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Aboriginal Aquaculture in Canada: Realizing Success

Proceedings of a Special Session held at Aquaculture Canada[OM]
Quebec City, 19 October 2004

Aquaculture is bringing a new opportunity for aboriginal peoples in Canada, as well as the United States, to realize success in achieving their short- and long-term economic, social, community and cultural goals. Many aboriginal communities are engaged in projects to assess aquaculture opportunities and a number are successfully operating commercial aquaculture enterprises. Aquaculture projects can provide economic benefits, strengthen historical connections to the aquatic environment and its resources, and develop capacity for the increasing responsibilities of environmental stewardship.

"Aquaculture projects can provide economic benefits, strengthen historical connections to the aquatic environment and its resources, and develop capacity for the increasing responsibilities of environmental stewardship."

There is potential for the expansion of Aboriginal aquaculture projects. Many First Nations are gaining responsibility for coastal areas as a result of treaty negotiations and other agreements. Some of these regions are prime areas for shellfish and finfish culture.

A special session on "Aboriginal Aquaculture in Canada: Realizing Success" was organized for the Aquaculture Canada[OM] 2004 conference in Quebec City to bring together those interested and involved in aquaculture development in First Nations communities in Canada. Aboriginal communities, academic institutions, project workers, government agencies, and aquaculture experts were all represented at the session.

The session was organized to provide a forum for presentations on aboriginal aquaculture projects and an opportunity for information exchange through presentations and discussions. The first goal of the organizers was to provide a better understanding of the opportunities and challenges of these projects and to identify factors that affect their success. The second goal was to share and discuss the experiences and issues around planning and implementing aquaculture projects, enterprises, or partnerships, so project representatives could benefit from the accumulated knowledge of the international aquaculture community.

The session provided a realistic picture of what it takes to plan, develop and implement an aquaculture project for aboriginal communities. The original sub-title of the session "Realizing Opportunity" was subsequently changed to"Realizing Success". It was adopted from one of the presenters, Larry Greba, who emphasized the need for aquaculture development projects to focus on achieving results.

The presentations covered shellfish and finfish projects from both the Atlantic and Pacific coasts in Canada and the United States. Information was presented on seven projects that had many common characteristics depite their diverse project and community situations. The organizers requested that each presenter describe their project by providing the project goals, the methods of working toward the goals, and the measures of success used to determine whether the goals had been achieved. Presenters described various aspects of their projects and identified the

critical factors that contributed to accomplishment or failure and described the general aspects of what they felt was a winning strategy for Aboriginal aquaculture projects.

The first presentation was "Training for Enterprise and Ownership in BC's First Nation Shellfish Aquaculture Initiatives", by Tim DeJager. Dr. DeJager defined key conditions, identified through working with coastal British Columbia First Nations, that must be identified and addressed to realize the potential for shellfish aquaculture in First Nation communities. These include sound business plan development and appropriate and timely training. The real needs of the communities and groups must be identified and incorporated into the planning. Business, financial, and human resource support is also required for those who are taking on the challenge of starting farms, marketing product, and managing businesses.

"Cultural Revitalization through Bivalve Aquaculture—The Suquamish Indian Tribe", presented by Viviane Barry, described a 3-year aquaculture project to restore sustainable resources of intertidal bivalves of the Suquamish Reservation in Puget Sound, Washington State, USA. Community involvement, ceremonial activities, cultural awareness, and employment opportunities are some of the successful activities from this shellfish enhancement project. Though the project was devised initially to provide stock for wild harvest, future opportunities from this project may come from implementing small-scale techniques into a larger commercial venture.

Brian Kingzett presented "A Regional Approach to the Development of a First Nation-Based Shellfish Aquaculture Industry in Northern British Columbia—Opportunities and Challenges". He provided information on the Turning Point Initiative and the Tsimshian Stewardship Committee, two native organizations in British Columbia. Twenty-two pilot shellfish farms, involving 12 First Nations are currently in place in remote areas of the central coast of BC. The success of the project to date was credited to the collaboration between local economic development groups, knowledgeable industry consultants, and local First Nations communities.

"First Nations Shellfish Aquaculture Training Strategy (FNSAT) at Malaspina University-College, British Columbia", presented by Linda Hiemstra, described a successful training strategy as a component for building shellfish culture capacity in First Nations communities. The FNSAT program has been developed to be appropriate to the technical requirements of First Nations shellfish projects and to address the skill requirements and the educational needs of the aboriginal people and remote coastal communities. The training program is flexible in order to meet the immediate and long-term requirements of the shellfish projects as well as the community goals. The course content and delivery methods are revised continually to ensure they are sensitive to cultural issues and appropriate for on-site distribution of information and skills.

Allison McIsaac's presentation "Development of an Oyster Farm in the Bras d'Or Lakes—Experience Gained, Lessons Learned" provided an overview of the challenges and successes of the Eskasoni Crane Cove Oyster Farm in Atlantic Canada. The project failed initially due to poor management and non-native managers ignoring traditional knowledge. A later project, carefully planned to incorporate community goals, was supported by the Band Council. This project focussed initially on developing technical expertise and determining the schedule

of oyster spatfall in the area. Secondly, appropriate spat collection and oyster culture equipment and techniques were identified and tested. Finally, a marketing strategy will be developed and tested.

The fifth presentation "Creating Opportunity, Realizing Success—The Kitasoo/Xaixais First Nation" by Larry Greba described the key components for successful finfish aquaculture projects for aboriginal people. The Kitasoo/Xaixais First Nation projects have had a clear vision and well-defined goals that have been key to the initial and ongoing success. A reliable business planning process, strong community support, and emphasis on education and cooperation, have provided sustainability over time. New and innovative initiatives such as consolidation of aquaculture projects, building of partnerships with other salmon aquaculture companies, and the development of processing plants have contributed to the longevity and financial success. The projects have provided social and economic benefits to the remote communities.

"The Kitasoo/Xaixais First Nation projects have had a clear vision and well-defined goals that have been key to the initial and ongoing success."

The final presentation in the session was "A New Era of Self-Sufficiency and Prosperity: The Future of Aboriginal Aquaculture in Canada" by Richard Harry. Mr. Harry is the Executive Director of the Aboriginal Aquaculture Association. The goal of the Association is to bring together First Nations people, representatives of the aquaculture industry and government with a common purpose of building prosperity in First Nations communities through aquaculture development. He outlined the challenges common to these projects, such as environmental management issues, access to financing and capital, availability of expertise and technology, developing and accessing markets, and managing the inherent risks in aquaculture businesses. He also described the benefits of addressing common problems through a central body such as the Aboriginal Aquaculture Association.

Each of the speakers shared enthusiasm for their projects and for the benefits of aquaculture projects for aboriginal communities. The presenters and the audience benefited from both the presentations and the subsequent questions and discussions. Issues specific to development of aquaculture projects for aboriginal people were described, but more importantly, methods of successfully overcoming common problems were presented and discussed.

The session was well attended and the response was enthusiastic. A similar session is being planned for the Aquaculture Canada^{OM} conference in 2006.

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Front cover: Manuel Purcel, an elder from the Suquamish Tribe in Puget Sound, Washington is sorting and cleaning trays with Pacific oyster *(Crassostrea gigas)*. Shellfish crops are cultivated in the vicinity of the Suquamish reservation for subsistence and ceremonial use. [Viviane Barry photo]

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Tim DeJager, guest editor

Training for Enterprise and Ownership in British Columbia's First Nation Shellfish Aquaculture Initiatives

Tim DeJager

Most of British Columbia's coastal First Nation communities are exploring or actively pursuing initiatives to develop shellfish aquaculture. Building human resource capacity is one of the most pressing needs. Training courses and programs that are accessible, relevant, practical, standardized, and comprehensive are in demand. Consequently, an industry training system is being developed in BC that involves multiple efforts and coordinated projects, the hub of which is the First Nation Shellfish Aquaculture Training Strategy (FNSAT) currently being managed by Malaspina University-College. Experience to date in developing and delivering training indicates that success in training will be linked to success in a broad range of industry and economic development components. Therefore, a successful program must address core training issues such as: 1) delivering training in 'real' conditions, involving pilot-scale farms, on-farm internships, and mentoring 2) developing a curriculum offering opportunities for advancement, and 3) nurturing internal management and entrepreneurship capacity. The program must also address larger technical, economic, and social issues such as: 1) obtaining community buy-in and ownership of the initiative, 2) coordinating training with enterprise development, 3) providing post-training technical and advisory support, and 4) accessing markets and attracting investment. A coordinated and comprehensive development strategy is needed if BC's Aboriginal training program is to be of lasting value.

Introduction

Most of BC's First Nation coastal communities are exploring or actively pursuing the development of aquaculture enterprises. Interest in shellfish culture is particularly widespread. First Nations are facing a future with fewer wild fish and shellfish available for commercial—as well as food, social, and ceremonial—purposes. Involvement in aquaculture is an emerging opportunity to secure a future in fish and shellfish production.

