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A CASE STUDY OF WHITE SHARK TOURISM IN  
CAPE COD: CONSERVATION AND MANAGEMENT  
CONSIDERATIONS FOR A GROWING INDUSTRY

BY

LETTY CASS

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

IN

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OF

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UNIVERSITY OF RHODE ISLAND  
2023

## **ABSTRACT**

In the past ten years, Cape Cod, Massachusetts has become a notable hot spot for white shark (*Carcharodon carcharias*) aggregation, which can be attributed to an increase of their food source, the gray seal. This increase in white sharks has had many positive and negative impacts on the community. In recent years, some businesses have taken advantage of the increased white shark presence by offering shark viewing tours directly off the coast of Cape Cod. This study investigated the growth and development of the shark tourism industry by conducting eleven semi-structured interviews with members of the shark tourism community. Results indicate that providing shark tourism offers many benefits for providers, but there are sustained and emerging challenges within the industry. Sustained challenges include environmental factors, recreational boater disruptions, fuel prices, perceived obligations to report shark sightings, and negative perceptions of shark tourism. The rapid growth of the shark tourism industry has led to emerging challenges, including an increased number of providers, air traffic concerns, and research interruptions. These developments have raised questions about the sustainability of this industry and how much longer it can continue to grow. This thesis explores these challenges and subsequent conservations and management implications.

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## CHAPTER 1: INTRODUCTION

The Marine Mammal Protection Act of 1972 gave protection to gray seals (*Halichoerus grypus*) by prohibiting any “take” of marine mammals—including harassment, hunting, capturing, collecting, or killing—in U.S. waters. After 50 years of implementation and enforcement, gray seal populations have shown signs of recovery (Roman et. al, 2013; Gruber, 2014). According to Gruber (2014), gray seals have started to expand to their historic ranges, occupying areas that have not been frequented in years. One such place is Cape Cod, MA. Starting in the 1990’s, gray seals started to appear in large numbers on Cape Cod for the first time since pre-industrial times, offering an optimistic sign of wildlife recovery.

Gray seals are an important part of the diets of white sharks (*Carcharodon carcharias* in the Northwest Atlantic and, because of this, the rise of gray seal populations along the New England coast has led to a greater presence of white sharks. The dense populations of these seals in Cape Cod have proven to be a reliable and fruitful feeding ground for white sharks and has thus increased their population density and activity in Cape Cod waters.

Starting in 2012, fishing charter companies and NGOs started to capitalize on the presence of white sharks by investing in a type of shark tourism that is different from anywhere in the world. Currently, cage-diving and chumming in Massachusetts state waters is banned, so instead, shark tourism providers in Cape Cod are providing wildlife viewing tours. These tours consist of a small six-person vessel for an intimate view of the sharks and rely on a

spotter pilot to find white sharks along the Cape Cod coastline. As white sharks have become more associated with the landscape of Cape Cod, shark tours have become more popular, and the industry has grown significantly.

Until now, there has been no research on shark tourism on Cape Cod. This project investigates the development of this industry and subsequent conservation and management implications through semi-structured interviews with shark tourism providers who were chosen as participants because of their breadth of knowledge of the industry and to develop a baseline for future research.

## CHAPTER 2: REVIEW OF LITERATURE

### Shark Tourism: Worldwide Operations

Shark tourism is often view as an economically viable alternative to extractive uses (e.g., shark finning, shark fisheries). Some have studied the economic advantages of shark tourism (Cisneros-Montemayor, 2013; Gallagher and Huveneers, 2018), with figures indicating a growing industry that outcompetes markets reliant on harming or killing shark species. Global shark landings have been declining in recent years, despite increases in effort and spatial expansion (Swarz et al., 2010). The increase in revenue from shark tourism and the decline in revenue from shark fisheries could serve as a reason to incentivize shark tourism for conservation. In some areas of the world, shark tourism has already replaced extractive uses and served as an economically viable alternative (Mimila-Herrera et al., 2016).

Shark tourism varies by location and is dependent on the type of shark. Generally, shark tourism activities can be broken down into four categories: shark tournaments, shark fishing, diving/snorkeling, cage-diving, and wildlife viewing. According to Meletis and Campbell (2007), all these categories can be considered consumptive or extractive forms of tourism. For this thesis, shark tournaments and fishing will not be explored because they are be considered a form of directly consumptive tourism that is currently illegal for white sharks in the United States.

### *Diving/Snorkeling*

Diving and snorkeling (“diving”) are popular forms of shark tourism. These industries are typically geared towards “non-aggressive” species, but there are exceptions. Diving activities use SCUBA equipment to view sharks, typically while swimming underneath the surface. Snorkeling will involve the use of a snorkel and mask to view sharks while staying near the surface. Neither of these activities will use a shark cage, and may or may not use attractants (e.g., feeding, bait, chum). Shark diving has grown exponentially since the 1990s due to several factors including: the development of lethal and non-lethal shark deterrent devices; efforts by diving magazines and resorts to assure divers that not all sharks are dangerous; and growth in nature-based and adventure tourism (Topelko and Deaden, 2005).

Diving shark tourism occurs all over the world with a variety of shark species but is most popular with whale sharks. Whale shark tourism is one of the most popular and widely studied shark tourism industries. Operations will typically offer open-water snorkel or diving tours to swim with naturally occurring aggregations of whale sharks. It is popular in Mexico and Philippines, but occurs in several other locations (Healy et al., 2020).

Diving and interacting with shark have led to challenges, including questions about animal welfare. Most tourism industries have rules about interacting with and touching wildlife, but there are questions about tourists complying with these rules. Many studies have explored how these activities

affects animal behavior and fitness. Some studies show evidence that there is an impact on the animal's physiology and behavior (Huveneers et al., 2013; Barnett et al., 2016; Brunnschweiler et al., 2018) while others do not (Bradley et al., 2017; Hammerschlag et al., 2017; Abrantes et al., 2018).

### *Cage-diving*

Cage-diving activities involve the underwater observation of sharks from a cage. Cage-diving operations revolve around shark species that are higher risk for causing injury or harm to humans. Normally, attractants are used to lure target species towards the cage. In other white shark aggregations sites such as South Africa, Australia, New Zealand, and Isla Guadalupe in Mexico, cage-diving is a popular industry.

Isla Guadalupe has become a popular white shark cage-diving location over the past twenty years due to the clarity of water and reliability of encounters, but there has been controversy. In 2016, two white sharks became stuck in diving cages. In this instance, the sharks were photographed in distressed, with one of them showing visible injuries. This garnered a worldwide response and negatively impacted tourism operators, with animal welfare advocates calling for a ban on cage-diving (Gallagher and Huveneers, 2018).

Alternatively, South Africa shark tourism has noticeably declined in the past five years due to the decline of white sharks in the area. According to Towner et al. (2022), white sharks have started to emigrate from common

aggregation sites in South Africa due to the presence of orca whales that seem to be actively hunting white sharks. Prior to this decline, South Africa was a popular spot for white shark cage-diving, but tour operators have started focusing on different shark species.

In New Zealand, there has been such strong opposition to the cage-diving industry resulting from concerns for public safety that the New Zealand government was taken to court over cage diving operations, with opponents arguing that chumming and cage diving operations result in sharks behaviorally associating anchoring boats with food. Additionally, opposition in Australia led to hefty restrictions on where cage diving can occur. Now, cage diving is only permissible near the Neptune Islands (Gallagher and Huveneers, 2018).

Cage-diving for white sharks is not an industry in Cape Cod (or Massachusetts). This can be attributed to two factors. First, chumming and cage-diving have been outlawed in Massachusetts state waters according to the Coastal Shark Conservation and Management Act. Second, white sharks in Cape Cod spend most of their time in water depths of 0-31 meters (101.7 feet), with 47% of that time in depths less than 4.5 meters (14.8 feet) (Winton et al., 2021), which is too shallow for cage diving. While they have been observed in federal waters off the coast of Massachusetts, they have been not been populous enough in deeper waters to support a cage-diving industry.

### *Wildlife Viewing*



To the best of my knowledge, there is no other white shark wildlife viewing operation in the world. This is mainly because, in other white shark hot spot areas, cage-diving is the most popular industry. In areas outside Cape Cod, white sharks spend more time in deep water. When white sharks are in deep water, their dark backs camouflage with the dark water underneath, thus making them difficult to view from a boat. This means that the best way to view white sharks in other hot spot areas is underwater in a cage. Occasionally, cage-diving and snorkeling/diving activities are conflated with white shark wildlife viewing in the literature. For this thesis, wildlife viewing will be treated as an activity independent of cage-diving and snorkeling/diving because there is no in-water interaction with the sharks.

In the Scotland and Northern Ireland, a basking shark viewing industry has recently developed. Some of the industry in Scotland is based around swimming with basking sharks, but other companies in both Scotland and Northern Ireland offer basking shark watching boat tours (Gray et al., 2022).

There are also whale shark viewing viewing around the world. According to Djunaidi et al. (2020), whale shark watching from kayaks/canoes has become a tourism activity in parts of Indonesia. This industry supplements the snorkeling/diving activities that are more common. Additionally, whale shark viewing tours in Mexico have grown in popularity and have become an important source of income for local communities (Mimila-Herrera et al., 2016).

Shark tourism in Cape Cod can best be categorized as wildlife viewing (also known as wildlife watching). The benefits and impacts of wildlife viewing

will be further explored in the final chapter of this thesis. Shark cage-diving and diving tourism have been extensively researched, but there is little to no research done investigating the impacts of wildlife viewing on sharks (and, to my knowledge, none on white sharks).

### Sharks Perceptions

Due to shark bite incidents, white sharks have long suffered a negative image and it has long been the struggle of conservationists to rally support and pride for them (Neff 2012). For years, white sharks have been the subject of books, movies, and TV shows, reaching populations of millions. This has allowed people all over the world to indirectly interact with these animals. Oftentimes, portrayals of white sharks are negative or exaggerated. These depictions have added to the “monster” or “eating machine” archetype that is commonly associated with sharks today (Panoch and Pearson, 2017).

One of the first, and arguably most famous, popular depictions of a white shark on film was the movie *Jaws* in 1975. This movie grossed \$470 million dollars worldwide and opened the doors for subsequent shark horror films, including three sequels of its own (O’Byrhim and Parsons, 2016). Le Busque and Litchfield (2021) analyzed 109 shark films to investigate how films portray shark-human interactions. Researchers found that it was found that 96% of the films overtly portrayed shark-human interactions as being potentially threatening to humans, 3% covertly portrayed shark-human interactions as being potentially threatening to humans, and only one film did

not include potentially threatening interactions. Another recent study has indicated that films containing sharks contribute to viewers fear of sharks (Ostrovski et al., 2021).

Other forms of shark media exist in popular culture. In 1987, Discovery Channel launched *Shark Week*, a successful television event that continues to this day. Initially, *Shark Week* centered around educational documentaries, which taught viewers all about the science, biology, and history of these animals (O'Toole, 2020). Today Shark Week has become a cultural icon, featuring celebrity cameos and pulling in millions of viewers, reaching 29 million at its peak in 2008 (Gibson, 2010). In recent years, *Shark Week* has been seen as problematic in the shark community for poor factual accuracy, fearmongering, bias, and inaccurate representations of science and scientists (Whitenack et al. 2022). While this may be true in some regards, studies have indicated that *Shark Week* viewers have significantly higher levels of knowledge about sharks compared to non-viewers (O'Bryhim and Parsons, 2016; Whitenack et al. 2022).

In addition to pop culture depictions, shark bite incidents tend to reaffirm negative preconceived notions (Neff, 2012; O'Toole, 2020), which can be linked to the way the media portrays these events. A recent study found initial evidence that exposure to media headlines discussing sharks increases perceptions of risk (Le Busque and Litchfield., 2021), meaning people perceive shark-human interactions to be more common than they are statistically when exposed to headlines about shark bites. The public largely perceives the

consequences following shark bite incidents to be death (Neff, 2012) because these events are considered low probability–high consequences incidents whose vivid nature skews risk perceptions (Sunstein, 2002).

It is also important to consider how shark bites are framed in the media and scientific literature. Traditional media continues to be interested in sharks as a newsworthy topic (Neff and Heuter, 2013) and studies have shown that over half of news articles written about white sharks are in reference to “shark attacks” and risks posed to humans (Muter et. al, 2013). Shark bite incidents have historically been covered in the form of sensationalist journalism (Sabatier and Huveneers, 2018), or media that refers to those content features and formal features of messages that have the capability to provoke attention or arousal responses in viewers (Grabe et al., 2001). This kind of journalism can be tied to language such as “shark attack,” which has been tied to increased fear and emotional distress (Neff and Hueter, 2013). According to Neff (2014), when shark bites are instead attributed to accidents, mistaken identity, defensiveness, or the human activity, it changes the stigma that sharks intentionally bite humans.

While shark bite incidents and media have historically established a negative image for white sharks, many studies have indicated that the public’s perception of sharks is more nuanced (Lucrezi et al., 2019; Panoch et al., 2017; O’Bryhim et al., 2015). Research from Peppin-Neff (2018) indicates that, even after fatal shark bite incidents, there is little public support for lethal policy responses. Jackman et al (2018) suggest that compassion conservation has

gained favor in recent years. Compassion conservation promotes the protection of individuals and populations and asserts the principle of *first, do no harm* (Wallach et al., 2015). Conservation measures typically aim to increase the populations of white sharks, but, with the increase of shark populations, come challenges related to human social responses (Carlson et al. 2019). Generally, the public opinion has shifted gears and is in favor of this non-lethal management (Jackman et al., 2015), but water use conflict remains.

### Cape Cod

Cape Cod is a hook-shaped peninsula off Massachusetts extending 65 miles out into the Atlantic Ocean with almost 560 miles of coastline (Cape Cod Chamber of Commerce, 2020a). According to the US Census, the year-round population of Cape Cod is about 232,000. There are no official statistics for the population of Cape Cod in the summer but estimates suggest it jumps to 500,000 when accounting for tourism activity.

Historically, Cape Cod has been known for sandy beaches and ocean culture. For these reason, Cape Cod is considered a “blue economy.” In just 2019, coastal tourism, commercial and recreational fishing, and shell fishing and their supporting industries brought in more than \$1 billion to the local economy (State of the Waters: Cape Cod, 2023). Additionally, community members and tourists alike have used the Cape for coastal recreation for years, thus making the local economy dependent on coastal resources. According to the Cape Cod Chamber of Commerce, in calendar year 2021,

direct domestic tourism spending in Barnstable County was \$1.37 billion, supporting 9,600 travel-related jobs and \$350.1 million in wages, while generating \$160 million in state and local taxes (exceeding 2019 levels despite restrictions from COVID-19). A review of literature yielded no studies on the economics of sharks on Cape Cod, whether negative or beneficial, so one can only speculate as to the financial impacts of sharks on Cape Cod. Further research is needed to investigate this topic.

### Sharks in Cape Cod

Prior to the 1700's, white sharks were abundant in Cape Cod. Starting in the 18<sup>th</sup> century, declines in gray seal populations modified the feeding behaviors of white sharks so that they mostly focused on other prey (e.g., dead cetaceans). This meant that sharks moved away from the coastal waters of Cape Cod and into the deeper waters offshore (Skomal et. al, 2012).

According to the environmental historian John T. Cumbler, Cape Cod resource use can be broadly categorized into three historical regimes, starting with the broad subsistence resource use by Native Americans (prehistoric times to 1700's), followed by a variety of resource extraction activities (including fishing and seal hunting) by Europeans (1700's-1900's), and, recently, the current regime of tourism and coastal recreation activities (Cumbler, 2014). This dependence on tourism and coastal recreation activities can be partially attributed to the disappearance of white sharks in the coastal waters of Cape Cod.

This return of white shark populations can be traced back to the Marine Mammal Protection Act of 1972, which gave protection to gray seals by prohibiting any “take” of marine mammals—including harassment, hunting, capturing, collecting, or killing—in U.S. waters. After 50 years of implementation and enforcement, gray seal populations have shown signs of recovery (Roman et. al, 2013; Gruber, 2014). According to Gruber (2014), gray seals have started to expand to their historic ranges, occupying areas that have not been frequented in years. One such place is Cape Cod, MA. Starting in the 1990’s, gray seals started to appear in large numbers on Cape Cod for the first time since pre-industrial times.

Due to this slow, but dramatic rise in gray seal numbers in the area, white sharks have returned to Cape Cod as a summer feeding ground (Moxley et al. 2017, Skomal et al. 2017). Since 2010, researchers have tagged 304 individual white sharks in Massachusetts waters (Atlantic White Shark Conservancy). While presence of white sharks on Cape Cod has increased, it’s important to note that the increase in shark activity is not an indicator for rise in global shark populations. Currently, white sharks are listed as Vulnerable on the International Union for Conservation of Nature (IUCN) Red List for Threatened Species. White sharks were designated as a protected species in most federal waters in 1997 and in Massachusetts state waters in 2005. Studies suggest that, prior to the ban, white shark populations had decreased by 79% of their historic levels (Walker, 1998). It is typically very difficult to measure white shark abundance due to their elusive nature and

migratory behavior. White shark sightings in the broader Northwest Atlantic have increased in the past 10 years, but it is still unclear whether this is due to an increase in seal numbers, thus denser population clusters of white sharks, or if white shark numbers are increasing.

The increase in white shark density has led to a myriad of human-wildlife conflicts, most notably an increase in shark bite incidence. In all the 20<sup>th</sup> century, only three shark attacks were reported in the waters of Cape Cod. This data lies in stark contrast to the current state of the Cape: since 2012, there have been five reported shark bite incidents, one fatal in 2018. Since the fatal shark bite incident, there have been no reported shark bite occurrences.

There is a wide range of options to manage shark-human interactions including technology-based, barrier-based, and biological-based (Simmons and Mehmet, 2018). These include barriers, tagging, visual detection, acoustic detection, magnetic, adaptive camouflage, culling, contraception, electric shock, scent smell and modifying human behavior. In recent years, Cape Cod has used a combination of these techniques. A study commissioned by the Outer Cape in 2019 concluded that the most effective management strategy for public safety and reducing human-wildlife conflict is modifying human behavior, most notably how humans interact with the water.

This has been the driving management strategy in Cape Cod, with localities encouraging beachgoers to be "shark smart" by staying in knee-deep water, not swimming at dawn and dusk (when sharks are more likely to be



feeding), and heeding warnings about shark presence (through flags, signs, and shark siting apps). These recommendations are effective when followed, but not all Cape Cod residents and visitors are happy about their limited access to the water. Opinions regarding the negative impact of white sharks have been highly publicized, most notably in an article published by the New York Times entitled “Fear on the Cape As Sharks Hunt Again” featured stories from water-users describing how white sharks have negatively impacted their relationship with the waters and coast of the Cape (Chivers).

Alternatively, the Cape Cod community has made other changes to adjust, with some embracing white sharks for their scientific, economic, and cultural value. One example of this is the establishment of shark tourism, but other changes have occurred. The Atlantic White Shark Conservancy (AWSC) in Chatham was opened in 2012 to provides support, both within Massachusetts and beyond, for scientific research, public education, conservation efforts, and public safety initiatives related to white sharks (AWSC). Another AWSC center opened in Provincetown in 2022 (AWSC, 2022). In 2013, Chatham started the “Sharks in the Park,” where works of art are created by local artists and are put on display from June through August (in recent years, the event has been renamed Arts in the Park to include more diverse art pieces) (Cape Cod Explore, 2022).

