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INDUSTRIALIZATION AND AQUACULTURE
IN THE BRITISH COLUMBIA SALMON INDUSTRY
IN THE 1980s

by

Angus McAllister, B.A.

A Thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfillment of
the requirement for the degree of
Master of Arts
Department of Sociology and Anthropology

Carleton University

Ottawa, Ontario

October 1989

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Thesis Supervisor

Chair, Department of Sociology and Anthropology

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October 2, 1989

ABSTRACT

Touted by various government agencies as a new "hi-tech" "cottage industry", the salmon aquaculture industry in British Columbia from 1984 to 1988, grew from less than 10 farming operations to over 200. At the end of 1988, B.C. salmon aquaculture was estimated to represent an investment of half a billion dollars in capital stock, and annual expenditures of another 400 million in operating capital. This thesis argues that, far from a cottage industry, salmon aquaculture has developed in British Columbia as a large-scale horizontally and vertically-integrated capitalist form of salmon production. It is argued that this new industrial means of salmon production threatens to displace the existing array of small-scale fishers and small processing capital from the wild salmon fishery. Why has this happened? The Canadian state is shown to have been centrally involved in the promotion of this new form of capitalist enterprise through its attempts to attract capital investment. Ultimately, the development of salmon aquaculture is explained as occurring in response to various barriers to capital accumulation affecting the B.C. wild salmon industry and B.C. economy.

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Industrialization and Aquaculture
in the B.C. Salmon Industry in the 1980s.

CHAPTER 1: INTRODUCTION

The British Columbia salmon industry has historically been characterized by high levels of simple commodity production. The persistence of this form of commodity production has been predicated on conditions of accumulation endemic to the salmon industry since the beginning of the century that have made the full subordination of small scale producers in the gillnet and troll salmon fisheries difficult and undesirable for capital. Subsequently, capitalist control over fresh and frozen salmon production on the west coast has been limited to indirect, economic forms of subordination cultivated through buyer-seller ties and oligopsonic advantages in the fish buying market. Direct producers in the troll and gillnet fleets thus far have retained rights of possession over their means of production and enjoy certain limited forms of economic ownership.

Recently, however, for these small scale producers such productive rights have become genuinely threatened.

In the early 1980s, a new form of industrial production was introduced to the B.C. salmon industry: namely, aquaculture, or "fish farming." While the commercial salmon fishery in British Columbia is based solely on the harvest of

wild¹ salmon stocks, salmon aquaculture involves the husbandry or cultivation of salmon from eggs to harvest in artificial surroundings. Focusing mainly on the fresh and frozen fish market, aquaculture technology offers multiple advantages to capital. These include the possibility of lower capital risks, decreased labour costs and increased control over the production process, resulting in more reliable production and a cheaper, more consistent product. Such advantages not only translate into greater competitiveness in international markets but also mean greater ease in the realization of surplus value.

Consequently, since its introduction less than a decade ago, aquaculture production has become a major focus of investment in British Columbia's salmon industry.

Between 1979 and 1988, the amount of capital invested in salmon aquaculture production in British Columbia soared from practically nothing to an estimated 200 million dollars fixed capital with another 300 million dollars worth of inventory. Operating capital accounted for another 400 million per year in expenditures. Nearly 98 percent of this investment occurred in the 4 years following 1984². Of this, at least 40% was provided by Norwegian corporate investors, while the

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¹ By wild stocks I mean salmon which are, at the time of capture, swimming free and surviving independently in a natural environment. This includes salmon raised initially in hatcheries, but later released into the wild.

² See Author Unknown. Salmon Farming In British Columbia: An Economic Impact Study. (Obtained from the Parliamentary Committee on Fisheries and Oceans).

rest of the capital investment was dominated by large domestic fish processing and food transnationals. In addition, the federal and B.C. governments provided capital in the form of loans, grants and subsidies totalling up to approximately 5 million dollars annually.

As a result, salmon aquaculture production has experienced a period of phenomenal growth. There were only 2 or 3 salmon farms in commercial operation along the B.C. coast in 1979, and only 10 farms in 1984, but 4 years later, by the end of 1988 there were over 200 salmon farms licenced for operation along the B.C. coast³.

The introduction and rapid proliferation of aquaculture production raises important questions about the development of the B.C. salmon industry. This thesis is an attempt to grapple with these issues. As my central task, I will develop an account of the transformations in relations of production brought about by the introduction of aquaculture production, especially the way in which they have affected the position of immediate producers in the B.C. salmon industry.

Chapter two of this thesis will outline the theoretical perspective and key concepts employed in this thesis to describe and explain the introduction of salmon aquaculture to the west coast fishing industry.

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³ Carmen Franks, B.C. Ministry of Agriculture and Fisheries, Pers. comm., January, 1989.

In chapter three, I describe the social relations salmon aquaculture represents as a new form of salmon production. I argue that salmon aquaculture as it has been developed in British Columbia in the 1980s, constitutes a form of capitalist commodity production. Salmon aquaculture is shown to be a large-scale, vertically and horizontally-integrated enterprise with substantial backward linkages to large-scale foreign capital and Canada's largest fish processing firms.

In chapter four, I examine the impact of aquaculture on relations of production within the British Columbia salmon industry as a whole. First, I discuss the relations of production that existed before aquaculture, focussing on the circumstances surrounding the historical persistence and reproduction of native and non-native petty commodity production. I then argue that the emergence of salmon aquaculture significantly extends capitalist relations within the British Columbia salmon industry, not only by adding to the current array of productive forms but by also threatening to displace petty commodity production and the small capitalist processors servicing this sector.

The final objective of this thesis, undertaken in chapter five, is to explain the emergence of aquaculture in the B.C. salmon industry as a new form of capitalist production. Here I reject accounts of industrialization that would view the advent of salmon aquaculture in British Columbia as simply the

result of the inevitable advancement of technology, since new forms of technology do not just appear in abstraction from the society which spawns them.

Viewed critically, I argue, aquaculture is more than simply technology: using the Marxist conceptualization of productive forces, aquaculture must be understood as a form of production encompassing a particular set of social relations and implying a particular set of consequences for direct producers. Under capitalism, the transformation of the productive forces (and their implications for relations of production) must be seen as intimately tied to the central dynamic of the capitalist mode of production: the drive to expand and intensify the means of capital accumulation.

The emergence of aquaculture as a new form of capitalist production in the B.C. salmon industry, I contend, has been governed by changing local and international conditions of capitalist accumulation during the 1980's. In detailing how these changing conditions of accumulation have affected the particular transformations in B.C. salmon production, I focus on the role of the Canadian state as a key agent of change. In particular, I explain how the development of aquaculture has been directly affected by the Canadian state's⁴ institutional interest in maintaining hegemony and its complementary interest with capital in guaranteeing conditions of accumulation.

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⁴ As represented by both provincial and federal governments.

CHAPTER 2: THEORETICAL UNDERPINNINGS

Industrial development in the British Columbia salmon industry over the past two decades has been implicitly accounted for by the institutions of the Canadian state as simply the product of the natural advancement of scientific knowledge and technological innovation. Examples of this are rife in the numerous documents and reports produced by the state⁵. Such explanations of industrial change, when combined with the liberal analyses of state institutions, often serve to obfuscate the social and class basis for such change. It is argued here that a critical prerequisite to an adequate explanation of the changes affecting the B.C. salmon industry in the 1980's is an understanding of 1) the Marxist concept of relations of production and 2) the dynamics which serve to transform these relations under capitalism.

The principal objective of this chapter is therefore to elaborate these key notions in a way that will be useful to the analysis ahead. Toward this end, this chapter first explains the concept of relations of production and the nature of such relations as entailed by the capitalist mode of production. Second, I elaborate the general nature of development affecting relations of production under capitalism and the dynamic of capital accumulation that propels this process. Third, I discuss the persistence of simple commodity

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⁵ For a good example see Fisheries and Oceans, Fisheries and Oceans Research Centres, Economic and Technological Benefits, 1988.

production under capitalism and relate this to the forms of simple commodity production characterizing the salmon industry in British Columbia: dependent and independent commodity production⁶. Finally, this chapter discusses the factors conditioning the development of the forces of production and the ramifications this has for the expansion of capitalist production into spheres of production previously dominated by simple commodity production.

I. Relations of Production

The social relations of production⁷ can be defined as "the relations of ownership by persons of productive forces or persons OR relations presupposing such relations of ownership."⁸ The social relations of production are the relations in a society which arise between people in reference to the relative degree of effective control their property rights accord them over productive forces.

Productive forces are the means of production and labour-power used by humans to produce their subsistence⁹. The means of production may be described as 1) the raw materials and 2) the instruments of production used in the

⁶ See Clement, 1983. p.195.

⁷ The term relations of production can refer to relations of production in both a broad sense referring to the totality of productive relations in a social formation or society and in narrower senses such as productive relations in given areas of production or in a particular workplace. In this thesis, unless otherwise indicated, the term will generally be used in reference to an area of production: this "area of production" will be specifically the west coast salmon industry.

⁸ See Cohen, 1978, p.35.

⁹ Ibid, p.32.

production process. Labour-power refers to "the productive faculties of producing agents: strength, skill, knowledge, inventiveness etc."¹⁰ In addition to denoting the means of production and labour-power, the productive forces, depending on their level of development, imply a particular mode of cooperation or organization of labour around the production process.

Under capitalism, the relations of production, as implied by ownership of the productive forces, are differentiated by class. Marx identifies three main classes: capitalist class (or bourgeoisie), the petty bourgeoisie and the working class (or proletariat).

The bourgeoisie is the dominant class under capitalism and engages in capitalist commodity production. The bourgeoisie is distinguished in that it undertakes capital accumulation through controlling or owning private property rights to the means of production and through employing the labour-power of the working class. Capital accumulation is made possible through the extraction of surplus value from the working class. Crucial here is that "capital accumulation" is understood to refer to the accumulation of surplus-value which is re-invested in the means of production: that is, plowed back into "additional plant and equipment, additional raw materials, and additional labour-power."¹¹

¹⁰ See Cohen, 1978, p.32.

¹¹ See Marx, 1977, p.61.

The working class may be distinguished in that it does not have private property rights to the means of production¹². Since workers lack such means to realize their labour-power, they are forced to serve the capitalist class in capitalist commodity production; that is, in order to survive, they are forced to provide labour-power to the capitalist class in exchange for wages.

The petty bourgeoisie control private property rights to their means of production yet differ from the capitalist class in that they do not, to any significant extent, rely on the labour-power of the working class as a means of generating surplus or accumulation. With the growth of bureaucracies, the division of ownership/management functions in government and business enterprise over the last century, a new fraction of petty bourgeoisie often termed the "new middle class", has emerged in capitalist societies¹³. This new middle class can be described as a managerial or professional class. While not directly owning means of production, it "performs both the tasks of capital...and that of labour, thus exercising both the rights of property and the obligations of labour, even though, like the working class, it only has its labour-power to sell."¹⁴

¹² If it does, these are insignificant in that they cannot be used as a means of subsistence except in subordination to the capitalist class. See Cohen, 1978, p.78-79.

¹³ See E.O. Wright, 1978.

¹⁴ See Clement, 1983, p.219.

In contrast to the bureaucratic functions performed by the new middle class, traditional petty bourgeoisie are distinguished by their involvement in small-scale production processes and some sort of title to the means of production (even if only rented). In the production of value, traditional petty bourgeoisie employ their own labour-power and that of their families and/or one or two helpers. Simple commodity producers form a class fraction within the traditional petty bourgeoisie. The central feature characterizing simple commodity production is the production of commodities as a means of generating exchange-value which is generally directed toward personal consumption or the servicing and replacement of means of production¹⁵. Simple commodity producers have persisted in many sectors of capitalist economies: the salmon industry in British Columbia is one such sector.

The central characteristic of the capitalist mode of production is that relations of production are predicated on private control and ownership of the means of production by the bourgeois class. These unequal relations form the basis for extraction of surplus value¹⁶ from the labouring classes

¹⁵ See Harriss, 1982, p.163.

¹⁶ Surplus value can be defined as the value of a commodity over and above the value of the labour-power necessary to make the commodity. Value, as described in Marx's Labour Theory of Value [See Marx, 1977, p.38-46; Jordon, 1971, p.42-44; Giddens, 1971, p.48-50], is conceived as the amount of socially necessary labour time which goes into the production of a commodity. In as much as labour-power is bought by the capitalist class and sold by workers, it is understood to be a commodity. Labour-power is, however, a unique commodity in that "this commodity possesses of being a source not only of

by the bourgeoisie and the accumulation of capital. Capitalists are able to appropriate surplus value from the labouring classes because they purchase the labour-power of these classes under conditions in which labourers lose their rights to the products of their labour, the use of labour and the direction of the labour process¹⁷. These rights are retained by the capitalist class and allow it to realize the surplus-value created by the labour of its workers. As stated in the introduction to Capital, Vol. I¹⁸, "capitalism is tied to the private ownership of the means of production, which allows private appropriation of produced commodities, thus private appropriation of surplus value and thus private accumulation of capital."

This process of capital accumulation is the basis by which the capitalist class consolidates its control over the means of production and, in turn, increases its domination over the relations of production in society¹⁹.

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value, but of more value than it has itself [Marx, 1977, p.301]." That is, labour-power can produce more value than the labour-power itself costs to buy. Surplus value is thus created because, under capitalism, labour-power is used in such a way that the value of the commodity it creates always exceeds the value of the labour-power required to produce them.

¹⁷ See Clement, 1983, p.219.

¹⁸ See Marx, 1977, p.55.

¹⁹ Within capitalist social formations, capitalist production dominates other pre-capitalist forms of production such as simple commodity production and subsistence production which may continue to exist alongside capitalist production in a social formation [Poulantzas, 1974, p.42]. The reproduction --even proliferation-- of these non-capitalist forms of production in societies dominated by otherwise capitalist relations has spawned debates among Marxists regarding an appropriate treatment of the concept of the mode of production: whether social formations should be seen as

In the B.C. salmon industry, capitalist production has in the past been typified mainly by the corporate-controlled seine vessel²⁰ fleet, although, as this paper will show, since the early 1980s capitalist production has also been represented by the newly emerging salmon aquaculture sector of the industry.

II. The Development of Relations of Production

The development of relations of production under capitalism, according to Marx, is characterized by the process in which other non-capitalist forms of production are continually eroded through the appropriation of their property rights by capital and the expansion and intensification of

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characterized by multiple modes of production (capitalist and other traditional non-capitalist), articulated and "structured in dominance" [Hall, 1978]; whether non-capitalist modes of production should be seen as part of a single mode of production (or single world system) [Wallerstein, 1979]; or whether mode of production should be replaced with a focus on social formation conceived as a determinate set of relations of production and the forms in which their conditions of existence are secured, with no analytic priority given to any specific set of economic relations [emphasis added, Cutler, Hindess, Hirst and Hussain, 1977]. Inasmuch as this debate is relevant to this thesis, I take a view closest to that Hall where social formations can be understood to contain multiple modes of production which are articulated and structured in dominance. Here, mode of production is used to refer to a particular set of relations of production. This would entail the position that the very nature of petty commodity production is demarcated by the domination of capitalist production in broader society.

²⁰ The seine fleet in the B.C. salmon industry is characterized by five to six person crews, net-capture techniques and larger vessels of 25 metres or more. These vessels supply fish to the industrial salmon canning industry. Capitalist commodity production has also recently emerged on a small-scale level among some large freezer trollers which have begun to employ four to six person crews for processing frozen salmon. For more detail on these wild fishery production sectors see Chapter 4.

capitalist production. The development of productive relations as such, is rooted in the capitalists' drive to accumulate capital. This drive to accumulate is not simply the result of personal greed or acquisitiveness: it is explained by the nature of competition between capitalists or capitalist firms.

"The battle of competition is fought by the cheapening of commodities. The cheapness of commodities depends...on the productivity of labour, and this depends in turn on the scale of production. Therefore the larger capitals beat the smaller. It will further be remembered that, with the development of the capitalist mode of production, there is an increase in the minimum amount of individual capital necessary to carry on a business under its normal conditions."²¹

The nature of capitalist competition thus means that increasing the rate of extraction of surplus value and the expansion of capital are imperatives for capitalist enterprise. Since small capitals tend to succumb in competition to the larger ones, individual capitalists must continuously accumulate surplus value and expand the amount of capital under their control in order to survive. If they do not, they will be forced out of business or swallowed up by other capitals²².

²¹ See Marx, 1977, p.777.

²² As is implied by this, the nature of capitalist competition results in the continuous concentration and centralization of capital. Capital is centralized as smaller capitals are defeated or absorbed by larger capitals; capital is concentrated as the amount of capital controlled by individual capitalist enterprises becomes greater and greater.

The capitalist imperative to intensify and expand accumulation results in two ongoing processes which are key to the analysis in this thesis: (1) the expansion of the capitalist means of accumulation through the continuing appropriation of traditional petty bourgeois means of production²³ and (2) the intensification of the capitalist production process through the continuing development of the forces of production²⁴. The nature and effects of the expansion of capitalist accumulation will be discussed next; the development of the forces of production will be discussed later in section 2.4.

III. Expansion of Capitalist Production

The capitalist classes expand their means of production through the appropriation of the means of production of traditional petty bourgeoisie producers; consequently, more property is concentrated in the hands of the capitalists and the ranks of the working class (and reserve army of labour) swell as these producers are expelled into the labour force. As Marx states:

"the continual tendency and law of development of the capitalist mode of production is more and more to divorce the means of production from labour, and more and more to concentrate the scattered means of production into large groups, thereby transforming labour into wage-labour and the means of production into capital."²⁵

²³ See Poulantzas, 1974, p.42-43

²⁴ Ibid., p.63

²⁵ See Marx, quoted in Clement, 1983, p.226

Through the progressive appropriation of their property rights by the capitalist class, the petty bourgeoisie are proletarianized: that is, they become more like the proletarian class²⁶. The appropriation of these producers' property rights benefits capital in two ways: 1) it allows capitalists to expand their capital and 2) it expands the pool of wage-labour available to capital by forcing immediate producers into a position where they can be exploited as a source of surplus value²⁷. Consequently, the capitalist class expands its ability to accumulate capital and increases its domination over the relations of production.

