Socio-economic and Cultural Overview and Assessment Report for the Pacific North Coast Integrated Management Area

Submitted to:

Fisheries and Oceans Canada
Ecosystem Management Branch
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Executive Summary

Introduction

A collaborative planning process is underway in British Columbia to establish an integrated oceans management regime for the Pacific North Coast Integrated Management Area (PNCIMA). The purpose of the PNCIMA planning process is to develop a plan for the study area that reflects an ecosystem-based approach to management of marine activities, fosters economic prosperity and sustainable development, and increases communication and coordination among governing authorities and stakeholders on matters of marine management and conservation. In order to realize these outcomes, planning will need to integrate environmental, social and economic considerations.

This Socio-economic and Cultural Overview and Assessment (SECOA) supports the planning process by providing a summary and synthesis of the best available information regarding socio-economic and cultural values and issues. This includes profiling the status, trends and outlook of coastal communities bordering the plan area, the role of the marine environment in shaping the region's cultural values, and the ocean's contribution to selected economic activities.

The SECOA was commissioned by Fisheries and Oceans Canada (DFO), Oceans Division, which collaborates with other federal agencies, the Province of British Columbia, First Nations, and stakeholders to develop the plan for PNCIMA.

The three main features of this SECOA follow from the federal legislation (Canada's *Oceans Act*) and policy documents[1] that provide the guiding framework for large ocean management area (LOMA) planning, like PNCIMA.

The first main feature is a consideration of the coastal communities bordering the marine area of the PNCIMA planning initiative. Recent trends in population, labour force, incomes, index of well-being, and linkages to the marine environment are identified. The information is presented for the total plan area, the individual regional districts in PNCIMA, and for individual settlements and municipalities. This feature informs the process of the tremendous diversity among communities and the opportunities and challenges they are facing. The second element is the consideration of cultural matters, specifically linkages between culture and the marine environment. The third main

[2] Canada's Oceans Strategy (2002), the Policy and Operational Framework for Integrated Management (2002), and the Oceans Action Plan (2005)

element is a consideration of economically important activities in PNCIMA that are reliant on or have key linkages to the marine environment. Eleven marine activities are profiled here[2].

The three features addressed by the SECOA are both diverse and complex. This poses a challenge for determining information to be collected and presented. The challenge is met by focussing on those matters pertinent to the planning process. More specifically, information was sought for any socio-economic or cultural value that could be changed by the integrated management plan implemented in PNCIMA. However, when this report was prepared, the plan was not formulated, although some broad directions were known. That is, the integrated management plan is intended to: [3]

- Reflect common understanding of PNCIMA's significant ecosystem components
- Outline an ecosystem based management framework
- Link to networks of marine protected areas
- Support coordination of related management processes
- Describe an implementation and adaptive management strategy

The integrated plan will not:

- establish a new regulatory framework[4]
- restrict existing legislative authorities
- fetter ministerial discretion

Consideration of what the plan would and would not be, and the linkage to the marine environment guided the collection of information reported here.

Information for this report is from existing studies completed for PNCIMA or other initiatives, key informant interviews, web searches, unpublished data compiled specifically for this report, and comments and suggestions from the PNCIMA Planning Office. An important source of feedback was gained from a stakeholder workshop held in Prince Rupert February 9th and 10th, 2010 (the "Workshop").[5] Participants were invited to comment and identify key issues and relationships, useful data sources, and trends. The collective contribution of the Workshop was an important information source for this SECOA.

[2] These activities were defined by the Planning Office, a coordinating and administrative body in place at the time that this report was drafted made up of representatives from federal agencies and First Nations
[3] From the presentation to the SECOA Workshop by DFO, February 9 and 10, 2010, Prince Rupert. The presentation may be viewed at http://www.pncima.org/pdfs/2010_SECOA_PNCIMA_PPT_Presentation.pdf
[4] However the planning process could identify areas requiring improved regulatory coordination.
[5] Workshop presentations and proceeding may be found at http://www.pncima.org/videosandpresentations.html.

Plan Area Description and Governance

PNCIMA covers an area of approximately 102,000 square kilometres in the Pacific Ocean. It includes the near shore and offshore areas of the Pacific coast. Its northern boundary is the international border at Dixon Entrance, south to Brooks Peninsula on the west coast of Vancouver Island and Campbell River on the east coast (see Map 1 on page 13).

The ocean area is unique for the diversity of ocean ecosystems it contains and the critical habitat it provides for many species. Humans have lived in this area for many years, sustained by its abundant marine and terrestrial resources which also shaped the inhabitants' social, economic and cultural values. Presently the PNCIMA is home to diverse First Nations, coastal settlements and major communities. The inshore waters of PNCIMA support aquaculture, fishing, marine tourism, and transportation. The offshore areas support numerous commercial fisheries, transportation and the potential for major energy developments.

PNCIMA may also be viewed as consisting of the sea surface, the water column and the seabed. The various activities and attributes noted above may occupy and/or utilize resources from these component parts of PNCIMA.

For this baseline, the focus was on federal and provincial laws and agencies with regulatory responsibility on matters related to the 11 marine activities profiled for this assessment. This is summarized in the following table. The table is not exhaustive in terms of agency involvement, but for purposes of marine planning, it reports the primary agencies whose activities may require some level of coordination to achieve planning objectives.

Table E1 Federal and Provincial Agencies with Ocean Management Responsibilities in PNCIMA

Marine Activity Value	Federal Agencies	Provincial Ministries
Sport fishing	• Department of Fisheries and Oceans	• Ministry of Forests, Lands and Natural Resource Ops. Jobs, Tourism and Innovation
Commercial fisheries	• Department of Fisheries and Oceans • Department of Foreign Affairs and Trade	• Ministry of Agriculture • BC Centre for Disease Control • Jobs, Tourism and Innovation (potentially)
Ocean recreation	• Department of Canadian Heritage • Parks Canada • Fisheries and Oceans Canada (CCG)	• Ministry of Environment • Ministry of Forests, Lands and Natural Resource Ops. • Ministry of Jobs, Tourism and Innovation
Marine transportation	• Canadian Environmental Assessment Agency • Environment Canada • Fisheries and Oceans Canada (Canadian Coast Guard) • Transport Canada	• Ministry of Environment • Ministry of Jobs, Tourism and Innovation • Ministry of Forests, Lands and Natural Resource Ops. • Ministry of Transportation and Infrastructure
Aquaculture	• Canadian Environmental Assessment Agency • Environment Canada • Department of Fisheries and Oceans	• Ministry of Forests, Lands and Natural Resource Ops. • Ministry of Agriculture • BC Centre for Disease Control • Jobs, Tourism and Innovation
Seafood processing		• Ministry of Agriculture • BC Centre for Disease Control
Marine Energy and mining	• Canadian Environmental Assessment Agency • Environment Canada • National Energy Board • Natural Resources Canada	• Ministry of Energy and Mines • Ministry of Forests, Lands and Natural Resource Ops. BC Environmental Assessment Office
Tenure on Aquatic lands	• Industry Canada	• Ministry of Forests, Lands and Natural Resource Operations
Ocean disposal	• Canadian Environmental Assessment Agency • Environment Canada	• Ministry of Environment
National defence and public safety	• Environment Canada • Fisheries and Oceans Canada (CCG) • Department of Foreign Affairs and Trade • Department of National Defence and the Canadian Forces • Transport Canada	• Ministry of Environment • Ministry of Public Safety and Solicitor General
Research, monitoring and enforcement activities	• Department of Fisheries and Oceans (CCG) • Environment Canada • Parks Canada • Natural Resources Canada • Transport Canada • Department of National Defence • RCMP • Agriculture and Agri-Food Canada	• Ministry of Environment • Ministry of Forests Land and Natural Resource Operations • Ministry of Agriculture • Ministry of Energy and Mines • Ministry of Jobs, Tourism and Innovation

Socio-Economic Profile

Integrated ocean management for PNCIMA is intended to benefit communities as well as marine ecosystems. Hence, there is a need to know about the communities, their current conditions, and expected future conditions. This knowledge base serves as a benchmark for identifying the future effects of the marine plan.

Reliable and comprehensive information about communities' social and economic characteristics is available from government statistical services, BC Stat and Statistics Canada. This is supplemented by interviews and reviewing earlier studies and community work completed in PNCIMA. Comparisons were made relative to changes over time, as well as reference to the rest of the province, to give some measure of how well the region is fairing in socio-economic terms.

In 2009 there were 118,170 persons living in the lands adjacent to the marine zone that is included in PNCIMA. This includes 14 incorporated communities, 17 unincorporated communities, and 32 First Nations communities. The body of the report presents an over-arching socio-economic profile for the whole of PNCIMA, and individually for the five regional districts included in the study area. Greater socio-economic detail at the regional district and community level is contained in the Appendix Report. The Appendix Report contains a summary discussion of the main communities, including incorporated, First Nation and unincorporated communities in PNCIMA.

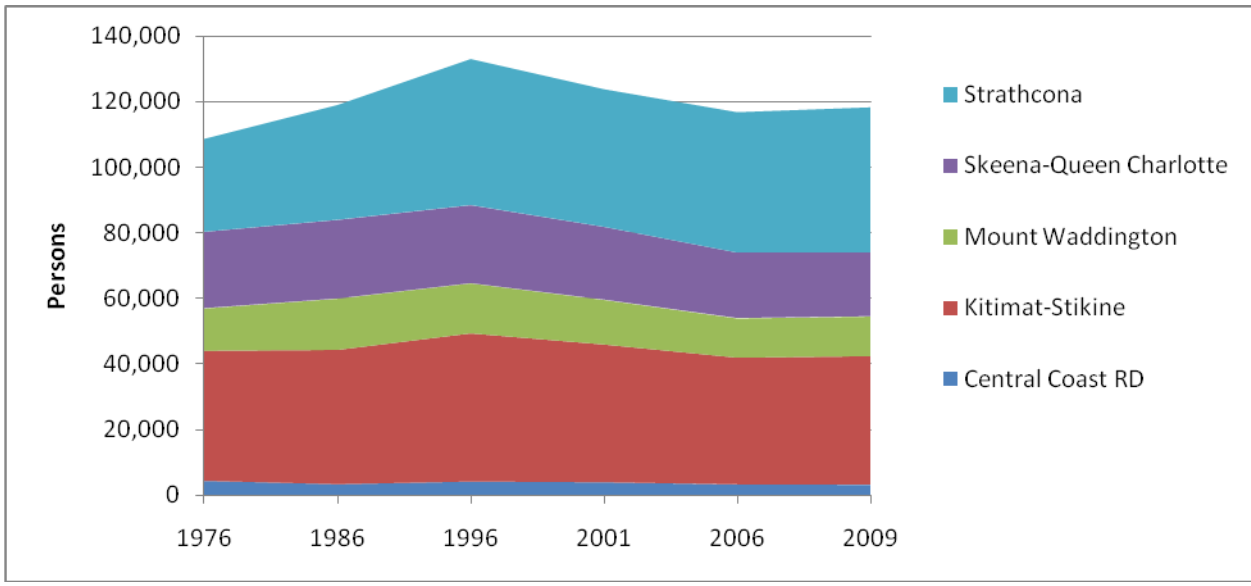
The primary indicators of socio-economic conditions presented here are:

- population trends,
- labour force and income, and
- index of socio-economic well being.

Population changes are mainly from natural growth (birth minus deaths) and migration. The former is relatively stable as it depends on factors that change slowly (e.g., age of population, gender distribution, fertility rate) while the latter fluctuates relatively rapidly (e.g. those in the workforce moving to improve economic opportunities). Rising population trends may be indicative of a youthful population and/or relatively buoyant economic conditions. A falling population trend may be indicative of an aging population and/or relatively poor economic prospects that compel persons to move t o seek better opportunities.

Over the period 1976 to 2009, PNCIMA's population increased to the mid-1990's but has declined steadily after that, as shown in the following figure.

Figure E1 Population Trends of Regional Districts in PNCIMA, 1976 to 2009



PNCIMA's total population in 2009 was about 9% above the comparable total in 1976, but 11 % below its total in 1996. In comparison, total provincial population in 2009 was 75 % larger than the 1976 population count and 15% above the 1996 total. The data indicates that PNCIMA population growth has substantially lagged that of the province over the period.

By 2006, the Strathcona Regional District had become the most populous and was the only regional district to record consistent positive population growth since 2001. The Kitimat-Stikine has the second largest population and Mount Waddington the fourth largest population, both have recently reversed a long period of population decline and have experienced a small increase since 2006. Skeena-Queen Charlotte Regional District and Central coast Regional District have seen their populations decline steadily since 1996 but declines appear to have slowed since 2006. In 2009, the four largest communities of Kitimat, Terrace, Prince Rupert, and Campbell River had a collective population of 65,075 or 55% of the PNCIMA total. Of these four largest communities only Campbell River had a larger population in 2009 than it did in 1996.

It would appear that net migration rather than natural increase is the dominant influence explaining the population trends. This is suggested by the positive population growth in the Strathcona Regional District which also has the oldest median age. The relatively younger populations in the central coast, Kitimat-Stikine and Skeena-Queen Charlotte regional districts had declining populations.

The size and composition of the labour force provides an indication of the relatively important economic industries. Broadly, industries may be categorized as either goods producing or service producing industries. Goods producing industries includes resource

harvesting (e.g. fishing, agriculture, aquaculture, logging, mining) and manufacturing (e.g. saw milling, sea food processing, boat building). Service industries include a broad range of public and private sector industries such as finance and real estate, retail and wholesale trade, accommodations, transportation, health and education. Generally, the service industries account for the larger share of the labour force. This is the case for PNCIMA, where the service producing industries account for 70% of the labour force in 2006. In comparison, about 78% of the total provincial labour force was associated with service industries in that year.

As compared to 1981, the trend has been increasing concentration of the labour force in service industries both in PNCIMA and in BC. However, in PNCIMA the number of persons in the labour force for all but the Strathcona Regional District has been declining. Coupled with declining population would suggest a net out-migration of persons in the labour force.

The relatively larger goods-producing industries as measured by the labour force numbers in PNCIMA in 2006 include the:

- Forest sector (including logging, forestry, wood processing and pulp and paper) with a labour force of 6,010;
- Construction sector with a labour force of 3,980;
- Fishing and sea food processing with a labour force of 2,790; and,
- Primary metal fabrication with a labour force of 1,710.

However, in the past year two pulp and paper processors (one in Kitimat and one in Campbell River) have closed permanently significantly impacting employment in the forest sector in PNCIMA. Also, primary metal fabrication employment is concentrated in the communities of Kitimat and Terrace and is primarily associated with one firm.

In the service producing sector the largest sectors by labour force in PNCIMA in 2006 include:

- Government services (including education, health care and public administration) with a labour force of 14,305;
- Retail and wholesale with a labour force of 7,710;
- Accommodation and food services with a labour force of 5,170; and,
- Transportation and warehousing with a labour force of 3,400 of which 850 is associated with water transportation and support activities to water transportation.

Overall, the labour force directly associated with marine activities in PNCIMA is difficult to determine as recreation and tourism activities, public administration activities directly related to the marine environment are not disclosed by the Census labour force numbers. In addition, many marine activities only occur on a seasonal basis so that individuals may report their main employment source as something other than marine related activities. That said, the activities that are identified in the Census data that are directly connected to

the marine environment - marine transportation, commercial fishing and sea food processing collectively had a labour force of 3,640 in 2006.

Median income for men and women is presented in the table below for each regional district in PNCIMA and for British Columbia. As illustrated, the median income for men in the Kitimat-Stikine Regional District, Mount Waddington Regional District, and Strathcona Regional District was higher than the median income for men at the provincial level. This was partly due to the concentration of male workers in high paying industrial jobs in these three regional districts. The median income for women in the PNCIMA region is lower than at the provincial level.

Table E2 Median Income for Male and Females in PNCIMA and BC, 2007

Jurisdiction	Male	Female
Kitimat-Stikine RD	$37,730	$18,415
Skeena-Queen Charlotte RD	$28,850	$18,280
Central Coast RD	$14,595	$11,115
Mount Waddington RD	$37,205	$19,170
Strathcona RD	$38,380	$21,810
BC	$36,350	$23,005

While median income provides a preliminary look at the reported earnings of individuals in the region, it is important to note that individual communities may have much higher or lower median incomes based on the activities they are involved in or the state of the local economy. For example, Kitimat with its larger primary metal processing labour force had a median male income of $64,225 in 2007 while nearby Hartley Bay had a median income for men of $9,635 in 2007. [6]

In recent years BC Stats has worked with social ministries to construct the index of community well being from available social and demographic data. The development of this index reflects the concern that measures of economic activity (e.g. gross domestic product, average income) may not be reflective of quality of life values or the sense of well being. The findings of research completed by BC Stats are reported here for locations in PNCIMA. An overall index of socio-economic well being is derived from considerations of economic hardship, crime frequency, health, education and circumstances related to children and youth. The index values are calculated for eight areas (local health areas) in PNCIMA. In general, the areas ranked less than the median value relative to other locations is BC. This would suggest a relatively higher level of socio-economic hardship for PNCIMA communities than is the case elsewhere in BC.

[6] Income includes earned income (wages and salary), government benefits and investment income, but does not include imputed income from informal sources e.g. income value of food from hunting and fishing.

While this may be viewed as an uncomplimentary finding, it also underscores the important opportunity integrated oceans management planning has to enhance community well being.

Cultural Profile

Culture relates to the distinct ways people classify and represent their experiences and act creatively. Our review of other LOMA planning documents found that discussions of culture are in the context of traditional activities, including economic and subsistence matters. While it is recognized that all communities hold cultural values linked to the marine environment, the perspectives of First Nations' communities are unique and consequently receive specific attention in this profile.

Many cultural issues relate to changes in the traditional relationship that historically existed between the marine environment and people's use of it as a sustainable source of wealth, sustenance and cultural norms. More specifically, issues raised by stakeholders at a February 2010 workshop related to:

- Concern about the decline of some fish stocks (particularly salmon which is considered a cultural life-line) and associated changes in commercial fisheries, and the effect this is having on lifestyle on the coast (this refers to all communities, but particularly First Nations);
- Interest in maintaining and reinforcing First Nations' traditional uses, local ecological knowledge and cultural values;
- Impacts of some commercial fisheries on the abundance and location of important cultural fish species such as eulachon;
- Interest in opportunities for the current generation to be gainfully employed in the commercial fishery, actively participate in the food fishery, or learn the associated traditional knowledge, uses and values; and
- The loss of personal and community self-sufficiency because of declines or changes in fisheries.

This profile reviewed the body of information, if available, to characterize the baseline matters underpinning several of these cultural issues.

Tangible evidence of cultural values is manifest in the many historic sites, midden sites, cultural depressions, rock art, burials, habitations, fish traps and subsistence sites found along the coastline in PNCIMA. More than 3,000 of these archaeological sites are recorded in provincial and federal inventories, but access to and use of archaeology site data is limited for confidentiality reasons. Other work by the BC Archaeology Branch suggests a high potential for the existence of cultural sites throughout the coastal area. Work completed for the Coast Information Team as part of the provincial Central Coast

Land and Resource Management Plan process found the highest concentration of heritage features were located along major waterways and fishing areas. The work noted that 87% of cultural features (including First Nations' features) were outside of the existing protected areas and therefore open to potentially non-compatible uses (Lee 2004). For marine planning in PNCIMA to effectively benefit marine heritage resources, some form of information sharing protocol should be established to allow this information to inform the process.

First Nations Culture in the Study Area

First Nations people have existed in PNCIMA for thousands of years over which time their economic activity, knowledge, traditions and culture have evolved with the ocean and its resources.

Traditional knowledge (TK), indigenous knowledge (IK), and traditional ecological knowledge (TEK) generally refer to the long-standing traditions and practices of indigenous peoples and local communities. While studies of traditional knowledge and uses have been undertaken by many First Nations communities in the study area, the information is not publicly available. This limited our consideration to anecdotal descriptions of the concepts behind traditional knowledge without purporting to represent the diversity of meanings and uses among coastal First Nations.

For coastal First Nations, the ocean shapes all cultural traditions and was and continues to be a provider of resources. Obtaining and using fish was a complex process involving the fish itself, the people, the act of fishing, the processing and preserving, and the means of distribution. Each of these steps requires TEK and the transfer of skills and knowledge down through the generations. TK is reflected in the use of traditional technologies such as tidal rock barriers and sapling-box traps for catching chum have endured even though modern gear is available. Different species of salmon were used and processed differently throughout the year and were supplemented with seasonal harvests of fowl and game. Ingenious methods are often used, employing knowledge of natural features, animal behaviour and ocean conditions for safe and efficient harvests.

In 1992, the Supreme Court affirmed the right of First Nations people to fish for food, social and ceremonial (FSC) purposes. The FSC harvest, which has priority over all other fisheries, is managed in consultation with First Nation communities. While ensuring First Nations share of the harvest, it does not insulate them from decline in fish harvests. Between 2005 and 2010, the provincial harvests of groundfish, pelagic and other finfish and shellfish declined, including key species such as salmon and herring (Fisheries and Oceans Canada 2012).

Non –First Nations Communities Culture

Non-First Nations settlement in PNCIMA is less than two hundred years old. The growth and development of many of the earliest settlements was based on access to seafood for commercial and subsistence purposes, including salmon, crabs, halibut and other ocean resources. Again, fish boats quickly became an essential means to participate in fish harvesting and other resource activities such as forestry and beachcombing. The ability to move or switch to other resource activities through the year allowed coastal villages to remain relatively stable.

Hunting and plant gathering, as well as fishing, were factors supporting coastal communities. Knowledge of where, how and when to access the food resource was particularly important as was the ability to process and preserve it thus enabling individuals and families to prosper year round. Local boat building was widespread, offsetting the need for capital and the importation of manufactured goods. This local reliance forged relationships and networks among family groups and villages and allowed the communication and transfer of traditional and technical knowledge. Kinship networks and the development of formal and informal organizations contributed to the distribution of credit, commodities, labour, recreation and cultural activities. Many fishing villages frowned on poaching and over fishing.

Today there are far fewer residents involved in the fishery than in the past. With significant changes to economies, lifestyles, and patterns of settlement over the past 100 years, in some communities the kinship and village networks that used to characterize community life either no longer exist or are greatly diminished. The ability to participate in the activities described above has diminished accordingly, although many coastal residents continue to fish and hunt and consider it a key feature of the rural lifestyle.

Data Gaps

Information on a number of cultural indicators exists, but some are sensitive and not publicly available. This hampers a fuller understanding of the past and current role certain features and elements of the marine environment may contribute to cultural values. In the context of marine planning, such information would support the formulation of use objectives and strategy consistent with maintaining the attribute. The accuracy of the FSC catch statistics could be improved and cultural indicators tracked by the Census are generally incomplete or inaccessible.

In spite of gaps in information, the key role of the fishery in the culture of both the First Nations and non-First Nations communities is self-evident.

Marine Activity Profiles

Eleven "activities" identified by the PNCIMA Planning Office as being pertinent to the marine planning process were profiled in this report. The nature of the marine activities ranged from existing or potential commercial developments (e.g., aquaculture, energy development) to public service activities (e.g., national defence, research, aquatic tenures).

Each profile contains a definition of the activity. The activity is followed by presentation of issues, opportunities or concerns that are related in some manner to aspects of the marine environment that may potentially be affected by the marine planning process. The issues, opportunities and concerns were drawn from comments made by Workshop participants, interviews, and other sources. A discussion of baseline conditions is then presented, generally summarizing the nature of the activity in PNCIMA, its location (with reference to the PNCIMA Atlas prepared by the Planning Office), and the economic contribution where the data are available. The baseline may identify certain events, policies or other factors that have influenced the growth and distribution of the activity in recent years in PNCIMA. This provides a framework for considering future growth potential. Important data gaps identified in completing the profiles were also noted.

The following table summarizes the findings for each of the eleven activities.

Table E3 Summary of Marine Activity Profiles

Sport fisheries; Recreational angling and collecting shellfish by residents and visitors	
Current Status and Recent Trends	Sport fishing effort shifting from south to central and north coast such that effort, catch, and expenditures increased markedly between 2000 and 2005.
Outlook	Growth in visitor anglers is anticipated if not constrained by supply. Sector expected to remain one of PNCIMA's lead contributors to the economy.
Key Data Gaps	DFO and the Sport Fishing Advisory Board have a variety of programs for monitoring the recreational catch and are continually evaluating methods for improving data collection and reporting. However, apart from DFO's five-year National Survey, a region-wide picture of the sport fishery, including angler characteristics, is incomplete. The sector size and structure, except for the fishing lodge sector, is not well documented.
Commercial fisheries; Harvest of wild finfish and invertebrates for commercial purposes	
Current Status and Recent Trends	PNCIMA accounts for about half of BC's total wild harvest by value. There is considerable variation by year, from a high of $222 million in 2004 to a low of $133 million (1999). Over the period 1996-2006, the trend in the value of salmon harvest was declining; the trend in the value of ground fish was increasing; and there was a stable trend for invertebrates.
Outlook	BC generally and PNCIMA specifically is well placed to serve growing markets on the Pacific rim with established brand recognition and marketing linkages. The volume of harvest is primarily dependent on the sustainable supply of respective fishery resource.
Key Data Gaps	The sector's economic contribution to PNCIMA communities is not well documented. The fleets' response to changing fisheries policies, and implications to communities is not well understood.
Ocean recreation (includes ocean tourism); Cruise ship, recreation boating, kayaking, whale watching and diving done by residents and visitors.	
Current Status and Recent Trends	Small boat activities concentrated in protected coastal waters. Relatively few cruise ships stop in PNCIMA ports (i.e. Prince Rupert). No reliable estimates of visitation trends. Room revenue, which is positively correlated with visitations increased annually in PNCIMA from 2001/08) despite economic slowdown.
Outlook	PNCIMA has capacity to expand ocean recreation attractions and services. Trends in global travel market forecast strong growth. Aging travelling population will be inclined to less physically demanding activities. Exchange rates, weather and unforeseen events may impact the sector positively or negatively.
Key Data Gaps	Lack reliable data on visitor volumes, participation rates, ad spending. Information on carrying capacity and user conflicts not well documented.

Marine transportation: All vessels > 20 metres, beginning/ending voyage in PNCIMA or in transit. Small vessel movement not documented.	
Current Status and Recent Trends	PNCIMA accounts for about 5% of BC's total ship movements. This is concentrated in southern section and during summer season. Volume has declined in recent years. Coast wide, vessel movements have declined 14% between 2005/09. PNCIMA has 5 routes served by BC Ferries carrying about 7% of their system's passengers (2009). Prince Rupert, Kitimat are major ports and Stewart smaller bulk port.
Outlook	Proposed and planned expansion of the Prince Rupert container port and other improvements could increase vessel calls from 415 (2010) to 1,160 (2020). Kitimat port expansions, announced and proposed, would increase vessel calls. Growing population and improved economic conditions will lead to an increase in vessels transiting in PNCIMA and calling into PNCIMA's coastal communities and ports.
Key Data Gaps	Documentation of the volume and distribution of small vessels is lacking. New Automatic Information System, to be operational in 2012, will provide better information on large vessel movement, enhance safety and improve environmental protection. Lack of reliable data for small vessel traffic.
Sector Aquaculture: culture of finfish, shellfish of plants in aquatic environment or manmade container.	
Current Status and Recent Trends	Finfish aquaculture production grown rapidly since mid-1980's. BC 4th largest global producer of farmed salmon. Total tenured area is 2,452 ha. or 56% of BC total. Most in PNCIMA are located between Campbell River and Port Hardy. Court imposed moratorium until new federal regulatory regime in place. BC shellfish industry about size of New Brunswick's. PNCIMA accounts for about 8% of BC's tenured area, or about 250 ha. Marine plant culture is at the pilot stage.
Outlook	Many sites in PNCIMA have biophysical capability to support aquaculture operations. This potential is constrained by conflicts with other marine users, and for finfish, concern about potential interactions wild stocks. Export markets for seafood are forecast to grow. North and central coast communities are advancing shellfish operations that may be operational within a few years. Technological advances may establish the commercial viability of closed containment finfish operations. There is potential to culture other species of fish and shellfish.
Key Data Gaps	Understanding of the industry's contribution to PNCIMA's economy is not well documented. There is apparently conflicting scientific evidence regarding finfish operations' effect on wild stocks. Future direction of public policy and regulatory requirements is under development.

Seafood processing: transformation of wild and cultured seafood into food products	
Current Status and Recent Trends	Recent trend is declining volume of seafood processed but increasing total wholesale value. BC industry sold $1.2 billion in 2008, 56 % from capture fisheries. Aquaculture share increased from 29% to 44% of total wholesale value from 1998 - 2008. Groundfish and invertebrates account for 2/3 capture fisheries produce. Trend is smaller processors serving a number of niche markets with range of value added products. In 2009 there were 97 processing establishments in BC, with 21 located in PNCIMA (Prince Rupert, Haida Gwaii, northern Vancouver Island and Campbell River area).
Outlook	Processors on BC coast well positioned to serve expanding seafood market on Pacific Rim. Industry specialization has reduced barriers to entry allowing smaller, specialized processors. Continued diversification of captured species processed with emphasis on increasing value added. Future trends in aquaculture production will directly impact the processing industry.
Key Data Gaps	The information reported is from secondary sources and key informant interviews. An industry survey of PNCIMA processors would clarify reliance on PNCIMA harvest, economic activity and their collective outlook and concerns.
Marine Energy and mining: Existing and potential energy and mineral resources.	
Current Status and Recent Trends	Public policy promoting "green" energy favours harnessing potential energy in PNCIMA's wind, tidal and wave resources. One offshore and 6 onshore wind projects at various stages of study. One pilot tidal plant near Campbell River and number of potential sites throughout PNCIMA. Wave energy is the least advanced, with the greatest potential offshore. Hecate Strait subject to preliminary oil/gas exploration that identified favourable geology. Activity on existing tenures not approved since 1972. Federal and provincial inquiries reviewed science and public opinion. Mineral development has historically occurred on land. There are numerous past producing sites in PNCIMA and 2 mines presently operating onshore. A provincial Order-in-Council prohibits the issuance of mineral tenure below the high tide line except in special circumstances.
Outlook	Wind energy projects will likely be the first energy generating site in PNCIMA of significance. Those sited offshore, and/or involving submarine cables, would have direct implications to marine environment. Tidal energy projects for off-grid users and potential contribution to BC grid have potential over a longer time frame. Commercial development of wave energy is more distant. Oil and gas exploration and development would have substantial socio-economic and environmental implications. However, if and when the activity proceeds and the conditions it would be accepted are not known. There are no near term prospects for submarine mining as viable potential deposits have not been identified.
Key Data Gaps	PNCIMA's energy and mineral development at this time is undeveloped. Development would proceed on a project by project basis, which is not well defined at this time. The more substantive projects will undergo scrutiny by provincial and federal environmental assessment processes which should examine and identify major project effects.

Tenure on Aquatic lands: The granting of tenure on BC Crown land below high water line issued under the *Land Act.* Tenure often ancillary to primary activity such as aquaculture, log storage, moorage, etc.	
Current Status and Recent Trends	Tenures are granted following a review processes commensurate with the tenure implications. At time of this survey, there were 26 investigative permits over 270,000 hectares. Two permits related to power line investigation account for most of the area. License of occupation were issued to 747 holders over 20,800 ha. Includes many log storage sites and aquaculture operations. Lease is the strongest tenure form, with 314 covering 2,560 ha. Most of these were to allow log storage.
Outlook	On-going development/settlement on coast will likely increase number of tenures issued under the *Land Act* over aquatic lands. The Coast Reconciliation Protocol signed by BC and coastal First Nations in 2009 provides for shared decision making on resource and land use decisions.
Key Data Gaps	Tenures to Crown aquatic land issued under federal or provincial Acts, other than the Land Act, were not addressed.
Ocean disposal: Deliberate disposal of approved substances at approved marine sites.	
Current Status and Recent Trends	Disposal sites and substances subject to regulation by Environment Canada. Fourteen active sites on BC coast, four are in the PNCIMA; 1 near Campbell River, 2 in Johnstone Strait, 1 near Prince Rupert. Two applications for disposal at Prince Rupert site (Browns Passage). Dredge material from Fraser River is approved for disposal at PNCIMA's southern sites.
Outlook	Southern disposal sites in PNCIMA will continue to be used for disposal of approved material from the on-going maintenance dredging of the navigable rivers to maintain shipping lanes. The Browns Passage site has been used infrequently for a long time. The proposed port expansions at Prince Rupert and Kitimat will likely generate material suitable for ocean disposal. It is not known if the Browns Passage site would be appropriate or suitable or whether a new site might be proposed.
Key Data Gaps	Information presented for approved disposal only. Data related to illegal disposal not available.
National defense and public safety: Activities countering threats to security and sovereignty, and the resources used to address public safety.	
Current Status and Recent Trends	No active military bases in PNCIMA, 3 closed bases. Canadian Fleet Pacific conducts sovereignty patrols (air and sea) that includes the PNCIMA. Patrols provide information to enforcement agencies. With respect to search and rescue, there are 15 Coast Guard Stations in PNCIMA. In 2008, there were 2,237 incidents reported coast wide, with about 20% in the PNCIMA. About 70% of the incidents in PNCIMA were north of Namu.
Outlook	Global terrorist attacks have changed the emphasis of national defense from expeditionary focus to domestic marine security. An increase in marine activity due to economic growth (port expansions) and increases in commercial and private boating activity may trigger need for increased security and rescue resources.
Key Data Gaps	There is no readily available information about the employment and income impacts in PNCIMA. Locations, timing, and frequency of naval activities not known. Future decisions will determine the most effective response to evolving defense and public safety needs in the PNCIMA which are not known.

Research, monitoring and enforcement: Efforts to learn more about marine functions for better management, supported by monitoring and enforcement. Compliance to policy and regulations.

Current Status and Recent Trends	Federal government agencies collectively lead efforts in research, monitoring and enforcement. Includes 8 separate agencies and 5 research institutes carrying out a broad range of programs, some of which are active in PNCIMA. Provincial government conducts marine monitoring and enforcement related to its jurisdiction (tenure to aquatic lands, foreshore plans, energy, etc.).BC has 1,264 coastal monitoring sites in PNCIMA. First Nations play a significant role in research and monitoring. In some cases First Nations Fisheries Officers monitor harvest for food, social and ceremonial purposes. Industry (commercial fishing, energy) provide research and monitoring related to respective interests. Environmental organizations operate research and monitoring programs at a number of sites in PNCIMA. Research/monitoring of seabirds, shorebirds, salmon, marine mammals, and marine habitat. BC research institutions conduct work, often in partnership with government, that may take place or pertain to PNCIMA.
Outlook	Research, monitoring and enforcement efforts are generally increasing in PNCIMA. Trend is more government led monitoring and enforcement conducted in partnership with local communities and industry. New economic development initiatives will bring funding related to Environmental Assessment requirements for projects and ongoing monitoring. Enforcement is seen as not keeping pace with changes in use patterns or activities. Current monitoring has shown that pollution from highly regulated industries (e.g. mines, pulp mills) decreasing while some pollutants are showing increasing trends from unknown sources.
Key Data Gaps	The income, employment and expenditures related to the research, monitoring and enforcement activity in PNCIMA was not available. Emphasis of research on the physical environment, relatively less scientific research on relationship to social, cultural and economic systems.

For several of the marine activities that involve commercial operations, data is available estimating the sector's contribution to the BC economy (termed gross domestic product), employment and income. Where not directly available, we used baseline sector information to scale the provincial value to an estimate of the PNCIMA value. The values are reported in the following table. PNCIMA's contribution to provincial GDP for five activities was in the order of $310 million in 2005. This is equivalent to $374 million at 2009 dollars.

Table E4 Economic Contribution of Selected Marine Activities (2005)

Activity	GDP[1] (BC)	PNCIMA		
		GDP[1]	Employment	Labour Income[1]
Sport fishing	$ 134	$54	1,680 full time positions	$35.6
Commercial fisheries	$103	$57	1,890 persons[2]	n.a.
Ocean recreation	$ 1,300	$ 27-31	504-585 full time positions	$16.8-$19.5
Marine transportation	$1,510	$75	680 persons[2]	n.a.
Aquaculture	$ 274	$ 124	755 persons[2]	$24.6
Seafood processing	$160	n.a.	1305 persons[2]	$ 44
Total	$3,481	$310		

Note:

1. millions 1997 dollars
2. number of persons in the labour force, which includes employed and unemployed

Potential economic contribution is not shown in the table. That is why the Energy and Mining Activity is not reported, as current activity is at a very low level.

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Acknowledgements

The Study Team acknowledges the assistance and support provided by numerous persons. This particularly includes Messrs. Neil Davis and Steve Diggon, and the other members of the SECOA Advisory Committee; members of the PNCIMA Planning Office who provided valuable comments on an earlier draft; those attending and participating in the SECOA Workshop held in Prince Rupert, and the many persons listed in the reference section that provided data and perspectives.

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Abbreviations

AFS……First Nations Fisheries Strategy
BCSGA..... BC Shellfish Growers Association
BCEAO ..... BC Environmental Assessment Office
BCF .....British Columbia Ferry Corporation
BCH..... BC Hydro and Power Authority
BCO ……...…..Burrard Clean Operations
CANFLT-PAC ..... Canadian Fleet Pacific
CEAA ..... Canadian Environmental Assessment Agency
CEPA ..... Canadian Environmental Protection Act, 1999
CCG..... Canadian Coast Guard
CCRD .....Central Coast Regional District
CFN .....Coastal First Nations
CSRD.....Comox-Strathcona Regional District
COSEWIC……Committee on the Status of Endangered Wildlife in Canada
CWS …….……..Canadian Wildlife Service
DFO..... Fisheries and Oceans Canada
EBM ..... ecosystem based management
ENGOs ……..……Environmental Non-government Organizations
FSC……...food, social and ceremonial purposes
GDP..... Gross Domestic Product
ILMB.....Integrated Land Management Bureau, BC Ministry of Forests and Range
IPP .....independent power producer
JRC.....Joint Rescue Co-ordination Centre
KSRD .....Kitimat-Stikine Regional District
LOC.....licence of occupation
LOMA .....Large Ocean Management Areas
LRDW ..... Provincial Land and Resource Data Warehouse (LRDW)
BC MOE.....BC Ministry of Environment
MAL .....BC Ministry of Agriculture and Lands
MARPAC .....Maritime Forces Pacific
MEMPR.....BC Ministry of Energy, Mines and Petroleum Resources
MPA .....Marine protected areas
MSBTED..... Ministry of Small Business, Technology and Economic Development
MWRD ..... Mount Waddington Regional District
NEB..... National Energy Board
NCSFNSS.....North Coast-Skeena First Nations Stewardship Society
PNCIMA .....Pacific North Coast Integrated Management Area
PSAEC……Pacific Scientific Advice Review Committee
ROW..... statutory right-of-way
GDP..... Gross domestic product
SAR ..... search and rescue
SARA ……*Species at Risk Act*
SECOA..... Socio-Economic and Cultural Overview Assessment
SOK..... spawn on kelp fishery
SQCRD.....Skeena-Queen Charlotte Regional District.

SRD .....Strathcona Regional District
TEU .....twenty foot equivalent unit (container)
VTS .....Vessel Traffic Services
Workshop .....PNCIMA workshop held in Prince Rupert, February 9th and 10th, 2010

1. Introduction

Background on PNCIMA

The *Oceans Act* (1997) establishes the legislative mandate to achieve sustainable development in all three of Canada's oceans. Canada's Oceans Strategy (2002) is the corresponding policy statement. The policy sets out a vision and strategy for integrated oceans management. In reaching this goal, a collaborative planning process is encouraged; one that involves regulators, user groups and other interest groups working to identify common objectives and strategies that result in a spatial plan and working relationships. The management plan is intended to promote a diversified, balanced economic development of oceans and coastal waters while preserving biodiversity and maintaining natural productivity (DFO 2001).

Canada's Oceans Action Plan also identified five priority Large Ocean Management Areas (LOMAs) for integrated ocean management planning led by DFO. The LOMAs are the Beaufort Sea Integrated Planning Initiative; the Gulf of St. Lawrence Integrated Management Area; the Placentia Bay and Grand Banks Integrated Management Area; the Eastern Scotian Shelf Integrated Management Initiative, and the Pacific North Coast Integrated Management Area (PNCIMA). This report addresses matters pertinent to the PNCIMA planning process.

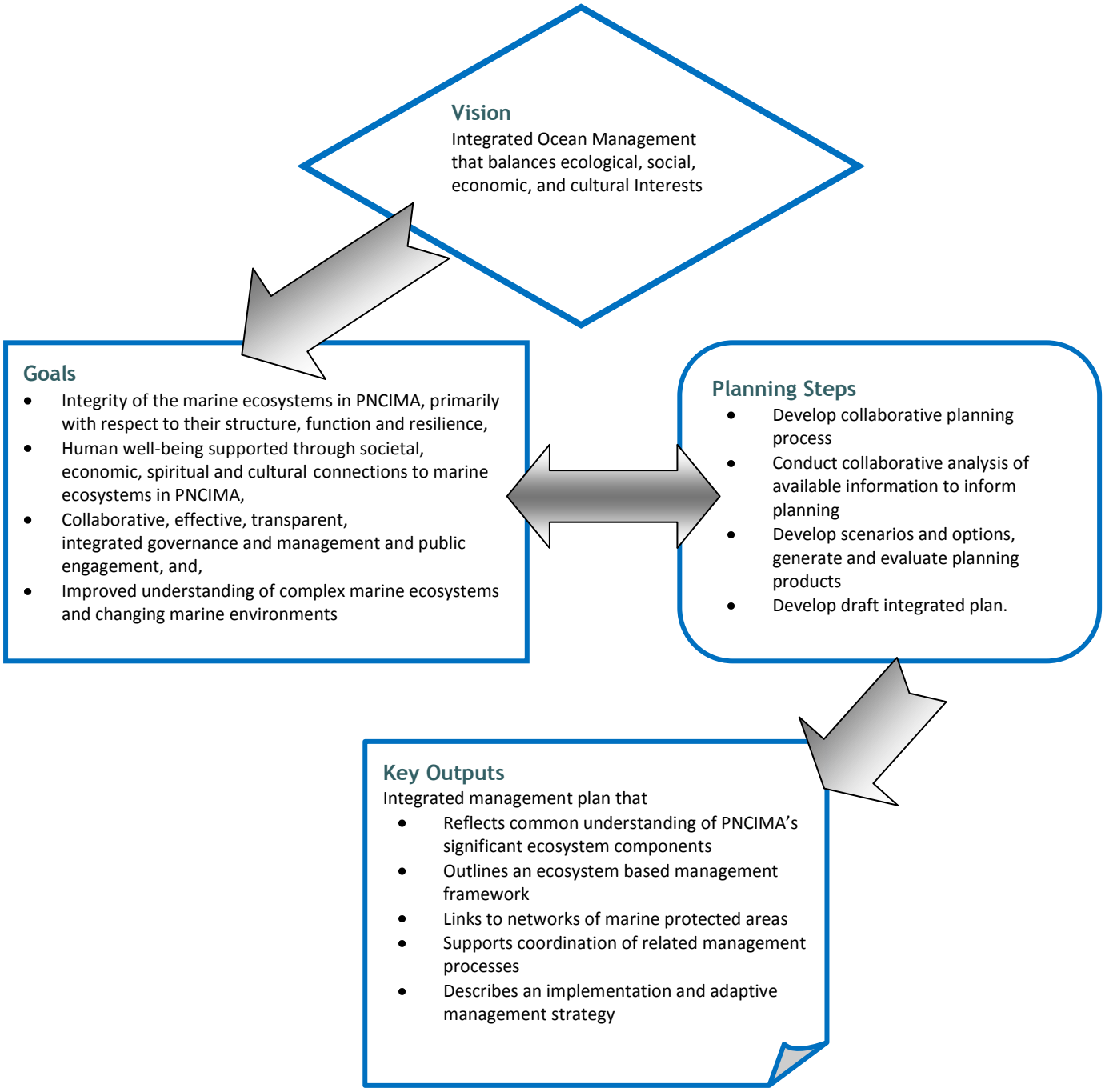
The objective of the PNCIMA planning process is to "ensure a healthy, safe and prosperous ocean area by engaging all interested parties in the collaborative development and implementation of an integrated management plan for PNCIMA". [7] This new approach will;

- Foster the sustainable development of the area and its resources
- Promote the understanding of ocean processes, resources and ecosystems in the area
- Promote application of the precautionary approach to the conservation, management and exploitation of the area's resources in order to protect these resources and preserve the marine environment
- Reflect that conservation, based on an ecosystem approach, is of fundamental importance to maintaining biological diversity and productivity in the area
- Recognize that the oceans and their resources offer significant opportunities for economic diversification and the generation of wealth for the benefit of all Canadians, and in particular for coastal communities in the area

[7] PNCIMA Planning Office

- Promote the integrated management of oceans and marine resources in the area
- Reaffirm participants' role as world leaders in oceans and marine resource management

Figure 1 Overview of the Vision, Goals and Outputs[8]



[8] Adapted from PNCIMA Planning Office (2009)

An overview of the main elements of the planning process is illustrated Figure 1. A core value is the need to balance ecological, social, economic and cultural interests. This value is reflected in the goals of the planning process and the major steps that will lead up to formulating the PNCIMA plan.

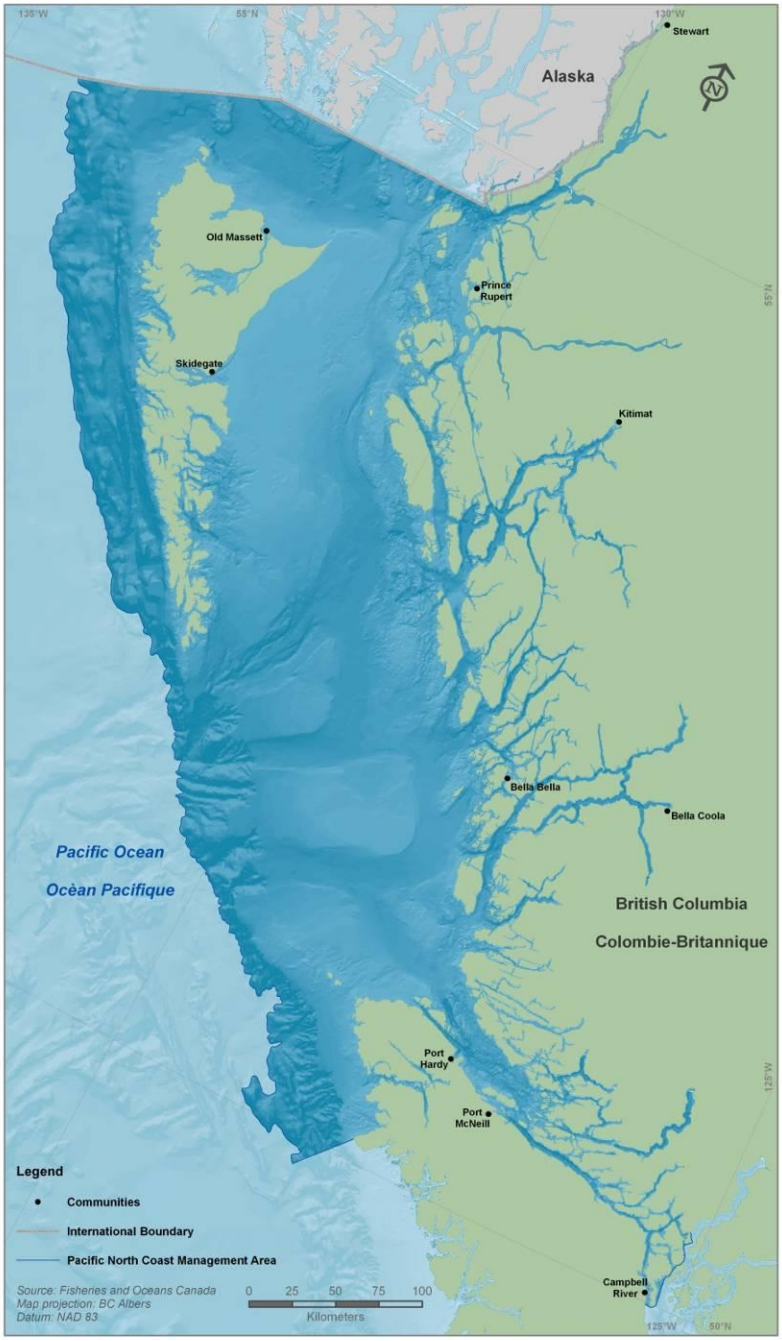
Study Area description

PNCIMA covers an area of approximately 102,000 square kilometres in the Pacific Ocean. It includes the near shore and offshore areas of the Pacific coast. Its northern boundary is the international border at Dixon Entrance, south to Brooks Peninsula on the west coast of Vancouver Island and Campbell River on the east costs (Map 1). The ocean area is unique for the diversity of ocean ecosystems it contains and the critical habitat it provides for many species.

People have lived in this area for thousands of years, sustained by its abundant marine and terrestrial resources which also shaped the inhabitants' social, economic and cultural values. The arrival of European traders and new inhabitants brought change, but the activities continued to be founded on the area's rich natural endowment. Fur trade, fishing, mining, forestry in PNCIMA have played a major role in shaping the character, and the economy, of British Columbia.

Presently PNCIMA is home to a diversity of First Nations, coastal settlements and major communities. The inshore waters of PNCIMA support aquaculture, fishing, marine tourism, and transportation. The offshore areas support numerous commercial fisheries, transportation and the potential for major energy developments. The region's ports are conduits of trade, linking Canada's businesses to markets in North America, Asia, and Europe.

Map 1 Pacific North Coast Integrated Management Area



Purpose of a Socio Economic Cultural Overview and Assessment

Integrated management requires a comprehensive and coordinated approach to planning and decision making based on a balanced consideration of society's interests, be it environmental, social, cultural, economic and institutional objectives (DFO 2003). Over the past several years research in PNCIMA has addressed various components of the Ecosystem Overview and Assessment Report. Given the numerous social, cultural and economic uses of BC's marine environment, it is also necessary to conduct a Socio-economic and Cultural Overview and Assessment (SECOA). This will support development of the appropriate socio-economic and cultural management objectives (Winterbottom 2008).

An objective of SECOA is to move social, cultural and economic issues from peripheral matters to drivers and integral parts of the planning process. Ecosystem objectives and human needs are to be seen as interconnected parts to a complete integrated ocean management plan (Sikaneta 2007).

Throughout the planning process, information about human values and uses will be brought to the process at the scale and detail necessary to address the matters at hand. In this respect, the SECOA is a process within the integrated planning process. This report provides a framework for the consideration of human needs and reports on the current status of these needs and values. It is a snapshot of a dynamic process. It gives those involved in the planning process a better understanding of the important values and activities occurring in PNCIMA that are linked to the marine environment. This report also presents a view of future trends based on historic information and continuation of the status quo. This may identify emerging issues that can be addressed by the PNCIMA initiative.

Hence, this report is an initial statement about the human needs in PNCIMA as it relates to the marine environment and the planning process. It is expected that future inquiry will expand on this body of information to meet the evolving needs of the planning process. The planning needs may include:

- Developing socio-economic and cultural objectives for PNCIMA;
- Assessing trade-offs between uses; and
- Identifying areas or attributes important for conservation or human use.

Overview of SECOA Report and General Limitations

The three main features of this SECOA follow from the base documents establishing the LOMA process and scoping studies completed for PNCIMA. The first main feature is a description of the social, economic and demographic characteristics of PNCIMA. There is tremendous diversity among the communities in terms of scale, characteristics of the population, the important sources of income, and connections to marine activities and marine based industries. The second main element is culture, specifically the linkage between culture and the marine environment. The third main element is profiles of the marine activities that are economically important to PNCIMA (and in a number of instances, of provincial and national prominence) and have important linkages to the marine environment. The linkage may be consumptive, such as fishing and aquaculture, or non-consumptive, such as ocean recreation or marine transportation. The activities may also interact with one another, creating conflicts or complementary relationships that may be addressed by the PNCIMA process. The eleven marine activities profiled here were identified by earlier studies.

This SECOA report was commissioned by Fisheries and Oceans Canada (DFO), Oceans Division. The Planning Office provided guidance and information in the preparation of the three main study elements, and commented on early drafts prepared in the course of completing the report, with DFO commenting on final drafts of the report.

This report contains five parts. Part 1 is this introduction section, an overview of the study methodology, and a description of the management and jurisdictional arrangements relevant to PNCIMA. Part 2 presents the demographic and socio-economic information at different scales, anticipating that planning process will require an overview of the plan area to address certain issues and community specific information. Detailed information about the demographic and socio-economic information for the 5 regional districts and their respective communities are in Appendix A (separate cover). Part 3 considers the cultural attributes and features that may be addressed, or potentially affected by the planning process. Part 4 is the profile of eleven marine activities. For each marine activity, the current conditions are described along with an outlook for future trends in PNCIMA, or the key factors that may influence future trends. Part 5 examines the potential interactions among marine activities and proposes an approach for identifying potentially substantive issues that could be addressed in the planning process.

The information contained and the perspectives provided in this SECOA are mainly at the plan area (i.e. PNCIMA) scale. Site specific and case specific matters would likely require additional detail regarding social, economic and cultural implications than is presented here. Besides the scale of the information, some data was not available for

inclusion in this report. The data gaps and limitation are noted in the context of each profile. Also, as noted above, the profiles are a snapshot of a dynamic process and considerable effort was put to collecting the most up-to-date information representative of conditions at a point in time. The outlook or trends presented for each profile addresses this dynamic, but predicting future states is inherently uncertain. It may be advantageous to update the SECOA once the draft plan is prepared, bringing the profiles up to date and identifying the plan's socio-economic and cultural implications.

2. Overview of Study Methodology

Scoping Study Approach

The guidance document for conducting a SECOA noted that there is no "one size fits all" report template (Winterbottom 2008). Specifically, the PNCIMA region is highly diverse in terms of its environmental conditions, its communities, important sources of income, social values and cultural interests. This diversity means there is an abundance of information and considerations that, if not organized, could paralyze the planning process by its sheer volume. The challenge is to "scope" the information such that the focus is fixed on those matters pertinent to the planning process.

It is relatively early in the planning process, so the components and initiatives that will be contained in PNCIMA's marine plan are not known in detail, but some broad directions are identified. [9]

That is, the integrated management plan is expected to result in

- Greater certainty and stability in oceans management;
- Better integration and coordination of new and existing processes;
- Ocean values and resources that are managed in a sustainable manner;
- Contributions to a national system of marine protected areas.

The integrated plan will not

- Establish a new regulatory framework[10];
- Restrict existing legislative authorities; or
- Fetter ministerial discretion.

