OVERCOMING BARRIERS IN THE SCALLOP AQUACULTURE INDUSTRY

A FIRST NATIONS PERSPECTIVE

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Photo Credit: Jeff Svanhill

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EXECUTIVE SUMMARY

There are an increasing number of First Nations adopting a more coordinated approach to building sustainable economies in First Nations communities across British Columbia. Productive and equitable partnerships, successful businesses and good jobs are crucial to improving the quality of life in communities. Many First Nations are starting to realize the true economic value of regional and tribal partnerships, specifically when building sustainable economies rooted in traditional stewardship practices.

This report builds on past ISIS projects focused on First Nations participation in the scallop and clam aquaculture industries on North Vancouver Island and on new ISIS research that examined ways to overcome the barriers to scallop aquaculture for the Nanwakolas Council and its member First Nations. Two significant barriers to successful scallop operations are securing reliable scallop seed and planning for the increased risks of ocean acidification. This report highlights the great potential for collaboration between Coastal First Nations on a number of points along the value chain, including research and development, labour capacity, and marketing. Collaboration could provide economies of scale, cost savings, reduced risk (or risk diversification) and create greater product awareness for groups of First Nations. Specifically, the report contributes to the body of applied research focused on the ever-present concerns about reliable access to shellfish seed in BC and the risk of ocean acidification threatening the shellfish aquaculture industry. The report aims to provide a current and succinct account, for First Nations, of the opportunities and challenges facing the scallop aquaculture industry.

INTRODUCTION

Shellfish aquaculture has long been intimately aligned with coastal First Nations culture. For the past few years, several First Nations on northern Vancouver Island and adjacent south central coastal areas of BC have worked in conjunction with ISIS to examine aspects of the shellfish aquaculture industry. Scallop and clam aquaculture have been a particular focus of past ISIS projects and one of the ever-present concerns has been the issue of reliable access to shellfish seed and the risk of ocean acidification.

Well aware of the risk associated with the scallop aquaculture business, coastal First Nations continue to engage the industry in a prudent, research-led approach. The crucial ways to alleviate some of this risk will involve partnering with academia to assist in the development of the industry and finding reliable sources for scallop seed for pilot grow-outs and future commercial development. Additionally, opportunities for collaboration between new First Nations aquaculture companies and established players will need to be considered in order to further diversify risks faced in the industry.

LAYOUT OF THIS REPORT

The first section of this report will begin by outlining the reasons why scallop aquaculture is a good focus for First Nations within north-island traditional territories. Section Two documents the benefits of collaboration amongst First Nations. Section Three provides an overview of funding options for capacity building and project planning. In Section Four, the report concludes with an analysis of potential options for scallop seed supply.

1.0 WHY SCALLOPS?

A previous ISIS strategic report on the scallop industry by Graduate Fellow Kelly Masson validates the potential of shellfish aquaculture for coastal First Nations, determining that scallop aquaculture is a high value industry with excellent growth potential for First Nations.

Various factors support the development of scallop aquaculture. First, the cold waters off the north-east coast of Vancouver Island are not very conducive to more established Vancouver Island cultured species: oyster and Manila clam. Second, the industries for other potential species (i.e. geoduck and cockles) have high barriers to entry. Promising geoduck farmers in the targeted region are having trouble obtaining licenses from the Department of Fisheries and Oceans, and the local cockle industry, which has been identified as having future potential, is currently undeveloped with no hatcheries producing seed.

Scallops seem to be a viable option for coastal First Nations; however, the issue of seed security continues to plague the industry in British Columbia. First Nations recognize this risk and some groups are attempting to address this barrier by exploring new scallop hatchery alternatives.

