



SCALLOP AQUACULTURE STRATEGIC ROADMAP

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Photo Credit: Kelly Masson

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EXECUTIVE SUMMARY

Many BC coastal First Nations communities are optimistic over the recent expansion of the provincial shellfish aquaculture industry and corresponding business opportunities - and with good reason. If entered into cautiously, shellfish aquaculture has the potential to create lasting social, cultural, and economic benefits for those involved. Building on this enthusiasm, this roadmap document aims to provide First Nations communities with a straightforward picture of what it takes to get involved, starting at the level of a pilot operation.

Beginning at the opportunity identification step, this roadmap takes readers through the steps of assessing the opportunity, planning the operation, and executing the pilot. Special consideration is paid throughout to three key success factors, (1) Timing and Planning, (2) Industry Relationships, and (3) Ongoing Evaluation and Revision. Taking these considerations into account at each step of the process will help Nations overcome common challenges and pitfalls. Successful development of an aquaculture operation also relies on the active guidance and enthusiasm of a committed aquaculture champion – a designated person with the required authority and resources to effectively guide the process.

KEY SUCCESS FACTORS

TIMING AND PLANNING

Without proper planning, communities may find some activities in the business development process require longer time to complete than anticipated, resulting in delays. Aquaculture champions must therefore seek to understand the length of main activities and be aware of any interdependent parts. Although some timing issues are common across the industry (such as the time required for seed procurement), others are less predictable and depend on that community's unique circumstances (such as the amount of time required to develop a governance structure).

INDUSTRY RELATIONSHIPS

A successful aquaculture industry relies on strong partnerships between hatcheries, growers, processors, and industry groups, among others. As such, a key success factor for new aquaculture operations is early identification and engagement with appropriate partners. Because the industry in BC is relatively small, there may also be circumstances where adequate partners or suppliers do not exist. In these situations, champions will need to identify how to fill these gaps early on.

EVALUATION AND REVISION

Throughout the investigation and planning process, the opportunity must be continuously evaluated in light of new findings. Based on this knowledge, communities may need to revise the approach, or in some cases, may decide not to pursue aquaculture in the immediate term to focus on other opportunities.

ROADMAP SUMMARY

PHASE 1: GET READY	
1.1 Identify and Engage Partners, Allies, and External Stakeholders 1.2 Build an Understanding of the Industry 1.3 Assess Fit with Existing Community and Economic Development Strategies 1.4 Take Inventory of Community Resources	The objective of this phase is to gain an understanding of shellfish aquaculture industry fundamentals and determine whether the opportunity warrants more thorough consideration and assessment. Identifying and engaging with community members and applicable industry organizations will help support a realistic understanding of the challenges and opportunities at hand. In addition, a strong understanding of the opportunity will help determine if aquaculture is a good fit with existing community development strategies.
PHASE 2: ASSESS OPPORTUNITY	
2.1 Assess Suitability of Community Assets and Resources 2.2 Identify and Analyze Market Trends and Characteristics Evaluate Financial Feasibility	After establishing a strategic fit with the community, the next step is to assess the opportunity in greater detail and determine the feasibility of going forward with a pilot. This includes assessing the suitability of existing community assets such as traditional lands, and evaluating the fit between local employees and the skills/knowledge required for the job. Underlying market trends are also analyzed in this step to provide an understanding of opportunities for future growth and expansion, as well as to identify potential markets. Financial analysis will be the largest activity of this phase, and will require the champion to compile detailed research and operational estimates.
PHASE 3: PLAN OPERATIONS	
3.1 Develop Shared Goals Based on Community Interests and Values 3.2 Establish Governance and Decision Making Approach 3.3 Secure Necessary Regulatory Approvals 3.4 Determine Seed Procurement Strategy 3.5 Determine Operational Approach 1.5 Develop Processing and Marketing Approach	Building on the previous phase assessment, the champion coordinates comprehensive planning for the pilot in Phase 3. An important part of this phase is internal consultation and planning to ensure business goals are aligned with community goals. In addition, it is important to consider governance and decision-making structures, and ensure they are developed and recorded in a meaningful way. Regulatory approvals are also pursued in this phase, including securing land tenure and shellfish aquaculture licensing. Lastly, this phase includes significant engagement with external partners, including hatcheries, processors, retailers, and suppliers. Potential partners are assessed based on an understanding of key considerations and preliminary agreements are forged.
PHASE 4: EXECUTE PILOT	
4.1 Prepare for Grow-out 4.2 Place Seed 4.3 Maintain Grow-out Operation 1.6 Harvest, Process, and Sell Final Product	Phase 4 is the culmination of all previous phases – the time when the plan is executed and the pilot operation is started. In the preparation step, the champion is tasked with hiring staff and preparing necessary equipment and infrastructure. Next, the seed is placed in the water, where it will remain relatively undisturbed save for periodic grading, defouling and monitoring. Finally, in the last step, the scallops are harvested, processed, and sold in the market. Depending on growth rates and other factors, the pilot can last from 16 to 30 months.

