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The Effect of Angler Education Materials on the Practice of Selective Harvest: Evidence From a Survey Experiment

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ABSTRACT

Catch-and-release fishing campaigns have aided in fish conservation. In some cases, this success has perversely led to the decline of trophy fish via increased fish density. Little information exists on how to best address such cases of widely spread, but imperfectly implemented, social norms in fisheries. Our study tested a variety of message sources to establish the most effective format for changing angler behaviour. A survey experiment was administered online to licensed anglers in Wisconsin, Florida, and Missouri. All respondents were asked about their anticipated future behaviour regarding selective harvest after viewing at least two placebo videos related to fishing. Individuals in the treated groups watched a short additional video about the benefits of selective harvest, with the sole difference between treatments being the title given to the primary speaker. Anglers were significantly more likely to keep a small or big fish when presented with information on selective harvest regardless of the information source compared to not being provided information on selective harvest, except in the scenario of 'at a fishery known for small fish, catch a big fish'. Anglers were significantly more likely to keep a small or big fish when presented with any information on selective harvest versus not, except in the scenario of 'at a fishery known for small fish, catch a big fish'. Our results suggested that any information on selective harvest (contingent on anglers receiving it as was forced by our experimental design) had the potential to increase the likelihood of keeping a small fish. An overall reluctance to keep any size of fish was evident, particularly for big fish. Lingering reluctance to keep fish suggests a need for further research regarding revealed behavioural changes in response to education to promote selective harvest to satisfy diverse anglers desires of higher catch rates and trophy potential.

1 | Introduction

Historically, most legal fish (e.g., exceeding a minimum length limit, not exceeding daily bag limit) captured in recreational fisheries were harvested for subsistence. Although fish are still harvested by recreational anglers (Gaeta et al. 2013; Embke et al. 2020), species-specific catch-and-release angling has increased in prevalence over time (Barnhart 1989; Sass and Shaw 2020). The black basses (*Micropterus* spp.) and muskellunge (*Esox masquinongy*) are two species groups where recreational fisheries have largely become catch-and-release through voluntary release of fish that are legal to harvest (Allen et al. 2008; Gaeta et al. 2013; Hansen et al. 2015; Gilbert and Sass 2016; Eslinger et al. 2017; Shaw et al. 2019; Sass and Shaw 2020). The prevalence of species-specific catch-and-release practices has often been associated with conservative harvest regulations, campaigns by conservation interest groups promoting the practice, and angler desires to increase the frequency of trophy fish (Sass

and Shaw 2020). In recreational fisheries, angler behavioural choices in public, open-access waterbodies to legally harvest or voluntary release captured fishes can influence fish conservation, population abundance, population size structure, and trophy potential (Miranda et al. 2017; Hessenauer et al. 2018; Sass and Shaw 2020).

Catch-and-release angling has been successful, and sometimes overly successful, in conserving fish populations. Although catch-and-release angling has helped conserve fish populations, high prevalence of the practice has also had unintended consequences that may not align with angler desires (Miranda et al. 2017; Hessenauer et al. 2018; Sass and Shaw 2020). Structuring fish populations (i.e., size structure, trophy potential) to meet angler desires is heavily reliant upon harvest and sometimes length, daily bag, and possession limits. When species-specific angler behaviours strongly favor catch-and-release, individual growth rates, population size structure, and trophy fish potential may be compromised. Pervasive catch-and-release can lead to density-dependent effects on growth and trophy fish and thereby potentially misalign angler desires with anticipated outcomes of the practice (Gilbert and Sass 2016; Sass and Shaw 2020). Pervasive catch-and-release has been implicated in harvest regulations failing to structure a largemouth bass (*Micropterus nigricans*) population in a Mississippi reservoir (Miranda et al. 2017) and declines in the frequency of maximum length and weight of muskellunge in northern Wisconsin lakes (Gilbert and Sass 2016; Sass and Shaw 2020). Hessenauer et al. (2018) showed that extremely low harvest rates of largemouth bass in two Connecticut reservoirs rendered minimum length limits ineffective for altering population size structure. When harvest rates are low, catch-and-release mortality may comprise the greatest mortality component in some recreational fisheries, although catch-and-release mortality rates have likely declined over time due to improved fish handling and release practices (Landsman et al. 2011; Shaw et al. 2019). Despite unintended and counterintuitive outcomes of catch-and-release angling, the practice has become a social norm for certain fish species and angler typologies.