Figure 1 – Major shellfish species harvested in British Columbia (2011)[1]

SHELLFISH	TONNES HARVESTED	WHOLESALE VALUE	COMMENTS[2]
Oysters (*cultured*)	7,500	$15,000,000	Well established industry on the southern end of Vancouver Island.
Clams (*cultured*)	1,300	$12,700,000	Well established industry with Manila clams (*Tapes philippinaraum*) being the main product.
Scallops & Other (*cultured*)	600	$3,700,000	A scallop aquaculture industry is in development with Island Scallops in Qualicum Beach being the main producer.
Prawns (*wild*)	2,800	$69,500,000	A Spot prawn (*Pandalus platyceros*) fishery is being established in British Columbia by the Cultured Crustacean Company.
Crabs (*wild*)	5,000	$57,000,000	Well established industry with the Dungeness crab being the main species harvested.
Geoducks (*wild*)	1,600	$46,600,000	Since the mid-1990's a potential geoduck culture industry has been researched, but DFO is still taking a very cautious approach involving extensive biological assessments and community consultation.
Sea Cucumbers (*wild*)	1,700	$10,800,000	Wild fishery is restricted to 25% of BC coast. Culture fishery is being considered for multi-trophic aquaculture.
Red Sea Urchins (*wild*)	2,500	$8,500,000	Wild harvesting of red sea urchins is relatively recent. Green sea urchin culture is now being researched.

[1] BC Ministry of Agriculture. (2012). *2011 British Columbia Seafood Industry Year in Review*. Victoria.

[2] BC Shellfish Grower's Association. (n.d.). *Industry Encyclopedia*. Retrieved 04 04, 2013, from BC Shellfish Grower's Association: http://bcsga.ca/about/industry-encyclopedia/

OCEAN ACIDIFICATION RISK

Although the shellfish industry has excellent growth potential along the coast of British Columbia, there is an ever-growing risk of ocean acidification that is threatening to halt any and all shellfish activity (see call out box).

The threat of an increasingly acidic ocean is mainly limited to the hatchery phase in shellfish aquaculture. Low pH water coming into hatcheries interferes with the formation of shellfish larval shells. The interference results in brittle shells and increased mortality. The threat is so great that hatcheries from Oregon to Vancouver Island have experienced 70~80% mortality in recent years.

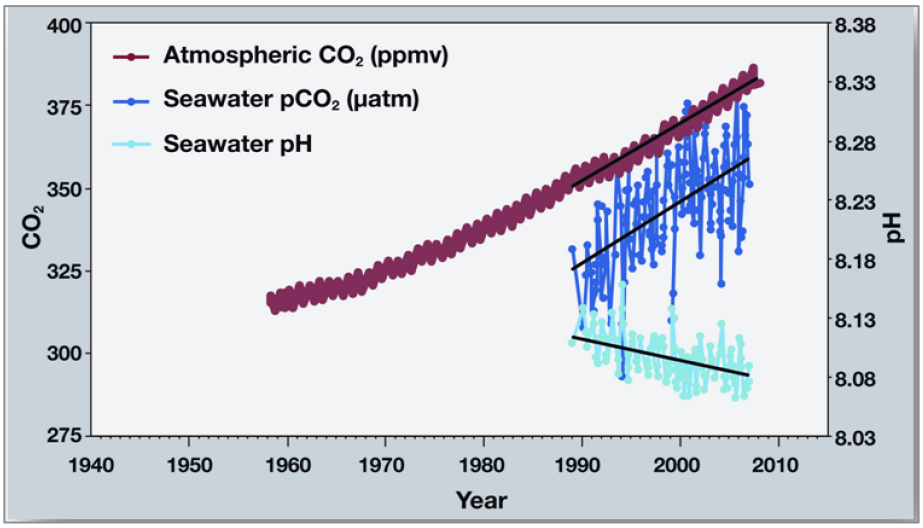
In order to combat the risks presented by ocean acidification, water coming into the hatchery must be monitored and treated. Experiments are being conducted by hatcheries such as Island Scallops and Taylor Shellfish to improve water quality, but no universal solution exists and high mortality rates continue to occur. [3,4]

Ocean acidification occurs naturally from upwelling of anoxic deep ocean water. During the spring season, offshore winds pull the top layer of ocean water away from the shore, which allows corrosive deep ocean water to move to the surface.

Despite the natural occurrence of upwelling, ocean conditions have gotten worse over the years due to human activity. Half of the carbon dioxide that enters the atmosphere is absorbed by the ocean. Once absorbed, carbon dioxide reacts to make the waters more acidic. The current water upwelling from the ocean depths is 30 to 50 years old, and since that time the concentration of atmospheric carbon dioxide has increased. Therefore, due to this time lag, the ocean will continue to acidify for decades.