The first notion that is central to understanding the development of the relations of production then, is that the *expansion of the capitalist control over the means of production in society is based on the continuing appropriation of the property of simple commodity producers and the subsequent displacement of these producers into the wage-labour market.*

IV. The Persistence of Simple Commodity Production

The above described impetus toward the expansion of capitalist production under capitalism however, does not always result in petty bourgeoisie producers becoming fully

²⁶ See Clement, 1983, p.222

²⁷ Significantly, the expulsion of small commodity producers into the wage-labour market also expands the reserve army of labour which ultimately serves to put downward pressure on workers wages.

subordinated by capital (that they actually become de facto members of the proletarian class). Capitalism is characterized by a tendency toward uneven development²⁸. As is the case in the B.C. salmon industry, petty bourgeoisie production in the form of simple commodity production may persist alongside capitalist production. These producers may remain mostly independent or may be partially subordinated by capital, losing or retaining various component rights to the means of production according to the exigencies of class struggle and developments in the social and material conditions of production. Nicos Poulantzas²⁹ identifies two such rights of ownership which are useful in elaborating the particularities of petty bourgeoisie production within the capitalist social formations: these are economic ownership and possession.

Economic ownership is "the power to assign the means of production to given uses and so dispose of the products obtained." In other words, control over the way value is realized and how it is directed once it is realized: control over the activities of accumulation and investment³⁰. Possession on the other hand, is defined as the "capacity to put the means of production into operation." By this is meant

²⁸ See Poulantzas, 1974, p.42.

²⁹ See 1974, p.18.

³⁰ Eric Olin Wright subdivided this economic ownership into several different levels of control [Wright, 1978, p.72]. For the analysis in this paper it suffices to state that at a maximum, economic ownership involves complete economic control over accumulation and investment relating to a production process and, at a minimum, it involves control over what one produces in one's immediate labour process.

property rights granting the power to direct the actual labour process or how things are produced³¹. The formal subordination of immediate producers is a condition which occurs with the loss of economic ownership rights over the means of production and real subordination is experienced by such producers with the loss of both economic ownership and possession over the means of production³².

The west coast salmon industry has been characterized historically by the persistence and reproduction of various forms of simple commodity production alongside capitalist commodity production. These forms of production have been distinguished by Wallace Clement³³ as independent and dependent commodity production. Independent and dependent commodity production represent different respective levels of subordination to capital and by implication, involve the retention by petty producers of differing levels of ownership rights over the means of production.

Independent commodity production exists where the immediate producer retains control over the legal and economic ownership and possession of the means of production. The producer is linked to capital through the open market and is

³¹ Poulantzas [1976, p.19] states that "economic ownership and possession, are distinct [from one another] in that they do not depend on the same relationship between owners and the means of production." What is meant here is that these rights may occur separately from one another, with, for instance, a member of the capitalist class having economic ownership over a particular means of production and an immediate producer (or "direct worker") holding the rights of possession.

³² See Clement, 1983, p.195

³³ Ibid. p. 229

largely able to avoid the exploitation of oligopsonic or contractual relations with buyers representing capital. Independent commodity producers in the salmon industry usually rely heavily on spousal and family labour but may at times hire casual labour (one or two helpers) if family labour is not available.

Dependent commodity production typically involves a relation between capital and immediate producers where capital, at some level, controls economic and sometimes legal title to the means of production. The immediate producer retains control of possession, usually legal ownership, and sometimes a minimal level of economic ownership. Dependent commodity production commonly arises in situations where immediate producers are subordinated to capital through relations of unequal exchange³⁴; these relations are generally facilitated through certain types of obligatory buyer-seller ties: for instance, through contract agreements, the payment of seasonal bonuses and the cultivation of indebtedness by processors.

Why do forms of production such as those described above persist in social formations otherwise dominated by capitalist

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³⁴ Relations of unequal exchange can involve a situation where capital extracts surplus from its tied producers through overpricing inputs in "upstream" supply markets and underpricing outputs in "downstream" product markets. The success of large capital in maintaining this form of exploitation is evidenced by the fact that, for instance, in the salmon industry, the average price per pound paid to fishers by large companies is often less than that paid by the rest of the industry [Schaffer, 1979, p.189].

relations of production? The perpetuation of these forms of production within capitalist social formations is related to the particular conditions of accumulation affecting different areas of production. These conditions of accumulation permit simple commodity producers to occupy niches of production which capital finds difficult or undesirable to fully penetrate. As Wilfred Denis³⁵ explains, simple commodity production may persist within the capitalist social formations "where, for various reasons, capital is unable to establish itself in its fully developed form, or where [a] particular form of simple commodity production [has] competitive advantage over capital."

Such barriers and impediments to the supplantment of simple commodity production by capitalist production can be seen to arise from both (1) the material conditions of production inherent in a particular setting and (2) the abilities and efforts of immediate producers in a particular setting to resist capitalist expansion.

Material conditions of production impeding the full expansion by capital into areas dominated by simple commodity production typically include the following:

- 1) high costs associated with maintaining the means of production caused by a) frequent and expensive servicing and replacement costs and b) having capital tied up unproductively in industries affected by fluctuating conditions of supply due to the seasonal nature of the industry or varying and unstable biological conditions³⁶.

³⁵ See 1983, p.15

³⁶ See Christensen, 1982, p.6-7; Pinkerton, 1983, p.24; Clement, 1983, p.233,

- 2) high risks resulting from weather, disease, stock/soil depletion,
- 3) high costs involved in supervising the skilled labour required to produce a particular commodity³⁷,
- 4) the efficiency relative to capital of small producers in particular areas of production³⁸,
- 5) problems with the realization of value relating to a) unreliable supply b) unstable and fluctuating world price markets, and c) the perishable nature of the commodity in question³⁹,

Barriers to the appropriation of ownership rights by capital related to the ability of immediate producers to struggle and resist domination include:

- 1) state support for simple commodity producers' property rights to the resource in question, resulting from these producers' political struggles⁴⁰,
- 2) the organization and existence of producer co-ops⁴¹,
- 3) the competitiveness of certain producers in certain areas, resulting from a) specialization and technological innovation and b) the willingness of small producers to have lesser needs, put in longer hours and to use their children and spouse in production⁴².
- 4) refusals by immediate producers to produce for capital, or organized attempts to re-negotiate the terms of productive relations offered by capital⁴³.

How does capital deal with such barriers to the expansion of capitalist accumulation? In these instances, the tendency of the capitalism has been to adapt to conditions of accumulation unique to a particular setting by articulating/

³⁷ See Clement, 1983, p.231

³⁸ See Taussig, 1982, p.197

³⁹ See Christensen, 1982, p.6-7

⁴⁰ See Marchak, 1987, p.29; Poulantzas, 1974, p.79

⁴¹ See Hill, 1967

⁴² See Clement, 1983, p.233

⁴³ See Bernstein, 1982, p.173

integrating simple commodity production with its schema of productive relations. Producers who are generally able to resist such integration can be said to remain as independent commodity producers. Others who are less able to resist become partially subordinated as dependent commodity producers.

The retention by dependent commodity producers of possession, and generally, some form of legal title to the means of production, serves as a means for capital to pass on the risks and costs of production to the immediate producer⁴⁴. Advantages accrue to capital because the immediate producer, often through the agency of his or her family, undertakes capital risks, services (or maintains) the means of production, takes on the responsibility of supervising labour, and --in as much as it serves to increase the 'absolute' return to him or herself-- tends to work harder and longer hours. The free labour of the spouse of the immediate producer in particular, is often a significant aspect of the reduced cost of this production for capital⁴⁵. Ultimately capital can maximize its realization of surplus value.

⁴⁴ See Bernstein, 1982, p. 174,; Clement, 1983, p.226; McMullan, 1984, p.71

⁴⁵ In the fishing industry, unpaid spouses (usually the wife of the fisher) as a rule, undertake a substantial portion of the labour needed to ensure a successful operation. Functioning as a fisher's shore-based "operations manager", they arrange fish sales with buyers, record and pass on crucial market and catch information, do accounting and administrative work, provide transportation to remote ports, arrange for and purchase food supplies, new equipment and repairs, assist in the maintenance of the boat during the off-season and sometimes work as crew, in addition to doing household labour and childcare.

To make the point that it is more profitable for capital to exploit the persistence of simple commodity production than completely subsume them, is not to say that the persistence of simple commodity production is merely a consequence of its being functional for capital. The conditions of accumulation affecting the degree of penetration of simple commodity relations by capital are clearly affected by the ability of simple commodity producers to resist the appropriation of their ownership rights through innovative production strategies and political struggle.

On another level however, it can be argued that the ability of such producers to resist, is delimited by broader structural factors relating to global patterns of capital accumulation and to the level of development of the forces of production. While the conditions under which capital manages to penetrate simple commodity production are affected by struggle or lack of it, these broader material conditions of accumulation determine the boundaries within which struggle occurs. When conditions of accumulation affecting capitalist production change, these can affect the conditions under which simple commodity production continues its existence.

V. The Development of the Forces of Production

The development of the forces of production under capitalism is significant in that it facilitates the intensification of the capital accumulation and the extension of capitalist relations into areas of production, such as

simple commodity production, capital had previously found unprofitable to undertake. The development of the forces of production is made possible by the continual "optimizing" of the combined means of production and labour power used in production⁴⁶. Here, less and less labour is needed to make more commodities as the means of production are replaced with newer ones in which the ratio of technology (constant capital) to labour (variable capital) in the production process increases.

The introduction of new technologies into the production process intensifies bourgeois accumulation by way of the following:

- 1) extending capital's private control over the means of production by replacing labour with privately-owned technology where previously living labour power was used to carry out production.
- 2) permitting the introduction of wage labour in new areas of production,
- 3) increasing capital's control over the labour process itself,
- 4) introducing a division between manual and mental labour in which mental labour becomes increasingly concentrated in the control of management, i.e. capital,
- 5) decreasing the cost of labour by a) replacing workers with technology, b) deskilling workers and c) reducing the costs of supervision,
- 6) increasing the volume, scale and pace of production,
- 7) improving the conditions of valorization of commodities.

⁴⁶ See Cohen, 1978, p.55

Thus, with the introduction of new technologies into the capitalist production process, two main tendencies may be observed: first, capitalist accumulation is intensified as more products are produced more reliably and more efficiently for less; and second, control over the means of production (knowledge, skill and the instruments of production) are more and more concentrated in the hands of the bourgeoisie as capitalist production extends itself into new areas previously unpenetrated by capitalist relations.

As such, the development of the forces of production under capitalism involves more than simply the development of science and technology. *Their development must be understood as equivalent to the development of new forms of production which embody new sets of social relations and imply a new set of consequences for direct producers.*

The introduction of new forms of capitalist production based upon the development of new technologies has important consequences for the persistence of simple commodity producers. These consequences derive from two factors entailed in the development of the productive forces under capitalism: 1) the expanding scale of production, and 2) the increased efficiency⁴⁷ of production.

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⁴⁷ This increased efficiency of production has implications not just for the cheapness of commodities but also for the reliability and quality-control possible in production. Consequently, not only are costs reduced but also capital is provided with an advantage in marketing its products.

Beyond a certain point, the expanded scale of production brought on by the development of productive forces becomes untenable for simple commodity production. This is first, because technologies beyond a certain scale are too expensive for simple producers to acquire and maintain and, second because the increased number of workers required to operate equipment and machinery implies a mode of cooperation which, by definition, is too large to be utilized under simple commodity relations⁴⁸. Consequently, in societies dominated by the capitalist mode of production, the form of production most likely to incorporate such expanded scales of production is capitalist.

New technologies of production put simple commodity producers at a competitive disadvantage with capital⁴⁹. The increased efficiency of new technologies enabled capitalist production to produce commodities more cheaply and to dominate markets formerly serviced by small producers. Consequently, these producers are marginalized or displaced into the wage labour market, losing their ownership rights to the means of production. Capital expands to fill their place.

In its effects on immediate producers and its implications for relations of production, the development of the forces of production can be seen as crucial aspect of the central dynamic of the capitalist mode of production: the

⁴⁸ See Clement, 1983, p. 177

⁴⁹ Ibid.

tendency toward the expansion and intensification of capital accumulation.

How do we account for the development of the forces of production under capitalism? Some writers, exemplified by G.A. Cohen⁵⁰, propose that the forces of production themselves are the driving force behind history⁵¹. The development of the productive forces are seen to evolve because "men" are rational and tend to apply their intelligence to improve their situation which, historically is one of scarcity⁵². That is, the development of productive forces is explained as initially arising independently of relations of production: as a consequence of some innate human "rationality" and an pre-determined "need" to improve their situation.

As other writers have argued, however⁵³, the impetus of technological development under capitalism is too easily fetishized in abstraction from the social relations, as "a thing in itself." Science and new technologies which arise from the application of science to the production process, do not just emerge in abstraction from society. The development of science and technology that serves to enhance the accumulation of surplus value can differ dramatically from that which might arise in other non-capitalist modes of

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⁵⁰ See 1978

⁵¹ In other words, Cohen argues that it is the relations of production in a given society are initially explained by level of the development of the productive forces --"far more" than the other way around [1978, p.134].

⁵² See Cohen, 1978, p.152

⁵³ See McNally, 1986; Harvey, 1982

production or that which can satisfy human wants and needs⁵⁴.

As argued by Poulantzas:

"Science...never exists in its pure form but always in the forms of its appropriation by the dominant class...Technological applications of science are in the direct service of capitalist production, in so far as they serve the development of capitalist productive forces, since the productive forces only exist dominated by the relations of production⁵⁵."

We must ask, what factors govern the particular way in which knowledge (science) and its practical application (technology) are developed under capitalism? In accounting for the development of productive forces, it is necessary to look beyond science and technology to the particular set of relations which spawned these forces in the first place. Rather than abstracting the forces of production from productive relations as does Cohen, it seems more appropriate to do the converse: base our understanding of the development of the forces of production in the context of the particular relations of production in which they are found to emerge. This is not to deny the effect of the development of productive forces on relations of production but rather, to return emphasis to the determining nature of relations of production as primary in our understanding of historical change.

⁵⁴ See Harvey, 1982, p.102

⁵⁵ See 1974, p.236

So, how does the development of forces of production under capitalism derive from the nature of relations of production? What is the driving impetus behind the constant revolutionizing of the forces of production?

In capitalist societies, the means of production of knowledge, and consequently of science and technology, are largely appropriated by capital (or the state acting in the interests of capital). The constant "revolutionizing" of the forces of production results from the continuing efforts of capitalist firms to increase the productivity of labour⁵⁶. As stated by Marx:

"Capitalism has an immanent drive, and a constant tendency toward increasing the productivity of labour, in order to cheapen commodities and, by cheapening commodities, cheapen the worker himself ... The objective of [this increasing] productivity of labour is ... the shortening of that part of the working day in which the worker must work for himself, and the lengthening, thereby, of the other part of the day in which he is free to work for nothing for the capitalist."⁵⁷

Competition from other capitals and struggles by workers demand that capitalist firms must constantly strive to increase the production of relative surplus value to survive. That is, under capitalism, the social relations of production --the relations of ownership between capital, other capitals and labour-- compel capital to maximize the productivity of its forces of production through continual innovation and the incorporation of labour-power into machines which can be owned

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⁵⁶ Ibid. p.120

⁵⁷ See 437-8, p.1977

and controlled by capital: this innovation is expressed in the impetus toward the continual development of science and technology. The incorporation of new science and technology into the production process is expressed in the emergence of new forms of production and as a direct result, makes possible the intensification and expansion of capital accumulation through the ongoing alteration of relations of production.

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Of course, new forces of production do not just appear, emitted mechanically on demand by capital to fulfil the needs of accumulation. It is therefore worthwhile asking, what factors mediate the particular way in which the forces of production develop under capitalism? Again, however, when we discuss the development of the forces of production, what is significant is not just the new knowledge and technologies which are deployed, but the new forms of production these imply and the productive relations they embody. Thus the question really being asked here is: why under capitalism, do new forms of production --embracing new scientific knowledge and new technologies-- tend to emerge in the particular way they do, at particular points in history?

We can begin to understand the factors governing the particular way in which the forces of production (and the relations they entail) are developed, by examining the

changing global and local conditions of accumulation⁵⁸ affecting capital in a given situation. These conditions of accumulation encompass various changing social and material conditions of production, including struggles by workers and the competitive efforts of other capitals which result in various crises and obstacles to accumulation for capital. In exploring the impact of such conditions on the development of the forces of production, however, it is crucial to account for the role of the capitalist state.

The capitalist state plays a key role here in that it attempts, through intervention, to mediate the obstacles and crises experienced by capital related to changing conditions of accumulation. By doing so, the state mediates the development of the forces of production and the emergence of new forms of production based on them.

How does the capitalist state mediate the development of the forces of production and the relations of production entailed by them? To answer this it is necessary to provide an account of how and why the capitalist state intervenes in society in the first place. In providing an account of this I incorporate aspects of the perspective of Joachim Hirsch and supplement it with some of the insights offered by Poulantzas and Gramsci.

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⁵⁸ By conditions of accumulation I mean to include the struggles of the various classes and class fractions in addition to the material conditions of production experienced by capital.

Hirsch, in his derivationist approach, sees the capitalist state as playing a key role in reproducing the capitalist mode of production. He argues that the state is key in that it acts to guarantee and secure the external conditions necessary for the continuation of capitalist accumulation and bourgeois political domination.

The form of the state, for Hirsch, is derived from the necessity, under capitalism, of abstracting relations of force from the immediate process of production. The state, consequently serves as an authority 1) removed from the economic production process, appearing as independent and neutral, but yet 2) vested with "legitimate" means of coercive power. As such, the state performs functions that cannot be fulfilled by individual private capitals.

