

Mode Effect and Response Rate Issues in North American Mixed-Mode Survey Research: Implications for Recreational Fisheries Management

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Introduction & Literature Review

The importance of recreational fisheries have been increasingly recognized in the U.S. and abroad for their social (Wilde et al. 1996; Hickley and Tompkins; 1998), economic (Hutt et al. 2012), and ecological impacts (McPhee et al. 2002; Coleman et al. 2004). However, the diffuse nature of access and heterogeneity in preferences of anglers makes managing recreational fisheries particularly challenging. Thus, effective management of recreational fisheries necessitates in-depth knowledge of angler attitude and behavior (Ward et al. 2013).

Obtaining these data on a scale applicable to fisheries management agencies with statewide jurisdictions is a challenge for human dimensions researchers in the United States. Human dimensions data have historically been collected through mail-back questionnaires delivered to a sample of residential addresses from a population of licensed anglers. However, response rates for mail-back questionnaires have declined precipitously over recent decades both within the context of natural resource management (Connelly et al. 2003) and the social sciences generally (Boser and Green 1997; National Research Council 2013). This decline has brought into question the ability of mail-based survey methods to obtain representative data for use in recreational fisheries management, particularly when knowledge of the characteristics of the broader population of anglers is limited.

The purpose of this study, therefore, is to compare differences in response rates, socio-demographic characteristics, and angler behaviors, motivations, preferences, and expenditures between and within samples obtained from three common survey designs.

Method

Data collection

In partnership with TPWD, the Statewide Survey of Licensed Anglers was administered via three modes of solicitation: a surface mail with web-push, a mixed-mode with both mail (with web push) and email invitation, and an email invitation. Freshwater and saltwater anglers ($n = 9,000$) were sampled from the larger population of approximately 1.2 million resident license holders in Texas (license period September 1, 2011 through August 31, 2012). For all three solicitation modes, the collection protocols were modified from the framework outlined by Dillman et al. (2014). The collection protocols for each sample were as follows:

1. Surface mail with web-push ($n = 4,000$): Four postal invitations were sent to participants with a web push contained within each, 1 week apart.
 - a. Letter sent informing participants of the study purpose and invitation to complete the questionnaire online with a URL link provided in the body of the letter.
 - b. One week following, a thank you/reminder postcard was sent to all participants. The postcard also contained the URL link to the online questionnaire.

- c. One week following, a second solicitation letter was sent to non-participants inviting them to complete the questionnaire via the URL provided within the body of the letter.
 - d. Last, a survey packet containing a cover letter (including URL for the online questionnaire), a hard copy of the questionnaire, and a reply postage paid self-addressed return envelope for the completed questionnaire.
2. Email-only ($n = 4,000$): Four email invitations were sent 1 week apart. Similar to the cover letter sent to the web push group, the email invitations outlined the study purpose and invited participants to complete the questionnaire online. Both a URL to be entered into participants' browser and hyperlinked icon ("Take Survey") were provided for participants to access the questionnaire.
 3. Mixed-mode ($n = 1,000$): Four simultaneous mail and email invitations were sent 1 week apart. These solicitations replicated the protocols outlined for the web push group with simultaneous solicitation using the protocols outlined for the email-only group. The sending of email and postal invitations were synchronized to arrive simultaneously with email invitations sent approximately 2 days following the mailing of hard copies.

Measures

We selected questionnaire items measuring avidity, motives, satisfaction, trip expenditures, days spent fishing, and socio-demographics to compare participants across modes of survey solicitation and response. Motivations, for example, have demonstrated utility for understanding angler satisfaction, management preferences, and attitudes toward fisheries management decisions. Satisfaction is also an important construct in recreational fisheries management that has been tied to individuals' continued involvement with angling.

Findings & Discussion

Response Rates

Our findings suggest that mixed-mode designs were most effective for generating the highest response rates. Our mixed-mode design relied on both surface mail and email invitations to participants and generated response rates more than twice that of email-only or surface mail (with web push) invitations. In terms of recommending a sampling design to researchers or managers, our results suggest that if a high response rate is the priority, then the mixed-mode design we describe is warranted. However, we also suggest survey designers and management agencies consider their priorities, such as the desired number of responses, costs, and available resources they have access to for conducting their surveys, given the limited variability we observed in terms of anglers' behaviors, preferences, motivations, and expenditures. In the context of our study, the lack of variability in these variables alludes to an email-only solicitation being a potential option for the agency's future collection efforts, and use customary weighting techniques on the collected data using age (Dillman et al. 2014).

Solicitation Mode

Our analysis of between-group variability revealed little variation in respondents' motives, satisfaction, and expenditures related to fishing trip expenditures. While we did observe variation in respondents' socio-demographic characteristics, this variation was not manifested in those indicators that provide more managerially actionable insight. These findings diverge from past human dimensions of fisheries work where socio-demographic

profiles often correspond with variability in factors related to preferences, motivations, and avidity.

Response Mode

Aside from soliciting participants through the mail or their email, our web push and mixed-mode designs provided participants with the option to respond via a paper or web-based questionnaire. Nearly 50 percent of web push participants and 70 percent of mixed-mode participants chose to respond online. In terms of socio-demographic differences, the results of our within-group analyses, which were consistent with past research. We observed that web-based participants were significantly younger and wealthier compared to those who responded via mail-back. Paper-based participants reported being older and having spent significantly more days fishing during the last twelve months, regardless of the mode solicitation. These results, when coupled with the proportion of respondents opting to complete the questionnaire online, even when given the option of a hard copy (46.2% for web push and 70.2% for mixed-mode), signals a trend for the conduct of future surveys.

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