

ISSN 1198-6727

**Education for Aboriginal
Fisheries Science and
Ecosystem Management**

*Fisheries Centre Research Reports
2002 Volume 10 Number 6*



Fisheries Centre Research Reports

2002 Volume 10 Number 6

Education for Aboriginal Fisheries Science and Ecosystem Management

Edited by

*Nigel Haggan, Claire Brignall,
Brent Peacock and Raychelle Daniel*

49 pages © published 2002 by

*The Fisheries Centre, University of British Columbia
2204 Main Mall
Vancouver, B.C., Canada*

ISSN 1198-6727

Dedication

This report is dedicated to Chief Simon Lucas

'Simon Says: The traditional knowledge from our Ancestors was a very powerful educational tool. Today we need to greatly expand our educational system, to give our knowledge and values their proper places. We need a whole new generation of Aboriginal fisheries scientists.'

Photo by Martin Dee

A great role-model: Chief Simon Lucas, from the Nuu-Chah-Nulth Nation on Vancouver Island, and co-Chair of the BC Aboriginal Fisheries Commission, receiving an Honorary Doctorate of Letters for his lifetime services to fisheries conservation. UBC, May 2002.



EDUCATION FOR ABORIGINAL FISHERIES SCIENCE AND ECOSYSTEM MANAGEMENT

Edited by Nigel Haggan, Claire Brignall, Brent Peacock & Raychelle Daniel
2002 Fisheries Centre Research Reports 10(6): 49 pages

CONTENTS

	Page
Director's Foreword	4
Abstract	5
Acknowledgements	5
Introduction	6
Objectives	
Organization of Report	
Context and Strategy	7
Ecosystem Science – Traditional and Modern	8
Aboriginal Worldview – Chief Simon Lucas	
New Ecosystem Science – Nigel Haggan	
Ecosystem Role of Salmon – Stephen Watkinson	
Coasts Under Stress	11
Rosemary Ommer, Principal Investigator	
Expected Outcomes	
Usefulness of the Research	
Workshop Findings	14
Issues and Constraints	
School Constraints	
College and University Constraints	
Linkages, Alliances and Partnerships	
Building Capacity	
Early Childhood to Grade 12	
Curriculum and Educational Resources	
Effective Recruitment Strategies	
Increase awareness	
Student Support	
Funding	
Social support	
Laddering – Pathways to different qualifications and employment opportunities	17
Get them young	
Accreditation and Transferability	
Easing the Transition	
Employment	
Employment needs assessment	
Career awareness	
Job needs and opportunities	
Recommendations	
Post-Secondary Programme Survey	19
Environmental Scan	
Fisheries Certificate	
Fisheries Diploma	
Fisheries Degree	
Post-Degree Diploma	
Master's and Doctoral Degrees	
Institutions Offering Fisheries Programs	
First Nations Experience With Fisheries Studies/Education	21
Raychelle Daniel, Y'upik Nation	
Panel Discussion	
Steve Watkinson, UBC Fisheries Centre	



David Cootley, Malaspina College
Teresa Ryan, UBC Fisheries Centre
Jacinda Jack, potential graduate student
Interview Responses - Raychelle Daniel
North Coast – Teresa Ryan
Central Coast – Jacinda Mack
Central Interior – Arnie Narcisse
Lower Fraser – Kim Guerin
Vancouver Island – Rob Simon

Hecate Strait Project: How Do We Incorporate TEK 27

Existing Educational Programs and Resources 29

 Wilp Wilxo'skwhl Nisga'a (The Nisga'a House of Wisdom) – Deanna Nyce
 UBC Department of Forestry – Gordon Prest, Sto:lo First Nation
 Protectors of the Forest
 Nicola Valley Institute of Technology – Paul Willms
 Human Resources Development Canada – Gerry Kowalenko

Employment Opportunities 31

 DFO Fishery Officer – Gordon Point, Musqueam Nation Council
 Other DFO Employment – Cameron West
 BC Fisheries – Rob Simon
 First Nations and Cooperative Programs – Arnie Narcisse BCAFC

ANNEXES.....35

 Annex 'A' Memorandum of Understanding Between BCAFC, UBC FC and UBC FNHL 35
 Annex 'B' Workshop Opening Remarks..... 37
 Annex 'C' Workshop Participants..... 38
 Annex 'D' Workshop Facilitator's Report 41
 Annex 'E' BCAFC Annual General Assembly Resolution #18-01/26/01..... 43
 Annex 'F' Dean's Letter UBC Graduate Studies 44
 Annex 'G' Aboriginal Post-Graduate Scholarship Programme 45
 Annex 'H' Back To The Future 46
 Annex 'I' Proposed First Nation Forestry Education Partnership Strategy 48



Supported by Fisheries and Oceans Canada



**Fisheries and Oceans
Canada**

49 pages © Fisheries Centre, University of British Columbia, 2002



DIRECTOR'S FOREWORD

ABORIGINAL FISHERIES NEED ABORIGINAL SCIENTISTS

At the opening of Jared Diamond's prize-winning book, *Guns, Germs and Steel*, an educated Aboriginal named Yani escorts Diamond, an urbane white Californian, up a New Guinea mountain to find endangered species of birds. Yani poses what many would find a difficult question, only possible between close friends. He asks Diamond why it is that Diamond's European ancestors apparently won out in the invasion, colonization and exploitation of the rest of the world – why was it not the other way round, with the New Guineans, for example, colonising Europe? Yani is not satisfied with the obvious answer - the Europeans had steel and guns, and spread germs, to which they had become immune over thousands of years, but which were lethal to human populations lacking immunity. There follows through the 480 pages of the rest of Diamond's book a scientific exposition of the history of our species that underpins one of the most powerful statements against racism that I have seen. Diamond shows how accidents of ecology, climate and geomorphology favoured the early acquisition of domestic plants and animals and the spread of agriculture and settled villages, leading both to advanced technology for warfare and new germs evolved from close proximity to domestic animals. Moreover, Diamond documents that many cultures were on a parallel route: accidents of geography and ecology allowed Europeans to get there first. By explaining how the differences that led to European domination came about, his thesis is a celebration of fundamental human equality, and by logical analysis, lends a calm dignity to the cultural diversity of all human peoples.

Aboriginal people, displaced, dispossessed and disregarded by colonising Europeans, have long had a raw deal. On the Pacific coast of North America, abundant fisheries supported a settled Aboriginal culture whose richness is normally only associated with agrarian societies that generate surplus production. These peoples traded and shared the wealth of these munificent natural resources with the first Europeans to arrive. Later, they staffed hundreds of canneries as fisheries were taken from them. But, although BC's fisheries were slowly and inexorably foreclosed to their original owners over two centuries, British Columbia's First Nations continued to look to fisheries as the guarantor of their continuing cultural, social and economic

existence. In Canada, constitutional protection of basic Aboriginal rights has provided some restitution, although there are still many day-to-day conflicts. Constitutional and Rights issues engage many other professions, but the presence of qualified fishery scientists trained in state-of-the-art analytical techniques, who can span both worlds because they are themselves Aboriginal, would clearly make a difference. Moreover, Aboriginal culture has an ethic of respect for the natural world and the unity of whole ecosystems that the sad history of over-exploited fisheries has shown it is mistaken for conventional science to ignore.

Equal opportunity in education is just one aspect of a route to a more just society and fisheries. After legal equality (surprisingly recently won), equality of access to educational advancement for disadvantaged groups requires proactive means to stimulate motivation and awareness. The presence of role models and a clearly signposted route to success are essential. It is disturbing that where issues concerning treaties, livelihoods and culture often revolve around fisheries, there is not one Aboriginal person with a PhD in this field in British Columbia, and only a handful with Master's degrees in fisheries. The Fisheries Centre is committed to improving this situation and has signed a Memorandum of Understanding (MoU) to this effect with the BC Aboriginal Fisheries Commission and the First Nations House of Learning (Annex A). Initiatives under the MoU have included *Back to the Future* research projects, where traditional ecological knowledge adds greatly to our understanding of past ecosystem abundance and diversity, workshops, symposia and graduate courses on Aboriginal fisheries, a proposal for an endowed chair of Aboriginal fisheries, and a search for funding for graduate student scholarships.

This report presents the results of preliminary research and the proceedings of a workshop that address a priority issue under the MoU, the ability to recruit and retain highly qualified Aboriginal fisheries scientists. The recruitment of Aboriginal students is also a UBC priority under President Martha Piper's 'Trek 2000' initiative.

The *Fisheries Centre Research Reports* series publishes results of research work carried out, or workshops held, at the UBC Fisheries Centre. The series focusses on multidisciplinary problems in fisheries management, and aims to provide a synoptic overview of the foundations, themes and prospects of current research. *Fisheries Centre Research Reports* are distributed to appropriate workshop participants or project partners, and



are recorded in the *Aquatic Sciences and Fisheries Abstracts*. A full list appears on the Fisheries Centre's Web site, <http://www.fisheries.ubc.ca/> from where copies of most reports may be downloaded free. Paper copies are available on request for a modest cost-recovery charge.

Tony J. Pitcher
Professor of Fisheries
Director, UBC Fisheries Centre

Diamond, J. (1997) *Guns, Germs and Steel: the fates of human societies*. Norton, NY, USA, 480 pp.

ACKNOWLEDGEMENTS

We acknowledge the Department of Fisheries and Oceans (DFO) for funding the research and workshop. We thank Dr Rosemary Ommer and the Coasts Under Stress Project for input and support. We thank the First Nations House of Learning for use of the beautiful 'Sty-Wet-Tan' at the UBC Longhouse and the Heiltsuk Urban Dance Group who performed at the reception.

ABSTRACT

Fisheries are of paramount economic, social and cultural importance to First Nations in British Columbia (BC), yet Aboriginal people are severely under-represented in fisheries policy, science, technical, enforcement, education and other employment. The report is an attempt to ascertain why this is and how it might be addressed. Two Aboriginal graduate students, one in fisheries, one in education, surveyed fisheries programs offered by BC colleges and universities and conducted interviews on the experience of First Nation members who have pursued, are pursuing, or want to pursue a career in fisheries.

A March 2001 workshop convened by UBC Fisheries Centre, UBC First Nations House of Learning and the BC Aboriginal Fisheries Commission reviewed these findings and provided additional perspective from First Nation leaders and educators, government and other organizations and employees. Breakout groups summarized input on constraints for adult and young students, and recommended ways to smooth the transition from community and school to higher education.

Problems identified include lack of transition or 'laddering' mechanisms for transfer of course credits, lack of funding, and lack of social support for the many adult learners seeking further education. However, the main disincentive appears to be systemic, and to stem from failure to validate and incorporate First Nations values and knowledge at all levels of fisheries training and education. The importance of fisheries, the number of potential students and the level of interest strongly suggest the value of developing several pilot programmes throughout BC that bring Aboriginal and 'western' scholarship together, enable 'laddering' from school to college to university, and acquaint students with and prepare them for the range of employment in policy, science, management, education and industry.



INTRODUCTION

The *Education for Aboriginal Fisheries Science and Ecosystem Management* workshop was held at the First Nations House of Learning in March 2001. The objectives were too:

- Investigate Fisheries programs in BC post-secondary institutions, evaluate First Nations content and the process of preparing for and finishing these programs;
- Interview post-secondary First Nations students enrolled or interested in Fisheries programs on their experience with the post-secondary institutes;
- Develop strategies of awareness to attract more First Nations students to post-secondary Fisheries programs;
- Discuss 'LADDERING' strategies to see if existing post-secondary programs can enable First Nations students to meet the requirements of post-secondary institutes and potential employers;
- Explore how post-secondary Fisheries programs could incorporate First Nations traditional knowledge and values in a new, ecosystem-based view of Canadian and world fisheries;
- Identify the scope of employment opportunities and explore ways to increase employment in research, management, industry, education and other areas.

The report is organized as follows:

- A **Context and Strategy** section identifies problems in BC and global fisheries, shortfalls in scientific capacity and under-representation of First Nations at all levels of fisheries science. New approaches to incorporate Aboriginal knowledge and values are introduced. Implementation strategy elements are identified.
- An **Ecosystem Science – Traditional and Modern** section presents the traditional ecological knowledge worldview through the words of Chief Simon Lucas. New developments in ecosystem science and ways to integrate knowledge are discussed.
- A **Coasts Under Stress** section describes a major research initiative to revitalize coastal communities.
- A major **Workshop Findings** section identifies issues and constraints from early childhood up to college and university level.

Strategies are identified for Kindergarten through grade twelve (K-12), college and university. Recommendations are made for laddering, increased awareness and enhanced employment.

- A **Laddering** section identifies programme continuity and accreditation issues.
- A **Post-Secondary Programme Review** section presents results of preliminary research into fisheries and natural resource management courses currently offered in BC.
- A **First Nations Experience** section presents the results of a survey of past and present students and presents text of a First Nation student panel on their experience with post secondary education.
- An **Educational Programmes** Section gives examples of programmes run by First Nations, colleges, university and government.
- An **Employment Opportunities** section lists some examples of the types of employment available.
- A series of **Annexes** present opening remarks, expressions of support and additional information.



CONTEXT AND STRATEGY

Human fishing is having a severe impact on global ecosystems. We have fished out top predators and are continuing down the food web (Pauly *et al.* 1998). That this also occurs in Canada (Pauly *et al.* 2001) will come as no surprise to First Nations. Government downsizing since the 1980s has resulted in a substantial loss of scientific, technical and enforcement capacity. Over the same period, Canada/US salmon wars, commercial allocation issues, the growing sport fish lobby and the recognition of First Nations' ancient rights through the Constitution, Supreme Court decisions and the BC Treaty Process, put increasing demands on the resource.

For years, First Nations have expressed concern about the level of resource extraction in both forest and fisheries. They have also been strong proponents of 'integrated resource management'. These concerns are now finding a wider voice in instruments such as the United Nations 'Code for Responsible Fisheries' (FAO 1995) in which Canada was a prime mover. Canada's *Oceans Act* calls for ecosystem management, precautionary management and broad-based consultation on the development of management plans. The challenge is how to put these ideas into practice. Fisheries are of paramount economic, social and cultural importance to First Nations. The unique wealth of First Nation art and culture is largely attributable to the richness and year-round availability of fisheries resources in the Pacific Northwest. First Nations look to marine resources as a major plank of economic and cultural renewal through the Treaty Process. Despite all this, First Nations are severely under-represented in all aspects of fisheries science. This is, at least in part, due to the sad fact that most First Nations experience of fisheries management is of having to stand by while resources that formed their society and economy were exploited by others. Being under constant surveillance and harassment while subsistence fishing is a common cultural experience.

This negative experience means that fisheries science will be a hard sell, until First Nations people see in it something they recognize and want. This vacuum led to a 1997 Memorandum of Understanding between the BC Aboriginal Fisheries Commission (BCAFC), UBC Fisheries Centre and UBC First Nations House of Learning (see Annex A). The goals are to:

- Make UBC fisheries science more responsive to the research needs of First Nation communities;

- Accelerate the enrolment of Aboriginal students in graduate programmes; and,
- Find respectful and effective ways to incorporate traditional knowledge and values.

The high priority given to recruitment of First Nations students is reflected in a 2001 BCAFC resolution (Annex E) and an August 24, 2001 letter from Dr Frieda Granot, Dean of Graduate Studies at UBC (Annex F). A goal of three Master's and/or PhD (Doctoral) students per year was set in 1998 with an annual funding need of \$75,000 (Annex G). Problems in meeting the recruitment goal led to discussions with DFO and agreement to run a workshop to explore ways to increase student enrolment and employment at all levels in fisheries.

Traditional knowledge that values all ecosystem components is vital to the development of our collective understanding of the nature of aquatic ecosystems and their connection to human communities (Simon Lucas, this volume). New ecosystem analysis tools that consider fisheries as human activities with social and cultural as well as economic dimensions provide an opportunity to incorporate traditional knowledge and values (Nigel Haggan and Stephen Watkinson, this volume). Together, we believe there is an opportunity to increase the participation of First Nations as a vital part of the fisheries of the future.

Implementation Strategy Elements

The following strategy elements should be designed and implemented in parallel:

1. A PR campaign that relates education to job opportunities;
2. Pilot programs in 2-3 BC regions to integrate First Nations knowledge and values into biological science education;
3. Integral field programs that involve First Nation and other experts;
4. Full transferability of credits and prior learning assessment;
5. Continuity of funding and support;
6. An evaluation process that satisfies First Nation and academic criteria.

References

- FAO (1995) Code of Conduct for Responsible Fisheries. Food and Agriculture Organization of the United Nations, Rome. 41pp.
- Pauly, D., Ma. Lourdes Palomares, Rainer Froese, Pascualita Sa-a, Michael Vakily, David Preikshot and Scott Wallace (2001) Fishing down Canadian aquatic food webs. *CJFAS* 58(1):51-62.
- Pauly, D., V. Christensen, J. Dalsgaard, R. Froese, and F. Torres Jr (1998) Fishing down marine food webs. *Science* 279: 860-863.



ECOSYSTEM SCIENCE – TRADITIONAL AND MODERN

Aboriginal Worldview - Chief Simon Lucas

British Columbia is a very unique province. It has 25 speaking languages so when you're talking about salmon, there are probably 25 different descriptions for it, and each of the First Nations have songs and dances for it. I think we basically understand each other in terms of the philosophy that links us together. We use the saying "everything is one" to describe things. We also say that you are "respectful" of the skies and streams. If there is no respect for those things that make things live, how can you respect yourself? I'd like to start by singing a song, and then I'll explain to you what it means.

That song is talking about a territory and it mentions exactly where it is. It's a place on the west coast, on the north side of Estevan Point, and every time the waves hit this particular point, they shoot up and create a whistle. The reason why the song was made is that several thousand years ago, there was a dispute about that territory because there was a whale that had died a natural death and was drifting around. There was a debate with the neighbouring tribe over who got access to it. We asked, "Do you have any songs that relate to this place?" The other tribe said, "No." And we said, "We do. Our chief has a song about it, so we notify you, and if anyone dares to take our property, beware of war." So this song is an important song for our tribe and for our head chiefs. It is very significant.

