Science and Good Manners– Investigating the Integration and Value Placed on Inuit Traditional Ecological Knowledge within Qallunaat Scientific Enquiry.

by

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ABSTRACT

Traditional Ecological Knowledge (TEK) is a highly geographical ontological framework which has long been marginalized in scientific discussions, but there is increasing consensus on the importance of using such knowledge systems in research and policy. With this in mind, this thesis examines the value placed on Inuit TEK in scientific endeavours in the Arctic, with a particular focus on the Canadian North. It first seeks to understand the complex and layered definitions of the term and it implications. Then, using thematic literature reviews of primary scientific research it examines the practical methodologies of contemporary Arctic science. It finds that sub-disciplines of Arctic research have interacted with TEK with different intensity and practices, and have tended to evolved in silos on this subject. Finally, interviews and second-hand accounts are recounted to formulate ideas about the best ways of practicing contemporary science in the North in ways that lead both to better science and to stronger relationships with communities.

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This thesis is the culmination of a year and a half of work, ideas, highs and lows, doubts and little triumphs. Throughout the whole process, I have found a community of people who have had my back every step of the way, and for them, I am so very grateful.

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I hope that this thesis provides insight into contemporary scientific endeavours in the Arctic and the importance of getting environmental questions and polices right. I believe we are at a unique time in history where a window is opening to engage with new ways of conducting science and research to better respond to new conditions. It seems fitting that this thesis is 99 pages; there will always one more thing to do.

McGill University is located on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinaabeg nations. McGill honours, recognizes and respects these nations as the traditional stewards of the lands and waters on which we meet today.

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CHAPTER 1: INTRODUCTION

1.1. Context Summary.

There will be increasing interest and scrutiny on the Arctic world in the coming years. New realities are bringing a growing southern presence to the North, a presence deeply connected to all aspects of geographical inquiry: climate change, the opening of the Northwest Passage, the struggle for resources in the polar waters, growing populations, and a renaissance of Indigenous sovereignty. Notably, the changing Arctic context is bringing a tremendous amount of science to the land that Inuit call Inuit Nunangat (Huntington, 2011). This science often clashes with Inuit cultural paradigms and community interests.

In 1981, Macpherson identified what he called Canada's "twin northern conservation challenges" (Macpherson, 1981, p.104). He challenges us to support indigenous communities' solutions to specific conservation issues and to install a northern resource-use plan on a solid foundation of knowledge. These two goals are quite visibly linked, and provide a potential bridge between questions sovereignty and Northern development. Indeed, sustainable development of the North is a topic with which governments, conservationists, and communities are increasingly grappling, with a fear that any decision made could fundamentally change the Arctic, especially under the increased risk of climate change (Damtoft et al, 2008).

This fear is not new; it can be found in the history of Canada's conservation estate, reflected in conservation plans for Arctic megafauna (see Sandlos, 2007). These plans are based in scientific knowledge. Many of conservation policies, notably the ones creating strict quotas on hunting, have been devastating for northern communities and have contributed largely to the contemporary mistrust among Inuit of southern scientific and government intervention regarding wildlife in the North (Sandlos, 2007). The legacy of Qallunaat scientific and policy "good intentions" in the Arctic

still runs deep through the results of some environmental policies in the North and the long history of either ignoring Inuit knowledge or extracting it.

Interactions (and tensions) between Qallunaat scientists and Inuit communities have crystallized around local knowledge of the land. This has been epitomized in a research frenzy which began in earnest in the 1950s, often around land-based, geographical questions, and brought notably, increased intervention in hunting rights (Sandlos, 2007, 18). Research, whether by private individuals within academia, corporations, or government branches, was furthered in the 1960s and 19870s as technology made the region more accessible, creating a new frontier for research and exploitation (Stuhl, 2013). Around the same period, with centralization of semi-nomadic Inuit communities, the new northern villages provided base camps and open-air "laboratories" for southern scientists to gather their data[1] The prior-existing divide between Inuit and the scientists in these places sharpened, and was exacerbated by intrusive research methods (Fienup-Riordan, 1999).

1.2 TEK and the Inuit Knowledge System.

Research in the Canadian Arctic has never occurred in a vacuum; it provides information for many northern policy decisions that have often preferred outside "expertise" to local knowledge holders' long experience. More and more, southern scientific practice is coming into deep contact with a different knowledge paradigm, what we might call here Inuit science. Of this, there are different levels of what can be encompassed into Inuit Knowledge Systems: Inuit Qaujimajatuqangit (IQ) is perhaps the broadest framework of these, and Inuit Traditional Ecological Knowledge (TEK) is

[1] For example, this is happening a lot today as climate change scientists flock to the North (Marino and Schweitzer, 2016).

comprised within this framework. Traditional Ecological Knowledge is a system of ontological creation and knowledge memory that encompasses aspects of Inuit institutions and understandings about their environment. Although it contains rich factual information however, TEK goes beyond to point to ethics and values, a cosmology, and methods to create knowledge. It is a practice deeply bounded in space, by which the landscapes of the Canadian Arctic are known to those who live within it.

Non-Inuit, or for this context, Qallunaat ("Southern"), scientific tradition, on the other hand, is deeply rooted in the scientific method which favours systematic observation, the creation and testing of hypotheses, measurement, and deduction, in Cartesian-Newtonian terms (Willis, 1990). The differences between TEK and Qallunaat science have long been debated as to their compatibility and until recently, a meeting of these two systems beyond the superficial and factual was impossible as the later was seen as systematic, deductive and generalizing, and the former inductive, anecdotal and focused (Omura, 1999). In recent years, this separation has slowly softened. Rather, there is growing realisation that for scientific work in the North to be constructive, there is a need for both forms of knowledge to act together.

1.3 Research Gap.

For a period spanning the 1950s through the 1960s, researchers were convinced that Inuit thought and culture were going to disappear, made obsolete by increased contact with southerners and their technology (Wenzel, 2001). This acculturation perspective was explicitly drawn by Frank Vallee in his monograph *Kabloona and Eskimo in the Central Keewatin* who argued that traditional Inuit reliance on wildlife would quickly cease to be adaptive, replaced by mechanical, white- collar, and other skills appropriate to a southernized economy (Vallee, 1967).

TEK only began to be a recognized concept in Qallunaat institutions in the 1970s as the resilience of Inuit adaptive traditions made it clear that acculturation was less of a given than had been previously presumed (G. Wenzel, personal communication, 10 October 2018). Rather, it became obvious that Inuit populations were growing and adapting to new realities while retaining core cultural traditions. Today, most questions in Inuit research have turned away from contemporary Inuit culture as at best a colourful remnant and instead have embraced notions of cultural sovereignty and social strength.

Omnipresent in these questions are environmental concerns. There has been a slow surge of both epistemological and practical focus on Inuit knowledge about this environment, especially TEK, acknowledging its potential in leading to better research and more impactful interventions while reasserting Inuit sovereignty. However, there is still resistance and confusion about conceptual understandings of TEK and its applicability within formal (i.e. Southern) scientific activity: this has led to misguided and damaging policy decisions, methodologies of knowledge exploitation, invasive science, and all around damaging relationships between Inuit communities and Qallunaat scientists. As Natan Obed, president of Inuit Tapiriit Kanatami (ITK) has recently noted: "For far too long, researchers have enjoyed great privilege as they have passed through our communities and homeland, using public or academic funding to answer their own questions about our environment, wildlife and people." (Obed in Lougheed E., 11 April, 2018).

In 1999, Wenzel underlined that, although it is widely accepted that TEK should be used in policy, "far less agreement exists on why this is not being accomplished yet, or on how the evolving particulars of such inclusion may affect methodological and theoretical approaches" (Wenzel, 1999, p.115). Ten years after this article was published, academia has yet to fully answer these questions. One way to begin to do this is to engage in a systematic inquiry of the value placed on TEK in different types of Arctic scientific research.

1.4 Research Aim.

This thesis is the outgrowth of an ongoing desire to learn about constructive scientific work in the Canadian Arctic. I am a complete outsider to the reality of the North, and the practical goal of this year-long research is to be trained, both in ideas and technique, to engage with northern environmental research and examine best practice examples with respect to Inuit science.

The aim of this research is thus to comprehensively question the value placed on Traditional Ecological Knowledge within research contexts taking place in the Arctic. TEK is emerging into public and academic consciousness as a critical part of Inuit culture that can inform and benefit Qallunaat science and Inuit wellbeing. Although legislation and policy already recommend TEK as an important link between Inuit and research communities, it is still yet unclear in what ways research should engage with the knowledge paradigm. Furthermore, while progress toward integration has been made, cross-cultural acceptance of these respective approaches still lacking. Whether this murkiness stems from an absence of will to optimize Inuit contributions is unclear; more likely, the cause also relates to deeply entrenched misunderstanding of a conceptual framework that could have real intellectual benefit.

1.5 Thesis Structure.

This thesis aims to answer three objectives. First, to understand the definitions and implications of Traditional Ecological Knowledge and local knowledge systems in the Arctic context. Second, to examine the ways in which TEK has been understood, valued, and integrated (and marginalized or erased) in scientific literature in the North. And third, to discuss best methodological practices for research in the Arctic, and argue the importance of thinking about these topics.

To answer these, the body of this thesis examines the interaction, through time and intensity, of Qallunaat science with Traditional Ecological Knowledge, through three main axes. First, preliminary work explores terms and concepts used in this discussion. This includes definitions of Traditional Ecological Knowledge and the scientific method, and a deeper analysis into their concepts. Next, this thesis uses northern science of varied disciplines as a primary source to question the value given to Inuit knowledge in northern scientific research in the twentieth and twenty-first centuries. This allows us to view the content of research projects themselves as providing insight into methods and values brought by these scientists to the northern context. From this, we can lay a framework to understand the different methodologies used in the practice of research in the Arctic. I supplement this understanding with interviews conducted in the Winter of 2018 with experts on the topic, to end by elaborating certain thoughts on the best ways to engage in scientific endeavour in the northern context.

CHAPTER 2: CONCEPTUAL FRAMEWORK – SETTING THE SCENE

2.1 Scientific Paradigms, Ethics, and the Creation of Knowledge.

The "Western" (henceforth called *Qallunaat*[2]) scientific method is based on questions of testable hypotheses and systematic, repeatable studies. Its methodologies are very much those of the laboratory and experiments, and in the field, these methodologies are adapted with similar concepts (Watson, 2012). Traditional Ecological Knowledge, on the other hand, is based on experience and knowledge passed-down throughout generations; it is also deeply spatial (Omura, 1999).

Payls (1997) distinguishes science as an epistemological system separate from common, every-day knowledge. He argues that common (or lay) knowledge is phenomenological, based on a certain set of observations, and often biased to cultural understandings or beliefs (Payls, 1997; Tsuji and Ho 2002). What is recognized as legitimate science is thus systematic, reviewed, attached to collective processes and past endeavours, and is self-reflexive (Payls, 1997). Science tends to accumulate quantitative data in this manner to measure phenomena and thus demands a large-scale understanding in order to be applied to policy (Johnson, 1992). This later point is especially important for wildlife management institutions: Qallunaat scientific models tend towards synchronic data, which is defined as "snapshots over large areas," (Berkes, 1994, p.20).

Diachronic data is defined as "a long series of observations over many generations" created in a small spatial area (Berkes, 1994, p.20) and many have argued that indigenous knowledge systems tend towards this type of knowledge creation (see notably Berkes, 1994). However, this idea has also been refuted through efforts to show the compatibility of both systems of knowledge (see notably Tsuji and Ho, 2002).

[2] *Qallunaat* is the Inuktitut term for people who are not Inuit. I think is a preferable, and most accurate term to use in this case.

In the "Social Theory and the Reconstruction of Science and Geography" Demeritt (1995) poses an interesting theoretical argument through which to look at the practice of science within geography, and the potential value placed on the social sciences within the same field. He posits that the modern dichotomy between these two fields stems from the epistemological divide between nature and society. Any post-modern critiques of scientific methodology can then easily be dismissed as simply anti-science (Demeritt, 1995). This lens is useful when looking at the value placed on "soft-science" in comparison with biology and other environmental disciplines. Similarly, Scott (2013) notes that "human signification occupies the space between [...] scientific purposes, and our novel experience in a given environmental context" (p.161). There is a growing separation in Qallunaat science of more abstract and varied understandings of the world, dismissed as qualitative understandings inapplicable to science. Thus, Qallunaat scientific paradigms, rooted in Canadian institutions, tend to quickly dismiss the more sacred and spiritual that might influence the "objective reality" (Scott, 2013, p.166).

It has to be noted that a fundamental aspect of Qallunaat science is that it is written, codified in texts, which are at the basis of the powerful institutions of the state and of the researching bodies (Omura, 1999). This codification of science has a long history of being a driver of colonial presence, through Christianity, through laws, and through a litany of institutions which entrenched elements like science into society while marginalizing those populations whose traditions lived orally (see, notably the case of the Torres Strait Islanders in Nietschmann, 1989). As Abraham Okpik explains in a project driven by the Nunavut Arctic College: "They had the book to prove to us that they had the better system" (Nakasuk et al, 1999, p. 88).

The methodological creation of knowledge permeates all realms of science and, as is required by the scientific method, is constantly subjected to scrutiny. Notably, D.R Anderson et al (2013) suggest paths to better legitimize and make rigourous the scientific method of wildlife research. In particular, they propose stricter guidelines in methodology and in the training of students to focus on the hypothetical-deductive method. For a further example of this, Anderson et al (2013) criticize "experiments" done without controls and large sample sizes, with confounding factors and no possibility for replicability (p.296). In a short article published in 2001, the same Anderson bemoans the lack of random sampling in ecological field research, a methodology he calls "convenience" (Anderson D.R., 2001, 1295). This opinion stems from the same notion of wanting to make a laboratory out of the natural world, as the laboratory is traditionally the setting in which good Qallunaat science is produced. This is echoed by Drescher et al (2013), who notes that expert knowledge is often rejected as "soft science", of lesser value because it is not testable, biased, and expensive to collect (p.9). . This demand for a return to hard-science within ecological research leaves little room for a qualitative flavour, and demands a delegitimization of any type of knowledge that does not fit traditional definitions of rigorous science.

There would thus seem to be a trend of contemporary thought that argues that qualitative methodologies, including substantial fieldwork have no place in environmental research, and that conservation efforts have been limited by these methodologies (Anderson D.R. et al, 2013). Watson (2012) strongly criticizes this statement. She states that "sustained fieldwork is additionally the target of critique by both expert and lay public-research biologists [who] critique field biologists for shoddy methods, for example, their lack of random site selection" (p.291).

The split between social and natural science has been demonstrated at the root of many conflicts and misunderstandings that lead to the misinterpretation and marginalization of local observations

and ontologies (see, for example, Sandlos, 2007, chapter 3). This might be starting to change however, as researchers are increasingly working with inter-disciplinary ideas, being trained in ideas and methodology stemming from both sides of the spectrum. Recently, northern research, and in particular the types of research on TEK which we will examine, has also focused efforts on bridging the gap between what is traditionally seen as a "soft" and "hard" sciences.

