

**RESOURCE DEVELOPMENT PATTERNS
OF THE BRITISH COLUMBIA SALMON CANNING INDUSTRY, 1870 TO 1970**

by

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ABSTRACT

The historical growth and development of the salmon canning industry on the British Columbia coast has followed a geographic pattern of spatial expansion and contraction between 1870 and 1970. This thesis focuses on changes in the spatial patterns of the industry brought about by factors of technology, transportation, markets, resource policy, and ownership.

This thesis tests a British Columbia resource development model suggested by Robinson (1972). The model involves four stages of development. The first is the discovery of the resource as an economically viable industry. It begins in a central location that has the necessary linkages to markets and establishes a process and technology to create a product. The second stage occurs with the rapid expansion of many small firms as they move the resource frontier outward to secure a supply of the resource. The third stage is where economic pressure forces many of the small firms to close or be absorbed by a few remaining companies. These larger firms consolidate the ownership of the industry and are able to achieve economies of scale through modernisation of technology. Finally, during the fourth stage the industry consolidates into a central location with a few high capacity plants.

The research involves the input and analysis of a geographic information system (GIS) compatible database containing the location, operational dates, and ownership of salmon canneries constructed along the coast of British Columbia between 1870 and 1970. The data were derived from archival and government records, historical maps, and previous research. The geographic information system was used to produce a series of maps to show

spatial patterns of expansion and contraction over time. Additionally, it shows how patterns of ownership change influence the distribution of canneries.

The analysis consists of a timeline of events, which was developed from historical records of the salmon canning industry. The timeline was used to set a context for change in the industry over time. The events are categorised as factors that influence the spatial pattern of the industry. Some of the factors that change the spatial pattern are technology, transportation, markets, resource policy, and ownership. The analysis also examines the role of small and large firms in the industry and suggests that two waves of development are important in changing the spatial geography of the industry. The first is the rapid expansion of the industry through the growth of small firms. Then a second wave occurs as an increase in the number of large firms consolidates the industry through the amalgamation of small firms and subsequent closures. As this process continues, there is an eventual concentration of the industry into a central location. The industry fits the resource development model although the pattern is much more complex than suggested by a set of four successive stages.

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This thesis is dedicated to my parents, Dale and Dorothy Stauffer.

Brian Dale Stauffer
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Chapter One

INTRODUCTION

The historical developments of some resource industries in British Columbia show spatial patterns of expansion and contraction. These spatial patterns are shaped by events which include implementation of new technology, development of transportation systems, transfers in ownership, shifts in political policy, and changes in market structure. The history of the British Columbia salmon canning industry illustrates a complicated pattern of expansion and contraction. Using a resource development model, this thesis will explore the process of industrial development in a geographical context. The research will use a geographic information system, previous research, archival and government documents, to construct a database to analyse this pattern of resource development.

A main focus of research in industrial geography has been to examine the locational aspects of plants, firms, and markets on a local, regional, or global scale. This thesis will analyse the long term history of a resource industry, in a region, to understand the spatial pattern of the processing plants and some of the factors that control this pattern. Specifically, it will examine the spatial pattern of the salmon canning industry along the British Columbia coast between 1870 and 1970. These dates encompass the period which best describes the spatial pattern of expansion and contraction. The research uses a regional spatial analysis that incorporates a longitudinal research design by looking at the process of industrial development over time.

An important part of the research looks at the role of large and small firms in the changing geography of the industry. The resource development model implies that firm size is a crucial factor in determining spatial patterns. As small independent canneries geographically expand the industry outward, they are later replaced with larger corporations that attempt to rationalise the industry through the use of technology and economies of scale. However, the role of small firms in the growth and changing geography of the industry is often overlooked.

Following this introductory chapter, a literature review chapter focuses on the spatial patterns of resource development and the historical development of the B.C. salmon canning industry. The first part provides an outline of the resource development model and concepts that are important in the development of the model. The second part is a summary history of the salmon canning industry with a focus on the key historical events that shaped the geography of the industry. The chapter concludes by identifying gaps of information in the literature.

Chapter three is an outline of the methodology of the research. It begins with the research design, sets the context for the research, and provides a framework for analysis. The second part details the collection of information and the construction of the database. The third part summarises the sources of bias and error present in the research. The fourth part describes the development of a geographic information system that is used as an analytical tool for understanding the spatial patterns of the industry. The chapter concludes by identifying some of the problems faced during the research.

Chapter four is an analysis of geographic change in the B.C. salmon canning industry. It begins with an overview of the number of canneries that operated and the overall production levels of the industry, over one hundred years. Part two describes a timeline consisting of a series of events that were significant in changing the spatial pattern of the industry. Part three looks at the distribution of canneries by using a series of maps at key points that are derived from the timeline. Part four is an analysis of the different roles of small and large firms in the industry. Using a series of maps, it shows the changing patterns of the industry in relationship to small and large firms.

Chapter five is a discussion of the research findings. First, the resource development model is discussed in terms of its application to the B.C. salmon canning industry. Second, is a discussion of the five factors identified as being significant in changing the spatial pattern of the industry. Third, the role of ownership is examined more closely by looking at the influence of large corporations in shaping the industry, as well as small firms and their significance in the early development of the industry.

The thesis concludes with a summary of the key findings of the research. It provides an assessment of the contributions of the thesis and outlines questions that arise from this research. Finally, some comments are made on the benefits of examining historical resource development in order to provide a better understanding of resource use in the future.

Chapter Two

LITERATURE REVIEW

Introduction

This chapter will review the literature and concepts used to research spatial patterns of resource development and the British Columbia salmon canning industry. The literature review is divided into two parts. The first part describes the conceptual framework on which the thesis is based. It begins by looking at the geography of coastal B.C., the physical constraints on development of the industry, and the communities that evolved around canneries. Next is an explanation of the resource development model used in this thesis. This is followed by a review of some of the theory on the location of industries and the factors of resource development location. Finally, the concepts of heartland and hinterland are introduced to describe the core-periphery dichotomy of the industry.

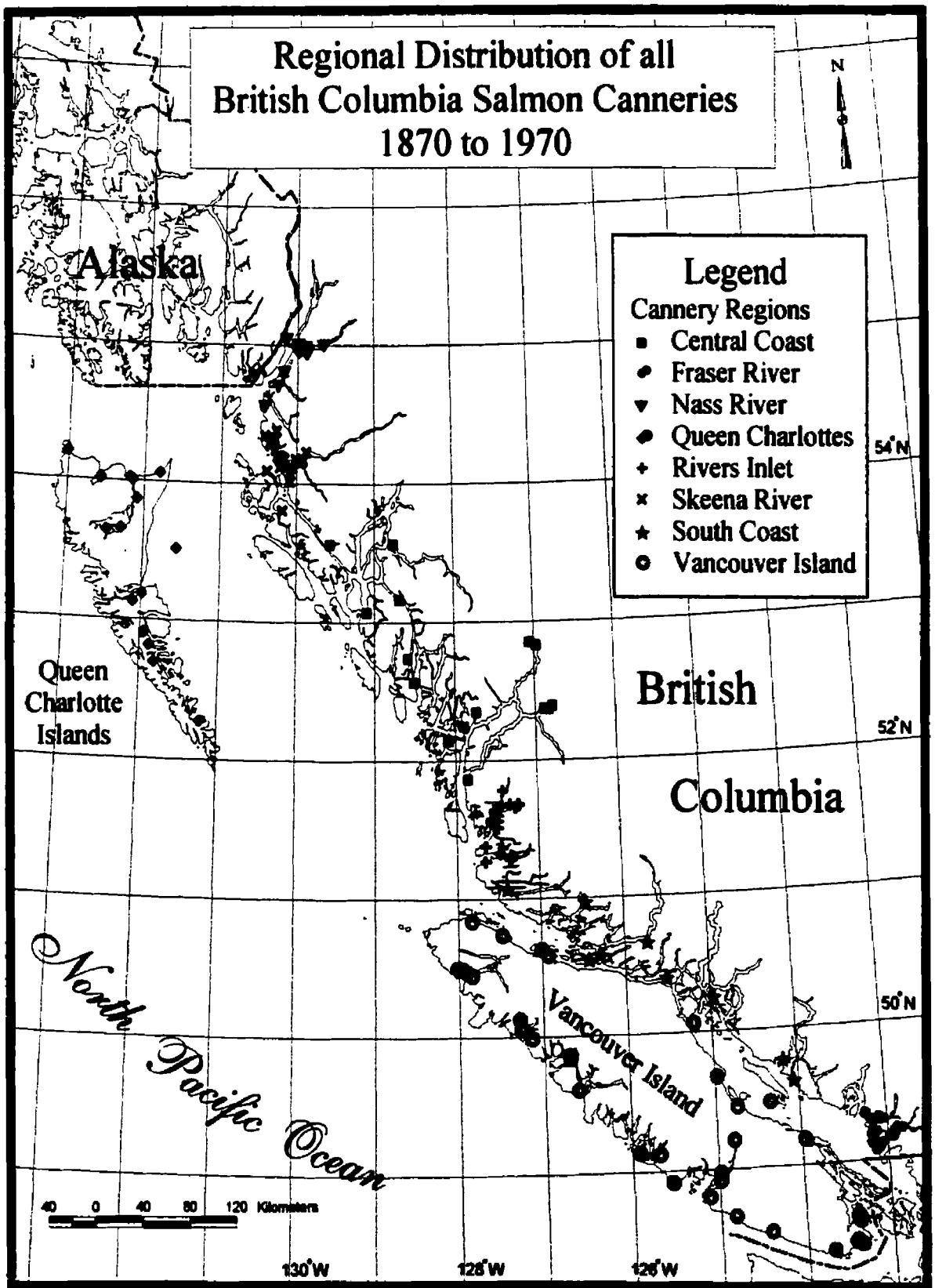
The second part of the chapter explores some key elements of the salmon canning industry. The first is the historical use of salmon as a resource and how it developed into an industry. Next is the role of policies and regulations to control development of the salmon resource. This is followed by a discussion of ideas central to resource use and ownership that apply to natural resource development. Also highlighted will be the role of technology and transportation as an important agent of change in resource development. Finally, the effects of economic events that played an important role in the development of the industry, such as the Great Depression, are discussed.

Geography of the Industry

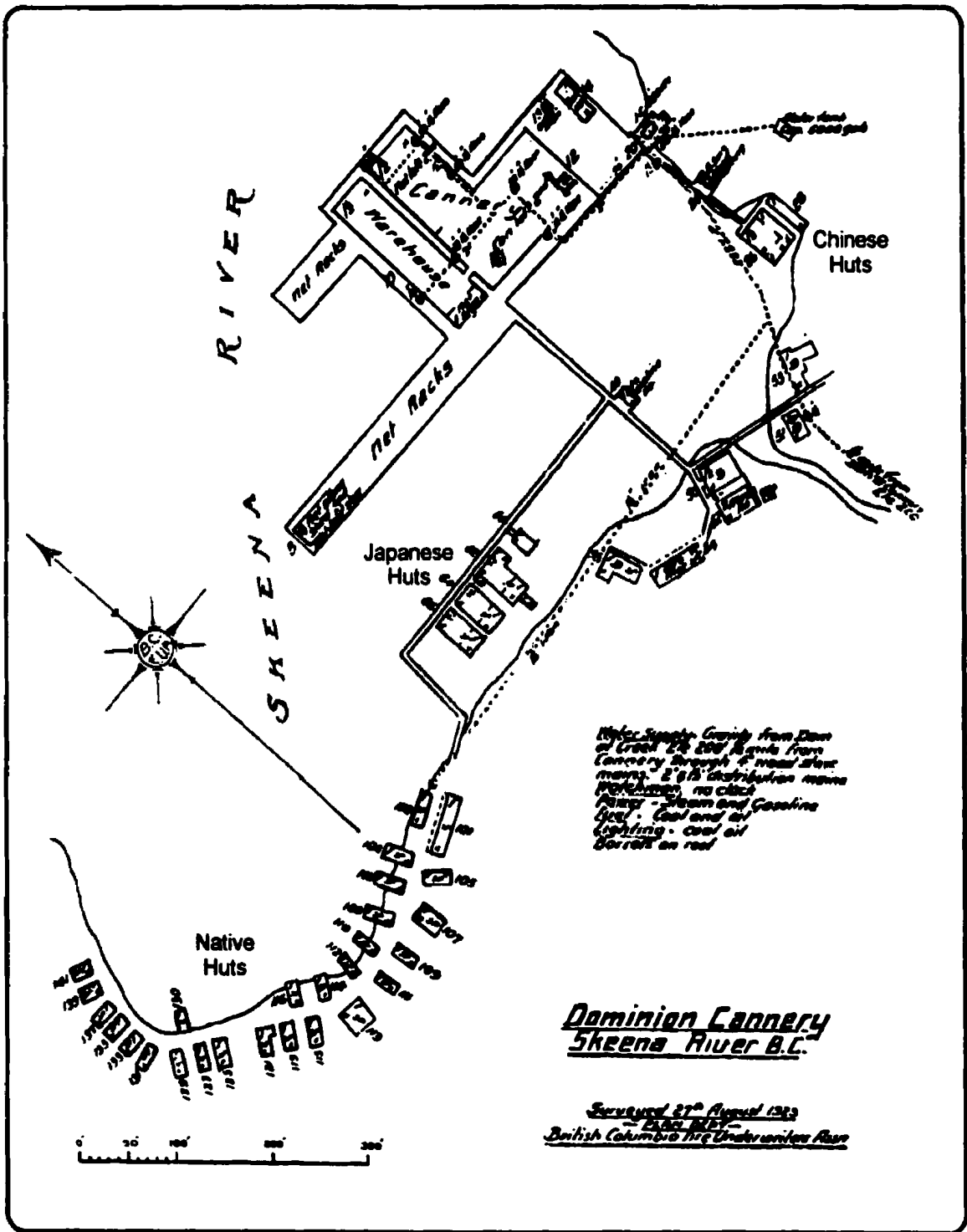
The geography of the B.C. salmon canning industry extends along western Canada's coastline including Vancouver Island and the Queen Charlotte Islands. The coastline of British Columbia is characterised by steep mountains surrounding many long inlets and channels that provide protection from the North Pacific Ocean. Access to much of the coast is restricted to water and air transportation. This proved to be a geographic barrier in the establishment of the salmon canning industry.

Within the geography there are regional distinctions which show that particular areas may have been more suited to salmon canning activity. Map 2.1 shows the regional distribution of all of the canneries that operated in B.C. between 1870 and 1970. There were high concentrations of salmon canneries at, or near, the mouths of salmon spawning rivers. The highest concentrations existed on the Fraser River, Skeena River, Rivers Inlet, and the Nass River. Others were dispersed widely along the coast to take advantage of smaller sources of salmon. The map shows 223 salmon cannery locations; however, there were as few as two (1870) and as many as 94 (1917) canneries operating in any given year (Canada, Statistical Basebook, 1958). As well, many of the canneries operating on Vancouver Island and the Queen Charlotte Islands operated after the 1920s.

During the early history of the industry, the remote canneries operated on a seasonal basis and were closed down for the winter months. Eventually, some permanent communities developed even though the canneries were built as short-term



Map 2.1



Map 2.2 Fire Insurance Map of the Dominion Cannery
 (Source: Gladys Blyth, Salmon Canneries: British Columbia North Coast, 1991 and UBC Special Collections)

operations. The canneries developed into small communities as the seasonal labour force built housing to live in year round. These houses were grouped together in areas surrounding the cannery and were very often segregated by ethnicity into Native, Japanese, and Chinese 'huts' (See Map 2.2). The canneries were built out on pilings over the water. Along the shoreline adjacent to the cannery were the houses for management, an office, mess hall, and some had a store for supplies.

The communities were very isolated and many were solely dependent on water transportation for access. A critical factor in the growth of the industry was the establishment of a coastal network of ships and ferries to transport people and supplies to these remote communities. The high costs associated with transporting medical supplies, perishable food products, and other daily necessities, meant that these communities needed to be self sufficient for long periods of time (Blyth, 1991).

In summary, the geography of the B.C. coastline provided formidable challenges to the industry. The distribution of canneries along the coast was varied with a few highly concentrated areas and the rest being widely dispersed. Canneries located in areas with better accessibility had a better competitive cost advantage than those did in remote areas. As the industry consolidated over time, locations with large salmon runs and access to transportation networks, such as the Fraser and Skeena rivers, became dominant.

Resource Development Model

The geography of British Columbia presents a series of challenges to settlement, transportation, and resource development. Large distances, dispersed settlement, and mountainous terrain impose costs and limitations. B.C. has a diverse richness of resources as a result of its climate, vegetation, and geology. As a result, there are many opportunities for natural resource industries to develop. The development of the B.C. fishing industry is summarised in the following:

Fish canneries were established at or near mouths of most rivers along the coast late in the nineteenth century, but the greatest concentration was near the Fraser and Skeena rivers which had the largest drainage basins and therefore usually had the greatest fish production. Gradually fishing technology improved so larger and faster fishing vessels, with better gear and larger carrying capacity, could harvest a larger area away from the river mouths. Thus the need decreased for many small canneries dispersed along the coast, and the processing industry concentrated in large canneries at a few central places. By the 1960s the former linear pattern of salmon canneries had become one of concentration at only the mouths of the Skeena and Fraser rivers, where there were shipping connections for export. This process of spatial concentration, arising from corporate integration and new fishing technology, is now complete on the West Coast (Robinson, 1972, p.5).

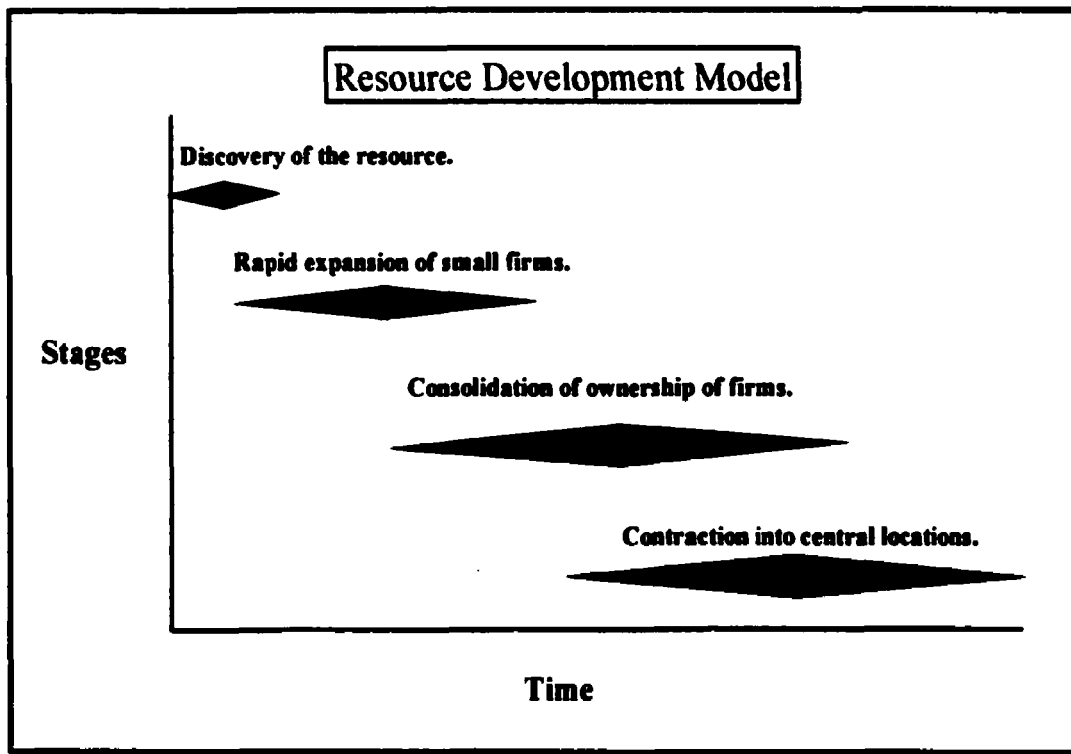
This pattern suggested by Robinson (1972) provides the basis for a resource development model and can be described as having four generalised stages (See Figure 2.1). Each stage tends to overlap and they do not have distinct beginnings or endings. The first stage is resource discovery, in which entrepreneurs bring together the necessary elements to market a particular product from a resource. In this stage, the industry is small and relatively undeveloped, but its potential is becoming better known. The production processes are usually labour intensive with limited capacity. The second stage of the model is rapid expansion and spatial dispersion of many small firms. In this

stage the industry is established and competition emerges as firms seek to gain a larger portion of the market. Processing plants expand into the resource frontier to take advantage of new sources of the resource. The third stage of the model is the consolidation of ownership, as large corporations are formed from the amalgamation of a number of smaller companies. This provides the industry with economies of scale and allows for expansion of production, adoption of technological innovations, and the elimination of a large sector of market competition. The fourth stage of the model involves spatial concentration. As the market becomes even more competitive, large corporations begin to rationalise the industry to stay profitable. As older plants become obsolete they are closed and replaced with larger high-capacity plants. The development of transportation methods and adaptation of technology allows the resources to be moved into central areas for processing in these larger plants. This stage continues until the exhaustion of the resource or a suitable replacement is developed.

Although the model is a generalised one, it gives an overview of the geographic changes within the B.C. salmon canning industry. However, there is little explanation of why it happens and how various factors influence the spatial pattern of the industry. Therefore, the model provides a framework with which to examine more closely the response of industry to particular events. Some of the more recent literature on industrial geography has suggested an order to these spatial patterns.

Chapman and Walker (1991) suggest that there may be evidence of order in the spatial evolution of all industries. While locational requirements may vary for different industries and emerge as variations in the pattern of development, these industry

Figure 2.1 Stages of the Resource Development Model.



patterns would “change through time in response to events such as the development of new markets and advances in technology which alter the relative significance of individual location factors” (Chapman and Walker, 1991, p.145). The particular influence of technology and transportation, as well as other factors, will be discussed later in the thesis in more detail. In what Chapman and Walker call a ‘life cycle’ of an industry, they suggest that process innovation is the most important factor driving the different stages of the cycle. In other words, it is the way the product is made, not changes in the product, which is significant throughout the history of an industry. They also emphasise the dynamics of industrial location as a process by suggesting that:

One of the most important consequences of this connection between manufacturing and the study of the development process has been to draw attention to the significance of time. Whereas normative location theory, for example, is essentially static, models of regional economic development encourage the adoption of an evolutionary perspective as existing patterns are regarded both as derivatives of former conditions and as major influences upon future states of the economic system (Chapman and Walker, 1991, p.26).

With these ideas of spatial order and evolutionary stages as a basis, this thesis analyses the B.C. salmon canning industry in terms of its 'life cycle'. The resource development model described above allows some understanding of the different stages and transition between the stages in the life cycle of the salmon canning industry.

Locations of Resource Development

In order to understand the changing spatial pattern of resource development, it is necessary to look at reasons why individual plants are located where they are. Generally, there is some economic advantage for an industry to locate a plant in a specific location. The proximity of the resource, labour, energy, transportation, markets, and capital are some of the factors critical to the success of individual plant locations. The relative importance of each of these factors changes over time and influences the overall spatial pattern of the industry.

Healey and Ilbery (1990, p.4) provide an understanding of the "processes of economic change and spatial patterns of economic activity". The processes, which lead to change in spatial patterns of economic activity, are developed through theoretical perspectives on economic location. They outline the different theoretical approaches to economic location and locational change, highlighting some of the strengths and

weaknesses of each approach. They suggest that by adopting an “integrated approach to the study of economic location and change” the development of spatial patterns of economic activity can be better explained (Healy and Ibery, 1990, p.30).

This thesis uses an integrated approach to understand spatial change in the B.C. salmon canning industry. It makes the argument that locational change is based upon many different factors that affect spatial patterns through time. There is an interrelation between the different factors and the spatial patterns that evolve. For example, changes in the market may lead to changes in ownership within the industry, or changes in transportation methods may change the amount of resource consumed. But this does not necessarily mean that a change in one factor will influence another factor. Change can occur in one factor and have little or no effect on others. Not only do the spatial patterns respond to changes in factors, but the relative importance of the factors also change in response to variations in the spatial patterns. For example, rapid growth in the industry may be a result of changes in technology, which in turn may lead to changes in resource policy. It is this complex interplay between the factors and spatial patterns of an industry that is important for understanding the resource development model.

Heartland and Hinterland

The idea of heartland and hinterland suggests a geographic dichotomy between a highly urbanised central core that maintains control over a much larger surrounding area that supplies the core with resources for economic development. This type of geography characterises British Columbia and continues to be a major factor in the economy of the

province (Davis and Hutton, 1989). The economy is primarily driven by resource extraction and this has allowed B.C. to become an important global player in the export of primary resources (Bradbury, 1987). The heartland provides linkages to export markets and is the centre of financial trade making it a portal for the flow of goods and capital to the hinterland. Each is dependent on the other for its role in economic development.

Denike and Leigh (1972) suggest that the concept of heartland and hinterland helps to illustrate the process of industrial development as a spatial phenomenon. In the heartland and hinterland model, an industry begins in the heartland and progresses outwards into the hinterland. The industry expands creating a resource frontier as raw resources flow from the periphery into the core to be processed and then shipped to markets. Eventually, some of the processing is done in the hinterland, bringing a finished product to the core and reducing the costs of transporting large amounts of the raw resource. To provide a labour force, small resource based communities are built to support the industry. Some of these communities grow to become more permanent settlements and emerge as regional centres. As processing technology and transportation links improve, the industry retracts into the central core. Production levels are maintained by operating high capacity plants that tend to be located in the centres. Eventually, the communities in the hinterland are left with high unemployment and an exhausted resource supply.

In the B.C. salmon canning industry this pattern began at the mouth of the Fraser river and expanded outward along the coast, eventually contracting back to the mouths

of the Fraser and Skeena rivers. Increased capacity of canneries and the range of the fish boats allowed firms to locate canneries in the heartland. This process is marked by the development of large firms purchasing smaller firms and consolidating their operations in urban centres. As the canneries in the hinterland became obsolete they were closed, leaving the people in the communities without an economic link to the heartland. The process of expansion and contraction has left many communities in the periphery without an economic base and emphasised the dichotomy between the urban heartland and the rest of the provincial hinterland (Robinson, 1998).

The spatial expansion and contraction of the B.C. salmon canning industry is an example of the complex interplay between the heartland and hinterland in resource development. The heartland and hinterland concept helps to explain the spatial pattern of development suggested by the resource development model. However, there are many factors that play a part shaping the geography of resource development. These will be discussed in more detail later in the thesis.

The Salmon Resource

The North Pacific salmon is an anadromous fish species that begins life in the gravel beds of mountain streams and migrates downstream to the ocean. Salmon spend most of their lives in the ocean returning as adults to reproduce in the same streams in which they began. Depending on the species, their life cycle can be anywhere from two to five years. These leads to wide variations in the number of adult salmon returning to spawn, called 'runs', in any given year. This variability in the runs is particularly

important because it is one of the factors that shaped the successes and failures of many canneries (Netboy, 1973).

It was recognised by the first Fisheries Commission in 1890 that the salmon resource would not be able to sustain the increasing fishing effort of the industry (Canada, Sessional Papers, 1892). The government attempted to regulate the industry in 1890 and again in 1907, but was unsuccessful in curtailing the increasing catches. Netboy (1973, p.376) remarks on the record year of 1913 that “it was estimated that 38 million returned from the sea that summer and 31 million were taken in the nets (compared to an average of 9 million in the previous twenty years), leaving 7 million to make their way to the spawning grounds”.

One of the attempts to help enhance the salmon resource was the establishment of fish hatcheries. The first salmon hatchery was the Bon Accord built in 1884 at Port Mann on the Fraser River. This is the first time there were conservation efforts for salmon. These efforts to safeguard the salmon eventually led to the establishment of the Sockeye Salmon Treaty and the formation in 1937 of the International Pacific Salmon Commission. However, by the end of 1937 the Dominion Department of Fisheries decided to close all of the salmon hatcheries and transfer the responsibility to the Provincial Fisheries (Lyons, 1969). The Dominion Department of Fisheries felt that there was little evidence that the hatcheries were enhancing the salmon stocks enough to warrant the cost of operating them. During the 1960s, the International Pacific Salmon Commission constructed special spawning channels, which proved to be much more successful than the hatcheries (Forester and Forester, 1975).

The natural cycle of salmon provides a renewable resource for the canning industry, however, the salmon resource has been faced with many challenges. The increasing fishing effort of a rapidly growing industry and the blockage at Hell's Gate on the Fraser River in 1914 are examples of two major impacts on the salmon resource. But, efforts have been made to conserve the salmon by enhancing their natural reproduction with the construction of fish ladders and spawning channels.

