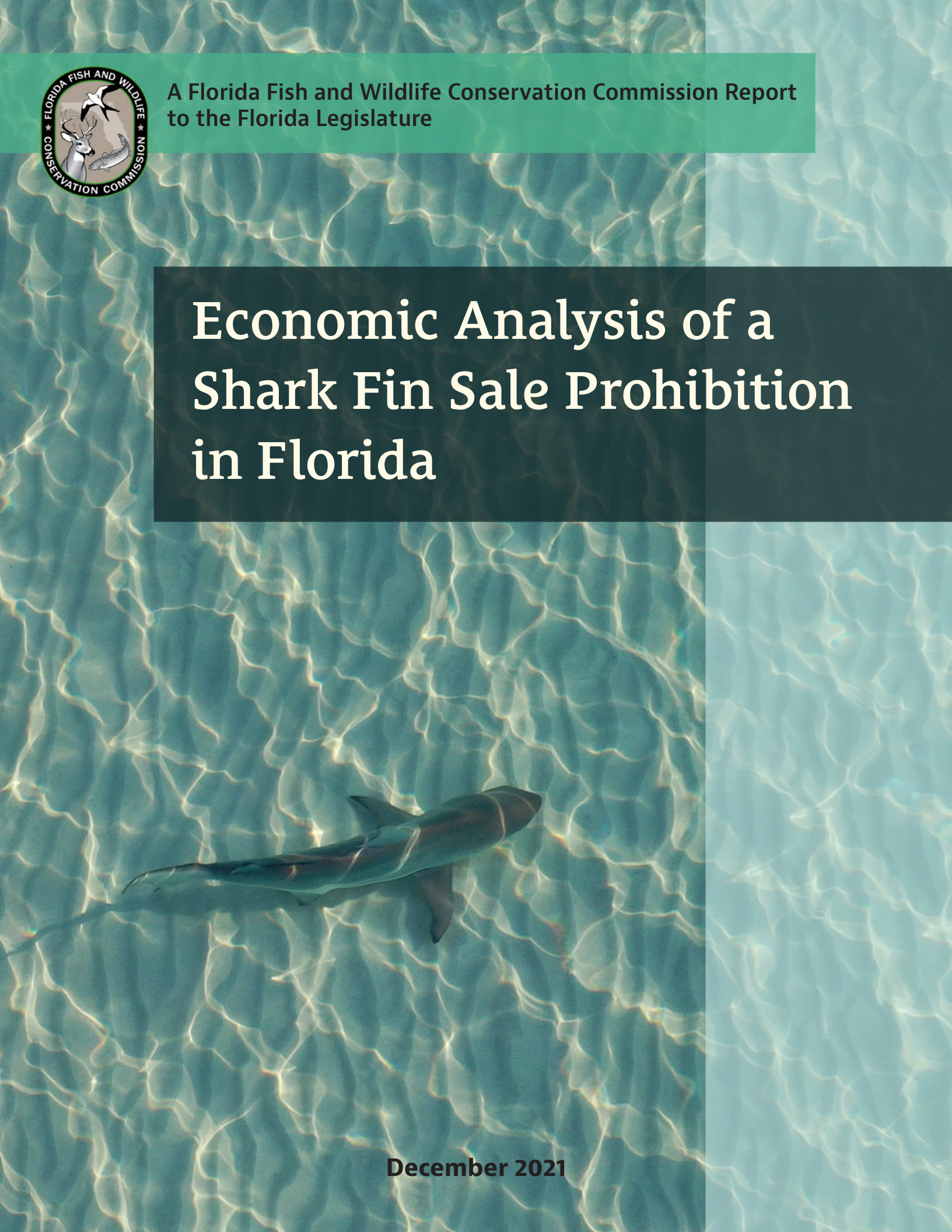
A Florida Fish and Wildlife Conservation Commission Report to the Florida Legislature

Economic Analysis of a Shark Fin Sale Prohibition in Florida



December 2021

Contents

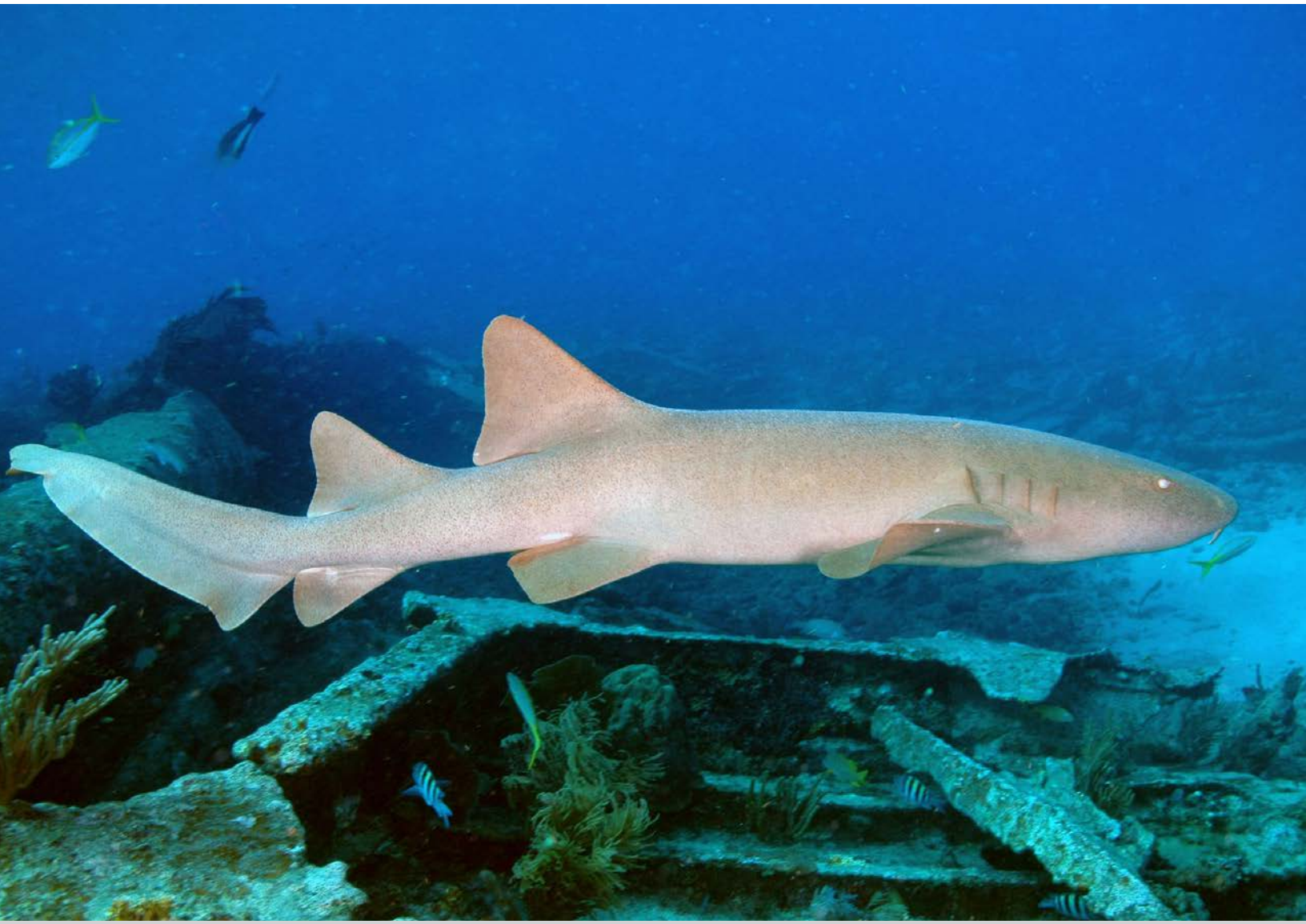
Hannah Hart, Krista Shipley, CJ Sweetman, Kristin Foss, and Derek Cox
FWC Division of Marine Fisheries Management

