



Analysis of Public Comments on Experimental Regulations for Protecting Black Bass during The Spawning Period in Eastern Ontario Reveals Both Stakeholder Acceptance and Skepticism

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Abstract

Recreational angling of nesting largemouth bass (*Micropterus nigricans*) and smallmouth bass (*M. dolomieu*) can greatly increase nest abandonment, and in the northern clines of their range, decrease recruitment. This is the case in eastern Ontario, where high levels of non-compliance and difficult to enforce regulations have impacted black bass (*Micropterus* spp.) conservation and management. Effective January 1, 2024 until December 31st, 2025, novel and experimental fishing sanctuaries were imposed on portions of Charleston Lake and Opinicon Lake that prohibit recreational fishing of all types from April 15th to the Friday before the first Saturday in July (encompassing the full bass reproductive season). As part of the formal process to institute these experimental regulations, public comments were collected on the Environmental Registry of Ontario. We examined those comments and identified supportive and non-supportive themes related to these experimental regulations. While a majority of stakeholders were in support of the new regulations, we also noted sub-themes that may hinder regulation acceptance. Those sub-themes include: a perceived lack of enforcement negating the potential benefits of the sanctuaries, under-estimation of the extent of non-compliance with existing regulations such that new regulations are unnecessary, misunderstanding and misinformation, as well as distrust of government and the academic research community. Understanding and addressing these stakeholder perspectives will help researchers studying the new sanctuary areas and managers understand any lack of compliance while informing future decisions about bass management in eastern Ontario and beyond.

Keywords Recreational fisheries · Regulation compliance · Largemouth bass · Smallmouth bass · Human dimensions · Fisheries management

Introduction

Globally, recreational angling is a popular activity that can generate a host of socio-economic benefits (Arlinghaus and Cooke 2009). For that reason, focal species targeted by recreational anglers are often subject to intensive management. In the case of the black bass recreational fishery, composed primarily of largemouth bass (*Micropterus nigricans*; LMB) and smallmouth bass (*Micropterus dolomieu*; SMB), in the United States, more anglers recreationally fish for these species than any other freshwater or saltwater species (U. S. Fish and Wildlife Service 2016). They are also popular game fish in Canada (Brownscombe et al. 2014) and in other parts of the world where they have been introduced (Quinn and Paukert 2009). Despite the benefits of recreational fishing, it also has the potential to

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adversely affect fish populations through alterations in population dynamics and opportunities for fisheries-induced evolution (Cooke and Cowx 2006; Lewin et al. 2006). Studies on LMB and SMB have provided evidence of these changes (Philipp et al. 2009; Philipp et al. 2023a). Therefore, it is critical to design science-based management strategies for black bass fisheries that take into account and mitigate these impacts.

Black bass are managed by natural resource management agencies to balance the demands of the recreational fisheries with the overall well-being of the populations for the benefit of diverse users (Long et al. 2015), although increasing conservation is becoming more central to their management (Taylor et al. 2019). In some jurisdictions, regulations include seasonal closures aimed at safeguarding bass during their reproductive phase, a time when they are particularly susceptible to angling pressure (e.g. Suski et al. 2003; Zuckerman et al. 2014; Stein and Philipp 2015). With the rise in popularity of catch-and-release angling, regulations have been adjusted as the harvest pressures have shifted, and there is a longstanding belief that there were only benefits to releasing fish (Myers et al. 2008). There is now ample evidence that catch and release angling does come with consequences (e.g. Arlinghaus et al. 2007; Cooke and Wilde 2007). In the case of black bass species, catch-and-release angling has extended parental care, with any disturbance during the reproductive period possibly leading to brood loss through predation and nest abandonment, resulting in a reduction in annual recruitment (Cushing et al. 1996; Philipp et al. 1997; Cooke et al. 2000; Suski et al. 2002, 2003; Suski and Philipp 2004; Hanson et al. 2007; Steinhart et al. 2008; Zuckerman et al. 2014). These issues are magnified in the northern range of both species (e.g., Ontario) where productivity and opportunity for multiple spawning events in a season are climatically limited. In Ontario, the current open season for LMB and SMB in Fisheries Management Zone (FMZ) 18 (an area encompassing the space between the Ottawa River, Lake Ontario and St. Lawrence River) begins every year on the third Saturday of June and remains open until December 15th. While the current regulations in much of southern Ontario prohibit the targeting or harvest of bass during their reproductive period, the spawning dates varies by year, the regulation is difficult to enforce (e.g. due to overlapping of open angling seasons of other species; Philipp et al. 2023a, 2023b) and compliance is generally low, although reasons have not been fully explored in the context of the Ontario black bass fishery (Philipp et al. 1997; Quinn 2002; Kubacki et al. 2002; Suski et al. 2002; Tufts et al. 2019). Despite prior recruitment research in black bass (e.g. Philipp et al. 2023a), there are trends leaning towards liberalization of black bass regulations in northern clines, such as those seen in Connecticut (Connecticut State Department of

Energy and Environmental Protection 2024), Michigan (Michigan Department of Natural Resources 2024), and Ontario (Ontario Ministry of Natural Resources and Forestry 2024). These actions may have devastating long-term effects and are pre-mature without critical bass management research.