## CHAPTER 3: METHODS

Since, to the best of my knowledge, this is the first research investigating shark tourism in Cape Cod, this research was designed following an exploratory case study structure to gather as much information as possible about shark tourism through providers. Shark tourism providers were chosen as participants for this research because of their experience in and knowledge of the industry. Case study research is an appropriate approach when the focus is on contemporary phenomenon operating within a real-life context (Bernard, 2017; Yin, 2009). While there were research questions guiding this research (see below), grounded theory methods were also utilized to allow research to concurrently be informed and guided the themes and topics uncovered in collaboration with the people working in shark tourism. The grounded theory approach allowed me to identify categories and concepts that emerged from discourse in real time, while linking these concepts and themes in the literatures (see Strauss and Corbin, 1990). This method is widely used to analyze ethnographic interview data and was appropriate in this case due to the novelty of the research and the limited information available when the research began.

### Research Questions

This research set out explore four main questions regarding shark tourism:

1. What kinds of shark tourism have developed on Cape Cod?

2. What members of the larger tourism community have shifted to practicing shark tourism?
  - What are the motivations for shifting to shark tourism?
3. How are shark tourism providers changing in response to the growing populations of white sharks in Cape Cod?
4. What is the role of shark tourism in Cape Cod?
  - Are shark tourism providers aiming to encourage pro-conservation behavior?
  - Are shark tourism providers aiming to educate the public?
  - What perceptions, attitudes and knowledge do shark tourism providers hold about shark conservation?

#### Study Location

This study took place on and around Cape Cod, MA, USA (Figure 1). Data elicitation activities consisted mostly of semi-structured interviews (Bernard, 2011) with shark tourism guides/providers and some other people associated with shark tourism on the Cape. These interviews were supplemented by field observations and analysis of literature and news sources regarding white sharks in Cape Cod waters. Seven interviews were conducted in person, and four were conducted over the phone/online, for a total of eleven interviews.

Of the seven in-person interviews, five took place on Cape Cod (one in Orleans; three in Chatham; one in East Falmouth), one took place in

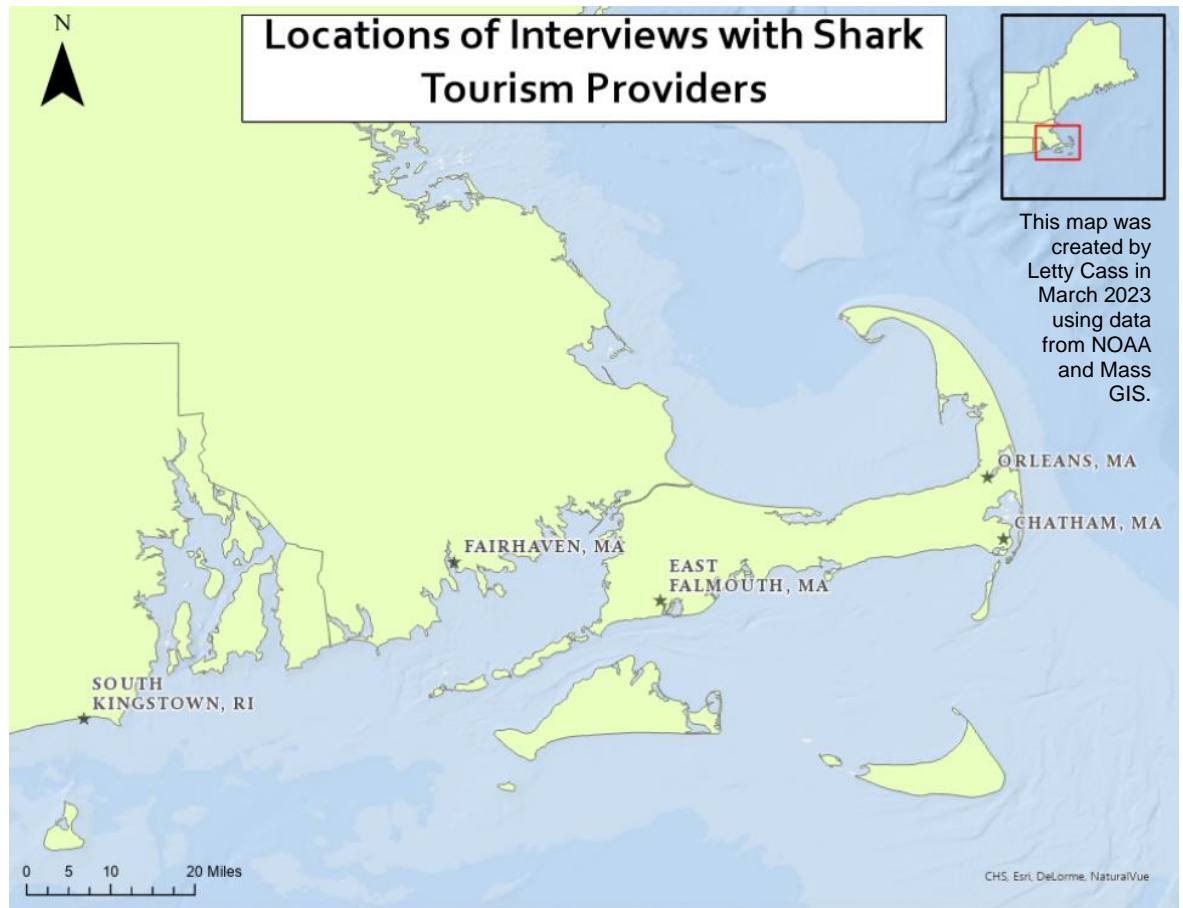
Fairhaven, MA, and one in South Kingstown, RI. In total, there were three trips to Cape Cod to collect data. The first trip took place from August 17-20, 2022, to visit Chatham. The next trip was on September 7, 2022, again to Chatham. Finally, the last trip to Cape Cod was on October 16, 2022, to visit East Falmouth. Outside of Cape Cod, there was one trip to Fairhaven, MA on September 26, 2022. Finally, the last in-person interview took place on October 25, 2022, in South Kingstown, RI. See Table 1.

*Table 1: Research Participants<sup>1</sup>*

<b>Role</b>	<b>Organization Type</b>	<b>Pseudonym</b>	<b>Mode of Interview and Location</b>
<b>Owner/Captain</b>	Private Business	Patrick	In person Orleans, MA
<b>Former Tour Guide</b>	NGO	Kari	In person Chatham, MA
<b>Tour Guide</b>	NGO	Olivia	In person Chatham, MA
<b>Owner/Captain</b>	Private Business	Frank	In person Chatham, MA
<b>Owner</b>	Private Business	Ben	Phone
<b>Owner/Captain</b>	Private Business	Scott	In person Fairhaven, MA
<b>Researcher</b>	Governmental	Chris	Zoom
<b>Pilot</b>	Contractor	Lenny	In person East Falmouth, MA
<b>Advocate</b>	NGO	Sam	Phone
<b>Pilot</b>	Contractor	Brady	In person South Kingstown, RI
<b>Researcher</b>	NGO	Christine	Zoom

---

<sup>1</sup> All names of participants have been changed for the purpose of this thesis. Any name mentioned throughout is a pseudonym assigned by the researcher.



*Figure 1: Locations of interviews*

### Sampling and Recruiting

To be recruited to participate in this study, participants had to be stakeholders in the shark tourism industry in Cape Cod, MA. Potential stakeholders included the shark tourism providers/operators, members of the shark non-profit community (e.g., educators, advocates, researchers), regulators, harbor masters and/or anyone benefitting from the presence of sharks on Cape Cod.

Participants were found by making initial contact with tourism providers found through online sources and by utilizing connections within Cape Cod.

Initial contact was made with different members of the tourism community (i.e., NGO, for-profit) to expand my sample to include varying perspectives. From there, snowball sampling was used as outlined by Johnson (1990). Snowball sampling consist of building and expanding a sample of potential informants through social networks by asking people to identify actors that have certain cultural and social characteristics, until the sample reaches saturation.

We were able to identify eleven shark tour operations currently operating out of Cape Cod, plus one that is no longer operational, for a total of twelve (Table 2). Every company was contacted via phone and email to participate in this research. There were twenty-two potential participants after contacting the twelve companies. Of the twenty-two people contacted, eleven agreed to participate in the research. These eleven people represented five of the shark tour operations.

*Table 2: Known shark tour companies on Cape Cod, MA.*

	Name	Type
1	Dive Bounty Hunter	Offshore cage diving
2	White Shark Tours Cape Cod	On-water shark tours; wildlife viewing
3	Jail Break Fishing Charters	On-water shark tours; wildlife viewing
4	Stick N' Rudder Aero Tours	Airplane shark tours; wildlife viewing
5	BlueWater Entertainment	On-water shark tours; wildlife viewing
6	Atlantic White Shark Conservancy	On-water shark tours; wildlife viewing
7	Monomoy Sportfishing	On-water shark tours; wildlife viewing
8	Down Cape Charters and Boat Rentals	On-water shark tours; wildlife viewing
9	Dragonfly Sportfishing	On-water shark tours; wildlife viewing
10	Fishy Business Sportfishing	On-water shark tours; wildlife viewing
11	Outermost Harbor Marine	On-water shark tours; wildlife viewing
12	Cape Cod Shark Adventures	Offshore cage diving No longer operational

#### Data Collection

Qualitative data was collected between August and November 2022 using semi-structured interviews (interview schedule attached in Appendix 1). Informed consent was obtained from all participants using signed consent forms detailing the purpose of the study, the rights of participants, including their right to withdraw from the study at any time without consequence, and the responsibilities of the researchers, including the contact information for the University of Rhode Island Internal Review Board (IRB).

Each interview started with a predetermined set of questions, but as is the nature with semi-structured interviews, the conversation developed and deviated as necessary. The interview guide was pre-tested with non-participating stakeholders to verify comprehension and flow. The guide was designed to take an hour, but actual interviews ranged in length from forty-five minutes to three-and-a-half hours.

The interview guide started with open-ended questions about business operations, moving onto broader questions about the shark tourism industry, and ended with personal experiences and observations. These questions were all asked out loud by the researcher, with verbal responses from the participants.

When a participant agreed to participate in the research, interview times and locations were scheduled. In-person interviews were the preferred format, but that was not always possible due to schedules or geographic location (e.g., some participants were not year-round residents of Cape Cod). If an interview could not be done in-person, then Zoom was suggested as an alternative. Finally, if neither Zoom nor in-person interviews were possible, a phone call was scheduled.

Interviews were recorded with permission of participants. Recording was done using the Voice Memo app on iPhone, with an iPad recording as back up. Field notes were taken before, during, and after the interview to record anything not captured in an audio file. Only one participant declined to be recorded, so more detailed notes were taken in that interview. Once the



recordings were complete, they were moved to password protected files and deleted off the Voice Memo App

The second section of the interview guide included quantitative questions with three Likert scales (regarding knowledge about white shark life history, shark management, and conservation in general (Dunlap and Van Liere, 1978) and a self-nature scale (Kleespies et al., 2021). For this section, all participants were provided a copy of the questionnaire to follow along. Four of the participants preferred to fill out the answers on their own (without the researcher reading the questions out loud). These four participants were encouraged to speak out loud and ask clarifying questions while filling out their survey to allow them the same experience as other participants.

The final section in the interview guide consisted of demographic questions. All participants answered questions about their age, gender, ethnicity, education, and political affiliation, but seven of participants declined to answer questions about income (both from shark tourism and from other sources).

After the interviews were complete, all recordings were loaded into the transcription software Otter AI and kept in password protected files. Due to the limitations of Otter AI, every transcript had to be read and refined to eliminate errors. Field notes were used as reference during this process. Interviews were transcribed to retain the interviewees exact words, whether they were grammatically correct or not. Transcriptions were cross referenced with field

notes to capture expressions, body language, and other external factors not caught on an audio recording.

Once completed, transcriptions were sent to participants to have for their records. Participants were encouraged to read the transcripts and check for accuracy. Of the ten transcriptions sent out, two participants followed up with clarifications. One participant reached out and requested that one of their comments be removed from the transcript.

### Data Analysis

Data was analyzed using thematic and in-vivo coding with NVivo coding software to complete this analysis. All the data collected during research, including interview transcripts, field notes, and pictures (taken in field and provided by participants), was coded. Thematic coding is beneficial for “systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a data set.” (Clarke and Braun, 2015). It is also useful to reduce or ‘distill data’ (Charmaz, 2006) and to sort patterns which enable the researcher to derive categories while minimizing the forcing of discourse into pre-conceived categories (Glaser, 2017). This method allowed me to identify keywords, themes, and topics that exemplify and illustrate the variety of perspectives, experiences, attitudes, and values held by study informants (Bernard, 2009).

A preliminary codebook was developed during the process of transcribing interviews, following the steps outlined by Gibbs (2007). This

codebook started with thematic codes relating back to the initial research questions, broken down into four categories: Change or Development, Conservation, Management, and Perceptions and Attitudes. As more themes emerged during transcribing, emergent codes that were not directly tied to initial research questions were added to the codebook.

At the end of transcribing, a preliminary codebook with thematic and in-vivo codes was finalized. In addition to the original four thematic codes, three more codes were added, including: Characteristics, Observations and Experiences, Tour Operations. These new codes represent categories of data that came up during interviews but were not directly addressed in the research questions.

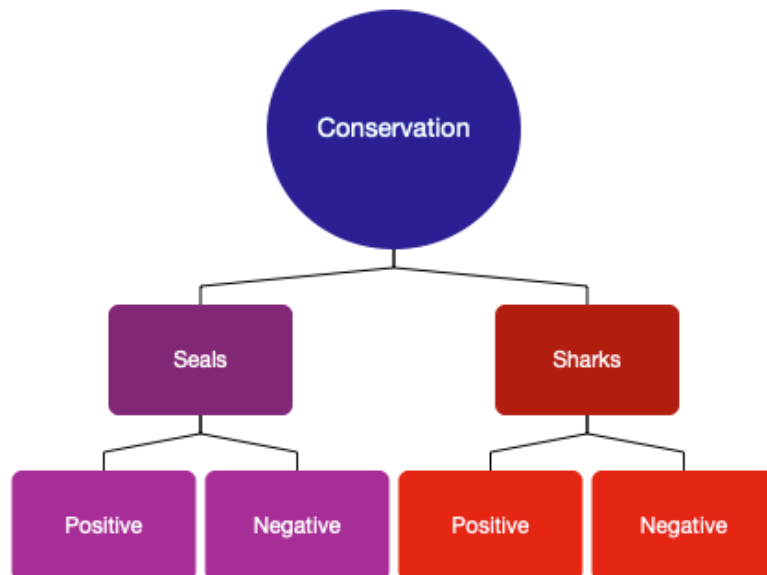
Before the actual coding began, each code was given a definition to note the nature of the code and to explain the thinking that lies behind it. This helped to maintain consistencies through the coding process and to eliminate codes that were too similar.

As the coding moved forward, the parent codes evolved to have “child” and “grandchild” codes. For example, under “Conservation,” the “child” codes “Seals” and “Sharks” were added. Under each of those codes were “grandchild” codes of “Negative” and “Positive” (Figure 2). During this time of development, the descriptions were updated to maintain a record of thoughts, ideas, and hunches that came up during this process (Gibbs, 2007).

In the early stages of coding, seven more codes were added to the codebook, including: Way of Life, Language, Drones, Code of Conduct, Local

Knowledge, Sharks and Mammals, and Other Tourism Locations. If a new code was added after another transcript had already been coded, that transcript was reviewed again. After the third transcript was reviewed, no additional codes were added for two reasons. First, for consistency in transcribing, and second, to limit the number of codes.

It is important to note that this analysis was conducted in a short time frame and represents a snapshot of circumstances among shark tourism providers in Cape Cod. Stakeholder views and perspectives can change over time and this analysis reflects only the data collection period.



*Figure 2: Example of parent, child, and grandchild codes.*

## Methodological Limitations

The seasonality of the Cape Cod tourism industry was a significant challenge in participant recruitment. White sharks primarily aggregate in Cape Cod from June to October, thus making these months the most lucrative time to offer shark tours. As a graduate student performing research, these months were supposed to be the months to conduct research. Most providers have a diversified business, not only offering shark tours, but charters, as well. When trying to recruit shark tour operators, many people indicated that they work 10–12-hour days, seven days a week during the summer season and were unavailable for interviews until the shoulder season (October/November). In addition to long summer days with limited availability, many providers only live on Cape Cod seasonally. Once the charter season ended, providers left Cape Cod for other parts of the country and were not available for in-person interviews.

There were also limitations in the amount of time available to do the study. By mid-November, more tourism operators were becoming available for interviews (in-person and via Zoom), but school commitments and graduation deadlines made it difficult to continue with interviews.

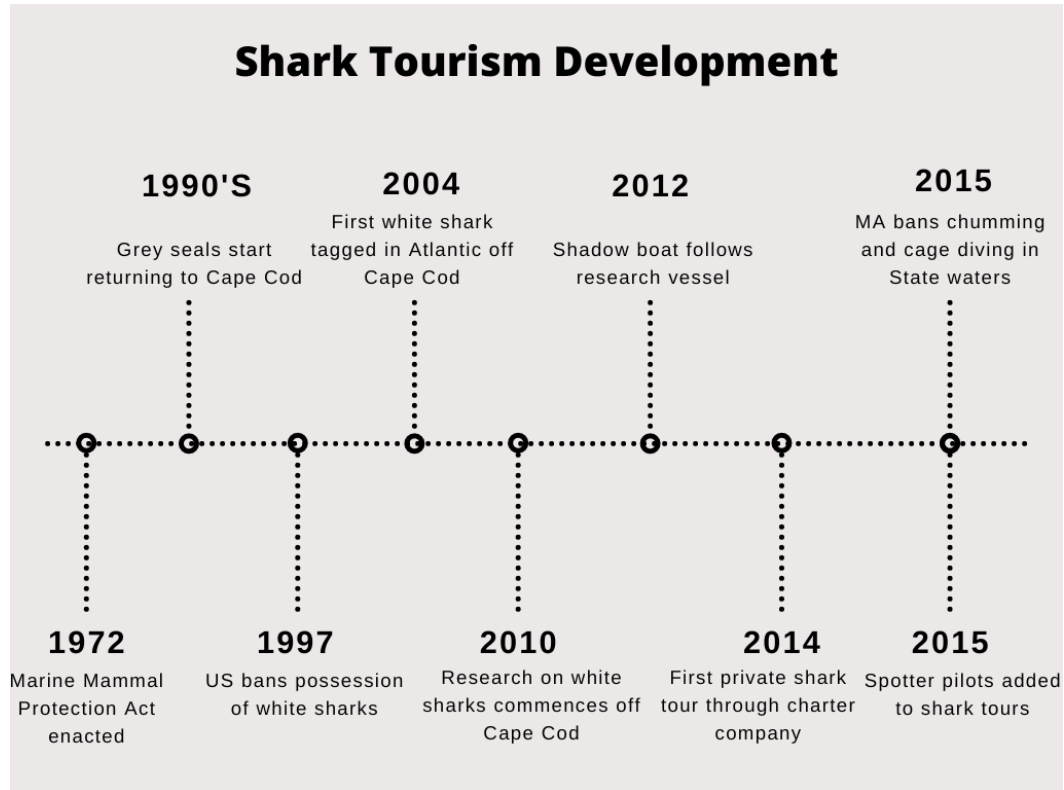
Finally, during the recruitment process, some providers expressed hesitation in participating in a scientific research study. Some were concerned with past negative experiences with science and management, others conflated the research with media reporting, and others were concerned about revealing proprietary information about their business. While most providers

did get past their apprehensions and agreed to be interviewed, eleven others declined to participate.