Resource Policy

Early in the development of the industry it became important to regulate the use of the salmon resource. Pressure on the salmon stocks increased with more efficient fishing technology and increasing numbers of canneries in the industry. The federal government through various types of licensing and regulation policies managed the consumption of the resource. These policies met with varying degrees of success. McMullan (1987) analyses the B.C. fishing industry in the context of three policy periods; an early regulatory phase (1880-1925), a modernisation through capital assistance phase (1926-1957), and a period of renewed licensing, regulation, and control (1958-1974).

During the early regulatory phase the industry had to deal collectively with "high production costs, competition, over-capacity, and labour supply problems, by controlling the spread of canneries and the size and character of fish fleets" (McMullan, 1987, p.108). Cannery owners formed associations to lobby the government for stricter control of licensing. Fraser (1977, p.2) argues that the major flaw in early licensing programs

was “the failure to understand the full implications of the policy”. The 1889 license limitation program encouraged exploitation of the resource, as fishermen demanded the right to have access to a public resource. In addition, canneries were licensed proportionally without restrictions on increases in canning capacity. This led to canneries being constructed with the intention “not of canning, but to secure an enlarged share of the total cannery licenses” (Fraser, 1977, p.2). The policy also encouraged a number of new entrants into the industry, further adding to the rapid growth of the industry. The first license limitation was removed in 1892.

The second period of license limitation began in 1908 with the Dominion Fishery Regulations. The regulations restricted the number of boats allocated to each cannery. These ‘boat ratings’ became a serious source of contention by the cannery operators and many did not adhere to the regulations (Doyle, 1910; Todd, 1910). The policy also restricted further issuance of cannery licenses in the Northern District. It was not until 1917, when the demand for canned salmon increased for the war effort, that the license limitation was removed.

The modernisation phase, described by McMullan as the period from 1926 to 1957, began with the removal of some important restrictions on the industry. For example, the restriction of gasoline powered boats in the Northern District, begun in 1911, was removed in 1924.

Mechanization was delayed in northern British Columbia (north of Cape Caution) where, after 1911, powered gill-netters were illegal. This prohibition was the result of companies not wanting to invest capital in powered gill-netters because, in the northern area, the majority of the boats were company-owned, not independently owned as on the Fraser (Stacey, 1982, p.26).

The removal of this restriction led to a rapid increase in the number of gillnet boats powered by gasoline engines (see Table 2.1).

In addition, the government provided capital assistance to firms during the late 1930s and early 1940s.

Utilizing government subsidies, the major firms built new plants and expanded and modified their facilities. They re-equipped their operations and technology to accommodate increased quantity and diversity of production (McMullan, 1987, p.117).

These subsidies helped to consolidate the industry by allowing large firms to lower capital costs by closing obsolete canneries and concentrating production in their remaining operations.

Table 2.1 Number of Gill-Net Boats Powered by Gasoline Engines, 1924 to 1928.

YEAR	1924	1925	1926	1927	1928
Number of Powered Gill-net Boats	85	242	630	675	1,049

(source: Canada, Sessional Papers, 1929).

During the third phase of renewed licensing and regulation, between 1958 and 1974, the government undertook a series of studies to re-implement license regulation of the B.C. fisheries. After 45 years of open access to the salmon resource, high demand for canned salmon created rapid growth in the industry and over-fishing needed to be regulated. The Sinclair Report was an examination of license limitation in the B.C. fishing industry (Sinclair, 1960). It proposed a system of sole government ownership with restriction of entry through a graduated licensing system. Government reluctance to implement a strong resource policy had thus led to "the development of various

licensing procedures that would lend themselves to restricted entry” (Fraser, 1977, p.23).

The report suggests:

The middle of the road between complete free entry into the fisheries as we now have and complete sole ownership, whether by government or by private firms, can be found along two main directions:

1. A system of taxes on the catch and or the fishermen.
 2. A system of licenses that will restrict the entry of fishermen.
- (Sinclair, 1960, p. 102).

The report favoured the use of a licensing system that would use a token fee that would be issued on a competitive basis. The number of licenses would be calculated based on optimal economics of the fishery using knowledge of catch capacity. There was very little support for the plan from both industry and the unions. The recommendations were rejected and the B.C. fisheries continued with open entry (Meggs, 1991). Although the report had important implications for policy in the fishing industry, it had no effect on the spatial pattern of the industry.

It was not until 1969 that the government again attempted to implement another system of license limitation with the Davis Plan. Hayward (1981) provides an examination of the federal government’s license limitation program implemented in 1969. The Davis Plan, named for the Minister of Fisheries who devised the plan, proposed a four-phase plan to:

...reduce the costs of production and create an economic surplus that would first, raise the level of the fishermen’s remuneration and second, provide a certain return to government to compensate for the use of this public resource and the increasing costs of resource management (Hayward, 1981, p.24).

The four phases included:

1. restricting further entry into the fishing fleet,

2. reducing the current fleet size,
3. improving the standard of vessels in the fishing fleet, and
4. introducing area regulations with fishing gear restrictions.

Commercial salmon fishing licenses were separated from the general fishing licenses and were only sold to qualifying fishing vessels. A buy-back program was implemented where existing license holders could sell their license back to the government. The licenses also became transferable, so that a license could be sold to another qualified vessel. The three different fishing techniques, trolling, gillnetting, and seining were based on the different feeding characteristics of the five commercial species of salmon. These fleet differences provided the basis for licensing control by limiting the types of gear fish boats could use and the length of time they could fish. There have been many debates over the success of the plan, however, most of the implications exist outside the bounds of this thesis (Fraser, 1977; Mitchell, 1977; Pearse and Wilan, 1979; Hayward, 1981).

In summary, resource policy had an important role in the development of the B.C. salmon canning industry. Certain policies tended to favour the development of large firms and the consolidation of the industry. While the intent of many of these policies was to manage the use of the salmon resource, the results were often offset by other factors. Policies that were aimed at controlling the numbers of boats and/or canneries, for example, but did not control fishing effort or production level in the industry.

Resource Use and Ownership

The concept of 'ownership' is problematic when dealing with resources such as fish, trees, or water. These have come to be known as common property resources. While in Canada these common property resources are regulated by the state, they are used by certain groups or individuals. The difficulty in regulation lies with the granting of access to certain individuals and not to others. One of the key problems is the distribution of the benefits of developing such a resource. Often it is the developer who gains in terms of the profit of sales and the state in terms of taxes levied. Very little is returned, in terms of the overall value of the resource, to the society to which the resources belong. It is the society that is left with the results of exploitation and exhaustion of the resource. The term 'common property' is understood as property rights between co-owners of resources who share management responsibility. 'Tragedy' occurs when the resource becomes freely open to any user, exploited beyond the capacity to regenerate, and maximised for short term economic gain over long term community benefit (Hardin, 1968). The result is an economy where 'private' property allows an individual to gain at the expense of overall common interests (Marchak, 1988).

In the case of the B.C. fishing industry, the federal government licensed large corporations to harvest salmon and profit from the sales. This process went unchecked for many years and as a result the salmon stocks have been reduced and the companies have closed down most of their operations. Pearse and Wilen (1979) argued that exclusive property rights allow short-term profitability for companies by lowering the

economic rent of the resource. This short-term profitability attracts new entrants into the industry, increasing the stress on the resource and decreasing overall profitability.

Ross (1987) outlined the pressures faced by the British Columbia fishing industry. He describes the once rich resource as becoming “increasingly threatened by larger numbers of fishermen with sophisticated fishing technology and by urban and industrial development” (Ross, 1987, p.179). The B.C. fisheries are a source of much political conflict between federal and provincial governments over jurisdiction, regulation, and management. There are also internal sources of conflict within the fishery over common property issues and the seasonal nature of the resource. Consolidation of the fisheries has maintained production while decreasing the fishing effort and eliminating many jobs and communities.

A result of increased ownership consolidation was the limitation of access to the resource. As large corporations formed, they gained a larger portion of the available licenses. It can be argued that these consolidations allowed established canneries greater access to the salmon resource. The profits gained by the cannery owners during this period gave them considerable advantage over new entrants in the industry by securing capital and a large portion of the market share. In this way, the major companies were able to maintain their control over access to the resource and limit entry of new participants to the industry (Fraser, 1977).

This consolidation of ownership is not unique to the B.C. fishing industry. A similar consolidation of ownership occurred in the B.C. forest industry in order to maintain secure access to a supply of timber. Marchak (1989) describes how B.C.’s

forest industry has been heavily controlled through licensing of resource tenures (see also Williston and Keller, 1997). The granting of tenure was to ensure a constant supply of raw material for the mills. This encouraged consolidation of ownership within the industry. She suggests that, “the rationale for favouring large companies is that they are believed to be more reliable (less likely to close down during a recession), more responsible (they have a long term interest in the resource and the labour force), and more profitable (economies of scale produce higher returns to this economy as well to the producer)” (Marchak, 1989, p.109). The concentration of ownership was in large part due to the history of government policies and their impacts on the industry.

In summary, an important part of the resource development process is the control of access to the resources and who benefits from the development. It has been suggested that although resources in B.C. are owned by the state, most of the benefits of these resources have been granted to large firms. As well, resource policies have tended to favour the development of these large firms and they gain a larger portion of the resource. The history of the B.C. fishing industry has followed this process beginning with early policy development and proceeding through corporate concentration of ownership.

Technology and Transportation

Advances in technology and transportation significantly altered the geography of the salmon canning industry. Technological innovations, in the processing of the salmon and in the preservation of the salmon while being transported to the canneries, had

important spatial impacts. A few of these innovations were unique to the industry, however, most were adopted from other industries. These changes impacted every aspect of salmon canning and were crucial in the corporate and geographic concentration of the industry.

Technological advances in the process of salmon canning increased the amount of salmon that could be canned and reduced the amount of manual labour. The development of Smith's butchering machine was a labour reducing and faster method for cleaning the salmon. This was one of the few technological innovations unique to the canning industry. The introduction of the automated sealing process with the sanitary tin can, from the fruit and vegetable industries of California, reduced the amount of spoilage due to leakage. The movement from manual canning to an automated process occurred in the B.C. salmon canning industry between 1871 and 1912. The early industry went through two stages of innovation. The first was the supplemental innovation of manual techniques and second was replacement technology which removed manual labour from the process (Stacey, 1982).

During the early history, "steam powered tenderboats would transport the salmon from the fishing grounds to the canneries" (Stacey, 1982, p.17). A 'tenderboat' was a steam powered tug that would tow the fish boats out to the fishing grounds and return with the scows (wooden barges) loaded with salmon to the canneries. This allowed the fleet to stay in the fishing grounds for longer periods. They became an important part of the industry by the early 1900s.

The development of a coastal radio communications system beginning around 1938 allowed the fishing fleet to communicate the locations of the salmon. The canneries were able to dispatch the tenderboats when the fish were caught and return to the cannery with the catch while the fleet continued fishing. An important benefit of a mobile communications system was the ability of a fish boat in distress to call for help. Weather reports and sea conditions prevented fewer surprises from bad weather (Blyth, 1991).

Transportation to the canneries was primarily by water and eventually developed into a coastal shipping network that moved people and supplies to remote canneries and settlements. An important factor influencing the spatial extent of a resource industry is the ability to move raw materials to processing facilities and then to move products to markets. Throughout the history of the B.C. salmon canning industry, developments in transportation played an important role in the shipping of canned salmon and in increasing the range of the fleet. The development of ocean and rail transportation also provided the industry with the ability to distribute its products to both foreign and domestic markets. The arrival of large transport ships, first sail then steam powered, to Victoria and Vancouver helped the fishing industry to participate in an export market (Millerd, 1988).

The arrival of the railways to the West Coast provided greater access to domestic markets and improved haul times for the British market. Seager (1996) provides a detailed look at the economy of British Columbia during its early industrialisation and stresses the importance of transportation development, in particular the Canadian

Pacific Railway, for the success of the B.C. economy. He provides an examination of each of the sectors of development that reveals enormous exploitation of rich resources as the railway increases accessibility to resources and movement of the products to markets. This exploitation is accompanied by a huge investment of capital in the province with the government attempting to regulate the extremely rapid growth.

In summary, technology and transportation were crucial factors in the development of the B.C. salmon canning industry. Internally the industry benefited from technological advancements in the canning process while fishing methods of the fleet increased the catch of salmon. Greater mobility of the fleet with gasoline engines allowed much faster movement of the salmon from the outlying fishing grounds to the canneries. As well, the completion of the Canadian Pacific Railway improved access to export markets.

Economics

As with most primary industries, the salmon canning industry closely follows the fluctuations in market demands and prices. World markets and prices had a direct impact on the success of each of the canneries and contributed to changes in the spatial extent of the industry. During economic downturns and low salmon prices many canneries were closed. During times of prosperity, new canneries were built and large corporations formed, reflecting the importance of the export staple in the British Columbia economy:

Between 1870 and 1881, . . . we find the kind of change in the structure of the economy which has been apparent in other regions: a relative shift from

the export staple (gold) which was the original cause for the region's growth, accompanied by the development of a new export staple (salmon) and the emergence of a manufacturing sector of some importance (Caves and Holton, 1980, p.153).

The success of canned salmon as an export staple contributed to the rapid economic success of early British Columbia. In particular, sockeye salmon has always maintained the highest market value of all B.C.'s fisheries products (British Columbia, 1979).

If we look at a comparison of the annual production of cases of canned salmon (pack) and its value, the value closely follows the size of the pack until about 1945 (see Figure 2.2). But after the 1940s, the value of the pack increases rapidly (Statistical Basebook, 1959, p.29). Possible reasons for this are: an increased capitalisation of the fleet from increased fishing technology, lower internal competition in the industry as the result of fewer firms, and increasing scarcity of the resource due to increasing fishing effort.

The salmon canning industry was important for the British Columbia economy. The economics of salmon canning was assumed through the adoption of canning technology to preserve the salmon for export. Market demands fuelled rapid growth of the early industry. The increased use of technology allowed market demands to be met with fewer canneries, however, the higher operating costs increased the value of the pack. As such, the industry was susceptible to market fluctuations which had an impact on the spatial patterns through the closure of canneries.

Production and Value of Canned Salmon in British Columbia

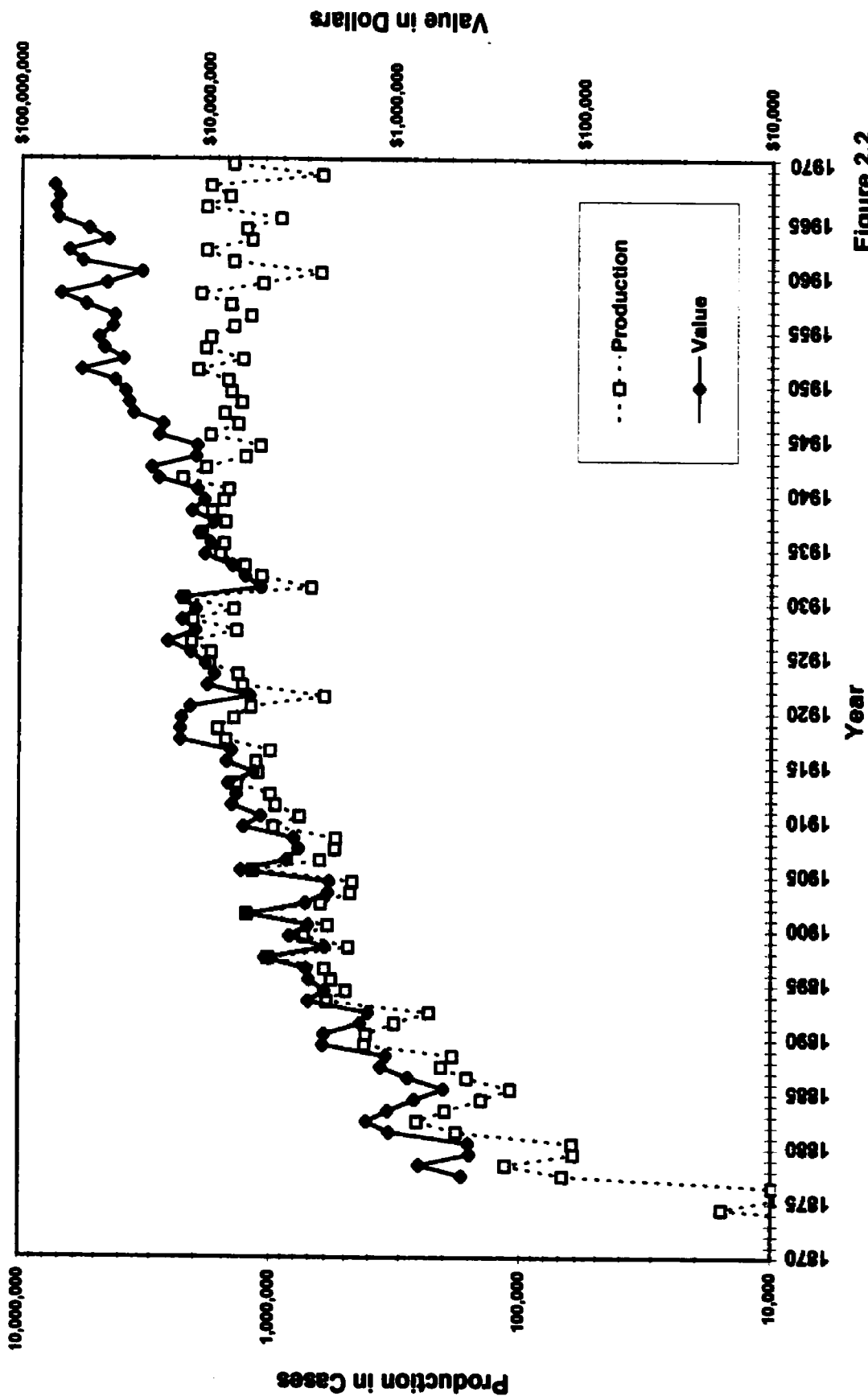


Figure 2.2

Conclusion

This literature review has provided a conceptual framework for the thesis. The geographic barriers of the B.C. coastline were eventually overcome and the industry has undergone a 'life cycle' process of expansion and contraction. The resource development model suggests that there are many different factors, which shape this process and that these factors may be interrelated in their effects on the industry's spatial pattern. The concept of heartland and hinterland helps to explain the spatial pattern of expansion and contraction of the industry by explaining the flow of goods and services.

Some of the elements of the salmon canning industry provide insight to the factors that effect change in the spatial pattern. The nature of the salmon as a renewable resource and the convergence at river mouths during annual migrations, provided the industry with a supply of resource. Many times during the history of the industry, the government attempted to regulate increased resource use through policy. Eventually, the resource becomes controlled by fewer and fewer firms through corporate concentration. Changes in technology and transportation were important agents in improving the movement of the salmon from the fish boats to markets. The canning of salmon to preserve the fish created an export market for salmon, which helped it become one of B.C.'s largest industries. This link to global economics, however, made the industry susceptible to market fluctuations. By analysing the B.C. salmon canning industry this thesis will show the resource development process and some of the factors controlling this process.

Chapter Three

METHODOLOGY

Introduction

The idea for this research developed during the summer of 1998 when visiting the North Pacific Cannery Village Museum in Port Edward, near Prince Rupert. A wall mural in the museum showed the corporate consolidation of the salmon canneries in British Columbia. There were fewer and fewer canneries as a result of these consolidations and the resulting closures had an impact on the geography of the industry. In turn, the literature suggested a pattern of expansion and contraction occurred during the development of resource industries. Therefore, this research came about as an analysis of the B.C. salmon canning industry using a geographic information system (GIS) to examine this pattern of development. The GIS was used to display a consecutive map series over the history of the industry and specific changes in the geography were linked to a timeline of historical events affecting the industry. This chapter will outline the procedures for designing the database, coding and entering data, and completing the spatial analysis of ownership of the industry. Discussion of each of the procedures includes problems encountered and their solutions.

Research Design

The scope of the research includes all salmon canneries that existed along the British Columbia coast between 1870 and 1970. The date of 1870 was chosen as a starting point for the research because it marks the beginning of commercial salmon

canning in British Columbia when the first salmon canneries, Anniesville and Sapperton, were put into operation. The date of 1970 was chosen as the end point because the processes of concentration and centralisation of the industry were fundamentally complete. After 1970, most operations were located in Vancouver and Prince Rupert and there has been little additional corporate concentration of ownership.¹

Ownership of the canneries is included in the research design to track how the corporate consolidation of the industry shaped the geography of canning activity. One of the key elements of the resource development model is the movement from small firms to larger firms. An analysis of these patterns will then determine the role of ownership in the salmon canning industry by identifying linkages between concentration of ownership and spatial change.

In order to provide a framework for the research the resource development model, discussed in Chapter Two, describes general stages of the spatial patterns of industry. It is used as a guide for explaining the geography of the industry at different periods. Using the model to set a context for the research allows comparative analysis for further research of other industries.

Data and Sampling

The population for the database includes 223 canneries that operated under 185 companies. The data were gathered from a number of different sources including published and unpublished research on the B.C. salmon industry. It was necessary to

¹ Note: During the course of this research, Canadian Fishing Company purchased the assets of B.C. Packers Ltd. in the fall of 1999.

distil the information from these many sources into one database that could be incorporated into the GIS. Some of the sources contained information for the major portion of the industry's history (see Carrothers, 1941; Lyons, 1969; Canada, Sessional Papers, 1876-1936; British Columbia, 1936-1959; British Columbia, 1960-1970; Newell, 1988; Roberts and Higginbottom, 1991) and some deal with specific areas, time periods, and events (see Ross, 1967; Fraser, 1977; Reid, 1981; Stacey, 1982; Higginbottom, 1988; Newell, 1989; Blyth, 1991). Dates of operation, company ownership transfers, and locations were extracted from text and tables and entered into the database with the appropriate coding. Many of the locations were found on small-scale maps that accompanied some of the sources. It was difficult to place the locations of the canneries with any precision because of the generalised nature of the maps. Some of the textual descriptions allowed for a more precise location to be determined for some of the canneries.

In order to provide integrity to the database, many different sources were researched to complete or verify information. These include government documents that show the licensing of canneries and fire insurance records. Some of the information is found in general historical accounts of life on the coast of British Columbia. The biographies and autobiographies of cannery owners and fishermen also provided useful information for entering into the database or confirming existing data (see Large, 1957; McKervill, 1967; Harris, 1990). As many different sources as could be found were used to try and confirm the accuracy of the information. However, there were discrepancies between some sources that may have introduced potential error in the database.

Access to government documents at the Federal Department of Fisheries and Oceans offices in Vancouver and the Pacific Biological Research Station Library in Nanaimo, provided data for a major portion of the database. Annual Reports of the Federal and Provincial Departments of Fisheries were consulted for the years 1873 to 1970. For the years 1873 to 1909, complete lists of operating canneries are available. After 1909, the number of canneries in each district is given. These government records provided the most complete source of statistical data for the database. From these records a complete database showing the total pack of canned salmon by region, numbers of canneries operating in each region, and the total number of cannery licenses issued, was constructed. Ownership data was obtained from these records between 1870 to 1906, after which the data were obtained from other sources.

The British Columbia Fisheries, by Carrothers (1941) and Salmon: Our Heritage, by Lyons (1969) also provided historical information on the salmon canning industry in B.C. and were the primary sources for much of the ownership and operation data. This information was checked against a number of other sources for verification. Many of the other sources only covered a portion of the canning industry, either spatially or temporally. Many of these secondary sources agreed for the most part with Lyons, however, there were a few instances where at least one of the sources appeared to disagree on the naming or location of some canneries.

By using some innovative research techniques, valuable information was discovered. The Wrigley's and Henderson's British Columbia Directories from 1874 to 1933, provided names and companies of salmon canneries that operated in B.C. each

year. Some of the discoveries made in these were identifying multiple names of a cannery, ownership information, and general locations of canneries. For example, there was a problem identifying the correct location for the Winter Harbour Cannery. It was listed in a previous source as being in the Nass District, as there is a Winter Inlet located there with ruins of buildings and pilings. However, the directory listing showed the address as being Quatsino, on Vancouver Island. Reference to a navigation pilot also showed that the cannery was in Winter Harbour, near Quatsino, and operated for many more years than was previously thought.

An important issue in researching the salmon canning industry of B.C. is in the definition of ownership. In sorting out the ownership of each cannery, there often appeared to be multiple ownership. Some of these canneries were owned by the managers of the cannery and others were owned by the agents acting for the cannery. The agents often operated as umbrella companies for some canning operations. The agents may have supplied capital and insurance for the canneries, as well as handled the shipping for various canneries. A cannery operator would have ties to one of these agents in Victoria or Vancouver to secure transportation of their pack to British markets and perhaps ties to another to secure capital for unprofitable years. This made defining ownership for some of the canneries difficult. Whether agents or cannery operators secured the assets of some canneries requires further investigation. An example is that of the Deas Island cannery. John Sullivan Deas worked as a tinsmith for Captain Edward Stamp, who owned Sapperton cannery. Stamp died in 1872 and the cannery continued to operate under Deas. The cannery was then sold to Holbrook and Cunningham. Deas

built another cannery at Cooperville, an abandoned saltery operation, with the help of Findlay, Durham, and Brodie. Although Deas operated the cannery, it is often referred to as owned by Findlay, Durham, and Brodie. Presumably, this is due to Deas selling complete interest to Findlay, Durham, and Brodie on August 19, 1878. Shortly after the transfer, Findlay, Durham, and Brodie secure capital from Britain and establish the B.C. Canning Company (Lyons, 1969). This example shows how complicated determining the ownership of a cannery can be. However, the important transfers in the formation of large firms were well documented.

Maps were used when available to determine the locations of canneries. Only a few historical maps showing cannery locations could be found and these were small scale maps showing the entire coast at a point in time. These were helpful at locating the canneries by pointing to a general area. The specific locations were found in coastal navigation pilots. The navigation pilots, Sailing Directions for the British Columbia Coast, (Canada, 1999) are a textual description of the coastline, identifying both natural and built features. These detailed descriptions of the coastline indicated ruins of former canneries and sites that remain intact. Many canneries were named for their geographic location. By looking up the name of a cannery in the index, the locations of some canneries were found. In the course of the research, two sites of ruins were found, but their names and ownership were not determined. Once the cannery locations were determined they were transferred to the GIS database.

The original licenses of the canneries were also consulted at the B.C. Provincial Archives. These were available for the period between 1909 and 1932 and were

included with much correspondence between the cannery owners and the Commissioner of Fisheries. Time and resources did not permit the full analysis of these documents, however, selected years of 1910 and 1924 were sampled to obtain a check for the existing database. These two years were selected because they included summaries of licenses issued for those years. At the time of this research, some of the documents had restricted access and could not be fully reviewed.

Database Construction

For a GIS analysis to be successful, the structure of the database must be carefully designed. It must contain all of the necessary variables required for a subset of queries. For the set of questions that will be asked in the analysis, the database must contain the relevant information. For this study the variables are:

- 1) the geographic locations of the canneries,
- 2) the years that they were operational, and
- 3) the ownership of each cannery in a given year.

Other information built into the design is the historical order of the construction of each of the canneries and the year of incorporation of each of the companies. The two major factors in the design of the database are the population and sample size, and the ability to display temporal data to show historical trends.

To display a temporal process of change in the canning industry, a time segment of one year was used because most of the data were routinely recorded on an annual basis. The first column in the database is represented by each of the salmon canneries that operated. The second column is the numerical ranking of each of the canneries in

terms of its historical order. For example, number one is the first cannery built, number two is the second, and so on. The third column indicates the geographic region the cannery is located in because much of the government data is segmented by these regions. The following columns each represent one year between 1870 and 1970, in which the ownership codes are entered (See Table 3.1).

Table 3.1 Database Sample.