Arias et al. (2015) stated that “nature conservation is fundamentally about managing people.” Indeed, the human dimension component of conservation can be one of the most challenging to manage (Manfredo et al. 1996). Conservation researchers across all disciplines have called for more approaches that incorporate human dimensions research (Mascia et al. 2003), and fisheries are no exception, especially with the inherent coupling of human-natural systems, and the need to understand and engage with the human side of the system (e.g. Arlinghaus et al. 2008; Post and Parkinson 2012; Lynch and Liu 2014). To meet conservation objectives, any regulation or protective measure can only be successful if users comply (e.g. Bova et al. 2017; Arias et al. 2015; Decker and Richmond 1995). Thus, in fisheries, it is crucial to understand the extent to which anglers accept new fishing regulations as a means to address issues with non-compliance (Page and Radomski 2006; Pierce and Tomcko 1998; Sullivan 2003). This is an aspect that is currently missing from the black bass fishery in eastern Ontario despite previous anecdotes about stakeholder frustrations with the lack of regulation compliance for black bass in FMZ 18 (Kubacki 1992; Ferguson 1995).

Prior research has paved the way for the implementation of pilot regulations for spawning sanctuaries, with data from a before-after-control-impact (BACI) study being conducted between 2019 and 2021 (e.g. Philipp et al. 1997; Philipp et al. 2023b; Suski et al. 2002). The COVID-19 pandemic and its restrictions on travel also provided the opportunity to explore the idea of a “whole lake sanctuary” that was created due to low angling pressure during the years of the pandemic (Philipp et al. 2023b). As a result, regulations (bass spawning sanctuaries) prohibiting fishing between April 15th and the Friday before the first Saturday in July on Charleston Lake and Opinicon Lake (Fig. 1) will be imposed. Fish sanctuaries do exist in FMZ 18 but their locations have not benefitted nesting black bass and thus, the new (temporary) experimental regulations to specifically protect bass during their reproductive periods will be the first of its kind.

To determine how the experimental regulations would be perceived and accepted, we obtained public comments available on the Environmental Registry of Ontario which houses notices on actions that may be affecting the environment, including changes in regulations. The registry allows for the public to submit comments, allowing us to explore stakeholder perspectives regarding the new experimental bass regulations. In an effort to understand



Fig. 1 Maps depicting the approved experimental black bass sanctuary areas (shaded in gray) in Charleston Lake (top) and Lake Opinicon (bottom)

how local stakeholders feel about the experimental regulations as well as black bass management strategies, we wanted to identify the key factors driving support and non-support among anglers. Additionally, we identified factors from within those supportive and non-supportive groups that may hinder progress towards regulation acceptance. We further used those themes to develop key questions for future research on this topic that can be pursued using other social science methods.

Methodology

On May 4th, 2023, the proposal for the temporary spawning sanctuary regulations was uploaded into the Environmental Registry of Ontario (ERO# 019-6728). The Ministry of Ontario sent out notices to property owners impacted by the areas of the temporary spawning sanctuaries, asking for comments to be submitted. The ERO portal had three components: 1) who they were commenting on behalf of, 2) an open-ended question that asked to explain their support stance, and 3) additional supporting links and documents. The portal was available online for public comment during a span of 46 days—May 4th, 2023 to June 19th, 2023 - after which comments were filtered for relevance and 19 irrelevant comments were omitted based on OMNRF criteria (e.g., did not deal with the topic of the post or were generic criticisms of government non-specific to this issue). In addition, a few comments were received via direct e-mail to the MNRF yielding a total of 105 comments to be considered for analysis. Upon request, the comments were sent to the research group to conduct analysis. A research ethics application was completed and submitted to the Carleton University Research Ethics Board B (CUREB-B) and clearance was provided on September 8th, 2023 for secondary use of those data (File no. 120004).

Coding and Analyses

Thematic analysis was conducted with NVIVO 14 software using a mix of deductive and inductive coding processes. Preliminarily, three main categories were identified by individuals at the MNRF which were “supportive,” “non-supportive,” and “unknown support” based upon the individual’s comment in the portal’s open-ended response section. Individuals who did not clearly state their stance were categorized as “unknown support.” Secondly, responses were reviewed to identify sub-themes within supportive and non-supportive groups. This includes scanning the results for key words or phrases to create a list of potential codes (i.e. sub-themes). It was important at this stage to note any contextual cues within comments (for

example, anytime “enforcement” was mentioned it was in the context of a “lack of enforcement”). Each response may contain multiple codes that are placed in multiple sub-themes as respondents often made several points to explain their stance on the regulations. One additional category that was identified after the first review was “factors slowing down regulation acceptance” for which no new sub-themes were created. Instead, sub-themes under this category were pulled from the existing main categories of “supportive and ‘non-supportive’”. Responses were then reviewed a second time and codes were placed under the existing sub-themes within the established framework. Coding was completed by one co-author but checked for validity by another co-author prior to the second round of coding. Additionally, key ideas were expanded upon using a mind-map to explore links between the sub-themes, identify overlapping ideas, and develop novel questions. For example, the idea of regulation enforcement was explored within supportive and non-supportive categories. Mind-maps are tools that can promote non-linear thinking to find connections between various concepts and increase critical thinking (Mahmud et al. 2012) which helped solidify understanding within the categories of “supportive,” “non-supportive” and “factors slowing down regulation acceptance.”

