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

Andy J. Danylchuk^{a*}, John Tiedemann^b, and Steven J. Cooke^c

^a Department of Environmental Conservation, University of Massachusetts Amherst, 160 Holdsworth Way, Amherst, MA, 01003, USA

^b Marine and Environmental Biology and Policy Program, Monmouth University 400 Cedar Avenue, W. Long Branch, NJ, 07764, USA

^c Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, 1125 Colonel By Dr., Ottawa, ON K1S 5B6 Canada

* Corresponding author at: danylchuk@eco.umass.edu

Target: Special Issue of Fisheries Research from Fishing Blind Symposium, AFS 2015

17 **Abstract**

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

39 work is needed to ensure that the conservation information they share is consistent with science-
40 based best practice.

41 **Keywords:**fishing trade, communication, social norms, recreational fishing, catch and release

42

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 Hooftstede 2010; Micu et al., 2011). For many 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 behaviour 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., 2013), 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 tradeshow 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 1). 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 trade shows 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 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 74-91% of respondents (n=15-32) indicated that they felt the impacts of an angling event were 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.

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

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, unpublished data - *note this manuscript has been submitted for consideration in the same issue of Fisheries Research as this current paper). 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 Hodstede 2010), our results suggest a disconnect between the beliefs 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 externalities rather than threats arising from the recreational fishing industry itself, which is often the case, especially in freshwaters (Beard et al., 2011; Cowx and Portocarrera 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.

Acknowledgements

Danylchuk is supported by the National Institute of Food & Agriculture, U.S. Department of Agriculture, and the Massachusetts Agricultural Experiment Station and Department of Environmental Conservation. Tiedemann is Director of the Marine and Environmental Biology

309 and Policy Program at Monmouth University. Cooke is supported by the Canada Research
310 Chairs Program and the Natural Sciences and Engineering Research Council of Canada.

311

References

- Airolidi, L., Balata, D., Beck, M.W. 2008. The grey zone: relationships between habitat loss and marine diversity and their applications in conservation. *J. Exp. Mar. Bio.Ecol.* 366, 8-15.
- Arlinghaus, R. 2006. Overcoming human obstacles to conservation of recreational fishery resources, with emphasis on central Europe. *Envi. Cons.* 33, 46-59.
- Arlinghaus, R., S.J. Cooke, J. Lyman, D. Policansky, A. Schwab, C.D. Suski, S.G. Sutton, and E.B. Thorstad. (2007) Understanding the complexity of catch-and-release in recreational fishing: an integrative synthesis of global knowledge from historical, ethical, social, and biological perspectives. *Rev. Fish. Sci.* 15, 75-167.
- Bartholomew, A., Bohnsack J.A., 2005. A review of catch-and-release angling mortality with implications for no-take reserves. *Rev. Fish Bio.Fisheries* 15, 129-154.
- Beard, T.D., Jr., Arlinghaus, R., Cooke, S.J., McIntyre, P.B., De Silva, S., Bartley, D., and Cowx, I.G., 2011. Ecosystem approach to inland fisheries: research need and implantation strategies. *Biology Letters*, 7, 481-483.
- Bower, S.D., Danylchuk, A.J., Brownscombe, J.W., Thiem, J.D., Cooke, S.J., 2016. Evaluating effects of catch-and-release angling on peacock bass (*Cichla ocellaris*) in a Puerto Rican reservoir: A rapid assessment approach. *Fish. Res.* 175, 95-102.
- Bush, A.J., Martin, C.A., Bush, V.D., 2004. Sport celebrity influence of the behavioral intentions of generation Y. *J.Advert. Res.* 44, 108-118.
- Carlson, B.D., Donavan, D.T., Cumiskey, K.J., 2009. Consumer-brand relationships in sport: brand personality and identification. *Inter. J. Retail Dist. Man.* 37, 370-384.

334 Cook, K.V., Lennox, R.J., Hinch, S.G., and Cooke, S.J., 2015. Fish out of water: how much air is
335 too much? *Fisheries*, *40*, 452-461.

336 Cooke, S.J., Cowx, I.G., 2004. The role of recreational fishing in global fish crises. *BioScience*,
337 *54*(9), 857-859.

338 Cooke, S.J., Cowx, I.G. 2006. Contrasting recreational and commercial fishing: searching for
339 common issues to promote unified conservation of fisheries resources and aquatic
340 environments. *Bio.Cons.* *128*(2006), 93-108.