Due to these difficulties in recruiting, the sample size ended up being smaller than desired and the quantitative section of the questionnaire could not be used for statistical analysis. While these questions are thus a small part of the overall analysis, they still served as useful conversation stimuli to elicit discourse about various aspects of participants' views of nature, sharks, shark management, etc. Later/follow-up studies with a larger sample might help further illuminate the distribution of themes, topics, and perceptions held by people involved in shark tourism.

## CHAPTER 4: SHARK TOURISM ON CAPE COD

### Timeline



*Figure 3: Timeline of shark tourism development on Cape Cod, MA.*

The catalyst for shark tourism in Cape Cod can be traced back to 1972 when Congress passed the Marine Mammal Protection Act, which prohibited any “take” of marine mammals—including harassment, hunting, capturing, collecting, or killing—in U.S. waters. This protection was applied gray seals, whose population numbers had been declining over the years. According to Gruber (2014), gray seals have started to expand to their historic ranges, occupying areas that have not been frequented in years. One such place is Cape Cod, MA. Starting in the 1990’s, gray seals started to appear in large

numbers on Cape Cod for the first time since pre-industrial times (Garcia-Quijano, 2018).

In 1997, the National Marine Fisheries Service put regulations in place which made it illegal for commercial and recreational fishermen to possess white sharks. At the time, white sharks were known to have a seasonal presence in the deeper waters off the coast of Massachusetts, but near-shore sightings were exceedingly rare at the time (Skomal, 2017). In 2004, a white shark was spotted and subsequently tagged with a satellite tracking device off the coast of Cape Cod near the Elizabeth Islands. According to the Cape Cod Times, this was the first white shark ever tagged in the North Atlantic.

This was the first tagging of many. According to the researchers interviewed for this study, in 2010, a long-term research project started in Cape Cod to track populations of Northwest Atlantic white sharks. Researchers would go out into the waters of Cape Cod to tag white sharks, using a spotter pilot to find the fish. In 2012, researchers capitalized on the interest in their research by pairing with the Atlantic White Shark Conservancy and started offering the opportunity for members of the public to watch them tag white sharks on a “shadow vessel” (i.e., a private vessel hired by the researchers to carry paying customers). The customers would view the sharks from the boat while learning about the research taking place.

As indicated in interviews with participants, customers started asking private charter companies if they could do shark tours in 2014. Having seen the success of researchers, they said yes. These first shark tours were



informal and did not have a spotter pilot. A private charter company realized that their chances of seeing a shark would increase if they used a spotter pilot, which they added in the 2015 season. Since 2015, more companies have started offering similar shark tours.

Also in 2015, Massachusetts passed an emergency regulation that banned chumming and cage diving in State waters. At that time, there were two companies offering shark cage diving tours. Both companies operated outside of State waters and were not affected by this new regulation, although one company did shut down shortly after.

The interest in white sharks did not stop with shark tours. In 2015, a shark center opened in Chatham to educate the public about white sharks and ongoing research. On one of my trips to Cape Cod, I went into all the tourist shops on the main street of Chatham and found shark paraphernalia in every store. A brewery that I went to on the Cape started offering a beer called “white shark wheat.” Christine, one of the researchers on the Cape, thinks it makes sense that people would come for and profit from sharks, saying, “I think it really speaks to the charisma and like the power of these animals. Maybe looking back on it, maybe we should have been a little more hip to the fact that yeah, obviously there was going to be an ecotour industry around these guys being here, because everywhere they aggregate, people want to go see them.”

In 2018, a white shark bit and fatally wounded a man at Newcomb Hollow Beach in Orleans. This shark bite fatality divided residents of Cape

Cod. Some called for seal and shark culls while others lauded the return of white sharks (Fraser, 2018). This incident also received nationwide attention (Mervosh, 2018; Sullivan, 2018). While residents worried that white sharks would destroy tourism on Cape Cod, some shark tourism operators noticed an increase in business. A captain in this study said that after the shark bite fatality the “phone [wouldn’t] stop ringing.” Additionally, speaking about the series of shark bites in Cape Cod, one participant said, “[The towns] were afraid that everyone was going to be scared to go to Cape Cod. You know, the old Jaws factor. And that proved to be untrue.”

## Participants

White sharks have had a noticeable cultural impact on Cape Cod and shark tourism community offers a unique perspective on this newfound interest. As mentioned above, the target population for this study consisted of stakeholders in the shark tourism industry in Cape Cod, MA. These stakeholders included the shark tourism providers/operators (i.e., owners, captains, former and current tour guides, and pilots), advocates, and researchers. Every participant in this research was assigned a code name to ensure confidentiality. See Table 1 for breakdown.

## *Demographics*

Table 3 outlines the demographics of research participants. Of the participants, four were female and seven were male, with a median age of 41-50, but the ages ranged from 24 to 78 years. Every participant identified as

white. Educational background varied. Seven participants have a college degree, two have doctorates, one has some college, and one has a high school degree.

Most participants (7) declined to answer yearly income questions, but those who did indicated between \$40,000 and over \$100,000. Six participants listed income outside of shark tourism including charter fishing, ecotours, boat purchase consulting, commercial fishing, navigational consulting, charter fishing, retirement, social security, rental properties, and retirement.

*Table 3: Demographic breakdown of participants.*

<b>Descriptor</b>	<b># Out of 11</b>
<b>Gender</b>	
<b>Male</b>	4
<b>Female</b>	7
<b>Age</b>	
<b>21-30</b>	2
<b>31-40</b>	1
<b>41-50</b>	4
<b>51-60</b>	0
<b>61-70</b>	2
<b>71-80</b>	2
<b>Ethnicity</b>	
<b>White</b>	11
<b>Highest Level of Education</b>	
<b>High School</b>	1
<b>Some College</b>	1
<b>College</b>	7
<b>Graduate School</b>	0
<b>Doctorate</b>	2

*Providers: Captains and Tour Guides*

Three captains were interviewed for this research, all of whom are also owners of their companies. Frank and Patrick are captains that started off running charter fishing companies and have since expanded to include other tours. Scott is a captain that owns two separate companies: one for shark tours and one for charter fishing. One owner, Ben, was interviewed who does not personally run shark tours anymore.

Frank described himself as the “captain, owner, operator, naturalist, bookkeeper, secretary, accountant” for his business, along with the “funniest captain in the fleet.” Patrick used similar language, adding, “The business is mine and nobody else to help.” Both Frank and Patrick have been fishing off Cape Cod for many years, recreationally, commercially, and for charters.

Scott has been involved in fishing tournaments since he was a teenager and attributes that experience to his success today. He said, “I’ve always been in the fishing business. And then I actually went from being pretty highly sought at doing shark tournaments. Like because I was finding sharks very well, even as a young kid.”

Outside of their businesses, all three Captains have a relationship with the water. Patrick dove, spearfished, surfed all over the world for many years. Frank is a jack-of-all-trades when it comes to the ocean but talked passionately about surfing. Since the fatal shark bite in Cape Cod in 2018,

both have eased back on their water activities (Frank, during peak shark season, and Patrick altogether).

Patrick was not upset or resentful about this lifestyle change. Instead, he often spoke about white sharks passionately, saying things like, “They are absolutely amazing. You're looking down at it seven million years of evolution swimming along below you and it just it totally floors me.” He has encountered sharks throughout his years of diving and has enjoyed his experiences, although he has “no urge to go in a cage and have great whites swimming around.”

Alternatively, Frank expressed a more complicated relationship with the presence of white sharks on Cape Cod, the theme of conflicting identities came up often in his interview. He finds it difficult to balance his ocean identify with this new presence of white sharks. He spoke about surfers who have left Cape Cod because of the white sharks and finds it disappointing because he feels “humans have a place in the world, on the ocean.” He also feels connected with nature and is cautious and intentional when doing shark tours, doing everything to have minimal impact on the sharks. “I don't really ever want to be in a position where what I'm doing as a human is impacting the behavior of wildlife. That's just a respect of nature. That should be inherently a part of every business and every, every human. Whether you're running a business or just, you know, out there looking at birds, you're not going to walk up and shake the tree to see it fly.” While the presence of white sharks has

benefitted his business, it is hard for him to justify this benefit considering the other impacts.

Scott is an active diver and continues to fish for recreation. He would not normally dive on the Cape in the summer due to visibility, so his in-water activities have not been as affected. Scott speaks humorously about sharks, having years of experience cage-diving with and fishing for them. He says things like “working with sharks is like herding cats” or, describing the feeding patterns of a mako shark as a “smash and grab.” He enjoys his time with sharks and since his background is in shark tournaments and cage-diving, he has not seen a drastic change in his life in the past thirteen years.

Every captain agrees that years of experience has helped their success. Both Scott and Frank alluded to proprietary business strategies that have contributed to the success of their business and said that it took years of experience to find these strategies. This experience alludes to recreational activities, as well. Frank said he tells his customers, “It’s a good thing that their captain has a lifelong experience surfing more than - and that’s more important than, say fishing or classic captaining and boat operating because we’re operating an extremely shallow waters. In the surf.”

Two tour guides were interviewed, one current and one former. They rely more heavily on their educational backgrounds for tours, each holding a Bachelor of Science. Both guides have been passionate about the ocean and sharks their whole lives. Kari said, “I was that kid that was a shark nerd and I always loved sharks. So for me, I just always was fascinated with the ocean.”

Olivia echoed these sentiments, saying, “Oh, I always loved sharks, I thought they were cool. I was always out on the boats, always out on the water and it was my favorite place to be and, you know, summering [on the Cape] obviously, you know, we, we go to Nauset Beach, and we play in the waves and everything and it was a really big deal when we saw seals.” Both guides attribute this lifelong love of sharks and the ocean to their current jobs, happy “changing the hearts and minds” of the public through education.

*Providers: Spotter Pilots*

Spotter pilots started being used on Cape Cod to spot sharks for research purposes. Researchers were looking for a way to find white sharks and pilots with fish spotting experience had the necessary skills. Sometimes, drones have come up as an alternative to spotter pilots, but Chris said, “We use spotters instead of drones to locate sharks because they can cover a lot of area over a short period of time. And, and they can probably see better than a drone can.”

Eventually, when shark tourism moved into the private sector, spotter pilots were in high demand. Some continued to work in research along with private interests, while some left research all together and worked exclusively with private companies. According to interviews with pilots, owners/operators, and informal conversations with other shark tour companies, there are four pilots that have been active in the industry since 2015. Lenny and Brady are two of these pilots and were interviewed for this research. More pilots have

started spotting sharks (“fish spotting”) as the industry has grown, but they were not available for interviews.

Lenny and Brady use their own planes to fish spot. Lenny flies a Piper PA 18 Super Cub and Brady flies a Citabria, a type of plane made for stunt flying. These planes are ideal for fish spotting. They fit one to two people and have windows that open so pilots can look down and spot fish. Each of their airplanes are equipped with marine radios to communicate with boats and air radios to communicate with other planes. Additionally, these planes are equipped with radar to track other planes in the same airspace and avoid traffic.

Both Lenny and Brady have a history of fish spotting prior to joining the shark tourism industry. Brady spent forty years tuna and swordfish spotting full-time, at which point he had “had about enough and then along came sharks.” Lenny fish spotted for tuna and swordfish as a part time hobby. He took up fish spotting in the summer full time twenty years ago when he retired from his full-time job. Both said that shark tourism has given them an opportunity to keep flying after retirement and do not plan on stopping any time soon.

### *Researchers*

Both Chris and Christine are shark scientists who conduct some of their research on Cape Cod. They are both familiar with the shark tourism industry - Chris from having been involved since the beginning and Christine from



regularly interacting with operators. Chris grew up being fascinated by sharks, having been exposed to Jaws in his formative years. Christine came around later in life, having grown up in an area known for shark bites and was fearful of encountering one. The more she read about sharks, the more she started to shift her opinion. Finally, a diving trip to the Florida Keys brought her face-to-face with a Caribbean reef shark. Christina said, "I realized they weren't this big, scary thing. And they were really beautiful. And I was like hooked after that."

Chris and Christine both voiced adamant support for the shark tourism industry. Christine said, "If I can do anything for shark conservation, I would bring everybody out on an ecotour," adding, "One thing I really love about the ecotours that have started here is that I mean, they're really bringing people out to see sharks in their natural environment...like it really is a game changer." Chris voiced a similar support, saying, "I think it's a great outreach tool. I think it's a great way to educate the public, it's, it's a, it's a new, viable business, you know, associated with charter fishing. Instead of fishing, you're showing people this iconic species."

Both Christine and Chris acknowledged the controversial reputation of white sharks on Cape Cod. As they put it, although the presence of white sharks indicates a healthy ecosystem, it does lead to human-wildlife conflict and is an emotional issue for folks on Cape Cod. Christine said, "We do get exposed to like, both sides of it. And, you know, people are afraid of what they

don't understand." As researchers, they both try to balance their roles in Cape Cod, understanding different perspectives and needs of the community.

### *Advocates*

Sam is a Cape Cod native and current resident who advocates for better shark mitigation measures with a non-profit organization. This organization invests in research for shark mitigation technologies that may be beneficial for Cape Cod (e.g., drones, sonar, buoys, aerial surveillance). Their goal is to investigate these options and share their knowledge.

During her interview, Sam expressed frustration that towns were not doing more for shark management and contends that Cape Cod townships can be doing more to protect the public. Referring to the uphill battle that she faces to get towns to invest, she said, "No is easy, yes is hard." As an advocate, she faces a continued struggle to be heard and taken seriously in the regulatory landscape.

Overall, Sam reports that she wants there to be more of a conversation about white shark mitigation and a shift away from the idea that humans have no place in the ocean. She emphasized, "I'm not advocating that we go shoot sharks. But the notion that we have a responsibility. How do we balance the idea?"

## Benefits of Providing Tourism

Participants identified a range of benefits to providing shark tourism including additional income, diversification, easier alternative, providing education, clientele, passion (Table 4).

Table 4: Quotes exemplifying the benefits derived from being a shark tourism provider.

Benefit	Quote
<b>Income</b>	<p>“I make more money....I enjoy it and it’s good money.” -Patrick</p> <p>“Yeah, I mean, listen, it's given me a lot of things I have in life.” -Ben</p>
<b>Diversification</b>	<p>“Financially, it's good, because the giant tuna spotting is kind of dried up because the price has dropped so much. There's so many tuna arounds, that they don't they can't justify an airplane, they don't need an airplane. And fish spotters get a percentage of the catch for like tuna fish and swordfish. If you're getting 25% of a \$3,000 fish versus \$20,000 fish that makes a big difference. Just wasn't financially feasible.” -Lenny</p> <p>“I was right at the point where I'd put forty years in fish spotting for tuna and swordfish. And I had about enough and then along came sharks. Seemed like a good gig and it got better.” -Brady</p>
<b>Providing education</b>	<p>“Adults, I think sometimes forget that they can learn new things, and that they can change their mind and that they can experience something different than what they thought and so it can be incredibly powerful to show someone something new and teach someone something that they've never learned before.” -Olivia</p> <p>“I mean, the benefit - you know, every time that a client or customer steps on my boat, one of my goals is for them to step off the boat with a greater understanding of our natural environment.” -Frank</p>
<b>Easier alternative</b>	<p>“To do something different. I had gotten a little burned out on fishing after thirty or forty years... I don't have to haul fish over the rail and clean fish. Take care of people's snarls in their lines...I have</p>

	<p>the tower up on my boat. The topside station puts me up above the riffraff on the deck.”-Patrick</p> <p>“This is my dream retirement job.” -Brady</p>
<b>Clientele</b>	<p>“You get to meet a lot of interesting people...And I mean, we've had anywhere from the waiter at the restaurant to NFL players, you know, we've had celebrities... Oh, but like, meet a wide spectrum of people.” -Scott</p> <p>“You know, listening to kids excitedly, tell their parents...what they learned today is so just heartwarming and warm and fuzzy and all that.” - Olivia</p>
<b>Passion</b>	<p>“I mean, it's a great way to make a living. And it's, it's the number one thing I'd want to do.” -Ben</p> <p>“You're really giving somebody experience. That's my, my thing: Experience of a Lifetime.” -Scott</p> <p>“It was a passion of mine. I just loved flying over the water looking at wildlife, you know? And I just naturally gravitated from flying airliners to this for retirement.” -Lenny</p> <p>“And it's, it's really it's really the same thing is there with the shark tours that originally attracted me to fishing. It's showing, you know, people come here for a week or they come here for their vacation and their time with me on my boat is almost invariably the highlight of their trip to Cape Cod.” -Patrick</p>

Many spoke about the additional income and diversification benefits. According to participants, no private businesses were making money from shark tours ten years ago. Charter fishing companies were already finding success on Cape Cod, but shark tours did add income and diversified their business. This diversification can be beneficial if white shark populations decrease or if the operators are otherwise forced to diminish their involvement with shark tours. Christine spoke about how the decline of white shark sharks in South Africa has led to cage-diving operations having to change their business model to focus on other species. In other parts of the world, communities have found success in diversifying fishing incomes to include marine tourism activities (Miret-Pastor et al., 2020; Chen, 2010). If Cape Cod providers remain diversified, they may find the same success as these other communities and avoid the pitfalls seen in South Africa.

Patrick and Frank also said that shark tours are less physically demanding than charter fishing. Patrick said, "My body is breaking down," so shark tours offer an easier alternative on the water. Frank agreed that shark tours are physically easier, but it's "far more mentally stressful" due to the educational requirements, the amount of coordination needed between boat and plane, and the complex maneuvering of the boat in shallow waters.

Providing education was an important aspect of shark tourism for many operators. Olivia said three times, "Tourism is education." She makes sure to emphasize this on her tours, and it's what makes her enjoy her job. All

providers spoke of their tours as an opportunity for people to see white sharks in their natural habitat and pride themselves on being able to use this model as a tool for education.

Other providers talked about their enjoyment spending time with clientele. Scott said that running trips out of Cape Cod and Nantucket led to celebrities joining him on shark trips. While this is not something he would advertise, it has added to the experience for him. Olivia finds clientele to be another benefit of her job, especially the reactions from kids. She described an occasion when a family came out for a second year and the kids were most excited to see her. She said, "Have you ever watched a TED talk the lollipop moment? That is education. In a nutshell, that is education." (A lollipop moment is a moment someone said or did something that made your life fundamentally better.)

### Cape Cod Operations

Cape Cod shark tours differ from white shark tours in other locations around the world. In Cape Cod, the shark tours can be categorized as wildlife viewing. These tours require a vessel and airplane. The vessel is normally manned by one Captain, in some cases a Captain and a tour guide. The airplane will have one person operating, typically a pilot with experience in the fish spotting industry. The captain leaves for the tour with a group of customers and is immediately in contact with the spotter pilot, either via radio or phone. When the tour starts, the spotter pilot is flying over Cape Cod, close

to the shore, looking for white sharks in the water. When a shark is located, the spotter pilot tells the captain where to go. The customers on the vessel will view the shark in its natural habitat from vessel. While the tour is with the shark, the spotter pilot will continue looking for other sharks. After 1.5-2 hours on the water, the tour will end, and the vessel will head back to the dock.