One of the words describes how your roots are buried deep, and it's important for people to understand. You might say how impressive a tree that has been standing for 1000 years is. After it falls down from natural causes, the roots stay there until a new tree starts again. Eventually the roots turn to earth, but the young one has already started its growth. Once the roots are there, they will never go away. So even if a tree falls down, you know there will be some remnants of that tree left. The big chiefs are the roots in our tribe. What do these roots have? This is where we talk about the pride and the wealth. Every grandparent wishes for the ultimate wealth – where roots are solidly planted. The ultimate wealth is the great-grandchild. When my son was born, my grandfather said, "I have achieved my goal. My great-grandson is alive and well and carrying on my name."

How does that build up? There has been a group of people that has built up the roots. It's important to recognize the value when one little

girl is born, when you know that she is going to build your nation and help build another nation. What's important when my granddaughter left my tribe is that she is going with a solid background. My grandchild and her children will always have the right to the coho streams. Along with that she will always have the right to a portion anytime my tribe comes across a whale. She will always walk with the dances and songs of our people so that other nations will always know where she came from. That's not to say that she's not a member of the other tribe now, but they will always know the tribe that she came from – the tribe that I came from. We have seven tribes in our group, and ours is one. She will always have the right when she comes back home to harvest cedar bark. She will always have the right to use the rivers, streams, and lakes to harvest salmon. She will always have the right to use our shore for red snapper. She will always have the right to take codfish. She will always have the right to use the clambled of our people, when she comes home.

There's something that's greater than all that, that all tribes talk about it: the day. Always look at the day. It is during that time that we see the vision of where we're going. This is why you have to be careful of what you're eating. You don't waste what you're eating.

Prior to that, the grandmother immediately – soon as the young woman is born, while she's in the womb – they're praying how she is going to be. She's going to be handy with her hands. She'll know how to handle cedar bark. She'll know how to prepare the salmon for smoking. And that's the ultimate wealth of the grandparents – when that child walks out with all the intelligence of the grandparents.

Abstinence is what's important for our people. Worshipping, talking to the creator. We're going to go out hunting sea otter. We have to prepare at the fall solstice in December; this is what we're going to start preparing. You have to abstain from your wife and from certain foods. To abstain, you have to deal with your mind, your spirituality, and your body. Every day was always worshipping and thanking. Our people say that you don't have to ask for anything. Everything we need is in our territory. All we need to do is to be thankful. Everything we need to be spiritually strong is here. So I hope I've given you some thoughts about how we're connected to our people. Those of you who live all the way up in the river – this is why you have to listen to those of us downstream. Some herring beds no longer exist. We have been harvesting for economic



gain. That's fine, it's what we need to live. But don't lose connection with what our grandfathers taught us. I hope I've given you something to think about.

New Ecosystem Science – Nigel Haggan

Nigel Haggan described how First Nations see people, landscape and living resources as a spiritual whole. As a result, traditional ecological knowledge deals with relationships between people, species, time, season and place over very long periods of time. This is very different from the western scientific approach, which has, at least up to recently, looked at the whole as something to be understood by taking it apart and peering at the bits. Thus, fisheries science studies aspects of the system, salmon, lingcod, whales and birds, as if they were sufficient unto themselves. For example, to look at old Pacific Halibut Commission reports, you would think halibut were the only fish in the sea. The only indication that other species even exist is a section on 'bycatch' of halibut in other fisheries. Traditional knowledge is a light that illuminates the entire stage. Western science is a spotlight on a star player. Resources are in such trouble that we desperately need to bring these perspectives together.

A 1998 study by Daniel Pauly and colleagues at UBC Fisheries Centre demonstrated that globally we are fishing down the marine food web (Pauly *et al.* 1998 and 2001). This is also true in Canada (Pauly *et al.* 2001). Tony Pitcher (2001) describes three processes that contribute to the problem. Each one works like a ratchet, something that moves easily in one direction, but is hard to turn back. The first is ecological: we have depleted large tasty fish, even driven them locally extinct, leaving the seas full of small, short lived species. If we persist in this, the seas of the future will be full of jellyfish and squid. This is already the case in the S. China Sea where we have been working on a project to restore depleted ecosystems in Hong Kong.

The second ratchet is economic: fishers invest in bigger boats, more powerful engines and high-tech fish-finding gear. This investment must be fed either by the fishers themselves, or by subsidies. A World Bank study (Milazzo 1998) estimated global subsidies at \$US 15-20 million.

The third ratchet deals with what successive generations see as 'normal'. Each generation of fisheries scientists, or indeed fishers, tends to see the amount of fish at the start of their careers as the amount that there ought to be (Pauly 1995).

The perception of productive potential thus decreases with each generation. Our most recent work shows that the world fish catch has been declining since the mid-1980s, rather than increasing as the UN agency responsible has maintained (Watson and Pauly 2002). This has catastrophic implications for the future of all of us.

In 1997, the British Columbia Aboriginal Fisheries Commission, UBC Fisheries Centre and UBC First Nations House of Learning signed a Memorandum of Understanding (Annex 'A'). One of the core objectives is to find effective and respectful ways to bring traditional knowledge and western science together. UBC Fisheries Centre and our global network of collaborators are developing software that allows us to build computer models of marine ecosystems that link all the information we can find on as many species as possible. Building a model brings scientists together who would not normally meet. First Nations and others who spend their lives on or by the water can 'ground truth' models by providing vital information on what species are there. This information can come from Traditional Ecological Knowledge (TEK), and from the observations of young people in programs such as Shorekeepers and Streamkeepers. Back to the Future (BTF, Annex 'H') is another step where TEK, history, archives, archaeology, fisheries studies and many other sources are brought together to create models of systems at different times in the past. One current project is building 4 models of Hecate Strait, a 1750s pre-contact model, a 1900s model after the start of steam trawling, a 1950s model and one of the present day. New valuation approaches let us compare these systems in ecological and social as well as strict economic terms (Sumaila *et al.* 2001). Thus, past models present both an audit of our performance as managers or stewards, and a way to set restoration targets based on the productive potential of a system.

On the participatory side, BTF requires a new level of cooperation based on recognition of the gravity of the problem of resource depletion, respect for different traditions of knowledge, reciprocity in sharing knowledge and commitment to use the knowledge to restore depleted systems (Haggan 2000; Haggan *et al.* 1998). Universities such as UBC can play a useful role in providing a neutral forum where First Nations, scientists, commercial and sport fishers and others can meet, and providing tools such as ecosystem modelling and BTF where shared knowledge can be put to work. Jo-ann Archibald



puts it a lot better by saying, “Knowledge Gains Power when it is shared” (Haig-Brown and Archibald 1996).

Life After Death: The Importance of Salmon Carcasses to Watershed Health Stephen Watkinson - Tsimshian Nation

Stephen adapted the Ecopath software to track the role of salmon carcasses in freshwater systems for his Masters’ thesis at UBC Fisheries Centre (Watkinson 2001). This was possible because marine and terrestrial nitrogen can be distinguished from each other (different isotopes). Stephen chose the Atnarko River near Bella Coola as his study area. Because his primary degree was in forestry, Stephen was interested in the contribution of carcasses to the forest as well as the waters. He found that:

- Carcasses provide the single largest annual pulse of nitrogen into the forest;
- Bears are a major carrier of marine nutrients into the forest (up to 1 km from river);
- Bears with access to salmon are larger; mink lactation is improved;
- In Alaska, over 40 species of birds and mammals were observed utilizing carcasses, eggs, or juveniles.

Stephen’s findings underscore the importance of salmon to forest as well as freshwater habitat, and demonstrate that any definition of ‘conservation’ must go above mere spawning needs to provide food and sustenance for the forest and wildlife. Pushing a bit further, it raises the question of whether there is any such thing as an ‘over-escapement’, at least from an ecosystem perspective. The findings also re-affirm the First Nations’ custom of returning salmon bones to the water.

References

- Haig-Brown, Celia and Archibald, Jo-ann. 1996. Transforming First Nations research with respect and power. *Qualitative Studies in Education*. Vol. 9 (3) 245-267.
- Haggan, N. 2000. Back to the Future and Creative Justice: Recalling and Restoring Forgotten Abundance in Canada’s Marine Ecosystems. Pages 83-99 in, Coward, Harold, Rosemary Ommer and Tony Pitcher (Eds). 2000 *Just Fish: Ethics in the Canadian Coastal Fisheries*. ISER Books, St. Johns, Newfoundland.
- Haggan, N., Archibald, Jo-ann and Silvia Salas. 1998. Knowledge Gains Power When it is Shared. Pages 8-13 in D. Pauly, T. Pitcher and D. Preikshot (Eds.) *Back to the Future: Reconstructing the Strait of Georgia Ecosystem*. UBC Fisheries Centre Research Reports. Vol 6 #5.
- Milazzo, M. (1998) *Subsidies in World Fisheries: A Reexamination*. World Bank Technical Paper No. 406. Washington, World Bank.
- Pauly, D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. *Trends in Ecology and Evolution* 10(10): 430.

- Pauly, D., Christensen, V., Dalsgaard, J., Froese, R., and Torres, F. Jnr (1998) Fishing down marine food webs. *Science* 279: 860-863.
- Pauly, D, Ma. Lourdes Palomares, Rainer Froese, Pascualita Sa-a, Michael Vakily, David Preikshot and Scott Wallace (2001) Fishing down Canadian aquatic food webs. *CJFAS* 58(1):51-62.
- Pitcher, T.J. (2001) Fisheries managed to rebuild ecosystems: Reconstructing the Past to Salvage the Future. *Ecological Applications* 11(2): 601-597.
- Sumaila, U.R., T. J. Pitcher, N. Haggan and R. Jones (2001) Evaluating the Benefits from Restored Ecosystems: A Back to the Future Approach. In *Microbehaviour and Macroresults: Proceedings of the 10th biennial conference of the International Institute of Fisheries Economics & Trade 2000* Corvallis, Oregon, USA. Compiled by Richard S. Johnston and Anne L. Shriver. International Institute of Fisheries Economics & Trade, (IIFET) Corvallis, Oregon 2001.
- Watkinson, S. (2001) *Salmon Carcasses, Nature’s Nitrogen Pill*. MSc Thesis, University of BC. Vancouver, Canada.
- Watson, Reg and D. Pauly (2002) Systematic distortions in world fisheries catch trends. *Nature* 414:534-536.



COASTS UNDER STRESS

Rosemary Ommer, Principal Investigator; Director, Calgary Institute for the Humanities

The Coasts Under Stress Project is a joint initiative of the University of Victoria, The University of Calgary and Memorial University of Newfoundland, in partnership with various other universities, including the University of British Columbia and in particular its Fisheries Centre. Our work is funded by the Natural Science and Engineering Council of Canada and the Social Sciences and Humanities Council of Canada, with contributions from Memorial University and the University of Victoria, First Nations and numerous other partners. The idea is to let us begin to understand the complex inter-relationship between the health of coastal communities and the environment on both the east and the west coast of Canada, especially given the social, economic and environmental changes that have recently affected, and will continue to affect, those coasts.

The goal of our work is to identify (using case studies from both coasts) the important ways in which changes to the natural environment (triggered by such things as overfishing) have interacted with social changes (such as industrial restructuring, state policy changes and the new global economy) to affect the health of people, their communities and their environment, over the long run. Our work is needed because coastal communities are under serious social, economic and environmental stress and, although these things are all inter-related, governments usually have to deal with them in separate boxes – fisheries in one, forestry in another, health in another, social programs in another. Our goal, then, is to try to get out of the boxes and see how changes in social policy and in environment (which today's jargon calls "restructuring") affect one another and the communities in which the changes take place.

We do this by asking five related questions, each of which is examined by interdisciplinary teams of researchers working in collaboration with our partners in selected local communities, among First Nations, and in various institutions, industry and government. Indeed, we think of our work as somewhat like a starfish, whose arms are distinct parts of one integrated living organism. Here are our "arms" and their questions:

1. How do different kinds of knowledge (local

and scientific) about the workings of ecosystems help to influence policy decisions which affect human and environmental health, for good or ill?

2. How might local ecological and scientific knowledge help us to understand changes in environmental, community and individual health in ways which would allow us to develop better strategies for the future?
3. What are the consequences of old and new strategies in the forestry and fisheries (renewable resource) sectors for community and environmental health and resilience?
4. What are the risks and benefits to communities and the environment of the development and exploitation of hydrocarbon and mineral (non-renewable) resources?
5. How has social and political change (or the lack thereof) affected the health of individuals, families and their communities?

Like the starfish, we also have a central organising function, which is part administration and part research belonging to the whole. The research will include an examination of the ethics underlying any policy suggestions we come up with, and the development and integration of historical data bases which will serve all our work. Our methods will vary, ranging all the way from grab sampling on the seabed by marine geoscientists to participant observation by anthropologists ... and many other techniques in between.

Expected outcomes

Our results will provide people on the coasts with an assessment of their current environmental, social and community health status, an analysis of how things got to be the way they are now, and policy suggestions for the future. We will also be able to identify which factors are regional or community specific and which are not. Overall, the answers to our big questions will give us five sets of new and valuable information:

1. We will find out how the interaction between science, decision-making processes (local, provincial and national) and wider socio-economic factors operates *and can be changed* to produce better science, more effective decision-making and more resilient, healthy communities. We will examine, for example, in partnership with communities, the interaction between scientific and local knowledge in developing resource



management policy by focusing on species (salmon, deep-sea fish) utilized by local communities in coastal British Columbia.

2. We will assess the value of local and traditional ecological knowledge sets, expert scientific knowledge and archival data as tools for understanding trends in community and environmental health, including the dynamics which must underlie those trends. For example, we will work with fishers and DFO to look at fish stocks; and with fish processors and community medicine experts on allergies to shellfish.
3. We will examine the major trends in the economy and environment of forestry and fisheries on the West coast, so as to uncover the relationship between economic development and environmental change in both sectors. The primary objective is to understand the consequences of restructuring in forestry and fisheries on human, community and environmental health – such things as run-off and water quality, for example, or the risks and benefits of aquaculture to people and the ecosystem.
4. We will examine how the health of individuals, families and communities is affected by the social and political changes that accompany economic/industrial and environmental restructuring. For example:
 - what happens to people and their communities when a fishery is closed or downsized?
 - where do people look for employment?
 - how do their incomes and working conditions change?
 - how do these changes affect relations between and among members of households?
 - what is the impact of changes in Employment Insurance regulations or cutbacks in social services, health or education?

Usefulness of the Research

Our questions will be answered through systematic collection and recording of information using interviews with local people, archival research, scientific research and existing databases. Information from these various sources will be combined to allow us to assess longer term trends in the health of local and regional ecosystems and local communities as well as the social and environmental processes associated with those trends. The results of this research will be presented to our partners among

the First Nations, in communities, and in business, industry or government, at meetings in which we will *jointly* explore the extent to which we have accurately captured the current situation in BC coastal communities. We will also explore, with these groups, the implications of our findings for the future and work to identify strategies that might be pursued at a local, regional, provincial and national level in order to promote ecological recovery and improved human and community health.

We cannot do this work without the help of First Nations. It is you who have the longest experience of living on the coast. It was you who lived here, for such a very long time, without doing damage to the environment that sustained you. You felt, you have taught me, that you were an integral part of that environment, not just outside it, as we have tended to think. Many members of our team, from both the east and the west coasts, have had the privilege before of working with some of you, when we were involved in the study called *Just Fish* (Coward 2000) which tried, as you can see from its subtitle, to come to grips with some of the ethical issues which are embedded in the management of our marine resources. Our partnership with people from the west coast First Nations made our work *much* richer than it would otherwise have been. Your wisdoms, which you shared with us and to which we paid very serious attention, enriched the final analysis which has become well-recognized in government circles as well as in academia. Some of you moved us to tears. When Arthur Vickers spoke to us, he explained that he had had what I would describe as a revelation one day. He made a mind-switch back from capitalist thinking about fishing for profit to First Nations thinking – fishing for need. It changed his life, he told us, and, in the telling, he changed the life and scholarship of some of our young team members forever.

Likewise we learned from the Haida Nation with whom we spent time and who taught us a great deal about their ethics, their view of their environment, their culture and way of life. I went back to Haida Gwaii the next summer and spent 3 weeks in Gwaii Haanas, looking, sailing, thinking, talking to watchmen. I learned about loss and sadness and celebration – and I understood more richly your ethic of ecosystem justice – justice for all things, not just people. I think now in terms, not just of a UN precautionary principle, but of the only way that I can see that working – through stewardship, defined as hands-on daily care, and hence through that care being taken by local people – an adjacency principle. Respect for



people and for nature need to go hand-in-glove, since we are all, when it comes down to it, interdependent.

Coasts Under Stress wants to continue, deepen and broaden the partnership that was built during the work of *Just Fish* (Coward et al 2000) and to do so in very concrete ways. We have much to learn from you, and we think, respectfully, we also have things to offer in exchange. We care passionately about coastal peoples and coastal environments. We know that the difficulties of sustaining a livelihood in coastal regions often appear to make it well-nigh impossible not to pillage the natural resources of the region. We believe that there has to be a way round that problem – and we think that our combined wisdoms and skills may be able to uncover what that way might be. It is our dream that, in four years' time, we may be able to offer to local communities and to all levels of government the results of our work. Those results will, we hope, drawing on a partnership of our science and yours, point to a set of strategies which will be respectful of First Nations, and other local communities, and the environment which surrounds us all, and which will point the way to people being able to continue to live on this coast in healthy communities embedded in a healthy natural environment. It is a tall order, and we may only get part of the way there – but it is worth trying, and I think it can be done, with your help.



WORKSHOP FINDINGS

This is the main output of the workshop. Participant input from two major breakout group sessions has been summarized under the following headings: *issues and constraints; linkages, alliances and partnerships; building capacity to undertake fisheries science programs at all levels; effective student recruitment strategies; funding and other student support; 'Laddering' or pathways to different qualifications; and employment opportunities.*

Issues and Constraints

The first step in creating a climate of possibility is to identify the constraints. The breakout groups identified constraints from early schooldays up to university:

School Constraints

- Little emphasis or value put on traditional knowledge;
- Difficult transition from TEK, or *Indigenous Science* at community level to science and management as taught and practised;
- Challenge of integrating oral traditional learning with standard math and science teaching;
- Lack of role models – lots in health, education, law, but very few in fisheries;
- Lack of trained people to teach math and science, elementary students being turned off. Result is students dropping out by grade 9-10;
- Lack of awareness of fisheries careers.

