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Perceptions of recreational fisheries conservation within the fishing industry: Knowledge gaps and learning opportunities identified at east coast trade shows in the United States

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ABSTRACT

The recreational angling community is comprised of diverse stakeholders, including the trade sector responsible for the manufacturing, distribution, and sales of tackle, boats, and clothing, angler-based travel, revenue-generating popular media, and angling services. Through marketing and promotion, fishing companies compete for customers by convincing anglers as to what success means when they go fishing. If the angling trade can influence the social norms in the recreational angling community, then this could hold true for norms related to the conservation of recreationally targeted fishes and their habitats. We questioned whether individuals working within the fishing trade are adequately informed about best practices for recreational fisheries conservation, since these perceptions could, in turn, influence the values portrayed in the marketing and promotion of fishing. For this study we surveyed fishing trade employees during five industry and consumer shows to evaluate their perceptions about recreational fisheries conservation and where they believe their consumers learn about these issues. Across events, respondents believed that commercial fishing and habitat loss were the greatest threats to recreational fisheries. Specific to the angling event, physical injury when handling (e.g., during hook removal) and duration of the fight were selected as having the greatest impacts on fish, with between 74 and 91% of respondents indicating that they felt impacts were species-specific. Respondents believed that their customers received information on best practices and conservation predominantly from peer-to-peer interactions, social media, and fishing magazines. They also indicated that one of the primary roles of the angling trade when it comes to recreational fisheries conservation is to convey best practices in marketing and promotion. Overall, the trade sector appears to be an important mechanism for reaching anglers, yet more work is needed to ensure that the conservation information they share is consistent with science-based best practice.

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1. Introduction

Globally, recreational angling is an industry that generates hundreds of billions of dollars in economic activity (World Bank 2012). The industry functions through the use of fishing equipment (e.g., reels, rods, tackle, bait) and associated services (e.g., boats, fuel, lodging, guide services) so participants can try to catch fish. Such goods and services related to recreational fishing can range from being basic and relatively inexpensive (e.g., handline and baited

hook, do-it-yourself), to elaborate, equipment-intensive, high-tech, and costly (e.g., offshore powerboat equipped with sophisticated GPS and sonar along with a highly-trained crew), and the selection of goods and services is often species- and location-dependent, varying with the skill and knowledge base of the recreational angler (Arlinghaus et al., 2007). As many recreational anglers will also attest, the accumulation of fishing gear is as much a hobby and obsession as is the actual activity of going fishing (McGuane, 2001).

Manufacturers and conveyers of goods and services maintain viable businesses by competing for the attention of consumers through marketing and promotion that emphasizes some benefit of using one company's products versus another (Petty et al., 1983; de Mooij and Hofstede, 2010; Micu et al., 2011). For many

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sports and recreational activities, the potential rewards of brand selection are often associated with athletic achievements based on improving skills that result in greater accuracy, speed, distance, and scores (Carlson et al., 2009). Marketing and promotional campaigns often use professional athletes to endorse products and draw consumers away from the competition (Stevens et al., 2003; Bush et al., 2004). Such tactics are also reflected in the recreational fishing trade, except that angler success is predominantly contingent on the probability of actually catching a fish. As such, recreational angler success, and essentially consumer/customer satisfaction, is largely contingent on access to and abundance of healthy recreational fish stocks (Arlinghaus, 2006; Schuett et al., 2010), and can be independent of angler skill, the type of gear used, and if the angler is catching to keep or practicing catch-and-release.

Although the foundations of recreational fisheries conservation and management largely fall on the shoulders of government agencies (Lackey, 1998; note, in some jurisdictions fisheries management is privatized as individuals and angling clubs maintain fishing rights such as in Europe [see Arlinghaus, 2006]), it is ultimately the decisions and behaviors of individual anglers that influence how fish and their habitats are treated (Arlinghaus et al., 2007). Recreational anglers may be willing to take risks by breaking laws and ignoring regulations rather than allowing other anglers to reap the benefits in open access recreational fisheries (Cox et al., 2002). Communications among anglers and related social networks can influence the perceived benefits of adopting best practices for recreational fisheries, including catch-and-release as a conservation tool (Arlinghaus, 2006; Arlinghaus et al., 2007). Nevertheless, even government agencies charged with setting and achieving management objectives can inaccurately communicate how anglers should be interfacing with their catch (Pelletier et al., 2007).