Regardless of the area of aquaculture undertaken and no matter which species are cultured, a comprehensive approach to development is needed. Within communities, it is necessary to create the conditions necessary for the development of successful aquaculture enterprises. The provision of aquaculture training must follow the same approach.

The availability of funding programs to explore and initiate shellfish aquaculture development by First Nations is increasing the urgency and pace of a number of initiatives in British Columbia. The demand for training is exceeding

the supply of training programs and qualified trainers.

This development is occurring in a context of significant challenges and changes within the shellfish farming industry both globally and regionally.[1] In this environment, it is critical that business development and training meet the real needs of the First Nations taking on the challenge of starting farms, marketing product, and managing businesses.

This paper identifies key conditions that must be realized and issues that must be addressed for the human resource potential of First Nation communities to be actualized. Eight key training conditions are identified.

Meeting the Challenges of Entering the Shellfish Aquaculture Industry

Unlike finfish aquaculture, with its high capital requirements and consolidation amongst industry players, shellfish aquaculture in British Columbia has, until recently, been a relatively easy industry to enter. Although constrained by lack of available sites for expansion, barriers to entry have been low. Capital requirements can be modest, depending on the type of product and culture system used. Although there are only a handful of shellfish processors, most growers have been able to find market and distribution channels through sales to the processing firms.

"First Nations cannot afford to start shellfish aquaculture businesses that are not highly productive and technically efficient."

Technical information on how to culture shellfish has been provided through the BC Ministry of Agriculture, Fisheries and Food and the BC Shellfish Growers Association. In addition, new growers have been able to work with established growers willing to share techniques and know-how.

However, the industry is currently facing significant challenges and changes. For example, it must become more competitive and efficient, as global producers of cultured shellfish product such as China, Chile, New Zealand, and Europe, are developing high production capacity that is, in some cases, leading to reduced prices.

Technology development and technology transfer do not occur efficiently in the shellfish industry and this hampers the ability of the industry to increase productivity and improve efficiency. The industry is fragmented and collaborations to develop technology and market product do not occur easily. The industry also needs to become much better at marketing.

First Nations entering the aquaculture industry must be prepared to meet challenges such as these. In addition, many will have to develop their businesses in remote areas of the coast, further adding pressure to the cost of production. First Nations cannot afford to start shellfish aquaculture businesses that are not highly productive and technically efficient.

Developing the Human Potential

Preparing people to take on all the roles and responsibilities necessary for success in aquaculture is paramount to the development of the industry. Training is a major component of planning and preparing for a new venture. Training, however, is much more than the conveyance of technical information and know-how. To be truly effective, training must involve the entire community and address critical needs so that enterprise and ownership become integral to the communities rather than alienated from them.

Training courses and programs that are accessible, relevant, practical, standardized, and comprehensive are being requested by First Nations. In response to this need, an industry training system is being developed that involves multiple ef-

forts and coordinated projects. The hub of the training initiative is the First Nation Shellfish Aquaculture Training Strategy (FNSAT) currently being managed by Malaspina University-College.

The delivery of curriculum-based training is central to preparing people to enter the shellfish aquaculture industry. But to be effective, training must be integrated with conditions and initiatives that provide a basis for people to succeed in aquaculture. Experience to date has shown that successful training is practical, motivating, and opens opportunity. But successful training is critically linked to a broad range of industry and economic development components.

Economic opportunity is nothing without the human capital to drive it. If people cannot get the real experience they need, if they do not see a future in the aquaculture industry, if they cannot become entrepreneurs and leaders in their communities and in the industry, then the training has not succeeded.

Training for Enterprise and Ownership

The following are some of the key conditions that must be met in order to actualize the "people potential" needed to build First Nation aquaculture enterprises:

1. Training that is practical and based in the "real world",
2. Opportunity for individual advancement,
3. Support for entrepreneurship and management,
4. Post-training technical, advisory and mentoring programs,
5. Community buy-in and support,
6. Enterprise development in step with skill development,
7. A market-driven business development plan,
8. Investment and partnering to help the enterprise grow.

1. Training that is practical and based in the "real world"

Most aquaculture training courses are based on the delivery of information in typical classroom settings interspersed with a variety of activities, site visits and laboratory and field exercises. This is important, but training is not complete without time spent in the "trenches". This can be accomplished in a number of ways:

- Pilot-scale training and demonstration projects provide direct experience with aquaculture techniques and requirements.
- On-farm internships of several days or weeks expose learners to business environments and situations.
- Experienced industry managers acting as mentors provide some on-call and on-going support to aspiring managers.

Figure 1
Students learning bivalve anatomy in a training course in shellfish aquaculture at Malaspina University-College.

2. Opportunity for individual advancement

The standardized training being developed in the FNSAT project is based in post-secondary institu-

tions. Initial training through extension courses can provide an important avenue for educational advancement. However, the business itself should be able to provide a home for aspiring individuals who want to become entrepreneurs, managers, and leaders.

Figure 2
Work on a pilot-scale oyster raft by members of the Hul'qumi'num Treaty Group.

3. Support for entrepreneurship and management

People who demonstrate a desire and aptitude to become entrepreneurs and managers need be accommodated in the business strategy. These individuals will be ones who are willing to take the risks, assume leadership, and meet the challenges of the business. There must be adequate incentives and rewards for them. In some cases they may want to start their own shellfish aquaculture businesses. If and how these will be integrated with larger community-based enterprises needs to be decided.

4. Post-training technical, advisory and mentoring programs

Education and training does not end with the awarding of a diploma or certificate. In fact, at that point, education is just beginning! Shellfish aquaculture is an industry of unknowns and great risks. Problems will occur, stock will die, and production problems will threaten profitability. Under these circumstances, it will be critical to have access to resource people who are able to troubleshoot and provide on-site guidance.

5. Community buy-in and support

An aquaculture project cannot be successfully launched unless a good part of the community is solidly behind the enterprise. While this is true for the industry as a whole, in First Nation communities it has added significance. Successful businesses will need to achieve a level of independence from the political process. Adopting a model of governance that prevents political interference but maintains accountability to the community is essential. In addition, the enterprise will need to communicate well with all community members, especially elders and schoolchildren. Communities will need assurance that shellfish aquaculture is a sound opportunity that will span many generations.

Figure 3
Shellfish farmer demonstrating an oyster setting facility to a group of students taking a Malaspina University-College shellfish aquaculture extension course.

6. Enterprise development in step with skill development

The development of an aquaculture enterprise must be well planned and implemented, so that people are trained and ready to step into the various roles as required. For example, technical training in the seeding of clams or harvesting of product should be given when these activities are occurring in the business so that the knowledge and skills developed can be immediately utilized. Management training may have to follow a different strategy. One of the most pressing needs will be the requirement for management expertise at an early stage in the start-up of the enterprise, well before community members may be ready to take on that role. Hiring interim managers and providing mentoring may be needed to bridge this gap.

7. A market-driven business development plan

The aquaculture industry has traditionally been production-driven rather than market-driven. This will have to be reversed. New entrants must be prepared to do what is needed, before production begins, to ensure their products will find a market. A number of First Nation enterprises are undertaking marketing initiatives at an early stage of their business development.

"The development of an aquaculture enterprise must be well planned and implemented, so that people are trained and ready to step into the various roles as required."

8. Investment and partnering to help the enterprise grow

Developing an aquaculture enterprise into a long-term successful business that remains strongly integrated into the community may need business partners and collaborators to succeed. The trends in shellfish aquaculture point in the same direction as finfish aquaculture. There is likely to be increasing consolidation, increased reliance upon new technology, and higher capital requirements. Partners can bring investment, access to markets, advanced technology, and other resources that will enable the enterprise to stay in it for the long term.

Conclusion

Succeeding in the dynamic and high-risk industry of aquaculture needs to be the driver for shellfish and other aquaculture development projects. Skills development, training and education will play a major part in the success. However, these initiatives to develop the capacity within First Nation communities to participate in the industry and be competitive and successful must be relevant, timely and linked to development of critical political, social and economic factors which together contribute to the goal. Consequently, a coordinated and comprehensive development strategy must be implemented if BC's shellfish aquaculture training program is to be of lasting value for First Nation communities.