Social norms, such as catch-and-release angling and stocking, can promulgate despite evidence for outcomes contrary to expectations (van Poorten et al. 2011; Sass and Shaw 2020; Arlinghaus et al. 2022; Radinger et al. 2023). Fish stocking provides a model example of a social norm and expectation for fisheries management agencies, governance systems, and anglers to increase fish population abundances and angler catch rates despite long-term and mounting evidence that the practice often does not meet either stated goal (Arlinghaus et al. 2022; Elwer et al. 2023; Radinger et al. 2023). Stocking continues as a social norm and expected practice of fisheries management agencies despite being a management panacea fuelled by disinformation (Arlinghaus et al. 2022; Radinger et al. 2023). For example, ecosystem-based habitat management has been shown to provide more benefits to fish populations than stocking (Arlinghaus et al. 2022; Radinger et al. 2023). Social norms such as stocking can be extremely difficult to change regardless of perceived versus realized outcomes. Pervasive catch-and-release angling represents a social norm that can reduce fish growth rates and ultimately not meet angler desires for higher population size structure and the frequency of trophy fish catch.

Despite substantial angler education efforts about the benefits of selective harvest of fish by many state agencies (e.g., Texas, Florida, Missouri), effects of education programmes on modifying angler behaviours (e.g., to legally harvest) remain largely unknown (Cooke et al. 2012; Delle Palme et al. 2016). We found no published literature that tested whether educational programmes influenced harvest decisions by anglers that ultimately could influence harvest practices and fish population vital rates. However, many of the educational programmes that increased the popularity of catch-and-release angling were most likely delivered by fishing personalities in fishing magazines and television. Still, changing behaviour to selective harvest remains elusive. We hypothesized that the source of selective harvest information would influence an angler's choice or willingness to selectively harvest versus catch and release a legal fish. We tested this hypothesis with a survey experiment whose treatment conditions included several different message sources (e.g., agency fisheries biologist, bass tournament organizer).

2 | Methods

To test our hypothesis about the effectiveness of different message sources, we implemented an online survey experiment in which licensed anglers were randomly assigned to watch one (or none) of a series of videos on selective harvest whose content was identical except for the job and title card of the primary presenter. Respondents were state fishing license holders recruited via email addresses we received from three different state fisheries management agencies (Wisconsin, Florida, and Missouri). As compensation for completing the survey, respondents received a $10 gift card to an online fishing store.

Upon entering the survey, respondents were sorted randomly into one of six experimental conditions: 'No Video'; 'No Title'; 'President—National Organization for Regional Bass Tournaments'; 'Fisheries Biologist—Department of Natural Resources (DoNR)'; 'Director—DoNR'; and 'President—Anglers Alliance for Responsible Bass Fishing'. This assigned condition determined what they viewed later in the survey. Our treatment was inspired by research in other fields that has shown that people's attitudes can be significantly influenced by the identity of the speaker, even if the message is the same (Lupia and McCubbins 1998; Druckman 2001).

Our survey consisted of three sections. The first was seen by all participants. It included a demographic battery, questions about fishing experience, and a section inquiring about general fishing attitudes. The second was a series of videos wherein our experimental manipulation occurred. All participants viewed two 'distraction' videos—one which explained how to tie a blood knot and another in which an angler discussed the use of a swim bait. For those in the control, 'No Video', condition, this was all they saw in this section. For all other conditions, there was a third video nested between the prior two described above that discussed the benefits of selective harvest. An infographic shown in the video was displayed on the left, with the message reinforced by the end card shown on the right (Figure 1). In the video, the primary speaker was identified with a title card that was focused upon for a few seconds (Figure 2). The only difference in what individuals viewed between treatment conditions was

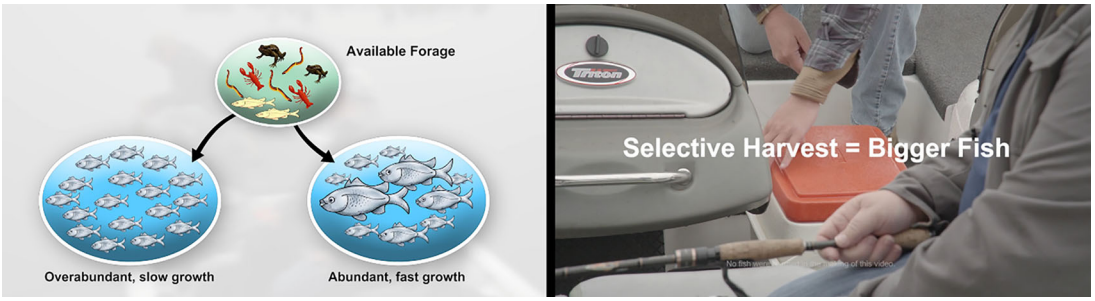

FIGURE 1 | Common treatment in the angler survey. The left panel is a graphic depicting how catching and releasing small fish can lead to an overabundant, slow growing fish population given limited food resources and density dependence. Alternatively, selectively harvesting small fish can lead to an abundant, faster growing fish population with some trophy potential given limited food resources and a release of density-dependent constraints on growth. The right panel shows the core message of the informational video suggesting that selective harvest of small fish can lead to bigger fish.

