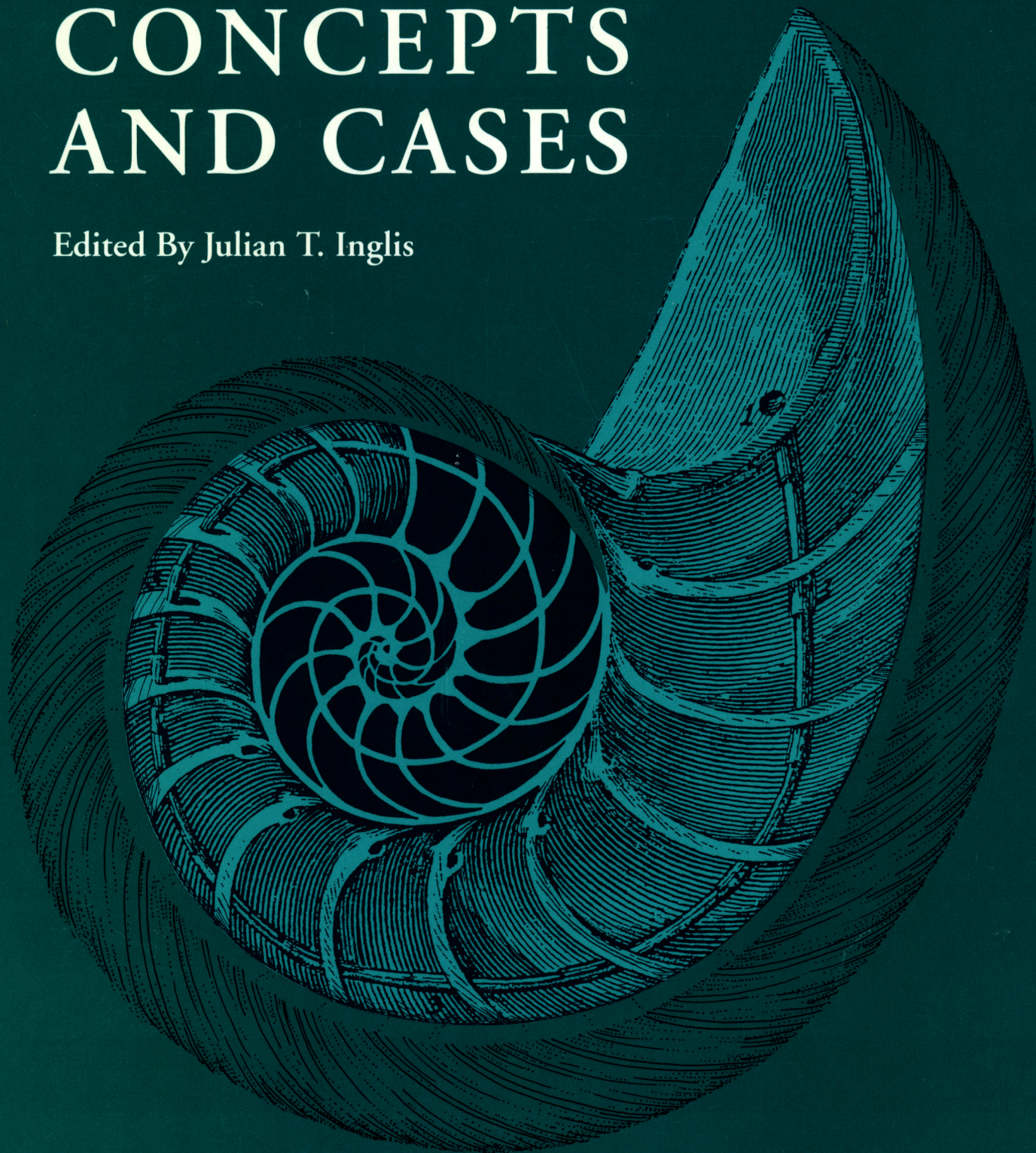


TRADITIONAL ECOLOGICAL KNOWLEDGE

# CONCEPTS AND CASES

Edited By Julian T. Inglis



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# **Traditional Ecological Knowledge: Concepts and Cases**

*Julian T. Inglis,  
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**International Development  
Research Centre**



**TRADITIONAL ECOLOGICAL KNOWLEDGE**

# CONCEPTS AND CASES





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International Program on  
Traditional Ecological Knowledge  
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## PREFACE

In December 1989, the United Nations General Assembly called for a global meeting that would devise strategies to halt and reverse the effects of environmental degradation. In response to this request, the United Nations Conference on Environment and Development (UNCED), commonly known as the Earth Summit, was held in June 1992 in Rio de Janeiro.

The Earth Summit produced agreements on basic principles for sustainability and established specific requirements for assuring a more secure and sustainable future. The principles are enshrined in the Rio Declaration and the requirements in Agenda 21, a comprehensive and far reaching program of action for assuring sustainability.

Critical to the successful implementation of Agenda 21 is the recognition of the contribution of indigenous peoples and their knowledge to the quest for a sustainable future. There are numerous references to indigenous knowledge, or what is commonly known as traditional ecological knowledge (TEK), in the Rio Declaration, the agreements, and Agenda 21, including:

- Principle 22 of the Rio Declaration
- Preamble, Articles 8 and 10 of the Convention on Biological Diversity
- "Forest Principles"
- Chapter 26 of Agenda 21

TEK refers to the knowledge base acquired by indigenous and local peoples over many hundreds of years through direct contact with the environment. It includes an intimate and detailed knowledge of plants, animals, and natural phenomena, the development and use of

appropriate technologies for hunting, fishing, trapping, agriculture, and forestry, and a holistic knowledge, or "world view" which parallels the scientific discipline of ecology.

In September 1991, recognizing the importance of TEK in planning and decision-making for sustainable development, UNESCO Canada Man and the Biosphere Programme (MAB) and the Canadian Environmental Assessment Research Council (CEARC) jointly sponsored the International Workshop on Indigenous Knowledge and Community Based Resource Management. More than 50 indigenous people and specialists participated in this two-day workshop. The workshop recommended that an international program be established to promote and advance the concept and use of TEK in planning and decision-making.

The Program was initially developed under the auspices of the UNESCO Canada/MAB program, and it is recognized under the UN Decade for Cultural Development. The International Program has now been formally established under the leadership of the Honourable James Bourque P.C., Chair, Traditional Ecological Knowledge at the Canadian Museum of Nature in Ottawa, Canada.

The goal of the Program is to promote and advance the recognition, understanding and use of TEK in policy and decision-making for sustainable development.

Program objectives are:

- to foster and support research into the nature, scope, use and preservation of TEK;
- to promote the development and implementation of a Code of Ethics and Practice regarding the acquisition and use of TEK;



- to facilitate the communication, and exchange, of ideas, information, experiences and practices associated with TEK;
- to promote the understanding and use of TEK through the formal, non-formal and informal education systems;
- to ensure that both traditional ecological knowledge and western-based science are employed in a complementary manner in planning and decision-making.

The papers in this volume were selected from presentations made in a number of special sessions on TEK, which were held as part of the Common Property Conference, the second annual meeting of the International Association for the Study of Common Property. The meetings were attended by indigenous peoples and specialists in the subject from around the world.

The papers selected for this volume represent a wide range of perspectives on the nature of TEK. They explore the underlying concepts, provide case studies, and confirm once again the importance and, as yet, unrealized potential of TEK in resource and environmental management. The papers reinforce the conviction that TEK can make a major contribution to the delivery of Agenda 21 and to sustainable development. The papers also reinforce the point that indigenous and local peoples have themselves lived in harmony with their environments for many hundreds of years, a relationship which is evident in many of their activities today.

The International Program seeks to encourage the use of this knowledge at the community level,

in all resource sectors, as a very real and essential contribution to the local, regional and national economy.

In many cases, it is a matter of survival.

James Bourque,  
*Chair*

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The papers making up the volume were for the most part delivered at the Common Property Conference — the Second Annual Meeting of the International Association for the Study of Common Property, University of Manitoba, Winnipeg, Manitoba, September 1991. The Keynote Address which forms Chapter 2 of the volume was delivered to the International Workshop on Indigenous Knowledge and Community Based Resource Management chaired by Jim Bourque, Government of the Northwest Territories, and

Chairman, Northern Working Group, UNESCO Canada Man and the Biosphere Program. The workshop was held in association with the Common Property Conference.

The papers were selected by an editorial committee comprised of Fikret Berkes, University of Manitoba, Rick Riewe, University of Alberta, Carl Hrenchuk, Canadian Council of Ministers of the Environment, Patrice LeBlanc, Canadian Environmental Assessment Research Council, and Julian Inglis, International Program on Traditional Ecological Knowledge.

Copy editing was the responsibility of Joan Haire, who took on the time consuming task of shaping the individual contributions into a coherent collection of essays. Credit for the final product must go to her. Editing assistance was also provided by Carl Hrenchuk.



# I. Traditional Ecological Knowledge in Perspective

*Fikret Berkes*



“Ecosystems sustain themselves in a dynamic balance based on cycles and fluctuations, which are nonlinear processes... Ecological awareness, then, will arise only when we combine our rational knowledge with an intuition for the nonlinear nature of our environment. Such intuitive wisdom is characteristic of traditional, non-literate cultures, especially of American Indian cultures, in which life was organized around a highly refined awareness of the environment” (Capra 1982:41).

Traditional ecological knowledge (TEK) represents experience acquired over thousands of years of direct human contact with the environment. Although the term TEK came into widespread use in the 1980s, the practice of TEK is as old as ancient hunter-gatherer cultures. In addition to ecology, the study of traditional knowledge is valued in a number of fields. For example, in agriculture, pharmacology and botany (ethnobotany), research into traditional knowledge has a rich history. In fact, in comparison to these fields, the study of indigenous knowledge in ecology is relatively recent.

The earliest systematic studies of TEK were

done by anthropologists. Ecological knowledge as studied by ethnoecology (an approach that focuses on the conceptions of ecological relationships held by a people or a culture), may be considered a subset of ethnoscience (folk science), defined by Hardesty (1977:291) as “the study of systems of knowledge developed by a given culture to classify the objects, activities, and events of its universe.” Pioneering work by Conklin (1957) and others documented that traditional peoples such as Philippines horticulturalists often possessed exceptionally detailed knowledge of local plants and animals and their natural history, recognizing in one case some



1,600 plant species. Other kinds of indigenous environmental knowledge were acknowledged by scientific experts. For example, Arctic ecologist Pruitt has been using Inuit (Eskimo) terminology for types of snow for decades.

Boreal ecologists deal with aspects of nature, particularly snow and ice phenomena, for which there are no precise English words. Consequently our writings and speech are larded with Inuit, Athapaskan, Lappish and Tungus words, not in any attempt to be erudite but to aid in the precision in our speech and thoughts (Pruitt 1978:6).

There has been growing recognition of the capabilities of ancient agriculturalists, water engineers and architects (for example, Fathy 1986). Increased appreciation of ethnoscience, ancient and contemporary, paved the way for the acceptability of the validity of traditional knowledge in a variety of fields. Ancient ways of knowing started to receive currency in several disciplines, including ecology. Various works showed that many indigenous groups in diverse geographical areas from the Arctic to the Amazon (for example, Posey 1985) had their own systems of managing resources. Thus, the feasibility of applying TEK to contemporary resource management problems in various parts of the world was gradually recognized. As stated in *Our Common Future*:

Tribal and indigenous peoples'... lifestyles can offer modern societies many lessons in the management of resources in complex forest, mountain and dryland ecosystem (WCED 1987:12).

These communities are the repositories of vast accumulations of traditional knowledge and experience that link humanity with its ancient origins. Their disappearance is a loss for the larger society, which could learn a great deal from their traditional skills in sustainably managing very complex ecological systems (WCED 1987:114-115).

Professionals in applied ecology and resource management fields such as fisheries, wildlife and forestry have been slow to take up the challenge of TEK. The reasons for this are as complex as they are perplexing (Freeman 1989). With the recognition of the value of TEK, the growth of the field has been rapid, however. It should be noted though that most of these contributions have come from interdisciplinary scholars rather than from ecology and resource management professionals.

Book-length works include studies in the transmission of TEK (Ruddle and Chesterfield 1977); community-based TEK research approaches (Johnson 1992); application of TEK to development (Brokensha et al. 1980) and to resource management (Klee 1980); detailed biological/ecological evaluation of fisheries TEK systems in Oceania (Johannes 1981); traditional conservation (Moruata et al. 1982; McNeely and Pitt 1985); traditional coastal resource management systems (Lasserre and Ruddle 1983); TEK of northern ecosystems (Freeman and Carbyn 1988), dryland ecosystems (Niamir 1990) and tropical forest ecosystems (Posey and Balee 1989); environmental philosophy and indigenous knowledge (Knuttdson and Suzuki 1992); volumes of selected topics (Johannes 1989) and studies of traditional marine resource management systems in Asia and the Pacific (Ruddle and Johannes 1989; Freeman et al. 1991).

A recent volume (Warren et al. 1993) contains an authoritative summary of the various indigenous knowledge fields from a development perspective. Some of the material summarized in it is based on the work done at the Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD), Iowa State University, which published the newsletter *CIKARD News*. As of 1993, this newsletter has been superseded by the *Indigenous Knowledge and Development*

*Monitor*, the newsletter of the Global Network of Indigenous Knowledge Resource Centers, based in The Hague, The Netherlands.

### Defining Traditional Ecological Knowledge

There is no universally accepted definition of traditional ecological knowledge (TEK) in the literature. The term is, by necessity, ambiguous since the words *traditional* and *ecological knowledge* are themselves ambiguous. In the dictionary sense, *traditional* usually refers to cultural continuity transmitted in the form of social attitudes, beliefs, principles and conventions of behaviour and practice derived from historical experience. However, societies change through time, constantly adopting new practices and technologies, and making it difficult to define just how much and what kind of change would affect the labelling of a practice as *traditional*.

Because of this, many scholars prefer to avoid using the term *traditional*. As well, some purists find the term unacceptable or inappropriate when referring to societies such as Native northern groups whose lifestyles have changed considerably over the years. For this reason, some prefer the term, *indigenous ecological knowledge*, which helps avoid the debate about tradition, and explicitly puts the emphasis on indigenous people.

The term *ecological knowledge* poses definitional problems of its own. If ecology is defined narrowly as a branch of biology in the domain of western science, then strictly speaking there can be no TEK; most traditional peoples are not scientists. If ecological knowledge is defined broadly to refer to the knowledge, however acquired, of relationships of living beings with one another and with their environment, then the term TEK becomes tenable. It is what Levi-Strauss (1963) has called the "science du concret", native knowledge of the natural milieu.

In this context, *ecological knowledge* is not the term of preference for traditional or indigenous peoples themselves. In the Canadian North, for example, native peoples often refer to their *knowledge of the land* rather than to ecological knowledge. *Land*, however, is more than the physical landscape; it includes the living environment. Interestingly, in the history of scientific ecology, *land* was also often used in the sense of *ecosystem* (Leopold 1949).

To arrive at a definition of TEK, it is necessary to sift through the various meanings and elements of TEK as emphasized in the major works on this subject (for example, Lasserre and Ruddle 1982; Ruddle and Johannes 1989; Freeman and Carbyn 1988). Putting together the most salient attributes of TEK from these sources, one may arrive at a working definition:

TEK is a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. Further, TEK is an attribute of societies with historical continuity in resource use practices; by and large, these are non-industrial or less technologically advanced societies, many of them indigenous or tribal.

### Western Science and TEK

There are both similarities and differences between traditional science and western science. Bronowski considers the practice of science (including magic) as a fundamental characteristic of human societies: "...to me the most interesting thing about man is that he is an animal who practices art and science and, in every known society, practices both together" (Bronowski 1978:9). Thus, one can probably say that both western science and TEK (and art) are the result of the same general intellectual process of creating order out of disorder.

There are also major differences, however, between the two kinds of science, some of them substantive and some perceptual. Johannes (1989:5) observes that "the attitudes of many biological scientists and natural resource managers to traditional knowledge has frequently been dismissive." Accomplishments of traditional societies in such fields as agriculture cannot be denied; most domesticated species predate western science. Nevertheless, the existence of curiosity-driven inquiry among traditional peoples has been questioned by those who regard the knowledge of other cultures as *pre-logical* or *irrational*, thus playing down the validity of TEK.

Opinions differ, but there is a great deal of evidence that traditional people do possess scientific curiosity, and that traditional knowledge does not merely encompass matters of immediate practical interest. Levi-Strauss (1962) has argued this point on the grounds that ancient societies could not have acquired such technological skills as those involved in the making of water-tight pots without a curiosity-driven scientific attitude and a desire for knowledge for its own sake. As Levi-Strauss (1962:3) states it, "the universe is an object of thought at least as much as it is a means of satisfying needs." As Harvey Feit (personal communication) paraphrased it, "moose are not only good to eat, they are good to think."

In general, TEK differs from scientific ecological knowledge in a number of substantive ways:

1. TEK is mainly qualitative (as opposed to quantitative);
2. TEK has an intuitive component (as opposed to being purely rational);
3. TEK is holistic (as opposed to reductionist);

4. In TEK, mind and matter are considered together (as opposed to a separation of mind and matter);
5. TEK is moral (as opposed to supposedly value-free);
6. TEK is spiritual (as opposed to mechanistic);
7. TEK is based on empirical observations and accumulation of facts by trial-and-error (as opposed to experimentation and systematic, deliberate accumulation of fact);
8. TEK is based on data generated by resource users themselves (as opposed to that by a specialized cadre of researchers);
9. TEK is based on diachronic data, i.e., long time-series on information on one locality (as opposed to synchronic data, i.e., short time-series over a large area).

There are exceptions, as always, to the above generalizations. For example, there is evidence from Feit's (1987) work with subarctic beaver trappers that TEK can be quantitative; Berkes' (1977) work shows that Cree fishermen of the subarctic are perfectly adept at carrying out controlled field experiments. As well, of course, scientific ecology can and often does use holistic approaches, and occasionally produces diachronic data.

In contrast to scientific ecology, TEK does not aim to control nature, and is not primarily concerned with principles of general interest and applicability (i.e., theory). TEK is limited in its capacity to verify predictions, and it is markedly slower than scientific ecology in terms of the speed at which knowledge is accumulated. A major way in which TEK may be further distinguished from scientific ecology concerns the



large social context of TEK. TEK is not merely a system of knowledge and practice; it is an integrated system of knowledge, practice and beliefs. The social context of TEK includes the following dimensions:

- a) Symbolic meaning through oral history, place names and spiritual relationships (Levi-Strauss 1962; Tanner 1979; Hrenchuk, this volume);
- b) A distinct cosmology or world view; a conceptualization of the environment that is different from that of Western science of which ecology is a part (Tanner 1979; Freeman and Carbyn 1988; Johannes 1989; Nakashima, this volume);
- c) Relations based on reciprocity and obligations towards both community members and other beings (Fienup-Riordan 1990), and communal resource management institutions based on shared knowledge and meaning (Berkes 1989).

Some of the dimensions of the social context of TEK are captured in the following quote from *Caring for the Earth*:

Hunting, fishing, trapping, gathering or herding continue to be major sources of food, raw materials and income. Moreover, they provide native communities with a perception of themselves as distinct cultures, confirming continuity with their past and unity with the natural world. Such activities reinforce spiritual values, an ethic of sharing, and a commitment to stewardship of the land, based on a perspective of many generations (IUCN/ UNCEP/ WWF 1991: 61).

### **Practical Significance of TEK**

It follows from these considerations that the preservation of TEK is important for social and

cultural reasons. For the group in question, TEK is a tangible aspect of a way of life that may be considered valuable (for example, Wavey, this volume). For the rest of the world, there are also tangible and practical reasons why TEK is so important, quite apart from the ethical imperative of preserving cultural diversity. The following list is adapted from the IUCN Programme on Traditional Knowledge for Conservation (IUCN 1986):

1. Traditional knowledge for new biological and ecological insights. New scientific knowledge can be derived from perceptive investigations of traditional environmental knowledge systems, as in the case of life cycles of tropical reef fish (Johannes 1981).
2. Traditional knowledge for resource management. Much traditional knowledge is relevant for contemporary natural resource management, in such areas as wetlands. "Rules of thumb" developed by ancient resource managers and enforced by social and cultural means, are in many ways as good as Western scientific prescriptions (Gadgil and Berkes 1991).
3. Traditional knowledge for protected areas and for conservation education. Protected areas may be set up so as to allow resident communities to continue their traditional lifestyles, with the benefits of conservation accruing to them. Especially where the local community jointly manages such a protected area, the use of traditional knowledge for conservation education is likely to be very effective (Gadgil et al., in press).
4. Traditional knowledge for development planning. The use of traditional knowledge may benefit development agencies in providing more realistic evaluations of

environment, natural resources and production systems. Involvement of the local people in the planning process improves the chance of success of development (Warren et al. 1993).

5. Traditional knowledge for environmental assessment. People who are dependent on local resources for their livelihood are often able to assess the true costs and benefits of development better than any evaluator coming from the outside. Their time-tested, in-depth knowledge of the local area is, in any case, an essential part of any impact assessment (Johannes, this volume).

In addition to these practical uses for TEK, it is also significant, as Carl Hrenchuk (personal communication) has pointed out, that a new-found awareness of TEK in mainstream western society can enhance our appreciation of the cultures that hold this knowledge. As well, the recording of such knowledge is significant in the political realm as a tool for social change. For example, the TEK of northern Canadian indigenous peoples as recorded by Nakashima, Hrenchuk and Tobias in this volume provides insight into the life of the people of these communities, and makes southern governments take this knowledge more seriously.

In the past, western science alone provided biological and ecological insights, the knowledge base for resource management, conservation, development planning and environmental assessment. At this stage of the development of TEK, it is possible to say that indigenous peoples and the knowledge held by them do have something to contribute to each of the above areas. But traditional knowledge is complementary to western science, not a replacement for it (Knudtson and Suzuki, 1992).

However, just what TEK can contribute and how is yet to be operationalized. As well, the question remains as to how scientific knowledge and TEK can be integrated — and whether such integration is desirable in the first place. Rooted in different world views and unequal in political power base, these two systems of knowledge are certainly not easy to combine. Serious attempts at integration inevitably come up against the question of power-sharing in decision-making. Many of the chapters in this volume are contributions towards exploring and resolving these issues.

### Overview of this volume

In Chapter 2, Chief Wavey of the Fox Lake First Nation, northern Manitoba, sets the stage for traditional ecological knowledge discussions by presenting an indigenous peoples' point of view. Chief Wavey's chapter, based on the keynote address which he delivered to the International Workshop on Indigenous Knowledge and Community-based Resource Management, makes explicit the political nature of the issue which is at the heart of any discussion of TEK. Chapter 3 by Ruddle addresses the key issue of how knowledge is transmitted from one generation to the next, based on his classic study of indigenous peoples in the Orinoco Delta of South America. Johannes (Chapter 4) provides perspectives on the use of traditional knowledge for a very practical and current issue: environmental impact assessment. Doubleday in Chapter 5 explores TEK as alternative collective wisdom relevant to a variety of matters at a time when existing norms, values and laws are increasingly called into question.

Chapters by Lalonde (Chapter 6) and McDonald and Fleming (Chapter 7) deal with development-related issues. Lalonde discusses the relevance of African indigenous knowledge to environment and development issues of today. McDonald and Fleming describe community-based economic development and resource management in the Hudson Bay Inuit (Eskimo) community of Sanikiluaq in northern Canada. Chapters by Hrenchuk (Chapter 8) and Tobias (Chapter 9) deal with the indigenous worldview, and illustrate two major emerging approaches for the documentation of traditional knowledge. Hrenchuk describes how a community of northern Manitoba Cree Indians in subarctic Canada utilizes an extensive territory for their hunting needs. Tobias deals with a Metis community in northern Saskatchewan, and a wildlife harvesting

study which debunked popular planning myths.

Chapters by Nakashima (Chapter 10), Usher (Chapter 11), Binder and Hanbidge (Chapter 12) and Eythorsson (Chapter 13) all deal with the relationship of indigenous peoples with the state in the management of resources. Nakashima explains the traditional knowledge of Sanikiluaq Inuit concerning eider ducks, and how this knowledge is an appropriate basis for the joint government-local native people co-management of eider. Usher presents a co-management study of two major caribou herds in the Canadian Arctic, which is one of the earliest co-management agreements involving indigenous peoples in North America. Binder and Hanbidge provide a second co-management case study of a land claims settlement in the Canadian Arctic. Eythorsson describes the Sami fisherman of northern Norway and explains why local knowledge and local norms provide the necessary supplement to scientific knowledge for resource co-management.

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## 2. International Workshop on Indigenous Knowledge and Community-based Resource Management: Keynote Address

*Chief Robert Wavey*



Recently, academics, scientific researchers and others have “discovered” that the knowledge which indigenous people hold of the earth, its ecosystems, the wildlife, fisheries, forests and other integrated living systems is extensive and extremely accurate. On the eve of the 500th anniversary of Christopher Columbus having stumbled upon North America, it is appropriate to provide comments from the perspective of an indigenous person in North America on what the concept of “discovery” means to us.

At the time Europeans first contacted Aboriginal peoples, the quality of our environment was such that our communities had access to ample supplies of clean water, timber and wood, berries and medicinal plants, beaver, muskrat, moose, caribou, geese and other wildlife.

The laws and customs of First Nations guided the sharing and management of resources, and ensured that our people could continue to enjoy, on a sustained basis, the resources which provided the needs of our families. These laws and customs are based on generations of observation and knowledge. Our laws and customs respecting land and resources also form the binding foundation of Aboriginal nations and systems of governance.

Europeans came to a resource-rich continent after millennia of management and stewardship of that continent by Aboriginal people. After 500 years of continuous exploitation and development, guided by science and technological discovery, non-aboriginal management systems have created an era of unprecedented opportunity for widespread ecological catastrophe.

As was the case with Columbus, “discovery” is in the eye of the beholder. It may be more accurate to state that the dominant European-based society, after 500 years, has finally stopped ignoring our traditional knowledge, laws and customs.

As indigenous people, we spend a great deal of our time, through all seasons of the year,

travelling over, drinking, eating, smelling and living with the ecological system which surrounds us. Aboriginal people often notice very minor changes in quality, odour and vitality long before it becomes obvious to government enforcement agencies, scientists or other observers of the same ecological system.

Governments have begun to view indigenous people and their knowledge of the land as an early warning system for environmental change, perhaps in much the same way as miners once viewed canaries. The difference is that a canary does not know why it died, or what was wrong; indigenous people do. The canary can not propose solutions or provide an example of lifestyles and ethics to restore ecological balance; indigenous people can. The canary does not foretell environmental change, but indigenous people accurately predict ecological disturbance, based on multi-generational accumulations of knowledge and experience.

Soon after contact with Europeans, indigenous people recognized that the foreign way of touching, using, and thinking about the earth would ultimately lead to ecological destruction and to an uncertain future for all people. Aboriginal leaders warned of the ecological consequences. In the words of Chief Seattle:

We know that the white man does not understand our ways. One portion of the land is the same to him as the next, for he is a stranger who comes in the night and takes from the land whatever he needs.

The earth is not his brother, but his enemy, and when he has conquered it, he moves on. He leaves his father's graves behind, and he does not care. He kidnaps the earth from his children, and he does not care. His father's grave, and his children's birthright are forgotten. He treats his mother, the earth, and his brother, the sky as things to be bought, plundered, sold like sheep or bright beads. His appetite will devour the earth and leave behind only a desert.

But in your perishing you will shine brightly, fired by the strength of the God who brought you to this

land for some special purpose, gave you dominion over this land and over the red man. That destiny is a mystery to us, for we do not understand when the buffalo are all slaughtered, the wild horses tamed, the secret corners of the forest heavy with the scent of many men, and the view of the ripe hills blotted by talking wires. Where is the thicket? Gone. Where is the eagle? Gone. The end of the living and the beginning of the survival.

Chief Seattle spoke these words in 1854.

The United Nations World Commission on Environment and Development found in 1987 that:

Social discrimination, cultural barriers, and the exclusion of [indigenous peoples] from national political processes makes these groups vulnerable and subject to exploitation... They become the victims of what could be described as cultural extinction ... .

In Canada, the process of acquiring Aboriginal lands for agriculture, forestry, mining and settlements was rooted in an official policy of cultural extermination which continued for several generations. In concert with the churches, Aboriginal children were removed from our communities year after year for the entire school season. We were prevented from speaking our languages and we were prevented from practising our ceremonies in respect for Mother Earth and our ancestors. Separating the children from the grandparents and elders resulted in many of our people losing touch with traditional resource uses and knowledge of the land.

The Government of Canada did not succeed. The traditions, cultures, languages, institutions and beliefs of our people live on and grow stronger every day.

Two important things have kept the Aboriginal people of Canada strong and together. The first is our tremendous sense of community and

family. Our traditional means of teaching — with the grandparents teaching the young while the parents provide for the family — remains today within our communities; it has ensured that the young people recover, restore and revitalize their traditions, their languages and their way of life. The second is that *most Aboriginal people in Canada still have the land*. Without the land, our knowledge of the land and the respect that we hold for the land, our communities and our way of life would not exist because *the land and the people are one*. A land base and extensive traditional ecological knowledge has ensured the cultural survival of Aboriginal people in Canada.

The boreal forest in Manitoba is almost roadless and is home to more than 33,000 treaty Aboriginal people living in some 30 communities. To Manitoba's northern people, there are no frontiers, wilderness or empty lands; the forest is the First Nations homeland. Manitoba's boreal forest region is almost completely interconnected by trails, rivers, lakes and portages. The region also contains hundreds of spring, summer and winter hunting, fishing, gathering and trapping encampments. The boreal forest provides considerable direct economic value to the communities, values which are largely invisible to resource developers, managers and politicians. In addition to the teaching of skills, each elder maintains continuity and links to the community resource area by transferring a highly detailed oral "map" and inventory of resource values and land use locations. These individual and family maps knit together into a rich and complete mosaic which provides integrated knowledge of the ecosystems within the community's traditional resource area.

Therefore, major ecological disturbances such as hydroelectric development and large-scale forestry activities have profound cultural impacts

by obliterating the reference points and actual resources that these maps are intended to share. Resource developments convert highly valued and sought-after family and community knowledge into memories. The UN World Commission describes the disappearance of indigenous cultures as "a loss for the larger society, which could learn a great deal from their traditional skills in managing very complex ecological systems." The same is true for the loss of traditional ecological knowledge.

If the concept of ecosystems includes those habitats extensively modified by humans, then traditional ecological knowledge is used by everybody every day of their lives; many are just not aware of it. In the cities of the world, for example, urban survival knowledge is a form of traditional knowledge. People must use their adaptive instincts to survive on the streets, in the school yards, in the factories and in the office towers. Urban families accumulate "street smarts" which change to meet the times. Detailed knowledge of the urban environment is essential for survival.

There is a major difference between traditional ecological knowledge, which is an instinctive adaptation taking place within a few short years, and the body of traditional ecological knowledge, which is accumulated for specific lands and handed down over many generations. For example, many resource developers and government planners often assume that Aboriginal people are highly adaptive and can survive the abrupt relocations and changes in the resource base caused by hydroelectric development. Traditional ecological knowledge related to current areas of land use, occupancy and habitation is often incorrectly assumed to allow for an instant knowledge of new or altered hunting and gathering locations. This attitude was evident during the diversion of the Churchill River and



the extensive damming of the Nelson River system in northern Manitoba. Although forcibly relocated Aboriginal people may survive in the end, their well-being will be affected for many generations while the patterns of experience and observations develop into detailed knowledge of the altered localized ecology.

When the international pulp and paper giant REPAP announced the purchase of a Forest Management Licence covering 108,000 square kilometres of northern Manitoba, an area the size of Guatemala, the Chiefs of northern Manitoba were determined to protect the traditional resource areas of the First Nations affected by documenting the oral and land use maps of resource users in the REPAP cutting area.

Earlier experience with the massive hydro-electric projects in northern Manitoba had proven that non-aboriginal developers and government considered impacts to Aboriginal land uses too general to quantify accurately using existing techniques. As a result, they were effectively ignored. The Chiefs were determined in the REPAP case to combine traditional ecological knowledge with science by developing an independent capacity to document detailed land use, managing the considerable map data with an automated geographic information system (GIS), and overlaying this data with maps of the REPAP cutting plans.

Under Manitoba's Environment Act, a joint Federal-Provincial Review of the REPAP forestry expansion and bleached kraft proposals is a mandatory requirement. The terms of reference for the environmental impact statement include a detailed assessment of the impacts of logging and roads on Aboriginal land use. However, the Chief of Northern Manitoba has refused to provide this information directly to consultants working for REPAP. Such land use information is the private property of the resource users and

the community. It is strictly confidential and may be released only with the consent of the resource user and community involved.

Through its Natural Resources Secretariat, the Council of Manitoba Northern Chiefs, the Manitoba Keewatinowi Okimakanak (MKO), negotiated an agreement-in-principle to have MKO First Nations conduct the land use mapping which was related to the environmental assessment process. Partly as a result of the REPAP agreement, MKO installed a geographic information system (GIS) supported by a system to display and analyze remotely-sensed images to ensure that First Nations benefit in future from the information collected as part of the assessment of forestry impacts.

The MKO GIS Development Project achieved several important objectives. Firstly, the proprietary nature of much of the resource and land use information of individuals was protected. Use, occupancy and habitation maps are often used during land entitlement selection and settlement, mitigation program assessment and other claims negotiations. In addition, impacts could be created by making specific details of land use public through publishing maps of prime hunting and fishing sites, gravesites and former community locations. Second, control of the raw land-use information allows the communities to optimize the acknowledged value of this information through skills development, contracted projects, employment and other means. And finally, MKO now has a comprehensive, computer-based geographic information system to incorporate existing and future land use mapping data, allow overlay and comparison of resource inventories and economic activity, and enable effective modelling of possible alternative patterns of development.

Maintaining complete indigenous control of traditional land use information is a cornerstone

in developing a link between traditional ecological knowledge and science. This ensures that indigenous people develop the skills and capacity to benefit from the growing interest in traditional ecological knowledge. Development of the capacity for indigenous people to independently respond to and directly participate in the resource management activities arising from the application of traditional ecological knowledge is also required.

For example, biologists and chemists working in field analysis acknowledge that a human being can often detect changes in taste, water, tissue and other substances, at levels below that of contemporary testing equipment. Aboriginal resource harvesters near the Ruttan copper-zinc mine in northern Manitoba have refused to drink water and eat fish and beaver from lakes which are not related to the licensed discharges from the mill. These changes in taste have developed over the past two years. A recent field sampling program designed by the MKO and Environmental Protection Laboratories identified sample sites and sample types on the basis of interviews with the principal resource harvesters. The field sampling technicians confirmed the significance of the 13 sampling sites suggested by an 83 year-old Cree trapper and others using the area. Work is now underway to develop a permanent First Nations capacity to link traditional ecological knowledge-based environmental monitoring with a sampling and laboratory analysis program directed and operated by Aboriginal people in northern Manitoba.

I have often been asked for some positive examples of First Nations management of natural resources. The question implies that First Nations management is something that is either new or developing through agreements with governments. First Nations in Canada have never surrendered the role of managing the nat-

ural resources protected by Aboriginal rights. In fact, the use of resources by Aboriginal people and the stewardship of resources have always been tied together. Many specific sites have been continuously used by our communities for generations, indicating the success of the existing direct management and continued stewardship by the communities.

Although government seeks to regulate lands and natural resources, the ability of government to manage these vast lands directly has always been limited. The government ability to actually manage resources is even more limited now with reductions in budgets and changes in government priorities.

When government and corporate managers fly into remote regions to set up camps for fieldwork, watching them pass overhead are a good number of Aboriginal faces turned to the sky. Aboriginal people watch as exploration camps are built, cut lines made, hydro sites selected, timber harvested and resource roads constructed.

The people retain a record of what the land and the resources have provided for generations, and Aboriginal people are the first to see the changes. The Aboriginal resource users are the principal managers of resources who also bear the burden of the long term impacts. Aboriginal people must develop unique strategies for adjusting to and accommodating these impacts to continue our direct use of the lands and resources.

First Nations intend to ensure a quality of the environment so that our traditional pursuits are maintained. First Nations recognize that influence over decisions concerning natural resources management and the quality of the environment is directly tied to the social, cultural and economic future of Aboriginal people. Ultimately the difference between poverty and prosperity is determined in large measure by the extent to

which Aboriginal people directly manage and control the nature, scale and type of development within our traditional lands.

Traditional resource management structures can continue to provide effective stewardship for lands and ecosystems which are not significantly disrupted by development and all the related ecological pressures. The need for linking non-traditional, science-based environmental technologies and management approaches with traditional ecological knowledge increases in relation to the extent of ecological disruption. This is particularly apparent, for example, when identifying problems related to hazardous wastes and industrial pollution. However, an identified need for applying science-based environmental technologies to a disrupted ecosystem does not mean that traditional ecological knowledge and Aboriginal stewardship should be replaced with science-based, non-aboriginal government authority. Traditional ecological knowledge is an important cornerstone of Aboriginal self-government. I agree with the UN World Commission findings that:

... the recognition of traditional rights must go hand in hand with measures to protect the local institutions that enforce responsibility in resource use. And this recognition must also give local communities a decisive voice in the decisions about resource use in their area.

In Canada, the entrenchment of Aboriginal and treaty rights in the Constitution, as well as the recent reinforcement of resource rights by the Supreme Court of Canada, provides for a mandatory role for First Nations in the management of natural resources. The role remains unfulfilled.

For science to effectively support traditional ecological knowledge and indigenous resource management in Canada and elsewhere, you

must place the highest priority on supporting the development of permanent technical, scientific and support capacity under the control and direction of indigenous peoples. There is no question that increased access to traditional ecological knowledge will allow non-indigenous managers a means for refining and focusing environmental regulation and management. However, I am concerned that science-based management approaches will use the improved ecological database not to focus on development-related ecological impacts, but to impose additional regulations and restrictions on the resource uses of indigenous peoples.

Science has never been neutral in relation to indigenous peoples, lands, resources and development. The struggle to control lands and resources to facilitate development is the principal feature of the relationship between indigenous peoples and governments worldwide. Science is based on discovery, and has provided the foundation for the industrialization of the earth and the concentration of wealth in the hands of those nations with the greatest scientific capacity. Traditional ecological knowledge is not another frontier for science to discover.

When you contemplate the linking of traditional ecological knowledge and science in order to support the healing of Mother Earth, I ask you to resist seeking to discover. I urge you instead to accept what is obvious.

Traditional ecological knowledge is based on mutual well-being and sharing. In our severely disrupted global environments, traditional ecological knowledge is now essential for our mutual survival. The benefits of traditional ecological knowledge can be shared when there is respect, understanding, the recognition of traditional rights, and the recognition of existing indigenous stewardship of many regions of the earth.

3.

# The Transmission of Traditional Ecological Knowledge

*Kenneth Ruddle*



Although knowledge is the foundation of social life, the sociology of knowledge, and particularly its transmission between or among generations, remains a neglected field. This is extraordinary in view of the fundamental socio-cultural importance of the process. Similarly, although children and young people actively participate in economic activities of households in the Third World, little is known of their contribution to community life nor of the socialization and the transmission of knowledge to them, nor of the related processes through which they eventually become fully productive adult members of society.