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Cultural Revitalization through Bivalve Aquaculture: The Suquamish Indian Tribe

V Barry

Viviane Barry and Paul Williams

The Suquamish Indian Tribe is located in Puget Sound, State of Washington, USA. Shellfish have always been, and will continue to be, important for subsistence, ceremonies, and commerce. However, the supply of clams and oysters to the tribal community is limited due to overharvest, lack of access to the shoreline, and pollution. The cumulative effects of the lack of harvest opportunity on the culture and social fabric of the tribe are significant. A 3-year aquaculture project completed on July 1st, 2004 addressed the need to restore sustainable sources of intertidal bivalves around the Suquamish reservation. The project goal was to bring scientific knowledge and aquaculture techniques to the community to secure sustainable crops of clams, mussels, and oysters for future generations. During the project, 19 Suquamish staff and tribal members were trained in basic shellfish biology, water quality, and aquaculture techniques. Theory and applied training were realized by implementing various enhancement and aquaculture activities. Trainees set up oyster cultch, helped design a float system and maintained oysters, mussels, and clams on floating lines, planted hardshell clam seed, and set up intertidal growing systems for oysters. Project managers are currently looking at incorporating these small-scale techniques into a larger commercial venture.

Background

The Suquamish Indian Tribe of the Port Madison Reservation is located in Kitsap County, State of Washington, along the western shore of Puget Sound. The lands were reserved for the tribe pursuant to the Point Elliott Treaty signed in 1855. The Port Madison Reservation was expanded by Executive Order in October 1864 and currently consists of over 3,141 ha of trust lands, historic allotments, and fee lands owned by Indians and non-Indians.

The 7-member Suquamish Tribal Council is the duly elected and constituted governing body of the Port Madison Indian Reservation by authority of the constitution and bylaws of the Suquamish Tribe of the Port Madison Indian Reservation as approved July 2, 1965 by the Under-Secretary of the Interior. Council terms are staggered to ensure continuity from year to year. The Tribal Council oversees the operation of 15 major divisions providing essential government services, developing economic opportunities, and employing over 185 Suquamish Indians and non-Indians.

The Fisheries Department, together with other departments, reports to the Tribal Council and is responsible for protecting treaty-reserved aquatic resources and initiating and maintaining enhancement projects on Pacific salmon and shell-

fish species. Members of the tribe exercise treaty fishing rights for the harvest of finfish and shellfish for commercial, ceremonial, and subsistence purposes. The Department of Fisheries co-manages the aquatic resources with the State of Washington and sets harvest allocations and harvesting schedules pursuant to the requirements of water certification, and the results of population assessments and the collection and analysis of other data.

The culture of the Suquamish Tribe centers on respect for an abundant and healthy environment. The Oral History Project[1] undertaken by the Suquamish Tribe in 1982 documented the critical importance of fish and shellfish harvesting, preparation and consumption to community and family life. A survey of seafood consumption, and preparation practices completed in August 2002 confirmed the continuing importance of fish and shellfish as cultural resources. The study found Suquamish tribal adults and children consume more seafood than other Native American, Asian-Pacific Islander, or other populations in the State of Washington surveyed to date. Shellfish consumption is higher than that of finfish.

The study attests to the importance of shellfish to the health and well being of tribal members, as well as to their cultural practices and traditions.[2] A majority of survey respondents reported a decrease in recent years in the amount of shellfish consumed. The reasons given for the decrease were most frequently related to changes in family composition, accessibility or availability of finfish and shellfish, and increased pollution. The decline is also reflected in a decrease in clam population densities on the beaches most utilized by tribal members (50% to 90% decrease from 1991 to 1998).

Figure 1
Kael Williams (left) explaining an oyster cultch setting technique.

The sociological effects of removing the source of food from the cultural traditions are many. During potlatches, funerals, namings or other ceremonies, event coordinators often have to purchase clams and oysters instead of harvesting them. Consequently, the contributions of the harvesters are not recognized at the ceremony. Families do not engage in harvest for subsistence and without that activity the link between the elders and youth is weakened. The knowledge that elders have of the tideland and their respect for the environment is not passed down to the youth. The cumulative effects of lack of harvest opportunity on tribal culture are significant. The elders possessing the traditional knowledge are in their seventies and eighties and soon the opportunity to learn from them will be lost.

Enhancement of clams and oysters on tribal tidelands provides a source of shellfish to strengthen these cultural activities. The commitment by the Suquamish Tribal Council to shellfish enhancement, demonstrated in the Year 2000 Strategic Planning Process, represents a reinforcement of the community's desire for the enhancement of shellfish resources, in order to provide increased availability and access for subsistence and cere-

monial purposes.

For many years, the supply of clams and oysters to the tribal community was limited due to overharvest, lack of access, and pollution. Although the reservation wraps around miles of shoreline, the tribe owns only a small amount that it purchased or acquired from donors. A court case interpreted the reservation boundary as not including the tideland. It is a tremendous irony that the reservation of a coastal tribe historically dependent on fish and shellfish would not include the tidelands along its border. Concentrated harvest on the few beaches the tribe has access to has led to overharvest of those beaches.

The following project was designed to restore the abundance of shellfish through enhancement with clams, oysters, and other bivalves. Enhancement was conducted on tribally owned beaches encompassing 2.8 ha of suitable habitat. In addition, the tribe is in the process of acquiring more beaches as coastal properties become available for sale.

Figure 2
Manuel Purcel (left) and Danny DeCoteau spreading Pacific oysters from cultch bags.

Comprehensive Long-term Goals and Objectives

The long-term goals addressed by this project were to restore a self-sustaining source of clams and oysters on tribal tidelands and to meet the social needs of the community to have a place to harvest shellfish for subsistence and ceremonial use.

In addition, this project was designed to enhance tribal heritage and culture by providing opportunities for the tribal community—especially the youth—to learn traditions surrounding the harvest and preparation of shellfish. Elders possess traditional ecological knowledge about the tidelands, which is not currently being passed down to their families because of the lack of opportunities to harvest shellfish.

Figure 3
Manuel Purcel cleaning and sorting oyster trays off the longline system.

Figure 4
Suquamish children collecting clams and other organisms on the community beach with their parents and grandparents.

Community Discussions and Involvement

The community provided guidance to the Tribal Council and Fisheries Department concerning shellfish availability through a variety of mechanisms. At the most formal and highest level, the importance of shellfish enhancement as a community goal has been recognized in the tribe's strategic planning process. A second means by which the community has commented directly on the proposed shellfish enhancement project is through meetings of Fisheries Department personnel with members of the Shellfish Committee, Elders Council, Youth Council, and discussion at Tribal Council meetings.

Early in the year 2000, the Suquamish Tribal Council developed a draft strategic planning document based on the input of all departments, tribal employees, elders, and members of the tribal community. Meetings were held at the department level, among department directors, in tribal community and staff forums, and, finally, at the September 2000 meeting of the General Council, where enrolled tribal members commented further on the changes in the draft document that had been recommended by tribal members in earlier meetings. The document presented to the General Council included the commitment to develop and implement a shellfish enhancement plan under the direction of the Fisheries Department.

Figure 5
Crew moving oyster cultch from the community beach to another location.

Fisheries Department personnel typically discuss program issues with members of the Elders Council throughout the year on an informal basis during regularly scheduled weekly Elders Coun-

cil lunches. Shellfish abundance and availability have been recurring subjects of concern. The Elders Council endorsed the enhancement project and agreed to participate by leading workshops on traditional ecological knowledge of the tidelands.

This project was managed by the Suquamish Fisheries Department and funded by the Administration for Native Americans (ANA), a federal agency.

Figure 6
Single Pacific oysters produced on the longline system.

Project overview

Community involvement

During the project's initial phase, tribal members and staff were invited to attend classes and participate in field activities to learn about shellfish aquaculture and biology. A succinct curriculum was developed on water quality, basic bivalve biology, and aquaculture and enhancement techniques. This was a highly valuable aspect of the project, providing skills and labor for the duration of the project and beyond.

Nineteen tribal staff and community members participated in the training and helped implement shellfish enhancement activities. Students worked on the community beach and tended shellfish on the barge (Fig. 1-3). They also initiated an experiment aimed at comparing the growth rate of Pacific oysters reared at different densities and having different initial spat sizes. One student used her recently acquired technical knowledge and combined it with traditional knowledge to create a poster presentation in English and Lushootseed. Young community children also benefited from the project with regular visits to the beach learning about ecology and aquaculture (Fig. 4).

Figure 7
Manila clams grew from 3 mm to an average of 25 mm in just a few weeks on the longline system.

Enhancement activities

Various techniques were used to grow oysters, mussels, and clams. Pacific oyster larvae were grown on cultch and as single oysters on floating lines. All spat and larvae were purchased at local shellfish hatcheries.

Figure 8
Beach crew removing predator nets in the early fall.

Oyster cultch

Over 1000 oyster cultch bags were set each year of the project, averaging 2.5 million oysters spread on local beaches per year (Fig. 5). Mortality rates were not calculated, but many cultch were buried by shifting sediment on one part of the community beach.

Shellfish on long lines

A spar buoy system once used to rear coho salmon served as an anchor for the long line system. The initial area used was 232 m^2. Five lines, each supporting eight stacks of Dark Sea™ trays, were installed.