FIGURE 2 | Treatment template in the angler survey. The left panel does not provide the message source within the video treatments. The right panel shows the message source as the director of Department of Natural Resources.

the title assigned to the individual, which was the same as the treatment condition message sources outlined above. It was not possible for participants to skip or skim through any of the videos.

The final section began with four questions composed of our primary dependent variables, all asking about future intended behaviour when fishing. The general topology of those questions was as follows: 'Suppose you are at (your favourite fishery/a fishery known for small fish) and you catch a (big/small) fish. How likely would you be to keep or release this fish?'. These questions were followed by a simple treatment check, which asked about the contents of the videos watched.

To measure harvest preferences, respondents were presented with four hypothetical fishing scenarios and asked how likely they would be to keep the fish they caught. Responses were recorded on a five-point Likert-type scale ranging from 'Would definitely release' to 'Would definitely keep'. These responses were recorded numerically from 1 to 5, with higher values indicating a greater likelihood of keeping the fish. This coding produced four outcome variables corresponding to the four hypothetical fishing scenarios included in our survey.

For each treatment condition, mean likelihood-of-keeping the fish scores were calculated by averaging respondents' recoded responses. These mean scores provided a summary measure of harvest intentions that could be compared across experimental groups. To test whether the likelihood of keeping a fish differed across treatment conditions, one-way analysis of variance (ANOVA) was conducted for each outcome. The first set of ANOVAs tested for mean likelihood score differences among all six experimental conditions. The second set of ANOVAs tested for mean likelihood score differences between pooled all video treatments and the no video control condition. This approach allowed us to assess differences among message sources and the overall effect of exposure to selective-harvest information materials. All statistical assumptions for ANOVA (independence, normality, homogeneity of variance) were met for our analysis. For all analyses, we used the null hypothesis of no difference in mean likelihood scores among all six experimental conditions or between the pooled all video treatment and no video treatment ($\alpha = 0.05$).

3 | Results

In total, 358,094 license holders were invited to participate in the survey; 321,528 were from Missouri, 24,108 were from Florida, and 12,396 were from Wisconsin. From this, 2112 surveys were started with 1333 being completed (a final response rate of 0.4%). Attrition largely occurred around the first video, perhaps when respondents realized that they could not skip through it. The mean age of respondents was the early 50s, and approximately 80% of the respondents were male (Table 1). Days fishing per year per angler averaged about 35 (Table 1). Most respondents had been fishing for about 30 years and participated in about one fishing tournament per year (Table 1). Mean angler demographics between treatments and associated variability was relatively similar for age, sex, days fishing per year, years of fishing experience, and the number of fishing tournaments participated

TABLE 1 | Mean characteristics of respondents (age [years], proportion female, days fishing per year, years fishing, tournaments fished per year) split into the different treatment groups of no video, no title of presenter of information, president of a fishing tournament organization, fisheries biologist of a Department of Natural Resources, director of a Department of Natural Resources, and president of a fishing alliance.

	No video	No title	President, tournament	Biologist, DoNR	Director, DoNR	President, alliance
Age	51.809 (13.887)	53.451 (13.162)	53.680 (13.094)	52.452 (14.338)	54.603 (12.389)	52.574 (13.841)
Sex (female)	0.181 (0.386)	0.222 (0.416)	0.179 (0.385)	0.218 (0.414)	0.181 (0.386)	0.160 (0.367)
Days fishing	34.652 (44.444)	30.912 (43.831)	35.869 (41.232)	38.644 (53.769)	36.510 (52.518)	34.528 (43.335)
Years fishing	30.220 (17.554)	27.435 (15.355)	31.697 (17.645)	30.834 (17.343)	30.033 (16.398)	31.068 (16.815)
Tourneys	0.899 (2.837)	0.974 (4.167)	1.127 (4.398)	1.024 (3.727)	1.266 (4.899)	1.330 (4.489)
N	243	196	234	220	227	213

Note: Values in parentheses denote the standard deviation about the mean.

in per year. Similarities in averages among treatments suggested that randomization ensured a good balance between conditions.

