

Improving the eel fishery through the
incorporation of indigenous knowledge systems
into policy level decision making

By

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Abstract

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As the world continues to transform due to factors such as to climate change, and the expansion of our towns and cities there will continue to be negative consequences for the ecosystems that support our natural resources, economic prosperity and all aspects of our lives. Effective management of ecosystems, natural resources, and harvesting practices is essential for ecosystem health, and sustained harvesting of natural resources. Although the value, importance, and benefits of the incorporation of Indigenous Knowledge Systems (IKS), particularly of traditional ecological knowledge (TEK) into western knowledge science, have been well recognized over the past few decades, suitable mechanisms for collecting and incorporating IKS into policy level decision making are not yet well understood. This research examines the role of IKS in policy level decision-making for Canadian fisheries. It uses a case study approach to explore how an IKS is incorporated at the community level eel fishery in Eskasoni First Nation, NS and how IKSs are incorporated into the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Species at Risk Act (SARA) process. Through this exploration, the various parts of the IKS value, beliefs, transmission, knowledge, adaption, and practice are examined to show how management decisions can be enhanced through the incorporation of IKSs.

Keywords: Indigenous; First Nations; Eels; Indigenous Knowledge System; Aboriginal Traditional Knowledge; SARA; Species at Risk; Eskasoni.

List of Abbreviations

AAROM: Aboriginal Aquatic Resource and Oceans Management

AFS: Aboriginal Fisheries Strategy

AFSAR: Aboriginal Fund for Species at Risk

ATK: Aboriginal Traditional Knowledge

ATKSC: Aboriginal Traditional Knowledge Sub-Committee

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

DFO: Department of Fisheries and Oceans

FSC: Food, Social, and Ceremonial

IKS: Indigenous Knowledge Systems

IFMP: Integrated Fisheries Management Plan

NACOSAR: National Aboriginal Council on Species at Risk

SARA: Species at Risk Act

SSC: Species Specialist Subcommittees

TEK: Traditional Ecological Knowledge

UINR: Unama'ki Institute of Natural Resources

WKS: Western Knowledge System

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Introduction

As the world continues to transform due to factors such as to climate change, and the expansion of our towns and cities there will continue to be negative consequences for the ecosystems that support our natural resources, economic prosperity and ultimately all aspects of our lives. Effective management of ecosystems, natural resources, and harvesting practices is essential for ecosystem health, and sustained harvesting (F. Berkes, Colding, & Folke, 2000; Chapin, Folke, & Kofinas G. P., 2009). Current natural resource management decision-making processes in Canada, especially at the governmental and academic levels, are guided primarily by western science-based knowledge systems.

Although the value, importance, and benefits of the incorporation of Indigenous Knowledge Systems (IKSs), particularly of traditional ecological knowledge (TEK), into western science-based knowledge systems have been well recognized over the past few decades (F. Berkes et al., 2000; F. Berkes, Armitage, & Doubleday, 2007; Houde, 2007; Reo & Whyte, 2012; Simpson, 2004), suitable mechanisms for collecting and incorporating IKS into policy level decision making are not yet well understood.

IKSs contain unique ways of understanding ecological relationships intertwining biological, spiritual, cultural, social, and management information. Developed over millennia of intricate relationships between Indigenous peoples and their territories IKSs have been adapted and transmitted across generations of human and non-human relations (Reo & Whyte, 2012). Although an IKS is

interconnected by nature, for the ease of conceptualization it has been broken down into five components, practice, beliefs, values, adaptation, and transmission (F. Berkes, 2006; Reo & Whyte, 2012). Using Mi'kmaq knowledge of American eel each component of the knowledge system will be introduced. Mi'kmaq put their knowledge system into practice during eeling trips, for example knowledge is put into practice when choosing habitats to eel or techniques used when spearing. The beliefs and values of the Mi'kmaq knowledge system form a moral code, and give a framework for determining acceptable and non-acceptable eeling practices (Reo & Whyte, 2012). Eeling knowledge has been transmitted over generations through oral tradition and observation, and adapted over time with the changing environment and socio-economical landscapes. The Mi'kmaq people have communally accumulated vast amounts of knowledge about the American eel within their knowledge system.

The American eel has been important to the Mi'kmaq people for thousands of years for medicinal, subsistence, health, social and ceremonial purposes as well as a source of economic livelihood (Davis, Wagner, Prosper, & Paulette, 2004). Over the past several decades directed commercial fisheries, habitat destruction and fragmentation from hydro dams and other anthropogenic factors have led to the decline in abundance and distribution of the American eel (*Anguilla rostrata*) (G. Chaput et al., 2014; Miller & Casselman, 2014). This decline in abundance and distribution has led the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to recommend listing of the American eel as threatened, and has triggered the consideration of a listing under Canada's *Species at Risk Act* (SARA). The implications of a threatened designation under

SARA could significantly affect Mi'kmaq people's ability to access the resource, maintain their relationship with the American eel, and exercise their Aboriginal and Treaty rights.

This research uses a case study approach to examine the COSEWIC and SARA assessment process for the American eel, as well as the community level management process of the American eel fishery in Eskasoni First Nation, Cape Breton, Nova Scotia. This case study explores how and if IKSs are integrated into processes, and identifies challenges and possible mechanisms for meaningful integration of IKSs into policy level decision-making.

1.1 Knowledge Systems

A knowledge system held by a community, whether the community is an indigenous community, scientific community, or local fishing community, is the system by which knowledge is developed, accumulated, and adapted over time (Carm, 2014). To facilitate the conceptualization of a knowledge system, it will be discussed as six individual parts; transmission, adaptation, values, beliefs, practice, and knowledge. A conceptual model has been developed to illustrate how this research defines a knowledge system (Figure 1). The knowledge is expressed through the five different parts of the knowledge system. Each of the five parts of the knowledge system is represented on the outer circle of the model, connected both to each other and to knowledge itself (Figure 1).

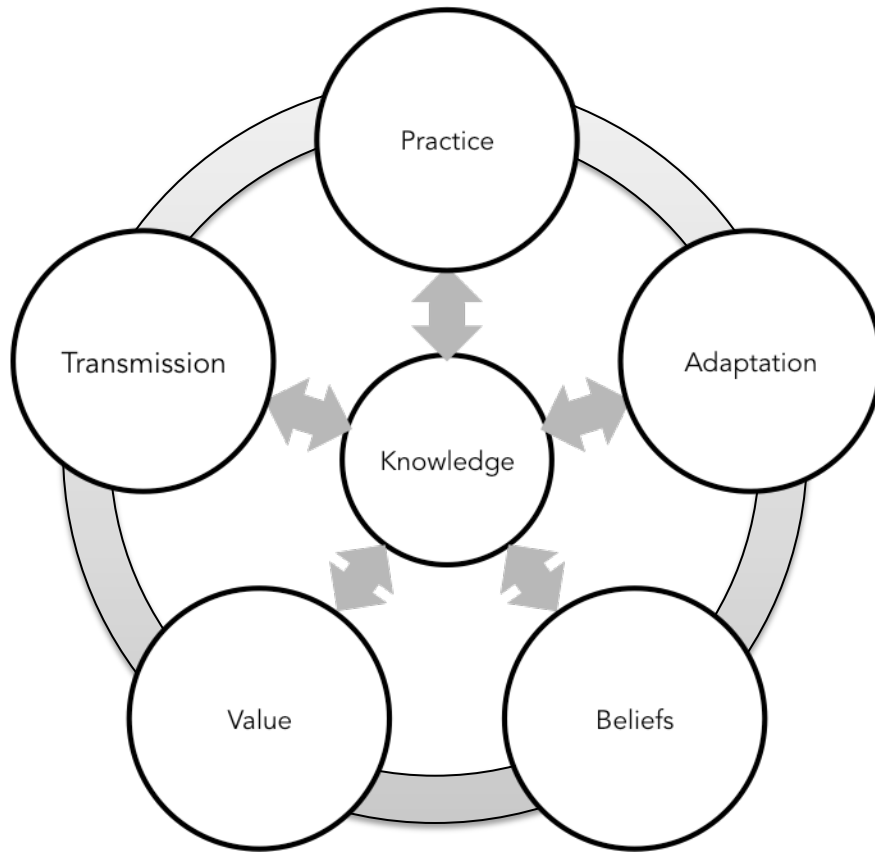


Figure 1 Conceptual model showing the six parts of a knowledge system and their interconnectedness.

Knowledge is transmitted in many different ways, though conversations, stories, observation, participation, body language, writing, and facial expressions. The practice of knowledge is the practical application of knowledge, finding best practices over time to achieve objectives (Reo & Whyte, 2012). The practice of knowledge is seen in actions and techniques. Adaptation of knowledge is seen in the way that practices change over time. As environments, values, or beliefs change, the knowledge system adapts to reflect those changes. Beliefs are the “why” of a knowledge system; beliefs provide reasoning for why one practice should be chosen over another. Along with the values, beliefs act to provide a moral code that distinguishes right and wrong(Reo & Whyte, 2012). Knowledge

systems are not static; they are dynamic systems that are constantly adapting as new situations and global events impact the world around knowledge holders (Battiste, 2005).

Thinking of a knowledge system like a clock provides a useful analogy. An observer is able to tell time, or specific knowledge, by looking at the face of the clock. However, although the observer looks only at face of the clock to tell the time, they acknowledge that there are many gears and mechanisms behind the face of the clock that are all interconnected. Each of the parts of the knowledge system can be thought of as a gear that is interlocked in some way with the other gears in the system. As the individual gears turn they influence the others to spin. If we were to take the clock apart we could potentially study each of the gears or parts in isolation. However, the individual parts only tell a piece of the story and it is not until they all move together that we can tell the time.

1.1.1 Indigenous Knowledge Systems

IKSs have been shaped over thousands of years of intimate relationships between Indigenous societies and their territories. Over millennia, these relationships between Indigenous societies and their territories have facilitated the accumulation of vast amounts of knowledge specific to their territory, and the development of unique, complex, and comprehensive systems for understanding the world around them. The ultimate source of knowledge for an IKS is the land itself (Turnbull, 2009). Even though there are many sources and types of IKSs there are common threads. Generally Indigenous ways of knowing intertwine spirituality, culture, beliefs, environmental knowledge, and social code into practices and all aspects of life (Carm, 2014). This non-

compartmentalized approach provides important ecosystem knowledge and frameworks for thinking about natural resources.

Indigenous knowledge has been defined and classified in many ways in the literature. Indigenous knowledge is often referred to as Aboriginal traditional knowledge (ATK) (Berkes, F., & Henley, T., 1997), Traditional Ecological Knowledge (TEK) (Houde, 2007; Reo, 2011), or, in Mi'kmaq territory, Mi'kmaq Ecological Knowledge. Each term has different connotations and definitions in the literature, and furthermore each term has different definitions within different organizations or disciplines. This inconsistency between definitions and organizations further adds to the difficulty of integration of IKS into policy. In general, Indigenous knowledge has been defined in relation to western knowledge and presented as a dichotomy. For example, Indigenous knowledge is generated trusting of inherent wisdom, while western knowledge is inherently skeptical. Indigenous knowledge is holistic rather than compartmentalized like western knowledge. An IKS sees kinship with the environment while a Western Knowledge System (WKS) sees dominance, and spirit is recognized in everything in an IKS while only humans are seen as having a spirit in a WKS (Barnhardt, 2005; Usher, 2000). Although this dichotomy can be useful for conceptualizing an IKS, it should be recognized that Indigenous knowledge is more than just the "binary opposite of western knowledge" (Battiste, 2005), rather Indigenous knowledge is acquired, valued and shared through its own knowledge system, its own ways of knowing.

Often when working with IKSs, scientists and managers easily see merit in incorporating the ecological knowledge from a knowledge system, but have

difficulty including other parts(Reo & Whyte, 2012). The values and beliefs within an IKS create management mechanisms that guide Indigenous harvesting practices. However, these mechanisms are not recognized as management within WKSs. By only incorporating the “ecological knowledge” portion of the knowledge system, much of the information is lost, since a great deal of knowledge is held within Indigenous languages, beliefs, practices, and the way knowledge is transmitted (Barnhardt, 2005; Reo & Whyte, 2012)

This research will define an IKS as the entirety of the Indigenous Knowledge system, including spirituality, culture, beliefs, environmental knowledge, transmission of knowledge, and social code into all practices and aspects of life. Again, while conceptually it may be easier to talk about each part of the knowledge system separately, it is recognized that each part is very much interconnected. Within the scope of this research we are specifically speaking about Mi’kmaq knowledge.

To illustrate the Mi’kmaq knowledge system, two concepts will briefly be discussed: *Netukulimk* and *M’sit No’kamaq*. *Netukulimk* is a Mi’kmaq concept that recognizes that the sustenance that you need is physical and spiritual, and that when you are taking to sustain yourself one must always be conscious of the seven generations to come (UINR, 2009). One must take in a way that does not compromise the future generations’ ability to sustain themselves and to maintain a relationship to the other species of the earth (UINR, 2009). *M’sit No’kamaq* translates to “all my relations”, and acknowledges that Mi’kmaq people are related to all those they share their territory with. The concept of “all my relations” acknowledges the spirit in all species and implies reciprocal

responsibilities. For example, if an eel gives itself to take care of the Mi'kmaq people, then the Mi'kmaq people must also take care of the eel.

1.1.2 Western Knowledge Systems

The scientific way of knowing, also referred to as science-based knowledge, is the primary way of knowing within a WKS (Kuhn, 2012). Two key frameworks guide the scientific process, the hypothetico-deductive method and positivist/reductionist perspective(Weiss, Hamann, & Marsh, 2013). The hypothetico-deductive method, or the scientific method, defines the practice for the investigation of the natural world and accumulation and transmission of knowledge. This method is a systematic verification process that involves the development of a hypothesis and systematic testing to prove or disprove through the collection and analysis of empirical data (Hassan & Hanapi, 2013; Kuhn, 2012; Weiss et al., 2013). The scientific method aims to produce empirical information that can be regenerated over and over(Hassan & Hanapi, 2013). These results are generally transmitted in the form of a report, peer reviewed journal article, or presentation at a discipline-specific conference.