Engaged First Nations need to factor the risk of ocean acidification into their business planning and understand the increased financial costs this environmental problem creates, especially considering the sensitive nature of scallops.

Figure 2 – Change in Atmospheric CO_2, Seawater pCO_2 and Seawater pH over time in the North Pacific



Courtesy: NOAA - PMEL Carbon Program (Modified after R.A. Feely, Bulletin of the American Meteorological Society, July 2008)

[3] Grossman, E. (2011). *Northwest Oyster Die-offs Show Ocean Acidification Has Arrived*. Yale environment 360. http://e360.yale.edu/feature/northwest_oyster_die-offs_show_ocean_acidification_has_arrived/2466/

[4] Clarke, B. (2012). *An acidic ocean threatens shellfish farms*. The Globe and Mail. http://m.theglobeandmail.com/news/british-columbia/an-acidic-ocean-threatens-shellfish-farms/article2219387/?service=mobile

2.0 COLLABORATION

2.1 COLLABORATION

Collaboration amongst businesses and organizations is helping to drive business performance. Companies willing to collaborate are achieving greater profitability and growth, greater customer satisfaction, greater labour productivity, and greater product quality and innovation.[5] Collaboration is simply defined as the action of working with others to produce something. First Nations with future aquaculture plans and, potentially Nations with current aquaculture operations, have an opportunity to collaborate to produce a sustainable and profitable aquaculture industry.

2.1.1 WHY COLLABORATE?

There are many benefits to collaboration that are particularly important to new business and established businesses. First, a company that collaborates with others is able to increase its size and market power. A fragmented group of companies with similar operations has less influence individually than as a united group. Size and market power have significant benefits when it comes to influencing public policy, bargaining with suppliers and buyers, and marketing.

Increased size and market power assists in achieving a second benefit: cost savings. Cost savings can be made through bulk purchase orders from suppliers and shared promotional expenses. In addition, since information sharing is essential in a collaborative relationship, best practices can be shared between companies in order to ensure efficient operations.

A third benefit of collaboration is risk mitigation. In the shellfish aquaculture industry, risk mitigation is especially important. One well-documented risk facing most First Nations is human capacity. Collaborating on recruitment strategies, training, compensation packages and retention strategies could help alleviate some of the risks associated with lack of human capacity.

Involving established aquaculture companies on Vancouver Island, such as Pentlatch Seafoods, in a collaborative relationship could provide benefits to both the established parties and the up-and-comers. New companies in the collaboration could acquire new technology and skills to streamline operations and accelerate problem solving. Established companies may not see much benefit from the relationship initially; however, in the long term there could be potential to diversify their operations by learning from new companies invested in different species, as well as enhance innovation by partnering in research investments.

In the end, the primary goal of a collaborative relationship between First Nations' aquaculture companies is to have shared prosperity, where each company becomes more profitable and sustainable by working together.

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[5] Frost and Sullivan. (n.d.). *Meetings Around the World: The Impact of Collaboration on Business Performance*. Frost & Sullivan White Paper.

2.1.2 NOTES ON COLLABORATION

When considering collaboration, First Nations' companies will need to first establish clear strategic objectives and outcomes for collaboration. There should be clear benefits to all companies involved with predetermined goals and outcomes. Although all companies should benefit from the relationship, the benefits do not necessarily need to be equal. A strong partner may not see much benefit in the short-term; however, there could be long-term strategic benefits.

Finally, learning from each other and sharing lessons learned is the most important goal. Building the knowledge base of the group by sharing and co-investing in research will benefit all the participating First Nations involved in shellfish aquaculture. [6,7]

[6] O'Marah, K. (2012). *Collaborative Execution: Speed, innovation and profitability*. SCM World. http://www.e2open.com/resource-center/resource/collaborative-execution-speed-innovation-and-profitability/

[7] Hamel, G. et. al. (1989). *Collaborate with you Competitors and Win*. Harvard Business Review January-February 1989, p. 133-139.

