WEST COAST VANCOUVER ISLAND SHELLFISH DEVELOPMENT PROJECT

May 2003

Prepared by

ECO-PLANNING CONSULTING SERVICES

for the

ALBERNI CLAYOQUOT ECONOMIC DEVELOPMENT COMMISSION

and the

WEST COAST VANCOUVER ISLAND SHELLFISH TASK FORCE

West Coast Vancouver Island Shellfish Development Project

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Acknowledgements:

This report was prepared by Trevor Wickham and Laura Loucks of Eco-Planning Consulting Services on behalf of the members of the West Coast Vancouver Island Shellfish Task Force: HRDC, BC Ministry of Agriculture, Food and Fisheries, Nuu-chah-nulth Tribal Council, Ecotrust Canada, Alberni Clayoquot Economic Commission Alberni Clayoquot, Alberni Clayoquot Community Futures, the Working Sound Shellfish Committee, and the WCVI Aquatic Management Board. Funding for the report was provided by an Industrial Adjustment Services Agreement with HRDC.

Eco-Planning was contracted to provide a comprehensive and current profile of the shellfish aquaculture industry in both Barkley and Clayoquot Sounds in order to maximize collaborative opportunities for the successful development of a regional shellfish industry on the west coast.

In addition to acknowledging the cooperative support of all the shellfish growers who took part in this study, the authors would also like to thank the contributions of the Task Force Members, Mark Hanley (Hanley and Associates) for helping to facilitate this project to its completion, Barron Carswell (BC Ministry of Agriculture, Food and Fisheries) for promptly providing industry data, and Josie Osborne (NTC Fisheries) for allowing us to use her library and reviewing sections of this report.

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1 Executive Summary

1.1 Background: WCVI Shellfish Task Force

Increased activity in the shellfish sector since the mid-1990's has highlighted several barriers to growing a sustainable, successful industry on the West Coast of Vancouver Island. Maximizing opportunities for the successful development of a regional shellfish industry will require actions on a number of fronts.

To ensure a planned, coordinated and adequately supported approach to regional shellfish development, a Task Force involving government, industry, business and non-governmental groups has been established. The Task Force, funded under the terms of an Industrial Adjustment Services Agreement with HRDC, proposes to explore ways to:

- Increase and improve communications, coordination and collaboration between Native and non-Native growers involved in Vancouver Island's West Coast shellfish industry;
- Identify and fill knowledge gaps about the WC shellfish industry;
- Assist growers with activities that will increase their market share;
- Assist with the development of a West Coast shellfish brand strategy; and
- Assist with advocacy to bring investment dollars into the West Coast communities to support shellfish development.

A particular focus of the Task Force will be to ensure coordination between the activities of the new Nuu-chah-nulth Shellfish Development Corporation, with new and established non-Native growers on the West Coast of the Island. It is evident that there are a number of areas where a consistent, collaborative approach will improve everyone's chances of success.

1.2 WCVI Shellfish Development Project Tasks

Working under the direction of Task Force members[1], the consultant(s) will:

- Collect, collate and summarize existing research and activity as it relates to West Coast Vancouver Island shellfish development;
- Analyze information gaps and new information requirements -- including a catalogue of existing and planned businesses (size, placement, capacity, products);
- Collect, collate and summarize new information related to WCVI shellfish development as directed by the Task Force;
- Develop an effective working relationship with established growers in the region to ensure their concerns and interests are understood and articulated to the Task Force;

[1] Members of the Task Force include: HRDC, BC Ministry of Agriculture, Food and Fisheries, Nuu-chah-nulth Tribal Council, Ecotrust Canada, Alberni Clayoquot Economic Development Commission, Alberni Clayoquot Community Futures, the Working Sound Shellfish Committee, and the WCVI Aquatic Management Board.

- Support, as required, the establishment of communications mechanisms for growers in the Region;
- Based on the information and relationships, assist the Task Force to develop an action plan (tasks, priorities, timelines) to shape and direct their work over the coming year.
- Manage relationships as required with Task Force members, industry and government representatives;
- Produce a final report detailing activities, findings and recommendations.
- Report to community and industry reps; and
- Attend Task Force meetings during the term of the contract (1-3 meetings as required).

Eco-Planning Consulting Services were contracted to perform this work and during the period of February to April, 2003 completed the work described herein. Below is a summary of the main findings contained in this report.

1.3 Annotated Bibliography

A desk top and internet study compiled an annotated bibliography of 63 government and non-government technical reports, academic research papers, conference proceedings and workshop summaries. Sixty percent of these reports were published in the past 5-year period, and 80% were published since 1993.

With the exception of 6 reports (where hard-copies were not located) abstracts which describe the contents of these reports are included for all 63 reports.

1.4 Growers Survey and Synthesis of Industry

Two separate surveys – one for current growers and a second for new growers - were designed, field tested and refined. Of the 58 individuals or companies holding tenure in Barkley and Clayoquot Sounds a total of 36 interviews were conducted.

The surveys collected information from 25 current growers and 11 new growers on present and future trends in seven main areas including: tenure, investment, production, employment, processing, and barriers and priorities. The highlights are summarized below:

1.4.1 Tenure Background

- 48% of current growers are part-time farmer whereas 73% of new growers will be business farmers.
- 72% of current growers farm one tenure in comparison to 64% of new growers who farm one tenure.
- 56% of current growers have combined tenure holdings of less than 5 hectares, whereas 55% of new growers have tenure that range from 6 ha to 20 ha.
- Pacific oysters are (and will continue to be) the predominate species grown on the west coast.
- Manila clams currently rank a distant second, with Mussels set to increase in the future.
- 60% of current farmers use string culture and plastic trays, whereas 65% of new growers plan to use string culture and plastic trays.

1.4.2 Investment

- 56% of current growers estimate their tenure to be worth less than $100k; and 20% estimate their tenure's value to range between $101k and $250k.
- 67% of new farmers estimate their tenure to be worth less than $100k; and 27% estimate tenure value to range between $101k and $250k.
- 64% of current growers estimate their infrastructure investment at less than $100,000, while 80% of new growers estimate their infrastructure investment at less than $50,000.
- 44% of current growers estimate the farm-gate value of their current product ranges from $101,000 and $250,000.

1.4.3 Production

- There was a 50% reduction in shucked product production from 2001 to 2002. Production in 2003 should reach about 75,000 gallons.
- Overall value of shucked product dipped slightly from 2001 to 2002, and is estimated to almost double in value in 2003 to $1.2 million.
- In 5 years time the combined shucked production for Barkley and Clayoquot could grow from:
- 66,400 gallons to just under 100,000 gallons.
- With a corresponding farm-gate value of just under $880,000 to over $1.4 million.

- Production of single and ½ shell increased by almost 75,000 dozen from 2001 to 2003.
- Value of single and ½ shell decreased by almost $450,000 from 2001 to 2003.
- In 5 years time the combined single and ½ shell production for Barkley and Clayoquot could grow from:
- 225,000 dozen to 1.08 million dozen.
- With a corresponding farm-gate value of just under $1 million to $3.15 million.

- Production of Manila clams dropped by 90,000 pounds from 2001 to 2003.
- Value of Manila clams dropped by almost $120,000 from 2001 to 2003.
- In 5 years time the combined Manila clam production for Barkley and Clayoquot could grow from:
  - 217,000 pounds to 575,000 pounds.
  - With a corresponding farm-gate value of just under $450,000 to $1.03 million.

1.4.4 Employment

- Shellfish farming in Barkley and Clayoquot Sounds creates approximately 156 employment opportunities which is approximately equivalent to 80 FTEs.
- Current tenure holders average 1.8 FTEs per tenure, in comparison to new tenure holders who average 3.3 FTEs per tenure.

1.4.5 Processing

- Mac's Oysters, Fanny Bay and Pacific Northwest are the most popular processors used by growers.
- However, 65% of new tenure holders plan to sell their product to Deep Harvest Bay.

- Long-term relationships; friendly and helpful people; and honesty/trustworthiness are the most often cited reasons for working with a processor.

1.4.6 Future Trends in 3-5 Years

- In next 3-5 years, 80% of current farmers want to diversify the species they farm, whereas <50% of new farmers plan to diversify.
- 25% of current growers are interested in changing to trays, and 22% considering changing to French tubes, whereas 90% of new growers are not contemplating changes in their growing techniques.

- In next 3-5 years 33% of current growers do not intend to make new capital investment, and 38% plan to make investments of under $75,000. Whereas, 75% of new growers plan investments of $150,000 or more.
- 37% of current growers plan to invest in Infrastructure & Technology and 18% in Labour. Whereas, 48% of new growers plan to invest in Infrastructure & Technology and 30% in Labour.

- Current growers top-three preferences for future markets are:
  1. New Processors/Local Consumers;
  2. Local Restaurants; and
  3. Value-added.
- New growers top-three preferences for future markets are:
  1. Local Restaurants;
  2. New Processors; and
  3. Export.

- Current growers indicated needing assistance in the following areas:
  1. West coast processor,
  2. Generic marketing,
  3. Market research and
  4. Low interest financing.
- New growers indicated needing assistance with:
  1 Generic marketing strategy.

1.4.7 Barriers and Priorities

- Current growers indicated that the main barriers they face are:
  1. Government regulation,
  2. Market access and
  3. Affordable financing.

- New growers indicated that the main barrier they face is:
  1. Access to capital and affordable financing.

- Current Growers ranked the following priorities which need to be addressed on a Regional Basis:
  1. Environmental Integrity and Water Quality
  2. Processing, Marketing & Quality Assurance
  3. Investment, Finance and Business Planning

- New Growers ranked the following priorities which need to be addressed on a Regional Basis:

1 Environmental Integrity and Water Quality
2 Investment, Finance and Business Planning
3 Processing, Marketing & Quality Assurance

1.5 Gap Analysis

We undertook an analysis of the existing literature on shellfish development in Barkley and Clayoquot Sounds to identify 'information gaps' or 'new information requirements' as it relates to shellfish development on the West Coast.

A thorough gap analysis of all the literature was beyond the scope of this contract, thus we compared the priority themes of current and new shellfish growers (expressed by growers in the interviews) with those reflected by the themes covered in the existing literature.

The result appeared to be inverse relationship between shellfish growers' priorities and the shellfish literature in both Sounds. More specifically, the higher priority a theme was for shellfish growers, the fewer the reports on that theme appears in the literature. Conversely, the lower priority a theme was for shellfish growers, the greater the number of reports on those themes appeared in the relevant literature.

Thus, the primary information gaps appear in:

1. Processing, Marketing and Quality Assurance (for both Barkley and Clayoquot Sounds); and
2. Investment, Finance and Business Planning (for Barkley Sound only).

1.6 Collaboration and Communications

One specific question in the survey focused on soliciting the opinions, experiences and perspectives of growers regarding how to enhance communications and collaboration among individuals in the industry on the west coast.

While few <u>new</u> suggestions were put forth by growers to enhance grower communication and collaboration, the three main messages repeated by current and new growers alike were:

1. Farmers already informally cooperate among themselves based on their own specific and pragmatic needs;
2. Do not create something new where there is not a broad, clear and pragmatic need expressed by growers themselves; and
3. Continue to use, support and make improvements to the existing associations.

Notwithstanding the above concerns, however, there were three specific suggestions expressed by growers to improve communications and collaboration.

1 WCVI Shellfish Growers Newsletter;
2 WCVI Shellfish Extension Worker; and
3 WCVI Shellfish Workshops and Farm-Site Visits.

1.7 Grower Meetings

Two separate meetings were held with shellfish growers from both Sounds on April 23rd (Tofino) and 24th, 2003 (Port Alberni). The purpose of these meetings was four-fold:

- To report back to the shellfish growers the findings of the growers surveys;
- To corroborate and/or correct the results and interpretation of the grower surveys;
- To verify that the barriers, needs and priorities expressed by the shellfish growers were correct; and
- To initiate discussions among shellfish growers and the Task Force to create a strategy for a future action plan.

Nine growers (25% of those interviewed) attended the meetings. They confirmed that the main barriers facing the industry at present are:

1. Government regulation;
2. Market access; and
3. Access to capital and affordable financing.

They also verified that the following priorities issues need to be addressed on a Regional Basis:
1. Environmental Integrity and Water Quality;
2. Processing, Marketing & Quality Assurance; and
3. Investment, Finance and Business Planning.

2 Annotated Bibliography

2.1 Background & Methodology

At the request of the Task Force, we were requested to collect, collate and summarize all relevant written research reports as it relates to shellfish development on the West Coast of Vancouver Island.

Research reports were identified and collected through three main methods:

1. A local desktop and internet study was undertaken using search engine parameters restricted to "Clayoquot Sound", "Barkley Sound" and "shellfish aquaculture";
2. Internet-based Library, Abstract and Journal searches were conducted; and
3. Direct contact was made with relevant industry representatives and organizations (Appendix 1).

The result of this study is 63 citations of government and non-government commissioned technical reports, academic research papers, conference proceedings and workshop summaries. Sixty percent of these reports were published in the past 5-year period, and 80% were published since 1993.

With the exception of 6 reports (where hard-copies were not located) abstracts are included for all 63 reports.

See the "Gap Analysis" (Section 3) for a detailed review of this literature as it relates to the priorities identified by shellfish growers.

2.2 Annotated Bibliography

Alberni-Clayoquot Regional District (2001). The Way Ahead: A Marine Sector Strategy. Duncan, BC, New Options Consulting Corporation: 142 + Appendices.

> In January 2001, a partnership of Alberni-Clayoquot development agencies initiated a seven month consultation process with the marine sector in order to identify potential future developments for an improved economy in the region. From the consultations several challenges were identified: lack of access to capital, overly complex regulatory regimes, lack of proximity to markets, a lack of marine infrastructure such as wharves and storage freezers, a lack of business information and insufficient marketing funds. The strategy identified recommendations for investments in a skilled labour pool, improved capital structures, and an enhanced knowledge base. Highlights among the development prospects identified included: joint ventures between Aboriginal and non-Aboriginal interests, a marine inventory, specific R&D initiatives, value-added fish processing, developing a water testing laboratory for the region, more tourism expenditures in Part Alberni and within Aboriginal communities, and a

need to encourage new opportunities for vessel/boat manufacture and repair services.

Bagordo, P. (2000). Final Report to the Central Region Board: Clayoquot Sound Shellfish Aquaculture Steering Committee. Tofino, BC, Clayoquot Sound Central Region Board: 8.

In February 1999, the Central Region Board (CRB) hosted an Oyster Workshop in response to growing community interest in shellfish aquaculture. In May 1999, the CRB helped facilitate the Clayoquot Sound Shellfish Aquaculture Steering Committee. It brought together the Ahousaht, Hesquiaht and the Tla-o-qui-aht First Nations and the Clayoquot Sound Oyster Growers Association, Ministry of Fisheries and British Columbia Assets and Land Corporation, the Nuu-chah-nulth Tribal Council Fisheries Staff, two CRB representatives, the Regional Aquatic Management Society, the Ma-Mook Development Corporation, the Alberni-Clayoquot Community Skills Centre Society and a variety of interested local people. The four goals of the committee were to: 1) develop Clayoquot Sound tenure application evaluation criteria, 2) develop a capability/suitability mapping process for Clayoquot sound, 3) develop and implement a shellfish farming training program and 4) investigate value-added business opportunities including the feasibility of a local processing plant.

Barkley Sound Planning Commission (1994). Barkley Sound planning strategy. Port Alberni, BC, Regional District of Alberni-Clayoquot: iv, 78 p. + 4 Appendices.

The Barkley Sound Planning Strategy, prepared In January 1994, was comprised by representatives from fifteen agencies from the Provincial government, Federal government and First Nations. The strategy provides the initial framework to guide local planning for managing the land, marine and shoreline areas up to 1000m inland, in Barkley Sound and Alberni Inlet. It attempts to simplify and clarify conservation and development rules within the area and complement several land use planning programs on Vancouver Island. A process for implementing the strategy is recommended and includes the following activities: 1) a development review process, 2) a float cabin evaluation project, 3) local area planning and zoning, 4) and resource management programs (water quality assessment, biodiversity conservation strategy, recreation sites review, visual analysis and landscape management plan, coordinated access management plans and fisheries management programs).

Barkley Sound Shellfish Aquaculture Steering Committee (n/d). Barkley Sound Community Application for New Shellfish Aquaculture Tenures. Port Alberni, BC, Regional Aquatic Management Society: 14.

The Barkley Sound Shellfish Aquaculture Committee was established by the Regional Aquatic Management Society (RAMS) in June 1999, after the November 1998 Provincial announcement regarding the "Shellfish Development Initiative" (SDI). The primary role of the Committee is to provide community input to the

BC Assets and Lands Corporation in their shellfish tenure application process. The Committee has met regularly since June 1999 to accomplish three major tasks. They are: 1) To recommend to BCAL a rate of development for the first call (Fall 2000) for new shellfish tenure applications. 2) To develop suitability maps showing where in Barkley Sound shellfish aquaculture is acceptable, may be acceptable, and not acceptable. 3) To develop community criteria and a community application which will be used, in addition to the Provincial applications process, to evaluate tenure applications and provide recommendations to BCAL on which tenures should be granted. Each of these tasks, and its results, is explained in detail.

BC Ministry of Sustainable Resource Management (2001). Workshop on Marine Plan Aquaculture: Opportunities and Challenges: May 2001, Tofino. Workshop on Marine Plan Aquaculture: Opportunities and Challenges, Tofino, BC, Ministry of Sustainable Resource Management.

In May 2001, a Marine Plant Workshop was held in Tofino for the purpose of: 1) discussing ways BC fisheries can play a positive role in fostering a successful marine plant industry, 2) identifying existing economic, biological and social concerns around marine plant aquaculture, and 3) exploring the limitations and possibilities for marine plant aquaculture in B.C. Workshop participants identified the following recommendations: 1) identify markets that could support the development of a marine plant aquaculture industry, 2) identify the best way of growing the species that have a market demand, 3) Ensure that there is a clear and streamlined regulatory process, and 4) Ensure that financial resources are available to assist those who wish to begin developing this new industry.

Bendell-Young, L. (2003). Determining the relative Importance of Upland versus Oceanic Sources of Cadmium to Oysters within Coastal British Columbia. Burnaby, BC, Center for Coastal Studies, Department of Biological Sciences, Simon Fraser University: 9 + Figures and Tables.

Objectives were to identify the relative importance of upland versus natural sources of cadmium (Cd) to oysters from the west coast of B.C. To meet this objective, two separate but complementary approaches were initiated in January 2002 and are continuing. The present report presents results of the research program that was funded by Environment Canada from January 2002 until August 2002. These are: 1) a regional survey based on CFIA (Canadian Food Inspection Agency) 2000 data to determine trends in concentrations of Cd in tissues of wild oysters (wild survey) and 2) a standardized grow-out experiment (cultured oysters) at locations based on data obtained primarily from the regional survey. Key findings can be summarized as: 1) Results from the wild and cultured oysters support initial findings of 2000 CFCI data (Appendix 2) that is, higher levels of Cd in B.C. oysters sampled from the south-central coasts (e.g. Desolation Sound and Barkley Sound) as compared to those sampled from North Coast or lower South Coast. 2) There is evidence for marked seasonal trends which completion of the three-year grow-out currently funded by MAFF will confirm. 3) Overall average Cd concentrations (ug Cd/wet weight of oyster) of

wild oysters are within the same range as those of the CFIA 2000 data - that is ca. 1.5-5.0 ug Cd/ wet weight of oyster. Values reported herein however, may be lower than actual due to freezing the oyster prior to analyses. Recent CFIA results indicate that freezing of oysters appreciably reduced Cd concentrations in defrosted wet tissue. Hence, determined Cd concentrations should be considered as underestimates of actual by a factor of ca. 1.5. 4) There are enough lines of evidence to indicate that at specific locations, anthropogenic influences such as upland disturbances due to logging are contributing to observed levels of Cd in B.C. oysters,

Booth, J. and H. Rueggeberg (1994). Consolidation of fisheries resource information, west coast Vancouver Island: Barkley Sound and Alberni Inlet. Nanaimo, B.C., Canada. Dept. of Fisheries and Oceans. Pacific Region. Habitat and enhancement Branch: vii, 68, [45] p.

In 1993, the South Coast Division of the Dept. of Fisheries and Oceans (DFO) initiated a program to collect, organize and report information pertinent to oil spill planning from fisheries staff. This is the first of a series which documents fisheries data for the west coast of Vancouver Island. This report, representing the first year of the program, describes the system developed to collect, organize and map that area. DFO Statistical Area 23 was selected as the study area to pilot the system. Fisheries resources covered by this report include commercial, aboriginal and recreational inshore fisheries for finfish and shellfish species as well as the location of important habitats. The location of shellfish beds and of spawning or rearing areas for finfish are also included as are areas where marine mammals are known to concentrate.

Bourne, N. and S. Farlinger (1980). Clam survey, Clayoquot Sound, British Columbia. Nanaimo, BC, Pacific Biological Station, Canada. Department of Fisheries and Oceans: 93.

Results of a survey for clam resources on two beaches, Whiskey Jenny and Atleo River, in Clayoquot Sound, British Columbia are described. Of three species of commercial interest, littleneck clams, Protothaca staminea, occurred in greatest mean numbers per unit area but butter clams, Saxidomus giganteus, had the greatest mean weight per unit area, Manila clams, Tapes philippinarum, occurred in lower abundance. Size distribution, length-weight relationships, and growth rates of these three species were made; numbers, weight, size frequency and length-weight relationships of other clam species found are also given. Clam biomass for the two beaches and for Clayoquot Sound was calculated. An estimate of the sustained yield of these clam resources for the Sound is provided

Broadley, T. and E. Gant (1999). Advent of Subtidal Geoduck Aquaculture in British Columbia. Aquaculture Canada 1999 http://www.aquacultureassociation.ca/abst_99/special2.htm, Victoria, BC.

Fan Seafoods Limited began developing subtidal Geoduck aquaculture in British Columbia in 1993. Early efforts focused upon political development of a co-

operative attitude with the various governmental agencies as well as the existing wild fishery. Once tenures were secured, further efforts focused upon raising the $11 million necessary for overall project economic viability. Technological advancement began to accelerate in 1995 and has evolved into five separate components. The hatchery component results in the end production of 3 + mm seed. This seed is then reared for 2-4 months in the adapted FLoating UPwelling SYstems (FLUPSY) of the primary nursery component. The seed is then over wintered in floating and benthic systems of the secondary nursery component for 9-11 months. Seed is then mechanically planted and reared for 5-7 years until it reaches an end market weight of 0.7 - 1.0 kg in the grow out component. The final component of the company's operation will be harvesting of the adult stock. The company expects that harvesting will be determined by a co-operative marketing approach, rather than with a production driven strategy.

Cameron, C. B. (2002). "The anatomy, life habits, and later development of a new species of enteropneust, Harrimania planktophilus (Hemichordata: Harrimaniidae) from Barkley Sound." Biological Bulletin- Marine Biological Laboratory 202(2): 182-191.

A new species of enteropneust, Harrimania planktophilus, lives intertidally and subtidally in mixed sediments in Barkley Sound, British Columbia, Canada. H. planktophilus has a long proboscis skeleton extending into the pharyngeal region. The collar (mesosome) has complete dorsal and ventral mesenteries. The trunk (metasome) has four distinct regions that can be recognized externally: the branchial region, esophageal region, hepatic region, and an undifferentiated intestinal region leading to the anus. The dorsal pharynx is large and has long gill slits without synapticles. Posterior to the gills is a constriction followed by a short esophageal region and a long gonadal region. The paired dorsolateral gonads extend almost to the end of the trunk. Eggs in the ovaries appear amber yellow, and the testes appear slightly paler. The trunk terminates at an anus with a well-developed sphincter muscle. H. planktophilus forms long sinuous burrows that are semipermanent and shared. Females deposit a tubular egg mass in a burrow in which the embryos develop directly into juveniles. Gastrulation appears to be by invagination, followed by a ciliated stage that has a telotrochal swimming band, suggesting that the ancestor to H. planktophilus developed via a tornaria larva. The juveniles emerge from the egg membrane with a ventral post-anal tail and assume an interstitial burrowing life habit. The post-anal tail, mode of development, small size and correlated simplification in body plan suggest that H. planktophilus is closely related to Saccoglossus, and together these worms may be sister taxa to the colonial Pterobranchia. A taxonomic key is provided to the enteropneust genera, and to the species of Harrimania.

Catherine Berris Associates Inc. (2001). Clayoquot Sound Coastal Plan - Scoping Document (Draft), Central Region Board: 13.

The Central Region Board (CRB) of Clayoquot Sound has been assigned the responsibility of preparing a scoping exercise for a coastal planning study for Clayoquot Sound. During late 2000 and early 2001, the CRB invited several

different people to meet with them to discuss various aspects of coastal planning. These meeting addressed: 1) Review of similar processes; 2) Review of LUCO experience with various coastal planning initiatives; 3) Review of LUCO coastal planning issues in Clayoquot Sound; 4) Presentations on coastal zone management from the federal perspective; 5) Presentation on Ecotrust Canada proposal to develop and monitor a conservation-based shellfish economy in Clayoquot Sound; and 6) Joint meeting of CRB/Central Region Chiefs with BCAL. As a result of these discussions, the CRB decided that it was interested in further pursuing the idea of developing a coastal plan for Clayoquot Sound. This document is the next step in that process. It outlines a proposed work plan and consultation process. It was developed based on significant input from the CRB, as well as contact with most of the primary government agencies.

Clapp, B. (1999). Underwater Harvester's Association Geoduck Enhancement Program. Aquaculture Canada 1999 http://www.aquacultureassociation.ca/abst_99/special2.htm, Victoria, BC.

The Underwater Harvester's Association (UHA) is comprised of all the licensed geoduck and horse clam fishermen in British Columbia. In 1994, the UHA funded and initiated a program to plant hatchery raised geoducks to enhance local populations. Planting geoducks had not been attempted in British Columbia. The initial objective was to eventually harvest up to 30 % of the yearly quota from the enhanced stocks. There were no hatchery facilities in British Columbia and no planting technology available for the UHA to copy. In 1999, there is a successful geoduck hatchery (Island Scallops) and the UHA has a machine that can plant up to 50,000 juvenile geoducks per day. The survival of the planted geoducks is around 50 % after two years.

Clayoquot Sound Central Region Board (1999). Summary of the February 4th, 1999 Workshop on: The Future of Oyster Aquaculture in Clayoquot Sound. Long Beach Golf Course, Central Region Board: 15.

In recent years oyster growers in Clayoquot Sound have demonstrated interest in opportunities to expand their industry. The Central Region Board (CRB) agreed that oyster culture in Clayoquot Sound had the potential to become an ideal economic development opportunity and diversification strategy. To this end, the CRB in November 1997, met with Ministers Cashore and Zirnhelt to discuss the potential of expanding opportunities for leases, and in May 1998, approached the Ministry of Environment, Lands and Parks to suggest: 1) Creating additional leasing opportunities for oyster farming in Clayoquot Sound; and 2) Convening an oyster planning workshop with all interested parties including: local growers, First Nations and other local and provincial government representatives. The need for the workshop was confirmed when in November 1998, the Province of BC announced its intention to facilitate the expansion of shellfish aquaculture by increasing access to Crown land. The Province, as par of the announcement, also indicated a desire to explain how the initiative would be implemented. Therefore, the Province's initiative, coupled with the CRB's request to hold a planning session, resulted in a workshop on February 4th 1999 in Tofino.