Kotryna Klizentyte
FWC Fish and Wildlife Research Institute

Economic analysis completed by Robert Botta, Christa Court, and Andrew Ropicki
University of Florida's Food and Resource Economics Department

I. Overview

On September 18, 2020, Governor Ron DeSantis signed the Kristin Jacobs Ocean Conservation Act (S.B. 680, 2020) into law, which became effective October 1, 2020. At the direction of the Legislature, the Florida Fish and Wildlife Conservation Commission (FWC) prepared this report to 1) evaluate the potential economic impact to the commercial shark fishing industry from a prohibition on import, export, and sale of separated shark fins (Section VII), 2) identify actions to lessen negative economic impact on industry (Section VIII), and 3) enumerate potential benefits to shark populations from such a prohibition (Section IX). Additionally, this report provides an overview of Florida's commercial shark fishery, background information on shark life history, history of shark overexploitation and preliminary recovery, finning prohibition, shark management, and a summary of current and past shark fin–related laws and legislation.



II. Florida's Commercial Fishery Overview and Landings

The commercial shark fishery in Florida targets several different species and is highly regulated in both state and federal waters. In federal waters, the most common gear types used to commercially harvest sharks includes bottom longlines and gillnets. In state waters, commercial fishermen are subject to more restrictive regulations, including a daily limit of one shark per person with a maximum of two sharks per vessel and the only allowable gear type is hook-and-line. In federal waters, the daily retention limits vary by permit type, region, and shark species. Due to the more restrictive regulations in Florida state waters, the vast majority of Florida's commercial shark harvest occurs in federal waters (> 99.4% by weight over the past 5 years) (Figure 1).

In state waters, there is a very limited hook-and-line fishery that is primarily a bycatch or opportunistic fishery when harvesters are targeting other species (e.g., Spanish mackerel). The most common shark species commercially harvested in state waters over the past five years are blacktip, bull, bonnethead, and Atlantic sharpnose sharks. The most common species commercially harvested in Florida federal waters over the past five years are blacktip, sandbar, bull, Atlantic sharpnose, and tiger sharks.

Sharks are a unique resource in that virtually the entire organism has commercial value. The meat, fins, liver, and jaws each have an important commercial value. In Florida, the greatest overall value comes from the meat and fins, and fins are the most valuable part of the shark by weight. Finning, the practice of removing a fin at sea and discarding the remaining shark body prior to landing, was prohibited in Florida state waters in 1992. In general, the total value of a shark depends on the species. Sharks with the highest food value are typically small-bodied coastal species, and the species with the highest fin value are most often large-bodied with large fins. In Florida, the species with the highest meat value are Atlantic sharpnose, blacktips, blacknose, and lemon sharks. Larger species like hammerhead, sandbar, and thresher sharks have the largest and most valuable fins. The demands for shark meat and fins have fluctuated over the years, but the market for these products has trended downward in more recent years.

Finning, the practice of removing a fin at sea and discarding the remaining shark body prior to landing, ***was prohibited in Florida state waters in 1992.***

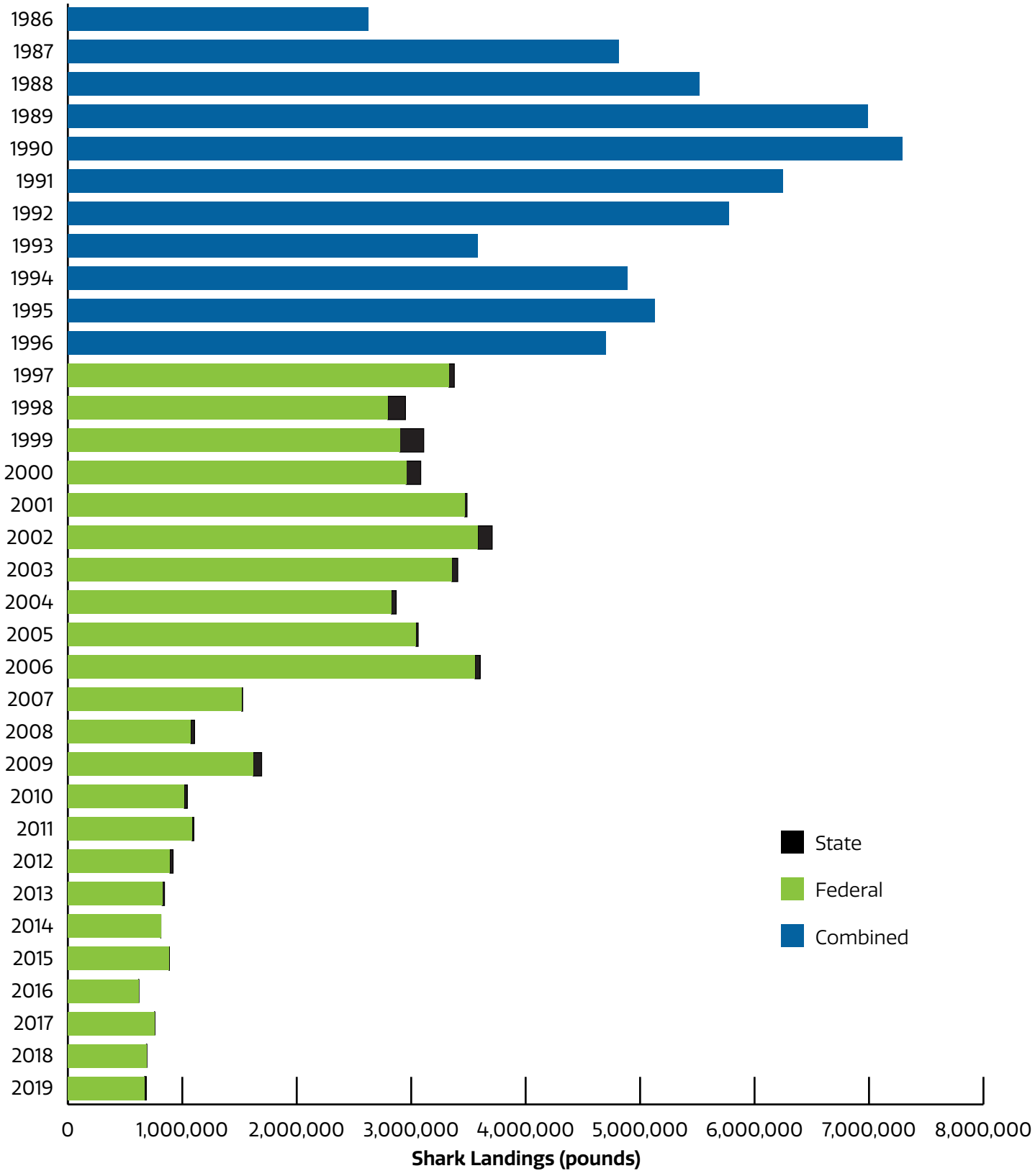
Blacktip shark found in Publix supermarket in New Smyrna Beach, Florida.

