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Proposing Dimensions of an Agroecological Fishery: The Case of a Small-Scale Indigenous-Led Fishery Within Northwest Territories, Canada

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Abstract: As fisheries face intersecting ecological and economic crises, small-scale fishers and Indigenous fishing communities have been organising globally to protect their rights. Yet governance of commercial small-scale fisheries in Canada has been dominated by colonial state actors in the interests of both conservation and economic growth. Meanwhile, agroecology has been considered an appropriate framework for reenvisioning and reshaping food systems in Canada's North. We propose four dimensions of agroecological fishing: governance, knowledge, economies, and socio-cultural values. We apply these to the Ka'a'gee Tu First Nation fishery in the Northwest Territories. We suggest that these agroecological fisheries dimensions, underpinned by Indigenous values and practices of stewardship, offer an alternative paradigm for the conservation of fish, waters, and fishing communities.

Keywords: agroecology; conservation; stewardship; small-scale fishing; Indigenous; governance; Canada; Northwest Territories



Academic Editor: Just Tomàs Bayle-Sempere

Received: 10 August 2024

Revised: 25 November 2024

Accepted: 8 February 2025

Published: 5 March 2025

Citation: Spring, C.; Temmer, J.; Skinner, K.; Simba, M.; Chicot, L.; Spring, A. Proposing Dimensions of an Agroecological Fishery: The Case of a Small-Scale Indigenous-Led Fishery Within Northwest Territories, Canada. *Conservation* **2025**, *5*, 13. <https://doi.org/10.3390/conservation5010013>

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1. Introduction

1.1. Fisheries in Crisis?

As Métis anthropologist Zoe Todd writes, “fish inhabit every Indigenous territory across the lands and waters that Canada claims as a nation-state” [1] (p. 60). The Northwest Territories (NWT) is no exception. Fish and fishing activities are a vital part of life in the NWT and have played a role in the region's foodscape for millennia. Fish and fishing are interwoven with the identities of the First Nations and Métis Peoples of the Dehcho region, on which this paper focuses. Almost every settlement in the NWT is located in proximity to a waterway, with fish contributing to local livelihoods, nourishment, and culture. For Indigenous communities across the North, fish are considered integral to subsistence economies, based on traditional knowledge and skills that are shared throughout communities and passed between generations. Fishing for trade and commerce has, since the early days of colonisation, been an important part of Indigenous peoples' integration into cash-based economies. Of the over 476 million Indigenous people in the world, around 27 million rely on fishing for their livelihoods and food security [2]. A review of the role of fish and seafood in Inuit Nunangat found that fisheries can influence food security through both

direct (i.e., nutritional value) and indirect (i.e., increasing household purchasing power) pathways [3].

Fish consumption and fishing practices have implications for human and ecosystem health, particularly given ongoing crises of aquatic biodiversity and poverty among traditional fishing communities [4]. Threats to small-scale fisher livelihoods include climate change, pollution, and overfishing, compounded by the COVID-19 pandemic [5]. In response to such risks, small-scale fishers and advocates have, in recent decades, aligned with broader movements for food sovereignty and agroecology in order to galvanise public attention and action [6,7]. Such advocacy has increased pressure on nation-states to ensure respect for Indigenous rights in decisions involving economic development and conservation, as we detail later.

While official NWT government fishery strategies remain centred on trade and growth, many Indigenous communities in the region uphold non-capitalist values of respect for land (encompassing respect for waters and watersheds). Traditional harvesting and sharing practices are based on principles that overlap with aspects of agroecology [8] and regenerative practices for managing terrestrial and aquatic food systems [9]. In this paper, we consider how such values could inform governance of commercial fishing activities in which many Indigenous communities participate, or seek to participate, as part of broader livelihood strategies and sovereignty struggles in a changing economic and ecological climate. There is a growing literature attending the need for fisheries management to incorporate Indigenous Knowledges and inherent Indigenous and/or treaty-based rights to self-determination within settler-colonial contexts such as Canada [1,10–13]. Despite such attention, however, dominant approaches to conservation and industrial strategy remain locked in colonial discursive and political structures [1,14,15]. How might agroecology help to enable socially just conservation?

Canadian state-led ‘conservation’ sciences and institutions developed in the 1950s, premised on the need to maintain productivity and profit in the interests of national (food) security, as it became recognised that industrial food production methods were devastating landscapes. However, ecological conservation has often taken a backseat to economic concerns. In the context of contentions over Mi’kmaw lobster fisheries, Davis [16] describes the “insult to one’s intelligence for the Department of Fisheries and Oceans (DFO) to insist that the Mi’kmaw must be shoe-horned into the existing lobster harvesting management system in order to assure resource conservation”, noting that the same government department oversaw East Coast stock collapses of multiple species, precipitating the “greatest ecological resource crisis and employment displacement in Canada’s history”. Davis critiques DFO-imposed licensing systems as conflicting with inherent and treaty rights for Indigenous fishers to pursue ‘moderate livelihoods’. He further argues that systems framed as pro-conservation, such as mandated harvesting seasons, may be primarily motivated by the economic rationale of regulating export supplies. By threatening the vested interests of seafood buyers, Indigenous fishers claiming their rights are met with repression in the name of state-led conservation, also revealed in Supreme Court of Canada decisions around aboriginal and treaty rights to fish [17].

In this paper we draw on agroecology, Indigenous food sovereignty, and small-scale fishing (SSF) literature to provide a theoretical exploration of four dimensions of agroecological fishing (governance, knowledge, economies, and socio-cultural). We apply these dimensions to the case of the Ka’a’gee Tu (also spelled K’agee Tue) First Nation (KTFN) fishery in the Dehcho region, arguing that fishers were engaged in forms of conservation and stewardship long before state-ordered fisheries management was imposed. Further, the community’s ongoing engagements with state, NGO, and university partnerships around water, wildlife, and environmental stewardship suggest that small-scale fisheries

like KTFN's already offer examples of agroecological fishing, and through this they enact food sovereignty. Such fishing suggests resilience given multiple threats to food security in Arctic and sub-Arctic regions where climate warming is occurring faster than average, but we note that such resilience has limits and that national and territorial policymakers should balance their hopes for regional economic revitalisation through fishing with protection for communities reliant on fishing for subsistence and cultural continuity.

1.2. Geographic Background

Canada is widely known for its vast waterways and aquatic species diversity. Home to some of the world's largest freshwater lakes and three coastal zones, ocean and freshwater fisheries have long been an important source of food, livelihoods, and culture for Indigenous and settler communities across the country. Northern fisheries have sustained such communities for centuries and continue to hold significant cultural relevance, contributing to sustainable livelihoods across the region. While Indigenous communities fish for subsistence purposes in freshwater lakes across the NWT, a regional commercial fishery has existed since the 1940s on Great Slave Lake (GSL), covering 27,200 km² [18] (see Figure 1). This fishery has long been a source of livelihood for fishers and fish workers throughout the region, many of whom are proud of its reputation as one of the last remaining sources of unpolluted freshwater fish.