Cannery Name	ID	Region	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880
Annieville Cannery	1	Fraser River	1	1	1	0	0	0	0	0	0	0	0
Sapperton Cannery	2	Fraser River	2	2	3	3	3	3	3	3	10	10	0
Annieville II Cannery	3	Fraser River	0	0	0	1	1	1	1	1	1	1	0
New Westminster (Lane, Pike)	4	Fraser River	0	0	0	4	4	4	4	8	8	0	0
Deas Island Cannery	5	Fraser River	0	0	0	5	5	5	5	5	5	5	5
Ewen's Lion Island Cannery	6	Fraser River	0	0	0	0	0	0	6	6	6	6	6
Inverness Cannery	7	Skeena River	0	0	0	0	0	0	9	9	9	9	16
Brownville Cannery	8	Fraser River	0	0	0	0	0	0	0	7	7	7	7
B.C. Cannery	9	Fraser River	0	0	0	0	0	0	0	0	11	11	11
Ladner "Delta" Cannery	10	Fraser River	0	0	0	0	0	0	0	0	12	12	12
Aberdeen (Windsor) Cannery	11	Skeena River	0	0	0	0	0	0	0	0	13	13	13
Coquitlam (Haigh's) Cannery	12	Fraser River	0	0	0	0	0	0	0	0	14	14	14
Mill Bay (Kincorth) Cannery	13	Nass River	0	0	0	0	0	0	0	0	15	15	15

Much of the data were in different formats and needed to be compiled into a standard coding system for analysis. For each year between 1870 and 1970, the ownership for each cannery was entered by assigning a numeric code to each company. The code was based simply on the historical order that the company was founded. For example, if 'Company X' was the tenth company to form and operate a cannery in B.C. a 10 was entered in each of the years a cannery owned by this company was in operation. If the cannery existed, but did not operate in a given year, it was indicated by a negative code number (i.e. -10). If the cannery did not exist or was closed

permanently, the value given for that year was 0. Company codes are linked to a table sorted by historical order and incorporation dates (See Table 3.2).

Table 3.2 Company Codes.

COMPANY	CODE	Historical Order	Year of Incorporation
Alexander Loggie and Company	1	1	1870
Sapperton Canning Company	2	2	1870
Holbrook and Cunningham Company	3	3	1872
Lane, Pike, and Nelson Company	4	4	1873
British Columbia Canning Company	5	5	1873
Ewen and Company	6	6	1876
English and Company	7	8	1877
Findlayson and Lane Company	8	9	1877
North Western Commercial Company	9	7	1876
King and Company	10	10	1878
British Columbia Fishing and Packing Company	11	11	1878
Delta Canning Company	12	12	1878
Windsor Canning Company	13	13	1878
Haigh and Sons	14	14	1879
Adair and Company	15	15	1879
Turner, Beaton, and Company	16	16	1880
Croasdaile and Company	17	17	1881

By structuring the data in this way, the database was able to answer some key questions about how the ownership of the industry changed over time. In any given year the database showed the number of operational canneries, who owned those canneries, and where they were located. When this information was linked to the GIS, a series of maps were produced that visually represent the impact of corporate consolidation on cannery location. Showing how cannery ownership changed the spatial geography of the industry, provided a mechanism for explaining the different stages of the resource development model.

Bias and Error

Bias occurred in some of the data sources consulted. Many different sources were consulted to try and minimise the bias, by cross-referencing. Time and resources were limited so some data could not be obtained. Many of the data sources have a bias, for example sources from a corporation or union had certain perspectives on the industry's development. In addition, some information may have been unavailable or overlooked at the time of the research.

The database contains numerical coding for the ownership, which could introduce coding errors. This method was chosen to reduce the size of the database, allow easy sorting of the data, and provide a reference to the historical nature of ownership. Most of the ownership is arranged from earliest (low number) to the latest (high number) to get a sense of longevity of a company. A few of the ownership codes are out of place as new information was obtained or existing data was corrected.

When dealing with historical data it is inevitable that there will be variations in the names of canneries, whether they operated or not, and even their exact location. In the case of naming, a list of all probable names for a particular site was maintained. This made it easier to sort out and cross-reference when the database was complete. For example, the Skeena River Commercial cannery was also known as Herman's Cannery, the Anglo-Alliance, and the Globe. In determining whether or not a particular cannery operated in any given year, unless otherwise stated, the cannery is assumed to have operated. Checking with annual reports of licensing in the fishing industry reduced this

error. It is known, however, that some canneries operated for periods without government licenses.

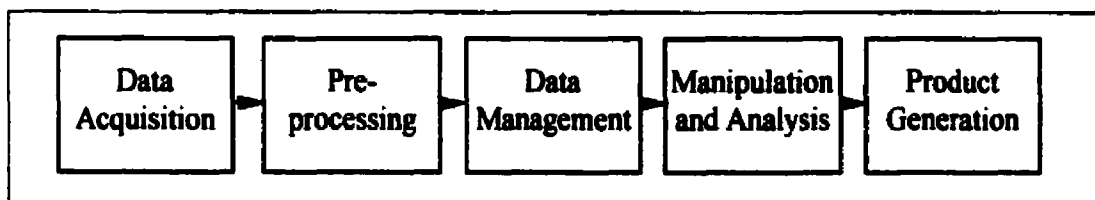
Another source of error in the database comes from determining the actual locations of the canneries. The map sources varied in their detail and scale. Some gave very precise locations, for example, the maps of the Steveston waterfront on the Fraser River. Others showed the entire coast of B.C. at small scales making it difficult to precisely locate a cannery. The worst case may be within ten to twenty kilometres of the actual site. An error was found on one of the map sources when one of the canneries was shown to be located on opposite sides of the inlet, about four or five kilometres apart, on two of the major map sources. A reference to nautical charts showed broken pilings at a location that agreed with another map source, so this was assumed to be the correct location.

Many of the older canneries were lost to fire, along with many of their records. For this research, the location and ownership information could be obtained from other sources such as government documents. Future research on individual cannery production, labour, and catch may be difficult to find for all canneries. It is also known that some owners operated 'dummy' canneries that were built simply to obtain licenses for fish boats. It is difficult to know whether or not these canneries operated in a given year. This could provide a source of error in the number of canneries that actually operated.

GIS Development

The purpose of developing this GIS application is to analyse the spatial characteristics of ownership in the B.C. salmon canning industry between 1870 and 1970. Using a GIS allows a much larger amount of spatial information to be analysed than traditional mapping techniques and the ability to perform spatial analysis with multiple attribute data and between different layers of information. The GIS software used for this thesis is ESRI's ArcView version 3.0. The GIS is designed to be able to produce a series of maps that show the location and ownership of salmon canneries operating in a given year. These maps were used to perform a visual and statistical analysis of distribution, concentration, and change of ownership over time. The five elements to the GIS process are: data acquisition, pre-processing, data management, manipulation and analysis, and product generation (Figure 3.3).

Figure 3.3 The Five Elements of a GIS.



(source: Star and Estes, 1990, p.25).

Data acquisition has already been discussed in detail in the Data and Sampling section. Once all of the data is compiled into the database spreadsheet, it was imported into the GIS and linked via spatial referencing to a base map. The base map component consists of a vector coverage of the coastline of British Columbia. These data were

obtained from the B.C. Ministry of Environment, Lands, and Parks, Terrain Resource Inventory Mapping (TRIM) data at a scale of 1:2,000,000. As part of the pre-processing, the base map vector coverage was imported into the GIS and more detail was added to the mouths of the Skeena and Fraser Rivers. The locations of the canneries were placed onto the coastline as point features and linked to the attribute database (spreadsheet). Data management involved checking existing data against multiple sources to ensure integrity and adding new information, as it became available. As a result, some re-coding had to be done to a few canneries to ensure the coding and historical order was correct. Manipulation and analysis was done through various sorting of the data. A number of different analyses are possible with the GIS. For this thesis, the analysis included the historical order of development of both canneries and firms, regional distribution, degree of concentration, and impact of firm size on the distribution of canneries. Product generation involved a series of maps, which displayed the spatial pattern of cannery locations for each year. Trends and patterns over the one hundred year period were discerned and correlated with events of the timeline and factors of locational change.

Conclusion

The design and coding of the database allows input of data from a variety of sources to provide map products for spatial analysis. The flexibility in the design will allow future data to be input into the database for analysis, such as production levels and employment data. The visual display of the information by using a GIS provides insight

into the industry's spatial development and generates new questions to be asked. This project will provide the beginnings of a database that will facilitate future research of the British Columbia salmon canning industry.

Chapter Four

ANALYSIS

Introduction

This chapter provides an analysis of the changes in the spatial pattern of the B.C. salmon canning industry between 1870 and 1970. The analysis consists of three parts. The first is an examination of how the number of canneries and the production levels of the industry changed over time. This is important in showing the increases and decreases in the number of canneries and the effect on production rates in the industry over time. Second, the analysis will describe the changing spatial patterns of canneries to show the expansion and contraction of the industry over time and provide an understanding of the overall spatial change in the industry. It will describe changes in the spatial pattern of the industry by linking them to a timeline of significant events to show how the industry responded to changes in technology, transportation, management policy, and corporate ownership. The third part will examine the role of small and large firms in the industry. It will explain the importance of small firms as innovators and a source of growth for the industry. It will also show how the formation of large firms led to the spatial concentration of the industry. By using ownership data in the GIS, a series of maps will show the pattern of ownership change and the spatial impact of corporate development. The goal of this analysis is to provide a foundation for linking the B.C. salmon canning industry with the resource development model.

Canneries and Production

Part one of the analysis describes a chart showing the number of canneries operating along the B.C. coast between 1870 and 1970 (see Figure 4.1). The chart also includes a line indicating levels of the total annual production of forty-eight pound cases of canned salmon. Data for the chart were obtained from a number of sources including Lyons (1969), the Department of Fisheries and Oceans Annual Reports from 1873 to 1936, the Provincial Fisheries Department Annual Reports from 1936 to 1959, and Provincial Department of Recreation and Conservation Annual Reports from 1960 to 1970. The goal of this part of the analysis is to show the pattern of growth and the relationship of production at the various stages of growth.

A couple of problems were encountered when compiling the data for this chart. First, the production data for the years 1870 to 1872 are not recorded in official documents, so the numbers given are estimates of the average annual production of the two canneries based on anecdotal information. Lyons (1969) estimates that 300 cases of 100 one pound cans were shipped to England from the Annieville cannery in 1870. The production rates from 1873 to 1875 are based on a calculation of the value of the export of canned salmon found in Carrothers (1941) and the market price of a case derived from Department of Fisheries Annual Reports (1876-7). Second, the numbers may not include canneries that were not registered with the government or include dummy canneries. Even though there may be errors from the actual numbers, the chart represents the overall trends and pattern of the industry.

Number of Canneries and Total Annual Production, 1870 to 1970

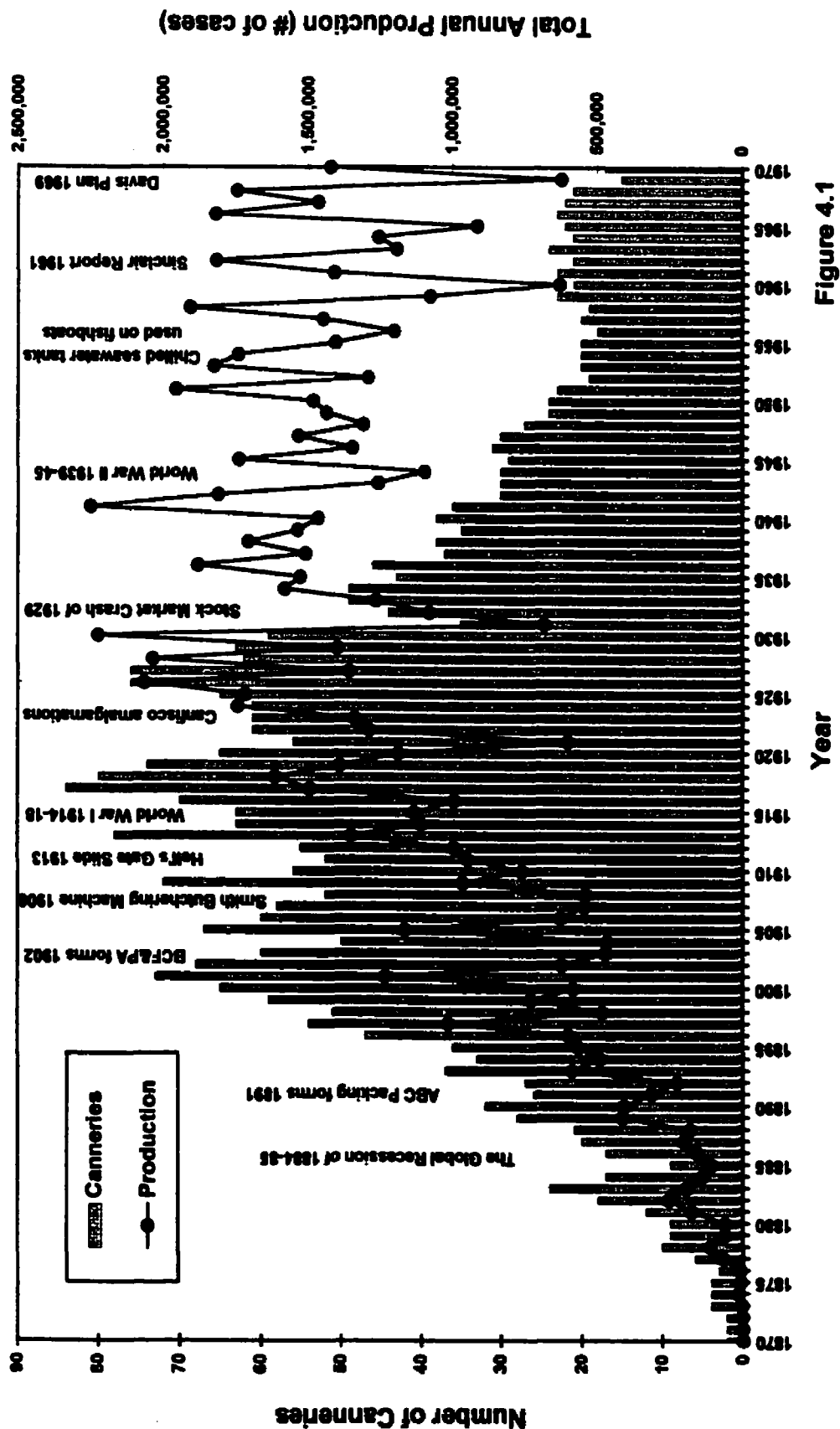


Figure 4.1

Canneries

Beginning in the 1870s, there were only a few canneries operating as the industry was highly labour intensive and preservation techniques were still being developed (see Figure 4.1). The industry was located primarily at the mouth of the Fraser River, around New Westminster, and along the south arm of the Fraser. In 1876, Inverness cannery was constructed at the mouth of the Skeena River as the industry began to expand along the coast seeking new sources of salmon. By the end of the 1870s the industry had grown to nine canneries. There was at least one cannery on all of the major salmon spawning rivers on the B.C. coast.

During the early 1880s, the industry underwent its first major setback as a world recession and low market prices for salmon close down many canneries, some temporarily and some permanently. In 1884, the first corporate development occurred with the amalgamation of the Delta Canning Company, Wellington Canning Company, and the holdings of J.A. Laidlaw, by the Victoria Canning Company. The reasoning behind the merger was that profitability could be maintained by operating canneries in different areas and thus offsetting years of poor salmon returns. By 1886, the industry began to recover and expanded rapidly with seventeen canneries in operation. Large influxes of British capital help fuel the expansion to supply a growing British market demand for Pacific salmon (Lyons, 1969).

Continuing through the 1890s, the new 'salmon rush' was attracting many entrepreneurs and the industry experienced its most rapid growth, expanding from 32 to 65 canneries by 1900. This was due primarily to increasing demand. The canning

process continued to be reliant on manual labour and cannery owners began to seek new methods to increase production (Carrothers, 1941).

During the first decade of 1900, technological development of the canning process helped to reduce labour shortages and strengthen the industry's ability to meet market demands. Furthermore, corporate development restructured a large portion of the industry with the acquisitions of British Columbia Packers' Association of New Jersey in 1902. Forty-two canneries on the B.C. coast were purchased, but only thirty-two of those continued to operate. The production of the new corporation accounted for half of the total pack for that year. Continued entry of new canneries maintained growth within the industry and by 1909 the government attempted to regulate this growth by placing restrictions of the number of boats licensed to each cannery.

In the 1910s, the number of canneries fluctuates due to resource variability and corporate buy-outs (see Figure 4.1). The British Columbia Packers' Association of New Jersey became a provincially registered company and changed its name to the British Columbia Packers Association in 1910 (Lyons, 1969). During World War One, twenty-seven new canneries were built to help provide for the war effort, in addition to the amount of production that was conscripted from existing canneries. The number of canneries reached its peak in 1917 with 94 canneries in operation (Canada, 1929). This occurred just after the restrictions on the number of cannery licenses were lifted.

The 1920s was a decade of corporate mergers, transfers of ownership, and acquisitions. The Canadian Fishing Company emerged as a major player when it added twelve canneries to its existing plant between 1923 and 1926. In 1926, the British

Columbia Packers Association purchased the seven canneries of Wallace Fisheries. In 1928, British Columbia Packers Ltd. was formed from the amalgamation of the British Columbia Packers Association, Gosse Packing Company, and Millerd Packing Company, bringing the total number of canneries in that company to forty-four. Shortly after the merger, eight of the newly acquired canneries were closed permanently. By 1929, B.C. Packers Ltd. and Canadian Fishing Company had emerged as the dominant companies in the B.C. fishing industry (Lyons, 1969).

The 1930s economic depression closed many canneries permanently and marks the beginning of the decline in the number of canneries operating in the industry (see Figure 4.1). The worst year for the industry was 1931, when only thirty-five canneries operated. The industry recovered slightly in 1933, but after this point began a steady decline in the number of canneries. In 1930 there are fifty-nine canneries operating and by 1939 there are only thirty-five operating.

During the 1940s, the process of rationalisation by the new large firms began to concentrate the industry into geographic centres. Many of the older and outlying salmon canneries are becoming obsolete and if not closed, they were converted to fishing stations or reduction plants. The number of salmon canneries continued to slowly decline throughout the 1940s to twenty-four.

In the 1950s, firms continued the process of rationalisation by operating only one or two canneries. Improved processing technology had allowed high capacity plants to be built. The range of the fishing boats was increased with the use of chilled seawater tanks to store the salmon and packer boats to return catches to the canneries.

Considerations for plant location were now focused on access to export linkages and economic services. By 1959 there were twenty-three canneries operating along the B.C. coast (see Figure 4.1).

The 1960s began with concern about the future of the salmon resource. Salmon stocks were beginning to decline and the number of vessels were increasing, creating over-capacity in the industry. The corporate side of the industry remained relatively stable, but the closures continued and by 1969 there were only fifteen operating canneries.

Production

The first attempt at canning salmon in B.C. was by James Symes in 1867 and 1869. This venture, however, met with little commercial success (Ralston, 1977). The first recorded commercial production of canned salmon is thought to have occurred in 1870 at Anniesville on the Fraser River (Carothers, 1941; Campbell, 1961; Lyons, 1969; Reid, 1973; Ralston, 1977). Some researchers have argued that the cannery may not have actually produced until 1871 (Stacey, 1982; Lee, 1983; Millerd, 1988; Meggs and Stacey, 1992). Carrothers (1941) suggests Alexander Loggie and Company purchased the saltery at Anniesville in 1870 and converted it to a cannery that same year. While the production numbers for the early years are not available, some estimates have been made based on other information. Stacey and Meggs (1992, p.3) believe that it was Alexander Ewen and Company in the summer of 1871 that canned at Anniesville and produced three hundred cases of one hundred one-pound cans of salmon. Regardless of

the debate over the exact events of the initial canning in B.C., the first commercial production of canned salmon occurred in the early 1870s.

The packs initially consisted of cases of one hundred one-pound cans for the first few years and then went to the Sacramento standard of four dozen one-pound cans. The 48 pound case is still used as the standard unit today. Until the early 1900s, production was limited because the process of manufacturing the cans was done by manual labour. The cans were hand cut and soldered with lead, limiting production to about 60 cans per day (Lyons, 1969). Workers would construct the cans prior to the start of the season and then were hired to work in the canneries (Stacey, 1982).

After 1876, government records of production are available. Production rates increased very rapidly in the early years of salmon canning as processing techniques were developed. Through the 1880s there was a high demand for labour, both skilled and unskilled. Chinese men were hired as tinsmiths and as butchers in the canneries to relieve some of the labour shortages. Individual cannery production increased with more mechanical processes and industry production increased with the rapid growth in the number of canneries (see Figure 4.1).

During the 1910s the introduction of the gasoline engine onto fish boats allowed a much greater range than with sail and oar. In 1917, Easthope began selling its four-cycle heavy duty marine engine which became widely used on the fish boats of the Fraser, however, the benefit of using powered fish boats was limited to areas south of Cape Caution (Lyons, 1969).

In the 1920s, production continued to increase from the development of the double seamed can and vacuum sealing process. This process increased production by better preserving the salmon, preventing spoilage during transport, and reducing the chances of lead poisoning. The restrictions on gasoline engines were removed from Northern waters in 1924, allowing these fishermen to extend their range and increase their catch. Also, First Nation's fishermen were granted the right to obtain licenses to operate seine boats (Canada, Sessional Papers, 1925). These changes increased the capacity of the fleet to supply the canneries.

By the 1930s, it was the number of salmon that could be caught that determined the production levels and not the limitations of the canning process. Some productivity was lost due to labour strikes as unions gained in strength and many canneries were closed due to poor economic conditions (Hill, 1967). Strikes in the fishing industry could have much more of an impact than in other resource industries. Due to the seasonal nature of fish runs, once the fish migrated past the catch areas, the economic opportunity was lost.

During the 1940s, corporate rationalisation concentrated the industry into fewer highly productive plants and decreased the number of canneries. In the first half of the decade most of the production was directed to the war effort in Europe. The largest annual production occurred in 1941 with 2,295,433 cases of canned salmon (see Figure 4.1). The large pack was due to a government embargo on the export of fresh and frozen salmon, which diverted most of the catch to the canneries. That year over 1,500,000

cases of salmon were purchased by Britain's Ministry of Food for the war effort (Canada, Sessional Papers, 1941, p.J17).

Through the 1950s and 1960s, production fluctuated from year to year but remained relatively high over the decade (see Figure 4.1). By 1970, the productive capacity of the remaining canneries replaces the production lost by canneries that were closed permanently.

In summary, the chart showing Canneries and Production shows a rapid increase in the number of canneries and a gradual increase in production rates until 1902. Production rates continued to increase until 1930. After 1930, the number of canneries began to decline, but the production levels remained high and widely fluctuating. By showing the number of canneries and the total annual production a relationship can be derived indicating the overall productivity of the industry. As technology and transportation methods developed, the industry was able to become more productive. Economic conditions and resource availability come to play a larger role in production levels. As individual plant capacity increased over time, it allowed the industry to concentrate into fewer highly productive plants. There is a critical point after 1930 when the numbers of canneries decreased, but the productivity remained high. This would suggest that new high capacity canneries are beginning to replace older canneries or existing canneries are being refitted with higher capacity machinery. There is a point during the late 1950s where the productive capacity of the canneries exceeds the supply of salmon and canneries no longer operate at peak capacity. This means that production is no longer determined by how much salmon a cannery can process, but rather by the

amount of salmon the boats catch. Much of the annual variation in the chart is due to the fluctuation in the number of salmon returning to spawn.

Spatial Patterns of the Industry

This section will describe some key events that were of particular importance in shaping the geography of the industry. A timeline was generated from a detailed historical background of the salmon canning industry. It is a list of events, the dates when they occurred, and the factors that had a role in shaping the salmon canning industry (See Table 4.1). The goal of the timeline is to link changes in the number of canneries and production to changes in the spatial structure of the industry. By identifying which of the events changed the spatial extent of the industry, this thesis hopes to highlight some of the key factors in shaping this resource development process. There are many factors influencing this process at any one time, however, this type of analysis should provide insight into specific factors that influence the overall spatial pattern. The spatial patterns can be seen through a series of maps showing the distribution of canneries at specific points in time. Previous studies of the industry show graphs or charts of the numbers of canneries, but the maps tend to only show a point in time or only a portion of the industry. The database created for this thesis has the potential to show the spatial patterns for each year so that changes over time can be studied. However, only selections of maps from the database are used to describe the industry at key points to show the changing pattern.

Table 4.1 Timeline of Events and Factors.

YEAR	EVENT	FACTOR
1870	First canneries built in B.C. on the Fraser River.	Ownership
1884	Global recession lowers markets.	Markets
1885	Construction of the Canadian Pacific Railway was completed.	Transportation
1890	First Wilmot Commission to investigate B.C. Fisheries.	Policy
1891	Formation of Anglo-British Columbia Packing Ltd.	Ownership
1892	Second Wilmot Commission.	Policy
1900	Easthope builds first gasoline engine for fish boats on Fraser River.	Transportation
1902	Formation of the British Columbia Packers' Association of New Jersey.	Ownership
1906	Introduction of the Smith Butchering Machine in B.C. canneries.	Technology
1910	Boat rating system is implemented on canneries.	Policy
1914	Hell's Gate slide blocks passage of salmon.	Policy
1914-18	World War I.	Markets
1914	Construction of Grand Trunk Railway is completed.	Transportation
1914	Completion of the Panama Canal.	Transportation
1918	Canadian Fishing Company begins canning salmon.	Ownership
1923-26	Canadian Fishing Company purchases twelve more canneries.	Ownership
1928	British Columbia Packers formed from second amalgamation.	Ownership
1929	Stock Market crash.	Markets
1937	International Pacific Salmon Fisheries Commission is formed.	Policy
1939-45	World War II.	Markets
1941	Japanese internment.	Policy
1950	Chilled seawater tanks used on fish boats.	Technology
1960	Sinclair Report published.	Policy
1969	Davis Plan begins.	Policy

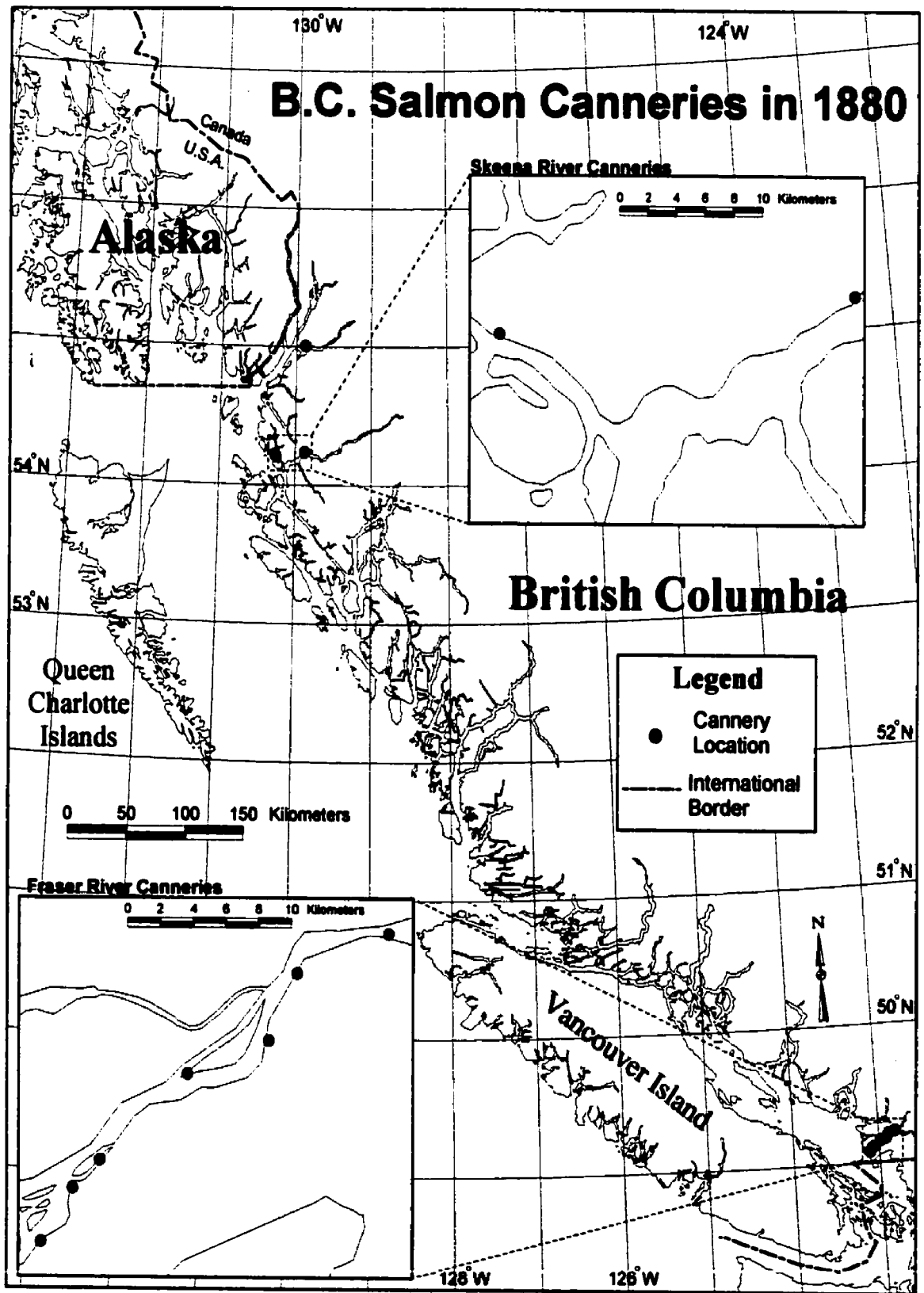
1870 to 1900

The first major event of the salmon canning industry in British Columbia was the construction of two canneries on the Fraser River in the early 1870s. A few years earlier there were small-scale operations that experimented with the process but these ventures