Coon, M. L. and E. J. Field (1976). Nootka Sound Kelp Inventory, 1975, British Columbia Marine Resources Branch: 26.

Coopers & Lybrand (1998). Economic Potential of the British Columbia Aquaculture Industry: Phase I Shellfish, Western Economic Diversification Canada: 29.

The Department of Western Economic Diversification commissioned Coopers & Lybrand Consulting to undertake a study of the economic potential of the BC marine aquaculture industry. This report examined the potential for shellfish farming including: 1) A biophysical capability analysis for clam and oyster farming; 2) Analysis of productivity trends; 3) literature and statistical reviews; 4) surveys of producers and processors; and 5) interviews with industry and government stakeholders. The major findings are: 1) Shellfish farming has the potential to become a $100 million industry in BC. 2) Realizing this potential could create more than 1,000 person years of employment in coastal communities over the next ten years. 3) significant long-term market opportunities for BC shellfish products exist in the US and Pacific Rim. 4) BC has a significant inventory of capable aquatic lands, a portion of which could be allocated to expand shellfish production. 5) Productivity is rising rapidly in BC due to industry's investment in technological improvements. 6) New shellfish species hold further promise for economic expansion. 7) Government support is necessary to address impediments to industry development.

Cross, S. F. and B. C. Kingzett (1992). Biophysical Criteria for Shellfish Culture in British Columbia: A Site Capability Evaluation System. Courtenay, BC Ministry of Agriculture, Fisheries and Food: 40.

The British Columbia shellfish culture industry began in the 1920's with the importation of the Pacific oyster, Crassostrea gigas, from Japan. The industry now encompasses a variety of additional species including the popular Manila calm (Tapes philippinarum) and the fast-growing Japanese scallop (Patinopecten yessoensis). Presently utilizing a foreshore area of over 1,500 hectares (50% intertidal and 50% subtidal), the developing B.C. industry could, through improved culture methods and the use of off-bottom culture techniques, at least double the current shellfish production for the province. Continued development and expansion of new shellfish culture sectors, will undoubtedly also have a profound effect on increasing production within the British Columbia shellfish culture industry over the next 10 years. Expansion will necessarily require the assessment of underdeveloped coastal areas both in terms of suitability and capability of each potential site for supporting shellfish culture. The SUITABILITY of a culture site is determined by those socioeconomic, resource use, infrastructural and marketing parameters which affect the viability of a proposed operation. In contrast, the CAPABILITY of a shellfish culture site refers strictly to environmental parameters and mitigators which will affect a site's ability to support the proposed culture.

Cross, S. F. and B. C. Kingzett (1993). Shellfish Culture Capability Appraisal for Clayoquot Sound Vancouver Island. Victoria, BC Ministry of Agriculture, Fisheries and Food: Discussion Document and Map Atlas 6+app.

The Map Atlas accompanies the case appraisal of Shellfish Culture Capability for Clayoquot Sound, Vancouver Island. It consists of a detailed assessment of the region's potential for culturing the Pacific Oyster, Manila Clam, and the Japanese Scallop - the three species presently produced commercially within BC. This completes work initiated by the MAFF in 1992 to develop a standard methodology for determining biophysical capability of marine areas for shellfish culture, and employs a standardized data acquisition survey approach recommended by Cross (1993): "Assessing Shellfish Culture Capability in Coastal British Columbia - Sampling Design Considerations for Extensive Data Acquisition Surveys". The map atlas is meant to accompany the document: Shellfish Culture Capability Appraisal for Clayoquot Sound, Vancouver Island. (S.F. Cross and B.C. Kingzett, AQUAMETRIX RESEARCH, May 1993. Prepared for B.C. Ministry of Agriculture, Fisheries and Food, Victoria, BC.

Cross, S. F., B. C. Kingzett, et al. (1992). Biophysical criteria for shellfish culture in British Columbia : Barkley Sound & Clayoquot Sound biophysical data. Courtenay, B.C., Aquametrix Research Ltd.; Prepared for Ministry of Agriculture, Fisheries & Food, Aquaculture and Commercial Fisheries Branch: 347 1 v. (various pagings).

The British Columbia shellfish industry presently utilizes a foreshore area of over 1,500 hectares (50% intertidal and 50% subtidal) and studies have indicated that expansion of the industry could, through improved culture methods and the use of off-bottom culture techniques in appropriate areas, produce at least double the current production of oysters alone. Continued development of new shellfish culture sectors (e.g., Japanese scallop and Manila clam), will undoubtedly also have a profound effect on increasing the production capability of the British Columbia shellfish culture industry of the next 10 years. The Ministry of Agriculture, Fisheries and Food has recognized the growth potential of the British Columbia shellfish culture industry, and is taking appropriate steps to clearly define coastal areas which are capable of sustaining shellfish culture. Where the Suitability of a culture site is determined by those socioeconomic, resource use, infrastructural and marketing parameters which affect the viability of a proposed operation, the Capability of a shellfish culture site refers strictly to environmental parameters and mitigators which will affect a sites ability to support the proposed culture.

Cross, S. F. and A. Williams (2000). Shellfish Aquaculture Carrying Capacity Study, Lemmens Inlet, Clayoquot Sound - Data Report - Winter Sampling Period. Sidney, BC, Aquametrix Research Ltd and Science Council of BC: 20.

The Clayoquot Sound Shellfish Growers Association, as well as other interest (e.g. BCSGA, coastal communities, First Nation groups, environmental conservation organizations), have recognized that the sustainability of shellfish

aquaculture , particularly in light of a recent move to allow more expansion of the industry, must consider maximum (sustainable) levels of production so that this aquaculture sector can be balanced within the context of natural ecosystem processes, including the productivity of other littoral and sub littoral species with which they interact. The objective of this study, in support of estimating the shellfish aquaculture carrying capacity for Lemmens inlet are to: 1) Document the circulation dynamics within Lemmens Inlet during ebb and flood tide exchanges; 2) Define the exchange rate of marine waters between Lemmens Inlet and the outer waterways of Clayoquot Sound; and 3) Collect information of phytoplankton dynamics and temporal-spatial changes in particulate organic matter. This aspect of our overall research program, which is intended to culminate in the development of a mathematical model for this system, is considered a winter data collection component for the study. It is our intent to further research during 2000 (spring/summer/fall) at other coastal sites (plus further sampling in Lemmens) to acquire the data necessary to describe seasonal changes in the parameters governing shellfish aquaculture carrying capacity. These data will then be used to develop a working mathematical model which will be of benefit to industry as well as to coastal zone resource managers.

Cross, S. F. and A. Williams (2001). Shellfish Aquaculture Carrying Capacity Study, Lemmens Inlet, Clayoquot Sound - Final Data Report. Courtenay, BC, Aquametrix Research Ltd. and Science Council of BC: 12.

The Clayoquot Sound Shellfish Growers Association, as well as other interests (e.g. BCSGA, coastal communities, First Nation groups, environmental conservation organizations), have recognized that the sustainability of shellfish aquaculture , particularly in light of a recent move to allow more expansion of the industry, must consider maximum (sustainable) levels of production so that this aquaculture sector can be balanced within the context of natural ecosystem processes, including the productivity of other littoral and sub littoral species with which they interact. The objective of this study, in support of estimating the shellfish aquaculture carrying capacity for Lemmens inlet are to: 1) Document the physical oceanographic processes which will effect temporal and spatial changes in primary productivity within Lemmens Inlet (including the exchange with outer waterways of Clayoquot Sound); 2) Collect information on phytoplankton dynamics and temporal-spatial changes in organic matter as indicators of food availability to shellfish resources in this inlet system; and 3) Incorporate these data into a model of shellfish culture carrying capacity specific to the Lemmens Inlet system, but transferable (in terms of data input requirements and functionality) to other growing areas in coastal British Columbia.

Day, A., B. Mottershead, et al. (1999). A New Approach to Shellfish Aquaculture Development in British Columbia: The Clayoquot Sound and Barkley Sound Shellfish Aquaculture Steering Committees. Aquaculture Canada 1999 http://www.aquacultureassociation.ca/abst_99/special2.htm, Victoria, BC.

In recent years, West Coast Vancouver Island native and non-native communities have expressed interest in developing and diversifying local economies through shellfish aquaculture. This desire, coupled with the November 1998 announcement of the Province's intention to work with communities in accepting applications for new shellfish aquaculture tenures resulted in the formation of the Clayoquot Sound and the Barkley Sound Shellfish Aquaculture Steering Committees. The objectives of these Steering Committees, which are currently comprised of representatives from First Nations, local communities, industry, the BC Assets and Lands Corporation, the BC Ministry of Fisheries, the Clayoquot Sound Central Region Board, and the West Coast Vancouver Island/Nuu-chah-nulth Regional Aquatic Management Society, are to determine suitable areas for shellfish aquaculture in local waters and to develop community based criteria by which tenure applications will be adjudicated. Both Steering Committees have begun suitability mapping exercises with local First Nations, industry, and communities and have begun developing economic, social, and ecological application criteria. The opportunities and challenges these Steering Committees face in achieving their objectives will be presented in more detail.

Druehl, L. (1999). Canadian Kelp Culture Technology and Opportunities. Aquaculture Canada 1999, Victoria, BC http://www.aquacultureassociation.ca/abst_99/special2.htm.

There is an increasing demand for kelp, resulting from the introduction of new products and a growing market for established products. Sea vegetables, including herring-roe-on-kelp, and plant fertilizers are examples of growing kelp markets. Pharmaceuticals, cosmetics, and feed for rearing sea urchins and abalone are examples of emerging kelp markets. To meet British Columbia demands, the reported wild harvest of kelp increased 50% from 1995 to 1997. Kelp cultivation can help meet these growing demands and, at the same time, provide the harvester with greater quality control and accessibility. Kelp farming consists of two stages, seed production and long-line cultivation. The technology for farming is established and limited infrastructure for seed production exists. The environmental conditions essential to a successful kelp farm operation are mostly understood. Six kelp species have been successfully farmed in British Columbia. Test farming in British Columbia and Washington State has indicated that up to 40 wet tonnes of kelp may be produced per acre per year and, where conditions warrant two crops per year, up to 64 wet tonnes may be produced.

Druehl, L. D. and C. T. J. Elliott (1996). Parks Canada Barkley Sound kelp distribution. Bamfield Marine Station (B.C.), Parks Canada.

Contents : v.1 - Introduction and part 1 Species description; v.2 - Parks Canada kelp distribution; v.3 - Description of the physical environment

Dunlop, R. (2000). "Area F Intertidal Clam Fishery Community Management Board: Emerging community-based management in Nuu-chah-nulth Ha'houlthee on the west coast of Vancouver Island." Bulletin of the Aquaculture Association of Canada 2.

Area F Intertidal Clam Fishery Community Management Board was formally established for the West Coast Vancouver Island clam fishery in 1998. The Board is composed of elected licensed clam harvesters and representatives from communities, First Nation governments and guardians, as well as the Fisheries & Oceans Canada and BC Fisheries. The objectives of the Board are conservation, long-term benefits from the fishery, and increasing the involvement of stakeholders in decision-making. This community management board, guided by a board development strategy, is developing a comprehensive inventory of area clam beaches, implementing a resource-based self-funding mechanism, and evaluating a set of licensing and technical micro-management options to improve the local intertidal commercial clam fishery. Vetting the micro-management options against the harvesters and communities will provide management direction to the Board and permit a stock assessment program to be designed to complement existing data collection and meet the needs of the preferred management options. The recent intertidal clam fishery and several issues before the Board, including license transferability and expansion of shellfish aquaculture, are briefly described.

Dunlop, R. and T. Simonson (1999). The Regional Aquatic Management Board; The Area F Clam Management Board; and The Shellfish Aquaculture Development Initiative. Aquaculture Canada 1999 http://www.aquacultureassociation.ca/abst_99/special2.htm, Victoria, BC.

Several community based management initiatives are developing on the West Coast of Vancouver Island. After years of work towards its establishment by the Nuu-chah-nulth First Nations, a Regional Aquatic Management Board is being negotiated with the federal Department of Fisheries and Oceans and the provincial Ministry of Fisheries for implementation in 1999. This Regional Management Board will set the framework for other community initiatives, two of which are already underway. The Area F Clam Management Board was established in 1998. Its objectives are: conservation of the intertidal clam resource; maximizing benefits to diggers, communities and future generations; and, exploration of local management options. In late 1998 the Province announced a Shellfish Aquaculture Development Initiative. The Province is piloting this initiative in Clayoquot and Barkley Sounds, working with the evolving West Coast Vancouver Island management groups to implement this initiative consistent with community interests and priorities.

Ecotrust Canada (2002). Nuu-chah-nulth Tribal Council Fisheries Shellfish Market Survey. Vancouver, Nuu-chah-nulth Tribal Council: 30 + appendices.

The Nuu-chah-nulth Tribal Council (NTC) Fisheries Commission has undertaken the development of business plans for First Nation Shellfish farming operations on the West Coast of Vancouver Island (WCVI). The first plan to be developed was for the Tla-o-qui-aht First Nation of Clayoquot Sound. Recent market conditions, challenges, and opportunities have presented themselves during the development of these plans. It would appear that the time is over when farmers

can simply seed product and assume that processing plants will buy all they can produce. Existing farms in Clayoquot and Barkley Sounds have harvestable product sitting in the water with existing processing plants in B.C. claiming they are not able to process the product. Growers need to become more proactive in securing long-term access to markets. The shellfish volume harvested from the Clayoquot Sound area alone is expected to triple within the next two years and a local industry of $2,000,000 per year in just that one portion of WCVI is very attainable within the next 3 - 5 years. A well developed shellfish production, processing, sales and marketing strategy is now essential to the Nuu-chah-nulth's successful entry into the shellfish sector within their traditional territory. Also, for such a strategy to be successful its design must consider the market trends identified in this report. Ecotrust conducted an intensive market survey to identify some of the major relevant market trends and opportunities for WCVI shellfish. The purpose is to provide information to assist Nuu-chah-nulth First Nations in formulating strategies that will ensure effective marketing of their proposed farm production.

Field, E. J. and M. C. S. Ltd. (1998). Kelp Inventory, 1997: Barkley Sound - Deer Group and Tzartus Island, B.C. Aquaculture and Commercial Fisheries Branch, Fisheries Development Report: 16 pp + 1 chart.

Foighl, D. Ó., B. C. Kingzett, et al. (1990). "Growth and survival of juvenile Japanese scallops, Patinopecten yessoensis, in nursery culture." Journal of Shellfish Research 9(1): 135-144.

Forbes, J. R., D. L. Mackas, et al. (1990). Zooplankton distribution and associated biological, physical and chemical data : Barkley Sound, Vancouver Island, April 1987 and May 1988 (MASS Program). Sidney, B.C., Institute of Ocean Sciences: 139.

Data collected during April 1987 and May 1988 in Barkley Sound, southwest Vancouver Island, as part of the Marine Survival of Salmon (MASS) Program are presented. The objectives of this component of MASS were to survey the distribution, abundance and size frequency of zooplankton and investigate underlying biological and oceanographic processes controlling the zooplankton community. For 1988, maps of the surface distribution of zooplankton biomass by size category, salinity and temperature, obtained by a flow-through sampling system, are provided. Zooplankton identity, abundance and size distribution determined from vertical net haul and BIONESS samples, together with biological, physical and chemical observations from CTD/rosette casts are reported. Data from 1987 are restricted to zooplankton identity, abundance and size distribution determined from vertical net haul samples.

Gillespie, G. E., M. Parker, et al. (1999). Distribution, abundance, biology and fisheries potential of the exotic varnish clam, (Nuttallia obscurata) in British Columbia. Ottawa, Canadian Stock Assessment Secretariat research document 99/193.

Varnish clams have recently become established in Georgia Strait, and have been found in Barkley Sound on the west coast of Vancouver Island and estuaries in Oregon. They are dispersing southward to Puget Sound, and could spread northward into the Central Coast, similar to manila clams. This paper discusses distribution and dispersal of varnish clams and collects available information on biology, ecology and population dynamics. This information is summarized, and gaps in required information are identified. The fishery potential, management approaches and assessment information requirements to develop and evaluate the effectiveness of management tactics are discussed. The paper suggests that varnish clams have potential as commercial and recreational resources, and should be managed accordingly.

Gillespie, G. E., B. Rusch, et al. (2001). Further Investigations of the Fisheries Potential of the Exotic Varnish Clam (Nuttallia obscurata) in British Columbia, DFO Canadian Science Advisory Secretariat Research Document 2001/143: 60.

Varnish clams, Nuttallia obscurata, are a recently introduced exotic bivalve that have become well established in southern British Columbia. This species has attracted attention from commercial and recreational fishers and clam culturists, and has been identified as a potentially valuable fishery resource. This paper presents results of several projects to collect biological and ecological information on varnish clams, in support of fishery development. The distribution of varnish clams in British Columbia continued to expand beyond the Strait of Georgia into Johnstone Strait and north along the west coast of Vancouver Island. They were found associated with other commercially important bivalves including Manila and littleneck clams, Venerupis philippinarum and Protothaca staminea, respectively, although generally higher in the intertidal zone. Varnish clam distribution extended lower in the intertidal zone on beaches that did not support large populations of Manila clams. Experiments to examine competitive relationships between varnish and Manila clams showed evidence of competition when the two were placed together, with varnish clams having some competitive advantage in the upper intertidal zone and Manilas in the mid-intertidal zone. Characteristics of harvest and processing of varnish clams were examined. Varnish clams >30 mm total length were harvested from mixed populations. Harvest efficiency was relatively high, 60-80%, for this size class. Breakage during harvest was low, approximately 2%, and shrinkage during processing was approximately 4%, evenly divided between weight loss due to water loss and losses due to mortality. Grit was purged readily from clams during wet storage within 48 hours. Commensal pea crabs, Pinnixia faba, were not purged from varnish clams even after 34 days. Successful development of a varnish clam fishery depends on a consistent supply for the market. This could be achieved by allowing harvests of varnish clams from tenured foreshore under aquaculture permits. As the market becomes established, demand and price may allow for economically viable commercial harvest opportunities. Further work is required to develop biological information to support management of a sustainable commercial fishery.

Goater, C. P. and A. E. Weber (1997). "Factors affecting the distribution and abundance of Mytilicola orientalis (Copepoda) in the mussel, Mytilus trossulus, in Barkley Sound, BC." Oceanographic Literature Review 44(8): 877.

M. orientalis, was found in 0-80% of summer-collected samples of M. trossulus from two sheltered locations in Barkley Sound, on the western coast of Vancouver Island. It was absent in mussels from two adjacent, wave-exposed locations. Mean abundance increased as average host size increased but was not associated with host density. The restricted regional distribution of this copepod in Barkley Sound (and throughout the Pacific Northwest) may be limited by factors that confine transmission to sheltered, muddy estuaries. Within such sites, copepod abundance is highest in large mussels collected near the low-tide mark.

Hand, C. M. and G. Dovey (1999). A survey of geoduck populations in the Elbow Bank and Yellow bank area of Clayoquot Sound, West Vancouver Island, in 1994 and 1995. Nanaimo, B.C., Science Branch, Pacific Biological Station: vii, 33.

A survey of geoduck (Panopea abrupta) stocks in a portion of Clayoquot Sound, on the west coast of Vancouver Island, was conducted by the Underwater Harvesters Association and Fisheries and Oceans Canada in Sept. and Oct. of 1994 and Sept. and Oct. of 1995. The purpose of these surveys was to estimate the density of geoducks in known beds, establish and verify the boundaries of the beds and determine the age and weight distribution of the population from samples of geoduck collected. Virgin density was also calculated by reconstructing it from the survey density, the density of geoducks removed by the fishery and the density of recruited geoducks. Survey results are considered in the process of quota calculations for the geoduck fishery on the west coast of Vancouver Island.

Harbo, R., T. Hollingshead, et al. (1990). Intertidal Clam Resources of the South Coast Area (including the Fraser River and Howe Sound). Nanaimo, BC, Fisheries and Oceans, Management Biology Unit, South Coast Division, Fisheries Branch.

The information contained in this catalogue of clam beaches (Area 12 to 20) was obtained from personal interviews, June to August 1986. Information for areas 23 through 27 was obtained from charts submitted in 1984 from Fisheries Officers for each respective area. Each statistical area contains a table listing the clam beaches and the intensity that each user group harvests in that area. The total harvestable areas of each individual beach is also indicated. The charts following show the estimated locations and areas of the harvested clam beaches. A summary of potential harvestable areas and reported sales slip landings of all commercial species for all the south coast (Areas 12 through 29) for 1985 is shown. This table indicates the involvement of each statistical area in the total harvest of clams. The areas of the clam beaches were calculated using a

G.T.C.O. Corporation, Gap I, digitizer. Estimated areas were +- 2 hectares upon repetitive trials. Accuracy of the measuring instrument is much greater than the actual positioning of the beaches on the charts. These shaded areas are only an indication of the potential area available for clam harvesting. To obtain an accurate estimation of clam populations the individual clam beaches would have to be sampled since clam bed distributions are patchy and discontinuous on an individual beach. The density of clams in a clam bed also varies from area to area. On the west coast Vancouver Island it is found from sample beaches that about one third of the beach area indicated on the nautical charts was actually harvestable area(Adkins and Harbo, 1986). Currently the majority of commercial clam harvesting is for native and Japanese littleneck clams, however prior to 1981 butter clams were the major species harvested. Some of the beaches noted for their butter clam content are noted in it the comments column of the tables listing the clam beaches.

Harbo, R., K. Marcus, et al. (1997). Intertidal Clam Resources (Manila, Littleneck and Butter Clams) Volume 1: The West Coast of Vancouver Island. Nanaimo, BC, Fisheries and Oceans Canada, South Coast Division: viii+116.

This report documents 326 beaches and 1672 ha on the west coast of Vancouver Island (WCVI) Pacific Management Areas 21 and 23 to 27. This area supports populations of Manila, Littleneck and butter clams. It is important to note this is not a complete inventory of all sites and only a portion of the identified beach area supports clam populations. The clam beach data are available in electronic formats. Most of the beaches identified are small "pocket" beaches with 280 beaches being less than 10 ha in size. The largest identified beach is 57 ha. Annual landings of intertidal clams, butter, littleneck, Manila and mixed (littleneck and Manila) are presented for the WCVI. Currently the most important commercial species are the Manila and littleneck clams and the WCVI may account for 20 to 25% of the annual British Columbia production. Peak landings for the WCVI were 862 t. in 1988. Historically, in the 1960's and earlier, butter clams were also important commercially. Other clam species may be present but have not been commercially exploited. Earlier assessments of clam populations indicate that recruitment is sporadic and annual rates of recruitment vary for beaches only a few kilometers apart. There are a number of beaches closed to commercial harvest for allocations to Aboriginal and recreational harvest. Some beaches are also closed due to pollution. Historically, paralytic shellfish poisoning has been a problem and there are a number of mussel monitoring stations established along the WCVI, 33 stations in 1995. There are also concerns for amnesiac shellfish poisoning on the WCVI. There are 12 commercial tenures (1995) to culture Manila clams on WCVI, all in Area 23 Barkley Sound. The shallow burrowing species of bivalves such as butter clams and littleneck clams may be impacted by the recent introduction of sea otters to the WCVI. Manila clams, found high on the tide in shallow waters, may not be as vulnerable to otter predation.

Harding, L. and M. Thomas (1987). Baseline sediment and tissue trace metals in Barkley Sound, Quatsino Sound, Surf Inlet and Laredo Sound, British

Columbia. Vancouver, Environment Canada, Environmental Protection Service: ix, 137 p.

Heath, W. and J. G. Lindsay (1993). Red algal blooms : effects on shellfish farming in British Columbia and steps to prevent shellstock losses. Victoria, B.C., British Columbia Ministry of Agriculture, Fisheries and Food Aquaculture Commercial Fisheries Branch; and Canadian Benthic Ltd.: vi, 14 p.

This report describes a major algal bloom event in British Columbia which resulted in unprecedented heavy losses of commercial shellfish stocks in Barkley Sound in September 1990. Several recommendations for procedures to prevent serious losses of shellfish stocks are presented, with the view to helping the B.C. shellfish industry be better prepared for such bloom events in the future.

Heath, W. A. (2001). Shellfish Aquaculture Extension through Collaboration with Industry in British Columbia. Aquaculture Canada 2001, Halifax, Nova Scotia, Aquaculture Canada http://www.aquacultureassociation.ca/ac2001/RoleExtension.htm.

Increasingly the delivery of technology transfer or extension for shellfish aquaculture in British Columbia is accomplished through partnerships among government agencies, academic institutions and the shellfish industry. Our Branch has supported capacity building in the BC Shellfish Growers Association, including for farm worker and manager training programs and Internet-based information dissemination. Extension staff work closely with industry in research projects and in the preparation of workshops, conferences and extension publications. Examples of current collaborations on farm management extension will be discussed.

Holmes, H. (1998). Shellfish Monitoring in Pacific Rim National Park Reserve. Research Links: A Forum for Natural, Cultural and Social Studies, Parks Canada. 6: 1,6,11.

The purpose of the project is to gather baseline data on five species which are harvested in British Columbia: butter clams (Saxidomus giganteus), littleneck clams (Protothaca staminea), Manilla clams (Tapes philippinarum), Pacific or Japanese oysters (Crassostrea gigas), an native oysters (Ostrea lurida). From these data we can learn whether populations increase or decrease over the long term in response to human and/or natural disturbances. The goals of the Shellfish Monitoring Project are to: 1) Obtain scientifically defensible data to assist in sound decision making for marine ecosystem protection. 2) Work cooperatively with the Department of Fisheries and Oceans (DFO), and First Nations to manage resources in a healthy and viable manner. 3) Quantify the impact of natural or human induced changes in the marine environment. 4) Provide information for a feasibility study on establishing the Broken Islands as a harvest refugium. 5) Provide a link to visitor use impact studies currently being conducted in the Broken Group Islands. Long term objectives are to: 1) Describe species distribution and abundance. 2) Provide early detection of introduced ,

exotic species. 3) Record the interaction between endemic and introduced species. 4) Identify critical 'seed' areas for possible restocking of non-protected shellfish habitats outside the National Park.

Jamieson, G., S. Dixon, et al. (2001). Initial evaluation of community structure in goose barnacle (Pollicipes polymerus) and sea mussel (Mytilus californianus) beds off the west coast of Vancouver Island, British Columbia. Nanaimo, BC, DFO Canadian Science Advisory Secretariat Research Document 2001/124: 60.

