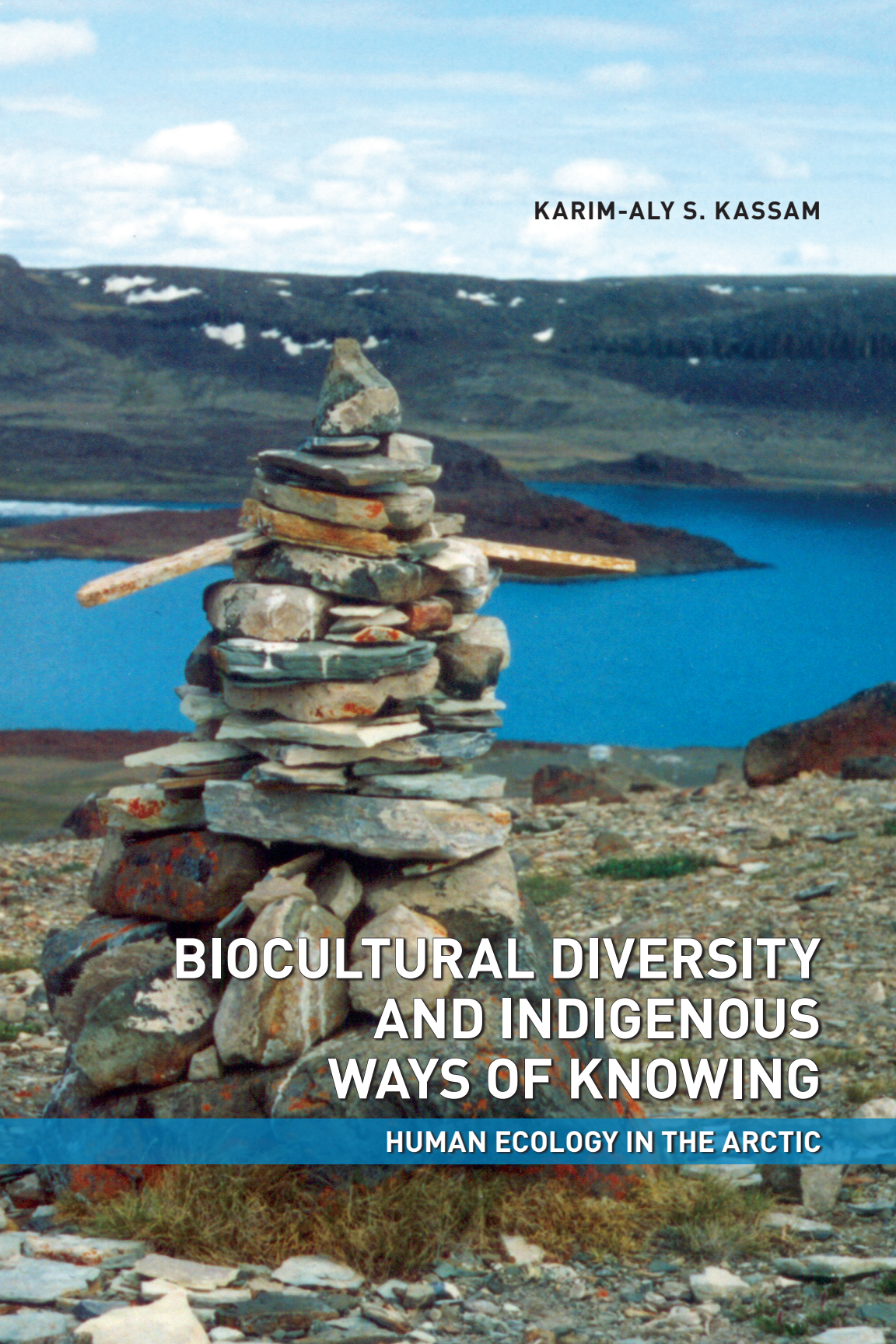
KARIM-ALY S. KASSAM
BIOCULTURAL DIVERSITY AND INDIGENOUS WAYS OF KNOWING
HUMAN ECOLOGY IN THE ARCTIC

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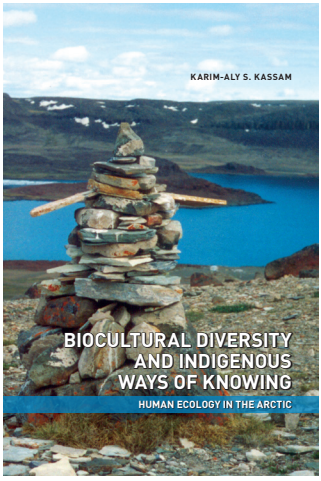

BIOCULTURAL DIVERSITY AND INDIGENOUS WAYS OF KNOWING: HUMAN ECOLOGY IN THE ARCTIC

by Karim-Aly S. Kassam

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CHAPTER 1

Introduction

> Conservation is getting nowhere because it is incompatible with our Abrahamic concept of land. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.… That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics. That land yields a cultural harvest is a fact long known, but latterly often forgotten (Leopold 1949: viii–ix).

At the dawn of the third millennium subsistence hunting and gathering are not relics of an earlier era, but rather remain essential to both cultural diversity and human survival. Arctic ecosystems continue to provide the basis for human existence, bridging biological and cultural diversity. In the mid-1990s, after the collapse of the Soviet Union's centralized economy, the world's most industrialized and densely populated polar region found itself facing shortages of food and fuel. In the Kola Peninsula and the Chukotka Peninsula these shortages threatened to starve and freeze entire communities. In Lovozero, on Russia's Kola Peninsula, the prices of essential food items (if available) fluctuated hourly as the rouble plummeted. Doctors could diagnose illness, but lacked medicines to treat patients. Hospitals, under the best of conditions, could only offer one meal a day to their patients,

if that. Help was not widely available from Russian government institutions; instead it arrived from other circumpolar indigenous communities and international institutions. The diverse Sami cultural groups from Norway, Sweden, and Finland came to the assistance of the Sami in Russia. Various Iñupiaq, Inuit, Inuvialuit, and Yupik groups came to the assistance of the Chukchi and Yupik in the Chukotka Peninsula.

While sharing some similarities with other international emergency relief efforts, these responses were otherwise unique because they involved the transfer of tools and knowledge to facilitate subsistence hunting and gathering. The ability to hunt and fish was not a question of sport, but essential for feeding members of one's community and household. A university degree was irrelevant to meeting one's immediate needs. A different kind of learning was necessary – knowing *how* to live off the land and sea. Although this ability to maintain a subsistence lifestyle was present in some individuals, it had been largely neglected and devalued during decades of industrialization and collectivization. To offset decades of Soviet discouragement of local resource use, for example, Alaska's Iñupiat found it necessary to send supplies and weapons to their neighbours across the Bering Sea. But before Chukotka's communities could effectively hunt marine mammals, the Iñupiat also found it necessary to pressure the International Whaling Commission to extend quotas to enable subsistence hunting. Moreover, for several years they invited community leaders, hunters, and scientists from the Chukotka Peninsula to Alaska's North Slope Borough to facilitate the transfer of knowledge and the strengthening of local institutions that would become stewards of hunters' rights and capacities to use local resources effectively.

These recent events provide a compelling link between biological and cultural diversity.[1] Diversity is not commonly associated with the Arctic and sub-Arctic, but it is in fact a reality of the circumpolar north. As subsequent chapters will illustrate, it is a common mistake in urbanized and industrialized societies of the twenty-first century to regard subsistence activities as anachronistic or obsolete cultural holdovers from earlier centuries. Instead, there are communities where these subsistence activities remain as essential as ever to cultural identity and even to human survival.

In the initial decades of the twenty-first century there are three pivotal trends confronting interdisciplinary scholarship that seeks to serve civil society: (1) growing questions of the relevance of the social sciences and humanities to human needs, (2) increasing need to integrate the biological and cultural, and (3) mounting threats to both biological and cultural diversity. These broad tendencies contextualize and inform this book (section 1.1). The response to these trends will determine how relations between human beings and their environment are perceived and explained. Whether and how diversity is perceived will be shaped by the perception of the Arctic and sub-Arctic as a homeland rather than a frontier for resource exploitation (section 1.2). A brief outline of the chapters and the research steps will illustrate how these three broad trends and the conception of the circumpolar north as a homeland are presented in this work (1.3).

1.1. Three Trends Affecting Applied Scholarship

First, faculties of social sciences and humanities are almost everywhere besieged by negative perceptions as to the relevance of their work, resulting in diminishing funding resources (Gibbons et al. 1994; Wilson 1999a). The responsibility for this largely lies with tenured faculty who have sought to remain comfortably within the confines of the university rather than using their scholarship to directly engage human communities. The word 'social' in the social sciences and the term 'humanities' imply subject matter of applied scholarship that seamlessly merges teaching, research, and service on crucial or relevant issues of concern to society.[2] Academic freedom through tenure is the basis for empowering the scholar to undertake meaningful work by bridging societal issues with academic activity. History illustrates that individuals employed in the private or government sectors are not able to speak up as effectively in difficult times; however, a scholar empowered by tenure is meant to fulfill precisely such a role – particularly since public resources are used to employ such individuals. It is not a matter of public duty as such, but a requirement. It is the scholar's responsibility to engage civil society through her or his respective discipline. The goal of teaching and research is service. It is this concept of service that makes research

relevant to social issues and teaching purposeful by creating a generation of critically engaged citizens. Based on this proposition, this book illustrates how social science research can be relevant and applied to human communities. It presents a process, an approach, of engaging diverse elements of human society with current and vital issues.

Second, the classic Cartesian dichotomy between nature and culture is a fallacy (Bateson 2002; Wilson 1975; 1999a). The varied fields of the biological sciences are knocking on the doors of the social sciences and humanities demanding to be allowed inside. While many social scientists are still engaging in 'physics envy,'[3] a significant number around the world are tackling issues of relevance to human rights, natural resource exploitation, the environment, and economic development through interdisciplinary and applied research that embraces both the social and the biological. This book utilizes the interdisciplinary field of human ecology to address current issues such as climate change and indigenous rights from a multi-disciplinary point of view, recognizing that expertise from the varied natural sciences and social sciences combined with local knowledge are critical when dealing with matters of societal concern. It demonstrates that in order for applied research to be effective, scholars must recognize that context integrates a cultural system and its social structure on an ecological foundation. This is true for diverse fields of study from anthropology, health care, sociology, and psychology to rhetoric. Human communities and their cultures cannot be separated from their biological basis, as will be illustrated in subsequent chapters.

Third, the increasingly accepted "clash of civilizations" hypothesis seeks to "remake the world order" by painting diverse cultures, societies, and religions with one monolithic stroke, thereby recreating global polarization. This trend has been brought about by the collapse of the Soviet Empire and the end of Cold War polarization which has released an upsurge of cultural and ethnic consciousness throughout the globe. Much like the collapse of the Ottoman Empire, these conditions create uncertainty and a certain amount of instability. However, the "clash of civilizations" premise heard often today achieved its hegemony as an explanation for the events of September 11, 2001. For instance, this hypothesis demonizes Muslim and Chinese societies, whose parts are diverse to a dizzying degree. This

hypothesis completely ignores indigenous cultures around the world, arguing, for instance, that in North America these cultures "were effectively wiped out" (Huntington 1996: 46).[4] This hypothesis, while pretending to acknowledge cultural diversity, does not recognize pluralism in human societies. It creates shaky taxonomies such as "the west" and "the rest," giving rise to pronouncements such as "if you are not with us you are against us." Such an outlook is limited to a polarized perspective which is blind to diversity in human society. It is not surprising, therefore, that policy makers and governments that hold the "clash of civilizations" perspective also have the worst environmental policies because they are wilfully blind to biological diversity. Humanity stands at the edge of an abyss of the sixth mass extinction in geological time. The difference between the previous five extinctions and this one is that in this case one species, that of human beings, is primarily responsible. This work illustrates that the field of human ecology in the context of the circumpolar north provides an effective lens to express the relationship between cultural and biological diversity. The Arctic and sub-Arctic provide a valuable geographical context in which to address questions of diversity, relations between the cultural and biological, and the relevance of the social sciences and humanities. This book makes a case for an ethic of conservation of biological and cultural diversity, proposing that the interdisciplinary outlook of human ecology is an ideal lens for understanding cultural and biological relations. As such, human ecology serves as a model for analyzing such interactions.

1.2. The North:[5] Frontier or Homeland?

The response to the question of whether the north is a frontier or a homeland determines whether biological and cultural diversity are germane to the future of humanity. The frontier prospective of the north as simply a geographic space from which to achieve extraction of valuable natural resources simply advances instrumental connectivity with the land and sea, whereas the north perceived as homeland is less instrumental and more attached. Its connectivity with the land and sea is complex at the level *living through* the environment. The discussion below shows how the frontier

perspective is a facile construct that can be deconstructed to reveal the north to be rich in diversity.

Differing visions of the north exist between those who live or are committed to the north and those who view it solely through a southern outsider's lens. A rich history and diversity of culture inform the conception of the north as homeland. The perception of the north as a frontier is relatively more recent, homogenous, and Eurocentric. The vision of the north as homeland originates from those who live, work, and play there, whereas, its conception as a frontier has southern roots. The latter is motivated by a desire to exploit natural resources whilst the former is informed by thousands of years of indigenous use of the land and sea. The notion of the north as frontier is myopic and simplistic. The nature of this engagement tends to emphasize discovery, vast riches, and the exotic. The search for the Northwest Passage as a means to the riches in the east was accompanied by a desire to discover great wealth in the north, and marked the beginning of cultural representations of the peoples and the environment of the Arctic and sub-Arctic.[6] At best these characterizations are romantic and at worst they are tantamount to intellectual colonialism (Coates and Morrison 1996). The following quote from Robert Service's famous poem "The Cremation of Sam McGee," one that has been taught to generations of school children, illustrates this perception of a mysterious gold-laden north:

> There are strange things done in the midnight sun
>
> By the men who moil for gold;
>
> The Arctic trails have their secret tales
>
> That would make your blood run cold;
>
> The Northern Lights have seen queer sights,
>
> But the queerest they ever did see
>
> Was that night on the marge of Lake Lebarge
>
> I cremated Sam McGee (Service 1990: 159).

These constructions suggest an indifference to the reality of the north as a homeland. Northern homeland is a regional consciousness linking local geography to cultural and economic life (Bone 1992). To call the north a homeland is to recognize its autochthonous political and social reality (West 1995). The reality of the north as homeland is characterized by diversity and complexity in the population demographic, culture, and economy. The north as homeland has withstood the test of time, showing the resilience and sustainability of indigenous lifestyle. Development in the north inspired by the frontier mindset, however, has and remains invasive and dogged by boom and bust cycles such as the Klondike Gold Rush at the turn of the nineteenth century. The north as homeland is conducive to circumpolar linkages to communities across national borders in meeting the challenges of globalization, as witnessed by the recent example offered at the beginning of this chapter. As frontier, the north is limited to staples dependence in supplying renewable and non-renewable resources to southern markets. In essence, one point of view is informed by industrial capitalism and is exogenous whilst the other is indigenous and shaped by a relationship with the natural ecology (Kassam 2001).

The Canadian national anthem describes the country as a "the true north strong and free." But what is the true north strong and free? Is there a distinct definition of the north, or is it really a constructed space? Where are stereotypes of a people or place constructed and sustained? They thrive in the realm of culture (Said 1993). Representations of the "north" are directly linked to the growth in literacy and the development of spatially oriented technologies of mass communications. In the early periods these were narratives in books, newspapers, advertisements, comics, painting, poetry, photographs, and later music and other audio-visual modes such as film. For example in Mary Shelley's classic novel, the creature says to Baron Frankenstein, "Follow me; I seek the everlasting ices of the north, where you will feel the misery of cold and frost, to which I am impassive" (Shelley 1993: 278). Yet the north is no more a place of misery than the heat and mosquitoes of the tropics. Nor is the ice eternal in the Arctic, as it comes and goes with seasons. There are marked changes in the sea and landscape as they follow the rhythms of the sun. Furthermore, with the threat of climate change there is now tremendous uncertainty about ice formation even

in the cold months of the autumn. The ecology of the north and its people are dynamic as in any other environment. Stereotypical images are the ones that are frozen. Overlapping factors such as memory, sensory perception, and skills in constructing images, available technology, and European preconceptions of this unfamiliar environment influenced early images of the north and its peoples. Characterizations of the environment and its peoples include terms such as primitive, noble, dangerous and menacing, overwhelmingly white, empty, and desolate.

The idea of the diverse people of the north as primitive is racist. It is a self-affirming and self-congratulatory construct which places Euro-American culture at the pinnacle of civilization. It justifies subjugation in the form of manifest destiny. The idea is strengthened by a sense of superior European technology compared to inferior, inefficient, and incompetent indigenous peoples. The problem with such a view is that it is not tenable, given the simple historical facts. European explorers in most cases did not survive without the assistance of indigenous peoples. As for technology, the British, and the Franklin expedition in particular, is archetypal in this case. It carried a large stock of foods requiring the accumulation of material equipment, whereas the Inuit used minimal equipment to ensure survival and used products of the land to make traps, fires, and shelter. They stored their technology in their minds (David 2000; Fienup-Riordan 1995; Grace 2002; King and Lidchi 1998; Wiebe 2003).

The characterization of the Aboriginal peoples as noble is romantic. Like religious fundamentalists wanting to return to a mythical past, these conceptions are self-revealing. The Native people are used as a counterpoint, as self-criticism to industrial society. Such stereotypes tell us more about their makers than about the indigenous peoples (David 2000; Fienup-Riordan 1995; Grace 2002; Said 1994).

The north as dangerous and menacing conveys the idea that death is synonymous with the idea of the north. Sir John Franklin's tragic expedition (1845) and the resultant injury to British pride caused historians to emphasize the bravery of explorers (David 2000; Grace 2002; Wiebe 2003). Representation of northern regions as empty lands and desolation served a political purpose. After the loss of the Franklin expedition and then John Rae's report from the Inuit suggesting that the expedition may

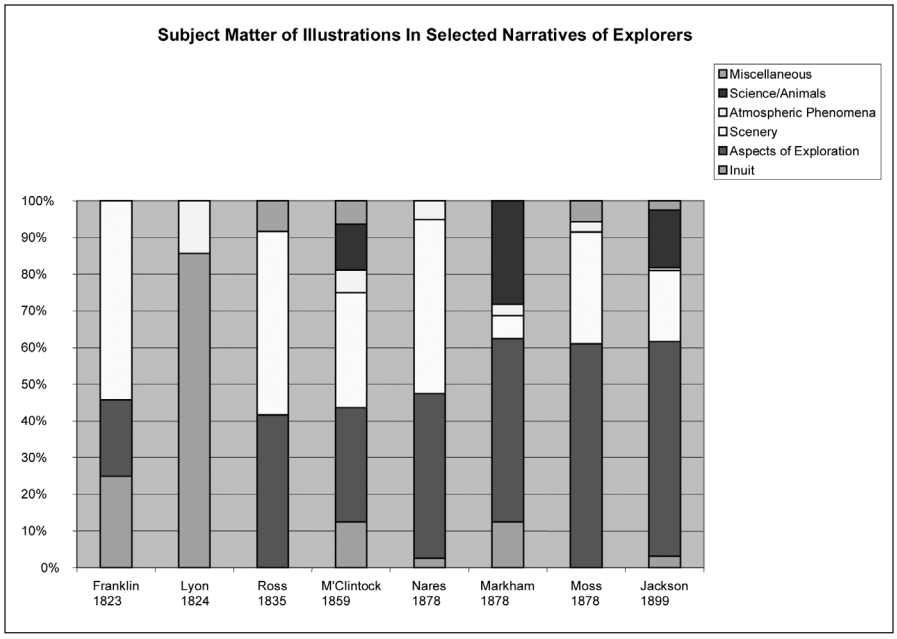

Figure 1.1: Subject Matter of Illustrations in Selected Narratives of Explorers.[7]

have engaged in cannibalism, the Inuit were characterized as 'savages' who could not be trusted, and their representations disappeared from accounts of explorers. Furthermore, when claiming a "discovered" land for the Empire, it becomes problematic if there are people living there. Therefore, it is better to ignore their presence; thus justifying the notion of 'empty lands' or *terra nullius* (David 2000; Fienup-Riordan 1995; Said 1994; Wiebe 2003).

Overwhelmingly the white north is a characterization associated with winter views, seascapes, icebergs, and vast skies with the aurora borealis. Notable in these images is human absence. Figure 1.1 illustrates the subject matter of illustrations from selected narratives of explorers. It is noteworthy that with the exception of Lyon (1824), images of the Inuit and other living organisms (category Science/Animals) are relatively few compared to images of scenery and aspects of exploration. Furthermore, the actual Arctic and sub-Arctic are filled with a diversity of colours and are not solely white (David 2000; Grace 2002).

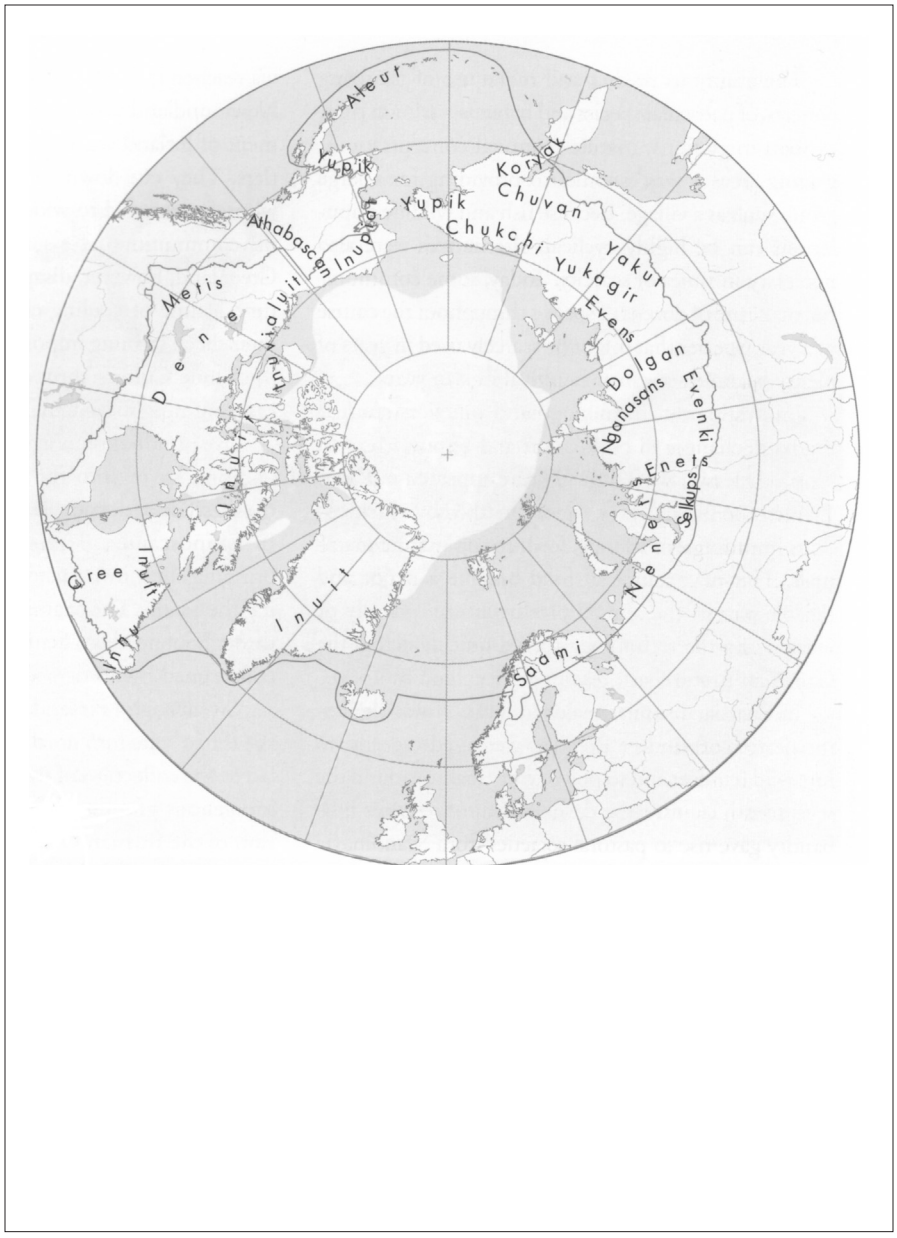

Figure 1.2: Cultural Diversity in the Circumpolar North (CAFF 2001: 58).

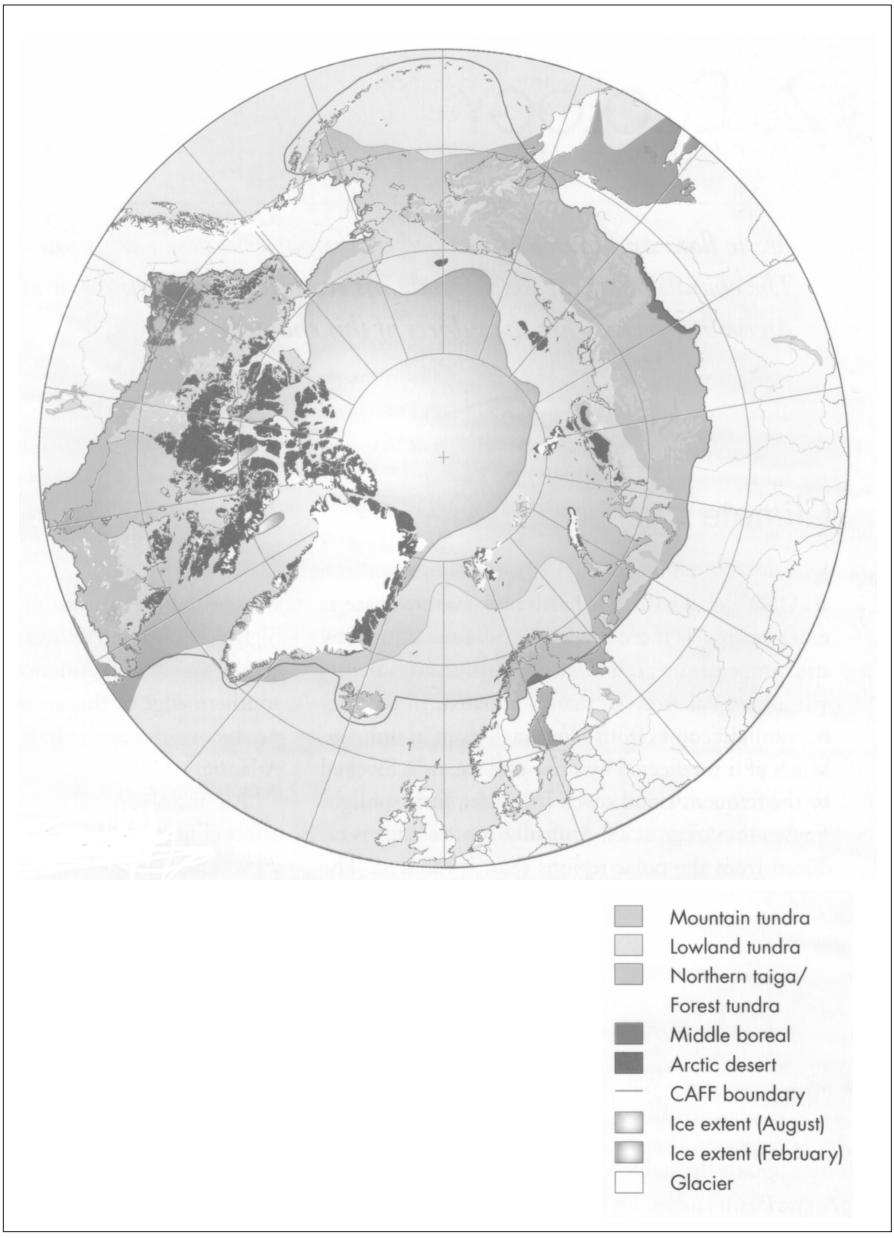

Figure 1.3: Ecological Diversity in the Circumpolar North (CAFF 2001: 18).

Why do such stereotypes of the north and its peoples persist? First, the nature of communications technology is such that it advances the interests of those who control it rather than those who actually live and work in the north. Second, teaching regarding the north places an emphasis on exploration in which the history of discovery is viewed as an end in itself. Third, this vision of the north is not dynamic or diverse, but simplistic, almost naïve, which serves to feed an appetite for trite forms of Hollywood-style entertainment.

A strong Aboriginal demographic and a mainly youthful population is combined with a rich cultural diversity in the regions of the circumpolar north. This diversity is manifested in the assertion of Aboriginal identity. The use of Aboriginal languages is a good indicator of this assertion. For instance, in 2001 almost 71 per cent of those who identified themselves as Inuit in Canada reported that they could conduct a conversation in Inuktitut (Statistics Canada 2003a). Inuktitut is itself marked by a significant diversity of dialects and is representative of a language group. Some of the other language groups in the Canadian territories include Chipewyan, Cree, Dogrib, South Slave, Kutchin-Gwich'in, and Tlingit. Figure 1.2 illustrates the cultural diversity of the circumpolar north. This map is indicative of circumpolar linguistic and cultural diversity. Cultural pluralism is a definitive attribute of the circumpolar north.

Diversity is not only present among the Aboriginal communities, but is also manifested in the ecology of the circumpolar north. The boreal forest encircles the north as a protective skin. After the Amazon, it is the second largest forest on the Earth. The boreal forest, the tundra, and the ice-covered regions create a unifying ecological diversity for the north. Figure 1.3 illustrates Arctic vegetation zones (biomes). In short, this ecological diversity matches the diversity of indigenous people, who have been living within these lands for thousands of years.

1.3. Overview of Chapters

This work is the culmination of over thirteen years of research and teaching related to human ecology in the Arctic and sub-Arctic. It represents a

reflexivity gained from years of experience. It situates action research methodology on a broader theoretical basis in order to provide insight into the human ecology of the circumpolar north.

Chapter 2 critically examines the concept of human ecology with specific reference to the relations between culture and nature. Beginning with a discussion of ecology as a founding science that informs the notion of human ecology, it recounts how human ecology incubated and emerged in the social sciences. These origins set the stage for discussing relations between biological and cultural diversity. The reliance on language as an indicator of cultural diversity and species as an indicator of biological diversity are discussed. A critique of the current propositions of human ecology is provided with specific reference to the nature-culture dichotomy, the role of human agency versus cultural materialism, and the fetish for averages that is tantamount to standardizing diversity. The chapter concludes with an argument for the need to reconceptualize human ecological relations.

Chapter 3 reconceptualizes human ecological relations by asserting that it is a lens for understanding relations between biological and cultural diversity with specific reference to the Arctic and sub-Arctic. Starting with a discussion of diversity as the basis of sensory perception which provides a (human ecological) context for the formation of relations, the discussion proceeds into different ways of knowing utilizing Aristotle's notion of *phronesis*, or practical wisdom. By contrasting different ways of knowing such as the context-independent knowing *that* with context-dependent knowing *how*, the chapter illustrates how these categories facilitate a wider process of learning. The chapter concludes with the assertion that human ecological understanding, in the context of communities in the circumpolar north, is best achieved through sensitivity to indigenous knowledge.

Chapters 4, 5, and 6 present cases to illustrate the relation between the biological and cultural through the interdisciplinary lens of human ecology. Explanation of human activity cannot be context-free. Application of human skills or social and biological interaction presupposes context, making human ecology fundamentally context-dependent. The case study approach through context-dependent knowledge provides insights into experience, which is precisely the basis of grounded theory. The case study approach is appropriately illustrated by Galileo's physical experimentation

and Darwin's zoological studies, both resulting in dramatic and significant contributions to knowledge. In other words, case studies produce theories. In fact, Darwin generalized on the basis of just one case study to produce the theory of evolution. While this work does not presume to offer such a grand theory, the power of good examples cannot be underestimated when formulating the notion of human ecology. A common criticism of the case study is that there is room for subjective and arbitrary judgement, and therefore the case study is less rigorous. The case study approach has no more inherent tendency towards verification of the researcher's preconceived notions than any other method of inquiry. The case study approach using the participatory method has its own rigour and basis for validity (as will be illustrated in chapter 5).

Partnership formation is a fundamental first step to achieving community participation in any human ecology research project. Meaningful and robust human ecological research cannot occur without community participation. Partnership formation occurs when trust is established in the relationship. Therefore, chapter 4, a product of such collaboration, illustrates the unique and diverse human ecological culture of the Arctic Inuit community of Ulukhaktok (formerly Holman), Northwest Territories, Canada. It briefly discusses the historical phases of human ecological relations and describes in detail current patterns of relations between humans, marine and terrestrial mammals, birds, fish, and plants. It reveals that sharing of the fruits of the hunt is at the basis of the cultural system and informs social relations in the community.

Chapter 5 draws upon human ecological research to explore the impact of climate change and sea-ice conditions on the subsistence lifestyle of the Iñupiat community of Wainwright, Alaska. Particular ways of knowing and the value of community participation and action research are examined as methodological approaches for investigating human ecological relations. The basis of validity is examined. Specifically indigenous knowledge about sea-ice formation, pressure ridges, leads, winds, and currents is presented as a valid source of scientific knowledge. A case is made for combining scientific and indigenous ways of knowing. Finally, human ecological impacts of climate change are discussed.

Chapter 6 examines the transformative character of human ecological mapping. Human ecological maps and their history are briefly related. The power of human ecological maps is described with reference to their mediating and communicative roles, reflexivity and human agency, and the intergenerational transfer of practical wisdom.

Chapter 7 draws together the key elements such as biocultural diversity, ways of knowing, and community participation in order to discuss the theoretical and practice implications of human ecological research.

CHAPTER 2

Relations between Culture and Nature: A Critical Consideration

And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind (Bible 1989 Genesis 1:21)

And God made the beast of the earth after his kind, and cattle after their kind, and everything that creepeth upon the earth after his kind (Bible 1989 Genesis 1:25)

So God created man in his own image, in the image of God created he him; male and female he created them (Bible 1989 Genesis 1:27)

2.1. Introduction

Culture and nature are not separate binaries because culture is an aspect of nature. It is an error of logical type to assign culture and nature equal

weight as distinct categories. What we need to explore is the relationship between the biological and cultural and how diversity and variation are expressed in those relationships. Nature is a foundation from which possibilities of culture emerge. Simultaneously, culture bridges human experience and meaning upon this foundation. Culture encompasses human activities that range from a way of life like hunting and gathering to the workings of the human mind.

In recent decades it has become obvious that the impact of the human species is global even in seemingly remote regions of the earth such as the circumpolar Arctic and sub-Arctic. This recognition of the human footprint is being gradually acknowledged in the industrialized world. As images of the earth as seen from the moon have caused a paradigm shift in consciousness, humans in industrial societies have begun to conceive of themselves as beings living with other diverse and complex organisms within the protective skin of the earth. Indigenous peoples of the Arctic and sub-Arctic have conceived of themselves along such lines for thousands of years. For them culture and nature are a seamless reality, not division.

In this chapter, we will explore the concept of human ecology and briefly tracing its roots in the social sciences and then connect it to recent literature. We will discuss the relations between biological and cultural diversity.

1. Human ecology, as espoused by its proponents, will be defined via the concepts of ecology and ecosystem. We will also provide a summary of the attributes and propositions of human ecology. References will be made to specific contexts; namely, to examples from the circumpolar north (sections 2.2–2.4).

2. Specifically, the works by scholars committed to this relatively new interdisciplinary area of study will be summarized and analyzed (section 2.5).

3. The current literature on the relationship between biological and cultural diversity will be examined (section 2.6).

4. The human ecology approach to the connectivity between biological and cultural diversity will be critically considered in relationship to northern indigenous circumpolar communities (section 2.7).

Critical consideration is part and parcel of scholarship. Criticism for the sake of academic elegance is of little value to applied research addressing societal aims such as conservation of diversity or sustainable livelihoods. Examination of current conceptualizations of the relationship between biological and cultural diversity is informed by these pragmatic objectives. Critical consideration in this chapter is undertaken not to diminish the contributions of other scholars but to propose alternative methods based on the body of their work. In other words, engagement with ideas through interrogation, clarification, and suggestion of different approaches is only possible because of a continuing conversation between scholars committed to the conservation of biological and cultural diversity.

2.2. Ecology: The Founding Science

Study of human ecology draws its inspiration primarily from the field science of ecology. Derived from the Greek word *oikos*, meaning household, *ecology* is the study of the house and is extended to a study of human interactions. The same Greek word is also the root for the branch of social science called economics. Ecology views the earth as a household or a whole system. As early as 1870, Ernst Haeckel explained that: "By ecology we mean the body of knowledge concerning the economy of nature – the investigation of the total relations of the animal both to its inorganic and to its organic environment" (Kormondy and Brown 1998: 29). Early English phrases such as "the economy of nature" and "the balance of nature" convey a sense in which nature is perceived as a mechanistic system consisting of a well-oiled machine and functioning in an orderly manner (Molnar and Molnar 2000; Nepstad and Nielsen 1993). This mechanistic world-view, influenced by then-current ideas of Newtonian mechanics, gave way to a

more comprehensive perspective with the creation of the British Ecological Society in 1913 and the Ecological Society of America in 1915.

In 1905 Frederick Clements, American plant ecologist (botanist), defined *ecology* as "the science of community" (Kormondy and Brown 1998: 29). From the beginning ecologists have sought to express the science of ecology in lyrical terms, using metaphors to convey its meaning. Twentieth-century ecological thinking viewed nature holistically as an organism. This concept of holism maintains that all things are connected and that these connections form a wider whole. By the 1920s ecology became increasingly recognized as a science (Nepstad and Nielsen 1993). However, it was not until the 1960s that ecology drew wide interest from both scientists and the average citizen. Viewing the earth from the moon shifted humanity's perspective. Metaphors of the Earth as an island with finite resources worthy of wise stewardship, as expressed by astronaut Neil Armstrong, or Earth as a spaceship requiring careful utilization of life support systems, as expressed by writer and economic thinker Kenneth Boulding, galvanized the public imagination (Juzek and Mehrtens 1974). Eugene Odum, an American ecologist, defined *ecology* as "the study of the structure and function of nature" and "the study of the structure and function of ecosystems" (Kormondy and Brown 1998: 29). This latter definition continues to be the standard. Odum (1989) argues that the role of the ecologist in the future will be to promote a holistic approach. "Ecology is now" he maintains "more and more a discipline that emphasizes a holistic study of both parts and wholes. While the concept of the whole being greater than the sum of the parts is widely recognized, it tends to be overlooked by modern science and technology, which emphasize the detailed study of smaller and smaller units on the theory that specialization is the way to deal with complex matters" (Odum 1997: 34).

2.3. Ecosystems

In 1935 Arthur J. Tansley, a British ecologist, expanded the concept of holism by bringing together ecology and systems science. He coined the term *ecosystem* for the natural environment as an interacting whole. *Ecosystem* is

a contraction of 'ecological system.' Tansley defined an *ecosystem* as "an organisational unit consisting of both living (biotic) and non-living (abiotic) things that occur in a particular place" (Kormondy and Brown 1998: 30). Article 2 of the Convention on Biological Diversity defines ecosystem as "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (Secretariat of the Convention on Biological Diversity 2001: 3). Therefore, the assemblage of plant and animal communities within a common habitat form an organized body, or *ecosystem*.

Ecosystems can vary in size. For instance, they may be very large, like the boreal (northern) forest or Arctic tundra, or much more confined, as in an aquarium or test tube. While delimiting an ecosystem is somewhat subjective, it is not without an internal logic. Creating and defining boundaries may be problematic for the ecosystem approach, but the idea that the system is open to inputs and outputs does not weaken the holistic theme of ecology (Nepstad and Nielsen 1993).

Because human beings occupy a dominant position within the ecosystem, it offers them a wide variety of resources. As omnivores, humans feed at different levels of the food chain. This complicates the task of placing us in an ecosystem. For example, Dene communities in the Canadian sub-Arctic consume terrestrial mammals, fish, and plants found within the boreal forest. Similarly, Sami, Iñupiat, and Inuvialuit communities in the Russian, Alaskan, and Canadian Arctic, respectively, consume marine and terrestrial mammals, salt and fresh water fish, and tundra plants. Analysis of an ecosystem illustrates that different species are components of an interdependent community whose activities have feedback linkages to other organisms within the system. Populations of *Homo sapiens*, like other species, are able to adapt through biological, behavioural, or both types of adjustments to meet the demands of their environment. By virtue of their adaptations, species occupy an ecological niche. Odum (1989) described an organism's niche as its "profession" and its habitat as its "address." Some of these "professions" for *Homo sapiens* include forager, fisher, cultivator, hunter, or intense agriculturist and industrialist within an ecosystem. The survival and flourishing of pre-modern and modern *Homo sapiens* under varying ecosystems has depended upon cultural adaptations that include

the interplay of technology and social institutions (Molnar and Molnar 2000: 23–50). In the Arctic and sub-Arctic, the persistence of hunting and gathering culture in addition to an industrial social complex is an adaptive response to given environmental factors and dramatic social change.

The concept of ecosystems is now the predominant model for our discussion of nature. The idea has been institutionalized in our national and international environmental frameworks so that it is the dominant scientific paradigm or world-view supported by industrial society. As a strategy for integrated management land, water, and living resources, the Convention on Biological Diversity (Secretariat of the Convention on Biological Diversity 2001) proposes the ecosystem approach as the primary framework for action. The ecosystem approach seeks to achieve three objectives: (1) conservation; (2) sustainable use; and (3) fair and equitable sharing of benefits from utilization of natural resources. Such a system recognizes that humans with their cultural diversity are integral components of many ecosystems. This approach focuses on the structure, processes, functions, and interactions among organisms and their environment. As ecosystem processes are non-linear, this approach promotes an adaptive 'learning-by-doing' approach to ecological management based on direct research. The convention outlines several principles that stress a decentralized democratic decision-making process involving local communities so as to promote local participation, responsibility, and accountability. The principles emphasize a practical approach with various scientific disciplines that work in tandem with indigenous knowledge and expertise. They also insist that private users should pay the costs associated with the benefits of utilization of an ecosystem and society should not be encumbered with mitigative, reclamation, and clean-up costs. Finally, the principles display a conservation ethic with a long-term, intergenerational perspective that emphasizes the sustainability of a biologically diverse system.

2.4. Human Ecology and its Propositions

Ecology is the science of the relations of organisms to their environment, and therefore, human ecology is the science of human community and

its dynamic interdependence with the environment (Bruhn 1974; Hawley 1950). Like ecology, which embraces life as a whole as well as particular populations of living organisms, human ecology examines human life as an aggregate phenomena. Therefore, human ecology views a 'community' as a pattern of relations that responds collectively to the environment enabling the organism to adjust. In the 1950s, Amos Hawley articulated the notion of human ecology as a field of sociology. He maintained that with community as the unit of observation, human ecology studies the static and dynamic morphology of collective life in its habitat. His perspective focused on how the environment fostered change and community development. In short, human ecology is "the study of form and the development of the community in human population" (Hawley 1950: 68). The unit of analysis for Hawley is the 'community.' The evolution of population in relationship to its environment is an expression of either dependent or independent variables (Micklin 1984). The variables that mould a social system give human beings tremendous potential for adjustment as a result of flexibility and refinement of behaviour. Human ecology is thus concerned with the functional and relational aspects of this behaviour. According to Hawley, although the human community is more than functional behaviour and the relationships that arise from it, the scope of human ecology is restricted to this sphere (Hawley 1950).

Hawley (1984: 1–15; 1986: 7–9) describes rudimentary propositions that form the human ecology paradigm.[1] Below we will examine these propositions and subject them to comprehensive critical considerations in section 2.7.

(1) As social phenomena occur in both space and time, human ecology is territorially based (1984). This proposition raises important questions relating to the context in which human beings dwell vis-à-vis the proximate and the global.

(2) As a community or population adapts to its environment, human ecology's central area of concern is this system of interaction (1984). The adaptation is based on interdependencies among members of a population (1986). This

proposition is informed by the notion of ecological systems and implies a cultural materialist view of adaptation.

(3) In human ecology, adaptation is an irreversible process of cumulative change of an organizational system moving from simple to complex forms (1984). All things being equal, the size and complexity of the development of a system is determined by the technologies of transportation and communication of a population (1986). The capacity of a system is enlarged by the acquisition of new information (1986). This proposition raises the question: can irreversibility of adaptation within a biological system also be extended to a complex social system, or in other words, do human beings have agency?

(4) The environmental relationship forms the organizing principle of a system and sub-system (1984). The axiomatic articulation of this proposition is clearly deterministic, tending to cultural materialism. Cultural materialism, a term coined by Marvin Harris (1968), seeks to explain behaviour, including ideological and symbolic aspects of human society, on the basis of biological needs.

(5) As adaptation takes place in the aggregate, human ecology is committed to a holistic and macro-level mode of analysis (1984). Hawley remains staunchly committed to the idea that adaptation takes place at the level of groups. According to Hawley: "Regrettably there are always miscreants who dwell on the tails of distributions. But we try not to let our affection for the aggregate, and for all individuals with traits that fall on the respective means, be dimmed by such deviants" (1998: 346). This sociological bias is a parametric proposition, which denies the value of diversity, a fundamental value of ecology.

According to Hawley (1984; 1986), these elements of the paradigm collectively provide a theory of change as well as a theory of organization with a forceful explanatory power. Human ecology provides a bridge across different disciplines, thereby treating problems or issues not manageable in other disciplines and elucidating independent variables to study individual behaviour.

In the inaugural issue of *Human Ecology* (Editors 1972: 1), the editors define human ecology as "the complex and varied systems of interaction between man and his living and non-living environment." From the succinct and terse introductory statement four attributes of the field of human ecology can be discerned that were intended to guide the articles in the journal: (1) is strictly interdisciplinary in approach; (2) deals with complex and interacting systems; (3) is based on applied research; and (4) is devoted to a wide variety of cross-cutting social issues of relevance. These attributes are echoed by a number of human ecologists (Borden 1988; 1990; Bruhn 1974; Micklin 1984; Pratt 1990; Straus 1990; Young 1991).

Atlantic College in Bar Harbour, Maine, was the first in the United States to offer an interdisciplinary degree in human ecology in 1969. In 1979 an interdisciplinary group met and by 1981 the Society for Human Ecology (SHE) was established. Within the first decade it had published several significant volumes of collected papers and international directories of human ecologists. SHE organized thematic meetings between interdisciplinary professionals with ecologically based interests, developed publications to unify a nucleus of people, and established a network between individuals and institutions (Borden 1988; 1990).

It was at a meeting of SHE in 1988 that the study of human ecology was defined as: "The discipline [that] seeks to understand and manage wisely the complex problems of the planet of which humans are a part. It integrates the old disciplines of highly specialized scientific investigation with the new discipline of seeing things, and acting upon them, as generalists" (Straus 1990: 22).[2]

In a subsequent meeting of SHE, Gerald Young (1991), in a tongue-in-cheek piece intended to challenge orthodox disciplinary sciences, listed eighteen heresies upheld by human ecology. These heresies are essentially statements that suggest what human ecology 'ought' to be rather than 'is'

as claimed by Young. While these statements were unsubstantiated by examples of applied activities of human ecologists, they nevertheless represent aspirations of the Society of Human Ecology. Listed below are these eighteen propositions.

- Human ecology is interdisciplinary,
- Human ecology is connective,
- Human ecology is committed to synthesis,
- Human ecology is transcendental (goes beyond one interpretation),
- Human ecology eschews chauvinism,
- Human ecology is holistic,
- Human ecology is humanistic,
- Human ecology is, by definition, anthropocentric,
- Human ecology concedes to subjective reality,
- Human ecology is process-oriented,
- Human ecology does not deny teleology,
- Human ecology acknowledges the mystical or spiritual,
- Human ecology denies determinism,
- Human ecology seeks to understand community,
- Human ecology recognizes some form of 'family' as a fundamental ecological unit,
- Human ecology recognizes the wisdom of the vernacular,
- Human ecology includes a normative vision, and
- Human ecology is subversive.

These propositions reveal, at best, the optimism characteristic of a new organization and, at worst, naïveté about the disciplinary calcification and defensiveness characteristic of academics. Nonetheless, they represent the aspirations of a group of scholars who are struggling to formulate and practise human ecology. At the Third International Conference of the Society

for Human Ecology (1988) entitled *Human Ecology: Steps to the Future*, the working group on applied human ecology viewed human ecologists as problem solvers and recommended that participatory processes be considered in dealing with human ecology applications (Pratt 1990). The decade of the 1990s saw an explosion in interest in environmental social science (Scoones 1999).

2.5. Human Ecology among the Social Sciences

Human ecology did not gain a foothold in the science of ecology. Ecology may be divided roughly into more or less three distinct branches – plant, animal, and human. According to Hawley (1950), the notion of subdivision of ecology into smaller units to facilitate observation, experimentation, and understanding is a normal process of analysis by science. However, compartmentalization and poor communication across disciplines of study related to ecology is a cause for dismay because it is an impediment to synthesis. When the Ecological Society of America (ESA) was formed (1915), its members were keen to include the study of human ecology; however, as soon as it was proposed that humans as a dominant species should be the focus of the ESA, enthusiasm waned (Bruhn 1974). Therefore, human ecology mainly developed in the social sciences rather than in the biological sciences.

Currently, the ESA has no option but to address issues of human relations with the environment as stated it concerns itself with the following cross-disciplinary issues: biotechnology, natural resource management, ecological restoration, ozone depletion and global climate change, ecosystem management, species extinction and loss of biological diversity, habitat alteration and destruction, and sustainable ecological systems (Ecological Society of America 2004). However, in 2005, as it marked its ninetieth anniversary, the ESA could not ignore the human dimension. Eugene Odum's (1997: xiii–xiv) comments are apropos. Citing C.P. Snow's *The Two Cultures*, which refers to the dismal communication between the sciences and humanities in academe, Odum calls for a "third culture" that links the sciences and social sciences broadly through human ecology.

2.5.1. Economics

While economics and ecology derive from the same term *oikos*, economics examines relations derived by exchange value and is limited to concerns for efficiency, maximization, and the price system. Human ecology, on the other hand, seeks to examine collective life and relations (Hawley 1950). Aristotle distinguished between *chrematistics* and *oikonomia*. *Chrematistics* is "defined as the branch of political economy relating to the manipulation of property and wealth so as to maximize short-term monetary exchange value to the owner," whereas *oikonomia* "is the management of the household (or community) so as to increase its use value to all members of the household (or community) over the long run" (Daly and Cobb 1990: 138). *Chrematistics* is short-term oriented, focuses on individuals, maximizes exchange or market value, and seeks unlimited accumulation. *Oikonomia* is long-term oriented, considers the whole community, focuses on use value, and seeks to meet concrete needs. Neo-liberal economics bears a startling resemblance to *chrematistics*. Modern economics in particular has veered away from its early biological thinking characterized by the Physiocrats, for whom economic activity could be likened to the circulatory system, to a more mechanistic perspective (Fusfeld 1982; Spiegel 1983). In environmental economics, natural resource issues are discussed in terms of market failure resulting from externalities. In ecological economics, a co-evolutionary systems approach conflating ecological and economic systems has been adopted. In institutional economics, concern is devoted to management of common pool resources. Unfortunately these areas of economic concern employ a static view of the environment and natural resources (Scoones 1999).

2.5.2. Political Science

In political science, the human ecological perspective is relatively recent compared to other disciplines. The ecological crisis characterized by an imbalance of natural and social processes informs the ecological perspective in political science in the context of international or foreign, national or regional, and local or civic politics. A political scientist tends to concentrate on a specific organizational response such as the governmental role in policy formulation, regulation, and implementation (Micklin 1984).

Political ecology has been concerned with balanced and harmonious traditional systems that have been disrupted by forces of modern change. In political ecology structural relations of power have been seen as critical in understanding social, political, and environmental relationships. Therefore, the notion of politically and socially constructed resources is important to gauging environmental change from the perspective of different actors (Scoones 1999). In short, political science views the environment as a field of competing stakeholder interests.

