Fisheries, 2025, **50**, 366–379
https://doi.org/10.1093/fshmag/vuae031
Advance access publication: February 10, 2025
Perspective

Provisioning fisheries: A framework for recognizing the fuzzy boundary around commercial, subsistence, and recreational fisheries

Vivian Mai-Anh Nguyen[1,2*], Kathryn J. Fiorella[3], Leandro Castello[4], Mahatub Khan Badhon[4,5], Christine Beaudoin[6], Jeanne Coffin-Schmitt[7], Steven J. Cooke[1,2], Aaron T. Fisk[8], Elizabeth Nyboer[4], Daniel M. O'Keefe[9], Emma D. Rice[4], Richard Stedman[7], Nicole Venker[7], and Aaron Macneil[10]

[1]Department of Biology, Carleton University, Ottawa, Ontario, Canada
[2]Institute for Environmental and Interdisciplinary Science, Carleton University, Ottawa, Ontario, Canada
[3]Department of Public and Ecosystem Health, Cornell University, Ithaca, New York, USA
[4]Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, Virginia, USA
[5]Department of Zoology, University of Dhaka, Dhaka, Bangladesh
[6]Urban Environments Department, Université de l'Ontario français, Toronto, Ontario, Canada
[7]Department of Natural Resources and the Environment, Cornell University, Ithaca, New York, USA
[8]School of the Environment, University of Windsor, Windsor, Ontario, Canada
[9]Michigan Sea Grant, Michigan State University Extension, West Olive, Michigan, USA
[8]Ocean Frontier Institute, Department of Biology, Department of Mathematics and Statistics, Dalhousie University, Halifax, Nova Scotia, Canada

*Corresponding author: Vivian M. Nguyen. Email: Viviannguyen@cunet.carleton.ca.

ABSTRACT

Although sparse, increasing evidence suggests an overlooked population of fishers whose fishing motivations and outcomes overlap across commercial, subsistence and recreational fishing sectors, resulting in underrepresented groups of fishers in management and policy frameworks. These fishers participate in what we frame as "provisioning fisheries," a concept we propose to highlight the underrepresented values from fishing and fisheries across recreational, sociocultural, psychological, economic, health, and nutritional dimensions. We argue that provisioning fisheries often support underserved groups, provisioning fishers may engage in informal markets, and, that distinction exists from sport-oriented recreational fisheries in power, risks, access barriers, fishing motivation, attitudes, and practices including rule and advisory awareness. We propose that provisioning fisheries should be consciously considered—whether as part of existing fisheries structures or even its own sector to promote more sustainable and inclusive fisheries management. Overlooking this population of fishers may risk further marginalization, conflicts, contaminant exposure, and inaccurate stock estimates. Therefore, we propose provisioning fisheries as a useful analytical category to explore the heterogeneity of fishers and their distinct needs, motivations, and behaviors. As an example of how these fisheries may function, we synthesize what we currently know about provisioning fisheries in North America with hypothesized differences between provisioning and the sport-oriented recreational fisher to encourage greater dialogue and investigation about underrecognized fisheries.

INTRODUCTION

The three main categories of fishing activity—commercial, subsistence, and recreational—are longstanding classifications in fisheries legislation and policy, shaping management strategies globally. Scholars are, however, increasingly critiquing these categories for failing to recognize groups of fishers who fall between or near the boundaries of these categories, leading to underrepresented and underserved communities in fisheries management and policies (e.g., Cooke et al., 2018; Nyboer et al., 2022; Schumann & Macinko, 2007). A brief discussion of the definitions and limitations of commercial, subsistence, and recreational fisheries will provide a foundation for understanding how these categories can be expanded to better represent diverse fishers and fishing activities.

Commercial fisheries are defined as fishing activities conducted specifically to capture fish products for sale (Smith, 2002),

Received: January 04, 2024. **Revised:** June 14, 2024. **Accepted:** December 20, 2024
© The Author(s) 2025. Published by Oxford University Press on behalf of American Fisheries Society.
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (http://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

often requiring a special license to do so. However, there are fishers who engage in trading, bartering, and/or selling fish, that sit in between or at the boundary of sectors including subsistence and recreational fisheries. For example, South African fishers who are in between the commercial and subsistence fisheries sectors, previously known as "informal fishers," often derived informal economic benefits from fisheries. Since 1998, they have been legally recognized as subsistence fishers to formally recognize the needs for harvesting fish at adequate amounts, legalizing modest sales, setting aside areas for exclusive use while protecting long-term sustainability of the resources (Branch, May, et al., 2002).

Subsistence fisheries are defined as "local, non-commercial fisheries, oriented not primarily for recreation but for the procurement of fish for consumption of the fishers, their families, and community" (Berkes, 1988, p. 319). The term *subsistence* carries the connotations of food provisioning for the purpose of meeting basic needs (Schumann & Macinko, 2007), however, many fishers in other sectors (e.g., recreational fisheries) harvest fish to consume for reasons beyond basic needs, such as cultural reasons, food sovereignty, or healthy food choices and may not consider themselves subsistence fishers despite fishing for food. Some fishers may similarly aim to meet diverse needs by harvesting and eating fish or may place primary importance on accessing fish to meet basic needs. Yet, subsistence fishing by non-Indigenous fishers is not recognized as a fishery in many parts of the world, particularly in western countries; except, to our knowledge, for Alaska (Alaska Department of Fish & Game, 2024; Muth et al., 1987) and South Africa (Branch, Hauck, et al., 2002; Branch, May, et al., 2002). Therefore, fishers who fish to meet their needs in places where subsistence or other relevant fisheries are not legally recognized, are often invisible.

Recreational fisheries have traditionally been conceptualized as fishing for sport and leisure and are formally defined by the Food and Agriculture Organization of the United Nations (FAO) as "fishing of aquatic animals (mainly fish) that do not constitute the individual's primary resource to meet basic nutritional needs and are not generally sold or otherwise traded on export, domestic or black markets" (FAO, 2012). The definition identifies recreational fisheries in opposition to subsistence and commercial fisheries. Yet, the definition fails to recognize the diverse benefits of recreational fishing, meaning groups reliant on the recreational fishery for food and nutritional security, cultural practices, and economic relief are not necessarily well represented in the recreational fisheries framework (Hamelin et al., 2022; Nieman et al., 2021; Nyboer et al., 2022). The term *recreational* emphasises leisure and sport, and public perception of recreational fishing tends to assume catch-and-release as opposed to harvest (Cooke et al., 2018). These deeply rooted perceptions and image of recreational fishing can influence decision-making processes in many jurisdictions and continues to structure research and management thinking (Pitcher & Hollingworth, 2002), despite literature recognizing their diverse benefits (Nyboer et al., 2022).

In practice, there are "recreational fishers" (i.e., people fishing under a recreational fishing license or legal framework) who engage in catch-and-harvest of fish for consumption, suggesting there is a "fun/food nexus" (Cooke et al., 2018) or a "fuzzy boundary" (Nyboer et al., 2022) between fishing primarily for household consumption and recreational fishing. The value of fish harvested as food is hard to assess given the intersecting dimensions of nutritional security, culture, and connection with community and the outdoors. People of diverse cultural backgrounds, including those identified as part of minority communities (e.g., immigrants and displaced peoples), make use of these fisheries (Burger, 2002; Quimby et al., 2020) and may derive a sense of belonging, place, and connection through fishing. For example, a Caribbean-immigrant fisher describes fishing: "when I fish and eat 'em, I remember who I am and where I'm from" (Corburn, 2007, p. 156). Fishing can provide access to culturally relevant food sources (Egeland et al., 1998; Toth & Brown, 1997), enable continuity in food gathering traditions (Prosser, 1997), and provide food for family and friends (Burger, 2013).

The limitation of this broad classification of recreational fishing activity is that it does not capture the full range of observed fishing behavior and sociocultural meaning of those practices resulting in an overlooked and underserved population of fishers (Ebbin, 2017; Nieman et al., 2021). This may be problematic because recreational fishers are diverse, and it is extremely difficult to characterize recreational fishers because of their complexity and drivers (Hunt et al., 2023). Variation across angler traits (e.g., skills, mobility, catch-orientation, harvest-orientation) with and across groups can influence their behavior and outcomes (i.e., impact on fisheries and benefits derived; Hunt et al., 2023). As such, we believe there is a subgroup of recreational fishers that are underserved in the current recreational fisheries framework.

Despite growing evidence, little has been written about who these fishers are and how existing fisheries frameworks address their needs. It is increasingly recognized that a subpopulation of people fishing under the recreational fishing framework access these fisheries for food and nutritional security (Corburn, 2007; Quimby et al., 2020), informal economies through sharing and/or trading caught fish (Ebbin, 2017; Pulford et al., 2017), local sale or barter of excess catch (Branch, Hauck, et al., 2002), and/or for sociocultural reasons (Hamelin et al., 2022), among other provisions. However, little is known about the balance of consumptive and non-consumptive motivations, how they relate to fishing experiences, practices, and preferences, to place and identity, and how they interplay with fisheries management. In this article, we propose the term "provisioning fisheries" to capture the multidimensional value of fishing that is not recognized in typical recreational, subsistence, and commercial fisheries frameworks. We call attention to the need for a clearer characterization of provisioning fishers and their diverse needs and values and discuss ways in which this information can support fisheries management.

Provisioning fisheries: A framework to capture the fuzziness of fisheries

We tentatively describe "provisioning fisheries" as a flexible framework highlighting the different "provisions" or benefits that fishers derive from fishing and fisheries that are not well captured in the conventional fishing sectors described above, which may result in the underrepresentation or marginal-

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

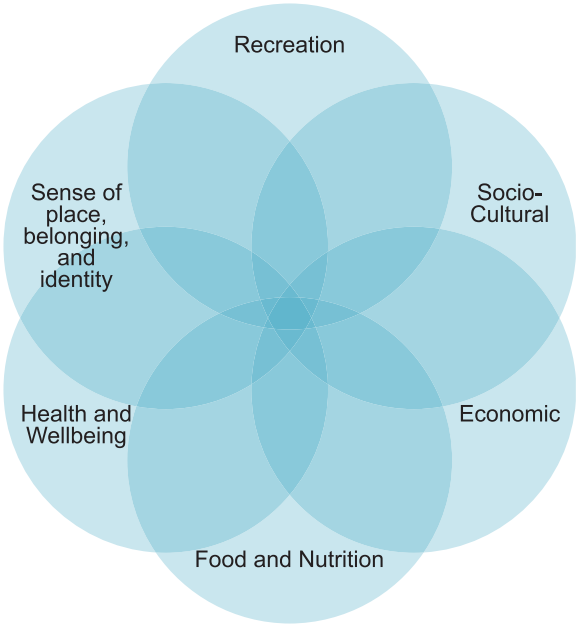

Figure 1. A conceptual diagram illustrating the multidimensional values and benefits of the provisioning fisheries framework emphasizing underrecognized and overlapping values of fisheries across recreational, sociocultural, identity, economic, health (physical and psychological) and well-being, and food and nutritional dimensions.

