“Knowledge is power”:
Re-imagining catch monitoring methods for the Kitasoo Xai’xais community-based fishery

By

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BA, University of Victoria, 2015

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Abstract

Faced with the mounting cumulative effects of climatic changes and anthropogenic pressures, social-ecological systems like fisheries increasingly rely on monitoring processes to support their ability to effectively adapt. Practices of Indigenous-led fisheries monitoring processes, rooted in long-standing laws and traditions, persisted in what is now known as Canada until colonial governments prohibited and criminalized Indigenous management of fisheries. In recognizing the harm done to Indigenous peoples through federal fisheries policies, the Government of Canada recently committed itself to a historic reconciliation agreement called the Fisheries Resources Reconciliation Agreement. The Fisheries Resources Reconciliation Agreement establishes unique commercial fisheries called community-based fisheries in each of the signatory Nations' territories while also committing the parties to co-management of priority species.

As signatory to the Fisheries Resources Reconciliation Agreement, the Kitasoo Xai'xais Nation is looking to develop a multi-species catch monitoring program to inform the management of their community-based fisheries. This Master's research was born from the Kitasoo Xai'xais Nation's desire to develop a community-based fishery that balances the long-term resiliency of the marine environment with social well-being and economic viability in a manner that embodies their principles of stewardship.

This research was carried out in partnership between the Kitasoo Xai'xais Stewardship Authority and the University of Victoria. The primary objective of the research was to establish a Nation-driven catch monitoring framework that could be used to inform the development of monitoring structures for the Kitasoo Xai'xais community-based fisheries stood up under the Fisheries Resources Reconciliation Agreement. The primary research questions advanced by this project are (1) What are successful community-led models of fisheries monitoring used in commercial small-scale fisheries across the globe?; (2) Based on past and present experience and future aspirations, what could a Kitasoo Xai'xais commercial fisheries monitoring program look like?

Through a literature review of models of small-scale fisheries monitoring (Chapter 2), we found that participatory decision-making structures, collaborative research, and adaptive management

practices were critical to the success of the models we studied. While the various catch monitoring programs and compliance structures we surveyed were distinct and context dependent, we learned that successful small-scale fisheries monitoring programs were firmly rooted in the communities' values, customs, and practices.

To answer the second research question, we used a participatory case study approach in partnership with Kitasoo Xai'xais Stewardship Authority staff (Chapter 3). We held semi-structured interviews with 8 knowledge holders in advance of the 2022 harvest season to understand past and present monitoring methods used in Kitasoo Xai'xais territory, and desired direction of a monitoring program. These interviews emerged from the Nation's desire to recognize and build upon existing systems of fisheries monitoring in the territory. The key outcome for this work includes a dockside catch monitoring interview guide aimed at gathering socio-ecological information from harvesters upon their return from a fishing trip. After two seasons of the dockside monitoring pilot program, we carried out 8 post-season interviews with knowledge holders. The lessons learned from the dockside catch monitoring pilot were reinforced by the recommendations of knowledge holders around the development of a monitoring system for the Nation's community-based fishery. Together, we collaboratively documented a suite of key elements comprising the community's vision for the Fisheries Resources Reconciliation Agreement monitoring structure.

Our research establishes a foundation for a Kitasoo Xai'xais Nation-led monitoring structure that centres both Indigenous and western knowledge systems. The recommendations gathered through this project can be mobilized by the Nation to advance the Kitasoo Xai'xais perspective around community-based fisheries monitoring structures at government-to-government planning tables set up under the Fisheries Resources Reconciliation Agreement. The findings from this research may be relevant to other small-scale fisheries in Canada and internationally, where managers are interested in designing more holistic and participatory systems of community-led catch monitoring. Our research contributes to the growing body of literature that is driven by Indigenous priorities in order to inform Nation governance objectives.

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Acknowledgements

This research was brought to life through the collective support of an incredible team. My immense gratitude goes to Kitasoo Xai'xais leadership, whose vision for the future of their community and territory inspires innovative lines of inquiry. I am honoured to have been invited to live and work in the community of Klemtu to advance some of the Nation's interests. Thanks to my colleagues and friends from the Kitasoo Xai'xais Stewardship Authority, who offered steadfast encouragement and support during this journey. I cherish the many ocean dips and shared memories created with the coastal rainforest underfoot.

My thanks to the many Kitasoo Xai'xais community members and harvesters who contributed their time and expertise to shaping this project. I appreciate every conversation we had over hot coffees in the Stewardship boardroom or under a shared umbrella in the rain at Halfways dock. I am grateful for your generosity in sharing your knowledge and will hold close to my heart the lessons I've learned around our shared stewardship responsibilities towards both community and natural spaces. Heartfelt gratitude goes to Elmer Starr, whose helping hands formed the foundation of this project, and to Sierra Hall, who is tenaciously carrying forward this work in Klemtu.

I have been fortunate to receive mentorship from colleagues who I deeply respect. My deepest thanks to my committee, Natalie Ban and Christina Service, for demonstrating admirable examples of applied research while offering compassionate and skillful guidance throughout this endeavor. Many thanks to Ken Cripps, whose visionary thinking ensured that this research fed into real world fisheries policy applications.

I am thankful for the academic community cultivated through the Ban Marine Ethnoecology lab group, with whom I've been lucky to share in the collective joys and sorrows of graduate school. To be surrounded by such curious and motivated colleagues is to be regularly inspired. Thank you to my cherished friends for creating countless opportunities for love and connection that empower me to be the best version of myself. The writing retreats on Galiano Island, long distance phone calls to Santa Rosa, and meandering beach walks in Bamfield and on the Sunshine Coast were critical components of this journey.

To my family, particularly my grandmother, mom, dad, and brother, Robby – thank you for your steadfast encouragement and support. I am forever appreciative of your unwavering love and of the values you've instilled in me.

Finally, this thesis was written on and inspired by the territories of the Kitasoo Xai'xais, Songhees, Esquimalt, and W̱SÁNEĆ peoples, upon which I am grateful to live and work.

Dedication

To friends who have become family in Klemtu

Chapter 1: Introduction

Introduction

Indigenous peoples have been monitoring their territories and making governance decisions for thousands of years. Longstanding systems of Indigenous fisheries management continued until racist colonial laws prohibited Indigenous fishing and management practices, profoundly impacting Indigenous governance systems (Truth and Reconciliation Commission, 2015; Atlas et al., 2017; Atlas et al., 2020). In recognizing injustices done to Indigenous stewardship and management practices, the Government of Canada is moving towards more collaborative and reconciliatory approaches of fisheries management with Indigenous governments. The recently signed Fisheries Resources Reconciliation Agreement (FRRA) is reflective of federal reconciliation efforts. The FRRA supports the establishment of commercial community-based fisheries in signatory Nations' territories, puts in place funding to support the acquisition of commercial fishing licenses, and commits the parties to collaborative fisheries management (FRRA, 2019). As signatory to the FRRA, the Kitasoo Xai'xais Nation is looking to implement a community-based fishery that embodies the Nation's longstanding principles of stewardship.

Through this research, we collaborated with the Kitasoo Xai'xais Nation to document the Nation's vision for community-based fisheries monitoring, inclusive of both ecological and social-wellbeing elements. This thesis offers a case study through which we applied a participatory research approach to co-create a Nation-driven monitoring program informed by Kitasoo Xai'xais objectives and values. Our learnings may be applicable to other Nations who are engaged in similar fisheries reconciliation processes or to small-scale fisheries managers who are interested in re-imagining commercial monitoring techniques. More broadly, our research contributes to the growing body of academic literature that is driven by Indigenous priorities and perspectives. The participatory approach we used to design our research methodology can be adapted by other researchers interested in collaborative methods of research. This introductory chapter contextualizes the research and offers a background to the policy landscape that informs this work. It outlines the main themes examined within the thesis and summarizes the collaborative research methodology our team applied to identify and explore those themes. The chapter also introduces

my position within the research and describes how my background influences my approach to research.

Commercial and small-scale fisheries monitoring in a changing environment

Faced with the mounting cumulative effects of climatic changes and anthropogenic pressures, fisheries and other social-ecological systems increasingly rely on monitoring processes to support their ability to effectively adapt (Thompson et al., 2019). Effective monitoring of patterns and abnormalities within fisheries as well as the species and ecosystem they depend on is important for enabling their long-term resiliency as it provides critical information that can be used to inform management decisions (Ostrom, 1990; Cox et al., 2010; Thompson et al., 2019). Fisheries monitoring enables the adaptivity of social-ecological systems (Berkes and Turner, 2006; Folke et al., 2010; Thompson et al., 2019).

Commercial fisheries managers often rely on information derived from western science methods to inform management decisions (Orensanz et al., 2015). Commercial fisheries in countries such as Canada that have the capacity to conduct data-based monitoring typically feature several common monitoring methods: those that are fisheries dependent (e.g. logbooks, fisher hails) and those that are fisheries independent (e.g. at-sea observers, overflight surveys) (DFO, 2012). These monitoring methods typically collect catch and effort information to inform catch per unit effort estimates, including the quantity of kept and released target species and bycatch (catch data), the location and timing of fishing (effort data), and fishing methods (effort data) (DFO, 2019). Monitoring information can also include observations around the biological characteristics of the catch, such as length, weight, colouring, age, and sex (DFO, 2019).

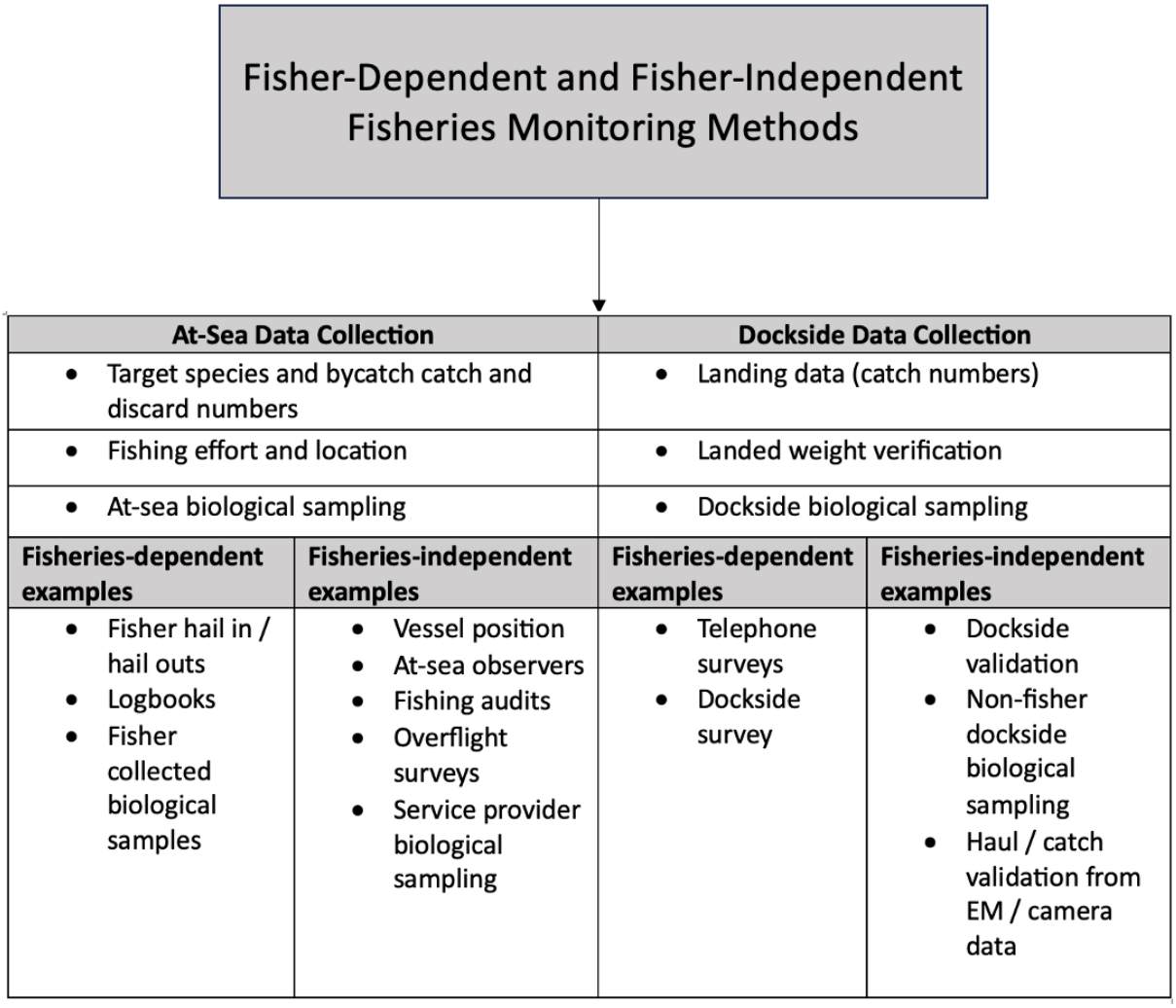

Figure 1.1 Fisher-dependent and fisher-independent monitoring and reporting tools and methods adapted from Fisheries and Oceans Canada (DFO, 2019).

Typical data collection methods used by Fisheries and Oceans Canada (DFO) to monitor commercial fisheries are resource intensive. For example, DFO's integrated Groundfish Program, launched in 2006, implements 100 per cent at-sea monitoring and 100 per-cent dockside monitoring for all commercial groundfish hook and line and trap vessels (DFO, 2024). Groundfish vessels typically use electronic monitoring systems on board, where video footage is taken on deck and reviewed (DFO, 2024). Before video monitoring, the commercial groundfish fleet had 100 per cent on-board observer coverage for the trawl fleet but only partial on-board observer coverage for the trap and hook and line fleet (DFO, 2012). Where camera is not functional or fishing area is partially or entirely obscured in the video footage, at-sea observers may be required on subsequent

fishing trips (DFO, 2024). In the Pacific region, Archipelago Marine Research Ltd. is the designated service provider for both at-sea observer and electronic monitoring services for the commercial groundfish industry (DFO, 2024).

The commercial prawn fishery in the Pacific uses vessel monitoring systems and electronic catch logs paired with an at-sea observer who samples a sub-set of traps to monitor stock status relative to DFO's in-season management targets (DFO, 2024). There are 17 at-sea observers deployed coastwide who sample active fishing vessels in a rotation (DFO, 2024) The at-sea observer spawner-index information is used to inform in-season decision-making (DFO, 2024). The vessel monitoring systems report the geographic position of the vessel, date, set and haul locations and timing to the industry service provider (DFO, 2024). The DFO approved third-party service provider for the prawn fishery is J.O. Thomas and Associates (DFO, 2024). Commercial salmon fisheries on the Pacific coast use on-board observers and logbooks (DFO, 2012). In addition to catch data, most commercial salmon fisheries use trained observers to retrieve biological data including lengths, weights, and tissue for DNA analysis (DFO, 2012).

The commercial industry is typically responsible for the costs associated with fisheries monitoring and catch reporting (DFO, 2019). The commercial vessel owners / license holders are responsible for making arrangements with approved industry service providers for the delivery of in-season monitoring information to DFO (DFO, 2024). Monitoring costs vary between commercial fishery industries (e.g. groundfish, salmon, prawn, etc.) as different service providers and monitoring methods are involved. DFO typically focuses on using these data for stock assessments of single species (DFO, 2019), even though the benefits of ecosystem-based management are recognized.

Most fisheries management systems around the world focus on single species even though many fisheries themselves are multi-species, which means that catches within the fishery comprise of a diverse range of species caught together by the same gear (Newman et al., 2018). Fisheries and Oceans Canada currently manages much of the commercial fishing on the coast of British Columbia through species-specific Integrated Fisheries Management Plans (IFMP), most of which have vague objectives for measuring the health and abundance of fish stocks (Archibald et al., 2021). National DFO objectives found in IFMPs include meeting "conservation objectives and

ensure healthy and productive fisheries and ecosystems" and managing "fisheries to provide opportunities for economic prosperity" (DFO, 2024). Species-specific objectives for the sustainability of prawn and shrimp stocks are "to ensure a minimum number of female spawners are available at the time of egg hatch by using a fixed escapement model, the prawn spawner index" (DFO, 2024). DFO's species-specific objectives found in the prawn and shrimp IFMP also include developing "standards for fishery monitoring for all fisheries, including commercial, recreational and First Nations" (DFO, 2024). The extent and intensity of DFO's monitoring regime varies with the fishery's size, location, and other management considerations (DFO, 2012). DFO's fisheries management models have traditionally focused on fishing mortality as the primary driver of species abundance and population collapses (Boyce et al., 2021). However, it is increasingly evident that broader environmental stressors, like ecosystem dynamics and climate change, significantly impact fish populations (Boyce et al., 2021). For multi-species fisheries, it is impractical to assess each harvested species separately to make management decisions in siloes (Newman et al., 2018) due to the complex nature of marine ecosystems and capacity constraints that often exist at the community level.

Small-scale fisheries present challenges to fisheries management agencies. While the concept of small-scale fisheries differs among regions (Berkes et al., 2001; Castilla and Defeo, 2001; Orensanz et al., 2013, Dias et al. 2020), key commonalities are typically present: small-scale fisheries involve low technology, are carried out close to shore using small vessels (if any), and are the primary source of food and income for harvesting families (Salas et al., 2011, FAO , 2015; Dias et al., 2020). Globally, small-scale fisheries contribute to around 40-50% of the world's fish supply (Sari et al., 2021, Villar et al., 2023) and support more than 500 million people (FAO, 2023; Villar et al., 2023). For these reasons, in the last several decades, small-scale fisheries have received increasing attention by researchers and fisheries managers (Arthur et al., 2022; Lancker et al., 2019; Villar et al., 2023). While small-scale fisheries operate in a more limited scope than commercial fisheries, they can nonetheless contribute to fish population declines due to overfishing (Allan et al., 2005; Gough et al., 2020, Villar et al., 2023) and lead to changes of species composition within marine harvesting areas (Hawkins and Roberts, 2004; Villar et al., 2023). Given their potential ecological impacts as well as their important role in supporting livelihoods, cultural identity, and local food systems, small-scale fisheries must be well-managed

(House et al., 2023). It is important to develop strong monitoring and management systems that are holistic and able to incorporate a variety of information inputs to fill gaps in fisheries where data is lacking (Orensanz et al., 2015).

While small-scale fisheries are commonly written about in the context of developing countries, developed countries such as Canada also have small-scale fisheries. Pangnirtung, a small community of 1,481 people in Nunavut territory, coordinates Inuit-owned Arctic char (*Salvelinus alpinus*) and turbot (*Reinhardtius hippo-glossoides*) small-scale commercial fisheries that co-exist with the community's subsistence fisheries (Galappaththi, 2021). In the Pacific, five First Nations won the right to exercise their Aboriginal rights to fish and sell fish by operating a small-scale and artisanal multi-species fishery within a court-defined area (*Ahousaht Indian Band and Nation v Canada*, 2018; DFO, 2022). This fishery, called the Five Nations Fishery, is executed using small, low-cost boats with limited technology and restricted catching power (DFO, 2022). Within this commercial small-scale fishery, effort controls restrict the type of fishing gear that is available to participating community-members (DFO, 2022).