INTRODUCTION

In recent years, a steady stream of new shellfish aquaculture operations have been established on the BC coast, many owned and operated by First Nations groups. Some of these ventures have been successful, and some have encountered significant setbacks. With this in mind, what do First Nations and First Nations organizations with aspirations of aquaculture need to know before jumping into the business?

This roadmap is not the first of its kind - industry groups, governments, and academic institutions have already developed a number of comprehensive resources about the industry (a summary of these resources is provided in Appendix A). Rather than duplicate these valuable resources, the aim of this document is to consolidate the most relevant pieces to provide an overarching look at key tasks and activities involved in developing a scallop aquaculture pilot operation within the context of First Nations communities.¹

AN AQUACULTURE CHAMPION IS THE PERSON WHO WILL GUIDE THE COMMUNITY THROUGH THE STEPS OF EVALUATING AND EXECUTING THE SHELLFISH AQUACULTURE PILOT PROJECT.

Throughout this roadmap, reference is made to an “aquaculture champion”. Who is an aquaculture champion, and what is their role? An aquaculture champion is the person who will guide the community through the steps of evaluating and executing the shellfish aquaculture pilot project. In some communities this will be the economic development coordinator, in others it may fall to a person in a fisheries role. The key is that the champion must have the resources and authority to carry out the planning process. The champion must therefore work closely with community decision makers, whether they be Chief and Council or the Board of the Band Corporation.

KEY SUCCESS FACTORS

Before delving into the details of the roadmap, it is important to highlight three key success factors that should be understood and applied throughout the planning process. An understanding of these factors can help First Nations avoid common pitfalls and setbacks:

- 1) **Timing and Planning:** How long will tasks realistically take to complete, and in what ways are tasks dependent on other the completion of other activities?
- 2) **Industry Relationships:** Is access to required industry partners available in the region? Do the partners meet the needs of the aquaculture business? If not, how can these deficiencies be managed?
- 3) **Evaluation and Revision:** Given what is discovered at each phase of the planning process, is shellfish aquaculture still a promising opportunity for the community? How can learnings from previous activities be incorporated into future activities?

These key success factors will be further detailed in Phase 3 of this roadmap.

¹ This roadmap was developed using the base case of Japanese (Pacific) Scallop production, however, many of the processes and activities will be equally applicable to other species of shellfish.

THE ROADMAP

With the key success factors in mind, this roadmap is organized into four phases:



Phase 1 – Get Ready: The goal of Phase One is for the champion to develop an understanding of the industry at the regional and global levels to inform the planning process. In this step the champion starts to evaluate the current state of the industry and begins building relationships with potential partners and stakeholders.

Get Ready

Phase 2 – Assess Opportunity: In this phase, the champion begins to evaluate the opportunity in greater detail, and will seek to understand the potential for success in light of the internal and external environment. This will include community consultation and engagement, governance planning, regulatory planning, and evaluation of potential partners. An important outcome of this phase is a preliminary financial analysis.

Assess
Opportunity

Phase 3 – Plan Operations: Having established the potential for a successful aquaculture industry in the previous phase, the champion now shifts attention from evaluating to planning. The champion begins with community engagement and governance planning. Next, they plan operational aspects of the business, including creating evaluation criteria for suppliers and partners and selecting top partners based on the analysis. Regulatory approvals are also sought in this phase.

Plan
Operations

Phase 4 – Execute Pilot: In Phase four, the aquaculture operation moves from a dream to a reality. Armed with information from previous phases, the aquaculture champion will execute the pilot, beginning with early preparation, and ending with harvesting and marketing.

Execute
Pilot

After reviewing this document, readers should have a high level understanding of the steps involved in planning, developing, and operating a scallop aquaculture operation. They should also gain an appreciation for the key challenges faced by aquaculture operations and the activities that should be undertaken in advance to mitigate these risks.

Finally, this document is intended to be a high-level resource for First Nations groups seeking to understand the process of undertaking an aquaculture pilot in greater detail. It is not a technical guide, and should not be used as such. Throughout the development process, Nations are suggested to seek the advice of trained shellfish professionals and Subject Matter Experts for technical issues. Suggestions provided in this document are for informational purposes only.