ization of certain fisher groups (i.e., provisioning fishers). Provisioning fisheries emphasizes the underrecognized and overlapping values of fisheries across recreational, sociocultural, identity, economic, health and well-being, food and nutritional dimensions (Figure 1). Some scholars and practitioners have described this certain fuzzy boundary fishery as "noncommercial" fishing (Leong et al., 2020; Quimby et al., 2020); however, defining in opposition is unspecific and the term noncommercial does not account for potential economic benefits. Others have highlighted the use of angling under recreational fishing licenses as "subsistence" fishing (Branch, Hauck, et al., 2002; Branch, May, et al., 2002; Ellender et al., 2010), which is specific to fishing for food but carries the connotation of fishing for survival that may overlook dimensions of choice as well as other sociocultural and economic values. In Alaska, "personal use" fishing is defined (Alaska Department of Fish & Game, 2024), but excludes barter and sales, while in South Africa the term informal fishing has been used prior to the implementation of the Marine Living Resources Act 18 of 1998 (Branch, Hauck, et al., 2002; Branch, May, et al., 2002; M. Young, 2013). Lastly, artisanal fishing (sometimes also referred to as small-scale or traditional fishing; see Rousseau et al., 2019) describes similar concepts to provisioning fisheries including the linkages between subsistence and way of life. Although its definition is complex and varies by region, it is more widely used in the Global South and is often defined by traditional fishing methods and simple gears (Batista et al., 2014; Branch, Hauck, et al., 2002; Branch, May, et al., 2002). Yet in addition to consuming self-caught fish, artisanal or small-scale fishers harvests two-thirds of global catch, and many places form the predominant or export economy (Short et al., 2021). We acknowledge and call attention to the overlap in concepts among the aforementioned terms and fisheries. We propose a provisioning fisheries framework because it highlights underlying multiple values, motivations, and derived benefits (including but not centering only on food-related benefits) from fishing and may serve as an umbrella framework bringing together these less recognized and fuzzy boundary fisheries (e.g., personal use, noncommercial, informal fisheries).

In this article, we establish a rationale for provisioning fisheries as a useful analytical category to explore unrecognized and/or underrepresented fisher groups that sit at boundaries of existing fisheries frameworks. We first synthesize and describe the underrepresented values (Figure 1) of provisioning fisheries based on existing literature and collective expertise of authors. Second, we note that provisioning fishers display recognizable distinctions from other groups of fishers. We focus on the recreational fisheries framework in North America as a reference point. To our knowledge, many fishers falling in between these fishing sectors are classified under the recreational fishing framework, despite deriving a set of values beyond sport and is thus the focus of our article. Based on this, we identify and describe a subgroup, provisioning fishers, of the diverse recreational fishing sector (much like the tourist subgroup of recreational fishing; Ditton et al., 2002; Hall, 2021). We propose hypotheses to investigate these distinctions between provisioning and sport-oriented recreational fishers. Lastly, we describe why it is critical for provisioning fisheries to be considered in management and research. Given the uneven geographical distribution of research on this topic, our synthesis is limited primarily to evidence derived from western fisheries, so we mostly focus on North American examples. This strategy might be applied in the future to other places to assess provisioning fisheries variability worldwide (see Nyboer et al., 2022 for global examples).

THE MULTI-DIMENSIONAL VALUES OF PROVISIONING FISHERIES

Several factors may correlate with participation in provisioning fishing including socio-demographics (e.g., income, ethnicity, residency), cultural and religious norms and beliefs, fishing motivations and behaviors, fishing location, fishing gear and style, target species, and others that have yet to be researched (Ellender et al., 2010; Nyboer et al., 2022; Quimby et al., 2020). For instance, fishers relying on fishing for food may use relatively low-tech gear (e.g., hand lines), live bait, multiple rods or lines, or catch and kill equipment (e.g., spears, dip nets, fish traps, gill nets, where legal) to maximize their catch rates (Branch, Hauck, et al., 2002; Branch, May, et al., 2002). Using location as an example, pier fishing in southern California is free and accessible, attracting a distinct fishing community that fishes as a possible coping strategy for food insecurity (Pitchon & Norman, 2012).

There is a fundamental difference between recreational anglers fishing with a tourist outfitter and having a Walleye *Sander vitreus* shore lunch on a remote lake vs. urban fishers who took public transit to reach a shoreline fishing site and

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

harvests fish that serve as a source of nutrient-rich food that would otherwise be unaffordable. Likewise, there may be important differences between fishers deriving various cultural connections to community and food through fishing. Studies on these distinctions are few and fragmented. A provisioning fisheries framework serves to document the dispersed literature and characterization of these distinctions. Recognizing the vast and dispersed literature on the multidimensional values of provisioning fisheries, we provide short overviews below to offer a sense of what they mean rather than providing an in-depth review of each. We do not provide an overview for the recreational dimension because of how well established it is in the literature (recreation and food dimensions are reviewed in Cooke et al., 2018; Nyboer et al., 2022).

Food and nutrition

Evidence from the Global North suggests that fishers from urban areas, economically disadvantaged groups, marginalized, ethnic, and racialized groups, and immigrant groups are likely to display higher harvest (as opposed to catch-and-release) and consumption behaviors due to stronger reliance on fishing for food and nutritional security, cultural ties and practices, or some combination of these (Britz et al., 2015; Burger, 2002; Ellender et al., 2010; Hamelin et al., 2022). In North America, subsistence use is not widely captured or understood, but there is increasing evidence illustrating people fishing for food under the recreational fishing framework (Ebbin, 2017; Nieman et al., 2021). Subpopulations of urban fishers, particularly from immigrant populations, have been observed to consume higher amounts of self-caught fish in the Great Lakes region relative to nonimmigrant fishers (Lauber et al., 2017). The consumption of fish may thus play a critical role in the provision of food and nutritional security for some fishers. These benefits are underscored by nutritional value; fish supply long-chain polyunsaturated fatty acids (including omega-3 fatty acids) that support child growth and development and have been associated with cardiovascular health and reduced inflammation (Koletzko et al., 2008; Lauritzen & Carlson, 2011). Beyond its nutritional value, harvest, preparation and cooking practices link food, nutrition, culture, and celebrations. "Eating them, after all, is the point" (Berger, 2017, p. 146), as David Berger explains in his book on the provisioning, recreational, and commercial dimensions of razor clamming in the state of Washington (USA). Consumption requires other processes besides harvest, such as inspection, cleaning, and preparation (Berger, 2017), and these practices vary according to family and tradition, and are passed down within sociocultural context. Similarly, for immigrant groups, sociocultural practices and the importance of fishing may be continued within new landscapes (Khakzad & Griffith, 2016).

Sociocultural

Studies have shown that local culture, heritage, and religious world views play a large role in harvest decisions (Aas & Kaltenborn, 1995; Arlinghaus, 2004). For example, fishers may never harvest fish because of religious or cultural beliefs, such as the Buddhist prohibitions on killing an animal or may only harvest larger fish because it can feed more people and requires less killings of animals (personal communication with immigrant fishers from Bhutan; Schroeder et al., 2008). The Bengalese use fish as part of socioreligious ceremonies, including birth to marriage to death (Deb & Haque, 2011). In Canada, recreational fishing for mackerel (Scombridae) is embedded in the sociocultural context and regarded as an intergenerational activity promoting sharing of food with community elders, bonding with family members, and teaching children about the marine environment and food harvest for both Indigenous and non-Indigenous coastal communities (Hamelin et al., 2022). Similar informal economies were found among provisioning fishers as part of social connections, capital, and networks (Ebbin, 2017; Nieman et al., 2021). Other cultural traditions may affect fishing behavior, such as taboos. In Brazil, fishers in the Amazon River basin often avoid catfishes because of local folklore (Silva, 2007). Ethnomedicinal uses of fish are found among various fishing and rural communities worldwide, such as in Brazil and other Asian countries (Atlaf et al., 2020; Deb & Haque, 2011); illustrating diverse cultural influences into fishing practices. With increasing global migration, it is likely that FAO-defined recreational fisheries that are popular in the Global North will experience greater cultural exchanges with small-scale and traditional fishing practices of the Global South resulting in varying fishing practices and outcomes relative to the conventional recreational fisher.

Sense of place, belonging, and identity

Fishing yields connections to sense of place, self, and belonging; however, these concepts are often elusive (Williams & Stewart, 1998). How they are defined and experienced by individuals is shaped by culture, gender, and other sociocultural constructs (Gallina & Williams, 2015). Fishing serves as a means of connecting with nature and developing a deeply rooted sense of place and identity among resource users (Hammitt et al., 2004, 2006; Olivos & Clayton, 2017) and identity (Olivos & Clayton, 2017). For example, a study of Hmong dietary change revealed that consuming fish serves an important cultural function in the Hmong American community and that the act of fishing helps the transition and adjustment to a new culture, serves as a link to their past home, and helps to maintain and preserve cultural and ethnic identity (Bengston et al., 2008; Koltyk, 1998; Story & Harris, 1989).

In Cuyahoga and Summit counties, Ohio (USA), it was observed that the Bhutanese were fishing for survival, and used nets as traditional practices and consumed all fish caught, including fingerlings. This was prior to workshops given to the Bhutanese between 2019–2022, on safe practice, consumption, and toxicants in fish. They no longer use nets and only prepare and eat adult fish (R. Brand & K. Leone, Cuyahoga County Board of Health, personal communication, 2023). Fishing practices and catch consumption are often essential to the continuation of cultural practices and the reinforcement of community identity and resilience (Johnson et al., 2014; Ritzman et al., 2018), but few studies have focused on this dimension especially within the recreational fisheries framework.

Health and well-being

Spending time outdoors while fishing is beneficial for mental health and well-being, and fishers make fishing choices to derive expected psychological benefit (Driver & Tocher, 1970).

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

Multiple studies on recreational fishing have asked fishers about why they fish and the benefits they derive from fishing; common responses include relaxation and connecting with nature and other people in a meaningful way (Ardahan & Turgut, 2013; Boucquey & Fly, 2021; Hunt & McManus, 2016; M. A. Young et al., 2016). For instance, participation in recreational fishing increased during the COVID-19 pandemic, where recreational fishers reported that fishing reduced their stress and improved their mental health (Karpiński & Skrzypczak, 2022). Past research has found that non-catch related factors are often more important to fishers' motivation than catch- and harvest-related factors (Driver & Knopf, 1976; Fedler & Ditton, 1986), while fishing satisfaction often depends upon catch even for anglers who self-report low levels of catch-based motivation (Arlinghaus, 2006). For more consumption-oriented individuals, the process of securing food to support nutritional security may contribute even more prominently to satisfaction by providing stress-relief and wellness. Food insecurity is a major source of stress, especially in families where food is needed to support children and the elderly and can negatively impact mental health independent of nutritional deficiencies (Pourmotabbed et al., 2020; Weaver & Hadley, 2009).