The geographical discipline is no stranger to these discussions. As an interdisciplinary science that often bases itself on more narrow factual disciplines, and as a theoretical lens that examines the interconnection between the integral components of the world, it is the perfect discipline for the analysis of the Qallunaat and Inuit scientific practice in the field.

2.2 The Construction of Wilderness.

Academic thought has long intertwined with philosophical discourse, and philosophy has shaped the ways we conceptualize the natural environment and the decisions we make about it. Then, how we define the environment has much of an effect on the ways we interact with it and our conceptions of what it *should* be.

At its core, nature is understood by Qallunaat paradigms through Cartesian binaries. These binaries include the dichotomy between human and animal, society (or culture) and nature (Cloke, and Johnston, 2005). Notions of wilderness come out of this nature dichotomization; from this, for example we get the term *wild animals*, in reference to the species which have not been tamed by humans both a romantic and a terrifying idea (Sandlos, 2007, 142-143). As such, in many Qallunaat frameworks, wilderness is defined as a particular version of nature that has not been touched by human activity and nature as separate from the human realm. Furthermore, traditional wildlife conservation paradigms in the Arctic are rooted in Hobbesian philosophy that extols the

fundamental need for coercive methods to prevent abuses of the system (Berkes and Feeny, 1990). This methodology is rooted in what (2012) calls the "modern ontological assumption" one that drives research in wildlife biology, by which explanation about the world outside of the human realm is presumed to be given by the rational, objective scientist. By this, scientific practice was developed by conceptualizing nature as something to be solely quantitatively studied. However, outsiders often see this nature differently than it is understood by local communities.

In Qallunaat paradigms, the land is understood as vulnerable to human activity and with this lies in notions of the "Tragedy of the Commons" (Hardin, 1968). This theory posits that the individualistic and greedy characteristics of Man, if left unchecked, will eventually destroy the environment. It is one by which commonly held land is "locked into a ruinous path of environmental degradation and ultimately starvation" (Collings, 1997, p.43). The phrase saw its origins in an 1833 pamphlet published by economist William Forster Lloyd who hypothesized that if cattle living on the British common land were to increase, overgrazing would eventually occur; and the profits for the individual farmer would increase to the detriment of other herders and the future of the resource (Lloyd, 1933). Lloyd's opinions of problematic common land led to an increase of politics of privatization, notably through the dramatic increase in formulation of British Inclosure Acts throughout the later part of the nineteenth century (McCay and Acheson, 1987).

Although the Tragedy of the Commons has proved fundamental to the development of environmental sciences and policy, its flaws have been tooted throughout the latter part of the twentieth century (Gordon, 1954). Importantly, the notion of the Tragedy dismisses the role of culture, norms, and beliefs which guide people's actions when, in reality, many codes (explicit and implicit) regulate how resource users exploit the land, and thus how they gain knowledge of it (Collings, 1997). By this understanding therefore, nature is seen by Qallunaat paradigms as something vulnerable to human activity and needs be managed for its own sake, and for ours.

The problem grows larger onto a geographical scale, and questions the ways in which we understand the landscape. Lowenthal (1961) notably argues that all humans are geographers who bring their particular individuality to their vision of the world, and then take care of the land in particular ways (or not). Meaningful places are thus layered upon the physical landscapes (Thrift, 2009). These subjective arenas are constructed by daily lives and our understanding of the place. The embodiment of place allows geographers to widen their range of inquiry into other fields, and, it can be argued, to examine the line where physical processes and human interactions play out. This line can be easily threatened. For example, in their 1999 documentary film, "L'erreur boréale", Desjardins and Monderie argue that extensive deforestation in Northern Quebec is threatening the transmission of knowledge to the next generation of stewards. Where land degradation is occurring, so is a weakening of the possibility of passing on ecological knowledge to the future generation.

2.3 The Legacies of Colonialism.

No framing of the situation between Qallunaat science and TEK would be complete without situating it within colonial legacies. Indeed, almost in every aspect that outsiders understand the Arctic is through conceptualizations of the land, its people and their culture, which have been codified over the years following European arrival in the Arctic. Scientific endeavour guided explorations through the North, adventures that formed the first recognized northern scientists (Franz Boas, Dewey Soper, Knud Rasmussen and the like). The systematized knowledge they created is the basis of current-day northern science. In some instances, it had the effect of marginalizing Inuit knowledge, relegating it to interesting, impressive even, but anecdotal

nonetheless (Sandlos, 2007)[3]. Later, when fur traders established themselves soundly on the land, notably through the Hudson's Bay Company whose vested interest lay in the animal riches of the land, they brought description, quantification and codification of the Arctic resources into written documentation (Qikiqtani Inuit Association, 2003).

Power dimensions were reinforced by descriptions of the "primitive people" who hunted the wildlife on in the "virgin land" and whose impulses to destroy the land needed to be controlled by Qallunaat presence (Posey, 1998). While in the beginning of colonial endeavours in the eighteenth century, notions of the lost "ecological noble savage"[4] rooted indigenous communities throughout the colonized world into a stereotype which was detrimental to their sovereignty and legitimacy (Posey, 1998, p.4). This noble savage was one with nature; he followed its laws wisely and respectfully, in all simplicity (Hames, 2007). If we compare this to the environmental degradation caused by so-called "state societies" where biodiversity was limited and a connection with nature was frayed, the dichotomy becomes obvious. It would seem that the concept of the "ecological Indian" was more of an attempt to say something about industrial societies, and bemoan the lost unity with nature (Hames, 2007, p.179).

In many places, the trope of the noble savage was turned on its head during the nineteenth and twentieth centuries. Beliefs that Indigenous people were losing their noble side by being in contact with Europeans brought blame of their "wanton slaughter" of animals; local communities were blamed for the "disappearance" of herds which the colonial administrations believed had existed previously (Sandlos, 2007). In New Zealand, for example, the Maori were blamed for the

[3] Franz Boas presents an interesting counter-current here; he spent prolonged amounts of time with Inuit communities in Baffin Island and his writing shows an example of participatory observation which entered into his writing (Müller-Wille and Barr, 1998)

[4] According to Ellingson (2001), the term was first coined in 1609 by French explorer Lescarbot.

disappearance of the Moa, and in Canada, the Inuit were wrongly accused of destroying caribou herds (Sandlos, 2007). The multiplication of guns was brought in as evidence of this new reality; the indigenous people with these instruments were no longer pure (Hames, 2007, p.181). Thus, it was believed that if these changing local communities were destroying the environment, they had to be brought in check. For example, Drane (2003) finds that erasure of indigenous people from the environmental consciousness has been at the centre of the creation of national parks and of conservation practices which advocate a return to the virgin land of which the indigenous person is not a part (14).

Both these qualifications of indigenous people, either as the" tainted noble savage" or as naturally destructive are without a doubt deeply problematic (Sandlos, 2007, p.12). Recently, discourse analysis has been central to deconstructing the power implications and systems of inequality entrenched in colonial continuities, but these legacies of these ideas still run deep, notably in the inequality in the value given to their knowledge about their land.

Scientific practice in the North has a long history of being damaging or inaccurate (see Sandlos, 2008; Collings, 1997; Johannes, 2010, among others). Sandlos' seminal 2008 monograph provides countless examples of the effects of policy based on wrongful interpretations of environmental aspects. For instance, misunderstandings of the dynamics of caribou herd migrations, and descriptions of phenomenal abundance by nineteenth century explorers of these herds, led to the creation of strict quota systems (sometimes even downright bans of hunting) imposed by national and regional governments, which had devastating effects on the health and culture of northern communities. Similarly, Collings (1997) tells the story of a biologist sent to Holman (Ulukhaktok, NWT) to conduct aerial surveys of the declining caribou herds who hired a local Inuk to "elicit their local traditional knowledge" (Collings, 1997, p.48). Irked by the attitude of the scientist and

the power dimension that was implied, the hamlet expressed deep dissatisfaction of the biologist, notably taking exception with the range of assumptions he made about the hunt. Misunderstandings of the environmental history of the place get quickly entered into scientific canon alongside damaging methodologies that marginalized Inuit communities, create mistrust, and sometimes, backlash.

Literature 1 **Scientific Paradigms, Ethics and the Creation of Knowledge**	Literature 2 **Constructing the Wilderness**	Literature 3 **The Legacies of Colonialism**
* The Scientific Method * Scientific attitudes * Methodological practice * Ethics * The Dissemination of Knowledge and Rights to Knowledge	* Cartesian binaries and Hobbesian philosophy * The Tragedy of the Commons * Rights to Land and Resources * Wild animals * The "ecological Indian" * Co-management	* Discourse Analysis * The Books - Codification *The "ecological noble savage" *Institutional Power and Inequality * Disastrous Effects

Figure 2.1 The conceptual framework for this thesis.

Conceptually, therefore, this thesis aims to place itself within the wider discussion of scientific paradigms and their application to ecological issues. The Qallunaat scientific method is based on hypothetical-deductive methodological practices that are meant to be testable (Peterson et al, 2005). This epistemological and ontological system has guided scientific attitudes since the Enlightenment and is at the core of institutional practices today (Scott, 2013). Conceptualizations of the environmental landscape are deeply rooted in this scientific practice, in Cartesian and Hobbesian philosophy that guides the ways in which the findings of ecological research are then applied. From

this, colonial legacies run deep in scientific paradigms and in the ways these systems are then used in contemporary institutions and policies. Discussions about Traditional Ecological Knowledge must be understood within this framework as it shapes our understandings of the concept, the value we place upon it and the ways in which we could change our interactions. The three bodies of literature examined here allow us to understand the creation of knowledge and science and how this interacts with notions of the wilderness as a construct that bolstered colonial patterns.

CHAPTER 3: METHODS

This thesis research uses a triangulation of methods to enquire about the value given to Traditional Ecological Knowledge in different scientific endeavours in the Canadian Arctic. The overlap of these methods, each answering a slightly different facet of the question is an attempt to rigorously uncover the realities of Northern science and in parallel participate in the ongoing discussion about methodological plurality. It is important to note that I have not yet had the opportunity to engage with these questions on the field; this thesis attempts to somewhat to fill this gap, and learn from others before engaging in northern research myself.

3.1 Parsing Definitions and Literature Review.

Using the conceptual framework developed in the previous chapter, this thesis employs a comprehensive literature review to engage with the discourse around the topic. This analysis is a tenet of rigour as it engages the researcher in the surrounding debates and issues of the topic (Clifford et al, 2016). Literature reviews are all the more important for inexperienced researchers as to systematically interrogate the work being done in a particular field, a step crucial to master before undertaking any further research (Auerbach and Silverstein, 2003).

In the case of this thesis, this particular literature review typifies the extent to which principles of traditional ecological knowledge has been defined over the years and throughout the disciplines. The overarching goal was to demonstrate the implications of TEK, where its richness in conceptualization and information lies, and thus how it might be valued, integrated, and understood within the context of Arctic scientific research.

3.2 Thematic Literature Sketch - Scientific Literature as Primary Source

The use of scientific literature as a primary source for enquiry is a form of systematic analysis that is a variation on the traditional systematic literature review; it combines the methodology of a literature review with the parsing of thematic coding. It is a method used in particular when evaluating practices and methodologies, and when one is attempting to find underlying patterns to certain phenomena in the research canon. For example, Watson (2012) uses this tool to examine how the practice of research for wildlife co-management purposes can produce conflict and builds an ethnography that parses scientific literature in order to study the practices and representation of science. Inspired by this for this thesis, the close examination of scientific literature allows for a deeper understanding on the value place on TEK in Qallunaat scientific methodology. With a diachronic and thematic lens, this information allows for comparisons and contrasts between different disciplines and schools of thought.

This thesis constructs detailed analyses of different sub-disciplines of northern scientific research. Larger emphasis was put on biological and ecological research as it is the realm in which traditional knowledge has historically been presented, with species argued to be "cultural keystone species" (Garibaldi and Turner, 2004, p.1). Although this term has mostly been applied to botanical resources, it is easily transferable to the animal realm, and identifies the species, which, coincidentally are at the center of conservation debates in Canada (Garibaldi and Turner, 2004). For the Arctic context, these cultural keystone species are defined as 1) caribou, 2) polar bear, 3) birds, and 4) marine mammals. To this is added 5) physical sciences which research the Arctic landscape.

Using Boolean searches in the WorldCat database, I selected seventeen articles for each of these five pre-determined sub-disciplines of Arctic science. Each of these articles were chosen at

random from a fixed-time frame which spanned from the 1980s to 2018 as well as an older piece of research (beginning of the nineteenth century to pre-World War II) and the newest article to date on the subject (published somewhere between 2017 and 2018). This brought the total of sample literature to eighty-five peer-reviewed articles. This was deemed a statistically acceptable sample size, especially given the relatively small, yet growing, amount of Arctic research. The goal was to provide understanding of the contemporary situation of Arctic science, and this time period was deemed long enough to conduct a latitudinal analysis over a generation of scientists and their influence; we can call the product of this analysis, "disciplinary sketches". The science presented in these papers also published in a varied selection of journals, providing a wider range of topics and philosophy.

Within each of the disciplinary sketches, systematic coding of their contents was conducted. Excel spreadsheets of the papers were created in a systematic manner, and keywords and themes were extracted. Particular attention was paid to the starting points of each research, to their methodology sections as well as their overall tone, conclusions, and acknowledgments. Close scrutiny meant looking for any wording that could point to evidence of TEK or of local knowledge in general, and attempting to assess the positioning of the scientist within the larger discussion around the valuation of this different ontological system.

The literature presented what is characterised as "hard-science". This is one of the least qualitatively studied areas of research. Practically, this stands to reason as technical vocabulary and statistical elements might be beyond the reach (and interest) of social scientists. However, this is also due to the nature of the hypothetical-deductive scientific method. Indeed, research publications in these fields, are more often than not, weighed by the accuracy of their data not by

the ways they obtain and disseminate it (C. Scott, personal communication, 14 March 2018). The worth of the science is therefore often solely based on other scientists' belief in the results of the research (C. Scott, personal communication, 14 March 2018). Indeed, the tenet of the traditional scientific method is replicability (Germano, 1999) and therefore, the results of the research are peer-reviewed prior to (and post) publication and cited mostly by other scientists in the same field. There is thus precious little re-examination of scientific literature by social scientists, and this could be a problem. Inaccuracies or errors in the results can be tied back to methodological flaws and lack of attention paid to certain frameworks that exist outside of the accepted scientific canon (Anderson, D. R., 2001). This is precisely where the training of interdisciplinary researchers is crucial. Geographers, notably, possess the perfect set of skills to interrogate the results, methodology and philosophy of the so-called "hard-sciences" as they are taught to question the links through the landscape and all spatial disciplines (see, for example Willems-Braun, 1997). This pattern is evident notably in the conduct of environmental impact assessments, which are the perfect example of putting together a range of previous scientific research to make policy decisions (see notably Covello, 1985).