KEY SUCCESS FACTORS

TIMING AND PLANNING

In the aquaculture industry, timing is critical. Seed must be ordered and placed in the water at specific times, and some supplies must be ordered months in advance. Some of these time requirements are predictable, but many will differ depending on the suppliers and agencies involved. In the planning steps, aquaculture producers should make note of any timing constraints and how these constraints could impact other steps. Figure 1 provides an overview of key timing considerations.

Figure 1: Timing Considerations

ACTIVITY	REMARKS
Aquaculture Licensing and Land Tenure	Timing will be better understood as the aquaculture licensing process transitions from provincial to Federal jurisdiction. In addition, the process may be more complicated if: • Other First Nations have conflicting claims. • Other resource users have conflicting use of the land. • The site is in a sensitive habitat area. • The site is not recognized as approved growing waters by Environment Canada. Communities should engage with Front Counter BC very early in the process to establish timeline estimates based on its unique circumstances.
Equipment Procurement	Supplies to build rafts and long lines should be easily procured from within the province. Specialized equipment such as lantern and pearl nets could require more time, particularly if the equipment must be shipped from manufacturers overseas. Up to three months advance notice may be required.
Processing	If a processor is not already licensed to process shellfish, they will be required to undergo a process to do so. This process includes preparing new Quality Management Program (QMP) plans, and potentially retooling the production facility. Depending on the processor, this could require significant lead-time.
Seed Procurement	Although some hatcheries may have excess seed available at short notice, for the most part, hatcheries require five to six months advance notice for any seed orders. Generally, if the seeds are placed in the water in Spring, orders will need to be placed in December at the latest.
Governance	If appropriate governance structures are not already in place, significant time may be required to develop them. In the case of an economic development corporation, development and implementation could take six months or more.
Consultation	The time required for community consultation will differ from place to place. In some communities, little demand for consultation will make this a brief activity. In others, effective consultation could take months.

It is also important to understand the grow-out process, particularly the range of timing possibilities for harvesting, which depends largely on uncontrollable water temperature. Figure 2 provides a high level overview of potential harvesting times. In best-case scenario, scallops can be ready for harvest in as little as 16 months. In the worst case, scallops can require up to 30 months in the water.

Figure 2: Potential Harvesting Times

Year 1												Year 2												Year 3											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
	PREPARE GROW- OUT	GROWOUT																																	
		BEST CASE HARVEST												AVERAGE CASE HARVEST						WORST CASE HARVEST															

An understanding of the time required for scallops to grow to a marketable size can only be determined through experience. By monitoring growth rates throughout the pilot process, champions will gain an understanding of the duration required.

INDUSTRY RELATIONSHIPS

Success in the aquaculture industry will rely on the abilities of the aquaculture operator, as well as the existence of a strong complementary services network including shellfish hatcheries, processors, and industry experts. A shellfish grower will experience limited success in the absence of these necessary linkages. Adequate identification and evaluation of these linkages is therefore a key success factor for an aquaculture operation. Further, if the industry is young and support is not yet developed, shellfish growers should consider how they can fill these gaps to reduce risk (this may require investments to build the necessary infrastructure). Figure 3 illustrates the many industry players that comprise a successful aquaculture industry.

Figure 3: Shellfish Aquaculture Industry Web


EVALUATION AND REVISION

Communities that are committed to leveraging existing capacity and assets have the potential to realize positive economic, social, and cultural benefits from participating in shellfish aquaculture. A key factor in achieving this success is an ongoing appraisal of the opportunity that is honest, rational and incorporates community resources and priorities. As a framework to support these conversations, this roadmap directs readers to evaluate and revise approaches in light of the learnings of the previous step. In some cases, communities may decide to abandon the opportunity of scallop aquaculture altogether to focus on more promising businesses.

British Columbia Coast



Photo Credit: Kelly Masson

SHELLFISH AQUACULTURE ROADMAP

PHASE 1: GET READY



Before jumping into business planning, the champion should first invest the time to build general industry knowledge and engage with partners and allies to understand opportunities and challenges. This will allow the champion to objectively evaluate the opportunity in later steps. Some preliminary engagement and community consultation can occur at this time, however, only the champion carries out most of these activities. For activities undertaken in this phase, it is assumed that the aquaculture champion is supported by community decision makers (i.e. Chief and Council, Board of business structure) and has the authority to make decisions for the proposed venture.

By building a comprehensive understanding of the industry before reaching out to the community, the champion is better able to field questions and provide objective details about the opportunity.

This phase is comprised of four steps: (1) Identify and engage partners and allies, (2) Build an understanding of the industry, (3) Assess fit with existing community and economic development strategies, and (4) Take inventory of community resources.