Economic

Some evidence suggests that fishers of disadvantaged socio-economic status tend to keep much of their catch for consumption at home, to offset food costs, or to share or sell within their community (Corburn, 2007; Steinback et al., 2009; Toth & Brown, 1997). A study on recreational anglers in the northeastern U.S. coastal counties reported 28% of anglers fish for reasons other than purely recreational, which included for food and supplementary income (Steinback et al., 2009). The concept of enhancing economic well-being and reducing reliance on the cash economy has been previously observed (Dickinson et al., 2015; Glass et al., 1990) and may become more prevalent with increasing food and fuel prices worldwide. Such behaviors have been observed in remote communities in Australia that have limited access to high quality animal protein and higher food costs compared to more central locations (Jackson et al., 2012, 2014). Nieman et al. (2021) found an informal economy among recreational fishers in Carteret County, North Carolina (USA), of sharing, selling, and trading fish. Fishers reported giving their catch to others on- and off-site, and in some cases feeding families in their communities. Shifts in recreational fishing intensity during the COVID-19 pandemic further underscore this trend (Coffin-Schmitt et al., 2023). With this in mind, it is likely that provisioning fishers more commonly participate in shore angling due to accessibility, and that what is typically considered recreational may have more economically and socially diverse dimensions than typically considered.

PROVISIONING FISHERIES: HYPOTHESES AND ASSUMPTIONS

We argue that provisioning fishers, who derive a combination of recreational, cultural, nutritional, food security, and other benefits, are distinct from recreational fishers (as defined by the FAO), warranting greater attention and consideration from fisheries managers and researchers. Although both recreational and provisioning fisheries have overlapping values, such as well-being, recreation, and nutrition (discussed above), we further argue that the underlying motivations, experiences, needs, and preferences of provisioning fishers are distinct. Our approach builds on other research suggesting multidimensionality of fishing practices. In particular, Quimby et al., (2020) identified seven common themes attributed to subsistence practices that may be present among pier fishers (i.e., potential provisioning fishers) in South Carolina (USA):

1. Small-scale or artisanal market participation.
2. Vulnerable or low socio-economic status and cultural identity.
3. Fishing locally.
4. Use of low-tech gear.
5. Regular engagement in fishing and consumption of self-caught fish.
6. Fishing for food for self, family, and/or community.
7. Derive "process benefits" such as social, cultural, and psychological benefits (Brown et al., 1998).

Cooke et al. (2018) and Nyboer et al. (2022) suggest that provisioning fishers have a blend of characteristics from recreational and subsistence small-scale fishers.

As a result of many provisioning fishers falling under the legal recreational fisheries framework and similarities of their characteristics to small-scale and artisanal fisheries, we draw on insights from the human dimensions of recreational fisheries and small-scale/artisanal fisheries literature to present five arguments that distinguish provisioning fisheries from the FAO-defined recreational fisheries. We make a case for the consideration of provisioning fisheries in some form, whether it is legally recognized or for specific considerations under existing fisheries frameworks:

1. Provisioning fisheries support marginalized groups of minorities, low socioeconomic status, and cultural diversity.
2. Provisioning fishers access a portfolio of food and income sources and opportunities.
3. Provisioning fishers' motivations, behaviors and practices are distinct from sport-oriented recreational fishers.
4. Provisioning fishers have different needs and may face different constraints or power dynamics relative to sport-oriented recreational fishers.
5. Provisioning fishers' face greater barriers to access and rule compliance and awareness than sport-oriented recreational fishers.

We elaborate on these arguments in the following sections.

Provisioning fisheries support marginalized groups

Provisioning fisheries may support a range of underrepresented, and marginalized groups that are more diverse than predominantly white, often upper-middle class sport-oriented recreational fishers, who may emphasize sport, catch-and-release, and specialized fishing techniques, and who dominate current research and management considerations (Anderson & Loomis, 2005). Studies in Global North countries have

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

shown that some immigrant and minority groups harvest most of the fish they catch to complement diet (Shatenstein et al., 1999; Silver et al., 2007) and to maintain cultural traditions (Corburn, 2007). Studies have also found that Black and Latino fishers in North America (Beehler et al., 2003), and immigrant communities in general (Murkin et al., 2003; Savadatti et al., 2019), participate in provisioning practices. In southern California (USA), there is indication that pier fishers (who can fish without a license) exhibit subsistence behavior. This fishery features higher representation of immigrant communities as well as ethnic and racial minorities, and the low-cost of pier fishing is accessible to poor, undocumented, and underprivileged members of urban communities (Lauber et al., 2017; Quimby et al., 2020). However, more data is needed to provide insights into the benefits and risks of provisioning fishing, specifically about cultural and linguistic diversity and the heterogeneity of immigrants, low-income, and ethnic minority communities participating in fishing.

Provisioning fishers access a portfolio of food and income sources

Food, nutrition, and economic dimensions of fisheries are often explored in small-scale and artisanal fisheries research. Globally, over two-thirds of wild fish are harvested by small-scale fishers, the majority of whom operate within low- and middle-income countries (Short et al., 2021). While some of these fish are retained for consumption, many enter regional and international markets. The harvest of fish thus constitutes a source of income and of food (e.g., Fiorella et al., 2014; Lancker et al., 2019). We hypothesize that this dual role likewise exists for provisioning fishers operating within recreational fisheries contexts, and informal markets of trade and sharing of fish may be substantially higher than for sport-oriented recreational fishers, who largely retain their catch for personal consumption or participate in catch-and-release fishing. Furthermore, small-scale fishers' households often participate in a portfolio of livelihood activities based on risks and benefits they encounter (Chambers & Conway, 1992; Ellis, 2000). Fishing is often only one part of a household's strategy, with participation influenced by seasonality of access and alternative opportunities such as wage labor, migration, and agricultural production (Fiorella et al., 2021). Similarly, we hypothesize that provisioning fishers may situate fishing within a portfolio of opportunities for food and income from other sources, in addition to a portfolio of recreation choices and opportunities to meet cultural needs.

Provisioning fisher drivers and behaviors are distinct from sport-oriented recreational fishers

Fisher motivations, attitudes, and behaviors are important constructs that help understand and predict fisheries management outcomes. Here, we hypothesize how these fishers' concepts and constructs (e.g., fishers specialization, catch-orientation, substitution behavior) may differ between provisioning and sport-oriented recreational fishers. Figure 2 offers conceptual illustrations of the dynamic multidimensional values of provisioning fishers and how they may shift, vary, interact and/or overlap depending on the fishers' motivations, which may ultimately influence behavioral outcomes.

Motivation and catch orientation

Generally, studies seeking to understand motivations for recreational fishing often focus on four motives: escape, achievement, exploration, and experiencing nature (e.g., Fedler & Ditton, 1994; Finn & Loomis, 2001). There is a need to further explore motivations tied to sociocultural, food and nutrition, economic value, sense of place, mental health, identity, and belonging. Fishing motivations are thought to be linked to a fisher's catch orientation (i.e., attitude towards catching something; Fedler & Ditton, 1994), and studies have generally shown low importance attributed to catching and keeping fish relative to non-catch motives, such as experiencing the outdoors, among recreational fishers (e.g., Arlinghaus, 2006; Birdsong et al., 2021). However, some studies suggest that recreational fishers' motives are more catch-oriented than previously believed (Beardmore et al., 2011). Among provisioning fishers, we expect catch orientation will shift depending on the provisioning dimensions they seek, which are not mutually exclusive. Fishers seeking economic, food, and nutritional provisions may be motivated to harvest fish for consumption, sharing, or selling over non-catch related motives. Thus, their catch orientation may lean towards catching many fish instead of a few large fish we often see with sport-oriented fishers (Figure 2). The same fisher may seek mental health and well-being dimensions and prioritize factors such as relaxation. On the other hand, we could argue that for cultural and/or religious reasons, some provisioning fishers may lean towards catching large fish over many small fish to reduce the number of fish that are killed. Therefore, we hypothesize that catch composition will differ based on the various provisioning dimensions sought, and further research is needed to define those differences (see Figure 2 for simplified conceptual examples).

Fishing satisfaction

Fisher satisfaction has been shown to shape preferences for regulations, compliance with rules, and other behaviors (Birdsong et al., 2021). Recreational fishers' satisfaction often rests on non-catch factors, such as fishing sites and amenities or social environment of a trip (Beardmore et al., 2013; Hunt, 2005). However, we hypothesize that provisioning fishers who are, for example, seeking food and nutritional security may tie satisfaction to quantity caught (Figure 2). Alternatively, provisioning fishers who fish for sense of place or identity, may be satisfied with a fishing experience that provides time in nature, with family, or links them to a fishing community (Figure 2). Thus, understanding the provisioning dimensions sought may offer greater insights into fishing satisfaction.

Fisher specialization, centrality to lifestyle, and substitution

A number of standardized measures help understand how changes or access to a fishery may impact fishers such as their resistance to change, or how they may substitute one target species for another, or substitute fishing for another activity (i.e., substitution behavior; Choi et al., 1994; Gentner & Sutton, 2008). For instance, the measure of "fisher or angler specialization" is a continuum of commitment to and specialization of fishing, often based on skill, equipment, target species, and fishing location preferences (Bryan, 1977). It

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

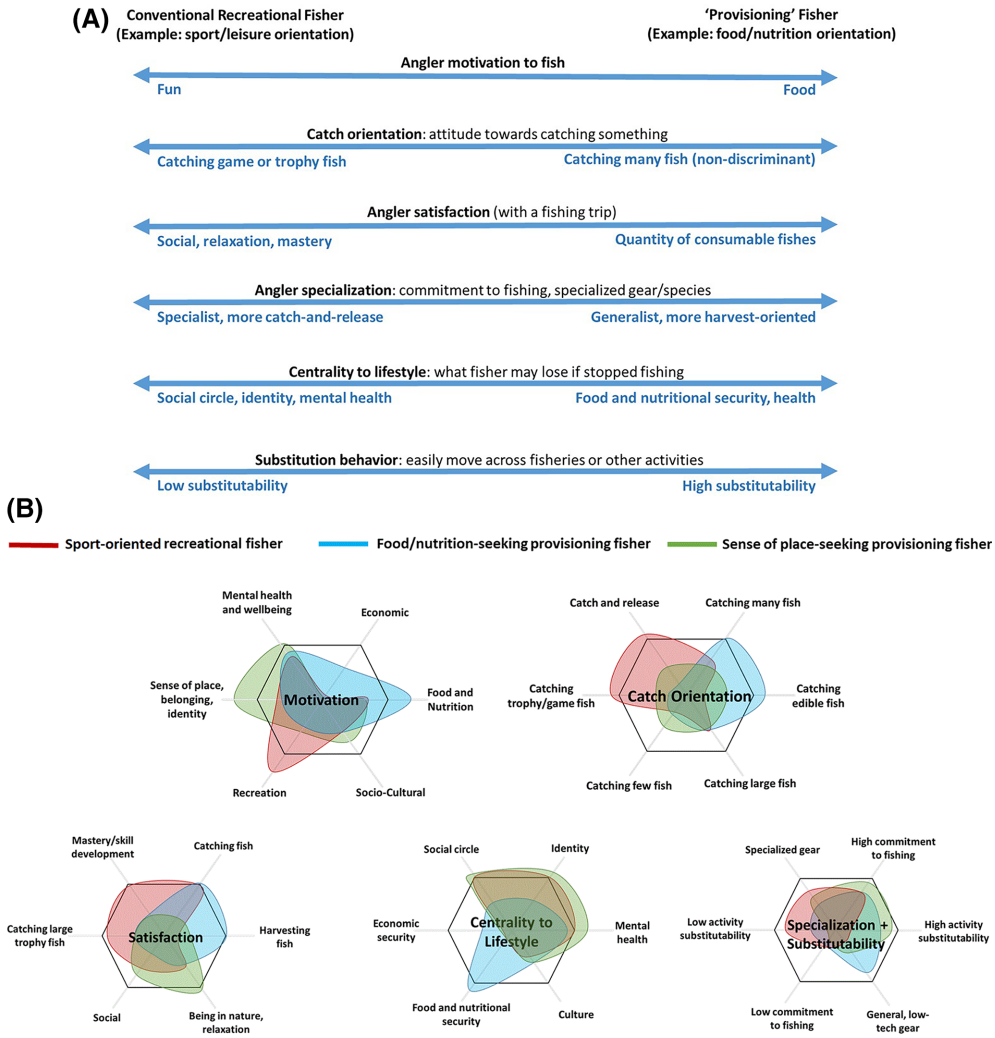

Figure 2. Simplified conceptual diagrams of proposed assumptions and hypotheses about potential differences between sport-oriented recreational fishers and provisioning fishers based on common concepts and theories from human dimensions of fisheries research. (A) Linear diagram outlining where fishers might fall on motivation and orientation spectra if they are a sport-seeking fisher vs. food and nutrition-oriented fisher. (B) Conceptual spider plots highlighting the complexity of each dimension and overlaying sport-oriented recreational fishers (red) from food- and nutrition-oriented provisioning fishers (blue) and sense of place and identity-seeking provisioning fishers (green). Note we use stylized, hypothesized examples based on existing literature, but one can hypothesize behavior shifts based on other criteria.