3.0 FUNDING OPTIONS

3.1 FUNDING AND FINANCING OPTIONS

This section explores funding and financing options for development opportunities for First Nations interested in skills development and business planning tools for engagement with the scallop aquaculture industry.

3.1.1 FUNDING

Funding is available for training and development, and business planning.

Figure 3 – Funding for Skills Development

PROGRAM	AGENCY	FUNDS AVAILABLE	COMMENTS
Capacity – Direct Support	New Relationship Trust	Up to $25,000 per project or $50,000 per project for groups of three First Nations	Support for capacity building. New funding will be available in April.
Consolidated Revenue Programs	North Vancouver Island Aboriginal Training Society	Case by case	Funding for job development programs and purchase of training programs. Consultation required.
Labour Market Partnership Program	Ministry of Jobs, Tourism and Innovation	Case by case (expenses are reimbursed)	Funding for the development of human resource strategies for communities.
Labour Market Solutions Program	Ministry of Jobs, Tourism and Innovation	Case by case	Graduates of the LMP Program may apply to this program for funding to implement training plans.
Skills Training	Aboriginal Aquaculture Association	Case by case	Federal budget outlined money for First Nations aquaculture training.
Active Measures	First Nations Social Development Society	Case by case	Create long-term permanent solutions to unemployment in First Nation communities.

Figure 4 – Funding for Business Planning

PROGRAM	AGENCY	FUNDS AVAILABLE	COMMENTS
Aboriginal Business Canada Program	Aboriginal Affairs and Northern Development Canada (via Nuu-chah-nulth Economic Development Corporation)	75% of business plan cost 50% of project costs up to $250,000 per band	Support for business planning, start-up, expansion, and marketing.
First Citizens Fund	BC Ministry of Aboriginal Relations and Reconciliation	Business loan up to $75,000	Support the cultural, educational and economic development of Aboriginal people in British Columbia. Requires 10% equity contribution.
Island Coastal Economic Trust		Up to $400,000	Create economic growth on Vancouver Island by funding targeted sectors, such as aquaculture.

3.1.2 FINANCING

VANCITY

Vancity focuses on blended-value financing for community-owned businesses. Blended-value refers to businesses that provide a social or environmental impact while adhering to traditional business accounting and responsibility. Vancity has loan programs that partner with other funding organizations as well as a microfinance division.

Figure 5 – Vancity Financing Programs

PROGRAM	DETAILS
Partnership with Aboriginal Affairs and Northern Development Canada	On reserve lending for community businesses and entrepreneurs. Up to $500,000 is available.
Partnership with Coast Opportunity Funds	Vancity works to leverage Coast Opportunity Funds grants. Vancity is able to multiply Coast Opportunity Funds capital by two or three times.
Resilient Capital	Vancity partners with the Vancouver Foundation to provide financing for social enterprises, including First Nations. Loans between $100,000 and $1,500,000 are available.
Micro Financing	Start-up capital of up to $75,000 for small businesses or to top-up other funding programs.

4.0 SCALLOP SEED SUPPLY OPTIONS

Seed security is one of the biggest issues facing the shellfish aquaculture industry in British Columbia. Oyster and clam seed, which is mainly imported from Washington State, comes from well-established hatcheries that are at constant risk of failure due to various environmental fluctuations. For scallop growers, seed is even scarcer with only two established hatcheries on Vancouver Island supplying seed to the entire province. This section of the report gives an overview of scallop seed procurement and supply options for First Nations.

4.1 SCALLOP SEED PROCUREMENT OVERVIEW

Scallops are cultured on both the east coast and west coast of Canada. On the east coast, the species farmed are the Sea scallop (*Placopecten magellanicus*) and the Northern Bay scallop (*Argopecten irradians irradians*). On the west coast, a hybrid version of the Japanese scallop (*Patinopecten yessoensis*) crossed with the Weathervane scallop (*Patinopecten caurinus*) is primarily farmed. Scallop seed is either procured from the wild or from established hatcheries.