1.1 IDENTIFY AND ENGAGE PARTNERS, ALLIES, AND EXTERNAL STAKEHOLDERS

	ACTION
As a first step, the champion should identify individuals, industry groups, and businesses that may be able to help the community build aquaculture knowledge. There are many challenges and opportunities inherent in shellfish aquaculture, and these lessons can be learned through discussions with people with practical experience. This is also the time to identify any external stakeholders that could be negatively impacted by an aquaculture operation.	• Identify likeminded First Nations groups with shellfish aquaculture experience. • Identify opportunities for collaboration, partnership, and business relationships (hatcheries, processors, retailers, etc). • Identify industry organizations and academic institutions that may be able to lend expertise or assistance. • Identify external stakeholders that may be impacted by an aquaculture operation in the Nation's traditional territories (including Aboriginal and non-Aboriginal stakeholders).

1.2 BUILD AN UNDERSTANDING OF THE INDUSTRY

Using the connections forged in the preceding step, the next step is to develop a detailed and realistic understanding of the industry. During this preliminary step, the champion will have detailed conversations with potential partners and allies to identify success factors and highlight any challenges that may limit success. The champion can also begin to identify a few high level options for the pilot operation, including size and grow-out approach.	ACTION • Develop a list of key topics and issues for further investigation. • Develop interview guides for conversations with partners and allies. • Organize and conduct interviews with partners and allies identified in the preceding step. • Based on these conversations: • Compile a list of success factors. • Identify key challenges and opportunities. • Identify 2-3 scenarios for the size and grow-out approach of the pilot operation.
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1.3 ASSESS FIT WITH COMMUNITY AND ECONOMIC DEVELOPMENT STRATEGIES

Most communities invest a significant amount of time and energy into developing strategies and plans to guide economic development. Before moving forward with a scallop operation, the opportunity should be evaluated and prioritized in the context of the community's overall goals. At this step some consideration should also be paid to identifying potential sources of funding and whether there is initial support to draw upon this funding for the purposes of developing a scallop aquaculture industry.	ACTION • Explore preliminary interest in shellfish aquaculture through broad community engagement and consultation activities. Focus on engaging individuals with high potential for later involvement. • Evaluate the opportunity in light of existing community and economic development strategies. Identify any conflicts. • Secure formal support from Chief and Council to investigate feasibility. • Identify potential funding sources and take note of qualification requirements. Approach local government to discuss preliminary feasibility of drawing upon funding source.
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1.4 TAKE INVENTORY OF COMMUNITY RESOURCES

Having developed an understanding of the industry the next step uses this information to conduct a preliminary assessment of community resources. This includes evaluating the capacity of the community to support the business, as well as assessing shared community assets like land, equipment, and traditional knowledge.	ACTION • Identify and engage with community members with applicable expertise and assets (shellfish aquaculture, business development, processing, fisheries, etc). • Compile a list of key community resources and potential employees. • Using existing provincial planning documents and traditional knowledge, identify 2-3 physical sites with suitable characteristics for aquaculture.
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Upon completion of Phase One activities, aquaculture champions will be organized to assess the shellfish opportunity, which is detailed in Phase Two.

PHASE 2: ASSESS OPPORTUNITY



In this phase, the aquaculture champion engages in more detailed planning and investigation activities to assess feasibility. This includes evaluating the suitability of internal assets and capacity (e.g. land and human resources), analyzing external factors (e.g. market conditions) and evaluating preliminary financial feasibility of the proposed project. This phase is comprised of three steps: (1) Assess suitability of community assets and resources, (2) Identify and analyze market trends and characteristics, and (3) Evaluate financial feasibility.

2.1 ASSESS SUITABILITY OF COMMUNITY ASSETS AND RESOURCES

Aquaculture is an attractive opportunity for many First Nations groups because it allows communities to make productive and sustainable use of valuable resources within traditional territories. In this step, the champion will formally evaluate potential sites using the help of a trained professional. The champion will also perform an honest assessment of local capacity to identify a pool of candidates for staff and management positions. Any capacity gaps will be noted to aid with forecasting requirements for training and development.	ACTION • Assess feasibility of top aquaculture sites by: • Engaging with professional aquaculture experts to conduct site tests for water and physical conditions. • Investigating transportation options to and from the site and ensuring the site is relatively close to processing facilities. • Confirm land availability (i.e. no conflicting land use) by contacting relevant provincial authorities. • Identify high potential community members for staff and management positions, and identify specific gaps in skills and competencies. • Identify training and education opportunities to fill capacity gaps.
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2.2 IDENTIFY AND ANALYZE MARKET TRENDS AND CHARACTERISTICS