College and University Constraints

The key questions are how to equip First Nation students to succeed in college and university and how to make colleges more responsive to First Nation needs? College level issues include:

- Culture shock for Aboriginal students coming from small communities to city. Failure rates are high even when students are ideally qualified;
- Entrance qualifications met on paper, but not in reality – need for upgrading;
- How do you get students comfortable, away from home?
- How do you cover off home responsibilities so that adult learners can leave home?
- How do you create a healthy support system while they are away from home?

The transition issues at Regional College level become more challenging when students enter major universities where First Nation students

are a very small percentage of the total student population compared with institutions such as Malaspina and the Nicola Valley Institute of Technology (NVIT).

Linkages, Alliances and Partnerships

Linkages are needed between government agencies (funding, educational, regulatory), communities, post secondary institutions and organizations. Initial tasks include protocol and process development and communication mechanisms. Some progress has been made, e.g. the Policy dialogue forum between the BC Aboriginal Fisheries Commission (BCAFC), and five federal government departments (Fisheries and Oceans, Indian and Northern Affairs, Environment, Human Resources and Parks), but implementation is lagging behind intent. Needs include delivery mechanisms, increased institutional capacity and flexibility - even in some cases new or expanded mandates. Some priorities are:

- Endorsement from First Nation organizations: Summit, Assembly of First Nations, UBCIC¹, UNN² – BCAFC take lead role;
- Formal mechanisms for cooperation with federal and provincial government e.g. expand the policy dialogue forum to include BC government agencies involved in management, enforcement and education;
- Full involvement of educational institutions, (engage the active support of First Nations Education Steering Committee), Aboriginal Urban Labour Market, etc.;
- Linkages between universities, community colleges and technical institutes. Build on existing relationships between First Nations and educational institutions, e.g. NVIT, UBC BCAFC Memorandum of Understanding;
- Exchange visits to learn about other First Nations programmes;
- Engage NGOs and Foundations in dialogue leading to active support;
- Cross-institutional comparison of programs;
- Communication on education, training and employment opportunities.

¹ Union of BC Indian Chiefs

² United Native Nations – Vancouver-based service organization for off-reserve and non-status people.



Building Capacity To Undertake Fisheries Science Programs

“You have to have an idea you can do this.”

Early Childhood to Grade 12

Participants strongly agreed that fisheries education must begin in early childhood. The key elements identified must start early and run through all stages of education. They include:

- Cultural awareness and involvement of Elders from pre-school onwards, e.g. involvement in traditional activities, such as fish and seaweed camps;
- Introducing fisheries early in education ‘Salmonids in the Classroom’, Streamkeepers, etc;
- Adapt existing materials for local situation, or develop new materials;
- Validate role of First Nations in fish management;
- Respect cultural roles, values, customs and community priorities in developing fisheries management plans.

Curriculum and Educational Resources

Key points of agreement are the need for cultural relevance and holistic approaches, best achieved by the involvement of Elders, and the need to balance classroom learning with relevant field activities and work-study opportunities. Quality educational materials are needed for all levels. Experiential and Field opportunities include:

- Salmonids in the classroom;
- Adopt-a-stream;
- Streamkeepers;
- Stream teams;
- Early aptitude testing to determine areas of strength and interest - Take right courses in high school;
- Involvement of First Nations students in guardian programs/mentoring;
- “Apprenticeship-like” process starting in high school;
- Incentive programs → exchange programs;
- Summer camps/ work studies where youth can work with Elders;
- Internships for different ages/levels;
- Co-op programs;
- Career fairs;
- Mentoring - returning post secondary students;
- Role models with passion for their careers required at all levels to offset negative impression from “uppity” Fisheries Officers.

Effective Recruitment Strategies

Increase Awareness

Awareness includes information on the different types of fisheries education available (see also Post-Secondary Fisheries Program Survey and Existing Educational Programs and Resources) and the career opportunities that correspond with each level or type of qualification. This awareness should include an understanding of the work, responsibilities, financial costs of education and the salary and benefits relating to different fisheries careers. Ways to increase awareness are summarized below:

- High quality materials available on Internet - showing educational steps from school to university, and job opportunities at each level;
- Video of diversity of Fisheries jobs (existing videos can be built on);
- Presentations to elementary schools, high schools, etc.;
- BCAFC take lead in developing a ‘Road Show’ on new fisheries science and educational opportunities;
- Career fairs in schools, colleges and online. Demonstration career fairs in field [i.e. Demo 2000—Forestry]
- Youth to visit colleges/universities, e.g. the “UBC Connect” programme where Grade 10 and 11 students spend 4 days on campus - each day focuses on a different faculty <http://students.ubc.ca/welcome/events/campus.cfm?page=connect>;
- Have appropriate courses or ‘mini-courses’ offered at community level as introduction to a program;
- Organize career days earlier than Grade 12, in isolated fishing communities;
- Youth to workshops and conferences on fisheries education opportunities;
- Exposure to role models - success stories from community members;
- Making school counsellors, Education Departments, band schools, fish/natural resource programs aware of opportunities;
- Continuity of support from elementary schools → job;
- Hands-on field experience - exposure through practicums, internships, co-op programs, work experience, e.g. summer work in First Nation fisheries programs;
- Youth to visit places of work (i.e. First Nation Fisheries Programmes, DFO, BC Hydro...);
- Funding and scholarship opportunities;
- Employment opportunities;



- Educational leave from employer;
- Availability/acceptance of prior learning assessment (PLA) and transferability of credits.
- Aboriginal Coordinator/Advisor;
- Arrange seminar series to improve peer contact interaction across disciplines;
- Tutorials and mentorships.

Funding & Social Support

How can we work together to provide appropriate support for Aboriginal students enrolled in fisheries studies?

Funding

- Earmark funding for First Nations fisheries students. Sources include federal, provincial and First Nation government, Crown corporations, e.g. BC Hydro, NGOs, private sector, e.g. major environmental consulting companies and foundations;
- Impressing line agencies of the funding situations First Nations students, particularly adult learners, find themselves in;
- More cooperation between line agencies at provincial & federal level;
- 4 year limit on funding is a problem, given time needed for upgrading and access to science;
- Coordinate funded summer employment opportunities so that students can gain relevant experience while earning, instead of having to take McJobs to survive;
- Dedicated 'front-end-loaded' funding for relocation, orientation period and time needed to settle in and acquire support services – particularly for adult learners with families;
- Dedicated funding for Masters and Doctoral students.

Social Support

- Support leaving communities, e.g. advice for moving to new place, setting up house, finding schools, day-care, doctor, bank accounts, finding way round campus;
- Housing—more family housing as well as single units;
- Day-care, especially culturally-appropriate day-care (e.g. www.longhouse.ubc.ca);
- Promote sense of community on campus 'Home away from home' e.g. UBC Longhouse or other services for First Nations;
- Catalogue of resources/services. Events, places, meetings, friendship centres (on and off campus);
- Connections with home community;
- Availability of traditional activities and foods at gatherings;



LADDERING - 'PATHWAYS' TO DIFFERENT QUALIFICATIONS AND EMPLOYMENT OPPORTUNITIES

The following points are summarized from breakout discussions on laddering. A forestry model presented by Gordon Prest is attached as Annex I. The actual breakout reports are presented on page 24.

Get Them Young – foster and hold an early interest in aquatic ecosystems:

- Involvement of children and Elders in traditional activities;
- Recognition of First Nations' role in management – links to tribal fisheries programmes;
- Involvement of Elders in formal education;
- Competent and dedicated teachers – particularly math and science/reduce turnover;
- Create opportunity (and time) for participation by role models and mentors;
- Curriculum materials and activities that are locally relevant;
- Education coordinators, teachers and counsellors aware of next steps in 'ladder';
- Visits/work experience with local fisheries programmes, DFO, Hydro, commercial fisheries, processing, ecotourism, other employers;
- Career fairs / college outreach to communities.

Accreditation and Transferability

- Availability of Prior Learning Assessment for adult learners;
- Availability of academic upgrading, particularly 'Access to Science' programs;
- Transferability of credits between programmes and courses.

Easing the Transition

- Laddering from school to regional college, then on to university rather than direct school → university;
- Continuing community links, e.g. student research projects/theses based in community;
- Having an Elder or knowledgeable community member on thesis committee;
- Comprehensive orientation programmes;
- More time and flexibility in programme design, particularly for adult learners;
- More coop programmes where people can 'earn as they learn';

- Facilitate summer employment, internships, etc.;
- Distance education and programmes in communities;
- Support services, including family housing, day-care, financial counselling, community services.

Employment

Employment Needs Assessment

Scientific, technical and other employment needs should be identified in consideration of the research, technical, administrative and other support needs of First Nation communities, federal and provincial governments, industry and NGOs. The assessment should include need for First Nation educators and trainers in fisheries science and technology.

This requires interagency cooperation and an overall mechanism to coordinate and facilitate the further identification of needs, laddering opportunities and capacity building. This mechanism should involve young and adult learners with input from Aboriginal people in the workforce.

Career Awareness

The key to career awareness is information on fisheries careers and the level of education required so that prospective students can take an informed decision. Issues include lack of opportunity/jobs in communities, or lack of funding to address fisheries priorities and problems in the territory; lack of full-time employment for fisheries technician, due to the seasonal nature of some fisheries work; and the reality that fisheries technicians are sometimes poorly paid compared to Band members working in forestry and other careers.

Job Needs and Opportunities

The following points are summarized from additional information on fisheries careers in the Employment section, page 31. These include DFO Fishery Officer, other DFO jobs, BC Fisheries and First Nations and cooperative programs:

- Communities need to identify job/careers to address their fisheries conservation, management and access needs;
- Make local First Nations Fisheries Commissions aware of diversity of jobs and skills needed;
- Increase awareness amongst educators;



- Diversification of technicians - not so specific, i.e. combined fish/forestry and wildlife education;
- Career fairs;
- Band newsletters, articles in Aboriginal and mainstream media;
- Celebrating successes - role models with passion about their careers;
- Job shadowing;
- DFO must offer more full-time jobs for First Nations technologists;
- Support for retaining current Aboriginal guardians to FTE status;
- Emphasize lab and science as well as assessment and habitat aspects of fish technician jobs;
- Access DFO career profiles information;
- Use government procurement strategy to get DFO contracts.

Recommendations

“One of the things we need to do is an inventory of elders in British Columbia. How do we get them more involved in teaching? How can we certify these people as teachers?”

Chief Simon Lucas

1. First Nation communities must be fully involved in developing linkages and strategies – colleges and universities need outreach programs to facilitate this dialogue.
2. BCAFC must take the lead in documenting diversity of careers and related education and skill requirements.
3. Fisheries education must start in early childhood, not wait until Grade 12 or first year of college.
4. More First Nations ‘ways of knowing’ must be implemented, including involvement of elders and locally relevant curriculum materials.
5. Students must be made aware of Fisheries employment opportunities at a younger age (work experiences, internships or summer camps).
6. Funding opportunities for First Nations students must be increased (grants, bursaries, scholarships and fellowships).
7. Dedicated funding is needed for graduate (Master’s and PhD) students.
8. Formal upgrading, orientation and access to science programs are needed.
9. A universal ‘laddering’ system is needed in BC post-secondary institutes so students can progress from one level to the next without doing remedial work (linkages between high school, colleges and universities).
10. Create supportive resources for on and off-campus so that students feel at home and are aware of services and have help to access them (e.g. “First Nations House of Learning”).
11. Fisheries employers must develop linkages with the First Nation communities.
12. Math and science curriculum must be developed to accommodate First Nations students without disrupting their values so they can advance to fisheries careers.
13. First Nations must see that their knowledge as well as western science is included in Fisheries education.
14. Relationships must be built among all people affected by the fisheries, both freshwater and saltwater (they are all connected).
15. The stakeholders should plan to have a similar gathering in 2002 to share developments in Aboriginal fisheries science and ecosystem management.



Post Secondary Programme Survey

Brent Peacock, UBC Ts'kel M.Ed. student

The BC post-secondary Fisheries programs identified are shown in Table 1. The programs are divided into certificate, diploma, degree, post degree diploma and graduate Fisheries programs.

Fisheries Certificate programs are usually one year in length. The objective is to train a person for employment as a Fish Technician. The programs try to offer the students more hands-on experience. When they are finished, students will be qualified for more hands-on employment. The programs are generally divided almost 50/50 (theory/practical). To teach a certificate-level fisheries program, a teacher must have had this type of experience and the 'know how' to demonstrate such skills.

Fisheries Diploma programs are usually two years in length and require some Grade 11 and 12 science classes for entrance. Most of the diploma programs have some sort of practical work experience component in their requirements for completion. The object of a diploma program is to train people to fit the role of Fish Technologist. The programs try to incorporate more theoretical class work but they still try to emphasize the practical side of fisheries. To teach a diploma course a teacher must have a more theoretical knowledge of fisheries but with practical experience.

Fisheries Degree programs comprise four years of class work. The degree-granting institutions have a standard set of requirements and grade point average to be accepted into these programs. The degree-granting institutes other than the degree program at Malaspina University College are focused on theory. The programs are designed like University undergraduate degrees in sciences. The students are trained to do a number of jobs such as fish assessment. The students will have a strong theoretical knowledge of fisheries after completion, but unless it is a co-op degree they may have little or no practical experience. Teachers with Master's or PhD degrees usually teach degree programs. The teachers have limited practical experience but usually have research skills not found in the instructors of certificate and diploma programs.

Post-degree Diplomas are usually one to two years and are specific professional training. The students have already completed four-year degree program but lack specific skills. The post-degree programs are intensive and attempt to teach

practical and theoretical skills specific to employment in Fisheries.

Master's and Doctoral (PhD) degrees are graduate programs offered by Universities. These graduate programs are formed around the student's interest. The programs are very theoretical and are designed to develop the student's critical thinking skills. The students are trained to be researchers and administrators in the fisheries field. Graduate programs are limited in size, so the competition to get into graduate school is very intense. The UBC Fisheries Centre is one of the few schools that offers graduate school classes which relate to First Nations and their philosophy about Fisheries. The graduate programs can be in a wide range of sciences and sometimes can be limited by the compartmentalization of the discipline.

The growing trend in fisheries programs is to add them to a forestry or environmental studies program. This latest trend is indicative of economic constraints and the desire to generalize students so they are more employable to a wider field of employers. The First Nations philosophy of fisheries is a more 'holistic' view of the environment and is not compartmentalized and specialized like scientific thinking. Fisheries moving in the direction of multi-disciplinarity might open the opportunity for more First Nations knowledge without having to curtail it to fit a specific scientific discipline.



Table 1
Institutions Offering Fisheries Programs

School	Certificate	Diploma	Associate Degree	Degree	Post-Grad	Graduate
BCIT		<u>*yes</u>				
Capilano College	<u>*yes</u>				<u>*yes</u>	
College of New Caledonia	Yes					
Douglas College	<u>*yes</u>					
Institute of Indigenous Government	yes		yes			
Justice Institute	<u>*yes</u>					
Kwantlen University College			<u>*yes</u>			
Langara College	<u>*yes</u>	<u>*yes</u>	<u>*yes</u>		yes	
Malaspina University College		<u>*yes</u>		<u>*yes</u>		
Nicola Valley Institute of Technology	<u>*yes</u>	<u>*yes</u>				
North Island College	yes					
Northwest Community College	<u>*yes</u>	<u>*yes</u>	<u>*yes</u>		<u>*yes</u>	
Okanagan University College				<u>*yes</u>		
Royal Roads University				<u>*yes</u>	<u>*yes</u>	<u>*yes</u>
Selkirk College		<u>*yes</u>				
SFU				<u>*yes</u>		<u>*yes</u>
Vancouver Community College	<u>*yes</u>					
University College of the Cariboo				<u>*yes</u>		
UBC				<u>*yes</u>		<u>*yes</u>
UNBC				<u>*yes</u>		<u>*yes</u>
UVIC				<u>*yes</u>		<u>*yes</u>
TOTALS	10	6	4	8	4	5



FIRST NATIONS EXPERIENCE WITH FISHERIES STUDIES/EDUCATION

Raychelle Daniel, Y'upik Nation and Graduate Student, UBC Fisheries Centre

Students are the reason for this conference, but, in the 'real world' are rarely involved in programme design. This section reflects the voices of First Nations students in two ways. The first part is a summary of input from interviews with 59 people conducted prior to the workshop. In the second part, student panellists speak for themselves.

Panel Discussion, Moderator Raychelle Daniel

Steve Watkinson, UBC Fisheries Centre

I've already described my research (see Page 10), so now I'll tell you how I got there. I got my elementary and secondary education in Port MacNeill at the north end of Vancouver Island. All there is in Port MacNeill is fishing and logging; that was all there was to do after school, so naturally I always thought that I'd go into fishing or logging. Then my dad was transferred to Tsouke, and no one was talking about fishing and logging there. All there was there was university. I took some general sciences after high school in a college. Then I asked myself what I could do that had to do with fisheries and logging, so I entered wildlife management in Animal Zoology here at UBC. I had problems with organic chemistry, so I took Forestry so I wouldn't have to deal with it. It was not until the last year of my undergrad that I looked at graduate school. The Fisheries Centre was recruiting Aboriginal students, and I thought, hey, someone is going to give me money to study fish. In terms of laddering, the biggest issue was funding. Had it not been funding and Nigel Haggan casting his recruiting net, I would have been out in the real world. Graduate studies is an expensive endeavour, and my own band doesn't have any experience with higher education. They think of me getting my PhD as my aunt who went to hairdressing school.