is understood that preferences generally shift from activity-general to activity-specific when a fisher becomes more committed to fishing and when fishing is central to their lifestyle (Choi et al., 1994; Ditton & Sutton, 2004). However, considering non-sport dimensions of fishing may challenge the notion that specialization increases as commitment to fishing increases.

Studies have shown that as specialization increases, their commitment to the activity increases and attitudes and preferences shift from consumption to voluntary catch-and-release (Oh & Ditton, 2006; Sutton & Ditton, 2001), although this does not always hold true (Dorow et al., 2010; Salz & Loomis, 2005). Further, highly specialized fishers are less likely to substitute their fishing with another activity. Understanding substitutability can help managers predict potential fisher response to constraints or changes to fishing participation and access (e.g., new regulation, reduced access, increased cost, lack of time, change in environment, etc.; Ditton & Sutton, 2004). As such, we hypothesize that provisioning fishers, who may seek food, nutritional, and economic provisions, may be less specialized (more generalists), have *higher* species substitutability (less discriminant on target species), and have *higher* activity substitutability (similar idea to the portfolio of livelihoods noted in section 3.2) due to the greater reliance on fish for food (Figure 2). In other words, if fishing was no longer available, they may give up fishing altogether to find alternative ways to gather food from their environment or meet nutritional needs. For instance, a random sample of anglers in Texas and Florida found a variety of acceptable substitutable activities, which included golf, camping, and hiking along with food-producing activities, including hunting and gardening (Ditton & Sutton, 2004). More targeted sampling of provisioning fishers is likely to find low substitutability for non-consumptive activities. Similarly, provisioning fishers who seek cultural connections to fish, fish-

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

ing as an activity, and outdoor recreation may have higher substitutability of fishing sites as they may not be reliant on how productive the site is. Alternatively, depending on sociocultural reasons and practices, fishers may be more specialized and have *low* substitutability if they have more specific fishing or harvesting practices and traditions, a history of successful harvesting at specific sites, or only feel comfortable fishing in some sites due to power dynamics. Oh et al. (2013) found that anglers who are more interested in harvesting fish are less likely to identify substitutable sites and less likely to substitute sites. This relationship was independent of place attachment and perhaps a result of successful harvest yields at known sites and/or cost of switching sites with less success.

Provisioning fishers experience differential needs and uneven power dynamics

Provisioning and sport-oriented recreational fishers have different relationships to power and political processes (Kadfak & Oskarsson, 2020; Osborne et al., 2021). We hypothesize that these power differences between fishers are not only due to differing motivations but also to material and structural conditions, including, but not limited to, (1) asymmetries in socioeconomic status, gender, race, and class of individual fishers, (2) uneven distribution of privilege, costs, and benefits among groups of fishers, and (3) conditions tied to colonization, legislative frameworks and other political–economic processes (Bavington et al., 2004; Osborne et al., 2021; Robbins, 2012). There is, thus, a need to investigate how these power imbalances between provisioning and recreational fishers relate to broader societal phenomena, such as capitalism, neoliberalism, and centralization of power in governance (Bogert et al., 2022; Svarstad et al., 2018). Such dynamics impact the well-being of groups and individual fishers. For example, the relationships between state run fisheries agencies and capitalistic enterprises during the past few decades may have influenced the development of fisheries as a for profit industry focused on the sales of equipment and services for "sport" fishing (i.e., boats, expensive fishing gear, high-end guide services). Our proposed model frames and values provisioning fisheries as a base source of nutrition and connection to culture. The lens of political ecology could support understanding the complex interconnections between the conditions that frame various fishing practices, including provisioning fishing, and how this relates to the material conditions of ecosystems. Looping back to hypothesis one, political ecology and environmental justice provide key conceptual tools that must be leveraged when developing theories around provisioning fisheries to ensure that marginalized groups maintain access to fishing (Svarstad & Benjaminsen, 2020).

Provisioning fishers face greater barriers to access and rule awareness

Limited data on rule compliance in general and within provisioning fisheries impedes managers' ability to gauge fisher numbers, effort, and fish harvest, resulting in less accurate stock assessment parameters (M. B. Rudd & Branch, 2017). Provisioning fishers of lower-income and/or minority groups may experience greater access barriers (Furman et al., 2023; Ghimire et al., 2014) resulting in distributive and procedural injustices. Thus, there is risk in overregulation or using regulatory frameworks and strategies for sport fishers, which may exclude these fishers or put them at risk under consumption advisories (Burger & Gochfeld, 2006). For example, fishing in the United States is regulated through complex systems of licensing and permitting as well as trespassing laws, which vary by state/province and county. Recent migrants and/or individuals with limited access to or proficiency of local or regulatory language, may have difficulty interpreting the rules and become more vulnerable within the legal system (Bengston et al., 2008; Lauber et al., 2017). Research on risk communication among fishers has found that low-income individuals, racial minorities, and immigrant groups often consume more fish than white fishers and are unaware of or avoid health advisory information and prefer relying on traditional knowledge or learning from other fishers (Beehler et al., 2001; Burger & Gochfeld, 2006; Pflugh et al., 1999). As such, it is likely that some provisioning fishers may be unaware of or unintentionally violate fishing rules and advisories. Power dynamics, language barriers, and challenges interpreting rules and advisories may also make provisioning fishers less likely to respond to annual surveys (often done by mail and/or email) that are sent to licensed fishers (Brownscombe et al., 2014; Wallen et al., 2016), further constraining understanding of their needs and motivations.

Understanding the underlying motivation of (non-)compliance behaviors is even more important than assessing the level of compliance because provisioning fishers may have a unique combination of socio-psychological drivers that differ from sport-oriented recreational fishers. This assumption suggests that provisioning fishers require a tailored strategy. In line with this argument, Beehler et al. (2001) suggested that older African American fishers were respected within their community, and, thus, working with peer leaders to reach fishers may be an effective way to enhance communication and understanding of fish consumption health advisories and fishing rules.

IMPLICATIONS OF OVERLOOKING NON-SPORT DIMENSIONS OF RECREATIONAL FISHERIES

By continuing to manage and study recreational fishers and fisheries as primarily for leisure we risk excluding and overlooking populations who fish to meet needs beyond recreation. Further, there is risk in overlooking how distinct behaviors, motivations, and needs of provisioning fishers affect the overall social-ecological systems of recreational fisheries (Arlinghaus et al., 2016). It is, thus, important to understand how best to evaluate, manage, and direct policy to support these fisheries. In this section, we provide an overview of different implications and risks of overlooking nonrecreational dimensions of provisioning fisheries.

Risks from consumption

In many settings, fish consumption places people at risk of contaminant exposure and these risks disproportionately accrue to minority communities (Burger, Pflugh, et al., 1999; Burger, Stephens, et al., 1999; Silver et al., 2007). The lack of attention to and management of provisioning fisheries may

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

increase health risks from contaminated fish, based on environmental factors and consumptive behaviors (e.g., fish source, species, size; amount and frequency of consumption; parts of fish consumed and cooking methods; Burger, 2013; Burger, Stephens, et al., 1999). These factors are influenced by personal preferences, sociocultural norms, access to information and access to safe waters. For example, Asian individuals in the United States and Canada tend to consume fish at higher amounts and frequency and use preparation methods that increase contaminant exposure risks (Hutchinson & Kraft, 1994; Murkin et al., 2003). Hmong fishers in Green Bay, Wisconsin (USA) consumed particular species, such as White Bass *Morone chrysops*, at higher rates (Hutchinson & Kraft, 1994). Research with Burmese, Karen, and Rohingya residents of Milwaukee, Wisconsin showed that culturally traditional methods of preparation (e.g., eating whole fish or fish organs) increased risk of polychlorinated biphenyl exposure (He et al., 2021). Nutritional benefits of fish consumption are generally considered to outweigh risks, even within vulnerable groups like young children and pregnant women (Hibbeln et al., 2019). Still, variability in toxin exposures may be significant and needs to be carefully evaluated without discouraging fish consumption, which has sometimes fallen *below* what would be nutritionally beneficial for women of child-bearing age due to contaminant concerns (Niederdeppe et al., 2019).

Efforts have been made to address consumption risks including an inclusive framework for examining consumption behavior of self-caught fish and identifying effective communication (Burger & Gochfeld, 2006). Targeted research with hard-to-reach, minority populations has illuminated differences in risk perception information acquisition about contaminants (Lauber et al., 2017). Research with Black and Latino anglers in Buffalo, New York (USA) showed that individuals often gain, trust, and apply information about safe fishing practices when it is received from peers as opposed to information from government agencies (Beehler et al., 2001, 2003). This suggests that minority populations continue to be at risk when local knowledge is not well aligned with institutional public health information.