4.1.1 DOMESTIC PROCUREMENT

Scallop growers on the east coast of Canada procure most of their scallop seed from the wild. Mesh bags filled with a nest of plastic strips are suspended in the water in areas with high populations of wild scallops. During late summer or early fall, scallop spawn-producing larvae float in the currents and eventually fall to the sea floor as spat. The suspended mesh bags collect spat as it falls. The spat establish themselves on the plastic strips and begin to filter feed. After approximately one year, the collector bags are removed from the water and the juvenile scallops are transferred to nets or cages for further development.[8]

In contrast, the seas off the west coast of Canada do not host as plentiful a population of wild scallops to recruit larvae from spat falls; hence, scallop seed is procured from hatcheries in British Columbia. Hatchery brood stock is spawned under controlled conditions in seawater filled tanks. The resulting larvae attach to spat bags and are nurtured in containers of recirculating seawater. When larvae reach the size of a spat, they are transferred to a nursery to boost growth. The advantage of hatcheries is that scientists are able to control the breeding process of scallops by manipulating water temperature and other environmental conditions to induce spawning.[9]

[8] (2013). Scallop Culture in Quebec: growing a larger industry. Fisheries and Oceans Canada. http://www.dfo-mpo.gc.ca/science/Publications/article/2007/27-12-2007-eng.htm

[9] BC Shellfish Grower's Association. (n.d.). Scallops. Retrieved 02 28, 2013, from BC Shellfish Grower's Association: http://bcsga.ca/about/industry-encyclopedia/scallops/

4.1.2 INTERNATIONAL PROCUREMENT

A number of scallop species are grown around the world. The species most commonly cultured in the Northern Pacific is the Japanese scallop (*Patinopecten yessoensis)*. The biggest producing countries are China, Japan, Russia, and South Korea.[10]

China's Scallop Industry

With an annual harvest of 1.4 million tonnes of scallops worth $1 billion, China has the world's largest scallop industry. Most scallops are cultured along the coast of the Yellow Sea and Bohai Bay. The three most commonly harvested species are the Chinese Scallop (*Chlamys farreri*), the Japanese Scallop (*Patinopecten yessoensis*), and the Atlantic bay scallop (*Argopecten irradians*). Over 50% of the scallops harvested are *C. farreri*, while *P. yessoensis* and *A. irridians* each represent approximately 20% of scallops cultured.

Figure 10 – Location of scallop aquaculture industry in China

By Kmusser (self-made, based on DCW data.) [CC-BY-SA-2.5 (http://creativecommons.org/licenses/by-sa/2.5)], via Wikimedia Commons

[10] (2013). Cultured Aquatic Species Information Programme: Patinopecten yessoensis. Food and Agriculture Organization of the United Nations. http://www.fao.org/fishery/culturedspecies/Patinopecten_yessoensis/en

Amazingly, China has nearly 10 thousand hatcheries producing scallop seed. High mortality in larvae settlement and metamorphosis is common; hence, the industry is attempting to reduce mortality rates by improving brood stock, feed and water quality.

Additional challenges to the industry in China include inbreeding, environmental pollution and disease. Along with cleaning up the environment, industry researchers have developed new varieties of scallops to try to counteract these challenges. New variants of *C. farreri* and *A. irridians* have been bred to produce higher yields, while a variant of *P. yessoensis* ("Haida Golden Scallop") has been developed to be more disease and stress resistant.[11]

The Haida Golden Scallop was developed by a team of researchers led by Professor Zhenmin Bao at China's Ocean University. Interestingly, the name "Haida" has no relation to the Haida First Nation, but is the Chinese pronunciation of Ocean University. The Haida Golden Scallop has been genetically bred for enhanced carotenoids, which gives the scallop meat an orange colour. The scallop has been successfully cultured and has proven to be more disease and stress resistant than the natural Japanese scallop (*P. yessoensis*).

While there are plenty of opportunities to purchase scallop seed from hatcheries in China, Korea or Japan, local procurement is the only sensible option. Sourcing seed from international markets is not optimal due to the shelf life of scallops. Scallop seed can only survive approximately 24 hours after being removed from a hatchery and put into a nursery. Therefore, the distance of international hatcheries from Vancouver Island may disqualify these hatcheries as a viable option.[12]

While purchasing seed from overseas is not a feasible option, there may be an opportunity to collaborate with experts in China and Korea to learn new technologies and aquaculture techniques. For instance, South Korea is currently experimenting with cockle aquaculture, which could result in both a reliable aquaculture method and the development of a cockle market in Asia.