Across four scenarios (1. At your favourite fishery, catch a small fish; 2. At your favourite fishery, catch a big fish; 3. At a fishery known for small fish, catch a small fish; 4. At a fishery known for small fish, catch a big fish), respondents receiving any video treatment were generally more likely to keep a fish than those who did not receive a video treatment (Figure 3). The mean likelihood of keeping a fish was significantly greater for respondents receiving any video treatment in scenarios 1, 2, and 3 compared to respondents who had not received the video treatment (scenario 1, $f_{5,1328} = 6.8$, $p < 0.001$; scenario 2, $f_{5,1328} = 3.1$, $p = 0.009$; Scenario 3, $f_{5,1328} = 14.1$ p < 0.001; Figure 3). There was no difference in the mean likelihood of keeping a fish between respondents of each treatment in scenario 4 ($f_{5,1328} = 1.4$, $p = 0.22$; Figure 3). Across the same four scenarios and breaking down the likelihood of keeping a fish by message source video treatment (no video, Fisheries Biologist—DoNR, Director—DoNR, no title, President—Alliance, President—Tournament), all respondents reported a higher mean likelihood of keeping a fish regardless of message source compared to the no video control group (Figure 3). The likelihood of keeping a fish among different message sources of the video treatment respondents did not differ based on overlapping 95% confidence intervals (Figure 3).

When the likelihood of keeping a fish scores were pooled into any video and no video treatments, the mean likelihood of keeping a fish was always greater for those presented with information on selective harvest (Figure 4). The mean likelihood of keeping a fish (small or big) was significantly higher in scenarios 1, 2, and 3 when respondents were presented with any information on selective harvest compared to not receiving any information on selective harvest (scenario 1, $f_{1,1332} = 29.6$, $p < 0.001$; scenario 2, $f_{1,1332} = 11.2$, $p < 0.001$; scenario 3, $f_{1,1332} = 65.5$, $p < 0.001$). Although the mean likelihood of keeping a big fish in scenario 4 was greater for respondents receiving information on selective harvest than those who did not, the difference was not statistically significant ($f_{1,1332} = 1.7$, $p = 0.19$).

4 | Discussion

Our experiment suggested that information presented to Florida, Missouri, and Wisconsin anglers about selective harvest increased the likelihood of these anglers keeping a fish. The likelihood to keep a fish after selective harvest outreach was not influenced by the message source, which ranged from hypothetical agency fisheries biologists and directors to hypothetical presidents of a bass alliance and tournament organization. Our findings were consistent except in the scenario of capturing a big fish in a fishery known for small fish. Overall, it appeared that selective harvest outreach would be important to change nearly exclusive voluntary release angler behaviours, yet reticence to selective harvest was still clear as the likelihood of keeping a fish between the control and treatment groups was not large despite identifying several statistically significant differences. In terms of change in the likelihood of keeping a fish after selective harvest outreach, the difference was roughly equivalent to changing from saying that you were 'somewhat unlikely' to keep a small fish, to saying that you were 'just as likely or unlikely' to keep such a fish. Our results also suggested that letting big fish go regardless of angler expectations of a fishery was firmly rooted in the catch-and-release ethic, and this practice resulted in a higher frequency of big fish released despite scientific literature suggesting otherwise (Hansen et al. 2015; Gilbert and Sass 2016; Miranda et al. 2017; Sass and Shaw 2020; Flink et al. 2024; Flink and Tibblin 2026).

In scenarios 1 and 3, the outcome question was how likely respondents would be to keep a small fish. Recall that our video treatment specifically focused on the selective harvest of small fish rather than big fish. If participants were influenced by the treatment, we would have expected a difference between groups in their likelihood of keeping a small fish. In both types of fisheries, treated anglers reported themselves as more likely to keep a small fish. The gap was particularly large in the scenario of a fishery known for having small fish. This makes sense since our video contextualizes selective harvest as a response to an

