



Full length article

Fishing practices and representations of shark conservation issues among users of a land-based shark angling online forum



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ABSTRACT

Recreational fisheries can play a significant role in the population dynamics of threatened fish species, but have received much less research and management attention than commercial fisheries. Land-based anglers are a group of recreational fishers that fish from beaches or piers; however, comparatively little is known about the practices and perceptions of this stakeholder group. In order to gather data for an initial assessment of the fishing practices of land-based anglers and their perspectives on shark conservation issues, we performed a content and discourse analysis of an online discussion forum used by the largest land-based shark fishing club in Florida. Discussion board content analysis can identify evidence that certain perceptions or practices exist within a studied sample, but cannot be used to estimate how common those perceptions and practices are among the wider population. We found evidence that forum users are demographically distinct from other recreational anglers in Florida, and are mostly young males. Some forum users perceive themselves as relatively low-income compared with other fishing stakeholder groups. There was no evidence in forum discussions that patterns of reported landing and release of hammerhead and tiger sharks changed following the introduction of new legal protections for these species in 2012. This study identified a minimum of dozens of cases of illegal shark fishing practices among forum users, and found evidence that some users are aware that these practices are illegal. There was evidence that some users believe that their own practices have no effect on shark populations and should not be regulated. Additionally, this study found the existence of mixed attitudes and levels of trust towards scientific researchers and environmentalists.

1. Introduction

Populations of many shark species have declined, and approximately 24% of all known species of sharks and their relatives are listed as Threatened with extinction by the International Union for the Conservation of nature (IUCN) Red List (Dulvy et al., 2014). While these population declines are mostly attributable to commercial overfishing, recreational fisheries can have a significant impact on fish population dynamics (Coleman et al., 2004; Cooke and Cowx, 2004; Lewin et al., 2006) including shark populations (Gallagher et al., 2016). McClellan Press et al. (2015) noted that recreational shark fishing occurs throughout the coastal United States, and 93% of surveyed recreational anglers had caught a shark at least once. In 2013, 2014, and 2015 more non-dogfish sharks were killed in the United States by

recreational anglers than by commercial fishers, which can be attributed to both increasing numbers of sharks caught by recreational anglers and declining U.S. commercial shark fisheries (State of U.S. Fisheries, 2013, 2014, 2015).

Anglers have a variety of different motivations for fishing, ranging from catching fish to eat to simply enjoying a day outdoors (Holland and Ditton, 1992). A detailed understanding of stakeholder motivations can improve communications between policymakers and stakeholders, potentially increasing stakeholder buy-in to new regulations (Lundquist and Granek, 2005). For example, boat-based charter recreational anglers in Florida enjoy catching sharks for the sport and challenge of catching a big fish, but are concerned about global shark population declines and therefore generally release what they catch (Shiffman and Hammerschlag, 2014). Moreover, Florida's shark anglers generally

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exhibit a strong overall conservation ethic towards sharks, and many value healthy shark populations (Shiffman and Hammerschlag, 2014; Gallagher et al., 2015b), as do recreational shark anglers in Australia (Lynch et al., 2010). Gallagher et al. (2015b) noted that half of surveyed Florida boat-based anglers identified themselves as members of a conservation-focused angling group or club. These motivations and their implications for management are comparatively understudied for anglers who fish for sharks from beaches, bridges, and piers, referred to herein as “land-based shark anglers.” These anglers may have different motivations, values, and fishing practices compared with anglers who fish from boats, and should be studied separately.

Large sharks are a popular target of Florida’s recreational anglers (Fisher and Ditton, 1993; Shiffman and Hammerschlag, 2014; Gallagher et al., 2015b). Gallagher et al. (2015a,b) noted that nearly half of surveyed anglers intentionally targeted sharks. Though catch and release is commonly practiced by recreational anglers targeting sharks (Babcock, 2008; Shiffman and Hammerschlag, 2014), certain species like hammerheads (*Sphyrna sp.*) can be highly susceptible to lethal and sublethal capture effects and post-release mortality due to a strong physiological stress response (Gallagher et al., 2014). The physiological stress effects associated with boat-based shark fishing practices have been assessed for several shark species (Skomal, 2007; Brill et al., 2009; Skomal and Bernal, 2010; Marshall et al., 2012; Gallagher et al., 2012, 2014). However, the physiological stress effects of land-based shark fishing are not as well studied (Gallagher et al., 2016), though a recent study (Ajemian et al., 2016) looked at catch trends among Texas land-based shark anglers.

Successfully implementing conservation and management regulations requires effectively communicating with stakeholders, understanding their perspectives, and understanding the social context in which their attitudes are formed (Lundquist and Granek, 2005). Stakeholders who accept the legitimacy of scientific research and believe in the fairness of regulations governing their actions may be more likely to willingly follow those regulations, and may help to enforce those regulations through compliance pressure on their peers (Kennedy, 2010). In contrast, stakeholders who do not accept the legitimacy of scientific research or the fairness or the regulatory process may be less likely to willingly follow regulations (e.g., Suman et al., 1999). The perspectives of land-based recreational shark anglers are comparatively understudied.

An increasing number of social interactions occur online, and studying these interactions through the use of content and discourse analysis can help researchers to more fully understand a particular community (Dalsgaard, 2016). Recreational anglers are known to use online discussion forums to communicate with each other about fishing practices and the regulations governing their sport (Ridings and Gefen, 2004). Joining and participating in these “virtual communities” allows anglers to learn from more experienced community members, and to find partners for future fishing trips (Martin et al., 2014). Anglers often share stories and photos of their catches in these forums, which allows other anglers to experience their fishing successes vicariously (Ridings and Gefen, 2004). Although this method has significant limitations (see discussion), content and discourse analysis of posts made to online discussion forums used by anglers can provide a cost-effective, unobtrusive, and effective method of obtaining first approximation data on land-based angling.

Data gathered from discussion boards is limited compared with targeted surveys or interviews, because it relies on members of the studied population voluntarily posting information without any prompting from the researcher. However, gathering information from online forums can be a low-cost, logistically simple way of gathering first approximation data on an otherwise poorly studied population (Martin et al., 2014). Discussion board postings can reveal whether or not certain attitudes or behaviors are present within the studied sample, but this data cannot be extrapolated to determine the how common these attitudes or behaviors within the larger population (Steinmetz, 2012).

Because of its status as a hotspot for recreational shark fishing (Shiffman and Hammerschlag, 2014; Gallagher et al., 2015b), Florida is an ideal location to study land-based shark fishing. Accordingly, to provide an initial characterization of south Florida’s land-based shark fishery, we conducted a content analysis of posts made by members of the South Florida Shark Club (the largest land-based shark fishing club in Florida) on their online discussion board. The South Florida Shark Club (SFSC) is an organization whose stated goal is to “promote and protect [the] sport of land-based shark fishing.” The SFSC’s discussion forums are an active place of discussion, with 1183 registered members of the South Florida Shark Club writing 48,334 posts on 7074 topics (as of January 31, 2014). Some discussion board posts report the results of shark fishing trips, while others focus on a variety of related topics, including proposed shark fishing regulations, perceptions of other stakeholder groups, and other shark conservation issues.

Scientific analysis of information posted in online discussion forums requires a hybrid of content and discourse analysis with descriptive methodologies from the discipline of ethnography, and has been referred to as “virtual ethnography” (Steinmetz, 2012). Online discussion forum posts are typically archived and searchable, allowing researchers to analyze months or years of conversations without needing to observe them in real time (Steinmetz, 2012). Discussion board analysis can be considered to be the virtual equivalent of reading diaries or autobiographies, already an established component of ethnography research (Nardi, 2015; Dalsgaard, 2016).

In this study, SFSC discussion board posts were analyzed to address the following research questions with the goal of providing initial information on this understudied system with potential conservation implications: 1) What are the reported demographics of forum users? 2) Which shark species do forum users report catching? 3) What fishing practices do forum users report utilizing to catch sharks (with specific focus on whether or not sharks are brought completely out of the water, and whether or not sharks are released)? 4) Is there evidence that reported fishing practices vary between species (especially with respect to protected species where landing is prohibited and release is required)? 5) Is there evidence that reported fishing practices change once a shark species gains new legal protections (which prohibit landing and require release)? 6) Is there evidence of SFSC forum user knowledge of and perspectives towards any shark conservation and management policies (including specific types of policies that users support or oppose and reasons for that support or opposition, as well as willingness to follow regulations governing their own actions)? and 7) Is there evidence of forum user perceptions of other stakeholder groups involved in shark conservation and management (with specific focus on scientific researchers and environmental advocates)?

2. Methods

2.1. Content analysis of SFSC discussion board posts

Content analysis was carried out on posts from the South Florida Shark Club online forum homepage (<http://www.southfloridasharkclub.com/foro/>, accessed January 31, 2014). This method is a form of unobtrusive research (Babbie, 2013), which allows researchers to study stakeholder preferences without influencing the stakeholders. This is useful for studying controversial topics that stakeholders may be uncomfortable discussing with a researcher (Babbie, 2013). When analyzing discussion board content, passive observation is an established best practice, because when forum users are aware that they are being studied, they may alter their behavior, or even express hostility to the researchers (Nardi, 2015).