Community-based fisheries monitoring systems

Community-based approaches to fisheries monitoring are gaining recognition from governments and researchers (Dias et al., 2020) and are increasingly being used to manage small-scale fisheries (Jupiter et al., 2014; Cohen and Steenbergen, 2015; House et al., 2023). Community-based monitoring approaches are described within academic literature as systems of observation about the natural world made by local stakeholders who make those observations in relation to their respective world views and objectives (Danielsen et al., 2014; Thompson et al., 2019). In the 1990s, ineffective top-down approaches to fisheries monitoring and management began shifting towards more participatory and collaborative approaches (Townsley, 1998; Wilson et al., 2003; Pomeroy and Rivera-Guieb, 2006; FAO, 2009, Dias et al., 2020). Community-based systems of fisheries monitoring have several advantages over government-centered structures, which include benefits related to collective skill development and learning and enhanced environmental stewardship stemming from empowering participation at the community level (Berkes et al., 1995, Danielsen et al., 2014; Dias et al., 2020). A challenge associated with community-based monitoring

systems is that they often depend on external sources for technical and funding support (Thompson et al., 2019). To support the long-term resiliency of community-based monitoring systems, participating communities themselves must hold the decision-making power, responsibilities, and benefits of the monitoring program (Garcia and Lescuyer, 2008; Thompson et al., 2019).

Local fisher knowledge and participation in community-based data collection and fisheries monitoring is increasingly acknowledged as valuable input into management processes (Gadgil et al., 1993; Berkes et al., 1995; Seixas et al., 2009; Orensanz et al., 2015). Fishers can offer invaluable long-term empirical information around species abundance and behaviour, habitat quality, and catch size at high resolution spatial and temporal scales (Orensanz et al., 2015). In academic literature, the definition of fisher knowledge is broader in scope than local and Indigenous systems of knowledge but is inclusive of both (Orensanz et al., 2015). The hallmark that defines fisher knowledge is that it is experience-based (Orensanz et al., 2015). Experience-based knowledge collected by local fishers extends well beyond ecological observations and is inclusive of socio-cultural elements relating to their communities and livelihoods (Orensanz et al., 2015). This holistic approach to monitoring ensures that human and social information is collected alongside ecological data to better inform fisheries management processes (Orensanz et al., 2015).

Indigenous systems of fisheries monitoring

The harvest of marine and terrestrial species was sustained by Indigenous peoples for thousands of years before the arrival of settlers (Ban et al., 2020). Indigenous peoples have an intimate knowledge of their ancestral territories which has long informed monitoring and management decisions (Turner and Berkes, 2006; Lepofsky and Caldwell, 2013; Thompson et al., 2019). These longstanding systems of management are codified through stories, ceremonies, harvesting practices, and family lineages (Berkes, 2004; Berkes, 2012; Berkes et al., 2000, Eckert et al., 2018). Indigenous monitoring approaches are integral to the sustainable livelihoods of many communities (Silvano et al., 2023). While Indigenous communities have observed and documented the collapse of social-ecological systems due variables such as climate changes and overfishing, their knowledge has been devalued in fisheries decision making processes (Atlas et al., 2022).

While conventional fisheries management has largely been rooted in a Eurocentric paradigm (Reid et al., 2020), Indigenous systems of monitoring exemplify a different way of thinking about catch per unit effort as a metric of stock status, rooted in Indigenous knowledge systems. Indigenous knowledge systems are relationships between humans and the natural world, the spiritual world, and with each other (Wilson, 2001; Kimmerer, 2000, Thompson et al., 2019). While western and Indigenous monitoring systems differ from one another in a myriad of ways, both knowledge systems can offer differ yet complimentary information to management processes (Moller et al., 2004; Thompson et al., 2019). The concept that distinct models of knowledge can co-exist with one another and, at times, complement each other when appropriate is reflected in multiple models, including Two-Eyed Seeing (Bartlett et al., 2012; Reid et al., 2021) and Braiding (Kimmerer, 2013; Bowles et al., 2022).

Fisheries reconciliation in British Columbia

The historic and ongoing colonization of coastal regions in what is now called British Columbia resulted in rapid shifts in Indigenous fisheries monitoring and management practices (Ban et al., 2019). The consolidation of fisheries management authority to the Canadian Federal Government through the Fisheries Act and associated colonial policies undermined Indigenous sovereignty and self-determination and disrupted thousands of years of Indigenous resource stewardship practices (Truth and Reconciliation Commission, 2015; Atlas et al., 2022). Federal policies criminalized First Nations' fisheries management practices (including the use of fish traps and weirs) and governance mechanisms such as potlatches (Atlas et al., 2017, Ban et al., 2019). These racist policies and regulations confined Indigenous peoples to reservations and forcibly relocated children to residential boarding schools (Harris, 2002; Truth and Reconciliation Commission, 2015, Ban et al., 2019), imparting ongoing harm that continues to impact Indigenous communities (Truth and Reconciliation Commission, 2015, Ban et al., 2019). Despite the far-reaching impacts of colonialism, Indigenous communities along the coast of what is now called British Columbia continue to harvest marine resources (Eckert et al., 2017) and assert their governance over their territories.

In recognition of harmful colonial regulations and policies, the Canadian Federal Government and eight Nations in the north and central coast signed the Fisheries Resources Reconciliation Agreement (FRRA, 2019). The FRRA establishes unique commercial fisheries called community-based fisheries in the signatory Nations' territories and provides funding for licensed buy-back programs that support signatory First Nation community members to participate in the commercial fishing industry (Atlas et al., 2022). The agreement also creates a formal process for Nation governments and Canada's Department of Fisheries and Oceans to collaboratively assess and manage the community-based fisheries (FRRA, 2019; Atlas et al., 2022). The collaborative framework for community-based fishery monitoring and management is designed to incorporate both quantitative stock assessment information and Indigenous knowledge into decision making processes (Atlas et al., 2022). This thesis is motivated by the desire to centre the Kitasoo Xai'xais vision in the collaborative development of the monitoring component of that framework.

Kitasoo Xai'xais people and stewardship of Kitasoo Xai'xais territory

The Kitasoo Xai'xais (kit-AH-soo hay-hays) Nation has practiced stewardship over their land and waters for thousands of years (KXIRSA, 2016). The two separate and distinct Kitasoo and Xai'xais Nations came together in the 1860's to form the Kitasoo Xai'xais Nation (Kitasoo Xai'xais, 2023). The Kitasoo Nation is the southernmost group of the Tsimshianic language family, where community members spoke a southern dialect of Tsimshian called Sgüüxs (Kitasoo Xai'xais, 2023). *Gitdisdzu* (git-dis-ju), the Sgüüxs spelling of Kitasoo, means "people of Disju". (KXSA, 2021). Geographically, Kitasoo territory encompasses the exposed outer islands and coastal areas of Kitasoo Xai'xais territory (Kitasoo Xai'xais, 2023). The Xai'xais Nation is part of the Wakashan language family, whose linguistic heritage is Xai'xais (Kitasoo Xai'xais, 2023). The Xai'xais territory includes the mainland and fjordic inner waters of Kitasoo Xai'xais territory (Kitasoo Xai'xais, 2023). Kitasoo and Xai'xais ancestors lived in villages and camps throughout the territory since time immemorial. (KXSA, 2021). The abundance of marine and terrestrial resources throughout the extent of the territory has sustained Kitasoo Xai'xais families for thousands of years to the present day (KXSA, 2021).

Kitasoo Xai'xais territory encompasses 13,000 square kilometers in the heart of the Great Bear Rainforest, extending from the deep inner fjords of the Central Coast mainland to the exposed outer islands in the west (see Figure 1). There are currently 517 Kitasoo Xai'xais band members, 319 of whom live on reserve in Klemtu, a community located on the east side of Swindle Island within Kitasoo Xai'xais territory (Kitasoo Xai'xais, 2023).

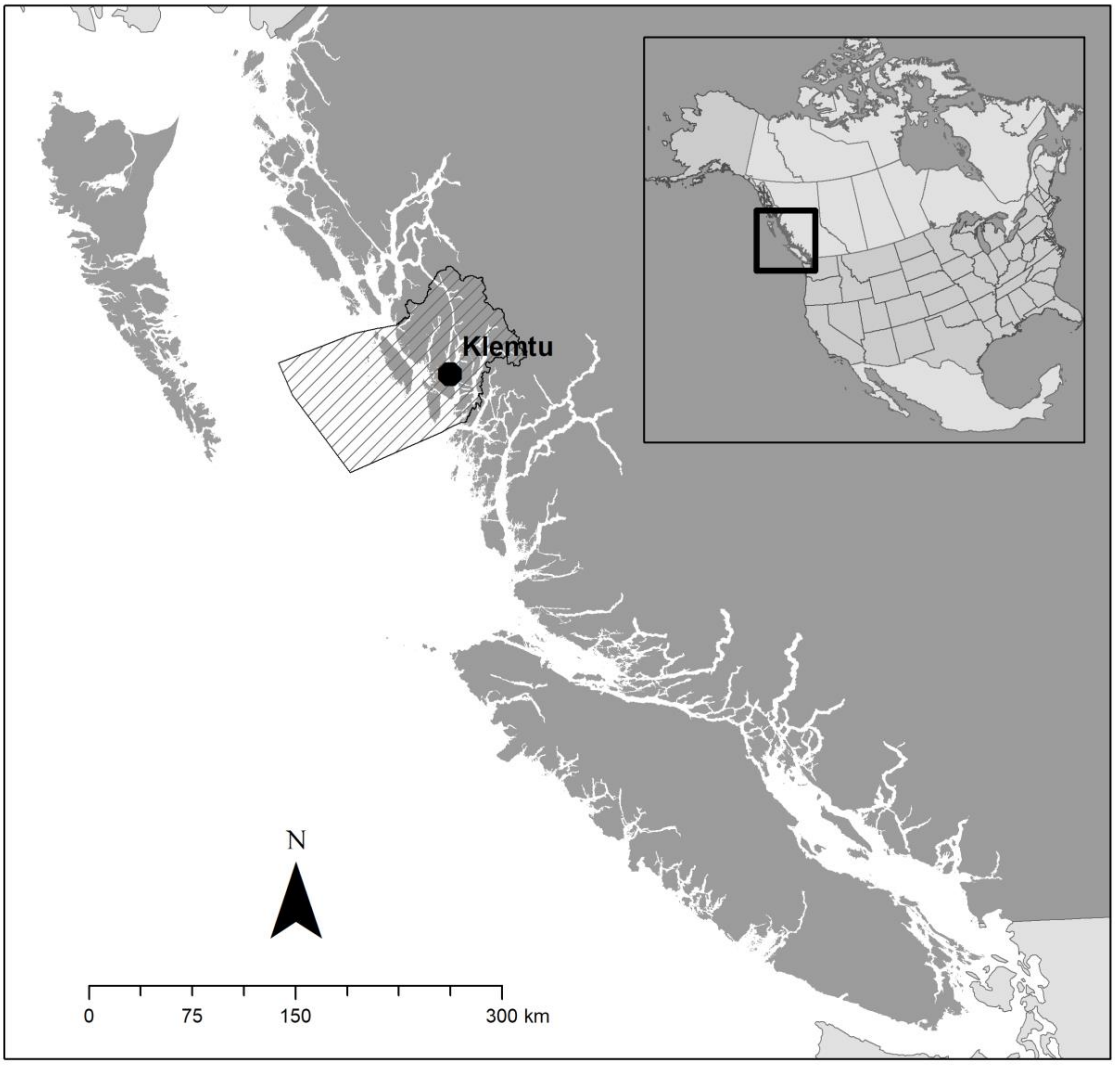

Figure 1.2 Kitasoo Xai'xais Territory and harvesting areas

The Kitasoo Xai'xais peoples have proactively monitored and managed the full extent of their territory since time immemorial (KXSA, 2021). Longstanding principles of stewardship, passed down orally for generations, form the foundation of the Nation's legal tradition and continue to

guide marine resource management decisions within the territory (KXIRSA, 2016). Kitasoo Xai'xais culture is grounded in a strong relationship with the land and sea, representing a cornerstone of community well-being (KXIRSA, 2016). This relationship is enshrined in the following Kitasoo Xai'xais guiding principles, which are informed by the Nation's laws, customs, and values (KXSA, 2021).

Łoomsk / xáła (respect): The Kitasoo Xai'xais guiding principle around respect refers to the inviolable truth that all living things have the right to be respected (KXSA, 2021). The teachings around łoomsk / xáła are evidenced in Kitasoo Xai'xais harvesting culture, where Nation members are taught to only take what they need, give thanks, and acknowledge those who behave accordingly (KXSA, 2021). Kitasoo Xai'xais community members respectfully steward their territory and the marine and terrestrial ecosystems that live within it (KXSA, 2021).

Sa̱gayt k'üülm g̱oot / q̓átualḿt̓a (interconnectedness): Everything in Kitasoo Kitasoo Xai'xais territory is connected, and even small changes can have cascading effects to the broader ecosystem. Humans are part of this system and are not separate from it. Practices of Nation-led resource stewardship incorporate integrated ecosystem approaches of management to ensure that balance is achieved between human interactions with the natural world (KXSA, 2021).

Sityaaw / xvíłsístái (reciprocity): Kitasoo Xai'xais teachings around reciprocity tell us that the natural and spiritual worlds provide us with everything we need to be healthy, and in return, we have an obligation to keep them healthy (KXSA, 2021). This responsibility includes giving thanks to the natural and spiritual worlds and respectfully stewarding marine and terrestrial ecosystems to ensure their long-term well-being (KXSA, 2021).

Gugwilx'ya'ansk / q̓áúɬʔaƛa (intergenerational knowledge): Gugwilx'ya'ansk / q̓áúɬʔaƛa ensures the passing down of generational wisdom. (KXSA, 2021). Kitasoo Xai'xais laws, customs, and values are taught by elders and knowledge holders (KXSA, 2021). Management decisions related to the natural world are to be made in consideration of the accumulated body of knowledge held by Kitasoo Xai'xais Nation members (KXSA, 2021).

The Kitasoo Xai'xais Nation's governance structure intertwines an elected Chief and Council system with the Nation's hereditary governance structure that predates European contact (Kitasoo Xai'xais, 2023). The Nation's Hereditary Chiefs work alongside the Band Council, a governing body comprised of an elected Band Chief and 6 Council members (Kitasoo Xai'xais, 2023). Kitasoo Xai'xais Hereditary Chiefs are personally responsible for making governance decisions related to specific areas within Kitasoo Xai'xais territory (Kitasoo Xai'xais, 2023). The Kitasoo Xai'xais Stewardship Authority (KXSA) is a Nation-led entity that provides Nation leadership and community members with technical advice and support related to environmental stewardship within the territory (Kitasoo Xai'xais, 2023). KXSA technical staff work to ensure that Kitasoo Xai'xais laws, values, and principles guide resource planning and management decisions (Kitasoo Xai'xais, 2023).

The Kitasoo Xai'xais Nation is a signatory to the FRRA. As such, the Nation is looking to implement a community-based fishery that balances long-term resiliency of the marine environment, with social-wellbeing and economic viability in a manner that embodies their guiding principles of stewardship. In light of the implementation of the novel community-based fishery in Kitasoo Xai'xais territory, the Nation invited the University of Victoria to collaboratively explore how culturally appropriate information on multi-species harvest could be used to inform the Nation's fisheries management decisions.

Research objectives, questions, and thesis structure

The Kitasoo Xai'xais Nation's desire to document their collective vision around commercial fisheries monitoring within the FRRA community-based fishery led to the development of our research topic. This research was carried out in partnership between KXSA and the University of Victoria. The main research questions advanced by this project are the following:

1. What are successful community-led models of fisheries monitoring used in commercial small-scale fisheries across the globe?
2. Based on past and present experience and future aspirations, what could a Kitasoo Xai'xais commercial fisheries monitoring program look like?

Chapter 1 of this thesis introduces the background context, key themes, objectives, research questions, and methodology underpinning this work. It additionally offers a description of my relationship to this research.

Chapter 2 includes a literature review of various models of small-scale fisheries monitoring. We explore the hallmarks of successful community-led fisheries monitoring programs and identify best practices used to establish them.

In Chapter 3, we offer a case study in which we applied a participatory research approach to document a community vision for a community-based fisheries monitoring structure. The research questions we explore in this chapter are (1) what are past and present Kitasoo Xai'xais fisheries management and monitoring practices used to inform the Nation's fisheries management decisions? (2) What are Kitasoo Xai'xais community members' recommendations for the development of a dockside monitoring program? (3) What are the high-level objectives and priorities that can inform the development of a community-based fishery monitoring program?

Chapter 4 discusses learnings related to each of the key research questions advanced in Chapter 1. Here, we also explore the significance of our findings to the Kitasoo Xai'xais Nation and beyond, reflect on the limitations of our research, and suggest future areas of research.

Methodological Approach

Methodological research approaches that are equitably beneficial to both Indigenous research partners and researchers are increasingly important, as too often, methods of research bring harm to Indigenous peoples and their territories (Ignace et al., 2023). Researchers are responsible for ensuring that their research upholds the principles advanced by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (Ignace et al., 2023). In thinking about how the UNDRIP articles relate to research projects, researchers are responsible for ensuring that their research methodologies adopt transdisciplinary research approaches as opposed to prioritizing western research framing (Ignace et al., 2023).

This Master's research was co-created through a partnership between the Kitasoo Xai'xais Stewardship Authority and the University of Victoria. Co-produced research models rely on the collaboration between academic and community research partners (Darby, 2017). Oftentimes, co-produced research values learning processes and community-identified needs emerging from the research as project outputs (Darby, 2017). Collaborative research approaches are often shaped by relationships and feature efforts to practice care and reciprocity (Darby, 2017).

We took a participatory case study approach to design and carry out this co-created research project. Participatory research is a mode of case study research where community members or local participants are included in all components of the research process, from conceptualizing the study and identifying research priorities to writing up the findings (Reilly, 2010). This anti-colonial style of research centres the voice of the community in research and positions community members as contributing researchers who are experts in their worlds (Reilly, 2010). Participatory case study research is conceptualized as a social action methodology that is intended to find solutions to issues identified by local community members with the results applied directly to those issues (Reilly, 2010).

To build an equitably beneficial research process, we followed the guidance developed by KXSA staff (Kitasoo Xai'xais Stewardship Authority, 2021). We formalized our intentions to carry out this research project by adding an appendix to the existing research agreement between the Ban Marine Ethnoecology Research Group and the Kitasoo Xai'xais Stewardship Authority. Through over 30 informal meetings with stewardship staff and community members, we co-created a research methodology that incorporated 2 qualitative interview components, complemented by a dockside survey composed of both qualitative and quantitative questions. Figure 2 below illustrates the co-created approach we designed to explore our research questions.