Dissecting the methodology of scientific research through qualitative analysis thus allows us to get to the root of on-going Arctic fieldwork and begin to understand the ways it interacts (or not) with the remote communities living on the land which being researched. It also shows the methodological evolution of the scientific interaction between Qallunaat and Inuit.

3.3 Interviews – Words of Wisdom

In order to corroborate the information found in the literature review and in the thematic literature sketches, I conducted a handful of interviews with five northern practitioners in the winter

of 2018. Interviews with three researchers in the academic setting, one in an local Inuit organization, and one in a national Inuit organization brought colourful opinions and more detailed ideas about methods and ethics; it also bolstered the patterns found in the literature reviews. Speaking to people about their experiences and knowledge was a way to give a level of depth to this thesis and, as a complete outsider to the topic, it was important for me to validate certain thoughts with experts who had actual on-the-ground experience with the concepts. These interviews occurred both in person and over the phone, and to engage participants in organic discussions, a semi-structured interview guide was loosely followed. The questions were adapted to the different disciplines and projects the participants had been, or currently were, a part of. The interview data was then coded in the method as described by Auerbach and Silverstein (2003) and analyzed in a step-wise fashion of increasing precision.

Prior to conducting these interviews, in fact before even beginning the project, I completed the online training of the Canadian Panel on Research Ethics (as was required by the McGill Review Ethics Board) and a McGill University Research Ethics Board application that gave me a "Research Ethics Board I Certificate of Ethical Acceptability of Research Involving Humans" (see Figure 6). I mention this here because it was deeply informative about the ethical obligations followed by who conduct research through a university. Knowing this gave me a level of understanding about the ethical frameworks under which northern scientific projects are conducted. The rigours of ethics boards in universities are a somewhat new phenomenon, and it is telling that there are nation-wide guidelines for all research involving humans (Kinsella, 2010). The TCPS 2 defines research as "an undertaking intended to extend knowledge through disciplines inquiry and systematic investigation" (Panel of Research Ethics). It is a somewhat utilitarian approach, which advocates the greatest good (or least harm) in methodology and in research outcome, where the individual and the community are given full consideration. Where the TCPS accounts for the

minimization of harm however, it stops short of dictating acceptable research content and design; from this comes the variety of research types but also paradigms and disciplinary traditions.

All in all, the methodology of this thesis together brings descriptive and primary sources in order to shed light onto the complex and layered issues of Inuit science, and the impacts of the interpretation of this on policy and research. This discussion is then brought into dialogue with northern scientific literature that is parsed as a primary source of material. Finally, the words of wisdom of a small sample of northern practitioners in different fields were brought into the story to show on-the-ground realities of engaging with the topics and build thoughts about the best ways to conduct good (and ethical) science in the northern context.

CHAPTER 4: CONTEXTUAL FRAMEWORK – SITUATING TEK

4.1 Defining Traditional Ecological Knowledge.

Defining Traditional Ecological Knowledge is a complex exercise. It is an ontological system whose definition and implications are many and whose label is unclear (Usher, 2000). Here, I propose to examine the many definitions given to the term through the last century to clarify the layered, complex, and rich nature of the term which, it will be argued, make TEK a perfect candidate for the use in scientific research.

There has been longstanding interest about Traditional Knowledge. In the Arctic context in particular, some of the earliest studies of indigenous people and cultural ecology are descriptions of local knowledge as it pertained to the land and its resources. In fact, Wenzel (1999) argues that we can go as far as Franz Boas, in the late nineteenth century, to see the first incorporation of TEK into the literature, through the explorers' study of the connection between the type of sea ice, seal populations, and Inuit settlement patterns (Wenzel, 1999; Boas 1888, p. 417). The actual term "traditional ecological knowledge" began to emerge in the 1970s from the recognition of the resilience of Inuit adaptive traditions rooted in deep knowledge about the ecosystem of which they are a part (G. Wenzel, personal communication, 9 September 2018). As colonial endeavours deepened, local knowledge of animals and their abundance were found useful for the mercantile fur trade reasons (Wenzel et al, 2008). Today, Inuit knowledge is mostly used for environmental management and conservation efforts (Wenzel et al, 2008).

There exist many definitions of TEK, each with their own implications, and the term could be understood as the sum of its component parts. First, the concepts of "traditional" points to the

transmission of knowledge through time and therefore of its strength in constructing ecological patterns and explaining them in context of the dynamic land that is the Arctic (. Oral traditions are at the centre of this concept. Through them the knowledge is transmitted and constantly reinterpreted. For instance, Stevenson (1996) recounts the definition of TEK given by the Dene Cultural Institute: "with its roots firmly in the past, TEK is both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technological and socioeconomic changes of the present" (p.281). TEK is highly experiential and situated in place, and has thus created knowledge landscapes which are being transmitted through generations (Stevenson, 1996). In this way, memory is stored within TEK and local knowledges, and it is intricately connected with a community and shared experience (Usher, 2000). The historical extension shown by this knowledge system contains, by nature, an understanding of ecological patterns upon which modern-day resource practices are built (Berkes 1993, p.3).

Most aspects of this knowledge have been widely compiled orally over the years, and increasingly codified by Inuit communities themselves. Today, the knowledge that is made public can be found in academic literature, in online databases, in oral history recordings, in place name atlases, and resource mapping projects. An interesting source for this later example is the Igliniit project, an open crowdsourcing map for the Arctic, out of Clyde River on Baffin Island, that allows people to plot different features and ecological observations they make as they move throughout the landscape (Gerheard et al, 2017).

Next, the term ecological points to the fact that TEK is situated locally and systemically, in an ecological system of which man, animals, and the land are interlinked parts. As such, Wenzel (1999) describes TEK as "knowledge held by Inuit that pertains to the dynamic interactions that occur among all the elements, cultural as well as biophysical, within the northern ecosystem"

(Wenzel, 1999, 114). Similarly, Usher (2000) offers that TEK refers to "all types of knowledge about the environment derived from the experience and traditions of a particular group of people" (Usher, 2000, p.3). This knowledge is inherently geographical: attachment to the land is derived from knowledge of place, created by acting within in. For Inuit, a tremendous amount of knowledge and identity come from travelling on and across the land, knowledge which becomes part of TEK systems (see, notably, Aporta, 2004).

An early illustration of the geographical nature of TEK comes from a somewhat peculiar source. H. G. Jones details the story of Eenoo, a young Inuk, who, in the 1830s, brought Scottish whalers to rediscover Cumberland Sounds, knowledge of which had been lost to Europeans since Davis' voyage in the sixteenth century. In his text, Jones argues that the traditional knowledge about the Sound given by Eenoo to the Europeans was long-held personal and cultural understanding of the place which allowed him to reconstruct from memory a mental map of the area. Knowing the integral parts of that environment, notably the movement of the whale pod brought Eenoo's knowledge of ecological components into an understanding of the landscape which he passed on to the Scottish crew (M'Donald 1841, cited in Jones, 2004). Alexander M'Donald, who penned the narrative of this episode in 1841 notes that the young boy held "faculties of mind which phrenologists have adduced as finding their legitimate exercise in the observation of the relative situation, extent, and peculiar appearances, of places." (Jones, 2004, p. 64). Colonial judgments abound in this text, but it showcases the sentiment, even two hundred years ago, that observation of landscapes is central to Inuit knowledge. They are also central to how the knowledge has been understood by outsiders.

TEK is therefore perfectly adapted to its environment, created within it and with a language meant to discuss it (Omura, 1999). The situated nature of the knowledge makes TEK into a local issue, at its core. In fact, many have brought up the geographical nature of the conceptualization of

TEK. Dr. Ann Fienup-Riordan, in an interview which took place in March 2017, offered that the term "traditional ecological knowledge" should be replaced by the term "local knowledge", or specific to each community (in her work, she often refers to "Yup'ik knowledge") to better reflect the territorial expertise of the community. Similarly, Houde (2007) notes that any study comprising TEK "requires a commitment to the local context" (Houde, 2007, p.10). The knowledge produced by the place and about the place, sees its relevance in the facts and explanations given by the ontological system (Doherty and Naug, 2006).

Finally, TEK refers to a system by which things are known and understood. As Hunn (1988) states: "TEK is knowledge" (p.14). It is transmitted through language, oral traditions, and teaching, but also through direct contact with the natural environment (see, notably, Doherty and Naug, 2006).). Warren (1991) talks about TEK as a *resource*. It is the production of information and understanding (Warren, 1991; WIPO, 2005). TEK has the potential to give quick and extremely precise factual information (Usher, 2000, p.1254). It is often restricted to personal observations of the land, and only reinforced through time and trial and error (Usher, 2000). However, it is also part of a wider system of understanding. It also creates a way of acting within the world and turning the knowledge "into successful ecological activity" (Wenzel et al, 2008).

Cultural geographer Peter Usher expanded Unidimensional definitions of Traditional Ecological Knowledge in 2000, and no discussion of TEK would be complete without mentioning his work. Usher conducts an in-depth analysis of TEK and creates four categories of knowledge. The first two categories concern empirical knowledge; for most Qallunaat, and for much of northern science, this is the level with which TEK is interacted. The rational and factual information (Category 1) is TEK at its most basic. Usher notes that this is knowledge "about what works, and sometimes about how or why" (Usher, 2000, p.186). Category 2 TEK brings about a

broader context in time and space, notions of patterns and cycles, and recorded in oral history. Usher goes beyond the empirical in Categories 3 and 4 to bring about complex notions of culture and society. Category 3 traditional knowledge encompasses values and ethics which dictate "how things should be" and Category 4 establishes the foundation for these values, and explains why things are the way they are (Usher, 2000, p.186).

Seven years after Usher, Houde (2007) adds a dimension of management and ethics to TEK. He argues that robustness is the key goal of TEK, providing Inuit communities with tools to counter a variety of challenges. Wenzel et al (2008) note that Qallunaat paradigms have often dealt with TEK on the side of the first two categories; they are most accessible, have been more studied in scientific practice, and thus form most outsider understandings of the ontological system.

In fact, TEK is far from an all-encompassing term, it can be found as an aspect within broader, more complex concepts. While all these attempt to say something about the North and local understandings of it, this plethora of inter-changeable terms make it quite complicated for the outsider to understand. Usher (2000) argues that the result of this conclusion sometimes makes TEK "impractical and inappropriate" to apply to practice. But it also gives it strength, situating the notion within larger frameworks; from this can be found both the complexity and richness of TEK, and an argument for the interest in studying it. Often, we see TEK conflated with the terms "traditional knowledge" (TK), "aboriginal traditional knowledge" (ATK) or "indigenous knowledge" (IK) (G. Wenzel, personal communication, September 2018). These terms are often brought in as a broad recognition of specific steadfast knowledge held by indigenous communities across Canada, transmitted by language through generations in a specific place and "rooted in experience" (Native Women Association of Canada, 2010). The concepts of TK also bring direct

notions of the cultural, spiritual, economic relationships between an indigenous community and its knowledge of the world (Native Women Association of Canada, 2010).

The most important all-encompassing term for TEK is Inuit Qaujimajatuqangit or IQ. IQ is the system by which Inuit knowledge, ethics, and a way of life are bound: it is the broad understanding that encompasses Inuit life, culture, values, and ways of being. In fact, IQ has been defined as a "living technology", based on concepts of reciprocity, consensus, environmental stewardship, and problem solving (Arnakak, 2000). Wenzel (2004) has argued that TEK is simply the most visible part of IQ; this sentiment is taken-up in a researcher's guide published by Inuit Tapiriit Kanatami and the Nunavut Research Institute in 2006 (TK and NRI, 2006). Indeed, TEK it is the visible aspect of the broader ontological and ethnical system that has been historically more accessible to Qallunaat, as it pertains to the physical and spatial expression of knowledge creation (Usher, 2000; Wenzel, 1999; Stevenson, 1996).

Due to the plurality of definitions, of uses, and of broader systems, Traditional Ecological Knowledge can be a difficult system to grapple with. For instance, information rooted in the ontology has often been argued to be anecdotal (Omura, 1999) Thus, the very qualities that makes TEK so bound-up with the local space and culturally specific, are the same characteristics which have led to it being argued to only contain facts mostly historical, superstitious, and all in all "inferior to modern science" (Omura, 1999, p. 23). The word "traditional" has also been noted as difficult, as it seems to lock the knowledge into the past (Posey, 1998); by emphasizing the historical aspect of the knowledge, it could seem that it is a product of a lost culture, which has been assimilated by modernity. This is problematic for obvious reasons, and must be understood with caution. Notably, Berkes (1993, p.3) offers that TEK is a product of "non-industrial or less technologically advanced societies"; as such, it is clear from this wording that the continuity

offered by the term "traditional" also bears the risk of locking the knowledge into the past, and leads to it be seen by outsiders as incompatible with modern day reality.

One last aspect of TEK is that of scientific endeavour. Exactly like Qallunaat science, the knowledge that Inuit communities hold about the Arctic landscape was created through time and experience, and points to ways of knowing about the world. Hobson (1992) notes this and urges, "southern scientists must never forget that traditional knowledge is science." (p.1). As such, I would like to propose to use the term Inuit science to refer to the process of making, holding, and using traditional ecological knowledge. In this thesis, I will use the term Inuit Science interchangeably with TEK in order to place it on an even playing field with Qallunaat science and point to the constant creation of knowledge, growth of culture, and potential of this system to teach about the North in ways that Qallunaat science cannot.

4.2 Playing out the Knowledge - TEK and Qallunaat Science.

There is a long intellectual history of Qallunaat science interacting with Inuit knowledge systems, not always with productive results, and sometimes damaging ones, with many gaps and omissions. The methods, knowledge, and vocabulary used by researchers determine the northern policy culture and attitude, especially when it comes to hunting quotas or the establishment of protected areas. When it comes to conservation however, a line is drawn between scientific parameters and or the knowledge and ontologies of the indigenous community. Scientist have little issue with incorporating what Inuit know in terms of ecological facts but this becomes more difficult when there are ontological differences that the scientific method cannot admit (Wenzel, 1999). In 1999, Nadasdy noted that, even when scientists take Inuit TEK into consideration, the consensus is that

the factual knowledge must be supported by an accepted theory or proven by Qallunaat scientific practice (Nadasdy, 1999).