In rural subsistence communities in particular, traditional knowledge is a central concern for the regulation and balance of exploitative pressures that permit an ecosystem to maintain stability and regenerative capacity. But almost without exception, most ethnographers, if they discuss childhood at all, have little to say about how traditional knowledge of specific skills is transmitted. The impression conveyed is that skills are transmitted and acquired in a disorganized, unstructured and highly individualistic manner. Studies of the ecology of human subsistence and food procurement neglect the processes through which information concerning either

the preservation of the system's integrity or its modification are transmitted from one generation to the next.

Because continuity from one generation to the next is implicit in the concepts of culture and society, the ethnographic literature concerned with generational transmission of information tends to deal with questions of how children are incorporated into their groups in only very broad analytical terms of cultural and social systems. Such analysis is more informative about the totality of what children learn than about how they acquire traditional ecological knowledge of specific tasks and skills.

However, it is clear from the persistence of social and cultural forms that learning at such general levels is not only structured but also culturally specific; there is no reason to suppose that the acquisition of particular traditional economic and ecological skills is any less so. The scanty data on the subject bear this out. For example, Raum (1940) identified the ages when Chaga boys are shown which banana leaves are best for fodder; Wagley (1957) described Guatemalan Indian boys receiving miniature hoes; and Mead (1930) detailed the experience of Manus children piloting adult canoes. The typical way in which the organization of subsistence training has been mentioned briefly is exemplified by the works of Holmberg (1950), Levine and Levine (1963), Read (1960), (Ruddle and Chesterfield 1977), and Whiting (1941), among others.

The often fragmented and cursory data on subsistence-level societies throughout the world obtained by researchers from a wide range of disciplines yield remarkably consistent generalizations about certain structural and processual characteristics of the transmission of traditional knowledge. These may be summarized as follows (Ruddle and Chesterfield 1977):

- (1) There exist specific age divisions for task training in economic activities.
- (2) Different tasks are taught by adults in a similar and systematic manner.
- (3) Within a particular task complex (for example, gill-netting in fisheries) individual tasks are taught in a sequence ranging from simple to complex.
- (4) Tasks are gender and age specific, and are taught by members of the appropriate sex.
- (5) Tasks are site specific, and are taught in the types of locations where they are to be performed.
- (6) Fixed periods are specifically set aside for teaching.
- (7) Tasks are taught by particular kinsfolk, usually one of the learner's parents.
- (8) A form of reward or punishment is associated with certain tasks or task complexes.

Just as traditional knowledge and its transmission shape society and culture, culture and society shape knowledge; these are reciprocal phenomena. Thus, vastly differing constructions of knowledge and processes of transmission as well as the social uses to which knowledge is put occur worldwide. To exemplify this, I use contrasting cases from Venezuela and Polynesia in the second part of this paper

Finally, a caveat is required here. It should be asked if the topic we are examining is really *ecological knowledge* or *environmental knowledge*, which includes the social environment. The former term implies an awareness in a given society of the systemic interactions among the components of an environment, an ethnoecological construct. In the absence of such a concept, and with the substitution of a unifying matrix imposed by an outside investigator, which might erroneously assume local systems thinking, the topic is really *traditional environmental knowledge*, in its broadest sense.

### **The Key Socio-cultural Role of Traditional Knowledge Transmission'**

In addition to its practical aspects of ensuring sustained resource management, the transmission of traditional knowledge has fundamental

socio-cultural importance to any society. During knowledge transmission over several generations, social institutions are gradually crystallized; routine or habitual ways of doing things gradually become the customary way that things are done. For children, a community's customary way eventually becomes the given-received social world, an analog of the biological-physical world with which it overlaps.

In the process of transmitting knowledge to a new generation, the transmitter's sense of reality is strengthened. The social world, which is embodied in traditional knowledge, becomes enlarged during transmission. But, of course, each new generation of receivers of knowledge understands the history and context of its society's institutions only by increasingly attenuated hearsay. The rationale underlying custom, tradition, normative and actual behavior, and rules and regulations must therefore be provided to learners by teachers through consistent and comprehensive legitimation.

The process of knowledge transmission leads logically to that of institutionalization, since the logic of institutions and that of the linkages among them emerges not from the institutions per se, but from the way in which they are treated by conscious reflection by those that operate within them, especially during the process of knowledge transmission. When such reflection is common to the various operators, it provides a logical framework for an institution. This logic also emerges from the reciprocity that occurs among operators of different systems, for example, as among fishermen and farmers, women and men, and different age sets. Continual acts of reciprocity establish the collective consciousness of a logical framework for linked resource systems and their accompanying institutions.

Therefore, knowledge assumes a pivotal role in any community; integration of an institutional

order is understandable only in terms of the knowledge that its members have and share. However, this does not necessarily imply complex indigenous theoretical constructs about the character of institutions, although this is also important. The primary knowledge is pre-theoretical knowledge: "the sum total of 'what everybody knows' about a social world" (Berger and Luckmann 1984:83). At this level, "every institution has a body of transmitted 'recipe knowledge' (Schutz 1960) ...that supplies the institutionally appropriate rules of conduct." (Berger and Luckmann 1984:83).

Such knowledge underlies the dynamics of institutionalized conduct and defines the areas of such conduct, as well as both defining and constructing the roles to be played in the context of such institutions. By definition, such knowledge also controls and predicts conduct by the operators within a resource system. Since such knowledge comprises a body of generally valid truths about reality, any deviance from the social order is a departure from reality — a deviance that could be variously interpreted as depravity, a symptom of mental illness, ignorance, criminality, willfulness, or a sign of a power struggle aimed at the eventual usurpation of authority. That leads to the need for social controls to handle deviance and to ensure compliance with social norms. There is a need to control deviance by ensuring compliance under the threat of sanctions.

Thus, a society's stock of knowledge, when either put into operation or reflected upon, becomes the local world; it becomes co-extensive with *the knowable*, and provides the framework through which that which is "not yet known will come to be known in the future" (Berger and Luckmann 1984:83), that is the acceptance or the rejection of innovation. In these terms, knowledge is the key dialectic of society, since knowledge about society both



captures everyday social reality and continuously reproduces it.

A body of knowledge develops over generations to refer to the various activities involved in a given resource system, and takes on a linguistic form. For example, consider fishing:

- (1) Vocabularies define species, habitats, weather patterns, sea conditions, seasons, fish behavior, and the like.
- (2) A collection of "recipes" must be learned in order to fish both correctly and with consistent success.
- (3) Knowledge is also a channeling and controlling force that underlies fishing institutions.
- (4) In the persistence and crystallization of fishing institutions, knowledge becomes the objective description of the activity/institution.
- (5) An objective arena/field/ethnoscience of fishing develops in parallel with the activity of fishing.

This body of knowledge is transmitted to the next generation as an *objective truth* during socialization, and then it is internalized as *subjective reality*. This transmission yields and gives identity to a specific type of person, a fisherman, whose principal social universe is constituted by that body of knowledge. As a consequence, to be an active fisherman implies that there exists a social world defined and controlled by a discrete body of arcane knowledge about fishing.

Only a fraction of an individual's experience is consciously retained and thus makes sense. What is retained and shared by persons pursuing a common activity such as fishing becomes

codified, usually in specific linguistic terms, and it can then be transmitted coherently to the next generation.

"The transmission of the meaning of an institution is based on the social recognition of that institution as a 'permanent' solution to a 'permanent' problem." (Berger and Luckmann 1984:87). Therefore, potential "actors of institutional actions must be *systematically* acquainted with these meanings. This necessitates some form of *educational process*" (Berger and Luckmann 1984; second emphasis added) to structure the transmission of any given body of knowledge, such as traditional ecological knowledge of fishing.

### **The Structure of Traditional Knowledge Transmission in a Mixed Peasant Economy in the Orinoco Delta, Venezuela**

The traditional system of knowledge transmission examined on Guara Island, in the Orinoco Delta of Venezuela (Ruddle and Chesterfield 1977), is highly structured and systematic, with either individual or small group instruction. Emphasis is placed on learning by doing through repeated practice over time rather than by simple observation and replication. Regardless of the complex of tasks to be taught, a teacher's first step is to familiarize the learner verbally and visually with the physical elements of the appropriate location. The entire complex is demonstrated over a period of time. Proceeding additively and sequentially from simple to complicated steps, the complex is divided into individual procedures that repeat those already mastered. Finally, an entire task complex is learned, with only occasional verbal correction needed. When competent, the learner is allowed to help the teacher, and to experiment and use his or her own initiative. Gradually, the role of the teacher is eliminated.

In terms of the framework for the transmission of traditional knowledge described above, the system on Guara Island fits as follows:

### (1) Age

The learning of tasks is age-specific (Table 1)<sup>2</sup>. Learning to recognize the names and characteristics of the more common items of the biota is the earliest ecological knowledge transmitted. Between two and five years of age, when a child is becoming mobile and learning to speak, the child begins to become familiar with foodstuffs and other materials used to satisfy household needs. Older children are mobile and verbal enough to be taught tasks which are prerequisites to livelihood activities, complexes of knowledge associated with household maintenance and the preparation and processing of food. Children are taken to the fields for the first time to observe cultivation techniques. Now ready for formalized instruction in food production activities, eight-year-old boys are taught to use implements and to use techniques which require a minimum of physical strength or skill. Gradually, more demanding task complexes are mastered, until, finally, boys of 11 to 14 years are prepared in complexes which are either exceedingly difficult to perform or are undertaken in dangerous locations.

### (2) Gender

Labour is divided according to gender and age as are the skills taught to a child. Both sexes are instructed in household and preparatory tasks (Table 1). With the exception of the use of the bush knife, in which boys are given special instruction, the training of both sexes is similar. While eight-year-old boys begin intensive training in cultivation and complementary activities, girls continue to perfect skills related to household maintenance in addition to receiving

instruction in those aspects of cultivation for which women are responsible. Though girls learn to sow and plant, to select seeds, and to care for the dooryard garden, other aspects of cultivation, animal husbandry, fishing, and hunting are taught only to boys. Plant and animal identification, harvesting for the pot, small-scale fishing, and the care of animals are learned by both sexes, mostly during early childhood.

### (3) Sequencing

Task complexes are taught sequentially (Table 2)<sup>2</sup>. The simpler and more familiar parts of a task are taught first. The ability to identify food plants by name and characteristic is among the earliest skills developed. Once a plant's characteristics are known, children are trained to procure it from easily accessible sites using implements of an appropriate size. As strength and skill increase, training is provided for the acquisition of a greater quantity of food, for entrance into more dangerous locations such as backswamps, and for greater discriminatory capabilities.

Both task complexes and individual tasks are taught sequentially, building on skills already developed, until an entire complex of tasks has been mastered. Age and strength as well as skill and experience determine advancement to successive levels.

### (4) Location

Children are taught to take advantage of the seasonal range and local diversity of food resources with the objective of ensuring full cognizance of all local food resources. From earliest training in the dooryard garden and in the river in front of the house, children of both sexes learn the rudiments of food preparation and household maintenance, which prepares them for later participation in food production. Sites for practicing these skills are the cultivated field, where children

practice using the bushknife, childcare and cultivation identification, and the pastures and grasslands, where children practice horseback riding.

Cultivation tasks are taught almost entirely within the locale designated for a cultivated field with the exception of early harvesting and plant identification, which is taught in the dooryard garden. Except for learning to care for and feed animals in the village, all animal husbandry instruction takes place in pastures and grasslands. Children are trained to fish and hunt in sites frequented by target species. Early education takes place in the river and cultivated field, but as a boy grows and becomes more skillful, he is taught to fish and hunt in the more dangerous backswamps and grasslands.

#### (5) Duration

Although it is realized that learning to manipulate the complex deltaic ecosystem is a life-long undertaking, formal or structured training in subsistence pursuits lasts only for about eight years, when boys are between the ages of six and 14. During this period, specific times during the daily work routine are allocated for instruction (Table 3)<sup>2</sup>. The duration of these periods is a function of both the complexity of what is being taught, and of the frequency with which training is undertaken. Similarly, the duration of both intensive training and the number of repetitions per session depend on both the laboriousness of the tasks, and the age at which the learner is introduced to them.

#### (6) Reinforcement

Children are punished only for breaching household rules during early childhood; they are never punished for deficiency in skill. Children learning subsistence activities are chastised when they fail in a task by being made ashamed of their failure to fulfill obligations both to themselves and

to the non-food-producing members of their families. Thus, the child's reciprocal responsibilities to its family are emphasized.

Rewards, however, are not entirely lacking: small children learning to cook may be given pieces of food for their assistance; boys are urged to learn cultivation tasks with a promise of their own small bush knife or of a small field of their own. Children of both sexes may be rewarded for animal care with the ownership of a hen or pig. Nonetheless, it is felt that the principal reward comes from proficient performance in itself, and a steady progression towards recognition as a person "who knows."

#### (7) Teaching Labour

The input of person-hours to instruction in all food-production activities combined comprises 14 percent of the total labour input required to operate the entire household subsistence system (Table 4)<sup>2</sup>.

Training in cultivation and complementary activities, like training in household chores, is almost a family undertaking (Table 5)<sup>2</sup>. Men are the principal teachers of subsistence activities, and women are the principal teachers of household chores. Certain cultivation tasks, like harvesting in the dooryard garden and some planting tasks, are performed by females, who are also the teachers of these tasks. Beyond the provision of a basic knowledge of wild fauna, imparted to the learner by the entire family, and the aspects of learning fishing, hunting and animal husbandry that take place in the village, training in complementary activities is done by the father, sometimes assisted by a child's grandfather or older brother.

#### **Transmission of Traditional Knowledge on Pukapuka: a Polynesian Contrast**

A striking contrast with the traditional education

system described above for Guara Island is found on Pukapuka, one of the Cook Islands of Polynesia, as analyzed by Borofsky (1987). Pukapuka appears to be typical of much of Polynesia, where much of the corpus of traditional knowledge is transmitted informally, as on Rotuma (Howard 1973). On Pukapuka, however, both formal and informal patterns occur.

In Polynesia, the transmission of traditional knowledge occurs within the all-pervasive context of status rivalry (Goldman 1970; Howard 1972; Marcus 1978; Ritchie and Ritchie 1979; Shore 1982; Borofsky 1987), which is competition over status issues. On Pukapuka, such status issues of relevance to the transmission of traditional knowledge are (1) social hierarchy, dependency, and deference to superiors, and (2) autonomy and peer equality (Borofsky 1987). Superior persons are deferred to by virtue of their social rank, not because they possess a superior knowledge. As an affirmation of their own status and worth, people challenge, qualify or elaborate on the knowledge of others (Borofsky 1987). Further, knowledge is not always acquired or used for practical everyday purposes, since an appearance of being knowledgeable and the manipulation of knowledge are used to enhance the status of an individual.

On Pukapuka, most knowledge is transmitted in the context of an activity which is situationally relevant to performing daily tasks. This is similar to the situation on the Polynesian island of Tikopia (Firth 1936), as elsewhere in Polynesia (Ritchie and Ritchie 1979). For example, place names on a reef and the names and characteristics of reef fishes are gradually acquired as boys accompany their fathers on fishing trips. Some knowledge, however, is taught and learned for enjoyment, such as the entertainment provided by the narration of legends that gradually socialize children into a group's traditions.

On Pukapuka, verbal instruction is rare. Both children and adults learn by observation followed later by imitation. Like Tubuai, another Polynesian island where learning is based on close observation, formal instruction is minimal, and questioning, especially by children, discouraged except where it pertains to concrete situations (Levin 1978). Observation is of paramount importance; "knowledge is something grasped visually (Borofsky 1987:81-82), and most Polynesians are visually-oriented toward knowledge. Listening to the conversations of others is a second important means of acquiring knowledge. Repetition of observation, listening and practice are the principal factors in the Pukapukan transmission of knowledge.

Learners attempt to maintain their own status with teachers by regulating when and where they will acquire knowledge. Status is also the reason why adults do not ask questions of others, since this would reveal one's own ignorance, and might cause the person questioned to either lose face or to be subject to ridicule if an incorrect or inadequate answer is given. However, casual, indirect conversation about a topic saves face.

























































Ridicule of others, a "pervasive element in Pukapukan education" (Borovsky 1987:92), is an important means of asserting one's own status and competence. And children are physically punished for doing things incorrectly. In contrast, praise and encouragement are uncommon. This seems to be widespread in Polynesia (Levy 1973; Levin 1978; Hooper 1990).

Challenge, indirect criticism, joking, and teasing among adults are also used as educational tools. The resultant pressure and competition is a stimulus to learning. Hence, for the young, learning is often a humiliating and painful experience, and many people prefer to learn on their own (Levy 1973; Borofsky 1987).

### **Conclusion**

In any society, the transmission of traditional knowledge among generations is a complex and fundamental process embedded within the deep socio-cultural structure. It is this characteristic rather than the inherent complexity of any biological and physical environment that determines the intricacy and methods of the transmission process and the complexity of the curriculum. Thus the formal/informal distinction has little relevance since the concern must be with the holistic study of a society. The curriculum and process of knowledge transmission is culture itself, and it is by no means haphazard or unstructured regardless of the methods of knowledge acquisition used, whether these methods are silent and individual observation and imitation, or additive and sequential direct teaching-learning.

Table 1: Division of Task Complexes by Gender and Age of Learner

Task	Sex		Age in Years											
	M	F	2	3	4	5	6	7	8	9	10	11	12	13
<b>EARLY CHILDHOOD</b>														
<i>Household Task Complexes:</i>														
Messenger	X	X												
Carry water and wood	X	X												
Child care	X	X												
Cooking	X	X												
Laundering	X	X												
Construction	X	X												
<i>Preparatory Task Complexes:</i>														
Identification of cultigens and animals	X	X												
Care of domestic animals	X	X												
Horseback riding	X	X												
Use of machete	X	X												
Swimming	X	X												
Use of <i>piragua</i>	X	X												
Line fishing	X	X												
<b>CULTIVATION</b>														
<b>Plant Identification</b>														
Plants in harvested state	X	X												
Food plants growing in dooryard garden	X	X												
Ornaments and medicinals	X	X												
Conuco plants	X	X												
Natural vegetation	X	X												
<b>Harvesting</b>														
Plants for home consumption														
Dooryard garden	X	X												
Conuco plants	X													
Larger root and tree crops	X													
Berry and fruit	X													
Coconuts	X													
<b>Commercial crops</b>														
Observation	X													
Packing cobs	X													
Cutting and harvesting own crop	X													
<b>Seed Selection</b>														
<b>Sowing, Planting, Care</b>														
Observation	X	X												
Covering holes	X	X												
Planting seeds	X	X												
Use of digging stick	X													
Transplanting tree crops	X													
Interplanting	X													
<b>Weeding</b>														
<b>Cutting and Burning</b>														
Observation - cutting	X													
Cutting with machete	X													
Cutting with axe	X													
Observation - burning	X													
Gathering and clearing	X													
Actual burning	X													
<b>Marketing</b>														
<b>Care and Construction of Tools</b>														
<b>ANIMAL HUSBANDRY</b>														
<b>Identification and Care of</b>														
Small Animals	X	X												
Feeding Larger Animals	X	X												
<b>Herding Techniques</b>														
Training and Taming	X													
Marking	X													
Curing	X													
<b>FISHING</b>														
Fish Identification	X	X												
Line Fishing	X	X												
<i>Guarál</i>	X													
Casting Net	X													
Harpoon	X													
Bow and Arrow	X													
Poisons	X													
<b>HUNTING</b>														
Animal Identification	X	X												
Lizard Hunting	X													
Netting Birds	X													
Trapping Animals	X													
Shooting Gun	X													
Bow and Arrow	X													

**Table 2: Sequence of Learning Within an Activity**

EARLY CHILDHOOD	CULTIVATION
<p><i>Household Task Complexes:</i></p> <p><b>Messenger</b>  Verbal and physical identification of objects  Holding  Carrying</p> <p><b>Carrying Water and Wood</b>  Identification of water and wood sources  Carrying small loads  Carrying water and wood for daily needs</p> <p><b>Child Care</b>  Cleaning and swaddling  Assisting to walk  Carrying small loads  Watching</p> <p><b>Cooking</b>  Fetching foodstuffs  Preparing utensils  Cooking foodstuffs  Combining of foodstuffs</p> <p><b>Laundering</b>  Laundering of one piece  Gradual increase of quantity</p> <p><b>Construction</b>  Retrieving  Hammering and mixing  Cutting and shaping</p> <p><i>Preparatory Task Complexes:</i></p> <p><b>Identification of Cultigens and Animals</b>  Visual exposure to those used in cooking  Repetition of names  Verbalization of characteristics  Retrieval of catch or harvest</p> <p><b>Care of Domestic Animals</b>  Throwing food to chickens and ducks  Naming of personal pet  Bundling of fodder for larger animals  Carrying of bundles</p> <p><b>Horseback Riding</b>  Sitting on horse  Clinging to walking horse  Using reins to guide and stop  Cantering and galloping</p> <p><b>Use of Machete</b>  Clearing brush with grapnel  Slicing with machete</p> <p><b>Swimming</b>  Floating on piece of wood  Paddling with arms and legs  Dog paddling without wood  Swimming with crawl stroke</p> <p><b>Use of Piragua</b>  Playing in boat  Pretending to paddle  Untying boat  Pushing off  Entering boat</p> <p><b>Fishing with Line</b>  Catching bait  Baiting hook  Tying hook to line  Pulling in fish</p>	<p><b>Vegetation Identification</b>  Verbal identification of plants consumed from dooryard garden  Identification of medicinals and decoratives  Identification of tree crops  Universally-cultivated conuco crops  Specialty crops  Rastrojo  Grassland  Swamps</p> <p><b>Harvesting</b>  For home consumption  Carrying harvested plants  Pulling and picking  Removal of small root crops with machete  Cutting of larger root crops  Picking berry crops  Commercial crops  Cutting maize  Chopping smaller tubers  Cutting large root crops  Picking trees and berries</p> <p><b>Seed Selection</b>  Seed plants used at table  Grain plants  Seedlings from tree crops  Plants propagated by cuttings</p> <p><b>Sowing and Planting</b>  Sowing of annuals  Maize  Covering holes  Placing maize seeds  Use of digging stick  Individual differences among annuals  Planting of root crops  Cleaning and preparation of clones  Laying out of clones  Placing and covering of clones  Use of shovel  Transplanting of tree crops  Interplanting in small conuco</p> <p><b>Care</b>  Weeding  Use of grapnel  Use of machete  Weeding of maize  Weeding of polycultural conuco  Protecting conuco from birds</p> <p><b>Cutting</b>  Collecting cut material  Slashing underbrush with machete  Cutting saplings with axe  Cutting trees with axe  Construction of scaffolds  Identification of rastrojo</p> <p><b>Burning</b>  Piling cut material  Clearing of firebreak  Firing against wind in conuquito  Identifying degree of dryness of cut vegetation</p> <p><b>Marketing</b>  Pricing  Guarding dugout  Selling from dugout  Selling in market</p> <p><b>Care and Construction of Tools</b>  Sharpening machete  Locating wood for handles  Shaping handles  Tying on blades</p>

**Table 2: Sequence of Learning Within an Activity** *(continued)*

## **ANIMAL HUSBANDRY**

### **Identification and Care of Small Animals**

- Verbal identification of caserio animals
- Feeding of small animals
- Care and feeding of animals within caserio

### **Herding, Taming and Marking**

- Rounding-up piglets
- Carrying piglets
- Training of young pigs
- Marking of piglets
- Naming of cattle
- Feeding cattle and horses
- Roping cattle
- Herding cattle in *chiqueros*
- Marking calves

### **Curing and Butchering**

- Curing cattle
- Butchering pigs
- Butchering cattle
- Herding cattle to Uracoa

## **HUNTING**

### **Identification of Animals Brought to Village**

#### **Lizard Hunting**

- Beating of brush
- Bludgeoning of lizard

#### **Netting**

- Clearing undergrowth
- Scattering grain
- Constructing blind
- Pulling net
- Hunting with small net
- Selling surplus
- Repair and construction
  - Knot
  - Sew

#### **Trapping**

- Retrieving catch
- Searching for materials
- Placing and tying trigger
- Use of miniature traps
- Use of rope trap

#### **Shooting Gun**

- Care and handling
- Loading
- Shooting at large inanimate objects
- Shooting at birds
- Shooting at mammals
- Hunting in backswamps

#### **Bow and Arrow**

- Shooting at inanimate objects
- Shooting small birds
- Holding torch
- Shooting large animals

## **FISHING**

### **Identification of Fish Brought to Village**

#### **Fishing with Hook and Line**

##### **Use of *Guarál***

- Baiting hook
- Pulling in fish
- Casting *guarál*
- Playing fish

##### **Casting Net**

- Pulling in net
- Throwing small net
- Fishing with companion
- Use of adult gear
- Repair and construction
  - Knot net
  - Sew net
  - Location of wood
  - Shaping of wood

##### **Harpoon**

- Fetching fruit
- Pull in catch in caño
- Throwing length of wood
- Throwing at inanimate objects
- Throwing at small fish
- Throwing at large fish
- Fishing with harpoon in backswamps

##### **Bow and Arrow**

- Shooting small bow at large inanimate objects
- Shooting birds and animals
- Shooting fish

##### **Construction and repair**

- Location of wood
- Shaping of wood
- Tying of points

##### **Poisons**

- Searching for plants
- Blocking stream
- Throwing poison
- Removing fish
- Cutting trees

##### **Marketing**

- Carrying surplus to friends or relatives
- Selling surplus in village with father
- Guarding boat in Tucupita market



**Table 3: Division of Task Complexes by Length, Frequency and Duration of Training**

Task	Age	Length of training session	Frequency of session	Repetitions per session	Duration of intensive training
<b>EARLY CHILDHOOD</b>					
<i>Household Task Complexes:</i>					
Messenger	2-3	5 mins	3 times/wk	2-3	2-3 mos
Carry water and wood	5-8	10 mins	daily	1 or 2	2-3 mos
Child care	5-8		2-3 times/wk	1	1-2 yrs
Cooking	6-8	10-15 mins	daily	1	1 yr
Laundrying	6-8	10-15 mins	twice/wk	1	1-2 yrs
Construction	4-12				
<i>Preparatory Task Complexes:</i>					
Identification of cultigens and animals	2-6	2-3 mins	daily	2-3	5 yrs
Care of domestic animals	3-7	5-10 mins	daily	20-30	4 yrs
Horseback riding	3-8	15-30 mins	daily	1-2	5 yrs
Use of machete	6-8	2-3 hrs	1 time/wk	10-12	2 yrs
Swimming	2-5	30 mins	2-3 times/wk	many	2 yrs
Use of <i>piragua</i>	1-8	15-30 mins	2-3 times/wk	many	3 yrs
Line fishing	6-8	30 mins	2-3 times/wk	many	2 yrs
<b>CULTIVATION</b>					
<b>Plant Identification</b>					
Plants in dooryard garden	2-6	5 mins	daily	many	4 yrs
Conuco plants	4-6	5 mins	daily	many	2 yrs
Natural vegetation	5-15	5 mins	daily	many	10 yrs
<b>Harvesting</b>					
Plants for home consumption					
Plants in dooryard garden	2-6	30 mins	daily	many	2 yrs
Conuco plants	6-8	15-30 mins	daily*	many	3-6 mos
Larger root and tree crops	8-10	30 mins	daily*	many	3 mos
Berry and fruit crops	8-12	30 mins	daily*	many	3-6 mos
Commercial crops	8-12	1 hr	daily*	many	2 yrs
<b>Seed Selection</b>	4-10	10-15 mins	daily*	many	4 yrs
<b>Sowing, Planting, Care</b>					
Covering holes	8-9	30 mins	one day	5-6	1 season
Placing of seeds	8-9	½ - 1 hr	daily*	5-10	2 seasons
Laying out cormels	9-10	½ - 1 hr	daily*	5-10	1 season
Use of digging stick (shovel)	10-12	½ - 1 hr	daily*	many	2 seasons
Transplanting	10-11	½ - 1 hr	daily*	5-6	1 season
Interplanting	10-13	½ - 1 hr	daily*	many	3 yrs
Protecting plants from birds	8-10	10 mins	one	1-2	1 day
<b>Weeding</b>	6-8	1 hr	one day	10-20	2 yrs**
<b>Cutting</b>	10-14	1 hr	daily*	many	4 yrs
<b>Burning</b>	10-14	1 hr	daily*	many	4 yrs
<b>Marketing</b>	10-11	30 mins	1-2/wk	many	1 yr
<b>Care and Construction of Tools</b>	9-14	1 hr	when needed	5-6	4-5 yrs
<b>ANIMAL HUSBANDRY</b>					
Identification and Care of Small Animals	3-8	5-10 mins	daily	20-30	4 yrs
Feeding of Larger Animals in Potreros	8-10	30 mins	daily	4-5	1 yr
Herding Techniques	8-14	1 hr	daily*	30-40	1 yr
Training and Taming	8-12	1 hr	daily*	many	1 yr
Marking	8-12	1 hr	daily*	4-5	1 yr
Curing	8-14	1 hr	when needed	4-5	1 yr
<b>FISHING</b>					
Fish Identification	2-6	2-3 mins	3-5 times/day	many	4 yrs
Line Fishing	6-8	30 mins	2-3 times/mo	many	2 yrs
<i>Guarí</i>	8-10	15-30 mins	1-2 times/wk	many	1 yr
Casting Net	8-10	15-30 mins	1-2 times/wk	many	1 yr
Harpoon	10-12	15-30 mins	daily	many	4-6 yrs
Bow and Arrow	10-14	1-2 hrs	2-3 times/wk	many	4-6 yrs
Poisons	8-12	1 hr	3-4 times/yr	2-3	1 yr
<b>HUNTING</b>					
Animal Identification	2-6	2-3 mins	3-5 times/day	many	4 yrs
Lizard Hunting	6-8	5-10 mins	1/mo	1-2	1 yr
Netting Birds	8-9	½ - 1 hr	2/mo	many	2 yrs
Trapping Animals	8-9	½ - 1 hr	1/mo	many	2 yrs
Shooting Gun	10-12	15-30 mins	2-3 times/wk	many	2 yrs
Bow and Arrow	11-14	1-2 hrs	2-3 times/wk	many	4-6 yrs
* In season					
** Includes time spent in learning the use of the <i>machete</i>					

**Table 4: Estimated Labor Inputs Per Annum**

Activities and task complexes	Total input of man-hours	Man-hours spent teaching	Percentage/Input of man-hours spent teaching
<b>CULTIVATION (per ha)</b>			
<i>Maizal</i> Site Preparation	220	47	21
Cleaning for Re-Use as Conuco <sup>a</sup>	124	17	14
Sowing and Planting Conuco <sup>b</sup>	355 <sup>c</sup>	47	20 <sup>d</sup>
Weeding <sup>e</sup>	240	25	10
Harvesting <sup>f</sup>	170	26	15
Marketing <sup>g</sup>	200	13	6
Subtotal	1309 <sup>h</sup>	175	15 <sup>h</sup>
<b>ANIMAL HUSBANDRY</b>			
Daily Maintenance <sup>i</sup>	400	48	12
Supplemental Feeding, Marking and Curing	140	32	23
Training and Taming	40	10	25
Marketing	140	16	11
Miscellaneous Tasks	50	6	12
Transhumance	64	<u>j</u>	<u>j</u>
Subtotal	834	112	13
<b>FISHING WITH:</b>			
Line <sup>k</sup>	200	27	14
<i>Guarál</i>	74	15	20
Casting Nets	58	12	21
Harpoon <sup>l</sup>	36	3	8
Bow and Arrow <sup>l</sup>	24	3	13
Suffocants	16	<u>2</u>	<u>13</u>
Subtotal	408	62	15
<b>HUNTING</b>			
Lizard Hunting <sup>k</sup>	24	2	8
Netting Birds	96	12	13
Trapping Mammals	24	3	13
Shotgun (Use of) <sup>l</sup>	250	25	10
Bow and Arrow (Use of) <sup>k</sup>	60	<u>7</u>	<u>12</u>
Subtotal	454	49	11
<b>TOTAL</b>	3015 <sup>m</sup>	398	14 <sup>m</sup>

<sup>a</sup> Refers to *maizal* only  
<sup>b</sup> Calculated for conuco only using data for maizal, beans, manioc, sweet potatoes, cush-cush, and yams.  
<sup>c</sup> Labor supplied by head-of-household, his wife, and pre-adult son(s).  
<sup>d</sup> Percentage calculated using 66.6 percent of total input of man-hours.  
<sup>e</sup> Calculated on basis of 5 weedings per year in conuco.  
<sup>f</sup> Total refers to conuco and includes maize (35 hrs.), manioc, sweet potatoes, cush-cush and yams (70 hrs., Musaceae [44 hrs] and tree crops [22 hrs.]). Time includes allowance for sacking, transporting, storing and marketing produce in caserio.  
<sup>g</sup> Not calculated per ha.  
<sup>h</sup> Subtotal reduced by 119 hours in calculating percentage to allow for 33.3 percent reduction of input in sowing and planting corresponding learner's labor input.  
<sup>i</sup> Task complex performed mostly by women and children.  
<sup>j</sup> Task complex taught in other situations.  
<sup>k</sup> Task complex performed mostly by boys.  
<sup>l</sup> Not including practice time.  
<sup>m</sup> Percentage calculated from a total reduced by the 119 hours which correspond to learner's labor input per year per ha. in sowing and planting.

Table 5: Division of Task Complexes by Teacher

	Relationship to Learner							Other
	Father	Mother	Older sibling		Grandparent		Compadre	
			Brother	Sister	Grandfather	Grandmother		
<b>PRE-ACTIVITY PERIOD</b>								
<b>EARLY CHILDHOOD</b>								
<b>Household Task Complexes</b>								
Messenger	—	Mo	—	Mi	—	S	—	—
Carry water and wood	—	Mo	—	Mi	—	S	—	—
Childcare	—	Mo	—	Mi	—	S	—	—
Cooking	—	Mo	—	Mi	—	S	—	—
Laundering	—	Mo	—	S	—	S	—	—
Construction	Mo	—	Mi	—	S	—	—	—
<b>Preparatory Task Complexes</b>								
Identification of cultigens and animals	Mo	S	S	S	S	S	S	—
Care of domestic animals	—	Mo	—	S	—	S	—	—
Horseback riding	Mo	—	Mi	—	S	—	—	—
Use of machete	Mo	—	S	—	S	—	—	—
Swimming	—	S	Mo	Mo	—	—	—	—
Use of <i>piragua</i>	—	S	Mo	Mo	—	—	—	—
Line fishing	S	—	Mo	—	—	—	—	—
<b>ACTIVITIES</b>								
<b>1. CULTIVATION</b>								
<b>Plant Identification</b>								
Plants in dooryard garden	—	Mo	—	Mi	—	S	—	—
Conuco plants	Mo	—	S	—	S	—	—	—
Natural vegetation	Mo	—	Mi	—	S	—	—	—
<b>Harvesting</b>								
Plants for home consumption								
Dooryard garden	—	Mo	—	Mi	—	Mi	—	—
Conuco plants	Mo-A	—	Mi	—	Mi	—	—	—
Larger root and tree crops	Mo-A	—	Mi	—	Mi	—	—	—
Berry and fruit crops	Mo-A	—	Mi	—	Mi	—	—	—
Commercial crops	Mo-A	—	Mi	—	Mi	—	—	—
<b>Seed Selection</b>	Mo	S-A	—	Mi	—	Mi	—	—
<b>Sowing, Planting, Care</b>								
Covering holes	S	Mo	—	Mi	—	Mi	—	—
Placing of seeds	Mi	Mo	—	Mi	—	Mi	—	—
Laying out cormels	Mi	Mo	—	Mi	—	Mi	—	—
Use of digging stick	Mo	—	—	—	Mi	—	—	—
Transplanting	Mo	—	—	—	Mi	—	—	—
Interplanting	Mo	—	—	—	Mi	—	—	—
Protecting young plants from birds	S	—	Mo	—	—	—	—	Mo
<b>Weeding</b>	Mo	—	S	—	S	—	—	—
<b>Cutting</b>	Mo	—	—	—	S	—	—	—
<b>Burning</b>	Mo-A	—	—	—	S	—	S	—
<b>Marketing</b>	Mo-A	—	Mi	—	Mi	—	—	—
<b>Care and Construction of Tools</b>	Mo	—	—	—	S	—	—	—
<b>2. ANIMAL HUSBANDRY</b>								
Identification and Care of Small Animals	—	Mo	—	S	—	S	—	—
Feeding Larger Animals	S	Mo	S	S	S	S	—	—
Herdng Techniques	Mo	—	Mi	—	Mi	—	—	—
Training and Taming	Mo	—	Mi	—	Mi	—	—	—
Marking	Mo	—	Mi	—	Mi	—	—	—
Curing	Mo	—	Mi	—	Mi	—	—	—
<b>3. FISHING</b>								
Fish Identification	Mo	S	S	S	S	S	S	S
Line Fishing	S	—	Mo	—	—	—	—	—
Guarál	Mo	—	Mi	—	S	—	—	—
Casting Net	Mo-A	—	—	—	S	—	—	—
Harpoon	Mo-A	—	—	—	S	—	—	—
Bow and Arrow	S	—	—	—	S	—	S	S
Poisons	Mo	—	—	—	S	—	S	—
<b>4. HUNTING</b>								
Animal Identification	Mo	Mi	S	S	S	S	—	—
Lizard Hunting	—	—	Mo	—	—	—	—	Mo
Netting Birds	Mo	—	Mi	—	Mi	—	Mi	—
Trapping Animals	Mo	—	Mi	—	Mi	—	Mi	—
Shooting Gun	Mo-A	—	—	—	Mi	—	—	—
Bow and Arrow	Mo-A	—	—	—	Mi	—	—	Mi

A: All — Task taught exclusively by person.

S: Some — Person undertakes some share of training

Mi: Minimal — Only occasionally teaches task. Mo: Most — Task principally taught by person.

—: In normal circumstances task never taught by person.

## Endnotes

(1) I make no apologies for drawing closely on Berger and Luckmann (1984) in this section, since elements of their important work provide a sorely needed conceptual framework for understanding the fundamental socio-cultural importance of traditional ecological knowledge.

(2) Tables after Ruddle and Chesterfield 1977.

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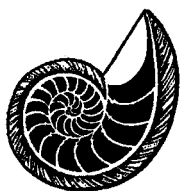
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## 4. Integrating Traditional Ecological Knowledge and Management with Environmental Impact Assessment

*R.E. Johannes*



Indigenous peoples' traditional ecological knowledge and management systems (TEKMS) are the subject of increasing attention in the developed world. Recently, in fact, the study and preservation of traditional indigenous knowledge progressed in one dizzying leap from being the focus of a small, albeit fast-growing fraternity of social and biological researchers to a media-certified public issue, courtesy of a cover story in *Time Magazine* (September 23, 1991).

### **Four Perspectives**

Awareness is spreading that TEKMS can be used to improve development planning in regions inhabited or exploited by indigenous peoples. TEKMS is especially pertinent to environmental impact assessment, but as Niamir (1990:98) states:

Paying lip service to the need to incorporate (TEKMS) into development design can be just as bad as paying lip service to popular participation. Too many projects have tacked on a "research on TEKMS" phase as an after thought, resulting in volumes of interesting but too exhaustive and inappropriate research reports, which are then filed and not

used by project designers and implementors. TEKMS needs to be incorporated effectively into the development process.