The following "filter" was used to identify the type of information to be examined in this SECOA;

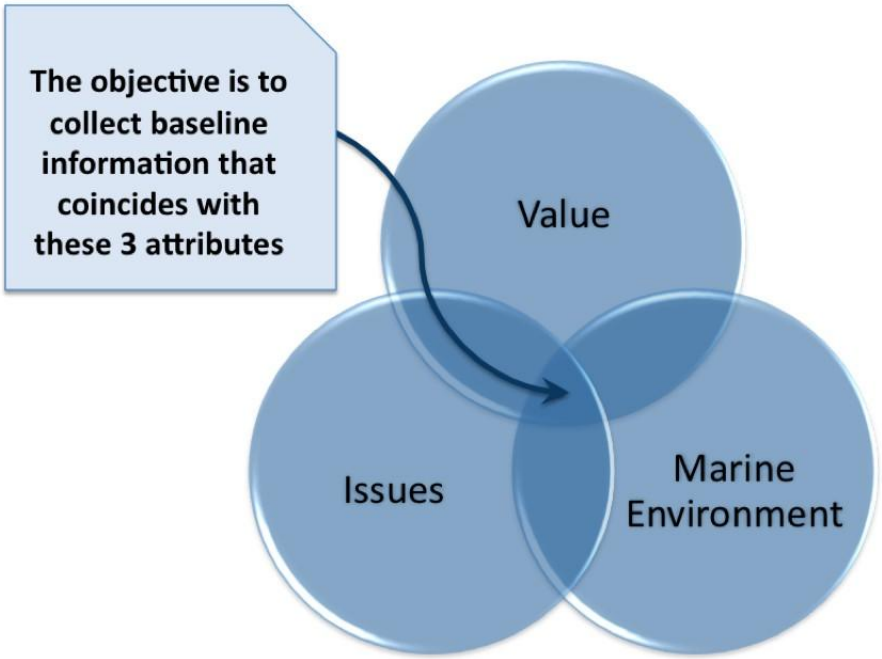
> *"any socio-economic value that is expected to be relevant to the integrated management plan implemented in PNCIMA, baseline information should be collected for the SECOA and trends identified*"

This approach is illustrated in Figure 2. The "value" in the figure may be related to community, culture, or one of the 11 marine activities. Some aspects of the value overlap with aspects of the Marine Environment. For instance, certain fish populations may hold significant cultural importance to certain communities, while the marine environment's energy potential may not (i.e. no overlap). Also the overlap of marine environment and value represents those matters that can be impacted by a marine plan. Issues are

[9] From the presentation to the SECOA Workshop by DFO, February 9 and 10, 2010, Prince Rupert. The presentation may be viewed at http://www.pncima.org/pdfs/2010_SECOA_PNCIMA_PPT_Presentation.pdf
[10] However the planning process could identify areas requiring improved legislation and/or regulatory coordination.

concerns and opportunities identified by planning process participants or background research . The common intersection of the three concepts, the overlap of value, marine environment, and issues, is the body of information addressed in this SECOA.

Figure 2 Nature of Information sought for the Base Line



Indicators and Information Sources

The matters that fall within this intersection are described in each profile in terms of the relationship to marine environment, key factors influencing the status of the value, the current status of the value and outlook, or future conditions given the continuation of existing policies (i.e. as if PNCIMA did not exist). This provides a base line and context for the planning process.

"Indicators" are used to portray the status of the respective value and how the status is changing through time. Indicators are selected based on the appropriateness and the availability of information. Community indicators include Census information for example, which is mainly quantitative, available for a series of years using consistent survey methods. Indicators for marine activities include anecdotal information drawn from interviews and may be quantitative or qualitative in nature.

Information on indicators and understanding of the values was derived from existing studies completed for PNCIMA or other initiatives, key informant interviews, web

search, unpublished data compiled specifically for this report, and comments and suggestions from the PNCIMA Planning Office.

An important source of feedback was gained from a stakeholder workshop held in Prince Rupert Feb 9th and 10th, 2010 (the "Workshop"). [11] The broad features of the SECOA and several draft profiles were presented to the Workshop. Participants were invited to comment and identify key issues and relationships, useful data sources, and trends. The collective contribution of the Workshop was an important information source for this SECOA.

It is the case that a number of issues and other views expressed at the Workshop were deemed to be outside of the scope of analysis as described above. Regardless, the issues section of each profile contains a record of issues even though some were not carried forward in the baseline assessment of the value.

[11] Workshop presentations and proceeding may be found at http://www.pncima.org/videosandpresentations.html.

3. Summary of Federal and Provincial Responsibilities for Marine Activities in PNCIMA

For the eleven marine activities profiled in this SECOA, Table 1summarizes the federal laws and agencies with regulatory responsibilities and Table 2 summarizes the corresponding information for British Columbia. The tables are intended to capture the legislation and regulatory arrangements that are directly relevant to ocean planning and the marine activities in PNCIMA. Hence the list is not exhaustive since the marine activities are subject to other federal, provincial and local statutes, but these were considered not directly pertinent to the marine planning process. The marine activities are listed in the right hand column of the tables.

The tables reflect the respective federal and provincial responsibilities for regulating aquaculture before the recent court decision because the respective government's adjustments to the ruling are under development at the time of writing.

The tables indicate some of the marine activities subject to regulation by one or several agencies or management regimes. Most of these matters will be addressed further in the discussion of the individual marine activity.

New and emerging ocean uses, such as the development of the ocean renewable energy potential, will put new demands on the legal and regulatory frameworks, which will continue to evolve in response to contemporary needs.

Table 1 Federal Agencies with direct roles in Ocean Management in PNCIMA

Entity	Primary Acts	Role / Responsibility	Related Human Activities
Canadian Environmental Assessment Agency	*Canadian Environmental Assessment Act*	• Reports to Minister of Environment. • Ensures appropriate level of EA assessment applied to federal decisions regarding policies, plans and projects. • Ensure environmental considerations are considered alongside social and economic considerations.	Marine Transportation (port development), Energy and Mining projects, Ocean Disposal, Aquaculture
Canadian Heritage	*Cultural Property Export and Import Act*	• Prevents uncontrolled loss by Canada of cultural material of outstanding significance and national importance. • Includes items recovered from heritage wrecks in Canadian waters.	Marine Recreation
Environment Canada	*Migratory Birds Convention, Canadian Wildlife Act, Species at Risk Act, Canadian Environmental Protection Act,* parts of the *Fisheries Act.* International conventions including *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (1972), and *Convention for the Prevention of Pollution from Ships.*	• Preserve and enhance the quality of natural environment • Conserve Canada's renewable resources • Coordinate environmental policies with other federal agencies (e.g. DFO).	Marine Transportation, Energy and Mining, Aquaculture, Ocean Disposal, National Defence
Fisheries and Oceans Canada	*Fisheries Act, Oceans Act, Species at Risk Act*	• Develop and implement policies and programs that ensure safe, healthy and productive waters and aquatic ecosystems for the benefit of present and future generations. • Supports other federal agencies, such as DND, RCMP, Environment Canada, Transport Canada in strengthening marine initiatives.	Commercial Fishing, Sport fishing, Aquaculture
Canadian Coast Guard		• Implementing agency for the following initiatives: Aids to Navigation, Marine Communications and Traffic Services, Search and Rescue, Environmental Response.	Marine Transportation, Marine Recreation, Marine Safety

Entity	Primary Acts	Role / Responsibility	Related Human Activities
Small Craft Harbours		• Operates and maintains a national system of harbours to provide commercial fishers and other harbour users safe and accessible facilities	Commercial Fishing, Recreation Fishing. Marine Recreation, Marine Transportation
Fisheries and Aquatic Management Sector	*Fisheries Act*	• Oversees development and implementation of fisheries management plans for each fishery. • Addresses First Nations fishing matters.	Commercial Fishing, Recreation Fishing, aquaculture
Oceans, Habitat and Species at Risk	*Oceans Act*	• Development of an integrated strategy to address the challenges of oceans conservation and protection and the increased risks and potential conflicts resulting from new ocean uses.	Potentially all activities
Department of Foreign Affairs and Trade	United Nations Convention on Law of the Sea	• Lead federal department for sovereignty issues. • *Law of the Sea Convention* addresses many aspects of ocean affairs within 200 mile of shore. • Manages unresolved boundary dispute with the US at Dixon Entrance.	Commercial Fishing, National Defence and Public Safety
Industry Canada	*Telecommunications Act*	• Issues licenses for the construction and operation of international submarine cables in Canadian jurisdiction	Marine Tenures
Department of National Defence and the Canadian Forces		• Defends Canada and Canadian interests while contributing to international peace and security. • Lead agency for National search and rescue.	National Defence and Public Safety
National Energy Board	*Oil and Gas Operations Act, Canadian Environmental Assessment Act, Canada Petroleum Resources Act, Canada Transportation Act*	• Regulates federal offshore pipelines and exports of oil, natural gas and electricity. • EA assessment under its jurisdiction.	Oil and gas development
Natural Resources Canada	*Canada Petroleum Resources Act*	• Issues oil and gas exploration permits	Oil and gas development
Parks Canada Agency	*Canada National Marine Conservation Areas Act*	• Protects the natural and cultural heritage of Canada's special places and ensures that they remain healthy and whole. • The proposed Gwaii Haanas National Marine Conservation Area Reserve will be established under the Act.	Ocean Recreation may affect other Marine Activities whose uses are regulated inside a marine protected area.

Entity	Primary Acts	Role / Responsibility	Related Human Activities
Transport Canada	*Canadian Shipping Act, Navigable Waters Protection Act, Pilotage Act*.	• Encourages transportation efficiency by fostering a competitive and viable Canadian marine industry. • Initiatives addressing marine safety and marine security. • Operates and divests public ports. • Certifies spill cleanup companies and sets response criteria.	Marine Transportation (including ports), Public Safety

Source: Fisheries and Oceans Canada (2009a)

Table 2 British Columbia Agencies with direct roles in Ocean Management in PNCIMA

BC Provincial Agencies (Ministries)	Acts and Regulations	Role/ Responsibility[1]	Related human activities
BC Ministry of Aboriginal Relations and Reconciliation	*Various*	• Aboriginal policy and coordination • Negotiation and implementation of treaty and non-treaty agreements • First Nation consultation and accommodation policy • Crown/First Nations relationships • Partnerships and Community Renewal • First Citizens' Fund	Potential to affect all values
BC Ministry of Agriculture (Food Protection Branch, Courtenay/ BC Centre for Disease Control)	*BC Fisheries Act and regs; BC Fish Inspection Act and regs*	• Agriculture, aquaculture, food industry development • Animal health and crop/plant protection • Food safety and quality • Commercial fisheries and fish processing • Marine fisheries and seafood industry development • Crop insurance • Grazing and range stewardship policy	Aquaculture, Commercial Fishing, Seafood Processing
BC Ministry of Energy and Mines • Electricity Branch • Alternative Energy and Policy Branch • Renewable Energy Development Branch • Mining and Minerals Division • BC Oil and Gas Commission	*Mines Act; Clean Energy Act; Utilities Commission Act; Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act; Mineral Tenure Act; Oil and Gas Activities Act; Petroleum and Natural Gas Act*	• Electricity and alternative energy policy • Oil and gas policy • Offshore oil and gas policy • Energy efficiency • Renewable energy development • Innovative Clean Energy Fund • Mines and minerals policy • Permitting and inspections of major mining projects • Geological Survey Service	Marine Energy and Mining, Tenure to Aquatic Lands, Energy and Mining, potential to affect other marine resource activities that may be considered in conflict with Energy and Mining activities
Ministry of Environment, BC Environmental Assessment Office	*Environmental Assessment Act;* Reviewable Projects Regulation; Concurrent Approval Regulations;	• Parks, wilderness and protected areas • Air, land and water quality standards • Pollution prevention and waste management	Potential to affect all values that trigger an Environmental Assessment

BC Provincial Agencies (Ministries)	Acts and Regulations	Role/ Responsibility[1]	Related human activities
	Prescribed Time Regulations; Public Consultation Policy Regulations; Transition Regulations	• Conservation Framework and Species-at-Risk policy • Species and ecosystem protection policy • Oceans protection and sustainability • Water protection and water sustainability policy • Water and air monitoring and reporting • Conservation and resource management enforcement • Climate Action Secretariat • Environmental Assessment Office • State of Environment reporting • Environmental monitoring • Flood Management • Environmental Emergency Response	as per the Reviewable Projects Regulation (typical projects include large scale marine energy projects, transportation and infrastructure projects, industrial activities)
BC Ministry of Environment (Environmental Protection)	*Environmental Management Act;* Waste Disposal Regulation; Minister's Code of Practice; Spill Cost Recovery Regulation; Emergency program Management Regulation; Spill Reporting Regulation		Aquaculture, Ocean Recreation, Marine Transportation (marinas), Energy and Mining, Ocean Disposal
BC Ministry of Environment (Climate Action Secretariat)	*Carbon Tax Act; Greenhouse Gas Reduction Acts and amendments (5 Acts in total)*		Potential to affect all values
BC Ministry of Environment • Ecosystems Branch • Fish and Wildlife Branch • Compliance Division	*Various*		Ocean Recreation, Sport Fishing, Public Safety, Research, Monitoring and Enforcement
BC Ministry of Forests, Lands and Natural Resource Operations (FrontCounter BC/ Crown Lands and Resources Division)	*Land Act*	• Forest stewardship policy • Timber supply, inventory and tree improvement • Pest and disease management policy • Forest investment • BC Timber Sales • Tenures and pricing • Resource roads and bridges policy • Crown land administration policy • Crown land allocation and authorizations	Potential to affect all values

BC Provincial Agencies (Ministries)	Acts and Regulations	Role/ Responsibility[1]	Related human activities
		• Forests and range authorizations • Roads/bridges/engineering • Clean Energy production • Mineral and coal titles • Mines and minerals permitting and inspections except for major mining projects • Tenures for Aquaculture • Water use planning and authorizations • Operational aspects of Aboriginal consultation and coordination • Tenures for Resorts and alpine ski developments • Licensing and permitting for angling, hunting and trapping • GeoBC and information management • Front Counter BC • Provincial hatchery and stocking program • Watershed restoration • Fish, wildlife and habitat management • Drought management • Dam and dyke safety and regulation • Flood plain management • Pests, disease, invasive plants and species • Public backcountry and commercial recreation • Recreation sites and trails • Archaeology and Heritage Conservation policy and permitting • Land and marine use planning • Resource management compliance • Crown land restoration • Forest investment operations • Wildfire management	
BC Ministry of Jobs, Tourism and Innovation (Rural BC Secretariat)	*Tourism Act*, various	• Tourism strategy • Aboriginal tourism	Potential to affect all values, specifically ocean recreation

BC Provincial Agencies (Ministries)	Acts and Regulations	Role/ Responsibility[1]	Related human activities
		• Recreational fish and wildlife promotion • B.C. brand designations • International and internal trade policy • Export market development • Trade, Investment, and Labour Mobility Agreement • Research, innovation and technology • Year of Science • Small Business Roundtable • Canada-BC Business Service Centre • Labour market & Immigration policy, • Provincial Nominee Program • WorkBC • BladeRunners • Industry training & Community adjustment • Community Development Trust • Community Business Loans Program • Regional economic and rural development • Economic development policy • Mountain pine beetle • Columbia Basin Trust • Rural BC Secretariat • Asia Pacific Trade and Investment • International Marketing Secretariat • Trade initiatives • Pacific Coast Collaborative • Multiculturalism	
BC Ministry of Transportation and Infrastructure	*Various*	• Transportation planning and policy • Highway construction and maintenance • Commercial vehicle safety and inspections • Port and airport development • Infrastructure grants & capital project management	Marine transportation (ports), potential to affect values that have an export component (aquaculture, commercial fisheries

Table Notes:
Current as of September 26, 2011. Accessed at - http://www.gov.bc.ca/premier/responsibilities/index.html

4. Socio-economic Profile

Community Definition

This chapter presents socio-economic profiles for PNCIMA, and the 5 regional districts located adjacent to the waters of the plan area. The community profiles are organized by the Regional District in which they are located. The profiles rely on readily available statistical data such as Statistics Canada's Census data and BC Stats data and, where possible, consistent data sets are used to describe communities located within a given Regional District.

Socio-economic profiles for key settlements (including incorporated municipalities, unincorporated communities, and First Nation communities) are contained in the Appendix Report.[12] The community information includes a description of the demographic, economic, and social characteristics of the resident population, and identifying linkages to the marine resource.

Regional Issues

Several regional issues related to the communities and human settlements are related to environmental, community stability, socio-economic well-being matters. Several specific issues are identified below.

Environmental

- Human settlement's impact on adjacent marine ecosystems can be diverse, but the principal categories of concern tend to be pollution, especially from sewage; in some places, land reclamation; and on wetlands for housing and commercial usages.
- For most of the communities in PNCIMA, sewage is handled with on-site systems such as septic tanks. These can create localized problems when not properly installed or serviced, resulting in seepage and contamination to receiving waters. Other impacts such as dredging for marine facilities can also impact the marine ecosystem.

Community Stability

In PNCIMA, the issue of declining populations and loss of a local tax base associated with the decline in the region's resource sectors has created has created new challenges for communities. Related issues raised at the Workshop were:

[12] Because of the large number of communities reported at the community level profile there is a large volume of information. This information is moved to The Socio-Economic Appendix Report, where it can be references without disturbing the balance of this main report..

- Many communities in PNCIMA have infrastructure deficits that will require considerable investment in the future. Infrastructure deficit makes it hard to put in place the infrastructure necessary to attract new industry. So while many communities have experienced a decline in their contribution from the marine environment associated with commercial fishing, they are further challenged in positioning their communities in new economies.[13],[14]
- With the closure of several industrial operations in recent years, communities' industrial tax base has eroded. Where this has led to out-migration of the associated work force, housing prices have fallen because of the surplus of homes on the market. In some cases the homes may be purchased by seasonal residents. The part-time residents spend less locally, resulting in a further impact on the local service sector.

Socio-Economic Well-Being

Socio-economic well-being issues reported at the Workshop included:

- The access to ocean resources is important to the region. Specifically, ocean resources are an important food source that residents have historically relied upon, and are contributing to social well being via the voluntary exchange of wild fish and seafood products among local residents.
- The quality of life, which is not well represented by income and employment, needs to be considered in future marine management decisions.
- In the past a large portion of the marine resources harvested in the PNCIMA were processed in the region, but that is no longer the case. For example, at one time seafood processing occurred in many smaller communities, but today much of the processing takes place in the Lower Mainland.
- Changing conditions in the commercial fishery has led to an increase in part-time employment for many. This has resulted in persons leaving the industry to find more substantive employment. To the extent young persons are not entering the industry and choosing non-marine related occupations, the ocean is becoming less important in terms of coastal communities economic livelihoods. It is important to not confuse economic attachments with general attachment to the ocean. Coastal communities are still very much tied to the ocean but they may not derive much money out of it anymore.

PNCIMA Overview

While planning will focus on the marine environment, PNCIMA also includes the five Regional Districts and the associated coastal communities that influence, and are

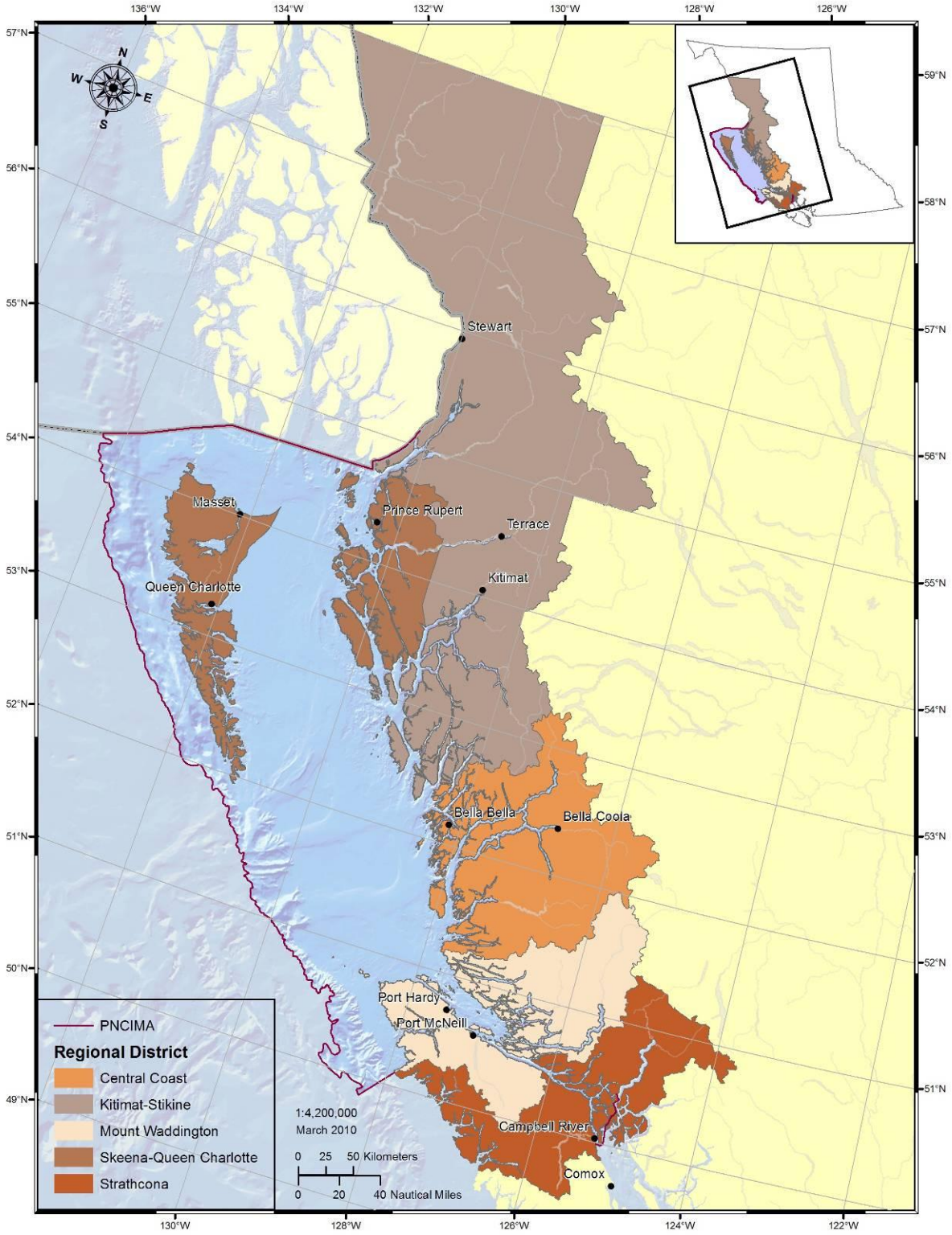
[13] An example includes coastal communities accessing the Canada-BC infrastructure program and being unable to raise the 1/3 funding required by the municipality or regional district. With many communities and areas now needing infrastructure upgrades, coupled with declining local tax revenue, it was indicated communities are falling behind.
[14] BC Stats. April 2007. British Columbia Fisheries and Aquaculture Sector. In 1984 commercial fishery and fish processing employment stood at 8,200 in BC; however, by 2005 this had declined to 5,700 by 2005.

influenced by, the marine environment. The five Regional Districts are shown on Map 2 and include:

- **Kitimat-Stikine Regional District (KSRD)** - includes the entire Regional District except for the communities in Kitimat-Stikine Electoral Area B (Hazelton area), Kitimat-Stikine Electoral Area A (Stewart area), and Kitimat-Stikine Electoral Area D (Telegraph Creek area).
- **Skeena-Queen Charlotte Regional District (SQCRD)** –the entire Regional District.
- **Central Coast Regional District (CCRD)** – the community profile section includes the entire Regional District.
- **Mount Waddington Regional District (MWRD)** – the entire Regional District.
- **Strathcona Regional District (SRD) –** this Regional District was formed in 2008 with the division of the former Comox-Strathcona Regional District (CSRD). Where possible, data is presented corresponding to the mainland and east coast portions of the Strathcona regional district and does not include Comox-Strathcona Electoral Area G (Gold River, Tahsis, and Zeballos area). For some information, data is only available at the Comox-Strathcona Regional District level, and is reported at this level.

The remainder of this chapter presents the socio-economic and demographic information for PNCIMA region as a whole. This provides an overview of the plan area's aggregate characteristics and trends. The corresponding information at the Regional District and community levels is found in Appendix A.

Map 2 Regional Districts in PNCIMA, 2010



Population

Table 3 highlights the population for the five Regional Districts in PNCIMA. Over the past 33 years (1975 to 2009), the population has declined in all the regional districts in PNCIMA except the Strathcona Regional District. Collectively, the total PNCIMA population grew about 9% over the time period, while the total provincial population increased by almost 75%. However, the growth has been driven by the Strathcona Regional District alone which is up 56% over the period.

For the populations of the Kitimat-Stikine and Mount Waddington Regional Districts there was an increase between 1976 and 1996 but since then the population in these two regional districts declined markedly. Both Regional Districts have less population in 2009 than they did in 1976. The Kitimat-Stikine region is down 1% and Mount Waddington is down 6.3%. However, between 2006 and 2009 both Regional Districts have seen a small population gains.

For the Skeena-Queen Charlotte and Central Coast Regional Districts there have been sharp population declines over the period from 1976 to 2009. For the Central Coast Regional District, the population fell rapidly between 1976 and 1986 with the closure of the pulp mill at Ocean Falls and the outflow of its workforce and dependents. The population then grew from 1986 until 1996 when it once again began a decline that has continued to 2009. The Central Coast Regional District has experienced the largest population decline in PNCIMA over the 33 year period, with a net outflow of 27% of its population. Skeena Queen Charlotte has also sustained consider population lose and is down almost 17% over the period. Skeena-Queen Charlotte Regional District has seen a steady decline in its population since 1986.

However, on the positive side, the Strathcona Regional District experienced strong growth over the 1976 to 1996 period; although, between 1996 and 2001 the District did see a net outflow of residents. In 2009, the Strathcona Regional District returned to its 1996 population level. Overall, the Strathcona Regional District is the only Regional District to show positive population growth over the 33 year period.

Table 4 presents the median age for each regional district in PNCIMA.[15] Overall, the population in four of the five regional districts in PNCIMA are younger as compared to the provincial population. Only the Strathcona Regional District (based on Campbell River median age)[16], which had a median age of 42.2 years, was higher than generally observed at the provincial level with a median age of 40.8 years.

[15] Median age is that age where half the population is older and half is younger.
[16] Strathcona Regional District is newly formed and was not in place when the age characteristic data was derived during the 2006 Census. As a result, Campbell River, the largest community in the Strathcona Regional District has been used to approximate the median age in the Regional District.

Table 3 Population and Change by Regional District and PNCIMA, 1976 to 2009

	1976	1986	1996	2001	2006	2009	% Change (1976 to 2009)
Central Coast RD	4,300	3,290	4,080	3,870	3,220	3,120	-27.4%
Kitimat-Stikine	39,850	41,120	45,370	42,180	38,805	39,380	-1.1%
Mount Waddington	12,855	15,570	15,195	13,570	11,960	12,040	-6.3%
Skeena-Queen Charlotte	23,315	23,995	23,815	22,215	19,980	19,440	-16.6%
Strathcona [1]	28,250	34,900	44,405	41,840	42,730	44,190	+56.4%
PNCIMA Total	108,570	118,875	132,865	123,675	116,695	118,170	+8.8%
BC	2,545,000	3,020,400	3,874,320	4,076,265	4,243,580	4,455,205	+75.1%

Source: BC Stats (2009)

Note: Comox-Strathcona was divided in 2008 into the Comox Regional District and Strathcona Regional District, only the Strathcona Regional District is in PNCIMA.

Table 4 Median Age for Regional Districts in PNCIMA

	Median Age
Central Coast RD	37.5 years
Kitimat-Stikine	38.2 years
Mount Waddington	40.0 years
Skeena-Queen Charlotte	38.4 years
Strathcona (based on Campbell River)	42.2 years
PNCIMA Total	n/a
BC	40.8 years

Source: Statistics Canada (2006)

Table 5 reports the land area and population density for each of the regional district. While PNCIMA's regional districts account for a relatively small share of the province's population, the region accounts for about 19% of the province's land base, resulting in population densities that are well below the provincial averages.

Table 5 PNCIMA Land Area and Population Density by Regional District, 2009

Land Unit	Land Area (square kilometres)	% of Land Area of BC	Population Density (Person/square km)
Central Coast RD	24,556.35	2.7%	0.1
Kitimat-Stikine	91,917.88	9.9%	0.4
Mount Waddington	20,288.19	2.2%	0.6
Skeena-Queen Charlotte	19,871.85	2.1%	1.0
Strathcona	19,000.48	2.0%	2.3
PNCIMA	175,634.75	18.9%	0.7
BC	924,815.43	100.0%	4.8

Source: Statistics Canada (2006) and BC Stats (2009)

Labour Force

Labour force includes those persons that are working, or actively seeking work. The persons have an industrial affiliation, which is reported here as either the "goods-producing" or the "service-producing" sectors. Table 6 summarizes the labour force trends in the goods-producing and service-producing sectors for the five regional districts, PNCIMA, and British Columbia in 1981 and 2006.

The goods-producing industries include Agriculture, Forestry, Fishing and Hunting, Mining and Oil and Gas Extraction, Utilities, Construction, and Manufacturing. The 15 industries in the service-producing sector typically account for the largest share of the labour force. Industries include: Wholesale Trade, Retail Trade, Transportation and Warehousing, Information and Cultural Industries, Finance and Insurance, Real Estate and Rental and Leasing, Professional, Scientific and Technical Services, Management of Companies and Enterprises, Administrative and Support, Educational Services; Health Care and Social Assistance, Arts, Entertainment and Recreation, Accommodation and Food Services, Other Services, and Public Administration.

Over the past three decades there has been a fundamental shift in the size of the labour force with the goods-producing sector growing relatively slower than the services-producing sector in both Canada, British Columbia, and for total PNCIMA labour force. In general, the goods-producing industries tend to be more sensitive to economic upturns and downturns than the service-producing sector. The total PNCIMA labour force has experienced a substantial reduction in its good-producing labour force, falling from 42% in 1981 to 27 % in 2006.

Table 6 PNCIMA Experienced Labour Force by Regional District, 1981 and 2006

	1981				2006				(Change 1981 to 2006)			
	Goods	Services	Unclass[1]	Total	Goods	Services	Unclass[1]	Total	Goods	Services	Unclass	Total
Central Coast RD (#)	4,950	745	190	1,430	320	1,070	45	1,435	-175	+325	-145	+5
(% share)	(35%)	(52%)	(13%)		(22%)	(75%)	(3%)					
Kitimat-Stikine (#)	9,380	10,300	700	20,380	5,595	13,010	740	19,345	-3,785	+2,710	+40	-1,035
(% share)	(46%)	(51%)	(3%)		(29%)	(67%)	(4%)					
Mount Waddington (#)	3,720	3,560	315	7,595	2,410	4,070	130	10,665	-1,310	+510	-180	-985
(% share)	(49%)	(47%)	(4%)		(36%)	(62%)	(2%)					
Skeena-Queen Charlotte (#)	5,365	6,820	345	12,530	2,690	7,655	320	10,665	-2,675	+835	-25	-1,865
(% share)	(43%)	(54%)	3%)		(25%)	(72%)	(3%)					
Comox-Strathcona[2] (#)	13,025	19,700	1,005	33,730	13,315	37,450	965	51,730	+290	+17,750	-40	+18,000
(% share)	(39%)	(58%)	(3%)		(26%)	(72%)	(2%)					
PNCIMA (#)	31,985	41,125	2,555	75,665	24,330	63,255	2,200	89,785	-7,655	+22,130	-355	+14,120
(% share)	(42%)	(54%)	(3%)		(27%)	(70%)	(2%)					
BC (#)	414,195	926,100	52,595	1,392,890	462,975	1,730,145	33,265	2,226,385	+48,780	+804,045	-19,330	+833,495
(% share)	(30%)	(66%)	(4%)		(21%)	(78%)	(1%)					

Source: Statistics Canada (2006)

Notes:

Unclass refers to Unclassified. Unclassified represents the labour force that could not be assigned to a specific industry sector.

Only labour force data for the Comox-Strathcona Regional District is available for 1981.

Overall, the table above shows that the goods-producing industries account for most of the decline in the labour force in each of the regional districts. However, the goods-producing sector still remains noticeably larger than typically seen at the provincial level in all the regional districts except the Central Coast Regional District.

Much of this decline in the goods producing share of the labour force is attributed to the decline in the forest sector, which is seen throughout rural British Columbia and in PNCIMA. The trend is expected to continue for export oriented manufactures (e.g., wood manufacturing, food processing) strive to increase labour productivity in the face of international competition. This will result in growth of the goods producing labour force to lag that of the service-producing sector (Human Resources and Social Development Canada 2006).

Personal Income

Total Personal Income

Table 7 presents the total personal income and number of taxfilers in the five PNCIMA regional districts[17], total PNCIMA and British Columbia between 1996 and 2007. Income is reported in constant dollars (i.e., 2001 dollar value) so the difference across years reflects change in real purchasing power and not inflation.

Overall, PNCIMA regional districts have lagged behind the change experienced at the provincial level over the entire period. In fact, the Mount Waddington, Central Coast and the Skeena-Queen Charlotte Regional Districts have experienced declines in total income between 1996 and 2007. These three Regional Districts also experienced a comparable decline in the number of taxfilers earning income over the same period. The Kitimat-Stikine Regional District also experienced a decline in the number of taxfilers and only narrowly missed a decline in total income. If it had not been for strong income growth in the Campbell River area between 2001 and 2007, the aggregate PNCIMA income would have declined over the 1996 to 2007 period.

Collectively, PNCIMA recorded a decline in taxfilers and only a marginal increase in personal income over the 1996 to 2007 period. This performance significantly lags the provincial performance , which had over 19% increase in the number of taxfilers and over a 50% increase in total personal income between 1996 and 2007.

[17] Campbell River and Sayward have been used to approximate the Strathcona Regional District as data on Strathcona Regional District has not been complied prior to 2008.

Table 7 Total Income and Number of Taxfilers for PNCIMA Regional Districts, PNCIMA and BC, 1996 -2007 ($2001)

	1996		2001		2007		Change 1996-2007	
	# Taxfilers	($'000s)	# Taxfilers	($'000s)	# Taxfilers	($'000s)	# Taxfilers	($'000s)
Central Coast RD	2,160	$41,929	2,110	$41,869	2,020	$40,058	(6.5%)	(4.5%)
Kitimat-Stikine RD	27,870	$841,817	26,310	$785,754	26,030	$842,762	(6.6%)	0.1%
Mount Waddington RD	8,900	$276,209	8,490	$262,494	8,310	$253,302	(6.6%)	(8.3%)
Skeena-Queen Charlotte RD	15,260	$444,390	13,910	$386,852	13,270	$378,327	(13.4%)	(14.9%)
Campbell River- Sayward [Note 1]	24,840	$755,198	24,940	$771,420	28,060	$978,214	13.5%	29.5%
PNCIMA	79,030	$2,359,543	75,760	$2,248,389	77,690	$2,492,663	(1.6%)	5.6%
BC	2,701,530	$79,315,788	2,883,600	$90,204,461	3,226,550	$119,146,853	19.4%	50.2%

Source: BC Stats (2000) (2004) (2009).

Note:

1. Strathcona Regional District was formed in 2008 with the division of the Comox-Strathcona Regional District; therefore, the Strathcona Regional District is represented by the two incorporated communities of Campbell River and Sayward and has been used to approximate the long-term trend in the Strathcona Regional District. Campbell River had a boundary change between 1996 and 2001 but it does not appear to have altered the number of taxfilers in the community.

Median Personal Income

Table 8 presents the median income for males and females by regional district in PNCIMA and compares this to British Columbian median income for the period from 1996 to 2007. This provides additional insight into the distribution of income in PNCIMA and how this has changed over the past decade.

The median income for men in four of the five Regional Districts was significantly higher than the provincial median male income in 1996. However, over the 1996 to 2007 period male incomes in PNCIMA regional districts lagged growth experienced at the provincial level. However, in 2007 three Regional Districts (Kitimat-Stikine, Mount Waddington, Strathcona as represented by Campbell River) continue to enjoy higher median incomes than males observed provincially.

For women, only the Skeena-Queen Charlotte Regional District had a median female income that was comparable to the provincial median income for women in 1996. However, in 2007 none of the Regional Districts had a median female income that was at a similar level as the provincial median for women. While the median income for women in all of the jurisdictions, except the central coast, did manage to increase noticeably, median income for women continues to lag.

In 2007, median income for women in the central coast was 48% of median income at the provincial level. While women in the other PNCIMA Regional Districts fared better they still did not earn the provincial median income level – Kitimat-Stikine (80%); Mount Waddington (83%), Skeena-Queen Charlotte (84%), and Strathcona (92%)

Table 8 Median Income for PNCIMA Regional Districts and BC, 1996 -2007

	1996		2001		2007		(Change 1996 to 2007)	
	Male	Female	Male	Female	Male	Female	Male	Female
Central coast RD	$13,540	$9,845	$14,480	$10,055	$14,595	$11,115	7.8%	12.9%
Kitimat-Stikine RD	$35,380	$12,970	$33,670	$14,495	$37,730	$18,415	6.6%	42.0%
Mount Waddington RD	$37,915	$12,665	$36,400	$15,940	$37,205	$19,170	(1.8%)	51.4%
Skeena-Queen Charlotte RD	$29,945	$15,313	$26,680	$16,520	$28,850	$19,280	(3.7%)	25.9%
Campbell River[Note 1]	$33,635	$13,910	$33,980	$16,235	$41,250	$21,230	22.6%	52.6%
BC	$26,720	$15,120	$29,395	$17,765	$36,350	$23,005	36.0%	52.1%

Source: BC Stats (2000) (2004) (2009).

Note 1: The City of Campbell River has been used to approximate the Strathcona Regional District. Median incomes for the Strathcona Regional District do not exist prior to 2008.

On a final note, while median income provides a preliminary look at the earnings of individuals at the Regional District level there may be great variation among communities with a regional district due to local economic circumstances. For example, Kitimat with its larger primary metal processing labour force had a median male income of $64,225 in 2007 while the median income for men in nearby Hartley Bay was $9,635 in 2007.

Socio-Economic Well Being Index

BC Stats, in cooperation with the social ministries, has developed a comprehensive set of over 80 indicators describing socio-economic conditions across various regions within British Columbia. BC Stats has developed methods for consolidating the large volumes of data into indices of regional well being. The four basic indices are relative measures of regional hardship (i.e., Human Economic Hardship, Crime, Health Problems, and Education Concerns). There are also indicators for "target groups" of children and youth. (See detailed methodology in the Appendix Report).

BC Stats compiles their data by Local Health Area (LHA). The shore side of PNCIMA consists of 10 LHAs with socio-economic well being data available for eight of them. Data for LHA 51, Snow Country (Stewart area) and LHA 83, central coast is not available because of the small populations would raise confidentiality concerns. In addition, only partial data is available for the Nisga'a LHA.

As presented in Table 9, the socio-economic indices for PNCIMA LHAs are weighted and compared against the other 78 LHAs with data in the province. An LHA ranked 39 indicates there are as many LHA recording better conditions as there are recording poorer conditions. As shown, the lower the ranking assigned to an LHA, the poorer the performance against the other BC LHAs; conversely, the higher the ranking, the better the ranking. Table 9 includes the three best performing LHAs in the province.

In general, PNCIMA LHAs ranked low relative to other LHAs in BC in the categories of economic hardship, with four of seven LHAs with rank less than ten. Conversely, three LHAs (Terrace, Prince Rupert, and Kitimat) ranked higher for health related indicators. Three lowest ranked LHAs for crime in BC are in PNCIMA (Campbell River/Vancouver Island West, Bella Coola Valley, and Nisga'a). Overall, four PNCIMA LHAs ranked ten or less for overall regional socio-economic rankings (Bella Coola Valley – 2, Vancouver Island North – 5, and Terrace – 7).

Table 9 Overall Regional Socio-Economic Index, 2008

	Regional Socio-Economic Index		Human Economic Hardship		Crime		Health		Education		Children		Youth	
			Wt= (0.30)		Wt= (0.20)		Wt= (0.20)		Wt= (0.20)		Wt= (0.05)		Wt= (0.05)	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank
PNCIMA Local Health Areas														
49 - Bella Coola Valley	0.97	**2**	0.92	**8**	1.15	**2**	1.24	**1**	0.79	**4**	1.18	**1**	-0.09	**47**
85 - Vancouver Island North	0.72	**5**	0.84	**10**	0.35	**24**	0.95	**4**	0.65	**9**	0.71	**11**	0.84	**8**
88—Terrace	0.70	**7**	1.09	**3**	0.58	**16**	0.41	**18**	0.47	**18**	0.62	**13**	1.09	**4**
52 - Prince Rupert	0.57	**11**	1.15	**2**	0.05	**40**	0.09	**39**	0.52	**14**	0.73	**9**	1.10	**3**
72/84 - Campbell River/ Vancouver Island West	0.48	**15**	0.32	**25**	1.34	**1**	0.15	**37**	0.12	**32**	0.90	**6**	0.36	**20**
50 - Queen Charlotte	0.48	**16**	0.27	**28**	0.69	**13**	0.37	**20**	0.73	**7**	0.71	**10**	0.12	**33**
80 – Kitimat	0.12	**30**	0.80	**11**	-0.78	**67**	-0.35	**62**	0.27	**26**	0.21	**27**	0.83	**9**
92 - Nisga'a	--	**--**	--	**--**	1.06	**3**	1.20	**2**	0.50	**17**	--	**--**	--	**--**
Highest Ranked LHA's In BC														
Saanich	-0.77	**75**	-0.81	**75**	-0.94	**76**	-0.57	**70**	-0.83	**73**	-0.37	**68**	-0.72	**73**
Summerland	-0.81	**76**	-0.92	**78**	-0.75	**65**	-0.80	**76**	-0.83	**74**	-0.47	**70**	-0.62	**71**
West Vanc-Bowen Island	-0.94	**77**	-0.86	**77**	-0.95	**77**	-0.85	**77**	-1.19	**78**	-0.86	**77**	-0.93	**77**

Source: BC Stats (2006).

Notes

1. LHA 51 Snow Country (Stewart) and LHA 83 Central Coast have been excluded from the ranking done by BC Stats because of their small populations.
2. See Appendix Report, Section 3 (Socio-Economic Index Methodology for overview of indicators and LHA locations.

Trends

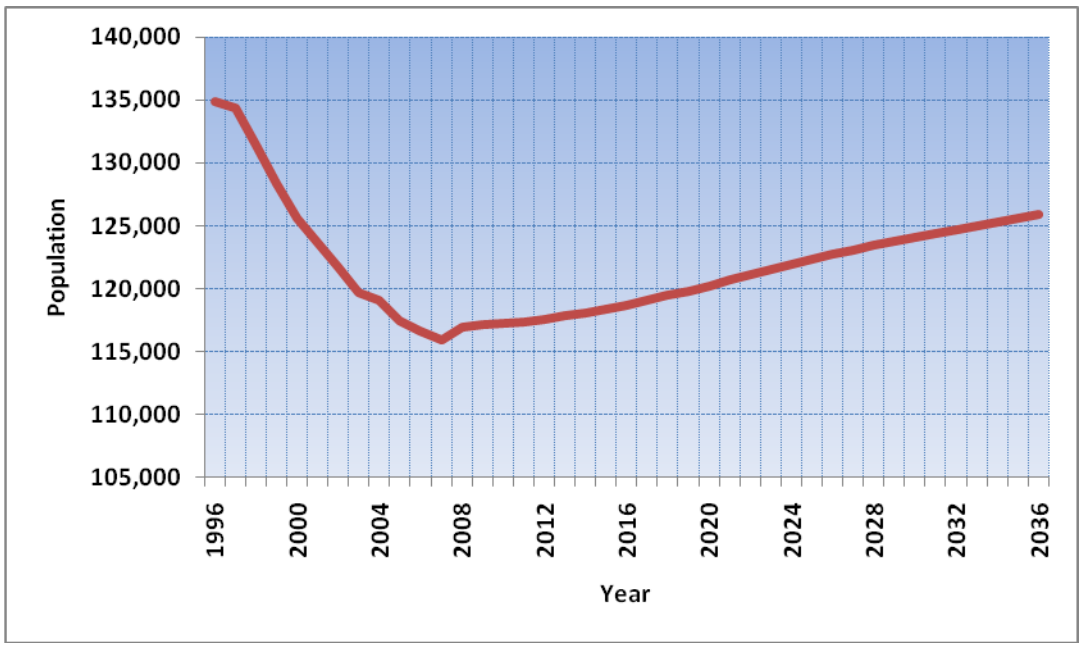
In the Workshop, participants identified several community trends discussed including:

- It was confirmed that many communities have experienced a decline in their population over the past several years as a result of job loss in basic sector industries, including those associated with marine resources (i.e., commercial fishing, seafood processing).
- Lack of economic development resources have limited the ability of individuals trying to create new ventures in their community. The regional entrepreneurs may have the motivation but cannot move forward in the current setting.
- Many workers are limited in their access to training, which impacts community diversification. Training opportunities in smaller communities are limited. For those seeking retraining, travel to another community becomes prohibitively expensive. This is a barrier for workers becoming reemployed and for smaller communities to engage in economic diversification.
- There is a history of resources being harvested locally and transported outside the region with little benefit to the local communities in PNCIMA.
- There are some signs of positive economic activities such as energy development in the region, new fishery resources and products, expanded shipping activities in Prince Rupert, First Nation's revenue sharing opportunities, and new aerospace activity associated with float planes, but to date the new employment opportunities have not offset the job loss in traditional economic sectors and the associated population declines.

The comments and points made by participants are supported by the population trends for PNCIMA, whose population declined by 14,695 persons (or 11%) since 1996. Looking ahead, BC Stats forecasts PNCIMA's population growth will turn positive, growing by some 8,800 residents between 2009 and 2036, or an increase of just over 7%, compared to 36% forecast at the provincial level. However, while the overall population is forecast to grow for PNCIMA, the forecasted growth is concentrated in the Strathcona Regional District which is anticipated to increase by 9,280 persons between 2009 and 2036.

Very little population growth is forecast for the Kitimat-Stikine Regional District (i.e. 115 person), Skeena-Queen Charlotte (i.e. 245 persons), and Central Coast Regional District (i.e. 280 persons). Mount Waddington Regional District's population is forecast to decline by an additional 1,145 persons by 2036. Over the same period of time, the British Columbian population will grow about 36%. Figure 3 presents the historical and forecast population for PNCIMA between 1996 and 2036.

Figure 3 PNCIMA Population Estimate and Forecast, 1996 to 2036



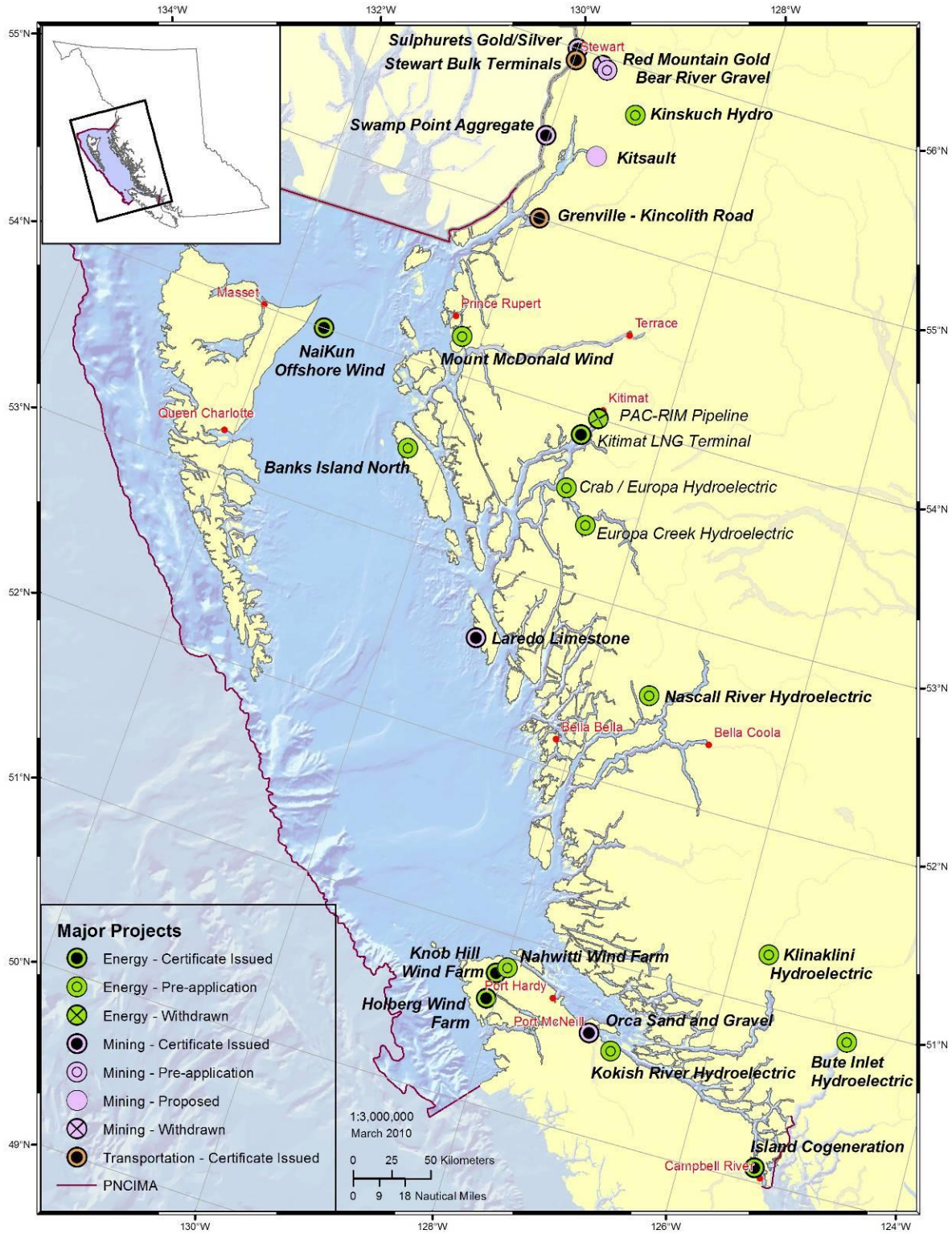
Source: BC Stats (2010)

It is noted that population forecasts are based on the characteristics of the current population (e.g. age, fertility rates) and assumptions about the level of net migration. The latter is very difficult to forecast in practice, though it is the major influencing factor for population trends observed in PNCIMA. In addition, individual communities can experience dramatic changes in population based on individual projects. Therefore, unanticipated expansions in economic activity could trigger increased net migration above those assumed in the current population projection and significantly change the longer term population forecast in the region. At the Workshop, participants talked of new opportunities that may create new economic activities.

Map 3 shows the major projects in PNCIMA that are in the BC Environmental Assessment process. The projects primarily consist of: energy projects (wind power and hydroelectric) and mining projects (aggregate and metal mining). Energy projects are spread across the region, while mining is centred in the Stewart region. Most of these projects are discussed further in Chapter 6.

Based on the current list of major projects, there is potential for a boost in population growth in the Stewart area. Development in the northern portion of PNCIMA could also boost populations in Prince Rupert, Terrace, and Kitimat above those presented in the forecast.

Map 3 Major Projects in PNCIMA, 2010



Source: BC Ministry of Environment, Environment Assessment Office (2010)

Data Gaps

Data gaps, some of which were identified in the Workshop, that may need addressing to support the planning process, are:

- A better understanding of the interactions of individual communities as the regional economy grows.
- There is little documentation of the role of the informal economy[18] in PNCIMA communities and particularly how the marine environment is linked to the community well-being of families and PNCIMA residents.
- Indicators of economic well-being at the community level may need to be formulated to monitor plan effects within an ecosystem based management planning framework. Work related to the Central Coast LRMP implementation may support this task (see work on A Review of Social Indicators for Land Use Planning in British Columbia).
- The spin-off economic implications of food fishing and commercial fishing in PNCIMA are not well documented for inclusion in the planning process. This might include a consideration of how much the region pays or foregoes to transport goods outside PNCIMA as compared to undertaking the activities in the region.

For community specific information, please refer to the Appendix Report. It presents the socio-economic and demographic information and analysis of the five Regional Districts and the individual communities in PNCIMA. It also provides additional information on the socio-economic index section presented above.

[18] The term Informal Economy is used by many international organizations, such as the United Nations and the International Labour Organization, and while definitions vary it is generally treated as that part of the economy that is not taxed, monitored by government or included in key economic statistics. Canada has recognized the existence of the Informal Economy in assessing effects of rural poverty (Parliament of Canada 2006).

5. Cultural Profile

Description

In its anthropological context, culture refers to the distinct ways that people classify and represent their experiences and act creatively. For this profile, the PNCIMA guidance document, which refers to "…communities' sense of identity, cultural distinctiveness, and social network and kinship systems …" provides some direction on cultural matters to be addressed in the baseline (Winterbottom 2008). The parameters include:

- Cultural diversity, including connection to and use of the marine environment
- Heritage resources;
- Traditional knowledge;
- Language; and
- Aboriginal Fisheries Strategy.

A review of other LOMA planning documents indicate that discussions of culture are mostly in the context of traditional activities, including economic and subsistence matters.

While the majority of content in this section refers to First Nations peoples, aspects of culture and lifestyle of non - First Nations peoples in PNCIMA may also be relevant to PNCIMA planning. Discussions about cultural values and how they relate to PNCIMA planning took place during February 2010 at the PNCIMA Workshop in Prince Rupert. These discussions noted cultural issues common to all communities. Workshop participants also clearly recognized the uniqueness of First Nations communities and their links between marine use and culture.

Issues

Many cultural issues relate to changes in the traditional relationship that existed between the marine environment and people's use of it as a sustainable source of wealth, sustenance and cultural norms. Although the context is primarily First Nations there are aspects of this changing relationship within non-First Nations communities as well. Cultural issues articulated at the Workshop are noted below. It does not necessarily imply the point is an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile.

Cultural issues identified at the Workshop related to the fishery resource are:

- Concern about the decline of some fish stocks (particularly salmon which is considered a cultural life-line) and associated changes in commercial fisheries, and the effect this is having on lifestyle on the coast (this refers to all communities, but particularly First Nations);

- Interest in maintaining and reinforcing First Nations' traditional uses, local ecological knowledge and cultural values;
- Impacts of some commercial fisheries on the abundance and location of important cultural fish species such as eulachon;
- Interest in opportunities for the current generation to be gainfully employed in the commercial fishery, actively participate in the food fishery, or learn the associated traditional knowledge, uses and values; and
- The loss of personal and community self-sufficiency because of the decline of fisheries.

DFO continues to adapt to these issues and their implications by delivering numerous programs, among them the Aboriginal Fisheries Strategy and the Pacific Integrated Commercial Fisheries Initiative.

Some cultural issues relate to physical characteristics of culture, namely heritage resources that may be affected by marine planning. These are:

- Potential loss of archaeological sites due to increasing storm events and sea level rise associated with climate change, particularly in the north coast and Haida Gwaii;
- Lack of formal protection of many historic and archaeological sites, such as underwater shipwrecks;
- Lack of site inventories of important intertidal and underwater sites such as clam gardens; and,
- Potential destruction and loss of archaeological sites due to increased human disturbance and activities, and lack of adequate surveillance and management (Bones 2009).

Marine Heritage Resources

Archaeological surveys in PNCIMA date back to the late 19th Century, but it has only been in the last 40 years that fieldwork has intensified, especially around protected areas such as the Gwaii Haanas National Park Reserve and Haida Heritage Site. More than 3,000 archaeological sites (historic sites, midden sites, cultural depressions, rock art, burials, habitations, fish traps and subsistence sites) are registered with provincial and federal inventories, even though detailed inventories have not been conducted in many areas (LGL 2004).

The provincial Archaeology Branch limits access to and use of archaeology site data so a spatial representation of those records, how they relate to the coastal environment and how they might be affected by marine planning is not available for this report.

Indirect indicators of heritage resources, however, point to a very strong relationship with marine areas. The Archaeology Branch has estimated archaeological potential for BC. In PNCIMA this potential is dispersed across the region with very few areas where potential is not believed to exist. The potential around inhabited areas on the coast is greater than

inland areas where land use may have been more sporadic. Many of these sites include First Nations' cultural features and are sensitive and subject to damage if their locations are revealed.