For Hirsch the primary mechanism determining this role and linking state action with the interests of capital is "institutional self-interest." Under capitalism, both state expenditure and state legitimacy are largely dependent on a healthy economy; *under capitalism, this means a healthy capitalist economy.*

There are two reasons for this particular relationship between the state and the capitalist economy. First, state expenditure is dependent on revenues drawn from the surplus generated within the capitalist economy (Jessop, 104). Second, the state's ability to legitimize itself is linked to continued capital accumulation because the health of "national

economy", to which the well-being of all sectors of society are tied (both in real terms and ideologically), is seen to be the responsibility of the state. The state thus depends on the capital accumulation process (and hence bourgeois political domination) as a pre-condition to its own functioning and existence: it acts to ensure its own continuity.

Complementing this basic structural determinant of state action is the fact that governing groups in charge of the political system have a vested interest in their own reproduction as "people living off politics"⁵⁹. The basic pre-condition to the securing of this interest is the maintenance of capital accumulation and bourgeois political domination.

For Hirsch the key factor conditioning and shaping the particular content of state intervention in capitalist society is the tendency of the rate of profit to fall (TRPF). This tendency for the rate of profit to fall is seen to arise from the continuing technological transformation of production and the struggles of capital and labour. This process serves as the basis for a continuing crisis and collapse of capital accumulation experienced by capital.

In the account of the state used in this thesis however, I wish to avoid any broad postulations or projections about the direction of tendencies of the rate of profit. Whether or

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⁵⁹ See Jessop, p. 104

not these crises in conditions of accumulation are ultimately rooted in the TRPF and the rising organic composition of capital is beyond the scope of what I wish to consider. What I do find useful for my analysis is not so much Hirsch's emphasis on the TRPF per se, but his accounting of the relation of state action to continuing crises and modulations in conditions of accumulation.

Hirsch explains that,

"crisis erupts when the amount of surplus-value appropriated by individual capitals is no longer sufficient to maintain the necessary rate of accumulation (so that) the existing mass of surplus value can no longer be profitably capitalized." [That is], "when existing conditions of exploitation (ie. the value relation of dead and living labour, rate surplus value, etc.) preclude a further profitable capital expansion..."⁶⁰.

For the purposes of this thesis, the "conditions of exploitation" as presented by Hirsch will be interpreted in a broad rather than narrow manner. That is, they will be seen to include the whole range of conditions of production deriving from intra and inter-class struggles, conflicts and competition -- which affect crises in the process of accumulation.

The state intervenes to counteract these crises of accumulation through developin_g, and mobilizing countertendencies which are directed toward the reorganizing of the production process and relations of production. Here,

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⁶⁰ See Hirsch, p.73

...the real course of the necessarily crisis-ridden process of accumulation and development of capitalist society decisively depends on whether and in what manner the necessary reorganization of the conditions of production and relations of exploitation succeeds."⁶¹

Following Hirsch, the state's particular role in reproducing the capitalist mode of production and counteracting crises of accumulation can be seen to involve the following functions:

1) The administrative redistribution of revenue for the purpose of a) sustaining and reproducing and b) pacifying wage-labour and its reserves. This form of 'welfare state' intervention arises from the increasing political and economic strength of the working class. It is a means of ensuring that the accumulation process continues without disruption.⁶²

2) The securing of general external conditions of production as a means of protecting the interests of particular individual or groups of monopoly capital against the encroachments of other "nationally" based capitals. "The state here becomes a direct instrument and object of monopolistic competitive struggle."⁶³

(3) The provision of infrastructural services which are primarily oriented towards making possible the development of the productive forces and the transformation of the labour process is probably the most crucial area of state

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⁶¹ Ibid., p.74

⁶² Ibid., p.84-85

⁶³ Ibid., p. 85

intervention. This involves furnishing conditions of production that fulfil "the basis and pre-condition of technological changes in the labour process which increase the productivity of labour and the speed of circulation of capital."⁶⁴

As crises of accumulation are ultimately a result of the complex interaction of competing and/or conflicting forces (inter- and intra-class conflict), the mobilization of countertendencies by the state, for Hirsch, must also be seen as inextricably related to the changing balance of class forces at different levels of society⁶⁵.

The measures needed to promote capital accumulation and counteract crises often involve interventions which threaten and upset the position of various class forces (among both the capitalist class and the proletariat)⁶⁶. Consequently, state interventions are not a smoothly-calculated response to the objective needs of reproduction but rather a crisis-ridden process of reaction and mediation.

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⁶⁴ Ibid., p. 93

⁶⁵ See Jessop, p.103

⁶⁶ As the concentration and centralization of capital advances, state interventions, while in form promoting the conditions of production for "capital in general", in practice, are increasingly directed towards the needs of specific capitals or specific capital groups. Increasing competition between fractions of capital creates increasing pressure for the state to "promote measures which are in the particular valorization interest of particular monopoly capital but which conflict with the reproduction requirements of capital as a whole [Hirsch, 1978, p.95].

Crises in political class domination may arise in the form of the following: 1) inter-fractional conflict over the advantages accruing to particular capital over others, 2) struggles emanating from the working class and/or concomitantly, failure to maintain conditions amenable to their pacification and containment and, 3) overall disruptions in capital accumulation resulting from events such as the destruction of natural resource bases of material production and social reproduction⁶⁷.

The state is forced to react to and mediate the threats, demands and needs of class forces in a way such that it contains conflict and maintains social cohesion⁶⁸. These conflicts must be kept at a level which does not disrupt the production process and threaten continued bourgeois political domination. The state's economic interventions are here, "overdetermined by the need to maintain political class domination."⁶⁹

Countertendencies to crises of accumulation therefore not only involve the securing of the economic conditions of capitalist reproduction but must also include the organization of hegemony: that is, 1) the continued cultivation of the 'consent' of subordinate classes to bourgeois domination and 2) the unification of dominant fractions and classes into a cohesive power bloc.

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⁶⁷ See Hirsch, p.95

⁶⁸ See Poulantzas, 1974, p.78

⁶⁹ See Jessop, p. 103

As a consequence of this pre-condition of the state's existence -- the need to maintain hegemony -- the state requires a certain relative autonomy from society⁷⁰. This relative autonomy gives the state bureaucracy the appearance of a neutral arbiter of the interests of the different classes and social forces, thereby freeing it to participate in the negotiation of hegemony. As "neutral" arbiter, it is the task of the state bureaucracy to cultivate the 'consent' of the subordinate classes to bourgeois rule through appeals to the need for a compromise with the broader "common" or "national interest" -- above and beyond the interest of any particular group.⁷¹ Hegemony is achieved by tying in the interests, experiences and aspirations of the subordinate classes and class fractions with that of a "common interest" which does not sacrifice the needs of capital accumulation and bourgeois political domination. This common interest is represented by the capitalist state in terms such that a broadly accepted problematic, for instance, the "health of the national economy", is formulated in a way that "privileges" a certain definition of "healthy economy." Here, the economy to be improved is the capitalist economy and it is consequently ensured that if and when state intervention takes place, whomever may or may not gain, capitalist interests are least likely to lose.⁷²

⁷⁰ See Poulantzas, 1978, p. 127

⁷¹ See Mahon, 1984, p.169

⁷² Ibid., p.172

So then, how does the state mediate the development of the forces of production? Through its interventions to promote capital accumulation and counteract crises of accumulation, the state creates conditions amenable to the development of the productive forces and new forms of capitalist production based upon them. The state, however, is also constrained in its actions in that it has to balance the impacts of its interventions against the response of the various class forces. It must mediate and contain struggle by cultivating a consensual balance among class forces which are compatible with bourgeois political domination.

The mediation of the development of the forces of production provided by the state is therefore not mechanically carried out in accordance with some inscrutable logic of capitalism. The state must itself respond to changing conditions of accumulation relating to inter- and intra-class struggles within a dynamic generated by relations of production and the contradictions these relations entail under capitalism.

Ultimately, an understanding the role of the state as mediator of struggle is crucial to understanding the emergence of new forms of production in areas like the west coast fishing industry.

CHAPTER 3: SALMON AQUACULTURE: SOCIAL RELATIONS.

Commercial salmon aquaculture or "fish farming" first appeared in British Columbia in the late 1970s. The numbers of these operations remained few --less than 10-- until 1985, when, with increases in state support and the timely introduction of significant amounts of Norwegian expertise and financial capital, their numbers began to multiply rapidly. This rapid growth has continued until the present. By the end of 1988, there were 207 salmon farms licensed for operation with still another 232 license applications pending. In this way, in less than four years the amount of capital invested in B.C. salmon aquaculture has risen from less than 10 million to an estimated 500 million dollars⁷³.

The emergence of this new form of salmon production has important ramifications for overall development of relations of production in the B.C. salmon industry. This chapter attempts to document the implications of salmon aquaculture for relations of production in the salmon industry with a particular focus toward assessing what its effect will be on small fishers and small processing capital in the fresh/frozen salmon sector.

The first section of this chapter describes salmon aquaculture production, detailing the nature of the product, product markets and the material setting of production.

⁷³ This includes investment in fish, which in B.C. are legally considered to be inventory and are, therefore, also part of capital stock. Library of Parliament, January 1988, p.2. Also The Fisherman, March 25, 1988, p.10.

The second section of this chapter examines how salmon aquaculture production has in fact developed within the British Columbia salmon industry. Here, I argue that salmon farming has emerged unambiguously as a form of capitalist production. Moreover, I show that it is one which is presently dominated by large-scale and foreign capital while at the same time, steadily becoming more concentrated in ownership and increasing in scale of operation.

I. What is salmon aquaculture?: Material Setting.

This section describes the actual material setting of salmon aquaculture in terms of the production process and the various support infrastructures involved.

Salmon aquaculture can be defined as the "cultivation of salmonoid fishes using artificial reproduction methods and husbandry techniques." The biological sensitivity of salmon require that farming operations be established in relatively sheltered locations with steady tidal flushing, cool temperatures and an absence of pollutants. The British Columbia coast with its long, deep inlets and heavy tidal flows, is particularly well-suited to satisfy these conditions.

In British Columbia, the major species of salmon cultivated are Chinook, Coho (native to the Pacific) and Atlantic salmon (from broodstocks imported from Europe or the east coast of Canada). The commodity produced by the

Salmon Aquaculture Operations in British Columbia

cultivation of these fish is fresh salmon, the production of which is directed at the world's luxury fresh fish markets and to a lesser extent, frozen fish markets⁷⁴. The main customers in these markets are restaurants, specialty seafood stores and retail supermarket chains in Japan, United States and Europe. In these markets there is a premium on quality, the earmarks of this being that fish must be of a premium species, well-handled and fresh.

Historically, B.C. salmon wholesalers have taken advantage of the proximity of the large U.S. markets for the major proportion of their fresh/frozen fish sales. The advent of salmon aquaculture on a large scale in British Columbia has meant an increased focus on these U.S. markets, especially in the light of increased competition on European markets from other European countries (chiefly Norway) producing farmed salmon. Currently, almost 70 percent of British Columbia's aquaculture production is exported to the United States.

World salmon aquaculture production increased from 5 thousand tonnes in 1980 to over 84,000 tonnes in 1987. This total is predicted to continue to grow to 172,000 tonnes by 1990 and 358,000 tonnes by 2000. Countries now producing farmed salmon include Norway, Scotland, New Zealand, United States, Chile and Japan. Until now, Norway has been the world's leading

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⁷⁴ While the greater emphasis is placed on the production of fresh fish, which is preferred over frozen, in 1988, renewed market competition and recurring gluts forced Norwegian aquaculture companies to freeze an average of 15% of their production. This figure is expected to increase as competition intensifies.

supplier of fresh farmed salmon, producing 47,000 tonnes worth 500 million dollars in 1987 compared to approximately 1000 tonnes in British Columbia worth 10 million. Given current inventories, farmed salmon production in British Columbia is predicted to equal or surpass the fresh/frozen fish production of the B.C. wild fishery of 14,000 to 18,000 tonnes. B.C. aquaculture production of salmon is expected to reach 20,000 tonnes by 1990 and 30,000 tonnes by 2000⁷⁵.

Aquaculture salmon production is best described as comprised of several distinct stages. These involve 1) obtaining eggs from mature wild or domesticated salmon, 2) fresh water incubation of eggs and raising eggs to smolts in hatcheries, 3) transfer of smolts to sea-based "grow-out" farms and raising them to maturity, 4) processing and 5) distribution. These production stages and the different industry sectors and infrastructures with which they correspond are described below.

A. The Salmon Farm

The salmon farm --the basic unit of production in salmon aquaculture-- is generally comprised of a system of floating net-cages⁷⁶ anchored offshore (or in a few cases, land-based tanks) in which the salmon are confined. Usually a worker

⁷⁵ See The DPA Group, Worldwide Farmed Salmon Production Forecasts to the Year 2000, March 1988, p.3.

⁷⁶ The net-cages are generally comprised of nets suspended 15 to 50 meters deep from steel frames and surrounded by walkways. Each cage is linked to the others so that on the surface they appear as a system of cell-like structures.

SALMON FARM FLOAT AND NETPEN

Source: *Aquaculture in BC: Getting Started*. Province of British Columbia, Ministry of Agriculture and Fisheries; May 1986.

residence and utility and storage warehouse is located on a nearby barge or onshore. Depending on the stage of production, from five to eight full and part-time on-site and management employees are required to operate the farm efficiently.

The actual farm site (an area of water) is leased from the provincial government and is subject to licensing and regulation by both federal and provincial governments. The firm leasing the site pays a set annual rental fee to the provincial government on the basis of number of hectares leased⁷⁷.

The production cycle of the salmon farm begins with the delivery of salmon smolts (baby salmon 5 to 12 months old) from a hatchery. The fish are cared for over a period of 2 to 5 years until they are harvested at a weight of 2 to 8 kilos (this being determined by the species of fish being cultivated). During this growth period, the sea-cages and the fish in them are constantly monitored for algae, plankton blooms (a potential threat of fish suffocation), disease, predators and various other threats.

The growth rate of the fish are accelerated through various procedures involving sexual modification, hormones, genetic selection and special diets. Feeding is manual or automated, the salmon diet being comprised of pellets made from herring or other low-grade fish sources. These pellets also contain the various control substances --antibiotics,

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⁷⁷ In 1987, this annual fee was 565 dollar per hectare.

hormones and synthetic pigments-- which regulate the health, growth, maturation and flesh colour of the fish⁷⁸.

In general, most salmon are harvested over the non-summer months in conjunction with the end of the wild fishery and diminished biological growth rates. The harvesting operation is staggered over a period of time according to customer demand and salmon maturation.

There are several different harvesting practises. Many firms sell their fish straight from the sea-pens to an established fishing company which will transport the fish to the companies facilities for processing and marketing. Other farms stun and bleed their fish before shipping them off to processors and still others slaughter and process their fish on site.

Salmon farming is not possible without certain key inputs, like smolts from hatcheries, veterinary services, research, feed manufacturers and sea-cage makers. These specialized support infrastructures and attendant expertise exist in British Columbia in varying states of development. The most important of these infrastructures, mentioned above, is the hatchery.

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⁷⁸ See Fish Farming International. December 1987, p.21. Whereas, initially shrimp shells were used as a source of pigments these have been replaced by synthetic carotenoid pigments.

operation is that it gains access to a source of capital or financial backing and to established markets and distribution systems.

Although the full amount of production subject to such farm-site/processor marketing arrangements is unknown, three indications as to their extent are (1) that four of the largest farming companies with 40% of total production capacity are participants in such schemes, (2) that in the 1986-1987 production year, one of the above-mentioned processors --McMillan Fisheries-- marketed over 20% of B.C.'s farmed salmon despite the fact that it did not have any farm sites yet in production⁹³ and (3) a 1988 British Columbia Salmon Farmers' Association (BCSFA)⁹⁴ survey which elicited responses from approximately half the B.C. salmon farming industry⁹⁵, reported that 32% of planned production for 1988-1989 had been contracted to B.C. processors.

1988; PR Newswire Services, Canadian and U.S. Seafood Interests Join Forces. March 9, 1988.

⁹³ Canadian Aquaculture No. 50, December, 1988, p.42; Rick Deegan, Ministry of Agriculture and Fisheries, Pers. comm.

⁹⁴ The British Columbia Salmon Farmers' Association is the main industry organization representing salmon farming business interests in British Columbia. It is funded by its membership but has also received major subsidies from the federal department of Fisheries and Oceans. See Chapter 5, p. 137.

⁹⁵ See BCSFA, The 1988/1989 Production Forecast Study. A total of 44 companies participated in the study. In 1988 there were between 80 and 90 companies participating in the BC salmon farming industry. Twenty companies not included in the BCSFA survey results were reported to be mostly smaller companies (non-responses), while the rest were not members of the BCSFA (and thus, not included in the survey). Since it is not known who was excluded from the study, it is impossible to tell how far 32% is from the actual amount of production contracted out to processors. It therefore must suffice as a minimum figure.

stated plans to become self-sufficient in eggs in the near future through the further development of domesticated broodstocks. In this case, it can be expected that salmon aquaculture practises will come to resemble those of industrial animal husbandry, where gene pools are controlled though the private ownership of breeding stock.

C. Other Infrastructures

A second, critical infrastructural service upon which salmon aquaculture is dependent, is the area of veterinary services. Over the 2-5 years it takes to go through a normal cycle of production, an outbreak of disease can devastate hatchery and farm stock. The ability to detect and control such outbreaks can make the difference between bankruptcy and profit⁷⁹. Currently, mortality rates among salmon farms average around 30% to 60%⁸⁰. The more this figure is reduced, the more profitable farming will become.

Veterinary services and related research, at this point, are mainly conducted and provided by the federal DFO, although there are increasing numbers of farming corporations and private companies entering the field. For many common diseases, like bacterial kidney disease (BKD) or vibrosis,

⁷⁹ Cultivation in hatcheries and net-cages force salmon to live together in artificially high densities. This has been shown to lead to higher mortality rates due to increased incidences and accelerated transmission of diseases which in the wild would be moderated by lower densities, natural predation and lower stress levels. Furthermore there is the ever present danger of new diseases being imported into Canada through the importation of eggs from Europe.

⁸⁰ See DPA Group, 1986, p.8-5.

effective solutions and controls have still yet to be developed. Disease screening services and veterinary pharmaceuticals have become increasingly important component of reducing mortality rates among farmed stock.