David Cootley, Malaspina College

My name is David Cootley from the Nicola Valley. I started my education in 1993. I went back and did my grade 12 and then worked to take care of fish. It didn't take long for me to realize I wasn't going to go anywhere without some paperwork. With some prodding from people like Arnie [Narcisse], I went to NVIT [Nicola Valley Institute of Technology] and got a resource technician certificate. I sat as student representative on the NVIT Board of Governors. I

got the Lieutenant Governor's Award that year. I worked for a bit, and decided that it still wasn't enough, so I went back to school again. That was a tough year – I had to leave my family and support system, and I was worried about my mom and dad. In my first term I had a really hard time. I failed algebra, so I had to repeat it. But since then, I've had excellent marks.

My family has made a lot of sacrifices – I had to wait until my daughter went to sleep before I could do my homework. Now I have a long distance relationship with them. But because I went away, my daughter learned how to be independent. Now she's at Malaspina. I applied for some scholarships and got the BC Aboriginal Fisheries Council award this year.

In our discussions earlier, we discussed how we get these students to go to school. I think the biggest question is "how do we make them leave their communities?" That's another reason why I had problems in first term – I was the only First Nations person there. You feel a little out of place, and it's hard. I won't take too much of your time, but I came to learn and meet people. When I'm done, I'll go home and hopefully get a job. Education won't guarantee me a job, but it'll give me an opportunity.

Teresa Ryan, former PhD student at the UBC Fisheries Centre

Teresa is a PhD student from Tsimshian people of Alaska. She is not a registered American Indian because she has her Canadian status. She went to school in the USA so this left her ineligible for funding. She commented her biggest hurdle was funding. The failure to have funding will affect one's self-esteem even with community and family support.

When I said earlier that the biggest problem was funding, it could also be limiting to your time. Maybe you can get a part time job working on another research grant, but that cuts into the time you have for the requirements for your degree. This is the first year I got band funding for my degree. There have been problems with some bands across the province, and I've heard that there have been students with problems like mine. It's important to look at all aspects of education. The point I'm at now is a PhD. I've come this far, and I'm not going to stop now. There have been many times when it crossed my mind and I asked, "Why I am doing this?" and I am reminded of the importance of my education when I look at a gathering like this. We can only make a difference when we've completed our goal, and we've made some changes. I've had



some great experiences. I've met great people and gone to remote locations. Hopefully some of this will result in something that I can give back.

Jacinda Mack, potential grad student

My name is Jacinda. I've been one of the lucky ones. I had a strong support system from my mother and grandmother. Education has always been a part of my life, so it was a natural thing for me to go into education. After high school, I went to Portugal for a year, and had an immense culture shock. It really struck me where my roots were. It was then that I realized the connection I had to my people, and I had a responsibility to my people to use the gifts that I had to help others who were not as fortunate as myself. I'm involved in eulachon conservation as well. It's important to pull all the information together. Elders need to be acknowledged in journals. I'd like to pursue a degree in Traditional Ecological Knowledge.

Interview Responses - Raychelle Daniel

I interviewed 59 people with a common desire to further their education in the field of fisheries science and management. Their experience varied from university, to on-the job training, to lifetimes of accumulated knowledge. I also interviewed some people who work in fisheries science and management.

In the interviews (see Box 1), I started out with them telling me a little about themselves, their background and what they were presently doing. They went on to describe their goals, what they wanted and desired for themselves and to what degree they wanted to be involved in fisheries management and science. Towards the end, I asked them what they saw as problematic in reaching their goal(s) and what they thought would have been helpful in overcoming those problems.

Out of 59 interviewees 18 were female and 41 were male. I don't know if the disparity is due to the methods used to find people who expressed interest in fisheries, or if it reflects the world, of fisheries science and management. This might be an area to follow up on. The following are some of the major issues that were brought up in my interviews and discussions.

Funding for education (and fisheries programs, e.g. enhancement) was a major concern for almost all interviewees. Existing education funding quite often overlooks living expenses, leaving many students working, trying to

Box 1: List of questions: first group are questions for people who already completed a fisheries program and have had some training; the second group are for those interested in pursuing further training.

- What experience and interest do you have in fisheries?
- Have you any formal education or training in fisheries management/science? If so, when/where/what was the program?
- Did you complete the program? If not, why did you not complete?
- Do you feel that it adequately prepared you? / What do you feel you need to know in order to become more involved in/prepared for fisheries management/science? / What skills/tools/etc do you feel would make you more productive/prepared? / What were your needs? / Did the program meet your needs?
- Why did you enter the program? / What were your initial goals/objectives for entering the program? / Do you feel that your initial goals were met for entering this program?
- What do you think were the program strengths? / What aspects of the program were most beneficial/valuable for your involvement in fisheries management/science? / Was the program realistic? Did it prepare you for what you faced in the real world?
- What do you think were the program weaknesses? What was missing from the program you would like to have seen included? What were/are some of your problems today (with involvement in fisheries management/science)?
- What do you feel, additionally, could improve the program to have met your needs? / If you were to design/alter the program, how would you change it?
- After completion of the program do you still have a desire to be involved in fisheries management/science?
- What experiences and interest do you have in fisheries (why are you interested)?
- Are you be interested in further education/training?
- Do you know of a program that interests you?
- Why have you not yet pursued this program (what is preventing you from getting the training)?
- What are some potential problems that need to be overcome in order for you to meet your goal? / If the above were altered would you pursue this interest?
- What are you looking for in a program? / What are your interests? / What is important to you (program and otherwise)? / What skills would you like to gain from such a program?
- Where would you be willing to go to obtain this education/training?

complete their studies and juggle their family life at the same time. More scholarships with allowance for living expenses would be helpful to many interested in continuing their education. Additionally some students find that it is easier to get funding resources for undergraduate and



certificate programs, but that funding is scarce or nonexistent for higher levels such as Master's or doctorate degrees. Another issue was the prospect of a leave of absence, such as maternity leave or for familial emergencies. Many employers may not be willing to wait, and the position may not exist after a leave of absence.

First Nations place a higher priority on family and family commitments than mainstream North American society. Sincere and effective efforts to increase First Nations involvement in fisheries management and science need to address these cultural priorities.

Another prevailing issue was the number of school and training programs that were located far from home. Several students were unable to complete their studies and returned home. Reasons for returning home included the lack of community support in large cities like Vancouver, which one newcomer described as having 'low social cohesiveness' in meeting their cultural needs. Being physically far from home posed a problem for some interviewees. Because their families remained at home, problems and issues arose that needed their attention or presence, resulting in their not returning to complete their programs. One proposed solution was to develop partnerships between communities and institutions of learning, whereby students would be able to remain closer to home, and at the same time learn skills and management techniques on site producing immediate application of knowledge. This would also involve and incorporate community interaction into the process. Another suggestion was to develop 'satellite' training locations, bringing the formal courses closer to home, perhaps even creating shorter and intense courses more accessible to remote regions. Distance education courses through the world wide web could lead ultimately to certificates in fisheries and science.

The Fisheries and Agriculture program at Malaspina College got quite a bit of positive feedback. One of the benefits of this program was the location; the smaller town setting was much more desired than having to relocate to a larger place such as Vancouver. Some people were concerned about relocating their families, particularly their children, and the influence of living in a larger city. Several people commented favourably on the quality of the teachers, the presence of a fish hatchery, good laboratory facilities, and the hands-on practicum at the Pacific Biological Station. Although this program was seen quite positively, some improvement could be made by incorporating more habitat and

watershed restoration techniques and more emphasis on freshwater habitat aspects, particularly for those who live on interior watersheds.

One respondent praised a Malaspina program that he thought had ceased to exist. It was a locally-delivered Fisheries Technician program in the interior, whereby instructors travelled for a several week period and offered intensive coursework. He believed it benefited Aboriginal communities as it was locally delivered and incorporated local First Nation values. He would like to see this option made available in future, possibly with some type of accelerated diploma associated with it. This type of programme might address some of the concerns of those who have not been able to continue their studies in fisheries.

Hands-on training is touched upon in several areas here, but is important enough to merit its own section. Interviewees stressed the importance of hands-on work. No amount of study and class work can prepare you for the scope and reality of what you see in a real work situation. This includes the preparation of methodology, collecting the data, making changes/adjustments to data collection methodology, data analyses, interpretation and presentation. One interviewee liked the idea of an apprenticeship and thought that would be very helpful in dealing with different aspects that might be encountered while in a biologist position.

Several respondents with fisheries work experience, but no formal university education, mentioned the problem of transfer or quantification of those work experiences towards university/college credit. Proposed solutions included laddering programs where work experience could be systematically incorporated or transferred into course credits. One interviewee commented that he needed to take 1.5 years of refresher courses in order to meet the pre-requisites for a three-year diploma. Even though he remained very interested in fisheries management, he found that having to wade through pre-requisites and keeping up with coursework made him lose sight of his main goal. As a possible solution, he recommended that we target the youth, get younger people interested in managing our resources. For himself, he wished he would have started sooner. He recommended getting younger people interested and set on a learning track towards sciences and math, so they would be better prepared than he was. He felt that students should be exposed to science and



math, and also that creative methods are needed to keep students interested, so that they don't quit. One interviewee noted that, while students quite often have interests in these areas, they may not continue studying science; he is not sure why they don't remain in the sciences, but this area should also be addressed.

Required courses such as biology, chemistry, and math were an issue for some respondents who wanted to return to school. A support system (i.e. tutorials) would help them to continue their studies and enhance their chances of success. Many adults returning to school have to balance family interests and responsibilities with the demands of coursework. A support resource would help - just knowing that there are other people out there in similar situations balancing different aspects of their lives. Technical writing and communication skills (writing proposals and reports) are areas that should be addressed.

Another problem was the difference between seasonal or project and year-round employment. One interviewee spent eight summers collecting fisheries data, but was not able to participate in the actual analyses, as the work was contracted (to a biologist) outside the community. He would like to return to school and be able to conduct the stock assessments and write the reports himself, as by doing this he would feel more involved in the process and not just hand over the data once the field season is over.

The political aspect of fisheries management, both in DFO and in local band councils, came up as a concern in several interviews. Two respondents thought that their career could only go so far. Although they were adequately trained and interested in being involved at a higher level, they were not able to get work based on their merit. Instead work was going to less qualified people based on the "it's who you know" mentality versus merit and qualifications.

A number of respondents thought that a more holistic management approach was needed. We should learn more about the various marine and freshwater food chains for the different fisheries using local knowledge and involving local fisheries users' viewpoints. The future direction in fisheries science and management should be to combine scientific methodology with traditional knowledge and practice.

LADDERING – BREAKOUT GROUP REPORTS

Each person at the workshop was asked to go and sit with people from their 'home' region and ask

themselves what would a child have to do to get a job in the fisheries and how would a child get to university from their region? What encouragement would they need? What options do they have? Key findings from this section are presented under 'Laddering'.

North Coast - Teresa Ryan

We thought we'd take a view along the trail. We'll start at curriculum at young age to spark curiosity. Invite elders to talk. Some of it already occurs, but we'd like to see more in, more formally. For example, demonstrate or describe old fishing techniques and show how they are integrated in cultures. There has to be high school directions toward community opportunities. Go into high schools and tell them what was available. Redirect career fairs to student preferences. See what Aboriginal students want to do, their interests. We need more First Nations educators. Need their levels that meet our expectations and needs. Bringing Elders into our daily lives. Developing program to facilitate that. Sharing information in community programs. With local villages, towns, industry, sport fisheries, government and non-government agencies to meet objectives. Also peripheral industries like Ecotourism lodges. Develop inter-community interests to share information across groups. Provide liaisons at colleges. It's very important to have one person here to contact the students to enroll in the next term. We think that person could assist in many different capacities. There has to be University presence in Aboriginal communities. We need people from UBC to go into our towns to talk and to make their presence known so that higher education isn't such a foreign institution, co-op experience in home communities to encourage students to bring knowledge back home and also other communities to get a broader view. The issue of mentoring and youth projects at the local levels. When the student comes back to their communities, they bring a mentor in with the next generation. Provide money or college credit for it. Perpetuate program. Intercollegiate programs - student exchange so horizons are broadened. Can bring this sort of experience to careers. That's a start.

Central Coast - Jacinda Mack

For the central coast, many of the points are similar to those from north coast. We talked about addressing the quality of the education (teacher turnover, curriculum, continuity in education). We discussed the issue of role models and having activities within communities on the industry and having elders integrated in schools, not just an add-on process. It's good to have



incentives for academic achievement. Utilizing resources and facilities of government. Building on things that are already there. Bringing science summer camps to spark community interest on Ecosystem model of central coast where everyone contributes. Validate First Nations knowledge of fisheries. Having access to appropriate academic courses so not always having to upgrade. Have academic accreditation and encouragement from elders to push students to go into the sciences. Identify students with potential and encourage them. Having more resources for one-on-one instruction. Having regional colleges, rather than going straight from little communities to UBC, which is intimidating. Also have returning student support. It's good for students to know they'll have some kind of support for the summer, like money or credit. Going from college preparation to undergraduate degree. Constantly building on what you have. Implementing the laddering within the field. The first nations support and communities should also go beyond support and funding. Working on Long-term strategies, and goals to follow through. One of the big things is that graduates are not returning to communities, so there has to be some way to keep people coming back to communities, exposing communities to students' experiences. Some programs like 'Discovery' www.discovery.org, that are already in place can be expanded upon. Just to make the science really attractive at young age. Some options are tribal fisheries program, aquaculture, and environmental conservation, DFO, BC government fisheries, and more. Also there's a big push for First Nations academics, teaching in universities. Some of the last things we talked about were networking between and within communities to build relationships so they already know each other when they go into school. Also capitalizing on Internet.

Central Interior - Arnie Narcisse

Focused on early childhood development, instilling crucial values through exposure and observation. Apprenticeship program that young Indian kids go through in fishing communities. My first job was putting strips on the fence, then carrying buckets, etc. It can go on whatever region you come from such as river fisheries, stream fisheries, lake fisheries. Next we talked about aptitude testing. Not everyone is geared to become a fisherman, or a computer technician. See their strengths at early stage and foster development. Throughout education experience, school should instill a sense of pride and respect for the jobs. Being a fisherman, being a technician is a good thing. We also spoke of the creation of mentoring programs for young

children such as youth working with youth. Tina pointed out an initiative program about kids aged 12 or 14 who went through mentoring when really young and now they're the mentors. There's a real communication bond between the kids that we can't duplicate. Schools and facilities and creating awareness like salmon hatcheries – learning what goes into that operation. It's a magic experience to see the eggs, the little eyes. Our education coordinators should have a wide breadth of knowledge about what's going on around us, so that they can be conversant when they go out and talk to other people about it. So that's why we chose to focus on the childhood. I admire those who were able to get beyond this, but this is very important.

Lower Fraser - Kim Guerin

Lower Fraser comprises many communities. We need a five-year strategy to develop things. Through partnerships, Memorandums of Understanding: Faculty of Science at UBC, VSB, House of Learning, and David Suzuki Foundation. Get sense of identity to give roots of where they came from. Our community, Musqueam, is named for the long grass that used to grow here. Looked at youth and elders as resource people to teach people about where we come from and connection with land and resources such as historical, cultural, biological, and language contents. In that resource package we would provide summer camp, river and ocean field trips like Ecotourism so children can spend time in water and participate in traditional activities. Different age group progression: from elementary to high school level, give different age groups the tasks they would be involved in like smoking salmon, creating fire for camp. Format would be like club where children are be involved and have a sense of ownership. Contests to take place, scholarship to be offered. Having Career Days and fairs to provide opportunities for children to meet people in the field as well as having cultural days for people to participate in activities of their culture. Science and math program: ensure tutoring is available and role models have access to children and have presence in their day-to-day lives. Incorporate traditional ecological knowledge. For example, using the descriptions of different parts of salmon, different fishing methods. So people could say these terms in our own language.

The Faculty of Science is a resource we haven't tapped into, but is one which we hope can provide more opportunities. Within the co-op programs, job-shadowing experiences should be implemented as well as community networking and information sharing. Within the



communities, the resources have been well developed. For example, in Musqueam our Elders are becoming fewer and fewer. To benefit from knowledge, and to make schools more accountable, we need special classes for students such as the class on First Nations history given at Point Grey Secondary. We need capacity analysis, such as Nisga'a. Deanna described this morning the study of the needs of people.

Vancouver Island - Rob Simon

We started off by recognizing 4 – 6 regions on the Island. Must start by sharing knowledge and inventory of knowledge so it's not lost. Integrate knowledge to incorporate modern techniques and principles. Reconcile traditional and current knowledge. Don't lose, but also an equivalency. "Respect" for tradition and for students who are learning. The acknowledgement of roots and hereditary chiefs and preparing children for challenges within the community programs are essential. This is a big-picture type of awareness to give the kids. No surprise as there is some eagerness and anticipation of next steps in moulding the child in traditional ways.

When child leaves, community support, cultural awareness. Maintain the linkages, don't forget where you came from, and keep family ties with the student. We then talked about the options once the child has left. Child must be taught about school – counsellors, principals, and teachers. How to integrate this back? If student is at university and is working on final paper or practicum, bring it back to community by having an Elder on the thesis committee. Community gives the student a problem to work out for them. There should be opportunity for credit of traditional knowledge. Even if a student's young, he knows something and he has to acknowledge that process in an affirmative way.



HECATE STRAIT PROJECT – HOW DO WE INCORPORATE TRADITIONAL ECOLOGICAL KNOWLEDGE?

Teresa Ryan, Tsimshian Nation Former UBC Fisheries grad student

Imagine an iceberg floating on a calm sea for a moment, tranquil and quiet, blue with light, and jagged from its journey. It is the shape of a mountain, and white like the highest of mountain peaks, but floating ever so gently with the currents of time and energy. The currents of water have traced their path intricately throughout the submerged mass. Life thrives on and around the ice, above and below the water surface. The monstrosity of its size is belied by the appearance of floating on the surface. The iceberg does not show the condition of the ice from a distance, unless you know how to read the light. It does not indicate the resident or visiting organisms, unless you know how to read the ice. Its depth is unknown unless you know how to read its movement. The knowledge of ice is one of the first accepted applications of traditional ecological knowledge or TEK. Did you know the Inupiak have seven different words for ice? Their lives depend on the knowledge of ice, knowing how to read the light, ice, and its movement. This is an example of the knowledge embedded in cultures that rely on their environment for survival. Our ecological knowledge has sustained us for many, many centuries. Each group of people adapted to their unique environment in a culturally defined manner. Knowledge of plants, animals, water, seasons, and climate was passed down to younger generations through culturally mediated methods, generally through oral tradition. It may have been expressed in stories, or it may have been taught during actual experience. But either way, it was told through oral tradition.