Risks of conflict, marginalization, and exclusion

Fishing, whether for recreation, food, or other motivations, requires individuals to navigate complex systems of social, legal, and physical barriers that delimit access to the fishery. The power imbalances and differences in priorities, norms, cultures, needs, and motivations among provisioning fishers may provoke resource and social conflicts. In fact, omitting sociocultural dimensions from fisheries management may lead to conflict, reduce trust, hinder collaborative management, and further marginalize certain fishers (Kaplan & McCay, 2004; Poe et al., 2014). Considering sociocultural dimensions helps unpack interactions between social groups and fisheries resources to support effective management (details on sociocultural dimensions of conservation discussed in Poe et al., 2014). In fact, evidence of conflicts has been documented between those who catch and release vs. those who catch and consume (Nyboer et al., 2022). These inequities and differences may further threaten food access, health, or well-being of provisioning fishers. Further, research in leisure studies, political ecology, and environmental justice raise concerns about equity and equality of access (Floyd & Johnson, 2002). For example, instances of racism, discrimination, and harassment from public land managers, recreationists, and private landowners have been reported by Hmong Americans in Wisconsin and Minnesota (USA), with a quote illustrating the types of comments received by public land managers: "They check our licenses, but they do not ask as frequently with the white people" (Bengston et al., 2008). Actual and perceived discrimination can impact fishing participation (Bengston et al., 2008; Schroeder et al., 2008). There is an inherent diversity among fishers that needs to be recognized to address structural causes that contribute to injustice (Svarstad & Benjaminsen, 2020), like racism and discrimination. Such experiences of discrimination can impact mental health and well-being, especially when there is a loss of cultural identity. Decline in fishing participation may also threaten natural resources and their conservation by reducing revenue from license sales that funds conservation, and by disconnecting people from nature. In fact, ties have been established between ecological degradation of fisheries and marginalization of certain groups (for example, women) from fisheries policies and fisheries science (Bavington et al., 2004). Thus, fisheries managers must ensure access and inclusion for all fishers and their needs.

Risks from data gaps leading to unsustainable practices

The knowledge gap on provisioning fisheries presents uncertainties and risks to fisheries management and fishers. For instance, the extent and magnitude of individuals or communities engaged in provisioning fisheries is largely unknown and unrecognized. The total harvest and the harvest of species directed to local consumption may be poorly captured or entirely omitted from fisheries data sets (although see Cooke et al., 2018; Embke et al., 2022). For example, survey data of household fish consumption from small-scale commercial or subsistence fisheries reveal 65% higher harvest of freshwater fish across Africa compared to the harvest data routinely collected by the FAO (Fluet-Chouinard et al., 2018). Specific cases in recreational fisheries also corroborate these data omissions. In the Parana River, Argentina, less attention is paid to anglers who fish primarily for food because target species are often small, not regulated, and perceived by management agencies less commercially valuable or important (López et al., 2008). This knowledge gap may lead to potential failures in monitoring and inaccurate assessment of stock health, as well as an underappreciation of the food and other services provisioned by global fisheries.

RETHINKING "RECREATIONAL" FISHERIES: IMPLICATIONS FOR FISHERIES MANAGEMENT

Research on provisioning fisheries could bring different perspectives to valuation practices and decision-making frameworks related to fishers that operate under recreational licenses despite a strong motivation to harvest fish. In some instances, these fisheries use gear types and target fish species that allow fishers to maximize harvest while minimizing costs. Examples include gigging for suckers (family: Catostomidae)

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

in the Ozarks (Rochon, 2010), dipnetting for Rainbow Smelt *Osmerus mordax* in tributaries of lakes Huron and Michigan (Brown & Taylor, 1995), and dark house spearing for Northern Pike *Esox lucius* in Minnesota (Schroeder & Fulton, 2014). Much of the literature on valuation of recreational fisheries assumes that higher expenditures and greater economic impacts are indicative of fisheries that are of the highest value to society, measuring economic impacts of fishing-induced tourism without consideration of economic or nutritional benefits to individual fishers themselves (M. A. Rudd et al., 2002). Cooke et al. (2018) noted that little research has been done on the subject, but the net benefits of fishing for consumption may exceed the costs in certain fisheries with liberal harvest regulations, high catch rates, and minimal costs.

Beyond North America, South Africa first recognized subsistence angling as separate from recreational angling in 1998. Documents of the process of formalization highlighted critical lessons learned, including clear definition and qualifying criteria for subsistence fishers, identifying the needs of fishers, vital role of "on-the-ground" fieldworkers to engage with fishing communities, ensuring sufficient capacity and resource sustainability among others (see Harris et al., 2002). Implementation has been slow but government authorities in South Africa are increasingly recognizing the multidimensional values of its inland fisheries, including the recreational sector, but also food security and economic benefits, to ensure formal recognition of rights to access fisheries resources and protecting livelihoods of provisioning fishers (Weyl et al., 2007). Similarly, Muth et al. (1987) documented lessons from the development of Alaskan subsistence fisheries with implications for the Great Lakes, and other fisheries. The authors highlight the importance of the distinct values of different fisher groups and the need for more research and engagement with this underrepresented population of fishers.

Knowledge about and representation of provisioning fishers in the decision-making process is likely a key to maintaining access to fisheries. Highly specialized recreational anglers exhibit a high level of involvement that often translates to membership in fishing clubs (Fisher, 1997), which are well-positioned to influence policy and legislation (Twardek et al., 2023). However, many highly specialized anglers also tend to deemphasize harvest (Bryan, 1977; Oh & Ditton, 2006) and may not represent the needs of provisioning fishers. Future research on provisioning fisheries should provide managers with new information on size, socio-demographic profiles, needs, values, motivations and behaviors of this subgroup of fishers; relevant fish populations; fishing gear selectivity; harvest rates; access site considerations; outreach needs; and stakeholder selection processes that will ensure that fishers can continue to sustainably harvest nutritional food for human consumption at a relatively low cost.

CONCLUSION: RETHINKING FISHERIES CATEGORIES BEYOND COMMERCIAL, SUBSISTENCE AND RECREATIONAL SECTORS

This overview of evidence demonstrates the existence of provisioning fisheries, and how the distinct characteristics of provisioning fishers and fisheries warrant greater attention. Provisioning fishers are likely to be those of minoritized ethnic or racial identities or vulnerable communities who fish to put food on the table, to practice sociocultural traditions and preserve cultural heritage, and in some cases, supplement income or nutrition. Barriers, risks, and opportunities exist for this lesser-known population of fishers. Risks include those of consumption, marginalization, and cultural loss, while there are many opportunities to better represent, serve, and value provisioning fishers. The unequal power distribution and dynamics can result in barriers to fishery access and threaten livelihoods and access to diverse fishery provisions. In the North American case, by continuing to manage recreational fisheries as is, there is significant risk to both social and ecological systems because of data gaps, relying on misleading assumptions, and overlooking the importance of multiple values of fishing and their impacts. Thus, we call for fisheries managers and researchers to pursue discourse, research, and actions that consider and emphasize provisions beyond sport and leisure into the recreational fisheries paradigm, which we suggest framing as provisioning fisheries.

FUNDING

This article is funded by the Human Dimensions Grant from the Great Lakes Fishery Commission.

CONFLICTS OF INTEREST

Authors V. M. N., S. J. C., and E. N. are editors for *Fisheries* and, therefore, did not participate in the review of this article.

ACKNOWLEDGMENTS

We thank Jessika Guay and Claire Crowley for their research assistance, and many individuals who shared their thoughts on this concept including Tim Johnson and Len Hunt (OMNRF), Robert Brand and Kate Leone (Cuyahoga County Board of Health). We are also grateful to key informants and provisioning fishers we have interacted with over the 2 years who have provided more understanding of these concepts. Lastly, we thank and acknowledge feedback and insights from David Fulton, fisheries practitioners from the 2024 Great Lakes Provisioning Fisheries Summit held in Windsor, Ontario, funded by the Cooperative Institute of Great Lakes Research, and several anonymous reviewers, which we incorporated into this article.

REFERENCES

Aas, Ø, & Kaltenborn, B. P. (1995). Consumptive orientation of anglers in Engerdal, Norway. *Environmental Management, 19*, 751–761. https://doi.org/10.1007/bf02471957

Alaska Department of Fish & Game (2024). *Subsistence Fishing.* Retrieved June 13, 2024 from https://bit.ly/4gg4cXx

Anderson, L. E., & Loomis, D. K. (2005). *Underrepresented groups in recreational fishing: A literature review.* Human Dimensions Research Unit, University of Massachusetts. Retrieved December 2024 from https://bit.ly/4gdRto2

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

Ardahan, F., & Turgut, T. (2013). Motivational factors for recreational fishing, the profile and life satisfaction level of recreational fishers and nonparticipants of fishing in Turkey. *Turkish Journal of Sport and Exercise*, *15*, 58–72. https://doi.org/10.15314/tjse.23449

Arlinghaus, R. (2004). *Recreational fisheries in Germany—A social and economic analysis* (*Vol. 18*, pp. 1–168). IGB Leibniz-Institute of Freshwater Ecology and Inland Fisheries.

Arlinghaus, R. (2006). On the apparently striking disconnect between motivation and satisfaction in recreational fishing: The case of catch orientation of German anglers. *North American Journal of Fisheries Management*, *26*, 592–605. https://doi.org/10.1577/m04-220.1

Arlinghaus, R., Alós, J., Beardmore, B., Daedlow, K., Dorow, M., Fujitani, M., Hühn, D., Haider, W., Hunt, L. M., Johnson, B. M., Johnston, F., Klefoth, T., Matsumura, S., Monk, C., Pagel, T., Post, J. R., Rapp, T., Riepe, C., Ward, H., & Wolter, C. (2016). Understanding and managing freshwater recreational fisheries as complex adaptive social-ecological systems. *Reviews in Fisheries Science & Aquaculture*, *25*, 1–41. https://doi.org/10.1080/23308249.2016.1209160

Altaf, M., Abbasi, A. M., Umair, M., Amjad, M. S., Irshad, K., & Khan, A. M. (2020). The use of fish and herptiles in traditional folk therapies in three districts of Chenab riverine area in Punjab, Pakistan. *Journal of Ethnobiology and Ethnomedicine*, *16*, Article 38. https://doi.org/10.1186/s13002-020-00379-z

Batista, V. S., Fabré, N. N., Malhado, A. C., & Ladle, R. J. (2014). Tropical artisanal coastal fisheries: Challenges and future directions. *Reviews in Fisheries Science & Aquaculture*, *22*, 1–15. https://doi.org/10.1080/10641262.2013.822463

Bavington, D., Grzetic, B., & Neis, B. (2004). The feminist political ecology of fishing down: Reflections from Newfoundland and Labrador. *Studies in Political Economy*, *73*, 159–182. https://doi.org/10.1080/19187033.2004.11675156

Beardmore, B., Haider, W., Hunt, L. M., & Arlinghaus, R. (2011). The importance of trip context for determining primary angler motivations: Are more specialized anglers more catch-oriented than previously believed? *North American Journal of Fisheries Management*, *31*, 861–879. https://doi.org/10.1080/02755947.2011.629855

Beardmore, B., Haider, W., Hunt, L. M., & Arlinghaus, R. (2013). Evaluating the ability of specialization indicators to explain fishing preferences. *Leisure Sciences*, *35*, 273–292. https://doi.org/10.1080/01490400.2013.780539

Beehler, G. P., McGuinness, B. M., & Vena, J. E. (2001). Polluted fish, sources of knowledge, and the perception of risk: Contextualizing African American anglers' sport fishing practices. *Human Organization*, *60*, 288–297. https://doi.org/10.17730/humo.60.3.awbh6he86mwdpxhv

Beehler, G. P., McGuinness, B. M., & Vena, J. E. (2003). Characterizing Latino anglers' environmental risk perceptions, sport fish consumption, and advisory awareness. *Medical Anthropology Quarterly*, *17*, 99–116. https://doi.org/10.1525/maq.2003.17.1.99

Bengston, D. N., Schermann, M., Moua, M., & Lee, T. T. (2008). Listening to neglected voices: Hmong and public lands in Minnesota and Wisconsin. *Society & Natural Resources*, *21*, 876–890. https://doi.org/10.1080/08941920701684197

Berger, D. A. (2017). *Razor clams: Buried treasure of the Pacific Northwest*. University of Washington Press.