Goose barnacles (Pollicipes polymerus Sowerby, 1833) have been harvested off the west coast of Vancouver Island since 1985. However, following rejection of approval to establish a sea mussel (Mytilus californianus) fishery because analysis indicated that harvesting this species would likely have significant negative ecological impacts, attention was directed to the possible effects of the existing commercial goose barnacle fishery. Since the ecological role of this species was also structural and its fishery implications had not previously been thoroughly investigated, the commercial goose barnacle fishery was closed in May, 1999, until appropriate evaluation studies could be done. Such studies were initiated in 2000, with objectives to: 1) evaluate the ecological role of goose barnacles in the exposed rocky intertidal; 2) to conduct goose barnacle biomass estimates in limited areas; and 3) to make management recommendations from an ecological perspective on how a commercial goose barnacle fishery, if reopened, should proceed. Here, we present initial results from our analysis of goose barnacle/sea mussel community structure and initial ecological observations of how experienced fishers harvest goose barnacles. Species diversity within the exposed rocky intertidal zone is complex and is correlated with matrix thickness (the combined layer of living animals, dead shells and associated debris). Following screening with a 1.0 mm sieve, 142 species were identified in our samples. Species predominating numerically (>1000 individuals/species collected, 85% of all individuals found) in the samples were Mytilus californianus, Cirolana harfordi, Petrolisthes cinctipes, Corophium sp., Hyale sp., Lacuna vincta, Pollicipes polymerus, Semibalanus cariosus, Cucumaria pseudocurata, and Lottia alveus, respectively. Species observed consisted of gastropods (40%), marine arthropods (20%), annelids (16%), echinoderms (7%), molluscs (5%), cnidarians (3%), unknowns (4%); and insects, chordates, and sipunculas (5%). Sea mussels and goose barnacles predominated at an intertidal elevation of 2 to 4 m. Experienced fishers typically harvest fist-sized "colonies" of goose barnacles from a sea mussel or acorn barnacle matrix, prying each colony off with a long flat steel bar. This harvest method produces divot holes in the mussel matrix layer or patches of bare rock in acorn barnacle areas. Three months after harvesting, the holes created in sea mussel areas had largely filled in through realignment of nearby sea mussels. Bare rock was still evident in acorn barnacle areas. Reduced community biomass at areas intensively harvested, anecdotally reported to be due to the actions of inexperienced harvesters in previous year(s), was visible at most sites.

Jamieson, G. S., L. Chew, et al. (2001). Phase 0 Review of the Environmental Impacts of Intertidal Shellfish Aquaculture in Baynes Sound. Nanaimo, BC, Canadian Science Advisory Secretariat, Fisheries and Oceans Canada: 103.

Kingzett, B. (1997). Investigation of Optimal Manila Clam Seeding Techniques: Economic and Cultural Considerations for British Columbia Manila Clam Aquaculture. Errington, BC, Science Council of British Columbia: iv+28+Figures.

Since Manila clams culture began in 1984, it has become established as a viable addition to the shellfish industry in British Columbia. Farmed production of clams has increased from 4 tonnes in 1985 to an estimated 900 tonnes in 1997. Investigations into culture methods have identified optimal substrates, tidal heights, seeding densities, and predator protection methods. Now that the capability for culture has been established, refinements in production techniques are required to improve the potential return on investment of clam culture. In standard Manila clam farming practice, clam seed are placed into culture plots at a size of six to eight millimeters and are harvested after three years of grow-out. In recent years, culturists have discovered that when optimal husbandry practices are employed, such as predator protection and regular digging of substrate, natural recruitment and survival of wild clams onto culture plots may equal of exceed seeding requirements. Purchase of clam seed represents a significant investment to clam culturists (as much as 27% of operating budgets), and may make clam culture uneconomical. However, reliance on wild seed carries significant risk since settlement of clam larvae may not occur in each year. Some culturists believe that seeding is necessary. In addition some culturists maintain clam seed in off-bottom seed nurseries to accelerate juvenile growth. Seed may then be planted on the beach for final grow-out at a larger size than would be obtained during the same period had the seed been planted directly. Oyster nursery techniques have been modified so that culturists with access to deep water tenures have the capability to raise seed clams using relatively simple structures. Seed raised to larger sizes must be handled regularly and requires increased operating cost in labour and capital for grow-out equipment. Proponents argue that by maintaining clams in off-bottom nurseries (boosting), survival is increased and that the grow-out cycle may be reduced from three years to two thus allowing the long-term production of area of ground to be significantly increased. Currently in British Columbia there is a moratorium on new clam culture tenures. Decreasing production cycles may represent the only method by which companies involved in Manila clam culture will be able to increase production once the existing tenure base is developed. The present study examines the benefits of seeding versus not seeding and the economics of using larger seed for planting. The objectives of this study are to optimizing culture methods and possibly identifying benefits of purchasing seed and nursery equipment which would translate into increase profitability of Manila clam culture. In addition, methods which will allow increase production of tenure areas by shortening production cycles from three years to two may provide a means of increasing long term production per unit area of clam culture. The specific study objectives are as follows: 1) Is it economically beneficial to raise seed clams to

larger sizes prior to planting? 2) What is the optimal size for raising seed in on-site nursery systems? 3) Is planting hatchery produced seed necessary for successful manila clam culture? 4) Can long-term production per are of ground be increased by seeding with larger sized seed? The report details results of investigations conducted on the experimental objectives by San Mateo Shellfish Ltd. for the period April 1995 to August 1997.

Kingzett, B. and D. Paltzat (2002). Supporting Community Shellfisheries and Aquaculture in Barkley Sounds: Stakeholder Participation in Shellfish Sanitation Monitoring and Investigation - Results of Shellfish Growing Water Sampling Programs in Barkley and Clayoquot Sounds. Nanaimo, BC, BC Shellfish Growers Association: 74 + Appendix.

The shellfish industry in British Columbia, which includes aquaculture and commercial, sport, and Fist Nation fisheries, depends upon unpolluted growing waters to produce the high quality and safe product necessary for human consumption. The shellfish industry in Barkley and Clayoquot Sounds is at a significant turning point. Local shellfish entrepreneurs and development agencies indicate that they are now in a good position to begin to develop the industry further in a manner that conserves the natural environment and supports local communities. Sanitary growing water monitoring data collected at shellfish growing areas within Barkley and Clayoquot Sounds between 1999 and 2001 by Environment Canada has shown that seasonal rainfall has adverse impacts on water quality. In response, the Pacific Shellfish Classification Committee (PSCC) agreed to the fall closure in conjunction with a SRS program at a meeting held in North Vancouver on April 11, 2001. Early proposals to close these areas to shellfish harvesting for large portions of the year would potentially have devastating effects on shellfish aquaculture and the commercial and food shellfisheries in the Sounds. In this project, the BC Shellfish Growers Association, with the support of the Underwater Harvesters Association, the Clayoquot Sound Oyster Growers Association, Nuu-chah-nulth Fisheries, and Ecotrust Canada worked with Environment Canada to initiate a project with the goals of obtaining necessary and critical information about the seasonal impacts on growing water quality within Barkley and Clayoquot Sounds. Further goals were to attempt to identify pollution sources, and assist in the development of management strategies that will avoid significant economic and social impacts on shellfish industry stakeholders while preserving the integrity and safety of shellfish harvested from the region.

Kingzett, B., R. Salmon, et al. (2002). First Nations Shellfish Aquaculture Regional Business Strategy: BC Central and Northern Coast. Victoria, BC, Aboriginal Relations and Economic Measures, Land and Water British Columbia Inc.: 254.

The goals of this project was to develop a strategy and framework for First Nations shellfish aquaculture on the Central and North Coasts that will assist in the development of economic measures to support First Nations' entry into the shellfish farming industry along the coast. The framework is intended to: 1)

Identify the best sites and best species for farming in each First Nation community, using existing baseline bio-physical and economic information; and 2) Establish a template for business planning through which First Nations will apply for tenure, obtain seed and equipment, train staff and management, and develop the processing, transportation, and marketing infrastructure necessary for success. The report provides a SWOT and other information to assess the feasibility for coastal First Nations communities to establish and develop shellfish aquaculture operations within their traditional territories by incorporating biophysical, suitability and socioeconomic factors. The report and strategy provides a comprehensive overview of the requirements for developing the shellfish farming industry along the whole of the Central Coast, North Coast, and Haida Gwaii/Queen Charlotte Islands land-use planning areas. The First Nation territories included in this study are: Kwakiutl, Oweekeno, Heiltsuk, Kitasoo, Haisla, Gitgaat, Kitkatla, Metlakatla, Lax Kw'alaams, and Haida. The goal throughout the report is not to make a final decision for stakeholders but to provide options and recommendations, which if acted upon, will assist in the development of a viable shellfish culture industry on the Central and North Coast.

Kingzett, B., R. Salmon, et al. (2002). Shellfish Aquaculture Brainstorming Workshop, Workshop Proceedings and Summary + Appendices. Shellfish Aquaculture Brainstorming Workshop, Nanaimo, Centre of Shellfish Research, Malaspina College.

Perhaps the most significant event was organizing and hosting a "brainstorming workshop" to address the question -How do we build a world-class shellfish aquaculture industry in BC? By all accounts, the workshop was very successful and extremely productive. The workshop was significant for a number of reasons. First, the event was unique in that it brought together, for the first time, a diverse mix of individuals involved in all aspects of the industry. Those attending included industry players in the traditional culture species of Pacific oysters and Manila clams (BCSGA members and other key industry producers alike), processors, marketers, new-species proponents/entrepreneurs, First Nations and coastal community representatives, seafood industry associations, and representatives from a wide variety of federal and provincial agencies as well as individuals from U-Vic and Malaspina. Second, all of the participants discussed and agreed on a shared five-year vision for the industry. This is the first time that industry and government have worked together to develop a shared vision - which is an essential ingredient for industry success. The five-year horizon was established because it is within the working future of most of the individuals participating in the discussion and, as such, has an ownership component. Third, the participants undertook a "needs inventory" and discussed and outlined in detail what was needed to support this vision, including the issues that must be addressed to support the identified needs. Fourth, we conducted a "needs assessment" to determine if the needs were being met (and how well) or not being met (a gap).Finally, the group set priorities to ensure that action be taken on the most important gaps; thereby focusing limited resources and key areas.

Kingzett, B. C., K. Reid, et al. (2000). Investigation of techniques for culture of Pacific Oysters in Hi-Flow Aquatech grow-out trays. Vancouver, BC, Science Council of British Columbia Technology B.C. Project #99-21.: 40 + Appendix.

The goal of these trays is to produce top quality oysters in the size ranges of 3.5 to 5 inches, the fastest growing market for high value single oysters. Increasing demands on quality require oysters of consistent shell shape and appearance in well defined size grades. In addition, meat quality is becoming increasingly more important for the fast growing flash-frozen oyster market. Farmers also require fast turn-around on growth and shortened production cycles in order to justify increased costs of intensification. During the spring of 1998, Odyssey Shellfish Ltd. established a preliminary monitoring program. The objective of this program was to monitor the initial effectiveness of the trays and to determine whether certain factors in the use of the trays showed enough variability to suggest that optimization was possible. This preliminary investigation showed that growth was rapid in the trays and that very high survival of oysters was experienced. It also demonstrated that there are significant effects from handling, density and initial loading strategies and these could have a significant effect on variability in growth of the population, and market characteristics such as shell and meat quality. The objective of the current investigation is to investigate factors that affect growth of oysters in Hi-Flow Aquatech oyster culture trays as defined both by rate of growth and market characteristics of the finished product. The goal is to find the most cost-effective method of producing a consistent high quality oyster at greater than 3.5-5 inches shell length in as short a time as possible. This investigation is being conducted at four commercial oyster farms in British Columbia. The results of this investigation would be to develop a Standard Operating Practice for tray use. This S.O.P. would benefit the companies participating in the proposed project and could be provided to other shellfish aquaculturists using or purchasing Hi-Flow Aquatech trays. The Hi-Flow Aquatech tray if used properly provides an efficient way to intensify production and addresses market demand for the production of larger high quality oyster products. With proper techniques established, Odyssey Shellfish and the collaborating companies believe that use of these trays will increase efficiency, marketability and profitability of oyster culture in British Columbia.

Kingzett Professional Services (2003). Investigation of Factors Affecting Sanitary Condition of Growing Waters in Barkley and Clayoquot Sounds: Multiple reports and files see: http://www.kingzett.bc.ca/projects/bark-clay2.htm.

Kingzett Professional, in cooperation with the BC Shellfish Growers Association and Environment Canada, has been working to develop and conduct an in-depth study of the factors that influence sanitary quality of shellfish growing waters in Barkley and Clayoquot Sounds on the west coast of Vancouver Island. This project began in response to extended fall closures for harvesting areas in the Sounds because of Environment Canada evidence of seasonal water quality degradation. Although there is evidence that decreased water quality is associated with heavy fall rainfall events, specific details about the identification

and source of the pollution, the length, range, depth, and extent of the contamination, and the relationship between climatological factors and decreased water quality need to be answered. This multi-season project will endeavor to address these issues with extensive field water sampling, lab analysis, and modeling of climatological relationships. These waters are important commercial, recreational, and First Nations shellfishery areas, and the prospect of extended harvesting closures due to water quality concerns called for studying many of the factors that influence water quality. This project will also look into issues such as how water quality is determined, and whether alternatives that better protect the public and the industry could be considered. Kingzett Professional has developed the study, located funding, are coordinating the various sub-components of the larger project, and are communicating the development of the study and other relevant issues predominantly through the BC Shellfish Growers Association website and community meetings with stakeholders.

Kingzett, B. C., N. Bourne, et al. (1990). "Induction of metamorphosis of the Japanese scallop, Patinopecten yessoensis." Journal of Shellfish Research 9(1): 119-126.

Kingzett, B. C., S. F. Cross, et al. (1996). A synopsis of biophysical information and shellfish culture capability appraisals for Nootka Sound, Kyuquot Sound and Quatsino Sound, Vancouver Island, Aquametrix Res., Prepared for B.C. Min. Agric. Fish. Food: 975.

Kruzynski, G. M. (2000). Cadmium in BC Farmed Oysters: A Review of Available Data, Potential Sources, Research Needs and Possible Mitigation Strategies. Sidney, BC, Canadian Stock Assessment Secretariat, Fisheries and Oceans Canada: 37.

In response to a request by the Canadian Food Inspection Agency (CFIA) in May 2000, the Department of Fisheries and Oceans (DFO), Pacific Region undertook to investigate the potential reasons for apparent elevated Cadmium levels in BC cultured Pacific oysters (Crassostrea gigas). Earlier in the year, CFIA reported that several shipments of BC farmed oysters had been rejected by the Hong Kong market for being in excess of their 2 ug Cd/g ppm) wet weight limits. A preliminary literature search was conducted, contacts were made with shellfish growers and processors, both Government and academic researchers were consulted and the resulting information was synthesized in the form of this report. There are no historical baseline data on Cd residues in BC cultured oysters, so Cd residue data on wild intertidal oysters collected over the period 1973-1999 by Environment Canada and DFO were used as a comparison. These were mapped and overlaid on current CFIA 2000 oyster data and indicated that in the northern reaches of the Strait of Georgia, there were already Cd residues approaching 2 ppm 27 years ago. IN the absence of any obvious anthropogenic Cd inputs, it was suggested that Cd is naturally available in some surface waters where oysters are reared, whether from mineral deposits, local geology or sediment transport from watersheds, or the heads of fjords. The bioavailability of dissolved Cd may be enhanced by low salinities. On the West Coast of Vancouver

Island, Cd accompanying nutrients such as phosphate upwelling from deep waters, could also be a contributing factor. Recommendations include the holding of a Cadmium and Oysters Workshop to exchange of information with oceanographers, geologists, geochemists, oyster growers, toxicologists, biochemists and biologists; the objective being to define fruitful avenues of research and possible mitigative strategies. A culture materials Cd leaching experiment, additional sampling of beach vs. previously suspended cultured oysters, and a 1-2 grow-out experiment using the same genetic stock of oysters distributed to geographically distinct locations on the BC coast is also suggested. Maps showing the relationship of BC coastal geology and existing stream sediment Cd data to oyster growing areas are provided and the suggestion is made that BC Fisheries may wish to consider local geochemistry in future oyster lease suitability approvals. Several hypotheses on Cd pathways from both marine and terrestrial sources have been gleaned from the literature and potential applications to the BC situation are suggested.

Kucey, K. (2000). Diversifying the WCVI Shellfish Aquaculture Industry: Assessing Opportunity for Value-Added Services and What it would take to Set Up Oyster Shucking in Clayoquot Sound, Ma-mook Development Corporation: 26.

The BC shellfish aquaculture industry is expanding and the communities of the Westcoast Vancouver Island are preparing for its development. In Clayoquot Sound in the Summer of 1999, partners to the Shellfish Aquaculture Initiative Steering Committee reached an agreement to take the regional industry to the 'next level' by working cooperatively. They started a critical discussion about processing and value-added services, and went on to identify venture opportunities in a shucking facility, promotion and marketing services for 'Made in Clayoquot Sound' products, and even a setting facility or shellfish hatchery over the longer-term. The best location for an oyster shucking facility was discussed, with Marktosis, Tofino, Ucluelet and Port Alberni considered. Tofino has emerged as the most likely location because of the presence of two HACCP-standard fish plants that could host shucking services. The main finding of this research is that an oyster shucking facility is feasible if a minimum supply of 15,000 gallons/year can be secured. This may be possible in Clayoquot Sound where local production is estimated near 30,000 gallons/year. Production in Barkley Sound is between 5 and 10,000 gallons/year, and under 5,000 gallons/year in Quatsino and Kyuquot Sounds. Nevertheless, questions remain about how sound a shucking venture would be a this time.

Levitan, C. W. (1991). Fecal coliform contamination : a literature review and case history analysis in B.C. Bamfield Marine Station (B.C.) [Vancouver], Bamfield Marine Station for British Columbia Aquaculture Research and Development Council; Funded by Industry, Science and Technology Canada, Fishery Sector Campaign: 48.

Shellfish are filter-feeding organisms and are capable of concentrating bacteria and viruses in their bodies. In order for the shellfish industry to provide

pathogen-free shellfish to the public, a system is needed to identify low risk shellfish. Since the early 1900s, fecal coliforms, normal bacterial inhabitants of the gastro- intestinal tract of warm blooded animals, have been used to indicate the presence of fecal contamination in water. The strengths and weaknesses of fecal coliforms as indicators are summarized. Suggestions for other indicators are reviewed and a research study for a new indicator is outlined. Solutions to coliform pollution problems as they relate to a shellfish sanitation program, are proposed. They include cleaning up the environment, monitoring programs, relaying and depuration, post-harvest care, and better communication between industry and government regulators. The report ends with a discussion of problems specific to Barkley Sound Growers. The problems fall into two categories. One is a lack of documentation of sources of pollution events. The second involves misunderstandings and miscommunications between the growers and the Department of Fisheries and Oceans. The regulatory problems are described using results from surveys of Barkley Sound growers and personal communications with DFO employees. It is suggested that a workshop is necessary, with growers, processors, and DFO present, to form a written policy to define how tainted oysters and communications should be handled.

Lightly, M. (1996). Consolidation of fisheries resource information, west coast Vancouver Island : Clayoquot Sound and Long Beach. Nanaimo, B.C., Canada. Dept. of Fisheries and Oceans. Pacific Region. Habitat and Enhancement Branch: vii, 63, [100] p.

In 1993, the South Coast Division of the Dept. of Fisheries and Oceans (DFO) initiated a program to collect, organize and report information pertinent to oil spill planning from fisheries staff. This report, representing the second and third year of the program, incorporates information obtained from DFO field staff with experience in Clayoquot Sound and Long Beach and from representatives of Ahousaht, Tla-o-qui-aht and Ucluelet First Nations. Fisheries resources covered by this report include commercial, aboriginal and recreational inshore fisheries for finfish and shellfish as well as the location of important habitats. The location of shellfish beds and of spawning or rearing areas for finfish are also included as are areas where marine mammals are known to concentrate.

Lucas, B. G., A. Campbell, et al. (2001). Survey of northern abalone, Haliotis kamtschatkana, populations in southeast Barkley sound, British Columbia, July 2000. Nanaimo, B.C., Pacific Biological Station: iii, 11 p.

A survey was conducted to provide an estimate of population numbers of emergent northern abalone in areas known to have abalone present in southeast Barkley Sound, British Columbia , during July 5 to 7, 2000.

Malloch, S. (2000). Marine Plant Management and Opportunities in British Columbia. Victoria, B.C., BC Fisheries, Sustainable Economic Development Branch: 50.

British Columbia's marine environment supports an amazing array of marine plants. Both northern and southern genera are represented in the more than 600 species of marine plants that are found along the coast. Twenty of these species are kelp species, representing one of the greatest diversity of kelps found anywhere in the world. Marine plants in British Columbia have long been recognized as a large but essentially under-utilized resource that could contribute significantly to the economy of coastal communities given appropriate demand and operational economics (Coon, 1983). The importance of marine plants can be discussed in economic or ecological terms. Not only are marine plants the basis of multibillion-dollar enterprises that include food, textile, pharmaceutical, cosmetic and biotechnological sectors; they also have important roles in coastal ecosystems. Marine plants provide habitat for many marine species, they are also significant primary producers of oxygen and organic matter in the nearshore environment. The goal of British Columbia's marine plant management strategy is to take advantage of the economic benefits of marine plants while not compromising the marine environment (Wheeler 1990, Coon 1983, Watson 1991). Underlying British Columbia's management and policy framework for marine plants is an understanding of both the economics of the seaweed industry and the biology of marine plants. The purpose of this report is to provide background information that may be used to update the Province's policies regarding marine plants. Information on the marine plant industry worldwide with special reference to the East Coast of Canada is presented in order to give context to marine plant opportunities in British Columbia. Past and present marine plant opportunities and management in British Columbia are also discussed.

Mitchell, D. (1995). An Evaluation of the Effectiveness of Beach Substrate Enhancement at two BC Clam Farms. Victoria, BC, BC Ministry of Agriculture, Fisheries and Food: 22 + Appendices.

The farming of Manila clams (Tapes philippinarum) in British Columbia started in the late 1980's in response to declining catches in the wild clam fishery and increasing prices and market demand. In order to increase their clam culture capacity, two BC clam farms conducted substrate enhancement projects in 1992 and 1993. These projects consisted of beach contouring on a shellfish tenure at Useless Inlet, located on the west coast of Vancouver Island, and beach gravelling on a tenure at Nanoose Bay, located on the east coast of Vancouver Island. Substrate enhancement at Useless Inlet was conducted by R. & S. Dunsmore during the summer of 1992 and consisted of contouring existing beach gravel substrates down to an optimal tidal range. This involved using an excavator and tandem axle dump truck to remove gravel from higher intertidal areas to reduce the tidal height of these areas to a range considered suitable for clam culture. Substrate enhancement at Nanoose Bay was conducted by Madrona Shellfish Ltd. in July of 1993 and consisted of adding a 10 cm layer of gravel on top of existing compact cobble/crushed shell substrates to provide a sufficient depth of gravel for clam culture. This involved moving screened 5-15mm gravel for a nearby gravel pit onto a beach, using two 6-wheel drive dump trucks, and spreading it to a uniform depth with a Cat. Both substrate

enhancement projects were conducted following review and approval of the respective tenure shellfish development plans by government regulatory agencies. Operational requirements were specified for the substrate enhancement work that minimized offsite environmental impacts including: defined access routes for heavy equipment, the type and placement of substrate material, and the timing of the enhancement activities. In order to evaluate the effectiveness of these beach substrate enhancement projects, the BC Ministry of Agriculture, Fisheries and Food (BCMAFF) sponsored the current study to determine if beach gravelling, and/or contouring, readily increases the productive capacity of clam tenures with regard to growth and survival of planted clam seed, and improved natural recruitment.

Mulkins, L. M., D. E. Jelinski, et al. (2002). "Carbon Isotope Composition of Mysids at a Terrestrial-Marine Ecotone, Clayoquot Sound, British Columbia, Canada." Estuarine, Coastal and Shelf Science 54(4): 669-675.

The relative contribution of summertime terrestrial versus marine carbon to an estuary on coastal British Columbia, Canada was explored using stable carbon isotopic (13 values) analysis of my crustaceans (Malacostraca: Peracarida: Mysidacea). We hypothesized that landscape linkages between the forested upland and adjacent inshore marine waters, via river, groundwater and overland flows, may influence carbon content and metabolism in the coastal zone. We sampled 14 stations spatially distributed in a grid and found 13C compositions of mysids ranged from -15·2 to -18·4. There was, however, no obvious spatial distribution of 13C values relative to the estuarine gradient in Cow Bay. Heavy tidal mixing is suggested to disperse marine and terrestrial carbon throughout the entire bay. From a temporal perspective however, mysid 13C signatures became enriched over the sampling period (mid-July to mid-August), which is representative of a stronger marine influence. This may arise because mysids are exposed to greater marine-derived carbon sources later in the summer, a decrease in freshwater input (and hence terrestrial carbon), changes in phytoplankton or macrophyte community structure, or that mysids preferentially feed on marine food sources. Overall, the recorded isotopic values are characteristic of marine organic carbon signatures suggesting that in summer, despite the proximity to shore, little or no terrestrial carbon penetrates the food web at the trophic level of mysids. This notwithstanding we believe there is a strong need for additional study of carbon flows at the marine-terrestrial interface, especially for disturbed watersheds.

Nash, C. E., R. N. Iwamoto, et al. (2000). "Aquaculture risk management and marine mammal interactions in the Pacific Northwest." Aquaculture 183(3-4): 307-323.

This paper reviews current aquatic farm production in the USA and estimates an annual financial exposure of US$350 million in the marine and coastal environments made up of sales, standing crop value and capital investment. In addition, nationwide aquatic farming creates almost 200,000 jobs and, with secondary and downstream activities combined, contributes about US$5600

million to the GNP. The paper then reviews the increasing risk that elements of the coastal aquaculture industry in the Pacific Northwest face from interactions with populations of marine mammals. These are particularly California sea lions and seals, which have greatly increased in the last 20 years from California to British Columbia. Specifically: (i) shellfish from traditional beds have been contaminated by fecal coliforms from seals and made unfit for human consumption, and have been experiencing increasing losses to river otters and sea otters; (ii) culture-based salmon fisheries, including endangered salmon stocks, have been exposed to heavy predation by sea lions and seals, resulting in both direct losses and reduced market value of wounded survivors; (iii) net-pen farms have been exposed to the same heavy losses from predatory sea lions and seals attacking fish in the pens, together with added financial burdens for anti-predator nets, increased maintenance and labor; and (iv) workers in aquaculture and fisheries, and other waterborne industries, have been observing less fear of humans by sea lions and seals, and more direct damage to servicing facilities. The four issues are discussed both technically and economically, and a number of solutions proposed for managing and controlling these increasing risks.

Naut'sa Resources Group Inc. (2001). An Overview of the Present Status and Options for Proceeding with Shellfish Aquaculture for the Nuu-chah-nulth First Nations. Port Alberni, BC, Nuu-chah-nulth Economic Development Corporation: 149.

At a time when many resource-based industries are in decline and coastal communities are searching for economic development alternatives, shellfish aquaculture has been identified as having significant potential. The Nuu-chah-nulth First Nations have a long history of using shellfish for food and cultural purposed and are now well placed to undertake shellfish culture and derive the potential benefits for their communities. To ensure informed decisions can be made about proceeding with shellfish developments, including opportunities provided by the IMA/MOU areas and other avenues, a multi-phase feasibility study will be undertaken to identify and move forward on the most suitable option(s) for the sustainable development of shellfish aquaculture for the Nuu-chah-nulth First Nations. The Nuu-chah-nulth have significant potential for shellfish aquaculture development coupled, in some cases, with special challenges including remote access, exposure and biotoxin closures. Options for development are many and varied. For individual First Nations, specific development directions will depend upon: their shellfish-related priorities, goals and desires, the specific sites available to the First Nation; and the existing level of shellfish operations and capacity within the First Nations. A generic vertical integration program, initiating at a grass roots level, has been outlined. The program initiates with an intensive aquaculture program by which a entity (First Nation or company etc.) gains economic benefits through controlled and consistent levels of production. Through a series of progressive strategic development, the program expands to encompass processing, marketing and research and development. This program can be utilized by either an individual First Nation or through the combined efforts of several First Nations. Three models have been constructed as a means of illustrating the different levels of

resource control and economic benefits being accrued from their shellfish resources - from treatment of the resource as a Fishery product to that of an Aquaculture product - and then apply the treatment that best meets their socio-economic and environmental perspectives and goals.