So how does one systematically obtain and organize information to ensure that it is useful for environmental impact assessment and that it can be tightly integrated with information obtained from other sources? Some investigators have gathered information on TEKMS indiscriminately in an attempt to record everything available for a culture, irrespective of its immediate practical value. Others have recorded this information on an ad hoc basis in the course of studying other aspects of indigenous cultures. Both

approaches are valuable, but neither are appropriate for environmental impact assessment. I would like to suggest that, for this purpose, research on TEKMS should focus on four essential perspectives or frames of reference:

- taxonomic
- spatial
- temporal
- social

### Taxonomic Frame of Reference

The first frame of reference for gathering and organizing traditional environmental knowledge is taxonomic. More has been written about indigenous plant and animal naming systems than any other aspect of traditional ecological knowledge. Many indigenous peoples know only the local language names for most local plants and animals even when they speak the outside investigator's language well. Thus, to study traditional knowledge about these species, one must first become familiar with these names.

The local significance of each indigenous plant and animal as well as soil/rock taxon should be determined. Otherwise, researchers are likely to overlook the importance of some as sources of food, medicine, structural material, tools, soil-improvers, totems or other sacred entities.

### Spatial Frame of Reference

Fundamental to environmental impact assessment is recording the spatial distribution of living and non-living resources and amenities by mapping. Knowledge possessed by local users can be invaluable in this context, especially in regions where recorded knowledge of local environments is poor. For example, Conklin (1957), Dolva et al. (1988) and others have shown that indigenous knowledge of the distribution and characteristics of different soil types

and the plants and animals associated with each can provide effective shortcuts for researchers investigating the local resource base. Local knowledge may make it possible to survey and map in a few days what would otherwise take months (for example, Howes 1980).

A good example of this approach is provided by the geographical information systems (GIS) for portions of northern Manitoba currently being created by First Nation peoples of the region (Wavey, this volume). By integrating information from sources as disparate as satellite imagery and TEKMS, traditional knowledge is being put into a format that is exceptionally valuable for environmental impact assessment.

Locations of rare or endangered species are more likely to be identified by local resource users involved in such mapping exercises than by outside researchers doing site inventories. Animal migration pathways and aggregation sites known to local people will not always coincide with areas judged to be important based on common criteria for identifying sensitive areas such as aesthetic qualities or species diversity. However, in these areas the value of the resources which are known to local people is sometimes very great.

Such aggregation sites often provide unparalleled opportunities to monitor and manage stocks because exceptionally large harvests may be made from them. Indeed, indigenous peoples often monitor year-to-year changes in the sizes of some of these aggregations and may reduce their exploitation pressure in periods when stocks are seen to be low (Johannes 1978).

Although not necessarily related, archaeological sites including burial grounds are often conveniently mapped at the same time as natural resources.

### Temporal Frame of Reference

The third suggested framework for gathering

and organizing traditional ecological knowledge is temporal. Indigenous resource users usually know the location and timing of a host of significant biological events. Areas that appear as unremarkable to an environmental impact assessment researcher during a site inventory in one period may serve as aggregation sites or migration routes for important animals in another. A relatively barren beach in September may be thronged with nesting turtles in May. Habitats that hold few birds during the day may fill with roosting birds at night after the resource inventory-takers have gone home.

While interviewing and working with Palauan fishermen in the mid 1970s, I was told of the months and lunar periods as well as the precise locations of spawning aggregations of some fifty-five species of food fish in this tiny archipelago (Johannes 1981). This amounted to more than twice as many species of fish exhibiting lunar spawning periodicity as had been described in the scientific literature for the entire world. Such information provides important spatio-temporal focuses for fisheries monitoring and management (Johannes 1980, 1991).

In northern Australia, white people name only two seasons — “the wet” and “the dry” — whereas Aborigines name six that are precisely defined by predictable changes in weather, tides, plant blooming and fruiting cycles, insect abundance, and the breeding cycles and migrations of fishes, mammals and birds (Davis 1988). The value of such information for environmental impact assessment (EIA) is obvious, but it would take years for an EIA team to assemble it using conventional means.

### Social Frame of Reference

The social frame of reference includes the way indigenous peoples perceive, use, allocate, transfer, and manage their natural resources. This

perspective is the hardest to bring into sharp focus, but it is no less important than the preceding three frames of reference. Traditional ecological knowledge cannot be used properly in isolation from the social and political structure in which it is imbedded. There is a burgeoning literature on this subject.

For environmental impact assessment, one important issue is often overlooked by people studying the sociology of traditional ecological knowledge: that is, the differing awareness among cultures of the impact that people can have on their natural environment. Some cultures clearly possess a traditional conservation ethic, by which I mean an awareness that people can deplete or otherwise damage their natural resources, coupled with a commitment to reduce or eliminate the problem (Johannes 1978). Other cultures apparently perceive little or no relationship between their activities and the state of their natural resources. (Carrier 1982; Johannes and MacFarlane 1991). Still others appear to have had a traditional conservation ethic, but one which has been eroded by external influences (Johannes 1978).

Environmental impact assessment should cover not only the direct impacts of a project on the environment, but also the impacts of altered human access to natural resources. The latter will depend in part on the nature — or absence — of a traditional conservation ethic among local people. For example, a road built through a remote area to allow access to a new mine gives access not only to miners but also to local peoples. How will the latter respond to these new opportunities? Will they exploit the newly accessible wildlife, timber and fish rapaciously or in moderation? The answer will depend in part on the extent to which they understand the consequences of uncontrolled harvesting. Where a traditional conservation ethic is weak or ab-



sent, those responsible for environmental impact assessments need to help to provide guidelines, especially through education, for reducing the environmental impacts of the local people.

### **On Methods**

Some researchers attempt to gather and record traditional knowledge on environmental subjects about which they are not well informed. This is unsatisfactory for several reasons. Indigenous experts in traditional ecological knowledge are usually proud of this knowledge and are not likely to be enthusiastic about imparting it to investigators who obviously do not appreciate the finer points. Diamond (1989) recounts an amusing but apt story illustrating this point.

Moreover, biologically unsophisticated researchers are not well equipped to determine what portions of the information they obtain are new, important, already well-known or implausible. They cannot ask the appropriate questions to pursue promising biological leads opened up by the local expert. Some older anthropological writings are loaded with tantalizing bits of information on traditional ecological knowledge which were not explored further. This is because the researcher was untrained in the appropriate environmental subjects, and therefore unaware of the potential significance of such information. Opportunities to record large quantities of valuable traditional ecological knowledge have been lost irretrievably for this reason.

I do not mean to imply that the study of traditional ecological knowledge is the exclusive domain of biologists. Such knowledge should be recorded and evaluated by people who possess an appropriate background in biology, ecology and resource management, and in the social sciences, which provide the appropriate skills for translating information from one culture and language to another and for addressing the

social frame of reference. When it comes to methods for studying traditional ecological knowledge, I have learned far more from social scientists than from biologists. But neither natural scientists nor social scientists can do the job well without the expertise of the other.

A flagrant deficiency in much of the literature describing traditional ecological knowledge is the absence of any effort to determine its validity. An informant who is an acknowledged local expert on environmental matters is just as concerned with getting the facts right as the researcher. However, there is always a temptation to embroider the facts to influence the outcome of any development initiative so as to favor the TEK expert's people — for example, to exaggerate the environmental significance of an area being considered for development so as to extract greater concessions from the developer. Furthermore, in some cultures, some individuals who are not TEK experts may pretend to be.

Obviously, it is desirable to test informants' assertions in the field at the appropriate times and places. But under the time constraints of EIA preparation this will often be impractical. So how does one gauge the reliability of one's informants? I ask a series of relevant questions to which I already know the answers. I also ask a series of questions that sound plausible but to which the informant could not possibly know the answers. An unequivocal "I don't know" in response to the latter provides some assurance that the information given by the informant will be reliable.

Because even the best experts are sometimes wrong, it is useful to differentiate between observation and interpretation. While observations of natural phenomena may be acute, the conclusions drawn from them may not be accurate. Being alert to this helps prevent accepting incorrect information. But by dismissing false

interpretations of natural phenomena too quickly, the investigator risks overlooking the possible value of the underlying empirical knowledge (Johannes 1981:137).

### Attitudes of Researchers to TEKMS

Many biologists still have an "attitude problem" when it comes to TEKMS. They dismiss the knowledge gained by indigenous peoples during centuries of practical experience as anecdotal and unsubstantiated. However, their own specialized knowledge is based typically on studies carried out over much shorter periods of time under conditions where being wrong does not entail the risk of going hungry.

But romantic and uncritical claims for traditional environmental knowledge and management practices represent an extreme which is almost as unfortunate. A taboo on the hunting of a species, assumed with little reflection by some social scientists to be an obvious conservation measure (McDonald 1977), may put increased pressure on some other, more easily depleted species. Locally prescribed methods for improving fishing or hunting which focus on propitiating spirits or counteracting the effects of sorcery may divert attention from the real and sometimes correctable causes.

Under the circumstances, it is exasperating to read assertions that superstitions and myths can be taken for granted to conceal functional ecological concerns. Some almost certainly do. But the assertion that all do implies that the *only* preoccupation of indigenous peoples is with their natural environment.

Some claims about the environmental wisdom of traditional cultures have been so overblown that they have provoked a backlash. To counteract these excesses, some writers now dwell single-mindedly on examples of bad natural resource management among indigenous peoples,

even advancing the opposing notion that traditional environmental practices were basically unsound (for example, Diamond 1987).

The truth lies somewhere in between. Wise and unwise environmental practices and valid and invalid environmental beliefs coexist in many cultures. To assume differently is to assume that with respect to natural resource management indigenous peoples are either inherently superior or inherently inferior to the cultures of the developed world. Both of these extreme images — noble or ignoble savage — connote prejudice and do not serve the needs of development planners.

### Proprietary TEK

Many cultures are not proprietary about their TEK. Some have even asked their governments to bring in researchers to record it for them. This is especially important where TEK is being lost. And percentage-wise, cultures are disappearing today much faster than species, while TEK is disappearing even faster.

But local people who reveal their traditional ecological knowledge are relinquishing a degree of status and power. They may be reluctant to reveal their knowledge if they can see no benefits from its disclosure, or if they fear that competitors might profit at their expense, or that development aided by their knowledge might damage their resources or restrict their use of them (Wavey, this volume).

Simeon Jimenez Turon, a member of the Ye'cuna tribe of Venezuela has said:

Understand learned one that there can be no intermediary who understands our region better than we do, or who knows us better than we know ourselves. Those who want to learn from us may do so, but you must also teach us the laws and the useful means to pursue our goals and petitions before the official authorities. In so far as you help us, we will help you.

(Brownrigg, 1982)

To pave the way for research on traditional ecological knowledge, development planners should have some incentives in mind, including lease payments, greater legal recognition of local authority over local resources, better protection from uncontrolled outside encroachment, enhanced income from tourism, assistance in dealings with the outside world, and employment in local natural resource management. Social scientists are comfortable with research that involves such tradeoffs; biologists who study TEK must learn to follow suit.

For some cultures, some portions of their TEK are strictly proprietary for good reasons. Robert Wavey, Chief of the Fox Lake First Nation of Manitoba states, for example, that, for his people, "maintaining complete indigenous control of the raw traditional land use information must be a cornerstone of linking TEK and science." This "allows communities to optimize the acknowledged value of this information through skills development, contracted projects and employment and other means." He also points out that, "it could be an impact in itself to make certain specific details of land use maps public by publishing maps of prime hunting and fishing sites, gravesites and former community locations" (Wavey, this volume).

## **Conclusion**

For those to whom the importance of integrating TEKMS with environmental impact assessment has been obvious, widespread recognition has been a very long time in coming. We can now expect accelerating growth in activities in this area; I hope that the observations presented here will seem mundane within a very few years. More importantly, we hope that indigenous peoples will have much greater voices in planning development that affects the environments we all depend on.

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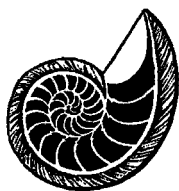
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## 5. Finding Common Ground: Natural Law and Collective Wisdom

*Nancy C. Doubleday*



Challenged by the recognition of the destructive potential of overexploitation of nature and of the ecological and human tragedies which may result, the adequacy of existing norms, values and laws are increasingly called into question. Common property and co-management approaches have been advanced as alternatives or co-requisites to management systems based in western science and law. Integrating common property management systems with western systems raises the issue of integrating local or

traditional ecological knowledge with scientific management. Traditional ecological knowledge (TEK) represents a collective understanding attained over long periods of time, in particular places, of the relationship between a community and the Earth. TEK may encompass spiritual, cultural and social aspects as well as substantive and procedural ecological knowledge. TEK may also include customary rules and laws, rooted in the values and norms of the community to which it belongs. This paper explores the issues and strategies concerning the accommodation of TEK, the often unstated tensions which

surround TEK, and some alternative strands of western thought; it is intended to advance the search for common ground in the discussion of common property and TEK.

The discussion of new paradigms of natural resource use which is based on common property and co-management has significantly advanced consideration of alternatives and supplements to conventional state-based management (Berkes and Feeny 1990:51) by examining a wide range of existing communal management systems. Persistent communal management systems are underlain by local or traditional ecological knowledge, and in terms of the development of

co-management systems involving state and local community authorities, the integration of these traditional ecological knowledge systems with resource management science remains a significant task (Berkes and Feeny 1990:52).

In general, contemporary communities which have traditional ecological knowledge exist at the margins or beneath the notice of dominant societies, a position frequently sanctioned legally, if not morally persuasive. While this paper draws examples from the experience of indigenous peoples, particularly Inuit, this discussion of TEK is cast in the broadest possible terms, and it is recognized that TEK occurs within many traditional communities which would not necessarily be identified as communities of indigenous peoples. For the purposes of this paper, the terms "traditional communities" or "traditional peoples" will be used to refer generally to communities and peoples possessing traditional ecological knowledge. Various traditional communities have also been identified by some as ethnic groups, minorities, tribal peoples and indigenous peoples.

Today traditional communities are frequently found in borderlands, hinterlands or undesirable areas (wastelands). They survive often because, by being out of the way, they avoid conflict with dominant societies, or because they have been resettled under duress from more desirable areas. Increasingly, isolation offers no escape, however, as the economies of dominant societies reach into these hinterlands to feed upon their resources, often displacing the peoples who live there, damaging their lands and extracting their resources. In the process, traditional lifestyles are disrupted and traditional ecological knowledge is cut adrift, perhaps lingering on in irrelevance before disappearing from living memory forever.

In a world divided and fearing for its fate, there is greater concern for diversity, both cul-

tural and biological, than perhaps at any other time in human history. This has resulted in greater and greater efforts on the part of the dominant ethnocentric paradigm to seek to accommodate other communities of beings. In general, these attempts at accommodation begin at a point in the dominant framework, and then, by compromise and logic, seek to stretch the framework to achieve sufficient integration to reduce the tension among the communities to tolerable levels. Examples of attempts to achieve accommodation by deformation of existing legal frameworks in other situations include:

- attempts to accommodate collective rights by modification of the individual rights framework of procedural liberalism (Taylor 1992)
- attempts to address environmental concerns by modification of the international framework of human rights (Brunner 1989:979)
- attempts to address animal welfare by extension of human rights, such as the right to life (D'Amato and Chapra 1991).

Similar attempts are being made within science, and are relevant to a consideration of accommodation. These include efforts to:

- relate ideas in theoretical physics to those of eastern philosophy (Capra 1975);
- relate ecology to the concept of the Earth as a living organism (Lovelock 1979);
- move from a reductionist mode of thought in order to see the material universe as a dynamic web of interrelated events (described by Capra 1988 in his review of the bootstrap theory of Geoffrey Chew);

- incorporate traditional ecological knowledge in resource management science.

These are all attempts to modify significantly our ways of thinking about previously accepted frameworks of knowledge.

As Berkes (1989) and others writing in that volume have pointed out, our institutions and long-accepted approaches to resource management no longer serve us. As we become aware of the limitations of some of the dominant norms and values of our society, and of the habits of mind which accompany them, we can begin to challenge those limits. Perhaps the environmental crisis which so many have cast in terms of overpopulation or pollution or global change is really a crisis in the way we think. In any event, it is legitimate to ask questions about the assumptions we make concerning our frameworks, and the standards of evaluation which we apply when we consider common property and traditional ecological knowledge.

We have begun to critically re-examine the prejudices of the past, and to look beyond them to a new appreciation of the wisdom and beauty of other cultures and other traditions, including those of the Third World, and of indigenous peoples. It would be a mistake to expect to erase our collective histories, to walk away, to begin afresh without reconciling the past. After all it is not so long ago that western European and American zoos chose to exhibit individuals from other cultural groups together with apes, as reported by Cramer (personal communication) and Bradford and Blume (Rydell 1993). For example, in North America, 500 years of our history have seen tribes removed from their ancestral lands, significant living natural resources exterminated, and vast areas of land expropriated, without recognition that a wrong had been done and without compensation. Not the least

of this devastation has been the destruction of ways of life which not only reflect spiritual and moral value systems, but also contain the knowledge of a viable living relationship between human beings and the Earth. This was done by others, who on arriving, imported and substituted their own religion and morality, laws, sciences and understandings, and pursued their own ends, arguing that their worldview, their paradigm, was the only correct one: an intellectual version of monotheism which prevailed to the detriment of all others. From a history filled with conflict, where can we look for the basis of reconciliation and accommodation?

### **The Legacy of Accommodation and Substitution**

It is necessary to understand that the result of this substitution of one worldview for another historically bears a legacy of paradox and injustice. In the Arctic, for example, Inuit who have lived in their homelands in Siberia, Alaska, Canada and Greenland in accordance with their values, knowledge and beliefs for thousands of years, have been coerced into negotiating their rights to their lands, resources and institutions with governments established by newcomers according to imported laws. To those truly entrenched in the paradigm of the newcomers who transplanted the dominant culture, this is neither paradoxical nor injustice.

Another example of the consequences of the dominant society paradigm substituting for the antecedent society paradigm is Inuit whaling. Inuit who, defined by their hunting culture, once made their own lives successfully in what is acknowledged to be one of the most demanding environments on earth, must now negotiate internationally through state governments, and the International Whaling Commission for the whales which they will take to continue their



way of life. This happens notwithstanding a number of international agreements generated by the legal system of the dominant paradigm which recognize both the right to self-determination and the right to subsistence of all peoples, including:

- the United Nations Charter Article 1(2), Arts. 73 and 76;
- the United Nations General Assembly Resolution 1314 (XIII) on Self-Determination of December 12, 1958 and the Declaration 1514 (XV) of December 14, 1960 on Granting of Independence to Colonial Countries and Peoples;
- the International Covenant on Civil and Political Rights;
- the International Covenant on Cultural, Social and Economic Rights;
- the Aboriginal Exemption under the International Whaling Convention of 1946.

As part of the process of understanding obstacles and opportunities for the integration of TEK in relation to western law and science, there is a larger question of the relationship of traditional communities from which TEK comes, to dominant western societies which must be admitted to the discussion. If the central issue is one of the acceptance and accommodation of TEK by western frameworks, then it is important to look for the common ground between the two, and for the logical points of contact. In order to integrate the two, there are institutional and procedural issues which must be addressed. The following exploration of elements of TEK and of western frameworks, both legal and scientific, is intended to contribute to this discussion of accommodation of TEK.

### **Western Legal and Scientific Frameworks: Norms, State Control and Avenues of Accommodation**

In the process of substitution of the Western European paradigm for that of North American indigenous peoples, for example, force was used but in the long-term, western norms and laws were far more effective agents of change. By declaring the supremacy of European laws, the substituted Western European paradigm acquired moral and legal authority. Subsequent arguments about rights, lands and resources were then heard in western courts under western laws. It would seem that law has played and continues to play a critical role in shaping the dominant assumptions of our society, as well as the shape of our world.

Where then among the legal and scientific roots of liberal democratic traditions can we look for sources of ideas more compatible with common property, more respectful of nature and of traditional peoples, including indigenous peoples and their knowledge?

The three fundamental roots of Western European legal tradition, divine law, natural law and positive law, have been explored in relation to indigenous peoples and their rights to lands, resources and autonomy in detail elsewhere (Weeks 1982; Doubleday 1989). For purposes of this discussion, a very brief overview is included here. Divine law is essentially sacred law held to have been given to humans by divine authority and almost inevitably through human intermediates. Within western societies for many hundreds of years, divine law has largely been the province of organized religion. At times, in the absence of the separation of church and state, it has given divine sanction to earthly kings, both in western and non-western societies. In non-western societies divine law is also widely respected, influencing daily life as well as the

larger relations of cultures to nature. For example, the beliefs of the North American Indian nations with respect to their relationship to the Creator is a central organizing principle. Divine law may also be found within contemporary state law, for example in the recognition of divine supremacy in Canada's constitution, *The Constitution Act, 1982*. Clearly, divine law can be understood in many ways in addition to the predominantly Christian view of Europeans at the time of Columbus and exemplified by the works of Victoria and other jurists of that era.

Natural law has been variously interpreted by scholars as being based on reason, not dependent on divine authority; and being derived entirely from the law of nature, as interpreted through various intellectual filters, depending on the beliefs of the interpreter. Natural law lives in the application of reason, as in practical reasonableness (Finnis 1980), and in the recognition of rights and responsibilities of individuals within societies. The Canadian Charter of Rights reflects some of these earlier natural law values and norms, as well as positive law directives, and represents one attempt to balance the situation of individuals with respect to the modern nation-state.

In terms of positive law, Grotius, who is often considered to be the father of modern international law, held that it was the law of nature which gave rise to the modern state. In turn, the creation and the application of positive law, aimed at producing order and therefore justice, gave rise to positive international law. This viewpoint holds that the state is the pinnacle of human civilization. It is a legitimate descendant of Grotius' view that international law is basically what states do, and therefore its rules are to be found in states' behaviors. Most importantly, the subjects of positive international law are states and states' interests. This should not

be surprising because it is the states who are the law-makers in this analysis. Positive international law has dominated western international law for the past 350 years or so.

The positive international legal tradition essentially stops at the level of organization of the state. New norms of international law are understood to emerge from state actions at the international level. Non-state entities are essentially without standing. Since, in the view of positivists, state-will has complete sovereignty and supremacy, it is not surprising that non-state forms of human organization have no status in international law in this view. For this reason, traditional communities and other non-state collectivities, including indigenous peoples, have not been accorded a voice in international affairs until very recently and much debate continues about their inclusion.

An alternative to the positivists and their statement of international law is to be found in the works of Pufendorf, who argued that international law was entirely derived from the law of nature. The natural law-based approach to international law starts from the position that relations among human beings within their societies were rooted in common concerns and the ideal of natural justice. The nation state did not occupy a central position in this formulation; indeed, the most notable fact about Pufendorf's works is his recognition of non-state communities, which in his view enjoyed many of the rights and prerogatives others ascribe only to state governments. This version of natural law-based international law is more susceptible to seeing non-state entities as subjects and objects of international law.

Natural international law is inherently more flexible than positive international law because of its emphasis on peoples rather than states as fundamental subject units, and because of its

inclusion of a broader range of sources, namely human reason, situations and the nature of things in the development of its rules (Weeks 1982). Natural international law has the potential to draw on a variety of perspectives. For these reasons, natural law is an attractive approach from the point of view of accommodating new paradigms in law and in science, including norms, values, concepts and worldviews originating with or implicit in ecology, in common property and in traditional ecological knowledge.

What we see in modern international law is a range of degrees of acceptance which go from acceptance only of positive law, through acceptance of a blend of positive and natural law, to an acceptance only of divine law as informing states' actions. If our framework of international law is rooted in positive international law, which is centered on states and their behavior, then it is hardly surprising that it is so difficult to recognize the rights of indigenous peoples or groups of peoples whose primary unit of organization is non-state. Equally, if state behavior, expanded by compacts among states is the basis of international law, including the law of environment, it is hardly surprising that international environmental law is about states' rights and interests rather than about nature.

With respect to innovation in international law, the greater flexibility of natural law with respect to recognition of sources of law means that new legal norms may first appear outside positive law. The desire of positive legal entities for stability will lead to the incorporation of these new norms within existing frameworks.

A clear contrast can be drawn by taking natural law as the foundation for a framework of international law because natural law recognizes and maintains the whole of legal relations from pre-state conditions, including recognizing the

diversity of natural and cultural circumstances which exist in the world. Even though modern positive international law recognizes nation-states from all quarters of the globe, the underlying concepts flow almost entirely from Western European sources. One of the consequences of this history is the inherent bias within international and state law in favor of western legal norms and values. For example, indigenous peoples are still struggling for recognition as subjects of international law because according to European positive law and values, the *de facto* sovereignty of indigenous peoples and their control of their territories was not widely recognized or respected.

The issues of fairness and justice for non-European peoples have been before the world community for a long time, both in discussions of human rights and of decolonization and states' rights. The specific case of indigenous peoples has not been satisfactorily addressed, either as a subset of the international law of human rights or of the international environmental law. The International Labour Organization (ILO) Convention 107 is an example of an early (1957) and rather paternalistic attempt to apply a human rights framework by treating tribal peoples as laborers.

One of the most controversial efforts to bend existing rights frameworks to accommodate other values is that of the animal rights movement. For example, it has been argued that the human right to life extends logically to whales, leading to a condemnation of Inuit whaling practices by likening the continuation of subsistence whaling to human cannibalism (D'Amato and Chapra 1991). Other writers, notably Lynge (1991, 1992) have pursued the analysis of man-animal relationships and the animal rights concept at length, from the perspective of hunting societies. The argument for the adoption of the

human rights approach, which is an artifact of western societies, and its expansion to accommodate non-human life forms is fundamentally anti-ecological. When this argument is applied as a basis for the violation of the cultural norms and values of other societies, it becomes fundamentally undemocratic, unless of course one subscribes to the view that liberal democracies must establish limits to tolerance (Taylor 1992:62), or to the view that identifies non-western civilizations as barbaric, and therefore excluded from democratic consideration (Kimball in Taylor 1992:72).

Western scientific traditions, like western legal traditions, have functioned historically from positions identified with narrowness, rigidity and reductionism, often fragmenting the experiential world into disciplinary domains, and reducing complexity and richness to deductive explanation. Many scientists still function in this reductionist mode, but they are no longer unchallenged. Many critiques have been written addressing the implications and consequences of western science, for nature, for humanity as a whole, for women and for non-western knowledge (for example Livingston 1973, 1981; Merchant 1980; Rozak 1972; Worster 1979). Many interesting attempts have been made to move from unorthodox positions into restatements of various aspects of western science as well (for example Rozak 1972; Capra 1988; Berkes 1989). The introduction of alternative views seems to require struggle, whether for a new international law, or for a new ecological perspective, as exemplified by the case of Lovelock and Margulis, who have labored to explore the Gaia hypothesis within the dominant scientific mainstream since the 1970s, consistently meeting with outright rejection in that milieu (Lovelock 1991:24). Here we see a conservative aspect of the dominant paradigm of

western science in opposition to consideration of ideas which might challenge accepted assumptions and the frameworks of which they are a part. Similarly, traditional ecological knowledge has its share of detractors, who argue from a variety of positions, some entrenched within the dominant scientific paradigm against serious consideration of TEK. It has been said that TEK has no scientific basis, that it is folklore, not knowledge, and so on, in attempts to discredit TEK by identifying it as not of the mainstream, meaning not acceptable.

Clearly, new awareness and new thinking are producing new sciences as well as new legal approaches; what is less clear is just how close this thinking is to engendering what Thomas Kuhn has identified as paradigm shifts (Capra 1988). What of the norms and values derived from the old reductionist scientific paradigm? What of the belief that evolution proceeds from simple to complex levels of organization in parallel with some sort of hierarchy of values? What of social Darwinism and Haeckle? These intellectual beliefs are not extinct by any means, and pose questions with respect to the process and success of accommodation of alternative views like those reflected in TEK.

Our beliefs about the nature of reality have both been derived from our interpretations of science and reinforced by it. Our knowledge grows, but changing our frameworks is difficult. It is very difficult to move toward an "ecology of mind" (Bateson 1972) from a position within frameworks which, by virtue of their historical development and institutional bias, are unecological if not anti-ecological.

In terms of environmental frameworks, it is not until the courageous statement of Raymond Dasmann to the 1975 General Assembly of the International Union for the Conservation of Nature and Natural Resources (now known as

IUCN the World Conservation Union) that there is any real suggestion that the political realities of survival facing traditional communities and traditional ecological knowledge have anything to do with the international environmental community. Dasmann said: "The problem of endangered peoples is like that of endangered species. With continued neglect it will solve itself, the people will die, or the species will become extinct. But the loss to humanity will be incalculable. If you believe as some of us do, that the future depends upon our ability to restore, at a higher technological level, the old man/nature continuum, the loss of those who can guide us would be tragic" (Dasmann 1975).

More recently, the World Commission on Environment and Development (WCED) recognized both the situation of indigenous peoples and other traditional communities, as well as the value of traditional ecological knowledge, and made the following proposal in what has come to be known as the Brundtland Report:

The starting point for a just and humane policy for such groups is the recognition and protection of their traditional rights to land and the other resources that sustain their way of life - rights they may define in terms that do not fit into standard legal systems. These groups' own institutions to regulate rights and obligations are crucial for maintaining harmony with nature and the environmental awareness characteristic of the traditional way of life. Hence the recognition of traditional rights must go hand in hand with measures to protect the local institutions that enforce responsibility in resource use. And this recognition must also give local communities a decisive voice in the decisions about resource use in their area (WCED 1987:115-116.)

This proposal recognizes the connection between rights to lands and resources, to local

management institutions and to participation in decision-making. It does not acknowledge the role of traditional ecological knowledge explicitly, but it does address the maintenance of "harmony with nature and environmental awareness characteristic of the traditional way of life". From the point of view of identifying points of attachment within existing frameworks on to which other approaches could be grafted, it is a very useful proposal for accommodation. This statement is interesting too in that it acknowledges that the use of terms outside existing legal frameworks in defining rights does not automatically invalidate those claims from the outset, as has previously been the case in much domestic and international law. However, given the very real global environmental threats which exist, such as the threats to the Arctic ecosystem and to the people who live there posed by toxic contaminants from various parts of the world, is the WCED proposal for meaningful local control enough? Recognizing decision-making capacities in other contexts or paradigms locally while allowing business as usual globally is unlikely to produce satisfactory long-term solutions.

Beyond the issues of effectiveness and accommodation, there remains the concern that inherent in the sustainable development approach is a utilitarian value system. Many critical analyses have been written about the assumptions implicit in this approach; it is not necessary to revisit them here (for example Leiss 1972; Livingston 1973, 1981; Merchant 1980; Rozak 1972; Worster 1979). It is however important to remember that there are other value systems which, given the opportunity, might make other proposals for relationships with nature, including spiritual and esthetic relations.

### **Traditional Frameworks: Context for Traditional Ecological Knowledge**

Traditional ecological knowledge represents a collective understanding attained over time of the relationship between traditional communities and the Earth. It is both evolutionary and dynamic in perspective, as well as being inherently conservative in the manner in which it is handed down. Frequently, it is articulated within a context of spirituality, and it is expressed in terms of roles, respect and responsibilities. It is part of a worldview that is ecological in the broadest sense in process and in organization.

Traditional ecological knowledge is traditional systems thinking in action. It is unique to the peoples who formulate it, based on the interaction of their culture with their environment, and integral to their worldview. In the past, traditional ecological knowledge and the belief systems of which it was a part were not universally accepted and admired by civilized Europeans. For example, some Europeans rejected indigenous knowledge and experience as pagan and, therefore, invalid when examined against a Christian framework. Others, like the European whalers, who were willing to rely on Inuit knowledge to direct them to new Arctic whaling grounds, or to harpoon whales more efficiently, exploited the indigenous peoples, their knowledge and their resources. For the indigenous peoples of the Americas, contact with Europeans has resulted in loss of lands, resources, languages, cultures and lives. Colonization has also despoiled and depleted the environment. Bearing in mind the exploitation of people, animals, trees, rocks and waters which indigenous peoples in these lands have already seen, it is not hard to understand why some feel that taking their knowledge is also exploitative and unacceptable.

Recently some of those concerned with envi-

ronment and natural resource management have begun to appreciate the intrinsic values of indigenous knowledge and belief systems for their ecological understanding. Yet without addressing fundamental issues like self-determination, restitution of lands and resources, and compensation, how can power be shared in a way which will ensure that traditional knowledge will not be misunderstood or misused? Many indigenous peoples are concerned with control of traditional knowledge because they fear its misuse and lack the power to prevent it.

Other questions remain with respect to the issue of who is to have access to traditional knowledge. While some societies see universal access to education as a fundamental right, other societies see access to traditional knowledge of various kinds as limited to those who prove themselves worthy of the privilege or to those who are in some way selected for or born to special status.

### **New Synthesis: Proposals for the Way Ahead**

There are essentially two options for consideration and implementation of TEK. The first is the process of accommodating these other traditions of knowing within the current dominant legal and scientific context. Central to the success of any such attempt to obtain acceptance of TEK and of the role of traditional communities through accommodation is the premise that our legal and scientific frameworks are dynamic, capable of accommodation, and have branches of thought to which intellectual grafts may be made. This approach also requires that accommodation be clearly distinguished from assimilation.

In the case of international law, which is rapidly becoming the dominant framework for action with respect to human rights and the

environment, we see incongruity where individual rights frameworks are bent in the effort to accommodate collective rights and non-human interests. A return to the earlier natural law foundation depicted by Pufendorf would create opportunities for the development of non-state international law. Such a development would also allow for evaluation of many of the judgments and decisions made in the process of the substitution of the Western European norms and values for those of other peoples around the world, including those of indigenous peoples in North America.

Another possible point of attachment to the dominant worldview for TEK is that of a renewed western science of ecology based on nature, such as that proposed by Lovelock. Unfortunately it is not clear that the dominant view of scientific ecology is prepared to make this accommodation at present. This leaves the practice of accommodation to the process of applied management on an ad hoc basis. This is where much of the real action of implementing TEK is occurring, for example in management boards where traditional communities using resources have won hard-fought political battles to become participants in the resource management process, and are asked to provide their views of scientific studies as well as their insights based on traditional knowledge.

Even where accommodation does occur, it does not necessarily happen easily. For example, the case of aboriginal whaling in the Western Arctic provides an example of this process, including phases of denial, acceptance, and accommodation of TEK by the dominant paradigm. In the early 1980s it became clear that the Inuvialuit, the Inuit of the Canadian Western Arctic, were deeply concerned about the abrogation of their traditional rights to take bowhead whales. The denial of aboriginal rights, history

and TEK had reached the point where scientific experts rejected claims to bowhead whaling and the traditional whaling history of the Inuvialuit because they just did not know it. At the request of some Inuvialuit, an effort was made to document their traditional ecological knowledge of bowhead whales and bowhead whaling. Despite a long period of contact with the dominant western society, and the suppression of their language and traditional ways by religious and educational authorities, who until quite recently were one and the same, it became clear that the tradition of bowhead whaling could be supported by the evidence of traditional knowledge (Raddi and Weeks 1983). In turn, this evidence established an historic claim, which was accepted, but was insufficient to gain consideration of a contemporary hunt due to conservation concerns based on western scientific knowledge of the stock. Ultimately, this prevailing scientific knowledge was effectively challenged by modern indigenous knowledge collected according to scientific principles, representing the final stage of accommodation of elements of TEK into the western scientific framework (Freeman 1988; Freeman et al. 1992).

As a consequence of the acceptance of this new information by the international scientific community associated with the International Whaling Commission, the Inuvialuit expectations of authorization for resumption at some level of their traditional subsistence hunt increased. Under Canadian law the *Inuvialuit Final Agreement of 1985*, which provided for a comprehensive land claims settlement, was recognized. One of the pertinent provisions of this agreement was a section stating that, where there was no conservation issue with respect to a stock of fish (which by definition includes marine mammals according to Canadian law), the Minister shall issue a permit to authorize such

harvest where requested. Under the 1983 amendment to *The Constitution Act*, this settlement was constitutionally protected.

The Inuvialuit with whaling traditions had been seeking a resumption of the bowhead hunt since the late 1970s, and by 1985 they had obtained a legally recognized, constitutionally protected right to do so. However, it was not until 1991 that after much careful consideration on both sides that a permit was granted and a whale was taken. Unfortunately, by this time many of the elders who worked for the restoration of their rights to utilize their traditional ecological knowledge in the pursuit of traditional activities were no longer alive. The process of accommodation is selective and slow.

Rather than lobby for the piecemeal adoption of TEK into the dominant western science or law, we could attempt to understand it as a whole. TEK is after all an approach to understanding and action that is culturally and geographically specific. It often comes with rules for its use, transmission and conservation. These rules are based on understandings of power, on traditions and on collective wisdom. The removal of TEK from its paradigm and its importation into another dominant worldview does violence both to TEK itself as a source of knowledge, and to the communities from which it comes. The issue is not one of unwillingness to share TEK necessarily, although there are those who feel this way. Rather, it is a recognition that unless power is shared as well and TEK is accepted as a whole, benefits may not be equitably distributed. Worse than this, the paradigm from which TEK comes and its actual cultural coordinates may be further eroded. The exploitation of traditional knowledge of medicinal plants by academics and pharmaceutical manufacturers is a classic example of the inequitable distribution of benefits as well as the

unequal application of laws designed to protect intellectual property. Just as utilitarian arguments about the preservation of rain forest end up drawing new terms in the old environment-development calculus rather than changing the calculus itself, the growing popularization of TEK will achieve little if the rights and responsibilities of the indigenous peoples and other traditional communities to whom it belongs are not respected.

There have been many eloquent and moving statements by indigenous peoples in North America about their traditional paradigms, and also about the agreed relationship between their context and that of the European newcomers. The Two Row Wampum of the Mohawks is a particularly graphic example. This shell tapestry depicts symbolically two parallel rivers, one to be traveled by the Europeans in their masted sailing vessel, which was understood to contain their traditions, laws and rights; and the other to be traveled by the Mohawk People in their canoe, which was understood to contain their traditions, laws and rights. Thus two parallel, independent, peacefully coexistent societies were envisioned by the Mohawk People (Henry Lickers, personal communication). The Mohawks were able to propose a solution for a situation with which the western mind continues to struggle hundreds of years later.

Today we see that western frameworks have given rise to large scale activities which have drastically impacted the Earth itself in many areas, impairing the quality of the environment and making the parallel existence of other societies all but impossible. As a consequence, there are great efforts to find threads within the dominant paradigm which can be used to mend the tears and produce a workable whole. For example, we see a shift toward interdependency in international environmental policy and toward



global perspectives in scientific thinking.

Many believe that our species and our Earth are approaching a crossroads. Even more agree on the need for change in terms of human values, behaviors and institutions. Some favor an elitist approach, driven by the dominant value system of western liberal industrial democracies. Others seek inclusion of many different voices and views within the dominant paradigm through accommodation or assimilation. These discussions have implications for traditional communities and for traditional ecological knowledge. If the dominant paradigm takes only the tools of TEK and assimilates them, we may see changes, but they will be circumscribed by the assumptions of that dominant paradigm.

There is an alternative to solutions based on accommodation/assimilation or elaboration of static frameworks of human rights if we are prepared to seek fundamental change. This preliminary paper has introduced the consideration of traditional ecological knowledge as an element of a worldview rather than as solely instrumental knowledge or as mere technology.