The Coast Information Team produced a *CIT Cultural Spatial Analysis* (2004) where cultural significance was mapped for First Nations and non-First Nations communities. The intent of the mapping was to identify local knowledge of places, spatially represent this knowledge on maps, identify threats to those values and facilitate land and resource management. Many different features were mapped, including heritage, sustenance, recreation and visual. Although much of the data were not published, the aggregated features inventory showed significant correlation with existing settled areas, with the density of features greatest in coastal zones, particularly major waterways and fishing areas.

The strong relationship between cultural features and coastal areas held true for First Nations as well as non-First Nations cultural features. It was also noted that 87% of cultural features (including First Nations' features) were outside of then-existing protected areas and therefore open to threat from other resource uses (Lee 2004).

First Nations in the Study Area

Communities in PNCIMA have formed a close relationship with the ocean as part of their economic, social and cultural fabric. For post-settlement communities this association goes back over a 150 years, while for First Nations, thousands of years of economic activity, knowledge, traditions and culture have evolved with the ocean and its resources.

First Nations communities

Individual First Nations communities are listed in Table 10 with population estimates. Many First Nations are involved in the treaty process, although the process is suspended for others.

Statements of Intent boundaries used for the land and resource negotiations cover the entire coastal land base and the majority of the ocean area in PNCIMA. PNCIMA is within the asserted traditional territories of coastal First Nations, many of which overlap. All or parts of 17 Statements of Intent fall within PNCIMA.

Table 10 First Nations of PNCIMA

First Nation	Estimated Band Members	Affiliations
Old Massett	2700	Council of Haida Nation Coastal First Nations
Skidegate	1473	Council of Haida Nation Coastal First Nations
Nisga'a	5779	Nisga'a Lisims Government
Lax Kw'alaams	3265	
Gitga'at Nation	673	Gitga'at First Nation North Coast – Skeena First Nations Stewardship Society Coastal First Nations
Kitasoo Nation	508	Tsimishian First Nations Oweekeno-Kitasoo-Nuxalk Tribal Council
Kitselas Band	537	Kitselas First Nation North Coast – Skeena First Nations Stewardship Society
Kitsumkalum	663	Kitsumkalum First Nation North Coast – Skeena First Nations Stewardship Society
Metlakatla	801	Metlakatla First Nation North Coast – Skeena First Nations Stewardship Society Coastal First Nations
Gitxaala	1779	Gitxaala First Nation North Coast – Skeena First Nations Stewardship Society
Haisla	1647	Haisla First Nation North Coast – Skeena First Nations Stewardship Society Coastal First Nations
Nuxalk	1527	Oweekeno-Kitasoo-Nuxalk Tribal Council
Heiltsuk	2246	Coastal First Nations
Wuikinuxv	282	Oweekeno-Kitasoo-Nuxalk Tribal Council Coastal First Nations
Da'naxda'xw Nation	193	Independent Treaty Negotiations Nanwakolas Council member
Gwa'Sala-Nakwaxda'xw Nation	853	Independent Treaty Negotiations Nanwakolas Council member
Quatsino First Nation	464	Winalagalis Treaty Group
Tlatlasikwala Band	61	Winalagalis Treaty Group
Kwakiutl	690	Douglas Treaty FN Nanwakolas Council member
'Namgis	1633	Musgamagw Tsawataineuk Tribal Council Nanwakolas Council member
Kwicksutaineuk/Ah-Kwa-Mish Tribes	277	Musgamagw Tsawataineuk Tribal Council
Tsawataineuk Band	509	Musgamagw Tsawataineuk Tribal Council
We Wai Kum Nation	684	Laichkwiltach Treaty Society
We Wai Kai Nation	935	Laichkwiltach Treaty Society
Kwiakah First Nations	40	Laichkwiltach Treaty Society Nanwakolas Council member

Source: Indian and Northern Affairs Canada (2010), Ministry of First Nations Relations and Reconciliation (2010)

Traditional Knowledge

Studies of traditional knowledge and uses have been undertaken by many First Nations communities in PNCIMA. As with archaeological data, however, the information is not considered publicly available because of concerns regarding data ownership and confidentiality. This section, therefore, only acknowledges and describes anecdotally the concepts behind traditional knowledge without purporting to represent the diversity of meanings and uses among coastal First Nations.

Traditional knowledge (TK), indigenous knowledge (IK), and traditional ecological knowledge (TEK) generally refer to the long-standing traditions and practices of indigenous peoples and local communities.[19] Holistic knowledge is inextricably linked to land, water and resources and acquired over time by direct experience but more importantly through relationships with contemporaries and ancestors. The intimate and spiritual connection to the sea, land and sky is universally held by indigenous peoples around the world, rooted in sense of place and ecological stewardship.

For coastal communities, the ocean shapes cultural traditions and was and continues to be a provider of resources. For the Haida, salmon are described as "integral to all life on Haida Gwaii and to Haida culture ". They are characterized as the primary source of nourishment and are integral to family, social and cultural traditions (Council of the Haida Nation 2005). Obtaining and using fish was a complex process involving the fish itself, the people, the act of fishing, the processing and preserving and the means of distribution. Each of these steps requires TEK and the transfer of skills and knowledge down through the generations (Weinstein 2006). The Nuxalk describe their traditional life as revolving around the seasons of the salmon, and included technologies that were considered marvels by early Europeans (Coastal First Nations 2007).

The linkages to TK and TEK continue to this day. The Gitga'at Land Use Plan notes the following:

> "While the Kitka'ata's social life was altered dramatically by the influence of European missionaries, the community retained many traditional customs and continued to move throughout their territory to different harvesting camps according to season. Fur-trapping, canning, fishing, drying and seaweed and berry harvesting influenced movement within the territory, and continue to have an effect today. From time immemorial, the Gitga'at people have existed in their territory, dependent upon its abundance and richness." (Gitga'at 2003)

[19] The term TEK is used for the remainder of this discussion.

Similarly , TEK also continues to play an integral role in First Nations' fisheries. Traditional technologies such as Kwakiutl tidal rock barriers and sapling-box traps for catching chum have endured even though modern gear is available. Different species of salmon were used and processed differently throughout the year and were supplemented with seasonal harvests of fowl and game. Ingenious First Nations methods were often used, employing knowledge of natural features, animal behaviour and ocean conditions for safe and efficient harvests. For example, Kwakiutl harvesters knew that butter clams and cockles in beds low on the beach and in tidal creeks are not subject to red tide problems or algal growth in summer, and thus were never dug for commercial harvests, but they were reserved for subsistence use (Weinstein 1994).

Anthropological studies have demonstrated that the traditional management and use of resources helped in sustaining communities with knowledge, technologies and systems that were passed down generation to generation. These practices became interwoven with cultural ethics and values that some First Nations feel are largely absent from modern management practices (First Nations Area Technical Teams 2008). TK and TEK represent not just cultural continuity for First Nations but the bases for attitudes and views about modern land and marine management. It is these concepts that are First nations are interweaving into emerging ecosystem based management practices. Many First Nations suggest they have practised adaptive resource management on the coast for millennia, expanding habitat and productivity of salmon especially and generating a considerable subsistence fishery that was the basis for highly evolved social and cultural practices (Guenette 2007).

Language

The use of language is an important indicator of cultural continuity. Although there are no comprehensive surveys of language use in the study area, and incomplete enumerations may not sufficiently capture language use in Census tracts, it is generally acknowledged that the spoken use, comprehension, reading and writing of traditional languages was declining steadily through the latter half of the 20th Century.

> "In 2006, the central coast reserve communities of Bella Bella had 9% and Kitasoo had 11% of individuals of First Nations identity reporting knowledge of traditional languages. Regionally, the Central Coast Regional District reported 9% and Mount Waddington Regional District reported 18% of individuals of First Nations identity reporting knowledge of traditional languages. In the north coast, 40% of First Nations individuals in Kincolith and 9% of First Nations individuals in Prince Rupert reported knowledge of First Nations languages in 2006. Regionally, the Kitimat-Stikine Regional District reported 23% and

> Skeena-Queen Charlotte Regional District reported 10% of individuals of First Nations identity with knowledge of traditional languages" (Sheltair Group 2009).

English is presently the predominant language of coastal First Nations, although many elders remain fluent in the indigenous language and schools continue to deliver and expand traditional language programs. For example, in 2006, Kincolith reported 40% of individuals of First Nations identity with knowledge of First Nations languages. Nisga'a language programs, including daily instruction at the community school, is contributing to this revival (Sheltair Group 2009).

Aboriginal Fisheries Strategy

In 1992, the DFO instituted the Aboriginal Fisheries Strategy (AFS) in response to a Supreme Court ruling affirming the right of aboriginal people to fish for food, social and ceremonial (FSC) purposes. The FSC harvest, which has priority over all other fisheries, is managed in consultation with First Nation communities, and authorized through Communal Licences issued by DFO. First Nations in PNCIMA engage with DFO on AFS in a variety of ways to support their participation in fisheries.

The official FSC harvest does not capture the overall importance of the food fishery as the data is considered incomplete for management areas overlapping the PNCIMA study area (FOC 2010). Both the commercial and recreation catches are known to contribute to the regional diet.

Outlook

The following are examples of how First Nations communities intend to be involved in conservation, economic and cultural activities through marine use planning.

- The Kitasoo Land and Resource Protection and Management Plan states "We have always had a land and resource use plan for our lands, forests, fish and wildlife. It lives in our heritage, in our oral history and in our everyday decisions as to where we collect food and where we fish and cut trees. Since the modern world doesn't understand our way of managing lands and resources, we will write it down in order to explain our intentions…To remain here as Kitasoo and Xaixais people we need to protect and enhance our culture and protect our heritage. We also need to live in the modern world. We need jobs to sustain our families. We need revenue and economic development to sustain our community..." (Kitasoo/Xaixais 2010)
- A draft document to support Haida Gwaii marine use planning is intended to guide the restoration of the sea to its full potential and sustain families, economies and cultures. The dual goals of (1) conservation and sustainability of all human activities and (2) effective collaborative management of the marine environment are key to balancing cultural, community and economic wellbeing (Council of Haida Nation 2007).

- The objectives of the Gitga'at First Nations articulated by the Gitga'at First Nation in their land use plan (2003) prioritize the protection of Gitga'at cultural heritage resources and the use of ecosystem-based management approaches to land and resource management. The plan stipulates hunting, fishing, trapping, harvesting of non-timber forest products and traditional plants and cultural and spiritual activities as overriding objectives in almost all land use zones (Gitga'at 2003).

The marine economy remains an important component of the economic base of First Nations. For example, approximately half of all residents on the north and central coasts have employment in the marine sector, with the most common positions being commercial fisher, fish plant worker and shore worker. First Nations residents who reported having worked in the marine sector tended to have higher incomes than the average resident.

Aquaculture is increasingly being explored by First Nations as an economic activity. Despite excellent site location features highly favourable to salmon aquaculture, most First Nations have avoided this activity because of concerns over the introduction of Atlantic salmon, pollution, disease and other perceived environmental effects (Haida Fisheries Program 2009). Some communities such as the Kitasoo Nation have managed to open smaller, niche-oriented processing facilities and invested in aquaculture operations, which has enabled employment and income independent of the wild fishery. Coastal First Nations are also collaborating to implement a coastal shellfish aquaculture initiative involving oyster and scallop farms on Haida Gwaii, the north coast and the central coast.[20]

Some First Nations' communities have expanded into tourism with more involvement in sport fishing lodges, and eco-tourism, most of it marine–based. However, in the last 20 years, the employment and income derived from these activities have not made up for declines in their participation in the commercial fishery or forestry – issues that have contributed to initiatives like DFO's Pacific Integrated Commercial Fisheries Initiative which aims to support the aspirations of First Nations to be more involved in the commercial fishery. Many First Nations have also investigated the cruise ship market as a potential source of tourism spending, but the BC industry itself has declined in recent years and landings at Prince Rupert have dropped in the last two years. Of a more general nature, many First Nations have yet to resolve cultural issues concerning the use and exposure of traditional knowledge in tourism. Yet traditional knowledge is itself a tourism asset among eco-tourism markets and may represent an avenue for preserving cultural values (Butler and Menzies 2007).

[20] This initiative is discussed in the following chapter under Aquaculture.

Renewable energy projects, including wind power and tidal power, have been proposed for many areas on the coast, but many are either in the exploratory stage or have yet to achieve commercial viability. The Naikun Wind Farm adjacent to Haida Gwaii is the only proposed major energy development with First Nations participation in PNCIMA.

Non-First Nations Communities

Although non-First Nations communities have existed in PNCIMA for less than two hundred years, they have developed their own cultural linkages to the marine environment, primarily through their involvement in the fur trade, commercial fishery and participation in activities such as community trade and barter that are not tracked in formal economic data.

The growth and development of many coastal communities was based on access to seafood for commercial and subsistence purposes, including salmon, crabs, halibut and other ocean resources. The fishery had a long season (May through to October) and had few regulatory barriers. Again, fish boats quickly became an essential means to participate in fish harvesting and other resource activities such as forestry and beachcombing. The ability to move or switch to other resource activities through the year allowed coastal villages to remain relatively stable.

The informal economy, including hunting and plant gathering as well as fishing, was also a factor. Easy access to areas where resources were abundant and the accumulation of traditional skills and knowledge allowed individuals and families to prosper year round. Knowledge of where, how and when to access food resources was particularly important as was the ability to process and preserve (Menzies, Mattson, Butler no date). Local boat building was widespread, offsetting the need for capital and the importation of manufactured goods. Instead, there was a high level of labour inputs, which forged relationships and networks among family groups and villages and allowed the communication and transfer of traditional and technical knowledge.

The lifestyle of the coastal fishing village embodied more than traditional knowledge and the informal economy. For example, in Sointula, many social and cultural features were found to be closely linked to the marine environment. Demographic variations in the community's birth rate were correlated to the seasonality of the fishery. Kinship networks and the development of formal and informal organizations contributed to the distribution of credit, commodities, labour, recreation and cultural activities. This independence and autonomy was reinforced by the ability to participate, if needed, in resource activities other than fishing (Miller 1978). Many fishing villages frowned on poaching and overfishing, while in Oona River "just take what you need" reflected the attitude of families attempting to make a living without depleting the fish and the trees (Butler and Campbell 2003).

Today, the wild salmon fishery continues to struggle. After forestry replaced fishing as the economic base for a number of communities in the late 1960s, other economic influences including tourism growth and amenity migration started changing the composition of the labour force. There are fewer residents involved in the fishery than in the past although many coastal residents continue to fish and hunt and consider it an important part of living in a rural area (Ference, Weicker and Company 2009). First Nations' and other communities in PNCIMA identify with the ocean and the culture it nourishes and the lifestyle it affords.

Data Gaps

In composing this baseline, two data gaps soon became evident: the incomplete record of major indicator resources such as heritage resources and ethnographic or anthropological studies of individual First Nations: and the gap created by restricted access to known information for reasons of confidentiality and First Nations' sensitivity to releasing traditional knowledge into the public domain. Specific gaps include:

- Documented archaeology sites are not made available by government and therefore cannot be used as a baseline indicator in this report. In any case, this record is assumed to be substantially incomplete. The Coast Information Team noted in their cultural spatial analysis of 2004, that First Nations' cultural features were not as well delineated as they were for other communities. In some cases this was due to the uniqueness of First Nation data sets where methods for collecting and organizing information can differ widely and access is restricted by data sharing agreements. CIT recommended more investment in gathering and analyzing cultural information to facilitate ecosystem-based management objectives for integrating cultural, economic and ecological values (Lee 2004).
- The actual status of the food fishery is unknown; total FSC catch levels tracked by DFO are incomplete, though work is underway between DFO and First Nations to improve catch information;
- Many cultural indicators, such as language use and country food consumption, may be enumerated by Census tracts but are generally incomplete or inaccessible; and
- Traditional Use studies undertaken for individual coastal First Nations were not made available for this report for confidentiality reasons.

For a cultural profile, the gaps present considerable methodological challenges. Nevertheless, for those gaps where the information exists but is not available, future protocols with the owners of the information may make it available in some form for marine planning or resource management.

6. Marine Activities

Introduction

Eleven "activities" identified by the PNCIMA Planning Office as being pertinent to the marine planning process are addressed in this chapter. These are, in order of presentation:

- Sport fisheries
- Commercial fisheries
- Ocean recreation
- Marine transportation
- Aquaculture
- Seafood processing
- Energy and offshore mining
- Tenure to aquatic lands
- Ocean disposal
- National defence and public safety
- Research, monitoring and enforcement activities

The common element in these activities is the use or occupation of PNCIMA by people. For a number of the activities, the resources of PNCIMA are, or potentially could be, the basis of a commercial activity that supports jobs, incomes and employment. In other cases, PNCIMA may provide a "service", such as Ocean Recreation, Ocean Disposal, which are valuable but not subject to a financial transaction. National defence and research are important public functions that occur in PNCIMA.

The activities are addressed using a common approach, modified to address an activity's unique considerations. Each profile begins by defining the activity in the context of the SECOA. That is, the socio-economic aspects of the activity associated with marine use in some manner. This is followed by a listing of "issues" regarding important matters associated with the activity that might be considered pertinent to the SECOA or the planning process. Many of the issues were raised at the Workshop, identified in previous studies or through key informant interviews. The list is a record of issues, which may or may not be examined further in the profile. A brief description is provided regarding the nature of the relationship of the activity to the marine environment or PNCIMA specifically. This provides context for the consideration of the activity and may suggest a linkage between the activity and future outputs of the PNCIMA planning process. Most of the profile is a presentation of the activity's current status in PNCIMA. This typically includes a review of recent historical performance, general location in some cases and regional and provincial significance. This section contains quantitative indicators (e.g. labour force, sales revenue, GDP) or qualitative representations to portray the contribution and status of the activity. An outlook or trend of the activity in PNCIMA is

provided where there is a reasonable basis to do so. Where that is not the case, the key factors influencing future status is addressed. The profile concludes with the identification of data gaps and omissions that, if addressed, would improve the quality of information available to the planning process.

It is noted that all of the Marine Activities profiled here depend to varying degrees on the function of marine ecosystems or marine attributes in PNCIMA. The ecosystem services have value distinct from the Marine Activity (e.g. value of estuarine habit is distinct from the landed value of salmon that "use" the habitat), but the value is typically not manifest in an observable transaction. Various methods are available to estimate non-market values (Philcox 2007). This consideration may be relevant as the planning process addresses particular issues or site specific matters; however the matter is not examined further in this baseline.

The activity profiles provide information at strategic level of decision making at the plan area scale. Several of the activities are composed of diverse and distinct activities (e.g. energy, commercial fishing, and aquaculture) that interact differently with the marine environment or in PNCIMA. Hence, there may be the need to "drill down", gathering sub-activity specific information as the need arises in the planning process.

Sport Fisheries

Description

Sport fishing is defined as sport fishing by any means, including angling and collecting shellfish. For the purposes of this profile we use the term angling and sport fishing interchangeably.

Sport fishing does not necessarily entail the actual catching of fish—it involves the attempt to catch, the catch itself, the harvest and the overall experience with the natural environment, both land and water-side. Participants may be engaged in sport fishing only, or they may be fishing in conjunction with other outdoor recreation activities such as camping and boating, perhaps as a secondary activity.

Participants in the sport fishery may be residents of the study area or tourists (i.e. anyone who travels more than 80 kilometres from their normal place of residence) (BC Stats 2007).

How participants engage in the sport fishing experience varies widely. At one end of the spectrum is the self-guided, independent angler with their own equipment and gear; at the other end is the fully-guided angler who has purchased an all-inclusive package that includes rental gear, angling guide services, air transportation and accommodations in resort lodges. Many anglers will fall somewhere in between these two experiences combining elements of relative independence perhaps with the purchase of gear, equipment or different services along the way.

Generally, non-resident anglers would be the primary client base of the guided fishing and lodge sector—resident anglers would not be purchasing packages but would be buying major equipment such as boats. Both groups would purchase rod and gear, gasoline, rentals and miscellaneous services, either prior to or during their trip.

The fishing "industry" includes establishments that sell directly to anglers, including angling guides and charters, resorts and fish camps, boat rentals and marinas, retail outlets such as tackle shops, transportation companies and the hospitality sector (e.g., hotels, campgrounds, restaurants).

Issues

The following issues were drawn from workshop comments, literature review and personal communications. They may not represent an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile.

Sport fishing contributes to the economic base of PNCIMA, and to the recreational choice and quality of life for many of its residents. The opportunity to fish (i.e. supply

conditions), the demand for angling and how the benefits from angling are distributed throughout the study area all have economic as well as socio-community implications for communities, especially those that have grown sport fishing as a destination tourism product.

The same set of core issues affecting coastal fisheries as a whole, namely the abundance and health of fish stocks and how access to those stocks is managed, are of great concern to sport fishing stakeholders. Because sport fishing is highly reliant on the quality and abundance of fish, the decline in harvest diminishes the perceived chances of success for residents and visitors. Numerous causal factors are likely behind the declines, including over-fishing, changing ocean conditions, pollution and changing freshwater habitats for anadromous fish.

Stock declines also have secondary effects when they exacerbate conflicts amongst other users competing for the resource, notably the commercial fishery and First Nations. Some commercial fishers have criticized the sport fishery for contributing to stock level declines, asserting that there are:

- Higher mortality rates of catch and release practices than recognized;
- Insufficient limits on rock fish harvests;
- Carrying capacity concerns in high use areas;
- Insufficiently monitored catch and effort levels.

Fisheries managers with mandates to conserve resources as well as support user groups have often been unsuccessful in simultaneously meeting the expectations of First Nations, commercial fishers and sport fishers.

The other important issue concerns participation rates in the sport fishery and how that is affecting sector development. The long term decline in angling licence sales, which is most evident on the south coast, is attributable to numerous demographic and socio-economic factors (Gislason 2004).

This has given rise to concerns about where future demand for angling will come from as the current crop of fishers retire from the sport. Participation rates among the growing urban populations in particular are low and it will be difficult to attract new anglers if opportunities require more time, effort and cost than in the past. The regulatory requirements for fishing are more onerous than many other outdoor activities where access to the Crown land base and water ways is virtually unimpeded.

A trend toward land-based angling, from shore, piers, or tidal bars, and more terminal fisheries, is helping offset the decline in licence sales on the coast. Compared to boat-based angling, shore-based angling is safer, less costly and well suited to family participation. It requires fewer skills and does not demand a lot of advanced planning.

For the lodge, charter and guiding industry that caters to visiting anglers, future demand for their product and competition from other international destinations will drive development. The strengthening Canadian dollar is a major challenge to the industry's ability to maintain the important US market.

Connection to the Marine Environment

Resource use

In 2005, the most popular species in PNCIMA, in terms of fish harvested, were Coho salmon, Chinook salmon, Pink salmon, halibut, and rockfish. The crab and shrimp/prawn harvest is also significant. The harvest of each species will vary from year to year and will be influenced by stock availability and regulatory conditions. In 2000, rockfish was the most widely caught species in PNCIMA sport fishery, followed by Chinook, halibut and Pink. The Coho catch for that particular season happened to be low, even though it remains one of the fishery's prime target species.

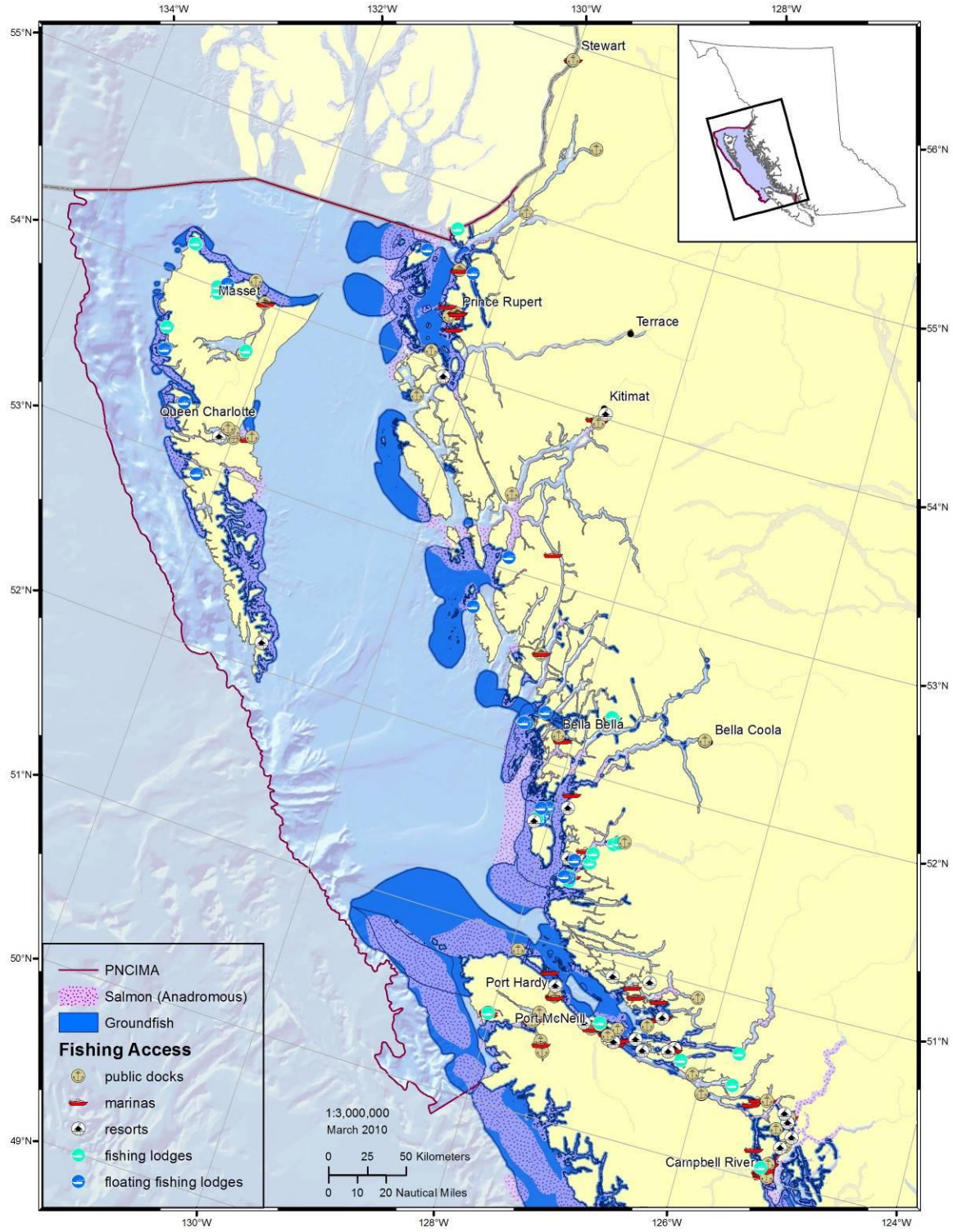
The steelhead is an important recreational fish, caught mainly in freshwater rivers and streams. Important summer and winter steelhead fisheries occur on several rivers in BC including the Skeena, Nass, Stikine and Dean rivers.

Use areas and communities

The spatial relationship between the sport fishery and communities in PNCIMA can be described in terms of three indicators, fishing areas, coastal infrastructure and sport fishing lodges. As seen in Map 4and Map 5 the sport fishery effort is distributed throughout all areas of PNCIMA. Ports, small craft harbours and marinas provide important infrastructure and services that allow sport fishers to access and navigate fishing grounds safely and conveniently. There are 30 ports, 38 fishing harbours, one recreational harbour and 44 marinas, 22 resorts, 26 marine fuelling stations and 22 resorts located in PNCIMA with facility clusters in Johnstone Strait, Rivers Inlet/Fitz Hugh Sound, north and west coast of Graham Island and the communities of Prince Rupert and Kitimat (Fisheries and Oceans Canada 2009b). The port and marina base coincides with the major recreation fishing areas as well (MacConnachie et al 2007).

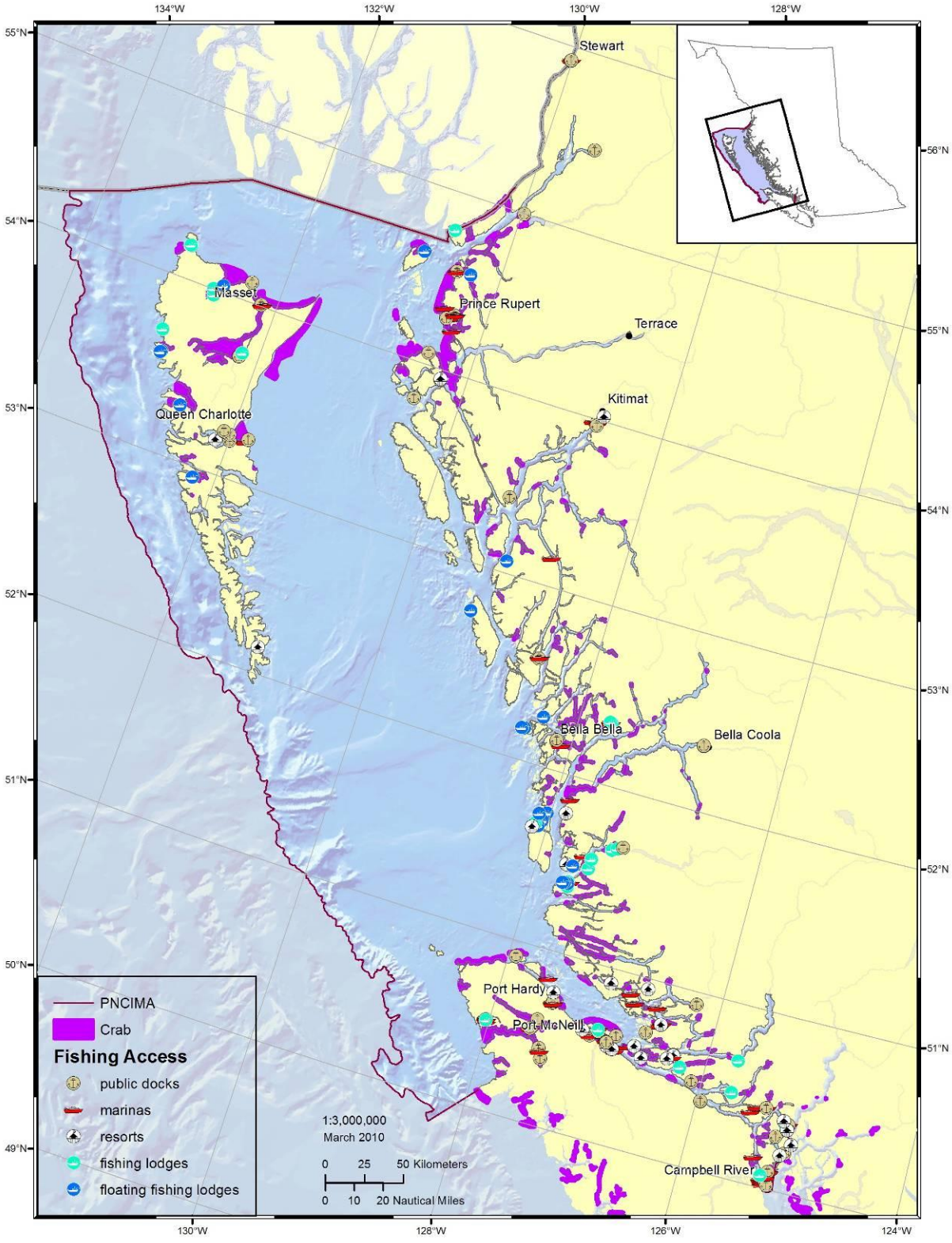
In 2006, forty-two sport fishing lodges were identified across PNCIMA, with clusters on Haida Gwaii, as well as Bella Bella, Hakai Pass to Rivers Inlet and Campbell River to Port McNeill (BCMCA 2010).

Map 4 Recreational Salmon and Groundfish Fishing Areas in PNCIMA



Sources: BC Marine Conservation Analysis and BC Integrated Land Management Bureau (2010)

Map 5 Recreational Crab Fishing Areas in PNCIMA



Sources: BC Marine Conservation Analysis and BC Integrated Land Management Bureau (2010)

Seasonality

Tidal salmon fishing is generally an open season year round, although most management areas have in-season salmon management measures during the peak fishing months, and in some years outright closures may occur. The majority of effort and catch is registered during the summer and autumn months when weather conditions are favourable and the salmon are running. Market studies have shown that visitors to BC who participate in sport fishing are more likely to do so in the summer than during any other season (Tourism BC April 2009).

Current conditions

Markets

The tidal sport fishery in BC attracts visitors from around the world, but the majority of anglers are either BC residents or from nearby markets. American anglers to BC tend to be from Washington, California and Oregon, while Canadian anglers are mainly from Alberta (DFO 2007). While some visiting anglers come to the province specifically for the fishing experience, the majority are in fact here for some other primary trip purpose. Canadian and American travellers who angle in BC give the province high marks as a fishing destination (Tourism BC April 2009).

No matter where they are from, anglers who fish in BC share similar demographic characteristics, but there are also some interesting differences (see Table 11). Among anglers from Canada and the US who had travelled to British Columbia at least once in 2005 and 2006, the majority were male, 61% were Canadians and 55% Americans. The gender imbalance is more exaggerated among resident BC anglers—in 2005, four of every five active anglers were male.

Canadian anglers were more likely to be younger than their BC resident or American counterparts. More than one third of Canadian anglers were between the ages of 18 to 34 years versus 22% for BC residents and Americans. Two of every five Americans who fished in BC were over the age of 55.

The most commonly reported household income category for all angler groups was $80,000 or more, with Americans especially reporting high incomes. Among BC resident anglers, those fishing in saltwater reported much higher household incomes than their freshwater counterparts. This is likely a reflection of the higher participation rates among the younger age groups.

Education information is not available for BC resident anglers, but among Canadian and American anglers in BC, education attainment differed markedly. More than 90% of Americans had at least some post-secondary education while close to two-thirds achieved

post-secondary graduation. Among Canadian anglers in BC, only one third had at least some post-secondary education and one quarter had attained graduation.

Table 11 Demographic Profile of BC Anglers, 2005

	BC Freshwater	BC Saltwater	Canada	US
Gender				
Male	83%	79%	61%	62%
Female	17%	21%	39%	39%
Age				
18-34	13%	22%	34%	22%
35-44	19%	15%	21%	9%
45-54	28%	26%	24%	28%
55-64	25%	24%	12%	21%
65+	15%	13%	9%	20%
Income				
Under $40,000	23%	16%	17%	13%
$40,000-$59,000	21%	18%	14%	15%
$60,000-$79,000	20%	19%		
$60,000-$99,000			26%	26%
$80,000+	37%	48%		
$100,000+			33%	40%
Not stated			10%	7%
Education				
Less than secondary			9%	1%
Completed secondary			28%	7%
Some post secondary			10%	26%
Completed post secondary			25%	63%
Other				
Not stated			1%	3%

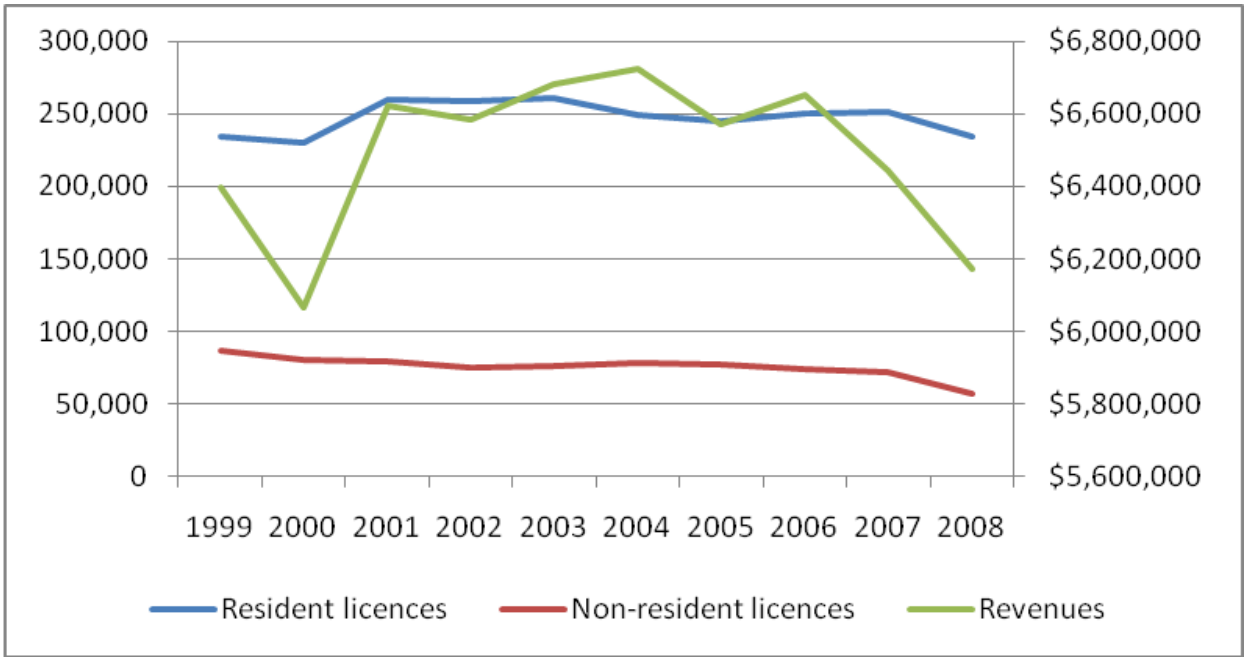
Source: Tourism BC (April 2009)

Licence Sales

The number of tidal waters sport fishing licences sold in BC for the 10 year period ending in 2008 are shown in Figure 4. The total number of licences sold in 2008 was 291,250 with residents accounting for 80% of the sales. Resident licence sales have held steady during this time, but non-resident sales have been in a slow but steady decline. Preliminary data for 2009 show resident sales rebounding but a continued drop-off in non-resident sales.

Revenues from the sale of fishing licences and stamps peaked in 2004 at approximately $6.7 million but have experienced a significant drop over the last three years.

Figure 4 BC Tidal Waters Sport Fishing Licence Sales and Revenues, 1999-2009



Source: Fisheries and Oceans Canada (2010)

Catch Levels

The sport fishery salmon catch in PNCIMA has grown over the past 10 years, at the same time as the salmon catch number on the south coast has been declining. This trend was first observed over 20 years ago when stocks collapsed in the Strait of Georgia, diverting fishing pressure to the west coast of Vancouver Island and to the north and central coasts where there were better opportunities.

Table 12 shows sport fishing activity indicators PNCIMA in 2000 and 2005. Each value was greater in 2005 than 2000, signalling on overall increase in fishing activity. Close to 100,000 anglers fished in the study area in 2005, a one third increase over 2000. Days fished amounted to 590,563 or approximately 6 days per angler. The number of fish caught and kept where both up appreciably, 74% and 51%, respectively.

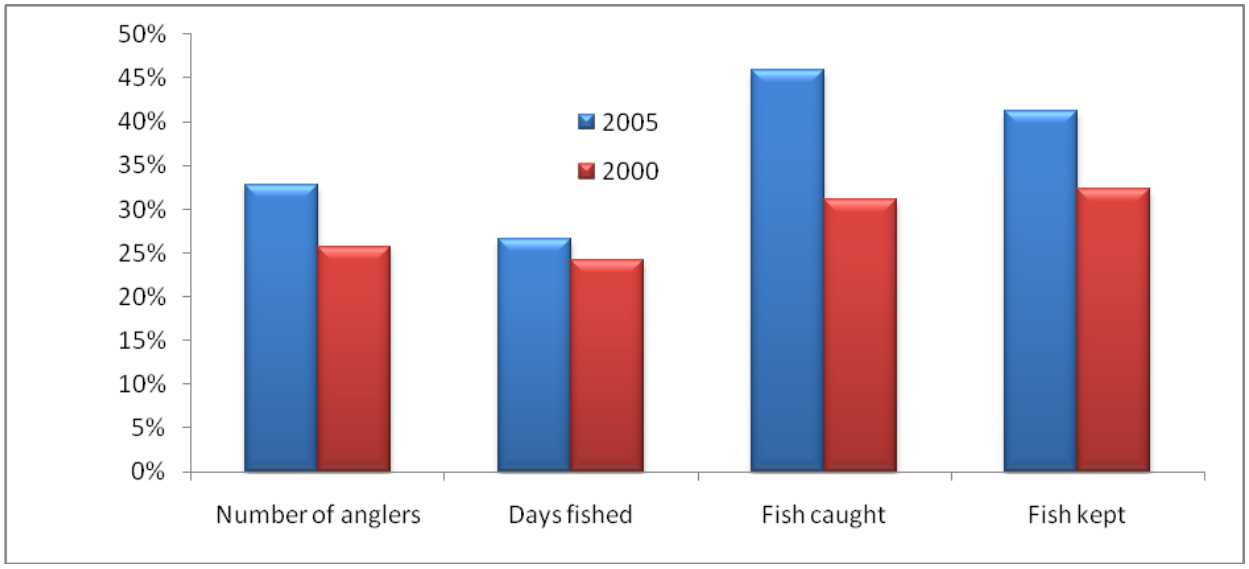
Table 12 PNCIMA Sport Fishing Activity, 2000 and 2005

	2005				2000			
	Resident	Non-res Can	Non-res Other	Total	Resident	Non-res Can	Non-res Other	Total
Number of anglers	47,242	21,103	29,634	97,978	36,103	15,403	21,839	73,345
Days fished	364,669	87,649	138,645	590,963	295,337	78,898	109,293	483,528
Fish caught	805,784	420,384	437,104	1,663,272	478,575	188,537	287,085	954,197
Fish kept	305,572	139,391	176,532	621,495	216,256	77,790	117,615	411,661

Source: Fisheries and Oceans Canada (2002), (2007)
Notes: Non-res Can – non-resident Canadian, Non-res Other – non-resident other than Canadian
Totals may not add up due to rounding.
PNCIMA study area is defined as Haida Gwaii, North coast, Central Coast and Johnstone Strait.
Catch statistics do not include shellfish.

PNCIMA's growing share of total provincial tidal sport fish activity can be seen in Figure 5. In 2005, one third of all anglers and one quarter of all days fished were in PNCIMA, well above levels experienced in 2000. The major difference in activity, however, was in the catch levels—in 2005, nearly five in 10 fish caught and four in 10 fish kept on the coast were in PNCIMA. In comparison, PNCIMA contributed about three out of every 10 fish caught and kept in 2000.

Figure 5 PNCIMA Share of Provincial Tidal Sport Fish Activity, 2000 and 2005



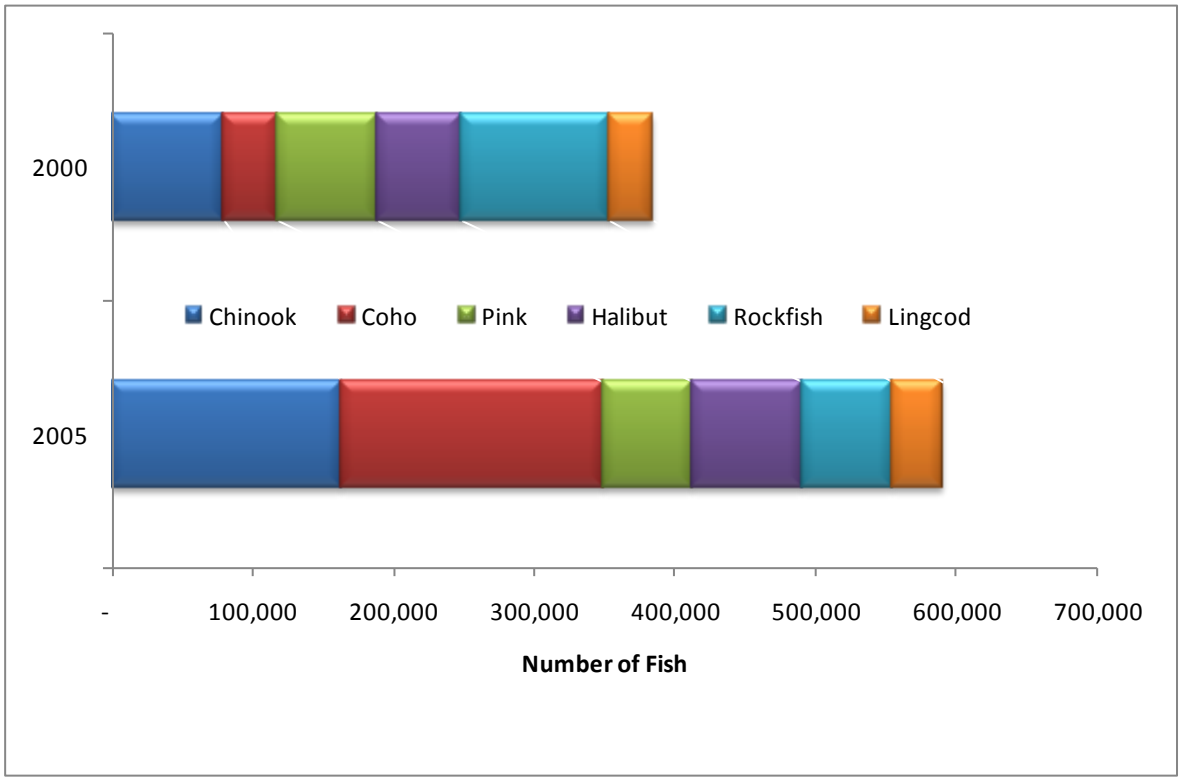
Source: Fisheries and Oceans Canada (2002), (2007)

The sport fish catch in 2005 consisted mainly of salmon, halibut, rockfish and lingcod (Figure 6). Fewer numbers of some species such as pink salmon and rockfish were kept

in 2005 when compared to 2000, but most others saw an increased harvest. The bulk of growth in the 2005 harvest was represented by Chinook, double the 2000 harvest, and Coho, which was almost five times higher than 2000.

In contrast to the finfish harvest, the shellfish harvest declined between 2000 and 2005, from 164,000 kilograms to 141,000 kilograms. The harvest of shrimp and prawns increased slightly, but this was more than offset by a decline in the crab and clam harvests.

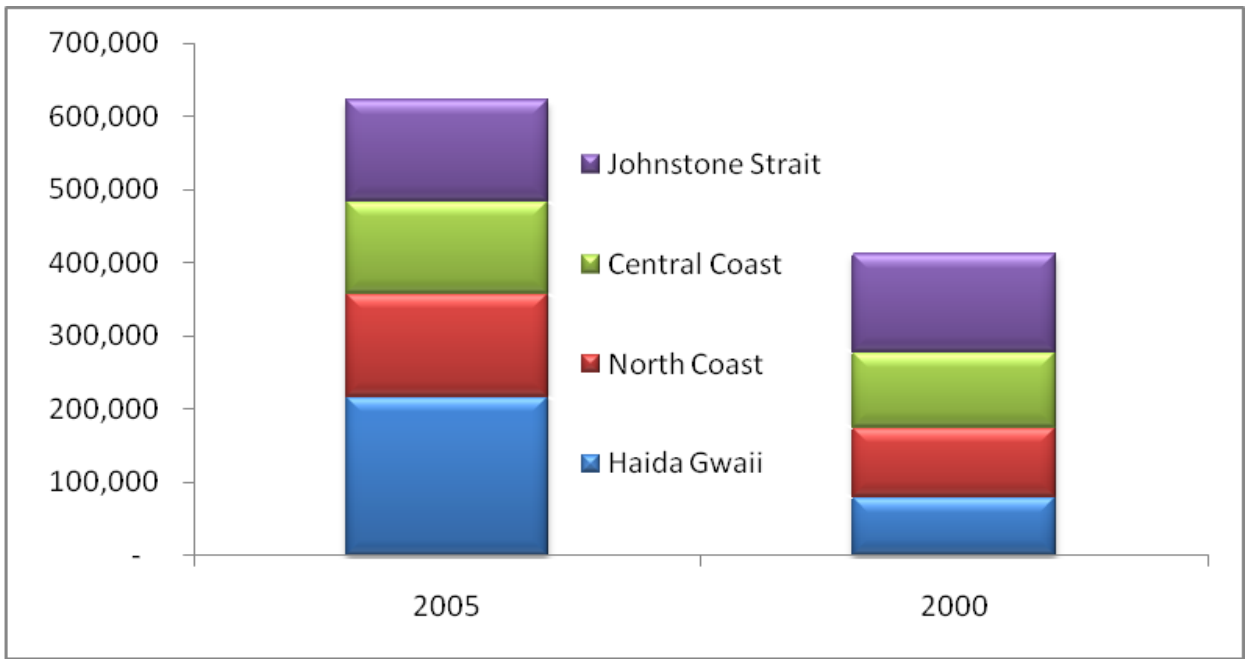
Figure 6 PNCIMA Sport-caught Fish Kept by Species, 2000 and 2005



Source: Fisheries and Oceans Canada (2002), (2007)

The growth in the finfish harvest between 2000 and 2005 was not distributed equally among the four major sub-areas of PNCIMA (Figure 7). Johnstone Strait in fact had a stable harvest between 2000 and 2005, while the central coast (24%) and north coast (46%) showed robust growth. The Haida Gwaii harvest, however, was dramatically higher at 176% because of greater fishing effort and success among resident and non-resident anglers.

Figure 7 Distribution of Kept Fish in PNCIMA, 2000 and 2005



Source: Fisheries and Oceans Canada (2002), (2007)

Expenditures

Data from the 2005 Survey of Sport fishing in Canada shows that PNCIMA accounted for $170 million in tidal sport fishing expenditures, 46.7% of the provincial total. Much of this is attributable to the fishing lodge sector, which is much more prevalent in the study area than it is on Vancouver Island and Strait of Georgia. Approximately 60% of all expenditures are packaged deals made available by the fishing lodges, with the remaining expenditures made on food and lodging (14%), travel (21%), fishing supplies (2%) and fishing services (3%). While all these expenditures grew between 2000 and 2005, it was again packaged deals and the fishing lodge sector that registered the greatest gains (110% versus 75% for total expenditures).

Table 13 PNCIMA Tidal Sport Fishing Expenditures, 2000 and 2005

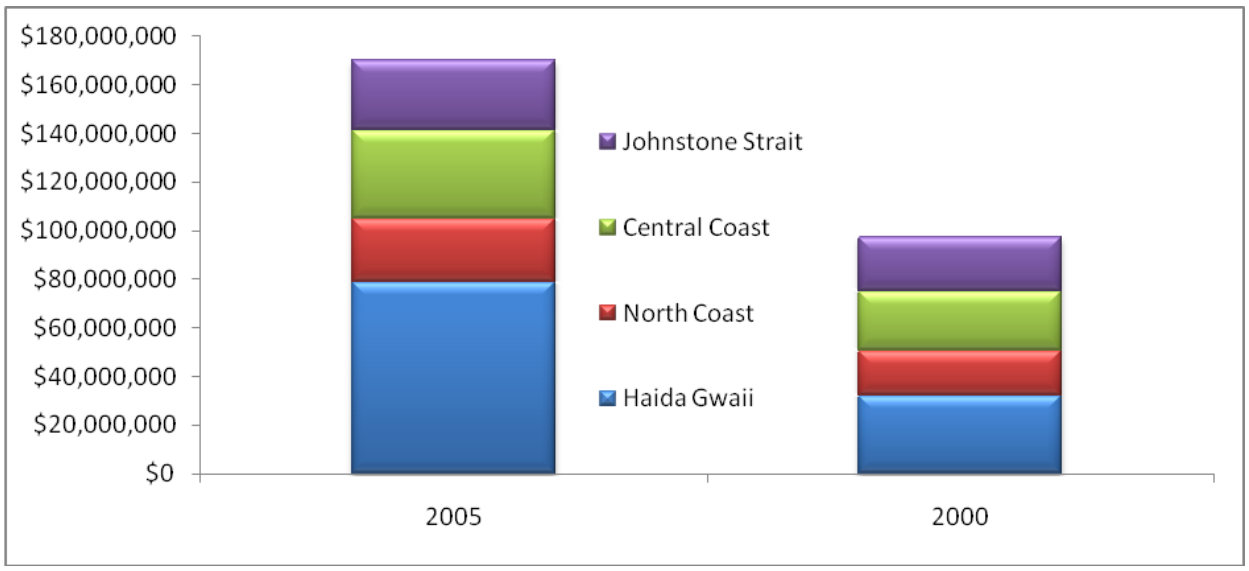
	2005				2000			
$ 1000	Resident	Non-res Can	Non-res Other	Total	Resident	Non-res Can	Non-res Other	Total
Package Deals	24,113	29,891	47,509	101,514	9,237	14,258	24,995	48,490
Food and lodging	9,119	7,114	8,441	24,674	6,498	3,643	7,084	17,225
Travel	20,337	7,597	7,822	35,756	14,665	4,441	5,904	25,011
Fishing supplies	2,443	464	653	3,560	1,982	364	633	2,978
Fishing services	1,734	883	1,844	4,460	1,092	1,007	1,423	3,522
Other	49	85	68	202	61	10	46	118
Total	57,796	46,033	66,337	170,166	33,536	23,723	40,085	97,343

Source: Fisheries and Oceans Canada (2002), (2007)
Notes: Totals may not add up due to rounding.
PNCIMA study area is defined as Haida Gwaii, North coast, Central Coast and Johnstone Strait.
Does not include major purchases and investments.

Average angler expenditures in PNCIMA were $1,737 in 2005. This consists of expenditures by BC residents ($1,223), non-residents from Canada ($2,181) and non-Canadians ($2,239). Whereas the majority of expenditures by BC residents in PNCIMA are for travel, food and lodging, non-residents are much more likely to be purchasing packaged deals.

If packaged deals from fishing lodges represent the bulk of spending in PNCIMA sport fishery, then the spatial distribution of that spending would be correlated with the location of lodge capacity. Figure 8 shows that Haida Gwaii has almost half of all fishing lodges activity, followed by the central coast (Hakai Pass/Rivers Inlet), Johnstone Strait and the north coast. The distribution of expenditures among the regions was more balanced in 2000, although the ranking was unchanged.

Figure 8 Distribution of Expenditures in PNCIMA, 2000 and 2005



Source: Fisheries and Oceans Canada (2002), (2007)

Economic Impacts

BC Stats estimated that the tidal sport fishery in BC generated $467 million in direct output, $134 million in GDP, 4,200 full-time equivalent employment and $88.9 million in employment income in 2005 (Table 14). The impacts attributed to PNCIMA, based on its share of the total tidal sport fish catch and expenditures as previously presented, are estimated to be $187 million in output, $54 million in GDP, full-time equivalent employment of 1,680 and $35.6 million in employment income.

A distinction is made here between benefits flowing to the provincial economy from the sport fishery in PNCIMA (i.e. Table 14) and the benefits actually accruing to PNCIMA communities. In particular, expenditures and the associated benefits of the fishing lodge sector are known to extend beyond the study area, which would result in local impacts being less than those estimated in the table.

Table 14 PNCIMA Tidal Sport Fishing Direct Impacts, 2005

	Expenditures $ millions	Output $ millions	GDP $ millions	Employment Full-time Equivalents	Employment Income $ millions
PNCIMA	170	187	54	1,680	35.6
BC	364	467	134	4,200	88.9

Source: Fisheries and Oceans Canada (2007), BC Stats (2007)

Note: Expenditures estimated from the 2005 Sport fishing Survey do not include capital purchases and therefore would be expected to be lower than the BC Stats output estimates, which originate with the BC input-output model.