Due to fluctuations in demand and restrictive shark regulations, many commercial shark fishermen are "portfolio" fishermen, meaning they target a variety of marine species throughout the year. For these fishermen, harvesting and selling all parts of a shark are important and allow them to fill in gaps during the fishing year when other fisheries' seasons are closed or quotas have been met. In recent years, eastern U.S. commercial shark landings and participation in the commercial shark fishery has dramatically declined from historical levels (Figure 1; HMS, 2021). Additionally, shark product prices, revenues to fishermen and dealers, and trade in shark products have declined (HMS, 2021).

Many commercial shark fishermen are "portfolio" fishermen, meaning they target a variety of fisheries throughout the year. The ability to harvest and sell all parts of a shark are important to their business.

Atlantic sharpnose sharks are primarily valued for meat.

Figure 1. Florida Commercial Shark Landings (in pounds, state and federal waters) from 1986–2019. Data from 1986–1996, the blue bars, are combined state and federal commercial landings. Starting in 1997, additional reporting requirements were implemented and landings in federal waters could be split out from landing in state waters. Green bars represent commercial landings in federal waters and black bars represent commercial landings in state waters. Note: 2020 data were not included to avoid capturing changes caused by the COVID-19 pandemic.



III. Shark Background

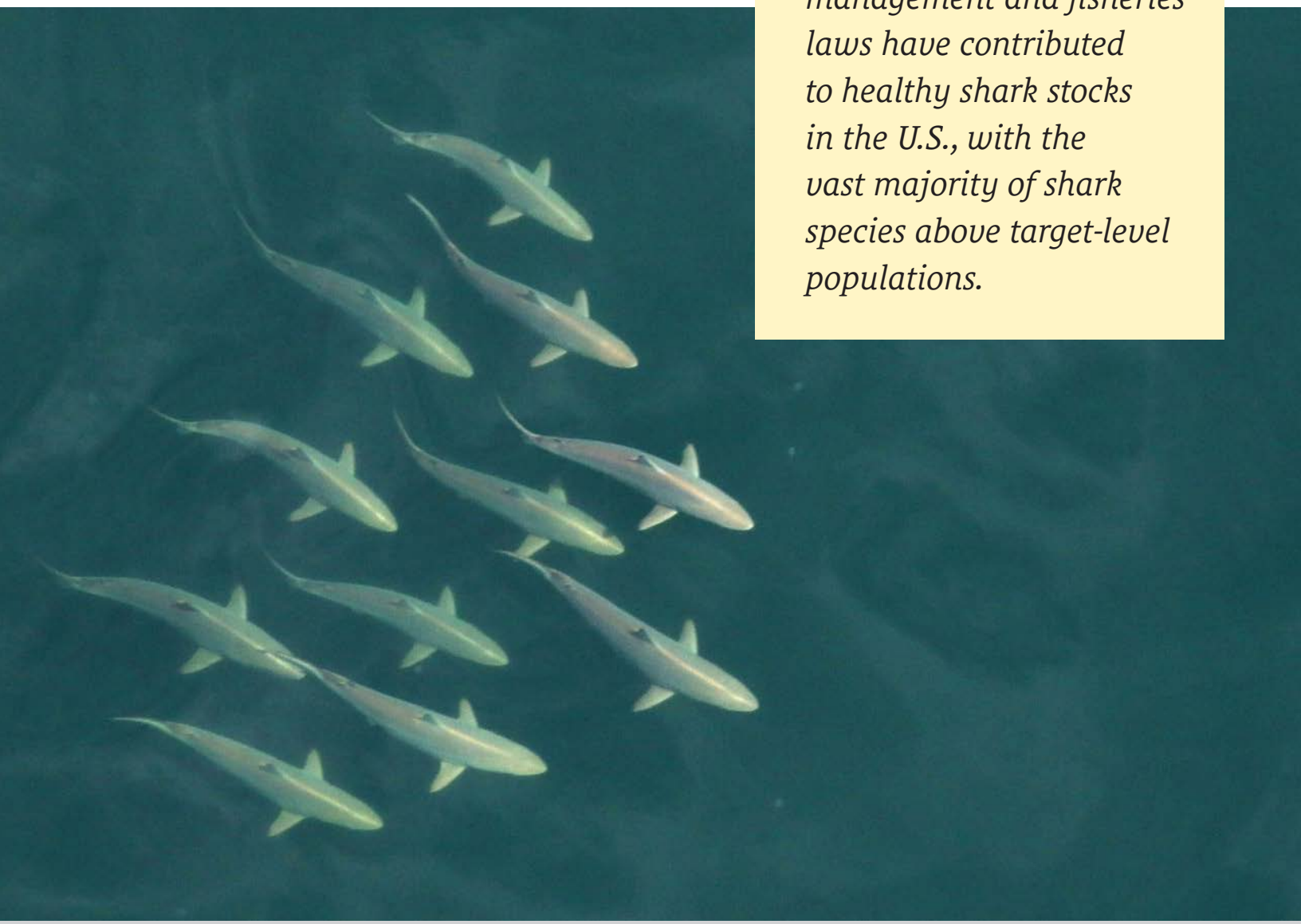
Many shark species are apex predators, and therefore have few natural predators. Compared to most fish species, sharks have a lower metabolism, grow more slowly, generally reach larger sizes, and are longer-lived (Musick, 2004). Consequently, sharks attain sexual maturity at late ages and produce few young compared with bony fishes, like snapper and grouper species (Helfman et al., 2009). All sharks reproduce internally and employ a range of reproductive strategies including egg laying and live birth. Most species have extreme maternal nourishment, and thus have low numbers of offspring and long reproductive cycles. In species that give live birth, gestation periods can last from 9-24 months, with some species requiring a one to two-year resting period before they can reproduce again (Castro 2009; Conrath and Musick, 2013). Due to these strategies, lifetime reproductive capacity is low for sharks. These life history traits result in slow rates of population growth and a limited ability to withstand high fishing pressure (Dulvy et al., 2014).