Findings

General Trends of Those in Support of Sanctuary Regulations

Of the 105 approved comments, 86 (82%) were in support of the sanctuary regulations outlined by the ERO # 019-6728. While many codes were identified and categorized into major themes (Table 1), below we highlight the main codes applied as reasons individuals may “support a regulation.”

In total, 31 codes were identified as “protecting ecosystem health and the environment,” where comments mentioned the well-being of bass, fish, aquatic ecosystems, as well as the general environment. As one respondent wrote:

“Creating these fish sanctuaries will greatly benefit long-term bass nesting and protect the overall well-being of the environment. It is a method that looks very promising and respects impacted communities. Bass are essential to the ecosystem; without it, there would be detrimental consequences.”

Secondly, 21 codes mentioned seeing anglers “illegally fishing for nesting bass” as a major driver for supporting regulations; whether individuals were targeting nesting bass on-purpose or accidentally (as by-catch for other fisheries

Table 1 Summary of major codes and sub-themes identified during analysis, containing examples of quotes that fit each sub-theme

List of major codes identified during analysis					
STANCE	Codes	Times coded	Notable Quotes		
SUPPORTIVE TOTAL COMMENTS THAT WERE SUPPORTIVE (82% OF 105)	Protecting ecosystem health and the environment	31	“Creating these fish sanctuaries will greatly benefit long-term bass nesting and protect the overall well-being of the environment. It is a method that looks very promising and respects impacted communities. Bass are essential to the ecosystem; without it, there would be detrimental consequences”		
	Illegally fishing for nesting bass	21	“As a resident of Charleston Lake I witness on a regular basis lots of fishing before the opening of Bass season. People say we are after Crappie not Bass. This is legal however the number of Bass caught and released at this time, although maybe accidental, can be devastating to the recruitment of newly hatched young”		
	Local ecological observations	15	“My memory may not be scientific but I remember my fishing for bass in Opinicon in the late 1970’s was excellent, both for numbers and size. The high fishing pressure today due to the number of anglers using modern boats and equipment to fish for nesting bass cannot be sustainable.”		
	Expansion of sanctuary areas or regulations	11	“There is a shoal at the mouth of Foster Bay that always have fishermen. They are often fishing too close to the docks in the Bay where the bass nests are located before bass season opens. It might be another good area to create a sanctuary to preserve the bass nests.”		
	Prior scientific knowledge	8	“The rise in hook wounding rates during the closed fishing season is resulting in reduced nesting success, and consequently, recruitment of black bass in both Opinicon and Charleston Lakes.”		
	Additional regulation suggestion	8	“Fishing should be banned 100 Metres from any shoreline until after Bass opens.”		
	Attended a presentation on the topic	5	“I attended the discussion on this issue at Queens last spring. I found it informative and it provided information that changed my view of bass spawning.”		
	COVID observations	5	“While our bass population thrived as a result of COVID, the number of bass in the lake is down dramatically from historical levels.”		
	NON-SUPPORTIVE TOTAL COMMENTS THAT WERE NOT-SUPPORTIVE (13% OF 105)	Disruption of angling autonomy	9	“It is important to consider the potential consequences for individuals who own property in the affected areas. These individuals may be disallowed from fishing with their young children or grandchildren off their docks for a minimum of two years, possibly even longer.”	
		Alternative ideas	7	“If you are worried about the bass population there are other ways to increase the bass population. You could stock the lake. Maybe consider letting kids still fish. I know they don’t need a license but we still have to follow the rules so maybe kids could still be allowed to fish.”	

Table 1 (continued)