Nootka Resource Board (2001). Nootka Coastal Landuse Plan, Land Use Coordination Office: 80 + 6 Appendices.

The purpose of the Nootka Coastal Land Use Plan is to address current coastal land use issues and to guide the long-term use, development and management of coastal Crown lands and resources of the Nootka Sound and Esperanza Inlet. The plan identifies 60 planning units, along with area designations, that will guide landuse decisions in the Nootka area. The objective of these area designations is to minimize conflicting uses and/or to more fully realize the environmental, recreational, or commercial potential of the Nootka area. For each planning unit, a primary area designation (conservation, recreation, aquaculture, general management, industrial and commercial, and settlement) is assigned. In areas where more than one use is compatible with the primary designation, a secondary or occasionally tertiary designation is applied. In addition, a number of objectives are assigned to further outline the intended uses and prohibitions in each unit. The plan will not alter the statutory authority of responsibility of provincial, federal, or local government, nor the rights associated with legally established land uses, including private land within the plan area. The plan and the planning process will also be without prejudice to First Nation treaty negotiations. The planning process did not receive formal participation from First Nations, however publicly available cultural and heritage resource information was incorporated, as well as values and interests brought forward by First Nation individuals.

Osborne, J. (2000). "A new approach to shellfish aquaculture development in British Columbia: The Clayoquot Sound and Barkley Sound Shellfish Aquaculture Steering Committees." Bulletin of the Aquaculture Association of Canada 2.

In recent years, west coast Vancouver Island (WCVI) native and non native communities have expressed interest in developing and diversifying local economies through shellfish aquaculture. This desire, coupled with the November 1998 announcement of the Province of British Columbia's intention to work with communities in accepting applications for new shellfish aquaculture tenures, resulted in the formation of the Barkley Sound and the Clayoquot Sound Shellfish Aquaculture Steering Committees. The BC Assets and Lands Corporation initially asked the steering committees (which are currently comprised of representatives from a broad range of interests) to accomplish three objectives: to determine suitable areas for shellfish aquaculture in local areas; to recommend rates of development for shellfish aquaculture in areas under the committees' operation; and to develop community-based criteria by which tenure applications will be adjudicated. In addition, both committees have extended their objectives to include supporting a locally developed oyster culture skills training program. The

Clayoquot Sound Steering Committee is also exploring local shellfish processing opportunities. The opportunities and challenges these steering committees face in achieving their objectives are presented.

Salmon, R. and B. Kingzett (2002). Profile and Potential of the BC Shellfish Aquaculture Industry 2002. Delta, BC, Vancouver Island Economic Developers Association: 67.

Kingzett Professional Services was contracted by the Vancouver Island Economic Developers Association (VIEDA) in the spring of 2002 to conduct a literature review of existing documents to develop a comprehensive profile of the current shellfish aquaculture industry in BC. The goal of this profile is to provide a clear picture of what the industry looks like today, how it is structured, what the potential is for future growth, as well as what barriers are currently impacting expansion and competitiveness. This activity was carried out using all existing sources of currently available statistical data, information and literature (qualitative and quantitative) to compile an industry synopsis document.

Salter, B. (2002). Shellfish Industry Economic Impact Analysis - New Marine Frontier Project Investment Attraction to Vancouver Island Phase 2 - Marketing Plan Development. Delta, Vancouver Island Economic Developers Association: 36.

The shellfish industry on Vancouver Island currently accounts for $66 million in economic output and 956 total jobs (direct, indirect and induced). Concentration of the industry occurs in Baynes Sound area, roughly Comox to Nanaimo. Much of the economic benefit and impact associated with the industry remains on Vancouver Island and in local communities. Industry technological developments have been local, and capital equipment and services associated with the industry are locally made of purchased. Analysis shows that 78 cents of every dollar spent in direct industry purchases remain in the local economy. The industry has great potential to grow in the short-term. The shellfish industry has set goals for growth that are considered realistic, and have the support of provincial and federal government. These goals would result in economic expansion of the industry to $206 million over a 5-year period, resulting in an industry with 3700 jobs, mostly in rural communities. All regions of Vancouver Island would benefit from the growth ranging from 100% increase and creating 250 jobs in the Baynes Sound area to a 900% increase and create 530 jobs on the West and North Coasts of Vancouver Island.

Taylor, F. J. R. and R. Haigh (1996). "Spatial and temporal distributions of microplankton during the summers of 1992–1993 in Barkley Sound, British Columbia, with emphasis on harmful species." Canadian Journal of Fisheries and Aquatic Sciences 53(10): 2310-2322.

The microplankton community of an open coastal embayment in British Columbia (Barkley Sound) was typical of cold waters of western North America, but different than that in more sheltered waters of British Columbia. The spring

bloom in May, 1 month later than usual in the Strait of Georgia and 2 months later than in the coastal fjords of southwestern British Columbia. In Barkley Sound, the summer plankton was dominated by diatoms owing to persistent upwelling offshore with onshore advection by wind forcing, whereas in other regions dinoflagellates and nanoflagellates usually predominate in the stratified waters of summer. Plankton distribution patterns allowed a distinction between blooms originating within the system and those advected from offshore. The highest biomass was consistently found in the sheltered northern corner of Barkley Sound (Toquart Bay). At least 14 potentially harmful species were present within the Sound. A rise in saxitoxin in the central island group coincided with an increase of Alexandrium catenella. A rise in domoic acid in the northwest coincided with an increase in Pseudo-nitzschia delicatissima and Pseudo-nitzschia pungens. There was considerable interannual variability, indicating the need for longer periods of study. Unpublished evidence points to strong dinoflagellate blooms in the fall.

3 Gap Analysis

3.1 Background

At the request of the Task Force, we undertook an analysis of the existing literature on shellfish development in Barkley and Clayoquot Sounds (Section 2) to identify 'information gaps' or new 'information requirements' as it relates to shellfish development on the West Coast.

Recognizing that a thorough gap analysis of all the literature was beyond the scope of this contract, an investigation of the literature was conducted to compare the priorities of current and new shellfish growers (expressed by shellfish growers in the interviews) with those reflected by the major themes covered in the existing literature.

3.2 Methodology

Through a review of some of the most recent reviews of the industry (Kingzett, Salmon, and Tillapaugh 2002; Salmon and Kingzett 2002), 13 shellfish industry 'themes' were identified. These are listed below in Table 1:

1. Environmental Integrity & Water Quality	2. Infrastructure Development
3. Investment, Finance & Business Planning	4. Labour, Extension and Training
5. New Species Development	6. Policies and Regulation
7. Processing, Marketing & Quality Assurance	8. Production
9. Public Perception	10. Technology Development
11. Tenure Access and Security	12. Transportation
13. Science and Research	

Table 1 Shellfish Industry Thematic Themes

All reports and articles collected for the annotated bibliography were reviewed and then categorized according to the:

- Major theme (or themes) that the report covered; and
- Geographic coverage (i.e. whether the report was specific to Barkley Sound, Clayoquot Sound or relevant to both Sounds).

The results of this categorization and the total number of reports in each of the three categories (i.e. Barkley, Clayoquot or Both Sounds) are listed in Table 2.

Categories/Themes	Barkley Sound Specific	Clayoquot Sound Specific	Relevant to Both Sounds
1. Environmental Integrity and Water Quality	(Barkley Sound Planning Commission 1994) (Bendell-Young 2003) (Hand and Dovey 1999) (Harding and Thomas 1987) (Heath and Lindsay 1993)	(Cross and Williams 2000) (Cross and Williams 2001)	(Jamieson, Chew, Gillespie, Robinson, Bendell-Young, Heath, Bravender, Tompkins, Nishmura, and Doucette 2001)

	(Levitan 1991)		(Kingzett and Paltzat 2002) (Kingzett Professional Services 2003) (Kruzynski 2000)
Totals	**6**	**2**	**4**
2. Infrastructure Development			
Totals	**0**	**0**	**0**
3. Investment, Finance and Business Planning		(Bagordo 2000) (Kucey 2000)	(Alberni-Clayoquot Regional District 2001) (BC Ministry of Sustainable Resource Management 2001) (Coopers & Lybrand 1998) (Ecotrust Canada 2002) (Kingzett, Salmon, and Canessa 2002) (Naut'sa Resources Group Inc. 2001) (Salmon and Kingzett 2002) (Salter 2002)
Totals	**0**	**2**	**8**
4. Labour, Extension and Training			(Heath 2001) (Salter 2002)
Totals	**0**	**0**	**2**
5. New Species Development	(Cameron 2002) (Druehl and Elliott 1996) (Field and Ltd. 1998) (Goater and Weber 1997) (Kingzett 1997) (Lucas, Campbell, Brouwer, Servant, and Webb 2001)	(Bourne and Farlinger 1980) (Hand and Dovey 1999)	(BC Ministry of Sustainable Resource Management 2001) (Broadley and Gant 1999) (Clapp 1999) (Coon and Field 1976) (Druehl 1999) (Foighl, Kingzett, Foighl, and Bourne 1990) (Gillespie, Parker, and Merilees 1999) (Gillespie, Rusch, Gormican, Marshal, and Munroe 2001) (Harbo, Hollingshead, and Clark 1990) (Harbo, Marcus, and Boxwell 1997) (Jamieson, Dixon, and Lauzier 2001) (Kingzett, Bourne, and Leask 1990) (Malloch 2000)
Totals	**6**	**2**	**13**
6. Policies and Regulation	(Barkley Sound Planning Commission 1994) (Barkley Sound Shellfish Aquaculture Steering Committee n/d) (Bendell-Young 2003) (Levitan 1991)	(Catherine Berris Associates Inc. 2001) (Clayoquot Sound Central Region Board 1999)	(BC Ministry of Sustainable Resource Management 2001) (Cross and Kingzett 1992) (Day, Mottershead, Osborne, and Story 1999) (Dunlop 2000) (Dunlop and Simonson 1999)

			(Kingzett, Salmon, and Tillapaugh 2002) (Nootka Resource Board 2001) (Osborne 2000)
Totals	**4**	**2**	**8**
7. Processing, Marketing and Quality Assurance	(Bendell-Young 2003) (Heath and Lindsay 1993) (Levitan 1991)	(Kucey 2000)	(Ecotrust Canada 2002) (Kruzynski 2000)
Totals	**2**	**1**	**2**
8. Production	(Cross, Kingzett, and Couch 1992)	(Cross and Kingzett 1993)	(Kingzett, Cross, and Gormican 1996)
Totals	**1**	**1**	**1**
9. Public Perception			
Totals	**0**	**0**	**0**
10. Technology Development	(Mitchell 1995)		(Broadley and Gant 1999) (Heath 2001) (Kingzett, Reid, and Richards 2000)
Totals	**1**	**0**	**3**
11. Tenure Access & Security	(Barkley Sound Shellfish Aquaculture Steering Committee n/d)	(Bagordo 2000) (Catherine Berris Associates Inc. 2001) (Clayoquot Sound Central Region Board 1999) (Cross and Kingzett 1993)	
Totals	**1**	**4**	**0**
12. Transportation			
Totals	**0**	**0**	**0**
13. Science & Research	(Forbes, Mackas, Brown, Denman, and MacIsaac 1990) (Holmes 1998) (Taylor and Haigh 1996)		(Booth and Rueggeberg 1994) (Lightly 1996) (Nash, Iwamoto, and Mahnken 2000)
Totals	**3**	**0**	**3**

Table 2 Thematic Categorization of Shellfish Literature: Barkley and Clayoquot Sounds

Interviews conducted with current and new shellfish growers (Section 4) requested growers to rank the same 13 themes (1 to 6) according to which themes they considered to be the top six priorities to be addressed on a regional basis. The results of these are detailed below in Figure 1 and Figure 2.

Clearly, the top ranking priority for both data sets is Environmental Integrity and Water Quality. The 2nd and 3rd ranking priorities for shellfish growers are similar: Processing, Marketing and Quality Assurance and Investment, Finance and Business Planning/ Infrastructure Development for current growers, and Investment, Finance and Business Planning and Processing, Marketing and Quality Assurance for new growers.

In order to compare the results of the report categorization process with the results expressed by current and new shellfish growers regarding regional priorities, a number of mathematical calculations were preformed and assumptions made:

- First, the results of the theme ranking process for both the current growers were combined; and
- Second, the raw scores for the combined survey rankings were weighted to reflect their respective priority level by multiplying the number of "votes" for each priority theme (i.e. 1.0 for 1st order priorities; 0.835 for 2nd order priorities; 0.668 for 3rd order priorities; 0.501 for 4th order priorities; 0.334for 5th order priorities and 0.167 for 6th order priorities).

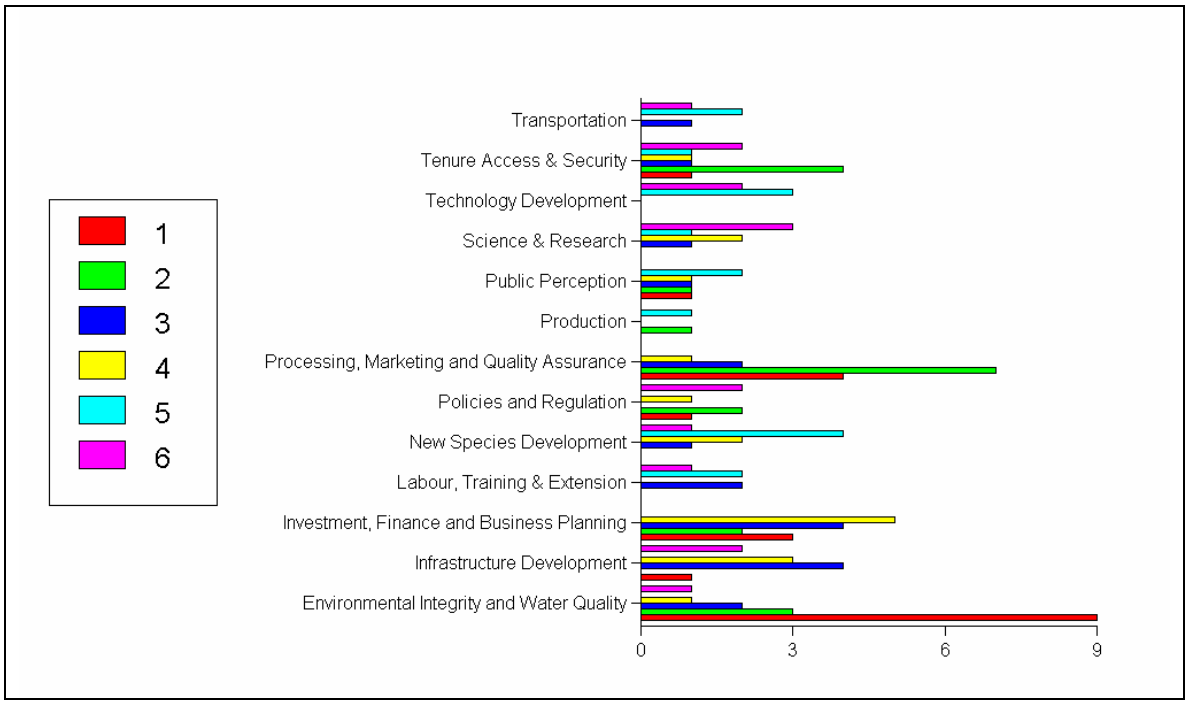

Figure 1 Top Priorities to be Addressed on a Regional Basis: Current Shellfish Growers

3.3 Gap Analysis Results

When current and new shellfish growers' priorities (Figure 3) are compared with the results of report categorization process of the shellfish literature for each Sound (Figure 4), in general there appears to be an inverse relationship between what shellfish growers identify as a priority, and what the themes covered by the available shellfish literature for both Sounds. More particularly, the higher priority a theme is for shellfish growers, the fewer the reports on that specific theme appears in the literature. Conversely, the lower the priority a theme is for shellfish growers, the greater the number of reports there are that covers those themes in the literature.

The two exceptions to this trend are the Environmental Integrity and Water Quality and Tenure Access and Security themes. In the former, there appears to be a reasonable balance between the high priority shellfish growers have given this theme and the attention it receives in the literature, while in the later, there is considerably more literature available (particularly in Clayoquot Sound) than the level of priority assigned to it by shellfish farmers.

In addition to this general trend, there appears to be two main types of gaps: primary and secondary.

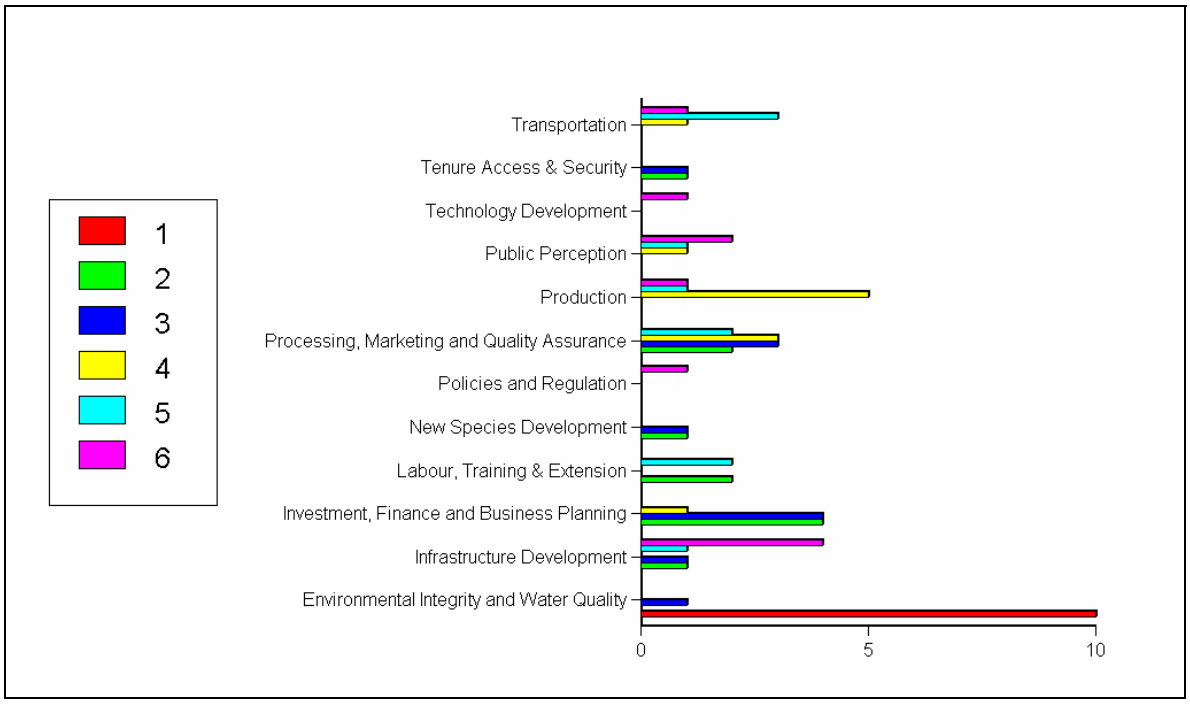

Figure 2 Top Priorities to be Addressed on a Regional Basis: New Shellfish Growers

The primary information gaps appear in the second and third highest priority theme areas identified by shellfish growers (Figure 3) namely in Processing, Marketing and Quality Assurance (for both Barkley and Clayoquot) and Investment, Finance and Business Planning (for Barkley Sound only).

Secondary gaps are evident as well. Despite the fact that Infrastructure Development, Public Perception, Labour, and Extension and Training are considered lower priority thematic areas by growers, they are not represented in the available literature for either of the Sounds.

Another notable gap appears in the Transportation theme. Despite the considerable cost and logistical constraints transportation has on the shellfish industry in both Sounds, no research appears in the literature which examines this theme.

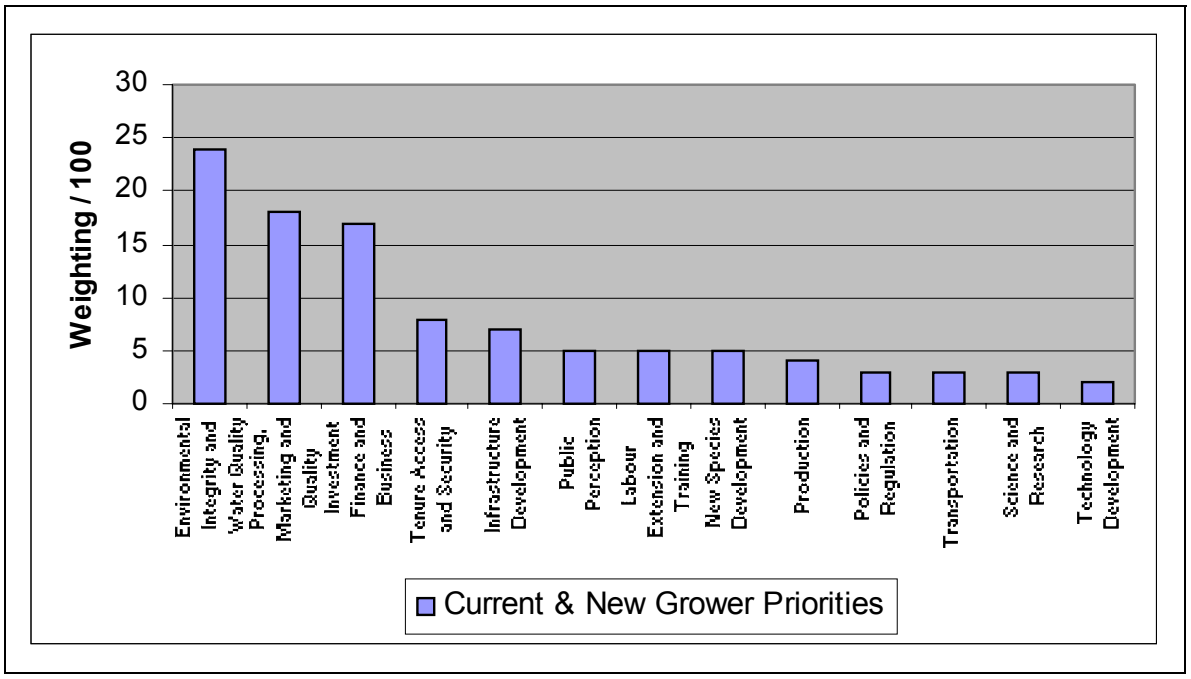

Figure 3 Shellfish Growers' Priorities: Combined Current and New

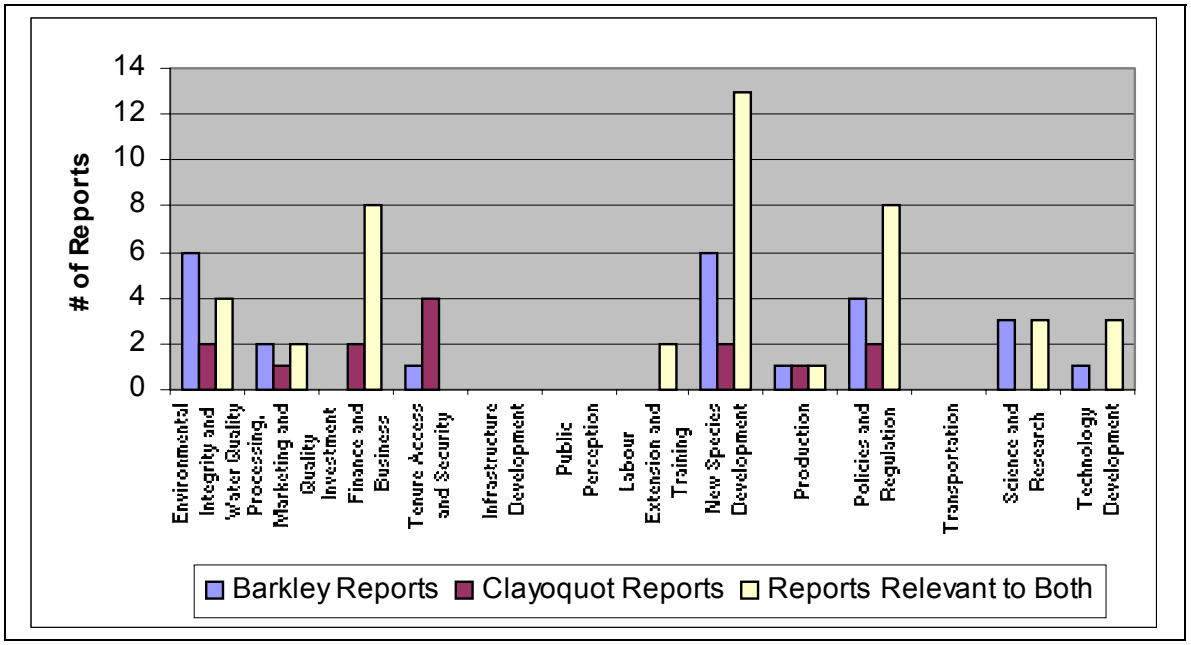

Figure 4 Shellfish Literature Priorities: Barkley and Clayoquot Sounds and Reports Relevant to both Sounds

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4 Grower's Survey

4.1 Growers Survey Overview:

Two separate surveys – one for current growers (Appendix 2) and a second for new growers (Appendix 3) were designed, field tested and refined.

Attempts were made to contact all of the 58 individuals or companies holding tenure in Barkley and Clayoquot Sounds[2]. For various reasons[3], twenty-two of these are not included in this survey

Of the remaining, a total of 36 interviews were conducted[4] with shellfish tenure holders from Barkley and Clayoquot Sounds. This includes 25 current growers and 11 new growers. In order to maintain the privacy of the individuals who participated in this study, their names are not included.

This sample of 36 individuals or companies (tenure holders) interviewed represents 77% of all tenure holders, and 78% of all tenures in Barkley and Clayoquot Sounds or 97% of the total tenures by hectares (Table 3).

	Number of Tenure Holders	**Number of Tenures**	**Size in Hectares**
Barkley Sound	33	47	201.9
Clayoquot Sound	14	21	91.3
Totals[5]	47	68	293.2
Participation in Survey	36	53	286.26
Percentage of Total	77%	78%	97%[6]

Table 3 Comparative Figures for Barkley and Clayoquot Sound: Actual vs. Survey Participation

[2] The contact list was provided by Barron Carswell, Manager Shellfish Aquaculture Development, Aquaculture Development Branch, BC Ministry of Agriculture, Food and Fisheries.
[3] Main reasons for not being part of the survey included: no permission to contact the individual, wrong and/or no forwarding numbers, lack of time and interest.
[4] Surveys were conducted over the period of March 2nd to April 4th 2003, a total of 31 were face-to-face interviews, while 5 were conducted on the phone.
[5] These figures were provided by Sean Cheesman, Aquaculture Development Branch, BC Ministry of Agriculture, Food and Fisheries.
[6] There was considerable variation between the size in hectares reported by the tenure holders and the size in hectares associated with the Land File Numbers for the same tenure. The Land File figures are used to generate this figure.

