,000 to 20,000	$6,000 to $10,000	2	12	1	1
2013	20,000 to 30,000	$6,000 to $10,000	2	7	1	1
2014	71,272	$27,832	2	28	1	1
2015	30,000 to 50,000	$10,000 to $20,000	1	13	1	1

Table 3.32. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks in Carteret County from 1988 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1988	0	$0	-	-	-	-
1989	0	0	-	-	-	-
1990	0	$0	-	-	-	-
1991	0	0	-	-	-	-
1992	0	$0	-	-	-	-
1993	0	$0	-	-	-	-
1994	1,000 to 5,000	$500 to $1,000	1	2	2	2
1995	0	0	0	0	0	0
1996	Less than 500	Less than $500	1	1	1	1
1997	0	0	0	0	0	0
1998	Less than 500	Less than $500	1	1	1	1
1999	195,306	$42,260	3	38	10	10
2000	199,414	$45,180	3	41	11	11
2001	1,348	$303	3	3	3	3
2002	10,000 to 20,000	$1,000 to $5,000	2	4	2	2
2003	42,908	$10,369	3	9	2	2
2004	50,000 to 60,000	$10,000 to $15,000	2	15	5	5
2005	10,000 to 20,000	$1,000 to $5,000	2	6	4	4
2006	5,000 to 10,000	$1,000 to $5,000	2	6	2	2
2007	0	$0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.33. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks in other counties from 1988 to 2015.

Year	Pounds	Ex-Vessel Value	Dealers	Trips	Participants	Vessels
1988	0	0	-	-	-	-
1989	0	0	-	-	-	-
1990	0	0	-	-	-	-
1991	0	0	-	-	-	-
1992	0	0	-	-	-	-
1993	467	$168	-	-	-	-
1994	3,991	$906	3	6	4	4
1995	722	$176	4	5	4	4
1996	12,000	$3,705	4	19	11	12
1997	4,103	$1,075	4	23	10	11
1998	11,080	$2,579	10	36	20	21
1999	4,564	$1,131	5	31	12	15
2000	67,002	$15,180	6	36	14	14
2001	36,286	$8,164	8	53	19	19
2002	20,834	$4,072	3	7	4	4
2003	70,222	$16,970	6	33	15	16
2004	50,000 to 60,000	$10,000 to $15,000	1	9	2	2
2005	0	0	0	0	0	0
2006	39,964	$8,321	5	12	7	7
2007	<500	<$500	2	2	2	2
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	Less than 500	Less than $500	1	1	1	1
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	Less than 500	Less than $500	1	1	1	1
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.34. Average landings, ex-vessel value and trips of sandbar sharks from 1994 to 2015 by port.

Port	Pounds	Ex-Vessel Value	Trips
Beaufort/Morehead City	24,680	5,447	6
Bodie/Hatteras/Ocracoke Islands	56,517	12,809	37
Engelhard/Swan Quarter	4,483	1,048	6
Other ports	85	19	3
Wanchese/Manteo	262,140	62,786	91
Wilmington Area	9,860	2,168	3

Table 3.35. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from 1994 to 2015 for Beaufort/Morehead City.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	1,000 to 5,000	$500 to $1,000	2	2	2	1
1996	< 500	< $500	1	1	1	1
1998	< 500	< $500	1	1	1	1
1999	195,306	$42,260	38	10	10	3
2000	199,414	$45,180	41	11	11	3
2001	1,348	$303	3	3	3	3
2002	10,000 to 20,000	$1,000 to $5,000	4	2	2	2
2003	20,000 to 50,000	$5,000 to $15,000	9	2	2	3
2004	50,000 to 60,000	$10,000 to $15,000	15	5	5	2
2005	10,000 to 20,000	$1,000 to $5,000	6	4	4	2
2006	5,000 to 10,000	$1,000 to $5,000	6	2	2	2
2007	< 500	< $500	2	2	2	2
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.36. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from 1994 to 2015 for Bodie/Hatteras/Ocracoke Islands port area.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	149,204	$33,686	227	47	50	6
1995	90,033	$21,845	128	36	36	12
1996	9,216	$2,845	30	18	18	7
1997	4,218	$1,105	12	11	10	5
1998	16,450	$4,041	14	6	7	3
1999	48,922	$11,534	36	16	18	5
2000	52,242	$11,801	37	15	15	5
2001	69,910	$15,730	35	12	13	6
2002	258,859	$50,595	77	11	10	4
2003	147,282	$35,593	54	7	7	5
2004	100,000 to 150,000	$25,000 to $50,000	38	3	3	2
2005	135,074	$25,511	46	3	3	3
2006	58,490	$11,826	41	8	8	3
2007	5,000 to 10,000	$1,000 to $5,000	8	2	2	1
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	5,000 to 10,000	$1,000 to $5,000	2	1	1	1
2012	500 to 1,000	Less than $500	1	1	1	1
2013	10,000 to 20,000	$5,000 to $10,000	4	1	1	1
2014	40,000 to 50,000	$10,000 to $25,000	17	1	1	1
2015	0	$0	0	0	0	0

Table 3.37. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from 1994 to 2015 for Engelhard/Swan Quarter.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	1,000 to 5,000	$500 to $1,000	3	2	2	1
1995	0	0	0	0	0	0
1996	5,000 to 10,000	$1,000 to $5,000	13	7	8	2
1997	1,000 to 5,000	$1,000 to $5,000	14	6	6	2
1998	500 to 1,000	< $500	3	3	3	1
1999	1,000 to 5,000	< $500	11	5	6	1
2000	5,000 to 10,000	$1,000 to $5,000	8	5	5	2
2001	10,448	$2,351	43	10	10	3
2002	20,000 to 30,000	$1,000 to $5,000	6	3	3	2
2003	40,000 to 50,000	$6,000 to $10,000	24	11	12	2
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	< 500	< $500	1	1	1	1
2007	< 500	< $500	1	1	1	1
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	Less than 500	Less than $500	1	1	1	1
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.38. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from 1994 to 2015 for Wanchese/Manteo.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	78,774	$17,760	39	11	12	3
1995	728,734	$174,896	255	26	19	4
1996	534,768	$165,120	187	28	21	3
1997	383,616	$100,534	137	26	20	3
1998	<375,000	<$100,000	103	20	15	2
1999	577,180	$125,779	154	18	20	4
2000	366,432	$82,853	144	33	34	5
2001	364,490	$81,675	140	24	25	4
2002	684,576	$140,772	197	31	31	6
2003	369,570	$89,602	150	23	22	5
2004	282,500	$57,761	109	18	19	3
2005	470,610	$105,070	144	16	18	4
2006	339,344	$71,346	104	15	16	5
2007	23,250	$6,643	34	13	14	4
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	50,000 to 60,000	$25,000 to $50,000	27	2	2	2
2011	50,000 to 60,000	$10,000 to $20,000	36	3	3	2
2012	10,000 to 20,000	$6,000 to $10,000	11	1	1	1
2013	5,000 to 10,000	$1,000 to $5,000	3	1	1	1
2014	20,000 to 30,000	$6,000 to $10,000	11	1	1	1
2015	40,000 to 50,000	$10,000 to $25,000	13	1	1	1

Table 3.39. Annual landings, ex-vessel value, trips, participants, vessels and dealers for sandbar sharks from 1994 to 2015 for Wilmington Area.

Year	Pounds	Ex Vessel Value	Trips	Participants	Vessels	Dealers
1994	< 500	< $500	3	2	2	2
1995	< 500	< $500	1	1	1	1
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	9,902	$2,305	14	9	9	7
1999	< 500	< $500	1	1	1	1
2000	58,824	$13,327	13	4	4	3
2001	25,064	$5,639	8	8	8	4
2002	0	0	0	0	0	0
2003	20,000 to 30,000	$6,000 to $10,000	7	2	2	2
2004	50,000 to 60,000	$10,000 to $15,000	9	2	2	1
2005	0	0	0	0	0	0
2006	39,720	$8,271	10	5	5	3
2007	0	0	0	0	0	0
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	Less than 500	Less than $500	1	1	1	1
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.40. Average landings, value, and trips for sandbar shark by gear from 1985 to 2015.

Geartype	Pounds	Ex-Vessel Value	Trips
Gillnets	18,346	$4,913	55
Hand Lines	3,567	$812	18
Longlines	263,770	$61,195	145
Other	544	$130	2

Table 3.41. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from gillnets, 1994-2015.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	81,338	$18,458	154	39	41	9
1995	58,495	$14,271	108	31	30	13
1996	19,010	$5,869	48	29	30	11
1997	5,934	$1,555	33	18	15	7
1998	4,526	$1,053	14	10	8	4
1999	10,160	$2,198	30	14	18	6
2000	20,034	$4,539	70	21	21	6
2001	29,300	$6,593	96	21	22	9
2002	56,218	$10,988	55	11	11	4
2003	66,378	$16,041	85	20	21	7
2004	18,354	$3,796	30	6	7	3
2005	500 to 1,000	Less than $500	6	3	3	2
2006	9,580	$2,001	23	7	7	5
2007	2,626	$750	17	4	4	3
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	18,562	$7,938	10	3	3	3
2011	10,000 to 20,000	$5,000 to $10,000	19	2	2	2
2012	10,000 to 20,000	$5,000 to $10,000	11	1	1	1
2013	5,000 to 10,000	$1,000 to $5,000	4	2	2	2
2014	20,000 to 50,000	$5,000 to $10,000	9	1	1	2
2015	20,000 to 50,000	$10,000 to $20,000	13	1	1	1

Table 3.42. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from handlines, 1994-2015.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	24,090	$5,423	44	19	21	9
1995	6,280	$1,508	8	7	7	5
1996	10,392	$3,209	5	5	5	3
1997	2,089	$547	19	10	12	6
1998	1,766	$411	36	19	22	12
1999	5,878	$1,471	31	13	16	9
2000	7,722	$1,750	42	23	23	10
2001	2,236	$503	12	11	11	9
2002	12,769	$2,506	14	7	7	6
2003	1,068	$258	9	6	6	5
2004	8,542	$1,788	5	4	4	3
2005	15,384	$2,989	8	3	3	3
2006	1,226	$250	11	6	6	5
2007	446	$127	4	4	4	4
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.43. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from longlines, 1994-2015.

Year	Pounds	Ex-Vessel Value	Trips	Participants	Vessels	Dealers
1994	128,215	$28,848	68	14	14	8
1995	753,858	$180,926	265	29	24	8
1996	521,706	$161,087	178	26	21	5
1997	383,914	$100,612	120	20	17	4
1998	374,794	$87,448	103	16	15	6
1999	808,192	$176,514	197	23	25	11
2000	651,234	$147,343	145	25	27	9
2001	439,644	$98,585	120	23	24	9
2002	911,586	$185,132	213	26	26	9
2003	562,076	$136,124	149	20	20	9
2004	493,368	$102,002	136	19	19	7
2005	603,654	$130,715	180	17	19	8
2006	434,956	$90,901	128	15	17	8
2007	25,018	$7,111	22	10	10	4
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	20,000 to 50,000	$10,000 to $20,000	18	1	1	1
2011	20,000 to 50,000	$10,000 to $20,000	19	2	2	2
2012	500 to 1,000	Less than $500	1	1	1	1
2013	10,000 to 20,000	$5,000 to $10,000	4	1	1	1
2014	20,000 to 50,000	$10,000 to $20,000	19	1	1	2
2015	0	$0	0	0	0	0

Table 3.44. Annual landings, ex-vessel value, trips, participants, vessels, and dealers for sandbar sharks from other gears, 1994-2015.

Year	Pounds	Ex-vessel Value	Trips	Participants	Vessels	Dealers
1994	1,000 to 5,000	$500 to $1,000	8	3	4	2
1995	141	$39	4	4	4	4
1996	0	$0	0	0	0	0
1997	0	$0	0	0	0	0
1998	Less than 500	Less than $500	1	1	1	1
1999	0	$0	0	0	0	0
2000	6,100	$1,000 to $5,000	1	1	1	1
2001	Less than 500	Less than $500	1	1	1	1
2002	1,878	$367	3	3	3	3
2003	Less than 500	Less than $500	3	3	3	2
2004	0	$0	0	0	0	0
2005	Less than 500	Less than $500	2	2	2	2
2006	0	$0	0	0	0	0
2007	1,000 to 5,000	$1,000 to $5,000	3	1	2	1
2008	0	$0	0	0	0	0
2009	0	$0	0	0	0	0
2010	0	$0	0	0	0	0
2011	0	$0	0	0	0	0
2012	0	$0	0	0	0	0
2013	0	$0	0	0	0	0
2014	0	$0	0	0	0	0
2015	0	$0	0	0	0	0

Table 3.45. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for sandbar shark using gill net gears, 1994-2015. (***Confidential Data)

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	528.2	-	-	-	-
1995	541.6	-	-	-	-
1996	396.0	-	-	-	-
1997	179.8	-	-	-	-
1998	323.3	-	-	-	-
1999	338.7	338.7	1.0	30	1.0
2000	286.2	286.2	2.0	70	1.0
2001	305.2	305.2	2.0	96	1.0
2002	1,022.1	1,022.1	2.0	55	1.0
2003	780.9	754.3	2.0	88	1.0
2004	611.8	611.8	2.0	30	1.0
2005	***	***	2.0	6	1.0
2006	416.5	383.2	2.0	25	1.1
2007	154.5	154.5	2.0	17	1.0
2008	0.0	0.0	0	0	0.0
2009	0.0	0.0	0	0	0.0
2010	1,856.2	1,856.2	2.0	10	1.0
2011	***	***	2.0	19	1.0
2012	***	***	2.0	11	1.0
2013	***	***	2.0	4	1.0
2014	***	***	2.0	9	1.0
2015	***	***	2.0	13	1.0

Table 3.46. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for sandbar shark using handline gears, 1994-2015.

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	547.5	-	-	-	-
1995	785.0	-	-	-	-
1996	2,078.4	-	-	-	-
1997	109.9	-	-	-	-
1998	49.1	-	-	-	-
1999	189.6	189.6	1.0	31	1.0
2000	183.9	122.6	2.0	63	1.5
2001	186.3	93.2	2.0	24	2.0
2002	912.0	638.4	2.0	20	1.4
2003	118.7	50.9	2.0	21	2.3
2004	1,708.4	1,067.8	3.0	8	1.6
2005	1,923.0	1,923.0	2.0	8	1.0
2006	111.5	76.6	2.0	16	1.5
2007	111.5	63.7	3.0	7	1.8
2008	0.0	0.0	0.0	0	0.0
2009	0.0	0.0	0.0	0	0.0
2010	0.0	0.0	0.0	0	0.0
2011	0.0	0.0	0.0	0	0.0
2012	0.0	0.0	0.0	0	0.0
2013	0.0	0.0	0.0	0	0.0
2014	0.0	0.0	0.0	0	0.0
2015	0.0	0.0	0.0	0	0.0

Table 3.47. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for sandbar shark using longline gears, 1994-2015.

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	1,885.5	-	-	-	-
1995	2,844.7	-	-	-	-
1996	2,930.9	-	-	-	-
1997	3,199.3	-	-	-	-
1998	3,638.8	-	-	-	-
1999	4,102.5	3,272.0	2.0	247	1.3
2000	4,491.3	2,080.6	3.0	313	2.2
2001	3,663.7	1,446.2	3.0	304	2.5
2002	4,279.7	2,343.4	3.0	389	1.8
2003	3,772.3	1,892.5	3.0	297	2.0
2004	3,627.7	1,522.7	3.0	324	2.4
2005	3,353.6	1,224.5	3.0	493	2.7
2006	3,398.1	1,547.9	3.0	281	2.2
2007	1,137.2	481.1	3.0	52	2.4
2008	0.0	0.0	0.0	0	0.0
2009	0.0	0.0	0.0	0	0.0
2010	***	***	2	18	1.0
2011	***	***	3	19	1.0
2012	***	***	2	1	1.0
2013	***	***	2	4	1.0
2014	***	***	2	31	1.6
2015	***	***	0	0	0.0

Table 3.48. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for sandbar shark using other gears, 1994-2015. (***Confidential data)

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	***	-	-	-	-
1995	35.3	-	-	-	-
1996	0.0	-	-	-	-
1997	0.0	-	-	-	-
1998	***	-	-	-	-
1999	0.0	0.0	0.0	0	0.0
2000	6,100.0	2,033.3	3.0	3	3.0
2001	***	***	3.0	6	6.0
2002	626.0	234.8	4.0	8	2.7
2003	***	***	3.0	4	1.3
2004	0.0	0.0	0.0	0	0.0
2005	***	***	3.0	2	1.0
2006	0.0	0.0	0.0	0	0.0
2007	***	***	3.0	16	5.3
2008	0.0	0.0	0.0	0	0.0
2009	0.0	0.0	0.0	0	0.0
2010	0.0	0.0	0.0	0	0.0
2011	0.0	0.0	0.0	0	0.0
2012	0.0	0.0	0.0	0	0.0
2013	0.0	0.0	0.0	0	0.0
2014	0.0	0.0	0.0	0	0.0
2015	0.0	0.0	0.0	0	0.0

Table 3.49. Average Landings, ex-vessel value, number of trips from 1994 to 2015 and trip duration (days at sea) from 2000 to 2015 by vessel length range for sandbar sharks.

Length	Pounds	Value	Trips	Trip Duration
11 to 20 Feet	3,360	$802	7	1
20 to 30 Feet	4,576	$1,118	7	4
30 to 40 Feet	99,007	$24,056	51	60
40 to 50 Feet	110,444	$25,421	41	55
Greater than 50 Feet	122,846	$28,410	29	83
Unknown	17,532	$4,471	9	2

Table 3.50. Average landings of sandbar sharks by market grade/size from 1994 to 2015.

Market Grade/Size	Pounds	Percent
Mixed	323,257	90.35
Small	4,820	1.35
Medium	15,203	4.25
Large/Jumbo	14,487	4.05

Table 3.51. Average vessel characteristics for vessels used in the sandbar shark commercial fishery.

Vessel Characteristic		Vessels
Average Age	15	577
Average Horse Power Rating	342	438
Average Number of Engines	1	232
Average Gross Tons	34	491
Average Length	37	524

Table 3.52. Demographic characteristics for commercial fishermen in the sandbar shark commercial fishery.

Demographic Characteristic	Result	Number of Fishermen
Average Age	43	250
Gender	Female	3
	Male	145
Race	American Indian	1
	Asian/Pacific Islands	1
	Caucasian	143

Table 3.53. Economic survey results for fishermen that participated in the sandbar shark (2007) fishery.

Survey Question	Fishermen
Less Than 50%	2
More than 50%	17

Table 3.54. List of species that were annually in the top 10 species harvested (based on pounds) from 1994 to 2015 by dusky and sandbar shark fishery participants.

Species	Number of years in Top 10
Hard Blue Crabs	22
Croaker	22
Bluefish	22
Yellowfin Tuna	21
Dogfish Sharks	20
Flounder	20
Swordfish	16
King Mackerel	11
Sandbar Shark	11
Gray Trout	10
Spanish mackerel	8
Squid	6
Bigeye Tuna	6
Sharks	5
Shrimp	5
Dolphin	3
Menhaden	2
Grey Tilefish	2
Spot	1

Table 3.55. Top 10 species landed (based on pounds) by 1999 dusky shark fishery participants from 1999 to 2015.

Year	Species	Rank	Year	Species	Rank
1999	Shark, Sandbar	1	2000	Bluefish	1
1999	Bluefish	2	2000	Shark, Sandbar	2
1999	Croaker	3	2000	Tuna, Yellowfin	3
1999	Swordfish	4	2000	Croaker	4
1999	Tuna, Yellowfin	5	2000	Dogfish, Spiny	5
1999	Sharks	6	2000	Swordfish	6
1999	Dogfish, Spiny	7	2000	Crabs, Hard	7
1999	Crabs, Hard	8	2000	Trout (Gray Trout)	8
1999	Tuna, Bigeye	9	2000	Dolphin	9
1999	Dolphin	10	2000	Flounders (Paralichthid)	10
2001	Bluefish	1	2002	Bluefish	1
2001	Shark, Sandbar	2	2002	Shark, Sandbar	2
2001	Tuna, Yellowfin	3	2002	Swordfish	3
2001	Croaker	4	2002	Tuna, Yellowfin	4
2001	Trout (Gray Trout)	5	2002	Croaker	5
2001	Swordfish	6	2002	Shark, Mako	6
2001	Tuna, Bigeye	7	2002	Tilefish, Grey	7
2001	Shark, Mako	8	2002	Trout (Gray Trout)	8
2001	Crabs, Hard	9	2002	Tuna, Bigeye	9
2001	Flounders (Paralichthid)	10	2002	Flounders (Paralichthid)	10
2003	Bluefish	1	2004	Bluefish	1
2003	Shark, Sandbar	2	2004	Croaker	2
2003	Croaker	3	2004	Shark, Sandbar	3
2003	Tuna, Yellowfin	4	2004	Tuna, Yellowfin	4
2003	Swordfish	5	2004	Dogfish, Smooth	5
2003	Shark, Mako	6	2004	Flounders (Paralichthid)	6
2003	Flounders (Paralichthid)	7	2004	Dolphin	7
2003	Tuna, Bigeye	8	2004	Shark, Mako	8
2003	Shark, Hammerhead	9	2004	Mackerel, King	9
2003	Dogfish, Smooth	10	2004	Tuna, Bigeye	10

Table 3.55 (continued). Top 10 species landed (based on pounds) by 1999 dusky shark fishery participants from 1999 to 2015.

Year	Species	Rank	Year	Species	Rank
2005	Bluefish	1	2006	Bluefish	1
2005	Croaker	2	2006	Croaker	2
2005	Shark, Sandbar	3	2006	Tuna, Yellowfin	3
2005	Tuna, Yellowfin	4	2006	Shark, Sandbar	4
2005	Shark, Blacktip	5	2006	Flounders (Paralichthid)	5
2005	Flounders (Paralichthid)	6	2006	Mackerel, King	6
2005	Mackerel, King	7	2006	Tuna, Bigeye	7
2005	Dogfish, Smooth	8	2006	Swordfish	8
2005	Shark, Mako	9	2006	Dogfish, Smooth	9
2005	Sharks	10	2006	Grouper, Snowy	10
2007	Bluefish	1	2008	Croaker	1
2007	Croaker	2	2008	Bluefish	2
2007	Tuna, Yellowfin	3	2008	Tuna, Yellowfin	3
2007	Tuna, Bigeye	4	2008	Tilefish, Grey	4
2007	Dolphin	5	2008	Dolphin	5
2007	Flounders (Paralichthid)	6	2008	Dogfish, Smooth	6
2007	Dogfish, Smooth	7	2008	Flounders (Paralichthid)	7
2007	Swordfish	8	2008	Tuna, Bigeye	8
2007	Sea Mullet (whiting, kingfish)	9	2008	Shrimp, Brown (summer), mixed	9
2007	Mackerel, King	10	2008	Swordfish	10
2009	Bluefish	1	2010	Bluefish	1
2009	Croaker	2	2010	Croaker	2
2009	Dolphin	3	2010	Squid	3
2009	Tuna, Yellowfin	4	2010	Swordfish	4
2009	Dogfish, Smooth	5	2010	Tuna, Yellowfin	5
2009	Dogfish, Spiny	6	2010	Shark, Mako	6
2009	Menhaden Bait	7	2010	Dogfish, Smooth	7
2009	Tuna, Bigeye	8	2010	Tilefish, Grey	8
2009	Flounders (Paralichthid)	9	2010	Flounders (Paralichthid)	9
2009	Mackerel, King	10	2010	Dogfish, Spiny	10

Table 3.55 (continued). Top 10 species landed (based on pounds) by 1999 dusky shark fishery participants from 1999 to 2015.

Year	Species	Rank	Year	Species	Rank
2011	Croaker	1	2012	Croaker	1
2011	Bluefish	2	2012	Tuna, Yellowfin	2
2011	Swordfish	3	2012	Swordfish	3
2011	Tuna, Yellowfin	4	2012	Dogfish, Spiny	4
2011	Squid	5	2012	Tuna, Bigeye	5
2011	Tuna, Bigeye	6	2012	Dolphin	6
2011	Shark, Mako	7	2012	Shark, Mako	7
2011	Dogfish, Smooth	8	2012	Tilefish, Grey	8
2011	Flounders (Paralichthid)	9	2012	Dogfish, Smooth	9
2011	Menhaden Bait	10	2012	Shark, Thresher	10
2013	Swordfish	1	2014	Bluefish	1
2013	Tuna, Yellowfin	2	2014	Tuna, Yellowfin	2
2013	Tuna, Bigeye	3	2014	Croaker	3
2013	Shark, Mako	4	2014	Dogfish, Spiny	4
2013	Dolphin	5	2014	Swordfish	5
2013	Croaker	6	2014	Tuna, Bigeye	6
2013	Bluefish	7	2014	Flounders (Paralichthid)	7
2013	Flounders (Paralichthid)	8	2014	Dolphin	8
2013	Shark, Blue	9	2014	Shark, Mako	9
2013	Shark, Thresher	10	2014	Shark, Sharpnose	10
2015	Croaker	1			
2015	Tuna, Bigeye	2			
2015	Tuna, Yellowfin	3			
2015	Dolphin	4			
2015	Dogfish, Spiny	5			
2015	Flounders (Paralichthid)	6			
2015	Swordfish	7			
2015	Cutlassfish (Ribbonfish)	8			
2015	Bluefish	9			
2015	Menhaden Bait	10			

Table 3.56. Top 10 species landed (based on pounds) by 2006 sandbar shark participants from 2006 to 2015.

Year	Species	Rank	Year	Species	Rank
2006	Tuna, Yellowfin	1	2007	Tuna, Yellowfin	1
2006	Bluefish	2	2007	Bluefish	2
2006	Shark, Sandbar	3	2007	Croaker	3
2006	Croaker	4	2007	Tuna, Bigeye	4
2006	Tuna, Bigeye	5	2007	Swordfish	5
2006	Swordfish	6	2007	Dolphin	6
2006	Mackerel, King	7	2007	Dogfish, Smooth	7
2006	Tilefish, Grey	8	2007	Sea Mullet (whiting, kingfish)	8
2006	Dogfish, Smooth	9	2007	Mackerel, Spanish	9
2006	Dolphin	10	2007	Mackerel, King	10
2008	Croaker	1	2009	Bluefish	1
2008	Bluefish	2	2009	Dolphin	2
2008	Tuna, Yellowfin	3	2009	Croaker	3
2008	Tilefish, Grey	4	2009	Tuna, Yellowfin	4
2008	Tuna, Bigeye	5	2009	Tilefish, Grey	5
2008	Crabs, Hard	6	2009	Dogfish, Smooth	6
2008	Dogfish, Smooth	7	2009	Swordfish	7
2008	Dolphin	8	2009	Dogfish, Spiny	8
2008	Swordfish	9	2009	Crabs, Hard	9
2008	Shark, Mako	10	2009	Tuna, Bigeye	10
2010	Croaker	1	2011	Croaker	1
2010	Bluefish	2	2011	Tuna, Yellowfin	2
2010	Tilefish, Grey	3	2011	Swordfish	3
2010	Tuna, Yellowfin	4	2011	Bluefish	4
2010	Swordfish	5	2011	Tuna, Bigeye	5
2010	Dogfish, Smooth	6	2011	Dogfish, Spiny	6
2010	Shark, Mako	7	2011	Shark, Mako	7
2010	Dogfish, Spiny	8	2011	Dogfish, Smooth	8
2010	Dolphin	9	2011	Mackerel, Spanish	9
2010	Tuna, Bigeye	10	2011	Shrimp, Brown (summer), mixed	10

Table 3.56 (continued). Top 10 species landed (based on pounds) by 2006 sandbar shark participants from 2006 to 2015.

Year	Species	Rank	Year	Species	Rank
2012	Tuna, Yellowfin	1	2013	Swordfish	1
2012	Croaker	2	2013	Tuna, Yellowfin	2
2012	Swordfish	3	2013	Tuna, Bigeye	3
2012	Dogfish, Spiny	4	2013	Croaker	4
2012	Tuna, Bigeye	5	2013	Tilefish, Grey	5
2012	Dolphin	6	2013	Mackerel, Spanish	6
2012	Tilefish, Grey	7	2013	Shark, Mako	7
2012	Dogfish, Smooth	8	2013	Bluefish	8
2012	Mackerel, Spanish	9	2013	Dolphin	9
2012	Shark, Mako	10	2013	Dogfish, Spiny	10
2014	Tuna, Yellowfin	1	2015	Tuna, Yellowfin	1
2014	Bluefish	2	2015	Croaker	2
2014	Dogfish, Spiny	3	2015	Swordfish	3
2014	Tuna, Bigeye	4	2015	Tuna, Bigeye	4
2014	Swordfish	5	2015	Dogfish, Spiny	5
2014	Croaker	6	2015	Dolphin	6
2014	Shark, Mako	7	2015	Shark, Mako	7
2014	Dolphin	8	2015	Bluefish	8
2014	Shark, Thresher	9	2015	Mullets, Jumping	9
2014	Mackerel, Spanish	10	2015	Mackerel, Spanish	10

8 FIGURES

Figure 2.1. Map of the major North Carolina water bodies.