Given how marketing and promotion campaigns are meant to capture the attention of recreational anglers, perceived values upheld within the fishing trade could influence angler attitudes and behavior when it comes to fisheries conservation and who is responsible for sustaining recreational fish stocks (as shown in other sports, Lear et al., 2007; Moutinho et al., 2007; Dionisio et al., 2008). For instance, research quantifying the impacts of catch-and-release has shown that air exposure can impact physiology, post-release activity, and increase mortality (Cooke and Suski, 2005; Cooke et al., 2013a), yet photos depicted in advertisements in the fishing industry frequently show fish being held out of water, often by fishing celebrities, even if they are predominantly a catch-and-release species (Cook et al., 2015). Such rules of behavior, or 'social norms' (Fehr and Fischbacher 2004), related to best practices for recreational fisheries conservation could be linked to how members of the fishing trade perceive their role within the angling community, however this linkage has yet to be assessed.

For this study we surveyed employees of the fishing trade as they attended industry and consumer tradeshows to evaluate their perceptions about recreational fisheries conservation and where they believe their consumers learn about best practices. Given the scale and diversity of the fishing industry, we acknowledge that perceptions likely differ by region, country, and fishing type, but do believe that modern platforms for marketing and promotion (e.g. Internet), the crossover of recreational anglers that participate in a range of recreational fisheries, and the globalization of the recreational fishing trade, all help to break down barriers to communications for companies targeting recreational anglers. As such, identifying knowledge gaps within a specific country or region could still provide a foundation for guiding the communications of best practices for recreational fisheries conservation from the fishing industry to their customers.

2. Methods

In-person written surveys were conducted during one industry tradeshow (Florida) and four consumer shows (New Jersey) between July 2014 and May 2015. Respondents were selected haphazardly while surveyors circulated through the shows, and only individuals that could clearly identify themselves as employees of fishing gear manufacturing companies, retailers, and service providers were asked to participate. A pilot version of the survey was circulated to company employees ($n = 10$) not attending the tradeshows to get feedback on terminology and identify any questions that were potentially confusing to respondents; responses from the pilot survey were not included in the data accumulated from the trade and consumer shows.

The survey was comprised of 15 questions (12 closed-ended, 3 yes/no) asking respondents about: 1) perceived threats to recreational fisheries, and 2) where they feel their customers get information about best practices for recreational fisheries conservation (Appendix A). Information was also obtained about whether they were recreational anglers themselves, their role in the company, and their history in the fishing industry. To avoid resampling, all individuals were first asked whether they had taken the same survey before. All closed-ended questions included an 'Other (please specify)' option to provide respondents with the flexibility to add a topic that was not already listed (Strauss, 1987). For two questions that focused on threat perceptions and impacts of recreational fisheries, respondents were able to select up to two of the options provided, thus in some cases the total number of answers for these questions could exceed the number of respondents. For questions related to respondent perceptions, we ranked the frequency of responses from highest (1) to lowest (depended on the number of categories), and when two or more categories had the same frequency, they received the same rank. Mean ranks (± 1 SD) were then calculated and used to compare trends in responses by industry employees across trade and consumer events. Ranks were compared for each question among tradeshows using a two-way contingency table and Chi square test comparing the distribution of scores. All analyses were performed using JMP 10.0.0 (SAS Institute, Cary, NC, USA) and the level of significance (α) for all tests was 0.05.