The alternative of natural law is perhaps most significant at the level of state frameworks. However, if the need for fundamental change is also understood to extend to reshaping the values of individuals as well as states, the exploration of natural law remains relevant. From the perspective of natural law, we have within us the capacity to change our views, and our frameworks. Thus we have the opportunity to develop those practices of mind and politics which will enable us to respect nature and each other. More pointedly, we have the opportunity to look beyond the instrumental value of traditional ecological knowledge to the value systems within which it is situated, and to listen to that wisdom with our minds as well as our hearts. Recognizing the significance of this work of lis-

tening, of understanding and of evolving respectful frameworks, an area of concern to which TEK research can contribute and as from which TEK can benefit, this paper advances the argument that natural law offers common ground for the continuing evolution of values and norms, and for the respectful inclusion of non-state interests, including traditional communities and traditional ecological knowledge. This preliminary paper is part of a body of work in progress which seeks to explore relationships among human experience, nature, law and science; it suggests strongly that traditional ecological knowledge will remain a critical focus for research and application in the development of new frameworks.

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## 6. African Indigenous Knowledge and its Relevance to Sustainable Development

*Andre Lalonde*



Many scientific and social researchers have begun to recognize the positive role that indigenous knowledge of the local ecosystem can play in the formulation and implementation of sustainable development policies and projects in developing countries. A similar conclusion was made in the final statement by the World Commission on Environment and Development (1987:12):

“Some traditional lifestyles are threatened with virtual extinction by insensitive development over which the indigenous peoples’ have no participation. Their traditional rights should be recognized and they should be given a more decisive voice in formulating policies about resource development in their areas (particularly in complex rain forest, mountain and dryland ecosystems).”

While it is clear that the concept of traditional ecological knowledge does not exclusively belong to indigenous peoples in Africa, research on African indigenous ecological knowledge is currently relevant for the following reasons:

- i) The long-term generation and transmission of knowledge of the local ecosystem offers a unique historical perspective into indigenous risk adjustment options. Modern scientists involved in the management and conservation of areas that may be ecologically fragile or marginal, or that contain genetically important plant or animal biodiversity, may benefit greatly from such alternative knowledge.
- (ii) There is growing international support and political recognition for universal human rights in development activities. Public

opinion is also calling for the physical and cultural protection for the remaining indigenous societies (including key elders and their languages).

### **The Nature and Development of African Indigenous Knowledge of the Local Ecosystem**

This paper investigates some of the positive traditional management practices in rural Africa which have been adapted and passed down over countless generations in harmony with the short and long-term carrying capacities of the local ecosystem. Some of these positive practices are based on symbolism, and involve spiritual rituals, religious practices, social taboos, and sacred animal totems. Other positive practices are based on the experiential, involving travel in order to learn from the experiences of other farmers, hunters, gatherers, fishermen, herbal medicine healers, and artisans. The traditional keepers and users of local ecological knowledge and wisdom are typically the key elders from rural African communities.

The ecosystem view of many indigenous African societies is reflected in the following traditional management practices which encompass individual and community wisdom and skills (Atteh 1989):

- indigenous soil taxonomies
- indigenous knowledge for potential use of local plants and forest products, and animal behavior and acquired hunting skills
- local knowledge of important tree species for agroforestry, firewood, integrated pest management, the control of soil erosion and soil fertility, and fodder management
- indigenous agronomic practices such as terracing, contour bunding, fallowing,

organic fertilizer application, crop-rotation and multi-cropping

- indigenous soil and water conservation and anti-desertification practices

The development of indigenous knowledge, or the change in the application of acquired ecological knowledge, is predicated upon conscious efforts by both individuals and the local community to better understand and live within the dynamic carrying capacity of the local ecosystem. Although most innovations in the application of indigenous knowledge are typically regarded with caution by traditional societies in Africa, under special circumstances they may be readily accepted by the entire community. Such circumstances may occur when local ecological and climatic conditions have dramatically changed, or have become stressed to the point of threatening collective and individual survival. Famine caused by drought, deforestation, desertification or topsoil erosion, and declining productivity are some circumstances which may encourage or necessitate the acceptance of innovation.

In some of Africa's most ecologically fragile and marginalized regions, knowledge of the local ecosystem simply means survival. As so much is at stake in changing traditional natural resource management practices, any proposed change is usually based on an informal evaluation and consultation process among key community members (usually a peer group involving elders). By sharing and comparing knowledge of key indicators that describe ecological responses to change or the prediction of environmental trends, the community can weigh the long and short-term costs and benefits of change related to any new innovation or application of local ecological management systems.

### Differences between Indigenous African Knowledge and Modern Scientific Knowledge

Table 1 provides some theoretical comparisons between the knowledge paradigms of scientists and indigenous societies. The fundamental differences between the two knowledge paradigms are characterized by an old African proverb which states “when a knowledgeable old person dies, a whole library disappears.” As practitioners, guardians and educators of indigenous knowledge, the death of key elders (along with the current disinterest of youth to learn traditional ways and languages) can severely limit and threaten existing sustainable livelihoods. Unlike the documented scientific system, much of the remaining traditional ecological knowledge in Africa exists only in oral form, passed on from knowledgeable individuals through shared practice and story-telling.

Indigenous knowledge systems were altered and disrupted in Africa during the colonial period. This disruption is currently perpetuated by

the inequitable north-south political and economic system, where indigenous knowledge systems are often ignored, under-valued or replaced by colonial, state practices.

### Opportunities for Maintaining and Transferring Indigenous African Ecological Knowledge

An important question facing development organizations that are interested in learning from indigenous knowledge is how to evaluate this alternative body of knowledge. Despite the inherent differences between traditional and scientific knowledge systems, innovative mechanisms are being sought by scientists such as anthropologists and development planners, to integrate both systems effectively in order to facilitate sustainable natural resource management planning. To achieve this, it is necessary to document, and consequently gain credibility and respect for the existing body of indigenous knowledge for the four agro-ecological regions in Africa (i.e., humid equatorial/coastal lowlands, sub-humid

**Table 1: Comparison of indigenous knowledge and western scientific knowledge (Wolfe et al. 1991)**

Comparison	Indigenous knowledge	Western scientific knowledge
Relationship	Subordinate	Dominant
Dominant mode of thinking	Intuitive (holistic)	Analytical (reductionist)
Communication	Oral (storytelling, subjective experiential)	Literate/didactic (academic, objective, positivist)
Data creation	Slow/inconclusive	Fast/selective
Prediction	Short-term cycles (recognize the onset of long-term cycles)	Short-term linear (poor long-term analysis)
Explanation	Spiritual (the inexplicable)	Scientific inquiry (hypothesis, laws)
Biological classification	Ecological (inconclusive, internally differentiating)	Genetic and hierarchical (differentiating)

tropical uplands, semi-arid zone, and arid zone).

An understanding of African indigenous knowledge systems within the cultural framework can help a development planner to understand more fully the dynamics of the local ecosystem. This approach can help establish a more flexible atmosphere through joint cooperation between the development planner and the affected indigenous community. For example, indigenous ecological knowledge may be utilized to suggest project site alternatives or mitigative measures which could help avoid or reduce inadvertent long and short-term damage to the ecosystem and traditional culture. As well, indigenous management practices and appropriate technology innovations that are implemented in partnership between development organizations and indigenous societies can also be adapted to help solve ecological problems faced by other societies in similar agro-ecosystems.

### Case-Studies

The following case-studies are included to provide some lessons learned by recent development initiatives in Africa. The case-studies utilized local indigenous knowledge to varying degrees in order to undertake traditional, low-cost approaches to protecting and sustainably utilizing the following four natural resource management strategies:

- maintenance of biological diversity
- biological and crop pest control strategies
- recycling and fixation of soil nutrients
- strategies to conserve soil and water

### Traditional Use of Neem Tree Bio-pesticides

Although traditional pest control systems were once widely used in tropical countries, their use has been severely disrupted by the introduction of modern agro-chemicals. This dependence on

expensive modern pesticides, apart from posing a potential threat to the health of the poor traditional farmer, is often poisonous to the local ecosystem (Heeds 1991).

The earliest known mention of poisonous plants having bio-pesticide properties is found in the Indian Rig Veda (2000 B.C.). Today, there are some 1,600 plant species which have been reported to possess such properties. The neem tree *Azadirachta indica* is one of the most promising (Hoddy 1991). The neem tree, or Indian lilac, is a hardy and fast-growing deciduous tree which is drought and salt tolerant. It can be grown on marginal soils with low fertility due to its powerful root system which can extract nutrients from deep layers of badly leached and sandy soils (Heeds 1991).

Throughout India and Africa, traditional farmers have known about the insecticidal properties of the neem tree for centuries. In Niger and Mali, farmers have long observed the immunity of its leaves to desert locust attack (Emsley 1991). Although not as powerful as synthetic pesticides, the neem extract contains 20 active ingredients, which makes it difficult for any insect pest to develop a resistance to them all (Hoddy 1991).

Some farmers in India and Africa are using scientific assistance to develop a neem spray made from the seeds of the fruit. It works as a repellent and antifeedant to many chewing and sucking insect pests in the larva or adult stages, including desert and migratory locusts, rice and maize borers, pulse beetles, and rice weevils. It also upsets the insect's hormone balance so that it becomes permanently incapacitated (Heeds 1991).

A recent seminar organized jointly by the NRI (Natural Resources Institute of Britain's Overseas Development Administration), provided a forum for African farmers to exchange

views on ways of reducing crop losses due to pests. The NRI, working on the Mali Millet Project, described how indigenous farmers in north-western Mali placed leaves of the neem tree under the millet heads when they lay them on the ground to dry. This practice discourages insect infestation (Pickstock 1992). A project funded by USAID recently brought together a team of entomologists and social scientists from Niger and the University of Minnesota to promote the exchange of indigenous knowledge on the uses of neem products in improving the sustainability of traditional agriculture in Niger (Warren 1991).

Chemists in 1988 determined the chemical structure of the neem tree extract, azadirachtin (Emsley 1991). Currently, over a dozen companies in industrialized countries are working on commercial neem products. In 1983, the American Environmental Protection Agency registered a commercial neem pesticide for marketing under the name "Margosan-O" (Hoddy 1991). Efforts are on-going to discover a chemically modified version of azadirachtin that is stable and as effective as naturally occurring neem (Emsley 1991).

#### Traditional Use of Fertilizer Bush and Agro-forestry

Since the 1960s scientists have recognized the validity of the traditional bush-fallow system associated with shifting cultivation or slash-and-burn agriculture. Agricultural experts and extension workers have since developed a low-cost and labour intensive farming system called alley cropping, an adapted technique which capitalizes on the beneficial attributes of bush fallow, yet overcomes some of its limitations (Lal 1990). With alley cropping, food crops are grown in wide rows that alternate with hedgerows of nutrient-producing trees and shrubs (for

example, *Leucaena* and *Acacia albida*). The hedgerows are pruned periodically, and the nitrogen rich material is returned to soil as mulch, which inhibits weed growth and retains soil moisture. The hedges are usually planted along the contours of sloping land in order to act like terraces by decreasing water runoff velocity and subsequent soil erosion.

Between 1984-88, the International Livestock Center for Africa (ILCA) and the International Institute of Tropical Agriculture (IITA) were involved in various on-farm research projects that introduced alley cropping to indigenous Nigerian farmers, particularly women. This was encouraged through the use of local theater and songs for promoting ecological knowledge and resource management skills (Cashman 1991). An innovative technique used in this project to overcome the suspicion and hesitance of local farmers, and to encourage them to adopt the foreign phrase "alley cropping", involved the re-naming of the term to "fertilizer bush" (Cashman 1991). This new phrase conveyed the primary benefit through a play which included catchy tunes and lyrics to describe the benefits of alley cropping.

#### Zimbabwe's Local Government Reform and the CAMPFIRE Program

Resulting partly from colonial rural land-use policies, and current social constraints such as increasing poverty and rising populations, the majority of indigenous communal farmers in rural Zimbabwe currently live on land which is typically marginal and degraded (Thomas 1991). The resulting unsustainable management of common resources due to inappropriate farming and hunting practices (for example, poaching) are indicative of Hardin's (1968) term "the tragedy of the commons".

In partial response to this dilemma, one of



Zimbabwe's most significant rural development policies implemented since independence was local government reform, which was tabled in 1980 with the District Councils Act (Mutizwa-Mangiza 1990). This reform measure, intended to revive rural local government, was followed by a formal decentralization policy in 1984. In 1988, a change to this policy was the move towards amalgamation of rural councils (large scale commercial farming areas) and district councils (areas where most peasant farmers live communally), through the Rural District Councils Act (Mutizwa-Mangiza 1990).

Unfortunately, the decentralized structure has effectively stripped traditional chiefs and headmen of their land allocation and judicial powers. These powers were transferred to the Village and Ward Development Committees, and to a system of community courts, respectively. Given the inextricable and fundamental links between traditional religion and customary land tenure, ecologically sound land allocation based on knowledge of the local ecosystem is difficult without the involvement and consent of the traditional chief and headmen (Mutizwa-Mangiza 1990).

As part of the above devolution process, Zimbabwe has recently undertaken an innovative wildlife co-management program. The program recognizes and includes the knowledge of indigenous people, for the sustainable management of threatened or economically important wildlife and marginal agricultural land (CAMPFIRE). This program aims to place the management and fair benefits back into the hands of local rural communities (Thomas 1991).

A factor paramount to the success of the CAMPFIRE program is that the benefits of a sustainable wildlife co-management structure be shared equitably with the local producer communities (Thomas 1991). This involves a challenge for developing local institutions which are

capable of developing effective linkages with state authorities while developing appropriate management structures. A common constraint on the implementation of effective co-management common property resource regimes involves the preponderance of stakeholders, whose interests and activities often run contrary to those of the local inhabitants. This can present serious problems to the eventual evolution of effective co-management institutions (Murombedzi 1991).

### Barabaig Sustainable Pastoral Management in Tanzania

This United Nations Research Institute for Social Development (UNRISD) case-study investigates some of the impacts on the traditional land management practices of the Barabaig, a semi-nomadic pastoral group in Tanzania, imposed by a large-scale agricultural development scheme.

Over many generations, the Barabaig have learned to sustainably exploit various foraging regimes based on sophisticated seasonal grazing rotations. The forage regime of most importance to the Barabaig is *muhajega*, a highly nutritious mix of grasses and herbs which grow on fertile soils that collect in depressions on the Basotu plains in Hanang district. The *muhajega* is highly valued by the Barabaig for its capacity to produce high milk yields and stimulate cattle growth, as well as to improve the recuperative powers of livestock suffering ill health from stresses involved with dry season and droughts (Lane 1990).

In this sub-Saharan region of Africa, the availability of water is the most limiting factor in the sustainable use of the common property. The Barabaig recognize that their use of land is limited to the right of usufruct, which permits the use of common land only when it is not denud-

ed beyond recovery or when other users are not disadvantaged (Lane 1990).

Partly in response to an expected increase in the demand for wheat in Tanzania and the inherent fertility of the muhajega, the Tanzanian government appropriated large tracts of land, including much of the fertile Basotu plains to implement a large-scale and controversial foreign-aid wheat scheme called the Tanzania Canada Wheat Program (TCWP) (Lane 1990). Much of the rationale involved in the appropriation of traditional Barabaig muhajega was the appearance to development planners and scientists that Barabaig land was often left vacant or "lying idle" (Young 1983). Lane (1990) assumes that these descriptions probably meant that the land was perceived as underutilized and that it could be used for more productive purposes.

In reality, this is representative of Barabaig traditional knowledge of the dynamics of seasonal grazing regimes and the need to let the ecosystem recover through fallow periods. The Barabaig have learned that, to make efficient use of natural resources, access to grazing needs to be controlled to prevent exploitation past the ecosystem's carrying capacity. All Barabaig forage regimes are subject to strict and complex restrictions developed and enforced by a hierarchy of Barabaig jural institutions that control the use of land, interpret customary rule, and adjudicate in rare conflicts over rights and duties (Lane 1990).

Recently, a powerful women's council called on men to account for allowing sacred land and trees to be plowed up for farming. The council threatened those involved in the illegal farming with a curse. Threatening a curse is effective because all Barabaig believe that a curse will bring ruin to people's lives (Lane 1990). This helps the Barabaig to protect and sustain all common resources for equitable benefit. For example, although surface water is universally accessible to

all Barabaig, routes to and from water sources are not to be restricted by homestead construction, and shared water sources must not be over-used, diverted or contaminated (Lane 1990).

Along with some of the adverse erosion such as gullies and sheet erosion resulting from ecologically inappropriate mechanized mono-cropping of wheat on the Basotu plains, and increased Barabaig reliance on the remaining forage regimes (i.e., unsustainable grazing rotations due to excessive grazing demand and hoof traffic), the overall carrying capacity of the forage ecosystems has been significantly lowered. This has serious implications for both the Barabaig people and the long-term fertility of the Hanang plains.

Lane (1990) admits that "although as yet, it is impossible to reveal a direct link between the TCWP and lack of Barabaig well-being, indications are that, whatever the scheme is achieving in production of wheat, it is failing to advance the welfare of neighboring Barabaig communities." Lane (1990) also points out that the plight of the Barabaig is, unfortunately, typical of a much wider problem for herdsmen throughout Africa who rely on the common resources of the local ecosystem. Existing traditional common land tenure systems should, in future, be recognized for their efficient or sustainable land-use regimes based on accumulated indigenous knowledge and local culture.

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## 7.

# Community-Based Economic Development and Resource Management in the Hudson Bay Area

*Miriam McDonald and Brian Fleming*



This case study examines how traditional knowledge is utilized in the development and management of a common-property resource in an Inuit community in northern Canada. As Freeman (1979, 1985), Gunn et al. (1988) and Nakashima (1990, this volume) suggest, Inuit traditional knowledge can contribute significantly to Arctic wildlife management. McDonald (1988) and Nakashima (1991) further identify the need to develop appropriate institutions so that this rich source of knowledge is applied and incorporated into decision-making for wildlife resource management. In this respect, we suggest that the development of community-based institutions is required for wildlife management to devolve in the Canadian Arctic as discussed by Usher (1986).

### **Human Ecological Dimensions**

The Belcher Islands are situated in the Canadian low Arctic, approximately 150 kilometres off the west coast of Quebec. They constitute a unique archipelago of about 1,500 low-lying islands encompassing approximately 1,930 square kilometres in southeast Hudson Bay. The community of Sanikiluaq, situated at the northern end of the main island, was established by the federal government in 1970 to administer and

serve the Inuit living in the Belcher Islands. In the early 1980s, Belcher Island Inuit became interested in acquiring cleaning technology to facilitate commercial harvesting and processing of eiderdown. The eiderdown is gathered from a non-migratory population of eider ducks known as the Hudson Bay Eider (*Somateria mollissima sedentaria*), and is also one of the few resources available with sufficient commercial potential to directly support the traditional subsistence

economy of hunting and soapstone carving.

In the Belcher Islands, eiderdown is a common-property resource which every household can harvest, or obtain through sharing and distribution among kin. It is collected in July as a seasonal activity contributing to the overall value of subsistence hunting during the summer months. Community hunters are familiar with the distribution of eider nest colonies in the islands. There is also a diversity of wild foods available during the month of July. Hence, specific places for harvesting eiderdown depend upon personal preferences, other wildlife harvesting opportunities, economic needs and environmental considerations. Accordingly, it is often harvested by families in camps or on daily hunting excursions from the settlement.

### **Management Needs**

Research into domestic use of eiderdown indicated there was no need to alter existing harvesting patterns for management purposes (Municipality of Sanikiluaq, 1990). People essentially followed traditional patterns of harvesting based on need. Community residents suggested, however, that the introduction of commercial harvesting could lead to overuse and cause negative impacts on the eider nesting population. Thus, specific reasons for developing a community-based system to manage commercial eiderdown harvesting included:

1. hunters' concern that, if not managed, the introduction of commercial activity may cause the population to decline;
2. the community having to demonstrate its management capability in order to receive territorial government economic assistance to develop commercial opportunities;

3. a management system having to be in place in order to obtain a commercial eiderdown harvest permit from the federal government.

### **Development of a Commercial Management System**

In adopting a community-based approach, the community identified the Hunters' and Trappers' Association (HTA) as the agency responsible for managing commercial harvest. In turn, the HTA sought synthesis of western-based information derived from scientific techniques, and their own knowledge derived from the community's long-standing use and observation of the Hudson Bay Eider. This synthesis was evident in the HTA's request for information, discussions of ecological considerations for introducing commercial harvest, and decisions regarding management practice.

Research and workshops with the HTA guided development of the management plan. Towards this end, the HTA reviewed a number of standard management practices provided by the Canadian Wildlife Service. Nest surveys were conducted over four years to provide baseline information important to economic planning and commercial management (Nakashima and Murray 1988; Municipality of Sanikiluaq 1987, 1990). Research on the harvest and use of eiderdown was also undertaken to understand existing land-use patterns in relation to the Hudson Bay Eider, other animal and bird species, and the socio-economic needs of the community (Municipality of Sanikiluaq 1990).

Analysis of the foregoing initiatives resulted in the HTA essentially adopting an adaptive approach to management based on monitoring and regulating commercial use as necessary. It further resulted in the HTA deciding that the traditional, open access system of harvesting was

important to maintain, and that it could sustain commercial activity by:

1. setting annual quotas for a harvestable surplus rather than fixed quotas based on total estimated resource availability;
2. encouraging and reinforcing traditional codes of conduct and practice in eiderdown harvesting;
3. monitoring the use of nesting areas by comparing commercial returns with baseline information from a population census.

The HTA decided to set annual quotas for the commercial harvest of eiderdown which, in any given year, fluctuates between an upper biological limit representing the maximum harvest the resource can sustain without causing adverse effects to the nesting population, and a lower economic limit indicating the minimal harvest required to sustain a community-based eiderdown industry (Figure 1).

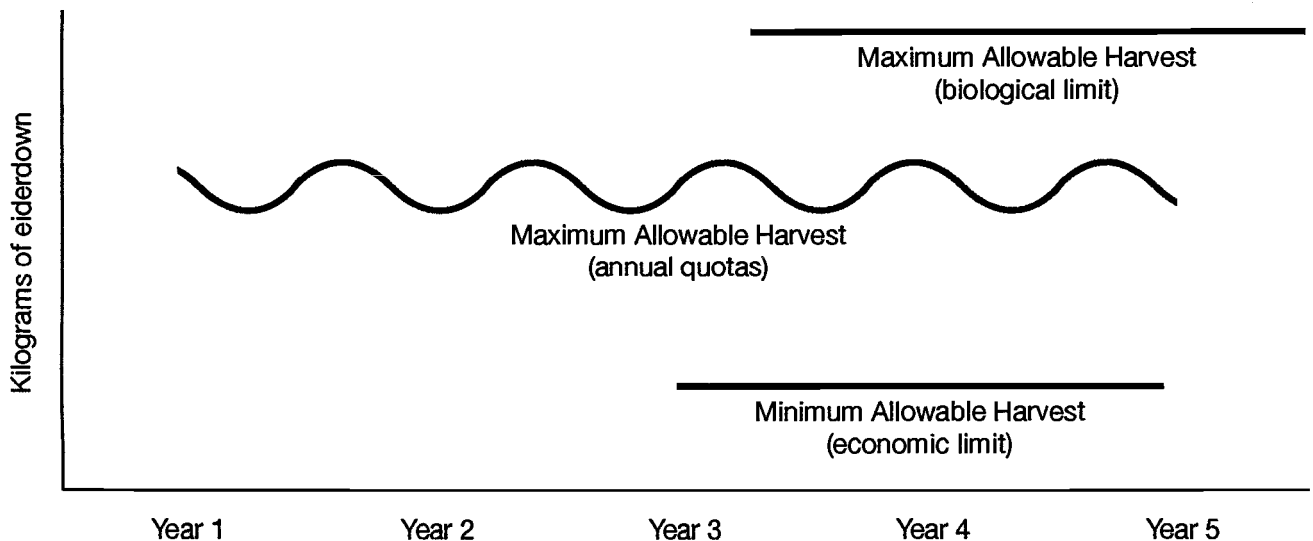
For purposes of setting annual quotas, the

cooperative tabulates by region and reports to the HTA the amount of eiderdown that they have purchased in the previous year. Concurrently, the cooperative provides the HTA with a demand forecast based on the expected volume of products they intend to manufacture from eiderdown and to sell in the upcoming year. Upon its receipt, the HTA reviews and evaluates this information by: (i) comparing the amount of eiderdown in each region to baseline estimates, and (ii) assessing the harvest information in relation to relevant ecological factors based on hunters' observations of the eiders during previous seasons. In this way, the culturally-encoded ecological knowledge of community residents becomes implicit to the management process; this is a crucial element that essentially provides meaning to the quantitative information available from annual harvesting records.

### Value and Contribution of Traditional Ecological Knowledge

In the research and development phase, the HTA identified a number of ecological considerations

**Figure 1: Commercial Harvest Limits**



that provided the context for utilizing results from the nest census. These included identification of key factors influencing the eider population such as availability and access to open water during the sea ice period. Although people, polar bears, foxes and sea gulls depend on eiders for food, the hunters regard availability of open water in winter as the main factor influencing the ability of eider ducks to survive.

The nest surveys also verified hunters' knowledge about the abundance and distribution of nest colonies. Subsequently, the HTA identified methodological problems with monitoring the population based on information from the nest census. People observe the Hudson Bay Eider nesting in different islands each year. Thus, fluctuations in nest colonies on individual islands could reflect changes in nesting distribution rather than changes in population size.

In identifying limitations to harvesting, the HTA advised that the amount of eiderdown available would be less than the annual production estimated from census results. Some of the eiders nest on remote islands that are difficult to access. Environmental factors such as wind and sea ice limit the outcome of all summer harvesting activities in the marine waters surrounding the Belcher Islands. People require eiderdown for domestic use. Articulation of these variables helps measurably in determining the supply of eiderdown available for commercial use. Additional features of the community-based management system were discerned from HTA discussions on the practicality, relevance and potential population impacts resulting from the implementation of standard management practices. Essentially, the community did not want the introduction of commercial harvesting to disrupt existing patterns of harvest and use. Therefore, in the absence of an overharvesting problem, the HTA did not want to restrict

people's access to nesting regions.

Wind, rain, sea ice and strong currents were again identified as natural limitations on annual harvesting efforts as the HTA was concerned that further restrictions might induce competition among harvesters, and might increase harvesting pressure on some nesting colonies. Likewise, the HTA did not favour hiring people to collect eiderdown for commercial production, and chose not to designate nesting areas according to type of use: commercial, domestic or wildlife sanctuary. They considered commercial harvest zones a potential problem because economic factors might assume greater importance than ecological considerations. Also, in the HTA's worldview, the eiders already have natural sanctuaries based on the principle that if the eiders are disturbed too much, they will nest in an area which is less accessible to humans the following year. As such, areas difficult for hunters to access due to prevailing winds and strong currents were identified as natural nesting sanctuaries for the Hudson Bay Eider.

Finally, the introduction of nest enhancement programs was regarded with skepticism by the HTA. Nest shelters were established on one island in the 1960s, but the eiders stopped nesting on that island for several years. Individual hunters further questioned if it was practical to increase population size through nest enhancement when the population is already limited by availability and abundance of open water in winter.

### **Commercial pilot harvest**

In 1990, the first commercial pilot harvest was conducted. The HTA set a commercial quota at 33% of the total harvestable supply based on a forecasted demand provided by the community's eiderdown cooperative. The remaining

67% of harvestable supply was designated for potential domestic use.

Only 36% of the commercial allocation was actually purchased, however, due to widespread sea ice severely restricting marine travel during the nesting period. As a result, as little as 1% of the eiderdown available in some regions was harvested.

In 1991, the 1990 harvest records enabled the HTA to advise the community of regional harvesting patterns. However, the HTA did not change the commercial quota in light of the environmental factors limiting the 1990 harvest, or in recognition that only 10.4% of the harvestable supply had been commercially harvested.

### Conclusion

This paper examined briefly how traditional ecological knowledge of the Belcher Island Inuit is incorporated into the development and management of a community-based eiderdown industry. The industry requires further development to commercially establish itself; however, the community has adopted a management plan to facilitate sustainable use of this important common property resource.

An important aspect of this management initiative is that it is designed and controlled by the community through the HTA and eiderdown cooperative. The management system is designed to continuously generate relevant information about the local eider duck population and its use through careful monitoring.

These monitoring activities include the distribution and amount of eiderdown harvested. They also take into account a complex of ecological factors that encompass several decades of observation from seasonal hunting activity. For example, the fall subsistence hunt for eider ducks provides a preliminary assessment of the annual rate of recruitment. Similarly, the extent

of winter mortality is observed while hunting other species during the sea-ice period. Through these kinds of assessments, important population trends can be detected over the long-term.

As information is discussed and reviewed in the community, concerns for the resource can be identified and appropriate responses formulated by the HTA to resolve problems. As such, management and use of the resource remains an adaptive process, whereby relevant information is gathered and examined by the community to negotiate a sustainable relationship with the resource through time. So long as monitoring and management of the resource is carried out by community residents, we have little doubt that the traditional ecological knowledge of the Belcher Island Inuit will continue to have a significant role in the use and management of the Hudson Bay Eider.



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## 8.

# Native Land Use and Common Property: Whose Common?

*Carl Hrenchuk*



Development in northern Manitoba has a largely industrial focus. The pace of development varies in relation to southern investment initiatives, commodity prices, and government subsidization. It operates on a set of underlying and implicit assumptions regarding historical and contemporary Native land and resource use, the nature of resources, and the character of the land. These presuppositions form the basis for continued misunderstanding between southern-based governments, or corporations, and Native communities in the North regarding future land use and development. The purpose of this

paper is to introduce three prevalent views regarding property, land, and resources, and to contrast these viewpoints with results from a case study of land use and occupancy from a northern Manitoba community. These data will explicitly demonstrate the basis of a differing understanding of land and resource issues. They will demonstrate the existence and operation of traditional ecological knowledge in the activity of resource harvesters from the community. The study results will also fundamentally contradict

the presuppositions which guide much of our thinking on northern development issues.

I will first review prevalent views of wilderness, Crown lands, and common property. It is both valid and instructive to look at ideas concerning northern lands which are widely held in society. It is these, as well as the fundamental constitutionally-defined arrangements under which lands and resources are governed, which shape legislation and development proposals for these lands. Then I will briefly introduce the

rationale and methodology of land use and occupancy studies. Through data obtained for and from the people of the Cree community of South Indian Lake, the land uses, the competing interests in land, and the meaning of historical and contemporary occupancy will be discussed. A summary of relevant property and resource management issues will conclude the paper.

### **Prevalent Views of Land and Resources**

In a Canadian setting, indigenous peoples are minority populations in all jurisdictions, with the exception of the Northwest Territories. Regionally, the North in Manitoba would have a majority Native population only if northern urban centres were excluded from consideration. It is, therefore, readily understood that, where viewpoints at odds with those of the mainstream population are held by Native groups, these perspectives might be unknown or discounted by the majority. In the case of lands and resources, northern Native perceptions are based on traditional ecological knowledge, the knowledge gained in current and historical use and in occupation. Nonetheless, it can be suggested that despite this empirical underpinning, Native perceptions and knowledge do not figure highly in the formulation of prevalent mainstream views of land and resources.

The first concept for review is that of *wilderness*. The Concise Oxford Dictionary mentions "desert, uncultivated and uninhabited tract", citing biblical references. The notion of wilderness carries with it a sense of wasteland which is empty and somewhat threatening. A contemporary understanding derives from and also departs from the dictionary definition.

There are wilderness parks, wilderness preservation groups, and wilderness activities. All these uses of the term are common in contemporary speech and seem to be commonly under-

stood. On the whole, the concept seems to involve lands which appear to have been predominantly unaffected by human activity and which are without permanent human settlement. This notion requires that the area be uninhabited and unspoiled. But wilderness travellers have discovered another element which seems to have been missed in the formal definition. The term wilderness carries with it a sense of awe or mystery encountered, which endows the land with added value. The requirement that the land be apparently untouched remains; wilderness travel is somehow spoiled by encounters with other groups of humans. The sense that "maybe no one else has been here before" seems to be an aspect of the wilderness experience. Wilderness parks may place restrictions on the number and timing of visitors, or limit travel to non-motorized vehicles in order to preserve this character of the experience.

Therefore, in the popular imagination, wilderness is seen as natural, uninhabited, and somewhat mysterious. It awaits discovery. In Manitoba, this classification includes a large portion of the province. Certainly, a glance at a provincial map encourages this perception. Areas without railway, roads, or transmission lines are extensive, particularly as one moves northward. In the North, communities appear as scattered dots separated by lakes, forests, and wetlands. There is no doubt that much of northern Manitoba typifies the essence of wilderness in the imagination of most of the contemporary Canadian population.

In Manitoba, many of the areas defined in the popular imagination as wilderness are provincial Crown lands. This designation includes forest reserves, provincial parks, wildlife conservation areas, and the bulk of the provincial area which is *unoccupied Crown land*. These are lands for which no private individual or firm has

acquired rights of property, or title. In spite of the fact that the Crown retains absolute title to private lands regardless of fee simple ownership (demonstrated through the right of expropriation), Crown lands are generally understood as those public lands to which no recognized private title exists.

In contrast with wilderness, unoccupied Crown land is a phrase which is more legal and denotative. It has a recognized place in law, and its usage is narrowly prescribed. Nonetheless, it takes on associative meanings in its use for the general populace. As with the term wilderness, the term unoccupied has come to mean uninhabited. In strict legal parlance, unoccupied refers to rights of property. However, the connotation, particularly with lands in the North, is that these lands are unused.

This leads directly to the notion of *common property*. The term itself is formal and generally limited to academic usage. It does not appear in everyday speech. But the concept is rooted in Canadians' sense of their country and their rights to enjoyment of it. Crown lands are common property. They are thought to belong to the public; in other words, they belong to everyone.

Crown lands, as well as being uninhabited and generally unused for specific or exclusive purposes, are also thought of as being available. Since they are public lands, the public can use them; access is open. In keeping with general societal trends, they are available for developments deemed to be in the general public interest.

The term *common property resource* is used primarily in the fields of economics and natural resources management. In traditional economic terms, as a class these resources are characterized by rivalry (one's use detracts from another's) and non-exclusivity (difficult to exclude additional users) (Randall 1987). More recently, common property resources have been classed

more finely according to the relevant property-rights regime in operation (Berkes and Farvar 1989; Feeny et al. 1990). In terms of the general sense of the population, the resources of Manitoba's unoccupied Crown lands are seen as property of the state (*res publica*). Ownership and management control is held by the Province, and access is generally open, if regulated.

In summary, when the majority of Manitobans look northward, they see wilderness. These lands, held by the Province, are unoccupied and available for use, including individual recreation and, potentially, industrial development. The resources within the landscape are seen as the property of all, although specification of private rights remains a possibility.

### Land Use and Occupancy Studies

Land use and occupancy studies have evolved since 1973 to document specific territories in which aboriginal interest has developed over time (Usher 1990). This type of study documents the historic and contemporary land use of an identifiable Native group, and consequently documents an area which comprises a homeland for these people.

Approximately standardized techniques have been developed to carry out such research (Freeman 1976; Ballantyne et al. 1976). Land use within living memory is documented through interviews, producing map biographies of active resource users. These biographies record the respondent's recalled involvement with the land and the harvest of its resources. Composite maps are created from the individual biographies and demonstrate collective land use activity for the group.

Maps of land use show the travels and perhaps the harvest areas of the persons interviewed. They do not necessarily constitute an exclusive interest through this use (Usher 1990). Occu-

pancy, on the other hand, relates to the territory intimately known and used by a group over several generations. In general terms, the area of occupancy is represented by a core area of land use, since the fringes of mapped use likely overlap with the traditional use of other groups.

Land use and occupancy studies also demonstrate both specific and comprehensive aspects of traditional knowledge. Specifically, traditional ecological knowledge is reflected in the data collected concerning particular resources, for example, where and when to find specific game. This information relates both to the relationship of animals and the environment, and to the cultural utilization and transmission of this knowledge. Comprehensively, traditional ecological knowledge is reflected in the delineation of the intimate and extensive knowledge of the topography in which the specific ecological information is held. This is not solely route-finding knowledge, but an expression of the concrete ways in which the animals, land, and community are linked. The notion of occupancy rests on the premise of traditional and continuing knowledge of the land and its resources. This knowledge is inherently ecological in the case of the boreal hunting Cree.

### **South Indian Lake Land Use and Occupancy**

The facts of Native land use and occupancy conflict directly with the prevalent majority views of northern wilderness area. This paper uses results from a case study of land use and occupancy of the community of South Indian Lake which was carried out in 1989 and 1990 (Hrenchuk 1991). It is doubtful that the details of South Indian Lake land use would be identical with those of any other community. Nonetheless, it is likely that the results are representative of Native knowledge and use of traditional areas in many parts of Canada.

### **Background**

South Indian Lake is a Cree community (approximate population 900) in northern Manitoba, which formed a permanent settlement in its current location (57°N 99°W) sometime near or before the turn of the century (Figure 1). This date should be seen as a point in a continuum of use and occupancy, and not as definitive of occupancy. What is being considered is a gradual movement from nomadic to more settled existence. From archaeological evidence, it is known that Cree-culture groups have been in the area for at least 1200 years (Pettipas 1989).

The major resource, Southern Indian Lake, is a biologically productive system; its relatively shallow depth and inflow of nutrients combined to create conditions which could readily support a fishing culture. The Cree term for the place, *Opipunapiwin* (wintering place) indicates its desirability as a seasonal home. Fish, moose and, for most of the period, caribou provide the basis of subsistence living.

In the period of European presence, trapping trade has been in evidence since 1700 (Wright 1971). Commercial fishing operations began in 1942 and, until the mid 1970s, the commercial fishery of Southern Indian Lake was the largest in northern Manitoba (Bodaly et al. 1984). At that time, Southern Indian Lake was impounded as a part of Manitoba Hydro's Churchill River diversion, and the mean lake level raised 3 m. Prior to this time, the community was largely self-sufficient, with little external assistance or government infrastructure (Van Ginkel Associates 1967). The flooding brought road access to the south end of the lake in 1972, television reception in 1974, and a modern townsite, if lacking running water and sewage facilities for most residents, by 1975.

### Methodology and Data Limitations

The purpose of the research was to determine the use and occupation of the area by the community within the period of living memory. A variety of forms of traditional ecological knowledge were sought. The location of hunting, fishing, and trapping resources, local place names, the sites of residency, the travels of community members, and areas of preferred use were mapped through individual map biographies between December 15-20, 1989 and between May 31 and August 8, 1990. Composite thematic maps of community use were compiled from the individual maps. The interview format was open-ended. This design allowed for elaboration of the meaning and importance of resource use as well as for the description of resource location.

The interview sample sought: (1) even geographic distribution of trapping effort, (2) representation from three age classes, with the inclusion of all available male elders and a number of female elders, and (3) involvement of trappers, hunters, and fishermen identified as significant figures within these fields. Of 47 interviews conducted, 36 involved a map biography; others focused more narrowly on the nature and timing of community origins.

The mapped results represent a minimal picture of the degree of community activity. Most of the maps present the activity of a minor portion of the harvesters of the community. Since effort was made to include many of the major harvesters in the sample, linear extrapolation of the results would not be expected. However, it is clear that data from a more complete sample would result in more comprehensive coverage. The study ignores women's harvesting altogether as it is qualitatively different from men's, and would have necessitated a much larger sample size. The travel and trapping routes marked are only the major routes, and in no way represent

the minor trapping trails nor the lifetime travel of individuals. Similarly, camps marked are a fraction of the places where individuals might have spent the night. The maps of wildlife areas are those of favored hunting grounds, and tend to an understatement of hunting range. The hunting of many wildlife species was not mapped at all. Extensive travels from early in this century were recorded anecdotally, but could not be mapped.