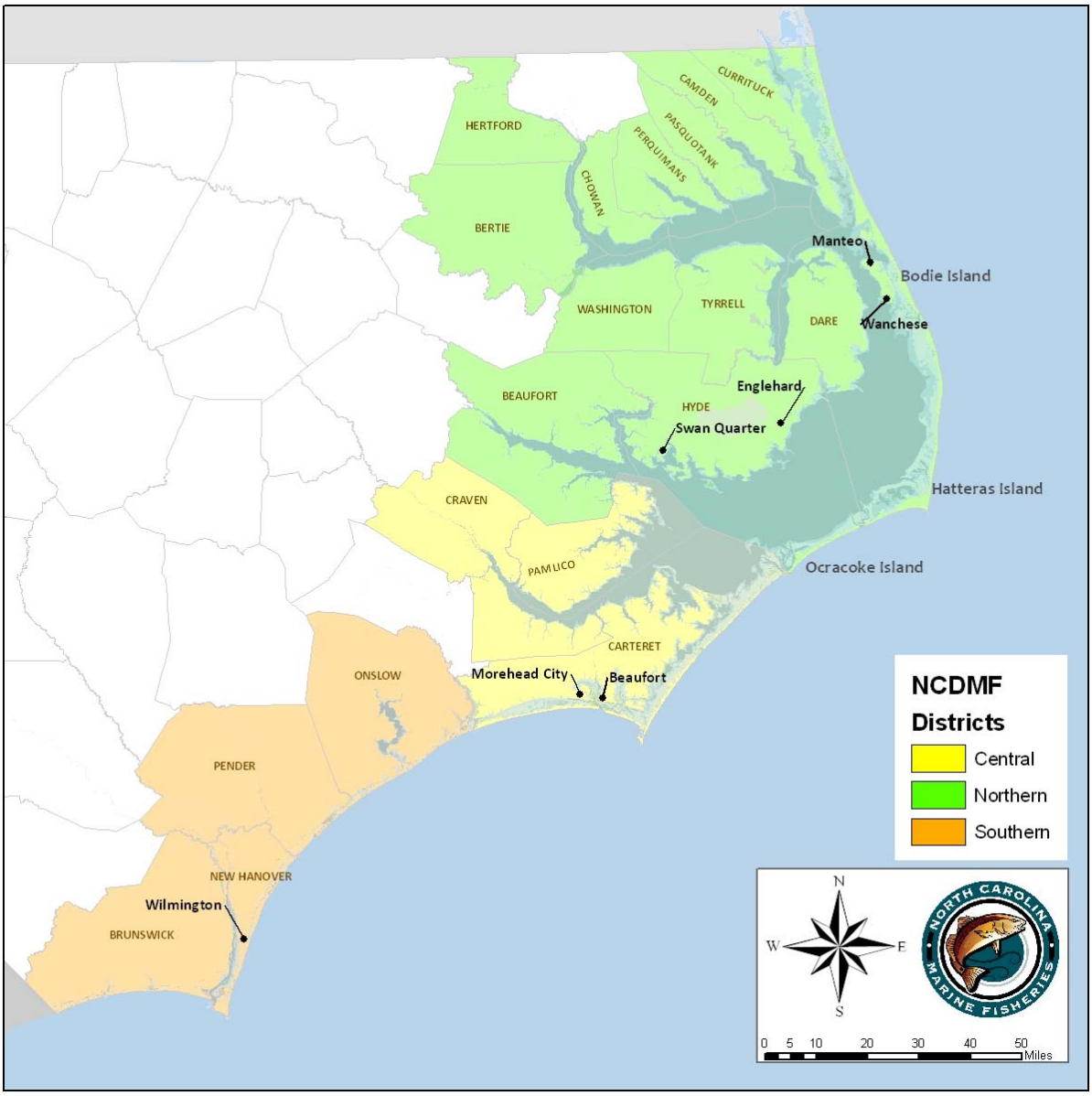

Figure 2.2. Map of eastern North Carolina coastal counties and ports.

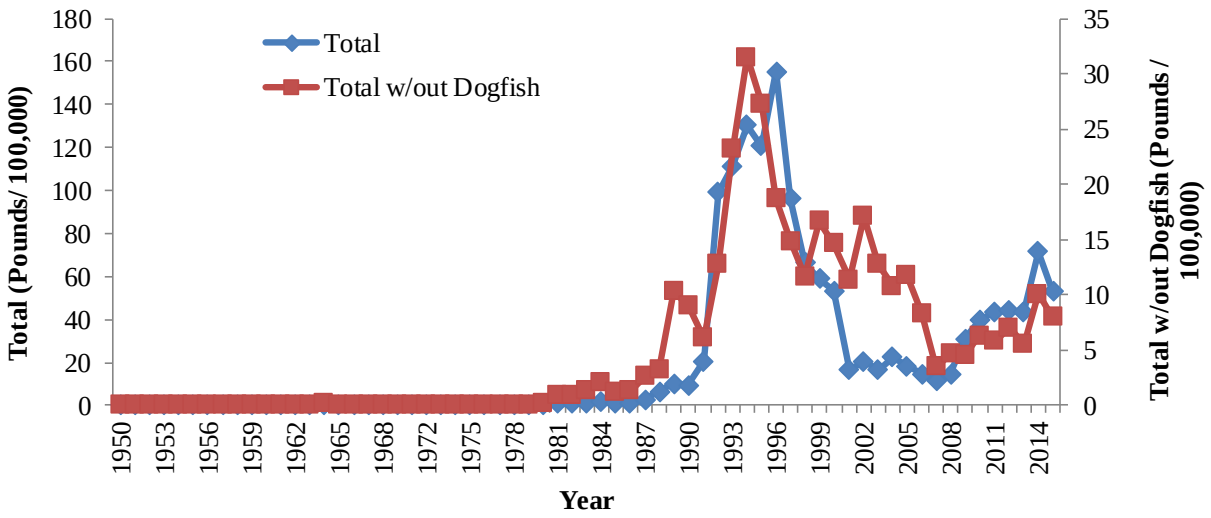

Figure 3.1. Total commercial landings of sharks from 1950 to 2015 including and excluding dogfish sharks.

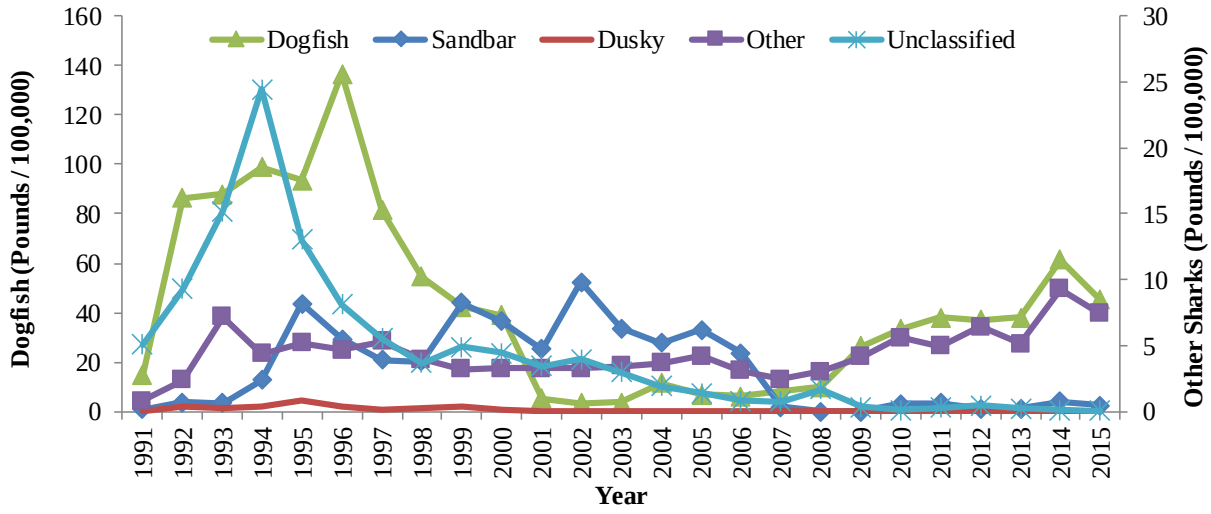

Figure 3.2. Total commercial landings from 1991 to 2015 by sandbar, dusky, dogfish, "other" identified, and unclassified sharks in North Carolina.

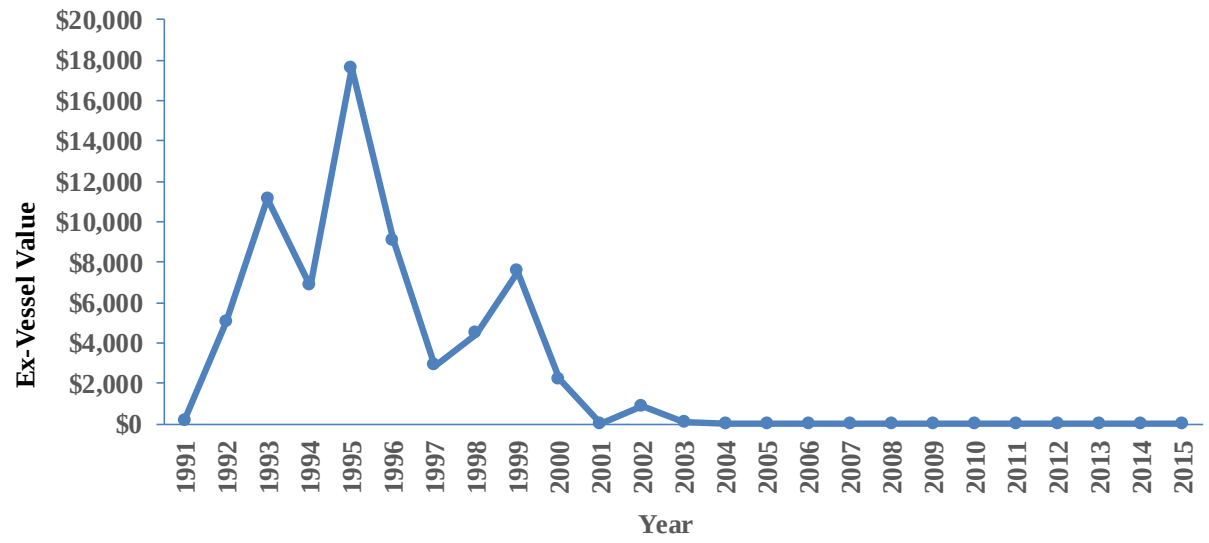

Figure 3.3. Annual ex-vessel value of dusky shark from 1991 to 2015.

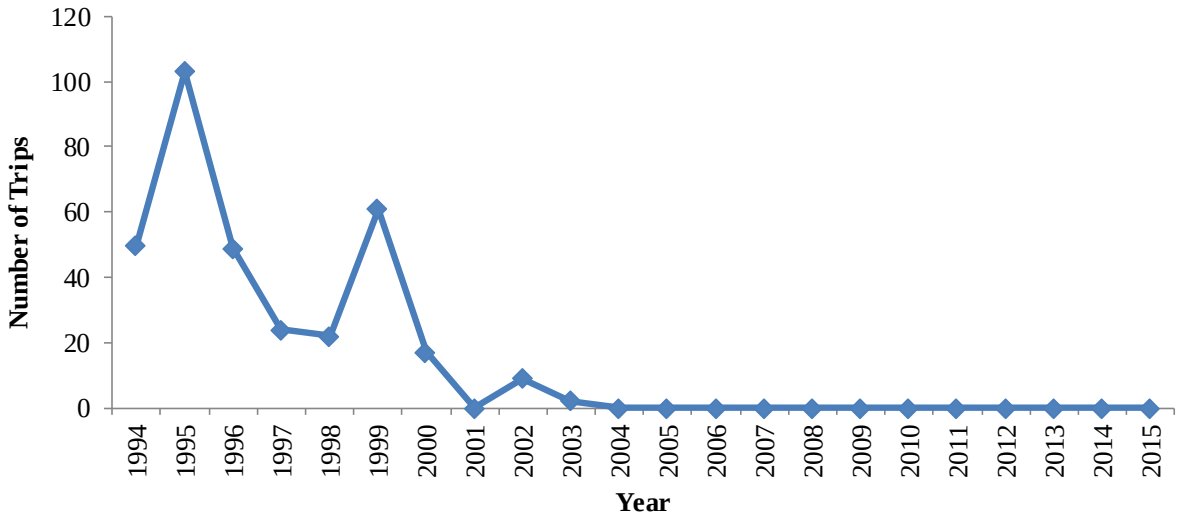

Figure 3.4. Annual number of trips landing dusky shark from 1994 to 2015.

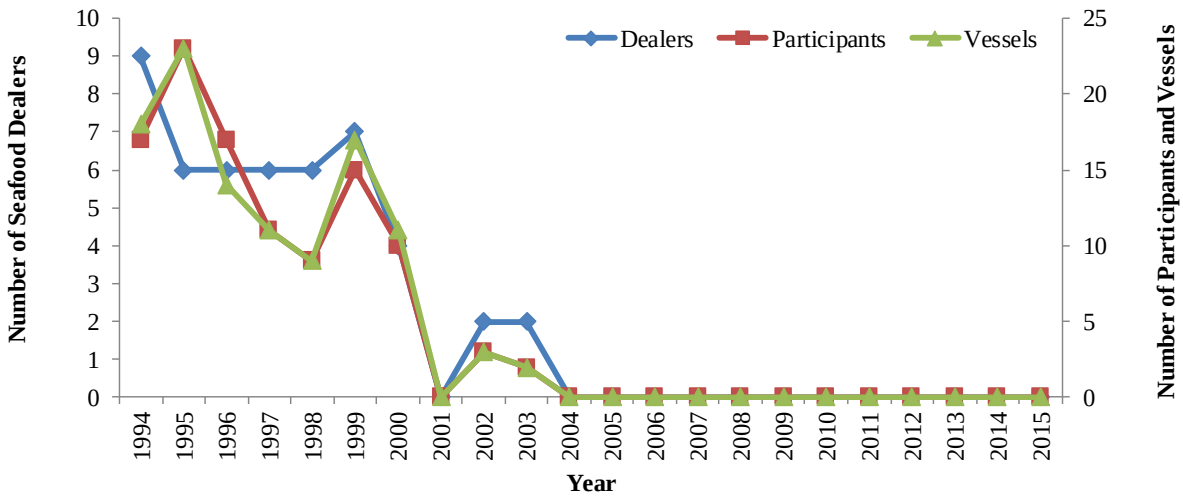

Figure 3.5. Annual number of seafood dealers, participants, and vessels recording landings of dusky shark, 1994 to 2015.

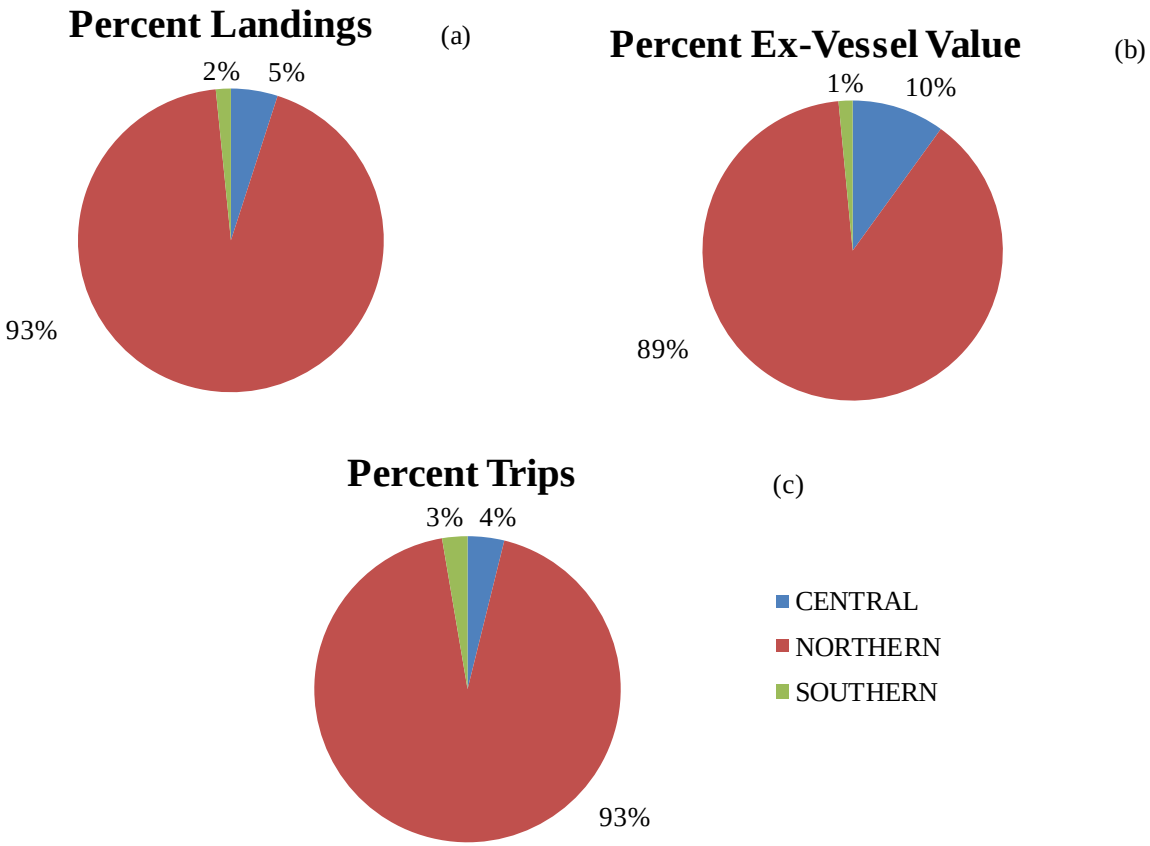

Figure 3.6. Percent of dusky shark landings (a) and ex-vessel value (b) from 1985 to 2015 and trips (c) from 1994 to 2015 by district.

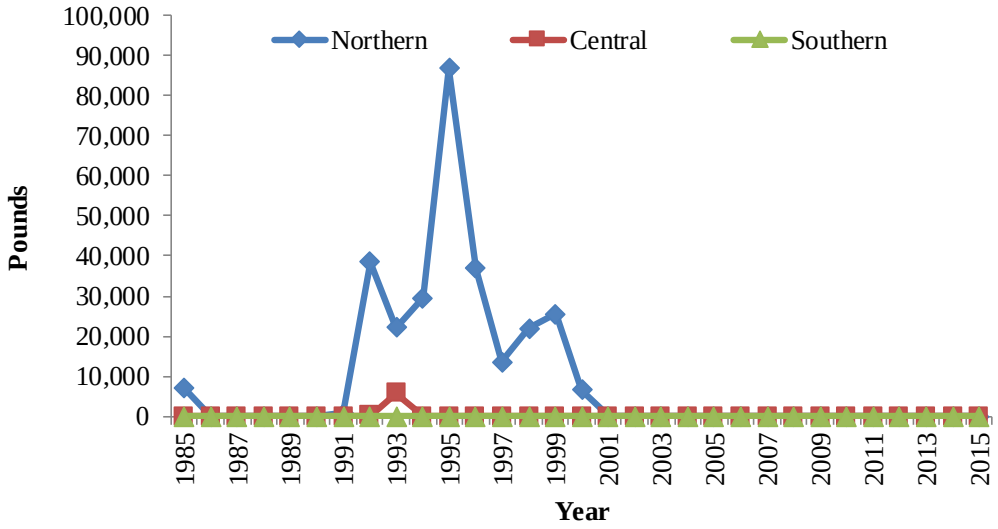

Figure 3.7. Annual landings of dusky shark by district, 1985-2015.

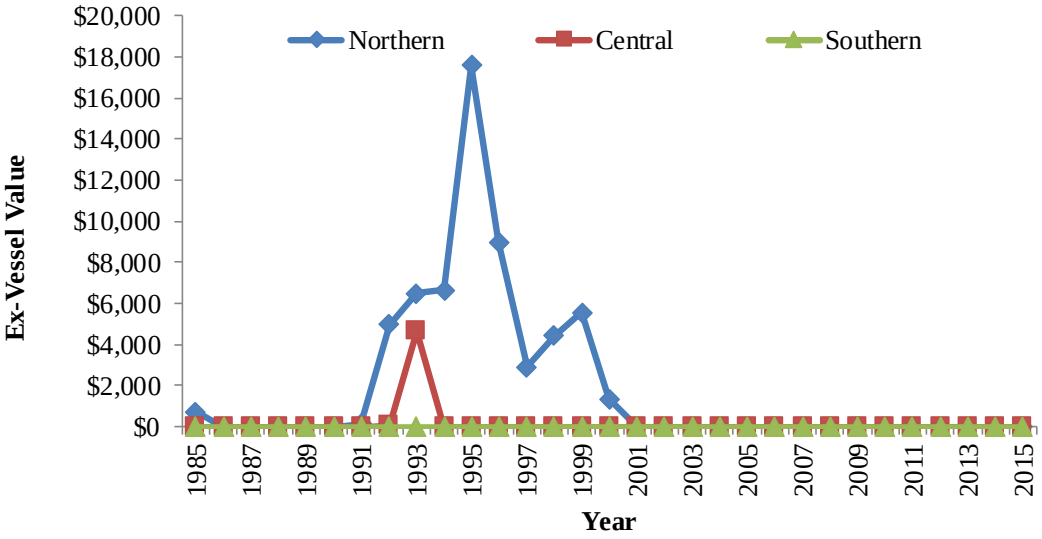

Figure 3.8. Annual ex-vessel value of dusky shark by district, 1985-2015

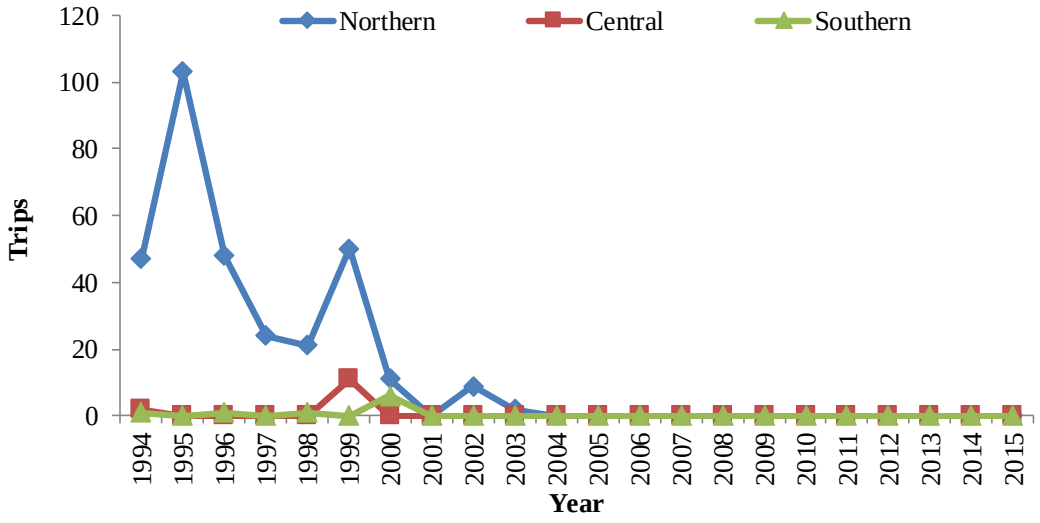

Figure 3.9. Annual number of trips landing dusky shark by district, 1994-2015

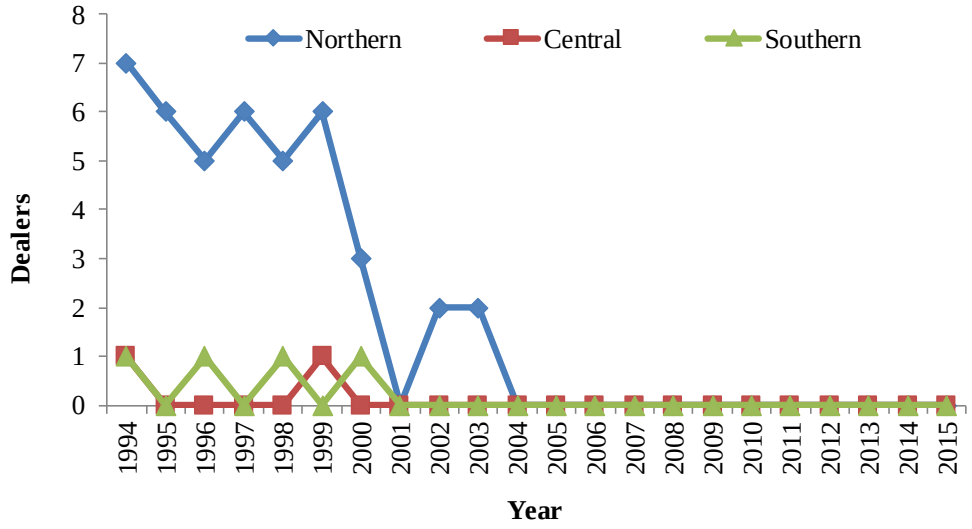

Figure 3.10. Annual number of dealers reporting landings for dusky shark by district, 1994-2015.

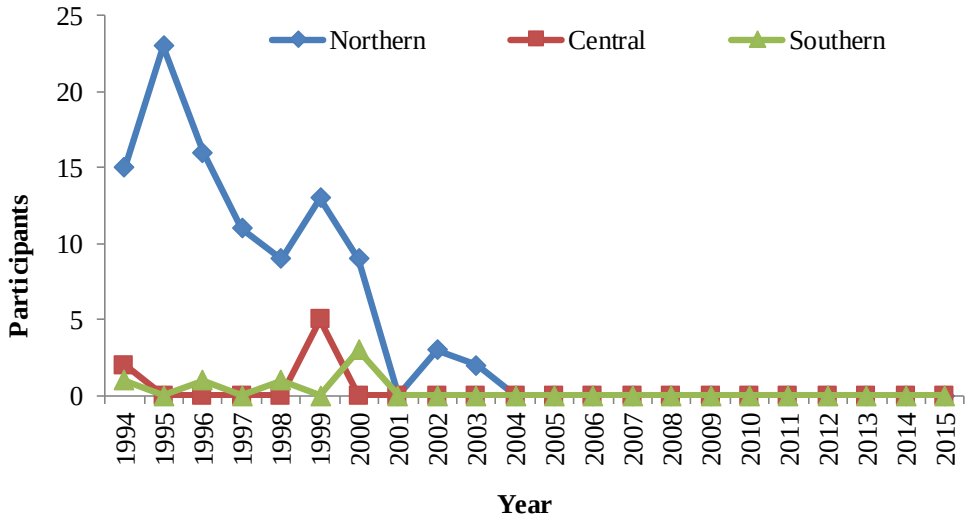

Figure 3.11. Annual number of participants landing dusky shark by district, 1994-2015.

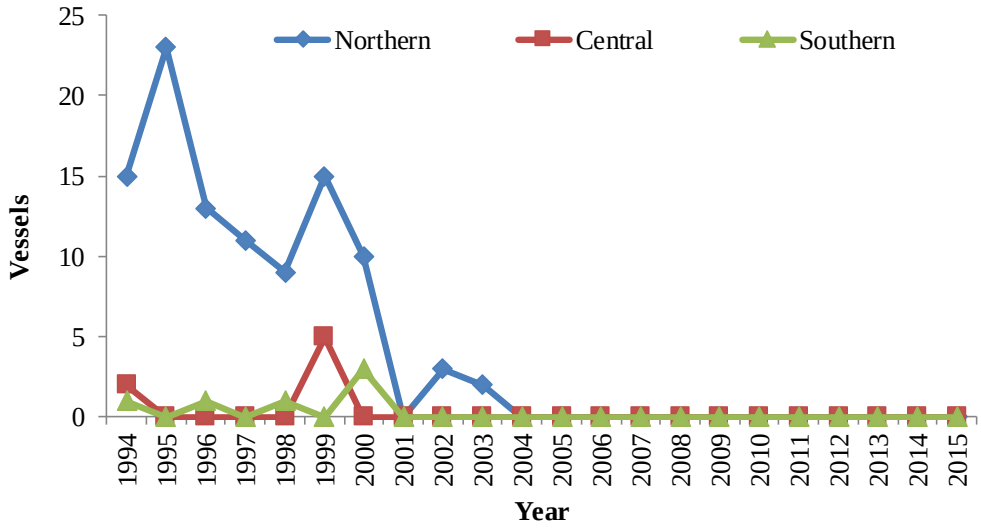

Figure 3.12. Annual number of vessels landing dusky shark by district, 1994-2015.

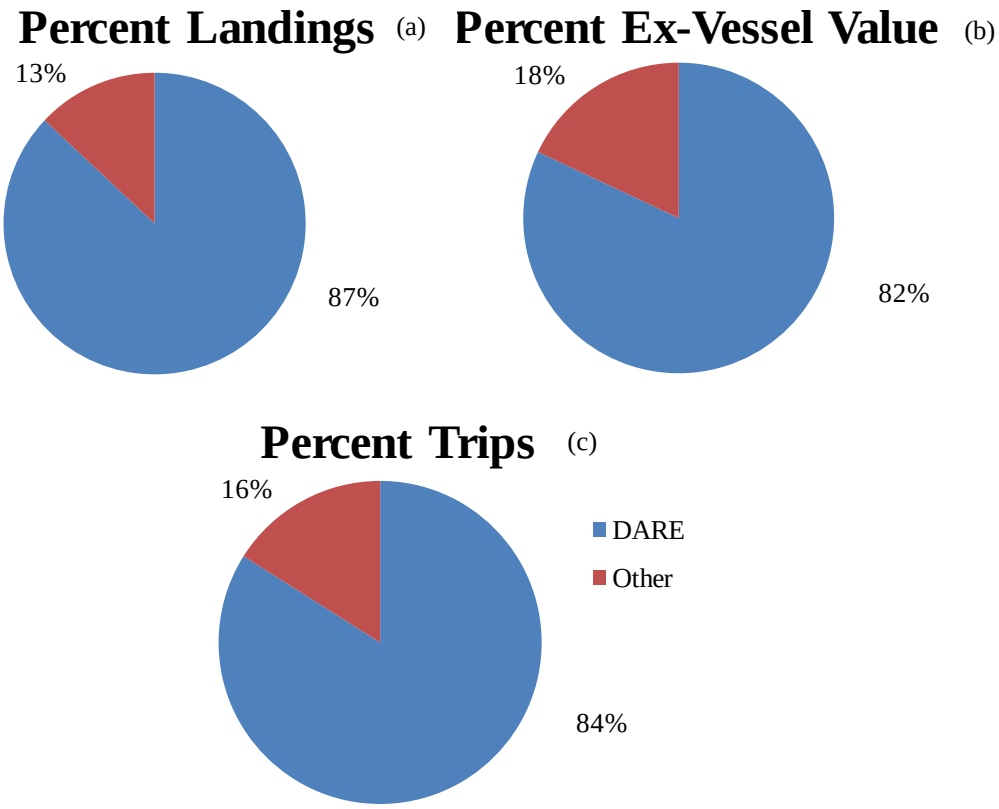

Figure 3.13. Percent of dusky shark landings (a) and ex-vessel value (b) from 1985 to 2003 and trips (c) from 1994 to 2003 by county.