3. Results

A total of 180 individuals completed the survey. However, ten surveys were excluded from the analyses because the response to the question about their current job indicated that they were not actually employed by a company involved in the fishing trade. Of the 170 remaining surveys, 24 respondents (14%) indicated that their role in their current company was something other than the categories provided, however, based on the roles they indicated we were able to assign them to existing categories. Not all respondents answered each of the 15 questions in the survey. Thus, some sample sizes reported below differ from the total number of respondents surveyed. Three respondents did not complete the entire back page of the survey, representing only 0.5% of the all survey questions. An additional 14 survey questions were left blank (0.55%), with nine of these being a question about the roles the respondents played when working for other fishing industry companies. No questions were skipped regarding the respondent's perceptions and beliefs regarding recreational fisheries conservation and the role of the industry.

A total of 18.2% of respondents ($n = 31$) identified themselves as sales representatives, 13.5% ($n = 23$) in product development, 12.9% ($n = 22$) as sales managers, 12.4% ($n = 21$) in media (print, online, video, photographers, writers), 10.0% ($n = 17$) as upper

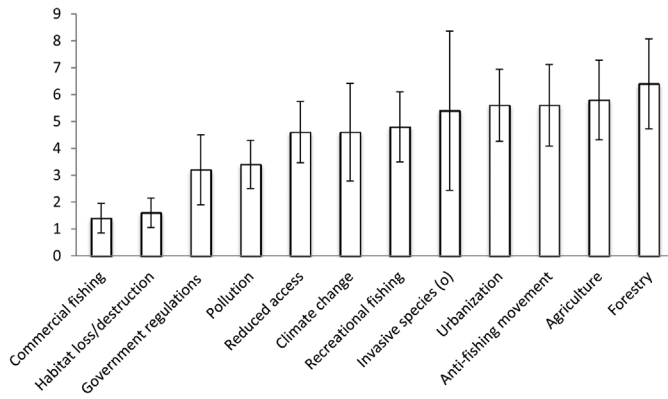


Fig. 1. Mean rank (±SD) of perceived threats to recreational fisheries, as expressed by industry employees at trade and consumer shows (n = 5). Lower values represent a higher proportion of responses.

management, 9.4% (n = 16) in marketing, 8.8% (n = 15) as fishing guides/boat captains, 8.8% (n = 15) direct sales/retail, 4.1% (n = 7) as travel agents, and 1.8% (n = 3) in company operations (e.g., information technology, customer service). The mean number of years individuals were with their current employer was 11 ± 1.5 yr (range across shows 0–50 yr), while the mean number of fishing companies each individual had worked for during their time in the industry was 2.2 ± 0.8 (range across shows 0–25 companies). A total of 94% of respondents indicated that they occupied a different type of position when they worked for other companies in the recreational fishing industry. Only 1.7% (n = 3) stated that they did not participate in recreational fishing themselves. For those that did fish, respondents had been actively engaged in recreational fishing for 35.2 ± 6.8 yr (0–65 yr across shows), and on an annual basis actively fished themselves for 103.4 ± 15.3 d (range across shows 0–300 d).

Across trade and consumer shows, respondents believed that commercial fishing and habitat loss posed the greatest threats to recreational fisheries, followed by government regulations and pollution ($\chi^2 = 55.09$, $p < 0.001$; Fig. 1). Invasive species were indicated as a threat to recreational fisheries at three of the five shows, and was selected as frequently as commercial fishing at one of these events. When fish are caught, respondents believed that physical injury when handling was the most deleterious to fish, followed by the duration of the fight, and air exposure ($\chi^2 = 155.54$, $p < 0.001$; Fig. 2). At three shows, angler inexperience was specifically indicated under ‘other’ (n = 4), representing 3% of the total responses. Among shows, between 74 and 91% of respondents (n = 15–32) indicated that they felt the impacts of an angling event were

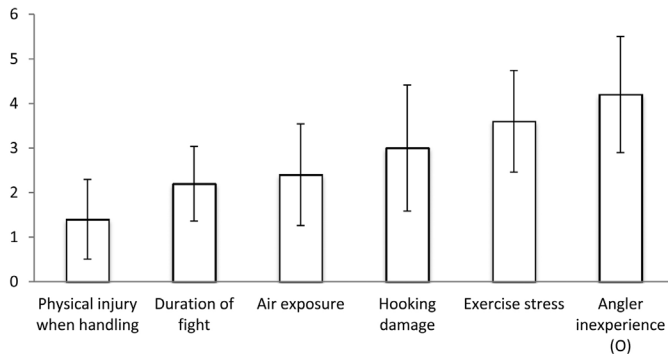


Fig. 2. Mean rank (±SD) of perceived impacts to fish that are caught and handled by recreational anglers, as expressed by industry employees at trade and consumer shows (n = 5). Lower values represent a higher proportion of responses.