Researchers have an obligation to protect the individual privacy of those who are unaware that they are being studied, which can be done by anonymizing all posts before analysis (Steinmetz, 2012). This obligation to protect individual privacy exists even when analyzing posts made by pseudonymous users, those who have a consistent online

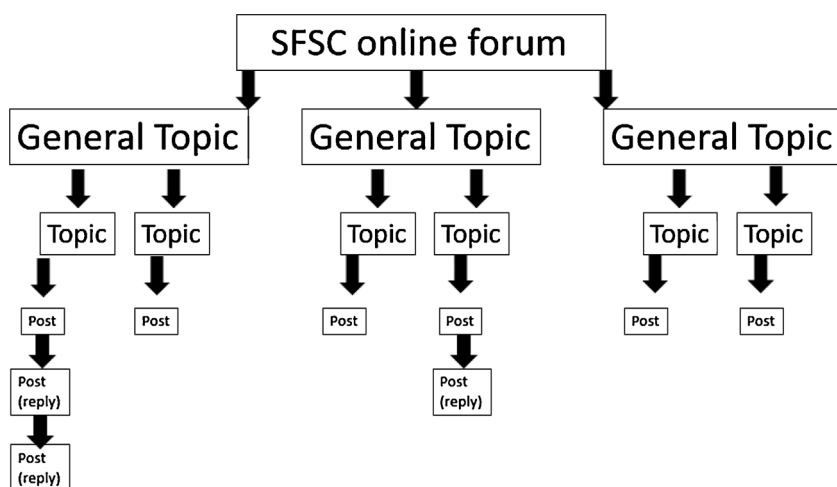


Fig. 1. A graphical representation of the hierarchical organization of content on the SFSC online discussion forum. General topics are the largest unit of organization, and are divided into topics. Each topic begins with a post, and may contain other posts which serve as replies to the original.

identity independent of their real-world names (Bernstein et al., 2011). Accordingly, to protect the privacy and anonymity of anglers, all names and identifying information were removed from posts (though many members used pseudonymous usernames) prior to analysis, and faces in all photos were blurred.

Throughout, we have occasionally standardized spelling, spacing, capitalization, and punctuation of quoted posts for ease of reading. However, we have not made grammatical corrections or altered the actual words or content of angler posts in any way. The intent is to allow the anglers to speak for themselves to the greatest extent possible, without distracting typographical errors. Forum posts can suggest that a perception or practice is present within the studied sample of SFSC forum users, but cannot be extrapolated to infer how common that perception or practice is within the wider population of land-based shark anglers.

Content on the SFSC forums was organized hierarchically (Fig. 1). At the top, there is a series of “general topics.” Within each general topic is a series of “topics,” which each start with a “post.” Posts may or may not have replies, also called posts. We determined subjects of interest prior to examining the SFSC forum, and determined which forum topics and posts to analyze based on these subjects. Every post within topics of interest (those focused on targeted species, fishing practices, and angler perceptions of other stakeholder groups and various other aspects of shark conservation and management, identified using keywords gleaned from a thorough initial reading of the discussion board content) (listed in Appendix A in Supplementary material) was downloaded using the Scrapy Python module on January 31, 2014 (Evans, 2009) to ensure that the information was not edited during analysis. All references to the text of posts made on the SFSC online forum refer to posts made before January 31, 2014, with the exception of posts documenting which species of sharks were caught and how they were handled (which include posts through December 31, 2015). Downloading posts using Scrapy Python did not require creating an account for the SFSC online forum. Once posts were downloaded, they were read, coded, and scored manually.

2.2. Forum user demographics and socioeconomic status

In order to detect evidence of forum user demographics, posts from the topic “introduce yourself” were searched for references to age and gender. In order to protect the privacy of forum users, no real names, pseudonymous usernames, hometowns, professions, or other identifying information was recorded. Additionally, we recorded any references to perceived socioeconomic class in other analyzed posts throughout the forum, though a statement of perceived socioeconomic class could not be independently confirmed with the data available here.

2.3. Reported fishing practices: species caught, brought ashore, and released

To determine the occurrence and relative rate of reported capture and handling practices for different shark species, all topics within the general topic “Florida shark fishing reports with pics” from January 1st, 2010 through December 31st, 2015 were analyzed. Posts referencing fishing trips outside of Florida, posts referencing boat-based fishing trips, or posts that did not include a photograph for independent confirmation were not included in analysis. To determine which shark species SFSC forum users reported catching, we noted the shark species included in each “Florida shark fishing reports with pics” post, and how many of each species were reported. All species identifications were independently confirmed by examining posted photographs. It should be noted that this method only detects catches and fishing practices that were voluntarily posted by SFSC forum users, and therefore represents a minimum count. Additionally, it should be noted that this method may result in a bias towards reporting a shark as landed, as photographs of sharks left in the water may be more difficult to obtain. For this analysis, only the first post within each topic was analyzed.

To determine which fishing practices that SFSC forum users report using to catch sharks and whether these practices vary between species, additional data was recorded from “Florida shark fishing reports with pics” posts. Within these posts, sharks were recorded as “landed” if a photograph unequivocally showed that a shark was completely out of the water. In contrast, if any part of the shark was still in water of any depth, that shark was recorded as “not landed” (Fig. 2). The percentage of sharks brought ashore was calculated by dividing the number of sharks of a species recorded as landed by the total number of sharks of that species that forum users reported catching. Additionally, any reference in a forum post to whether or not the shark was released was recorded, and was divided by the total number of sharks of that species that forum users reported catching. Reported landing percentages and reported release percentages were compared between species using Z-tests of proportions, with a Bonferroni correction added to account for testing multiple hypotheses.

The practice of bringing certain species ashore is illegal under Florida law. Section 68B-44 of the Florida Administrative Code notes that for species including lemon sharks (*Negaprion brevirostris*), sandbar sharks (*Carcharhinus plumbeus*), tiger sharks (*Galeocerdo cuvier*), and great, scalloped and smooth hammerhead sharks (*Sphyrna lewini*, *S. mokarran*, and *S. zygaea*, referred to as “hammerheads” herein), “No person shall harvest, possess, land, purchase, sell, or exchange any or any part of these species....land...means the physical act of bringing the organism ashore.” These protected species must be released “free, immediately, alive and unharmed.” The Florida Fish and Wildlife Conservation Commission’s (FWC) best practices guide for saltwater fishing notes that “it is never legal to hold onto a fish that is not allowed to

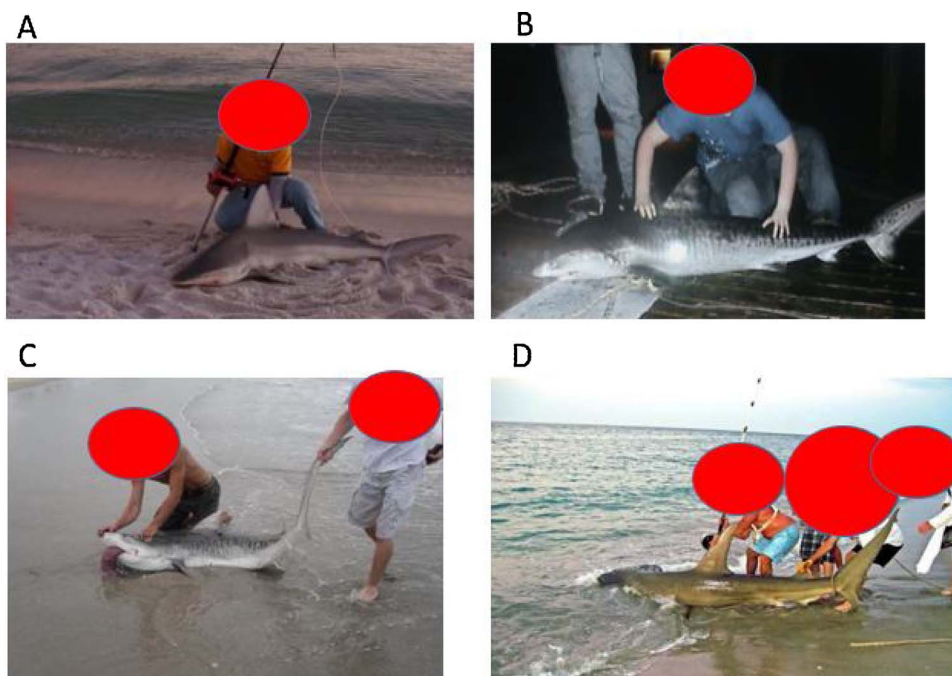


Fig. 2. Representative photographs from the “Florida shark fishing report with pics” forum topic demonstrating criteria for recording sharks as “brought ashore” or “not brought ashore.” A) This sandbar shark is far up on the beach, and is unequivocally completely out of the water. It was recorded as “brought ashore.” B) This tiger shark is on a dock, and is unequivocally completely out of the water. It was also recorded as “brought ashore.” C) This tiger shark appears to be mostly out of the water, but it is not unequivocally completely out of the water. It was recorded as “not brought ashore.” D) This great hammerhead shark has its gills still in the water, and was recorded as “not brought ashore”.

be harvested...to weigh or measure it.” We used this definition and standard to detect illegal fishing practices associated with handling of prohibited species.

Tiger and hammerhead sharks were added to the Florida prohibited species list in January of 2012. To determine whether reported fishing practices changed once these species gained new legal protections, we compared reported landing and release frequencies for tiger sharks and hammerhead sharks over time from 2010 through 2015 using ANOVAs assessing the effect of year on reported landing or release percentage, with a Bonferoni correction added.