Within western society, scientific ideas and their proponents are often accepted without question (Longino, 1990). The WKS is compartmentalized by nature; knowledge exists within different disciplines, separated into distinct categories (Barnhardt, 2005). Scientific practices are often heralded as being fully objective, however, they are very much governed by values and beliefs (Longino, 1990).

1.2 Definitions

The following definitions are included to inform the reader of how this research has interpreted each term.

Aboriginal Traditional Knowledge (ATK) – is knowledge that Aboriginal people have accumulated through experiences over generations about their territory as well as about the species with which they share their territory. ATK includes all knowledge held by Aboriginal people; TEK may be thought of as a subset of ATK. Although not explicit in the literature, ATK has developed connotations to existing in the past and the word “traditional” within ATK has been the subject of dispute. ATK is the term that is used by the Canadian Government, SARA, COSEWIC, and the Department of Fisheries and Oceans (DFO).

Indigenous Knowledge (IK) – is all types of knowledge held by a group of people that has been accumulated through experiences over generations about their territory as well as about the species with which they share their territory (Usher, 2000). IK is the knowledge that has been accumulated through an IKS.

Indigenous Knowledge System (IKS) – is a way of knowing, a knowledge system that can be seen in the values, beliefs, practices, knowledge, transmission, and adaptation of knowledge. An IKS is a dynamic and interconnected way of knowing. It does not separate a traditional way of knowing from a contemporary way of knowing.

Traditional Ecological Knowledge (TEK) - is ecological knowledge held by an indigenous community. TEK sought by researchers is generally about population

trends over time, abundance, habitat, distribution or lifecycles of specific species. TEK recognizes Indigenous people's connection to place and TEK has been predominantly used in scientific research on climate change (Armitage, Berkes, Dale, Kocho-Schellenberg, & Patton, 2011; Berkes, Colding, & Folke, 2000), collection of baseline data (Usher, 2000), and conservation (Berkes, Folke, & Gadgil, 1995; Drew, 2005). TEK focuses on gathering knowledge and fails to recognize the cultural and spiritual components, dynamism, and interconnectedness of an Indigenous way of knowing (Battiste, 2011; Simpson, 2004).

Western Knowledge System (WKS) – is a way of knowing that is predominately based on the scientific method or also known as the hypothetico-deductive method. A WKS strives to obtain objective knowledge and is compartmentalized in nature. Science-based knowledge, created by the WKS is the basis for resource management in Canada.

1.3 Research question

The overarching research question for this research is: How can Indigenous knowledge used in the Eskasoni eel fishery, both Food, Social, and Ceremonial (FSC) and commercial, be used to enhance policy-level decision making with respect to the eel fishery? To explore and inform the overarching research question three sub-questions have been designed to guide this research:

1. How can eel fishery sustainability be maintained when differences in value systems are potentially impacting its management?

2. How is the FSC eel fishery impacted by the commercial eel fishery in Eskasoni First Nation?
3. What are possible mechanisms for the transmission of IKSs into policy?

The American eel and the American eel fishery have been chosen for a number of reasons. Eels are, and have been important to the Mi'kmaq people for thousands of years. The American eel has recently received a threatened listing recommendation from COSEWIC, triggering consideration for listing under SARA. There are potential implications for the Mi'kmaq peoples' ability to exercise their aboriginal and treaty rights if eels are listed under SARA. In addition, large gaps exist in the scientific understanding of American eel. For all of these reasons, the American eel fishery has been chosen as a case study for the overarching question of this research. This research is based on the proposition that the incorporation of IKS into decision-making processes has the potential to enhance management and sustainable harvesting of the American eel.

2 Methods

Over the past several decades, research in Indigenous communities has increased. Unfortunately, much of this research has been conducted without the consent of the communities involved, with researchers "parachuting in," and leaving without reporting the findings back to the community (Battiste, 2011; Castleden, Garvin, & First Nation, 2008; Smith, 1999). This has resulted in communities being distrustful or skeptical of researchers, and suffering from what has been coined research fatigue (Castleden et al., 2008; Simpson, 2004).

Conscious of this, this research has been conducted using a participatory approach. For the purposes of this research, a participatory approach is defined as an approach with the core philosophy of inclusivity and recognition of the value of engaging communities into the research process with the intent of providing something that will be useful to the community (Cargo & Mercer, 2008; Cochran et al., 2008).

This research is positioned under the umbrella of the larger research project in which Eskasoni First Nation, along with other First Nations and academic institutions across Canada, have committed to researching if and how Indigenous knowledge systems could enhance the current regime for fisheries governance and management in Canada.¹ The community of Eskasoni First Nation has been instrumental in the development of both the research question and methodology of this research. Throughout this research, the community of Eskasoni has provided direction and guidance towards the production of meaningful, relevant, and timely research.

Two meetings were held before the submission of the proposal for this research. The first meeting was held with members of Eskasoni Band council, commercial fishers, members of the Fish-WIKS research team, and representatives from Unama'ki Institute of Natural Resources (UINR). This meeting provided a general direction as to what research themes are important to the community. The second meeting was held with representatives from UINR and helped to narrow the scope and refine the research questions. After the project proposal was

¹ See www.fishwiks.ca for additional information on this pan-Canadian partnership research project.

revised but before the ethics application submission, a third meeting was held with council, commercial fishers, representatives from UINR and Crane Cove Seafood. Crane Cove Seafood is a fish harvesting and processing company owned and operated by Eskasoni First Nation. The Crane Cove Seafood building is shared with UINR and was the physical location from which fieldwork for this research was carried out. During this meeting, the researcher presented research questions and methods, including potential questions for the semi-structured interviews. Discussion on potential areas for possible participatory mapping sessions was also raised. Attendees provided positive and constructive feedback. Suggestions from the meeting were incorporated into the final version of interview questions and project design. Key contacts in Eskasoni included the community liaison coordinator for the Fish-WIKS research project and the senior biologist for UINR, both of whom live in Eskasoni. Approval was obtained from both Dalhousie University as well as the Mi'kmaq Ethics Watch committee to conduct the research (Appendix A and B).

2.1 Researcher

As the researcher, I self-identify as a member of both the Mi'kmaq and Wolastoqiyik (Maliseet) nations. I grew up on mainland Nova Scotia and have a background in Marine Biology and Youth Work. Although I do not consider myself a very traditional person, I do observe some traditions regularly, such as smudging and attending Pow Wows. The majority of my traditional teachings have all been received from Wolastoqiyik elders who speak Wolastoqiyik and follow Wolastoqiyik calendars. Although Wolastoqiyik culture is similar to

Mi'kmaq culture, there are differences between the teachings, culture, and language. Furthermore all Wolastoqiyik and Mi'kmaq communities are different, so that the communities that I am from and grew up in are not necessarily like Eskasoni.

It is known that there are differences between Mi'kmaq communities on mainland Nova Scotia and those on Cape Breton Island. One in particular that has impacted this research, is that many communities on mainland Nova Scotia have retained little of the Mi'kmaq language due to deep historical trauma. It is common to hear most conversations occur in English in mainland communities, while on the Island, many more people speak Mi'kmaq and conversations occur in Mi'kmaq more often than English. My limited ability to speak and understand Mi'kmaq resulted in being seen as an outsider in some instances during this research, while my obvious Mi'kmaq and Wolastoqiyik heritage also led to being seen as an insider at times. For example, all interviewees were offered to have interviews conducted in Mi'kmaq, through a translator, although none accepted. One interviewee made a point to make it known that they were being accommodating to me, as I was not a Mi'kmaq speaking person. In this instance I was seen as an outsider. In other interviews interviewees used inclusive language such as "we, us, our" including the researcher into their answers with their hand gestures and body language. In one instance the interviewee referred to the researcher as "*Tus*", the Mi'kmaq word for daughter and used as a term of endearment, indicating the interviewee saw the researcher as an insider. Being seen as both an insider and outsider throughout this research provided an interesting cross section of community perspectives, and helped the researcher understand the community's attitude to both insiders and outsiders. Being seen

as an outsider showed the community's mistrust of outsiders and protective position to their place and fisheries. Being seen as an insider allowed the researcher to gain a fuller understanding of the intricacies of the eel fishery in Eskasoni.

2.2 Research Site

All interviews and participant observations with eel fishers were conducted in Eskasoni First Nation. Eskasoni is a Mi'kmaq community located along the Bras d'Or Lakes of Unama'ki or what is now known as Cape Breton, Nova Scotia (Figure 2). As discussed earlier Eskasoni First Nation was chosen prior to the full development of the research question and was chosen because of their involvement with the Fish-WIKSs research project.



Figure 2 Map showing the location of Eskasoni First Nation on the Bras d'Or Lakes, Cape Breton, Nova Scotia. (Google Maps, 2014)

Eskasoni First Nation is the largest Mi'kmaq community in the world, with a population of nearly 4000, and covers 36.4 square kilometers (Eskasoni, 2014a; Eskasoni, 2014b). Although Eskasoni is the largest Mi'kmaq community today, Eskasoni was not established, as we know it today, until the 1940's, when the government of Canada implemented its centralization policy (Eskasoni, 2014b). This centralization policy forced the relocation of Canada's Aboriginal people to centralized locations. In Nova Scotia, Mi'kmaq people were relocated to either Shubenacadie on the mainland or Eskasoni. Like other First Nations communities in Canada, a community-elected Chief and Council govern Eskasoni.

The community of Eskasoni is involved in fisheries for both commercial and FSC purposes. Eskasoni owns and operates Crane Cove Seafood, a commercial fishery company. Crane Coves Seafood is the largest employer in Eskasoni, employing 12 full time staff and 150 fishermen (FishWIKS, 2013). In the 2012-2014 community report it was identified that 9.49% of Eskasoni's revenue came from commercial fisheries (Eskasoni, 2014a). Eskasoni is also home to the UINR, which represents the five Mi'kmaq communities of Unama'ki and was formed to address concerns regarding natural resources and their sustainability (UINR, 2013).

2.3 The Case Study

Understanding a complex problem, such as how IKS is incorporated into policy-level decision-making is too large for the scope of this research. By choosing to look at a specific case study, it allows the scope of the research to be narrowed

while still taking an in-depth look at the problem (Tellis, 1997; Yin, 2014). For this research, the incorporation of an IKS into policy level decision-making is explored by reviewing the COSEWIC and SARA processes for the assessment of the American eel as a case study. The following sections outline various aspects of the case study, and why this particular case study gives a unique perspective into the incorporation of IKSs into policy level decision-making.

2.3.1 The Mi'kmaq people and eels

For thousands of years, Mi'kmaq people have lived with their territory, known to the Mi'kmaq people as Mi'kmaq'ki, encompassing what is now known as Eastern Canada. The Mi'kmaq, along with the Passamaquoddy, Maliseet, Penobscot, and Abenaki Nations form the Wabanaki Confederacy. Governance of the Mi'kmaq was carried out through the Wabanaki Confederacy along with the Grand council of the Mi'kmaq, which consists of district, local, and a grand chief (Berneshawi, 1997). Traditionally, hunting and fishing territory for each family was decided within these governing systems. Although these governing systems were important for decision making, it is important to note that, unlike Western governing bodies, the spirituality, economic, politics, and mental aspects of the society were not treated separately.

Over millennia of living together with their territory, Mi'kmaq have developed deep and reciprocal relationships with species that share Mi'kmaq'ki. One species that is of particular interest for this study is the relationship between the Mi'kmaq and the American eel or *Kataq*. Eels have not only been an important source of food and nutrition for many Mi'kmaq people but are also socially, medicinally, economically, spiritually, and culturally important. Eels have the

ability to bring a community together through fishing and feasting activities and they have been shown to be important in the strengthening of community bonds (Weiler, 2011). The depth of the Mi'kmaq people's relationship with the eel is illustrated through its presence in legends, art, petroglyphs, numerous technologies for harvesting eels, ceremonies, and social events (Davis et al., 2004). Historically and presently, eel fishing is an important aspect of Mi'kmaq culture.

Eels have also played an important role in the struggle for Mi'kmaq people to have their inherent and treaty rights recognized by the Canadian government, specifically in the iconic and significant 1999 *Marshall Decision* (R. v. Marshall.1999). Donald Marshall Junior was arrested in August of 1993 for fishing and selling eels without the proper license. This event sparked a lengthy court battle and ultimately the tumultuous readmission of the Mi'kmaq people into the fishing industry (Wicken, 2002).

2.3.2 Legal Landscape

There have been two major court decisions that have changed the legal landscape for aboriginal fisheries in Eastern Canada, the *Sparrow Decision* and the *Marshall Decision* (Sparrow v. the Queen.1990; R. v. Marshall.1999). The *Sparrow Decision*, 1990, acknowledged Aboriginal people's inherent right to harvest resources for FSC purposes (Sparrow v. the Queen.1990; Wildsmith, 1995). Aboriginal peoples right to fish for FSC purposes takes precedence over all other uses of the resources (commercial, recreational), with the exception of conservation (Sparrow v. the Queen.1990; DFO, 2013). The *Sparrow Decision*

also has important implications for established Aboriginal peoples' right to be consulted through the establishment of what is commonly referred to as "The Sparrow Test" (Sparrow v. the Queen.1990; Hipwell, Mamen, Weitzner, & Whiteman, 2002). The Sparrow Test essentially states that the Crown must consult with Aboriginal peoples when there is the possibility of infringement on Aboriginal rights (Hipwell et al., 2002).

In the *Marshall Decision*, 1999, the Supreme Court of Canada ruled that Mi'kmaq and Maliseet peoples have the treaty right to participate in the commercial fisheries and to obtain a moderate livelihood (R. v. Marshall.1999; Davis et al., 2004; Wicken, 2002). For management purposes, the Mi'kmaq fisheries, post-Marshall, have been divided into two separate management categories, commercial fisheries and FSC fisheries. Each type of fishery is managed separately through the DFO. Given that conservation takes precedence over all categories of fishing, the designation of eels with threatened status by COSEWIC and the consideration for listing of eels under SARA may have implications for both the FSC and commercial eel fisheries. As of yet, the specifications of potential implications have not been laid out or communicated to Aboriginal communities(Denny & Paul, 2012). Given the potential for impacts to Aboriginal eel fishing because of COSEWIC and SARA listings, the incorporation and communication with Aboriginal communities during the process merits further investigation.