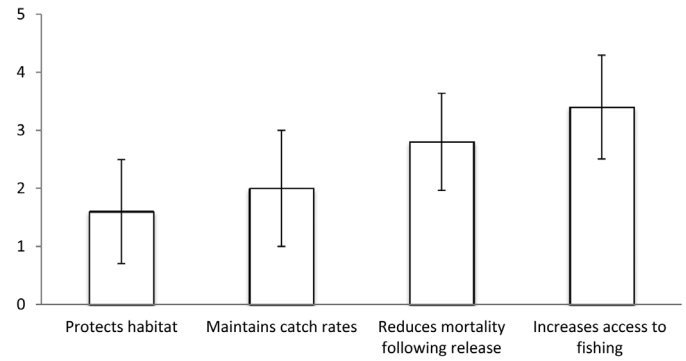


Fig. 3. Mean rank (±SD) of perceived goals of recreational fisheries conservation, as expressed by industry employees at trade and consumer shows (n = 5). Lower values represent a higher proportion of responses.

species-specific (i.e., that not all fish respond the same way to angling).

Respondents most frequently indicated that they believed best practices for recreational fisheries conservation results in the protection of habitat and the maintenance of catch rates, followed by a reduction in mortality after release and increased access to fishing ($\chi^2 = 191.5$, $p < 0.001$; Fig. 3). Following best practices and abiding by regulations were more frequently selected as important contributions recreational anglers can make when it comes to fish conservation ($\chi^2 = 52.91$, $p < 0.001$; Fig. 4). When asked about where they believed anglers get their information about the conservation of recreational fisheries, direct peer-to-peer, social media, and fishing magazines were selected more frequently than options such as government and non-government agencies, and fishing product companies ($\chi^2 = 55.28$, $p < 0.001$; Fig. 5). For two shows, respondents indicated that they were not sure where their customers received information on recreational fisheries conservation. Respondents most frequently indicated that the role of the fishing industry in fisheries conservation is to convey best practices in marketing material and lobby to change to public policy related to fishing (e.g., through the American Sportfishing Association, American Fly Fishing Trade Association), followed closely by participating in research ($\chi^2 = 70.61$, $p < 0.001$; Fig. 6). Across shows, 20–86% of respondents (n = 3–21) were personally members or volunteered for conservation organizations that focused on fish or aquatic ecosystems, and 39–89% of respondents (n = 3–21) indicated that their company belonged to and/or supported angling-based conservation organizations.

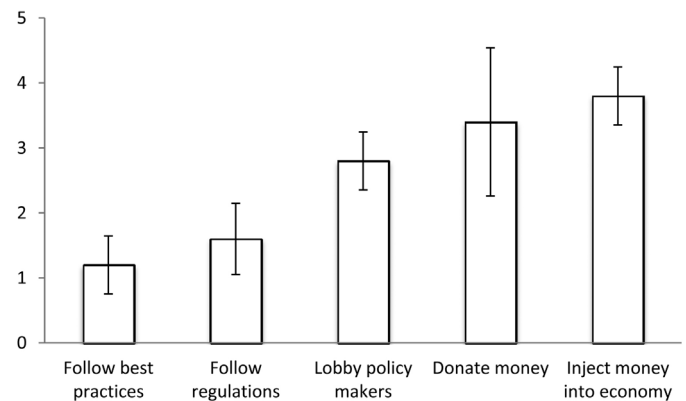


Fig. 4. Mean rank (±SD) of perceived role anglers play in recreational fisheries conservation, as expressed by industry employees at trade and consumer shows (n = 5). Lower values represent a higher proportion of responses.