Single oysters grown in trays suspended on long lines were a success. More labor-intensive than the oyster cultch growing technique, it produced excellent mature oysters much quicker. Most Pacific oysters set in trays at 10 mm were ready to spread on the beach to harden their shells after 6 months on the long lines. European flat oysters of the same initial size took much longer to grow (around 2 years), but did well. Blue mussels, cockles, and manila clams were also grown in trays. Clams were set in trays at a 2 to 3 mm size and were boosted to approximately 25 mm in 5 months. The trays proved to be a good alternative to using a flupsy. The long line system produced about 60,000 Pacific oysters, 15,000 European flat oysters, 5,000 mussels, and boosted approximately 200,000 clam spat into larger clam seed in 2 years (Fig. 6 and 7).

Clam seeding

Over 0.8 ha of beach area

Figure 9
Ed Carriere, a Suquamish elder, demonstrates a traditional clam roasting technique during the Lushootseed language fair.

was seeded with manila clams. Most clams purchased were between 1 to 3 mm. They were placed in spat bags, then in dark sea trays, and suspended on the long lines. A survival rate of approximately 75% was experienced in the trays. All clams were planted under protective predator nets. Nets were left throughout the growing season and pulled off the beach in the fall (Fig. 8).

Clam survival after planting was mixed and varied with beach location and size at planting. Because many areas had never been enhanced before, part of this exercise was to identify the best spots.

Ceremonial Activities

Most activities and workshops related to this project were held in conjunction with other events. Workshops and family meetings were held during Lushutseed language fairs in 2002 and 2003, before canoe journeys in 2002 and 2004, and during the commemoration of Chief Sealth every summer. During these events, elders demonstrated many traditional ways of preparing and serving shellfish (Fig. 9).

Through February 2004, tribal elders also led spiritual ceremonies at a local beach (Doe Keg Wats), educating participants about the physical and spiritual relationships between the beach, estuary, tribal members, and flora and fauna.

The 2003 General Council Meeting saw the first shellfish harvest as a result of local beach enhancement. Shellfish were prepared according to tradition and served to over 300 tribal members.

Also, shellfish produced during this project were at the center of many funerals, weddings, and elder honorings. Now that this shellfish operation is established, sustainable shellfish crops will provide sufficient native foods for the many cultural gatherings and events, as well as a regular subsistence staple food for families.

The Future

The next step could be to begin a commercial shellfish operation, but for the time being production will remain at its present level, which is low maintenance and self sustaining. Now that growth rates, costs and harvests are known it would not be difficult to produce a business plan.

Acknowledgments

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B Kingzett

A Regional Approach to the Development of a First Nation-Based Shellfish Aquaculture Industry in Northern British Columbia: Opportunities and Challenges

Brian Kingzett and Tammy Norgard

With over half the BC coastline located north of Vancouver Island, the potential for shellfish aquaculture in this largely remote area has not been realized. Creating an industry in such a large area where no shellfish aquaculture infrastructure exists presents significant challenges and a regional development approach is critical to success. During 2003, twelve First Nation communities working with two native organizations, Coastal First Nations Turning Point Initiative Society (TPI) and the Tsimshian Stewardship Committee (TSC) initiated a program of 22 pilot farms, regional business planning, and infrastructure development to test, explore options, and hopefully establish a successful industry. This program has been undertaken with local economic develop groups, Ecotrust Canada (conservation NGO), industry consultants and local First Nation communities. Results of pilot farms have largely been successful and a regional feasibility study completed in early 2004 laid out a business strategy that is guiding further phases of early industry development in this region. In the next phase of the project there is a focus on "pre-industry development and capacity building" that includes further community work, grow-out testing, training, establishing farm sites, regional and community business plans, market strategies and sourcing capital for development.

Introduction

With over half the British Columbia coastline located north of Vancouver Island, the potential for shellfish aquaculture in this largely remote area has not been realized. For more than 30 years most bivalve fisheries have been closed and aquaculture held back in this area due to a lack of sanitary and marine biotoxin monitoring in this region. Previously all but two small shellfish farms have been located on the south coast of British Columbia. The area of the project extends approximately 400 km north to south and covers 3 degrees of latitude.

The 12 coastal First Nations in this area are embarking on an ambitious shellfish aquaculture development program. Creating an industry in such a large area where no shellfish aquaculture infrastructure exists presents significant challenges and a regional development approach is seen as critical to success.

To that end the 12 Nations have come together to move the initiative forward jointly through two native organizations, The Coastal First Nations Turning Point

Initiative Society (TPI) and the Tsimshian Stewardship Committee (TSC). This is the first time that so many communities in the north and central coast and the Queen Charlotte Islands (Haida Gwaii) have cooperated in such a large-scale exploration of shellfish aquaculture all at once

A strategic development plan was established in 2002, and in 2003 the two groups initiated a program of pilot farms and regional business planning and infrastructure development to explore options and hopefully establish the foundations of a successful industry.

Funding

The Turning Point Initiative under the guidance of Larry Greba and the Tsimshian Stewardship Committee led by Bruce Watkinson of Kitkatla first raised funds from local communities, Indian and Northern Affairs Canada (INAC), the BC Economic Partnership Initiative and NRC IRAP (National Research Council Industrial Research Assistance Program) to explore this business opportunity. They and others are still engaged in fund-raising to assist with training and the transition to a full-fledged industry.

Project Team

A large project team was assembled that included staff of:

- First Nations Groups;
- Blue Revolution Consulting Group, which provided technical, business planning and marketing expertise;
- Ecotrust Canada, a west coast NGO that promotes environmental issues through development of conservation-based economies and has significant business planning expertise;
- BC Ministry of Agriculture Fisheries and Food provided assistance with pilot sites;
- The North Coast Water Quality and Biotoxin Society, a non-profit group that is working to provide community-based Canadian Shellfish Sanitation Program services in northern BC; and
- The Prince Rupert Economic Development Corporation.

This latter group then worked with leaders, staff and community participants from each community.

First Stage Farms

The project began early in 2003 with the development of 22 “first stage” pilot farm sites spread across the region. The goal of these farms was to test and demonstrate species and methodologies to support site assessments, provide training opportunities, familiarize communities with shellfish culture, and provide information for later business planning.

In June of 2003 we used local First Nation vessels and community members to deliver equipment, anchor and build sites. Sites in the Tsimshian communities consisted of a raft and small surface long lines. Surface long lines were installed in the Turning Point communities.The sites were seeded in simultaneously in July. Seed was often delivered to the sites by floatplane. The sites have been maintained and monitored regularly ever since. Each site was seeded with:

- Single Pacific oysters in different types of trays,
- Cultch oysters,
- Gallo and blue mussels,

- Japanese weathervane scallops
- Edible kelps, on some sites.

Growth, temperature and oceanographic Information

Growth and survival data are being recorded. As well, continuous temperature data are being collected and oceanographic monitoring is being performed at each site.

Successful grow-out

Generally the communities have experienced excellent grow-out success, especially with oysters and scallops.

Business Planning

Concurrent with the development of seeding of pilot sites, the second phase of this initiative has involved the development of a regional business plan that examines the feasibility of the communities working together to overcome infrastructure, logistical, processing and marketing issues. This planning exercise recognized that the decision on the species grown and the form of products must be market driven and recognized the logistical realities of working in this region. To test various assumptions, the project team settled on a series of case studies and worked backwards to examine what a $10 million dollar a year wholesale industry would look like.

Case study determinations

Using the information generated during this exercise, the team determined optimal size and siting requirements for farms, capital and labour requirements, processing, governance and corporate requirements.

Figure 1
Location of the 22 pilot farms.

Community and regional workshops

Before, during, and after this exercise, workshops were held in each community to explain the process, discuss regional and community issues, and get community feedback to assist the planning. We also held three regional workshops where leaders from each community got together as a group.

Regional business plan

The result of the initiative has been a regional business plan that sets out the analysis of feasibility and proposes a recommended business structure and implementation strategy for the communities. The critical recommendation was, of course, that to reduce business risk and provide the best chance of economic success that most, if not all, the communities needed to work together in such a manner that individual community goals were balanced against the regional approach.

Production overview

The recommended approach is to provide an umbrella development corporation that looks after shared requirements

such as general direction, seed, processing, and marketing but allows each individual community to independently operate its own farms.

Organizational requirements

An organizational diagram for this model includes a shellfish trust responsible for investment dollars, equal participation by communities in the board of directors of the development corporation and individually-owned and operated farms.

Potential new jobs

The business model suggests that this approach could conservatively generate approximately 280 full-time-equivalent jobs in the region.

Potential results

Other results would include more than $25 million per year in wholesale value with strong local economic multipliers, with First Nation businesses that maintain important high conservation values. Working together, the communities believe that they are capable of achieving a world class sector, attracting new investment to the region, and contributing to maintaining infrastructure and export development in central and northern BC.