In this step, the champion undertakes detailed market analysis activities to understand the outlook for the industry and provide context for marketing decisions (for example, product mix, pricing, promotion approach and target markets). The champion should also seek to understand larger trends and growth rates and how they could support activities.	ACTION • Using available statistics and reports, perform detailed market analysis to determine: • Key supply and demand trends in aquaculture, including trends in international and domestic production and characteristics of key markets. • Domestic and international competitors, market share, and competitive advantages. • Market prices for wholesale and retail pricing. • Identify processing and marketing trends including sustainability certification initiatives.
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2.3 EVALUATE FINANCIAL FEASIBILITY

Finally, in this step the champion will, either independently or with the help of an external consultant, prepare financial projections to understand feasibility of the pilot and to identify funding requirements. Consultation with Subject Matter Experts and potential industry partners will be essential to determine estimates for key variables such as staffing requirements, as well as equipment costs, transportation options, processing fees, and seed costs.

ACTION

- **Working closely with Subject Matter Experts and using the pilot size scenarios outlined in Phase 1, prepare a pro forma income statement and cash flow projection for the life of the pilot.**

Vancouver Island Coast



Photo Credit: Kelly Masson

PHASE 3: PLAN OPERATIONS



Having determined the financial feasibility of going forward with an aquaculture pilot, the next phase is to carry out detailed planning, which must occur internally within the community and externally for the selection of partners. This phase is likely to require significant work - comprised of the following six steps: (1) Develop shared goals based on community interests and values, (2) Establish governance and decision making approach, (3) Secure necessary regulatory approvals, (4) Determine seed procurement strategy, (5) Determine operational approach, and (6) Develop processing and marketing approach. For some of these steps, additional insight is provided in a summary table of key considerations. These tables provide a starting point for planning purposes.

3.1 DEVELOP SHARED GOALS BASED ON COMMUNITY INTERESTS AND VALUES

Community members and decision makers are likely to have strong and legitimate opinions regarding the use of traditional assets. In this step, these stakeholders are consulted and a shared vision for the future is established based on community interests and values. Focus should be placed on expectations for employment and the distribution of benefits from the operation (including whether there will be community distribution of the final product).	ACTION • Conduct engagement and consultation activities with the local community and establish a set of shared interests and values pertaining to the aquaculture operation. • Based on these values and interests, work with the community to establish a list of goals to be achieved by the operation. • Agree upon a shared priority for the operation – culture, profit, or capacity building - and enshrine this agreement in a culturally relevant manner.
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3.2 ESTABLISH GOVERNANCE AND DECISION MAKING APPROACH

In this step, the focus shifts from the broad community to the level of decision-making and governance. If the Nation already has an effective governance structure in place that separates business and politics, the focus of this step will be on developing formalized oversight procedures relative to the economic development corporation. If the band does not have a formalized business arm (such as an economic development corporation), the focus of this step will be to develop a formal approach to overcome potential conflicts that may arise.	ACTION • If governance structure is in place: • Assess the suitability of the structure and develop new guidance documents for the aquaculture business if necessary. • If governance structure is not in place: • Work with Chief and Council to develop interim governance documents for the business: (1) Roles and responsibilities document that outlines decision-making authority and accountability structures. (2) Formalized decision-making process, including a protocol for how conflicts will be resolved. • Decide on how business finances will be covered, including who has signing authority.
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3.3 SECURE NECESSARY REGULATORY APPROVALS

Applications for tenure of crown land for aquaculture are administered by the province while other approvals such as licensing and navigable water permits are administered at the federal level. As of Spring 2012, both levels of government are in the process of harmonizing structures to provide a seamless application and approvals process (expected by Fall 2012). Although much of the approvals process occurs at the federal level, the entire process can be carried out through local Front Counter BC offices, which liaise between the producers and the required government bodies. An overview of approvals/regulations is in Appendix B.	ACTION • Meet with Front Counter BC to begin the tenure and licensing process. Identify any additional work that will need to be carried out for the application. • Engage consultant to assist with the preparation of required documents (for example, for tenure and navigation applications). • Prepare and submit required documents.
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DECISION AREA	KEY CONSIDERATIONS
Regulatory Approvals	• Strategic planning: In the long term, there may be considerable value for Nations to join together to encourage the Government to consider establishing a Memorandum of Understanding (MOU) process for aquaculture tenure in the Central Coast. • Adjacency to reserve: If the land sought for tenure is located adjacent to reserve land, the tenure approvals process may be expedited somewhat. • Time required: The amount of time required to secure the necessary approvals can differ significantly depending on the site in question. Working with a knowledgeable consultant to prepare the paperwork may help ensure the application is complete and reduce the need for document resubmission.

