

The Intersection Between Diverse Small-Scale Fisheries and the Recreational Fishing Sector in the Inland Waters of Canada

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Abstract

Unlike the marine environment, where small-scale fisheries tend to intersect with large-scale commercial fisheries, in inland waters' small-scale fisheries typically intersect with the recreational fishing sector. In some ways, small-scale fisheries and recreational fisheries are similar – for example, both tend to be ignored and undervalued, and can contribute to individual and/or local food security. In Canada it is common for small-scale fisheries (of various

sorts) to occur on the same lakes and rivers where recreational fisheries are also focused. Here we explore the synergies and conflicts that arise in freshwater systems in Canada where small-scale fisheries and recreational fisheries intersect. We also consider what this multi-sector fishing pressure means to governance in the current Canadian context. We use a case study approach with three cases that each focus on where small-scale fisheries (both Indigenous and commercial) and recreational fisheries interact in lakes of eastern Ontario and Manitoba, as well as on the lower Fraser River. Our goal is to illustrate how fisheries management and conservation requires holistic and innovative thinking and the recognition that different fisheries sectors operating in inland waters are inherently interconnected.

Introduction

Although marine fisheries often garner more attention than those in inland waters (Cooke et al. 2014), freshwater fish populations, as well as the fisheries and communities that depend upon them, are in a perilous state such that they require more attention than they are presently given. Before one even considers the consequences of fisheries exploitation in inland waters, there are other stressors external to the fishing sector such as pollution, habitat alteration, invasive species, climate change and many emerging threats. Inland fisheries have similar issues as marine fisheries, such as bycatch (Raby et al. 2011) and overharvest (Allan et al. 2005), which can contribute to population declines. Collectively these threats have led to what is now widely regarded as a freshwater biodiversity crisis (Harrison et al. 2018), with freshwater ecosystems among the most threatened on the planet (Carpenter et al. 2011) and freshwater fish the most imperiled vertebrate taxa second only to amphibians (Watson et al. 2018). The WWF Living Planet Index reports that freshwater biodiversity has declined more than 80% since the 1970s (WWF 2018) and in 2021 released a report that labels freshwater fish as forgotten (Panda 2022). Indeed, the state of freshwater biodiversity is so dire that the WWF and other partners have created an emergency action plan focused on decision makers and stewards in an attempt to restore freshwater

ecosystems (Tickner et al. 2020).

Not only are freshwater fish often forgotten, so are the fisheries that are based upon them (Cooke et al. 2016). By the numbers, freshwater harvest is overshadowed by the marine capture fisheries but on a per volume basis (i.e., comparing the volume of marine vs fresh surface water on the planet), freshwater harvests are much greater (Lynch et al. 2016). Moreover, freshwater fisheries provide nutritional security for rural regions and some of the most marginalized and economically vulnerable people while supporting livelihoods, ranging from those working in processing through the recreational fishing guides (Lynch et al. 2016). There are a myriad of other benefits that are specific to different sectors such as the leisure and well-being aspects that arise from recreational fisheries (Tufts et al. 2015), and the cultural and ceremonial connections associated with Indigenous small-scale fisheries (Atlas et al. 2021). We are just now beginning to acknowledge and understand the importance of inland fisheries to stakeholders and rightsholders (e.g., Lynch et al. 2020; Golden et al. 2021) and there remains much work to do (Lynch et al. 2017).

Few industrial-scale commercial fisheries operate in inland waters such that most harvest-oriented inland fisheries are considered small-scale. Yet despite their small scale, there is a great deal of diversity within these fisheries in terms of gears, markets, value, scale, and so on. Even the motivation for fishing is highly variable. In some regions small-scale fisheries have a strong cultural component and may be linked to rights systems, while in others, profit and economic opportunity are the primary motivation. Because most freshwater systems can be accessed without the need for massive vessels with offshore capability, the same waters fished by small-scale commercial fishers may also be used by the recreational sector. This is particularly the case in developed countries (Arlinghaus et al. 2002) including Canada, and is also becoming a common phenomenon in emerging countries (e.g., India, Brazil) and those in the global south (Bower et al. 2020). Some recreational fishing is done in a catch-and-release manner where fish are released with the assumption they will survive, while other recreational fisheries (or fishers) may be more harvest-oriented (Cooke et al. 2018). The line is often blurry between small-

scale fisheries (especially those with a strong subsistence component) and recreational fisheries (Nyboer et al. In Press), generating misunderstanding in research and policy discussions and potential conflict between sectors.