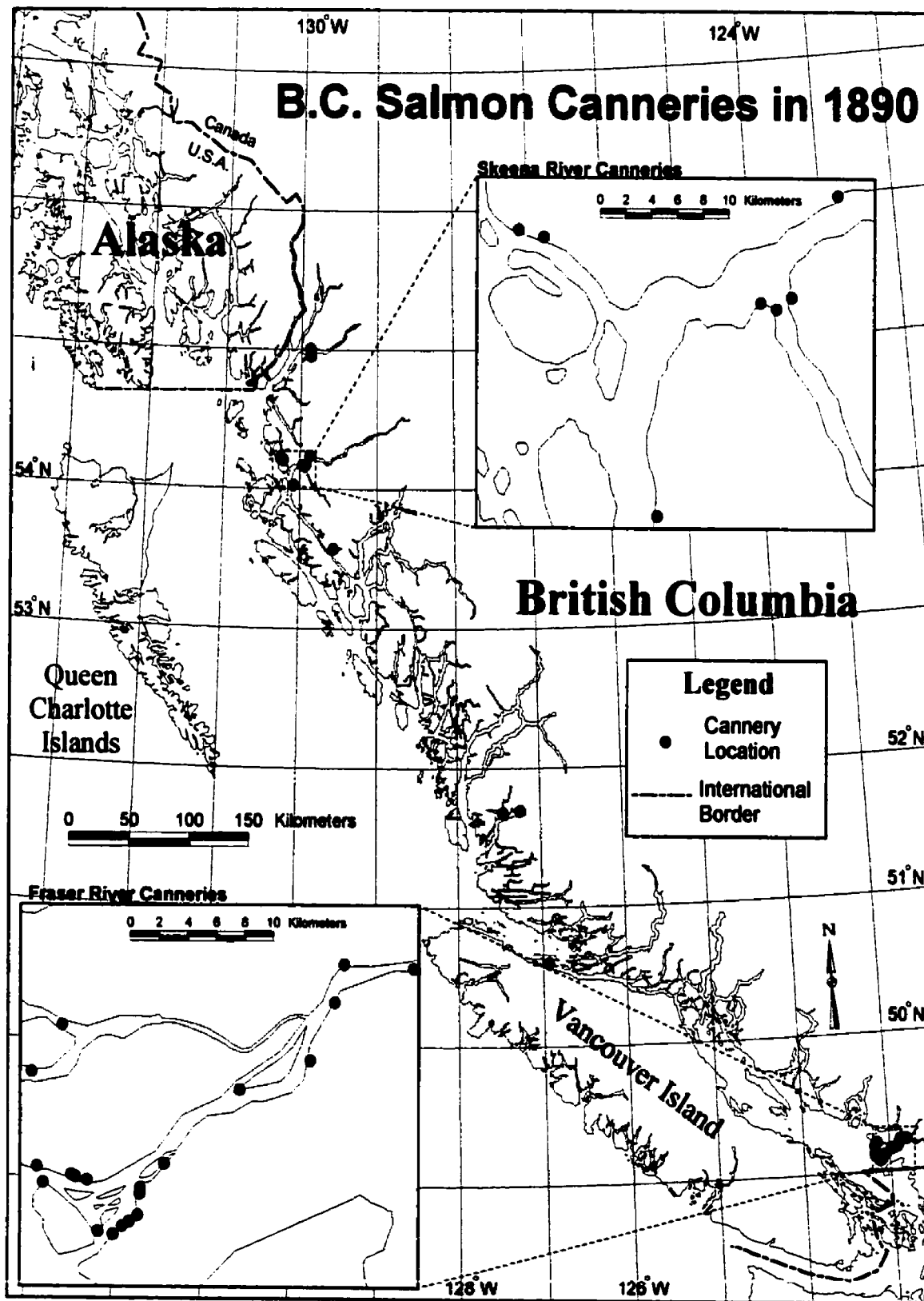
never proved successful. The first commercial production of canned salmon in B.C. was by Alexander Ewen and Associates at the Anniedale cannery. That same year, Captain Edward Stamp built the Sapperton cannery just upstream from New Westminster. The early years of the industry were full of setbacks and difficulties, but these were often offset by an enormous surplus of salmon. By the end of the 1870s, canneries had been built on the Skeena, Nass, and Rivers Inlet, expanding the industry outward to all of B.C.'s major salmon rivers (Carrothers, 1941; Lyons, 1969).

The map for 1880 (Map 4.1) shows the industry in its early stages of growth, with most of the activity centred on the Fraser River. Small firms run all of the canneries at this time. The concentration of canneries was due to the limited extent of the fleet and availability of services. By 1880, there are seven canneries operating at the mouth of the Fraser River, two on the Skeena River, and one on the Nass River.

With increased market demand, fifteen new canneries were constructed during 1882 and 1883 to profit in the economic boom of the fishing industry. During 1884 and 1885, a world recession and low salmon prices gave the industry its first major setback. As a result of global recession, eight canneries were closed temporarily and five were closed permanently. Only seven of the thirteen canneries that operated in 1883 remained operational. The arrival of the railway to the Pacific Coast in 1885, provided greater access to domestic markets and improved haul times to the British market (Seager, 1996). The industry recovered by 1888 and expanded rapidly as major investments of capital were made from Britain. By 1890, there were thirty-two canneries operating



Map 4.1



Map 4.2

(Map 4.2). Fears of over fishing from such rapid growth led the government to begin the first investigation into fisheries practices on the Fraser River (Hayward, 1981).

During the early 1890s, the B.C. fishing industry had two royal commissions. The goal of the first Wilmot Commission was to develop a set of regulations to govern the fisheries. The report received strong opposition in the House of Commons and was never enacted. A second Wilmot Commission in 1892 consisted of testimony from a number of cannery owners, government officials, fishermen, and public representatives, about the state of the industry. The primary objective of the Commission was to deal with the issue of the discard of fish waste (offal) into the river (Canada, Wilmot Commission, 1893). It was seen as a health hazard to the many communities along the Fraser River and waste of potential product. Ideas were put forth to use the offal as a source of fish oil and fertiliser for the nearby farms. Twenty-four of the Commission's recommendations became the first fishing regulations of the industry.

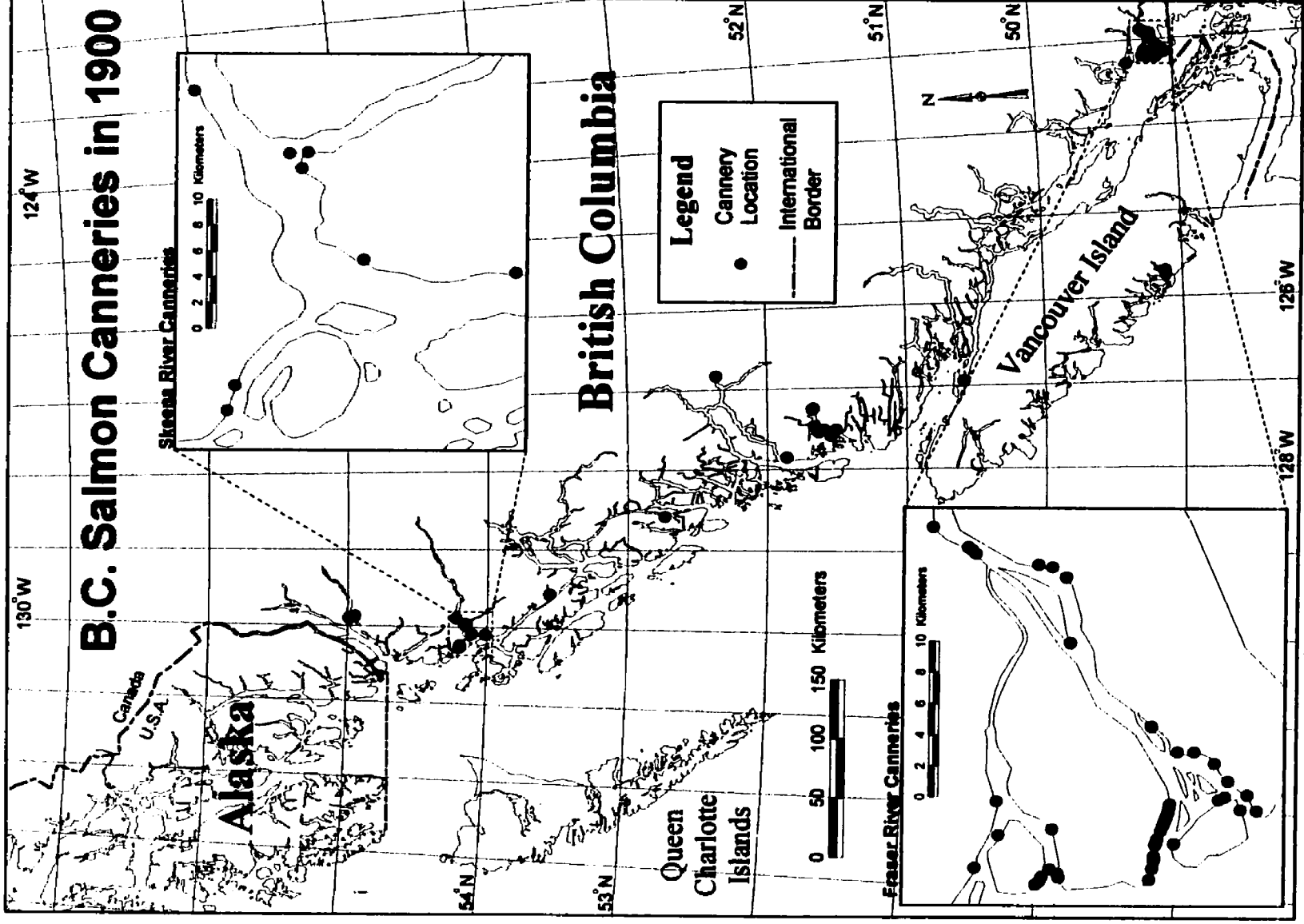
The formation of the Anglo British Columbia Packing Company was organised by Henry Bell-Irving in 1891 and was the amalgamation of nine independent canneries. This was the fifth major company to form in the B.C. industry and the largest, so far. The venture sought to fill the empty holds of the clipper ship Titania with canned salmon on its return to Great Britain. This event was important because the shipment solidified the market in Europe for B.C. salmon (Lyons, 1969). By 1900, sixty-five canneries were in operation as a result of this expanding European market.

1900 to 1930

By 1900, the industry had dispersed along the coast with concentrations at the Fraser River, Rivers Inlet, and Skeena River (Map 4.3). The high number and limited geographical dispersion was due to the continued limitation of the fishing boats to travel long distances. The canning process had developed into an industrial process that was highly mobile, as canneries were constructed and operational in under a year. The low productive capacity of each cannery allowed many canneries to draw on the salmon resource at each of the major rivers. There were sixty-five canneries operating on the coast in 1900, with the majority located on the mouth of the Fraser River. By this point, the fishing industry had become a major economic force in British Columbia and salmon canning led the growth of the industry.

In 1900, Easthope Bros. Ltd. built the first engine made for a fish boat in B.C., but it took about six years before the engines were widely adopted. The increased range of the boats meant that they could fish over a greater range and in a greater degree of weather, than with sail and oar. As a result of the increased power of motors, larger 'tenderboats' were built for transporting the salmon from the fishing grounds to the canneries (Stacey, 1982). The increased catching capacity of the fleet provided surplus fish for the canneries, which led to an increase in production.

During the 1890s, many of the canneries had generated significant debt with the banks in eastern Canada. During this time many companies were joining to form publicly owned corporations as a way to secure capital for their ventures. The 1902 formation of the British Columbia Packers' Association of New Jersey, from the



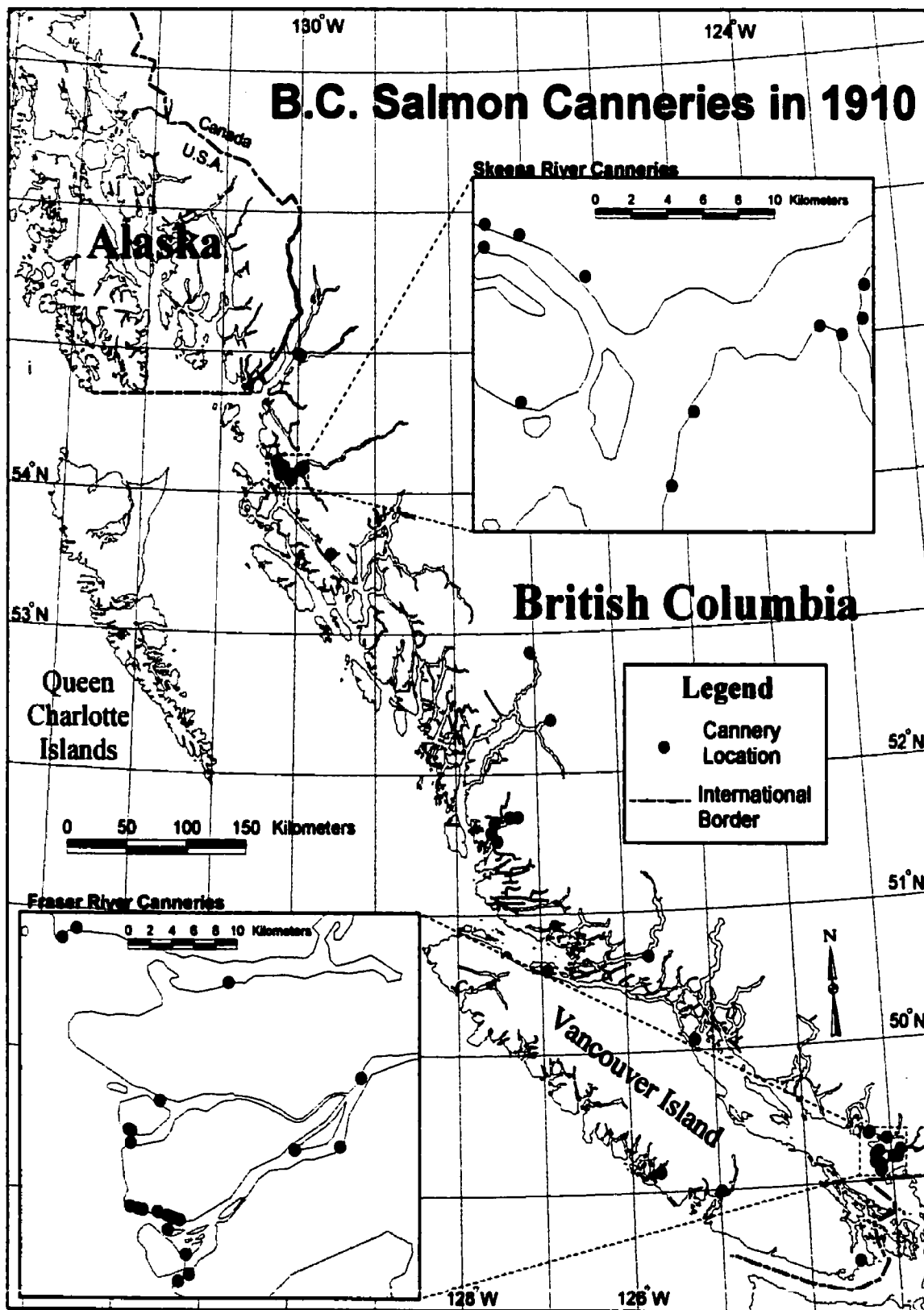
amalgamation of 42 canneries, formed the largest corporation in the industry. Henry Doyle and Aemilius Jarvis were the agents in securing the capital from Eastern Canadian investors and organising the new company. The corporation was an important agent in shaping the spatial pattern of the industry through its consolidation practices (Lee, 1983). In the three years following the amalgamation, twenty-two of the British Columbia Packers' canneries were closed.

In 1906, the Smith Butchering Machine was installed in nine B.C. canneries. This was the beginning of an industry wide implementation of the technology. As the salmon canning industry adopted mechanical process technology it was able to expand spatially, increase productivity, and reduce manual labour. The Smith Butchering Machine was one of the few machines that was designed exclusively for the salmon canning industry and was the first major increase in productive capacity of the canning line. This machine was a mechanical means of removing the head, fins, and entrails of the salmon. It could process 60 fish per minute, replacing the labour of six Chinese butchers (Stacey, 1982). The impact of the Smith Butchering Machine on the spatial pattern of the industry was significant only when taken in context with its contribution to the overall productivity of a cannery.

As Stacey (1982) suggests, this marked the period of increasing productivity due to incremental advances in technology, beginning with the horizontal steam retort which allowed much faster cooking. The high capital outlay for the implementation of innovative processes was costly and these costs would have been a disadvantage for new entrants into the industry. This overcapitalisation, as has been suggested by Stacey, was

the impetus for the formation of the B.C. Packers' Association. Mechanisation of the industry allowed larger companies, with greater access to capital, to consolidate their production into fewer canneries. The impact on the spatial pattern appeared slowly over time as these technologies were adopted. It became more apparent later, when productivity remained high while the number of canneries decreased.

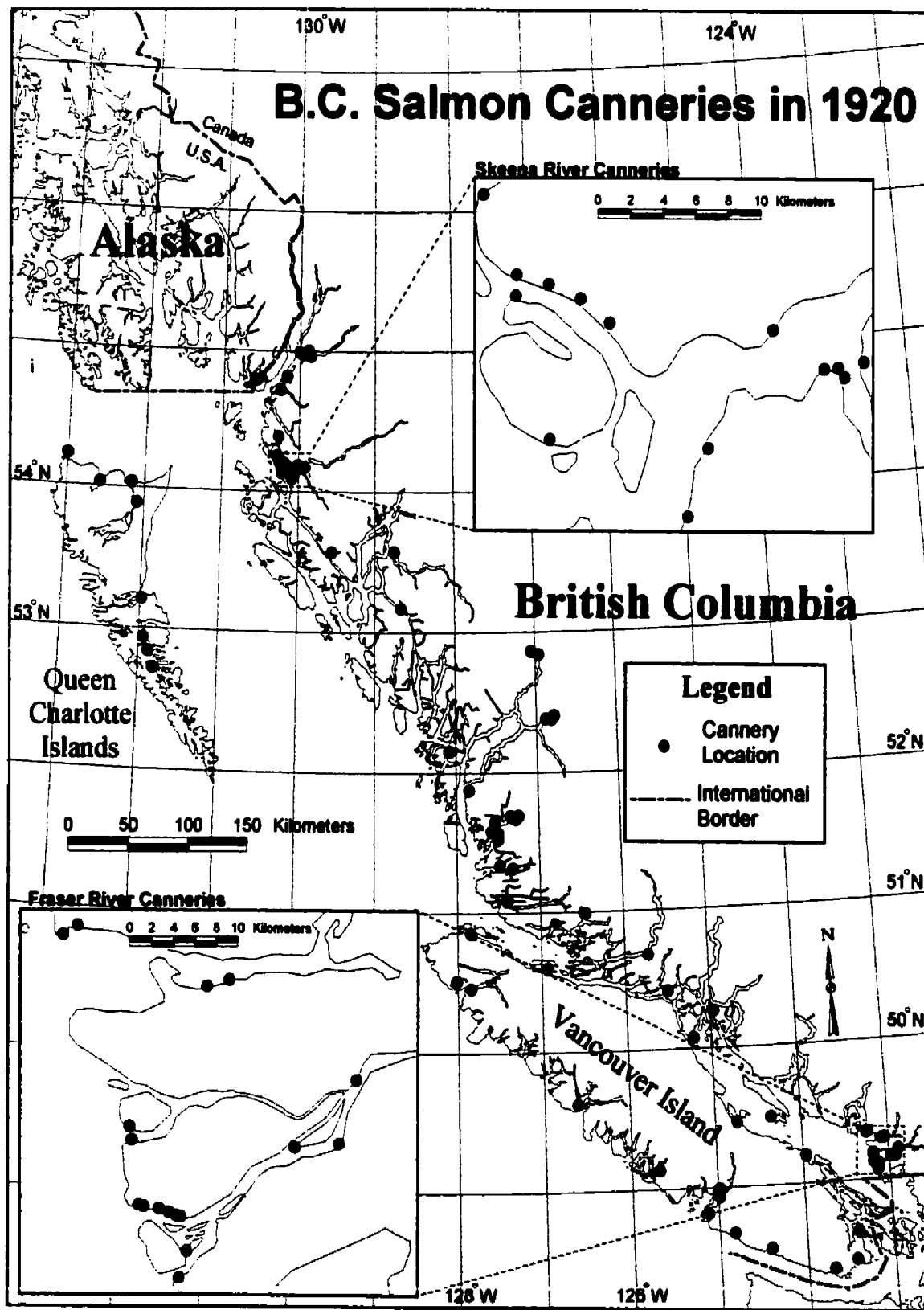
In 1909, a commission was appointed to investigate B.C. fisheries in terms of the number of fish boats that should be allotted to each cannery. This led to the 1909 Boat Rating system implemented on canneries to control the fishing effort of the fleet by limiting the number of boats each cannery could operate. The ratings were based on the Fraser River where there were many more canneries located (Map 4.4), providing a greater stress on the salmon stocks (Canada, Sessional Papers, 1910). As noted earlier, many dummy canneries were constructed with the intent to gain more boat licenses, but the salmon was canned at another cannery. The implementation of these ratings on the canneries in the Northern District was felt to be unfair and a tactic to reduce competition. The rating assumed a generalised productive capacity of a 'one line' plant. This was possibly the catalyst that led to the increasing construction of multiple line plants, as shortly after this point many Northern District canneries began adding canning lines to their operations. Therefore, the implementation of this policy led to an overall increase in the productive capacity of industry, having the opposite effect of its intent to manage the salmon resource. This is one of the reasons why it is important to look at the production levels as well as the number of canneries.



Map 4.4

On February 23, 1914, the construction of the Canadian Northern Railway at Hell's Gate led to a landslide that nearly blocked the Fraser River. The landslide prevented the passage of most of the salmon in 1914 and decimated many of the future salmon runs, particularly the Adams River sockeye run which is one of the largest salmon runs. A temporary flume was constructed so the salmon could be dip-netted from below the blockage and assisted upstream. An effort was made during 1914 and 1915 to clear the debris from the river using a specialised dredge that was suspended across the canyon on cables between two towers (Canada, Sessional Papers, 1916). The effort was successful in clearing most of the debris, however, the damage to the salmon runs had already been done. There was no immediate effect on the spatial pattern of the industry, however, it initiated an increase in awareness by fisheries officials of the external factors that they had to contend with in managing the salmon resource. As a result of the slide, the decimated Adams River sockeye salmon did not return in the expected numbers in 1917 and many canneries began to can pink and chum salmon to supplement their packs (Canada, Sessional Papers, 1917). In this sense, by marketing the other species of salmon, there was more resource available to supply the large number of canneries. In 1944 and 1945, concrete fish ladders were constructed to aid fish passing up through Hell's Gate (Lyons, 1969).

The year of 1914 was very important for the B.C. salmon canning industry for three other reasons. The Panama Canal was completed providing a shorter shipping route to Europe. The Grand Trunk Pacific railway was completed to Prince Rupert allowing better access to markets for the northern canneries. World War I began and



Map 4.5

much of the salmon pack was purchased by Britain for the war effort. Many new canneries are constructed to increase production for the war, with the majority of this growth occurring on Vancouver Island and outlying areas of the coast.

After World War I the industry shows a much more dispersed pattern, along with continued concentrations around the major river mouths (Map 4.5). The maps of 1900 and 1920 show very different spatial patterns, but have similar numbers of canneries. There were eighteen canneries operating on Vancouver Island and eight on the Queen Charlotte Islands as the industry continued to expand the resource frontier. Fifteen canneries were operating on the Skeena River. Gasoline engines on fish boats were being used in the south, but continued to be restricted in the waters north of Vancouver Island. Fewer canneries on the Fraser River (thirteen) suggest that the impact of the gasoline engine, the increasing productive capacity of the canneries, and corporate concentration of the industry was beginning.

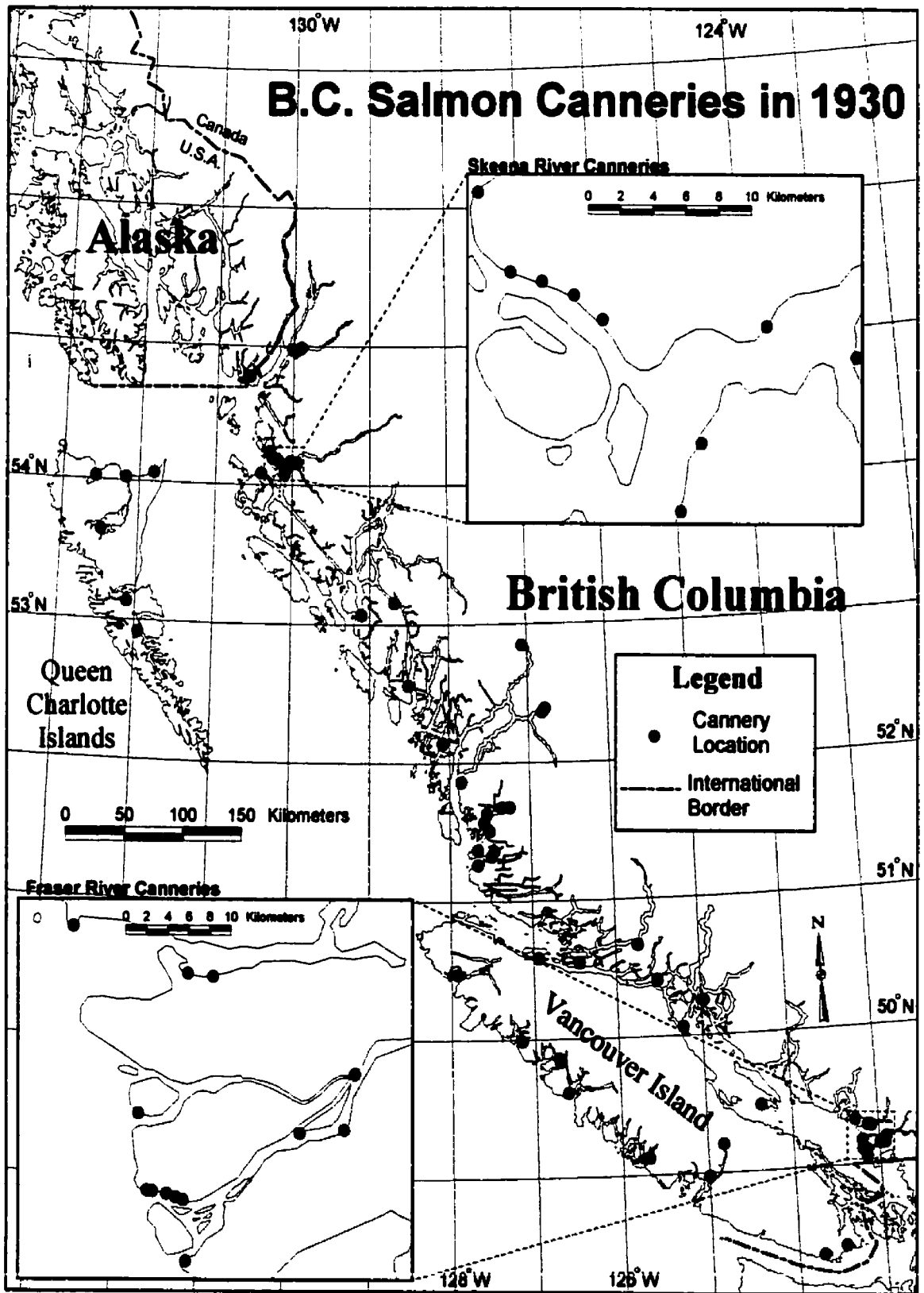
The 1920s marked significant changes in ownership that would have major implications on the geography of the industry. The years of 1923, 1925, and 1926, were years of major amalgamations for the Canadian Fishing Company Ltd. and in 1928 the second major amalgamation to form B.C. Packers Limited. This consolidated ownership of about sixty percent of the industry into two firms. Many of the newly acquired canneries were closed as B.C. Packers Ltd. and Canadian Fishing Company Ltd. struggled to survive the economic crisis of the 1930s.