Berkes, F. (1988). Subsistence fishing in Canada: A note on terminology. *Arctic*, *41*, 319–320. https://doi.org/10.14430/arctic1739

Birdsong, M., Hunt, L. M., & Arlinghaus, R. (2021). Recreational angler satisfaction: What drives it? *Fish & Fisheries*, *22*, 682–706. https://doi.org/10.1111/faf.12545

Bogert, J. M., Ellers, J., Lewandowsky, S., Balgopal, M. M., & Harvey, J. A. (2022). Reviewing the relationship between neoliberal societies and nature: Implications of the industrialized dominant social paradigm for a sustainable future. *Ecology & Society*, *27*, article 7. https://doi.org/10.5751/ES-13134-270207

Boucquey, N., & Fly, J. (2021). Contested commoning: Urban fishing spaces and community wellbeing. *International Journal of the Commons*, *15*, 305–319. https://doi.org/10.5334/ijc.1095

Branch, G. M., Hauck, M., Siqwana-Ndulo, N., & Dye, A. H. (2002). Defining fishers in the South African context: Subsistence, artisanal and small-scale commercial sectors. *African Journal of Marine Science*, *24*, 475–487. https://doi.org/10.2989/025776102784528493

Branch, G. M., May, J., Roberts, B., Russell, E., & Clark, B. M. (2002). Case studies on the socio-economic characteristics and lifestyles of subsistence and informal fishers in South Africa. *South African Journal of Marine Science*, *24*, 439–462. https://doi.org/10.2989/025776102784528457

Britz, P. J., Hara, M., Tapela, B., & Rouhani, Q. (2015). *Scoping study on the development and sustainable utilisation of inland fisheries in South Africa (615/1/15)*. Water Research Commission. Retrieved December 2024 from https://bit.ly/3DknSLc

Brown, R. B., Xu, X., & Toth, J. F., Jr. (1998). Lifestyle options and economic strategies: Subsistence activities in the Mississippi Delta. *Rural Sociology*, *63*, 599–623. https://doi.org/10.1111/j.1549-0831.1998.tb00694.x

Brown, R. W., & Taylor, W. W. (1995). Effects of a recreational dip-net fishery on Rainbow Smelt egg deposition. *North American Journal of Fisheries Management*, *15*, 165–169. https://doi.org/10.1577/1548-8675(1995)015<0165:EOARDN>2.3.CO;2

Brownscombe, J. W., Bower, S. D., Bowden, W., Nowell, L., Midwood, J. D., Johnson, N., & Cooke, S. J. (2014). Canadian recreational fisheries: 35 years of social, biological, and economic dynamics from a national survey. *Fisheries*, *39*, 251–260. https://doi.org/10.1080/03632415.2014.915811

Bryan, H. (1977). Leisure value systems and recreational specialization: The case of trout fishermen. *Journal of Leisure Research*, *9*, 174–187. https://doi.org/10.1080/00222216.1977.11970328

Burger, J. (2002). Consumption patterns and why people fish. *Environmental Research*, *90*, 125–135. https://doi.org/10.1006/enrs.2002.4391

Burger, J. (2013). Role of self-caught fish in total fish consumption rates for recreational fishermen: Average consumption for some species exceeds allowable intake. *Journal of Risk Research*, *16*, 1057–1075. https://doi.org/10.1080/13669877.2013.788546

Burger, J., & Gochfeld, M. (2006). A framework and information needs for the management of the risks from consumption of self-caught fish. *Environmental Research*, *101*, 275–285. https://doi.org/10.1016/j.envres.2005.11.004

Burger, J., Pflugh, K. K., Lurig, L., Hagen, L. A., & Hagen, S. (1999). Fishing in urban New Jersey: Ethnicity affects information sources, perception, and compliance. *Risk Analysis*, *19*, 217–229. https://doi.org/10.1111/j.1539-6924.1999.tb00401.x

Burger, J., Stephens, W. L., Boring, C. S., Kuklinski, M., Gibbons, J. W., & Gochfeld, M. (1999). Factors in exposure assessment: Ethnic and socioeconomic differences in fishing and consumption of fish caught along the Savannah River. *Risk Analysis*, *19*, 427–438. https://doi.org/10.1111/j.1539-6924.1999.tb00418.x

Chambers, R., & Conway, G. (1992). *Sustainable rural livelihoods: Practical concepts for the 21st century*. Institute of Development Studies.

Choi, S., Loomis, D. K., & Ditton, R. B. (1994). Effect of social group, activity, and specialization on recreation substitution decisions. *Leisure Sciences*, *16*, 143–159. https://doi.org/10.1080/01490409409513227

Coffin-Schmitt, J. L., Clements, N., Marshall, G., Liu, L., Trombitas, A., Yuan, S., Wang, Z., Grainer Safi, A., Hanson, K. L., & Fiorella, K. (2023). Wild and backyard food use in Upstate New York, USA during COVID-19. *Frontiers in Nutrition*, *10*, 1222610. https://doi.org/10.3389/fnut.2023.1222610

Cooke, S. J., Twardek, W. M., Lennox, R. J., Zolderdo, A. J., Bower, S. D., Gutowsky, L. F., Danylchuk, A. J., Arlinghaus, R., & Beard, D. (2018). The nexus of fun and nutrition: Recreational fishing is also about food. *Fish & fisheries*, *19*, 201–224. https://doi.org/10.1111/faf.12246

Corburn, J. (2007). Community knowledge in environmental health science: Co-producing policy expertise. *Environmental Science & Policy*, *10*, 150–161. https://doi.org/10.1016/j.envsci.2006.09.004

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

Deb, A. K., & Haque, C. E. (2011). 'Every mother is a mini-doctor': Ethnomedicinal uses of fish, shellfish and some other aquatic animals in Bangladesh. *Journal of Ethnopharmacology, 134*, 259–267. https://doi.org/10.1016/j.jep.2010.12.001

Dickinson, B. D., Orth, D. J., & McMullin, S. L. (2015). Characterizing the human dimensions of a hidden fishery: Riverine trotline fishers. *Fisheries*, *40*, 386–394. https://doi.org/10.1080/03632415.2015.1062372

Ditton, R. B., Holland, S. M., & Anderson, D. K. (2002). Recreational fishing as tourism. *Fisheries*, *27*, 17–24. https://doi.org/10.1577/1548-8446(2002)027<0017:RFAT>2.0.CO;2

Ditton, R. B., & Sutton, S. G. (2004). Substitutability in recreational fishing. *Human Dimensions of Wildlife*, *9*, 87–102. https://doi.org/10.1080/10871200490441748

Dorow, M., Beardmore, B., Haider, W., & Arlinghaus, R. (2010). Winners and losers of conservation policies for European eel, *Anguilla anguilla*: An economic welfare analysis for differently specialised eel anglers. *Fisheries Management and Ecology*, *17*, 106–125. https://doi.org/10.1111/j.1365-2400.2009.00674.x

Driver, B. L., & Knopf, R. C. (1976). Temporary escape: One product of sport fisheries management. *Fisheries*, *1*, 21–29. https://doi.org/10.1577/1548-8446-1-2

Driver, B. L., & Tocher, S. R. (1970). Toward a behavioral interpretation of recreational engagements, with implications for planning. In B. L. Driver (Ed.) *Elements of outdoor recreation* (pp. 9–31). University of Michigan Press.

Ebbin, S. A. (2017). Fishing for food: Piloting an exploration of the invisible subsistence harvest of coastal resources in Connecticut. *Agriculture & Food Security*, *6*, Article 12. https://doi.org/10.1186/s40066-016-0087-z

Egeland, G. M., Feyk, L. A., & Middaugh, J. P. (1998). *The use of traditional foods in a healthy diet in Alaska: Risks in perspective (6)*. Alaska Division of Public Health, Section of Epidemiology. Retrieved December 2024 from https://bit.ly/4iHIuNK

Ellis, F. (2000). *Rural livelihoods and diversity in developing countries*. Oxford University Press.

Ellender, B. R., Weyl, O. L. F., Winker, H., Stelzhammer, H., & Traas, G. R. L. (2010). Estimating angling effort and participation in a multi-user, inland fishery in South Africa. *Fisheries Management & Ecology*, *17*, 19–27. https://doi.org/10.1111/j.1365-2400.2009.00708.x

Embke, H. S., Nyboer, E. A., Robertson, A. M., Arlinghaus, R., Akintola, S. L., Atessahin, T., Badr, L. M., Baigun, C., Basher, Z., Beard, T. D., Jr., Boros, G., Bower, S. D., Cooke, S. J., Cowx, I. G., Franco, A., Gaspar-Dillanes, M. T., Granada, V. P., Hart, R. J., Heinsohn, C. R., … Lynch, A. J. (2022). Global dataset of species-specific inland recreational fisheries harvest for consumption. *Scientific Data*, *9*, 488. https://doi.org/10.1038/s41597-022-01604-y

FAO (Food and Agriculture Organization of the United Nations). (2012). *FAO Technical guidelines for responsible fisheries: Recreational fisheries (1020-5292)*. FAO, Fishery and Aquaculture Economics and Policy Division. Retrieved December 2024 from https://bit.ly/41zw3xh

Fedler, A. J., & Ditton, R. B. (1986). A framework for understanding the consumptive orientation of recreational fishermen. *Environmental Management*, *10*, 221–227. https://doi.org/10.1007/bf01867360

Fedler, A. J., & Ditton, R. B. (1994). Understanding angler motivations in fisheries management. *Fisheries*, *19*, 6–13. https://doi.org/10.1577/1548-8446(1994)0192.0.co;2

Finn, K. L., & Loomis, D. K. (2001). The importance of catch motives to recreational anglers: The effects of catch satiation and deprivation. *Human Dimensions of Wildlife*, *6*, 173–187. https://doi.org/10.1080/108712001753461275

Fiorella, K. J., Bageant, E. R., Schwartz, N. B., Thilsted, S. H., & Barrett, C. B. (2021). Fishers' response to temperature change reveals the importance of integrating human behavior in climate change analysis. *Science Advances*, *7*, eabc7425. https://doi.org/10.1126/sciadv.abc7425

Fiorella, K. J., Hickey, M. D., Salmen, C. R., Nagata, J. M., Mattah, B., Magerenge, R., & Fernald, L. H. (2014). Fishing for food? Analyzing links between fishing livelihoods and food security around Lake Victoria, Kenya. *Food Security*, *6*, 851–860. https://doi.org/10.1007/s12571-014-0393-x

Fisher, M. R. (1997). Segmentation of the angler population by catch preference, participation, and experience: A management-oriented application of recreation specialization. *North American Journal of Fisheries Management*, *17*, 1–10. https://doi.org/10.1577/1548-8675(1997)017<0001:SOTAPB>2.3.CO;2