Conservation has always been an important source of research and planning in the North, and one of the areas in which TEK is most talked about (Berkes, 1985). TEK has often been placed under the umbrella of this conservation paradigm, against the backdrop that Inuit culture has undergone fundamental change because of technology that has brought a loss of natural checks on wildlife use. (Berkes, 1985). Thus, there is a perceived need to control and manage wildlife for conservation purposes. Emergence of discussions around the compatibility of Inuit and Qallunaat sciences has been epitomized in these discussions. This is shown notably in Kaiichi Omura's 1999 article entitled "Science against Modern Science: the Socio-Political Construction of Otherness in Inuit TEK". In the article, Omura underlines the traditional conceptualizations of Qallunaat scientific paradigms which we have seen earlier (as quantitative, hypothesis-based, the separability of human and nature) and those of Inuit TEK often seen as complementary, but incommensurable, with Western science (Omura, 1999). The barriers for TEK to be properly integrated in modern science, Omura argues, are a "socio-political construction" which stems from the interactions between Qallunaat and Inuit societies, and attempts to distance them further (Omura 1999, p.339).

For instance, Kendrick (2000) underlines four main barriers to dialogue between Qallunaat and Inuit with regards to co-management; here, he applies it to caribou management, but it can be widened to encompass all clashes between TEK and Qallunaat science dialogue as well as all the people involved. First, there are "historical differences", legacies of colonialism and neo-colonial influences, which affect both sides and the ways they interact (Kendrick, 2000). Next is the difficulty in respectful difference in a cross-cultural setting; discussions about the applicability of TEK would fit perfectly here. Then, there are jurisdictional differences, which will be underlined later in the section on TEK in Canadian law. Finally, it becomes even more difficult to speak about

concepts such as TEK and environmental management when there is a low level of community engagement and identification with the broader institutions (such as a co-management board).

Sallenave (1994) argues that much of the perceived barrier to the practical integration of TEK into Qallunaat systems is perceptional. Scientists and Inuit perceive certain environmental phenomena differently; they thus also have different ideas about what might constitute significant impacts of a certain project (Sallenave, 1994). This conflict between both knowledge paradigms (and their effects) is deeply underlined in Sandlos (2007) who provides an understanding of the history of the northern wildlife science in Canada. Sandlos notes that "the expression of state authority over the apparently corrupt local hunting cultures of the Dene and Inuit was a process of coercive change that led to many northern Aboriginal communities towards a future that was not of their own making" (Sandlos, 2007, p.230). Indeed, the Qallunaat knowledge paradigm has historically held most the power, and the imbalance led to the marginalization of Inuit science and understandings about the land. As is noted in Anderson and Nuttall's seminal work:

> All around the circumpolar North, there are people [...] of extraordinary insight whose lives have been crushed underfoot by the power of a system of knowledge comprised by the history of its mistakes" (Anderson and Nuttall, 2004 p.ix)

There is a tremendous amount of power in the debate around TEK. It has the potential fill part of the gap that has been created by colonialism and its legacies.

4.3 Institutional TEK - in Research and the Law.

Research in the North is regulated by a number of different bodies. It often originates in institutions such as universities, governmental departments, or industry that impose their rules and guidelines on the proposal. Then, the project goes through institutions such as the Nunavut Research Institute and the Aurora Research Institute in the NWT whose policies decide on the

permits which may be given to scientists (G. Wenzel, personal communication, 18 March 2018). The project is often presented to the community and is subject to their permission; notably can be formalized by council resolution (TK and NRI. 2006). If the scientist wants a deeper level of understanding of the sensibilities needed to conduct work in the North, large institutions such as Inuit Tapiriit Kanatami (ITK), representative of the Inuit Nunangat, oversee research proposals at every level. ITK has power of influence on proposals and funding, and often provides reports on the need for certain types of research which certain communities would care for (or not, if it is the case) (E.Loring, personal communication, 8 March 2018)

Bolstering the efforts of organizations like ITK, Traditional Ecological Knowledge is entrenched in law. In particular, the rights of Inuit to the inclusion of their traditional knowledges are enshrined in certain laws and conventions which make up the institutional landscape of the Canadian Arctic. However, the definition of TEK, and the implications of this, varies, leading to a particular legal climate surrounding the topic. In parallel with these overarching legal documents, it is important to underline that Inuit norms, albeit mostly unrecognized by the Canadian legal system, with IQ at its centre, guide practices and understandings of TEK. IQ norms have sometimes been defined three categories of actions: things that have to be avoided (*tirigusuusit*), things that have to be followed (*malagait*), and things that have to be done (*piqujait*)s (Center for Outdoor Ethics). Here, respect for TEK is at the core. When Inuit began to deal with Qallunaat institutions, they also had to begin to talk about the legality of wildlife management (Sandlos, 2007). Managing the animals, as prescribed by the legal frameworks cited above, implies division between the human and animal realms, and introduces the notion of a quarrel between them; however, Inuit law was that one should not quarrel with wildlife because “it would take revenge” (Center for Outdoor Ethics).

The UN's 1992 Convention on Biological Diversity, which Canada signed and ratified on April 12, 1992, binds each signatory to "subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity." It has been stated by the Decision IV/9 of the Conference of the Parties (COP) that from the term respect is meant "traditional knowledge should be given the same respect as any other form of knowledge," (Conference of the Parties to the Convention on Biological Diversity, 2008). Mauro and Hardison (2000) take this phrasing to include scientific knowledge (p. 1265)

Following COP21 in 2008, the Indigenous Peoples and Climate Change Conference published a report that aimed to remind of the valuable contributions held by indigenous knowledge holders. For researching bodies, the report urges researchers to:

> "(i) allow for indigenous traditional knowledge to become an integral part of climate change research while ensuring the full and effective participation of indigenous peoples in the research process (...) (iii) conduct participatory and multi-disciplinary research with and among indigenous peoples in the context of climate change; and (iv) Ensure that relevant research is made available to indigenous peoples and to national, regional and international policy makers" (IPCCC, 2008, p.10)

In Canada, the language surrounding TEK in resource management is specified to Inuit, First Nations, and Métis groups, and is deeply tied to its colonial legacies and current political climes. The Berger Report of 1977 was the first formal recognition of the richness of environmental knowledge held by these groups, and the obligations to it by Canadian institutions. Researching the environmental impact of a proposed pipeline through the Mackenzie Valley, Justice Berger spent months travelling the North and conducted hearings where local opinions, and ecological knowledge were brought to the forefront. Berger concluded that the indigenous groups of the area

had not been adequately consulted and their knowledge of the area needed to be taken into greater consideration (Sallenave, 1994). The report brought credibility to the knowledge of native hunters in particular (Freeman, 1992).

The trailblazing claims agreement of the James Bay and Northern Quebec Agreement has traditional knowledge at its core. In the early 1970s, a proposed hydrological and damning project affecting the rivers of northern Quebec, in Cree and Inuit territory galvanized the Indigenous populations who feared a loss of the traditional hunting grounds, their resources, and their cultural landscape. In 1972 and 1973, a prolonged court case brought by these communities was argued on basis of traditional ecology, a concept previously unfamiliar in Canadian law (Mauro and Hardison, 2000). Traditional ecology, the understanding that humans and nature are interdependent with "mutual obligations leading to respect" became the core notion in an injunction to stop the destruction of the Cree and Inuit ancestral lands. In 1972, Justice Albert Malouf ordered Hydro-Quebec to stop its project on Cree and Inuit lands and demanded that the boundaries of these territories cease to be trespassed upon. Although the decision, called the Malouf judgement, was quickly overturned by Quebec's Appeals Court, it was the greatest example thus far where TEK was used in such a big legal case, and the very language it introduced was connected to the knowledge of the Cree and Inuit about the land (Mauro and Hardison, 2000).

In 1997, the Northwest Territories adopted the first Canadian policy regarding Traditional Knowledge. It defined it as "knowledge and values which have been acquired through experience, observation, from the land or from spiritual teachings, and handed down from one generation to another." (Northwest Territories Traditional Knowledge Policy, 1997). The main points of the policy can be categorized in three sections, those pertaining to "preservation and promotion of traditional knowledge", to design and implementation of government policy and those guiding

research. For this last point, the policy states that "the primary focus of traditional knowledge research should be the Aboriginal community." (Northwest Territories Traditional Knowledge Policy, 1997).

Following the JBNQA, the creation of Nunavut as a territory and as the landscape for the Nunavut Land Claims Settlement Act, further brought TEK concepts into legal institutions. The Nunavut Act established what Timpson calls the "creation of a new jurisdiction" at the heart of which are Inuit communities' own understandings of their homeland, as the spatial expression of Inuit Qaujimajatuqangit (Timpson, 2006, p.82). Similarly, the 1984 Inuvialuit Final Agreement incorporates the principle that "the relevant knowledge and experience of both the Inuvialuit and the scientific communities should be employed in order to achieve conservation" (Inuvialuit Final Agreement, 1984, article 14.5).

The Canadian Environmental Assessment Act of 2012 makes a loose provision for the integration of TEK into environmental assessment. It has been noted, notably by Usher (2000), that the language in the document provides no guidelines or instructions to the collection, use, and integration of TEK within these frameworks, and therefore its operationalization is unclear. It should also be added that the wording also represents in no way a condition or strong suggestion to make use of this knowledge.

A piece of prime importance to wildlife management is the Canadian Species at Risk Act (SARA) which regulates all protection of fauna and flora. The legislative base includes the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which was created in 1977 because of the need for "a single, official, scientifically sound, national classification of wildlife species at risk." (COSEWIC, 1977) The wording of this policy is striking; there exists no definition of scientific soundness, and legitimacy of knowledge is only given to one system.

In fact, Johaness et al (2000) rightly state that all Arctic regions are now controlled under a "western-science based state management systems" (Johaness et al, 2000, p. 206)

Usher (2000) notes, the wording for the integration of Inuit knowledge and science into the research and policy framework is vague, inconsistent, and does not provide any particular guidance in its implementation. Sallenave (1994) echoes this sentiment and argues that for TEK to be correctly integrated into practice would mean an overhaul of current, perhaps unpalatable alteration of structures such as Environment Impact Assessments.

There has thus been spaced opened for the recognition of TEK in the Canadian legal framework, enough to bolster the sentiment of the importance of this ontological system. However, the legacies of knowledge marginalization run deep, the legal requirements have yet to find a true expression in practice. Importantly, as we will see in the following chapters, the scientific work which provides the base for policy created under these laws has yet to find consensus on the issue.

This chapter has allowed us to dive deeper into the complexity of the term traditional ecological knowledge in its spatial, cultural, and political implications. Definitions of the concept have widely varied over the years and through different schools of thought, each bringing in their own assumptions and consequences. However, by and by, the term attempts to grasp the paradigm of local, generational and dynamic knowledge systems which hold layered understandings of the Arctic environment. TEK is bound with large concepts which inform it, most importantly Inuit Qaujimajatuqangit, as well as broader terms such as IK, ATK, and others. For the purposes of this thesis, I have proposed here to use the terms TEK and Inuit Science interchangeably, as a recognition of the situated nature of ontology and the rebalancing of the power dynamics embedded in the interaction between Qallunaat and Inuit knowledges. The Qallunaat scientific system has often interacted with Inuit science through the application of ecological science, which is especially

present in resource management laws and policies; it is here that conflicts between both scientific paradigms are clearest.

CHAPTER 5: RESULTS – A THEMATIC ANALYSIS

I had the privilege to talk to Dr. Ann Fienup-Riordan in March 2018. A researcher renowned for her work with Yup'ik communities in Alaska, Dr. Fienup-Riordan has presented, over the years, a case for the central importance of local knowledge and of local control over the knowledge. In the interview, she related a Yup'ik saying which counsels, "Don't live without an elder"; but, she added, "don't live without a scientist". This sentence brings about an important framing of the issue. We have seen that science is extremely powerful, the basis of policies and actions which are fundamental to day to day lives and to the future; by this same token, science in the North has been damaging, notably because its reliance on knowledge removed from the local context. This is not a new idea, and attention is being paid to rectify this trajectory. Traditional Ecological Knowledge has been growing as a term in the literature canon. However, sub-disciplines of Arctic science have dealt with the concept of TEK differently, with differing attention, valuation, and intensity. This chapter attempts to illustrate this.

5.1 A Growing Presence of TEK.

We can use Web of Science, an important academic database, as a proxy for understanding the increase in value placed on concepts of Inuit science. The more the terms come up in academic literature, the more we can presume that it is seen as an important concept by the academic institution.

An analysis of the number of research articles written on, about, or with, TEK show that interest in the topic is growing. As shown previously, there is a longstanding interest about Traditional Knowledge. This extensive environment knowledge has always been of interest to non-

Inuit, first in terms of surviving in northern conditions, then for mercantile reasons, and today most often for conservation. However, in the past 20 years, the explicit naming and conceptualization of TEK has seen an exponential growth in academic thought. To date, the term appears in 107 publications of Arctic research.[5]

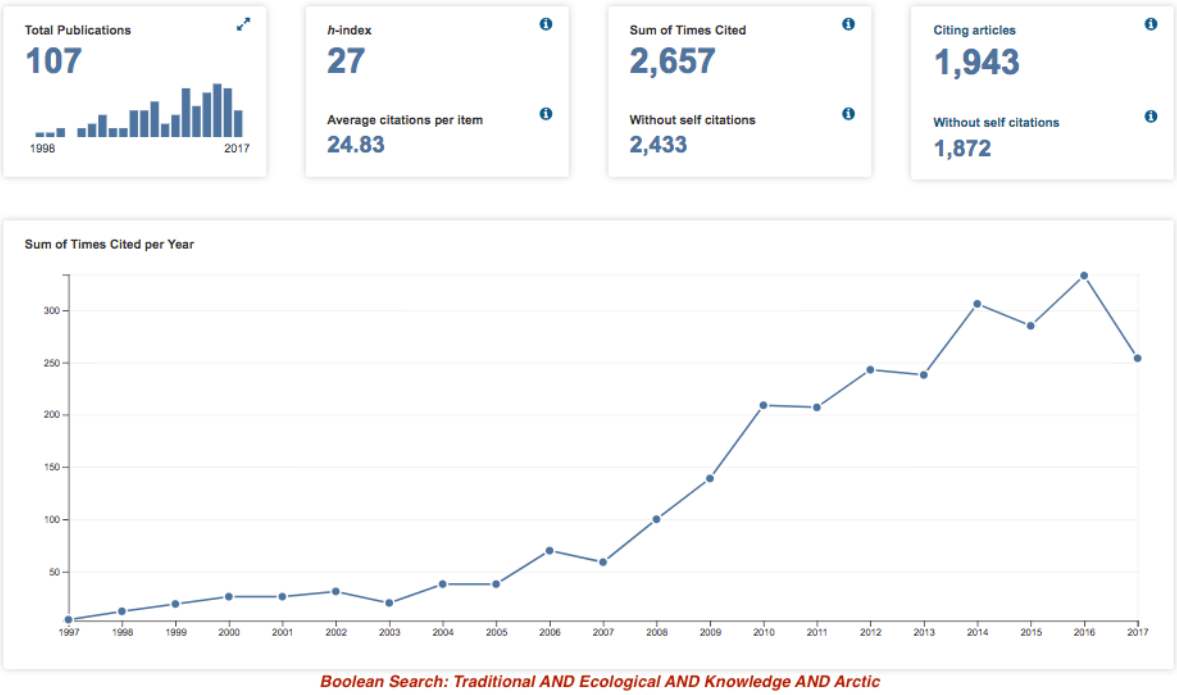

Figure 1Web of Science - Boolean Search "Traditional" AND "Ecological" AND "Knowledge" AND "Arctic" (15 January 2018).