Figure 1. Map showing Great Slave Lake, some zones of which are designated as a commercial fishery, as well as Kakisa/Tathlina Lakes to the southwest, comprising KTFN territory and fishery. Source: [WorldAtlas.com](https://www.worldatlas.com) (accessed on 20 February 2024).

KTFN territory (and its fishery) lies to the southwest of Great Slave Lake and includes the settlement of Kakisa, which nestles next to Kakisa Lake and the nearby Tathlina Lake. This small Dene community of approximately 50 people is located nearly 150 km by road from the nearest grocery store, and many people remain reliant on 'country' or 'traditional' foods accessed through hunting, fishing, and gathering [19,20]. In recent years, the community has begun a community garden to improve access to cultivated produce,

to support food sovereignty and self-determination goals [19]. One commercial fishing license is currently operational in the community, administered by the DFO. Many KTFN community members fish on a subsistence basis for personal consumption and to share within kinship-based sharing networks across the region. There is an abundance and diversity of fish found across the Great Slave Lake fishery, the larger regional fishery to which Kakisa is connected; the fishery's lakes are home to at least 34 fish species and a myriad of non-fish species. Commonly harvested species include Lake Trout (*Salvelinus namaycush*), Lake Whitefish (*Coregonus clupeaformis*), Inconnu (*Stenodus leucichthys*), and Walleye (*Sander vitreus*—sometimes locally and in other regions referred to as pickerel), Arctic Grayling (*Thymallus arcticus*), Suckers (*Catostomus commersonii*), Burbot (*Lota lota*—locally called mariah), and Northern Pike (*Esox lucius*—locally called jackfish) [18].

Indigenous communities and government scientists have been raising concerns over multiple threats facing lake and fish health in the NWT. Rapidly warming temperatures and accompanying changes in wind speeds and ice cover are affecting water circulation and oxygen levels vital to fish, as well as aquatic reproductive and migratory behaviour of native and invasive species [21,22]. Sediment plumes and contaminant accumulation that can affect fish ecosystem health and fishing livelihoods are impacted by bioregional industrial activity, including dam construction, mineral mining, and fossil fuel extraction [23–25]. Rühland et al. [24] suggest the onset of a “new limnological regime” for the Great Slave Lake region as a result of accelerated climate warming and accompanying ecosystem transformations. These impacts have led to the establishment of health advisory warnings for fish consumption, and the introduction of new species that could potentially change ecosystem function [26]. In 2024, insufficient precipitation throughout the watershed caused water levels on GSL and Kakisa Lake to drop to the lowest in recorded history, further impacting fish and aquatic ecosystem health [27]. For communities that rely on fish, the health of the land and waters in this reality of climate change is a critical issue [25]. As we will show, stewarding this ecosystem requires recognition, protection, and sovereignty of Traditional Knowledge and management practices that are critical in ensuring the sustainability of this vital food source for the future.

1.3. Agroecology and Indigenous Food Sovereignty

Agroecology as ‘science, practice, and social movement’ has become popularised in response to dominant modes of agribusiness premised on synthetic inputs, export, and growth-oriented industrial production, and exploitation of the labour of humans and other animals at the expense of ecological sustainability and wellbeing [28]. Its principles foreground cultural and bio-ecological relationships between places, people, and food; use of appropriate technology; and political-economic arrangements that foster just and sustainable livelihoods and territorial sovereignty [29,30]. More than just a descriptor of practical and technical approaches to food production, it has been articulated as a rallying call for institutional and social changes in the power dynamics and governance of food and economic systems, going beyond place-based experiments toward what Molina [31] describes as “a science of collective action in favor of sustainability; a philosophy of action” (p. 49). In contrast to reformist approaches, agroecology’s transformative approach centres dynamics of governance, control, and power as the key determinants of socio-technical change [32]. Scholars and activists continue to probe its discursive and organisational capacity to produce political changes that might further existing movements for Indigenous rights and food sovereignty for those marginalised by dominant food systems [33,34].

While the science of agroecology is rooted in early 20th-century agronomy as the application of ecological thinking to food systems [35], it has been reinterpreted, broadened, and adopted by movements for Indigenous and small-scale farming and fishing around

the world, and beyond food production to encompass transformations in the global food system [36]. The 2015 Nyéléni Declaration on Agroecology includes traditional fishing in its description of agroecological practices, describing how “ancestral production systems have been developed over millennia, and during the past 30 to 40 years this has come to be called Agroecology” [37]. The recognition of agroecology as reflected in values and practices dating back to time immemorial, and stretching far into a future horizon, has prompted calls for agroecology as a decolonial challenge to conventional agri-food policy in Canada’s North [8]. As such, agroecology offers a paradigmatic break from colonial-capitalist food regimes and dominant narratives of extractivism and human domination, through an ethos that fosters attention to climate and other threats to lands and waters while reflecting social and cultural values. These values include fishing as being central to material and cultural survival.

Agroecology prioritises food as a basic need rather than primarily as commodity, echoing Indigenous principles of taking just enough of a resource, and utilising it fully [38]. Agroecological principles have been increasingly considered and applied to food-producing sectors besides agriculture, including the land and water stewardship required to fish, hunt, and gather food [8,9,34]. In the NWT, agroecology comprises a holistic approach to food systems that may fit better with traditional Dene ways of thinking and doing than other academic tools that rely on breaking the world down in order to understand things [39], a tendency we recognise in this very work. Price et al. [8] view agroecology as consistent with Indigenous values and priorities: “northern Indigenous environmental stewardship aligns with agroecology as an alternative framework for agriculture development in the [NWT] ... agroecology ... describes a relationship between humans and land centered around respect and reciprocity” (p. 3).

Fisheries have received growing attention as part of global movements for food system change, including food sovereignty [6,7] and regenerative agriculture [40]. Comparable variables between terrestrial and aquatic ecosystems include biodiversity and resilience to external threats and environmental changes through capacity for adaptative self-organisation [9]. However, others have argued that the regeneration framing emphasises ecological concerns at the expense of political analysis, including questions of Indigenous justice that have been so central to agroecological movements, as has anti-capitalism [41]. With this critique in mind, we consider agroecology as a frame that links literature around ecologically-minded fishing to a decolonial politics, drawing on existing scholarship applying agroecological thinking to Northern contexts [8].

The inclusion of small-scale and Indigenous fishers in the global movement for agroecology is evident in policy reports co-written by national and international advocacy groups, including one following a World Forum of Fisher Peoples knowledge exchange in Indonesia in 2016 [34]. These constitute global networks of knowledge exchange where the pillars of food sovereignty have been applied to fisheries and harnessed in campaigns and organising struggles [7]. In 2015 the FAO published the ‘Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Poverty Eradication and Food Security’ [42]. These set out principles and guidelines for upholding human rights through, for example, States’ duties to include a diversity of fisher voices in participatory policy processes while respecting small-scale fisher knowledge and marginalised groups, including Indigenous peoples. These FAO Guidelines are the result of years of advocacy and co-development by 4000 fishers and fish workers from 120 countries, and are considered a key tool in achieving several Sustainable Development Goals [5]. Figure 2 displays overlapping features of the FAO Guidelines, agroecology, and food sovereignty frameworks.