1930 to 1950

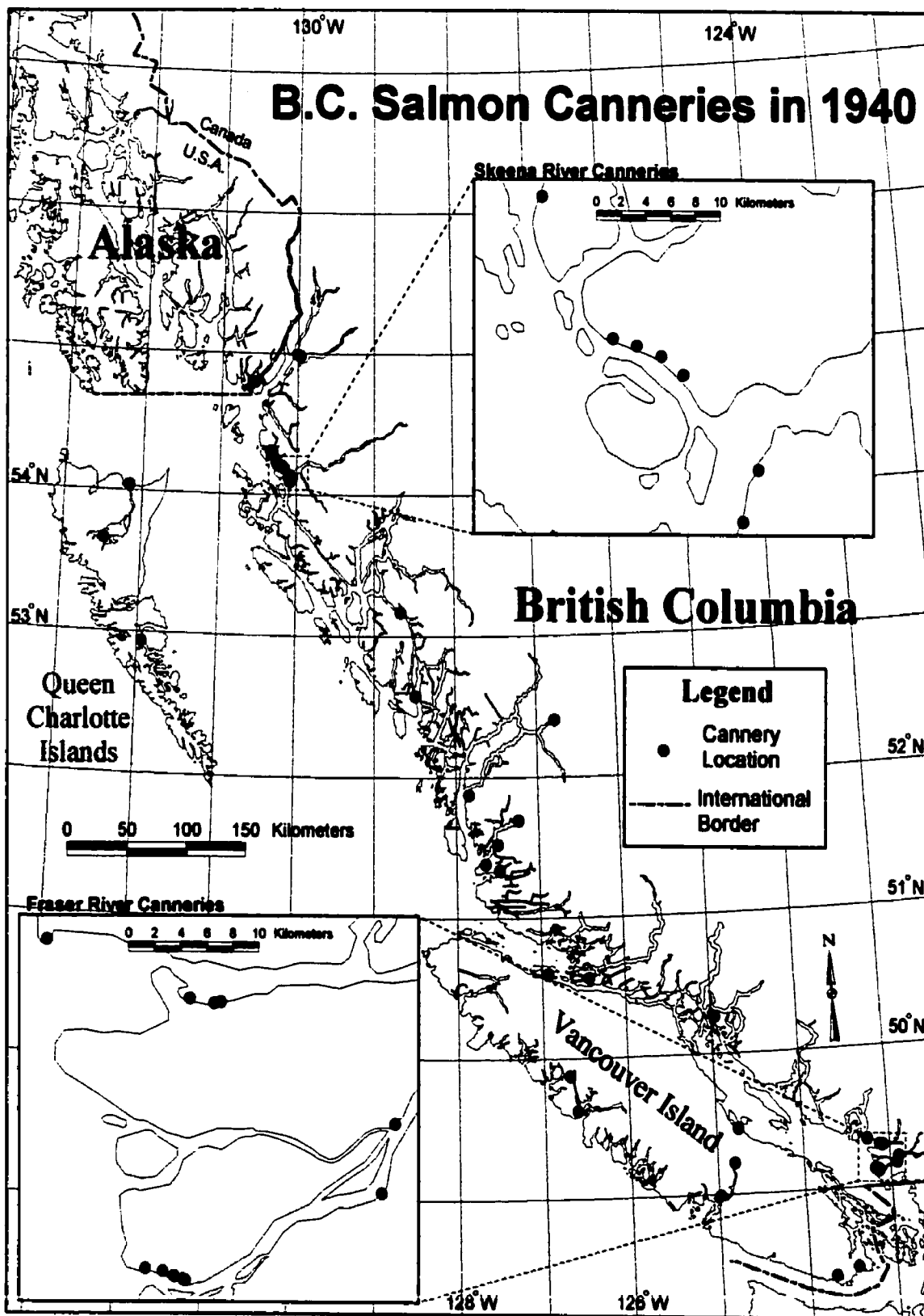
In 1930, the industry was widely dispersed along the coast but the number of canneries was decreasing as a result of the recent amalgamations of B.C. Packers Ltd. and Canadian Fishing Company (Map 4.6). There were about the same number of canneries as in 1900 and 1920, but the spatial pattern was again very different. The number of canneries around the Fraser River had decreased substantially and was beginning to decrease on the Skeena River and Rivers Inlet. The industry was continuing to expand on the Queen Charlotte Islands, Vancouver Island, and central areas of the coast. The mobility of the fleet had increased, but the perishable nature of the salmon still limited the range of the fish boats.

The Stock Market crash of October 1929 had a large effect on the spatial pattern of the B.C. salmon canning industry. By 1931 twenty-seven canneries were closed as a result of the heavy losses of sales in 1930. Companies began to centralise their canning operations as they tried to rationalise the industry. By the end of the 1930s Depression there were only thirty-five canneries operating under eleven firms, cutting the industry by half in only ten years.

Negotiations between Canada and the United States over the fishing of salmon had been occurring since 1892. The ratification of a formal agreement began with the signing of the Sockeye Salmon Fisheries Convention on May 26, 1930 (Lyons, 1969). This led to the formation of the International Pacific Salmon Fisheries Commission (I.P.S.F.C.) on July 28, 1937. The goal of the Commission was to protect the salmon from increasing fishing capacity and environmental disasters, like the Hell's Gate slide.



Map 4.6



Map 4.7

The Commission constructed special fishways at Hell's Gate between 1944 and 1946 and at other sections of the Fraser River that obstructed the passage of the salmon. Other projects included specially constructed spawning channels to aid in salmon reproduction (Forester and Forester, 1975). The importance of the I.P.S.F.C. to the B.C. salmon canning industry at this time was as a voice in the management of an international resource. The Alaskan salmon fisheries was now the largest producer of canned salmon on the west coast of North America, intensifying competition in the market place. Japan and Russia were also fishing the salmon stocks, adding to the pressures on the resource.

During World War II, Britain again purchased much of the production for the war effort as it had done in World War I. Early in the season of 1941 "the Federal and Provincial Governments adopted policies that would have the effect of diverting as much of the salmon catch as possible to the canneries" to increase production of canned salmon (British Columbia, 1941, p. J17). These policies continued until September 1947 when the Federal government removed the policies. After the removal of these policies many canneries closed or consolidated their operations.

The impact of the 1930s Depression can be seen by the severe reduction in the number of canneries, which are now concentrated at the mouths of the Fraser and Skeena Rivers (Map 4.7). This impact was lessened somewhat during World War II as those canneries that were operational at the time benefited from wartime production. There were no longer any canneries operating at Rivers Inlet and only nine canneries operating outside of Vancouver and Prince Rupert. The canning process had become highly mechanised, decreasing the number of workers in a cannery and allowing more

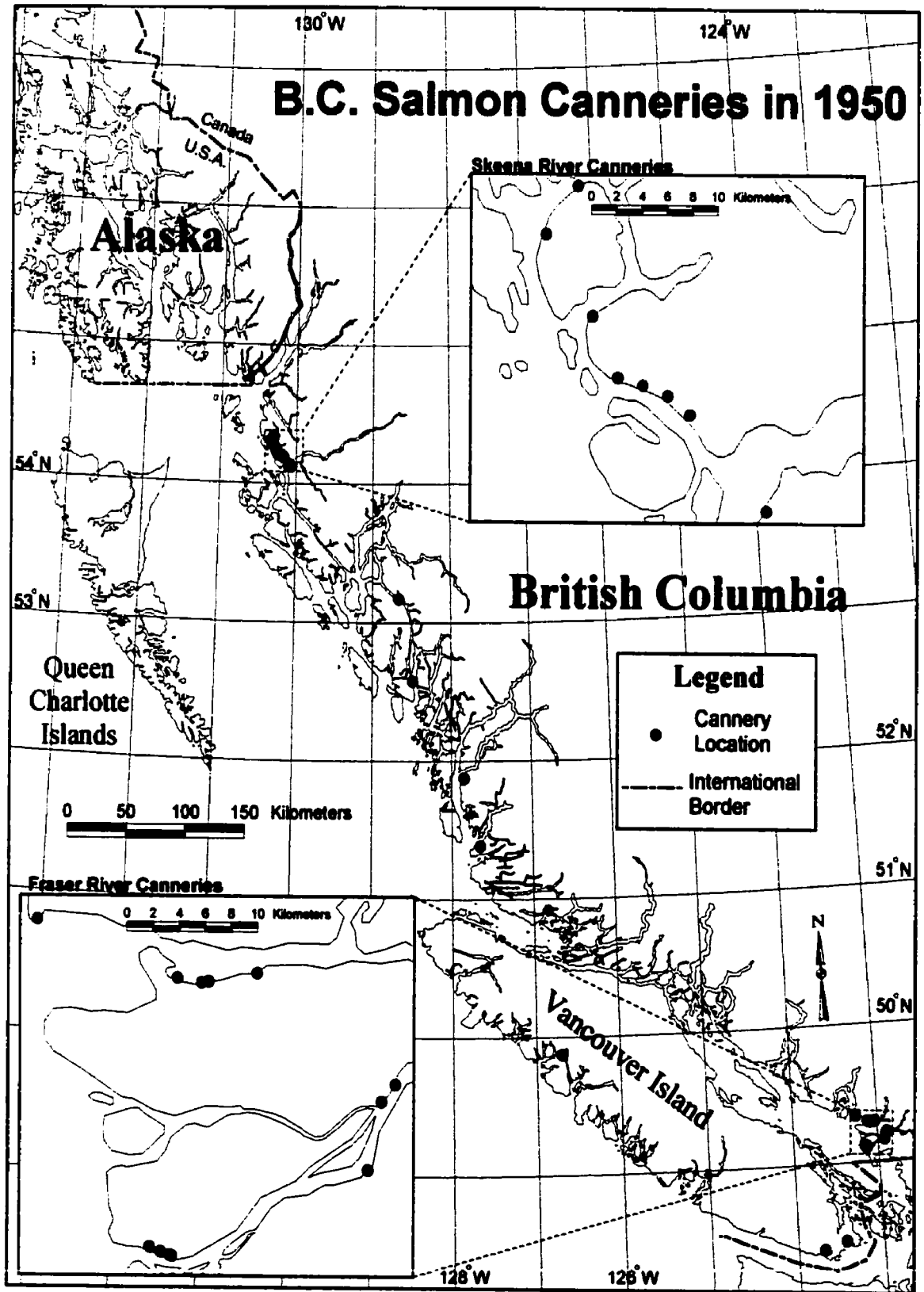
efficient canneries to replace the older canneries. Technological improvements to the canning process and transport of the raw salmon had allowed high capacity plants to be built in these centres.

The state of the industry during the war years can be seen in an annual report from the Provincial Fisheries Department:

Since the beginning of the war the number of canneries operating in the Province has been consistently less than before the war. The shortage of labour generally, and particularly the shortage of technical help, has forced a consolidation of operations in many cases. Not only have companies been forced to close down one or more of their operating canneries and consolidate their own operations, but in several instances different companies have been forced to come to working agreements to can each other's fish. These consolidations and joint operations have been entirely voluntary on the part of the companies, brought about principally by the shortage of labour (Government of B.C., 1944, p.M19).

Much of the shortage of labour was due to the Japanese-Canadian internment. Most of the Japanese community, about 8000 people, was relocated to internment camps in the interior of B.C. and the prairies. They were not allowed to return to the coast until 1949 (Miki and Kobayasi, 1991). Fears and prejudice after the bombing of Pearl Harbour in 1942 led to the confiscation of the entire Japanese Canadian fishing fleet (Roy *et al*, 1990). The government seized 1,337 fish boats, but realising the impact on the industry, the government sold 887 of the vessels at auction (Forester and Forester, 1975; Meggs, 1991). Some 660 of these boats were purchased by the cannery operators, who in turn resold them to fishers who would assure the sale of their catch to their cannery.

The large firms had the advantage of owning multiple canneries, which allowed them to be more flexible in their operations during the war years.



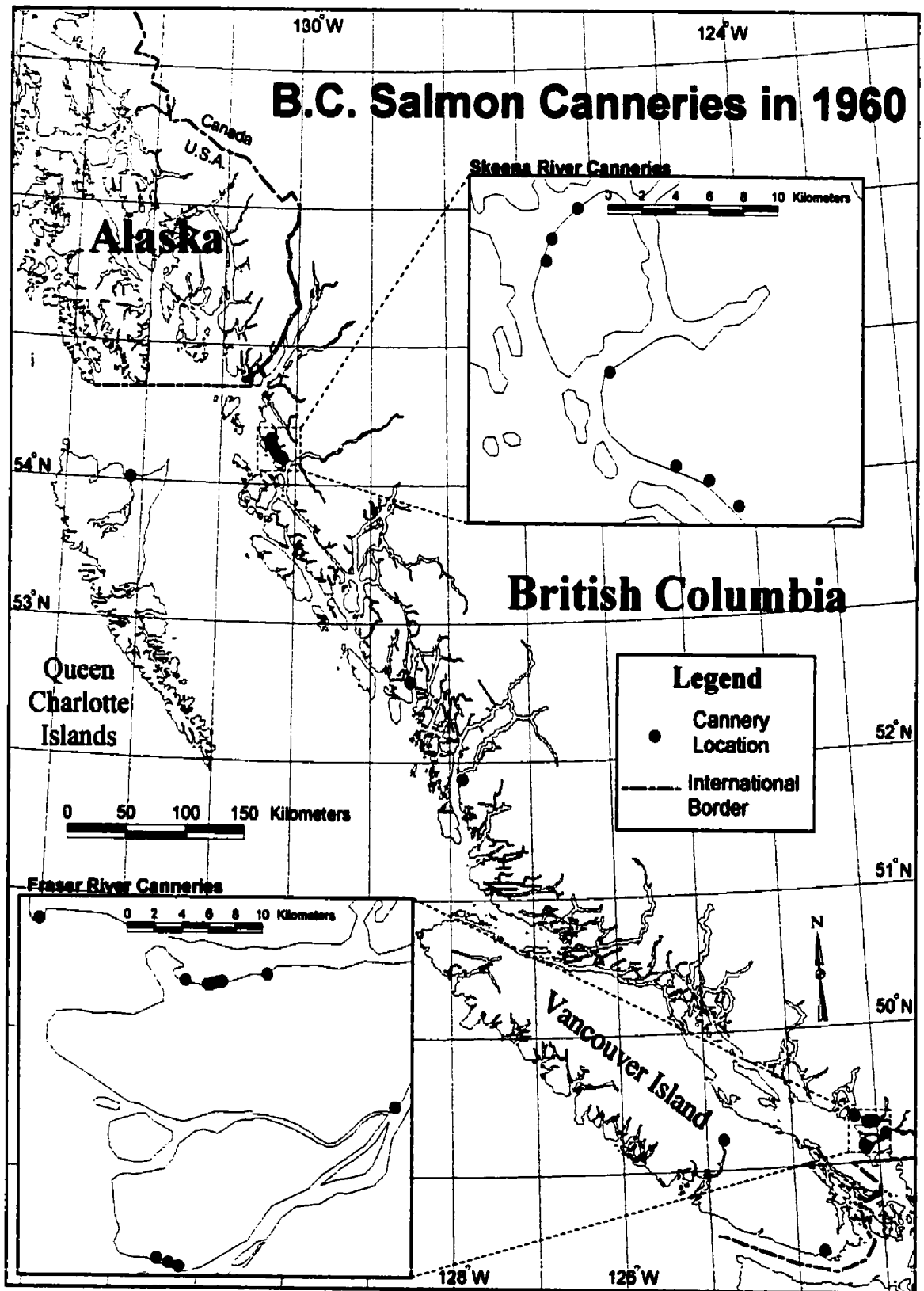
Map 4.8

Although some concentration of operations had followed the disastrous season of 1930 in an effort to economize the overhead, the continued application of this policy had been more or less forced on the processors by the pressure of wartime conditions...As it became the custom to process more fish at central locations, those establishments were expanded to handle the larger quantity (Lyons, 1969, p. 470).

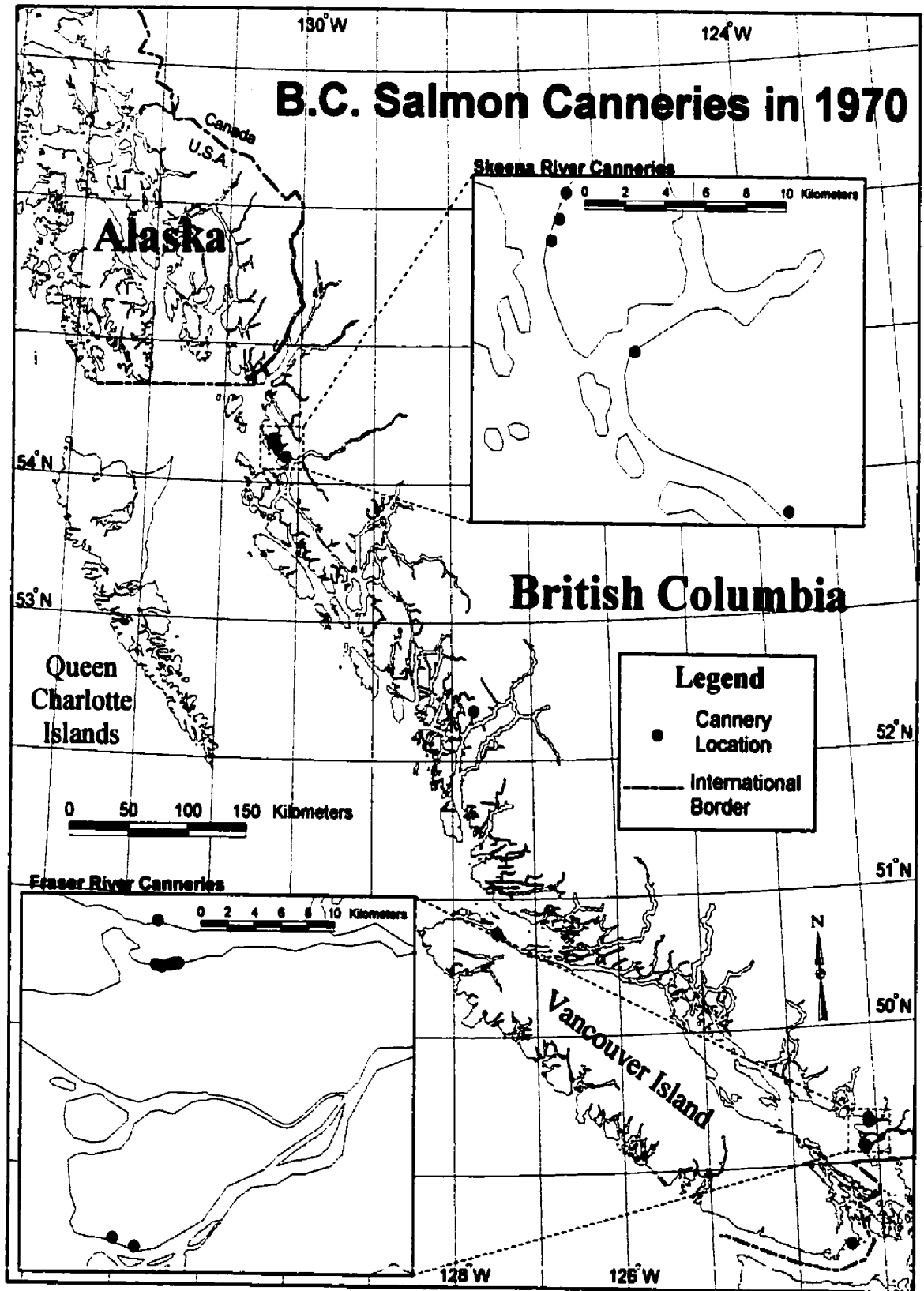
Those canneries with newer technology and greater capacity were favoured to continue operating. Of the twenty-four canneries operating in 1950, eighteen of them were located at the mouth of the Fraser and Skeena Rivers (Map 4.8). The canneries that were closed in the outlying areas were never reopened.

1950 to 1970

By the mid-1950s, fishing technology had greatly improved the catch of the fishing fleet. Experiments were conducted in 1955 by the Fisheries Research Board on the feasibility of using chilled seawater tanks on the fish boats. The tanks preserved the salmon allowing the boats to travel much farther from the canneries. The fish were suspended in the brine preventing damage from crushing and allowing easier loading and unloading. The system used refrigeration coils to keep the sea water within one degree of freezing. This greatly reduced the perishability of the fish, increased the individual capacity of the fleets, and reduced the number of boats and fishermen needed to supply the canneries. This advancement in technology was a critical part of allowing canneries to be more centrally located (Lyons, 1969). However, the numbers of canneries does not clearly show what was occurring in the industry at this time. There were a few new canneries built by new firms during the 1950s and these replaced the closure of older canneries. The new canneries were high production plants located in



Map 4.9



Map 4.10

Vancouver and Prince Rupert. By 1959, nineteen of the twenty-three canneries operating were located on the Fraser and Skeena Rivers.

In 1960, the process of geographic concentration was continuing with still fewer canneries outside the Fraser and Skeena Rivers (Map 4.9). There were twenty-one canneries operating, with only three located outside of the Fraser and Skeena Rivers. As industrial concentration neared its greatest intensity, large firms operated only two or three canneries. Four of the largest firms maintained much of the productive capacity of the industry with large multiple line canneries, while the rest of the industry consisted of smaller operations. By the end of 1969, Anglo-British Columbia Packers announced that it was going out of business and there were major closures by B.C. Packers and Canadian Fishing Company (Meggs, 1991). During the 1970 season only seventeen canneries were in operation, but these had almost the same production as the thirty-eight canneries operating in 1940 (Map 4.10).

In summary, the maps show points in time of the expansion and contraction of the B.C. salmon canning industry. The spatial patterns of the industry show a growth and decline that can be linked to a number of historical events. The industry initially centred around the mouth of Fraser River and later on the Skeena River. More canneries were built in outlying areas along the coast as the industry expanded rapidly until 1902. The industry was at its peak of geographic expansion between 1915 and 1925. After 1930, the process of geographic concentration began as outlying canneries were closed in favour of more centrally located canneries. By 1960, the concentration into the central areas around the Fraser and Skeena Rivers was generally complete. The analysis will

now look at the changes in ownership of the industry, as it was one of the major factors that changed these spatial patterns.

The Role of Small and Large Firms

The analysis of small and large firm size shows two very distinct patterns of development, each of which played an important role in the development of the B.C. salmon canning industry. This part of the chapter will examine firm size by looking at the change in the numbers of small and large firms, as well as the change in the number of canneries operated by each. It will then look at how these changes impacted the spatial patterns of the industry.

To show changes in industry ownership, firm size was divided into small and large firms. A small firm consists of one or two canneries and a large firm consists of three or more. The separation between large and small firms was placed between two and three canneries for two reasons. First, there is a statistical break between the number of canneries operated by each firm. Most of the firms operated one or two canneries, then there are a few that operate three to five and a few more that operate more than five. Although there were a few firms that own three to five canneries at times, these have been included with the large firms because they were generally accepted as major players in the industry and were important in the merger activity. For example, the J.H. Todd Canning Company began operations in 1882 with one cannery, added an additional cannery in 1889, and a third in 1902. Even though the development of J.H. Todd occurs over a long period of time, they are considered a large firm for this

analysis. Firms that began with many canneries, such as B.C. Packers Ltd., and eventually consolidated their operations into one cannery, are considered a large firm throughout their operational history. The small firms typically stayed small throughout their operational history. Second, consideration for the firms' placement in the overall history of the industry was taken into account when determining the designation of firm size. Some firms tended to be recognised in the literature as being significant players in the industry. These firms may have been considered medium sized by a statistical means, however, their importance to the development of the industry was significant.

Small and Large Firm Development

The chart showing the number of small and large firms shows two very different trends (Figure 4.2). Small firms increased in numbers quite rapidly prior to 1900, with clear drops during two economic recession periods of 1885 and 1892. There was a dramatic drop in the number of small firms in 1902 due to the amalgamation of the B.C. Packers' Association. This impact was slightly recovered by 1906 as new small firms continue to enter the industry. After 1907, the restriction of new entrants into the industry led to a marked drop in the number of small firms. When this policy was removed, just before World War I, small firms began entering the industry once again. Besides the economic benefits of the War, there was a small boom in the industry as returning soldiers provided a much needed source of labour for the fishing industry (Lyons, 1969). However, between 1921 and 1940 there was a gradual decline in the

Number of Large and Small Firms, 1870 to 1970

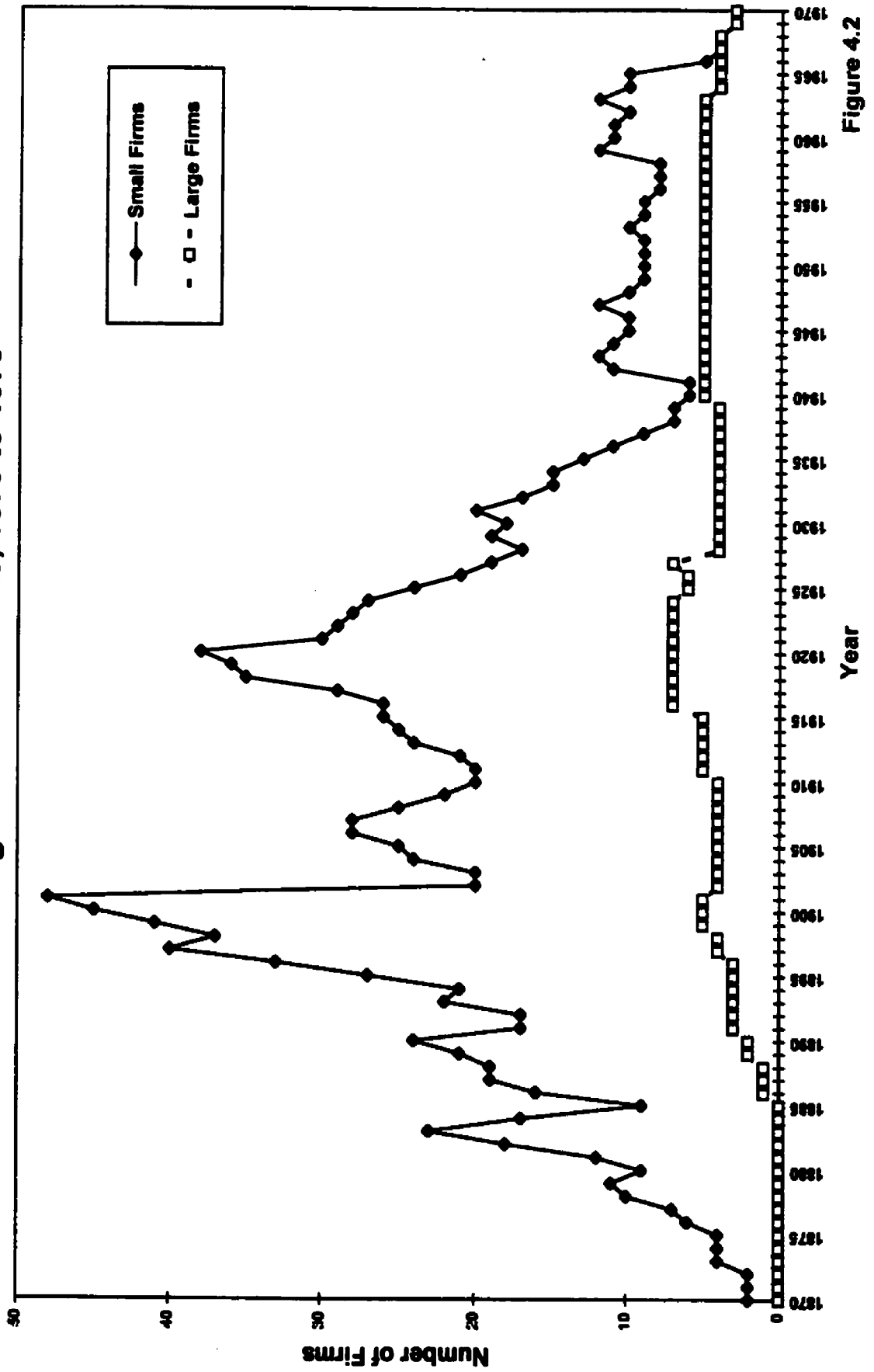


Figure 4.2

number of small firms as many were purchased by larger firms or failed to remain competitive in the industry. A few small firms continued to operate through the 1950s and 1960s, but their production role in the industry was minor.

While the number of large firms in the B.C. salmon canning industry was small, however, their impact was very significant. Large firms began to emerge around the late 1880s and early 1890s. There was not much growth in the number of large firms after 1902 and the number remained relatively stable throughout the rest of the study period. However, this chart fails to show a crucial effect that large firms had on the industry, as it does not show the number of canneries operated by large firms, the changes in ownership between large firms, and the effect these changes had on the industry spatially.