From this graph, and two others in the appendix (Figures 5 and 6), we see that the interest in the concepts surrounding Inuit science is rising. This aligns well with the growth of questions of indigenous sovereignty, ethics, and aboriginal rights. Alongside these, there is also increasing attention paid to the Arctic context, as changing climates and environmental conditions bring about questions of sustainability, resilience, vulnerability. This trend showcases the importance of

[5] The concept of Qaujimajatuqangit, on the other hand, although it has followed a similar trajectory, is only referenced in sixteen publications to date on the Web of Science. This is perhaps not surprising, as IQ has long been seen as more complex, less accessible to the common outsider (Wenzel, 1999).

increasing our attention to local and traditional knowledge systems, and the pressing need to understand these concepts in the correct manner to avoid repeating the mistakes of the past.

5.2 Looking for TEK in the Content of Scientific Publications

Taking a thematic approach of analysis, I wanted to understand and describe the ways various disciplines negotiate the knowledge between Inuit and the environment, with a particular focus on wildlife management and land conservation, to answer the question "How has Traditional Ecological Knowledge been used and valued by different scientific disciplines?" This will be answered in a series of literature sketches derived through in-depth literature reviews; the approach on each topic by different disciplines will be analyzed and compared and contrasted. In particular, I was interested in evidence of the acquisition and use of Traditional Ecological Knowledge (TEK) by these researchers. I was also hoping to see some representation of communities' views on the research conducted.

First, the relationship between humans, landscapes, and animals is an absolutely central one to the Inuit traditional knowledge system. Inuit life and culture revolves around interactions with the Arctic fauna and, in fact, a bulk of on-going research projects in the North involve some aspect of examining this relationship. Explicitly, in the world of research and policy, TEK is often found under the umbrella of biology where, Collings (1997) notes "biologists tend to dismiss local beliefs" (p.48).

5.2.1 Caribou Research

Research on caribou populations has the longest and perhaps deepest history in northern science. The importance of these herds in Arctic livelihoods has made them central characters in the canon of scientific literature. In general, caribou research can be understood as a discussion around herd

size. Indeed, early literature analyses the depletion of the herds due to overhunting by Inuit communities. These discussions became all the more important after widespread environmental change was created by industrial projects, such as the ones conducted in Northern Quebec (Meredith, 1985). The checks and balances on Inuit hunting are still an important part in caribou biological research but the vocabulary has changed, and methodologies are more precise.

The first systematic census and analysis of the Ungava Caribou herd of Northern Quebec in a 1958 study by Banfield and Tener. Their article became the baseline for all further research on the topic and established herd sizes upon which all future ones were calculated and compared (see notably Couturier et al. 1990; Momeau and Payette, 2000; Boudreau et al, 2003). The researchers based themselves on Low's 1897 theory of three distinct Ungava herds[6] and used data on calf increment obtained from observations on a mix of scattered aerial photographs, range studies, and information on forest an tundra fires, on predators, as well as on "native utilization" (Banfield and Tener, 1958, p.570). This information on the caribou hunt was obtained by interviews with missionaries, traders, native police, and northern service officers. Banfield and Tener note that these interviews provided only "sketchy" information (Banfield and Tener, 1958, p.572). Today, this is viewed more as a reflection of Qallunaat misunderstandings of Inuit hunting traditions[7]. This

[6] Interestingly, the support for Low′s theory is that there are three different ″Indian″ bands who were on attendance on the caribou, which supports the theory that the herds were probably separate).

[7] To reinforce this, in 1958, Kelsall published a survey which assumed that any increases in caribou herd size was only due to migration, not population growth. Kelsall talked about a decline to about 200,000 individual caribou in the 1950s, and predicted a complete obliteration of the species by 1969 (Kelsall, 1958). The notion of a "wanton slaughter" of the animals would have shaken the public to its core, and given the sense that Inuit were destroying the mythical north, and led to the paternalistic argument that state control over-hunting would benefit Inuit hunters in the long-run (Sandlos, 2008). This echoes warning posed by Garret Hardin in 1968 by which overpopulation and common land would inevitably lead to the decline of land productivity and thus come to the detriment of the very communities which depended on its resources.

is a clear use of TEK as factoids, Usher's Categories 1 and 2 where TEK is interpreted to fit a certain conclusion.

Caribou research eventually went beyond the vocabulary of "exceedingly abundant" or exceedingly vulnerable. In 1985, Meredith attacked a problem of quantification of herd size in Northern Quebec by publishing a report compiled in the wake of concerns about caribou herd depletion in the 1980s. The drowning of approximately 10,000 caribou in 1984 in the Caniapiscau River (Northern Quebec) due to hydroelectric damming had galvanized media attention and forced the government to organize a workshop in 1985 that brought different stakeholders together. This workshop exemplifies the contrast between Qallunaat and Inuit science. Meredith notes that the James Bay Energy Corporation "presented highly technical charts, graphs, maps and tables"; the representative from Makivik Corporation, the Inuit research organization "had virtually no hard data but an abundance of oral history and personal experience."[8] (Meredith, 1985, p.700).

Parlee and Wray (2016) present a good example of research being done about caribou TEK itself. It brings in another dimension to the debate, of the people from which the TEK is gathered. The authors point out that Inuit women hold traditional knowledge about wildlife and practices relating to this, and yet, their knowledge is often ignored in understanding caribou population dynamics (Parlee and Wray, 2016). Women have a tremendous amount of influence in whether the caribou return to the area (Parlee and Wray, 2016). For example, if the product of the hunt is carefully prepared and demonstrated proper respect, the herds are likely to return the following year (p.175). Indigenous oral histories hold long record of the fluctuations of caribou herd sizes

[8] Meredith also notes that the caribou workshop integrated many comparisons between the knowledge and observations of the caribou between northern Quebec Inuit and Lapp communities in Finland. It is a good example of cross-border sharing, which is not often seen in the academic literature but exists at different organization levels.

through the traditional knowledge of hunters which guide traditional cycles of hunting[9] (Parlee and Wray, 2016). Indeed, while modern day declines are often argued to be caused by overhunting, "wanton slaughter" (Sandlos, 2007), evidence of this is sparse, and ignores long-held traditional hunting techniques and wildlife resource management, but this pattern of blame about overhunting is echoed throughout the literature.

Recently, statistical modelling has proved a new tool for more accurate prediction of trends in herd size and shows a shift in direct blame of hunting and hunters. Statistical modelling intersects with TEK through corroboration. Observations and hunting data can be put into models which are then used to predict population sizes of certain species. A 2008 article by Sorensen et al runs multiple regression models to prove that disturbances either in the form of wildfires or anthropogenic action results in caribou habitat loss which lower boreal caribou numbers in northern Alberta. The goal is to develop a model for future management plans. Recently, studies have also been undertaken about caribou herd size and health using an ecological-landscape lens. Notably, Théau and Duguay (2014) use Landsat TM imagery to find the summer range of the George River caribou herd.

5.2.3 Polar Bear Research

Polar bears, the king of the North, have a particular hold of the Canadian imagination and thus are the subjects of particular attention from the public and the scientific community. This charismatic megafauna is a component of Inuit diet and a cultural and spiritual landmark. The earliest explorers

[9] Parlee and Wray show that women comprise only 2.27 percent of regional management-boards (2016 p.184).

were also fascinated by their majesty and the bear is the ultimate prize for contemporary big-game hunters. More recently, polar bears are becoming the icon of climate change as the Arctic sea ice diminishes (Englehard, 2017). In contrast to caribou, the seminal nature of the animal has lead a research focus on individual polar bears as representative of the general health of the Arctic environment (Englehard, 2017). Due to the iconic nature of the animal, both in Inuit cosmology and in the Qallunaat imagination, many questions arise when scientists intervene with the king of the North.

Nowhere is a current contrast in attitudes towards TEK more obvious than in the differing methods of polar bear surveillance. For example, there have been discussions about collaring polar bears: the scientists argue it is crucial to monitoring population numbers while the Inuit hunters blame the collaring for the disappearance of the bears: playing with animals is considered unacceptable and is thought to lead to animals no longer making themselves available for hunting (Wong and Murphy, 2016). However, the most influential polar bear scientists use the sequence of capture, tagging, tattooing, measuring and release of individual bears. (see notably Messier et al 1994; Stirling, 1986 and 2011; Obbard and Middel, 2012, Johnson et al. 2017). Polar bear biologists Obbard and Middel (2012) remark that the popularity of these capture methods are an evolution away from the anecdotal use of TEK and other sampling strategies. Arguing this methodology has brought forth central aspects of TEK which are more difficult for scientists to contend with (much more than the "simple facts" elicited from traditional knowledge holders), in a way that has been more public than for other species.

Inuit communities, on the other hand, have been increasingly vocal about their aversion to these highly invasive bio-ecological methods of data collection, and there have been discussions about changing the methodology, although it is far from being widely accepted among biological circles (de Groot et al 2013, p. 394). As such, another methodological school for polar bear

population size estimates is found in non-invasive methods of calculation such as satellite imagery and hair snags quantification, shown notably by Aars et al (2009). However, new discussions around using expert knowledge and hunting data have emerged in the beginning of the twenty-first century.

In a 2011 article written by Wong et al, the authors prove that experienced Inuit hunters hold of the intricacies of polar bear characteristics (notable the size and sex) learned by reading the tracks in the landscape. Their paper concludes that the expertise of local communities is the most reliable source of information we could find on polar bear characteristics and populations (Wong et al 2011, p.150). This article is perhaps one of the best examples at hand of wildlife researchers attempting to prove to the wider scientific community that TEK is a valid, and extremely useful scientific methodology by interacting directly with the community and their practices. Similarly, de Groot et al (2013) offer an analysis of the use of polar bear hair snags in that it is cheap and also allows for the "inclusion of communities in leading and participating in collecting samples" (de Groot et al 2013, p.397). It also "preserves the invaluable hunting and tracking techniques of Inuit hunters" as described in Wong et al (2012).

O'Neill et al (2008) also argue for similar non-invasive polar bear population size estimates such as the use of hunter observations, this time in relation to climate change, to the extent that expert knowledge can fill in the gaps in accepted Qallunaat science:

> "Expert judgement is not intended to be a substitute for scientific research (Morgan and Henrion 1990), but to define the current knowledge and range of uncertainty surrounding a given response [...] such approaches are of value for management decisions where uncertainty is high and where there is a lack of empirical data to assess uncertainty." (p.1650)

These alternative research techniques for polar bear management seem to slowly be acknowledged in the field. For example, Wong (2016) only has one citation in Google Scholar, de Groot et al (2013) are cited nine times and Wong et al (2011) have eleven. An older article that seems to have had a wider impact is O'Neill et al (2008), cited 71 times in the past ten years. By contrast however, Stirling (1989), describing polar bear immobilization techniques has been cited 259 times, and a similar article written in 2011 already has 44 citations. This is clear evidence of the far and strong reach of these more orthodox research techniques which rarely account for TEK or local observations.

5.2.3 Ornithology and Marine Life Research

We can combine research about birds and marine life as they have many striking similarities. Indeed, cross-border migratory species such as birds and marine life present the case of animals that are key to Inuit diet but also difficult to geographically localized as part of the Canadian Arctic because their movements are so wide reaching. Both disciplines of ecological research have had similar foci, notably observing the effects of contaminants on animal behaviour.

In terms of bird ecology, the oldest article in the sample is Dewey Soper 1940 exploration of bird distribution in the Canadian Arctic. Soper's many travels with Inuit made their knowledge of the land at the centre of his understandings and led him to put the knowledge in his methodological repertoire (Soper, 1940).

An important branch of Arctic ornithology is preoccupied with the behaviour of the birds; here also there is little room given to local understandings. This is an area where we could expect that TEK would have a lot of offer. However, the publications in the scientific canon make little mention of this. These papers are highly statistical, often based on field observations and laboratory analysis of specimens. For example, a highly cited article is Woo et al (2008) who studied the

behaviour of a seabird predator, the Brünnich's guillemot, over fifteen years. They examined prey feed and hunting behaviour observed on the field, and then correlate this understanding with plasma isotopes. Notably, reading Lovehorn et al (2014 and 2015), one could be led to believe very little presence of Inuit in the area; the only mention is made of sampling eiders shot by hunters near Barrow, Alaska. However, Gaston et al (2012) note that "friction with the local Inuit over bird resources is hardly surprising. All large Arctic seabird colonies in Canada show signs of early Inuit habitation nearby [….]" (p.221). There is therefore recognition of Inuit communities but for the science, this seems to mostly stop there.

Local knowledge and arctic ornithology was brought to the forefront by 1999 article by Ann Fienup-Riordan, is both a novelty in biological research and a marker of a distinct change in northern biological research. Commissioned to research geese conservation projects in a Yup'ik community in Alaska, the researcher went beyond the stated goal of the project and brought to light the perception of community elders on the government scientists who were running projects on the nesting grounds near the town. To this end, Fienup-Riordan underlines that understanding on the Yup'ik elders' point of view that the agency of the birds was being disturbed by invasive scientific methodology led to a clash between community and scientists, with each viewing the other as extremely problematic. Fienup-Riordan notes "the stated goal of the AVCP's goose project was to de-politicize biology by explaining the methodology and importance of science to the community. This ambitious goal was not met. Yet, a beginning was made in better understanding" (Fienup-Riordan, 1999, p.20).

The clash of ontologies, but also the importance of communication is epitomized in the young Yup'ik biologist who conducted the interviews for Fienup-Riordan's paper; he talks about the difficulty in contradicting the elders' views, even when he can back up his argument with Qallunaat science. With more statistical methodology than Fienup-Riordan, in a very recent article,

Zavaleta (1999) uses goose declines and hunters' knowledge of this to show that resource users understand the biological mechanisms behind species populations, therefore corroborating the accuracy of TEK with regards to the geese. (Zavaleta, 1999, p.262).

Marine biology has followed a similar disciplinary pattern as ornithology. As such, Johaness et al (2010) show that there is only one book on TEK in regards to fish and marine life[10] (what they call FEK), a reality which they say "reflect doubt on the value of such knowledge" (Johannes et al, 2010, p.258). They then go on to provide examples about the "folly of dismissing" TEK, moments where local people's knowledge of the ocean far surpassed the data interpreted by outsider scientists (Johannes et al, 2010, p.258). Notably, the authors state, allegations of over-use of Arctic marine resources are often confusing for the Inuit communities who do not see species populations the same way scientists might.