2.3.3 American eel

The American eel (*Anguilla rostrata*) is a catadromous species of eel, closely related to the European eel (*Anguilla anguilla*), is distributed widely along the western Atlantic Ocean, primarily along coastal areas, as well as the inland rivers and lakes of Eastern North America (Jessop, 2006). American eels are semelparous, having only one reproductive event (Chaput, G., Cass, A., Grant, S., Huang, A.M., and Veinott, G, 2012). Much of their life is spent in the lakes, rivers, and estuarine environments, migrating only after sexual maturation the thousands of miles to the Sargasso Sea to spawn (Miller & Casselman, 2014). Although it is known that eels spawn in the Sargasso Sea, the exact location of spawning remains a mystery (Miller and Casselman, 2014; Jessop, 2006).

The life cycle of the American eel starts in the Sargasso Sea as a transparent larva, also known as a leptocephalus. The leptocephalus both passively and actively drifts up the Gulf Stream for seven to twelve months. Upon reaching the continental shelf, they begin their transformation from leptocephalus to the familiar eel shape as glass eels and journey into coastal areas (Jessop, 2006). During the journey to coastal waters, glass eels grow, gain pigmentation, and finally become elvers. The elvers will continue upriver in search of optimal habitat and will remain in rivers as juvenile or yellow eels. Sexual maturity in eels happens between 3-7 years and factors governing this remain unclear, although it is likely that size and environmental conditions trigger maturation (Jessop, 2006). Once sexual maturity is reached, eels begin their migration to the Sargasso Sea to spawn and the life cycle continues.

2.3.4 Eel population decline

Populations of American Eel have been in decline since the 1950's (COSEWIC, 2011b). Threats to eels have been categorized as current and potential threats. Potential threats to eels include climate change, further hydroelectric development, and effects of stocking programs (COSEWIC, 2011b). Current threats to eels include dams, habitat degradation, fisheries, chemical and biological contamination, and invasive species (COSEWIC, 2011b). Of all the threats identified, fisheries and dams have been identified as having the largest impact on eel populations (Schuegraf & Dowd, 2007). As eels are semelparous, all pre-spawning eel deaths from threats such as dams or fishing potentially reduce reproductive capacity (Schuegraf & Dowd, 2007). Special management considerations and strategies must be taken when managing fisheries of semelparous species. Further contributing to the complexity of eel management, targeted fisheries for the American eel takes place over all stages of the life cycle from glass eels to sexually mature adults (Chaput et. al., 2012).

2.3.5 Why this case study?

This case study provides an excellent opportunity to explore how and if IKS is incorporated into policy level decision making, from the community to policy level. The complexity of the American eel's lifecycle, its international distribution ranging between the Caribbean and Canada, gaps in scientific knowledge, possible implications for Aboriginal rights, conservation concerns, and social and cultural importance to the Mi'kmaw people make the incorporation of IKS into this process extremely relevant and can potentially help to address the gaps that WKS cannot. Additionally, as this process of assessing the status for the American eel and its possible recovery is currently ongoing, this research is

timely and can hopefully provide insight to all stakeholders and recommendations for future endeavors.

2.4 Interviews

Interviews were conducted with three groups of participants - Eskasoni First Nations eel fishers, DFO staff involved in the SARA process, and COSEWIC advisors involved in the assessment of the American eel. All interviews were in-depth semi-structured. All fishers with past or present involvement in the eel fishery, either for FSC or commercial reasons, were invited to participate in this research. There were 13 interviews completed in Eskasoni with eel fishers during the summer of 2014. Fishers ranged in age between early twenties to mid-seventies. Of the thirteen individuals interviewed, twelve of them were male and only one of them was female, who also happened to be the youngest interviewee. Interviews were generally conducted in the boardroom in the Crane Cove Seafood building and coffee or tea, as well as a small snack was provided.

2.5 Mapping

Participants were asked to participate in a participatory mapping exercise to better understand their relationship with place. The mapping exercise allowed for a unique understanding of how the IKS connects to place (King, 2013). The majority of eel fishing takes place within the Bras d'Or Lakes. This was determined through conversations with the community liaison coordinator and co-supervisor. Using this information, a base map was found of the Bras d'Or area that included five Mi'kmaq communities (Eskasoni, Potlotek, We'koqma'q,

Wagmatcook, Malagawatch). Mapping sessions took place with the interviews and 9 eelers participated. During mapping sessions Mylar was laid over the base map and reference points were drawn. Participants were provided with three colors of permanent markers - one to represent summer eeling, one for winter eeling, and one to represent where they went eeling for the first time. Participants were invited to draw, trace, circle, or mark an "X" on the map as they outlined the areas eeling took place on the map.

A generalized approach was purposely taken at the suggestion of the community to protect individual fishers, as well as the community. After mapping sessions were completed, the maps were then amalgamated by type of fishing, that is one map was made on mylar compiling all the summer eeling locations, one for winter, and one for the locations of eelers first eeling trips. Maps were then digitized using Arc GIS and areas were outlined with polygons.

2.6 Data Analysis

Using a manual content analysis approach, all interview data collected was analyzed to identify potential patterns of similarity and differences across the responses for each of the questions asked. This allowed for information needed to answer the research questions to be obtained and interpreted and also provided plausible explanations to the findings to be identified, ultimately leading to evidence-based recommendations for improvement in the selected policy processes.

2.7 Limitations

Due to the time constraint of this research, it was limited to a current snapshot of time. While I was fortunate to get staff involved with the SARA process, this research could have been enhanced had there been more time to pursue interviews with DFO staff involved with the SARA process in the lead region for the management of eels, namely the Gulf region.

3 Results

3.1 IKS Approach to Eel Fishery and Management

The following results are from the interviews with eel fishers from Eskasoni First Nation. The results have been broken down into practices, values, language, place, adaptation to eel population decline, and IKS response to commercial eel fishing. Results have been broken down in this way to reflect the parts of the knowledge system as illustrated in Figure 1.

3.1.1 Eel Fishing Practices

Eel fishing trips began at an early age for the majority of eelers, between the ages of eight and 12. Eelers explained that although they had joined their father, grandfather, or uncle they did not actually use the spear for a number of years. The first year's eeling were spent observing others during the practice of eeling. This period of observation generally lasted for two or more years. Young eelers were not generally told when they were ready to begin eeling; interviewees spoke of eventually wanting to try for themselves and simply picking up a spear one day. A small minority of participants were not taught to eel by a family member, these participants spoke of hearing stories of eeling

from family or friends and eventually being offered or seeking a friend to teach them or teaching themselves. Eelers that had been taught by friends did not undergo a period of observation like those who had been taught by family members. Participants who were interviewed had been involved in the eel fishery anywhere between two and sixty years.

Eeling takes place throughout the year. In the summer and fall, eeling is generally done from a boat. Eelers attach a lantern to the front of the boat and use a summer spear to catch the eels. All eelers use spears, although there is variation in the design in the spears between eelers (Figure 3A, 3B). Some eelers design their own spears, making modifications from the traditional ones that were more made out of wood and metal. Other eelers choose to stick to traditional spears. Experienced eelers spoke about the important differences between summer and winter spears and techniques, as well as differences between rock and muddy bottom. Some eelers do not have access to boats and eel from a dock or wade into shallow water. Summer eeling trips generally last about four hours, taking place between 10 pm and 2 am at night, varying in length depending on the age of eeler, if children are accompanying the eeler, etc. Some of the younger eelers have been experimenting with new methods of catching eels, such as diving with a spear and flashlight wrapped in a plastic bag, or Hawaiian sling (a tiny slingshot spear gun). Some of the younger male eelers spoke of diving for eels and spearing them underwater with friends. Four eelers spoke about using nets and three specifically spoke of using fyke nets. One eeler joking said he made his own spears from spring metal and “they are made not to miss”. One spoke of using a fishing rod and fishing by hand.

Summer eeling is limited by weather conditions, eeling can only take place when there is little to no wind and the waters are calm so that the boat is steady and the eels can be seen. One of the more experienced eelers spoke about how he had developed a sense over time when good nights for eeling were coming. During their time of observation young eelers learn how to identify good places to eel, generally marked by the presence of eelgrass and muddy bottoms. Eelers also mentioned that there was a good deal of trial and error involved in finding good eeling spots, so that after you have been eeling for some time, you would know how to pick out the good eeling spots.



Figure 3 Handmade eeling spears for summer eeling (A & B) and winter eeling (C).

In the winter, eeling occurs on the ice, near the shore, and is limited by the presence of good ice. Eelers cut a hole in the ice using an axe or chainsaw, and using a winter spear (Figure 3C) they methodically circle the hole searching the unseen muddy bottom with their spear. One eeler, who learnt to eel at an older age, told a story of his first time eeling and observing the pattern in the snow his friend's footprints made. His friend's footprints were uniform in the snow, while his were scattered, through this observation he was able to adapt his approach.

3.1.2 Eel Fishing Values and Beliefs

Eels harvested are not just for consumption within eeler's households as all eelers spoke of sharing their catch. All eelers valued being able to share eels with elders, family, or other community members. The youngest two eelers interviewed only went to get eels for other people, or at the request of grandparents, and do not eat eels themselves. Some of the older eelers talked of enjoying eeling alone, implying it was a time for relaxation and reflection to connect with nature.

Eeling trips happen for a variety of reasons, but generally all eeling trips were initiated by the requirement of food for either themselves or at the request of others who could not go eeling, and the right weather conditions. Several eelers spoke about periods of their lives where they have to eel for dinner because they could not afford food at the store, did not have access to a store, or that they had to eel to make a small livelihood to provide other necessities for their family. One eeler told of how his father used to go eeling when a community member passed away and that his father would use those eels to make *Kataqaboul* (eel soup) to bring to the wake. He felt he should really continue the tradition, because no one had done it since his father passed away, but it was easier said than done. He also felt the practice of bringing eels to a wake showed a great deal of respect. Younger eelers spoke about eeling with cousins or friends and shared humorous stories about the time someone fell in the water or dropped a phone in the water. Camaraderie during eeling trips was a part of the motivation for many eelers. Experienced eelers spoke of the enjoyment they got from taking their grandchildren out eeling, and teaching their grandchildren

the lessons that they have been taught and learned over their many years eeling.

The amount of eels that is acceptable to take during winter eeling and summer eeling is different. During winter, eelers keep all eels regardless of size. When asked how they knew they had enough during winter eeling trips, many eelers replies "when you are cold" or "when the sun is going to set". During summer eeling trips, eelers would get anywhere between one and four-dozen eels. Some eelers spoke about going out with a set number of eels needed in mind, based on what had been requested of them, and returning home when they reached this number. Participants cited a variety of reasons for knowing that they had caught enough during summer eeling trips including when their stomach started growling or when it was time to turn around. The Mi'kmaq concept of *Netukulimk* was mentioned a number of times when talking about how many eels to take. *Netukulimk* is a concept that is related to the non-Aboriginal concept of sustainability. It describes the sustenance that you need to survive is also alive, has a spirit, and deserves respect. *Netukulimk* recognises that humans are not the superior being and that when we harvest food we cannot compromise the future generations' ability to also access these "resources".

When asked about how eels were fished or used in the past, eelers gave a variety of answers. Several participants either did not know or did not address the question in the interview. The youngest eeler interviewed replied that many of the people who used to eel have died, implying that their knowledge has gone with them. A few people spoke of the medicinal uses of eels as casts or to

help people fall asleep. An Elder spoke about how eels used to behave and form eel balls and that people do not see this behaviour any more.

When asked about the future of eels, two of the younger men talked about how they would like to take their kids but were worried that there may not be any eels for their kids to fish or that they would not feel comfortable going if the population was too low. Two eelers talked about how if they did not do something, there would be no future because the population would be too low. One eeler said that people needed to share their knowledge so that it gets passed down. One interviewee was concerned about what would happen if Mi'kmaq people were not able to maintain a relationship with eels.

3.1.3 Eel Fishing Language

Language is where a culture's knowledge and worldview is held (Barnhardt, 2005; Battiste, 2000). At the end of the first interview of this research, this association of language with knowledge became evident as the participants started writing down Mi'kmaq words that pertain to eeling. Although there was no specific question requesting Mi'kmaq eeling words in the interview questions, many eelers naturally began talking about Mi'kmaq eeling words. Some eelers were quite curious to check my list of words, changing spelling or definitions, and adding words they felt were missing. A list of 21 words pertaining to eels or eeling was compiled during the interviews, and final spelling and definition advice was solicited from language experts in the community.

Table 1 Mi'kmaq words relating to eels or eel fishing and their English definitions, gathered during interviews with eelers in Eskasoni First Nation.

Mi'kmaq Word	Definition
Nkioql	Eel spear in summer
Sum'kwati	A pole for eeling made from black spruce
Kataq	Eels
Katew	A single eel
Saqsikwemk	Eeling at night using a light, the action of spearing
Katewapu	Eel soup or eel stew
†pqasaw	A bigger eel with more meat, big enough to bake it, preparation of dried eel
Pqwi'kn	Hole
Kate'j	Baby eels or little eels
Kata'skw	Eelgrass
Skmoqn	Mucus or slime on a eel
Welpaqawipk	Calm
Wi'just'napaqsi't	Wind makes calm water un-clear
Kate'kemk	Catching eels
N'atuwaqn	Eel spear in winter
L'natkw	Black spruce
Mejikapua'q	Dirty murky water
Paqs†m†n	Cutting along the back bone to open eel up to bake
Siskuwik	Muddy soft bottom
Kato'mo	Eel oil
Wasoqnmaqñ	Lantern or touch
Wasapa'q	Crystal clear water

3.1.4 Eel Fishing's Interactions with Place

Indigenous knowledge is place based, generated with and from the territory (Barnhardt, 2005). The maps drawn by eelers help to illustrate how they interact, move within, and use place. All eel fishers were invited to take part in mapping session. Of the thirteen interviewed, nine participated in mapping sessions. Three categories of use were examined - summer eeling, winter eeling, and where eelers went for their first eeling trip.