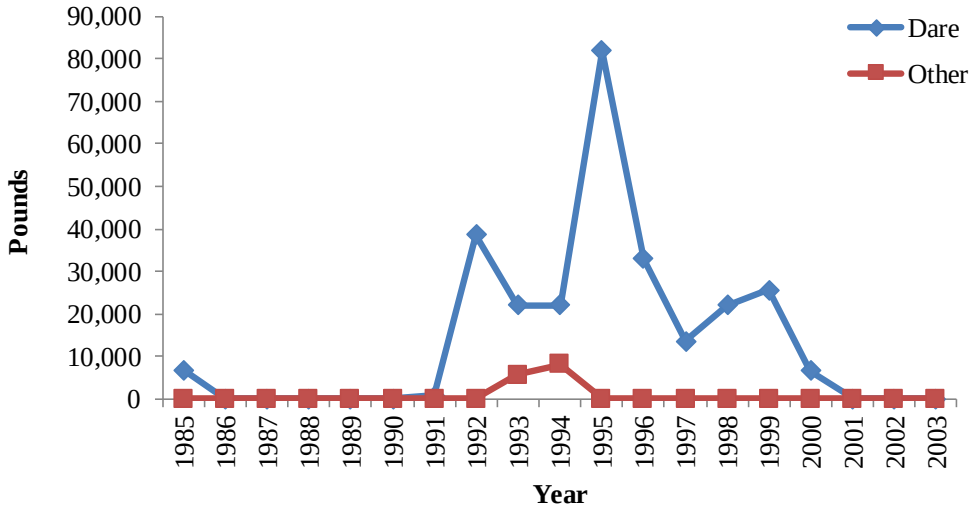

Figure 3.14. Annual landings of dusky shark by county, 1985-2003.

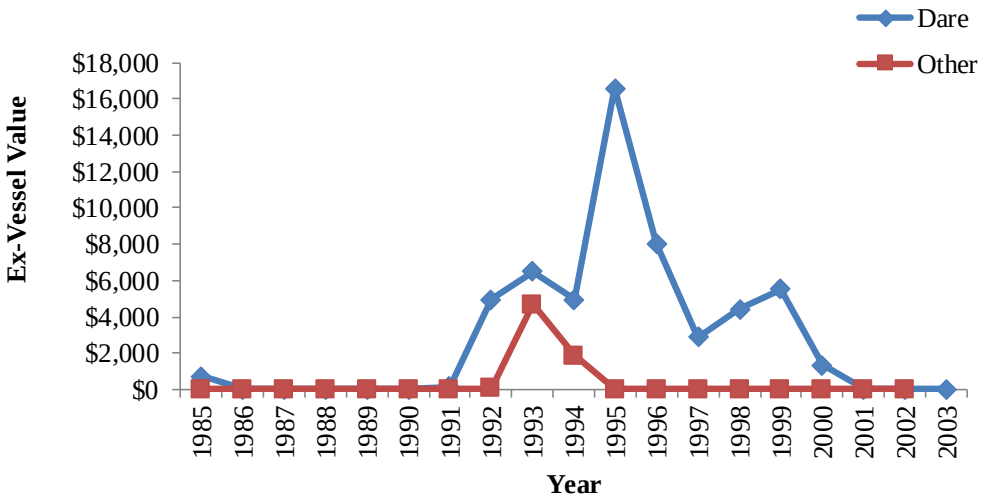

Figure 3.15. Annual ex-vessel value of dusky shark by county, 1985-2003.

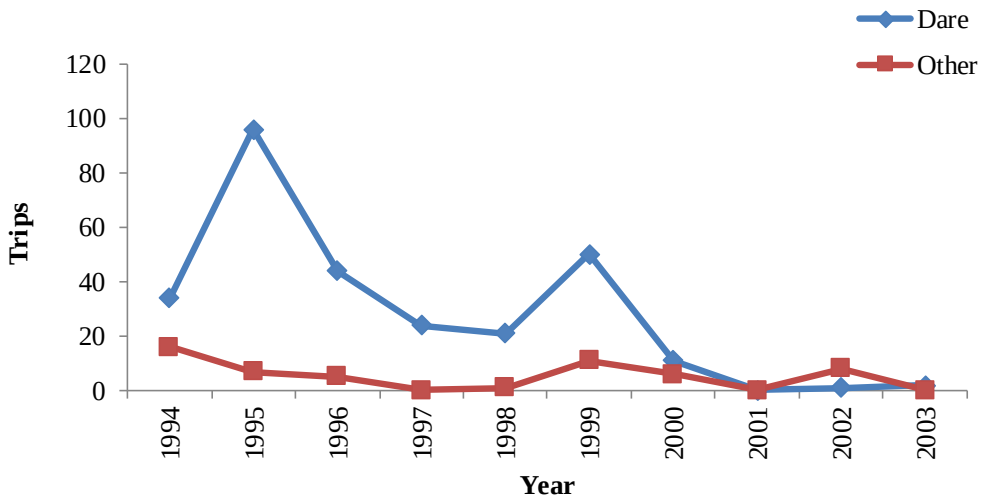

Figure 3.16. Annual number of trips for dusky shark by county, 1994-2003.

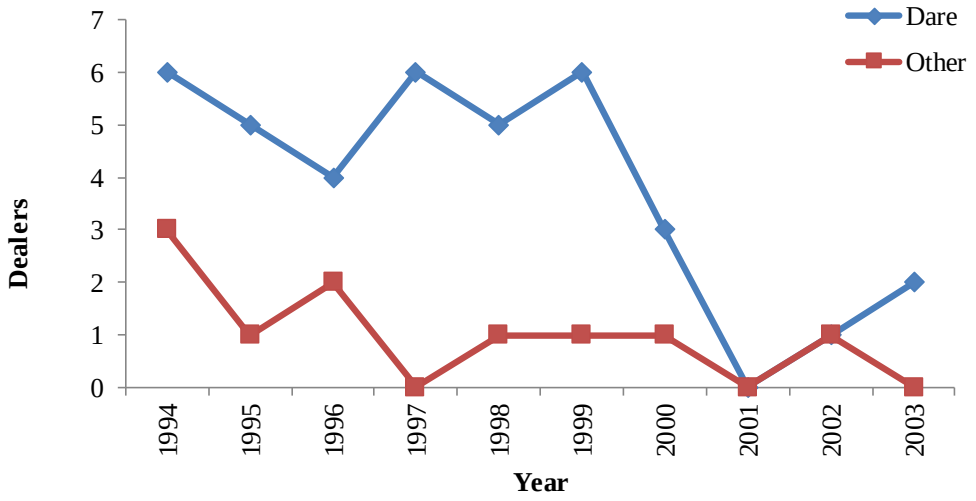

Figure 3.17. Annual number of dealers for dusky shark by county, 1994-2003.

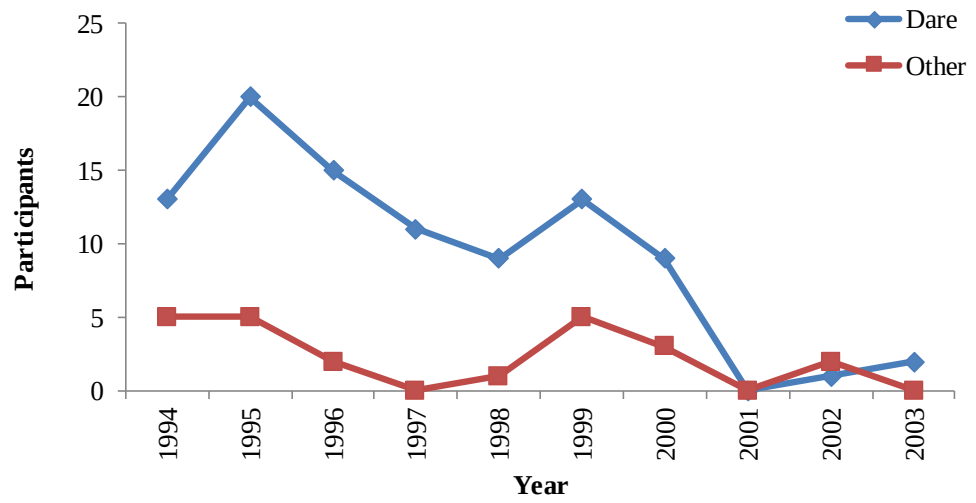

Figure 3.18. Annual number of participants for dusky shark by county, 1994-2003.

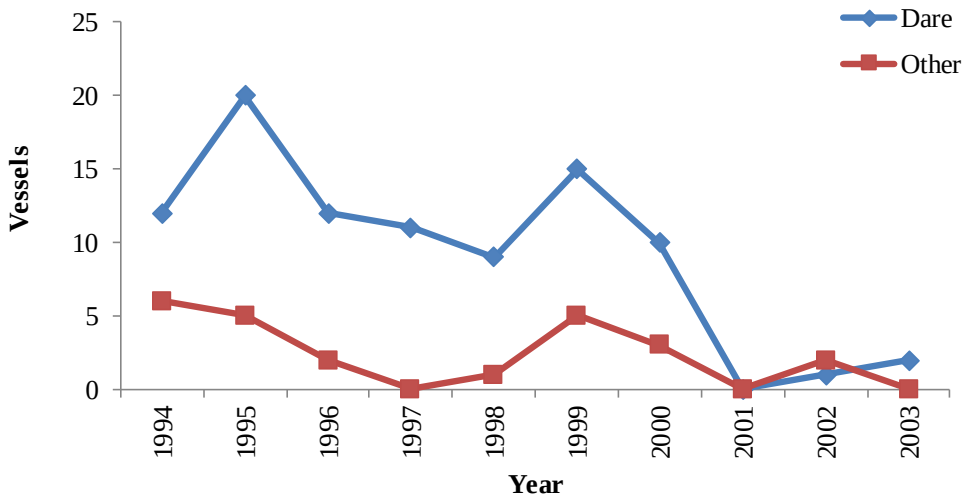

Figure 3.19. Annual number of vessels for dusky shark by county, 1994-2003.

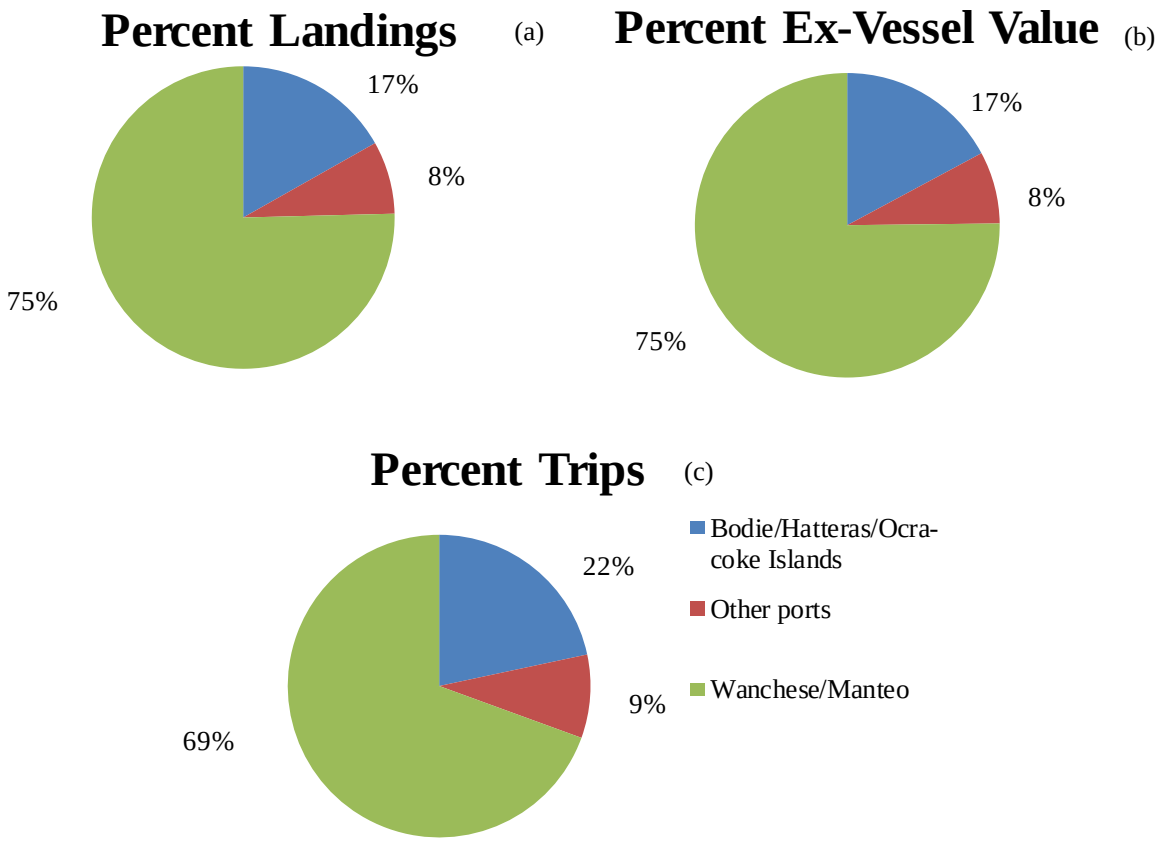

Figure. 3.20. Percent of dusky shark landings (a), ex-vessel value (b), and trips (c) from 1994 to 2003 by port.

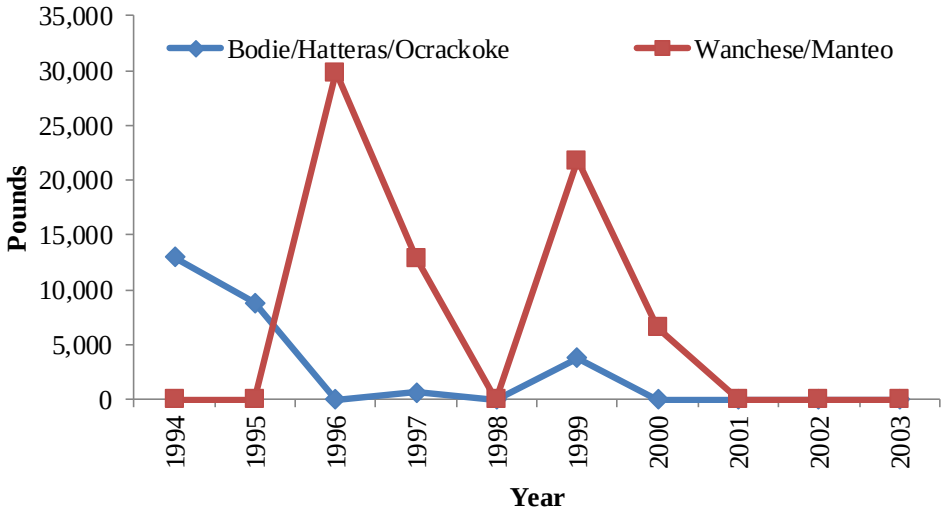

Figure 3.21. Annual landings of dusky shark by port, 1994-2003.

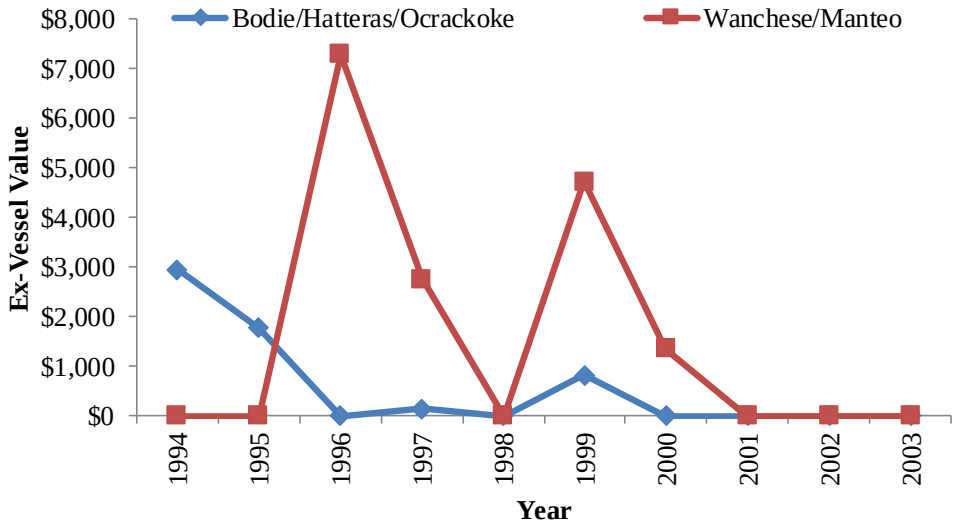

Figure 3.22. Annual ex-vessel value of dusky shark by port, 1994-2003.

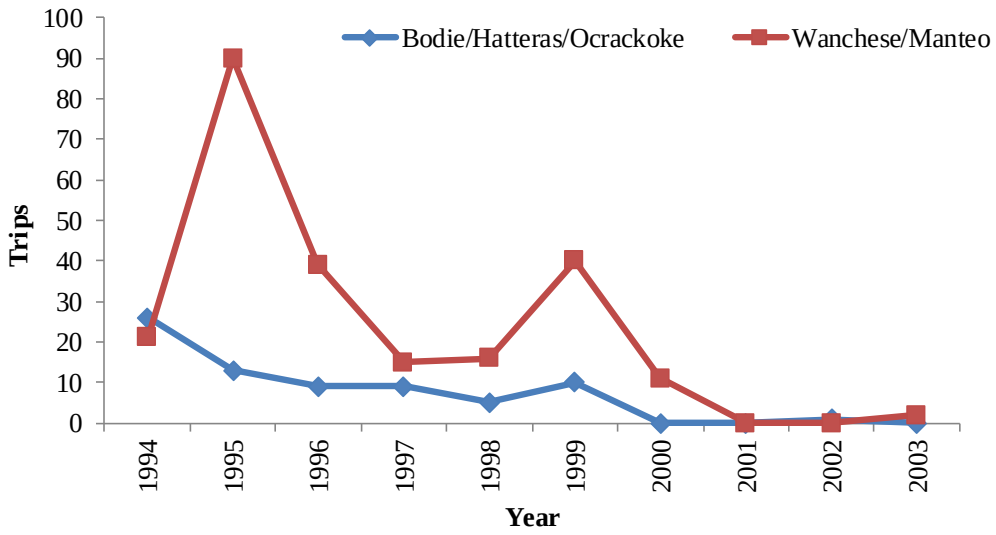

Figure 3.23. Annual number of trips for dusky shark by port, 1994-2003.

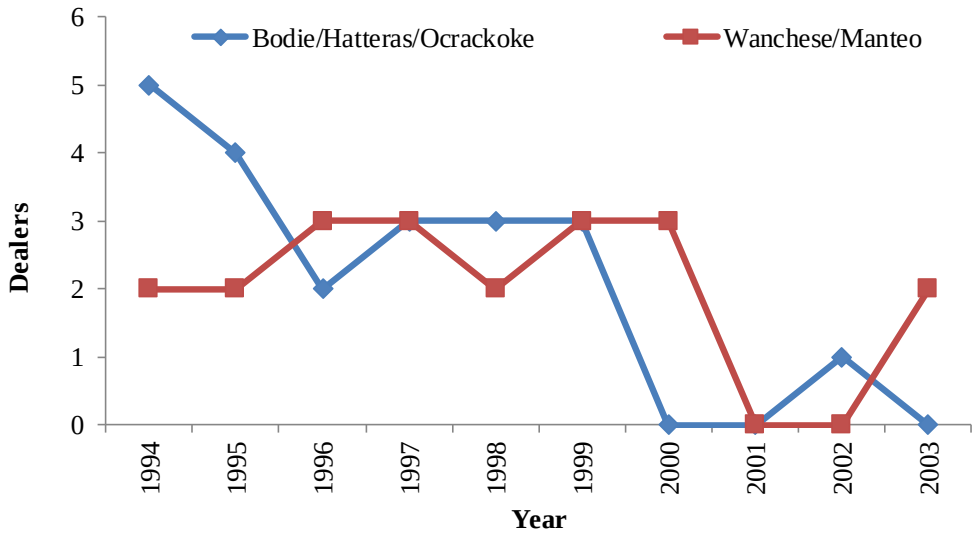

Figure 3.24. Annual number of dealers for dusk shark by port, 1994-2003.

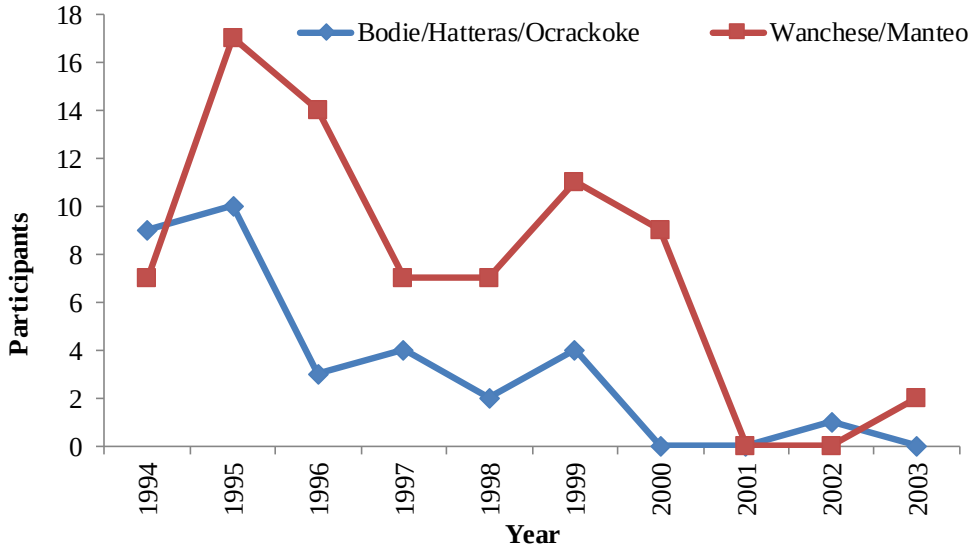

Figure 3.25. Annual number of participants for dusky shark by port, 1994-2003.

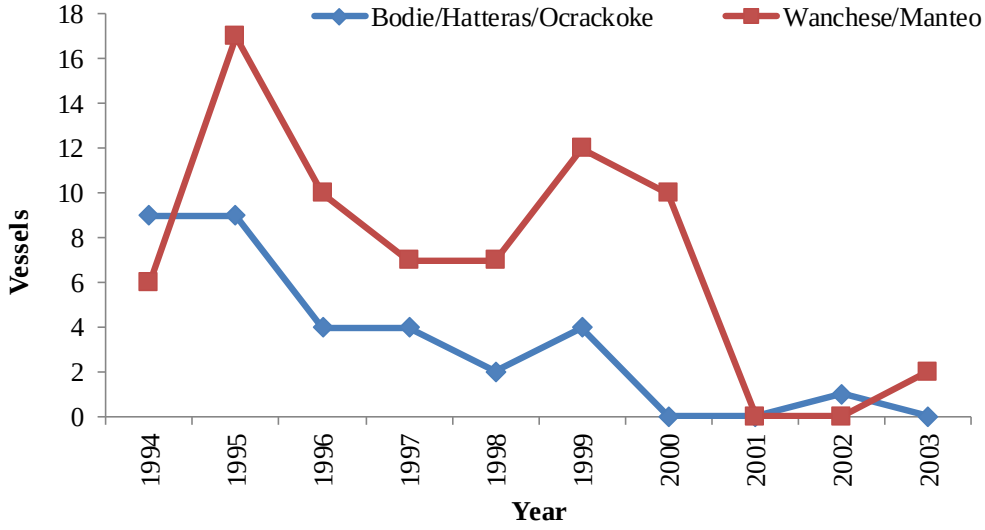

Figure 3.26. Annual number of vessels for dusky shark by port, 1994-2003.

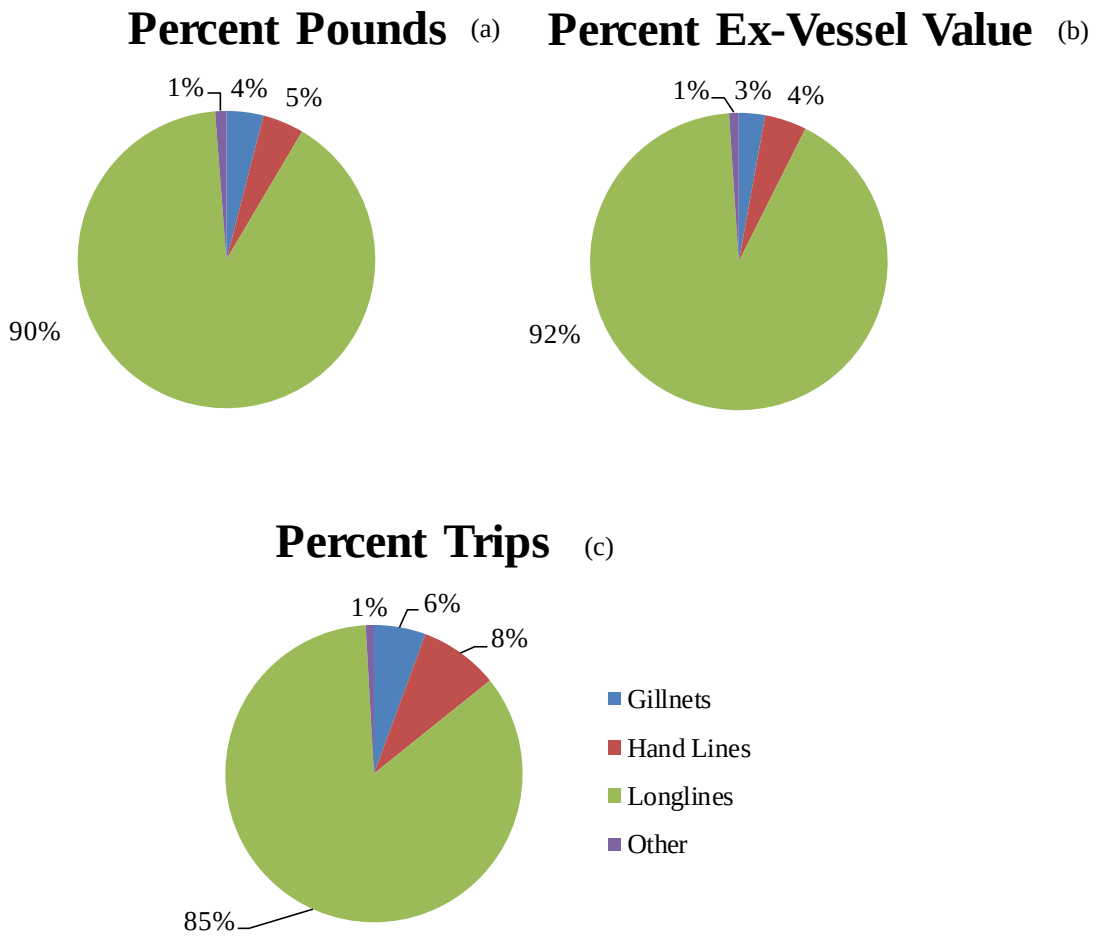

Figure 3.27. Percent of dusky shark landings (a) and ex-vessel value (b) from 1985 to 2003 and trips (c) from 1994 to 2003 by gear.

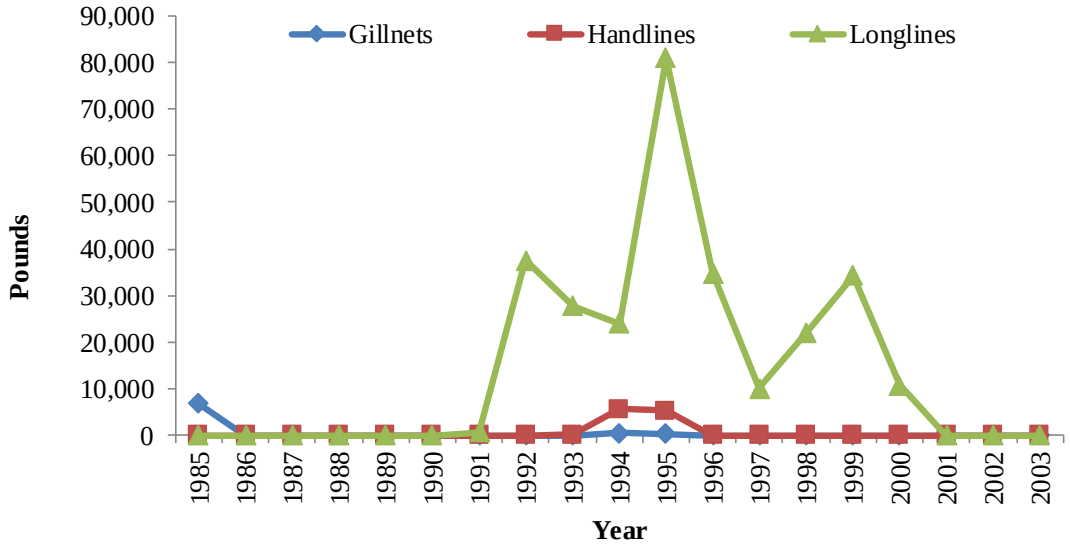

Figure 3.28. Annual landings of dusky shark by gear, 1985-2003.