Here we explore the synergies and conflicts that arise in freshwater systems where small-scale fisheries and recreational fisheries intersect, drawing on case studies and examples from Canadian fisheries. Much like the rest of the world, freshwater biodiversity in general is in decline in Canada due to a variety of anthropogenic threads (Desforges et al. 2021) and there are examples of freshwater fish populations that have collapsed as a result of fisheries exploitation (Post et al. 2000). Indigenous populations in Canada are rightsholders who often engage in inland fisheries for ceremonial and cultural purposes, to support food security, and access economic opportunity through moderate livelihood fisheries that are by definition small-scale. At the same time, recreational fishing is popular across the country with both Canadian residents and tourists alike (Brownscombe et al. 2014). We use a case study approach with a focus on instances where small-scale fisheries (both Indigenous and commercial) and recreational fisheries intersect in lakes of eastern Ontario, where commercial and recreational fisheries intersect in Manitoba, and where all fisheries sectors intersect in the lower Fraser River of British Columbia. We also consider what this multi-sector fishing pressure means to management and governance in the current Canadian context. Our goal is to illustrate how fisheries management and conservation requires holistic and innovative thinking and the recognition that different fisheries sectors operating in inland waters are inherently interconnected. This perspective is different from the status quo which tends to think of these sectors as isolated entities.

Case study 1: Eastern Ontario multi-sectoral fisheries

There are several types of fisheries in Eastern Ontario. Eastern Ontario falls within the Great Lakes-St. Lawrence Basin and is characterized by many inland waterbodies along with the Canadian waters of the eastern basin of Lake Ontario (especially the Bay of Quinte) and the upper St. Lawrence

River. These waters are home to diverse fish communities including various combinations of black bass (*Micropterus* spp.), northern pike (*Esox lucius*), walleye (*Sander vitreus*), muskellunge (*Esox masquinongy*), yellow perch (*Perca flavescens*), lake trout (*Salvelinus namaycush*) and sunfish (*Lepomis* spp.). The area has long been renowned for its high-quality angling opportunities (See Figure 1) due in part to its proximity to the United States, which supports a large tourism sector. There is evidence of concern by resource managers about the level of fishing and harvest arising from the recreational sector going back many decades. For example, in the 1940s the provincial government instituted a number of fish sanctuaries in eastern Ontario focused on protecting largemouth bass (Zolderdo et al. 2019). Aside from continued issues with anglers illegally targeting nesting bass during the reproductive period (which can lead to nest failure; Kieffer et al. 1995), black bass populations are doing reasonably well. In recent decades this has extended to include many live release competitive fishing events that target black bass, making the recreational fisheries sector rather visible. However, other sectors are also active in eastern Ontario.



Figure 1. Recreational fishing in eastern Ontario. Credit: Cooke Lab

Both Indigenous and commercial fisheries are active in this area. Indigenous fisheries (mostly the Tyendinaga Mohawks) use primarily spears and gill nets, and tend to focus on walleye. Fish are used for nutrition, ceremonial purposes, and to support moderate livelihoods consistent with Canadian law. Commercial fisheries are not nearly as prominent as they were in the mid 20th century. Commercial fishing effort has involved gillnet fisheries in the nearshore areas of Lake Ontario and the St. Lawrence (especially in the Bay of Quinte) as well as hoopnet fisheries in those areas and in smaller inland lakes and rivers. Not surprisingly, there have been conflicts between the various sectors. Here we focus on two such conflicts – one between Indigenous fishers and the recreational sector, and another between the small-scale commercial fishers and the recreational sector. We preface this by noting that given its role in fisheries management, the provincial government natural resource management agency (currently called the Ontario Ministry of Natural Resources, Forestry and Northern Development) has also been involved to various extents in these conflicts – both contributing and helping to resolve them.