Summer eeling was identified in six areas in the Bras d'Or Lake (Figure 4). Some eelers identified places that had been passed down from their fathers or grandfathers, and had been traditional eeling grounds for their family for hundreds of years. Other eelers identified places where they had discovered or been shown based on habitats, such as muddy bottoms or eelgrass.

Winter eeling was identified in four areas in the Bras d'Or Lakes (Figure 5). Like summer eeling spots, many winter eeling spots had been passed down from their fathers or grandfathers, and had been traditional eeling grounds for their family for hundreds of years. Some eelers spoke of finding potential winter eeling spots during summer eeling trips, remembering them in relation to a unique tree or other landmark, and returning in when the ice formed.

Only one area in the Bras d'Or Lakes was identified where eelers experienced eeling for the first time (Figure 6). All eelers experienced eeling for the first time

along the shore of Eskasoni. Three sub-areas were identified, the beaches, John Paul's Lane, and Goat Island and surrounding islands.

Among the three categories of eeling, summer eeling had the largest distribution across the Bras d'Or Lake (Figure 7). As illustrated in the figure, there was a large amount of eel fishing activity identified along the shores of Eskasoni.



Legend
 Eel_Summer

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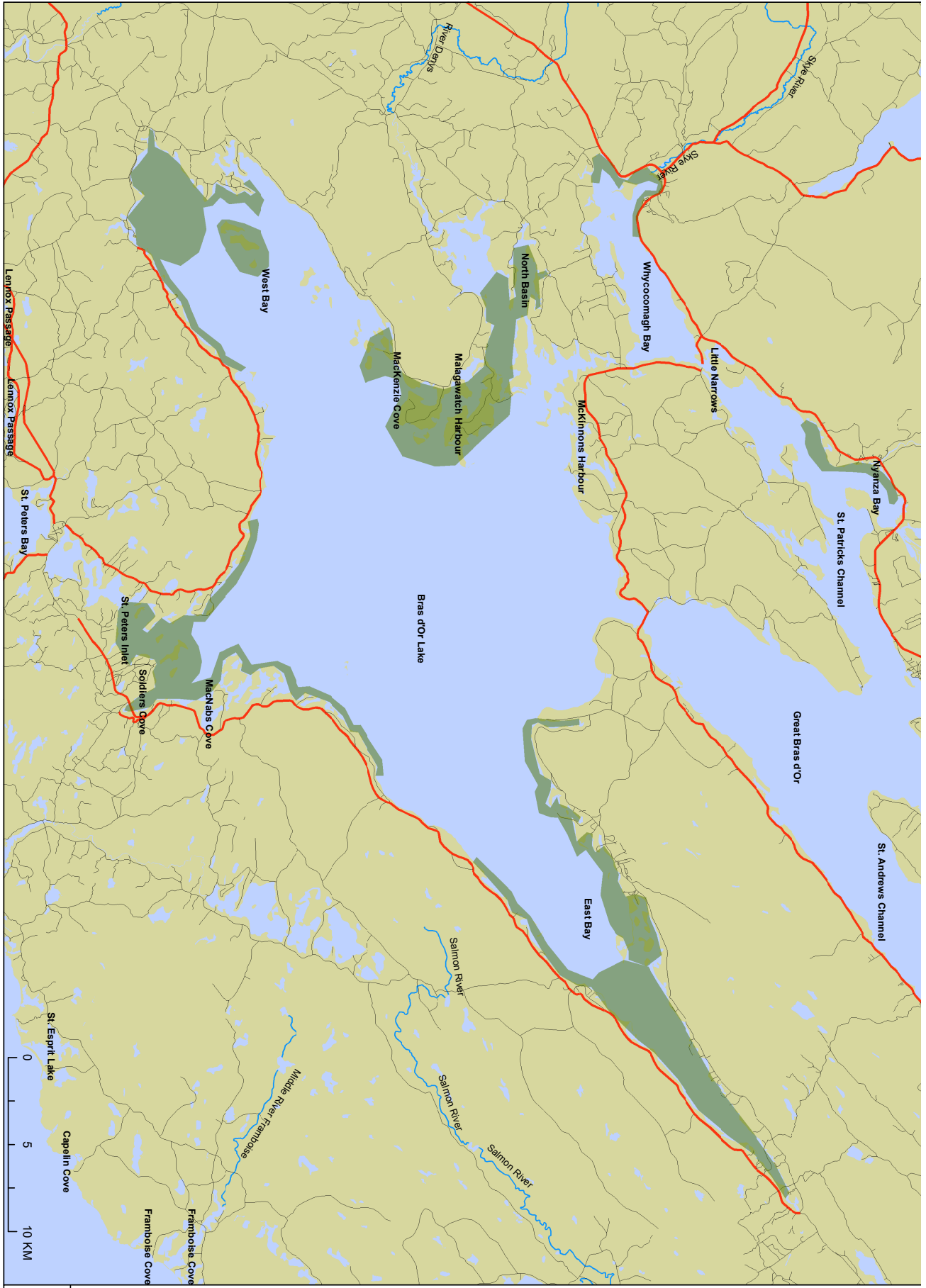


Figure 4 Map of Bras d'Or Lakes and summer eeling areas identified by Eskasoni eel fishers.



Legend
 Eel_Winter

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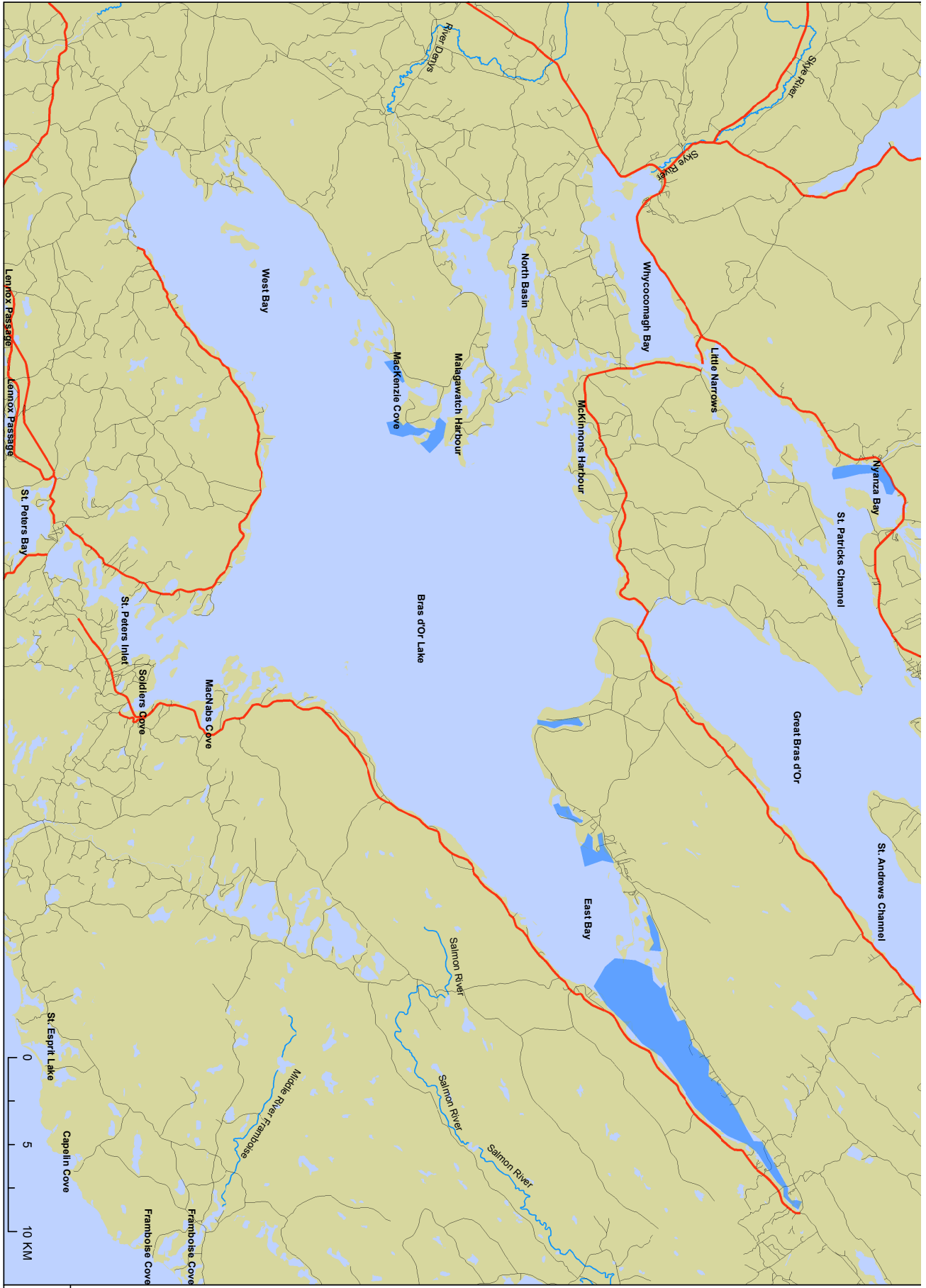


Figure 5 Map of Bras d'Or Lakes winter eeling areas identified by Eskasoni eel fishers.



Legend
 Eel_Other

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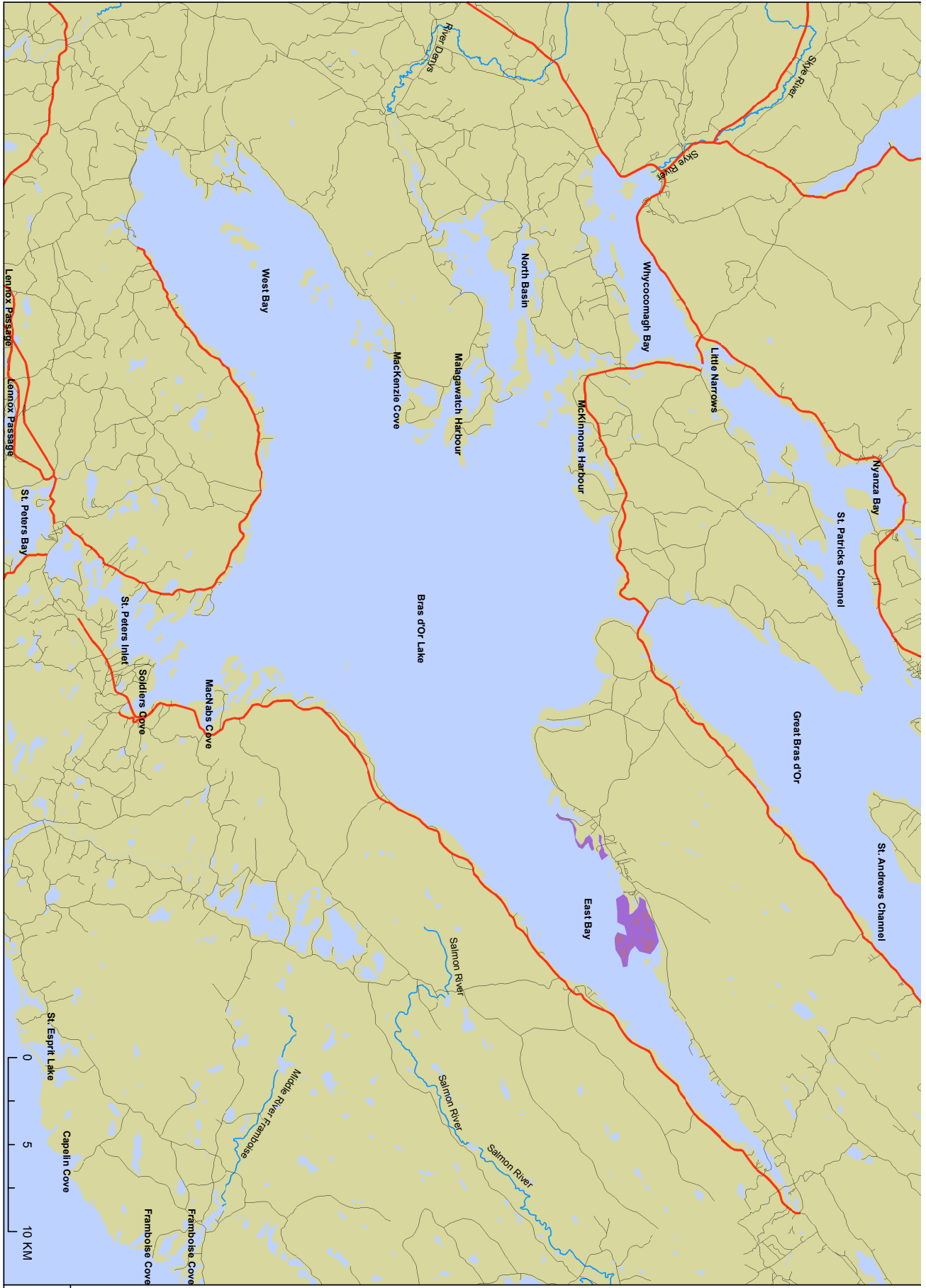
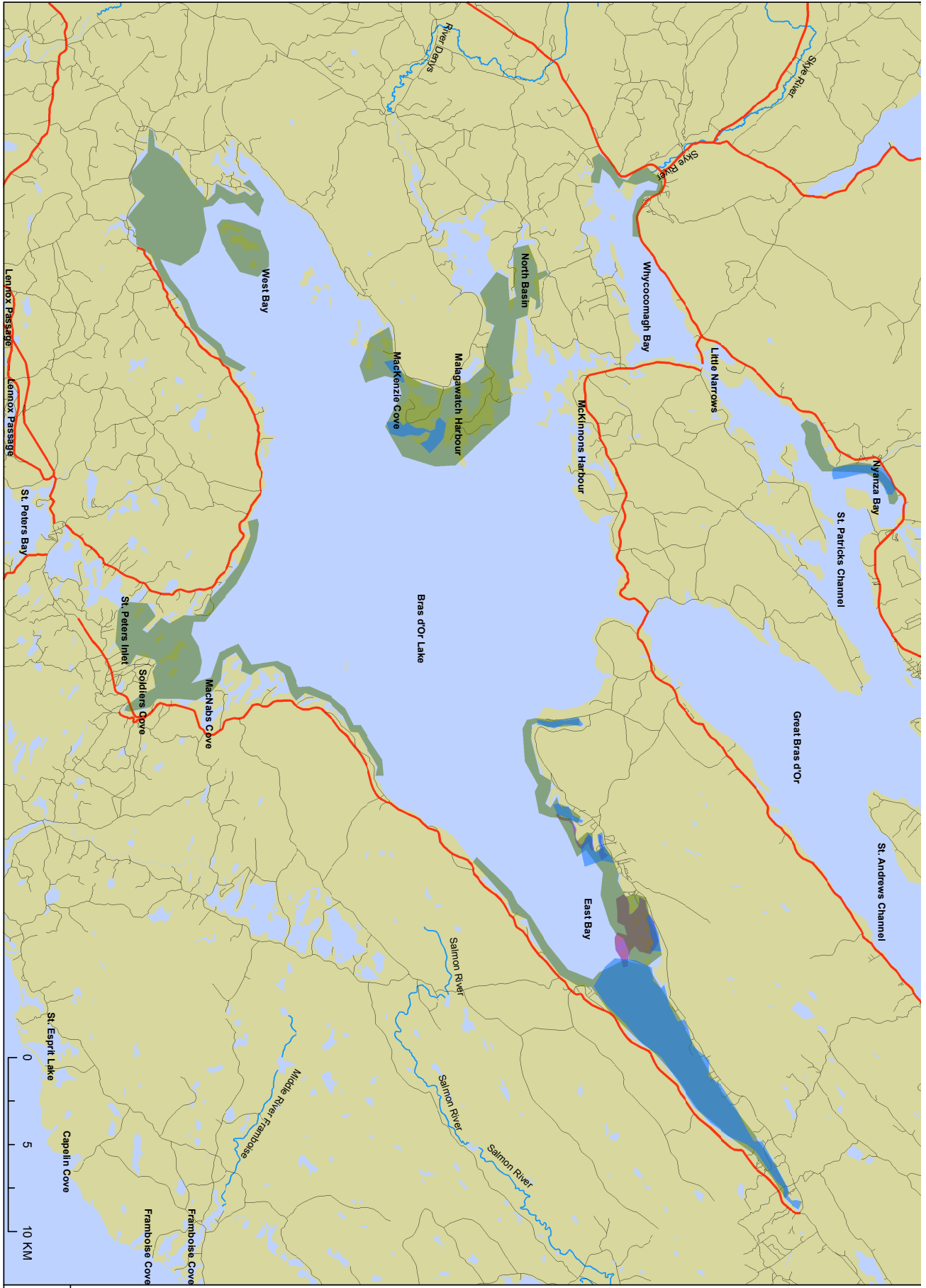