4.2 LOCAL SUPPLY OPTIONS

To date, there are only two local suppliers of scallop seed in BC: Island Scallops in Qualicum Beach and Wenlian Aquaculture Company in Courtney. Another possible seed supplier in the near future is Coastal Shellfish Corporation in Prince Rupert.

4.2.1 ISLAND SCALLOPS

Island Scallops is the largest scallop seed producer in British Columbia. They have developed the hybrid Pacific Scallop to grow in local waters and view this hybrid scallop as their proprietary product.

[11] Hu, X. (2013 March 24). Professor at the College of Marine Life Sciences, Ocean University of China. (J. Svanhill, Interviewer)
[12] (2013). Seed. BC Shellfish Growers Association. http://bcsga.ca/about/industry-encyclopedia/seed/

Island Scallops sells scallop seed ranging in price from $0.08 to $0.16 per seed. Pearl nets embedded with smaller seed are also sold by Island Scallops at a lower price per unit.[13]

Island Scallops has been a reliable supplier to its own operations and to other commercial scallop growers, namely the We Wai Kai Seafood Corporation on Quadra Island. However, last year Island Scallops experienced severe mortality in their hatchery and were unable to supply the We Wai Kai Seafood Corporation and other growers with seed.[14] This example highlights the problems with the monopolistic market for scallop seed and the need for risk diversification in scallop seed procurement; more than one supplier is needed to ensure reliable annual supply.

4.2.2 WENLIAN AQUACULTURE COMPANY

The Wenlian Aquaculture Company has their hatchery in Courtney. Wenlian produces scallop seed every year and has the capacity to produce seed for other species, such as Manila clams. Wenlian is also involved in the sea cucumber industry, producing seed for free in return for harvested product at the end of the grow-out period. On average, Wenlian sells seed at $0.01 per millimeter, with most growers buying scallop seed at 10 millimeters in length. Scallop seeded is graded by size. A 100% refundable deposit is required for any seed order. In contrast to Island Scallops, Wenlian has not experienced high mortality rates in its hatchery due to ocean acidification. This may be due to the fact that the sea water entering their hatchery is from deep depths (50 metres). Wenlian is currently expanding its operations by building a second hatchery near the south end of Vancouver Island.[15]

4.3 FUTURE SUPPLY OPTIONS

Having only two hatcheries available to supply scallop seed is risky for First Nation scallop operators in BC. A clear example is the high scallop larvae mortality at Island Scallops in 2012 that prevented the We Wai Kai First Nation from getting their regular supply of scallop seed. To diversify this risk, the First Nations will need to look at other innovative options.

4.3.1 COASTAL SHELLFISH CORPORATION[16]

The Coastal Shellfish Corporation is located in Prince Rupert, BC. The company is a fully vertically integrated scallop producer, with a new hatchery completed in 2010. Unfortunately, the hatchery failed to produce scallop seed in its first year of operations. Currently, a new operations team is in place and the company plans to have seed available for the 2014 season. Coastal Shellfish's scallop hatchery was built to supply the company's scallop operations. Sales to outside parties will depend on the capacity of the hatchery and negotiations with potential buyers. In November 2013, Coastal Shellfish will have a better idea of their capacity and the availability of seed for external growers.[17]

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[13] Vernon, L. (2012 August). Controller at Island Scallops. (J. Svanhill, Interviewer)
[14] Saunders, R. (2013 January 25). CEO at Island Scallops. (J. Svanhill, Interviewer)
[15] Yu, A. (2013 March 1). Marketing Representative at WenLian Aquaculture Company. (J. Svanhill, Interviewer)
[16] (Text box reference) Bowman, S. (2013 February 22). CEO at Coastal Shellfish Corporation. (A. John, Interviewer)
[17] Venturini, V. (2013 January). VP Operations at Coastal Shellfish Corporation. (J. Svanhill, Interviewer)