2.4. Forum user perceptions with respect to shark conservation and management policies

To detect evidence of forum user perspectives towards shark conservation and management policy, specific topics and their associated posts were identified by the inclusion of previously selected keywords and analyzed. These included topics addressing proposed bans on fishing from beaches, topics discussing a recent Florida Fish and Wildlife Conservation Commission decision to add several new sharks to the state prohibited species list, and topics referring to fishing policy or regulations in general. These posts were analyzed to detect whether evidence that any forum users were aware of or concerned by shark conservation threats was present. Posts were also searched to detect evidence that any forum users support or oppose a given regulation and (determined from posts mentioning those regulations), when applicable, what reasons were provided for that support or opposition. Additionally, these posts were analyzed to detect evidence that any forum users were willing or unwilling to follow certain regulations (explicitly stating that they would not follow those regulations), and, when applicable, what reasons were provided to justify that willingness to follow or ignore regulations.

2.5. Forum user perceptions of other stakeholder groups involved in shark conservation and management

Any discussion forum posts that may suggest the presence of other relevant attitudes among forum anglers were recorded. These include references to perceptions of scientific research or environmental advocacy. These posts were examined to detect evidence of positive or

negative attitudes towards scientific research, scientists, and environmental advocacy among forum users. Finally, posts were analyzed to detect evidence of forum user perspectives concerning socioeconomic class conflicts (or other issues of power dynamics) between land-based anglers and other stakeholders.

3. Results

In total, this study analyzed 1256 posts from 91 topics from the SFSC online discussion forum. These topics were selected based on the presence of keywords and subjects of interest, and there is no way to determine how many different users posted because of the anonymized data.

3.1. Forum user demographics and socioeconomic status

Ninety-five anglers replied to an “introduce yourself” post with demographic information. Sixty-six (70%) were age 30 or younger, and only two were female. These demographics are broadly consistent with what was observed in photographs prior to blurring faces to protect the privacy of anglers, and broadly consistent with observations made from media coverage of land-based shark fishing in Florida (unpublished data).

Discussion forum posts provided evidence that some users perceive themselves as relatively low-income compared to other fishing stakeholders. Specifically, posts suggest the presence of a belief among some forum users ($N = 9$ posts that mention this subject) that wealthier Floridians are unfairly discriminating against them and their sport, and that certain government policies and regulations favor wealthier boat-based anglers over poorer land-based anglers (Table 1). One forum user posted that shark anglers were being discriminated against out of a “desire to keep regular folks out of the rich seaside towns.” It is impossible to independently confirm that these anglers are in fact relatively low-income with the available data, but no posts dispute this perception.

3.2. Reported fishing practices: species caught, brought ashore, and released

SFSC forum users reported catching a total of 1527 sharks of 15 species in posts to the forum topic “Florida shark fishing report with pics” dated from 2010 through 2015 (Fig. 3). Blacktip sharks (C.

Table 1

Selected representative quotes from forum posts referencing a perception that land-based shark anglers are being discriminated against by wealthier Floridians or government policies that favor the wealthy.

We are unfairly being targeted and discriminated based on people's fear of sharks and the desire to keep regular folks out of the rich seaside towns

These fish we are catching are the poor man's big game fish, the only way we have to live out our dreams

I now see how it really is with people calling us rednecks trying to insult us

This law says it's ok for the rich who can afford a big boat and gas bill to compete in kill tournaments. The poor ole normal man who can't get pass state waters is not allowed to play without harassment. As usual the rich gets special [privileges] that the normal person does not

our way of life is threatened by these people who from there million dollar mansions would rather not have anyone from outside their community coming to their beaches

They only want the richest of the rich around the coastal areas here. Take a drive along the coast where my favorite fishing spots are and you wouldn't even be able to tell the coast is right there. The sand and the surf are blocked out of view by the unoccupied mansions and condos. these condos are maybe half full for 1/5th of the year and empty for the rest, and work to keep the citizens of this area from being able to access and enjoy the beach. Where a mansion or condo doesn't stand, shrubs, trees, fences, even piles of dirt and rocks are put there to block anyone out who cannot afford to live there. You have to buy property worth over a million to get on the beach as much as you want

I am in the army defending our country and back home my government is doing this to the common man

I feel that in today's society and judicial system it is the people or person with the biggest wallet and the with the greatest influence that gets their way

we are an easy target, no big money, just a bunch of blue collar guys who don't have political connections or connections with FWC bigwigs

limbatus, N = 429) were the species that forum users most commonly reported catching. Reported catches also included several species which are protected in Florida waters (Fig. 4), including lemon sharks (*Negaprion brevirostris* N = 254), sandbar sharks (*C. plumbeus* N = 126), tiger sharks (*G. cuvier* N = 124), great and scalloped hammerhead sharks (*S. mokarran* and *S. lewini*, combined as “hammerheads” N = 115), and Caribbean reef sharks (*C. perezii* N = 1). These catches of protected species included at least 389 examples of illegal fishing practices (landing members of protected species or delaying release to measure their catch). One post noted that 17 tiger sharks were captured by a small group of anglers in a single evening. Additionally, the South Florida Shark Club hosts an annual fishing tournament called the “Big Hammer Challenge” which focuses on catching hammerhead sharks, the results of which are in a separate forum topic not analyzed by this study.

In almost all cases where a photograph was provided, the reported species matched what was shown in posted photographs. In a few cases,

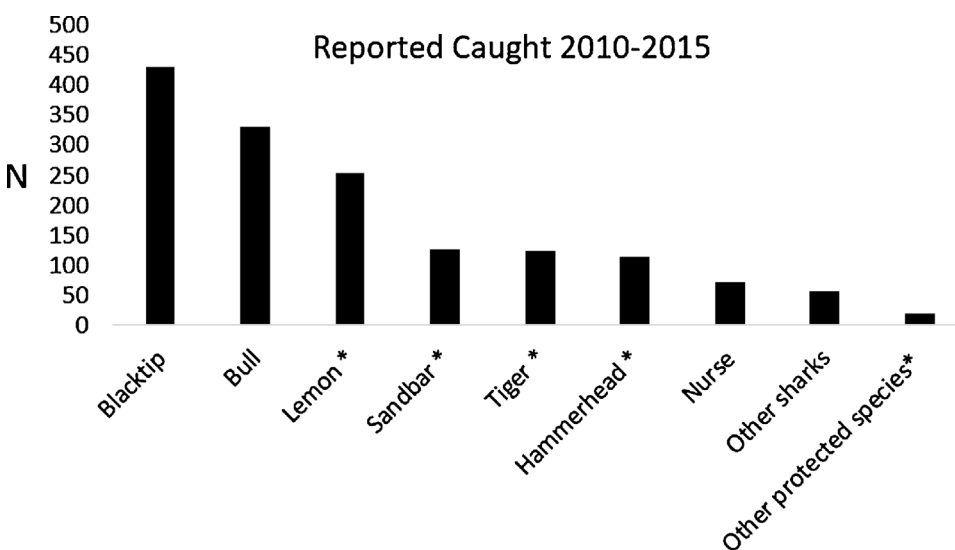


Fig. 3. The number of sharks that SFSC anglers reported catching in the “Florida shark fishing report with pics” forum topic from 2010 to 2015. Species with an asterisk are protected in Florida waters, though tiger and hammerhead sharks did not gain protections until January 2012. The “other sharks” category includes spinner (*C. brevipingna* N = 29), Atlantic sharpnose (*Rhizoprionodon terranova* N = 19), and bonnethead (*S. tiburo* N = 10) sharks. The “other protected species” category includes dusky sharks (*C. obscurus* N = 9), spotted eagle rays (*Aetobatus narinari* N = 5), mako sharks (*Isurus* sp. N = 4), and one Caribbean Reef shark (*C. perezii*).

blacktip sharks were misidentified as spinner sharks (N = 4) or bull sharks (N = 2), and in one case a sandbar shark was misidentified as a dusky shark. Every time that a post misidentified a captured shark species, a reply from another SFSC user corrected the species identification.

Eight hundred and seventy-nine of the 1527 sharks (57.5%) identified in forum posts were brought ashore and photographed unequivocally completely above the waterline (Fig. 4.). Anglers were significantly less likely to report (or post a photograph of) landing hammerhead sharks compared with other protected species (vs. tiger sharks $Z = -3.38$, $P = 0.001$; vs. sandbar sharks $Z = -4.395$, $P < 0.0005$, Fig. 5A), but not vs lemon sharks following a Bonferroni corrected alpha of 0.0125 ($Z = -2.3$, $P = 0.02$.) There was evidence that some forum users perceive that landing a shark is necessary. For example, one angler posted that “from shore it’s a whole different story, you don’t have the advantage of being above the fish and pulling him to a solid structure. You have to beach him to stop him... there is no way you are going to remove the hook while the fish is still in the water.” No posts expressing an alternative viewpoint (that landing a shark is not necessary) were identified. There was evidence that some forum users may be aware of species-specific variability in post-capture survival. For example, one angler posted that “certain sharks can handle being landed better than others; lemons, bulls, and tigers are very resilient while hammers and blacktips are not.”

Only 5.5% (N = 84) of analyzed posts in the “Florida shark fishing report with pics” topic explicitly mentioned releasing the captured shark, though none explicitly mentioned killing the shark. Most posts simply did not reference release or retention at all. Hammerheads were reported as released (13% of reported catches) more often than other protected species (Fig. 5B). However, the difference was not significant except in comparison with lemon sharks ($Z = -3.22$, $P = 0.001$).