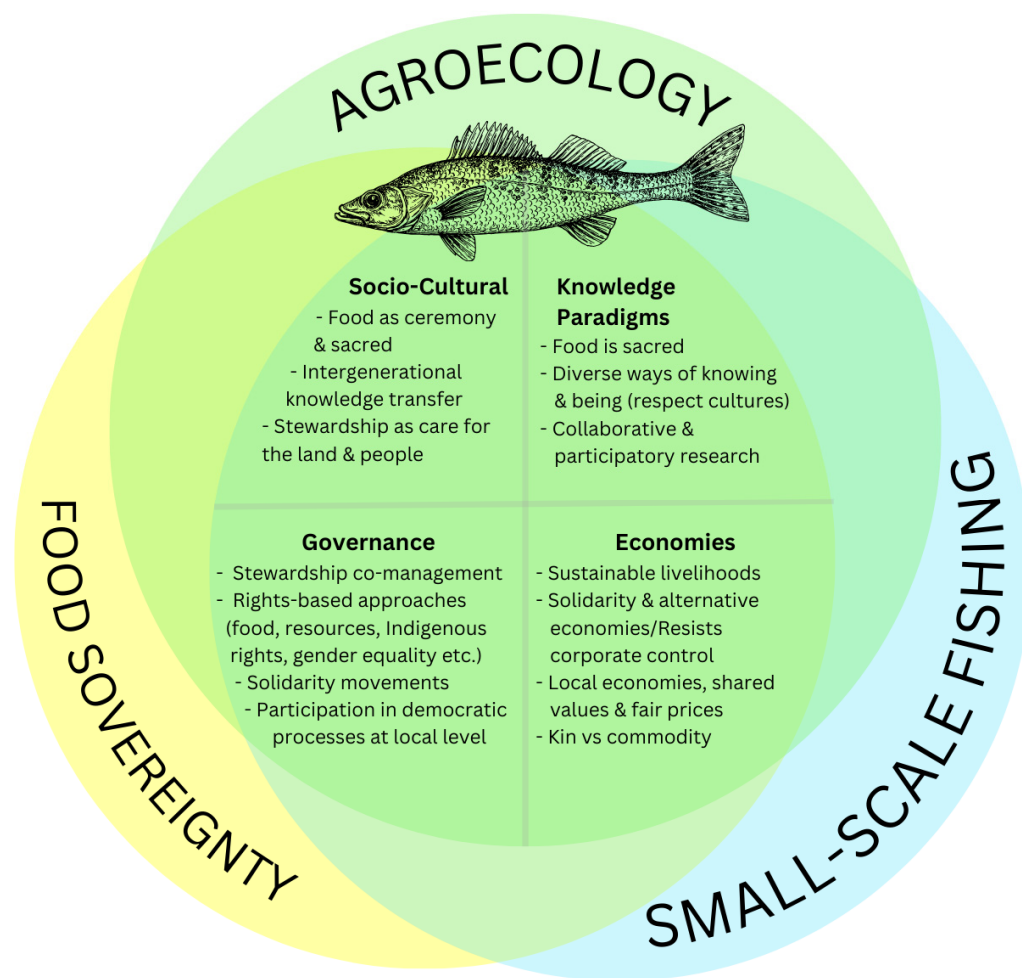


Figure 2. Four Dimensions of Agroecological Fishing drawing on connections among Agroecology, SSF, and Food Sovereignty frameworks [6,33,39].

Such discourses reflect ongoing discrepancies between Indigenous rights and nation-state policy. For example, the FAO Guidelines reflect efforts to implement the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which involves grappling with the arguable incommensurability of Indigenous and state-capitalist legal orders [1]. These tensions are not new; Davis and Jentoft [43] note that the Rio Declaration of 1992 recognised Indigenous rights with respect to fishing in ways that challenge “nation-states’ proprietorial claims and regulatory authority” (p. 224). In such ways, global movements and governance structures may offer pathways to greater sovereignty in settler-colonial contexts, but this is not to downplay the ongoing legacy of nation-state power in shaping Indigenous lives and environments, which we explore through attention to fisheries management in Canada’s North.

With renewed interest in “revitalizing” the Great Slave Lake commercial fishery in the NWT [44], and in the context of a fast-changing climate and movements towards reconciliation and Indigenous-led governance and conservation, it is important to recognise good practices and models to share within the region and beyond. This paper describes the collective actions of KTFN as a model for Indigenous-led, small-scale fisheries in the NWT, and recognises the ongoing efforts of this small community to protect, monitor, and harvest fish from their traditional territory for the benefit and wellbeing of community members. To this end, we present four thematic dimensions that link agroecology to fisheries (governance, knowledge, economies, and socio-cultural), and consider how each dimension applies to the KTFN fishery. We present a description of each dimension (see Figure 2)

first, introducing the reader to concepts from literature that we then bring to bear on our discussions with community members. We then consider “stewardship” as an underlying principle and bridging concept that crosscuts the four dimensions and brings agroecology into closer conversation with existing discourses in Indigenous-led conservation.

2. Materials and Methods

This research is part of an ongoing, decade-long engaged and collaborative relationship between the KTFN and University partners around issues of climate change adaptation and sustainable food systems. The work is grounded in a participatory action research (PAR) approach that ensures research is community-driven and responds to practical concerns through the active collaboration of researchers and community participants [19,45,46]. Fundamental to the work conducted in northern communities is building trust-based relationships by fostering opportunities to spend time together, often on the land, being flexible, and creating opportunities to involve communities in all aspects of the research process [47]. We take a lead from “two-eyed seeing” methodologies that emphasise both Traditional and Western knowledges [48]. As far as possible, we try to be mindful of our lenses, frames, legibility, and purpose, as academics not living in the NWT full time and travelling to conduct fieldwork when possible (and preferable for host communities). As settler researchers (C.S., J.T., K.S., A.S.), this process highlights how knowledge is co-created and shared in purposeful ways to achieve the common goal of increasing food system resilience within, among, and beyond participant communities. It is strong trust-based relationships that can create the iterative cycle of knowledge creation, community action, and reflection.

A word of caution and a nod at the limitations of this preliminary research: as with other efforts to undertake participatory research and policymaking in Indigenous contexts, engaging communities in ideas and visions drawn from other places requires mindfulness of the competing priorities, limited human resources, and persistent crises that many Indigenous communities are contending with. As several of our co-authors are non-resident researchers, we endeavour to be aware of our limited grasp of the complexities of the political, epistemological, economic, and cultural contexts of where we work. Our team includes two residents of KTFN who contributed their knowledge to many conversations about fisheries that informed this paper. We also consulted with colleagues who provided government perspectives from their expertise in fisheries.