Sport Fishery Structure

The sport fishery is comprised of independent anglers and a service industry that produces the angling experience by selling directly to anglers. The service industry is an aggregation of many different services and trade activities, including transportation, accommodation, food and beverage services, boat and sporting goods retail, marinas, charter and guiding services and other recreational services.

In 2007 the British Columbia Ministry of the Environment completed an inventory that included information on the number of businesses supplying services for the BC Fishing Tourism Sector. The results, aggregated by Tourism BC's six tourism regions, are shown in Table 15. A total of 1,576 businesses were documented, well over half of which were in coastal areas. Over one third (36%) of these businesses were supplying services directly related to angling, including guiding, charters, and outfitting, while 22% were furnishing accommodation services and another 16% were retailers. Transportation and miscellaneous services rounded out the industry.

Table 15 Primary Sport Fishing Services Offered by Tourism Region

	VI	VCM	KR	CCC	TO	NBC	Number	% Total
Angling services	47.5%	39.2%	24. 8%	13.7%	13.4%	39.9%	566	35.9%
Accommodations	18.6%	13.6%	6. 9%	57.3%	29.9%	21.0%	339	21.5%
Retail	11.0%	14.3%	34.7%	12.2%	20.3%	17.3%	244	15.5%
Clubs & associations	4.3%	10.1%	16.8%	6.1%	13.4%	7.0%	129	8.2%
Boat / marine services	10.9%	9.3%	2.0%	0.0%	8.0%	2.1%	115	7.3%
Not defined	4.1%	5.5%	10.9%	6.1%	8.0%	7.8%	96	6.1%
Transportation	1.4%	1.8%	1.0%	1.5%	2.7%	2.1%	28	1.7%
Boating services	1.0%	1.0%	1.0%	0.0%	2.7%	0.4%	16	1.0%
Other	1.4%	5.3%	2.0%	3.1%	1.6%	2.5%	43	2.7%
Total	**32.7%**	**25.3%**	**6.4%**	**8.3%**	**11.9%**	**15.4%**	**1576**	**100%**

Source: Tourism BC (April 2009)
Note: VI-Vancouver Island, VCM-Vancouver Coast Mountain, KR-Kootenay Rockies, CCC-Cariboo Chilcotin Coast, TO-Thompson Okanagan, NBC-Northern BC.

In PNCIMA, the last reliable estimate of the number of tourism businesses was conducted during the Tourism Opportunity Studies carried out between 1997 and 2001. As seen in the tourism section (Table 33), 235 operators specialising in sport fishing services were recorded as operating in the North Island, mid coast, north coast and Haida Gwaii during 2000-2001. Many of the other 305 tourism operators in the area would have catered to anglers even though they might not be classified as serving the sport fishery.

Table 16 Tourism Businesses in PNCIMA Study Area, 2000-2001

		CR & PM FD	North Island	Mid Coast	North Coast	Haida Gwaii
Number of unique establishments		211	43	63	67	62
ACCOMMODATIONS	Lodge/Resort	46	9	19	2	12
TOUR OPERATORS	Marine charters, salt	165	34	44	65	50

Source: Economic Planning Group (1997), Clover Point Cartographics (1998, 2000a, b), Marilyn Chisholm & Associates (2001).
Note: 1. CR & PM FD - Campbell River and Port McNeil Forest Districts. Roughly coterminous with the Mount Waddington and Comox-Strathcona regional districts.
2. North Island is equivalent to the Mount Waddington Regional District.

Based on the sizeable expansion of the sport fish harvest and spending by anglers since 2001, we would expect the local industry to have experienced some measure of growth during that time. We know, for example, that the number of fishing lodges today (49) has increased since 2001. For the other businesses serving the sport fishery, expansion has generated more business activity, both in the number of firms but also in the size of firms. However and as previously discussed, because many companies serving anglers in PNCIMA are not based in the study area, this growth may not be manifested in the local business base.

Trends

The base case scenario for sport fishing in PNCIMA will be subject to a combination of demand and supply factors.

Future demand is expected to be a function of participation rates, the cost of fishing, population growth and tourism growth. Fishing licence sales trends show an overall decline in fishing participation in the province going back 30 years. As the average age of the North American population increases, participation is likely to continue declining. Research by the US-based Outdoor Industry Foundation indicates that involvement in outdoor recreation activities decline as a person ages. The life cycle of fishing participants, where youth participation is initially high but declines in adolescence and young adulthood, was very similar to those of other outdoor activities. Still, fishing remains one of North America's most popular outdoor activities (Outdoor Industry Foundation and Boating and Fishing Foundation 2009). Efforts by organizations such as the Freshwater Fisheries Society of BC, which has launched a marketing plan in Non-Tidal waters aimed at increasing the number of adult basic licences and juvenile licences in the province by 30% over the next 10 years by recruiting lapsed and occasional anglers back to the sport, may increase participation and demand in the future. Tourism BC and Environment Canada research has found that the rate of active participation in sport fishing is less than half of interest levels, which indicates a substantial growth potential for the activity.

Overall provincial tidal fishing effort and pressure has shifted from southern coastal waters to the north and central coasts where fishing effort, catches and expenditures are increasing. On the south coast, declining ocean survival rates for some salmon species, increased conservation requirements (Species at Risk Act) and fewer fish have led to new restrictions on Chinook, Coho, rockfish and lingcod, which is pushing more anglers to the mid and north coast where opportunities are greater. Even though the angling experience is more than landing a fish, the opportunity and expectation for success in doing so is still a demand driver for the sport. As costs rise, either because of the increasing effort needed to make a catch, or through greater transportation and leisure time needed to get to areas where success rates are better, the number of potential anglers may decline as their willingness to pay is exceeded.

Communities in PNCIMA have been losing population over the last decade rather than growing—unless this trend is reversed, local demand effects (i.e. from anglers resident in PNCIMA) are likely to be negative.

In contrast, there are few signs that that part of tourism associated with the sport fishery (i.e. non-resident anglers coming to the study area) will not continue to grow in the future. Overall tourism industry growth, coastal BC's status as an international fishing destination, continued lodge investments and marketing, growing community investments in local tourism infrastructure and marketing efforts and better overall fishing opportunities compared to the south coast are expected to stimulate the expansion.

With respect to supply side factors, namely the continued availability of a quality angling experience, is subject to many uncertainties and the effects on the sport fishery remain in question. Environmental conditions including water quality, ocean health, species survival rates and stock levels will be a major factor in determining resource management decisions by government. Disagreements with First Nations and the commercial fishery over the allocation of the catch notwithstanding, the sport fishery is likely to continue generating benefits for the provincial economy that make it one of the leading contributors to the ocean economy in PNCIMA.

First Nations are seeking to become more involved in the industry, with restrictions on certain aspects of sport fishing that some do not agree with (such as catch and release). One example is discussions underway between the Haida and lodge operators about protocol agreements, revenue-sharing, employment and other benefits.

Data Gaps

Data gaps in the sport fishery are in two main areas, catch data and industry structure.

- DFO and the SFAB have a variety of programs for monitoring the recreational catch and are continually evaluating methods for improving data collection and reporting. In-house

estimates from DFO using creel surveys, logbooks, and observations are produced, but only irregularly, for certain management areas and for certain types of angling. This makes assessment of effort across fisheries and regions very difficult. The research is also held in different DFO offices in PNCIMA and any assembly of time series data is administratively difficult as well.

- The survey of sport fishing in BC that is produced every five years by DFO and the provinces has useful, detailed profiles of the sport fishery harvest, effort and expenditures, but may be prone to error due to the long recall times associated with journal reporting. In addition, the 2005 version has yet to publish regional and sub-regional results similar to previous surveys—this limits the application of the research, particularly for compiling regional time series relevant to PNCIMA.
- Like tourism, estimates of the size and structure of the industry serving the sport fishery is unknown, the exception being the fishing lodge sector. The last comprehensive field work is associated with the Tourism Opportunity Studies of a decade ago.
- The fact that many operators active in PNCIMA are not locally based makes it difficult to determine the economic impacts of the industry within the study area.
- The data used for this profile does not reflect the impacts on the sport fishery of more recent economic and industry conditions. The rising Canadian dollar, the 2008 recession, increased border security and declining overnight visits by US residents would collectively suggest declining sport fishing activity and revenues.

Commercial Fisheries

Description

Commercial fishing activity refers to the harvesting of wild finfish and invertebrate species using a variety of techniques, gear types and vessels, for commercial purposes. Several commercial fishing activities take place in PNCIMA and PNCIMA waters also provide important habitat to most of the commercial fishing stocks harvested in British Columbia and abroad. The distribution and fishing effort varies, but overall PNCIMA is a significant catch area for most BC fisheries (J.G. Bones Consulting 2009). The commercial fisheries in this section consider four broad fisheries categories including:

- **Salmon fisheries** (Chum, Pink, Chinook, Sockeye, and Coho);
- **Groundfish fisheries** (dogfish, flounder, hake, lingcod, Pacific cod, Pacific Ocean perch, pollock, rockfish, sablefish, skate, sole, halibut and turbot);
- **Small pelagic fisheries** (herring, mackerel, smelt, eulachon, sardine, anchovy, and other fish); and,
- **Invertebrate fisheries** (clams, crabs, Horse clams, octopus, prawn, scallop, sea cucumber, sea urchin, shrimp, squid, geoduck, and other shellfish).

Collectively, these commercial fisheries categories support the employment and employment income observed for the commercial fishing industry, with the labour force often working in more than one fisheries category.

Issues

Earlier work has identified several challenges in the commercial fishing sector within PNCIMA including (J.G. Bones Consulting. 2009):

- Fishery stock abundance changes due to a combination of factors: changes to harvest strategies and levels, and evolving biological and oceanographic conditions, including climate change effects;
- Potential changes in species type, abundance and distribution due to climate change and ocean dynamics;
- Potential changes of fishing sectors and sector scales as a result of changes in fisheries policy, market values, and global demand for seafood products;
- Potential conflict with other non-fishing commercial and recreational activities such as wind farms and First Nation marine resource interests and rights;
- Competition amongst different allocations and conservation program objectives, including MPA establishment;
- Impact to bottom and sub-tidal habitat associated with bottom contacting harvesting techniques;

- Seabird mortality incurred due to bycatch in longline fisheries, and entanglement in set net fisheries which conflicts with the Migratory Bird Convention Act;
- Incidental take impact caused by some gear-type fisheries on 'non-directed non-commercial' species such as eulachon; and,
- Economic impact of stock declines on fisheries, coastal communities and employment base.

Overall, PNCIMA represents an important component of the commercial fishing resource on Canada's west coast and the implications of concerns and issues in many instances are of provincial significance.

Connection to the Marine Environment

Resource Use

Fisheries and Ocean Canada is responsible for managing marine fish stocks on the Pacific coast of Canada. For the purpose of managing fishing of the Pacific Coasts' various stocks, the Pacific Coast has been divided into segments known as Pacific Fisheries Management Areas (PFMA). Through openings and closures of these Areas to harvesting, DFO is able to manage catch effort on given stocks and species.

Commercial fishing makes extensive use of PNCIMA with twenty-eight of DFO's 48 PFMAs being located within PNCIMA boundaries. PNCIMA includes PFMAs one to 13, 27, 101-111, 127, 130 and 142. These management areas, also called DFO Statistic Areas provide the boundaries within which Fisheries and Ocean manage the Pacific Coasts' commercial fishing activity (Fisheries and Ocean Canada, nd).

Over time, management measures for the commercial fishery have grown to include license limitations, establishment of total allowable catches (TACs), individual vessel quotas, use of fishing area closures (time and area) and implementation of vessel limits for commercial species. In all, these factors have implications on the total fishery effort for specific species in PNCIMA. The PNCIMA Atlas presents 17 maps outlining commercial fishing effort by key fisheries and gear types for PNCIMA (Fisheries and Ocean Canada, nd).

Habitat Significance

Another consideration is the ecological and biological significance of various marine areas in PNCIMA to the overall health of commercial fishing species. The identification of Ecological and Biologically Significant Areas for PNCIMA was completed in two phases. In Phase 1, the identification of Important Areas for many fish species important to the commercial fishing sector was undertaken in 2006 using interviews with field experts and considering relevant literature. Overall, most of PNCIMA serves as Important Areas for the various commercial fish stocks. These are systematically

outlined in the PNCIMA Atlas in a series of five maps outlining Important Areas for specific species (Fisheries and Ocean Canada. nd).

In addition, parts of PNCIMA are important migration corridors, marine rearing and staging areas for juvenile salmon migrating seaward, and adults returning to their coastal watersheds of origin. PNCIMA is occupied for a variable period of time not only by the majority of salmon stocks originating from British Columbia, but also by many populations originating from the states of Washington, Oregon and California.

Importance to Communities

The mobility and variety of the commercial fishing fleet means that the activities associated with commercial fishing is undertaken by a workforce that resides across PNCIMA and coastal region of British Columbia. The largest share of the PNCIMA fishery workforce resides in larger communities in the region including Prince Rupert, Campbell River, and the Lower Mainland outside of PNCIMA. However, most communities in PNCIMA continue to have a portion of their workforce involved in the commercial fishing sector. In addition, some fish stocks such as salmon from PNCIMA will ultimately contribute to the livelihoods of fishers from the United States and other countries.

Current Conditions

Overall, the commercial fishery in British Columbia in 2009 included a harvest of 150.6 million tonnes, with a landed value of $208.5 million (Fisheries and Ocean. nd.). The harvest from PNCIMA makes an important contribution to the overall commercial fishery sector in British Columbia. Current conditions of the various fisheries are summarized in terms of land value, labour force and GDP.

Salmon Fisheries Landed Values

The Pacific salmon fisheries target five salmon species: Chum, Pink, Chinook, Sockeye, and Coho. The salmon commercial fishery utilizes three gear types including troll gear used in the open ocean, seine and gillnet used in the inshore, and terminal fisheries (See Appendix C for detail on gear type, harvest volume, and land value).

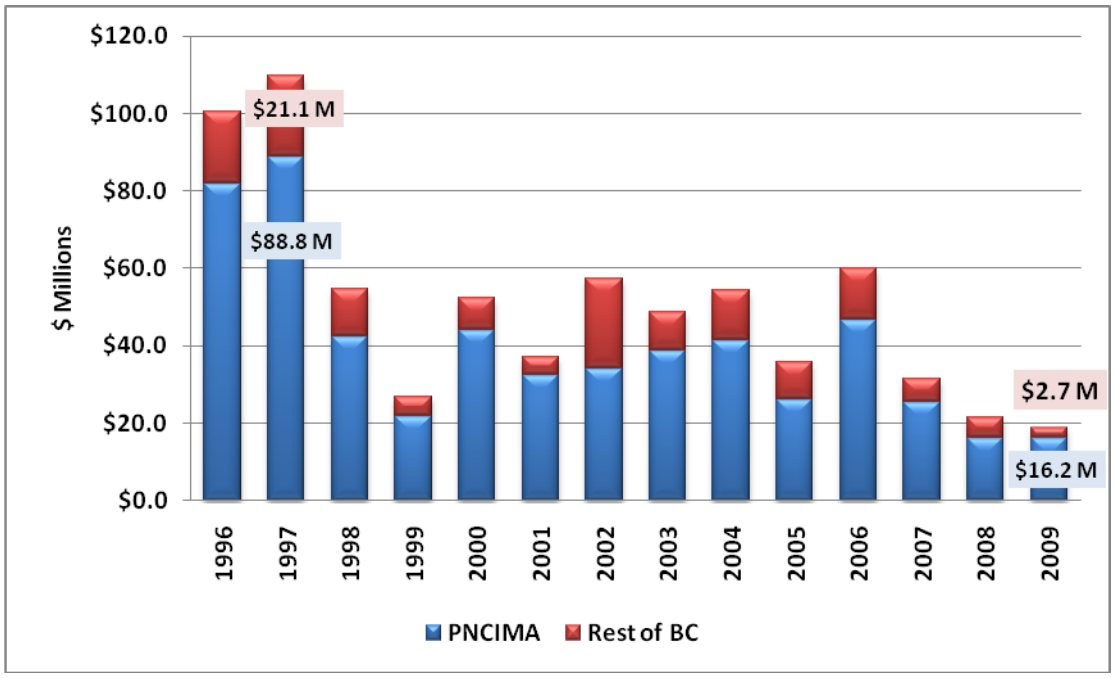
Overall, the total harvest for the period from 1996 to 2009 in PNCIMA area included 306,445.8 tonnes of salmon, of which:

- Chums made up 86,883.0 tonnes or 28.4%;
- Pinks made up 117,813.8 tonnes or 38.4% ;
- Chinook made up 12,331.5 tonnes or 5.2%;
- Sockeye made up 80,421.8 tonnes or 26.2%;and,
- Coho made up 8,995.7 tonnes or 2.9%.

As shown in Figure 9, PNCIMA has represented the major share of the landed value of salmon in the province over the past fourteen years.[21] However, the landed value of salmon has changed noticeably over the past fourteen years for both PNCIMA and the province. In 2009, the total BC salmon fishery made up approximately $18.9 million or 9.1% of the $208.5 million seafood harvest in British Columbia (Fisheries and Oceans. nd).

However, the salmon industry has contributed much larger values in the past, with 2009 representing the lowest landed value in the fourteen years reviewed. The highest landed value was in 1997, when the total landed value of salmon was approximately $109.9 million and made up 28% of the total commercial fishing landed value in that year (Fisheries and Oceans. 2010a).

Figure 9 Landed Values for Salmon Fisheries, 1996 to 2009



Source: Department of Ocean and Fisheries (2010a)

Groundfish, Other Fisheries and Small Pelagic Fisheries Landed Values

As mentioned earlier, the groundfish fisheries are made up of numerous species including dogfish, flounder, hake, lingcod, Pacific cod, Pacific Ocean perch, pollock, rockfish, sablefish, skate, sole, halibut, and turbot. In addition, included here are other fisheries:

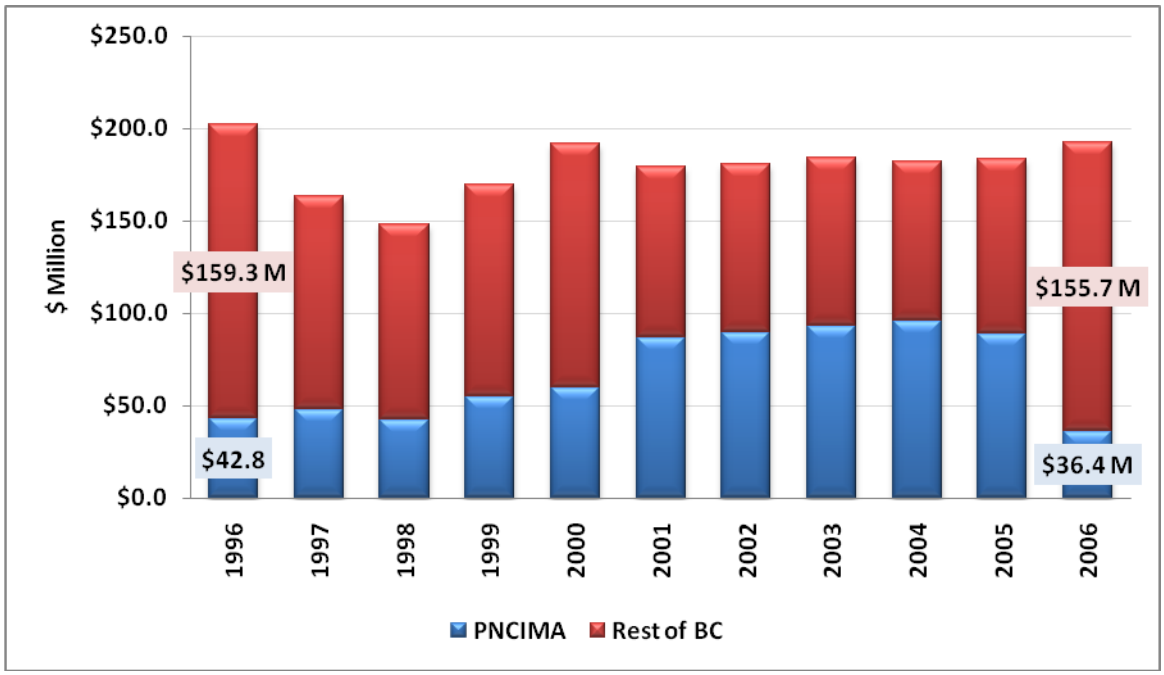
[21] Landed value corresponds to the price paid to the commercial fishers for the whole fish.

mackerel, smelt, tuna and other fish; and the small pelagic fisheries which consist of herring, sardine, anchovy, eulachon, and smelt, with herring being the dominant pelagic fishery.

As shown in Figure 10, PNCIMA has made a sizable contribution to the landed value of the groundfish fishery, other fishery, and small pelagic fishery over the past fourteen years in British Columbia. In 2009 alone, the collection of these fisheries in PNCIMA had a landed value of over $36 million or 19% of British Columbia's total landed value of $192.1 million.

Over the past fourteen years, PNCIMA has made up well over 20% of the landed value of the groundfish, other fisheries, and small pelagic fisheries. PNCIMA's largest contribution was in 2004 when a landed value of $93 million was taken from the region, representing 53% of the total provincial harvest for groundfish, other fisheries, and small pelagic fishery.

Figure 10 Landed Values for Groundfish and Small Pelagic Fisheries, 1996 to 2006



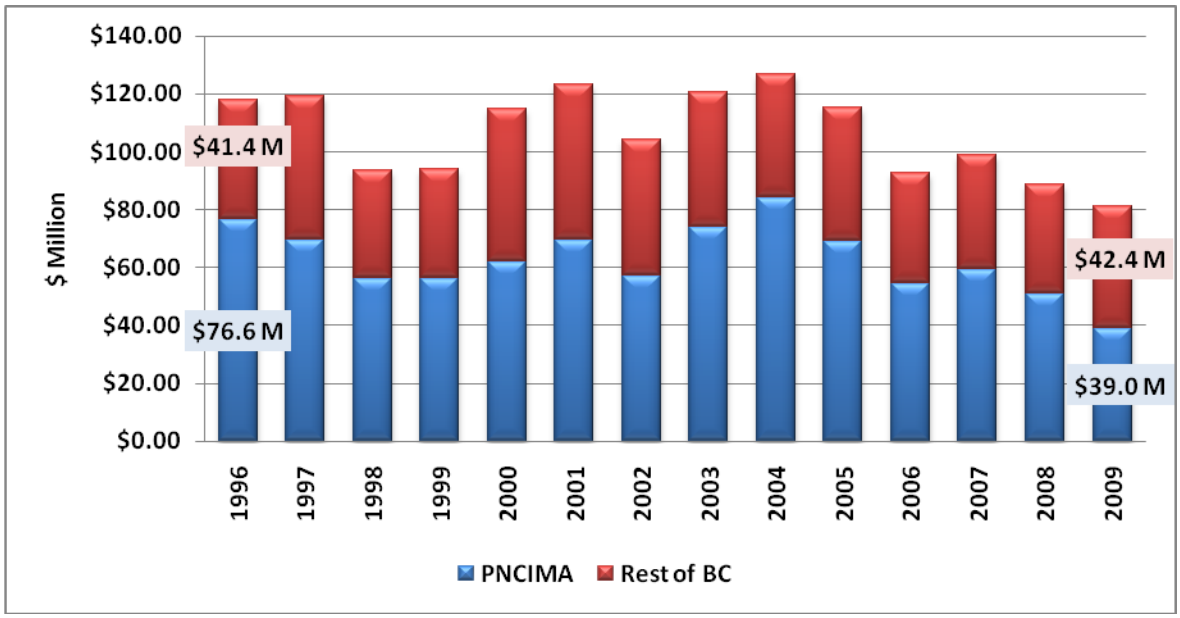
Source: Department of Ocean and Fisheries (2010)

Invertebrate Fisheries Landed Value

The invertebrate fisheries consist of the harvesting of geoduck, Horse clams, intertidal clams, octopus, squid, shrimp, prawn, crab, sea urchin, sea cucumbers, and scallops. In 2009, the total BC invertebrate fishery made up approximately $81.4 million of the landed, value or 39% of the $208.5 million seafood harvest in British Columbia.

As summarized in Figure 11, PNCIMA makes up a significant component of the invertebrate fishery landed value. In 2009, the invertebrate fishery in PNCIMA had a landed value of almost $39 million, or 48% of British Columbia's total landed value of $81.4 million. In addition, in most of the past fourteen years, PNCIMA has made up well over half of the total landed value of the invertebrate fishery. The highest share came in 1996 when the landed value in PNCIMA was $76.6 million, or 65% of the total landed value of the invertebrate fishery in British Columbia.

Figure 11 Landed Value for Invertebrate Fisheries, 1996 to 2009



Source: Department of Ocean and Fisheries (2010)

Of note, PNCIMA's harvest of invertebrates is dominated by the harvest of prawns, geoducks, and Dungeness crabs. For the period summarized in Table 17, the harvest of geoduck, Dungeness crab, and prawns has accounted for over 84% of the total landed value in the invertebrate fishery.

Table 17 PNCIMA Landed Values of Prawns, Dungeness Crabs, & Prawns, 2006 to 2009

	2006	2007	2008	2009
	($ Millions)			
Geoduck	$23.2 M	$23.0 M	$17.9 M	$10.3 M
Dungeness Crab	$9.3 M	$21.2 M	$21.7 M	$12.2 M
Prawn	$13.7 M	$8.4 M	$5.4 M	$10.8 M
Total	$46.2 M	$52.6 M	$45.0 M	$33.3 M
% Share of PNCIMA	84.4%	88.4%	88.5%	85.4%

Source: Department of Ocean and Fisheries (2010)

PNCIMA's Total Landed Value

Table 18 highlights the landed value for all fisheries for the 1996 to 2009 period and illustrates the importance of PNCIMA to the overall commercial fishing sector. A complete data set exists for PNCIMA for the 1996 to 2006 period, and during this period the total landed value of all fisheries from PNCIMA made up between 40% and 61% of the total landed value in the province.

The highest value from PNCIMA came in 2004 when a landed value of $221.8 million was recorded and represented 61% of the total provincial landed value of $363.5 million. Conversely, the lowest year from PNCIMA was in 2006 when the region's landed value was $138.0 million and made up 40% of the total provincial landed value of $345.0 million.

Table 18 Landed Value for Fisheries Categories in PNCIMA and Total BC, 1996 to 2009

	PNCIMA				Total BC				PNCIMA % Share of Total
year	Salmon	Groundfish/ Pelagic	Invertebrate	Total	Salmon	Groundfish/ Pelagic	Invertebrate	Total	
	($ Millions)				($ Millions)				(% of BC Total)
1996	$81.9	$42.8	$76.6	$201.3	$100.5	$202.1	$118.0	$420.6	47.9%
1997	$88.8	$48.2	$69.9	$206.9	$109.9	$163.2	$119.1	$392.2	52.8%
1998	$42.3	$42.3	$56.3	$140.9	$54.6	$147.7	$93.5	$295.8	47.6%
1999	$21.8	$54.9	$56.5	$133.2	$26.9	$169.8	$94.0	$290.7	45.8
2000	$44.1	$59.5	$62.1	$165.7	$52.4	$191.9	$114.8	$359.1	46.1%
2001	$32.4	$87.2	$69.5	$189.1	$37.1	$179.0	$123.4	$339.5	55.7%
2002	$34.2	$89.7	$57.4	$181.3	$57.3	$180.9	$104.0	$342.2	53.0%
2003	$38.8	$93.4	$74.0	$206.2	$48.6	$183.9	$120.6	$353.1	58.4%
2004	$41.4	$96.0	$84.4	$221.8	$54.3	$182.3	$126.9	$363.5	61.0%
2005	$26.1	$88.9	$69.2	$184.2	$35.7	$183.7	$115.4	$334.8	55.0%
2006	$46.8	$36.4	$54.8	$138.0	$60.1	$192.2	$92.7	$345.0	40.0%
2007	$25.4	n/a	$59.4	n/a	$31.6	$141.1	$99.1	$271.8	n/a
2008	$16.1	n/a	$50.9	n/a	$21.5	$115.0	$88.8	$225.3	n/a
2009	$16.2	n/a	$39.0	n/a	$18.9	108.2	$81.4	$208.5	n/a

Source: Department of Ocean and Fisheries (2010)

Economic Contributions

Labour Force

The fishing resource supports the commercial fishing labour force and income in PNCIMA and elsewhere in British Columbia. Table 19 highlights the experienced labour force in 2006 in the commercial fishing sector for each regional district in PNCIMA and the provincial total. Overall, approximately 36% of the provincial experienced labour force in commercial fishing resides in PNCIMA. As illustrated, this represents a labour force of 1,890 in PNICMA.

Table 19 Experienced Commercial Fishing Labour Force, 2006

Jurisdiction	Labour Force	% Share of BC Total
Skeena Queen Charlotte RD	640	12.3%
Queen Charlotte Island	80	
Prince Rupert/Port Edward	480	
Kitimat-Stikine RD	170	3.3%
Nass Valley	70	
Central Coast RD	105	2.0%
Mount Waddington RD	275	5.3%
Comox-Strathcona RD	700	13.5%
Campbell River and Area	255	
Total PNCIMA	1,890	36.4%
British Columbia	5,195	100.0%

Source: Statistics Canada (2006)

Table 20 outlines the experienced labour force at the provincial level, in the Greater Vancouver Regional District (GVRD), and the two larger centres for the commercial fishing labour force in PNCIMA. Overall, the commercial fishing experienced labour force is spread throughout BC's coastal region, with the largest labour force concentration in the GVRD area.

As illustrated, the commercial fishing labour force at the provincial level is 80% men and 20% women. Meanwhile, in Campbell River the participation ratio is 90% men, and in Prince Rupert men make up 71% of the labour force.

Overall, median wages in the commercial fishing industry are lower than the median wages generally observed for all industries in BC. In 2006, the BC median wage for all industries for men was $48,070 and for women it was $36,740. Meanwhile, in commercial fishing the median wage for full-time, full-year of work was $36,870 for men and $32,270 for women.

However, working a full year was somewhat elusive for most of the commercial labour force, with the average of weeks worked in 2006 being 27.8, while the average number of

weeks worked in BC for all industries was 42.5. In addition, it is important to note that there is considerable wage variation across fisheries, with some being more lucrative (e.g., geoduck, sablefish) while others pay significantly less (e.g., trolling these days).

Table 20 Experienced Commercial Fishing Labour Force in BC, 2006

	Campbell River	Prince Rupert	Greater Vancouver RD	British Columbia
Total Commercial Fishing Labour Force	255	480	1,540	5,195
Male	230	340	1,170	4,160
Female	25	145	370	1,035
Average weeks worked in 2005	26.4 wks	32.5 wks	28.2 wks	27.8 wks
Median Income for full-year, full-time work				
Total	$45,300	$40,175	$39,570	$36,575
Male	X	$41,685	$40,150	$36,870
Female	X	X	$30,640	$32,270

Source: Statistics Canada (2006)

Fishers' Registration Card

The Fishers' Registration Card (FRC) is required by any individual who wishes to participate in the commercial fishery. Because the period during which it is possible to commercially fish is limited by the stocks or fishery regulations associated with openings and closures, some of the people who work in the fishery are not able to earn a living at this activity year-round (BC Stats. 2007). Therefore, the FRC likely provides a more accurate reflection of the total participating labour force than the Statistics Census labour force numbers.

The FRC numbers are reported in Table 21 and indicate the maximum number of participants in the commercial fishing sector. For example, the PNCIMA and BC experienced labour force from the Census is smaller than the FRC recorded in 2006 likely because not all those acquiring registration cards identify commercial fishing as their primary occupation (a required condition in the Census). The annual number of FRCs provides a trend in participation. Over the period from 2004 to 2008, the total number with an FRC has steadily declined both within PNCIMA and at the provincial level.

Table 21 Fishers' Registration Cards Numbers, by Regional District in PNCIMA, 2004/09

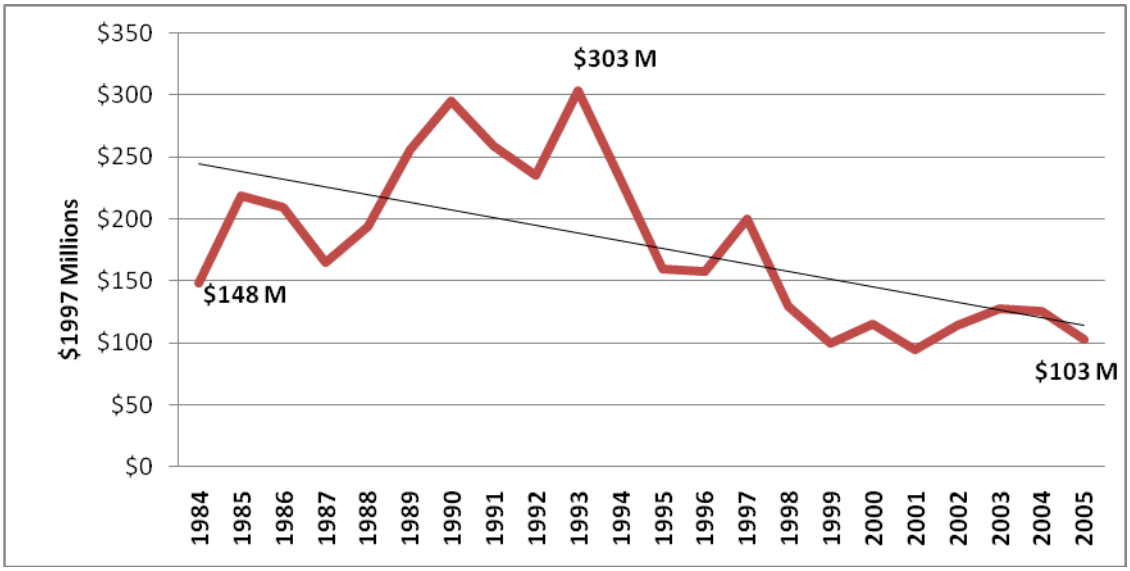
Regional Districts	2004	2005	2006	2007	2008	% Change
Skeena-Queen Charlotte (QCI Portion)	141	106	99	92	86	-39%
(Mainland Portion)	887	854	798	753	679	-23%
Kitimat-Stikine	63	51	35	42	33	-48%
Central Coast	152	139	144	162	118	-22%
Mount Waddington	438	421	384	313	292	-33%
Strathcona	555	533	514	405	345	-38%
Total PNCIMA	**2,236**	**2,104**	**1,974**	**1,767**	**1,553**	**-31%**
Total BC	**8,421**	**7,741**	**7,543**	**6,614**	**5,912**	**-30%**
PNCIMA Share (%)	26.6%	27.2%	26.2%	26.7%	26.3%	

Source: DFO (2010)

Gross Domestic Product

Figure 12 reports the real gross domestic product (GDP) for the commercial fishery in British Columbia between 1984 and 2005. Over this period, the commercial fishery GDP has ranged between $303 million and $103 million ($1997) with the long-term downward trend for the sector and a decline in its share to the overall contribution to the provincial economy. Assuming that GDP is distributed in proportion to landed value, PNCIMA's contribution in 2005 was in the order of $57 million.

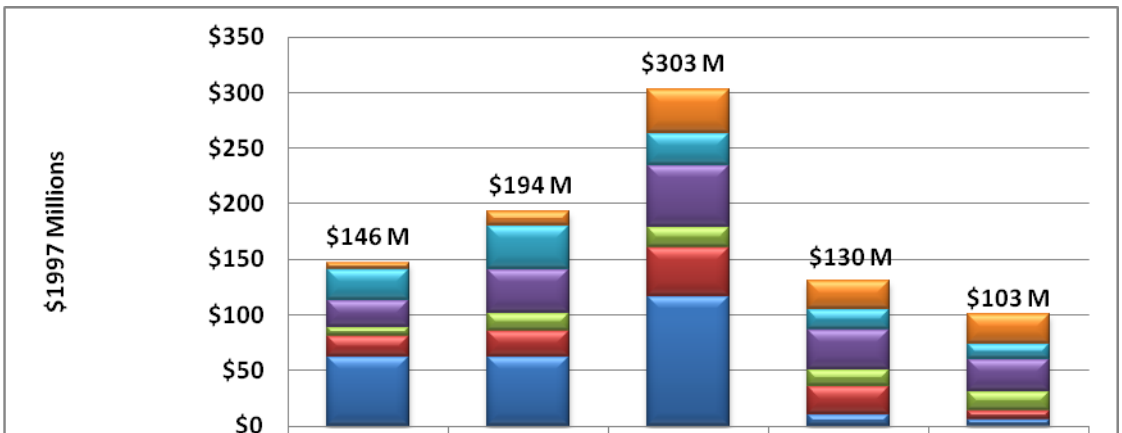
Figure 12 Real GDP for Commercial Fishery, 1984 to 2005 ($1997 Millions)



Source: BC Stats (2007)

Figure 13 highlights the GDP breakdown by specific fishing categories for selected years between 1984 and 2005.

Figure 13 BC Commercial Fishing GDP By Fisheries Categories, 1984 to 2005



	1984	1988	1993	1998	2005
Other	$6	$13	$39	$26	$27
Geoducks & Clams	$28	$39	$29	$18	$14
Groundfish	$24	$39	$56	$36	$29
Halibut	$8	$16	$18	$15	$17
Herring	$19	$24	$44	$25	$8
Salmon	$62	$62	$117	$11	$6

Source: BC Stats (2007)

As illustrated above, while the trend for total GDP is a decline, this is mostly attributed to decline in salmon and herring, while several other fisheries have maintained their contribution or increased in value over the period.

Trends

The Workshop identified several specific trends in the region including:

- Given the challenges within the commercial fishing industry in PNCIMA, there are no new workers entering the sector resulting in the loss of the next generation of fishers and boaters, impairing the transfer of skills and disconnecting the local industry and communities from the fishing resource over time.
- Already the number of people participating in commercial fishing is significantly reduced, and coastal communities have started to lose their connection to the ocean and its resources.
- Ocean health in general and within PNCIMA is becoming more of an issue. Already the region is seeing different fish species that threaten wild salmon stocks and if this continues will create impacts on salmon stocks. This trend may also impact other fisheries as well over time, but at the same time may create new fishery opportunities.

Work undertaken for DFO highlights some of the trends the commercial fishing sector in PNCIMA and the Pacific Coast face looking at issues of globalization (Nelson Bros Fisheries Ltd 2007). Specifically:

- Globalization, combined with shifting ocean conditions and evolving fishery management philosophy, has created challenges effectively crippling the salmon and herring sector in Canada's Pacific fishery. Yet over the same period, this very business and resource environment has provided opportunities allowing other Pacific fisheries, specifically groundfish and invertebrate fisheries, to grow and flourish.
- The salmon sector, unable to cope with the pace and scope of the change facing it, has suffered. A substantial fleet rationalization program reduced the eligible licenses by 50% over the period from 1996 to 2000, but failed to restore viability.
- The groundfish and invertebrate sectors have featured many successes. Part of the success is attributed to BC's endowment of species that are in strong demand in global markets: sablefish and prawns in Japan, geoducks in China, fresh groundfish fillets in the USA, and Dungeness crab throughout the world. Much of the success is because these BC participants have positioned themselves to benefit from opportunities presented by globalization, while weathering its challenges.

Data Gaps

The Workshop identified several gaps that the current work was not able to address. These gaps include:

- Information that includes the boundary of the 200 mile limit and allows for the capture of the full ecosystem and resource use will ensure a fuller understanding of the value of commercial fishing to the region.
- An understanding of the shift within the commercial fishing sector and investigating: fleet ownership, licenses owned out of the local area, reduction in crew size, aging in fleet ownership, reduction in flexibility in harvesting to get a better understanding of the socio-economic transition in the PNCIMA communities and the future for the fishing industry in the region.
- A deeper look at the indirect and induced employment and spending associated with the commercial fishing sector to PNCIMA communities. Expanding the understanding of how the revenue from the commercial fishery circulates in PNCIMA.
- Timely and complete access to commercial fisheries data at a scale that is useful for specific planning areas is often difficult to assemble.

Ocean Recreation

Description

Marine Recreation versus Tourism

Marine recreation includes activities attributable to residents and non-resident (i.e. tourist). Resident recreationists represent an induced effect on the tourism industry in that spending derives from some direct or indirect source of income (e.g. the resident logger who boats in the area). The tourist, however, represents economic base activity because spending is equivalent to an export of goods and services and therefore creates community wealth. Generally speaking, recreation profiles and impact assessments will attempt to distinguish between these two groups based on how they are affected by marine resource management policies and decisions. In brief, a change in tourism activity attributable to those decisions will represent an equivalent gain or loss in the local economy, whereas a change in resident recreation activity will often, but not always, result in a transfer of spending within the region, with no anticipated loss to the local economy.

BC Stats defines a tourist as a person who travels to, or stays at, a place outside his/her usual environment for a period of no more than a year. Business and pleasure travel are included. Tourists do not have to travel far from home, or stay away overnight – they can include day-trippers, as well as people making longer excursions (BC Stats 2008b). Anyone who travels more than 80 kilometres from home is considered a tourist, while a

person travelling less is classified as a resident (BC Stats 2007). All recreation activity undertaken by visitors not living in the PNCIMA study area or the five adjoining regional districts is therefore considered tourism.

The majority of indicators used to measure recreation activity do not differentiate between resident and non-resident participants (according to our definition above). Some activities such as guided sport fishing and whale watching (i.e. all commercial recreation services for which a fee is paid), as well as cruise ships and lodge activity can be attributed to tourism, but others such as kayaking and diving are more difficult to separate. The absence of total use activity estimates for kayaking, boating, wildlife viewing, diving and general recreation is a data gap that precludes the quantification of resident and non-resident components anyway. Even so, we believe that the majority of recreation activity is accounted for by non-residents, and though this can only be anecdotally substantiated, we will treat those activities as tourism-related in this profile.

Key Activities

Most tourism in the study area does not entail the direct use of the ocean as a recreation input. We know from visitor surveys that the majority of travellers, including those using the ferry system as a means of transport, are on highway tours, conducting business or visiting friends and relatives. Activities like beachcombing, swimming, surfing, hiking, wildlife viewing and sightseeing may be pursued by these travellers, and the ocean setting may be integral to the overall visitor experience, but ocean recreation per se would not be the trip purpose. In fact, only a small percentage of visitors are in the region primarily to pursue ocean-based activities.

The ocean recreation component is composed of five major activities in PNCIMA. A brief description of each follows.

- **Cruise ships** – The Alaska cruise industry, the world's third busiest, features two major itineraries of 7 and 10-day cruises, the first from US ports (usually Seattle and San Francisco) and the second from Vancouver. The US cruises make one port call in Canada, primarily Victoria, with lesser numbers visiting Prince Rupert and Campbell River. The large majority of Vancouver-based cruises travel direct to Alaska and will not make another port call in Canada. A 3 and 4-day cruise product is now being marketed out of Vancouver—it does include calls at the other BC ports, primarily Nanaimo. Finally, small expedition ships (pocket cruises) will make numerous calls on their itineraries at small ports, as well as the major cruise destinations. In 2009, the cruise industry in BC generated $704 million in cruise-related expenditures, 5,639 full-time job equivalents, $255 million in employment income and $35.4 million in direct business taxes (Cruise BC 2009).
- **Recreational boating** – Recreational boating encompasses powerboats and sailboats conducting their activities in a marine environment. Participants may undertake these

activities on a single-day or multi-day guided or unguided basis. Infrastructure such as public docks, boat launches and repair facilities are important supporting features. Linked activities may include swimming, fishing, scuba diving, sightseeing, or wildlife viewing. A study of the BC boating sector (Genesis 2007) estimated recreational boating expenditures in 2006 of $2.7 billion, generating over $1 billion in GDP, 19,300 jobs, $705 million in employment income and $380 million in government taxes.

- **Kayaking** - Sea kayaking is a mode of transport that allows participants to view the marine-terrestrial interface at a more leisurely pace than via motorized transport. The activity can be undertaken as a guided or unguided single or multi-day excursion. Staging areas are characterized by public docks, boat launches, huts, motherships and shuttling services. Linked activities include bird watching, whale watching and other wildlife viewing, camping, hiking, swimming and beach activities, fishing and marine cruising. A 2006 survey of the BC Kayak companies (TBC December 2007) found that this sector guided 70,000 visitors in 2005, generating $11.3 million in tourism revenues. Haida Gwaii and Broughton Archipelago were popular areas in PNCIMA.
- **Whale watching** – Whale-watching is a major part of the eco-tourism or adventure tourism industry, measured by revenues earned. It focuses on non-consumptive observation and education of whales but also includes other features such as local flora, fauna, culture and geology. Although whale watching may be ancillary to activities such as hiking, sightseeing, kayaking or boating, it is the guided sector that accounts for the majority of participation. The duration of the excursion varies from hours to multiple days.
- **Diving** - British Columbia resident and non-resident participating in this activity must either be certified divers or non-divers involved in first-time certification courses. They can be either independent or private divers who purchase or rent equipment and transportation, or they can guided as part of an organized commercial tour, in which case the tour operator does the outfitting and transport. The diving experience for both user groups ranges from half a day to multiple days in duration. A 2004 study of the BC dive industry (Ivanova 2004) found that 116 dive operators served about 25,000 divers, with gross expenditures on services and equipment of approximately $15 million. This would place diving on a similar economic footing as kayaking.

Angling is an outdoor recreation activity profiled separately in this report because of its importance and frequency of participation.

Issues

The following issues were drawn from the workshop comments, literature review and personal communications. They may not be an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile.

Ocean recreation is sensitive to two major influences, general economic conditions that underlie participation in ocean activities, and resource use conditions that determine both the nature and the quality of the recreation experience. The following major issues are noted:

- Current recessionary conditions are adversely affecting tourism, with some activities such as cruise ship visits hit particularly hard;
- Coastal communities have relatively narrow tourism bases and their ability to capture more tourism spending and diversify their economies is limited by the following:
  - Declining populations;
  - Relatively narrow tourism/recreation seasons;
  - High proportion of out-of-region operators, which means that jobs, incomes and profits deriving from local resources do not all accrue to local communities;
  - Lack of business resources including market awareness, capital and market-ready product;
  - High transportation costs to get to the region;
  - Inadequate infrastructure.
- Carrying capacity and the quality of the visitor/user experience are becoming issues in high use areas. The BC Coast remains an iconic destination for many ocean recreation activities, but our understanding of how these might be affected by overuse or mismanagement of the resource is not clear. This is a multi-dimensional problem where different trends and developments are interacting:
  - Conflicts between resident recreationists and commercial recreation operators;
  - Conflicts between different forms of recreation;
  - Conflicts between tourism/recreation and other industrial uses, including forestry, energy development (e.g. proposed wind farms, transmission lines) and aquaculture;
  - Community and foreshore development that impinges upon activity areas;
  - Adverse affects on the marine environment and wildlife by tourism operators and recreation users (noise, disturbance, pollution).

Connection to the Marine Environment

Resource use

The PNCIMA study area is a popular location for nature-based recreation activities by residents and non-residents (i.e. visitors). The linkage to the marine environment can be through the direct or indirect use of water as a recreation resource, as a means of transportation through, to and from recreation areas, or both. The majority of visitors, even though they may be using the marine environment as a means of transportation, do not directly engage in ocean recreation. They are highway touring, visiting friends and

relatives, conducting business, experiencing First Nations culture or participating in various forms of community or land-based experiences. Even for these individuals, however, the marine environment may be essential to overall experience or setting.

For recreation activities that directly involve the use of the marine environment, the linkages are direct and fundamental to the experience. This applies not just to the primary activity itself but to secondary pursuits. According to Tourism BC, the most popular secondary activities among Canadian and US kayak, whale watching, scuba diving and boating visitors were sunbathing or sitting on a beach, swimming in the ocean, and wildlife viewing other than whales (Tourism BC 2009). For many of these participants, therefore, the ocean is essential to the entire experience and not just part of it. Lastly, most ocean recreation is unique in that it cannot be substituted with comparable experiences in different environments.

Use areas and communities

As noted in Map 6, PNCIMA has clusters of marine recreation infrastructure including anchorages, docks, marinas, repair and fuelling businesses, campgrounds and parks that support ocean recreation activity.

As noted in the Marine Transportation section, summer cruise ship traffic transits Hecate Strait and to a lesser extent the Inside Passage with Prince Rupert receiving a small percentage of the total number of passengers as a port-of-call. BC Ferries, which serves as an important transportation service for coastal marine recreation, connects most communities on the coast.

Recreational boating occurs through the study area, but is concentrated near larger population centres where there are available services, infrastructure and land transportation links, including Northern Vancouver Island communities and Prince Rupert.

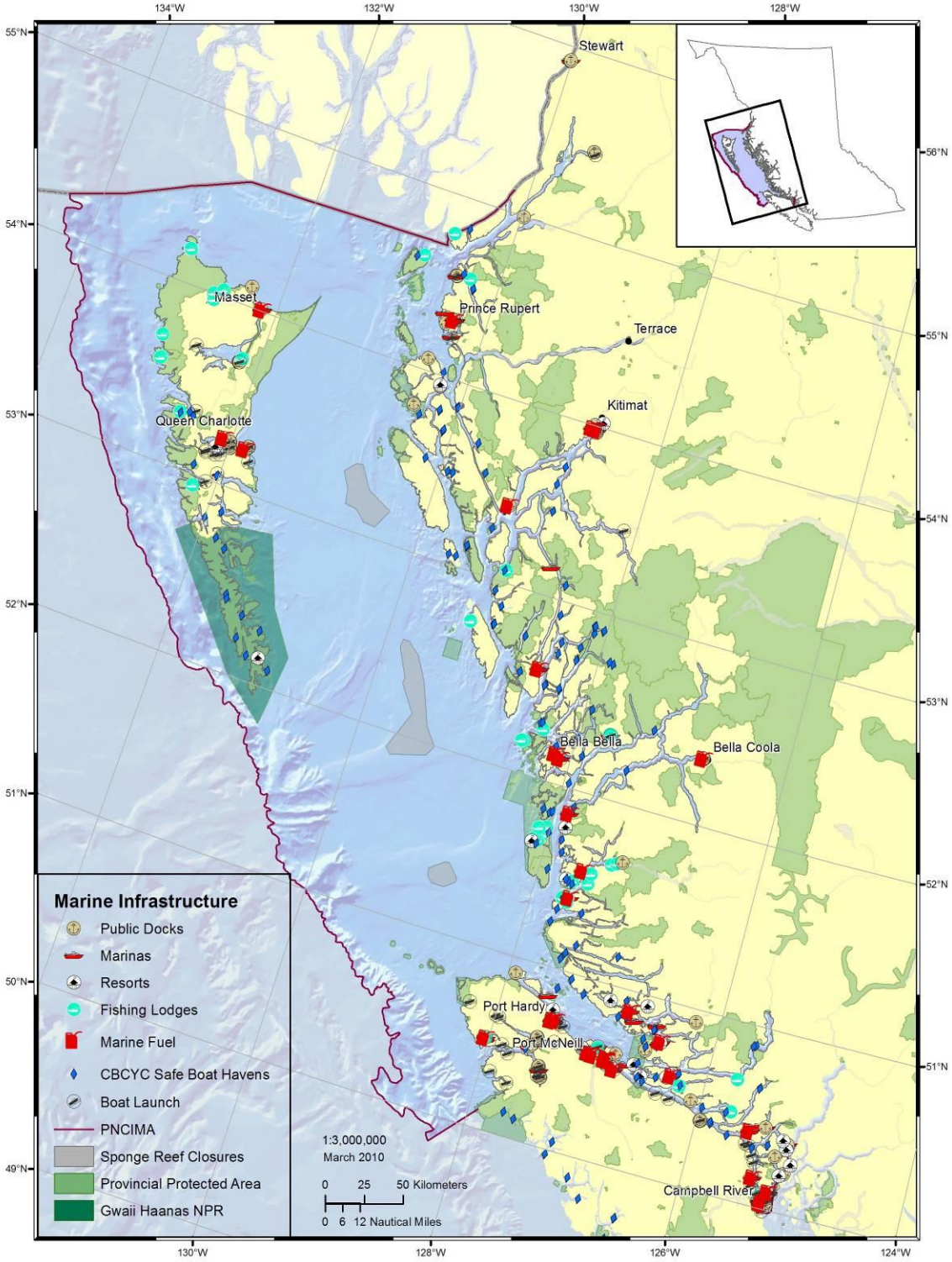
High use kayaking areas in PNCIMA include the well-known destinations of Haida Gwaii and Johnstone Strait which are able to offer diverse marine values, scenery, wildlife viewing and First Nation culture. Many parts of the study area are not attractive for kayaking, due to remoteness, exposure or lack of other recreation features, however the availability of tours, charters and BC Ferries services have made it possible to access virtually any area of the coast.

Participation in whale watching and wildlife viewing can occur as part of some other primary recreation activity such as boating or kayaking, or it can be a commercial service, such as that offered by whale watching tour operators. There are tour operators based in Prince Rupert, Telegraph Cove and Campbell River while some coastal lodges

will also offer tours, including bear viewing. Wildlife viewing is also a big part of most tours in Gwaii Haanas.

BC is recognized as one of the world's top cold-water dive destinations for its abundant and diverse marine life, relatively healthy marine environment and challenging dive opportunities. Dive areas are accessed by private transportation, shuttling services or tour operators. Resort lodges may also offer diving services. Browning Pass (Browning Wall and Hunt Rock), Stubbs Island, Cormorant Channel and Hakai are popular destinations within PNCIMA.

Map 6 Recreation Infrastructure and Features in PNCIMA



Sources: BC Marine Conservation Analysis, Parks Canada and BC Integrated Land Management Bureau (2010)

Seasonality

Tourism and recreation in PNCIMA is highly seasonal and will vary according to the activity pursued. Accommodation revenues on Northern Vancouver Island and the north coast are concentrated in the peak summer months, as noted in Table 22. Other measures such as ferry traffic, cruise ship visitation and visitor centre attendance confirm the importance of the late spring and summer months. Individual activities such as boating, whale watching, kayaking and lodge activities are also concentrated in the peak season due in part to more favourable weather conditions. All activities, however, can be conducted year-round.

Table 22 Room Revenues, 2008 ($000)

	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Total
Vancouver Island	50,595	89,572	137,631	52,385	330,182
	15%	27%	42%	16%	100%
Mount Waddington	1,050	1,709	3,926	980	7,665
	14%	22%	51%	13%	100%
Northern BC Tourism Region	33,252	38,490	49,584	34,612	155,938
	21%	25%	32%	22%	100%
Skeena-Queen Charlotte & Kitimat Stikine	4,106	7,611	11,924	4,357	27,997
	15%	27%	43%	16%	100%

Source: Tourism BC (2010b), (2010c)
Note: Data not available for central coast.

Current conditions

The spending of visitors and residents on ocean recreation in BC supports thousands of businesses and employees in coastal communities. Tourism is one of the province's leading economic drivers, generating $13.8 billion in spending, $6.6 billion in gross domestic product (GDP), 131,000 person-years of employment and $4.7 billion in wages and salaries in 2008 (Table 23). Individual communities vary somewhat in their dependence on tourism, from a low of 4% in Kitimat-Terrace to 11% on Haida Gwaii. As other resource sectors such as commercial fishing and forestry decline on the coastal, tourism has the potential to contribute an increasing share of the economic base to help stabilize and grow communities.