### *Cost*

According to participants, shark tours cost anywhere between \$1800 to \$2500. These costs are per boat and can typically accommodate between four and six people. Every provider indicated that prices were higher than most people expect because the addition of a spotter pilot increases costs. Additionally, these prices include fuel, vessel costs, and employee salaries.

### *Season*

Shark tourism season runs from July to October. This season slightly varies year to year, depending on when white sharks come and go. Some providers start offering shark tours in late June, although the chance of seeing a white shark that early is low. Come October, white shark populations are still high, but Cape Cod weather causes frequent cancellations. Operators indicated that July, August, and September are the best times to go on a shark tour. These months have plenty of white sharks and optimal viewing conditions. Some companies will run one trip per day, six days a week. Others



will run three per day, seven days a week if there is demand and weather allows.

### *Tour Locations*

Tours typically leave out of Chatham or Orleans, although other locations are used when necessary (Figure 4). Tour operators want to travel to shortest distance possible to find a shark to save on fuel and to increase the amount of time viewing the shark. Spotter pilots will direct Captains where to go once a shark has been spotted. Ideally, this will be close to the launch site.

There are some white shark “hot spots” so tours can sometimes be predictable. For example, once tours are underway, they tend to stay near Chatham and Orleans because of their close proximity to Monomoy (an active haul-out spot for gray seals and therefore an active feeding ground for white sharks). This is especially true in peak season when sharks are plentiful.

While these areas are generally reliable, Patrick did comment on the unpredictability of white sharks, saying. “There's just two weeks ago [in early August], there were virtually no sharks around. I don't know. And it went deathly quiet for about two days. There were no shark sightings at all. And I had a guy and his son going on the third day, and I told him I said, ‘Listen, we got wind blowing and there have not been any shark sightings for two days.’ He said, ‘No, my son's birthday, we feel lucky.’ And we had one of the best shark trips I've ever had.” Other interviewees made similar comments,

indicating there are some days when white sharks are everywhere and other days when they are nowhere to be found.

In shoulder seasons, white shark locations are not as predictable, but there are some patterns. According to Frank, white sharks tend to “start on the corners” of Cape Cod. Meaning, when they first arrive in Cape Cod, they are more commonly found in Provincetown, Truro, and Beacon Hill (Figure 4). Tours in late-June and early July will travel to those areas, though not ideal because of the long travel time.

Brady did find it important to mention that while there are congregation areas for white sharks, they can be found everywhere. “There is no beach on the Cape where I have not seen a shark,” adding, “I mean, every single inch, every single inch I've seen a shark on or within 10 feet of every single inch. Every beach, there's a white shark on it. Especially on the east, all the way up to Race Point and even around the corner.”

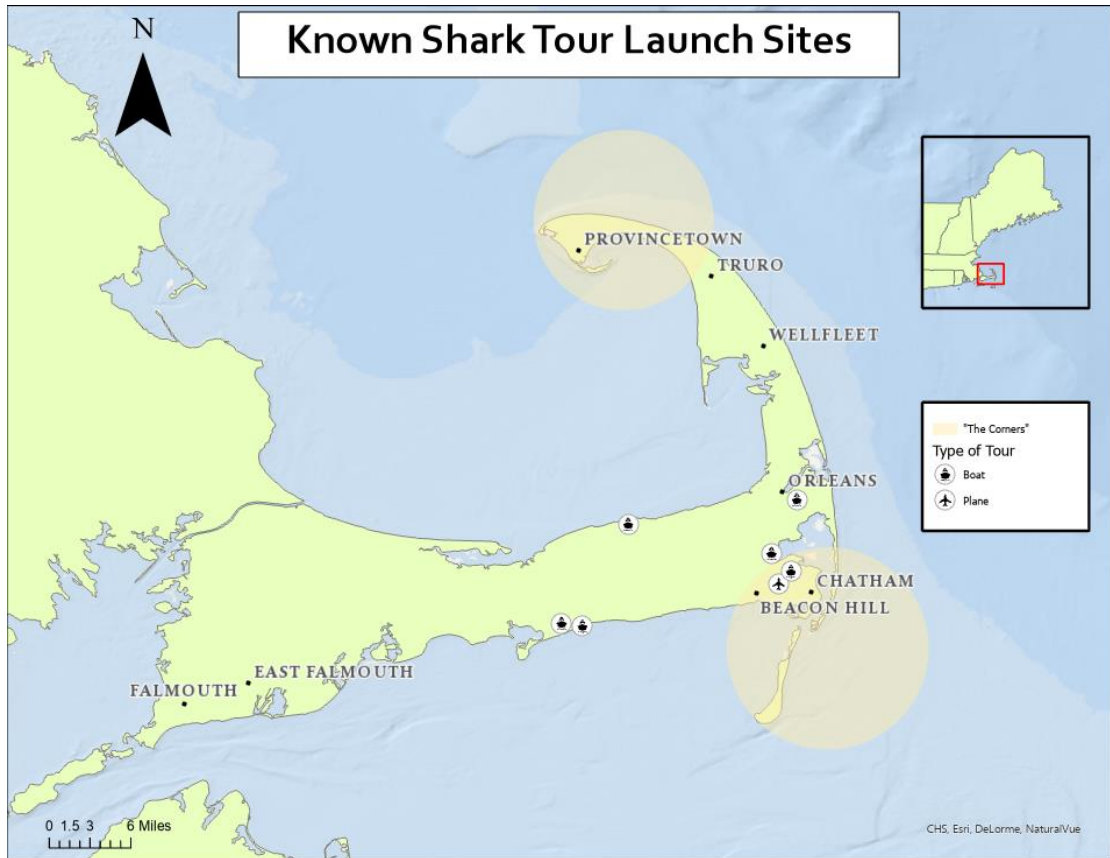


Figure 4: A map showing the areas of Cape Cod colloquially referred to as “The Corners,” and the common launch sites for shark tours.

### *Vessel Capacity*

Most tours take place on a vessel that can hold up to six passengers. The limit of six passengers stems from three reasons. First, most of the operators getting into shark tourism started off as charter fishermen. While some charter fishermen on the Cape operate head boats or party boats, it is mainly smaller operators with six passenger vessels that have started providing shark tours. Of the three captains interviewed, two said that they held a master's license, the other held a six-pack license (a US Coast Guard license that allows the holder to take up to six paying passengers and crew out on the water), which is another limit on how many people they can bring out.

Second, all operators discussed the size of their vessels and thus, the limit of passengers, as an important factor in the quality of the shark tours. Every single provider spoke about the personalization that comes with each shark tour. By having a more intimate setting with a small group, providers can cater the tours to the wants and needs to the customer.

Finally, if shark tourism operators increased their vessel size, the white sharks would be harder to spot. These tours operate in shallow waters that were often described as "unpredictable" by operators. According to Frank, "In order to provide that epic moment of seeing a shark and its natural environment sometimes that means putting the boat in a precarious situation that requires experience and knowledge and operating that vessel safely." A

larger boat would not be able to maneuver in the shallow waters as effectively, if at all, limiting the number of sharks available for viewing.

### *Information Provided*

When asked about information provided on tours, answers varied widely. When starting the trip, every operator does a boat safety speech and introduction, but after that, every single operator indicated that they do not have a set script when doing shark tours. The information provided on the tour is dependent on the customer and what they are interested in. Frank said, “You need to very quickly find out how to achieve the best experience and what, what these people are going to be happiest about and try to provide that. What makes them tick, what makes them tick and it might be more biological. It might be more environmental. You know, and it might be a funny joke. It might be just shut up and watch, you know.” Scott also said that is depends on the clientele, as well, saying, “You get or get the marine biology students that are very interested and hey, we have some great discussions. Like, I share what I know and I know 10 times what I do...and they have more of a textbook [understanding], where I can explain what I see day to day.”

Being on a shark tour, the conversation would naturally gravitate towards a range of shark topics. Ben said, “So throughout the whole day, you know, there was a lot of talk about sharks. You know, the challenges, they have pressures, they have the threats, you know, how they operate, how they

move, there is essentially our multiple hours of shark discussion and interaction.”

When asked where they got their information about white sharks, interviewees said it came from experience fishing off the Cape for many years and supplemental information through basic online research. Frank said he’s careful to let customers know that he is not a marine biologist but can rely on his “vast amount of experience and hours on the water as both a commercial and recreational fisherman” to lead these tours. Additionally, he relied on anecdotal science and knowledge, saying he has had “hundreds and hundreds of hours of shark tours and 1000s of - over north of 1000, 2000 sharks I've been able to observe.”

Olivia, on the other hand, does not come from a fishing background and is more inclined to rely on scientific research, both long established and ongoing. She said in her interview that “tourism is education,” and indicated that she prefers to use the best scientific information available. Typically, she sources her information from peer-reviewed articles and reputable research institutions (e.g., NOAA).

Patrick has more than thirty years of experience fishing off Cape Cod but has also worked with shark researchers in the past, so he uses this combination of experience to educate his customers while on board. Some information will be directly from researchers, while other information will be anecdotal from his years on the water.

All providers agree that many trips involve some discussion about shark life history, general information about Cape Cod, local geography, and experiences on the water. The more research-focused trips will involve conversations about the Marine Mammal Protection Act, conservation, and shark perceptions/misperceptions. Again, this all depends on the customer and the person providing the tour.

Shark Tours: How and Why They Work

#### *Cape Cod Marine Conditions*

Geographical characteristics of the Cape are beneficial for the shark tours. Frank, tapping into his science background, says, “Chatham and, and in general most of Orleans, although they're - they can be very different ocean environments - they are very unique within the New England region. Oceanographically and have a combination of factors that allow us to have a really unique experience with the sharks.” Going on to say, “You have the opportunity, and the environment presents us throughout much of the summer season, with relatively calm and very clear water devoid of major forms of life such, as you know, the Wellfleet mung, right, the dinoflagellates and whatnot. And also, the growth on the bottom, is much more limited. You have a - you have rapidly moving sand and it's coarse grained, you know, beige but wider sand so when you have that clear water over that whiter sand, you have on a dark fish you have extraordinarily high contrast, with a clear environment and a perfect opportunity for, for viewing these, these fish.”

Essentially, from Monomoy to Provincetown, the sand is white close to the shore. When the white sharks swim over this white bottom, their dark grey backs starkly contrast with the sand. Additionally, white sharks in Cape Cod spend more time close to shore and in shallower water. This is thought to be because their primary prey, grey seals, are there or are on shore. This unique combination of factors in Cape Cod allow spotter pilots to find and identify white sharks more easily and allows for people on tours to view the white sharks more easily from the boat. This geology has contributed the success of shark tours on the Cape.

### *Ideal Conditions*

Every provider described the ideal conditions for shark tours, with some variation. The ideal conditions for spotting from the sky and the ideal conditions for viewing on the water do not always overlap. On a vessel, the perfect shark tour takes place on a sunny day with wind out of the southwest or west. Calm seas are ideal, but according to Olivia, “You don’t need a perfect greasy flat day, which you actually don’t want because then the sun glare is gonna get in your way.”

Sun and light angles were something mentioned by most providers. Frank said, “These sharks are very hard to see. You have to be in the right spot. You have to have the right light angle.” Sometimes, it is beneficial to have a little overcast to cut the glare, but too much overcast will darken the water and make it difficult to see sharks from the vessel. Olivia, describing



cloudy weather said, "Any big clouds it's gonna darken up the water like really quickly. So that can make it a little bit harder to see - sharks are all about stealth. They've got that awesome counter shading: dark back to light belly, so they will really blend in with that darker water."

As for ideal flight conditions for spotters, Lenny says that the "best hours of the day are when the sun is the highest, the middle of the summer we you know it's good from nine o'clock to say four o'clock in the afternoon. But [in fall], the sun is a different angle, so you're wanting ten to two, you know. And of course, the tough days are the cloudy days overcast with wind."

## CHAPTER 5: INDUSTRY CHALLENGES

Shark tours have started to grow since 2015. During interviews, participants were asked what challenges the industry is facing, and their answers were subsequently coded during analysis. These challenges can be broken down into two categories, those sustained over time and those attributed to industry growth.

Sustained challenges have been present or mostly present since the beginning of shark tourism in Cape Cod. These challenges can be classified as pertaining to 1) the Cape Cod environment, 2) recreational boater disruptions, 3) fuel prices, 4) perceived obligations to report shark sightings, and 5) negative perceptions of shark tourism.

The challenges attributed to industry growth are more recent and are a direct result of the rapid development of shark tourism. These challenges include 1) an increase in the number of providers, 2) air traffic concerns, and 3) interruptions to white shark research.

### Sustained Challenges

#### 1. Environmental

##### *Cape Cod Weather and Boats*

Not surprisingly, many operators spoke about challenges with Cape Cod weather. Everyone said that weather is the number one reason that a trip would have to be cancelled. While factors like rain, wind, and fog come into play, many spoke about the unpredictability of weather in Cape Cod. As Kari

put it, "Weather is quite unpredictable here on Cape Cod sometimes, especially here in Chatham...it can have its own kind of separate system it seems like where Chatham can be completely fogged in but if you go right down the road to Orleans, it's a beautiful and sunny day just like this...it looks like a sunny and beautiful day but the wind is still really bad offshore."

This weather is generally manageable in July and August but come September and October (peak white shark time), the weather works against operators. Shark tourism providers and researchers said that they could be running shark tours and conducting research daily in these later months - the demand is there, and white sharks are still in Cape Cod waters. The limiting factor is the weather. In October, Chris said, "I got so much wind. It's killing me. You know, I would be out if the wind dropped out. But the - we've had, we've had a steady blow for the last five, six days and it's driving me nuts."

### *Cape Cod Weather and FAA Limitations*

Pilots pointed to weather as the most important variable impacting their work. For a spotter pilot, they have ideal conditions for spotting sharks, but also must adhere to visual flight rules (VFR) set by the Federal Aviation Administration (FAA) to put their planes in the air. VFRs are specific to types of airspace and altitudes and are based on the principle of "see and avoid." Spotter pilots in Cape Cod are flying in lower altitudes and during the day, so flight visibility needs to be between one statute mile (at <1,000 feet) and three statute miles (at >1,000 feet).

Most commonly, fog and low cloud cover are the VFR conditions that will cancel a shark tour. According to Patrick, there are days where he would be able to take customers out on the boat, but “fog will cancel a trip because [my pilot] can't jump the plane in the fog.” Olivia said that pilots “can't go if there's low lying clouds or fog. You know, these aren't instrument pilots. These are people who are looking out their window to find sharks. So, you know, if the airport goes to IFR, instrument flight rules, they can't fly legally, they cannot fly. So, you're limited.” (Instrument Flight Rules (IFR) are a set of regulations under which a pilot operates an aircraft in weather conditions that are not clear enough to see where they are going.) When asked when he would have to cancel a tour because of flight conditions, Brady said, “I can go out and fly in less than VFR. I might get in trouble doing it. But chances of finding anything are slim to none. You got to stay down low. It's a pain and it can be dangerous too.”

Wind is also a factor for spotter pilots. Crosswinds could make taking off and landing difficult and unsafe. Heavy winds would be reason to cancel a trip, which, according to Olivia, is okay. It's a “win for the pilot but also win for us. We don't want our guests throwing up [from the swell].”

Weather conditions may linger and prevent a pilot from operating for days. Lenny said that a “northeastern easterly blows water towards the Cape, and it tends to get cloudy. So that really affects you sometimes for days after a good northeast breeze. You're handicapped.” Many on-water operators spoke

about lingering environmental conditions from weather, but they were more concerned about water clarity and visibility.

### *Cape Cod Weather and Water Clarity and Visibility*

Participants had many ways to describe the waters of Cape Cod after a stint of bad weather: gross, chocolate milk, root beer, snow globe. These metaphorical descriptions were referring to the sediments that make the water murky and decrease visibility. Everyone has their own way to describe these conditions because it is a common issue for shark tours.

Murky water can last for days or weeks after a storm, especially in the later summer and early fall. Frank described this well, saying, “So as we get into September, October, the limiting factor becomes water clarity. You know, and we can have days if we get the right amount of upwelling...we can have days that are perfect and clear. But you can have longer periods of murkiness depending on swelling [and] weather.” This is important to operators because darker, murkier water makes it harder to view sharks from a boat. Olivia was describing a trip that had gone on before her interview and said, “Winds were pretty high yesterday...they were plenty safe and plenty fine for us to be in today. But since we just had that storm the other day, it picked up a lot of sand in the water and the water was brown.” These are These issues will continue to be a limiting factor for operators, as there is no way to improve visibility on these marginal days.

Interestingly, while murky water makes it more difficult to actually see sharks in the water, Brady said that he can easily tell that sharks are present because of “shark trails”: trails made by shark tails dragging through the sediment (Figure 5).



*Figure 5: "Shark trails"  
Provided by research participant Brady.*

## 2. Recreational Boater Disruptions

A common theme throughout the interviews was the increase of public disruptions from recreational boaters while shark tours were operating. As the popularity of shark tours has increased and the public has become more

aware of their existence, members of the public have increasingly become obstacles in shark tour operations.

The most common observation among providers was the increase in recreational boats crowding around a shark tour while it was happening. Frank commented, “So we had we had one trip this year where I did have somewhere between 10 and 15 boats within a boat length or two or three, you know, as they were everybody was a boat line from each other.” While this has been happening for years, a few providers commented on the recent increase in public disruptions, Olivia said, “It’s not new or anything but definitely happening a lot more than it has in the past.” One pilot said that he has seen recreational boaters trying to attract sharks to their boat by “chumming” and “throwing fish in the water.” This did not attract any white sharks, but this story does exemplify an aspect of public interest in white sharks and the lengths people may be willing to go to see one.

These disruptions have been “manageable” but do cut into the bottom line for business operations. Operators lose time with sharks, must shift their focus from paying customers to members of the public, and use more fuel to move locations to avoid crowding. Additionally, shark tour operators consistently indicated that they exercise caution around sharks when on tours, but recreational boaters may not have the same skills or awareness to operate safely around these animals or other vessels. An incident with a recreational boater may lead to negative impacts on the shark tourism industry.

Shark tourism providers have had to adopt strategies to ward off members of the public, or “shake the fleas” as one provider called it. Four of the operators said that recreational boaters listen to the radio channel that the shark tour providers use to communicate. This has led some of operators have come up with code language to use while using the radio channels to keep recreational boaters in the dark.

Two operators indicated that when other recreational boaters become aware of their shark tour, they will temporarily lead them away from the shark hot spots. Once the recreation boaters realize that they are being deceived, they will stop following that operator for the day.

Both pilots mentioned that when they are fish spotting, they will intentionally avoid flying over their associated boats because it signals to the public that those are shark tours. Lenny said, “I’ll fly over and put [the shark tour] on [the shark]. I try not to fly above the boat. Because that attracts attention.”

Every operator that expressed frustrations with the recreational boats also indicated that they understood the desire to see a shark in the wild. Three of the on-water operators spoke about using these encounters as an opportunity for education. Olivia was describing one encounter when her tour was surrounded by recreational boats and she said, “I’m on these boats trying to explain to people what they’re seeing, trying to help them and trying to educate because I’m like, ‘Well, if they’re gonna be all up in my grill, I might as well try to educate them”,’ and people tend to be pretty respectful if I’m like,



‘Okay, the sharks halfway between us like, don't like please don't come closer. If you keep this distance like we can get the shark between us and like you'll have a better chance of seeing it if you keep it a little bit further away from you.’ So, trying to explain to them how they can do it better. Even in that moment, even if it doesn't stick. But even if in that moment, it's better.” Frank says, “Recreational boaters are going to be there and most of them have nothing but good intentions. And who doesn't want to see a shark?”