Floyd, M. F., & Johnson, C. Y. (2002). Coming to terms with environmental justice in outdoor recreation: A conceptual discussion with research implications. *Leisure Sciences*, *24*, 59–77. https://doi.org/10.1080/01490400252772836

Fluet-Chouinard, E., Funge-Smith, S., & McIntyre, P. B. (2018). Global hidden harvest of freshwater fish revealed by household surveys. *Proceedings of the National Academy of Sciences of the United States of America*, *115*, 7623–7628. https://doi.org/10.1073/pnas.1721097115

Furman, K. L., Harlan, S. L., Barbieri, L., & Scyphers, S. B. (2023). Social equity in shore-based fisheries: Identifying and understanding barriers to access. *Marine Policy*, *148*, 105355. https://doi.org/10.1016/j.marpol.2022.105355

Gallina, M., & Williams, A. (2015). Variations in sense of place across immigrant status and gender in Hamilton, Ontario; Saskatoon, Saskatchewan; and, Charlottetown, Prince Edward Island, Canada. *Social Indicators Research*, *121*, 241–252. https://doi.org/10.1007/s11205-014-0636-4

Gentner, B., & Sutton, S. (2008). Substitution in recreational fishing. In Ø Aas (Ed.), *Global challenges in recreational fisheries* (pp. 150–169). Wiley. https://doi.org/10.1002/9780470697597.ch8

Ghimire, R., Green, G. T., Poudyal, N. C., & Cordell, H. K. (2014). An analysis of perceived constraints to outdoor recreation. *Journal of Park and Recreation Administration*, *32*, 52–67. https://bit.ly/41YFDtP

Glass, R. J., Muth, R. M., & Flewelling, R. (1990). Distinguishing recreation from subsistence in a modernizing economy. In J. Vining (Ed.), *Social science and natural resource recreation management* (pp. 151–164). West View Press.

Hall, C. M. (2021). Tourism and fishing. *Scandinavian Journal of Hospitality and Tourism*, *21*, 361–373. https://doi.org/10.1080/15022250.2021.1955739

Hamelin, K. M., Macneil, A., Curran, K., & Bailey, M. (2022). "The people's fish": Sociocultural dimensions of recreational fishing for Atlantic Mackerel in Nova Scotia. *Frontiers in Marine Science*, *9*, 971262. https://doi.org/10.3389/fmars.2022.971262

Hammitt, W. E., Backlund, E. A., & Bixler, R. D. (2004). Experience use history, place bonding and resource substitution of trout anglers during recreation engagements. *Journal of Leisure Research*, *36*, 356–378. https://doi.org/10.1080/00222216.2004.11950028

Hammitt, W. E., Backlund, E. A., & Bixler, R. D. (2006). Place bonding for recreation places: Conceptual and empirical development. *Leisure Studies*, *25*, 17–41. https://doi.org/10.1080/02614360500098100

Harris, J. M., Branch, G. M., Clark, B. M., Cockcroft, A. C., Coetzee, C., Dye, A. H., Hauck, M., Johnson, A., Kati-Kati, L., Maseko, Z., Salo, K., Sauer, W. H. H., Siqwana-Ndulo, N., & Sowman, M. (2002). Recommendations for the management of subsistence fisheries in South Africa. *South African Journal of Marine Science*, *24*, 503–523. https://doi.org/10.2989/025776102784528420

He, X., Raymond, M., Tomasallo, C., Schultz, A., & Meiman, J. (2021). Fish consumption and awareness of fish advisories among Burmese refugees: A respondent-driven sampling study in Milwaukee, Wisconsin. *Environmental Research*, *197*, 110906. https://doi.org/10.1016/j.envres.2021.110906

Hibbeln, J. R., Spiller, P., Brenna, J. T., Golding, J., Holub, B. J., Harris, W. S., Kris-Etherton, P., Lands, B., Connor, S. L., Myers, G., Strain, J., Crawford, M. A., & Carlson, S. E. (2019). Relationships between seafood consumption during pregnancy and childhood and neurocognitive development: Two systematic reviews. *Prostaglandins, Leukotrienes and Essential Fatty Acids*, *151*, 14–36. https://doi.org/10.1016/j.plefa.2019.10.002

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

Hunt, L. M. (2005). Recreational fishing site choice models: Insights and future opportunities. *Human Dimensions of Wildlife, 10*, 153–172. https://doi.org/10.1080/10871200591003409

Hunt, L. M., Arlinghaus, R., Scott, D., & Kyle, G. (2023). Diversity of anglers: Drivers and implications for fisheries management. In J. W. Neal, T. J. Lang, R. M. Krogman, K. F. Kurzawski, J. B. Taylor, & K. M. Hunt (Eds.), *Angler recruitment, retention, and reactivation: Influencing the future of fisheries and aquatic conservation* (pp. 113–140). American Fisheries Society.

Hunt, W., & McManus, A. (2016). Recreational fishing supports health and wellbeing in Western Australia. *Australian and New Zealand Journal of Public Health, 40*, 292. https://doi.org/10.1111/1753-6405.12490

Hutchinson, R., & Kraft, C. E. (1994). Hmong fishing activity and fish consumption. *Journal of Great Lakes Research, 20*, 471–478. https://doi.org/10.1016/S0380-1330(94)71163-1

Jackson, S., Finn, M., & Featherston, P. (2012). Aquatic resource use by Indigenous Australians in two tropical river catchments: The Fitzroy River and Daly River. *Human Ecology, 40*, 893–908. https://doi.org/10.1007/s10745-012-9518-z

Jackson, S., Finn, M., & Scheepers, K. (2014). The use of replacement cost method to assess and manage the impacts of water resource development on Australian Indigenous customary economies. *Journal of Environmental Management, 135*, 100–109. https://doi.org/10.1016/j.jenvman.2014.01.018

Johnson, T. R., Henry, A. M., & Thompson, C. (2014). Qualitative indicators of social resilience in small-scale fishing communities: An emphasis on perceptions and practice. *Human Ecology Review, 20*, 97–115. https://doi.org/10.22459/her.20.02.2014.05

Kadfak, A., & Oskarsson, P. (2020). An (urban) political ecology approach to small-scale fisheries in the global south. *Geoforum, 108*, 237–245. https://doi.org/10.1016/j.geoforum.2019.11.008

Kaplan, I., & McCay, B. J. (2004). Cooperative research, co-management and the social dimension of fisheries science and management. *Marine Policy, 28*, 257–258. https://doi.org/10.1016/j.marpol.2003.08.003

Karpiński, E. A., & Skrzypczak, A. R. (2022). The significance of angling in stress reduction during the COVID-19 pandemic—Environmental and socio-economic implications. *International Journal of Environmental Research and Public Health, 19*, 4346. https://doi.org/10.3390/ijerph19074346

Khakzad, S., & Griffith, D. (2016). The role of fishing material culture in communities' sense of place as an added-value in management of coastal areas. *Journal of Marine and Island Cultures, 5*, 95–117. https://doi.org/10.1016/j.imic.2016.09.002

Koletzko, B., Lien, E., Agostoni, C., Böhles, H., Campoy, C., Cetin, I., Decsi, T., Dudenhausen, J. W., Dupont, C., Forsyth, S., Hoesli, I., Holzgreve, W., Lapillonne, A., Putet, G., Secher, N. J., Symonds, M., Szajewska, H., Willatts, P., & Uauy, R. (2008). The roles of long-chain polyunsaturated fatty acids in pregnancy, lactation and infancy: Review of current knowledge and consensus recommendations. *Journal of Perinatal Medicine, 36*, 5–14. https://doi.org/10.1515/jpm.2008.001

Koltyk, J. A. (1998). *New pioneers in the heartland: Hmong life in Wisconsin*. Prentice Hall.

Lancker, K., Fricke, L., & Schmidt, J. O. (2019). Assessing the contribution of artisanal fisheries to food security: A bio-economic modeling approach. *Food Policy, 87*, 101740. https://doi.org/10.1016/j.foodpol.2019.101740

Lauber, B. T., Connelly, N. A., Niederdeppe, J., & Knuth, B. A. (2017). Urban anglers in the great lakes region: Fish consumption patterns, influences, and responses to advisory messages. *The Science of the Total Environment, 590*, 495–501. https://doi.org/10.1016/j.scitotenv.2017.02.189

Lauritzen, L., & Carlson, S. E. (2011). Maternal fatty acid status during pregnancy and lactation and relation to newborn and infant status. *Maternal & Child Nutrition, 7*, 41–58. https://doi.org/10.1111/j.1740-8709.2011.00303.x

Leong, K. M., Torres, A., Wise, S., & Hospital, J. (2020). *Beyond recreation: When fishing motivations are more than sport or pleasure*. Pacific Islands Fisheries Science Center. Retrieved December 2024 from https://repository.library.noaa.gov/view/noaa/23706

López, H. L., Menni, R. C., Donato, M., & Miquelarena, A. M. (2008). Biogeographical revision of Argentina (Andean and Neotropical Regions): An analysis using freshwater fishes. *Journal of Biogeography, 35*, 1564–1579. https://doi.org/10.1111/j.1365-2699.2008.01904.x

Murkin, E., Cole, D. C., Kearney, J. P., Sheeshka, J., & Dawson, J. (2003). Fish consumption practices among frequent consuming fishers of five Ontario Great Lakes areas of concern (AOCs). *Journal of Great Lakes Research, 29*, 436–447. https://doi.org/10.1016/s0380-1330(03)70449-3

Muth, R. M., Ruppert, D. E., & Glass, R. J. (1987). Subsistence use of fisheries resources in Alaska: Implications for Great Lakes fisheries management. *Transactions of the American Fisheries Society, 116*, 510–518. https://doi.org/10.1577/1548-8659(1987)116<510:SUOFRI>2.0.CO;2

Niederdeppe, J., Connelly, N. A., Lauber, T. B., & Knuth, B. A. (2019). Effects of a personal narrative in messages designed to promote healthy fish consumption among women of childbearing age. *Health Communication, 34*, 825–837. https://doi.org/10.1080/10410236.2018.1437526

Nieman, C. M., Rudman, A. N., Chory, M. L., Murray, G. D., Fairbanks, L., & Campbell, L. M. (2021). Fishing for food: Values and benefits associated with coastal infrastructure. *PLoS One, 16*, e0249725. https://doi.org/10.1371/journal.pone.0249725

Nyboer, E. A., Embke, H. S., Robertson, A. M., Arlinghaus, R., Bower, S., Baigun, C., Beard, D., Cooke, S. J., Cowx, I. G., Koehn, J. D., Lyach, R., Milardi, M., Potts, W., & Lynch, A. J. (2022). Overturning stereotypes: The fuzzy boundary between recreational and subsistence inland fisheries. *Fish & Fisheries, 23*, 1282–1298. https://doi.org/10.1111/faf.12688

Oh, C. O., & Ditton, R. B. (2006). Using recreation specialization to understand multi-attribute management preferences. *Leisure Sciences, 28*, 369–384. https://doi.org/10.1080/01490400600745886

Oh, C. O., Sutton, S. G., & Sorice, M. G. (2013). Assessing the role of recreation specialization in fishing site substitution. *Leisure Sciences, 35*, 256–272. https://doi.org/10.1080/01490400.2013.780534

Olivos, P., & Clayton, S. (2017). Self, nature and well-being: Sense of connectedness and environmental identity for quality of life. In G. Fleury-Bahi, E. Pol, & O. Navarro (Eds.), *Handbook of environmental psychology and quality of life research* (pp. 107–126). Springer.