Pre-Industry challenges

So far, however, all that exists is a plan and a good start on the ground. The majority of the work now needs to be done in what we call "pre-industry challenges". These involve firming up community buy-in and commitment, maintaining and expanding the pilot farms, and putting the corporate structure together. Each community must establish commercial grow-out sites and refine individual business plans. Markets need to be developed and confirmed ahead of product reaching the market and future employees must be trained. Biotoxin and sanitary surveys need to be expanded through the region, and a specific processing infrastructure needs to be developed, as well as a suite of miscellaneous but critical minor projects.

Figure 2
Oyster grown in a tray at one of the pilot farm sites.

Conclusion

In many ways this regional project is just beginning. All communities and project partners acknowledge that there are considerable challenges ahead and that the development of a northern shellfish culture industry will not be easy or fast.

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First Nations Shellfish Aquaculture Training Strategy at Malaspina University-College, British Columbia

Linda D. Hiemstra

In 2002, the British Columbia Ministry of Agriculture, Food and Fisheries funded a 3-year Malaspina University-College project, through a grant from the BC Economic Measures Fund administered by the Treaty Negotiations Office, to develop shellfish culture training for First Nations communities. The purpose of the First Nations Shellfish Aquaculture Training Strategy is to build capacity within First Nations facilitating the development of shellfish aquaculture businesses and assisting the move from a consultant-based to a band-based model. The Strategy consists of three phases: 1) design and develop an overall training framework including inter-institutional accreditation and laddering mechanisms; 2) assess and recommend training program delivery system(s) appropriate and accessible to First Nations people of coastal communities; and 3) develop curricula to address the gaps and shortcomings of current training and training delivery systems. To date, 17 courses have been completed or are under development, with many deliveries throughout the province. This paper describes the project, the consultative process, the training courses, and the course materials.

Background

The Fisheries and Aquaculture Extension Program, at Malaspina University-College, Nanaimo, British Columbia, specializes in developing, coordinating and delivering customized educational programs and courses to the fisheries and aquaculture industries. The extension program provides training courses, curriculum development, and workshop and conference organization and management through scheduled deliveries, contract educational projects, and training partnerships.

There are 27,200 km of coastline in British Columbia, including islands, and while not all the coastline is available or appropriate for shellfish culture, vast potential still exists for shellfish activities. This potential has not been completely realized by members of coastal communities, which are often isolated with small populations dominantly or completely inhabited by aboriginal people.

Aboriginal shellfish culture projects have the potential to provide growth in the BC shellfish culture industry, which in turn will enhance the economy of the province. Shellfish culture may also support a more viable economy in coastal communities by providing employment and opportunities for self-employment. This is especially important with the recent reduction in employment in the commercial fishing and forestry industries. Along with a high degree of potential, there is also a high degree of interest by First Nation individuals and communities

in developing shellfish aquaculture projects.

First Nations Strategy for Shellfish Aquaculture Training

The First Nations Strategy for Shellfish Aquaculture Training (FNSAT) is a 3-year project initiated jointly by the Centre for Shellfish Research and the Fisheries and Aquaculture Extension Program at Malaspina University-College, Nanaimo, British Columbia. The project started in 2002 and was funded for 3 years by the Economic Measures Fund (BC Treaty Negotiations Office), via the BC Ministry of Agriculture, Food and Fisheries. The purpose of FNSAT is to build shellfish culture capacity within aboriginal peoples of British Columbia, allowing them to assume control over developing shellfish aquaculture businesses and move from a consultant-based model of development to a band- or community-based model creating employment and economic benefit for their community. To accomplish this, a standardized training program, based on industry skill levels, that utilizes the regional education institutes as well the experts who have been working with First Nations as consultants, needed to be developed.

Figure 1
Manila Clam Seeding: Enhancing Productivity Course.

The FNSAT project has three components: 1) design and development of an overall training framework, including inter-institutional accreditation and laddering mechanisms; 2) assessment of current shellfish aquaculture training programs and delivery systems appropriate and accessible to aboriginal people of coastal communities; and 3) development of curricula to address the gaps and shortcomings of current training and delivery systems. The laddering of courses into existing diploma and degree programs was deemed important as it provides manageable intermediate steps that make higher levels of education more accessible to capable and willing students. Benefits are to be gained by offering upward and lateral mobility for students through the post-secondary education system via the FNSAT training framework.

This paper focuses on the development of training courses and materials to address the gaps and shortcomings identified in the assessment of current training programs and delivery systems.

Figure 2
Bearch Survey for Growers Course.

Consultative Process

All FNSAT work was undertaken in consultation with representatives of aboriginal coastal communities, representatives of the shellfish aquaculture industry, educational experts, representatives of government agencies and industry associations, as well as consultants. Regional meetings were conducted to ensure area-specific needs were documented and incorporated into the training framework. The consultative process was overseen and directed by the FNSAT Advisory Committee, which has representation from all stakeholders.

Training Courses

With guidance from the FNSAT Advisory Committee, regional First Nations representatives and industry representatives, 37 shellfish aquaculture training courses were identified as being required to support development of shellfish aquaculture projects. Of these, 17 courses were recognized as being urgent and were supported under the initial funding.

The training requirements were categorized into four groups and the courses developed initially were purposely from all categories. The foundation and general interest category includes courses that cover broad subject areas. The general technical courses provide general information on technical subjects. Both of these groups of courses are good introductions for those who do not have much shellfish culture experience. General managerial courses are for the supervisor or project manager who has some shellfish culture experience but requires training in specific areas. The specialist or species/sector courses provide highly detailed and comprehensive information on a defined subject and are suitable for those who have general shellfish culture experience and now have specialized responsibilities.

Foundation and General Interest Courses

1. **Collaborative Shellfish Culture for Communities and Other Groups—**introduction to shellfish aquaculture and business development in the context of a community (5 days).
2. **General Workplace Safety and Skills—**overview of safety issues and safe working techniques specific to the shellfish culture environment (5 days).
3. **Shellfish Harvesting, Processing and Food Safety—**provides information needed to harvest and prepare product for processing according to food safety practices in the BC shellfish industry (5 days).
4. **Environmental Management for Shellfish Aquaculture—**focuses on intertidal stewardship, wildlife and farm interactions, and building a plan for long-term environmental monitoring (5 days).
5. **Shellfish Culture Resource Package—**a self-contained presentation, including materials for distribution, that outlines the possible application of shellfish aquaculture to a community.

General Technical Courses

6. **Water Quality Monitoring—**covers fecal coliform, biotoxins and viruses, pollution sources, sampling methods, and monitoring strategies (2 days).
7. **Northwest Shellfish Culture Tour—**visits to production sites of shell-

fish aquaculture companies to learn first-hand successful and innovative techniques (3 days).

General Managerial Courses

8. **Shellfish Tenure Application Process in B**C—provides information on site selection, regulatory agencies and their requirements, and the application process (2 days).
9. **Federal Permitting for Tenure Application in BC**—provides information for tenure applicanats on the requirements of the Navigable Waters Act and the Canadian Environmental Assessment Act (1 day).
10. **Shellfish Products and Marketing**—provides an overview of the knowledge and skills required to make logical and appropriate decisions about products to grow, develop and market (5 days).
11. **Overview of Starting and Operating a Shellfish Aquaculture Business**—provides thorough understanding and skills to start and operate a shellfish aquaculture business in BC (5 days).
12. **Shellfish Growout Systems**—provides information for the technician or crew supervisor who requires a thorough understanding of the various types of shellfish grow-out systems used in the BC industry (5 days).

Specialist Courses

13. **Shellfish Nursery Systems**—covers larval biology, suspended and intertidal systems, design and construction, new species being cultured and integration of nursery systems with growout systems (5 days).
14. **Clam Beach Survey: Field Methods**— presents the survey method requirements of Fisheries and Oceans Canada for depuration harvest (2 days).
15. **Clam Beach Survey: Data Analysis**—provides techniques and data analysis programs required to prepare a report for Fisheries and Oceans Canada for depuration harvest (3 days).
16. **Manila Clam Seeding: Enhancing Productivity**—program focuses on ecology and biology of beach culture, production planning, water quality, seeding, and business planning (10 days).
17. **Beach Survey for Growers**—directed study of information required for growers to evaluate biomass and growth of a clam beach (3 days).

All courses, except one, are a mix of field exercises and classroom instruction. All courses have technical and practical exercises integrated with lectures and discussion activities with a maxi-

Figure 3
Beach Survey: Data Analysis Course.

Figure 4
Collaborative Shellfish Culture for Communities and Other Groups Course.

mum of 2 hours of lecture punctuated with a site tour, field or lab exercise. Participants are encouraged to participate through discussions, providing their unique experiences and knowledge for the benefit of the whole class.