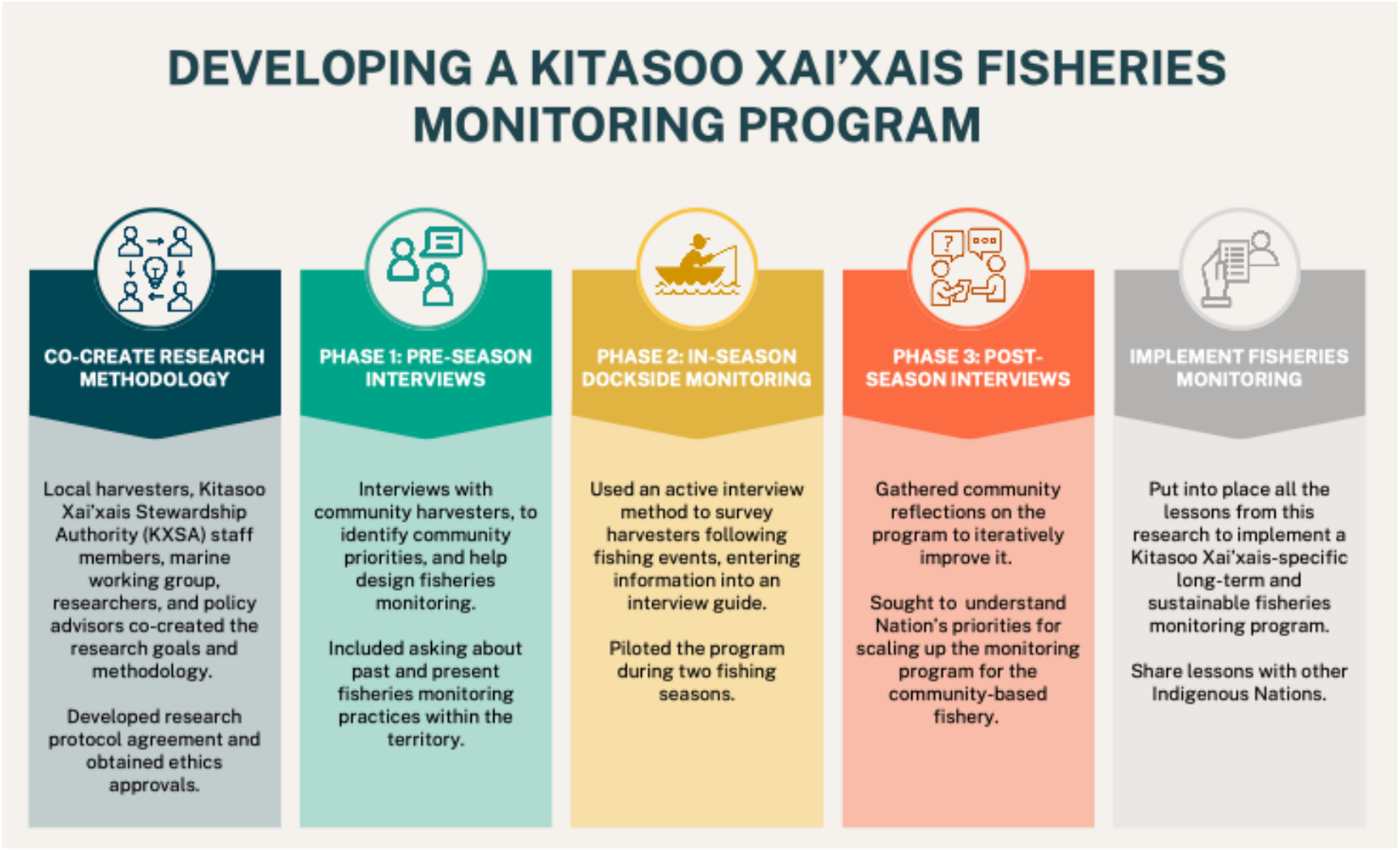

Figure 1.3 Developing a Kitasoo Xai'xais fisheries monitoring program

Through preliminary meetings with KXSA representatives, we identified guiding research priorities and objectives that would form the foundation of our collaborative work together. We discussed the anticipated applications of the findings to ensure that the research outcomes would be relevant for the community on a timescale that could be useful in a policy context. We designed this Master's research to address both an acute, temporally-limited research need related to the formation of regional FRRA monitoring policies and also to establish the foundation for a longer term Nation-led fisheries monitoring program. As illustrated in Figure 2 above, we co-created a study design that incorporates several interview components. Through our preliminary research meetings, we identified logistical constraints and flexibilities related to carrying out the pre- and post-season conversations, discussed the consent process for interviews, and identified where we could lean on community expertise to support the project. As a non-Indigenous researcher who was not raised in Kitasoo Xai'xais culture, my cross-cultural capacities are limited. It takes time to create meaningful relationships with community members (Ignace et al., 2023). An important component of this Master's project was being present in Klemtu for extended periods of time and prioritizing relationships with harvesters, community members, and other KXSA staff.

Following the collective scoping conversations and development of the research methodology, I carried out a literature review surveying various community-led catch monitoring programs. The literature review methods are detailed in Chapter 2. We then applied a participatory case study approach to co-create a Kitasoo Xai'xais vision for the FRRA community-based fisheries monitoring program. A detailed outline of the methods we applied are available in Chapter 3.

My relationship to this research

This thesis carries with it my biases and world views as a female researcher of non-Indigenous ancestry. I was born on Sḵwx̱wú7mesh and Tsleil-Waututh Nation territory and raised on the Lekwungen and WSÁNEĆ territories (Victoria, BC) and Pomo territory (Santa Rosa, CA). My lineage on my mother's side is Scottish, French, and German. My father's ancestry is Scottish and English. As a descendant of European settlers, I have participated in and directly benefited from settler-colonial systems that have excluded Indigenous communities from their territories, families, governance practices, and have attempted to sever their cultural connections to the land

and to each other. I have been educated in western academic institutions, pursuing higher level studies in environmental studies and law, and recognize the bias I carry embedded within my worldview as a result.

My relationship with the Kitasoo Xai'xais Nation began when I was hired as a marine planner for KXSA in 2019. This work brought me to Klemtu and the Great Bear Rainforest for the first time and introduced me to different ways of knowing and relating to marine spaces. As my relationship with this work deepened, so did my understanding of the interaction between Indigenous and western laws and policies impacting the social dimensions of marine use. When the FRRA was signed and discussions around community-based fisheries began within the community, I learned about the upcoming body of work associated with its implementation. Government-to-government tables were established under the FRRA during my early tenure as a Master's student. I continued on as a part-time marine planner for KXSA during this time, and in that capacity, was invited to sit in technical FRRA meetings related to fisheries monitoring. At those technical tables, the FRRA signatory Nations began developing a Nation-led catch monitoring vision to inform the regional monitoring framework that would be implemented in the community-based fisheries. I am grateful to have had the opportunity to carry out this Master's research alongside those discussions, and to ensure that the perspectives I was hearing from Kitasoo Xai'xais community members were effectively reflected in the government-to-government outputs related to fisheries monitoring. Following my Master's studies, I look forward to returning to my role at KXSA full-time, and in doing so deepening my relationships with the people I have met in Klemtu and the lands and waters within Kitasoo Xai'xais territory.

Chapter 2: Successful models for commercial small-scale fisheries and effective community-led monitoring practices used in each model

Introduction

The Fisheries Resources Reconciliation Agreement (FRRA), initially signed in 2019 by Fisheries and Oceans Canada (DFO) and eight Nations in the Northern Shelf Bioregion, constitutes an opportunity to reimagine fisheries management (FRRA, 2019). The agreement supports the establishment of novel community-based fisheries in each of the signatory Nations' territories and commits both parties to collaborative fisheries governance (FRRA, 2019). The novel community-based fisheries to be implemented under the FRRA are commercial small-scale fisheries accessible only to signatory Nation members fishing in designated areas close to home (FRRA, 2019). The Kitasoo Xai'xais Nation, as signatory to the FRRA, is looking to implement a community-based fishery near their community of Klemtu that balances conservation and sustainability with economic viability.

Fisheries monitoring is important for ensuring the conservation and long-term sustainability of marine habitats by collecting and synthesizing information that can inform the management of common pool resources (Ostrom, 1990; Cox et al., 2010; Lindenmayer and Likens, 2010) and better enable the adaptability of social-ecological systems (Berkes and Turner, 2006; Folke et al., 2010; Thompson et al., 2019). Monitoring of ecological and social systems includes components of routine observation, analysis, and application of patterns or abnormalities to inform management (Pulsifer et al., 2012; Alessa et al., 2016., Thompson et al., 2019). Indigenous peoples have developed an intimate knowledge of their ancestral territories which has informed monitoring and management since time immemorial (Turner and Berkes, 2006; Lepofsky and Caldwell, 2013; Thompson et al., 2019). Long-standing practices of Nation-led marine stewardship grounded in this knowledge persisted until colonial governments criminalized Indigenous management of fisheries (Johannes, 1978; Newell, 1993; Harris, 2001). Traditional ecological knowledge (TEK), knowledge and practice passed down through generations via cultural transmission, is increasingly used to corroborate positivistic scientific data in ecological monitoring practices (Berkes, 1999; Berkes et al., 2000; Berkes et al., 2003; Moller et al., 2004; Bohensky and Maru, 2011, Adams et al., 2014, Eckert et al., 2018, Thompson et al., 2019). However, to achieve true integration of

Indigenous knowledge and western science, Indigenous knowledge holders and scientists need to hold the same power (Simpson, 2014; Irlbacher-Fox, 2014; Thompson et al., 2019, Reid et al., 2020).

This literature review will inform implementation of the Kitasoo Xai'xais community-based fishery and provide examples of good practices for monitoring by synthesizing approaches that have worked in other regions of the world. Rather than providing a comprehensive review of all fisheries management approaches, the literature review focuses on models that may be relevant to Kitasoo Xai'xais territory. The monitoring practices analyzed in this review include catch monitoring, biological or species monitoring, and compliance monitoring. Following this first introductory section, section two of the literature review will focus on different models of co-management and the aforementioned monitoring techniques. Section three will explore monitoring systems used in Locally Managed Marine Areas (LMMAs). Section four will examine Territorial Use Rights Fisheries (TURFs) and associated monitoring practices. Finally, section five offers a brief discussion around how the learnings arising from the literature review may be applicable to the Kitasoo Xai'xais community-based fishery.

The methods used to conduct the literature review were selected so as to provide examples most relevant to Kitasoo Xai'xais territory. Expert knowledge of small-scale fisheries models that might be relevant to the Kitasoo Xai'xais Nation informed the initial starting point for the review. From there, targeted literature searches were conducted to find relevant examples of catch, species, and compliance monitoring for each model. Case studies were summarized for each small-scale fisheries model and summary tables were developed to illustrate principal learnings and recommendations. I anticipate that the findings of this research may be useful to Kitasoo Xai'xais Stewardship staff, policy advisors, and Kitasoo Xai'xais leadership as they develop and implement the Kitasoo Xai'xais community-based fishery.

Fisheries co-management

Fisheries co-management arrangements feature the sharing of power and responsibility between government and local resource users (Berkes et al, 1991; Berkes, 2003). Hallmarks of co-

management knowledge partnerships include empowerment of resource users as well as shared risks among all parties (Mullowney et al. 2020). While in academic literature, the term co-management is fairly recent (circa late 1970's), long-standing government-community partnerships co-managing fisheries have been documented as early as the 1890s (Jentoft and McCay, 1995; Mullowney et al., 2020). The uptake in co-managed systems of fisheries management indicates an increasing understanding that humans are an integral part of biological systems and that the social dimension of management should complement biological science (Berkes, 2003; Plummer and Fitzgibbon, 2004; Mullowney et al., 2020, Chevallier et al, 2021).

Co-managed fisheries feature a number of unique characteristics that distinguish them from other governance arrangements. An important element of successful co-management systems includes participatory decision-making practices in environmental governance (Berkes et al., 2001, Gutierrez et al., 2011). The term participatory practice refers to the inclusion of local groups and land claimants in decision-making processes (Berkes et al., 2001). Participatory decision-making processes must be adaptive as new information becomes available for them to be most effective (Wilson, 2009; Mullowney et al., 2020). Another hallmark of successful co-managed fisheries is effective interaction between scientists and resources users, as both parties can produce complementary knowledge to one another (Berkes, 2008; Berkes, 2009; Mullowney et al., 2020). Collaborative research between government, scientists, and harvesters is a critical component of successful co-managed arrangements as it promotes increased trust between parties (Berkes, 2009; Mullowney et al., 2020). In addition, collaborative research is most effective where all parties clearly define and agree upon trusted sources of information (Linke and Jentoft, 2013; Mullowney et al., 2020). In terms of design, co-management systems are more effective when management area boundaries reflect ecosystem considerations (Pomeroy et al., 2001; Mullowney et al., 2020).

Models of co-management are used around the world. In an effort to refine the scope of the literature review for this theme, I selected co-management models and associated monitoring systems that may be applicable to the Kitasoo Xai'xais community-based fishery. In northern Manitoba, commercial and subsistence fisheries co-exist in a de facto co-management arrangement (Islam and Berkes, 2016). In 2013-2014, 30 out of a total of 63 First Nations in the region were licensed for commercial fisheries and are all assumed to also have subsistence fisheries (Islam and

Berkes, 2016). In the Norway House Cree Nation, the two fisheries co-exist without much conflict, despite targeting the same fish species with similar fishing gear (Islam and Berkes, 2016). The commercial fishery is controlled by the Norway House Fisherman's co-op, through which commercial fishing licenses are owned and regulated (Islam and Berkes, 2016). The co-op is integrated into the local community as most profits are reinvested into local development (Islam and Berkes, 2016). Spatial and temporal separation successfully reduces conflict between the two small-scale fisheries (Islam and Berkes, 2016).

The Newfoundland and Labrador (NL) snow crab fishery grew rapidly after the collapse of the finfish industry in Atlantic Canada, spurring DFO to implement a 'modern fisheries model' of collaborative management and participatory decision-making (Davis and Korneski, 2012; Mullowney et al., 2020). The snow crab fishery is significant for both small-scale fishers and large boats alike and represents a cornerstone industry for the rural fishing communities that remain in NL (Davis and Korneski, 2012). Though the management process is not fully co-managed as DFO continues to formally set objectives and make decisions for snow crab, DFO collaborates with fisheries scientists and harvesters in the management regime (Mullowney et al., 2020) in an arrangement that may be applicable to the Kitasoo Xai'xais community-based fishery.

Fisheries co-management monitoring arrangements

Small-scale fisheries monitoring in co-management arrangements encompasses a diversity of participatory methods. In an effort to monitor catch for a network of small-scale fisheries in Indonesia, the Indonesian Ministry of Marine Affairs and Fisheries and the United States Agency for International Development (USAID) collaboratively developed a logbook system for community level monitoring (Sair et al., 2021). The catch monitoring logbook system faced institutional capacity challenges in management in addition to challenges with fishers' capacity (Sair et al., 2021).

In response to a number of implementation challenges, including fisher literacy, lack of trust, and knowledge in species identification, recommendations were made in an effort to improve the system. The recommendations include calls for "fisher friendly" logbook forms with less data

points, focusing solely on minimum variables like Catch Per Unit Effort (CPUE), number of fishing days, and landed catch data (Sair et al., 2021). Importantly, the recommendations note that the logbook system should not increase operational cost or constrain fishing access, and instead provide incentives to small fisheries for logbook compliance in the way of government support programs like insurance schemes and eco-label certification (Sair et al., 2021). Catch monitoring programs should also build local capacity and support small-scale fishers in logbook recording, data entry and verification, data management, and awareness building (Sair et al., 2021).

The methods of monitoring used in the partially co-managed NL snow crab management system mentioned above include stock assessment quantified via multi-species bottom trawl survey data to estimate biomass (Mullowney et al., 2020). Trap surveys are also conducted by DFO in collaboration with harvesters, with a few localized bays having time series spanning more than 25 years (Mullowney et al., 2020). Fishery performance rates are estimated by reviewing commercial logbooks and at-sea observer coverage information (Mullowney et al., 2020). In 2003, harvesters and DFO also collaboratively developed a province-wide trap survey for snow crab called the Collaborative Post-Season Survey (CPS) (Mullowney et al., 2020). Harvesters are randomly selected to conduct the CPS survey using their own gear (Mullowney et al., 2020). They are accompanied by an at-sea observer while taking biological measurements from their catch (Mullowney et al., 2020). Data is submitted to DFO Science Branch where it is checked for quality and archived (Mullowney et al., 2020).

In the de-facto co-managed commercial and subsistence fisheries in Norway House Cree Nation territory, effective compliance monitoring of net ownership is integral to the success of the two small-scale fisheries (Islam and Berkes, 2016). Compliance monitoring is carried out by a provincial conservation officer and an assistant officer who is a well-respected senior member of Norway House (Islam and Berkes, 2016). During their patrols, they check fishing nets, all of which must be tagged in order to establish the authority under which the net is set (ie. subsistence or commercial) (Islam and Berkes, 2016). Where there is conflict, the preferred enforcement approach is characterized by quiet and informal negotiation and communication as opposed to charges and fines (Islam and Berkes, 2016). Norway House community members deem this

monitoring and enforcement approach as legitimate because it is reflective of Cree cultural values of mutual tolerance, respect, and reciprocity (Islam and Berkes, 2016).

While elements of the aforementioned small-scale fisheries monitoring programs are contextually unique, generalized lessons relevant to participatory monitoring are evident. Table 1 below outlines a number of learnings and recommendations from the case studies above that may be applicable to the Kitasoo Xai'xais community-based fishery.

Co-management Monitoring framework	Learnings / recommendations
Catch monitoring	Fisher friendly logbook forms with less data points are more accessible (Sair et al., 2021)
	Fisher friendly logbook forms should focus on the following minimum variables (CPUE, number of fishing days, and landed catch data) (Sair et al., 2021)
	Logbook system should provide incentives to small fisheries for logbook compliance through government support (insurance schemes, financial support, eco-label certification) (Sair et al., 2021)
	Local capacity building is essential for a successful logbook program (ie. assistance filling out logbooks, education in data entry and verification, data management, and community awareness building) (Sair et al., 2021)
	Logbook programs should be flexible and allow harvesters to submit their logbooks belatedly (Sair et al., 2021)
Species monitoring	Co-management systems should be adaptable as new information is gathered through monitoring efforts (Mullowney et al., 2020)
	To be most effective, collaborative management measures employed in fisheries should be both practical and understood by all partners. Effective and accessible communication is key (Mullowney et al., 2020)

	Clear and persistent communication is particularly important at the beginning of undertaking co-management initiatives (Mullowney et al., 2020)
	Long-term management measures in co-management arrangements should accompanied by well-tested biological justification (Mullowney et al., 2020)
Enforcement monitoring	In co-managed compliance and enforcement programs, government officers working in partnership with Nations must be aware of the cultural values of the Indigenous communities with which they work (Islam and Berkes, 2016)
	Conflict resolution characterized by communication and mutual respect as opposed to legal charges and fines benefits all parties and leads to greater social acceptance of fisheries enforcement programs by communities (Islam and Berkes, 2016)
	Joint patrols by government officers and respected community members have proven to be effective (Islam and Berkes, 2016)
	Cultural values of each Nation should dictate local conflict resolution mechanisms. For example, in the Norway House fisheries, elders are shown respect by not being contested if subsistence fishing in a commercial fishing area (Islam and Berkes, 2016)

Table 2.1 Learnings and recommendations for successful implementation of co-management fisheries monitoring frameworks applicable to the Kitasoo Xai'xais community-based fishery

Hallmarks of the successful co-managed small-scale fisheries examined above may be applicable to the Kitasoo Xai'xais Nation. Generally, the participatory decision-making structure for the new community-based fisheries should be adaptive and open to new information as it becomes available. Monitoring practices will likely also be informed by collaborative research intertwining both biological science and Indigenous knowledge in a participatory manner. The monitoring methods used for snow crab are not directly applicable to groundfish but could be to prawn and crab, particularly the Collaborative-Post Season Survey. The fisher friendly logbook system used the Indonesian small-scale fisheries network is appears to be a particularly useful example to look

to when considering catch monitoring programs for Klemtu. If paired with an effective capacity building program for harvesters, this monitoring method may represent a cost-efficient option for building a long-term catch dataset for the Kitasoo Xai'xais community-based fishery. The compliance monitoring and enforcement system employed in the de-facto co-managed commercial and subsistence fisheries in Norway House represents a promising case study that can be used to inform the Kitasoo Xai'xais community-based fishery. Joint compliance patrols by DFO and the Guardian Watchmen could be structured in a way that builds off of the lessons learned.

Locally managed marine areas

Contemporary, competitive resource use by multiple parties requires that local communities integrate contemporary scientific knowledge with local management practice in order to achieve sustainability objectives (Jupiter et al., 2012). Communities can do this by strengthening governance of local tenure and rights-based fisheries in the form of Locally Managed Marine Areas (LMMAs) (Johannes, 2002; Govan, 2009; Jupiter et al., 2012). LMMAs are nearshore marine areas that are managed by local communities or through a partnership between local communities and governments or partner organizations like non-government organizations (NGOs) (Govan et al., 2006; Govan et al, 2009, Jupiter et al., 2017). LMMAs are often created in response to a community's perceived threat to food security or desire to improve livelihoods through local economic revenue (Govan et al., 2009). LMMAs are designed to meet local management objectives through community-based institutions exercising customary or local governance (Govan et al., 2009; Jupiter et al., 2014). While there is anecdotal evidence from communities that LMMAs result in appreciable increases of marine resources, there is less quantitative evidence, like increased landings or CPUE, to support these findings (Govan et al., 2009).