Table 23 Summary of Tourism Indicators

Revenue[1]	GDP[1]	Employment[1]	Wages and Salaries[1]
$13.8 billion	$6.6 billion	131,000	$4.7 billion

Total Community Income (%)[2]	Alert Bay (5%)	Central coast (7%)	Prince Rupert (8%)
	Port Hardy (5%)	Kitimat-Terrace (4%)	Haida Gwaii (11%)

Source: Tourism BC (2009a), BC Stats (2009)
Notes: 1. BC, 2008
2. 2006

Market characteristics

The BC tourism industry drew 9.6 million visitors in 2008 from inside the province, elsewhere in Canada and internationally. The distribution of spending as seen in Table 24 shows key markets in order of size to be BC, US, Alberta, Asia/Pacific, Europe and Ontario. North American markets represented 75% of total visitor volume and 72% of all visitor spending in 2008.

Visitor studies are not available for the study area to tell us how markets there might differ from the provincial averages presented in Table 24. The only small-area visitor study conducted in recent years was in the summer of 2007 for Prince Rupert (Tourism BC2008). It showed the market origin of visitors to be 79% North American and 21% overseas, comparable to the province though with a slightly higher proportion of domestic versus international travellers.

Table 24 Visitor Volume and Expenditures in BC by Market Origin, 2008

Visitor Volume				Visitor Expenditures			
Canadian	9.6 million	Intern'l	4.5 million	Canadian	$4.1 billion	Intern'l	$3.6 billion
BC	71%	USA	67%	BC	51%	USA	46%
Alberta	20%	Europe	14%	Alberta	27%	Europe	24%
Ontario	5%	Asia/Pacific	17%	Ontario	13%	Asia/Pacific	26%
Prairies	3%	Other	2%	Prairies	5%	Other	4%
Other	1%			Other	4%		

Source: Tourism BC (2009a)

To better understand what motivates visitors to come to this province, Tourism BC in cooperation with the Canadian Tourism Commission, conducted an extensive survey of Canadian and US travel patterns in 2006. The research presented in Table 25 provides analysts with a much better understanding of how ocean recreation factors into trip planning, and more importantly, the extent to which travellers participate in those activities once they arrive in the province.

Water-based activities motivated the largest number of trips to BC for both US and Canadian travellers, followed by land-based activities, theme/amusement parks, exhibits/historic sites/museums, festivals and events and the performing arts. When asked what activities they participated in during their trips, water-based activities, at a 54% rate, ranked fourth place (out of 13 major activities) after shopping/dining/food, land-based activities and exhibits/historic sites/museums. The market data show that water and the ocean environment are key features that attract visitors to the province and form an integral part of their experience once they are here.

Table 25 Activities on At Least 1 Out-Of-Town Pleasure Trip To BC in 2004-05

	Participate			Motivate		
	US (#)	CND (#)	TOTAL	US (#)	CND (#)	TOTAL
Total	170,510,241	18,439,508	188,949,749	170,510,241	18,439,508	188,949,749
Shopping/Dining/Food Related	137,592,588	15,555,074	153,147,662	24,261,252	2,942,092	27,203,344
Land-based Activities	99,661,556	12,456,548	112,118,104	42,958,231	5,493,886	48,452,117
Exhibits/Historic Sites/Museums	94,778,928	10,926,982	105,705,910	31,705,596	3,230,458	34,936,054
Water-based Outdoor Activities	90,788,938	12,168,205	102,957,143	44,499,135	6,254,055	50,753,190
Theme /Amusement Parks	91,738,527	8,731,962	100,470,489	41,735,992	2,886,567	44,622,559
Festivals and Events	72,385,317	8,236,410	80,621,727	26,587,563	2,957,867	29,545,430
Performing Arts	67,336,843	8,234,267	75,571,110	25,608,847	3,282,096	28,890,943
Team Sports/Tournaments/Games	31,493,144	4,039,679	35,532,823	10,576,356	1,653,200	12,229,556
Winter Outdoor Activities	20,776,969	5,596,081	26,373,050	13,323,324	3,156,741	16,480,065
Hands-On Learning Activities	16,258,318	2,483,836	18,742,154	5,181,890	684,822	5,866,712
First Nations Experiences	14,641,128	2,139,302	16,780,430	4,552,422	532,032	5,084,454
Amateur Sports Tournaments	12,304,917	2,086,896	14,391,813	6,284,449	1,059,132	7,343,581
Air-Based Activities	2,379,368	207,529	2,586,897	950,714	65,745	1,016,459

Source: Tourism BC (2009b)

The Tourism BC studies also provided some demographic insights into visitors to BC, including profiles for individual activities. Table 26 shows the number of participants and other demographic characteristics for six activities that are prevalent in PNCIMA study area. Although only "typical" profiles are cited, some general conclusions about participants can be drawn. First, visitors participating in ocean activities tend to be younger than the general leisure traveller. Second, US travellers appear to be older on average than their Canadian counterparts. Third, females are just as likely as males to participate in ocean recreation. And fourth, those participating in the different ocean activities have remarkably consistent income (wealthy), education (well-educated) and household composition (adult couples with no children) profiles.

Cruise ship travellers were not included in the above studies, and we know from cruise activity reports that their demographics are in fact much different than those presented in Table 26. The vast majority of Prince Rupert cruise ship passengers were from the United States (97%), only a few were from overseas (2%), other Canadian provinces (0.9%) or British Columbia (0.2%). Only 16% of cruise ship passengers were under 35 years old, while half were 51 years of age and older. (Tourism BC 2008)

Table 26 Market Demographics of Sector Tourists with Recent Pleasure Trips to BC

	Leisure Touring		**Ocean Activities**		**Wilderness Lodge**	
	Can.[1]	**US**	**Can**	**US**	**Can.**	**US**
No. participants[2]	2,763,250	7,025,878	3,079,726	n/a	464,977	769,476
Typical visitor						
Gender	Female	Male	Female	n/a	Male	Male
Age	45-54	65+	30-44	n/a	18-34	45-54
Household income	>$100,000					
Education	Post-sec. grad					
Household Comp.	Adult only					

	Sea Kayaking		Diving/Snorkelling		Whale Watching	
	Can.	US	Can.	US	Can.	US
No. participants	330,479	483,876	1,016,386	1,766,690	887,966	2,062,731
Typical visitor						
Gender	Female	Male	Male	Male	Female	Female
Age	18-34	18-34	18-34	45-54	18-34	55-64
Household income	>$100,000					
Education	Post-sec. grad					
Household Comp.	Adult only					

Source: Tourism BC (2009b)

Notes: 1. Canada excludes BC residents
2. Overnight trips to BC in two-year period 2004-05

Visitation and Expenditures

There are no reliable estimates of current visitation and recreation use in PNCIMA area. The absence of wide-area visitor exit surveys—Tourism BC has not conducted a comprehensive visitor study for the province for the last 12 years—is one reason for this. Another reason is that statistical agencies, including Tourism BC, now prefer supply-side modelling using Tourism Satellite Accounts (TSA) for determining the value of tourism. Unfortunately, regional and sub-regional aggregations of this data are not provided so estimates of tourism activity in PNCIMA study area by this method are not available. The TSA collects data from tourism-related establishments so theoretically it might have been possible to estimate PNCIMA tourism if we knew the regional share of tourism businesses in relation to the province. However, the establishment data compiled for the

three Tourism BC travel regions[22] overlapping the study area cannot be easily disaggregated and then recombined to provide a proportional share of total provincial establishments. The only reasonably reliable indicator that is available at the sub-regional level, within the resources of this study, is room revenues, which BC Stats publishes for all regional districts and some municipalities.

In 2007, 14.6 million people visited BC and spent $13.3 billion (Tourism BC 2009)[23]. We estimate between 2% and 2.3% of that visitor volume and spending would be attributable to PNCIMA based on room revenue proportions appearing in Table 27.

Table 27 Room Revenues in BC and PNCIMA Study Area, 2001-2008

	2001	2002	2003	2004	2005	2006	2007	2008
BC Total ($000)	1,474.2	1,506.4	1,485.7	1,591.0	1,688.3	1,815.3	1,967.9	1,977.4
Strathcona[e]	3.4	3.5	4.0	4.1	4.4	5.3	6.1	7.6
Mount Waddington	5.3	4.9	5.6	5.4	5.7	6.4	7.5	8.2
Central Coast	1.4	1.6	1.9	1.9	2.0	2.0	2.2	1.9
Skeena-Queen Charlotte	11.7	11.4	11.7	11.9	12.0	12.6	17.1	16.0
Kitimat-Stikine	7.6	7.6	7.7	8.2	8.7	9.3	11.2	11.4
PNCIMA ($000)	29.5	29.0	30.9	31.6	32.9	35.6	44.0	45.1
PNCIMA as % of BC	2.0%	1.9%	2.1%	2.0%	1.9%	2.0%	2.2%	2.3%

Source: BC Stats (2010)
Note: e—estimated revenues for the Campbell River area.

Using room revenues as a guide, visitor volumes in PNCIMA are estimated at between 292,000 and 336,000 in 2009, with expenditures of between $266 and $306 million (Table 28). These expenditures would cover all tourism activity, including leisure travel, business travel and visiting friends and relatives. This spending would go to businesses throughout the region that provide visitor services—the major industries being accommodation, food and beverage, retail, transportation and other services.

Our estimate of between $58 million and $67 million in expenditures on ocean activities is based on work done by GSGislason (2007) which found that 22% of all tourism spending is on ocean activities. While this is a provincial average, we know that even inside PNCIMA the majority of leisure and business travel does not entail the direct use of the ocean.

[22] Northern BC, Cariboo Chilcotin Coast and Vancouver Island.
[23] The $13.3 billion estimate differs significantly from the $7.7 billion estimate in Table 24. The larger figure is a supply-side estimate from BC Stats that is believed to be more representative of the industry that the demand-side estimates from Statistics Canada in Table 24, which do not capture all tourism spending. For a more detailed discussion of these differences see Tourism BC (2009a), page 24.

Table 28 Expenditures on Ocean Recreation in PNCIMA, 2009

	BC 2007	PNCIMA 2009	
		Low	High
Non-resident			
Visitor Volume	14.6 million	292,000	336,000
Expenditures	$13.3 billion	$266 million	$306 million
Ocean expenditures	$2.9 billion	$58 million	$67 million
Resident			
Ocean expenditures	$0.6 billion	$12 million	$14 million
Total	$3.4 billion	$70 million	$81 million

For example, in a 2007 Prince Rupert visitor study, the most popular **primary** activity for overnight leisure travellers was general sightseeing (49%) followed by other sports and recreation (15%), fishing (11%), shopping or entertainment (7.6%) and culture, attractions or an event (7.4%). Outdoor adventure as a primary trip purpose was only mentioned by 5% of those surveyed. When visitors were asked about secondary activities, rather than just their primary activity, participation rates in outdoor activities was considerably higher, as shown in Table 29. (Tourism BC 2008)

Table 29 Activities that overnight leisure travellers participated in, Prince Rupert region and on entire trip, 2007

Activity	Percent that Participated in while in the Prince Rupert Region	Percent that Participated in during Entire Trip
Wildlife Viewing (whale, bear, birds, etc.)	52.9%	75.4%
Fishing	12.3%	18.5%
Kayaking/Canoeing	5.4%	12.7%
Boating (other than kayaking/canoeing)	12.7%	16.4%
Mountain Biking	0.8%	4.8%
Cycling (other than mountain biking)	1.9%	4.3%
Hiking	20.4%	42.1%
Flight Seeing	5.9%	11.9%
White Water Rafting	0.4%	4.4%
Rock Climbing	0.1%	1.3%

Source: Tourism BC (2008)

A breakdown of the preceding expenditure estimates by individual activity is not possible, given the absence of consistent and up-to-date participation rates and spending in the study area and for BC as a whole. A 2003 study found 75,000 users spent $38.6 million in direct expenditures on nature-based recreation activities on the north and

central coasts (Table 30). If fishing and land-based activities are excluded, then the expenditures by residents and non-residents was closer to $10 million. However, this study did not include the North Island nor did it account for cruise ship activity.

Table 30 Estimated Number of Users and Expenditures by Activity for Central and North Coast, 2003

Activity	Number of Users	User Days	Revenue
Boating	1,595	24,100	3,060,000
Saltwater Fishing	31,682	220,087	21,361,220
Freshwater Fishing	3,804	14,006	2,269,769
Kayaking	3,060	23,220	1,820,400
Hunting	2,400	14,000	1,720,000
Diving	300	700	95,000
Nature Study	25,800	994,000	5,037,157
Snowmobiling	2,225	25,170	1,478,000
Mountaineering	190	2,240	143,400
All Terrain Vehicle	3,250	32,500	1,501,000
Ski Touring	130	1,200	26,500
Hiking	350	2,800	56,000
River Sports	115	820	34,400
Trail Riding	30	150	3,000
Totals	74,931	1,354,993	$38,605,846

Source: Economic Planning Group (2003)

One activity that can be readily quantified is cruise ships, and more specifically for activity through the ports of Prince Rupert and Campbell River. Cruise ship passenger counts in 2008 and 2009 for BC ports are shown in Table 31. All ships in the Alaska cruise market will navigate PNCIMA, but only those calling on Prince Rupert and Campbell River will have passengers disembarking and undertaking tourist activities. In 2009 cruise ship activity at the Port of Prince Rupert was down by close to 50% from 2008, from 63 to 31 cruise ship calls and from 103,524 passengers to 54,867 passengers. Despite the drop-off, cruise ship visitors remain a key market for Prince Rupert, one that has grown from less than 3,000 passengers annually prior to the development of the Northlands Cruise Terminal in 2004. Campbell River activity dropped to a mere 162 passengers in 2009 from the 2008 level of 1,952. In 2007, the number of passengers disembarking was 2,300. Greater efforts at marketing the port and potential for an increase in pocket cruise activity is expected to raise the community's cruise ship profile in the future.

Cruise BC estimated passenger spending in Prince Rupert in 2005 to be $5.1 million (Business Research and Economic Advisors 2008). Even though 2009 expenditures would have been only half that amount (due to the halving of passenger volumes this past season) we have assumed that with continuing infrastructure, service and market

development, the 100,000 embarkations remain a reasonable medium-term benchmark for the industry in Prince Rupert.

Table 31 BC Cruise Ship Passenger Volumes, 2008-09

	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	2008	2009
Vancouver	0	336,694	515,971	1,781	854,446	898,473
% change from 2007	no change	-8.6%	-11.4%	-82.6%	-11.0%	5.2%
Victoria	0	153,027	228,468	11,485	392,980	452,000
% change from 2007	no change	19.0%	16.5%	-30.0%	15.2%	15.0%
Nanaimo	0	2,193	8,692	6,250	17,135	18,955
% change from 2007	no change	-48.2%	5.5%	-65.2%	-43.7%	10.6%
Campbell River	0	0	1,904	48	1,952	162
% change from 2007	no change	no change	n/a	n/a	n/a	-91.8%
Prince Rupert	0	42,230	61,294	0	103,524	54,867
% change from 2007	no change	7.0%	3.8%	no change	5.1%	-47.1%

Source: Tourism BC (2010a), (2010b), Cruise BC (2009)

The Economic Impacts of Ocean Recreation in PNCIMA

The direct economic impacts of ocean recreation in PNCIMA are estimated in Table 32, based on assumptions contained in GSGislason (2007). Gross domestic product, employment and employment income are estimated for ocean recreation (excluding sport fishing). Expenditures of between $56 and $65 million generate GDP of between $27 and $31 million. Employment ranges from 504 person-years to 585 person-years, and the associated employment income is between $16.8 and $19.5 million.

Table 32 Direct Economic Impacts of Ocean Recreation in PNCIMA, 2005

	BC	PNCIMA	
		Low	High
Expenditures on ocean activities	$3.4 billion	$70 million	$81 million
Excluding sport fishing	$2.8 billion	$56 million	$65 million
GDP	$1.3 billion	$27 million	$31 million
Employment (person-years)	25,200	504	585
Employment Income	$0.8 billion	$16.8 million	$19.5 million

Note: All impact coefficients for $million in expenditures are taken from GSGislason (2007).

Industry structure

The spending by visitors and residents on ocean recreation supports a sizeable base of tourism operators and businesses in the province and PNCIMA. The exact number of businesses is difficult to determine because tourism is not classified as an industry by Statistics Canada. Tourism spending is distributed across a number of different industries

that may or may not obtain the majority of their revenues from, or perceive themselves to be a part of, tourism.

In 2008, there were 17, 774 tourism businesses in BC, 65% of which were in accommodation and food services and 20% in transportation. Approximately 10% were in the amusement, gambling and recreation classification, which would include most nature-based operators. (Tourism BC 2009a)

In PNCIMA, the last region-wide estimate of the number of tourism businesses was conducted during the Tourism Opportunity Studies carried out between 1997 and 2001. As seen in Table 33, 540 tourism operators were recorded as operating in the North Island, mid Coast, north coast and Haida Gwaii during the 1997-2000 period. Not all operators active in the region physically located there, and operators may have been counted in more than one area; therefore, the actual number of local operators is well below this estimate. This is especially true of charter and tour operators.

Trends

The following tourism and recreation trends are expected to affect the future growth and development of ocean recreation in PNCIMA study area:

- **Tourism Growth** - The World Travel and Tourism Council has forecast a doubling of world travel and tourism demand from just over $7 trillion in 2010 to $15 trillion by 2020 (WTTC 2010). Tourism BC has established growth forecasts for provincial tourism revenues and customs entries of a similar magnitude. Over the next decade, tourism will very likely contribute a greater share of provincial GDP than it does today.
- **Changing Demographics** - Tourism growth is expected to continue to be driven by the baby boomers and the baby bust/Generation X groups.
- **Activity Trends** - With the aging of the Canadian and American populations, activities that are physically demanding, such as outdoor adventure (summer and winter) or alpine skiing are expected to grow at lower rates than the population of travellers as a whole (Research Resolutions and Consulting 2004). Activities that require low levels physical activity, such as cruise ships, wine/culinary and cultural activities, are expected to increase at higher rates than the population of travellers.

Table 33 Tourism Businesses in PNCIMA Study Area, 2000-2001

Number of unique establishments		CR & PM FD	North Island	Mid Coast	North Coast	Haida Gwaii
		473	116	115	141	168
ACCOMMODATIONS	Hotel	13	13	3	7	7
	Motel	26	4	2	6	3
	RV/Campground	27	12	4	2	6
	Lodge/Resort	46	9	19	2	12
	Bed and Breakfast	60	30	9	22	23
	Charter boats	7	0	7	26	16
	Other accommodation	24	5	21	11	10
Total		203	73	65	76	77
ATTRACTIONS	Museum	6	5	0	4	3
	Arts/Culture/Heritage	19	10	2	4	24
	Marina - public	28	9	5	0	1
	Marina – private	3	2	0	7	0
	Other	41	2	1	2	4
Total		97	28	8	17	32
TRANSPORTATION	Marine	4	2	1	4	n/a
	Air	4	3	4	4	n/a
	Bus	3	0	0	3	n/a
	Rail	1	0	0	1	n/a
Total		12	5	5	12	n/a
TOUR OPERATORS	Guide-outfitter	5	0	5	0	2
	River rafting	1	0	1	0	
	Marine charters, salt	165	34	44	65	50
	Marine charters, fresh	21	4	14	3	4
	Air tours/charters	22	5	12	5	4
	Geology & Minerals	0	0	0	0	0
	Kayak/Canoe	40	1	8	7	21
	Bus tours	7	2	0	4	7
	Rail tours	2	0	0	0	0
	Hell/Cat ski/hike	0	3	0	0	0
	Hiking/Mountaineering/Nature	34	13	10	2	2
	SCUBA/snorkelling	25	9	1	4	5
	Caving/spelunking (1)	8	2	0	0	0
	Snowmobile	2	1	0	0	0
	Cycling	7	0	0	0	0
	Rock climbing	3	1	0	0	0
	Horse and Trail	7	0	1	0	0
	Ski touring	7	2	0	0	0
	Other	2	0	2	3	6
Total		358	77	98	93	91

Source: Economic Planning Group (1997), Clover Point Cartographics (1998, 2000a, b), Marilyn Chisholm & Associates (2001).

Note: 1. CR & PM FD - Campbell River and Port McNeil Forest Districts. Roughly coterminous with the Mount Waddington and Comox-Strathcona regional districts.

2. North Island is equivalent to the Mount Waddington Regional District.

- **Declining US Market** - Between 2000 and 2008, the number of US residents entering Canada through BC has shrunk by more than one-third (–36.1%) from a peak of just over 7.0 million entries to less than 4.5 million entries.
- **Value of the Canadian Dollar** - The rising value of the Canadian dollar versus the US dollar has significantly hurt the Canadian tourism receipts over the last 10 years. This discourages US inbound travel and encourages Canadian outbound travel. Whereas Canada is now 14th globally in terms of inbound tourist arrivals it is 8th in outbound travel, giving the country a major travel deficit.
- **Cost of Energy** - Gasoline prices are said to be a major influence on North American auto travel behaviour, but since prices tend to move equally for competing jurisdictions, it is difficult to determine how the run-up in prices till mid-2008 and the subsequent drop have affected travel patterns.
- **Major Events** – The last decade of travel trends in North America have been marked by one-time events that have managed to significantly alter travel behaviour in some regions for extended periods of time. The 9/11 incident, SARS, wild fires, and in 2009 the influenza A (H1N1) virus all resulted in effects felt throughout the tourism industry.
- **Approved Destination Status for Canada in China –** Canada has recently received Approved Destination Status (ADS) from China, which should encourage significant growth in this market. However, most of this growth is expected to accrue to large urban areas.
- **Expected Tourism Labour Shortage** - The tourism industry in British Columbia is expected to experience labour shortages even as the number of visitors coming to the province climbs. The industry faces shortages of skilled labour across a broad range of tourism occupations and across all regions of the province.
- **Green Tourism**: Destinations that are focusing on marketing only "green" suppliers are expected to benefit from above-average tourism growth in the years ahead.

Data Gaps

As noted previously in this profile, the data describing tourism and recreation activity on the BC coast are dated, incomplete and generally unable to provide a cohesive account of the industry in the PNCIMA study area. While visitation and spending can be surmised for the industry as a whole, any further delineation by region/community or by activity area is hindered by the lack of visitor studies and knowledge of business establishments. The following gaps are noteworthy:

- Lack of data on visitor volumes and spending.
- Unknown activity use and participation rates—major activities such as kayaking and diving have well documented use areas, but the actual number of visitors or users is not systematically tracked.
- Industry characteristics - estimates of the size and structure of the industry are only approximate and dated. Datasets such as Statistics Canada's business establishment counts provide some insights but they are unable to capture even a majority portion of expenditures and cannot account for the impacts of non-resident operators.
- Information on carrying capacity and the effects on tourism and recreation of other marine activities such as aquaculture are not well documented.

Marine Transportation and Safety

Description

Marine transportation in PNCIMA facilitates a broad range of activities and commerce that is vital to coastal communities. It enhances economic activities at the regional and provincial scales; and it has international, regional and local significance.

Marine transportation includes vessels completing voyages within PNCIMA, ending or beginning the voyage in PNCIMA, or transiting the waters of PNCIMA without stopping. Trip purposes includes international trade, coastal freight services to coastal communities and industry, pleasure and recreation, and commuting. For each of the purposes, generally the vessel is suited to the purpose and the marine conditions it might encounter. Vessels include deep sea freighters, ferries, cruise ships, tug with tows or barges, and private recreation boats.

An indicator of marine transportation would reflect the frequency of voyage by type of vessel, the more actively travelled routes, and how this pattern may change with the seasons. Larger vessels (i.e. greater than 20 meters) are subject to mandatory monitoring, which provides a body of data helpful in characterizing these components of marine transportation. A corresponding body of data for the smaller vessels is not

readily available. In some cases, anecdotal information is available to characterize small vessel traffic.

Port facilities have a direct influence over the type and magnitude of marine traffic to frequent the port. The three primary ports in PNCIMA included in this profile are of Prince Rupert, Kitimat and Stewart. The current conditions of these ports are described and their respective expansion plans (where applicable) to provide an indication of future ship traffic. Small harbours are focal points for the fishing fleet and smaller vessels.

Issues

Many of the issues and concerns related to Marine Transportation are related to the perceived detrimental effects of the activity, and the risk of a marine accident and the consequential environmental damage. A number of these issues were re-iterated at the Workshop. The list is intended to be a record of concerns and matters raised. It does not necessarily imply the point is an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile;

- Safety issues related to the increase in large vessel traffic and the types of cargo visiting expanded ports of Prince Rupert and Kitimat.
- Environmental risk resulting from proposed port developments in Kitimat.
- Impact on marine water quality and marine ecosystems from legal or illegal discharge of waste water, garbage, noise, accidental spills, ballast water exchange and vessel/whale interactions.
- Conflicting exclusive uses in marine traffic lanes with fixed trap gear in both coastal and offshore waters.
- All sizes of vessels contribute to shoreline erosion, and it is a cumulative process. There is the need to know how this aspect of marine transportation is impacting shoreline values.
- Consider moving the offshore boundary of PNCIMA thus extending the plan area to beyond the tanker exclusion zone.
- There is a perception held by some that;
  - There are a large number of unreported marine accidents and spills,
  - Response time for addressing marine accidents in PNCIMA is too long,
  - There are presently insufficient resources based in PNCIMA to adequately respond to marine accidents.
- The maintenance and expansion of harbours, docks and boat ramps facilitate safety and are important to coastal communities.
- Shipping introduces invasive plants.
- Fixed, or relatively fixed, marine structures (offshore wind farms, fixed fishing gear) creates potential for collision with marine traffic and consequential damages.

Connection to the Marine Environment

Most of the issues identified above relate to detrimental effects of marine transportation on the marine environment, actual or potential. Examples include vessel discharges (e.g. spills and garbage) and other effects (e.g. shore damage from wakes). The occurrence of these detrimental effects and their significance to the marine environment in PNCIMA is not well documented. The activity may spatially conflict with other commercial activities that may give rise to socio-economic consequences. In this context, the seasonality of operation and transit routes may be affected by marine management planning. Weather plays a significant role in the safe transit of all vessels. It may influence the timing of the journey as well as the travel route. The protected channels along the central coast provide a corridor facilitating safe marine travel.

Current Conditions

The profile of marine transportation in presented in quantitative and qualitative terms using trends over the past five years where the data is available. The profile begins with an overview of large ship movements.

Marine traffic characteristics

All vessels exceeding 20 metres in length are required to participate in the Vessel Traffic Services (VTS) program.[24] Participating vessels broadcast their position at certain log-in points, which is monitored by other vessels as well as the Canadian Coast Guard. Analysis of the ship reports by the CCG is reported here. It is helpful in characterizing the spatial, temporal and composition of marine transport in PNCIMA.

The unit of measure is a "vessel movement". A vessel making a voyage through several reporting zones has a transit movement counted for each zone. For a ferry, each arrival/departure is a movement, which yields multiple movements per day on many routes. The indicator is positively correlated to marine shipping activity, but in most cases the number of movements does not measure the number of vessels or voyages involved. As noted, the data excludes most pleasure craft and small fish boats. Most of these vessels would travel the more protected waters, along the east coast of Vancouver Island and the Inside Passage.

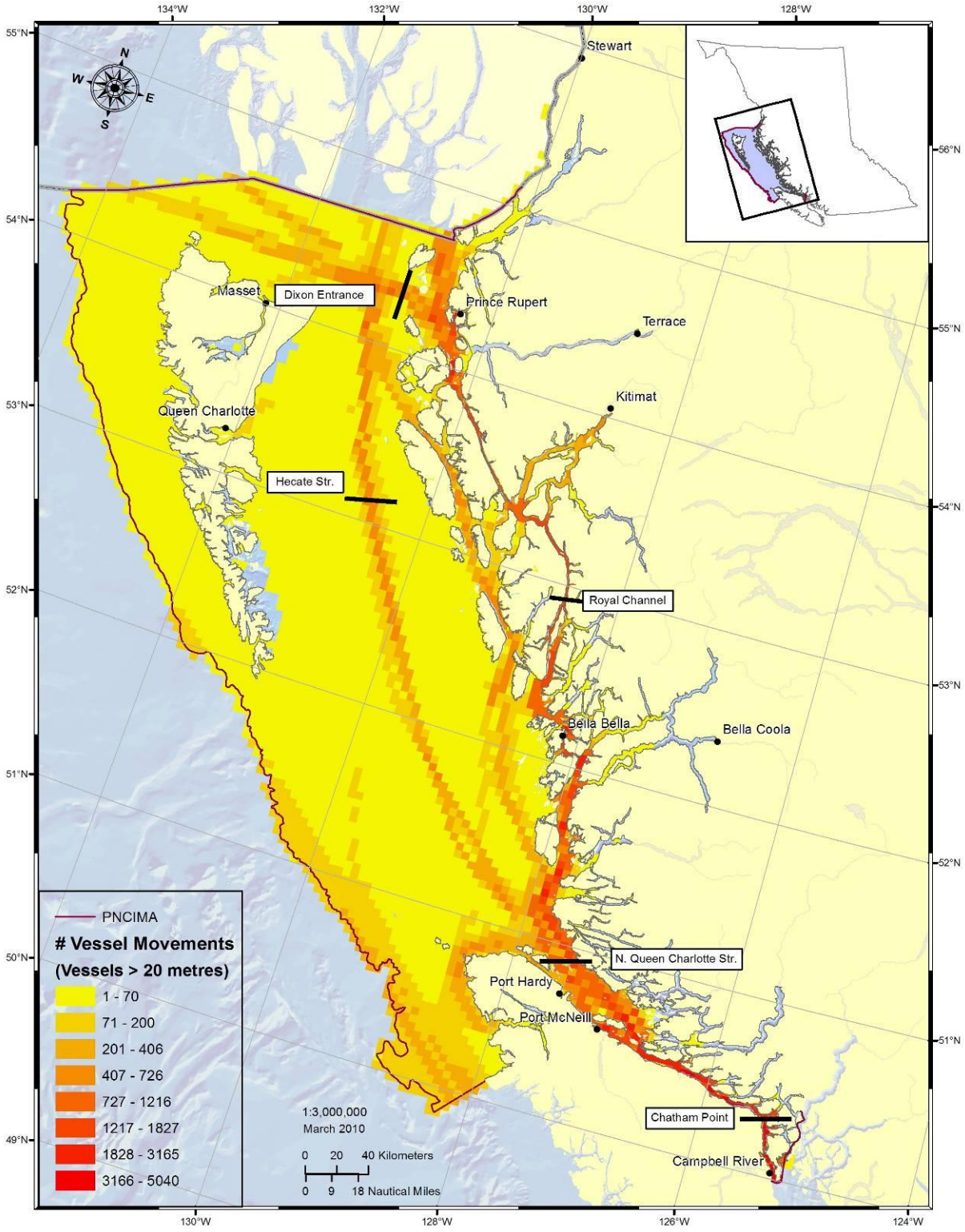
Total traffic movements on the coast has been declining in recent years, from about 500,000 in 2006 to 430,000 in 2009, a 14% decline in movements (VTS 2010). This is attributed to fewer vessels, reflecting the economic slowdown (particularly in the forest

[24] Pleasure yachts less than 30 metres and fishing vessels less than 24 metres are excluded from the calling requirement. . Tug boats are required to participate if the combined length of the tug and item being pushed or towed is more than 45 metres or the object being pushed or towed is greater than 20 metres.

industry) and a trend toward larger ships (Northway 2010, Wade 2010 pers. comm.). Over the period, the Prince Rupert Region (i.e. from Cape Caution to Alaska border) share of total movements in the region remained roughly at 5%.

Map 7 summarizes VTS data from 2007. The darker shaded zones are the relatively higher vessel concentrations. The higher concentration of vessel movement is mostly in protected waters along the east coast of Vancouver Island (i.e. Johnstone Strait, Queen Charlotte Strait and Discovery Passage), and the Inside Passage from Cape Caution to Prince Rupert.

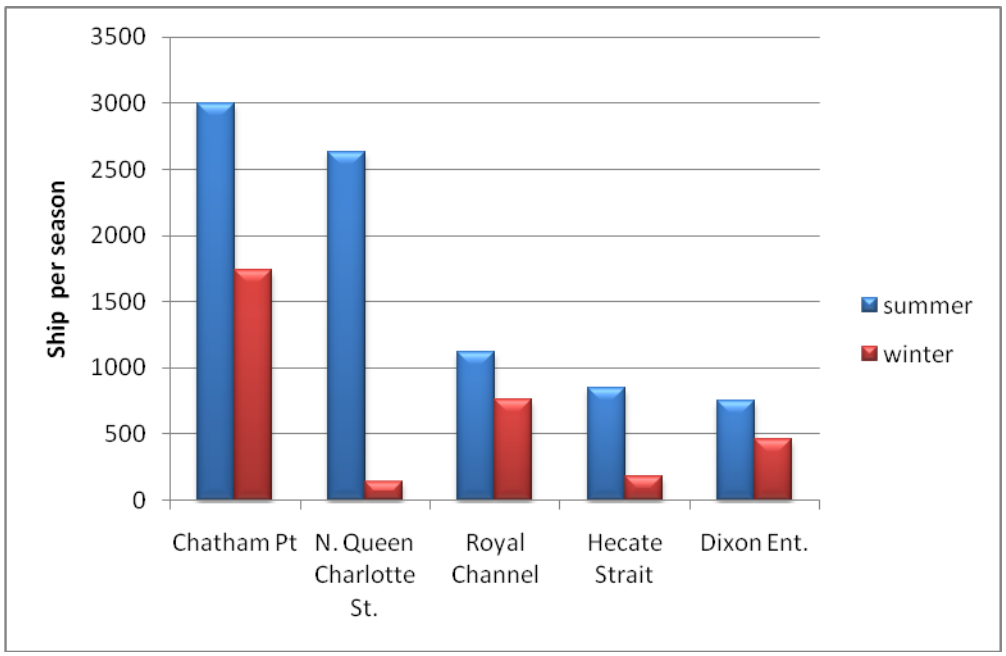
Map 7 Vessel Movements in PNCIMA (greater than 20 m in length), 2007



Source: Canadian Coast Guard (2007)

Figure 14 shows total traffic movements for the selected points indicated on the map. The data shows higher traffic volume in the southern part of PNCIMA and in summer season at all locations. The locations showing the least seasonality are Royal Channel and Dixon Entrance locations.

Figure 14 Seasonal Traffic Movements at Selected Points



Source: Canadian Coast Guard (2010)

Table 34 summarizes the seasonal movement data by the relative traffic shares of the various vessel types for the several locations shown on the map. Broadly, tug/barge account for the largest share of vessel movements at most locations, the exceptions being the Hecate Strait and Dixon Entrance locations. Cruise ship movement account for 80% of the vessel movements at the Hecate Strait location in the summer. Cargo carrier movements account for the greatest share of vessel movements at the Dixon Entrance location. The inbound/outbound cargo traffic movements at Dixon Entrance are likely visiting the major ports at Prince Rupert, Kitimat, and Stewart. Large commercial vessels exceeding 12.5 meters in depth do not use the corridor east of Vancouver Island because of depth restrictions at Seymour Narrows (Northway 2010 pers. comm.). Carriers of petroleum products bound for Kitimat use an established route through Principe Channel. Otherwise, tankers travel west of a voluntary exclusion zone west of PNCIMA.

Table 34 Seasonal Summary of Vessel Movements at Selected Locations

	Chatham Pt		N. Queen Charlotte St.		Royal Channel		Hecate Strait		Dixon Ent.	
Vessels	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**
Total	2993	1737	2628	138	1120	762	461	145	754	451
Fish boats	17%	18%	12%	34%	16%	11%	4%	3%	6%	8%
Cargo	4%	6%	5%	14%	0%	1%	13%	92%	37%	71%
Ferry	0%	0%	10%	14%	14%	10%	0%	0%	1%	0%
Tug/barge	59%	75%	52%	38%	62%	77%	2%	4%	19%	22%
Cruise	19%	0%	22%	0%	7%	0%	80%	0%	38%	0%

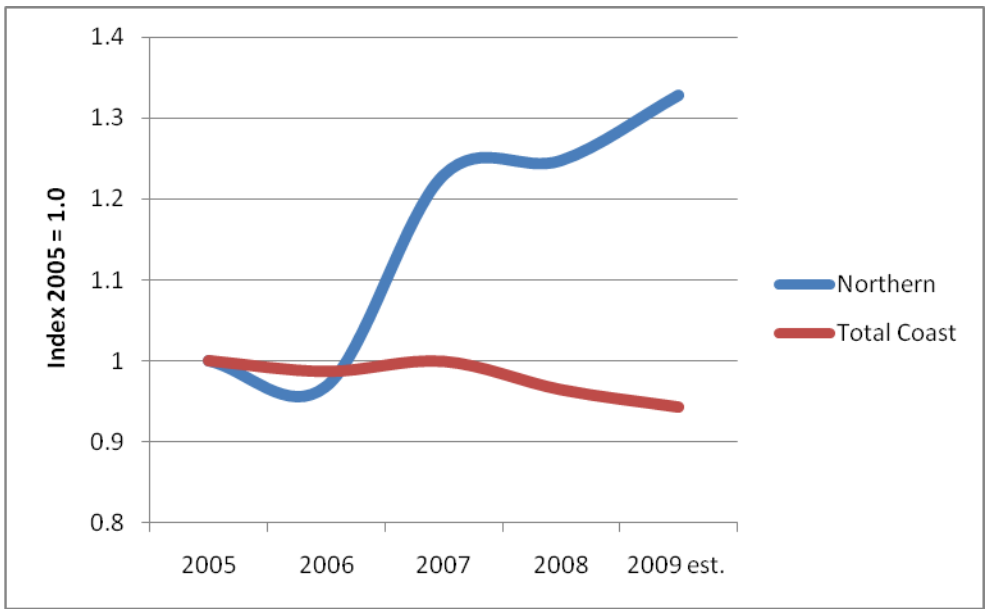
Source: Canadian Coast Guard (2010)

Tug and barge traffic movements in the Prince Rupert region is second only to ferry traffic movement. About 80% of the traffic consists of journeys wholly within the region or visiting a port. This finding is reflective of a number of locally based barge companies serving communities and industrial operations. This includes operators based in Campbell River, Shearwater, and Prince Rupert. Vancouver based tug/barge companies also serve the area. Barges deliver construction material, fuel[25], lumber, containers, foodstuff to industrial camps and communities. Tugs also move seasonal fishing lodges to and from their winter moorage (Chisholm 2009).

Another indicator of commercial vessel traffic is the number of pilot assignments in northern region (e.g. Triple Island and various ports). It is compulsory that all international flagged vessels that do not have Canadian certified officers obtain a pilot before proceeding to/from these ports. In 2005, there were 941 northern assignments, or 8% of the total coastal assignments. In 2009, the estimated number of northern assignments was 1,250, or 11% of the total coastal assignments. That is, northern assignments are increasing faster than total assignments. This is evident in Figure 15, which shows the relative growth of assignments for the north and the total BC coast since 2005.The latter has declined over the period (consistent with the trend in ship movements) , while northern assignment increased sharply after 2006.

[25] It was indicated at the February workshop that all fuels to Central Coast communities are delivered by barge.

Figure 15 Index of Pilot Assignments (2005 = 100)



Source: Pacific Pilotage Authority, (2005 to 2008)

Ferry Traffic

As noted earlier, ferry movements account for a very large proportion of total vessel movements in PNCIMA because of the frequency of repetitive movements. There are a number of small privately operated ferry services, mostly serving communities from Prince Rupert. Communities served include Metlakatla, Oona River, Kitkatla, Hartley Bay, Digby Island and Tuck Bay. The Alaska State Ferries operates a terminal in Prince Rupert providing car and passenger service to US ports on the Alaska Marine Highway System. There are also several marine taxi operators in the study area providing passenger service (e.g. out of Shearwater, Port Hardy).

The largest single operator is BC Ferries (BCF). BCF operates on 7 designated routes in PNCIMA providing scheduled service for passengers, private and commercial vehicles. The routes and descriptions of service are summarized in Table 35 . Route 10 (Port Hardy/Prince Rupert) is the longest route at 274 nautical miles with intervening stops. The shortest route is Campbell River/Quadra Is., which is 1.8 nautical miles in length and takes 10 minutes. Ferry users consist of local residents and related traffic, and tourist/visitor traffic. The latter is most pronounced in the May to September period.

Table 35 BC Ferry Routes in PNCIMA (2008/09)

Route #	Ports Served	Description	Actual Round Trips	Passengers
10	Port Hardy/Bella/Bella/ Klemtu/ Ocean Falls/ Shearwater/Prince Rupert	Several times a week, year round with seasonal variation	121	46,024
11	Skidegate/ Prince Rupert	Several times a week, year round with seasonal variation	191	39,591
40	Port Hardy/Bella/Bella/ Klemtu/ Ocean Falls/ Shearwater/Bella Coola	Summer Only	38	8,349
23	Campbell River/Quadra Is.	Year round service	6,272	844,419
24	Quadra Is./Cortes Is.	Several times a day, year round with seasonal variation	2,140	103,900
25	Port McNeill/Alert Bay/Sointula	Several times a day, year round with seasonal variation	3,961	244,156
26	Skidegate/Alliford Bay	Year around service	4,390	111,653

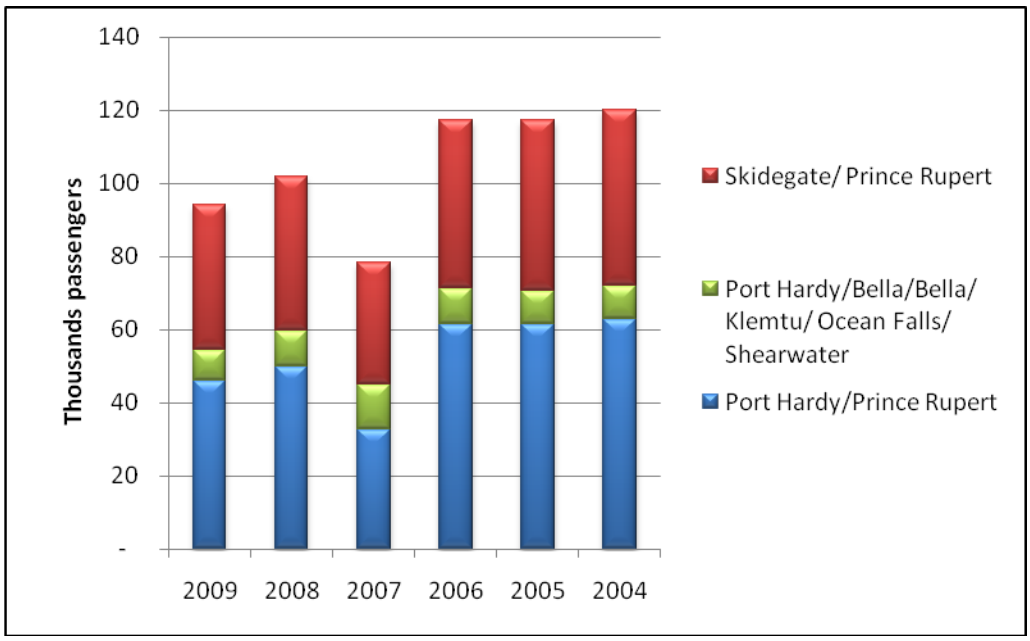
Source: BC Ferries (2009)

In 2009, there were about 17,000 round trips on BCF routes in PNCIMA, carrying about 1.4 million passengers. This is about 20% of BCF's total round trips and 7% of the total passenger volume. The Campbell River/Quadra Island route accounted for the most round trips and passengers in 2009.

Routes 10 and 40 traverse Queen Charlotte Strait to the Inside Passage, while Route 11 crosses the relatively open waters of Hecate Strait, linking the ports of Prince Rupert and Skidegate. In 2006, the sinking of the MV Queen of the North reduced the number of annual roundtrips and ridership on Route 10. Since then, ridership on the northern routes has rebounded (Figure 16). BCF expects readership to continue growing with the commissioning of its newest vessel on the route.[26]

[26] As reported in Chisholm (2009), page 24.

Figure 16 Passenger Count on BCF's Northern Routes



Source: BC Ferries (2009)

Major Ports in PNCIMA

Port facilities have a major influence over the nature and magnitude of ship movement within PNCIMA.

There are three ports in the study area that handle large vessels such as cruise ships, bulk carriers, container ships, etc. The facilities are located at Prince Rupert, Kitimat and Stewart. An overview of the respective port as they relate to marine transportation follows.

The Prince Rupert Port Authority is the only Canadian Port Authority within PNCIMA and its mandate includes management of the Port of Prince Rupert, which includes the largest commercial port facilities in PNCIMA. Historically, facilities were configured to handle bulk commodities, including coal, grains, and forest products. Investments in port infrastructure over the past 5-7 years expanded the port's capabilities to handle large cruise ships, pocket cruise vessels and container ships. At the end of 2010, the port had five specialized terminals. The number of commercial calls to the various terminals is shown in (Table 37). The total number of calls has increased annually from 2006. This positive overall increase can be attributed to the build up of container traffic since the opening of the facility in October 2007 and a substantial increase in bulk coal shipments in 2010/11. This increase has offset recent declines in passenger ship calls and the variations in commodity shipments. Also, car and passenger services are provided from Prince Rupert by BC Ferries and the Alaska Marine Highway Ferries.

Table 37 Commercial Calls to the Port of Prince Rupert

Terminal	Cargo	2006	2007	2008	2009	2010
Ridley Terminals Inc.	Coal	58	75	73	64	107
	Wood Pellets	0	6	7	20	24
Prince Rupert Grain	Grain	87	114	70	104	87
Inner Anchorages	Logs	12	16	13	25	27
Fairview	Containers	0	9	79	104	106
	Liquid wax	4	4	2	4	4
Northlands (Cruise Ships)	passengers	48	44	47	23	25
Atlin (Pocket Cruisers)	passengers	16	17	16	9	3
Total Commercial Calls		225	285	307	353	383

Source: Prince Rupert Port Authority (2011)

The Port of Prince Rupert has a number of development proposals that would be expected to increase ship visits in the future. The proposals include:

- Expansion of the Fairview Container Terminal from its current 500,000 twenty foot equivalent units (TEU's) design capacity to 2 million TEUs. The project is presently under review by the Canadian Environmental Assessment Agency (CEAA) at a comprehensive study level of environmental assessment.
- A proposed industrial access road, alongside the existing CN rail line, will connect Fairview Terminal and Ridley Island terminals.
- Ridley Terminals Inc. has initiated expansion and upgrades of its coal terminal to double current annual capacity of 12 million tonnes by 2015. As of mid-2011, clearing of a 14 hectare addition is underway, as are preparations for a new dumper-pit system and installation of a third stacker-reclaimer.
- The Port's Gateway 2020 plan for its Ridley Island property encompasses potential developments that include terminal capacity for bulk and break-bulk cargo; barge and short sea shipping; automobiles and other roll-on/roll-off cargo; and warehousing and logistics infrastructure. The $90 million Road Rail Utility Corridor Stage 1 project (announced in 2011) will support these developments by providing additional transportation and utility infrastructure on the island.

The port of Kitimat is located at the head of Douglas Channel, a long fiord that extends 140 km from Hecate Strait into the mainland. It has three privately owned and operated terminals. Two of the terminals are single berth. The third is double berth for handling break-bulk vessels and barge facility. The major cargos moving through the port include alumina, aluminum, petroleum

coke, condensate, methanol, sackcraft and liner board. There is also a full service tug operator. About 250 to 300 vessels call at the port annually (Chisholm 2009). The closure of the Eurocan pulp mill may be expected to reduce vessel calls to the port in the near term.

There are several major industrial developments planed for Kitimat or nearby. These include (MSBTED 2009):

- Break-bulk facility to handle product not shipped by container. Proposal would add up to 8 new deep sea berths,
- Expansion of the Rio Tinto Alcan aluminium smelter capacity by 400,000 tonnes/year,
- Kitimat to Summit Lake Pipeline proposed by Pembina Pipeline Corp. would involve importing condensate,
- Spirit Pipeline-TMX North Project, proposed by Kinder Morgan and Pembina would involve exporting condensate from Kitimat,
- Northern Gateway Pipeline Condensate pipeline proposed by Enbridge would involve importation of condensate and export of petroleum products linked to a pipeline from Kitimat to Edmonton. The project is in the pre-application regulatory phase and plan to submit an application in early 2010 to a joint environmental and regulatory review (i.e. CEAA and NEB) by a three member panel announced January 2010 (Borland 2010 pers. comm., and CEAA 2010). The review process may take 2-3 years,
- Kitimat LNG Terminal proposed by Kitimat LNG Inc and Pacific Northern Gas at Bish Cove 18 km. south of Kitimat. Export capacity is 610 mmcf/day. The proposal has obtained all the required environmental approvals and construction is expected to begin in 2010.

Stewart is located at the head of Portland Canal, a 150 km fiord that is ice free year round. Steward Bulk Terminals is a private facility, originally developed to load concentrate from the Granduc/Newmont copper mine. It continues as primarily an export facility for mines operating in northwest BC. This has included the Eskay Creek, Snip and Huckleberry mines (Stewart Bulk Terminals 2010).

Potential future throughput is suggested by the number of large base metal and coal properties with development potential that could ship through Stewart (rather than Prince Rupert or Kitimat). The more advance projects are (MSBTED 2009);

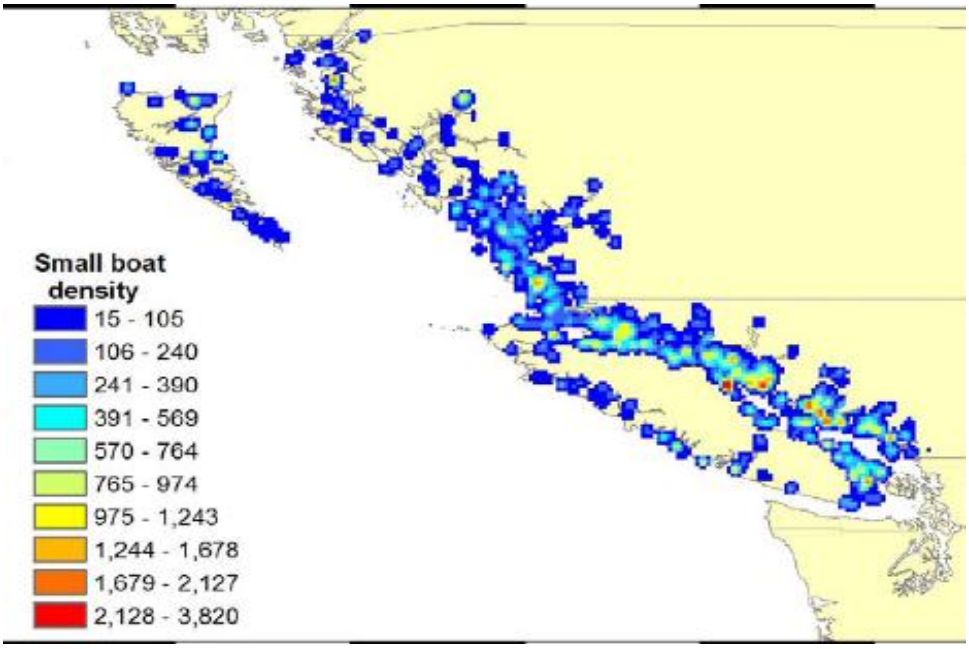
- Mount Klappan Coal Slurry Pipeline to the Stewart is understudy.
- Schaft Creek Porphry Copper-Gold Mine, a 100,000 tonne pre day of ore mine located 45 km west of Highway 37. It is at the pre-application stage of the environmental assessment process
- Red Chris Mine is a 30,000 tonne pre day of ore mine located 18 km from Iskut village. The property has obtained environmental approvals, with development contingent on obtaining power supply.

- Kerr-Sulphurets Gold Copper mine is 65 km north of Stewart with tentative ore production of 80,000 to 120,000 tons over a 25 year period.
- Bronson-Slope Copper/Gold/Silver/Molybdenum mine is in the Iskuit Valley north of Stewart. Ore production is planned for 15,000 tonnes/day. The project has been submitted to the Canadian Environmental Assessment Agency for review.
- Galore Creek Gold/Silver/Copper mine is north of Stewart. The mine's processing capacity is 65,000 tonnes/day and the operator indicates that the concentrate would be shipped through Stewart. Construction on the mine was suspended because of cost overruns and a new mine plan is being developed.

Small Boat Traffic and Small Harbours

There are a large number of small harbours and ports throughout PNCIMA serving the needs of local residents, visitors and the fishing industry. Many of the facilities were operated by Canada, but were divested to local interests (i.e. provincial, municipal or local organizations). A listing of these ports is found in MacConnachie (2007). Other coastal infrastructure for boating was noted in the marine recreation section.

Map 8 Small Boat Density on the BC Coast



Source: Therriault and Herborg (2007)

For small vessel (i.e. less than 20 meters) there is not the consistent body of data to track the intensity of vessel traffic in coastal waters. However, the location of small craft marinas, moorings and anchorages have been used to as a relative indicator of small boat density in BC waters. The original work related to assessing the contribution small boats

may have in the spread of invasive species (Therriault and Herborg, 2007). The work is used here to provide a general overview of small boat activity in PNCIMA. In the study area, small boat density (sum of features per square kilometres) is generally low, except for higher concentrations around communities (particularly Campbell River) and popular fishing locations (e.g. Hakai Pass).

Vessel Discharges and Spill Response

A number of issues identified at the Workshop were related to unregulated vessel discharges and accidental spills. The record of spills attended by Canadian Coast Guard (CCG) is reported here in partial response to the concern, while recognizing that all spills, discharge of garbage, etc. are not reported as noted in the Workshop.

Most vessels discharges are subject to regulated limits. For instance, onboard sewage treatment is now common on cruise ships (Johannessen 2007). However, some discharges exceeding regulated limits may occur accidentally or illegally.

Any discharge of a pollutant (as described in the Canadian Shipping Act) from a vessel that is not permitted by regulation is to be reported to the CCG. The responsibility for responding to pollution incidents lies with the polluter. The CCG's role, through its Environmental Response Division, is to ensure an appropriate response is effected either by monitoring the polluter's clean up efforts, or, if a polluter is unknown, unwilling, or unable to respond to an incident, by managing the response. Responsibility for responding to "spill reports" in PNCIMA is shared by offices located in Prince Rupert, handling the north coast and Haida Gwaii, and Victoria, addressing the remainder of PNCIMA. The frequency and characteristics of reported spills is presented here as an indicator of discharges exceeding the accepted limits. It was noted in the Workshop that spills occur but are unreported.

The number of marine spills in BC requiring some level of response is summarized by area and vessel types, as recorded by CCG, in Table 36

Table 36 Marine Spills Recorded on BC Coast[1] (2004-2009)

Vessel Type	Nth Coast (Nth of Cape Caution)	Vanc. Is. & Central Coast[2]	South Coast
Fishing Vessels	63	106	41
Pleasure Vessels	54	103	98
Small Commercial	5	21	21
Tug boats	4	36	43
Barges	10	29	43
Deep Sea Vessels	4	4	27
Ferries & Cruise ships	3	16	25
Govt. Vessels	4	11	3

Source: CCG (2010b)

Notes:

1. CCG does not track incidents in the PNCIMA area separately from the rest of the coast.

2. Stats from Vancouver Island include incidents from South of Brooke's, Victoria to Campbell River and South Coast include stats from Campbell River/Bute Inlet to Vancouver and the US Border.

While most of these incident involved small volumes of non persistent oil that is resolved in hours to a day, there were three more significant incidents during the time period: the Queen of the North (approximately 200,000 litres), Robson Bight (7,000 litres) and a log barge in Prince Rupert Harbour (3,000 litres). There was also the land based incident where 15,000 litres entered the marine environment from a tank in Hartley Bay.