341 Cooke S.J., Donaldson, M.R., O'Connor, C.M., Raby, G.D., Arlinghaus, R., Danylchuk, A.J.,
342 Hanson, K.C., Hinch, S.G., Clark, T.D., Patterson, D.A., Suski, C.D., 2013. The physiological
343 consequences of catch- and- release angling: perspectives on experimental design,
344 interpretation, extrapolation and relevance to stakeholders. *Fish. Manag. Ecol.* *20*, 258-287

345 Cooke, S.J., Philipp D.P., Dunmall K.M., Schreer J.F., 2001. The influence of terminal tackle on
346 injury, handling time, and cardiac disturbance of rock bass. *N. Am. J. Fish. Manag.* *21*. 333-
347 342.

348 Cooke, S.J., Suski, C.D., 2005. Do we need species-specific guidelines for catch-and-release
349 recreational angling to effectively conserve diverse fishery resources? *Biodivers. Conserv.* *14*,
350 1195-1209.

351 Cooke, S.J., Suski, C.D., Arlinghaus, R. and Danylchuk, A.J., 2013b. Voluntary institutions and
352 behaviours as alternatives to formal regulations in recreational fisheries management. *Fish*
353 *and Fisheries*, *14*, 439–457.

354 Cox, S.P., Beard, T.D., Walters, C., 2002. Harvest control in open-access sport fisheries: hot rod
355 or asleep at the reel? Bull. Mar. Sci. 70, 749-761.

356 Cowx, I.G., Portocerrero, A.M., 2011. Paradigm shifts in fish conservation: moving to the
357 ecosystem services concept. J Fish Biol. 79, 1663-1680.

358 Danylchuk, A.J., 2015. The fundamentals of fish: the path to responsible angling. This Is Fly,
359 50, 60-67.

360 Danylchuk, S.E., Danylchuk, A.J., Cooke, S.J., Goldberg, T.L., Koppelman, J., Philipp, D.P.,
361 2007. Effects of recreational angling on the post-release behavior and predation of bonefish
362 (*Albula vulpes*): the role of equilibrium status at the time of release. J. Exp. Mar. Bio.
363 Ecol. 346, 127–133.

364 Danylchuk A.J., Suski, C.D., Mandelman, J.W., Murchie, K.J., Haak, C.R., Brooks, A.M.L.,
365 Cooke, S.J. 2014. Hooking injury, physiological status and short-term mortality of juvenile
366 lemon sharks (*Negaprion brevirostris*) following catch-and-release recreational angling.
367 Conserv. Phys 2,1-10.

368 de Mooij, M., Hofstede, G., 2010. The Hofstede model: Applications to global branding and
369 advertising strategy and research. Int. J. Advert. 29, 85-110.

370 Dionisio, P., Leal, C., Moutinho, L., 2008. Fandom affiliation and tribal behavior: a sports
371 marketing application. Quantitative Market Research: An International Journal, 11(1), 17-39.

372 Fehr, E., Fischbacher, U. 2004. Social norms and human cooperation. Trends in Cognitive
373 Sciences, 8(4), 187-190.

374 Gingerich, A.J., Cooke, S. J., Hanson, K. C., Donaldson, M. R., Hasler, C. T., Suski, C. D.,
 375 Arlinghaus, R., 2007. Evaluation of the interactive effects of air exposure duration and water
 376 temperature on the condition and survival of angled and released fish. *Fish. Res.* 86. 169-178.

377 Hoekstra, J.M., Boucher, T.M., Ricketts, T.H., and Roberts, C. 2005. Confronting a biome crisis:
 378 global disparities of habitat loss and protection. *Ecology Letters*, 8, 23-29.

379 Jackson, J.B.C., Kirby, M.X., Berger, W.H., Bjorndal, K.A., Botsford, L.W., Bourque, B.J.,
 380 Bradbury, R.H., Cooke, R., Erlandson, J., Estes, J.A., Hughes, T.P., Kidwell, S., Lange, C.B.,
 381 Lenihan, H.S., Pandolfi, J.M., Peterson, C.H., Steneck, R.S., Tegner, M.J. Warner, R.R.,
 382 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science*, 293, 629–
 383 638.

384 Katz, J., Moyle, P.B., Quinones, R.M., Isreal, J., Purdy, S., 2013. Impending extinction of
 385 salmon, steelhead, and trout (Salmonidae) in California. *Environ. Biol.Fishes.* 96, 1169-1186.

386 Lackey, R., 1998. Fisheries management: integrating societal preference, decision analysis, and
 387 ecological risk assessment. *Environ. Sci. Pol.* 1, 329-335.