Therefore, areas of low defined use in the composite maps of travel may result from sampling bias or from relatively little actual use. There has been a general understatement of community activity by study methods and only partial documentation of community use of resources.

### Land Use Information

Despite the limitations of the study data, an adequate portion of land use information was collected and compiled to represent the territorial extent of South Indian Lake land use. The most fundamental demonstration is made by the compilation of total reported travel and camps (Figure 2). The map represents the major trapping routes of individuals in their living memory, and to a degree, travel for hunting purposes. Camps which are marked principally indicate cabins. The image portrayed is of a land base which has been traveled extensively and which is known intensively. If it were not for the bias of the relatively small sample, it is likely that the bulk of the area within the Registered Trapline (RTL) perimeter would be covered to uniform density with travel lines.

Travel for trapping purposes formerly extended considerably beyond the perimeter of the RTL section (indicated on Figure 2), which was established in 1946. The area adjacent to the current community of Tadoule Lake was regularly trapped from South Indian Lake when specific

fur prices warranted the extended travel. Since trapline registration was instituted, trapping is formally limited to the RTL section. However, hunting travel still takes place up to a distance of 400 km from the community.

The extent of hunting involvement is suggested by Figure 3, which maps areas indicated to be of current significance to the South Indian Lake wildlife harvest. The details of this map have been sufficiently generalized to protect the community's traditional knowledge and use while still representing the extent of hunting activity. The sites shown on the map are also seasonally variable, providing further safeguard against unwanted usage.

The map contains no historical component; it is a picture of contemporary use only. A total of 232 prime sites in four wildlife classes (3 for caribou, 102 for moose, 108 for waterfowl, and 19 for muskrat) were identified by 32 individuals. Hunting sites ranged throughout the RTL section, and were marked in 39 of 50 traplines. It should be noted that the location of areas for hunting grouse, ptarmigan, rabbits, beaver, porcupine, lynx, and bear was not attempted. It can also be assumed that a more complete sample would have identified further sites with more even coverage. Considering the limited number of species for which mapping was done, hunting can be seen as an important and widespread activity for South Indian Lake residents.

Harvesting activity is by no means limited to an area near the community. Favored sites were identified at a distance of up to 175 km by air from South Indian Lake. Of note is the relative unimportance given the areas surrounding Southern Indian Lake itself. Habitat alteration due to lake impoundment has limited the availability of waterfowl and moose during the open water season. The presence of a flooded zone of trees or of sheer banks due to slumping has

increased the difficulty of spotting, shooting, and retrieving moose. Therefore, although hunting is still pursued with considerable interest, a portion of this activity has been displaced inland by development effects.

Commercial fishing is another use which has been affected by lake impoundment and diversion. Figure 4 maps the preferred and most consistent net sites on Southern Indian Lake as identified by respondents, again generalized to prevent exploitation of local knowledge. A total of 380 prime locations were identified for the period prior to impoundment, and 114 were identified for the period since. There is low correspondence to date between pre- and post-impoundment sites. The decline in the quantity and the quality of the whitefish catch following lake impoundment has been well documented, and in part, mapped (Bodaly et al. 1984; Peristy 1989). The case study data tend to confirm the results of these authors, and also to expand the geographic area considered to be of importance in the distribution of fishing effort. For the purposes of this paper, the extensive use of the majority of Southern Indian Lake is of principal interest. Three months of widespread open-water fishing effort each year would normally provide considerable hunting opportunity surrounding the main lake.

A total of 58 inland lakes commercially fished by South Indian Lake permit holders were identified. Considerable effort has gone into these largely fly-in fisheries since flooding and diversion of the main lake. A compensation program administered by the South Indian Lake Fishermen's Association has encouraged this trend and was intended to offset the loss of productivity of Southern Indian Lake.

Domestic harvesting of fish was not well represented in the case study. A small sample of lakes was identified inland: 37 lakes by 21

individuals. However, the interview process did not differentiate between inland lakes fished commercially and those inland lakes fished commercially and domestically. Furthermore, domestic fishing locations were not sought for Southern Indian Lake.

### Occupancy and Resource Use

Occupancy refers to the group's collective sense of its own territory in relation to that of others (Usher 1990). In a sense, it is defined by a summation of historic use of the area, and an expression of the breadth of the community traditional ecological knowledge. Land use, however, may not be exclusive to a single group. Overlapping use likely takes place at the fringes of the area utilized. The territory occupied typically has a well-defined core, and less well-delineated boundaries.

In the case of South Indian Lake, the major overlap in travel and hunting takes place to the north with the Churchill Band of Tadoule Lake, and to the south with the Nelson House Band in their RTL. Excursions are made to the north primarily to hunt caribou and from the north to hunt moose and geese. To the south, South Indian Lake residents hunt moose and waterfowl. There is little indication of travel from the south into the South Indian Lake RTL for hunting.

On the one hand, this type of overlapping land use has been going on for centuries (Dickson 1977). The boundaries of use and occupancy may change over time, but a delineation of territory is mutually recognized among neighbouring groups. Boundaries may fluctuate, but a well-known core area remains. On the other hand, overlapping resource harvesting takes place in another more modern fashion. Resources within the understood territory are allocated by the state to other uses and alienated from the group. In the case of South Indian Lake,

tourism operations, active mineral claims, and private land with ownership outside of the community now exist within the RTL section. As well, areas identified by the Nelson House Band for land exchange under the terms of the Northern Flood Agreement also occur within the area traditionally occupied by South Indian Lake residents. Unlike the gradual alteration of boundaries, this newer process does not engage South Indian Lake land use at the edges, but potentially at the heart of its territory and its central resources. The flooding of Southern Indian Lake for the purposes of diversion and hydro development is an omnipresent demonstration of this fact for the people of South Indian Lake. The economic component of hunting, trapping, and fishing has declined as a direct result of the intervention, and the traditional ecological knowledge of the community has been substantially impaired.

In summary, historic and contemporary land use has defined a territory for South Indian Lake which engages the land area used by other groups. The defined core area of community occupancy is approximately 35,000 km<sup>2</sup>. This territory is known in intimate detail, traveled, and named. Traditional place names are far more numerous than those found on the official government topographic maps (see Figure 5 for toponyms surrounding the main lake, and Figure 6 for translation of Cree place names).

Involvement in traditional resource uses remains vital to the community. For example, figures for the 1987-88 season placed the value of the South Indian Lake trappers' sales as the largest in the province for a single community. Hunting takes place over a wide area in the current context. Although reduced since impoundment, the fishery maintains ongoing economic and social significance for the community (Baker 1990).



The persistence of traditional values can be seen in this land use. The case study sought to investigate the vitality and importance of this resource-based activity to current community life and culture. Personal, cultural, and economic motivations were suggested by respondents to explain their continued involvement in "bush" life. These reasons are essentially interrelated. In the mixed village economy, subsistence and commercial sectors overlap. Cultural values are central to the existence of bush life, which sustains the social relations of the culture, and which to date has provided the economic framework of the community.

The bush life figures in a community perception of its future. The majority of respondents (16 of 29) envisioned a viable lifestyle based in the bush which community members could take part in. This life in the future was seen to involve adaptations of traditional pursuits to meet economic opportunities. The life is based on the land itself; in the words of one respondent, there is a need for "healthy country", with game and fish, in order to "manage". The land base has been at the centre of the culture. Historical land use and harvesting has defined territory which has been, and remains, known and occupied by the people of South Indian Lake.

### **South Indian Lake Occupancy vs. Prevalent Views of Resources**

The effect of long-term use and occupancy of an area is a territorial interest. It is these particular lands and resources which have supported the culture and allowed the survival of the people. From a community standpoint, this territory is generally understood to be their own.

How does this sense arising from occupancy stand against views of land and resources generally prevalent in society? It is not the intention of this paper to consider strict legal distinctions

nor to attempt any clarification of the confusion surrounding definition of Aboriginal rights. No fine distinctions will be made between status, non-status, and Metis opportunities under the purview of law. Rather, the prevalent majority views regarding northern lands and resources will be investigated in light of traditional occupancy of lands and of use of the resources of these lands. Clearly, traditional use and occupancy contradict some of the fundamental assumptions underlying these widely-held views.

The case study should conclusively illustrate that the region is not wilderness in a conventional sense, but a homeland for the people who have used it for generations. The territory is intimately known through continuing intensive and extensive use. These lands do not await discovery except in a personal sense. As indicated by overlapping, traditional use with use by other groups, areas of occupancy are largely contiguous across the North. If land use and occupancy studies were to be carried out right across northern Manitoba, it is likely that this wilderness theme would be refuted at almost every point. These lands are known, named by local custom, and in use.

The character of wilderness, as commonly perceived, remains partly illusory. To the wilderness traveler, the wilderness encounter apparently must remain pure and inviolate; seeing others in the landscape somehow spoils the experience. The facts of the matter argue differently. These areas have been in use for centuries and remain in use. No doubt there is a wonderful exhilaration in traveling northern lakes for the first time. The solitude and the land itself are captivating. But it is illusory to think that others have not gone on before nor inhabit the area today. The communities which appear as points on the provincial map may seem dispersed throughout this wilderness, but the extent of

community travel and the intimate detail in which the lands are known refutes this notion.

Unoccupied Crown land is fundamentally a legal term with precise distinctions regarding property. The *Natural Resources Transfer Agreement*, a schedule to the *Constitution Act (1930)*, mentions the right of the Indians of the Province "of hunting, trapping and fishing game and fish for food at all seasons of the year on all unoccupied Crown lands" (paragraph 13). In law, the denotative meaning is understood. It entirely discounts historic occupancy outside of reserve lands where treaties have been signed. The connotative association is that the lands are unused. Though there is little fee simple title in the South Indian Lake area, from a pragmatic standpoint it cannot be said that these are unoccupied lands. A fundamental contradiction exists between the two perceptions. On the one hand, there is a legal definition of "unoccupied". On the other hand, there is evidence of historic and contemporary land use and group occupancy of a recognized territory.

This concept is extended to the resources of these "unoccupied" lands. Native people have had no authority on the basis of aboriginal title nor on the basis of customary use to regulate the allocation of resources within their traditional areas (Usher 1982). This has been the prerogative of the state. Overall, these resources are seen by the majority population, and in law, as common property of the state (*res publica*). In the community, however, despite a recognition of this view under law, there is an abiding sense that these are South Indian Lake lands and resources, and communal property (*res communis*). Access to all resources is not open to all. Rather, resources are shared or apportioned by custom among community members. After all, it is these resources upon which the community was founded and upon which it has survived.

Perceptual differences underpin the divergent views of the nature of land and resources between the dominant mainstream culture and that of the community.

This conflict of perceptions can only lead to non-compliance with state-imposed regulation and allocation with respect to resources where there are resource pressures or conflicts. Decisions which are perceived as unfair lead to resource degradation and related injustice among users (Grima and Berkes 1989). Part of the perception of unfairness stems from the lack of formal input from the community for management or allocation of local resources. Land use and natural resource regulation is discretionary and responsive to a limited range of uses or users (Rees 1987). Decisions regarding fisheries or trapping made by the state may be informally brought to community resource associations for comment. But it is entirely discretionary whether this does indeed take place, and whether the input received in the community is at all utilized. Decisions regarding mine, road, or hydro developments which indirectly concern the resource base receive community input only through a much wider and more general process of public participation in environmental assessment.

State management has tended to emphasize forest, mineral, and hydro resources in the North. This approach tends to generate conflicts at the local level where the major social costs to such development are felt (Feit 1988). In the situation of South Indian Lake, the development of the Churchill River diversion is exemplary of this tendency. Little share of the prosperity created by the project has accrued to the community. At the same time, the project has degraded community self-sufficiency through impacts on the resources upon which the economy was based.

The sense of common property held by the state enabled the project to proceed. The sense of

communal property through long-standing use and occupancy led to a pervasive sense of injustice within the community. No amount of compensation can overcome the sense of having lost what was rightfully, historically, and communally held.

### Conclusion

The views of the majority of Canadians conflict with those of northern Native communities concerning northern territory, resources, and property. On the one hand, there are assumptions regarding wilderness, unoccupied Crown lands, and property resources held in common by the state. On the other hand, there are notions of communal resources, communal territory, and a wealth of traditional ecological knowledge, all of which have developed through historic use and occupation.

This clash of views, which includes reliance on differing sets of ecological knowledge, is at the root of conflict surrounding northern development projects slated for areas traditionally occupied by Native communities and designated as Crown land.

At the community level, there continues to be an interest in, and a reliance on the resources of the bush for personal, economic, and cultural reasons. Yet this engagement with the land is formally disregarded by the land- and resource-use policies of the state, and by the underlying assumptions of such policy.

At some point the need to connect these divergent viewpoints must be recognized. Resource managers interested in compliance with regulations regarding resource use must become cognizant of traditional ecological knowledge, and of the long-standing patterns of use and local control of resources. Co-management schemes go some distance in recognizing this claim, though traditional ecological knowledge

is rarely explicitly incorporated. These schemes to date, outside the context of comprehensive land claims, generally also deal only with fish and wildlife resources. However, this limitation is both artificial and unrealistic for several reasons:

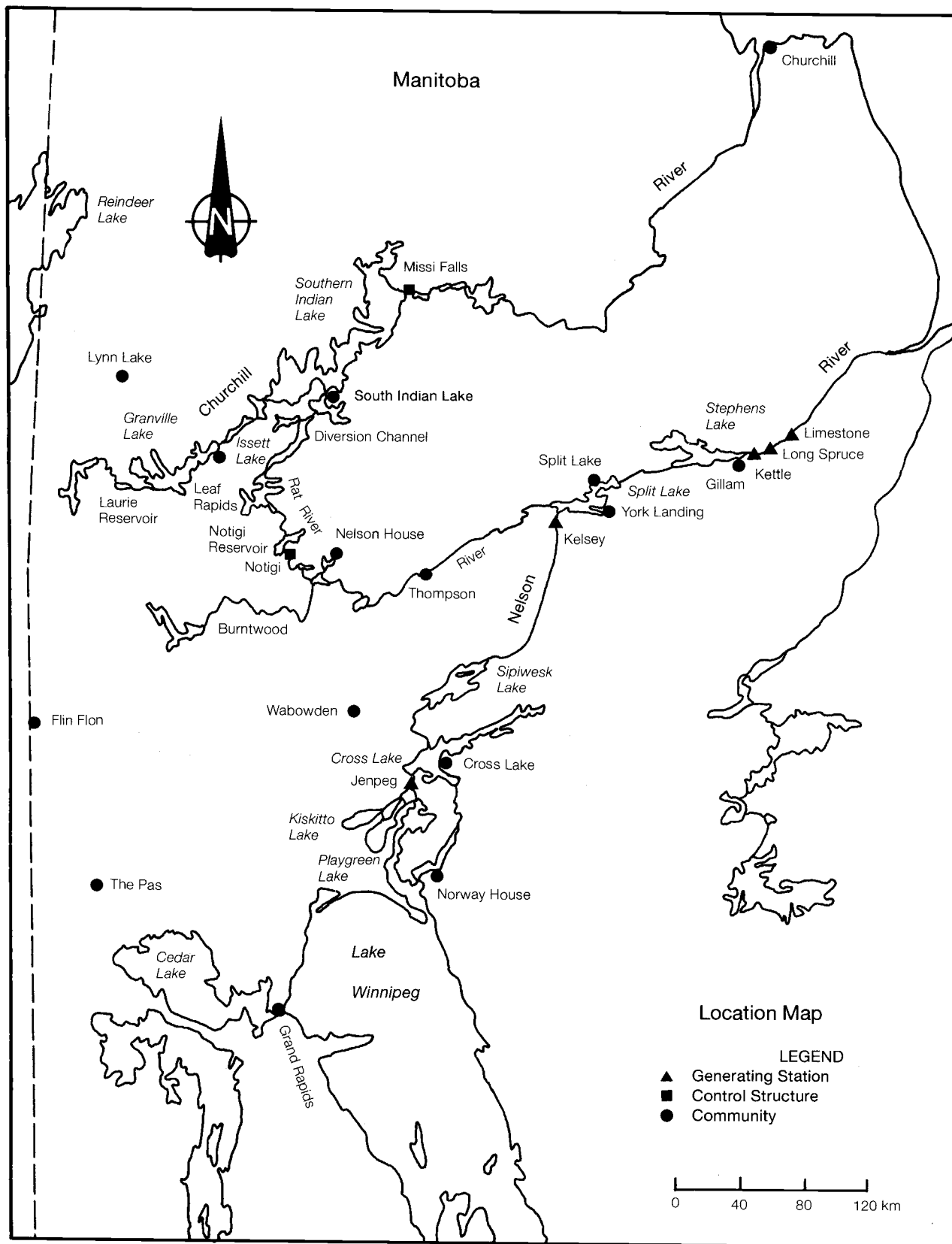
- The actual resource base of the communities is not restricted to these categories.
- Ecosystems are integrated, and development effects are not limited to political categories of resources.
- Social life within the community culture is tied to resource harvesting and to the sharing of its products.

Some measure of authority over the entire resource base which supports the culture would be preferable. In this way, those with the most to lose would gain some control over their territory.

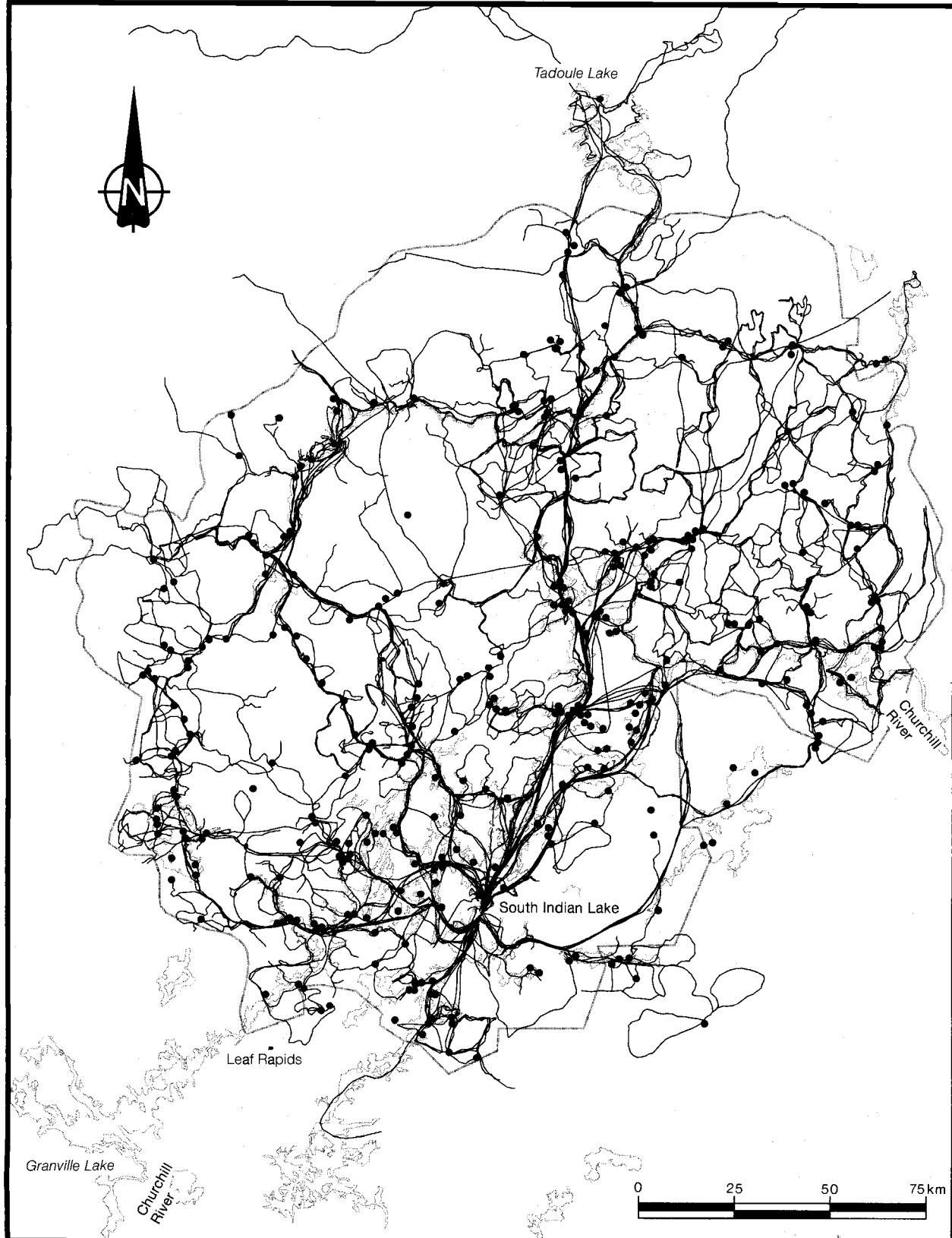
Governments interested in community development and in lessening the flow of transfer payments must recognize the legitimate interest of communities in traditional resource areas. Payment of royalties from resource rents earned within community resource areas (such as those from hydro generation) would be a more direct recognition of this historic interest in lands. Such royalties could provide an additional economic foundation for these communities and a true stakeholder's position in northern development, where some authentic measure of control had also been gained. Native communities interested in maintaining or regaining some control of traditional resources must attempt to document the type and extent of their traditional land use on an historical and contemporary basis to make the facts known to the world. For despite an underpinning in current reality and historical fact, Native perceptions and traditional knowledge do not figure highly in the

formulation of prevalent mainstream views and policies regarding lands and resources in most of Canada.

Until the fundamental conflict between common and communal tenure is recognized and somehow reconciled, conflict over northern resources will likely continue. And development will likely continue to ignore, and to impair, the access of Native communities to their traditional base of resources.



**Figure 1:** Location of South Indian Lake (57°N, 99°W), Manitoba, Canada.



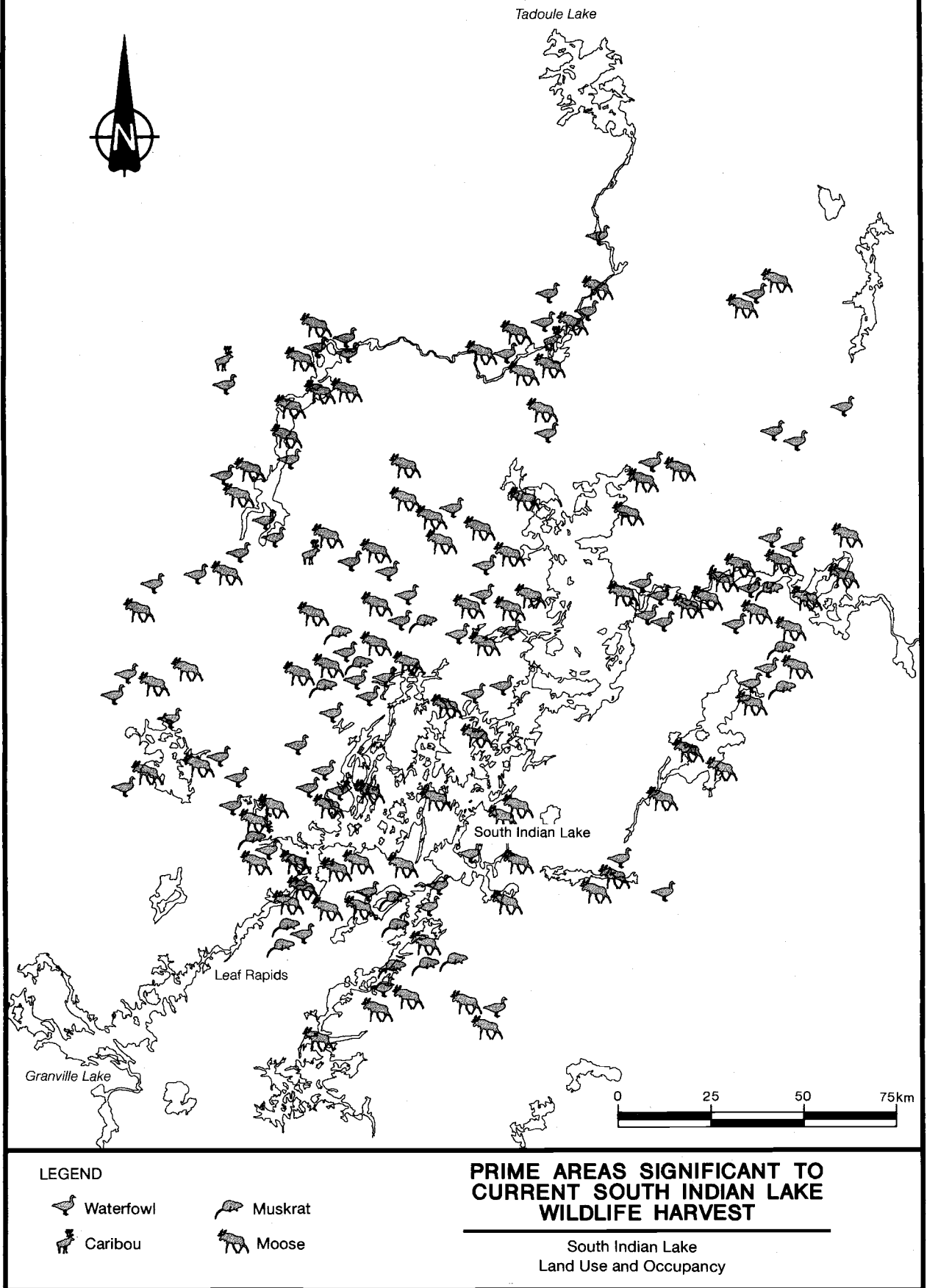
**LEGEND**

- Total reported travel
- Total reported camps

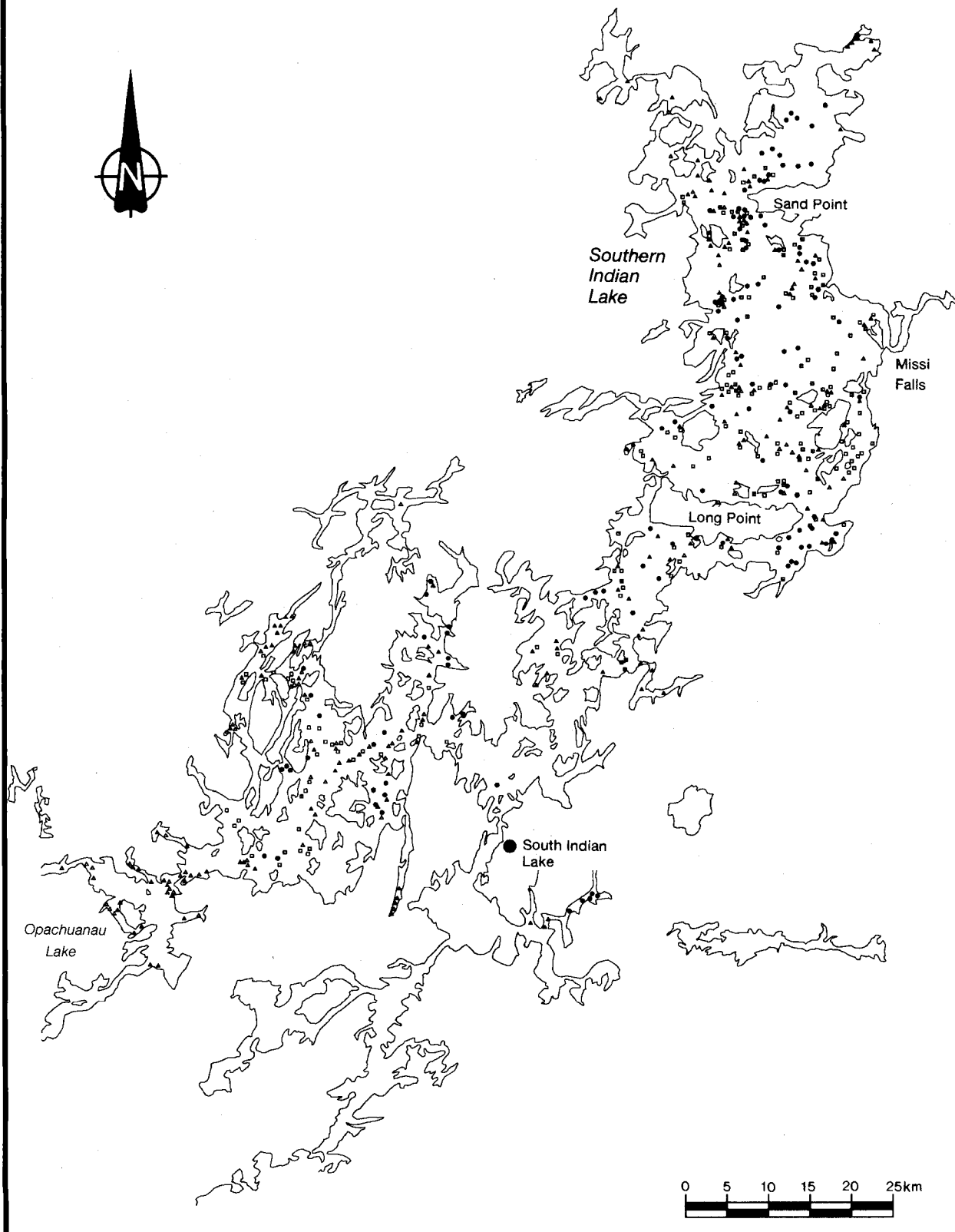
**TOTAL REPORTED TRAVEL AND CAMPS PLUS RTL PERIMETER**

South Indian Lake  
Land Use and Occupancy

**Figure 2:** Total reported hunting and trapping travel (major routes) within living memory; also marking camps and Registered Trapline perimeter. Utilizing technique of map biography in 36 interviews in December, 1989, and between May and August, 1990.



**Figure 3:** Areas identified as significant to current South Indian Lake wildlife harvest, generalized to protect the knowledge from exploitation. Information derived from 32 map biography interviews.



**LEGEND**

- △ Summer, pre-impoundment
- Winter, pre-impoundment
- Post-impoundment

**PREFERRED COMMERCIAL  
FISHING SITES IDENTIFIED,  
SOUTHERN INDIAN LAKE**

South Indian Lake  
Land Use and Occupancy

**Figure 4:** Preferred commercial fishing sites identified through map biography interviews for pre- and post-impoundment periods (impoundment completed in 1976), Southern Indian Lake.





**Figure 6: Translation of Cree toponyms,  
vicinity of Southern Indian Lake.**

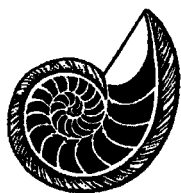
apischiwapasehk	Small Narrows
Atarine sepesis	Atarine's Creek
Baselihk	Basel's Place
kaispawahkasik	High Sand
kapihtawahkak	Sand Halfway
keskapiskowisepe	High Rock Creek
kesekekichichisihk sakahikan	Short Fingers Lake
kinosew minischikos	(Jack) Fish Island
kiputchineyaw	Scarecrow Point
maskowapaw	Bear Narrows
mihchikewiwasahk	Dorsal Fin Bay
mihkwapiskohk	Red Rock
minahikosepesisihk	Big Tree Creek
mistahiwapahk	Main Narrows
mistimininihwakan ministik	Big Spoon Island
mistatimwaskisinsakahikan	Horseshoe Lake
mistatihkamek wasahaw	Jumbo (Whitefish) Bay
mosoministik	Moose Island
Murdo Moose neyaw	Murdo Moose Point
mwako ministik	Loon Island
namekosepesisihk	Trout Creek
namewwapaw	Sturgeon Narrows
onakayayame wasahaw	Where the fish are spawning Bay
onihchawikewinihk	Where he was born
opachuanau	Fast-Flowing Narrows
opochawapenihi	Muskrat hunched up
oskiwan ministik	Moose Nose Island
pakichishtakan	Drop your load
pakiskwawiwahk	Ice Built-Up Bay
Samuel wasahaw	Samuel's Bay
sesepewapaw	Duck Narrows
wasekamawisakahikan	Clear Lake
wawakanakesehk	Crooked Narrows

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## Stereotyped Village Economies and the Pinehouse Harvest Research

*Terry Tobias*



In early 1982 I was invited by the Metis community of Pinehouse, a small Cree-speaking village located on the Churchill River ( 55°-31'N, 106° 34'W) in northern Saskatchewan, to work closely with villagers in designing and undertaking land use studies. Council wanted these studies to measure and to demonstrate the community's dependence on surrounding provincial crown lands. Earlier government-sponsored planning documents had been rejected by the community largely because they had ignored villagers' use of those lands.

As the 1980s ushered in harder economic times for northerners, Council felt all the more compelled to embark on its own research endeavour because Pinehouse, like other northern communities, often found itself in conflict with a newly-elected, and what was perceived to be a particularly hostile provincial government. The new government was seen to be strongly predisposed to restricting the access of residents to their traditional land bases; this perception was based on the government's major policy reviews concerning allocation of renewable resources in the north.

There was also a long-standing tendency of both industry and government to assume that northern villages do not use adjacent lands to any significant extent. It was against this background that Council undertook its studies. Council was confident that the research findings would support its contention that the land base is an integral and vital part of the economy. The data gathered indicate that this confidence was well-placed. In one year, the almost 700 residents, over 50% of whom were under 15 years of age, harvested 186,000 pounds (84,370 kg) of edible meat. In that same year, harvesting

activities accounted for approximately one-third of the village's income.

Until just a few years prior to the commencement of the Pinehouse research, the village could be reached overland only in winter. In 1978 the all-weather road linking the settlement to centres in the south was completed. Apart from the obvious advantages, it opened up access to southern economic interests. The community's traditional land base was now thrown open to exploitation by mining and pulp companies, tourist outfitters, outside hunters and anglers. This process of alienation of the Pinehouse land base, detailed elsewhere (Tobias 1988) consisted of many incremental and seemingly disparate components. Whether actually placing land and resources beyond the access of residents or merely holding out the threat or probability of doing so, those events collectively contributed to the concerns and apprehensions of villagers.

This paper is a critique of planning documents that preceded or were contemporary with the Pinehouse research effort, and it compares the assumptions made in those documents regarding the informal bush (subsistence) economy with the Pinehouse findings. The discussion that follows suggests that much of conventional planning done on behalf of Pinehouse constitutes another factor in the process of land alienation. Also implicit is that, if planning in the north is to be effective from a northern perspective, it must incorporate indigenous knowledge, which in this context means harvest data.

Conventional economic analyses tend to produce very distorted portrayals of village economy. Such studies usually ignore the informal economy of northern Native settlements. This is often true even in cases where a community's income-in-kind sector is measurably larger than some of the highly monetarized formal sectors, including wages, transfer payments, and commodity sales.

Because analysts often construct profiles based only on the readily-accessible records of government agencies and employers, they implicitly accept the premise that production, exchange, and consumption occur only within a market context where the sole medium of exchange is cash. Conventional treatments consistently recognize wages as legitimate income, and wage-earners as employed, while totally ignoring the value of wild meat and regarding the full-time harvester of meat as unemployed.

Economic profiles that underestimate the value of a community's bush economy perpetuate certain sentiments. Images of a community whose inhabitants do not depend on the renewable resources of the surrounding lands are consistent with images of grossly exaggerated poverty. The traditional economy is conjured up as being one where harvesting activities are considered a quaint and quickly fading relic of the past. Most analysts conclude that the village's inhabitants are passively languishing in the hinterland because they have no viable economic base. They are viewed as maintaining themselves primarily through welfare with some cash from trapping, small amounts of income-in-kind from harvesting activities, and the occasional temporary job.

Understanding the value of income-in-kind is important. As many other researchers have argued, a basic feature of the appropriation of resources at the frontier is the belittlement of the contribution those resources make to the lives of the locals. Once it has been established that the northern village economy is virtually non-existent, the way has been ideologically cleared for the imposition of industrial structures on top of local ones, regardless of the real net effects on local structures. The denial of the existence of any locally viable system is conducive to the unimpeded expansion of frontier. After all, it is

a logical step to conclude that inactive and indigent Indians will embrace whatever concept of development is espoused by the incumbent government and whatever projects are being touted by industrial proponents.

The prevalence of misinformation concerning the northern Native economy, whether appearing in consultants' reports or internal government discussion papers or mainstream media, has a tremendous impact on government policy in the North. Whether a particular discussion paper or economic profile becomes formally incorporated into policy is immaterial. The implicit assumptions and pronouncements of such documents have a life of their own and become the basis by which decisions tend to be made.

In Saskatchewan the precursor of the stereotypical village profile can be traced back at least 30 years. The Center for Community Studies was founded by the provincial CCF government and the University of Saskatchewan in the late 1950s. In 1960 it signed a three-year contract with the province's Department of Natural Resources to undertake socio-economic surveys of the north. One of the three reports produced under this contract was entitled, *Trapping and Fishing in the Economy of Northern Saskatchewan* (Buckley 1962). Given the focus of the research, it is remarkable that the significance of income-in-kind was casually dismissed. Without providing substantiating evidence, the author alludes only once to that sector, concluding with the words, "moose and fish are by no means standard items in the diet." In the absence of any informal economic production, given the very high cost of store-bought food and durables in the north and the demonstrably small cash incomes of northerners, it is logical to conclude that people must truly be in dire straits. The above report states, "where men still live primarily by trapping and fishing we have found

extreme poverty." The final report of the Center's survey of the North, entitled *The Indians and Metis of Northern Saskatchewan: A Report on Economic and Social Development* (Buckley et al. 1963), makes not a single allusion to the income-in-kind sector.

Over a decade after the Center for Community Studies had finished its research, the Saskatchewan Power Corporation made application to construct a large dam on the Churchill River. The provincial government commissioned the Churchill River Study, which produced 31 volumes of scientific findings. The government also appointed the Churchill River Board of Inquiry, which was mandated to weigh the arguments presented by the Study and to advise on whether to proceed with the dam. The mandate of the Study was to assess impacts within an official study area, the western boundary of which was located well within the Pinehouse land base, although the village itself was excluded.

There was no baseline information regarding the income-in-kind sectors of the five Cree-speaking communities to be most affected by the dam. The Study's socio-economic sector (Stabler et al. 1975) was required to analyze all components of these villages' economies. In addition, the government funded the Churchill Committee, a group of regional government representatives and local leaders of the five settlements. The Committee commissioned a series of reports, all of which focused heavily on an assessment of the role of traditional harvesting activities. These reports were commissioned in an attempt to balance the skewed analysis that was being presented to the Board by the Churchill River Study. The Federation of Saskatchewan Indians was also very concerned with some of the research methods and preliminary findings of the Study. The two local bands involved eventually prohibited Study researchers from visiting the

five villages and belatedly undertook their own research project. Their report represents the only serious attempt undertaken in Saskatchewan prior to the 1980s to assess village informal economy (Ballantyne et al. 1976).

In 1978 the Board finished its deliberations and made its recommendations. The principal recommendation was that the project not proceed. It is very difficult to know how much the availability of a specific type of information was a factor in the final outcome of the hearing process. It is clear, however, that the Board found the Study's analysis of the northern economy to be highly dubious. For example, the Study's socio-economic sector (Stabler et al. 1975) claims that almost 80% of all families in the study area were below the subsistence level, eliciting from the Board the only appropriate response possible. The Board concluded that such an assertion made nonsense of the Study's calculation of the area's per capita income since anyone who visited the settlements would have readily seen that the villagers were not starving.