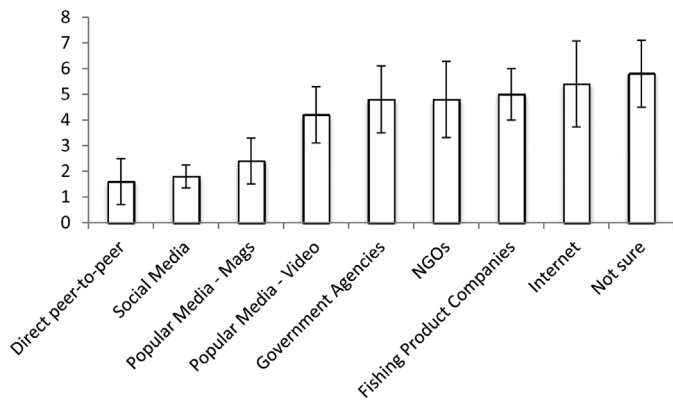


Fig. 5. Mean rank (\pm SD) of perceived sources where anglers learn about recreational fisheries conservation, as expressed by industry employees at trade and consumer shows ($n=5$). Lower values represent a higher proportion of responses.

4. Discussion

Employees of angling trade companies that were surveyed during trade and consumer shows expressed a diversity of threat perceptions associated with broad impacts to recreational fisheries, with commercial fishing and habitat loss most frequently selected as the greatest threat. Commercial fishing is often singled out and highlighted in the popular media as the dominant cause of the decline of fish stocks, particularly in the marine realm (Jackson et al., 2001; Pauly and Zeller, 2016), so it is not surprising that threat perceptions within the recreational angling community would point to commercial fishing as potentially impacting their catches. Interestingly, in the freshwater realm, overfishing by commercial interests occurs rarely (Cooke et al., 2014) with most overexploitation being attributed to the recreational sector (Post et al., 2002), at least in developed countries. Similarly, habitat loss, fragmentation and the collapse of ecosystems are occurring at rapidly on a global scale (Hoekstra et al., 2005; Airoldi et al., 2008; Waples et al., 2009; Katz et al., 2013), and such impacts are very observable phenomena that are often reaching a broader audience via new stories. Interesting, the scale and diversity of recreational angling could indeed be influencing the status of recreational fisheries world wide (reviewed in Cooke and Cowx, 2004, 2006), yet our survey revealed that recreational angling was selected as a perceived threat to recreational fish stocks very infrequently and roughly equivalent to factors such as reduced access and climate change.

Specific to recreational angling, threat perceptions regarding impacts to fish when caught and released were relatively consistent with research that has focused on the physical injury, physiological stress, and post-release behavior and mortality (Bartholomew and Bohnsack 2005; Cooke and Suski, 2005; Cooke et al., 2013a; Cook et al., 2015). Physical injury when handling, extended fight times, and air exposure have been identified as impacts for a number of recreationally targeted fish species (Cooke et al., 2001; Arlinghaus et al., 2007; Danylchuk et al., 2007; Gingerich et al., 2007; Danylchuk et al., 2014; Lennox et al., 2015; Bower et al., 2016 Arlinghaus et al., 2007; Danylchuk et al., 2007; Gingerich et al., 2007; Danylchuk et al., 2014; Lennox et al., 2015; Bower et al., 2016), and has been the focus of recent popular media articles specifically targeting recreational anglers (Danylchuk, 2015). Recent campaigns on social media (e.g., KeepEmWet Fishing, <http://www.Keepemwet.org/#home>) are also being used to reach the angler community about best practices for catch-and-release. Our survey also showed that the majority of respondents believed that impacts are species-specific, which is again consistent with the

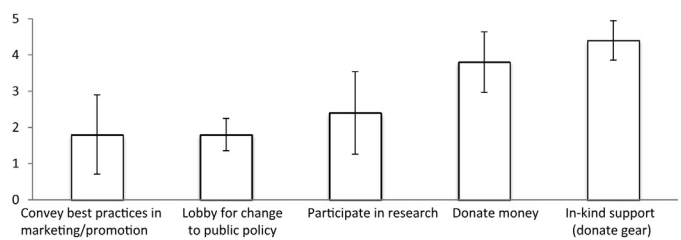


Fig. 6. Mean rank (\pm SD) of perceived role anglers play in recreational fisheries conservation, as expressed by industry employees at trade and consumer shows ($n=5$). Lower values represent a higher proportion of responses.

emerging science focused on catch-and-release (Cooke and Suski, 2005; Cooke et al., 2013a).