There is a concern about an increased likelihood of spills in association with increased vessel traffic to the ports of Prince Rupert and Kitimat if the respective port expansion plans proceed. The issue is related to the probability of an incident, and the adequacy of the response capability. Earlier risk assessments recognized that marine accidents happen, and they can occur anywhere and for any reason. Responsibility for emergency preparedness is a shared responsibility with industry, Transport Canada, Environment Canada, Fisheries and Oceans, and the BC Ministry of Environment, and may involve local communities and First Nations. The response plans will need to be reflective of the new challenges increased vessel traffic may pose. An overview of the emergency preparedness capabilities, with reference to the Port of Kitimat, was recently completed for the Living Oceans Society. [27]

Emergency response to a marine accident threatening the environment may be separated into preparedness and dealing with an incident. Transport Canada ensures that Canadian vessels have in place prevention and preparedness measures while the response to actual

[27] EnviroEmerg Consulting Service. 2008. *Major Marine Vessel Casualty Risk and Response Preparedness in British Columbia*. Prepared for Living Oceans Society. 166 pp.

spills is broadly the responsibility of the spiller and CCG Environmental Response ensures that the response is appropriate either by monitoring the polluter's efforts or managing the response.

The Canada Shipping Act (CSA 2001), which came into force in July 2007, assigns joint responsibility to Transport Canada and the Department of Fisheries and Oceans (Part 8) for pollution prevention and response. Transport Canada is given authority under CSA 2001 and regulations as listed below to implement CSA 2001 and Regulations which control any discharge at sea and in Canadian waters:

- Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals
- Ballast Water Control and Management Regulations
- Environmental Response Arrangements Regulation
- Response Organizations and Oil Handling Facilities Regulations

While regulations and standards are being further developed to bring more focus to implementing CSA 2001, Transport Canada remains committed to investigating and prosecuting contravention of regulations under its mandate.

As noted earlier, the typical arrangement holds the polluter responsible for responding to a spill and the CCG monitors the overall response. For prescribed vessels and oil handling facilities, a large part of Canada's preparedness capacity is provided by organizations certified by TC as mandated under the *Canada Shipping Act*. The *Act* sets out the capabilities the responder must maintain, the formulation of spill response plan, the availability of resources and specified response times. In BC, the certified response agency is Burrard Clean Operations (BCO). Coast wide, BCO responds to about 20 incidents per year.

In PNCIMA, BCO has prepared three area plans. These cover North Vancouver Island-mid coast (Area 6), north coast (Area 7) and Haida Gwaii (Area 8). The plans address the following matters:[28]

- Area sensitivities
- ICP locations
- Local contacts
- Staging areas
- Helispots
- Protection/treatment strategies
- Equipment resources
- Logistical support services

[28] The plans may be viewed at http://www.burrardclean.com/spill-response/area-plans

- Vessel launch locations

Table 37 summarizes BCO's resources in PNCIMA to respond to an oil spill. The trailers contain the clean-up equipment which may be deployed by BCO or a contractor's vessel.

Table 37 Spill Response Equipment in PNCIMA

Plan Area	Vessel	BCO Trailer	CCCG Depot
Area 6	0	3 (Port Hardy, Campbell River, Bella Bella)	3 (Port Hardy, Campbell River, Bella Bella)
Area 7	1 (Prince Rupert)	2 (Prince Rupert, Kitimat)	1 (Prince Rupert)
Area 8	0	1 (QC City)	1 (Sandspit)

Source: Burrard Clean Operations

BCO relies on specialty trained fisherman to respond to and cleanup spills. Termed the Fisherman's Oil Spill Emergency Team, there are about 180 members coast wide (Gardiner 2010 pers. comm.). In response to increasing marine traffic in the north and central coast, BCO established a permanent office in Prince Rupert in 2008 with a full time staff of three. Contractors are employed part time in Haida Gwaii, Shearwater, Port Hardy and Campbell River to maintain the equipment in ready condition.

Economic Contribution

The primary economic benefit of Marine Transportation to BC, and the residents, visitors, business and communities in PNCIMA, is the reduction in the cost and other transport advantages marine transportation offers relative to alternatives. For many coastal communities, the only viable alternative may be air transport. This advantage of marine transportation may be fundamental to whether a business proceeds, an investment is made, or where one chooses to reside. The role that BCF plays in PNCIMA illustrates this point. BCF's service supports those living and working in coastal communities and in some instances brings customers to the area, hence supports those local businesses. But this benefit is typically not attributed to the transportation service. Similarly, an aggregate deposit located near tidewater may be commercially viable while the same deposit located inland may not be because road building costs are prohibitive. The employment and revenue of the operation is attributed to mining industry, but it would not be developed without low cost marine transportation. While the GDP of these economic activities dependant on marine transport is associated with its particular industry, the real source of the value could be attributed to marine transportation. Its economic contribution is pervasive, difficult to measure, but clearly evident when it is curtailed or restricted.

The GDP attributed to marine transportation at the provincial level is estimated at $1,510 million in 2005.[29] There is no direct measure of the contribution the industry active in PNCIMA makes to this total. If the economic contribution is roughly proportional to PNCIMA's share of total vessel movements, the contribution would be in the order of $75 million.

The total number of persons in the deep sea and coastal water transportation industry resident in PNCIMA was 680, or 12% of the industry's total BC labour force in 2006. The residency of the labour force is summarized in Table 38.

Table 38 Experience Labour force in Marine Transportation

Industry	Comox-Strathcona	Mount Waddington	Skeena-Queen Charlotte	Kitimat-Stikine	Bulkley-Nechako
Deep sea, coastal and great lakes water transportation	435	35	200	10	-

Source: Statistics Canada (2006)

BC Ferries spent about $62 million (excluding fuel and capital charges) to provide services on the seven routes in PNCIMA in 2009. About $41 million of this was spent on the three northern routes (BC Ferries 2009). While a detailed breakdown was not available, likely a large portion of this expenditure is for labour, services and materials to support the ships and terminals. The proportion of the expenditure that circulates in the local economy depends on where the crew reside and the location of suppliers, which is not known and varies with the route.

Ports and small harbours are links in the overall transportation system that supports efficient movement of people, goods and commodities. Along with the ships that provide marine transportation, roads, rail and pipeline infrastructure are parts of the overall system on land. Each of these links in the transportation chain support economic activity that is acknowledged here.

Trends

Traffic volume is derived from those factors that give rise to the purpose of the trip, and to a degree, changing technology. As presented in the vessel movement statistics, vessel traffic consists of internal movements, external and transient movements.

The trends in PNCIMA community population will influence local barge traffic numbers, and the frequency of ferry arrivals, for instance. The population forecast for coastal

[29] Gislason (2007), page 24, Table 9.

communities is for relatively slow growth, hence will likely not stimulate substantial increase in vessel traffic. Local economic conditions also directly influence the level of marine traffic. For example, the decline in the coastal forest industry is typically cited as the cause of a declining number of ship movements' coast wide. Similarly, a rebound in the coast forest industry, or growing coastal economy generally, would stimulate increased ship movements.

The announced projects and port expansion plans in Prince Rupert and Kitimat may be expected to increase the frequency of commercial vessel visits. For the Kitimat LNG facility, the proponent estimates between 70-90 LNG tankers would call per year at the port once it became fully operational. [30] The total number of vessel calls per year to the proposed Northern Gateway project is estimated to be 220, composed of 150 calls exporting product and 70 calls importing condensate (Anderson 2010 pers. comm.). Vessel visit estimates were not available for the other projects proposed for the port.

In Prince Rupert, the several announced expansion projects are expected to increase the number of vessel visits. This is summarized by cargo category in Table 39. The calls by cruise ships to the port are highly uncertain and a conservative forecast is provided. The other ship forecasts are scaled to the timing and capacity of the port improvement. By 2020 vessels calls to the port may be 4 times the number in 2009.

Table 39 Forecast of Commercial Ship Calls to Prince Rupert

Cargo	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commodity	234	241	286	296	406	586	665	695	695	695	695
Container	156	156	156	200	250	300	416	416	416	416	416
Passengers	25	50	50	50	50	50	50	50	50	50	50
Total	415	447	492	546	706	936	1,131	1,161	1,161	1,161	1,161

Source: Prince Rupert Port Authority (2010)

With respect to the ships calling into Stewart, if the mine at Galore Creek goes into production, the proponent estimates 2 to 4 ship visits per month to ship concentrate.[31] There are a number of announced projects, some of them noted earlier, that if developed would also depend on marine transport for market access.

The proposed expansions at the Fairview Terminal and Ridley Island in Prince Rupert would likely result in an expansion in spill response capability in the coming years. If the pipeline projects proposed for Kitimat proceed, spill response resource capabilities would

[30] Kitimat LNG Terminal (2006). Page 3-44.
[31] NovaGold Canada Inc. (2006). Page 5-149.

be increased substantially. Kitimat would become a designated port under the *Shipping Act* which would require increased resourcing. A base office might be established in Kitimat and satellite stations in several of the coastal communities (Gardner 2010 pers. comm.).

In general, commercial vessels calling at the three northern ports would transit Dixon Entrance, north of Haida Gwaii if serving Asian ports. Southbound vessels (e.g. containerships to Vancouver or Long Beach, Ca.) would travel down Hecate Strait and the west coast of Vancouver Island (Northway 2010 pers. comm.).

Transient traffic will depend on economic growth in Alaska, and trends in the Alaska cruise ship market. While the traffic volumes are subject to cyclical trends, it is reasonable to expect over the longer term that growth in the Alaska economy would require growing marine trade. Cruises to Alaska have declined for the first time in 2009, primarily due to the recession in the US. The timing of a rebound in this market is not known (Angus 2010 pers. comm.).

Data Gaps

The following data gaps are identified with respect to marine transportation;

- Recreational boating: consolidated data on the characteristics of recreational boating as a marine transportation activity is not available. This would include for example, descriptions of boat type, magnitude and frequency of vessel trips, routes and ports used. Spill data and rescue data does include pleasure boats, kayaks, etc. Potential sources of small boat data are the aquatic invasive species data base (DFO) and vessel tracks from the hook-and-line fishery. A recent survey of recreation boating for the purpose of tracking the spread of invasive plants may produce useful information (Therriault 2010 pers. comm.).
- Ship movement reporting: Ship movement data derived from vessels participating in the VTS may not be a reliable indicator of marine transportation. The CCG is implementing an Automated Information System to enhance vessel safety and environmental protection. In addition, the system will provide details that will support a clearer picture of marine transportation (by participating vessels). For instance, information about vessel characteristics, operating performance, cargo and voyage details. The data may be available for analysis in 2012 (Wade 2010 pers. comm.).
- The float plane is an important transport mode supporting many activities along the coast, but it is not considered in this profile as a vessel, as some workshop participants proposed. If, on further examination, it is determined that air travel has direct implications to PNCIMA and the planning process then the aspects of the activity should be examined.

Aquaculture

Description

Aquaculture is defined for this profile as the production of fin fish, shell fish and marine plants in an aquatic environment or human made container of water for commercial purposes. Aquaculture operators adopt methods and invest in facilities intended to enhance growth and the market value of production. This may include regular stocking, protection from predators, etc. The primary harvest from the aquaculture industry is sold or transferred to the Seafood Processing industry, where it is transformed into a food product. The Seafood Industry is addressed in the following profile, even though the two activities are in some cases occurring within the same company.

Issues

Some of the main issues and considerations pertinent to the aquaculture industry are summarized in the following points. The list of issues includes views raised at the Workshop. The list is intended to be a record of concerns and matters raised. It does not necessarily imply the point is an accurate description of the circumstance in every instance. Also, some of the issues raised are outside the scope of this profile.

- Aquaculture involves the exclusive use of marine sites located in protected inshore waters and the foreshore which may also be attractive to competing resource users and public use.
- Aquaculture sites and activities are subject to overlapping jurisdictions, involving federal, provincial and local government authorities. This creates a substantial administrative burden on small operators.
- Lack of certainty related to tenure and operating requirements constraints investment in aquaculture operations. Applications for new sites have experienced significant delays.
- Aquaculture, particularly shellfish culture, is dependent on good water quality conditions, which can be degraded by other marine activities.
- The Aquaculture industry is competing in the world seafood market, hence controlling costs and maintaining high quality product are keys to commercial survival.
- Aquaculture operations may create a nuisance to adjacent tenure holders, property owners or other users (e.g. boaters, marine tourism operators, public) Nuisance may be related to noise, visual impacts and odours related to the farming activity.
- Climate change may affect the industry's long term operations due to changes in water temperature and water quality.
- Issues specifically related to fin fish aquaculture using open-pens are:
  - Interaction of sea lice and juvenile wild salmon
  - Sea bed waste below pens
  - Escape of farmed fish to the detriment of wild stocks

- Introduction of disease to wild stocks

Connection to the Marine Environment

Aquaculture operations are located where the site conditions are suited to the organism's environmental requirements, to protect the farm's infrastructure, and to satisfy operating needs such as access and the availability of inputs (e.g. labour, good water quality and appropriate water temperature) are essential characteristics for finfish and shell fish farms. Particular biophysical variables that are considered include (depending of the organism being cultured and the farming method used) salinity, dissolved oxygen, suspended sediments, pH, disease prevalence, fouling potential, predation potential, and beach characteristics for intertidal sites. For fish farms, water movement helps create optimal conditions. Intertidal sites and floating facilities are sited in relatively protected inshore waters.

Applications for sites on Crown land are subject to siting criteria. For example, the criteria for finfish sites specify a minimum distance from other resource users, marine activities, First Nation interests and other marine resource values (e.g. at least 1 km from a significant salmonid spawning stream).

The aquaculture activity also affects the marine environment, as indicated by several of the issues noted above. These effects are subject to federal and provincial regulations and operations are monitored by government and the operator.

Current Conditions

For the purposes of this discussion, the finfish, shellfish and plant aquaculture sectors are addressed separately. The industry is first addressed at the provincial scale and then industry operations within PNCIMA. The industry's significance to the provincial and regional economies is then considered.

At the time of writing, certain regulatory aspects of finfish and shellfish aquaculture were being transferred from provincial to federal jurisdiction. In February 2009, the Supreme Court of British Columbia (*Morton v. British Columbia)* found that regulation of fish farms is a federal responsibility. Specifically, the court found that the licensing provision and related regulations in the BC *Fisheries Act* pertaining to finfish and shellfish operations to be *ultra vires.* The decision did not affect the jurisdiction of marine plants.

The Government of Canada's vision for regulating the finfish and shellfish sectors anticipates improvements over the prior framework. The regime is expected to be more consistent and transparent in practice (DFO 2009c).

Finfish

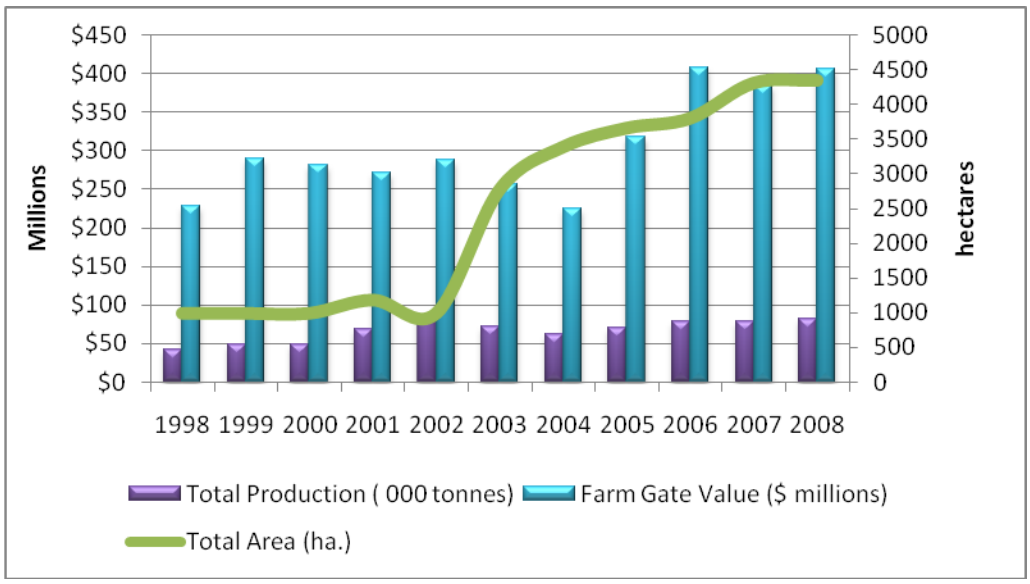
Finfish aquaculture in BC has grown dramatically from its infancy in the 1980's. The industry started from about 10 small sites located on the Sunshine Coast rearing Coho and Chinook salmon in 1984. The sector expanded rapidly and by 1989 there were 135 farms. About this time several international corporations bought local operations and began farming Atlantic salmon. This species is considered more suitable for farming because of higher survival and faster growth rates. Since the 1990's, industry consolidation has led to fewer, larger companies with integrated hatcheries, grow-out, processing and marketing activities. In 2008, finfish aquaculture industry consisted of 18 companies with a total of 138 tenured sites. (MAL, 2010) Presently, BC is the world's fourth-largest producer of farmed salmon, after Norway, Chile and Scotland.

In 1995, the provincial government placed a moratorium on new fish farm licenses and completed an environmental impact assessment of the sector. The moratorium was lifted in 2002. As noted above, a moratorium is currently in effect to December 2010. Separate from the court decision, the province suspended finfish aquaculture on the north coast in March 2008 while "it examines the feasibility of adopting a new approach to aquaculture management in collaboration with First Nations". [32]

Figure 17 summarizes statistics for the finfish aquaculture sector. Though the earlier years are not shown in the table, total production of farmed harvest had increased annually since the mid-1980's. Even though a moratorium was in place to 2002 and the number of sites remained constant, total production doubled. This is attributed to industry operators becoming more experienced in BC waters, reducing costs and increasing production (MMK 2007). Since the lifting of the moratorium, the total area under license increased from 1,000 hectares in 2002 to 4,349 hectares six years later and the number of sites increased by 15. Most of the increase in area is attributed to the expansion of existing tenure areas to include seabed anchor points previously outside the tenure. Some tenures were enlarged to accommodate reconfiguration of pens to improve productivity and in some cases to increase the pen area (Harrower 2010, pers. comm.).

[32] Ministry of Agriculture and Lands. 2009. *For the Record, The Facts on B.C. Aquaculture.* Accessed at http://www.gov.bc.ca/fortherecord/aquaculture/aq_environment.html?src=/environment/aq_environment.html.

Figure 17 BC Farmed Salmon Statistics



Source: Ministry of Agriculture and Lands (2010)

Since 2002, the annual provincial salmon production has been between 70-80 thousand tonnes (the exception was 2004 which was lower). Over the last decade Atlantic salmon's share of total production increased from 79% to 94%. The productive capacity of the industry, given its current "footprint" and technology is probably not more than 90,000 tonnes per year.[33] As evident in the figure, the total farm gate value was in an uptrend from 2004.

In 1998, fifty companies held tenures with the top five producing 75% of the total farmed harvest. Pan Fish (Norway) is the largest tenure holder. Pan Fish's purchase of Marine Harvest in 2007 meant that the company held a total of 70 aquaculture licenses, or some 56% of the provincial total (MKK Consultants, 2007). [34] Marine Harvest is the world's largest producer of farmed salmon and controls about 20% of the world's salmon production. Other companies with relatively large holdings in BC are Mainstream Canada, Grieg Seafood BC Ltd, and Creative Seafoods.

Table 40 summarizes the farm fish operators in PNCIMA as of September 2008. A comparison to the total provincial industry indicates that PNCIMA has about 60% of the sites and 56% of the tenured area under license in BC. Most of the farms are located between Campbell River and Port Hardy, and Quatsino Sound on the west side of

[33] MMK Consulting Inc. page 98..
[34] Pan Fish has taken the name Marine Harvest after the purchase.

Vancouver Island. A cluster of sites are found in the central coast near Klemtu and several are south of Prince Rupert.[35]

Table 40 Summary of Aquaculture Licence Holders in PNCIMA

Company	Total Licenses	Total Area
Marine Harvest Canada Inc.	42	1198
Pan Fish Canada Ltd.	26	861
Sub- total Pan Fish	68	2059
1331735 ONTARIO LIMITED (Mainstream Canada)	11	321
Grieg Seafood BC Ltd.	1	38
Middle Bay Limited Partnership	1	11
S.K.M. Enterprises Ltd.	1	12
Yellow Island Aquaculture (1994)Ltd	1	11
total	83	2452

Source: ILMB (2008)

Shellfish

Shellfish growing has been practiced in British Columbia for at least 100 years. The first introduction of oyster seed was in the Ladysmith Harbour, Boundary Bay and Esquimalt in 1903. Aquaculture on a commercial basis first began in Canada in the 1970s, and grew very quickly throughout the 1980s (BCSGA 2010). There are two basic types of shellfish farming. One is off-beach with the growing organisms suspended from rafts or buoys. The other is growing on or near the sea bed in the intertidal zone.

Most of the provincial production is outside PNCIMA, in Baynes Sound, Cortes Island and Malaspina/Okeover Inlet. The culture of Pacific oysters and Manila clams account for about 85% of total production by value in 2008. Pacific oysters are the most widely cultivated species. Over the past twenty years the adoption of off-bottom growing methods has shifted the oyster growing sites from intertidal to deep water sites and significantly increased productivity. Manila clams account for most of the clam harvest. Clam farming began around 1985, and recently the farmed harvest exceeded the wild harvest. Other farmed species include scallops, mussels, sea cucumber, sea urchin, geoduck clam, and spot prawns. Abalone would be a candidate if its population recovers sufficiently. Over the past decade the "other shellfish" category (i.e. not oysters or clams) increased from 3% to 16% of total shellfish production (by value) (MAL 2010).

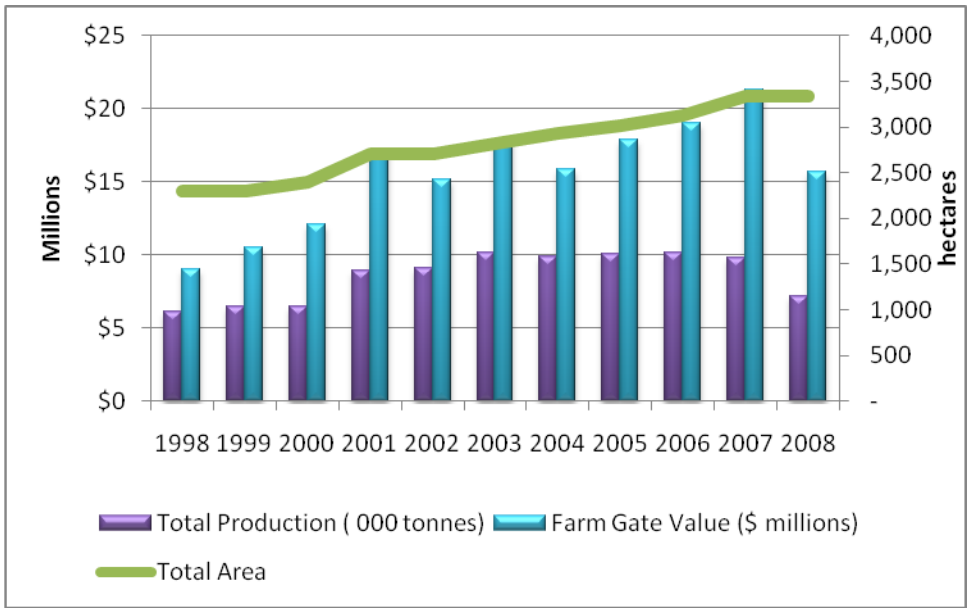
The provincial shellfish aquaculture sector is about one sixth the size of the Washington State industry, and about the same as New Brunswick's mussel industry. Nevertheless,

[35] See PNCIMA Atlas (draft) page 93 for location of Finfish sites.

growing conditions and BC's natural attributes are excellent and provide the conditions for significant industry expansion (BCSGA, 2008).

The provincial cultured shellfish industry is composed of a large number of small operators. The sector has not been subject to the consolidation that characterized development of the finfish sector. Operators are not as well capitalized and may be more susceptible to adverse market conditions. In 1998, there were 236 operators on the coast on 427 tenured sites. Ten years later there were 322 operators on 506 sites. As indicated in Figure 18, the total area under tenure has increased, but this is not reflected in increased production. In 2008, total shellfish production was similar in weight to a decade earlier but of higher value.

Figure 18 BC Shellfish Aquaculture Sector Statistics



Source: Ministry of Agriculture and Lands (2010)

The licensed shellfish growers in PNCIMA are listed in Table 41. In 2008, PNCIMA accounted for about 8% of the licenses and 7% of the total area under tenure. Most of the sites are just north of Campbell River and in Quatsino Sound. The Quatsino First Nations is the largest single holder of licences and area under tenure. Most of the corporate holders are small operators, differing mainly in legal organization of the business from an individual (Stevenson 2010 pers. comm.).

Table 41 Shellfish Licences in PNCIMA

Grower Category (number)	Licenses	Total area (ha.)
First Nations (1)	10	92.5
Corporate (11)	18	108.2
Individuals (10)	11	45.1
Total	39	245.8

Source: ILMB (2008)

Work is underway on the central and north coasts, and Haida Gwaii that may lead to establishing future shellfish operations. The Coastal First Nations and the North Coast-Skeena First Nations Stewardship Society have, over the past five years, completed extensive work that identified the best sites and shellfish species for commercial development. Of the nine First Nations communities involved, as of December 2009, seven indicated their willingness to proceed to the final stages of business development. Tenure applications and other necessary permits are in process with provincial and federal agencies (Coastal First Nations, 2010). Scallops were determined to hold the greatest commercial promise.

The current business model envisages 7 farms located nearby the 7 participating communities. A central hatchery would supply the growing sites. Processing may be contracted to an existing operation or, at some point in time, a dedicated facility. Each farm is a substantial investment of some $2 to $3 million. A farm staff of 12 persons is anticipated when the site becomes operational, or total farm employment in the initial phase of development of some 85 persons. The hatchery would employ 10 persons, and there would be some 30 to 40 jobs in processing. The current expectation is that farm construction could commence in 2011 and require 4-5 years to ramp up to full production (L. Greba 2010 pers. comm.).

Plants

The marine plant industry consists mainly of small-scale operators harvesting less than 100 tonnes per year from non-farmed sites. In 2007, 53 marine plant harvesting licenses were issued and 43 licenses were issued the following year.

Most of the plant harvest is for the spawn-on-kelp fishery. In 2007, about 300 tonnes of *M. integrifolia* was landed by 22 licenses for this purpose (IEC Collaborative Marine Research 2007). Licenses for other species were also issued. These plants were processed for human consumption or manufactured into cosmetics, pharmaceuticals and fertilizer.

In PNCIMA, there is presently no cultured plant operation. The following is a summary harvest of wild plants in PNCIMA (D. Paltzat 2010 pers. comm.).

The harvest of kelp for the spawn-on-kelp (SOK) market takes place throughout PNCIMA. In Haida Gwaii there are 5 individuals harvesting Giant kelp. The total quota for harvest is 29 tonnes. The harvest occurs on the west side of Moresby and Graham Islands from Fredrick Island to Tasu Sound, and on the east side of Graham and Moresby Islands from Skedans Point to Cape St. James. On the north coast, 8 individuals harvest Giant kelp for the SOK fishery. The harvest quota is approximately 31 tonnes. The harvest occurs in areas around the Dundas Islands, Big Bay, Duncan Bay, Stephens Island to the North tip of Banks Island, northwest side of Porcher Island and Edye Passage to Chismore Passage. On the central Coast harvest takes place in the Estevan Group as well as Smith Sound. While the central coast is closed for harvest of herring this season, the harvest of marine plants is not affected. On Vancouver Island, near Port Hardy, there is one individual holding a license to harvest up to 2 tonnes of Giant kelp.

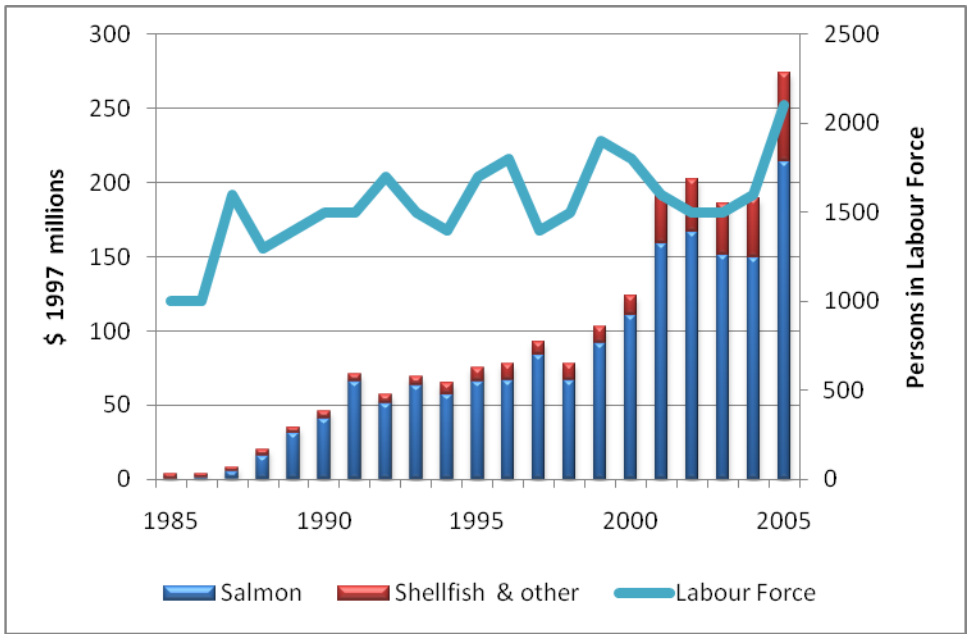
There are several tenures for harvest plants for end users other than SOK market. In Haida Gwaii, an individual is harvesting *Alaria*, Giant kelp, and Bull kelp for food and bath and spa products. The harvesting occurs in Rennell Sound and Skidegate Inlet, with a total quota of 2 tonnes. On the north coast, a tenure allows harvesting of Giant kelp (4 tonnes), Bull kelp (4 tonnes), Fucus (1 tonnes), *Alaria* (2 MT), and *Laminaria* (2 tonnes). The harvest is used for production of food, spa, and fertilizer products. The harvest sites are around Porcher Island. Another license of 75 tonnes permits the commercial harvest of Giant kelp and Bull kelp for food products. Harvest is in the vicinity of the Dundas Group and Porcher Island. On Malcolm Island, there is one tenure to harvest up to 300 tonnes of Giant kelp. The harvest is used to produce fertilizer.

Economic Contribution of Aquaculture

Since 1984, the aquaculture industry (including finfish, shellfish and plants has been among the fastest growing industries in BC (Figure 19). In 1984, the industry's GDP was estimated at $3 million, or less than 1% of the commercial wild fishery. By 2005, the industry's contribution to provincial GDP has exceeded that of the commercial fishery, sport fishery, and seafood processing industries. The economic growth of aquaculture industry's growth is largely attributed to the growth of salmon farming. Between 1984 and 2005, GDP of salmon farming rose from $.3 million to $214 million. Over the same period, the shellfish farming sector's contribution to GDP increased from $3 million to $31 million. (BC Stats 2007) The Industry's labour force numbers have fluctuated

between about 1,500 to 2,000 persons (Figure 19). The labour force is about equally divided between the finfish and shellfish operators.[36]

Figure 19 GDP and Labour Force in BC's Aquaculture Industry



Source: BC Stat (2007) tables 1 and 3.

In PNCIMA, aquaculture operations are concentrated around northern Vancouver Island and, as noted earlier, accounts for a substantial share of provincial finfish production. [37] All of the large companies involved in salmon farming have offices in the region. Marine Harvest Canada has administrative offices in Campbell River and a processing plant in Port Hardy. Mainstream Canada's has administrative offices in Port McNeil and Campbell River. Most of the shellfish operators in PNCIMA reside close to their licence area or a nearby community (i.e. Campbell River, Quadra Island) (R. Stevenson 2010 pers. comm.). On the central coast, Marine Harvest held six licenses in 2005, with the harvest supplying the processing facility in Klemtu operated by the Kitasoo First Nation. On the north coast, there are three finfish licenses which were inactive in 2005.

An estimate of the direct economic contribution of the aquaculture industry in PNCIMA is summarized in Table 42 (excludes harvest of marine plants). The estimates were

[36] The BC Shellfish Growers indicate there are about 700-1,000 persons active in the shellfish culture operations. BC Salmon Farmers Association estimate about 2,800 jobs in salmon farming, but more than half of these would be involved in processing which is not included here.
[37] The regional information is reported in MKK Consulting and pertains to conditions in 2005/06.

scaled from the respective provincial totals based on PNCIMA's share of tenured area and adjustments based on industry interviews. It should be noted that most of the employment and income is contributing to rural economies and coastal communities, primarily on the North Island and central coast. Also, each fish farm make substantial purchases of input materials (e.g. feed) and services that support additional employment in the region and elsewhere in BC.

Table 42 Estimated Economic Contribution of Aquaculture Industry in PNCIMA (2005)

Region	Sales ($ millions)	GDP ($ millions 1997)	Employment (person years)	Annual Payroll ($ millions)[4]
N. Vancouver Is.	$181	$ 108	725[2]	$23.9
Central Coast	$26[1]	$ 16	30[3]	$0.7
North Coast	nil	nil	nil	nil

Notes:

1. There was no harvest in 2005. Based on normal year harvest of 5,850 tonnes and 2005 average farm gate value.
2. Comprised of 650 persons in finfish operations and 75 in shellfish
3. Estimate from Marine Harvest.
4. From BC Stats (2010) *Survey of Employment Trends*. Shellfish average earning and wages estimated at $24,500/yr and $34,000 for finfish operators. Excludes benefits loading.

Trends

British Columbia's protected coast line and water quality indicate a large number of sites with the biophysical capability to support aquaculture production. The physical potential is constrained however by social, environmental and economic concerns. Therefore, the extent the aquaculture industry can maintain its current state, or expand, depends on the interplay of the various regulatory factors noted below:

General

- Expansion of aquaculture "land" base has been slowed by various moratoria and a protracted application process. Some applications have been in process for up to four years. [38]
- Community growth and expanded rural settlement along the foreshore will increase the potential for conflict with existing aquaculture operators, or preclude the establishment of new ones.
- The assumption by the Federal government of responsibilities for licensing and other regulation of finfish and shellfish activities reduces jurisdictional overlaps and may lead to improved administrative efficiency and transparency.
- Many existing sites and proposed new ones are potentially impacted by First Nations land claims or subject to consultation.

[38] MMK Consulting, page 98.

Finfish

- Environmental concerns about the potential long-term environmental impact of salmon farming on wild salmon stocks, until resolved, will create uncertainty and controversy in the operation and expansion of farms.
- Markets for BC's products are growing. With respect to the large western US market, BC has a location advantage relative to Chile which has lower production costs. Recent curtailment in Chile's salmon production creates a potential opportunity for BC to expand its sales to Chile's customers.
- Increases in finfish production in recent years are mostly attributed to optimizing site configuration and operating improvements. Productivity enhancements are subject to diminishing returns. Given current technology, substantial increases in production would be based on an expanded productive land base.
- Consolidation in finfish farming and international ownership has improved access to investment capital.
- There is potential to culture other finfish (e.g. Black cod, halibut) and shellfish species.
- The salmon farming industry continues to research alternative technology to mitigate environmental effects, such as closed containment systems, land based systems and different feeds (MAL, 2010b).
- Ocean ranching, which involves releasing the juvenile fish to mature at sea and captured by a commercial gear type on its return, may have potential.

Shellfish

- Seven new shellfish sites north of Vancouver Island are moving toward commercial productions by First Nations communities, perhaps in the next 5 years. This initial phase, if it proves to be commercially viable, would greatly increase shellfish culture provincially.
- Expanded shellfish production in established areas may require industry consolidation, with fewer better capitalized operators.
- There is potential to culture other shellfish species.

Provided BC's aquaculture industry remains internationally competitive, and environmental and socio-economic matters are sufficiently resolved, future growth in industry production can be expected.

Data Gaps

The following data gaps were identified in the completion of this profile.

- Data on operations performance, economic contribution and role in communities of aquaculture operations is not that well documented.

- Research on the impact of aquaculture operations on the marine environment and wild fish populations would facilitate a better understanding of possible management options.
- The implications of the recent court decision to have DFO assume regulatory responsibility for aquaculture operations are not known at this time.
- The economic potential for wild and cultured marine plant harvesting is not well delineated. Coastal plant inventories that exist, coupled with industry interviews would better define the existing scope and future potential of this sector as a farm activity.

Seafood Processing

Description

Seafood processing involves the transformation of the marine organisms into food products for sales to domestic and international markets. The sector's primary sources of seafood are from the domestic capture fishery, the aquaculture industry, and imported seafood. Seafood processes are subject to licensing and regulatory requirements by the BC and federal governments. The definition of processing contained in the BC *Fisheries Act* is adopted here to provide consistency with reported data. The *Act* defines processing to include a range of activities (e.g. eviscerating, filleting, icing, canning, smoking, salting, drying, preserving, etc.) for preparing fish or aquatic plants for market. It does not include activities on a licensed fishing vessel that might engage in these activities while delivering its catch.

Reasonably comprehensive information about recent trends of the industry is available at the provincial level, but there is relatively little regional detail. The processing industry operating in PNCIMA is described in terms of the number and location of plants, aggregate labour force and wages.

Issues

Some of the issues related to the seafood processing sector identified in the Workshop are presented below. The list is intended to be a record of concerns and matters raised. It does not necessarily imply the point is an accurate description of the circumstance.

- Traceability, or the record of seafood product through the value chain from harvest to the final consumer, is increasingly becoming required by regulators and demanded by consumers.
- There is no requirement for having seafood processed in the area where it was harvested, and much of the harvest from the north coast is processed outside the region.
- Processors are gaining control of the harvesting sector by accessing and controlling harvest quota (vertical integration of operations).

- The Processing industry has concentrated in the lower mainland because of better service base, larger labour pool and lower costs.

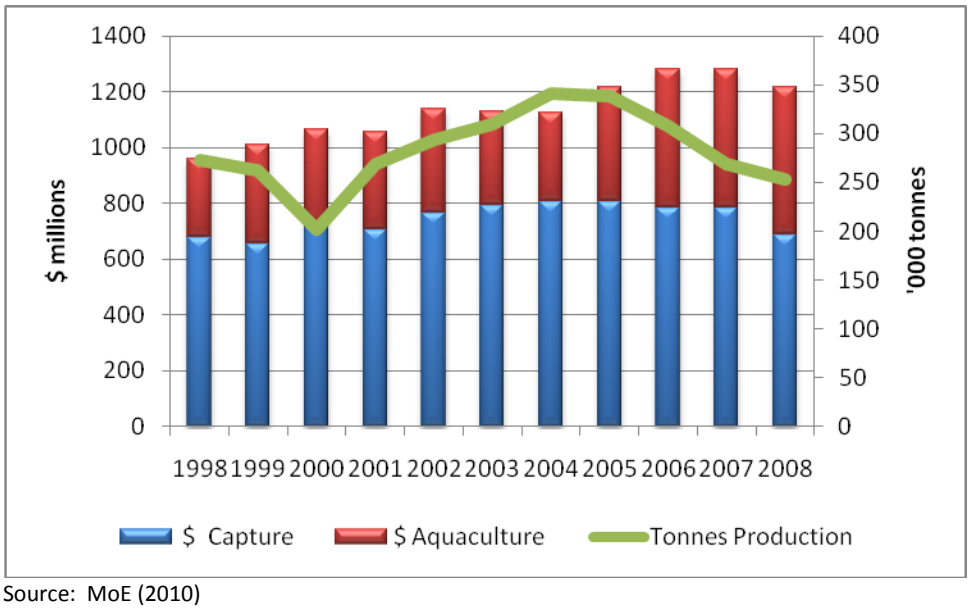
With respect to traceability, DFO in collaboration with provincial governments and industry have developed a process for issuing the necessary certificates to satisfy the European Union's regulations. Seafood processing is a step in the value chain that would be documented.

The seafood processing industry does not depend on the marine environment to the degree those harvesting the marine organism do. However, changes in the primary harvest of capture and cultured fishery directly affects the industry's opportunities to satisfy its customer requirements. The industry also relies on marine transportation for low cost delivery of the primary harvest to plant sites that are often located on, or near tidewater.

Current Conditions

The wholesale value of BC seafood processing industry was $1.2 billion dollars in 2008. (BC MoE 2008) This is comprised of harvest obtained from capture fisheries, aquaculture operations, and imported catch. The trend in total value of production is positive over the past decade. Wholesale values will vary due to changes in product prices as well as production volume. In recent years, the total value was generally increasing even though the total volume of production was declining (Figure 20). The share of cultured seafood increased continuously over the last decade, from 29% of total wholesale value in 1998 to 44% in 2008.

Figure 20 Seafood Processing

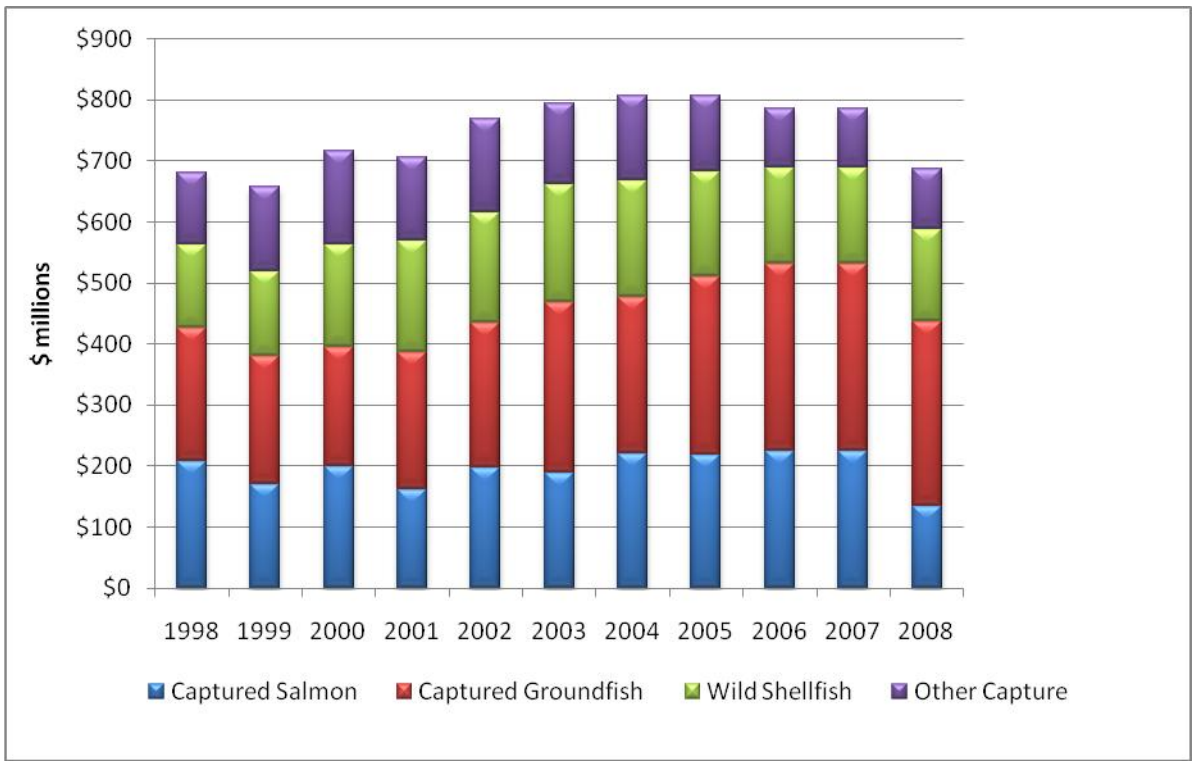


Source: MoE (2010)

The three main categories of seafood in the captured harvest are salmon, groundfish and shellfish. (Figure 21). Salmon includes the 5 species of Pacific salmon, each with different product niches and market values. The aggregate annual wholesale value of salmon averaged almost $200 million over the past decade except in 2008, where it dropped to $135 million, its lowest value over the period. The wholesale value in 2008 is due to a relatively large pink salmon harvest, which has generally lower product value than products from sockeye, Chinook and Coho. The wholesale value of groundfish increased substantially in both absolute and relative terms, particularly in the most recent three years. The increase is largely attributed to increasing wholesale value for halibut and hake. Species also contributing to higher wholesale value are sablefish, lingcod and dogfish. The aggregate wholesale value of Pollock, rockfish and Pacific cod declined.

The wholesale value of wild shellfish averaged about $180 million annually over the period. Prawn, crab and geoduck sales were, on average, similar in magnitude and collectively accounted for almost 80% of the total wholesale value. The geoduck wholesale value declined recently but this was offset by increased crab sales. Other products included in the category are wild clams, scallops, sea cucumbers and urchins. The "other" category includes herring, tuna and other species. The wholesale value of herring (herring row and herring on kelp) has fallen from $120 million to about $40 million, mostly due to the reduction in the landed volume. The wholesale value of tuna rose from $14 million in 1998 to nearly $50 million in 2008.

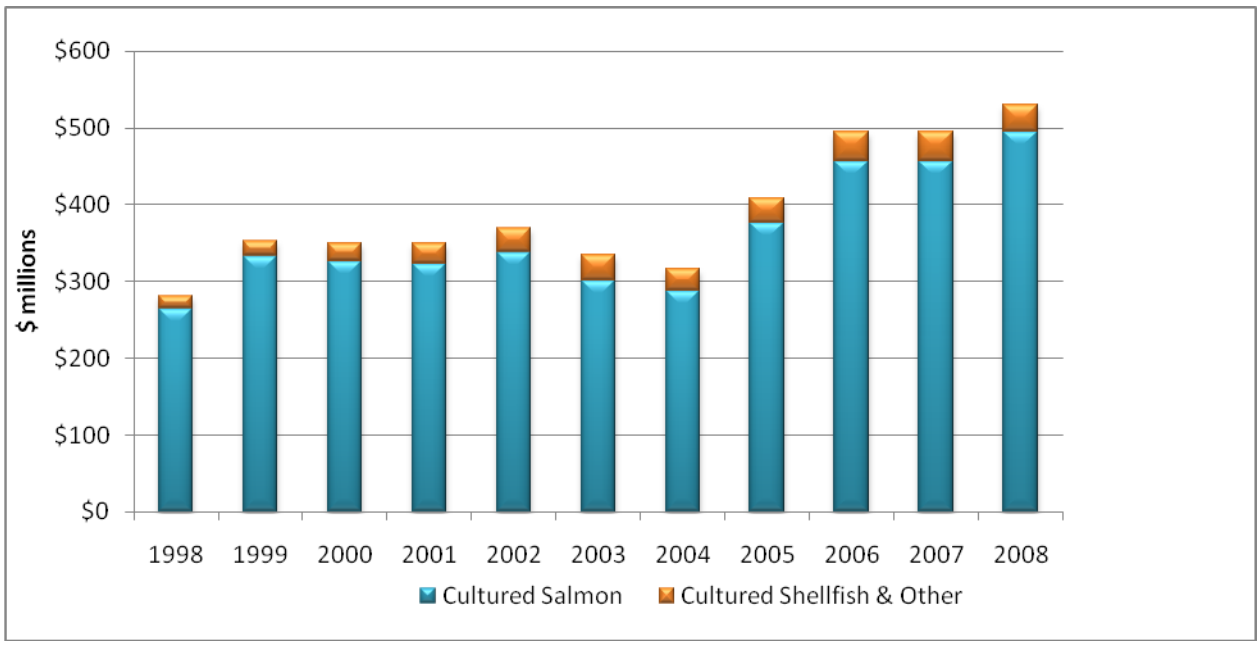
Figure 21 Total BC Wholesale Values of Processed Captured Harvest



Source: BC MoE (2010)

The total wholesale value of the culture harvest is mostly composed of salmon, particularly Atlantic salmon (Figure 22). The contribution of shellfish, while not large, has been increasing in recent years. As addressed in the Aquaculture profile, produce from the salmon farms located in PNCIMA likely account for about 55% of the total harvest volume (see Table 42). Cultured produce from cultured shell fish operations in PNCIMA is not as large.

Figure 22 Total BC Wholesale Values of Processed Cultured Harvest



Source: MoE (2010)

The increase in the wholesale value of cultured salmon is related to the increase in the farm gate value of farmed salmon rather than increase in harvest, which is discussed in the Aquaculture profile (Figure 17).

Export of seafood products accounts for between 2-3% of BC's total export sales and 36 % to 40% of BC total agriculture exports between 2000 to 2009 and 80% of the provincial export trade in animal products (DFO 2010). In 2008, BC was Canada's largest exporter of fish and seafood. The three most important species making up BC's seafood exports were farmed Atlantic salmon (37% of export value), hake (7%) and crab (6%). BC's seafood is exported to over 70 countries but the primary markets are the US (56%), Japan (19%), China (7%) and the EU (4%).[39]

[39] Reported by BCSeafood.ca. website address is http://www.bcseafood.ca/industry/stats.php

Figure 23 BC's Trade in Seafood Products

Source: Statistics Canada (2006)

The past decade shown in Figure 25 only hints at the enormous changes the processing sector underwent beginning in the late 1980's. Previous to that time, the commercial fisheries were almost entirely based on salmon and herring, which supported relatively short, intensive harvest seasons. The processing sector required large capacity that was fully utilized for short periods of the year. The large capital outlay and low return led to industry concentration of just a few firms; namely Canadian Fishing Company, BC Packers, J.S McMillan, and Prince Rupert Fisherman's Co-op. The decline of the salmon/herring fishery has led to a less concentrated processing industry. That is, generally smaller but more numerous operations that are making increasing reliance on outsourcing and focussing on generating positive cash flow throughout the year. Greater utilization of shellfish and groundfish and cultured species has supported longer operating seasons and year around operations. The processing sector focus is value added serving high value niche markets (i.e. live, special cuts, specialty processing). [40] In 2008 the processing industry utilized 90 different species of fish, shell fish and plants producing 472 distinct product species combinations (BC MoE, 2008).

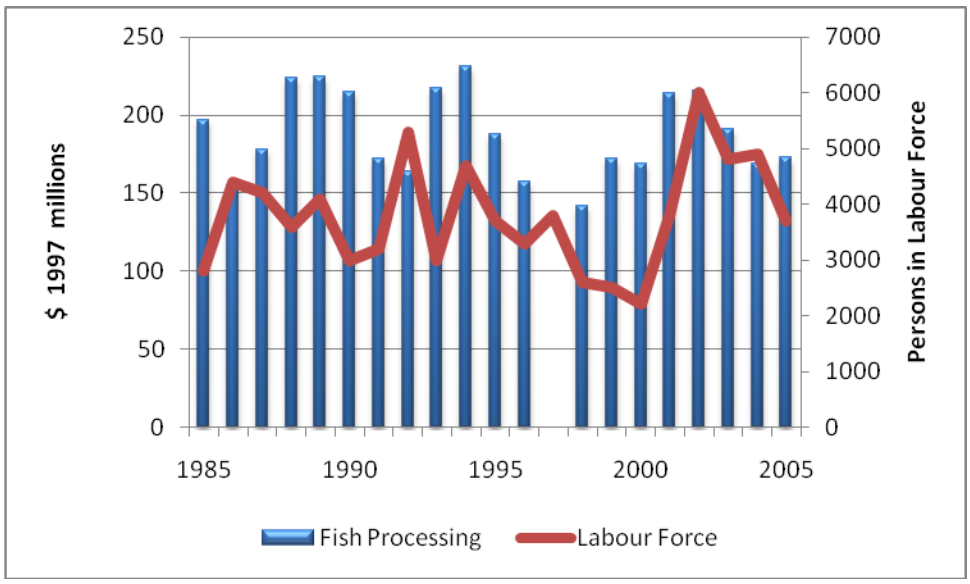
Economic Contribution

The GDP of the seafood processing industry and the number of persons in its labour force for the period 1985-2005 are summarized in Figure 24. Recall that GDP for the fish processing industry is calculated by subtracting the input cost of the "raw" seafood and

[40] See Nelson (2007 and Egan (2001) for good discussion of the processing industry's transformation

other goods and materials involved in processing, from the sales revenue of the processed product. Over the period, the industry's GDP has fluctuated between $150 million to $220 million, expressed in constant dollar terms. The industry's economic contribution appeared to be declining in the early part of the decade.

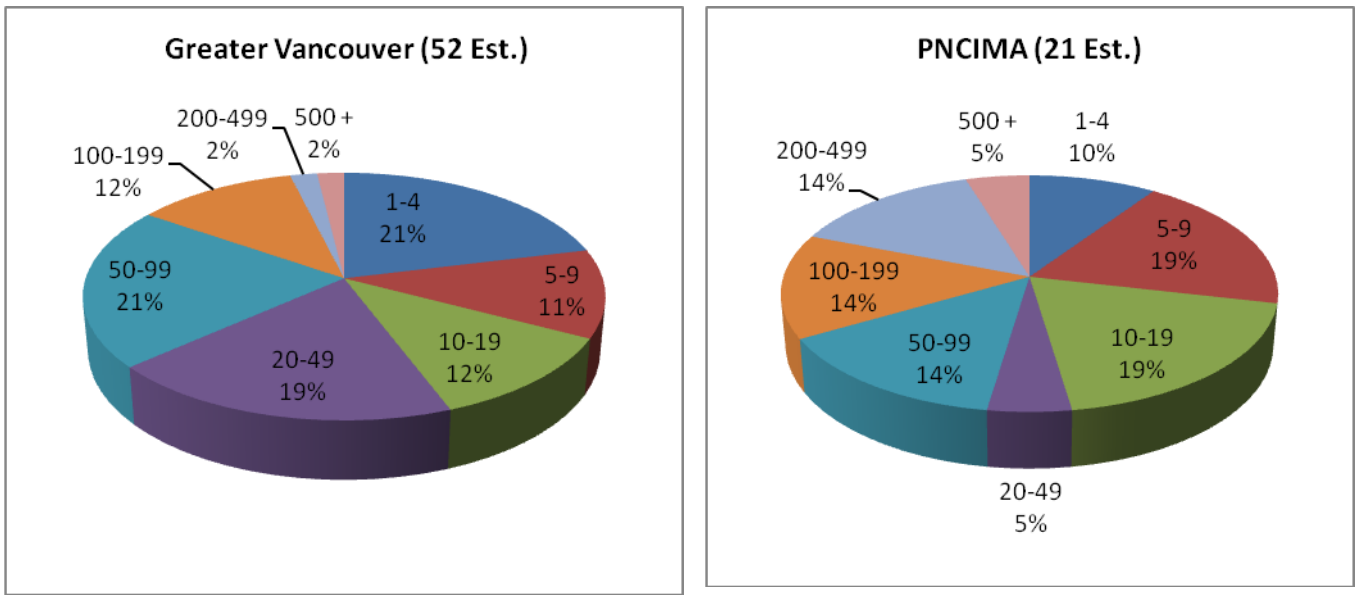
Figure 24 GDP and Labour Force in BC's Seafood Processing Industry



Source: BC Stat (2007) tables 1 and 3.

At December 2009 there were a total of 97 seafood processing "establishments" with employees. Fifty-two of these establishment were located in the Lower Mainland and 21 in the PNCIMA region (Figure 25). While PNCIMA has fewer establishments, they tend to be larger. For instance, 16% of the seafood processing plants in Greater Vancouver had more than 100 employees, as compared to 33% of the establishments in PNCIMA.