Figure 6 Map of Bras d'Or Lakes and first time eeling areas identified by Eskasoni eel fishers.



- Legend**
- Eel_Winter
 - Eel_Summer
 - Eel_Other



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Figure 7 Map of Bras d'Or Lakes and summer, winter, and first time eeling areas identified by Eskasoni eel fishers.

3.1.5 Adaptation to Eel Population Decline

The large majority of eelers interviewed stated that there are far less eels today than there were when they started eeling. In the past it was easy for eelers to catch eels to feed their families and community. Some eelers spoke of themselves or their relatives coming home with a bag or bucket full of eels in the past. Now, eelers feel they are lucky to come home with a dozen eels. One eeler said that eels are “very much in trouble”. Eelers provided a variety of predictions as to the cause of the decline of eel populations. Many of the participants mentioned commercial fishing as the problem, and participants voiced specific concerns with the elver fishery². Several participants shared their anger at the fact that an elver fishery exists and that they felt eel populations were too low to support it. Development was also identified as a potential cause of decline, specifically of new roads and cottages built near the water, the bridge near Little Narrows, and the Canso Causeway. It was felt that these new developments destroy habitat, act as barriers restricting eel movement, and create stress for the eels that prevents them from settling. Participants were concerned with its impact on the eels and their environment from pollution. Several eelers spoke of how visibility when eeling gets worse quicker during the summer eeling season. Some participants voiced concerns with the amount of “worms” found in the eeling during certain times of the summer.

² DFO manages the eel fishery in two groups, the adult eel fishery and the elver fishery. The elver fishery is directed at eels under 10cm in length(DFO, 2003).

In response to the observed decline in eel abundance, the large majority of eelers have changed their eeling habits. When abundance of eels is very low, eelers take time off fishing, from a night or two, to a number of years. Many eelers talked about decreasing the amount of eeling trips in correlation to the amount of eels they saw. Eelers showed real concerns for the eels, one eeler spoke about how he would go out in his boat just to see how many eels there were for a few summers without actually catching any and only resumed eeling when he felt there were enough eels present. Many eelers also make a point not to fish the same area more than once during a self-imposed time period. The time period varied between eelers and was anywhere between a month and a number of years. Some eelers spoke harshly about eelers they felt were not observing this practice or took too many eels. There are a number of precautions eelers take when eeling to assure that they were not harming the eels. Many eelers spoke about being patient and selective in the eels they aimed for during summer eeling. Young eelers talked about being taught to aim close to the tail of the eel so that if the eel did get away it would have a better chance of surviving. It was very important to eelers that they did not needlessly harm eels.

3.1.6 Commercial Eel Fishing

Only two participants indicated that they had been involved in the commercial eel fishery. Both had since made the choice to leave the commercial fishery because of concerns about the eel population decline. A small number of people spoke about selling eels in a non-commercial capacity to make a small profit, some stated that they only want to recoup the cost of gas or only took money when it was offered. The majority of participants had never been

involved in the commercial eel fishery or ever sold eels. Some shared strong moral objections to the commercial fishery, feeling it was disrespectful to sell eels. Most of the participants were aware of commercial fishing for eels happening within and outside the Bras d'Or lakes, either in the past or in the present. The most common commercial fishing eelers spoke about were fyke nets used by non-Aboriginal fishers and elver fisheries by non-Aboriginal fishers.

3.2 WKS Approach to Eel Fishery and Management

The following results are from interviews with those involved in either the COSEWIC, or SARA process. These results illustrate the WKS approach to the eel fishery and management.

3.2.1 COSEWIC and SARA assessment process

The decision-making process to list the American eel under the SARA was discussed in all interviews, with those involved with either the COSEWIC or SARA process. Participants work for different organizations or different sectors within the same organization; this allowed participants to share their understanding and role in the assessment process from different perspectives. Figure 8 illustrates the process as identified by participants.

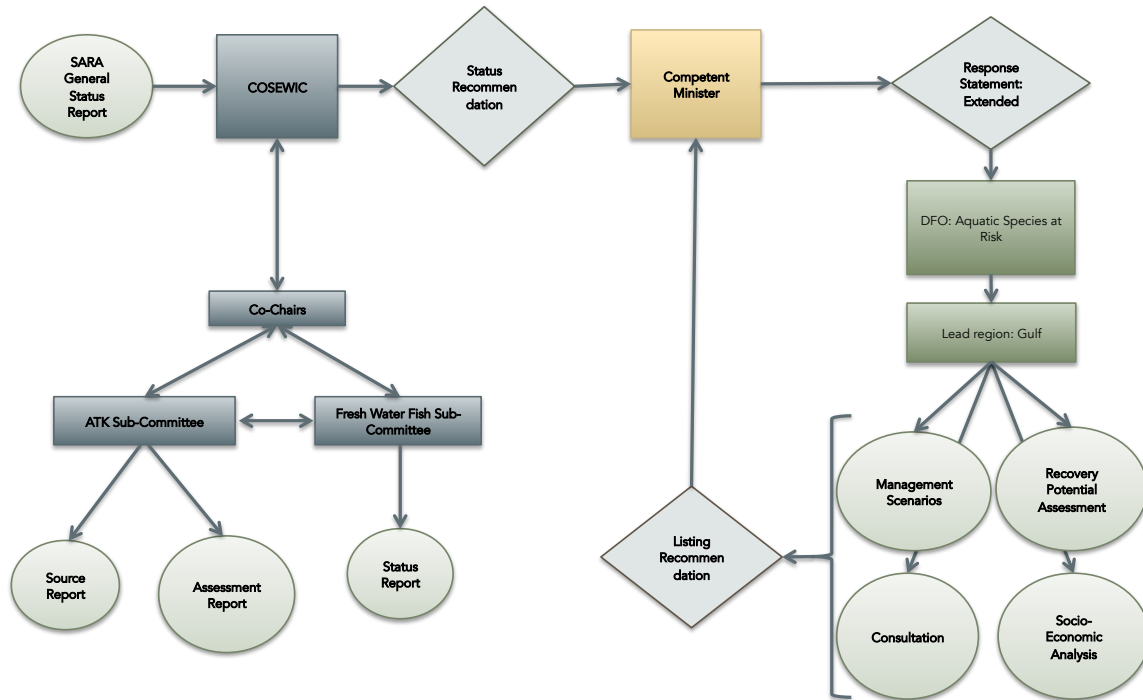


Figure 8 Flow chat outline the COSEWIC and SARA assessment process for the American eel.

The assessment process starts with the release of the general report on the status of wildlife species in Canada, which is prepared every five years (SARA, 2014b). This report outlines which species are doing fine, and which ones merit further assessment by COSEWIC. COSEWIC consists of ten Species Specialist Subcommittees (SSCs) and the ATK Subcommittee (ATK SC) (COSEWIC, 2014). Each subcommittee is co-chaired by two members who along with members from each of the 13 provincial and territorial government wildlife agencies, 4 federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Canadian Museum of Nature), 3 non-government science members, 10 Co-chairs of the SSCs have voting membership(COSEWIC, 2014).

The ATK SC has a number of responsibilities, first to support the SSC in their assessments of species by providing ATK to incorporate into their reports through the production of a status report or an assessment report. It is up the discretion of the ATK SC to produce either a status report or an assessment report based on their assessment of the amount of ATK available and significance of the species to aboriginal communities. Secondly the ATK SC can create their own prioritized list of all the species that are coming up and identify those that will be significant to Aboriginal communities and provide prioritizing recommendations to the SSCs.

Once ATK status or assessment reports has been given to the SSC, it is then incorporated into the SSC status report and goes to the voting members of COSEWIC. All voting members review the status report and vote on the appropriate listing for the species. The American eel was last assessed in 2012 and COSEWIC recommended that it be listed as threatened under the SARA(COSEWIC, 2011b).

Upon receiving the listing recommendation, the Minister of Environment can list the species straight away, undergo a normal listing process, or as in the case of the American eel, undergo an extended listing process. In the response statement, the Minister of Environment also identifies the competent minister(s) to undertake the listing process. For the American eel, the Minister of Fisheries and Oceans as well as the Minister responsible for the Parks Canada Agency were identified (SARA, 2014a). The extended listing process can include undergoing a recovery potential assessment, management scenarios, consultation, and a socio-economic assessment (DFO, 2014). The selected lead

region undertakes all reports outlined in the extended listing process. In the case of the American eel SARA assessment, the lead region is the DFO Gulf Region. After all appropriate reports are completed; the lead-region makes a listing recommendation to the Minister. For the scope of this research, the process ends with this listing recommendation. It is acknowledged that it does continue past this point.

3.2.2 Eel Fishery Management

In eastern Canada, there are three general categories of eel fishing that take place; commercial, Aboriginal (FSC) and recreational. All management decisions, licenses, quotas, gear restrictions, and fishing areas are regulated by the DFO. Both the commercial and recreational eel fisheries operate under licenses and quotas. Eels are fished using various harvesting methods including spears, pots, weirs, nets, long lines, traps and rod and reel (COSEWIC, 2011b; Ford, 2014). The eel fishery is managed as two different fisheries, an elver fisher and an adult eel fishery (Ford, 2014). The recreational eel fishery is also divided into two fisheries, pots (which is being phased out) and other gear such as spears. Recreational eelers are allowed to harvest a maximum of ten eels per day with spears, and all eels harvested must be a minimum of 35 cm long (Ford, 2014).

The FSC fishery is managed under Aboriginal Fisheries Strategy (AFS) agreements, and individual eelers are not issued licenses or quotas. Management of FSC eel fishery happens within a separate section of DFO than the commercial and recreational eel fishery. All management of Aboriginal fisheries takes place through Aboriginal Affairs of DFO. There are approximately

ten commercial communal eel licenses in the Maritime Region. However, it could not be determined which of those are currently active (Ford, 2014). All communities have FSC licenses and eel fishing takes place over many different habitats and throughout the entire year (Weiler, 2011).

3.3 Incorporation of IKS into Eel Fishery and Management Decision-Making

This section identifies the various challenges found for incorporating IKS into decision-making as well as some of the successes, and suggestions from eelers.

3.3.1 Challenges for Incorporation of IKS

The interviews with those involved in either COSEWIC or SARA identified a number of challenges and success stories for the incorporation of IKS into the decision making process. Challenges were found to fall within three categories logistical, conceptual, or communication.

3.3.1.1 Logistical challenges

All participants, involved in either COSEWIC or SARA, identified the lack of an existing process for both gathering and incorporating IKS into reports, processes, and decision-making as a large challenge or barrier. Some spoke of themselves and anecdotally their colleagues not knowing where to start with collection or incorporation of ATK. This confusion about the process created barriers for some that prevented them from including ATK into their work. One

participant spoke of feeling hesitant to include ATK because they were unsure of the proper process.

Participants also acknowledged that there are many challenges for the development of such a process, which would outline how to include ATK into their reports and decision-making. The complex nature of ATK and diversity of the many Aboriginal Nations and groups in Canada make it difficult to develop a “one size fits all” approach. Participants also acknowledged the lack of capacity within their own organizations to undertake the development of such a process.