Small-scale Indigenous vs recreational fisheries conflict

Conflicts between Indigenous fishers and the recreational fishing community in Eastern Ontario have existed for decades with lack of clarity about the relative harvest of each sector (Wolf 2002). Tensions were particularly high during the early 1990s when walleye populations in the Bay of Quinte were doing poorly and there was a need to reduce fishing mortality of mature fish. The provincial government explored a variety of actions, including temporary closures of all sectors. This action was met with great opposition by the recreational sector. The Ontario Federation of Anglers and Hunters (a non-governmental organization) argued that there were ways to maintain fishing opportunities for both anglers and Indigenous communities (OFAH 2001) although their proposals were never fully enacted. The fishery bounced back as the ecosystem stabilized following introduction of a number of invasive species and environmental changes. Recently, the walleye populations are

doing well and conflict is largely invisible (Baldwin 2020). Yet, when the next decline or low year class becomes evident, it is almost certain that these conflicts will again come to the forefront. Efforts to develop respectful and collaborative relationships between various actors have been ongoing through the Fisheries Management Zone (FMZ) Council which have been active since approximately 2010 in both Lake Ontario (FMZ 20) and the lakes and rivers of eastern Ontario (FMZ 18). Those councils involve representatives from all fishing sectors, including Indigenous governments, and serve as forums for learning, sharing and understanding common issues related to fisheries. Strong relationships and open dialogue might help to alleviate future conflicts.

Small-scale commercial vs recreational fisheries conflict

In the 1990s, with growing recreational fishing pressure in the Bay of Quinte, conflicts arose between anglers and the commercial fishers. The commercial fishers use gill nets to target yellow perch and lake whitefish (*Coregonus clupeaformis*) but there can be significant bycatch of non-target species that are desirable to anglers (e.g., black bass, northern pike). Moreover, commercial gear is sometimes deployed in areas used by recreational anglers (OMNR 2003). During the 1980s the provincial government instated gear buyback programs for gillnets, began to institute more regulations on gillnets, and encouraged commercial fishers to transition to other gears such as hoopnets (BQFMP 2010). Through incentives and regulatory levers the commercial fishery has been scaled back with fish harvest at <10 % of historic levels (BQFMP 2010) and only of local importance (i.e., there is little export).

Similar conflicts have arisen in some of the smaller inland lakes where hoopnets are used by the commercial sector. The conflicts have centred on various lake users (e.g., cottagers, anglers, boaters) and the commercial sector. Most of these fisheries involve a single fisher being licensed for a given waterbody who would typically operate out of a small boat. The idea that an individual fisher could be allocated a quota equal to that of the entire recreational sector for a given waterbody, including the tourism industry that

it supports, leads to conflicts with lake users. In addition, bycatch of turtles has led to increased attention on the commercial sector from a variety of stakeholder groups and governments (Larocque et al. 2020). The ‘not in my backyard’ sentiment combined with regulations intended to protect turtles has led commercial fishers to push their fishing activities to periods where they are less visible (e.g., fall) to anglers or cottagers (Nguyen et al. 2013), reducing the intensity of the conflict. As these small-scale commercial fishers retire, there is evidence that they are not being replaced and this sector may disappear (Nguyen et al. 2013). Although conflict remains, there is growing understanding of turtle conservation among commercial fishers which is leading to broader adoption of turtle conservation measures.

Case study 2: Manitoba multi-sectoral fisheries

Manitoba, like eastern Ontario, has several types of fisheries. Manitoba has an abundance of inland waterbodies distributed throughout several drainage basins and for this reason Manitoba has a rich diversity of fishes and a rich fisheries history. Indigenous and commercial fisheries have long fed and economically supported Manitobans. Thirty species are advertised to recreational anglers as trophy fish (see Manitoba’s Master Angler Awards Program <https://anglers.travelmanitoba.com/>), making Manitoba a tourist destination for inland angling. However, due to overlap with multiple fisheries sectors in several fisheries, conflicts arise that require innovative management solutions. To highlight this, two conflicts will be used: the Lake Winnipeg Walleye conflict and Red River Channel Catfish (*Ictalurus punctatus*) conflict. Both conflicts pit commercial fishers against recreational anglers.