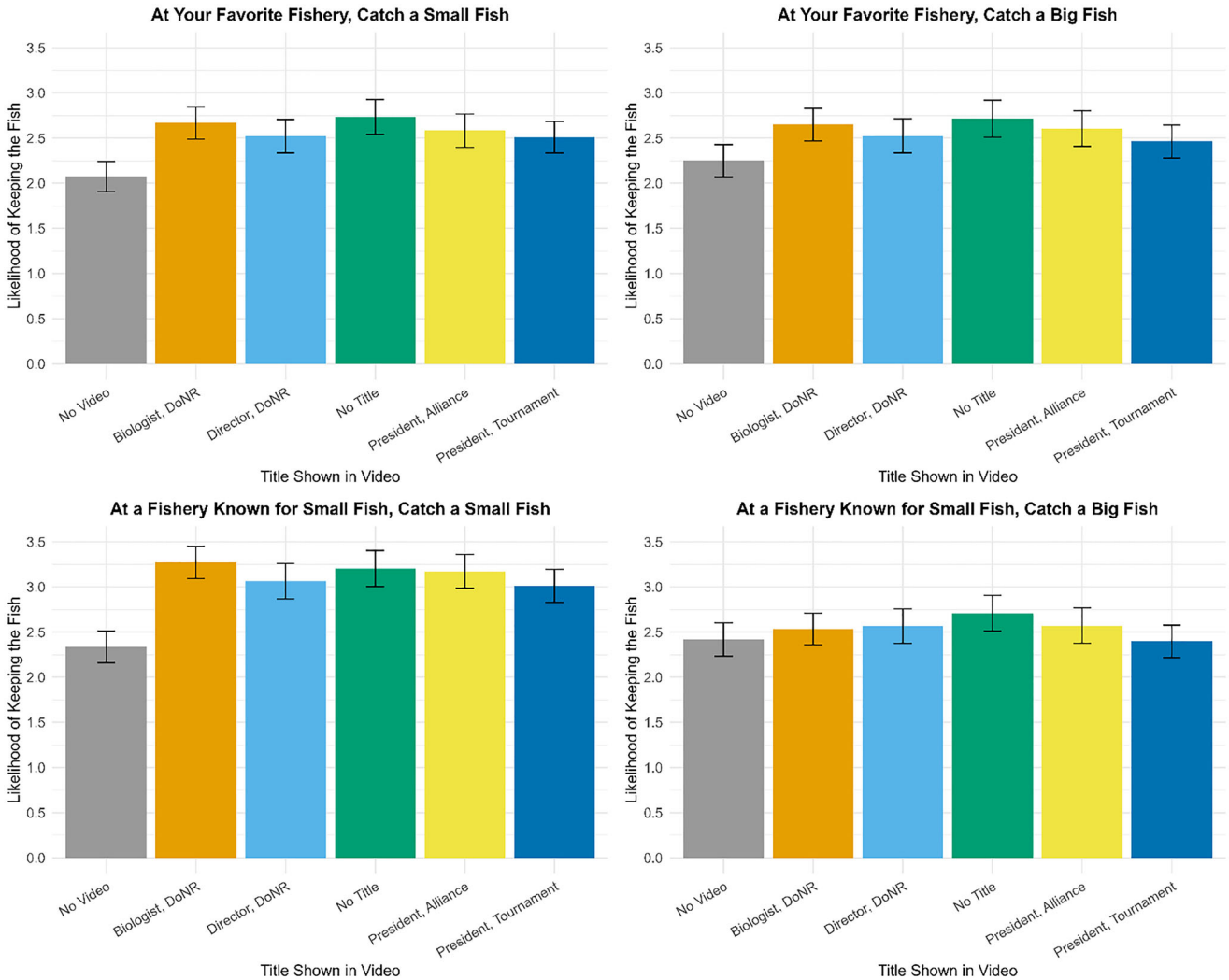

FIGURE 3 | Mean likelihood of keeping a fish given a scenario of (A) at your favourite fishery, catch a small fish (top left panel); (B) at your favourite fishery, catch a big fish (top right panel); (C) at a fishery known for small fish, catch a small fish (bottom left panel); and (D) at a fishery known for small fish, catch a big fish (bottom right panel) among treatments of no informational video on selective harvest presented and informational videos on selective harvest presented by a fisheries biologist of a Department of Natural Resources, director of a Department of Natural Resources, no title of presenter, president of a fishing alliance, and president of a fishing tournament organization. Error bars about the mean likelihoods denote the 95% confidence intervals.

overpopulation of small fish—a condition that anglers may not believe applies to their favourite fishery, which they likely choose at least partially on the criteria of yielding sizable catches. The substantive takeaway was that individuals treated with any video on selective harvest were significantly more likely to keep a small fish. In contrast to catching a big fish in scenarios 2 and 4, our results suggested that after selective harvest outreach on density-dependent growth in fishes and regardless of message source, respondents were provided with information making them more likely to keep a small fish than a big one. This also suggested that respondent preferences were focused on catching bigger fish and that selective harvest of small fish would aid in achieving that goal (Sass and Shaw 2020).