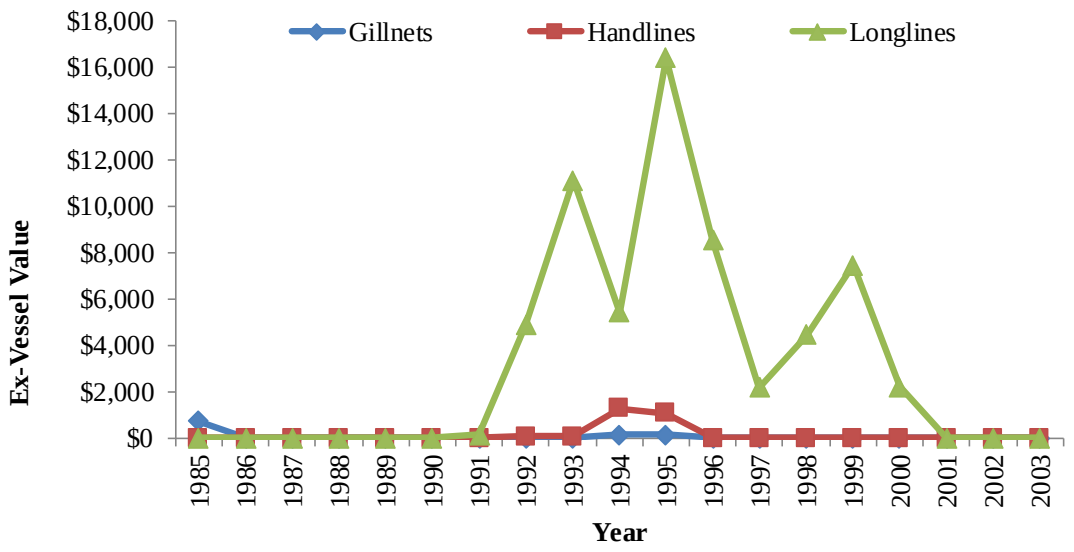

Figure 3.29. Annual ex-vessel value of dusky shark by gear, 1985-2003.

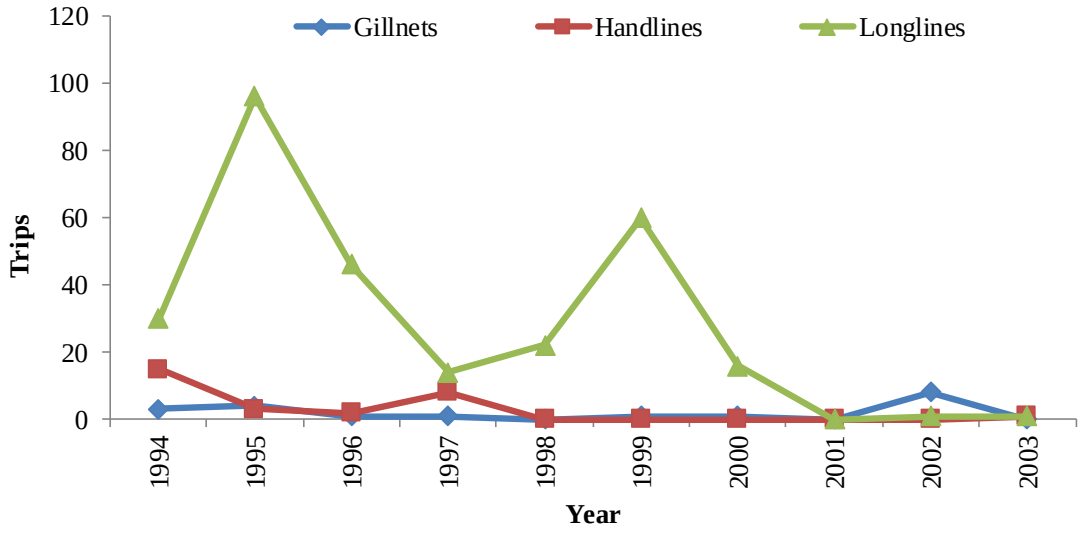

Figure 3.30. Annual number of trips for dusky shark by gear, 1994-2003.

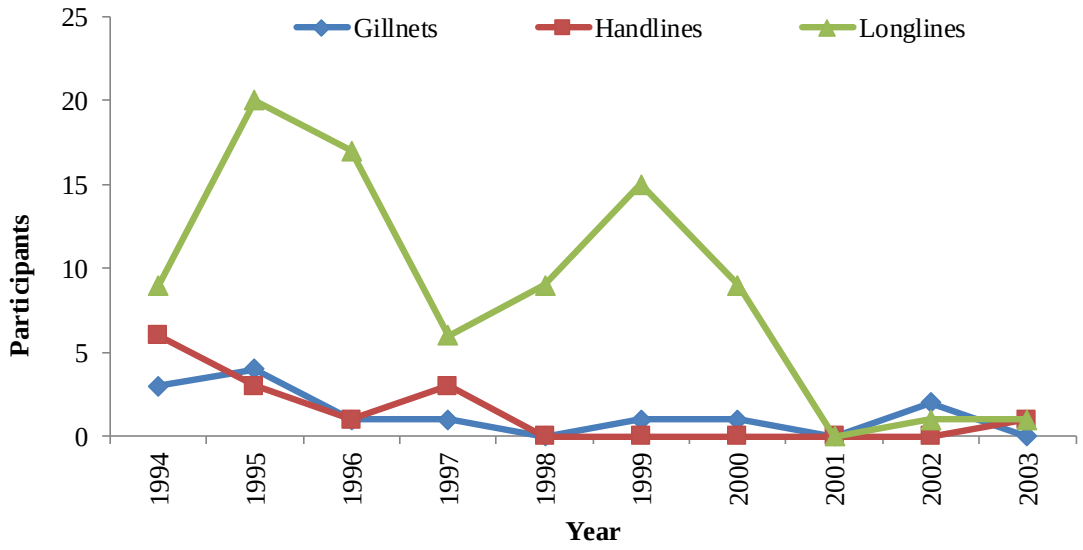

Figure 3.31. Annual number of participants for dusky shark by gear, 1994-2003.

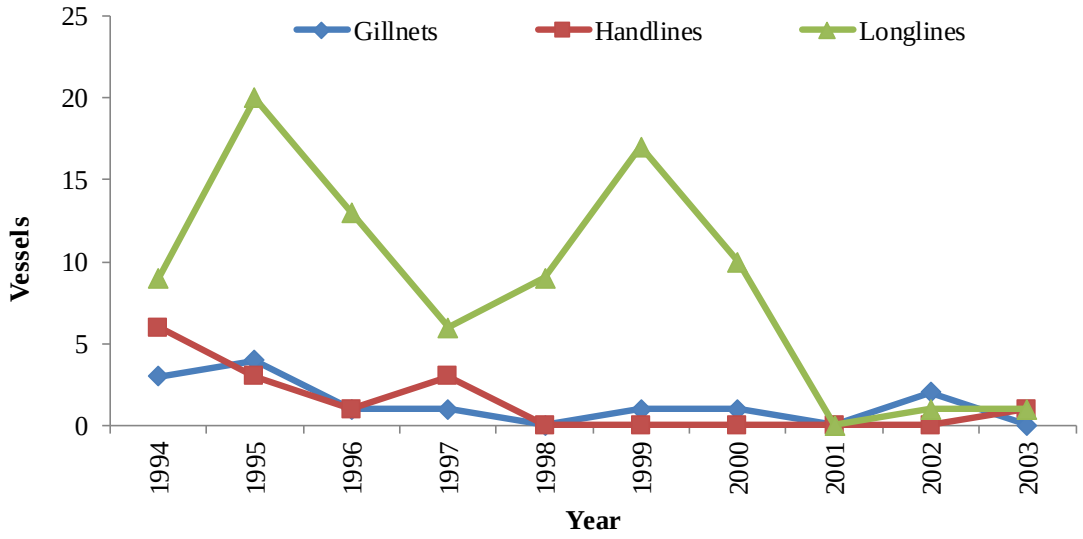

Figure 3.32. Annual number of vessels for dusky shark by gear, 1994-2003.

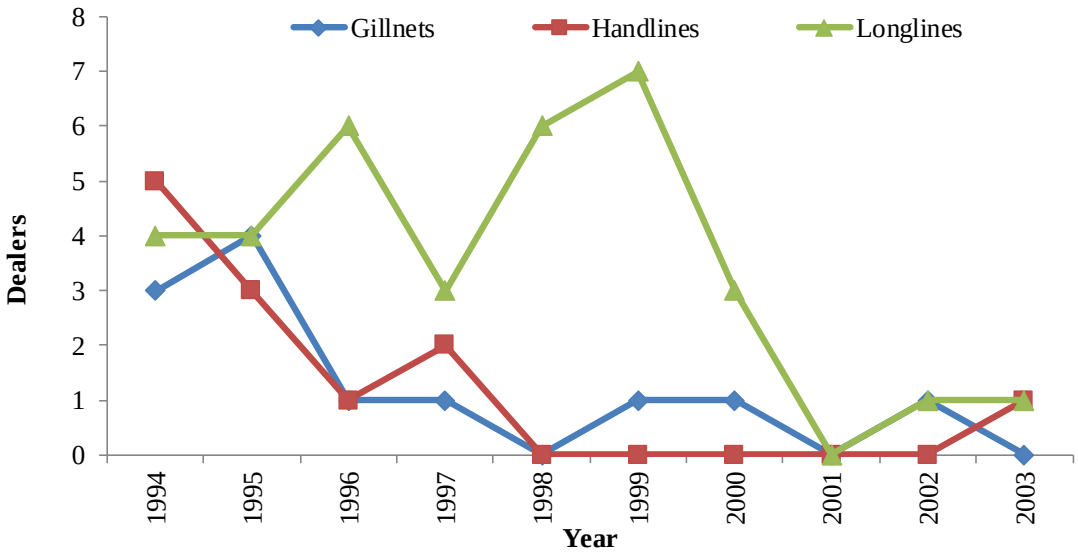

Figure 3.33. Annual number of dealers for dusky shark by gear, 1994-2003.

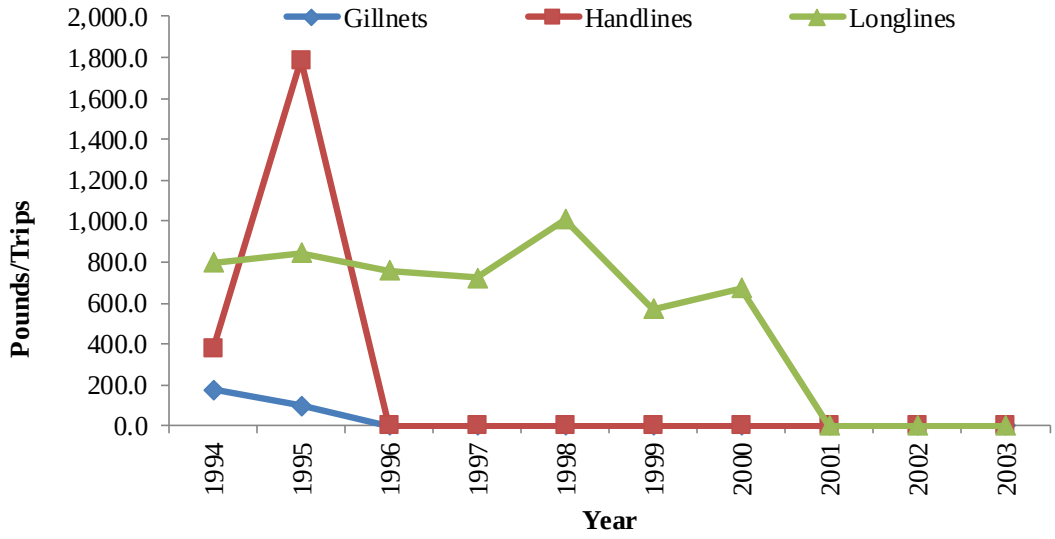

Figure 3.34. Annual pounds/trip for dusky shark by gear, 1994-2003.

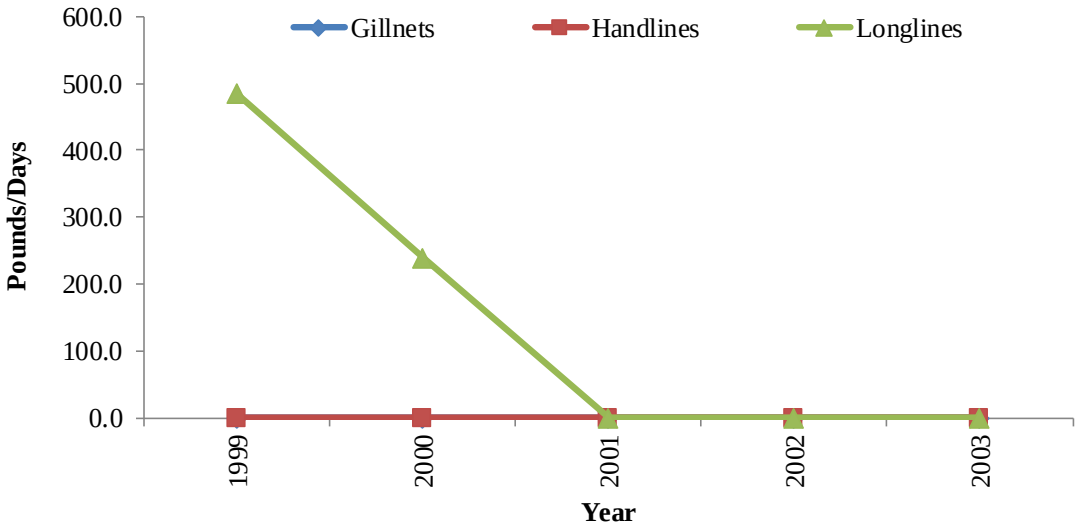

Figure 3.35. Annual pounds/day for dusky shark by gear, 1999-2003.

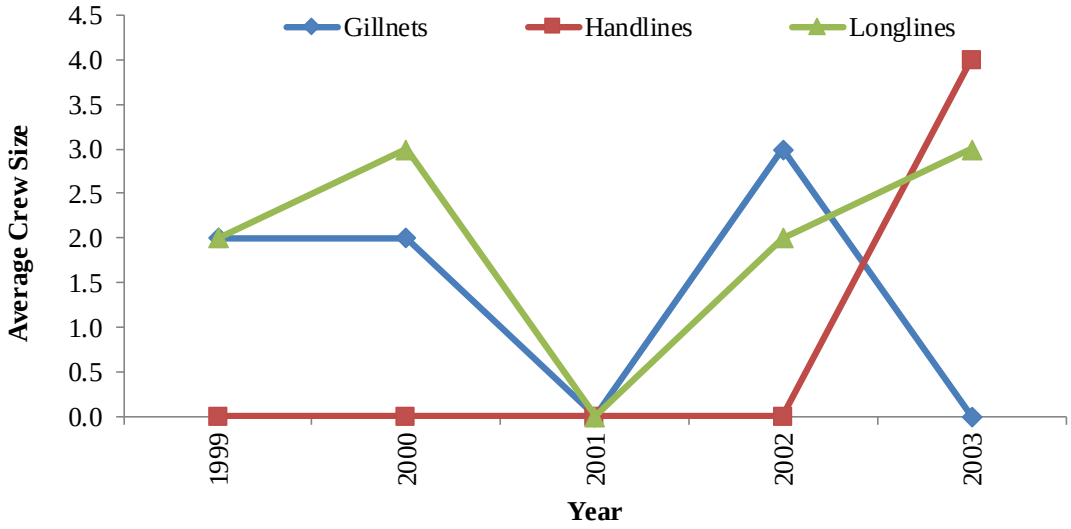

Figure 3.36. Annual average crew size for dusky shark by gear, 1999-2003.

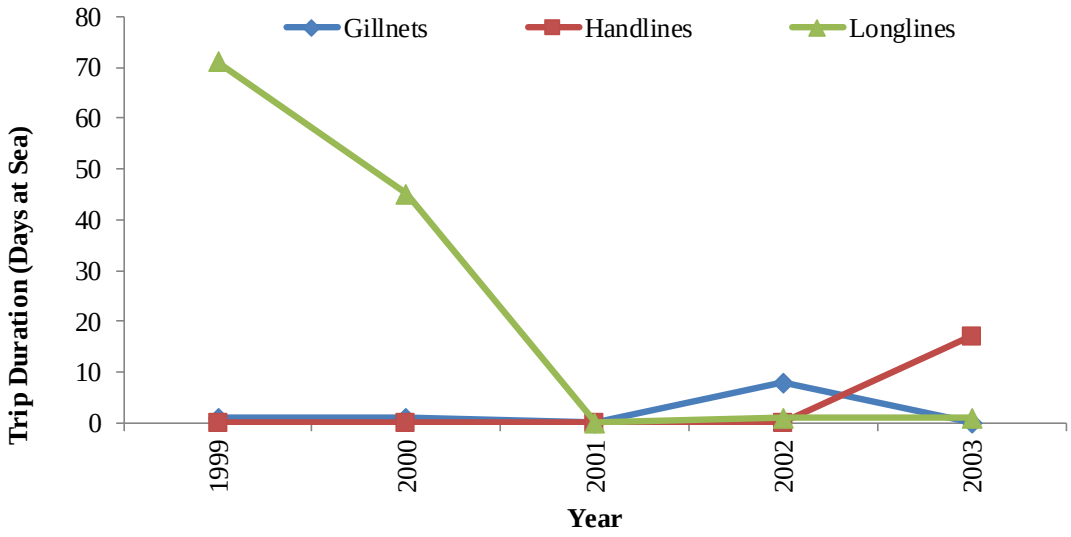

Figure 3.37. Annual trip duration for dusky shark by gear, 1999-2003.

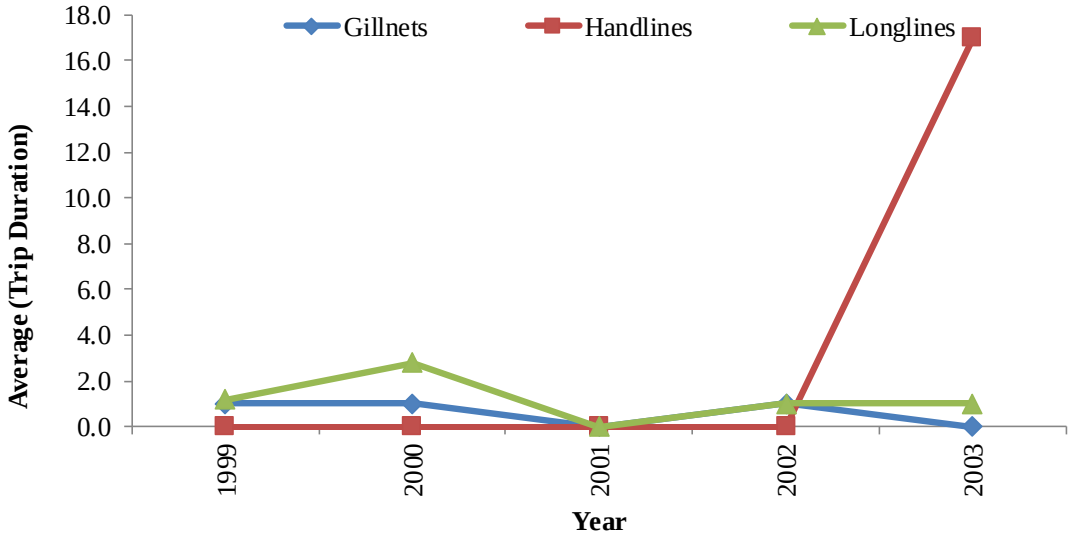

Figure 3.38. Annual average trip duration for dusky shark by gear, 1999-2003.

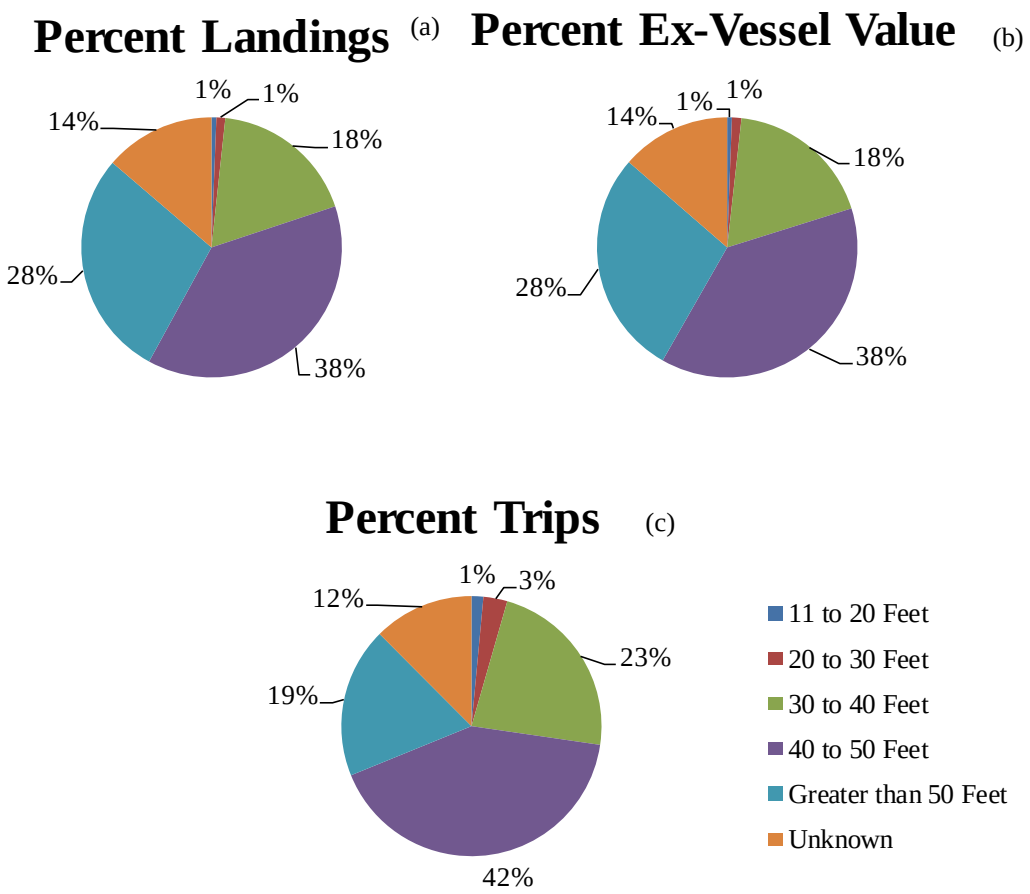

Figure 3.39. Percent of dusky shark landings (a), ex-vessel value (b), and trips (c) from 1994 to 2003 by vessel size.

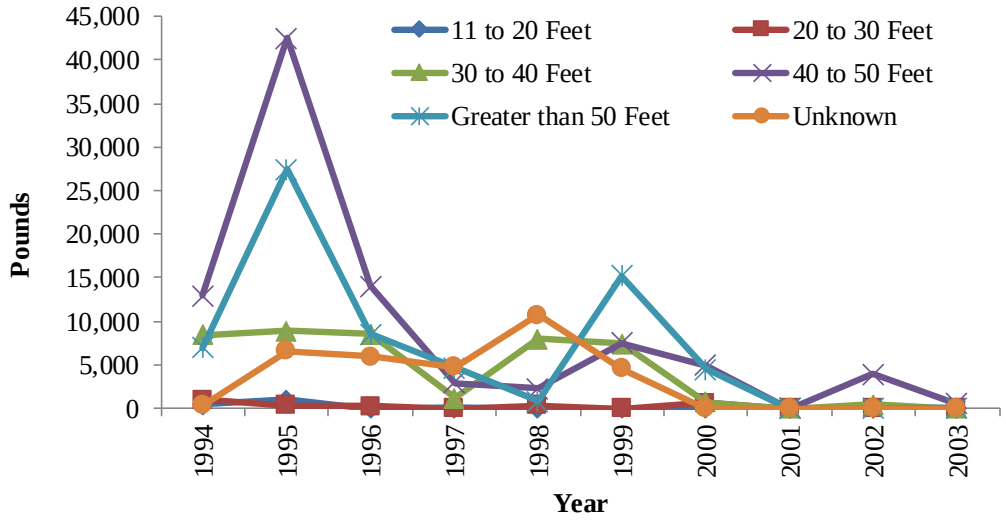

Figure 3.40. Annual landings of dusky shark by vessel size, 1994-2003.

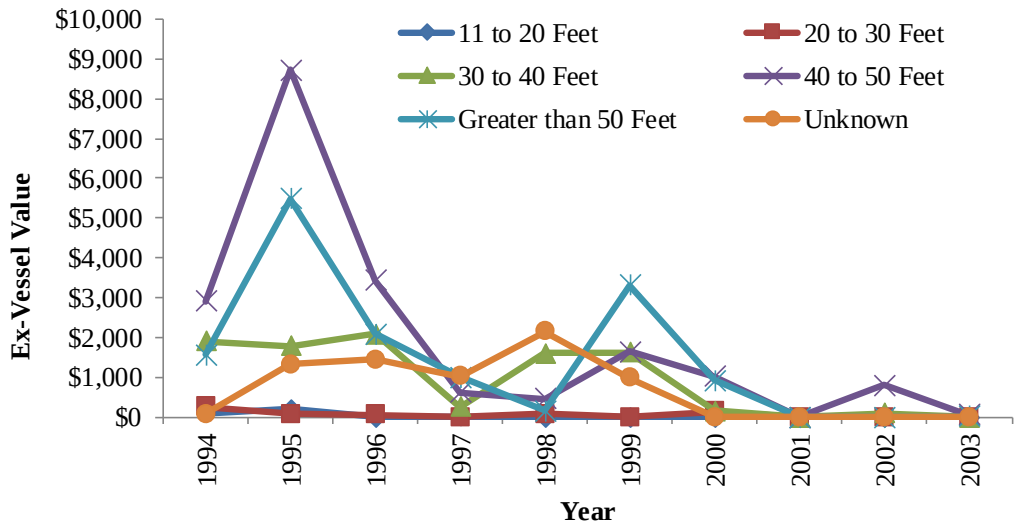

Figure 3.41. Annual ex-vessel value of dusky shark by vessel size, 1994-2003.

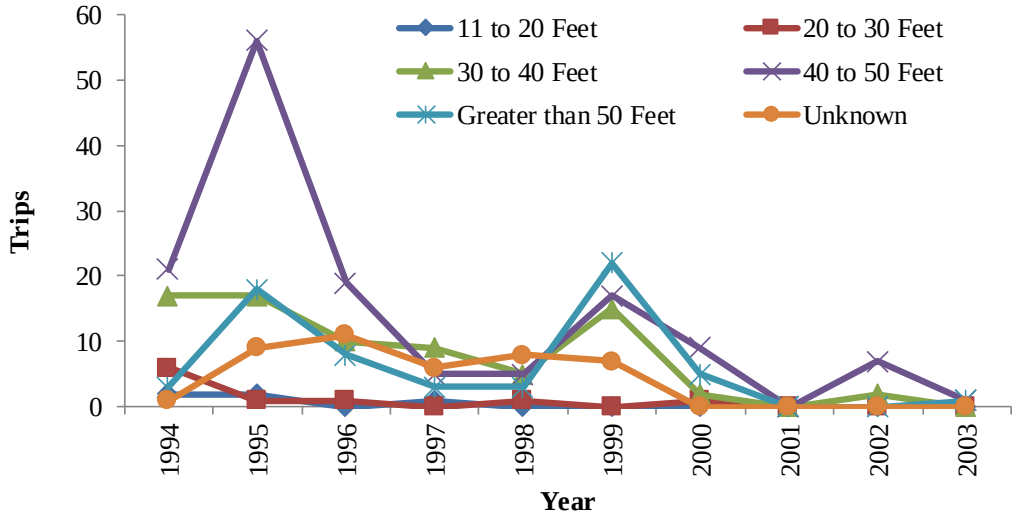

Figure 3.42. Annual trips of dusky shark by vessel size, 1994-2003.

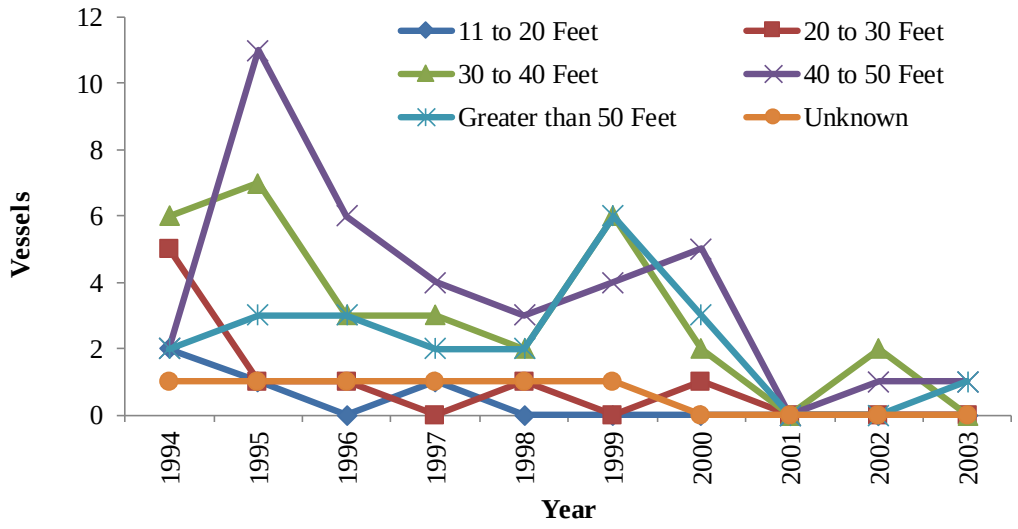

Figure 3.43. Annual number of vessels for dusky shark by vessel size, 1994-2003.

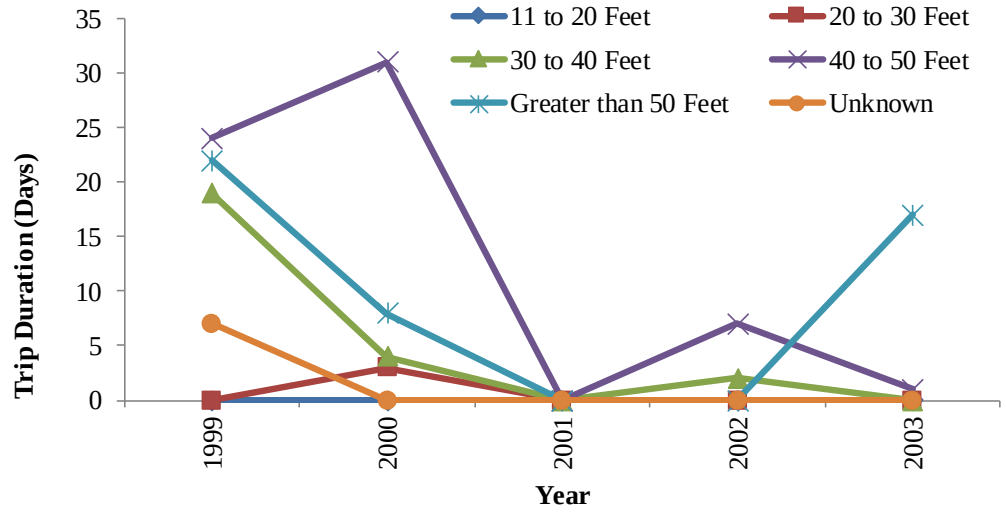

Figure 3.44. Annual trip duration for dusky shark by vessel size, 1999-2003.