Figure 25 Establishment count by Employees (employee range per establishment)



Source: Canadian Business Pattens, Statistics Canada
Note: Est. is short for establishments

The major concentration of processing plants in PNCIMA are located in/near Prince Rupert, Haida Gwaii, northern Vancouver Island and Campbell River area. A listing of operations (which differs from establishment count adopted by Statistics Canada) and their respective product lines is summarized below.

Table 43 PNCIMA Processing Plants

Company Name	Community	Products
Andersen Foods International Ltd	Prince Rupert	n.a.
Great Glacier Salmon Ltd.	Prince Rupert	Salmon-BBQ, Cold, smoked, fresh, frozen
Odin Seafoods Ltd.	Prince Rupert	Seafood
Prince Rupert Custom	Prince Rupert	n.a.
Porcher Seafoods	Prince Rupert	Seafoods
Albion Fisheries	Massett	n.a.
C.B. Island Fisheries	Massett	Salmon, Seafood, Invertebrates
Omega Packing Company Ltd	Massett	Crabs, Fin Fish; Seafood; Invertebrates
Seapak QCI Processing Ltd	Massett	Fin Fish; Salmon; Seafood; Invertebrates,
Bella Bella Fisheries Ltd.	Waglisla	Herring; Roe; Salmon; Shellfish
Kitasoo Seafoods Ltd	Klemtu	Salmon- farmed; Sea Cucumber; Spawn on Kelp
Bella Coola Valley Seafoods	Bella Coola	Salmon- jerky, smoked, steaks , fresh
Harbour Marine	Port Hardy	n.a.
Hardy Buoys	Port Hardy	n.a.
Hooked on Seafood	Alert Bay	Fin Fish; Salmon; Seafood; Invertebrates
Keltic Seafood Ltd	Port Hardy	Groundfish; Herring; Salmon; Shellfish
Brown's Bay Packing Company	Campbell River	Salmon-farmed
Agri Marine Processing	Campbell River	n.a.
Campbell River Sea foods Ltd.	Campbell River	Bottom fish- Steaks; Salmon-smoked
Walcan Seafood Ltd	Quadra Island	Prawns; Salmon-farmed; Seafood

Source: British Columbia Food Processors Directory (2007) and BC Seafood On line

Employment in seafood processing is composed of seasonal full time, seasonal part time and year around employment, depending on the seasonality of the seafood being processed. In 2005, about 20% of the employed labour force in seafood processing were working part time. However, as noted earlier because the resource harvest is less cyclical, a higher proportion of the work is year round.

The total provincial labour force involved in seafood processing in 2006 was 5,070 persons (Statistics Canada, 2006). Females comprised about 45% of the work force. The corresponding experienced labour force for PNCIMA is 1,305, or 26 % of the provincial total. The distribution of the labour force among PNCIMA regional districts is shown in Table 44.

Table 44 Seafood Processing Industry Labour Force and Average Wages in PNCIMA

Regional District	Labour Force (persons)	Wages/salaries (Millions)
Comox-Strathcona	360	$12.05
Mount Waddington	280	$9.37
Skeena-Queen Charlotte	605	$20.24
• RD's share in Prince Rupert	445	$14.89
Kitimat-Stikine	50	$1.67
Central Coast	30	$.99
Total PNCIMA	1,305	$43.67

Source: Statistics Canada (2006)
Note: The BC average earnings for the labour force in 2005 was $33,460 (BC Stats, 2007). Labour force includes persons with no income. Average earning for employed persons in Prince Rupert sea food processing industry in 2005 was $47,800.

Trends

The fundamentals for BC's seafood processing industry are a healthy resource, growing global demand for seafood, and a strategic location for accessing Pacific Rim markets. This would suggest tremendous opportunities for the BC industry. However, the record is spotty, with some segments of the processing industry showing success while others are in decline. Processors involved in groundfish and hake, shellfish and farmed salmon are performing well, while pink salmon is not.[41]

A common feature of the prosperous sectors is that they have resolved internal differences, and established effective, cooperative relationships with regulators and members in the value chain (Nelson, 2007).

The BC processing industry is export dependant. It is a relatively small player in world markets, and must be responsive to global conditions to remain competitive. Given these considerations, the future development path of the industry will be influenced by the following considerations:

- Given vertical integration in aquaculture operations, processing of cultured species will expand in-line with expansion in primary aquaculture operations.
- Culturing of other species (e.g. halibut, black cod) as well as increasing species diversity in the capture fishery (e.g. Pollock, turbot) will support increased processing activity.

[41] *Challenges and Opportunities of Fisheries Globalization: Perspectives from Canada's Pacific Coast.* Nelson, Stuart. 2007. Pg. 35.

- Industry specialization and reduced capital requirements have reduced barriers to entry, which provides opportunities for local participation, particularly First Nation participation.
- Realization of the opportunities will an require appropriately skilled labour force that may require training initiatives.
- Prince Rupert port expansion will provide improved access to Pacific Rim markets.
- Consumers are increasingly demanding assurance of high quality products obtained from sustainably managed resources. Processors will need to support and participate in initiatives related to traceability and certification to give BC products a competitive advantage.
- Federal and provincial fisheries management has been used to pursue economic and social objectives that insulate the sector from international pressures. While the policies may be successful in keeping industry activity in local hands, it may also slow the industry's response to external forces.

Data Gaps

This profile has depended on secondary sources and Census information that is reported at the industry level. A survey of the 21 industry operators in PNCIMA could greatly improve the information base. The survey would address the species and source of input raw seafood, operating statistics, labour force characteristics, purchase of other goods and services and future investment.

Marine Energy and Mining

Description

Energy includes both the use of energy in PNCIMA and the potential development of various energy resources for local use and sales to external markets. The development and production of new energy sources will require large financial investments with significant economic implications to PNCIMA economy. The potential energy projects, particularly those sited on the water or the seabed, could affect a number of other marine activities.

Future energy development potential includes both renewable (i.e. wind, tidal and wave) and non-renewable (oil and natural gas) energy resources. These will be described in terms of their respective resource potential, if available, and in terms of proposed facilities required to develop the energy sources, where plans are advanced. Public policies and government decisions have a substantial influence on the pace and scale the major development will proceed. This role is identified in the discussion.

Mining activity is described here in terms of existing and proposed operations on the seabed or the foreshore.

Issues

Energy and mining includes a diverse range of activities that are different in scale and magnitude. The issues presented below are a record of matters raised at the Workshop and from other sources. It does not necessarily imply the point is an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile. Those that may be of direct relevance to the marine planning process in PNCIMA are addressed in this baseline.

- Renewable and non-renewable energy development may compete with existing users in marine areas, giving rise to conflicts among resource users. Do existing users have priority, or a claim to compensation if displaced by new developments?
- Developments could impact a wide range of users and access to resources, giving rise to new types of conflicts among resource users that are presently not addressed by government policies, or arrangements between industry, governments and communities.
- Tax and tenure regimes for offshore energy projects need to be clearly articulated by provincial and federal governments.
- Tenure overlaps and jurisdictional ambiguity creates major uncertainty for large investments required to develop offshore wind, oil and natural gas resources.
- Impacts of all energy developments on:
  - marine protected areas
  - navigation safety

  - visual quality
  - fish habitat
  - migratory birds
  - human health effects (e.g. oil spills and electromagnetic fields around wind farms)
- Socio-economic benefit to residents though local hire and procurement policies are uncertain.
- The experience from developing Canada's offshore oil and gas resources on the east coast may provide lessons respecting the risks and impacts of resource development in PNCIMA.
- Closure bonding on resource developments should be required of developers to ensure the site is cleaned up and there are no lasting detrimental environmental effects when an operation shuts down.

Issues specifically related to Mineral Development were the following:

- Public discussion of the impacts and benefits of seabed exploration and mining is needed as a step to formulating policy and regulatory principles appropriate to this emerging marine use.
- A good understanding of what may be required for site reclamation in the marine environment and the adequacy of bonding were regulatory issues specifically identified.
- Acid rock drainage and other negative environmental impacts from old mines needs to be addressed.
- Sand and gravel and industrial mineral deposits located on tidewater, serving the west coast of North America, are becoming more numerous in PNCIMA.

Connection to the Marine Environment

Energy projects interact with the marine environment in several ways. An energy generating facility may be fixed to the sea floor or floating. They would be sited where the energy conversion process is technically and economically favourable, which may affect other marine users or uses. Ancillary works, such as transmission lines and pipelines would be placed on the seabed. Exploration activities, construction and operations could give rise to a range of effects (e.g. submarine noise, spills and discharges of different types of materials). Wave and tidal projects extract energy contained in the marine system. Mining exploration and development on the seabed or foreshore may effect other marine users or uses and can likewise result in negative environmental and socio-economic effects if not sited carefully. Many of these potential effects are not currently well understood.

Current Conditions

The energy needs of most residents in PNCIMA are delivered from sources outside the area, since there are no major energy generating stations in PNCIMA. Household, commercial and industrial electricity requirements are mostly served by BC Hydro and Power Authority's provincial electricity transmission grid. "Off-grid" communities are also served by BCH using diesel generating plants, and small hydro facilities. Communities include Bella Bella,

the Bella Coola Valley and Haida Gwaii. BC Hydro has a 46 MW thermal plant in Prince Rupert fuelled by natural gas to provide short-term to electricity in case of a short term transmission disruption. Isolated settlements (e.g. First Nations communities, resorts, camps, residences) along the coast independently meet their electricity requirements from small hydro and/or diesel generating plants.

Public policy has influenced the direction and pace of project development nationally and provincially. In particular, concerns about climate change have led both Canada and British Columbia to adopt policies that reduce greenhouse gases and stimulate the development of renewable energy sources. BC's *2007 Energy Plan* (MEMPR 2007) commits to encouraging development of renewable electricity generation. This commitment is entrenched in law with the target to reduce provincial greenhouse gas emissions by 33% compared to 2007 level by 2020, and 80% by 2050 (*Greenhouse Gas Reduction Act)*. In response to these initiatives, BC Hydro's 2008 Long Term Acquisition Plan proposes a target of 5,000 GWH/yr of "clean" energy generated from proven technologies and purchased from independent power producers (BC Hydro 2008). The accumulation of this power supply is from projects competing in the "Clean Power Call" initiated periodically by BCH. This has stimulated private interests to investigate a large number of projects based on an array of energy resources. The predominant source is hydro power (e.g. run-of-river) but also biomass and wind projects have been submitted for consideration. BC Hydro selects from the submissions and offers terms of a power purchase agreement. For most projects, the purchase agreement is critical for the project to proceed to development. From the call conducted in 2006, BCH accepted 29 small hydro projects and three wind projects. The two wind proposals in the Peace River area are proceeding, while the third (near Prince Rupert) is not. In the latest call, there are 10 wind projects and 3 of these are adjacent to PNCIMA.

The *Energy Plan* also established the Innovative Clean Energy fund, which thus far has provided funds for a hydroelectric project at Hartley Bay replacing diesel generation, a tidal project north of Campbell River and two wave energy projects off the west coast of Vancouver Island (outside PNCIMA). Further discussion on the renewable energy resources in PNCIMA is addressed in the Renewable Energy sub-heading below.

PNCIMA includes all or parts of four sedimentary basins that are good candidates for hosting hydrocarbon deposits[42]. Past exploration found evidence of the presence of oil and gas deposits. In 1972, both the federal and provincial governments imposed oil and gas exploration moratoria that remain in-place. Nevertheless, there is a commitment in The *BC Energy Plan* and its *Update* (MEMPR 2009) to work with the federal government to lift the moratoria and to ensure that oil and gas offshore resources are developed in a scientifically

[42] See PNCIMA Atlas (draft) Page 101

sound and environmentally responsible matter. The provincial position includes a commitment to work with coastal communities, First Nations and environmental organizations to ascertain the benefits and address the concerns associated with the resource development.

Renewable Energy Resources

There are potentially three sources of renewable energy whose development could have implications to the marine environment. These are wave, tidal and wind resources.[43] There are a number of potential projects under examination by industry. Where the site requires access to provincial Crown land, a tenure under the *Land Act* is required. An investigative permit is used to access a site and temporally install monitoring equipment. A licence of occupation is a more enduring tenure suggesting the tenured area might support a commercially viable renewable energy facility. The tenures are summarized in Table 45 and the locations are shown in Map 9.

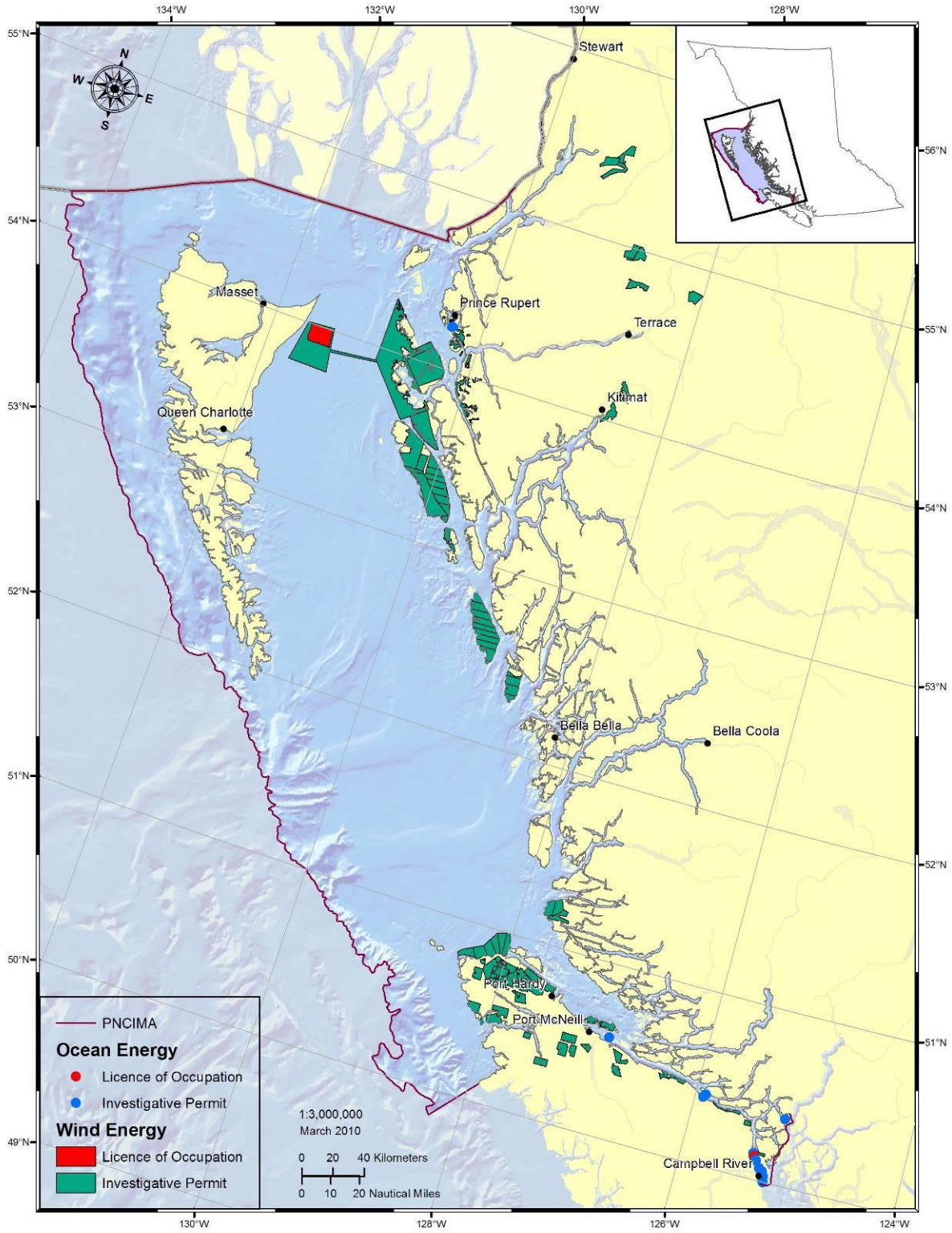
Table 45 Renewable Energy Investigative Permits in PNCIMA

	Investigative permits	Licence of Occupation (ha.)
Ocean Energy (#)	18	1
Ocean Energy (total ha)	734	2.8
Wind Energy[1] (#)	8	2
Wind Energy[1] (total ha)	17,8617	15,586

Source: ILMB (2010)
Note: 1. Marine portion of tenures only

[43] The three energy sources satisfy the definition of "clean" or renewable energy in BC Hydro's long term energy plan.

Map 9 Wind and Ocean Energy related Tenures in PNCIMA (2010)



Source: ILMB (2010)

Waves contain large amounts of energy, particularly large waves and ocean swell. There are two basic technologies, fixed onshore and floating offshore. Initial research focused on the former, while there is now greater interest in the variety of offshore options. A 500 kilowatt fixed device has been in operation off the coast of Scotland selling energy commercially since November 2000 (BC Sustainable Energy Association 2010).

The total wave energy potential for the entire west coast BC is in the order of 37,000 MW (MEMPR 2010b). The greatest wave energy potential in PNCIMA is found offshore, in the larger waves. The wave energy potential drops sharply in the inshore waters. There is also a strong seasonal variation, with the energy potential during the winter months 6 to 8 times the summer season (Cornett 2006). In 2001, work completed for BC Hydro identified Winter Harbour and Ucluelet as suitable sites for wave energy generating plants of some 200 megawatts each. Two wave energy demonstration projects have been awarded funding of $2 million each from the Innovative Clean Energy Fund for projects located near Tofino and Ucluelet. Wave energy development is presently in the pre-commercial stage of development in BC. The cumulative effect of the work underway and future research may lead to the commercialization of this abundant energy resource.

Tidal energy is derived from fast flowing water current created by the rise and fall of the water level in a tidal cycle. Turbines submerged in the tidal stream convert the tidal energy to electricity. The tidal current is dependent on the predictable relationship of the sun and moon, so it is highly predictable. In general, suitable sites are narrow channels subject to large tidal range, hence strong currents. The best sites in BC are located in Georgia Strait and Johnstone Strait. It is estimated that as the technology improves BC's tidal power potential could be equivalent to about 40% of BCH power generation in 2001 (Blue Energy 2009). There are numerous sites in PNCIMA.[44] The highest energy site is at Seymour Narrows, in Discovery Passage, north of Campbell River (DFO nd).

The project consortium consisting of New Energy Corporation, Canoe Pass Tidal Energy Corporation and the City of Campbell River, propose a tidal energy project near Seymour Narrows. The Canoe Pass Tidal Energy Project will consist of two 250 kilowatt (KW) turbines suspended from a bridge between Maude and Quadra islands connected to the provincial transmission grid. The turbines are expected to be installed in late 2010 with a total capital cost in the order of $6.3 million (Tidaltoday 2010). As noted above, the project has received partial funding from the BC provincial government. The project is subject to screening review under the CEAA. The screening process is presently on hold pending submissions from the project proponent (James 2010 pers. comm.).

[44] DFO (nd) pgs 96-97 for sites in PNCIMA

The feasibility of a tidal project to displace diesel system on Stuart Island (located at the entrance to Bute Inlet) was investigated by MEMPR. The uncertainty relating to project cost meant that a definitive conclusion could not be made (Davidson 2007). Nevertheless, the investigation suggests the opportunity that may be available as the technology becomes proven.

Development of the wind resource is the most advanced of the three renewable energy sources addressed here. World wind energy generating capacity has been doubling every three and half years since 1990 and total world capacity at the end of 2006 was around 72,000 megawatts (World Energy Council 2007). Most of the capacity is located onshore, but offshore sites are planned or completed in Denmark, Ireland, Sweden, Germany and the United Kingdom. In BC, there are two wind farms in the northeast supplying electricity to the provincial grid.

In PNCIMA, there is one offshore wind energy proposal and number of onshore proposals, at various stages of development.[45] These projects are summarized in Table 46. It is noted that project capacity estimates are subject to change, reflecting design changes and build out options. The two projects that hold power purchase agreements from the 2006 Clean Energy Call are not proceeding presently because of project cost escalation. The NaiKun, Banks Island and Knob Hill projects in PNCIMA are three of the 10 wind projects listed in the latest Clean Energy Call.[46]

[45] See DFO (nd), pg 99 for a location of the projects.

[46] BC Hydro announced on March 11,2010 the 19 projects it selected for award of an Electricity Purchase Agreement. The list did not include the wind projects in the PNCIMA. However the PNCIMA projects remain under consideration. Announcement viewed at http://www.bchydro.com/planning_regulatory/acquiring_power/clean_power_call/selected_proposals.html

Table 46 Wind Energy Projects in PNCIMA

Project Name	Location	description	Status in EA [1,2]
NaiKun Offshore Wind Energy Project[3]	offshore wind energy project in Hecate Strait	396 MW. the BCTC grid near Prince Rupert on the mainland side and near Tlell on Haida Gwaii	Certificate Issued BCEAO in 2009. Review under CEAA in process. Participating in current Clean Energy Call.
Holberg Wind Energy Project[4]	Mount Brandes near Holberg, North Vancouver Island	58.5 MW wind power project with a total of 39 wind turbines	Project was certified on Oct 22 2004 (BC). Offered power purchase agreement in 2006. Proposal withdrawn by proponent in 2005.
Mount Hayes[5]	4 km south of Prince Rupert	27 MW capacity from 18 turbines	Offered power purchase agreement in 2006
Knob Hill Wind Farm Project[6]	Northern Vancouver Island (Holberg BC)	100 MW capacity from 43 to 66 turbines	Certificate Issued (BC) in 2004 for larger capacity project.
Mount McDonald Prince Rupert Power corp.[7]	Port Edward	Proposed wind farm with an estimated installed capacity of 250 megawatts with between 100-150 wind turbine generators and associated new infrastructure and roads.	Pre-Application (BC)
Banks Island North Wind Energy Project (North Coast Wind Energy Corp)[8]	90 km S. of Prince Rupert	339 to 700MW wind power generation facility on Banks Island. Project consists of approx 103 to 234, 2.0 to 2.5 MW wind turbines and a transmission line to the BCTC grid south of the Skeena River.	Pre-Application (BC); CEAA screening
Nahwitti Wind Farm Project[9]	45 km North West of Port Hardy	Site located 45 km NW of Port Hardy on Northern Vancouver Island. Operating 50-100 wind turbines with total capacity of 100 to 150 MW.	Pre-Application (BC)

Notes:

1. BC Environmental Assessment Office
2. Canadian Environmental Assessment Agency
3. NaiKun Wind Development Inc. Accessed at http://www.naikun.ca/news_media/news.php?id=94
4. Project no longer active. Shown in table for comparison purposes only. Employment estimated based on average coefficients for industry (Joseph 2008)
5. Project information not available. Estimates based on industry average coefficients
6. Sea Breeze Power Corp. http://www.seabreezepower.com/sites/seabreeze2/files/09-8-4-KnobHill-Handout.pdf
7. Ecosystems Consulting 2009
8. Katabatic Power Corp. accessed at http://www.katabaticpower.com/banks.html
9. Nomis Power Corp. accessed at http://a100.gov.bc.ca/appsdata/epic/documents/p249/d31569/1253660804733_9b468e0278d5a299fc0747521e9dde78c91856e7cf6551a6dc44594a73efd0cb.pdf

The NaiKun Wind Project is at an advanced planning stage, but was not selected in BC Hydro's recent clean energy call. The project site is offshore in Hecate Strait east of Rose Spit on Haida Gwaii. The project would consist of up to 110 towers in an area of about 100 km^2. Submarine transmission cables would run east and link to the BC Hydro grid at Ridley Island and run west to local distribution systems on Haida Gwaii. The project obtained an Energy Project Certificate from the BC Environmental Assessment Office in late 2009. The EA assessment addressed the expected project effects on the environment and socio-economic impacts, the latter included impacts on (Hemmera 2009):

- Community and services
- Land use and tenure
- Economic considerations
- Visual resources
- Public health
- Radio communications
- Navigation

A project review under the CEAA is pending. The company has an agreement with the Haida Nation, and discussions have also addressed arrangements that would facilitate the Haida Nation to take an equity position if the project is developed (Burns 2010 pers. comm.). Necessary elements for the project to proceed are completion of the federal EA review, obtaining the required tenures and licenses from the responsible authorities, a power purchase agreement with BC Hydro and project financing.

The other wind projects proposed in PNCIMA are land based. Several of these proposals would probably involve submarine cables to tie into the provincial transmission grid. Those projects likely to have substantial environmental or socio-economic implications are subject to environmental assessment by the responsible agencies.

The development of the proposed wind projects could have meaningful economic impacts provincially as well as in PNCIMA communities. The magnitude of the impacts are illustrated in Table 47. Detailed economic impact data was only available for the NaiKun wind farm. The indicated capacity of the other projects proposed in PNCIMA was summed and average coefficients were adopted to provide an estimate of the economic implications. The economic effects are conservative because the "spin-off" effects are not presented nor are targeted initiatives that proponent's might adopt to stimulate further economic activities. [47] The NaiKun Wind Project's economic effects will probably be most apparent in Prince Rupert and Haida Gwaii. Prince Rupert would likely be the main supply centre for those wind projects sited close by the community. Similarly, Port Hardy area would likely experience most of the economic effects from developing wind projects on northern Vancouver Island.

[47] Examples are economic diversification opportunities. For discussion see page 82, Vol. 11, Hemmera (2009)

Initially, this additional employment would be limited if the skills were not locally available, but could increase over time.

Table 47 Economic Indicators of Proposed Wind Projects in PNCIMA

	NaiKun Offshore Wind Energy Project[1]		Onshore Potential (875 MW)[2]
	PNCIMA	**BC**	**BC**
Construction Phase (1 year)			
Direct employment (person-years)	381	421	3,645
Government Revenue ($ million/yr.)	n.a.	$22.4	n.a.
GDP ($ million/yr.)	n.a.	$37.6	$778
Operations Phase (average annual values			
Direct employment (person-years)	30-50	65	200
Government Revenue ($ million/yr.)	n.a.	$23.5	n.a.
GDP ($ million/yr.)	n.a.	$7.5	$243

Notes: n.a. not available
1. From Vol. 11, Hemmera (2009)
2. Prorated based on capacity from GSGislason (2007) Table 21

Oil and Gas

PNCIMA contains all or parts of four sedimentary basins; Queen Charlotte, Winona, Tofino, and Georgia. The Queen Charlotte Basin (QCB) is the largest by area and is semi-enclosed between mainland BC and the Queen Charlotte Islands. In the north, the basin is connected to the Northeast Pacific Ocean via Dixon Entrance, to Queen Charlotte Sound in the south, and to the Strait of Georgia via Queen Charlotte Strait in the southeast (see map).

Over the years, the QCB has been shown to have particular combinations of geological structure and lithology that favour the development of hydrocarbon deposits (Locke, 2006). These deposits are known as 'plays', and can be partly identified through the use of seismic imaging (Hannigan and Dietrich, 2011). Predicting how a play might operate and what it contains, however, is difficult, and requires exploration drilling for validation. On finding hydrocarbons, additional wells are drilled to delineate the play and to test its potential for commercial development. If a play is found to be commercially viable, production wells are drilled and usually require semi-permanent infrastructure.

Based on analysis and interpretation of historic seismic and well data, the Geologic Survey of Canada (GSC) estimates that the QCB may contain approximately 9.8 billion barrels of oil and 25.9 trillion cubic feet of gas (Locke, 2006). Although these amounts are larger than previous estimates, they do not represent the amount of oil and natural gas that would be

economic to develop and extract. At present, recoverable estimates used for oil are approximately 25-34% and 60-75% for natural gas, though these values fluctuate depending on the technology, costs, and output prices, and are likely to change in subsequent years. Application of a 30% recoverable rate for oil and 70% rate for natural gas results in 2.9 million barrels of oil and 1.8 trillion cubic feet of gas for QCB. However, these estimates remain uncertain because of limited data availability.

In 1913, the first well was drilled off the west coast of Graham Island, the largest island in the Haida Gwaii archipelago (Locke, 2006). More wells were drilled between 1949 and 1972, while the major phase of offshore petroleum exploration occurred between 1965 and 1969 in which eight offshore wells were drilled and not found to contain commercially valuable accumulations. Substantial seismic profiling led these efforts covering approximately 17,000 km. In the 1980s, the Geological Survey of Canada (GSC) imaged a regional grid of 1,200 km (Royal Society of Canada, 2004).

In 1959, British Columbia declared a Crown reserve over oil and gas resources in the area east of a line running north-south three miles seaward of Queen Charlotte Islands and Vancouver Island. Seismic imaging of the offshore environment continued by companies holding exploration tenures (Royal Society of Canada, 2004). Almost ten years later, the federal government withheld exploration approval in the Strait of Georgia until a federal-private study on the effects of seismic exploration on fish stocks was completed. During that study, wells were drilled in the offshore region from Barkely Sound north through Queen Charlotte Sound and Hecate Strait and by the beginning of 1970, 18 wells were drilled and multiple permits were granted (see map).

In 1972, parallel moratoria on offshore oil and gas exploration and development were imposed by both provincial and federal governments due to concerns about the environment. The federal moratorium resulted in the suspension of rights by way of Orders in Council under those permits that were issued prior to 1972. Ten years later, the Government of Canada enacted the Canada Oil and Gas Act (COGA), which allowed existing permits be renegotiated into exploration agreements. The federal government chose not to renegotiate the permits. In 1987, the Canada Petroleum Resources Act (CPRA) replaced the COGA and the former permits remained valid, but inoperable. The governments have maintained the policy-based moratoria and neither government has issued licenses to explore in offshore B.C.

The potential economic impacts arising from oil and gas development is highly uncertain, because it is not known if commercial deposits exist and if found, how the deposits might be developed, the technology involved, the production life of the resource and the economic conditions that might exist during the production period. The direct economic impacts presented below illustrate the potential magnitude of the economic effects given what are intended to be reasonable assumptions. The reported values are annual economic impacts

from the development and operation of one field whereas it is likely a number of fields would operate concurrently. For instance, production from Cook Inlet, Alaska (generally viewed as geologically similar to the Queen Charlotte Basin) has 7 producing oil fields and 17 gas fields.

Table 48 Annual Economic Impact of Oil and Natural Gas Field Development

Impact	Oil Field	Natural Gas Field
Direct employment (person-years)	2,180	1,150
Direct Labour Income ($ million/yr.)	145	76
GDP ($ million/yr.)	3,522	1,170

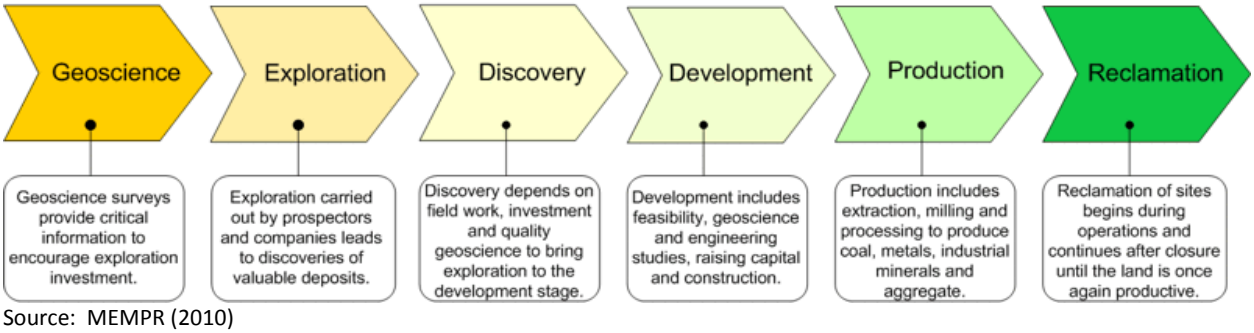
Source: GSGislason (2007), Table 20
Note: Assumes long term oil price of US $50/ barrel and natural gas of US $6 mcf .

If the estimate of commercial resource potential is reasonably accurate, the economic impact of the development would be substantial, both provincially and to coastal communities. However, many sensitive issues need to be addressed first before lifting the moratorium. After that, it would take a number of years to delineate the resource and develop it if commercial accumulations were found.

Mining

Mining is a point focused, time limited industrial activity that continues as long as the mineral can be extracted profitably. MEMPR defines six essential steps to mining (Figure 26). The collection of information is the initial step, leading to increasing levels of on-the-ground development if results are favourable and the process moves to the next phase. The completion phase is mine reclamation which restores the productivity of the land. Mining activity may cycle through the first two phase repeatedly before a discovery is made. Once a discovery is made, the cycle may continue to cycle through early steps until sufficient information is obtained to either move to the next phase or abandon the property. In a few cases the property moves to development, production and reclamation.

Figure 26 Six Essential Phases of Mining



Source: MEMPR (2010)

Table 49 summarizes the record and status of mineral development activities above the high tide line in PNCIMA. The indicator values are reported for bands of distance from the coast. The indicated current producer is the Anyox property on Alice Arm, which is presently in the review process and is not operating. The inaccessibility of large parts of the coast is evident in the data, with all of the indicators of exploration activity diminishing in count as the distance to tide water increases. The table includes mineral indicators on lands that have since been included within protected areas and are now longer available for mineral development.

Table 49 Mining Indicators in PNCIMA

Indicator	1 km from coast	> 1 km and less the 2.5km	> 2.5 km but less than 5 km from coast
Developed Prospect	12	12	5
Past Producer	50	18	8
Producer	1	0	0
Prospect	30	13	23
Showing	241	85	69
Anomaly	0	1	0

Source: MEMPR (2010c)
Note: Table include indicators in provincial parks/conservancies, and does not include Crown granted mineral claims

There are two operating mines near to PNCIMA, both on land and near Campbell River. Most of the advanced exploration projects are metal deposits located at the head of Alice Arm. The industrial mineral operations are generally located near tidewater on Vancouver Island (Table 50).

Table 50 Operating and Advanced Exploration Properties in PNCIMA

Property Name	Mineral	Location	Nearby Community
Operating Mines			
Quinsam Coal	Coal	Vancouver Is.	Campbell River
Myra Falls	zinc, copper, gold, silver	Vancouver Is.	Campbell River
Developed Properties			
Kitsault	Molybdenum	Alice Arm	Terrace/Prince Rupert
Homestake Ridge	gold, silver	Alice Arm	Terrace/Prince Rupert
Big Bulk	Copper	Alice Arm	Terrace/Prince Rupert
Hushamu	copper-molybdenum-gold	Vancouver Is.	Port Hardy
Bonanza-Sitka	Gold	Cape Caution	Port Hardy
Industrial Minerals			

Pem 100	Silica, clay	Vancouver Is.	Port Hardy
Orca	Aggregate	Vancouver Is.	Port Hardy
Benson Lake	Aggregate	Vancouver Is.	Port Hardy
Monteith Bay	Silica	Vancouver Is.	Port Hardy

Source: MEMPR (2009b)

With respect to mineral development on or below the seabed, the technology is emerging. The most advanced project is a gold-copper deposit (Solwara mine site) at a depth of 5,500 feet in the territorial waters of Papua New Guinea. The project has received environmental approval and the contracts to develop have recently been obtained by the title holder (Mining.com 2010).

In BC, the province by Order-in-Council has prohibited the establishment of mineral tenure below the high tide line (Conte 2010 pers. comm.). In rare circumstances a tenure may be issued if a strong case can be made. There is one tenure in PNCIMA that encompasses a tidal lagoon. A second tenure involved an underground mine in Haida Gwaii whose deposit extended below the high tide. The mine is closed and the tenure may have lapsed.

Mineral exploration expenditures contribute to the local economies of Terrace, Prince Rupert and Steward (from NW exploration development) and Port Hardy, but estimates are not readily available.

The development of a mineral deposit is subject to provincial environmental review and approvals. In most circumstances the mineral tenure holder keep the First Nations in whose traditional territory the property is located apprised of progress. Major mineral developments that may give rise to substantial environmental and/ or socio-economic concerns are subject to review under the BC *Environmental Assessment Act* and potentially the *Canadian Environmental Assessment Act.* The potential concerns related to the marine environment that might be addressed include the marine transportation of fuel and material to support operations and shipment of concentrate or products. The management and control of acid rock drainage is an environmental concern that is addressed as an operating and reclamation matter.

Trends

The energy potential of PNCIMA is diverse and substantial. It appears that its development would give rise to substantial social and economic implications. The proposals to establish wind energy projects in PNCIMA are the most advanced prospects, in terms of technology, commercial viability and social acceptability. Tidal and wave project require further technological advances to bring them to a commercial stage. Exploration of PNCIMA's oil and gas potential hinges on reaching social consensus, which is difficult to predict if, or when, that might occur.

In this context, the following trends are also noted:

- The governments of Canada, BC, many states in the US and the US government have brought in, or intend to establish greenhouse gas regulatory regimes (e.g. renewable energy targets, cap and trade systems). These regimes will favour energy generated from renewable energy sources. This stimulates efforts to press toward commercial development of PNCIMA's wave and tidal energy resources, and continued development of wind potential.
- When wave and tidal energy become "proven" technologies, a number of opportunities may become feasible. This includes smaller scale projects serving "off-grid" settlements and larger scale projects that create permanent employment and income in rural locations.
- Over time there will be an increase in submerged transmission cables on the sea floor, including lines linking generating sites to the transmission grid and lines to increase transmission capacity.
- The development of PNCIMA's renewable energy potential could make an increasing contribution to PNCIMA's economy.
- The first step to further investigate PNCIMA's oil and gas potential appears to be reaching social consensus to do so. BC Energy policy makes a commitment to pursue this consensus. While the extrapolation of limited exploration data suggests a sizeable resource, there is no certainty it would be found, and if so, how it might be developed and produced. Development would pose environmental risk, perhaps not unlike those posed by east coast off-shore development, and probably provincially significant economic effects.

Data Gaps

There is overlap and a lack of information about how governments are addressing tenuring and regulating energy development fixed to the seabed or in the water column.

There is no operating experience in PNCIMA with how the various ocean energy projects would impact other marine users, although this is addressed for those projects subject to an EA review. The project reviews could be monitored by those involved in marine planning in PNCIMA.

Tenure to Aquatic Lands

Description

Coastal tenures addressed here are those issued by British Columbia under the *Land Act* on Crown lands below the high tide line[48]. This is termed "aquatic Crown land" (MAL 2008). Aquatic Crown land extends offshore to the recognized limit of provincial jurisdiction. Federal harbours (i.e. Prince Rupert) and local harbours are excluded from aquatic Crown lands and there is ambiguity with respect to some waters in PNCIMA not addressed by the Supreme Court decision of 1984 (see Chapter 3). First Nation's territorial claims also create ambiguities for issuance of tenure to aquatic lands in PNCIMA.

A tenure gives the holder authority to enter and use Crown land according to the terms of the tenure. The terms vary, creating four broad categories of tenures to better match the authority provided for the activity proposed. The terms of the tenure range from a short term permission to conduct a specific activity to rights approaching fee simple ownership. The various tenure types are introduced below. This section provides an overview of the tenuring process and an aggregate description of the tenures issued on PNCIMA's aquatic lands.

Several of the commercial marine activities addressed in this SECOA hold tenure on Crown aquatic lands (i.e. Aquaculture, Energy and Mining). The economic implications of these marine activities are addressed in the respective section. There are other marine activities that are not profiled in the SECOA that may hold tenure on Crown aquatic land, such as log handling tenures, marinas, and utilities. These tenures are included in the following discussions.

Issues

The following list of issues includes views raised at the Workshop. The list is intended to be a record of concerns and matters raised. It does not necessarily imply the point is an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile.

Issues raised include:

- There may be an economic output associated with a tenure, but there needs to be recognition of the adverse effects of the tenure's use on environment values and/or exclusion of other potential users.
- Before tenures can be issued First Nation's interests and rights should be recognized.

[48] Other provincial acts may be used to grant tenure. An example is a special use permit for log storage issued by the Ministry of Forests and Range. The non-*Land Act* tenures are not addressed here.

- There is potentially overlapping seabed tenures in Hecate Strait that may conflict and are presently unresolved (e.g. existing exploration permits and applications for offshore wind energy project).
- Lack of secure tenure impedes new investment (e.g. investment in shellfish aquaculture).
- There is a need to rehabilitate or reclaim lands on some vacated tenure sotes where the tenure caused environmental damage (i.e. the tenure has expired).

Several of the issues are addressed, at least in part, in the discussion of Current Conditions.

Connection to the Marine Environment

Crown Aquatic lands are the seabed and the foreshore. That is, aquatic land is a component of the marine environment. The granting of tenure in isolation does not impact the marine environment. It is the activity that may occur on the tenured land that may give rise to a range of effects to marine environment. The regulation of the activity that is allowed under the terms of the tenure (e.g. the operation of a finfish farm) is addressed by other legal authorities.

Current Conditions

The five broad tenure forms and their respective applications are described below. An overview of the number of tenures and the approximate total area of Crown aquatic land in PNCIMA in mid-2010 are reported in Table 51 and discussed in the context of each tenure category. As noted in the table some tenures include terrestrial and aquatic component reported in aggregate. Additional information is available for specific tenures (e.g., location, term, holder).

An **investigative permit** grants the right to carry out a specific use for a short time and the holder is better served than by a licence of occupation. A permit does not grant exclusive use and may cover a general area. The permittee must allow public use and must recognize the potential overlapping and layering of tenures. Permits are replaceable with a maximum term of two years. There are 26 such permits issued covering some 270,000 ha. Two permits issued for electric powerline account for 90% of the area under tenure. There is one relatively large investigative permit issued to investigate guided nature guiding potential.

A **licence of occupation** (LOC) conveys fewer rights than a lease. It gives non-exclusive use for the purpose described, and minimum improvements are involved. It is not a registerable interest in the land and does not require a survey. It does not allow the tenure holder to curtail public access over the license area unless that would impact the licensees' right to use the land. It may be issued where minimal improvements are proposed, where a short-term tenure is required, and in a remote area where survey costs are prohibitive. It may also be used to allow development to proceed while awaiting survey requirement for other tenure type. The term of a LOC is from five to 30 years. For the Crown, an LOC is the preferred tenure either for land supporting numerous users or where it wishes to maintain greater control of land management as compared to a lease.

There are 747 LOC in PNCIMA covering 20,834 hectares. It is the common tenure choice for aquaculture and nature guiding which account for a large proportion of the area under tenure. Log storage accounts for the largest number of LOC's issue and there are a large number for private moorage.

A **lease** is issued where long term tenure is required and/or where substantial improvements are proposed, and/or where definite boundaries are required to avoid conflicts. A lease gives the holder exclusive use of the lease area and can exclude the public. The term of a standard lease is 30 years. The 314 leases extant in PNCIMA account for almost 2,560 hectares. Log holding and storage leases account for about 60% of the total area under lease and 30% of the leases issued. Aquaculture operations and commercial purposes account for most of the remaining leases.

A **statutory right-of-way** (ROW) is normally used to authorize linear uses of Crown land for transportation, communication, energy production and utility developments. The tenure holder is granted legal right of passage over the land for a specific purpose. It generally does not confer the right of exclusive use, but does provide certainty with respect to access and improvements. Exclusive use may be granted under section 65 of the *Land Act* where required for safety reasons. There is a total of 62 ROW covering 784 ha. in the aquatic lands in PNCIMA. All ROWs in PNCIMA are for utility purposes, primarily power lines and sewage facilities.

Table 51 Land Use and Forms of BC Land Act Tenures in Aquatic Lands in PNCIMA (hectares and (#'s of tenures))

Land Use (purpose)	Investigative Permit	Licence of Occupation	Lease	Right of Way (or easement)	Temporary Permit/ Interim Licence	OIC Reserve	Other	Other type	Total
Aquaculture									
Finfish		2790.0 (79)	147.1 (5)						2937.6 (85)
Shellfish	89.6 (2)	654.3 (36)	45.7 (6)				912.7 (8)	Designated Use Area	1712.0 (71)
Commercial Recreation									
Community Outdoor Recreation		2.1 (2)	1.5 (1)						3.6 (3)
Ecotourist Lodge		0.1 (1)							0.1 (1)
Fish Camps		5.7 (2)	1.0 (1)						6.6 (3)
Nature Guiding / Saltwater Guiding *(includes - significant land component)*	17947.5(1)	13887.7(19)							31835.2 (20)
Miscellaneous		4.0(2)							4.0 (2)
Private Camps		0.5 (2)							0.5 (2)
Tidal Sports Fishing Camps		12.4 (9)	0.8 (2)						13.2 (11)
Commercial									
Commercial A / Commercial B *(both overlap land and marine)*		84.9 (107)	102.4 (102)		2.7 (1)		11.8 (2)	Direct Sale / Lease Purchase option	456.5 (220)
Commercial wharf		13.9(19)	23.6 (17)						37.5 (36)
General / Miscellaneous		47.4 (12)	52.9 (18)				74.7 (3)	BCAL Inventory	175.0 (33)
Hunting Fishing Camp / Trapline cabin		4.0 (2)	1.4 (1)						5.7 (4)
Marina		48.4 (11)	36.5 (16)						84.9 (27)
Private yacht club			0.4 (2)						0.4 (2)
Industrial									
General / Miscellaneous	21.7 (1)	680.8 (5)	9.2 (3)		671.6 (1)	8.23 (1)	9.0 (2)	BCAL Inventory	1799.8 (18)
Heavy Industrial	282.5 (1)	24.1 (6)	534.4 (12)				8.3 (1)	Direct Sale / Lease Purchase option	2079.7 (22)
Light Industrial		180.3 (20)	49.0 (15)						229.4 (35)
Industrial Camps		24.4 (4)	2.9 (1)						27.3 (5)
Log Handling/Storage		2044.5 (248)	1541.7 (94)		159.9 (1)		1121.6 95)	Designated Use Area	6182.8 (507)
Ocean Energy	734.5 (18)	2.8 (1)							737.3 (19)
Residential									
Floating cabin		3.1 (4)							3.08 (4)
Floating community									0.5 (1)

Land Use (purpose)	Investigative Permit	Licence of Occupation	Lease	Right of Way (or easement)	Temporary Permit/ Interim Licence	OIC Reserve	Other	Other type	Total
Miscellaneous/Recreational/Remote		7.8 (12)					4.6 (4)	BCAL Inventory	12.3 (16)
Private moorage		18.1 (100)	2.2 (8)				3.9 (37)	Specific Moorage	24.2 (145)
Strata moorage		0.1 (1)	1.2 (1)						1.3 (2)
Transportation									
Ferry Terminal		2.9 (6)	0.2 (1)			2.7 (2)			21.2 (11)
Navigation Aid		0.1 (1)				15.0 (4)			159.8 (54)
Public wharf		2.9 (10)	7.1 (8)			53.2 (27)	1.987(2)	Provincial Transfer Of Admin.	196.5 (62)
Utilities (includes some portions over land)									
Electric Powerline	249800 (2)	261.7 (7)		709.6 (23)	22299.3 (3)				273,076.2 (36)
Gas and Oil		0.1 (1)		0.2 (2)	0.74 (2)				1.0 (5)
Miscellaneous	47.4 (1)			0.7 (2)					48.1 (3)
Sewer / Effluent		9.0 (16)		14.7 (27)	0.191 (1)				24.3 (46)
Telecommunication		16.2 (2)		53.3 (6)					69.5 (8)
Water line				4.1 (4)					6.1 (5)
Total	268923.1 (26)	20834.1 (747)	2561.4 (314)	782.6 (64)	23134.4 (27)	79.2 (34)	2148.4 (154)		

Source: ILMB (2010)
Note: Some terrestrial tenures overlap between marine and land areas.
Includes issued tenures and applications for tenure.

The allocation of Crown land adheres to the following principles (MAL 2008b);

- Crown land values are managed for the benefit of the public.
- Economic, environmental and social needs and opportunities are identified and supported.
- The interests of First Nations' communities are recognized.
- Decisions are timely, well-considered and transparent.
- Public accountability is maintained during the allocation of Crown land.

The Integrated Land Management Bureau (ILMB) is responsible for implementing land allocation policy. An application for tenure is submitted to Front Counter BC where it is subject to a defined approvals process. Broadly, that involves the applicant submitting the required information corresponding to the tenure sought and the application being referred to agencies, local government, First Nations, and other recognized groups. The applicant is required to post notice of the application on-site and may be required to seek public input (e.g. open house for an aquaculture tenure application). At this stage the province carries out consultation with First Nations (as per its guidelines) to identify the potential for First Nations rights or title and whether infringement of either might occur. Consent from adjacent land owners may also be obtained. If an application is approved, a bond may be required to ensure compliance and completion of all obligations specified in the tenure (e.g. clean up or reclamation of the area). An annual rent is fixed by policy.

The application is also considered in the context of the land use zones, objectives or strategies expressed in the coastal marine plan or land use plan in which the subject land is located (Hebert 2010 pers. comm.). In PNCIMA, the province has completed coastal plans for Quatsino Sound, the North Islands Strait and Johnstone-Bute areas. The plans assist the provincial government in tenure application decisions for the foreshore and near shore lands. Vancouver Island Summary Land Use Plan, approved in 2000, identified coastal areas for future planning, among other things. The Central Coast and North Coast LRMP's (2006) are strategic plans covering coastal lands north of Bute Inlet. Both plans promote the application of ecosystem-based-management (EBM) principles. The plans included new protected areas (i.e. conservancies) with many of them having a marine component. The Haida Gwaii Strategic Land Use Agreement also adopts EBM as the basic land management principle. The Council of the Haida Nation initiated marine planning for the waters surrounding Haida Gwaii.

Trends

The granting of tenure is an administrative process. The responsible agency and policies are subject to changes over time. The most recent provincial Throne Speech emphasized the desire to facilitate and streamline the government approvals process, which may be reflected in changes to the tenure adjudication process (Trotter 2010 pers. comm.)

It may be expected that increasing use and occupation of the Crown land in PNCIMA will increase the number of land tenures issued. However, the tenure adjudication process is adaptable to the circumstances of each application such that determination on the application reflects wider land use objectives and the views of interested parties. (Herbert 2010 pers. comm.).

The Coastal Reconciliation Protocol, signed by BC and coastal First Nations in 2009, provides for share decision making on resource and land use decisions. A decision matrix will be created to identify different decision types on the land base and match these to differing levels of engagement between the parties. In the first phase, decisions related to *Land Act* decisions will be addressed, as well as forestry and commercial recreation (Office of the Premier 2009).

Data Gaps

Data gaps in the presentation are:

- Tenures to Crown aquatic land issued under provincial *Acts*, other than the *Land Act*, were not addressed.
- Tenures to federal Crown aquatic land were not identified. This would exist in federal harbours and seabed outside of provincial jurisdiction.

Ocean Disposal

Description

Ocean disposal addresses the deliberate disposal of approved substances at approved marine sites. The activity is regulated under the *Canadian Environmental Protection Act, 1999* (CEPA). Under CEPA, disposal permits may be considered for the following substances:

- Dredged material;
- Fish waste and other organic matter resulting from industrial fish processing operations;
- Ships, aircraft, platforms or other structures from which all material that can create floating debris or other marine pollution has been removed to the maximum extent possible;
- Inert, inorganic geological matter;
- Uncontaminated organic matter of natural origin; and
- Bulky substances that are primarily composed of iron, steel, concrete or other similar matter that does not have a significant adverse effect, other than a physical effect, on the sea or the seabed.

Discharges from land or from normal ship operations (such as bilge water) are not considered disposal at sea, but are subject to other controls.

Disposal at sea is considered acceptable for non-hazardous material and where it is the environmentally preferable and practical alternative. Permits are not granted if practical opportunities are available to recycle, reuse or treat the waste.

Connection to the Marine Environment

The deleterious effects of ocean disposal are minimized by the strict regulation of the activity. CEPA prohibits the ocean disposal of substances that may be harmful to the marine environment. Only materials that have been rigorously tested and meet the requirements under CEPA, its related regulations and policy guidelines are approved for ocean disposal. After disposal is completed the site is monitored to verify whether the assumptions made during the permit review and site selection process were correct and sufficient to protect the marine environment and human health. This information provides valuable feedback with regards to the adequacy of permit conditions and the effectiveness of regulations and policies to adequately protect the marine environment.

Current Conditions

Historically, regulated ocean disposal has occurred at some 110 sites along the BC coast. Presently, there are 14 active disposal sites on the coast with 4 active sites in PNCIMA. The balance of the sites are in the Strait of Georgia and receive most of the disposed

volume. The disposal sites in PNCIMA are described in Table 52. Several of the sites are identified in the PNCIMA Marine Atlas (PNCIMA 2011). In addition to the 4 active disposal sites there are 34 historic disposal sites (Johannessen et al, 2007).

Table 52 Disposal at Sea Sites in PNCIMA

Disposal site	Status	Background
Cape Mudge	Active	n.a.
Hanson Island, Johnstone Strait	Active	Site designated in 1980. To 2005, the total volume of disposed material is approximately 225, 653 cubic metres. The site is located in 470 metres of water depth. Most of the disposed material is from maintenance dredging at log handling facilities on northern Vancouver Island.
Hickey Point, Johnstone Strait	Active	Site designated in 1980. To 2005, the total volume of disposed material is approximately 183, 694 cubic metres. The site is located in 270 metres of water depth. Most of the disposed material is from maintenance dredging at forest industry sites and is comprised of wood waste, silt, clay, sand and gravel.
Malcolm Island, Queen Charlotte Strait	Inactive	Site designated in 1984. To 2005, the total volume of disposed material is approximately 120, 960 cubic metres. The site is located in 180 metres of water depth. Most of the disposed material is from maintenance dredging at log handling facilities on northern Vancouver Island.
Queen Charlotte Strait, near Port Hardy	Inactive	Site designated in 1984. To 2005, the total volume of disposed material is approximately 20, 613 cubic metres. The site is located in 390 metres of water depth. Most of the disposed material is from maintenance dredging at log handling facilities on northern Vancouver Island.
Brown Passage (Prince Rupert)	Active	Designated date not available but long time use. In 2007 a permit was issued to the Prince Rupert Port Authority to dispose of up to 15,000 cubic metres. The site is located in 180 metres of water depth. Fairview Terminal was the loading site for the material

Source: Environment Canada (2008)

Disposal at sea is administered by Environment Canada under a permit process. An applicant must provide required information as set out in the *Act*. For dredged material and geological matter, this can require field sampling and laboratory analysis. As well, additional information may be required to assess specific concerns of a proposed site. All applications are subject to an Environmental Assessment processes under CEAA, usually a screening review. The application is assessed by Environment Canada with advice from the Regional Ocean Disposal Advisory Committee (RODAC). This expert committee includes representation from Environment Canada, and Fisheries and Oceans Canada. The permit review involves a numbers of steps and may take 2 to 3 months. This includes a 30 day waiting period that is mandatory under CEPA.

An application must include proof of publication of a "Notice of Intent" in a newspaper local to the proposed project area. This notice provides details about the proposed activities to the public who are invited to submit comments throughout the application process. Any potential conflicts with other legitimate uses of the sea need to be addressed during this process.

The application identifies the source and nature of the material for disposal, and the proposed disposal site. The applicant may propose to dispose of the material at an "active site" or a new site. For a new site, the assessment process would require information on the following matters for consideration of the application:

- Proximity to coastal and marine resources
- Potential to affect marine species and their habitat
- Interference with marine uses in the area
- Evaluation of mixing and transport characteristics at the site
- Feasibility of monitoring the disposal site, and
- First Nations' concerns.

This information can add considerable time and expense to the process from the applicants perspective which generally encourages the use of active sites. An "inactive" site is one that has not been used for at least 10 years. In the application process, an inactive site is addressed as if it were a new site. Approved permits are valid for one year.