3.4 DETERMINE SEED PROCUREMENT STRATEGY

Scallop seed is currently only available from a handful of hatcheries in BC, and the finicky nature of seed production means that even if seed is ordered in advance, there is no guarantee that breeding will be successful. In this step, the champion decides upon a seed procurement strategy based on conversations with hatcheries and Subject Matter Experts. In some cases, it may be advisable to engage with more than one hatchery for the purpose of mitigating the risk of seed production failure.	ACTION • Compile a list of key considerations for seed procurement and evaluate hatcheries based on these factors. • Engage with top-rated seed producer(s) to pursue a supply arrangement. • Arrange for seed transportation, ensuring that grow-out infrastructure has been installed and tested prior.
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DECISION AREA	KEY CONSIDERATIONS
Seed Procurement	• Lead Time: Some seed hatcheries require orders to be placed by December at the latest to be ready for a Spring grow-out. • Size of seed when sold: Smaller seed is less expensive, however, it may also suffer from higher mortality and may be required to spend part of the grow-out process in pearl nets. Larger seed is more expensive, but may undergo the entire grow-out process in lantern nets. • Potential for a long-term relationship: Some hatcheries will be interested in developing long-term supplier relationships with producers, while others may be focused on their own grow-out operations and will only be able to supply seed intermittently. • Consistency and reliability of production: Hatchery production is a risky business, and all hatcheries should be expected to experience failure at one time or another. As such, it may be advisable to aim to procure seed from more than one hatchery if possible.

3.5 DETERMINE OPERATIONAL APPROACH

Potential operators must decide the mix of equipment that will be used for the grow-out operation. This includes deciding between long-line and raft systems, and whether to undertake early grow-out in pearl nets. At this step the champion will also carry out planning related to training and development of employees, including identifying educational requirements and enrolling future employees in the program as necessary.	ACTION • Determine ideal grow-out equipment requirements based on conversations with stakeholders and site characteristics. • Create a timeline with estimated time required to build and order equipment, allowing ample time for shipping if required. • Based on previous assessment, create educational plans for high-potential employees and enroll in programs as necessary.
DECISION AREA	KEY CONSIDERATIONS
Grow-out Planning	• Risk of theft: Scallop aquaculture operations are at high risk for theft, specifically when grow-out sites are located in remote areas. Raft grow-out systems are more vulnerable to theft than long-lines, because long-line systems require special equipment to be pulled out of the water and rafts do not. • Cost: Rafts are more expensive to build than long-lines, but long-lines require special equipment for harvest, including a suitable fishing vessel. This may present an additional cost, depending on the existing resources of the community. • Local capacity to construct rafts: Rafts can be constructed locally, but to do so requires access to the necessary tools and equipment and the availability of workers with suitable skills. • Size of seed when placed in the water: If seeds are placed in the water at a relatively small size (3mm to 10mm), they must undergo a growing step in small mesh pearl nets. If placed at a larger size (over 10mm), the pearl net step may be skipped, and the seeds may be placed directly in lantern nets. Buying seed at a large size saves the trouble of purchasing pearl nets and transferring the scallops, but larger seed is also more expensive.

3.6 DEVELOP PROCESSING AND MARKETING APPROACH

As shellfish aquaculture is a relatively undeveloped industry in BC, there is currently a lack of processors that are licensed for scallops in the vicinity of the Nanwakolas Nations. In this step, the aquaculture champion evaluates potential processors according to a set of criteria and begins to make arrangements with the most promising partner(s). In this step the champion also considers harvesting and marketing considerations, including when the scallops will be harvested, and how they will be sold in the market.	ACTION • In consultation with Subject Matter Experts, compile a list of key considerations for shellfish processors. • Evaluate local processors according to the above criteria. • Contact potential processors to determine their availability. • Based on discussions with Subject Matter Experts, develop a harvesting strategy best suited for the particular circumstances of the operation. • Drawing on the market research performed in a previous phase, develop a preliminary marketing approach that includes consideration for fresh or frozen product lines.
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DECISION AREA	KEY CONSIDERATIONS
Processing	• Distance from grow-out site: During harvest season, time is of the essence to move live product to final customers while minimizing mortalities and preserving freshness. Distances of over 20 nautical miles should be avoided if possible. • Capacity: Processors must have the physical capacity to handle expected processing volumes. This can be a challenge, especially in the busy summer season. Due to strict food safety standards, processors must also completely sanitize and/or retool the production line between species. To recoup the cost of these changes, processors may require minimum processing volumes. • Scallop specific equipment: Because they can be shucked by hand, scallops do not generally require specialized equipment for processing. If a processor already has the infrastructure in place to process other shellfish, scallop processing should not be a problem. If the processor is generally focused on finfish, however, this could present a challenge. • Licensing and Food Safety: Processors must be licensed to process scallops under the Canadian Shellfish Sanitation Program (CSSP). This requires the development of specialized Quality Management Program (QMP) plans for each species. Processors must also be inspected by the Canadian Food Inspection Agency (CFIA).
Harvesting	• Time of Year: The quality and weight of scallops may vary depending on the time of year they are harvested and the current stage of the reproduction process. Quality is generally poor while scallops are spawning. • Weather: Generally, it is more difficult to harvest in the winter due to inconsistent weather and safety concerns. Summer harvesting is ideal for this reason; however, processing facilities are also at their busiest at this time.
Marketing	• Fresh or Frozen: Fresh scallops generally command a premium price in the market, while frozen scallops may experience downward pricing pressure due to competition from low priced competition from overseas. • Wholesale vs. Retail: During a pilot operation, it may be advisable to sell finished scallops to a wholesaler rather than market them independently. Retailing the product independently will result in higher margins for the business, but will also require significant time and knowledge to carry out effectively.