The research presented in this paper emerged from a broader project carried out from 2021 to 2023 investigating economies and infrastructures of food production, distribution, and access in the Dehcho region of the NWT, particularly for communities upholding traditional food systems. As food production continues to increase in Kakisa and neighbouring communities through gardens and greenhouses, researchers have been working with communities to explore options for regional food distribution. Tensions exist around the sharing versus selling of food, as opportunities emerge to commercialise food production from a growing agricultural sector [49]. To understand such opportunities and navigate complexities, our research team has conducted interviews, community food system planning events, and ongoing discussions with members of KTFN around food systems planning and food sovereignty. A common theme of such discussions has been the important role that fish play in the livelihoods of the community and how similar issues exist with fish that are emerging with food from gardens. Commercial fishing has long been a site of contestation around a variety of governance issues: licensing, selling, lake access, conservation, and inter-governmental relations. Based on these conversations, this paper presents exploratory research into the history and current contentions characterising the community’s commercial and subsistence fisheries. We hope that this work contributes

to broader and inclusive conversations about food sovereignty, participatory governance, and environmental justice in the sub-Arctic. By placing these issues in the context of dimensions of an agroecological fishery, it is our hope that the paper prompts new thinking both within the region and for fisheries elsewhere, especially with respect to recognising Indigenous fishers' agency and sovereignty over their lands and waters as a vital ingredient of conservation through stewardship.

3. Results: Dimensions for Recognising Agroecology in a Small-Scale Indigenous Fishery in Northern Canada

Drawing on Price et al. [8], we derive four dimensions of an agroecological fishery: governance, economies, knowledge, and socio-cultural. Environmental stewardship constitutes a fifth dimension in [8], which we adopt as a core underlying value of the KTFN food system that cuts across the other four dimensions and to which we return in Section 3.5. Each dimension considers how an agroecological fishery might achieve goals of both ecological and livelihood conservation. Each dimension is explained in terms of principles and mechanisms to enable a more agroecological approach to fisheries before applying these to the KTFN fishery.

3.1. Dimension 1: Principles and Mechanisms for Agroecological Governance

Agroecology departs from production-oriented policies through its emphasis not only on ecological considerations but on the “collective knowledge, rights and agency of the most affected” [31] (p. 12). Fisheries policy in Canada has gone some way to incorporate bottom-up forms of governance through, for example, policies geared towards co-management of socio-ecological systems [50–52]. However, fisheries management has been dominated by the use of devices such as licenses and quotas that confer fishing access as a matter of bestowed privileges rather than as rights [43]. Fisheries conservation is formally the preserve of the federal government department Fisheries and Oceans Canada or DFO (previously the Department of Fisheries and Oceans). We further consider its role under Dimension 2 (Knowledge), suffice here to note DFO's dominant role in fisheries governance, including zoning and policing of commercial fishing, in ways that many Indigenous fishers feel impinge on their subsistence and traditional rights [53,54].

The NWT is the last remaining member jurisdiction of the Freshwater Fish Marketing Corporation (FFMC), a federal Crown Corporation founded in 1969 to stabilise prices for fish harvesters but beleaguered by internal and external contestation, logistical costs and market pressures, worsened by the withdrawal of other regions from the marketing board [55]. With its future status in question at the time of writing, Indigenous and non-Indigenous fishers alike have disagreed on the benefits of having to sell through FFMC if they wish to sell fish outside of the territory, complaining of a lack of transparency and democratic governance as well as poor prices [55]. Export permits can be obtained by fishers wishing to sell outside of the region and who possess the administrative capacity to achieve this.

As Cadman et al. [56] note, Canadian colonialism continues to deeply impact Indigenous Peoples' ability to derive social or economic benefits from their marine and freshwater ecosystems. Dene traditional values revolve around the stewarding of relationships between humans and environments [57], in direct contrast to the Western notion that humans can ‘manage’ land and resources; following this, Indigenous modes of governing fishing commons might look like rotating fishing areas or dispersing fishing efforts over space and time, rather than managing annual harvest quotas based on assumed discrete stocks [58].

Agroecological fishing's political dimension calls for international solidarity, with SSF advocates arguing the importance of fostering communication and alliances between

agroecological fishers in different places to have a greater political voice against the many forces that would coopt, and present barriers to, agroecological fishing [34]. Rights-based and inclusive fisheries governance increases fishers' incentives to manage fisheries for conservation, especially if holistic issues pertaining to housing, health, education, and other livelihood determinants are included in industrial and labour policy [59]. Findings from the review by Brockington and colleagues [3] indicated the need to integrate policies related to fisheries and wildlife management together with food and health policies. Viewing fishing through a broader food systems lens suggests how fisheries can contribute to health, livelihoods, and community wellbeing via fair and democratic processes [6]. An agroecological fishery would thus support food sovereignty by placing control of decision-making over markets and broader economic development and climate policy in the hands of fishing communities affected by such policies. We now consider the extent to which this is the case for the KTFN fishery.

Applying Dimension 1 to KTFN Fishery

Discussions with KTFN fishers suggested ambivalence towards the managerial-colonial State. The legal obligation to sell export fish via FFMC involves bureaucratic reporting requirements related to government-led stock monitoring for conservation, but it also provides stability in prices and a guaranteed buyer. Meanwhile, Indigenous community members are permitted to sell fish within the NWT (as long as they are logging and reporting catches to DFO) and may distribute fish in non-commodified networks of exchange between communities, for example, as donations to community events, distributions to Elders, and so on (see Section 3.3). While fish caught in the NWT might be sold to global markets via FFMC, fishers face barriers in selling their fish locally, making it difficult to purchase locally caught fish through grocery retailers even in Yellowknife, the territorial capital that sits on Great Slave Lake itself [60].

Some commercial fishers in KTFN and across the region are members of the Tu Cho Fishers Cooperative, the business arm of the NWT Fishermen's Federation. In a history of commercial fishing on GSL [55], former fisher and NWT-based author Fran Hurcomb describes a hopeful vision for the Tu Cho coop, one of greater control over fish processing infrastructure by fishers via the cooperative. Further, she suggests some successful collaborative fishery conservation in nourishing the conditions to support such revitalised fishery governance: "Years of careful monitoring by DFO, Indigenous communities and other interest groups around the lake have ensured that fish stocks are in good shape. A new fish plant in Hay River, run by the locally owned and operated Tu Cho Cooperative will lead the way with a truly Northern approach to harvesting and distributing Great Slave Lake fish, with a minimum of waste and targeted marketing" [55]. Tu Cho was thus intended to enable greater co-management between fish harvesters and the territorial government (and its visions align somewhat with food sovereignty goals, including appeals to regional identity and uniqueness). However, in part due to existing political dynamics and a highly dispersed network of fishers for whom both online and in-person gathering is not always easy, it has not found the leadership and organisational structure to turn financial resources (channelled by the territorial government) into collective power for fishers themselves, begging questions of whom it best serves. Several Indigenous communities of the NWT are voting members of the Great Slave Lake Advisory Committee (GSLAC) and are also engaged in nation-to-nation (i.e., with the federal government) negotiations around land tenure, natural resource management and other issues that include fisheries governance. However, some communities have felt that it is up to them to make proactive efforts to engage with federal agents (often trained and/or located outside of the territory), rather

than those agencies making efforts to consistently reach out to communities that are often dealing with recurrent crises and competing priorities.