Luckily for this thesis, lack of books on TEK and marine life has not precluded articles from being written about the subject. The eleven articles in the sample showcase the difficulty of underwater biological research, and thus a reliance on the catch-numbers provided by hunters and fishermen themselves. To learn about the ocean requires a certain reliance on local communities' observations (Higdon et al, 2009; Sergeant and Brodie, 1969), knowledge about marine systems and habits (Breton-Honeyman et al, 2016), catch-numbers (Breiwick et al, 1984), and sometimes supplemented by aerial surveys (Hamill et al, 2004). This makes the oceans an interesting place where TEK can be examined without the contentious scrutiny and condemnation surrounding more charismatic mega-fauna. Gonzalez's (2001) report for the Nunavut Department of Fisheries and

[10] Johannes R.E. (1981*) Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia.* University of California Press, Berkeley

Oceans showcases the perceived importance of TEK in marine science by reporting on the knowledge held by the Repulse Bay community, documenting it so it may be "combined with scientific information [to provide] a more complete understanding of the narwhal population." (Gonzalez, 2001, p.191).

Seals, beluga whales, narwhales, and bowhead whales are the largest species with which Arctic biology contends. In this literature sample, a good portion of the science in the past thirty years has seemed to address questions of pollutants found in these species (see Wagemann et al, 1996, Lemes et al 2011; Outridge et al, 2009). The methodology required by this type of research is often killing the animals and bringing the specimens to southern laboratories. Strikingly, most of the research methodologies seem to engage to some extent Inuit hunters who provide samples of the animals (either whole individuals or certain parts, like the skin) to the scientists (see, notably, Breton-Honeyman et al, 2016).

Apart from Fienup-Riordan (1999), Zaveleta (1999) and Collings et al (2017)[11], Arctic ornithology and marine ecology seems to have engaged only superficially with TEK. Eleven articles about birds and ten articles on marine wildlife (both out of seventeen) make no mention of local knowledge or communities. Much of the research on these species involves aspects of pollutants found in specimens, mercury in particular, and it seems that most of the focus on both marine life and birds has been mostly concentrated there in the past thirty years. While samples might be done with the help of Inuit hunters, barely anything about their knowledge enters the canon. This type of research demands specimen catches and then laboratory analysis in the South:

[11] Collings et al (2017) did not appear in our sample but are central to mention here as he conducted an extensive traditional knowledge survey about beluga whales in the Northwest territories. s

ornithologists gather eggs (Fienup-Riordan, 1999) and marine biologists, whale biologists in particular, use the products of the community's hunt (Johaness et al, 2010).

5.2.4 Landscapes Research and Physical Science

Conducting physical science in the Arctic is of a different flavour from wildlife research. It is arguably a younger endeavour, indicative of the split between the hard and soft sciences, and especially within the sub-disciplines of quantitative science.

Any study of the Arctic is deeply spatial and these studies of wildlife find their spatial expression in space-based science such as botany, geomorphology, and climatology. The North's unique ecology creates in turn a unique environment for scientific enquiry to be conducted. These space-based sciences have been used most importantly in the creation of the northern parks, marine protected areas, and the conservation estate more broadly (see Sandlos, 2007). Cuerrier et al (2015) propose a conceptualization of valuable landscapes as "cultural keystone places". Using the same vocabulary as has been used to highlight cultural keystone species, they showcase the physical attributes of places, and the knowledge about them. Under the definition given by UNESCO, cultural landscapes are those in which are expressed long relationships between local communities and the natural environment, a reflection of land, resource use, and relationships between people and the *terra firma* (UNESCO Cultural Landscapes). This wording shows that landscapes can also be the subject of TEK; it so happens that these are places which also happen to be rich in biological diversity (Cuerrier et al, 2015). It is therefore necessary to include in this longitudinal analysis, a section on the study of the landscape itself.

Two main trends of research on Arctic landscapes base themselves completely on Inuit knowledge of the place. The first is work on Inuit travel and mouvement across the land, and the knowledge which is then created of as a result. Dr. Claudio Aporta is one of foremost experts in

the academic world this topic. Throughout his career, by tracing the travel routes taken by Inuit in various communities, he explained how a strong knowledge of these landscapes, created through movement and present in individual and collective memory, allows people to safely travel, hunt, fish, and generally be connected with other communities in the region. If one could find a way to conceptualize the Arctic landscape through Inuit understandings; landscape perception would be a fully embedded element within it. In his 2004 article "Routes, trails and tracks: Trail breaking among the Inuit of Igloolik", Aporta introduces the idea of an Inuit "memoryscape" that brings together many ideas about spatial landscape, cognitive landscapes, and their role in community and individual memory. The term was coined by Nuttall in 1992 as "not only to the mere physical territory remembered by a particular individual, but also to the community's interaction with a place through time" (Aporta, 2004, p.39).

Similarly, toponymy, a vein of research concerned with recording and interpreting the place names by which the Arctic is understood as the Inuit homeland. A seminal work in this regard is Ludger Muller-Wille's extensive survey of place names in Nunavik. Similarly, a master's thesis written in 2000 out of McGill University by Darren Keith. Notably, Keith argues that place names hold knowledge about resources that are key to subsistence (Keith, 2000)[12].

There exists barely any study specifically of the TEK of landscape elements themselves; in this sample, only one article focuses on the landscape perspective of Inuit science on the topic, Aporta's work on navigational knowledge.[13] One example that was not in our sample, however,

[12] In his career after McGill, Keith went on to collaborate on a place name atlas for the Kitikmeot. The goal of the on-going project is to comprehensively record places names of the region and their meanings, implications and oral histories in the regional dialects, and produce paper and oral maps (See Keith et al, 2014 and the Kitikmeot Heritage Society).

[13] Although it is not about Inuit TEK, it is worth mentioning here Julie Cruikshank's majestic book called *Do Glaciers Listen* (2010) which describes the production of local knowledge in the Saint Elias mountains (in and around the southwestern Yukon) and the embodiment of cultural meaning within these landscapes.

lies in the compilation of Inuktitut terminologies for snow and ice. *SIKU: Knowing Our Ice* was compiled in 2010 and edited by some of the foremost Arctic researchers of our time (Igor Krupnik, Claudio Aporta, Shari Gearhead, Gita Laidler, and Lene Kielsen Holm). It documents Inuit knowledge of the icescape in all its integral parts, and is a fascinating, and extremely important, look into the knowledge, experience, and understandings of local Inuit communities on the ever-changing Arctic.

Apart from the lines of qualitative enquiry described above, physical science in the Arctic has mostly bypassed local knowledge systems. This scientific practice includes studies of ice cores, geology, geomorphology (for reference, see Schüpbach et al, 2009; Pollard et al, 2009). These types of science often occur in very remote areas where permanent communities do not exist, or they are conducted by teams of researchers that do not include social scientists who might be more receptive to aspects beyond the collection of hard physical data (E. Loring, personal communication, 8 March 2018). Quite often, this research is conducted in the High Arctic and with highly specialized knowledge, calculations with the bulk of the analyses often conducted in laboratory in the South. Due to the nature and geography of these sciences, this research is seen as having much less to do with Inuit and seen as having much less direct effect on communities. However, the permissions given for this type of research must be given by the community who claims title over the particular area and by the equivalent of the Nunavut Research Institute (NRI) in the different provinces and territories that grants licenses. The physical scientists must comply with a litany of regulations regarding for instance, waste removal, fuel storage, planning transport of equipment. For instance, the NRI has a special division for research regarding land and water, this includes "geology, hydrology, water quality, oceanography, geology/geomorphology, glaciology, air quality" research

(NRI). In these cases, the Institute would notably look at the environmental impact of the research and issues access permits (NRI).

More recently, climate change science has taken an increasing proportion of Arctic science, as questions of environmental change and the vulnerability of northern populations have been brought to the forefront of public attention. The gap between the "hard-sciences" has been somewhat of a bridge here recently, as local communities' experiences are brought to the forefront. In this fairly new focus for the Arctic, we see the integration of local knowledges about the changing weather, sea ice, and the effects of these. Sometimes, this information is integrated into published works as factoids and anecdotes, essentially as an aside to basic scientific explanation, not as a complete epistemological system in and of itself (see for example, Hanesiak and Wang, 2005). Sometimes, local understandings and observations form the basis for research (for reference, see Ford et al 2012; Laidler et al, 2008, Krupnik, 2011). In this new worldwide discussion about climate change, it seems like the recognition of Inuit communities' knowledge, and the fact that they are at the forefront of any change in the Arctic environment, has placed increased interest in traditional knowledge in the sense that it provides long-held knowledge about the land and thus an understanding about how it might have changed. However, a climate change meme is also that the traditional knowledge system has become too weak to provide a viable adaptive framework (G.Wenzel, personal communication, 28 March 2018).

We have thus far seen differences in the ways that different disciplines address and integrate local and traditional knowledge. These differences are reflective of the particular disciplinary histories which strongly impacts the manner in which the ecological element is understood and studied. Due to the nature of academic research, which builds upon past science, the canonical literature presents a baseline for future research and past research methods moulds the future ones. If, for example,

polar bear scientists have long-engaged in animal tagging, the habit is now well-entrenched in methodology and hard to break. This, however, does not mean that there is no potential for slow and gradual methodological change which would facilitate the integration of local and traditional ecological knowledge: it only takes a few scientists to present different ideas about knowledge creation and disseminate them to their colleagues to begin an institutional change. We have seen this in northern ornithology, notably, where an article such as Dr. Fienup-Riordan's 1999 publication presented a different way of doing research; the fall-out from her article was the emergence of new discussions about community perception of damaging research that was inconsiderate of traditional and local knowledge. With biological research, local knowledge of herd sizes, patterns, animal behaviour can do more than complement Qallunaat science. Indeed, it can force researchers to ask different questions, look at certain things in a variety of ways,

With the emergence of more northern research which redefines the ways in which science can interact with TEK, we might expect creative new ways of defining and interacting with the concept. However, we must mention here a risk of which we must steered clear, making TEK into a token term as a way to legitimize northern research and make it acceptable (E. Loring, personal communication, 8 March 2018).

5.2 Looking for Community Acknowledgment in Scientific Publications

The acknowledgments sections of publications allow us a special window into understanding the methodology behind the published research, insight into the ways in which the science was conducted, and in particular to the people who were involved in the research.

To this end, I examined the acknowledgement sections of the same pieces of literature that composed our review. Of the eighty-five articles parsed in this literature review, seventy-five present us with an acknowledgments section.

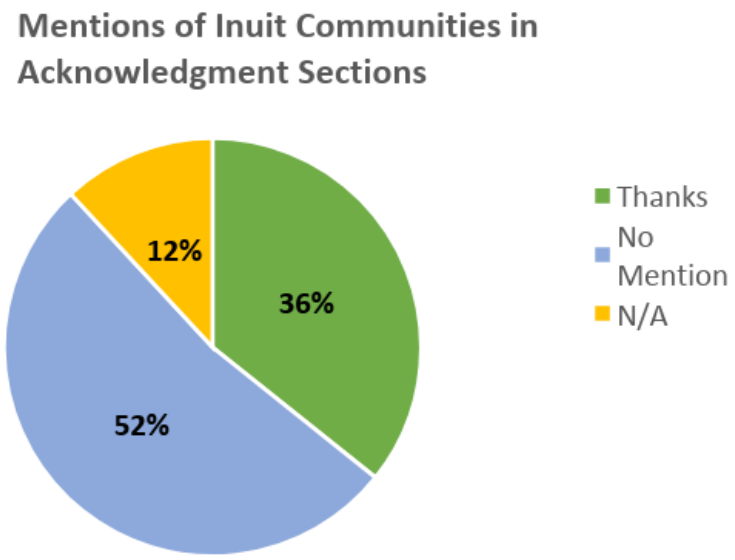

Figure 2 Mentions of Inuit Communities in Acknowledgments Sections of the Literature Sample

We see that 36 percent of the articles make explicit reference to Inuit communities and/or community members and elders. Many of these acknowledgments thank the Inuit for their "interest" (Black et al 2007, p.162), for choosing to "partake in this study" (Heyes 2007, p.152). Others offer a broader thanks, noting their support, collaboration and contributions which "made the research possible" (Laidler et al., 2009, p.393). One, Gould and Walk (1997) makes explicit reference to the place held by local knowledge in the research by thanking those who "provided local and native insight into the land." (p.1758). Two articles in the sample note that community consent was obtained through formalized tribal council resolutions. Interestingly, many of the publications about marine life thank Inuit communities for hunting the specimens that are then

analyzed in laboratory; Lewis et al, for example, even thank the students of Arctic college who dissected the specimens (Lewis et al, 2010)

The acknowledgments section is also a good indicator of the funders of this Arctic research[14] and can provide some insight into the interest paid to the research by different bodies and institutions. The two main Canadian funding agencies, the Social Sciences and Humanities Research Council (SHERC) and the Natural Sciences and Engineering Research Council (NSERC) provided funding to approximately 22 percent of the articles in this sample. The Canadian Institutes of Health Research (CIHR) are major funders for research involving health, and the ArcticNet project is a recent giant in research on climate change. These funding bodies are extremely large and provide wide support for most research activity. This broadness means that organizations such as Inuit Tapariit Kanatami might have little influence over the types of research projects that get approval (E.Loring, personal communication, 8 March 2018).

In the sample, we also see the results of provincial grants such as the "Fonds Pour la Formation des Chercheurs et Aide à la Recherche (Fonds FCAR)" as well university-specific ones, which tie the research to the institution. Of interest also, Hydro-Quebec is thanked as a funder in four articles on caribou, probably as a result of the JDNQA and the issues surrounding damning rivers and the effect of changers in hydrological regimes on caribou migration. In terms of governmental support, the main sources and collaborators are the Nunavut Wildlife Management Board, the Makivik Corporation, and Nunavut Tunngavik. Universities are also thanked in a bulk of the papers in this sample. The Polar Continental Shelf Project is here an important national provider of in-kind support biological research in the Arctic, mentioned sixteen times in the acknowledgments in the sample. The Project is a branch of Natural Resource Canada and its

[14] To note here, this is not necessarily in terms of quantity of funding given; I am presuming that if they appear in the acknowledgments, they have given substantial financial support.

mission is to "provide safe, efficient and cost-effective logistics in support of *science* and *Government priorities*" (Government of Canada, Polar Continental Shelf Program)[15].

In an interview conducted in March 2017 with a representative of Inuit Tapariit Kanatami (ITK), it was brought up that the funding agencies have a substantial amount of sway on the ways research is conducted, both on its ethical implications and on the methodological practice. An organization like ITK works these agencies and proposes paths for best research practices and considerations, by, for example, offering their guidelines for the acceptability of proposals (E.Loring, personal communication, 8 March 2018). These organizations also make use of scientific meetings to convey ideas, and suggest Inuit-relevant research ideas to northern scientists. Researchers who attend these conferences, reach out to organizations like ITK in order to develop better proposals which are in turn more likely to be accepted by funding agencies. It is a good example of the potential of overarching ideas making their way into the very practical realm of research funding. There is a flip-side to this however as there exists certain important funding bodies whose priorities lie elsewhere and therefore might not be as in-tune with considerations around local knowledge, community-based research and so-forth. There is work to be done here if organizations like ITK want to expand their ideas and influence research of a broader scale.