Other infrastructures needed for salmon aquaculture production are supply inputs like feed and equipment manufacturers. Feed constitutes the largest single operating cost of a salmon farming operation --often comprising 40% to 60% of annual operating costs. In British Columbia, there are several feed mills operating within the province but most production is supplied three major operations which are controlled by large domestic fish processors or Norwegian capital.

Equipment like sea-cages, feeders, anchoring systems, barges and boats is generally supplied by local manufacturers or imported from Europe. Imported equipment is up to 60% more expensive than that manufactured domestically but is generally purchased as an obligatory condition of receiving financial aid from Norwegian or other established capital.

II. Salmon Farming in British Columbia: Social Relations.

This section discusses the relations of production in the B.C. salmon aquaculture industry as they have developed in the late 1980s. I first discuss capital formation, showing how the industry is dominated by large-scale capital and characterized by extensive vertical integration. Second, I discuss

the organization of production and describe how it employs a division of labour characteristic of capitalist relations. Finally, I discuss the extent to which capital dominates the industry in terms of concentration of ownership and control. I show how this concentration has increased significantly in the last few years since the industry's inception.

A. Capital Formation

Aquaculture, in British Columbia, in contrast to other fisheries-based forms of fresh/frozen salmon production, has developed over the past decade as a predominantly capitalist form of production. Petty commodity production is generally not represented in the B.C. salmon aquaculture industry. Until 1984, there were a number of what appeared to be small-scale, family-run salmon aquaculture operations in British Columbia. Their status as "petty commodity producers" however, was somewhat questionable. The small-scale farms in operation during the late 1970s and early 1980s were often largely experimental and would have been of doubtful commercial viability if not for generous backing from corporate sponsors, the state and other external sources⁸¹. This type of "petty commodity production" has since all but disappeared from the farming industry. Of the nine such farms operating in 1984, only three are reported to remain⁸². The rest have either gone out of business, expanded with help from

⁸¹ See Science Council of British Columbia, 1985, p.18-19.

⁸² See Canadian Aquaculture, July/August, 1988.

their corporate sponsors or have been taken over by larger capitalist firms, often Norwegian-backed.

While no comprehensive data is available on the origins, types and sizes of capitalist firms investing in B.C. aquaculture⁸³, two things are clear: (1) most investment is by large foreign transnationals and that (2) there is a high degree of vertical integration between the various sectors of production within the industry.

Although a number of the transnationals initially investing in B.C. aquaculture were well-established North American firms (e.g. Rockefeller International, Union Carbide, Campbell's Soup Company, Scargill and Kaiser Resources), most investment has initially come from Norwegian-based firms. A survey in 1986 by the DPA Group⁸⁴, concluded that 50% of the capital in the industry was controlled by foreign interests, with over 90% of this being Norwegian⁸⁵. Overall DPA

⁸³ Foreign investment in the B.C. salmon aquaculture industry is essentially unregulated and is subject to no formal reporting requirements. See Bjorndal and Schwindt, 1987, p.23. ; Also Deegan, Pers. comm., February 1988.

⁸⁴ DPA, 1986, p.6.

⁸⁵ BC Business Magazine, October, 1987, p.27; Bjorndal and Schwindt, 1987, p.23; Also Gilje [See 1986, p.1], who states that in 1986, 100 of 172 farms operating or planned were backed by Norwegian interests. According to the British Columbia Salmon Farmers' Association (BCSFA) [See Library of Parliament, January 1989], the overall proportion of Norwegian capital invested in B.C. aquaculture has decreased somewhat since 1987. This is a consequence of the increased confidence of domestic capital in salmon aquaculture.

estimated Norwegian investment to represent 40% of the total capital investment in the industry⁸⁶.

Norwegian companies investing capital in British Columbia include Sea Farm International, Noraqua, Royal Seafoods, Hagensborg Technologies Inc and A/S MOWI --currently the largest fresh fish exporter in the world. A study by Bjorndal and Schwindt⁸⁷ reveals that most of these companies are well-established in the Norwegian aquaculture industry with varying interests in supply, production and marketing. Table 1 below gives an indication of these company's aquaculture investments in 1987. Several of the same firms are concurrently involved in aquaculture ventures in other countries like Scotland, Chile and New Zealand.

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⁸⁶ The level of Norwegian capital invested is said to have declined over the past year as Canadian investors gain confidence in the industry.

⁸⁷ See Bjorndal and Schwindt, 1987 p.23-25.

TABLE 1: Norwegian Participation in British Columbia Aquaculture, 1986⁸⁸.

<u>Company</u>	<u>Sector</u>				
	Equipment	Feed	Hatchery	Farm	Distribution
Sea Farm	-	-	*	*	*
MOWI	-	-	*	*	*
SAGA	-	-	*	*	*
Noraqua	-	-	*	*	*
Royal Seafoods	-	*	*	*	*
Norwegian Enterprises	*	-	*	*	*
Undertun	*	-	-	*	-
BP Nutrion	-	*	-	-	-
EWOS	-	*	-	-	-
Oppdrettsservice	*	-	-	-	-
ATI	*	-	*	*	*

Norwegian firms participating in the B.C. aquaculture industry have generally opted for joint ownership or direct investment in existing Canadian firms. This type of arrangement has been attractive to Canadian firms because of (1) the expertise and prior experience of the Norwegians and (2) the willingness of Norwegian companies to provide startup and operating capital.

According to Bjorndal and Schwindt⁸⁹, the participation of Norwegian firms in such arrangements is typically

⁸⁸ Ibid, p.29.

⁸⁹ Ibid, p.28.

predicated on agreement with the following items. First, the acquisition by the Norwegian company of operational control of the farming operation⁹⁰. By operational control is apparently meant overseeing day-to-day production and the right to set guidelines for production. Second, the obligation that the farming operation purchase equipment, supplies and often eggs through the Norwegian parent firm (typically at a price 50% to 60% higher than that for comparable Canadian-made goods⁹¹). A third condition of Norwegian backing in cases where the Norwegian parent company had marketing interests, was Norwegian control over the marketing of the farm's fish.

Also investing money are some of Canada's largest domestic fish-processing companies. These include names like B.C. Packers, Canada Packers, National Sea Products and J.S. McMillan. Some of these companies, like Canada Packers, have entered into joint ventures with Norwegian firms, while others have bought into existing companies or started their own grow-out facilities. However, as with the Norwegians, these companies have been interested in more than just ownership of farming operations: their investment activities have also been directed toward securing control over the supply of fish produced by farms.

That is, in addition to acquiring shares in fish farm assets, these large processors have been pursuing and securing

⁹⁰ Ibid, p.28.

⁹¹ See Bjorndal and Schwindt, 1987, p.31; Dale Blackburn, General Manager, SeaFarms, Pers. comm.; Gary Nakashima, Vice-President, Pacific Net & Twine, Pers. comm.

marketing agreements with both large and small independent fish farms. Examples of companies participating in joint marketing agreements are B.C. Packers and Royal Pacific Sea Farms, J.S. McMillan and Hardy Seafarms, National Sea and Pacific Aquafoods, and Bornstein Seafoods (U.S.A.) and Hagensborg Resources. These eight farming and processing enterprises are among the largest in North America. In such agreements, the financial support provided by the processor generally involves purchasing up to 50% of the shares in a farm operation and/or, where smaller farming operations are involved, payment of up to the entire cost of growing fish to marketable size.

In the latter cases, the net "profit" made by the farm on the sale of fish to the processor is generally split between the processor and the farm (that is, a portion of the profit is returned to the processor).

Above and beyond such "profit-sharing", the reward for the processor is two-fold: (1) the arrangement guarantees the processor exclusive supply and marketing rights to a farm's fish; (2) the processor gains a certain amount of control over the production process (through "quality control") and over the decision of when to sell. This latter control is exercised by the processor through the monitoring of "quality control" and fish health, and by advising the farming operation on when to sell⁹². The advantage for the farm

⁹² Canadian Aquaculture, December 1988, p.42.; Interview with fish farmer, June 1988; BC Packers, Internal Memo, December

operation is that it gains access to a source of capital or financial backing and to established markets and distribution systems.

Although the full amount of production subject to such farm-site/processor marketing arrangements is unknown, three indications as to their extent are (1) that four of the largest farming companies with 40% of total production capacity are participants in such schemes, (2) that in the 1986-1987 production year, one of the above-mentioned processors --McMillan Fisheries-- marketed over 20% of B.C.'s farmed salmon despite the fact that it did not have any farm sites yet in production⁹³ and (3) a 1988 British Columbia Salmon Farmers' Association (BCSFA)⁹⁴ survey which elicited responses from approximately half the B.C. salmon farming industry⁹⁵, reported that 32% of planned production for 1988-1989 had been contracted to B.C. processors.

1988; PR Newswire Services, Canadian and U.S. Seafood Interests Join Forces. March 9, 1988.

⁹³ Canadian Aquaculture No. 50, December, 1988, p.42; Rick Deegan, Ministry of Agriculture and Fisheries, Pers. comm.

⁹⁴ The British Columbia Salmon Farmers' Association is the main industry organization representing salmon farming business interests in British Columbia. It is funded by its membership but has also received major subsidies from the federal department of Fisheries and Oceans. See Chapter 5, p. 137.

⁹⁵ See BCSFA, The 1988/1989 Production Forecast Study. A total of 44 companies participated in the study. In 1988 there were between 80 and 90 companies participating in the BC salmon farming industry. Twenty companies not included in the BCSFA survey results were reported to be mostly smaller companies (non-responses), while the rest were not members of the BCSFA (and thus, not included in the survey). Since it is not known who was excluded from the study, it is impossible to tell how far 32% is from the actual amount of production contracted out to processors. It therefore must suffice as a minimum figure.

The private production, purchase and sale of salmon eggs and salmon broodstock is another key aspect of the new industry. Before 1980, no private salmon hatcheries were licenced to operate in British Columbia. By 1985 however, there were 5 such hatcheries, and by 1987, the number of private hatcheries operating in B.C. had risen to a total of 38⁹⁶ and in 1988, 47⁹⁷. Over half of these hatcheries are vertically integrated with farming operations. The large economies of scale necessary to ensure commercial viability in independent hatcheries⁹⁸ mean that nearly all private hatcheries are controlled by the larger companies, which often own two or three hatcheries. These companies sell their smolts to other companies without hatchery facilities.

According to figures provided by Allan Kenney of the British Columbia Salmon Farmers Association, four companies accounted for nearly 70% of smolt production in the industry in 1988⁹⁹. The largest smolt supplier in the industry, Royal Pacific Sea Farms, currently controls three hatcheries with production capacity of 12 million smolts, nearly 20% of the entire industry production capacity (65 million smolts) and over 40% of the current production (28 million smolts)¹⁰⁰.

⁹⁶ See Canadian Aquaculture, July 1988, p.11.

⁹⁷ Geoff Meggs, The Fisherman, Pers. comm.

⁹⁸ Reported to be a production capacity of 800,000 smolts. An minimal production 100 tonne farm needs 50,000 smolts per year.

⁹⁹ Allan Kenney, BCSFA. Pers. comm. May 12, 1989.

¹⁰⁰ See Aquaculture Digest. February, 1988. p.23.

In the future, aquaculture technology offers capital the possibility of exclusive control over salmon reproduction. Between 1981 and 1986, 95% of the salmon eggs used by the salmon farming industry were supplied through the Department of Fisheries and Ocean's salmon enhancement program¹⁰¹. Through the development of breeding programs, it is expected that private hatcheries will replace the state as the source of genetic materials¹⁰² by 1990 and control over these materials will pass from the state to capital. Currently, there are indications that the federal government is even now considering the sale of state hatcheries to private interests. Over the past few years, the state has contracted out the management of eight state hatchery operations to private interests and there are some reports that these operations may even be completely privatized¹⁰³. With the capital-intensive nature of hatchery production and the private ownership of salmon reproductive materials in aquaculture, capital is clearly in an advantageous position to establish a monopoly over the biological materials necessary for salmon production.

B. Organization of Production

In the actual salmon farming operation itself, workers generally do not retain rights of *economic ownership* or

¹⁰¹ See Department of Fisheries and Oceans, Fisheries and Oceans Research Centres: Economic and Technological Benefits, 1988, p.30.

¹⁰² See Canadian Aquaculture, July 1988, p.11.; Also The Fisherman, July 15, 1988, p.7.

¹⁰³ See The Fisherman, July 15, 1988, p.11.

possession over the means of production. Aquaculture entails an explicit division of labour --between manual and mental labour, workers and management, low-skilled labourers and specialists-- which replaces the skilled crew of the fishing vessel. This particular division of labour derives from the technology-intensive nature of aquaculture production. First, much of the knowledge needed to farm salmon is built into the aquaculture technology owned by capital. Second, the required knowledge and skills for deploying the technology to be concentrated in the hands of management rather than in the hands of workers. Overseeing the division of labour between management and workers, are the owners of capital. The capitalist farm firm and its sponsors exercise ultimate control over how capital shall be invested in production, the way in which the products of labour shall be disposed of, how value will be re-invested and retains control over the pace and content of the production process.

In 1987, the salmon farming industry in British Columbia directly employed some 570 people full-time and about 230 people part-time (not including workers in hatcheries). On average, salmon farm-sites in British Columbia employed 1 administrative, 4 full-time and 2 part-time workers¹⁰⁴. Given that most aquaculture firms own more than one farm and that several also own hatcheries, the number of workers employed is higher for individual companies: an average of approximately

¹⁰⁴ See Ministry of Agriculture and Fisheries, Aquaculture Information Bulletin, No. 18. 1987, p.2.

10 employees per company (there were 77 companies). The average hourly wage among farmworkers in 1988 was estimated to fall somewhere between \$4.25 and \$8.00 per hour¹⁰⁵. This is well below the average provincial hourly wage, which in 1988 was \$11.62¹⁰⁶.

The category of "administrative" worker reflects the existence of a "managerial class" under whose authority the control and direction of the production process is carried out for capital. There is a division of labour on farms such that for most workers, tasks tend to be low to medium skilled involving feeding fish, moving fish, monitoring fish, predator control, checking, changing and cleaning nets and harvesting. Management of the business, deciding on the purchase of inputs, when to harvest, when and where to sell the fish, re-investment of profits and more scientific tasks like interpreting data, prescribing veterinary services or calculating changes in diets, are carried out by management and specialized "consultants" hired by capital.

C. Concentration of Capital

The B.C. aquaculture industry is still in a state of rapid growth and consolidation. Since aquaculture first established itself, the volume and scale of production controlled by individual companies within the industry has

¹⁰⁵ B.C. Ministry of Fisheries and Agriculture, Pers. comm. February 1, 1988; See BCSFA, in Library of Parliament, December 1988.

¹⁰⁶ Globe and Mail, February 1, 1988, p.B1

increased tremendously. This change is indicative of both (1) rapidly increasing horizontal integration in the industry via the concentration of ownership and control of farm-site licences in the hands of a few large companies and (2) significant increases in the size of the operations run by these companies.

Although initially characterized by single farm operations, the aquaculture industry has quickly become dominated by large-scale operations in which the production of several farm sites is controlled by a single enterprise which often also owns hatchery and processing facilities. This process of consolidation is reflected in the increase in the percentage of farm-site permits held by large multiple-farm companies between 1985 and 1988. While in 1985, only 9% of operating farm-site permits in British Columbia were owned by large multiple-farm companies, this number increased to 18% in 1986, to nearly 50% by the end of 1987, and to over 70% by the end of 1988 (see Table 2).

TABLE 2: Percentage of Salmon Farm Sites Controlled by Multi-site Companies, 1985-1988¹⁰⁷.

<u>Multi-site Companies</u>	
<u>Year</u>	<u>% Sites Controlled</u>
1985	9%
1986	18%
1987	50%
1988	70%

Another way of looking at the trend toward concentration of control is to examine the increasing number of farm sites owned by the largest companies in the industry. In December 1987, the ten largest companies described in Table 3, owned outright, 26% (40) of the total of 151 farm-site licences issued. This was an average of 4 farm-sites each. By January 1989, the largest 10 companies owned 38% (77) of 207 licences. In one year the largest 10 companies in the industry have doubled their holding to an average of nearly 8 farm-sites per company.

If our focus is narrowed to the four largest companies, the tendency toward concentration of ownership is even more pronounced. In 1987 the four largest companies owned 15% (24) of a total of 151 farm-site licences --an average of 6 farm-

¹⁰⁷ See DPA Group, Industrial Organization of the B.C. Salmon Aquaculture Industry. September, 1986 p.4.; Rick Deegan, B.C. Ministry of Agriculture and Fisheries, Pers. comm., February, 1988; Brenda Dickson, B.C. Ministry of Agriculture and Fisheries, Pers. comm. April, 1989.

sites each. A year later, in 1988 the four largest companies owned 22% (45) of the total of 207 farming site licences issued. This is an average of over 11 farm-sites each.

TABLE 3: Concentration of Ownership, 1987-1988¹⁰⁸.

<u>Largest 4 Companies</u>		
	<u>1987</u>	<u>1988</u>
Percentage of Sites	15%	22%
Average No. of Sites Each	6	11
Share of Total Prod. Capacity	34%	38%
<u>Largest 10 Companies</u>		
	<u>1987</u>	<u>1988</u>
Percentage of Sites	26%	38%
Average No. of Sites Each	4	8
Share of Total Prod. Capacity	not available	44%

As important as the number of site licences in affecting the concentration of ownership in the industry, is the concentration of production capacity. In 1987, the 4 largest

¹⁰⁸ See DPA Group, Industrial Organization of the B.C. Salmon Aquaculture Industry. September, 1986 p.4.; Rick Deegan, B.C. Ministry of Agriculture and Fisheries, Pers. comm., February, 1988; Brenda Dickson, B.C. Ministry of Agriculture and Fisheries, Pers. comm. April, 1989. By production capacity is meant "pen-volume" in cubic meters as reported in the Salmon Farm Management Plan filed with the B.C. Ministry of Agriculture and Fisheries for each licenced site.

companies controlled an estimated 34% of production capacity. In 1988, the 4 largest companies, all of which were backed by foreign investment, controlled 38% of the production capacity of the entire industry¹⁰⁹. The largest 10 controlled 44%.