2.5.3. Geography

In geography the recognition of human behaviour and its impact led to consideration of linking organism to place. From the seventeenth to the nineteenth centuries, early geographers debated whether to study the influences of the physical environment on humans or explain human relations in terms of the natural environment. In either case, it was recognized that human occupancy was connected to social phenomena. In 1903, when the Department of Geography was established at the University of Chicago, its aim was to dwell in an intermediate position between the natural and social sciences. Population geography became the most closely aligned to the notion of human ecology although geographers continued to debate nature and culture as separate entities. Furthermore, human geography in contrast to human ecology tends to proceed by way of the environment instead of by way of organism. As a result, adaptation as a means of change is not well developed in a geographical conception of human ecology. Nonetheless, geography as a field of study provides a significant link between the biological, physical, and social sciences (Bruhn 1974; Hawley 1950; Micklin 1984).

2.5.4. Sociology

Sociology has sought to include human ecology in studies of social organization. Historically sociologists have also used mapping of spatial distribution of social phenomena. Amos Hawley, in his influential work *Human Ecology: A Theory of Community Structure*, describes human ecology as "primarily a sociological concern" (1950: 73; 1984; 1986). At the University of Chicago in 1915, Robert Park devised an area of ecological studies in sociology where human relationships are affected by the surrounding

environment. The term human ecology first appeared in 1921 in a volume entitled *An Introduction to the Science of Sociology* by Park and Burgess (1969). It is noteworthy that in sociology, the study of human ecological phenomena was primarily based in cities. Park described human ecology as "an attempt to investigate the process by which the biotic balance and the social equilibrium (1) are maintained once they are achieved and (2) the process by which, when the biotic balance and social equilibrium are disturbed, the transition is made from one relatively stable order to another" (Park 1952: 158). In addition to the Chicago school in the United States, human ecology gained prominence in Chile and India (Bruhn 1974). Sociologists tend to be limited to a populations-organizational response to environmental conditions. Conceptual orientations to human ecology in sociology are at a macro-level, avoid subjective factors such as values and motives, and give lip service to the influence of culture on ecological organization (Micklin 1984).

2.5.5. Psychology

In psychology, unlike sociology, human ecology did not develop as a specific area of study. However, with the notion of 'life space' or the 'psychological environment,' developed by Kurt Lewin (1948), the individual and the environment are regarded as a single constellation of mutually dependent factors. It is, therefore, not surprising that while he concerned himself with practical social issues, Lewin was devoted to integration among the social sciences. By the 1950s and 1960s, the fields of psychological ecology and later the field of environmental psychology gained a foothold due to the recognition of the need to understand a person in his or her environment. The milieu is part of the total culture and affects behaviour (Bruhn 1974).

2.5.6. Anthropology

Early anthropologists acknowledged that habitat influenced the diversity and geographic distribution of cultures. Kroeber (1965) urged anthropologists to consider the 'whole' culture within its environmental setting. Unlike geographers, anthropologists perceived cultures not as mere reflexive responses to their habitat, but as a force that also influenced it. Anthropologists have studied how cultural behaviour affects environmental

phenomena and how the experience of the habitat affects cultural conduct (Bruhn 1974). Unlike sociologists, they include wider substantive phenomena within their purview of human environmental relations. Human ecological perspectives in anthropology are divided into cultural ecology, ethnoecology, and systemic ecology. Cultural ecology examines the processes that enable a society to adapt to its environment. Ethnoecology concerns itself with culturally based perceptions of the human habitat and is taxonomic in nature. Systemic ecology is deterministic and characterized by cultural materialism. It focuses on causal relationships between the physical environment from which human cultures extract resources to produce and transform energy. While these three approaches to human ecology are diverse, all make explicit that the ecology of human social systems cannot be understood without consideration of cultural meanings (Micklin 1984). Ecological thinking in anthropology maintains that just as natural environments are homeostatically regulated, so are societies that rely on nature. This type of thinking fails to engage complexities associated with ecological and social dynamics despite ample evidence from ethnographic cases to the contrary (Scoones 1999).

This review of human ecological perspectives among the disciplines indicates that together these views can be complementary, each providing a window into a wider understanding of human environmental relations. Bruhn (1974) concludes that in order for human ecology to be a unifying science it needs to be interdisciplinary and collaborative with different disciplines. However, trapped by the paradigm of disciplinary self-interest, human ecology remains a fragmented science and so its understanding of human relations with the environment continues to be disjointed.

2.6. Relations between Biological and Cultural Diversity

The fledgling field of human ecology, while being cognizant of the link between ecology and culture, has been associated primarily with the social sciences. Of late, proponents of the biological sciences have been knocking at the gates of the social sciences demanding to enter. They contend that as the twentieth century belonged to physics, the twenty-first century will

belong to the biological sciences because this is where fundamental issues reside that face human civilization. Despite fundamental weaknesses,[3] E. O. Wilson's *Sociobiology* (1975) has been the boldest attempt so far to transcend the disciplinary boundaries of biological and social sciences seeking a *Consilience* (Wilson 1999a) or unity of knowledge much like Odum's "third culture." The discussion has taken an urgent tone as cultural diversity as well as ecological diversity faces the grave prospect of extinction. Because of these concerns, literature on the relationship between diverse cultures and their varied ecological contexts is appearing with even greater frequency. In the next section, the nature of the relationship between biological and cultural diversity will be examined. Specifically, the works by scholars committed to this relatively new interdisciplinary area of study will be summarized and analyzed. The proposed approach to establishing the connectivity between biological and cultural diversity will be critically considered with a view to applicability in northern indigenous circumpolar communities.

2.6.1. Diversity: A curse or blessing?

The word diversity implies a condition or quality of difference, variety or unlikeness. In the fifteenth century, diversity was considered contrary to what is right, agreeable, or good. It was associated with evil, mischief, and perversity. Starting in the early twentieth century, diversity has been applied to technical contexts such as operations of electrical systems and reception of radio signals. The ability to handle various power demands and receive multiple radio signals at different frequencies connotes a positive application of the word diversity (OED 2003). The contradictory meanings connected to the word diversity illustrate the two ends of a continuum in which diversity has been understood and tolerated.[4]

In the creation narrative of Judeo-Christian societies, linguistic diversity, and by implication cultural diversity, may be interpreted as undesirable. The descendants of Noah were punished by being given the curse of multiple languages for attempting to reach heaven by building the Tower of Babel (Bible 1989 Genesis 10:11; Muhlhausler 1994; Nettle and Romaine 2000). Furthermore, standardization or monism was a goal pursued by philosophers of the European Enlightenment – the idea of a common language to bind the nation-state (Brody 2000; Harmon 2002; Lovejoy 1936).

For instance, linguists in the 1970s believed that diversity and economic development were at odds. Economic development could be only achieved by a modernized and centralized nation-state which had a single language (Nettle and Romaine 2000). Given the mechanistic mindset of the industrial revolution, with assembly line production and task-simplifying division of labour, it is understandable how such a socio-economic system could feel threatened by diversity. Arguably, this is also true of contemporary thinking in the global marketplace through the enforcement of harmonized regulations in free trade agreements or economic unions. Even the desire by large corporations for a single operating system in the computer industry may be construed as examples of a continued effort to undo the curse of Babel.

However, Judeo-Christian creation narratives are not decisive in their characterization of diversity as undesirable. The Old Testament shared by Judaism and Christianity begins with acknowledgment of difference and the glories in the biological diversity of creation. Yet with respect to cultures, linguistic diversity is presented as a curse. Notwithstanding this seeming contradiction, the first chapter of Genesis starts with: "In the beginning God created the heaven and the earth. And the earth was without form and void; and the darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. And God said let there be light: and there was light." Genesis implies that the perception of difference is achieved through light. Light is a metaphor for the ability to discern. The remaining verses in this chapter make reference to the diversity of life (Bible 1989 Genesis 1: 3–27). Along the same lines, another Abrahamic tradition,[5] Islam, also views human diversity as worthy of reflection. "O humankind! We created you from a single pair of a male and a female, and made you into nations and tribes, so that you may *know* each other"[6] (Quran 1975 49:13) – the implication being that direct experience of diversity is a source of knowledge.

2.6.2. Adaptation and variation: Unforeseen possibilities

The arrival and prominence of conservation biology made scientific research the handmaid of environmental advocacy and spurred the growth of the idea of biodiversity (Harmon 2002). Biodiversity, a term coined by Arthur G. Rosen in 1985, refers to biological diversity. The recognition of

biological diversity, however, is not new. Charles Darwin gloried in the diversity of life.

> It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance, which is almost implied by reproduction; Variability, from the indirect and direct action of the external conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved (Darwin 1996: 398).

Similarly, Alfred Russel Wallace reiterated this diversity and articulated the evolutionary basis of life. "Every species has come into existence coincident both in space and time with a pre-existing closely allied species" (quoted in Quammen 1997: 41).

Francois Jacob, a molecular biologist, simultaneously articulates the idea of origin in biological diversity and opens it to future paths or possibilities. In *The Possible and the Actual*, Jacob (1982) emphasizes that complex and unforeseen possibilities emerge from adaptation and variation. He explains that while Western science is founded on a monastic conception of

an orderly universe created by God, and while science attempts to confront the possible with the actual:

> The Darwinian view has … an inescapable conclusion: the actual living world, as we see it today, is just one among many possible ones. Its present structure results from the history of the earth. It might well have been very different; and it might even not have existed at all! (Jacob 1982: 15).

Adaptation is at the centre of evolutionary thinking because it is linked to the theory of the origin of the world. Adaptation took place at the initial stage of 'primordial soup' and then natural selection did its work. At the heart of evolutionary thinking is a stochastic range of possibilities (pluralism). In other words, science cannot bridge the possible with the actual or, to state it even more tersely, "the difference between 'is' and 'ought' cannot be bridged by science" (Greenwood 1984: 23). Science probes, but it does not prove (Bateson 2002: 27). Variation is the prime mover of evolution.

> Diversity is one of the great rules in the biological game. All along generations, the genes that constitute the inheritance of the species unite and dissociate to produce those fleeting and ever different combinations: the individuals. And this endless combinatorial system which generates diversity and makes each of us unique cannot be overestimated. It gives a species all its versatility, all its possibilities.… Diversity is a way of coping with the possible. It acts as a kind of insurance for the future. And one of the deepest, one of the most general functions of living organisms is to look ahead, to produce future.… In humans, natural diversity is further strengthened by cultural diversity, which allows mankind to better adapt to variety of life conditions and to better use resources of the world (Jacob 1982: 66–67).

In this sense of the word, biodiversity is first a restatement of the great issue of concern to Wallace and Darwin – that is, the origins of diversity. Second,

biodiversity also reflects the future possibilities inherent in it as described by Jacob. The notion of diversity is imbued with the idea of origin and possibilities. It simultaneously bridges the present with the past and opens up to the future. It carries with it a constant sense of becoming.

2.6.3. Defining biodiversity: Keeping all the parts

The notion of biodiversity is conflated with the current ecological crisis facing the planet, including the potential of a sixth major extinction in geological time. The planet has not faced the prospect of such a mass extinction in sixty-five million years. The word biodiversity simultaneously creates both a sense of deep wonder for diversity and an alarming anxiety at its potential loss, thereby stirring an individual out of self-indulgence and sheer apathy (Harmon 2002). When describing biological diversity, Edward O. Wilson combines the notion of diversity and its origins in a complex ecological system, starting with the genetic and linking it to the global. Biodiversity is: "The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families, and still higher taxonomic levels; includes the variety of ecosystems, which comprise both the communities of organisms within particular habitats and the physical conditions under which they live" (Wilson 1999b: 393). In this definition ecological diversity is an aspect of biological diversity. The Convention on Biodiversity restates it without overt references to evolutionary biology and defines biodiversity as "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Secretariat of the Convention on Biological Diversity 2001: 5).

Conservation biologists argue that the world's biological diversity is being homogenized at an ascending rate, thereby engendering the death of birth, that is, at a rate that outstrips the pace of evolution (one hundred million years) to replace diversity with new species. This loss of diversity jeopardizes the ability of an ecosystem to withstand environmental stress. Diversity is fundamental to the effective functioning of the biosphere. Furthermore, damage to biological diversity limits sources of food, new medicines, and other essential products of use to humans and their societies

(Dasmann 1991; Wilson 1999b). Jacob explains that: "Evolution does not produce innovation from scratch. It works on what already exists, either transforming a system to give it a new function or combining several systems to produce a more complex one" (1982: 34). He refers to this as tinkering. "What characterizes the living world is the basic unity that underlies its tremendous diversity" (Jacob 1982: 37). Tinkering creates diversity by endlessly combining bits and pieces. We need to keep all of the parts in order to tinker (Leopold 1949). Thus, the present connotation to the term biodiversity provokes a sense of urgency due to human avarice and the short-sightedness in the operations the global market system.

Wilson (1999b) argues that preservation of biodiversity is outside the ambit of the market system. We should not look to the marketplace (or neo-liberal economics) for solutions.[7] He makes a case for preserving the "hotspots" – that is, regions with the highest density of biological diversity. These "hotspots" must be turned into nature reserves or protected areas (Dasmann 1991; McNeely 1997). Besides the obvious difficulties in determining and building consensus on what constitutes a biodiversity "hotspot" as well as quantifying diversity, focus on particular species such as mega-fauna as flagship species and restricted regions of conservation may miss the point of overall sustainability. "Coldspots," which may be ignored, are equally valuable in providing benefit to the planet's ecological systems as a whole (Bridgewater 2002; Kareiva and Marvier 2003; Myers et al. 2000). In the context of the Arctic, the proportion of endemic species is lower than the tropics, but this misses the point of conservation of biodiversity because conservation becomes species-focused rather than based on variation or, more specifically, the role of diversity itself. It also ignores the overall importance of relations between biological and cultural diversity in one region and its application to other parts of the globe. Furthermore, the drawing of boundaries in terms of reserves despite their obvious success in certain regions (Bruner et al. 2001; Nabhan, Pynes, and Joe 2002) is antithetical to indigenous conceptions of their relationship to the environment in the Arctic and sub-Arctic. The very notion of reserves in North America carries a tragic historical memory. These approaches are appropriate to cultures and economic systems that presume "dominion"[8] over nature.

2.6.4. Cultural Diversity

Culture is one of the most complicated words in the English language because of its varied uses in different systems of thought. Culture carries both the idea of tending to natural growth (such as *cultivation*) and of a sense of honour along with worship forming a group identity (such as *cult*). Since the seventeenth century, the agricultural meaning of culture has been extended by metaphor to the process of human development – that is *cultivation* of the human mind. There are three distinct, but not mutually exclusive uses of the word culture (Williams 1989). One use of the word culture relates to spiritual and aesthetic growth. This resonates with its root meaning of honour and worship. Another application of the word culture indicates a particular way of life. This extends the metaphor of cultivation to day-to-day living of a particular group or people. Inherent in this sense of culture is the idea of plurality – that there are diverse manifestations of everyday living among different human communities. This means that cultural diversity may be expressed over time in the same community or across various communities in the same time period. A third use of the word culture is to describe a variety of artistic and intellectual practices – that is, music, song, dance, literature, painting, sculpture, theatre, or film.

David Harmon, in his work *In Light of Our Differences*, defines cultural diversity as the "variety of human expression and organization, including that of interactions among groups of people and between these groups and the environment" (2002: 40). This definition includes the three associated meanings of the word culture in a wide range of spatial boundaries, that is between contemporaneous cultures as well as across temporal domains, and that changes over time in the same culture. Harmon identifies three indicators of cultural diversity: (1) subsistence and livelihood, (2) creative activities, and (3) group identification (2002). These coincide with the uses of the word culture as subsistence and livelihood in a particular way of life; creative activity as artistic and intellectual practices related to human development; and group identification, which is suggestive of values that uphold time-honoured traditions in the context of worship and identity.

Language is used both as a proxy and a benchmark for shrinking cultural diversity (Harmon 2002; Maffi 2002; Nettle and Romaine 2000). Luisa Maffi, a linguist, ethnobiologist, and anthropologist, estimates a potential

loss of 50–90 per cent of the world's 6,800 languages in the next 100 years (Graddol 2004; Maffi 2002: 386). It took 100,000 years to build linguistic diversity. The diversity of languages that exists today reflects the adaptation to natural and social conditions (Muhlhausler 1994). For 85 per cent of the world's languages there are fewer than a 100,000 speakers. The small languages are unevenly shared across both continents and cultures (Nettle and Romaine 2000: 32). While the loss in biological and cultural diversity is a historic phenomenon, the current pace of damage is accelerating and is both indirectly or directly due to human action. Maffi (2001) maintains that a loss of 90 per cent of the world's languages in the twenty-first century may be a greater threat than loss of biodiversity. Furthermore, Maffi (2001) argues that both the loss of the world's languages and bio-species represents a total and irretrievable loss because this information is not documented. A similar argument is made by Wilson (1999b). He suggests that productive research needs to fill in the blanks on the biodiversity map, an inventory of species, as there are many species we know nothing about.[9]

There is a nuance worthy of reflection in this convergence between advocates of conservation of cultural diversity and advocates of biological diversity. References to diversity by Darwin, Wallace, and Jacob have been related to evolution and adaptation through variance. In short, variance is the focus. On the other hand, documentation or mapping in a taxonomic sense as suggested by Wilson and Maffi reflects a shift where the idea of species becomes more significant to conservation. Clearly the one best able to identify a particular species of plant, animal, or bird is the 'expert.' This Linnaean tendency is noteworthy and we will return to it in the next section. However, the taxonomic impulse raises the question: mapping and documenting according to whose criteria? Are indigenous ways of categorizing considered as worthy as those of Carl Von Liné?[10]

2.6.5. Implications of loss of linguistic diversity

The implications of a drastic decrease in linguistic diversity include the loss of understanding carried in diverse human languages. Furthermore, the loss of speakers of those languages is linked to issues of human rights, ethics, social justice, and retention of cultural identity. Finally, language and environment creates knowledge that mediates cultural-environmental

relations. Especially at risk is the loss of indigenous knowledge. Humans have developed many different ways to talk about their relationship with their environment. Each of these languages encodes and transmits knowledge differently. Language itself in this sense contains and conveys the human ecology of indigenous communities (Maffi 2001). Nettle and Romaine (2000) echo this concern in *Vanishing Voices*. They suggest that biological terms such as death and extinction apply to the life of languages. "A community of people can exist only where there is a viable environment for them to live in, and a means of making a living. Where communities cannot thrive, their languages are in danger. When languages lose their speakers, they die" (2000: 3). Therefore, losing one's language implies losing the knowledge, beliefs, values, and practices that language encodes. It is really a loss of identity, of a sense of self (Maffi 2002; Nettle and Romaine 2000). Furthermore, much of the knowledge in one language cannot be imparted in another foreign language (Bridgewater 2002) because such knowledge is associated with a particular way of life, a specific context and circumstance (Brody 2000).

Maffi maintains that languages are dynamic – they generally do not die, but get transformed. The death of a language occurs when (1) speakers shift to another more dominant language and do not transfer it to the next generation, and (2) communication or transmission is broken down due to decimation through disease, natural disaster, war, or genocide (2002: 385). Nettle and Romaine add that people stop speaking a language as a self-defence strategy (2000: 6). They also explain how languages die. Their analysis is essentially similar to that of Maffi but more nuanced. According to Nettle and Romaine languages die when (1) the speakers cease to exist (genocide, disease), (2) the speakers are forced to shift to another language, and (3) the speakers voluntarily shift to another language (2000: 90–91). The distinction between voluntary and forced shift is not as precise, and in fact it is difficult to distinguish "coercion from choice" (2000: 93–97). It helps to speak of voluntary shift as top-down or bottom-up. In top-down death, the language retreats from the official domain of use. Bottom-up occurs when language is no longer in everyday use and is mainly for ceremonial or formal use (2000: 91–92). In the context of the Arctic, language use must be related to functionality, use in day-to-day subsistence activities.

2.6.6. Language as culture

Hugh Brody argues that each language provides a particular outlook. He uses the example of the origin myth of Judeo-Christian society to explain the outlook of that particular society. "On the one hand, a passion to settle, on the other, a fierce restlessness; a need to find and have and hold an Eden, alongside a preparedness to go out and roam the world; an attachment to all that is meant by home, and an overriding commitment to a socio-economic system, to some form of profit rather than to a place" (Brody 2000: 87).

There is a particular kind of instrumentalism associated with this outlook; everything, including the environment is seen as a means to an end. "Hunters and gatherers constitute a profound challenge to the underlying messages that emerge from the stories of Genesis. They do not make any intensive efforts to reshape their environment. They rely, instead, on knowing *how*[11] to find, use and sustain that which is already there.… Everything about the hunter-gatherer system is founded on the conviction that home is already Eden, and exile must be avoided" (2000: 89–90). Brody's fundamental insight is that hunter-gatherers, with their reliance on a single region, are profoundly settled. As a system, over time, it is farming, not hunting that generates 'nomadism.' "Agriculture evokes the curses of genesis" (2000: 90). In essence the objective of a farming culture over time is the creation or manufacture of Eden, and profit from domination of land. Since this is not sustainable over time, it creates hierarchies, lack of sufficient land, and so agriculturalists need to move to 'new lands.' It is the farmers who are in fact nomadic. The objective of a hunter culture is not change, but conservation. The restlessness is not with the land and its transformation; the place where they live is already ideal; it is Eden.

The agro-industrialist culture is more readily dismissive of diversity whilst the hunter-gatherer culture is more accepting. Brody explains that hunter-gatherers needed at least 100,000 years and possibly 250,000 years for a geographic diaspora, whereas farmers needed only one-tenth the time for a geographic diaspora. Hunter-gatherer societies are currently at the environmental margins because they are displaced by farmers and because of their world-view of the environment. They live on *The Other Side of Eden* (i.e., the title of his book).

According to Nettle and Romaine (2000), the grammatically most complicated languages are spoken by tribes in remote areas where they have had no contact with related languages and whose way of life is currently under threat. In addition, the world's major languages are becoming more streamlined as a result of intertranslation and cultural contact. Many of the world's languages are dying due to the spread of a few languages such as English, French, Chinese, Hindi, and so on. They argue that the curse of Babel is false: monolingualism is not a means of preventing war and differences. Language disputes are not about languages, but about perceived inequalities among people who speak different languages. Language is preserved when a people's way of life continues (Nettle and Romaine 2000).

2.6.7. Language as ecology

Diverse environments support linguistic diversity while political, geographic, and economic factors influence the level of diversity. Nettle and Romaine contend that: "A large language could be endangered if the external pressures on it were great, while a very small language could be perfectly safe as long as the community was functional and the environment stable" (2000: 41). This is relevant to the Arctic because functionality refers to the maintenance of a subsistence hunting culture and its relation to human ecology. They make a connection between biological and cultural diversity in the form of niches. They argue:

> If a habitat is drastically altered or destroyed, the organisms that once inhabited it will be wiped out. Just as languages claim territories of various sizes, every species has a niche. Niches, in turn, have various widths or limits to their distribution.… The higher the latitude, the greater the average area and latitudinal extent of a species range. This is known as Rapoport's Rule. Thus, the relatively fewer species in the northern latitudes have much more extensive ranges than do the more numerous species inhabiting the tropics.… One reason the tropics have more species of organisms is the availability of relatively constant amounts of energy, in particular from the sun. ...Niche widths can change, however, and disrupt a relatively stable ecosystem.… We have

> become the first species in 3.5 billion year history of life to live outside the confines of our local ecosystem. Now all but a handful of hunter-gatherer societies live outside their local ecosystems (Nettle and Romaine 2000: 43–46).

Like conservation biologists who speak of "hotspots" of species diversity, Nettle and Romaine talk of "hotbeds" of languages. The authors suggest that "there are remarkable overlaps between the areas of greatest biological diversity around the world and greatest linguistic/cultural diversity around the world, allowing us to speak of a common repository of biolinguistic diversity" (Nettle and Romaine 2000: 27). They argue that there is high linguistic density in the tropics which then declines as "one moves towards the poles" (Nettle and Romaine 2000: 32). Yet the authors quote a study (Nichols 1992) that indicates that the greatest structural diversity of languages is found in the Americas and the Pacific basin, despite excluding the Eskimo-Aleut languages (Nettle and Romaine 2000: 36–38). Furthermore, they conclude that these languages are primordial; that is, the languages are close to their natural state (2000: 39). Again they shift their reasoning and argue that "we see that those areas which are rich in languages also tend to be rich in biodiversity value. Biodiversity is concentrated through the tropics and tails off towards the poles, just as linguistic diversity does" (2000: 43).

Finally the authors argue that they have presented evidence that indicates "why the same amount of habitat destruction in the tropics would lead to many more biolinguistic extinctions than would occur in the higher latitudes" (Nettle and Romaine 2000: 46). Yet they use the example of the Sami, an indigenous community living in the northern regions of Fino-Scandinavia and Russia, whose livelihoods are threatened (Nettle and Romaine 2000: 47). In short, adherence to reasoning based on "hotspots" or "hotbeds" is flawed because it misses cultural diversity in the Arctic and sub-Arctic.

So far the discussion of the loss of cultural diversity bears a marked resemblance to the discussion on loss of biodiversity, because they are fundamentally linked.

2.6.8. Species-language model

Maffi (2001) suggests that literature in the 1990s provided increasing recognition of the connection between biological and cultural diversity. This connection was made by Western anthropologists in the Arctic at least some fifty to a hundred years earlier (Boas 1998; Nelson 1969). Furthermore, in the case of indigenous cultures in the Arctic, this realization is not the real issue. The real source of concern is the desire by southern peoples to exploit the natural resources in the Arctic and sub-Arctic and their lack of understanding of its implications for biological and cultural diversity. Maffi further argues the connection of language to cultural and biological diversity was not made until more recently; again, in the Arctic this was noted much earlier. Indigenous communities have achieved stability with their ecological surroundings by becoming the efficient users of a given region and understanding its potentialities. Consequently, viable cultural traditions of indigenous communities are a key factor in maintaining biologically rich environments.

Maffi makes a link between language and species respectively as a way of illustrating the relationship between biological and cultural diversity.

> Biological evolution is a process of learning – the cell learns, the genes encode the learning of the species. Cultural evolution is also a process of learning and of memory encoding, largely occurring through language. Now economic globalization processes are being touted as the ultimate, inevitable step in human evolution. If so, one should expect them to enhance human memory correspondingly. But quite to the contrary, they are crucially based on effacing, the annihilation of memory: biological memory, by wiping out species and environments; cultural memory, by wiping out, either physically or through assimilation, whole distinct human groups, with their diverse stores of knowledge, beliefs and practices and the languages in which the latter are encoded and by which they are transmitted; and even individual memory, as everything we know is at constant risk of being washed out by the rising tide of homogenization by which the forces of economic globalization are fostering shorter

and shorter memory spans and more and more mindless living (Maffi 2001: 39).

Below (Figure 2.1) is a summary of the model for the relationship between biological and cultural diversity as put forward by two prominent writers in this field, Luisa Maffi (2001; 2002) and David Harmon (2001; 2002). Species is identified as a marker for biological diversity and language is identified as an indicator for cultural diversity. The process of speciation is heredity and the process of language transmission is memory. These processes are stochastic because one can talk about the probable, but never the actual.

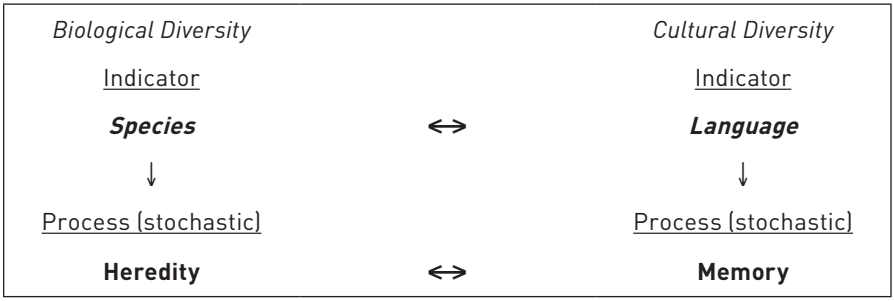

Figure 2.1: Model for Link between Biological and Cultural Diversity

2.7. Critique

There are various flaws in the propositions of human ecology and the language species model used to explain the relationship between biological and cultural diversity. The failings of both human ecology and the species-language model are stunningly similar and reflect a weakness in the fundamental premises when addressing the relationship between nature and culture. If the relationship between the biological and cultural is to be understood, then the basic assumptions in the literature need to be exposed and examined so that the notion of human ecology may be effectively re-articulated. Foremost among these underlying premises are (1) the nature-culture dichotomy, (2) determinism in the form of cultural materialism,

(3) the denial of human agency and its influence on culture, and (4) dependence on static and taxonomic conceptions of the aggregate that depend on the law of averages at the expense of genuine holism. These problematic assumptions seek to standardize diversity, which is a contradiction.

2.7.1. Nature-culture dichotomy

Greenwood (1984) explains that non-evolutionary thought expresses a radical dichotomy between nature and culture – a struggle between natural laws and human will. These naturalistic arguments set ethical standards. Natural laws must be obeyed unless we wish to destroy our relationship with nature. The rise of evolutionary thinking has been significantly jarring to the historically well-developed and firmly established paradigms of human understanding based on non-evolutionary modes of thought. Evolutionary thinking challenges fixed standards of what is natural and desirable, whereas the persistence of non-evolutionary thinking sustains a dichotomy between nature and culture. The problem is not the complexity of the evolutionary view, but the implications that arise from it. Evolutionary theory has challenged us to reconceptualize nature and natural processes, but it does not radically divide cultural and natural processes. Instead, it suggests that justification for our moral and ethical beliefs should be found in other places.

Two factors are involved in evolutionary processes that produce complex organisms such as humans: (1) constraints like the genetic mechanisms that specify the rules of the game within an organic system; and (2) historical circumstances that determine the interactions between systems and the actual course of events. While simpler objects are dependent on the constraints, complex objects are increasingly also dependent on historical circumstances (Jacob 1982). For humans, biological evolution did not occur independent of cultural evolution; the two operated in tandem. Culture has been central to the production of the human animal. In other words, nature in the form of human evolutionary biology is not independent of culture. For instance, proto humans became *homo sapiens* as a result of perfection of tools, development of hunting and gathering practices, organized family units, and reliance on systems of symbols such as language and ritual as forms of communication. Step-by-step cultural and biological evolution worked together to give proto humans selective advantage to adapt and

evolve into *homo sapiens*. In short, "without man, no culture certainly; but equally and more significantly, without culture no men" (Geertz 2000: 49).

The balance of nature perspective is yet another permutation of the nature-culture dichotomy. Scoones (1999) argues that human ecology tends to take a static and equilibrium view of ecosystems based on a premise of balance of nature. This point of view ignores issues of dynamics and variability (diversity), which results in a partial and limited analysis.

Despite arguments in the ecological sciences since the 1930s that the balance of nature does not exist and has never existed, notions built on homeostatic regulation and stable equilibrium conceptions have continued to dominate the fundamental assumptions of models, thereby affecting policy recommendations and management of rangelands or forests. The idea of harmony with nature, rather than being seen as a human desire, is expressed as a nature-imposed necessity and used to justify moral and ethical positions and policy actions. The balance of nature view has persisted and resisted change due to poor communications between disciplines, conceptual framing of the various disciplines based on equilibrium modes of thought, and reinforcement by policy prescriptions. The way the natural world is then classified, viewed, and interpreted is embedded in management decisions, policy recommendations, and actions that may have negative consequences on indigenous populations. For instance, the drive to return to pristine nature reserves, displacing local populations, is often informed by such sentiments.

Ethnographic work continues to indicate that such a view is untenable and that nature and culture must be viewed as co-created. Cultural materialist characterization of human ecology is deterministic because it views human existence in terms of energy flows from material surroundings, and the meanings people derive are external to the major cause of their existence. Nature in this world-view is real, material, and mundane, whereas culture is unreal, unnatural, and vague. Such perspectives maintain that cultures are not competent to see the consequences of their own behaviour and require the outside 'objective' scientist to see the real consequences of people's behaviour (Greenwood 1984). The species-language model, with its tendency towards static and taxonomic abstraction by experts, is an example *par excellence* of the nature-culture dichotomy. In short, the divide is

a cultural phenomenon itself. A view of nature deeply entangled with social practices and modes of cultural representations is essential. However, one must guard against universalist determinism or cultural relativism when adopting such a view (Scoones 1999).

2.7.2. Determinism versus agency: A case for social change

In many respects the cultural materialist is not unlike Dostoevsky's Grand Inquisitor with respect to his assumptions about human nature as a static category.[12] The cultural materialist rejects human agency just as the Grand Inquisitor rejects Christ's assertion in favour of free choice that "Man does not live by bread alone."[13] If human nature is constant and only its expression varies with the situation, then there is no hope for change for humanity in the future. The idea that human nature is static and human culture evolves is a reflection of the nature-culture dichotomy.

The cultural materialist point of view tends to be macro-oriented and pays little attention to micro-level diversity. As a result, it does not deal well with change and does not answer questions like: What causes transitions in human societies? What is adaptation? How do we distinguish between maladaptive and adaptive systems? Cultural materialism lacks the force of operationalization. As Greenwood succinctly states, the principle of parsimony in science does not call "for the simplest explanation but the simplest *possible* explanation" (1984: 194).

The species-language typology for cultural and biological diversity is a simple explanation. It does not address the role of social change, an objective that one would expect to be foremost for conservationists.

The role of cultural and social processes as conceptually independent, but mutually interdependent, yields interesting insights into the complex connectivity that comprise relations with biological foundations. To deny the interplay between the roles of culture and social structure is to ignore the potential impact of social change.

The impact of the two world wars and the Russian Revolution compelled Pitrim Sorokin (1962) to write a four-volume work on social conflict titled *Social and Cultural Dynamics*. At a time in history when the promise of humanitarianism and democracy seemed strong, the seemingly impossible outcome occurred of dictatorship, human suffering, and mass

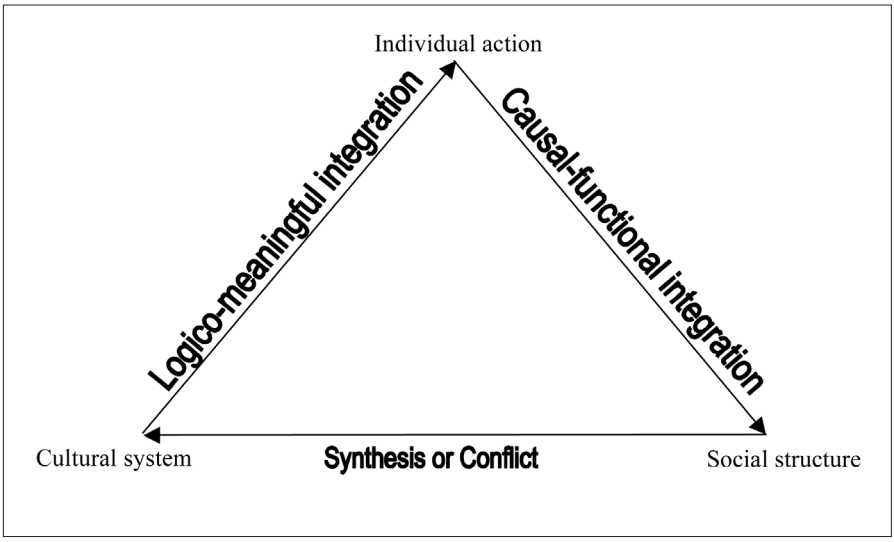

Figure 2.2: Interplay of Cultural System, Social Structure, and Individual Action.

murder. These events drove Sorokin to develop a system to examine social change.

Using Sorokin's ideas as a basis, Clifford Geertz (2000) developed the two levels of analysis. Culture is an ordered system of meanings and symbols upon which social interaction takes place. The social system is the pattern of interaction itself. At the level of culture, there is a framework of meaningful and communicative symbols, values, and beliefs. In this system, human beings define their world, express their feelings and make their judgments. The cultural level is where individuals draw meaning, interpret their experience of the world, and guide their actions. On the social level, the continuous process of interactive behaviour forms a social structure. It is within this structure that individual or group action takes place in the context of a network of social relations (see figure 2.2). At the level of culture, there is "logico-meaningful integration" and at the social level, there is "causal-functional integration"[14] (Geertz 2000: 142–69; Sorokin 1962).

An excellent example of social change that did not result in conflict between the interplay of social structure and cultural system is the relationship of the bowhead whale Iñupiaq human ecology. Sharing is a fundamental cultural value among the Iñupiaq of Wainwright, Alaska. The *Nalukataq* festival is the social context where this value with its concomitant beliefs is manifested after a successful whale hunt. The introduction of the wage economy and capitalist emphasis on individual profit, the growing power of the International Whaling Commission, and mechanization of hunting techniques have put considerable stress upon the social structure of Iñupiaq communities, but has not displaced its cultural system of ordered meanings, upon which the social interaction takes place. Almost forty years ago, Richard K. Nelson characterized whale hunting in the community of Wainwright as a "lost art" and predicted its demise (1969: 213). He said: "How significant whaling is or has been in the total economic picture is open to question, especially in modern times when it is degenerating even in its greatest stronghold at Point Hope. Whaling involves hard work and long cold nights for the crews, expense and effort with the hope of prestige for the *umailik*, or crew captain" (Nelson 1969: 214). Some twenty years later Nelson had to revise his predictions of not only the demise of whale hunting but the subsistence economy as a whole. He admitted his error with honesty worthy of a true scholar:

> When I lived in Wainwright during the 1960's, I believed that growing contact with the outside world would soon eliminate subsistence as the basis of village economy and culture.… It is so instructive to look at these predictions now, almost 20 years later: the material aspects of life in Wainwright have undergone a steady and progressive change, resulting in far greater modernity than I could have foreseen.… Wainwright's recent history shows that change is not a constant, universal, or one-directional process. Nor can it be accurately predicted. Subsistence has persisted here for a number of reasons, most of them related to its prominent position in Iñupiat culture, social organization, and value system (Nelson 1982: 111).

Subsistence hunting continues to thrive in Wainwright, Alaska, as the Iñupiat navigate their cultural and ecological heritage in the twenty-first century (Kassam and the Wainwright Traditional Council 2001).

Andrew P. Vayda (1988) is equally critical of tendencies in human ecology to concentrate on behaviour affected by environmental factors while paying little attention to the environmental consequences of human actions. There is a need, he argues, to include individual intentions, goals, beliefs, knowledge resources, and situation in an explanation of human ecology. Goals constantly inform human action and should be the source of empirical information for the human ecologist. He warns against convenience at the expense of veracity in the situation. It is important to be cautious in attributing consequences of actions to adaptation or strategies or problem solving. It is important to discern that the response is a product of design and not just coincidence. Generalizations of behaviour by human ecologists need to take into account contextual factors; namely, the validity of a generalization depends upon the situation in which the behaviour occurs and the intentions that informed it. Attention to context does not mean following a predefined cultural or ecological 'whole.' Contexts are loose, contingent interactions, influenced by movements of peoples, resources, and ideas across the boundaries of ecosystems, societies, and cultures (Vayda 1988).

A striking example of context where design informs action and action bears a marked consequence on human ecology is co-management of Arctic Char in the small Inuvialuit community of Ulukhaktok (formerly Holman), Northwest Territories, in the Canadian western Arctic. In the summer of 1998, while undertaking research in this hamlet, I had the opportunity to attend a meeting of the Char Working Group, which consisted of Canadian federal government scientists, leaders of the Inuvialuit, and representatives of local hunters, fishers, and trappers who 'co-managed' the stock of Arctic Char. This meeting was devoted specifically to fish stocks in Char Lake. After five years of conservation measures by community members, such as reduced catch and use of larger mesh nets, the stocks of this landlocked species of Arctic Char rose enough to sustain a higher catch. When the scientists raised the prospect of increasing the catch beyond the agreed twenty-five char per household from this lake as targets had been met, the fishers refused, preferring to continue conservation measures. However, in

one household, the fisher distributed his char to a greater number of people in the community, namely his children and grandchildren. The quota for all households was adjusted so that this individual could get enough Arctic char and the overall catch remain low at level of conservation measures agreed upon. Inuvialuit behaviour, based on local knowledge and cultural values, was designed to sustain both the char and the needs of community members with tangible consequences for the human ecology of the region.

The interwoven nature of biological and cultural evolution in humans suggests agency. Culture has a changeability which solely biological processes do not have. Whilst paths of biological evolution cannot be reversed, cultures can visit unexplored paths, by re-examination of values and beliefs to make changes and adapt. Chemical and biological time binding is different from time binding in culture. This is a hopeful note for humanity only if understood and acted upon.

2.7.3. A fetish for averages: The standardization of diversity

Throughout his articulation of the human ecology paradigm, from the beginning till his last "confessions," Amos Hawley (1998) emphasized that it is a concept about the aggregate. As is characteristic of many social scientists, Hawley fetishized the average and the mean. This parametric weakness is obvious in the species-language dichotomy. In addition to suggesting the nature-culture dichotomy, effectively this approach specifies that the relationships between biological and cultural diversity that constitute species (or a population of species) and languages (or a family of languages) follow a normal distribution (bell curve). In essence, diversity becomes standardized because it reflects averages rather than variance (see figure 2.3).

Bateson (2002) explains that number (an organism or individual) is different from quantity (species or community). "*Numbers* are the product of counting. Quantities are the product of measurement" (2002: 45). This means that numbers can be conceivably accurate because they have discontinuity between each integer. However, quantity is always approximate, it can never be exact. "In other words, number is of the world of pattern, gestalt, and digital computation; quantity is of the world of analogic and probabilistic computation" (Bateson 2002: 46). Quantity does not determine a pattern. "It is impossible, in principle, to explain any pattern by invoking

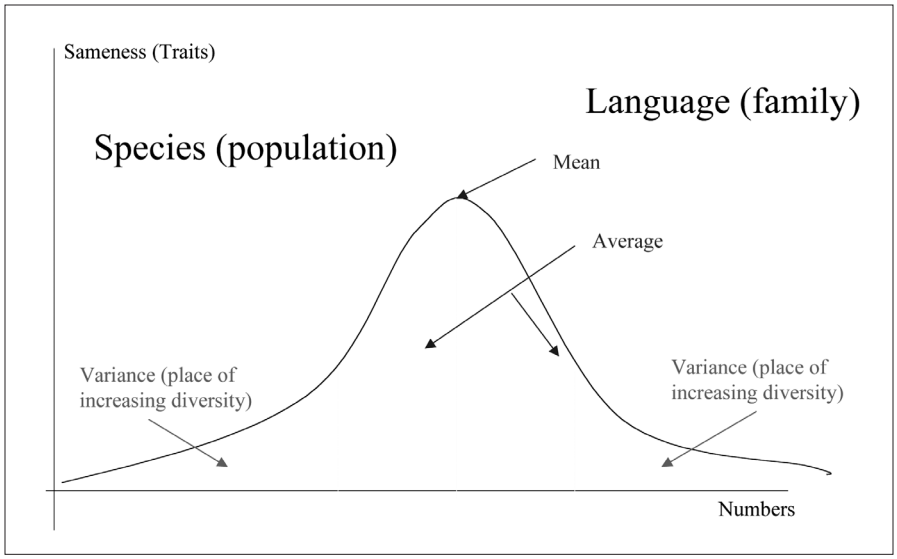

Figure 2.3: Standardization of Diversity.

a single quantity. But note that a ratio between two quantities is already the beginning of a pattern. In other words, quantity and pattern are of different logical type and do not readily fit together in the same thinking" (Bateson 2002: 49). Averages are approximates; comparing language and species is comparing approximates, and tells us little about how to conserve diversity. Relationships form with discrete events, not averages.

David Harmon (2001; 2002) draws on the work of Theodosius Dobzhansky (1961) to respond to the problem of "species" in nature. He points out that variation in nature is discontinuous. The idea of organic discontinuity is essential for Harmon because this is how he justifies the taxonomic classification of species. He argues: "that there is a basically accurate correspondence between what we perceive to be separate groups of fundamentally similar organisms and the actual existence in nature of such separate groups.[15] The exceptions to the rule do not disprove it; they merely illustrate the higher-order difficulty intrinsic to any analysis of diversity versus identity" (Harmon 2001: 58). Invocation of the idea of identity by Harmon implies classification. Classification does not address diversity,

or specifically, observations of interconnectivity between culture and diversity. In this context, the invocation of identity merely serves to standardize diversity through a taxonomic analysis that privileges a category of classification found only in one culture.

For instance, research among diverse cultures in the Arctic illustrates the complexities involved in classification. The naming of the Arctic fox varies between Western science (Linnaean taxonomy) and Iñupiat perceptions of their environment. To the ecologist the Arctic fox is *Alopex lagopus*. To the Iñupiat of Wainwright, Alaska it is two beings, *Tigiganniaq* or *Qiangaqtuluk*, depending upon the phase variance of blue or white based on their experience of the fox (Kassam and the Wainwright Traditional Council 2001). Which classification is *real*? Is the Western 'expert' best suited to decide? The fact is that a typological view of species, especially when trying to meet conservation objectives, may not really protect diversity (Rojas 1992). The idea of species is limiting.

Harmon similarly privileges Western taxonomic structure with respect to culture in his section "the species problem in culture." "Like species, like religions, here again the problem is how to distinguish what is happening at the margins" (Harmon 2001: 60). He acknowledges that the word *culture*, like *species*, is resistant to easy definition. He offers Tylor's "complex whole," Sapir's "assemblage," and Geertz's "pattern of meaning" by way of definitions for culture. He concludes: "Again, it is evident that some defining set of characteristics is at the centre of these complex unities" (Harmon 2001: 61). He chooses the mean or average rather than the variance. However, interconnectivity is not between averages, but between the discrete elements within the continuum of variance among different organisms.

Harmon then proceeds to argue that cultural diversity is in peril and makes a case for languages as "the most accessible indicator of global cultural diversity" (Harmon 2001: 63). There are an estimated 249 families or stocks of languages. A stock is the degree of divergence found among Indo-European languages. There are also *isolates*, languages that do not have any discernible relations with other languages (Nettle and Romaine 2000: 36). This raises the point that the species-language equation is not easily made. Just like we cannot draw a boundary with species easily, we cannot draw similar boundaries with languages. In effect we would be engaging in the

standardization of linguistic diversity if we did. Genetic and language evolution do not follow the same processes even though in the process of evolution they interact (Pennisi 2004a). Recent evidence not only indicates that there is diversity among the click languages of Africa, said to be the original languages of humanity, but their classification into one Khoisan language family has been called into question (Pennisi 2004b).

Besides being simply incorrect, there is a more profound weakness in privileging the notion of species or language as a typology. It is reminiscent of the Aristotelian mode of thought in physics, where frequency determines lawfulness and the essential nature of events. Aristotelian physics depended on regularity of occurrence for classifications to determine whether an object is natural or not natural. Yet diversity takes place in a specific circumstance; it is the individual event that makes it significant. Galilean physics did not assign a value to an object; rather, the substantial is replaced by the functional. It does not operate in binary, but in a continuum. This does not mean that Galilean modes of thought, by concentrating on the particular, ignore the greater or whole. Rather, rigid and abstractly defined classes that determine the physical nature of things were simply not relevant according to Galileo (Lewin 1935). The typological approach taken by the proponents of the species-language model is akin to the notion of special creation, which Wallace and Darwin effectively debunked. The idea that an understanding of the greater or whole can be approached by recognizing diversity is both a characteristic of Galilean thinking and of evolutionary thought as described by Darwin, Wallace, and Jacob. In these modes of thought, the exception cannot be ignored because it is relevant – it is the basis of diversity and the stepping stone to discovering unity from the particular. The species-language link lacks the forcefulness of a specific context and is therefore vacant due to excessive generalization.

Describing diversity by means of a category such as species is to standardize diversity. Diversity is dynamic, not static. There are multiple layers of interaction between culture and its ecological environment. These are best described by 'relationship' rather than 'causality,' by 'meaning' rather than 'mean.' David Turnbull is scathing in his criticism:

> To coordinate commensurability, to order according to a common standard or measure, to make uniform, is to deny, suppress, and stifle diversity. It sublimates difference into identity. Assemblage and diversity are in contradiction with one another, yet we have little alternative except to find ways of working with incommensurability and contradiction. Hence there is an attached conundrum; if we are attempting the assemblage of knowledge of complex, multiplicitous, interactive, phenomena we need a complete rethink of all the components and ontologies involved. We need to rethink the very ideas of assemblage and of diversity, which implies rethinking our understanding of science and knowledge and of the enlightenment project itself (2003: 3).

The key point here is that the preservation of diversity leads to the preservation of species, but the reverse does not hold true. The notion of fragmentation in island biogeography illustrates this: once ecosystem decay has set in, no amount of species preservation will help (Quammen 1997). Turnbull (2003) makes a case for examining the linkages and interactions between plants, animals, insects, environments, and humans. He argues that easy identification of cultural diversity with language is just as flawed as that which equates biodiversity with species.

The failure of applicability of the species-language model is revealed by Smith, ironically, in Maffi's edited volume (2001), Smith begins his case study of Native North America by a qualification that an empirical analysis of the relationship between biological, cultural, and linguistic diversity is still in its infancy. He chooses to compare biological diversity to cultural and linguistic diversity. His point of entry is entirely taxonomic, defined by "cultural areas," "ethnolinguistic groups," and "species richness." He does not examine the multidimensional connectivity between biological and cultural diversity (Smith 2001: 98–99) and he finds the correlation between linguistic, cultural, and biological diversity problematic. He argues that some Native North American groups are culturally diverse and linguistically similar, whereas other societies are linguistically similar and culturally diverse. There was strong correlation between cultural and linguistic

diversity and tree species, but low correlation between various mammal species. The policy outcome of the language-species model is conservation of "hotspots" and "hotbeds" of diversity. Based on linguistic atlases, the essentialist categorization of culture as language in comparison to species has been replicated several times (Collard and Foley 2002; Moore et al. 2002; Pagel and Mace 2004). These studies have resulted in a strong correlation of lower latitudes to species and language richness. As noted, these categorizations miss the so-called "coldspots" where historically cultural diversity has been present but not viewed through the proxy of language.

For example, up to the mid-1800s cultural diversity was supported by rich biological diversity of the sea and land in northwest Alaska. In a region of 40,000 square miles (104,000 square kilometres), slightly larger than South Korea, ten different Iñupiaq nations engaged in trade, warfare, and peace. Their cultural diversity is not identifiable at the level of language. There would be no correlation between species and language based on linguistic atlases. Societal boundaries and territorial borders were determined by culture and ecological resources that defined their relationship to the land and sea. One of the elements from which these Arctic communities derived their identity was at the level of speech (subdialect). The contours of intonation, rhythm, and speed of speech were the basis of striking differences (Burch 2005). The point is that this taxonomic approach does not yield helpful insights and is problematic, as the author is forced to rely on questionable categorizations and unreliable approximations. It is preferable to explore connectivity.

Instrumental connectivity (language and species as indicators) is a standardized approach that emerges from a scientific culture based on taxonomic categorizations and tends to be global in perspective and detached from context. Then there is connectivity within localities; that is, at the level of local life. This is a type of complex connectivity that confounds taxonomy because it is multidimensional. In this sense instrumental connectivity is impoverished of dimension, of insights, because it is a one-dimensional account of the relationship between diversity at the ecological and cultural level. Unlike instrumental connectivity, complex connectivity does not give conceptual privilege to the indicators such as language and species. Complex connectivity is empirically demanding as well as rich. This type

of connectivity has a strong sense of consequentiality, that is, consequences arising from actions (Tomlinson 1999). This type of connectivity recognizes agency and steers clear of the nature-culture dichotomy.