There were no significant changes in reported fishing practices for hammerhead or tiger sharks following the introduction of new legal protections for these species in 2012 (Fig. 6). Reported hammerhead shark landing rates ($F = 0.001$, $P = 0.97$) and release rates ($F = 0.39$, $P = 0.56$) were not related to capture year. Relationships between capture year and tiger shark landing rate ($F = 0.005$, $P = 0.98$) and tiger shark release rate ($F = 2.81$, $P = 0.17$) were also not significant.

3.3. Forum user perceptions with respect to shark conservation and management policies

Posts suggest that forum users appear to be aware of and concerned by commercial overfishing of sharks (and of associated population declines). Some anglers shared conservation petitions, news articles and



Fig. 4. Photos (with faces removed) that unequivocally show protected species being brought completely out of the water. A–D show hammerhead sharks, E–G show lemon sharks, H shows a sawfish, I–L show sandbar sharks, and M–P are tiger sharks. Shark N is not unequivocally out of the water, but is included because it shows anglers measuring the shark before release. B, E, H, and P also show protected species being measured before release.

personal opinions about overfishing and shark finning ($N = 38$ posts mentioning this subject, Table 2). However, posts ($N = 24$ mentioning this subject) suggest the presence of a perception that commercial fisheries, not recreational anglers, are the only significant threat to sharks and should be the primary focus of conservation action (Table 3). Additionally, there was evidence that some forum users believe that certain new proposed restrictions on recreational angling were based on questionable scientific data (Table 4), and that fishing restrictions were evidence of government overreach in general (Table 5).

Discussions of current and proposed fisheries regulations on the SFSC forum suggest that some users pay close attention to rules governing their sport, and that some are actively involved in submitting official comments in support of their policy preferences. Posts suggest that forum users were concerned about two specific types of recreational angling regulations: municipalities banning fishing from local beaches, and the addition of popular sportfishing targets like hammerhead sharks and tiger sharks to the state prohibited species list (which eventually came into effect in 2012). Several coastal towns and cities have proposed banning fishing from their beaches, largely due to a concern that such fishing will attract sharks that will cause problems for swimmers (e.g., <http://archive.tcpalm.com/news/shaping-our-future/growth/martin-county-commission-to-vote-on-booze-ban-at-beaches-regulating-shark-fishing-2ab8721d-e307-0ae2-367582401.html>, accessed November 20, 2016). Posts suggest that some land-based shark anglers believe that this argument is flawed, and that sharks are not attracted to the beach by their fishing practices. These anglers argue that they fish at these beaches because sharks are already there. However, there was evidence that some forum users believe that beach-based anglers should try to be respectful of swimmers (Table 6).

The 2012 addition of tiger sharks and three species of hammerhead

sharks to the Florida prohibited species list was debated by forum members. We found evidence of a perception that these new protections could have negative consequences for sportfishing as a whole, as well as evidence of support for these regulations (Table 7). While some land-based anglers seem to object to all regulation of their sport, others point out that “responsible shark fisherman understand what they can, and cannot do.” Posts also suggest the presence of some frustration at irresponsible practices of other anglers (Table 7).

We found evidence of a perception that under the right circumstances, fishing regulations can be broken without punishment. Posts ($N = 29$ mentioning this subject) focused on how to continue fishing in locations where fishing was restricted or banned, and how to continue fishing for prohibited species without being caught, fined or prosecuted. The content of these posts included shared e-mail replies from law enforcement officers and from a defense attorney. One forum topic, “avoiding becoming an easy target,” included suggestions such as not advertising in advance where you will be fishing, not allowing strangers to photograph you, fishing primarily in areas where law enforcement officers rarely patrol, managing social media privacy and security settings, and scripting what to say if a lifeguard or law enforcement officer asks you to stop fishing (Table 8). Some users said that they would not follow any laws that restricted their ability to fish for whatever species they wanted wherever they wanted. In one case, an angler reported that he had successfully exploited loopholes in the regulations to avoid getting in trouble even after he was caught breaking them, and suggested that other anglers emulate this strategy (Table 8).

3.4. Forum user perceptions of scientific research and scientists

We found evidence that forum users are skeptical of scientific research that influences regulations (Table 4), as well as related

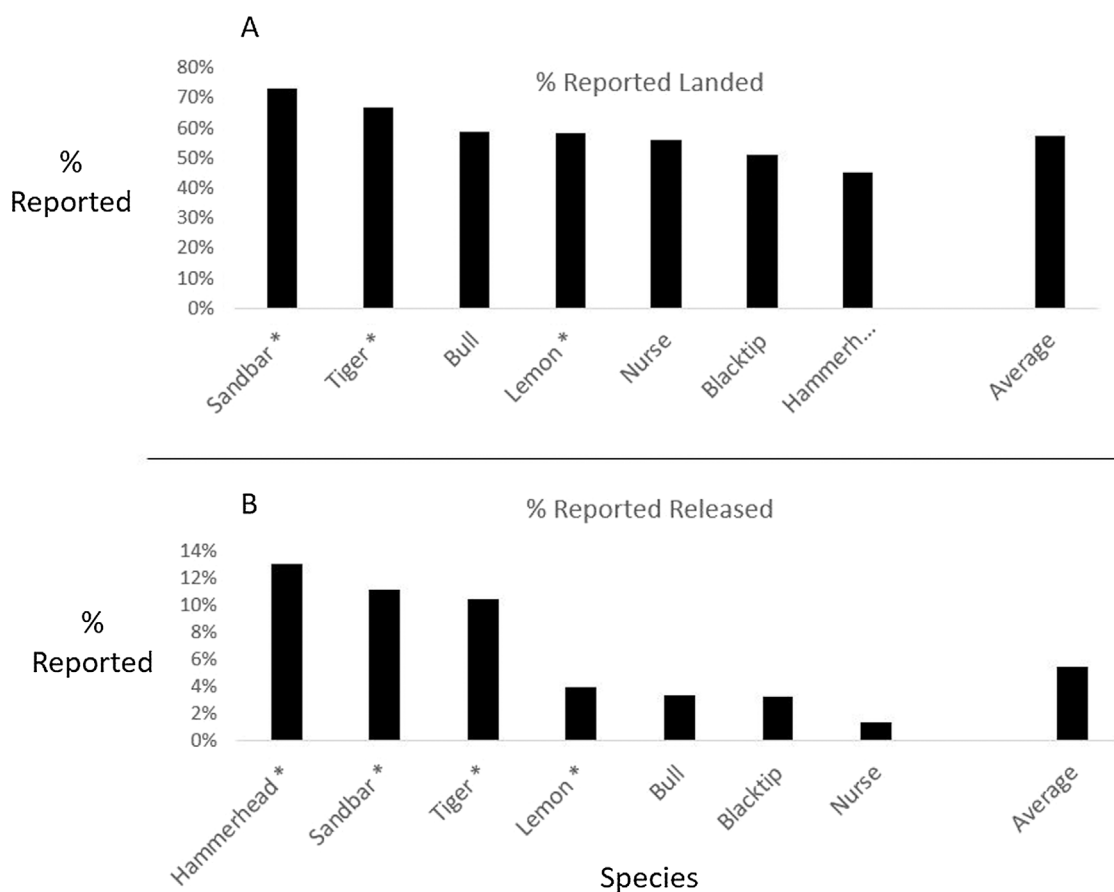


Fig. 5. A) The percentage of sharks of each species that were reported as landed, either through statements or through photos showing the sharks unequivocally, completely of the water. Protected species for which landing is illegal are indicated with an asterisk and B) The percentage of sharks of each species that SFSC anglers reported releasing, either through text or through a photograph showing the shark swimming away.

skepticism of scientists themselves. There was evidence that forum users have confidence in their “*traditional*” practices and are hostile to scientific empiricism when it contradicts (or appears to contradict) their experience or the knowledge which has been passed down to them (N = 17 posts that mention this subject). For example, one user wrote “*if they can’t make people believe there is a problem they won’t be given the research grants to study some stuff for the next few years which is where their salaries come from as well.*” There was also evidence that forum users recognize the potential value of successfully collaborating with the scientific community (Table 4). One user wrote “*I believe that the only way we will be able to keep this sport alive will not be by battling scientists and researchers with funding and influence, but to come up with some sort of agreement before it’s too late.*”

3.5. Forum user perceptions of environmentalism and environmental advocates

As noted above, there is evidence that forum users have pro-environmental attitudes, including concern about commercial overfishing and shark finning. However, there is also evidence that user perceptions of environmentalists is quite negative (N = 24 posts mentioning that subject). One conservation-minded statement from a user was prefaced with “*I am no tree hugger,*” and conservationists were described by one user as “*biased self-serving interests like the big lobby eco-terrorists.*” There was no evidence that forum users recognized that they may share interests and goals with environmental conservationists.