Two points should be made here with regard to the above figures on number of sites licenced and production capacity controlled by the top 4 companies. First, the large increase (50%) in number of site licences compared to the lower increase (12%) in production capacity for the top 4 firms in 1988, can be explained by the fact that many of the new farm sites licenced, have yet to be put into operation. When these sites are put into operation, the share of production capacity controlled by the top 4 companies can be expected to increase significantly. Second, the percentage of production capacity controlled by these 4 companies (38%) is larger than their share of site licences (22%) because the capacity of farm sites controlled by the larger multiple-site enterprises tend to be much larger than average. In 1987, the average production capacity per site among the largest four multiple-farm companies was more than twice the average size of sites among the remaining industry: 256 tonnes compared to 123 tonnes.

The above figures on larger site capacities are borne out by the fact that, despite owning only 20% of the farm-site licences, the four largest companies in B.C. produced 40% of

¹⁰⁹ See Library of Parliament, 1989, p.3 and Canadian Aquaculture, Spring, 1987. p.31-34.

B.C.'s farmed salmon in the 1987 production year¹¹⁰. In 1988, with still only 22% of the farm-site licences, the four largest companies were said to control in excess of 50% of B.C.'s farmed salmon production¹¹¹.

This disproportionate percentage of production capacity controlled by the largest companies is expected to rise especially with the introduction of a new breed of operation dubbed, the "superfarm." Built by large companies like Royal Pacific, Hagensborg and IBEC, these farm-sites are said to have individual capacities of between 650 and 1000 tonnes/year¹¹².

In addition, it is the larger farming operations that have the capital and expertise to run the technologically sophisticated hatcheries. Hence, it is these same operations which exercise control over the genetic pool of domesticated salmon. In 1986, three companies, Royal Pacific, Western Aquatech and Seastar Resource, all integrated farming operations, supplied the smolts of over 75% of B.C. salmon farming operations¹¹³. By 1988 one these three, Royal Pacific had tripled its hatchery capacity through the acquisition of

¹¹⁰ B.C. Salmon Farmers Association, reported by the Library of Parliament. Pers. comm. March, 1989.

¹¹¹ Dr. John Spence, President, Hardy Seafarms, Aquaculture '89 Conference; reported in Canadian Aquaculture, March/April 1989, p.7.

¹¹² These latter figures are based specifications for fish pens ordered by these companies in the spring of 1988.

¹¹³ Ministry of Agriculture and Fisheries, Aquaculture Information Bulletin, No. 12. 1987, p.11. These figures were the latest available from the B.C. government as of 1988.

Seastar Resources, and a third company, Prince Rupert Sea Farms Ltd.

The increasing domination of the industry by large-scale capitalist firms is in part a result of the construction of new sites but also largely because of mergers and the acquisition of other farming, feed production, hatchery and processing companies by these companies. Competitively, such developments are very significant since, for these larger enterprises, vertical integration with feed or smolt production can reportedly lower overhead costs of farming by as much as 50%¹¹⁴.

While comprehensive figures on mergers and takeover activity are scarce, examples abound. Typical of this activity was a series of takeovers beginning in 1987 with the purchase of Long Beach Shell, a small independent processor by a large aquaculture firm, Seastar Resources. This was followed with the buyout of another small processor, Kingfisher Enterprises the same year. In addition to grow-out operations, hatcheries and processing, Seastar also owned one of six aquaculture fish feed manufacturers in the province at the time. As mentioned above, Seastar Resources was in turn bought out by Royal Pacific Sea Farms in 1988, which subsequently also acquired ownership of another farm operation, Prince Rupert Sea Farms, and a similar facility owned through a joint venture with the Prince Rupert

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¹¹⁴ See B.C. Business. October 1987, p.33.

Fishermen's Co-op. Further afield, Royal Pacific has recently acquired a fish food plant in Nova Scotia, Aqua-Pro Systems, and is developing a large subsidiary operation in Chile. In 1988, Royal Pacific concluded a deal with the British Columbia's largest processor, B.C. Packers, through which Royal Pacific will market all of its fish.

A similar pattern of development is reflected in the evolution of Pacific Aquafoods, currently British Columbia's largest farmed salmon producer. Pacific Aquafoods was created with the merger of Tidal Rush Marine Farms with Aqua Foods and Deluxe Seafood in 1985. In 1986, Pacific Aquafoods formed a subsidiary, Crystal Waters SeaFarm, in a joint venture with Norwegian-controlled Sea Farm Canada. Since then, Pacific Aquafoods has gone on to acquire interest in Quatsino Seafarms and a U.S. firm, American Aquafoods. In turn, majority interest in Pacific Aquafoods was acquired in 1987 by the Canadian seafood giant, National Sea Products. National Sea subsequently has become the company's exclusive marketing arm.

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From the above account, we can see several features which distinguish relations of production in the B.C. salmon aquaculture industry. First, it is dominated by large-scale, capitalist production. Economic ownership and possession of the means of production are fully controlled by capital and not by direct producers.

Second, compared to the types of production found in wild fishery, salmon farming involves a significant division of labour between (1) the owners of capital (2) the scientific and managerial class of "experts" who oversee production and (3) the production workers who guard, feed and move fish, clean pens and harvest the catch. The technology-intensive nature of aquaculture production means that most labour is low-skill and fewer workers are needed to produce a given quantity of fish.

Third, the B.C. aquaculture industry is dominated by large-scale direct investment by large foreign multinationals, principally Norwegian. There are extensive backwards linkages with these Norwegian firms for financial capital, feed, equipment, supplies, marketing and technical expertise. As a consequence of this vertical integration, much of the labour contained in the equipment and technology is imported from abroad, displacing workers in Canada.

Fourth, vertical integration has also occurred in the industry in the form of backwards linkages to large-scale domestic processing capital from the wild fishery. These firms exert substantial control over the supply of aquaculture fish through direct investment in grow-out operations and independent marketing agreements.

Fifth, there is an increasing concentration of control over farm production such that, between 1985 and 1988, the percentage of farm operations controlled by horizontally

integrated companies increased from 9% to 70%. Furthermore, at present, 50% of production and at least 70% of "reproductive capacity" (hatchery production) has come under the control of the four largest firms in the industry.

CHAPTER 4: THE IMPACT OF AQUACULTURE ON RELATIONS OF PRODUCTION IN THE WILD SALMON FISHERY

In this chapter I examine the impact of salmon aquaculture on relations of production in wild fishery. As a necessary prelude, I first provide an explanation of the relations of production and patterns of industrialization affecting the B.C. salmon industry prior to aquaculture. This examination is necessary as a means of providing an understanding of the context into which aquaculture has emerged in the 1980's. Three key aspects of salmon industry are outlined. These are 1) the particular forms of commodity production which historically have prevailed in the salmon industry prior to the introduction of aquaculture, 2) the basis for the persistence and reproduction of forms of simple commodity production in the industry and 3) the pressures which have lead towards the erosion of these forms of simple commodity production beginning in the 1970's.

In section two, I go on to argue that the development of salmon aquaculture represents a move toward the complete domination of the B.C. salmon industry by large scale capital. First, I argue that more than simply supplementing the existing array of productive forms, salmon aquaculture seriously threatens to displace petty commodity producers in the fresh/frozen sector. These producers, especially aboriginal people, small-boat troll and small-boat combination fishers, can expect in the near future, lower prices for their products, further appropriation of their share of the salmon

resource by other interests and ultimately increased levels of marginalization and displacement from the industry. Second, the development of salmon aquaculture in B.C. will likely increase the domination of large-scale capital in the wild fishery by displacing the small capitalist processors which depend on petty producers in the fresh/frozen fish sector for their fish supply.

I. Relations of Production in the Wild Fishery.

A. The Structure of the Salmon Fishery

The activities of the British Columbia wild salmon fishery are structured around the exploitation of a highly mobile natural resource: the Pacific salmon. The salmon comes in five sub-species: chum, pink, sockeye, chinook and coho salmon, all of which spend the majority of their 2-5 year life cycle at sea, but are spawned, and return at the end of their lives en masse to spawn in the freshwater rivers and lakes which drain to the B.C. coast.

1. Social Categories in the Wild Fishery

At the harvesting level, the salmon fishery is comprised of four different types of operation employing different vessel-based methods of catching salmon: trolling, combination trolling/gillnetting, gillnetting and seining.

Trolling vessels are generally 30 to 50 feet long and employ lines, lures and hooks which are towed through the water when fishing. Combination boats are the same size and

carry both trolling and gillnet gear. These boats troll most of the time but will often gillnet on the one or two days a week gillnetting is permitted. Although the trolling season closes in early September, combination boats can continue gillnetting, usually until late October. In 1987, troll and combination licences comprise 75% (3280) of the total licences in the fishery.

Trolling is geared towards producing spring and coho salmon as a 'finished' commodity for the premium fresh/ frozen fish market. This tendency arises because of onboard chilling or freezing, the special handling trollers can give their catch and the superior quality of fish that the hook and line method can produce. Combination boats are generally gillnetters which have diversified their operations into trolling fresh/frozen fish production as a result of seine pressure on their catch.

Gillnetters are generally smaller owner-operated vessels 30-50 feet long and employing 1-3 persons. They capture fish by entangling them with nets which hang down vertically from the surface of the water across the salmons' path. Gillnet licences comprise 14.4% (644) of the total licences in the fishery.

Seines employ large purse nets which surround and trap migrating schools of fish. They are by far the most efficient technique for harvesting, capable of producing in a single day up to one hundred times more value than gillnetters or

trollers. There are 546 seine boats in the salmon fishery comprising 12.2% of the total licences.

Gillnetting and seining differ from troll production in that they are generally oriented towards the mass production sockeye, pink and chum subspecies of salmon as a 'raw material' for canneries. As opposed to trolling which is permitted seven days per week during the fishing season, the seine and gillnet fisheries are restricted to usually only one or two days per week. The emphasis on "appearance" in the premium fresh or frozen market excludes the net fleet from servicing this market. Net methods are used for the canned market because the bruising and damage to appearance of the fish inflicted by mass production and netting techniques is of little commercial consequence to the raw product. New handling and cold storage technologies on seiners, however, have recently made them competitive on fresh/frozen markets.

Clement [1983] has described the relations of production in the B.C. wild salmon fishery as involving several different levels of commodity production. These levels of production are distinguished by their level of control over their means of production and their relation with capital. The categories germane to the discussion in this chapter are: capitalist commodity production, dependent commodity production and independent commodity production

Capitalist commodity production corresponds to the highest level of subordination to capital and represented by

the seine fleet. In the seine fleet, most vessels are owned or controlled by large processing capital and workers do not have economic ownership or possession. Wage-labour is employed, paid in form of piece-rates or crew shares. Seine vessels are generally 50 to 100 feet long and employ 5 to 7 persons.

Dependent commodity production is found mostly in the gillnet fleet, but also in combination and troll fleets. These producers can be seen as occupying an ambiguous class position in which they share attributes of both labour and the petty bourgeois. Although the means of production in this sector are generally owned or at least independently operated by direct producers who are not direct employees of capital, capital maintains a certain level of domination over production through buyer-seller ties and oligopsonic control of the market for net caught fish. These producers are said to have possession over the means of production but tend to lack economic ownership. Most aboriginal people in the commercial fishery fall into this category of production, although some of their production also goes to subsistence uses.

Independent commodity production corresponds with petty bourgeois production and is mostly found in the small boat troll and combination fleets. This area of production remains the least dominated by capital mainly because of (1) the relatively high level of competition that exists among buyers in fresh/frozen fish markets (2) the relative absence of dependency on capital to supply the processing needed to fully

realize the value of fresh/frozen fish and consequently (3) higher prices. These producers are said to exert possession and a high degree of economic ownership over the means of production. Some of these vessels process their fish with onboard freezer units which gives them even more independence as they can wait until the price is right before they sell. Independent and dependent petty producers constituted 87% (3924 out of 4470) of the licences in the total fishery in 1988.

2. Buying and Processing Capital in the Wild Fishery

The fish buying and processing level of the salmon industry can generally be separated into (1) smaller buyer/processors and a producers' marketing co-operative (see page 80) which buy fish mainly for the *fresh/frozen* markets and, (2) the large vertically-integrated processors like Weston-controlled B.C. Packers, which buy fish as raw material to process for the *canned salmon* market and as both a raw¹¹⁵ and finished product for the *fresh/frozen* markets.

The smaller buyer/processors and co-operative are mainly dependent on the independent owner-operated vessels in the troll and combination fleets to provide them with their supply

¹¹⁵ The large corporate processors buy raw as well as "processed" salmon for the *fresh/frozen* markets in as much as they can obtain sufficient supply of cheap, high quality raw fish from newer more efficient seine vessels equipped with refrigeration systems. The purchase by large processors of raw fish for *fresh/frozen* processing on land is likely to increase as a result of a March 1988 GATT council ruling that struck down Canadian controls which limited export of *fresh/frozen* salmon to only the most premium quality.

of fresh/frozen fish. In 1984 there were 25 of these companies in addition to the co-operative.

Four large companies dominate canning production. These firms are in a significantly better position to sustain themselves than the smaller companies. In 1986 the four companies controlled 90% of all canning production in B.C. and 50% of fresh/frozen production. These companies are able to suppress fish prices through oligopsony while at the same time securing a supply of fish through the use of contractual buyer-seller ties and the ownership of their own fleet of vessels, mainly seiners and rental gillnetters. It is estimated that in this way such large companies control indirectly over 70% of the actual fish supply¹¹⁶.

3. Other Market Segments in the Wild Fishery.

In addition to the industrial canning and fresh/frozen market segments in the wild fishery, there are the market segments represented by (1) the native Indian food fishery, (2) the commercial sports fishery and very recently, (3) commercial fish hatcheries run by native Indian corporations.

The native Indian food fishery is generally a subsistence fishery which provides salmon for consumption by native communities. The commercial sports fishery is dominated by capitalist-controlled charterboat operations that service corporate and foreign tourist markets in British Columbia. The emerging commercial hatchery sector produces smolts (baby

¹¹⁶ See UFAWU, 1981, p.8.

salmon) from wild stock. The hatcheries sell their smolts in markets provided by the private aquaculture industry and the Federal Department of Fisheries and Oceans, which essentially, pays these firms to produce smolts for wild stock enhancement.

Since each of these sectors compete in a different market segment, market competition is avoided; however, competition does occur on a resource allocation level. That is, there is a continuing and intense competition over the supply of wild salmon. Producers within each market sector lobby the state to minimize restrictions on their production effort and to guarantee them a maximum share of the overall salmon catch. This competition is evident in the deep political and ideological divisions among producer organizations within the fishery.

5. Producer Organizations in the Salmon Industry

The wild fishery in British Columbia is marked by a myriad of producer organizations representing different market segments and different gear sectors and interests within the fishery. On a broad level, these political organizations can be divided into five groups¹¹⁷: Unions, Native fishers, Processors, Associations and Co-operatives.¹¹⁸

¹¹⁷ See Clement, 1988, p. 117; Also Marchak, Guppy and McMullan. p. 223, 1987.

¹¹⁸ While commercial sports fishermen are represented by a group called the Sports Fishery Advisory Board, this cannot be considered a true producers' organization. While representing commercial sports interests, it is set up and wholly funded by the Department of Fisheries and Oceans for the sole purpose of advising the government.

The United Fishermen and Allied Workers Union (UFAWU) represents labour in all aspects of the production and processing of fish in British Columbia regardless of gender, aboriginal status or "race." While workers and small-scale fishers in all gear sectors are included in its membership, capital and management are explicitly excluded. The UFAWU organizes around labour-management issues including the negotiation of working conditions, fish prices, wages and benefits contending that fish prices comprise a piece-wage for small dependent commodity fishers. It negotiates with the Fisheries Council of B.C., the major organization representing fish processors and buyers. Additionally, the UFAWU organizes around issues involving the right to organize and the state's regulation of the fishing industry and fish habitat.

The Native Brotherhood of British Columbia represents native Indian fishermen and male native shore workers in labour-management issues like wage/price bargaining and on cultural and political issues affecting the aboriginal fishery and land claims. Native women shoreworkers are generally members of the UFAWU rather than the NBBC. While the NBBC often bargains alongside the UFAWU in negotiations with fish processors, it does not always support the union during strikes. As the NBBC does not distinguish class position as a basis of membership, the leadership of the NBBC tends to be dominated by small capitalist seine vessel-owners¹¹⁹. The

¹¹⁹ The advantage of organizing around "race" for the NBBC is that it allows the organization more focus, more scope and a

representation of both labour and capital within the NBBC has been the basis for much of the tension between the NBBC and the UFAWU during labour-management disputes.

The major fish processors are organized as the Fisheries Council of British Columbia (FRBC). The FRBC bargains as a block with the UFAWU and the NBBC over wages, fish prices and other labour-management issues. It also represents the interests of fish processors to the state on issues like fisheries regulations and protection against foreign competition.

Producer associations are represented by groups like the Pacific Trollers Association (PTA), the Pacific Gillnetters Association (PGA), the Pacific Seiners Association (PSA), the Gulf Trollers Association (GTA) and the Northern Trollers Association (NTA). These organizations can be described as representing petty bourgeois and small capitalist commodity producers who identify with the interests of capital. In the B.C. fishery, these organizations oppose strikes and other union activities and organize around minimizing constraints on their own narrowly-defined group's ability to compete "freely" in the catching of fish. Consequently, most of their activities tend to be directed at the state (rather than capital or management) and tend to be intensely focussed on guarding and maximizing their particular share of the salmon catch against other groups.

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broader base in its representation of native interests in negotiations with the state. See Clement, 1988, p.130.

The Prince Rupert Fishermen's Co-operative (PRFC) is the only fisher's co-operative in British Columbia and is the second largest processor in B.C. fish processing. The cooperative was formed as an alternative to the union so that producers could fish during strikes and bypass the big corporate processors. While comprised of mostly salmon trollers, this co-operative also has in its membership, halibut fishers, gillnetters, seiners and six large dragners. The PRFC is more a marketing than a producer's co-operative in that production is not co-operative and workers in the processing plants and on the boats are not eligible for membership. Furthermore, its leadership tends to be dominated by large vessel owners. Consequently, the co-operative represents more the interests of management and capital than labour. The PRFC does not tend to get overtly involved in lobbying the state over allocation and fishery regulation, but rather tends to limit its concerns to the buying, processing and marketing of fish.