PHASE 4: EXECUTE PILOT



Having built a suitable understanding of the aquaculture industry, the next step is to execute the shellfish pilot. In this step, the planning and research undertaken in the previous months will be put into action. Provided previous steps were carefully completed, decision-making in this phase should be relatively simple.

4.1 PREPARE FOR GROW-OUT

In this step, final preparations will be made to place seed in the water. This includes preparing the site with the necessary equipment and hiring and training staff.

ACTION

- Hire and train employees.
- Build and test grow-out structure (rafts, long-lines).
- Procure additional equipment, such as lantern nets, ropes, and floats, and arrange for transportation to the grow-out site.

4.2 PLACE SEED

With employees trained and infrastructure in place, seed can now be placed in the water to begin grow-out.

ACTION

- Transport equipment to the grow-out site.
- Place seed in nets and secure them in the water.
- Gather any information required for record keeping.

4.3 MAINTAIN GROW-OUT OPERATION

The grow-out step can last anywhere from 16 to 30 months depending on the characteristics of the scallop seed as well as environmental factors. Activities during this time will be largely routine, and will include the maintenance and observation of stocks.

ACTION

- Perform periodic grading to ensure scallops are grouped by size and monitor stocks for theft.
- Defoul nets periodically.
- Perform required record keeping and information gathering activities like monitoring water quality.
- Check and maintain equipment and infrastructure periodically.

4.4 HARVEST, PROCESS, AND SELL FINAL PRODUCT

Once the scallops have reached a marketable size, it is time to harvest, process, and market the final product. Depending on the approach, the final product may be sold fresh or frozen, and may be marketed directly by the First Nation, or by a wholesaler.

ACTION

- Harvest finished scallops and transport to processing facility.
- Oversee processing activities.
- Carry out marketing activities as planned.

1. APPENDIX A: ADDITIONAL RESOURCES

DOCUMENT NAME (YEAR)	ORGANIZATION	AVAILABILITY	KEY CONTENT
SHELLFISH AQUACULTURE DEVELOPMENT – BRITISH COLUMBIA FOCUS			
Deepwater Shellfish Aquaculture – an Economic Profile (2002)	Prepared for Economic Development Branch – BC Ministry of Sustainable Resource Management	Online	High-level document to provide tools for economic analysis of shellfish aquaculture opportunities. Includes detailed information on costs, challenges, and opportunities.
Land Use Operational Policy – Aquaculture (2011)	Ministry of Forests, Lands, and Natural Resource Operations	Online	Policy for the siting and improvements of tenures for finfish, shellfish, and marine plants on Crown land. Overview of tenure approval and application process.
North Island Straits – Shellfish Aquaculture Barriers and Constraints Study (2003)	Edwin Blewett & Associates Inc, and Nelson Bros Fisheries Ltd.	Online	Review of key barriers and constraints holding back the further development of shellfish aquaculture on North Vancouver Island.
Potential and Profile of the BC Shellfish Industry (2002)	Prepared for the Vancouver Island Economic Developers Association Marine Frontiers Project	Online	Profile of the state of BC shellfish aquaculture to provide a picture of the industry, including current state, potential for future growth, and barriers impacting expansion and competitiveness. Good overview of potential in the context of the global market, but the information is now somewhat out of date.
Shellfish Culture Capability Appraisals (2008)	Prepared for the BC Ministry of Agriculture, Fisheries & Food	Online	A number of capability appraisals for BC Coastal Regions have been developed by the province over the years. These documents outline high potential areas for shellfish development. A number of these reports are available through the link provided.
West Coast Shellfish Sector Strategic Action Plan 2011 – 2015 (2010)	Canadian Council of Fisheries & Aquaculture Ministers (CCFAM)	Online	Outlines areas for improvement in BC shellfish aquaculture with a focus on improving public governance of aquaculture. Essentially an outline of ways in which the government can improve existing governance for the benefit of the industry.
SHELLFISH AQUACULTURE DEVELOPMENT – ABORIGINAL FOCUS			
Aquaculture Development – An Economic Opportunity for BC Coastal First Nations (n.d.)	Prepared by the Aboriginal Aquaculture Association	Online	Outlines the potential for aquaculture as a means of economic development in First Nations communities. Includes situation overview and case studies and summaries of First Nations that have undertaken aquaculture operations. These include: K'omoks Nation, Kitasoo Nation, Naut'sa mawt Nations, Kitkatla Nation, Cape Mudge Band, Tla-o-qui-aht Tribe, Sechelt Indian Band, and Ahousaht Nation, among others.
First Nations Shellfish Aquaculture Regional Business Strategy – BC Central and North Coast (2002)	Prepared for Aboriginal Relations and Economic Measures – Land and Water BC	Online	Very comprehensive strategy and framework document created for First Nations led shellfish aquaculture development on BC's Central and North Coast.