List of major codes identified during analysis

STANCE	Codes	Times coded	Notable Quotes
	Lack of existing enforcement	7	<i>"The current lack of adherence to established rules and regulations is disconcerting. It raises questions about the effectiveness of enforcement and monitoring on Charleston Lake. Before introducing new measures, it seems imperative to address the existing challenges and find solutions to improve compliance."</i>
	Property value decrease	5	<i>"I bought my property primarily for fishing, and now that value of the this cabin will be severely impacted as we are caught right in the middle of the proposed sanctuary. I would never have purchased this property had the sanctuary been in place at that time."</i>
	Issues with sanctuary boundaries	4	<i>"Furthermore, I kindly request clarification regarding Lumber Bay. While the proposal mentions Sand Bay and Sally's Hole, I noticed that Lumber Bay is shaded in green on the provided map. This discrepancy has caused some confusion, and I would greatly appreciate clarification on whether Lumber Bay is also part of the proposal."</i>
	Healthy current population	3	<i>"Our time here, over the last 20+ years, the bass population has seemed nothing but healthy and abundant."</i>
FACTORS SLOWING DOWN REGULATION ACCEPTANCE			
	Lack of or need for enforcement	19	<i>"Proceed with your study, however, I will note the importance of policing and monitoring fishermen early in the season,"</i>
	Regulation rejection due to underestimation of non-compliance	10	<i>"Anglers don't target bass before the season starts so minimal are caught while they are spawning,"</i> <i>"This past spring I did not catch a single bass off of my dock while they were spawning and I probably caught over a dozen pike and 50-100 bluegill and pumpkinseed. This is evident that you can fish in these zones without catching any bass,"</i>
	Misinformation or misunderstanding of study purpose or general ecology	9	<i>"I have noticed that all bass finish spawning well before the opening date between the 1st to 2nd week of June. July 10 is incredibly far off and is not even close to the date that the bass stop guarding fry,"</i> <i>"I have also sat in a presentation of this proposal and my understanding is that the majority of studies for this were completed on lake Opinicon and not Charleston. These two bodies do not seem comparable, at least to my eye."</i>
	Distrust of government or academia	6	<i>"As with many areas where the government tries to trample on the rights of citizens of the Charleston Lake area, such as when they tried to take over the Blue Mountain forest area to expand the Provincial Park, once the government gets their foot in the door the damage will be done."</i>

such as Northern pike, *Esox lucius*). Most respondents specified that they had witnessed these activities during the closed black bass season:

“As a resident of Charleston Lake I witness on a regular basis lots of fishing before the opening of Bass season. People say we are after Crappie not Bass. This is legal however the number of Bass caught and released at this time, although maybe accidental, can be devastating to the recruitment of newly hatched young”

A total of 15 codes for those who were in support of the regulation had made “local ecological observations,” including some knowledge on black bass nesting habits, identifying population or demographic trends in black bass, or other broader areas of ecological knowledge that led them to support these regulations.

“My memory may not be scientific, but I remember my fishing for bass in Opinicon in the late 1970’s was excellent, both for numbers and size. The high fishing pressure today due to the number of anglers using modern boats and equipment to fish for nesting bass cannot be sustainable.”

Finally, 11 codes were identified that suggested an “expansion of sanctuary areas or regulations” either to different parts of Lake Opinicon and Charleston Lake, the whole of the lake or to other Lakes across Ontario:

“There is a shoal at the mouth of Foster Bay that always have fishermen. They are often fishing too close to the docks in the Bay where the bass nests are located before bass season opens. It might be another good area to create a sanctuary to preserve the bass nests.”

General Trends of Those not in Support of Sanctuary Regulations

Of the 105 approved comments, 14 comments (13%) were submitted by individuals who were not supportive of the regulation moving forward. Nine individual quotes were coded as “disruption of angling autonomy,” indicating that some level of fishing autonomy will be lost in areas where respondents own property or on the lakes in general. Coupled with this, five codes were identified as a fear of “property value decrease” mostly due to an inability to fish from or adjacent to their property, but also encompassed a fear of tourists avoiding these lakes for recreational fishing (and associated socioeconomic benefits).

“It is important to consider the potential consequences for individuals who own property in the affected areas. These individuals may be disallowed from fishing with their young children or grandchildren off their docks for a minimum of two years, possibly even longer.”

“Lack of existing enforcement” was a code identified seven times among non-supportive respondents. This is an idea that seems rooted in the thought that there are other areas that are lacking due to non-enforcement or a lack of enforcement and fear that any methods that include “self-enforcement” would lead to cottager conflicts.

“The current lack of adherence to established rules and regulations is disconcerting. It raises questions about the effectiveness of enforcement and monitoring on Charleston Lake. Before introducing new measures, it seems imperative to address the existing challenges and find solutions to improve compliance.”

Lastly, 4 codes were placed under “Issues with sanctuary boundaries” due to confusion and vagueness of the areas listed on the ERO and suggestions to move sanctuary areas away from areas of high human traffic:

“Furthermore, I kindly request clarification regarding Lumber Bay. While the proposal mentions Sand Bay and Sally’s Hole, I noticed that Lumber Bay is shaded in green on the provided map. This discrepancy has caused some confusion, and I would greatly appreciate clarification on whether Lumber Bay is also part of the proposal.”

Factors “Slowing Down Regulation Acceptance”

While no specific category was initially identified for potential factors that would slow down the acceptance of regulation, certain sub-themes emerged within the coding process that were clearly identified under this category. Based on contextual elements of the comments, some of the supportive and non-supportive comments actually represented points of views and ideas that could hinder acceptance of this regulation and potentially act as nudges or tipping points between supportive and non-supportive positions. It is important to note a distinction between factors of staunch non-support and factors we identified as “slowing down regulation acceptance.” In our case, the factors slowing down regulation acceptance are those factors where action by researchers (or other trusted actors) may help to nudge skeptical individuals to accept the regulation, as opposed to other non-supportive factors that would largely remain unchanged.