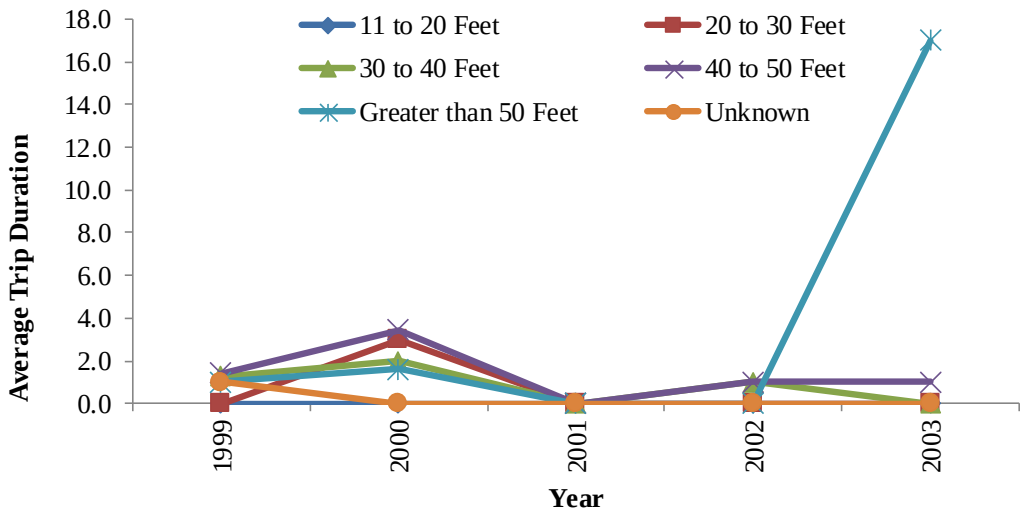

Figure 3.45. Annual average trip duration for dusky shark by vessel size, 1999-2003.

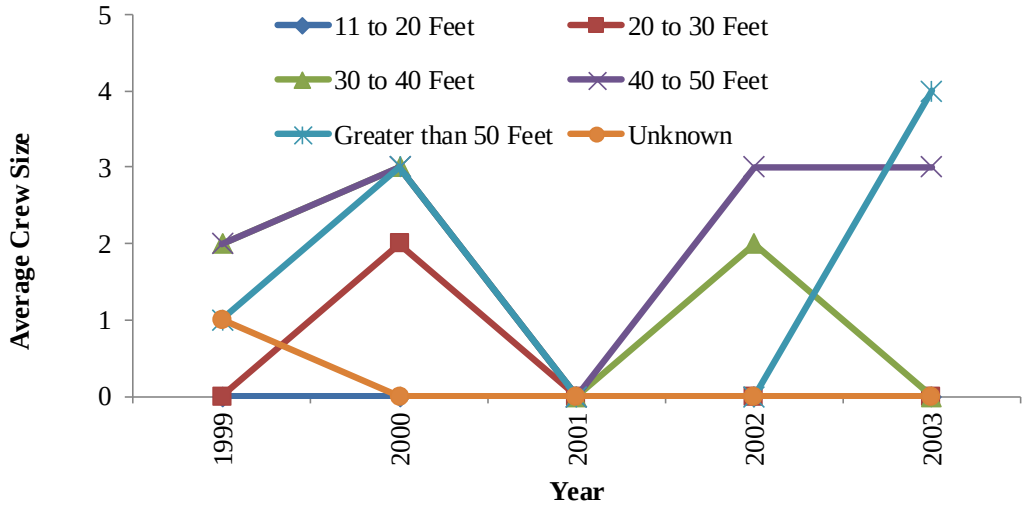

Figure 3.46. Annual average crew size for dusky shark by vessel size, 1999-2003.

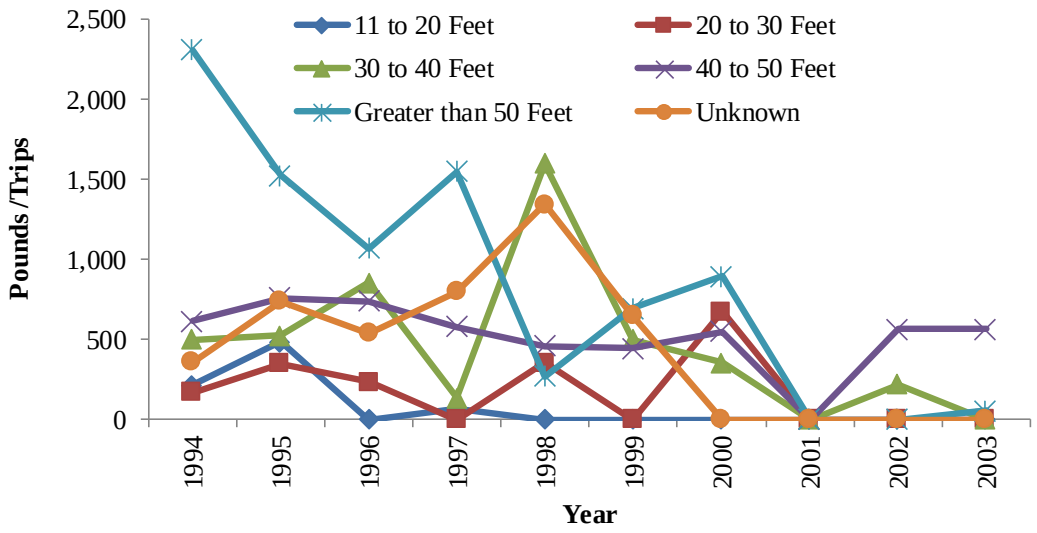

Figure 3.47. Annual average pounds per trip for dusky shark by vessel size, 1994-2003.

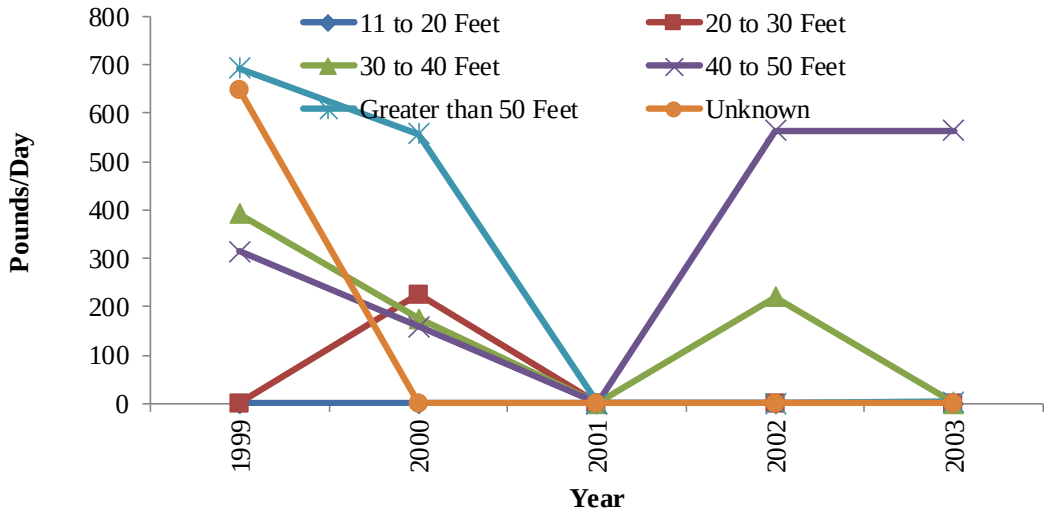

Figure 3.48. Annual average pounds per day for dusky shark by vessel size, 1999-2003.

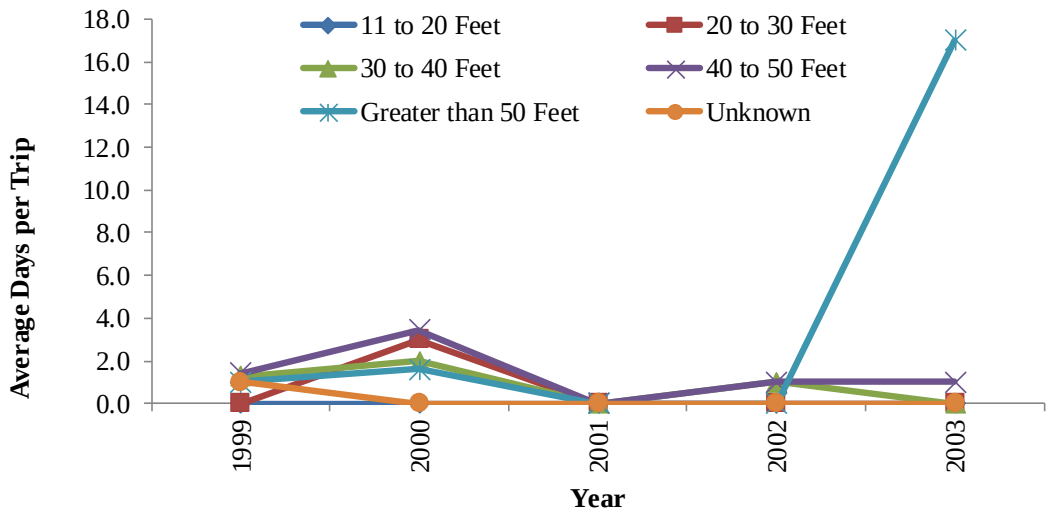

Figure 3.49. Annual average days per trip for dusky shark by vessel size, 1999-2003.

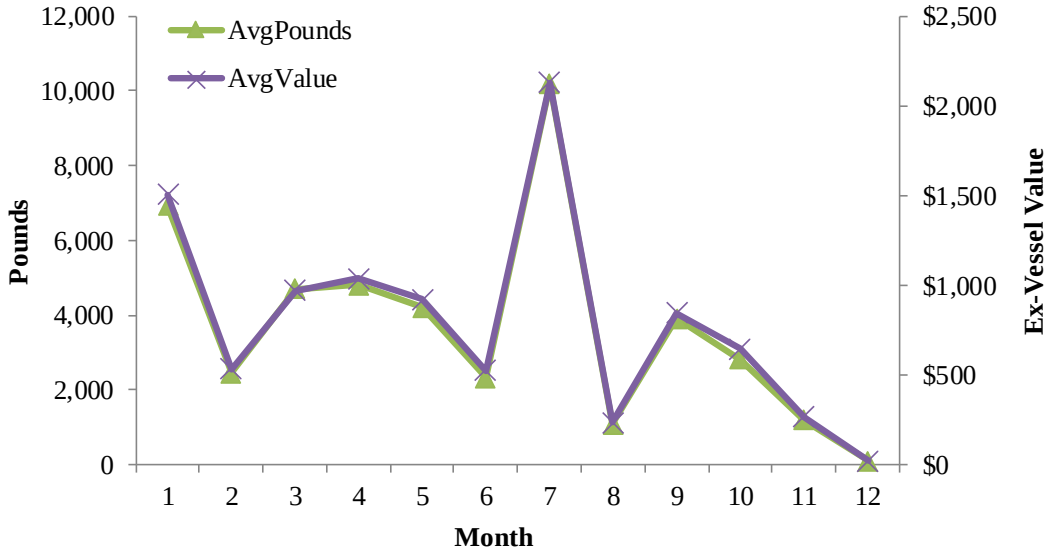

Figure 3.50. Average landings and ex-vessel value for dusky shark, 1994-2003.

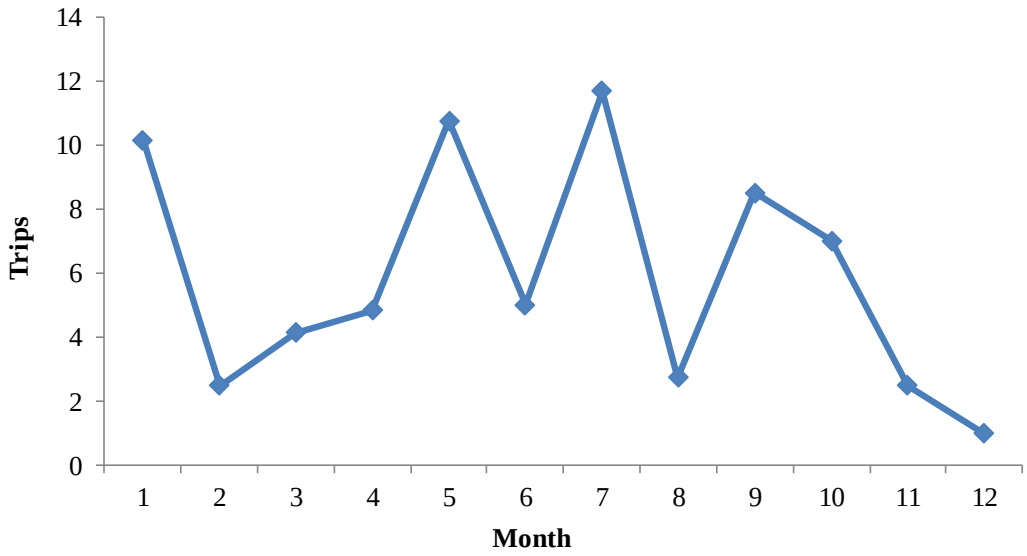

Figure 3.51. Average number of trips by month for dusky shark, 1994-2003.

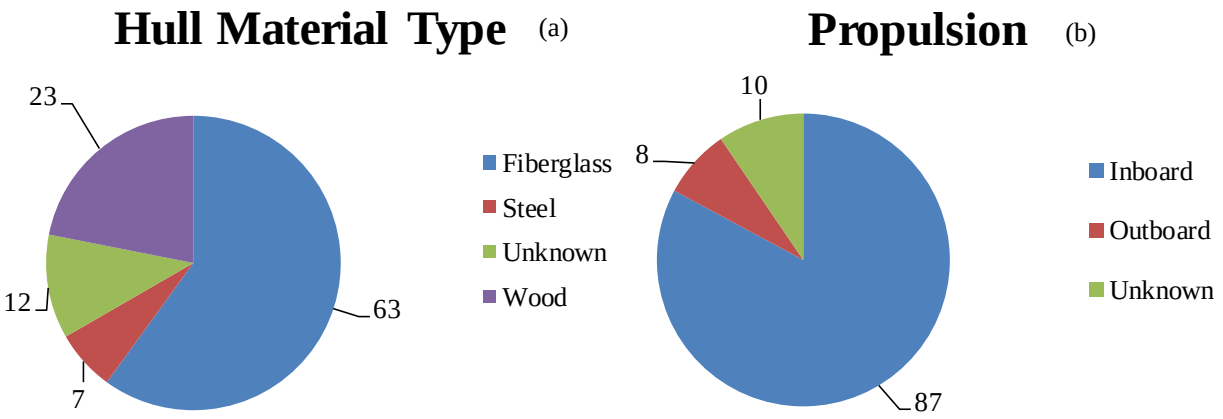

Figure 3.52. Hull material type (a) and propulsion (b) for vessels in the dusky shark commercial fishery.

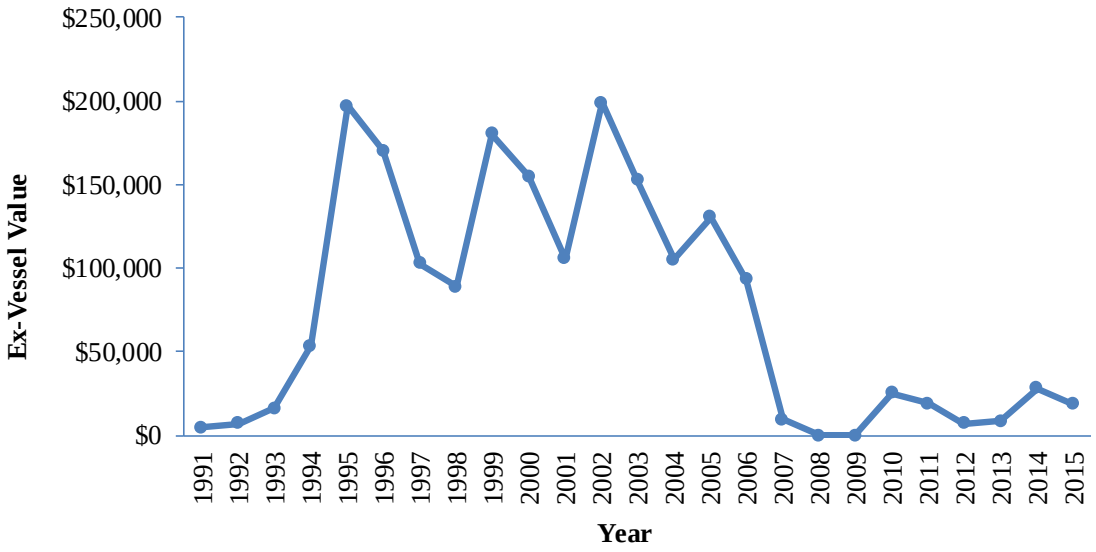

Figure 3.53. Ex-vessel value of sandbar shark from 1991 to 2015.

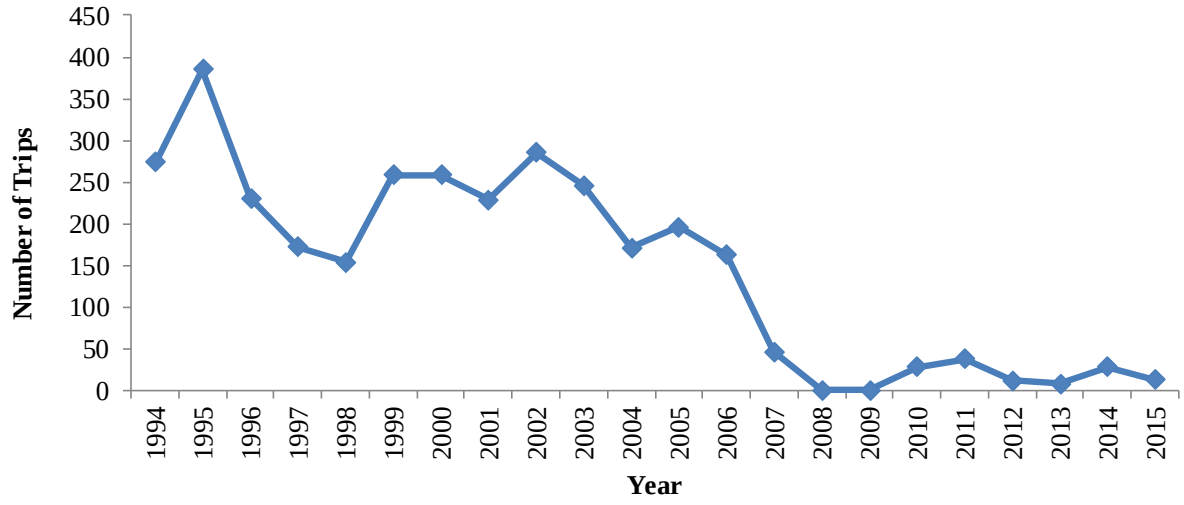

Figure 3.54. Annual number of trips landing sandbar shark from 1994 to 2015.

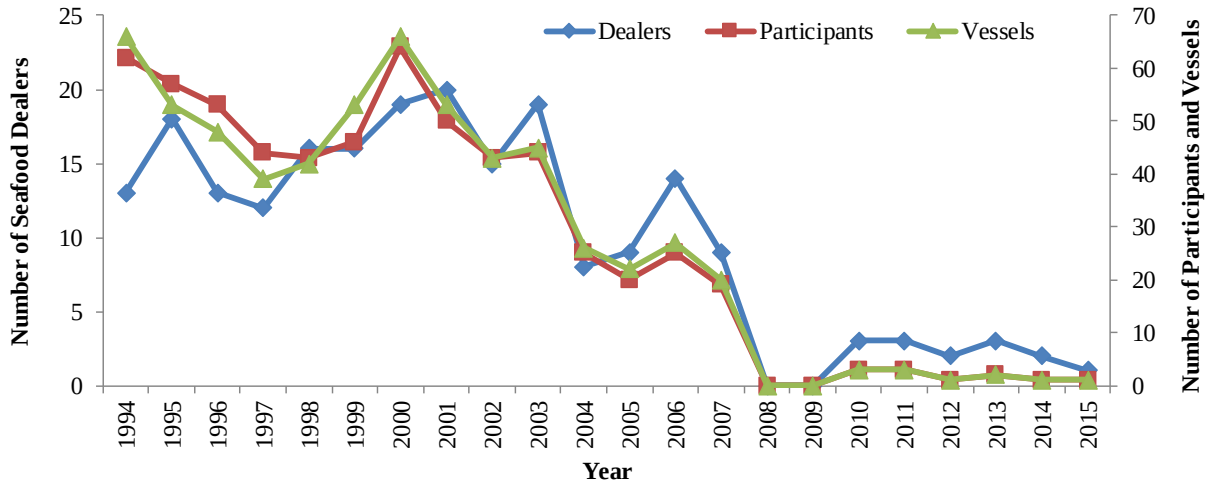

Figure 3.55. Annual number of seafood dealers, participants, and vessels recording landings of sandbar shark, 1994 to 2015.

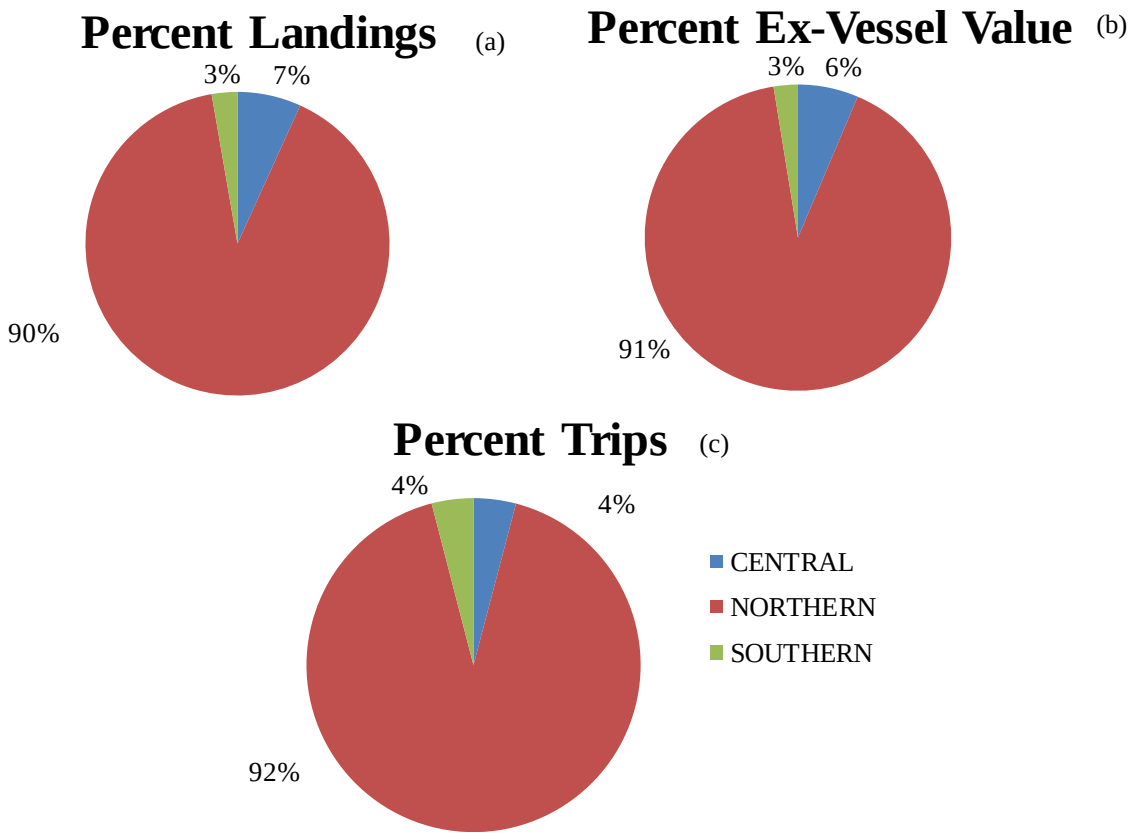

Figure 3.56. Percent of sandbar shark landings (a) and ex-vessel value (b) from 1988 to 2015 and trips (c) from 1994 to 2015 by district.

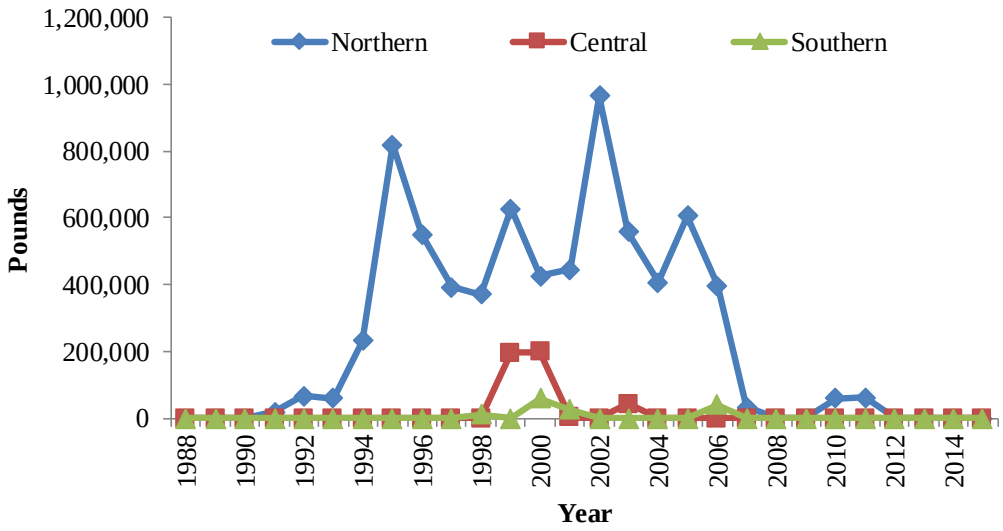

Figure 3.57. Annual landings of sandbar shark by district, 1988-2015.

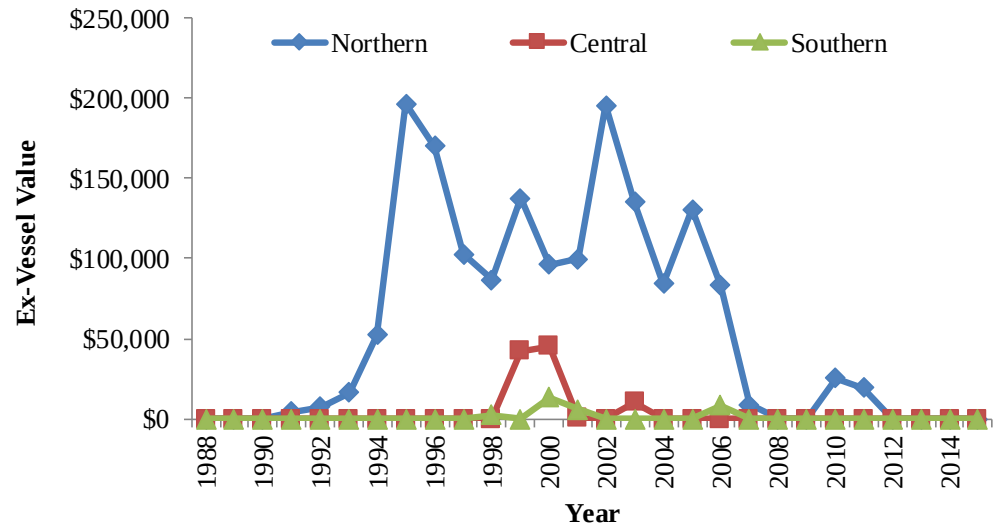

Figure 3.58. Annual ex-vessel value of sandbar shark by district, 1988-2015.

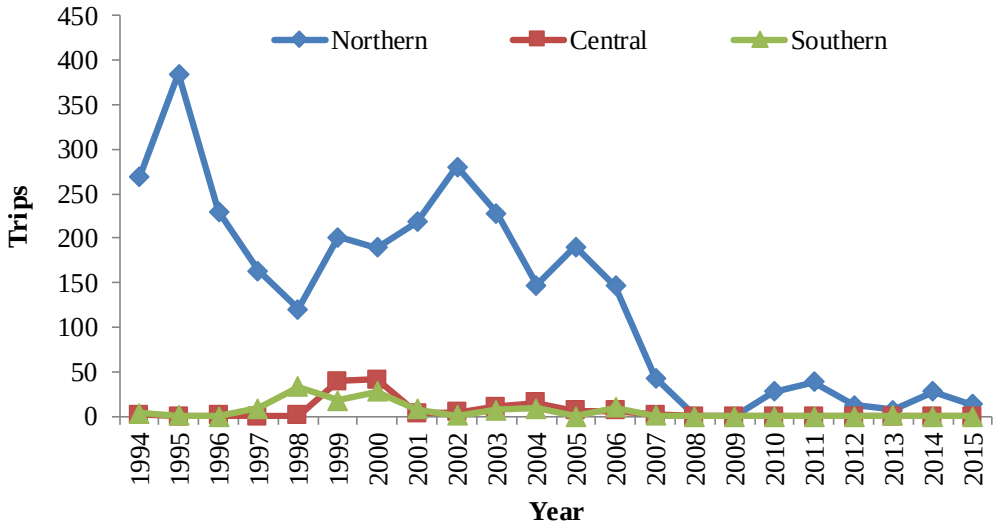

Figure 3.59. Annual number of trips landing sandbar shark by district, 1994-2015.