Osborne, T., Brock, S., Chazdon, R., Chomba, S., Garen, E., Gutierrez, V., Lave, R., Lefevre, M., & Sundberg, J. (2021). The political ecology playbook for ecosystem restoration: Principles for effective, equitable, and transformative landscapes. *Global Environmental Change, 70*, 102320. https://doi.org/10.1016/j.gloenvcha.2021.102320

Pflugh, K. K., Lurig, L., Von Hagen, L. A., Von Hagen, S., & Burger, J. (1999). Urban anglers' perception of risk from contaminated fish. *The Science of the Total Environment, 228*, 203–218. https://doi.org/10.1016/s0048-9697(99)00048-0

Pitcher, T. J., & Hollingworth, C. E. (2002). Fishing for fun: Where's the catch. In T. J. Pitcher, & C. E. Hollingworth (Eds.), *Recreational fisheries: Ecological, economic and social evaluation* (pp. 1–16). Blackwell Science

Pitchon, A., & Norman, K. (2012). Fishing off the dock and under the radar in Los Angeles county: Demographics and risks. *Bulletin, Southern California Academy of Sciences, 111*, 141–152. https://doi.org/10.3160/0038-3872-111.2.141

Poe, M. R., Norman, K. C., & Levin, P. S. (2014). Cultural dimensions of socioecological systems: Key connections and guiding principles for conservation in coastal environments. *Conservation Letters, 7*, 166–175. https://doi.org/10.1111/conl.12068

Pourmotabbed, A., Moradi, S., Babaei, A., Ghavami, A., Mohammadi, H., Jalili, C., Symonds, M. E., & Miraghajani, M. (2020). Food

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025

insecurity and mental health: A systematic review and meta-analysis. *Public Health Nutrition*, *23*, 1778–1790. https://doi.org/10.1017/s136898001900435x

Prosser, N. S. (1997). Fishing—An American tradition at a decisive point: An introduction. *Proceedings of the Fifty-First Annual Conference of the Southeastern Association of Fish and Wildlife Agencies*, *51*, 18–19. Retrieved from https://seafwa.org/journal/1997/fishing-american-tradition-decisive-point-introduction

Pulford, E., Polidoro, B. A., & Nation, M. (2017). Understanding the relationships between water quality, recreational fishing practices, and human health in Phoenix, Arizona. *Journal of Environmental Management*, *199*, 242–250. https://doi.org/10.1016/j.jenvman.2017.05.046

Quimby, B., Crook, S. E., Miller, K. M., Ruiz, J., & Lopez–Carr, D. (2020). Identifying, defining and exploring angling as urban subsistence: Pier fishing in Santa Barbara, California. *Marine Policy*, *121*, 104197. https://doi.org/10.1016/j.marpol.2020.104197

Ritzman, J., Brodbeck, A., Brostrom, S., McGrew, S., Dreyer, S., Klinger, T., & Moore, S. K. (2018). Economic and sociocultural impacts of fisheries closures in two fishing-dependent communities following the massive 2015 U.S. West Coast harmful algal bloom. *Harmful Algae*, *80*, 35–45. https://doi.org/10.1016/j.hal.2018.09.002

Robbins, P. (2012). Political versus apolitical ecologies. In P. Robbins (Ed.), *Political ecology: A critical introduction* (pp. 11–24). John Wiley & Sons.

Rochon, B. G. (2010). *Activity involvement and place attachment of fish giggers in the Missouri Ozarks* [Doctoral thesis]. University of Missouri.

Rousseau, Y., Watson, R. A., Blanchard, J. L., & Fulton, E. A. (2019). Defining global artisanal fisheries. *Marine Policy*, *108*, 103634. https://doi.org/10.1016/j.marpol.2019.103634

Rudd, M. A., Folmer, H., & van Kooten, G. C. (2002). Economic evaluation of recreational fisheries policies. In T. J. Pitcher, & C. E. Hollingworth (Eds.), *Recreational fisheries: Ecological, economic and social evaluation* (pp. 34–52). Blackwell Science.

Rudd, M. B., & Branch, T. A. (2017). Does unreported catch lead to overfishing? *Fish & Fisheries*, *18*, 313–323. https://doi.org/10.1111/faf.12181

Salz, R. J., & Loomis, D. K. (2005). Recreation specialization and anglers' attitudes towards restricted fishing areas. *Human Dimensions of Wildlife*, *10*, 187–199. https://doi.org/10.1080/10871200591003436

Savadatti, S. S., Liu, M., Caglayan, C., Reuther, J., Lewis-Michl, E. L., Aldous, K. M., Parsons, P. J., Kannan, K., Rej, R., Wang, W., Palmer, C. D., Steuerwald, A. J., Wattigney, W. A., Irvin-Barnwell, E., & Hwang, S.-A. (2019). Biomonitoring of populations in western New York at risk for exposure to Great Lakes contaminants. *Environmental Research*, *179*, 108690. https://doi.org/10.1016/j.envres.2019.108690

Schroeder, S. A., & Fulton, D. C. (2014). Fishing for Northern Pike in Minnesota: Comparing anglers and dark house spearers. *North American Journal of Fisheries Management*, *34*, 678–691. https://doi.org/10.1080/02755947.2014.910573

Schroeder, S. A., Nemeth, M. L., Sigurdson, R. E., & Walsh, R. J. (2008). Untangling the line: Constraints to fishing participation in communities of color. *American Fisheries Society Symposium*, *67*, 97–112. https://doi.org/10.47886/9781934874042.ch9

Schumann, S., & Macinko, S. (2007). Subsistence in coastal fisheries policy: What's in a word? *Marine Policy*, *31*, 706–718. https://doi.org/10.1016/j.marpol.2006.12.010

Shatenstein, B., Kosatsky, T., Tapia, M., Nadon, S., & Leclerc, B. (1999). Exploratory assessment of fish consumption among Asian-origin sportfishers on the St. Lawrence river in the Montreal region. *Environmental Research*, *80*, S57–S70. https://doi.org/10.1006/enrs.1998.3929

Short, R. E., Gelcich, S., Little, D. C., Micheli, F., Allison, E. H., Basurto, X., Belton, B., Brugere, C., Bush, S. R., Cao, L., Crona, B., Cohen, P. J., Defeo, O., Edwards, P., Ferguson, C. E., Franz, N., Golden, G. D., Halpen, B. S., Hazen, L., … Zhang, W. (2021). Harnessing the diversity of small-scale actors is key to the future of aquatic food systems. *Nature Food*, *2*, 733–741. https://doi.org/10.1038/s43016-021-00363-0

Silva, A. L. D. (2007). Comida de gente: preferências e tabus alimentares entre os ribeirinhos do Médio Rio Negro (Amazonas, Brasil). *Revista de antropologia*, *50*, 125–179. http://dx.doi.org/10.1590/S0034-77012007000100004

Silver, E., Kaslow, J., Lee, D., Lee, S., Lynn Tan, M., Weis, E., & Ujihara, A. (2007). Fish consumption and advisory awareness among low-income women in California's Sacramento–San Joaquin delta. *Environmental Research*, *104*, 410–419. https://doi.org/10.1016/j.envres.2007.03.003

Smith, T. D. (2002). A history of fisheries and their science and management. In P. Hart, & J. Reynolds (Eds.), *Handbook of fish biology and fisheries* (*Vol. II*, pp. 61–83). Blackwell Science.

Steinback, S., Wallmo, K., & Clay, P. (2009). Saltwater sport fishing for food or income in the Northeastern US: Statistical estimates and policy implications. *Marine Policy*, *33*, 49–57. https://doi.org/10.1016/j.marpol.2008.04.001

Story, M., & Harris, L. J. (1989). Food habits and dietary change of Southeast Asian refugee families living in the United States. *Journal of the American Dietetic Association*, *89*, 800–803. https://doi.org/10.1016/s0002-8223(21)02252-5

Sutton, S. G., & Ditton, R. B. (2001). Understanding catch-and-release behavior among U.S. Atlantic Bluefin Tuna anglers. *Human Dimensions of Wildlife*, *6*, 49–66. https://doi.org/10.1080/10871200152668698

Svarstad, H., & Benjaminsen, T. A. (2020). Reading radical environmental justice through a political ecology lens. *Geoforum*, *108*, 1–11. https://doi.org/10.1016/j.geoforum.2019.11.007

Svarstad, H., Benjaminsen, T. A., & Overå, R. (2018). Power theories in political ecology. *Journal of Political Ecology*, *25*, 350–363. https://doi.org/10.2458/V25I1.23044

Toth, J. F., & Brown, R. B. (1997). Racial and gender meanings of why people participate in recreational fishing. *Leisure Sciences*, *19*, 129–146. https://doi.org/10.1080/01490409709512244

Twardek, W. M., Lapointe, N. R., Danylchuk, A. J., Lennox, R. J., Roberts, R., & Cooke, S. J. (2023). Angler influence on policy and legislation. In J. W. Neal, T. J. Lang, R. M. Krogman, K. F. Kurzawski, J. B. Taylor, & K. M. Hunt (Eds.), *Angler recruitment, retention, and reactivation: Influencing the future of fisheries and aquatic conservation* (pp. 75–100). American Fisheries Society.

Wallen, K. E., Landon, A. C., Kyle, G. T., Schuett, M. A., Leitz, J., & Kurzawski, K. (2016). Mode effect and response rate issues in mixed-mode survey research: Implications for recreational fisheries management. *North American Journal of Fisheries Management*, *36*, 852–863. https://doi.org/10.1080/02755947.2016.1165764

Weaver, L. J., & Hadley, C. (2009). Moving beyond hunger and nutrition: A systematic review of the evidence linking food insecurity and mental health in developing countries. *Ecology of Food & Nutrition*, *48*, 263–284. https://doi.org/10.1080/03670240903001167

Weyl, O. L. F., Potts, W. M., Rouhani, Q. A., & Britz, P. (2007) The need for an inland fisheries policy in South Africa: A case study of the North West Province. *Water SA 33*, 497–504. https://doi.org/10.4314/pelj.v16i5.6

Williams, D. R., & Stewart, S. I. (1998). Sense of place: An elusive concept that is finding a home in ecosystem management. *Journal of Forestry*, *96*, 18–23. https://doi.org/10.1093/jof/96.5.18

Young, M. (2013). Achieving equity in the fishing industry: The fate of informal fishers in the context of the *Policy for the Small-scale Fisheries Sector in South Africa*. *Potchesfstroom Electronic Law Journal*, *16*, 287–326. https://doi.org/10.4314/pelj.v16i5.6

Young, M. A., Foale, S., & Bellwood, D. R. (2016). Why do fishers fish? A cross-cultural examination of the motivations for fishing. *Marine Policy*, *66*, 114–123. https://doi.org/10.1016/j.marpol.2016.01.018

Downloaded from https://academic.oup.com/fisheries/article/50/8/366/8006542 by Carleton University Library user on 22 August 2025