2.7.4. Need to reconceptualize human ecology

Scoones argues that three themes are central to ecological thinking in the social sciences:

- Detailed and situated analyses of peoples in places based on spatial and temporal dynamics;
- Growing understanding of environment as both product and setting for human interactions, taking into account structural analyses environmental processes as well as human agency in producing environmental transformation; and
- Appreciation of complexity and uncertainty in social-ecological systems, with the recognition that prediction, management, and control are unlikely if not impossible (1999: 490).

Detailed, dynamic, temporally and spatially situated analyses should encompass a historical perspective utilizing a range of qualitative, quantitative, and textual methods from both the natural and social sciences. Such eclectically combined methods emphasize diversity and complexity in nonlinear social-ecological relations.

Structure, agency, and scale in environmental change are dynamically and recursively created in a nonlinear, nondeterministic, and contingent fashion. Dialectical and co-evolutionary conceptions provide room for difference, complexity, and unexpected contingency. Environments are both a template and product of human action. Complexity and uncertainty raise important implications for perceptions, policy, and practice because the science will always be incomplete and the system a moving target.

These three themes need to be broadly engaged by various disciplines for a new ecological thinking to be realized. The nature-culture dichotomy, much like the indigenous versus scientific knowledge dichotomy, is unhelpful. Enquiry based on interdisciplinarity, hybridity, and innovative eclecticism involving historical analysis, qualitative and interpretive approaches

as a part of multi-sited and multi-actor processes is the methodological way to proceed.

Gunderson and Holling (2002) engage in a "quest" for a theory to find unity between social, cultural, and natural systems in *Panarchy: Understanding Transformations in Human and Natural Systems*. The "quest" for a unifying theory guided by the principle of simplicity seeks to integrate economic, ecological, and institutional systems on the one hand, and to encompass space from local to regional to global and time from months to millennia on the other. Drawing their inspiration from the Greek god Pan, they describe interplay of the three interacting systems as *panarchy*. This theory of *panarchy* contains the notions of dynamic systems with unpredictable change, cross-scale hierarchies of structures that enable adaptive responses, and of interdisciplinarity. The theory views nature as an adaptive and evolving complex system (Gunderson and Holling 2002: 3–22). The idea of *panarchy* provides the basis for some valuable case studies which reiterate the idea that theories are grounded in specific contexts, as discussed by Bateson (2002), Geertz (2000), Jacob (1982), and Sorokin (1962). *Panarchy* differs from these previous works in its emphasis on economics as a separate system. The concept of adaptive cycles is valuable and noteworthy. Within an adaptive cycle three properties – potential, connectedness, and resilience – determine the dynamics of change. "*Potential* sets the limits to what is possible – it determines the number of options for the future. *Connectedness* determines the degree to which a system can control its own destiny, as distinct from being caught by the whims of external variability. *Resilience* determines how vulnerable a system is to unexpected disturbances and surprises that can exceed or break that control" (Gunderson and Holling 2002: 62). Novelty in adaptive capacity is related to building on and re-integrating existing components to provide new paths and opportunities.

2.8. Summation

The objective of this chapter has been to discuss recent literature about the relationship between biological and cultural diversity that falls within a

larger framework of the study of human ecology. We have discussed the following key ideas:

- Human ecology draws its inspiration and defining characteristics from ecology.
- Like ecology, human ecology is a science of community utilizing the concept of holism – where all things are connected to a greater 'whole.'
- The ecosystem forms the organizing unit of that 'whole' connecting the biotic as well as the abiotic.
- As ecology is the science of relations between organisms and their environment, human ecology makes the human community the central focus of these dynamic and complex interconnectivities.
- Human ecology aspires to be interdisciplinary, to examine complex and interacting systems, to respond to a wide variety of cross-cutting issues of societal relevance, and to be applied to nature.
- Historically, human ecology gained a foothold in the disciplines of the social sciences rather than the biological sciences.
- Ecology, when it commemorated the ninetieth year of its founding in 2005, could no longer ignore human dimensions of environmental relations.
- In the new millennium, human ecology promises to be the 'third culture' linking the sciences and social sciences.
- The main obstacles to the development of this third culture are disciplinary self-interest and a fragmented understanding of human relations with the environment.
- Recent literature on the relationship between biological and cultural diversity illustrates yet another attempt to underscore the need and significance of human ecological perspective.
- It seeks to bring about a 'consilience' between the biological and social sciences and driven by the concept of diversity.
- Diversity is employed to make a case for conservation of biological life and cultures in the face of mass extinction.

- Historically the concept of diversity is associated with both positive and negative qualities.
- These varying perspectives are informed by Judeo-Christian creation narratives.
- The core of biological diversity is adaptation and variance which open up to unforeseen possibilities.
- The word 'biodiversity' carries with it a wonder at the variety of life and a concern for its extinction.
- In order to tinker, evolution needs all the parts.
- Cultural diversity is equally magnificent and threatened.
- Evolution of complex beings like humans is informed by both biological as well as cultural factors.
- Language may be a proxy for culture and expresses an ecological outlook.
- The loss of linguistic diversity is at least as dramatic as the loss of biological diversity.
- The link between biological and cultural diversity lacks the force of context specificness and is vacant of meaningful interconnectivity, which is essential to maintaining overall diversity.
- Social change is an important ingredient in the discussion of biological and cultural diversity.

While human ecological thinking seeks to unify and transcend disciplinary boundaries, it suffers from fundamental weaknesses. Primary among these is the nature-culture divide. This conceptual failing gives rise to additional flaws such as the balance of nature or equilibrium perspective, determinism in the form of cultural materialism, and the fetish for averages at the expense of variance. The flaws are mirrored in the language-species model which has been used to illustrate the relationship between biological and cultural diversity.

The species and language binary is an error in logical typing. Biology and culture are not equal types. Culture emerges from a biological basis – it is an aspect of nature. Cultural diversity emerges from biological diversity.

The species and language binary is a critical error because it reveals a separation between culture and nature in the minds of the proponents of the species language-link, the very gap they seek to close. The objective is to study nature-culture relations so as to conserve both, not to equate them. The species-language model is parametric and does not reveal a relationship between biological and cultural diversity. Relationships form between discrete events, not averages.

There is a gap in understanding the relationship between cultural and biological diversity. Some scholars have asserted that there is such a relationship and offer examples to illustrate its nature. They have not developed an approach to illustrate the relationship that can withstand basic scrutiny. This gap in understanding is largely due to three factors: (1) scholars feel pressured to illustrate this relationship in order to preserve biological and cultural diversity, and therefore, they take intellectual shortcuts due to the sense that time is running out; (2) this is a relatively new area of transdisciplinary (interdisciplinary) research, so it takes time to develop a systematic body of ideas; and (3) it is one thing to promote multidimensional analysis in theory and quite another to actually deal with the cumbersome nature of such an analysis and meaningfully undertake it in the field. In spite of its good intentions the species-language model is seriously flawed.

CHAPTER 3

Human Ecology Reconceptualized: A Lens for Relations between Biological and Cultural Diversity

To see a World in a Grain of Sand

And a Heaven in a Wild Flower

Hold Infinity in the palm of your hand

And Eternity in an hour (Blake 1991: 333).

3.1. Introduction

A reconceptualization of human ecology provides the path to the complex interconnectivity between the biological and cultural. Considering the division between ecology and human ecology, the biological and cultural, the need for integrating ecological thinking in the social sciences is undoubtedly compelling. The task, however, is fraught with challenges that threaten the foundations of disciplinary thinking and, worse still, rattle the 'iron cages' of academic self-interest. These 'iron cages' of disciplinary myopia

essentially remain the same even as one hegemonic dogma replaces another. William Blake expresses it aptly: "The hand of Vengeance found the bed to which the Purple Tyrant fled; the iron hand crush'd the Tyrant's head and became a Tyrant in his stead" (Blake 1991: 332). The current undertaking for reconceptualization of human ecology does not offer a grand unifying theory. The aims of this work are more modest and practical. First, it seeks to conceptualize indigenous human ecology in the Arctic and sub-Arctic in a way that is relevant to its context. Second, it does so without losing sight of the relations between biological and cultural diversity.

The context of the Arctic and sub-Arctic is important for significant reasons:

- It is culturally and biologically diverse;
- Its cultures have retained the fundamental threads of their traditions despite dramatic social change; in other words, they see, interact, and relate with the world with different socio-cultural premises;
- There is hope through applied and collaborative research with the people of these regions that humanity as a whole may benefit;
- There is an established history of indigenous communities working with and teaching southern researchers;
- The potential for continued mega-project resource development initiatives such as gold, diamonds, natural gas, oil, and fisheries represent the interface between technological industrial thought and needs with another human endeavour founded on values of biological and cultural holism;
- The region is a microcosm of issues that face humanity in the third millennium such as indigenous rights, globalization, impact of chemical pollutants, global climate change, use and abuse of renewable and non-renewable natural resources, militarization, etc.;
- Most of the critical thinking in the social sciences is devoted elsewhere and does not attend to the participatory research this region and its peoples require; and

- There is restructuring of international relations with the decline of the Soviet Empire and the rise to economic hegemony of neo-liberalism.

From such a vantage point the value of reconceptualizing human ecology may be also useful in high latitude alpine as well as other indigenous contexts. At the dawn of the twenty-first century, the Arctic and sub-Arctic and its peoples are not as remote as they may have seemed a hundred years ago. Nor are the social and ecological concerns in the circumpolar north inconsequential. They are, in fact, relevant to all of humanity.

3.2. Human Ecology for the Arctic and Sub-Arctic

In the circumpolar Arctic and sub-Arctic, human ecology describes the relationships between people and their environment. It includes the relations between humans and other animals, plants, and their habitat (Juzek and Mehrtens 1974: 4; Kassam and the Wainwright Traditional Council 2001: 3–4). Human ecology addresses subjects such as population growth, pollution, wildlife management, technological development, and use of non-renewable and renewable resources.

According to Molnar and Molnar (2000: 8–9) there are four central elements to human ecology that are distinct, but not mutually exclusive. These are diet, disease, demography, and development. These categories are necessary for understanding human survival. First, diet relates to dependence on nutrients for energy, growth, and basic preservation. The quality and quantity of food affects factors such as health and lifespan. Second is disease, which is related to nutrition. Detrimental changes in the environment affect human survival. For instance, malnutrition, pathogenic organisms, and exposure to pollutants can affect the health of humans. Equally, the ability to mitigate the effects of disease also impacts human health. Third, demography, the study of the nature of population, its structure and composition from generation to generation, is also affected by diet and disease. Development, the fourth element, links all the previous categories as it uses the various features of the environment including natural resources as a means for human survival and cultural existence.

For instance, the influenza epidemics of 1902 and 1918 illustrate the collective impact of diet, disease, demography, and development. As a result of increasing contact with Euroamericans, influenza significantly reduced Inuvialuit populations in the Canadian western Arctic. Combined with the depletion of coastal caribou herds, the reduction weakened Inuvialuit resilience in the face of dramatic social change. In the 1930s, due to developments in communication technologies and increasing globalization, the Canadian government introduced reindeer herding to the western Arctic, using Siberian reindeer herds stationed in Alaska and Sami reindeer herders from Norway (Robinson and Kassam 1998). For the Canadian government this was a way to 'civilize' hunting and gathering culture by encouraging the Inuvialuit on the 'path of development' to agriculture. For the Inuvialuit it was a matter of survival under the stress of disease, famine, and dramatic change.

The globalizing or expansionary tendency of agro-industrial culture simultaneously linked the Inuvialuit to Siberia at one edge of the circumpolar world and to Norway at the other extremity. As a result of the contact, there has been intermarriage between two indigenous Arctic communities, the Sami and the Inuvialuit, and there has been interbreeding between caribou and reindeer. A reindeer herd remains in the Canadian western Arctic and is maintained by an Inuvialuit-Sami family. The combination of diet, disease, demography, and development has permanently affected the human ecology of the Western Canadian Arctic.

Human ecology is simultaneously a function and a narrative of human beings' developing a socio-cultural system on the foundation of nature. Therefore, social institutions, including political decision making, have a key linkage to human ecology as it has a bearing on human-environmental decisions. It is not a coincidence that the largest global political organization, the United Nations, has an organ, the Secretariat on the Convention on Biological Diversity, devoted to issues related to ecosystems and human ecology world-wide. Thus, human ecology includes the implications of human activities and their cultures on the environment: harnessing energy in all its forms both renewable and fossilized; development and utilization of technology in all its dimensions; and the dynamics and density of population, all of which have an impact on the natural world.

In the context of the circumpolar Arctic and sub-Arctic, indigenous human ecology goes beyond the etiology of diet, disease, demography, and development as described by Molnar and Molnar (2000). Such Cartesian causal mechanisms are not sufficient. Furthermore, unlike the language-species model discussed in chapter 2, a conception of human ecology, which acknowledges that genotype, environment, and phenotype combine to act in a circuit of interactions, is essential (Lewontin 1974; 1982). Such an approach recognizes complex connectivity and avoids the instrumentalism of lineal thinking. Lineal thinking engenders teleological fallacies where a predetermined end dictates the process and ignores all other factors so as to validate the hypothesis or proposition (Bateson 2002). The species-language approach does not reveal the multiplicity of relations between organisms and their environment. When we speak of human ecology, we are not engaging in a linearly determined genealogical notion of *relatedness* (or kinship), but rather the progenerative idea of an all-encompassing connectedness of *relationships* (or kindred).

Subsistence hunting is related to basic needs and these needs are culturally defined (Sahlins 2000). Therefore, subsistence hunting is seen as a social construct based on culturally determined needs. In the Arctic and sub-Arctic, this relationship is reciprocal. Subsistence hunting is not only culturally bounded by needs, but in turn, it also informs the social structures of the indigenous communities that undertake this activity. The relationship between the activity of subsistence hunting and cultural expression is dynamic, intimately interconnected, and symbiotic. For instance, historical sources on the Inuit of Pelly Bay indicate that collaboration in subsistence activities and food distribution was not only a necessity in the strategy of hunting and fishing, but a "recognised behavioural norm." These activities were not only achieved by social cohesion, but were undertaken to reinforce social cohesion (Balicki 1970). With technological change and the introduction of the wage economy, one would expect that social cohesion in subsistence hunting communities would be undermined if it were purely for necessity. However, Stevenson (1997) examined the historical records of the Cumberland Sound Inuit and the Copper Inuit and acknowledged that contact with Euroamericans produced some changes as a result of technology, such as the rifle and the penetration of the market economy.

It encouraged individualizing tendencies among the Inuit, but overall there was not significant change to Inuit social structure and self-identity. In short, subsistence hunting is not only what one lives *on*; rather, it is also what one lives *by*, because it sustains the life of a culture. Brody (2000) uses the seemingly contradictory phrase "individualistic egalitarianism" to describe the behaviour of hunters. On the one hand, people have the right to do their own thing. On the other hand, they have a responsibility to share the success of the hunt. The *Nalukataq* festival after a successful whale hunt is an excellent example of this. In the actions of hunters, this cultural norm of egalitarianism mitigates the potential for social conflict created by market-oriented values with their emphasis on individualism. In essence, difference in an individual's ability does not mean there has to be a difference in well-being of members of the community as a whole (*oikonomia*).

There are five factors in demonstrating the deep connectivity between the biological and cultural that requires explanation:

1. Perception (section 3.3);
2. The notion of relations in hunting and gathering cultures (section 3.4);
3. The role context provides in framing those relations (section 3.5);
4. The development of experiential knowledge, knowing *how*, or practical wisdom (*phronesis*) that informs indigenous human ecology (section 3.6); and
5. An interpretation of human ecology viewed through the prism of indigenous knowledge (section 3.7).

3.3. Diversity and Perception

While culture and nature are betrothed, they may seem unmarriageable (Stewart 1975). Gregory Bateson's *Mind and Nature: A Necessary Unity* (2002) makes it possible to conceive of human ecology as a rigorous science

that embraces humanity's relation to its physical environment and its mental relation to its informational environment.

This insurmountable division simply fades to reveal what has been intuitively obvious to many cultures across the world – the continuous thread between nature and culture.

Diversity is the foundation of sensory perception and is the basis of knowledge. Perception is achieved by recognition of difference. Human sense organs fundamentally perceive by differentiation. This characteristic is shared by human beings with all other organisms. Otherwise perception is not possible. If perception is not possible, there is no knowledge. Sensory organs perceive 'things' to be separate from other 'things.' These 'things' are made *real* by their relationship with other 'things.' The nervous system enables biological reality by allowing an organism to process incoming information about a possible world for use in everyday life (Bateson 2002; Jacob 1982). Diversity is therefore the basis of our consciousness and ultimately makes us human. To corrode diversity implies an alteration in our humanity. "We mold our 'reality' with our words and our sentences in the same way as we mold it with our vision and hearing" (Jacob 1982: 58). In short, sameness does not produce relationships, and without relationships there cannot be understanding.

The notion of diversity asserts a pluralistic world – an earth made up of relations between many interacting things. Conservation of diversity is not just an ideal to strive for, but a practical necessity. In fact, in the twenty-first century it is urgent for the survival of humanity and all life on this planet.

3.4. Relations

Among the indigenous peoples in the Arctic and sub-Arctic, ideas about nature are supported by their social system; conversely, the social system is supported by their ideas of nature. Their view of nature and the social system is doubly guided and interrelated. These relations extend to other organisms. The word 'animal,' is derived from *animus*, meaning "endowed with mind or spirit" (Bateson 2002: 5). Tim Ingold (2000) explains that among subsistence hunting cultures the idea of person is combined with that of

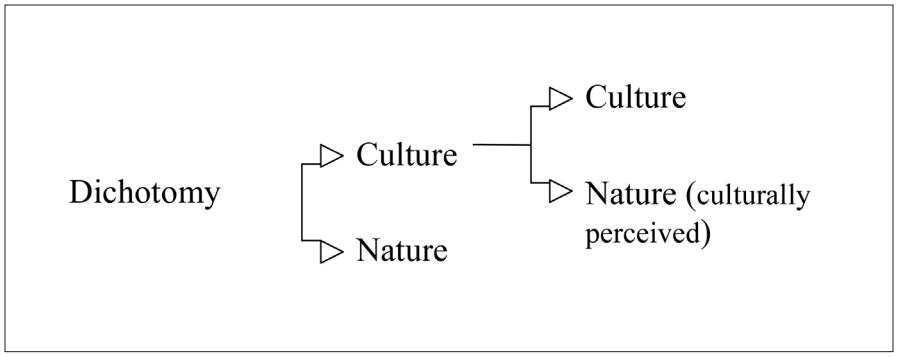

Figure 3.1: The Binary of Nature and Culture.

an organism. Therefore, relational thinking is extended beyond persons as cultural subjects to all organic life. "For if every organism is not so much a discrete entity as a node in a field of relationships, then we have to think in a new way not only about the interdependence of organisms and their environments but also about their evolution" (2000: 4). Therefore, in the hunt, the bodily substance of a caribou or whale is not taken, it is *received* (Bodenhorn 1990; Ingold 2000; Thorpe et al. 2001). This is the context that gives meaning to the direct experience of the hunter.

In such a context the binaries of culture and nature (as represented in figure 3.1) are irrelevant. A dichotomy between culture and nature leads to a perception of nature mediated through culture.

Being hunter and gatherer involves "active, practical and perceptual engagement with the constituents of the dwelt-in world." Ingold continues:

> The contrast, I repeat, is not between the alternative views of the world; it is rather between two ways of apprehending it, only one of which (the Western) may be characterized as the construction of a view, that is as a process of mental representation [figure 3.1]. As for the other, apprehending the world is not a matter of construction but of engagement, not of building but

> of dwelling, not of making a view *of* the world but of taking up a view *in* it (2000: 42).

In such a world, human beings are not composites of body and mind, but undivided beings, what Ingold calls "organism-persons" (2000: 47). The organism-persons relate to other humans, and non-human agencies, as well as inanimate entities in their environment (see figure 3.2). Therefore, in these spheres of connectivity there is no separation, but contextually delimited segments of a single ecological system. This notion of relations in active engagement within the world is the basis of human ecology of indigenous peoples in the Arctic and sub-Arctic.

Ingold argues that plants and animals, human and non-human, are all organisms. Furthermore, the organism should not be thought of as containing life, or expressing it, but as emergent within the life process itself. "As beings, persons *are* organisms, and being organisms, they – or rather we – are not impartial observers of nature but participate from within in the continuum of organic life.… that is, of restoring human beings to the organic lifeworld in a way that does not, at the same time, reduce them to mere objects of nature" (2000: 90). "The notion that persons, as beings in the world, can appear in both human and other-than human forms may sound strange, but it is not half as strange as the notion that to become a person – to be in a position to know and reflect upon the nature of existence – means taking oneself out of the world" (2000: 95). Whether Ingold's description of non-humans as persons is outrageous to an agro-industrial culture is beside the point. The fact remains that in the context of diverse cultures in the circumpolar north, many acknowledge the existence of non-human persons.

A being 'is' not because of a certain property contained within, but by its 'relation' in a continuum of beings. Context is the relational field where the being is experienced (Ingold 2000: 97,105). Experience of the world does not separate mind and nature. A person's total sensory involvement in an environment is intrinsic to the ongoing process of being alive to the world.

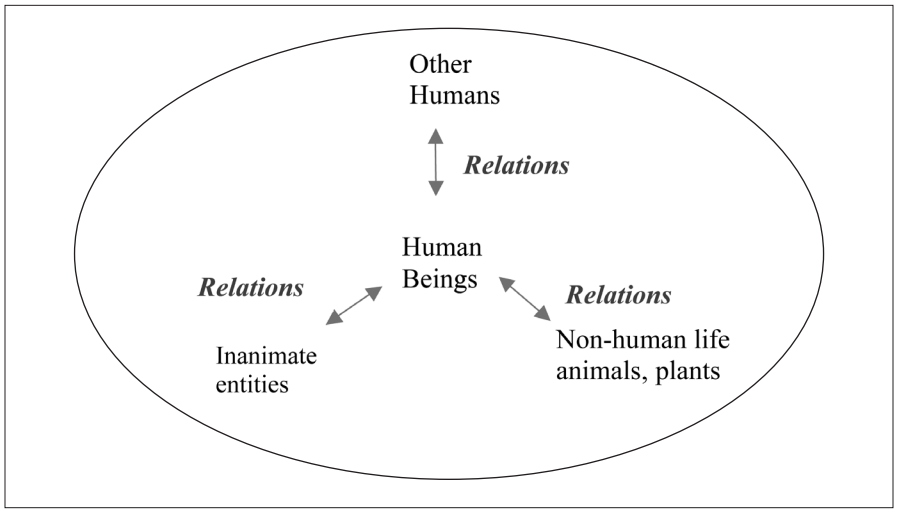

Figure 3.2: The Concept of Human Ecology Illustrated.

3.5. Context Provides Basis for Relations

As noted earlier, perception is achieved by recognition of difference. Diversity is basic to mental perception. Otherwise perception is not possible. There is no objective experience. Experience is mediated through sense organs and is therefore subjective because it is perception. This idea is contained in the root word for knowledge, *gnosis*, meaning knowledge by direct experience. The process of perception is inaccessible, but the product is accessible. We observe actions. The division of the perceived universe into parts and wholes is convenient and may be necessary. But necessity does not determine how it is done. Explanation grows out of description and the description carries arbitrary categories. This explanation is what provides meaning or culture. If perception is not possible, however, there is no explanation, and therefore, there is no such thing as knowledge and no culture.

Learning is achieved in a context. Context is understood in two forms: spatial and temporal. A context provides the basis of narrative – as a pattern which connects. These patterns are dynamic. Context brings out relationships (Bateson 2002: 15). Meaning is revealed through relationships.

The study of culture is less experimental and more interpretive than other sciences. Clifford Geertz (2000) takes a semiotic approach to the study of culture, describing it as an interpretive science dealing with the webs of significance spun by humans. These interworked systems that comprise a culture take place within a context. An ethnographic description of culture is "thick" in its complex specificity and circumstantiality. Context in a pattern of social relations is fundamental to theoretical formulations of culture. Geertz maintains that cultural diversity goes beyond its mere garb, appearance, or setting and defines humanity as various in both its essence and expression.

It is the particularities that reveal the universal in the same way that small facts reveal large issues.

> The aim is to draw large conclusions from small, but densely textured facts; to support broad assertions about the role of culture in the construction of collective life by engaging them exactly with complex specifics (Geertz 2000: 28).

The universal may only be approached through recognition of the particular, which is varied in different contexts. The reverse is not possible, and to argue otherwise is myopic and motivated by an illusory monism. In other words, small facts hint at big truths. This was a characteristic of the development of the theory of evolution when Alfred Russel Wallace and Charles Darwin challenged the notion of special creation. Wallace and Darwin were influenced by specific contexts (namely islands in different parts of the globe) as they developed the concept of evolution. Through fastidious observations of the island milieu Wallace and Darwin arrived at a theory (Darwin 1996; Quammen 1997).

Similar processes preceded the revolution in physics when Galileo challenged Aristotelian modes of thought. The quantitative tendency in modern physics is associated with a desire to achieve a full description of concrete actuality. Aristotelian thinking engages in excessive valuation of the general rather than the particular. In Aristotelian thought the individual event seemed fortuitous and unimportant, whereas in Galilean thought it is significant. In Aristotelian thought lawfulness is determined when

events recur regularly. Frequency determines lawfulness and reveals the essential nature of events. However, in Galilean thought and what became modern physics, lawfulness is not determined by regularity or frequency, but is characteristic of every physical event. The dynamics of a process are derived from the concrete individual to the concrete situation (Lewin 1935). The famous refrain of the English poet William Blake, "To see a World in a Grain of Sand and a Heaven in a Wild Flower," has deep resonance with the idea that the particular provides a glimpse into the universal (Blake 1991).

3.6. Knowing

In many respects, the acknowledgment of indigenous knowledge by scientists working in northern regions or more remote regions of the globe resembles Baconian empiricism, where "truth is found in nature, not books." The recognition of the value and contribution of indigenous knowledge is a breakthrough over the hegemony of the expert much like that of the seventeenth-century craftsmen and artisans who broke through the class system and thus contributed to the intellectual revolution in which Galilean modes of thought prevailed over Aristotelian modes in physics (Berman 1984). Galilean modes of thought are the basis for modern empirical science. They bear a remarkable resemblance to indigenous knowledge. Both knowledge systems are functional and grounded in concrete experience (Lewin 1935).

The foundations of knowledge for hunter-gatherers is through revelation, *gnosis*, direct experience. By the practical act of hunting and gathering, the landscape with its fauna and flora enters directly into the constitution of persons, not only as a source of nourishment, but also as a source of knowledge. Therefore, knowledge from a relational point of view lies not in the heads of predecessors, but in the world that they point out to you. Knowledge is in the salient features of the experiential environment shared between generations. Living in the land ensures the continuity of the language that expresses that knowledge. Removing a community of speakers from the land cuts the language adrift from its generative source of meaning, its ecology (Ingold 2000).

3.6.1. Knowing how and knowing that

Knowing through direct experience is a key concept in philosopher Gilbert Ryle's *The Concept of Mind* (1984), in which he discusses the difference between knowing *how* and knowing *that*. The latter relates to finding out *that* something is the case, such as that the Iñupiaq word for the bowhead whale is *aġviq*. The former relates to finding out *how* to do something, such as the method of walking across thin ice. In the context of understanding whether (knowing *that*) climate change is taking place, we must ask *how* the performance of tasks on sea-ice by the Iñupiat of Wainwright is being affected (see chapter 5). Knowing *how* is embedded in experience – it is contingent. It is gained through performance. In other words, in action intelligence is displayed. In the performance of an act knowing *how* is manifested. An individual who is bodily active is also mentally active. Thought is not separated from action and it is not simply habitual practice; a performance is an intelligent practice because each action is modified by its predecessor. It is reflection-in-action (Schön 1983). As a result an Iñupiat hunter is able to proceed in uncertain and possibly unique situations.

Because learning is involved with each act, activity is tantamount to the movement of the person through the world. In order to understand knowing *how*, a particular type of competence is required. Just as the intelligent performer acts critically, the intelligent spectator must follow critically because learning *how* is not like learning *that*. Knowledge in the case of learning *how* is not imparted; it is experienced. Iñupiat knowledge of sea-ice is experiential. Richard K. Nelson in his *Hunters of the Northern Ice* (1969) expresses the depth of Iñupiat knowledge of sea-ice that practically expresses experiential knowing:

> The Eskimos [Iñupiat] have developed an ability to predict movements from their knowledge of the peculiarities of each type of wind and each flow of current, so that for any combination of the two they can make a reliable forecast of ice safety. This knowledge is very subtle and is difficult to acquire, especially without a full understanding of the Eskimo language [Iñupiaq] and many years of actual daily experience with these phenomena (Nelson 1969: 41).

In light of this and the relational nature of indigenous human ecology, language is not so much what lies within persons, but between them (Brody 2000).

One has to be brought up in a particular language and environment to see the world as the Inuit see. Language is related to daily practice through memory. Memories are formed through the function of the senses. Memories are generated and forged through the movement of persons in the course of day-to-day activities. This is easily conveyed through the Inuit words for ice and snow. These complex words for snow and ice are necessarily nuanced to enable decision making and prediction on when to travel and hunt. The difficulty in understanding these concepts or terms is not an issue of incomprehensibility, but unfamiliarity (Brody 2000). This is because this type of knowledge is experienced on the ground, as it were. It is not learning from books, but learning from the experience of living from and on the land and sea. It is knowing *how* as opposed to knowing *that*. It is knowing how to survive on sea-ice, rather than just knowing *that qaqudluk* is fulmar (Ryle 1984). In other words, it is possible to learn another language. However, there are limits to what translation can achieve. Learning *how*, that is, critically following the teacher by living with the people, is a way to achieve knowledge. Brody recounts his experience learning Inuktitut:

> When I had asked Anaviapik to teach me Inuktitut, and when he said he was eager to do so, I had thought we were talking about words and grammar [knowing *that*] about speaking, while he had supposed we were talking about a way of being [knowing *how*]. He had embarked upon the task of teaching me how to do and to be *Inuk-tituk*, 'in the manner of an Inuk.' Anaviapik had always known what it would mean to learn his language (Brody 2000: 64).

In essence hunter-gatherer knowledge is dependent on an intimate physical connection with the world and the creatures that live in it. This intimacy enables a comprehensive understanding of the local environment. Knowing *how* is inductive and intuitive. It emerges by allowing all that has been learned to process itself. It is more sophisticated than linear logic because

it assigns weight to multiple factors in the act of hunting and gathering. Knowing *how* illustrates the contextual relationship between cultural and biological diversity. It is the human ecology of an area.

3.6.2. Performance

Dreyfus and Dreyfus (1986) developed a model for the learning process. As the title of their work, *Mind over Machine*, suggests, there are aspects of the unity of the human mind-body in action that a machine cannot learn to do. Gilbert Ryle also sought to deal with the "dogma of the Ghost in the machine" (1984: 22), dismissing the idea that the body and mind are separate like a machine. Knowing *how* and knowing *that*, as presented in the previous section, are not real binaries. The two forms of knowing were compared and contrasted in the previous section for the sake of understanding. However, this dichotomy is artificial.

While using the idea of knowing as explained by Gilbert Ryle (1984), Dreyfus and Dreyfus do not acknowledge, nor do they directly link, his contribution to their model of learning (1986: 16–19). Whatever the reason for this oversight, combining the two approaches provides a textured and nuanced understanding of the interrelationships between knowing *how* and knowing *that* in the process of learning. By asking how people acquire knowledge and skill, Bent Flyvbjerg (2001)[1] builds on the work of Dreyfus and Dreyfus in showing how learning is achieved in the social sciences and illustrating the relationship between context and knowledge. The Dreyfus and Dreyfus model consists of five levels of the learning process.

1. The *novice* learns context-independent facts and rules necessary to the performance of action or of a skill. A novice would judge her own performance on the basis of context-free rules. While the rules are necessary to gain experience they quickly become a barrier for the novice to overcome (Dreyfus and Dreyfus 1986: 21–22; Flyvbjerg 2001: 11,20).

2. The *advanced beginner* gains real life experience recognizing its link to the concrete and dependence on context. The beginner learns to interpret on the basis of concrete

experiences by gaining from the situation (Dreyfus and Dreyfus 1986: 22–23; Flyvbjerg 2001: 12,20). These first two stages are characteristic of Gilbert Ryle's (1984) learning *that* and knowing *that*.

3. The *competent performer* has a fluidity that illustrates adaptation to the concrete situation. There is a relationship of involvement between the performer and the context. The performer feels responsible and attached. There is greater consequence for the performer's actions than in the first two stages. Therefore, there is an element of interpretation and judgment exercised by the performer. The competent performer is involved in making a choice of goals and plans for the basis of their actions. The decision making is increasingly context-dependent. From this stage there is a qualitative jump from analytical problem solving to genuine, human expertise as experienced in the last two stages of the learning process. Analytical rationality, while necessary, is slow compared to the bodily involvement, speed, and intimate knowledge which are characteristic of the last two stages (Dreyfus and Dreyfus 1986: 23–27; Flyvbjerg 2001: 13–15, 20–21). This is the transition phase between Gilbert Ryle's (1984) knowing *that* and knowing *how*. It is the stage of learning *how*.

4. The *proficient performer* decides in a more continuous, not sequential, manner, without needing to choose goals or reflect on alternatives. Previous actions inform current performance. Analytical decision making is combined with intuitive involvement (Dreyfus and Dreyfus 1986: 27–30; Flyvbjerg 2001: 16, 20). Intuitive involvement and understanding is synonymous with knowing *how*.

5. The *expert* has reached a level of proficiency where intuitive involvement grows into synchronous and holistic action. Cumulative practice and concrete experience are central

> to the achievement of expertise. Here intuition relates to experience that is, bodily, emotional, and intellectual. It is performance at the point of virtuosity. The expert acts from a holistic understanding, not through forethought. For experts, problems and solutions are not separate categories because their skills are part of themselves; their bodies and the separation between subject and object disappears. The performance is fluid and effortless (Dreyfus and Dreyfus 1986: 30–36; Flyvbjerg 2001: 17–21). This is the end goal of the learning process.

The first three stages are rational in that they relate to calculation or reasoning out of action based on context-independent behaviour. The last two are arational, where context is relevant to knowledge and development of skills; they are situational and experience-based. The Dreyfus and Dreyfus model shows that the rational mode of thinking, because it is rules-oriented and based on formal logic, recreates human characteristics that are close to machines. It is, however, inadequate in explaining the total spectrum of human activity. It is a fallacy to raise rationality and analysis to the supreme level of human activity because this would exclude context, judgment, practice, trial and error, experience, common sense, intuition, and bodily sensation (Flyvbjerg 2001: 22–23).

With respect to the learning process, the use of the ideas of Dreyfus and Dreyfus (1986) as well as Ryle (1984) in tandem provides valuable insights into knowledge generation and consequently into indigenous human ecology in the Arctic and sub-Arctic (see table 3.1). Human ecology is ultimately the process of *living through* relations with biotic and abiotic elements within one's environment. It employs the complete human, body and mind, in an intuitive, knowing *how* to live.

Table 3.1: A Summary and Consolidation of the Models of Knowing

Dreyfus and Dreyfus	Ryle	The Learning Process
Novice	Learning *that*	Knowledge is imparted (context-independent)
Advanced beginner	Knowing *that*	
Competent Performer	Learning *how*	Knowledge is by experience (context-dependent)
Proficient Performer	Knowing *how*	
Expert		

It is important to keep in mind that for the hunter, this process is cumulative and iterative and not a linear progression or an arrow, but more like a feedback loop or circuit building on the experiences of the performer.

3.6.3. Phronesis

Aristotle (2004), in *The Nichomachean Ethics*, identifies three intellectual virtues. Chief among these virtues is *phronesis*, or practical wisdom. The other two are *episteme*, scientific or demonstrative knowledge, that is context-independent; and *techne*, which is context-dependent knowledge that is necessary in order to make things. These three forms of knowledge, while distinct, are not mutually exclusive. Instead they are co-dependent to the learning process.[2]

It should be noted that the earlier criticism of the parametric universalistic and naturalistic Aristotelian mode of thought as compared to Galilean mode of thought in physics is linked to Aristotle's *Physics* and *Metaphysics* (1998) rather than his *Ethics*. The notion of *phronesis* is primarily drawn from his discussion of intellectual virtues in his *Nichomachean Ethics* (2004).

Phroenesis is practical wisdom that is marked by reflexive analysis in which cultural values are contributing factors. It is knowledge of *how* to secure the ends of human life. It involves daily praxis, pragmatic action, context-dependent knowing based on variable factors. This virtue is closely tied to the idea of *oikos*,[3] the root word of both ecology and economics, meaning the management of the household, community, or state (Aristotle 2004: 150). *Phronesis* requires the interaction between the general and the

particular, judgment and choice; it is concrete and related to experience. It takes into account the universal through the particular.

The process of learning viewed as *phronesis* is instructive about the process of knowledge generation, acquisition, and application. In this sense any form of knowledge generation, scientific or indigenous, is ultimately not context-independent. Paul Feyerabend (2002) in *Against Method* argues that events, procedures, and results that constitute science have no common structure; there is not a standardized way. This implies that scientific knowledge or *episteme* is contingent before it is generalized. Furthermore, the 'public' can participate and contribute to the formation and expansion of human knowledge. "Still there are many things we can learn from the sciences. But we can also learn from the humanities, from religion, and from the remnants of ancient traditions that survived the onslaught of Western Civilization" (2002: 249).

Feyerabend elucidates the connection between idea and action, cosmology and empiricism, which is context-dependent. "Creation of a thing and creation plus full understanding of a correct idea of the thing are very often parts of one and the same process and cannot be separated without bringing the process to a stop"(2002: 17). He gives the example of the Copernican point of view, which ran counter to contemporary reason and experience, or Einstein's theory of general relativity. More recently, an example from the Arctic pertaining to research on the phenomena of Aurora Borealis illustrates that a 'pre-existing dogma' may be tested by what seemed like a naïve question from a graduate student. In the 1960s the process of auroral morphology seemed to have reached its limit and it seemed that there was nothing left to be done, much like Aristotelian physics before Galileo. Syun-Ichi Akasofu (2001), then a graduate student, developed a conceptual qualitative model by observation before quantitative analysis to open a new field on auroral substorms. He integrated ground-based and satellite research to topple a theory that was firmly entrenched with some considerable resistance from the established scholars.[4]

We will now briefly return to the idea of human agency through reflexivity and the potential of social change (section 2.6.2). The context-specificity of culture points to the dependence of humanity on extra-genetic mechanisms for governing behaviour. The distinction between generalizations

and explanations when looking at consequences of behaviour needs to be closely examined. There is a diversity of explanations and generalizations based on actions informed by a people's knowledge and beliefs. Human ecologists must be able to move freely between explaining human actions and their non-human consequences. Therefore, a study of consequences can be a guide to behaviour and the study of behaviour can be a guide to consequences. Generalizations and case studies are not divorced from each other. Not only do generalizations need to be supported by case studies, but case studies require the use of generalizations (Vayda 1988).

Therefore, context-dependence does not mean just a more complex form of determinism. It is an open-ended relation between contexts, actions, and interpretations. It is a form of double-loop learning (Argyris, Putnam, and Smith 1985). Flyvbjerg summarizes well when he writes: "The rules of a ritual are not the ritual, a grammar is not a language, the rules for chess are not chess, and traditions are not actual social behaviour" (Flyvbjerg 2001: 43). Sorokin (1962) and Geertz (2000) made a distinction between a cultural system and social structure. The thread between a cultural system and a social structure is reflexivity, the basis of human agency.

We must take into account the interpretations of self-reflecting humans. This is a double hermeneutic where both self-interpretation and the relation to the context studied explain peoples actions. Reflexivity, the ability of an entity to react back upon itself, is essential because it is capable of producing change. Flyvbjerg explains: "Stability cannot be achieved when that phenomenon which is the locus of inquiry (human activity) is both subject and object of science" (2001: 36). Reversibility in human action is possible through reflexivity and action – "Human practice and history … can be unmade, as long as we know how it was that they were made" (2001: 112).[5]

The major point here is that all knowledge generation is context-dependent – even *episteme*, before it is generalized and decontextualized. *Phronesis*, therefore, is not a state of knowledge, but a dynamic process within the framework of human ecological relations. The diagram (figure 3.3) below expresses the iterative process for the performer such as the subsistence hunter. The present articulation of *phronesis* emphasizes praxis or action-orientation. It also illustrates the fundamental role of reflection or deliberation in determining appropriate action. *Phronesis* also has ethical import;[6]

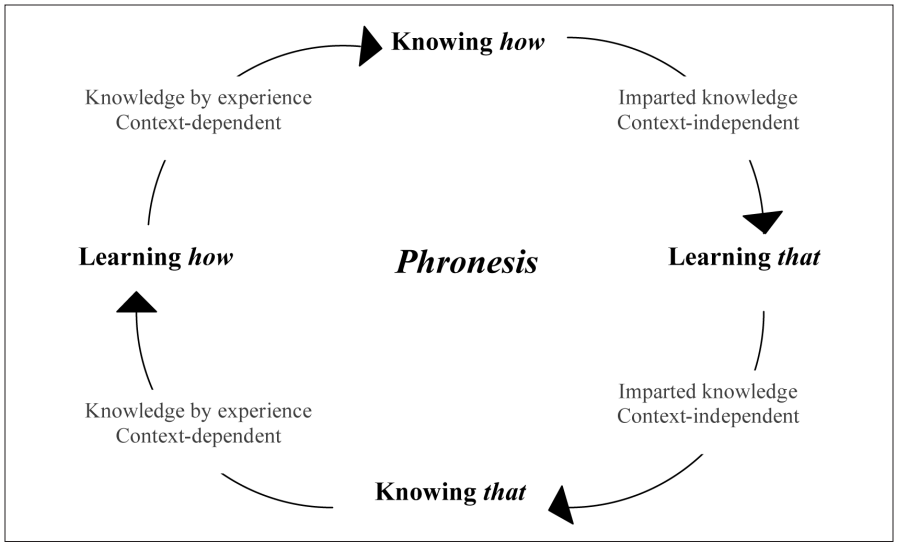

Figure 3.3: *Phronesis* Illustrated.

it is informed by the values which guide and inform action (Eikeland 2006). I will return in chapter 5 to the ways in which ethical values arising from the cultural fabric of the Iñupiaq inform subsistence activities in relation to sea-ice and climate change.

Aristotle maintained that we may grasp the nature of *phronesis* if we consider those who are adept at it (2004). With this humanitarian and participatory conception of knowledge we now turn to the understanding human ecology through indigenous knowledge.

3.7. Understanding Human Ecology through Indigenous Knowledge

In the Arctic and sub-Arctic, humanity has sustained itself over thousands of years because of *phronesis*. The perceptions of indigenous peoples who derive their livelihood and maintain their existence from the fruits of the

land and sea are worthy of reflection and consideration due to their sustainable and therefore successful relationship with their natural environment. While there is debate on the inherent tendencies of Aboriginal people to be environmentally conscious (Howard and Widdowson 1996; Nuttall 1998), the outcome of this discussion does not change the fact that indigenous communities in the Arctic and sub-Arctic have definite relationships with the natural environment. Those relationships contribute to a reconceptualization of human ecology based on the value and techniques of indigenous knowledge.

When engaging indigenous knowledge, the disciplinary boundaries of the biological and social sciences become permeable, requiring an interdisciplinary mindset. Various terms have been used for the knowledge of indigenous peoples. It has been labelled people's science, folk-ecology, rural people's knowledge, ethnoecology, ethnohistory, ethnobiology, ethnobotany, ethnoscience, local knowledge, traditional environmental knowledge, traditional ecological knowledge, simply traditional knowledge, indigenous ecological knowledge, and even indigenous technical knowledge (Agrawal 1995; Chambers 1991; Cruikshank 1998; Ellen and Harris 2000; Grim 2001; Johnson 1992; Kassam and Graham 1999; Kawagley 1995; Sillitoe 1998; Stevenson 1996). This list is by no means exhaustive, but it serves to make the point that there is a diversity of terms for indigenous knowledge. Furthermore, these terms are infused with ecological conceptions indicating the extent of indigenous peoples relations with their habitat. With regard to detailed observations of their habitat, the knowledge of indigenous hunters shares some important characteristics with science (*episteme*).

An understanding of human ecology in the Arctic and sub-Arctic is provided by indigenous communities who share their knowledge with university researchers and policy makers (Battiste and Henderson 2000; Ellen and Harris 2000; Kassam and the Soaring Eagle Friendship Centre 2001; Kassam and Graham 1999; Kassam and the Wainwright Traditional Council 2001; Kawagley et al. 1998; Knudtson and Suzuki 1992; Sillitoe 1998). Indigenous knowledge is best described by its attributes: context specificity, complex connectivity, empirical tendency, cumulative nature, and plurality.

3.7.1. Context specificity

As human ecology relates to a particular ecological region or ecosystem, indigenous knowledge is also context-specific, related to, and contained within, a group of people who live in a defined geographic region. Indigenous knowledge includes a web of relationships between humans, animals, plants, natural forces, spirits, and land forms. Therefore, social, ethical, and spiritual relationships also have an ecological foundation. Even family, clan, or tribal relations are influenced by the ecological system. For instance, the interchange between humans and whales is spiritual for the Iñupiat of Wainwright, Alaska. The emotional connection is highly intimate; suffice it to say, that before, during, and after the hunt prayers are recited for both the whale and the crew.

3.7.2. Complex connectivity

Human ecology is holistic in that it encompasses the interconnectedness within an ecological system and these relationships that form a greater whole. Similarly, indigenous knowledge arises from closeness to the land and the relationships with living things. In this sense, it grows out of a connection to the natural surroundings. It is obtained by the labour of living and experiencing the context, and not through book-learning. Indigenous knowledge is derived from a sense of kinship with or, more accurately, a kindred spirit with other living creatures, the land, the sea, and the spirit worlds. Knowledge in this context is derived fundamentally from the environment. As a result of the kindred spirit there is no separation between the biotic and abiotic or between renewable and non-renewable. These categories simply do not arise as there is an interrelationship between all forces and forms within the natural world. Furthermore, indigenous knowledge informs, and is formed by, the cosmology or world-view of a group of people. In this sense, it is intimately linked to their spiritual and ethical fabric, which has a holistic manifestation in practical day-to-day expressions. The ecological features of indigenous knowledge described above have clear social consequences. For instance, bowhead whale harvesting activities of the Iñupiat influence the relations between the captain of the whaling crew and his wife. Coinciding with the whaling season are numerous household traditions that must be upheld in order to have a successful whale hunt. The

captain's wife ensures the house is clean, as tradition states that a whale will not return to an unkempt house. As well, all food items are kept off the floor in a whaling captain's house for the duration of the hunting season to prevent a whale from going under the ice after being struck. The captain's daughters and other female community members help with the house-cleaning, but the men of the whaling crew – including the captain – are responsible for cleaning the cellar. The contents of the cellar are consumed at *Nalukataq* and Christmas feasts to make space for the anticipated whale. The *Nalukataq* festival is a metaphor of the human ecology of Iñupiat who hunt the bowhead whale. This is a community event, held shortly after a successful hunt. People gather not only to share from the harvest but also to give thanks to both the whale and the whaling crew. Social bonds among community members, and in turn with bowhead whales, are renewed and reinforced at the *Nalukataq*. In an Iñupiat community like Wainwright, Alaska whaling is more than just a major food source; it defines the cultural life of the community (Freeman et al. 1998; Kassam and the Wainwright Traditional Council 2001; Nelson 1982).

There is an important difference between the starting point of indigenous knowledge and the human ecological lens. Complex connectivity in indigenous knowledge is inherent; individuals perceive their system of knowledge as an indivisible whole. Whereas the human ecological lens begins with the separation between culture and nature and as a result of recognizing the interrelationship that comprises complex connectivity between cultural systems, social structures, and ecological contexts, it seeks to reframe itself to a holistic perspective. While this difference is subtle, it is important, because demonstrating the connectivity of cultural systems, social structures, and ecological context is the aim of this work.

3.7.3. Empirical tendency

The paradigmatic characteristic of indigenous knowledge as described in sections 3.7.1 and 3.7.2 is also combined with a practical empirical trait. Indigenous knowledge is observational, analytical, practical, and effective. Rather than exploring the biochemical or physiological makeup of plants and animals, it provides responses to such questions as: where are they found, what methods may be used to harvest them, and how can they be

utilized? Indigenous knowledge provides valuable and detailed insights into the ecosystem such as an understanding of the flora and fauna, climatic changes, and how plants and animals behave and interact with each other and are influenced by climatic or seasonal variations. Indigenous knowledge provides information on harvesting techniques, processing and storage of foods, and nutritional and medicinal value of various plants and animals and their different parts. In this sense, indigenous knowledge shares a common characteristic with scientific knowledge in that both are empirical.

However, the field sciences such as botany or applied chemistry differ from indigenous knowledge in the nature and exposition of this empirical quality. While the field sciences may convey the depth of knowledge in terms of structure of a plant or animal, indigenous knowledge expresses the breadth of relationships among plants, animals, and the environment. When combined they reveal a wider canvas of relationships that make up the human ecology of a region. For instance, current research on sea-ice and climate change in the Iñupiat Village of Wainwright, Alaska, illustrates how both forms of knowledge are contributing to a more comprehensive understanding of changes in the environment. Iñupiat hunters and whalers are in direct contact with sea-ice on a consistent basis. They have an intimate understanding of sea-ice formation, robustness, and breakup. They are able to observe and detect any changes in sea-ice conditions. Sea-ice itself is an important indicator of climate change. Synthetic radar-aperture (SAR) images from satellites provide a macro-perspective exposing information on time of sea-ice formation, break-up, and movements, provided the satellite is passing over the region at that time. When the micro-perspective or context-specific information through indigenous observation is combined with SAR imagery, the indigenous community members and researchers have a greater understanding of what is occurring to the whole (see chapter 5).

3.7.4. Cumulative

While indigenous knowledge is empirical it is also cumulative. It compels the holders of indigenous knowledge to be conscious not only of the wisdom and observations of their generation but of the generations that preceded them. This does not mean that tradition is fixed in a particular time or age. In fact, it is dynamic and adaptive. The holders of the knowledge do not

only have a perception of the pastness of the past, but also its presence. New ideas and approaches are quickly adopted if they are seen to benefit the people. Similarly, field sciences like ecology also have values and traditions which link this knowledge together from generation to generation (i.e., *phronesis*). This edifice is not static, it is an ark on a flowing river adapting to the changing currents and seasons while preserving a common theme. In human ecology and indigenous knowledge the common theme is humanity's relationship with its habitat. In Wainwright, Alaska, subsistence activities are carried in conjunction with both global scientific as well as local indigenous knowledge systems. In the process of hunting the bowhead whale traditional techniques and understanding of sea-ice, currents, and wind patterns are combined with use of aluminium boats, outboard motors, and modern communication systems. They are used together to meet the practical day-to-day needs of the community, such as survival and nutrition (Kassam and the Wainwright Traditional Council 2001; Nelson 1982). Therefore, it would be analytically sterile and factually inaccurate to separate scientific and indigenous knowledge systems. Both co-exist and interact in a finely intertwined web of complex relationships. Furthermore, both systems of knowledge demonstrate heterogeneity within themselves. Binary categorization ends up fixing these knowledge systems in time and place without regard to social context and the dynamic nature of knowledge (Agrawal 1995; Wenzel 1999).

3.7.5. Plurality

Finally, neither the knowledge nor its holders are homogeneous. Indigenous knowledge, like many knowledge systems, is sufficiently complex that it does not lend itself to terse and easy characterizations. This is why one can only speak of certain attributes of indigenous knowledge rather than providing comprehensive definitions. The degree to which an individual within a group may hold this knowledge varies with age, gender, social class, level of experience, linguistic ability, access to oral tradition, and even interest in the subject. Similarly, a field science like ecology is heterogeneous with a diversity of expertise and knowledge across a wide spectrum of issues and concerns.