4. State Intervention

State intervention in the British Columbia commercial salmon fishery historically has been extensive. There are two main reasons for this. First, the federal government is charged with the responsibility for managing fish stocks and fishing effort so as to maintain a biologically sustainable resource base. Consequently the state must intervene to prevent overfishing and the destruction of fish habitat. Second, the fishery is ruled by the convention that salmon are a

"common property resource."¹²⁰ While individual producers within the fishery are privately licenced to wield particular harvesting rights, this right is delimited by the rights of the group to which the fisher belongs. Therefore, the common property right thereby refers to a right collectively held by a particular user group within the fishery and is taken to mean that the user group as a collective have the guaranteed right to a share of the overall catch. Consequently the state intervenes to guarantee this collective right through allocation of harvest shares according to user group. These interventions involve the selective management of fishing effort, through the selective restriction of harvesting gear and harvesting time of different groups¹²¹.

B. Persistence of Petty Producers

The persistence of petty commodity production in the west coast salmon industry has been predicated on conditions of

¹²⁰ Although private property rights have existed in the form of title to wield particular types of gear and certain sizes of boat (an allotment of production capacity) since 1968, no individual or private entity is guaranteed exclusive title to any portion of the resource prior to capture.

¹²¹ As a consequence of the state's interventions, the fishing industry has been characterized by extensive lobbying of the state by producers' organizations. With no completely enforceable prior-to-capture rights, different individuals and groups focus their production efforts at maximizing their individual yield of what is ultimately a limited number of fish. There are two means by which this is accomplished: (1) by maximizing fishing power within the restrictions designated by the state and (2) by organizing and lobbying the state for (a) larger official allocations of the catch and, (b) favourable practices with regard to the management of fishing effort: meaning generally, more leniency toward ones own group and greater severity toward others.

production which have made it difficult and undesirable for capital to fully subordinate immediate producers. The major conditions affecting the persistence and reproduction of petty commodity production in the troll and combination sectors of the salmon fishery are related to the material conditions affecting production and the ability of producers to resist capitalist expansion through struggle.

The material conditions affecting the persistence of petty producers have been facilitated by (1) the high costs and risks involved in managing the highly skilled labourers and widely dispersed small boat fleets necessary to catch these species of salmon, and (2) the unreliable, dispersed and greatly fluctuating supply of wild fish.

Small fishers manage their own labour, underwrite the costs and risks of production and can be dispersed in densities corresponding to that of the fish. Consequently, capital has found it cheaper, less risky and more efficient to secure its fish supply using contractual arrangements with petty producers than to expand capitalist production into the fishery.

The historical persistence and independence of the troll fleets has, in particular, been because of their specialization in the fresh/frozen market niche. The quality and appearance of the product produced by trollers until very recently, could not be achieved by the mass production techniques of the capitalist-controlled net fishery. As a

result of the advantages offered by this specialization, gillnetters have increasingly diversified into combination production, increasing their independence from capital and supplementing their gillnet income with trolling.

The persistence of petty producers has also been facilitated by their political organization. Their political strength has allowed them to use the common property resource convention of the fishery as a weapon against any attempts by the state to diminish the share of the catch they have been allocated. The common property right to fish means that the state cannot deny them the right to their share of the fish. Consequently, despite the fact that seine technology is becoming more and more efficient at producing fresh/frozen fish among traditional net species (see Table 4), the state has been reluctant to allocate any of the traditional fresh/frozen troll species (coho and chinook) to the seine fleet¹²².

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¹²² See Ministry of Agriculture and Fisheries, Province of B.C., 1988, Fisheries Production Statistics of British Columbia 1987. p. 10-11.

TABLE 4: Fresh/Frozen Sockeye Production by the Net Fleet, 1974-1985¹²³

Year	Percent of Sockeye Catch Processed as Fresh/Frozen	Troll Share of Sockeye Catch	Net-Caught Share of Fresh/Frozen Sockeye Production (Minimum Possible Share)
1972		1%	
1973		2%	
1974	2%	13%	0%
1975	6%	5%	1%
1976	5%	2%	3%
1977	1%	2%	9%
1978	6%	15%	11%
1979	33%	9%	24%
1980	12%	2%	10%
1981	15%	1%	14%
1982	34%	25%	9%
1983	19%	6%	13%
1984	33%	5%	28%
1985	33%	11%	22%
1986	43%	22%	21%

C. Pressures Toward Proletarianization

A major factor in the pressures toward proletarianization has been the emphasis of the state on "economic efficiency" in the fishery. Industrial efficiency has been generally defined by economists within the state bureaucracy as "the need to maintain an optimum quantity and distribution of capital and labour in the salmon fleet such that the 'overall cost' to the industry of harvesting the salmon is minimized."¹²⁴

Rather than emphasizing any qualitative or distributive logic, the state's concern with "industrial efficiency" is

¹²³ Source: Ministry of Environment and Parks, Province of B.C., 1986, Fisheries Production Statistics of British Columbia 1985; Larry Nelson, B.C. Ministry of Agriculture and Fisheries, Pers. comm.

¹²⁴ See Fraser, 1978, p.9; Pearse, 1982, p.81

defined in terms consistent with conditions for maximizing capitalist accumulation¹²⁵. The ultimate beneficiaries of "minimizing overall costs to the industry" through an "optimum mix of labour and capital" and "successful competition in world markets" are (1) capitalist processors which buy fish and (2) capitalist fish producers. It is only these interests which are large enough in scale to represent an "optimum mix of labour and capital" and are thereby entitled to be left over after the overall cost to "the industry" of producing salmon is minimized. The state's concern with "minimizing the overall cost of production to the industry" thereby means nothing more than minimizing the overall costs for capital and the elimination of obstacles to capital accumulation.

Largely as an outcome of the federal government's efforts to increase economic efficiency, the British Columbia salmon fishery has undergone considerable change in both structure and content since the early 1970's. During the boom period of the 1970's there was rapid growth and a massive injection of capital into the industry. The pattern of growth during this period was largely shaped and defined by State economic development policies enacted in the late 1960's. These policies

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¹²⁵ Ultimately the state presents labour, capital and the general public as mutual beneficiaries of industrial efficiency. In presenting the benefits of industrial efficiency accruing to not only capital but also labour and the public, the problematic of "industrial efficiency" is linked with the "national" or "common" interest. What is good for "the industry" is represented as good for the "nation" and thereby implicitly, good for all. While this may be true to a limited extent, the interest that loses the least in the pursuit of such industrial efficiency, is capital.

limited fishing licenses and designated them as a saleable commodity --effectively privatizing the right to fish and allowing capital to extend its control over production through the acquisition and accumulation of such licences. In addition, throughout the 1970's, construction of larger vessels and capital improvement in the fishery was encouraged by the state through various financial incentives for the building of larger, more efficient vessels. As a result, of these policies, hundreds of larger, new vessels entered the fishery through the practice of appropriating and pyramiding the licences of smaller boats.

This outcome was accentuated in the 1980's by the recession which, paralleled by a series of poor fishing years, forced more small producers into bankruptcy with a combination of low fish prices and dramatically high interest rates.

Between 1969 and 1982 --despite a general decline in the number of boats fishing-- the capital value of the fishing fleet nearly quintupled, climbing from 91 million to 432 million dollars. Between 1969 and 1987, the west coast seine sector increased significantly in size and as a proportion of the total salmon fleet: from 369 vessels representing 6% of the fleet in 1969 to 546 vessels representing 12.2% of the fleet in 1987¹²⁶. Conversely, between 1969 and 1987, as a result of the transferral and pyramiding of gillnet and troll licences into licences for newly constructed seiners, the

¹²⁶ See Pearse, 1982, p.99-100. and Maureen Kostiner, DFO Pacific, Pers. comm.

gillnet and troll fleets were reduced by one third, from 5732 to 3924 vessels¹²⁷. Native Indian participation in the troll and gillnet fleet dropped even more drastically, nearly 50%, from 800 to 425 boats¹²⁸.

Furthermore, due to the state's accommodation of increased seine production over the 1980's, the seine share of total salmon production has increased to an average of 51% from what used to be an average of 27% during the 1960's¹²⁹ (see Table 5). While the troll share of production has remained relatively constant at around 25%, the gillnet share of production has dropped from an average of about 50% to around 20%.

The gains in the share of production controlled by the seine fleet during the 1970's and 1980s represent an increase in the level of capitalist commodity production in the fishery, the corollary of which has been the increased marginalization and expulsion of direct producers from the industry, particularly in the gillnet sector where native peoples are most highly concentrated.

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¹²⁷ Ibid. Ibid.

¹²⁸ A major reason for the decline in aboriginal participation was the design of the state's licencing scheme which discriminated against producers like native Indians, who had less efficient equipment and sold less fish. Also, since native Indian vessels tended to be older, and licences less expensive to acquire, they provided capital a cheap pool of licences for the seine fleet. See Pearse, 1982, p.102, 151-152.

¹²⁹ UFAWU, 1981b p.11-14.

TABLE 5: Share of BC Salmon Catch According to Gear Sector

Fisheries Production Statistics (j) BC,
1985, BC Ministry Of Agriculture and
Fisheries; Larry Nielson, pers. comm.

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Despite these pressures towards elimination, small direct producers in the gillnet and troll sectors have thus far persisted, primarily because their political organization has allowed them to capitalize on their ability to produce high quality fish for the fresh and frozen fish markets (or in the case of gillnetters, diversify into such production through combination operations). The high level of specialized and individual care needed to satisfy such markets and the high cost and risk of maintaining small boat fleets have made it difficult for capitalist firms to compete effectively in this area of production. Consequently, capitalist control over fresh and frozen salmon production on the west coast, so far has been limited to economic forms of subordination extended through buyer-seller ties and oligopsonic advantages in the fish buying market. Direct producers in the troll and gillnet fleets, have retained rights of possession over the means of production and limited forms of economic ownership.

Beginning in the 1980's however, these petty commodity producer ownership rights have been threatened by the advent of aquaculture or fish farm production.

II. Implications of Aquaculture for the Wild Fishery.

The advent of salmon aquaculture threatens petty commodity production in the wild fishery on several fronts. These include market competition, the displacement of state supports which have in the past protected and guaranteed

interests of petty fishers against other societal interests and possible biological impacts on wild stocks.

A. Market Competition.

The first threat to petty producers from aquaculture comes through the penetration of global fresh/frozen salmon markets by large-scale capitalist aquaculture production. As the main suppliers to the specialized fresh/frozen salmon market, petty producers have until recently, been relatively safe from direct competition with other industrialized methods of production owned directly by capital. The penetration of these markets by aquaculture capital represents an assault on the key market niche by which petty commodity producers in the B.C. salmon fleet have historically maintained themselves. There is now good reason to believe that emerging competition --both domestically and abroad-- from farmed salmon will serve to reduce both the prices paid and market share held by petty producers in the B.C. wild fishery. These effects in turn, threaten the continued existence of these fishers.

The competitive effects of salmon aquaculture on the wild fishery have been minimized and denied by the state and other promoters of salmon farm development¹³⁰. These interests first, assert that aquaculture and the wild fishery service

¹³⁰ See J.A. Spence, p.19-20, and Rogness and Lin, p.19 in Gillespie Inquiry, Government Agency Submissions, Appendix III.; British Columbia Salmon Farmers Association, Aquaculture in British Columbia: An Overview. 1988, p.15.; B.C. Ministry of Agriculture and Fisheries, Rick Deegan, Michael Coon and Carmen Franks, Pers. comm.; and Department of Fisheries and Oceans, various sources, Pers. comm.

different markets since most wild fishery production is canned while farmed salmon are always sold fresh. Second, they argue that because the wild fishery occurs during the summer and most salmon farms harvest their fish in the winter, farmed salmon physically could not compete with the wild fishery -- especially the fresh fish supplied by the wild fishery. Consequently, it is asserted, farmed salmon merely serves as a complement of the wild fishery, not competition.

Such arguments are misleading on several counts. First, while it is true that farmed salmon do not compete on the same markets as canned salmon, the same cannot be said in the case of fresh and frozen salmon, which constitute the greater part of the value generated in the fishery. While the industrial fleet -- which fishes primarily for the canned markets-- does not compete with farmed fish, this clearly is not the case for small fishers. Petty commodity fishers comprising nearly 90% of licence holders in the fishery, depend on the fresh and frozen markets for a major, if not the only, source of their earnings¹³¹.

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¹³¹ By petty producers I am +again referring to the native and non-native fishers who held trolling, gillnet and combination 'A', 'B' and 'N' licences in 1988. Eighty-five percent of these vessels have troll or troll/gillnet combination licences, indicating that they derive a significant portion, if not all of their income from the fresh/frozen market. While 15% of the small boat fleet have strictly gillnet licenses and depend on the canned market for most of their income, even these producers rely on the fresh/frozen market as an important component of their income. Such fishers not infrequently derive a significant proportion of their season's income from fisheries targeted at the fresh/frozen market, such as the Robertson Creek chinook fishery or the Gulf silverbrite chum fishery in the autumn. For, many of these fishers, a catch strategy which allows them to take advantage

Second, the assertion that the seasonality of the wild fishery prevents competition ignores the fact that 90% of all non-net wild production is retailed in frozen form and that the vast majority of this is marketed over the fall and winter at the same time that fresh farmed production hits the market¹³². Eighty-five percent of frozen salmon is sold on export markets in Europe, Japan and United States which are heavily penetrated by the Norwegian, Scottish and Chilean, in addition to Canadian, farmed salmon. The overwhelming evidence is that farmed or not, when fresh salmon is available, consumers in these markets invariably choose it

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of the premium prices available on the fresh/frozen market for different species at different times of the year, is an effective way to maximize their earnings.

¹³² Retailers I worked with for over three summers and Christmases in Vancouver did not sell frozen salmon in the summer and claimed that they generally purchased their winter inventories from wholesalers before the end of the season to avoid higher prices. On a statistical level, DFO figures on frozen fish inventories 1986-1987 indicate that at least 50% of frozen salmon is wholesaled to retailers after the salmon season is over [see Department of Fisheries and Oceans, Canadian Fisheries Products and Inventories, 1986-1987]. This factor, in conjunction with the above indications that even frozen salmon wholesaled in-season is retailed during the winter months, would indicate that most wild caught frozen salmon is marketed in the winter, at the same time as most farmed fish.

over frozen salmon¹³³. In today's markets, it is the farmed salmon which is fresh and the wild salmon which is not.

Third, it is not just frozen wild salmon which are at a market disadvantage to farmed salmon. Numerous market surveys have shown that fresh wild salmon too, are seen as second to farmed salmon in retailer preference¹³⁴. The reliability of supply and consistency and freshness of product promised by the farmed product have given it a distinct competitive advantage over wild salmon¹³⁵. This position is reflected in the price structure of the salmon market in which prices for both fresh and frozen wild salmon fall below those of farmed salmon on average, by \$1.00 to \$1.70 per kilogram¹³⁶

Fourth, the costs of producing aquaculture salmon are expected to decrease significantly as mortality rates decline, as aquaculture technology becomes more efficient and the economies of scale enjoyed in capitalist aquaculture increase.

¹³³ Numerous marketing studies indicate that all other things being equal, consumers in North America, Europe and Japan consistently and unwaveringly prefer fresh salmon to frozen. Wild-caught frozen salmon has generally served as a market substitution for fresh salmon when fresh wild fish were not available. Hence, a continuous supply of fresh farmed salmon hinders the marketability of wild-caught frozen salmon. See DeVoretz and Salvanes, in The Salmon Market Newsletter, Spring 1989, Vol. 1., No.2 p.6.; DPA 1986, 3-1,8-7; Anderson and Brooks, 1986 cited in Spence p.18, in Gillespie, Appendix III; Aquaculture Magazine, May/June, 1987, Vol. 8, No. 4, p.34.; Science Council of B.C., 1984, p.161,167,170-171; levi-lloyd, Submission to Gillespie Inquiry, November 12, 1986, p.2.

¹³⁴ Rogness and Lin, Alaska Sea Grant Report 86-3, 1986.

¹³⁵ See Canadian Aquaculture. Winter, 1986, p. 16.; B.C. Ministry of Economic Development, Submission to the Gillespie Inquiry. p.13.; Science Council of B.C., 1984, p.167,171.

¹³⁶ See Canadian Aquaculture. Winter, 1986, p.15-16. Also B.C. Ministry of Economic Development, Submission to the Gillespie Inquiry. p.13.

Thus, farmed salmon's cost advantage relative to the wild fishery is predicted to increase (for a more detailed account of this cost advantage see Chapter 5, Section 1B). Furthermore, cheap non-unionized aquaculture labour in Canada and other farmed fish producing countries like Chile contribute to farmed fish cost advantage over British Columbia wild fish. Despite the greater selling price of farmed salmon, the cost of producing farmed fish in Canada, \$4.50 per kilo¹³⁷ is, even at present, comparable to or even lower than that of processors buying wild salmon from small producers in the wild fishery, \$4.80 per kilogram¹³⁸. Moreover, the premium prices paid for farmed fish give farmed salmon producers a better ability to survive price decreases. Small producers will have to catch more fish to sustain the same income at a time when their catches are significantly declining.

Finally, in the past, small producers in the B.C. salmon fishery have enjoyed higher prices from large processor/buyers partly because of the dependence of the processors upon these fishers for supply and the level of competition within the industry for this supply. Aquaculture will likely reduce this advantage by offering processors a secure alternate source of high quality fresh/frozen fish which they control or own themselves. While, the comparable production of fresh/frozen

¹³⁷ See Price Waterhouse, Long Term Outlook for the Canadian Aquaculture Industry. Report prepared for Department of Fisheries and Oceans, January, 1989. p.35.