4. Discussion

4.1. Forum user demographics and socioeconomic status

Data from the “introduce yourself” topic suggests that forum users may be a demographically distinct group of recreational anglers. Forum users appear to be overwhelmingly young and male, different from the overall recreational angling community (53% of Florida recreational anglers and 52% of nationwide recreational anglers are female, 72% of Florida anglers and 69% of nationwide anglers are over 34 years old, Fish and Wildlife Service, 2011). Several SFSC members discuss having blue collar jobs and being “*regular Joes.*” We found evidence of a perception that wealthier coastal towns are discriminating against relatively low-income anglers and attempting to deny them access to coastal resources, though it is impossible to determine the accuracy of this perception among the wider population of anglers using forum data. Users also discuss their frustrated recognition that angling regulations don’t restrict wealthier boat-owning anglers as harshly as land-based anglers are restricted. Similarly, while conservationists often frame their work as a struggle against powerful corporate interests, some land-based anglers also clearly perceive scientists and conservationists as wielding significant social power relative to them. While relatively few posts support this perception, most posts were about unrelated topics and no posts refuted it. Stakeholder outreach strategies associated with new regulations should factor in these perceptions and concerns. Some anglers may be predisposed to distrust these regulations, and the facts and reasoning behind them should be explained thoroughly and respectfully factoring in inherent skepticism. Such outreach strategies may benefit from the involvement of anglers, researchers, or stakeholder organizations who are already trusted by the angling community.

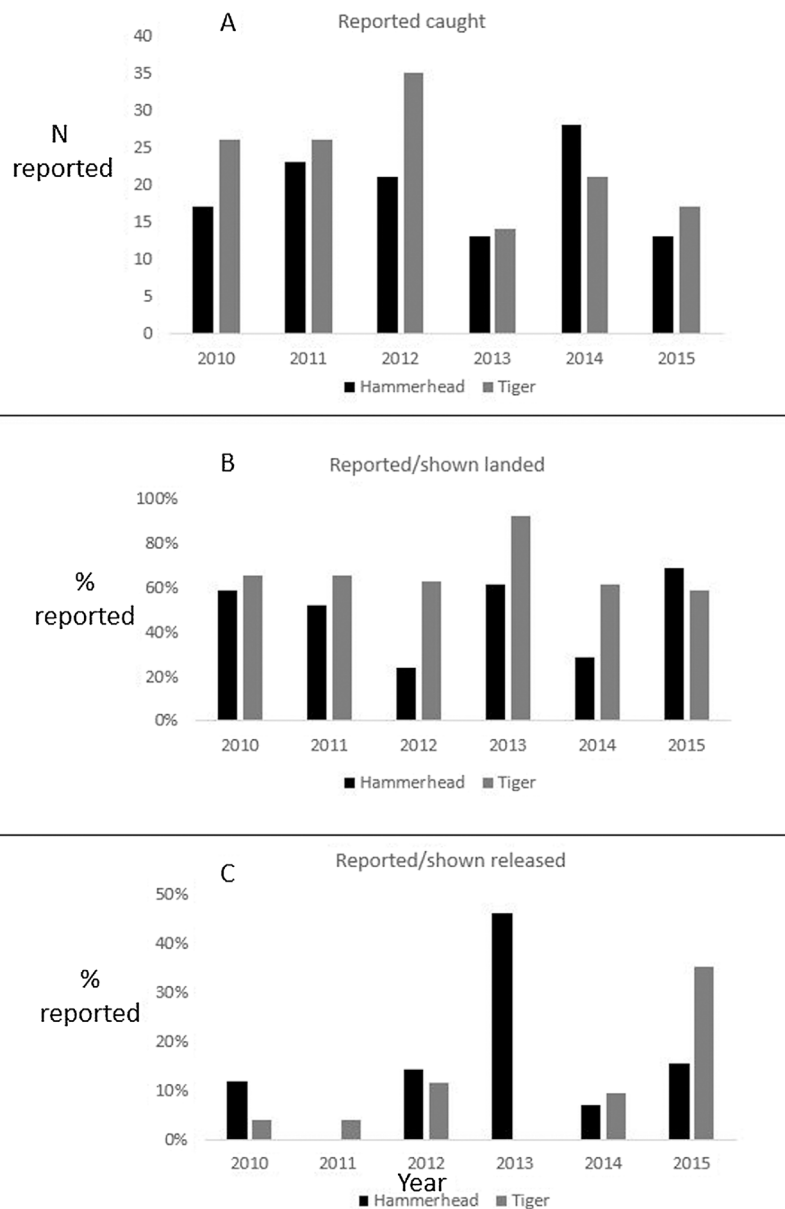


Fig. 6. Reported patterns of A) catch, B) landing, and C) release for hammerhead and tiger sharks before and after the legal protections for these species were enacted in January 2012.

Table 2
Selected representative quotes from forum posts demonstrating knowledge of and concern about shark population status and other examples of conservation ethic.

*Shark populations have been diminished on a world wide scale by the over fishing of the commercial fishing fleets of the world. Our goal has shifted from just catching sharks, to catching and releasing and educating fisherman and the general public of the need to protect sharks to secure their survival. We no longer kill sharks indiscriminately like were the common practice in the shark fishing community in the past give the shark stocks time to recover from so many years of commercial overfishing and good to see a release, in my opinion if you release the ones caught from land they'll only breed to make more little land-based sharks in the future
NO MORE MARLBORO CIGARETTE BILLBOARDS, WE NEED A SAVE THE SHARKS BILLBOARD!!!!!!"
WE WORK VERY HARD TO SAVE THE SHARKS WE CATCH
We at the SFSC know sharks need to be protected and we encourage everyone to safely release tiger sharks and hammerhead sharks back into the wild*

4.2. Reported fishing practices: species caught, brought ashore, and released

SFSC land-based shark anglers reported catching hundreds of sharks every year from 2010 through 2015, including dozens of protected species. This should be considered as a conservative estimate of total

land-based catch, as there are likely to be land-based anglers who are not members of this club, and SFSC anglers likely do not report every shark they catch. Even this minimum estimate of the scale of Florida's land-based recreational shark fishery suggests that this fishery should be given more research, stakeholder outreach, and management attention than it has received to date.

We found evidence of resistance to granting legal protections to hammerhead sharks that would prohibit landing and require release. Despite this resistance, our analysis of forum users' reported fishing practices shows that hammerheads are the least likely species to be reported as landed and the most likely species to be reported released. These reported fishing practices may be influenced by an awareness that hammerhead sharks are relatively physiologically fragile, which was noted by some users. Indeed, Gallagher et al. (2014) noted that great hammerhead shark blood had significantly higher lactate and pCO2 values after capture than blacktip, bull, lemon, or tiger sharks, values associated with extreme physiological stress. It is important to note that discussion board posts only show what fishing practices these anglers voluntarily reported, and the actual frequency of landing and release among the population remains unknown. Release is commonly reported among charterboat-based shark anglers in Florida (Shiffman

Table 3

Selected representative quotes from forum posts suggesting that commercial fisheries, not recreational anglers, should be the ones targeted by regulations.

directed towards the sport fisherman that have no impact on the shark stocks... A Complete ban on longlining of sharks is what is truly needed to give the shark stocks time to recover from so many years of commercial overfishing"

The rec fisherman cannot touch the population of sharks of any kind and dummies like guy pushes against folks that are on the same side when he could use his time a bit more wisely and push against long liners in other countries or big companies like BP who destroys entire ecosystems in one swipe. Priorities!!! get them in line folks, starting with the worst

If the so called "environmentalists" was doing their proper job and working towards a worldwide ban on finning the government would not be punishing the rec fisherman for what the commercial fisheries has done

it is incredibly annoying when someone kills a shark and all these tree huggers freak out. they don't realize that we don't kill every shark we catch we kill probably less than 1% they are so concerned by what local fishermen do with their catch but they don't care as much about commercial fishermen killing hundreds of sharks

Again, I just think we the recreational anglers should not be paying a price for the actions of others. The commercial fishermen and longliners are the ones that need have their privileges reduced as they are the ones depleting the oceans. And again most of this takes place outside of Florida

Does not seem fair does it??So the commercial guys can continue to set there long lines out beyond state waters and KILL both Hammerheads and Tiger sharks.....IS THAT THE BIGGEST BUNCH OF CRAP OR WHAT?

WE HAVE BEEN PRACTICING OUR SPORT FOR DECADES AND ARE AWARE OF THE NEED TO ACT MORE EFFECTIVELY TO ENCOURAGE CHANGE IN COMMERCIAL FISHING POLICIES AROUND THE WORLD—THIS SHOULD BE OUR FOCUS AND THE DIRECTION WE MOVE IN. WE ARE ALSO INTERESTED IN THE SURVIVAL OF THREATENED SPECIES BUT FEEL IT IS TRULY IN THE SHARK'S BEST INTEREST TO ACT ON A LARGER SCALE TO EFFECTIVELY ENCOURAGE CHANGE IN FISHING PRACTICES AROUND THE WORLD WHERE THE SHARKS ARE BEING DECIMATED ON LONGLINES BY THE MILLIONS

one of the problems is rod and reel fisherman attacking each other, instead of using that same anger and enthusiasm against the real problem which is long liners!!!!"

not educated to the real threats that affect worldwide fish stocks, A)Pollution B)The loss of coral reefs C)Developing nations that ignore international treaties/laws that safe guard the oceans and it's sea life D)Commercial Overfishing E)Over development on the coast & the destruction of seaside natural habitats F)Deforestation G)Global Warming ALL THESE THINGS ARE INTERCONNECTED AND AFFECT THE OCEANS

do these people really think that the Land based Shark Fishermen does nearly the same damage as these commercial or charter guys? Seriously?