In scenarios 2 and 4, the likelihood of keeping a fish was related to catching a big fish. In these scenarios, the treatment did not have as large of an effect as in the catching a small fish scenarios 1 and 3. This may not be particularly surprising since our video had no direct message regarding the treatment of big fish. Interestingly, participants who were treated with any video reported that they were significantly more likely to keep a big fish at their favourite fishery. This finding aligned with Flink et al. (2024) and Flink and Tibblin (2026), who found high selectivity of anglers to harvest large, predatory fish and lower release rates of longer fish in Swedish lakes. We found this result to be a little puzzling given the lack of direct messaging in the video on the topic of big fish. We speculate that introducing the idea of small fish overpopulation may have made anglers more covetous of larger specimens. Or, as discussed above, our findings may have been related to the respondents being informed about the trade-offs between fish size, catch rates, and trophy potential by selective harvest outreach. Alternatively, culling smaller fish may be more palatable to anglers desiring bigger fish or for consumption. It is also possible that selective harvest of smaller fish was already engrained within anglers due to the promoted and perceived benefit of increasing trophy fish potential through conservation of

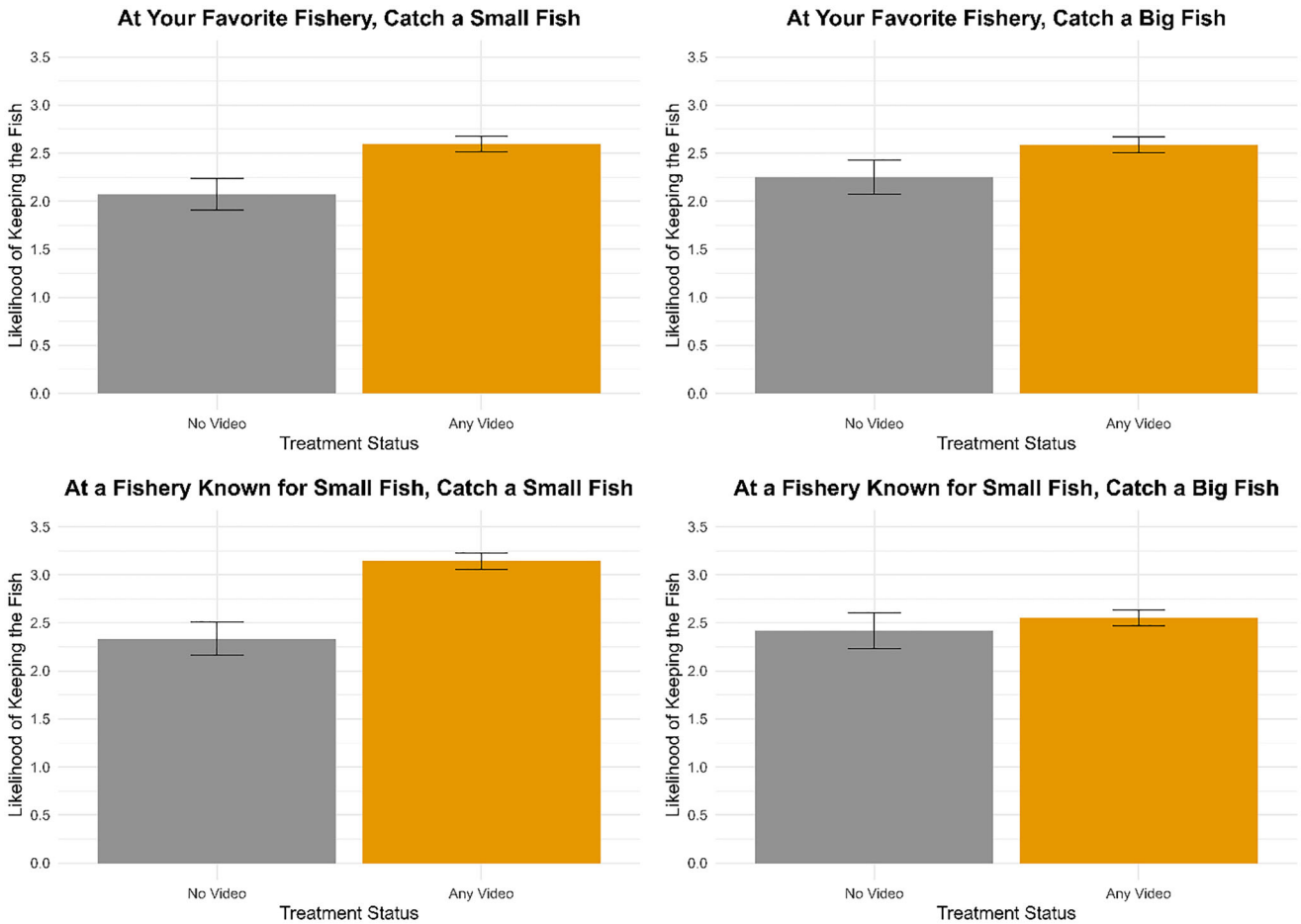

FIGURE 4 | Mean likelihood of keeping a fish given a scenario of (A) at your favourite fishery, catch a small fish (top left panel); (B) at your favourite fishery, catch a big fish (top right panel); (C) at a fishery known for small fish, catch a small fish (bottom left panel); and (D) at a fishery known for small fish, catch a big fish (bottom right panel) between treatments of no informational video on selective harvest presented and any video of selective harvest presented. Error bars about the mean likelihoods denote the 95% confidence intervals.

these fish. Based on our findings, a better understanding of angler attitudes and reasonings for releasing bigger versus smaller fish regardless of our treatments appears to be an important avenue for future research.

We acknowledge that our study had several limitations. Although our response rate was relatively low (0.4% despite administering over 350,000 surveys) even when providing licensed anglers with an incentive (i.e., gift card) to participate in our survey, we were still able to able to discern some statistically significant and meaningful results that suggested that informational materials about selective harvest could be effective to influence this practice among anglers. Despite our best effort to target all available demographics of licensed anglers in Florida, Missouri, and Wisconsin by administering over 350,000 surveys, we acknowledge that our survey respondents resulted in a non-random sample. Most respondents were middle-aged, White males. Although our respondents did not entirely represent the overall demographics of anglers in these states, they likely represented the subset of anglers most likely to influence potential ecological and fisheries