As the Federation of Saskatchewan Indians had hoped, the Churchill River Board of Inquiry turned to their research materials for an alternative perspective. The Board discussed their findings, and it is obvious that it accepted their analyses. While the Board's deliberations were informed by serious attempts to describe the informal economy, the planning activities surrounding another mid-70s, large-scale hydro project on the Churchill River were conducted in the absence of any such data.

When the Churchill River Diversion Project, part of the massive Churchill-Nelson River Hydro Project, became operational, the level of Southern Indian Lake in Manitoba was raised, and it flooded hundreds of square kilometers of the village of South Indian Lake's land base. Waldram (1983) has demonstrated that the

flooding of the lake caused irreparable harm to the local economy, which had been one of the most viable in the north. The Lake Winnipeg, Churchill and Nelson Rivers Study Board did not have good data concerning village economies. Its deliberations remained influenced by the distorted conventional economic profiles it had been presented with.

The Churchill River Board of Inquiry demonstrates that the existence of a reliable data base concerning the income-in-kind sector can have a bearing on planning decisions. On the other hand, in the absence of such data, community well-being can be seriously compromised as was the case with South Indian Lake. It is sobering to realize that Pinehouse and South Indian Lake share a number of similarities: both are Cree-speaking villages of virtually the same size and located in the same watershed. These are reminders that Pinehouse, like all small northern communities, remains vulnerable to the consequences of poor planning decisions because of inadequate baseline information.

Very soon after the road into Pinehouse was completed in 1978, a number of planning processes were initiated by outside interests. Industry undertook one initiative (Kilborn Ltd. 1979), while the provincial government undertook three initiatives (Beak Consultants Ltd. 1979; Hilderman Feir Witty Associates 1981; Underwood McLellan Ltd. 1981). All were mandated to examine the village's economy and to consider it in their recommendations and findings.

Fishing, the single most important informal economic activity in Pinehouse, received the most cursory treatment of all categories. This is predictable because usually no government statistics are compiled on fish from family nets. The report by Kilborn Ltd. (1979) makes no comment about domestic fishing, while the report by

Underwood McLellan Ltd. (1981) mentions the importance of fish as a local food source early on and states that it is to be discussed later, but then makes no further mention of it. Having clearly identified its study area to include all of Pinehouse Lake, Beak Consultants Ltd. (1979) provides the following account:

"Available data on the subsistence fishery are sketchy and often incomplete. Subsistence fishing is undoubtedly more extensive in those lakes situated near established communities (i.e., Lac la Plonge and Pinehouse Lake). The total number of fish harvested each year within the study area is likely quite low".

Hilderman Feir Witty and Associates (1981) represents the most thoughtful effort to consider the Pinehouse informal economy. However, it uncritically accepts the 20 lb./capita/yr. fish consumption value suggested by the Churchill River Study. Efforts to trace the origins of this value strongly suggest that it was simply fabricated (Northern Village of Pinehouse 1987a).

In contrast to their treatments of the domestic fisheries, all four planning documents provide a quantitative description of the community's commercial fisheries. Government statistics concerning annual production by weight, landed value in dollars, and number of licensed operators appear in all the profiles. However, dependent as they were on government systems of data collection, the accounts had to stay within quite narrow limits of analysis. For instance, as one of the reports (Underwood McLellan Ltd. 1981) acknowledges, there are no ways of knowing how many residents participate because the ratio of fishermen to licenses remains unknown. And again, consistent with the lack of attention to the domestic fisheries described above, the four reports describe only the formal aspect of the

commercial fisheries. Though acknowledging that the industry "provides an important source of employment and income for the people of Pinehouse" (Underwood McLellan Ltd. 1981), the four documents ignore the fact that a considerable quantity of fish from commercial nets stays in the village for local consumption.

Studies by Kilborn Ltd. (1979) and Underwood McLellan Ltd. (1981) completely omit any consideration of meat from hunting and trapping activities. The study by Beak Consultants Ltd. (1979) acknowledges that trapping provides a source of food and, though it makes no mention of the importance of some hunted species, it cites one government biologist's guess concerning the annual moose harvest by trappers. The report by Hilderman Feir Witty and Associates Ltd. (1981) cites a consumption value for meat from trapping and hunting that was provided by an early Churchill Committee review of available materials pertinent to the Churchill Basin's bush economy. All four accounts of the trapping industry are replete with government statistics concerning numbers of licensees, annual production, and cash value of harvests. The report by Beak Consultants Ltd. (1979) states that in 1978 the Pinehouse labour force included three trappers, even though official government statistics show that there were close to three dozen active trappers.

In summary, the economic profiles of Pinehouse constructed by consultants seriously overlooked the village's informal economy. The principal explanation for this is that data on informal activities are almost non-existent, and neither the terms of reference nor budgets of consultants permitted the collection of primary data.

The authors of planning documents cannot, however, be exonerated entirely from taking responsibility for the distorted portrayals that they create. As professionals, it is incumbent



upon planners — particularly those working in cross-cultural contexts — to be aware of and to question the premises underlying their work. The danger inherent in having one's working assumptions remain totally implicit and unexamined is that it becomes impossible to ascertain whether or not the research being produced is working for or against any given interest. The objectivity that professionals aspire to becomes unrealizable. Instead of providing policy-makers with a balanced piece of research that will be acceptable to all concerned, the consultant risks inadvertently fulfilling the role of special interest advocate.

The above study by Underwood McLellan Ltd. (1981) was undertaken under the auspices of the Community Planning Branch of the Department of Northern Saskatchewan, and warrants further comment. The beneficiaries are stated to be the residents of Pinehouse; its authors intended the report to be the community's long-term comprehensive planning tool. Because the consultants were oblivious to the existence of an informal bush economy, one can surmise that the study was on shaky ground from its inception.

For the initial basis of this study, information about Pinehouse and its region was gathered. Data on the physical, social and economic environment, including population, land use and other data, were used to obtain a comprehensive perspective of the community.

This comprehensive perspective even went so far as to accommodate "the needs and aspirations of the people" which were avowedly "extensively studied from a social and cultural perspective".

The latter assertion is reiterated numerous times throughout the report. "The needs and

wishes of the people of Pinehouse were carefully defined in consultation with the people and their community leaders". And yet there is good reason to question such statements, since the document was rejected by Council. The document was rejected because it implicitly advocated the ideology of frontier expansion while ignoring some crucial values.

The study in question abounds with statements to the effect that the villagers are underemployed or unemployed. It includes numerous statements and inferences to the effect that the advent of industrial mega-projects on the Pinehouse land base is imminent and inevitable. And clearly, it is the opinion of the report's authors that such projects can only "bring a significant boost to the economy of Pinehouse", specifically by way of job creation and income generation. The assumption on which the implicit message of the study is based is that, apart from the highly visible and oversized transfer payment sector and the small inadequate wage sector, Pinehouse has no economy. The inference is that the traditional economy is dead:

The traditional way of life is now largely a thing of the past. Traditionally the local people survived by depending on the natural environment for the supply of food... This is no longer the case... Unfortunately, the traditional subsistence economy, which has been largely substituted by a system of dependency [welfare], has not yet reverted to an economy based on salaries, wages or other forms of self-sufficiency.

Regardless of which consulting group had been hired by the government to undertake the Pinehouse study, it seems that this diagnosis was almost predictable. In its effort to obtain the contract, one firm submitted a 12-page proposal which made no reference to hunting, trapping,

or fishing (Hilderman Feir Witty and Associates 1978). Another group submitted a 41-page proposal which states that the "heart of any community is seen in its commercial zone. Here, the economic function of the community takes place" (Institute for Northern Studies 1978). Ten other community planning studies, almost all of which were done under the auspices of the Department of Northern Saskatchewan, were reviewed for the purposes of seeing how various consultants approached the subsistence economy. Of those ten studies, six make virtually no mention of the fact that income-in-kind plays any role at all. The remaining four acknowledge that an important subsistence economy exists. However, the few isolated statements that attest to the importance of a non-monetary subsistence economy are downplayed by virtue of the fact that the reports are full of quantitative data concerning the wage, transfer payment, and commodity sectors.

From the above review of the conventional profiles of the Pinehouse economy, a familiar stereotype emerges. The community is seen to be dependent on what is generally perceived as an over-sized transfer payment sector and a lamentably under-developed wage sector. The monetary aspect of the commodity sector is cautiously acknowledged as being important while income-in-kind is ignored. Participation in harvesting activities is conveyed as being virtually non-existent or a declining and inevitably doomed remnant of the past. Remember, the context of the research was defined in part by the villagers' experience of a quickly accelerating alienation of its land base after the all-weather road was completed. The village's political leadership believed that the conventional planning exercises of the late 1970s and early 1980s were in effect apologies for the unmitigated expansion of the southern economic frontier onto its land

base. It was the stereotypical profile of its village economy that moved Pinehouse Council to initiate its bold efforts to undertake its own planning research.

The community's research began in 1982. The only external funding consisted of one or two "planning advisory service agreements", each providing \$5,000 from the province of Saskatchewan. The Pinehouse research project was a community-initiated and community-controlled endeavour from the onset.

One of the first steps was to solicit information concerning methodologies to apply to the measurement of income-in-kind from provincial agency personnel. Most people that we wrote to replied that they couldn't help us in this regard. However, in reply to our letter regarding past studies on domestic fisheries in northern Saskatchewan, the region's senior fisheries ecologist referred us to a single source: one of the early Center for Community Studies documents (Buckley 1962). It is also interesting that the Churchill River Study's socio-economic sector (Stabler et al. 1975) states that one of the Center's reports (Buckley et al. 1963) represents "the last intensive study of northern Saskatchewan". The authors evidently relied heavily on that earlier work. Thus, the lack of serious attention to northern informal economy found in the government reports of the early 1960s also characterizes the impact documents of the mid-70s. Furthermore, those early reports were still being referred to by some resource managers well into the 1980s. Fortunately for our efforts in Pinehouse, there were pertinent methodologies and models being developed and applied in other provinces such as Quebec.

We adapted the available models and a variety of harvest surveys were conducted over a two and a half year period, yielding a wealth of data concerning the contemporary economy

(Northern Village of Pinehouse 1987a; 1987b). The results of one of these surveys are summarized in Table 1. Over 186,000 pounds of edible meat were harvested and made available for consumption in one 12-month period. This is equivalent to an average of three-quarters of a pound of fresh meat for each woman, man, and child every day of the year. The numbers presented in the table are believed to be conservative. A more realistic estimate may be that the village harvested 215,600 pounds in 1983–84, translating into a daily per capita availability of meat of .88 pounds (Northern Village of Pinehouse 1987a).

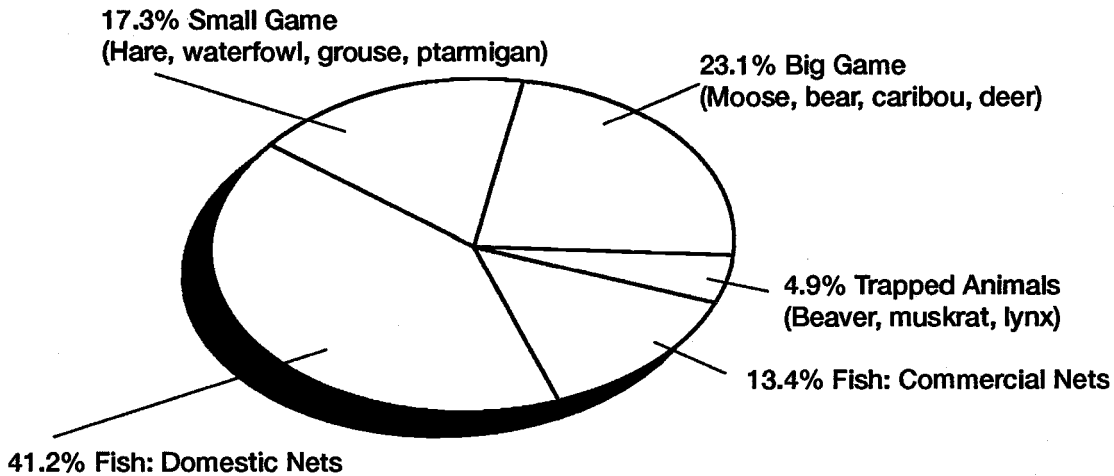
The data in Table 1 are aggregated and shown graphically in Figure 1. Fish from domestic nets accounted for 41% of the village's harvest of meat; fish taken from commercial nets, but consumed locally, accounted for 13%. Big game animals represented 23%, small game animals

17%, and edible trapped animals 5%. A conservative valuation of the village's harvest was done (Northern Village of Pinehouse 1987b), converting the income-in-kind harvested, including berries and fuelwood, into dollars. This monetary valuation cannot express the value of the harvest to residents because there are no ways to translate the complex of cultural values inherent in harvest procurement into dollars. It cannot be inferred that the loss of access to the resources can be fairly compensated. Figure 2 indicates that transfer payments accounted for 34% of the village's gross income, wage employment 31%, and the bush economy 35%; each of these sectors represented just over a million dollars. Bush economy includes both income-in-kind (17%) and commodities (18%).

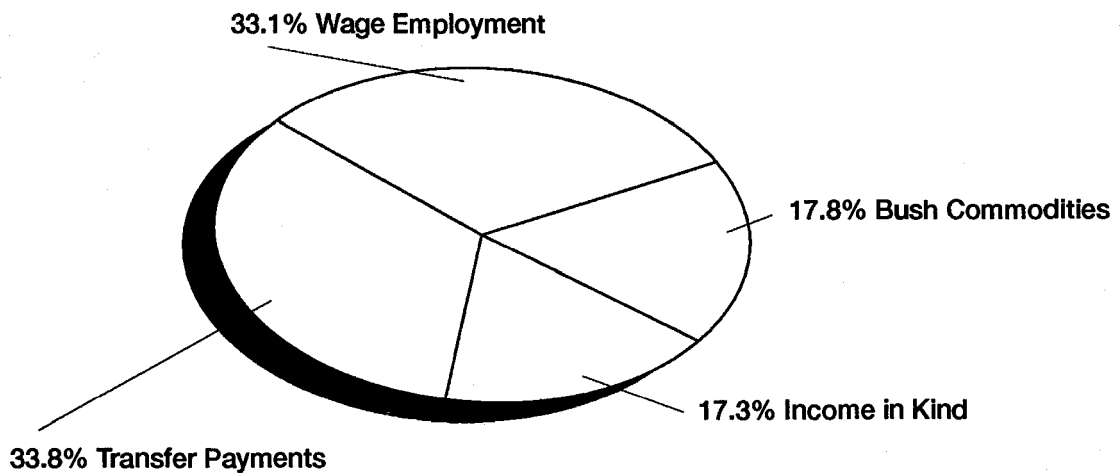
The most striking findings pertain to the harvest of fish for consumption by residents.

**Table 1:** Resource Harvest for Local Consumption by Pinehouse Residents  
(April 1983 to March 1984)

Harvest Item	Total Number Harvested	Equivalent Edible lb.	Equivalent Edible kg	As % of Total Meat (edible lb.)
Fish	52,584	101,649	46,108	54.6
Moose	52	26,052	11,817	14.0
Hare	9,310	17,689	8,024	9.5
Bear	72	15,120	6,858	8.1
Waterfowl	8,232	12,348	5,601	6.6
Beaver	296	4,973	2,256	2.7
Muskrat	2,813	3,938	1,786	2.1
Grouse/Ptarmigan	3,305	2,313	1,049	1.2
Deer	10	1,010	458	0.5
Caribou	4	836	379	0.5
Lynx	31	263	119	0.1
Total Meat	—	186,191	84,455	99.9
Berries	—	6,687	3,033	—
Fuelwood (cords)	682.5	—	—	—



**Figure 1: Resource Harvest by Category**  
Village of Pinehouse (1983-84)



**Figure 2: Total Annual Gross Income (April 83-March 84)**  
Village of Pinehouse

Villagers produced over 100,000 edible pounds (45,360 kg) of fish in a 12-month period. This figure, which includes 25,000 pounds (11,340 kg) taken from commercial nets but used for

local consumption, represents 55% of the community's entire harvest. During another one-year survey period, the members of five selected households harvested almost 15,000

edible pounds (6,804 kg), which represents 70% of their combined harvest of meat. For one of the five units, fish accounted for 86% of all meat procured. The importance of domestic fishing is also indicated by the high number of villagers who harvested from family nets. In one 12-month period, 80% of all resident adult males fished domestically while 41% retrieved fish for local use from commercial nets.

The Pinehouse informal economy is undoubtedly far larger and healthier than the conventional portrayal of a barely-surviving, income-in-kind sector that is tenuously maintained by the activities of a handful of die-hard old-timers. There is widespread participation in the harvesting of resources, and these activities clearly yield prodigious quantities of food and fuel.

The provincial agency's 1983-84 estimate of fish taken from Pinehouse Lake for local use was 9,920 pounds (4,500 kg). The village's own research estimate for 1983-84 was over 101,000 edible pounds (45,814 kg), with well over 90% of this figure coming from Pinehouse Lake. This discrepancy represents a difference of one order of magnitude. Despite the fact that agency personnel expressed concern regarding the accuracy of their numbers, it is obvious that they had not been at all aware of the real size of the Pinehouse domestic fisheries. The difference in the two estimates was initially quite startling. This is less the case now, given the findings of more recent research. For instance, a wide-ranging, in-depth study entitled *Involvement of People of Indian Ancestry in Saskatchewan's Fisheries* (Murray and Clouthier 1986) concludes that government estimates for domestic harvests are understated by at least an order of magnitude.

The lack of reliable income-in-kind data precludes good planning in the context of mega-projects. It has implications for the planning of all specific economic development projects,

regardless of size, and it certainly has serious ramifications for resource policy formulation. It is impossible to manage effectively and allocate wildlife resources when managers have no clear idea of the number of animals that are being removed from a population. It is not only fish and small game — the categories that are most difficult to determine reliable harvest estimates for — that professionals have difficulty with. At a 1984 meeting of the Hunter Advisory Committee, a body of experts established to advise provincial cabinet and annually recommend changes to the regulations, a biologist lamented the fact that his agency had no idea whether the unregulated moose harvest in northern Saskatchewan consists of 50 or 5,000 animals. At the same meeting another senior biologist stated that Pinehouse residents don't eat bear meat. Yet in 1983-84 villagers harvested 72 bear which represents 15,120 edible pounds (6,858 kg) and 8% of the community's total harvest of meat for the year. It is conservatively estimated that 78% of the animals harvested were eaten (Northern Village of Pinehouse 1987a). Given the lack of baseline harvest data, how can big game regulations, or any wildlife allocations for that matter, really be effective?

The case of fisheries policy as it relates to Pinehouse strongly suggests the need for harvest data. In 1983 and 1984 the Saskatchewan government commenced major reviews of its policies concerning big game hunting, rice farming, and commercial fishing. All three documents released for public comment clearly accorded domestic users a lower status vis-a-vis resource allocation while at the same time encouraging increased use by tourists and southern investment capital. The new policy paper regarding fisheries states that the province will "promote a shift of the game fish harvest from commercial to the sport fishery" and it would "restrict the

number of participants" in the commercial fishery. However, game fish (specifically pike and pickerel) are a crucial part of the commercial harvest and, at then current prices, fishermen could not cover their costs selling the only marketable non-game species (whitefish). Northern political leadership rejected the new policy not only on the basis of its probable consequences for commercial fishermen, but also because it fails to recognize the importance of fish as income-in-kind. Domestic fishing is not mentioned in the policy summary.

The government's policy reviews were based to some extent on information concerning northern residents' harvesting levels. The problem is that the information base used was so flawed that the resultant policy directions ran the risk of being seriously misguided. For instance, the government's *Proposed Saskatchewan Fisheries Policy — Action Plan* was informed by the findings of a benefit-cost analysis produced by consultants, an analysis based on some unfounded assumptions regarding the magnitude of northerners' use of the resource base. The government had commissioned the work (Beak Consultants Ltd. 1981) specifically for the purposes of policy development. One of a number of the Pinehouse objections to it pertains to the estimate of the magnitude of northerners' dependence on fish; the cost/benefit analysis stated that "an estimated 227 northern residents...supplemented their diet with fish". In an official response the village mayor claimed that he could "name over twice that many people in Pinehouse alone who supplemented their diet with fish netted for domestic purposes in 1980. Probably well over 20,000 northern residents (90 times the consultants' estimate) greatly supplemented their diet with fish taken from domestic and commercial nets in that year".

The fisheries policy review of the early 1980s

represented a thrust towards encouraging a major new user group in the north, the tourist angler. Pinehouse Council feared that a sizable new user group would result in decreased access for the existing users. Its concerns were not misplaced. Not being cognizant of the size of the local food fishery, the regulatory agency was omitting it from consideration when setting annual legal harvest limits for the other user group, the commercial fishermen. Since allocations were not being based on a realistic picture of what was already being harvested from the lake, Council anticipated that the new policy would seriously hurt the fisheries if adopted. Council expected that the outcome would eventually amount to one more step in the incremental alienation of people's land base and resources.

This is just one of numerous conceivable contexts where planning can be effective only if indigenous knowledge is brought into the process. In the absence of such information, planning exercises — whether northern megaprojects, resource policy revisions, or community planning studies — can work primarily for the advancement of southern interests. They can seriously undermine northern economies and cultures, which works against all our interests.

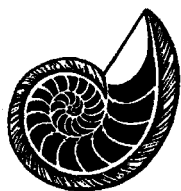
*AUTHOR'S NOTE: I am grateful to the Council of the northern village of Pinehouse for giving me permission to use its data.*

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## Astute Observers on the Sea Ice Edge: Inuit knowledge as a basis for Arctic Co-Management

*Douglas J. Nakashima*



Cooperative management is increasingly viewed by state wildlife agencies as one of few remaining options for the management of wildlife in the North American Arctic. According to Stirling (1990:iii), "aboriginal peoples want, need and will have much more direct involvement (in wildlife management) than they have had." Bell and Gillman (1991:1, 8) observe that the era of "back room allocation" is over and that "management agencies have little choice but to adopt some form of cooperative management." As co-management edges towards the mainstream of renewable resource management practice, it is important to consider the extent to which it fulfills the aspirations, not only of state managers, but also of Native peoples.

One area of particular concern to Native peoples (Simon 1991) provides the point of departure for this paper. It is the extent to which traditional ecological knowledge (TEK), the knowledge of Native peoples about their natural environment, is recognized by state managers and integrated into the management process. If Native peoples and state managers are to be equal partners in co-management, then equal consideration must be given to the distinct systems of knowledge and management that each

cultural group brings to the process. Admittedly, an integration of indigenous and western scientific ways of knowing and managing wildlife is difficult to achieve. But has a decade of co-management provided some progress towards this end?

Studies of existing co-management arrangements provide little encouragement (Osherenko 1988; Berkes 1989; Cizek 1990). Even in the case of the Beverly-Kaminuriak Caribou Management Board, widely regarded as successful



co-management in action, TEK has been completely marginalized. Government biologists retain exclusive control over research (Cizek 1990; Usher, personal communication.) and as a result, western science prevails. Where traditional knowledge is explicitly recognized, it is clear that wildlife managers require that it take a back seat to science. Stirling (1990:iii) speaks of combining "traditional and modern approaches", and yet writes at length about the need for extensive scientific training for Native peoples, without any mention of the need for a reciprocal flow of knowledge from Native experts to wildlife scientists. His commentary suggests that the burden of integrating indigenous and western knowledge is to be borne by Native individuals and communities, and not to be shared by scientists and managers.

Clearly, a gulf remains between TEK and science, and between Native peoples and wildlife managers. That the traditional knowledge of indigenous peoples is now gaining increasing recognition world-wide (Brabyn and Hadley 1991; Simon 1991), as well as in Canada, only serves to highlight the failure of co-management initiatives to incorporate TEK into their research and decision-making processes. Why has TEK encountered so much difficulty gaining recognition and acceptance from wildlife professionals? Johannes (1981:ix) attributes at least part of the resistance to TEK to "an elitism and ethnocentrism that runs deep in much of the western scientific community." Similarly, Freeman (1986) points out that wildlife professionals, failing to recognize that they themselves work and think within the confines of a "scientific" culture, reject other systems of knowledge as inferior.

While ethno- or culturocentrism plays a fundamental role largely unrecognized by wildlife professionals, this paper addresses another facet of the problem: the scarcity of information about

TEK. While pioneering research in the North American Arctic has helped bring TEK to the forefront of contemporary debate (for example, Laughlin 1968; Nelson 1969; Freeman 1979), the task now at hand is to evaluate its nature and content, as well as its potential applications in contemporary wildlife management (whether state, indigenous or cooperative). Assessments of this nature may help alleviate the skepticism that many wildlife professionals experience when confronted with TEK, and may dispell misconceptions about TEK which remain well-established in some circles.

Accordingly, this paper offers a detailed examination of one subset of the traditional ecological knowledge of the Inuit of southeastern Hudson Bay: their knowledge of the winter ecology of the Hudson Bay Eider (*Somateria mollissima sedentaria*). In so doing, it illustrates on the one hand, the sophistication and exacting nature of TEK and, on the other, its evident and immediate applicability in wildlife management. To set Inuit knowledge into appropriate perspective, the presentation of Inuit data on eiders is preceded by a brief survey of contemporary scientific knowledge of the Hudson Bay Eider.

### Methodology

Inuit from three communities in southeastern Hudson Bay contributed to this study of traditional ecological knowledge. The information presented here is part of a larger data set collected by means of semi-directive interviews and covering a wide-range of topics including the hunting, use, classification, anatomy and ecology of eiders (Nakashima 1991). Over 200 interview-hours were compiled during the period 1985 to 1989. The majority of this research was conducted in Sanikiluaq, N.W.T., the only community located on the Qikirtait, or Belcher Islands. Data were also collected in Inujjuaq and

Kuujuaraapik, Nunavik (northern Québec). Interviews were often conducted with the assistance of interpreters because a number of those interviewed spoke only Inuktitut. Biogeographical information was recorded on acetate overlays on 1:250,000 scale maps. Interviews were tape-recorded to permit the transcription and translation of key interviews or sections of interviews.

In this text, pseudonyms have been employed. Inuktitut place names are employed whenever possible, and are accompanied by the equivalent English name when first cited. All Inuktitut place names mentioned in the text are shown in Figure 1. Orthography of place names for Quebec and near-shore areas follow Müller-Wille (1987). The orthography of place names in the Qikirtait, originally collected by B. Saladin d'Anglure and M. Vézinet in 1976, has been corrected with the aide of Sanikiluaq Inuit.

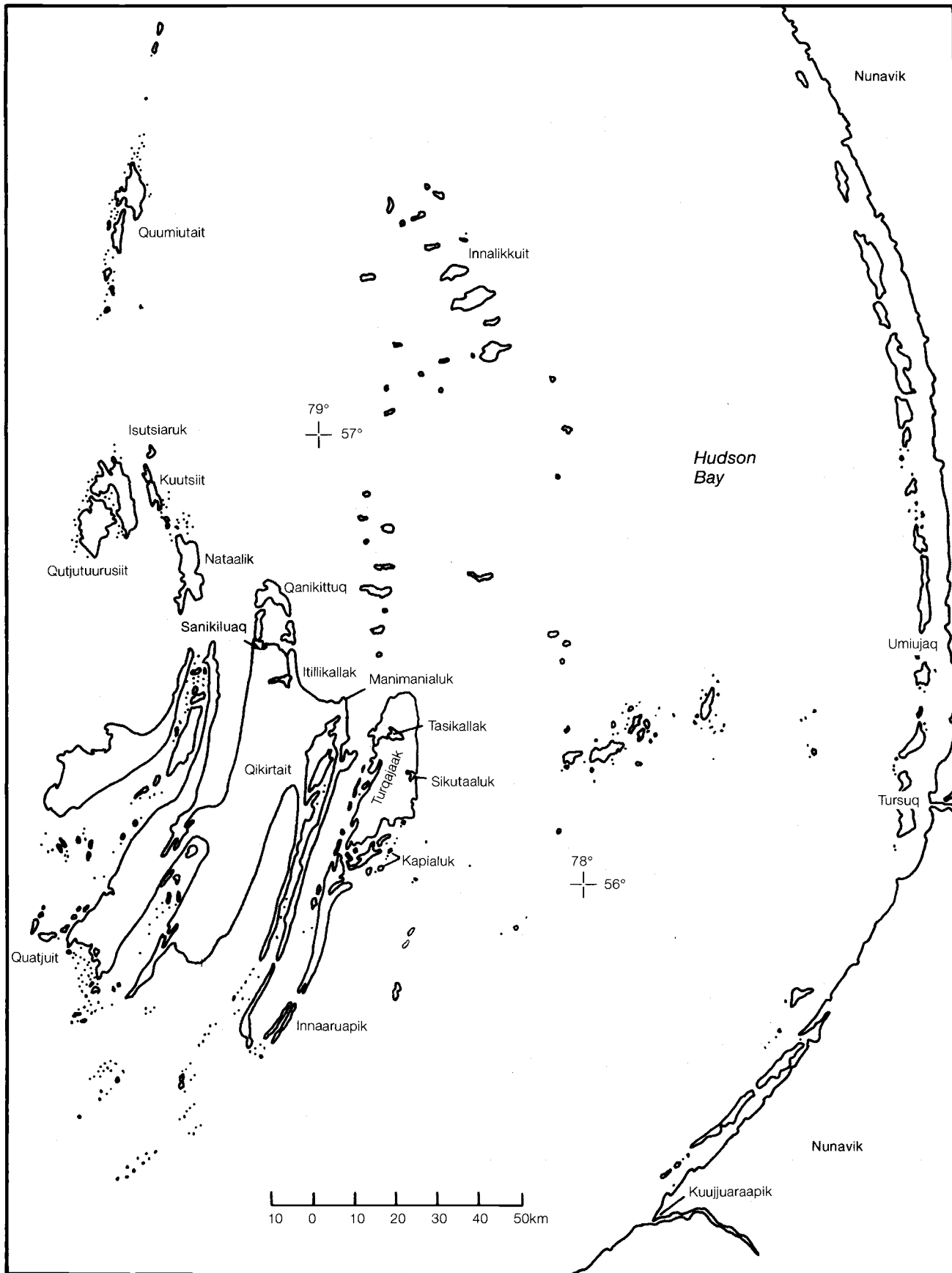
#### ***Somateria mollissima sedentaria*: the Scientist's Eider**

The scientific community has only recently recognized that the Common Eiders of Hudson Bay constitute a morphologically and biogeographically distinct group. Until the 1940s, Hudson Bay Eiders were considered to belong to the geographically-distant American Eider subspecies (*S. m. dresseri*), which nests and winters on the Atlantic coasts of Canada and the north-eastern United States. Only in 1941 did L.L. Snyder correct the error, conferring upon Hudson Bay Eiders the epithet *sedentaria* in recognition of its year round occupation of Hudson and James Bays. Nonetheless, even as late as the 1960s, Todd (1963:187) writes that the "only authority for the wintering of this Eider on the open waters of Hudson Bay" is "Eskimo report", a situation that he grudgingly describes as "acceptable for the present." For biologists today, the situa-

tion has hardly changed. Reed and Erskine (1986:160) question whether the entire *sedentaria* population could be wintering in the North given that it has been "detected by so few ornithological observers." Their "observers" do not include Inuit.

Few scientific studies specifically focus upon Hudson Bay Eiders, and of these, only a handful provide data immediately pertinent to wildlife managers. Driver's (1960) research in the Qikirtait deals with duckling ethology, and Schmutz (1981) examines eider coloniality at La Perouse Bay, Manitoba from the perspective of evolutionary ecology. Noteworthy exceptions to this general state of affairs are aerial surveys of eider nest colonies along the Nunavik coastline of Hudson Bay conducted by Cooch (1954) and Chapdelaine and Tremblay (1979), and observations on eider breeding biology in the Qikirtait by Freeman (1970). These data offer but a cursory indication of Hudson Bay Eider distribution, population size and biology. The balance of the scientific literature on Hudson Bay Eiders is a haphazard collection of observations made incidental to other investigations (see Abraham and Finney 1986 for a recent review).

Biologists' observations are for the most part restricted to the traditional summer field season. Data on Hudson Bay Eiders in winter are for all practical purposes non-existent. Information provided by Freeman (1970) is the most pertinent, identifying important eider wintering areas to the west and north of the Qikirtait. It is worth noting, however, that Freeman worked closely with Inuit and recognized early on the value of their ecological knowledge. It is likely that the information he presents integrates Inuit observations with his own. Other information is more fragmentary. Manning (1976), for example, observes and counts eiders wintering at three locations near the Qikirtait while



**Figure 1:** Sites in southeastern Hudson Bay appearing in the text and their Inuktitut place names.

conducting a helicopter survey for polar bear. Similar information collected incidental to other scientific activity exists for a few locations along the west shore of Hudson Bay (Abraham and Finney 1986).

In summary, the scientist's knowledge of Hudson Bay Eiders is fragmentary, restricted to the open water period, and, as biologists themselves realize, "not currently adequate for the purposes of management" (Abraham and Finney 1986:55). One illustration of the unreliability of the scientific data base is provided by Abraham and Finney (1986), who set themselves the unenviable task of piecing together scattered scientific information to estimate Hudson Bay Eider population size. Relying primarily upon the aerial survey of Chapdelaine and Tremblay (1979), they estimate a breeding population of 45,000 birds. These results lead Reed and Erskine (1986) to conclude that the Hudson Bay Eider population is suffering an annual 5% decline. In 1985, however, ground surveys of eider nest colonies in southeastern Hudson Bay were conducted by Makivik Research, an Inuit organization, in cooperation with Inuit communities. These more exacting data provide an estimate of eider population size of 83,000 birds for eastern Hudson Bay alone, 84% larger than Abraham and Finney's estimate for all of Hudson and James Bays (Nakashima and Murray 1988). Furthermore, this more recent estimate suggests that rather than declining, the Hudson Bay Eider population may be increasing annually by 7%.

This example suggests how wildlife management decision-makers may be led astray by an impoverished scientific literature comprised of fragmented and incidental observations. For many Arctic species, severe deficiencies in scientific knowledge similar to those noted here for the Hudson Bay Eider, are not the exception but

the rule. Wildlife managers nonetheless make decisions and take actions based upon deficient scientific data, declaring that for the time being it is the only information available. In so doing, they choose to ignore the traditional ecological knowledge of Native peoples.

### **Mitiq: Inuit Knowledge of the Hudson Bay Eider**

In the nomenclature of the Inuit of Qikirtait and the west coast of Nunavik, the Hudson Bay Eider is known as *mitiq*. Whereas scientific data on the Hudson Bay Eider are limited, the collective knowledge of the Inuit of the communities of Sanikiluaq, Inujjuaq and Kuujjuaraapik offers a comprehensive understanding of eider distribution and ecology. In this paper, discussion focuses upon the species' winter ecology. Wintering in the North, Hudson Bay Eiders are subject to a demanding climatic regime. Biologists have never had occasion to observe eiders exposed to such rigorous conditions; their winter observations are confined to milder climes (for example, Nilsson 1984 (Baltic Sea); Guillemette 1991 (Gulf of St. Lawrence). Extensive Inuit observations, however, provide invaluable insights into winter phenomena which have yet to be documented in the scientific literature. The following three sections present Inuit knowledge of the winter distribution of eiders; *pullait*, ice domes formed by eiders; and *nigajuk*, eiders trapped by ice.

### **Winter Distribution**

Inuit are familiar with the fine details of the seasonal distribution of eiders in south-eastern Hudson Bay. Information on eider distribution in winter is of particular interest: first, because as has been noted, scientific data on the subject are for all intents and purposes non-existent and second, because it has important applications in

wildlife management.

Inuit of the Qikirtait report that Hudson Bay Eiders congregate in winter at a limited number of locations. They explain that eiders concentrate at open water areas which consistently remain ice-free throughout even the coldest winter months. Not surprisingly, where there is no open water in winter, there are no eiders. Where open water is likely to freeze over, eiders are few. Between the western coastline of Nunavik to the Qikirtait archipelago, for example, much of the ocean surface freezes into a continuous ice sheet which excludes eiders from this extensive region. While small areas of open water may pierce this ice sheet, such as along the eastern shore of Turqajaak (Tukarak Island) or at Tursuq (the mouth of Richmond Gulf), these sites do not attract large numbers of eiders as they freeze over during severe winters (see *nigajuk* below). In the vicinity of Innalikkuik (King George Islands) powerful currents disrupt the formation of a continuous ice sheet, but as these waters remain choked with moving pack ice, few eiders remain throughout the winter (see Figure 1).

In contrast, Inuit observe immense numbers of Hudson Bay Eiders off the landfast ice along the western perimeters of the outermost archipelagos: Qikirtait, Qutjutuursiit (Split Island in the North Belcher Islands), and Quumiutait (Sleeper Islands). The concentration of eiders along this outer floe edge peaks in February-March when the extent of sea ice approaches its maximum. During these months, the distribution of Hudson Bay Eiders in south-eastern Hudson Bay is more restricted than in any other period of the year.

Inuit note, however, that the occurrence of open water is not the only factor which influences eider location. Extending westward from the landfast ice edge are the waters of Hudson Bay, largely covered in winter by shifting pack

ice. Areas of open water occur throughout the ice pack, but Inuit observe that eiders do not venture far from the landfast ice edge. Instead they occupy the open lead between the floe edge and the ice pack floating offshore. According to Inuit, eiders remain close to the landfast ice edge in order to feed.

Even along this ice edge, which stretches from Qikirtajuaq (Long Island) near the mouth of James Bay, northward along the western perimeters of the Qikirtait and Quumiutait archipelagos, eiders are not evenly distributed. Inuit observe that some stretches of ice edge have few or no eiders while in other areas, they are abundant. In the vicinity of the Qikirtait, wintering eiders are found in large concentrations south of Quatjuit, off the archipelago's southwestern ice edge. A second area of concentration occurs off the western margin of Qutjutuursiit, and a third area occurs near Quumiutait.

#### **Pullait: the Formation of Ice Domes by Eiders**

While most Hudson Bay Eiders winter along the offshore leads, lesser but nonetheless significant numbers frequent polynyas situated within the bounds of the landfast ice. Powerful tidal currents funnelling through narrow passages between land masses maintain these relatively small areas of water ice-free throughout the winter. Inuit refer to these permanent open-water areas as *ikirasait*.

For the Inuit of the Qikirtait, the occurrence of unusual ice formations known to them as *pul-lait* (sing. *pullaq*) is associated with polynyas frequented by eiders. The term *pullaq* is applied to bubbles of air and suggests the condition of being inflated. Schneider (1985:270) translates *pullaq* as "a bubble of air rising from the depths of the water." In the present context, Inuit apply the term to shallow ice domes which are buoyed

up by large bubbles of air trapped beneath the ice surface. These ice domes only occur near polynyas frequented by numerous eiders.

Inuit describe the formation of *pullait* as follows. The constant diving of numerous birds feeding on the ocean floor introduces air bubbles under the ice surrounding a polynya. These bubbles collect, and where the salt-water ice is thin and flexible, they force it upwards into a shallow dome. As more and more eiders enter and frequent the air space beneath the dome, the latter grows in size. In some cases these domed ice formations are said to become very large, permitting scores of eiders to cluster within the confines of their arched roofs.