When I listened to an Inupiak elder describe the ice of the far north, I captured something in his presentation that I have yet to find in any textbook. He took these pictures over time during many different experiences of hunting or travelling on the ice. The ice has many forms and each day casts a new light on it. What I captured from his presentation of beautiful images was not the 200+ pictures of ice, but the compassion with which he views his world. The detail of his knowledge was pervasive through each image. He did not describe any two exactly the same, although some locations were repeated with different incidents of history.

What is TEK?

Indigenous Ecological Knowledge (IEK) and TEK consist of the knowledge gained by generations of people using natural resources from a specific area and the environment of those resources. It is in the knowledge of manipulating the products of those resources into subsistence use, material culture, and culturally prescribed ceremony. It is embedded in cultural practices, and language. It is embodied in the compassion of those who experience their environment.

The use of TEK is not new. For example, the use of Pacific salmon as a food source came from the knowledge of Indigenous people. How to capture the fish most efficiently in rivers and estuaries first came from indigenous people. The first warnings of over-harvesting salmon came from Indigenous people. The use of TEK in the past few hundred years has generally been for convenience of resource extraction, and unfortunately yielded little benefit for Indigenous people.

Since World War II, an accelerated natural resource loss has occurred across the continent. Many generations of First Nations have sought participation in resource management by requesting inclusion of TEK. Their requests were admonished and ignored. Now, as the new millennium begins, TEK may provide the only baseline information of environmental conditions and resources. Natural resource use continues as it has for many, many centuries, where there are resources.

TEK is also not a new concept for many people here in attendance. You are familiar with TEK, its uses, and benefits. The new concepts regarding TEK lie with the integration of valuable cultural knowledge into science and resource management policy. For many years, First Nations people have wished to have a voice in the management of natural resources that have been exploited to prevent extirpations or extinctions, and to maintain their access.

Forests have been shaved to the ground, salmon are gone, eulachon are missing, abalone is gone, herring spawn is not like it used to be, halibut are not so big, rockfish are missing in areas, seaweed is missing in areas, some clams are poisoned, cedar trees are not so big and they aren't as strong, saltmarsh grasses aren't where they used to be and some are gone, and so it goes.

But now, they want us to tell them what it used to be like. How many animals were there? A fine line exists in obtaining TEK and its use, particularly in this province in regards to land claims



settlements. Cultural propriety must be preserved. Cultural rights must be respected. It must not be exploited.

TEK is complex in its use and application. It is not easily applied to scientific methods. It is not impossible to extract data, but it is not easy to quantify that data in many cases. The information is more applicable to living and surviving in an environment than it is to analysis. Knowing where to find specific resources and understanding the complex environment of that resource is important for the value of the resource. The value is culturally defined, whether it's a food resource or has another use.

An important use of TEK in science today is to help determine ecosystem conditions from long ago. Maybe the salmon, abalone, herring, halibut, cedar, and eulachon will come back. I think we all want things to return to the way it used to be, when the rivers were fat with salmon. If our voices will be heard, then we should tell our stories.

The Hecate Strait project is the tip of the iceberg

The Hecate Strait Project is one of many that contribute to the Back to the Future approach to fisheries science. It is a contributing project to the larger Coasts Under Stress Project (please see page 11 and www.coastsunderstress.ca). These projects are ambitious, complex and important. It is a method to have our voices heard. We can contribute to the science of restoring ecosystems by contributing the knowledge we have of our environments.

In the Hecate Strait Back to the Future project we will make a computer (ECOPATH) ecosystem model of the 1750s, compare it to a 1990s model and evaluate the impacts of changes to coastal communities. The model I will help to construct for the 1700s will have information about many other species. It will provide a "picture" of the ecosystem during a time when things were much different for us.

Deriving TEK from archives, ethnohistory literature, and interviews

Information sources for past models include, explorers' journals, e.g. Cook's Third Voyage, Menzie's Journal, MacKenzie's Expedition and the Hernandez Voyage. We will conduct interviews with communities and individuals. We will also need researchers willing to travel to communities to interview people and record information. Some of you may know the people in your community that have worked on gathering

historic information. They may be able to share their resources with project members. They may have information for our project. They may know who does have the information.

How is TEK used?

Some information will provide data for use directly into scientific analysis. Other information will need some calculation. For example, in order to determine how many eulachon (*Thaleuthys pacificus*) may have entered a certain river, a record of the amount of Grease¹ traded may provide some clues. We know how many eulachons it takes to make a certain amount of Grease. We can calculate how many eulachons it took to make the amount of Grease traded, plus add the amount of eulachon smoked and dried to calculate about two-thirds to three-fourths of the amount of eulachon at that particular location.

In Conclusion

An important aspect of this project is to realize the importance of our participation for our own benefit, as First Nations. The products of the project will be available to the communities, for our use. It is a method for us to tell our stories about how things have gone horribly wrong. It is a way to design a better future for management of resources that have always been important to us.

¹ Oil rendered from eulachons is a very important food, medicinal, trade and cultural resource for Aboriginal people in the Pacific Northwest.



EXISTING EDUCATIONAL PROGRAMS & RESOURCES

Wilp Wilxo'oskwahl Nisga'a (The Nisga'a House of Wisdom) - Deanna Nyce

A 1995 study by the Nisga'a Nation concluded that we needed trained people to actualize the treaty. We needed more people to get post-secondary education. The Nisga'a are located just under the Alaskan Panhandle so we could not economically get our people to schools on the coast. We had to develop our own courses. The First Nations Studies was the first course funded along with the accreditation of our teachers in language and 'Traditional Ecological Knowledge'. Wilp Wilxo'oskwahl Nisga'a (WVN) hopes to advance to a PhD program in Native Studies.

WVN works through partnerships with other post-secondary institutions. WVN is going to do Native Nursing and Medical Doctor training but because of the size of the population this will be limited. WVN is working with Malaspina to develop a geographic-specific fisheries program. The WVN hopes to bring Fisheries, Forestry and Conservation (Parks and Officer) training together. The students once they finish can work directly for the Nisga'a Nation or go on to further their post-secondary education. The WVN is working to expand its community education to meet the needs of the community.

In September, they had 200 courses in five locations. Most of the funding is from the WVN and some funding from the treaty, Provincial and Federal governments. "If we waited for government, it would never happen." The WVN is developing curriculum for future programs. The WVN is researching questions to meet community needs. "It is very important: impact of the WVN on community – enhancing self-esteem and supporting the people studying and staying in community."

One of the problems that the Nisga'a people have had is re-educating their people in culture after they have been away from the community. "I don't know if you went through this, but our people certainly did. Quite often the students went off and came back knowing 'everything' and started telling people what to do."

UBC Department of Forestry - Gordon Prest, Sto:lo First Nation

Gordon Prest talked about the "relationship between the forests (terrestrial ecosystems) and the oceans (aquatic ecosystems)... to look at the biosphere and our relationship to it...to look at

the earth as the mother of all things...sometimes referred to as the Gaian Theory".

"When we take this perspective that the biosphere is a living and breathing entity called mother earth [by many indigenous people] we will look at the world in a different way. It is a relationship that is based on respect...which is the same as our relationship to our own mothers".

Protectors of the Forest

Ross Hunt, who is a student at UBC, created a logo to reflect this worldview. I told him we should have trees and bears because I felt I had a connection about bears. I'd like to explain this to you:



Logo by Ross and Karen Hunt
<http://www.forestry.ubc.ca/firstfor/index.html>

- The black bears represent the indigenous people trying to protect the tree and all the natural resources that depend on it.
- The eagle shows the connection between the earth and air
- The salmon underneath show the connection between the water and the roots of the tree and how important the watersheds are to all living things.
- The connection from the eagle to the salmon creates the Circle of Life and the power of the sun.
- The Tree of Life shows five branches on each side it represents the Five Elements of Earth: Wind, Fire, Minerals, Water and Air.
- Between the roots and the salmon is the medicine wheel with the four directions, which represents the various homelands of the students who come to this place for the teachings in forestry and conservation to become, like the bear, "protectors of the forest."



People with a Bachelor of Science (Forestry) can become professional foresters. We have about two hundred and fifty First Nations forest techs out there but I think we need at least a thousand. For BScs in Forestry, we currently have twenty First Nations undergrads at UBC, eight graduated, and two in graduate degrees but we need a hundred. Out of the hundred, maybe seventy-five can become registered professional foresters. I would like to think we should have at least twenty MScs over the next ten years, and ultimately have five PhDs to teach at places like UBC for First Nations perspectives. I like to think that it's a partnership between industry, government, and First Nations; we can't do this by ourselves. We also need to reach out to other disciplines.

Nicola Valley Institute of Technology - Paul Willms

Department Head, Natural Resource Technology

Nicola Valley Institute of Technology (NVIT - www.nvit.bc.ca) takes a holistic approach when considering fisheries, wildlife and forestry. They admit they are not there yet but they 'are evolving'. NVIT started out at BCIT, but moved up to the Okanagan in 1993 with twelve students. The original intent was for the students to start at NVIT, get a certificate and 'ladder' down to BCIT to finish. The 'laddering' process was not successful, so now they offer the entire diploma at NVIT but have kept the affiliation with BCIT.

In 1995, NVIT became a public institution. "We have redefined our focus as serving four areas: wellness, governance, economic development, and land. The land part is what our natural resources diploma covers". The laddering process is technician diploma after one year, and technologist after two. The accreditation of our technologist program is based on the external checkmark at the mainstream level.

Within our program, we have developed more First Nations content than other colleges, but we've tried to maintain other standards. About eighty-five percent of our students are Aboriginals. Ninety percent of those come from outside the Nicola Valley and other parts of Canada, so our focus is all of BC. Our role is to get students to participate in other colleges and universities. A need is the development of access to science programs for First Nations. There was a good program here but it was discontinued. I hope it is brought back: giving mature students a pathway to get back to university.

At NVIT, "we're natural resources with a broader view". The NVIT faculty of Forestry offers a smooth transition to UBC Forestry.

Human Resources Development Canada - Gerry Kowalenko

Gerry has been working with fisheries since 1995. "It's interesting that both fisheries and farming, those who provide food, are going into 'bad times'". His project has been to address programs in fisheries and assist people in training and upgrading. Himself and three others handle the Federal Government's \$53 million restructuring program. The first priority is to help people get through the season, secondly, helping people adjust, thirdly, protecting and rebuilding the habitat." The joint effort of several Federal Departments, they have used \$400 million, 50% to fishing industry, and 25% to encourage people to leave the fishing industry. "Our budget within HRDC was \$30 million assisting fishermen with retraining and upgrading". Six million went into programs specifically for Aboriginal Human Resources (Skeena 20%, 43% Vancouver Island and the Nuuchahnulth).

The government's first approach was 'emergency funding'. Emergency funding is 'get them over to the next fishing season.' The government then took the next step: 're-train'. "We look at someone who's unemployed and try to get them back into a job. If people were still going to fish, to give them some sort of way to earn income in off-season". HRDC has collected statistics from 500 projects and collected data from 1000 First Nations in the fishing industry. "The most difficult part of the fisheries restructuring program is that fisheries is the largest employer of First Nations. Therefore, impact is extremely severe".

Gerry outlined the problems with the west coast fishing. The fishing is so important to the West Coast First Nations that now the industry is failing they are resistant to change. The problem is that the fishing industry is "becoming more mechanized and will require a higher level of skills". The retraining programs are mostly benefiting the older generation. The *Fisheries Restructuring Plan* is finishing up but there will still be funding available from other sources.



EMPLOYMENT OPPORTUNITIES

DFO Fishery Officer - Gordon Point, Musqueam Nation Council

I want to remind you that I'm armed [smiles and indicates pistol]. I'll try to be very quick and concise. I feel inadequate to speak here. There are some very eloquent speakers and some learned people, and I have no letters after my name. I was drafted at last minute about one hour's notice. What I would like to touch on are broader issues that I see. Would like to give background of my progression. I am a member of the Musqueam Nation and elected on tribal council. Seen some growth, some lack of growth in terms of council.

My background is that I arrived here through accidental opportunities. I used to seine, used to fish. I then realized that I wanted more of a career rather than bouncing from job to job. I went through a program in DFO. It was a stepping-stone. I went to the Justice Institute. There are opportunities there, but what I want to touch on is that, in this environment, we're the exceptions to the rule. We're solar flares that flares up, but the rest of the people are back home. I want to emphasize that we as people communicate differently.

When I'm dealing with someone who doesn't know the language, I have to make sure that they understand their rights. If not, I go on the phone with an interpreter. When I deal with enforcement with my people, I have to make sure the First Nations have been consulted, because when I go to court for enforcement, I have to go on facts, not assumptions. Sometimes we don't communicate properly. We work on assumptions. We need to articulate what we're looking for. Are we talking about looking for jobs, or raising capacity? We heard eloquently from Miles Richardson and Nathan Matthew yesterday on the question of management. Can we manage salmon, or do we manage ourselves? When I talk about management, I think about keeping the status quo. Maybe we don't want the status quo. Maybe we want to improve the situation.

Yesterday a young man approached me, who asked how to go further as an enforcement officer. Maybe to do that, we need an atmosphere of change. I've constantly heard words, like yesterday, words like 'respect' and 'honour'. When we say it as Indian people, are they being received in the same context? I don't think so sometimes. We need to move away from rhetoric and get some commitment from the government. How many First Nations people are in positions

of power? Not too many. We talk about rights, but we must recognize that with rights comes responsibility. We joke about hiding fish in a bush. I remember doing that too. Those things continue to go on, but we need to respect in our own communities the need for responsibility and accountability for this resource. If we truly want to raise awareness, we need to change how we're conducting business – how we communicate. Do we want participation or jobs? We could do both. We need to go to communities to see what they want, take a coordinated approach to communities, and going to show the recruiting opportunities, not just stumble on it haphazardly. We need to be more coordinated in how to present the opportunities. I think those in turn will lead to meaningful career opportunities, within government, communities, and within our own communities.

Other DFO Employment - Cameron West

My name is Cameron West and I work with DFO, and have been for about 25 years. What I wanted to mention was the diversity of opportunities in the department. There are about 24,400 in DFO distributed throughout the province – in enforcement, in hatcheries, in coast guards, as biologists, technicians, computer people, etc. There are tremendous numbers of jobs in the government. Gordon's overhead earlier with the triangle in forestry was very enlightening, it applies to fish as well as trees. As you go higher up, it's similar to how fisheries work is structured. If you're looking for opportunities, you can come in as a PhD, as a biologist, you can come in as a field tech, resource management training, and fish officer training.

In addition to this laddering, there's a process called the pipeline. You start at the bottom. When I started, I was hired as a summer student because I could run a boat. When the department hires you, you're hired to do something practical. This is where it starts. You're brought on to do short-term programs, summer programs; eventually you stay and you're kept on over time, and you can see other opportunities to move. As you're there, other programs come along. Stream stewardship programs, for example. There's a lot of opportunity there. I didn't come prepared with what you need to sign up. You can see me afterwards. It's probably worth noting that the people in the department have the same concerns like laddering that we have brought up here. We have an employee-driven committee. There were two dozen or so of profiles of people with jobs in the department. I don't have them with me, but we describe the programs... it's not easy, but there are opportunities. Many of the skills that I



haven't heard mentioned are useful to get in. I'd like to make one other point. When Nathan Matthew spoke yesterday morning, when you talked about fishing and the smoke house and smoking, I used to do that too. When I went into fisheries, I stayed because it was an honorable profession in my mind. It has brought me into contact with people with the region. I've been talking about DFO, but there are many joint opportunities and I've had friends who have gone back and forth between them. I hope this is a snapshot for what we can do at DFO.

BC Fisheries - Rob Simon

Note: Elements of the BC Ministry of Fisheries have since been re-absorbed into the Ministry of Water Air and Land Protection (<http://www.gov.bc.ca/wlap/>), the Ministry of Sustainable Resource Management (<http://www.gov.bc.ca/srm/>), and the Ministry of Agriculture Food and Fisheries (<http://www.gov.bc.ca/agf/>).

Some job opportunities may no longer exist due to government downsizing.

Ministry Priorities: Fish Conservation and protection: Impacts of federal restructuring in the Commercial Fishing Industry on People and communities: growing economic importance of Recreational Fishing, Aquaculture in the Economic Benefits from Fisheries Resources and Diversity Fishing Communities, the demand for greater Public involvement and accountability in Fisheries Management decisions.

Structure: BC Fisheries, part of the Ministry of Agriculture, Food and Fisheries employs approximately 165 people who work in 20 geographic locations throughout the Province. Two divisions make up the ministry: Programs and Operations, and Planning and Liaison. BC Fisheries has offices located in Victoria (headquarters), Courtenay, Vancouver (Fisheries Research at UBC), a small two-person lab in Nanaimo, and Prince Rupert. There are five trout hatcheries in BC. Fraser Valley Region (Abbotsford), Vancouver Island Region (Duncan), Kootenay Region (Fort Steele), Summerland Region and Clearwater Region.

Minister: the Honorable Ed Conroy is the Minister of Agriculture, Food and Fisheries and Minister Responsible for Rural Development.

Employment Equity: BC fisheries are committed to employment equity. Applications for employment are encouraged from qualified equity groups, including persons with disabilities,

Aboriginal persons, visible minorities and women in under-represented job occupations.

Most common job categories

Biologists (annual salary range: \$45,396 to \$60,896): Approximately 33 positions located in Victoria, Nanaimo, Courtenay and Vancouver. Biologist positions require a Bachelor of Science degree specializing in a variety of disciplines including Aquatic, Zoology, Animal, Environment/Ecology, depending on the job requirements. A Master's degree or experience in a specialized field is usually required.