The relative newness, only having been established for just over a decade, of the ATK SC within COSEWIC was seen as a contributing factor to confusion around the process. Those inside and outside of the ATK SC are still trying to determine the process and expectations of the ATK SC and ATK within the COSEWIC process.

Ownership of data presents a major challenge. Participants identified legal, ethical and logistical concerns with the inclusion of ATK into reports and processes. Some participants spoke of making the choice not to include ATK for ethical reasons. Once ATK is included into a report, it is not possible to protect the knowledge, or the communities that the knowledge came from. After a report that includes ATK is released to the public, there is no way to monitor what is done with the ATK. This creates major legal, and ethical concerns for Aboriginal communities as well as organizations producing reports.

The challenges of working with limited time and money came up in every interview. Generally members of COSEWIC are members on top of their regular jobs, mostly in academia. This limited amount of time was seen as a challenge to participants. Funding was also seen as a major concern. It was stressed during many interviews that the “best available science and ATK” are included into the report, however, it was also stressed that limited time and funds only allowed for the collection of ATK through already publically available information. Publically available information for the collection of ATK limits information to the information found on websites or in reports. It was identified that there was no specific mechanism for verifying the source of reports. Participants felt that the best-case scenario would be to gather ATK from communities for every relevant species assessed by COSEWIC and SARA, but that was unrealistic and was not in the budget. Participants were very aware of the trade off or compromises they need to make because of the budget limitations. For example, if money is allocated to the collection of ATK it means that money must be taken from somewhere else, usually decreasing the overall amount of species assessed in that year.

3.3.1.2 Conceptual challenges

Many of the participants had difficulty explaining how and where ATK fits into the COSEWIC and SARA process and where it fits into the reports. Many saw easy links between TEK and the reports or assessments but the cultural and spiritual aspects were much more difficult to conceptualize. The phrase “there is no place for it” in reference to the cultural and spiritual components of IKS and COSEWIC, as well as within other parts of the process came up a number of times. None of the participants spoke of management from IKS or ATK. Many

participants spoke of IKS as interconnected in nature, but were unsure how to translate that to the work that they do.

Concepts such as time or resources are interpreted differently in western worldview and in an Indigenous worldview. Many of the participants recognized these differences in interpretation as a challenge when working with Aboriginal communities and organizations. For example, managers and politicians operate within a relatively short and finite timeframe, while Indigenous communities generally think in terms of undefined long periods of time (7 generations). Indigenous communities often operate on a much larger timescale, for example the Mi'kmaq refer to the next 7 generations to come when discussing management of the eel. Further still the Mi'kmaq do not assign a set number of years to 7 generations.

One of the components of the SARA assessment process is the development of a socio-economic assessment of the potential impacts of listing a species under SARA. This assessment takes into considerations the implications a specific listing will have on various communities, including Aboriginal communities. Participants felt that Indigenous value systems do not easily fall into the western framework for conducting socio-economic analysis. Therefore it was hard to meaningfully assess what the impact of a listing under SARA would be on culture and IKS.

3.3.1.3 Communication challenges

There were a number of communication challenges that participants had experienced, creating barriers for incorporating IKS into policy level decision-

making. All participants spoke of mistrust between Aboriginal communities and government, or organizations affiliated with the government. Many participants cited historical trauma as the seed of this mistrust and felt it was understandable that this mistrust existed. They also spoke of lack of education in their own upbringing of these historical traumas and having to educate themselves on their own time. Most commented that the more they learned about historical trauma in Canada and Indigenous ways of knowing, the better they could understand why things are the way they are today. Many felt that relationships between their organizations and Aboriginal communities were continuing to improve. Respect was mentioned a number of times and participants acknowledged that respect had to be key.

Many spoke of the importance of building and maintaining meaningful relationships with Aboriginal communities, but did not think that these types of relationships necessarily exist presently.

One of the main challenges cited by COSEWIC for the incorporation of ATK is that they are only able to use publically available information, and that some communities may have this type of information but do not know about or understand COSEWIC. Although COSEWIC is arms length from the government it is not technically a governmental organization, but the perception that they are the government creates challenges for them. Members of COSEWIC stated that the majority of responses they receive from Aboriginal groups or communities are reactionary. Under best-case scenarios, they would like to have the information before the assessment, not at the end, so that it could be incorporated. Again, because of funding and time, there is limited interaction

between Aboriginal organizations and COSEWIC, and little understanding or even awareness of COSEWIC.

Some participants spoke of the language barrier. Some communities quite literally are speaking a different language. The understanding of the language used in these processes may have different connotations between communities and SARA, COSEWIC, and DFO.

3.3.2 Successes for Incorporation of IKS

When asked about successful processes for the incorporation of ATK, participants gave a number of specific examples such as the grizzly bear, northern Dolly Varden, and wood bison. However specific reasons why these processes went well were not given. Aboriginal Aquatic Resource and Oceans Management (AAROM) advisory committees, and CLFCs were also mentioned and seen as good for capacity building. One participant referenced their involvement up north with co-management boards, feeling those had been more successful at the incorporation of ATK than the processes in the south. Generally when participants were asked about successful projects they had been involved with they circled back to the challenges.

3.3.3 Suggestions from Eelers

Eelers showed concern with the status and the management of eels. Some eelers voiced concerns with the practices of non-aboriginal eelers, feeling they

were greedy, and describing how this had negative impacts on the eels. One eeler gave the example from his own experiences when he saw a non-Aboriginal eeler putting eels back into the water during winter eeling. The Aboriginal eeler felt the non-Aboriginal eeler was just trying to fill his daily quota ³with only large eels, discarding the small eels without concern for their survival. The Aboriginal eeler stated that the small eels were frozen and would not survive if they were put back into the water after being speared. The Aboriginal eeler felt the non-Aboriginal eeler was greedy and disrespectful. The Aboriginal eeler said "I just didn't like the way he did that" and he offered to take the non-aboriginal eeler's little eels. Many eelers felt their way of knowing was currently being excluded from management and they hold a lot of useful information to help. There was a general feeling that management was not considering the cultural part of Mi'kmaq knowledge.

The majority of eelers stated that they would voluntarily take a number of years off eeling if it meant that the eels would still be around for their great grandchildren to eel. Some said they could easily stop eeling for themselves, but if their grandparents or elders requested eels they did not feel they would be able to refuse.

Many mentioned the difficult relationship between aboriginal peoples and the DFO, and government in general and spoke of the tension that was felt. The majority of eelers felt DFO should spend more time talking to them about management. Others spoke of feeling like the 'scapegoat', being blamed for the

³ Non-Aboriginal recreational eelers are allowed to harvest up to 10 eels a day. Eels must be over 35 cm.

decline of fish populations for many species. Some eelers noted that they would hate to see the eels go through what the cod went through (Myers et. al., 1997). One eeler spoke of how he felt DFO employees just see their management position as a job and therefore did not feel fully responsible for the species' wellbeing. Many of the eelers used quite strong language to explain their mistrust, concerns, and frustrations with DFO.

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3.4 Definitions of ATK

All participants involved with either COSEWIC or SARA were asked to give a definition of ATK based on their own personal understanding of the term. Participants were asked to define ATK rather than IKS because ATK is the terminology commonly used in their organizations. These definitions are strictly from the participants and do not directly reflect their organizations official definitions or positions. Participants identified that ATK contains trends over time and specific information of species distribution, abundance, movement, general health, threat, predators, and lifecycles. Two participants recognized that ATK contains information about cultural significance of species, one further went on to explain that for the purposes of their organization these aspects were not relevant. None of the other participants mentioned cultural or spiritual aspects as part of ATK. The majority of participants identified that ATK is communal knowledge, long term, and passed from generation to generation.

Some of the participants spoke of who would hold ATK, this included elders, resource users, and community knowledge holders. Many also stated that knowledge holders would be accepted by their community as an expert. Answers from participants varied quite a bit, as did their comfort with offering a definition based on their personal understanding.

4 Discussion

The discussion is structured around the three research questions. Each question will be discussed individually.

4.1 Question 1

How can eel fishery sustainability be maintained when differences in value systems are potentially impacting its management?

This section outlines the values found in the Indigenous and Western knowledge systems. By examining the differences in values, and how they are expressed within the two knowledge systems, their interactions and impacts on eel fishery management and sustainability are determined.

4.1.1 Eel Fishing Practice, Values, and Beliefs

Through the practice of eeling, eelers express values and beliefs (Table 2), and illustrate how knowledge is transmitted and adapted over time. For example, by undertaking a period of observation eelers show respect for the eel, as well as the oral tradition. Through this period of observation eelers learn patience, respect for the eel, proper eeling techniques, and how to identify and respect

place. The proper eeling technique during summer is to aim for the tail end of the eel, avoiding spearing the head or body. This technique helps to ensure survival of the eel if it is punctured and escapes. The tail end of an eel is fleshy while the head and body end contain important organs, such as the swim bladder. If a spear punctures an eel's swim bladder and it escapes, it will die. The development of this technique within the IKS is an example of how values and beliefs are transmitted and adapted over time, and integrated into practices. The observation period also illustrates how eelers value the transmission of knowledge through the oral tradition (i.e. stories), observation, and experiential learning.

Table 2 Various Eskasoni Mi'kmaq eeling practices and the associated community beliefs and values expressed in interviews with eelers.

Eeling Practice	Community Beliefs	Values Expressed
Sharing eels with elders, family, and community members	<ul style="list-style-type: none"> • Share with those who can not eel for themselves • Showing respect for Elders • Proper skills are needed so eels will not get harmed 	<ul style="list-style-type: none"> • Kinship • Reciprocity • Generosity
Undertaking a period of observation before eelers begin to eel	<ul style="list-style-type: none"> • Learning how to identify habitat • Patience 	<ul style="list-style-type: none"> • Respect for the eel • Oral tradition • <i>M'sit No'kamaq</i>
Deciding to leave the commercial eel fishery	<ul style="list-style-type: none"> • Commercial fishery is hurting eel populations 	<ul style="list-style-type: none"> • 7 Generations • <i>Netukulimk</i>
Using spears over nets	<ul style="list-style-type: none"> • Nets catch too many eels • Only take what you need 	<ul style="list-style-type: none"> • Respect for the eel • <i>Netukulimk</i>
Keeping all eels caught during winter spearing	<ul style="list-style-type: none"> • Eels will die if you put them back, it is wasteful 	<ul style="list-style-type: none"> • Respect for the eel • <i>M'sit No'kamaq</i>
Not fishing or only taking enough for the elders during years of low populations	<ul style="list-style-type: none"> • Not right to eel when population are low • Still want to respect elders 	<ul style="list-style-type: none"> • 7 Generations
Visiting eeling sites only once in a cycle	<ul style="list-style-type: none"> • Avoid overexploitation • Avoid too much pressure on the eels 	<ul style="list-style-type: none"> • <i>Netukulimk</i> • Relationship with territory • Respect for place
Being extremely selective during summer fishing, only taking the "good sized ones"	<ul style="list-style-type: none"> • Leave the smaller eels to have a chance to grow and reproduce 	<ul style="list-style-type: none"> • <i>Netukulimk</i> • Respect for the eel

4.1.2 Eel Fishing and the Value of Kinship

The values of kinship and generosity are seen in the way eelers transmit knowledge, distribute harvest, and interact during eeling trips. All eelers had either been taught to eel or had been told stories about eeling by a family member. The importance of family was also reflected in how eelers distribute their harvest. Similar to what has been found in other Nations (Reo & Whyte, 2012), eeling trips were largely initiated by family members, community, or elders' requests for eels. This commitment to family, elders, and community shows the deep values of kinship, and generosity driving the eel fishery in Eskasoni First Nation. Many eelers take time to clean and prepare eels for cooking before delivering them to elders. The preparation of eels can be a time consuming, labour intensive process, and further shows the eeler's dedication to their community and elders. Through these practices eelers express values of kinship and generosity (Table 2). The distribution of eel harvests amongst family and community is important to recognize when determining the amount of harvested eels per trips. Although eelers may harvest anywhere from one to four dozen eels per trip, these eels are normally distributed amongst many households. For example, if an eeler harvests a dozen eels on one trip and distributes the catch to three households than the total catch per household would be only four eels.

Eel fishing in Eskasoni is not all seriousness; although there is a great deal of respect for eels and place, there is also a great deal of fun and humour. The Mi'kmaq people are known for their humour and exhibited this during interviews and eeling trips. One interviewee did a number of humorous eel impressions

during the interview to show how eels behave in different environments. During eeling trips, eelers often exclaim, “we’re going to starve” after a fellow eeler misses, or when an eeler mistakenly aims for a stick (which looks a lot like eels in the dark) they are teased for the rest of the trip. Eelers were quick to tell funny stories during interviews of a fellow eeler or themselves and their misadventures during eeling trips. This sense of the humour displayed by eelers demonstrates the depth of camaraderie that takes place during eeling trips, and the joy that eelers get from their relationship with the eel, place, their family, and their community. Eel fishing in Eskasoni acts to maintain the transmission of knowledge through oral tradition, maintain community bonds, and instil young eelers with social values such as kinship and generosity.

4.1.3 Eel Fishing and the Value of Place

Eeling takes place along the shore of much of the Bras d’Or Lakes (Figure 7). During mapping sessions eeler identified where they eel, and how they know to eel there. Some eelers identified the traditional hunting and fishing territories of their family. These territories had been passed down from generation to generation. This intergenerational relationship with territory has led to a deep understanding of place, which facilitates eelers’ ability to detect changes in their environment through observation. Not only are they able to detect changes in place, eelers felt a strong obligation to take action when negative changes were observed. Eelers felt reciprocity to both eels and to place. This respect for place and eels was expressed in eelers’ practice of visiting sites only once within a cycle (Table 2). This cycle for each eeler was different, generally ranging between a year and five years. Additionally, eelers cover much of the Bras d’Or

Lakes during their eeling trips (Figure 7); it would presumably be much easier for them to literally eel from their backyards, instead they put a great deal of effort into visiting many sites so as not to pressure one particular area. Through this practice shows eelers' further show respect for place and eels (Table 2).