Inexperienced hunters are cautioned to remain alert to the presence of *pullait* when approaching a body of open water frequented by eiders. The ice forming the dome is too thin to support the weight of a human being and the powerful tidal currents associated with the polynya can quickly draw one under the ice. The dome is so shallow that its slight rise above the surrounding ice surface is almost imperceptible even to the experienced eye. In order not to fall through these eider domes, hunters are warned to proceed forward with caution, testing the ice surface before them with the iron rod of the harpoon.

Along the Nunavik coastline, it is unusual for eiders to occur in numbers throughout the winter. As a result, the hunters of Inujjuaq and Kuujjuaraapik are not familiar with *pullait*, nor with the dangers they pose. A hunter's account of a recent mishap which occurred while hunting eiders near Inujjuaq provides independent confirmation of descriptions of *pullait* provided by Inuit from the Qikirtait. During the winter of 1986, Paulusie was out hunting with several companions. Eiders were spotted on an area of open water adjacent to Innaliit (McCormack Island, near the north end of the Hopewell

Islands chain). This was the first winter that open water had persisted throughout the winter at this site. The hunters decided that they would approach and try to shoot some of the birds. Paulusie and a companion took the lead, but, unaware of the possible danger of *pullait*, they did not test the ice. Paulusie recalls noting a shallow rise in the ice which, as they were close to shore, he assumed to be land. But as they moved onto the rise, to their great surprise, the ice suddenly gave away beneath their feet, plunging them into the water below. As the ice broke around them, numerous eiders flew out from the now-exposed pool of water, adding to the hunters' sense of disorientation.

In their confusion, the two hunters dropped their rifles and one lost a mitten. Fortunately for Paulusie and his companion, the *pullait* was situated near the shore and over relatively shallow water. With the help of the other hunters who were nearby, they were able to get out of the water and eventually able to retrieve their rifles.

Paulusie described the *pullaq* into which he and his companion fell as being approximately 25 m in diameter. He estimates the thickness of the ice of the dome as no more than a couple of centimetres and the distance between the ice and the water surface below as some 75 cm. The *pullaq* was located adjacent to the land and less than 9 m from the edge of the open water area where eiders were first spotted. The eiders present were mostly *mitiaraviniit*, juveniles born during the past summer.

### **Nigajuk: Eiders Trapped by the Sea Ice**

Inuit describe another aspect of the winter ecology of eiders on Hudson Bay: the mortality of large numbers of eiders due to entrapment by ice. The trapped birds are known to the Inuit as *nigajuit* (sing. *nigajuk*).

Every few winters, the Inuit of the Qikirtait

discover large numbers of dead eiders. These clusters of dead birds are almost always found in the same locations: the eastern shore of Turqajaak, the east shores of the Bakers Dozen Islands, the northeastern shore of Qanikittuq (Wiegand Island) and the shoreline between Manimanialuk (Gushie Point) and Itillikallak (the valley east of Windy Lake). Less frequently, dead eiders are also encountered along the eastern shores of Kuutsiit (Laddie Island) and Nataalik (Johnson Island). Numbers of dead eiders have also been found in the southeastern sector of the Qikirtait, southeast of Innaaruapik (Broomfield Island).

The locations of these winter-killed eiders to the east, northeast and southeast of land masses is related to the local pattern of ice formation. Inuit explain that when the sea freezes in these regions, the last open water occurs to the east of land. Eiders remaining in the region gather on these shrinking areas of open water. For a considerable length of time, the vigorous activity of numbers of eiders can keep these holes from freezing over. But when tidal currents weaken, the wind calms, and temperatures drop very low, these areas rapidly begin to freeze.

Inuit observe that the constant diving and rising of eiders in these small areas of open water splashes water up onto the ice edge. This water rapidly freezes, gradually building up into an ice wall around the hole's shrinking perimeter. It is interesting to note that observations by Freeman (1968:276) on ice formation around holes kept open by trapped belugas in Jones Sound, N.W.T., correspond closely with descriptions reported here for eiders. Describing the holes, he writes: "The edges had been built up by spray and waves generated by movement of the whales in the opening." This wall eventually becomes high enough to prevent eiders from leaving the hole, for they are heavy birds that must taxi along the water surface in order to take flight.

According to hunters, at this stage only the heads of the birds are visible above the encircling rim of ice. It is these trapped eiders which Inuit refer to as *nigajuit*, a term which may also be used to designate a snare for birds or mice (Schneider 1985). *Nigajuit* eiders make easy prey, and Inuit crouching alongside the opening are able to harvest them by stabbing with a harpoon.

As the holes continue to shrink in size, the ice wall may continue to build up due to the trapped eiders' frenzied activity. Eventually, a partial roof may be created over the hole. The drifting snow of blizzards are described by Inuit as contributing to the formation of this ice roof. Breathing holes maintained by trapped beluga whales roof over in similar fashion (Freeman 1968). If the eiders in the hole are numerous, some eiders will drown, unable to regain the surface due to the crush of bodies. If bitter cold temperatures persist, the hole may eventually freeze completely, locking the bodies of the dead eiders into an icy grave.

The majority of these *nigajuk* eiders are juveniles, experiencing their first winter. Inuit explain that these young, inexperienced birds are not aware that in order to survive the winter they must abandon the eastern Qikirtait region and seek out more dependable areas of open water such as the polynyas or the ice edges of the western part of the archipelago. During severe winters, thousands of young eiders perish as *nigajuit* are trapped and then drowned or frozen into the sea ice. Others abandon the rapidly-freezing areas of open water. Denied access to their benthic marine prey, the eiders are doomed to death by starvation and exposure. Barry (1964) reports similar die-offs of King Eiders (*S. spectabilis*) in the Western Arctic due to sudden and severe freezes in late spring or early fall.

In the eastern Hudson Bay region, the winter of 1991-92 was a hard one. Observations of a

massive die-off of eiders were collected from a Sanikiluaq hunter, during a recent trip to the community in August 1992. In May 1992, Simiunie was out hunting by snowmobile in the eastern Qikirtait. He traveled along the sea ice east of Turqajaak, starting from Sikutaaluk (Laddie Harbour) and heading northwards to the area east of Tasikallak (Costello Lake), and southwards as far as Kapiialuk (the island chain southeast of Mavor Island). Simiunie encountered the bodies of frozen eiders throughout this entire area. He estimates that along his more or less straight path northwards from Sikutaaluk, a distance of some 10 kms, he came across some 300 eider carcasses. Given that the eiders were scattered all over the ice surface "like gravel" and that he saw as many southwards from Sikutaaluk as northwards, he estimated that the number of dead ran into the thousands.

Off the east shore of Turqajaak, just opposite the highest point of land 7 km north of Sikutaaluk, is the area which Simiunie believes was the last to freeze over during the past winter. Although the ocean surface was frozen solid when Simiunie was present, he could still easily make out the conforms of what was once an ice hole. Within this raised perimeter, he saw the bodies of eiders frozen into the sea ice. The bodies of other eiders were located around the edge of the former hole. Presumably, the eiders had succumbed to cold and hunger where they sat. Interestingly, Simiunie observed not only dead young, but also male and female eider adults. South of Sikutaaluk, however, the frozen eiders that he encountered scattered over the ice were almost exclusively *mitiaraviniit*, juvenile eiders born the past summer.

### Some Reflections on TEK and Wildlife Management

This paper provides a glimpse of an immense

realm of observations, information and conceptualizations which constitutes Inuit knowledge of the natural environment. Although limited to the discussion of three aspects of the winter ecology of eiders, this brief assessment offers insights into the content of TEK and its utility in wildlife management. By bringing together traditional and western management practice, as well as TEK and science, Inuit and scientists have an opportunity to adapt the management of wildlife to the rapidly changing social, economic and political circumstances of the contemporary North.

Potential applications of this traditional data set in contemporary wildlife management are numerous. For example, precise data on when and where animal populations concentrate are of great importance. As hunters, Inuit have always exploited this exacting knowledge of seasonal change in animal distribution. Their ability to harvest at specific junctures of time and space when animals are concentrated represents the traditional formula for successful subsistence in an environment which appears barren and hostile to the unknowing eye. Today, Inuit as managers can continue to exploit this knowledge of changing animal distribution to ensure the sustainable use of wildlife populations. In the case of the eider, Inuit knowledge of seasonal distribution reveals the vulnerability of the population to environmental catastrophes such as an oil spill. Such an event would pose a serious threat to an eider population which in winter is highly concentrated in polynyas and along floe edges. To minimize impacts, management decision-making requires the precise distributional knowledge which only Inuit possess.

Inuit knowledge of winter concentrations also suggests a more efficient means to monitor eider population size. As contemporary managers, Inuit might choose to conduct aerial surveys



along the outer floe edges in mid or late winter (perhaps March) when the eider population is most concentrated. By focusing on the areas of concentration that they have identified off Quumiutait, Qutjutuursiit and southwest Qikirtait, a time and cost efficient means of monitoring a large proportion of the eastern Hudson Bay Eider population might be developed based upon Inuit knowledge. Sanikiluaq Inuit are not unfamiliar with wildlife surveys. For several years now, they have monitored the size of the introduced reindeer population by means of winter surveys by snowmobile and by airplane (Arragutainaq et al. 1990). The community has also conducted several nest surveys of the local eider population (Nakashima and Murray 1988; McDonald and Fleming 1990).

The distributional data presented here could be extended with relative ease, by collecting complementary information from the Inuit of the more northerly Hudson Bay communities of Puvirnituk, Akulivik and Ivujivik. Their knowledge would help identify whether the floe edges of the Qikirtait-Qutjutuursiit-Quumiutait archipelagos constitute the principal wintering grounds of the entire eastern segment of the Hudson Bay Eider population, or whether additional wintering concentrations exist, perhaps off the floe edges of Arviliit (Ottawa Islands) or Puujjunaq (Mansel Island).

If surveys of eiders are to be conducted at polynyas, the surveyors should consider Inuit observations that substantial numbers of eiders may be located out-of-sight, under the ice, in *pullait* of the eiders' own making. Contemporary eider management will improve if Inuit managers include their own knowledge of winter mortality. Their understanding of the age-specific nature of *nigajuk* mortality and the irregularity of its occurrence provides invaluable insights into eider population dynamics.

The traditional ecological knowledge of Inuit is a vast and diverse resource with numerous potential applications in wildlife management. For many species of Arctic wildlife, TEK far outstrips current scientific knowledge. Yet Inuit have not gained any meaningful recognition of their knowledge in contemporary management forums. Co-management arrangements would appear to offer a unique opportunity to integrate indigenous and western scientific knowledge and management practice, but this opportunity has not yet been seized. It is evident that TEK has a vital role to play in the development of viable systems of wildlife management. The challenge that must now be confronted is that of bringing TEK and western science together to contend with the complex resource management issues of the contemporary North.

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## II.

# The Beverly-Kaminuriak Caribou Management Board: An Experience in Co-Management

*Peter J. Usher*



The Beverly-Kaminuriak Caribou Management Board (BKCMB) was established in 1982 by a ten-year intergovernmental agreement, in response to a widely perceived crisis in the management of the Beverly and Kaminuriak barren-ground caribou herds. These herds range between the Northwest Territories, Manitoba, and Saskatchewan (Figure 1). Five signatory agencies fund the Board's operations, which brings together four separate jurisdictions as well as users and managers. The Board's mandate is to develop and make recommendations to governments and users for the conservation and management of the two herds, and to promote conservation through education and communication. The Board consists of eight user members and five government members (Table 1), and meets thrice-yearly. The major task of the Board during the initial years was the development of a management plan (BKCMB 1987).

Although the Caribou Management Board is simply an advisory body with no management powers, it is often cited as a positive and successful example of co-management (Monaghan 1984; Osherenko 1988; Cizek 1990; Thomas and Schaefer 1991; Scotter unpublished). Certainly, it is one of the earliest examples in North America, and it is the first for major big game herds.

Has the Board been a success, and if so, what accounts for it? The short answer is a qualified yes. This is partly a credit to the Board itself, and to its supporting agencies, and partly a matter of good fortune. This paper, based on a recent evaluation commissioned by the Board (Usher 1991), outlines its strengths and weaknesses, and the prospects and challenges for the future.

**Table 1: Composition of the Beverly-Kaminuriak Caribou Management Board**

<b>GOVERNMENT MEMBERS</b>		<b>5</b>
<b>Jurisdiction</b>	<b>Agency</b>	
Canada	Indian Affairs and Northern Development	1
Canada	Environment	1
Manitoba	Natural Resources	1
Saskatchewan	Parks and Renewable Resources	1
Northwest Territories	Renewable Resources	1
<b>USER MEMBERS</b>		<b>8</b>
<b>Jurisdiction</b>	<b>Communities</b>	
Manitoba	Brochet/Lac Brochet South Indian Lake/Tadoule Lake	2
Saskatchewan	Black Lake/Camsell Portage Fond du Lac/Stony Rapids/Uranium City Wollaston Lake	2
NWT (Keewatin)	Arviat/Baker Lake/Chesterfield Inlet Rankin Inlet/Whale Cove	2
NWT (Mackenzie)	Fort Smith/Resolution/Lutsel K'e	2

**Table 2: Communities, Population, and Harvest by Jurisdiction  
Beverly-Kaminuriak Caribou Management Board**

<b>Jurisdiction</b>	<b>Communities</b>	<b>Population (1989)</b>	<b>Mean Annual Harvest (1982-89)</b>	<b>Per Capita Harvest (1982-89)</b>
Manitoba	4	2445	2599	1.06
Saskatchewan	6	3446	2923	0.85
NWT (Keewatin)	5	4388	9112	2.08
NWT (Mackenzie)	3	3277	unreported	
<b>Total</b>	<b>18</b>	<b>13556</b>	<b>13011*</b>	<b>1.27*</b>
*not including Mackenzie communities				

## **Background**

The Beverly and Kaminuriak caribou herds are often characterized as a shared resource — shared among jurisdictions and among Inuit and Dene hunters and communities. Yet in other important respects, these herds are not a shared resource, and this has made the Board's task easier than it might otherwise have been.

First, the herd is used almost entirely for subsistence hunting by about eighteen small Aboriginal communities around the edge of the caribou range (Table 2). The licensed resident and guided sport hunt is very limited, and there is virtually no commercial hunt. The subsistence priority was recognized in both the Agreement itself and the composition of the Board. The consensus within the Board about management for subsistence priority has minimized a major source of conflict surrounding most other large mammal populations, and which is often a central task of management agencies to resolve.

Secondly, there is little competition for the range itself, which is among the least developed parts of northern Canada. Human settlement is limited to the periphery of the range, there are no roads or other rights of way through it, and there are only a few small non-renewable resource developments (although others are proposed). Most current activity, such as exploration and sport fishing, is seasonal.

## **How Participants See the Board**

Governments like the Board because it provides a venue for consultation with users, and for co-ordination (especially with respect to research) among jurisdictions. For some agencies, it provides a "single window". If there is a problem with caribou, the Board is the place to deal with it. It provides a sounding board for government initiatives, as well as early warning of user concerns and an orderly way of dealing with them.

The Board's recommendations are generally regarded as sound, even if governments do not or cannot act on all of them. The Board is seen as realistic, responsible, relatively non-political and diplomatic, but firm.

From governments' perspective, caribou are no longer a high profile political problem, and the Board is seen as an important reason for that. If the Board ceased to exist, it would have to be recreated in a crisis, almost certainly both at greater expense than it currently requires, and with reduced effectiveness because the continuity of good relations would have been lost. Ministers and senior managers seem also to have recognized the political advantages of letting the Board take responsibility for some difficult decisions rather than imposing their own solutions.

Users like the Board because it gives them an opportunity to speak directly with managers and biologists on the resource of most central concern to them. Governments must justify their policies to users, and are answerable for the results at the Board, although government representation is not necessarily as senior as some members would like. Users feel that, while the Board is by no means perfect, they get more respect and a better hearing, and that the situation is a vast improvement over the days when management policy was made behind closed doors.

The Board also gives users a chance to communicate with each other to learn of conditions and developments around the range, and to compare observations, to identify issues to develop common strategies, and to provide mutual support. These opportunities are especially appreciated by users in the provinces, where historically they have had little effective clout with resource managers and treaty rights have been interpreted restrictively. Inuit users, in comparison, do not see the Board as so central or valuable an institution. One reason is that they have

more political power in the Northwest Territories (NWT). Another reason is that the land claims process is providing some alternative venues for conflict resolution. Nonetheless, the work of the Board has been and continues to be valued by many users in the Keewatin.

From the perspective of ordinary users, the chief criterion of the Board's success would be to make caribou more accessible. This is especially so at the southern end of the range, where in some years people have to travel a long way at great expense to get their food. Some feel the best way for the board to spend its money would be on aircraft patrols to inform hunters where the caribou are. Inuit users want the Board to protect the calving grounds.

### **Achievements**

The Board can take credit for several significant achievements. The Board works well as a team. It has been reasonably effective as a lobby with governments, and an advocate for the subsistence interest. It has been a success in coordinating research and monitoring among jurisdictions, and in public and hunter education. The Board has communicated well enough with hunters and their communities to have their goodwill, if not their full understanding of its mandate and function.

The Board has had effective input into allocation and regulatory decisions. However, these do not cost governments much money. The Board's success in protecting caribou and caribou habitat from external human activity is more limited. In this respect it can only act as a lobby group; other agencies must pay the costs, and most have been largely unwilling to do so. For example, while the Board has pressed for full protection of the calving grounds from industrial development, no such action is likely. Despite the attention that the Board has given to fire

management, there has not yet been any significant improvement in the protection afforded the winter range.

Overall, there has been substantial change in the approach to caribou management by all government agencies since the late 1970s. A purely technical approach to management has given way to public relations and participation. Where caribou biologists and managers once sought to minimize harvester access and use through top-down regulation and enforcement, there is now more emphasis on involving harvesters through conservation education and participation in management.

This is part of a broader national trend in wildlife management which the Board has contributed to as well as benefited from. This development is not a gratuitous gesture of good will by governments. It is a result of years of political and legal struggle by Aboriginal peoples to obtain recognition of their rights and claims. The Board is in part a product of that struggle, as well as of a recognition by governments that cooperation would be a more effective and less costly conservation strategy than trying to enforce draconian restrictions on a hostile and mobile group of hunters.

The Board owes part of its success to good fortune. For example, almost immediately after the Board came into being, it became apparent that both herds were more numerous than supposed, and that in the short term, at least, the dire measures advocated by some were unnecessary. Instead of being an emergency response team cobbled together in crisis, the Board had some breathing room in which to develop a cooperative atmosphere and a management plan.

The size and productivity of the herds continues to be satisfactory, and there are no immediately apparent threats to this situation. This outcome cannot be credited directly to good

management by the Board (or even by its supporting agencies), except insofar as the improved political climate, and sense of security among hunters, may have improved the climate for self-regulation.

The effect of this good fortune, however, is that the Board has never been tested by scarcity, and that may still be the most crucial test it will face in the future. What the Board can undoubtedly claim as a success is in contributing to, if not indeed creating, an atmosphere of mutual recognition, tolerance, and understanding, which is essential for dealing with any future crisis.

### **Problems and prospects**

Managers, users and signatory agencies have recommended that the agreement creating the Board be renewed for another ten-year term. If governments accept this recommendation, the Board will face some new challenges in its second decade.

First, there are some important issues the Board has not yet addressed. For example, there has been no contingency planning by the Board for crisis allocation. Such an event would require clear justification of need, and fairness of application. Communities would want powerful evidence that populations were really at risk, and this evidence would have to be consistent with their own concepts and observations. They would also want to know what remedial and compensatory actions governments were prepared to take.

The Board does not yet have a clear strategy for dealing with major industrial or transport developments on the range, for which pressure will likely increase. Nor has the Board addressed questions of longer run management strategy, such as intensive versus low level or passive management.

There is a need for the Board to renew its

management efforts and to revise its management plan. But there are at least two broader issues that confront it: one is the future political environment and role of boards, and the other is on the use of traditional environmental knowledge.

It seems likely that in a very few years, the Board's pride of place as the model of co-management will decline, and so may its effectiveness. There are already many boards in the North, especially in the NWT, and there will be many more after native claims are settled. Of special concern will be the wildlife management boards.

The risk is that none of these boards will continue to be the convenient "single window" that governments now find useful. Politicians may discover that the proliferation of boards is convenient because they can be delegated the political heat and because they provide a means for allowing issues to get shuffled around without resolution. In such an environment, issues of representativeness and accountability of boards as well as of their members may lead to a level of formalization and politicization which is antithetical to the present mode of operation of the Caribou Management Board, and which may imperil its continued success.

From an Aboriginal political perspective, neither this Board nor the board model itself fulfill objectives such as self-government or self-management. Boards are instruments of public government which provide for user representation. The distinction between users and managers remains fundamental to the Board's structure and mandate. In this sense, the Board is not fully an instrument of co-management, even in the sense of providing a forum for negotiation. Neither do the proposed claims-based management boards measure up to these ideals. These boards, if implemented as planned, will differ from the



Caribou Management Board in some important ways. First, there will not be a user majority. Secondly, they will consist of appointed representatives of the parties, drawn from the public (in fact generally from interest groups), not members of the parties themselves. In other words, they will not constitute a meeting place for users and managers, but a political forum for more general conflict resolution. Since they will be dealing with all species, there is likely to be more "horse-trading" (although the separation of functions among several boards under the Inuvialuit final agreement may reduce this effect in that case). These claims-created boards may thus prove less satisfactory to Aboriginal hunters and their communities than the Caribou Management Board.

The Board tries to bridge a major cultural gap with respect not only to traditional environmental knowledge, but also to political process and to the principles by which the relations of humans and animals are managed. The Board attempts to do this through the structure of meetings and agendas, and through sincere and committed efforts by its members, yet there are bureaucratic imperatives that are difficult to avoid.

Effective bridging requires the listening and learning that come over a long time. Meetings in isolated communities can require a week away from home and office, and there is always pressure to move the discussion along. Longevity of membership and regular attendance have helped to develop continuity of dialogue, but this effect is not widely spread beyond the Board itself.

Another problem is language. English is the working language of the Board, and there is no translation, unless for the benefit of non-members present. Hunters with the most profound ecological knowledge tend thus to be effectively screened from Board membership (although

they frequently attend community meetings).

The use of English as a common language masks the fact that the participants use significantly different versions of English. Some of the central terminology of the Board — wildlife, management, census, population — involves concepts which are not directly translatable between English, Chipewyan, and Inuktitut. Some terms do not necessarily mean the same things in English to all members. Such terms are subject to negotiation in this and other forums (especially, for example, in the negotiation of wildlife agreements in land claims). Where the need to negotiate these terms is not openly recognized (as is sometimes the case with the Board), alternate meanings simply become ignored or marginalized.

A major difference between the present Board and previous interjurisdictional technical committees is that biologists are required to justify their methods and conclusions. In addition, managers are required to justify their policies and strategies to users. User members are all reasonably fluent in English, but most are not familiar with scientific or bureaucratic jargon. Most government members and technical support staff do make the effort to explain their work and their conclusions to user members in plain English. The user members do not necessarily understand it all, and few feel comfortable explaining it in their own communities.

However, if users do not fully understand what they are being told, or do not agree with it, they may either avoid seeking clarification, or state their concerns in a metaphor so unfamiliar to managers that no useful dialogue is initiated. As well, government members are supported by technical staff. User members rarely have technical support. Consequently, approval of research agendas and proposals by user members may be more apparent than real.

While major field research initiatives are unlikely to begin without the approval of the Board, in practice this tends to mean delay rather than outright abandonment. The nature of caribou research itself remains unaffected by user perspectives or participation. User input affects research priorities, and the selection of research problems, but not research design. To the extent that users have systematic knowledge of caribou, board meetings have not proved to be the venue in which it is articulated or drawn out. Meetings have not been the occasion for drawing out and systematizing observations from around the range, even though users themselves share these observations informally.

I think this points to a deeper problem which the Board has not addressed. This is the basic model or paradigm which governs its operations, of which issues of language and terminology are only symptomatic. If there is no shared model to begin with, one must be negotiated. While developing the management plan was a useful process for the Board, the product did not include a shared paradigm between users and managers as a whole.

To make this point more clearly, it is necessary to distinguish between observations, data, or "facts", on the one hand, and on the other, the framework by which these facts are integrated into a system of understanding that guides action. Too often, traditional environmental knowledge is thought to consist of the former, when in fact, like any other system of knowledge, it consists of both.

The management biology model, which is geared to predicting if not indeed creating maximum or optimal sustained yield, is operationalized by data derived chiefly from a series of instantaneous, systematic surveys of population, movement, condition, and the like. These are integrated into a predominantly mathematical

model to yield the required results. Much traditional knowledge, which is largely descriptive, fits a "natural history" model now not much favored in management biology. The data base of traditional environmental knowledge is not required by the management model, and indeed is hardly recognizable by it. The data supplied by hunters themselves are thus largely irrelevant to the management model as *information*, however interesting they may be to managers as *anecdotes*. So long as the management biology model is hegemonic, traditional knowledge cannot be an effective guide to action.

### Conclusions

The Caribou Management Board is not an adversarial forum between government and user members. Decision-making is largely by consensus. Where votes are taken, the split is rarely between users and managers. Members have developed a good working relationship and have a sense of participating in a team effort. The result has been improved respect for each other as people, and to some extent increased understanding of their ideas and ways of doing things. This was a major objective of the Board, for which it can claim significant success.

Some years ago I suggested that the criteria for co-management ought not simply to be user participation in the state system, or even the appropriation of user knowledge by the state system, but rather a harmonization of the state and indigenous systems or approaches to understanding (Usher 1986). What I have described is certainly progress. However, the knowledge of Aboriginal hunters has still not been adequately utilized, nor their views adequately understood and incorporated into the management process.

That is a major and continuing challenge not only to the Caribou Management Board, but to other similar co-management arrangements. If

this challenge is not met, the danger is that instead of building bridges between systems, boards become arenas for proselytizing and conversion with the management biologist in the role of the missionary.

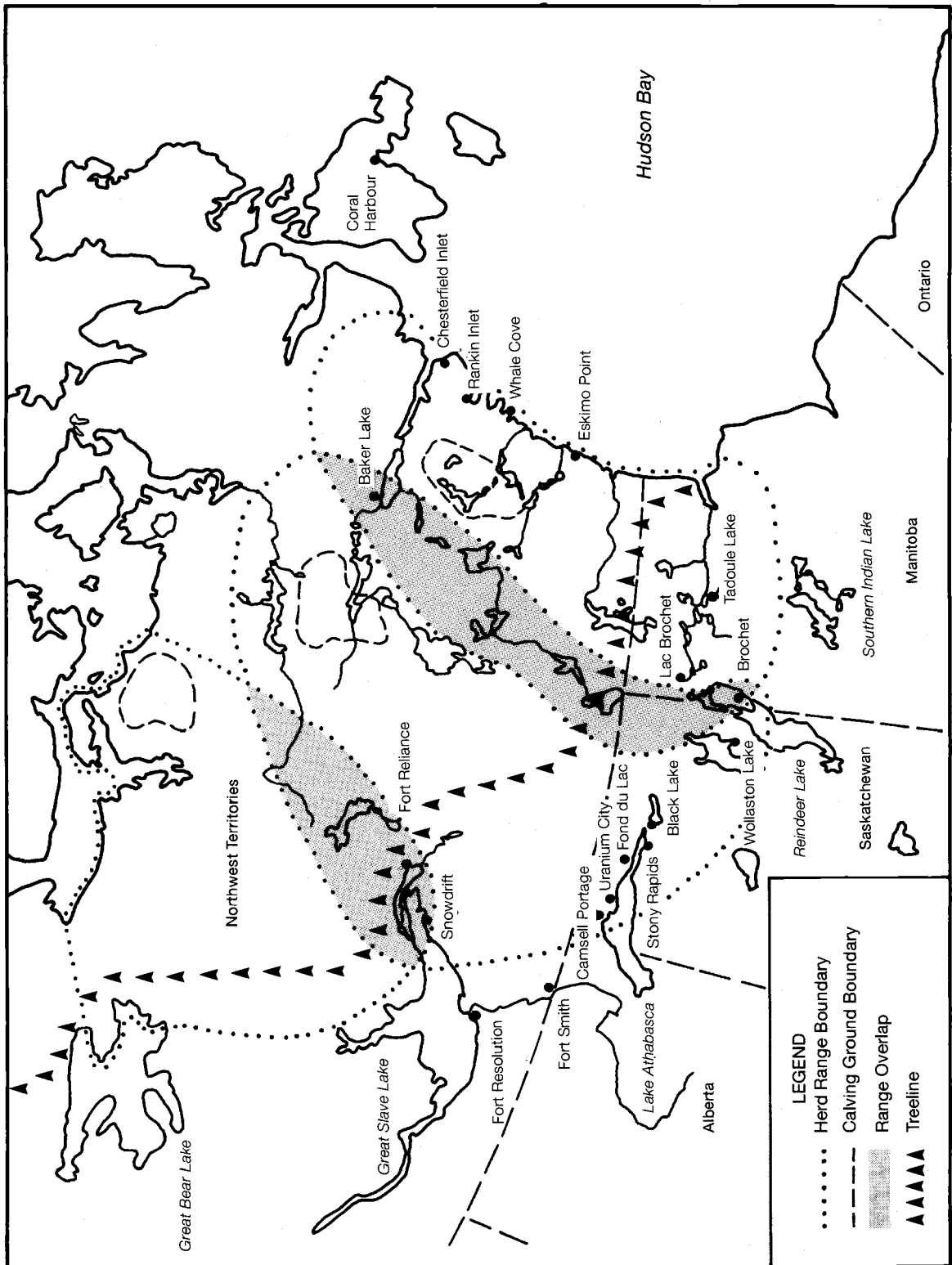


Figure 1: Traditional range of the Beverly, Kaminuriak and Bathurst herds in relation to treeline communities of traditional users.

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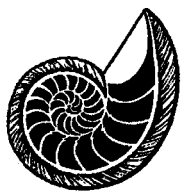
## 12.

# Aboriginal People and Resource Co-Management *The Inuvialuit of the Western Arctic and Resource Co-Management under a Land Claims Settlement*

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AND

*Bruce Hanbidge*



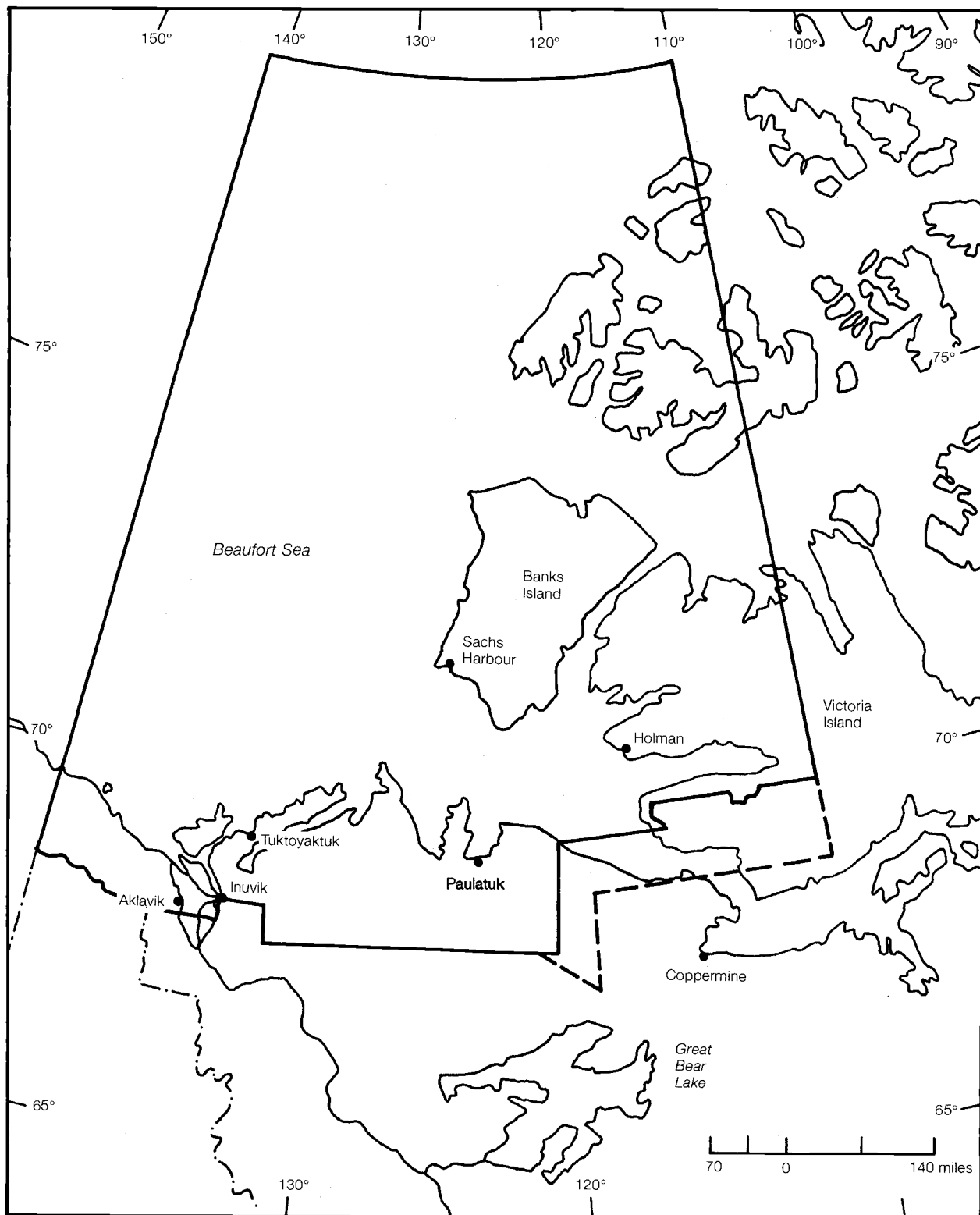
The Inuvialuit are the Inuit (Eskimos) of the Western Arctic Region of the Northwest Territories. Their land claims settlement was legislated under the "Western Arctic (Inuvialuit) Claims Settlement Act" in June 1984. Over 3500 Inuvialuit are represented under the IFA, most of them residents of the Western Arctic, living in six communities: Inuvik, Aklavik, Tuktoyaktuk, Paulatuk, Sachs Harbour and Holman (Figure 1).

The Region is approximately 1,300,000 square kilometres (500,000 sq mi) in area, some 90,000 square kilometres (35,000 sq mi) of which are private lands. Inuvialuit harvesting rights apply within the entire Settlement Region.

The implementation of the wildlife provisions of the Inuvialuit Final Agreement (IFA) is largely an exercise in the co-operative management of resources. There are issues relating to renewable and non-renewable resources, the management of migratory and relatively sedentary wildlife species, institutional structures and paradigms, internal and external conflicts, questions of equity, effectiveness and efficiency, and the

enforcement and maintenance of interests and rights.

The IFA created two separate management structures — the Inuvialuit Game Council (IGC) and the Inuvialuit Regional Corporation (IRC) — as policy and administrative bodies. The IGC deals with matters that affect wildlife such as renewable resources conservation, management and harvesting. The IRC is a development-oriented body, managing the Inuvialuit private lands and cash compensation. In effect, the IRC is a large firm with business interests and an orientation to increasing the tangible value of the corporation.



**Figure 1: Inuvialuit Settlement Region**

The relationship between the IRC and the IGC is not explicitly spelled out in the IFA (Robinson and Binder 1991). Rather, there is a deliberate dichotomy created under the IFA, and the means of resolving the conservation and development mandates must be sought internally. This is addressed by the various co-management bodies.

### Co-management Systems

Co-operative management systems and institutions emerge when a resource has a number of parties with different interests and rights. Common property is not open-access non-property. It has owners. Communal ownership is that "whereby a community controls access to a resource by excluding outsiders and regulating its use by insiders." The property continuum is, simply portrayed: open-access — state property — common property — communal property — private property. Furthermore, there are "no common property resources, just as there are no private property resources. There are, instead, resources that are managed as private property in one place and as common property in another" (Bromley 1989:871).

We do not attempt to differentiate in our cases between common and communal property; some of the resources in the study area are commonly owned, and others are communally owned. Nor do we attempt to quantify costs and benefits; the co-management systems that we discuss are assumed to seek the most efficient means of addressing issues, subject however to the Inuvialuit tradition of consensus in decision-making, and the transactions costs thereby incurred.

Osherenko (1988) defines a co-management regime as:

an institutional arrangement in which government agencies with jurisdiction over resources and user groups enter into an agreement covering a specific

geographic region and spelling out: 1) a system of rights and obligations for those interested in the resource; 2) a collection of rules indicating actions that subjects are expected to take under various circumstances; and 3) procedures for making collective decisions affecting the interests of government actors, user organizations, and individual users.

Pinkerton (1989:5) describes the co-management process:

...by instituting shared decision-making among these actors, co-management systems set up a game in which the payoffs are greater for co-operation than for opposition and/or competition, a game in which the actors can learn to optimize their mutual good and plan co-operatively with long-term horizons.

Pinkerton also outlines seven management functions that a co-management system can perform. If all functions are under the control of the particular system, it is complete; if not, it is an incomplete system. These seven functions are:

- data gathering and analysis
- logistical harvesting decisions
- harvest allocation decisions
- habitat protection
- regulations enforcement
- enhancement and long-term planning
- broad policy decision-making

Under the IFA, these functions are performed by a variety of co-management bodies under the direction of the Inuvialuit wildlife users, the hunters and trappers in the six Inuvialuit communities, through their Inuvialuit Game Council (IGC).



### **Inuvialuit Co-Management Bodies**

Five renewable resources co-management bodies were created under the IFA to manage specific resource fields under the aegis of the IGC:

- Environmental Impact Screening Committee (EISC)
- Environmental Impact Review Board (EIRB)
- Wildlife Management Advisory Committee for the Northwest Territories (WMAC (NWT))
- Wildlife Management Advisory Committee - North Slope (WMAC (NS))
- Fisheries Joint Management Committee (FJMC)

These bodies are charged with specific resource sector issues. The IGC is a policy-making body, referring to advice from both the Hunters and Trappers Committees (HTCs) and the co-management bodies in its deliberations, and reporting back to the communities through the HTCs. In addition to the five co-management bodies and IGC, there is a joint secretariat, which provides technical and administration support to four of the five co-management bodies; WMAC has its own secretariat.

The directors of the IGC are chosen by the HTCs; the directors of the IRC are chosen by the Community Corporations (CCs). The IGC in turn appoints the Inuvialuit members on all joint government/Inuvialuit bodies having an interest in wildlife. Half of the representatives on each of these bodies are appointed by government, with a chairman appointed by government with Inuvialuit approval. The exception to this is the Fisheries Joint Management Committee (FJMC), whose chairman is appointed directly by the committee members.

In this paper we discuss the activities of the

WMAC, the FJMC, the HTCs, and the IGC. We review particular examples of co-management agreements, and examine them with respect to species, location and access, and disposition. We look at how the HTC membership provides user observations through the IGC in management and research decision-making.

### **Cases and Discussion**

Table 1 summarizes the data presented in this section.

#### **Bowhead Whales**

In September 1991, the hunters of Aklavik fulfilled one long-sought goal: the hunt of a bowhead whale (*Balaena mysticetus*) for subsistence consumption. This initiative was supported fully by all Inuvialuit bodies, including the IRC and IGC and by the Department of Fisheries and Oceans (DFO). The co-management bodies provided a means of addressing the request for the quota, and for enabling the hunt itself, but the initiative was clearly an HTC membership effort.