### 3. Fuel prices

Every owner mentioned the burden of fuel costs on their business. Every single operator had to increase the price of their shark tours prior to summer of 2022 because of the rise of fuel costs. Some added a fuel surcharge to their standard prices, while others increased the cost of their tour permanently. The increase in fuel prices affects both the vessels on the water and the airplanes needed for fish spotting. Scott commented, “Like, I mean, I'm sure - I did, close to usually do about 80,000 gallons a year. Between the shark boats and my other business, too. But like, that's a lot of fuel.” When asked about challenges, Frank spoke about fuel prices as an added challenge, saying, “And of course, we're running at five, six bucks a gallon fuel, 1.3 miles per gallon, two hours, two hours to get it done. And it gets to - it did it got to a point where it was a bit frustrating. But that's the nature of the beast right now.”

This increase in fuel costs led to higher prices for shark tours. Some operators implemented a fuel surcharge, while others increased their total

cost. Patrick increased his prices and said, “That will not drop, even if fuel prices drop.” Prices for tours will likely remain in the \$1800 to \$2200 range for this next summer, as operators are unsure about future fuel costs.

#### 4. Perceived Obligations

In Cape Cod, there are several safety measures in use to educate and alert the public to the presence of white shark. These safety measures vary from town to town, but generally, there will be signs (Figure 6) or flags (Figure 7). Additionally, there is an app called Sharktivity run through the Atlantic White Shark Conservancy. This app crowd-sources information from researchers, safety officials, and other users to send notifications about shark sightings. Data from white sharks that have been tagged is also available to view on the app. Anyone who downloads this app has access to the data.



Figure 6: Sign at Race Point warning visitors of the presence of white sharks.



*Figure 7: Flag at Nauset Beach alerting beachgoers to the presence of white sharks.*

Some Sharktivity users have permission to report a shark sighting that are confirmed without verification (“verified users”). These reports will immediately be sent to the app as a confirmed shark sighting. Other users can report sightings, but these sightings will need to go through a verification process (“unverified users”). This is to avoid unnecessary panic if, for example, someone accidentally reports a sunfish as a shark.

Since shark tourism operators are frequently on the water looking for sharks, occasionally they will spot a shark close to a public beach with people swimming. There is no legal obligation to report these sightings, but every operator felt they had a moral obligation to report. When asked if he felt it necessary to tell someone about a shark sighting, Frank said, “It’s my least favorite thing to do because you’re interrupting someone’s day but I think it’s

more favorable than watching somebody get bit.” One operator who is a verified user on the Sharktivity app expressed concern about the ability of other operators to report sightings, saying, “Other charters that might be doing [shark tours] don't necessarily have the same tools, the same way to access the public safety manager. So it makes me concerned about oh, you're just gonna look at the shark and not tell anyone.”

While this is a genuine concern, other operators reported that they have built relationships with public safety officials to report sightings directly to them. Lenny said, “If there's a shark close to a beach. I tell [the captain] and he'll call the local Harbormaster. Like in Nauset. Or any of those beaches up and down the Cape.” Brady described a similar informal operation, saying, “I tell the boat you know, whenever there's a shark close to close to a beach where there are swimmers. And I, I might say might suggest you might want to close the beach down. But I've never seen like, an imminent danger.” Frank, speaking about his relationship with a public safety official in Orleans said, “We've met and discussed our approach to safety and have a very positive working relationship. And I think he has faith in my ability to determine when I think there's public safety issues, and when not and I'll keep him as informed as possible.”

These relationships and resources are an important benefit for shark tourism in relation to the community, but they are informal and are not required. Sam said the informality may be for the best, saying, “That is that is the most imperfect system I've ever heard...it's like sign language and smoke

signals...this is anecdotal, it's not a program." Despite these reports being unrequired, operators will continue to report sightings because of a perceived obligation to do so.

## 5. Negative Perceptions

Four of those involved in the shark tourism industry discussed their struggles from dealing with negative perceptions and beliefs about shark tourism from the public. These negative perceptions can be grouped into two broad categories: 1) the perception that the shark tours are negatively impacting the white sharks; 2) the belief that conducting shark tours teaches sharks to come near humans. This may be because shark tourism is typically associated with cage diving, chumming, and direct interactions. Extensive research has been done to explore the impacts of these activities on shark species. Some studies show evidence that there is an impact on physiology and behavior (Huveneers et al., 2013; Barnett et al., 2016; Brunnschweiler et al., 2018) while others do not (Bradley et al., 2017; Hammerschlag et al., 2017; Abrantes et al., 2018).

Some providers reported feeling hurt by the publics' response to their shark tours. Frank commented, "The public perception, public perception is definitely something that, you know - who the hell wants a bad reputation or hate mail? I don't want that." Scott, also discussing challenges from the community mentioned, "Once a while I run into somebody and they get all mad at me about it and be like, 'You're causing sharks to eat people,' I'm like, you know,

something an uneducated person would say.” Patrick also spoke about the negative attention given to sharks and shark tours, linking it to the impacts on his livelihood, saying, “If somebody’s been repelled by the sharks, I’d say that they’re, they’re my business. They’re my income.”

Other providers had a more relaxed view of the public opinion. Lenny commented, “They don’t know what they’re talking about most of them. The naysayers that are always on Facebook.” Another provider was even more dismissive of the public outcry. When asked about challenges to the industry, they said “Cape Cod is the home of whiners and crybabies, I can tell you that.”

There has been no research done on impacts of wildlife viewing on white sharks, so any ill will towards shark tourism providers stems from other sources and/or experience. As the shark tourism industry increases, these negative perceptions have the potential to increase because the industry will become more visible.

### Emerging Challenges

Of the 11 participants, eight indicated that the industry is growing rapidly, with more businesses offering shark tours each year. In 2012, the first shark tours took place on the Cape. These shark tours were the shadow vessels that followed a research boat tagging white sharks. In 2014, the first private company started offering shark tours and the industry grew rapidly after that. When asked if shark tourism was at or reaching capacity, Frank said, “Absolutely. 100%...beyond 100%.” Lenny commented, “We didn’t realize

it was gonna be this big. You know, we do it for you know, this guy wants to go look for sharks. Okay. The next week, there's two guys. I don't know. It's just incredible amount of tours they're doing nowadays.”

Participants identified three adverse effects of this rapid growth including: 1) An increase in the number of providers; 2) Air traffic concerns; and 3) Interruptions to research. These effects are directly caused by the rapid industry growth and stem into other issues, shown in Figure 8.

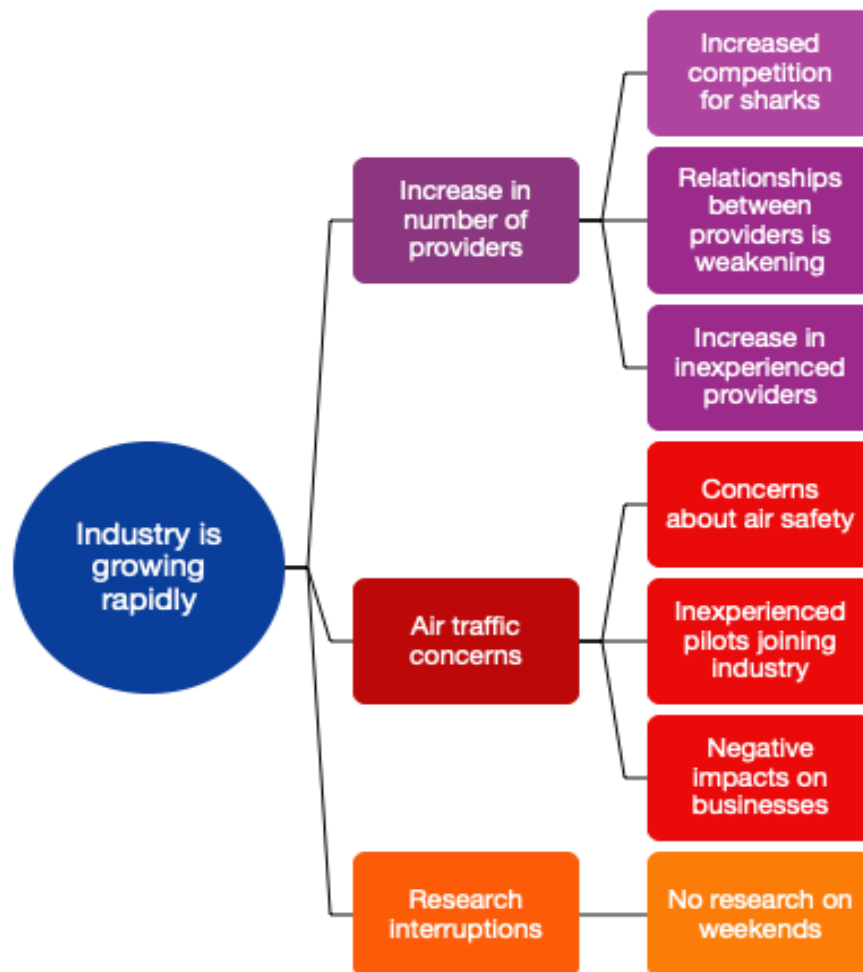


Figure 8: Emerging challenges in the shark tourism industry due to rapid growth.

## 1. Increase in Number of Providers

The rapid growth of the shark tourism industry has increased the number of providers offering shark tours from two in 2014 to 11 in 2022. This increase in providers has led to more inexperienced operators, has started to weaken relationships between providers and has increased competition for access to sharks in the field.

### *Inexperienced Providers*

White sharks in Cape Cod are spending more in shallow waters (Winton et al., 2021). As Christine put it, “The areas where they’re hunting for seals here are very shallow. And they really like they’ll push it depth wise, they, they pretty much hug the bottom.” It is in the shallow waters where operators get the best views of white sharks. Much of the time, captains on tours need to operate their vessels in shallow waters despite the risks. As Frank said, “In order to provide that epic moment of seeing a shark in its natural environment sometimes that means putting the boat in a precarious situation that requires experience and knowledge and operating that vessel safely.”

Experienced operators in Cape Cod know how far to push the limits in shallow water, taken factors like tide, bathymetry, and wave action. These skills can be learned over time, but some operators expressed concerns about new operators putting their vessels into these precarious positions. Not only



are their vessels and customers at risk, but there is potential to accidentally harm a shark, a concern that three operators expressed during interviews.

Every provider indicated that if a shark being viewed is showing signs of discomfort (e.g., sudden movements), they will ease away from the shark and look for a new one. As Oliva said, “If the shark mellows out and stays close to shore, like we can try to come up next to it again. But if it's very clearly like taking off, not sticking around, you know, we're not going to chase it. We're not going to you know, follow it. We're not going to hunt it down and force it.”

These precautions are not required and are only carried out by providers by choice. This indicates that *social institutions* go beyond formal regulations about responsible shark watching are being collectively formulated by shark tourism providers. A social institution is defined as a “widely understood rule, norm, or strategy that creates incentives for behavior in repetitive situations” (Polski and Ostrom, 1999). While this shows a responsible code of conduct, the increasing number of operators could lead to a shift in quality and a decline in cooperation with informal rules.

### *Increased Competition for Sharks*

Shark availability also drives competition between providers. While the number of sharks in Cape Cod has increased, there is still a limit to the number of sharks that are available to view on a tour. Operators expressed concerns that an increase of shark tour operations on the water will make more difficult to find sharks that are good for viewing.

Two operators shared experiences where other shark tour operators interrupted a trip so that they could view their shark, as well. Some operators referred to this as “stealing a shark” or “shark mugging.” Lenny commented, “For the most part, you know, the commercial charter fishermen they know all know, each other than respect each other? Seen very few - once in a while, you'll see a guy, like, a charter guy will come in and try to mug us on our fish.”

Shark availability determines where a tour will take place and thus, how far a shark operator needs to drive to find a shark. When discussing shark availability, Frank said, “So we've had - we had days this summer where I had to skip over five or six sharks and run five or six miles to get to a fish that might not be as good.” Operators commented that this extra effort increases the amount of fuel needed and thus operational costs. Additionally, driving further to find a shark reduces the amount of time that guests spend viewing sharks.

Every operator agreed that the numbers of sharks to view is not currently a large operational challenge, but participants expressed concern that the rapid growth of the industry would increase competition for sharks and make tour operations more difficult.

### *Weakening Relationships Between Providers*

Close, strong social relationships between providers were apparent throughout the research process. For example, during one interview, a participant was texting with another Captain about the weather for the

upcoming weekend, giving them advice so they could plan a shark tour. Operators said that when they were unavailable for a shark tour, they would recommend other providers. This collaboration has benefited operators by facilitating each other's success, maintaining harmony between operators, enhancing business, and ensuring a quality product for everyone.

When the shark tourism industry was just beginning, most of the operators already knew each other. Many of those interviewed referred to a mutual respect in the shark tourism industry that stemmed from these already established relationships. In the beginning, these providers operated under a code of conduct, or informal set of rules. These rules include the responsible code of conduct mentioned before, but also rules that dictate how operators interact with each other on and off the water. An example of this code of conduct is that shark providers would never "mug" or "jump on" another provider's shark.

The rapid growth of the industry has attracted new operators that have not been working with other operators in the same capacity. The unofficial code of conduct that was present in the early days of shark tourism has not been practiced by everyone who is new to the industry and this has caused some tension. An example of this is the "shark mugging" described earlier. Since most operators knew each other, they would respect space, but share sharks when necessary. In recent years, shark mugging has increased.

Another point of contention is the perceived decline in quality. As Frank said, "Now we've got boats with companies, there's one, one company in

particular that runs like a head boat style, and they- they're not owner/operator, and their captains are inexperienced. Or inexperienced in this realm. And that impacts the quality of their product. And it impacts the quality of everyone else's product." (A head boat generally refers to a commercial vessel that can carry more than six passengers). Perceived lowered standards for conducting business have caused tension within the community, which makes collaboration and consistency more difficult.

## 2. Air Traffic Concerns

All shark tour providers said that spotter pilots were necessary to provide a quality shark tour. In the summer of 2022, every provider interviewed said that they had a 90-100% success rate with spotter pilots. Due to this success, the model of running shark tours with spotter pilots has continued.

With the increase of companies offering shark tours, there has been an increase in air traffic over Cape Cod. When Brady described the increase in planes, he said, "In the last two years it's increased markedly, but not drastically," but he has concerns that the air over Cape Cod will become like a "hornet's nest." Alternatively, Frank described the current state of air traffic as the "Cape Cod Air Circus." Christine said, "Because, like, we can see it, just from our perspective, like every year, the landscape becomes kind of more and more crowded, there's more ecotour operators out there, there's more planes in the sky." Lenny described a typical day in flying in Cape Cod during peak summer months, saying, "From Nauset down to tip of Monomoy there

could be a dozen airplanes. And when the sharks are concentrated like off Monomoy sometimes there's, you know, half a dozen or more airplanes within a couple miles. So, you can see them all zigging and zagging.” Some providers and pilots have expressed genuine concern about this increase for three reasons including concerns about air safety/lack of oversight, inexperienced pilots joining the industry, and the negative impacts this has on their business.

### *Air Safety*

First, pilots are concerned about air safety and the lack of oversight for air traffic. Frank frequently brought up the aerial component, saying “You go from not having the collaboration among pilots for the product and the service to the potential for not having collaboration amongst the pilots for safety. Some of these guys are turning off transponders. Some of these guys are not communicating on the aviation channels on the radio. And some of them are not licensed commercially.”

Speaking to the changes in the air traffic patterns, Lenny said, “I see one coming. Okay. So I'm just coming down from the south. I'll keep an eye out. I see his altitude so I can adjust my altitude and avoid them, you know, and we're, and the experienced fish spotters that I've flown with, over the years we've flown in the same tight area. We're, we communicate, and we say, Brady will say, ‘I'll be a 1200 feet,’ I'll say, ‘I'll be at 1000 feet,’ [another pilot] will say, ‘Okay, I'll go 1500,’ so we can we could fly around. But then you get -

now you're getting inexperienced pilots with these people starting up these businesses. Yeah. And they, they just come at you." He continued to describe one incident saying, "One of the pilots that claimed that he avoided a collision by he claimed - I heard five feet." As the industry grows and more planes are in the air, these concerns have increased.

Brady does not seem as concerned about the increase in air traffic, saying, "We are loosely coordinated together and talking on one specific channel all the time...I wouldn't call it congested, working within the same area. And we look out for each other." According to Frank and Lenny, this comradery and coordination seem to be declining as more pilots join the industry.

#### *Inexperienced Pilots Joining the Industry*

The near miss incident described above alludes to the second concern among providers regarding air traffic: the influx of inexperienced pilots joining the industry. The original four spotter pilots that helped launch the shark tourism industry are no longer enough to meet demand. More pilots have started to join, but there are concerns about their qualifications and abilities. Both Lenny and Brady have over thirty years of experience fish spotting and both they attribute this experience to their current success as fish spotters for sharks. When asked about the skills necessary for fish spotting, Lenny said, "Off the coast of Chatham on a nice day like today, anybody could find [a shark]. It's on marginal days where you get people on a boat paying big money that you have to find sharks and, you know, experience really pays off."

Lenny and Brady said that some people pick up fish spotting quickly, but there is a learning curve to it. Some participants expressed concerns about the new pilots that have joined the industry, most of whom are younger, have less flying experience, and have little to no fish spotting experience.

Additionally, there are questions as to whether some of these new spotter pilots are legally eligible to fly. When Lenny was talking about new pilots he has encountered flying, he said, "Number one, you have to have a pilot's license. There's guys out there without pilot's licenses. Number two, you have to have a commercial pilot's license, which you have to have to fly for hire." He added, "But the regulations are on the books. [The FAA] only come in once there's an accident." These concerns about air safety and pilot qualifications were echoed in seven interviews.

### *Negative Impacts on Business*

Finally, operators are concerned about how the increase in air traffic and inexperienced pilots will affect their business. Patrick had concerns that if air traffic were to increase more, it would cut into his bottom line. The more time a pilot spends looking for a viable shark, the less time his customers have for viewing sharks. He expressed his concerns, saying, "If you were to double or triple that amount of planes with people, you know that the sharks, shark population isn't going to double or triple and, and we're really, we're really scrupulous. At least I am and everybody else seems to be about not jumping on someone else's shark."

Frank was also concerned that the increase in air traffic, along with increased boat traffic, would start to give shark tourism a bad name. Providers fear that these factors would lead to harsh regulations that limit the ability to do tours. Frank said, "There is a concern in the industry that once the FAA figures out what's going on, they're either going to A) put the clamp down on it, or B) shut it all down. That's a major concern." Lenny, having been involved in flight standards for years, said that there are already regulations on the books, but FAA does not seem to be involved because they are "reactive not proactive."

Brady commented that the growth bottleneck for shark tourism is the number of available pilots. Lenny, knowing that some pilots are flying without proper licensing, said that the one factor that is absolutely required is an airplane and there is a limited amount of people that own them. These two factors have the potential to slow the increase in air traffic but is unclear whether it will slow the growth of the industry.