Shark over-exploitation in the eastern U.S. (i.e., Atlantic Ocean and Gulf of Mexico) began in the mid-1970s, when sharks were deemed an underutilized resource and commercial harvesters were encouraged to target sharks due to the decline of other commercially important fisheries (Musick et al., 1993; McCandless et al., 2014). Commercial shark landings steadily increased from the mid-1970s through the 1980s, peaking in 1989, as the demand for shark products (e.g., meat, fins, and cartilage) increased (ASMFC, 2008). Around the same time, a directed recreational shark fishery rapidly developed, and shark fishing

tournaments became increasingly popular shortly after the movie "Jaws" was released in 1975 (Musick, 1993; Cortés et al., 2006). The increase in commercial and recreational landings coupled with low population growth rates (Au et al., 2015) ultimately led to the significant decline of shark populations by the 1990s. While the magnitude of the decline has been debated, many species were negatively impacted. Large-bodied, coastal shark species were most affected by this expansion of commercial and recreational shark fisheries due to their large amount of meat, large fin sizes, and proximity to land (Dulvy et al., 2014). In contrast, small coastal sharks experienced less dramatic declines (SEDAR 13, 2007), likely because they have higher population growth rates and are less susceptible to fishing pressure (Au et al., 2015).

Following the over-exploitation of several shark species, significant management actions at both the state and federal level have likely contributed to the preliminary recovery of multiple species (Peterson et al., 2017). Years of strict management and fisheries laws have contributed to healthy shark stocks in the U.S., with the vast majority of shark species above target-level populations (HMS, 2021). Sustainable shark fisheries are the result of successful management measures, and these measures incorporate best available science to prevent overfishing while providing commercial and recreational fishing opportunities.

Years of strict management and fisheries laws have contributed to healthy shark stocks in the U.S., with the vast majority of shark species above target-level populations.



IV. Shark Finning Prohibition

To conserve sharks, the U.S. has enacted some of the strictest shark management measures in the world, including prohibiting activities that are unsustainable or wasteful. "Finning" is the illegal practice of removing of a shark's fins at sea and discarding the remaining carcass prior to coming to shore. The act of finning has been prohibited in Florida state waters since 1992, in Atlantic, Caribbean, and Gulf federal waters since 1993, and in all U.S. federal waters since 2000. Since then, even more stringent regulations and penalties related to illegal harvest of fins have been implemented at both the state and federal level. Under these regulations, all sharks harvested from Florida's state and federal waters must be landed in whole condition with fins naturally attached. After sharks are brought to land in whole condition with fins naturally attached, they can be further processed and all parts of the shark, including the fins, can be sold to licensed wholesale dealers.

V. Management Background and Regulatory History

Please refer to FWC's An Overview of Shark Management in Florida Report (MyFWC.com/media/27608/7b-sharkmanagementreport.pdf) for further details on history of shark management in Florida, current shark stock status (when known), and biological/ecological information relevant to management of sharks within the eastern U.S.

Management Agencies

Sharks are managed by multiple agencies along the U.S. Atlantic coast and Gulf of Mexico. FWC manages sharks in Florida state waters [shore to 3 nautical miles (nm) in the Atlantic and shore to 9 nm in the Gulf]. However, along the Atlantic coast (from Maine through the east coast of Florida), state management of shark fisheries is coordinated by the Atlantic States Marine Fisheries Commission (ASMFC) through the Interstate Fishery Management Plan (ISFMP) for Atlantic Coastal Sharks. As a member state, Florida has agreed to cooperative, interjurisdictional management of sharks. When modifications to the ISFMP are approved by ASMFC, the 15 member states are asked to adopt consistent or equivalent regulations. If a member state does not implement management measures, ASMFC can request the U.S. Secretary of Commerce declare a moratorium on fishing for these species and prevent interstate commerce for that species in that state.

National Marine Fisheries Service (NMFS) Division of Highly Migratory Species (HMS) manages sharks in federal waters (state waters boundary out to 200 nm offshore). HMS also participates in shark management at the international level through the International Commission for the Conservation of Atlantic Tunas (ICCAT), the Convention on International Trade in Endangered Species of Wildlife and Flora, and the United Nations Food and Agriculture Organization.

The status of many shark species is unknown due to insufficient data.

Federal Shark Management Overview

HMS manages 42 shark species in federal waters in the Atlantic, Gulf of Mexico, and U.S. Caribbean. These 42 shark species are divided into five management groups: large coastal, small coastal, pelagic, smoothhound, and prohibited. Of the HMS managed species, 23 are allowed for commercial harvest and 19 species are prohibited from both commercial and recreational harvest in federal waters.

Spiny dogfish is harvestable in federal waters but is not managed by HMS; instead, it is jointly managed along the Atlantic coast by the Mid-Atlantic Fishery Management Council, the New England Fishery Management Council, and the ASMFC. With the addition of spiny dogfish, there are 24 species that are allowed for harvest from federal waters off Florida.

Stock Assessments

Shark populations are assessed at the national and international level through stock assessments. Stock assessments involve analyses and mathematical modeling to estimate the health and size of a fish stock, measure how fishing has impacted the stock, and project future sustainable harvest levels. In the southeastern U.S., most shark stock assessments for domestically-mananged fisheries are conducted by NMFS under the Southeast Data and Assessment Review (SEDAR) regional stock assessment process. ICCAT conducts stock assessments at the international level for pelagic shark species like shortfin mako and porbeagle. While some shark species have completed/accepted stock assessments, many species have not been assessed and their status is unknown due to insufficient information.

Federal Commercial Regulations

The commercial shark fishery is strictly regulated in federal waters to help maintain sustainable shark populations and conserve vulnerable and overfished species. Federal vessel permits are required for commercial shark harvest in state and federal waters off Florida. Permits include Shark Directed, Shark Incidental, and Smoothhound Shark (allows harvest of smoothhound sharks only). *See Table 1 for a detailed overview of federal commercial shark permits.* Both the Shark Directed and Shark Incidental permits are limited-access, meaning there is a cap on how many permits NMFS issues, while the Smoothhound Shark permit is open-access. In addition to the three permits listed above, a Shark Research Fishery permit is available to Shark Directed permit holders, which allows a small number of commercial fishermen to harvest sandbar sharks. In 2020, eight Shark Research Fishery permits were issued, six of which were issued to Florida harvesters. The Shark Research Fishery permit is highly regulated and provides important fisheries-dependent data to HMS for use in stock assessments. An Atlantic Shark Dealer permit is necessary to purchase sharks from licensed commercial fishermen.