change through selective harvest. Recreational angler demographics remain relatively racially homogenous (White males), and most recreational anglers are middle-aged as participation rates in younger anglers (particularly males) have declined over time (Arlinghaus 2006; Burkett and Winkler 2019). Despite the non-random angler demographic sample of our survey respondents, we reasoned that this would likely be the appropriate angler demographic to focus upon for selective harvest outreach campaigns to increase trophy fish potential and rebalance fish communities to satisfy diverse angler desires and for fish conservation purposes when needed, respectively.

We also acknowledge that our survey only focused on anticipated angler selective harvest behaviour, which may or may not translate to realized angler harvest behaviour following selective harvest educational campaigns as tested here. Therefore, selective harvest educational campaigns provide a ripe opportunity for future research to test whether anticipated behaviour translates to increased selective harvest. Largemouth bass fisheries in Wisconsin, USA, provide a model system to empirically test for realized angler selective harvest behaviour following regulation changes to promote harvest or selective harvest educational campaigns. Largemouth bass relative abundances have significantly increased in Wisconsin waterbodies over time, with corresponding declines in mean length at age due to density-dependent effects on growth (Hansen et al. 2015; Sass et al. 2026). Currently, many largemouth bass populations in Wisconsin are overabundant and do not provide a balance between catch rates

and trophy fish potential (Mrnak et al. 2025; Thommes et al. 2025; Sass et al. 2026). Further, culturally, economically, and recreationally important adult walleye (*Sander vitreus*) abundance and natural recruitment have declined and been shown to be negatively correlated with largemouth bass relative abundance in Wisconsin inland lakes (Hansen et al. 2015; 2017, 2018; Embke et al. 2019; Dassow et al. 2023; Sass 2025; Sass et al. 2026). As such, the Wisconsin Department of Natural Resources (WDNR) has liberalized largemouth bass harvest regulations on several waterbodies to promote harvest and improve growth rates and population size structure, and to potentially ameliorate negative effects on other important fish species such as walleye (Sass et al. 2026). Sass et al. (2026) found that liberalized harvest regulations significantly reduced largemouth bass relative abundances and increased population size structure. Likewise, a largemouth bass selective harvest educational campaign is being considered by the WDNR to provide a better balance of catch rate and trophy fish opportunity in this recreational fishery, as well as to aid struggling walleye populations (Sass 2025; Sass et al. 2026). Key to understanding whether liberalized largemouth bass harvest regulations or selective harvest educational campaigns translate to realized angler harvest behaviour as anticipated will require fisheries-dependent data through point-intercept angler creel surveys, which the WDNR routinely conducts on Wisconsin waterbodies (Sass et al. 2023, 2026).