By looking at the number of canneries owned by small and large firms, the impact of large firms was much more apparent (Figure 4.3). The pattern of small firm canneries follows very closely with the number of small firms, as indicated in Fig. 4.2. The pattern of large firms, however, shows a rapid increase in the number of canneries that were owned by large firms. The trend in the large firm canneries clearly shows the shift of ownership from small firms to large firms. The major amalgamations of B.C. Packers in 1902 and 1928 appear as spikes in the graph, but they are anomalies to the underlying trend of the large firm pattern. Although the two amalgamations had immediate effects on the distribution of canneries, the overall spatial pattern of expansion and contraction in the industry remained. After the 1940s, ownership of the

Number of Canneries Owned by Large and Small Firms, 1870 to 1970

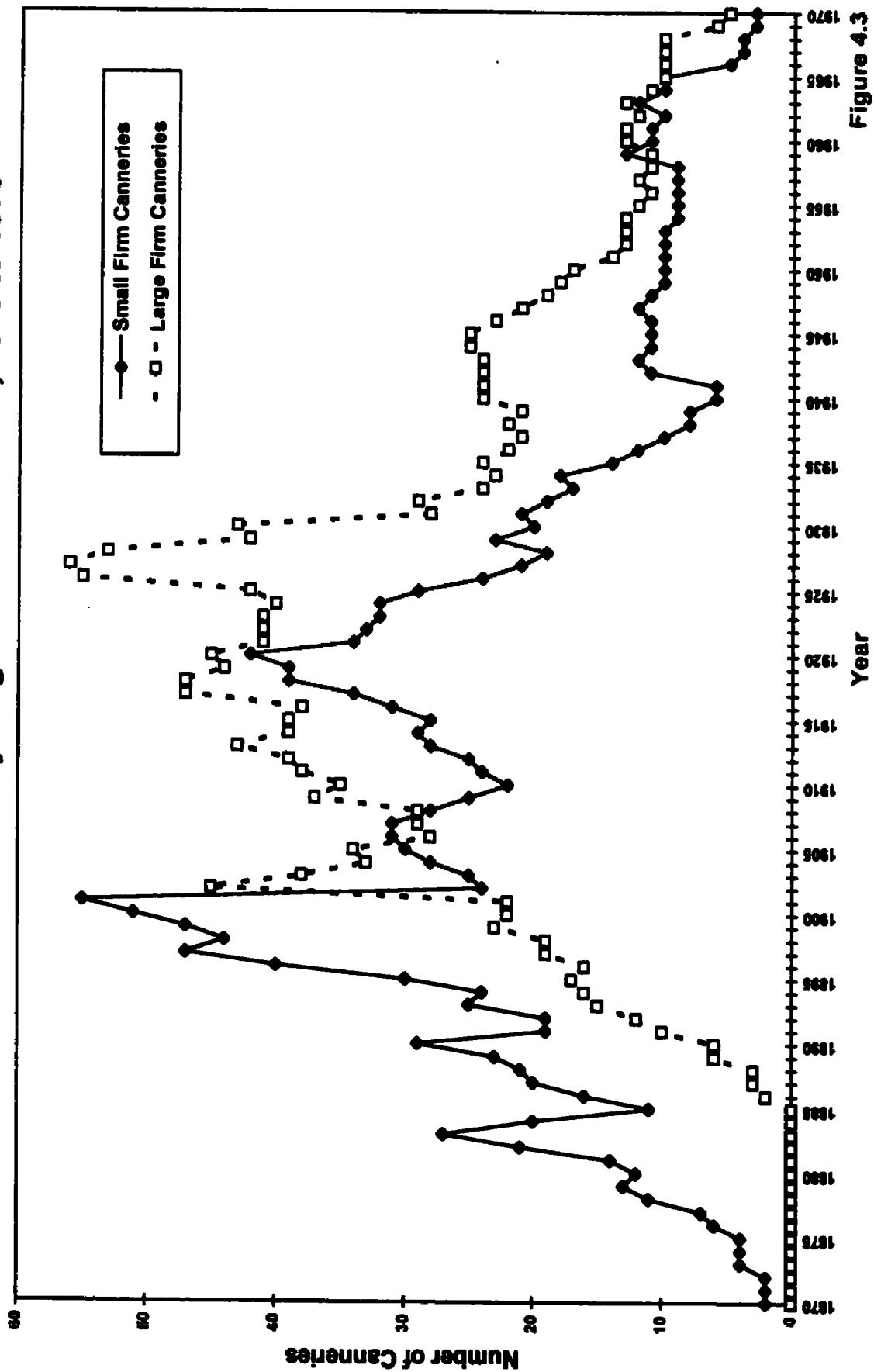


Figure 4.3

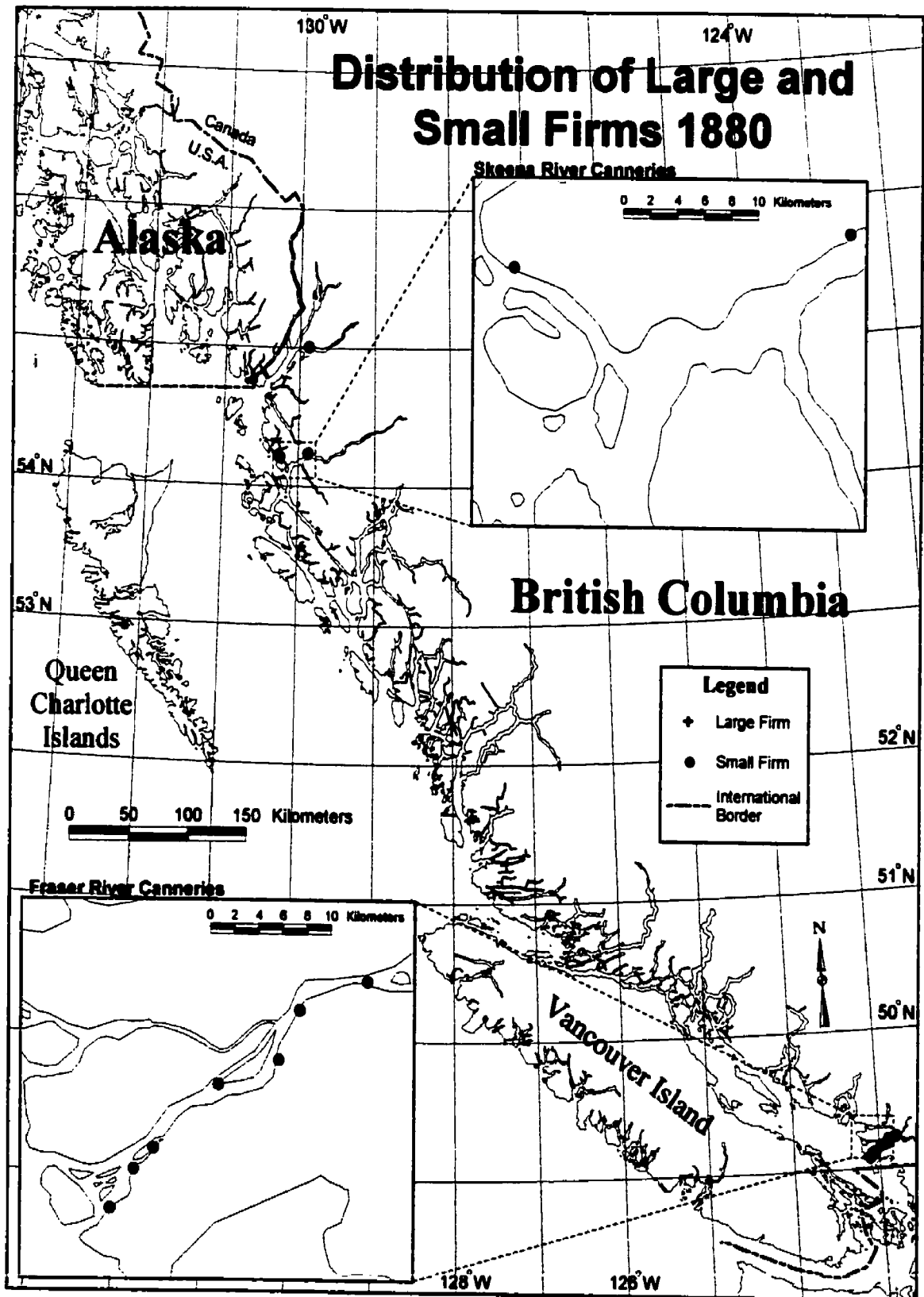
industry was concentrated into the large firms and the number of canneries gradually decreases.

Spatial Patterns of Small and Large Firms

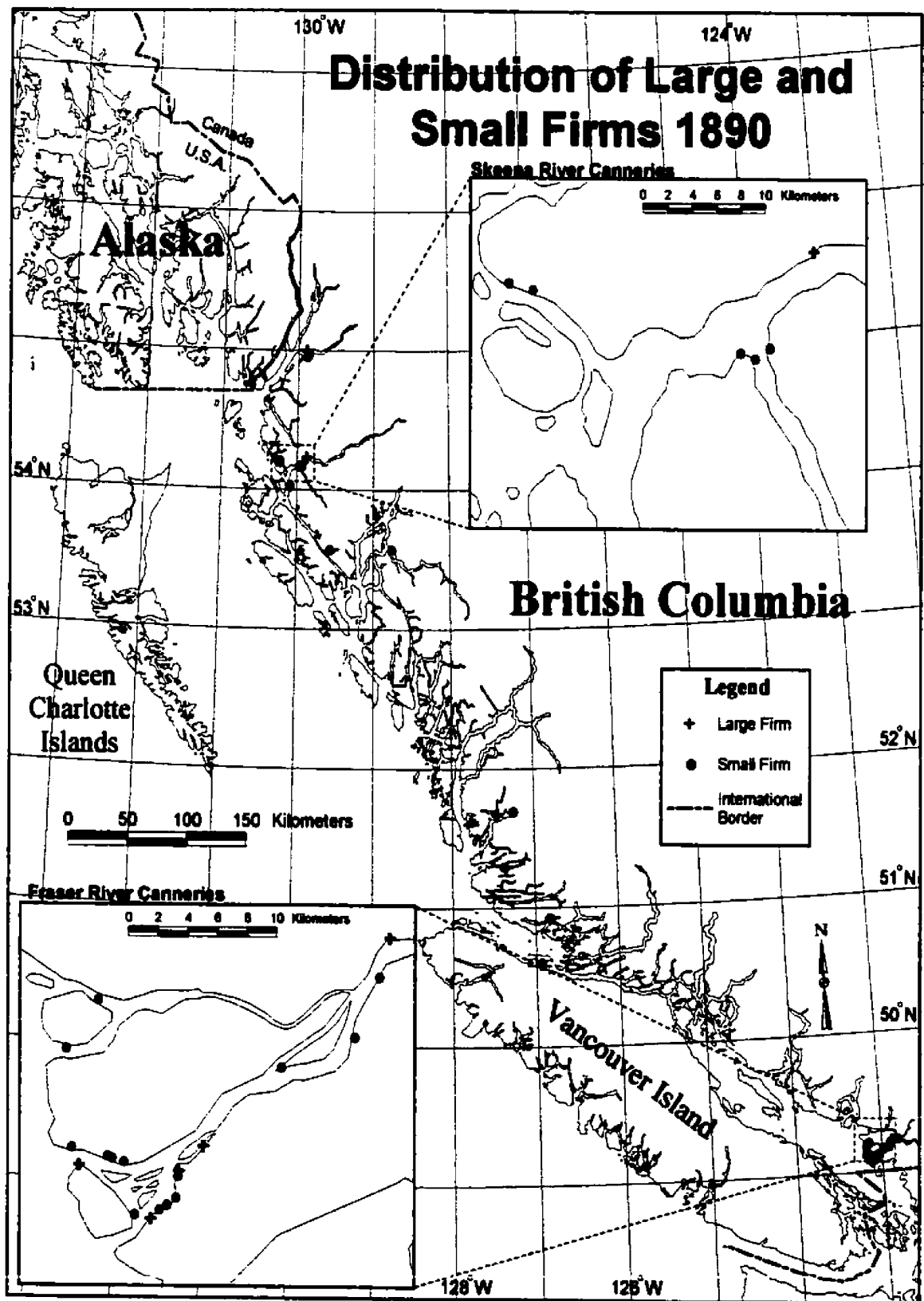
1870 to 1900

Small firms played an important role in the early development of the B.C. salmon canning industry. The industry grew as small independent firms expanded out into the resource frontier. The many independent canneries far out-numbered the larger corporations until 1902 (See Figures 4.2 and 4.3). Most of the small firms did not last as they were purchased by large firms and closed down. A few of the small firms had a long history, like the Cassiar Canning Company that operated continuously for 80 years between 1903 and 1983 (Blyth, 1991). In 1880 there were ten small firms each operating one cannery (See Map 4.11). Seven were located at the mouth of the Fraser River, two on the Skeena, and one on the Nass.

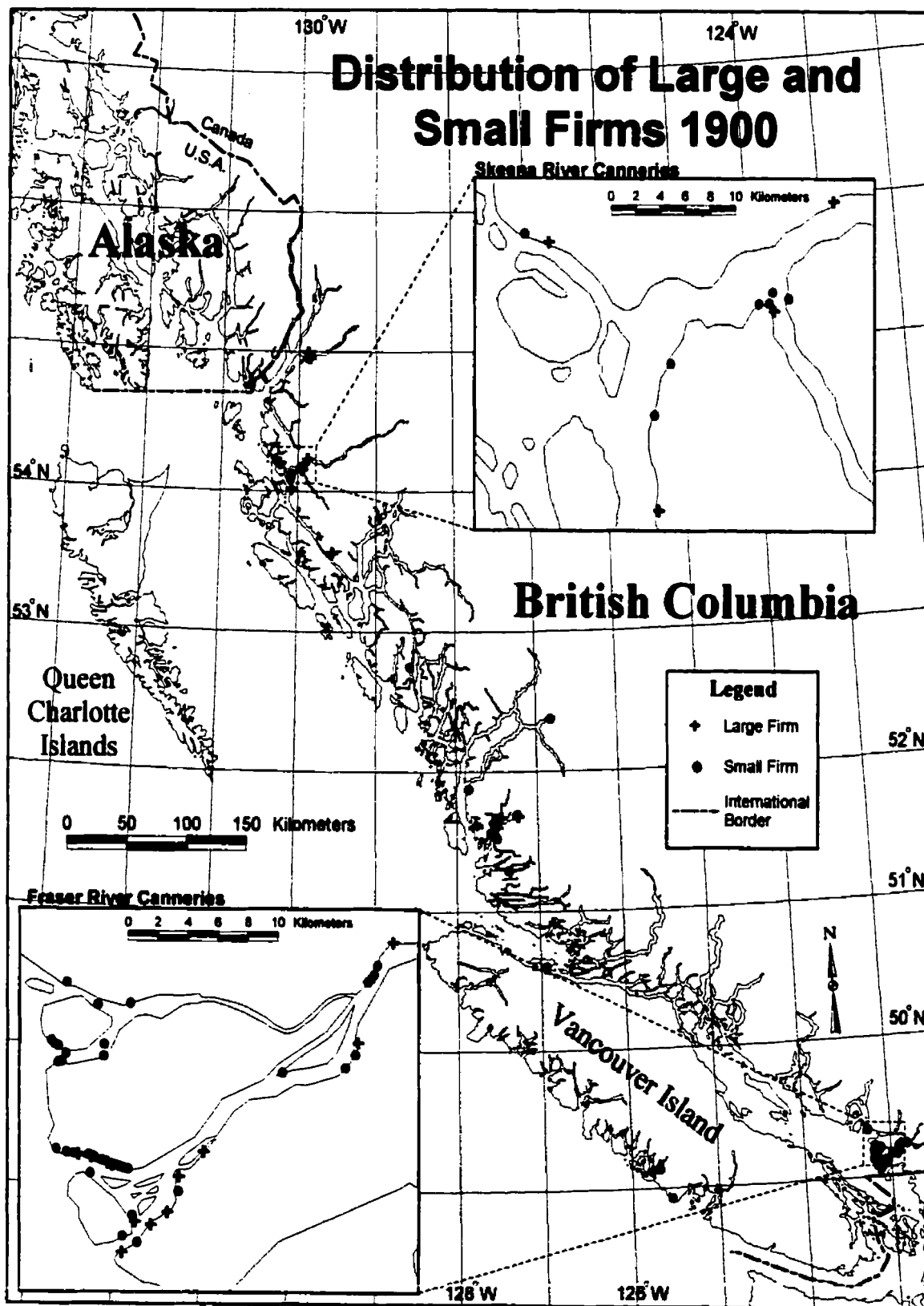
Large firms began to develop in the B.C. salmon canning industry during the middle 1880s and early 1890s (See Map 4.12). Initially, these were privately owned firms run by a few wealthy individuals. The first amalgamation to form a large firm was by the Victoria Canning Company, which in 1884 purchased the assets of the Delta Canning Company, Wellington Packing Company, and the Laidlaw Cannery. It was not until 1886 that Victoria Canning Company operated all of its canneries due to the market recession the previous two years. The first firm to seek investment capital to form was the Anglo-British Columbia Packing Company (ABC Packing) in 1891. Henry



Map 4.11



Map 4.12



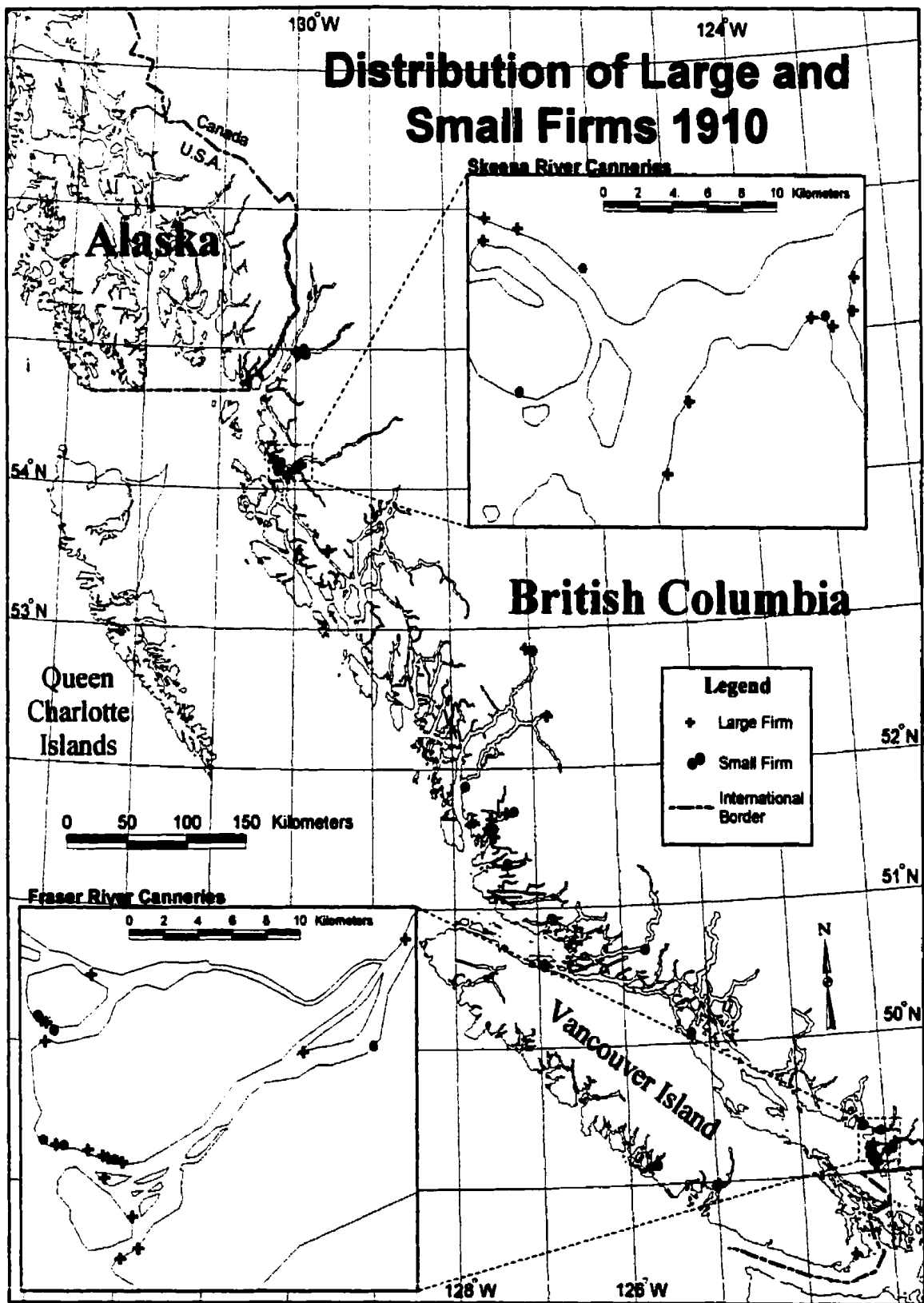
Map 4.13

Bell-Irving secured capital from British investors and registered the firm in London. He returned to British Columbia and purchased nine canneries, seven on the Fraser and two on the Skeena, for \$330,000 (Lyons, 1969). By 1900, there were five large firms operating twenty-two canneries, about one third of the industry (see Map 4.13). Other large firms incorporated before 1900 were the British Columbia Canning Company, Federation Brand Canning Company, J.H. Todd and Son Ltd., and Brunswick Canning Company.

1900 to 1930

In 1902, the British Columbia Packers' Association of New Jersey was formed through the largest amalgamation in the industry and its development had significant influence on the spatial pattern of the industry (Lee, 1983). The purchase of 42 canneries provided the Association with a wide distribution along the coast. Some canneries were bought to eliminate competition and others to ensure a supply of salmon in years of low salmon returns (Reid, 1973). After 1902, the small firms were significantly reduced in numbers. Although, even after the amalgamation there are new entrants to the industry that continue the geographic expansion.

There was a significant shift in ownership between 1890 and 1910, which changed the geography of the canneries. During 1906, significant portions of large firm canneries are closed; however, in 1909 some were reopened to process the large numbers of sockeye returning that year. In 1910, the distribution between small and

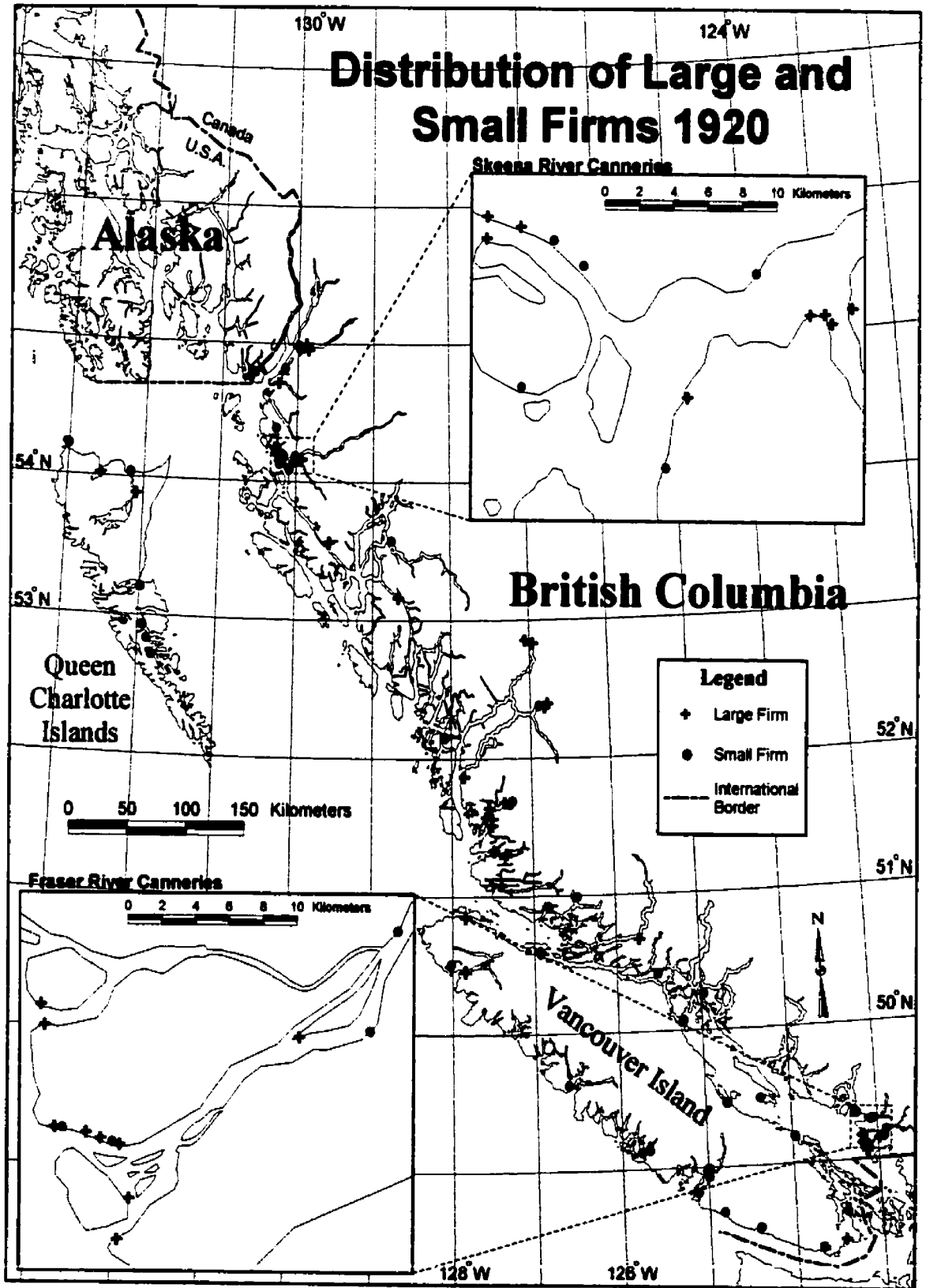


Map 4.14

large firms was fairly equal, but small firm canneries comprised only 39 percent and large firms were 61 percent of the industry (See Map 4.14).

In 1910, the British Columbia Packers' Association of New Jersey applied for a charter under the British Columbia government as the British Columbia Packers Association and it became a provincially registered company (Lyons, 1969). However, the right to conduct business outside the province was restricted in 1912. In 1914, The British Columbia Fishing and Packing Company Limited was formed under a Dominion charter to allow the company to continue participating in export trade. However, this company was operated as a holding company and had no control over the operations, until 1921. The political climate of the time was one of patronage and Eastern Canadian investors would have been more comfortable investing in a Canadian company (Lyons, 1969). The ownership transfer had little to do with changing the spatial pattern of the industry, but it was an important milestone for the company and reflects significant political changes in Eastern Canada that occurred during the early 1900s. The changes in the naming of this company create some confusion, so a list of the changes is provided in Table 4.2.