In this chapter, we have examined a range of northern research foci which each have their own history, theories, priorities and methodologies. In a sample of the literature, we have seen the grand trends of northern ecological science and extent to which local Inuit knowledges are found in the body of research. We showed that the different disciplinary traditions of northern science have been built on a land where local knowledges have been either ignored or misconstrued, and while

[15] For further research, it would be worth looking deeper into the intricacies of the Project.

deeply rooted in the space of the Canadian Arctic, Northern researchers have generally applied research methods which are set much more in the Qallunaat scientific paradigm than in local understandings of place. We have also examined the different actors present in the research process, and posited that the extent to which communities are made a part of the research project might be indicative of the attention paid to local knowledge, and the openness to conducting science in a different manner than was done in the past.

CHAPTER 6: ANALYSIS – NORTHERN SCIENCE, PRESENT AND FUTURE

6.1 A Categorization of Northern Science.

From the sample, we can recognize that the value of Traditional Ecological Knowledge in Arctic scientific research can be categorized as operating through four different levels. We see here that Usher's four categories of TEK are echoed in the value placed on Inuit communities and their knowledge, in scientific literature.

First (before Usher's categories come into play), there are that scientific research which shows no mention of TEK or similar concepts and considerations. This research often relates no connection with any elders or communities, methodologies by-passing Inuit presence in the Arctic as well as cultural knowledges. This type seems to constitute a majority of ecological scientific endeavour in the Arctic, especially when it comes to biological research and the physical sciences. Of the sample of eighty-five pieces of research studied here, thirty-nine percent show no evidence of Traditional Ecological Knowledge use or community consideration.

Parsing closely, we see this is more or less even across sub-disciplines. Six caribou research articles, nine polar bear articles, and seven on marine mammals make no mention of TEK or related notions. There seems to be an even slightly less of ornithology literature which uses TEK. This would echo the sentiment given by the ornithologist I interviewed in February 2018 who explained that the facts given by TEK were not rigorous truth; therefore, the incorporation of them into published work would delegitimize the results of his research. For the most part, these pieces of scientific literature even make no mention of Inuit communities. However, the admission of historical presence and hunting, without any more precision, is used occasionally, in the introduction or conclusion of the paper (this comes up in at least three articles of this category in sample).

This is indicative of an awareness that locals have knowledge, but that the knowledge has no utility for the science. This science shows direct continuity with the setting aside of local knowledge, a legacy of colonialism certainly, but also a product of the institution of the scientific method (Scott, 2013). With increased codification of TEK in the law and new thoughts on ethical research, it is striking that much northern research still seems to bypass TEK completely.

Second, science has also incorporated Traditional Ecological Knowledge by using it as factoids. This is the level based in Usher's framework. Through this, mentions to elders and communities are done in the acknowledgements of the paper but ecological information (historical and contemporary) is not directly credited. These kinds of reports also make little or no mention of any of the deeper aspects of Inuit science. In the past, TEK has often been touted as providing interesting facts, and not much else. However, the lack of overt and explicit facts from TEK knowledge holders in the literature sample is striking. In this snapshot of contemporary research, only eleven pieces of scientific research integrates TEK simply as facts.

This could be indicative of two things. There might be reticence in using TEK without a deeper analysis of the concepts, and much scientific research has neither time, support, or even interest in doing so. The codification of TEK in law and research institutions has created some confusion about the appropriateness of using it (Usher, 2000). Therefore, in a certain type of scientific endeavour, its concepts are bypassed completely. The pattern might also be the result of a positive trend however. Scientific work in the Arctic might be turning greater attention to truly understanding all the dimensions of TEK before using publishing it (E.Loring, personal communication, 8 March 2018). If this is true, we should see a rise in on-going northern research that holds Inuit science as a basic tenet.

The current lack of TEK facts in modern literature could also be explained by the argument brought forth by Eric Loring at ITK: because scientists rarely visit the North before they begin a project, they do not base their projects on local knowledge; therefore, there is no room for the incorporation of even the most “practical facts” given by TEK simply because the knowledge does not enter the scientific research process at the beginning.

We can connect to this a third category of northern science, which is the logical progression of using Inuit science as factoids but one that has interacted with the community for a longer time. This is research which uses TEK within its framing of the question at hand, and in its methodology and conclusion. Only nine pieces of literature in the sample values TEK in this way. The published reports explain the depth of knowledge provided by Inuit scientific frameworks, showcasing the value and importance of codifying it in official literature canons, explain their particular methodological process of gathering the necessary TEK, often through interviews or trips on the land. These use many aspects of TEK and information from local communities as a baseline and thus the Qallunaat canon. Going along with the explanation given by Eric Loring, finding TEK in this manner in published work is indicative of long-term research projects, proposals established under community-consultation, and conducted with prior knowledge of the frameworks of Inuit science (E. Loring, personal communication, 8 March 2018). A perfect example of this combination is an article written by York et al (2016) on polar bear demographics. They state that: “Our evidence is partly scientific (comparison to subsequent surveys), partly logical (the demographic estimates suggest a dramatic decline that has not occurred) and partly taken from Inuit and Inuvialuit traditional ecological knowledge" (p. 2897).

Fourth, there are those reports on Traditional Ecological Knowledge itself. These examine the knowledge of an ecologically related topic, and often posit conclusions on the conceptual

framework. This type of research examines TEK of certain topics, and incorporates the TEK paradigm into their methodology. The publications which come from this type of work often make a strong case for the value of TEK and the potential for its reconcilability with Qallunaat science within academic and policy research. At the core, the goal of such research is to address the disconnect between Qallunaat science and Inuit science (Omura, 1999). By doing so, it also smoothens the differences between some sub-topics of northern science. This attempt to grapple with TEK also does so on the local communities own terms.

In the sample, we find twenty-one examples of this type of research. All of these written in variations of a collaborative effort between professional researchers and Inuit community members, where the later are the main people thanked in the acknowledgments, not only for their collaboration but for all aspects of the research project. Here, we see the flip side of the third category of northern research. Instead of fitting traditional and local knowledge paradigms into Qallunaat publications, this scientific practice uses Qallunaat science to deepen explanations of local knowledge (A. Fienup-Riordan, personal communication, 6 March 2018). Here, although less common than research without any evidence of TEK, there is a substantial presence of this type of literature in the canon; it represents approximately thirty percent of our literature sample. Most strikingly, it is found to have increased largely in the past decade, mostly in research published from the 2000s onwards. This type of scientific endeavour is surely a result of groundbreaking work such as Fienup-Riordan's 1999 article, which paved the way for scientific research to bridge the divide between quantitative and qualitative science, and offered a construction of research proposals with local knowledge at the origin.

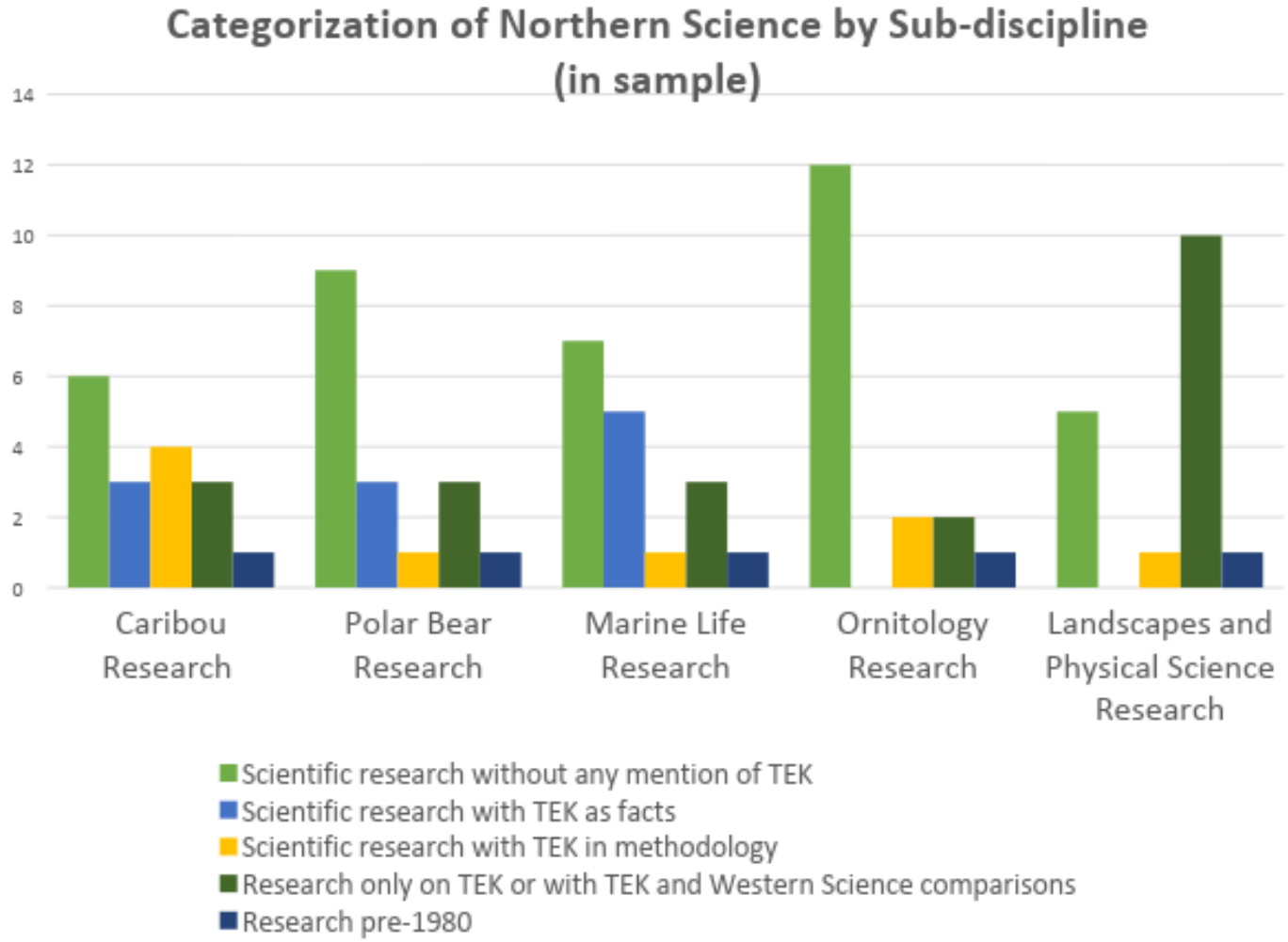

Figure 3 Categorization of Northern Science by Sub-Discipline (in sample)

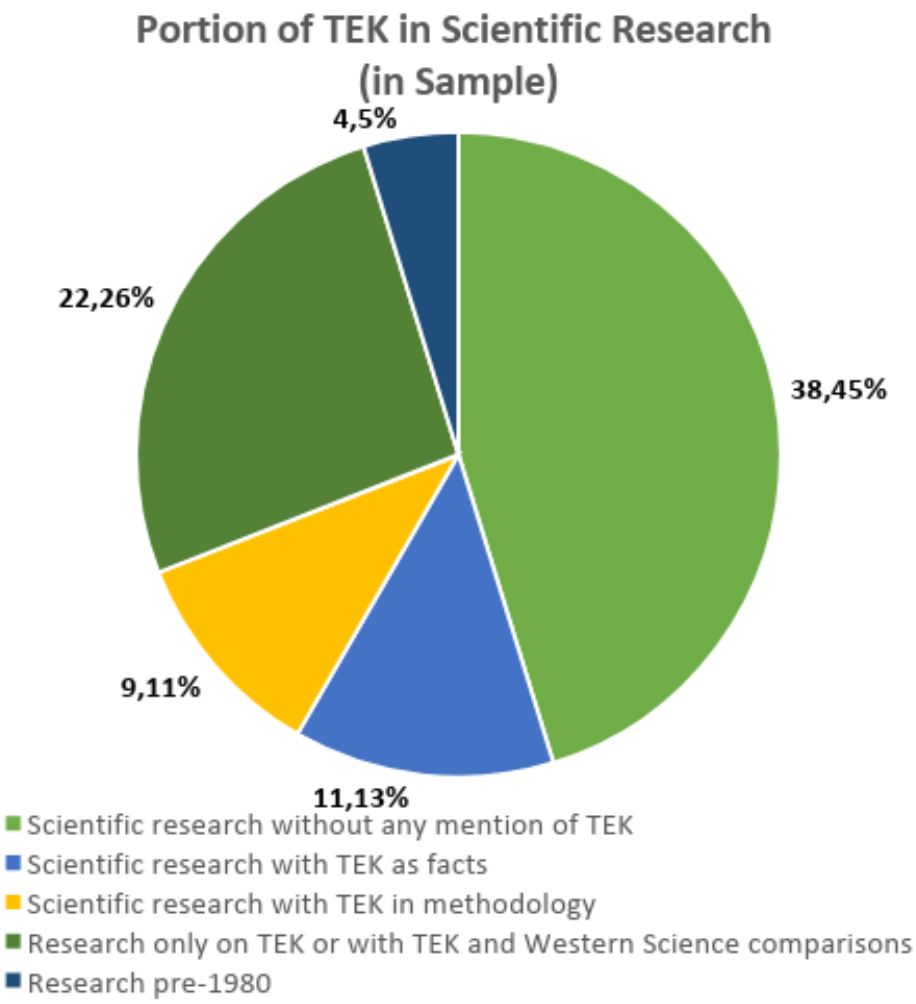

Figure 4 Portion of TEK in Scientific Research (in sample)

We see a clear split between wildlife and physical sciences. They are subject to different sensibilities and regulations, and the publication of their results resonates in two very different spheres. As wildlife management is a central, and sensitive, aspect of northern policy, it has brought discussions about TEK much more into play, either by research it or eliciting reaction when it ignored TEK completely. The physical sciences find themselves on the outskirts of such discussions, although with the advent of climate change discussions, perhaps not for long.

Even within these categories of northern science, we see differences in the sub-disciplines and the ways they have interacted with Inuit Science. Arctic biology has grown in silos dependent on the species studied. This has created disciplinary foci notably on population estimation techniques (caribou research), of tagging (polar bear research) and of behaviour (marine mammals and bird research). In these silos, methodological tradition has shown integration of local knowledge at different levels. Generally, while there is a new trend of engaging Inuit science into this research, a counter-current also demands closer attachment to the scientific method.