HMS annually sets the season length for each of the harvestable shark management groups based on the amount of sharks that can be harvested each year, called the annual quota. The number of sharks a commercial harvester can keep each trip, also known as a daily trip limit, varies by permit type, and HMS can adjust the trip limit throughout the fishing year based on available quota to either slow or accelerate the rate of harvest. Additionally, all harvested sharks must be landed with the head, tail, and fins naturally attached.

See HMS Commercial Compliance Guide and HMS website for the most up to date federal commercial retention limits, seasons, and closures.

The commercial shark fishery is strictly regulated to help maintain sustainable shark populations.

Commercial harvester using vertical longline gear in federal waters.

Table 1. HMS commercial shark permits, information about each permit, and number of permits in the Eastern Atlantic and in Florida as of January 1, 2020. 2020 numbers are displayed since 2020 is the year referenced in the Kristin Jacobs Ocean Conservation Act (2020; see section VI, Fin-related laws and legislation, below). Numbers of permits in Florida are indicated in parentheses. Note: Shark Fishery Research permits were issued on February 28, 2020.

Permit	Permit information	Total number of permits
Shark Directed	· Limited access and must be renewed annually. · Allows commercial harvesters to directly target sharks in federal waters.	194 (105)
Shark Incidental	· Limited access and must be renewed annually. · Allows commercial harvesters to retain incidentally caught sharks in federal waters. · Can retain a max. of 3 large coastal and 16 small coastal sharks (*total sharks kept can vary depending on time of year and remaining quota*).	226 (107)
Smoothhound	· Open access and must be renewed annually. · Allows commercial harvesters to directly target smoothhound shark species (smooth dogfish, Florida smoothhound, and Gulf smoothhound).	152 (14)
Shark Fishery Research	· Limited number of research permits awarded each year. Not always awarded to same harvesters each year. · Number of permits available each year varies and is dependent on available quota · Required to have an observer aboard at all times. · Other conditions of permit depend on number of vessels selected, available quota, and research needs.	8 (6)
Atlantic Shark Dealer	· Open access and must be renewed annually. · Allows wholesale dealers to purchase and sell sharks.	98 (29)

Florida State Waters Shark Management Overview

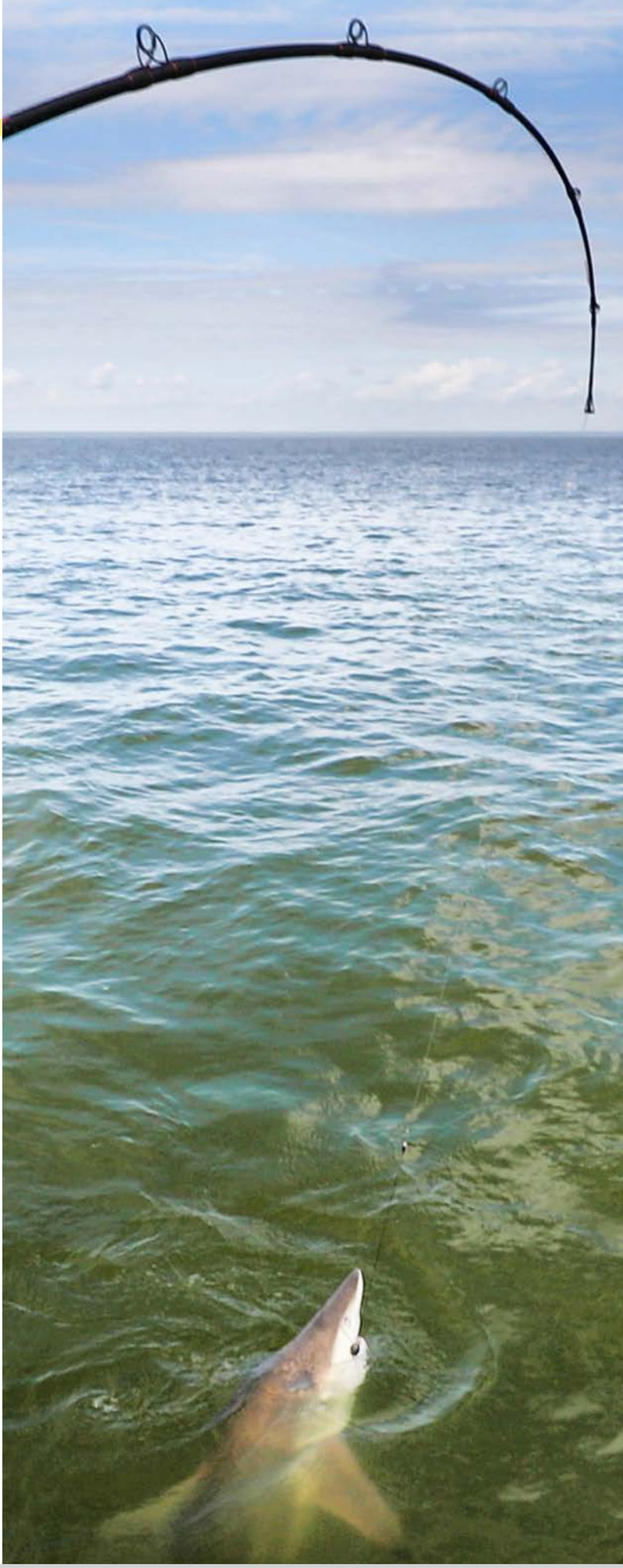
In Florida state waters, there are 15 commercially harvestable shark species and there are 28 species prohibited from commercial harvest.

State Commercial Regulations

In state waters, commercial shark fishermen are required to have both a commercial federal vessel permit and the state's commercial fishing license (the Saltwater Products License). Additionally, commercial harvesters may only sell their shark harvest to wholesale dealers who have a valid federal Atlantic Shark Dealer permit.

In general, FWC holds commercial harvesters in state waters to similar regulations as recreational shark harvesters. Fishers are allowed one shark per person per day with a maximum of two sharks per vessel. Seven species are subject to a minimum size limit of 54-inches fork length. Sharks without a minimum size limit include several small coastal species that do not generally reach 54-inches fork length (e.g., Atlantic sharpnose shark).

The only allowable gear type is hook-and-line. Non-stainless-steel, non-offset circle hooks are required when using natural bait, and the use of natural bait is prohibited when using treble hooks. The possession and use of a device capable of quickly cutting the leader or hook is required when targeting sharks from shore or a vessel. Additionally, all harvested sharks must be landed with the head, tail, and fins naturally attached.



VI. Fin-Related Laws And Legislation – *State And Federal*

S. 379.2426, F.S. – Regulation of shark fins; penalties

In 2017, the Florida Legislature created s. 379.2426, F.S. (updated in 2020 to current version, see below), to increase penalties for violations involving the landing of a shark fin that has been separated from a shark, or the possession of a separated shark fin in or on Florida waters.