Four key themes were identified that may slow or hinder regulation acceptance:

1. “Lack of or need for enforcement.” Nineteen codes were identified from individuals who *support* the regulations passing but had clear concerns about the existing enforcement and the effectiveness of regulations without enforcement. This differs from the individuals identified in the non-support group who had responses coded under this same code. Among the support group, this would be seen as a reason a supportive individual would be wary of a regulation:

“Proceed with your study, however, I will note the importance of policing and monitoring fisherman early in the season,”

“I think this is a great step forward in conservation as long as it is enforced by conservation officers,”

“In addition - enforcement **MUST** be present and visible for this to truly work. Citizen monitoring only goes so far, there are so many who ignore current regulations. Even if through ignorance it still needs to be enforceable to be a meaningful test.”

2. “Feeling new regulations are unnecessary due to underestimation of illegal behaviour by anglers.” Nine codes were identified from individuals who are *non-supportive* of the regulations due to certain skewed perspectives, including the idea that individuals do not target bass prior to their open-season:

“Anglers don’t target bass before the season starts so minimal are caught while they are spawning,”

Or that bass cannot be caught if you are fishing for other species of open-season fish:

“This past spring I did not catch a single bass off of my dock while they were spawning and I probably caught over a dozen pike and 50-100 bluegill and pumpkinseed. This is evident that you can fish in these zones without catching any bass,”

As reported before by Philipp et al. (1997), anglers do catch bass prior to the open-season, sometimes, illegally. Thus, these observations are incorrect and have misled individuals into thinking that bass populations are safe from illegal fishing prior to the open-season.

3. “Misinformation or misunderstanding of study purpose or general ecology” Ten codes were identified from

those *non-supportive* of the regulations and represent examples of general ecological misinformation:

“I have noticed that all bass finish spawning well before the opening date between the 1st to 2nd week of June. July 10 is incredibly far off and is not even close to the date that the bass stop guarding fry,”

Based on observations in just the Summer of 2023, we know that bass were spawning well into the second and third week of June as colder May temperatures delayed spawning. Spawning variability (both timing and nesting success) often depends on the specific climatic factors of the year (Philipp et al. 1997; Suski and Ridgway 2007). Thus, comments such as these were determined to be misinformed, based upon this study.

Or a misunderstanding of the study:

“I have also sat in a presentation of this proposal and my understanding is that the majority of studies for this were completed on Lake Opinicon and not Charleston. These two bodies do not seem comparable, at least to my eye.”

“[Different]bays should be able to determine the health of bass nesting without the possible interruption of anglers, and would have no impact to property owners like myself and many others.”

4. “Distrust of government & academia”. Finally, six codes were identified by individuals *non-supportive* of the regulations who were mistrusting of government or academic bodies:

“As with many areas where the government tries to trample on the rights of citizens of the Charleston Lake area, such as when they tried to take over the Blue Mountain forest area to expand the Provincial Park, once the government gets their foot in the door the damage will be done.”

Discussion

Significance of Black Bass Management in Eastern Ontario

To our knowledge, this study is the first to explore direct ERO comments on spawning sanctuaries as it relates to black bass. As there is insufficient information available on regulation non-compliance in eastern Ontario, examining

these comments provided crucial insights into the thoughts and attitudes of anglers prior to the implementation of the fishing regulation.

Factors among Individuals Supportive of this Regulation

The portal responses showed overwhelming support for the experimental spawning sanctuaries outlined for Charleston Lake and Lake Opinicon. Additionally, a large proportion of these individuals expressed reasoning that aligns with general environmental stewardship and protection of the environment (aquatic or otherwise). Having a strong propensity towards ecological protection is extremely important when dealing with regulation compliance (e.g. Brennan and Lo 2002; Nguyen 2011; Dunlap and Van Liere 1978; Stern and Dietz 1994; Ones et al. 2015). Furthermore, anglers have shown to care and take interest into the protection of environments and are often excellent stewards of conservation actions (Granek et al. 2008; Bate 2001; Kirchhofer 2002; Cambray and Pister 2002), which will be increasingly important in FMZ 18, especially if the experimental spawning sanctuaries turn out to be an effective black bass management strategy. There were numerous public presentations on the proposed experimental regulations as well as significant discussion and debate on social media such that it is likely that many of the respondents were somewhat aware of the scientific and management basis for the experiment.