Scientific Technical Officers (annual salary range: \$38,923 to \$55,372): Approximately 40 positions located in Victoria, Vancouver and the five hatcheries. STO'S require a technical diploma or related university degree plus related work experience. The senior supervisory positions require leadership, planning, and supervisory and financial skills. These positions provide technical/scientific support to senior professional and technical staff. STO's positions in Fisheries include Hatchery Managers, Hatchery Fish Culturists, GIS (geographic information system) Technicians, Research Technicians and Data Technicians.

Fish Inspection Officers (annual salary range \$36,628 to \$51,980): There are five fish inspection officer positions, one located in Victoria, three in Courtenay and one in Prince Rupert. These positions require a technical diploma in fisheries resource management, plus related experience including enforcement activities, or an equivalent combination of education, training and experience.

Administrative/Clerical (annual salary range \$27,978 to \$35,863): There are approximately 21 positions located in Victoria, Courtenay and the five Hatcheries. These positions provide administrative and clerical support to management and professional employees. They require from three to four years of related work experience with keyboarding skills, word-processing and spreadsheet skills.

Senior Administrative Officers (annual salary range \$38,923 to \$51,980): There are approximately 18 positions all located in Victoria with one position in Courtenay. These include Research Officers, Policy Analysts, Communications Officers and one Licensing Officer. There are also two Economist positions in Victoria (annual salary range from \$46,844 to \$62,862).



First Nations and Cooperative Programs - Arnie Narcisse, BCAFC

I'd like to speak about some of the employment opportunities and the educational requirements needed to take advantage of these employment opportunities in the field of fisheries management.

Prior to becoming chair of BCAFC, I was the program manager for the Nicola Watershed Stewardship and Fisheries Authority (NWSFA). NWSFA is made up of 7 member bands from the Nicola Valley. The NWSFA program was basically an effort to restore Chinook and Coho stocks in the Nicola watershed to eventually allow terminal fisheries. When the program began, our initial stock assessment efforts pointed out that the Coho were in very low numbers, around three to four hundred. The Chinook were in the range of three thousand at that time. Consequently we undertook an effort to restore those salmon populations. We captured brood stock in cooperation with the local hatchery, which in turn incubated and raised the fry to the 1+ smolt stage. These smolts were then transported to smolt ponds located on the Coldwater River and Spahomin Creek where originally the brood stock was captured in an effort towards imprinting the smolts to their natal streams to reduce strain upon their return. It has been determined that strain of hatchery released fish is one of the biggest problems in stock restoration. Thus we felt that to improve stock survival these measures were necessary. Smolts were kept in the smolt ponds for a period of six to eight weeks in the springtime and were released with the spring freshets.

We recognized early on that just dumping fish back into the system was not going to do the full job of restoring salmon populations in the Nicola watershed. We also realized that we needed to do a thorough habitat restoration assessment, and that habitat enhancement and creation efforts were required to help these Chinook and Coho salmon. The Nicola River is subject to high temperatures in the summer time and a great deal of riparian vegetation is required to keep it cool. Our initial habitat enhancement efforts entailed the development of side channel rearing areas at strategic locations in the Nicola watershed from Spence's Bridge to the Coldwater River. We would take a side channel area and enhance it utilizing large woody debris and creating riffles and overhangs and other such natural features that are conducive to good habitat for fish. In terms of habitat protection efforts, we did bank stabilization utilizing everything from hard rock riprap to what are

considered soft bioengineering techniques such as wattling. The bank stabilization efforts were required to reduce siltation occurring in the Nicola River. We were also involved in riparian vegetation development. As the Nicola valley was a very agricultural area with a lot of cattle and horses it was necessary to build setback fencing in the areas where we did our planting. The shrubs and trees used for planting were developed by a crew, which gathered indigenous seed stock and grew it in our own greenhouse. Species used included red alder, silver willow, paper birch and other indigenous stocks of plants and shrubs. In our initial year we planted thirty six thousand shrubs and rooted stock throughout the Nicola watershed.

In terms of habitat creation efforts we developed an area called Site 4, which was a stagnant slough that the cattle company was using for irrigation purposes. The slough was isolated from the mainstem Nicola River by the Kettle Valley railway bed. What we did was to breach the old rail bed some three hundred yards upstream of the slough site and excavate an inflow channel to the slough and an outflow channel at the bottom of the slough. This created the necessary flow required to get life back into the system.

Our initial stock assessment showed basically that sculpins and other invertebrates were the only things in there. Now, three years later, we find a balanced ecosystem with coarse fish such as red-sided shiners and other fish as well as Coho, Chinook, rainbow and steelhead. We also realized that we needed a methodology to gauge the success of the stock restoration of these various habitat-enhancement efforts. So we embarked on a river stock assessment that included everything from helicopter over-flights to stream walks, to deadpitch activity. The initial helicopter over-flight gave us some sense of the abundance that we would be assessing each year. The stream walks refined those numbers. And the final deadpitch activity verified those numbers. As part of the deadpitch activity we were also conducting aging efforts through the removal of otoliths and scale samples and other baseline data required for stock assessment such as percentage of spawn released and others.

An example of the credibility of the NWSFA stock assessment program is the Coldwater River Coho enumeration fence. This fence was built to determine the success of the Coho restoration program. Previous efforts to assess Coho were hindered by the fact that the Coldwater River is a very volatile system subject to rain and snow events and other such natural catastrophes. What



was required was a structure that would be able to withstand the volatility of the Cold Water. The NWSFA in conjunction with DFO, the Province of British Columbia and the City of Merritt successfully constructed this facility. This was possible only because the four levels of government bought-in and participated in this idea.

In terms of addressing this forum, we need to point out the capacity that is required to undertake a comprehensive fisheries management program. To run a program of this nature, we require people with technical skills that allow them to determine the scale and scope of work necessary in their specific territory or watershed. Good fisheries management requires good fisheries science in the knowledge that you don't fudge science.



ANNEX 'A'

MEMORANDUM OF UNDERSTANDING

Between:

The BC Aboriginal Fisheries Commission

and,

The UBC Fisheries Centre

and,

The UBC First Nations House of Learning

DEFINITIONS:

Indigenous people: This term is used in accordance with United Nations' practice to include the Aboriginal peoples of BC, Canada and worldwide.

DISCLAIMER

This Memorandum of Understanding merely sets forth the understanding of the parties with respect to the general principles which will guide their activities. It is not intended by any party to constitute or create a legally-binding agreement. This Memorandum of Understanding is without prejudice to the present and future aboriginal fishing rights and claims of First Nations.

WHEREAS:

- A. The BC Aboriginal Fisheries Commission (BCAFC) supports the aspirations of Indigenous people for an appropriate role in all aspects of fisheries conservation, protection and management; and,
- B. BCAFC has consistently fought to ensure a fair allocation of catch of all species for the traditional, contemporary and future use of Indigenous peoples; and,
- C. BCAFC recognizes that conservation and wise use in today's world of high fishing capacity require a high standard of excellence in biological and management sciences; and,
- D. Indigenous people are seriously under-represented in the world of fisheries science; and,
- E. The UBC First Nations House of Learning (FNHL) exists to promote Indigenous peoples' access to UBC in general and science in particular and to provide a respectful, nurturing and supportive climate on campus; and,
- F. The UBC Fisheries Centre (FC) is committed to the highest standards of scientific excellence and has a global network of contacts; and,
- G. FNHL and FC have joined forces to encourage the enrollment of Indigenous students in fisheries; and,
- H. FC & FNHL have launched several general initiatives to enhance Indigenous peoples' access to university science; and,
- I. These initiatives were discussed at a July 8, 1997 meeting between BCAFC, FNHL and FC where various concerns were put forward by BCAFC to protect cultural and spiritual values, and cultural property and to ensure that the traditional knowledge of Indigenous communities is used respectfully and appropriately with all appropriate permissions and due accreditation; and,
- J. FC & FNHL acknowledge and recognize these concerns and are fully committed to work with Indigenous communities to ensure that values are respected and that all initiatives are relevant to Indigenous communities as well as being of a high scientific and technical standard.



NOW THEREFORE THE PARTIES WISH TO SET FORTH THE PRINCIPLES WHICH WILL GUIDE THEIR COOPERATION:

1. To cooperate in the following areas:
 - i) making university science relevant to the fisheries concerns and research priorities of Indigenous communities;
 - ii) accelerating the enrolment of Indigenous students in fisheries science at UBC and in cooperation with Regional Colleges; and,
 - iii) relating the concerns of BC Indigenous communities to the worldwide agenda being pursued by the UN.
2. To establish a Steering Committee representative of the Parties to implement this Memorandum and having a proper balance between academic and community input. Terms of reference are attached as Schedule "A".
3. To develop and refine the components of the "Opening the Doors" proposal developed by FC & FNHL.
4. To identify the major concerns of Indigenous communities relating to the accessing and use of traditional knowledge and propose basic principles and guidelines for a protocol to guide UBC and the global academic community in the respectful cross-validation of traditional knowledge with "western" science.
5. To consult with Indigenous communities on how well the protocol contemplated by #4 above meets their specific situation and modify as necessary.
6. To cooperate on fund raising for the above noted initiatives.
7. To consult with Indigenous communities to identify additional areas of cooperation and to develop workplans, schedules, budgets and implementation strategies.

Dated at Vancouver, BC, this 18th day of December, 1997

ORIGINAL SIGNED BY:

Fred Fortier, Chair & Speaker, BC Aboriginal Fisheries Commission

Dr. Frieda Granot, Dean of Graduate Studies, UBC

Nigel Haggan, Research Associate, UBC Fisheries Centre

ANNEX 'B' - OPENING REMARKS

UBC – Jo-ann Archibald

Jo-ann Archibald welcomed everyone to the House of Learning. She described the four house-posts that are in the Longhouse. She described how they had been carved by four different sets of carvers and that they represented the four directions and provided the House of Learning with strength from their spirituality. For a full description, please see www.longhouse.ubc.ca/great-hall.html.

Nigel Haggan, UBC Fisheries Centre

Nigel Haggan welcomed everyone to the workshop. He acknowledged that UBC was on Musqueam territory. He acknowledged that the academic discipline was not as old as the Musqueam traditions but he hoped they could join together.

Arnie Narcisse, Chair, BC Aboriginal Fisheries Commission

"In 1997 we entered into a Memorandum of Understanding with the Fisheries Centre and the House of Learning. However, there are still not enough students learning about fisheries management. We need to reassume our place as stewards of these resources. We need to take the knowledge of people like Simon Lucas and marry it with the science of the Fisheries Centre. I look at students like Stephen Watkinson as the light at end of the tunnel for us – he took the knowledge that he learned from his tribe and came to this institute to learn basic science requirements, and today he will show us the benefits of nutrients in ecosystems. We've known about the use of science, but it takes someone like Stephen to put it all together.

We took another slant at that when we talked about sharing knowledge. That's what this initiative is all about: bringing the science and the First Nations communities together. I'm glad to see that we've got people like Miles Richardson here. We need to incorporate treaties into the process. We need to have the capacity to manage our own resources. That's mainly what this is all about. I'm glad to see Dr Laura Richards here – she is a scientist from the DFO Pacific Biological Research Station. She and others are the type of people that we're trying to develop to put out into those other communities and agencies that look after our resources. In conclusion, I'd like to thank the Department of Fisheries and Oceans and the BC Aboriginal Fisheries Commission for sponsoring this. I look forward to the next couple of days."

Miles Richardson, Chief Commissioner, BC Treaty Process

"I'm from the Haida Gwaii eagle clan. I am the chief commissioner of the BC Treaty Commission and I'm pleased to join you all. I want to acknowledge the BC Aboriginal Fisheries Commission, UBC First Nations House of Learning, and UBC Fisheries Centre for convening today for an important discussion. Fisheries are important to me and to all Aboriginal people. There isn't an Aboriginal person in British

Columbia who isn't intimately connected with fish and doesn't have a stake in how we as humans interact with fish, so today's discussion is important."

Miles then described his role as the chief treaty commissioner. The treaty process is about building nation-to-nation relationships. The importance of fisheries is included in this mutually respectful relationship process. "All I can say, is that each of you in your own nation has an opportunity to change all that." In the treaty process of negotiating fisheries, First Nations bring their 'ways of knowing' to the table, a worldview of respect, and the Crown brings its scientific worldview and commerce. He asks, can we as human beings manage fish? He challenged us to keep an open mind and not walk away if the other side critically or constructively disagrees with you. "Be clear about what you are going to do." He says, change always 'ruffles feathers' but the object is to try to find a way for change to be accommodating for everyone.

Rosemary Ommer

Rosemary Ommer welcomed the participants on behalf of the Coasts Under Stress Project www.coastsunderstress.ca, a major initiative to explore the past and present effects of social change and changes in the pattern and scale of resource harvesting on individual, family, community and ecosystem health. "Our study areas include fisheries, forestry, mining, oil and gas, ecotourism, health and of course, education. The Back to the Future marine ecosystem project is a good example of how we look to the past to provide direction for future policy. We cannot do any of this work without the help of First Nations. It is you who have the longest experience of living on the coast. It was you who lived here, for such a very long time, without doing damage to the environment that sustained you. You felt, you have taught me, that you were an integral part of that environment, not just outside it, as we have tended to think. I am very pleased to be with you today and wish you great success in your work."

UBC representative (Herbert Rosengarten for Martha Piper)

Dr Herbert Rosengarten welcomed the delegates on behalf of UBC President Dr. Martha Piper. The workshop objectives are very much in line with UBC goals for increasing First Nations enrolment at UBC.

ANNEX 'C': Participants

James Andrew
First Nations House of Learning
1985 West Mall
Vancouver, BC V6T 1Z2
604-822-5677
jrandrew@interchange.ubc.ca

Doug Andrie
Fisheries & Oceans
Box 970
Ucluelet, BC V0R 3A0
250-726-7304
andried@pac.dfo-mpo.gc.ca

Dr Jo-ann Archibald
Assoc Prof Ed. Studies
Pond G26, 2044 Lower Mall
Vancouver, BC V6T 1Z2
604-822-5286
jo-ann.archibald@ubc.ca

Dave Bates
Capilano College
PO Box 1609
Sechelt, BC V0N 3A0
604-885-9310
dbates@capcollege.bc.ca

Terry Bedard
Treaty and Aboriginal Policy
Directorate
DFO, #300-555 W. Hastings St.
Vancouver, BC V6B 5G3
604 666-7103
bedardt@pac.dfo-mpo.gc.ca

Christine Bentley
Haida Tribal Society
Box 251
Queen Charlotte City, BC V0T
1Z0; 250-559-2395
frustrate2@hotmail.com

Cherlyn Billy
Central Interior Partners in AHRD
Shuswap Nation Tribal Council
304 – 355 Yellowhead Hwy.
Kamloops, BC V2H 1H1
250-828-9762
cherlyn.billy@cipahrd.org

Catherine Blackstock
Gitksan Hereditary Chiefs
PO Box 229
Hazelton, BC V0J 1Y0
(250) 842-6780. fax: (250) 842-
6709; gto@bulkley.net

Archie Blankinship
Nicola Valley Inst of Technology
4155 Belshaw Street
Merritt, BC V1K 1R1
250-378-3300, fax: 250-378-3332

Jennie Blankinship
Institute of Indigenous Government
342 Water St.
Vancouver, BC V6B 1B6
604-602-3413

Kelly Blankinship
224 -1850 Adanac St
Vancouver, BC V5L 2E3

Tanya Bob
First Nations Coordinator
Buchanan C159
UBC Faculty of Arts
1866 Main Mall
Vancouver, BC V6T 1Z1
604 822-0075, tbob@arts.ubc.ca

Lance Bremner
Nicola Valley Inst of Technology
4155 Belshaw St.
Merritt, BC V1K 1R1
250-378-3300, fax: 1-250-378-3332
lance_bremner@hotmail.com

Claire Brignall
Fisheries Centre
University of British Columbia
2204 Main Mall
Vancouver, BC V6T 1Z4
c.brignall@fisheries.ubc.ca

Pam Brown
Museum of Anthropology
University of British Columbia
6393 NW Marine Drive
Vancouver, BC V6T 1Z2
604 822-6587
pbrown@interchange.ubc.ca

Nathan Cardinal
Fraser River Aboriginal Fisheries
Secretariat
604-225-2220
cardinal@interchange.ubc.ca

Simon Cisco
Box 1899
Merritt BC V1K 1B8
250-378-3523

David Coutlee
Nicola Watershed Stewardship &
Fisheries Authority
Merritt BC V1K 1B8
250 378-5365; fax 250 378-5355
Dave.Coutlee@nwsfa.org

Jeremy Crow
Lower Similkameen Indian Band
Box 100
Keremeos, BC V0X 1N0
250-499-5528
lsibresources@hotmail.com

Raychelle Daniel
Fisheries Centre
University of British Columbia
2204 Main Mall
Vancouver, BC V6T 1Z4
daniel@zoology.ubc.ca

Tina Donald
North Thompson I.B.
PO Box 220
Barriere, BC V0E 1E0
250-672-9995,
ntibgis@simpw.com

Bill Duncan
Native Brotherhood of B.C.,
Box 45,
#711 - 850 West Hastings Street
Vancouver, BC V6C 1E1
604-684-1951
nbbc@nativevoice.bc.ca

John Elliot
Chemainus First Nation
1261A Trans Canada Highway
Ladysmith, BC V0R 2E0
250 245-7155, fax: 250 245-3012
Jelliott@cfnation.com

Margo French
Nicola Valley Inst. of Technology
4155 Belshaw Street
Merritt, BC V1K 1R1
1-877-682-3300 (BC residents only)
250-378-3300, fax: 250-378-3332
margofrench39@hotmail.com

Beryl Guerin
Executive Director
BC Aboriginal Fisheries
Commission
#707-100 Park Royal
W. Vancouver, BC V7T 1A2
604-913-9060, fax: 604 913-9061

Bob Guerin
Musqueam Fisheries Department
6820 Salish Drive
Vancouver, BC V6N 4C4
604-263-4649
rjguerin@direct.ca

Kim Guerin
BC Aboriginal Fisheries
Commission
#707-100 Park Royal
W. Vancouver, BC V7T 1A2
604-913-9060, fax: 604 913-9061
kguerin@bcafc.org