4.2 Grower Survey Results:

4.2.1 Experience

Of the 25 current growers surveyed, over 70% have been in the industry for over 6 years, with 32% being in the industry greater than 15 years (Figure 5). By comparison, of the 11 new applicants surveyed, over 63% have been in the industry less than 12 months.

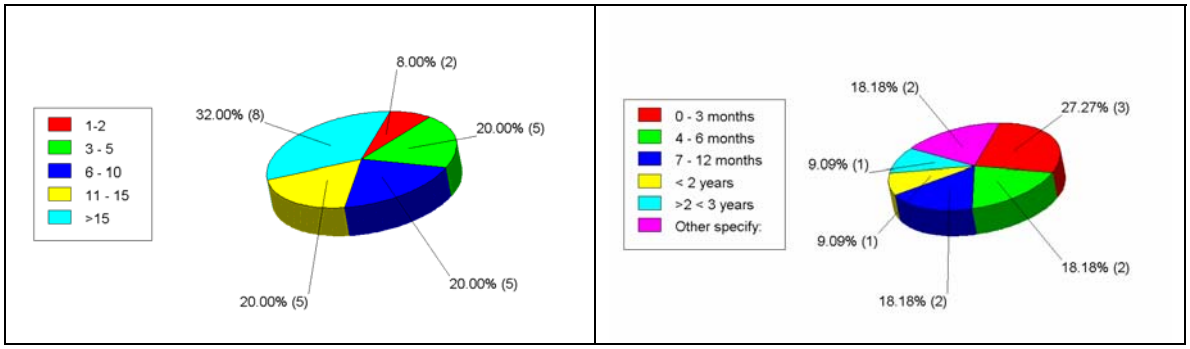

Figure 5 Comparison of Time in Industry: Current vs. New Growers

While 100% of all new growers indicated they intend to stay in the industry for greater than ten years, just over 75% of current growers indicated the same with 6 individuals indicating their intention is to get out of the industry within the next 5 years.

In both cases for current and new growers alike, the two most frequently cited sources for knowledge about shellfish aquaculture comes from experience (i.e. self taught) and learning from/working with others in the industry Figure 6.

Of the 25 current growers indicating membership with a shellfish industry group, only 12 or 48% are members of the BC Shellfish Growers Association, 10 or 37% are member of the Clayoquot Sound Oyster Growers Association. Respective percentages for the 12 new growers surveyed are 92% (BCSGA) and 8% (CSOGA).

Almost 50% (11/23) of current growers describe themselves as part-time farmers, while less than 30% of new growers classify themselves as the same. However, while only 8 or 32% of current growers consider themselves as business farmers, almost 75% of new growers classify their operations as a business (Figure 7).

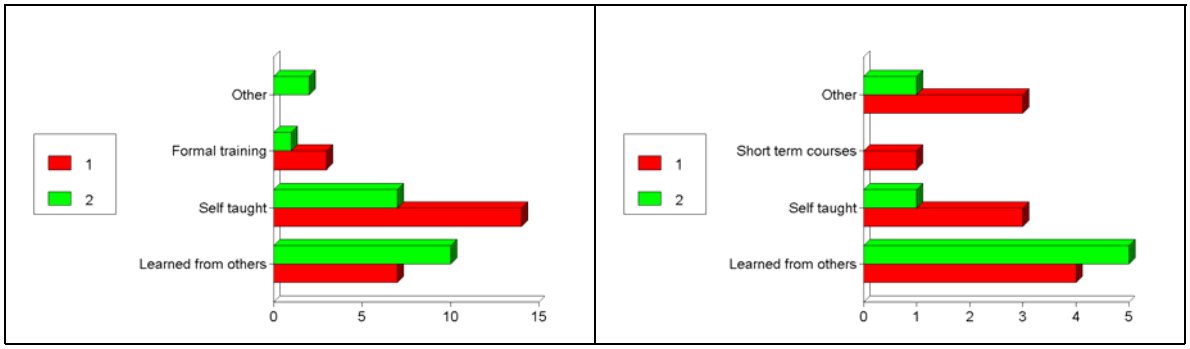

Figure 6 Comparison of Learning about Shellfish Farming: Current vs. New Growers

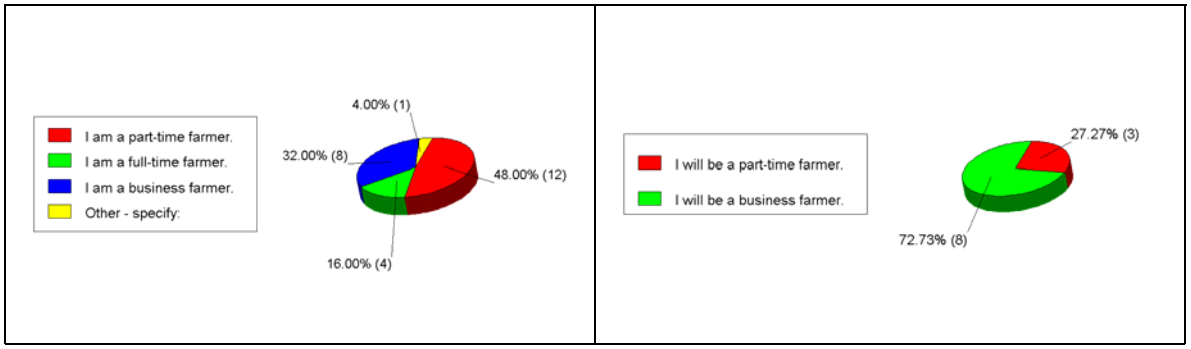

Figure 7 Comparison of Type of Shellfish Operation: Current vs. New Growers

4.2.2 Tenure Background

The majority of current growers (i.e. 18 individuals or 72%) farm one tenure, while an additional 4 individuals or 17% farm 2 tenures. By comparison, 7 or 64% of new growers farm one tenure, while the remaining 4 individuals or 36% or farm between 2 and 4 tenures each (Figure 8).

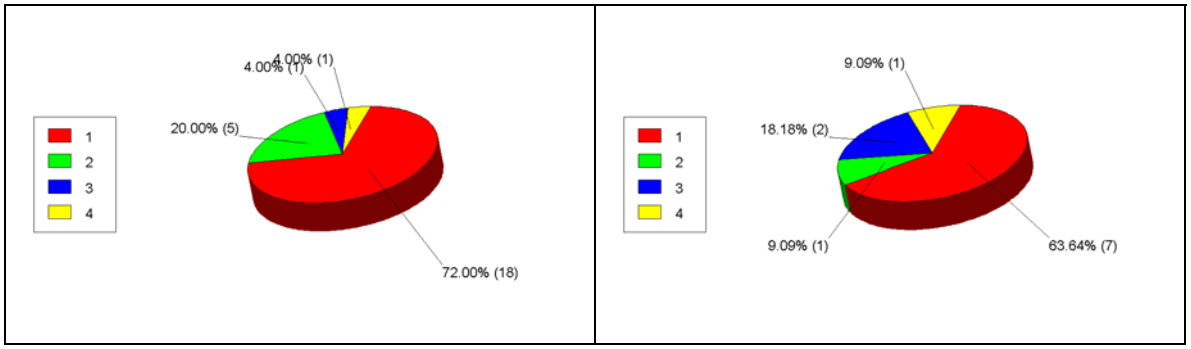

Figure 8 Comparison of Tenure Holdings: Current vs. New Growers

Over 56% of current growers (or 14 individuals) have combined tenure holdings of less than 5 hectares, while 40% (10 individuals) have holdings ranging from 5 ha to 19.9 ha. One farmer has tenure greater than 20 ha. New growers tenure holdings are considerably larger by comparison with only 18% (2 individuals) owning tenures smaller than 5 ha and 55% (6 individuals) with tenures that range from 6 ha to 20 ha. One new grower has tenure in excess of 50 ha (Figure 9).

Sixty-eight percent of current farmers (or 17 individuals) claim to be utilizing 51% or more of their total tenure at present. Similarly, 82% (9) of new farmers expect that by their 5th year of operation they will be utilizing 51% or more of their total tenure (Figure 10).

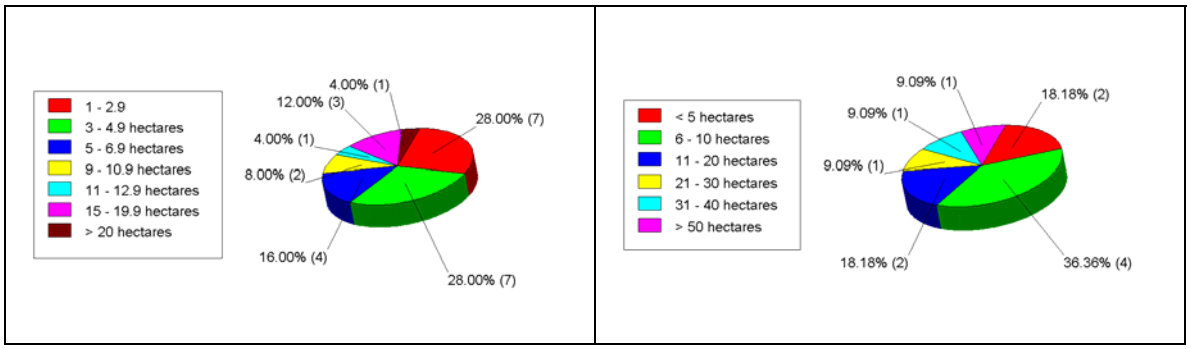

Figure 9 Comparison of Tenure Size: Current vs. New Growers

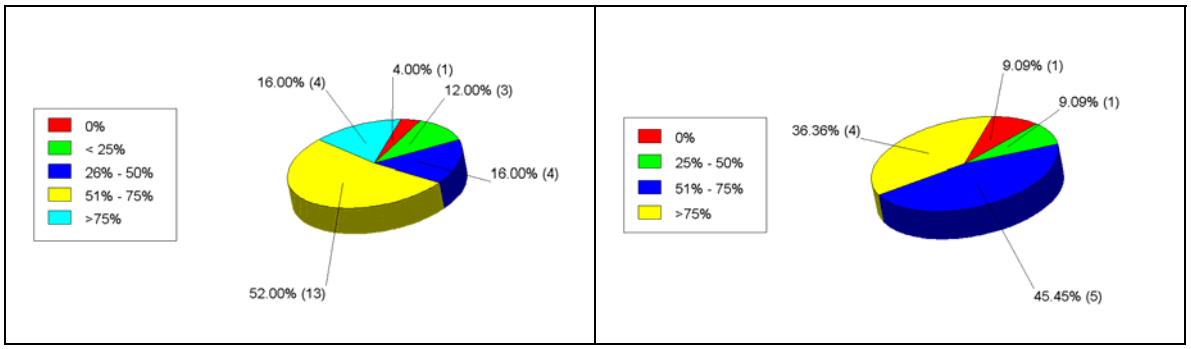

Figure 10 Comparison of Tenure Utilization: Current vs. New Growers

Pacific oysters rank number one as the predominate species grown on the west coast. Manila clams are currently a distant second. It appears that new growers plan to continue this trend, though mussels might complete with Manila clams for the second most important species. It also appears that a broader range of products will be farmed/harvested in the future (Figure 11).

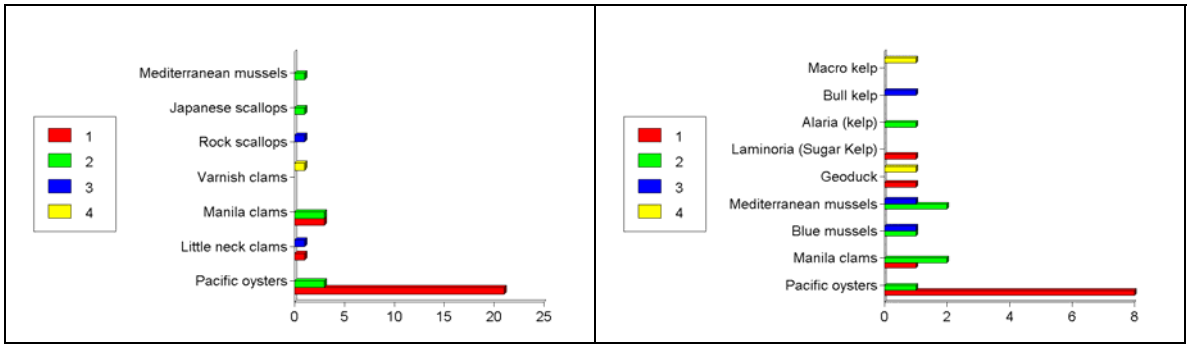

Figure 11 Comparison of Ranked Importance of Species Grown: Current vs. New Growers

Combined, string culture (using oyster blue) and plastic trays account for 60% of the top 2 ranked oyster growing techniques currently employed by farmers. Similarly, 65% of new growers also plan to use string culture and plastic tray culture as their main growing techniques (Figure 12).

Sixty-five percent of current growers (or 16 individuals) use barrels and long-lines as their main suspension method, with rafts being ranking as the second most popular

method with 17% (or 4 individuals) indicating them as their preference. New growers, on the other hand, appear to have a stronger interest in using rafts (36%) or a combination of rafts and barrels/longlines (Figure 13).

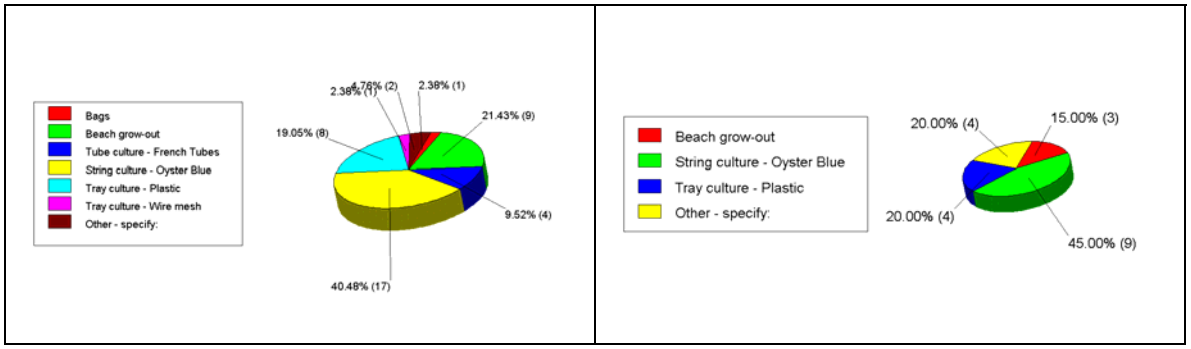

Figure 12 Comparison of Ranked Importance of Growing Techniques: Current vs. New Growers

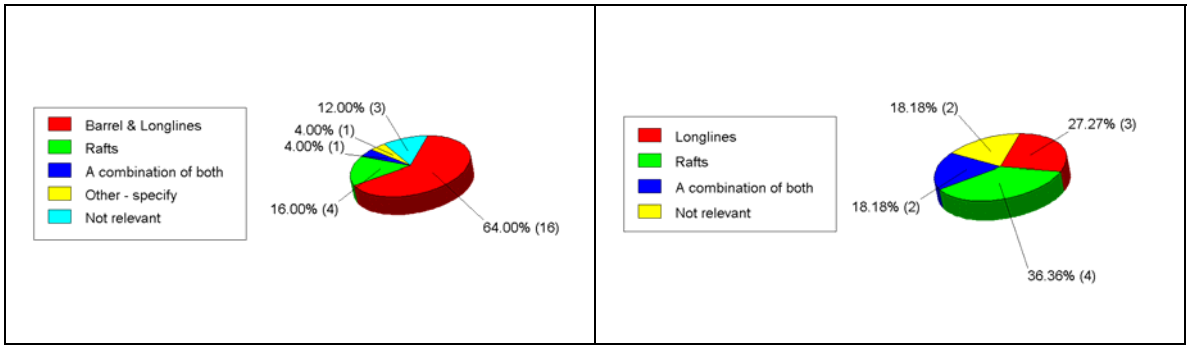

Figure 13 Comparison of Ranked Importance of Suspension Methods: Current vs. New Growers

4.2.3 Investment

Of the 25 current growers reporting on the estimated value of their tenures[7], approximately 56% (or 14 individuals) estimated them to be worth less than $100,000, while a further 20% (5 individuals) estimated their tenure's value to range between $101,000 and $250,000. The remaining 16% of farmers (4 individuals) estimated the value of their tenures at over $250,000. Whereas, sixty-seven percent (7 individuals) of new farmers estimated their tenure to be worth less than $100,000, while 27% (3 individuals) estimated their tenure's value to range between $100,000 and $250,000, and 9% (1 individual) estimated their tenure's value at over $250,000 (Figure 14).

[7] Only the value of the bare tenure – exclusive of equipment and/or on-site product.

Figure 14 Comparison of Tenure Value: Current vs. New Growers

Sixteen of 23 current tenure holders (or 64%) estimated the value of their infrastructure investments at less than $100,000, while 6 (or 24%) situated their infrastructure investment between $100,001 and $250,000. Three growers (or 12%) estimated their infrastructure investment at more than $250,000. Not surprisingly, for new growers, overall infrastructure investment is considerably less with nine of eleven growers (over 80%) reporting infrastructure investment less than $50,000 and only two growers (18%) reporting current infrastructural investment greater than $50,000 (Figure 15).

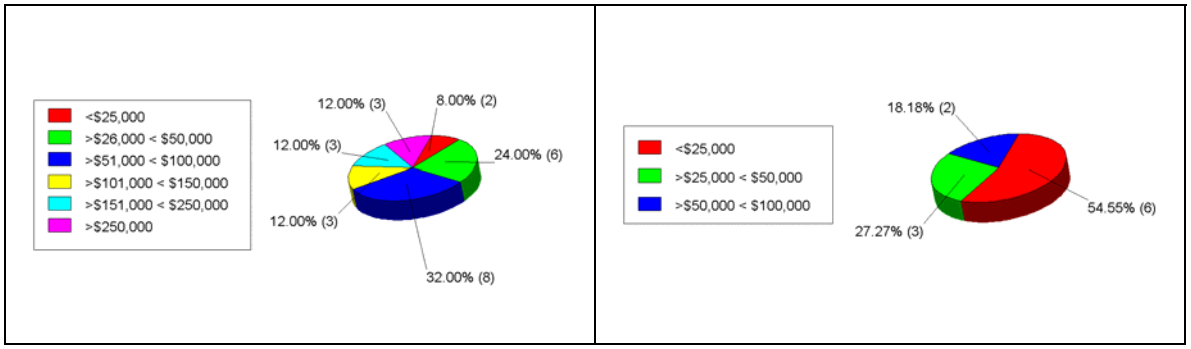

Figure 15 Comparison of Infrastructure Investment Value: Current vs. New Growers

Regarding the current farm-gate value of all age-classes of product on site, of the 25 reporting farms 32% (8 individuals) estimate a current value of less than $100,000. Forty percent (11 individuals) estimate their farm-gate product value ranges from $101,000 and $250,000, while the remaining 24% (5 individuals) have product on-site with a farm-gate value exceeding $250,000 (Figure 16).

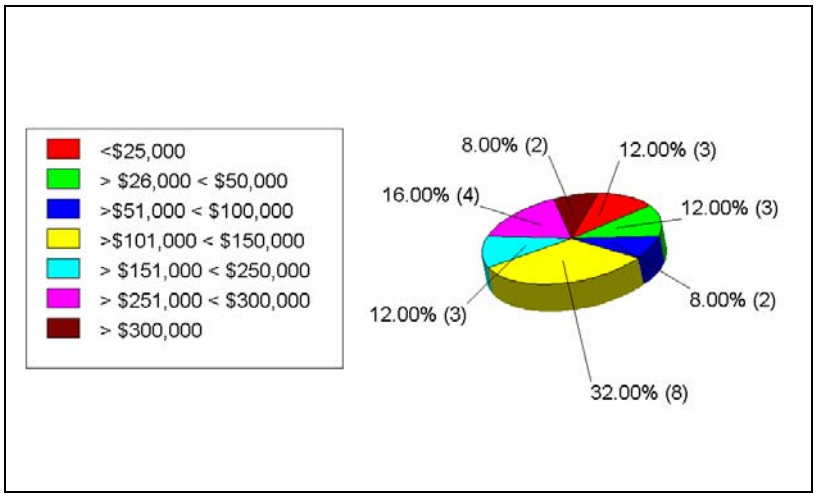

Figure 16 Estimated Farm-gate Value of Product: Current Growers

4.2.4 Production

Over 75% of current farmers interviewed have actively harvested product in the past 2 years. The exceptions are 4 farmers who have yet grown-out product to harvestable size, 1 farmer who has been shut down as a result of water quality issues (*kebsiella*), and 1 farmer who, due to personal circumstances, has had to let his tenure sit fallow for the past years (Figure 17).

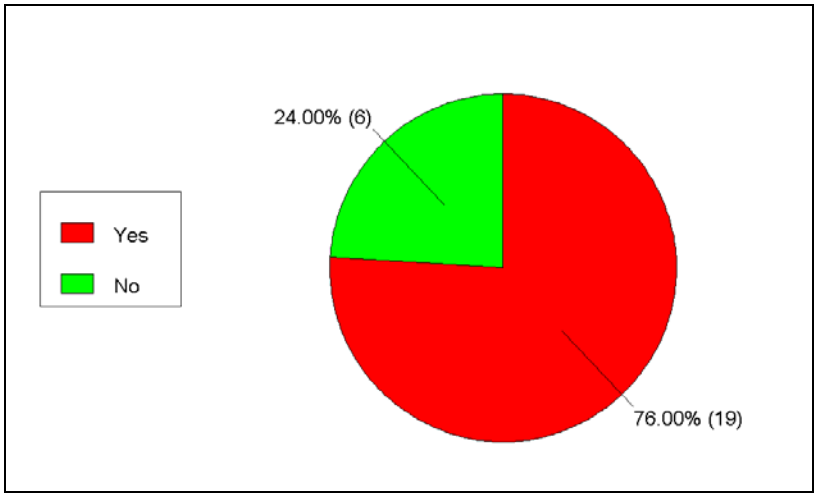

Figure 17 Current Growers Harvesting in Past 2 Years

Of the growers who harvested product in the past two years, there was an overall 50% reduction reported in shucked oyster production from 2001 to 2002, with production expected to reach about 75,000 gallons in 2003. Despite this fluctuation, the overall value of shuckers dipped only slightly from 2001 to 2002, and is estimated to almost double in value in 2003 to $1.2 million in comparison to 2002 levels (Figure 18).

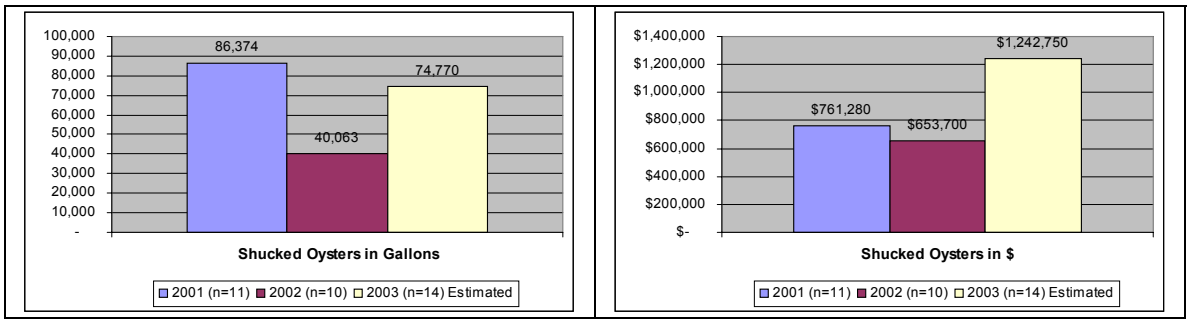

Figure 18 Shucked Oyster Production and Value, 2001 – 2003

Assuming that future production of shucked product harvested on current tenures will be equivalent to the average of the 2001-2003 period, and if future estimated production of shucked product from seven new tenures is added, an estimated growth in production and value levels can be calculated which might be similar to that shown in Figure 19. Given these assumptions, in 5 years time combined shucked production for Barkley and Clayoquot could be estimated to grow from its current average level of 66,400 gallons to just under 100,000 gallons, with a concurrent growth in farm-gate value from just under $880,000 to over $1.4 million.

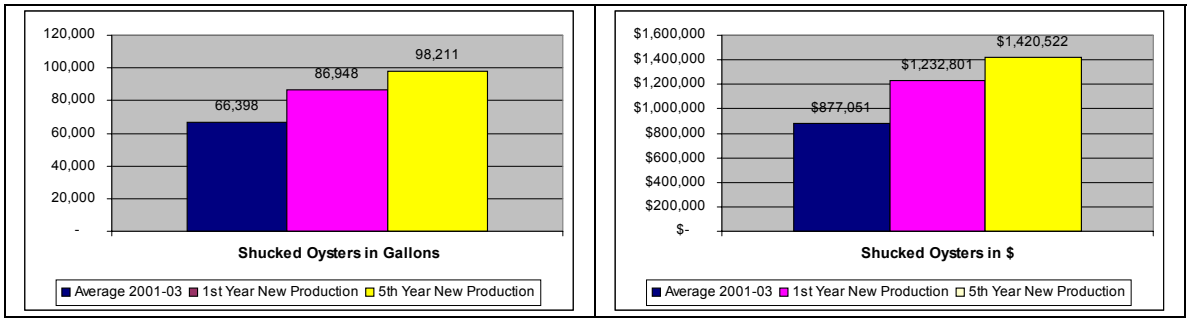

Figure 19 Estimated Combined Current and New Shucked Oyster Production at Year 1 and Year 5

While reported single and ½ shell production increased by almost 75,000 dozen from 2001 to 2003, the overall value appears to have decreased by almost $450,000 for the same period (Figure 20).

Once again, assuming that future production of single and ½ shell oysters harvested on current tenures will be equivalent to the average of the 2001-2003 period, and if future estimated production of single and ½ shell product from five new tenures is added, the estimated growth in production and value levels might be similar to that shown in (Figure 21). Thus, production might be estimated to grow from its current average level of almost 225,000 dozen to roughly 1.08 million dozen, with a concurrent growth in farm-gate value of just under $1 million to $3.15 million.