These increased penalties are intended to provide a significant financial deterrent for potential violations. Commercial and recreational harvesters who possess or land a separated shark fin, as well as harvesters, wholesale dealers, and shark fin processors who sell, import, or export shark fins in violation of s. 379.2426, F.S., are subject to criminal and administrative penalties as provided in s. 379.2426(5), F.S., and summarized in Table 2.

Table 2. Penalties for harvesters who possess or land a separated shark fin, as well as harvesters, wholesale dealers, and shark fin processors who are in violation of s. 379.2426, F.S.

Offense	Class of offense	Criminal penalties	Administrative penalties and license restrictions
First violation	Misdemeanor of the second degree	A fine of up to $500, and/or up to 60 days imprisonment	A mandatory administrative fine of $4,500 and the suspension of all license privileges under chapter 379, F.S., for 180 days.
Second violation	Misdemeanor of the second degree	A fine of up to $500, and/or up to 60 days imprisonment	A mandatory administrative fine of $9,500 and the suspension of all license privileges under chapter 379, F.S., for 365 days.
Third or any subsequent violations	Misdemeanor of the first degree	A fine of up to $1,000, and/or up to 1 year imprisonment	A mandatory administrative fine of $9,500 and the permanent revocation of all license privileges under chapter 379, F.S.

During the period in which a person's license privileges are suspended or revoked pursuant to ss. 379.2426(5), F.S., a person may not participate in the taking or harvesting, or attempt the taking or harvesting, of saltwater products from any vessel within the waters of the state; be aboard any vessel in which a commercial quantity of saltwater products is possessed through an activity requiring a license pursuant to Ch. 379, F.S.; or engage in any other activity requiring a license, permit, or certificate issued pursuant to Ch. 379, F.S.

Amendment to s. 379.2426, F.S. – *Kristin Jacob's Ocean Conservation Act (2020)*

As of October 1, 2020, the "Kristin Jacob's Ocean Conservation Act," which amended s. 379.2426, F.S., prohibits the import, export, and sale of separated shark fins. However, exceptions allow (1) sale of separated shark fins by commercial fishermen harvesting from a vessel that was federally permitted as of January 1, 2020, (2) sale and export of separated shark fins by wholesale dealers with a valid federal shark permit as of January 1, 2020, (3) sale and export of domestically-sourced shark fins by a shark fin processor that obtains separated fins from a wholesale dealer holding a valid federal Atlantic shark dealer permit as of January 1, 2020. There is no exception for the import of separated shark fins.

The short-term effect of this bill is to limit the ability to sell separated shark fins to only those with a valid federal shark permit on January 1, 2020. If unchanged, the long-term effect of this bill will be to phase out the ability of shark harvesters and wholesale dealers to sell separated shark fins due to attrition or transfer of permits to a new vessel. The Legislature directed FWC to evaluate the potential economic impact to the commercial shark fishing industry associated with these additional prohibitions and to submit a report to the Governor, the President of the Senate, and the Speaker of the House of Representatives by December 31, 2021.

S. 1106 and H.R. 2811 – *Shark Fin Sales Elimination Acts (2021)*

United States Senator Corey Booker (D-NJ) introduced S. 1106 on April 28, 2021. As of October 21, 2021, S. 1106 had 23 cosponsors and was referred to the United States Senate Committee on Commerce, Science, and Transportation.

Delegate Gregorio Kilili Camacho Sablan (D-Northern Mariana Islands) introduced H.R. 2811 on April 22, 2021. As of October 21, 2021, H.R. 2811 had 207 cosponsors, including 14 Representatives from Florida, and was referred to the United States House of Representatives Committee on Natural Resources and the United States House of Representatives Committee on the Budget.

If passed, these bills would prohibit the possession, sale, and purchase of shark fins/tails or products containing shark fins/tails. Both bills would exempt fresh or frozen spiny and smooth dogfish fins and tails. However, the United States Secretary of Commerce would be required to report to Congress by January 1, 2027, with a recommendation on whether the exemption should continue. Additional exemptions for temporary possession would be allowed: (1) for shark fins and tails taken under a state, territorial, or federal permit and are destroyed upon separation, (2) use for non-commercial subsistence purposes, (3) use for display or research purposes, or (4) retention by a permit-holder for a noncommercial purpose.

While S. 1106 has progressed legislatively (see following), the United States Committee on Natural Resources has not acted on H.R. 2811 as of November 8, 2021.

S. 1260 – Endless Frontier Act (2021)

S. 1260 is a comprehensive, 2,376-page bill that would establish a Directorate for Technology and Innovation in the National Science Foundation and establish various programs and activities. United States Senate Majority Leader Charles Schumer (D-NY) introduced S. 1260 on April 20, 2021. Since the introduction of the bill, S. 1106, the Shark Fin Sales Elimination Act, was added to S. 1260. The United States Senate approved S. 1260, with the shark fin elimination legislative language included, on June 8, 2021.

If passed, S. 1260 would prohibit the possession, sale, and purchase of shark fins/tails or products containing shark fins/tails. Fresh or frozen spiny and smooth dogfish fins and tails would be exempt. However, the United States Secretary of Commerce would be required to report to the United States Congress by January 1, 2027, with a recommendation on whether the exemption should continue. Additional exemptions for temporary possession would be allowed: (1) for shark fins and tails taken under a state, territorial, or federal permit that are destroyed upon separation, (2) use for non-commercial subsistence purposes, (3) use for display or research purposes, or (4) retention by a permit-holder for a noncommercial purpose.

H.R. 406 – *Shark Sales Elimination Act (2021)*

United States Representative Ted Lieu (D-CA) introduced H.R. 406 on January 21, 2021. As of October 21, 2021, H.R. 406 had one cosponsor and was referred to United States House of Representatives Committee on Natural Resources. If passed, this legislation would prohibit the sale and possession of all shark parts or products containing any shark part.

S. 1372 and H.R. 3360 – *Sustainable Shark Fisheries and Trade Act (2021)*

United States Senator Marco Rubio (R-FL) introduced S. 1372 on April 27, 2021. As of October 21, 2021, S. 1372 had three cosponsors, including United States Senator Rick Scott (R-FL) and was referred to the United States Senate Committee on Commerce, Science, and Transportation.

United States Representative Daniel Webster (R-FL) introduced H.R. 3360 on May 19, 2021. As of October 21, 2021, H.R. 3360 had 12 cosponsors, including four Representatives from Florida, and was referred to the United States House Committee on Natural Resources and the United States House Committee on Ways and Means.