Morgan Guerin
Musqueam Nation
6820 Salish Drive
Vancouver, BC V6N 4C4



604 263-4649

Nigel Haggan
UBC Fisheries Centre
2204 Main Mall
Vancouver, BC V6T 1Z4
604 822-6939, fax 604 822-8934
n.haggan@fisheries.ubc.ca

Sheila Heymans
Fisheries Centre
University of British Columbia
2204 Main Mall
Vancouver, BC V6T 1Z4
s.heyman@fisheries.ubc.ca

Daniel Hill
Native Education Centre,
Director of Development
285 East 5th Ave.
Vancouver, BC V5T 1H2
604-873-3772 x318
dhill@helix.net

Victor Isaac
'Namgis First Nation
P.O. Box 210
Alert Bay, BC V0N 1A0
250 974-5556, fax: 974-5900

Leah Jackson
Nicola Valley Inst of Technology
4155 Belshaw St.
Merritt, BC V1K 1R1
250 378-4984, fax: 1-250-378-3332

Jonathan Joe
DFO, 3225 Stephenson Point Road
Nanaimo, BC V9T 1K3
250-756-7243
joej@pac.dfo-mpo.gc.ca

Warren Johnny
Chemainus First Nations
12603 Trans Canada Hwy
Ladysmith, BC
V9G 1M5
250 245-7155
Wjohnny@cfnation.com

Trevor Jones
BC Hydro
333 Dunsmuir St.
Vancouver, BC V6B 5R3
604 623-3888
trevor.jones@bchydro.com

Laureen Kinney
Regional Director Treaty and
Aboriginal Policy Directorate
DFO, #300 - 555 West Hastings St.
Vancouver, BC V6B 5G3
604-666-7478
kinneyl@pac.dfo-mpo.gc.ca

Jerry Kowalenko
Human Resources Development
415 - 757 West Hastings Street
Vancouver, BC V6C 1A1
(604) 681-8253, fax: (604) 666-
6945

Neal Lamb
Ucluelet Band
6169 River Road
Port Alberni, BC
250-723-7045
envalamb@home.com

Sandy Leighton
Tsimshian Tribal Council
138 1st Avenue
Prince Rupert, BC
250-627-8782

Chief Simon Lucas
BC Aboriginal Fisheries
Commission
#707-100 Park Royal
W. Vancouver, BC V7T 1A2
604-913-9060, fax: 604 913-9061

Madeleine MacIvor
Assoc. Director
First Nations House of Learning
1985 West Mall
Vancouver, BC V6T 1Z2
604 822-8942, fax: 604 822-8944
madeleine.macivor@ubc.ca

Dawn Machin
Okanagan Nation Fisheries Comm.
3255-C Shannon Lake Rd
Westbank, BC V4T 1V4
250-707-0095
fisheries@syilx.org

Ryan Mathison
Musqueam Fisheries Department
6820 Salish Drive
Vancouver, BC V6N 4C4
604-263-4649

Jacinda Mack
Nuxalk Nation
PO Box 65
Bella Coola, BC V0T 1C0
250-799-5187
gelmucw@hotmail.com

Nathan Matthew
Workshop Facilitator
Box 612
Barriere, BC V0E 1E
250 672-5652
mlmatthew@direct.ca

Jim Morin
Institute of Indigenous Government

342 Water St.
Vancouver, BC V6B 1B6
604-602-3439
jmorin@indigenous.ca

Jordan Muldoe
Nicola Valley Inst. of Technology
4155 Belshaw Street
Merritt, BC V1K 1R1
1-877-682-3300 (BC residents only)
250-378-3300, fax: 250-378-3332
jordantops@hotmail.com

Marilyn Mura
Coordinator, First Nations Water
Use Planning Committee
BC Aboriginal Fisheries
Commission
#707-100 Park Royal
W. Vancouver, BC V7T 1A2
604-913-9060, fax: 604 913-9061

Arnie Narcisse
Chair, BC Aboriginal Fisheries
#707-100 Park Royal
W. Vancouver, BC V7T 1A2
604-913-9060, fax: 604 913-9061

Deanna Nyce
Wilp Wilxo'oskwhl Nisga'a
PO Box 237
New Aiyansh, BC V0J 1A0
250-633-2292
deanna_nyce@ecunet.org

Brian Olding
President, Brian Olding & Asc.
12671 26th Avenue
South Surrey BC V4A 2K8
604 531-7132, fax 604-531-9611
brian.olding@telus.net

Rosemary Ommer
Coasts Under Stress
Sedgewick B110
University of Victoria
Victoria BC V8W 2Y2
(250) 472-5152
ommer@uvic.ca

Brigid Payne
DFO, 1278 Dalhousie St.
Kamploops, BC V2C 6G3
250-851-4955
payneb@dfo-mpo.gc.ca

Brent Peacock
First Nations House of Learning
University of British Columbia
1985 West Mall
Vancouver, BC V6T 1Z2

Gilbert Peace
Nicola Valley Inst. of Technology
4155 Belshaw Street



Merritt, BC V1K 1R1
250-378-3300, fax: 250-378-3332
Robin Peeace
Nicola Valley Inst. of Technology
4155 Belshaw Street
Merritt, BC V1K 1R1
robb14@hotmail.com

Jordan Point
DFO
Aboriginal Enforcement
Coordinator
12551 No. 1 Road
Richmond, BC V7E 1T7
604-664-9253
pointj@pac.dfo-mpo.gc.ca

Melanie Power
Fisheries Centre
University of British Columbia
2204 Main Mall
Vancouver, BC V6T 1Z4
m.powers@fisheries.ubc.ca

Gordon Prest
First Nations Coordinator
UBC Faculty of Forestry
2424 Main Mall
Vancouver, BC V6T 1Z4
604-822-0651
prest@interchange.ubc.ca

Shawn Quick
Nicola Valley Inst. of Technology
4155 Belshaw Street
Merritt, BC V1K 1R1
1-877-682-3300 (BC residents
only)
250-378-3300; Fax: 250-378-3332
shawnquick74@hotmail.com

Laura Richards
Director of Science
DFO
555 West Hastings
Vancouver
604-666-6746
richards@pac.dfo-mpo.gc.ca

Miles Richardson
Chief Commissioner
BC Treaty Commission
Suite 203
1155 West Pender Street
Vancouver, BC V6E 2P4
604 482-9200, fax: 604 482-9222

Dr Herbert Rosengarten
Executive Director
President's Office
The University of British Columbia
6328 Memorial Rd.
Vancouver, BC V6T 1Z2

Teresa Ryan
Institute for Resources &
Environment
Library Processing Ctr. Rm 436E
2206 East Mall
Vancouver, BC V6T 1Z3

Nicholas Scapillati
David Suzuki Foundation
219-2211 West 4th Ave.
Vancouver, BC V6K 4S2
604-732-4228
nicholas@davidsuzuki.org

Mary Shaw
BMED
106-655 North Rd
Coquitlam, BC V3J 1P5
604-936-5134
mshaw@hotmail.com

Mary Shem
108-3655 Clark Drive
Vancouver, BC V5V 3N1
mshem@hotmail.com

Michael Shepert
Carrier Sekani Tribal Council
#2000-1460 6th Ave.
Prince George, BC V2L 3N2
250 562-6279; fax: 250 562-8206
mshepert@scts.bc.ca

Rob Simon
BC Fisheries
Aboriginal Relations
Intergovernmental Relations Branch
PO Box 9359, Stn. Prov. Govt.
Victoria, BC V9W 9M2
250-387-9575
Rob.Simon@gems5.gov.bc.ca

Pablo Sobrino
Fisheries & Oceans
#3-100 Annacis Pkwy
Delta, BC
604-666-6478
sobrinop@pac.dfo-mpo.gc.ca

Vicki Sparrow
BC Aboriginal Fisheries Comm.
#707-100 Park Royal
W. Vancouver, BC V7T 1A2
604-913-9060, fax: 604 913-9061

Willard Sparrow
David Suzuki Foundation
604-732-4228
willard@davidsuzuki.org

Jennifer Spence
Fisheries & Oceans
555 West Hastings
Vancouver, BC
604-666-2403
spencej@pac.dfo-mop.ca

Jennifer Stevens-Trotti
DFO, Treaty & Aboriginal Fisheries
Policy Directorate
555 West Hastings
Vancouver, BC
604-666-9427
trotti@pac.dfo-mpo.gc.ca

Thelma Stogan
Musqueam
4011 Staulto Ave
Vancouver, BC

Cam West
DFO, 555 West Hastings St.
Vancouver, BC
V6B 563
604-666-0797
westc@pac.dfo-mpo.gc.ca

Paul Willms, RPF
Department Head, Natural Resource
Technology
Nicola Valley Inst. of Technology
4155 Belshaw Street
Merritt, BC V1K 1R1
1-877-682-3300 (BC residents only)
250-378-3300, fax: 250-378-3332
pwillms@nvit.bc.ca

Ross Wilson
Heiltsuk Fisheries Program
Box 880
Waglisla, BC V0T 1Z0
250-957-2303
dasla@pacifcoast.net

Howie Wright
Okanagan Nation Fisheries
Commission
3255-C Shannon Lake Rd
Westbank, BC V4T 1V4
250-707-0095
biologist@syilx.org

ANNEX 'D': - FACILITATOR'S REPORT

**Overview of Education for Aboriginal Fisheries Science
and Ecological Management
First Nations House of Learning, U.B.C.
March 26, 27, 2001**

Nathan Matthew, Facilitator

OVERVIEW

The organization of a gathering of individuals who have various interests and represent different perspectives in aboriginal fisheries science and ecological management was a relevant exercise. The contemporary constitutional and legal landscape in relation to aboriginal title and rights over the fishery resource demands aboriginal participation in fisheries governance and management. This requirement for aboriginal involvement is a significant change in current governance and management practice. To secure a place for aboriginal people in governance and management of fisheries resources the capacity to manage these resources is essential. The education of aboriginal people in fisheries science and ecosystem management is in itself a challenge, but so is the requirement to respect and include traditional knowledge and interests in the resource. The topics of discussion and the inclusion of elders, students, aboriginal organizations, academic institutions and government agencies led to a better understanding of the challenges facing education planners. The discussions themselves led to relevant recommendations for further educational programming.

SETTING THE SCENE

Chief Simon Lucas' aboriginal worldview set the tone for the whole two days. His stories and songs underlined the importance of oral traditions of First Nations people.

The presentations on traditional ecological knowledge highlighted not only the critical role First Nations have in establishing baseline information on the fisheries resource but also the relevance of this type of knowledge to mainstream curriculum.

The inclusion of the students brought energy to the gathering. It was refreshing to observe the keen interest these young people demonstrated in fisheries science and ecosystem management. The challenges they made to both First Nations leadership, government agencies and established education programs came from their clarity of purpose.

The presentations by education programs outlining scope of available education programs realistically showed the opportunities available for aboriginal students. The panel on employment opportunities gave an overview of potential job opportunities for graduates.

DISCUSSIONS

The results of discussions in the breakout sessions provided excellent suggestions about how to:

- build linkages between communities, post secondary institutions and organizations
- build capacity of aboriginal people to undertake fisheries science programs
- implement effective recruitment strategies
- support aboriginal students
- build clear pathways for aboriginal learners to different qualifications and employment opportunities

FUTURE CONSIDERATIONS

The intent of gathering of students and representatives of education institutions, aboriginal organizations and government agencies to develop strategies to increase the participation of aboriginal persons in fisheries science and ecosystem management education programs and to include aboriginal worldviews and traditional ecological knowledge in those programs was met. In order to follow through with some of the ideas presented the following comments are presented:



1. Communication and Coordination

If the goal of increasing the number of aboriginal persons in fisheries sciences and ecosystem management programs is to be realized there must be continued communication between communities, students, educational institutions, First Nations organizations and government agencies. The efforts of all these stakeholders must be focussed and coordinated around key initiatives such as:

- protocol development
- recruitment
- education program development at all levels
- student support
- career awareness and employment opportunities
- integration of funding
- information sharing

Consistency and an orientation to action are keys to forward movement.

2. Commitment

There should be a commitment by the various stakeholders to work together to establish priorities and develop action plans in key areas as noted in #1 above.

3. Get them young!

The challenges facing young aboriginal learners in successfully completing an academic university program are similar to those of a young salmon successfully returning to its stream of origin. The support for aboriginal learners must begin early and be provided to all aboriginal learners, especially in the math and sciences areas. The demand for academically qualified aboriginal persons is high in many areas. Potential employment in fisheries and ecosystem management should be made known to aboriginal learners in the elementary level.

4. Another gathering

The stakeholders should plan to have a similar gathering in 2002 to share developments in aboriginal fisheries science and ecosystem management.

Submitted by Nathan Matthew, facilitator



ANNEX 'E' - BCAFC ANNUAL GENERAL ASSEMBLY

RESOLUTION # 18-02/26/01

TITLE: EDUCATION FOR ABORIGINAL FISHERIES SCIENCE

RESOLUTION # 18-02/26/01

TITLE: EDUCATION FOR ABORIGINAL FISHERIES SCIENCE

MOVED BY: Kowaintco Shackelly, NWSFA
SECONDED BY: Larry Grant, Musqueam First Nation

CARRIED BY: Consensus

WHEREAS The BCAFC, UBC Fisheries Centre and UBC First Nations House of Learning have a MOU to make university fisheries science more accessible to First Nations, develop respectful ways to bring TEK and modern fisheries science together and accelerate the enrollment of First Nation students in fisheries programs; and

WHEREAS The partners are working towards the identification and implementation of educational and training programs to enable young people and mature students to follow an accredited career path up to and including graduate programs; and

WHEREAS There is no secure or dependable source of funding support for graduate students.

THEREFORE BE IT RESOLVED THAT

The BCAFC supports the creation of an ongoing scholarship fund of \$75,000 *per annum* to support three Masters and Doctoral students; and

FURTHER BE IT RESOLVED THAT

The BCAFC calls upon appropriate First Nation, federal provincial and other agencies and organizations to contribute to program funding and design.

Original signed by:

Original signed by:

Original signed by:

Arnie Narcisse
Chair

Chief Simon Lucas
Coastal Co-Chair

Chief Ken Malloway
Interior Co-Chair



Annex 'F': Dean's Letter to UBC Graduate Studies

UNIVERSITY OF BRITISH COLUMBIA

Office of the Dean
180-6371 Crescent Road
Vancouver, BC Canada V6T
www.grad.ubc.ca

Frieda Granot, PhD, MSc, BSc Dean of Graduate Studies (604) 622-2931 tel (604) 822- 9202 fax fgranot@mercury.ubc.ca

122

April 24,2001

Re: Aboriginal Fisheries Students at UBC

To Whom it May Concern:

UBC gives high priority to increasing the enrolment of Aboriginal students. In the University's vision for the 21st Century, we have identified, and the UBC Senate has approved, the goal of enrolling 1,000 First Nations students to UBC. While we have done moderately well in attracting First Nations students in fields such as education, law and health, we have been less successful in recruiting First Nation students to the natural sciences.

For this reason, we are particularly supportive of activities under a 1997 memorandum of understanding between the BC Aboriginal Fisheries Commission, UBC Fisheries Centre and UBC First Nations House of Learning. We must build on this foundation of understanding and create incentives for First Nations students to consider UBC.

UBC has made some progress in its focused interest on Aboriginal Fisheries. Projects include a unique interdisciplinary project "Back to the Future" that presents model reconstructions of past ecosystems to local communities and First Nations. Pilot projects have been carried out in the Georgia and Hecate Straits. Additionally, a small project carried out by a First Nations graduate at the Fisheries Centre has provided a nitrogen balance sheet for a whole marine ecosystem in Rivers Inlet, showing the intimate relationship between salmon spawning, first growth forest, and both forest and ocean wildlife. Such linkages are strong in intact systems: the work shows salmon depletion prejudices the survival of a surprisingly wide range of organisms.

We encourage you to work together with us and help fully realize our common vision in support of Aboriginal Fisheries and the recruitment of new First Nations scholars to the field. In this regard, the University has identified a priority need to provide scholarship funds for First Nations graduate students pursuing Masters or Doctoral studies in Aboriginal Fisheries. We are actively seeking funds from the private sector for this purpose. For further information please contact Nigel Haggan at UBC Fisheries Centre, 822-6939, email n.Haggan@fisheries.ubc.ca

Thank you for your consideration. The University welcomes your input and suggestions on how we might best achieve these objectives together.

Yours sincerely,

Frieda Granot

Dean



ANNEX 'G' - Aboriginal Post-Graduate Scholarship Programme

Funds requested: \$75,000/year

Proponents: BC Aboriginal Fisheries Commission, UBC Fisheries centre, UBC First Nations House of Learning.

Fit with Mandates:

The proposal is in line with federal and provincial government goals of increasing Aboriginal employment in ecosystem and fisheries management and development. The proposal meets UBC criteria for increasing Aboriginal enrolment.

Summary

The immediate objective is to enroll 3 masters and/or doctoral students annually for a total funding need of \$75,000. The longer-term goal is to provide funding over a 10 year period, by which time, there will be a core group of First Nation scientists who will provide the role models and mentoring to sustain the intake of new students in fisheries science. The need to build science research capacity among aboriginal peoples is recognized as a key element in moving towards fisheries co-management.

Rationale

First Nations have been involved in the Fisheries of North America for 1000s of years. Their inclusion in the scientific, management and policy-making process is crucial. Yet, despite the fact that BC First Nations look to fisheries as a major source of future economic, social and cultural well-being, there are few Aboriginal people with Masters' or Doctoral degrees. This translates into a scarcity of highly qualified First Nations' personnel in all aspects of BC fisheries. Enrolment of First Nation graduate students is a priority of a 1997 Memorandum of Understanding between UBC Fisheries Centre, the BC Aboriginal Fisheries Commission and UBC First Nations House of Learning. An annual target of 3 students was set, but has not been attained primarily due to lack of dedicated post-graduate funding.

'Fit' between UBC Fisheries Centre and First Nations' Science

UBC are world leaders in new ecosystem based science that involves scientists, stakeholders and managers in creating computer simulations of marine ecosystems. This involves integration of data from many sources including TEK. It thus relates well to the traditional First Nation worldview that emphasizes the connections between people, ecosystem and environment. It also fits with requirements of the new Oceans Act for precautionary management, ecosystem management and involvement of a very broad base of stakeholders.