It was the users' own kinship and lifestyle contacts with their Alaskan Inupiat cousins that provided the vital knowledge at all stages of harvest, from achieving the quota to hunting the whale.

#### **Beluga Whales – Domestic**

A Beluga Management Plan was developed by Canada and the Inuvialuit in 1991 to manage the stocks of beluga whales (*Delphinapterus leucas*) that summer in the Beaufort Sea. Prior to the IFA, management was implemented under a variety of federal acts and regulations. After consultations with the HTCs of Inuvialuit communities, the Fisheries Joint Management Committee formulated two goals:

- to maintain a thriving population of beluga in the Beaufort Sea;

- to provide for optimal harvest of beluga by Inuvialuit.

## **The Beaufort Sea Beluga Management Plan addresses the following:**

- determination of sustainable harvest levels;
- conservation and protection guidelines for development activities;
- development of bylaws, regulations, and a mechanism for enforcement;

- guidelines on research and monitoring of public education.

The Inuvialuit harvest of Beluga is about half of the most conservatively estimated total allowable catch. There is no quota; the Inuvialuit traditional management system functions well without it. The FJMC allocates the subsistence quota to the Inuvialuit communities; the HTCs in the communities then allocate these to the beluga hunters. It is the hunters who are the source

**Table 1: Species Co-Management**

Agency	Species	Dimension	Location	Issue
IGC	1 Bowhead	International	Can/US	Subsistence Quota
	2 Beluga	International	Can/US	Management/Quota Alloc
	3 Polar Bear	International	Can/US	Quota
	4 Caribou	International	Can/US	Development
FJMC	5 Bowhead	International	Can/US	Subsistence Quo
	6 Beluga	International	Can/US	TAC/Subsistence Quota
	7 Char	Domestic	Akl., Paul., Hol.	Commercial Quota/Research
	8 Whitefish	Domestic	Mack. Delta	Commercial Test/Research
WMAC (NWT)	9 Grizzly Bear	Domestic	Inuvik, Tuk.	Quota
	10 Polar Bear	International	Can/US	Management (Beaufort Sea)
	11 Polar Bear	Domestic	Paul., Sachs, Hol.	Management/Quota
	12 Muskoxen	Domestic	Sachs, Hol.	Commercial Quota
	13 Caribou	International	Can/US	Subsistence/Mgt.
	14 Caribou	Domestic	Inuv't., Gwich'in	Subsistence/Quota/Mgt.
HTCs	15 Wildlife	Domestic-ISR	Community	Quotas/Enforcement
	16 Wildlife	Commercial	Community	Tag Allocation

## Notes:

2/6: DFO regulate non-Inuvialuit; HTC's regulate Inuvialuit.

7/8: Fisheries enforced by GNWT Ren Res (by DFO delegation); marine mammals by DFO

14: Gwich'in involvement is pending Gwich'in Final Agreement ratification/promulgation

15/16: HTC's regulate Inuvialuit in ISR, GNWT Renewable Resources regulate non-Inuvialuit.

- FJMC is the only body that directs and conducts research; other bodies advise and monitor its conduct by renewable resource agencies.

- (Porcupine): Porcupine Caribou herd.

- TAC: Total Allowable Catch

of most of the data. Because they see the value of the information and the need for management, they are critical players in the Plan.

### **Beluga Whales – International**

The Inuvialuit and the Inupiat of Alaska are currently discussing the development of a common management agreement for Beluga. The Alaska Inuvialuit Beluga Whale Committee was formed to discuss the management of the common beluga stock by the Inupiat and the Inuvialuit (FJMC 1991). The close cultural, community and kinship ties between the Inupiat and the Inuvialuit go a long way in simplifying the dialogue and co-operation between the two groups. Here again, the users with their field observations and their traditional knowledge systems are vital to capturing information and enabling the management regime.

### **Charr**

Within the ISR, there are three separately managed provisional stocks of charr (*Salvelinus alpinus/malma*). One is near Aklavik, the second near Paulatuk, and the third near Holman. Because of a declining charr population, the Paulatuk HTC requested the commercial quota for that area not be allocated, and the Department of Fisheries and Oceans complied. There is also an effort to voluntarily limit charr subsistence harvesting.

In 1986, the community of Aklavik, through the HTC, expressed a concern that fish size was decreasing. Prompted by this concern from the community and DFO, the FJMC requested a complete closure of the river to fishing. The river was closed in 1987 and re-assessments are now under way to monitor the recovery of the stock. These user initiatives bode well for conservation of the charr stocks in the ISR.

### **Whitefish**

There are substantial numbers of whitefish (Subfamily *Coregoninae*) in the Mackenzie Delta. The Uummarmiut Development Corporation (UDC), a wholly owned subsidiary of the Inuvik Community Corporation, is conducting the third year of a five year commercial test fishery, a project designed to establish commercial quotas for whitefish and the commercial viability of such an enterprise.

Key to the success of the project to date is the coordination of research, employment training of local people, and sustainability and viability objectives by the creation of a steering committee comprised of representatives from all groups and agencies (Fricke, personal communication).

The Government of the Northwest Territories (GNWT) Department of Economic Development & Tourism (ED&T), DFO, and the Uummarmiut Development Corporation (UDC) jointly co-ordinate the project; biological study is conducted by DFO, project management is provided by UDC, and funding is provided by ED&T and Renewable Resources (GNWT), DFO, FJMC and UDC. The training in fish handling is conducted by UDC, on the job. UDC has been progressively taking over co-ordination and management of the field work in the project.

HTC support was required from the communities of Inuvik and Aklavik, as was HTA support from the Gwich'in communities of Arctic Red River and Fort MacPherson. Thus, although the Gwich'in Final Agreement has not yet been enacted and enabled, the Gwich'in are nevertheless consulted through their HTAs. This is cross-claim co-management in action. Closer co-ordination will be required if commercial fishing is implemented.

### **Grizzly Bear**

The Inuvialuit have exclusive harvesting rights to

Grizzly Bear (*Ursus arctos horribilis*) within their settlement region. In 1987 the Tuktoyaktuk HTC expressed concern about over-harvesting. The organization suggested that a quota be established, and the process of implementation began. The management of the grizzly bears in the Tuktoyaktuk area resulted in the first time that a native organization (and user group) enacted wildlife regulations enforceable under government statutes.

The users' own observations were the trigger for the development of a management plan and regime. Because there is such valuable field observation at the user level, clearly there is strong argument for incorporating traditional ecological knowledge into research and management systems.

### **Polar Bear**

Polar Bear (*Ursus maritimus*) is another migratory species. There are at least two discrete sub-populations in the ISR: one in the Banks Island area, and one that ranges between the Baillie Islands in the N.W.T and Icy Cape in Alaska. The Banks Island Polar Bear sub-population is managed in a manner similar to that for the Grizzly Bear case cited above. The international polar bear sub-population is managed through the Polar Bear Management Agreement for the Southern Beaufort Sea (IGC and NSB, 1988). The Polar Bear Management Agreement is:

an international agreement between the Inuvialuit and the Inupiat of Alaska. It was developed pursuant to Articles 2 and 7 of the International Agreement on the Conservation of Polar Bears and Their Habitat (1976). As the major users of this resource, the Inupiat and the Inuvialuit recognize their unique position to benefit from its management. With the assistance of the WMAC and the United States Fish and Wildlife Service, these two

user groups have cooperatively developed the management agreement.

The agreement's primary objective is the maintenance of a healthy and viable population of polar bears in perpetuity. It accomplishes this through:

- (a) the enactment of hunting regulations to maximize protection of female bears and cubs.
- (b) the collection of data on all polar bear harvests.

Other objectives include the minimization of the detrimental effects of human activities, particularly industrial activities, on polar bear habitat, and the encouragement of the wise use of polar bear products and by-products. Efforts to obtain legislative changes are integral to satisfy these objectives.

... In recognition of this agreement, the United States Fish and Wildlife Service officially commended the IGC and the North Slope Borough Fish and Game Management Committee and presented them with an award for their efforts. (Carpenter et. al. 1991)

We cannot overstress the vital role played by Inuvialuit hunters and management systems in this case.

### **Inuvialuit Renewable Resource Conservation and Management Plan**

This conservation and management plan is the result of a co-operative effort by the FJMC and the WMAC. It was endorsed by the IGC and the government bodies involved in co-management. It is the blueprint for acting on the requirements and recommendations arising from the IFA and the Report of the Task Force on Northern Conservation (1984).

The plan sets out a long term strategy for renewable resource conservation and management in addition to providing specific direction to the co-management bodies on issues of concern. A priority of the plan is that local community

plans will be developed within the overall ISR plan to highlight local goals and priorities. A community plan has already been developed for Paulatuk (WMAC 1990) and another is under way for Tuktoyaktuk. The other four community plans are to be completed soon.

The Inuvialuit believe that this approach will exemplify the philosophy of the Inuvialuit, for whom the fish, wildlife and other renewable resources are so important. The plan's principles and goals are a good example of co-management in action, reinforcing the traditional stewardship of the land but expressing it in contemporary terminology. Traditional ecological knowledge is embedded in the community plans through the participation of community hunters and trappers, and their participation enables management at the community level.

### **Commercial Utilization of Renewable Resources**

Wildlife harvesting is a consumptive use of wildlife, with three categories of use: subsistence, commercial and recreational. But these distinctions are not easy to make, nor do they occur separately. The Inuvialuit trade different game products among individuals, families and communities; sometimes for cash, sometimes for goods (barter), and sometimes for festive reasons. There is a social dimension to forming and maintaining hunting partner arrangements and bartering ties.

Commercial activities include guided sports hunting (for polar bear, muskoxen and caribou), commercial sales of caribou and muskoxen, and, as the north develops, new activities such as the test fisheries in the Mackenzie Delta.

### **Renewable Resources Development Corporation**

As indicated earlier, the IRC and the IGC are dis-

tinct and separate structures with different orientations to development and conservation. Commercial, development activities fall under the purview of the IRC. The Renewable Resources Development Corporation (RRDC), a private corporation, was created in early 1990 by the IRC. Its mandate is to develop viable economic ventures based on renewable resources. Its objectives are to:

1. become a medium sized, diversified renewable resource corporation;
2. develop renewable resource based enterprises that would:
  - a. maximize profit
  - b. provide local employment
  - c. create spin off industries;
3. develop national and international markets for renewable resource products from the Western Arctic region;
4. develop locally the management and administrative structure necessary to support the corporation;
5. support the research and management systems necessary to manage the resource.

The sectors that the RRDC proposed to develop were:

- large scale harvesting of wildlife for edible and non-edible products;
- commercial fisheries;
- tourism, (all aspects including lodges, tours, big game hunting and outfitting);
- restaurant business aimed at northern foods.

The RRDC is currently developing the commercial harvesting of muskoxen on Banks

Island. For this, it needs to improve herding, slaughter, handling, processing and marketing techniques.

### **Structural and Development Issues**

There are potential problems in the commercial development of a renewable resource: a single-minded corporate objective may end up competing with subsistence and recreational use and conflicting with conservation requirements. This can be mediated by ensuring local participation at all levels of the corporation. The IFA allows for local control by way of quota allocation by the community HTC. The community also has its say in the commercial development side by way of its management role in the IRC via the Community Corporation.

A potential structural problem is an increased polarization of the CCs and the HTCs since the HTCs are so clearly oriented to resource conservation and the IRC so oriented to development. Over time, as new generations of Inuvialuit become more involved in the modern-day commercial economy, will there be an erosion of the wildlife conservation ethic? Will Community Corporations and Hunters and Trappers Committees naturally become polarized camps of the development/conservation dichotomy? Is there a need for a new community institution, perhaps a Council of Elders?

The IRC/IGC dichotomy may also become more pronounced if the IRC grows along western commercial lines. There are no advisory bodies within the IRC that function quite like the Joint Secretariat, providing general technical management advice and expertise. Individual advisors can thus become powerful forces in influencing corporate management decision-making. Neo-classically minded advisors and consultants may have little time for traditional

systems, especially if they are seen to be antithetical to commercial market systems.

### **Complications Arising from Contiguous Land Claims**

Migrating wildlife don't recognize human boundaries. When species are harvested by two or more native groups, their management requires a mechanism that allows for the participation of all concerned groups.

The IFA addresses this need by providing membership on the co-management bodies to non-Inuvialuit native wildlife harvesters with settled land claims. Membership is limited in duration to the resolution of issues of mutual concern, and it is conditional on reciprocity. These groups must provide for equivalent Inuvialuit membership on their wildlife boards.

Because of the potential complexities of three or more parties involved in a co-management issue, the IFA provides for the creation of overlap agreements to specifically define the relationship between native claims groups. The Inuvialuit and the Gwich'in signed an Overlap Agreement in 1984 that deals with wildlife harvesting by Gwich'in within the ISR and by Inuvialuit south of the ISR, until the settlement of the Gwich'in land claim.

An additional item addressed in the Overlap Agreement recognized the Gwich'in claim to the ownership of a block of land within the ISR, and deals in general terms with the principles for mutual consultation in its management and development.

The complication of two land claims being applicable to the same piece of land and the conflicting jurisdictions of the various boards is the topic of a current Overlap Agreement being negotiated between the Inuvialuit and the Gwich'in.

## Research

Control by any group or body can seriously hamper the consensus required in co-management. Control can be exercised indirectly, through control of funding. As noted earlier, of the five IFA co-management bodies, only the FJMC can undertake its own research directly. The other bodies only advise on their own research priorities.

The Inuvialuit user orientation to research conflicts with that of academic and government agencies. What the Inuvialuit desire is applied rather than pure research. At the same time, the very existence of Inuvialuit systems seems to create demands from outside the region for more information. Where research, management and regulatory decisions were once made by outside bureaucrats and agencies, these bodies must now consult with the Inuvialuit. It sometimes seems to the Inuvialuit that those outside agencies often demand more information than they used to, and that they expect that Inuvialuit systems should provide this at no cost. The existence of a supplier of information creates demand for information. Students and researchers often seem to expect free and open access to information and time from Inuvialuit bodies.

## Conclusion

With reference to Osherenko's (1988) definition of a co-management regime, the following conclusions can be drawn:

- 1) a system of rights and obligations for those interested in the resource: the Inuvialuit are required to follow conservation principles while holding the rights to subsistence harvest in different species, with protection of these rights under various laws, statutes and regulations.
- 2) a collection of rules indicating actions that subjects are expected to take under various circumstances: the rules are as clear as can be without being overly rigid and complicated. The IFA is mostly a collection of rules and principles to be followed as issues arise over time.
- 3) procedures for making collective decisions affecting the interests of government actors, user organizations, and individual users: the processes of consultation are defined in the IFA. Much of the IFA outlines responsibility areas, consultation measures and regimes, and participants in the processes. Each wildlife co-management body makes collective decisions on behalf of the participants and users, with HTC's providing direct input from resource harvesters. Where development/conservation conflicts occur, especially from pressures from outside participants, the EISC and EIRB function as systems for resolution on a more formal basis.

As to Pinkerton's (1989) complete/incomplete systems and the functions of a co-management system:

- 1) data gathering and analysis : the users themselves, the co-management bodies and the government agencies collect and analyze data for harvest and management purposes.
- 2) logistical harvesting decisions: these are made at the community HTC level for subsistence hunting, and by the RRDC and the HTC's for commercial harvests.
- 3) harvest allocation decisions : these are made at the community, the co-management bodies, and the IGC levels, depending on the species and the purpose.
- 4) habitat protection : this aspect is generally practised at all levels. There is no "tragedy" in the Inuvialuit commons.

- 5) **enforcement of regulations:** the HTC's pass their own bylaws and monitor and enforce these internally; the IGC at the general level if required, and the government agencies on a broader level and at the request of the Inuvialuit.
- 6) **enhancement and long-term planning** (where to concentrate effort and what future is desired): this is an integrated role among the community HTC's, the co-management bodies and at the IGC/IRC level for the longer term.
- 7) **broad policy decision-making:** this is the function of the IGC, with technical advice from the co-management bodies and user advice and input from the communities' HTC's.

We think that the IFA as a total system, linked as it is with the various levels of government and their agencies, is a complete system. It is a strong system. While the IFA has not created a fully autonomous system, it has in a sense made agency arrangements with government: for the Inuvialuit to perform some of the tasks previously undertaken by government, and for the government to perform some of the Inuvialuit's functions by means of its agencies.

We think the success of co-management in the Inuvialuit Settlement Region is demonstrated by the relatively low public awareness of the cases we have described. There is little in the media, usually a good sign of minimal strife, but also little in the academic record. This is unfortunate since we believe a lot has been accomplished over the past seven years since the signing of the IFA.

Traditional knowledge plays a strong part in the Inuvialuit management systems, from data collection and general wildlife observation, to decision-making, to implementation and en-

forcement of decisions. Without input of data from the users in the field, there would be less information collected at greater cost.

There is a need for greater co-ordination of research effort. There are still researchers working in the North without consulting residents, and whose work conflicts with wildlife harvesting activities. It is not that the Inuvialuit insist on controlling the thrust of research, but that the North is becoming smaller and all activity needs better co-ordination. In the end, however, the Inuvialuit are the landlords of part of the Inuvialuit Settlement Region and the stewards of all of it. Their approval is required for access to their lands.

The serious test of the co-management regimes will come with increased subsistence and commercial demand for particular resources.

We conclude this paper by making a call for the study of active northern co-management systems by the academic community. There is much that could be learned from closer study of the IFA co-management bodies and their successes in the various fish and wildlife management and harvesting issues, for instance. There will be an ongoing and increasing demand for this information in the implementation of future land claims settlements. Efficient systems will be sought to maximize scarce financial and human resources. In fact, there is likely a danger that co-management systems under other claims will be crippled by insufficient funding. Efficiency decisions made by economists may see a tradeoff of the long-term benefits for short-term economy.



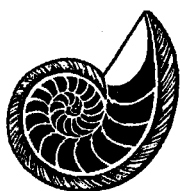
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### 13. Sami Fjord Fishermen and the State: Traditional Knowledge and Resource Management in Northern Norway

*Einar Eythorsson*



The conflict between small scale fjord-fishermen and Danish seine fishermen in Northern Norway is one of many examples of conflicts over common property resources throughout the world, which can also be seen as a conflict between traditional ecological knowledge and formal, scientific knowledge. This paper raises the question of compatibility between the two types of knowledge in the case of fjord fishing.

If management of common property resources can be improved by integrating traditional ecological knowledge and scientific biological knowledge as a basis for resource management, there is no reason why such an integration should not be tried. Though there are several examples of successful co-management, in most cases there are hindrances to be overcome. One challenge is how to interpret traditional knowledge in order to make it relevant to resource managers. New, costly institutions have been established to let scientists and managers meet hunters and fishermen so that they can learn to share each other's knowledge. This paper discusses some of the reasons why such sharing sometimes seems difficult to achieve.

#### **The Setting**

The fjords in Finnmark, the northernmost region of Norway, were all originally populated with Sami. But after centuries of Norwegian and Finnish settlement in these areas, most of the fjordal communities now present themselves as Norwegian (Eidheim 1971).

The community of Lille Lerresfjord, on the east side of Altafjord, is fairly typical in this way. In the population of about 80 people, only those older than 50 can still speak the Sami language.

Until the 1970s, most households were practising occupational pluralism, including fishing, keeping sheep, hunting and seasonal work outside the community. In some households this pluralism continues but now involves old-age pensions, other welfare payments or seasonal

work on a local fish-farming plant as components of the economic cycle. Fjord fishing is still very much the economic basis of the community. This kind of fishing can actually be called a traditional Sami resource use, in the same way as reindeer herding (Bjoerklund 1990). The cosmology of the fjord fishermen is still strongly attached to Sami language and traditions.

### Two Types of Knowledge

Resources may be defined as those components of an ecosystem which provide goods and services useful to man (Gibbs and Bromley 1989). There are however great cultural differences between peoples and groups in defining which components classify as resources. Such components become resources with the help of knowledge, technology and social institutions. The key concept here is *traditional knowledge*. What people know about their environment, and how they categorize this knowledge, will obviously have an impact on what they do to their environment (Moran 1979).

*Ethnoecology* is another concept, reflecting ecological knowledge possessed by groups who have based their economic adaptation on natural resources in their local environment for many generations. From an ethnoecological point of view, such knowledge should not be separated from its cultural context. How knowledge is codified and how it affects people's use and management of common property resources should be the main focus of research.

Concepts like traditional knowledge and ethnoecology can easily be mystified as a kind of undefinable wisdom of "natural peoples", long lost for urban westerners. In real life though, the difference between traditional and scientific knowledge is not that great. Freeman (1985) argues that both types of knowledge rest on the systematic gathering of empirical observations.

The main difference lies in the methods used for collection and analysis of data. Scientific knowledge needs a wide range of methodical observations to establish a model of a situation, for instance to estimate the development of a certain stock of animals within an ecosystem. Before a biologist can come to a conclusion about the development of the stock, he must collect great amounts of quantitative data over some time. A local fisherman, who is familiar with the area, will react spontaneously to observations that deviate from the usual pattern. He will be observant to qualitative changes, signs which indicate that something unusual is happening. He will interpret such signs within the context of his experience and traditional knowledge, and discuss his interpretations with fellow fishermen and neighbours.

From this standpoint there is no need for a contradiction between traditional knowledge and scientific knowledge. The two types of knowledge should be complementary, and resource managers should gain from using both types as a basis for management regimes.

### Economic Adaptation and Traditional Knowledge among the Coast Sami

Like similar cultures traditionally based on fishing, hunting and gathering, the economic adaptation of the Coast Sami is based on a wide range of ecological knowledge. Firstly, definitions of which components of nature are "resources" are based on such knowledge. Secondly, there is a knowledge about how these resources can be utilized, and thirdly, there is knowledge about ecosystem functions, relations between species and sustainability of different resources. The *moral element* can be found in norms and unwritten rules about resource use.

Pedersen (1989) mentions two such norms concerning resource use among the Sami. Local

people in Sami areas strongly oppose government rules allowing the grouse hunting season to start on September 10. While sport hunters start on September 10, the locals start hunting about October 1, claiming that the young grouse needs more time to gain flying strength and independence from its parents. The other example is from lake-fishing, where locals keep their nets off the spawning grounds, allowing the fish to spawn undisturbed.

Historically, the economic adaptation of the Coast Sami is based on quite varied and extensive resource use in an annual cycle. A wide range of natural components are defined as resources for the household. Such variation along with mobility has helped the Coast Sami to cope with changes, both in resource abundance and in market conditions for household products. Flexibility in resource use, allowing switching from one resource to another, may be a strategy for sustainable harvesting. Poor fishing seasons may be compensated for with more intensive hunting, or vice versa. A bad hay season may also be compensated for with more use of fish by-products and algae as animal fodder.

Such flexibility is dependent on knowledge about possible substitutes for scarce resources. The knowledge about how algae, boiled fish heads and guts can be used as a substitute for hay is a good example. But, strangely enough, the use of peat as a substitute for wood did not reach the Sami until the 1860s. Consequently, flexibility in feeding animals sometimes occurred at the cost of depleting wood resources, since boiling fish for animals was energy consuming.

### **Traditional Knowledge and Fjord Fishing**

Today, what is left of the traditional adaptation may best be seen in the fjord fishing and in animal husbandry. Traditional "feeding rules" prescribing seasonal variations in sheep diet are still

in practice (potatoes in December and January; algae in January, February and March; boiled fish heads and guts in the spring).

Fjord fishing is small-scale, unspecialized and low-capitalized. Each fishing community has its traditional sea territory within about one hour's range from home.

Different species are fished upon at different times of the year, but the cod season from January to April is economically the most important. This paper concentrates on traditional knowledge about the ecology of cod.

The gill-net season may start early in January, but catches are small until February and March. Fishermen with small boats usually set their nets in the neighbouring fjords, Store Lerresfjord and Bekkarfjord (on the east side of the island Seiland). Those with bigger boats set nets along the east coast of Seiland, from Bekkarfjord to Seibukt. Local fishermen usually have "personal" spots, where they set their nets every year. One young fisherman used the phrase "the inheritance banks" about fishing spots he had taken over from his father and grandfather. The fishermen have a fairly accurate method of navigation, using certain points in the landscape to locate fishing spots. On their personal spots, fishermen are able to calculate tidal currents with great accuracy. One fisherman told me that he had tried to set nets on his neighbour's spot, but without catching anything. "It was not just bad luck", he said, "but I lacked the accurate knowledge about the bottom and the tidal current".

Many fishing spots in the traditional fishing territory are well known in the community. If a fisherman finds a new spot, he may try to keep quiet about his find. Knowledge about fishing spots is not readily passed on to outsiders.

It seems that fishing spots and fishing territory are very much the same as before the introduction of motors and the sonar.

The rich cod fishing in February, March and April is based on catching cod on its migration to its spawning sites. Spawning sites are to be found in many fjords in Finnmark. In the sea-territory used by Lille-Lerresfjord fishermen, there are three spawning sites: at Bekkarfjord, Store Lerresfjord and along the south-east coast of Seiland. These sites are said to be difficult to exploit for Danish seiners because of the rocky bottom, which may be the reason why they have not suffered the sad fate of many other more accessible spawning sites. The fjord fishermen argue that even with high density of gill-nets on a spawning site, the stock will not be threatened. The biggest fish with the highest reproductive capacity will not be caught in the nets, simply because it's too big to get stuck. Danish seiners, on the other hand, will harvest everything indiscriminately. Local stocks of cod are now said to be extinct in many fjords where the spawning sites are accessible to Danish seiners. Local fjord-fishermen state that the cod, like the salmon, migrates back to its place of birth to reproduce itself. Therefore, overfishing of local stocks may result in total abandonment of certain spawning sites since there are no fish left to find the way back. In the local Sami taxonomy, the cod belongs to different spawning stocks or *types*, which look slightly different. The cod inside the fjord is of three types, all different from the Norwegian Arctic cod, which has its spawning site in Lofoten.

The three types are:

1. **Algae-cod** (Sami: tararunuk). It is slightly brown in colour, staying in shallow water in the algae-belt. It may derive its colour from the brown algae among which it lives. The algae-cod never leaves the fjord. This type of cod seems to be disappearing, along with the brown algae belt.
2. **Fjord-cod** (Sami: vuotnaguolli). Much the same as algae-cod, except for the colour. Spawns in the fjord, and does not migrate out of the fjord. The head is big, in comparison to its rather lean body. Vuotnaguolli starts spawning before the migrating cod. After the spawning period it will stay for some time in shallow water near the coast, where it can be caught if nets are set parallel to the coastline. From early summer to early winter it lives in deep water inside the fjords.
3. **Migrating cod** (Sami: buoiddesguolli). Cod migrating to the spawning sites in the fjord in winter, but living in the open sea the rest of the year. This cod is fatter, with a bigger liver than the fjord cod. The Sami name buoiddesguolli means "the fat fish". This type of cod is the economically most important for the fjord-fishermen. It reaches the spawning sites 2-3 weeks after the fjord cod.

The different types of cod prefer different spawning sites. In Store Lerresfjord most of the spawning fish is fjord-cod. Both types spawn in Bekkarfjord, but on the east side of Seiland only migrating cod spawns. Until recently, Norwegian fisheries biologists have not recognized the existence of local stocks of cod.

### **Fish in Time and Space**

Being able to predict where fish is to be found in time and space is probably the most important knowledge for a fisherman. From experience of their own and earlier generations, fishermen know where and when certain species of fish will probably turn up. They have developed causal explanations and theories about what goes on below the surface of the sea. They also have to learn about the landscape on the sea-bottom.

The older fishermen, who learned this before the time of the sonar, have made great efforts to memorize this kind of data systematically. They possess "a mental map" of the bottom, with a large number of fishing spots (Paine 1957). A fishing spot is memorized by drawing two imaginary lines between some visual parts of the landscape (islands, mountains, capes and even houses), in such a way that the two lines cross each other on the fishing spot. (This method of location finding is called triangulation.)

The sonar, which projects a visual picture of the sea-bottom, has led to a devaluation of the mental maps of the elders. But they do not agree that their knowledge and experience can be substituted by technology, as one stated:

"To make a living from fishing in the fjord, you are quite dependent on the knowledge passed on from the earlier generations about what species of fish can be exploited here, tidal currents, fishing spots, how to place nets and so on. This is often a matter of accurate calculation. In periods with a short supply of fish, this kind of knowledge becomes even more important. The young are not interested in learning these things, they depend on the sonar technology, but they don't last very long as fishermen."

The sonar also has its shortcomings. It does not show if the bottom is rocky or muddy, nor does it help predict tides or the strength of tidal currents. As an illustration, I was told about how fishermen from outside the community tended to lose a lot of gear when they sat their nets in the area. "They were not used to such steep slopes", I was told, "and they could not calculate the strength of the current." Their nets would therefore get stuck on the rocky sea-bed.

### **Different Ecological Models**

How valid are the descriptions of fish-stocks,

fish-types and migration routes given by local fishermen? Is it relevant to compare the local models with ecological models created by biologists? What may count for the validity of local models is that fjord-fishing in this area is a very old traditional activity and the pattern of fishing has in many ways remained unchanged for generations. Observations and experiences have therefore been accumulated and analyzed through several generations. For Norwegian oceanographers and biologists, fjord-fishing has not been a priority. Local stocks of cod do not seem to exist in the language of fisheries management officials, though some recent biological fisheries research projects conclude that such local stocks probably exist (Jakobsen 1987).

Fishing quotas are based on estimated recruitment to the stock of Norwegian Arctic cod, that is, cod spawning in Lofoten. One may ask if a successful reproduction in Lofoten, about 500 km away from the spawning sites in the Altafjord, always indicates success in the reproduction of the local stocks, and vice versa. In practice, resource management is based on a general ecological model quite different from the detailed local model. This difference is extremely important for our understanding of the chronic conflict between local fishermen and the fisheries managers about whether Danish seiners should be allowed to fish in the fjords.

The Norwegian fisheries management is organized in a way that makes it difficult for the fjord-fishermen to make their demands heard. Local demands calling for more restrictive policy towards Danish seiners seldom reach the top-level in the management hierarchy. However, such demands have broad support among fishermen in Finnmark. In 1987, the annual congress of the Finnmark Fishermen's Union (Finnmark fiskarlag) passed a resolution calling for a total ban on Danish seine fishing on spawning

sites. This and dozens of other similar resolutions coming from local branches of the fishermen's union or municipal councils have been broadly rejected by the representatives of the fisheries department.

In 1990, individual vessel quotas were introduced for all fishing vessels in Norway, including the small boats. Because of formal criteria about last years catch, registration of the boat and a demand that owner and fisher must be the same person, many fjord fishermen were actually excluded from all cod-fishing. Small quotas for those who were allowed to fish caused a great deal of frustration, since the abundance of cod in the fjord was greater than it had been since the 1950s.

### **Danish Seiners and Morality**

There is a lot of research done on norms and unwritten rules in traditional resource-use, and how such norms may be interpreted as local resource management systems. It is logical to ask if the ecological model described by the fjord-fishermen results in certain norms and rules concerning fishing behavior. Do fishermen behave in an ecologically sound way, according to their own models? Does the fact that local fjord fishermen do not participate in the Danish seiner fisheries reflect a kind of a norm? There may be other explanations. For example, a Danish seiner represents a sizeable capital investment, requiring the vessel to be operated on a whole-year basis. Fishermen fishing on a whole-year basis may also prefer to live in larger fishing communities on the outer coast. But throughout the period of fieldwork, I could not fail to observe that local people always refer to Danish seiners in moral terms. "All Danish seine fishermen know they are doing wrong, they readily admit it themselves," is a frequently heard remark, "but they too have problems paying their debts."

The arguments used in condemning the Danish seine fishing are of two types: ecological arguments, such as ruining of the local stocks of cod, and arguments concerning social justice, such as the fact that the Danish seiners "steal" from the local fishermen. Both types represent a kind of moral condemnation, referring to norms concerning "right" and "wrong" fishing.

Some people may argue that the ecological insight of the fjord-fishermen is just their way of constructing arguments in a conflict of economic interests. Unlike scientists, who are trained to view their data at a "neutral" distance, fishermen are involved in a world of conflicting interests. It is evident that ecologically sound management of local stocks is very much in the economic interest of the local fjord-fishermen (they are not mobile, and they have no large capital investment). If they actually behave according to the norms and ecological morality they put forward in words, there should be no reason to believe that the fishermen's models are only loose opinions, made up for use in actual debates.

### **Local vs. Scientific Knowledge**

The differing characteristics of local traditional knowledge and scientific knowledge can be summed up as follows:

- a) Traditional local knowledge is usually not documented in writing and not necessarily put into words. Sometimes it is difficult to separate this kind of knowledge from certain working operations in which traditional knowledge is a vital element.
- b) The organization of reality into categories is often based on different systems in traditional knowledge, compared to scientific knowledge. The taxonomy of animals in traditional knowledge refers to characteristic

differences, not only in phenotype, but in behavior and annual cycle.

- c) Local knowledge often has a reference to time and space but as points of reference that are different from scientific knowledge. Time may be referred to as harvesting seasons or different phases of the moon. Space can be made up of different fishing spots, or a "mental map" covering the topography of land and sea-bottom.
- d) Like scientific knowledge, local knowledge is based on accumulated empirical data, but the method of accumulation is different. Local people register ecological change as deviations (qualitative or quantitative) from a known normal situation.
- e) Traditional local knowledge is holistic, as it is not split into different disciplines. It often includes multi-species ecological models, explaining causal relations between events in the environment.
- f) Traditional local knowledge is also social knowledge. The ecological models include social and cultural components such as the social consequences of different ways of harvesting or managing common property resources.

In this paper I have shown some examples of local ecological knowledge. This kind of knowledge is not necessarily true in the same way that scientific knowledge is not necessarily true. For instance, causal explanations in local ecological models may sometimes prove wrong if tested in a scientific manner. An outsider will sometimes have trouble separating between traditional knowledge transmitted between several generations and random local views. I believe that the local ecological models presented in this

paper are not, however, random views but real traditional knowledge.

Compared with traditional knowledge, scientific knowledge is fragmented into different disciplines and fields. Biological knowledge and social knowledge are strictly separated from each other. This is one reason why scientific models are sometimes unable to catch the same phenomena as traditional knowledge (Freeman 1989). In most cases, the central policy of resource management is based on scientific knowledge and generalized ecological knowledge. The structure of the central policy can also be compared to that of scientific knowledge, fragmented, divided into sectors and fields which operate independently. The economic adaptation of the Coast Sami has a holistic structure like the traditional knowledge attached to it. A Coast Sami household does not operate as a bundle of different occupations and industries comprising fishing, fish processing, agriculture, hunting, and seasonal construction work. Different activities and harvesting different resources are intertwined and dependent upon each other.

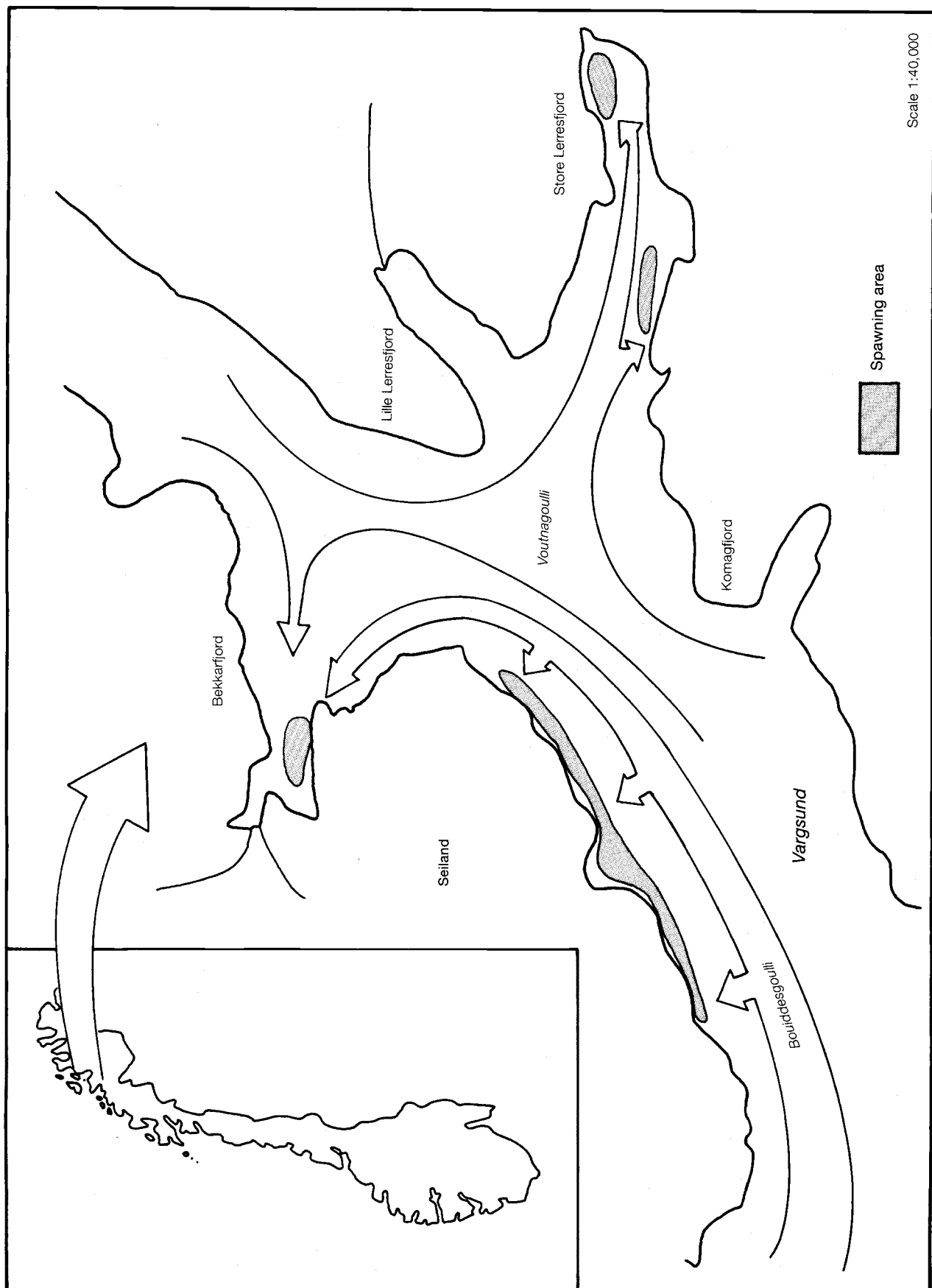
Earlier in this paper I mentioned local norms concerning the cod fisheries. It looks as if there is a clear correlation between traditional ecological knowledge about resources in the local harvesting territory and the norms that the fishermen express and apply to their own behaviour. Their moral condemnation of the Danish seine fisheries in the fjord is usually explained by both ecological and social arguments (ecologically unsound and socially unjust). Some fishermen even claim that the spawning sites inside the fjords should also be protected against gill-net fishing in the spawning period.

Local norms concerning harvesting of common property resources are not only based on ecological causal models, but also on what



people consider as social justice and traditional rights to harvest resources in the local area. But it is important to remember that such norms in many cases may be founded upon empirical observations, collected by several generations, though methods for collecting data are different from what we usually understand by scientific method.

Local traditional knowledge and local norms could therefore prove to be an important, or even a necessary supplement to scientific knowledge for the establishment of ecologically sound and socially just management of common property resources.



**Figure 1:** Spawning areas and migration routes for two different stocks of cod, according to local fishermen's descriptions.

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