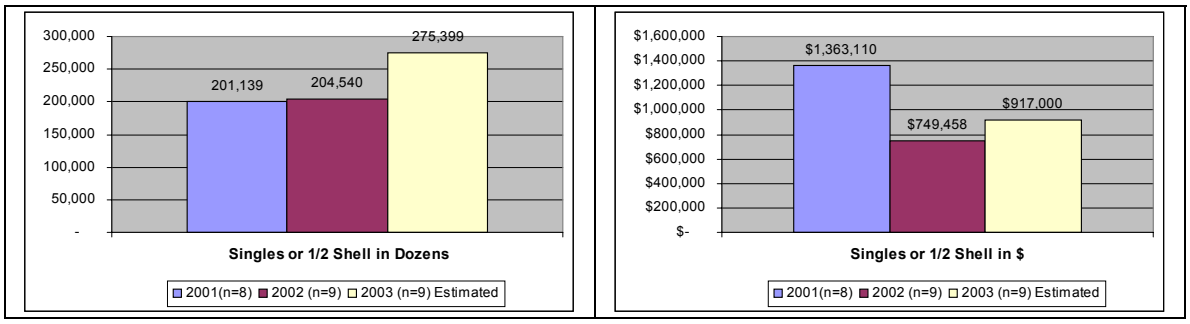

Figure 20 Single and ½ Shell Oyster Production and Value, 2001 – 2003

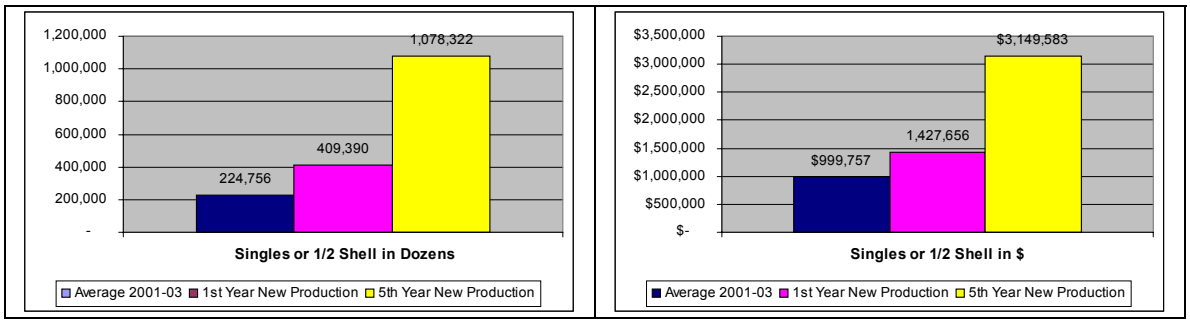

Figure 21 Estimated Combined Current and New Single and ½ Shell Oyster Production at Year 1 and Year 5

According to clam growers, Manila clam production dropped by 90,000 pounds between 2001 and 2003 (estimated), with a corresponding drop in value of almost $120,000 or about 21% over the same period (Figure 22).

Based on the assumption that future production of Manila clams grown by current tenure holders will be equivalent to the average of the 2001-2003 period, and by adding the estimated production of Manila clams from three new tenures, the estimated growth in production and value levels for Manila clam production in 5 years might be similar to that shown in (Figure 23). Thus, production could be estimated to grow from its current average annual level of 217,000 pounds to almost 575,000 pounds, with a concurrent growth in farm-gate value from just under $450,000 to $1.03 million.

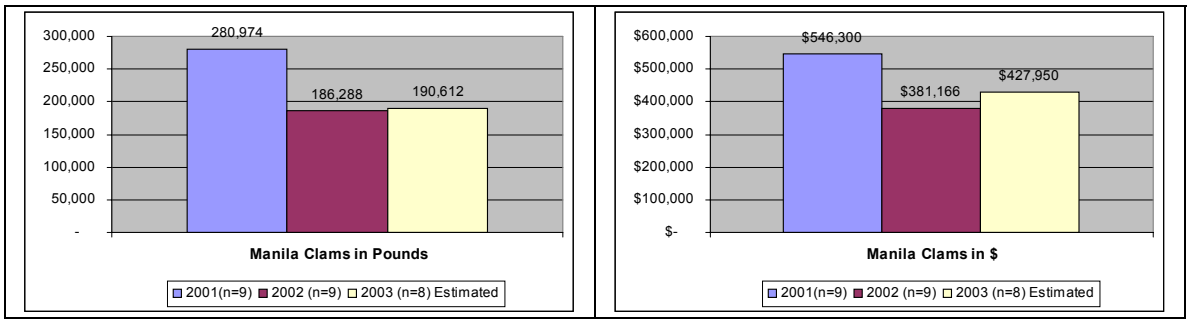

Figure 22 Manila Clam Production and Value, 2001 – 2003

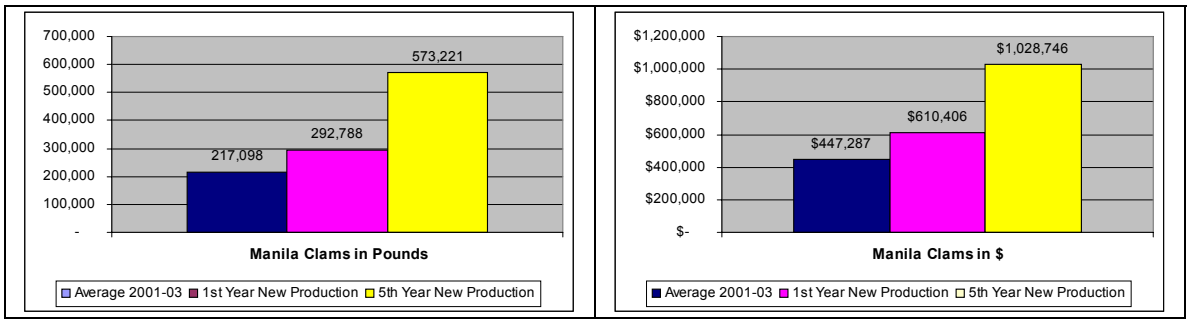

Figure 23 Estimated Combined Current and New Manila Clam Production at Year 1 and Year 5

4.2.5 Employment

For the 25 current tenure holders[8] responding, 103 employment opportunities[9] are directly derived at present from working on shellfish tenures in Barkley and Clayoquot Sound. Assuming this level of employment is held constant over the next three years, as the 11 new tenure holders become operational, an additional 53 employment opportunities can be expected to be created. Sixty-six percent of current farms employ between 2 and 6 individuals, and 16% employ as many as 8-10 individuals. Eighty-two percent of new growers, on the other hand, employ up to 6 individuals with 18% of farms between 7 and 8 individuals (Figure 24).

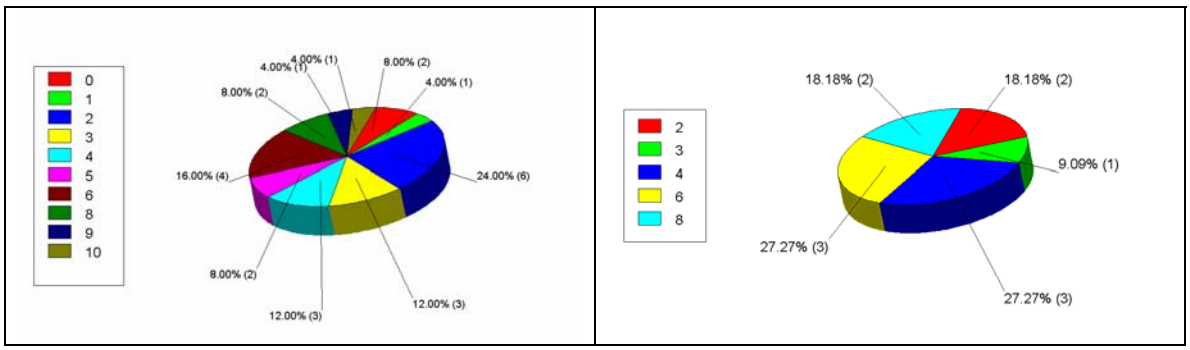

Figure 24 Comparison of Employment Opportunities: Current vs. New Growers

The 103 employment opportunities reported by current tenure holders corresponds to 45.9 full-time equivalents (FTEs), which is an average of 1.8 FTEs per tenure holding. By comparison, the 53 new employment opportunities created by the ten new tenure holders is equivalent to 32.8 FTEs or an average of 3.3 FTEs per tenure holder. Thus, something in the order of 80 FTEs of employment would be expected to be generated by the combined current and new tenure holders working in Barkley and Clayoquot Sounds (Table 4).

[8] In this case, the term 'tenure holder' is used to describe an individual who is in possession of one or more shellfish tenures.

[9] In this case, an 'employment opportunity' is used to describe an individual who is employed to work. It does not describe the length of that employment.

	Total Number of Tenure Holders	Total Employment Opportunities	Total Number of FTEs	Average FTEs per Tenure Holder
Current Tenure Holders	25	103	45.9	1.8
New Tenure Holders	10	53	32.8	3.3
Estimated Totals	35	156	78.7	2.2

Table 4 Comparison of Full-Time Equivalents Employed: Current vs. New Tenure Holders

4.2.6 Processing and Marketing

Of the 25 current growers interviewed, 84% (or 21) reported selling product to processors in past two years (Figure 25).

Of the current growers who have sold product in recent years, Mac's Oysters, Fanny Bay and Pacific Northwest are the most popular processors to sell product to. In the future, almost 65% of new tenure holders anticipate selling their product to Deep Harvest Bay (Figure 26).

Long-term friendly, trustworthy, and honest relationships are the most frequently cited (31 responses) reasons for choosing to sell to a particular processor. Good prices, prompt payment and fair and consistent yields (11 responses) are cited as the next important attributes for choosing to work with a particular processor (Figure 27).

Less than 10% of current growers have a long-term agreement with a processor. Of the two who do, these arrangements involved agreements on the price and timing of payment for seed (Figure 28).

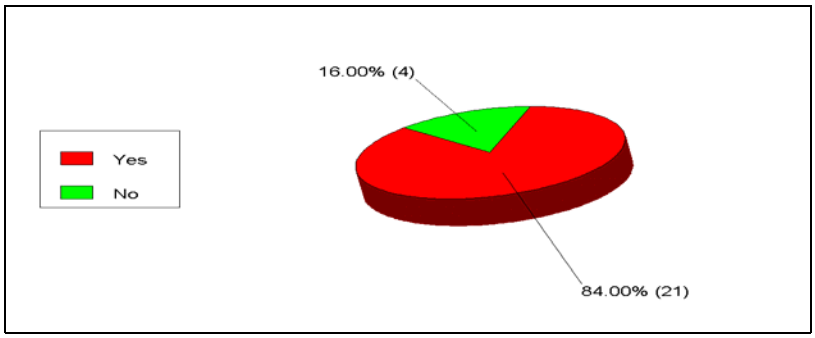

Figure 25 Current Producers Selling Product in Past Two Years

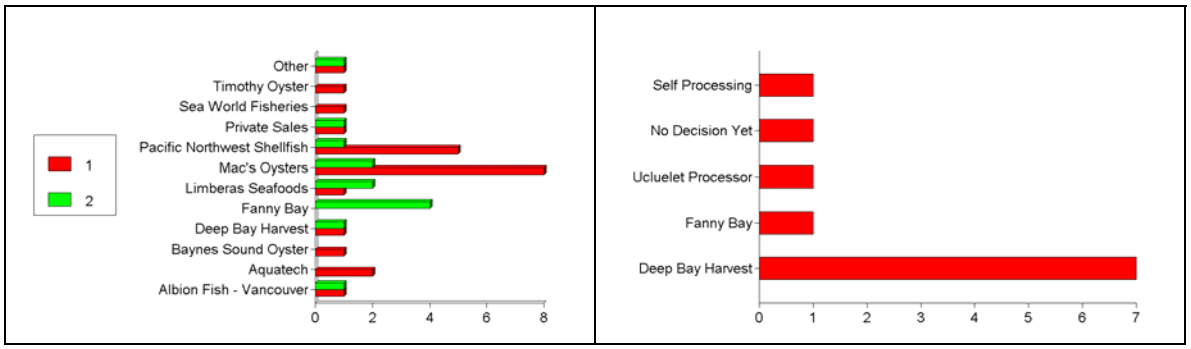

Figure 26 Comparison of Processors Used by Growers: Current and New

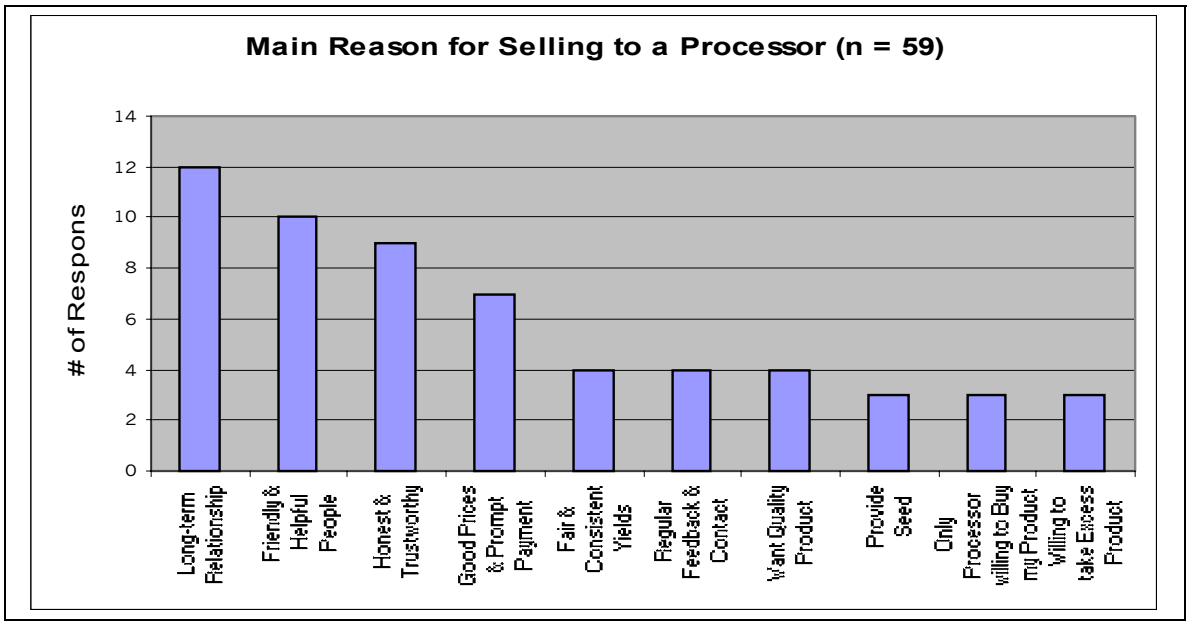

Figure 27 Main Reasons for Selling to a Processor

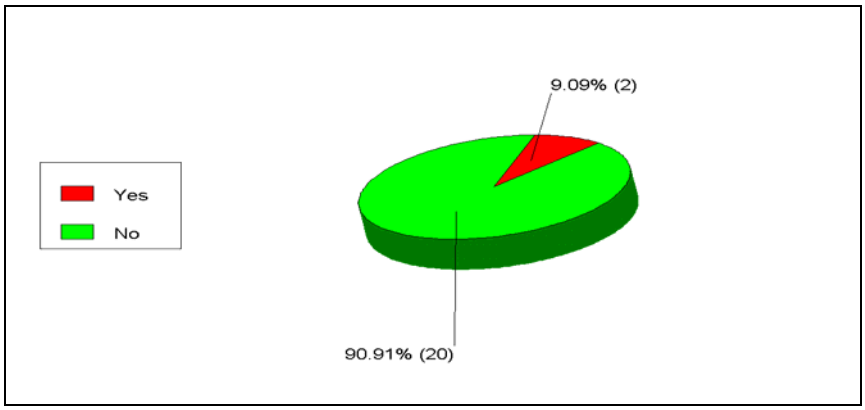

Figure 28 Current Growers With/Without Agreements with Processors

4.2.7 Future Prospects

Forty-four percent (11 individuals) of the current growers are interested in expanding their tenure holdings in the future, whereas only one of 11 new growers expressed interest in expanding their tenure in the next 3-5 years (Figure 29).

Of the 11 current growers expressing interest in expansion of their operations, seven wish to expand their holdings by 3 hectares or more. The one new grower expressing interest in tenure expansion indicated they wanted to expand by more than 5 hectares (Figure 30).

There appears to be considerable interest (80%) among current farmers in diversifying the species they farm – mussels (27%) and Japanese scallops (18%) being among the most popular. For new farmers, less than 50% (5/11) are interested in diversifying in the next 3-5 years – mainly mussels and clams (Figure 31).

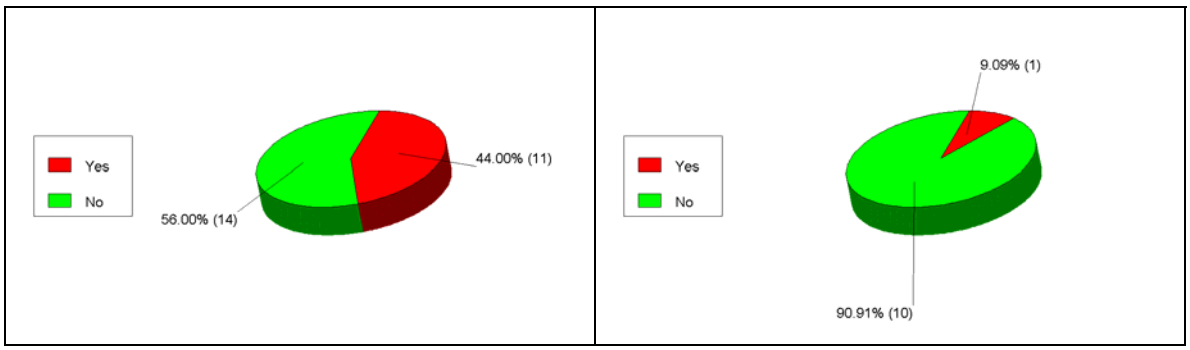

Figure 29 Comparison of Interest in Expanding Tenure Holdings: Current vs. New Growers

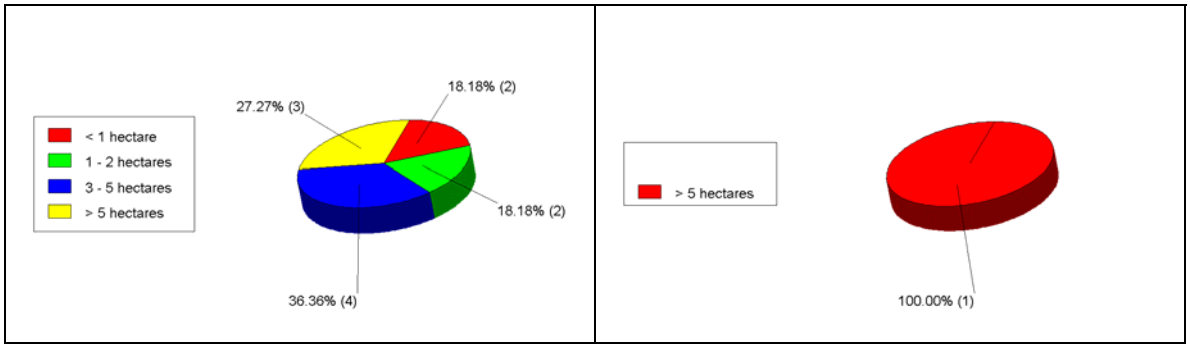

Figure 30 Comparison of Preferred Size of Tenure Expansion: Current vs. New Growers

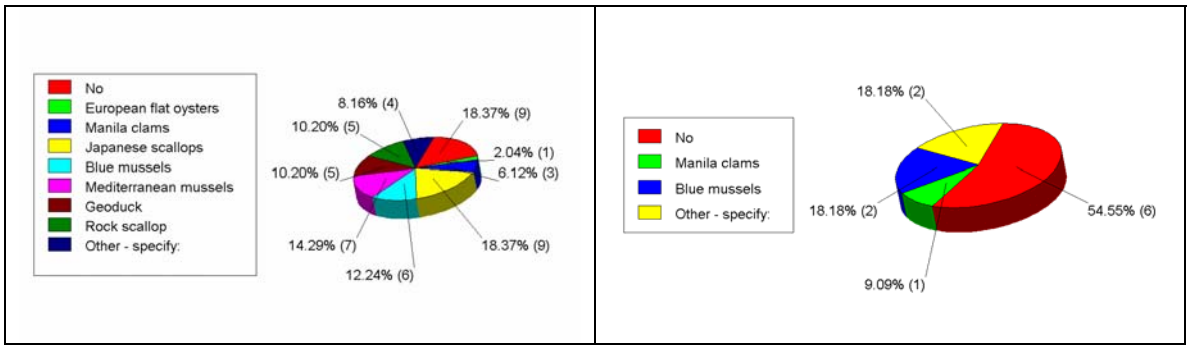

Figure 31 Comparison of Interest in Diversifying Species Grown: Current vs. New Growers

Half of current oyster growers anticipate no changes in the type of techniques they use over the next 3-5 years, 25% (8 individuals) indicated a future interest in the use of trays, and an other 22% (7 individuals) are considering changing to French tubes. This is in sharp contrast to new growers who overwhelmingly (90%) are not contemplating future changes to their growing techniques (Figure 32).

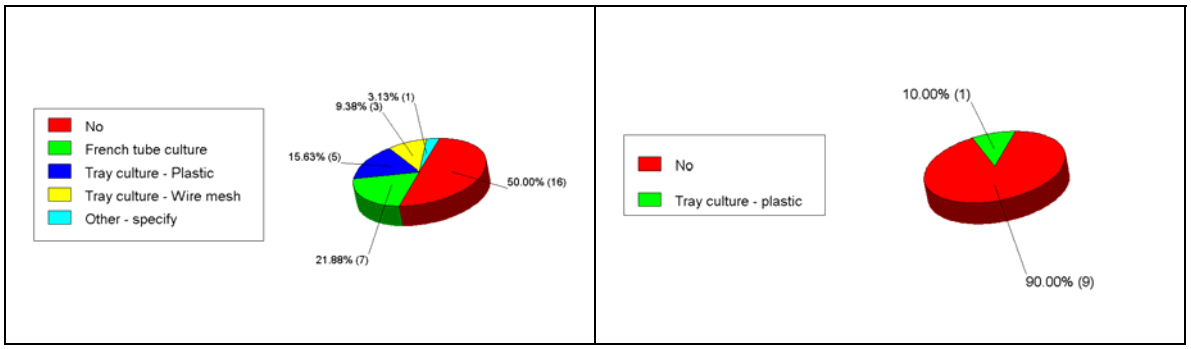

Figure 32 Comparison of Interest in Changing Oyster Growing Techniques: Current vs. New Growers

Thirty-three percent of current growers (8 individuals) do not intend to make any new capital investment over the next 3-5 year period, while 38% plan to make investments of under $75,000, and 21% plan to make investments of between $76,000 and $150,000. Only 9% (2 individuals) reported plans of investments exceeding $ ¼ million. Almost 75% of new growers are planning investments of $150,000 or more, and only three anticipate investing less than $150,000 over the next 3-5 years (Figure 33).

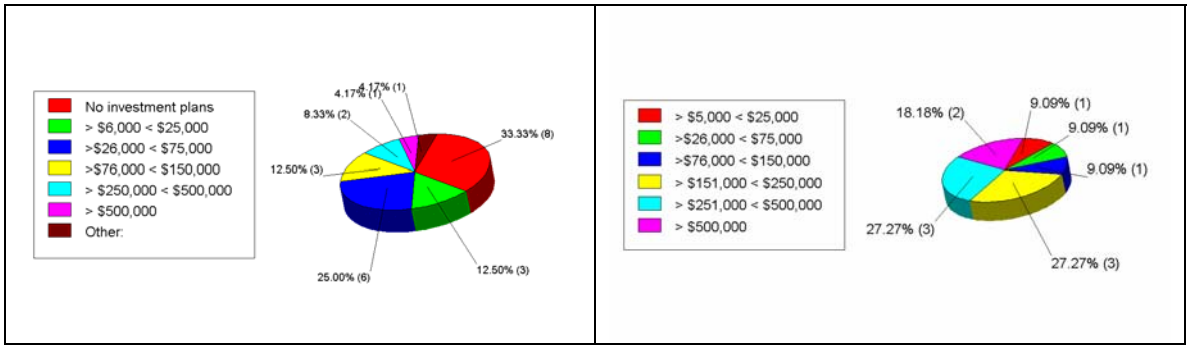

Figure 33 Comparison of Plans for Investment in Next 3-5 Years: Current vs. New Growers

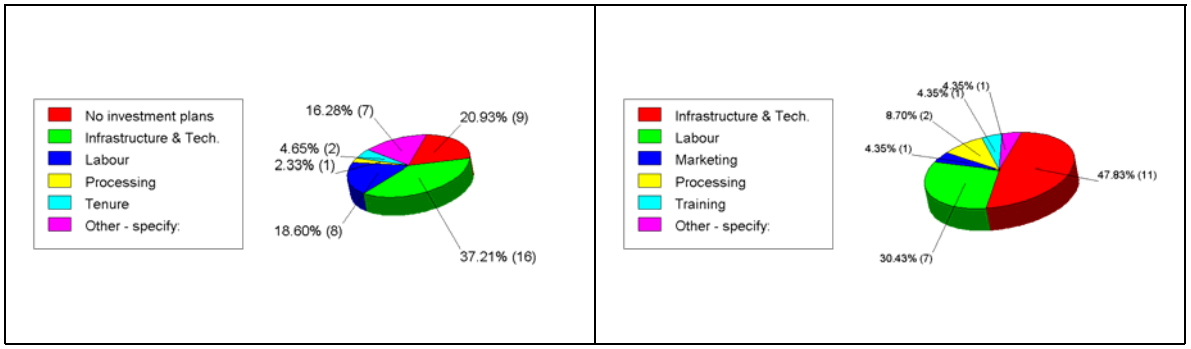

Figure 34 Comparison of Areas for Investment in Next 3-5 Years: Current vs. New Growers

Infrastructure, technology and labour are the main areas which both current and new growers reported having plans to invest in over the next 3-5 years. These areas account for 37% and 18% respectfully for current growers, and 48% and 30% for new growers (Figure 34).

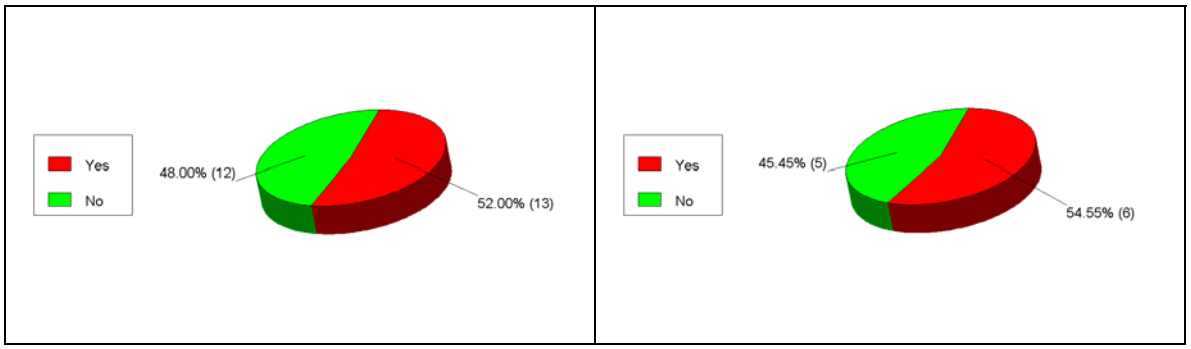

Figure 35 Comparison of Plans to Increase Employment in Next 3-5 Years: Current vs. New Growers

Fifty-two and 55 percent of current and new growers respectively have plans to increase employment over the next 3-5 year period (Figure 35). Of those current and new growers who anticipate creating new employment opportunities, 33% expect this to create 1-2 new FTEs for each operation (Figure 36). Not surprising, part-time and seasonal employment opportunities are anticipated to grow with 84% of current growers and 44% of new growers predicting an increase of 1-4 part-time employment opportunities per operation over the next 3-5 years (Figure 37).