Periodically harvested closures (PHCs) are a common form of LMMA that function similarly to rotational fisheries harvests (Hart, 2003; Goetze et al., 2017). While PHCs often result in increased catch efficiency for both fishes and invertebrates, this also means that smaller amounts of local fishing effort can result in greater biodiversity loss and overharvesting (Jupiter et al., 2012; Goetze et al., 2017). Management tools beyond PHCs that are applied within LMMAs include permanent

closures, gear restrictions, and access restrictions, among others (Jupiter et al., 2014; Jupiter et al., 2017).

Successful LMMAs feature a suite of characteristics that work towards their effectiveness as a spatial management tool. As is the case with other spatially managed fisheries, larger LMMAs and PHCs with clearly defined boundaries are most effective (Goetze et al., 2017, Jupiter et al., 2017). Setting strict deadlines for fisheries closures and subsequent compliance enforcement or community engagement is also a crucial hallmark in effective LMMAs (Goetze et al., 2017). Another effective component of successful LMMAs includes development of an education and awareness plan in marine resource management for the community, which supports community acceptance and ownership of the LMMA (Kawaka et al., 2016). Effective monitoring practices for LMMAs include enhancing participatory processes that blend traditional and centralized governance (Govan et al., 2009). Ongoing community discourse around best methods for monitoring is important for community-based adaptive management, and similarly, external monitoring expertise should not be relied upon (Govan et al., 2009). Instead, emphasis on community-based approaches to monitoring should be first tested (Govan et al., 2009).

LMMAs are often seen in the South Pacific (Govan et al., 2009), where centralized management by government has not been able to manage subsistence fisheries adequately (Jupiter et al., 2014). While there are hundreds to thousands of LMMAs in this region, there is little documentation or evaluation of local management strategies (Jupiter et al., 2014). Within the South Pacific, there has been a rapid increase of PHCs implemented across Melanesia (Goetze et al., 2017) as well as Fiji (Govan et al., 2009). Of the South Pacific countries to implement LMMAs, Fiji contributes the largest amount of area under management (Govan et al., 2009). LMMAs have also been rapidly growing in the African regions of south-west Madagascar (Gardner et al., 2020) and Kenya (Kawaka et al., 2016).

Fisheries monitoring arrangements in Locally Managed Marine Areas

The catch monitoring program in a small-scale lobster LMMA in Madagascar features two types of participatory fisheries monitoring, catch / effort surveys and catch composition surveys (Long,

2017). A member of the local community is employed to facilitate the program and collect catch information following training and initial supervision by international volunteers (Long, 2017). Both survey types employ an opportunistic approach to sample selection in an effort to minimise inconvenience to fishers (Long, 2017). Both surveys are usually carried out at once, but in cases where was is not possible, the catch / effort survey is prioritized (Long, 2017).

The catch / effort survey methodology allows for estimation of annual catch (Long, 2017). The survey is conducted from February to September and consists of visiting landing sites at dawn and counting drag marks left in the sand by launching boats to estimate total effort (Long, 2017). Boats engaged in lobster fishing are sampled opportunistically and are surveyed for number of fishers on board, number of pots checked and lobsters caught, and total weight of catch (Long, 2017). In addition to catch / effort surveys, catch composition surveys are also carried out to determine lobster species caught, total length, carapace length, sex, and whether or not females are berried (Long, 2017). The catch data collected is used to inform participatory decision-making processes (Long, 2017).

LMMA species monitoring in Madagascar is supported by permanent field presence of NGO outreach agents and community-based technicians who work with communities on short term projects (Gardner et al., 2020). In some LMMAs, communities have used tourism programs to bring international paying visitors to conduct long-term ecological monitoring of coral reef systems (Gardner et al., 2020). The constant presence of tourists in these areas is also likely a significant deterrent to illicit fishing (Gardner et al., 2020). Enforcement monitoring in various Kenyan LMMAs was carried out via on water patrols by fishers and co-management committee members (Kawaka et al., 2016). There are few enforcement patrols conducted by Kenyan State Department of Fisheries officers due to lack of funding (Kawaka et al., 2016).

There may be some applicability of LMMA principles to the Kitasoo Xai’xais community-based fishery. Table 2 outlines lessons learned from the above case studies that may be relevant to Kitasoo Xai’xais community-based fishery monitoring programs that are established through the FRRA.

LMMA Monitoring framework	Learnings / recommendations
Catch monitoring	Opportunistic sample selection minimizes inconvenience to fishers (Long, 2017)
	A comprehensive assessment should be made for long-term population effects on priority species as opposed to short-term increases in CPUE during NTZ closures (Long, 2017)
	NTZs are a useful tool but not a complete solution because the regional nature of lobster stock means that it cannot be effectively managed at the community level if management measures are implemented in isolation of one another (Long, 2017)
Species monitoring	Collaborative monitoring approaches between NGO technicians and community-based technicians can be successful (Gardner et al., 2020)
	Tourism programs can be used to support long-term ecological monitoring initiatives (Gardner et al., 2020)
	The presence of tourists is likely a deterrent to illegal fishing (Gardner et al., 2020)
Compliance monitoring	On-water patrols carried out by fishers and co-management committee members have been successful (Kawaka et al., 2016)
	Efforts by government and NGOs to build capacity of fishing communities in ongoing marine resource management and monitoring has empowered local communities (Kawaka et al., 2016)
	Education and awareness plans for the broader community (not harvesters alone) should be considered early in the implementation process (Kawaka et al., 2016)
	Active enforcement on the water (regular patrols) are critical for compliance monitoring. Enforcement should be given

	greater prominence early on in the LMMA implementation process (Kawaka et al., 2016)

Table 2.2 Learnings and recommendations for successful implementation of LMMA fisheries monitoring frameworks applicable to the Kitasoo Xai'xais community-based fishery

Learnings from the LMMA monitoring case studies outlined in this section may be relevant to Kitasoo Xai'xais territory. The catch / effort survey methodology employed in the small-scale lobster LMMA in Madagascar might be an appropriate model to look to for participatory catch monitoring. Unlike the fisher friendly logbooks used in the Indonesian co-management small-scale fishery, catch data is collected by an employed community member, which lessens the onus of reporting for harvesters in Klemtu. Because Kitasoo Xai'xais territory is so remote, the applicability of the tourism species monitoring program used in Madagascar LMMAs is uncertain, though an interesting consideration for future Spirit Bear Lodge eco-tourism programs. Similar to the recommendations stemming from the co-managed small-scale fisheries in Indonesia, the development of an education and awareness plan for the broader community of Klemtu should be considered to build local capacity and support community ownership and acceptance of the community-based fishery and associated monitoring frameworks.

Territorial use rights fisheries

Territorial Use Rights Fisheries (TURFs) are a spatial management tool or "sea tenure" that allows for exclusive fishery access by a defined group in a defined area (Christy, 1992). TURFs are designed to address overexploitation related to lack of sufficiently defined property rights, which is common in small-scale fisheries (Quynh et al., 2017). TURFs can be applied to the surface, bottom, or entire water column of an area (Christy, 1992). Within a TURF area, harvest rights can vary, ranging from the privilege to fish in an area leased from a centralized body of government to complete ownership over a TURF zone (Afflerbach et al., 2014). Areas where TURFs are combined with marine reserves (TURF-reserves) are increasingly recognized for their ability to balance conservation and community fishing objectives (Afflerbach et al., 2014).

Hallmarks of successful TURF fisheries mirror various elements of co-management and LMMA arrangements in that most feature a participatory or co-managed structure (Quynh et al., 2017). Clearly defined and easily identifiable boundaries are integral to the success of TURFs (Christy, 1992). TURFs are well suited for benthic or sedentary species as it is more likely that their protected home range falls within the TURF area (Castilla and Defeo, 2001; Afflerbach et al., 2014). Compliance monitoring within TURFs is challenging; the literature suggests that government-led enforcement programs may be too expensive so (co)-enforcement by fishers themselves will encourage higher levels of compliance (Quynh et al., 2017). In this respect, the location of a TURF relative to a community is important, as the further the distance between the community and fishing grounds is, the less effectively fishers can monitor for compliance and the less effectively a TURF performs (Quynh et al., 2017).

While TURF systems exist around the globe, only those with the most promising monitoring practices applicable to the Kitasoo Xai'xais community-based fishery were examined in detail. The TURF system created for benthic fisheries in Chile is extensive and well designed, featuring clear boundaries, mechanisms for conflict resolution, co-management, supervision, and sanctions (Arias and Stotz, 2020). Small-scale benthic fisheries in Chile feature a top-down management approach based in 16 administrative regions along the coastline (Chevallier et al., 2021). The coastwide small-scale fisheries management system combines TURF areas with "open access" fisheries (Chevallier et al., 2021). The "open access" zones are subject to different management measures than the more restrictive TURFs and are accessible to more fishers (Chevallier et al., 2021). Chilean TURFs have contributed to strengthening territorial stewardship for small-scale fishers despite the fact that decision-making power largely remains in centralized government (Chevallier et al., 2021). TURF systems also exist in Vietnam (Quynh et al., 2017) and Mexico (Villaseñor-Derbez et al., 2019). The TURF system in Mexico allows fishers from the same community, operating as one fishing cooperative, to request legal recognition of community-based marine areas as fish refuges (Villaseñor-Derbez et al., 2019). The profits from the TURF are then distributed among the fishing cooperative (Villaseñor-Derbez et al., 2019).

Fisheries monitoring arrangements in Territorial Use Rights Fisheries

In the Chilean small-scale fisheries example referred to above, it is challenging to collect reliable catch and effort estimates at the local level due to the complexity associated with multi-gear and multi-species fisheries paired with remote landing sites and sporadic fishing efforts (Chevallier et al., 2021). Reliable catch monitoring programs are important for sustainable management of both the economic and ecological aspects of these small-scale benthic fisheries (Chevallier et al., 2021). While the following catch monitoring example applies only to the "open access" zones as opposed to the TURF areas themselves, both spatial management tools complement one another in the coastwide small-scale fishery and are relevant to the Kitasoo Xai'xais community-based fishery.

The catch monitoring program developed for select Chilean "open access" fisheries is conducted by scientific observers from the National Fisheries Support Institute (IFOP) (Chevallier et al., 2021). Scientific observers collect daily landings recordings from 15 fishing coves within the benthic small-scale fisheries monitoring program (Chevallier et al., 2021). Observers also collect resource composition data by identifying each landed benthic resource to the most accurate taxonomic level and weighing the landings (Chevallier et al., 2021). To estimate effort, observers record the time of departure and return for each boat, count the number of harvesters, and gather information on location of landings by both direct observation and post-landing interviews (Chevallier et al., 2021). Scientific observers have conducted surveys 5 days per week in 15 fishing coves for time periods spanning 6-17 years depending on the study site. This program is the first systematized assessment of small-scale fisheries to be conducted over such a large spatial and temporal scale (Chevallier et al., 2021).

TURFs in Mexico are monitored annually and provide valuable biological data used in management decisions (Villaseñor-Derbez et al., 2019). Biological data is gathered from the monitoring of reserve sites, where no fishing occurs, and control sites (Villaseñor-Derbez et al., 2019). Control sites are not directly adjacent to reserves to prevent spillover, feature habitat characteristics similar to reserve sites, and are located where fishing occurs in the TURF (Villaseñor-Derbez et al., 2019). The data is then collected by both members from the local community and Mexican Civil Society Organizations, who serve as a link between harvesters and centralized government (Villaseñor-Derbez et al., 2019). Each site is surveyed annually for species richness and abundance of fish and invertebrate species (Villaseñor-Derbez et al., 2019).

Compliance monitoring within Chilean TURFs is primarily the responsibility of fisher organizations themselves (Davis et al., 2015). Local harvesters monitoring within their management area and notify the Chilean government of poaching activity and illegal fishing (Davis et al., 2017). Once notified, Chilean officials are responsible for enforcement (Davis et al., 2015). Despite this system of co-managed compliance monitoring, there are high rates of illegal poaching (Davis et al., 2015). There are multiple theories for ineffective compliance monitoring. Local capacity and financial resources may hinder fisher's ability to participate (Davis et al., 2017). Effective enforcement may also be prevented by the high social cost of denouncing a fellow community member for poaching (Davis et al., 2015). Fishers may also have no interest in compliance monitoring because they consider government intervention ineffective (Davis et al., 2017).

TURF Monitoring framework	Learnings / recommendations
Catch monitoring	Benthic small-scale fisheries management plans should focus on multi-species management / monitoring practices that consider the interdependence of species within the fishery (Chevallier et al., 2021).
	Local stakeholders should be included in the decision-making process for developing a monitoring system (Chevallier et al., 2021).
	The results of the long-term catch monitoring research in Chile suggests that top-down systems of marine management do not adequately consider spatial variations in localized ecological and socioeconomic conditions which results in overexploitation (Chevallier et al., 2021).
Species monitoring	Species monitoring data can be successfully collected by both community members and civil society organizations (which act as a bridge between harvester's and centralized government) (Villaseñor-Derbez et al., 2019)
	TURF-reserves do not appear to increase lobster densities among the sites studied in Mexico (Villaseñor-Derbez et al., 2019)

	The lack of effectiveness of Mexican TURF-reserves may be attributed to the relatively young age of the reserves or poor ecological coherence of the reserve design (Villaseñor-Derbez et al., 2019)
	The recommended size for TURF-reserves is "more than twice the size of the home range of adults and juveniles" (Villaseñor-Derbez et al., 2019)
Compliance monitoring	Community / harvester enforcement of small-scale fisheries is more cost effective and can encourage higher levels of compliance (Quynh et al., 2017)
	More research is needed on the impact enforcement has on shared trust between fishers and government as well as between fishers themselves (Quynh et al., 2017)
	There is no one TURF design that will work for all cases. The successful design of a TURF and its monitoring programs will be context specific (Quynh et al., 2017)
	The success of co-managed compliance monitoring may be compromised by the high social cost of denouncing a fellow community-member to centralized government (Davis et al., 2015)
	Community-based compliance programs need to be accompanied by sufficient financial and capacity building support (Davis et al., 2015)

Table 2.3 Learnings and recommendations for successful implementation of TURF monitoring frameworks applicable to the Kitasoo Xai'xais community-based fishery

Different aspects of TURF design and monitoring systems may be applicable for the Kitasoo Xai'xais community-based fishery. Kitasoo Xai'xais Stewardship Authority marine planners and policy advisors should consider which species might be best suited towards this style of fisheries management as effective practices indicate that benthic, sessile species appear to benefit most from smaller TURF areas. Alternatively, larger sized TURF areas may be more effective to encompass the home ranges of more mobile species. The Chilean catch-monitoring program employed in its "open access" small-scale fisheries is impressive in its temporal and spatial scale, yet it lacks a

participatory element as it is carried out solely by scientific observers associated with the National Fisheries Support Institute. Despite this, the methods used may be applicable to the Kitasoo Xai'xais community-based fishery catch monitoring program as both qualitative data collected through fisher interviews and quantitative landing data are used to inform the broader catch monitoring assessment. Compliance monitoring led by local harvesters may function better in Kitasoo Xai'xais territory than in the Chilean case study, as Indigenous law and the Kitasoo Xai'xais food fish policy will likely be used in the event that a community member commits an infraction.

Discussion

While the novel Kitasoo Xai'xais community-based fishery will be designed and implemented in a manner most accessible and appropriate to the Nation, the above case studies offer valuable insight into successful practices used in other small-scale fisheries models. Table 4 illustrates various hallmarks of successful small-scale fisheries systems falling under the relatively broad themes of system design, area design, and monitoring design that may be applicable to the Kitasoo Xai'xais community-based fishery. Where surveyed fishery models indicated that an element falling within these themes was relevant to its success, it was marked in Table 4 with an "X". Absence of an "X" does not necessarily mean that the component is not applicable to any particular small-scale fisheries model as the literature review was not comprehensive. It may also indicate that a particular element may not have been studied yet or is not mentioned in the academic literature.

	Co-Management	**LMMAs**	**TURFs**
System Design			
Adaptive participatory Decision Making	X	X	X

Collaborative research between science and resource users	X	X	X
Strict deadlines for fisheries closures		X	
Compliance enforcement	X	X	X
Community education and awareness plan for marine resource management	X	X	
Bottom up approach for management with regional coordination		X	X
Flexible mechanisms for conflict resolution	X		X
Integrating social sciences into fisheries management institutions	X		X
Area Design			
Clearly defined boundaries	X	X	X
Management area boundaries reflect ecosystem considerations	X		X
Small management areas are best suited towards benthic species			X
Management area needs to be large enough to provide adequate protection for more mobile species			X
Management area is located close to community			X
Monitoring Design			
All parties define and agree upon trusted sources of information	X		
Monitoring approaches are largely collaborative efforts between community members and an external party (NGO, government)	X	X	X
Community-based approaches to monitoring are prioritized over external expertise		X	
Flexible catch monitoring programs are accessible and support capacity building of harvesters	X	X	X
Participatory monitoring programs should provide incentives to fishers for compliance (financial, etc)	X		X
Multi-species management and monitoring plans should be prioritized			X

Local monitoring programs should be informed by the cultural values of the Nations in which they are implemented	X		

Table 2.4 Hallmarks of successful small-scale fisheries systems across co-management, LMMA, and TURF models

The Kitasoo Xai'xais community-based fishery will feature adaptive participatory decision-making and collaborative research between science and fishers as under the FRRA, both Canada and the Nation have committed to collaborative fisheries governance. Another element of successful co-managed and LMMA fisheries applicable to the Kitasoo Xai'xais community-based fishery is a community education and awareness plan for marine resource management. This component is closely tied to community and harvester capacity building, which is integral to the success of many small-scale fisheries as a whole as well as to participatory monitoring programs established under each model. Greater knowledge dissemination throughout Klemtu may result in more informed decision-making and more acceptance of the program at the community level.

The general monitoring design considerations found in the case studies are valuable for the development of participatory fisheries monitoring programs for the Nation. The recommendation around the importance of multi-species management and monitoring plans is of particular interest and should be used to guide monitoring efforts at the sub-regional and regional levels. Importantly, the case studies offer a number of potentially applicable participatory monitoring practices. All models recommend that community-based approaches to monitoring should include an element of capacity building for the broader community. Tangentially related is the monitoring program developed by the Gitga'at Nation in the North Coast of British Columbia (Thompson et al., 2019). Though not reviewed in this exercise as the program did not fall within the themes of co-management, LMMAs, or TURFs, the monitoring framework developed by the Gitga'at Nation and academic researchers is a relevant example to look to while developing Kitasoo Xai'xais community-based monitoring programs. Two data collections tools were developed by community-members in partnership with researchers, a harvest logbook and interview guide (Thompson et al., 2019). Both could be adapted for use as tools in the community-based fishery in Klemtu.

Compliance enforcement, while essential for the success of many small-scale fisheries models, may represent a more complex challenge for implementation. In the TURF context, co-managed compliance regimes have stumbled, in part because of the high social cost of denouncing a fellow community-member to centralized government for non-compliance (Davis et al, 2015). Due to the complicated relationship between DFO and the Nation, alternative compliance regime structures could be contemplated, where enforcement is carried out by the Kitasoo Xai'xais band council or Stewardship Authority. The disparity between the success of compliance monitoring and enforcement programs in the TURF context and the de-facto co-management arrangement in Norway House is particularly striking. Based on the lessons learned from these case studies, it appears that co-management of a compliance and enforcement program might be more effective, provided that its structure is rooted in the cultural values of the respective Nation it is situated in.