3.8. Summation

This chapter has argued that human ecology can be reframed by placing it within a northern indigenous context. Even while taking into account criticisms such as the nature-culture dichotomy, the tendency toward balance-of-nature perspectives, and the fetish for averages at the expense of diversity, the potential for social change through human agency implies that reconceptualizing human ecology will further both scientific study and indigenous knowledge. In the Arctic and sub-Arctic context one does not undertake a change of intellectual garments and tools of understanding. Categorizations of Western versus indigenous ways of knowing end up being myopic and facile. Knowing, *phronesis*, is both humanitarian and participatory. It is context-specific and anthropocentric.

The key ideas covered in this chapter may be summarized in the following points.

- Diversity is the basis of sensory perception, and it is this characteristic that unites humans with all other organisms.
- Diversity defines our humanity and moulds our reality.
- The evolutionary development of sensory perception and mental processes within an organism is stochastic. We can predict in terms of the possible and even the probable but never bridge the gap to the actual.
- Human beings (including researchers) are not impartial observers of the natural world but participate within it utilizing mind and body.
- This participation is characterized by relations with other humans, non-human life such as plants and animals, and inanimate entities.
- Context provides the basis for these relations.
- Context is a story, narrative, pattern that connects, revealing meaning through relationship.
- Human ecology is interpretive where the particular speaks to the universal and small facts shed light upon large issues.

- Knowing is embedded in direct experience of the senses and therefore, within a specific contextual relation.
- Relationships become the basis of knowledge.
- Knowing *how* is a dynamic process through action and reflection that is not separate but is a simultaneous performance. It is one *intelligent* act.
- This type of knowing is *phronesis*, reflexivity in action, a double hermeneutic, where self-reflecting humans interpret the consequences of actions.
- *Phronesis* is a dynamic process involving a circuit of knowing *how*, knowing *that*, and learning *how*. It is the iterative movement from context-dependent, experiential knowledge to context-independent, imparted knowledge. It is approaching the universal from the particular and vice versa.
- Humanity has extra-genetic mechanisms for governing behaviour and this agency produces social change.

Paul Feyerabend, in his work *Against Method* (2002), explains that knowledge is contingent and furthermore that *idea* and *action* are combined. This has significant implications for research because it means that cosmological and empirical considerations are not separate. The analytical lens of human ecology informs both the understanding of the relationship between the biological and cultural, as well as the method by which to reveal these relations. It is, by definition, context-specific and therefore, could only be examined on a case-by-case basis. The research sites are the location and locality, situation and situationality, condition and conditionality from which we can understand the relationships between biological and cultural diversity. The elements of this reconceptualized analytical lens include: context, perception, diversity, relationships, and knowledge generation (Bateson 2002; Ingold 2000; Ryle 1984; Turnbull 2000). Most importantly, the process must be participatory to be considered genuine *phronesis*.

The individual case study provides access to context-dependent knowledge and facilitates learning *how*. The case study approach was central to Galileo's experimentation on gravity as well as development of Darwin's and Wallace's contribution to the theory of evolution. The case study is

central to understanding human ecology. In the next three chapters, we will explore different aspects of applied human ecology. Chapter 4 will explore the human ecology of Ulukhaktok (formerly Holman), Northwest Territories, Canada. This chapter will serve as an illustration of indigenous human ecology in the context of an Inuit cultural system functioning within the social structure of the Canadian market economy. Chapter 5 will focus on the process of *phronesis* in dealing with relevant issues of societal concern such as climate change in the Iñupiat community of Wainwright, Alaska, USA. It will show that knowledge is what lies between us and not within us. Chapter 6 will examine the mapping of indigenous human ecology. It will connect the sharing of knowledge to the exercise of power. It will demonstrate that power is not possessed but expressed through human ecological relations.

CHAPTER 4

"Man and His Friends" – An Illustrative Case of Human Ecology in Ulukhaktok, Northwest Territories, Canada

He prayeth well, who loveth well
Both man and bird and beast.
He prayeth best, who loveth best
All things both great and small;
For the dear God who loveth us,
He made and loveth all (Coleridge 1991: 189).

The Arctic Inuvialuit community of Ulukhaktok (formerly Holman), Northwest Territories, Canada, illustrates human ecology in all its dimensions. Before providing details on that community's current interaction with the environment, we need to review the three historical phases that have affected the human ecology of the region. With this background we can show how human ecology, in this case subsistence hunting and gathering, maintains specific cultural values such as sharing which in turn sustain the community through dramatic social change. While community participation is essential in the process of undertaking action research, without it the enterprise of generating human ecological knowledge would fail. This chapter only refers to its necessity while the next chapter explores it in detail.

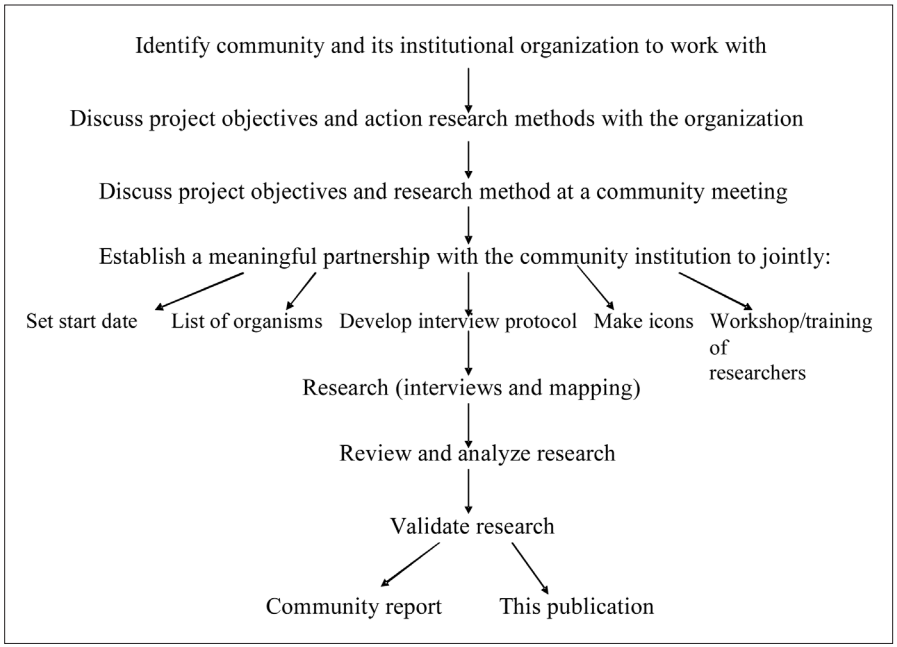

Figure 4.1: Steps to Human Ecological Research.

Community participation for the purpose of applied research requires a meaningful partnership. This partnership is where the researcher(s) and the community forge their working relationship. It is a verbal or written agreement between partners. The project priorities and parameters for the research partnership are identified and established. Figure 4.1 illustrates the steps in undertaking human ecological research which were rigorously applied for each of the communities discussed in chapters 4, 5, and 6.

In the case of the hamlet of Ulukhaktok (formerly Holman), the community was represented by the Ulukhaktokmuit Hunters and Trappers Committee.[1] The Ulukhaktok Hunters and Trappers Committee consists of seven elected members and a hired resource person. The seven members include a president, vice-president, secretary-treasurer, and four directors. At the initial meeting of the Hunters and Trappers Committee (HTC) the following points were presented to set the stage for further discussion: (1) a

description of the project and an explanation of the human ecology component; (2) the role of community researchers in mapping, interviewing, and collecting samples; and (3) community ownership of research results, publications of findings in a non-technical language so as to enable widespread understanding and support for making policy recommendations arising from the study. Discussion began with questions on budget expenditures such as the living expenses of the project team, salaries for community researchers, and incidental costs associated with design of icons by a local artist for mapping. These costs including the purchase of groceries had been budgeted for and designated to be spent within the community where the research was taking place. As the human ecology research was tied to critical issues such as the impact of chemical pollutants, one HTC director was concerned about unnecessarily alarming the residents of Ulukhaktok. However, another director explained that more information is better than no information. Having answered questions, the researcher left and the HTC deliberated on the merits of engaging in a partnership on this research project. The committee members said they would inform the researcher by the end of the day. Within an hour and a half he was informed that the Hunters and Trappers Committee wanted to engage in a partnership and that he should prepare to make a presentation in Inuvialuktun and English at a community meeting set to take place at 7:00 p.m. the next day.

Noted below is a summary of the questions and responses from the community meeting.

- Will the project team take human tissue samples? The researcher replied that they would only take samples of wildlife.
- Would the project team only take samples of marine wildlife? The researcher answered that the Hunters and Trappers Committee would determine which plant and animal; marine and non-marine samples should be collected in terms of priority of resource use by the community.
- A description of the qualifications of community researchers was requested. The researcher explained they had to be bilingual (Inuvialuktun and English), be able to conduct interviews, and that ultimately it would be the HTC that would recommend people to the project research team.

- In which seasons would research be conducted? The researcher replied in all the seasons that are appropriate to the community.
- How would the research be used? The researcher replied that the research would be used to set policy and make decisions on community use of the subsistence resources. The Hunters and Trappers Committee will in due course chart the course of how the information gathered should be used to community benefit. Research would also be used for educational purposes to teach students.

Human ecology identifies patterns of relations of a community to its environment. This includes relations between humans and other animals, plants, and their habitats. As a narrative of human life within a dynamic socio-cultural system intimately interconnected to a dynamic ecological system, human ecology functions as the thread linking culture with nature and an overall system with its individual players. As an interdisciplinary examination of complex interacting systems, human ecology's commitment to applied research addresses cross-cutting issues of relevance to society. The title of this chapter, "Man and his Friends," is inspired by a drawing by Helen Kalvak, resident and artist from Ulukhaktok, Northwest Territories. The basis of this chapter was a study undertaken by the author as part of multi-disciplinary research on the impact of chemical pollutants in the Inuit community of Ulukhaktok, but this chapter will only discuss the human ecology of Ulukhaktok, without entering into a discussion of the issue of chemical pollutants.

Ulukhaktok (70˚43′N, 117˚ 43′) is a community which is part of the Inuvialuit Land Claim Agreement in Canada located on the western extent of Victoria Island on the Amundsen Gulf at the head of the Beaufort Sea (see figure 4.2). The human ecology of the region of Ulukhaktok has undergone three phases of change. While below these stages are outlined as distinct and clear events, the fact is that the change has been mixed, intertwined, and continuous. However, this continuity was interrupted by European contact, fur trading, and resource extraction on an industrial scale. It is difficult to point to exact dates for the transition. For the sake of reference general dates are given to summarize the process of change.

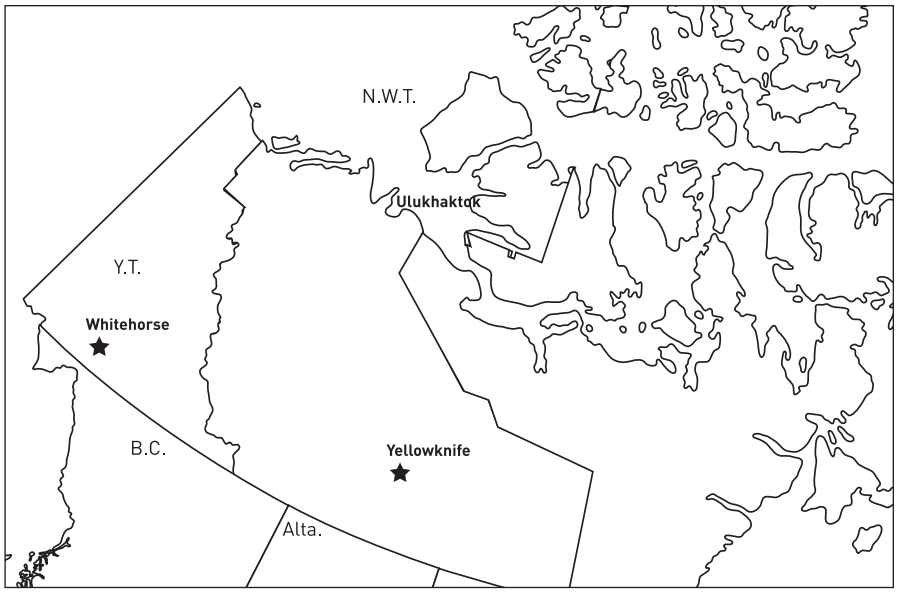

Figure 4.2: Ulukhaktok (Holman) in the Canadian Western Arctic.

4.1. Diversity and Subsistence Hunting and Gathering

The first phase (prior to the establishment of trading posts in Copper Inuit territory in 1916) is characterized by extensive use of the land and sea, seasonal migration, and trading among various small but distinct Inuit groups. The description Vilhjamur Stefansson provides of an encounter with a group of Inuit from southwestern Victoria Island is pregnant with meaning in terms of human ecological relations.

> In general, we tried to get a man from each party we came upon to accompany us to the next party or village so as to introduce us properly and guard against possible mishap, but when it happened that no one was with us when we came to a village, we always had to go through the formality of standing outside the house until some one could get a little blubber, cut it in pieces,

> and let each of us swallow one piece. This … is the ordinary test to determine whether the visitor is human or spirit, for it is a well known fact that spirits will not swallow blubber. We found the people everywhere, when this formality was over, uniformly hospitable and glad to see us (Stefansson 1913: 204).

Consumption of food defines the *realness* of a human person. The ability to eat 'blubber,' a staple for the Inuit, defines one's humanity. Thus, food gained from another organism provides the basis for the formation of relations between human beings whoever they may be (in this case, of vastly different cultures). The modern term that the Inuit of the western Canadian Arctic collectively use for themselves is Inuvialuit, which means *real* person. In the late nineteenth and early twentieth century, it was not common for the Copper Inuit to come across a white man, and they were late in having sustained contact with Europeans. The term 'Copper Inuit' is used in academic literature to identify those Inuit who made copper hunting implements and tools, which the Inuvialuit did.

While travelling further north on Victoria Island, Stefansson makes a note of "superstition" among the Copper Inuit: "There were continual requests that I should next summer 'think away' sickness from them and 'think them' plenty game and good fortune. There have been requests of this sort at all villages, but nowhere so serious, insistent and often repeated" (1913: 295). Stefansson's account misses a fundamental point, namely that to "think good" also means to *act* good.[2] It is a way of knowing and understanding where thought and action are part of a single performance.

The Arctic community of Ulukhaktok, Northwest Territories, Canada, is made up of the descendants of the Copper Inuit. The settlement of Ulukhaktok was first founded in 1923 with the Hudson's Bay Company Trading Post and then moved to its present site at Queens Bay in 1965. Although currently the people of Ulukhaktok refer to themselves as *Ulukhaktokmuit*, people of the place where the *ulu*, semi-lunar shaped knives, are found, the community traces its ancestry to three groups, namely the *Kanghiryuachiakmuit* from the Minto inlet region, the *Kanghiryuakmuit* from Prince Albert Sound region, and the *Puivlingmuit* from Read Island. In addition, there have been some Inuit from regions further west, including as

far away as Alaska, who came as traders. The term *muit* means 'people of' and expresses the diversity of Inuit human ecology and way of life. While in academic literature these various groups have been categorized collectively as the Copper Inuit, reflecting the hand mining and use of copper tools such as knives, there is diversity among them. Stefansson (1913) documented nineteen subgroups among the Copper Inuit, whereas Jenness (1922) lists seventeen and Rasmussen (1932) refers to fourteen. While scholars like Richard Condon assert linguistic unity among these sub-groups, he admits that their diversity is revealed through the prefix attached to the *muit*. For instance, the names of sub-groups such as *Kanghiryuakmuit*, people of the big sound (i.e., Prince Albert Sound), *Nagyuktogmuit*, people of the caribou antler (i.e., southwestern Victoria Island), or *Umingmaktomuit*, people of muskoxen (i.e., Bathurst Inlet),[3] shed light on each community group's relations with their habitat and not just in terms of geography but also in the nature of their interaction with their environment. Membership in a community (*muit*) is determined by presence in the area and performance of the community's primary activity such as hunting polar bears, seals, caribou, or muskoxen (Condon 1981; 1987; 1996; Damas 1984; Milton Freeman Research Limited 1976a).

Charlie Kitologitak, an Inuit elder with deep knowledge of the livelihood of his people, testified at the MacKenzie Valley Pipeline Inquiry in 1976 and described "two tribes" in the region of Prince Albert Sound. He described an event where a group of hunters from one "tribe" killed without any apparent cause all the children and nearly all the women except for two survivors. As a result, hunters from the other tribe tracked down members of the offending community and killed them all (MacKenzie Valley Pipeline Inquiry 1976: 4006–4009). This suggests that not only was there the presence of diversity among the Copper Inuit, but in some instances these differences led to warfare rather than intermingling.

Tiger Burch (1998; 2005), in his research among the Iñupiaq of northwest Alaska, asserts that the prefix accompanying the suffix *muit* actually represents 'society' or 'nation.' Instead of the conception of the Iñupiaq as one people across the North Slope of Alaska, he asserts diversity of nations, much like the distinct nations of Europe. Despite their relatively smaller size, a few hundred people, and lack of the systems of government we have

come to associate with the nation-state, he argues that the identity of each of these communities was sufficiently distinct to allow this analogy: "Like modern nations, those of early nineteenth-century northern Alaska had dominion over separate territories, their citizens thought of themselves as being separate peoples, and they engaged one another in war and trade" (Burch 1998: 8). Burch credits the diverse fauna of the tundra and forest of northwest Alaska for the survival of these separate nations in their habitats. The spread of diseases from European contact eroded the ability of these nations to defend their territories, and famine forced them to leave their homelands. These two factors collectively weakened and then led to a collapse of these nations by the mid-1800s. Whether the use of the term 'nation' is appropriate or not to describe diverse Inuit communities is irrelevant to the significance of the prefix connected with the suffix *muit* as the indicator of ecological habitat of a people. This prefix, however, is not a deterministic design which hems a particular people into an ecological niche. Instead, it expresses a cultural system that combines with social structure to inform ecological relations, which in turn informed cultural systems and social relations through a complex connectivity. It is this complex connectivity that produced diversity in Inuit communities.

Climatic cooling in the central Arctic has been made a causal factor in the development of the varied fishing and hunting cultures of the Copper Inuit. These cultures are characterized by seasonal migration of small family groups that were highly adapted to their local contexts. It is these varied groups that early explorers such as Robert McClure (1850s) encountered. It was not the fleeting contact made with him during his attempt to find the Northwest Passage, but his ship, the *Investigator*, trapped in the ice at Mercy Bay in June 1853 and abandoned, that had a significant impact on the Copper Inuit. Items of food and clothing were of little value to the Inuit, but its soft wood and iron were of immeasurable value in their daily life. As late as 1905, Christian Klegenberg reports meeting a man with knife made from a saw blade taken from the *Investigator* (Condon 1996; Stefansson 1921; Stevenson 1997).

In terms of seasonal practices, breathing-hole sealing was common in the winter. Once harvested, the seal was divided into twelve to fourteen parts to be shared with partners who previously had or later reciprocated

in exchange. Caribou and waterfowl hunting along with fishing featured prominently in the summer months. In the fall the Copper Inuit continued to fish in small groups at frozen lakes and took advantage of the cache of foods stored from previous hunts (Condon 1996; Milton Freeman Research Limited 1976a).

Food sharing and co-operative hunting among non-relatives is a key facet of this group's social structure. The seal-sharing partnership is an example of this exchange. Sharing extended to spouses when relations needed to be forged between family groups. Certain procedures were observed in preparation of foods so that land and sea mammals were not cooked in the same pot. Seal and caribou meat were not stored together. Sewing of caribou hide was prohibited in the winter, and all clothing had to be prepared by the fall before moving to sealing grounds in the winter. Shamans who acted as seers were said to be helped by a number of guiding animal spirits in their activities. Sharing and co-operation typified Copper Inuit culture and contributed to their survival (Condon 1996). Observations and records from early contact indicate that patience, self-control, and self-effacing humour are characteristics of the ancestors of the modern-day Inuit of Ulukhaktok.

4.2. Trading, Trapping, and the Formation of Dependency

The second phase (1916 to 1980s) is characterized by the increasing role of trapping activities given impetus by the establishment of the Hudson's Bay Company trading posts as well growing efforts at Christianization, particularly by the Anglicans. Ironically, both God and Mammon arrived at the same time because the desire to save souls was matched by a thirst for furs. The effect of this was to promote extensive inland use as opposed to coastal marine use, because of intensive trapping of the Arctic fox among other fur-bearing animals. It is important to note that before the introduction of the snowmobile, dog teams were key to trapping and fishing as well as harvesting of marine mammals. Fishing and hunting of marine mammals was essential not only for human nutritional needs but also for feeding the

dogs. At this time a lot of income was also derived from hunting seal and selling their hides (Mackenzie Valley Pipeline Inquiry 1976: 3949).

> The country has changed since 1916. Even while we said our farewells the traders were all heading eastward to the new land where beautiful white fox skins were valueless [traditionally of no monetary value to the Inuit] and a fortune could be gained in a night. White men have invaded it from every quarter, and the twilight of ignorance and superstition is yielding to the dawn of a greater knowledge. Bows and arrows have passed with other weapons into the darkness of the past, and a new mechanical age has brought magazine rifles, shotguns, steel traps, and even gasol[i]ne engines. The caribou are passing with the bows and arrows; of all the herds that once crossed the narrow strait to Victoria Island hardly one now reaches the Arctic shore. Strange diseases are making their appearance, disease that the old-time Eskimos never heard of and for which he has no name. The stern laws of civilization have descended on the land; no longer is infanticide tolerated, or the blood-feud allowed to run its course. "Furs, furs and more furs," is the white man's cry. "Without furs there is no salvation, no ammunition to shoot the scattered game and satisfy your hungry children." The tribal bands where each man toiled for all and shared his food in common are resolving into their constituent families, and every family vies with the rest in the race for wealth and worldly prosperity (Jenness 1975: 246–247).

In 1916 the Hudson's Bay Company established its first permanent trading post in the region, when Christian Klegenberg built a post near the mouth of the Coppermine River. At the end of the First World War, Diamond Jenness in the quote above observed dramatic change as the culture of the market sought to overwhelm subsistence hunting. However, Jenness's pessimism was not fully borne out until the 1940s. Subsistence activities persisted and continued to inform the values of the community of Ulukhaktok. In this phase most of the communities in the region continued to follow their

seasonal round of hunting and fishing. The Inuit were slow to intensively engage in trapping activities until the 1940s.

In 1939 the construction of the Hudson's Bay store began in *Ulukhatok*. This attracted Western Inuit from the MacKenzie Delta and Banks Island who began to build houses. Increasingly fox trapping was combined with traditional practices. A dependency based on exploitation developed, or as Usher reports, "the Eskimos were being robbed blind" (1965: 63).

> The relationship of the Eskimo to the trader became virtually that of a bonded servant. To trap initially the Eskimo had to be supplied with traps, and generally a rifle and other gear. Having no means to pay for this outfit, he went in "debt" to the trader, and settled his account the following spring by bringing in his catch of furs. Both the availability of the white fox and its market price fluctuated considerably, and in some years the Eskimo was unable to pay his debts. This indebtedness prevailed for almost thirty years, until other sources of cash became available to the Eskimos (Usher 1965: 62).

The dependency was generated through establishing a need for rapid methods of food gathering, such as the fishing net and the rifle (Stefansson 1913: 203), as well as developing a taste for items such as tobacco, sugar, and flour which ninety years earlier were items the Inuit ignored in the wreck of the *Investigator* when they chose useful hardware. In addition, the dependency was engineered by what is tantamount to extortion by not giving market value for the fox furs and deliberately giving cleaning rods for guns which damaged the rifles, thereby furthering sales in a saturated market (Usher 1965). Dependency on traded goods potentially threatened not only relations between neighbours in terms of co-operation and sharing in subsistence activities, but other relations within the human ecological context.

By the late 1950s and early 1960s other income sources such as government employment, family allowances, and social assistance encouraged the process of sedentization and trapping that undermined seasonal migration related to subsistence hunting and fishing. First influenza and then tuberculosis epidemics attacked the region. Furthermore, availability of caribou

and other game declined. Diet, disease, demography, and development were combining to weaken subsistence hunting activities and the Inuit way of life, creating dependency on the new market economy. Nonetheless, while the effect of disease was significant, the Inuit of Ulukhaktok fared better than the Hudson's Bay Company–dependent Inuit to the south because of their persistence in maintaining their traditional subsistence lifestyle.

In the 1960s the price of seal skins increased dramatically. At this point the human ecology of Ulukhaktok consisted of trapping, sealing, and subsistence hunting. At the MacKenzie Valley Pipeline Inquiry, Roy Goose testified on behalf of the Hunters and Trappers Association of the Community of Ulukhaktok. He explained that "Most of the people in Holman Island, the ones without jobs, are professional hunters and trappers. They are people that *know*[4] the land, that *know* the ocean, that *know* everything relating to the environment" (MacKenzie Valley Pipeline Inquiry 1976: 3963). In his testimony, Mr. Goose gave data on the harvest of various mammals, fish, and birds. Over a six-month period from October 1975 to March 1976, approximately 225 caribou were harvested and 900 Arctic fox. Over a period of almost a year 1,700 seals were harvested, based on the number hides sold, although the department of fisheries testified that 6,000 to 8,000 seals were harvested in Ulukhaktok. This discrepancy, if correct, suggests that the remaining seals were harvested for local consumption and clothing needs. In any case, 1,700 seal hides were sold to the local Cooperative or the Hudson's Bay Company. In one year approximately 350 pounds of Arctic char per family or 6,000 pounds in total were consumed by the community. There was a quota of 16 polar bears per year for the community. Mr. Goose also made a request on behalf of the hunters and trappers to end the ban on hunting muskoxen due to their growing numbers and suggested the introduction of a quota system to prevent over-hunting. He could not estimate how many other fish and migratory birds, ducks, or geese were hunted, although they were important to the community's nutritional needs. He provided a dollar value for only those animals that had a market outside of Ulukhaktok and could not estimate the market value of the harvest of other animals for the purposes of subsistence. Total income from the sale of seal hides was $60,000[5] and white fox fur $39,000 (MacKenzie Valley Pipeline

Inquiry 1976: 3962–3973). However, the use value of these and other animals and plants harvested was much greater to the community.

The founding of the Holman Eskimo Cooperative in 1961 was a direct result of sedentization and a response to economic dependency, using co-operative principles. Its aim was to provide a small but stable income to the members of the community. More importantly, it was a source of pride and represented Ulukhaktok's Inuit culture to southern Canada and the rest of the world. With a contribution of ten dollars each, five Inuit and the Oblate Priest, Father Henri Tardy, formed the Co-operative (Wight 2001).

> In 1961 it started with six people, you know, these six people were the ones that started the Co-Op, as members, and their goal was to make some products that could be carried out through the people, the people can make them and sell them. These six people find out that by working together, sticking together, they can support themselves. In those days they had to think lots before they started that Co-Op because they had to start a Co-Op, otherwise they would be on welfare. These six people were too proud to go on welfare, so what they did was they started a little Co-Op by starting with sealskin tapestries. (Testimony of Simon Kataoyak, MacKenzie Valley Pipeline Inquiry 1976: 4001).

In 1965 Father Tardy introduced the first snowmobile and by the 1970s snowmobile use was widespread. By the 1980s, with pressure from animal rights groups and the anti-trapping lobby, the international market for furs was decisively damaged, which marked the decline of trapping and seal hunting for skins.

4.3. Natural Resource Extraction, Land Claims, and Subsistence Activities: A Time of Possibilities

The third phase (1980s to present) is characterized by the collapse of the fur trade and a growing pressure for the development of non-renewable

resource extraction. In addition, it has been characterized by a political assertion of indigenous rights by the Inuit in terms of land claims and the establishment of co-management bodies for natural resource use. Despite these socio-economic changes, the cultural system, characterized by values arising from a tradition of hunting and gathering, has sustained the community: first in terms of its nutritional needs, and second through the preservation of its values, particularly sharing.

> He wants to see the Eskimos live the way they are for quite some time. He wants to see the children on the land supporting themself [themselves] from the land. Like we don't have money among ourselves, but our pride in living off the land is one thing that we don't want taken away. (Interpreter translating for Paul Pagotak who was testifying to Justice Thomas Berger at the Mackenzie Valley Pipeline Inquiry 1976: 3937–3938.)

> They [mining companies] never clean that place up because they were bankrupt. There's a lot of garbage up there that's never been cleaned.… There's barrels there that shouldn't be laying around there.… You see, those kind of advantages that are taken up there, I don't feel too good about Muskox Mines and Grand Roy because they were not cleaned up.… They just left everything there. So you see, that's why we are scared to say "Yes, go ahead drill." We can't do that because these people didn't clean up at all. (Simon Kataoyak testifying to Justice Thomas Berger at the Mackenzie Valley Pipeline Inquiry 1976: 3942.)

> Also we would like to be involved when we start developing this country because we can develop with these southern people. We know that they need oil the same all over they're short of oil. We don't want to see southern people short of oil because in the wintertime some other places they are really cold too, I know, I been in south. All these people, we are Canadians, we should be involved in this country together. So only way we

> can do it is unite together with Eskimos and Indians and white people, only way we can develop this country, because really rich country according to the scientists in the north, because there's all kinds of gas we heard about in Tuk [Tuktoyaktuk], even Banks Island. We are not stingy for this country. That's the trouble, because we really endanger our way of life. Then we would like to see the thing, right now the settlement of land claims before all these things occurs. That's all I have to say for now. (Wallace Goose testifying to Justice Thomas Berger at the Mackenzie Valley Pipeline Inquiry 1976: 4018–4019.)

Some thirty years later and after ratification of the Inuvialuit Final Agreement (1984), the Inuvialuit Regional Corporation (itself a governing institution resulting from the Agreement) is a leading proponent of the MacKenzie Valley Pipeline, where it stands to gain as a partner along with private oil companies.

As a result of the Inuvialuit Final Agreement in 1984, the Wildlife Management Advisory Council, supported by the Fisheries Joint Management Committee, undertook a conservation and management plan for the Inuvialuit region. It organized community-based management plans for each of the six Inuvialuit communities. In the case of the Olokhaktokmiut Community Conservation Plan, information was collected from existing community sources, the Community Conservation Plan Working Group, and from the community in general. Where the community felt appropriate, suggestions from outside experts and specialists were incorporated. The goals of the document were to identify important land-use areas and make recommendations for their management as well as describe a community processes for making culturally appropriate decisions relating to resource management. The report was intended to assist resource management planning and serve as an effective educational tool. It is noteworthy that when this human ecology research began in 1998, the plan was rediscovered by resource-use decision makers in the community because there was a strong consonance between what was documented in the plan and what respondents were saying in the human ecology research interviews.

The conservation plan is meant to provide guidance to the people of Ulukhaktok and to other organizations and individuals with an interest in the land, marine, and living resources in the area. In order to assure long-term, environmental, social, and economic benefits, the Inuvialuit Final Agreement requires the Wildlife Management Advisory Council to determine the total allowable harvests of game. The Wildlife Management Advisory Council accomplishes this by working with the local Hunters and Trappers Committee (HTC), who in turn collaborate with many organizations under the umbrella of the Wildlife Management Advisory Council in determining the total allowable quota. Long-term planning is also addressed in the Olokhaktokmiut Community Conservation Plan through geographic and qualitative documentation of significant cultural and renewable resource sites and the archiving of present conservation measures and future research goals.

4.3.1 Demographic Profile

In the census year 2001, the population of the Hamlet of Ulukhaktok was approximately 400, an almost 6 per cent decline from the 1996 census year (see table 4.1).

The median age of the population is 26 years, with over 40 per cent of the population below the age of 20 (see table 4.2). Compared the Canadian average, where 26 per cent of the population is below the age 20, the population of Ulukhaktok is relatively younger, which is similar to other Aboriginal communities in Canada. High fertility rates combined with increasing life expectancy have given the Inuit the highest growth rate even when compared to other Aboriginal peoples in Canada. In Ulukhaktok the majority of the population is Aboriginal and specifically Inuit, with less than 5 per cent of non-Aboriginal descent (Statistics Canada 2003a; 2003b; 2003c).

Table 4.1: Profile of the Hamlet of Ulukhaktok (Statistics Canada 2003c)

Population in 2001	398
Population in 1996	423
1996 to 2001 population change (%)	-5.9
Total private dwellings	144
Population density per square kilometre	3.2
Land area (square km)	124.43

Table 4.2: Age Characteristics for the Population of the Hamlet of Ulukhaktok (Statistics Canada 2003c)

	Total	**Male**	**Female**
All persons	400	185	210
Age 0–4	25	10	15
Age 5–14	110	50	60
Age 15–19	40	15	25
Age 20–24	15	10	10
Age 25–44	140	70	70
Age 45–54	30	10	20
Age 55–64	25	15	10
Age 65–74	5	5	5
Age 75–84	10	5	0
Age 85 and over	5	0	0
Median age of the population	26.2	26.7	25.7
% of the population ages 15 and over	66.2	67.6	69.0

Sedentization, the concentration of the Inuit in a settlement, has had a significant impact on adolescence. The transition from childhood to adulthood was relatively swift in the first phase of Inuit human ecology, as the young person was expected to participate in subsistence activities. Girls got married close to puberty and boys married as soon as they acquired the necessary skills to sustain a family. Marriages were arranged by families much in advance and were not a matter of individual choice. Time for maturation has increased. Youth role models now come from among peers, both local and electronic, rather than simply small family groupings as in the past. Inuit youth in Ulukhaktok today have a high degree of autonomy. Research

indicates Ulukhaktok teenagers tend to be self-confident individuals with a pleasant demeanour, who live equitably and do not place excessive demands on personal relationships. The youth do not engage intensively in seasonal subsistence activities during the school year and have gained significant leisure time. Nonetheless, seasonal subsistence activities continue to be part of their lives. In the early fall, in addition to temporary wage employment, boys engage in subsistence activities such as seal and rabbit hunting. In the fall, boys accompany their fathers to Fish Lake for caribou hunting and fishing. In the winter, some boys may engage in trapping while attending school as well as playing hockey and skating. Some rabbit hunting continues in this season. In the early spring teenagers may go ice-fishing and caribou hunting. In the spring, adolescents are increasingly outdoors engaged in waterfowl hunting, as well as playing baseball and football. In the summer, many families go to their seal hunting camps (Condon 1987).

In terms of educational attainment such as high school graduation, trades certification, college diploma, or university degree, males tend to have greater qualifications than females in the community, although this may be changing with greater participation of women in school attendance (see table 4.3). In the age group 20 to 24 years, 41 per cent have less than high school education, 41 per cent have attained high school graduation, 12 per cent have trades certification, and approximately 12 per cent have a university degree or diploma. In the age group 35 to 44 years, almost 39 per cent have less than high school education, 15 per cent have attained high school graduation, 23 per cent have some form of trade certification, and 15 per cent have a college certification or diploma. Finally, in the age group 45 to 64 years, 70 per cent have not attained high school graduation, 20 per cent have trade certification or diploma, and 20 per cent have university certification, degree, or diploma. While these data point to the potential for integration into the global market economy, they reveal little about the subsistence hunting practices of the community and its real value to the community.

Table 4.3: Population Characteristics: School Attendance, and Highest Level of Schooling (Statistics Canada 2003c)

School Attendance	Total	Male	Female
Total population 15 years and over attending school full time	50	15	40
Age group 15–19 attending full time	30	10	20
Age group 20–24 attending full time	0	10	10
Total population 15 years and over attending school part time	20	0	10
Age group 15–19 attending part time	0	0	0
Age group 20–24 attending part time	10	0	0
Highest Level of Schooling			
Total population aged 20–34	85	40	50
% of the population aged 20–34 with less than a high school graduation certificate	41.2	50.0	30.0
% of the population aged 20–34 with a high school graduation certificate and/or some postsecondary	41.2	37.5	30.0
% of the population aged 20–34 with a trades certificate or diploma	11.8	25.0	20.0
% of the population aged 20–34 with a college certificate or diploma	0.0	0.0	20.0
% of the population aged 20–34 with a university certificate, diploma or degree	11.8	25.0	0.0
Total population aged 35–44	65	30	35
% of the population aged 35–44 with less than a high school graduation certificate	38.5	33.3	42.9
% of the population aged 35–44 with a high school graduation certificate and/or some postsecondary	15.4	0.0	0.0
% of the population aged 35–44 with a trades certificate or diploma	23.1	33.3	0.0
% of the population aged 35–44 with a college certificate or diploma	15.4	0.0	0.0
% of the population aged 35–44 with a university certificate, diploma or degree	0.0	0.0	0.0
Total population aged 45–64	50	25	25
% of the population aged 45–64 with less than a high school graduation certificate	70.0	60.0	80.0
% of the population aged 45–64 with a high school graduation certificate and/or some postsecondary	0.0	0.0	0.0
% of the population aged 45–64 with a trades certificate or diploma	20.0	40.0	0.0
% of the population aged 45–64 with a college certificate or diploma	0.0	0.0	0.0
% of the population aged 45–64 with a university certificate, diploma or degree	20.0	0.0	0.0

According to 2001 census data, the unemployment rate in the hamlet is approximately 12 per cent. The total number of persons age 15 and over in Ulukhaktok with income was 250. For this group, total income was comprised of 80.1 per cent from earnings, 16.4 per cent from government transfers, and 2.4 per cent from other sources. The median income for persons 15 years of age and over was $12,256 (Statistics Canada 2003c). These data do not address how subsistence hunting practices are valued. While attempts have been made by establishing price equivalences between a pound of beef and caribou, for instance, this market-oriented attempt, while useful, does not reveal the use value (*oikonomia*) of subsistence activities to the community in terms of cultural systems and social structures. Such an approach is vacant in terms of the connectivity of human ecological relations.

There are 105 families and 130 households in the community. Lone-parent families make up one third of the households in the community and one-person households make up 23 per cent of the total households (Statistics Canada 2003c). In terms of religious affiliation, 79 per cent of the residents of Ulukhaktok are attached to Protestant Christianity, 16 per cent to Catholicism, and 5 per cent have no religious association (Statistics Canada 2003c).[6]

4.3.2. Research Overview

A total of thirty-two interviews were undertaken in 1998 and 1999. All interviews were validated in 1999 with the respective community members interviewed. In preparation for this publication this chapter was reviewed by the Hunters and Trappers Committee. Individuals both read and corrected the transcripts of their interviews or, in the case of elderly community members, the transcripts were read to them for comment. Ages of those interviewed ranged from the late twenties to early eighties. At the time the interviews were undertaken, almost half were below the age of forty. Of the thirty-two people interviewed exactly half were female. This gender balance contributed to a more holistic understanding of the human ecology of Ulukhaktok. Ten of those interviewed were senior members of the community and could be considered 'elders,' two of whom have subsequently died. The vast majority, if not all, participate in the subsistence harvesting

lifestyle now or have done so in the past. In addition to day-to-day wage employment, many participate in subsistence harvesting to varying degrees.

Several of the respondents used phrases such "*when I woke up*" or "*when I started remembering*." These terms or phrases refer to their earliest memories as children. In other words, they refer to a time as far back as they can remember as conscious beings. Many references were made to a time long ago. This tended to refer to a period of time when the Inuit (specifically the respondents) lived a seasonal subsistence lifestyle with their families.

The human ecology of Ulukhaktok is fundamentally defined by the subsistence activities of its community members, which has resulted in a cultural system that works in tandem with the social structure. Subsistence hunting is both culturally bounded by subsistence needs and formative of the social structures of the indigenous communities that undertake this activity. In Ulukhaktok, for example, the institutional presence of the Hunters and Trappers Committee and the annual *Kingalik* Jamboree in mid-June are examples of cultural-ecological interconnectivity. At the Jamboree both young and old are encouraged to compete and demonstrate their traditional skills such as seal flensing, hide stretching, fish filleting, and other traditional skills and recreational activities. The event serves as a testimony to the continued interaction between the cultural and ecological. As noted earlier (chapter 3), Inuit collaboration in subsistence activities and food distribution is not only a necessity in the strategy of hunting and fishing, but a recognized behavioural norm. These activities result from social cohesion, but also are undertaken to reinforce it.

With technological change and the introduction of the wage economy, one would expect that social cohesion would be undermined if subsistence hunting was only a necessity – something needed to survive. Today, in Ulukhaktok, it is difficult to differentiate the wage economy from subsistence hunting, as these activities are interdependent. The peoples of the circumpolar world exist in the global economy and yet retain their historical identity and culture. To hunt ringed seal, for example, community members need to take time away from their daily wage employment, buy gasoline to power their boats or snowmobiles, purchase bullets, and so on. It is neither possible nor useful to force a division between the wage economy and subsistence hunting. They are now interdependent activities

and represent the socio-economic reality of many northern indigenous communities. Subsistence hunting is part of the web of contemporary relations that comprise the human ecology of indigenous communities in the Arctic and sub-Arctic. It cumulatively underpins the nutritional, economic, cultural, and social needs of these communities.

For example, several classes at the Helen Kalvak School were asked to describe their favourite foods and meals for the day (table 4.4). Elementary and junior high school students showed greater preference for food harvested through subsistence activities than store-bought foods. In terms of preferred choice by students, foods from subsistence activities are ranked with 80 per cent greater frequency than store-bought food. The most frequently mentioned foods are pizza, seal, and dried meat, with caribou having the highest frequency of mention. Amongst the older children, particularly those in grade 10, non-traditional foods began to feature more prominently (table 4.4). These data imply that the subsistence lifestyle has a significant presence for the younger generation. Overall, the responses of the children indicate the continued vibrancy of the subsistence activities in Ulukhaktok.

The Centre for Indigenous Peoples' Nutrition and Environment (CINE) undertook interview questionnaires and surveys to assess the dietary benefit and risk in 10 per cent of the households in the community of Ulukhaktok in the autumn (September to December) of 1998 and the late winter (February to April) of 1999, along with other Arctic communities. The objectives of the study were: (1) to derive quantitative estimates of "traditional/country and market food," that is, food consumption from subsistence activities versus store-bought food comprised of items from southern markets; (2) to develop databases of nutrient and dietary exposure to contaminants in "traditional foods"; and (3) to outline the benefits of these foods in terms of nutritional, socio-economic, and cultural significance. This study was carried out in eighteen Inuit communities across the Canadian Arctic, including Ulukhaktok. The data is presented in the aggregate, representing the five regions of the Canadian Arctic where the Inuit live, and is of little use in terms of specific information on Ulukhaktok. Whatever specific information is provided on the subsistence activities of the community of Ulukhaktok has been taken into account in the human ecology research

Table 4.4: Preferred Foods of Students at Helen Kalvak School

	Kindergarten	Grades 2–3	Junior High	Inter Class	Grade 10
Breakfast	N/A	N/A	Cereal (11) Juice (6) Toast (3) Tea (1) Pancakes (1) Eggs (1)	N/A	Cereal (7) Toast (4) Nothing (3) Juice (2) Eggs (1)
Supper	N/A	N/A	Caribou Soup (6) Caribou Meat (4) Pizza (1) Burgers (1) Meat (1) Duck (1) Fish Heads (1) Potatoes (1) Corn (1)	N/A	Caribou Soup (2) Corn (2) Sandwiches (1) Stew (1) Beef Ribs (1) Potatoes (1) Pogos (1) Fish (1) Pop (1) Hamburger Helper (1) Chicken (1) Caribou (1) Salad (1) Steak (1)
Favourite Foods	Noodles (1) Cereal (1) Pancake (1) Caribou (1) Muskox (1) Seal (1) Bird (1) Fish (1)	Caribou (6) Duck (4) Fish (2) Char (1) Seal (1) Rabbit (1) Meat (1) Spaghetti (1)	Caribou (12) Pizza (9) Dry Meat (7) Seal (5) Muskox (4) Fish (4) Duck (3) Soup (2) Polar Bear (2) Char (1) Piffie (1) Corn (1) Junk Food (1) Pie / Cake (1) Mahu (1) Chicken (1) Fries (1) Hamburger (1) Rabbit (1)	Caribou[7] (8) Fish Soup (4) Dried meat (3) Seal (3) Muskox (1) Frozen Meat (1) Ice Cream (1)	N/A

results. Furthermore, the CINE study provides general trends that validate the human ecology research results for the hamlet (Kuhnlein et al. 2000).

Overall the CINE study concluded that food obtained from subsistence hunting and gathering activities was a significant socio-cultural resource. These food sources contained substantial nutrients and a higher quality of diet compared to the store-bought foods. Furthermore, respondents maintained that foods from subsistence hunting are healthy for children and pregnant women, as well as being "tasty" and important to community life. Various meats and mixed food preparations such as pizza and spaghetti were most frequently mentioned as favourite store-bought foods. Store-bought food tended to be higher in fat content, especially saturated fat. Store-bought food was also associated with chronic disease and obesity. Furthermore, the economic benefits of foods arising from subsistence hunting and gathering were considerable – 8 per cent of the respondents in the eighteen communities surveyed indicated that they could not afford to buy store-bought food to meet their daily dietary needs (Kuhnlein et al. 2000).

Subsistence activity in Ulukhaktok is seasonal and linked with harvesting of several species at one time. The seasonal round derived from our human ecology research (figure 4.3) indicates the interrelationship of seasons, plant appearance, animal movement, and harvesting by the community of Ulukhaktok. In addition, it illustrates the intensity of resource use according to seasons. In the interviews, berry harvesting was most frequently mentioned as a plant harvesting activity. Among the birds, ptarmigan, Canada goose, and eider (king and common) feature most prominently. For the large terrestrial mammals, both muskoxen and caribou are important subsistence foods. Among the fish, lake trout and char were commonly mentioned as harvested foods. Among furbearers, Arctic hare and Arctic fox were the most frequently mentioned. It is noteworthy that the fox was harvested for its fur, whereas the hare was harvested primarily as food. Among the marine mammals, seals and polar bears are most significant. The seal is slightly underestimated because some respondents did not differentiate between the ringed and bearded seal. If this is taken into account, the two most significant species to the community of Ulukhaktok are seal and caribou (Ulukhaktok Interviews[8]).

The interviews indicate that sedentization of the Inuit and the wage economy has resulted in the decline of harvested foods over time in Ulukhaktok. However, the wage economy also funds the continuance of the harvesting of subsistence foods. In terms of food consumption there have been slight changes in the usage of the organs, some of which are rarely consumed. In terms of storage, use of refrigeration rather than indigenous methods of caching food is a relatively recent option.[9] Certain types of meat, such as seal, are no longer aged by many of the respondents. In terms of consistency over time, boiling of foods continues to be a method of preparation.

4.4. Human Ecology of Ulukhaktok

This section should be read with the land and marine use map of Ulukhaktok (see foldout map). Listed below are detailed descriptions of harvesting procedures, harvest sites, and methods of consumption of plant and animal species of particular significance to subsistence living in Ulukhaktok as determined by the Hunters and Trappers Committee and through interviews with community members. The map, along with the icons (visual representations) of the plant and animal life, the Inuit names in the local dialect, common English names, and the scientific names creates a shared vocabulary for subsistence harvesters, scholars, and policy makers to engage in discussion of the human ecology of Ulukhaktok.

Preceding the detailed description drawn from the interviews, vignettes from taped interviews in 1964 by Helen Kalvak (1901–1984) will be added to provide texture to the human ecological information. Found in a shoe-box with the first of eighteen tapes missing, these interviews impart a narrative quality to the human ecology of Ulukhaktok. Helen Kalvak, a Ulukhaktok resident, local artist, founding member of the Co-operative and reportedly *angakuq* (shaman), originally gave these interviews to accompany her drawings. While these drawings may have been sold, the accompanying narratives remain largely ignored.

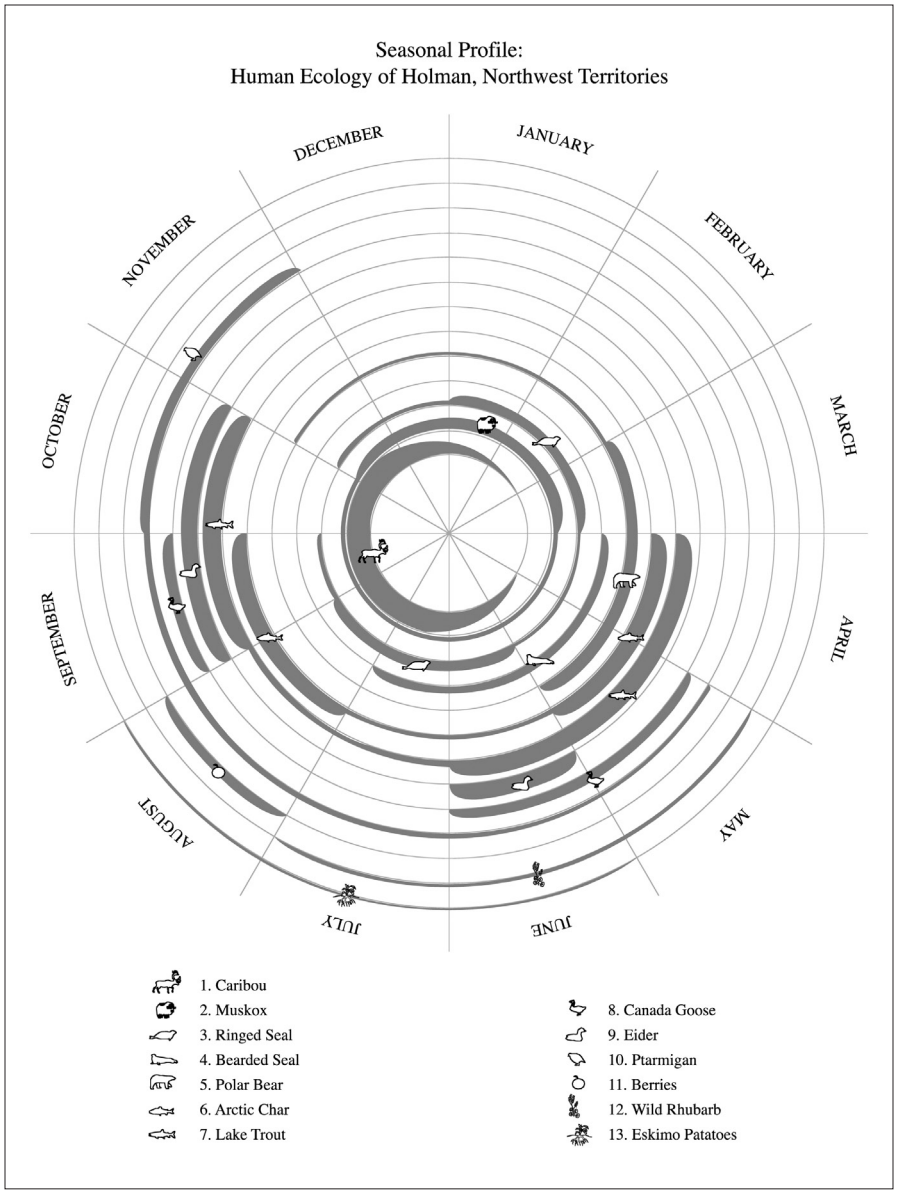

Figure 4.3: Seasonal Round Indication Intensity of Harvest.

4.4.1. Tariuqmiuttat*: Marine Mammals*

The residents of Ulukhaktok have historically relied on marine resources for their livelihood. Seal and polar bear hunting continue to be important because they provide income from the sale of skins and subsistence food for local residents (Ulukhaktok Interviews).

☞ ***Nattiq*: Ringed Seal *(Phoca hispida* or *Pusa hispida)***

> Long ago when it was time for the seals to come up on the ice to sunbathe – when it is almost time to travel inland – the family would hunt seals together using metal sled runners. Sometimes the father would take his son with him. They would hunt seal by the crack [in the ice] or look for seal holes. They did not have many dogs, and so would walk beside their sleds or even help their dogs pull the sleds. That's the way the people were long ago (Kalvak 1964: Tape 6).