The poles of the spears are generally carved from *L'natkw* (black spruce), because black spruce grows in marshy areas and is resistant to rotting. *L'natkw* is one of the words eelers considered important enough to have on the list of eeling words (Table 1). Without knowing the importance of black spruce for the construction of eeling spears, its place on the list may be confusing. Eelers' knowledge of the properties of black spruce, and its position on the list of important eeling words further show eelers' relationship with territory, how they value place, and the interconnectedness of their knowledge of their territory.

4.1.4 IKS Approach to Eel Fishery

Values are expressed in the various adaptations eelers have made in technique, technology, and fishing habits. There are obvious differences in summer eeling and winter eeling practices; summer takes place from a boat, while winter on the ice. The adaptation of the eeling spear (Figure 3) shows how eelers have taken their knowledge about the eel's habitat and behaviour and how it varies with the seasons and translated into practice. Eelers explained that they adapt their technique and technology so that eels do not get away. This may seem obvious, but when eelers described that they did not want eels to get away the driving consideration was not because they wanted to catch many eels. To an eeler the idea of hurting an eel and it getting away was the worst thing possible, one

eeler even described it was the “scariest” thing that could happen. The adaptations eeler have made in technology and technique, and the values that drive them demonstrate the length and depth of the relationship that the Mi’kmaq people have with the eel and place. Young eelers today still are adapting spears, trying new metals and designs.

The seasonal adaptations to eel management are not only in the varied technique and tools, but also in the acceptable number of eels to harvest. In the summer, there is generally a set number that is acceptable to take (a dozen or so per trip), while in the winter it is acceptable to take as many as one can get. Also in the summer, it is not acceptable to harvest small eels, while in the winter it is an unofficial rule that eelers keep all the eels harvested, regardless of size. During summer eeling, eelers are able to see the size of the eel they aim for and can decide to spear for it or not, but in the winter when eels are in the mud under the ice, eelers have no way of knowing the size of the eel before they spear it. These adaptations to management show the eelers’ relationship with the seasons and cycles of the eels and are based on respect for the eel and a deep understanding of the cycles of their territory⁴.

Adaptations to eeling were also undertaken when eelers observed declines in abundance of eels. These included eelers voluntarily taking time off eeling, decreasing number of eeling trips per season, and taking less eels per trip. These adaptations also show respect for the eels and a connection to the

⁴ There are different dishes for different sizes of eels, so whatever eelers catch they are able to use. Large eels are baked, and smaller eels are used in soup or stew.

environment. Eelers were able to observe changes in environment and the decline in abundance because of their ongoing relationship with place. The response to the decline in eel abundance was rooted in *Netukulimk*. Eelers, regardless of age or having children, spoke of wanting to make sure that the eels would be around for their great grand-children. One eeler explained that the eel had been an important teacher to him, it had taught him how to respect the environment, and made him the person he is today. The eeler went on to say that eels can teach us what is happening in the environment if we listen, and that he would like them to be around for the next 7 generations.

4.1.5 WKS Approach to Eel Fishery

The WKS approach to eel fishery management and conservation is based on science-based knowledge, governmental processes, and mandates that stem from legislative Acts. The WKS employs a top-down approach to management of fisheries. Each type of eel fishery (FSC, adult commercial, elver commercial) is managed separately and sometimes within different sections of departments or organizations. For example, the commercial elver fishery and adult eel fishery are managed by separate sectors than the FSC fishery, and the assessment species status is done by two different organizations. The amount of intricate processes involved in eel conservation and management shows how the WKS values compartmentalization and order. The ultimate objective of the WKS approach is to maintain the population so that harvesting can continue. The multilevel process-intensive management system of the WKS (Figure 8), leads to slow responses in adaptations to management. The existence of COSEWIC and SARA show the WKS commitment to conservation and sustainability.

4.1.6 Comparing IKS and WKS approach to the eel fishery

Differences in values were identified between the IKS and WKS approach to the eel fishery. The IKS values included kinship, sustainability (*Netukulimk, Msit Nokoma, 7 generations*), respect for the eel and place, and generosity. The WKS values included process, science-based knowledge, economic benefits, compartmentalization and sustainability. The value of in the WKS approach conservation and sustainability was illustrated by the existence of COSEWIC and SARA. The IKS approach to the eel fishery intertwined management within the practices, stories, and social norms of the community while the WKS approach was found in mandates and processes stemming from legislative Acts. Both knowledge systems value sustainability, however, the definition and objectives of a sustainable eel fishery differ. For example Aboriginal eelers, were all very quick to state that they would stop eeling for however long it takes to bring back the eel population. They value and believe that in order for the eels cultural significance to be passed down to future generations they must take responsibility upon themselves. Some eelers were interested in becoming involved in monitoring or recovery initiatives so that even if they were not eeling they would maintain their relationship with the eel. The objectives for Aboriginal eelers were to obtain eels to share with their community and to pass on knowledge to the next generation. The objective for commercial eelers is to make money to maintain a livelihood. There are strengths in both approaches to fisheries management. The collaboration of the two approaches has strong potential to enhance sustainable fisheries management in Canada.

4.2 Question 2

How is the FSC eel fishery impacted by the commercial eel fishery in Eskasoni First Nation?

This section outlines Eskasoni's involvement in the commercial eel fishery and how eelers see the commercial eel fishery impacting their FSC fishery.

4.2.1 Commercial Eel Fishery in Eskasoni

Very few of the participants interviewed had been involved in the commercial eel fishery. Both commercial eelers interviewed had chosen to stop commercial eeling and expressed concerns with the impacts of the commercial fishery on eel populations. Both still continue to fish eels for FSC purposes. Eelers talked about both past and present commercial eel fishing in the Bras d'Or Lakes. When talking about the commercial eel fishery in the past eelers stressed that had been far too many nets out there and it "wiped out" the eels. Eelers spoke about the elver commercial fishery in the present, and felt it was having a large impact of eels and if continued would have further negative impacts on their ability to FSC fish for eels.

During the interviews some eelers stated that the amount of money that could be made from the elver fishery was up to five thousand dollars a night. Even though there is a high monetary incentive attached to the elver fishery none of the eelers voiced any interest in being involved.

4.2.2 Eel Fishing Decline

The majority of eelers observed decline in eel abundance. During interviews eelers answered quickly and with certainty when they were asked if there had been changes in eel numbers. From the conviction with which eelers discussed possible reasons for eel decline and the large number of possible reasons they gave, it was clear that eelers have given a great deal of thought to the topic. Many eelers speculated that the past and present commercial eel fisheries had negative impacts eels in the Bras d'Or Lakes.

4.3 Question 3

What are possible mechanisms for transmission of IKS into policy?

This section highlights possible mechanisms for transmission of IKS into policy, outlines some of the challenges, and identifies some of the benefits.

4.3.1 Importance of language

Eelers illustrated the importance of language to them through their enthusiasm in providing a list of Mi'kmaq eeling words (Table 1) and in the way they encouraged the researcher to learn the words. It was not enough that the words just remain on paper, it was important to eelers that the researcher practice and use the words. Language is an integral part of a knowledge system, culture and worldview are held within a language (Barnhardt, 2005; Battiste, 2000).

Netukulimk and *M'sit Nokomaq* are two Mi'kmaq words, which as previously discussed, roughly translate to "sustainability" and "all my relations". The translation of the Mi'kmaq words into English does not fully articulate the values and worldviews they embody. By translating these words into English, it is also translating the Mi'kmaq values into Western values, assuming that the objectives of *Netukulimk* and sustainability are the same.

The inclusion of Indigenous knowledge systems into WKS processes has multiple benefits. First it allows for the inclusion of the concepts, words, and terms in their unabridged form, so that meaning is not lost in translation. Secondly it shows commitment to understanding and honouring Indigenous people language and knowledge system. Third it will allow for cross-cultural understanding between WKS and IKS.

4.3.2 Definitions of ATK

The perception as well as the interpretation of terms such as ATK, IK, or IKS by resource managers and policymakers impact how they are incorporated into processes (Weiss et al., 2013). In Canada, the term used by organizations such as DFO, SARA, and COSEWIC is ATK. It was found that there are many different definitions, understandings, and comfort levels with ATK between staff at these organizations. It was also found that TEK is generally the first thing that comes to mind for many in the WKS. TEK is limited in that it only describes knowledge about the environment and does not include the cultural, spiritual, or management facets of an IKS. In order to meaningfully incorporate IKS into

decision-making the importance of all parts of the knowledge system must be recognized.

4.3.3 Challenges for Incorporating IKS into Policy

There were many challenges identified for the incorporation of IKSs into policy level decision-making. Some participants identified that their comfort-level with the process was low and that the lack of clarity in processes for the incorporation of ATK made them hesitant to initiate such a process. Aboriginal issues are often contentious and appear to be left unexplored in government for fear of conflict. In addition many of the participants came into their current positions with little understanding of the historical traumas and contemporary issues facing the Aboriginal peoples of Canada. They had been taught little, if anything at all, about Aboriginal peoples during their education. There is a large gap in Canada's school systems, ignoring Aboriginal peoples history and contemporary struggles. If IKSs are to be incorporated into these processes there must be greater priority given to educating the people of Canada about Canada's First Peoples, so that its value to the decision making process is appreciated. Further, should future managers and policymakers incorporate IKSs into process, they will have knowledge of the history and contemporary struggles, a higher level of comfort and cross-cultural understanding.

Lack of time and money for the COSEWIC process caused the organization and its members to make compromises between assessing more species for protection, and collection of ATK for inclusion in the process. These compromises create moral and ethical dilemmas for members.

Although the National Aboriginal Council on Species at Risk (NACOSAR) and Aboriginal Fund for Species at Risk (AFSAR) were not mentioned in any of the interviews, they were identified in the literature as playing important roles for the incorporation of ATK into the process of eel management⁵. AFSAR provides funding for projects that focus on species at risk recovery projects and its objective is to foster “meaningful collaboration with Aboriginal people and organizations in the implementation of programs under the Species at Risk Act” (Canada, 2014). NACOSAR was established with the SARA, and the members of NACOSAR are appointed by the Minister to represent Aboriginal peoples of Canada (NACOSAR, 2014). NACOSAR’s role is to provide advice to the Minister of Environment and to provide recommendations to the Canadian Endangered Species Conservation Council (NACOSAR, 2014). Both of these organizations provide opportunity to incorporate IKSs into the process. These organizations may not have been mentioned in the interviews due to a number of reasons, perhaps like COSEWIC and SARA they have difficulty creating a presence in the public eye.

4.3.4 Benefits of Incorporating IKS into Policy

The management of natural resources in Canada is based on western science-based knowledge systems (Gratani et al., 2011). Prior to contact, Indigenous communities sustainably managed their territories and natural resources using their own management framework embedded in their knowledge systems

⁵ They were perhaps not mentioned because participants were unsure as to how they fit into the process and it was to participants unclear how information gathered under AFSAR funding is integrated into the process.

(Gratani et al., 2011; Simpson, 2004; Turnbull, 2009). Currently, the management system for natural resources in Canada has very little meaningful incorporation of IKSs into policy-level decision-making processes. Benefits of including IKSs into policy level decision-making and science-based knowledge include but not limited to the generation of baseline assessments, improved monitoring and evaluation capacity (Berkes, 2006), innovations and improved practices, enhancement of long-term planning (Ryan, 2012), reconciliation, and cross-cultural understanding (Ens, Finlayson, Preuss, Jackson, & Holcombe, 2012). The management approaches and practices of an IKS can benefit WKS by providing new frameworks for management of natural resources. The inherent connectedness, long-term planning, and values can guide fisheries management and enhance long-term sustainability.

5 Recommendations

5.1 Overarching Recommendations

This section discusses the overarching recommendations for both eel management and the SARA process, and more broadly for all policy level decision making. These recommendations will help to overcome some the overarching challenges for the incorporation of IKS into policy level decision making.

➤ Increase meaningful communication

The increase of meaningful communication between DFO, SARA, and COSEWIC and Aboriginal groups and communities will help to strengthen relationships and build trust (Ens et al., 2012). This research found a number of instances

where lack of communication has possibly been the cause of frustration in Aboriginal communities. For example, Aboriginal eelers being frustrated with the winter eeling practices of non-Aboriginal eelers, feeling putting dead small eels back was disrespectful. This frustration for eelers has further caused them frustration with DFO. Meaningful communication between Aboriginal fishers and DFO would allow discussion of these frustrations, and facilitate the incorporation of IKS into fisheries management.

➤ **Building and strengthening relationships**

Meaningful communication must be coupled with the continuation of building and strengthening relationships with organizations and aboriginal groups. One workshop is not sufficient to overcome decades of mistrust. Through the establishment of meaning communication and long-term relationships, both parties will achieve better cross-cultural understanding. It has been seen in this research that the objectives and definitions within the two knowledge systems differ. For example, each knowledge system has its own understanding of sustainability. For the WKS sustainability appears to mean harvesting as much as possible of the resource while leaving enough to harvest next year. For the IKS sustainability is a reciprocal relationship with a relation, harvesting only what you need to ensure seven generations to come can also have a relationship with that species. Cross cultural understanding will help both knowledge systems understand the objectives of each other and enable them to work together to find sustainable harvest practice that are in line with differing values in the knowledge systems.

One of the few successes that were found in this research was the use of advisory committees. Advisory committees allow for people to be part of the process. Participants felt advisory committees were a good way to bring many perspectives to the table. Additionally, it was expressed that face time with people through advisory committees allowed for a greater understanding of each other's point of view.

➤ **Broadening of the definition of and understanding of ATK and TEK to IKS**

Changing the definitions used by organizations will facilitate a more accurate understanding by those who are incorporating IKSs into processes and decision-making. It was found that staff working within DFO, SARA, and COSEWIC were unsure how to define ATK and generally felt more comfortable defining TEK. The expansion of the definition of ATK to IKS in these organizations will broaden the type of information that is gathered to incorporate, as well as the comprehension of those using it.