There are presently two applications for disposal in PNCIMA, both for disposal at the Browns Passage site. The applications are to dispose of fish offal. The applications have not begun the EA process with Environment Canada, who are awaiting further information.

There is one active permit held by Fraser River Pile & Dredge (GP) Inc. It is an "umbrella" permit allowing for up to 70,000 cubic metres to be loaded from a number of identified sites and for disposal at several sites, including the Cape Mudge and Hanson Island sites in PNCIMA. Environment Canada will be notified by the permit holder of the specific disposals within these permit parameters.

The record of permitted material for disposal at sea in the Pacific and Yukon Region during the period April 2006 to March 2008 is summarized in Table 53. The dredged material is mostly sand taken from the Fraser River to maintain navigable channels. Geological matter is native material consisting of clay, glacial till and rocks that is excavated from building sites. The source of this material is mostly development sites in the Lower Mainland. Nearly all of the material was deposited at sites in Strait of Georgia, within relatively short travel distance for the source.

Table 53 Volume of Material Permitted for Disposal at Sea (tonnes)

Disposed	2006- 2007	2007- 2008
Dredged material	601,120	1,948,050
Geological matter	1,627,600	1,345,500
Vessel		1,118
Total	2,228,720	3,294,668

Source: Environment Canada (2008) Table 16.

A record of ocean disposal at sites in PNCIMA was not available, but the sites account for just a small amount of the total disposed in the region (Leung 2010 pers. comm.).

Economic Contribution

Disposal at sea is considered acceptable for non-hazardous material and where it is the environmentally preferable and practical alternative. In conceptual terms, the economic benefit of this activity is the cost saving relative to alternative disposal options, including recognition of associated environmental costs. No quantitative estimate of the value is available. It is noted that approval is not granted if practical opportunities are available to recycle, reuse or treat the waste.

Environment Canada levies a charge of $470 per 1000 cubic metres ($362 per thousand tonnes) of material disposed of. The revenue is put to site monitoring activities. The fee is collected on the volume stated in the permit. The permit holder can apply for a refund for unused volume. The total monitoring fee revenue collect (before refunds) in the two years reported in Table 53 was $ .8 million and $ 1.2 million respectively.

Trends

The record indicates that the main impetus in BC for at sea disposal has been the on-going maintenance dredging of the navigable rivers to maintain shipping lanes, and inert materials from land development. In PNCIMA, the record indicates that the sites at northern Vancouver Island are primarily used by the forest industry. The Brown Passage site west of Prince Rupert has been used infrequently for a long time. Continued industrial and land development activities in these two areas will likely generate material suitable for ocean disposal. In particular, Environment Canada is aware of a number of relatively large projects in the north moving toward development that would likely seek a permit for ocean disposal (S. Standing 2010 pers. comm.). Presently, the only active site is Browns Passage. It is not known if the site would be appropriate or suitable. As noted above, a new site is initiated by an applicant.

Data Gaps

The following data gaps were recognized in completing this profile:

- Data on use of disposal sites in PNCIMA is general. If needed for the planning process the history of disposal and monitoring results could be requested.
- Substantial developments are proposed for the Port of Prince Rupert, Port of Kitimat, and wind farm developments on northern Vancouver Island and the central coast. It is not known if these developments would generate substantial material suitable for ocean disposal (i.e. non-hazardous) and if current active sites are acceptable and commercially viable options.

National Defence and Public Safety

Description

National defence in PNCIMA relates to Canada's responsibility to maintain its national sovereignty. This involves marine and aerial patrols to monitor activities in order to counter security threats, illegal immigration, encroachment of foreign fishing vessels and drug smuggling. The task is made challenging in PNCIMA by the proximity of international boundary, and the length of largely unpopulated coastline.

Public safety, in the context of marine activity in PNCIMA, relates to the resources available to prevent or address threats to human safety.

Issues

The range of issues suggested by Workshop participants and from other sources are summarized below. The list is intended to be a record of concerns and matters raised. It does not necessarily imply the point is an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile;

- Potential interference of naval exercises with other activities and uses, and potential damage to sensitive marine habitat.
- Increased demand for customs and security operations due to increases in visitors entering by large cruise ships, pocket cruisers and private craft.
- Potential for increase in illegal fishing activity due to changes in species distribution.
- Training programs for PNCIMA residents to qualify for positions related to marine safety are not locally available.
- Port expansion plans and new projects triggering increases in large commercial carriers will increase security requirements and the public safety risk.

Current Conditions

National Defence

The Maritime Forces Pacific (MARPAC) is responsible for maintaining multi-purpose, combat-capable maritime forces to conduct operations in Canadian waters and in support of national objectives primarily in the Pacific Rim Region, but also anywhere in the world. For maritime domestic security and defence in PNCIMA, the Canadian Fleet Pacific (CANFLT-PAC) based at CFB Esquimalt is the lead agency. CANFLT-PAC conducts coastal patrols, port security, mine countermeasure operations, and naval control of shipping.

The Pacific fleet includes five Halifax-class frigates, an air defence command and control destroyer, a replenishment vessel, six coastal defence vessels and a submarine. All of

the major ships can carry Sea King helicopters. Maritime missions are also supported by long-range Aurora patrol aircraft based in Comox on Vancouver Island. The aircraft have successfully tracked ships involved in illegal people-smuggling operations, identified polluting vessels and obtained evidence of illegal driftnet fishing in the North Pacific Ocean. Also based at Comox are aircraft capable of conducting specialized search and rescue missions (MARPAC, 2010).

CANFLT-PAC monitors vessels movements over the entire North Pacific. In PNCIMA and Canada's economic zone it conducts "sovereignty patrols". These patrols assist Canada's enforcement agencies by providing accurate and timely surveillance information related to the detection, reporting and deterrence of illegal activities. Given the 27,000 kilometres of coastline to be patrolled, only the navy and air force have capability to maintain constant surveillance. The agencies relying on information from the patrols includes the Canadian Coast Guard, Department of Fisheries and Oceans, the Royal Canadian Mounted Police (RCMP), Parks Canada, Environment Canada, and the Customs, and Canadian Revenue Agency. For example, naval vessels work closely with the RCMP in its efforts to control illegal drug traffic into Canada, to educate and support remote communities and to maintain its effective Coastal Watch Program. It will be through combined operations that the maritime surveillance aspects of domestic security will be enhanced in the coming years.

In PNCIMA, the Pacific Fleet occasionally conducts training operations and infrequently holds joint exercises with US forces (exercise "Northern Edge). It is noted that planning of the naval exercise includes social and environmental assessments to minimize conflicts with commercial activities or marine wildlife. Navy ships currently make infrequent use of ports in PNCIMA (Pash 2010 pers. comm.).

Although there are no active military bases in PNCIMA, there are three former bases: CFS Massett, RCAF Alliford Bay, and RCAF Prince Rupert (Johannessen et al, 2007).

Search and Rescue

Maritime search and rescue (SAR) on Canada's Pacific coast is handled by the Joint Rescue Co-ordination Centre Victoria (JRCC). The JRCC is responsible for planning, co-ordinating, controlling and conducting aeronautical and maritime search and rescue (SAR) operations within Victoria's Search and Rescue Region. The JRCC is operated by the Canadian Forces in conjunction with the Canadian Coast Guard. The JRCC has working relationships with the corresponding rescue coordination centres in Juneau and Elmendorf, Alaska.

JRCC Victoria responsibility is approximately 920,000 square kilometres of mainly mountainous terrain of Yukon and British Columbia and 560,000 square kilometres of

the Pacific Ocean, extending to approximately 600 nautical miles offshore. The rugged and often inaccessible terrain, severe weather, and large expanses of sparsely populated areas make the Victoria SRR the most demanding region to conduct SAR in the country. (JRCC 2010)

Once JRCC is notified that a person(s) is in danger, the SAR co-ordinator begins to organize the rescue. All available information about the person(s) in danger is gathered and recorded and the positions of potential assisting resources in the area of the incident are determined. SAR co-ordinators are trained to evaluate various situations and send the most effective resources to deal with a particular incident. In complex and major incidents, many resources are often sent or tasked to assist. The Canadian Coast Guard's task is to provide the maritime resources in support of the marine SAR activities.

In 2008 there were 2,237 incidents reported coast wide. About 20% of this total was in PNCIMA. Excluding false alarms, there were some 400 recorded incidents in PNCIMA, with about 70% of the incidents recorded north of Namu (i.e. SAR area 306) and the balance of incidents south to Campbell River (SAR area 305) in 2008. In general, call outs north of Cape Caution are more serious in nature because of the remoteness of the region and more severe conditions (Namera 2010 pers.com).

Table 54 summarizes the types of incidents and number by vessel type. The four incidents involving large commercial vessels were very minor (Obermeyer 2010 pers. comm.). Motor and pleasure craft accounted for the greatest number of calls. A large proportion of the incidents classified as a medical emergency is a "people and other" category because the data did not indicate the vessel type the person was aboard, if any.

Table 54 Canadian Coast Guard Incident Attendance[1] (2008)

		Category of Incident			
Vessel Type	**Total**	**Sinking/ Grounded[2]**	**Disabled**	**Medical[3]**	**People and Other**
Large Commercial	4		2		2
Cruise Ships, ferries, tugs and barge, tour boats	22	4	2	10	6
Fishing Vessel , work boat	77	18	37	11	11
Motor and Pleasure Craft	188	37	97	15	39
People and Other[4]	108	13	8	76	11
Total:	399	72	146	112	69

Source: Canadian Coast Guard (2010c)

Notes:

1. SAR Regions 305 and 306 excludes false alarms.
2. Includes fire, taking on water, crashes, capsize
3. Includes people in the water
4. Includes canoe, kayak, unknown, nil and other

A key component of the marine resources available for SAR is the Coast Guard Auxiliary with stations located at strategic locations along the coast. The Coast Guard Auxiliary is a non-profit organization that carries out SAR services either as the principle resource or as an additional resource. The locations of the 15 Coast Guard Auxiliary units in PNCIMA are listed in Table 55.

Table 55 Coast Guard Auxiliary Stations in PNCIMA

#	Station Name	#	Station Name
45	Massett	66	Queen Charlotte
48	Bella Bella	67	Stewart
63	Kitimat	68	Ocean Falls
64	Prince Rupert	74	Kitkatla
65	Port Simpson	75	Kincolith
42	Kyuquot	50	Port McNeill
43	Port Alice	51	Alert Bay
54	Campbell River		

Source: Canadian Coast Guard Auxiliary (2009)

Another SAR resource is “ships of convenience”, which are vessels that may be close to the emergency site and have the trained personnel to render the assistance required. For instance, BC Ferries is frequently asked by the CCG to respond to vessel emergencies (Cameron 2010, pers. comm.).

The CCG, through its Marine Communications and Traffic Services program promotes safe movement of vessels by broadcasting safety information, regulating traffic movements, managing an integrated marine information system and detecting distress situations and ensuring assistance is delivered promptly. Presently, the PNCIMA area is not covered by land based radar, so the Coast Guard is reliant on radio communications. There is no formal traffic separation zone, such has been established in Juan de Fuca, which has substantially greater vessel traffic. Cruise ships follow a traffic separation protocol while passing Helmcken Island in Johnstone Strait.

Trends

With the terrorist attack in 2001, Canada's naval defence priorities shifted from an emphasis on traditional expeditionary focus to greater involvement in domestic marine security (Canada Navy, 2005). This is reflected by the increased co-ordination of the Navy's operations with the enforcement agencies (i.e. Department of Fisheries and Oceans, the Royal Canadian Mounted Police (RCMP), Environment Canada, and Customs, and Canadian Revenue Agency). The increase in marine activity in PNCIMA attributed to port expansions, increase in settlement and activity generally, will likely lead to the need for increased surveillance and monitoring activities. Ultimately, substantial growth in marine traffic and communities could lead the Navy to consider re-establishing a permanent presence in the region.

Data Gaps

Information on the expenditure, employment, and economic activity in PNCIMA communities, or provincially related to defence and public safety matters undertaken in PNCIMA, were not available. How these activities may evolve in light of potential for increased marine traffic is not specified or at least not publicly available. There are also gaps in data on frequency and locations of military operations.

Research, Monitoring, and Enforcement

Description

Research is the function of learning more about ecological, social and cultural functions, processes and interactions to afford improved or more holistic management of PNCIMA. Benefits of research include the following[49]:

- "Locating relics of the maritime past can help us piece together portions of our history and improve the understanding of our heritage.
- Creation of detailed maps, both within and outside our EEZ, can aid in creating inventories of natural resources, improving navigation and commerce, and identifying important habitats.
- The discovery of new resources may boost the economy.
- New life forms, such as those found within the hydrothermal vents, may provide us with new bioproducts with applications in human health, agriculture, and industry. These discoveries may also help us generate new hypotheses about the beginning of life on Earth, and the potential for life on other planets."

Monitoring is ensuring pre-determined thresholds are not exceeded and that there is compliance with existing rules and regulations. Many research projects, such as the measurement of salinity and sea surface temperature, require longer-term monitoring to ensure robust results are obtained. Long-term stewardship of resources is reliant on effective monitoring.

Enforcement is the function of putting into effect compliance to regulations regarding resource use; the activity occurs when infractions to regulations are noted during monitoring. There is a close relationship between monitoring and enforcement and defence and public safety, with both functions often conducted concurrently.

There are a wide range of activities which incorporate elements of research, monitoring and enforcement, including commercial and sport fisheries, aquaculture, marine transportation, and coastal industry.

Issues

Issues suggested by Workshop participants and from other sources are summarized below, grouped by type of issue. The summary is intended to be a record of concerns and

[49] Taken from National Research Council (2003).

matters raised. It does not necessarily imply the point is an accurate description of the circumstance. Also, some of the issues raised are outside the scope of this profile

Research

Two general issues were raised regarding research. First, not enough research has been conducted to inform Ecosystem Based Management of the marine environment. Second, some research activities can have a negative impact on the marine environment[50].

Some identified gaps in knowledge were quite broad (e.g. the effects of climate change and ocean acidification), while others are specific to a species or marine activity. Workshop participants recommended that to ensure the greatest benefit, research activities should be focused on gaps that will help move the PNCIMA process forward and expressed that it is unknown if current research efforts are meeting those needs.

First Nations traditional knowledge was identified as a significant asset that could improve resource management, but its may not be generally available because of sensitivities. More broadly, the body of local knowledge is diminishing because people are leaving the region and/or less people are employed in marine industries.

An important resource that was identified as underutilized for research and monitoring was volunteer organizations. Examples of volunteer projects/groups include the coastal bird survey, beach bird survey, stream keepers and mapping efforts hosted by community mapping network (e.g., eelgrass).

The Oceans Act calls for collaboration between industry and government, and this collaboration is reflected in research and monitoring partnerships that have been established. Workshop participants expressed concern regarding "proponent driven" research related to the development of economic opportunities (e.g., wind farms, port expansion, etc) and monitoring of existing activities (e.g., commercial fishing). It appears that Workshop participants are looking for government to lead the research agenda in a coordinated manner rather than be responsive to industry.

Monitoring and Enforcement

Monitoring and enforcement issues are linked, with the major concern being the perceived lack of resources (both funding and staff) dedicated to those activities. Specifically mentioned was a dearth of monitoring related to enforcement and related staff vacancies. Monitoring is expensive and is most useful if conducted on a continuous basis; this requires a secure base of funding to ensure it is adequately resourced. A lack of

[50] See Booth (2006) for a detailed discussion on the potential negative impacts of research.

funding for monitoring is documented as a major limiting factor to opening up PNCIMA to bivalve harvesting (Fisheries and Oceans Canada 2010a).

User sectors have expressed concern that regulations are not enforced evenly, if at all, both between and within user groups. They also indicated that costs of enforcement are not necessarily proportionally distributed. By way of example, it was noted that costs for monitoring and enforcement are more onerous for small vessels than for larger ones (smaller vessels have less net revenue to support the monitoring fee). Further, workshop participants suggested that enforcement was not keeping pace with the expansion of activities, particularly for new fisheries, and that there are not enough "people on the ground" to conduct enforcement activities. Workshop participants expressed that the responsibility (and costs) for monitoring and reporting is being downloaded to user groups, yet the results of the monitoring are mistrusted.

Incentives for compliance were seen as a missing component for monitoring and enforcement. Regulations with insufficient enforcement were seen to provide little benefit to the communities or the resources they are intended to protect. Examples provided include the quota system for fisheries and at-sea garbage disposal for shipping and transport.

It was noted that research, monitoring and enforcement should occur beyond the boundaries of PNCIMA because of the impact of activities outside PNCIMA on the values found within PNCIMA. More research and knowledge on how marine processes interact would improve efforts in this area.

Some Workshop participants suggested there was a need for monitoring and enforcement that is not yet occurring, including marine disposal of wastes such as plastics or treated wood[51].

Some Workshop participants expressed a desire for greater collaboration between DFO and First Nations with regards to monitoring and enforcement of fisheries-related activities. Some suggested that a divestiture of some enforcement powers (e.g. to Coastal Guardians) could be beneficial towards improved resource management. Generally it was felt that there was a lack of communication between enforcement groups. This lack of communication further extends to communicating the results of monitoring and enforcement, such as how Canada is meeting its international marine commitments.

[51] Johannessen et al (2007) discusses environmental concerns regarding treated wood.

Connection to the Marine Environment

Research, enforcement and monitoring are conducted on and in the marine environment, and rely on the use of marine resources. The long-term vitality of some marine resources (e.g., Northern abalone) relies on continued efforts in research, enforcement and monitoring. The economic benefits of these activities can accrue to local communities through hiring boats and local researchers and through economic spin-off spending in local communities.

Generally research and monitoring impacts on the marine environment (i.e. extraction of samples or living organisms; interference with water movement etc.) are limited. However research involving seismic studies is controversial and has resulted in advocacy and court action to prevent or modify operations. For example a National Science and Engineering Research Council application to conduct seismic testing in Douglas Channel (the Batholith Project) was withdrawn in 2007 due to concerns regarding impacts on marine mammals.

Current Conditions

Research, monitoring and enforcement activities are conducted on an on-going basis in PNCIMA. Generally the field season starts in mid-April and runs until September. Research has been limited in PNCIMA compared to other geographies due to the distance from the research centres in Vancouver and lower Vancouver Island and potential for severe weather in the fall and winter months. There are a number of methods of in research, monitoring and enforcement, often used in conjunction with one another. [52].

- Research vessels;
- Moored buoy;
- Commercial ships (private vessels with scientific instruments attached);
- Manned patrol vessels;
- Manned aircraft;
- Voluntary Monitoring Systems (includes vessel monitoring and electronic monitoring)[53]; and
- Remote sensing, including radar and synthetic aperture radar (SAR), optical imaging (satellite, etc), and acoustic methods.

The following outlines research, monitoring and enforcement efforts by the Federal and Provincial governments, First Nations, industry, research institutions, and non-

[52] Se for example http://www.pac.dfo-mpo.gc.ca/science/oceans/bcferries-traversierCB/tools-outils-eng.htm
[53] See Brooke et al (2010) for a listing of 10 types of systems

government organizations. In many instances research, monitoring and enforcement is undertaken as a joint effort.

Federal Government

Federal government agencies play a leading role in research, monitoring and enforcement. Table 56 lists federal agencies involved in these activities, with the first three agencies expending 85-90% of federal government marine-related expenditures (GSGislason 2007).

Table 56 Federal Agencies involved in Research, Monitoring and Enforcement

Agency	Research, Monitoring and Enforcement Activities
Fisheries and Oceans Canada (DFO)	Commercial and sport fisheries monitoring and enforcement. Marine science and research, conservation and protection. Research centers (see Table 57 below).
Environment Canada	Activities related to conservation and protection of ecosystems and species, marine pollution prevention and remediation, weather and environmental prediction, and environmental assessment.
Parks Canada	Activities at Gwaii Haanas National Park Reserve and Haida Heritage Site, including conservation and protection of ecosystems and species.
Natural Resources Canada	Research supporting offshore energy and mineral resources, including seafloor mapping with multi-beam technology and research on slope stability and sponge reefs.
Transport Canada	Regulation, inspection, and certification of ships.
Department of National Defence	Monitoring and enforcement support (e.g. surveillance for illegal fishing) of marine regulations.
Royal Canadian Mounted Police	Monitoring and enforcement, including patrol ship marine bases in Prince Rupert (the Patrol Vessel Inkster ,a 19.75 metre fast patrol aluminum catamaran with 4 person crew; 24' rigid hull inflatable with 4 person crew) and Campbell River (the Nadon, a 17.7 m (58 ft) fast patrol catamarans). Two sister ships to the Nadon are also based on the west coast outside of PNCIMA.
Agriculture and Agri-Food Canada	Monitoring (seafood inspection – e.g. Canadian Shellfish Sanitation program)

Additionally, the Natural Science and Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council of Canada (SSHRC) are federal programs that provide funding to support research at B.C. post secondary institutions. Information available from NSERC and SSHRC does not specify the location the research is undertaken. For example, in 2009 $324,286 was provided to a

researcher at Simon Fraser University to assess the impacts of bottom-fishing gear on benthic marine ecosystems[54] but there is no indication if some portion of the research is being conducted in PNCIMA.

DFO has five research facilities in BC (Table 57). None are located in PNCIMA although they all conduct research relevant to PNCIMA.

Table 57 DFO Research Facilities in BC

Facility (Location/partners)	focus	# staff
The Center for Aquaculture & Environmental Research (Vancouver / UBC)	Integrate ecosystem and conservation with sustainable aquaculture practices for growing aquatic species of global importance.	No information
Cultus Lake Salmon Research Laboratory (Chilliwack)	Study factors affecting the freshwater life-cycle stages of Pacific salmon (Sockeye is current focus).	11 DFO + university researchers
Institute of Ocean Sciences: (Sidney / Co-located with the Pacific Geoscience Centre, Canadian Coast Guard Pacific fleet, Canadian Wildlife Service and North Pacific Science Organization)	Centre for research on coastal waters of BC, the Northeastern Pacific Ocean, the western Canadian Arctic and navigable fresh waters east to the Alberta border. Focus on ocean conditions and the effects of variability and fluctuations of conditions on marine ecosystems, including fisheries and ocean research, environmental science and hydrography.	250+
Pacific Biological Station (Nanaimo / Satellite field office in Prince Rupert and other locations outside of PNCIMA)	Principal centre for fisheries research on the West Coast. Focus on: - Stock Assessment - Aquaculture - Marine Environment and Habitat Science - Ocean Science and Productivity	200+
Salmon Assessment and Freshwater Ecosystem (SAFE) Division (Simon Fraser University)	Research activities are primarily associated with the incubation, rearing, migration, and feeding behaviour of salmonids, and the health and carrying capacity of the habitat on which they depend. Specific research projects include effects of timber harvesting on fish habitat, water withdrawal and energy generation impacts and effects of riverine conditions on adult salmon migration.	5

[54] http://www.nserc-crsng.gc.ca/Disclosure-Divulgation/2009/grants_report_jan-march2009_e.pdf

DFO has been supporting research on emerging fisheries since the early 1990's (LGL Ltd, 2004). Since 2003, DFO has been conducting independent fisheries research surveys which track abundance of commercial and non-commercial species. These efforts, conducted jointly with industry, are undertaken in four specific areas, three of which are in PNCIMA (Queen Charlotte Sound/Hecate Strait, the West Coast of Vancouver Island, and the West Coast of the Haida Gwaii)[55]. Surveys are intended to be conducted every second year and follow a depth stratified random design to provide relative abundance indices for benthic and near benthic species (Booth, 2006).

DFO is also working with stakeholder and First Nation groups to develop catch monitoring standards for all fisheries with a focus on data collection to estimate catches, releases, and other essential biological data for stock assessments and fishery management evaluations (Fisheries and Oceans Canada, 2009d).

Much of the science conducted by DFO is subjected to peer review through the Canadian Scientific Advisory Secretariat (CSAS). CSAS is responsible for review and evaluation of all scientific information on the status of living aquatic resources, their ecosystems, and on biological aspects of stock management. DFO research science for the Pacific region is published in various journals and summarized annually in a state of the Pacific Ocean report, the most recent of which was published in 2009 based on 2008 research[56].

The Fisheries Act provides legislative authority for management and protection of harvestable fish and shellfish. Enforcement is conducted by DFO's Conservation and Protection Directorate which has approximately 170 fishery officers in the Pacific Region (BC and Yukon). Canadian Coast Guard Marine Enforcement Officers are trained in enforcement and have the same powers as fishery officers. Contract monitors and validators generally have limited enforcement training and for the most part observe, record and report to enforcement authorities, although some monitors and validators have enhanced enforcement training. Integrated Fishery Management Plans outline enforcement issues, tasks and methods for each fishery.[57]

Fishery Officer effort and marine user compliance is tracked through the Fisheries Enforcement Activity Tracking System. Recent successes include convictions for poaching northern abalone. One case in 2006 led to the arrest of 3 individuals, fines of $30,000, forfeiture of equipment totalling $183,000, and a scuba-diving ban (Hall, 2008). Hall (2008) suggests that sport fishery for halibut is poorly monitored and enforced,

[55] A map of the survey areas will be available though the British Columbia Marine Conservation Analysis (BCMCA) in the fall of 2010.
[56] Available at http://www.pac.dfo-mpo.gc.ca/science/psarc-ceesp/osrs/index-eng.htm
[57] Plans are available at http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/MPlans.htm

resulting in a catches well above 12 per cent of the total allowable catch derived by the International Pacific Halibut Commission. Peterson et al. (2005) noted decreasing portions of DFO Pacific region's $290 million budget was being spent in fieldwork and enforcement.

In the 2009, 518 person-days of on-ground monitoring of the commercial shrimp and prawn fishery occurred, at a cost of $59,200 paid by industry. About 40% of this effort was in waters north of Cape Caution (Fisheries and Oceans Canada, 2010c). The enforcement effort coast-wide resulted in 46 violations, 21 of which court or other action was taken (Fisheries and Oceans Canada, 2010c).

Under the Species at Risk Act, DFO is responsible for recovery planning for marine species listed; Environment Canada is responsible for migratory birds and Parks Canada responsible for species on waters administered by Parks Canada. There are 9 species listed under the Species at Risk Act (SARA) with range within PNCIMA for with recovery plans have been finalized. The species are; blue, fin, and sei whales; leatherback turtles; northern abalone; northern resident and transient killer whales; sea otters; short tailed albatross; and pink rooted shearwater. These plans ban specific activities and include provisions for monitoring and enforcement. There are a number of other species listed under SARA that have status reports and assessments, management plans, habitat action plans and other reports. These species include the North Pacific right whale, humpback whale, marbelled murrelet, ancient murrelet, harbour porpoise, Steller sea lion, and rougheye rockfish (type 1 and 2).[58] The first step for species to be considered for listing under SARA is monitoring.

Environment Canada conducts a variety of programs relating to research, monitoring and enforcement, such as those coordinated through the Canadian Wildlife Service and Canadian Shellfish Sanitation Program. Enforcement activities by Environment Canada under the Canadian Environmental Protection Act and the Fisheries Act are reported nationally but figures are not available specifically for PNCIMA.

Under the Canadian Shellfish Sanitation Program, Environment Canada works with DFO and the Canadian Food Inspection agency to ensure the safety of shellfish for consumption. Environment Canada monitors water quality in areas where shellfish are harvested and makes recommendations to DFO on shellfish beds to be opened or closed.

The Canadian Wildlife Service (CWS) has operated seabird monitoring programs on Haida Gwaii and currently operates a joint monitoring program on Triangle Island with

[58] Information on these and other species listed under SARA can be found at http://www.sararegistry.gc.ca/sar/listing/schedules_e.cfm?id=1.

Simon Fraser University. Between 1993 and 2002 they operated a rat eradication program on Langara Island and are working to prevent the spread of racoons in Haida Gwaii. CWS have permanent monitoring plots in Gwaii Hannas National Park Reserve and Haida Heritage Site. They partner with Bird Studies Canada to conduct the BC Coastal Waterbird Survey, a monthly assessment that has volunteers cover 200 standardized shoreline sites. Regular sampling of seabirds for contaminants is carried out under the National Searbird Monitoring Program.

In 2007 Environment Canada announced $1 million in spending towards studies to support the establishment of the Scott Islands Marine Wildlife Area to protect seabirds.[59]

The Canadian Environmental Assessment Agency, a federal body accountable to the Minister of Environment, conducts environmental assessments of projects when a federal authority has decision making responsibility for the project. This process may involve research to support the assessment. Sections 4.3 of this report describe some of the major projects which are undergoing, or about to undergo Provincial Environmental Assessment some of which are also subject to federal assessment.

The Pacific Geoscience Centre, part of the Geological Survey of Canada and accountable to the Minister of Natural Resources, has conducted much research throughout PNCIMA, with a focus on the Queen Charlotte Basin, using multi-beam sonar, side scan sonar and seismic survey (Booth, 2006)[60].

Nationally the Canadian Coast Guard has 116 vessels of various sizes on which science can be conducted, 17 of which are dedicated to science programs. The Pacific Region website lists 31 ships based in BC (Table 58) plus helicopters based in Victoria and Port Hardy.

[59] http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=67B8B3F8-DF0F-44AD-A41F-6D9BCF64C62C
[60] See http://gdr.ess.nrcan.gc.ca/ed_pad/e/viewer.htm for survey sample locations.

Table 58 Coast Guard Vessels in Pacific Region

Vessel type	Number in Pacific Region
High Endurance MultiTasked Vessel – Light Icebreaker	1
Medium-Endurance Multi-tasked Vessel	2
Offshore Oceanographic Science Vessel	1
Offshore Fishery Science Vessel	1
Mid-Shore Patrol Vessel:	3 (1 based in PNCIMA)
SAR Lifeboats	11
Hydrographic Survey Vessel:	2
Near-Shore Fishery Research Vessel	1
Specialty Vessel:	7 (4 based in PNCIMA)
Air Cushioned Vehicle:	2

The Canadian Coast Guard planned to allocate 15.5 % of vessel time across Canada to directly support science initiatives in 2009-10 (CCG, 2009)[61]. For science, this amounts to 3802 operational days of vessel time and 230 hours of helicopter time in 2009-10. An additional 720 operational days were planned for special science initiatives. Coast Guard "clients" include DFO Science, the Canadian Hydrographic Service, Environment Canada, Natural Resources Canada, and research supported by the Natural Sciences and Engineering Research Council of Canada.

Nationally the Canadian Coast Guard planned to allocate 10.1% of 2009-10 time to fisheries and aquaculture management. Activities include "patrol closed and boundary areas, as well as to conduct inspections at sea to ensure compliance with the regulations designed to ensure an orderly fishery" (CCG, 2009). The CCG is considering changes to the Marine Enforcement Officer program in the Pacific Region which would provide a stronger, legislated role for law enforcement.

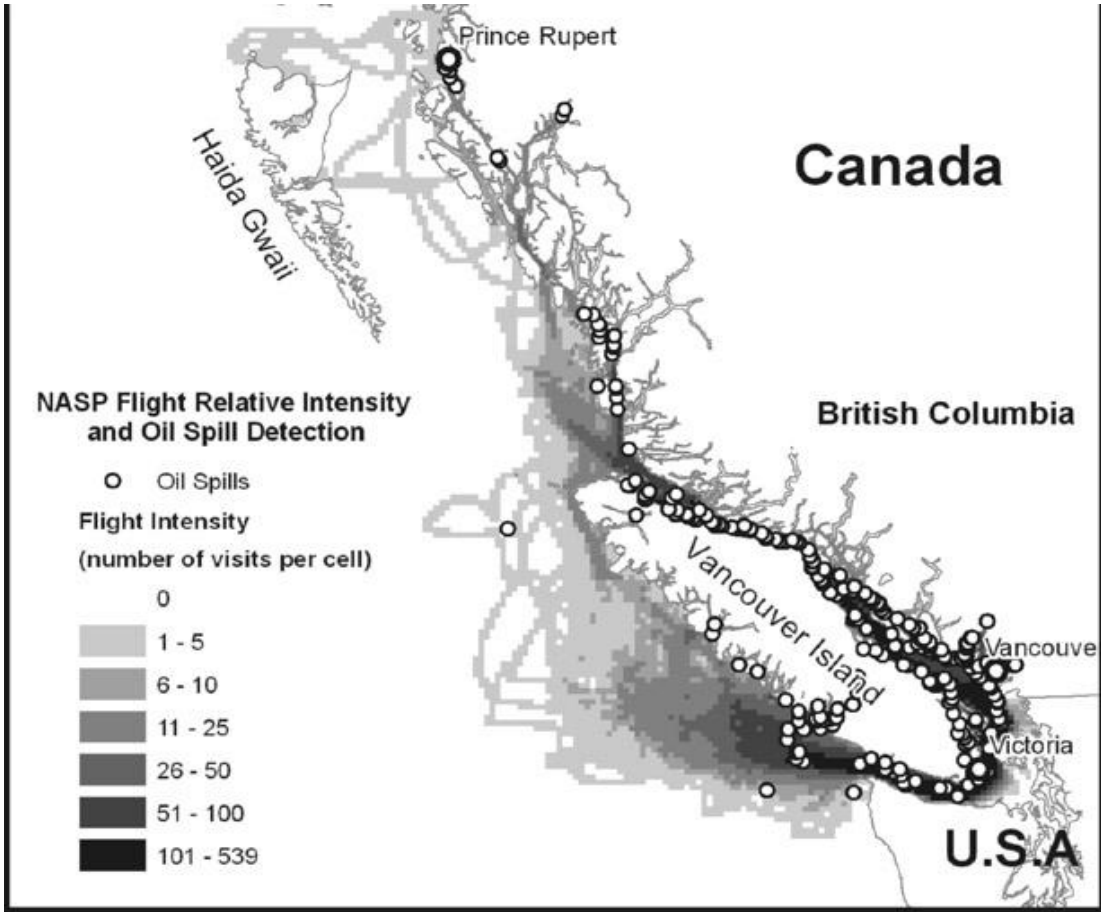
In the Pacific Region, total Canadian Coast Guard staff employed in 2007 was 946. It is unknown how many directly support research, monitoring and enforcement activities within PNCIMA. Employment numbers are expected to be stable for future years, with some increase (nationally) for staffing recently approved vessels (CCG, 2009).

Transport Canada operates the National Aerial Surveillance Program (NASP). Map 11 below portrays relative flight relative intensity and documented oil spills from 1997 to 2006. Until the end of 2007, the program involved using two crew members to visually identify possible oil spills. In 2008 a more sophisticated remote sensing system was

[61] Figures are only available nationally.

introduced that can detect polluters at night and under low cloud was introduced, using a Dash 8 aircraft patrolling out of Vancouver. Used in conjunction with Radarsat data from the Integrated Satellite Tracking of Polluter's Project, evidence gathered by the NASP crews is forwarded to the respective departmental and Environment Canada regional offices for enforcement. In 2006-7, nationally, there were 98 pollution incidents detected out of 10,063 visually observed vessels.[62] This compares to 2008-9, where 183 pollution incidents were detected from 9,947 visually observed vessels and 76,767 automatically identified vessels.

Map 10 Relative flight relative intensity and documented oil spills (1997 - 2006)



Source: O'Hara et al, 2009

Industrial discharges to the marine environment (e.g. pulp mills, aluminum smelter, etc) are monitored for environmental effects. Ocean dumping is monitored and permitted by Environment Canada and material deposited is tested for chemicals (see Section 6.10).

[62] See http://www.dfo-mpo.gc.ca/oceans/management-gestion/healthyoceans-santedesoceans/initiatives-eng.htm#pollution)

Cruise ship monitoring does not appear to be as active in BC as in Alaska and Washington State, possibly because of the generally higher standards set for sewage and grey water discharges in those jurisdictions (Van der Voo 2010). In 2008 in Alaska, 12 of 20 cruise ships violated state water quality standards. In 2009 13 of 18 were fined. Alaska regulations are more stringent than those in BC, and independent onboard monitors test ships for levels of pollutants in sewage that can disrupt marine life (Rosenfeld, 2010).

Provincial Government

The provincial government efforts are focused on planning, monitoring and enforcement. Provincial research is directed by the B.C. Research and Innovation Strategy[63] led by the Ministry of Small Business, Technology and Economic Development, and generally funded through cost sharing partnerships with research institutions. Funding priorities cover ocean sciences (including fisheries and aquaculture) and alternative energy. One example of provincially funded research is modelling of noise impacts, conducted by researchers at *JASCO Research Ltd* in 2007.[64]

Table 59 shows provincial agencies involved in research, monitoring and enforcement consistent with their jurisdiction.

[63] http://www.sbed.gov.bc.ca/tri/research/Pages/default.aspx#main-content
[64] http://www.sbed.gov.bc.ca/TRI/research/SuccessStories/sector/Pages/acoustic.aspx

Table 59 Provincial Agencies involved in Research, Monitoring and Enforcement

Agency	Activities
Ministry of Agriculture and Lands	Conducts compliance reviews of site management plans, inspects existing and proposed sites, and collects facility reporting data.
Integrated Land Management Bureau, Ministry of Forests	Marine planning, tenures approval.
Ministry of Energy, Mines and Petroleum Resources	Research and monitoring for wave, wind, and tidal energy. Monitoring mining sites for downstream impacts.
Ministry of Environment / (BC MOE Ocean and Marine Fisheries Division	Regulation of finfish aquaculture[1], development and monitoring of coastal environmental indicators, marine protected areas
Ministry of Small Business, Technology and Economic Development	Research funding and partnerships

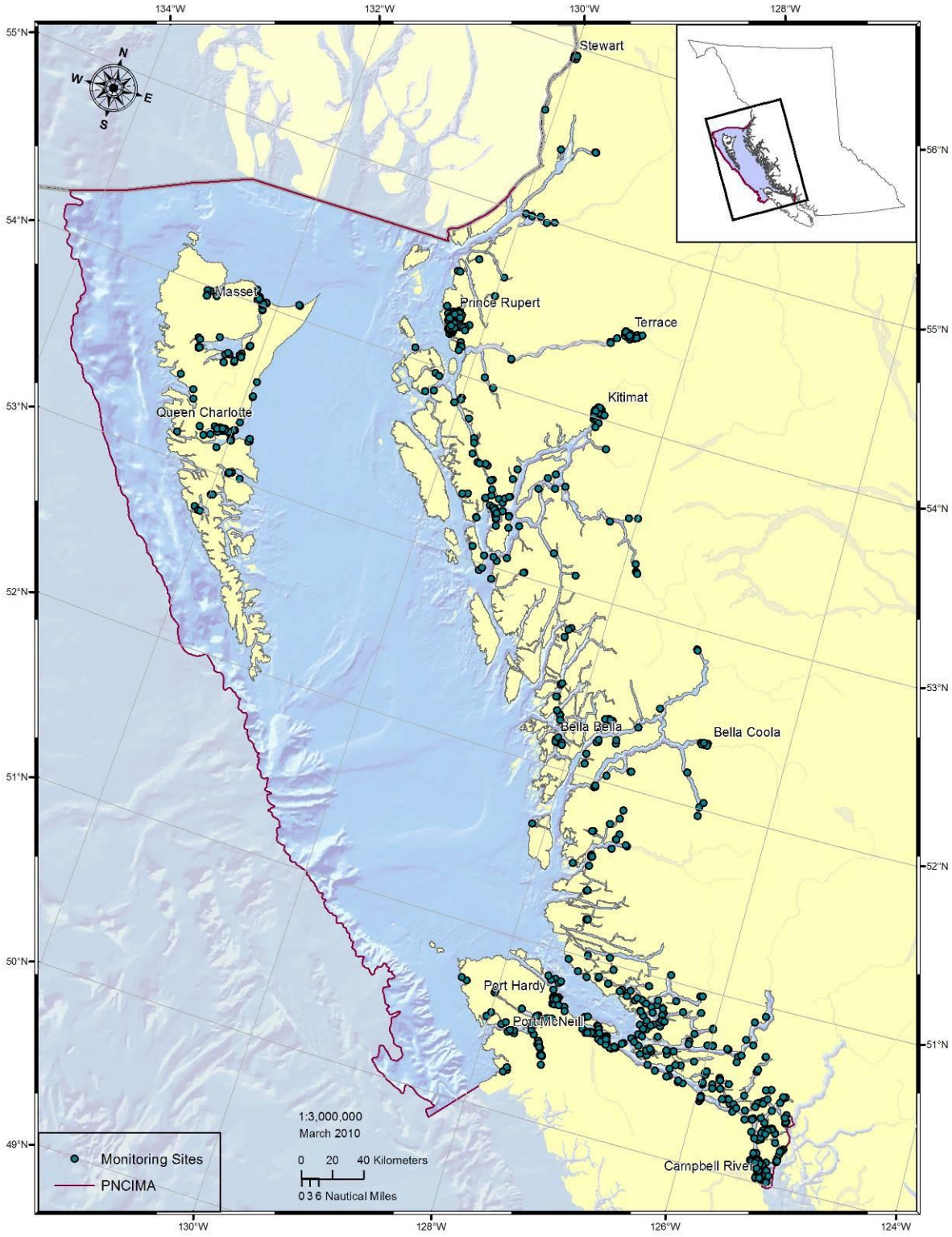
Note:

1. This responsibility is being assumed by the federal government in response to court decision discussed in Aquaculture profile.

Federal and provincial regulations require careful monitoring and extensive mitigation and reclamation programs for mines. For example regular biweekly water quality monitoring has taken place at the Quinsam Coal Mine since 1986 – the mine is located on the Quinsam River which drains into the PNCIMA marine area. Abundant data exists for the former Island Copper Mine on Rupert Inlet, Quatsino Sound. Johannessen et al (2007) provides a summary of research and monitoring for former mines on the north coast. BC Ministry of Energy Mines and Petroleum Resources monitors and regulates mining activity that could negatively impact the marine environment. Booth (2006) noted the large number of studies that have been undertaken on the impacts of onshore mines on the marine environment, including the Island Copper Mine at Rupert Inlet, Alice Arm/Kitsault at Observatory Inlet and Anyox at Observatory Inlet.

The BC Ministry of Environment monitors some 31,542 sites for such things as river flow, industrial discharges or well water quality. Of these 1264 are coastal and within PNCIMA, as shown on Map 12.

Map 11 Ministry of Environment Environmental Monitoring Sites



Source: Ministry of Environment, 2010

First Nations

First Nations play an important role in place-based monitoring due to their long-term relationship to the landscape and through programs, such as the Coastal Guardian Watchman Network[65], the Haida Fisheries Guardian Program[66], and the species recovery efforts around abalone. Fisheries and Oceans Canada (2010d) reports that programs set up by the Heltsiuk Tribal Council and Council of Haida Nations to monitor water quality, biotoxin and management issues have allowed them to set up communal intertidal clam fisheries. The Coast Watch Program, which monitors local Northern Abalone populations and reports illegal activities, is central to the recovery of that species. First Nations fisheries programs (e.g., Haida Fisheries, Nisga'a Fisheries, and Kwakiutl Territorial Fish Commission) have conducted studies on marine species such as bivalves, crabs and herring.

> "Some First Nations employ Aboriginal Fishery Officers/Guardians to monitor the Aboriginal food, social and ceremonial fisheries of their organization. The Aboriginal Fishery Officers/Guardians carry a "Fishery Guardian" designation, depending on their level of training and carry out activities including stock assessment, catch monitoring, joint and co-ordinated patrols, reporting activities harmful to fish habitat, and consult and work co-operatively with the Department. Monitoring and Enforcement Protocols are negotiated between Conservation and Protection staff and some First Nation communities and are outlined in their Fisheries Agreements. The Aboriginal Guardian Program is currently under review by the Department." (Fisheries and Oceans Canada, 2010a)

Enforcement procedures related to Nisga'a fisheries are defined in the Nisga'a Enforcement Agreement. Federal Fishery Officers and B.C. Conservation Officers have the authority to enforce Nisga'a laws and regulations and work together in this approach (Fisheries and Oceans Canada, 2009).

TEK efforts are of particular interest as the trend is to blend western science with TEK to help develop and implement robust solutions to ecological management challenges.

Industry

Much of the research and monitoring efforts for commercial fishing are undertaken through cooperative programs carried out in conjunction with industry associations. An

[65] http://coastalguardianwatchmen.ca
[66] The program is designed to monitor, assess and enforce a variety of activities along the Central and North Coast. The Guardian Watchmen Program acts as an ambassador for the Nation; the eyes and ears of the Nation.

example of co-management is provided through the Canadian Sablefish Association, which takes an active role in monitoring, research, assessment and management of the commercial sablefish fishery. A Joint Project Agreement between DFO and Wild Canadian Sablefish Ltd (WCS) sees WCS and individual harvesters contribute $1.5 million dollars to support a number of research and monitoring activities. DFO contributes in-kind costs that cover such items as administration, salaries for fishery managers, scientists, biologists, support staff and enforcement staff and research, patrol vessels and aircraft (Fisheries and Oceans 2010b).

The International Pacific Halibut Commission is federally funded by Canada and the USA and, among other activities, conducts research and monitoring along the Pacific Coast (Hall, 2008). Other examples of joint monitoring efforts include electronic monitoring (e.g. video surveillance, electronic logbooks for groundfish and crab), third party monitoring (e.g. on-board observers) and fisher logs, and unloading slips forwarded to fisheries managers. Electronic monitoring has the benefit of self-policing and producing information which can support research objectives. The commercial ground fishery has 100% at-sea monitoring and 100% dockside monitoring funded through the industry (Fisheries and Oceans 2010b). High monitoring costs are seen as an issue by industry.

Studies required for industrial marine and nearshore development (e.g. environmental impact assessments) also contribute to the research and monitoring efforts in PNCIMA.

Research Institutions

Institutions play a leading role in research and monitoring, funded through a combination of grants, donations and coordinating volunteer time. GSGislason (2007) found that B.C. University and Research Institution Ocean Sector expenditures in BC were $60 million in 2005-6, an increase of $19 million over 2002-3 spending. Table 60 shows institutions noted as conducting significant marine research in BC (over $1 million in expenditures).

Table 60 BC Research Institutions conducting marine research (2005-06)

Institution	BC expenditure (millions)	Focus
British Columbia Institute of Technology (B.C.I.T.)	$ 2	Training, nautical sciences and seamanship.
Malaspina University College (now Vancouver Island University)	$4	Technical training in fisheries, aquaculture, and resource management.
Simon Fraser University (SFU)	$ 3	University research
University of British Columbia (U.B.C.)	$ 25	Oceanography, Engineering, Zoology.
University of Victoria (UVic)	$ 21	Remote sensing, Climate Change Modelling, Whale Research Laboratory North-East Pacific Timeseries Undersea Networked Experiment and (Victoria Experimental Network Under Sea
Bamfield Marine Sciences Centre	$ 5	Applied marine and coastal scientific research, and technology commercialization.
B.C. Centre for Aquatic Health Sciences	$ 1	Aquatic animal health, food safety, and environmental and welfare issues.

Source: GSGislason, 2007

Over three quarters of expenditure is based at two institutions, the University of British Columbia and University of Victoria. Much of the growth in expenditure is due to a growing program at the University of Victoria, with spending between 2002-3 and 2005-6 increasing from 6 million to 21 million. A significant portion of that increase is related to infrastructure development outside of PNCIMA (VENUS and NETUNE projects). Research reports for various initiatives, such as the series of environmental reviews regarding the moratoria on oil and gas extraction (see Johannessen et al, 2007 for a listing of reports) or the shoreline mapping exercise conducted for the Province in the 1990's, generate significant economic activity. Only one institute, the B.C. Centre for Aquatic Health Sciences, is based in PNCIMA, in Campbell River.

There are many collaborative research efforts, including those among universities (e.g. the North Pacific Universities Marine Mammal Research Consortium[67]) and between research institutions and government (e.g., seabird research and monitoring program on

[67] http://www.marinemammal.org/consort.php

Triangle Island, a joint project of Simon Fraser University and the Canadian Wildlife Service). Studies range from field studies to laboratory research to model development, all of which benefit from and contribute to the knowledge of the resources found in PNCIMA.

Increasingly the work is becoming more interdisciplinary. Guenette et al. (2007) provides a summary of modelling based research from UBC while Red Fish Blue Fish Aquatic Society (2007) provides a listing of BC-based academics conducting marine conservation-related research, including research on marine mammals, ecology, socio-economics, and fisheries. No information was available detailing efforts specific to PNCIMA.

One research partnership highlighted by LGL Ltd (2004) is the US-based National Marine Mammal Laboratory from NOAA which conducts studies on marine mammals in partnership with DFO, academic researchers, Cascadia Research and private interests.

The Vancouver Aquarium is central to a number of research and monitoring partnerships. The BC Cetacean Sightings Network is a collaboration of the Vancouver Aquarium, DFO and Environment Canada to document whale and dolphin sightings. Another research partnership is the Pacific Ocean Shelf Tracking (POST) project which tracks the movements of marine species using acoustic transmitters and receivers. POST is a project of the Census of Marine Life. POST has been in operation since 2004, with permanent listening stations operating since 2006. The network currently extends over 3000 km and has a broad partnership of government, academic and research institutions and private foundations in Canada and the USA with the Vancouver Aquarium serving as secretariat. In 2010, POST will invest resources in maintaining receivers and downloading data from the existing permanent array twice during the field season, from March to November). POST is part of the Ocean Tracking Network. Costs (including deployment) are approximately $400 per tag (on average 7500 tags are deployed on a given river for tracking salmon) and $15,000-$50,000 per listening array with data retrieval and array maintenance at $5000-$12,000 per array[68] (Payne, 2008). In PNCIMA Map 13 shows arrays are deployed at Lippy Point (north of Quatsino Sound), Queen Charlotte Strait (near Port Hardy) and on the Skeena and Campbell Rivers. Arrays have been deployed previously on the Nimpkish and Keogh Rivers and Brooks Peninsula.

[68] Price is dependant on equipment deployed.

Map 12 Post Configuration

Source: www.postcoml.org

Environmental Non-government Organizations

Increasingly Environmental Non-government Organizations (ENGOs) are conducting scientific marine-based research. Several of the more active ones, and recent work, are discussed here.

One recent example is the 2009 Finding Coral expedition, lead by the Living Oceans Society which received over $1 million in funding from a private US Foundation. [69]

The Raincoast Conservation Foundation operates a research station on Denny Island from April – October that can accommodate 8 researchers and a 70 foot research vessel that accommodates 10 researchers and operates 7 months of the year. Raincoast partners include Institute of Ocean Sciences, the University of British Columbia, and Simon Fraser University.

[69] See www.findingcoral.com

Straitwatch operates a marine mammal monitoring program in Johnstone Strait, from Port Hardy to Campbell River with a focus on Robson Bight.

The Laskeek Bay Conservation Society operates a field station from May-July on East Limestone Island, Haida Gwaii, conducting research and monitoring on seabirds, shorebirds and marine mammals.

Orca Lab, based out of Hanson Island at Blackney Pass, uses a network of remote hydrophone stations with a 50 km^2 range to monitor northern resident killer whales during the summer and fall. Acoustic data is supplemented by visual sightings from Hanson Island and a video monitoring station on Cracroft Point, Johnstone Strait.

The Coastal Ecosystems Research Foundation is based out of Dawson's Landing and conducts ecological research along the Pacific coast of North America, focusing on the grey and humpback whales of British Columbia

Bird Studies Canada, in partnership with the CWS, First Nations and others, operates a number of programs that include PNCIMA, including the Coastal Waterbird Survey, Beached Bird Survey and Christmas Bird Count..

Island Conservation is partnering with BC Parks, CWS, the Quatsino First Nation, and the Tlatlasikwala First Nation to remove invasive mammals from the Scott Island that are negatively impacting seabird colonies.

A number of marine ENGOs combine research with public outreach and advocacy and include PNCIMA as a focal point. Living Oceans Society maintains their headquarters on Sointula with at least 6 of their staff working out of that office. T.Buck Suzuki Environmental Foundation works for the protection of fish and fish habitat and EcoTrust Canada works at the intersection of conservation and community economic development promoting innovation and providing services for coastal communities, First Nations and enterprises to green and grow their local economies. These two organizations share an office in Prince Rupert, each with one local staff member. WWF Canada has a Prince Rupert Office with one staff member. Other marine ENGOs who are active in PNCIMA but are based from outside the region include the Canadian Parks and Wilderness Society, David Suzuki Foundation and the Sierra Club of BC. Much of their funding for efforts in PNCIMA comes from private foundations and local donors.

Trends

Research, monitoring and enforcement efforts are generally increasing in PNCIMA. With the completion of the marine plan for PNCIMA, there will be a need for on-going monitoring against the baseline and intended plan objectives.

Increasingly the trend will be for government led monitoring and enforcement to partner with local communities and industry. Current examples include joint efforts between Parks Canada and the Haida Nation to monitor Gwaii Haanas National Park Reserve and Haida Heritage Site and joint monitoring efforts by DFO and the commercial fishing industry using electronic monitoring methods. Concurrently non-government organizations are developing capacity to undertake research and monitoring (e.g. eelgrass mapping on the Community Mapping Network). Availability of local and traditional knowledge will continue to decline as traditional marine use patterns shift and if the population decline continues.

Electronic monitoring is expected to continue to provide robust and reliable information as efforts in this area are expanded, but it is costly to the fishing industry. Spending by the federal government appears to be consistent, although Hall (2008) noted there is a perception that there is decreasing economic support from the federal government in research, monitoring and enforcement.

Hall (2008) found through interviews with researchers that there is currently more emphasis on physical science rather than social science research.

New economic development opportunities, such as proposed port expansion or alternative energy development, will bring opportunities and funding related to initial viability and, if approved, ongoing monitoring. The NaiKun Wind farm provides an example where a joint research project was completed by the wind farm proponents and commercial crab fishermen. On-going monitoring of approved developments, will generate information and support economic activity throughout the lifespan of the development. A challenge will be to make research conducted for private interests (e.g. for project approvals) publicly available.

Enforcement is seen as not keeping pace with changes in use patterns or activities. For example regulations, monitoring and enforcement of cruise ship pollution is thought to be stronger in the USA than Canada. "Canadian regulations and monitoring have not been harmonized with US regulations. The stricter US rules have the potential to render Canadian waters more vulnerable to the intentional release of pollutants by cruise ships in waters with laxer regulations, monitoring and enforcement." (Haggerty et al., 2003). In another example of rapid changes, LGL Ltd (2004) reports of a 1986 study of the Queen Charlotte Basin that described 33 species of groundfish whereas a 2001 study of the same geography described 77 commercially fished groundfish species.

Changes in use (e.g. expansion of aquaculture, Kitimat LNG terminal, alternative energy development) may require changes to existing regulations, monitoring and enforcement. Climate change may affect biological responses, requiring new monitoring. Increasingly

research is being conducted into climate adaptation, but this work is typically undertaken on a coast-wide scale, rather than the PNCIMA scale.

Current monitoring has shown changing trends in pollutants, with pollution from highly regulated industries (e.g. mines, pulp mills) decreasing while some pollutants, such as cadmium in shellfish and seabirds, are increasing from unknown sources. Regulation has reduced local sources of persistent organic pollutants, but long-range transportation suggests additional monitoring at a broad scale is required.

Data Gaps

The following data gaps were identified in the completion of this profile.

Potentially useful information that was not available includes the number of researchers conducting work in PNCIMA, funding for PNCIMA-based research (on an institution by institution basis), number of enforcement staff and number of successful prosecutions resulting from enforcement. In some instances there is data available for all of BC or all of Canada but not PNCIMA.

It was noted that a lack of resources to set up appropriate monitoring has precluded development of the clam resources in the North (Fisheries and Oceans Canada, 2010b).

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