Seals continue to be a key resource for the people of Ulukhaktok (Kuhnlein et al. 2000; Mackenzie Valley Pipeline Inquiry 1976; Neumann 1992). Although both the ringed and the bearded seal are present in the area, ringed seals tend to be more abundant (Damas 1984; Neumann 1992; Usher 1965). Due to their greater numbers and their smaller size, which makes it easier to handle them once harvested, the ringed seal is preferred by the hunters of Ulukhaktok (Ulukhaktok Interviews).

During the mid-sixteenth century seals were harvested from kayaks in the open water. The cooling of the climate, however, gradually limited the amount of open water present in the area and the local residents were forced to adapt to the changing environment. Four hundred years later, the Copper Inuit of Victoria Island developed a successful ice-harvesting method for the hunting of seal (Condon 1996). The sealing season would begin in February, with April being the best time for hunting young seals. Hunters would go out on the ice and take seals at their breathing holes, or by their snow dens, using toggle head harpoons. This method of sealing involved co-operation among the hunters, and therefore, when a seal was caught it

was shared among those who participated. Hunters would also distribute portions to predetermined partners who would reciprocate with the same body part sometime in the near future (Condon 1996; Neumann 1992). An elder recalled, that is when he *started to remember*, his parents did not live in one place; rather they travelled within the region seeking the best hunting grounds. At this time, April Island had a high seal population, as did the open water between the settlement of Ulukhaktok and the nearby two small islands[10] (Ulukhaktok Interviews).

> When the snow drifts came and the snow was hard enough to build igloos, the people looked for seal holes. The dogs were used to sniff out seal holes. When there was an area found where there were many seal holes, the community built their homes there. Throughout the winter they hunted seals right up until there was no sunlight. When hunting for seals, the hunter used a tool called an *Unaak* to poke and find the seal hole. Then they would harpoon the seal. They would also use an *elukin*. An *elukin* was a bent tool (like a hook) that allows the hunter to find the exact middle of the hole because that is the best spot from which to harpoon the seal. After a seal was caught, the seal was prepared for all of the community to share. The meat, the blubber and the blood were shared among the people. The hunter's wife divided it and the women of the community were responsible for getting their share from her. After all the people had their share of the seal, the remainder was cooked by the hunter's wife. All parts were boiled and then divided up among the community members. When there were no more seals in that area, the community moved. They moved in search of seals until they could no longer find the breathing holes. When this happened the men started to hunt polar bears (Ulukhaktok Interviews).

In the first half of the twentieth century winter trapping activities grew in importance, and as a result less time was devoted to the harvesting of seals within the winter months (Condon 1996). Hunting therefore became

common in the summertime, when hunters would travel to areas such as Minto Inlet, Kugluktuk (Coppermine), and strategic spots close to Ulukhaktok. Hunters would travel together in search of breathing holes, at which the seals were taken (Mackenzie Valley Pipeline Inquiry 1976).

With the dramatic decline of caribou populations in the area during the 1960s and the opening of the Co-operative store in 1961, sealing activities increased (Condon 1996; Neumann 1992). Three techniques were utilized by hunters so that they could harvest the seal almost year round: (1) seal stalking in the springtime; (2) open-water hunting by boat in the summertime; and (3) seal hooks in the wintertime (Condon 1996). The meat from the seals harvested was a major source of dog food, while the hides were commonly sold to the Co-operative store (Neumann 1992; Usher 1965).

In April, hunters would make a basin in the snow and put the sealskin over it and let it freeze, then use it to store seal fat in June. It would be used all winter for the lamps.

> Long ago they hunted ringed seal. They would hunt the seal in Minto Inlet with a harpoon or a bow and arrow. At the end of the summer, after they hunted the seals, they dried out the sealskin to make containers in which they stored seal blubber. This blubber was used the next winter as fuel for the lamps. Once the ice became strong enough they went out onto the ice to hunt seals. The hunters brought dogs in order to go along the ice ridges and sniff out the seal holes. The hunter would then break the top of the ice that was covering the hole. Many hunters went out together and gathered around different breathing holes, standing on caribou hides and fox skins to keep their feet from getting cold. They used harpoons and hunting blades; they tied the hunting blade to the end of the harpoon to stab the seal. Once a seal was spotted, the men would create noise and disturbances so that the seal would go to a designated breathing hole where a hunter awaited the prey. Once the seal was caught, the men slit the seal down the middle of its chest and ate the liver and the blubber of the seal. This gave them energy that allowed them to continue to hunt. When the men returned to the

> village, they divided the seals equally between the community members, and a young adult distributed the seal to each household. When they caught a lot of seals they would store the meat in a stone cache covered with sealskin. The storage area would be chosen and located in a place that could not be accessed by polar bears. Throughout the winter they looked for seal holes for hunting, but as the days got shorter and there was little light, they would walk back to town guided by lamps lit in town and telling stories. It was these stories that kept the men alive during the cold walks. In the town at night, one person would light a seal lantern and then distribute the flame to each household. The flame would be started by flint-like rocks, rubbing them together – this was the guiding light for the hunters (Ulukhaktok Interviews).

At present ringed seals are hunted from November through to September in the vicinity of Ulukhaktok. In the winter, the seal is taken on the ice using a hook and snowmobile. It is common for the skins of these winter seals, however, to be heavily scratched, making them less desirable. In the summer, they are hunted by boat in the open water or at the edge of the ice floe, using a .222 or .223 calibre rifle. Some respondents reported that seals are fattest in the summertime (June to August) and are easier to hunt, as they like to lie on top of the ice and bask in the sun. The meat of a young ringed seal hunted in the spring is said to be tender and preferred by elders (Ulukhaktok Interviews).

The seal harvest is widely distributed, being shared with family, friends, and particularly elders. The skin is often sold to the Department of Renewable Resources as a source of income. In addition to being harvested for human consumption, these sea mammals also provide dog food for hunters who keep dog teams (Ulukhaktok Interviews).

The stomach, liver, kidneys, blubber, and heart are eaten, although one respondent specifically stated she does not eat the innards. The penis, head, bladder, and the bowels are not consumed. A number of the respondents have reported that they have stopped eating the kidneys, although no reason was given. The flippers are aged and eaten. Seal meat is prepared and

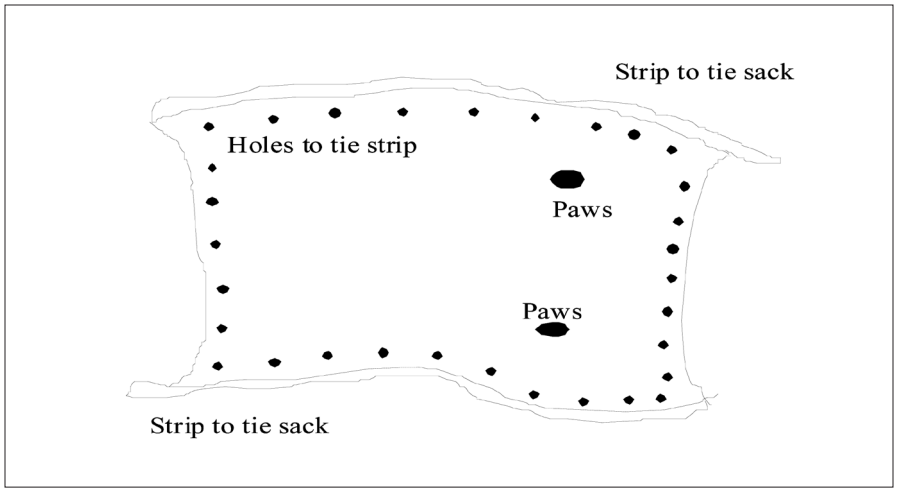

Figure 4.4: Sealskin Sack Used for Aging.

consumed in a variety of ways: boiled, frozen like icicles (*qwak*), roasted, or with seal oil. Dried meat and oil also is made from ringed seals hunted in the summertime. According to one resident seal meat is never fried because "… once my mother had fried seal for my father and it had poisoned him" (Ulukhaktok Interviews). The liver is consumed fried, frozen (*qwak*), or raw. Two respondents indicated that they avoid eating seal during their mating season (mid-March to mid-June), due to the strong odour of the meat (Ulukhaktok Interviews).

Seal meat may also be aged and it is usually the older hunters who continue this practice. Many residents of Ulukhaktok eat aged blubber and flippers as a delicacy. There were two methods described for aging seal flippers: the traditional and the contemporary. For the traditional method a thin layer of fat is applied to the sealskin sack and the seal flippers are placed on top. Another layer of fat is applied directly to the flippers before the sack is tightly sealed and placed underground. Figure 4.4 illustrates the sealskin sack used for aging. The sealskin sack remains underground for two months, at which time the flippers are properly aged. Although aged meat can be eaten cooked, aged seal flippers and fish are always eaten raw (Ulukhaktok Interviews).

The more recent methods use a similar technique, though instead of using the sealskin sack, a brown paper or cardboard box is used. Using the same process as described above, the paper or box is covered with a thin layer of fat, as are the flippers. Stored above ground, a piece of plywood is placed on top of the paper or cardboard box, with stones surrounding it to protect it from light. Aging is complete in about one to two months, depending on the air temperature (Ulukhaktok Interviews).

To age seal meat, it is placed in a sealskin sack with the innards taken from several seals. No fat is added as it is already contained within the meat. The sack is stored underground or in a cache covered with gravel, for one to two months. Care must be taken to ensure it is not left too long, as over-aged meat is too strong to eat (Ulukhaktok Interviews).

Seal fat is aged so that it can be easily stored and used for food and lamp fuel in the winter months. For this process the fat is cut into strips, placed in a sealskin sack, and stored above ground. Large stones are placed around the sack to protect the aging fat from weasels. If meat is left on the fat, it will hurt the eyes when the oil is burned. To lessen the effects, contaminated oil is mixed with fresh seal oil (Ulukhaktok Interviews).

There is a clear gender division of labour in the butchering the seal. Women "flesh" (skin or flense) the sealskin using an *ulu*, after which the men wash and stretch it. "Even if a man wants to go hunting, but his wife does not know how to flesh the seal, the man needs to get someone else to do it" (Ulukhaktok Interviews). Once dried, the hide is either sold or women use it to make clothing. Sealskin is useful for making waterproof clothing, wind pants, mittens, and boots. Hats and *utugaks* (white soles) are items made from seal hide. Sealskin is softest in the spring, summer, and fall, though the best market price is given for hides hunted in July and August. A hunter recalled having waterproof boots made of ringed seal skin that had bearded sealskin soles for increased durability (Ulukhaktok Interviews).

Ugyuk: Bearded Seal *(Erignathus barbatus)*

> There were two men going seal hunting. They were going to look for the bearded seal. The one waited for seals at their holes, while the other was looking for more seal holes. When

> the man was going to seal holes he yelled out to the man that was waiting for seal at a seal hole, 'There was a bearded seal here. It may be going towards you.' When the bearded seal went to him he speared it and when he was trying to pull it up real hard, the other man ran to him.… 'Pull harder and try and pull it higher so I can poke it too.' That's what they would say to each other. The other would reply 'I'm trying to pull as hard as I can. Wait until it has stayed under water for a while. If it stops the struggling I will let it up.' If it stops struggling that means that it needs air and it will be easy to pull. They would talk to one another. When it had stopped struggling, he pulled it out of the water. So if it came out of the water, he wanted to poke it by the eyes. When it came up from the water the other man speared it in the chest. When they had poked it with the harpoon in the chest where the bones are far apart in the heart, before they had pulled the harpoon out of its chest, the bearded seal started to sink. That was when it had died. When it had died they made the hole bigger with the knife so they could pull it out (Kalvak 1964: Tape 6).

Although not as actively hunted as its ringed cousin, the bearded seal continues to be important to the residents of Ulukhaktok. The CINE study indicated that there was very low consumption of bearded seal (Kuhnlein et al. 2000). In the past, an abundance of bearded seals were to be found at Berkeley Point, where there would also be great numbers of polar bears. People would utilize the entire seal, except for the "pass" (lower intestine or bowels), gall bladder, and the yellow tissue surrounding the liver. The seal blubber would be aged to make oil dip. Amongst the organs the liver, stomach, and kidneys would commonly be eaten. Seal flippers would be covered by the hide and then buried underground for aging. Half of the skin of the seal was used as strands for rope, while the other half was used for *kamik* (boots). The making of rope was a complex task, which usually took place in the summertime. The strands were made out of sealskin that was first aged to produce skin that was soft, flexible, and strong enough for rope. The finished product would be used to make harnesses for dogs and

wider strands would be used for runners on the *komatik* (sleigh). Women and men worked close together in this activity, as careful flensing was important in the making of the rope strands (Ulukhaktok Interviews).

In the spring and summer months (April to August), the bearded seal is hunted in the northeast corner of Prince Albert Sound, as well as the same areas as the ringed seal. Some hunters sell the skin to the Northern Store,[11] give it away, or dry it to make *mukluks* and shoe soles. Preparation of bearded seal is similar to that of ringed seal. The meat is boiled to make a rich broth and the fat is aged, boiled, and then eaten. Some hunters age or dry the meat. As in the past, seal flippers are often aged before being eaten. Two respondents stated that they do not eat the lungs. Bearded seal is commonly shared with relatives and elders. If there is an abundance of seals harvested, the meat and skin with fat attached is also fed to the dogs (Ulukhaktok Interviews).

Nanuq: Polar Bear *(Ursus maritimus)*

> … The man had a knife, but when he was running away from the bear, he was trying to run so fast that he dropped his knife. When the bear caught up to the man it tried to bite him and it sniffed him. It slapped him with one of its paws by the hips, but the bear did not make the man fall. And it never bit him. When the bear smelled the man, it had smelled a loon because … he was wrapped in it when he was just born. His grandmother had wiped him with a loon skin when he was just born.… When the bear smelled the scent of loon he didn't bite the man. Because the bear had grown up with the loon, and he had smelled the loon, the man that had been attacked by the bear did not die and he lived. And so he got the bear, he killed it (Kalvak 1964: Tape 5).

In the past, hunters would venture far out into Amundsen Gulf in search of polar bear. Although the best time to hunt was during the winter months, bear could be hunted year round. Hunting for polar bear would begin in

March, when the seal holes could no longer be found in the area. Either alone or in pairs, hunters would venture far out onto the ice in search of the polar bear, to areas such as Banks Island, Walker Bay, Horizon Islets, and Nelson Head. One or two dogs would accompany the hunters and would be used to track the bear (Condon 1996; Mackenzie Valley Pipeline Inquiry 1976; Milton Freeman Research Limited 1976a; Neumann 1992). When a polar bear was located, the hunters would carefully watch and observe before sending the dogs to distract it. Once the dogs attracted the bear's attention, the hunters would use harpoons and attack the bear from behind. The hunter would try to stab the bear in the kidney region of the lower back where there was no bone. He would then fight with the bear until he was able to kill it. If the bear carcass was too big to pull, the hunter would cut up the skin, making a sled on which he could pull the bear home. As the hunter approached the village the people would run out to help him drag in the meat to the village (Damas 1984; Mackenzie Valley Pipeline Inquiry 1976). In his second expedition, Stefansson described a group of Inuit in the region of Prince Albert Sound that survived in the winter by solely hunting polar bear and traded the fat and meat for seal from other Copper Inuit (Stefansson 1913).

Hunters would sometimes spend ten to twelve days on the ice hunting bear and taking no food with them. Each man had a pouch tied around his neck that he kept under his clothes. When he put snow in this pouch, his body heat would melt it to water, allowing him necessary hydration. The longer the man walked in search of food, the longer he survived merely on water. Once the polar bear was caught and killed, the man could eat some of the fat. He would cut the fat into small chunks, put it into the snow to cool and then ate a very small amount of fat, being careful not to eat too much, as it would have been quite some time since he had last eaten. The bear was then brought back to the community, where an *ulimaun* was used to cut it up. The entire animal, including the skin, was divided and shared within the community (Mackenzie Valley Pipeline Inquiry 1976).

In the past, the intestine, meat, and the heart were eaten, while the urinary bladder, liver, lungs, and the pass (bowels) were not. Out on the ice, the first part of the bear to be eaten was the ribs. Hunters would wait until they returned to camp to eat the paws, which were prized and considered

a delicacy. The skin – which was prepared by fleshing, drying, and finally cleaning it – was often used as a ground sheet. According to one seasoned hunter, the best way to prepare a sled was to use polar bear fur to smooth mud on sled runners. The lighter skin of a year-old cub could also be used for pants as wind-breakers (Ulukhaktok Interviews).

For the 1975–76 calendar year, the Ulukhaktok settlement area had a quota of sixteen polar bears. According to the records kept by the Hunters and Trappers Association of Ulukhaktok, this quota was filled in approximately one and a half weeks, 99 per cent of it in a 25–30 mile radius of Ulukhaktok (Mackenzie Valley Pipeline Inquiry 1976). According to some hunters, these conservation measures are not necessary as the number of polar bears harvested prior to hunting regulations was much lower (Ulukhaktok Interviews).

At present, hunting is restricted to male polar bears from November to December, after which both male and female bears are hunted until May. Hunters are able to distinguish between male and female bears by their tracks. Males have heels and females do not; as well, the female bear's front feet are turned in (Ulukhaktok Interviews).

> Two years ago [1996], he and his uncles were hunting bear. They got carried away playing crib till about one in the morning. An elder went out to get some snow and he heard heavy breathing close-by him. He looked and there was a polar bear 7 feet away, sitting back eating char. He quickly went back in and said there was a bear outside. They sent up a flare to light the sky but had to wait until the next day to get the bear (Ulukhaktok Interviews).

If the bear is fat the meat is consumed or it may be aged for a couple of days in order to tenderize the meat. The meat is boiled. In the past it was not uncommon for the fat and meat to be eaten frozen or raw.[12] The meat of a thin bear is particularly tough and therefore not eaten. Polar bear fat is commonly consumed, and the "feet" (paws) are eaten as a delicacy. As in the past, the kidneys, bladder, pass (bowels), and genitalia are not eaten. Although no reasons were given, most community residents no longer

consume the intestines, lungs, stomach, and heart. The liver of the polar bear is especially avoided; as it is known to cause hair loss when consumed. Hunters who use dog teams may feed a small portion of the liver to the dogs. This was to allow the dogs "to be familiar with the bear." Since polar bear meat spoils easily, it is not stored for later use. Consequently, when a bear is successfully harvested, it is shared with friends, family, elders, and other community members. In some instances, polar bear meat is left behind at the harvest site after the valued skin and paws are removed. Polar bear hide is usually salted and sold, either in the fur auction or privately, although the hide of a particularly large bear may be saved and used as a ground sheet (Ulukhaktok Interviews). According to the CINE study, bear consumption in the community is low (Kuhnlein et al. 2000). Many, but not all, of the respondents and their families, including children but not teenagers, consume polar bear meat.[13] What is not consumed is often given to the dogs, including some of the internal organs (Ulukhaktok Interviews).

The polar bear is hunted using a rifle and is tracked by either a snowmobile or with a dog team. The snowmobile is useful in chasing the bear on smooth sea-ice but it is not effective on rough ice or near open water. In some cases, sport hunters use bows to kill bears (Ulukhaktok Interviews).

Qilalugaq: Beluga Whale *(Delphinapterus leucas)*

Beluga whales have not generally been hunted near the community of Ulukhaktok and therefore, consumption is low (Kuhnlein et al. 2000). They migrate past Read Island every year in the fall (Mackenzie Valley Pipeline Inquiry 1976).[14] Some Ulukhaktok residents trace their ancestry to this small island located off the coast of Wollaston Peninsula in Dolphin and Union Strait (Milton Freeman Research Limited 1976a). Therefore, while beluga harvesting is not a major subsistence activity in Ulukhaktok, some older respondents remember the process. Whale nets were used by beluga hunters of the early to mid-1900s. When a whale was caught in the net, the hunters would hurry out to it in their boats and harpoon it before it drowned and sank. Women would then prepare both the meat and the *muktuk*. The meat would be boiled, dried, smoked, or eaten raw. The *muktuk* was eaten raw (Ulukhaktok Interviews).

The beluga whale carcass also provided material that would be used for a variety of purposes. According to one respondent, sometimes the skin was used for soles of shoes, while the stomach would be thinned, dried, and made into a sack that would be used to store and transport subsistence foods. Some people would also stretch the whales' intestines over cabin windows, enabling the light to shine through while providing protection from the outer elements (Ulukhaktok Interviews).

Beginning in the late 1960s, beluga whales began to be sighted further north on Victoria Island nearer Ulukhaktok, in areas such as Berkeley Point, Minto Inlet, and Prince Albert Sound (Mackenzie Valley Pipeline Inquiry 1976). In the summer of 1975, several belugas were harvested in these areas. It is estimated that about thirty whales wintered east of Prince Albert Sound at the time (Mackenzie Valley Pipeline Inquiry 1976). "The whales kept the ice open all winter and also had a spot of open ice at the east end of Prince Albert Sound" (Ulukhaktok Interviews). Beluga harvesting near Ulukhaktok is opportunistic and not a regular part of the subsistence life of the community. Only one Ulukhaktok resident hunts belugas regularly. He does so in the summertime near Read Island and only consumes the *muktuk*. In June 1998, several belugas were sighted near Ulukhaktok, but there were no reports of harvesting (Ulukhaktok Interviews).

Aiviq: Walrus (*Odobenus rosmarus)*

> The walrus had killed a seal and he had it as food. And the bear had smelled the seal and the bear was trying to take the seal away from the walrus. And they were arguing with each other. They were fighting each other. The bear was trying to take the seal away from the walrus because the bear's food is seal and walrus. Their meat and fat are the same. I only found out that the meat and fat of seals and walrus are the same when I was left alone by my relatives. When I was a little girl when we were kagikyoak, my uncle Kanana got a walrus. I don't know what they did with the meat, but I used to see them eating the fat and they used to eat the skin when they cook it (Kalvak 1964: Tape 9).

The walrus is not common in the Ulukhaktok area, with rare sightings every three to four years. As hunters are not familiar with the animal, they are cautious about hunting it (Usher 1965). One Ulukhaktok resident successfully hunted a walrus in 1996, during the month of August. He noticed that no seals were present in the area where he found the walrus. The skin and fat of the animal were given to community elders, and the hunter's parents – "they ate it like *muktuk*." The hunter consumed the rest of the walrus, eating everything but the lungs. He dried most of the meat (Ulukhaktok Interviews).

4.4.2. Nigyutit*: Terrestrial Mammals*

Residents of Ulukhaktok have relied on two key terrestrial mammals for food and clothing – the caribou and the muskox. Both animals inhabited the region in vast numbers before European contact in the late 1800s, when animal populations began to decrease (Condon 1996). With the advent of the rifle, both of these species significantly decreased in numbers – so much in fact, that the muskoxen in the area were almost hunted to extinction (Condon 1996). The meat and hide from these animals continues to be an important source of food within the community of Ulukhaktok. They are hunted separately. Many residents stated that "caribou don't like muskox" and that they would never be found in the same areas at the same time (Ulukhaktok Interviews).

From the 1940s to the 1980s, Ulukhaktok relied heavily on income generated from trapping. It is estimated that 45 per cent of a household's income came from trapping activities (Condon 1996). According to Usher (1965) residents of would hunt and trap the Arctic fox, weasel, Arctic hare, and occasionally ground squirrels for their pelts. Reliance on the trapping and selling of furs, however, has decreased over the years. Respondents mentioned that the only animals harvested currently for their pelts are the Arctic hare, Arctic fox, and if the opportunity arises, wolf (Ulukhaktok Interviews).

Tuktu: Caribou *(Rangifer tarandus)*

> While a man and his wife had been walking on land, they chased caribou. The woman chased the caribou and the man was hiding. They had made Inukshuks. One got left behind so they got it (Kalvak 1964: Tape 12).

According to one respondent, caribou hunting is the highlight of the whole year. Currently, the caribou is a staple in Ulukhaktok and is widely shared by the hunters with elders, family, and other community members – one hunter reported sharing with forty-six individuals within the community. The CINE study confirms high consumption of caribou (Kuhnlein et al. 2000). Because sharing has social and cultural importance, it remains a significant component of the subsistence and food consumption activity of Ulukhaktok (Mackenzie Valley Pipeline Inquiry 1976). Several respondents stated, however, that it is difficult to find community members with additional caribou meat to share.

According to Usher (1965), Ulukhaktok residents in the 1950s harvested caribou from the following herds: (1) Great Bear herd – winter range was in the Fort Franklin/Dease Bay area and summer range was in the Richardson and Coppermine River area; (2) Radium herd – winter range was in the Hottah Lake area and summer range was in the Tree River area; (3) Rae herd – winter range was in the Lac la Martre area and summer range was in the Bathurst Inlet area.

Although the caribou were being harvested from all three herds, there were very few animals to be found at the time Usher was undertaking his research (Usher 1965). At present hunters report harvesting caribou in the following regions: George's Island, Prince Albert Sound, Minto Inlet, Berkley Point, Wollaston Peninsula, the west end of Diamond Jenness Peninsula, and the Shaler Mountains (Ulukhaktok Interviews).

In the past, men and women worked together in groups to hunt caribou at the north end of Victoria Island. At this time guns were not available and hunters used harpoons or bows-and-arrows. During the season when "the caribou would be dropping their long hair" (summer), the hunting

party would build a narrowing corridor composed of *inukshuks* that were placed 100 metres apart from one another. The men would hide in dugouts at the narrow end of the corridor, and the women would guide the caribou through the corral by chanting. When the caribou came to the narrowing portion of the passage, the waiting men would strike the animals. After killing the caribou, the women would prepare the meat and leave it out to dry on sticks propped horizontally between two large stones, allowing the group to continue with their subsistence pursuits. On their way back from hunting, this meat would be used immediately for meals, and any surplus would be stored in packs carried by dogs. The caribou hunting season would conclude at the end of the summer and prior to "freeze-up," when the Inuit would travel to the lakes upstream and engage in fishing (Mackenzie Valley Pipeline Inquiry 1976). Hunters also speared caribou from kayaks as the animals crossed rivers and lakes. This practice took place when caribou and hunters were further inland (Condon 1996; Damas 1984; Stefansson 1913).

The Northern Copper Inuit had strong beliefs about the preparation of the caribou after it was harvested. People who participated in the hunt were required to help in the butchering and distribution of the carcass. It was believed that those who did not help would embarrass the animal spirits and would consequently be hunted themselves. Additionally, the hide of the caribou would never be sewn during the winter months, the meat would not be cooked in the same pot that contained items from the sea, as land and sea products were prohibited from being cooked in the same pot. Finally, one could not place seal meat beside caribou inside the snow house. When a young hunter made his first kill, it was customary for him to cut open the caribou head with an *ulimuan* (chisel-like instrument) and distribute the inner membrane to the elders, who would consume it (Condon 1996).

During the 1940s and 1950s the caribou population in the Ulukhaktok region declined significantly. One resident reported that in the 1950s caribou crossed from Banks Island to Ulukhaktok and many had drowned in the salt water during the crossing. He suspected that this event might have been responsible for the decline in caribou numbers that was reported during this time period. Other residents attribute the decline of the caribou in the 1940s and 1950s to a change in hunting practice. During this time, the harpoon and bow-and-arrow fell out of use, as hunters took aim with the

newly introduced rifle, which allowed larger numbers of caribou to be taken. Another hunter indicated that there were no caribou in the area when he was a child; however, as he grew older the caribou number increased until they could be found all year round (Ulukhaktok Interviews).

In the past, caribou would be hunted all year round, but hunting intensified in late August when the caribou were fat and considered the most desirable (Condon 1996). Usher (1965) indicated that at the time of fall-rutting, male caribou were avoided because they had a strong taste and were not considered "good eating." Today, the majority of the hunters hunt caribou from July to November only due to conservation measures, although some respondents also hunt in May during the calving season and in the winter months (Condon 1996; Kuhnlein et al. 2000).

Caribou meat is eaten fried, dried, boiled, roasted, made into soup, "ground up" (minced) and cooked in lasagne, raw, or frozen (*qwak).* Caribou bulls are said to have more fat, which is usually stored and consumed with dried meat or fish. In addition to the meat other parts of the caribou are consumed. The snout, when boiled for two to three hours, is said to be tasty. The brain is eaten cooked or raw, and the tongue and eyes of the caribou are eaten boiled. Caribou hooves are boiled for two to three hours and are also considered "very good eating." The bone marrow is scooped out and eaten raw. The heart, liver, head, feet, fat, and kidneys are also consumed.

In the past the entrails of the caribou would be eaten with seal oil, although one respondent specifically stated that he did not consume the intestines and several others stated they no longer eat the kidneys. The lower intestine and bowels are not consumed. The contents of the stomach (undigested plant matter) can be eaten like vegetables; however, several respondents stated they no longer engage in this practice. One respondent reported giving the foetuses of pregnant caribou to elders because they are easier to chew. Animals found already dead are not consumed, based on guidance from elders (Ulukhaktok Interviews).

In the past, caribou hunted in the spring were aged under large stones (not gravel) to protect them from scavengers like foxes and wolves. In the winter, the hunter would return to claim his cache. At present some hunters continue to age their caribou in this manner and pick it up using a snowmobile in the winter. However, the majority of respondents store their caribou

directly by freezing it (in a community freezer), often drying it first. One respondent reported leaving the caribou meat to age in a warm area, where the meat would not receive direct sunlight. The meat would be left there for about two weeks and then frozen if its taste became too strong (Ulukhaktok Interviews).

The skin of the caribou hunted in August is said to be very useful for clothing. The legs are skinned and dried, and given to the Hunters and Trappers Committee (HTC) or the school. This part of the hide is usually utilized to make boots (*kamiks*). The rest of the skin is used for making trousers, parkas (*kulitak*), *mukluks*, and mittens. Caribou hide is thickest in the fall, and is usually used as a ground sheet or sleeping roll because of its high insulating quality. The antlers are also used for jewellery, such as earrings, as well as for spears used for fishing and hunting seal. In the past, sinew from the caribou was dried and utilized to make snares and ropes (Condon 1996).

Caribou are commonly hunted using .22, .270, .30-.30 calibre, and 7 mm rifles. However, some hunters use a bow-and-arrow. While snowmobiles and all terrain vehicles are the most common form of transportation when hunting on land, some respondents reported using dogsleds to hunt caribou (Condon 1996).

Umingmak: Muskox *(Ovibos moschatus)*

> There were two muskoxen, a female and a male. The male had really nice black fur and its horns were real white, and the female had a young one. An Inuk was looking at the male muskox's horns to see if it was a young horn muskox, because it may have marrow in its horns. If it did, he would not want to kill it. If a horn has too much marrow in it the people would not use them for anything. They would not use them for their tools or clubs or anything. While the man was looking at their horns to see if they were too young to kill, the female muskox held her horns for the man to see. The man was not a real man, but a shaman, a real smart shaman. Because he was so smart he was checking to

> see if the horns of the muskox had some marrow in them with his hand. If the muskox was old enough, and if the horns were good, he wanted to kill the male. The horns were real nice and white, and looked young. The horns of the male muskox had no cracks on them, because he had seen that the male muskox was not full grown yet. The shaman told his people not to kill it (Kalvak 1964: Tape 10).

Muskoxen are found throughout the Ulukhaktok area, and consequently there are no specific areas where they are hunted. Respondents mentioned a variety of areas where muskoxen have been harvested, both in the past and at present: near the hamlet; north along the west end of Diamond Jenness Peninsula; Boot Inlet; north side of Minto Inlet; east of north Tahiryuak Lake (heading toward Shaler Mountains); Holman Island; south end of Diamond Jenness Peninsula; Kuujja River; Amitukyok Lake; Imigaahook[15] Lake; and Third Lake (Ulukhaktok Interviews).

Residents hunt muskoxen with either a rifle or a bow, and prefer small or young female animals. When a mother is killed, the calf must also be killed as well because it cannot survive alone. Although muskoxen are hunted year round, a number of respondents stated that hunting intensified during the winter months. The CINE study confirms high consumption of Muskoxen and hunting throughout the year (Kuhnlein et al. 2000). One respondent does not hunt muskox when it is dark (in the winter), as the meat tends to take on a strong odour during this time (Ulukhaktok Interviews).

Muskoxen meat is dried, sometimes ground up prior to cooking, fried, boiled, roasted, or made into soup. Salt, pepper, and spices are often added for taste. Eating the meat frozen (*qwak*) is a recent practice that a few hunters engage in. The meat is stored through either drying or freezing. Some residents also age the meat for about a week before freezing it. Five respondents specifically stated that the muskoxen are shared with others (Ulukhaktok Interviews).

The majority of respondents stated that the meat, hindquarters, ribs, marrow, tongue, and fat are commonly consumed in the community, while the penis and testicles are typically avoided. However, there is some variation when it comes to the hooves, heart, head, lungs, eyes, and stomach of

muskoxen. Some respondents reported eating these parts, while others said that they did not (Ulukhaktok Interviews).

The hide from the legs of muskoxen may be made into boots (*kamiks*), while the horns are used for carving and the hide of muskoxen calves may be used to make mitts. The wool (*kiviuk*) from the hide is sometimes sold by the pound to the Co-operative store. Occasionally, Ulukhaktok residents will invest a large amount of time in preparing the hide to make ground covers, toboggan cushions, camouflages for goose hunting, or rugs (Ulukhaktok Interviews).

Ukaliq: Arctic Hare *(Lepus arcticus)*

> A story of a Muskox and a rabbit. The rabbit was feeding along a river where there was a lot of sticks, and while the rabbit was feeding, a muskox was getting closer to the rabbit, and the rabbit looked up and looked at the muskox. The muskox said to the rabbit, 'my friend is eating like a ball of kidneys,' the muskox called the rabbit his friend … '*Novila Novila Panagisakniatoga Panagisakniatoga Oyagaom Okoagani*,' that was the song of the rabbit, but the muskox had no song to sing. And so the both of them went their separate ways following the river, eating grass and plants. The rabbit ate roots and then it went behind some rocks by the river, and the muskox stopped and laid down between two small hills (Kalvak 1964: Tape 9).

The Arctic hare is hunted mostly for food, rather than its skin. It is roasted, boiled, and then eaten with seal oil or as soup. One respondent stated she coats the meat with "Shake-and-Bake" and then fries it. In the past, the entire rabbit would be eaten, including the intestines. Today, however, it is only the meat, and to a lesser extent the internal organs (liver, kidney, and heart), that are commonly consumed. Some respondents stated that they only consume Arctic hare when it has been freshly caught, while others dry and store it, or simply freeze it for use later (Ulukhaktok Interviews).

The majority of hunters harvest the Arctic hare between the months of August and February. The hunting of the hare is commonly associated with the increasing darkness brought on by winter. One respondent stated that he hunted the Arctic hare year round. In August the hare is said to be "fat, tasty, and good-eating." This furbearer is usually found and hunted on higher ground with a .22 calibre rifle (Ulukhaktok Interviews).

Although the Arctic hare is primarily harvested as food, older women use the skin for clothing and trims. Other hunters simply dispose of the skin. On average, one hunter indicated that he would harvest twenty to thirty hares annually (Ulukhaktok Interviews). Our research contradicts the findings of the CINE study (Kuhnlein et al. 2000) that consumption of Arctic hare is very low in the community. Previous studies (Condon 1987; 1996) concur with our results.

Tiriganniaq: Arctic Fox *(Alopex lagopus)*

> A polar bear got a seal. When the bear had pulled the seal on top of the ice, a raven came along because it smelled the seal that the polar bear got. The raven wanted to eat from it. There were also some foxes that smelled the seal that the bear got. They also came. The polar bear and foxes were trying to fight over the seal. It was the way long ago to fight for food (Kalvak 1964: Tape 15).

The Arctic fox is consumed less frequently today than in it was in the past. One respondent stated that he was concerned about rabies and therefore chooses not to eat the fox anymore. He concluded, however, "they are still good if they are boiled." Only "fat-foxes" are eaten; thinner ones are trapped solely for their pelts (Ulukhaktok Interviews).

The "fat-fox" is generally boiled for a long time prior to eating, "until it is soft and tender like canned chicken." It is considered cooked when it is tender enough that a knife is not required to cut it. Fox meat can also be prepared by frying it with onions, and salt and pepper are often added for flavour. All family members will eat the tender meat. If the hunter keeps

a dog-team, the head is often fed to the dogs. The pelt of the Arctic fox is commonly used as trim around the hood of parkas, and consequently many respondents who trapped the animal stated that they sold the hides at auction, or to the local Northern and Co-operative store (Ulukhaktok Interviews).

Trapping of the Arctic fox takes place between the months of November and May, and is commonly combined with other subsistence activities. Both conibear and double-spring leg-holds are used to trap the fox. However there is a clear preference for to latter, as they are less hazardous to humans. Testimony from the Mackenzie Valley Pipeline Inquiry indicates that during the 1970s, the community of Ulukhaktok would harvest approximately 900 Arctic fox a year, and that there was a shrinking population of the animal in the southern reaches of Victoria Island (Mackenzie Valley Pipeline Inquiry 1976: Ulukhaktok Interviews).

Amogoh: Wolf *(Canis lupus)*

> … When we had skinned the wolf, the wolf had so much fat that it looked so good to eat, and I thought it was a dog. I was so surprised to see a wolf with lots of fat. The wolf had fat just like caribou fat, and my husband said to me that he's got to have fat like the caribou, he eats only caribou because they're inland away from the ocean. I was cutting it and I asked what part I should cook, the leg parts or some other part? I was going to get some from the leg, but I thought again and took part of the ribs (Kalvak 1964: Tape 4).

The wolf is hunted during the fall, winter, and sometimes in the spring. Two respondents stated they were opportunistic hunters, as they would only hunt wolf when they came across them while undertaking other harvesting activities (Ulukhaktok Interviews).

Wolves have been hunted at Kikiktolak Island (George Island) Halahikvik, Diamond Jenness Peninsula – specifically at the northwest and east end of Prince Albert Sound, Fish Lake, Air Force Lake, and around the town site. Long ago the wolf was also hunted in the Kugluktuk region.

4.4.3. Tingmiat: *Birds*

> People long ago made weirs where they would try and catch geese and ducks. They would try to make them go into the weir by chasing them towards the trap that was meant for the geese and ducks. They made them rest before killing them – they didn't kill them when they were tired, only when they were rested. The weir was made from a hole in the ground that was covered with grass, far away from the lakes. Where there are some ducks or geese in the pond or lake, they tried to make them go up on land. Down at Banks Island, long ago, they killed them for dry meat and to eat. They dried the parts with more meat on them, like the hind legs, the chest, and the back part. They cooked only the feet, head, and wings when they wanted to eat. That's the way people down at Banks Island used to hunt ducks and geese long ago (Kalvak 1964: Tape 3).

Several species of birds are hunted in proximity of Ulukhaktok. Migratory waterfowl such as geese, ducks, cranes, and loons were being reported by community members as common food sources. Ptarmigans, which are relatively abundant year round, are also an important dietary component. Hunting tends to be focused around the spring and fall during times when migratory birds are gathered in groups and numerous. The selection of species hunted and consumed is dependent on a number of factors including accessibility, abundance, and desirability of the meat. While certain species are prized more than others, bird harvesting is often an opportunistic venture. Birds are taken when fishing or when hunting caribou or other mammals. Often, less desired species of geese and ducks are accidentally harvested by hunters while attempting to shoot a preferred variety. Still others become caught in fishing nets.

Having replaced the bow-and-arrow, snares, and the bola in the 1960's, Inuit hunt waterfowl almost exclusively by shotgun, while ptarmigans and owls are also hunted by .22 calibre rifles. During the 1960s and 1970s, bird harvesting increased in popularity. Spring camps were strategically located near migration routes, feeding grounds, or nesting areas. In the summer,

ducks would be taken while hunting seals on the open water (Milton Freeman Research Limited 1976a). With the introduction of the shotgun, birds could be taken in larger numbers than in the past, permitting the meat to be dried or frozen for use in the winter or following seasons. While hunting methods have changed, sharing of the catch has remained a vital part of community relations. Hunters commonly distribute bird meat to elders, relatives, and other members of the community. As in the past, many members of the community take an active interest in the hunting, preparation, storing and distribution of the meat.

> In early spring they moved back onto the land. They hunted small game, whatever they came across, and gathered eggs. They also snared or lassoed the waterfowl. The snares and the ropes were made out of the sinew of caribou. If they ever caught a seagull or a jaeger, they dried out the skins and used them for napkins or rags (Ulukhaktok Interviews).

With a few exceptions, preparation methods are common to most species of birds. Drying and freezing is used to store meat. Large walk-in freezers are now available for community use; however, bird meat is also dried and stored under the permafrost. An unplucked eider duck, for example, is placed in a burlap or gunny sack with or without innards to be dried, aged, and frozen in an underground cache. The amount of time required for aging depends on the temperature and final use. If the meat is for human consumption, the aging process typically takes two weeks. However, the meat can be stored in this manner for several months if it is to be used as bait for trap lines. Boiling and roasting are the preferred methods of cooking most bird species. In the case of boiling, the resulting broth is used as a stock for soups.

Consumption patterns are also similar among Ulukhaktok residents. However, depending on the type of bird and the variety of tastes within the community, organs, intestines, and other parts not considered meat may or may not be eaten.

Qingalik*: King Eider *(Somateria spectabilis)

Amaulik*: Common Eider *(Somateria mollissima)

As with most migratory birds, the hunting season for eiders begins in the spring and continues through to July. Both species are hunted in the same locations, including the immediate area around Ulukhaktok, the west end of Diamond Jenness Peninsula, along the north shore of Prince Albert Sound, Coast Point, Holman Island, around Union Strait, Five-Mile Island, and at Mashooyak. It is common for a single hunter to take fifty or more eiders per season (Ulukhaktok Interviews).

While both the king and common eider are prevalent on Victoria Island, and share a number of similar characteristics, hunters indicated a decided preference for the king eider. The main reason for this preference is that the meat of the common eider tends to be tough "like rubber."

Eider breast meat is boiled as soup, dried, roasted, or aged. The innards, head, and feet of both eiders are not commonly consumed, though one resident mentioned that the innards of eider ducks are occasionally aged and then eaten. The meat is often stored in the freezer for year-round consumption. Several residents continue to use the feathers to insulate snow pants and other clothing (Ulukhaktok Interviews).

Kaglolik / Kakhaok*: Pacific Loon *(Gavia pacifica)*, *Tuullik*: Common Loon *(Gavia immer)*, *Doodlik*: Yellow Billed Loon *(Gavia adamsii)*, *Evitalik/Qaqhuaq*: Red Throated Loon *(Gavia stellata)

> …They were sad because a loon had poked and killed their son. They were going to the lake to look for loons at springtime, because they were mad at them for killing their son. The woman made her cane into a spear and said that she would walk and swim in the water to poke the loons. The man had no bow-and-arrow. The woman said that if the loon goes to her, she would poke it in the beak. While they were looking for loons, they

> saw two small loons swimming in the water. When they went to them, they started to tangle with one of them. Even when it went under water, the woman would not let go of it and she went under water with it. When she was in the water she did not reach the bottom – she only stayed on top of the water because she had a weasel and it was her good luck charm. She only walked on the water and never went down or never reached the bottom. She swam with all her clothes on and followed the baby loon all over because the other baby loon could fly a little. It flew around and waited for its mother. When the mother put her baby loon on her back, the man poked and killed the baby loon. When the mother loon lost both of her babies, she landed in the lake and the woman started to paddle toward her, because she wanted to poke it. She poked the loon in the mouth with her cane, and she killed it too. After she had killed all the loons, she never thought of her son again (Kalvak 1964: Tape 3).

Loons are only occasionally harvested in the community of Ulukhaktok. It is common for hunters to take only one or two loons between the months of June and September. Harvesting the loon is more often than not accidental; as nets set out to catch fish inevitably end up capturing loons. Hunters also report inadvertently killing loons while shooting at other waterfowl, although they indicated that there were times when they would specifically target the loon. Loons are found in the same locations as eider ducks. Many hunters reported harvesting loons within four or five miles of Ulukhaktok, Pituitak[16] (south of Ulukhaktok), Coastal Point, Prince Albert Sound, and Safety Channel (Ulukhaktok Interviews).

Described as being tougher than eider duck, loon meat is usually boiled as soup. One resident reported drying and aging the meat, while another indicated this type of preparation was unusual for this particular bird species. A young loon, "with the new feathers," is preferred, as the meat tends to be more tender. Typically the guts and liver are not eaten, although one respondent stated that he ate the stomach. In the past the beak was used to make arrowheads (Ulukhaktok Interviews).

Uluagullik: Canada Goose *(Branta canadensis)*

> A story of an old woman. She was alone with her dog. Every day she went out, when it was daylight, she saw geese flying over her and she was running out of food.… She saw geese flying over so she was on the look out while she was kneeling at the entrance of her tent. While she was on the look out she heard the geese again. When she heard the geese making noise, she made her pot ready and waited for them. The geese with young ones started to fly over the tent real close, so she picked up her pot and said, 'my pot is empty and I don't have anything – how am I going to fill it up?' While the geese were flying over some young geese started to fall because their wings went funny and they fell down. They fell down because she had held her pot up with nothing to cook. When the young geese were falling, she let her dog loose and it chased the geese. The young geese tried to get away, but the dog got one and killed it. The woman called him and he brought it to the woman. After she had cooked it, she ate until she was full and then put the rest of the meat and gravy away. She ate a little of it everyday and waited for some people to come back (Kalvak 1964: Tape 3).

The Canada goose is hunted during both the spring (May through June) and fall migration (August through September), in a variety of locations that include: Anialik Lake,[17] Hingelik Lake, Nakushin, Hinigouk (Graveyard Bay), Kaglokyoak River, Coast Point, Ulukhaktok, Safety Channel, Halahikvik, Kuuk River, Minto Bay, the west end of Diamond Jennesse Peninsula, Cape Bering, the west end of Victoria Island, and on the west end of Wollaston Peninsula. Ten to twelve geese may be harvested in a single day, with as many as fifty being taken per season (Ulukhaktok Interviews).

Only the meat and the feet of the Canada goose is consumed, leaving the innards, intestines, and liver to be discarded. The meat is commonly eaten either roasted, boiled, or as soup, and can be dried or frozen for later use. In the past, goose meat was commonly aged, or dried slightly and then aged,

as was the case with other waterfowl. If large quantities of geese were taken, the surplus would be dried and stored within the permafrost (Ulukhaktok Interviews).

Hunting geese is usually combined with other subsistence-related activities. One hunter reported hunting geese while preparing for the caribou harvest. Another indicated that he also does some trout fishing while hunting geese (Ulukhaktok Interviews).

Qugruk: Tundra Swan *(Cygnus columbianus)*

Unlike other waterfowl, swans are hunted infrequently, as they are fairly uncommon in the Ulukhaktok region. One resident indicated that her father would occasionally get one, while a hunter mentioned that he only harvests one every four to five years (Ulukhaktok Interviews).

Swans are hunted primarily in the spring, at the time of their migration north in May and June. However, they may also be harvested in August or the beginning of September. A shotgun is typically used when harvesting this waterfowl near Minto Inlet, on the west end of Diamond Jenness Peninsula, along the southeast end of Prince Albert Sound, near Kagloryuak River, Safety Channel, and Coast Point. Once harvested, the swan is cleaned and the meat is boiled. The wing of the swan makes an effective broom, and was commonly used in the past for this purpose (Ulukhaktok Interviews).

Kanguq: Snow Goose *(Chen caerulescens)*

The snow goose is harvested, prepared, and stored in much the same ways as the Canada goose, though it is hunted primarily during the spring migration (May and June). While it is abundant in the region, residents in the past seem to have consumed little of this species. It has only been in recent years that the snow goose has become popular to hunt. With its distinctive black-tipped wings, the snow goose is commonly hunted along the west end of Diamond Jenness Peninsula, along the south side of Minto Inlet, on Banks Island along the Kaleb River, at Ptarmigan Point, Coast Point, and Pingokyoak (Ulukhaktok Interviews).

As with the Canada goose, only the meat is eaten. It is commonly eaten as soup or roasted, and can be stored in the freezers for later use. In the past, waterfowl, such as the snow goose, would be stored in the ground below the permafrost (Ulukhaktok Interviews).

Tatilgak: Sandhill Crane *(Grus Canadensis)*

> The first time a crane had poked a young boy, when the boy was chasing it, the crane had turned around and poked him. The child's mother was so mad, and she cried so much that she cut the wings of two cranes and she let them walk. The two cranes that had killed her son were suffering because they had no wings to fly. They were getting real fat beside the ponds, they ate mice and grass and some food from the bottom of the pond in the shallow parts, because they could not dive very deep, and they got fat. When they were real fat, and their feathers looked nice, the women that had cut their wings went to them with only her ulu. They attacked her by the legs so she could no longer walk. They poked at her muscle and chewed them up, and then she couldn't walk any more. Because she could not walk any more, the two cranes were making her suffer like she had done to them, because they could not fly any more (Kalvak 1964: Tape 4).

Cranes are the first migratory bird to arrive in the Ulukhaktok area during the spring migration, and are therefore one of the first species harvested. Hunting usually begins in the early spring, towards the end of May, just outside of the community, as well as at Coast Point (Ulukhaktok Interviews).

Akilgivik: Rock Ptarmigan *(Lagopus mutus)*; *Nikhaktok*: Willow Ptarmigan *(Lagopus lagopus)*

> The ptarmigan was watching over them because the woman

> had a ptarmigan good luck charm. She had a dream about her ptarmigan. When she got up she started telling her husband, her in-laws and other relatives about the dream. She said that she had a dream about 'a ptarmigan that was sleeping with me while I was sleeping. I think something is going to happen to me. Maybe I'm going to get sick or I am going to lose my parents or maybe I will go somewhere.' She said of her dream (Kalvak 1964: Tape 12).

Fairly abundant all year round, the ptarmigan is an important food source to the residents of Ulukhaktok. This upland game bird can be hunted year round, but is usually harvested from spring through fall. Hunting begins in May and is intensive in November. Ptarmigan harvested in the fall are usually fat, and therefore, considered "good eating." During the summer months, the ptarmigan is hunted opportunistically while hunters engage in other subsistence activities. A .22 calibre rifle is often used to hunt the ptarmigan in the following areas: southern and eastern end of Prince Albert Sound, Coast Point, Holman Island, Tahioyak region, and just outside of the community (Ulukhaktok Interviews).

Ptarmigan meat is commonly eaten either roasted, sometimes dipped in aged seal oil, or boiled. As with other birds, the meat can also be frozen or dried for later use. If a hunter gets numerous ptarmigan, the birds are either shared with friends and family, or used as food for the dogs. Only the meat and some internal organs (heart and kidney) of the ptarmigan are consumed. The intestines and feet are not eaten (Ulukhaktok Interviews).

Ahangik: Long-tailed Duck *(Clangula hyemalis)*

The long-tailed duck is not commonly harvested or consumed in the community of Ulukhaktok. Hunters who do hunt this particular bird species usually do so during the months of June and July. As with other birds, the meat is typically boiled, with the resulting broth used as soup (Ulukhaktok Interviews).

Ukpik: Snowy Owl *(Nyctea scandiaca)*

While the harvesting of snowy owls has declined over the years, a number of Ulukhaktok residents continue to harvest the bird. The owl is hunted in the fall, when the birds are fat and considered the best for eating. Areas surrounding the community, Coast Point, and Prince Albert Sound are common hunting grounds. One hunter times his hunt with the rising population cycle of the snowy owl, which he estimates to be approximately every four years. The meat, which is said to taste like chicken, is boiled and eaten as soup (Ulukhaktok Interviews).

Niglignaq: Brant *(Branta bernicla)*

The brant is hunted during the spring migration, in areas surrounding the community and on Prince Albert Sound. However, as this particular bird species is fairly rare in the Ulukhaktok area, the brant is not commonly harvested. One resident mentioned that it had been many years since she had actually seen a brant. As with other birds, the meat from the brant is roasted, boiled, or made into soup (Ulukhaktok Interviews).