Course Materials

A manual has been developed for each course which provides the participants with the detailed technical information covered in the course. The manuals have been designed to be used as an ongoing reference in the workplace and to be of value to the shellfish project. Participant manuals also include a glossary of terms, references, contact list, equipment suppliers, government regulations and other information that may be required for the student to meet their workplace responsibilities.

The instructor needs to be prepared for a variety of situations. Courses are delivered at the Malaspina University-College campus in Nanaimo or in any of the many remote coastal communities of BC. Each delivery is unique, since all of the courses have field components and have to work with the available low tides and weather restrictions. Also if the course is held in a community, local events often take precedence over training. An Instructor Guide has been developed for each course to assist the instructor with the delivery of the course material, the preparation of the learning environment, and the management of an adult class. The guide contains information on adult learning styles, responsibilities of the instructor, "to do" lists for 1 month and just prior to the course, and an instructor itinerary which includes information on field sites and activities. It also includes a section of additional technical information and references to assist in providing the most current and comprehensive information. This information may include general publications, scientific publications, industry newsletters, information on government websites, tide tables, maps of harvestable areas, information on the local community and local shellfish activities. The guide also includes an electronic PowerPoint presentation of the course material. The presentation is complete with speaker notes that emphasize the important points and ensure the course delivery flows in the most appropriate manner.

Figure 5
Environmental Monitoring Course.

Many courses include an in-class video developed as a tool to depict certain aspects of shellfish culture, such as

underwater survey techniques and explanations of complicated field methods. Other materials provided to the course participant for use during the class and in the workplace include concise, waterproof field versions of methods and procedures, and CDs containing data analysis programs.

All courses have written exercises and knowledge evaluations that can be delivered orally if required. The exercises are designed to engage the course participant in the activity and to allow the instructor to evaluate the participant's level of knowledge. The knowledge evaluation is most often "open book", with the participant using the manual as a reference tool. The performance of each course participant is evaluated through attendance, participation, and the marks from the exercises and knowledge evaluations.

Each student is provided with a course evaluation to provide a personal assessment of the training. Most participants take the time to complete the evaluation, which provides a critique of the FNSAT program through a series of questions on the instructional methods, appropriateness of the course content and delivery mechanism. The evaluation also requests information on the training requirements of each participant. This information is then used to modify the training and can also be collated into community or regional requirements to be used for preparing future educational programs.

Course Delivery

In 2003 and 2004, 21 FNSAT courses were delivered at Malaspina University-College in Nanaimo or on-site in coastal BC communities. One hundred and sixty-six course participants have been provided with technical training pertinent to their shellfish culture projects. These courses have also provided opportunities for further education for many members of First Nations coastal communities.

Conclusion

The goal of the First Nations Shellfish Aquaculture Training program at Malaspina University-College is to support the emerging First Nation's shellfish culture industry by providing training that is appropriate to developing shellfish culture businesses. The FNSAT program provides a gateway for further education and advancement opportunities that may not otherwise be available to people from remote communities. Providing training that is flexible, sensitive to cultural issues, and appropriate to the needs of aboriginal coastal communities is essential to achieving the FNSAT goal. However, the long term success of this program is due, in a large part, to the initial and ongoing consultation process, especially in the development of training topics and the preparation and revision of course materials to ensure the information is appropriate to the requirements of First Nation's shellfish aquaculture objectives.

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The photos used in this publication are of students participating in First Nations Shellfish Aquaculture Training program courses. Photos were taken by Tim DeJager, Anne Bonvegna, and Linda Hiemstra.

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Development of the Eskasoni Oyster Farm in the Bras d'Or Lakes: Experience Gained, Lessons Learned

Allison McIsaac

In the 1970s, the Eskasoni First Nation operated Crane Cove Oyster Farm. Although the farm was well funded by the government, it ceased operating within a few years after it tried to expand too rapidly. It also suffered from poor management which paid little attention to the traditional knowledge of the Mi'kmaq workers. Interest in oyster culture remained strong, however, and in the 1990s a research and development project was initiated. The project was a success and within a few years had set a goal of producing one million oysters per year. Equipment was purchased, rearing trays were constructed, staff were trained, and a processing facility was built. The project was progressing well until 2002 when disease MSX struck, causing significant losses. The focus of the project is currently on studying the disease problem, but the goal is to return to oyster farming.

Introduction

The First Nation community of Eskasoni, located on the shore of the Bras d'Or Lakes, Cape Breton has had a long history of involvement in the aquaculture industry. In the 1970s, Eskasoni was home to Crane Cove Oyster Farm, a large-scale operation that collected oyster spat and placed the seed on the bottom for grow out. The operation was well funded by the government, but the farm tried to become too large too fast. Non-native managers lacked expertise in the field and paid little attention to the traditional and local knowledge of the Mi'kmaq workers when selecting spat collection sites. For these and other reasons, Crane Cove Oyster Farm did not reach its potential and ceased operating.

Interest in the oyster remained strong, with community members actively participating in both the commercial wild harvest and the food fishery, while applying for and receiving leases, as well as opening an oyster packaging plant and brokerage. Those involved in the Crane Cove Oyster Farm believed that oyster culture in the

Figure 1
Promotional photo from the early 1970s for the Crane Cove Oyster Farm featuring the late Chief Dan K. Stevens. [photographer unknown]

Figure 2
Materials used in the oyster spat collector trials in 1994. Top: plastic harp. Center right: plastic mesh (snow fencing). Center left: wood veneer rings. Bottom: smaller mesh Vexar® collector after spatfall. [EFWC photos]

Figure 3
Wooden tray damaged by shipworm. [EFWC photo]

Bras d'Or Lakes could be successful.

Renewed Development of Shellfish Aquaculture

In 1994, Eskasoni Fish & Wildlife Commission (EFWC)—then called the Aboriginal Fisheries Services—began a research project at the Department of Fisheries and Oceans Oyster Research Station in Gillis Cove, the best known spat collection area in the Bras d'Or Lakes.

The focus of the project was to identify a suitable oyster spat collector for the Bras d'Or Lakes. Traditional spat gear including scallop shells and cement-dipped Chinese hats and plastic harps were compared with other, easily obtained materials such as wood veneer rings, large and small mesh (without cement) and rope anchored with bolts (Fig. 2).

All collectors were deployed during spatfall, typically the last 2 weeks of July, and the efficacy of each collector was determined. This work was summarized in a technical report co-authored by our Senior Biologist Shelley Denny and published in 2003.[(1)] The results illustrated that plastic (Vexar®) mesh was the most economical material because collectors could be custom made to suit a collection area, they were easy to set out and clean, and spat could be easily removed. The next step in the development of the culture methods was to identify an appropriate nursery growout method.

Studies were designed to compare bottom culture with various types of tray designs. Trays were constructed of wood, PVC pipe with Vexar® sides and bottoms, and vinyl coated wire mesh with Vexar® inserts. It was found the vinyl-coated wire provided the most flexibility and versatility in design and use as well as being durable. The wooden trays were destroyed by shipworm (Fig. 3) and the PVC units were affected by excess water from storm surges as well as freezing and thawing. After many prototypes, we developed a versatile tray that could withstand the elements and pests such as the shipworm (Fig. 4).

Figure 4
Basic design of vinyl coated wire tray with insert. Trays can be stacked then suspended or placed on bottom. [EFWC photo]

From 1994 to 1999 the operation was supported by the Eskasoni Band Council as well as various funding opportunities of the federal and provincial government such as the Nova Scotia Links Program, the Science and Technology Youth Internship Program of the Department of Fisheries and Oceans, Nova Scotia Youth Corps, Enterprise Cape Breton Corporation and Aborigi-

nal Business Canada, to name a few. During this time, we focused on learning and understanding the life cycle of the oyster, as well as studying growth rate and survivorship using different growout systems.

By 2000, having the technical aspect of the operation well in-hand, we had collected enough oysters to focus on the commercial aspects of the oyster farm. After relying on project-based funding for 6 years, the Eskasoni Band invested a portion of the funds received from the government as a result of the Marshall Decision and began training individual Band members interested in privately pursuing aquaculture ventures. This funding allowed us to purchase time- saving equipment such as a large workboat and construct equipment such as trays that would potentially produce 1 million oysters per year. A small processing facility constructed in 1998 became a federally registered plant in 2002 with staff being trained in quality management and quality assurance (Fig. 5).

Figure 5
Jason Francis (left) and Patrick Joe grading oysters while undergoing quality management and assurance training.
[EFWC photo]

Our next step was to develop marketing experience and build a name for our product.

Present Situation and Future Steps

Unfortunately, the oyster disease MSX (multi-nucleated sphere X) was discovered in eastern Canada in the fall 2002. Marketing attempts were postponed as significant losses in oyster stock were experienced. Our focus is now on studying the problem through research and development projects with the goal of eventually returning to our oyster operations. It will then be essential for us to develop or hire business expertise to complement our technical abilities.