Importantly, some other Northern regions and communities have settled ‘comprehensive’ (or ‘modern’) land claims that embed Indigenous participation and traditional modes of governance into fisheries management, though often still including the federal government as co-management partners [1,61,62]. Stalled progress towards such a land claim in the Dehcho region limits the ability of its First Nations to protect and govern their lands and waters despite inherent and treaty-based rights to do so. Protected Areas are another mechanism, at both territorial and federal levels, to pursue greater recognition and respect for Indigenous conservation principles and autonomy [25,62,63]. KTFN’s relative political stability contrasts with some other First Nations whose Indian Act-forced subjection to particular models of ‘democracy’ have damaged traditional forms of relationality in decision making [64]. However, predominant fish governance remains more vertical and nation-state-dominated than an agroecologically-designed fishery would be structured.

3.2. Dimension 2: Knowledge Paradigms in Agroecological Fishing

Agroecological movements have developed through their engagement with non-Western cosmologies and Indigenous communities, prompting the addition of food’s sacredness to the pillars of food sovereignty [65]. Agroecology holds the potential to epistemically heal the ‘metabolic rift’ between capitalist valuation systems and the ecological wellspring of use value [66]. Agroecology thrives upon diverse ways of knowing and being, if frictions and synergies between them are allowed to be voiced [66]. One salient tool in imagining possibilities for an agroecological and decolonial fishery by navigating such difference is ‘two-eyed seeing’. Reid et al. [67] suggest ‘two-eyed seeing’ as a framework for synthesising, and treating as equally important, knowledges from Western and Indigenous traditions. It recognises observations by Indigenous Elders and others as discerning of the natural world and its communication of spiritual power [68].

Collaborative research is underway to apply two-eyed seeing to fisheries management [69–71]. This includes acknowledging that fish can be seen and treated not as a resource from which to exploit profit, but as kin, and beings with agency [72]. Conservation, in this view, is inherently social. The DFO-sponsored Aboriginal Aquatic Resource and Oceans Management (AAROM) program supports community-based monitoring by KTFN in Kakisa and elsewhere. Originally conceived as an interim measure for Indigenous communities to build capacity for fisheries management in the absence (or during negotiation) of land claims (personal communication), AAROM now operates as 33 watershed-focused and Indigenous-led aquatic co-management ‘departments’ across Canada, many of which have been in operation for over a decade. Where AAROM works well, it allows natural scientists, governments, and Indigenous communities to share observations and methodologies to better understand ecological interactions that affect land and water-based livelihoods [71]. AAROM departments also provide a way for DFO to be fed data on the state of subsistence fisheries. The networks and knowledge formed through AAROM partnerships can form the basis of governance planning in anticipation of settling comprehensive land claims [personal communication].

Indigenous guardianship programs have been another way for knowledge gathered through AAROM projects to be translated into practical conservation efforts, though concerns remain about the implications of these for genuine self-determination if they remain embedded in Western governance models [67,72,73]. Elsewhere in the NWT, government fisheries managers and scientists have conducted collaborative studies with Indigenous harvesters to compare traditional methods for assessing fish health with lab-based anal-

yses, such as whether traditional modes of assessing liver quality in Burbot can detect contaminants and thus assess the best fish to eat [23].

Zoe Todd, however, warns of the risks inhering in stated efforts to foster reconciliation through dialogue and recognition alone, urging Indigenous leaders to “unpack who and what we are being asked to reconcile to, to weave and braid our worlds to” [74]. Given the continued institutional dominance of white supremacy and organisational logics of private property, individualism, and (over)consumption, Todd warns against the unevenness between the ‘two eyes’, unless settler power holders work to actively dismantle the colonial inheritances of dominant legal systems, markets, and infrastructures.

Applying Dimension 2 to KTFN Fishery

Before the KTFN commercial fishery was formed and incorporated into contemporary regulatory monitoring and marketing regimes, Elders observed the land to ensure harvesting respected the relationships between humans and the environment. Kakisa’s food-sharing economy is based on fundamental principles of sustainable harvesting and consumption. Fish are one of a diversity of wild foods that make up traditional human diets. By consuming a diverse diet, harvesting pressure on any one specific species is reduced, and populations can thrive. Aquatic and terrestrial species are observed and harvested only when the environment shows signs of species health.

KTFN fishers in Kakisa have long worked with government and industry to ensure they maintain ecosystem and species health while participating in fishing as a livelihood. Chief Lloyd Chicot described how previous generations of commercial fishers would ship upwards of 150 ‘tubs’ of fish in a haul harvested by between seven to ten fishers. Meanwhile, they were in close contact with government agencies to monitor fish health, including via the AAROM program. Chicot recalled how regional AAROM programs were shaped by experimental community-based monitoring efforts in Kakisa. KTFN fishers observe the natural environment and draw on their Traditional Knowledge to interpret ecosystem health through their Dene worldview. By partnering with scientists to monitor water quality and aquatic species health, fishers practice two-eyed seeing as part of their responsibility to steward their more-than-human kin, and make harvesting decisions that uphold multi-generational relationships with the Land. Knowledge accrued through the AAROM partnership is often shared via an online regional portal where different AAROM departments can learn from one another. Nevertheless, questions remain about the extent to which fishers can practically utilise such online information.

The persistent lack of trust between fishing communities and state institutions can be partially explained by the latter’s overall reliance upon Western scientific methods as the basis for governance decisions around commercial fishing. Formerly mobile communities now residing in an area over a long period of time (including KTFN) may have lost some of their ability to track fish populations as they were able to when they lived more migratorily. However, as the people fishing an area consistently, they can observe fish behaviors and habitats holistically and over time, whereas fisheries officers tend to rely upon data-gathering methods based on particular places and particular times that do not necessarily fit with fishers’ movements and priorities.

Linking knowledge politics with the following section on economies, it is worth noting the implications of tensions between different ways of knowing for fishing livelihoods. Indigenous communities have little choice but to participate in wage economies, while the Fishery Act’s division of fishing into differently-governable types (commercial, subsistence, sport, and so on [58]) creates tensions between Indigenous values of taking only what one needs when harvesting from the land, and the need to generate income. Nevertheless, relying upon the land as the basis for meeting financial and subsistence needs does not con-

travene harvesters' incentives to steward land and waters in sustainable ways. Indeed, such reliance can bolster the observation that resource users are better placed than governments to conserve resources [75]. These tensions bring us to the next dimension: Economies.