I'll be honest I'm not against the ban for Commercial Fishermen as they are the ones that deplete the stocks of such fish. However, I am completely against the Recreational ban. I think it would be ridiculous if a recreational fisherman could not keep a Hammer or Tiger if he/she so desires. I mean how many hammers/Tigers do recreational fishermen get per year in Florida? The recreational fishermen do not deplete the stocks of these fish. Fish stocks are depleted by commercial fishermen/longliners etc. And most depletions take place outside of Florida.

et al., 2014), as well as among boat-based shark anglers in Australia (Lynch et al., 2010). However, in at least one case (Martin et al., 2014) posts made to an online recreational fishing forum were broadly correlated with actual fishing effort. Additionally, this study did not assess the results of the Hammerhead Challenge fishing tournament, which has received negative media attention in the past year (e.g., <http://wfla.com/2016/07/29/fl-officials-blame-shark-death-spike-on-fishermen/>, accessed November 20, 2016, which noted that poor angler handling practices were responsible for the deaths of hammerhead sharks).

The introduction of new legal protections for hammerhead and tiger sharks did not have a significant effect on reported landing or release frequencies among forum users. This suggests that the landing and release behaviors reported to the SFSC forum may be influenced by personal perceptions of best practices rather than legal requirements. For example, McCarty and Shrum (1994) noted that personal beliefs about the importance of recycling may have a stronger influence on recycling behavior than new regulations requiring this practice. However, Kinzig et al. (2013) noted that if a new policy requires a pro-environment behavior, repeatedly performing that behavior may lead to individuals increasingly valuing it.

Common land-based fishing practices documented in this study may be relatively physiologically stressful to sharks compared with boat-

Table 4

Selected representative quotes from forum posts showing user perceptions of scientists. This includes posts suggesting that policies restricting angling are based on questionable or biased scientific data, as well as posts demonstrating respect for scientists expertise.

what has happened to OUR country, when did bogus science and the views of minority groups are what govern the rest of us

These knuckle head scientist want to blame us for the declining shark stocks even if they KNOW THAT TO BE A HUGE LIE

we should come together as much as possible to defend ourselves from the ambitious self-righteous pompous pale skinned book worms that call themselves scientist and twist the truth,talk eloquently to less intelligent military types who believe the beautiful bullshit talked in their ears. The people at FWC and the commission are not smart enough or are inclined to work that hard to do their own independent research so they believe every supposed SAVIOR OF THE RESOURCES THAT scare them with the scenario of extinct shark populations

These lawmakers believe everything the overzealous scientist whisper in their ears so they gladly pass unjust laws that are forever changing the face of our sport

That's why I don't take much stock in what alleged scientists have to say

I am not sure how much these people really care about sharks, it seems to me all this is more like an attempt to get their name out there in the scientific community and advance their careers

Another example of book smart with no experience misinformation you have gathered on the way to earning your Player Hater Degree took some time to research this thing a bit the last couple of days and I think the best approach to this from our perspective is to attack the data from which these conclusions were made. There are a lot of contradictions in the so called "experts" opinions on shark stocks and how they draw their conclusions on populations. I would like this clearly defined with no assumptions made from biased self-serving interests like the big lobby eco-terrorists and other groups who seem only interested in protecting their grant money and contributions platform

I don't take much stock in what those guys have to say. Their info is flawed, numbers a doctored to how they think it best suits them

I realize biologists that study these animals in the wild have a whole other perspective than the anglers. Both would be better served to have a working relationship with each other coming to some sort of consensus as to maybe a small tag fee like \$10 a shark will at least save us the opportunity to harvest the sharks. Scientists get some funding and we get our trophy

I just wish scientists and marine biologists with clout, could help spread the word more, because they are the ones who know first hand what extremities humans will encounter without sharks!

thats what i thought but it was scientists who know more bout them then we do

based angling practices. Land-based anglers may drag sharks they catch across rough terrain onto shore, where sharks are susceptible to injury while lacking the buoyant support of the water. The perceived need to bring sharks on land for hook removal also may make captured sharks vulnerable to the effects of air exposure, which has been described as one of the greatest stressors associated with recreational angling in some fish species (Cooke and Suski, 2005). In teleost studies, only a few minutes of air exposure can result in a variety of negative physiological and behavioral effects. Possible effects include permanent gill damage (Cooke et al., 2002, largemouth bass *Micropterus salmoides*), up to an 80% reduction in hemoglobin oxygen carriage (Ferguson and Tufts, 1992, Rainbow trout *Oncorhynchus mykiss*), post-release behavioral impairment (up to 24 h of greatly reduced startle response to predators, Davis and Parker, 2004, sablefish *Anoplopoma fimbria*; significantly increased resting behavior and significantly reduced foraging behavior, Arlinghaus et al., 2009, Pike *Esox lucius*), and increased post-release mortality relative to fish not exposed to air (Suski et al., 2007, Bonefish *Albula vulpes*). Following simulated capture by commercial fisheries gear, Frick et al. (2010) noted that prolonged air exposure increased physiological stress levels in two shark species. Gallagher et al. (2014) noted that nearly half of hammerhead sharks appeared to suffer post-release mortality following simulated fishing, while Gurshin and Szedlmayer (2004) found a higher post-release survival of 90% in Atlantic sharpnose sharks. Future studies should attempt to quantify the physiological stress effects associated with land-based shark fishing practices, including prolonged air exposure and abrasions from rough terrain; although these practices may also occur in boat-based fishing, they may be more common among land-based shark anglers (McClellan Press et al., 2015). Future stakeholder outreach efforts should seek to

Table 5

Selected representative quotes from forum posts suggesting that fishing regulations are a problem of government overreach.

The best way to combat this, & it's not just FWC, this is a nationwide epidemic, is to register, & register any & everyone that you can, and VOTE, vote this totalitarian, power-hungry bunch out of office & try to keep this from ever happening again, GOD willing the tide will turn in NOVEMBER, but it won't on its own, it will take Patriots who honor the gift our Military has fought & died to preserve for us

America will be lucky in the EXTREME to survive this guy's term, ALL the EXEC.ORDS, all the rearranging of gov't. dept.s, all the BILLIONS thrown away, just to make sure they WERE thrown away & the skyrocketing fuel/power costs, the attempted gun grabs, fast & furious, AND thing s like this ridiculous, treasonous piece of garbage, are all to set up his moves in his last[Thank GOD] term, when he is going "Fundamentally change the United States", translated, that truthfully means "Absolutely decimate the United States; destroy the economy, finish off the Dollar, destroy our Constitutional form of Gov't., expand the totalitarian, socialist, nightmare that him & his handlers have decided to enslave Americans with

This garbage like the "legislation" here, HAS to be fought from the house/. /senate, Americans need to put extreme pressure on the congress to repeal all the ruinous exec orders, all the "fundamental changes" before it's too late, if this guy has his way, America, our home, is finished

DO NOT BE SURPRISED that soon you'll hear people being arrested left and right.... Let's see how many of us will last to shark fish. This is the beginning of the end for shark fishing in Florida.

RECREATIONAL FISHERMAN around the world are under attack by overzealous conservationists

WHEN THE REST OF THE WORLD IS THINKING OF WAYS OF SHUTTING US DOWN, WE ARE THINKING HOW WE WILL EVOLVE, IMPROVE TO NOT ONLY SURVIVE TRYING TIMES BUT EXCEL IN THEM

This is the united states of America and we have the right to live out our dreams. We hurt no one and some communist wants to push their way on us taking away land based shark fishing from is against our rights

"I will gladly and honorably attend to defend the rights of not only the land-based fisherman but all Florida shorebound anglers. Our rights as fisherman are under attack and we must each do what we can to defend our rights

"That really sucks, that is our rights they are messing with

Animal rights over people's rights

there are people in life who have no fun and entertain themselves by ruining someone's perfectly legal, safe, and non-harmful fun. I hope we will still be allowed to shark fish there in the future

The moment has arrived for those who care about our sport to take action and defend our liberties

communicate these results with the goal of encouraging less stressful angler behavior, and future regulations that require less stressful should be considered.

In this study, dozens of illegal interactions with protected species were documented, suggesting the need for increased stakeholder outreach and management attention. This should not be considered an estimate the frequency of these behaviors among the wider population, because anglers may be unwilling to publicly share evidence of their illegal fishing practices online. However, other studies have shown that people voluntarily post their illegal interactions with wildlife online. For example, an analysis of aquarium hobbyist online forums revealed widespread sale of the invasive *marmorckrebs* crayfish in jurisdictions where sale and possession are banned (Faulkes, 2013). Additionally, El Bizri et al. (2015) found hundreds of YouTube videos of illegal hunting practices in Brazil. Both studies suggest that people were fully aware that they were breaking the law, but did not expect law enforcement to intervene.

4.3. Forum user perceptions with respect to shark conservation and management policies

There was evidence that some forum users are aware of and concerned by commercial shark overfishing and finning, demonstrated by sharing news articles and petitions about these practices. This suggests the presence of a conservation ethic among land-based shark anglers, though additional research would be needed to assess how common this conservation ethic is among the wider population. Boat-based recreational shark anglers in Florida have also appear to have a conservation

Table 6

Selected representative quotes from forum posts showing that some anglers believe that they have a responsibility to be respectful of other beachgoers as they believe that they have a right to use the beach.