➤ **Explore the legal framework for ATK**

The complex legal system for the incorporation and collection of IKSs creates a challenge for many organizations. Organizations, such as COSEWIC, do not have a legal framework in place for the protection of IK. The absence of legal frameworks creates legal, and ethical concerns for Aboriginal communities as well as organizations producing reports. Additionally organizations with little time and funding do not have the capacity to fully explore the creation of legal framework. Research into the legal protection of IKSs needs to be conducted by

those who have the capacity, time, and funding, perhaps within the federal government or at an academic institution.

5.2 Fisheries Management Recommendations

IKS is not currently viewed as possible contributor to management by DFO. This research has shown how the practices of eel fishers express values and beliefs (Table 2). The practices of eel fishers contain management decisions, based on the IKS values and beliefs. Table 3 shows how eel fishing practices from an IKS perspective can be translated into WKS eel fisheries management. Currently DFO is in talks with various Aboriginal organizations to update the American eel Integrated Fisheries Management Plan (IFMP) for the Maritime region. The IFMP is used by the DFO to “guide the conservation and sustainable use of marine resources” (DFO, 2010). The development of an IFMP provides the opportunity to incorporate IKS management practices. Through advisory boards, it also creates opportunity for relationship building, and cross-cultural understanding.

Table 3 Management Recommendations from an IKS Approach to the Eel Fishery and Management

Eeling Practice	Management Recommendations
Sharing eels with elders, family, and community members	<ul style="list-style-type: none"> • Minimum FSC level ensured
Undertaking a period of observation before eelers begin to eel	<ul style="list-style-type: none"> • Courses for fishers which include Mi'kmaq cultural awareness
Deciding to leave the commercial eel fishery	<ul style="list-style-type: none"> • Conservation efforts
Using spears over nets	<ul style="list-style-type: none"> • Gear restrictions
Keeping all eels caught during winter spearing	<ul style="list-style-type: none"> • Change to seasonal management for fishery • Varying Size Limitation of seasonal periods
Not fishing or only taking enough for the elders during years of low populations	<ul style="list-style-type: none"> • Adaptive management • Monitoring programs
Visiting eeling sites only once in a cycle	<ul style="list-style-type: none"> • Conservation efforts
Being extremely selective during summer fishing, only taking the "good sized ones"	<ul style="list-style-type: none"> • Size limits for summer eeling

5.3 COSEWIC and SARA Process Recommendations

Through an examination of the COSEWIC and SARA process for the American eel seven places where further or increased incorporation of IKSs could enhance the process have been identified. Each star indicates a place in the process where there is opportunity for the further or increased incorporation for IKS and for non-Aboriginal organizations to work with Aboriginal organizations (Figure 9).

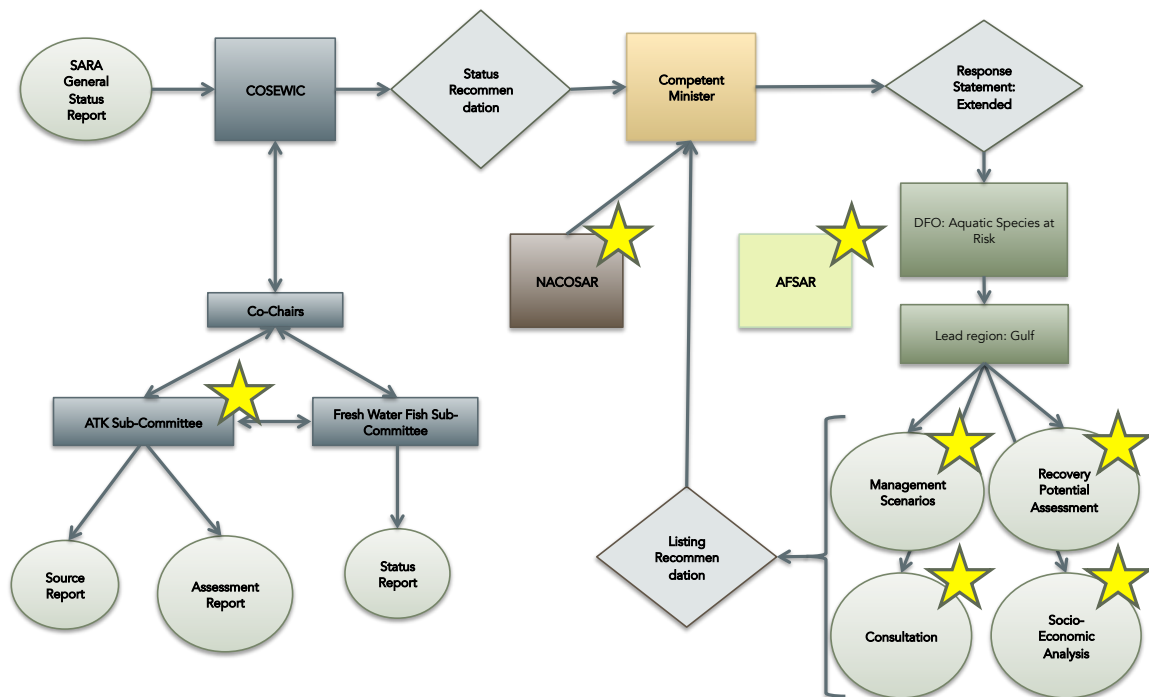


Figure 9 Potential places, indicated with stars, within the COSEWIC and SARA process where further opportunity exists to incorporate IKS.

The recovery potential assessment, consultation, and socio-economic analysis all provide opportunity to initiate conversations with Aboriginal communities about the incorporation of IKSs. These also present places where more Aboriginal people can be incorporated into the process through the use of advisory

committees for example. Advisory boards were one of the few identified examples where successful relationships with Aboriginal communities or organizations had been established.

Within the Aboriginal components of the process (ATKSC, NACOSAR, AFSAR), there exists opportunity to use decolonized methods for the collection of IKSs and decision-making, and to employ ceremony as a method and Indigenous ways of knowing before the information is incorporated into reports.

Decolonized methods such as ceremony (e.g. talking circles) allow IKSs to function as IKSs without having to adhere to colonial processes (Simpson, 2004). Using decolonized methods will act to build trust between Aboriginal organizations and communities, help to build and strengthen relationship, and to empower Aboriginal people and their cultures (Smith, 1999; Wilson, 2008).

Part of the process is to develop management scenarios for potential listing; this is an excellent opportunity to include IKSs and the management frameworks into management scenarios. As seen in this research, Aboriginal communities already have adapted management practices in response to observed decline in the American eel. These management adaptations developed in an IKS would work to enhance sustainability of species. Additionally it would provide opportunity for cross-cultural understand between DFO and Aboriginal communities.

5.4 Recommendations for Eskasoni

Three areas of high importance for retention of language, and transmission of culture and knowledge were identified in Eskasoni, John Paul's Lane, the Beaches, and Goat Island and surrounding Islands. Although the community is aware of the uses of these areas, perhaps they have not been thought of in terms of cultural and language retentions. All three of these areas were identified as places where young eelers learn to eel (Figure 6). Special attention to the preservation of these habitats would work to preserve habitat for eels, as well as protect important habitats for cultural and language retention and transmission. The community of Eskasoni could establish monitoring program in collaborations with AAROMS to ensure the habitats remain good eeling areas, culture and language retention, and to facilitate the teaching of younger generations about honouring the environment and relationships with relations.

6 Conclusion

Through the exploration of the parts of an IKS, mechanisms for the incorporation of IKSs into policy, how values and beliefs are expressed through practices, and the IKS approach to management were determined. Results from interviews with eel fishers from Eskasoni First Nation showed how the Mi'kmaq KS is interwoven into all aspects of the eel fishery and management at the community level. This was contrasted by the WKS approach to fisheries, which was process intensive and compartmentalized. A number of opportunities for the incorporation of IKS into processes were found. Including within the following organizations ATKSC,

NACOSAR, and AFSAR. It was found that an IKS and WKS have differing approaches to eel fisheries management, these different approaches to management both have strengths and by working together will enhance sustainability of fisheries management. Acknowledging IKS as a management approach is the first step to a meaningful collaboration between IKS and WKS.

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ommonName=American%20Eel&scienceName=&returnFlag=0&Page=1](http://www.cosewic.gc.ca/eng/sct1/searchdetail_e.cfm?id=891&StartRow=1&boxStatus=All&boxTaxonomic=3&location=All&change=All&board=All&commonName=American%20Eel&scienceName=&returnFlag=0&Page=1)

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Appendix

A. Appendix Dalhousie Ethics Approval



Social Sciences & Humanities Research Ethics Board Letter of Approval

September 03, 2014

Ms Amber Giles
Marine Affairs Program (Science)

Dear Amber,

REB #: 2014-3343
Project Title: Improving EEL Fishery Management Through the Incorporation of Indigenous Knowledge into Policy Level Decision Making- A Case Study in Eskasoni, Cape Breton
Effective Date: September 03, 2014
Expiry Date: September 03, 2015

The Social Sciences & Humanities Research Ethics Board has reviewed your application for research involving humans and found the proposed research to be in accordance with the Tri-Council Policy Statement on *Ethical Conduct for Research Involving Humans*. This approval will be in effect for 12 months as indicated above. This approval is subject to the conditions listed below which constitute your on-going responsibilities with respect to the ethical conduct of this research.

Sincerely,

A handwritten signature in cursive script, appearing to read "Valerie Trifts".

Dr. Valerie Trifts, Chair

B. Appendix Mi'kmaq Ethics Watch Ethics Approval



November 20, 2014

Amber Giles
Master of Marine Management Candidate
Dalhousie University
Marine Affairs Program
2-40 Ocean Sciences Building
1355 Oxford Street
Halifax, NS B3H 4R2

Dear Ms. Giles:

I wish to inform you that the Mi'kmaq Ethics Watch committee has reviewed and approved "*Improving Eel Fishery Management through the Incorporation of Indigenous Knowledge Systems into policy level decision making.*"

As your project moves forward with the approval of the Mi'kmaq Ethics Watch, I must note that individual communities have their own perspective on research projects and it is your responsibility to consult them to ensure that you meet any further ethical requirements. Governments, universities, granting agencies, and the like also have ethical processes to which you might have to conform.

When your project is completed, the Mi'kmaq Resource Centre at Unama'ki College would be pleased to accept the results in a form that could be made available to students and other researchers (if it is appropriate to disseminate them). Our common goal is to foster a better understanding of the Indigenous knowledges.

If you have any questions concerning the Mi'kmaq Ethics Watch review of your project please do not hesitate to contact me and I will forward them to the committee members.

Sincerely,

Stephen J. Augustine,
Dean
Unama'ki College and Aboriginal Learning
Cape Breton University

CAPE BRETON UNIVERSITY | UNAMA'KI COLLEGE

Tel: (902) 563-1871 | P.O. Box 5300, 1250 Grand Lake Road, Sydney, NS B1P 6L2 CANADA | WWW.CBU.CA/UNAMA'KI

C.



Questions:

1. Can you please tell me the title of your current position and how long you have held it? How long have you been with this organization?
2. Does your organization use or collect ATK?
 - 2.1. If no then why not? What information is being used, what are the challenges
 - 2.2. If yes, How does your organization describe Aboriginal Knowledge or Aboriginal Traditional Knowledge (ATK)?
 - 2.3. Are you mandated to include/incorporate ATK?
 - 2.4. If so, how is ATK used?
 - 2.5. Is there a protocol for the incorporation for ATK into decision making?
3. How is ATK collected by your organization?
 - 3.1. What communities or individuals are contacted for the collection of ATK?
 - 3.2. Who conducts the collection of ATK?
 - 3.3. Are Mi'kmaq or other First Nations individuals/ communities/ organizations provided the opportunity to confirm that ATK has been interpreted accurately?
 - 3.4. Are Mi'kmaq or other First Nations individuals/ communities/ organizations included in any other aspects of assessments/ management/ science?
4. Are there potential implications to Mi'kmaq or other First Nations fishers if the American eel is listed under the Species at Risk Act (SARA)? If so, what are there different implications at differential level of designation?
 - 4.1. Are these implications taken into consideration by your organization?
 - 4.2. Are there mechanisms to discuss potential implications of a SARA listing with those impacted?
 - 4.3. Are discussions about possible impacts of a SARA listing or other aspects of the eel fishery with Aboriginal communities something you think your organization is interested in?
5. Describe the relationship between Aboriginal communities/ organizations and the organization where you work.

- 5.1. Are there challenges for the incorporation of ATK? Can you provide an example?
- 5.2. Have you been involved in a successful relationship between your organization and Aboriginal individuals/ communities/ organizations?
- 5.3. Do you have any recommendations to improve upon the process in future assessments/ management/ science?

Interview Questions For Eel Fishers:

1. Do you remember your first time fishing eels?
 - a. Who taught you how to fish for eels?
 - b. How long have you been fishing for eels?
 - c. How do you know where to go and when to go?

2. How do you fish for eels? (Spear, net, etc.)
 - a. How were eels fished in the past?
 - b. What were some of the uses of eels in the past?
 - c. What do you see for eel fishing in the future?

3. How many eels do you generally catch per trip? (map, where, when)
(Show me where you catch a lot, show us where you caught a little)
 - a. How do you know when you've caught enough?
 - b. What do you do with all the eels you catch?
 - c. How do you know which ones to keep?
 - d. What do you do with the eels you catch?

4. Have you noticed any change in the number of eels since you started fishing for eels? (map, show us where)
 - a. If so, more or less?
 - b. Have you changed the way you fish for eels in response?
 - c. Why do you think there is a change in eel population?

5. Have you ever commercially fished for eels? (Map)
 - a. Do you know of any commercial fishing taking place?
 - b. Does the commercial fishery impact the FSC fishery? (Interaction)

6. Is it important to share your ways of knowing about eels/eel fishing with everyone?
 - a. Do you think those who regulate the eel fishing understand your ways of knowing?
 - b. How would you explain your way of knowing to a person making decisions about the fishery?

7. Do you have any stories about eels or eel fishing you would like to share?