DOCUMENT NAME (YEAR)	ORGANIZATION	AVAILABILITY	KEY CONTENT
Getting Started in Aquaculture – A Guide for Aboriginal Economic Development (2006)	Prepared for the Aboriginal Aquaculture Association	Online	Excellent aquaculture guide for First Nations. Includes good resources on the planning and development stages and includes links to additional planning and development resources. Information on the application and approvals process is no longer current. Excellent summary of key funding sources available.
Nanwakolas Council Society Seafood Market Entry Opportunities Report (2011)	Prepared for the Nanwakolas Council by ISIS	Limited Circulation	Report outlining opportunities for Nanwakolas member nations in the seafood industry. Contains research into the outlook and viability of aquaculture for a number of shellfish species.
FEASIBILITY AND PLANNING DOCUMENTS			
Development of New Raft Technologies for the BC Shellfish Aquaculture Industry (2010)	Vancouver Island University – Centre for Shellfish Research	Online	Report outlining the results of the development of prototype rafts. Includes good discussion of the requirements for rafts in the region, and a break down of potential costs of building the proposed rafts.
Feasibility of a Shared Shellfish Hatchery for the BC Shellfish Aquaculture Industry (2008)	Vancouver Island University – Centre for Shellfish Research	Online	Draft feasibility report outlining the possibility of building a new hatchery in BC to service the growing shellfish aquaculture industry. Contains a detailed financial analysis and exploration of options.
POLICY AND GUIDELINE DOCUMENTS			
Canadian Shellfish Sanitation Program (CSSP) Manual of Operations (2011)	Canadian Food Inspection Agency, Environment Canada, Fisheries and Oceans Canada	Online	Very detailed manual of operations for the Canadian Shellfish Sanitation Program. Includes the entire range of shellfish production, from growing area to shipping the processed product.
Fish Processing Plants – Guidelines for Plan Approval and Structural Requirements (2009)	BC Centre for Disease Control – Provincial Health Services Authority	Online	Provides an overview of the licensing process and construction requirements for new fish processing facilities.
Update of Traceability Readiness: Section 3 - Regulations with Traceability Information Requirements (2010)	Government of BC	Online	Outlines traceability requirements for shellfish. Provides an overview of information gathering requirements for various international food safety and security regulations. Includes guidelines for record keeping and traceability.
STRATEGIC OVERVIEW DOCUMENTS			
The State of World Fisheries and Aquaculture (2010)	Food and Agriculture Organization of the United Nations	Online	This is a great document if you are looking for a comprehensive review of trends and issues in aquaculture from a global perspective. Puts the BC industry and potential for growth in context.

2. APPENDIX B: SHELLFISH AQUACULTURE REGULATION IN BC

ROVAL REQUIRED	RELATED LEGISLATION	JURISDICTION
Aquaculture License	Fisheries Act	Department of Fisheries and Oceans (Federal)
Transfer of Fish or Aquatic Invertebrates	Fisheries Act	Department of Fisheries and Oceans (Federal)
Placement of Floats and Infrastructure in Waterways	Navigable Waters Protection Act	Transport Canada (Federal)
Assessment to ensure aquaculture operation does not impact species at risk.	Species at Risk Act	Environment Canada (Federal)
Assessment of Environmental Impact	Canadian Environmental Assessment Act	Environment Canada (Federal)
Use of Crown Land (Tenure)	Land Act	Provincial