¹³⁸ Prices averaged from Department of Fisheries and Oceans, Chinook and Coho catch statistics for 1985.

salmon by the 3,500 producers in B.C.'s small boat wild fishery between 1980 and 1985 averaged 10,333 tonnes/year¹³⁹, the total production capacity in 1988 of the ten largest salmon aquaculture companies in British Columbia exceeded this at 14,500 tonnes. The production capacity for the entire fish farming industry in 1988 was near 36,000 tonnes and is expected to increase to over 40,000 tonnes by 1990. Through contractual agreements and ownership of aquaculture operations in the B.C. industry, the large processors are no longer completely dependent upon small fishers for securing their supply of fresh/frozen fish for the year and subsequently, they are under even less pressure to engage in price competition to guarantee this supply.

Given the competitive advantages of farmed salmon over wild, small producers in the B.C. salmon fishery can expect less return on their labour in the form of decreases in prices for their fish. Figures from a variety of sources¹⁴⁰ indicate that worldwide salmon farming production is expanding faster than markets can absorb and is starting to exert downward pressure on fresh/frozen salmon prices¹⁴¹. This problem was first encountered by B.C. wild salmon in European markets when

¹³⁹ The aquaculture industry competes on the high quality fresh and frozen fish markets with coho, chinook and imported Atlantic salmon. The comparable high quality products in the wild fishery are fresh and frozen coho and chinook caught by the small boat troll and combination fleets. Between 1975 and 1985 the wild fishery had an average annual output of these products of 10,333 metric tonnes.

¹⁴⁰ Price Waterhouse, Long Term Outlook for the Canadian Aquaculture Industry. Report prepared for Department of Fisheries and Oceans, January, 1989. p.36.

¹⁴¹ Ibid., January, 1989. p.31.

in the early 1980's, fresh Norwegian aquaculture fish began entering the market in high volumes¹⁴².

This downward pressure will increase in coming years. World consumption of wild fresh/frozen salmon in 1983 was 388,400 tonnes. Between 1981 and 1987 world farmed salmon production increased by 700% from 12,100 to over 84,000 tonnes per year. By 1990, world farmed salmon production is expected to double again, reaching 172,000 tonnes. By 2000, farmed salmon production is predicted to reach 358,000 tonnes¹⁴³. In less than seven years, total world markets for fresh/frozen salmon --a luxury commodity yet-- will have had to increase by nearly 50% to accommodate the increases in production and by 2000 these markets will have to double.

In the United States and Europe, the most important markets for B.C. fresh/frozen salmon, gluts have resulted in continuing declines in prices of up to 25% for farmed salmon since 1985¹⁴⁴. Prices for the less preferred wild salmon have followed suit¹⁴⁵. In 1989, supply gluts resulting from increases in world farmed salmon production have caused the price of fresh/frozen salmon to drop by over 50%. At all

¹⁴² Science Council of B.C., 1984, p.170.

¹⁴³ See DPA Group, Worldwide Farmed Salmon Production Forecasts to the Year 2000. Prepared for Department of Fisheries and Oceans, March 1988, p.3.

¹⁴⁴ See DPA Group, 1988; Canadian Journal of Agricultural Economics, November 1988; Canadian Aquaculture, December 1988, p.33.

¹⁴⁵ See Aquaculture in Canada: Report of the Standing Committee on Fisheries and Oceans, July 1988, p.48-49; Aquaculture Digest, February 1988, p.22; Erskin's Seafood Letter, January 29, 1988, p.5; The Fisherman; Canadian Aquaculture; DPA, 1986, p.5-13;

price levels, fresh/frozen wild caught fish are leading the downhill slide¹⁴⁶.

Ultimately, the market competition from salmon aquaculture production threatens the income and existence of small wild fishers in the B.C. salmon fishery because of its downward pressure on wild caught fresh/frozen salmon prices. How is this happening? First, there is a greater consumer preference for farmed fish as a result of the superior conditions of supply, better quality and fresh form of the farmed product compared to the wild. To maintain a share of the market, the price of wild salmon will have to decrease. Second, the non-unionized, large-scale, technology-intensive nature of aquaculture production means that production costs for farmed fish will decrease substantially over the next few years. Third, the sheer volume of aquaculture production will have an downward effect on fresh/frozen prices in the export markets the wild fishery has traditionally served. Petty producers are not in a position to compete.

While the increasing competition and downward pressure on salmon prices will result in increased corporate concentration in the aquaculture industry, the effect on producers in the troll and combination boat sectors of the wild fishery is likely to be elimination. If these types of fresh/frozen production in the wild fishery are no longer competitive with

¹⁴⁶ See Pacific Fishing, August 1989, p.11; Financial Post July 8-10, 1989 p.1.; Vancouver Sun, July 15, p.A8 and July 17, p. A14

aquaculture, it is not unlikely that as their political power decreases with their numbers, they will be pushed out. Already waiting in the wings and ready to compete are new seine boat technologies for fresh/frozen production.

B. Disease Transference to Wild Stocks.

A second way in which the introduction of salmon farming poses a threat to petty producers is through the biological risks posed to wild salmon by farmed stocks. Nearly 100% of salmon farms are located in waters through which the entire wild salmon population passes on the way to spawn. Farmed salmon pose a risk to these wild stocks for several reasons.

First, experience in Norway has shown that the crowded, stressful conditions in fish farms tends to be related to high levels of parasites, infection and disease among farm fish. Fish farms produce massive quantities of sewage waste which are expelled into surrounding tidal waters and result in eutrophication (200 tonnes of fish are estimated to produce sewage equivalent per day of a town of 3000 people). When a disease spreads through a farmed salmon population it can mutate extremely quickly. Consequently, the environment of salmon farms tend to serve as multiplying stations for disease. Farm operations in effect, can act as a disease factory for wild stocks¹⁴⁷. In 1987, Norway was forced to use the powerful poison, Rotenone, to kill everything living in 28 major river systems because of an epidemic of a parasite in

¹⁴⁷ See Egidus, Hansen, Jonsson and Naevdal, 1988, p.4.

wild fish populations thought to have been generated by domesticated farmed fish.

Second, many of the fish farms are using Atlantic salmon eggs from Scotland and Norway. It is feared that these foreign eggs could carry new strains of disease for which wild breeds of Pacific Salmon have no resistance. In January of 1989, Washington State fisheries officials were forced to destroy 3 million smolts and 1 million eggs because of an outbreak of a fish disease previously unknown in North America, viral hemorrhagic septicemia (VHS)¹⁴⁸. VHS was the disease that killed off the entire rainbow trout population of mainland Europe in the 1960s.

Third, there are concerns that the vaccines, antibiotics and algaecides used extensively in aquaculture production could spawn new super-resistant bacteria and viruses to which farmed fish would be resistant and wild stocks vulnerable.

Finally, there is concern that escaped farmed fish, already a common occurrence in British Columbia, could threaten wild stocks through genetic hybridization. The domesticated fish are genetically selected for traits like late maturation, docility and high growth rates¹⁴⁹. Some studies have indicated that if large enough numbers of these farm fish breed with wild fish populations, there is significant risk to the wild fish populations through the

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¹⁴⁸ See Globe and Mail, March 2, 1989. p.3.

¹⁴⁹ See North Atlantic Salmon Conservation Organization, 1988, p.8.

"dilution" and loss of genetically-selected survival characteristics. The one recorded case of the dilution of wild stocks with non-indigenous genes, (from the Kalininka to the Naiba River in the Soviet Union), resulted in the virtually extinction of the indigenous (Naiba River) salmon population¹⁵⁰. In Norway, concerns about their wild stocks (smaller than in British Columbia) have prompted the government to establish wild stock gene banks.

Given what has already happened in Europe, the risk of a major epidemic from fish farms decimating the wild fishery is realistic. Yet the recent leak of a government paper known as the "Russell memo" indicates that despite state regulations requiring the quarantine of sick fish and the report of all fish kills over 1%, there has been little enforcement and a lack of compliance with these regulations in the farming industry¹⁵¹. Furthermore, most of the state's guidelines are "self-enforced." Without strict state regulation and monitoring of disease, the farmed fish population poses a significant threat to the interests of petty producers, particularly since the fish they catch are more susceptible to farmed fish diseases because they are of the same species.

C. Pressures to Re-allocate Salmon Resource and Habitat

A third threat to petty producers resulting from the development of aquaculture, involves increasing pressure on

¹⁵⁰ Ibid, p.2, p.9.

¹⁵¹ See The Fishermen, April 21, p.13. See also Rankin and Brown, 1988.

the federal government to re-allocate the salmon resource and salmon habitat to "users" other than petty producers in the wild fishery. Various agencies of the state have suggested that with the advent of salmon aquaculture production, it is no longer necessary to guarantee a share of the resource to petty producers. Fresh/frozen coho and chinook salmon production can be carried out by aquaculture instead. From the perspective of the state, the share of the resource controlled by 3000 to 4000 petty producers in the troll and combination fleet might be re-allocated more productively to other interests. These include native people, the commercial sports fishery, various industrial interests and the large capitalist processors who control the industrial seine and gillnet fleets.

First, native people have been putting increasing pressure on the federal government to allocate a larger share of the fishery to them since the early 1980s. Native people have demanded a return of salmon resources and habitat currently used by the commercial fishery to their control. These pressures have culminated in several important land claims and native rights cases¹⁵² which have recently resulted in aboriginal fishing rights on aboriginal lands being declared valid over the regulations of the federal Fisheries Act (this re-allocation would not of course, be a threat to native fishers).

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¹⁵² For instance see The Fisherman, "Court upholds Gitskan bylaw in key native rights case" June 23, 1989, p.14.

Second, the commercial sports fishing industry in B.C. (which is dominated by large capitalist interests) has been seeking a larger share of the chinook and coho catch historically allocated to petty producers in the troll and combination fleets. The federal DFO has been increasingly favourable to such changes and since 1983, trollers in certain areas of the inner coast have had up to 90% of their catch re-allocated to large commercial sports fishing interests¹⁵³. This re-allocation has coincided with an increase in the size and lobbying power of the sports industry. The commercial sports fishing industry in British Columbia grew 75% between 1980 and 1985, and in 1985 generated an estimated \$400 million dollars in direct expenditures¹⁵⁴. The views of DFO are certainly shared by some members of the provincial government. In April of 1988, Bruce Strachan, the B.C. Environment Minister stated publicly his sentiment that the small-boat fresh/frozen fishery should be replaced by aquaculture and corporate net fisheries so that sports lodge operators could fish without constraints¹⁵⁵.

Third, industrial users like hydro, mining and logging interests also seek to benefit from a re-allocation of salmon habitat by the state. For instance, the Alcan Aluminium company benefited when the federal government allocated it salmon habitat in the Nechako river to build the 600 million

¹⁵³ See Collier, 1984, p.7 and Pacific Fishing, March 1988, p.29.

¹⁵⁴ See Standing Senate Committee on Fisheries, December 1987, p.58-59.

¹⁵⁵ The Fisherman, April 22, 1988, p.1-2.

dollar Kemano II dam in 1988. The Nechako dam provides Alcan with hydroelectric production for its aluminum smelter in Kitimat and 42 million dollars in hydro power sales to the U.S. granted under the Free Trade Agreement.

Fourth, under the new terms of the Pacific Salmon Treaty negotiated with the United States since 1984, B.C. salmon processing capital stands to gain from a re-allocation of a large portion of the petty producer fleet's chinook and coho catch to the Americans, in return for Canadian control over the catch of Fraser River pinks and sockeye. These pinks and sockeye are, of course, predominantly harvested by the capitalist-controlled seine fleet. If capital is already getting its supply of fresh/frozen fish through aquaculture production, it is easier for the state to trade off the petty catch. This summer (1989), as a consequence of the re-allocation of chinook and coho to the Americans, the troll and combination fleet were shut down for a week, after reaching 50% of their quota only ten days into the two month season.

According to the Science Council of Canada report on Aquaculture in 1984, aquaculture production permits the state to allocate wild salmon resources to alternative interests. In all the above instances of pressure to re-allocate the salmon resource, salmon aquaculture offers the state the option of re-allocating the resource to one fraction of capital without depriving fishing capital its supply of fresh/frozen fish. For instance, as the Science Council of

Canada report states¹⁵⁶: "reducing commercial pressure on salmon stocks by farming these species would help to meet the growing sport and Native food requirements without further depleting the wild resource."¹⁵⁷

As with the native and sports fishery, the Science Council logic applies to the state's concerns with re-allocating salmon habitat to industrial users like B.C. hydro, mining and logging interests. The use of capitalist aquaculture for fresh/frozen production would free up salmon habitat for more profitable pursuits. As stated in the Pearse Report on Pacific fisheries in 1982, "[T]he federal government should ensure that habitat is not sacrificed to other competing values, such as forestry, mining, hydro-electric power...unless it is assured that benefits will accrue to Canadians that will at least offset the loss in fish production capacity."¹⁵⁸ From the Pearse perspective, given that aquaculture means that natural fish habitat is no longer needed for fresh/frozer salmon production, the re-allocation of that habitat to other uses like hydro-electric power is increasingly justified.

In the long-run, aquaculture production increases the state's possibilities for allowing the allocation of the wild fishery to other users and for alternative uses of salmon habitat, both for the purposes of promoting capital

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¹⁵⁶ Science Council of Canada, 1984, p.13.

¹⁵⁷ Ibid, p.13.

¹⁵⁸ Pearse, 1982, p.24.

accumulation, as in the case of industrial users, and for managing political struggle, as in the case of native peoples. In other words, for petty producers, the development of aquaculture threatens to seriously weaken state guarantees on production.

D. Privatization of Salmon Reproductive Materials

The privatization of reproductive materials in the salmon farming industry poses a threat to small producers in the wild fishery, because it is only capital which has the resources to use these materials. Privatization effectively removes the reproduction of salmon from the public domain and potentially puts the control of the entire resource in the hands of capital. Non-capitalist producers are excluded from decisions affecting the genetic development of the domesticated species, which happen to be just those species most relied upon by small fishers.

E. Threat to Small-Scale Processing Capital

The large-scale penetration of fresh/frozen production by capitalist aquaculture bodes badly for the small capitalist buyer-processors who have historically been found in the fresh/frozen sector of the wild fishery. As discussed above, salmon aquaculture in British Columbia is characterized by integrated harvesting and processing operations where both areas of production are controlled by the same large capitalist firm, usually large-scale foreign or domestic

capital. In areas where the harvest operation is owned independently of processing operations, special contractual or franchising arrangements are frequently made with the large-scale domestic processors even before smolts are bought from the hatchery. For small capitalist buyers and processors, the effect of integrated processing and special marketing agreements in aquaculture is similar to those found in the large processor dominated seine sector of the wild fishery: they are cut off from the fish supply. The high capital costs involved in running integrated farming or underwriting farm production prohibit the participation of these small firms in such schemes. It is ensured that their attempts to secure supply are confined to the small-boat wild fishery. Hence, while fresh frozen production in the wild fishery is generally characterized by a petty producer harvest sector which sells to both small and large capital buyer/processors, salmon farming is generally directly controlled by capital on both levels. If competition from salmon aquaculture threatens petty production in the wild fishery, the small capitalist buyer who depend on this industry for supply are also threatened.

CHAPTER 5. THE EMERGENCE OF SALMON AQUACULTURE IN BRITISH COLUMBIA: AN EXPLANATION.

The previous chapter details the implications of salmon aquaculture as a new production force, on relations of production in the B.C. salmon industry during the 1980s. Salmon aquaculture is shown to have developed as a new form of fresh/frozen salmon production dominated by large-scale, vertically-integrated capital. It is argued that aquaculture production significantly extends capitalist domination of the relations of production in the salmon industry, and ultimately threatens to displace existing simple commodity production forms of fresh/frozen salmon production in the wild fishery. Chapter five attempts to explain this event: that is, it provides an account of how and why salmon aquaculture emerged as a capitalist form of production in British Columbia in the 1980s.

At the level of theory, this chapter addresses the question of how to explain the development of the forces of production. As argued in chapter two, the emergence of new forms of production¹⁵⁹ must be viewed as more than simply the introduction of "new technologies", abstracted from social relations. The Marxist notion of "productive force" employed in this thesis addresses this issue by placing technology in a

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¹⁵⁹ By "form of production" I refer to the combination of productive forces and division of labour comprising a production system at the level of the workplace. At level of the social formation this would be referred to as mode of production.

social context, recognizing it as both derivative of, and having implications for, relations of production.

It is argued that under capitalism, the development of new forces of production, such as found in the B.C. salmon industry, are driven by capital's need to overcome the crises and threats to accumulation posed by continuing inter- and intra-class conflict and competition. The social and material conditions of production deriving from these class dynamics entail that capital must constantly increase the productivity of its means of accumulation in order to survive. The development of the forces of production serves to increase capitalist productivity through the replacement of human labour with new technologies and the transformation of relations of production in areas where capitalist production previously did not exist.

New productive forces, however, are not simply mechanically emitted on demand by capital in response to adverse conditions of accumulation. That is, the development of new forces of production and their incorporation into new forms of production that benefit bourgeois accumulation in a given area of production or geographic area, are not guaranteed¹⁶⁰. Resistance by direct producers, lack of infrastructure, cost of research and development among other things, may pose difficulties for capitalist development. This is where the state plays a central role.

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¹⁶⁰ Especially given the increased global mobility of capital.

According to Joachim Hirsch, the state is the key agency serving to promote and mediate capitalist development of the forces of production. That is, the state plays a dual role in facilitating the development of the forces of production: it both promotes the development of the forces of production such that they benefit capitalist accumulation and at the same time, it mediates the struggles of the various class forces which might resist or object to these transformations.

Why does the state act in this manner? Hirsch argues that the state under capitalism engages in these activities because its own institutional interests -- economic and hegemonic -- are linked to the maintenance of capitalist accumulation and bourgeois hegemony in the jurisdiction it governs. Since the state and its civil constituency generally depend on the revenues generated by a capitalist economy and function in a global economy dominated by capital, the state's institutional fiscal well-being and political legitimacy tend to be corollaries to a stable and healthy capitalist economy. In other words, the actions of the state are structurally delimited by its conditions of existence under capitalism: it acts to ensure its own continuity.