Eggs

The gathering of eggs is not as popular or common as it once was. Those who do engage in this subsistence activity typically collect Canada goose, king eider, and common eider eggs, which are either boiled or fried prior to eating. According to one resident, boiled eggs "taste rubbery, like seagull eggs" (Ulukhaktok Interviews).

In the past, eggs were gathered at Ramsey Island, and along the southwest coast of Prince Albert Sound. There was no preference given to the species of bird; rather, all eggs that were found were collected. When taking eggs from a nest, the gatherer would leave a few behind to encourage the bird to return to the same nesting area the following year. Eggs were eaten immediately either boiled or fried. Those that were to be stored were first boiled and then placed under ground until freeze-up (Ulukhaktok Interviews).

4.4.4. Iqaluit: *Fish*

> When the lakes still had ice, and when the rivers were flowing, the fish were running down stream, and they had made a fish weir. A man and woman were spearing fish, while their child was on land. When the rivers are still deep the children stay on land while their parents build weirs. They were getting a lot of fish after they had made the weir. They were so happy when they started to get a lot of fish without having to jig through the ice. The man and wife were so happy for the fish they had got from the deep weir that they had made for the fish that were going down the river to the ocean. That was how the people learnt to how make fish weirs (Kalvak 1964: Tape 2).

In the early 1900s fishing was the main subsistence activity during the spring months. People would gather at Lake Tahiryuak to fish and dance. This particular lake had what was called a *quunnguq* – a crack in the ice that people would fish from (Condon 1996). Men, women, and children alike, would participate in jigging for char or trout through the ice until early summer (Condon 1996; Damas 1984). During the warm summer months, corrals would be built in shallow streams that would allow for a few hundred fish to be taken. The haul would be preserved for winter by drying and then smoking the fish, or by burying them in stone caches (Condon 1996).

> When they finished hunting caribou at the end of the summer, before freeze up, they went to the rivers where the fish were heading up stream to the lakes. They caught the fish by using fish weirs. A fish weir was a corral-like area built in the lake. By using rocks, narrow corridors were constructed that lead to a large enclosed circular area. The area was divided into rooms, which were individually used by each family. In order to get the fish into the weir, the men walked towards the weir making the fish swim into it. The men and women wore hip waders made out of sealskin that kept them dry (Ulukhaktok Interviews).

In the early fall Arctic char would make its annual run from the ocean to the inland lakes. Char were desirable at this time of year, because they were the fattest. People would spear the fish that were trapped strategically in stone weirs, located in the rivers and streams. The fish were dried, with the majority being stored for use in the late fall or early winter. When the days began to get shorter and colder, people would head back to their wintering grounds to fish at known spawning areas of frozen lakes. People preferred to catch the male Arctic char and utilized polar bear teeth when jigging for this fish. Char fishing would continue through October, until the ice got too thick to chop through (Condon 1996).

By the middle of the century, nets had replaced fishing weirs. As char fishing was still an important subsistence activity, residents would travel to Fish Lake in late October to set nets under the ice or jig for fish through holes chopped in the ice. The majority of fish, however, were caught during the open water seasons, when nets would be set in the ocean and near the mouth of the Kuujjuak River (Condon 1996; Usher 1965). Individuals would set an average of four to five nets that were usually thirty feet by six feet (Usher 1965). During the summer they fished for char and trout by jigging for them. They would store their catch in a dug out hole in the ground that was lined with stones. After the fish had been placed in the dugout, on top of the stones, the catch was covered with more rocks. This allowed for air circulation that would dry the fish, as well as provided protection from other animals. The dry fish was good for up to a year, so they left them all summer while they headed north and inland to hunt the caribou (Ulukhaktok Interviews).

The most important fish species at this time was Arctic char. In the mid-1970s the Hunters and Trappers Association of Holman Island reported that each family in Ulukhaktok harvested approximately 300–350 pounds of Arctic char annually from Fish Lake, with the community total being approximately 5,000–6,000 pounds per year (Mackenzie Valley Pipeline Inquiry 1976; Usher 1965). Two sub-species of whitefish, the broad and the crookedback, along with the lake herring, were also common to the area at this time and were actively harvested by the people. Lake trout were also harvested in nearby lakes. Grayling and saffron cod, as well as capelin, were caught in July as they spawned near beaches (Usher 1965).

Arctic char remains the most important fish species to the people of Ulukhaktok, with lake trout also being actively harvested. Currently, landlocked char, Arctic cisco, cod, and whitefish are infrequently found in the lakes and streams on Victoria Island. Consequently, Ulukhaktok residents do not actively fish for them. Herring and sculpin are no longer caught, although it is not clear whether these trends are due to low availability or personal preference (Ulukhaktok Interviews).

Fishing generally takes place from April through to October, with most species being caught during this time frame. The exceptions are cod, which is caught year round, and whitefish, which is harvested only in October. During the spring and fall, residents of Ulukhaktok prefer to catch fish using nets or by jigging. This differs from the summer harvest, when people favour fishing using a rod-and-reel. The catch is generally prepared and consumed in a variety of ways including boiled, fried, baked, smoked, grilled, or frozen (*qwak*). Usually the entire fish, excluding the innards and the fins, is eaten (Ulukhaktok Interviews).

Char

During migration to inland lakes in August, char are harvested and then aged. Depending on personal preference, the process may or may not include the fish entrails. In the past, the aging process involved putting the char in a sealskin sack, placing it underground, and covering it with stones. The current method involves placing the char in a wooden box, which is then stored out of direct sunlight in a cool place. In order to prevent spoilage, the inside of the fish must be properly cleaned prior to aging. Spoilage from aging is determined by peeling the skin from the flesh of the fish once the aging process has been completed. If it peels off easily, the fish has spoiled and should not be eaten. Aged fish are eaten raw or frozen (Ulukhaktok Interviews).

A number of Ulukhaktok residents enjoy aged char heads. This process involves both the fish-head and the spinal column without the entrails. In the past, it was common to include the guts as well, so to improve the taste and quicken the aging process. The ingredients were placed in a sealskin sack and placed underground with stones covering them. Today, the sealskin sack has been replaced with pails, cardboard boxes, and steel mixing

bowls. The fish-heads, along with the spinal column, are placed in one of these types of containers and stored out of direct sunlight. The entrails are no longer included. In instances where the temperature becomes too high, the lid is removed so that the air can escape. The aging process is complete in approximately one to two weeks (Ulukhaktok Interviews).

The CINE study confirms that consumption of char is high, at least once a week among the households in Ulukhaktok (Kuhnlein et al. 2000).

Scientists do not make a distinction between the Arctic and landlocked char. The different colours are due to one group consuming shrimp-like orange crustaceans. The community, however, does make this distinction and therefore each will be discussed separately (Ulukhaktok Interviews).

Ivitaaruq: Arctic Char *(Salvelinus alpinus)*

The Arctic char is harvested from May through to October. In the spring, the fish migrate south, along the shoreline, where they are actively harvested with jigs or nets, and usually consumed fresh. During their fall migration, char are caught using the same methods, mainly for storage for the winter months (Ulukhaktok Interviews).

One Ulukhaktok resident remembers setting nets for Arctic char with her father. After a successful fishing excursion, they collected driftwood and prepared a fire with thin rocks placed on the flame to cook the fillets. This was the tastiest char she remembers eating (Ulukhaktok Interviews).

Currently residents of Ulukhaktok use nets, rods-and-reels,[18] winter jigging, and occasionally spears to harvest char. One respondent stated that he sets nets three or four times a day, depending on the amount of time he has and the amount of fish he requires. It is common to catch seventy to eighty fish in one net. Another fisherman stated he catches about two hundred char. One resident expressed concern about the over-harvesting of the char. He attributes this occurrence to the improved availability of harvesting equipment, which in turn increases the success of the char harvest (Ulukhaktok Interviews).

Arctic char is prepared in a variety of different ways for consumption. It is made into soup, fried, boiled, baked, smoked, grilled, frozen (*qwak*), dried, aged, or roasted. Occasionally, seal oil is used as a dip for the prepared char. Several respondents stated that they enjoy the liver, stomach,

and eggs fried with onions. Others, however, stated that the innards are not eaten. The fins of this fish, as with other fish species, are not consumed (Ulukhaktok Interviews).

For storage Arctic char is either dried or frozen,[19] or is dried and then frozen. Dried fish can be good for up to a year, though bigger fish are too oily to dry and are therefore stored in the refrigerator. One Ulukhaktok resident stores the fish he catches at Tahiryuak Lake in Halahikvik (Ulukhaktok Interviews).

Iqalukpik: Landlocked Char *(Salvelinus alpinus)*

The availability of landlocked char is limited in the lakes near Ulukhaktok, and the fish caught are often very small in size. Those who harvest this particular species do so at the same time they fish for lake trout (April through to October). Some use fly rods at the open edge of the ice, while others jig or use rods. One respondent stated that he takes about twenty fish a year. The landlocked char is fried, dried, boiled, or frozen, though according to one resident, it is not as good as ocean char. The innards are not eaten (Ulukhaktok Interviews).

Ihuuhuk: Lake Trout *(Salvelinus namaycush)*

Lake trout are caught from mid-March through to October; however, a number of residents indicated that they did not fish for them during the summer months. Common in the lakes and streams on Victoria Island, this particular fish species is harvested all over the island. In the past, the south end of Diamond Jenness Peninsula and Aniuktuk[20] were areas commonly used for fishing for trout (Ulukhaktok Interviews).

Jigging and ice fishing takes place in the spring and fall, while rods are used in the summer to catch trout. One resident reported taking a few hundred lake trout annually (Ulukhaktok Interviews).

> They would fish for char and trout in late October by jigging through the ice. The catch would be used as meals for the dogs and for themselves. They cooked the fish they were going to eat right away – the rest was frozen and eaten along the way (Ulukhaktok Interviews).

Having less fat than char, lake trout is consumed after baking, drying, boiling, frying, freezing (*qwak*), or occasionally roasting. Trout meat, however, is not aged. As with other fish, trout is stored by freezing. In the past, it was stored by being placed underground. Everything but the fins and the innards is consumed (Ulukhaktok Interviews).

Angmagiak: Arctic Cisco *(Coregonus autumnalis)*

There are three different Inuniaktun words for the Arctic cisco, one of which is *Iqaluhaq*. The Arctic cisco, or *Iqauhaq*, is caught using gillnets mostly in the summertime (June, July, and August), although some fishing does occur in the spring and fall. As with the landlocked char, the availability of this fish species is limited and the fish caught tend to be very small. While not widely consumed, the Arctic cisco can be consumed either dried or frozen. Some people do not consume the innards and head, while others enjoy the entire fish. The cisco is said to make "the ocean black" (Ulukhaktok Interviews). The CINE study suggests that consumption of cisco is very low (Kuhnlein et al. 2000).

Uugak: Cod *(Gadus ogac, Arctogadus glacialis, Eleginus gracilis)*

The cod, or *Uugak*, is caught year round, though is not as frequently harvested. It is eaten mainly by the older generation. Those who continue to harvest this particular fish do so throughout the spring summer, and into the fall. The cod is consumed fried, dried, or boiled (Ulukhaktok Interviews). The CINE study suggests that, as with the cisco, the consumption of cod is also very low (Kuhnlein et al. 2000).

Kapihilik: Lake Whitefish *(Coregonus clupeaformis)*, Broad Whitefish *(Coregonus nasus)*

Although the availability of whitefish in the Ulukhaktok area is quite limited, several residents continue to harvest it. They do so by placing fishnets under the ice during the month of October. Once caught, the whitefish is consumed after it is boiled, roasted, fried, or frozen (*qwak*), though it is never aged. The head, fins, and innards are not eaten (Ulukhaktok Interviews).

Pikoaktitak*: Herring *(Clupea harengus)[21]

Although herring is no longer harvested in the community of Ulukhaktok, one resident recalled that it was caught during the summer months. Some of the catch was eaten immediately, while the rest was dried, stored away for winter in the icehouse, or used for dog food (Ulukhaktok Interviews).

Kanayugaq*: Fourhorn Sculpin *(Myoxocephalus quadricornis)

Sculpin is no longer actively harvested in the Ulukhaktok area, although there is no indication as to why this is so. In the past this fish was harvested with fishnets, primarily in the springtime. Occasionally, it was harpooned in the fall and eaten frozen (*qwak*). It was prepared by cooking, boiling, or drying the meat, and the liver was said to be the best part. In addition, scuplin was used as baby food and dog food (Ulukhaktok Interviews).

4.4.5. Plants

Plants are an important resource for the community of Ulukhaktok. In addition to providing essential nutrition to residents, they are also the primary source of food for the animals that the community relies on for subsistence. Undoubtedly, plants form the foundation of the Arctic food web.

There are a variety of plant species that thrive in the short but intense growing season typical of the Ulukhaktok area, which include lichens, roots, and fruits. Plants have historically held significance as a food source, flavouring, and medicines. The women of Ulukhaktok have traditionally been the gatherers of plants, a practice which continues today (Ulukhaktok Interviews).

Qunguliq*: Wild Rhubarb *(Oxyria digyna)

Rhubarb is usually collected during the summer months of May, June, and July on the south side of Minto Inlet and areas within and surrounding the community. This particular plant species prefers areas of high soil fertility, and is often found near animal dens, bird nesting sites, or settlements. The plant's stocks are boiled for their juices or eaten raw. Gatherers avoid collecting rhubarb close to roads or paths because the plants may potentially

be polluted by all terrain vehicle and snowmobile exhaust or human waste (Ulukhaktok Interviews).

Mahu: Eskimo Potato *(Hedysarum alpinum americanum)*

Eskimo Potato is a common legume that is easily recognized by its unscented pink flowers, bright green leaves, and 'Y' shaped stalks. Primarily gathered by women, it is commonly collected "just after the land thaws and before it freezes again" (spring through to fall). Eskimo Potato is found near the bluffs around Ulukhaktok and on the north shore of Prince Albert Sound, "in spots where the ground is soft." The plant is reported to be the sweetest just after a rainfall. Eskimo Potato is eaten either boiled or raw, often with seal oil (Ulukhaktok Interviews). Stefansson (1913) recorded that while Eskimo Potato was abundant in the regions of Prince Albert Sound, Minto Inlet and Victoria Island in general, its consumption among the Inuit of this region is relatively lower than among Inuit in Alaska. At present the consumption of Eskimo Potato is very low (Kuhnlein et al. 2000).

Berries

Arctic blueberries, blackberries, and cranberries, are all commonly collected by Ulukhaktok residents during the months of August and September. Although the location of berries varies from year to year, they tend to grow in similar areas as Eskimo Potato. While women are the primary gatherers of plant resources, one male resident stated that he collected his own. Berries are eaten raw, used in baking, or made into jam (Ulukhaktok Interviews).

4.5. Discussion

The detailed human ecology of the Ulukhatokmuit reveals that relations between the biological and cultural are direct, complex, and pervasive. There is no rupture between nature and culture. Despite dramatic change in a short period of time that resulted from Euroamerican contact, disease, and

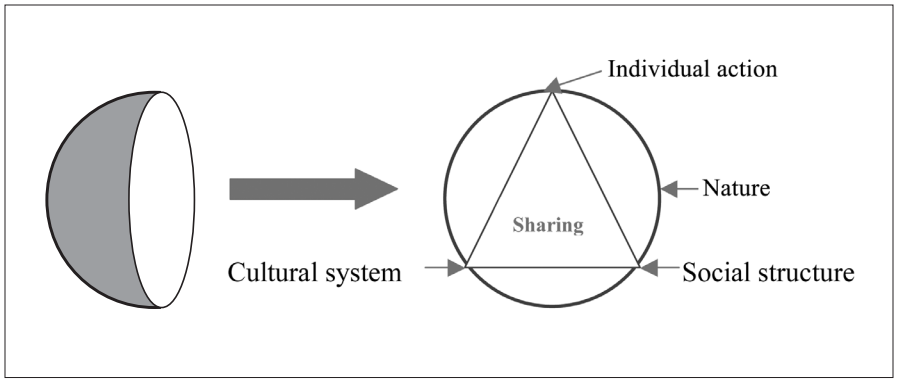

Figure 4.5: Dissection of the Human Ecology of Ulukhaktok.

penetration of the market economy, the subsistence way of life continues to sustain the Inuit of Ulukhaktok.

Sharing is at the basis of the cultural system and informs social relations in the hamlet. As the animal gives of itself, so does the hunter give of his or her harvest. It is this process of *giving* (and not taking) that is actualized in the form of sharing. Sharing provides an insight into the relationship that forms the basis of the human ecology of Ulukhaktok. Life gives unto life. The interviews indicate that sharing is omnipresent at every level, including but not limited to preferred animals such as seals, caribou, and muskoxen. Elders, family members, friends, and the community as a whole partake in the sharing.

Sharing reveals the anatomy of Inuit resilience in the face of social change. In the face of technological change, such as the introduction of the snowmobile and the gun, and in spite of social change, such as disease and the emphasis on individual accumulation through the market economy, the value of sharing, combined with the basic need for sustenance, has nourished not only bodies of the *Ulukhatokmuit* but their spirits as well. If we were to dissect the human ecology of Ulukhaktok, this case study illustrates that the *cultural system* informs the *social structure*, which is manifested in the *actions of individuals* through the value of *sharing* (see figure 4.5).

The case study illustrates (see foldout map) that the land and marine use is extensive rather than the intensive usage typical of an agro-industrial culture. Notwithstanding sedentization, Inuit human ecology retains the knowing *how* of subsistence living. With modern modifications, the aging of various types of foods, the rendering seal oil for lamps and human use, and the preparation of various types of animals and plants for human consumption indicates that indigenous knowledge remains intact because Inuit subsistence lifestyle remains in *place*. Subsistence hunting and gathering continues through a comprehensive understanding of the environment that is ongoing. The experience of being Inuit does not lie within the *Ulukhatokmuit* but in the relations between them and the surrounding ecology.

The next case study is an example of Iñupiat observations of variance in their relations of their surrounding ecology. It is an excellent illustration of how human ecological research must be alert to variance rather than relying solely upon the aggregate or average of community responses. In the human ecological study undertaken for Ulukhaktok, some community responses indicated climatic variation in their local ecology. Thus, chapter 5 examines Iñupiat knowledge of sea-ice.

CHAPTER 5

"The Weather Is Going Under"– Human Ecology, *Phronesis*, and Climate Change in Wainright, Alaska, USA

We may grasp the nature of prudence [phronesis] if we consider what sort of people we call prudent.… Hence, when we think that Pericles and others like him are prudent, because they can envisage what is good for themselves and for people in general; we consider that this quality belongs to those who understand the management of households or states (Aristotle 2004: 150).

5.1. Introduction

Of the four objectives of this case study, the most important is an understanding of how the process of *living through* generates practical wisdom (*phronesis*). The second objective, related to the first, is a presentation of the value and relevance of indigenous knowledge on issues of societal concern such as climate change. The third objective is the articulation of a method

which is best suited to gather and understand this knowledge. The final objective is the presentation of the human ecological implications of climate change.

Subsistence lifestyle inherently connects people to their environment, allowing them to observe discernible change. Therefore, indigenous knowledge about sea-ice, which is so important to subsistence livelihoods, has the potential to enrich and expand our collective understanding of climate change in the Arctic. Recent studies using documented personal observations based on indigenous knowledge indicate climatic variations on a regional basis (Krupnik and Jolly 2002; Magnuson 2000; Nichols et al. 2004; Reidlinger and Berkes 2001). Subsistence activities provide a practical foundation from which to undertake a study on climate change using both indigenous and scientific knowledge systems. Because sea-ice[1] is such a visible entity which is interwoven into the daily lives of polar communities, personal observation of ice phenology can help researchers understand climatic change.

In the context of Wainwright, Alaska, we have an unusual condition in that indigenous knowledge about sea-ice, gained through direct participation in Iñupiat subsistence activities, is relatively well documented (Nelson 1969; 1982). On the other hand, scientific knowledge about sea-ice is comparatively incomplete and can be made more rigorous by access to current as well as already documented indigenous knowledge. This has been recognized by researchers in the Arctic who have repeatedly pointed out that one of the values of utilizing indigenous knowledge arises from the incomplete nature of scientific knowledge (Berkes 1999; Cruikshank 2001; Kawagley 1995; Kawagley et al. 1998; Nelson 1969; Norton 2002; Reidlinger and Berkes 2001; Wenzel 1999). Furthermore, research on climate change is not simply driven by incomplete science, but by public desire for and participation in the process by indigenous Arctic communities. Some researchers have described research in Arctic environmental changes as a 'frontier' in polar science and public action (Krupnik and Jolly 2002).

Sea-ice conditions play a fundamental role in subsistence hunting activities of Wainwright. Harvesting of marine mammals establishes the baseline for research using sea-ice as an indicator of local climate change. This case study seeks to document sea-ice morphology and phenology

based on observations by community members from Wainwright. The research on climate change was conceptualized on the basis of their subsistence lifestyle. With ice movement and because of it, there is an abundance of marine resources for harvest in the North Slope of Alaska. The residents of Wainwright are significantly dependent upon the fruits of sea for their nutritional needs (Braund 1993; Fuller and George 1999; Ivie and Schneider 1988; Kassam and the Wainwright Traditional Council 2001; Luton 1986; Nelson 1969; 1982). Along with the richness of the sea there are additionally special problems of safety and travel on open water and sea-ice. As a result, the Iñupiat have over successive generations developed detailed knowledge of the sea-ice environment and methods for interacting with it (Nelson 1969; 1982).

Wainwright, Alaska, is located 85 miles (136 kilometres)[2] southwest of Barrow at 70.59° north and 160.07° west, on the Chukchi Sea (see figure 5.1). The community is 480 kilometres north of the Arctic Circle. It is inhabited by a mix of *Kuugmiut* (people of the Kuk River) and *Utuqqaġmiut* (people of the Utuqqaq River). Both groups are Iñupiat. Wainwright, originally known as *Ulġuniq* by the Iñupiat, is one of eight communities belonging to the North Slope Borough, which acts as the political subdivision or municipal government for northwestern Alaska. The population of Wainwright is approximately 550 residents with 91 families (Kassam and the Wainwright Traditional Council 2001).

The effects of climate change in this small locality, when tabulated from indigenous knowledge and satellite photographs, have been shown to be significant. The micro-environmental changes occurring, documented by science and indigenous knowledge, are being repeated in the whole circumpolar region. This site-specific study points to the need for similar studies throughout the region and on other continents.

1. The starting point of this case study is the conceptual underpinnings and methodological process for the gathering of indigenous knowledge regarding sea-ice (section 5.2).

2. This is followed by a summary of the climate change–related local observation from previous human ecology research

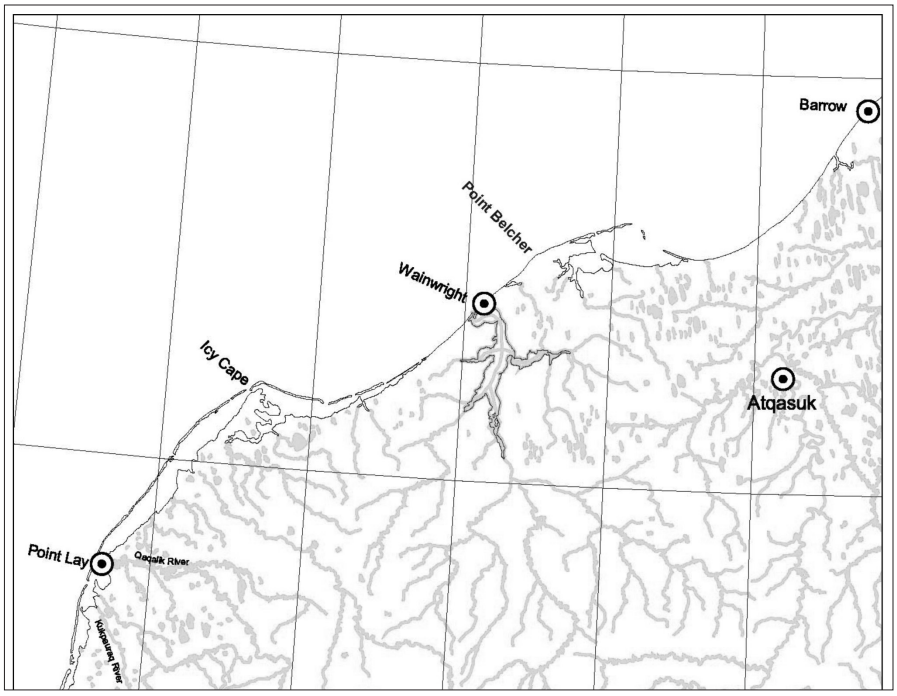

Figure 5.1: Map of Wainwright.

carried out in partnership with the community of Wainwright, Alaska (section 5.3).

3. This chapter presents research results relating to sea-ice phenology and morphology (section 5.4).

4. This chapter examines the human ecological implications of climate change as described by the community (section 5.5).

5. This chapter concludes with a discussion of the overall case study with respect to context-dependent knowledge (section 5.6).

5.2. An Approach to *Phronesis*

Community participation and action research elaborates knowing *how* in a way that is methodologically sound and necessary to investigate *phronesis* or practical wisdom. The information gathered through action research may be validated in a numbers of ways because validation is both an exercise in power and speaks to the credibility of the research. This section hopes to answer the question of how such research is best validated.

5.2.1. Phronesis Revisited

Knowledge from a human ecological point of view does not lie in the heads of individuals, but in the relations between them and their environment. Human ecology exemplifies the complex interconnectivity between the biological and cultural. Iñupiat human ecology provides spheres of contextually defined connectivity that enable knowing *how* one lives with and on sea-ice. In turn, this practical wisdom, or *phronesis*, sheds light on weather changes in Wainwright, Alaska. Learning is achieved in a context, which provides an explanation of connected patterns. These patterns are revealed through relationships such as those of the Iñupiat of Wainwright, Alaska, to sea-ice.

The geophysical location of Wainwright compared to other communities on the North Slope of Alaska speaks to context-dependent knowledge. One of the participants in the research, Homer Bodfish, explained: "The sea conditions between Barrow and Wainwright are very different. The reason for this is the 'U' shaped location of Wainwright from Icy Cape in the west to Point Belcher in the East." The village is located on a peninsula on the east side of the mouth of the Kuk River. Unlike Barrow or Point Hope, Wainwright is not located on a point. Therefore, ice movement in this region is different because it forms a concave arc moving NNE to SSW bounded by Icy Cape (*Qayiaqsiġivik*) approximately 50 miles (80 kilometres) to the southwest and Point Belcher (*Nunaġiaq*) 15 miles (24 kilometres) to the northeast (Nelson 1969: 35). As Wainwright is located on a shallow bight where the bottom drops gradually into the Chukchi sea, land-fast ice extends out several miles steadily as the winter progresses (Nelson 1969: 33). Because of its unique location, ice movement in the Wainwright area is

affected equally by both the wind and current relative to other coastal communities on the North Slope. Therefore, knowledge of sea-ice movement for the purposes of subsistence hunting is distinct to Wainwright's coastal geography and gained through direct experience.

Knowing *how* is crucial to ecological problems resulting from climate change. It is noteworthy that the science of weather forecasting predates satellites, computers, and modern communications technologies, and it emerged from indigenous or local experiential knowledge. Hunting and gathering, agriculture, and maritime and overland travel for trade all required human societies to be able to forecast weather.

The method of research by applied scientists is pragmatic and best described as *praxis* (Greenwood and Levin 1998). The scientist first 'speculates' – that is, generates a hypothesis, and, second, makes observations or conducts experiments. Simultaneously, it is important to note that the hypothesis, while tentative, is arrived at by posing questions based on previous observations (Mayr 1982). The questions are posed within a particular social context and, therefore, are contingent. The process is neither purely deductive nor inductive; rather, it closely resembles knowing *how* (Berg 1995). The knowledge generated is context-specific, not based on absolutes and requires continuous testing. In essence there is a diversity of methods of gathering knowledge which involve observation, participation, and experimentation, all of which rely on learning *how*.

5.2.2. Community Participation and Action Research

The character of the knowledge (knowing *how*) determined the nature of research methodology employed in this study. Knowing *how* is gained through performance where the hunter is bodily and mentally active. Knowledge is both achieved and communicated through participation in partnership with the community, an essential element in enabling an understanding of Iñupiat experience of sea-ice. Meaningful community participation includes the involvement of the community in the planning of the research process, collecting and analyzing information, and utilizing the research results. In this way community participation is an active process in which community members are involved in influencing the direction as well as the execution of the research at all stages. The aim of action research is not

simply the generation of a research product, but also the integration of the aspirations and priorities of the community at every stage.

This case study flows from action research on human ecology, which examined the relationships between Iñupiat of Wainwright and their environment: specifically, the relations between humans, other animals and plants, and their habitats. A total of fifty interviews were conducted in 1999. Twenty-two of the participants were female and twenty-eight were male. Their ages ranged from the early twenties to the late nineties. All participants except one, a young female, were currently or had been in the past hunters, fishers, and/or trappers. There were thirty-eight currently active hunters, fishers, or trappers among the participants. Approximately half of the participants were over the age of sixty and were considered 'elders,' all of whom had engaged or continued to engage in a subsistence lifestyle.

In the summer of 2000 when the results of the research were being presented to the Wainwright Traditional Council for validation, observations on climate variations, taken from interviews, were also noted. At the outset of the research, there had been no intention to study the impact of climatic changes at the local level, although weather changes were discussed as they affected harvesting and food consumption (Kassam and the Wainwright Traditional Council 2001: 9). As early as the 1980s, weather changes were perceptible to hunters as a result of a shift in the position and formation of leads in sea-ice, which was manifested in changing waterfowl behaviour in terms of feeding and landing locations (Nelson 1982: 108–9). It is not surprising that the intimate knowledge the Iñupiat have of their local ecosystems revealed perceptions by Wainwright community members of broad changes in the climate and, as a consequence, in animals. The leadership of the community requested that additional research be undertaken to explore Iñupiat knowledge of climate change to confirm the earlier research because of its importance to their subsistence activities. A total of fourteen new interviews were conducted with captains of traditional whaling crews and subsistence hunters who have an immediate and intimate empirical understanding of sea-ice conditions. These new interviews based on climate specific questions are the basis of this case study.

Action research is anchored in community participation. Its purpose is to produce practical knowledge gained from and returned to the

community. Action research recognizes that such knowledge is revealed through participation rather than simply logic or observation (Dewey 1933; Feyerabend 2002; Greenwood and Levin 1998; Lewin 1951; Reason and Bradbury 2001). While recognizing the value of the outside 'expert,' this approach also values the practical wisdom or *phronesis* of local inhabitants. The actors in this form of knowledge production are socially diverse. In turn, the community is involved in the construction of its own knowledge (Gibbons et al. 1994). Action research methodology is central in determining validity of the research undertaken. Indigenous knowledge, in this case Iñupiat knowledge of sea-ice, is not merely data, but part of a greater social context (Cruikshank 2001).

5.2.3. Validity

Validity criteria in action research are as significant as in any other scientific activity because this type of research deals with matters that are complex and important to the lives of the Iñupiat, and eventually, to the wider human community. Just as in science, in action research validation of knowledge is community-based. In science, rigorous testing of the validity of propositions is determined on the basis of *communities of inquirers*, whereas in action research it takes its domain from *communities of social practice* (Argyris, Putnam, and Smith 1985). Through experimental methods and the peer review process inquirers rationally criticize each other's claims. Similarly, in action research the community, in this case, the Iñupiat hunters and traditional whaling captains, engage in public reflection on their observations. Public testing may result in potential disconfirmation of knowledge claims. Just as *communities of inquirers* constitute a base of knowledge experts, so do the subsistence hunters constitute knowledgeable experts (Kassam and Tettey 2003). While science tests the validity of knowledge generated in their *communities of inquirers* to check if the proposition is falsifiable, participatory research tests the knowledge generated through its usability (workabililty) for the communities it seeks to serve. This gives action research a strong pragmatic or practical underpinning (Argyris, Putnam, and Smith 1985; Greenwood and Levin 1998). In other words, is the knowledge given about sea-ice actually useful; does it work; can it be applied? This type of validity test is possible because the nature of the knowledge regarding sea-ice is

primarily of the form of knowing *how* to undertake subsistence activities on sea-ice, and the ultimate test is survival.

After analysis of the additional interviews, the climate change interview results were presented to the community of Wainwright, Alaska, in the summer of 2001 for validation at an open meeting. Fourteen community members were present, ten who had participated in the interviews and four others who were among the leadership of the community and had an interest in the research. The validation session was held in two parts: before and after noon. Unlike the interviews that were conducted individually, the examination of research results was a group activity. Eight posters reflecting an analysis of the interviews with regards to wind and current patterns, sea-ice formation, pressure ridges, and leads illustrated by maps and notes were meticulously reviewed. In addition, satellite aperture radar (SAR) images for the period 1996 to 2000 were on hand and reviewed by community members present. Consensus on validity of information from the interviews undertaken occurred after discussion, clarification, and in some cases correction of data presented. New and relevant information was added as a result of this process. It was at this meeting of the group that the title of the case study was determined: "The weather is going under" – reflecting the deep anxiety community members were feeling from their increasing inability to anticipate changes in weather.

Finally, the penultimate draft of this chapter was reviewed by the Wainwright Traditional Council for accuracy of observations and analysis in the spring of 2004. The research results are compared and contrasted with earlier studies carried out by Nelson (1969; 1982) that provide valuable Iñupiat knowledge of sea-ice previously documented at Wainwright, Alaska, and with satellite aperture radar (SAR) images for the Wainwright coastal regions over a period of five years (1996 to 2000).

5.3. Previous Human Ecology Research

As noted earlier, the fifty interviews conducted for human ecology research provided the impetus for further research on variations in weather affecting Wainwright. Summarized below are eight observations made by hunters, fishers, and trappers in the community.

1. Many community members noted that there has been an increasingly observable warming trend over the last fifteen years.

2. Local observation indicated clear biological impacts on organisms arising from climatic change. A warmer and longer fall season affects the quality of fur found on animals such as wolves, wolverines, and foxes. Blair Patkotak, who hunts fur bearers, noted: "The quality of fox, wolverine, and wolf fur is much better in colder years." He observed that the guard hairs, which are the longer and more wiry strands, are not as long as they were ten or fifteen years ago. For instance, the guard hair on the hindquarter of a wolverine now ranges between four and six inches, where it once was considered normal for them to reach eleven inches. Winter conditions do not dramatically affect the fur quality, even if the winter is cold. The quality of fur is said to be directly affected by warmer autumn months.

3. Warmer fall and winter months also appear to affect the freeze-up of sea-ice around the region of Wainwright, Alaska. Participants in the research observed that freeze-up, which used to begin in October, is not taking place until December. Furthermore, when freeze-up does occur, the ice is not forming as thickly as it used to.

4. Climatic changes make subsistence harvesting activities potentially dangerous and have a direct impact on the ability of the hunter to harvest food. Figure 5.2 illustrates the range of harvest of foods for Wainwright. Specifically, the people of Wainwright continue to harvest a number of marine mammals: the bowhead and beluga whales, the bearded and ringed seals, and the walrus.

5. Safe harvesting of the bowhead whale requires calm weather and strong ice. Hunters must be aware of thin ice that may not support the weight of a bowhead whale as it

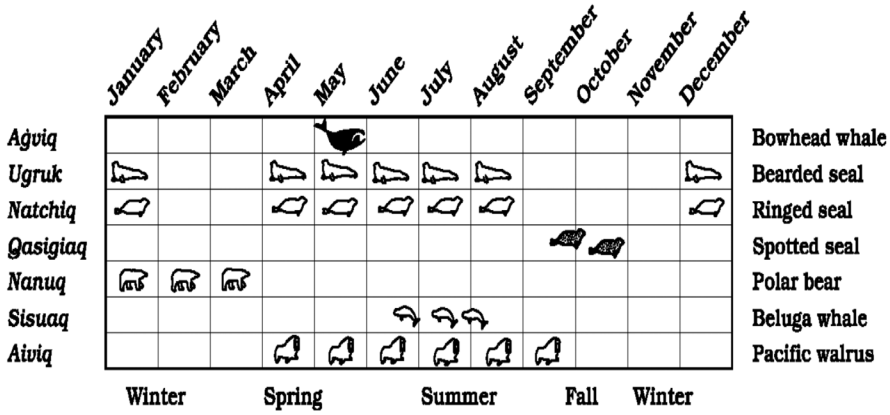

Figure 5.2: Marine Mammal Harvest Season.

is being pulled out of the water and up onto the ice with block and tackle. The bowhead harvesting season is from mid-April to early June, as the bowhead do not pass by the community during their fall migration. This reiterates the context-specific character of sea-ice phenology and subsistence hunting practices in Wainwright compared to a neighboring Iñupiat village like Barrow which undertakes harvesting of the bowhead whale in both spring and fall.

6. Strong and stable ice conditions are required for marine mammal harvesting. Hunters prefer to harpoon walruses, which tend to sink, on drifting floes and pans of ice after the breakup. Due to their size, they are usually butchered out on the ice anytime after mid-June through November. Although seals are not as heavy as walrus, the hunters also butcher *ugruk* (bearded seal) directly on the sea-ice after the hunt. Hunters take home only the usable portions of the *ugruk* leaving the remainder. This is a relatively more efficient method of butchering than taking the large seal back to the home of the hunter, provided that the sea-ice is solid and stable.

7. Late freeze-up also has an impact on the polar bear population, which is trapped on the land and appears to be starving. Community members are often forced to kill these bears when they come to the town seeking food as they pose a danger to the community. Several years back, a resident from the neighbouring village of Point Lay (to the West) was killed by a starving polar bear. In the summer of 2000 during research on indigenous knowledge of climate change, there were several sightings of polar bears stranded on land and one had to be killed because it ventured into the community. Examination of the bear indicated that it was starving.

8. An elder, aged sixty-two, noted that the tundra appears to be softening and melting. As a child, he remembered being able to dig only six inches deep into the ground. Now he can dig three feet into the ground.

As a result of these observations by community members about climatic factors, there was sufficient justification to warrant further investigation on subsistence harvesting and climate change through sea-ice conditions.

The next section provides the results of the fourteen additional interviews conducted specifically to document local observation of climate change in Wainwright, Alaska.

5.4. Human Ecology and Climate Change

In order to understand whether (knowing *that*) climate change is taking place, we must ask *how* the performance of tasks on sea-ice by the Iñupiat of Wainwright are being affected. In this section, two more objectives of this case study will be dealt with: namely, to observe *phronesis* in action and to illustrate the value of indigenous knowledge to issues of societal concern. Below we will summarize Iñupiat knowledge of ice formation, grounding of pressure of ridges, opening of leads in ice, and the dynamic and mutually reinforcing roles of winds and currents.

5.4.1. Ice Formation

It is said that previously, formation of slush ice in the Wainwright area began in late September or early October. Slush ice was then pushed offshore by the wind forming against the Arctic pack ice which was extending southward. The broad floes of the newly formed young ice extend towards the land with winds from the sea in October. In 1964, Nelson reported that ice hunting had begun by late November in Wainwright (1969: 11). Furthermore, in 1981 Nelson observed that formation of *tuvaq*, or land-fast ice, may vary and ice may not reach the shores of Wainwright until late November (1982: 2–4).

The talent the Iñupiat display in hunting marine birds and mammals is fundamentally linked to their knowledge of sea-ice. The presence of ice for the Iñupiaq brings the promise of game. Once the shore-fast ice has formed, the seasonal cycle of hunting may begin. Figure 5.3 illustrates the seasonal nature of harvesting of resources and their relative intensity. Furthermore, it indicates periods in which sea-ice may affect harvesting of a resource. While the figure does not show the presence of pans and floes of ice in late June through to September, they are essential for the harvesting of walrus and bearded seals.

At present, community members contend that within their lifetime they have witnessed significant change in ice formation. In the past, slush ice was present in September and shore-fast ice began forming in October. Billy Blair Patkotak,[3] an elder, noted that "fifteen years ago we could predict ice formation, we cannot do so now, the system is screwed up now." Over the last twenty-five years, ice formation, on average, has gradually moved later into the fall. Twelve of the fourteen interviewees gave specific information stating that they have noticed warmer weather conditions where freeze-up has shifted from mid or late September to late November or December. Barry Bodfish, an elder hunter, pointed out that shore-fast ice once began forming in September; however, at present people are still boating in late October and into November. In 2001, freeze-up (formation of shore-fast ice) did not occur until January 16. Late ice formation has been blamed for altering ice morphology, causing a negative impact on hunting and travelling in the coastal areas around Wainwright. Thirteen out of the fourteen interviewees stated that they have noticed the nature of sea-ice has changed

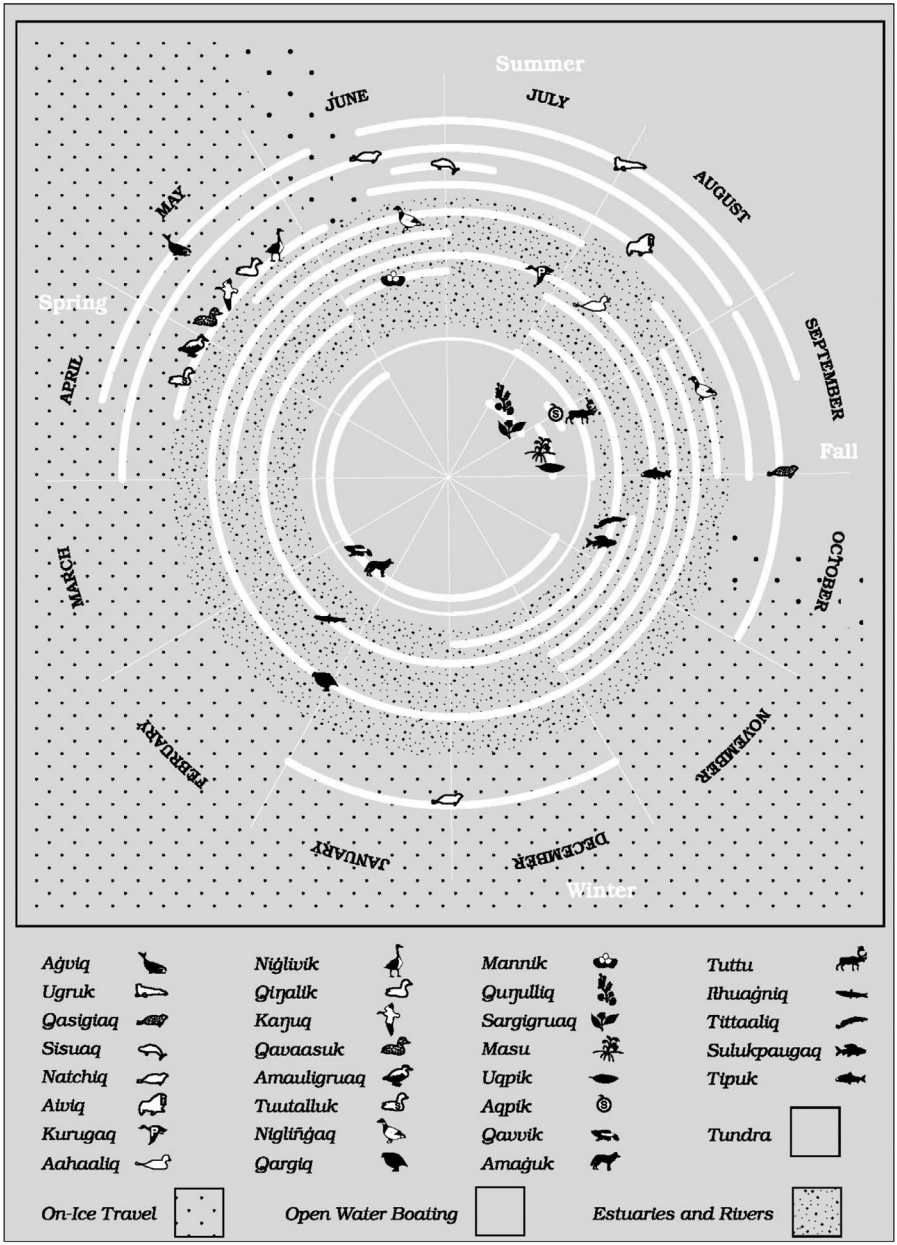

Figure 5.3: Seasonal Profile of Subsistence Harvesting in Wainwright, Alaska.

over the last twenty-five years. It is noteworthy that most hunting activities are not conducted in large groups, with the exception of subsistence whaling, which takes place with a crew of ten to twenty people. Therefore, the observations of these hunters reflect their individual experiences and as part of different subsistence whaling crews. In the past, ice was rough, thick, and robust, whereas currently, ice tends to be thinner, less likely to anchor to the shore and tends to "rot" (i.e., thaw) more rapidly in the spring. Billy Blair Patkotak noted that late ice formation and conditions such as rain in February are not allowing the ice to grow thick like it once did. Current research based on multidecadal scale of surface air temperature indicates a warmer summer in the Arctic which contributes to late ice formation. Furthermore, models based on this data predict declining sea-ice thickness as the warming trends continue (Johannessen et al. 2004). Thin, poorly developed ice makes subsistence activities more difficult. Tasks such as hauling a whale out of a lead up onto the ice have become burdensome and dangerous to whaling crews. Gene Aguvluk, a member of a whaling crew, explained that larger whales keep breaking through thin ice at present, whereas in the past crews rarely faced this problem because the ice was much thicker. Billy Nashoalook, an elder, confirmed that single year ice tends to "rot" quickly, resulting in concerns for safety of subsistence hunters. Overall, community participants in the research noted that the ice seems to be a lot more "damp" (wet) and it does not get very thick. They estimated that it does not get thicker than four feet. They explained that when snow falls onto the water and does not melt, the ideal condition for sea-ice formation has begun. The current and the wind then work together to push the snow together to form "young" ice in the fall. This "young" ice accumulates to form shore-fast ice.

Temperature is important to the formation of sea-ice. The north wind helps form slush-ice and the calm weather allows it to grow, thus making the ice stronger. In the past, cold prevailing winds from the north/northeast in the early fall, along with a current running parallel to the coast in a southerly direction, helped facilitate ice formation. Late fall would have south/southwesterly winds and a current out of the south, resulting in pressure ridge formation. At present there has been a reversal with southern winds prevailing in early fall and northeast winds dominating the late fall.

This altered pattern retards ice formation in the autumn, and once the ice does form, it tends to get forced out to sea before it can become solid shore-fast ice. The participants emphasized an increase in erratic weather patterns. They had not observed such variation in ice formation before, nor did they recall the presence of less robust (thinner) ice in the past.

5.4.2. Pressure Ridges

Pressure ridges are an important characteristic of sea-ice. They act as anchors, grounding shore-fast ice to the ocean floor in shallower areas. Pressure ridges allow for safe passage for hunters on the shore-fast side of the ridge even when the current is shifting. According to Nelson (1969: 67), at Point Belcher and Icy Cape the "ice piles heavily" due to the depth of the water and movement of the current. Furthermore, on the south side of Icy Cape, which is an area exposed to southerly storms, there is intense ice movement with very high and extensive ridge formation (Nelson 1982: 11). Nine of the community members interviewed stated that pressure ridges are smaller and fewer in number today, compared with the past. They noted that this change is particularly observable in the past five to six years. Community members noted that because of thinner ice, pressure ridges do not anchor to the ocean floor. Without pressure ridges anchoring sea-ice to the shore, ice can be easily carried out to sea by wind and current. This can be a very dangerous situation, explained Noah Phillips, because hunters can drift out to sea, creating an often life-threatening situation. George Agnasagga, a hunter, pointed out that once the pressure ridges form, the ice is safe landward of the ridge. The ice may move on the seaward side of the pressure ridge, but it is anchored solidly and is safe on the shoreward side. He explained that in order for large anchoring pressure ridges to form, there must be strong south/southwesterly winds coupled with a current out of the south in the late fall and early winter. This will force the ice to pile up along the shore. Without these two factors, large anchoring pressure ridges will not be created, as was the case in the spring of 2000. With little southerly wind over the winter (1999–2000), pressure ridges were few and poorly developed along the coast of Wainwright.

During validation of research results participants agreed that the wind and current dynamics for anchoring pressure ridges require a

strong westerly to southwesterly wind and a current moving from southwest to northeast. The new irregularity of the weather makes the reliability of pressure ridges difficult to discern. This means that predicting weather conditions by the Iñupiat for subsistence activities becomes increasingly difficult.

5.4.3. Leads

The location of leads is directly related to the formation and location of pressure ridges. Leads are longitudinal openings in the ice that are formed on the seaward side of large pressure ridge. Leads form when winds and currents break the ice free from anchored shore-fast ice and move it outward into the ocean. The locations of leads normally change from year –to year as a result of wind and current patterns. Certainty in terms of the location of grounded ice is determined after leads have formed and closed several times. The most effective test to find the location of grounded ice and the safest leads is a storm that would normally shift the ice away. Therefore, the Iñupiat hunt on the landward side of the leads that run parallel to the coastline (1969: 15; Nelson 1982: 4). Leads begin as cracks in the ice. Not all cracks become leads. For hunters, fractures in the ice that are more or less perpendicular to the coast are considered safe for travel. However, ice on the seaward side that runs parallel to the coastline may easily break away from the shore-fast ice (Nelson 1969: 54).

Nelson reported that the northeast wind is most likely to create an open lead. Unlike the coast at Point Hope or Point Barrow, in Wainwright hunters have had to travel 10 to 20 miles (16 to 32 kilometres) from the shore to hunt for the bowhead whale. Sometimes hunters have travelled to Icy Cape to the southwest or Point Belcher to the northeast to take advantage of leads that remain open longer, are closer to the shore and have a greater abundance of whales (see figure 5.1). In May 1965, he observed that hunters in Wainwright went out 12 miles (19 kilometres) from the shore during the whaling season (1969: 39; Nelson 1982: 11–12). Billy Blair Patkotak stated that on average leads form 2 to 10 miles (3 to 16 kilometres) out in front of Wainwright. Currently the leads tend to be slightly closer to shore than they were in the past (20 to 30 years ago). The exact location of the leads does necessarily hinder subsistence activities. However, if the leads do not

open or are too far from the shore, hunting may be hampered. Also, if pressure ridges do not anchor the ice or the ice is not robust around open leads, hunting activities can be hindered, as pointed out by Gene Aguvluk in the section on ice formation (5.3.1).

The current is from the south in the spring – that is, moving pack ice from the southwest to the northeast. The current in the fall shifts to the north – that is, moving pack ice from the northeast to the southwest, therefore, along the coast. As noted earlier, ice conditions in Wainwright differ from Barrow to the northeast and Point Hope to the southwest because Wainwright is located in a gulf between Point Belcher and Icy Cape. Ice break-up occurs at Blossom Shoal. High tide can break the ice without wind, only using the strength of the current. Whaling Captain Rossman Peetook explained: "In calm weather we have seen the lead open-up because the tide goes up and down, *katak*." Gregg Tagarook Sr., an elder, added: "On that day when the lead opens up we know that the North wind is going to blow."

Rossman Peetook explained that high tide with a southwest wind, that is, moving to the northeast, is called *Aunnaġruk*. Low tide with northeast wind, that is, moving to the southwest, is called *Nigiqpak*. When there is first high tide and then low tide, the ice can crack and form a lead. This is referred to as *katak*. At present leads are forming closer to the land. The thicker the shore-fast ice, the longer it can potentially stay in the spring. At present the shore-fast ice is not very robust. The wind and current are increasingly irregular, thereby affecting lead formation.

5.4.4. Winds and Currents

Both wind and current direction are central to discerning climatic changes in Wainwright. It is useful to review Nelson's research work documenting extensively the knowledge of Iñupiat hunters regarding sea-ice formation and movement as it relates to wind and current direction. Nelson is very clear that this knowledge is entirely gathered from the Iñupiat of Wainwright and no other external or published sources were consulted (1969: 391–397; Nelson 1982: 41).