Another essential aspect among individuals in support of the experimental sanctuary regulations is the incorporation of local ecological knowledge (LEK) defined as “knowledge held by a specific group of people about their local ecosystems” and is facilitated by those who are “intimately familiar” with the resources that are being affected (Olsson and Folke 2001; Davis and Wagner 2003; Anadon et al. 2009). Individuals that supported the proposed regulations were knowledgeable on black bass ecology or had observed anglers that ignored existing regulations (e.g. 21 codes identified for angling out-of-season). It is clear from this study, that how anglers or cottagers perceive the usefulness or necessity of a regulation can depend heavily on what they have experienced or observed over time. While misconceptions can also be considered LEK, it was evident in the study how “correct” LEK can then drive further support for new regulations. While black bass species are not of particular ecological concern in Ontario (i.e., they are widespread and not considered threatened according to any provincial or federal population status assessments), LEK can yield insight on key black bass population trends that cannot be captured by current government stock assessment techniques. LEK has traditionally been underutilized in fisheries management, it is slowly making its way into

research (Bohensky et al. 2013; Hind 2015; Rehage et al. 2019), especially for species that are data-poor or lack records in catch-and-release (Lavides et al. 2009; Thornton et al. 2010; Daw et al. 2011; Beaudreau and Whitney 2016; Adams et al. 2014). Policies are often enacted when populations or a species starts to show declines, with the issue being an inability to assess temporally, when these declines are occurring (Oro and Martinez-Abraín 2023). Knowledge of stock status can drive future evidence-based management strategies such as the proposed spawning sanctuaries to avoid a situation that often occurs in conservation, where we are “too little, too late.”

Factors among Individuals Non-supportive of this Regulation

Of all the approved comments, 14 (13%) expressed non-support for these new regulations mainly due to changes to fishing autonomy, property value decreases, lack of enforcement and issues with sanctuary boundaries. It is important to note, within the context of our study, that non-support does not necessarily imply non-compliance but rather emphasizes the importance of compliance as a factor for management success. We will briefly discuss potential non-compliance as angler motivations towards non-support and how that could drive future regulation non-compliance. Fisheries non-compliance has been an issue for decades, with varying studies outside of the black bass fishery reporting various non-compliance rates (Bova et al. 2017; Hauck and Kroese 2006; Pierce and Tomcko 1998; Muth and Bowe 1998; Thomas et al. 2015; Page and Radomski 2006; Curcione 1992; Nielson and Mathiesen 2003). Angler non-compliance can negatively impact the success of regulation programs (Paragamian 1984; Pierce and Tomcko 1998) and should be of special concern for new regulations.

Angler motivations are highly relevant to non-support and potentially non-compliance. These sentiments are expressed clearly within the public comments analyzed. Anglers have different motivations for fishing and these motivations are often categorized into two schools of thought. The first of these are considered “catch outcomes,” which involve finding high quality fishing sites, availability of those sites, and quality or quantity of catches (Hunt et al. 2013; Birdsong et al. 2021). In our study, we identified that perceived changes to angler autonomy (which in return may impact an angler’s catch) and issues with sanctuary boundaries as key catch outcomes driving non-support of the experimental regulations. Ultimately, some anglers feel restricted by the experimental regulations, even if it is unknown how catch-related outcomes could change. The second considers some drivers of angling to be “non-catch outcomes” and involve elements such as experiencing nature and socializing (Arlinghaus 2006; Oh and Ditton 2008;

Oh et al. 2013). Oftentimes, the latter motivation for angling can be a greater driver for angling when compared against just catch-related outcomes (Ditton and Fedler 1989; Driver and Knopf 1976; Moeller and Engelken 1972). While there are perceived changes to catch outcomes (e.g. restriction of angling area) in this study, some property owners have expressed concern over changes in non-catch outcomes, such as an inability for their family to fish off the dock together, which some cottagers have expressed would diminish interest in visiting their properties. While the angling restriction only covers small portions of the lake for part of the angling season, these sentiments will be important to monitor as the project progresses.

Understanding the Tipping Point between Support and Non-support: The Factors Slowing Down the Progress Toward Regulation Acceptance

Recognizing the factors that may slow down regulation acceptance among different support groups will help in identifying the key areas that need to be addressed for effective regulations. We identified four main themes that could slow down the process for regulation acceptance. The findings show that there are people who may be more accepting of a new regulation depending on the reasons they may have inhibitions about those regulations. Those identified skeptics could still be won over as these new regulations unfold as their reasons for not accepting the regulation are items that could be addressed by researchers, managers, or other parties involved. In our context, we recognize there may be individuals who may never choose to comply with new regulations, thus, it is crucial to understand the factors that may influence skeptics who are slow to accept the sanctuaries but who may eventually end up supporting the sanctuary regulations.