Employees of angling companies believed that the role of anglers in fisheries conservation is to follow government regulations and best practices for catch-and-release, and there was a fairly consistent belief that their customers received information about conservation and best practices mainly through direct peer-to-peer interactions, social media, and fishing magazines. Similarly, Nguyen et al. (2012) showed that the interpersonal interactions while fishing and the Internet were the common channels of communications within the recreational salmon angling community along the lower Fraser River, British Columbia. Although the Internet can be a very accessible source of information, Pelletier et al. (2007) showed that government web sites were not always accurate sources of information for guidelines for catch-and-release. For angler based non-government organization, a recent study that focused on the prevalence and accuracy of best practices for catch-and-release revealed that out of 189 organization web sites, <5% mentioned anything about catch-and-release, and only two of these included a comprehensive list of guidelines for minimizing impacts when handling and releasing fish (Sims and Danylchuk, 2016 – submitted for consideration). Although the Internet can be a very accessible tool for sharing information, a mix of outreach and education approaches are likely needed to effectively engage the all anglers about responsible fishing practices (Nguyen et al., 2012). Clearly there is opportunity for members of the trade that engage in direct marketing (e.g., TV or magazine advertisements, product packaging) or have direct interaction with anglers (e.g., fishing guides and outfitters) to promote best angling practices.

Although trade representatives accurately identified the common impacts and stressors associated with catch-and-release, and believed that recreational anglers should follow guidelines for best practices for handling and release, they infrequently selected fishing product companies as a source of information where anglers obtain their information about the conservation of recreational fisheries. Nevertheless, respondents most frequently selected “convey best practices in marketing material” when asked about the role of the recreational fishing industry in fisheries conservation. Given that marketing and promotion by angling trade companies could influence the social norm within the angling community (Bush et al., 2004; de Mooij and Hofstede, 2010), our results suggest a disconnect between the believes of trade employees and the potential influence they have on best practices that are aligned with the science of catch-and-release. Even though it appears that the potential impacts of catch-and-release on fish are fairly well understood (e.g. physical injury when handling, air exposure), there appears to be a breakdown in communications as to how marketing material may or may not be advocating handling practices that are best for the fish. For example, in angling trade marketing and promotional material it is common to see images of fish being held out of water, yet air exposure can greatly increase the physiological stress imposed on fish that are caught by recreational anglers (reviewed in Cook et al., 2015). Formal and informal guidelines

communicated by government and non-government agencies often suggest that air exposure should be minimized or eliminated for fish that are to be caught and released, either through mandated regulations or through voluntary conservation practices (Cooke et al., 2013b; Cook et al., 2015). Given that air exposure of fish following capture can increase post-release mortality, encouraging a change in the social norm within the angling community could improve the fate of fish once released (Cook et al., 2015).