3.3. Dimension 3: Economic Considerations for an Agroecological Fishery

Pathways towards agroecological fishing might include reshaping markets in the interests of small-scale livelihoods and solidarity. Such “institutional innovations” imply private, public, and civil society actors (re)organising the rules governing their production and consumption networks to support agroecological values, including producer democracy and ecological sustainability [76]. Such innovations include cooperative distribution and direct marketing systems [30,53,77]. In the NWT, ‘food hubs’ have formed a focus of ongoing regional discussions about institutional innovations to improve food distribution in the territory. Food hubs aim to connect fishers and eaters via direct marketing, quality assurance and transparency, product aggregation, and support for access and distribution. Consumers are often motivated to participate through shared values including fair pricing for producers, support for local enterprises, and improved environmental impacts of local food systems [78,79].

Similarly, alternative seafood marketing strategies can seek to (in the Polanyian sense) ‘re-embed’ economics in broader socio-material realities [80]. Akin to community-supported agriculture (CSA), ‘community-supported fisheries’ (CSF) seek to strengthen connections between producers and eaters through membership schemes that can improve access to high-quality and sustainable food for consumers and reduce risks for fishers by diversifying their market access [2,81]. Many CSFs incorporate principles of food sovereignty, including local control, valuing producers, valuing food for people over profit, working with nature, building knowledge and skills, and localising food systems [82,83]. In one study [82], CSF consumers appreciated non-market values supported by CSFs, many of which resonate with Indigenous concerns for reciprocity with human and more-than-human communities and practices of sharing that support community food security [8].

Direct marketing schemes and cooperatives offer ways to decommodify fish sales (for example, some urban CSFs, such as Fishadelphia in the United States, design sales mechanisms for low-income members to acquire seafood cheaply or for free), even as they may bolster commercial fishers' labour power and income. Nevertheless, they can also be read in terms of neoliberal reforms that include labeling schema and co-management as ways to tweak fisheries primarily for economic success rather than socio-ecological justice [82]. Questions also remain as to how to implement direct sales models such as CSFs given the NWT's remote geographies (a recurring challenge to economies based on export via centralised infrastructure such as FPMC, as recounted in [55]) and internet access barriers for some communities, but existing practices of direct selling based on kin networks and word-of-mouth suggest infrastructures suited to removing market ‘middle-men’. [55] notes a resurgence of entrepreneurs and small, locally owned companies around Great Slave Lake that hold export licenses and form part of a broader resurgence of Northern autonomy over resource management and infrastructure.

From another perspective, agroecology challenges the treatment of fish primarily as a commodity or resource to be extracted for profit rather than as members of socioecological systems. Dene, and many other Indigenous norms and values, consider foods harvested from the lands and waters to be sacred. As such, cultural norms often discourage the commodification of traditional foods [65,84]. Fish is, for many communities, an exception to this norm. An important component of the northern ‘mixed economy’, fish are considered a culturally important gift to be shared with kin, while fishing is considered a sustainable livelihood option to generate income that can, in turn, support other land-based activities.

State-led fish conservation has been managed in ways that may not threaten economic development, but which may clash with Indigenous rights. Difficult questions arise over the use of licenses and quotas as fishery management tools, as these may confer some protection against free market forces and thus conserve traditional livelihoods but still represent the imposition of state power and private property regimes into natural resource stewardship in ways that may hamper Indigenous autonomy [85,86].

Economies are thus inextricably linked to questions of governance and knowledge. The potential for a clash of values between fish as kin and fish as commodity reflects what Leroy Little Bear [87] describes as Indigenous consciousness having become “a site of overlapping, contentious, fragmented, competing desires and values” (p. 85). Mainstream conservation can equally be a site for cultural and material dispossession, even as Indigenous communities are expected to provide knowledge, labour, and social capital to conservation efforts that increasingly valorise (and expect the involvement of) Indigenous participation [88]. Little Bear [87] notes that both colonisers and the colonised share an overlapping but always-clashing worldview, a clash that prevents effective and ethical governance and that suppresses diverse ways of knowing. All power holders over fisheries governance decisions should be mindful of multiple watery ontologies and embrace ‘two-eyed seeing’ over a hierarchy of particular ways of ordering worlds (‘science’, ‘conservation policy’, ‘marketing rules’, etc.).

Applying Dimension 3 to KTFN Fishery

The commodification of fish has significantly altered the way that fish and fishers live, with multiple socio-ecological impacts. Memories of the NWT’s commercial fishing boom were recounted by KTFN members during a trip in April 2022 to visit newly constructed emergency shelters (for those encountering increasingly precarious environmental conditions on the land) at the edges of Kakisa and Tathlina lakes, travelling along winter access roads that connect them. These routes followed seismic lines laid by oil companies decades ago, a reminder that geographies have long been shaped by extractive industries. Chief Chicot recalled the 1940s and 50s, when large fishing boats and crews travelled from places like Alberta to fish these lakes, leading to the collapse of certain fish stocks. Such activity followed the opening up of Hay River’s road and port infrastructure, alongside growing postwar markets [55]. The memory of those fish losses was accompanied by the recollection that such incursions to traditional waters were not approved by KTFN.

Throughout the region’s fishing boom (and subsequent demise), the community continued its subsistence fishing practices, for example, through fishing camps, with women often drying and selling fish. One commercial fisher recalled his mother, who spoke only Dene Zhaté (South Slavey), selling fish but often being paid far less than the fish were worth. With the provision of DFO-issued licenses from the 1940s, several community members became commercial fishers themselves, with few licenses remaining active or available today. Commercial licenses for specific fishing areas determine catch limits for particular species; pickerel (walleye) in the case of Kakisa, though a fisher recalled that this was previously a surplus fish that would end up as bycatch given the lack of a market. In the spring, community members continue to dry fish by traditional methods, especially those species that are not considered ‘valuable’ according to FFMC logics (including sucker fish).

The KTFN fishery operates across multiple economies to support diverse, small-scale, sustainable livelihoods. While some may participate in the commercial fishery, many in the community participate in subsistence harvesting. Subsistence fishers harvest, trade, and share fish as a component of multiple traditional and income-earning activities that contribute to household and community food security. These activities require considerable skills and knowledge, including filleting, smoking, and drying fish to produce food that

is highly sought-after regionally. Meanwhile, the commercial fishery engages in a mixed economy [89], selling fish commercially through FFMC and directly to communities and individuals in the NWT. Those who participate in the commercial fishery, however, also share and trade fish through a regional network of family and other kin. Traditional foods are shared among community members to reinforce kinship bonds, support families, and ensure food is responsibly consumed [90]. Sharing food reduces the risk of waste, while traditional fish preparation techniques lengthen the shelf-life of fish in ways that mitigate some of the challenges of fresh fish marketing. Fish waste also holds the potential to provide compost for food growing; helping to close resource loops.