To our knowledge, our study was the first of its kind to blend the disciplines of political science and fisheries management to address the social norm of voluntary catch-and-release by recreational anglers. Political scientists often conduct research related to why a voter may vote in a particular way and what information may be needed to sway that vote in a different direction. Here, we used a common political science methodological approach to better understand information sources that may make an angler more likely to selectively harvest versus catch and release a fish. We learned that any information source resulted in a greater likelihood of an angler harvesting a small fish and sometimes a big fish that would have otherwise been released. We feel that our relatively novel, interdisciplinary approach may be applicable to other recreational fisheries practices that are influenced by social norms where changes may be needed for fish conservation or to structure fish populations to meet diverse angler desires (e.g., stocking, highly harvest-oriented fisheries, fish habitat management).

Educational campaigns have previously been used in recreational fisheries management with some success, including for the promotion of catch-and-release angling and best fish handling practices to reduce discard mortality and fish stress, responsible environmental behaviours, and future fishing regulation compliance. For example, Cooke and Suski (2005) and LaRochelle et al. (2021) provided guidance on open water and ice fishing catch-and-release best fish handling practices to reduce discard mortality and sublethal effects, respectively, while Delle Palme et al. (2016) showed that youth anglers highly trained in catch-and-release practices tended to minimize air exposure, wet their hands, and keep fish in water during dehooking prior to release compared to less trained youth anglers. Siemer and Knuth (2001) found that youth exposed to a national fishing education programme and experienced-based fishing were more likely to show responsible fishing and environmental stewardship anticipated behaviours. Saul and Rosario (2019) showed that anglers previously cited for fishing regulation violations and given the opportunity to participate in a fisheries education class programme to reduce or waive fines were more likely to accept and comply with fishing regulations thereafter. These studies suggest that anticipated angler behaviours gleaned from educational campaigns such as ours may translate to realized angler behaviours to change entrenched social norms that may be misaligned with current management needs in recreational fisheries.

5 | Conclusion

Species-specific catch-and-release behaviour by anglers has unquestionably become a social norm so widespread and successfully implemented that in some cases it has perversely reduced fish growth rates and resulted in population size structures contrary to angler desires and expectations due to regulation ineffectiveness and density-dependent growth (Gilbert and Sass 2016; Miranda et al. 2017; Hessenauer et al. 2018; Sass and Shaw 2020). Further, pervasive catch-and-release has sometimes resulted in imbalanced fish communities where some species are subject to high harvest-orientation by anglers versus others that are not (Sass and Shaw 2020). In such cases, negative ecological and population sustainability effects may become apparent for the harvest-oriented species (e.g., largemouth bass, a species with a pervasive catch-and-release angler orientation versus walleye (high harvest angler orientation)) (Sass and Shaw 2020; Embke et al. 2025; Sass 2025). The difficulty in managing or changing social norms is that they can persist even when evidence suggests that they should not (Arlinghaus et al. 2022; Radinger et al. 2023). Thus, we tackled the largely unexplored topic of how to most effectively implement a selective harvest education programme aimed at altering the social norm of catch-and-release angler behaviour.

To accomplish this end, we introduced an embedded survey experiment that tested the influence of message source on the effectiveness of an educational video on selective harvest. Although we found it somewhat surprising and contrary to anecdotal and impressionistic accounts, the anglers in our study seemed to not deferentially respond to fisheries organizational leaders and sceptically to managers. We believe that our finding offered some optimism to managers. That is, where managers hope to use educational campaigns to adjust angler behaviour, our results suggested that those campaigns need not go out of their way to persuade particularly prominent fisheries organizational leaders to be part of those campaigns. If effectively delivered, the message can come from any source. Though we have no direct evidence for this here, there is no reason to believe that this would not apply to other important messaging about ecosystem and vegetation management, fish handling (Delle Palme et al. 2016), and other angler behaviours affecting the health of fisheries. We further reason that anglers themselves may be the most influential sources of information to change the behaviours of other anglers.

Through disparate, interdisciplinary collaboration, we highlighted the benefits that survey experiments can have on causal inference. A variety of disciplines from political science to

economics to psychology have already incorporated these insights into the betterment of their collective corpus of knowledge. We hope that future research in the human dimensions of fisheries will take full advantage of these methods to produce better and more reliable information and understanding of angler behaviour.

Author Contributions

Nathan W. Monroe: conceptualization, data curation, formal analysis, investigation, methodology, visualization, writing – original draft, writing – review and editing. **James F. Spriggs**: conceptualization, data curation, formal analysis, investigation, methodology, visualization, writing – review and editing. **Micheal S. Allen**: conceptualization, writing – review and editing. **Greg G. Sass**: funding acquisition, writing – review and editing.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All data have been deposited on GitHub (https://github.com/nmonroe2/The-Effect-of-Angler-Education-Materials-on-the-Practice-of-Selective-Harvest).

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