Getting Started

The MoU partners will work with contributing agencies to recruit students. In the event that 3 students cannot be found in the first year, remaining funds would be applied to publicity, e.g. community outreach, websites, articles in the Aboriginal press, and identification of 'laddering' mechanisms to facilitate student enrolment.



ANNEX 'H'

BACK TO THE FUTURE A Marine Ecosystem Restoration Agenda Nigel Haggan, UBC Fisheries Centre

Concept and Approach: BACK TO THE FUTURE (BTF) proposes rebuilding rather than sustainability as the policy goal of fisheries management (Pitcher and Pauly 1998). The rationale is the failure to take account of the ecological impacts of fishing on biodiversity and ecosystem structure (Pitcher 1999) as documented by the decline in trophic level of marine ecosystems brought about by industrial fishing (Pauly et al. 1998). Where this process occurs over generations, perceptions of what the resource "ought to be" in terms of abundance and diversity are successively reduced (Pauly 1995). Even though today's generation of fishers knows from their grandparents' tales, that things were better than they are now, they still discount these estimates of past abundance as fanciful or unachievable.

BTF combines scientific knowledge with the traditional ecological knowledge (TEK) of First Nations (Bomford and Caughley 1996; Haggan et al. 1998; Haggan and Beattie, 1999; Haggan 2000; Hunn 1993; Inglis 1993; Salas, et al. 1998), the knowledge of fishers and maritime communities (Berkes 1993; Freeman and Carbyn 1988; Johannes 1981; Neis 1992 and 1999; Scheibling and Mladenov 1987), historical and archival sources, faunal remains from archaeological sites and marine sediments (Casteel 1976; Crockford 1994 and 1997; Dennell 1995; Morales, et al. 1994; Wendrich and van Neer 1994, Yellen 1995). ECOPATH, (www.ecopath.org; Christensen and Pauly 1992 and 1993; Pauly and Christensen 1996) is used to construct mass-balance models of present and past ecosystem states. This allows initial comparison of today's ecosystem with the abundance and diversity prior to the onset of modern industrial fishing.

ECOSIM (Walters et al. 1997) is then used to simulate alternate ecosystem states that could be achieved through rebuilding (taking into account local extinctions, introduced species, probable effects of climate change). Possibilities include exploring the likely effects of different management options for recovery of depleted cod stocks. Depending on resources, it may also be possible to conduct some level of analysis on the impact of other development options such as oil and gas, mining and forestry on the health and consequently the benefits obtainable from marine ecosystems.

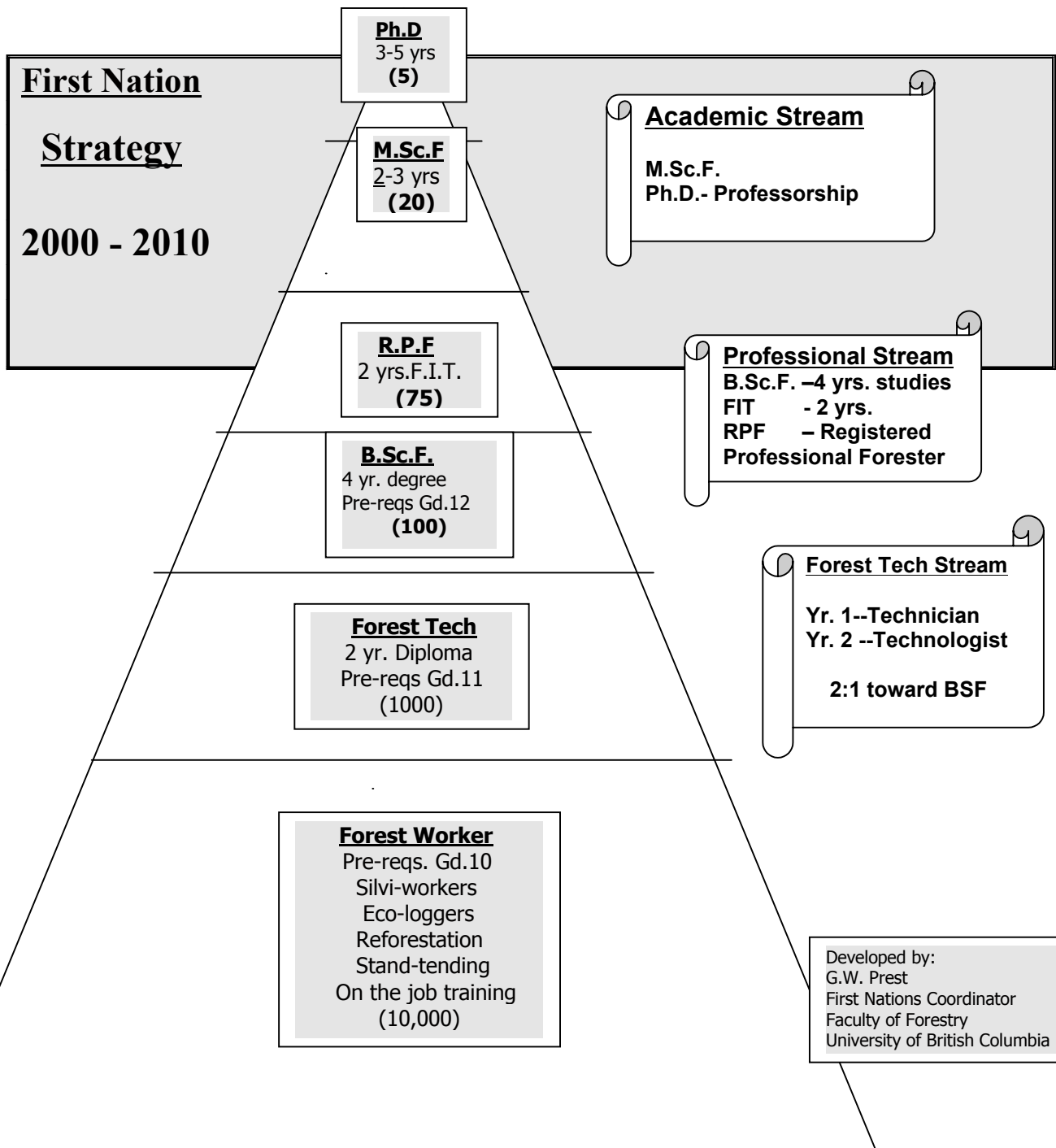
BTF uses state of the art ecosystem modelling and ethical facilitation processes to bring fishers, scientists, managers, historians, archaeologists and others together to reconstruct marine ecosystems as they might have been prior to modern industrial fishing. Past states are then evaluated in terms of their economic, ecological and social value as compared with present resource levels (Pitcher 1999; Pitcher et al. 1999; Sumaila in press, also www.orst.edu/dept/IIFET/2000/abstracts/sumaila1.html). This provides an audit of how we have done in 'managing' our natural capital. It also maximizes the chance that the diverse interests who participated in the reconstruction will agree on restoration goals.

ECOSPACE (Walters, et al. 1998) allows comparison of the ecological, social and economic effects of different management regimes from open access, through gear restrictions to 'no take' marine protected areas.



References

- Berkes, F. 1993. Traditional Ecological Knowledge in Perspective. In *Traditional Ecological Knowledge: Concepts and Cases*. Edited by Julian T. Inglis. International Development Research Centre, Ottawa pp. 1-10.
- Bomford, M. and J. Caughley. 1996. Ecologically sustainable harvesting of wildlife by aboriginal peoples, p. 60-74. In M. Bomford and J. Caughley (eds.). *Sustainable Use of Wildlife by Aboriginal Peoples and Torres Strait Islanders*. Australian Government Publishing Service, Canberra.
- Casteel, R.W. 1976. *Fish Remains in Archaeology and Paleo-Environmental Studies*. Academic Press, London, 180 p.
- Christensen, V. and Pauly, D. (1992) ECOPATH II - a system for balancing steady-state ecosystem models and calculating network characteristics. *Ecol. Modelling* 61: 169-185.
- Christensen, V. and Pauly, D. (Eds) (1993) *Trophic models of aquatic ecosystems*. ICLARM Conference Proceedings 26, Manila, 390
- Crockford, Susan. 1994. New archaeological and ethnographic evidence of an extinct fishery for giant bluefin tuna on the Pacific Northwest coast of North America. *Fish Exploitation in the Past*. Proceedings of the 7th meeting of the ICAZ Fish Remains Working Group. Van Neer, W. (ed.) *Annales du Musee Royal de l'Afrique Centrale, Sciences Zoologiques* No. 274. Tervuren, Belgium.
- Crockford, Susan. 1997. Archeological evidence of large northern bluefin tuna in coastal waters of British Columbia and northern Washington. *Fishery Bulletin* 95:11-24.
- Dennell, R. 1995. The world's oldest spears. *Nature* 385:767
- Freeman, M. and L.N. Carbyn (editors) 1988. *Traditional Knowledge and Renewable Resource Management*. Occasional Publication No. 23, Boreal Institute for Northern Studies, Edmonton.
- Haggan, N. 2000. Back to the Future and Creative Justice: Recalling and Restoring Forgotten Abundance in Canada's Marine Ecosystems. Pages 83-99 in, Coward, Harold, Rosemary Ommer and Tony Pitcher (Eds). 2000 *Just Fish: Ethics in the Canadian Coastal Fisheries*. ISER Books, St. Johns, Newfoundland.
- Haggan, N., Archibald, Jo-ann and Silvia Salas. 1998. Knowledge Gains Power When it is Shared. Pages 8-13 in D. Pauly, T. Pitcher and D. Preikshot (Eds.) *Back to the Future: Reconstructing the Strait of Georgia Ecosystem*. UBC Fisheries Centre Research Reports. Vol 6 #5.
- Haggan, N., Archibald, Jo-ann, and Salas, S. 1998. Knowledge Gains Power when it is Shared. Pages 8-13 In *Back to the Future: reconstructing the Strait of Georgia Ecosystem*. Eds. T. Pitcher, D. Pauly & D. Preikshot. UBC Fisheries Centre Research Reports, Vol. 6 No. 3.
- Hunn, E. 1993. What is traditional knowledge?, p. 13-15. In N.M. Williams and G. Baines (eds.). *Traditional Ecological Knowledge: Wisdom for Sustainable Development*. Centre for Resource and Environmental Studies, Australian National University, Canberra.
- Inglis, J.T. (Editor). 1993. *Traditional environmental knowledge: concepts and cases*. Ottawa: International Program on Traditional Knowledge and International Development Research Centre.
- Johannes, R. E. 1981. *Words of the lagoon: fishing and marine lore in the Palau district of Micronesia*: Univ. Calif. Press. Berkeley.
- Morales, A., Rosello, E. & Canas, J.M. (1994) *Cueva de Nerja (prov. Malaga): a close look at a twelve thousand year ichthyofaunal sequence from southern Spain*. pages 253- 262 in W. van Neer (ed) *Fish Exploitation in the Past*. Ann. Sci. Zool. Mus. Roy. L'Afrique Centrale, Tervuren, Belg. 274.
- Neis, B. (1992). *Fishers' Ecological Knowledge and Stock Assessment in Newfoundland*. Newfoundland Studies 8, 2.
- Neis, B., L.F. Felt, R.L. Haedrich and D.C. Schneider. 1999. An Interdisciplinary Method for collecting and Integrating Fishers' Ecological Knowledge into Resource Management. Pp. 217-238. In D. Newell and R.E. Ommer (eds) *Fishing Places, Fishing People: Traditions and Issues in Canadian Small-Scale Fisheries*. Univ. of Toronto Press. Toronto. 374p.
- Okey, T.A. and D. Pauly (eds) 1998. *A Trophic Mass-Balance Model of Alaska's Prince William Sound Ecosystem, for the Post-Spill Period*. UBC Fisheries Centre Research Reports 1998, Vol. 6(4).
- Pauly, D and V. Christensen 1996. (eds) *Mass-Balance Models of North-eastern Pacific Ecosystems*. UBC Fisheries Centre Research Reports 1996, Vol. 4, #1.
- Pauly, D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. *Trends in Ecology and Evolution* 10(10): 430.
- Pauly, D., D. Preikshot and T. Pitcher (eds.) 1998b *BACK TO THE FUTURE: reconstructing the Strait of Georgia Ecosystem*. UBC Fisheries Centre Research Reports, Vol. 6 No. 3.
- Pitcher, T.J., D. Pauly, N. Haggan and D. Preikshot (1999) 'Back to the Future' a method employing ecosystem modelling to maximise the sustainable benefits from fisheries Management. Pages 447-465 In *Ecosystem Considerations in Fisheries Management*. Alaska Sea Grant Anchorage.
- Pitcher, T.J. (1998) "Back To The Future": a Novel Methodology and Policy Goal in Fisheries. Pages 4-7 in Pauly, D., Pitcher, T.J. and Preikshot, D. (Eds) *Back to the Future: Reconstructing the Strait of Georgia Ecosystem*. Fisheries Centre Research Reports 6(5)
- Pitcher, T.J. (1999) *The Use Of Ecosystem Modelling In Comparative Policy Analysis: Maximising Sustainable Benefits From Lake Nasser's Aquatic Resources*. In Craig, J. (ed) *ICLARM Workshop On Lake Nasser's Fisheries*.
- Pitcher, T.J. (2001) *Fisheries managed to rebuild ecosystems: Reconstructing the Past to Salvage the Future*. *Ecological Applications* 11(2): 601-617.
- Pitcher, T.J. and Pauly, D. (1998) *Rebuilding ecosystems, not sustainability, as the proper goal of fishery management*. Pages 311-329 In T.J. Pitcher, P.J.B.Hart and D. Pauly (Eds.) *Reinventing Fisheries Management*. Chapman and Hall, London.
- Salas, Silvia, Archibald, Jo-ann and Nigel Haggan 1998. *Aboriginal Knowledge and Ecosystem Reconstruction*. Pages 22-28 In *BACK TO THE FUTURE: reconstructing the Strait of Georgia Ecosystem*. Eds. T. Pitcher, D. Pauly & D. Preikshot. UBC Fisheries Centre Research Reports, Vol. 6 No. 3.
- Scheibling, R.E. and P.V. Mladenov 1987. *The Decline of the Sea Urchin, Tripneustes ventricosus, Fishery of Barbados: A Survey of Fishermen and Consumers*. *Mar. Fish. Rev.* 49(3): pp 62-69.
- Walters, C. D. Pauly and V. Christensen 1998. *Ecospace: prediction of mesoscale spatial patterns in trophic relationships of exploited ecosystems, with emphasis on the impacts of marine protected areas*. International Council for the Exploration of the Sea, ICES C.M. 1998/S:4, 20 p.
- Walters, C., V. Christensen and D. Pauly. 1997. *Structuring dynamic models of exploited ecosystems from trophic mass-balance assessments*. *Reviews in Fish Biology and Fisheries* 7:139-172.
- Wendrich, W.Z. and van Neer, w. 1994. Preliminary notes on fishing gear and fish at the late Roman fort at Abu Sha'ar (Egyptian Red Sea coast). Pages 183-189 in W. van Neer (ed) *Fish Exploitation in the Past*. Ann. Sci. Zool. Mus. Roy. L'Afrique Centrale, Tervuren, Belg. 274.
- Yellen, J.E. (1995) *A middle stone-age carved bone industry from Katanda, Upper Senliki River (Kivu), Zaire*. *Science* 268.



Aboriginal Forestry Career Path – Forest Worker to Ph.D.

- **Forest Worker** – (10,000) entry level Laborer/Certified Machine/Equipment Operator positions
- **Forest Technologist** – (1,000) Field technician/technologist positions
- **B.S.F.** – (100) B.Sc.F. Degrees (25) on Academic Stream (75) on F.I.T. Stream to R.P.F.
- **Registered Professional Forester (RPF)** – (75) Forest Resource/Operations Manager
- **M.Sc.F.** – (20) Ethno – Scientists and Ethno- Botanists with BC Colleges and Universities
- **Ph.D** – (5) Professorships with BC Universities (Instructors/Professors)



Proposed First Nations Forestry Education and Training Partnership Strategy

Until recent times, First Nation's people have been excluded from *meaningful* participation within the BC forest sector. However, with the eventual resolution of the aboriginal land question, First Nations will be assuming communal ownership over portions of their traditional territories and *become much more involved in the forest sector at all levels*.

Currently, *with less than 10 aboriginal registered professional foresters (RPFs) and 250 forest technologists* registered in BC, there is an obvious need to increase these numbers to meet the challenges to be faced in preparation for the post treaty era. It is timely to develop a strategy to educate and train aboriginal people to participate in the forest sector and academia as follows:

- 10,000 job trained Aboriginal forest workers through co-management agreements with governments and joint venture business agreements with forest companies by 2010.
- 1,000 Aboriginal forest technologist graduating from the community colleges and provincial post-secondary institutes by 2010. (Nicola Valley Institute of Technology, BC Institute of Technology, Selkirk College, College of New Caledonia, Northern Lights College, Malaspina University College and Northwest Community College).
- 100 Aboriginal (B.S.F.) graduates from the UBC Faculty of Forestry, UNBC and UCC by 2010.
- 75 Aboriginal Registered Professional Foresters (R.P.F.) certified with the Association of B.C. Professional Foresters (ABC PF) by 2010.
- 20 ethno-scientists (M.Sc.F.) graduating from the UBC Faculty of Forestry by 2010.
- 5 (Ph.D.) doctoral Aboriginal graduates from the UBC Faculty of Forestry by 2010.

By adopting a collaborative partnership strategy including the forest sector; government; academia with First Nations will result in educating and training the necessary numbers of Aboriginal forest workers, forest technologists; RPFs and academics by the year 2010.

By building better First Nation access to forestry education and training programs and by building better understanding on the part of the dominant society on aboriginal issues and perspectives will create a political environment that will eventually lead to a more stable socio-economic society as we move towards the post – treaty era in the 21st century.

For more information on this strategy contact GW Prest, First Nations Coordinator,
UBC Faculty of Forestry
Tel: 604-822-0651
e-mail: prest@interchange.ubc.ca