It should be noted that not all Indigenous communities in the NWT engage in commercial fishing, and selling of traditional foods is not commonly practiced as it is often seen as contrary to cultural ethics. This can vary between communities and there are tensions within and between communities and regions around selling traditional foods. For example, another NWT lakeside community previously engaged in commercial fishing but, upon noticing declines in certain fish stocks, collectively decided to stop selling fish; the subsistence fishery persists [personal communication]. Other communities have debated whether commercial fishing clashes with principles of only taking as much as is needed [39]. Nevertheless, many of the NWT's commercial fishers are Indigenous and see fishing, including commercially, as a way to retain connections to land and traditions, and as part of Indigenous rights. In Kakisa, the community helps to ensure that any commercial fishing does not negatively impact the subsistence fishery by using different fishing locations; in such a small community, communication about where and when nets are placed is easily achieved (for more examples see [91]).

3.4. Dimension 4: Socio-Cultural Considerations for Agroecological Fishing

Fish have long played a central role in the ceremonial lives of Indigenous communities. Inseparable from law, economy, collective knowledge, and ecological management, ceremonial life is an instrumental component of the kinship and relationality upon which stewardship rests [68,92]. Current DFO licensing arrangements for commercial fishing tend to leave out the food/subsistence, social, and ceremonial aspects of fishing [11], reflecting the 'resourcist' perspective that reduces fish to just one more 'natural resource' to be managed in the name of profit, or even health/nutrition and sustainability, but not as part of broader food and social systems of which fishing communities are a part [93].

Human lives and livelihoods have often been neglected in mainstream conservation discourse [94] but, as suggested in Section 3.3, it is possible to reshape fisheries governance, labour arrangements, and fish markets in ways that centre the knowledge, values, and identities of fishers and fish workers themselves [81]. Mainstream fisheries governance approaches, including co-management, do not necessarily translate to benefits for fishing communities within a context of neoliberalism, which further disembods economic activity from cultural and social contexts by imposing market logics that pitch fishers as competitive entrepreneurs [95]. In contrast, Lowitt, Levkoe, and Sayers [54] write about how Batchewana First Nation's fishery, on Lake Superior in present-day Ontario, shows the continuity of Indigenous tradition and knowledge since pre-colonial times, and thus the seeds of broader Indigenous resurgence despite violent state repression and threats to sovereignty (even within fishery 'co-management' efforts).

Movements for food sovereignty and agroecology, in contrast, have attempted to make explicit class and other values-based solidarities of SSF in different places, asserting a key role for fishers as workers and community members [7]. Viewed through a sovereignty lens, fisheries (and their governance) can be sites for (re)valuing traditional knowledge and skills and celebrating fishing as part of cultural heritage and sacred worldviews [6]. This

includes creating space for Indigenous languages in governance and, relatedly, attending to intergenerational concerns: the inclusion and consideration of both youth and Elders as vital for knowledge transmission and cultural thriving. For many Indigenous communities, the passing of fishing traditions (both commercial and subsistence) to younger generations is another important aspect of fishing as part of cultural continuity and survival. This point is inextricably linked to notions of knowledge and of two-eyed seeing, whereby Indigenous lifeways are not simple matters of ‘cultural difference’ but of different modes of understanding and constituting worlds [88].

Applying Dimension 4 to KTFN Fishery

In Kakisa, fish were historically harvested in the fall season, hung on sticks to cure, and stored out in the open near the shore of Tathlina Lake, where the community was originally located. This type of fish, prepared as food for dog teams, is referred to as ‘stick fish’. This practice is no longer commonly practiced because households now use snowmobiles in place of dog teams to travel across frozen landscapes. However, community members continue to share stories of stick fish and they still practice smoking fish over open fires in the spring. Kakisa is well known in the region for having the best quality smoked ‘dry fish’, and people from surrounding communities frequently inquire about it through kinship-based sharing networks.

Fish play a role in ceremonial and celebratory activities such as fish fries that may be part of gatherings with other communities, as well as being an important part of everyday commensality within and between households. As with other traditional food system activities, KTFN organises educational camps and harvesting trips as ways to engage youth in learning traditional fishing skills. Such activities are sometimes supported through partnerships with universities and non-governmental organisations such as the Yellowknife-based Fly Kid Foundation, which aims to foster fishing and ecosystem knowledge and skills among the region’s young people.

As noted under Dimension 3: Economies, Kakisa’s commercial fishery navigates both licensed sales through FFMC and the provisioning of fish across kin networks in ways that strengthen reciprocal ties with others and across geographies that do not neatly correspond with the regulatory borders of territorial/FFMC jurisdiction. Fish is also shared with non-Indigenous communities, such as in exchange for potatoes from Hutterite colonies located across the provincial border near Le Crete, Alberta. How far such smaller-scale and diversified infrastructures of food distribution reflect both resilience and vulnerability, in the face of the declining federal marketing board that has, thus far, offered a degree of income stability, remains unknown.

3.5. Stewardship as Cross-Cutting Dimension

While Canada’s federal fisheries policy has moved towards valuing traditional knowledge and mandating Indigenous involvement in management decisions, many communities remain ambivalent around who most benefits from management arrangements, given histories of overfishing for the benefit of purchasing companies and markets often located far from the region itself. Policies framed as pro-conservation need to be read for underlying economic prerogatives such as generating scarcities to maintain export values, and for their potential to clash with Indigenous rights for subsistence and livelihood. We have proposed agroecological fisheries governance as a framework for decolonial fishery conservation.

However, the recognition that “agroecology is not yet resonating” with many farmers or fishers [30] (p. 2) affirms the need to align agroecology with other struggles and frames that may have greater salience, especially for Indigenous communities involved with movements centring reconciliation, LandBack (and WaterBack) [96], resurgence and/or

survivance [97,98], ‘collective continuance’ [99] and Indigenous Food Sovereignty [100], all concepts concerned with distributive as well as representational justice for colonial harms. We also consider “stewardship” as an important and salient concept that might bridge agroecology with Indigenous worldviews.

Stewardship cuts across governance, knowledge, and economic and cultural aspects of fisheries. This synthetic dimension and underpinning praxis blurs the categorising tendencies of (our own) Western academic analysis. Rather, it highlights the interconnectedness of the different dimensions in the underlying principle of stewardship as an ethic of care for lands and people that may be missed by narrower conceptions of sustainability [8].

We acknowledge critiques of the anthropocentric assumption of stewardship paradigms for human–nature interactions, characteristic of Western conservation [101]. Yet Indigenous ontologies of interdependency over dominance offer deep-rooted and place-based lessons for greater attunement to ‘common worlds’ in response to Anthropocentric divisions [101]. Stewardship, as an alternative framing to mainstream conservation, might in this way re-suture the Cartesian dualism that has long underpinned paternalistic notions of human dominion over nature (as well as humans othered as ‘closer to nature’ as in so many justificatory colonial narratives). Todd [102] indicts academics’ tendencies to claim more-than-humanism as their own scholarly invention rather than as a tradition of much Indigenous thought, scholarship, and action. Indigenous stewardship retains a role for human agency in maintaining cycles of ecological regeneration and continuance [68]. Conservation, viewed in this light, takes on ethical, political, and material character but also spiritual and ceremonial significance.