If passed, S. 1372 and H.R. 3360 legislation would prohibit the importation of shark products from a nation that does not have measures to provide for the conservation and management of sharks as well as measures to prohibit shark finning that are comparable to those of the United States. Additionally, both bills would require the United States Department of Commerce to certify nations with protections for sharks that are comparable to those of the United States and revise regulations to include rays and skates as species that are subject to the Seafood Import Monitoring Program.

VII. Evaluation of Potential Economic Impacts of a Shark Fin Sale Prohibition

An analysis of the potential economic impact related to a complete prohibition on the sale of shark fins in Florida was conducted by the University of Florida's Food and Resource Economics Department. A full report of the economic analysis, including detailed methods, is available upon request.

Introduction

The Florida commercial shark fishery is a highly concentrated industry, with a small percentage of fishers accounting for most of the revenue. During 2015–2019, between 43 and 71 fishers landed sharks each year, with the top 5 harvesters accounting for 76% of shark revenues, and the top 15 harvesters accounting for approximately 95% of all shark revenues statewide. Average shark landings accounted for 0.33%, or $835,947, of all Florida commercial fishery landings during the five-year period. Among the trips reporting shark fin revenue separately (44% of trips), shark fins account for 57% of total shark revenue.

Florida's commercial shark fishery is highly concentrated, with a small percentage of fishers accounting for most of the revenue.

The objective of the economic analysis was to (1) estimate how a complete prohibition on shark fin sale would change fishing trips with shark harvest and (2) estimate the economic impact of changes to Florida's commercial fishing and seafood wholesale dealer industries. Data used in the analysis came from FWC's commercial trip ticket data system from 2015–2019 and included shark landing information by species of shark landed, non-species-specific shark belly flaps, and non-species-specific shark fins. The analysis focused on these recent years to best represent the current state of the fishery; 2020 trip ticket data was not included to avoid capturing changes caused by the COVID-19 pandemic, including reductions in Shark Research Permit trips because

of unavailability of the required federal observers. It is important to note that the total fin revenue is unknown. This is because the absence of fin revenue reported on a trip ticket with shark landings does not mean fin revenue was not collected by the harvester, because sharks sold whole can be further processed into meat and fin products after the initial dock-side transaction. Additionally, trip ticket data only captures revenue paid to the harvester, and the economic analysis cannot account for loss in revenue following initial sale from harvester to wholesale dealer.

Two scenarios were used to describe potential impacts a shark fin sale prohibition would have on the commercial industry. Scenario 1 only evaluates trips where shark fin revenue was reported separately in the trip ticket and assumes fin revenue on all trips would be lost and any trips that significantly rely on shark harvest (at least 40% of trip revenue) would not occur (all landings revenue would be lost – including non-shark). Scenario 2 also includes trips with shark landings but no recorded fin revenue assuming that while fin revenue is not separately valued on the trip ticket the fin value is included in the shark meat price (a fin premium). Similarly to Scenario 1 it was assumed all fin premium would be lost and trips with more than 40$ of trip revenue from shark harvest would not occur.

Objective 1 Key Findings: Estimate impact of change in fishing trips and species targeted

Scenario 1 and 2 resulted in direct and indirect losses to commercial fishers, with a greater loss in revenue to commercial fishers in Scenario 2.

Overall, the total harvest-related revenue loss (Scenario 1) would be $745,318.92 per year.

For Scenario 1, revenue loss from separated shark fin sales (direct loss) would equate to about $422,470.81 per year, revenue loss from shark meat sale

(indirect) would be about $316,644.21 per year, and revenue loss from non-shark sales (indirect) would be approximately $6,203.91 per year. Overall, the total of all harvest-related revenue loss would add up to about $745,318.92 per year.

For Scenario 2, shark fin revenue losses (direct losses) would equate to $457,605.34 per year, revenue loss from shark meat sale (indirect) would be $341,933.53 per year, and revenue loss from non-shark sales (indirect) would be $10,639.57 per year. Overall, the total of all harvest-related revenue loss would add up to $810,178.43 per year.

Objective 2 Key Findings: Economic impact analysis

The estimated annual revenue losses for each scenario described above were then used as the basis for an economic impact analysis to determine the broader economic impacts associated with these direct and indirect losses. An analysis by parts approach was used (Lucas, 2020) in which expenditure data was used. Economic impact analyses include outputs of direct, indirect, and induced effects. Direct effects are defined as a positive or negative effects the industry has on the region due to the nature of the industry. Here, they are modeled as direct expenditures. Expenditure categories included, but were not limited to, bait, fuel, consumable equipment and inputs, equipment repair costs, insurance and administrative fees, and labor. Indirect effects are outputs that impact other industries and businesses within the main industry's supply chain. Induced effects are the spending of labor income from the industry's employees, after savings and taxes are accounted for.

Total economic impacts associated with Scenario 1 are a loss of $1.48 million in total industry output or sales revenue in Florida. This represents about $836 thousand in total value added or gross regional product, $522 thousand in total labor income, and 16 total full-time and part-time jobs (Table 3).

Table 3. Estimated economic impacts associated with a prohibition on fin sales for Scenario 1.

Impact type	Employment (jobs)	Labor income ($)	Value added ($)	Industry output ($)
Direct effect	11.9	319,283	417,071	745,319
Indirect effect	1.2	81,083	191,620	336,935
Induced effect	2.6	121,864	227,799	402,215
Total effect	15.7	522,230	836,490	1,484,469

Total economic impacts associated with Scenario 2 are a loss of $1.61 million in total industry output or sales revenue in Florida.

Total economic impacts associated with Scenario 2 are a loss of $1.61 million in total industry output or sales revenue in Florida. This represents about $909 thousand in total value added or gross regional product, $567 thousand in total labor income, and 17 total full-time and part-time jobs (Table 4).

Table 4. Estimated economic impacts associated with a prohibition on fin sales for Scenario 2.

Impact type	Employment (jobs)	Labor income ($)	Value added ($)	Industry output ($)
Direct effect	12.9	347,067	453,366	810,178
Indirect effect	1.3	88,140	208,295	366,255
Induced effect	2.8	132,469	247,623	437,217
Total effect	17	567,676	909,284	1,613,650

The loss of revenue may be small compared to other profitable fisheries but is significant to current fishers. Although compared to other fisheries that bring in an increased annual revenue, it is important to consider the number of commercial fishermen and wholesale dealers that participate in the sale of sharks and shark fins. As described above, this is a concentrated industry where a limited number of Florida fishermen depend on this resource. Therefore, loss of revenue is significant to these Florida fishermen.

The loss of revenue may be small compared to other profitable fisheries but is significant to current fishers.

VIII. Potential Actions to Lessen or Offset Negative Economic Impacts of a Fin Sale Prohibition

As part of the required components of this report, FWC identified a variety of actions that could lessen or offset the negative economic impacts of a fin sale prohibition in Florida. Potential actions that could be considered are outlined in the Table 5.