Lake Winnipeg Walleye

Walleye in the Lake Winnipeg small-scale commercial fishery are managed as part of an individual transferable quota where each fisher can harvest any of three species (Walleye, Lake Whitefish and Sauger (*Sander canadensis*)). The fishery has an annual landed value of \$12–20 M, and walleye are the most

valued of the three species, leading to a disproportionate amount of harvest in the commercial fishery. There is also a significant recreational fishery for large walleye (called 'Greenbacks') that attracts both local and out-of-province fishers, and an Indigenous food fishery for Walleye. Generally, the three fisheries co-exist, though in recent years there has been a decline in larger Walleye that has stressed commercial fishers and limited recreational angling opportunities (Manitoba Wildlife Federation 2018). The conflict has manifested with editorials published in local media by both commercial and recreational fisheries stakeholders (e.g., Botelho-Urbanski 2018), and a generally level of distrust with the data by commercial fishers (Kives 2019). To protect trophy fishing for Walleye on Lake Winnipeg, provincial regulations currently only permit one fish over 55 cm be harvested. However, a proposed regulation that prohibits retaining any Walleye over 70 cm is being considered. To shield the largest Walleye from targeted commercial fishing, a maximum allowable mesh size of 131 mm stretched measure was added to the commercial regulations in 2017. Quota buybacks have also been used to reduce total catch sizes and smaller mesh sizes have been instituted to ensure smaller fish avoid being caught. Additionally, to protect spawning fish in Lake Winnipeg, the Walleye angling season in Southern Manitoba will be pushed back one week and important spawning areas will be closed to fishing. The conflict is still ongoing.

Red River Channel Catfish

In a 16-km stretch of the lower Red River near Selkirk, Manitoba there is a world-class trophy fishery for Channel Catfish. Anglers regularly catch fish >800 mm and it is common for fish to be greater than 20 years old (Siddons et al. 2016). The fishery attracts local and out-of-province fishers and is a clear economic benefit for the area. The fishery is upstream of the Lake Winnipeg three species fishery, and thus, commercial fishers encounter Channel Catfish as bycatch. In 2018, the Province permitted the sale of bycatch, which caused an outcry from recreational fishery stakeholders, many of which run guiding businesses along the river. However, the decision did include measures to

limit the impact to the trophy fishery: sales of bycaught Channel Catfish can only be made directly to consumers, and it is illegal to sell to restaurants, stores, and dealers. Additionally, other regulatory measures that maintain the trophy catfish fishery are the relatively conservative bag limits and maximum size regulations in the recreational fisheries; four fish daily where none over 600 mm can be harvested in Manitoba, and five fish daily with one over 600 mm in Minnesota and North Dakota. Lastly, while the stock biomass is large, the longevity required of individual fish to provide a trophy fishery is sensitive to relatively small levels of harvest (Hansen 2019) and so it will be important to monitor the stock for potential negative effects of the small harvest. The conflict seems to have lessened overtime, though more direct monitoring of stakeholder's observations would be helpful to ensure commercial and recreational fishers are satisfied.

Lake Sturgeon

In 1910 the Lake Winnipeg commercial fishery was closed due to significant declines in the population. However, recreational angling is still permitted but is entirely 'catch and release' and there are spawning time closures. Additionally, no sturgeon fishing is allowed in the Winnipeg River and portions of the Nelson River due to Conservation Closures. Different sectors receiving varied allocations and opportunities almost always yields conflict. The Saskatchewan–Nelson River Lake Sturgeon population has been deemed Endangered by The Committee on the Status of Endangered Wildlife in Canada but it currently is not protected by the *Species at Risk Act*. Harvest is not permitted, though subsistence fishing under constitutionally-protected Aboriginal and Treaty Rights is allowed so long as fish are not caught in Conservation Closures. Beginning in 1992, and revised in 1997 and 2012, the Province and their partners, including Manitoba Hydro and the Kischi Sipi Namao Committee have provided stewardship for the species in a variety of ways including the development of management and stewardship plans, funding for state-of-the art research, and investments in lake sturgeon culture (Conservation and Water Stewardship Fisheries Branch 2012; Manitoba

Hydro 2016). The efforts of the Province and their partners are bearing fruit; there is evidence that most of the major rivers in Manitoba have lake sturgeon stocks that are no longer considered to be declining, though many of the populations will likely never return to historic levels. Mark-recapture modeling of the Saskatchewan River stock for example estimates an increase from a few hundred fish at the turn of the millennium, to more than 15,000 animals today. Similar studies in a section of the Winnipeg River produce population estimates of over 60,000 juvenile and adult Lake Sturgeon.