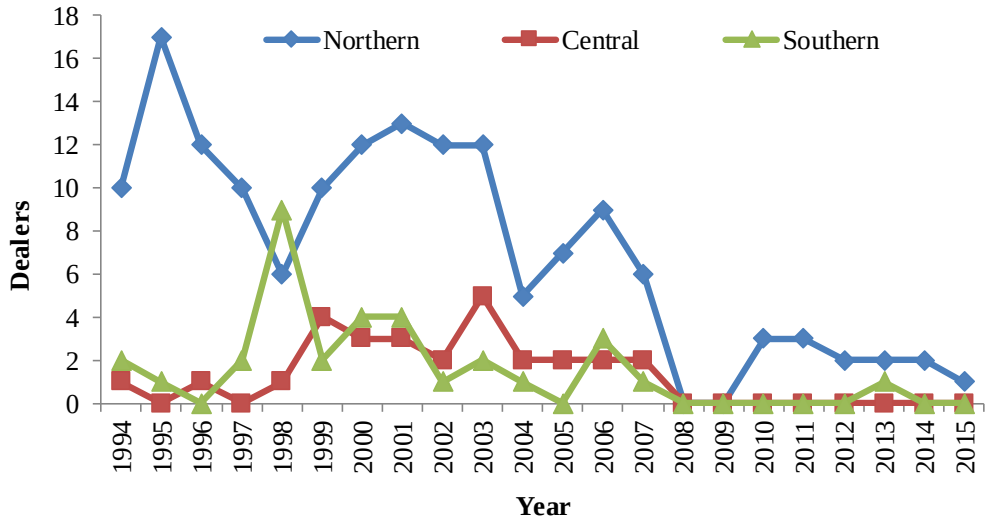

Figure 3.60. Annual number of dealers reporting landings for sandbar shark by district, 1994-2015.

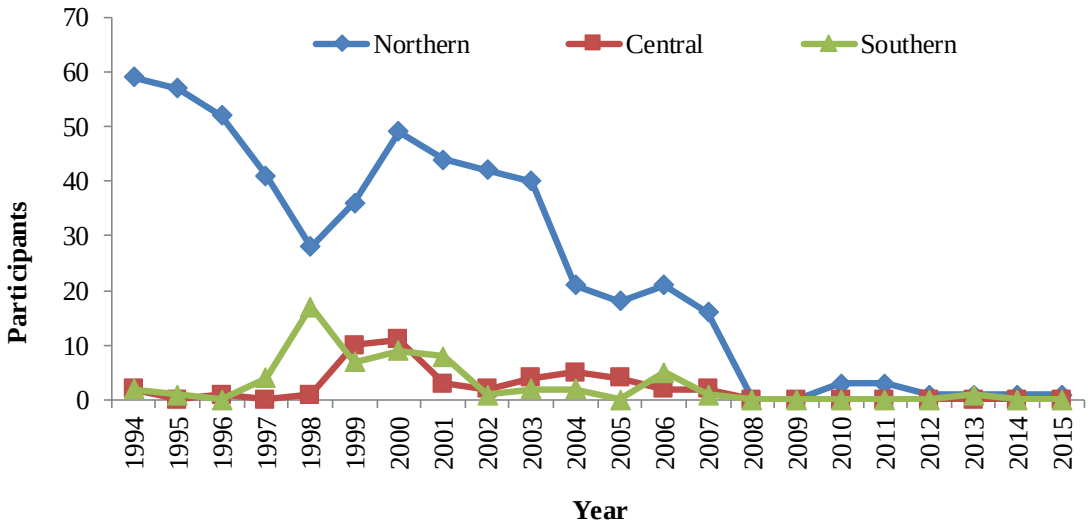

Figure 3.61. Annual number of participants landing sandbar shark by district, 1994-2015.

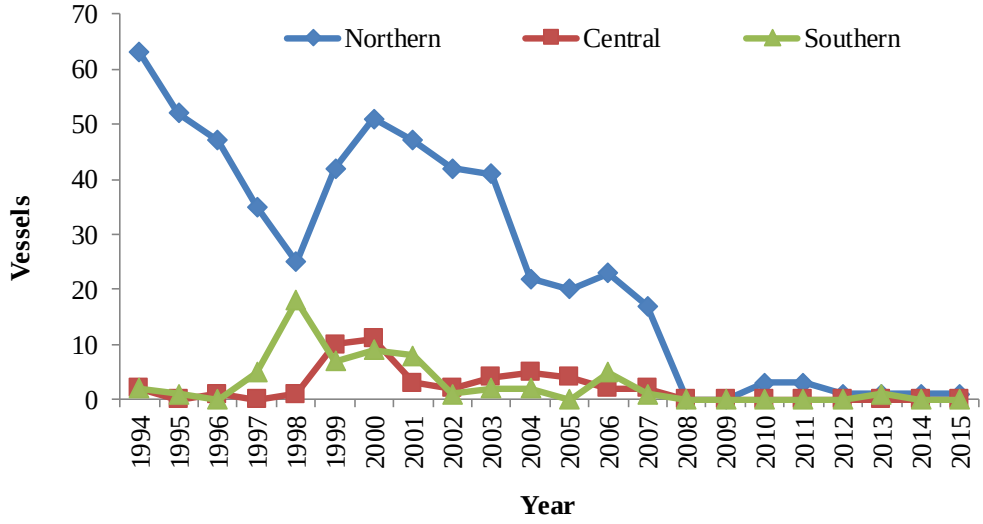

Figure 3.62. Annual number of vessels landing sandbar shark by district, 1994-2015.

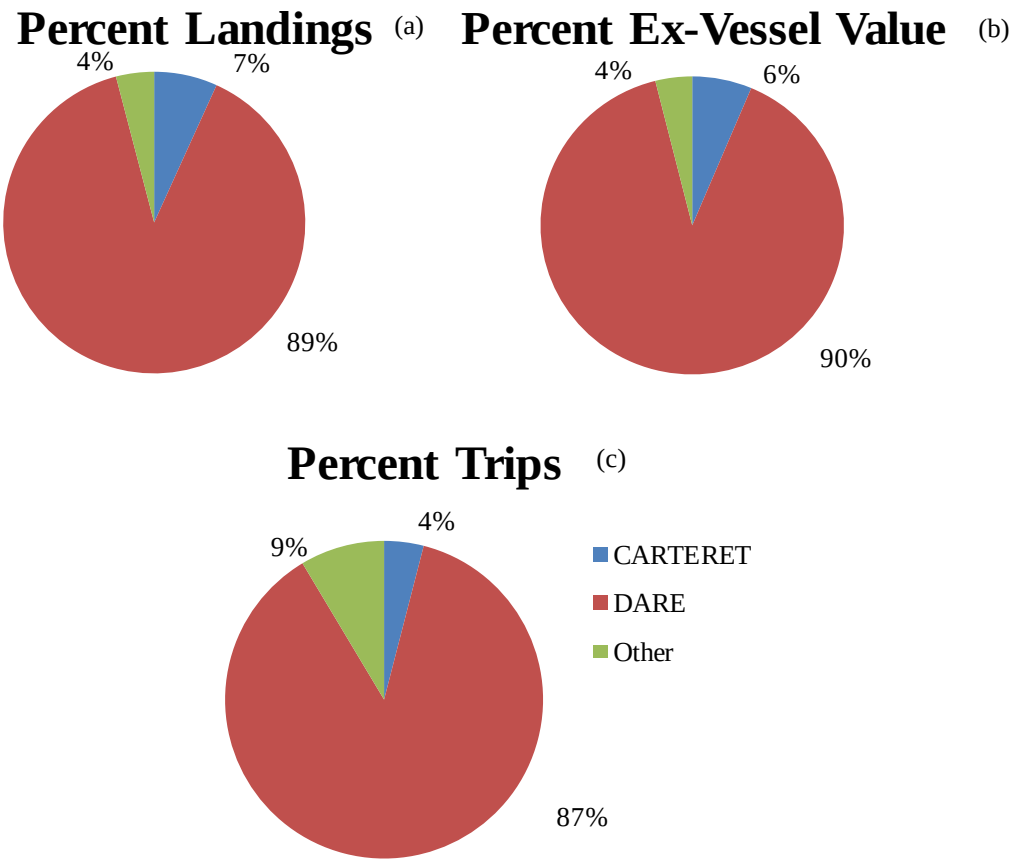

Figure 3.63. Percent of sandbar shark landings (a) and ex-vessel value (b) from 1988 to 2015 and trips (c) from 1994 to 2015 by county.

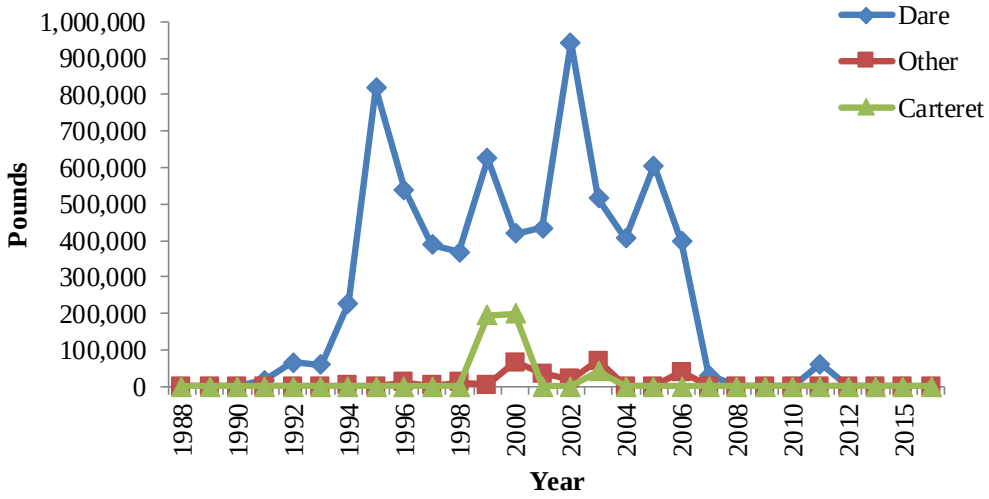

Figure 3.64. Annual landings of sandbar shark by county, 1988-2015.

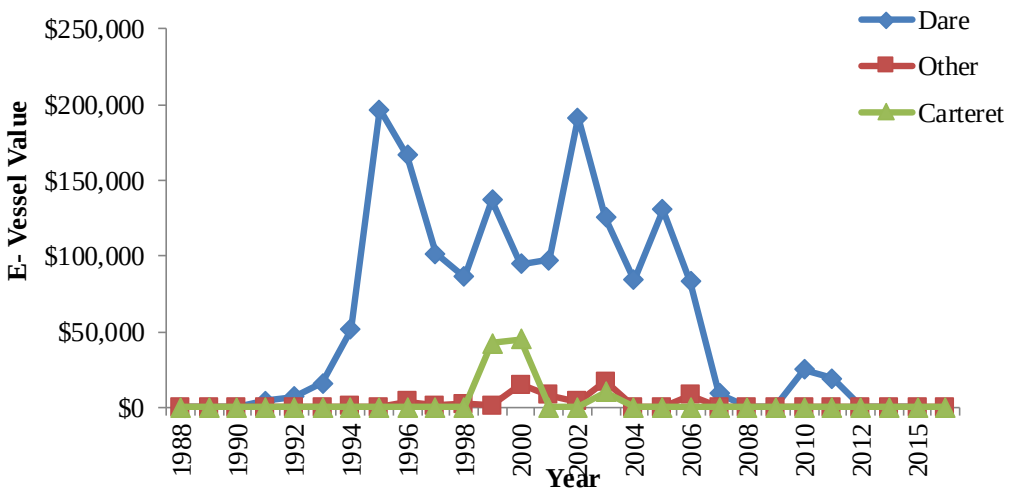

Figure 3.65. Annual ex-vessel value of sandbar shark by county, 1988-2015.

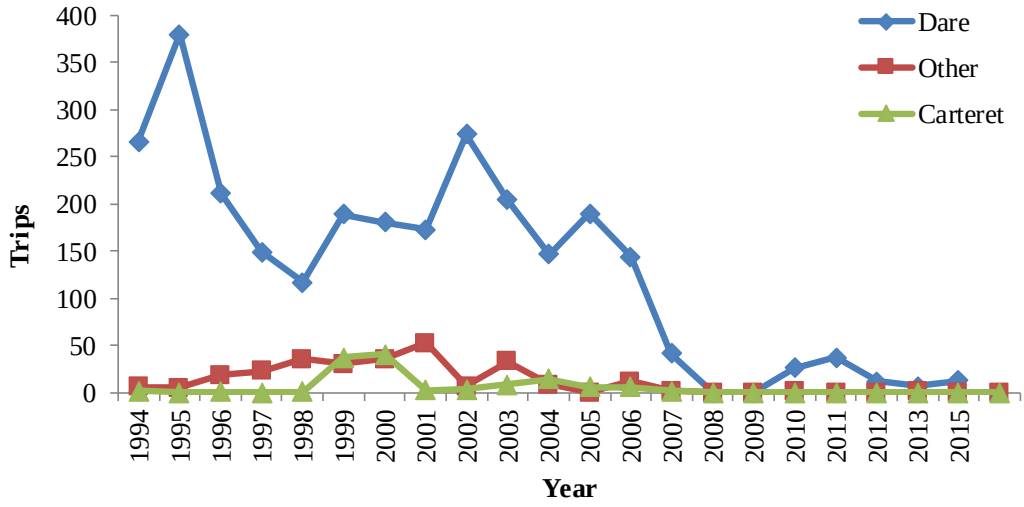

Figure 3.66. Annual number of trips landing sandbar shark by county, 1994-2015.

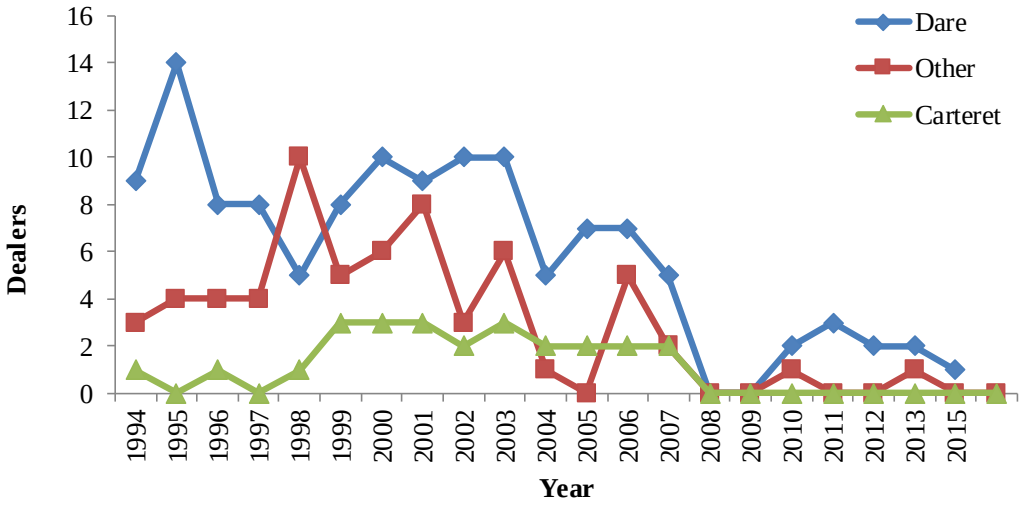

Figure 3.67. Annual number of dealers reporting landings for sandbar shark by county, 1994-2015.

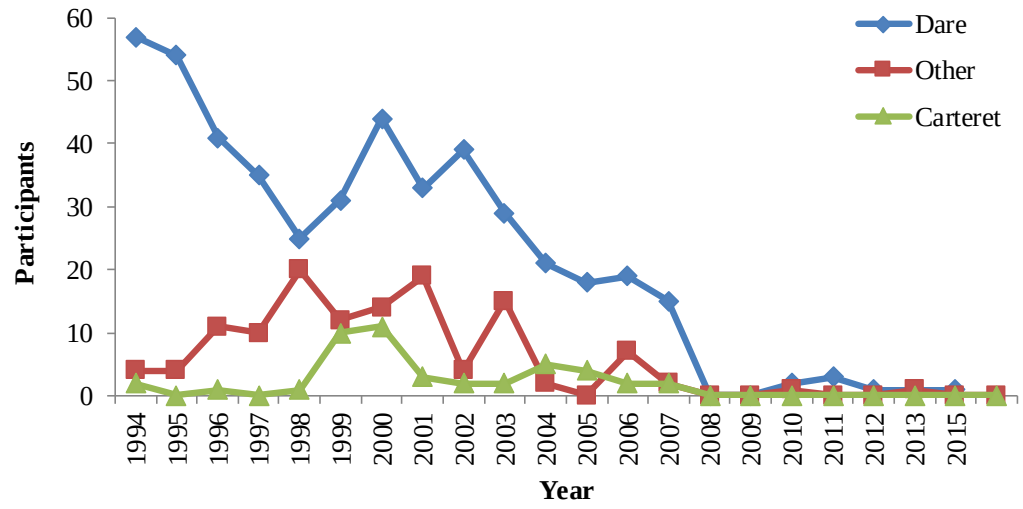

Figure 3.68. Annual number of participants landing sandbar shark by county, 1994-2015.

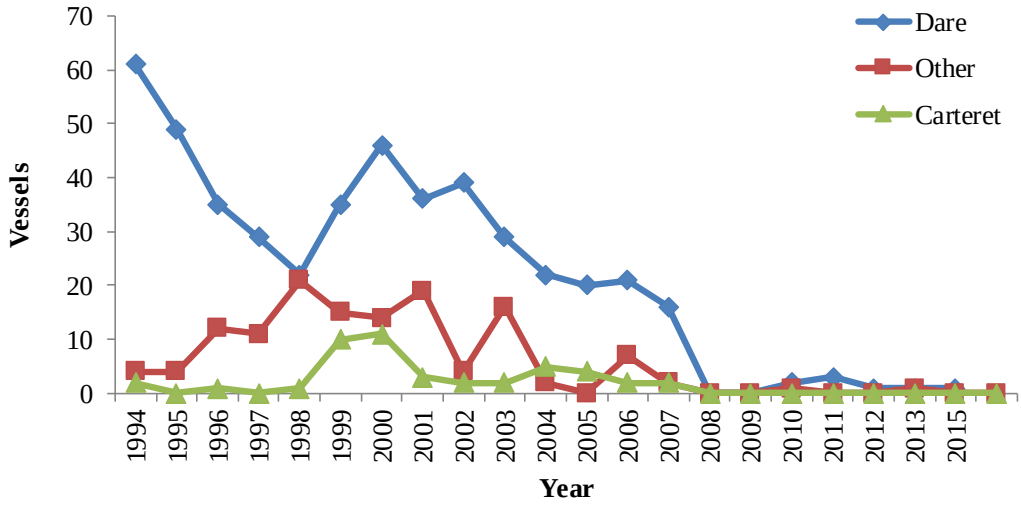

Figure 3.69. Annual number of vessels landing sandbar shark by county, 1994-2015.

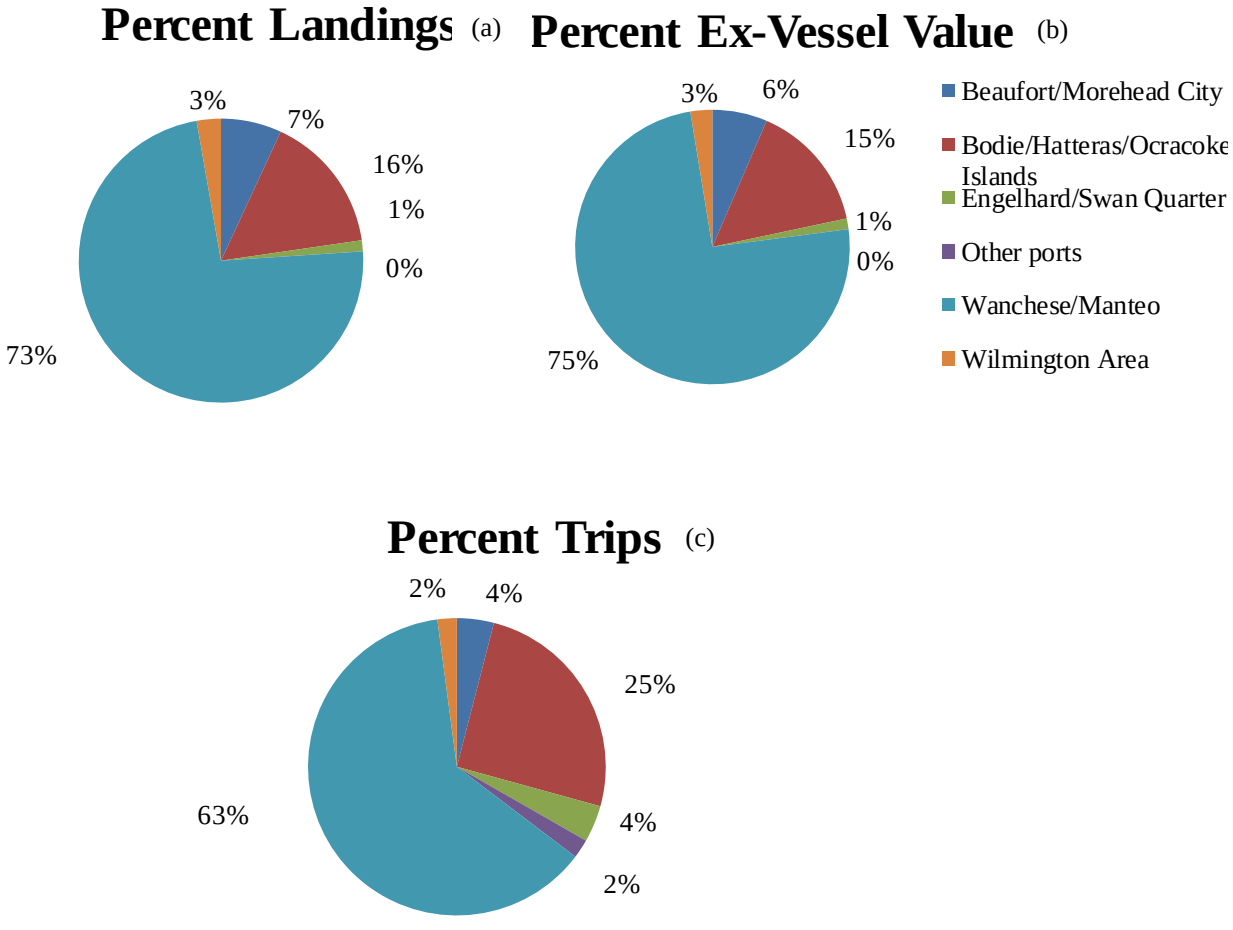

Figure 3.70. Percent of sandbar shark landings (a), ex-vessel value (b), and trips (c) from 1994 to 2015 by port.

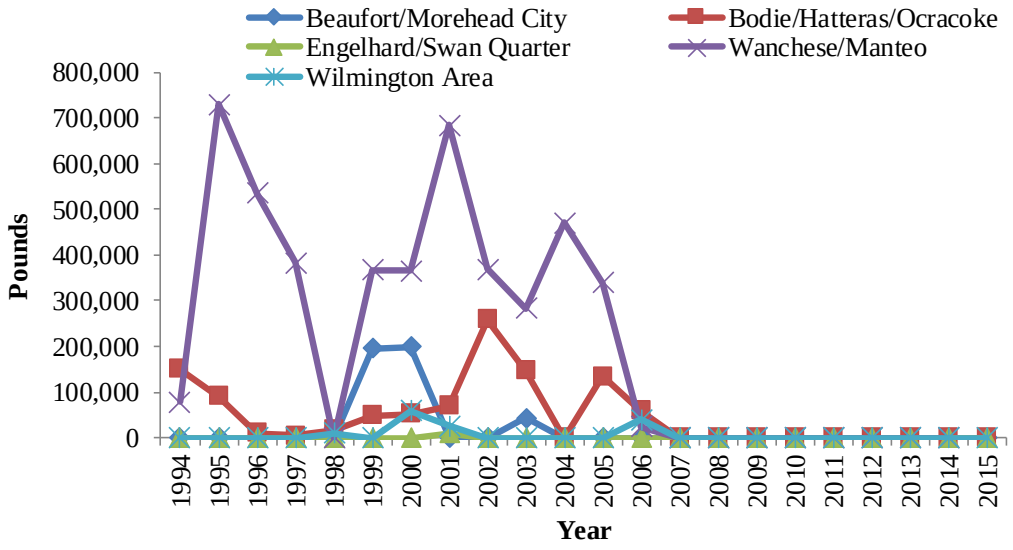

Figure 3.71. Annual landings of sandbar shark by port, 1994-2015.

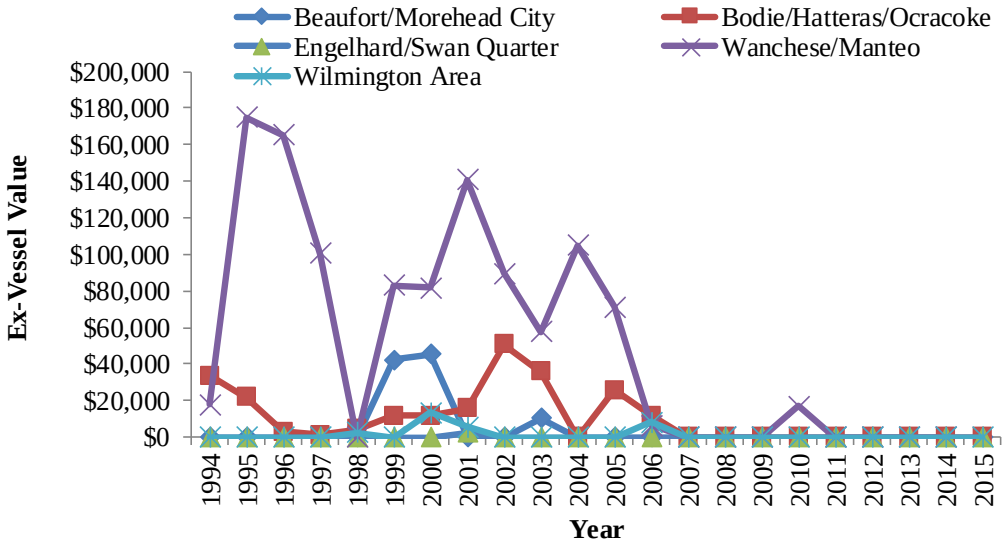

Figure 3.72. Annual ex-vessel value of sandbar shark by port, 1994-2015.

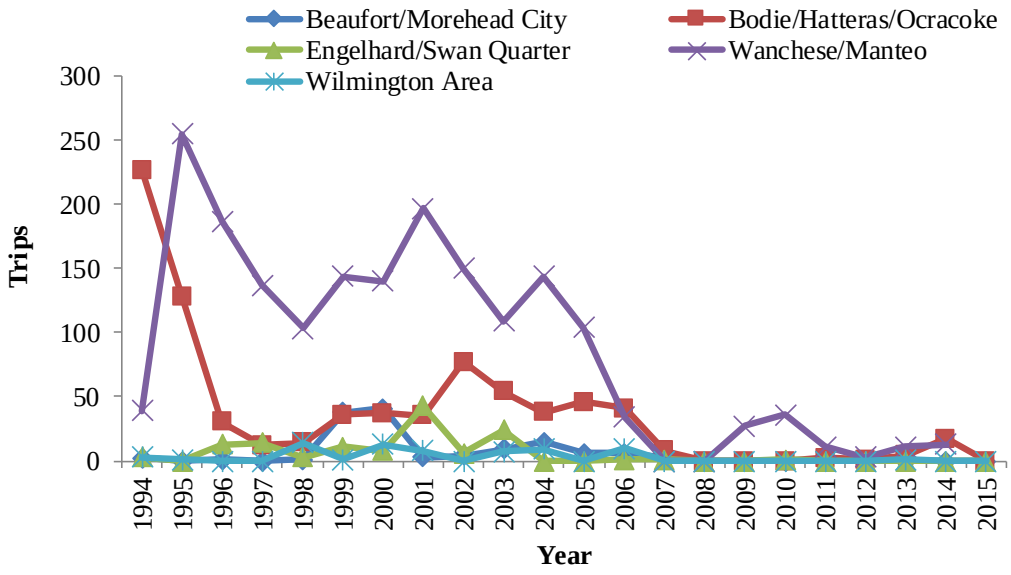

Figure 3.73. Annual number of trips landing sandbar sharks by port, 1994-2015.

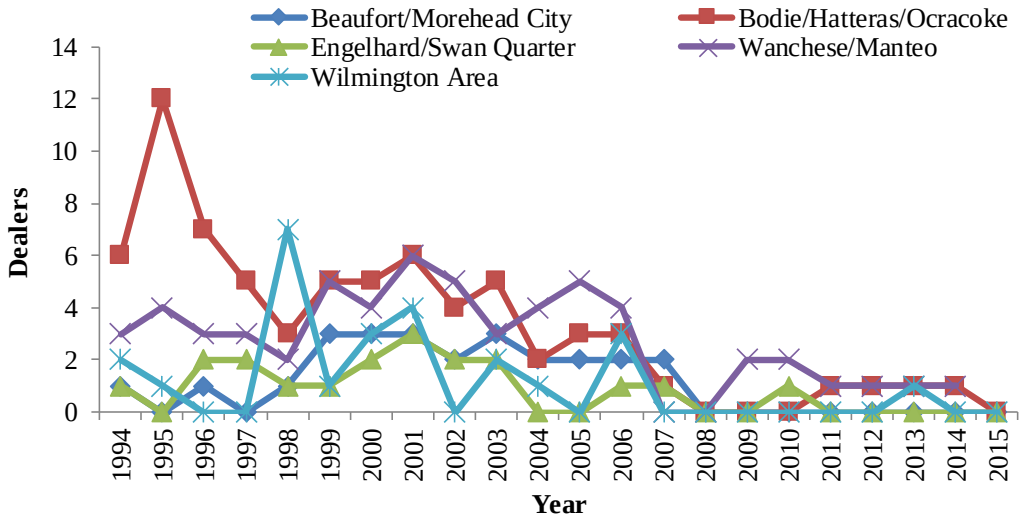

Figure 3.74. Annual number of dealers reporting landings of sandbar shark by port, 1994-2015.