388 Lear, K.E., Runyan, R.C., and Whitaker, W.H., 2007. Sports celebrity endorsements in retail
 389 products advertising. *International Journal of Retail & Distribution Management*, 37(4), 308-
 390 321.

391 Lennox, R. J., Brownscombe, J.W., Cooke, S.J., Danylchuk, A.J., Moro, P.S., Sanches, E.A.,
 392 Garrone-Neto, D., 2015. Evaluation of catch-and-release angling practices for the fat snook
 393 *Centropomus parallelus* in a Brazilian estuary. *Ocean Coast. Manag.* 113, 1-7.

394 McGuane, T., 2001. *The Longest Silence: A Life in Fishing.* Vintage Press, 304 p.

395 Moutinho, L., Dionisio, P., Leal, C., 2007. Surf tribal behaviour: a sports marketing application.
396 Marketing Intelligence & Planning, 25, 668-690.

397 Micu, A.C., Dedeker, K., Lewis, I., Moran, R., Netzer, O., Plummer, J., Robinson, J., 2011. The
398 shape of marketing research in 2021. J. Advert. Res. 51, 213-221.

399 Nguyen, V.M., Rudd, M.R., Hinch, S.G., Cooke, S.J., 2012. Differences in information use and
400 preferences among recreational salmon anglers: implications for management initiatives to
401 promote responsible fishing. Human Dimensions of Wildlife, 17, 248-256.

402 Pauly, D., Zeller, D., 2016. Catch reconstructions reveal that global marine fisheries catches are
403 higher than reported and declining. Nature Communications, 7, 1-9.

404 Pelletier, C., Hanson, K.C., Cooke, S.J., 2007. Do catch-and-release guidelines from state and
405 provincial fisheries agencies in North American conform to scientifically based best
406 practices? Environ Manag. 39, 760-773.

407 Petty, R.E., Cacioppo, J.T., Schumann, D., 1983. Central and peripheral routes to advertising
408 effectiveness: the moderating role of involvement. J. Consum. Res. 10, 135-146.

409 Post, J.R., Sullivan, M., Cox, S., Lester, N.P., Walters, C.J., Parkinson, E.A., Paul, A.J., Jackson,
410 L., Shuter, B.J., 2002. Canada's recreational fisheries: the invisible collapse? Fisheries 27, 6-
411 17

412 Schuett, M.A., Lu, J., Ditton, R.B., Tseng, Y.P., 2010. Sociodemographics, motivations, and
413 behavior: the case of Texas anglers 1989-2004. Human Dimensions of Wildlife, 15(4), 247-
414 261.

415 Stevens, J.A., Lathrop, A.H., Bradish, C.L., 2003. Who is your hero? – Implications for athlete
416 endorsement strategies. *Sports Marketing Quarterly*, 12(2), 103-110.

417 Strauss, A.L., 1987. *Qualitative analysis for social scientists*. Cambridge University Press.
418 Cambridge, UK.

419 Waples, R.S., Beechie, T., Pess, G.R., 2009. Evolutionary history, habitat disturbance regimes,
420 and anthropogenic changes: what do these mean for resilience of pacific salmon populations?
421 *Ecology and Society*, 14(1), 3. [online] URL:
422 <http://www.ecologyandsociety.org/vol14/iss1/art3/>
423

Figure Captions

Figure 1: Mean rank ($\pm$ 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.

Figure 2: Mean rank ($\pm$ 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.

Figure 3: Mean rank ($\pm$ 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.

Figure 4: 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.

Figure 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.

Figure 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.

Figure 1

Figure 2

478 **Figure 3**

488 **Figure 4**

Figure 5

Figure 6

Appendix 1

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

Circle the closest

Sales Rep

Fishing Guide

Sales Manager

Travel Agent

Marketing

Writer

Product development

Photographer

Upper Management

Other (please describe)

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

Sales Rep

Fishing Guide

Sales Manager

Travel Agent

Marketing

Writer

Product development

Photographer

Upper Management

Other (please describe)

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:

Commercial fishing

Agriculture

Recreational fishing

Forestry

Habitat destruction/loss

Pollution

Reduced access to waterways

Anti-fishing movement

Climate change

Government regulations

Urbanization

Other (please name or explain)

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

Select one:

Something that helps maintain catch rates

Something that reduces mortality following release

Something that just protects habitat

Something that increases access to fishing opportunities

Other (please name or explain)

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)

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

3

4 Yes

No

5

6