Acknowledgments

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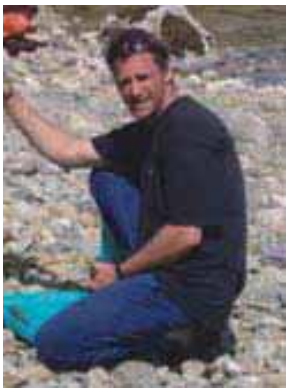

Creating Opportunity, Realizing Success —The Kitasoo/Xaixais First Nation

Larry D. Greba

In the late 1980s the Kitasoo/Xaixais community began farming salmon as an alternative to depending on dwindling commercial salmon runs. The community designed and built a 100-ton salmon farm that had significant commercial success. A business decision was made a few years later to look for a partner and in 1998 an agreement was signed with Marine Harvest Canada (NUTRECO). An important factor in the decision to work with this company was their emphasis on social, economic and environmental sustainability. Three salmon culture sites are currently in commercial operation and the Kitasoo community has primary control of the enterprise. To date, the partnership has resulted in 55 full-time jobs that provide $1.4 million in wages annually (approx. $14,000 per household).

Introduction

The Kitasoo/Xaixais community, in the wake of staggering unemployment resulting from a failing wild salmon fishery, began to rebuild its economy in the 1990s on a foundation of aquaculture. Through perseverance and hard work, a stable aquaculture industry has emerged that now provides close to 50% of the direct jobs in Klemtu. Several key factors have led to the success of Kitasoo.

The Community

Klemtu is a remote central-coast First Nations community located approximately 600 km north of Vancouver. The community of 400 is accessible only by boat and plane. The economy and the culture of the people have always been oriented to the sea. The traditional territory of the Kitasoo/Xaixais people is approximately 10,000 square kilometers and consists of a myriad of islands and waterways within which they are the only human inhabitants.

The community of 100 homes is modern and self-sufficient with its own hydro power generating station, a K-12 school system, a fish processing plant, salmon hatchery, sawmill, general store and fuel station.

Figure 1
The Kitasoo/Xaixais territory on the central coast of British Columbia.

The Transition from Fishing to Farming

Like many First Nation communities in British Columbia, wild salmon was the lifeblood of Klemtu. For centuries, local salmon runs provided food for the people, and since the 1920s provided commercial opportunities. The wild fishery peaked in the 1950s and 1960s , but since

then stocks have dwindled to a mere shadow of their former strength, barely providing enough for local food needs. From 1987 to 2000 the community went from having 15 commercial salmon vessels to none, virtually shutting down the local processing facility.

Figure 2
Early salmon farm in Klemtu.

The First Commercial Fish Farm

In the late 1980s the community began to pursue salmon farming as an option to wild harvesting. The Band sold their large commercial salmon vessel and fishing license and developed a 100-ton salmon farm. Klemtu designed and built its own farm, and processed and marketed its own product. The enterprise began on a pilot scale with a significant emphasis on training.

Despite significant commercial success, by 1993 the writing was on the wall: "go big or get out". Consolidation was occurring in the industry as prices for salmon began to drop as production increased worldwide. .

The Second Stage of Aquaculture Development: Partnership

Kitasoo made a business decision to wind down its own aquaculture operations and look for a business partner. A significant amount of time was spent working with the whole community. Environmental groups were actively engaged in negative campaigning against fish farming and it was critical that the community have a reliable basis and sound principles on which to guide the partnership agreement process.

Four years and 3 companies later, Kitasoo emerged in 1998 with an agreement with Marine Harvest Canada (NUTRECO) to work in partnership to develop salmon farming using a development model based on sustainability that worked for both parties. An important factor in the decision to enter into the agreement with Marine Harvest was their commitment to a "triple bottom line", placing equal emphasis on social, economic and environmental sustainability.

Figure 3
Today's operational fish farm in the Kitasoo/ Xaixais territory.

The agreement gave Kitasoo control over the development of the aquaculture sites. It provided assurances to the Kitasoo that environmental protection would be a principle that would continue to be upheld. The agreement also made provision for a substantial

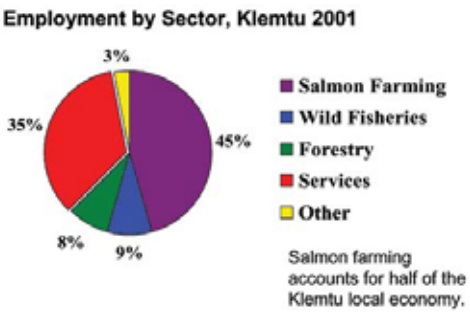

Figure 4
Employment by sector in Klemtu.

level of local training and employment opportunities for members of the community. Training material developed by North Island College was adapted to suit the specific needs of community members.

By 2004 the partnership has resulted in the availability of five sites, three of which are currently in commercial operation. The tenures are held by the Kitasoo community, providing longterm access to farm sites. Marine Harvest Canada has retained primary business control of the enterprise.

In addition, a processing plant in the community is integrated with the fish farming operation. It produces value-added products, providing additional direct jobs and economic spin-offs. The employment goal of the partnership is to create one full-time job for each of the 100 households in the community. To date, 55 full-time jobs have been created, resulting in $1.4 million in annual wages for the community. This is equivalent to $14,000 per household in Klemtu, and is of enormous economic and social benefit to this remote community

Ensuring Sustainability

Kitasoo has not sacrificed the protection of the environment for the sake of jobs and economic development. On the contrary, a high standard of environmental protection has been integral to the success of the partnership. The model for sustainability is based on continual environmental monitoring by an independent scientific team coordinated and deployed by Kitasoo. This team is working in conjunction with universities, government and other professional associations in British Columbia.

For example, baseline dive surveys to assess biodiversity were done at a farm (Localsh Bay) and control site (Myers Pass) prior to establishment of the farm. Subsequent surveys were done in the summer of 2001 after the farm had been in operation. Ten invertebrate phyla were observed in both the baseline and post-farming surveys. However, an increase in the number of invertebrate families and species were observed at the sites after farming had commenced.

Figure 5
Fish processing in Klemtu.

Kitasoo has a 10 to 15 year time horizon to review, evaluate and potentially grow the industry.

Keys to Success

While there have been many steps along the way and much trial and error, several key factors have led to Kitasoo's success. Here are the top 10.

- COMMUNITY SUPPORT— Without this you are dead in the water. Maybe not today, but it will catch up to you.

- JUST GET STARTED—Everything must have a start, but not an end.
- SEEK OUT THE RIGHT PARTNERS—This can take a significant amount of time, but seeking the right partner is critical.
- RECOGNIZE YOUR EQUITY—Cash is not the only form of equity in a business arrangement. Sites, infrastructure and labor pools are all community assets with significant value.
- CLARIFY YOUR NEEDS AND GOALS—As a community, recognize the primary goals and objectives of the aquaculture business. These may include profit, jobs, environmental sustainability, peripheral businesses, maintaining territorial control, and capacity building.
- RECOGNIZE THE NEEDS OF YOUR PARTNER—What motivates your partner? Profit, profit, profit, and usually more profit. Recognize, accept and plan for their success and allow them to do what they do best. All will succeed.
- EDUCATE YOUR COMMUNITY—Continuously update, educate and include the community in major decisions related to the business, whether they be good or bad decisions. Good information breeds wise decisions.
- KEEP POLITICS AWAY FROM BUSINESS—Political interference is a sure-fire way to confuse and cripple a business. Develop a stable board of directors (preferably answerable to the public, not to politicians) from inside and outside the community to look after your interests. There is no substitute for good management and leadership.
- NURTURE THE BUSINESS—Constantly monitor the business and get involved in the decisions. If possible have a person working one-quarter or half-time monitoring the business and improving relations and communications between partners, local governments, and other groups such as ENGOs.
- HAVE A VISION AND DON'T BE DISTRACTED—Strong leaders have a realistic vision of what they want. Stay focused on your original objectives. Don't get greedy by the success of others. Don't be distracted by outside pressures.

Figure 6
Village of Klemtu.

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More information on Kitassoo can be found at www.kitasoo. org.

A New Era of Self-Sufficiency and Prosperity: The Future of Aboriginal Aquaculture in Canada

Richard Harry

The Aboriginal Aquaculture Association (AAA) is a non-profit society with the mandate to assist in the development of aquaculture by First Nations, and to promote aquaculture that respects and supports First Nation communities, culture and values. Its vision is "First Nations working together to share knowledge and build strength".

Introduction

Aquaculture is a new wave that has approached the shores of First Nation lands. It represents an exciting opportunity to re-build First Nation economies and can help propel them into a new era of self-sufficiency and prosperity. The challenge lies in catching this wave in such a way that it carries communities towards a sustainable future.