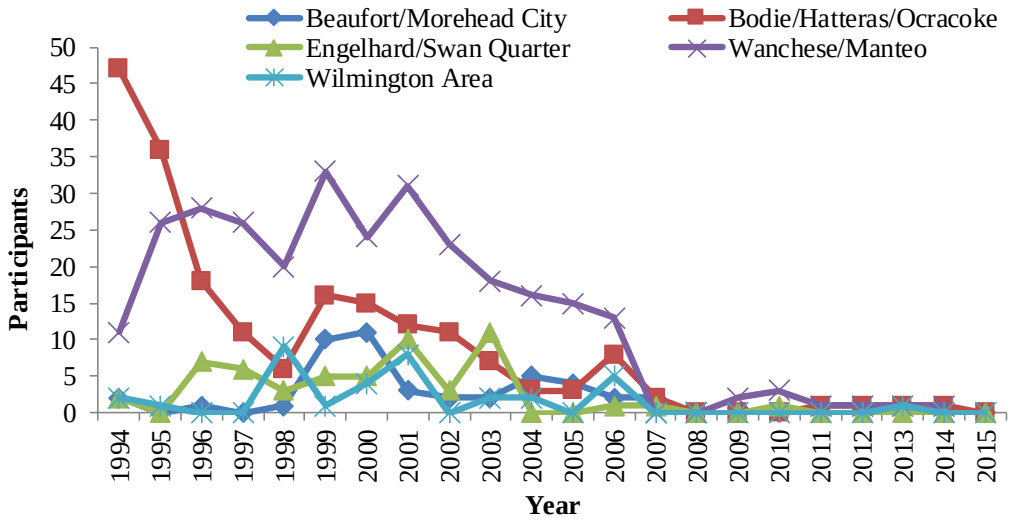

Figure 3.75. Annual number of participants landing sandbar shark by port, 1994-2015.

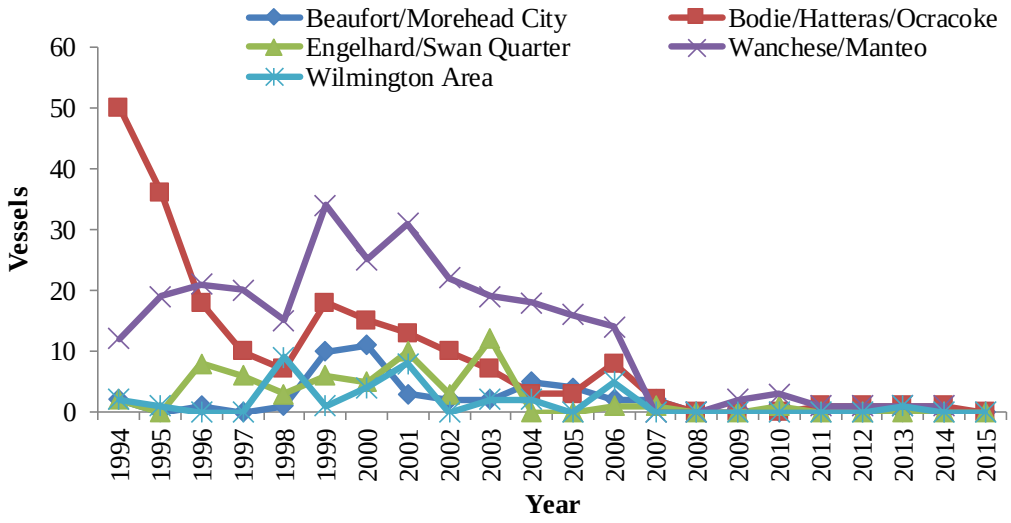

Figure 3.76. Annual number of vessels landing sandbar shark by port, 1994-2015.

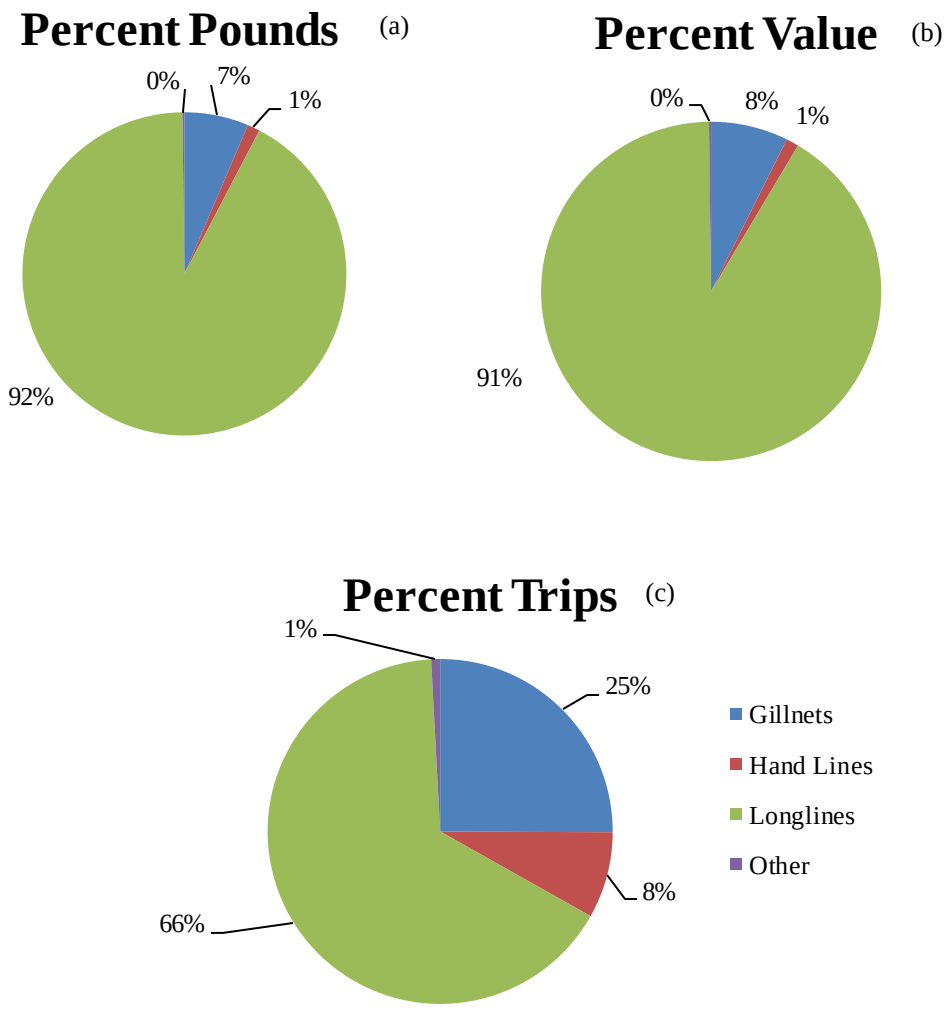

Figure 3.77. Percent of sandbar shark landings (a) and ex-vessel value (b) from 1988 to 2015 and trips (c) from 1994 to 2015 by gear.

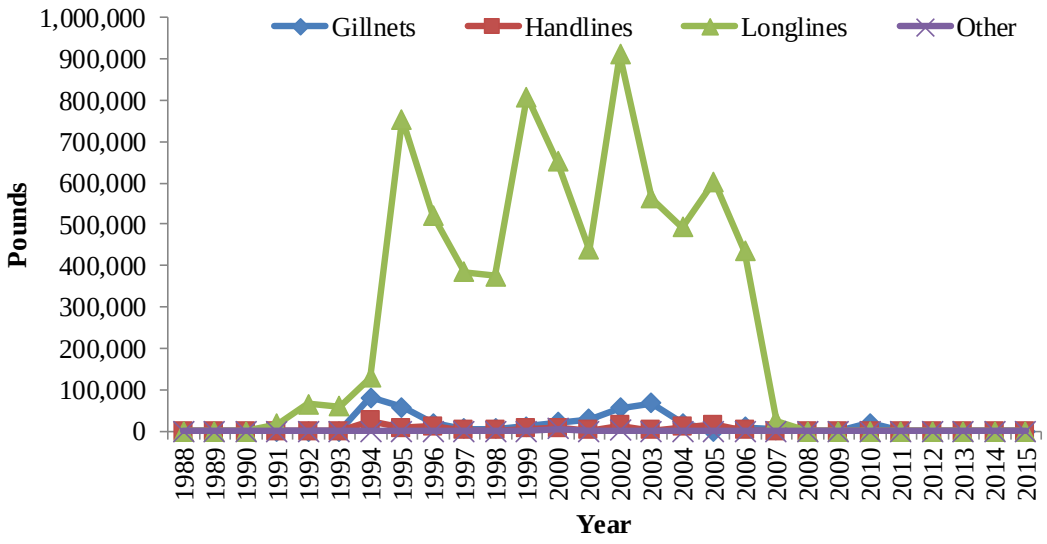

Figure 3.78. Annual landings of sandbar shark by gear, 1988-2015.

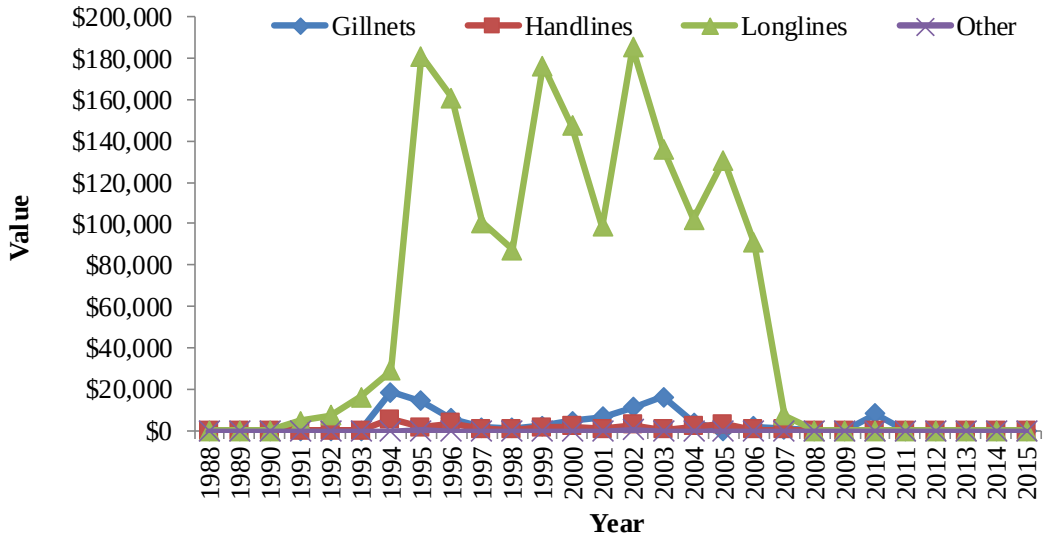

Figure 3.79. Annual ex-vessel value of sandbar shark by gear, 1988-2015.

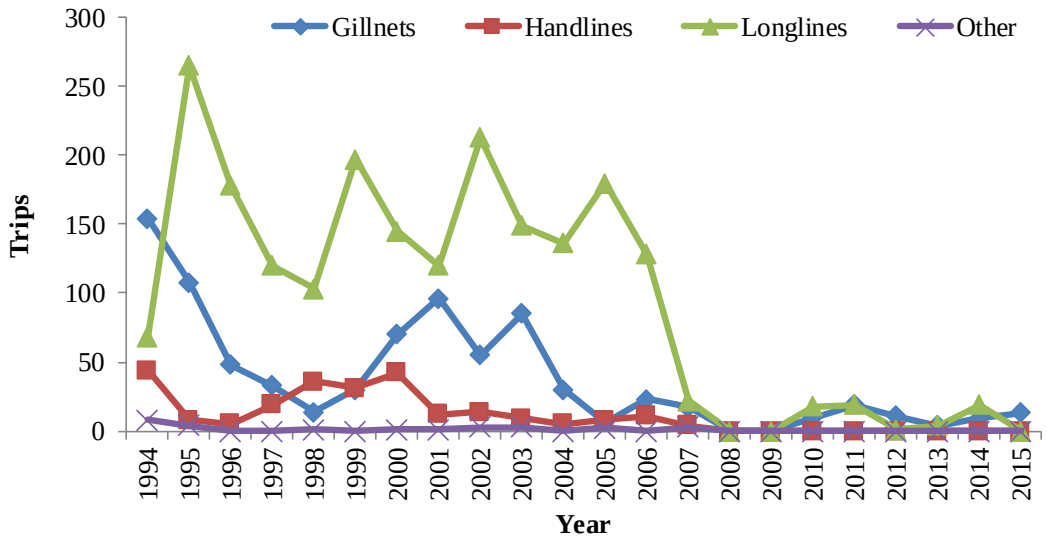

Figure 3.80. Annual number of trips for sandbar shark by gear, 1994-2015.

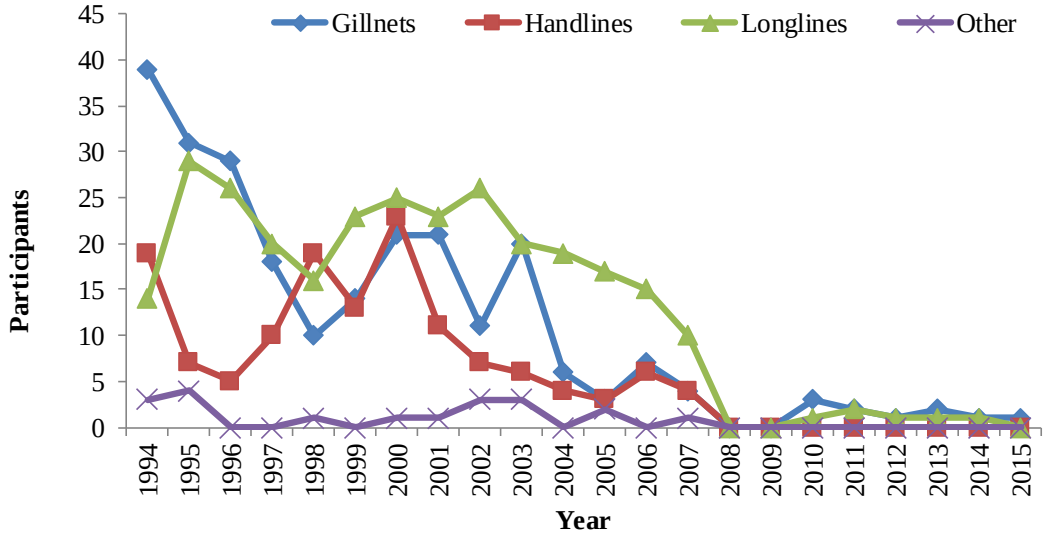

Figure 3.81. Annual number of participants for sandbar shark by gear, 1994-2015.

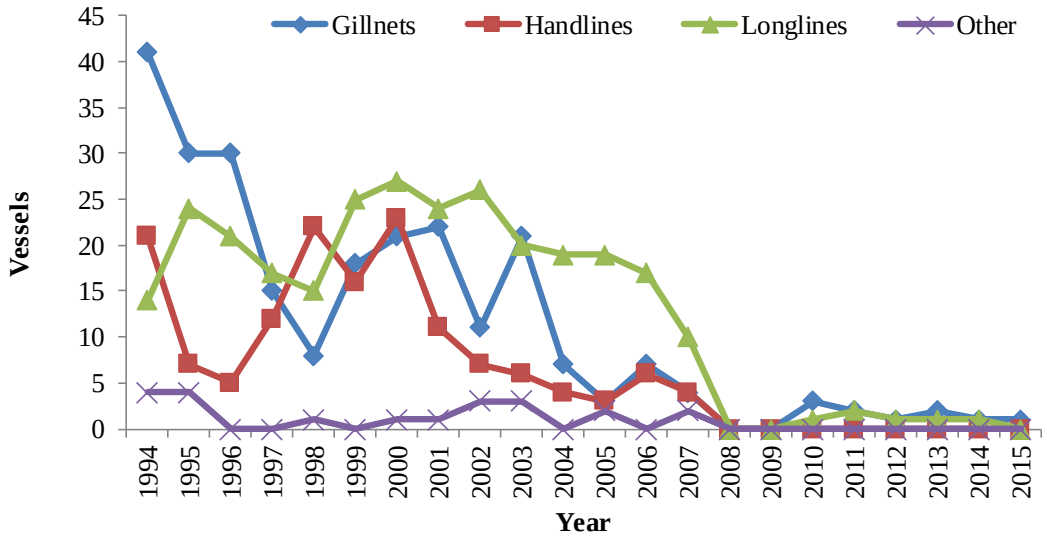

Figure 3.82. Annual number of vessels for sandbar shark by gear, 1994-2015.

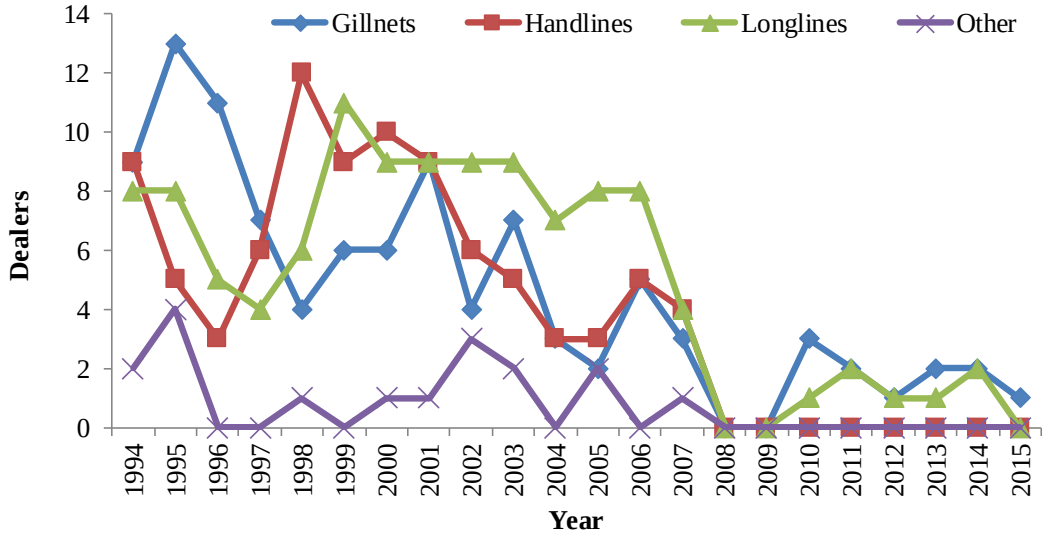

Figure 3.83. Annual number of dealers for sandbar shark by gear, 1994-2015.

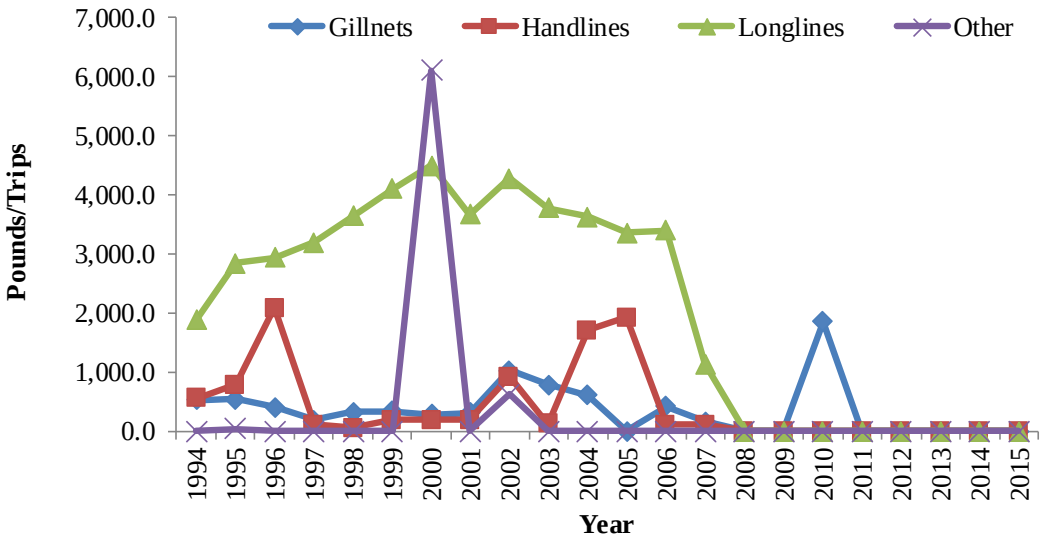

Figure 3.84. Annual pounds/trip for sandbar shark by gear, 1994-2015.

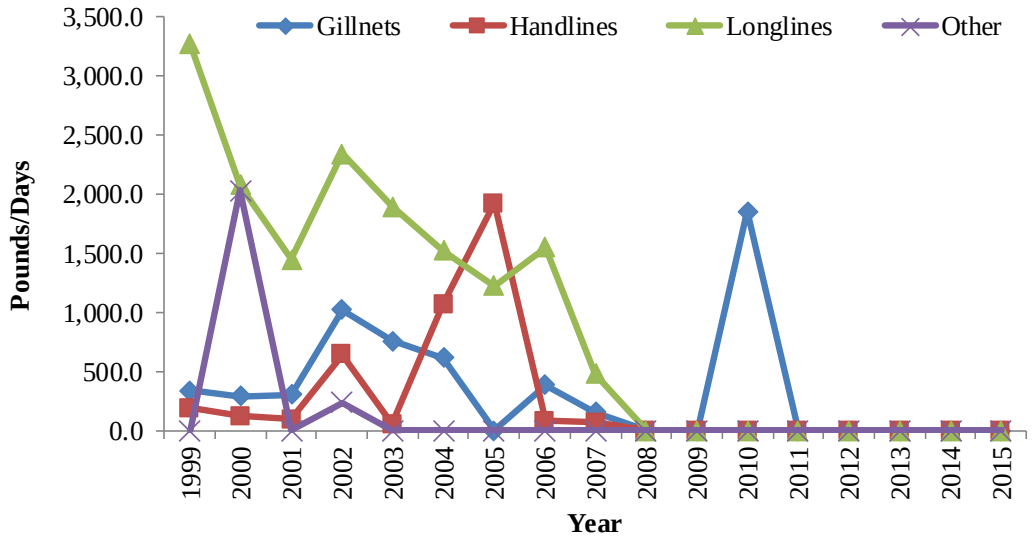

Figure 3.85. Annual pounds/day for sandbar shark by gear, 1999-2015.

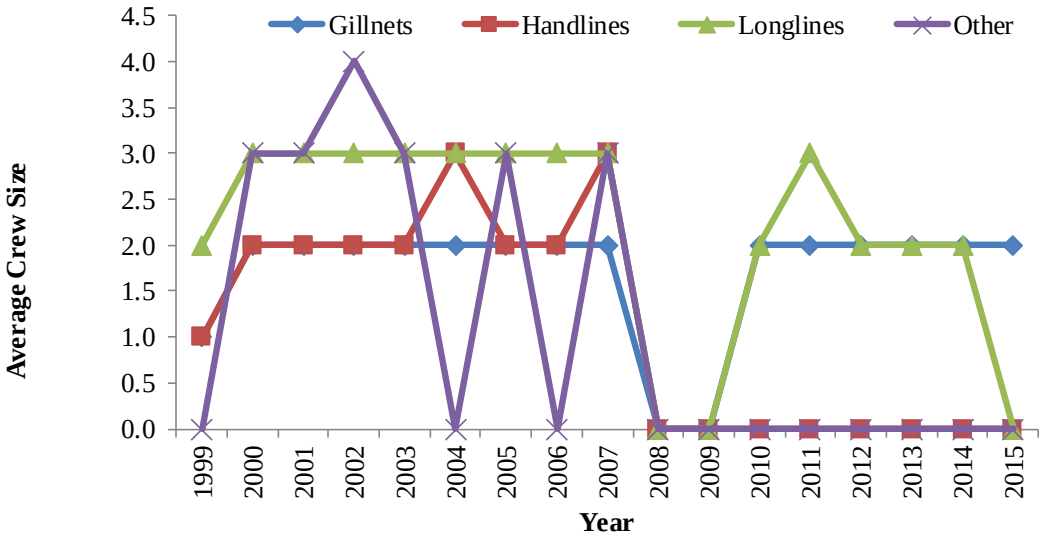

Figure 3.86. Annual average crew size for sandbar shark by gear, 1999-2015.

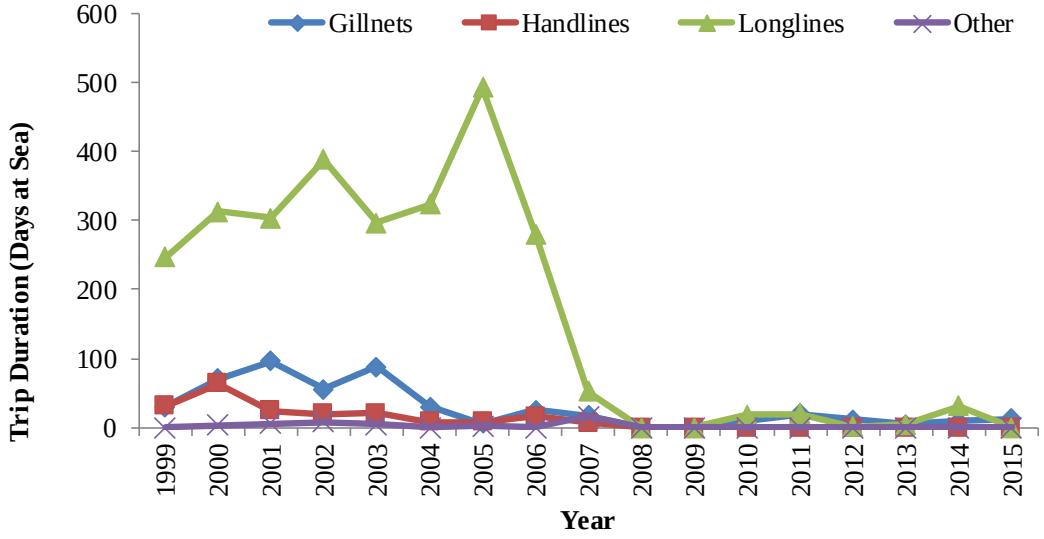

Figure 3.87. Annual trip duration for sandbar shark by gear, 1999-2015.

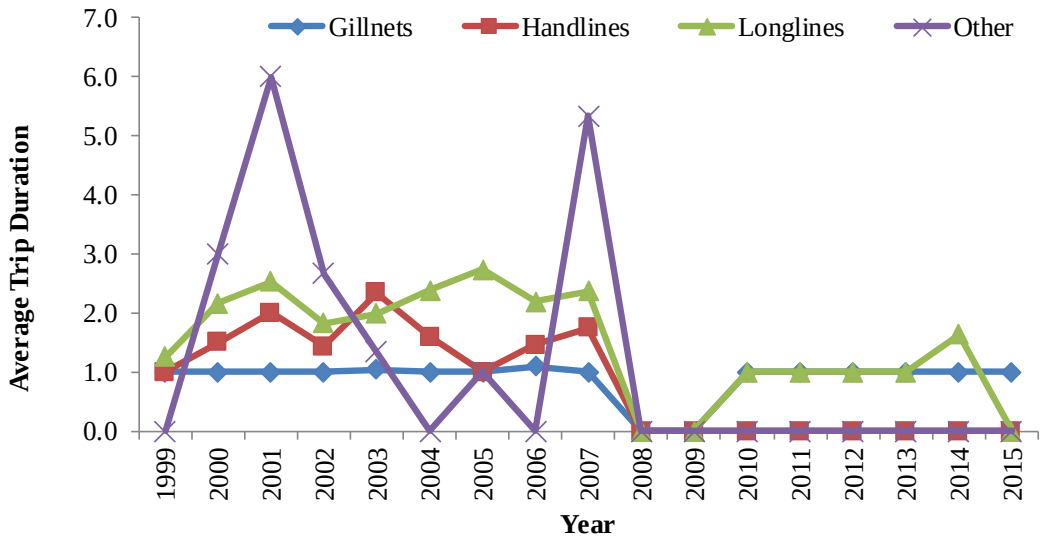

Figure 3.88. Annual average trip duration for sandbar shark by gear, 1999-2015.

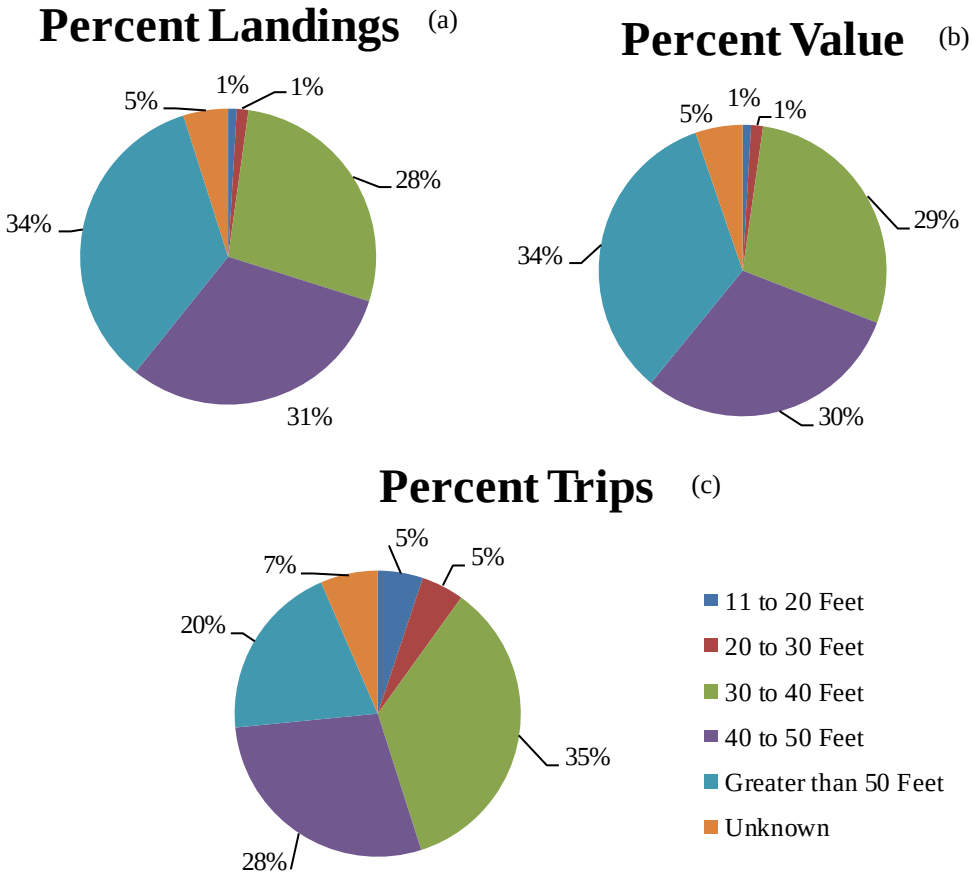

Figure 3.89. Percent of sandbar shark landings (a), ex-vessel value (b), and trips (c) from 1994 to 2015 by vessel size.