The Enforcement Element

One of the main issues raised by respondents was the lack of enforcement for already existing regulations in eastern Ontario, which results in people feeling disengaged in a new regulation. This sentiment is not new for anglers in eastern Ontario (Kubacki 1992; Ferguson 1995). Enforcement is one of the most important features that influence regulation effectiveness (Edgar et al. 2014) and anglers are heavily influenced by their individual beliefs about the amount of enforcement for a regulation (Walker et al. 2007). In our study, people on both sides of support expressed displeasure and worry about the potential lack of increased enforcement with the addition of an experimental regulation. With limited numbers of conservation officers and their need to patrol large areas and address a wide range of fish and wildlife issues, enforcement remains somewhat

limited. A question that needs to be further explored is how stakeholder beliefs and perceptions on enforcement can change if there is continued lack of enforcement (summary of recommendations and actions can be seen in Fig. 2). Another aspect of enforcement is peer pressure, where anglers are judged by their peers for their actions. Peer pressure has been an effective driver (Milinski et al. 2002; Cooke et al. 2013), to help speed up the process of regulation acceptance. Using these peer driven sanctions is especially effective if anglers perceive peer-pressure driven enforcement to be useful and are concerned about their own reputations if they do not sanction (Guckian et al. 2018). In the case of these sanctuaries, peer-pressure driven enforcement will likely play a part in regulation compliance, despite fears that there will be an escalation of conflict among resource users. Equipping lake users with skills on how to engage in sanctioning in a safe and effective manner could be worthwhile.

Another concern is the blatant non-compliance due to outright rejection and the potential retaliation in the face of the regulations, which is especially an issue with a lack of enforcement officers. It will be important to avoid a situation described by Suski et al. (2002) where bass in some voluntary sanctuary areas actually experienced higher hook wounding rates due to blatant non-compliance. For the experimental spawning sanctuaries, the location, signage, increased outreach, and peer-to-peer networks should have a greater advantage to guard against blatant non-compliance issues versus the voluntary sanctuaries that were assessed by Suski et al. (2002). Regardless, we may still observe issues with blatant non-compliance that will need to be addressed as the regulation is implemented.

Feeling New Regulations are Unnecessary Due To Underestimation of Non-compliance

Cowx et al. (2010) described one of the key reasons for the disconnect between recreational fisheries and conservation as being a lack of ecological knowledge about species abundance and the factors constraining resource sustainability. In general, individuals may have skewed perspectives about ecosystem issues, which in turn skews their perspective on regulations (Knuth and Siemer 2007). These skewed perspectives can be a driver for statements described as “underestimation of non-compliance or illegal activity,” such as “nobody fishes pre-bass opener.” Some of these ideologies contrast previous research (e.g., Philipp et al. 1997) and the widespread opinions of some local anglers and cottagers that have observed heavy pre-season bass angling. These skewed perspectives would explain why some stakeholders are not keen to adopt these regulations or alternatively view them as advantageous to the bass population. To better inform their perspectives, it may

