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Understanding angler behaviors that influence the spread of aquatic invasive species

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ABSTRACT:

Mounting evidence suggests the unintentional spread of aquatic invasive species (AIS) stemming from human behavior is degrading aquatic ecosystems in the Great Lakes region. Understanding the reasons why anglers make decisions and express preferences for the future is fundamentally important for enhancing communication with public audiences and developing scientifically informed strategies that can minimize human impacts on the environment. Effective fisheries management therefore requires knowledge of the factors that influence angler behavior related to the spread of AIS. Data were collected from 1,120 license-holding anglers in IL, MI, WI, and NY who completed a mixed mode survey with mailback and online options, 60 anglers recruited on the IN shoreline of Laken Michigan, and 801 anglers from an online convenience sample drawn from the Canadian province of Ontario. First, we quantified the effects of psychological processes on angler behaviors relevant to the spread of AIS and learned that engagement in behavior was markedly low but could be explained by “short-term” (e.g., risk perceptions) and “long-term” (e.g., values) drivers. Results from a structural equation model indicated that appreciating and preserving nature (i.e., biospheric values) explained how anglers saw threats to themselves, their community, and ecosystems, whereas value systems driven by self-worth and achievement were weakly related to threats to the self from AIS. Also, personal risk perception was more influential than social risk perception in shaping behavior, indicating that AIS preventative action is unlikely to occur unless anglers believe risks threaten their everyday lives. Differences emerged in a comparison across subgroups defined by fishing environments to direct managerial attention to anglers at highest risk of transmitting AIS from the Great Lakes to inland waterways. Secondly, we examined angler preferences for hypothetical changes to fishing scenarios using a discrete choice experiment and effectively predicted their decisions about the future. The probability of choosing a scenario increased with the presence of voluntary or mandatory wash stations, lower costs per fishing trip, greater amounts of native fish species, fewer impacts from AIS, and increased quality of fish habitat. In an analysis of cost

in relation to the other four features assessed in the experiment, we observed the quality of fish habitat was most valuable whereas the amount of native fish species was least valuable according to survey respondents. In a comparison between anglers in the US and Canada, largely similar patterns emerged indicating an internationally consistent management approach could be well received. Finally, we examined the conjoint effects of preferences for future fishing scenarios and psychological drivers of angler behavior in the Great Lakes region. By integrating a structural equation model with a discrete choice experiment into a “hybrid choice model” we increased our statistical efficiency and ability to understand how psychological drivers explained tradeoffs between management regulations and ecosystem changes from AIS. We observed that biospheric values were most important, followed by altruistic and egoistic values in explaining preferences for the future. Normative pressure that reflected feelings of moral obligation to engage in AIS preventative behaviors and beliefs that one individual could make a difference were strong but non-significant predictor variables. Additionally, willingness to pay to support AIS management differed based on fishing mode, in that anglers who fished from boats were more sensitive to cost than shoreline or mixed-group anglers. Preferences also differed by age, in that younger anglers were more likely to be open to change and supportive of decisions to reduce impacts from aquatic invaders.