Table 5. Potential actions that could be considered to help offset the negative economic impacts of a full prohibition on the sale of shark fins in Florida.

Potential Action	Details
Direct payments to affected industries and employees (harvesters, wholesale and retail dealers, supporting businesses such as bait providers, gear manufacturers, and marine fuel stations)	The Florida Legislature could offset loss by compensating employees in affected industries for lost income for a set number of years or a percentage of the amount loss for a set number of years.
Direct payments to harvesters	The Florida Legislature could offset loss by compensating fishery participants for lost income for a set number of years or a percentage of the amount loss for a set number of years.
Equipment buy-back	The Florida Legislature could offset loss by "buying" the participants boat and gear at a specified rate.
Federal permit buy-back	The Florida Legislature could offset loss by "buying" the permit at a specified rate.
(Request from industry) Promote other fishing opportunities	Harvesters have requested additional access to other fisheries, such as fisheries managed under an Individual Fishing Quota, to compensate for lost income. However, these fisheries and permits are not managed under FWC jurisdiction and FWC does not have the authority to allow additional access.

IX. Potential Impacts on Shark Populations from a Florida Fin Sale Prohibition

A prohibition on selling shark fins in Florida will have indeterminate impacts to shark populations. Although the sale of separated fins may cease, the harvest of sharks is likely to continue at some level since harvesters would still be able to harvest sharks and sell meat or other shark parts (e.g., belly flaps, jaws, and livers). Therefore, any effect on shark populations would be dependent on whether fishermen continue to target sharks for non-fin products, which the economic analysis indicates will happen at some level.

Additionally, sharks are highly migratory species that travel long distances and cross state or even international boundaries. After leaving Florida waters, sharks are likely targeted by commercial and recreational fishermen in coastal states and potentially other countries. Along the eastern Atlantic, specifically, many shark species make up a single population targeted by fishermen from Texas up to New England. Due to many shark species being a shared resource across state boundaries, it is not possible to determine potential impacts of a Florida prohibition on sale of fins on shark populations.

A Florida fin sale ban may also shift shark fishing pressure to other states that do not prohibit the sale of separated fins. Such a shift in pressure was seen when California and Texas implemented their fin ban. Currently, several states in the U.S. have prohibited the sale of shark fins but many coastal states still allow landing and sale of fins.

Lastly, a Florida shark fin sale prohibition is expected to negatively impact federal research efforts. Harvesters with the Shark Research Permit, more than half of which reside in Florida, often target data-limited species, such as sandbar and other large coastal sharks. With this permit, which requires 100% NMFS observer coverage during fishing trips, scientists are able gather biological data and other information that will be useful in future assessments of population status. The shark species targeted on these research trips have a high fin value and a much lower meat value compared to smaller coastal sharks like Atlantic sharpnose and blacktip sharks. If harvesters are no longer able to gain income from sale of fins on these trips, the cost of the research trip may be greater than the profit and may dissuade participation by commercial harvesters.

A prohibition on selling shark fins in Florida will have indeterminate impacts to shark populations but will impede federal shark research efforts.

References

ASMFC, 2008. Interstate Fishery Management Plan for Atlantic Coastal Sharks. Fishery Management Report No. 46 of the Atlantic States Marine Fisheries Commission: pp. 1-193.

Au, D.W., S.E. Smith, and C. Show, 2015. New abbreviated calculation for measuring intrinsic rebound potential in exploited fish populations—example for sharks. Canadian Journal of Fisheries and Aquatic Science (72): 767-773.

Castro, J.I., 2009. Observations on the reproductive cycles of some viviparous North American sharks. Aqua 15(4): 205-222.

Conrath, C.L., and J.A. Musick, 2013. Reproductive Biology of Elasmobranchs. In: Biology of Sharks and their Relatives, 2nd edition. J. Carrier., J.A. Musick, and M. Heithaus (eds.). CRC Press, Boca Raton, FL.

Cortés E., E. Brooks, P. Apostolaki, and C.A. Brown, 2006. Stock assessment of dusky shark in the U.S. Atlantic and Gulf of Mexico. Sustainable Fisheries Division Contribution SFD-2006-014, Panama City Laboratory Contribution 06-05.

Dulvy, N.K., S.L. Fowler, J.A. Musick, R.D. Cavanagh, P.M. Kyne, L.R. Harrison, J.K. Carlson, L.N.K. Davidson, S.V. Fordham, M.P. Francis, C.M. Pollock, C.A. Simpfendorfer, G.H. Burgess, K.E. Carpenter, L.J.V. Compagno, D.A. Ebert, C. Gibson, M.R. Heupel, S.R. Livingstone, J.C. Sanciangco, J.D. Stevens, S. Valenti, and W.T. White, 2014. Extinction risk and conservation of the world's sharks and rays. eLife 3: e00590. https:doi.org/10.7554/eLife.00590.

Helfman, G.S., B.B. Collette, D.E. Facey, and B.W. Bowen, 2009. Chondrichthyes: sharks, skates, rays, and chimaeras. In: The Diversity of Fishes: Biology, Evolution, and Ecology, 2nd edition. G.S. Helfman, B.B. Collette, D.E. Facey, and B.W. Bowen (Eds.). Wiley-Blackwell Publishing, West Sussex, UK: pp. 205-230.

HMS, 2021. Shark Fishery Review (SHARE) Draft Report.

Lucas, M., 2020. IMPLAN Pro: The Basics of Analysis-by-Parts. IMPLAN Group Help Desk. https://implanhelp.zendesk.com/hc/en-us/articles/115002799353-IMPLAN-Pro-The-Basics-of-

Analysis-by-Parts.McCandless, C.T., P. Conn, P. Cooper, E. Cortes, S.W. Laporte, and M. Nammack, 2014. Status review report: northwest Atlantic dusky shark (Carcharhinus obscurus). Report to National Marine Fisheries Service, Office of Protected Resources: 72 pp.

Musick, J.A., 2004. Management of Sharks and Their Relatives (Elasmobranchii). In: Elasmobranch Fisheries Management Techniques. J. Musick and R. Bonfil (eds.), Asia Pacific Economic Cooperation. Singapore: pp. 1-8.

Musick, J.A., S. Branstetter, and J.A. Colvocoresses, 1993. Trends in shark abundance from 1974-1991 for the Chesapeake Bight of the U.S. Mid-Atlantic Coast. NOAA Technical Report NMFS 115: pp. 1-18.

Peterson, C.D., C.N. Belcher, D.M. Bathea, W. Driggers, B. Frazier, and R.J. Latour, 2017. Preliminary recovery of coastal sharks in the southeast United States. Fish and Fisheries (18): 845-859.

SEDAR 13, 2007. Small Coastal Shark Complex, Atlantic Sharpnose, Blacknose, Bonnethead, and Finetooth Shark. Stock Assessment Report: 397 pp.