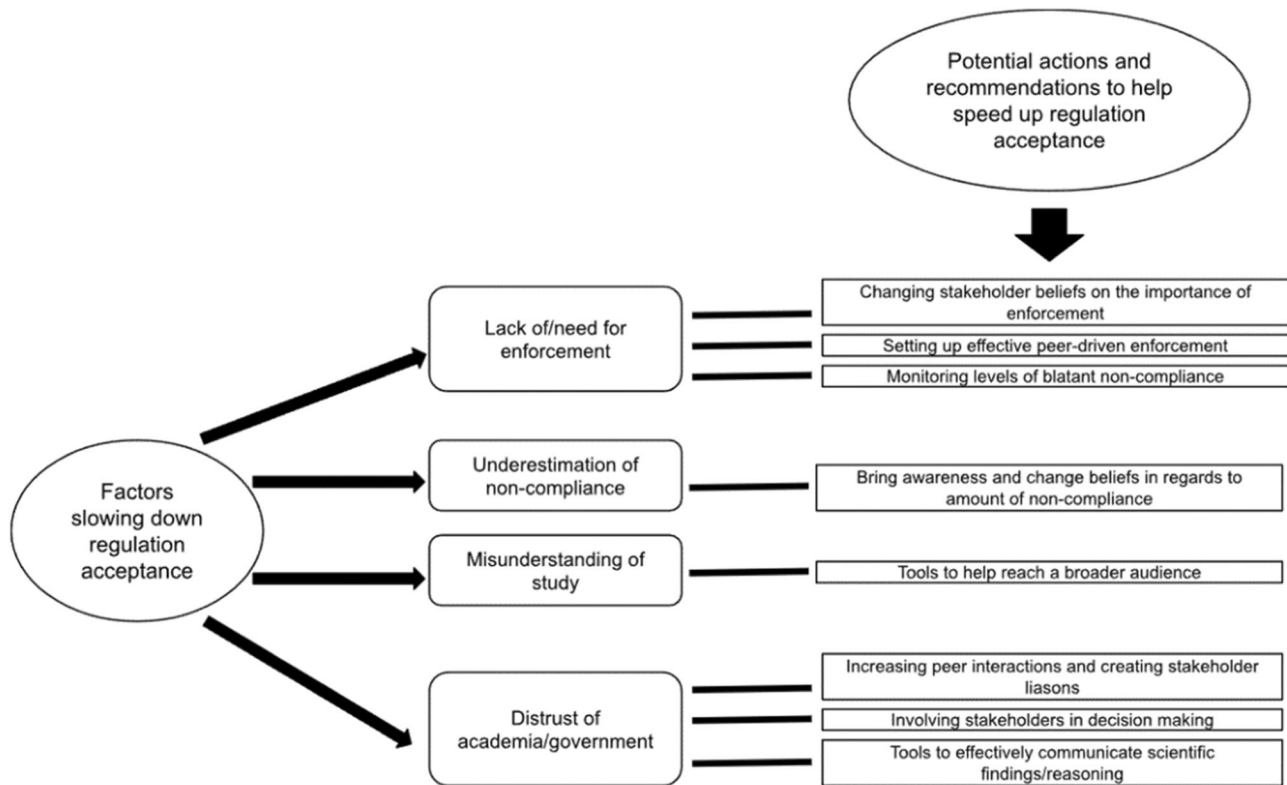


Fig. 2 A summary of the factors slowing down regulation acceptance and potential actions that can help increase acceptance of the black bass spawning sanctuaries

not be enough to just show the science-based evidence. More attention needs to be given to how best to educate anglers to shift their beliefs and sentiments. Additionally, tools to help “compliant” anglers recognize that there are individuals who actively do not follow regulations could be helpful.

Misunderstandings or Misinformation Regarding the Experimental Regulations

There are some comments that imply some respondents have misunderstood the objectives of the sanctuary studies and that may be hindering regulation acceptance. Opposition to regulations can occur when objectives are not understood (Petty et al. 1992). Education and outreach programs can make objectives clear and answer questions about both the regulations themselves and about broader ecological knowledge and have been well documented to increase willingness to cooperate and support environmental regulations (e.g. Petty et al. 1992). Leading up to the experimental sanctuary regulations, presentations were made to various cottage associations and angler groups as a way of alleviating any concerns or misunderstandings of the proposed sanctuaries. This was shown to be successful as, five individuals noted in the comment portal that they shifted from uncertainty to support after attending

these meetings. This example highlights the connection between education and regulation acceptance among those who are not considered early adopters towards the regulation. While these outreach presentations were apparently effective, it is evident that more engagement is necessary to communicate the ecological components and management objectives of the regulatory change and study. The extent of local stakeholder awareness remains unclear and additional time and improved outreach tools to engage a broader audience are warranted.

Distrust and Alienation

Distrust of government is widespread, as shown in this study. Public stakeholders and local residents, such as the cottagers in this study, are highly involved and passionate about issues regarding their local lakes. Thus, it is important to consider the development of peer interactions and networks among local stakeholders to potentially help increase acceptance among late majority adopters through connections with early adopters. Additionally, regulations should aim to increase cooperation between anglers and managers to help bridge the gap in the wake of new management practices (Policansky 2008) rather than further divide individuals regarding the new spawning sanctuaries. There are significant challenges to bridging this gap between

environmental managers and local stakeholders (Cooke et al. 2013; Knight et al. 2008; Pullin et al. 2004; Nguyen et al. 2017). Some individuals may feel as though bureaucracy has compromised the validity of researchers and thus anglers can feel devalued and unimportant during fishery management processes (Package and Conway 2010, Gilden and Conway 2002, Harms and Sylvia 2001). Although fishers may not be intrinsically opposed to regulation development, they can feel alienated in the regulation development process (Boonstra et al. 2017), especially if past regulations were implemented without considering the needs and interests of recreational fishers (Arlinghaus 2005). As a result, we must ponder how we can do a better job involving stakeholders in the decision-making process. There are plenty examples of aquatic protected areas failing due to lack of local support and this leads to resentment and indifference towards the institution implementing the regulation (considering the regulation imposed to be a ‘foregone conclusion’; Fiske 1992; Salmana and Verardi 2001; Wolfenden et al. 1994). In this context, there will also be increased difficulty in effectively communicating scientific reasoning and findings if stakeholders already feel alienated throughout the process. This can lead to further blatant non-compliance and potential rejection of the results of the experimental study, which will impede forward progress made in black bass conservation.

Conclusions and Recommendations

This study provides insight into the perspectives of those who are supportive of the experimental spawning sanctuary regulations and those who are not. Additionally, it identifies factors that aim to slow down regulation acceptance among stakeholders who are wary to adopt sanctuaries as an acceptable black bass management strategy. Although regulations are rarely perfect, and stakeholders will rarely be 100% satisfied (Renyard and Hilborn 1986), the structure of these regulations provide ample research opportunities to better understand both the ecological effects and the social aspects of black bass management strategies, and how we can foster positive interactions to alleviate misunderstandings and mistrust in a world where many fishing regulations are leaning towards liberalization (e.g. regulations in Connecticut, Michigan and Ontario). We recommend continued reporting to the OMNRF of blatant non-compliance while developing methods of peer-driven efforts to improve compliance (e.g., sanctioning). Additionally, there is need for targeted outreach efforts that aim to foster positive interactions, shift values, beliefs and sentiments, explore ideas of peer interactions and create opportunities for knowledge exchange among decision makers, researchers, anglers, cottagers, and other relevant actors.

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Compliance with Ethical Standards

Conflict of interest The authors declare no competing interests.

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