Up until recently, shark tours had a 1:1 vessel to airplane model. According to Frank and Lenny, one provider started using a 2:1 vessel to airplane ratio in the summer of 2022. This new model could change the way shark tours are run in Cape Cod. There are clear advantages to increasing the number of boats using one spotter pilot: trip costs would decrease and less pilots would be needed (thus decreasing air traffic)

There are disadvantages to this model, as well. First, the quality of the tours may be impacted. As Frank said, the tours are not about the quantity of sharks, but the quality of sharks, "getting the best viewing experience."



Second, while this model would reduce the number of planes, it would increase the number of vessels on the water. As explored in earlier sections, boat traffic and the increase in providers is already a concern in the shark tourism community. Third, it is unclear if increasing the number of boats to pilots is safe because the pilot will spend less time on air safety and more time looking for sharks and coordinating with shark tour vessels. One pilot did say that they could manage multiple boats in one trip. This was a person with extensive experience in fish spotting, so the ability to manage multiple boats at once may not be possible for all pilots.

### 3. Research Interruptions

In 2010, Cape Cod became a newly important location for white shark research. There are currently multiple research projects being conducted through Woods Hole Oceanographic Institution, Massachusetts Department of Marine Fisheries, and the Atlantic White Shark Conservancy. Not all researchers were asked to participate in this study, but two were contacted because of their ongoing research on Cape Cod and their connection to shark tourism. Both researchers agreed to be interviewed.

Both researchers discussed the challenges that are presented when doing field work. For the most part, the researchers have experienced the same complication as shark tour operators when it comes to public disruptions, air traffic, and environmental limitations.

Public disruptions came up with both researchers. Chris, speaking about research and availability of sharks said, "We will not go out on weekends because there's too much activity on the water on weekends. And in essence, we're competing with private interests and with eco tours. And we don't want to do that." Public disruptions happened well before shark tourism was an established industry in Cape Cod. When researchers are out on the water, recreational boaters see a spotter plane overhead and recognize the research boat, which draws attention and interest.

Despite these interruptions, researchers were supportive of the shark tourism industry. Christine said, "If I can do anything for shark conservation, I would bring everybody out on an ecotour, either an ecotour here or somewhere where they could go cage diving with sharks." This was said after telling a story about how her relationship to sharks changed after a diving experience in the Florida Keys. Chris also discussed the benefits of shark tourism, saying, "I support it, I think it's a great outreach tool. I think it's a great way to educate the public, it's, it's a, it's a new, viable business, you know, associated with charter fishing. Instead of fishing, you're showing people this iconic species."

Research on white sharks is expected to continue in Cape Cod for the foreseeable future. The current disruptions are manageable, but as is the case with the tourism side, incidents have increased over the years.

## CHAPTER 6: CONSERVATION AND MANAGEMENT IMPLICATIONS

### Wildlife Viewing

Cape Cod shark tours are unique to anywhere else in the world, because only in Cape Cod are the conditions right to view white sharks from a vessel. As explored earlier, these perfect conditions refer to Cape Cod's coastal geology, the tendency of white sharks to stay in shallow waters, and the bountiful availability of grey seals as a food source. The unique model of viewing white sharks from a vessel places the industry in a separate wildlife tourism category known as wildlife viewing, which can be defined as "any tourist activity with the primary purpose of watching, studying or enjoying wildlife" (Masters, 1998). Wildlife viewing exists globally in different locations and ecosystems. To limit the scope, shark tours in Cape Cod will be categorized as marine wildlife viewing, which can include marine wildlife watching holidays, wildlife boat trips in marine or estuarine areas, guided island or coastal walks, observing marine life from land viewpoints, visiting marine or coastal nature reserve, participating in a marine life study tour or conservation holiday, and visiting marine wildlife visitor centers and marine aquaria (Zeppel and Muloin, 2008). In scientific literature, shark "wildlife viewing" is often conflated with activities like cage-diving and snorkeling/diving, but, for the purposes of this paper, this definition will only apply to wildlife viewing activities, with no physical or in-water interactions.

Wildlife viewing is not typically associated with white sharks because of the unreliability of the activity. Typically, cage-diving is the most reliable way to

see white sharks in their natural environmental. For this reason, there is almost no literature exploring the benefits or impacts of white shark wildlife viewing. Alternatively, there is a substantial amount of literature exploring the benefits and impacts of wildlife viewing on other creatures, notably marine mammals (e.g., whales, seals, sea lions). These benefits and impacts are crucial to explore to understand the conservation and management implications of shark tourism in Cape Cod. This chapter will explore the benefits and impacts of wildlife viewing, as well as the conservation and management implications regarding the specific type of shark tourism that exists in Cape Cod.

#### *Wildlife Viewing: Benefits*

White shark tourism in Cape Cod has separated itself from the negative impacts of other forms of shark tourism (i.e., chumming, cage-diving, and snorkeling/diving). It is important to investigate the difference between Cape Cod shark tours and other kinds of shark tourism to exemplify the benefits of wildlife watching.

First, there is no chumming in Cape Cod. It is not only illegal in Massachusetts state waters, but there is also no need to chum. In places where chumming occurs (e.g., South Africa, Isla Guadalupe), sharks spend their time in deeper waters and are harder to find without the assistance of provisioning. White sharks in Cape Cod are plentiful and easy enough to find with the help of a spotter pilot. This eliminates the need to chum to attract the

white sharks. This means that there are no concerns about altering white sharks' natural environment or behavior or causing ecological spirals typically associated with chumming (Gallagher and Huveneers, 2018). Additionally, there are no public safety concerns directly related to shark tourism (e.g., white sharks associating boats and humans with food).

Second, there is no cage-diving in Cape Cod. Like chumming, cage-diving is illegal in Massachusetts state waters, but cages are not needed for an up-close view of the white sharks in Cape Cod. (There is one company that offers cage-diving out of Massachusetts, but they operate in federal waters and promote mako and blue sharks as the main species of interest.) One of the largest concerns associated with cage-diving is safety for sharks. This would refer to incidents where white sharks become stuck in cages during cage-diving excursions. Since cage-diving is both illegal and unnecessary in Cape Cod, these negative impacts of shark tourism are not factors.

Finally, there is no white shark snorkeling/diving industry in Cape Cod, mainly because this type of tourism is associated with "non-aggressive" shark species like whale or reef sharks. The main concerns with snorkeling and diving tourism are animal welfare (e.g., touching sharks), fitness, and behavioral changes. It is unlikely that diving or snorkeling with white sharks will ever become a viable industry because of the actual and perceived risks. For now, the impacts associated with snorkeling and diving shark tourism are not applicable to Cape Cod.

Additional benefits of wildlife viewing have been explored in the literature. According to Meza-Arce et al. (2020), wildlife watching is most often associated with its conservation benefits by promoting environmental outreach and education for tourists and local communities. Learning during wildlife encounters contributes to pro-environmental attitudes and on-site behavior changes, with some longer-term intentions to support and engage in marine conservation actions (Zeppel and Muloin, 2008). Additionally, wildlife viewing promotes a non-extractive economic activity for local communities, incentivizes the protection for wildlife, and provides a platform for scientific research. According to research participants, the tourism industry in Cape Cod has shown benefits including the potential to enhance education, promote research, and incentivize shark conservation.

#### *Wildlife Viewing: Impacts*

Wildlife viewing has been associated with possible negative impacts, as well. Activities from tours such as disruptions during sensitive periods, approaching animals too closely, and making loud noises or sudden movements may lead to disturbance to animals. Disturbances have a range of effects, but most notably can lead to change in natural behavior and/or distribution of populations (Aquino et al., 2021). Research has been done to explore the impacts of cage-diving and chumming on white shark behavior, but little has been done to investigate behavioral changes after less invasive interactions. Additionally, impacts on species are extremely nuanced and

species specific and therefore conservation impacts of wildlife viewing are still being debated. This lack of information makes it difficult to explore impacts that wildlife viewing may have on white sharks, but it is a necessary consideration when evaluating shark tourism in Cape Cod.

### Conservation and Management Implications of Sustained and Emerging Challenges

The benefits and impacts identified in the literature are applicable to shark tourism in Cape Cod, but the sustained and emerging challenges explored in Chapter 5 have offer unique conservation and management implications that warrant additional exploration (Table 5), which will be explored in the remainder of this thesis.

Table 5: Conservation and management implications of sustained and emerging challenges of shark tourism.

	Management Implications?	Conservation implications?
<b>Sustained Challenges</b>		
<b>Environmental</b> <ul style="list-style-type: none"> <li>• Weather limitations</li> <li>• Weather regulations under FAA</li> <li>• Water clarity and visibility</li> </ul>		
<b>Recreational boater disruptions</b>	Yes	Yes
<b>Fuel prices</b>		Yes
<b>Perceived obligations</b>	Yes	
<b>Negative perceptions of shark tourism</b>	Yes	
<b>Emerging Challenges</b>		
<b>Increased number of providers</b> <ul style="list-style-type: none"> <li>• Inexperienced providers</li> <li>• Increased competition for sharks</li> <li>• Weakening relationships between providers</li> </ul>	Yes	Yes
<b>Air traffic concerns</b> <ul style="list-style-type: none"> <li>• Air safety</li> <li>• Inexperienced pilots</li> <li>• Negative impacts on business</li> </ul>	Yes	
<b>Research interruptions</b>	Yes	Yes



## 1. Recreational Boater Disruptions

As shark tours have become more popular, they have started to draw more attention from the public, specifically recreational boaters. Recreational boaters have been piggybacking off shark tours in hopes of seeing a white shark from their own vessel.

### *Conservation Implications*

Cape Cod has always been a popular spot for boating, and this will not be changing anytime soon. For this reason, white sharks in Cape Cod will always be around boats. The presence of recreational boats does not offer immediate conservation concerns, but rather how recreational boats are operating near white sharks.

Tour operators spoke about the skill and experience it takes to operate a shark tour and the related safety considerations they have for nature and wildlife. Recreational boaters may not have practice these same skills and apply the same considerations when inserting themselves into a tour. Unskilled and unsafe behavior (e.g., approaching animals too closely, making loud noises, sudden movements) from boaters may cause or increase disruptions to the white sharks.

This behavior from recreational boaters has been observed in other forms of wildlife viewing tours, most notably whale watching. In areas like the Pacific Northwest, there have recently been questions regarding the role of whale watching tours. Whale watching operators argue that they provide a

“sentinel” role on the water. They are incentivized to know where wildlife is and do everything they can to protect it. Additionally, they believe their presence helps alert and educate other boats. On the other side of the argument are those who say that tour boats act as “magnets,” attracting boats that would have otherwise been ignorant to the presence of wildlife (Pedelty, 2020; Shields, 2022). This sentinel vs magnet argument has prompted debates in whale watching areas about the benefits of tours and whether the risks outweigh the benefits. Although white sharks are not afforded the same protection as whales (under the Mammal Protection Act, whales are protected from any “take” - including harassment, hunting, capturing, collecting, or killing), the impacts may still be the same.

### *Management Implications*

White shark tours on Cape Cod raise the same concerns about whether they are sentinels or magnets. While white sharks are protected from fishing and retention, sharks are not afforded the broader protections applicable to whales (which are protected under the Marine Mammal Protection Act). However, there have been arguments made within the scientific community that sharks should be treated more like marine mammals when it comes to conservation and management (as opposed to being managed as fisheries) (Herdnon et al., 2010; Techera, 2011).

Tourism providers do not have any ownership or rights to white sharks in Cape Cod. Additionally, they cannot control the actions of these boaters. In

the future, regulators may need to consider the role of shark tours in Cape Cod (sentinel or magnet) and the impact of recreational boaters on white sharks. For now, more research is needed to understand the impacts of boats on white sharks. As more information becomes available, actions like educational campaigns and laws prohibiting intentional crowding of shark tours on recreational boaters may be necessary.

## 2. Fuel Prices

Every owner mentioned the burden of fuel costs on their business and, because of this, every business had to increase the price of their shark tours prior to summer of 2022. Some added a fuel surcharge to their standard prices, while others increased the cost of their tour permanently.

### *Conservation Implications*

Increased fuel costs may drive some operators to change their business model to reduce expenses and increase revenue. They could do this in two different ways: 1) Increasing the size of their vessel to accommodate more people; 2) Using one spotter pilot for multiple boats on the water. Increased vessel sizes could have conservation implications.

Currently, all shark tour operations can accommodate up to six people. This limit is due to license restrictions, but also because smaller vessels can operate more easily in shallow waters (where white sharks are easier to find and view). There are already questions about how small vessels, both

commercial and recreational, are impacting sharks. If commercial vessel sizes were to increase, there may be greater impacts to shark well-being. Again, there has been no research to investigate how vessel presence impacts white sharks, but factors like vessel type and size should be considered in future studies.

### 3. Perceived Obligations

There is no formal way for shark tourism providers to report a shark sighting. Some providers have access to an app called Sharktivity. Other providers have developed informal relationships with public officials.

#### *Management Implications*

Shark tourism providers are arguably on the water observing sharks more often than anyone else in Cape Cod. Spotter pilots are out daily during peak shark season with eyes on the water. Every provider interviewed indicated that they would prefer these systems and relationships remain informal and not be formalized through regulation. This is because of liability issues that they fear may arise from not reporting a shark. If there were to come a time when shark tour operators were required to report shark sightings, it may be beneficial to officially absolve providers of any liability.

### 4. Negative Perceptions of Shark Tourism

Some members of the public have negative feelings towards shark tourism. These negative feelings can be broadly categorized into two groups: 1) the perception that the shark tours are negatively impacting the white sharks; 2) the belief that conducting shark tours teaches sharks to come near humans.

### *Management Implications*

Currently, there is no peer-reviewed literature exploring the impacts of wildlife viewing on white sharks, which may indicate that the topic is a low concern for white shark research. When asked if shark tours were impacting wildlife in anyway, every single provider and researcher said no. There is no way to confirm these observations until research has been conducted.

There have been instances where the perceived impacts of shark tourism and public outcry have driven regulatory change. For example, in Australia, public concerns about the proximity of cage-diving to regional townships led to the cage-diving industry being restricted to the Neptune Islands in 2002 (Gallagher and Huvneers, 2018). In these have been in instances where providers were chumming waters. With the current lack of research surrounding white shark wildlife viewing, any regulatory action in response to public concern would be precautionary.

#### 5. Increased Number of Providers

The rapid growth of the shark tourism industry has increased the number of providers offering shark tours from two operators in 2014 to eleven providers

in 2022. This increase in providers has led to more inexperienced operators, has started to weaken relationships between providers and has increased competition for sharks.

### *Conservation Implications*

An increase in shark tourism providers has the same potential impacts as the disturbances from recreational boaters. Inexperienced providers may have less refined skills than veteran operators. Additionally, study participants indicated that some new shark tourism providers will crowd sharks (e.g., “shark mugging”). Unskilled and unsafe behavior like this may cause or increase disruptions to the white sharks.

### *Management Implications*

The Cape Cod shark tourism industry is currently operating under a voluntary management structure. Now that the sharks have become something that people make money from, the access to the space around the sharks has become a commodity. The influx of issues resulting from the increased number of providers may mean that the industry is at a tipping point and formal regulations may be needed. Formal regulations refer to the government implementation of mandatory management controls such as permits and licenses, policies (e.g., management plans, codes of conduct, and protected species status) and spatial restrictions (e.g., Marine Protected Areas and zoning plans). Voluntary management involves the informal

implementation of management controls by operators wishing to protect their individual needs where formal regulation is lacking. Voluntary management can both fill the void of and complement formal management controls (Healy et al., 2020).

The only formal regulations specifically limiting shark tourism are those banning chumming and cage-diving. Otherwise, shark tourism providers are currently working under an informal code of conduct to operate in the same area with the same resources. Until recently, this code of conduct was working. Operators showed an awareness of responsible practices and worked together to maintain quality. Development within the industry has changed this norm and led to concerns about the viability of a voluntary management structure.

Shark tourism providers in Cape Cod have expressed interest in a cautionary approach to formal regulations. Among providers, there is fear that too many regulations will destroy the industry. There is also concern that no regulatory action will allow the industry to grow past carrying capacity, making operations more difficult and less lucrative. So, the options for future management are either stick with the status quo or regulate the growth of the industry. For those participants who spoke about regulating the industry, there was agreement that any regulations should come from the providers. While there is an inherent competing interest in self-management, input from key stakeholders is not unheard of. The operators involved in shark tourism know

the emerging challenges in the industry and have reason to find the best solutions to these challenges.

When asked about management ideas, providers suggested limited permitting (i.e., cap on number of boats), an registry for charter vessel, and educational/safety requirements for tourism providers. Each of these options offers a range of benefits and drawbacks.

Limited permitting could slow the growth of the industry and reduce negative impacts associated with crowding. While this may be one of the fastest and most immediately impactful solutions, it may be seen as exclusionary and inequitable.

A registry for charter vessels offers two benefits. First, a registry would allow officials to track operators involved in the industry (since there is currently no system in place). The United States Coast Guard inspects and keeps track of charter fishing vessels, but they do not maintain a registry for marine tours for six people or less. Second, a registry for charter vessels could add a legitimacy to operations by being associated with or “approved by” a governing agency. This system could ignite problems, depending on if the registry is mandatory or voluntary. A mandatory registry might be seen as an infringement on ability to do business. A voluntary registry would defeat the purpose of keeping track of all vessels involved in shark tourism but may still legitimize the businesses who register.

Finally, education and/or safety training for providers also offer benefits. First, safety training would improve operator practices and make all tours



operate on the same level, thus increasing safety for white sharks. Second, providing white shark education to operators may improve information provided on the tour. Third, education and safety training may equip shark tourism providers with the skills they need to deal with problems associated with shark tourism (i.e., recreational boaters).

## 6. Air Traffic Concerns

Shark tours need a fish spotter pilot to find white sharks on tours. The growth of the shark tourism industry has led to an increase in air traffic, leading to concerns about air safety/lack of oversight, inexperienced pilots joining the industry, and the negative impacts this may have on business.

### *Management Implications*

The FAA has regulations that address the air traffic concerns outlined by participants. The most relevant regulations to shark tourism are those outlining requirements for pilots, commercial pilots, and insurance. The problem with these regulations is that they are not being followed by all operators and are not being enforced by the FAA. As Lenny said, the FAA is reactive not proactive. If there were to be an accident, regulations may be tightened. Simply following the current regulations set forth by the FAA would have immediate impacts on the shark tourism industry.

There are also concerns among providers that if unsafe air practices continue, regulations will not just be enforced, but made harsher, as well.

Harsher regulations could refer to standards that are made specifically for the shark tourism industry, tighter restrictions of number of planes in the air, or a complete ban on fish spotting for shark tours. Participants reported a 90-100% success rate when using spotter pilots. If spotter pilots were banned or limited from the shark tourism industry, it would have negative effects on the success rate of tours and the industry as a whole.

#### 7. Research Interruptions

Cape Cod has become an ecologically significant hot spot for white sharks. Research started in 2010, and now there are multiple research projects being conducted through Woods Hole Oceanographic Institution, Massachusetts Department of Marine Fisheries, and the Atlantic White Shark Conservancy. Researchers on the water are facing similar problems with recreational boaters as shark tourism providers.