Conclusion

The above case studies of commercial, small-scale fisheries offer valuable lessons that can be adapted for use by the Kitasoo Xai'xais community-based fishery. This literature review indicates that participatory decision-making structures, collaborative research, and adaptive management practices are all foundational to successful fishery implementation across all models surveyed. The various catch, species, and compliance monitoring programs associated with each small-scale fisheries arrangement are distinct and context dependant yet provide applicable lessons and recommendations that can be used to inform the development of effective systems for the Kitasoo Xai'xais Nation. Above all else, it is evident that the implementation of the community-based fishery and relevant monitoring programs should be informed by the community and must be rooted in Kitasoo Xai'xais' values, customs, and practices.

Chapter 3: "Knowledge is Power": Developing catch monitoring methods for the Kitasoo Xai'xais community-based fishery

Introduction

Small-scale fisheries contribute to food security, resilience, and employment in communities across the globe (Johnson, 2006; Weeratunge et al., 2014; Chuenpagdee and Jentoft, 2015). While

small-scale fisheries differ between regions and communities (Chuenpagdee and Jentoft, 2015), they directly employ millions of people internationally and contribute to the food security of at least 450 million people (Berkes et al., 2001). The participation of community members in small-scale fisheries means that the income generated from this sector contributes to local economies (Chuenpagdee and Jentoft, 2015). Healthy small-scale fisheries are important for the well-being of coastal communities, including Indigenous communities that have stewarded local marine ecosystems for millennia (Lee et al., 2019).

While small-scale fisheries exist in many communities around the world, they are often understudied (Berkes, 1990; Zeller et al., 2014; Islam and Berkes, 2016). With the exception of small-scale fisheries that target commercially valuable marine species, these fisheries are underrepresented in academic literature as they do not have the same quantitative information available as industrial fisheries (Johannes 1998, Johannes 2002, McClanahan, 2009). The United Nation's Food and Agriculture Organization data are based on landings that enter market mechanisms, and as such, they underestimate the economic and social contributions of small-scale fisheries broadly, where catches are often bartered, traded, and consumed for subsistence (Bartley et al., 2015; Pauly, 2014; Harper and Zeller, 2011; Lingard et al., 2011; Islam and Berkes, 2016). A system based on the commercial value of small-scale fisheries does not accurately represent their true value in local and regional economies as harvested food fish is a critical component of the diet of coastal communities (Pauly, 2014; Bartley et al., 2015; Islam and Berkes, 2016).

Canada is a case in point. Small-scale fisheries are much less studied than industrial fisheries, despite small-scale Indigenous fisheries having existed for thousands of years. Long before the creation of industrial fishing practices, Indigenous Nations engaged in more than subsistence fishing, and operated fisheries-based economies, trading with both neighbouring and distant communities' settlers (Stewart, 2008; Castaneda, 2020). Since colonization, subsistence and commercial fishing in Canada has become increasingly separated. However, some small-scale fisheries can be characterized as having both commercial and subsistence components (Sowman and Cardoso, 2010; Berkes, 2015; Islam and Berkes, 2016). Commercial and subsistence small-scale fisheries currently exist within Canada, though limited published literature exists on the interaction between them (Islam and Berkes, 2016).

Practices of Indigenous led fisheries stewardship persisted in Canada until colonial governments delegitimized, prohibited, and criminalized Indigenous management of fisheries (Johannes, 1978; Newell, 1993; Harris, 2001). Indigenous peoples regulated their vast fisheries for millennia, practicing management strategies by controlling harvest pressures and using selective fishing gears seasonally (McMillan and Prosper, 2016; Islam and Berkes, 2016, Castañeda, 2020). The period of rapid and unsustainable natural resource extraction following European colonization was enabled by the implementation of federal policies and laws (Lee et al., 2019). Under the Canadian federal governance regime, the Department of Fisheries and Oceans (DFO) managed fisheries in a centralized agency command-and-control system (Lee et al., 2019). The federal Fisheries Act (1868) was legislated to regulate fisheries nationally, which simultaneously supported the expansion of non-Indigenous fisheries and the displacement of Indigenous fishing practices, laws, and economies (McMillan and Prosper, 2016; Castaneda, 2020). The restrictions imposed on Indigenous management regimes in the 19th century resulted in Nation led fisheries shifting from being wholly self-determined to almost entirely state controlled (Castaneda, 2020). The Canadian judicial system has since passed decisions affecting Indigenous fisheries, ruling that Indigenous peoples possess the right to fish for food, social, and ceremonial (FSC) purposes, and that this right has priority, after conservation, before recreational and commercial harvesting activities (R v Sparrow; 1990, Fisheries Act, s 9.3 ; Islam and Berkes, 2016; Castaneda, 2020).

While small-scale fisheries management in the province now known as British Columbia has been characterized by federal command and control since colonization, the governance landscape is becoming more inclusive to Indigenous governments in the management and monitoring of marine and terrestrial species (Lee et al., 2019). While state-led governance institutions have been slow to accept the authority of Indigenous governments (Lee et al., 2019), the recently signed Fisheries Reconciliation Framework Agreement (FRRA) represents a shifting fisheries management landscape. In recognizing past wrongs and harm done to Indigenous fisheries policies and stewardship practices, the federal government of Canada committed itself to a historic reconciliation agreement (FRRA, 2019). The FRRA was signed initially in 2019, and later in 2021, by eight signatory Nations in the Northern Shelf Bioregion (NSB) and DFO (FRRA, 2019).

The FRRA supports the establishment of novel commercial community-based fisheries in signatory Nations' territories, puts in place funding to support the establishment and management of those fisheries, and commits the parties to collaborative fisheries management (FRRA, 2019). The community-based fisheries established under the FRRA are a new and distinct commercial fishery, characterized by a unique set of flexibilities that are not available in conventional commercial fisheries (FRRA, 2019). They will be executed on small to medium sized vessels exclusively by Nation members and will operate within defined areas adjacent to signatory Nation communities (FRRA, 2019). As signatory to the FRRA, the Kitasoo Xai'xais Nation is looking to implement a community-based fishery that balances long-term resiliency of the marine environment with economic viability in a manner that embodies the Nation's principles of stewardship.

In this Chapter, we aim to centre Kitasoo Xai'xais voices in establishing a vision for the monitoring of the newly established community-based fishery. This work was a partnership between the Kitasoo Xai'xais Stewardship Authority and the University of Victoria, working together to leverage capacities and expertise to help design a fishery monitoring program. The purpose of this paper is not to detail statistics about community member's catches, but instead, to offer a case study about the development of a Nation-led catch monitoring program aimed to support the FRRA community-based fisheries. The research questions we explore in Chapter 3 are (1) what are past and present Kitasoo Xai'xais fisheries management and monitoring practices used to inform the Nation's fisheries management decisions; (2) What are Kitasoo Xai'xais community members' recommendations for the development of a dockside program?; and (3) What are the high-level objectives and priorities that can inform the development of a community-based fishery monitoring program?

Kitasoo Xai'xais Nation case study

The Kitasoo Xai'xais Nation is redefining what fisheries monitoring and management practices look like within their FRRA community-based fishery. The Kitasoo Xai'xais Nation has practiced stewardship over their land and waters for millennia (KX, 2016). Longstanding principles of stewardship form the foundation of Kitasoo Xai'xais' legal tradition and guide resource

management decisions (KX, 2016). Kitasoo Xai'xais territory is located on the Central Coast of British Columbia, in the heart of the Great Bear Rainforest. The Nation's remote community of Klemtu is situated on Swindle Island, approximately 77 kilometres north of the next closest community of Wáglísla / Bella Bella, and 105 kilometres south of Txalgiuw / Hartley Bay. There are currently 517 Kitasoo Xai'xais Nation members, 319 of whom live in Klemtu (Kitasoo Xai'xais, 2023). However, low human population density does not mean that the region hasn't seen disproportionate impacts from fishing. The small population and remote nature of Klemtu can result in capacity constraints which introduces challenges to program implementation.

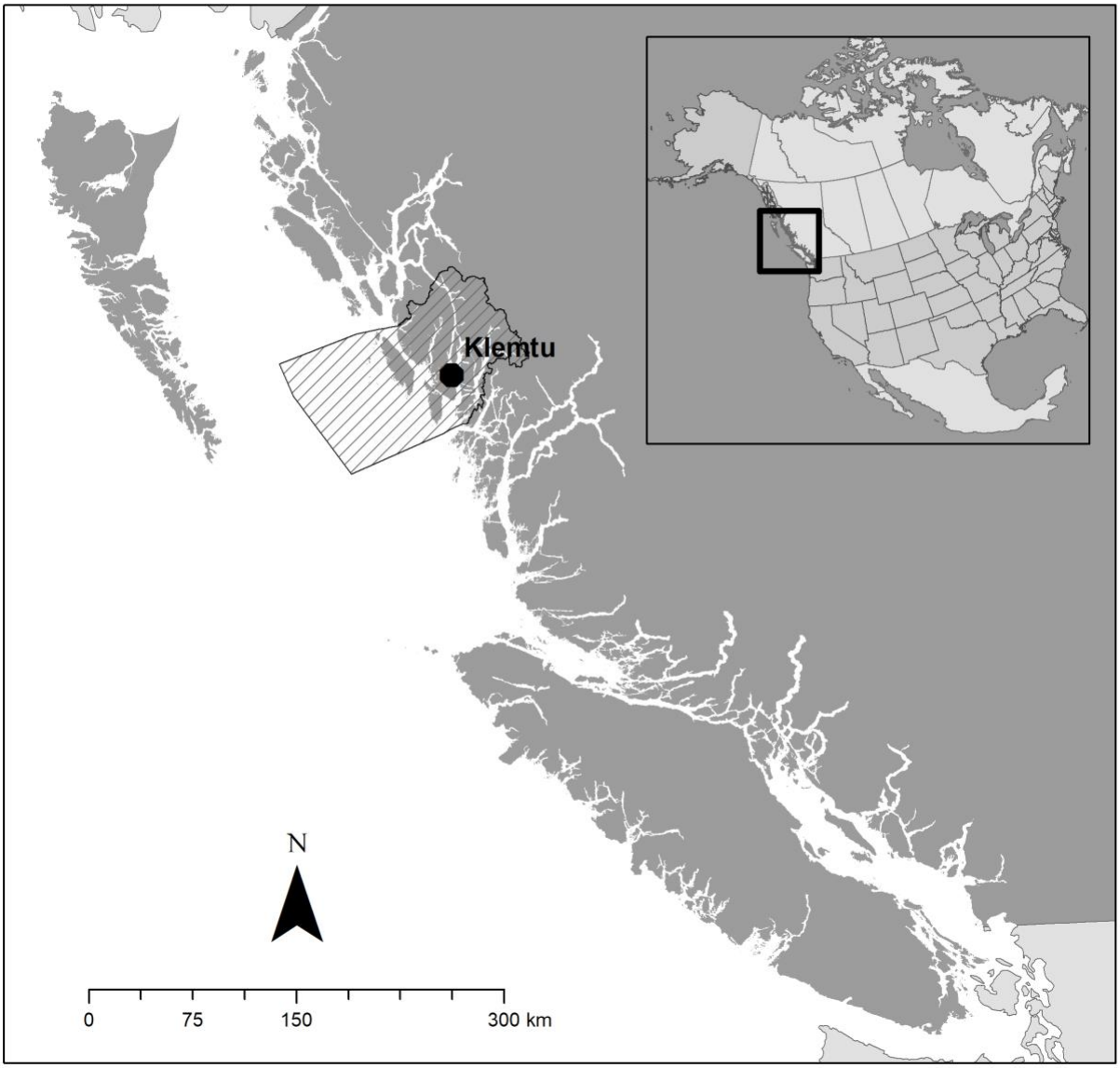

Figure 3.1 Map of Kitasoo Xai'xais territory and the community of Klemtu on the Central Coast of British Columbia

The Kitasoo Xai'xais Nation is developing a rigorous community-based catch monitoring program to assess local commercial and FSC fishing pressure in relation to population abundance of targeted species, in addition to other ecological and social-wellbeing questions. The Kitasoo Xai'xais Nation invited the University of Victoria to partner with them to explore different catch monitoring models for their community-based fishery. The findings of this study are solely owned by the Kitasoo Xai'xais Nation and some detailed results, like catch numbers, are not meant to be

shared more broadly. In this study, Kitasoo Xai'xais harvesters, researchers, leadership, and policy advisors collaboratively designed and piloted a multi-species catch monitoring program with an aim to inform the FRRA community-based fishery.

At the time of this study, the technical components of the community-based fisheries were being negotiated by the signatory partners at FRRA policy tables. The community-based fisheries did not yet exist, so we piloted the catch-monitoring program in the Nation's FSC fishery, which acted as a proxy. There is substantial overlap in the between Kitasoo Xai'xais fishers harvesting for FSC and those who participate in the community-based fishery.

Methods

The primary aim of this research was to collaboratively identify important components to inform the development of a catch monitoring system that was suitable for the community of Klemtu. Local harvesters, Kitasoo Xai'xais Stewardship Authority (KXSA) staff members, and policy advisors co-created the research goals and methodology, which is depicted in Figure 3 below.

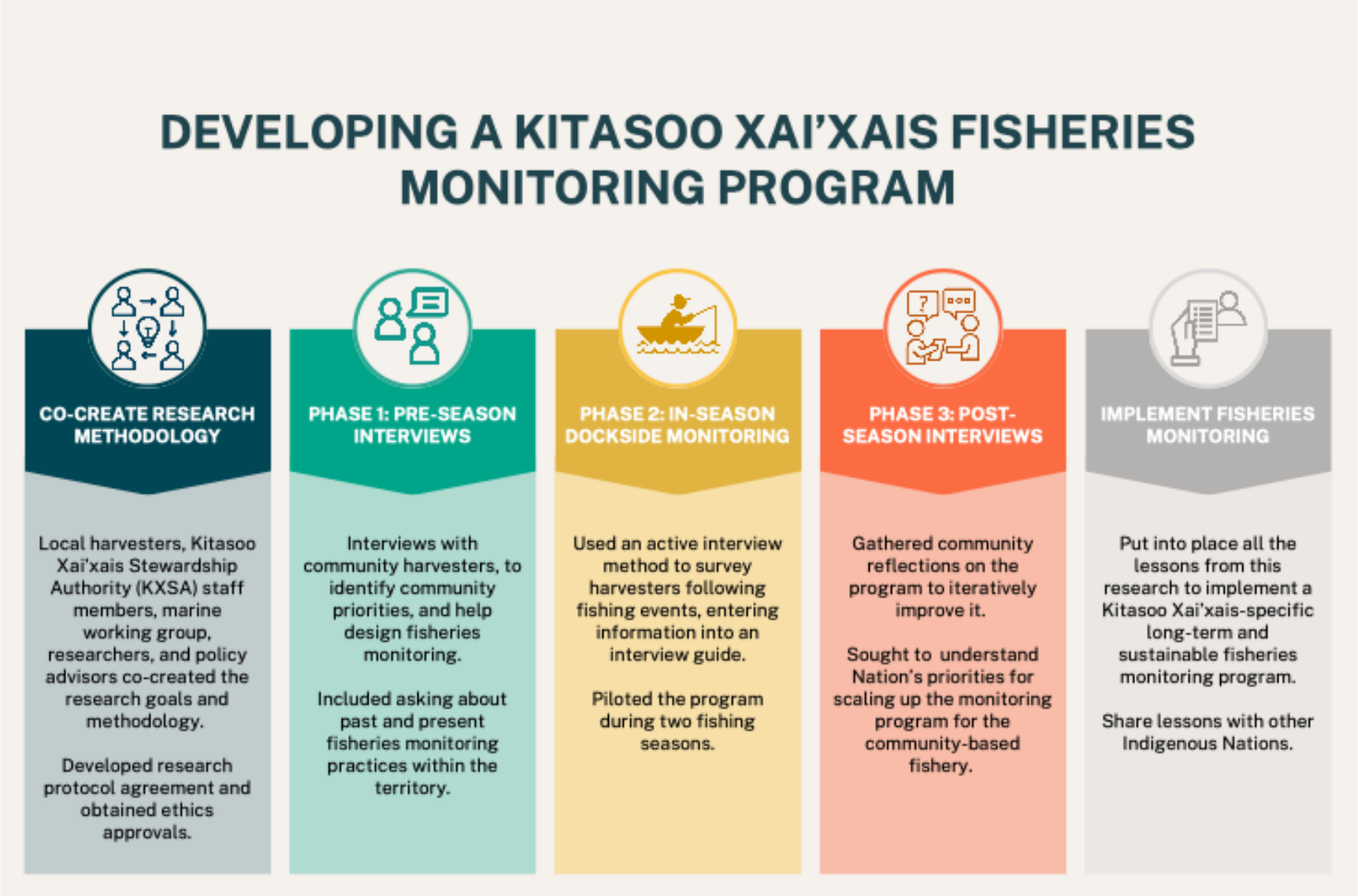

Figure 3.2 Developing a Kitasoo Xai'xais fisheries monitoring program

The Kitasoo Xai'xais marine working group, whose membership includes hereditary and elected leadership, community members, and representatives from other departments within the Nation, guided the conceptualization of the project. We held meetings with Nation members to identify Kitasoo Xai'xais priorities that would guide this research, which centered the importance of the research outputs being directly applicable to Nation governance and fisheries management decisions. Additional Nation priorities included the importance of the study being community-driven, and the research's ability to advance Kitasoo Xai'xais Nation members' perspectives at regional level FRRA planning tables. Through meetings with stewardship staff, harvesters, and local fisheries managers, we developed a collaborative research methodology with three components: pre-season interviews, in-season dockside monitoring, and post-season interviews. Prior to carrying out the research, we developed a research protocol agreement between the Kitasoo Xai'xais Nation and the University of Victoria and received human research ethics approval (UVic ethics protocol #22-0111-02).

The pre-season interview questions aimed to ground this study in past and present fisheries monitoring practices within the territory, which was highlighted as a research goal through methodology discussions with KXSA staff. The pre-season meetings also incorporated questions to identify community priorities that would inform the development of a dockside monitoring program built from existing Kitasoo Xai'xais monitoring practices. In discussion with local harvesters, we decided that a snowball sampling approach would be most effective for organizing pre-season interviews with community members and Nation staff. We held interviews at the location of the interviewee's choice (e.g., at the dock, in their homes, in the KXSA office). KXSA staff and researchers collaboratively developed open ended interview questions. We took notes during the interviews and qualitatively coded them in NVivo using an inductive coding approach.

We designed the in-season dockside monitoring pilot program to be carried out in the Nation's food fishery to apply the learnings from the pre-season interviews. Harvesters and stewardship staff reviewed several iterations of the interview questions in advance of the fishing season to ensure that the questions were capturing useful information. Once the multi-species survey was developed, we held unstructured interviews with harvesters from most fishing families in Klemtu to confirm the methodological catch monitoring approach, and collect feedback on the interview

guide in advance of piloting the dockside program in 2022. In advance of the pilot program, we developed and circulated a community notice about the catch monitoring program, explaining what the purpose was and introducing the dockside research team (see Appendix A). The dockside monitoring pilot program employed an active interview method to survey harvesters following fishing events. Because Klemtu is a small community, we were able to identify all the individuals involved in community harvesting. We interviewed everyone willing to participate, either at the dock once they returned from their fishing trip or via a follow up phone call. We recorded the dockside interviews on paper interview guides and then entered the data into Excel (version 16.77). Following data entry, we used R studio (version 2023.12.0) to calculate catch per unit effort for all harvested species. While we presented the catch per unit effort results to the KXSA marine working group following each pilot season, these data are held confidentially by the Nation due to their sensitive nature. Thus, we do not report on results of the in-season dockside monitoring program.