Case study 3: Conflict in the multi-sectoral lower Fraser River Pacific salmon fishery

When Pacific salmon return to the Fraser River after transitioning from life in the ocean and begin their upriver migration, their high densities make them highly vulnerable to harvest often with competing interests in access among different sectors. Currently, the status of Fraser River Pacific salmon populations is extremely dynamic, with immense interannual variation in run size – the number of adults present during spawning migrations - between, among, and within populations (Beamish et al. 1999; McKinnell & Irvine 2021). However, in the last several decades, the abundance of returning adults for many populations has decreased to numbers that generate grave concern among scientists, stakeholders, managers, and Indigenous groups (Peterman and Dorner 2012; Stuart 2021). This concern has led to the designation of certain Fraser River salmon populations as critically endangered by the IUCN (Hume 2008), while others have been assessed in various states of imperilment by the Committee on the Status of Endangered Wildlife in Canada. The exact cause of declines remains debated but surmounting evidence supports synergistic and/or cumulative effects of a multitude of factors including climate change, habitat destruction, and fishing mortality (see Lichatowich & Lichatowich 2001; Cohen 2012).

Since the mid 1900s, large scale commercial exploitation has occurred in the marine environment, where salmon retain their silver coloration and

highly marketable flesh. More recently, shifts in fisheries policy have allotted more commercial licenses to inland salmon fisheries, where individual stocks can be targeted (DFO 2001). These in-river fisheries are largely Indigenous, who conduct fisheries for food, social and ceremonial purposes (FSC fisheries; DFO n.d.), which are enshrined in law and in some cases may support so-called moderate livelihoods (Davis & Jentoft 2001; See Figure 2).



Figure 2. Indigenous fishers in the Fraser River harvest Pacific salmon. Credit: Cooke Lab

Recreational salmon fisheries in the Fraser River watershed have grown into a sector with hundreds of thousands of participants and an estimated value of over \$100 million CAD per year (Fraser Valley Regional District 2019). Inland areas where recreational fishing is permitted during salmon runs can become extremely crowded, particularly in sections close to metropolis areas (e.g. Chilliwack-Vedder). Conflicts among recreational fishers occur with relative frequency, particularly when shore space is limited. As Indigenous communities regained their inherent right to access salmon fisheries in the Fraser River watershed there have been some conflicts among sectors.

In an effort to mitigate observed declines and improve annual recruitment, when estimated run-sizes are low, fishing opportunities are constrained. Affirmed by Supreme Court Decisions (the Marshall decision [see Wiber & Milley 2007] and the Sparrow decision, leading to the Sparrow ‘test’ [Harris & Millerd 2010]) based on rights enshrined in Section 32 of the *Canadian Charter of Rights and Freedoms*, fishing opportunities must first be allocated to Indigenous rights holders for food, social and ceremonial fisheries. When conservation and FSC fisheries obligations are met, quota is allocated to Indigenous fishers to support moderate livelihoods and then to a combination of non-Indigenous commercial (including small-scale) and recreational fisheries.

Despite the strong legal foundation supporting the allocation structure, conflict can arise when individuals within or external to sectors disagree with such rights, policies, and management actions. Indeed, on numerous occasions, the lower Fraser River has been the site of volatile conflict among different fishing sectors with mutual interest in adult Pacific salmon. The situation has been so acrimonious that there has even been violence (see CBC News 2009). In 2021 the salmon returns to the Fraser have been so dire that even FSC fisheries were curtailed (see Fawcett-Atkinson 2021). Yet, the government decided to provide some limited opportunities for recreational fishing which reinvigorated debate about Indigenous rights and allocations. Nonetheless, even in the face of conflict there is also evidence that the various fisheries sectors in the lower Fraser River are committed to working together. For example, the Lower Fraser Collaborative Table (LFCT) was initiated which as of fall 2021 had a membership of 23 First Nations of the Lower Fraser Fisheries Alliance, various recreational fishing groups, and small-scale commercial fishery representatives. It is still early days but there is a common goal of working collaboratively to have a common voice when communicating with government (BCWF 2021). This type of venue has great promise for building understanding and demonstrating to government that there is consensus for some issues. Social science work in the Lower Fraser reveals that there is potential to get past the ‘blame game’ given that although competing interests are relevant, conflicts tend to be associated with deeper