- 1) *CLEAN UP THE BEACH when you leave. – Don't leave trash or fish/bait on the shoreline when you are done fishing. Be responsible and take two extra minutes to unhook your bait, put it back in the cooler, and dump it in a proper area, such as the trash or a dock near the intercostal where they fillet and dump fish all day. Leaving the beach clean is the most important thing because that is where the majority of complaints have come from people against land based shark fishing.*
 - 2) *Don't fish extra crowded beaches with people swimming everywhere, as in July 4th for an example. That's asking for complaints.*
 - 3) *Keep your crew under control, depending on beaches.- If you are fishing in the keys or on a remote beach somewhere, you can play loud music, possibly have fires, and make all the noise you want because there is nobody around to complain. If you are fishing near towns with lots of houses around, or next to big hotels and tourism places, don't throw a 30 person kegger out there with a DJ. Someone will call the cops and it's for unnecessary reasons. The more positive attention that we draw to ourselves, the better for the short and long run. I'm 21 so I like to party like everybody else, but keep it under control on beaches that may draw attention.*
- A victory for sure because no ban was passed instead lifeguards and police can ask shark fisherman to leave a beach if someone complains or feels in danger. Makes sense to me!!! Responsible shark fisherman understand what they can, and cannot do.*
- After watching the video I'm pissed. I can't believe Blake did that with all those people there. No wonder it caused a stink. I hope that stupid shit don't cost us big time. I want to apologies to everyone for their stupid actions. It wasn't ignorance because they knew better. I thought I taught them a more politically correct way of doing things. If we don't lose our rights we got a lot to talk about. Looks like I'm gonna have to explain every bad scenario and spell it out for them. Listen to the little voice in your head that says "maybe we shouldn't do that".*
- Once a shark dies you might as well take the jaws to have a memento of your capture. I personally no longer practice this so that when the rare occasion that a shark dies on me the critics cannot say "he killed it for a set of jaws", that's my personal criteria.*
- We have to make sure that people aren't shark fishing in the day near people swimming... idk who's been doing that... but it obviously isn't helping us and it isn't the best thing to be doing regardless.*
- Especially the new kids on the block trying and putting in the time to catch a big fish. They look to this site for guidance on matters of style and our philosophy on how this Sport should be perused. I believe that through our desire to improve the image and heritage of the sport it will evolve into a respected form of game fishing.*

ethic. For example, Shiffman and Hammerschlag (2014) noted that 82% of Florida charterboat captains always release sharks they catch, and some explicitly advertise their practices as eco-friendly. Similarly, Gallagher et al. (2015a,b) found that 76% of surveyed shark anglers considered themselves knowledgeable about shark conservation, and McClellan Press et al. (2015) found that most anglers believe that sharks are a valuable part of the marine ecosystem.

Although this study found evidence that some forum users have a conservation ethic, we also found evidence of a perception that restrictions on recreational angling are unjust because commercial fishing is a much larger problem. A lack of posts challenging this perspective suggests that some users may be ignoring or unaware of the potential impact of their own activities, as well the fact that commercial fisheries are also restricted by management regulations. However, not challenging the view that recreational angling is harmless and shouldn't be regulated could also be explained by an attempt to avoid arguments with peers. While these results provide evidence that this attitude is present among SFSC forum users, it cannot determine how common it is among the wider population of land-based recreational shark anglers. It should be noted that a similar lack of recognition of the impacts of recreational angling has been observed among other anglers in Florida (e.g., Gallagher et al., 2015b) noted that climate change was perceived as a greater threat to sharks than recreational angling despite many survey respondents coming from a demographic that generally rejects scientific evidence of climate change). This potential lack of awareness of otherwise conservation-minded stakeholders to the impact of their own activities has also been observed with whale watchers, i.e., those who observe whales from shore are more likely than those who watch whales from boats to be concerned about how boats disrupt whale behavior (Finkler and Higham, 2004); and hikers, i.e., people who

Table 7

Selected representative quotes from forum posts expressing concerns about proposed restrictions on beach-based fishing or targeting hammerhead or tiger sharks, and selected representative quotes from forum posts expressing support for regulations.

All seaside communities that have passed SHARK FISHING BANS since the 1960's have done so illegally and with impunity or total ignorance of fishermen's rights I had NO IDEA that such a thing as a "shark fishing ban" actually existed. Coming from Texas, the idea of having such laws is ridiculous

let's get these sea-side cops educated to the fact that there SHARK FISHING BANS are totally Illegal and Unconstitutional, GET INVOLVED OR LOSE YOUR FISHING RIGHTS

Shark fishing from a beach does not put at risk swimmers. A hooked shark has never attacked a swimmer. Shark fishing takes place in the evening mostly when bathers are out of the water. We do not chum sharks to a beach (that would be absurd). We do not attract sharks to the beach, they already live and thrive there

one of our primary concerns is the erosion of big game fishing in Florida as more species are BANNED. Any species that is put on the 'no take' list cannot be claimed for a World Record from Florida waters. Soon all the big fish we once were able to target will forever be put out of reach of anglers

With these Complete Bans imposed, soon there will be nothing left we can take from the ocean. We don't want the needless killing of any shark but I as a BIG GAME HUNTER am personally of the opinion that a person targeting a world record should be able to do it in a state that has always had the reputation of being "Fishing Capital of the world". Restrictions imposed on fisherman should be based on sensible scientific research and align with the well-being of the masses

As a young man growing up shark fishing all over Florida I and many us of us in the SFSC dreamed of one day catching a World Record shark. At the top of the list of sharks that we wanted a Record for were the Tiger shark and the hardest fighting shark of all the hammerhead. That dream will soon be one to be abandoned because of laws proposed to ban the taking of those two species

It is critical that we manage our fisheries in this state and have a responsibility to so but let's do it in a sensible way

As strict as some of our laws are I wouldn't mind if they tightened others I have a 2 year old boy and I want him to be able to see sharks in the wild when he grows up The fact is don't you want to protect something that you love? I want there to be plenty of Sharks around so that my kids and even grand kids can catch them and get to see these magnificent perfect predators up close

We have more pressure than ever to be good stewards ourselves on the beaches we fish

approach wildlife too closely are aware that wildlife is stressed, but believe that their own proximity to wildlife is not the cause of that stress (Taylor and Knight, 2003).

Some forum users discussed a belief that certain regulations restricting their behavior are unfair. If this attitude is common among the wider population of land-based anglers, it may limit angler willingness to follow these rules. How stakeholders perceive the consequences of their environmentally harmful behavior is strongly correlated with willingness to change that behavior (reviewed in Kollmuss and Agyeman, 2002). In this case, a perception that recreational angling has an insignificant effect on population dynamics of target species may result in an unwillingness to change fishing practices. However, stakeholders may be more likely to accept outside information (e.g., scientific evidence) related to possible harmful impacts of their actions if they already have pro-environment attitudes (reviewed in Steg and Vlek, 2009). The presence of pro-environment attitudes among some forum users was demonstrated through posts including stated concerns about commercial overfishing and shark finning. If these pro-environment attitudes are widespread among the larger population of land-based recreational shark anglers, it may mean that these anglers could be willing to accept scientific data documenting harmful effects of certain recreational angling practices. However, other forum posts, including those downplaying the conservation impacts of land-based fishing practices, suggest that this acceptance may not have occurred yet. McClellan Press et al. (2015) found that many anglers are willing to adopt new fishing practices perceived as less harmful to sharks under some circumstances, and Cooke et al. (2013) found that engaging anglers can result in these stakeholders enforcing best practices amongst themselves even without formal regulations in place. These best practices should consider the experiences of the anglers themselves (e.g. Danylchuk et al., 2011) as well as the best available scientific research. To minimize the risk of Florida's land-based anglers distrusting the

Table 8

Selected representative quotes from forum posts discussing how to avoid getting prosecuted for violating fishing regulations, and declarations of ignoring the law.

Be smart, protect our sport by not naming specific beaches where you plan to fish in order to avoid any further conflicts with the beach going public or local authorities who really don't appreciate us catching sharks on their beaches. so when you want to post an event or a shark fishing trip state a general area without naming the specific place. Specific spots to be fish. You can say Palm Beach without saying Boynton beach, or you can say Miami without saying 43 street, you can say West Coast without saying Bradenton you can say the panhandle without saying Destin. Understood? If you state the specific beach you will be an easy TARGET, you might have locals trying to ambush us by taking pictures of us or asking questions that can be used against us in some absurd way, and to ban our sport

but FORGET Facebook, it's a method deliberately designed to track/control people, nothing more, that's why the lefty,progressive creep that designed it is now a multi Billionaire; & the CIA has awarded him lots of "perks".....STAY AWAY from Facebook, don't believe it? do some research

Don't talk to police, they can't build a case against you with just pics on Facebook Take down all pic's that may be questionable from FACEBOOK and another thing keep the media away from you when your shark fishing"

WHEN YOU GET TO THE DOCK AND A FWC OFFICER COME'S UP TO YOU HE IS GOING TO ASK YOU WERE DID YOU CATCH THAT SHARK OR FISH AT ALL I HAVE TO SAY IS THAT I WAS FISHING 3 MILES EAST OF FOWEY ROCKS OR SOME THING LIKE THAT. YA KNOW WHAT I AM TALKING ABOUT. THE FWC TOLD ME THE ONLY WAY FOR THEM TO FINE YOU OR TAKE YOU TO JAIL FOR HAVING A HAMMER OR TIGER SHARK. THEY HAVE TO CATCH YOU FISHING IN STATE WATER'S

the killing process is only legal in federal waters, and illegal in state waters but catching is legal in both state waters and federal. What FWC doesn't tell you is, when they ask you "Where you catch that hammerhead" they mean by that "Catching AND killing aka harvesting". And here you go – now you know the loophole. Example: You're on the boat, 200yds from shore, hook the monster, apply light pressure to let it run in federal waters, apply heavy drag, bring it to the boat, kill it, tale tie the fish, then do everything else mentioned above

Just say you're fishing for grouper, How can anyone really police land based shark fishing? Unless you openly admit to targeting sharks, I don't see how you can get caught I actually managed to speak to a beach patrolman (he didn't want to give me his name, which I understand), I asked him about the supposed ban and if he knew anything about it. At first he avoided the topic, basically saying no comment, but did eventually say that he was told about it from a superior but he didn't feel it was legal for him to kick someone off the beach just for fishing no matter what species. He then told me that not everyone in the force knows it and only the highest ranking officials will actually stop you

yes some of the FWC are a little lost actually very lost, It all comes down to a fwc giving you a ticket and going to court and presenting a case on what you read as the law, as soon as a state court (that is very weak) reads what is written in the rules and regulations it will get thrown out in a heartbeat, it's very misleading just like many of their other many written regulations, you can tell they have a real genius writing there rules

I don't care if fishing becomes a felony I WON'T STOP!"