A majority of both current and new growers expressed interest in capitalizing on new markets - 58% and 82% respectfully (Figure 38). As indicated in (Figure 39), current growers rank their top-three new market preferences as:

1. New Processors/Local Consumers;
2. Local Restaurants; and
3. Value-added.

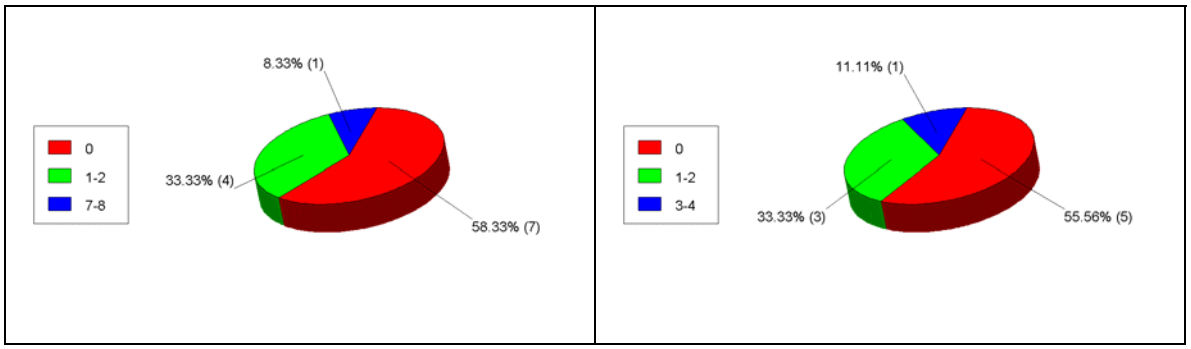

Figure 36 Comparison of Plans to Increase Full-time Employment Opportunities in Next 3-5 Years: Current vs. New Growers

New growers, on the other hand, ranked their top-three preferences as:

1. Local Restaurants;
2. New Processors; and
3. Export.

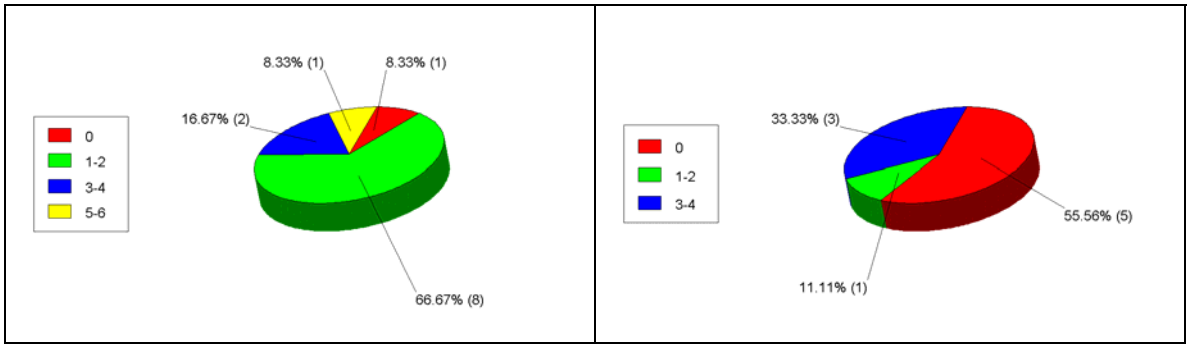

Figure 37 Comparison of Plans to Increase Part-time Employment Opportunities in Next 3-5 Years: Current vs. New Growers

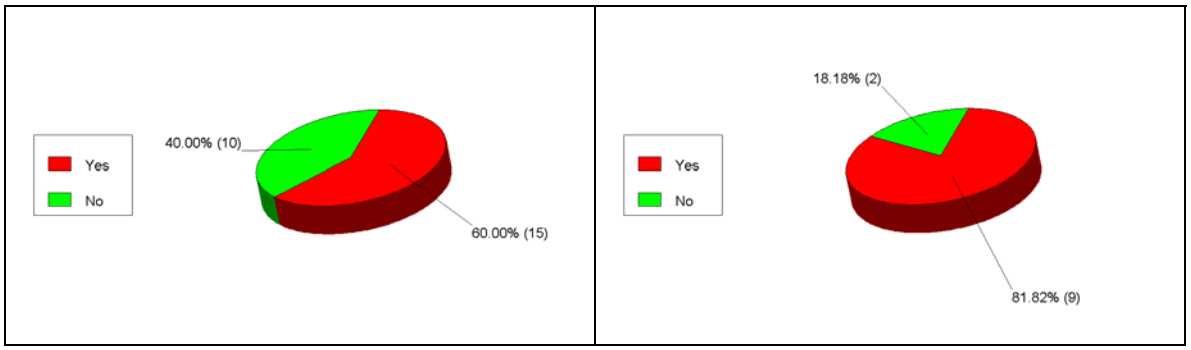

Figure 38 Comparison of Interest to Capitalize on New Markets in Next 3-5 Years: Current vs. New Growers

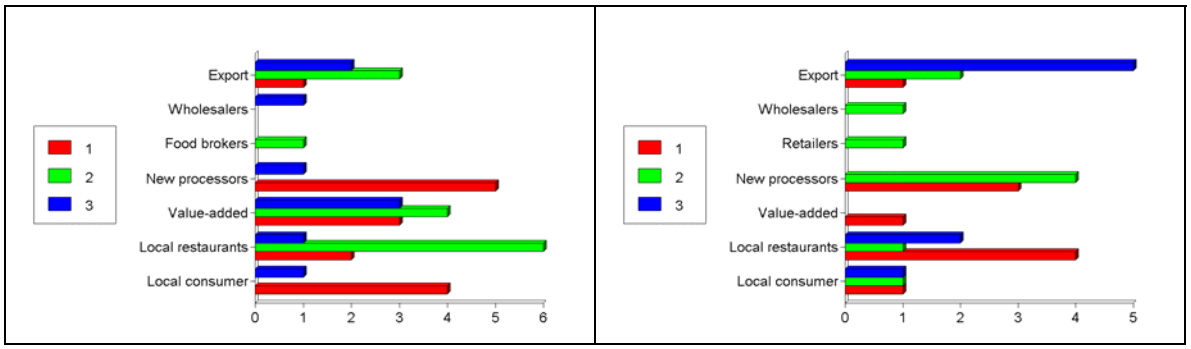

Figure 39 Comparison of Top Three Ranked Priorities for New Market Expansion in Next 3-5 Years: Current vs. New Growers

While 13 current growers did not identify any specific types of assistance to help achieve their future market expansion interests, seven indicated the need for a west coast processor, and 4 identified generic marketing, market research and low interest financing as essential to the development of future markets. New growers, in comparison, strongly recommended that a generic marketing strategy is needed to achieve future market expansion (Figure 40).

Figure 40 Comparison of Types of Assistance Required for New Market Expansion in Next 3-5 Years: Current vs. New Growers

4.2.8 Opportunities for Regional Collaboration

Eighty-three percent of current growers and 100% of new growers believe that a planned, coordinated and adequately supported approach to regional shellfish development will improve everyone's chances for success in the shellfish industry in Barkley and Clayoquot Sound (Figure 41).

The ranking of priority industry areas to be addressed at a regional level are quite consistent for both current and new growers as shown in Figure 42 and Figure 43.

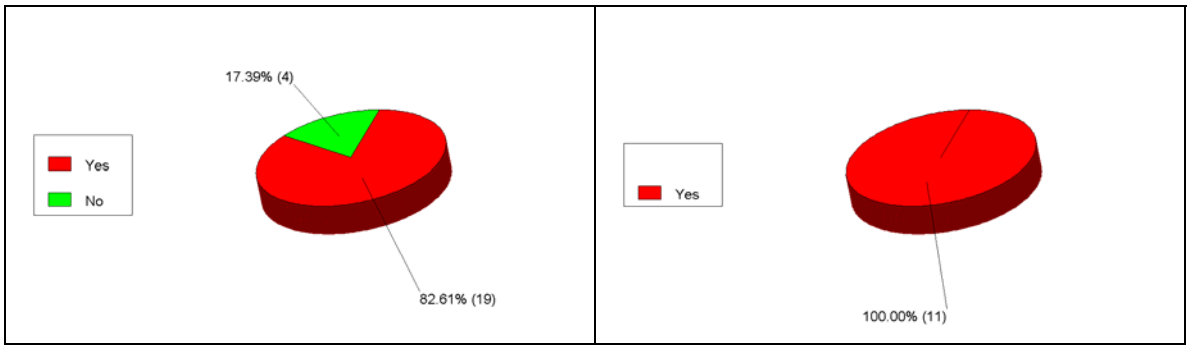

Figure 41 Comparison of Support for a Regionally Planned, Coordinated and Adequately Supported Approach to Shellfish Development: Current vs. New Growers

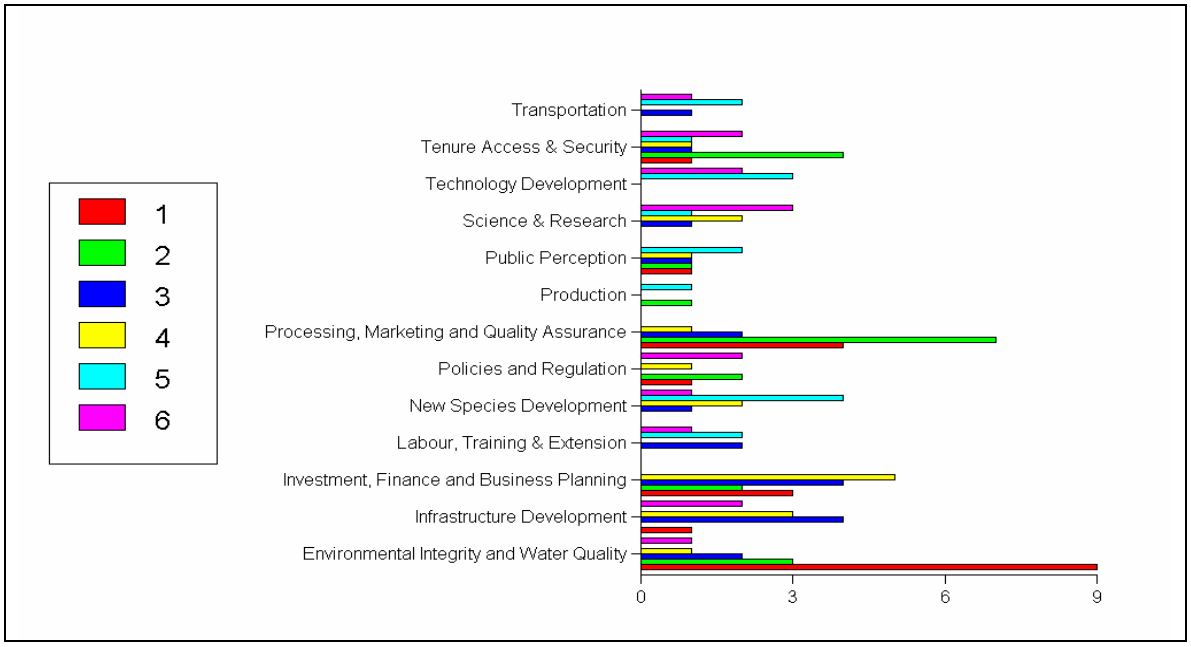

Figure 42 Priorities to be Addressed on a Regional Basis: Current Growers

Both clearly indicate that Environmental Integrity and Water Quality are their first priority (scoring 9 and 10 respectfully for current and new growers). Second and third priorities for current growers are Processing, Marketing and Quality Assurance (7 votes) and Investment, Finance and Business Planning (4 votes). New growers ranked Investment, Finance and Business Planning as its second priority (4 votes) and Processing, Marketing and Quality Assurance as its third priority (3 votes).

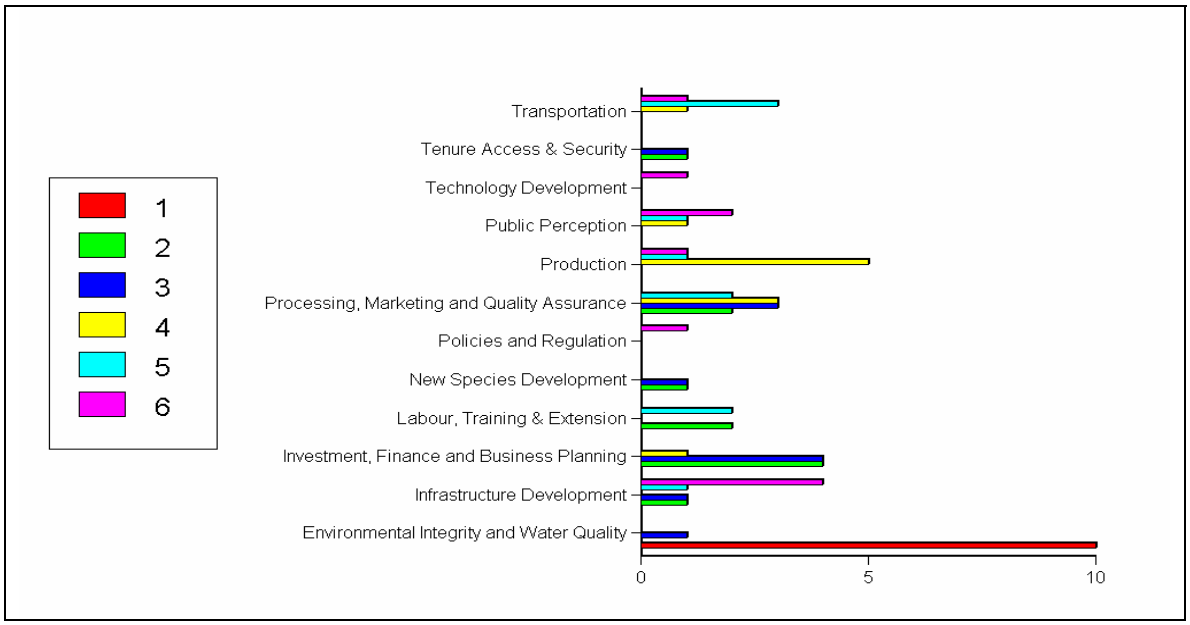

Figure 43 Priorities to be Addressed on a Regional Basis: New Growers

Regarding the three main barriers interfering with the development of their businesses, current growers indicated government regulation, market access and affordable financing as their greatest obstacles. Whereas new growers, identified access to capital and affordable financing as the main impediment to their current business plans (Figure 44).

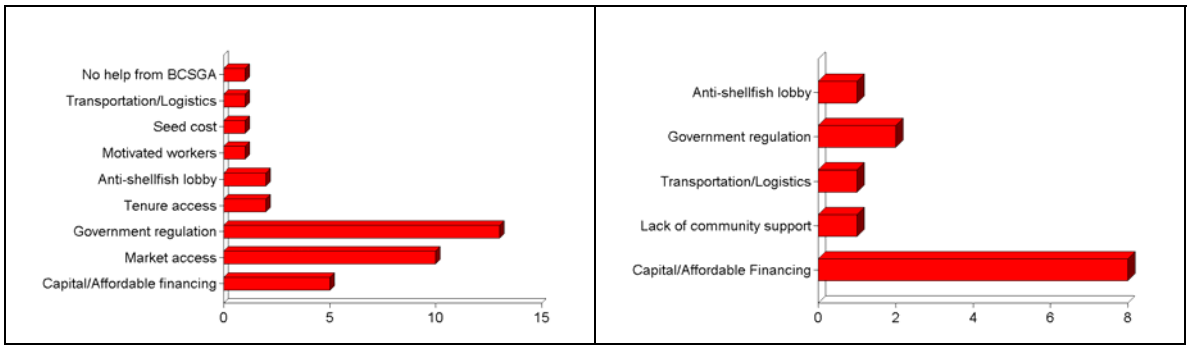

Figure 44 Comparison of Barriers to Shellfish Development: Current vs. New Growers

5 Communication and Collaboration

5.1 Background and Methodology

One question in the survey focused on soliciting the opinions, experiences and perspectives of growers regarding whether they felt there was a need to enhance communications and collaboration among individuals in the shellfish industry on the west coast.

> *Do you have any ideas or recommendations that could enhance communication and collaboration among EXPERIENCED and NEW shellfish growers – native and non-native alike - in Clayoquot and Barkley Sounds?*

In general, while there were some similarities to the individual answers from Barkley and Clayoquot Sound growers, an equally clear message was delivered: No one from either Sound expressed a remote interest, nor could see any benefits to be gained from working collaboratively with the other Sound. That said, each Sound had there own individual foci and are dealt with separately below:

5.2 Barkley Sound Growers

Discussions about collaboration with long-term growers from Barkley Sound inevitably end up in conversation about the Barkley Sound Shellfish Growers Association (BSSGA). In the late 1980s to mid 1990s a group of about 10 growers in Barkley Sound formed this marketing cooperative, and for the first number of years (in the opinion of many) was exceedingly successful, both in terms of the quality and quantity of product sold, and the superior prices it received in the market.

We were a force to be reckoned with.

Ex-Barkley Sound Shellfish Association Member

Despite its success, however, by 1995 (for reasons that range from a poorly designed governance model, to fiscal mismanagement, a loss of trust among members, favouritism, and drug abuse), amidst significant financial loses to a number of members, the association dissolved, leaving what could only be termed a very acrimonious attitude towards any future types of cooperation for many of the growers who were involved.

Barkley Sound growers are tough old sea salts and renegades who don't want to do anything together and won't be organized.

Barkley Sound Shellfish Grower since 1995

The combination of this historical negativity towards cooperation, and the stereotypical individualism resulting from the geographic isolation of Barkley Sound, has resulted in a general reluctance among most growers to want or need to work together. So much so that one long-term grower went so far to say:

Barkley growers will go out of their way NOT to Cooperate...it's hard to build a cooperative approach… the mentality is just not there.

Barkley Sound Shellfish Grower since 1993

Two other long-term growers summed-up there opinions using animal metaphors to describe the challenge of organizing growers in Barkley Sound:

Organizing growers in Barkley is like trying to herd cats.

Barkley Sound Shellfish Grower since 1983

Organizing growers in Barkley is like trying to teach an old dog new tricks.

Barkley Sound Shellfish Grower since 1993

Despite this rather pessimistic view towards collaboration and cooperation, some new tenure holders as well as those unaffected by the demise of the BSSGA did express some recognition of the benefits of cooperation among peers. These individuals largely take it upon themselves to find avenues to cooperate where they have a clearly defined or site-specific need. They also rely on the BCSGA (see below) for support on more macro-level issues affecting the industry as a whole.

5.3 Clayoquot Sound Growers

I see no need (to collaborate)…we're a stand alone operation.

Clayoquot Sound Shellfish Grower since 1985

Despite the fact that there are several farmers in Clayoquot who see little need to cooperate, prefer to work individually and not partake in the activities of the Clayoquot Oyster Grower's Association (COGA), the overall tenor towards collaboration among growers in Clayoquot is distinctly different than that in Barkley Sound.

Where growers have a real and defined need (i.e. to share in the purchase and/or transportation of seed, barrels or oyster-blue rope), or where they see an issue that affects their self interest (i.e. tenure expansion and carrying capacity in Lemmen's Inlet) they work together without hesitation. But, as one grower bluntly cautioned, no one has an appetite for participating in process without a clearly defined purpose:

Don't create bodies or processes where they are not

needed…no one has the time for it.

Clayoquot Sound Shellfish Grower since 1995

Growers in the Clayoquot created the COGA for very pragmatic reasons some 5-6 years ago - as a response to protect their interests and distinguish themselves from the growing political and public pressure surrounding fin-fish aquaculture. As a consequence, the use of, support for, and participation in, the COGA and its activities appear to be quite high among Clayoquot growers.

Clayoquot growers citied recent examples of COGA's participation in the Working Sound initiative, water quality testing studies, and the recent farmer study tour to Nootka Sound to see French Tubes as the type of specific and tangible cooperation that they are interested in taking part in and supporting.

The existing informal farmer-to-farmer discussions and associations work fine.

Clayoquot Sound Shellfish Grower since 1991

In addition, there is already a well established, informal and effective exchange of information and self-help among growers in Clayoquot Sound who are more than happy to help one another. In the opinion of most, formalizing this informal network is not likely to improve it, nor broaden grower participation.

Despite their willingness to help one another on a voluntary basis, and given their pragmatic nature, there is not a lot of support for allocating the limited financial resources available to make it easier for new growers to compete with those who built the industry.

If someone is passionate about learning something new, they'll find out about it on their own…there's no need to create something new or give something away free.

Clayoquot Sound Shellfish Grower since 1991

5.4 Collaboration with First Nation Growers

Very few growers seemed to be aware of the imminent and significant increase in First Nation participation in the shellfish industry. Consequently, they had nothing specific to say about how to improve collaboration among native and non-native growers beyond extending an invitation to them to participate in the existing industry associations.

Despite that, one current grower expressed the concern that the industry not be separated into two detached entities.

A good and close working relationship with the NTC farmers will be crucial in the future…it is essential that growers do not divide along racial lines.

Clayoquot Sound Shellfish Grower since 1996

5.5 BCSGA as a Vehicle for Communications and Collaboration

BCSGA membership dues are structured in such a way as to reduce collaboration and communication by making rates too steep for smaller farmers…only the larger operations are in the 'loop'.

New Barkley Sound Shellfish Grower

While some growers expressed concerns that association fees were either too high relative to what they received in return, or structured in such a way as to discriminate against small growers, others regard the BCSGA as an association that no longer meets their needs.

We no longer receive the frequent updates and assistance on what is going on in the industry from the BCSGA and meetings.

Barkley Sound Shellfish Grower since 1988

BCSGA used to keep growers informed, but not now…. they're too expensive.

Barkley Sound Shellfish Grower since 1993

In contrast, however, other long-term growers explained that the BCSGA is the first place they go for answers to their questions or for industry information. Others went so far as to say that the services provided by the BCSGA (in the form of research, updates, workshops etc.) have been fundamental to their success in the industry.

The workshops at annual meetings of the BCSGA have proved invaluable for my business….in particular the cross-pollination of ideas from meeting and speaking with farmers and university researchers from Washington, Oregon and Alaska.

Barkley Sound Shellfish Grower since 1972

A long-term supporter of the BCSGA best summarized the view that growers will only benefit from the BCSGA's capacity as a facilitator of communications and collaboration in the industry to the extent that they participate in and support the Association:

This is an endless source of frustration…those who don't come to meetings or take part in the Association are constantly trying to re-invent the wheel rather than benefiting from working together.

Barkley Sound Shellfish Grower since 1993

5.6 New Suggestions for Communications and Collaboration for Growers

Overall, very few new suggestions were put forth by growers to enhance grower communication and collaboration.

The main three messages coming from growers were:

- Farmers already informally cooperate among themselves based on their own specific and pragmatic needs;
- Continue to use, support and make improvements to the existing associations; and
- Do not create something new where there is not a broad, clear and pragmatic need expressed by growers themselves.

Notwithstanding these, however, there were a few suggestions that were expressed by growers which may be worth considering, provided there is a broad range of support and costs are not prohibitive.

5.6.1 West Coast Shellfish Growers Newsletter

Back in the 1980s there was an informal newsletter in Barkley Sound called SPAT. It was published 'on-the-cheap, warts-and-all' for-and-by growers and dealt with issues in a straightforward manner. Despite its unpolished appearance, it was quite successful and was a welcomed source of information and exchange among Barkley Sound growers.

It was so successful in fact, that soon government began contributing to fund it, and circulation expanded to include government and industry officials. Shortly afterwards, it stopped being published because (in the opinion of one grower) it had steered away from its original mandate to serve the needs and interests of growers.

Re-launching the newsletter for all west coast shellfish growers was suggested by a number of growers. Provided it maintained a clear hands-on orientation, avoided duplication of resources available elsewhere, linked with and promoted the activities within the region, and focused on meeting the needs of growers, it might help to further develop and improve communication and collaboration among growers of the two Sounds.

5.6.2 West Coast Shellfish Extension Worker

A shellfish extension worker (modeled on the agricultural industry) who would be available on an "as needed" basis, was suggested as a means for growers to stay up-to-date with the latest research and information updates in the industry.

Such an individual would ideally have a broad range of hands-on experience in the industry, visit growers on-site, facilitate research, and be able to provide advice and recommendations to growers on ways to improve or streamline their shellfish particular operations.

5.6.3 West Coast Shellfish Workshops and Farm-Site Visits

Regularly scheduled workshops or site-visits (scheduled around the tides so it did not interfere with harvesting) were also recommended as another means to enhance communications and collaborations. A number of growers supported these provided they focus on themes relevant to growers interests and they were informal farmer-to-farmer learning opportunities and not classroom lecture/theory focused.

6 Shellfish Growers Meetings

6.1 Shellfish Growers Meetings Background

Following the completion of the research, report-back meetings were held with shellfish growers from both Sounds on April 23rd (Tofino) and 24th, 2003 (Port Alberni).

The purpose of these meetings was to:

1. Report back to the shellfish growers the findings of the growers surveys;
2. Corroborate and/or correct the results and interpretation of the grower surveys;
3. Verify that the barriers, needs and priorities expressed by the shellfish growers were correct; and
4. Initiate discussions among shellfish growers and the Task Force to create a strategy for a future action plan.

6.2 Shellfish Growers Meetings Results

Nine growers (25% of those interviewed) attended the meetings. They confirmed the results of the growers' survey that the main barriers facing the industry at present are:

1. Government regulation;
2. Market access; and
3. Access to capital and affordable financing.

They also verified that the following priorities issues need to be addressed on a Regional Basis:

1. Environmental Integrity and Water Quality;
2. Processing, Marketing & Quality Assurance; and
3. Investment, Finance and Business Planning.

Notes from the meetings are included as Appendix 4 and Appendix 5.

Appendix 1 Research Sources – Annotated Bibliography

Journals and Abstracts

1. Aquaculture
2. Aquaculture Association Canada Abstracts (2002, 2001, 2000,1999)
3. Aquaculture Economics and Management
4. Aquaculture Engineering
5. Aquaculture Research
6. Aqua-online
7. Aquatic Botany
8. Aquatic Living Resources
9. Aquatic Sciences and Fisheries Abstracts
10. Aquatic Toxicology
11. BIOSIS
12. Bulletin of the Aquaculture Association of Canada
13. Canadian Journal of Fisheries and Aquaculture Sciences
14. Conservation Biology
15. Current Contents/Agriculture, Biology and Environmental Sciences
16. Elsevier BIOBASE
17. Fisheries Research
18. Freshwater and Aquaculture Contents Tables
19. GEOBASE
20. Ingenta Online
21. Journal of Shellfish Research
22. Journal of Shellfish Research
23. Journal of World Aquaculture
24. Marine Biology
25. Marine Science Contents Tables
26. North American Journal of Aquaculture
27. North American Journal of Fisheries Management
28. Scirus Online
29. SeaWeb Aquaculture Clearinghouse
30. The Progressive Fish-Culturist
31. Transactions of the American Fisheries Society

Libraries, Organizations and Individuals

1. Alberni Clayoquot Regional District
2. Aquaculture Magazine
3. Aquametrix Ltd.
4. Aquanet
5. Bamfield Marine Station
6. Barron Carswell, BC MAFF
7. BC Shellfish Growers Association
8. Canadian Aquaculture Industry Alliance
9. Clayoquot Regional Board
10. Long Beach Model Forest

11. Ecotrust Canada (Tofino)
12. Fisheries and Oceans Canada
    a. Canadian Science Advisory Secretariat
    b. Pacific Biological Station
    c. PSARC
    d. "Waves"
13. Josie Osborne, NTC
14. Brian Kingzett, Kingzett Professional Services
15. Leah Bendell-Young, SFU
16. Office of the Commissioner for Aquaculture Development
17. Pacific Shellfish Growers Association
18. Roberta Stevenson, NTC
19. Science Council of BC
20. Strawberry Isle Research Society
21. Tidepool
22. Underwater Harvesters Association

Appendix 2 Current Shellfish Growers' Survey

WCVI Shellfish Questionnaire - Current Growers

Instructions
This survey is being undertaken on behalf of the WCVI Shellfish Task Force - a group of representatives from industry, regional, provincial and First Nations governments and non-governmental agencies including Human Resources Canada, BC Ministry of Agriculture Food and Fisheries, the Nuu-chah-nulth Tribal Council, the Alberni-Clayoquot Economic Development Commission, Ecotrust Canada and Community Futures. This group is interested in exploring ways to:

- Assist growers with activities that will increase their market share
- Assist with bringing investments to the west coast to support shellfish development
- Identify and fill knowledge gaps in the WCVI shellfish industry; and
- Increase and improve communications and coordination and collaboration among Native and non-native shellfish growers.