#### *Conservation Implications*

Conservation regulations prioritize incorporating “best available science.” This science drives policy to best manage wildlife. Currently, there are significant gaps in white shark research and knowledge. To the best of my knowledge, there is no research on the impacts of boat presence on white sharks, whether this be a tour vessel or recreational boat. This lack of data makes conservation efforts more difficult because of unknown factors. The

precautionary approach has sometimes been applied to shark conservation and management, but not always.

Cape Cod is now a significant location for white shark research. Data from this research will be invaluable for future conservation and management decisions. Much like the shark tours, research vessels have been facing interruptions from recreational boaters. These interruptions have not stopped research but have occasionally slowed progress. Additionally, the influx of shark tourism providers has added a level of competition for space while on the water. Again, this competition has not stopped research, but has impacted when researchers can collect data.

### *Management Implications*

The main concerns from researchers are interruptions from recreational boaters and industry growth. The management implications are similar to those outlined in “Recreational Boater Disruptions” and “Increased Number of Providers.” The main difference here is the prioritization of research versus private industry.

Regarding recreational boater disruptions, there are different scenarios. If recreational boaters are regulated (e.g., crowding shark boats is made illegal), then research and shark tours could be treated equally. If shark tour operations are treated as “magnets” for recreational vessels, then their industry may be regulated, and research would continue as is. This could lead to more recreational boats crowding research vessels.

As for the increase in number of providers, the management scenarios remain the same. There is the option to stick with the status quo and let the industry grow indefinitely, or there is the option to limit the number of shark tour operations through some form of regulation. This could decrease the slight competition between researchers and shark tourism operators, depending on how many tourism providers remain.

## CHAPTER 7: CONCLUSION

The return of white sharks to Cape Cod has created a shark tourism industry that is unlike any other in the world, and this industry has grown significantly over the past ten years. These shark tours have provided a range of benefits to providers and has given these providers an incentive to continue providing tours. Despite the successes, the Cape Cod industry has also faced sustained and emerging challenges. The sustained challenges of this industry include environmental limitations, public disruptions, fuel prices, perceived obligations to report shark sightings, and negative perceptions of shark tourism. The rapid growth of the industry has led to a set of emerging challenges including an increased number of providers, air traffic concerns, and research interruptions.

These sustained and emerging challenges have presented a range of conservation and management implications, with the greatest impacts being attributed to recreational boater disruptions, the increasing number of providers, and air traffic concerns. These challenges warrant further investigation and collaboration with tourism providers to enact the best management strategies, but participants in this research did present potential ways to address their concerns. With this information, preliminary recommendations can be made for their greatest challenges.

Recreational boater disruptions mirror complications that have plagued the whale watching industry for years. Unfortunately, in areas where recreational boaters crowd commercial whale watching vessels, no viable

solutions have been presented because regulators need to balance the need for adequate management strategies, while still allowing for a viable tourism industry. Given that Cape Cod has become an ecologically significant area for white shark populations it is important to consider the role of shark tourism. Without research regarding the impact that wildlife viewing or boating has on white sharks, there can be no definitive solutions. Looking forward, research on these impacts should be prioritized and vessels (both commercial and recreational) should be advised or required to adhere to precautionary safety requirements when operating around white sharks.

As for the increasing number of providers, participants have already provided some input for how to manage this challenge. The main suggestions included limited permitting, a charter vessel registry, and education and safety training. Since limited permitting could be viewed as exclusionary, the best path forward may be a combination of a charter vessel registry and education and safety training. Ideally, education training would provide basic information about white sharks to tour operators (e.g., how their presence could potentially impact white sharks, how to report shark sightings, white shark life history), and safety training would offer providers tips and best practices for operating around white sharks. Once an operator has completed an education and safety course, they can register their charter vessel with the appropriate entity. This system may be more time consuming for the shark tour providers but would help address the challenges stemming from the increased number of providers. Additionally, this would address other challenges including

perceived obligations to report sharks, negative perceptions of shark tourism from the public, air traffic concerns, and research interruptions.

Overall, air traffic challenges present some of the most pressing concerns. Participants in this research were concerned that an air traffic accident is imminent because of the inexperienced and commercially unlicensed pilots that are now involved in the industry. Fortunately, the FAA already has rules and regulations that address the major concerns from operators. This means that the problem is enforcement, not lack of rules. In the future, basic enforcement strategies should be used on Cape Cod to check the qualifications of pilots flying for the shark tourism industry. These checks could be done through the aforementioned registry system or through existing databases maintained by the FAA. This step may seem arbitrary, but the ultimate goal would be to prevent the likelihood of an air accident occurring, and thus, avoiding the potential of harsher FAA regulations in the future.

To further elaborate on these conservation and management implications, more research is needed. Topics that warrant more investigation include: 1) Benefits and impacts of wildlife watching for white sharks; 2) Regulatory possibilities for the shark tourism industry, including the development of a system to solicit feedback from operators; 3) Compliance and enforcement with FAA regulations in the fish spotting industry; 4) Behaviors of recreational boaters around wildlife watching tours. By expanding on these topics, more sound management recommendations and decisions can be made without unnecessarily or arbitrarily regulating the shark tourism industry.

## APPENDICES

### Appendix 1: Survey Instrument

**ID:**

**Date of interview:**

**Time of Interview:**

**Interviewer:**

**Location of interview (town/village, place):**

**Field Notes:**

1. Where do you currently live? (City, state, country) [IF they live on Cape Cod, ask how long they have lived there]

How long on Cape Cod? \_\_\_\_\_

2. Do you live anywhere else throughout the year?

\_\_\_ Yes \_\_\_ No

If yes, where? \_\_\_\_\_

3. Where are you originally from?

### **Tourism Background**

4. What kind of tourism do you currently provide in Cape Cod? [Have participants elaborate if necessary]

\_\_\_ Hunting/trapping

\_\_\_ Snorkeling

\_\_\_ Charter Fishing

\_\_\_ Kayaking or Canoeing

\_\_\_ Spear fishing

\_\_\_ Recreational boating

\_\_\_ Educational/informational

\_\_\_\_\_

\_\_\_ Stand up

paddleboarding



- |  |                                       |
|--|---------------------------------------|
| <input type="checkbox"/> Surfing               | <input type="checkbox"/> Biking       |
| <input type="checkbox"/> Food/beverage         | <input type="checkbox"/> Jet-skiing   |
| <input type="checkbox"/> Historical            | <input type="checkbox"/> Water-skiing |
| <input type="checkbox"/> Viewing wildlife_____ | <input type="checkbox"/> Boating      |
| <input type="checkbox"/> Scuba Diving          | <input type="checkbox"/> Cage diving  |
| <input type="checkbox"/> Other: _____          |                                       |

Additional information:

5. What kinds of tourism have you provided in the past? [Have participants elaborate if necessary]

- |  |   |
|--|---|
| <input type="checkbox"/> Hunting/trapping                | <input type="checkbox"/> Snorkeling                 |
| <input type="checkbox"/> Charter Fishing                 | <input type="checkbox"/> Kayaking or Canoeing       |
| <input type="checkbox"/> Spear fishing                   | <input type="checkbox"/> Recreational boating       |
| <input type="checkbox"/> Educational/informational _____ | <input type="checkbox"/> Stand up<br>paddleboarding |
| <input type="checkbox"/> Surfing                         | <input type="checkbox"/> Biking                     |
| <input type="checkbox"/> Food/beverage                   | <input type="checkbox"/> Jet-skiing                 |
| <input type="checkbox"/> Historical                      | <input type="checkbox"/> Water-skiing               |
| <input type="checkbox"/> Viewing wildlife_____           | <input type="checkbox"/> Boating                    |
| <input type="checkbox"/> Scuba Diving                    | <input type="checkbox"/> Cage diving                |
| <input type="checkbox"/> Other: _____                    |   |

Additional information:

Basic Information About Tours

6. What is your current role in shark tourism?

- Owner of company
- Tour guide
- Captain
- Consulting party

Pilot  
 Other: \_\_\_\_\_

7. What kind of organization do you own and/or work for?

NGO (i.e., non-profit, club, association)  
 Government organization  
 Private business  
 Other

8. Where do your tours typically take place? [If answer is "on land" skip to question 11]

On land  
    If on land, where: \_\_\_\_\_  
 On a vessel  
    If on a vessel, name of harbor/marina: \_\_\_\_\_  
 Other \_\_\_\_\_

9. What kind of vessel is used on your tours?

Kind/style: \_\_\_\_\_  
Size: \_\_\_\_\_  
Passenger capacity: \_\_\_\_\_  
Other information (if provided):

10. What safety measures are in place for passengers?

<input type="checkbox"/> Lifejackets	<input type="checkbox"/> Passenger List
<input type="checkbox"/> Water Lights	<input type="checkbox"/> Fire extinguisher
<input type="checkbox"/> Safety speech	<input type="checkbox"/> Lifeboats on board
<input type="checkbox"/> Life ring	<input type="checkbox"/> Flares
<input type="checkbox"/> Safety info sheet	<input type="checkbox"/> Other: _____

11. What months of the year do your shark tours operate?

<input type="checkbox"/> January	<input type="checkbox"/> July
<input type="checkbox"/> February	<input type="checkbox"/> August
<input type="checkbox"/> March	<input type="checkbox"/> September
<input type="checkbox"/> April	<input type="checkbox"/> October
<input type="checkbox"/> May	<input type="checkbox"/> November
<input type="checkbox"/> June	<input type="checkbox"/> December

12. How many tours does your company/organization do a per week? Per month?

13. How many people do you have working for your company? How many help with shark tours?

14. How many people can go on each tour (not including Captain and crew)?

15. How much does a tour cost? [Indicate if this is per person or per tour]

\$\_\_\_\_\_ per person per tour

In Depth Information About Business

16. When did your company/organization start providing shark tours? [YEAR]

17. When you first started providing shark tours, where did you get your information?

18. How does the tour operate from beginning to end? Has that changed?

19. What kind of educational information is provided on your tours? [Check all that apply]

Conservation

Shark safety

Shark life history

Local geography

Shark perceptions/misperceptions

Marine Mammal Protection Act

Cape Cod general information

History

Other: \_\_\_\_\_

20. Under what circumstances would you cancel a tour? What are the ideal weather conditions?

21. What do you do on tours to keep the wildlife safe? Are there any safety measures?

22. Do you think it's important to have safety measures for the wildlife? Why?

23. What are the main challenges faced by the industry?

24. What challenges have you faced in shark tourism?

25. Have you noticed any changes in the industry since you started?

### **Experiences and Observations**

***Now I would like to talk to you about your experiences and observations in shark tourism. These will mainly be open-ended questions to explore your personal experiences in the industry.***

26. What was your relationship to sharks before you became involved in shark tourism?

27. Why did you make the decision to get involved in shark tourism?

28. What benefits have you found providing shark tourism? (Examples: enjoyment of being outdoors, being with the ecosystem, being with people, financial independence).

- What are the good things about this job?

29. What have you observed about sharks? Sharks and their ecosystem? (The importance of sharks, their relationship to the ecosystem, feeding)

Docile, humans get in the way, affect the

30. Do you think that shark tourism is important for conservation? Why?

31. What do you think are the best management strategies for humans and white sharks in Cape Cod?

32. Have you noticed tourism having any effects on sharks? (long-term and short-term observations)

33. Do you think that white sharks have been beneficial to Cape Cod? How so?

34. **Knowledge**

**Now I want to share a series of statements about the ecology of sharks in Cape Cod. Some of these statements have been factually confirmed. I would like to know if you agree or disagree with these statements. Answer AGREE, DISAGREE, or UNDECIDED for the following.**

	Agree	Disagree	Undecided
White Sharks are a federally protected species	1	2	3
White Sharks are a state (MA) protected species	1	2	3
White Sharks are natural historical residents of nearshore Cape Cod waters	1	2	3
White sharks in Cape Cod hunt mostly for grey seals	1	2	3
White sharks in Cape Cod hunt mostly for harbor seals	1	2	3
White sharks in Cape Cod hunt both grey and harbor seals	1	2	3
White sharks in Cape Cod eat large quantities of fish	1	2	3
White sharks are year-round residents of Cape Cod waters	1	2	3
White Sharks migrate into Cape Cod every year in the warm months	1	2	3
White Sharks in Cape Cod come from as far away as the Gulf of Mexico	1	2	3
You can expect to find white sharks wherever there are breeding concentrations of prey seals	1	2	3
Dead whales are another important source of food for white sharks	1	2	3
Adult white sharks have been known to enter Cape Cod saltwater ponds to give birth to their young.	1	2	3
White sharks see people as a regular source of food	1	2	3
White sharks grow very fast	1	2	3
White sharks are not vulnerable to	1	2	3

overfishing			
White sharks, as top predators, are important for the “balance” of marine ecosystems	1	2	3
Allowing sharks to re-populate in Cape Cod will restore the balance to seal populations in the area	1	2	3
Most white shark attacks on people are believed to be cases of “mistaken identity”	1	2	3
Orcas, or killer whales, are confirmed predators of white sharks	1	2	3

35. **Conservation**

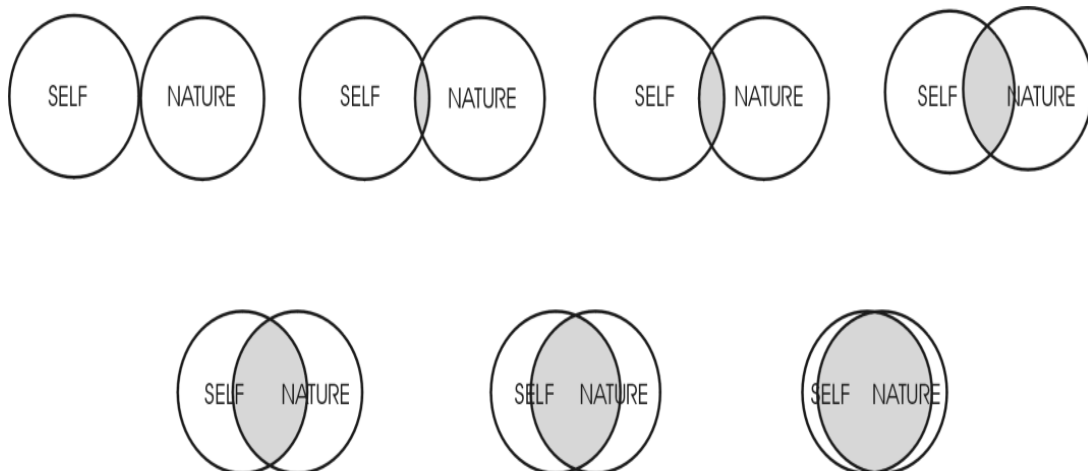
***Could you tell me about your support for approaches to managing white sharks in nearshore Cape Cod waters? I am going to read you some statements and ask whether you STRONGLY SUPPORT, SUPPORT, ARE NEUTRAL ABOUT, OPPOSE, OR STRONGLY OPPOSE the following.***

	Strongly support	Support	Neutral	Oppose	Strongly Oppose
Undertake “shark culls” to keep white shark populations in control (in places where they have been involved in repeated conflict with humans)	5	4	3	2	1
Undertake “seal culls” to reduce the number of gray seals in Cape Cod, thus decreasing the food source for white sharks	5	4	3	2	1
Act against individual animals that are aggressive or dangerous to people	5	4	3	2	1
Require or expect people who visit, swim, or do water recreation in Cape Cod to learn about white sharks and take reasonable actions to reduce risks	5	4	3	2	1
Increase tagging and acoustic and/or satellite monitoring of sharks to help track their movements	5	4	3	2	1
Use shark monitoring as a tool to alert people of known large shark whereabouts	5	4	3	2	1
Allocate funding for aerial or drone monitoring of beach areas to spot and alert approaching large white sharks	5	4	3	2	1
Implement physical barriers such as nets to reduce shark access to beach bathing areas.	5	4	3	2	1



Allow people to kill sharks approaching or threatening them or their families.	5	4	3	2	1
Allow agencies to restrict human water activities in places of high shark activity or concentration	5	4	3	2	1
Require shark diving or shark watching operations to undergo training to reduce impact on shark behavior	5	4	3	2	1
Prohibit shark diving or shark watching operations from using food to attract sharks, in order to prevent sharks from associating humans or boats with food.	5	4	3	2	1

36. **Self and Nature Scale (SN)**



Please indicate the picture below that best describes your relationship with nature and the environment (SELF = you, NATURE = the environment) (code: #1-7, where 1= no overlap and 7=almost complete overlap)

[INTERVIEWER: SHOW SCALE TO INTERVIEWEE AND MARK THE FIGURE INDICATED BY THE RESPONDENT]

**37. Conservation and the Environment**

I would like to ask you some questions about your beliefs about conservation and the environment. I am going to read you some statements and ask whether you STRONGLY AGREE, AGREE, ARE NEUTRAL ABOUT, DISAGREE, OR STRONGLY DISAGREE WITH THE STATEMENT.