Following two seasons of the dockside pilot program, we carried out post-season interviews to gather community reflections on the program as well as understand Nation priorities for scaling up the monitoring program for the community-based fishery. We kept the research methodology flexible so as to adapt to Nation priorities and feedback. In designing the post-season interview guide, we aimed to develop questions that would center voices from the community in visualizing a multi-species commercial fishery monitoring system suited to the needs of the Nation. We mirrored the pre-season interview methods, interviewing many of the same participants. We transcribed the interview notes and coded them in NVIVO, again using an inductive coding approach to identify themes related to multi-species fisheries monitoring within the Kitasoo Xai'xais community-based fishery.

Results

We conducted 16 pre and post-season surveys with community harvesters, KXSA staff, and policy advisors, and 109 dockside interviews with harvesters over two field seasons in 2022 and 2023. Below, we describe both the pre and post-season interviews results by broad themes related to the Nation's vision for the community-based fishery monitoring program. These themes touch on concepts around Nation governance, accessibility, adaptability, accuracy, innovation, capacity

building, and reciprocity. While the results from the dockside catch monitoring interviews are held confidentially within the Nation, broad lessons learned from the pilot programs are incorporated throughout the results in this paper.

Pre-season interviews

Past and present Kitasoo Xai'xais monitoring practices

In describing both past and present monitoring methods employed by Kitasoo Xai'xais Nation members, harvesters and fisheries managers alike emphasized that the practice of harvesting itself is both monitoring and management. Since time immemorial, harvesters have made observations out on the land that subsequently informed the Nation's management decisions. These in situ monitoring methods are widely practiced by Kitasoo Xai'xais community members today. For example, salmon is a key food fish species of importance for the Nation, and interviewees often spoke to the importance of monitoring river systems during the harvest season. One interviewee recalled that they would run all over the territory to "… watch salmon stocks in my herring punt. I'd note where there are not as many salmon. I'd do it for the whole month… once a week to see how stocks are doing. I'd go to co-management [Kitasoo Xai'xais fisheries department] with the information… we would recommend that stocks are low and that an area should remain closed for the time being." Harvesters make similar observations today, and often bring observations of note to local fisheries managers or stewardship staff. Monitoring observations are made holistically at the ecosystem level rather than species by species. Harvesters spoke about how monitoring includes making observations about the broader ecosystem as a whole, for example, noting the physical health of grizzly bear populations in the territory and connecting that information with the annual salmon return.

Similarly, harvesters spoke to their practices of monitoring abundance levels for species including herring, deer, bears, beavers, sea otters, and mink while out on the water and land. If harvesters note an underabundance of a particular species in an area, they prioritize responsible harvesting practices aimed at conservation of the marine ecosystem. Where herring spawn is thin on submerged hemlock branches, for example, community members are taught to leave those fronds

behind so as to create an opportunity for the herring eggs to hatch. Harvesters additionally recalled past experiences around harvesting deer for their families. In recent years, harvesters reported drastically decreasing population levels of deer in Kitasoo Xai'xais territory and have since stopped hunting. Harvesters are aware of what they are harvesting and make individual decisions to ensure they are not taking species that are too small or only taking part of what is available instead of the whole thing.

Indigenous law in the form of teachings passed down through generations by hereditary leadership and community members inform past and present monitoring practices. For example, lessons passed down from Kitasoo Xai'xais elders speak to the importance of being aware of and controlling the numbers of animals harvested during fur trapping season. Awareness is particularly important within the fur trapping harvest because animals including bears, beavers, sea otters, and minks are slower to reproduce. Generational knowledge transmitted through storytelling also illustrates the interconnected nature of monitoring the land and sea. Harvesters noted that they were taught to make observations about the seasonality of different species, which function as indicators of harvest. For example, the growth of skunk cabbage indicates that the seaweed season will begin soon.

Previous and current monitoring practices are also inclusive of social well-being indicators related to community access to sufficient foods. An interviewee spoke to previous hunting practices, noting that "when my boys and myself went hunting, a thing we did was get three nice big bucks a year. That puts up 70 to 80 bags of meat. It would be enough for a year. We wouldn't do any more hunting after that. You eat what you got". Kitasoo Xai'xais harvesting practices embody the principle of only taking what is needed for the community. Nation members harvest from the territory with an awareness of how much food their families need for the year.

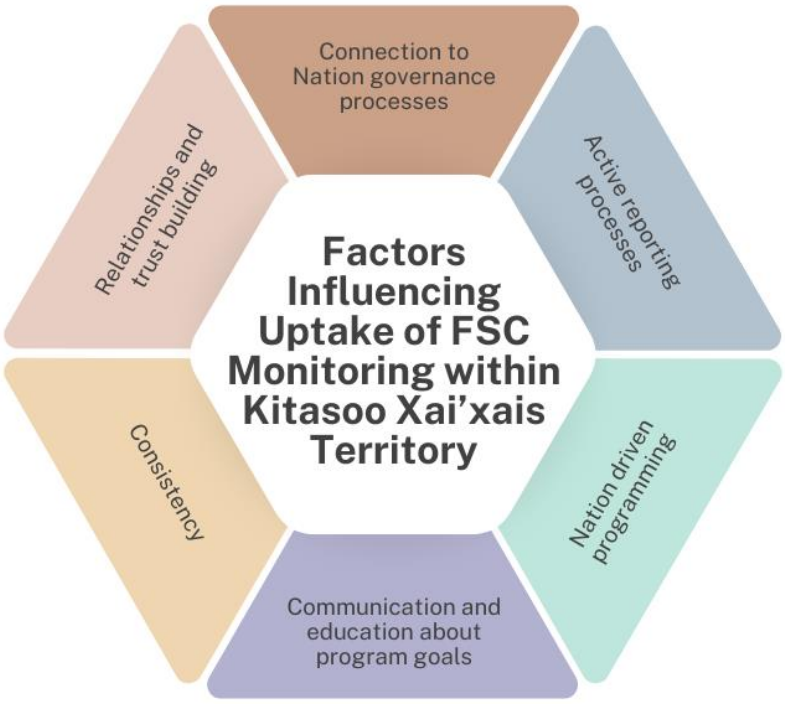

Figure 3.3 Pre-season interview results outlining factors that contribute to the success of catch monitoring programs within Kitasoo Xai'xais Territory

Pre-season interview participants spoke to factors that may have impacted the success of previous and ongoing FSC monitoring programs within the community. Where catch reporting is a requirement of federal program, uptake is generally limited, and reporting can be patchy. In contrast, Nation driven programs are typically well received, particularly where catch information is fed directly into Nation decision-making processes through the Kitasoo Xai'xais Food Fish Committee. For example, the Nation piloted different FSC catch monitoring techniques with varying levels of success. Voluntary logbooks and catch calendars have been implemented in the past without much uptake. Catch calendars were briefly used as a monitoring tool at the Central Coast sub-regional level, but Kitasoo Xai'xais fisheries managers reported that there was a low calendar return rate within the community. Interview participants also noted that the resolution of data collected by catch calendars did not adequately meet the information needs of the Nation as

they were not able to effectively capture harvest effort. Harvesters noted that they valued the catch calendars and referred to them in subsequent years to revisit their own fishing trends and document when migratory species of food fish would arrive in the territory. Harvesters also noted that for those in open boats, like punts, catch calendars were the more convenient monitoring tool as compared to logbooks. The Kitasoo Xai'xais fisheries department currently coordinates an FSC monitoring program that collects catch information from harvesters and is fed into the Nation's Aboriginal Fisheries Strategy reporting. There is limited community uptake in this program, as the information is a requirement of a federal DFO funding arrangement. Kitasoo Xai'xais fisheries staff also spoke to previous efforts in monitoring the commercial salmon gillnet fishery in the mid 1990's. The Nation coordinated a commercial catch monitoring program wherein fisheries staff collected catch numbers and scale samples from gillnetters fishing in close proximity to Klemtu. This catch monitoring effort was motivated by community concerns around key target food fish species like Sockeye and resulted in a commercial fishing closure in Finlayson Channel. Nation-led commercial monitoring efforts continued until the salmon gillnet fishery was closed in Kitasoo Xai'xais territory.

A common theme raised by interview participants was the importance of relationships and trust building influencing program success. Within previous and ongoing catch monitoring programs carried out in Klemtu, various relationships are established that require a foundation of trust. Within federal FSC reporting structures, the lack of trust around how data will be used by Canada has impacted the success of the monitoring program. Kitasoo Xai'xais fisheries staff note that a fear of limitation can exist amongst harvesters which may contribute to hesitancy around reporting. Trust must also exist internally within Nation driven catch monitoring programs between harvesters and data collectors. The culture of secrecy around fishing hot spots can interact with harvesters' willingness to share information. Interviewees observed that a strong community driven catch monitoring program should be firmly rooted in trust between harvesters, fisheries managers, and data gathering field staff.

The methodologies of various catch monitoring initiatives piloted in Klemtu have impacted the success of those programs. Passive data collection methods like logbooks and catch calendars experienced low success rates within the community. Reporting structures that position the

harvester as responsible for reaching out to report their catch to an office-based fisheries staff member have similarly struggled. Both harvester and fisheries staff interviewees noted that an active reporting process, wherein fisheries staff consistently follow up with harvesters following a fishing trip, has achieved the most success in terms of reporting. Fisheries staff additionally observed that consistent and active reporting processes can support the development of reporting habits but they need to be implemented sustainably with organizational capacity constraints in mind.

Another broad theme raised by pre-season interview participants was the role of communication and education in the uptake of local monitoring programs. Interviewees reported that previous catch monitoring initiatives faltered in part because of a lack of clarity around their purpose and management application. Improved communication and education around the specific research questions that the monitoring programs aim to answer in addition to clarity around how the information will be used to inform management decisions is a critical factor affecting local participation. Participants noted that the lack of communication around the application of catch information may have fed into fears around fishing limitation. KXSA fisheries staff suggested that more education around how catch and effort data inform stock assessments would have better positioned previous monitoring programs for success.

Pre-season interviewees also shared their perspectives on the importance of consistency in a monitoring program. Previous FSC catch monitoring efforts within the territory included historical catch interviews with partnering academics. The historical catch data interviews were carried out through distinct research projects that were not repeated from year to year. The historical FSC catch data is held internally within the Kitasoo Xai'xais Stewardship department. Historical catch information has many valuable applications, but there is also value in consistently collecting catch and effort data to inform in-season management decisions made by the Nation. The methods in which data is collected should also remain consistent, which highlights the importance of adequate program capacity and staffing at the local level.

Recommendations for the development of a Kitasoo Xai'xais catch monitoring program

In pre-season interviews we asked participants about their recommendations for the development of a catch monitoring program. We organize the recommendations into what, where, when, how, and why (Table 1). Responses reflected the lessons learned from past successful and unsuccessful attempts at fisheries monitoring. The recommendations in table 1 are supported by illustrative quotes from interviewees and were incorporated directly into the design of the catch monitoring dockside pilot project in 2022.

	Recommendation	**Illustrative Quotes**
What	The dockside survey should be **comprehensive:** include all species, gears, and locations. It should ask **quantitative information** about: • number of fish caught • species caught • gear type used • location(s) fished • depth fished • fishing effort Include questions about **zero catches**: when harvesters were unable to catch their target, or anything, at a particular location Include **qualitative questions** (open-ended questions) such as: • quality of harvested species • fisher observations	"Right now, what we need to do is get back to the point where we talk about how many fish we catch. What Chums are coming into our bay". "I mark down numbers for all species, how many bags of herring eggs I have gotten, deer, stuff like that". "People will go out crab fishing and often do that with another fishing trip. If they are doing something else, they can throw traps out on the way". "Sometimes people notice things. Salmon may be thin and not looking healthy… They are like people. Sometimes they have bad times. People would say here that a Coho will taste differently from the same river from one year to the next".

	• perception of success of fishing trip	
Where	**Dockside face-to-face interviews** **Telephone interviews** if face-to-face is not possible	"Sometimes you could hang down there [at the dock]. Bring coffee and tea and hang down there. If you want it to work out, the best thing to do is be there".
When	**Survey effort should vary by season.** March to September are the busiest fishing times. Daily surveys may be best then; weekly might suffice in other seasons Ideally **individual harvesters can suggest their preference for survey frequency**	"I think you have to think about how people do their harvesting through the year … the survey should almost be adapted throughout the year in terms of target species. It can be extended across the year". "For the success of a program, it's important that someone knows the pulse of fishing in the community. Everyone knows when someone goes out. You need to be making a call that day".
How	**Face-to-face dockside surveys**, or as preferred by individual harvesters Build **trust** with harvesters (e.g., those interviewing harvesters should introduce themselves and their role in the program so that fishers can put a face to a name) **Communicate out** about the program, for example through: • face-to-face conversations with harvesters and their families,	"What if you were to ask people [about their preferred survey method] the first time you contacted them? Klemtu is so small… it's a special case here. Things that would never work anywhere else are possible here". "You need to be on the ball and have your finger on the pulse of the community. You need to be listening to the VHF or staring out the window. Once you've got trust and

	either down at the docks or at their homes • social media posts • hardy copy notifications to harvesters posted in public spaces • throughout the season, and yearly summary	built support for the program then people will text you".
Why	Information needed to support the Nation's ability to make **management decisions**	"Let [community members] know how this will benefit what the community has. Let them know our plans of restoring our resources and helping control who takes this in and out of the community, what it is used for, and helping control the distribution of resources".

Table 3.1 Summary of Kitasoo Xai'xais knowledge holders' recommendations regarding the what, where, when, how, and why of a catch monitoring program

In-season dockside monitoring and post-season interviews

The pre-season interviews, including reflections about past and ongoing fisheries monitoring, and recommendations for this new monitoring program, informed the development of the in-season dockside monitoring pilot program carried out in 2022 and 2023. Following two seasons of piloting the in-season dockside monitoring pilot project in the Nation's FSC fishery, we held post-season interviews to reflect on the program and determine which elements were most important for the FRRA community-based fishery monitoring structure. Post-season interviewees reflected on some of the lessons learned from the dockside monitoring pilot program to inform their recommendations for the community-based fishery monitoring program. Results from the post-season interviews are outlined in Table 2 below. The summarized findings center voices from Kitasoo Xai'xais harvesters, community members, leadership, and stewardship staff in articulating a vision for community-based fishery monitoring.

Elements necessary for an effective CBF monitoring system	**Illustrative Quotes**
Accessibility	"It's important that the [catch] monitoring program is affordable for fishers". "[The monitoring program] needs to be cost effective. We can't be putting the monitoring burden on the community-based fishers who are fishing limited amounts of quotas". "I would like to see a [monitoring] process that is largely dockside. That will increase cost effectiveness".
Adaptivity	"Up front, we need to be adaptive in terms of responding to the size and scale of our fishery and the data we're collecting until we get it right. Not being scared to adapt is important".
Communication	"It's important to have good communication and understanding of the program [to the community]. Information out and season recaps. There are more questions that come in form the families than from the harvesters".
Consistency	"We want to be rigorous and consistent in the way we collect data".
Data accuracy	"It's important to create a good system where we're always gathering the right information". "The robustness of the [current] reporting process has been super useful at informing both FSC numbers and work we're doing with the community-based fisheries. It has been useful at informing how we transfer the learnings

	to the work we need to do at those tables. It goes a long way to create that expectation and vice versa. We have to [operate] at a high level of rigor in the community-based fisheries which will feed back into the food fisheries".
Governance	"The power of a monitoring program is to gather information for the Nation to make decisions. We need to know which areas have enough and which areas need more help … We need everything to be documented: marine, terrestrial, medicines. If Kitasoo Xai'xais works towards controlling all management decisions, we will know what we have on the land". "We're buying all these [FRRA] licenses back and need to make decisions on them". "It will be important to communicate about community fishing notices and that those notices are based on local management [decisions]."
Innovation	"This is an opportunity to think outside the box. For many fisheries, we're hoping to reset the clock in terms of catch monitoring. Up front, we will have to demonstrate that these alternatives are viable. They are a unique opportunity." "… it's important to get the zeroes. Electronic monitoring data will give you that. It will be more accurate than the logbooks". "The [electronic monitoring] program needs to be capable of being multi-species. Each fishery has its own sampling protocol and somehow we need to create a one stop shop. I think that with the Coast Tracker, a simple *set / haul* button would really help and that can apply as easily to halibut as to prawn".

Job creation	"With any dockside validation or monitoring program, we want to create jobs. We want to create more employment than just dockside validation and processing alone".
Nation driven	"First and foremost, [the program] needs to be Nation driven. We're not going to get support for the catch monitoring program unless it's Nation driven".
Scalable	"Presumably, if we come up with something that works for us it should work for other fisheries as well. Ideally this should be applied coast wide".

Table 3.2 Elements necessary for an effective Kitasoo Xai'xais community-based fishery monitoring system

Fishers emphasized the importance of data gathering accuracy, adaptability, and flexibility in a fisheries monitoring context. Local fisheries managers noted that the community-based fisheries can give the Nation an accurate reflection of food fish catches as the program catalogues the community-based fishery bycatch. Due to the multi-species nature of the Nation's food fishery, the future community-based fishery dockside validation model must be flexible enough to capture a variety of different species that might be harvested during a single fishing trip. Harvesters explained the importance of having the ability to gather information beyond those harvested in the commercial community-based fishery, for example, seagull eggs, deer, and cockles. Monitoring approaches also should be adaptable for different gear types that may be used on a single fishing trip. The insights from community members and fisheries managers around the food fishery are particularly relevant to the FRRA community-based fisheries as fishers will be able to participate in their food fishery while fishing their commercial license. Fishing for both commercial and food purposes works towards a circular economy and decreases food waste. Harvesters also noted that dockside validation programs should be flexible enough to gather information on commercial and FSC catch in one interview. Finally, KXSA staff noted the importance of developing a dockside survey with the ability to accurately capture where fishers were unsuccessful in catching a particular species.

Other themes raised in discussion with Kitasoo Xai'xais Nation members and staff included monitoring capacity, intergenerational knowledge transfer, and communication. The importance of developing a monitoring program that is adequately resourced in terms of staffing capacity is essential. The theme of intergenerational knowledge also arose in conversations with harvesters, specifically around the importance of teaching youth how to participate in the Nation's community-based fisheries. Fishers noted the importance of communicating how the monitoring program will work towards the community's benefit and work to share results with harvesters.

Nation management and governance as it relates to community-based fishery monitoring repeatedly came up as a theme during interviews. Catch monitoring is an exercise of governance, and Nation members identified its importance in informing management decisions. During interviews, harvesters proposed re-invigorating the Nation's food fish committee, a body that contributes to fisheries management direction for the community. The Nation's food fish committee determines which areas are open to fishing within the territory and which are closed. Harvesters suggested using the Kitasoo Xai'xais marine working group to review and update the Nation's food fish policy. Fishers also emphasized the importance of bringing these perspectives to the FRRA government to government tables currently developing community-based fishery monitoring frameworks for various species.