cognitive and perceptual differences among resource users (Nguyen et al. 2016). Taking time to better understand similarities and differences in how the groups understand threats to the resource would inform policy processes and could be another outcome of collaborative efforts. It is too early to know if the LFCT will greatly diminish or eliminate conflict, but it is the type of initiative that could do just that and will help to understand the basis for different perspectives.

Synthesis and conclusions

In inland systems, multi-sector fisheries are common. With that, comes the potential for conflict. Using three case studies we demonstrate the complex ways in which such conflicts arise and manifest. It is difficult to capture the nuance, emotion and history of conflict in a short chapter. Nonetheless, doing so, even at a high level, can reveal opportunities for avoiding or overcoming conflict. Reflecting on the case studies presented here, two obvious actions are revealed, although these actions are themselves interconnected.

1) Managing multi-sectoral fisheries in a holistic and integrated manner

It is common for inland fisheries to be managed in ways that are somewhat discrete (Suuronen & Bartley 2014). Fisheries management objectives and plans may be developed for individual fisheries sectors, yet never fully integrated. This leaves opportunities for mis-steps by overpromising to individual sectors and not being fully transparent with all users. This also can lead to fisheries management objectives that conflict with one another leaving fisheries managers in the difficult position of trying to satisfy everyone even when impossible to do so (Hilborn 2007). By creating multi-sector fisheries management plans that have both high level management objectives embraced by all with additional sector-specific objectives that align with those high level objectives, all resource users and stewards are able to see themselves as part of the bigger plan. Moreover, this should involve considering other factors

that intersect with fisheries (Cooke et al. 2016). An ecosystem approach to fisheries management is well embraced in the marine realm (Garcia & Cochrane 2005) but is less common in inland waters (Beard et al. 2011). These efforts also tend to require greater transparency and create opportunities for sharing and learning (see next section). Our case studies highlight the importance of thinking holistically when addressing multi-sectoral fisheries in an integrated governance format. Moreover, the cases highlight the role of different rights, values and interests which collectively can generate implicit hierarchies in diverse sectoral settings.

2) Creating mechanisms for sharing and learning among resource users and stewards

It is understood that conflicts (of any sort, but especially those involving natural resources) are best addressed through dialogue and understanding that involves legitimate governance institutions with a willingness to consider stakeholder and rightsholder perspectives (Ratner et al. 2018). Conflicts are often intensified or emerge when some groups are marginalised or excluded from fisheries planning and decision-making processes (Ratner et al. 2018). This emphasizes the importance of creating opportunities to engage with diverse users and stewards (see Reed 2008 for thorough overview of the benefits of engagement and strategies for doing so). In some cases these efforts are top-down where institutions have mechanisms and processes that span engagement through co-management (e.g., the eastern Ontario example) yet they can also be bottom up where resources users and stewards come together to create a stronger voice when interacting with decision makers (e.g., the BC example with the LFCT). No matter the mechanism, what is essential is that there are opportunities to share, listen and learn from each other and to work together to identify common concerns or goals. Natural resource management institutions should take a more active role in conflict resolution rather than being the cause of such conflict (Ratner et al. 2018). Lack of transparency and failing to adopt an ecosystem approach to fisheries management both contribute to conflict but can also be overcome.

Engagement with resource users and creating mechanisms for different users to interact with each other should be an ongoing process rather than a knee-jerk reaction to a problem or conflict. Doing so will often prevent conflicts from arising in the first place. It is important to note that fisheries issues, even when they appear to be very local, are also influenced by broader social, political, cultural, and economic factors (Bächler et al. 2002) which can add an additional layer of complexity. Anticipating conflicts (rather than operating from a reactive perspective) will benefit from more holistic thinking and creating new governance structures and mechanisms. There is work to do but the future of inland fisheries would benefit from such efforts.

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