The number of small firms dropped as a result of further closures and the restriction of new licenses in the northern district between 1908 and 1911 (Lyons, 1969). However, by the end of 1911 the government relaxed the restrictions on new canneries in the northern district and there was an immediate response as large firms expanded their holdings and four new small firms entered the industry by 1913. Due to demand for canned salmon during World War I, the industry went through another period of growth



Map 4.15

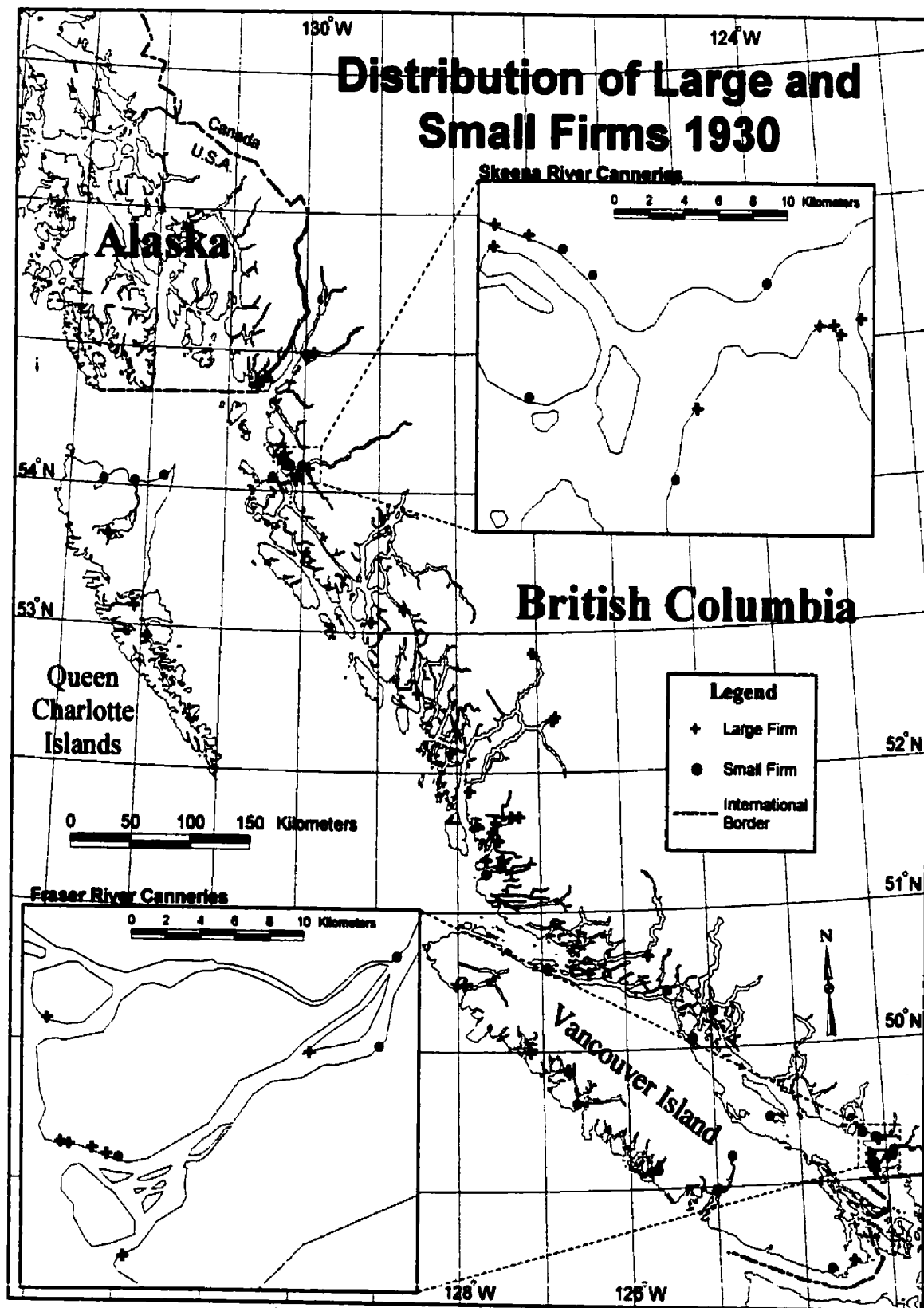
from 1912 to 1922. During this period, large firms continued to operate the majority of the canneries and these were widely distributed along the entire coast, including Vancouver Island and the Queen Charlotte Islands (See Map 4.15).

Table 4.2 Changes in the Naming of B.C. Packers Ltd.

1902	British Columbia Packers' Association of New Jersey was formed.
1910	British Columbia Packers Association applied for registration under a British Columbia charter. (Note they simply drop the apostrophe).
1914	A Dominion charter is granted to the British Columbia Fishing and Packing Company Limited. (Not the operating company until 1921).
1920	British Columbia Fishing and Packing Company Limited purchased the assets of the British Columbia Packers Association.
1921	British Columbia Fishing and Packing Company Limited became the operating company and British Columbia Packers Association existed only as a holding company.
1928	British Columbia Packers Limited was formed.

(source: Lyons, 1969).

During the 1920s many of the remaining small firms continued to become part of mergers that concentrated the ownership of the industry into a few large firms. Canadian Fishing Company Ltd. (Canfisco) formed in 1909 as a sister company to the New England Fishing Company, an American firm (Muszynski, 1987). Canfisco did not engage in salmon canning until 1918 with the construction of its Home cannery (Meggs and Stacey, 1992). In 1923, 1925 and 1926, Canfisco expanded its operations to become the second largest corporation in the industry with thirteen canneries. Canfisco had strategically acquired these canneries so its operation covered all of the major salmon



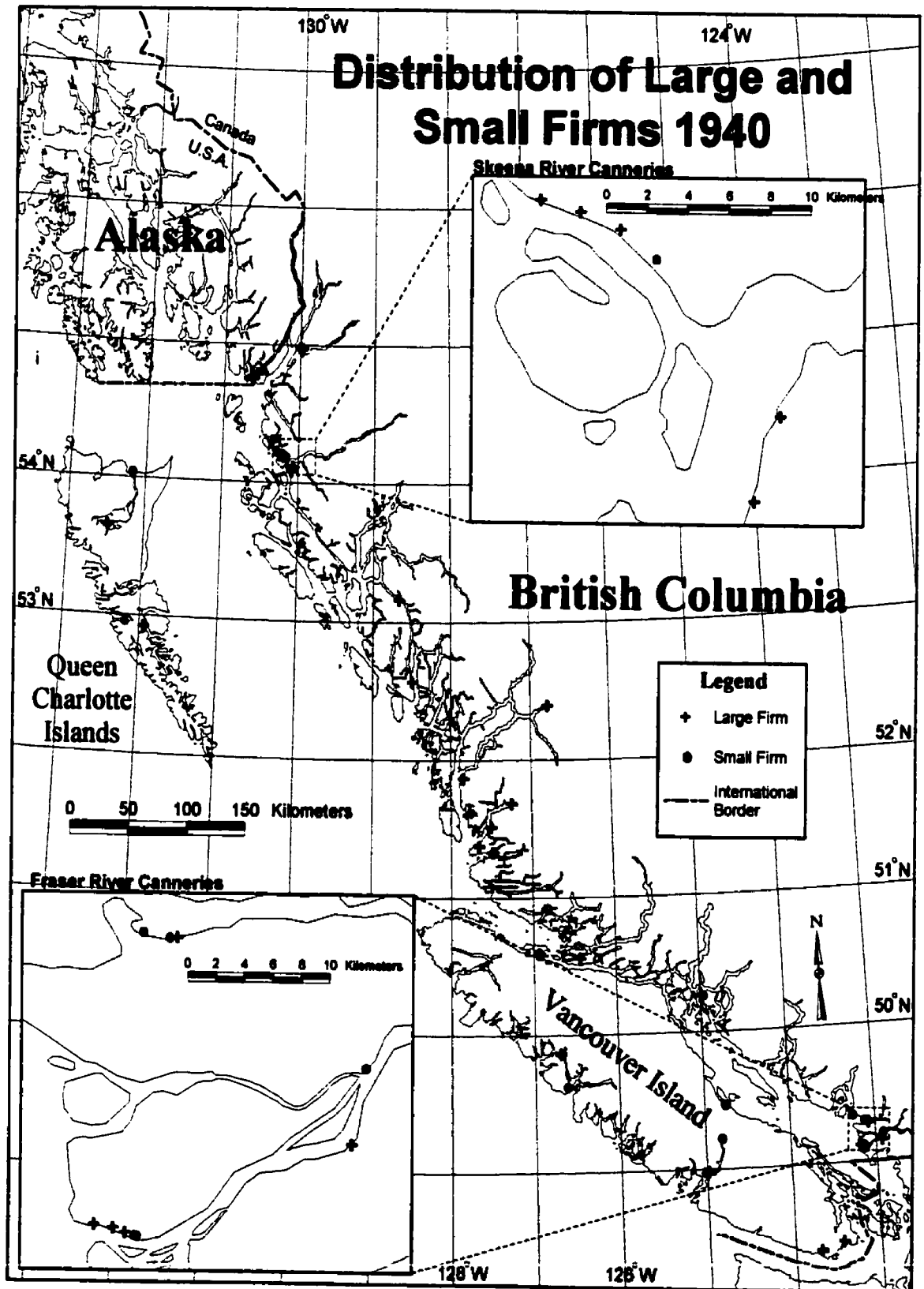
rivers on the B.C. coast. The 1928 amalgamation of B.C. Packers Ltd. once again eliminated many small firms from the industry (See Map 4.16).

1930 to 1950

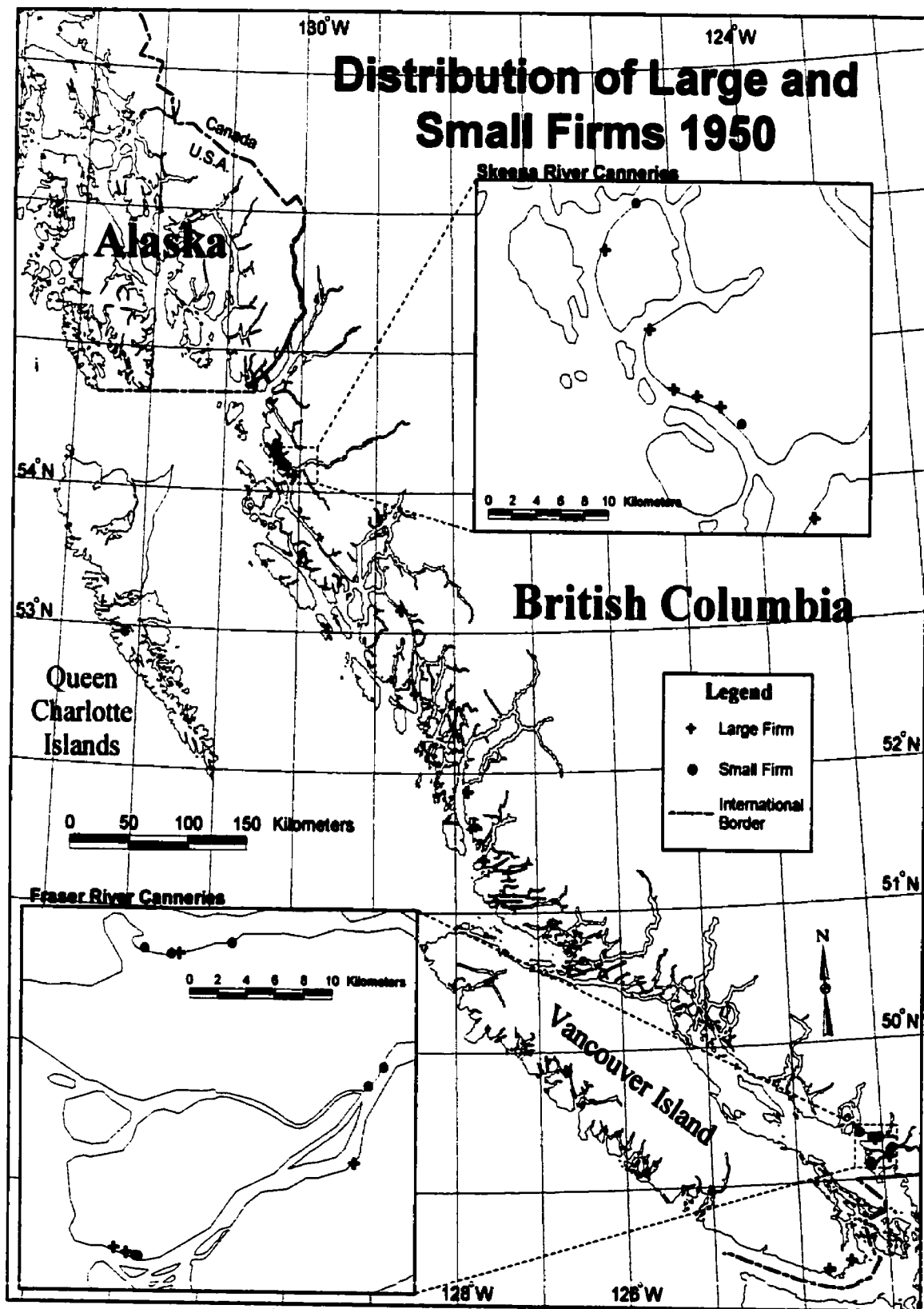
Through the 1930s, the number of small firm canneries continued to decline due to the Depression and competition from large firms (See Map 4.17). The large firms survived the Depression by consolidating their operations. During the mid 1930s, B.C. Packers closed many of its canneries and refitted the remaining ones with improved processing technology, in order to remain economically competitive. Many of the small firms did not survive the Depression and decreased from twenty in 1931 to only six in 1940.

A small boom in the industry occurred during World War II from the purchase of much of the canned salmon pack by the British government. By 1943, the number of small firms doubled to twelve, but the number of large firms and their canneries, remained the same. By the end of the 1940s, the contraction of the industry into central locations became more apparent as many of the canneries outside of Fraser and Skeena Rivers were closed (See Maps 4.17 and 4.18).

The formation of Nelson Brothers Fisheries began in 1929 with the purchase of the St. Mungo cannery. The firm then purchased Ceepeecee in 1934 and Port Edward in 1943. Nelson Brothers began as a small firm but eventually grew into a major producer in the industry.



Map 4.17



Map 4.18

1950 to 1970

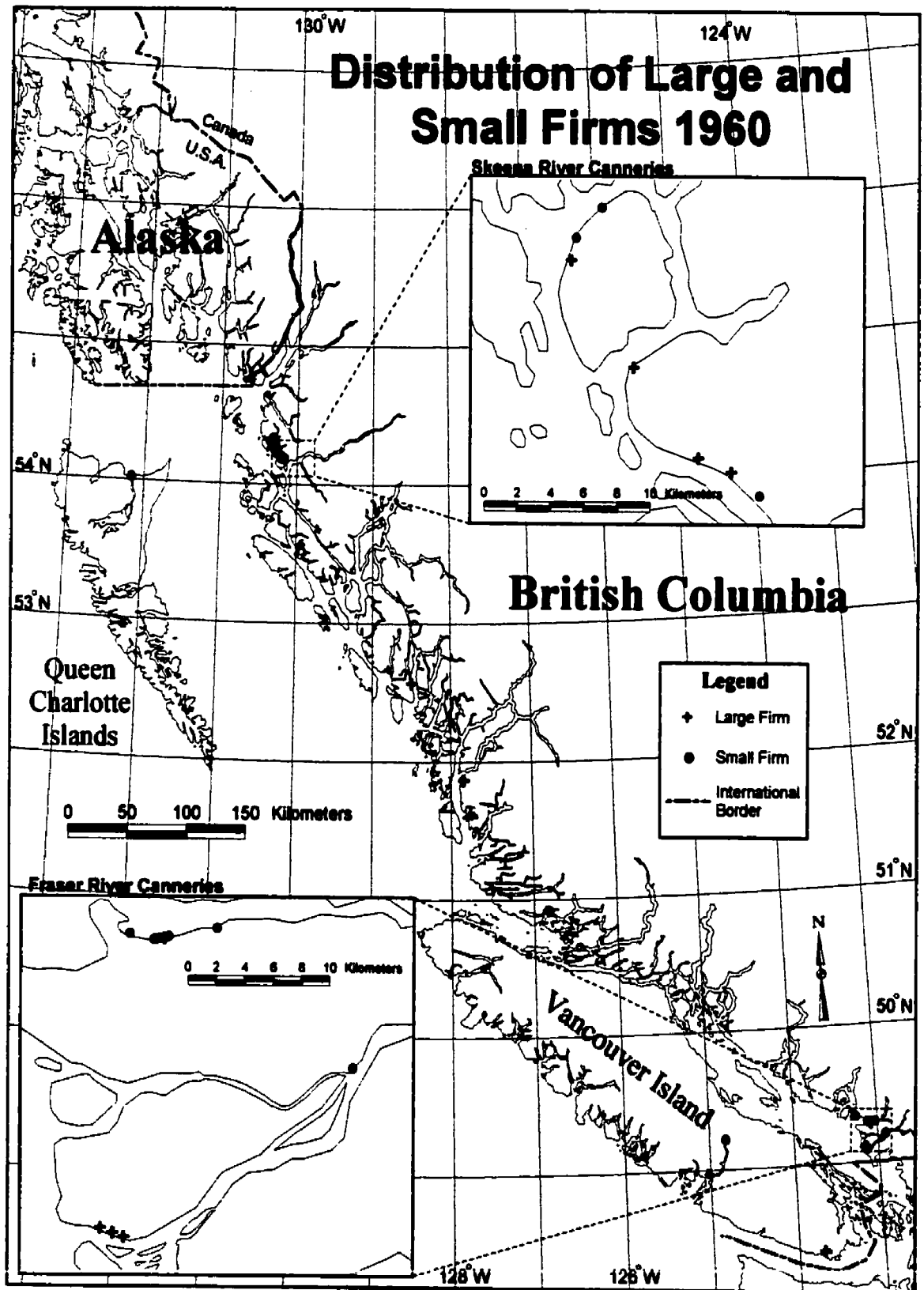
By 1950, B.C. Packers operated only three canneries; Imperial, on the Fraser, Sunnyside near Prince Rupert, and Namu, just north of Rivers Inlet (see Map 4.18). The canneries of B.C. Packers were highly productive and strategically located to take advantage of the entire coast (Lyons, 1969).

Even though many of the original small firms disappeared through the merger activity of the 1920s, there was a resurgence of small firm activity during the 1950s. The Select Standing Committee on Agriculture in 1979 found that:

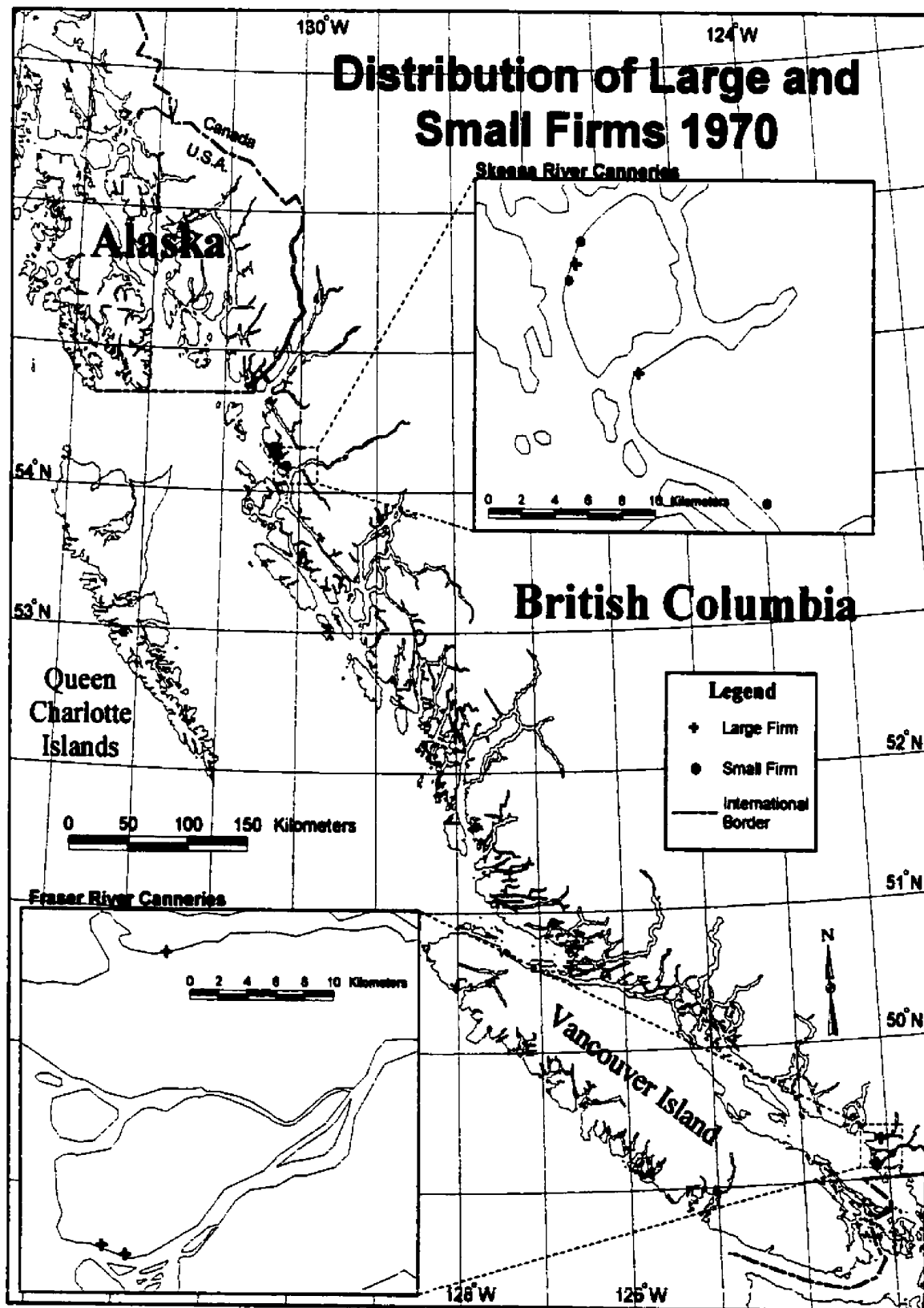
The number of small, private companies has been steadily increasing. The number of small canning operations has increased substantially between 1950 and 1960, but has subsequently dropped back to the same number as 25 years ago. Part of this decline in small company canning activity occurred when large companies purchased the smaller canneries and subsequently closed them down" (British Columbia, 1979, p.66).

Even though the small firms outnumbered the large, many of these new small firms only operated for a few years.

During the 1960s, many of the large firms began to merge and form alliances. The formation of Allied Pacific Processors was a joint agreement between Canadian Fishing Company Ltd. and British Columbia Packers Ltd. The major portion of the agreement was the joint purchase of J.H. Todd and Son, which later included the sale of all assets. The secret amalgamation of Nelson Bros. Fishing by B.C. Packers Ltd. was brought to the fore in 1968, when the Paramount Cannery was purchased by B.C. Packers Ltd. and closed. In 1969, Anglo-British Columbia Packing Ltd., one of the oldest firms on the B.C. coast, permanently closed its canneries. The last few canneries



Map 4.19



Map 4.20

operating outside of the Fraser and Skeena rivers were closed and the industry was concentrated into two centres (See Map 4.19 and 4.20).

The small firms were most important in the expansion of the industry. They were leaders with innovations that were later adopted industry wide. Most of the small companies were located in the hinterland, seeking out new sources of salmon in order to secure a place in the market. This meant that they had to be independent for long periods of time and access to most services was limited. Another difficulty for the small canneries was their dependence on the agents and suppliers of materials. The commissions on materials and shipping costs meant that the small firms were often at the mercy of these agents. Many of the agents gained ownership of some of the canneries as the result of capital extensions. Some of these canneries were then sold to larger firms in order to recover some of the financial losses.

The consolidation of ownership, through mergers and acquisitions, had a major effect on the spatial patterns of the B.C. salmon canning industry. Of these, the 1902 and 1928 B.C. Packers amalgamations, and subsequent closures, had the greatest impact. The larger firms tended to purchase and close existing canneries, rather than construct new canneries during their expansions. The patterns indicate that the role of large firms was one of consolidation of ownership and spatial concentration.

In summary, the growth of the B.C. salmon canning industry can be attributed to the rapid development of many small firms. These small firms led the way in geographic expansion as well as the innovation of processing techniques. As capital became available, large firms began to amalgamate the industry for economies of scale and

competitive advantage. The large firms were able to centralise the industry as developments in technology and transportation permitted.

Conclusion

The changes in the spatial pattern of the British Columbia salmon canning industry were linked to significant historical events. The timeline provides an historical context in which to analyse the B.C. salmon canning industry and a way to understand the significance of particular events in shaping the industry. Some of these events led to the opening and closing of canneries, which changed the number of canneries of the industry. Two events, which had a significant impact on the number of canneries of the industry, were the 1902 amalgamation of the B.C. Packers' Association and the Depression of the 1930s. Still other events, like the adoption of gasoline engines on fish boats and the destruction of salmon by the Hell's Gate slide, were elusive in their impact as their effects were experienced gradually over time. The spatial patterns of the industry follow a wave of development outwards beginning in regional centres. As the wave subsides over time, the concentration of canneries begins to decrease in the centres and then later decreases on the outer areas of the coast. Finally, only a few plants are left in the central locations.

Overall, it appears that the changes in ownership were the most important agents of change in the spatial patterns of the industry. To illustrate the process of corporate consolidation, the spatial pattern of small and large firms shows how amalgamation and then rationalisation impacted the industry. The purchase and subsequent closures of

small firms by large firms concentrates ownership. As corporate concentration occurs, the industry contracts into geographic centres. Improved transportation and technology allow the large firms to maintain market production with fewer canneries.

Chapter Five

DISCUSSION

Introduction

The B.C. salmon canning industry shows a spatial pattern that is changed by various events through time. While the spatial pattern follows the resource development model in a general way, the industry has undergone important changes that are not explained by the model. The changes surround significant historical events in the industry. This chapter will first discuss the implications of using the resource development model to analyse spatial patterns of industrial development. It will look at the importance of the model to set the context for the research and provide a critical examination of the model. Second, it will explore the factors of locational change and their influence in shaping the industry. These factors are based on the different types of events in the timeline. For example, the use of gasoline engines in the fish boats was a factor of transportation, or the 1930s Depression was a factor of market economics. The chapter will conclude by linking the aspects of geography, factors of location, and the size of firm to the development of the B.C. salmon canning industry.

The Resource Development Model

The resource development model is an ecological model that describes the spatial patterns of a resource industry. The B.C. salmon canning industry follows this resource development model generally, but there are aspects of the industry, which it does not explain. The four stages of the model are not discrete and overlap in the

transition from one stage to the next. This section will discuss the resource development model as it relates to the salmon canning industry and the implications of using the model as a tool for understanding the process of industrial development.

Discovery begins with the initial construction of canneries in B.C. and ends with the beginning of a 'salmon rush' by many small firms eager to stake a claim in the industry. The salmon canning industry was not a new discovery of a resource, but rather it was the application of canning technology to an existing resource. Being able to preserve the perishable salmon ensured that the product would survive the long transportation times to distant export markets. This was a period that initially involved a great degree of manual labour. The initial production was low, but innovation and adaptation of technology increased the success of the process. The industry expanded outward as the success of these ventures increased the demand for new sources of salmon.

Rapid expansion begins with increasing numbers of canneries being built outwards from a central location. Shortly after, the industry established access to the resource, labour, and a process of manufacture, many new canneries were constructed. The industry attracted many new entrants as the process became simplified and capital became available. It was formed from many small independent companies operating only one or two canneries. The role of the small firm was in expanding the industry and the resource frontier. They were also leaders of innovation, often improving the methods of processing salmon. Between 1870 and 1900, the industry had expanded along the entire coast of British Columbia with canneries on every major salmon river. Expansion

diminishes, as the numbers of canneries being closed is greater than the number of new canneries constructed.

Consolidation of ownership begins with the first merger of multiple small firms and continues right through until there are only a few large firms left. Concentration of ownership in the B.C. salmon canning industry occurs in two periods. The first period is one of corporate development between 1880 and 1902. The formation of early large firms, like Anglo British Columbia Packing and British Columbia Packers' Association, had the advantage of owning multiple canneries along the coast. This advantage allowed the firms operational flexibility by being able to close canneries in lean years and operate them during profitable years. The second period was one of amalgamation of firms during the 1920s when Canadian Fishing Company and British Columbia Packers Ltd. become the dominant corporations in the industry. This concentration of ownership by a few large firms allowed corporate consolidation and increased response to the economics of the industry. By 1970, most of the B.C. salmon canning industry was owned by two large firms, British Columbia Packers Ltd. and the Canadian Fishing Company.

Contraction into a centralised location begins with the closure of outlying canneries and ends with a small number of canneries located in a geographic centre. A geographic centre for the B.C. salmon canning industry is a heartland location with a large salmon spawning river, port and rail connections, and a local labour pool. This was accomplished through increasing use of technology on the canning lines, the improvements in transportation of the catch, and corporate consolidation. Improving the

speed of the canning line and the development of multiple canning lines allowed fewer high capacity canneries. The development of the sanitary can and the high-speed vacuum sealer further reduced mechanical downtime and increased daily productivity. The companies were also able to close the canneries that were less productive and move the equipment to increase the productivity of a more centrally located cannery. Development of larger and faster fishing boats, and the use of chilled seawater tanks to preserve the salmon, allowed the fish boats to stay out longer and travel farther from the canneries. This allowed the canning operations to be located near business centres and transportation hubs while the fishing took place in more remote areas. This concentration of the industry continues beyond this study, however, the end of this stage of the model will occur when the last cannery in B.C. closes permanently and the industry no longer exists.

There are two key reasons why the resource development model is important. First, the model sets a context for analysis of a resource industry by describing the different phases of development. By breaking up the history of the industry into stages it is easier to explain how the industry evolved spatially. Second, it helps to describe very generally the spatial patterns of change in the industry so trends can be seen for comparative analysis against other industries. Further research of industrial patterns may show similar spatial patterns and be able to identify common factors of resource development.