I won't stop fishing because of this law, and I hope no one else stops either

We are outlaws now!!!!!!!"Strapped with A 16/0 on the side of me...I'm A shark fishing mother f\$cking G"..... HELL YEAH! I'M still sharking!!

"if that happens in Florida u will be able to find me behind bars, sharker for life

legitimacy of angling regulations, the scientific data and reasoning behind these regulations should be thoroughly explained to land-based shark anglers, preferably by scientists or managers with whom they can build trust.

Some users seem to perceive that decisions which affect something important to them are being made without their input, by people whose expertise they aren't familiar with and may not recognize as valid (a phenomenon reviewed in Kainer et al., 2009). Some users posted that they would not follow any laws that restricted their ability to fish for whatever species they wanted wherever they wanted. In contrast, other forum users appear to have concerns about the fairness of regulations affecting an activity they care deeply about, and seem to try to be a responsible and self-regulating group, sometimes frowning on activities they see as irresponsible or reflecting badly on land-based shark anglers as a whole. Both attitudes are present among SFSC forum users, but is impossible to know which view is more commonly held among the wider population of anglers without further study.

4.4. Forum user perceptions of interactions with other stakeholder groups

We found evidence that forum users appear to care about sharks and want to advance some conservation goals, while feeling they have little in common with environmentalists or scientists. To engage effectively with these anglers, conservationists and scientists may be helped by increased efforts to understand and show respect for this group and seek their expertise rather than condescend or attempt to dictate best practices without engagement with the community. Some forum users appear to have a conservation ethic, which suggests that cooperation and collaboration between the environmental community and these anglers may be possible (and even mutually desirable in some cases). Indeed, terrestrial hunters frequently have a strong conservation ethic (e.g., duck hunters helping to protect wetlands from development, Geist et al., 2001). Evidence from the forum shows that some users are well informed about several shark conservation topics (including commercial overfishing and shark finning) and care about these issues, suggesting common ground that could be a starting point for scientific and environmental outreach efforts. Evidence provided here suggests the potential for scientists and managers to work much more closely and productively with this community, but also demonstrates there are some individual anglers who may not be responsive to such an approach.

Some anglers perceive academics and policymakers as being out of touch and lacking in the real world experience which anglers reasonably believe they have developed in their years of catching sharks. A perception that the process of knowledge production is legitimate and unbiased is important to whether or not stakeholders accept regulations (Kosut, 2006; Rogers, 2008). While the anglers in this study recognize many of the realities that scientists are currently demonstrating empirically (for instance, the relative physiological sensitivity of hammerheads,) their different approach to knowledge production suggests that some anglers may not immediately and uncritically accept drastically different fishing practices just because scientists tell them they should. Recognizing both the legitimacy of angler knowledge and the barriers that differences between these knowledge systems may create to communication with academic scientists suggests the potential to improve this relationship to the benefit of both groups. Additionally, the interactions that some anglers have with these sharks may result in an independent dataset that can add to scientific conclusions (e.g., Frezza and Clem, 2015 documented how bonefish *Albula vulpes* anglers' observation about declining populations supplemented scientific surveys of bonefish populations). It is important to note that any collaborative research project between scientists and anglers should be driven by close collaboration with scientists equipped to understand the current gaps in research knowledge, and that the types of collaboration recommended here entail far more exchange between groups than the provision of catch and release tags to anglers.

Land-based anglers perceive that they (but not wealthier anglers who own boats) have been disproportionately affected by state management regulations, since they are unable to simply shift to fishing from boats in Federal waters as boat-based anglers can. However, these regulations affecting Florida waters were created by the state-level FWC, which has no jurisdiction to regulate fishing in Federal waters. Users are likely correct when they point out that restrictions on fishing from beaches, not boats fishing adjacent Federal waters, disproportionately affect low-income anglers who cannot fish offshore. As a user points out, "it is the people or person with the biggest wallet and with the greatest influence that gets their way," a principle reviewed with respect to environmental regulations in general by Igoe (2006). This concern raised by forum users should be further considered in future policymaking. Additional clarity about the intention of the law and the limitations of management frameworks may make anglers somewhat more accepting of these regulations, or at least create an alternate narrative to one that views these laws as a hostile act against land-based angling. This may be an issue of how the regulations are communicated

to these stakeholders rather than the text of the regulations themselves.

4.5. Advantages and disadvantages of discussion board content analysis

Content analysis of online discussion forums offers several advantages compared with surveys, interviews, or focus groups. First and foremost, this method is logistically and financially more feasible for the study of a geographically diffuse population. The members of such a population may be difficult for researchers to identify and contact directly, but some may already be communicating with one another online. Additionally, the archiving function of discussion boards permits analyses of trends through time without requiring long-term observation of a population. Analysis of discussion forum posts can reveal the presence of conservation-relevant attitudes and practices, if not how common they are in the wider population. Though this method cannot answer every critical research question about a population's knowledge, attitudes, and practices, it can provide a first approximation and suggest areas of focus for future in-depth studies.

Future researchers considering content analysis of online discussion forums should be aware of several limitations of this method. Perhaps most importantly, this method cannot assess the actual rate of occurrence of certain attitudes or behaviors among the wider population of anglers; it can only assess what SFSC forum users voluntarily post about those attitudes or behaviors. Therefore, data from this study can only indicate the existence of particular angler practices or perceptions among those posting to this specific forum. Applying results from a discussion board content analysis to the broader population assumes that every member of the population has equal access to and familiarity with internet tools. However, older anglers may be less familiar with such tools (Martin et al., 2012), even though 58% of U.S. senior citizens do report using the internet in general (Pew Internet and Society, 2013). Additionally, internet access is less commonly available to outdoorsmen with lower incomes, or those in more isolated areas (El Bizri et al., 2015). This means that certain demographics may be excluded from the analysis entirely, which may significantly bias results. Additionally, it is difficult for researchers to independently corroborate the authenticity of stories shared on social media (Dalsgaard, 2016). This difficulty may be of particular concern when dealing with "fish stories" shared by a community known to exaggerate details of their activities. This method requires forum users to have previously discussed the topic of interest, a distinct disadvantage compared to directly asking study subjects about these topics. Finally, while anonymizing discussion board posts is necessary and important to protect the privacy of users, it significantly limits the kinds of analysis that can be performed on the data recovered from the discussion board.

4.6. Conclusions

This study provided evidence that land-based shark anglers in Florida catch a minimum of hundreds of sharks each year, suggesting that additional research attention should be paid to this comparatively understudied fishery. We documented dozens of cases of illegal interactions with protected species, including bringing protected species completely out of the water and delaying release to measure the shark. Additionally, reported fishing practices did not change following the introduction of new legal protections for hammerhead and tiger sharks. Discussions on how to avoid getting caught, as well as how to avoid arrest or prosecution if caught, suggest that some anglers are aware that their practices are illegal.

While this study provides evidence that some SFSC forum users closely follow regulations governing their sport, it also suggests that some users may be unwilling to follow those regulations because they believe that commercial fishing is a bigger problem. There was also evidence that some forum users are skeptical of the science behind fishing regulations and have negative attitudes towards scientists. However, there was also evidence that other forum users have positive

attitudes towards scientists and understand the need for fishing regulations based on available research. Additionally, despite evidence of users demonstrating a conservation ethic, users seem to hold negative attitudes towards conservationists themselves. While good communication between stakeholder groups is helpful in managing any resource, it seems particularly vital here. Conservationists, scientists, regulators and land-based shark anglers, however different, share many values and each care deeply about the future of sharks.

These results (which target one of the largest known discussion boards focusing exclusively on this type of angling) represent a useful initial analysis of this emerging conservation issue, even if the perspectives and practices analyzed here may be atypical of the broader land-based shark angling community. Further research on land-based shark angler knowledge, attitudes and practices is needed to determine if some of the perspectives expressed by anglers in this study are widespread in the angling community. This future research should take the form of surveys, interviews, and focus groups targeting the broader community land-based shark anglers.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.fishres.2017.07.031>.

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