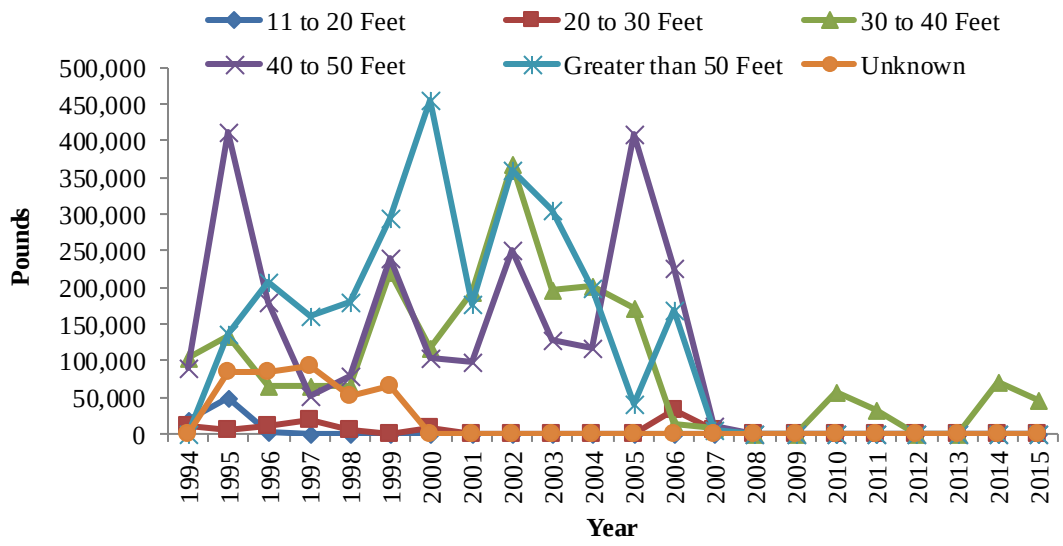

Figure 3.90. Annual landings of sandbar shark by vessel size, 1994-2015.

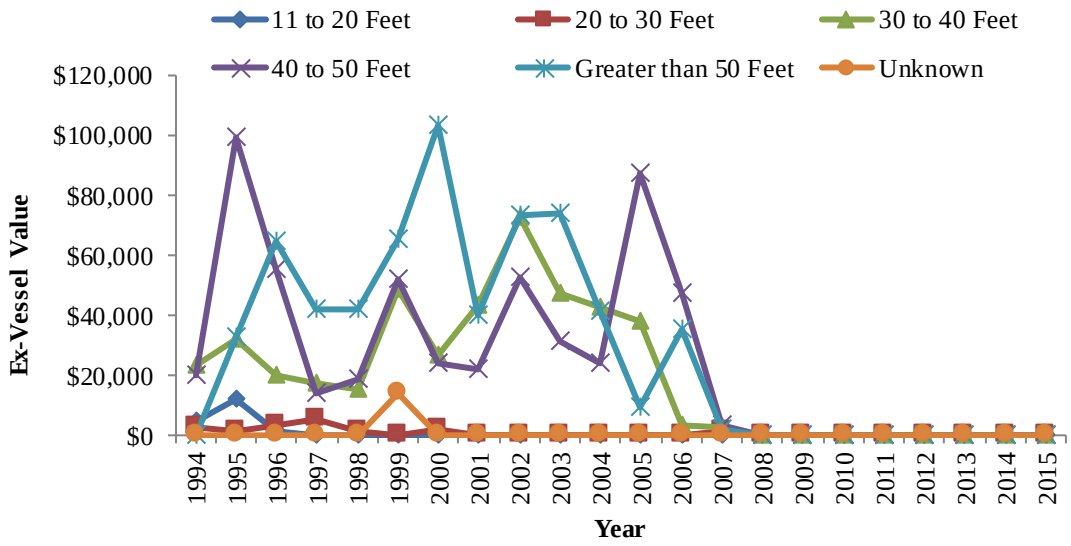

Figure 3.91. Annual ex-vessel value of sandbar shark by vessel size, 1994-2015.

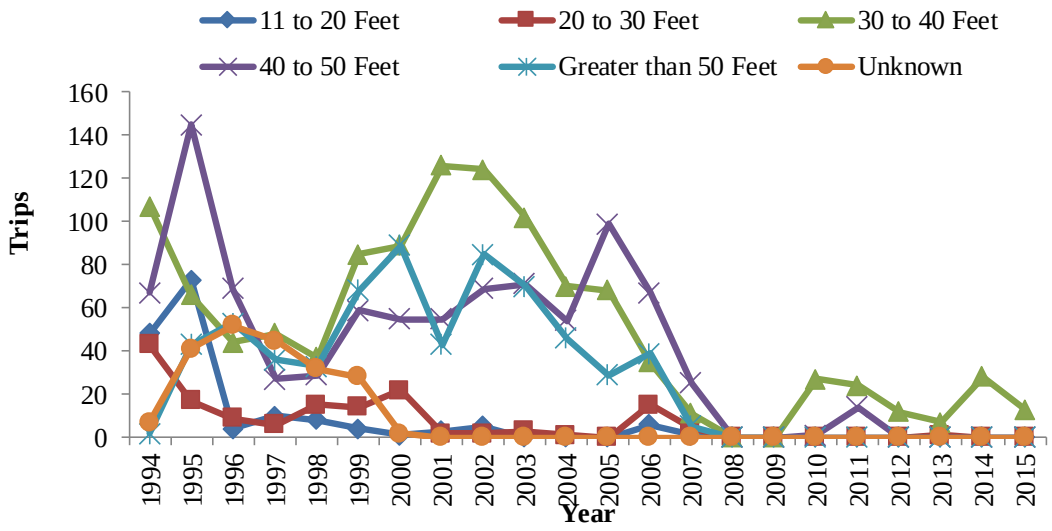

Figure 3.92. Annual trips of sandbar shark by vessel size, 1994-2015.

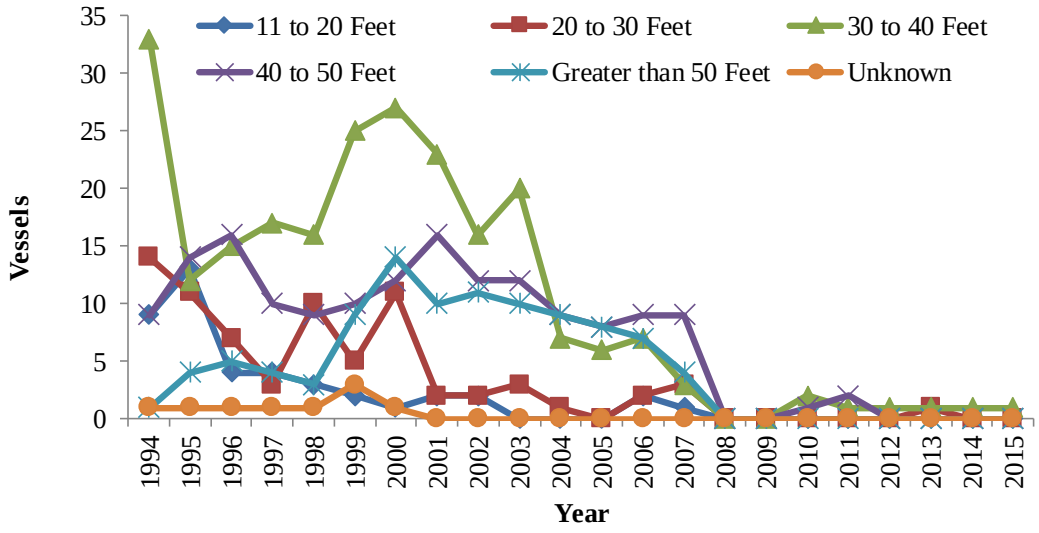

Figure 3.93. Annual number of vessels for sandbar shark by vessel size, 1994-2015.

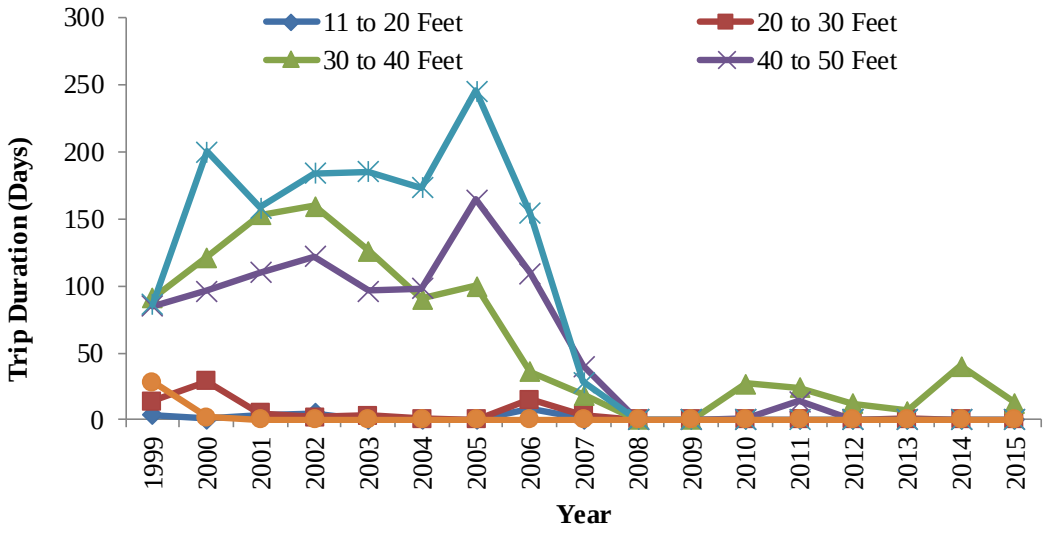

Figure 3.94. Annual trip duration for sandbar shark by vessel size, 1999-2015.

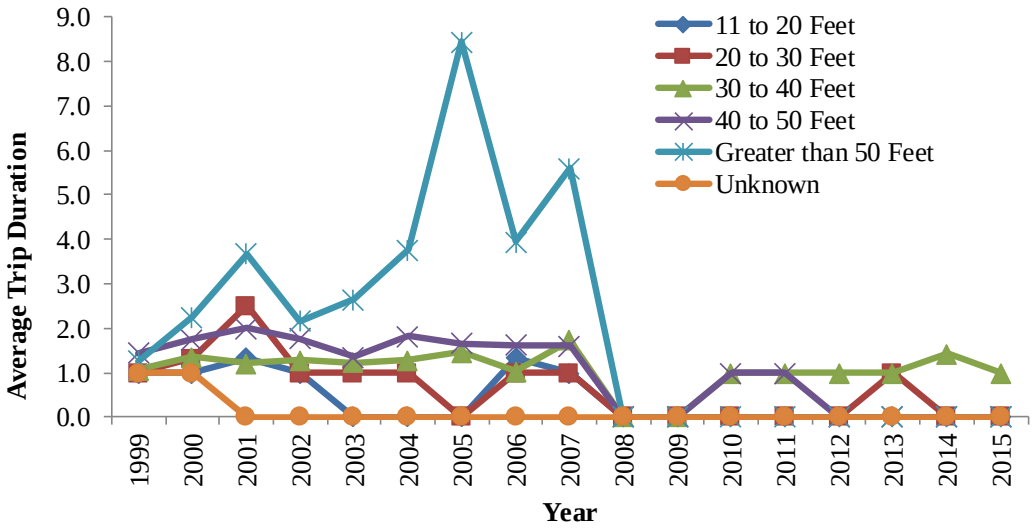

Figure 3.95. Annual average trip duration for sandbar shark by vessel size, 1999-2015.

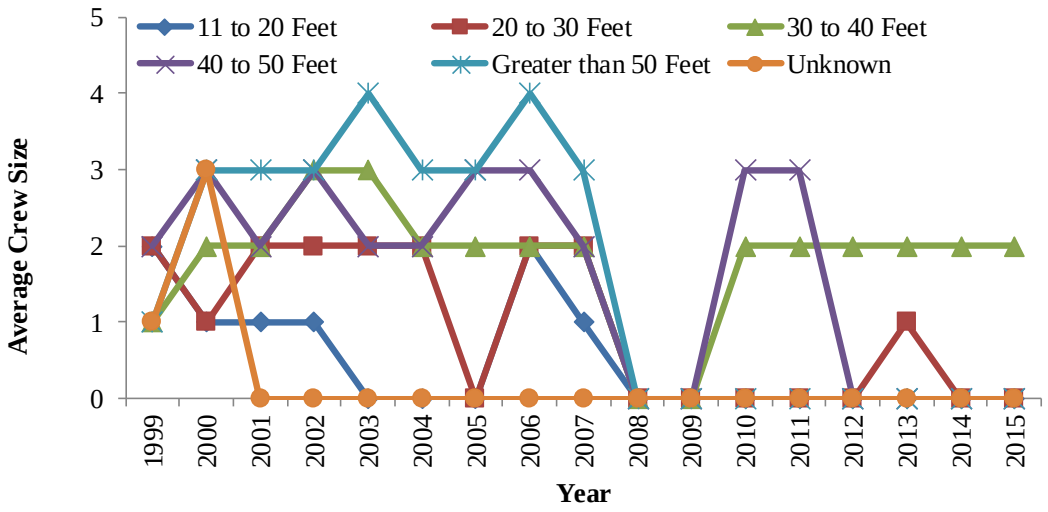

Figure 3.96. Annual average crew size for sandbar shark by vessel size, 1999-2015.

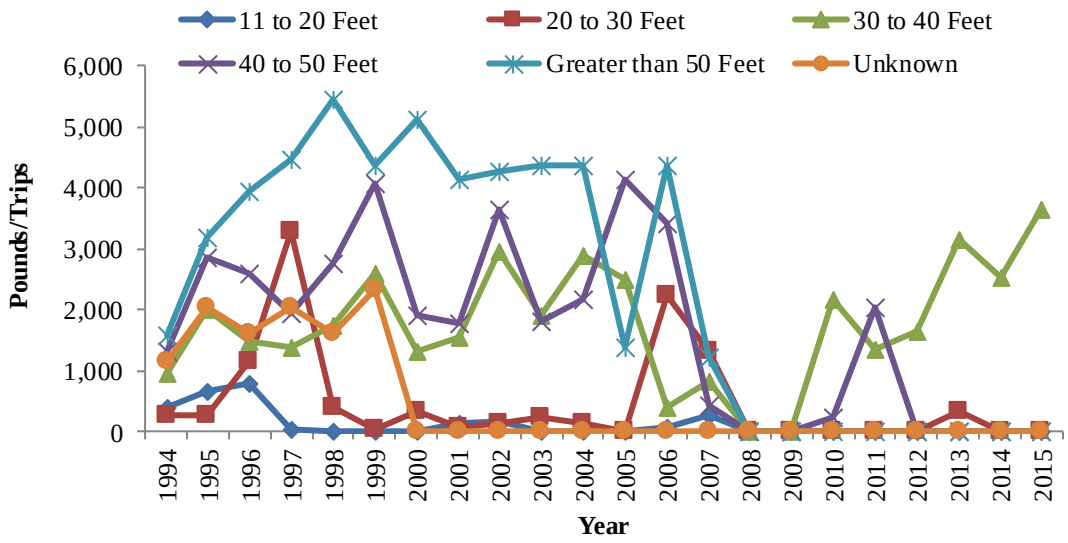

Figure 3.97. Annual average pounds per trip for sandbar shark by vessel size, 1994-2015.

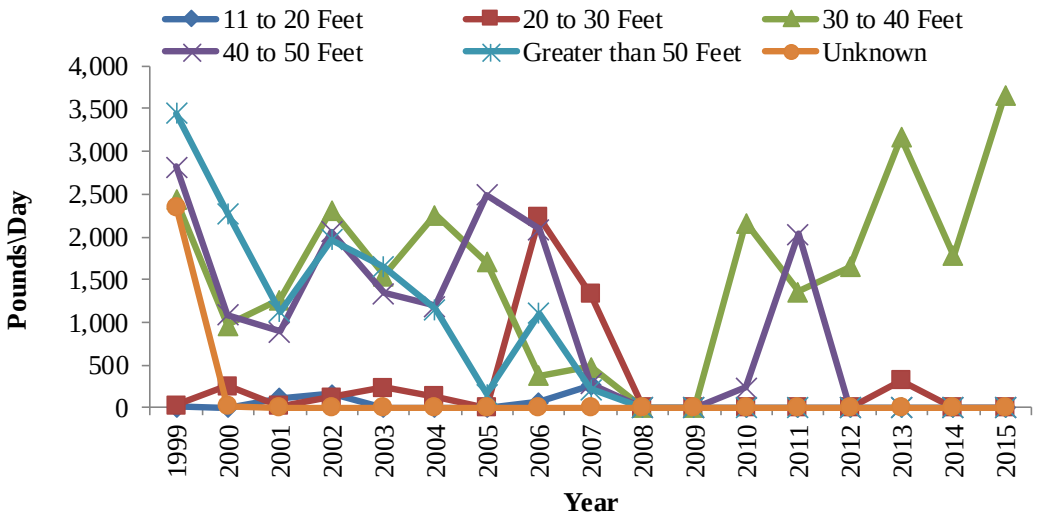

Figure 3.98. Annual average pounds per day for sandbar shark by vessel size, 1999-2017.

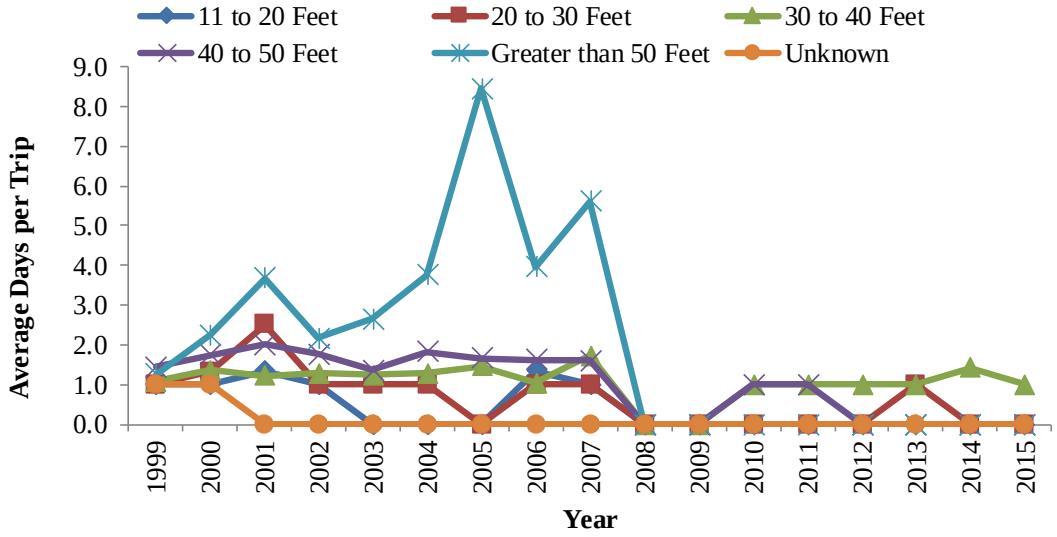

Figure 3.99. Annual average days per trip for sandbar shark by vessel size, 1999-2003.

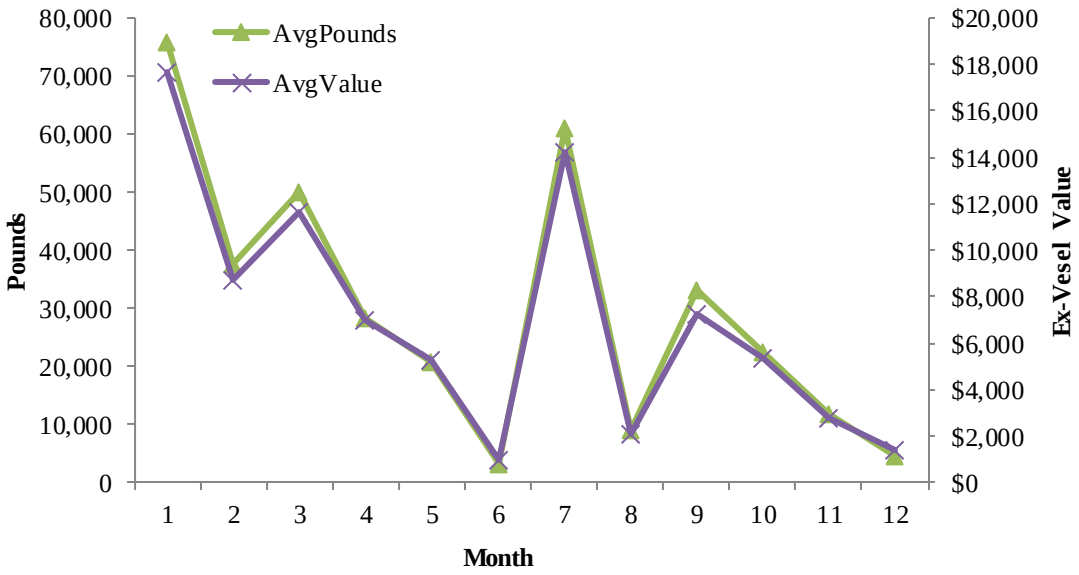

Figure 3.100. Average landings and ex-vessel value for sandbar shark, 1994-2015.

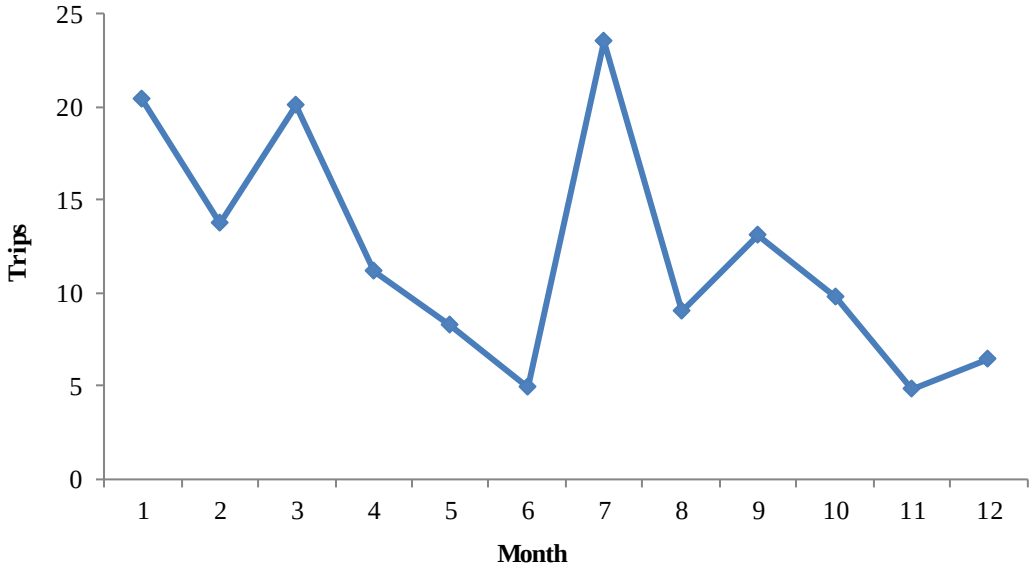

Figure 3.101. Average number of trips by month for sandbar shark, 1994-2015.

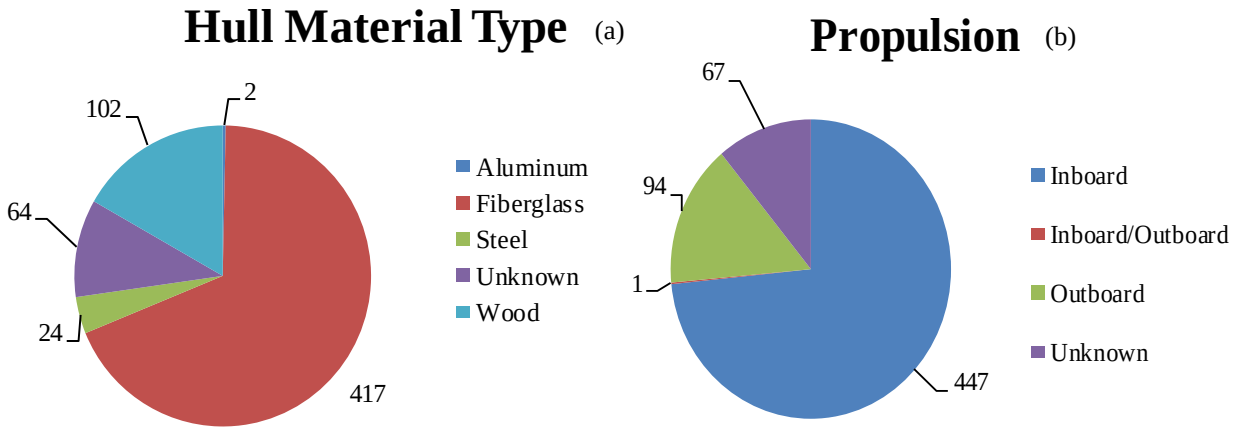

Figure 3.102. Hull material type (a) and propulsion (b) for vessels in the sandbar shark commercial fishery.

APPENDIX I

Species	Complex
Sandbar (*Carcharhinus plumbeus*)	Research Complex
Silky (*Carcharhinus falciformis*)	Large Coastal Complex
Tiger (*Galeocerdo cuvier*)	Large Coastal Complex
Blacktip (*Carcharhinus limbatus*)	Large Coastal Complex
Spinner (*Carcharhinus brevipinna*)	Large Coastal Complex
Bull (*Carcharhinus leucas*)	Large Coastal Complex
Lemon (*Negaprion brevirostris*)	Large Coastal Complex
Nurse (*Ginglymostoma cirratum*)	Large Coastal Complex
Blacknose (*Carcharhinus acronotus*)	Blacknose Complex
Atlantic Sharpnose (*Rhizoprionodon Terraenovae*)	Non-Blacknose Small Coastal Complex
Bonnethead (*Sphyrna tiburo*)	Non-Blacknose Small Coastal Complex
Finetooth (*Carcharhinus isodon*)	Non-Blacknose Small Coastal Complex
Scalloped Hammerhead (*Sphyrna lewini*)	Hammerhead Complex
Great Hammerhead (*Sphyrna mokarran*)	Hammerhead Complex
Smooth Hammerhead (*Sphyrna zygaena*)	Hammerhead Complex
Blue (*Prionace glauca*)	Pelagic Complex
Oceanic Whiteip (*Carcharhinus longimanus*)	Pelagic Complex
Porbeagle (*Lamna nasus*)	Pelagic Complex
Shortfin Mako (*Isurus oxyrinchus*)	Pelagic Complex
Common Thresher (*Alopias vulpinus*)	Pelagic Complex
Smooth dogfish (*Mustelus canis*)	Smoothhound complex
Florida smooth dogfish (*Mustelus norrisi*)	Smoothhound complex
Sand Tiger (*Odontaspis Taurus*)	Prohibited
Bigeye Sand Tiger (*Odontaspis noronhai*)	Prohibited
Whale (*Rhincodon typus*)	Prohibited
Basking (*Cetorhinus maximus*)	Prohibited
White (*Carcharodon carcharias*)	Prohibited
Dusky (*Carcharhinus obscurus*)	Prohibited
Bignose (*Carcharhinus altimus*)	Prohibited
Galapagos (*Carcharhinus galapagensis*)	Prohibited
Night (*Carcharhinus signatus*)	Prohibited
Caribbean Reef (*Carcharhinus perezi*)	Prohibited
Narrowtooth (*Carcharhinus brachyurus*)	Prohibited

Atlantic Angel (*Squatina dumerili*)	Prohibited
Caribbean Sharpnose (*Rhizoprionodon porosus*)	Prohibited
Smalltail (*Carcharhinus porosus*)	Prohibited
Bigeye Sixgill (*Hexanchus nakamurai*)	Prohibited
Bigeye Thresher (*Alopias superciliosus*)	Prohibited
Longfin Mako (*Isurus paucus*)	Prohibited
Sevengill (*Heptranchias perlo*)	Prohibited
Sixgill (*Hexanchus griseus*)	Prohibited

APPENDIX 2

Bulleted list of major management measures that impacted the commercial fishery for dusky and sandbar sharks.

- 1993-Quota established for the large coastal shark, which included dusky and sandbar sharks at the time, complex at 2,436 metric tons dressed weight that is split evenly between two 6-month seasons.
- 1999-Limited access established for the commercial shark fishery.
- 1999-Quotas reduced for large coastal shark complex (dusky and sandbar sharks still included in this complex) to 1,285 metric tons dressed weight.
- 2000-Dusky shark removed from the large coastal shark complex and place in the prohibited shark complex.
- 2003-Large coastal shark quota split between ridge back (which included sandbar sharks) and non-ridge back groups, ridge back quota set at 931 metric tons dressed weight. This only lasted for the 2003 fishing season.
- 2004-Large coastal shark quota set at 1,017 metric tons dressed weight.
- 2005-Large coastal shark quota split into tri-mesters and into regions.
- 2005-Time/area closure established off the coast of North Carolina.
- 2008-Research fishery established for the sandbar shark fishery, quota set at 87.9 metric tons dressed weight.
- 2013-Research fishery quota set at 116.6 metric tons dressed weight for sandbar sharks.
- 2015-Research fishery quota set at 90.7 metric tons dressed weight for sandbar sharks.