	Stron gly Agree	Mildl y Agree	Neut ral	Mildly Disag ree	Stron gly Disagr ee
We are approaching the limit of the number of people the earth can support	5	4	3	2	1
Humans have the right to modify the natural environment to suit their needs	5	4	3	2	1
When humans interfere with nature it often produces disastrous consequences	5	4	3	2	1
Human ingenuity will ensure that we do NOT make the earth unlivable	5	4	3	2	1
Humans are severely abusing the environment	5	4	3	2	1

The earth has plenty of natural resources if we just learn to develop them	5	4	3	2	1
Plants and animals have as much right as humans to exist	5	4	3	2	1
The balance of nature is strong enough to cope with the impacts of modern industrial nations	5	4	3	2	1
Despite our special abilities, humans are still subject to the laws of nature	5	4	3	2	1
The so-called “ecological crisis” facing humankind has been greatly exaggerated	5	4	3	2	1
The earth is like a spaceship, with very limited room and resources	5	4	3	2	1
Humans were meant to rule over the rest of nature	5	4	3	2	1
The balance of nature is very delicate and easily upset	5	4	3	2	1
Humans will eventually learn enough about how nature works to be able to control it	5	4	3	2	1
If things continue on their present course, we will soon experience a major ecological catastrophe	5	4	3	2	1

**Demographics**

38. Age \_\_\_\_\_

39. Gender

- Female       Male  
 Transgender       Non-binary  
 Intersex       Write-in: \_\_\_\_\_  
 I prefer not to say

40. What ethnic group do you consider yourself to belong to? (Mark all that apply)

- African American  
 White or European American  
 Asian  
 Native American  
 Hispanic  
 Hawai'ian or Pacific Islander  
 Other (specify): \_\_\_\_\_

41. What is your highest completed level of formal education?

- Elementary School  
 Middle School  
 High School  
 Associate degree  
 Trade/technical/vocational training  
     College Degree  
     Graduate Degree  
     Doctorate Degree

42. What do you consider your political affiliation?

- Republican  
 Democrat  
 Independent  
 Other: \_\_\_\_\_

43. Have you belonged to any of the following types of organizations in the past five years?

a) A fishing-related organization

Yes  No

Name of organization:

---

b) A hunting-related organization

Yes  No

Name of organization:

---

c) An environmental organization that is not fishing or hunting-related

Yes  No

Name of organization:

---

d) An animal welfare or animal-right organization

Yes  No

Name of organization:

---

44. Are shark tours your sole source of income? [If yes, skip to question 56]

Yes  No

45. What are your other sources of income?

46. What is your approximate annual total income before taxes? (Choose only one from the following categories)

Under \$10,000

From \$10,000 to \$19,999

From \$60,000 to \$69,999

From \$20,000 to \$29,999

From \$70,000 to \$79,999

- |   |  |
|---|--|
| <input type="checkbox"/> From \$30,000 to \$39, 999 | <input type="checkbox"/> From \$80,000 to \$89,999 |
| <input type="checkbox"/> From \$40,000 to \$49,999  | <input type="checkbox"/> From \$90,000 to \$99,999 |
| <input type="checkbox"/> From \$50,000 to \$59,999  | <input type="checkbox"/> \$100,000 and above       |

47. What is your approximate annual income before taxes from **shark tourism**? (Choose only one from the following categories)

- |   |  |
|---|--|
| <input type="checkbox"/> Under \$10,000             |  |
| <input type="checkbox"/> From \$10,000 to \$19,999  | <input type="checkbox"/> From \$60,000 to \$69,999 |
| <input type="checkbox"/> From \$20,000 to \$29,999  | <input type="checkbox"/> From \$70,000 to \$79,999 |
| <input type="checkbox"/> From \$30,000 to \$39, 999 | <input type="checkbox"/> From \$80,000 to \$89,999 |
| <input type="checkbox"/> From \$40,000 to \$49,999  | <input type="checkbox"/> From \$90,000 to \$99,999 |
| <input type="checkbox"/> From \$50,000 to \$59,999  | <input type="checkbox"/> \$100,000 and above       |

-----END-----

48. Is there anything else about shark tourism that I should ask that I have not?

49. Can you recommend anyone else that I should be speaking to?

*That will do it for the interview. Thank you so much for taking the time to speak with me. I'm going to be taking this recording and transcribing our conversation. If you'd like, I can send you the transcription. You can read it for accuracy or just keep the copy for your records.*

*Do you have any additional questions for me?*

## BIBLIOGRAPHY

- Abrantes, Kátya G., Juerg M. Brunnschweiler, and Adam Barnett. "You are what you eat: Examining the effects of provisioning tourism on shark diets." *Biological conservation* 224 (2018): 300-308.
- Aquino, J. F., Burns, G. L., & Granquist, S. M. (2021). A responsible framework for managing wildlife watching tourism: The case of seal watching in Iceland. *Ocean & Coastal Management*, 210, 105670. <https://doi.org/10.1016/j.ocecoaman.2021.105670>
- Barnett, Adam, Nicholas L. Payne, Jayson M. Semmens, and Richard Fitzpatrick. "Ecotourism increases the field metabolic rate of whitetip reef sharks." *Biological Conservation* 199 (2016): 132-136.
- Bernard HR, and Gery Ryan. 2009. *Analyzing Qualitative Data: Systematic Approaches*. Thousand Oaks, CA: Sage Publications.
- Bernard HR. 2011. *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. Lanham, Maryland: Altamira Press. 665 p.
- Bernard, H. Russell. *Research methods in anthropology: Qualitative and quantitative approaches*. Rowman & Littlefield, 2017.
- Bradley, Darcy, Yannis P. Papastamatiou, and Jennifer E. Caselle. "No persistent behavioural effects of SCUBA diving on reef sharks." *Marine Ecology Progress Series* 567 (2017): 173-184.
- Brunnschweiler, J. M., N. L. Payne, and Adam Barnett. "Hand feeding can periodically fuel a major portion of bull shark energy requirements at a provisioning site in Fiji." *Animal conservation* 21, no. 1 (2018): 31-35.
- Clarke, Victoria, Virginia Braun, and Nikki Hayfield. "Thematic analysis." *Qualitative psychology: A practical guide to research methods* 222 (2015): 248.
- Cape Cod Chamber of Commerce. (2020a). About Cape Cod. Retrieved From: <https://www.capecodchamber.org/life-on-cape-cod/living-here/about-cape-cod/>
- Carlson, John K, Michelle R Heupel, Chelsey N Young, Jessica E Cramp, and Colin A Simpfendorfer. "Are We Ready for Elasmobranch Conservation

Success?" *Environmental Conservation* 46, no. 4 (2019): 264–66.  
Doi:10.1017/S0376892919000225.

Charmaz, Kathy. *Constructing grounded theory: A practical guide through qualitative analysis*. Sage, 2006.

Chen, Chung-Ling. "Diversifying fisheries into tourism in Taiwan: Experiences and prospects." *Ocean & Coastal Management* 53, no. 8 (2010): 487-492.

Chivers, C. J. "Fear on Cape Cod as Sharks Hunt Again." *The New York Times*, October 20, 2021, sec. Magazine.  
<https://www.nytimes.com/interactive/2021/10/20/magazine/sharks-cape-cod.html>.

Cisneros-Montemayor, Andrés M., Michele Barnes-Mauthe, Dalal Al-Abdulrazzak, Estrella Navarro-Holm, and U. Rashid Sumaila. „Global economic value of shark ecotourism: implications for conservation.“ *Oryx* 47, no. 3 (2013): 381-388.

DJUNAIDI, ASRIL, Jamaluddin Jompa, Nadiarti Nurdin Kadir, Ahmad Bahar, Sukirman DJ Tilahunga, Deborah Lilienfeld, and Maulita Sari Hani. "Analysis of two whale shark watching destinations in Indonesia: status and ecotourism potential." *Biodiversitas Journal of Biological Diversity* 21, no. 10 (2020).

Dunlap, Riley E., and Kent D. Van Liere. "The "new environmental paradigm"." *The journal of environmental education* 9, no. 4 (1978): 10-19.

Fraser, Doug. "Shark Meeting Draws a Crowd in Orleans." Cape Cod Times. Accessed March 16, 2023.  
<https://www.capecodtimes.com/story/news/2018/11/15/shark-meeting-draws-crowd-in/6289565007/>.

Gallagher, Austin J., and Charlie PM Huveneers. "Emerging challenges to shark-diving tourism." *Marine Policy* 96 (2018): 9-12.

García-Quijano, Carlos G. (2018) After a fatal shark attack on Cape Cod, will the reaction be coexistence or culling? *The Conversation*. September 27, 2018.

Gibbs, Graham R. "Thematic coding and categorizing." *Analyzing qualitative data* 703 (2007): 38-56.



- Gibson, M. (2010). A Brief History of Shark Week. Time. Retrieved From: <http://content.time.com/time/arts/article/0,8599,2008020,00.html>
- Glaser, Barney G., and Anselm L. Strauss. *The discovery of grounded theory: Strategies for qualitative research*. Routledge, 2017.
- Grabe, M. E., Zhou, S., & Barnett, B. (2001). Explicating sensationalism in television news: Content and the bells and whistles of form. *Journal of Broadcasting & Electronic Media*, 45(4), 635-655.
- Gray, Chelsea, Erin Peters-Burton, Cynthia Smith, and E. C. M. Parsons. "Basking shark tourism in Donegal, Ireland—a case-study of public interest and support for shark conservation." *Aquatic Conservation: Marine and Freshwater Ecosystems* 32, no. 3 (2022): 537-550.
- Gruber, Chase. "Social, economic, and spatial perceptions of gray seal (*Halichoerus grypus*) interactions with commercial fisheries in Cape Cod, MA." (2014).
- Hammerschlag, N., L. F. G. Gutowsky, A. J. Gallagher, P. Match, and S. J. Cooke. "Diel habitat use patterns of a marine apex predator (tiger shark, *Galeocerdo cuvier*) at a high use area exposed to dive tourism." *Journal of Experimental Marine Biology and Ecology* 495 (2017): 24-34.
- Healy, Teleah Joy, Nicholas James Hill, Adam Barnett, and Andrew Chin. "A global review of elasmobranch tourism activities, management and risk." *Marine Policy* 118 (2020): 103964.
- Herndon, Andrew, Vincent F. Gallucci, Douglas DeMaster, and William Burke. "The Case for an International Commission for the Conservation and Management of Sharks (ICCMS)." *Marine Policy* 34, no. 6 (November 2010): 1239–48. <https://doi.org/10.1016/j.marpol.2010.05.001>.
- Higginbottom, Karen, Chelsea Northrope, and Ronda Green. *Positive effects of wildlife tourism on wildlife*. Gold Coast: CRC for Sustainable Tourism, 2001.
- Huveneers, Charlie, Paul J. Rogers, Crystal Beckmann, Jayson M. Semmens, Barry D. Bruce, and Laurent Seuront. "The effects of cage-diving activities on the fine-scale swimming behaviour and space use of white sharks." *Marine Biology* 160 (2013): 2863-2875.
- IUCN Red List of Threatened Species. "The IUCN Red List of Threatened Species." Accessed March 6, 2022. <https://www.iucnredlist.org/en>.

- Jackman, J., Bettencourt, L., Vaske, J., Sweeney, M., Bloom, K., Rutberg, A., & Brook, B. (2018). Conflict and consensus in stakeholder views of seal management on Nantucket Island, MA, USA. *Marine Policy*, 95, 166–173. <https://doi.org/10.1016/j.marpol.2018.03.006>
- Johnson, Jeffrey C. *Selecting ethnographic informants*. Sage Publications, Inc, 1990.
- Kleespies, Matthias Winfried, Tina Braun, Paul Wilhelm Dierkes, and Volker Wenzel. "Measuring connection to nature—a illustrated extension of the inclusion of nature in self scale." *Sustainability* 13, no. 4 (2021): 1761.
- Laskowski, A. (2017). Tracking Cape Cod Sharks. Boston University. Retrieved From: <https://www.bu.edu/bostonia/fall17/greg-skomal-cape-cod-sharks/>
- Le Busque, Brianna, and Carla Litchfield. "Sharks on film: An analysis of how shark-human interactions are portrayed in films." *Human Dimensions of Wildlife* 27, no. 2 (2022): 193-199.
- Lucrezi, Serena, Suria Ellis, and Enrico Gennari. "A Test of Causative and Moderator Effects in Human Perceptions of Sharks, Their Control and Framing." *Marine Policy* 109 (2019): 103687. <https://doi.org/10.1016/j.marpol.2019.103687>.
- Masters, D. "Marine wildlife tourism: Developing a quality approach in the highlands and islands." *A Report for the Tourism and Environment Initiative and Scottish Natural Heritage, Inverness* (1998).
- Meletis, Zoë A., and Lisa M. Campbell. "Call it consumption! Re-conceptualizing ecotourism as consumption and consumptive." *Geography Compass* 1, no. 4 (2007): 850-870.
- Mervosh, Sarah. "Fatal Shark Attack Off Cape Cod Is First in Massachusetts Since 1936 - The New York Times." Accessed March 16, 2023. <https://www.nytimes.com/2018/09/17/us/cape-cod-shark-attack.html>.
- Meza-Arce, Mercedes I., Luis Malpica-Cruz, Mauricio E. Hoyos-Padilla, Francisco J. Mojica, María Concepción Arredondo-García, Claudia Leyva, Rebeca Zertuche-Chanes, and Omar Santana-Morales. "Unraveling the white shark observation tourism at Guadalupe Island, Mexico: Actors, needs and sustainability." *Marine Policy* 119 (2020): 104056.
- Mimila-Herrera, Emanuel, J. A. Trujillo-Córdova, N. Cárdenas-Palomo, and O. F. Reyes-Mendoza. "Tourist satisfaction with whale shark watching and

swimming tours in the Mexican Caribbean." *Qscience proceedings* 2016, no. 2 (2016): 36.

Miret-Pastor, Lluís, Agustín Molina-García, César García-Aranda, and Paloma Herrera-Racionero. "The connection between recreational fishing and the traditional fishing sector in the emerging area of marine tourism: challenges and opportunities for diversification with the European Fisheries Fund (EFF)." *ICES Journal of Marine Science* 77, no. 6 (2020): 2369-2374

Moxley JH, Bogomolni A, Hammill MO, Moore KMT and others (2017) Google Haul Out: earth observation imagery and digital aerial surveys in coastal wildlife management and abundance estimation. *Bioscience* 67: 760–768

Muter, B. A., Gore, M. L., & Riley, S. J. (2009). From victim to perpetrator: evolution of risk frames related to human–cormorant conflict in the Great Lakes. *Human Dimensions of Wildlife*, 14(5), 366-379.

Neff, C. (2012). Australian Beach Safety and the Politics of Shark Attacks. *Coastal Management*, 40(1), 88–106.  
<https://doi.org/10.1080/08920753.2011.639867>

Neff, C., & Hueter, R. (2013). Science, policy, and the public discourse of shark “attack”: a proposal for reclassifying human–shark interactions. *Journal of environmental studies and sciences*, 3(1), 65-73.

Neff, Christopher. "Human perceptions and attitudes towards sharks: examining the predator policy paradox." In *Sharks*, pp. 107-131. Routledge, 2014.

O'Bryhim, Jason R., and E.C.M. Parsons. "Increased Knowledge about Sharks Increases Public Concern about Their Conservation." *Marine Policy* 56 (2015): 43–47. <https://doi.org/10.1016/j.marpol.2015.02.007>.

Ostrovski, R. L., Violante, G., . M., de Brito, M. R., Valentin, J. L., & Vianna, M. (2021). The media paradox: Influence on human shark perceptions and potential conservation impacts. *Ethnobiology and Conservation*, 10(12), 1–15. <https://doi.org/10.15451/ec2020-12-10.12-1-15>

O'Toole, Jessica. *Anthrozoology and Public Perception: Humans and Great White Sharks (Carcharodon carcharias) on Cape Cod, Massachusetts, USA*. University of Washington, 2020.

- “Outer Cape Shark Mitigation Alternatives Analysis Available HERE | Truro MA.” Accessed April 28, 2022. <https://www.truro-ma.gov/home/news/outer-cape-shark-mitigation-alternatives-analysis-available-here>.
- Panoch, Rainer, and Elissa L. Pearson. “Humans and Sharks: Changing Public Perceptions and Overcoming Fear to Facilitate Shark Conservation.” *Society & Animals* 25, no. 1 (April 18, 2017): 57–76. <https://doi.org/10.1163/15685306-12341441>.
- Pedelty, Mark H. "Sentinels of Silence? Whale Watching, Boat Noise, and the Orca." (2020).
- Pepin-Neff, Christopher, and Thomas Wynter. "Shark bites and shark conservation: an analysis of human attitudes following shark bite incidents in two locations in Australia." *Conservation Letters* 11, no. 2 (2018): e12407.
- Polski, Margaret M., and Elinor Ostrom (1999) An institutional framework for policy analysis and design, Paper on Workshop in Political Theory and Policy Analysis Department of Political Science, Indiana University.
- Raudino, Holly, Dani Rob, Peter Barnes, Roland Mau, Emily Wilson, Sarah Gardner, and Kelly Waples. "Whale shark behavioural responses to tourism interactions in Ningaloo Marine Park and implications for future management." *Conservation Science Western Australia* 10, no. 2 (2016).
- Roman, Joe, Irit Altman, Meagan M. Dunphy-Daly, Caitlin Campbell, Michael Jasny, and Andrew J. Read. "The Marine Mammal Protection Act at 40: status, recovery, and future of US marine mammals." *Annals of the New York Academy of Sciences* 1286, no. 1 (2013): 29-49.
- Sabatier, E., & Huveneers, C. (2018). Changes in media portrayal of human-wildlife conflict during successive fatal shark bites. *Conservation and Society*, 16(3), 338-350.
- “Section 6.37 - Coastal Shark Conservation and Management, 322 Mass. Reg. 6.37 | Casetext Search + Citator.”
- Shields, Monika W. "Commercial whale-watching reduces vessel incidents in the vicinity of killer whales in Washington State." *Marine Policy* 145 (2022): 105290.
- Simmons, Peter, and Mehmet Ibrahim Mehmet. “Shark Management Strategy Policy Considerations: Community Preferences, Reasoning and

Speculations." *Marine Policy* 96 (October 2018): 111–19.  
<https://doi.org/10.1016/j.marpol.2018.08.010>.

Skomal GB, Braun CD, Chisholm JH, Thorrold SR (2017) Movements of the white shark *Carcharodon carcharias* in the North Atlantic Ocean. *Mar Ecol Prog Ser* 580: 1–16

State of the Waters: Cape Cod. "Overview." Accessed March 6, 2023.  
<https://capecodwaters.org/overview/>.

"Stats - Cape Cod Chamber of Commerce | Cape Cod, MA." Accessed March 6, 2022.  
<https://www.capecodchamber.org/members/membership/statistics/>.

Strauss, Anselm, and Juliet Corbin. *Basics of qualitative research*. Sage publications, 1990.

Sullivan, Emily. "Swimmer Dead After Shark Attack On Cape Cod." *NPR*, September 15, 2018, sec. National.  
<https://www.npr.org/2018/09/15/648295206/swimmer-dead-after-shark-attack-on-cape-cod>.

Sunstein, Cass R. "Probability neglect: Emotions, worst cases, and law." *Yale Lj* 112 (2002): 61.

Swarz, W., SALA, E., Tracey, S., Watson, R. & Pauly, D. (2010) The spatial expansion and ecological footprint of fisheries (1950 to present). *PLoS ONE*, 5, e15143.

Techera, Erika J. "Good Environmental Governance: Overcoming Fragmentation in International Law for Shark Conservation and Management." *Proceedings of the ASIL Annual Meeting* 105 (2011): 103–7. <https://doi.org/10.5305/procanmeetasil.105.0103>.

Topelko, Karen N., and Philip Dearden. "The shark watching industry and its potential contribution to shark conservation." *Journal of Ecotourism* 4, no. 2 (2005): 108-128.

Towner, A. V., R. G. A. Watson, A. A. Kock, Y. Papastamatiou, M. Sturup, E. Gennari, K. Baker et al. "Fear at the top: killer whale predation drives white shark absence at South Africa's largest aggregation site." *African Journal of Marine Science* 44, no. 2 (2022): 139-152.

Trave, Claudia, Juerg Brunnschweiler, Marcus Sheaves, Amy Diedrich, and Adam Barnett. "Are We Killing Them with Kindness? Evaluation of

Sustainable Marine Wildlife Tourism." *Biological Conservation* 209 (May 1, 2017): 211–22. <https://doi.org/10.1016/j.biocon.2017.02.020>.

Walker, Terence I. "Can shark resources be harvested sustainably? A question revisited with a review of shark fisheries." *Marine and Freshwater research* 49, no. 7 (1998): 553-572.

Wallach, Arian D., Marc Bekoff, Michael Paul Nelson, and Daniel Ramp. "Promoting predators and compassionate conservation." *Conservation Biology* 29, no. 5 (2015): 1481-1484.

Whitenack, Lisa B., Brady L. Mickley, Julia Saltzman, Stephen M. Kajiura, Catherine C. Macdonald, and David S. Shiffman. "Sharks, Lies, and Videotape: a content analysis of 32 years of Shark Week documentaries." *bioRxiv* (2021): 2021-08.

Williams, Eric. "Great White Shark Tagged off Woods Hole." Cape Cod Times. Accessed March 3, 2023. <https://www.capecodtimes.com/story/news/2004/09/24/great-white-shark-tagged-off/50930824007/>.

Winton, Megan V., James Sulikowski, and Gregory B. Skomal. "Fine-scale vertical habitat use of white sharks at an emerging aggregation site and implications for public safety." *Wildlife Research* 48, no. 4 (2021): 345-360.

Yin, Robert K. *Case study research: Design and methods*. Vol. 5. sage, 2009.

Zeppel, Heather, and Sue Muloin. "Conservation benefits of interpretation on marine wildlife tours." *Human Dimensions of Wildlife* 13, no. 4 (2008).