However, two axes are slowly changing the ways Qallunaat research thinks about Inuit science. The first is individual researchers and thinkers, who (alongside increasingly vocal communities) by legitimizing the ontological paradigm have the power to change the ways their particular disciplines conceptualize TEK and the value it may have for their science. Next, regulatory bodies are promulgating these ideas. By the formalization of the layered definitions of TEK in law and policy, institutions have formalized the importance of TEK and established it as a requirement for research (Mauro and Hardison, 2000). Evidence of a uniform application of this is arguably scarce in the practice of on-going scientific projects, and echoes the worry that, if TEK is to be formalized in tokenistic ways, it may be misconstrued.

6. 2 Engaging with TEK in Local Communities - Best Practices.

This analysis of the literature shows that Traditional Ecological Knowledge has been valued differently and to different extents over the past thirty years as well as differentially across disciplines of Northern Science. Deep analysis has shown the beginnings of new ideas about the integration of TEK into Qallunaat scientific paradigms, a sense that the knowledge system can bring to better relations with local communities but also make better science. However, if the

theoretical grounds have been prepared, there seems still to be a lack of accessible tools to grapple with the question.

As a professor of ornithology that I interviewed in late February said: “I do not see how TEK could be integrated into my research”. This statement portrayed openness to the concept, but also a lack of curiosity of the ways in which this could be done, and the benefits of doing so. This same scientist told me he had little to no interaction with Inuit communities during his field season, even though there was a community right next to the bird colony he was studying.

As we have seen, experts about the topic have established that the two systems are not incompatible, and this thesis argues that TEK can in fact lead to better science; it seems, however, that this argument has not been embraced by all northern researchers (Nadasdy, 1999). When I talked about this perspective to an anthropologist who has focused his career on different variations of traditional knowledge, we came to the conclusion that while we are seeing the beginnings of a change perhaps there has not been enough work done in convincing southern scientists about the intrinsic benefit found within TEK systems (C. Scott, personal communication, 14 March 2018). Part of the solution might be to present researchers with concrete models to show the utility of local knowledge and tools to bring the systems into accepted scientific research. Another solution might be to bolster possible interactions between scientists and local communities.

Evidence abounds to show that certain research practices in northern communities can lead to conflict and tensions. However, when the communities are fully involved in the research, the project can be changed and made better, creating trust and constructive (ultimately better) science. Fienup-Riordan states “if the new ethics is to have real meaning, we need to pay close attention to these local conversations and what they say about the practice of science as well as its object” (Fienup-Riordan 1999, p.20).

By all accounts, much potential exists to influence younger researchers who are generally more responsive to changing their methodological frameworks and ways of doing research (E. Loring, personal communication, 8 March 2018). A lot of work has been done over the last few years, by influencing organizations like Inuit Tapiriit Kanatami to form a generation of scientists more in-tune with the needs, desires, and concerns of local communities (E. Loring, personal communication, 8 March 2018). There is much discussion to be had about the best methodologies for working with Inuit communities within the realm of ecological and spatial science especially. For example, I had the opportunity to attend the Intercultural Indigenous Workshop held at McGill University in November 2017. The goal of the workshop was to train young researchers to work in Indigenous contexts, and to share perspective, experiences and thoughts about the best ways to conduct research in the Canadian North. In and of itself, the existence of this new workshop is proof of increasing attention paid to new directions of fieldwork and interactions between Qallunaat researchers and Inuit communities. It also shows a real desire to conduct future research in ways that are well mannered, respectful, and sustainable, and that leads to better science.

Today, as we have seen, TEK is enshrined in research funding protocols, regulations, and policies, and yet the paths to its implementation seem unclear. From this, stems an element of tokenism of the term (C. Scott, personal communication, 14 March 2018). Many ideas have been brought forth to bridge this divide. Among the practical solutions, these are characterized by notions of best practices, of the correct ways for Qallunaat science to interact with local knowledge holders and use TEK

Simple methodological shifts can positively affect the researcher-community interaction, things that must be addressed from the initial formulation of a research project (E. Loring, personal

communication, 8 March 2018). TEK cannot be fully engaged with if basic steps are not followed. For example, when working with Inuit communities, conversational interviews are considered both more culturally appropriate and more comprehensive (Nadasdy, 1999). As underlined by both Sandlos (2008) and Briggs's (1970), rigid questionnaires, surveys or to some extent any kind of semi-structured interviews tend to be reductionistic at best and damaging to relations with Indigenous communities at worst.

6.2.1 Working with TEK as a Function of Relationships.

Relationships are the key to working with Inuit science and local communities in general. If done this way, the process of scientific research has the potential to be a conversation deepening over time (C. Scott, personal communication, 14 March 2018).

Thinking of the scientific process as the coproduction of knowledge with local communities allows the opening of more opaque areas of dialogue which have in the past lead many to throw out aspects of TEK which are seen only as a matter of belief. Fienup-Riordan notes this in her research as well, the importance of building a connection with a community from the very beginning of the research process; instead of attempting to force a project on them.

Engaging with TEK means to take the time to know the community and from that, the knowledge and understandings they might have. It is necessary to engage first with the science which is created in the communities, with TEK in all its nuances and implications. The current research framework, as practiced in universities and in government, is not always conducive to taking time to build these relationships: pressing deadlines, the limits of funding, tenure-pressure, the traditional hold of the scientific method in certain disciplines all are systematic barriers to a new research practice (E. Loring, personal communication, 8 March 2018). There is also the necessity of working on these relationships to involve communities fully in the research process,

from the conception to the dissemination. For example, local organizations can initiate calls for certain projects, local elders and hunters can be involved in the running of a project, even local students can be brought in to analyse data (E. Loring, personal communication, 8 March 2018). Ensuring that communities be fully aware and involved in the project is crucial, and, not only can it bring to

In order to begin to address this issue, flexibility of the project is also a necessity. This flexibility can be translated in the willingness to alter a project or even deeper, a conception, and be open to having your mind changed. It can also mean a deeper effort into learning Inuktitut and integrating the vocabulary into publications (TK and NRI, 2006). A main barrier to this was the problem of translation; as much of TEK is necessarily intertwined with the language, the nuances of the concepts and of the overarching system can be lost in translation (A. Fienup-Riordan, personal communication, 6 March 2018). There is thus attention to be paid in the language used, and in the recognition of the power embedded in relations of language.

CHAPTER 7: GOOD MANNERS AND CONCLUDING REMARKS

7.1 Summary

The three goals of this research were to gain an understanding of the complex definitions of Inuit Traditional Ecological Knowledge, then to use these to examine the ways TEK is valued in contemporary scientific research in the Arctic, and from this posit ideas for better methodological practices in the context. This thesis has shown the interconnection of these aims in building towards a training of sorts for a young researcher to ask the right questions.

First, we have seen that Traditional Ecological Knowledge is the product of Inuit science. Practiced as an expression of culture, survival, perception, it is deeply situated in the Arctic context. The construction of TEK as a system diametrically opposite to Qallunaat science has marginalized both the communities which hold the knowledge and the understandings themselves. The long history of damaging research in the Canadian Arctic has been caused by the double-edged sword of ignoring local knowledge while extracting the useful information from communities for use in Qallunaat scientific paradigms and policy.

Next, analysis of the literature has shown that there is a spectrum with which TEK has been valued within northern scientific practice. In particular, we see a pull on both extremes: a demand for a return to empirical quantitative research and a burgeoning of new research done on an ontological system different from Qallunaat science. We can also see the hermetic vision of many sub-disciplines of Arctic research: each biologist with eyes on her own species and each physical scientist on their own scientific element. However, with growing discussions about the importance of inter-disciplinarity, ethics, and the advent of research on local knowledge systems as a whole,

there is potential to rethink the methodology under which northern research is conducted. It begins with people being trained right.

Finally, this training needs to occur under the guise of new methodologies that understand and value community knowledge and ontological differences. Very recently, while the finishing touches were being put on this thesis, Inuit Tapiriit Kanatami released their *National Inuit Strategy on Research*. The five priorities they identify are the following:

- Advance Inuit governance in research.
- Enhance the ethical conduct of research.
- Align funding with Inuit research priorities.
- Ensure Inuit access, ownership, and control over data and information.
- Build capacity in Inuit Nunangat research. (ITK, 2018)

This is a ground-breaking document, clearly showcasing ideas which have been present for the last few years and proposing a comprehensive plan to enact these ideas into practice. Interestingly, many of these ideas have been touched upon in this thesis.

7.2. Good Manners

As practitioners, researching in the Canadian north means spending time within communities and interacting with TEK. While work can be done to prove the necessity of the knowledge system, formalize our understandings of the ontology, and propose paths to better integrate it into the canon of scientific work, the very first step is learning to act properly with the context of our research. It involves what Wenzel calls *good manners* (G. Wenzel, personal communication, December 2017). Good manners begin from the very conceptualization of a project. It can mean going to see Inuit

organizations like ITK before planning your project, asking questions and being open to ontologies different than your own (E. Loring, personal communication, 8 March 2018). When in the North, these good manners include a litany of small things that one should do when a guest in a community. It means talking to people, being respectful, being open and honest about your intentions, not overstaying your welcome, and building relationships.

People who have worked for a long time in this context also talk about the importance of humility of the researcher (A. Fienup-Riordan, personal communication, 6 March 2018; E. Loring, personal communication, 8 March 2018). These good manners are not directly related to local and traditional knowledge. However, they do aim to open up communication between communities and researchers, create stronger relations, and ultimately provide space for expanding discussions and therefore, they become the fundamental first step in undertaking research with TEK. Good manners are what would allow for openness of intellect, for listening to the other, and for our research being not only respectful but also useful.

Traditional Ecological knowledge holds a tremendous amount of potential. It is the key to better science, better scientific practice and better relations. Researching and writing this thesis over the last year and a half has shown me the complexities of engaging with an ontological paradigm that has been barely integrated into the canon of literature we usually engage with in the university setting. Yet it also demands attention be paid to altering some aspects of this very literature. We must go beyond methodologies which elicit traditional knowledge. In doing so, we must not throw this knowledge away because it is too complicated to understand but rather recognize its value and train ourselves in valuing its system.

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APPENDIX

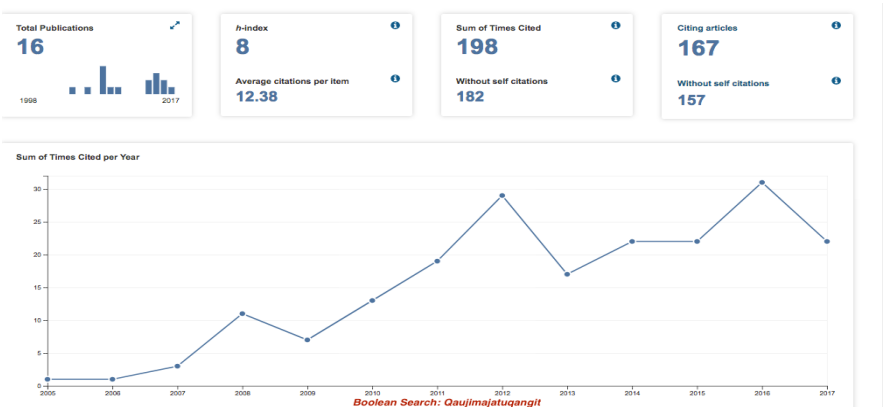

Figure 5 Web of Science - Boolean Search "Qaujimajatiqangit" (15 January 2018).

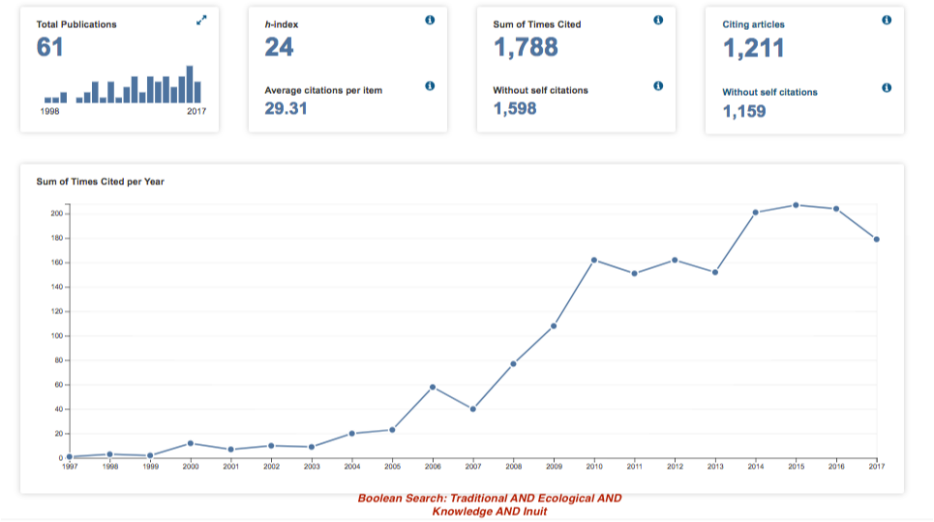

Figure 6 Web of Science - Boolean Search "Traditional" AND "Ecological" AND "Knowledge" AND "Inuit" (15 January 2018).

McGill

Research Ethics Board Office
James Administration Bldg.
845 Sherbrooke Street West. Rm 325
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Website: www.mcgill.ca/research/researchers/compliance/human/

Research Ethics Board I
Certificate of Ethical Acceptability of Research Involving Humans

REB File #: 319-1217

Project Title: Inuit Science in Qalluunat Research – Investigating the integration and value placed on Traditional Ecological Knowledge in scientific enquiry and the best ways to engage with Inuit knowledge systems of the Arctic

Principal Investigator: Dorothy Heinrich

Department: Geography

Status: Undergraduate Student

Supervisor: Prof. George Wenzel

Approval Period: **February 1, 2018 to January 31, 2019**

The REB-I reviewed and approved this project by full review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans.

Deanna Collin
Ethics Review Administrator, REB I & II

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* Approval is granted only for the research and purposes described.
* Modifications to the approved research must be reviewed and approved by the REB before they can be implemented.
* A Request for Renewal form must be submitted before the above expiry date. Research cannot be conducted without a current ethics approval. Submit 2-3 weeks ahead of the expiry date.
* When a project has been completed or terminated, a Study Closure form must be submitted.
* Unanticipated issues that may increase the risk level to participants or that may have other ethical implications must be promptly reported to the REB. Serious adverse events experienced by a participant in conjunction with the research must be reported to the REB without delay.
* The REB must be promptly notified of any new information that may affect the welfare or consent of participants.
* The REB must be notified of any suspension or cancellation imposed by a funding agency or regulatory body that is related to this study.
* The REB must be notified of any findings that may have ethical implications or may affect the decision of the REB.
* The REB must be notified of any suspension or cancellation imposed by a funding agency or regulatory body that is related to this project.
* The REB must be notified of any findings that may have ethical implications or may affect the decision of the REB.

Figure 7 McGill Research Ethics Board I Certificate of Ethical Acceptability of Research Involving Humans