Reiterating that knowledge about weather and sea-ice morphology is context-specific, Nelson's research confirms that unlike Point Barrow or

Point Hope, where the current can shift heavy winter ice, in Wainwright both the current and wind must combine to move shore-fast ice (Nelson 1969: 35). However, in warmer months the current plays a greater role (Nelson 1969: 85). The current in the winter moves along the same direction as the wind and in the summer flows from the south (Nelson 1969: 39). Currents shift before an approaching change in the wind. When there is a slight west or southwest wind, a hunter will first test for the direction of the current before travelling far out onto the ice. A slow northeast current is a warning not to go beyond the safety of land-fast ice (Nelson 1969: 37). In the spring, the warm current, the bright sunlight, and mild temperatures combine to melt the ice. By June these conditions cut away at the shore-fast ice and signal the end of the whale-hunting season (Nelson 1982: 6–7).

In general an offshore wind moves ice out to sea and an onshore wind brings it onto the coast of Wainwright. Current direction, however, may lessen the influence of wind on ice movement. The south, southeast, east, and northeast winds move the ice seaward. The north, northwest, west, and southwest wind move the ice landward to Wainwright. The winds affect the current. Winds from the south, southeast, and southwest cause a southerly current moving ice offshore along the coast of Wainwright. Winds from the west, northwest, north, northeast, and east cause a northerly current moving ice onshore along the coast of Wainwright. Nelson reports that this "correlation is most pronounced" in the winter months from November to April. In the spring and summer from May to August the current runs from the south to southeast. Finally, in the autumn, from August to November, it runs from north to northeast except in the case of occasional southerly storms where it is temporarily reversed (1982: 7–8).

Wind from the northeast, which is the usual direction of winter storms, causes the pack ice to drift seaward, thereby opening cracks and leads along the coast of Wainwright. While this is dangerous for ice travel, it is favourable for seal hunters who hunt along the landward side of the lead, especially when the northeast wind is moderate, keeping the lead open. In the late spring and summer, when the sea-ice moves much more readily, this wind is decidedly more dangerous. The Iñupiat hunters are very careful not to take unnecessary risks in travelling across unsafe sea-ice. Billy Blair Patkotak illustrates the significance of knowing *how* to traverse sea-ice: "When

the ice is formed good and solid, before you go out too far, 3 to 4 miles (5 to 6 kilometres), be sure to make a hole in the ice and determine which way the current is flowing. If the current is moving away from the shore, do not go far. If the current is moving toward the shore, go as far as you want to go. In a west wind you go and with an east wind you be careful. When it turns warm in January or February on sea-ice, go home because a storm is coming."

Current direction may be determined by first digging a hole into the ice, widening a crack or using an open lead. Then a hunter may throw in an object, like a piece of ice, and trace the direction in which it is swept. Occasionally, hunting may take place on the seaward side of the pressure ridges. In such a situation, hunters carefully watch current and weather conditions as they venture beyond the solidly grounded ice (Nelson 1969: 34). If a crack has appeared behind a hunter and it has not widened to prevent him from crossing, he will check the direction of the flow of the current by tossing a piece of ice into the water. If a current is from the north he will move south, and if the current is from the south he will move north on the ice. There is safety in travelling down current because ice that moves parallel to the coast of Wainwright will often remain in contact with shore-fast ice pilling into Icy Cape to the southwest or Point Belcher to the northeast (Nelson 1969: 58).

In the cold months, the north and east winds lower tides, thereby grounding shore-fast ice. A modest southeast wind accompanied by a south or southwest current holds the pack against the shore-fast ice. However, a powerful southeast gale in the spring can open wide leads. Hunters explain that this wind can blow shore-fast ice away as accompanying tides lift the grounded ice from the bottom along the coast of Wainwright. Onshore winds such as those from the south, southwest, west, and northwest move the pack ice and hold it firmly against the shore-fast ice along Wainwright's coast. However, this may differ at Icy Cape, where the ice may move and open leads under these conditions. In the spring and summer, these winds allow to the hunters to safely venture far out onto the ice in search of seals (Nelson 1969: 35–37). Observation of wind direction in the spring and summer is key in determining movement of ice packs because this movement relates to the availability of marine birds and mammals (Nelson 1969: 41).

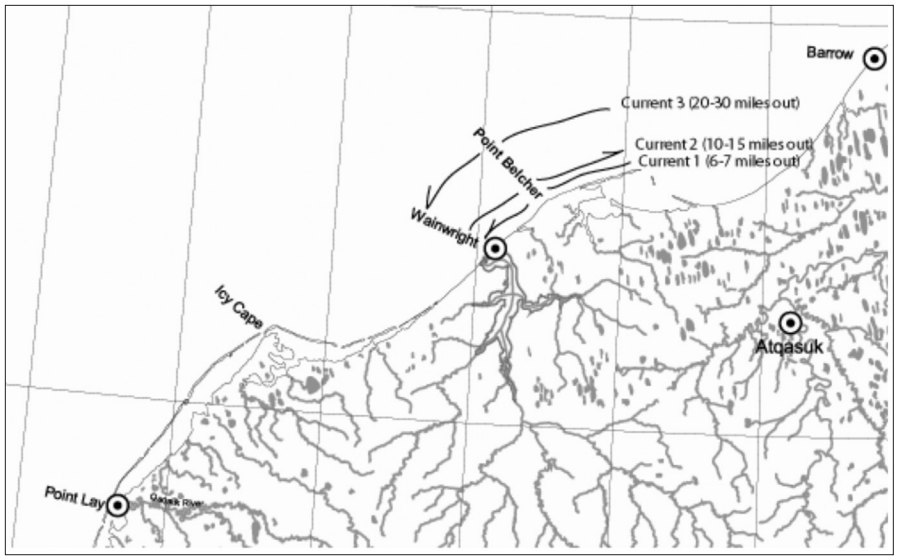

Figure 5.4: Three Currents Present at Wainwright, Alaska.

Both wind and current direction are important variables in ice formation and movement. As previously mentioned, based on past experience, early fall used to consistently have a north/northeasterly wind with a northern current, creating a cold environment, thus allowing ice formation to begin. Late fall used to be dominated by a south/southwesterly wind and a southern current, forcing the ice against the land in order to create large anchoring pressure ridges. At present, weather such as southerly winds in early fall and northeast winds in late fall retard and damage ice formation patterns. For example, in late fall a northeast wind forces the young ice out to sea before it can become solid shore-fast ice.

The community members involved in spring whaling stated that the spring winds must be out of the north/northeast and a current out of the north to force the pack ice offshore in order to open the leads. It was also noted that if one of these variables (wind or current) is diminished or is not present, ice morphology and dynamics will be altered so as to have a direct impact on subsistence hunting. Charles Nayakik, an elder and experienced hunter, remembers when calm weather and weak currents did not open the

leads and his family almost ran out of food, because they were unable to hunt the animals that congregate around open water.

According to Barry Bodfish, an elder with considerable experience of hunting on sea-ice in the areas around Wainwright, there are three currents running parallel to the coast (see figure 5.4). When the three currents are balanced, the pack ice stays close to the shore, allowing for safe travel and subsistence hunting, around open leads. However, approximately every twenty years on a cyclical basis the first current (6 to 7 miles or 10 to 11 kilometres out) and the second current (10 to 15 miles or 16 to 24 kilometres out) weaken. Simultaneously, the third current (20 to 30 miles or 32 to 48 kilometres out) strengthens, regardless of wind direction. This current pattern "sucks" the pack ice far out into the ocean, delaying spring hunting activities (such as walrus and seals) until the summer or even early fall. The pack ice will return only when the two currents closer to the shore regain their original strength. When the south wind is blowing, the first current is stronger and the third current is weaker. While Nelson in his documentation of Iñupiat knowledge regarding winds and currents does not make any reference to the existence of three simultaneously acting currents, he does indicate that it is difficult to judge current direction in the summer months because of eddies and counter currents along the edge of shore-fast ice or leads. Furthermore, surface currents may differ from subsurface currents (1969: 49). These various currents along the coast of Wainwright have a direct impact on the formation of sea-ice and its morphology.

5.4.5. Satellite Images

In addition to the research conducted with participants in the community of Wainwright, additional assistance was available from the North Slope Borough's Geographic Information Systems division, which helped to access and interpret satellite imagery. Synthetic Aperture Radar (SAR) images were used to complement information collected. For each year from 1996 to 2000, a total of five years, one image per month was collected from April to December for a total of nine months of the year. Keeping in mind the expenses associated with accessing each of these images, nine months out of the yearly seasonal calendar of subsistence activities seemed reasonable. Depending upon the availability of the SAR images, the pictures were taken

roughly a month apart. While these images are only two-dimensional and do not portray the dynamic quality of the knowledge the Iñupiat have of sea-ice conditions, collectively they suggest trends.

Even though the SAR images do not provide information on the quality of pack-ice or the robustness of shore-fast ice and its relationship to ridges, they indicated that the heavy pack ice formed with shore-fast ice by mid-December. Until November, the area around Wainwright is characterized by offshore pack ice and young ice forming along the coast. The only exception is the image for December 2000, in which pack ice is still offshore, there is open water, and shore-fast ice did not form until January 2001. Images for spring for the five years indicated smaller open leads in April in front of the village of Wainwright, and by June large leads extending as far northeast as Point Belcher or the Village and widening beyond Icy Cape to the southwest. As the leads progress to the southwest of Wainwright they tend to get larger. This corroborates what the Iñupiat have already stated, that in the spring and early summer the current is from the south moving the pack ice from the southwest to the northeast. By July the SAR images indicated that there is open water around the coastal area of Wainwright. The SAR images show that indeed ice formation along the coast of Wainwright is now delayed as community members maintain. Furthermore, the images suggest that there is swift decay of shore-fast ice as the Iñupiat hunters contend.

When indigenous knowledge of the local context is combined with SAR data, both the community and researchers have a deeper understanding of natural phenomena such as sea-ice formation and variation in weather. However, SAR data alone is limited because it does not provide detailed information that links movements of currents and wind patterns along the coast of Wainwright. This knowledge is best gained from those who engage in contemporary subsistence living. In comparison to satellite images, Iñupiat knowledge of sea-ice is cumulative and continuous, based on a culture of hunting and gathering, whereas SAR data, while valuable, are episodic, based on access and availability of technology (see table 5.1). Iñupiat knowledge is local whilst SAR imagery is global. In other words, Iñupiat knowledge is more intimate with the land and context-specific in contrast to SAR data, which provides a macro-perspective. As a result, Iñupiat knowledge is rich in detail about sea-ice currents and wind patterns whereas SAR images

are superficial, giving information as to ice surface. Because of the distance from which the image is taken and the nature of the technology, SAR data are static while indigenous knowledge provided by hunters is dynamic, illustrating a complex interplay of factors affecting sea-ice formation. Validation of Iñupiat knowledge is gained from a community of practitioners, whilst validation of SAR images is obtained through a community of experts. Iñupiat knowledge is based on knowing *how* and memory, and in contrast SAR images are based on knowing *that* and technology.

Table 5.1: Contrasting Characteristics of Iñupiat knowledge and SAR Images

Iñupiat Knowledge	**SAR Images**
Cumulative	Episodic
Local	Global
Rich in detail	Superficial
Dynamic	Static
Validation by community of practitioners	Validation by community of experts
Obtained by knowing *how*	Obtained by knowing *that*

The comparison of Iñupiat knowledge of sea-ice to SAR imagery is not intended to diminish the value of a particular scientific technological approach to investigation of climate change; rather the aim is to show the value of indigenous knowledge and the usefulness of both when the knowledge systems are combined. The scientific and indigenous categories are not mutually exclusive in the contemporary Arctic, as each informs the other in the day-to-day life of the Iñupiat.

Additional prospects for further research may also include a more detailed study of satellite images taken at regular intervals to reflect the dynamic movement of sea-ice. A valuable exercise may include participation of indigenous knowledge holders in the interpretation of satellite imagery. It should be noted that this satellite imagery is not ordinarily graphed for reasons of climatic change or indigenous human ecology. However, when interpreted with a human ecological lens and combined with indigenous knowledge, it becomes extremely valuable in understanding change.

5.5. Human Ecological Impacts

This section explores the human ecological implications of climate change. Climatic change in the region of Wainwright reveals three interconnected impacts on the human ecology of the area: (1) concern for the safety of hunters resulting from erratic weather conditions; (2) its implications for subsistence activities; and (3) the bearing these changes will have on the cultural system and social structure of the community.

The most immediate impact of climatic change in Wainwright is safety for subsistence hunters. Gene Aguvluk and Terry Tagarook stated that the best conditions for whaling occur when the prevailing winds are north/northeasterly. Such conditions will force the ice offshore, opening the leads where whales can surface. At this time of year, the current can be either from the north (which will help hold the lead open) or from the south (which will force the lead closed). Billy Blair Patkotak states that the east wind is what opens the lead, because it forces the ice directly offshore.

A spring with erratic winds or a lack of east wind can result in difficulties for whaling crews, as leads will not remain open. Barry Bodfish noted that the spring whaling harvest has not really been greatly effected by deteriorating ice conditions over the last twenty-five years. However, he said whale migration patterns have been altered in relation to the ice conditions. Even though whales are still obtainable off the coast of Wainwright, hunters face a problem that was previously not present. Currently, as Gene Aguvluk pointed out, ice conditions have deteriorated to the point where hunters have to search for ice that is robust enough to support the weight of a harvested whale.

The second implication of climate change is the viability of subsistence activities on sea-ice. The people of Wainwright are keen observers of the behaviour patterns of bowhead and beluga whales, seals, and walruses and their interaction with sea-ice. They know the importance of solid and stable ice conditions and they know that the ice is thinner than it used to be and how this impacts on their ability to harvest marine mammals safely. North/northeast wind patterns in the late autumn retard shore-fast ice formation, which in turn affects the formation of pressure ridges and the necessary leads for harvesting whales in the spring. The loss of ability to hunt marine

mammals in safety may not only result in increasing accidents and loss of life on sea-ice, but may put greater pressure on harvesting of terrestrial mammals to compensate for food sources by the community. Furthermore, there may be increased pressure on other animal species that marine mammals feed upon as populations increase. Finally, marine mammal calving and migration patterns may be dramatically affected.

For the community, one issue prevails: the warming trend needs to be studied closely. The people of Wainwright have clearly indicated their concern for this erratic weather. In the words of Raymond Aguvluk, "Maybe next year we won't see ice." Iñupiat knowledge of ice phenology and morphology is a characterized by knowing *how*. This mode of knowledge enables hunters to be aware of both details and uncertainties and it is based on a relatively continuous transfer of knowledge from one generation to the next. As its objective, their knowledge does not aim to shape or control the environment but seeks the intimacy of existing within it through participation. This means having the ability to deal with dynamic ice conditions. However, the erratic weather situation around coastal Wainwright is a source of stress because it creates a disjunction, a fissure in the direct relationship between the Iñupiat and their habitat as they have known it. The implications of this type of instability and consequential anxiety in a subsistence hunting culture are difficult to assess beyond initial concerns of safety and travel on sea-ice. The loss of the power to predict climatic behaviour by the Iñupiat may lead to a debilitating anxiety that has profound effects on subsistence hunting practices, nutrition, and socio-cultural institutions. This case suggests that a study needs to be undertaken to assess the impact and implications of stress experienced by subsistence communities like Wainwright as a result of climate change. An examination of coping practices and adaptation may not only contribute to general knowledge of human dimensions of climate change, but more importantly, be useful to northern communities and their survival.

The third potential impact of climatic change in the region is that the combined effects of loss of safety on sea-ice and disturbance in subsistence hunting of marine mammals and birds may contribute to conflict between the cultural system and social structure of the community. As illustrated in chapter 2 (section 2.7.2) and demonstrated in chapter 4, human ecological

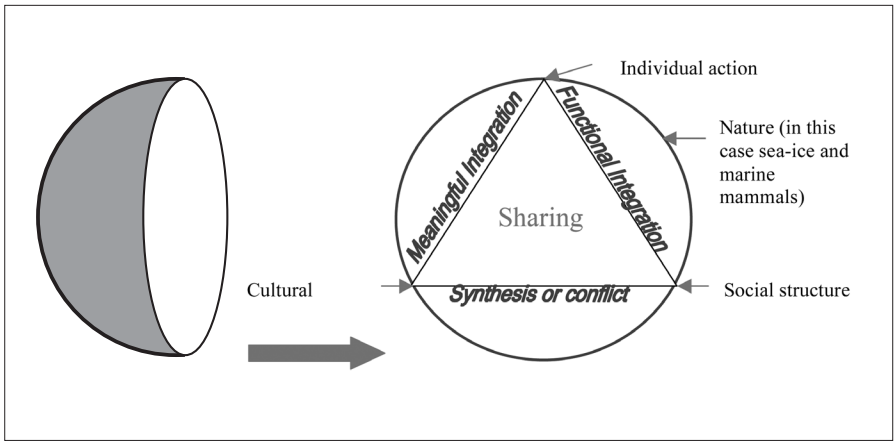

Figure 5.5: Dissection of Human Ecological Relations.

relations are dependent on a cultural system of symbols, values, and beliefs. Sharing, manifested, for instance, in the social context of the *Nalukataq* festival, is a fundamental value. If sea-ice conditions continue to deteriorate to the point where subsistence activities can no longer be carried out in the way they have been, socio-cultural impact may be devastating to the fabric of the community. Figure 5.5 illustrates the dynamic and deep interconnectivity between nature, culture, social structure, and individual actions in human ecological relations. A potential conflict arises when individuals are unable to integrate an important cultural value like sharing into their social action.

Historical evidence clearly indicates that the value of sharing has a deep resonance with, and a common thread linking the subsistence cultural system to, its social structure. The value of sharing has sustained human ecological relations of the Inuit of Ulukhaktok (chapter 4) or the Iñupiat of Wainwright in periods of dramatic socio-cultural upheaval. However, climatic variation may diminish the capacity of communities to be resilient. Human agency also has upper limits defined by its physical, cultural, and biological factors. In short, one needs *all* the parts in order to tinker.

Is the current climatic variation a challenge to sharing that can be overcome or will it result in a deterioration or modification of this fundamental value? Such understanding generated by action research could help the community's resilience. The stress study suggested in this chapter would be the beginning of undertaking the severity of the challenge.

5.6. Discussion

Knowledge at its point of generation is context-dependent. In order to achieve the four objectives of this case study: (1) to view *phronesis* in action; (2) to illustrate the value of indigenous knowledge in the study of climate change; (3) to suggest a process ideally suited to gather and understand this knowledge; and (4) to examine the human ecological implications of climate change, research had to be specific to the context of Wainwright, Alaska. In other words, in order ask *whether* climate change is taking place in the region of Wainwright, Alaska we had to examine *how* the performance of subsistence activities on sea-ice is being affected. Therefore, the case study has focused on Iñupiat observations of sea-ice.

This case study represents the movement from knowing *how* to learning *how* to knowing *that*. Knowing *how*, in this case, is represented by Iñupiat human ecological relations. Learning *how* is characterized by the research carried out by Nelson (1969; 1982) and this study. Knowing *that* are the research results (including the SAR data) which were then reviewed by a community of practitioners. It is an example of *phronesis*, the knowledge of *how* to secure the ends of human life. As such, *phronesis* is not a state of knowledge, but a dynamic process within a framework of human ecological relations. This case reveals that *phronesis* is firmly grounded in an ethical framework. The value of sharing was the objective end of the informed process of *phronesis*. This humanitarian and participatory conception of knowledge, which is why action research may have an immediate local impact on the community where it is conducted. Its impacts are derived from its inclusive methodology and its community oriented practical objectives.

The research in Wainwright is yet another indication that the nature and culture dichotomy does not exist in the context of indigenous societies of

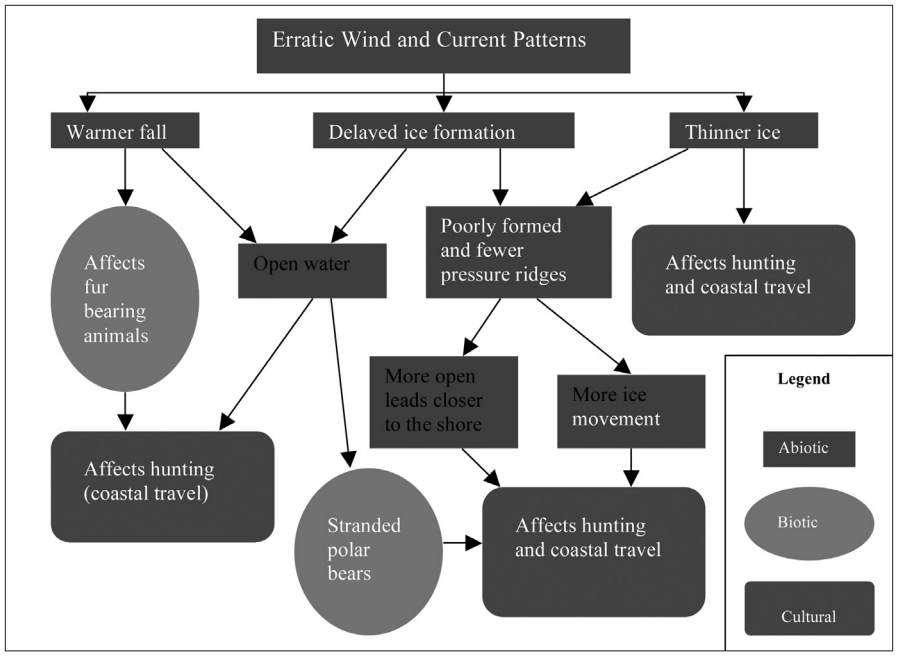

Figure 5.6: Human Ecological Relations (Abiotic, biotic, cultural) and Climate Change[4]

the Arctic. Figure 5.6 summarizes the dynamic human ecological relations resulting from the research on climatic variation in Wainwright, Alaska. In spite of the limitations of two dimensions and bound by causal representations, it nonetheless displays the complex interconnectivity of culture and nature.

Even though there is considerable evidence that there is climate change underway in Arctic environs with predictions of dramatic warming trends (Comiso 2003; Duerden 2004; Johannessen et al. 2004), the Wainwright research is not oriented towards an assertion that global climate change is underway. Rather it asserts that there are significant changes in the coastal weather of Wainwright, Alaska, that have a direct impact on the safety of the Iñupiat and the survival of their culture. This research does inform research on global climate change, but it does not directly address the subject or form

conclusions about it because global climate change is based on worldwide averages and synoptic generalizations. At the macro-level of abstraction, there will always be debate, exceptions and therefore, uncertainty (Duerden 2004), whereas, the information related to changing weather patterns in Wainwright, Alaska, is specific, concrete, and embedded in human experience. Research indicates that climatic changes are being experienced along the coast of Wainwright, and this has immediate implications for the nutritional and social needs of the Iñupiat.

Applied research aided by indigenous knowledge and community participation is essential to understanding context-specific weather changes that manifest themselves in a global pattern. Similar research in other western Arctic communities confirms changes related to sea-ice formation and robustness. However, particular factors such as wind and current patterns may differ (Nichols et al. 2004). This indicates that there is a dynamic and complex interplay of geography, ecology, and culture. Concerted efforts to link further research, taking into account context-specific events across a wide number of circumpolar subsistence hunting communities, can contribute to a thorough understanding of climate change in the region as a whole. This would involve a major, sustained (multi-year) trans-Arctic and even circumpolar action research project. Using human ecology values, the project would include many communities, four or five countries, and a large number of researchers. Such research is not impossible, but it would be costly in the short term. However, the actual and practical long-run benefits would far outweigh the costs.

The purpose of this case study is to acknowledge the relevance of indigenous knowledge in the twenty-first century. This case study illustrates that northern research breaks through disciplinary boundaries. It speaks to the value of the knowledge generated from Iñupiat subsistence hunters related to sea-ice. The community of experts includes the community of practitioners, namely subsistence hunters who are most affected by climatic change. Addressing current research issues in the north requires not only interaction between the biological, physical, and social sciences, but also indigenous knowledge. Iñupiat knowledge of sea-ice is embedded in their cultural experience of subsistence hunting. It arises from knowing *how* to live on and derive a living from sea-ice. In this sense, this type of community-initiated

and directed research extends the boundaries of interdisciplinarity to include indigenous knowledge systems. It is a collaborative process where diffusion of knowledge is primarily achieved through participation. Thus, generation of knowledge, like understanding sea-ice and climate change in Wainwright, reflects actors that are as socially diverse as hunters and scientists.

Climate change researchers and modellers decry the lack of *in situ* data (Comiso 2003). Poor data on sea-ice thickness is a clear example (Johannessen et al. 2004). The challenge remains for scientists and modellers to work with subsistence hunters to develop mechanisms utilizing indigenous knowledge, much as the Galilean revolution in science depended upon and employed the knowledge of craftsmen. Indeed, there are limitations to indigenous knowledge as there are with any knowledge system, but the practical and effective use of indigenous knowledge in climate change modelling goes relatively unexplored. The human ecological action research approach has not been utilized over a broad area. Extrapolation from Wainwright indigenous knowledge cannot be done even to a community like Barrow, Alaska, a mere 136 kilometres to the northeast on the same coast and in the same state. Since extrapolation is problematic, the pooling of dozens, if not hundreds, of such studies would be the only way to map the situation in the circumpolar region.

CHAPTER 6

6: Mapping Human Ecology: A Transformative Act

> O humankind! We created you from a single pair of a male and a female, and made you into nations and tribes so that you may know each other (*Quran* 1975: 49, 13).

6.1. Introduction

The mapping of human ecological relations illustrates in an explicit way the transformation of knowing *how* to knowing *that*. This transformation reveals that power, like knowledge, is relational; it is not an entity and, therefore, cannot be possessed. Harley (2001: 79), in his *The New Nature of Maps*, argues that: "The social history of maps, unlike literature, art, or music, appears to have few genuinely popular, alternative, or subversive modes of expression. Maps are pre-eminently a language of power, not protest." Harley is only partially correct. While it is true that maps express the language of power, human ecological mapping demonstrates that there are alternative expressions of the cartographic venture which are popularly supported by indigenous peoples and take map making outside the domain of the geographer-conqueror.

A cartographic venture with participation of otherwise marginalized groups is elsewhere described as "counter-mapping." Some of the objectives of counter-mapping include: recognition of (land) rights; protecting and promoting biological and cultural diversity; demarcating and protecting traditional territories; assembling, documenting, and safeguarding local knowledge; facilitating management for land use; generating community awareness and self-empowerment; recording baseline data; and enabling conflict resolution (Arvelo-Jiménez and Conn 1995; Chambers 1997; Eghenter 2000; Gonzalez et al. 1995; Hodgson and Schroeder 2002; Hughes 1999; Nietschmann 1995; Peluso 1995; Poole 1995; Sirait et al. 1994; Sparke 1998; St. Martin 2001). Counter-mapping shares similarities with human ecological mapping, as both primarily seek to realign power relations through the application of local knowledge of land use.

Participation of the knowledge holders in the process of mapping and strategically applying their know *how* is fundamental to shifting power relations. The objectives of this chapter are to explain the methodology of human ecological mapping, establish its historical significance in the Canadian north, and provide meaningful examples of its communicative capacity, its ability to engender human agency, and its role in intergenerational transfer of knowledge. In this chapter we will:

1. Discuss the power of maps (6.2),
2. Explain human ecological maps (6.3),
3. Give historical examples of human ecological mapping (6.4), and
4. Examine current research for strategic application of human ecological mapping (6.5).

6.2. The Power of Maps

The who, what, where, and how of power is recognized in relationships. Michel Foucault (1987) described this relational nature of power by linking

it to knowledge. Relations take place in the particular, the concrete. Power, therefore, is exercised, not seized (not possessed like an entity). The notion of *phronesis* as described by Aristotle in terms of the management of the household or state through practical wisdom speaks to the relational nature of knowledge and power. Power and knowledge are deeply connected; the application of knowledge implies the exercise of power and the exercise of power implies the application of knowledge. Like knowledge, relations of power do not stand apart; they are part of human ecological relations. Power is exercised in dynamic interactions from multiple points of reference and is often unequal. Resistance is also inherent to the application of power. Because of its relational nature and its link to knowledge, power has the ability to transform perception. As such, power must not be interpreted as inherently negative. It is productive because it is part of the relations that produce reality (Flyvbjerg 2001).

The map is a mimetic metaphor of the relational nature of knowledge and power dynamic. Mapping is an act of demarcation which creates boundaries and constructs identities. Geography, as a language, is imbued with spatial metaphors revealing the exercise of power. The word 'region,' for instance, draws its roots from the French word *regere*: to rule. 'Province' is from the Latin *provincia*, referring to a conquered territory (Foucault 1980). As a practical instrument of colonial power, the map enabled access to 'new' lands. In the cultural dimension, the map was a visual metaphor, a new way of looking at the 'known' world, and a way of fashioning attitudes of Europeans at home. The *double entendre* is conveyed through Orientalist scholarship. As a noun, Orientalism, the field of study, expresses the west (occident) in relation to the east (orient). As a verb, the activity of Orientalism locates the individual or the culture of the occidental researcher in relation to the 'other.' Both usages are relational. A key feature of this relation is that the process of orientation has occurred through scholarship, which explained the unfamiliar, enigmatic, and amorphous 'other' in the language and cultural paradigm of the occident. The map not only served as an instrument of military occupation, but as an agent of cultural imperialism. The application of knowledge not only manifests itself in an overt exercise of power, but also serves as a more subtle yet equally effective strategy to transform attitudes in the domain of culture (Harley 2001; Kassam

and Maher 2000; Said 1993; 1994; Winichakul 1994). Hence, 'discovery' of 'new worlds' meant possession in the cultural terms of the occident (Harley 1992). The search for the Northwest Passage from the Atlantic to the Pacific is an example of this possessive impulse.

The early use of indigenous knowledge in mapping to spearhead conquest and resource extraction is well documented (Belyea 1992; Latour 1986; 1987; Rundstrom 1990; Whitfield 2000; Winichakul 1994; Wright 1993). In the Arctic, mapping based on indigenous knowledge was crucial to exploration motivated by the goal of finding the Northwest Passage in order to gain access to imagined riches. For example, the Hudson's Bay Company was seeking geographic knowledge not only to control and expand its lucrative fur trading business, but also to access new markets and products. In 1716, ten Chipewyan drew a map at Fort York which identified the 'copper mines.' This provided the impetus for expeditions to seek the Northwest Passage by land to Coppermine. In 1767 two Chipewyan leaders returned to Prince of Wales Fort on Hudson Bay from a five-year voyage to Coppermine (Kugluktuk) and traced a map onto deer hide. This map became the basis of an employee of the Hudson's Bay Company, Samuel Hearne's, third, final, and successful voyage to find the Northwest Passage by land. In this expedition Hearne was accompanied by the Chipewyan leader Matonabbee and his men (Glover 1983; Helm 1989; Kassam and Maher 2000; Lewis 1998; Nuffield 2001; Speck 1983). Similarly, Captain Parry, Commander of the British Admiralty, in his second expedition to discover the Northwest Passage from the Atlantic to the Pacific (1821–1823), describes in his journal how the Inuit prepared maps. He explains how he and Captain Lyon obtained geographical knowledge from an Inuit woman named Iligliuk, which was later verified by another Inuit, a man named Ewerat (Bravo 1996; Kassam and Maher 2000; Parry 1969). Acquainted with the voyage of Captains Parry and Lyon, Sir John Ross, a Captain in the Royal Navy, undertook a voyage (from 1829 to 1833) to discover the Northwest Passage. In his journal, Ross describes how he used the same technique to gain geographical knowledge from the Inuit. Ross gave a sketch of the already known land to Ikmallik, whom he identified as a "hydrographer." The Inuit man, Ikmallik, then drew him a map to guide him on his voyage (Kassam and Maher 2000;

Ross 1969). In 1883–84, Franz Boas also relied heavily on Inuit map making to collect ethnographic and cartographic knowledge (Boas 1998):

> The Eskimo exhibit a thorough knowledge of the geography of their country.… They have a clear conception of all the countries they have seen or heard of, knowing the distances by day's journeys, or, as they say, by sleeps, and the directions by the cardinal points.
>
> As their knowledge of all the directions is very detailed and they are skilful draftsmen they can draw very good charts. If a man intends to visit a country little known to him, he has a map drawn in the snow by some one well acquainted there and these maps are so good that every point can be recognized. Their way of drawing is to first mark some points the relative positions of which are well known. They like to stand on a hill and look around in order to place these correctly. This done, the details are inserted. It is remarkable that their ideas of the relative position and direction of coasts far distant one from another are so very clear (Boas 1964: 235–36).

Beyond the obvious conclusion that settlement of the north, and specifically the sub-Arctic and Arctic, depended significantly on indigenous knowledge and mapping, these early maps are attempts at "commensurability" – a means to translate indigenous spatial frameworks to European geographical terms (Bravo 1996). This is significant because it illustrates the communicative capacity of maps across cultures.

6.3. Human Ecological Maps Explained

Maps are knowledge as power. Using the language of symbols, maps represent a social product mediating cultural systems and individual actions. The selectivity of content and style of representation are a means of conceiving and structuring the world in a manner that exerts a particular set of relations. The human ecological map is a social product that articulates

indigenous cultural values through individual actions of subsistence hunters and gatherers on the foundation of nature. In this sense, the human ecological map reclaims the 'other' and seeks to describe indigenous cultural and ecological space based on indigenous terms.

The human ecological map shares the following characteristics with any other cartographic venture (Keates 1982: 62–86; Kolacny 1969: 74–49; Robinson and Pechenik 1976: 23–42; Winichakul 1994: 53–55):

1. It makes a claim to reality in the form of two-dimensional graphics;
2. This two-dimensional format for three-dimensional relations results in selection, generalization, and approximation of details;
3. Therefore, the map involves interpretation;
4. Paradoxically, despite interpretation, the use of symbols and other devices seeks to make the map literal in relation to experienced reality so that it has mimetic quality;
5. The map is communicative for both producers and users because of its mediating capacity to illustrate human relations with the environment; and
6. Thus, the map has a predictive quality because it points to the implication of human action.

The human ecological map represents practical knowing, or *phronesis*. It is not imagined space like a nation or state; instead its identity arises from the concrete. It is context-dependent in that knowing *how* sustains a livelihood from the land and sea for the management of the household and community. Nor is it geographical in a strict Cartesian sense; it is a product of the interplay of the cultural, social, ecological, and physical context. It is simultaneously a cognitive and practical exercise. The map arises from knowing *how* to live on the land and sea. Its reading represents the process of learning *how* and the completed map represents knowing *that* (see

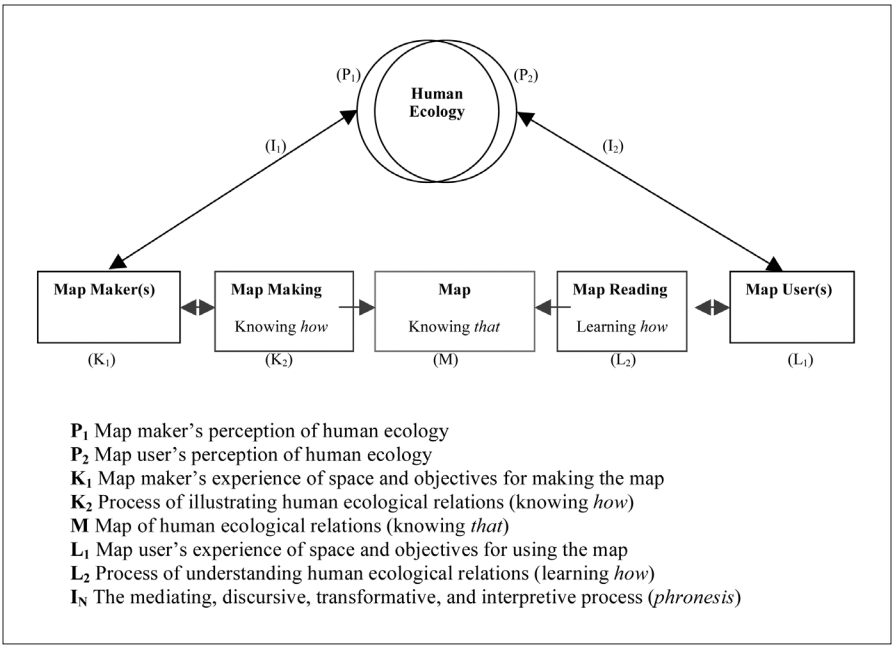

Figure 6.1: Human Ecological Mapping Process and Use.

foldout of the human ecological map of Ulukhaktok). The process is like a circuit, iterative because each time the map is used it is remade and the process begins again; as such it becomes dynamic and is modified by the experience of the user (see figure 6.1).

The maker(s) perceive (P) geographical terrain with reference to their experience of human ecological relations (I). Using participatory mapping techniques human ecological knowledge (K) is transformed into data that produce the map (M). The user(s) interprets this information (L). These interpretations (I) form an understanding of human ecological relations (P). When the map making process is participatory, the potential for the double hermeneutic arises as the know *how* of many individuals displays the human ecological relations of a community. A double hermeneutic occurs when self-interpreting map makers also use the map and view both their own actions in relation to context as well as other people's actions. A human ecological map engenders such reflexivity, which is the ability to react upon

itself, an essential feature in enabling change. Reflexivity is at the heart of human agency. Thus, the human ecological map not only transforms three-dimensional into two-dimensional spatial representation of knowledge, but it has the power to transform perception.

One of the fundamental features of human ecological maps is their reliance on the use of narratives and oral histories in their construction. Firmly embedded within these narratives is the thread of lived experience (knowing *how*) and the wisdom derived from the practice of living from the sea and land (*phronesis*). While maps of human ecology incorporate modern cartographic conventions in their production, they do not rely for their veracity on appeals to scientific or cartographic standards. Validity is achieved by practice, through the lived experiences and accumulated knowledge of the indigenous peoples who participate in the creation of the maps. Derived primarily through interviews carried out within the indigenous context and supported by field visits, these maps reveal that knowledge exists primarily within human ecological relations.

Most importantly, human ecological maps represent the deep connectivity of a specific group within a specific bio-region. Quintessentially, a land and marine use map articulated by a community is a metaphor for indigenous human ecology. For reasons of commensurability, maps of land and marine use are influenced in their creation by the availability and accessibility of topographic databases. These human ecological maps may contain a multiplicity of locally gained information depicting subsistence activities on the land and sea (Brody 1988; Fort McKay First Nations 1994; Robinson, Garvin, and Hodgson 1994; Robinson and Kassam 1998; Bigstone Cree Nation and Metis People of Kituskeenow 1999; Dene Tha Nation 1997).

For example, the method of production of the base topographical map for the Kola Sami in the context of the uncertain political conditions of Russia in 1995 is informative. As one large topographical map of this highly militarized region was not available to the public, the map of the Kola Peninsula was made by grafting together numerous smaller maps. First, smaller topographical maps were purchased at a bookstore in Murmansk; second, these maps were then transported to Finland; third, from there they were couriered to Canada; fourth, in Canada they were combined together to

form a large topographical map; fifth, they were taken back to the Kola Peninsula, crossing military checkpoints on the way from Fino-Scandinavia to Russia; and finally the Sami confirmed that indeed this larger base map reflected the extent of their land and marine use.[1]

Some of the current issues in Arctic and sub-Arctic human ecology include: land claims involving indigenous peoples and their national governments, the impact of chemical pollutants on Arctic marine communities, the effects of climate change, sustainable use of natural resources (both renewable and non-renewable), and the transfer of ecological knowledge held by indigenous peoples to the next generation. An understanding of the human ecology of indigenous people is critical to each one of these issues. Human ecology is symbolically and literally illustrated through mapping of land and marine use. Such land and marine use maps represent the interconnectivity of cultural, social, biological, and physical elements of the indigenous world, laid out and given spatial, temporal, and representational form within a topographic map. These maps portray the relationships among people, their communities, and the surrounding and supporting biotic systems by providing a graphic representation of how indigenous people within a specific geographic region interact with and use resources derived from the land and sea. The themes of these maps may be broad, depicting ethnographic, historical, and/or current information on land and marine use patterns. They may also represent specific ecological knowledge by providing information on hunting, fishing, herding, trapping, the utilization of plant species, forestry practices, wildlife migration patterns, and locations of sacred sites, all of which are of socio-cultural significance and important to the livelihood of a contemporary indigenous community (Kassam and the Soaring Eagle Friendship Centre 2001; Kassam and Graham 1999; Kassam and the Wainwright Traditional Council 2001).

Human ecological mapping establishes boundaries on the basis of the practice of subsistence living. However, these boundaries are mediated by natural features such as mountains and waterways. The boundary is not a single artificial line creating borders. The Inuit define regions by the use of waterways (Wiebe 2003). Similarly, on the Kola Peninsula, the Sami, even after forced collectivization of their reindeer herds under communism, defined the territory of different reindeer herds or brigades by the rivers

waterways and the tree line (Robinson and Kassam 1998). The boundary is demarcated by human ecological relations more like a zone rather than a single line drawn by a ruler. These human ecological relations also define the political space based on land use and occupancy. Land and marine use maps change the focus solely from imposed boundaries to human ecological relationships. What is at first glance a topographical map made in the Cartesian tradition becomes, with human ecological relations, crowded with complex biological and cultural connectivity, and not just empty space with names on it.[2] While the average topographical map takes the human out *of* nature, thereby promoting the nature-culture dichotomy, the human ecological map seeks to place the human *in* nature, thus collapsing the duality. Human ecological maps resemble a third space where different ways of knowing meet and different types of geographic knowledge co-exist through encounter and synthesis.

6.4. Some Historical Examples of Mapping Human Ecology

Human ecological maps confirm indigenous power defined by human ecological relations and thereby, indigenous rights. Land and marine use is one of the most effective ways to map human ecology. Noted below are four examples of human ecological mapping of indigenous use of the land and sea. The first example is from the work of Franz Boas, a German scholar trained in physics, mathematics, and geography. The experience of living with the Inuit of Baffin Island was a significant turning point in his life. Subsequently, Boas helped found the field of cultural anthropology as a discipline in the social sciences. Second, the Inuit Land Use and Occupancy Project represents unique opportunities and challenges in the Canadian north. This project was supported by the Canadian federal government because it could help resolve differing objectives of development, sustainable subsistence use, and conservation. It also mediates the 'frontier' perception of the north as ripe for resource exploitation by southern interests and the perception of the north as a 'homeland' within which to maintain a sustainable livelihood (Rees 1987). Third, the Mackenzie Valley Pipeline Inquiry put land use planning, and therefore, indigenous human ecology

on the Canadian political planning agenda when Justice Thomas Berger maintained that resource development could only proceed after settlement of indigenous land claims (Fenge 1987). Finally, the fourth example outlines the work undertaken at the Arctic Institute of North America in the 1990s in which human ecological mapping took place in the boreal forest in partnership with indigenous communities and with support from the government and private sectors in the western Canadian provincial north. The objective of providing these historical examples is to establish that human ecological mapping is an established fact in the Canadian north.

6.4.1. Pakkak's Map

Mapping has been used as a means to communicate the human ecology of indigenous Arctic peoples cross-culturally. For instance, Franz Boas describes in his diary on Friday, October 26, 1883, his interaction with an Inuit man named Pakkak who had sketched for him a map, taught him to pronounce local place names, and showed him sites for summer camps for caribou hunting (Boas 1998: 127). Two key points need to be noted from this early example of human ecological mapping: first, that there is commensurability between Pakkak's perception of space and that of Boas the geographer; and second, that the map represents Inuit experience in the form of a visual metaphor of indigenous knowledge. The mimetic metaphor is complemented by a verbal explanation. In other words, visual images are contextualized by words, and conversely words can be contextualized by visual images. This suggests the potential for the multiplicity of meanings or hermeneutic associated with a metaphor. In fact, the interaction of the oral with the visual is pregnant with multiple meanings and with the possibility of transforming perceptions.

6.4.2. The Inuit Land Use Occupancy Project

Almost a hundred years later, in 1973, the Inuit Tapirisat of Canada (ITC) undertook to document human ecology in order to create a comprehensive and verifiable record of Inuit land use and occupancy across the Canadian Arctic. The result was a three-volume work outlining the Inuit Land Use and Occupancy Project (Milton Freeman Research Limited 1976a). On the basis of 1,600 individual land and marine use maps from an estimated 2,000

interviews with Inuit in 33 communities covering approximately 1.5 million square miles (2.4 million kilometres) of northern Canada, the project described seasonal hunting, fishing, and trapping activities of Inuit living in the Canadian Arctic. The project covered three periods: prior to the arrival of traders, the fur trade years, and the years marked by permanent settlement (i.e., from the nineteenth century to the mid-1970s). The testimony of community member Bill Goose at the Mackenzie Valley Pipeline Inquiry hearings in Ulukhaktok illustrates the powerful implications of mapping indigenous human ecological relations.

> I believe I.T.C.… [made a] presentation to the government on the land claims proposal, and it's going to take some time before things start to happen, and this pipeline, I don't know when it's going to take place but my concern is that I'd like to see the land claim settlement first happening before the pipeline (Mackenzie Valley Pipeline Inquiry 1976: 4014).

These cartographic illustrations of Inuit human ecology, combined with oral testimony, contributed to the negotiation and successful ratification of the Inuvialuit (1984) and Nunavut Comprehensive Land Claim Agreements (1993) and the creation of a new territory, Nunavut (1999). Articulation of Inuit human ecology in the form of maps shows their knowledge, values, beliefs, and perceptions about the land and sea (Kassam and Maher 2000). This case exemplifies the significance of human ecology to issues of indigenous rights and land claims, thereby reiterating both the communicative and transformative capacity of human ecological maps.

6.4.3. Mackenzie Valley Pipeline Inquiry

Human ecology in the Canadian north is primarily related to two conflicting perceptions of the environment: first, a largely southern Canadian point of view of the north as a 'frontier' ripe for resource exploitation; and second, a principally northern Canadian perspective of the Arctic and sub-Arctic as a 'homeland.' The former is characteristic of instrumental connectivity with the land and sea, whilst the latter is characteristic of complex connectivity. The frontier outlook advances the nature-culture dichotomy through

a mental construction of the environment, whilst the homeland perception is engaging taking a view not *of* but *in* the local ecology.

In 1977, a year after the three-volume work of the Inuit Land Use and Occupancy Project was published, the report of the Mackenzie Valley Pipeline Inquiry, entitled *Northern Frontier, Northern Homeland*, was released (Berger 1977). In addition to gathering testimony from 300 experts, Justice Berger carried out hearings in 35 northern communities listening to evidence from approximately 1,000 northerners. The contents of this report and its recommendations were of historic significance to northern Canadian human ecology. The knowledge of, and concern for, their ecosystem were effectively communicated by the indigenous peoples. For instance, at the Mackenzie Valley Pipeline Inquiry hearings in Ulukhaktok, John Kuneyuna describes the objectives of mapping Inuit Human Ecology:

> I.T.C. was telling us how to mark our land how we used it, they wanted us to mark even the ocean, how much of the ocean we used and how much of the land we used. That's the reason why I am saying this, because if the two holes that they are planning to drill in Tuk [Tuktoyuktuk a community across the Beaufort sea from Ulukhaktok], it might be the place where the people are mainly hunting for bears or seals.… if an oil spill occurs then what will happen is the livelihood of Tuk is going to be spoiled because if that oil spill is running loose and it's not controlled, well the whales are the main resource for Tuk, and seals, and the whales might move to some other areas and it wouldn't be good because Tuk would be out of whales and seals (Mackenzie Valley Pipeline Inquiry 1976: 4016–4017).

The report, authored by Justice Berger, provided extensive evidence of the pattern of land and marine resource use by the Dene, Metis, and Inuit peoples of the Mackenzie Valley. It described the potential impacts that a proposed pipeline down the Mackenzie Valley would have on the way of life of these indigenous communities. As with the Land Use and Occupancy Project, maps and oral testimonies were used to document the human ecology of the Dene, Metis, and Inuit peoples. The struggle to define the

Canadian north of the 1970s as either a 'frontier' open for resource exploitation or a 'homeland' in which indigenous communities have clear and historic relations with the land and sea was decided by the Berger Inquiry. A ten-year moratorium was placed on the pipeline so that indigenous communities could increasingly participate in decisions that would affect their ecosystem (Kassam and Maher 2000). In the early part of the twenty-first century, American and Canadian corporations are engaging in a discussion for a pipeline to be built as several indigenous land claims have been settled and indigenous communities are also seeking to make investments in non-renewable resource development to generate employment for a burgeoning and youthful aboriginal population. Ecological relationships of indigenous Arctic communities to their habitat, like indigenous knowledge, are not static, but constantly being transformed while maintaining their essential connection to the land. The next few decades will be challenging for sustaining biological and cultural diversity in the circumpolar Arctic and sub-Arctic because the north is on the verge of a new era of southern-driven resource exploitation that will change indigenous human ecological relations.

6.4.4. Arctic Institute of North America

Starting in the early 1990s, the Arctic Institute of North America at the University of Calgary began to undertake a number of what it called "traditional land use and occupancy studies" throughout northern Alberta. These studies were undertaken within a number of complex contexts that have included staple resource development (timber, mining, oil, and gas), defining indigenous common property rights, and resource management and development in partnership with private interests. Using participatory approaches to research, overlays of indigenous land use and occupancy were combined with topographic maps to assist in decisions about resource conservation, land use planning, and industrial development (Robinson, Garvin, and Hodgson 1994).

Maps documenting indigenous resource use were completed, with the following communities of northern Alberta as research partners: Anzac, Janvier, and Conklin (Robinson, Garvin, and Hodgson 1994); Fort McKay (Fort McKay First Nations 1994); Dene Tha' (Dene Tha Nation 1997); and

Kituskeenow (Bigstone Cree Nation and Metis People of Kituskeenow 1999).

6.4.5. Double Loop Learning – Transformation in Power Relations

A profoundly significant change occurred in the relation of power between the maps drawn by Matonabbee (and other Chipewyan) for the Hudson's Bay Company, Iligliuk's map for Captain Parry, Ikmallik's map for Captain Ross, and Pakkak's map for Franz Boas, on the one hand; and the maps prepared by the Inuit for their own rights in the Land Use Occupancy Project and the indigenous communities in the Canadian north at the Mackenzie Valley Pipeline Inquiry, on the other. Despite colonization, there is no proof of intellectual superiority on the part of the European explorer-geographers over the indigenous map makers. Both had cartographic skills, as the explorer journals attest. If anything, the indigenous peoples were more knowledgeable about their geographic and human ecological context than the visiting and ultimately conquering Europeans (Rundstrom 1990).

What is it, then, that made the Europeans difficult to resist? To the indigenous cartographer the map was simply a guide for the Europeans. Boas (1964) explains how the Inuit draw maps in the snow to guide. After a snowfall or a gust of wind these maps are erased only to be redrawn again when someone else needs information to get to a particular place. To the Europeans that map was more. It was a means to prove something – to prove the path to the Northwest Passage, to show proof of imagined riches located in a distant land. As Brody (2000) would argue, the map helped fulfill the "curse of genesis" by facilitating the expansionary propensity of European societies with agricultural roots. They took these maps and transported them home to convince others. The maps would validate their claim to existence and possession. As noted in chapter 5, in the scientific and technological enterprise validity is determined by a community of experts. Bruno Latour (1986: 5) explains that in an "agonistic" encounter in scientific claims, doubt is diminished by being able "to muster on the spot the largest number of well aligned and faithful allies." "Thus, the history of science is in large part the history of the mobilization of anything that can be made to move and shipped back home for this universal census" (Latour 1987: 225). Maps furthered these ends and ultimately the process

of conquest, settlement, and displacement of Aboriginal rights to facilitate resource extraction. Again, the Europeans did not possess any particular superiority, as adequately displayed in what would otherwise would have been a comical farce if were not for the tragic end to Sir John Franklin and his men in his third expedition (Wiebe 2003). Compared to the English, the Inuit had developed superb technology for their environment such as clothing, building shelter, hunting, finding each other in the snow and ice, and travelling the tundra in darkness. The British among the Europeans seemed to have a particular penchant for making martyrs of "those who get killed and take a lot of lives with them through their wilful stupidity" (Wiebe 2003: 43).