There are many obstacles that need to be overcome before First Nations can fully take advantage of the aquaculture opportunity. These include overcoming challenges in the area of environmental management, accessing financing and capital, accessing expertise and technology, developing and accessing markets, and finding ways to reduce and manage the inherent risks in aquaculture businesses. Meeting these challenges successfully is much more likely if First Nations work together in taking advantage of this opportunity.

"The aquaculture industry . . . has significant potential for restoring coastal First Nations to thriving, self-sustaining communities."

The Aboriginal Aquaculture Association (AAA) was formed to bring together people from First Nations, the aquaculture industry, and the government, and unite them in a common purpose focused on building prosperity in First Nations through aquaculture.

The Opportunity of Aquaculture

> "When I was on the band council we started looking into fish farming in 1985 right up to 1989. We got involved with a fish farm that existed in Kyuquot. It really worked out for us because we decided we would be part of the solution rather than be the problem. The fish farm is directly impacting the community financially and socially. I would say it has been really positive. I have worked as the band chief . . . in Kyuquot for about twenty years. Whenever there is an opportunity in terms of employment it makes a real positive impact in the community. . . . A person works and he puts in his time working, it really makes a difference in his life and in his family, which impacts the community ."
>
> —From an interview with Richard Leo, former Chief of the Kyuquot First Nation

The aquaculture industry is bringing opportunity to First Nation communities. It has significant potential for restoring coastal First Nations to thriving, self-sustaining communities.

Aquaculture has been the fastest growing sector of the BC economy, growing by 5000% between 1984 and 2002. During this same period, the over-all BC economy grew by 75% and the tourism industry only grew by 47% during that time. In 2002, the BC aquaculture industry generated revenues of $304 million and provided over 2000 production and fish processing jobs.

Opportunities exist in salmon farming and shellfish culture, and new opportunities will arise as other species begin to be cultured. Salmon farming accounts for about 90% of all aquaculture in BC. The industry produces over 40,000 tonnes of salmon each year. About 1800 direct full-time jobs and 2000 indirect jobs are created by the industry in coastal communities. In the years to come, salmon farming could become a $1 billion industry, creating 20,000 new jobs. Manila clams and oysters account for most of the other 10% of the aquaculture industry. The shellfish industry is poised for growth and this will come from more intensive culture of shellfish, as well as from the addition of new tenures. It has been estimated that clam and oyster production could increase by 10-fold over a decade, becoming a $100 million industry and adding 1000 production jobs.

The small scallop industry has potential for great expansion, with large areas of suitable habitat available. In addition, there is a very strong market for scallop products. Mussels are just beginning to be cultured in BC on a commercial scale. While there are many technological challenges to growing mussels, these are being overcome and mussel culture may become a major West Coast industry as it has on the East Coast of Canada.

New species for culture represent great promise for the future of First Nations involved in the industry. Presently sablefish and geoduck are in the early stages of commercial production. Species that have demonstrated strong potential for commercial development in the near future include sea urchins, abalone, sea cucumbers and kelp.

Aboriginal Aquaculture Association logos

The Challenges of Aquaculture

First Nations planning to be involved in the aquaculture industry face a number of critical challenges. These challenges occur in the areas of environmental management, access to start-up and operating capital, access to technical expertise, market development for cultured products, and risk management. The AAA can help its members overcome these obstacles and face these challenges.

Harvesting farmed salmon

Environmental challenges

Fish and shellfish farms interact directly with the environment in which they operate. These interactions are often complex and difficult to manage properly. The aquaculture industry continues to monitor these interactions and improve environmental management. The perception that aquaculture cannot be done in a manner that protects the natural environment creates a major barrier to First Nations becoming involved in an industry that represents an opportunity to build sustainable economies.

The AAA can play a unique and important role in the development of aquaculture by First Nations and in First Nation territories. It will be able to provide accurate information to First Nations and the public on the environmental issues relating to aquaculture. It will enable First Nations to participate in research and environmental monitoring programs before and during farm operations. A First Nation environmental certification program is also a possibility. Finally, the AAA can promote development partnerships with industry, which will give First Nations a say in site location and operational practices of the farms.

> "I don't think there's one Indian band anywhere that wants to get into something that's going to pollute, destroy, or do anything harmful to the environment just for the sake of jobs . . ."
>
> — Ben Robinson, Economic Development Officer, Kitasoo/Xai'Xais Fist Nation

> "We've had this [farm] for how long now? Our people still dig clams there. I eat shrimp every week. So if it is done properly, if it is planned properly, if the First Nation people have a major input in the siting. . . then it can work. . . . It has happened here."
>
> — Percy Starr, Councillor, Kitasoo/Xai'Xais First Nation

Investment and financing challenges

First Nations face unique challenges in accessing capital to support the development of aquaculture. Business planning and developing partnerships with industry are areas where the AAA can assist its First Nation members. This can be done through collectively approaching potential investment partners, assisting in developing and negotiating First Nation and industry partnerships and agreements, and lobbying government to strengthen its support for First Nation aquaculture development. In addition, it can help put aquaculture on a more secure footing by lobbying for positive regulatory change.

Technical challenges

Aquaculture is an evolving industry undergoing rapid technological change. Global factors relating to costs of production and market conditions mean that aquaculture in Canada must be at the forefront of technical developments in order to remain competitive. The AAA can assist its members in this area through networking and information exchange amongst its members and industry technical experts. Improving access to technical training and assisting in the further development of industry training programs are areas where the AAA can be of service to First Nations.

Market development challenges

Market development is a critical activity to ensure that the aquaculture industry remains viable and provides a long-term opportunity for First Nations. Facilitating marketing partnerships and cooperatives is one way in which the AAA can increase the effectiveness of marketing initiatives of First Nation aquaculture businesses. Involvement in quality certification programs will help members achieve these standards in their own finfish or shellfish production systems.

Risk challenges

Aquaculture represents a relatively high risk to both new entrants and established businesses in the industry. The AAA is working with industry to manage and reduce risk to First Nations who become involved in aquaculture. One way of achieving this is through increased involvement of First Nations in research and development. Networking and sharing of information is also a risk management strategy that can be implemented through membership in the AAA. Improving access to training programs will also be important in long-term risk management for First Nation aquaculture businesses.

Shellfish harvest

Mission, Vision and Organization of the Aboriginal Aquaculture Association

The mission of the Aboriginal Aquaculture Association is:

- To promote and assist the development of First Nation aquaculture, and
- To promote the development of aquaculture that respects and supports First Nation communities, culture, and values.

Its vision is "First Nations working together to share knowledge and build strength". The AAA is a non-profit society. Voting membership is open to:

- First Nations,
- First Nation organizations and companies, and
- First Nation individuals.

Non-first nation organizations, companies or individuals can also become members of the AAA. They are supporting, non-voting members.

Recognizing that some First Nations are interested in or support only certain types of aquaculture, the Association is organized into three chapters:

- Salmon aquaculture,
- Non-salmon finfish aquaculture, and
- Shellfish, invertebrate and marine plant aquaculture.

Members have the option of joining one or two chapters, or choosing general membership, which includes involvement in all three chapters.

Securing funding for its operation is the first challenge facing the AAA. Recognizing that many First Nations who are interested in aquaculture do not have the means or resources to directly fund the Association, the AAA believes that membership should be open to all without cost. To help it get on its feet, the AAA will initially pursue funding support from government and through donations from industry. In the future, the Association may be able to develop activities that will generate revenues to support its mission.

Activities of the Aboriginal Aquaculture Association

- The AAA will hold regular general membership meetings.The fequency of the meetings will be determined by the needs of the membership. Additional special seminars focusing on a topic of particular interest to the members will also be held. For example, a shellfish marketing workshop is currently being planned.

- The AAA is interested in developing aquaculture programs for its members that will ensure that First Nation aquaculture businesses will attain the highest environmental and quality standards.
- The AAA is involved in the development of a First Nation farm certification program. Environmental monitoring programs are already implemented in areas where finfish and shellfish farms are operating. Many of these will involve industry partners. These may be specifically related to research and development projects, or form part of the on-going environmental monitoring of operating farms. Investment and market programs have also been initiated. For example, a study to attract Chinese aquaculture partnerships is currently underway.

Future initiatives may include such things as:

- A salmon farming training fund and apprenticeship program,
- Joint public relations program with the aquaculture industry,
- Developing a marketing cooperative,
- Developing new species for culture, and
- Strengthening environmental monitoring programs.

Conclusion

The Aboriginal Aquaculture Association can become a focal point for First Nations to work together to develop new community economies based on sustainable, responsible aquaculture. However, its success will depend directly on getting involved in the AAA by becoming members and participating in the activities and initiatives that are undertaken.

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