Discussion and Significance

This Chapter outlines the co-created research process that we used to document the Kitasoo Xai'xais vision around community-based fishery monitoring. Other studies have similarly documented the steps they took to develop their community-based monitoring programs (Parlee and Lutsel K'e Dene First Nation, 1998; Thompson et al., 2019). In this study, we detail the process of collaboratively identifying the Nation's research priorities and objectives related to fisheries monitoring and co-designing the study methodology with Kitasoo Xai'xais stewardship staff. The Lutsel K'e Dene First Nation's *Community-Based Monitoring Pilot Project* developed a model for community-based monitoring in 1996 (Parlee and Lutsel K'e Dene First Nation, 1998). The research team documented the participatory process they designed to carry out their research (Parlee and Lutsel K'e Dene First Nation, 1998). The aim of this pilot project was to meaningfully

involve the Lutsel K'e Dene community in documenting the effects of mineral resource extraction on their community (Parlee and Lutsel K'e Dene First Nation, 1998). The research team outlined their study process, wherein researchers sought guidance from community members around monitoring indicators and, similar to our research outlined in this Chapter, collaboratively developed their questionnaires with community researchers (Parlee and Lutsel K'e Dene First Nation, 1998). Our co-developed research process also has parallels to that described in the Gitga'at "We Monitor by Living Here" project (Thompson, 2015). In both research frameworks, the research objectives and priorities were driven by the partner First Nations (Thompson, 2015). Similarly, in both projects the research methodology was developed through meetings with community members and research staff (Thompson, 2015). While the "We Monitor by Living Here" project iteratively tested and revised monitoring methods with harvesters on a seasonal basis (Thompson, 2015), our research sought out reflections from harvesters following the delivery of the pilot program. Documenting and sharing the co-created research process is an important component of community-based collaborations between Indigenous and non-Indigenous research partners (Thompson et al., 2019). Communicating out on the process that we co-developed to carry out this study allows other interested researchers and communities to adapt it as necessary.

The findings of this research advance the notion that monitoring systems should be designed by and led by First Nations as a way to recognize their authority to monitor and manage their fisheries. Monitoring itself is an exercise in Indigenous governance, and therefore it is essential that First Nations have a voice in designing and implementing fisheries monitoring programs (Thompson et al., 2019). Indeed, as the results of this study suggest, small-scale fisheries require different approaches than industrial fisheries in terms of monitoring. The cost effectiveness of assessing and managing multi-species fisheries represents a challenge to fisheries managers and harvesters around the world (Newman et al., 2018). This finding was similarly highlighted by Kitasoo Xai'xais knowledge holders who spoke to the importance of cost effectiveness and accessibility of a monitoring program for community-based fishers. In the current DFO-led commercial monitoring system, different commercial industries require various arrangements with third party service providers. For community-based harvesters fishing multiple commercial licenses, monitoring each of these fisheries individually with various third-parties represents a significant cost to their operations. For example, the Kitasoo Xai'xais Nation piloted their first community-

based fishery in spring 2024 with a local harvester and discovered that the cost for the third-party monitoring system for prawn would represent around 14% of the fisher's total landed value for the fishery (personal communications, anonymous). The third-party monitoring system for the groundfish industry would have represented around 40% of the community-based harvester's total landed value for fishing a halibut license (personal communications, anonymous). At the scale that FRRA community-based fisheries intend to operate, local harvesters fishing with low tech gear off of small vessels may experience challenges harvesting enough to make their fishing trip cost effective relative to the monitoring cost. The expense associated with DFO's current monitoring model creates an accessibility barrier that stands at odds with the stated objectives of the FRRA community-based fisheries around empowering Indigenous peoples to meaningfully participate in the commercial fishing industry. Beyond cost effectiveness, monitoring systems should be designed to respond to the unique flexibilities of the FRRA community-based fisheries from an operability perspective as well. Electronic monitoring systems that require cameras may not be suitable for the variety of vessel types that local harvesters choose to fish off of. For example, open deck punts used commonly by local harvesters in Klemtu are not designed to mount camera equipment. Furthermore, the species-specific monitoring approach standardized by Fisheries and Oceans Canada is impractical for holistically understanding the broad range of environmental and anthropogenic stressors that may impact multi-species fisheries (Johannes, 1998; Newman et al., 2018; Boyce et al., 2021). Kitasoo Xai'xais community members and harvesters spoke to the importance of holistically monitoring their fisheries with a monitoring approach designed to collect both social and ecological information. The FRRA monitoring framework developed by the governance partners should be tailored to address these unique community-based fisheries characteristics.

Our results have practical significance to the Kitasoo Xai'xais Nation as this research lays the groundwork for the establishment of the Kitasoo Xai'xais community-based fisheries monitoring program. Kitasoo Xai'xais technical representatives can directly translate outputs from this project into government-to-government processes with Canada and other FRRA signatories. As the FRRA is now being implemented by Canada and the signatory Nations, all parties are working together to develop a tailored approach to catch monitoring within the community-based fisheries. This was identified as a priority area of work within the FRRA.

The signatory Nations are collaboratively developing a Nation-led catch monitoring vision to guide these discussions with Canada. The intent is to ensure that the monitoring framework is reflective of the Nations' values of stewardship and conservation and that it is designed to enable the success of community members who participate (Coastal First Nations, n.d.). Kitasoo Xai'xais representatives can use the learnings from this research to leverage the perspective of Kitasoo Xai'xais community members within these discussions to ensure that the resulting monitoring framework effectively meets the needs of the community. This research centred the vision of Kitasoo Xai'xais harvesters and leadership as community-based fisheries are implemented and collaborative monitoring and management structures are developed.

As internal monitoring capacity is built up within KXSA, we anticipate that future work lies in addressing challenges around sourcing long-term program funding and consistent staffing within the remote community of Klemtu. Moving forward through the FRRA implementation process, the Nation will eventually determine who will bear the long-term cost of the community-based fishery monitoring program. The Nation can ensure that this decision aligns with the findings of this research, where Kitasoo Xai'xais knowledge holders and stewardship staff have highlighted the importance of monitoring program accessibility and cost effectiveness for participating harvesters. Should the monitoring program be funded by community-based fishers themselves (the model used for many industrial fisheries) (Karp and McElderry, 1999), the Nation can work to ensure that the program cost is reasonable as compared to the revenue generated from fishing.

While we aimed to interview a subset of Kitasoo Xai'xais knowledge holders and stewardship staff for this research, we recognize the limitations in our sample size. There are a limited number of people who spend significant time harvesting in Klemtu and a related need may be to support community members' access to fishing opportunities. Additionally, we were unable to pilot the dockside monitoring program in the Nation's community-based fisheries because they had not been implemented yet. Piloting the program in the FSC fishery as a proxy gave us practical insights related to the delivery of the program that we can adapt to the community-based fishery. Opportunities to better understand the monitoring needs of the community will arise as the

community-based fisheries are implemented and experiential knowledge is gained through the act of doing.

Looking beyond the Kitasoo Xai'xais context, this research is applicable to other First Nations in the Northern Shelf Bioregion and beyond as they implement their own community-based fisheries. The iterative and co-created research process used to carry out this research may be adapted by other Indigenous groups who are interested in documenting their own community visions for fisheries monitoring. Academics and fisheries managers who are interested in reimagining catch monitoring methods for small-scale fishers might also be interested in the resulting vision articulated by the Kitasoo Xai'xais through this research. The findings from this research can support the design of community-led fisheries monitoring programs which enables better informed fisheries management decisions.

Chapter 4: Conclusion

Introduction

The recently ratified Fisheries Resources Reconciliation Agreement (FRRA) inspired the research effort to document a collective Kitasoo Xai'xais vision for community-based fisheries monitoring. This thesis explored different fisheries monitoring structures by advancing the following research questions: (1) What are successful community-led models of fisheries monitoring used in commercial small-scale fisheries across the globe?; (2) Based on past and present experience and future aspirations, what could a Kitasoo Xai'xais commercial fisheries monitoring program look like? In this chapter, I present the findings related to these questions and reflect on their potential applications within Kitasoo Xai'xais territory and to other First Nation governments in the region. This chapter also describes the academic contributions offered by this research, the limitations of the study, and discusses suggestions for future research.

Question 1: What are successful community-led models of fisheries monitoring used in commercial-small scale fisheries across the globe?

While conceptualizing the research process for this thesis, we decided that the study should be grounded in a literature review surveying various models of community-led fishing programs.
We explored research question 1 by scoping out existing small-scale fisheries monitoring efforts and identifying hallmarks of successful programs. I analyzed 54 peer reviewed journal articles, focusing on relevant fisheries monitoring models that could inform the implementation of the Kitasoo Xai'xais community-based fisheries monitoring program. The monitoring practices synthesized in the literature review included catch monitoring, biological or species monitoring, and fisheries compliance monitoring. Using targeted literature searches, I examined various monitoring techniques applied within in three fisheries models: co-managed fisheries, Locally Managed Marine Areas (LMMAs), and Territorial Use Rights Fisheries (TURFs). Across all small-scale fisheries models surveyed, we found that foundational elements of successful community-led fisheries monitoring programs included participatory decision-making structures, collaborative research, and adaptive management practices.

For catch monitoring programs to find increased uptake in small-scale fisheries, studies found that local communities should be involved in the development of monitoring programs and in the decision-making processes informed by them (Berkes et al., 2001; Long, 2017, Chevallier et al., 2021). This recommendation mirrors those made by Kitasoo Xai'xais knowledge holders, who signified that their community-based fishery monitoring program should be Nation driven and guided by their legal traditions, values, and customs. Kitasoo Xai'xais community members also indicated the importance of linking monitoring information with the Nation's governance processes. The FRRA community-based fishery, as a co-managed fishery with Fisheries and Oceans Canada, will feed into decision-making processes made by the Nation. Through regional government-to-government tables, Kitasoo Xai'xais technical representatives can work to ensure that co-management processes established through the FRRA adequately respond to information arising from the community-based fisheries' monitoring initiatives.

In addition to governance objectives, researchers also cited collaborative and participatory research as a hallmark of successful small-scale fisheries monitoring programs (Berkes, 2009; Davis and Korneski, 2012; Gardner et al., 2020; Mullowney et al., 2020). In studies that we surveyed, programs that incorporated meaningful collaborative research between harvesters and governance partners fostered trust and understanding between parties (Berkes, 2009; Mullowney et al., 2020). In collaborative research arrangements, monitoring programs succeed where the information inputs are clearly defined and agreed upon by both parties (Linke and Jentoft, 2013; Mullowney et al., 2020). These recommendations support the government-to-government work that the Kitasoo Xai'xais Nation is engaged in around collaboratively defining monitoring objectives and data inputs for the FRRA community-based fisheries. With any monitoring program that is established in the community, Kitasoo Xai'xais knowledge holders have emphasized the importance of community members leading research programs at the local level. This finding is consistent with Govan et al.'s recommendation that external monitoring expertise should not be relied upon for fisheries information and instead, community-led approaches should prioritized (Govan et al., 2009). The FRRA community-based fisheries monitoring program should empower community members to gather relevant fisheries information that can inform the Nation's collaborative fisheries management decisions.

Within the case studies surveyed, several researchers recommended that best practices for small-scale fisheries monitoring programs include adaptive management (Govan et al., 2009; Wilson, 2009; Mullowney et al., 2020). For monitoring programs and decision-making processes to be effective, they must be adaptable as new information becomes available (Wilson, 2009; Mullowney et al., 2020). Kitasoo Xai'xais fisheries managers similarly highlighted the importance of adaptivity for the FRRA community-based fisheries, emphasizing that the community monitoring program should be adaptive in terms of responding to the size and scale of the Nation's fisheries. Once the Nation's community-based fisheries are implemented, the monitoring approach should be designed to effectively adapt to changing needs and priorities as they arise.

For the FRRA community-based fisheries monitoring program to be successful, it must be driven by Nation-priorities and reflect the values and culture of the communities within which it is implemented (Coastal First Nations, n.d.). This also aligns with what we learned about the hallmarks of successful co-managed fisheries monitoring programs through our literature review. Through our survey of co-developed monitoring programs, we learned that monitoring structures were more successful when they were reflective of the cultural values of the community (Islam and Berkes, 2016) and where monitoring efforts are driven by community-led priorities and approaches (Govan et al., 2009). The results of long-term catch monitoring research in some areas suggest that top-down approaches to monitoring and management are unable to adequately consider the localized ecological and socioeconomic complexity of small-scale fisheries (Chevallier et al., 2021), which further emphasizes the importance of community-led monitoring approaches.

Question 2: Based on past and present experience and future aspirations, what could a Kitasoo Xai'xais commercial fisheries monitoring program look like?

To answer this question, we applied a participatory research approach through which we explored 3 sub-research questions: (1) what are past and present Kitasoo Xai'xais fisheries management and monitoring practices used to inform the Nation's fisheries management decisions?; (2) what are Kitasoo Xai'xais community members' recommendations for the development of a dockside monitoring program?; and (3) what are the high-level objectives and priorities that can inform the development of a community-based fishery program?

Through over 30 informal meetings with Kitasoo Xai'xais Authority (KXSA) staff and knowledge holders, we identified overarching research objectives and co-created the research methodology that guided our work. In these initial conversations, KXSA staff identified guiding research priorities, which emphasized that the study must be community-driven, and the research outputs should be directly applicable to Kitasoo Xai'xais governance and fisheries management decisions. Our research process included 2 qualitative interview components, complemented by a dockside survey composed of both qualitative and quantitative questions.

Question 1. What are past and present Kitasoo Xai'xais fisheries management and monitoring practices used to inform the Nation's fisheries management decisions?

Recognizing past and present Kitasoo Xai'xais fisheries management and monitoring actions honours and builds upon the Nation's long-standing fisheries stewardship practices. We explored question 1 through semi-formal "pre-season" interviews with knowledge holders, stewardship staff, and policy advisors for the Nation. We identified participants through a snowball sampling approach, and our subsequent conversations followed a semi-structured interview guide. These interviews offered us insight into the Nation's fisheries monitoring approaches and established a foundation upon which we could build the FRRA community-based fishery monitoring vision.

While describing past and present Kitasoo Xai'xais monitoring methods, knowledge holders and stewardship staff highlighted that the practice of harvesting itself is both monitoring and management. Kitasoo Xai'xais community members have made observations while harvesting out on the land for thousands of years. Those observations have informed fisheries management decisions made by the Nation. This finding is consistent with perspectives from other Nations in the region, where the documentation of observations produced through harvesting has informed social-ecological monitoring processes for millennia (Thompson et. al, 2019). Recent research in Gitga'at Territory has produced a conceptual framework which describes how Gitga'at community members monitor their lands and waters through use and occupancy (Thompson et al., 2019). This framework, co-created in partnership with researchers from the University of Victoria, illustrates the social and ecological indicators that Gitga'at people use to monitor while harvesting out on the

land (Thompson et al., 2019). During the pre-season interviews, Kitasoo Xai'xais harvesters spoke to similar monitoring methods, whereby community members would make holistic in situ observations at the ecosystem level and communicate them as necessary to Nation leadership. Similar to the Gitga'at monitoring framework, in addition to ecological observations, social indicators around community food security inform Kitasoo Xai'xais monitoring systems. Many of the long-standing Kitasoo Xai'xais monitoring practices are informed by Indigenous law, which is passed down through generations by hereditary leadership and community members. Kitasoo Xai'xais guiding principles around respect, interconnectedness, reciprocity, and intergenerational knowledge (KXSA, 2021) inform the Nation's methods of caring for their territory and community.

Question 2. What are Kitasoo Xai'xais community members' recommendations for the development of a dockside monitoring program?

During the pre-season interviews, we asked participants about their recommendations for the development of a catch monitoring program that could inform the FRRA community-based fisheries monitoring structure. These conversations were a critical step outlined in the co-created methodology process for this research. Through a series of informal interviews, knowledge holders and stewardship staff reflected on the what, where, when, how, and why of a Kitasoo Xai'xais-led catch monitoring program. Many recommendations made by interviewees mirrored those we learned about in the literature review, around the importance of clear and persistent communication (Mullowney et al., 2020), community-based participatory approaches to monitoring program development (Govan et al., 2009; Chevallier et al., 2021), and connection of monitoring information into governance processes (Long, 2017).

Following the pre-season interviews, we co-created a draft dockside catch monitoring interview guide through an iterative review process with harvesters. Following the harvest season, we solicited suggestions from fishers around how to improve the catch monitoring program and dockside interview guide by incorporating targeted questions into the post-season surveys we carried out. The dockside catch monitoring interview guide is available as an appendix to other interested groups to adapt for their individual objectives and priorities.

Question 3. What are the high-level objectives and priorities that can inform the development of a community-based fishery program?

Following two harvest seasons, we carried out "post-season" interviews, aimed at reflecting on lessons learned in the FSC dockside catch monitoring pilot project and from those learnings, identifying the Nation's objectives and priorities for the FRRA community-based fisheries monitoring program. We developed an interview guide that prompted interviewees to describe the elements of a successful Kitasoo Xai'xais commercial fishing monitoring program. Much of what we heard is consistent with the academic literature on community-led monitoring programs. In recognizing the impact that small-scale fisheries can have on species composition within harvesting areas (Hawkins and Roberts, 2004; Villar et al., 2023), the Kitasoo Xai'xais vision for monitoring emphasizes the importance of robust and consistent monitoring structures that are able to operate at a high level of rigor in terms of data collection. Small-scale fisheries research has found that effective monitoring systems are adaptable as new information becomes available (Mullowney et al., 2020), which is consistent with the recommendations described through the post-season interviews.

To support the long-term resiliency of community-based monitoring programs, the communities themselves must hold governance and decision-making authorities (Garcia and Lescuyer, 2008; Thompson et al., 2019). Kitasoo Xai'xais knowledge holders and stewardship staff similarly emphasized the importance of ensuring that information collected from the monitoring program informs the Nation's fisheries management decisions. During the time that this research was carried out, the Kitasoo Xai'xais Nation re-invigorated its food fish committee, revising the Nation's food fish policy and updating the committee's structure. The fisheries monitoring program developed through this project can inform both the food fish committee's decisions as well as the Nation's collaborative decision-making processes established under the FRRA. Chapter 3 adds to the growing body of literature that highlights the importance of Indigenous governance systems and long-standing relationships of in situ knowledge gathering and documentation while out on the land (Thompson et al., 2019).

Applications within and beyond Kitasoo Xai'xais territory

An anticipated application of this research within Kitasoo Xai'xais territory is its practical ability to build the Nation's capacity to carry forward a multi-species catch monitoring program beyond the temporal range of this thesis. Through our literature review, we learned that efforts to build monitoring capacity within fishing communities was a key driver in monitoring program success (Kawaka et al., 2016; Davis et al., 2015). This aligns with similar findings around the notion that collaborative research should be judged by its capacity to transition research skills to partnered communities rather than by its primary research outputs (Coombes et al., 2014; Thompson et al., 2019). As the FRRA community-based fisheries are implemented, the KXSA monitoring program will be further refined and scaled up to fit the monitoring needs of the fisheries.

The findings of this research have applications at the policy level, where Kitasoo Xai'xais technical representatives sit at government-to-government tables with other FRRA signatory Nations and Fisheries and Oceans Canada. All parties are currently working together to develop a tailored catch monitoring approach to inform the community-based fisheries. During the time of this research, the signatory Nations began collaboratively developing a Nation-led monitoring vision to guide their discussions with Canada. The results of this research assisted Kitasoo Xai'xais technical staff in leveraging the vision of Kitasoo Xai'xais community members and harvesters in these discussions, to ensure that the monitoring framework is reflective of the Nation's needs.

Academic Contributions

This thesis outlines the co-created research process that we used to document the Kitasoo Xai'xais vision for a community-based fishery monitoring program. Other studies have illustrated the importance of detailing the steps taken to develop community-based monitoring programs (Parlee and Lutsel K'e Dene First Nation, 1998; Thompson et al., 2019). In this thesis, we outline the process that we used to identify the Kitasoo Xai'xais Nation's research priorities and detail the co-created methodology we developed as a team. Documenting this process contributes to the academic literature around co-created methodologies centering Indigenous research.

Study limitations

This thesis primarily focused on FRRA community-based fisheries monitoring; however, we learned through our interviews that the Kitasoo Xai'xais community is interested in gathering information around all harvest, inclusive of marine, terrestrial, and medicinal flora and fauna. Through the interview process, knowledge holders indicated the importance of monitoring for all types of harvest and feeding this information into the Nation's management decisions. This indicates an opportunity for future work, where the Kitasoo Xai'xais fisheries monitoring program can be adapted and scaled up to gather a wider variety of information around terrestrial and medicinal harvest.