What was different was that the European powers like the British and French were compiling maps from all over the world, collecting information from different regions so as to achieve aims like conquest, economic domination, and resource extraction. This knowledge was being transported from its point of generation, centralized, and combined with other knowledge from other locations. The sheer magnitude of the scale of operation and the values that engineered it made the colonial project different – it had nothing to do with intellectual prowess as such. The maps fed the appetite generated by the administrative complexity of the colonial enterprise. Transportation technology and the printing press facilitated empire (Innis 1973; 1995). Furthermore, the ability to print and publish enabled growing support for one's claim among a community of 'experts' (Latour 1986; 1987). The visualization of geographic knowledge had more convincing power. The cost to objecting to these claims would be high because it would demand printing and distribution of counter-claims. The link between 'manifest destiny' and claim of 'empty lands' was facilitated by maps drawn from an instrumentalist perspective to achieve colonial aims. Even the fiction of 'empty lands' could be accepted as fact if enough 'experts' in a distant land agreed in the court of some European monarch that it was true.

Latour (1986: 20–22; 1987: 215–57) describes nine attributes that enable "two-dimensional inscriptions" like maps to gather support for claims to validity:

1. These maps are *mobile*;
2. Once drawn these maps are *stable* (do not disintegrate while being transported);
3. The maps are *flat* and therefore easy to *dominate*;
4. Their *scale* can be *modified* at will;
5. Maps can be *reproduced* en masse;
6. The maps can be *recombined* while maintaining optical consistency;
7. It is possible to *superimpose* images of different scales and origins;
8. Maps can be *made part of a written text*; and
9. The two-dimensional aspects of the maps can merge *with geometry*.

These qualities give advantage those who control the technology to transport, print, publish and distribute this type of visualized knowledge.

To achieve this consensus among a community of experts, the explorers had to establish "commensurability" with indigenous knowledge of the land and sea from the Arctic. Michael Bravo (1996) explains that early encounters in mapping by explorers built commensurability, cross-cultural communication that speaks to the "veracity" of information, that is, validity on the basis of European cartographic standards of measurement. However, since communication is inherently participatory, one can argue that the mapping encounters also informed the Inuit about the relational power of maps.

What facilitated the shift in power relations in the Inuit Land Use Occupancy Project and the Mackenzie Valley Pipeline Inquiry? First, the Inuit realized the potential power of the visual to transform perception by superimposing their human ecology onto topographical maps that otherwise showed 'empty spaces' for resource extraction. The Inuit Tapirisat of Canada in 1973, using the skills of a number of academics, in an act of strategic brilliance and humanistic foresight, proposed and succeeded not only in convincing the government of Canada to support a massive study to document (both text and maps) Inuit land use and occupancy, but more importantly in printing, publishing, and distributing this information. This knowledge thus became mobile and part of the archive of the central government as well as other centres like the university library (Milton Freeman Research Limited 1976a).

The second, most important act was on the issue of validity. The fact that Justice Berger in the Mackenzie Valley pipeline Inquiry did not primarily rely on the testimony of experts from the government, private sector, and environmental organizations is key. Validity was not based solely on the testimony of *communities of inquirers* (knowing *that*), but *communities of social practice* (knowing *how*). Profoundly telling examples of this are to be found in the transcripts of community hearings, which were also documented, printed, published, archived, and now, even distributed on the internet. For instance, the hearing at the community of Ulukhaktok is revealing when Justice Burger is presented with testimony from Inuit hunters attesting not only to sightings of, but actually hunting and showing the exact position on topographical maps of, beluga whales. Testimony from Inuit hunters maintained that the "white" whale is indeed found as far north as Victoria Island despite 'scientific' and 'expert' testimony to the contrary (Mackenzie Valley Pipeline Inquiry 1976: 3943–3944, 3959–3960). In short, the Canadian government, through both visual and textual documentation from the Inquiry, established precedence for validity based on *communities of social practice* or knowing *how*. This ushered in a fundamental shift in the relation of knowledge and power.

6.5. Action Research and Community Participation in Mapping Human Ecology

Mapping that negotiates validity on the basis of *communities of social practice* as well as *communities of inquirers* results in an expression of the relational nature of knowledge and power from a human ecological perspective. David Turnbull, in his *Masons, Tricksters And Cartographers*, describes knowledge as an assemblage, a motley, a patching of the local (2000: 4). In an effort to preserve both biological and cultural diversity, Turnbull makes a case for a third interstitial space – the human ecological map. Its space bridges the field sciences and indigenous ways of knowing. Human ecological maps (1) mediate symbols and facilitate communication across cultures, (2) encourage a double hermeneutic to generate human agency by transforming perspectives, and (3) transfer of practical wisdom (*phronesis*) intergenerationally. Examples of recent human ecological knowledge, detailed below, are particularly noteworthy for their practical use to communities through applied research.

Human ecological research combines mapping with interviews to enable simultaneous validation and robust research results. There is a range of benefits associated with using this participatory approach in research. First, it removes control from the outside 'expert' and places it within the community members' knowledge based on social practice. The researcher acts as a catalyst to begin the process and then steps back to let the community members participate. Second, there is room for a diversity of views and overlapping of ideas as different aspects of human ecological relations are brought to light. Third, the maps are portable and may be taken to various locations in a community for discussion in small groups or to the homes of elderly community members and returned with detailed and specific information. Fourth, it enables validation and cross-checking of information (Chambers 1997; Kassam and the Wainwright Traditional Council 2001).

6.5.1. Mediating Symbols and Communicative Role

A human ecological map is discursive, using its own mediating symbols to communicate. For instance, the maps and descriptions depicting human-land relationships (i.e., the human ecology) for the community of Ulukhaktok, an

Inuit marine community on Victoria Island, employed symbols of animals and plants that were designed by a local artist and accepted by the community partner, the Ulukhaktok Hunters and Trappers Committee. As noted in chapter 4, the objective of the research in Ulukhaktok was to examine human ecological relations and the impact of chemical pollutants. Having agreed upon what constituted an appropriate symbolic representation or icon for a bearded seal, caribou, snowy owl, Arctic char, blueberry, and so on, consensus developed on the symbols to be used in the mapping process and, hence, the categories of information that would be represented on the map. During the process of design, Peter Palvik, the community member and artist who developed the icons, was not familiar with the appearance of several plants used within the community as women traditionally collected these plants. Winnie Akhiatak, a community member participating in the research project, collected the plants so that Peter could design representations for them as icons (see figure 6.2). In the research process, the placing of icons on the map coincided with oral descriptions of harvest and use of animal, plant, and other land and marine resources as well as narratives and oral histories from the community members (see chapter 4).

In Ulukhaktok, as in each community, meticulous attention was paid to the design of appropriate representational symbols and consensus building in order to establish a common vocabulary that may be used and understood by all partners in the project. As a first step, the researchers (*community of inquirers*) and local knowledge holders (*community of social practice*) agreed upon Inuit, scientific, and common names of plants and animals that corresponded to the icons representing plants animals harvested within the community. This created a basis from which the *community of inquirers* could apply their knowledge and experience to explain the significance and importance of the research, and describe complex notions such as bio-accumulation of pollutants in specific animals and plants. Such discussion and dialogue between scientists and community members established the basis – the terms of reference – for collecting, testing and analyzing samples. Community members then undertook the collection of samples, knowing precisely what species and specific parts of plants and animals are required by the scientists. Having collected and analyzed these samples, the scientists were then able to communicate the results back to the community. To-

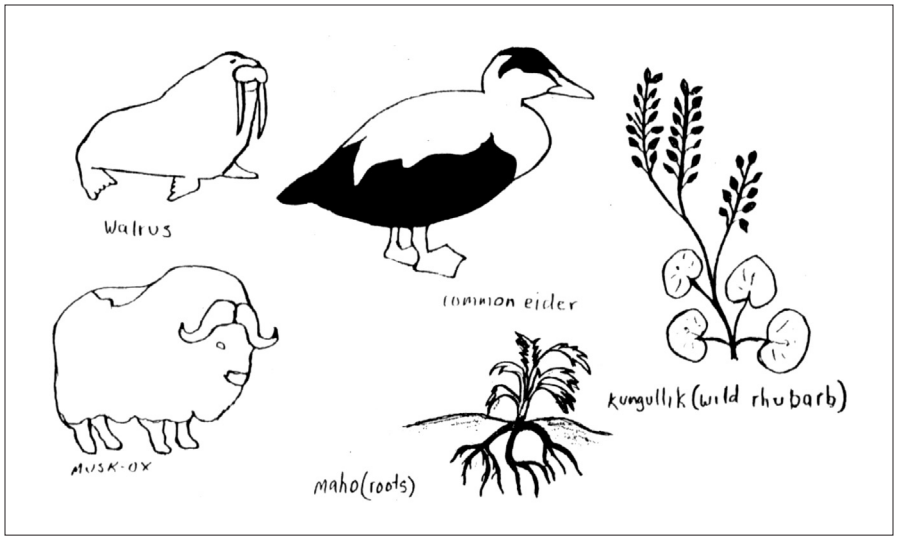

Figure 6.2: Icon Design, a Step in the Communicative Power of Human Ecological Maps.

gether, both the *communities of inquirers* and *communities of social practice* then applied the knowledge they had collectively assembled. The consensus facilitated communication between community members, between the research team and the community, and ultimately with outside resource users. The aim of constructing a human ecological map is not simply to create a shared metaphor that combines systems of indigenous knowledge with applied sciences, but also to correlate these signs and symbols in order to convey this knowledge to a wider audience of policy makers.

The need for symbols to be context-specific because they represent objects beyond their physical attributes becomes even more significant when a map overtly seeks to transform the user's perspective. Symbols simultaneously mediate the experience of the map maker as well as that of the user. In human ecological research, the community is both the maker and first user of the map, modifying and applying the collected knowledge. Then outside users such as policy makers and resource developers such as mining or oil and gas companies also view this knowledge. For instance, when undertaking human ecological mapping in Ulukhaktok, Northwest Territories,

Canada; Wainwright, Alaska, USA; and Novoe Chaplino, Chukotka Peninsula, Russia, there was some disagreement on the symbol for the wolf. The Yupik representative from Novoe Chaplino maintained that the existing symbol for the wolf looked more like a fox and did not represent the "strength" of the wolf. The icon had to be redesigned so that there could be agreement among all three communities. Similarly, during design phase for mapping Kola Sami reindeer herding and other land use, the symbol proposed for grave sites (⛦) by the research team was rejected by Sami representatives. Instead they argued this symbol represented a church. In turn, they proposed what looked like a roof on a grave (⛫). Our proposal was based on our experience of mapping in Canada, where indigenous communities were influenced by Catholic or Protestant Christianity. Hence, the cross (†). The Sami were influenced by Orthodox Christianity. Hence, a cross representative of that tradition (☦). In other words, the signs on a map are based on social assumptions which require that the symbols on the map are not only situated where they are supposed to be, but are also situational to their cultural milieu.

6.5.2. The Double Hermeneutic and Human Agency

The communicative nature of the human ecological map arises from the motives of its makers and their desire to gain agency. In a collaborative project on the Kola Peninsula, Russia, the Sami, after agreeing upon the design of icons, determined the scale to be applied and geographical area to be covered on a topographical map. Having established the boundary of human ecological use, herders, hunters, and gatherers began indicating reindeer migration patterns, calving areas, harvest sites for various plants and animals, sacred areas, and historical places which were mapped in an effort to introduce co-management of reindeer herding on their traditional lands (Robinson and Kassam 1998). Figure 6.3 illustrates the process of mapping among the Sami in the Kola Peninsula Russia. The mapping process involves an animated discussion and description of the information. The process when it comes together is surprisingly enjoyable and exciting to community members and researchers alike. The power of a visual illustration of an assemblage of knowledge from genesis to completion cannot be underestimated as a form of empowerment.

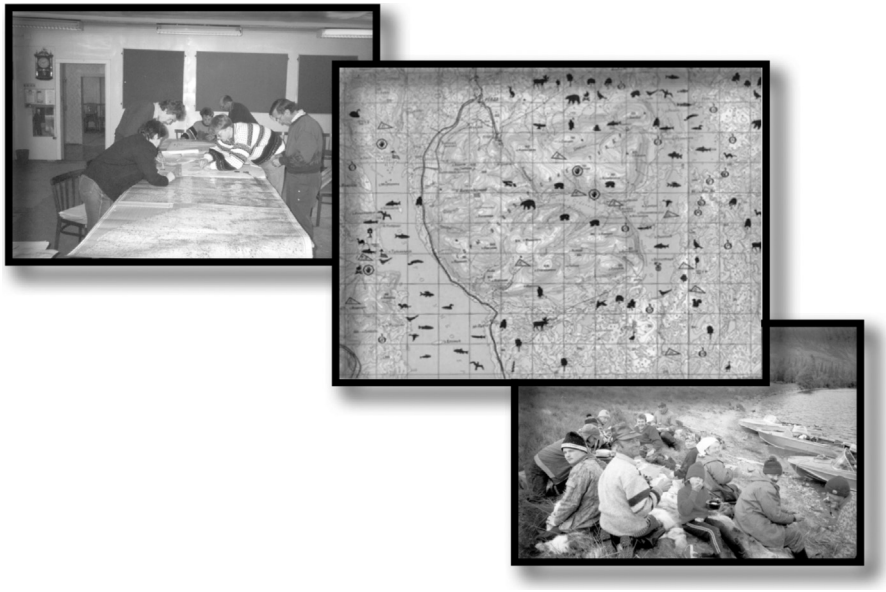

Figure 6.3: The Process of Mapping Human Ecology.

For instance, when the Sami land and marine use maps were completed for the region of Lovozero (on the Kola Peninsula), they depicted diverse information such as reindeer herding process according to the seasons; bird, fish, terrestrial and marine mammal harvesting sites; and the location of sacred places. In 1997, the Russian mayor of the town of Lovozero viewed the knowledge of the indigenous Sami peoples – he simultaneously validated (knowing *how*) through his own experiences as a hunter and fisher as well as learning the extent of Sami land use. He was also a critical user of the map (learning *how*). Although he was neither a participant in the production of the maps nor a known proponent of Sami land rights, a few days later in capital of the region, Murmansk, and in the presence of the media, members of the Russian Academy of Sciences, and the Governor, he attested to the authenticity and value of the maps. As such, human ecological maps not only have the ability to transform physical space, but also the user's perspective.

In the spring of 1998, the development of a gold mine in the Voronye Tundra, including a bridge across the Voronye River, was proposed by Voronye Minerals, a joint venture of Swedish mining company Boliden Ltd. and the Administration of the Murmansk County. The effect of the development would have opened up the tundra to widespread access and the mine would have devastated essential reindeer herding grounds. Local Russian, Nenet, and Komi, along with the Sami, protested the bridge and the gold mine development. The human ecological map prepared by the Sami was used to illustrate the potential impacts of the development on the ecology of the region and to the livelihoods of the people of the area. As a result of a campaign undertaken by the local Sami, the participation of the Sami Parliament in Fino-Scandinavia, support from the regional Russian Duma and the Governor of Murmansk, the sponsoring Swedish company withdrew its investment from the development initiative, thus averting an impending environmental catastrophe. Empowered by the strategic application of cartographically represented indigenous knowledge, the Sami are currently utilizing the map to thwart tourism development that excludes their participation in their sacred heartland of *Sedozero*.

The case of the Sami map indicates that the communication of indigenous human ecological knowledge, combined with knowledge derived from the field sciences using the map, can facilitate socio-political empowerment. The human ecological map becomes a source of authority in the process of exerting indigenous rights. However, the map alone is not sufficient. It can serve as a catalyst as long as the indigenous community has the basic organizational infrastructure and institutions that can enable the production of the maps and the realization of its socio-political potential. In the case of the Kola Peninsula, partnership with the local and national Sami associations was essential to the research and construction of the map. This map remains protected in the Lovozero *Dom Cultury* (Cultural Centre) for use by the Sami and local and regional policy makers.

In a similar case, documenting and mapping human ecological relationships of the Iñupiat of Wainwright, Alaska, places knowledge at the community's disposal at a time when corporate and government forces unite to exploit oil reserves in northwest Alaska. While the original intent of the human ecology research has been to trace the impact of chemical pollutants

by marine pathways, the community is also able to use the land and marine use maps to illustrate their traditional rights and the impact of resource development on their subsistence lifestyle. Currently these maps are being used by the community to negotiate the extent of oil drilling rights in the region as a result of the U.S. government's effort to begin oil and gas development in the National Petroleum Reserve on the North Slope of Alaska. In short, human ecological mapping can be a major counter-force to southern cartographic use meant to benefit non-Iñupiat interests.

6.5.3. Intergenerational Transfer of Phronesis

In the long run, the impact of the human ecological maps in the cases we have discussed above will be on intergenerational transfer of knowledge. All of the indigenous communities involved in the research have identified this as an important outcome of their research partnership. For instance, in the Iñupiat community of Wainwright, Alaska, the information derived from the research will be used as teaching material for young Iñupiat students. The president of the Wainwright Traditional Council, June Childress, in her foreword to *Passing On The Knowledge*, the publication containing the research results, notes:

> *Passing On The Knowledge* is a tool for communicating knowledge between generations. I hope that it will create a desire among young people to write down the knowledge they get from their elders. This report is a model that young people can use to write their own family histories. I hope the maps and analysis will be used not only for this research project, but in the schools and by community members as well (Kassam and the Wainwright Traditional Council 2001: ii).

Land and marine use maps provide local people not only access to the knowledge of their ancestors, but also an impetus for a younger generation of indigenous people to interpret and re-interpret this knowledge and to make their own contribution to this growing body of knowledge. Furthermore, the human ecological map is a catalyst for dialogue. Increasingly, children are repositories of the knowledge of their grandparents. For

instance in Lovozero, Russia, the community member who participated in interviewing and constructing the map was also an elementary school teacher. She took drafts of the maps to her class and encouraged the young students to trace regions of the map where their families historically lived and migrated as clan groups. The children took these maps home to their grandparents and returned the next day with more detailed information plotted on the map demonstrating the Sami relationship with their local ecology as well as with narratives of their ancestors. The maps acted as a vehicle for a discussion between the children and their grandparents on their common history, spirituality, and way of life. In effect, the engagement between the two generations integrated indigenous values and the practice of their way of life in the context of human ecological relationships.

6.6. Discussion

Power is relational – it is exercised, not seized. Therefore, power relations are not external to human ecological relations, but embedded within them. The various cases of mapping in this chapter indicate that knowledge and power imply one another. Since power is relational, it is manifested in a context, in the particular, in the concrete action of *living through* the peaks and troughs of existence. The exercise of power, like knowing *how*, is implied in Aristotle's notion of *phronesis* – where the land and sea are not subject to instrumental thinking ripe for resource extraction (*chrematistics*), but valued instead for providing sustainable livelihoods (*oikonomia*). Examples of human ecological maps in this chapter display how these power relations shift from a dominating 'frontier' point of view to a 'homeland' perception. The frontier perspective, reminiscent of instrumental connectivity, is limited in its conception of human ecology because of the nature-culture dichotomy, whereas a homeland perspective, which acknowledges complex connectivity, is empirically demanding and rich in its human ecological relations. How the two ways of knowing co-exist to create a third space for conserving the deep interconnectivity between biological and cultural diversity has been the subject of this chapter.

The human ecological map reclaims the 'other' by displaying indigenous cultural ecological relations on their own terms without loosing the ability to communicate across cultures. It is noteworthy that the domination of the 'other' and acquiring their 'empty lands' required maps to effectively displace indigenous land use from its cultural context. Yet it is also the map, this time produced with the participation of the "other," which reintegrates cultural and ecological relations onto a cartographic context. This type of mapping has opened up a new terrain of power relations in which struggles over resources are linked to issues of cultural diversity and biological diversity. However, human ecological mapping is neither a panacea nor a quick fix with regard to indigenous rights or resource management. With land use and occupancy maps, it still took decades of political negotiations and research for indigenous communities in the Canadian Arctic and sub-Arctic to settle their land claims.

The human ecological map corresponds to an assemblage of both indigenous as well as Western cartographic knowledge – a combination of elements that provide a unique metaphorical representation of knowledge hitherto not revealed. This commensurability enables cross-cultural communication. However, the veracity of the information contained in such maps is derived from *communities of social practice* – those who engage their ecological environment in subsistence activities. This assemblage gains mobility through the map, giving the ability to traverse disciplinary and cultural boundaries. A culture of ethnographic research, documentation, printing, distribution, and archiving generates support for the values of subsistence livelihoods. This, too, is a form of validation. In an academic context, the validation emerges from *communities of inquirers*. As such, the human ecological map negotiates the coexistence of seemingly contradictory forms of authority. The mutual coexistence of differing forms of validity actually represents the transformation from context-dependent knowing *how* to context-independent knowing *that*. Experiential knowledge necessarily depends on *communities of social practice* for its validity, and imparted knowledge, being mobile, depends on validation by *communities of inquirers* who may be elsewhere. Here we are not discussing a divide between science and indigenous knowledge, because both forms of knowledge are context-specific in their generation. Rather we are discussing the

transformation of knowledge in order to communicate and engender a shift in perception and power relations. The shift occurs when reading the map by drawing from its communicative power – learning *how*.

The human ecological map has the potential to generate a double hermeneutic, a reflexivity, the ability in self-reflecting individuals to produce a change in perception. This communicative capacity of the map is illustrated in its ability to realign power and knowledge relationships and to achieve agency for its makers. The Inuit Land Use Occupancy Project, the Mackenzie Valley Pipeline Inquiry, and the Sami maps are clear examples of this. Regions viewed from an instrumental perspective as frontiers valued by outsiders solely for their resources are transformed by the map into thriving biotic systems incorporating human ecological relationships hitherto not considered, but always present. The strength of the map lies in its ability to alter the viewer's perception of the land and sea. The capacity of successful cross-cultural communication to produce change in perception is characterized by the establishment of a common vocabulary of symbols and trust in the veracity of the knowledge generated. The participatory approach is key to facilitating the language of trust. An illustration of this is the example of human ecology research in Ulukhaktok, where a common vocabulary for communication among researchers and community members alike was created. Human ecological mapping is not only a medium for imparting information, but a representation of an indigenous knowledge laid out in a manner so as to transform the understanding of those who use the map. By first establishing commensurability, it challenges their perceptions – speaking at the same time not only to the hunter and the applied scientist but also to the government policy maker and the corporate executive.

The communicative nature of these maps does not suggest that they are always effective in an adversarial context. A human ecological map is very useful but not sufficient to respond to a political authority that is adamant on extraction of natural resources. The map engenders an enabling environment for discussion, but it also requires a commitment, on all sides, to facilitate the discussion. This willingness arises from consensus in civil society as well as policy makers. Civil society is not necessarily strong in all regions of the world. The example of the Mackenzie Valley Pipeline Inquiry in this chapter illustrates how this willingness was given an institutional

framework by including testimony from 35 northern communities and over 1,000 community members. Not all governments are willing to invest time and resources in such a process. For human ecological maps to be effectively utilized, they require political and legal support.

The value of human ecological maps of the Iñupiat community of Wainwright still remains to be discovered. At this time it is unclear if the community will be able to communicate their subsistence land and marine use concerns to corporate interests in the National Petroleum Reserve on the North Slope of Alaska in an effective manner. However, early encounters indicate that when oil companies produce maps of their allotments for exploration and drilling, the community leaders also pull out human ecological maps for Wainwright. Concrete evidence of sensitivity on the part of government agents and corporate representatives to Iñupiat concerns still remains to be seen.

The human ecological map does not undo a history of alienation or quickly resolve complex issues related to sustainable livelihoods, resource extraction, and conservation of biological and cultural diversity. It provides a common vocabulary for engagement. Complex issues cannot be mapped but can be approached using a human ecological map. A map ultimately only captures one portion of a wider narrative of bio-cultural relations.

It is important to be aware that some cognitive categories will not be commensurable or translatable because they are not interchangeable units. As well, a community might choose not to map certain information, for instance, on sacred places, in order to protect it from political and economic calculus.

Human ecological maps have the potential of becoming independent of their creators. This is an area of deep concern. In the process of mapping human ecological relations, the goal of holism may be compromised because the map simplifies, aggregates, and demarcates. This may lead to ignoring valuable details and nuances associated with diverse land and marine uses. Excessive generalization in maps may lead to homogenization of diversity, making it vacant of meaning and divorcing it from the human ecological relations that produced it, thus becoming an artefact of those who know *that* rather than expressing the experiences of those who know *how*. To mitigate this, the map must be contextualized by the testimony of

its producers in order to remain close to knowing *how*. Again, the human ecological map must be contextualized by the visual and the verbal testimony of its creators.

The process of human ecological mapping may co-opted and bounded by simplistic notions of community to serve only one group's interest, further marginalizing the disadvantaged in a community. For instance, the interests, priorities, and claims of women or vulnerable groups within a community may be ignored, ultimately to the peril of not only the process but the community as a whole. Human ecological mapping requires researchers to be consistently attentive to whose interests are being served.

The cartographic venture has a tendency towards over-reliance on discrete boundaries. The map is not a neutral tool: a community maps its biocultural relations within bounded space; and the map in turn also defines the community and its space. Often there may be overlapping claims over territories by various indigenous communities which will require negotiation and resolution.

The horizontal ability of human ecological maps to reach across cultures within a specific historical time frame is matched by a vertical tendency that allows the map to communicate or engage across generations within the same culture with different historical experiences. The map may simultaneously reflect the past, present, and potential land and marine use. It creates an enabling platform from which a young indigenous person can conceptualize *living through* the land and sea in a language that is relevant to her or his context.

Indigenous human ecological maps are the 'third space' which expresses the deep interconnectivity between biological and cultural diversity. Such maps create a shared space for different knowledge systems to work together. Diversity cannot be conserved if only one way of knowing dominates. However, with human ecological mapping, different knowledge traditions are able to work together for the benefit of understanding the relationships between biological and cultural diversity.

CHAPTER 7

Implications of a Human Ecological Outlook

In the twenty-first century human ecology has the potential to be the 'third culture' linking the sciences and social sciences. The obstacles to the development of this third culture are disciplinary self-interest and a fragmented understanding of human interaction with the environment. The examples cited in the preceding chapters show that the relationship between the biological and the cultural is best observed through a human ecological lens. The analytical elements of a human ecological lens include: context, perception, diversity, relationships, and knowledge generation (chapter 3). Human ecology is necessarily interdisciplinary because it examines complex and interacting systems. It has the ability to meaningfully inform a wide variety of cross-cutting issues of societal concern which are as diverse as climate change (chapter 5) and land use rights (chapter 6). It is a fully functional bridge between the biological and the cultural.

At the end of a narrative, we often ask: what is the moral of the story? In this case: what are the practical and theoretical implications of this research? In human ecological research theoretical and practice applications cannot be separated. There are five fundamental pillars on which this work rests. They are (1) the case for diversity (section 7.1); (2) the humanitarian paradigm of knowing – *phronesis* (section 7.2); (3) the participatory approach to the validity of research (section 7.3); (4) the role of human agency in mediating cultural systems, social structures, and individual actions to

transform perceptions (section 7.4); and (5) the argument that maintains that the universal may only be approached through the particular (section 7.5). These five points are summarized below.

7.1. Case for Diversity

Diversity is the basis of sensory perception, and it is this characteristic that unites humans with all other organisms. Diversity defines our humanity and moulds our reality. Human beings are not impartial observers of the natural world but participate in it, utilizing mind and body. This participation is characterized by relations with other humans, non-human life such as plants and animals, and inanimate entities. Context provides the basis for these relations. Context is a story, a narrative, a pattern that reveals meaning of these relationships. Human ecology, as a narrative, interprets the particular and speaks to the universal by showing how small facts shed light upon large issues.

At the biological or cultural level, it is important to keep in mind that in order to tinker, evolution needs all the parts. This simple proposition makes a profoundly significant case for cultural and biological diversity. By placing human ecology within a northern indigenous circumpolar context (where it may have been least expected) this work demonstrates the significance of diversity. The human ecological example of the Inuit of Ulukhaktok illustrated the complex interconnectivity of relations between biological and cultural diversity (chapter 4). The case of climate change in Wainwright shows how those diverse relations between the biological and cultural are in peril (chapter 5).

7.2. A Humanitarian Approach to Knowing

Knowing is embedded in direct experience of the senses and therefore, within specific contextual relations. Relationships are, therefore, the basis of knowledge. This type of knowing is *phronesis*, or reflexivity in action, where self-reflecting humans interpret the consequences of actions. *Phronesis* is a dynamic process involving a circuit of knowing *how*, learning *how*,

and knowing *that*. It is the iterative movement from context-dependent, experiential knowledge to context-independent, imparted knowledge and back to context-specific learning that makes knowledge generation in human ecology relevant to both theory and practice. In other words, it is approaching the universal from the particular.

For instance, the subsistence hunting lifestyle of the Inuit of Ulukhaktok (chapter 4) and the profound knowledge of sea-ice of the Iñupiat of Wainwright (chapter 5) illustrate knowing *how*. They provide the context for knowledge generation. Knowing *how* is a dynamic process where action and reflection are not separate for the subsistence hunter and gatherer but a simultaneous performance. It is one *intelligent* act. For the researcher to critically follow and learn *how* is a step in the transformation of the relational nature of knowledge to the researcher. The knowledge undergoes a process of generalization from the particular to the universal. The researcher undergoes transformation in perception in the other direction, moving from the general to the particular. The act of documenting this knowledge (chapters 4 to 6) completes the transformation into knowing *that*. The representation of Inuit, Iñupiat, or Sami knowledge in the form of mapping human ecology (chapter 6) is a manifestation of knowing *that*. However, that knowledge has a history, a process that led to it. Engaging that knowledge is the first step to learning *how*, thereby returning back to the context of knowledge generation.

7.3. Participatory Approach to Research and Validity

Because human ecological relations are inherently participatory, human ecological knowing is also relational and participatory. Furthermore, research about knowing also has to be participatory. The analytical lens of human ecology informs both the understanding of the relationship between the biological and the cultural and the method by which to reveal these relations. It is by definition context-specific and therefore may only be examined on a case-by-case basis. The research sites are the location and locality, condition and conditionality from which we can understand the relationships between the biological and the cultural.

Phronesis, or practical wisdom, encompasses different ways of knowing. These forms of knowledge have concomitant forms of validity. Most importantly, the process must be participatory to be considered genuine *phronesis*. Those who know determine what is known. The value of a community's knowledge is realized when it is shared meaningfully through participation in and contribution to the direction of research. Knowing, *phronesis*, is context-specific and anthropocentric at its generation, which makes the community a full partner in human ecological research.

When knowledge arises from knowing *how* to live from the land and sea as in the case of human ecology of Ulukhaktok and Wainwright, its validity is conferred by *communities of social practice*, that is, the subsistence hunters and gatherers. They are the experts who collectively confirm the validity of their knowledge. When knowing *how* is transformed to knowing *that* and made mobile by the researcher so that it is generalized, only then can *communities of inquirers*, experts, namely other researchers living elsewhere, comment on its validity based on their accumulated knowledge. Experiential context-dependent knowledge necessarily depends on *communities of social practice* for its validity, and imparted context-independent knowledge, being mobile, depends on validation by *communities of inquirers*.[1] In Galileo's experiments, for instance, validation by *communities of social practice*, that is, craftsmen, would have been prompt because they were present. He worked and spent considerable time with artisans in their workshops. However, validation by *communities of inquirers*, as we know, was much more time consuming because first there needed to be a paradigm shift from the generalized knowledge of that period, namely Aristotelian physics. This is not only an issue of the relational nature of knowledge but also the relational nature of power as discussed in the case of mapping Sami, Inuit, and Iñupiat human ecology (chapter 6). The case study of mapping human ecology illustrates the transformation of knowing *how* by *communities of social practice* to knowing *that* by *communities of inquirers*. The resulting map is then used by the community of social practice to reflect on its traditional practices and so its knowledge. In turn the community of inquirers use the map to reflect on their knowledge. Both groups are transformed by both the exercise of applied action research itself and the knowledge that is gained. Mapping human ecology influences both

communities in their practice and in the power relations that result from this knowledge.

7.4. Human Agency and Transformation

Power is relational. It is exercised, not seized. Therefore, power relations are not external to human ecological relations but embedded within them. Humanity has extra-genetic mechanisms for governing behaviour, and this agency produces social change. Learning *how* is an important element in facilitating a change in perception and therefore the first step in creating change through human agency. The individual case study provides access to context-dependent knowledge and facilitates learning *how*. The case study approach was central to Galileo's experimentation on gravity as well as development of Darwin and Wallace's contribution to the theory of evolution. The case study has also been central to understanding human ecology.

The two cases of the Inuit community of Ulukhaktok (chapter 4) and the Iñupiat of Wainwright (chapter 5) illustrate the process of *living through* change and how the diversity of indigenous cultures is sustained. The examples of these communities show the application of *phronesis*, practical wisdom, to secure the ends of human life (knowing *how*). These case studies also demonstrate that *phronesis* integrates their *cultural system* by informing the *social structure* in which they operate and which is also manifested in their *individual actions*. In the case of the Inuit of Ulukhaktok, through the value of *sharing*, the community has so far avoided potential conflict arising from their cultural system and dramatic change to their social structure resulting from its penetration by the values of the market economy (see figure 7.1). In the case of the Iñupiat, sharing as a value has created a synthesis between their *cultural system* which co-exists with a *social structure* impacted by the market economy. However, the adverse impact of climate change may drive a wedge between their *cultural system* which values sharing and the *social structure* which facilitates it. The outcome is by no means certain as the community has consistently demonstrated its resilience through the capacity to adapt under conditions of dramatic change.

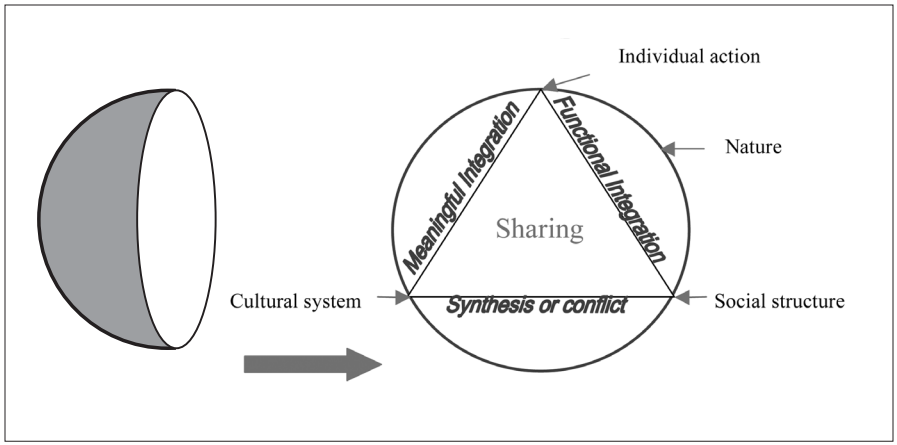

Figure 7.1: Dissection of Human Ecological Relations.

As explained in the previous section, human ecological mapping (chapter 6) has the potential to generate a double hermeneutic, a reflexivity, which produces a change in perception of individuals. This communicative nature of the map is displayed in its ability to gain agency for its makers and to realign power and knowledge relationships. The human ecological map corresponds to an assemblage of both indigenous as well as Western cartographic knowledge – a combination of elements that provide a unique metaphorical representation of knowledge. The transformation of knowledge in order to communicate across cultures engenders a shift in perception and, potentially, in power relations. The shift occurs when reading the map and drawing from its communicative power – learning *how*.

This model (as represented by figure 7.1) points to the capacity of human agency which is the reflexivity of human societies through *phronesis*. The example of circumpolar societies in the face of dramatic change is informative particularly in terms of conservation of cultural and biological diversity. At a global level, it is also informative in the context of the relations between nations and the variety of cultures and creatures that live within their borders. Pluralism and conservation as values may provide a useful synthesis between diverse cultural systems and diverse social structures, thereby leading to preservation of biological and cultural diversity for

the benefit of all humanity. Just like sharing for the Inuit and Iñupiat, the value of pluralism may be central to conservation of biological and cultural diversity on this planet.

7.5. Approaching the Universal through the Particular

Knowledge is contingent because *idea* and *action* are combined. This has significant implications for research because it means that cosmological and empirical considerations are not separate. If theory and practice are separated they become vacant because they are divorced from their context. This is particularly true of human ecological understanding. An understanding of the whole may only be approached through the particular. It is the expansive multiplicity within the particular that determines the life and death of theories or cosmologies. If the different taxonomies of all the diverse cultures and all the diverse species of life were known, categorized, and permanently established, human agency would be stale and fossilized.

It is on this note of unity through diversity or knowing the universal through the particular that this narrative concludes. In the absence of adequate prose to express this idea, one seeks refuge in metaphors found in poetry. The Persian Sufi poet, Farid ud-Din Attar, composed *Manteq at-Tair*, translated as *Conference of the Birds* (1984), in the twelfth century. Among the key themes he addressed is the relationship between diversity and unity and approaching knowledge of unity through diversity. He tells the story of all the birds of the world seeking their King, whose name is Simurgh. At first all the birds decide to make the journey to find their King – a journey that is not unlike the one undertaken through the seven chapters of this work. Once they discover the difficulties associated with the journey, the prominent birds like the hawk, peacock, heron, owl, and nightingale make excuses. Ironically, it is not necessarily the stronger birds that complete the journey. The journey involves travel through seven perilous valleys helped by a guide and leader, the Hoopoe. He explains the journey to the birds.

> The first stage is the Valley of the Quest;
>
> Then love's wide valley is our second test;

The third is Insight into Mystery,

The fourth Detachment and Serenity –

The fifth is Unity; the sixth is Awe,

A deep Bewilderment unknown before,

The seventh Poverty and Nothingness –

And there you are suspended, motionless,

Till you are drawn – the impulse is not yours –

A drop absorbed in seas that have no shores (Attar 1984: 166).

The point that he is making concerns knowing in an experiential manner, as learning *how*. Out of the many thousands of birds only thirty survive to complete the journey. Before arriving at the court of Simurgh they cross the valley of Unity.

Next comes the Valley of pure Unity,

A place of lonely, long austerity,

And all who enter on this waste have found

Their various necks by one tight collar bound –

If you see many here or but a few,

They're one, however they appear to you.

The many here are merged in one; one form

Involves the multifarious, thick swarm

(This is the oneness of diversity,

Not oneness locked in singularity);

Unit and number here have passed away;

Forget for-ever and Creation's day –

That day is gone; eternity is gone;

Let them depart into oblivion (Attar 1984: 191).

The birds finally discover Simurgh, their King. In Persian *si* means thirty and *murgh* means bird. The play on words is that the journey is completed by thirty birds (*simurgh*).

There in the Simurgh's radiant face they saw

Themselves, the Simurgh of the world – with awe

They gazed, and dared at last to comprehend

They were the Simurgh and the journey's end.

They see the Simurgh – at themselves they stare,

And see a second Simurgh standing there;

They look at both and see the two are one,

That this is that, that this, the goal is won.

They ask (but inwardly; they make no sound)

The meaning of these mysteries that confound

Their puzzled ignorance – how is it true

That 'we' is not distinguished here from 'you'?

And silently their shining Lord replies:

'I am a mirror set before your eyes,

And all who come before my splendour see

Themselves, their own unique reality;

You come as thirty birds and therefore saw

These selfsame thirty birds, not less nor more;

If you had come as forty, fifty – here

An answering forty, fifty, would appear;

Though you have struggled, wandered, travelled far,

It is yourselves you see and what you are' (Attar 1984: 219).

…..

The substance of their being was undone,

And they were lost like shade before the sun;

Neither the pilgrims nor their guide remained.

The Simurgh ceased to speak, and silence reigned

(Attar 1984: 220).

Human ecological research can find its spirit in this poem. That spirit points out that the community of inquirers (the birds) and communities of social practice (also birds) can find their grail (the king) in the search, the journey. When the two communities work together in mutual respect, the knowledge generated transforms both. The practice of inquiry into the practice of *living through* transforms what was divided and diverse into something that is united and whole. Expressing that wholeness is the essence of human ecology.

Notes

1: Introduction

1 These events also provide a unique twist to the rhetoric of globalization through the use of indigenous transnational organizations – a subject that will not be explored in this work.

2 This statement is not intended as polemical, but is rather an observation made repeatedly by social scientists of their own respective fields and the social sciences and humanities as a whole. In addition to the various publications cited throughout this work, *Open the Social Sciences*, Report of the Gulbenkian Commission on the Restructuring of the Social Sciences, presents thoughtful recommendations (Mudimbe 1996).

3 Physics envy is a metaphor that illustrates the quantitative compulsion to reduce the socio-cultural context to a series of abstract models and statistical inferences that are vacant of local nuances and therefore ultimately not useful for practical purposes.

4 It is therefore not surprising that in September 2007, while 143 member states approved the United Nations Declaration of the Rights of Indigenous Peoples, four English-speaking countries, namely Australia, Canada, New Zealand, and the United States of America, with histories of cultural genocide of indigenous peoples in their midst voted against it.

5 North is towards, or in the direction of, that part of the earth or the heavens which (in the northern hemisphere) is most remote from the midday sun. The word "north" is also applied with qualifications as in north by east or with reference to movement, extent, or direction. The definition of north can be understood as the position of an object, flow of a river, or direction of travel in relation to the north poles' location in the northern hemisphere (OED 2003). In scientific terms the Arctic is the area north of latitude 66.7° where the sun does not set below the horizon at midnight on midsummer's night, and does not rise above the horizon at midday on midwinter's day. The problem with this definition is that it has a solar rather than an ecological, human community, or geopolitical focus. West Alaska, the Aleutian Islands, Southern Greenland, and Iceland all fall to the south of 66.7E, and therefore are excluded from the

Arctic in this definition (CAFF 2001). In lieu of disagreement on specifics, the circumpolar north is a convenient abbreviation for both the Arctic and the sub-Arctic which will be utilized in this work for ease of understanding.

6 In 1776, amending its 1745 legislation, the British Parliament agreed to give a £20,000 reward for the first voyage through any northern passage by sea from the Atlantic to the Pacific; and a £5000 reward for any expedition that sailed as far north as 89° north (David 2000)

7 Adapted from David 2000: 52.

2: Relations between Culture and Nature: A Critical Consideration

1 At first (1984) Hawley describes five elements and then (1986) three propositions that comprise the human ecology paradigm. The latter three are called the adaptive, growth, and evolution propositions.

2 This impulse towards practical wisdom, what Aristotle refers to as *phronesis*, is a theme underlying indigenous human ecology.

3 For a critical analysis of Wilson's Sociobiology see Greenwood's (1984) *The Taming of Evolution*.

4 Trends in conservation biology against invasive species reflect continued discomfort with the notion of diversity as the discussion takes place in a milieu of science, politics, and culture (Peretti 1998). Anti-immigration rhetoric and its xenophobic language are marked by a striking similarity to the discussion of invasive species.

5 Islam, like Judaism and Christianity, traces its monotheistic roots both genealogically and intellectually to Abraham (see Armstrong 1993; Feiler 2002).

6 The emphasis is mine.

7 Neo-liberal market economics focuses on the short-term exchange value (chrematistics) and not long-term use-value (*oikonomia*).

8 Genesis 1:28.

9 The desire to document is understandable although it may be interpreted as self-serving in terms of professional interests.

10 It is worth noting that the canonical Linnaean texts drew ideas from indigenous cultures in southeast Asia before transporting them to Europe where they became the standard (Ellen and Harris 2000: 10).

11 Emphasis is mine. We will return to the idea of knowing *how* in the next chapter.

12 See Dostoevsky's (1913: 259–79) *The Brothers Karamazov*.

13 Bible (1989), Luke 4:4; Mathew 4:4; Deuteronomy 8:3.

14 This is not unlike Donald Schön's (1983) "espoused theory" and "theory-in-use." In this case, "espoused theory" is the cultural level of meaning and "theory-in-use" is the social level of action. Conflict arises when there is a contradiction between "espoused theory" and "theory-in-use."

15 My question is: What if there is continuity and with our five senses we are not sensitive to that continuity of variation?

3: Human Ecology Re-conceptualized: A Lens for Relations between Biological and Cultural Diversity

1 Also without acknowledging Ryle.

2 It is here that I have a fundamental disagreement with Flyvbjerg (2001). He argues that *phronesis* is knowledge representative of the social sciences and *episteme* is akin to the natural sciences. Not only does such a generalization fail to see that knowledge generation is necessarily context-dependent, but it smacks of the nature-culture dichotomy discussed in chapter 2. Furthermore, Flyvbjerg asks: "how does one argue theoretically for practical skills one uses to formulate a theory?" He asserts that that the natural sciences are cumulative and predictive whereas the social sciences are not (2001: 29). However, if we hold an evolutionary perspective then we can talk about possibilities and even probabilities in both the social and natural sciences, but we can never predict the actual (Jacob 1982). In other words, Flyvbjerg is wrong about the both the natural and social sciences. He argues, furthermore, that the social sciences do not undergo paradigm shifts, just "waves of intellectual fashion." Perhaps Flyvbjerg's observations about the natural and social sciences are simply a wave of fashion too.

3 Look at discussion of *oikonomia* in section 2.4.1.

4 I am grateful to Dr. David Norton for drawing my attention to this case.

5 Flyvbjerg's statement is reminiscent of Francis Bacon: "The secrets of nature reveal themselves more readily under the vexation of art than when they go their own way" (Berman 1984: 17), or Kurt Lewin, the godfather of action research, who said: "We do not understand the inner structure of a social system until we try to change it" (Greenwood and Levin 1998: 56).

6 Olav Eikeland (2006) articulates the notion of *phronesis* in the larger context of Aristotle's intellectual virtues. It is from this more holistic view of *phronesis*, which includes its connection to culturally grounded ethical aims, that the foundation is set for wise action to emerge.

4: "Man and His Friends" – An Illustrative Case of Human Ecology in Ulukhaktok, Northwest Territories, Canada

1 Ulukhaktokmiut is the Inuit name for the people of Holman. It is also spelled elsewhere as Olokhaktokmiut. It is named after the bluff called Ulukhaktok facing south on Victoria Island between Queen's and Jack's Bay.

2 The reference to illness by villagers may also reflect fear of diseases that accompanied European contact and devastated Inuit populations in the Arctic.

3 The name for each of these groups speaks to their human ecological relations.

4 The emphasis is mine to refer back to the discussion on knowing *how*.

5 Dollars Canadian.

6 In a personal conversation, in July and again in August 1998, a local artist who has achieved international standing explained that he/she no longer "made drawings of medicine" because of his/her Christian belief. The local clergy did not encourage such drawings, even though the demand for drawings with shamanic narratives was great and the artist had attained prominence through such drawings.

7 Includes caribou soup, tongue, heart, frozen caribou, fried caribou, and caribou burgers.

8 The data obtained through human ecology research among the *Ulukhatokmuit* will be cited as 'Holman Interviews' so as to facilitate triangulation with other information sources which also will be cited.

9 The traditional way was just to freeze food outside.

10 The open water is currently a spring hunting area.

11 Formerly the Hudson's Bay Company store, the Northern Store is still owned by the Hudson's Bay Company.

12 Consumption of raw polar bear meat may lead to trichinosis. Health officials have advised the community of this potential hazard.

13 It seems that teenagers are influenced by southern media representations of polar bears as "cuddly and cute" animals.

14 Contrary to testimony by 'experts' where scientists claimed that whales did not migrate north to Victoria Island, community members testified to repeated sightings of the Beluga Whale.

15 Amitukyok and Imigaahook are English transliterations of the Inuvialuit name of the location. It was validated by the Hunters and Trappers Committee in May 1999.

16 This word is an English transliteration of the Inuvialuit name of the location. It was validated by the Hunters and Trappers Committee in May 1999.

17 Anialik, Hingelik, Nakushin, and Hinigouk are English transliterations of the Inuvialuit name of the location. It was validated by the Holman Hunters and Trappers Committee in May 1999.

18 Rods are used only in the summertime.

19 The fish is wrapped prior to freezing.

20 This word is an English transliteration of the Inuvialuit name of the location. It was validated by the Holman Hunters and Trappers Committee in May 1999.

21 Herring was discussed in interviews, but not mapped by respondents.

5: "The Weather Is Going Under" – Human Ecology, *Phronesis*, and Climate Change in Wainright, Alaska, USA

1 Temperature variations create immediate impacts on seasonal growth and decay patterns of sea-ice; consequently, sea-ice is a useful indicator of climatic trends. Sea-ice is a relatively thin floating layer of ice averaging 2 to 3 metres with a salt water origin, located in the polar-regions, covering approximately 7 per cent of the world's oceans: an area greater than Europe and North America combined. It is a product of the earth's very complex climate system and is extremely sensitive to any alterations in the surface energy balance. As a result, slight warming trends can have a tremendous impact on growth and ablation patterns of polar sea-ice. The phenomena of sea-ice is not a static process, it is a dynamic relationship that inherently records climatic variability occurring at the global scale. Ice morphology, formation, and melting dates can point to cooling or warming patterns.

2 As community members in Wainwright express measurement in English in the imperial system, distance will be given miles with approximate equivalents in the metric system in brackets.

3 Father of Blair Patkotak mentioned in section 5.2.

4 The objective of this image is to demonstrate the connectivity. Differentiation by colour of the abiotic, biotic, and cultural, albeit not sufficient in complexity, reinforce the connectivity that comprises relation of the Iñupiaq to sea-ice.

6: Mapping Human Ecology: A Transformative Act

1 Several factors had to be configured in order for the Sami to map their human in the context of Russia in the mid-1990s. External intervention was a key element in facilitating the documentation of indigenous knowledge: see *Sami Potatoes: Living with Reindeer and Perestroika* (Robinson and Kassam 1998).

2 The idea of *terra incognita* was furthered by mapping and placing names from the European conqueror's culture to transform what was otherwise 'unknown.'

7: Implications of a Human Ecological Outlook

1 Here we are not discussing a divide between science and indigenous knowledge because knowledge is context-specific in its generation.

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Holman

At the dawn of the third millennium, dramatic challenges face human civilization everywhere. Relations between human beings and their environment are in peril, with mounting threats to both biological diversity of life on earth and cultural diversity of human communities. The peoples of the Circumpolar Arctic are at the forefront of these challenges and lead the way in seeking meaningful responses.

In *Biocultural Diversity and Indigenous Ways of Knowing*, author Karim-Aly Kassam positions the Arctic and sub-Arctic as a homeland rather than simply a frontier for resource exploitation. Kassam aims to empirically and theoretically illustrate the synthesis between the cultural and biological, using human ecology as a conceptual and analytical lens. Drawing on research carried out in partnership with indigenous northern communities, three case studies illustrate that subsistence hunting and gathering are not relics of an earlier era, but rather remain essential to both cultural diversity and to human survival.

This book deals with contemporary issues such as climate change, indigenous knowledge, and the impact of natural resource extraction. It is a narrative of community-based research, in the service of the communities for the benefit of the communities. It provides resource-based industry, policy makers, and students with an alternative way of engaging indigenous communities and transforming our perspective on conservation of ecological and cultural diversity.

DR. KARIM-ALY KASSAM has been working with the peoples of the Arctic for over fifteen years. His research focuses on the complex connectivity of human and environmental relations, addressing indigenous ways of knowing, sustainable development, and climate change. In partnership with indigenous communities, he has conducted research in the Alaskan, Canadian, and Russian Arctic and sub-Arctic; the Pamir Mountains in Afghanistan and Tajikistan; and the forests in the south of India. Dr. Kassam is International Associate Professor of Environmental and Indigenous Studies at Cornell University.

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