Indigenous stewardship encompasses holistic dimensions of agroecology. Human agency, viewed as participation in ongoing and interdependent natural cycles without directing them [103], is an essential component of governance for Indigenous sovereignty and wellbeing, which involves tackling racist relics in policymaking that view Indigenous being, agency, and knowledge as dispensable [68]. Governance, knowledge, and stewardship are thus closely linked. They involve recognising land, waters, and ecologies as alive and sovereign, with humans as allies and protectors rather than extractors from an objectified ‘resource base’ [68].

Such capacity to protect is best achieved when stewards are afforded full rights to their traditional territories. A stewardship-based economy requires identifying existing Indigenous and peasant practices that, through ceremony, care, and, if needed, political contestation, act to challenge the commodification of environments, and the utilitarian mindsets that underlie this [104]. Practically, this involves alternative economic arrangements, whether community-supported marketing, food hubs, cooperatives, and so on, that allow food producers to make a living wage rather than be pressured to over-exploit resources. Many Indigenous fishers continue to participate in multiple economies by selling key species to make a living while sharing less commercially desirable species (by-catch) through kinship-based sharing networks [91]. This combination of entrepreneurial, social, and cultural practices reinforces an ethic of conservation (including using every part of the animal), strengthens social and cultural ties to community and land, increases access to healthy foods, and provides fishers with funds to carry out valued work that provides for families in remote areas with few other income-earning prospects.

Stewarding an agroecological fishery would start with community discussions around ecological and social justice concerns that are often obscured in dominant conversation and economic revitalisation discourses. We have considered some of the challenges for such governance in a settler-colonial context, including the role of state bureaucracy, regulation, and market control. Policymakers would be invited to interrogate and “unsettle” policy arrangements that prioritise monetary values but also conservation that disregards the

people whose livelihoods depend on their interrelationships with land, water, and fish. As Avalos [68] (p. 10) writes, “a critical component of addressing environmental crises is to interrogate settler colonialism as a structural dimension of modern life. . . . Settler ecologies rely on a materialist view of nature as a problem to be solved, which distances the land and possibilities of deep relational care”. Recognising and tackling knowledge asymmetries would thus be a vital first task for an agroecological fishery.

4. Conclusions

Peña [105] (p. 2) suggests that agroecology should be conceived as a “community-based asset-building movement” in service of broader goals of food sovereignty and environmental justice. We have suggested ways that agroecological principles, often rooted in land-based movements, can be applied to fisheries. Such change requires linking ‘economies’ (defined beyond capitalist markets to include social reproduction, ecological embeddedness, and distributive justice) to political and socio-cultural needs for greater participation by fishers in ecological, resource-allocation, and marketing decisions; overcoming institutional barriers to technology and training; and addressing social needs of fisher communities relating to colonial trauma, gender inequities, or other forms of discrimination [5].

A resurgence of Indigenous and community-led aquatic monitoring programs suggests that, in the NWT, decolonial fisheries governance is beginning to be put into practice, reflecting federal obligations to include Indigenous knowledge and participation in ecological management decisions [106]. The KTFN fishery’s history is constituted by Indigenous practices and stories that predate colonisation and continue to this day outside of the purview of formal markets and fish-as-commodity. It is this continuity, and the people upholding it, that we suggest contains the seeds of bottom-up governance required to foster an agroecological fishery for the NWT. Mobilising the founding principles of agroecology to reframe collective visions for fishery sustainability starts with democratic forms of governance. Identifying ways in which traditional forms of governance, knowledge practices, economies, and culture have survived alongside the commercial regime and federally backed supports that dominate the NWT fishery’s history, allows us to suggest how ‘agroecological fishing’ might operate both as a meaningful and salient frame and identity for fishers, consumers, and policymakers. An agroecological vision for the fishery can also support democratic processes through which diverse human and more-than-human actors make decisions that impact fishers’ livelihoods and fish habitats in a sustainable way. Rather than seeking to propose an approach that erases difference and contestation, we propose ‘agroecological fishing’ as a framework for governance that can create—and which requires—space for political struggle. Nevertheless, describing fisheries in terms of agroecology in the NWT is new, and may not be the right language for what is evolving in terms of both subsistence and commercial fisheries development. It gives us a starting point to link current community-led initiatives with movements for food sovereignty at regional, national, and global scales.

While not an exhaustive account of ongoing fisheries governance struggles in the NWT, our paper raises a number of questions: in the wake of declining federally run marketing boards, how can fish be marketed locally and regionally without expecting individual fishers to become entrepreneurs in a challenging market and geography, in what is already a challenging livelihood with an aging workforce? Do such ruptures offer openings toward stewardship-based economies? Do structures such as fisher-run cooperatives offer alternatives that can pool risk and improve the representation of fishers in policy decisions around funding, regulation, and so on? Or, do these promises of change reflect an appearance by governments to yield agency to fishers who are ill-equipped

to take on such responsibilities amid increasingly unstable socio-ecological conditions? Finally, if fishing (along with agriculture) is being framed as a potential growth sector to mitigate declining opportunities in ecologically damaging industries like mining and fossil fuel extraction, how can lessons be learned from the past around balancing conservation and economic needs, while respecting Indigenous land and food sovereignty?

Author Contributions: Conceptualisation, C.S., J.T., K.S., M.S., L.C. and A.S.; methodology, C.S. and A.S.; validation, M.S. and L.C.; formal analysis, C.S. and J.T.; investigation, C.S. and J.T.; writing—original draft preparation, C.S. and J.T.; writing—review and editing, K.S., M.S., L.C. and A.S.; visualisation J.T.; supervision, A.S.; project administration, C.S.; funding acquisition, K.S. and A.S. All authors have read and agreed to the published version of the manuscript.

Funding: Funding was provided in part by the Social Science and Humanities Research Council (SSHRC) (435-2021-1119), the Canadian Institute for Health Research (CIHR) (166443), MITACs (IT24346), and the Government of Canada through their Climate Change Preparedness in the North and Climate Change Health Adaptation Programs (PN-NT-096-2018-KTFN).

Institutional Review Board Statement: The studies that contributed to the writing of this paper were conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Research Ethics Boards of Wilfrid Laurier University and University of Waterloo (protocol code #7181 and #6656 and 2 June 2022 of approval).

Informed Consent Statement: Research was carried out according to the Tri-Council Policy Statement 2, and informed consent was obtained from all participants involved.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Acknowledgments: We would like to thank KTFN for their generous hosting and sharing of knowledge with academic researchers, and especially Chris Chicot. We also thank those who have provided insight and support through, for example, taking time to discuss ideas, linking us to useful resources, assistance with editing, and commenting on drafts, including Fran Hurcomb, Heidi Swanson, Tracey Williams, Mike Tollis, Lillith Brook, staff at DFO, and Elisabeth Miltenburg.

Conflicts of Interest: The authors declare no conflicts of interest.

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