The B.C. salmon canning industry generally fits the model, but there are factors not explored by the model. It tends to rely on ownership, technology, and transportation

as the agents of change, but does not include the role of markets, and policy in shaping resource development. The model also fails to distinguish the different roles of small and large firms in the changing spatial patterns of the industry over time.

Factors Influencing the Spatial Pattern of the Industry

Throughout the development of the B.C. salmon canning industry many factors of production played a role in changing the spatial extent of the industry. As each of the factors of transportation, technology, policy, markets, and ownership changed through time, they influenced how the industry responded. The changes in the factors had an influence on the growth of the number in canneries and the spatial pattern of the industry.

Figure 5.1 Summary of Independent and Dependent Variables.

<u>INDEPENDENT VARIABLES</u>	<u>DEPENDENT VARIABLE</u>
TECHNOLOGY	SPATIAL PATTERNS OF THE B.C. SALMON CANNING INDUSTRY
TRANSPORTATION	
RESOURCE POLICY	
ECONOMICS	
OWNERSHIP	

Figure 5.1 is a summary of the factors influencing the spatial pattern of the industry. The five factors identified, function as independent variables which lead to the

changing spatial pattern as described in the maps. In the discussion below, these five factors are described in more detail. It is crucial to remember the general point that the effects of these factors may take some time to overtake impacts on the industry's spatial pattern.

Technology

The role of technology in shaping the B.C. salmon canning industry was significant in that it provided the tools for change. Technology allowed the industry to expand outwards by providing an industrial process that was portable and adaptable. It later allowed the industry to concentrate through the increased productive capacity of individual canneries. There were many important developments in technology that influenced the salmon canning industry.

Payne (1964, p.307) has suggested that "four major technological developments immediately after the turn of the century permitted a complete change in character of the industry". The four developments were:

- (a) The small reliable internal combustion engine, introduced by Easthope (1902) and Vivian (1904), ending the days of reliance on sail and oar.
- (b) The allowance of purse seines and traps; (1904) a legislative change that enabled an increase in productivity and created an ability to harvest less valuable species previously left untouched.
- (c) The Smith Butchering Machine; (1906) an automatic eviscerating machine which substantially reduced the amount of labour required in a cannery and increased its throughput capability.
- (d) The sanitary can, automatic can making, and filling machines, (1900-1912) reduced further the vast amount of labour required in a cannery and increased its productive capacity.

The chilled seawater holding tank should also be included because, along with the adaptation of the gasoline engine, they were the two technologies most significant in expanding the range of the fishing fleet.

Transportation

In the development of any industry, transportation is crucial for both the movement of raw materials to processing facilities and then for moving the product to market. The B.C. salmon canning industry went through important developments in both these aspects that helped to shape the geography of the industry.

Transportation of the salmon to the canneries began with small sail and oar powered fish boats. Typically, two people would operate the Columbia River skiffs, named after the river where they were first developed and used. One would row the boat while the other would set the net and then collect the salmon. These small craft had to operate close to the canneries so that they could return the salmon before they spoiled. The first major transportation advancement was the use of a small steamboat that would tow the skiffs out to the fishing grounds and then return them at the end of the day. Adaptation of the gasoline motor to fish boats shortly after 1900 allowed an increase in the size and range of the boats. Eventually, the use of tender boats meant that the fishing fleet could move salmon from the fishing grounds to a cannery in a more central location for processing (Stacey, 1982).

The transportation of the canned salmon to markets began with sailing ships that would depart from Victoria to Europe. The switch to steamships and the opening of the

Panama Canal meant a faster and more reliable mode of transportation (Millerd, 1988). In addition, the construction of railways to the West Coast was significant because they provided an alternative route to eastern Canada and Europe. The railways also played a role in determining the central locations to which the industry would eventually contract.

Resource Management Policies

Resource management policies played an important role in the geography of the industry by shaping who was permitted to fish, as well as how and where fishing practices were permitted. Throughout the history of the B.C. fishing industry, the Federal government has managed the resource through the implementation of policy and regulation. In May 1896, Alex Anderson was appointed as the first Fisheries Inspector to oversee the new fishing industry in British Columbia. In 1889, the government attempted to control the number of fish boats by issuing a system of license limitations. Of the initial 500 licenses issued, 450 were divided between the canneries and 50 were given to independent or 'free fishermen'. The boat ratings quickly became a problem with the rapid increase in the number of new canneries being built. Cannery operators would simply build a dummy cannery to obtain more boat licenses. The license limitation was removed in 1892 and changed to allow only British subjects to obtain licenses (Carrothers, 1941; Fraser, 1977). By 1900, the number of licenses issued had increased to 3,700 (Meggs and Stacey, 1992). As Shaffer (1979, p.4) has suggested, "limiting access of licenses or changing their costs can have profound effects on the

structure of the industry". The licensing program had effect opposite to that which it intended, as it actually encouraged rapid growth of the industry and increasing demands on the salmon resource. License limitation also permitted the development of an oligopoly (few sellers and many buyers) of corporate control with three companies eventually producing 70 percent of the total pack (Reid, 1981).

Due to the rapid growth of the industry around 1900, the Department of Fisheries divided the coastal waters into districts. In 1904, the coast was divided into two districts. District 1, included all areas of "Vancouver Island, the Strait of Georgia south of Cape Mudge and the Mainland watershed south of Bute Inlet" and District 2 included all areas to the north (Canada, Sessional Papers, 1906, p.202). In 1906, a third district was separated out to include Vancouver Island and an overseer was appointed in the Upper Skeena District. The separation into districts allowed the government to regulate each of the areas differently. The most significant of these restrictions was the restriction of motorised fishing boats in District 2. This restriction was put in place from 1912 to 1924 to prevent over-fishing by the rapidly increasing number of canneries and fish boats in northern waters. Also, a majority of the cannery and fish boat licenses issued in northern waters were primarily to British subjects to encourage settlement in remote areas (Canada, Sessional Papers, 1925).

International management of the salmon fisheries began in 1930 with the Sockeye Salmon Fisheries Convention and the formation of the International Pacific Salmon Commission. It was in 1937 that the Commission formally ratified a treaty on the management of Pacific salmon. Even though negotiations between the United States

and Canada had been going on since 1892, it was 45 years before a salmon management treaty was signed (Roos, 1991).

Market Economics

Market demand for Pacific salmon was the initial reason for the development of the salmon canning industry. Throughout its history, market economics have played a crucial role in the number of canneries that operated in the industry. In the early years, the growing market in Europe allowed the rapid growth that established the fishing industry as a major part of the B.C. economy. The first time the industry is impacted from poor market conditions is in 1884 and 1885 when a global recession forced low prices for salmon. Of the 24 plants that operated in 1883, only 17 operated in 1884 and 9 in 1885.

Again in the early 1890s the industry went through an economic depression and low market prices for salmon. These difficult times contributed to the development of unionisation among labour and the amalgamation of cannery ownership in the early 1900s (Innis, 1941). The stock market crash of October 1929 was one of the most influential events that shaped the salmon canning industry. Of the 63 canneries operating in 1929 only 35 were operating in 1931 (Canada, Sessional Papers, 1933). Market demand remained high enough for most of the remaining canneries to be able to sell their production throughout the 1930s. Many of the outlying canneries, particularly in Smith Inlet, the Queen Charlotte Islands, and Rivers Inlet were closed permanently as a result of the Depression.

During World War II, many canneries had profitable seasons due to trade agreements with Britain to supply canned salmon for the military and domestic markets. Due to this trade agreement with Britain, the industry had its highest production rates ever with a peak in 1941 with over 2.2 million cases produced (Canada, Sessional Papers, 1942). As with most resource industries, market demand significantly effects viability. Over its history, the B.C. salmon canning industry has responded to market changes with spatial and firm expansion during upswings and spatial contraction and firm consolidation during downswings.

Ownership

There are two aspects to ownership that were influential in changing the geography of the B.C. salmon canning industry. First, the growth of the industry was primarily the result of small independent entrepreneurs building canneries. Second, the formation of corporations through the purchase of independent canneries allowed large firms to consolidate the industry.

The salmon canning industry in B.C. grew out of the construction of small independent canneries most of which operated in the resource frontier. These were the forerunners of innovation in the processes that established the way for the large corporations. Many of the independent canneries that were successful were purchased by the large corporations to be included in their operations or closed to prevent competition. The location of the cannery was an important factor in determining the

success of the operation. Many canneries that were located away from the major rivers often failed financially during years with small returns of salmon.

The formation of corporations was an important stage in the development of the industry. It permitted a co-operative tool to cut costs, negotiate prices for salmon, and deal with the labour unions. The most significant and influential of the large corporations in shaping the industry was British Columbia Packers' Association (see Lee, 1983). During the formation of B.C. Packers' Association, Henry Doyle proposed that an amalgamation would cut costs by reducing the number of boats on the water and implementing new technology to reduce labour costs (Meggs and Stacey, 1992). In the early period of amalgamation these were offset by the increase in new entrants to the industry. Carrothers suggests that:

The amalgamation movements of the early nineties, the early part of the century, and the twenties were accentuated by increasing mechanisation within the canneries and the consequent increasing demands for mechanisation of the primary process of taking the fish. On one hand, this development was linked to the problem of labour and on the other, to the problem of conservation (Carrothers, 1941, p.xi).

Even the increased access to capital was not as beneficial as thought, as Henry Doyle was later criticised for putting B.C. Packers' Association into serious financial trouble after the 1902 merger (Higginbottom, 1988). In 1904, Doyle resigned from the company to pursue his own ventures.

The second period of amalgamation in the 1920s is highlighted by the growth of the Canadian Fishing Company and the formation of B.C. Packers Limited. The concentration of ownership accomplished a number of costs and benefits to the industry (Reid, 1973). First, the formation of an oligopoly allowed greater competition in

international markets (i.e. U.S., Russia, and Japan). Second, an increased efficiency was gained through the use of new technology, not only on the production lines, but also with fishing gear and transportation. Some of these efficiencies were offset, however, as the profits were often consumed by construction costs and implementing new technology.

The formation of large corporations through the purchases of independent canneries and their subsequent closures was the primary method in the consolidation of the industry. In the three years following the formation of the British Columbia Packers' Association in 1902, half of the canneries purchased were closed permanently. Again in 1928, many of the canneries purchased in the amalgamation of B.C. Packers Ltd. were closed shortly afterwards. The closures were justified as an economic rationalisation of the industry to maintain the viability of the other canneries in an increasingly competitive market. In the late 1920s, Alaskan canneries dominated production levels and suppressed market prices making it difficult for B.C. canneries to compete (Netboy, 1973). There was increasing political motivation for the formation of large corporations. In the early years, many of the cannery owners were wealthy British aristocracy who brought their family fortunes to British Columbia to establish businesses. Many of these people had a great deal of political influence. It has been suggested that many of the resource policies favoured the formation of these large corporations. For example, the fish boat licenses issued to a cannery could be transferred to another cannery if it were closed.

There is evidence that consolidation later extended to the large corporations during the 1950s and 1960s. A report to the Select Standing Committee on Agriculture in 1979, found that “the number of large companies has decreased through amalgamation or purchase. Through consolidation of canning facilities, the number of canning plants operated by large companies has decreased in 25 years by two thirds and their share of canned product, as measured by value, has dropped by 20 percent” (British Columbia, 1979, p.66).

Conclusion

The spatial pattern of the B.C. salmon canning industry follows a resource development model that is shaped by changes in factors of production that centre around significant events. This chapter has highlighted five factors and discussed their influence on the B.C. salmon canning industry. It is important in setting a context for research of spatial patterns of industry and in making comparisons with other industrial geographies.

The growth and decline of resource industries is controlled by many factors, all of which interact with one another over time. The factor of ownership plays a large role in changing the geography of the industry. The discussion of ownership shows that large corporations alone did not control the geography of the industry, but rather it was a complex interplay between the establishment of small independent firms and the rationalisation of the industry through mergers and subsequent closures of canneries. The factor of transportation in the movement of the resource to central locations allows

a concentration of the industry. Technology allows production of individual canneries to increase and the need for fewer canneries. Market economics had a role in determining the flow of capital to the industry. Resource policy influenced the industry in determining when and where the resource was used and who was permitted to use the resource. The cumulative effect of these factors help to explain the changes portrayed in the descriptive resource development model.

Chapter Six

CONCLUSIONS

This thesis has examined the spatial pattern of development of one of British Columbia's major resource industries. The spatial pattern of the B.C. salmon canning industry between 1870 and 1970 followed a process of expansion and contraction that is generally described by the resource development model. But the model is descriptive and does not detail possible explanations for this complex process of industrial geography. The thesis incorporated the use of a GIS to analyse the industry to provide a visual way of representing patterns of industrial development over time.

Changes in the spatial pattern of the industry were in response to a number of events. A timeline was developed to trace the role of different events and their effect on the spatial pattern of the industry. There are key events that have significant influence on the spatial pattern of the B.C. salmon canning industry. Notable events include:

- the growth of the British market for canned salmon;
- the construction of transcontinental railways;
- the use of the gasoline engine to power fish boats;
- the implementation of boat ratings in an attempt to regulate the industry;
- the two periods of corporate concentration of ownership;
- the Depression of the 1930s severely impacting the market; and
- World War I and World War II;
- the technological adaptation of chilled seawater tanks on fish boats.

These events were compared with the spatial patterns of salmon canneries to see how the event changed the industry. While each of the events had varying amounts of influence, some of which were not immediately apparent, the timeline gives some sense of the types of factors that are important in changing the spatial patterns of the industry.

A series of maps shows changes in the distribution of canneries at key points in time. The maps show how the industry responded to events and how it follows, in general terms at least, the stages of the resource development model. The spatial effects of the B.C. Packers Ltd. amalgamations' for example, show how the formation of large corporations was an important part of the concentration of the industry. As large corporations rationalised their operations, they closed plants that were not profitable and increased production at the remaining plants. Within this pattern of corporate concentration, the role of small firms in the industry can be described as one of expansion and innovation.

The change in the number of canneries over time tells us of the growth and decline of the industry, but says little about changing spatial patterns. Production levels give clues to the role of technology, but again, offer little insight into the changing spatial patterns. By combining information about the number of canneries and production levels we can get a sense of the increasing productive capacity of individual canneries through the implementation of technologies. This is an important part of how corporate consolidation and spatial concentration were able to occur. Through the adoption of technology that increased production, only a few high capacity canneries constructed in central locations were needed to process the resource.

Many reasons have been suggested for the spatial concentration of the fishing industry in British Columbia. Ross suggests that "most of the closures were caused by high seasonal operating costs at the remote locations and when the ability to transfer fish over larger distances without seriously diminishing quality was achieved, centralised

locations became attractive” (Ross, 1987, p.186). The growth of large companies and the development of organised labour created competition over the salmon resource. Prices for salmon became critical in the success of a cannery and were often the source of labour strikes. This led to improvements in technology in the canneries and in fishing gear that increased the profitability of salmon canning (Meggs and Stacey, 1992). The development of refrigeration technology allowed the construction of cold storage plants. These canneries were able to extend the length of the canning season and the boats could keep the salmon on ice until they reached the cannery. Muszynski (1987) also suggests that the history of the fish processing industry in B.C. indicates a pattern of corporate competition and spatial concentration. Labour shortages and bottlenecks on the canning lines were resolved through increased mechanisation of the process. The need for process technology pushed up the costs of operation and a few highly capitalised large firms replaced many of the small firms.

This thesis draws on previous research to explain parts of the resource development process, however, additional research is needed on many of the factors and events employed to test whether their impacts have been as marked as historical accounts suggest. In addition, there are a number of questions related to the social and cultural geographies of the salmon cannery communities that need elaboration and description. All of these questions will add to our understanding of the role of the salmon canning industry in the development of British Columbia. Future research in B.C.’s industrial geography will also need to study how the resource development model fits with other industries. The implications of large corporate concentration play a large

role in the economic development of communities faced with industrial closure. For example, the recent amalgamations in the B.C. forest industry will concentrate the industry into central locations and impact many communities. There may also be other factors that are unique, to those particular industries and linkages between industries, which influence the spatial patterns of development.

There are two reasons why this research is important. The first, is to understand part of the history of resource development in British Columbia. The B.C. salmon canning industry provides a good example to illustrate the resource development process. Analysis of the historical development of natural resources provides some understanding of the nature of resource use, so that we may be better able to use resources in the future. It reminds us that even renewable resources are limited in their capacity to be utilised. The second, is an attempt to understand how and why the geography of this industry changed over time. The natural process of expansion and contraction is being expressed in an industrial landscape. The process that the B.C. salmon canning industry went through is part of a much larger process of globalisation, where ownership is concentrated and larger more efficient factories are built, to respond to changing markets.

The thesis has explored the resource development model, identified key factors, and shown differential roles for large and small firms. By using a resource development model as a guide, it gains insight into the changes of the large scale process of industrial development. Although the thesis provides an understanding of a long-term economic process, it is only part of very complex milieu of economic, social, and environmental

change. Perhaps by understanding the role of industrial development in our communities we will be better prepared for change in the future.

BIBLIOGRAPHY

- Adachi, Ken. (1991). The Enemy That Never Was. Toronto, ON: McClelland and Stewart.
- Blyth, Gladys Young. (1991). Salmon Canneries: British Columbia North Coast. Lantzville, B.C.: Oolichan Books.
- Bradbury, John. (1987). British Columbia: Metropolis and Hinterland in Microcosm. In Heartland and Hinterland: A Geography of Canada (2nd edition.), Larry McCann (ed.), 401-440. Scarborough, ON: Prentice-Hall.
- British Columbia. (1979). Select Standing Committee on Agriculture: The Salmon Industries in British Columbia Phase 3 Research Report. Victoria, B.C.: Legislative Assembly.
- (1960-1970). Department of Recreation and Conservation Annual Reports, 1960 to 1970. Victoria, B.C.: The Queen's Printer.
- (1936-1959). Provincial Fisheries Department Annual Reports, 1936 to 1959. Victoria, B.C.: The Queen's Printer.
- British Columbia Fire Underwriters Association, Planning Department. (1924). Plans of Salmon Canneries in British Columbia with Inspection Reports on Each: Dominion Cannery, Skeena River B.C. Special Collections Library, University of British Columbia. Vancouver, B.C.
- Campbell, Blake A. (1961). The Role of the Fisherman in the Economy of British Columbia. In The British Columbian: A Product of His Environment. Victoria, B.C.: Proceedings of the 13th British Columbia Natural Resources Conference. pp. 247-61.
- Canada. (1999). Sailing Directions: British Columbia Coast (South Portion) vol. 1 ed. 16. Ottawa, ON: Fisheries and Oceans Canada.

- (1991). Sailing Directions: British Columbia Coast (North Portion) vol. 2 ed. 12. Ottawa, ON: Fisheries and Oceans Canada.
- (1958). The Commercial Salmon Fisheries of British Columbia: Statistical Basebook Series, No.3. Ottawa, ON: Department of Fisheries of Canada.
- (1910). Sessional Papers Dominion - British Columbia Boat Rating Commission, 1910: Report and Recommendations. Port Essington, B.C.
- (1893). Sessional Papers Proceedings of the British Columbia Royal Fisheries Commission (Wilmot Commission). Victoria, B.C.: Dominion Government of Canada, Department of Marine and Fisheries.
- (1873-1936). Sessional Papers. Annual Reports of the Dominion Department of Fisheries, 1873 to 1936. Ottawa, ON: The Kings Printer.

Carrothers, W.A. (1941). The British Columbia Fisheries. Toronto, ON: The University of Toronto Press.

Caves, R.E. and R.H. Holton. (1980). An Outline of the Economic History of British Columbia, 1881-1951. In Historical Essays on British Columbia ed. Friesen and Ralston. Toronto, ON: Gage Publishing. pp. 153-165.

Chapman, Keith. and David F. Walker. (1991). Industrial Location: Principles and Policies. Oxford, U.K.: Blackwell Press.

Davis, Craig H. and Thomas A. Hutton. (1989). The Two Economies of British Columbia. B.C. Studies. (82). pp. 3-15.

Denike, K. G. and Roger Leigh. (1972). Economic Geography 1960-70. In Studies in Canadian Geography: British Columbia. ed. J.L. Robinson. Toronto, ON: University of Toronto Press. pp. 69-86.

Doyle, Henry. (1910). Correspondence to Deputy Fisheries Superintendent. Box #14 of GR0435. Victoria, B.C.: British Columbia Provincial Archives.

Forester, J. and A. Forester. (1975). Fishing: British Columbia's Commercial Fishing History. Sannichton, B.C.: Hancock House Publishers.

Fraser, G. Alex. (1977). License Limitation in the British Columbia Salmon Fishery. Economics and Special Industry Services Directorate: Pacific Region.

Hardin, Garrett. (1968). Tragedy of the Commons. Science. (162) Dec, 12 1968 pp. 1243-1248.

Harris, E.A. (1990). Spokeshute: Skeena River Memory. Victoria, B.C.: Orca Book Publishers.

Hayward, Brian. (1981). The B.C. Salmon Fishery: A Consideration of the Effects of Licensing. B.C. Studies. (50) pp. 39-51.

Healey, Michael J. and Brian W. Ilbery. (1990). Location and Change: Perspectives on Economic Geography. Oxford, U.K.: Oxford University Press.

Henderson's Gazetteer and Directory, 1900 to 1917. Vancouver, B.C.: Henderson Publishing Company.

Higginbottom, Edward N. (1988). The Changing Geography of Salmon Canning in British Columbia, 1870-1931. Simon Fraser University. (unpublished thesis).

Hill, A.V. (1967). Tides of Change. Vancouver, B.C.: Evergreen Press.

Innis, H.A. (1941). Forward. In W.A. Carrothers The British Columbia Fisheries. Toronto, ON: The University of Toronto Press. pp. v-xii.

- Large, R.G. (1957). The Skeena: River of Destiny. Vancouver, B.C.: Mitchell Press.
- Lee, Helen. (1983). Corporate Strategy in the British Columbia Fish-Processing Sector. Simon Fraser University. (unpublished thesis).
- Lyons, Cicely. (1969). Salmon: Our Heritage. Vancouver, B.C.: Mitchell Press.
- Marchak, Patricia. (1989). History of a Resource Industry. In A History of British Columbia: Selected Readings. ed. Patricia E. Roy. Toronto, ON: Copp Clark Pittman. pp. 109-128.
- - - (1989). What Happens When Common Property Becomes Uncommon?. B.C. Studies. (80). pp. 3-23.
- McKervill, Hugh. (1967). The Salmon People: The Story of Canada's West Coast Salmon Fishing Industry of British Columbia. Vancouver, B.C.: Gray's Publishing.
- McMullan, John. (1987). State, Capital, and the B.C. Salmon-Fishing Industry. In Uncommon Property: The Fishing and Fish-Processing Industries in B.C. ed. Patricia Marchak, Neil Guppy and John McMullan. Toronto, ON: Methune. pp. 107-52.
- Meggs, Geoff. (1991). Salmon: The Decline of the B.C. Fishery. Vancouver, B.C.: Douglas and McIntyre.
- - - and Duncan Stacey. (1992). Cork Lines and Canning Lines: The Glory Years of Fishing on the West Coast. Vancouver, B.C.: Douglas and McIntyre.
- Miki, Roy and Cassandra Kobayashi. (1991). Justice in Our Time: The Japanese Canadian Redress Settlement. Vancouver, B.C.: Talonbooks.

- Millerd, Frank W. (1988). Windjammers to Eighteen Wheelers: The Impact of Changes in Transportation Technology on the Development of British Columbia's Fishing Industry. B.C. Studies. (78). pp. 29-52.
- Mitchell, Bruce. (1977). Hindsight Reviews: The British Columbia License Programme. In Pacific Salmon Management for the People. ed. D. V. Ellis. Victoria, B.C.: University of Victoria. pp. 148-186.
- Muszynski, Alicja. (1987). Major Processors to 1940 and Early Labour Force: Historical Notes. In Uncommon Property: The Fishing and Fish-Processing Industries in B.C. ed. Patricia Marchak, Neil Guppy and John McMullan. Toronto, ON: Methune. pp. 46-65.
- Netboy, Anthony. (1973). The Salmon: Their Fight for Survival. Houghton Mifflin: Boston.
- Newell, Diane. (1989). The Development of the Pacific Salmon-Canning Industry: A Grown Man's Game. Montreal/ Kingston: McGill-Queen's University Press.
- - - (1988). Dispersal and Concentration: The Slowly Changing Spatial Pattern of the British Columbia Salmon Canning Industry. The Journal of Historical Geography. 14(1). pp. 22-36.
- Payne, R. L. (1964). Technology in the B.C. Fishing Industry. In Inventory of the Natural Resources of British Columbia. Victoria, B.C.: The British Columbia Natural Resources Conference. pp. 306-311.
- Pearse, P. H. and J. E. Wilen. (1979). Impact of Canada's Pacific Salmon Fleet Control Program. Journal of the Fisheries Research Board of Canada. 36(7). pp. 764-769.
- - - (1979). Property Rights and the Regulation of Commercial Fisheries. Department of Economics Resource Paper No. 42. Vancouver, B.C.: University of British Columbia Press.

- Ralston, Keith. (1981). Patterns of Trade and Investment on the Pacific Coast, 1867 to 1892: The Case of the British Columbia Salmon Canning Industry. In British Columbia Historical Readings. eds. W. Peter Ward and Robert A.J. McDonald. Vancouver, B.C.: Douglas and McIntyre. pp. 296-305.
- (1976). John Sullivan Deas: A Black Entrepreneur in British Columbia Salmon Canning. B.C. Studies. (32). pp. 64-78.
- Reid, David J. (1981). Company Mergers in the Fraser River Salmon Canning Industry. In British Columbia Historical Readings. eds. Peter W. Ward and Robert A.J. McDonald. Douglas and McIntyre: Vancouver. pp. 306-327.
- (1973). The Development of the Fraser River Salmon Canning Industry: 1885 to 1913. Department of the Environment: Economics and Sociology Unit Northern Operations Branch Fisheries and Marine Service, Pacific Region.
- Roberts, Arthur and E. Higginbottom. (1991). Aerial Archaeology of Historic Period Salmon Cannery Sites. In British Columbia: Geographical Essays in Honor of A. MacPherson. ed. Paul M. Koroscil. Burnaby, B.C.: Department of Geography, Simon Fraser University. pp. 113-137.
- Robinson, J. Lewis. (1972). Areal Patterns and Regional Character. In Studies in Canadian Geography: British Columbia. ed. J.L. Robinson. Toronto, ON: University of Toronto Press. pp. 1-8.
- (1998). British Columbia: Canada's Pacific Province. In Heartland and Hinterland: A Regional Geography of Canada (3rd edition). eds. L. McCann and Angus Gunn. Scarborough, ON: Prentice-Hall. pp. 321-355.
- Roos, John F. (1991). Restoring Fraser River Salmon: A History of the International Pacific Salmon Commission, 1935-1985. Vancouver, B.C.: The Pacific Salmon Commission.
- Ross, William M. (1987). Fisheries. In British Columbia: Its Resources and People. Western Geographical Series vol. 22. ed. Charles N. Forward. Victoria, B.C.: University of Victoria. pp. 179-96.

- (1967). Salmon Cannery Distribution on the Nass and Skeena Rivers of British Columbia, 1877 - 1926. The University of British Columbia. (unpublished thesis).
- Roy, Patricia E., J.L. Granatstein, Masako Iino, and Hiroko Takamura. (1990). Mutual Hostages: Canadians and Japanese During the Second World War. Toronto, ON: University of Toronto Press.
- Seager, Allan (1996). The Resource Economy, 1871-1921. In The Pacific Province: A History of British Columbia. ed. Hugh J.M. Johnston. Vancouver, B.C.: Douglas and McIntyre. pp. 205-252.
- Sinclair, Sol. (1960). License Limitation- British Columbia: A Method of Economic Fisheries Management. Ottawa, ON: Department of Fisheries.
- Shaffer, Marvin. (1979). Commercial Fishing Policy Study: Economic Management of the Processing Sector. Vancouver: Maritime Resources Branch.
- Stacey, Duncan. (1982). Sockeye and Tinplate. Victoria, B.C.: British Columbia Provincial Museum.
- Star, J. and J. Estes. (1990). Geographic Information Systems: An Introduction. London, U.K.: Prentice-Hall.
- Todd, J.H. (1910). Correspondence to Deputy Fisheries Superintendent. Box #14 of GR0435. Victoria, B.C.: British Columbia Provincial Archives.
- Williston, Eileen and Betty Keller. (1997). Forests, Power and Policy: The Legacy of Ray Williston. Prince George, B.C.: Caitlin Press.
- Wrigley's Classified Business Directory, 1918 to 1934. Vancouver, B.C.: Wrigley Publishing Company.