This survey has been designed as one way to gather baseline information on various aspects of the industry to help develop a planned, coordinated and adequately financed shellfish action plan for the WCVI.

Information collected from this survey will be used to indicate TRENDS in the WCVI shellfish industry. However, all proprietary business information collected will be held in strict confidence and none will be published or shared in any way that the specifics of your answers will be attributable to your particular shellfish site or business circumstances.

Your willingness to take part in this survey is much appreciated.

Please provide the following information. (*required)

First Name*

Last Name*

Company*

Phone*

Fax*

Email*

Barkley or Clayoquot*

Size of Tenure #1*

Experience

1. How many years have you been in the shellfish industry?

(Select only one.)
- 1-2
- 3 - 5

- 6 - 10
- 11 - 15
- >15

2. How long do you intend to stay in the shellfish industry?

(Select only one.)

- <2
- 3 - 5
- 6 - 10
- >10

3. Rank the 2 most importance sources where you have learned the most about how to farm shellfish?

(Rank responses from 1 to 2.)

[ ] Learned by working with others in industry
[ ] Self taught
[ ] Short term courses
[ ] Formal training
[ ] Other - specify

4. Are you a member of any industry groups?

(Select all that apply.)

- BC Shellfish Growers Association
- Clayoquot Oyster Growers Association
- Pacific Coast Oyster Growers Association
- Other - specify:

5. How would you describe your shellfish operation?

(Select only one.)

- I am a part-time farmer.
- I am a full-time farmer.
- I am a business farmer.
- Other - specify:

Tenure(s) Background

6. How many tenures do you have?

(Select only one.)

- 1
- 2
- 3
- 4
- 5

7. What is the combined size in hectares of your tenure(s)?

(Provide one response only.)

8. What proportion of your tenure(s) is currently being farmed/utilized?

(Select only one.)

- 0%
- < 25%

□ 26% - 50%
□ 51% - 75%
□ >75%

9. Rank in order of importance the main type of shellfish you are/plan to be farming?

(Rank responses from 1 to 8.)
[ ] Pacific oysters
[ ] European flat oysters
[ ] Manila clams
[ ] Japanese scallops
[ ] Blue mussels
[ ] Mediterranean mussels
[ ] Geoduck
[ ] Urchins
[ ] Red Algae
[ ] Brown Algae

10. What are/will the 2 main types of growing techniques you use on your oyster tenure(s)?

(Select two.)
□ Beach grow-out
□ FLUPSYs
□ Tube culture - French Tubes
□ String culture - Oyster Blue
□ Tray culture - Plastic
□ Tray culture - Wire mesh
□ Not relevant
□ Other - specify:

11. What 2 main suspension method(s) do/will you use on your oyster tenure(s)?

(Select two.)
□ Barrel & Longlines
□ Rafts
□ A combination of both
□ Other - specify
□ Not relevant

12. If you currently/plan to farm scallops, what technique do you mainly use?

(Select only one.)
□ Lantern or pearl nets
□ Ear hanging
□ Combination of both
□ I don't farm scallops

Investment

13. What is the estimated current value of your (combined) tenure(s) - not including product or infrastructure/equipment?

(Select only one.)
□ <$25,000
□ > $26,000 < $50,000
□ >$51,000 < $100,000
□ >$101,000 < $150,000

□ > $151,000 < $250,000
□ > $250,000
□ Other:

14. What is the current estimated value of your combined product-on-site (i.e. 1st year class + 2nd year class = 3rd year class)?

(Select only one.)
□ $0.00 - I have not yet begun to grow product.
□ <$25,000
□ > $26,000 < $50,000
□ >$51,000 < $100,000
□ >$101,000 < $150,000
□ > $151,000 < $250,000
□ > $250,000
□ Other:

15. What is your estimated current value of all your infrastructure investments (i.e. rafts, barrels, floats, lines/pins, boats, buildings, harvesting equipment etc.)?

(Select only one.)
□ <$25,000
□ >$26,000 < $50,000
□ >$51,000 < $100,000
□ >$101,000 < $150,000
□ >$151,000 < $250,000
□ >$250,000
□ Other:

Production

For the following types of products, please indicate the production per hectare from your tenure(s) for the last two years.

16. Have you harvested product in the last 2 years?

(Select only one.)
□ Yes
□ No **(Skip to Q. 41)**

17. For the following types of products, please indicate the production per hectare from your tenure(s) for this coming and the last two years. Shucked oysters (in gallons) for 2003?

(Provide one response only.)

18. Shucked oysters (in gallons) for 2002?

(Provide one response only.)

19. Shucked oysters (in gallons) for 2001?

(Provide one response only.)

20. Singles or half-shell oysters (in dozens) for 2003?

(Provide one response only.)

21. Singles or half-shell oysters (in dozens) for 2002

(Provide one response only.)

22. Singles or half-shell oysters (in dozens) for 2001?

(Provide one response only.)

23. Clams (in pounds) for 2003?

(Provide one response only.)

24. Clams (in pounds) for 2002?

(Provide one response only.)

25. Clams (in pounds) for 2001?

(Provide one response only.)

26. Shucked oysters (in $) for 2003?

(Provide one response only.)

27. Shucked oysters (in $) for 2002?

(Provide one response only.)

28. Shucked oysters (in $) for 2001?

(Provide one response only.)

29. Single or half-shell oysters (in $) in 2003?

(Provide one response only.)

30. Single or half-shell oysters (in $) for 2002?

(Provide one response only.)

31. Single or half-shell oysters (in $) in 2001?

(Provide one response only.)

32. Clams (in $) in 2003?

(Provide one response only.)

33. Clams (in $) in 2002?

(Provide one response only.)

34. Clams (in $) in 2001?

(Provide one response only.)

35. Other (Name the product(s) and include weight in pounds) in 2003?

(Provide one response only.)

36. Other (Name the product(s) and include weight in pounds) in 2002?

(Provide one response only.)

37. Other (Name the product(s) and include weight in pounds) in 2001?

(Provide one response only.)

38. Other (Name the product(s) and value in $) in 2003?

(Provide one response only.)

39. Other (Name the product(s) and value in $) in 2002?

(Provide one response only.)

40. Other (Name the product(s) and value in $) in 2001?

(Provide one response only.)

Employment

41. Including yourself, how many individuals are employed/do you plan to employ on your tenure(s)?

(Select only one.)

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

42. Recognizing that work schedules and patterns vary throughout the year, can you estimate the average number of HOURS PER WEEK that each individual (including yourself) works on your tenure(s)?

Processing and Marketing

43. Have you sold product in the past two years?

(Select only one.)

- Yes
- No **(Skip to Q. 44)**

44. For the last 2 years of production, indicate which processor(s) purchase your product AND the estimated percentage.

45. What are the main reasons for you selling to these companies?

46. Are you bound by any long-term agreements with a processor?

(Select only one.)
- Yes
- No **(Skip to Q. 48)**

47. If yes, can you describe how this affects current business decisions.

Future Prospects

Please answer the following questions regarding the future considering the next 3-5 years.

48. Over the next 3-5 years, do you plan on expanding your shellfish tenure holdings?

(Select only one.)
- Yes
- No **(Skip to Q. 50)**

49. If yes, ideally how many hectares would you like to add to your operation?

(Select only one.)
- < 1 hectare
- 1 - 2 hectares
- 3 - 5 hectares
- > 5 hectares

50. Over the next 3-5 years, do you plan on diversifying your operation to include any of the following species of shellfish?

(Select all that apply.)
- No
- Pacific oysters
- European flat oysters
- Manila clams
- Japanese scallops
- Blue mussels
- Mediterranean mussels
- Geoduck
- Rock scallop
- Urchins
- Other - specify:

51. Over the next 3-5 years, do you anticipate changing the main growing techniques you use on your oyster tenure?

(Select seven.)
- No

- Beach grow-out
- FLUPSY's
- Tube culture - French Tubes
- String culture - Oyster Blue
- Tray culture - Plastic (1/2 shell)
- Tray culture - Wire mesh (1/2 shell)
- Other - specify

52. Over the next 3-5 years, how much new capital do you plan to invest in your business

(Select only one.)

- I don't plan on making any new investments.
- <$5,000
- > $6,000 < $25,000
- >$26,000 < $75,000
- >$76,000 < $150,000
- > $151,000 < $250,000
- > $250,000
- Other:

53. Over the next 3-5 years, what are the two main areas you would you invest in?

(Select two.)

- I don't plan on making any new investments.
- Infrastructure & Technology
- Labour
- Marketing
- Processing
- Tenure
- Training
- Other - specify:

54. Over the next 3-5 years, do you expect to increase the number of people you employ in your operation?

(Select only one.)

- Yes
- No **(Skip to Q. 57)**

55. If yes, how many would you expect to be employed full-time?

(Select only one.)

- 0
- 1-2
- 3-4
- 5-6
- 7-8
- 9-10
- >10 - specify:

56. How many would you expect to be employed seasonally or part-time?

(Select only one.)

- 0
- 1-2
- 3-4
- 5-6

□ 7-8
□ 9-10
□ >10 - specify:

57. Would you like to capitalize on any new markets (listed below)?

(Select only one.)
□ Yes
□ No **(Skip to Q. 60)**

58. If yes, please rank the top THREE future markets in order of priority for YOUR BUSINESS.

(Rank responses from 1 to 3.)
[ ] Local consumer
[ ] Local restaurants
[ ] Value-added
[ ] New processors
[ ] Food brokers
[ ] Retailers
[ ] Wholesalers
[ ] Export
[ ] Other - specify

59. To access these markets, what type(s) of assistance would you require? [Provide as many suggestions as you like].

Opportunities for Regional Collaboration

The WCVI Shellfish Task Force believes that a planned, coordinated and adequately supported approach to regional shellfish development will improve everyone's chances for success in the industry including established and new growers in Clayoquot and Barkley Sound.

60. The WCVI Shellfish Task Force believes that a planned, coordinated and adequately supported approach to regional shellfish development will improve everyone's chances for success in the industry including established and new growers in Clayoquot and Barkley Sound. Do you agree with this statement?

(Select only one.)
□ Yes
□ No

61. If so, please rank the following themes 1 to 6 according to what you feel are the top priorities to be addressed on a REGIONAL BASIS.

(Rank responses from 1 to 6.)
[ ] Environmental Integrity and Water Quality
[ ] Infrastructure Development
[ ] Investment, Finance and Business Planning
[ ] Labour, Training & Extension
[ ] New Species Development
[ ] Policies and Regulation
[ ] Processing, Marketing and Quality Assurance
[ ] Production
[ ] Public Perception
[ ] Science & Research

[ ] Technology Development
[ ] Tenure Access & Security
[ ] Transportation

62. Do you have any ideas or recommendations that can enhance communication and collaboration among EXPERIENCED and NEW shellfish growers in Clayoquot and Barkley Sounds?

63. What do you consider is the single most significant barrier to the growth of YOUR business?

64. What concerns do you want the Task Force to be aware of that have not been addressed in this survey?

Appendix 3 New Shellfish Growers Survey

WCVI Shellfish Questionnaire - New Applicants

Instructions

This survey is being undertaken on behalf of the WCVI Shellfish Task Force - a group of representatives from industry, regional, provincial and First Nations governments and non-governmental agencies including Human Resources Canada, BC Ministry of Agriculture Food and Fisheries, the Nuu-chah-nulth Tribal Council, the Alberni-Clayoquot Economic Development Commission, Ecotrust Canada and Community Futures. This group is interested in exploring ways to:

- Assist growers with activities that will increase their market share
- Assist with bringing investments to the west coast to support shellfish development
- Identify and fill knowledge gaps in the WCVI shellfish industry; and
- Increase and improve communications and coordination and collaboration among Native and non-native shellfish growers.

This survey has been designed as one way to gather baseline information on various aspects of the industry to help develop a planned, coordinated and adequately financed shellfish action plan for the WCVI.

Information collected from this survey will be used to indicate TRENDS in the WCVI shellfish industry. However, all proprietary business information collected will be held in strict confidence and none will be published or shared in any way that the specifics of your answers will be attributable to your particular shellfish site or business circumstances.

Your willingness to take part in this survey is much appreciated.

Please provide the following (*required)

First Name*

Last Name*

Company*

Phone*

Fax*

Email*

Barkley or Clayoquot*

Size of Tenure #1*

Experience

1. How long have you been in the shellfish industry?

(Select only one.)

- 0 - 3 months
- 4 - 6 months
- 7 - 12 months
- < 2 years
- >2 < 3 years
- Other specify:

2. How long do you intend to stay in the shellfish industry?

(Select only one.)

- <2
- 3 - 5
- 6 - 10
- >10

3. Rank the 2 most importance sources where you have learned the most about how to farm shellfish?

(Rank responses from 1 to 2.)

[ ] Learned by working with others in industry
[ ] Self taught
[ ] Short term courses
[ ] Formal training
[ ] Other - specify

4. Are you a member of any industry groups?

(Select all that apply.)

- BC Shellfish Growers Association
- Clayoquot Oyster Growers Association
- Pacific Coast Oyster Growers Association
- Other - specify:

5. How would you describe your planned shellfish operation?

(Select only one.)

- I will be a part-time farmer.
- I will be a full-time farmer.
- I will be a business farmer.
- Other - specify:

Tenure(s) Background

6. How many tenures do you have?

(Select only one.)

- 1
- 2
- 3
- 4
- 5

7. What is the combined size in hectares of your tenure(s)?

(Provide one response only.)

8. What proportion of your tenure(s) will be farmed/utilized by its 5th year of operation?

(Select only one.)

- 0%
- < 25%
- 25% - 50%
- 50% - 75%
- >75%

9. Rank in order of importance the main type of shellfish you plan to farm?

(Rank responses from 1 to 8.)

- [ ] Pacific oysters
- [ ] European flat oysters
- [ ] Manila clams
- [ ] Japanese scallops
- [ ] Blue mussels
- [ ] Mediterranean mussels
- [ ] Geoduck
- [ ] Urchins
- [ ] Turkish Towel
- [ ] Laminoria (Sugar Kelp)
- [ ] Alaria (kelp)
- [ ] Bull kelp
- [ ] Macro kelp

10. What will be the 2 main types of growing techniques you use on your oyster tenure(s)?

(Select two.)

- Beach grow-out
- FLUPSYs
- Tube culture - French Tubes
- String culture - Oyster Blue
- Tray culture - Plastic
- Tray culture - Wire mesh
- Not relevant
- Other - specify:

11. What 2 main suspension method(s) will you use on your oyster tenure(s)?

(Select two.)

- Longlines
- Rafts
- A combination of both
- Other - specify
- Not relevant

12. If you plan to farm scallops, what technique will you mainly use?

(Select only one.)

- Lantern or pearl nets
- Ear hanging
- Combination of both
- I don't farm scallops

Investment

13. What is the estimated current value of your (combined) tenure(s) - not including product or infrastructure/equipment?

(Select only one.)

- <$25,000
- > $25,000 < $50,000
- >$50,000 < $100,000
- >$100,000 < $150,000
- > $150,000 < $250,000
- > $250,000
- Other:

14. What is your estimated current value of all your infrastructure investments (i.e. rafts, barrels, floats, lines/pins, boats, buildings, harvesting equipment etc.)?

(Select only one.)

- <$25,000
- >$25,000 < $50,000
- >$50,000 < $100,000
- >$100,000 < $150,000
- >$150,000 < $250,000
- >$250,000
- Other:

Production

15. For the following types of products, please indicate the estimated production from your tenure(s) for the 1st and 5th years of production. Shucked oysters (in gallons) for 1st year?

(Provide one response only.)

16. Shucked oysters (in gallons) for 5th year?

(Provide one response only.)

17. Singles or half-shell oysters (in dozens) for 1st year?

(Provide one response only.)

18. Singles or half-shell oysters (in dozens) for 5th year?

(Provide one response only.)

19. Clams (in pounds) for 1st year?

(Provide one response only.)

20. Clams (in pounds) for 5th year?

(Provide one response only.)

21. Other (Name the product(s) and include weight in pounds) for 1st year?

22. Other (Name the product) and include weight in pounds for 5th year?

23. Shucked oysters (in $) for 1st year?

(Provide one response only.)

24. Shucked oysters (in $) for 5th year?

(Provide one response only.)

25. Single or half-shell oysters (in $) for 1st year?

(Provide one response only.)

26. Single or half-shell oysters (in $) for 5th year?

(Provide one response only.)

27. Clams (in $) for 1st year?

(Provide one response only.)

28. Clams (in $) for 5th year?

(Provide one response only.)

29. Other (Name the product(s) and value in $) for 1st year?

30. Other (Name product(s) and value in $) for 5th year?

Employment

31. How many individuals do you plan to employ on your tenure(s) by year 3?

(Select only one.)

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

32. Recognizing that work schedules and patterns vary throughout the year, can you estimate the average number of HOURS PER WEEK that each individual will work on your tenure(s)?

Processing and Marketing

33. Which processor(s) do you plan to sell your product to AND what is the estimated percentage of product they will purchase?

Future Prospects

34. Over the next 3-5 years, do you plan on expanding your shellfish tenure holdings?

(Select only one.)

- Yes
- No

35. If yes, ideally how many hectares would you like to add to your operation?

(Select only one.)

- < 1 hectare
- 1 - 2 hectares
- 3 - 5 hectares
- > 5 hectares

36. Over the next 3-5 years, do you plan on diversifying your operation to include any of the following species of shellfish?

(Select all that apply.)

- No
- Pacific oysters
- European flat oysters
- Manila clams
- Japanese scallops
- Blue mussels
- Mediterranean mussels
- Geoduck
- Rock scallop
- Urchins
- Other - specify:

37. Over the next 3-5 years, do you anticipate changing the main growing techniques you use on your oyster tenure?

(Select seven.)

- No
- Beach grow-out
- FLUPSY's
- Tube culture - French Tubes
- String culture - Oyster Blue
- Tray culture - Plastic (1/2 shell)
- Tray culture - Wire mesh (1/2 shell)
- Other - specify

38. Over the next 3-5 years, how much new capital do you plan to invest in your business

(Select only one.)

- I don't plan on making any new investments.
- <$5,000
- > $5,000 < $25,000
- >$25,000 < $75,000
- >$75,000 < $150,000
- > $150,000 < $250,000
- > $250,000

□ Other:

39. Over the next 3-5 years, what are the two main areas you would you invest in?

(Select two.)
□ I don't plan on making any new investments.
□ Infrastructure & Technology
□ Labour
□ Marketing
□ Processing
□ Tenure
□ Training
□ Other - specify:

40. Over the next 3-5 years, do you expect to increase the number of people you employ in your operation?

(Select only one.)
□ Yes
□ No

41. If yes, how many would you expect to be employed full-time?

(Select only one.)
□ 0
□ 1-2
□ 3-4
□ 5-6
□ 7-8
□ 9-10
□ >10 - specify:

42. How many would you expect to be employed seasonally or part-time?

(Select only one.)
□ 0
□ 1-2
□ 3-4
□ 5-6
□ 7-8
□ 9-10
□ >10 - specify:

43. Would you like to capitalize on any new markets (listed below)?

(Select only one.)
□ Yes
□ No

44. If yes, please rank the top THREE future markets in order of priority for YOUR BUSINESS.

(Rank responses from 1 to 3.)
[ ] Local consumer
[ ] Local restaurants
[ ] Value-added
[ ] New processors
[ ] Food brokers
[ ] Retailers

[ ] Wholesalers
[ ] Export
[ ] Other - specify

45. To access these markets, what type(s) of assistance would you require? [Provide as many suggestions as you like].

Opportunities for Regional Collaboration

46. The WCVI Shellfish Task Force believes that a planned, coordinated and adequately supported approach to regional shellfish development will improve everyone's chances for success in the industry including established and new growers in Clayoquot and Barkley Sound. Do you agree with this statement?

(Select only one.)
Yes
No

47. If so, please rank the following themes 1 to 6 according to what you feel are the top priorities to be addressed on a REGIONAL BASIS.

(Rank responses from 1 to 6.)
[ ] Environmental Integrity and Water Quality
[ ] Infrastructure Development
[ ] Investment, Finance and Business Planning
[ ] Labour, Training & Extension
[ ] New Species Development
[ ] Policies and Regulation
[ ] Processing, Marketing and Quality Assurance
[ ] Production
[ ] Public Perception
[ ] Science & Research
[ ] Technology Development
[ ] Tenure Access & Security
[ ] Transportation

48. Do you have any ideas or recommendations that can enhance communication and collaboration among EXPERIENCED and NEW shellfish growers in Clayoquot and Barkley Sounds?

49. What do you consider will be the single most significant barrier to the development of YOUR business?

50. What concerns do you want the Task Force to be aware of that have not been addressed in this survey?

Appendix 4 West Coast Shellfish Development Committee Meeting, Tofino

Growers Meeting – Notes

April 23/03, Long Beach Golf Course

There was the whole discussion around the production figures, the predictions and the math not making sense. Some of the challenges came from comparing different time frames, the issue of the price for singles and ½ shells and whether all the figures represented wholesale price or retail.

There seemed to be agreement that the priorities and barriers noted in the study were accurate.

Comments included:

"Shellfish is not the most viable industry for job creation."

"Long term strategies are needed."

"….concerned about big players coming in and taking over the local industry."

"We need a vehicle." – this was in reference to needing to be organized and speak with one voice.

Question and Answer Session

After the presentation there was an extensive discussion about the priorities amongst the shellfish growers for further action. In general, the growers were in unanimous agreement with the survey findings for industry priorities and concerns, and felt it important to proceed in a collaborative manner. It was also agreed that the challenges of marketing, water quality and Federal/Provincial Policies are interlinked and require a coordinated approach for moving forward in the shellfish industry.

The Need for a Coordinated Approach
As the growers discussed priorities and concerns, it became evident that the top three priorities must be tackled simultaneously and collaboratively. As one participant stated:

"Government regulations linked to water quality issues are in turn, linked to market fluctuation. Whether or not the government shuts you down - effectively ties to market uncertainty in the future."

The topics of supply and demand, production quality and value added were introduced by the growers as relevant issues that they all had to work on together.

"I think there is hope but I think we really have to work on it and be creative. We have to look at developing new things - smoked, and vacuumed sealed oysters hanging next to the beef jerky in every grocery store."

"For access to the larger markets, we need large volumes without the uncertainty of government shut downs. There is also a problem with American suppliers undercutting Canadian suppliers."

As the discussion evolved into finding solutions, one grower spoke about the need for integrated management between regional, provincial and federal government departments. This led to the question of whether or not the growers are interested in being part of the collaborative effort initiated by the Task Force.

At this time, Rick Roberts was introduced as a representative from the Vancouver Island Economic Developers' Association (VIEDA) and invited to give a summary of how government was working to support the industry in a coordinated manner.

The Way Ahead: A Variety of Views
VIEDA has been researching viable economic development strategies for the last five years and has concluded that the shellfish industry is the most viable industry to support and invest in. Furthermore, they have been working on a strategic plan that involves attracting North America's top shellfish processors to Vancouver Island as a means to expand the shellfish market. VIEDA's plan is to attract investment that will expand the number of jobs in the industry by increasing the demand for production.

"If we can attract the right company they'll bring the market. We're hoping within 12-18 months that 2 main processors will be on the Island."

While many of the growers were pleased to hear that the regional government has been working towards investing in the shellfish industry, several questions were raised about bringing in more processors.

As one grower put it:

"If existing processors can't make it, it makes me concerned that you want to bring in the big players. Why not work with existing processors to expand their markets?"

Another grower had the suggestion that growers had to work together to create the demand:

"We need to create a bigger demand. We need Albertans to switch from eating beef to eating oysters".

A Vehicle for Moving Forward
Despite the mixed views on how to address the challenges of marketing and production, there was a unanimous sense among the growers that there needs to be

a vehicle through which industry can co-ordinate with regional, provincial and federal governments.

One area in which this seems most plausible is the issue of water quality and the need for a coordinated sampling and monitoring system. Furthermore, the issue of water quality and government shut-downs also relates to the need for growers to diversify the species they grow. The growers agreed that species diversification is another example of the need to work together.

As one participant pointed out, the next steps are to determine what the roles and responsibilities are vis-à-vis the growers and the task force:

"What are the roles and responsibilities of the growers within the realm of possibility of what the growers can actually do? And what can they do in relation to the task force and what does the task force do in relation to the government? We can't do it all."

Appendix 5 West Coast Shellfish Development Committee Meeting, Port Alberni

Growers Meeting – Notes

April 24/03, Cedar Wood Lodge, Port Alberni

The questions was raised over the use of the term 'business' when differentiating between hobby and serious grower. The term was clarified.

This meeting has a very similar conversation about production figures as the previous meeting did.

When the meeting got to barriers and priorities, some of the comments were:

"Growers do not take public opinion seriously and this is a real problem because the industry is being smeared along with fish farming. A very serious problem."

"Growers will react to a gap in the market, but how to organize to do it is the problem."

"The problem now is that you can't just be a grower. You need to be a marketer too."

"The industry seems to be at a critical point when there is a great need to get over the hump (meaning move the business to a larger scale) and there is no capital to do this."

"BC's production is a drop in the global bucket."

"Marketing is key, a BC brand, or organic labeling."

"Currently we don't have the market for what we are producing, how will we handle increased production that is expected soon."

"One problem is that processors have their own leases and so they take their product first and only yours if they need it."

"Why is it that local processors don't want to expand."

"We just about had USP at the starting gate with a processing plan when their parent company, Trident, said no way."

"New Zealand is where we are now and they built their organization though planning and cooperation."

"There is a gap between 1st Nations activities and the rest of the growers."

"Marketing and processing are the critical issues."

"Knee jerk government action has really hurt the industry."

"Water quality is an issue and we have a vested interest in maintaining good water quality. Our problem comes from being dragged into the fish farm debate."

"The local industry will only see serious expansion if new markets are found. Selling to the local restaurant is important but not enough to grow the industry."

"The local industry is volatile and tenures are changing hands."