We were unable to pilot the dockside monitoring program in the Kitasoo Xai'xais community-based fishery because it had not been implemented at the time of this research. Instead, we piloted it in the Kitasoo Xai'xais FSC fishery as a proxy because many of the same community members will participate in both fisheries. Piloting the program in the Nation's FSC fishery gave us valuable information about the implementation of a dockside catch monitoring program in Klemtu, but we recommend that additional work be carried out to better understand the monitoring needs of the Kitasoo Xai'xais community-based fisheries as they are implemented. Finally, although the Kitasoo Xai'xais Nation co-created this research project and it was carried out using participatory methods, this thesis is written from my perspective as a non-Indigenous woman and should not be interpreted as a Kitasoo Xai'xais perspective.

Suggestions for future research

While the literature review undertaken in Chapter 2 focuses on the hallmarks of effective catch monitoring, biological monitoring, and fisheries compliance monitoring programs, we limited our research scope to only exploring Kitasoo Xai'xais community members' perspectives on catch monitoring for this Master's thesis. However, the FRRA community-based fisheries will require that compliance monitoring structures are established in addition to catch and biological monitoring programs. Future research opportunities exist in ensuring that catch, biological and compliance monitoring systems for the community-based fisheries are reflective of Kitasoo Xai'xais needs and priorities.

Through the post-season interview process, Kitasoo Xai'xais knowledge holders and stewardship staff spoke to the importance of accessibility within community-based fisheries monitoring systems. Third party fisheries monitoring systems are expensive and may represent a barrier to accessibility of the community-based fishery program to local harvesters. Future research opportunities related to developing novel fisheries monitoring technologies may have the power to decrease monitoring costs and creating more equitable access to economic opportunities within the Nation's community-based fisheries.

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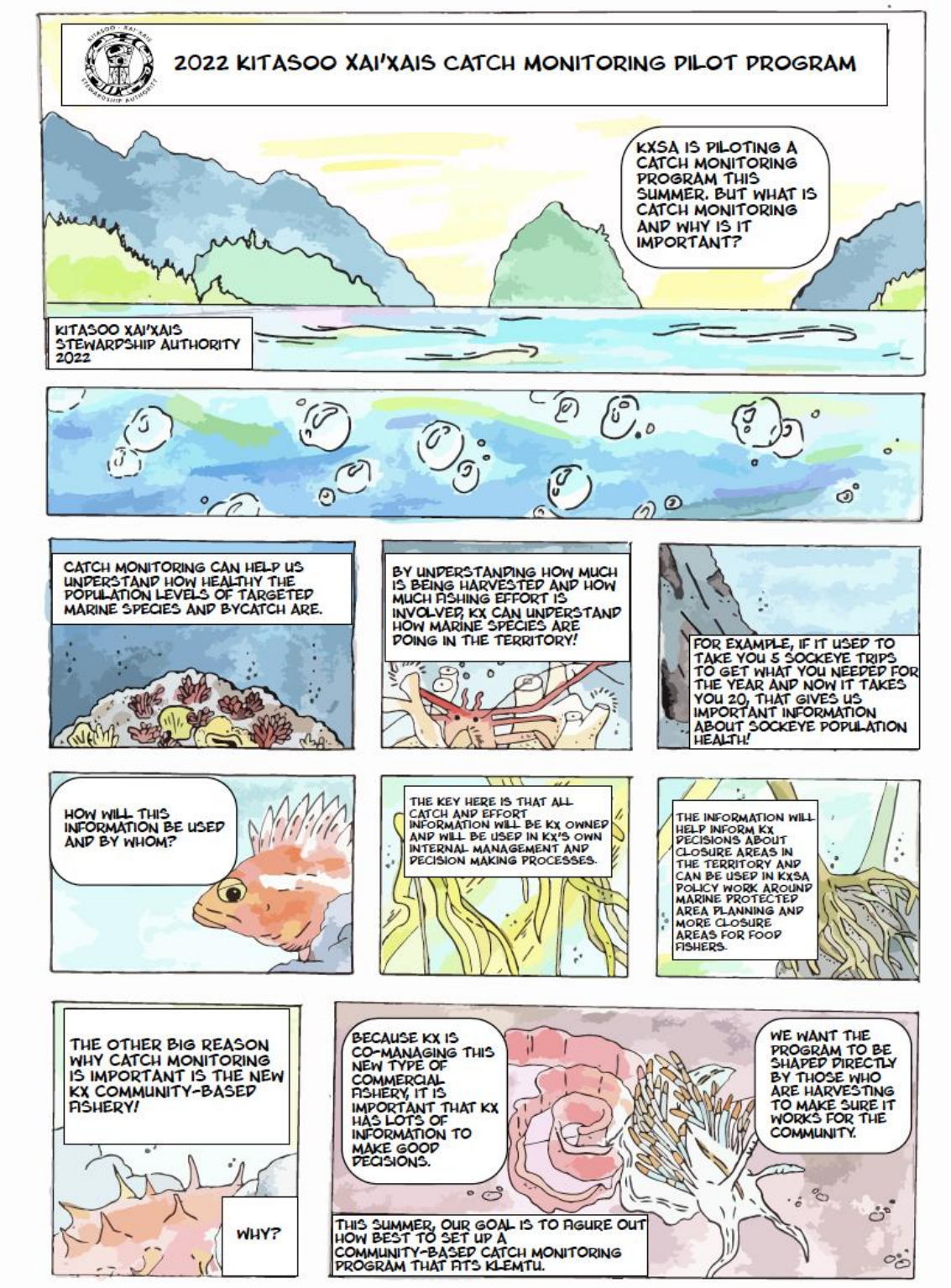
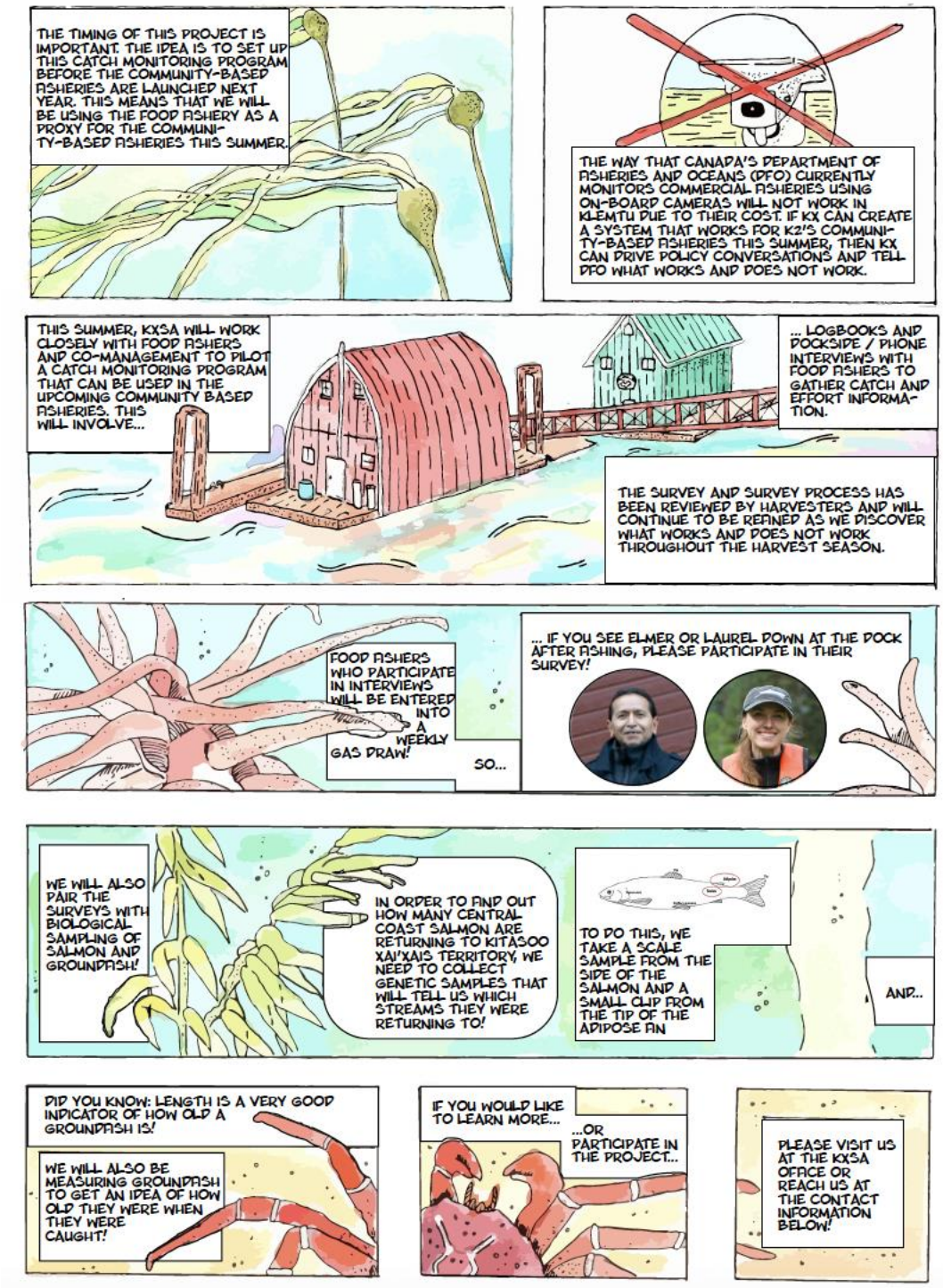
Appendices

Appendix A: Community catch monitoring notification




THE TIMING OF THIS PROJECT IS IMPORTANT. THE IDEA IS TO SET UP THIS CATCH MONITORING PROGRAM BEFORE THE COMMUNITY-BASED FISHERIES ARE LAUNCHED NEXT YEAR. THIS MEANS THAT WE WILL BE USING THE FOOD FISHERY AS A PROXY FOR THE COMMUNITY-BASED FISHERIES THIS SUMMER.
THE WAY THAT CANADA'S DEPARTMENT OF FISHERIES AND OCEANS (DFO) CURRENTLY MONITORS COMMERCIAL FISHERIES USING ON-BOARD CAMERAS WILL NOT WORK IN KLEMTU DUE TO THEIR COST. IF KX CAN CREATE A SYSTEM THAT WORKS FOR K2'S COMMUNITY-BASED FISHERIES THIS SUMMER, THEN KX CAN DRIVE POLICY CONVERSATIONS AND TELL DFO WHAT WORKS AND DOES NOT WORK.
THIS SUMMER, KXSA WILL WORK CLOSELY WITH FOOD FISHERS AND CO-MANAGEMENT TO PILOT A CATCH MONITORING PROGRAM THAT CAN BE USED IN THE UPCOMING COMMUNITY BASED FISHERIES. THIS WILL INVOLVE...
... LOGBOOKS AND DOCKSIDE / PHONE INTERVIEWS WITH FOOD FISHERS TO GATHER CATCH AND EFFORT INFORMATION.
THE SURVEY AND SURVEY PROCESS HAS BEEN REVIEWED BY HARVESTERS AND WILL CONTINUE TO BE REFINED AS WE DISCOVER WHAT WORKS AND DOES NOT WORK THROUGHOUT THE HARVEST SEASON.
FOOD FISHERS WHO PARTICIPATE IN INTERVIEWS WILL BE ENTERED INTO A WEEKLY GAS DRAW!
SO...
... IF YOU SEE ELMER OR LAUREL DOWN AT THE DOCK AFTER FISHING, PLEASE PARTICIPATE IN THEIR SURVEY!
WE WILL ALSO PAIR THE SURVEYS WITH BIOLOGICAL SAMPLING OF SALMON AND GROUNDFISH!
IN ORDER TO FIND OUT HOW MANY CENTRAL COAST SALMON ARE RETURNING TO KITASOO XAI'XAIS TERRITORY, WE NEED TO COLLECT GENETIC SAMPLES THAT WILL TELL US WHICH STREAMS THEY WERE RETURNING TO!
TO DO THIS, WE TAKE A SCALE SAMPLE FROM THE SIDE OF THE SALMON AND A SMALL CLIP FROM THE TIP OF THE ADIPOSE FIN
AND...
DID YOU KNOW: LENGTH IS A VERY GOOD INDICATOR OF HOW OLD A GROUNDFISH IS!
WE WILL ALSO BE MEASURING GROUNDFISH TO GET AN IDEA OF HOW OLD THEY WERE WHEN THEY WERE CAUGHT!
IF YOU WOULD LIKE TO LEARN MORE...
...OR PARTICIPATE IN THE PROJECT...
PLEASE VISIT US AT THE KXSA OFFICE OR REACH US AT THE CONTACT INFORMATION BELOW!

Appendix B: Dockside harvester interview guide

Researcher Name:
Date and Time of Interview:

Date of Fishing Trip:		**Fisher Name:**				**IN / OUT:**		
1. Number of Salmon Species & Effort								
Location	Hours Fished	Gear Type	If gillnetting: # of sets at each location and Net Length (ft)	Chum: Kept / Rel	Chinook: Kept / Rel	Sockeye: Kept / Rel	Coho: Kept / Rel	Pink: Kept / Rel
1.)								
2.)								
3.)								
2. Number of Groundfish Species & Effort								
Location	Hours Fished	Gear Type	Depth (ft)	Halibut: Kept / Rel	Lingcod: Kept / Rel	Dogfish: Kept / Rel	Rockfish (list species) _____ Kept / Rel	
1.)								
2.)								
3.)								
3. Number of Crab & Effort								
Location		Number of Traps	Average Trap Depth (ft)		Soak Time	Crab Kept: M/F	Crab Rel: M/F	Green Crab: # caught
1.)								
2.)								
3.)								
4. Number of Prawn & Effort								
Location		Number of Traps	Average trap depth (ft)		Soak Time	Prawn: Kept / Released (5 gallon buckets)		
1.)								
2.)								
5. Other (i.e. Sea cucumber, urchin, clams, cockles, deer, sea lion, seaweed)								
Location	Hours Fished	Gear Type	_____ Kept		_____ Kept		_____ Kept	
1.)								
2.)								
3.)								
6. Is there anything you tried to catch that you didn't get? Where? _____						**7. How was fishing today? (circle) Good Okay Bad**		
9. Was the trip a success? (circle) Yes No Why or why not? _____						**10. Fuel Cost:** _____		
11. Who will this harvest be shared with? _____					**12. Circle one: Refusal Partial Catch data given (not verified) Biosamples / Full**			

Rockfish codes: YE = yelloweye; QU = quillback; SH = shortraker; CO = copper; CH = china
VE = vermillion; BO = bocaccio; CA = canary; TI = tiger; BL = black; BR = brown

Appendix C: Supplementary materials

University of Victoria
School for Environmental Studies

Participant Consent Form

Kitasoo Xai'xais Multi-Species Catch Monitoring

You are invited to participate in a study entitled "Kitasoo Xai'xais multi-species catch monitoring". This is a collaborative project between the University of Victoria and the Kitasoo/Xai'xais First Nation. The project is being conducted by Natalie Ban and Laurel Sleigh, and a community research assistant (TBD). Kitasoo Xai'xais Stewardship Authority (KXSA) staff and affiliates may also participate in conducting interviews. Natalie Ban is a professor in the School of Environmental Studies at the University of Victoria and you may contact her at 250-889-8285 or nban@uvic.ca. Laurel Sleigh is a graduate student, and she can be contacted at 250-852-2655.

Purpose and Objectives
This project has been developed together with KXSA. The goal of this project is to is to develop a multi-species catch monitoring program that can be used by the Kitsaoo Xai'xais Nation in the internal management of their resources.

Importance of this Research
This project will assist the Kitasoo Xai'xais First Nation in developing a multi-species catch monitoring program which can be used by the Nation to inform management decisions around marine resources and fisheries.

Participant Selection
You are invited to participate in this study because of your long history of experiences harvesting in the KX territory.

What is involved
Interviews: If you consent to participate in this research, your participation will include a ~1 hour interview in a location that is comfortable and convenient. The interview will inquire about your knowledge about past and present Kitasoo Xai'xais fisheries management and monitoring practices. Audio-tapes and written notes will be taken and a transcription will be made.

Surveys: if you consent to participate in this research, your participation will include a ~15 minute survey, recurring (frequency TBD). The survey will inquire about what you have caught fishing and how much effort you exerted catching it.

Inconvenience, risks, and benefits
Participation in this study may cause some inconvenience to you, including the time committed to the interview. There are few known or anticipated risks to you by participating in this research, including emotional or physical fatigue in disucssing topics around marine fisheries mangement. The potential benefits of your participation in this research include being able to share your knowledge to inform fisheries management in KX territory.

Compensation
As a way to compensate you for any inconvenience related to your participation, you will be given an honorarium of $TBD. If you consent to participate in this study, this form of compensation to you must

not be coercive since it is unethical to provide undue compensation or inducements to research participants. If you would not participate if the compensation was not offered, then you should decline.

Voluntary Participation
Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at **any time** without any consequences or any explanation. If you do withdraw from the study your data will be used only with permission and your compensation adjusted to match time contributed fairly.

Anonymity and Confidentiality
Your name will remain unlisted and data provided anonymous unless you otherwise consent to the use of your name in research outputs or photos (See below in Anonymity section). Your confidentiality and the confidentiality of the data will be protected by password protected computers.

Dissemination of Results
It is anticipated that the results of this study will be shared with others in the following ways: through community workshops, directly to participants, scientific journal publications, scholarly presentations and meetings, the Kitasoo/Xai'xais website, community newsletter, presentations to policy-makers, social media, and potentially through community education materials.

Disposal of Data
Data from this study will be disposed through paper shredding and deletion of all digital data if you ask to have your data destroyed. If participants allow, data will be stored by KXSA in their archives, and at the University of Victoria Marine Ethnoecology Lab under password protection or encryption.

Contacts
Individuals that may be contacted regarding this study include Dr Natalie Ban, Laurel Sleigh, and Doug Neasloss. You may also verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

This form is to be completed when receiving information from community members.

I _____ authorize the Kitasoo/Xai'xais Stewardship Authority (KXSA) to release or publish the information contained in the:

- ☐ interview
- ☐ documents
- ☐ photos
- ☐ recordings
- ☐ other (please specify) _____

provided on ___, _____, _____,
day month year

to:

- ☐ Community and Nation use only
- ☐ Any individual or entity (public)

The above information is provided: ☐ anonymously, or ☐ with attribution

I understand I have the right to refuse to authorize the use of this information. I understand that I may revoke my consent to the release of this information at any time by notifying the Kitasoo/Xai'xais Stewardship Authority in writing (except to the extent that the information has already been released).

_____

Printed Name of Knowledge Holder Print Full Name Date

_____

Signature of Witness Print Full Name Date

Protocol for Completing Form 2:

1. Review the entire release form with the Knowledge Holder and explain the purpose of it.
2. Explain to the Knowledge Holder the two confidentiality options.
3. Check the box of the level of confidentiality the Knowledge Holder authorizes the information for.
4. Explain to the Knowledge Holder the principle of anonymous use. Ask they if they are ok with their name being shared with this information.

Examples of Each Confidentiality Level:

<u>Any individual or entity</u>

- This means that the information can be provided to anyone. For example:
    - The province of BC, a news reporter, a member of a neighbouring First Nation.

<u>Community & Nation use</u>

- KXSA will have an agreement with anyone outside the community that uses this information.
- KXSA will review everything before it is published, to make sure it is accurate and not taken out of context. For example:
    - A master's student from UVic is writing an academic journal article using some of the information. KXSA reviews a draft of their document to make sure it is not harmful to the community before it is published. If it is harmful, we ask them to change it.
- KXSA will ask community members not to share this information beyond the community.