Although our survey was limited in scope, we found relatively consistent responses related to the impacts of catch-and-release, but also gaps when it comes to how industry representatives perceived their role in shaping the social norms about the conservation of recreational fisheries. For instance, depicting fish handled in water rather than air in marketing material could help change the social norm related to this stressor (Cook et al., 2015), however not all respondents believed that air exposure was a threat. While respondents believed that the angling industry should play a role in conveying best practices in marketing material (in addition to lobbying for change in public policy), there was a broad range of individual and corporate participation in conservation organizations that focused on recreational fisheries. This may act as a barrier to communication and dissemination of accurate best practices for catch-and-release within the fishing industry. Consistent and persistent communication of the science of catch-and-release to the fishing trade could help provide a stronger foundation for marketing and promotion of best practices that are in line the outcome of scientific studies on catch-and-release. Potential turnover and movement of employees among angling trade companies could help spread the knowledge of best practices for catch-and-release, however this depends on whether social norms within the angling trade are geared towards conservation messaging that can reduce impacts on fish that are handled and then released. Differences among sub-cultures in the recreational angling trade and broader community may be difficult to overcome, however even subtle changes in marketing and promotion, and, in turn, angler behavior, could reduce impacts on recreational fish stocks. Moreover, the threat perceptions focus largely on externalize rather than threats arising from the recreational fishing industry itself, which is often the case, especially in freshwaters (Beard et al., 2011; Cowx and Portocerrero, 2011). Yet taking time to reflect on practices undertaken by the recreational fishing sector can only promote further positive developments that benefit fish, fisheries, aquatic ecosystems and the industry itself.

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Appendix A.

1) What role do you currently play in your company?

Circle the closest

<i>Sales Rep</i>	<i>Fishing Guide</i>
<i>Sales Manager</i>	<i>Travel Agent</i>
<i>Marketing</i>	<i>Writer</i>
<i>Product development</i>	<i>Photographer</i>
<i>Upper Management</i>	<i>Other (please describe)</i>

2) How many years have you been with your current company?

3) How many other companies have you worked for that focus on recreational fishing?

4) What roles have you play with previous fishing-related companies?

Circle the all that apply

<i>Sales Rep</i>	<i>Fishing Guide</i>
<i>Sales Manager</i>	<i>Travel Agent</i>
<i>Marketing</i>	<i>Writer</i>
<i>Product development</i>	<i>Photographer</i>
<i>Upper Management</i>	<i>Other (please describe)</i>

5) How many years have you been a recreational angler?

6) How many days out of each year do you fish?

7) What do you personally feel are the top two 'broad' threats to recreational fisheries?

Pick two:

<i>Commercial fishing</i>	<i>Agriculture</i>
<i>Recreational fishing</i>	<i>Forestry</i>
<i>Habitat destruction/loss</i>	<i>Pollution</i>
<i>Reduced access to waterways</i>	<i>Anti-fishing movement</i>
<i>Climate change</i>	<i>Government regulations</i>
<i>Urbanization</i>	<i>Other (please name or explain)</i>

8) In your opinion, what defines a best practice when it comes to the conservation of recreational fisheries?

Select one:

<i>Something that helps maintain catch rates</i>
<i>Something that reduces mortality following release</i>
<i>Something that just protects habitat</i>
<i>Something that increases access to fishing opportunities</i>
<i>Other (please name or explain)</i>

9) What aspects of the angling event do you feel are the most stressful for fish?

Select one:

- | | |
|----------------------------|--------------------------------|
| Extend of the fight | Exercise stress |
| Air exposure | Physical injury when handling |
| Damage at hooking location | Other (please name or explain) |

10) Do you feel that potential impacts of recreational angling on fish differ from species to species?

Yes No

11) Where do you think that most anglers get information about the conservation of recreational fisheries?

Select two:

- | | |
|---------------------------|---------------------------------|
| Direct peer-to-peer | Government agencies |
| Popular Media (Magazines) | Non-government agencies |
| Popular Media (Video) | Fishing product companies |
| Social media | Other (please name or describe) |

12) What is the primary role of recreational anglers when it comes to conservation?

Select one:

- | | |
|-----------------------|--------------------------------|
| Donate money | Lobby policy makers |
| Follow best practices | Inject money into economy |
| Follow regulations | Other (please name or explain) |

13) Are you personally affiliated with or volunteer for any conservation organizations that specifically focus on fish or aquatic ecosystems?

Yes No

14) What role do you feel the recreational fishing industry plays in conservation?

Select one:

- | | |
|-------------------------------|---|
| Donate money | Convey best practices in marketing material |
| Participate in research | Lobby for changes to public policy |
| In-kind support (donate gear) | |

15) Is the company you currently work for formally connected to or working with a conservation organization?

Yes No

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