In this chapter, I show how the above approach to understanding capitalist development can illuminate and explain, in concrete terms, the factors governing the emergence of aquaculture production in the British Columbia salmon industry in the 1980s. Part one explains the key

features of aquaculture production which have made it attractive to capitalist development. Part two argues that the capitalist domination of aquaculture development in British Columbia was made possible largely as a consequence of the policies and interventions of the Canadian state which (1) promoted the transformation of the forces of production (2) secured the economic conditions of capitalist development (3) rejected the need to support aboriginal and other non-capitalist forms of production and (4) maintained hegemony by containing opposition to this type of development by non-capitalist producers and other popular constituencies. Finally, part three outlines the various concerns which have structured the Canadian state's involvement with aquaculture development. I attempt to show that aquaculture development was facilitated by the state¹⁶¹ as a means of resolving its complementary interest with capital in overcoming certain threats to accumulation which derived from conditions of production in the B.C. salmon fishery and the broader B.C. economy¹⁶².

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¹⁶¹ By the term state, I refer to the apparatus of both federal and provincial government. I shall differentiate between these two bodies when it is appropriate during the course of this analysis.

¹⁶² This analysis proposes that the particular outcome of aquaculture development occurred in consideration of the set of conditions and delimitations discussed in the analysis; it is not meant to imply that there were not other ways for the state to resolve these issues within the bounds of these delimitations.

I. Aquaculture Technology: Advantages for Capitalist Production.

In part one of this chapter, I explain the features of salmon aquaculture production which have made it attractive to capitalist investment. I show that aquaculture technology as developed in British Columbia, offers significant advantages to large capital over traditional forms of fresh/frozen salmon production in the wild fishery. These advantages are shown to be in the areas of (1) control over reproductive materials (2) labour and production costs (3) supply competition and (4) control over the production process.

A. Private Control of Reproductive Materials

In Canada and other countries, the biological reproduction of salmon in the wild and the reproductive materials necessary for this, are designated as public property, and are therefore subject to state control¹⁶³. The development of aquaculture is attractive to capital as a commercial technology first, because it facilitates the private control of the reproduction of salmon and salmon reproductive materials. Aquaculture technology permits removal of the biological reproduction of salmon from the wild -- considered a public domain -- and permits its occurrence in a private setting under artificially-controlled conditions¹⁶⁴. In this new

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¹⁶³ In Canada, the federal Fisheries Act prohibits the removal of salmon eggs or other genetic materials from the wild.

¹⁶⁴ The ability to cultivate an organism in a different setting from what is commonly considered the public domain is important to affecting private control. This is illustrated with the case of ocean ranching. Ocean ranching involves the

setting, salmon reproduction, the reproductive materials and the products of reproduction can become subject to control by capital as private property.

Consequently, aquaculture production allows the ownership by capital, of not only the technological, but also the biological means of salmon production. That is, in the context of B.C. salmon aquaculture, not only are farm leases and salmon farming technology privately controlled, so too are the bio-genetic materials necessary to reproduce salmon.

Private control over salmon reproductive materials substantially extends capital's control over the means of production. Capital no longer must depend upon the state to manage the reproduction of the salmon supply. This supply can be produced and manipulated according to the needs of capital and the needs of individual capitals. Fish can be sterilized to grow faster, genetically tailored to the needs of marketing, or selected according to their compatibility with fast

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reproduction of fish in a artificial private setting similar to that of salmon farming. However, after smolting, as opposed to being kept in pens and fed artificially like in aquaculture, the salmon are released into the ocean to grow freely. The salmon are harvested by the company that released them when they return to their site of birth. Despite the profoundly lower production costs of this method of fish production, it has not been commercially adopted because it has not been politically feasible for the state to assign to ranching firms private property rights to their salmon while in the ocean. Regardless of ownership claims, while swimming freely in the ocean, fish are considered to in the public domain and therefore, common property.

weight gain and the high stock densities experienced in net pens¹⁶⁵.

Furthermore, the private control of salmon reproductive materials represents the commodification by capital of salmon broodstock and the genetic materials produced by the broodstock. It offers a new area from which capital may extract value. In British Columbia, between 1980 and 1987, the number of private hatcheries expanded from 1 to 37, over 20 of which were involved in the private sale of broodstock, eggs or smolts. A number of these hatcheries were also selling smolts and eggs overseas to countries like Japan, Chile and New Zealand where there are no indigenous salmon stocks to provide a basis for new salmon farming industries.

B. Lower Labour and Production Costs

Aquaculture technology, also offers decreased labour and production costs, compared to the wild fishery. These advantages result from the compatibility of aquaculture with:

- a) year-round use of processing and production equipment;
- b) freedom from common property conventions of the wild fishery;
- c) a reduction in the skill level needed by workers in production
- d) higher productivity of labour.

¹⁶⁵ See Discovery Foundation BCRD, February, 1988 p.20. Also Canadian Aquaculture. March/April 1989 p.32. Also B.C. Research, Submission to the Gillespie Commission. December 8, 1986.

1. Lack of Seasonal Limitations

The first advantage of aquaculture is that production is not seasonally limited. The seasonality of the wild fishery represents a cost to capital because during the off-season a large proportion of capital is tied up unproductively in idle boats and processing equipment. With the use of aquaculture technology, 1) there are no state limitations on salmon production for conservation purposes and 2) there are no natural constraints on harvest imposed by weather and other natural conditions. As a consequence processing and production equipment may be utilized year around and capital is used more efficiently.

2. Freedom from Constraints of Common Property

A second reason for the lower costs of aquaculture is its freedom from the common property conventions found in the wild fishery. As argued in the previous chapter, the persistence of petty commodity production in the wild fishery has meant that while fishing technology has become more efficient and fewer fishers are needed to harvest the catch, *the number of fishers participating in the fishery has not decreased.*

From the perspective of capital, the persistence of smaller producers unnecessarily inflates the costs of production in the fishery. These fishers create a massive surplus in the amount labour and capital needed for the efficient harvest of the catch. While, capital sees these fishers as a grotesquely inefficient means of harvesting the

catch, it is constrained in its ability to effectively compete with these fishers. Employing the convention of common property in the wild fishery, smaller producers in the fishery have been able to force the state to guarantee them an even share of the overall annual catch. To enforce this guarantee, the state artificially restricts the production of fishing units controlled by capital. As a result capital must under-utilize its own powerful and efficient industrial fishing fleet, and is forced to pay more per unit of production to meet its supply needs from independent producers.

Over 4 years from 1982 to 1985, processors paid an average of 33% more per metric tonne for gillnet-caught salmon and 93% more per metric tonne (converted round weight) for combination and troll-caught salmon, compared to what they paid for salmon caught by the industrial seine fleet (see Table 6).

TABLE 6: Average Price paid per Metric Tonne of Unprocessed Salmon as a Percentage of Seine Price, 1982-1985¹⁶⁶.

<u>Gear Sector</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Comb/Troll	181% \$2718	194% \$2175	220% \$4122	168% \$3058
Gillnet	108% \$1617	152% \$1701	123% \$2804	147% \$2676
Seine	100% \$1499	100% \$1120	100% \$1871	100% \$1821

¹⁶⁶ These figures were obtained from Rita Morris, DFO Pacific, February 1988. All prices are converted to prices for round (unprocessed) weights using DFO figures. This conversion has deflated the troll prices used in the chart.

For capital, aquaculture represents lower production costs simply because it offers an alternative to artificial constraints on capital's fishing power and dependence on the petty commodity producers of the wild fishery. As stated by a Science Council of Canada document in 1985¹⁶⁷:

With fixed-enclosure aquaculture, the common property problem of harvesting is eliminated, providing the institutional framework for the efficient production of fish products from privately-owned or leased farms.

In British Columbia, there is no history of common property with regard to aquaculture operations, and the practice of limiting the cultivation of fish to a fixed enclosure eliminates any legal ambiguity with regard to fish inhabiting the public domain¹⁶⁸. The political struggle over property rights is thus tilted in favour of capital. While the common property convention compels the state to protect the property rights of small producers in the wild fishery, it

¹⁶⁷ Science Council of Canada, Aquaculture: An Opportunity for Canadians. March 1985: p.12.

¹⁶⁸ The importance of resolving questions of common property is illustrated with the case of salmon ranching. Salmon ranching involves an operation releasing into the wild, privately-owned artificially-cultivated fish, and harvesting them at maturity, upon their return to their place of origin to spawn. While the employment of fixed enclosures has set aquaculture apart from the common property conventions of the wild fishery, the Canadian state has deemed that salmon ranching's practice of releasing of fish into wild, makes the protection of private property claims over such fish politically unfeasible as long as the ocean resources are deemed subject to common property claims. The inability of the state to enforce private property rights in salmon ranching has permanently frozen the development of this industry. See Science Council of British Columbia, 1984, p. 28; Also Brett and Bourne in J. Pritchard (ed.), Proceedings of the National Aquaculture Conference. 1984 p.36.

is unlikely to be compelled to do so in the case of aquaculture. Since the state takes no measures to protect the interests of other classes of producer against those of capital, capital is freer to fully exercise its control over its means of production and compete on its own terms.

3. Low-Skilled Labour

A third reason for lower production costs in salmon aquaculture is that the labour required in the production process is generally less skilled than in the wild fishery. Labour costs are consequently lower. Capital is able to employ this low-skilled labour for two reasons.

First, much of the social knowledge needed to farm salmon is built into the aquaculture technology owned by capital. Computer programs, eviscerating machines, medicines, automated fish feeders, environmental sensing technology and fish feed embody much of the expert knowledge needed to operate a fish farm.

Second, the scale and division of labour in aquaculture production allows the required knowledge and skills for deploying the technology to be concentrated in the hands of management rather than in the hands of workers. Thus, rather than having to pay workers for their skills and knowledge, an aquaculture company need only purchase technology that embodies such knowledge and hire managers to administer the workers and technology. If expert knowledge is needed to

repair equipment or solve special problems, management can contract the work to outside experts on an occasional basis.

4. Higher Productivity of Labour

Production costs are lower because the elimination of the labour needed to pursue and capture fish before harvest and the increased technological component of production in aquaculture means higher productivity. That is, the number of workers needed to produce a given quantity of fish is significantly lower in aquaculture production than in the wild fishery. This means lower labour costs per unit production. Table 7 below illustrates the potential productivity gains aquaculture technology offers over the wild fishery. In the British Columbia wild fishery, the average production per fisher in 1986 (one of the highest production years on record) was 7.135 metric tonnes. Within the less-efficient troll/combination vessel sector, the main source of fresh/frozen salmon, the average production per worker would be even lower¹⁶⁹. In comparison, during 1988, the Norwegian salmon farming industry produced an average of 20 metric tonnes of fresh/frozen salmon per worker, three times that of the B.C. wild fishery.

¹⁶⁹ In 1985, the B.C. troll, combination and gillnet small boat fisheries employed an estimated 7,870 fishers. They produced approximately 48,850 metric tonnes of fish. The average production per worker in this fleet is 6.2 metric tonnes. Figures were based on the assumption of two crew members per vessel for trollers and combination boats, three for freezer trollers and one and one half per vessel on gillnetters.

TABLE 7: Average Production per Worker: B.C. Wild Fishery vs. Norwegian Aquaculture (1986)¹⁷⁰.

	B.C. Wild Fishery	Norwegian Aquaculture
Number of Workers	10,870	4,000
Total Product (metric tonnes)	77,563	80,000
Production per Worker (metric tonnes)	7.135	20

C. Less Competition Over Supply

A third major advantage of salmon farming for large capital is that aquaculture offers processors the prospect of privately owning or having exclusive marketing rights to the large-scale production of fish farms. This eliminates the need to compete with other mainly smaller processor-buyers for fish supply in the wild fishery. In contrast with the wild fishery, supply is more secure and production costs are no longer subject to the inflationary pressures of competitive buying, and -- for those firms which own fish farms -- capital need no longer be bound up in the infrastructure associated with cultivating "tied" producers for such buying.

Between 1975 and 1986, the fresh/frozen sector of the wild fishery had between 26 and 41 processor-buyers, whereas the industrial or canning sector had between 7 and 12. The

¹⁷⁰ Figures derived from Price Waterhouse, The Economic Impacts of Fishing in British Columbia - 1986. December 1987; and Price Waterhouse, Long Term Production Outlook For the Canadian Aquaculture Industry. January 1989. p. 16,17,29

larger numbers of small capitalist processors in the fresh/frozen processing sector of the wild fishery have meant intensified price competition for fish supply. Rather than engaging directly in price competition to secure supply in this sector, large capital has preferred to rely on the cultivation of tied producers.

This preference is reflected in the fact that over the years 1975 to 1986, prices offered by the large processors have consistently lagged behind those of the smaller processors. Ultimately, the decision to avoid price-competition has weakened the oligopsony of these processors in the fresh/frozen market. In the latest year for which statistics are available (1986), the largest four capitalist processors controlled only 54% of production in the fresh/frozen sector of the wild fishery, versus almost 90% in the canning sector¹⁷¹.

For large capital, the constriction of profits represented by supply competition in the fresh/frozen wild fishery is eliminated by moving into aquaculture production. Aquaculture supply and distribution in British Columbia is highly integrated with virtually all grow-out operations controlled in some fashion by large processor/distributing capital through ownership or financing agreements. The large amounts of financing needed to secure ownership in, or to gain

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¹⁷¹ These figures are derived from a discussion in February 1988 with Larry Neilson, B.C. Ministry of Agriculture and Fisheries.

marketing rights for, a salmon farming operation are prohibitive to smaller capitals. With salmon aquaculture, large capital is in a position to bypass fishers and competing capitalist buyers in the wild fishery and supply itself with salmon for fresh/frozen markets. Inter-capital competition over supply is minimized. Aquaculture's elimination of the need to compete for supply in the fresh/frozen salmon sector means fewer risks and fewer constrictions on profits for large capital in this sector of production.

D. Increased Control Over Production Process

A fourth major advantage provided by salmon aquaculture is increased control over the production process. In the traditional fishery, fishing companies have very little control over the quality and supply of the fisher's landed product. Natural conditions, technological limitations and the relative control of fishers over their labour process limit the extent to which capital can direct production.

With aquaculture technology, the manipulation of genetic, biological and environmental variables alongside greater control over the labour process, permits increased control by capital over the quality and supply of the commodities produced -- translating into better product value in the market.

Aquaculture technology improves control over quality first, in the way that it reduces problems of spoilage and inconsistent product quality. In the wild fishery,

limitations of distance, weather and fishing conditions mean that fish can be of less than premium quality by the time they are sold. For most fishers it is more economical to deliver once every one or two weeks (or, for freezer boats once a month) rather than deliver everyday. Over 90% of wild-caught non-canned salmon is frozen, and fresh salmon is at least five to twelve days old when sold. While frozen fish has a longer shelf life, fresh fish is preferred by consumers. Furthermore, processing in the wild fishery is often inconsistent and poorly done. The labour force on a boat cannot be adjusted once at sea. In periods of heavy fishing, crews are generally forced to concentrate on hauling fish and end up neglecting the processing side of production.

In contrast with the wild fishery, a salmon farm operation can slaughter and deliver its fish fresh within 24 hours nearly anywhere in North America and within 48 hours to Europe and Japan. This capacity means that product freshness can be ensured in a way which has been impossible in the wild fishery. Less than 15% is frozen. This means that marketers have the option of freezing if it becomes an advantage in a particular market and that companies do not have to invest in maintaining expensive frozen inventories.

Furthermore, an increased surveillance of the labour process and more flexible access to the labour force than is possible at sea, mean better enforcement of production standards and a higher and more consistent quality during

processing. This assurance of freshness and product quality is a clear advantage when it comes to marketing salmon.

Aquaculture technology promises improved product quality, secondly, because it can produce a more uniform product and adjust itself better to market preferences. Regulated feeding regimes, genetic selection and direct supervision of labour mean that fish are uniform in size and appearance and allow a producer to respond to market preferences. Salmon marked for markets such as Japan, where red flesh is especially prized, for instance, have recently had their dosage of red flesh pigments doubled in accordance with the requests of Japanese wholesalers. To produce fish of a designated size and optimal body weight for a particular market, salmon are genetically selected and harvested at the appropriate point in their growth cycle. Reflective of this increased responsiveness to market preferences is the term "designer fish", one of the latest buzzwords to hit the industry.

For capital, the ability of aquaculture technology to consistently produce a fresh high quality product, tailored to particular markets, is a major advantage in maximizing the realization of product value. This perception of higher quality is reflected in the prices fetched by aquaculture salmon. These generally range from \$1.00 to \$1.70 per kilogram higher than those of wild salmon¹⁷².

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¹⁷² See B.C. Ministry of Economic Development, Submission to the Gillespie Inquiry. 1986, p.13.

Another advantage of increased control over production in aquaculture, relates to issues of supply. In the wild fishery, salmon may be marketed fresh only during the two to three months per year the fishing season is open. Fishing companies have no control over the timing of landings or quantities of fish landed by fishers. Processors must take what they can get since supply is largely dependent on natural conditions and the willingness of primary producers to produce for the prices offered. This unreliability of supply creates problems in marketing. Without being able to plan production, a firm is at a disadvantage in responding to and anticipating demand, not to mention guaranteeing supply to prospective clients. During gluts, processors are forced to stockpile frozen salmon and during shortages, they cannot meet their supply obligations.

In contrast with this, salmon farms can produce fish for the fresh market all year-long. Supply is reliable and producers can be responsive to demand. The pacing and quality of production can be adjusted more exclusively to meet the needs of capital. These improved conditions of supply offer several benefits to capital.

First, it is possible for fish companies to do better advance marketing of products because of prior knowledge of production volumes. Without a reliable and consistent supply, restaurant and other wholesale buyers are reluctant to advertise or pre-market their goods and are unable to build up

long-lasting consumer confidence in their products¹⁷³. Fish companies are at a disadvantage when competing against substitution goods like chicken or tuna, which can be supplied year around on a consistent basis. The continual and reliable supply of fish offered by aquaculture helps to remove these constraints. The possibility of advanced marketing opens up new wholesale markets for fresh salmon where previous unreliable supply conditions had acted as a constraint on demand¹⁷⁴.

Second, production can be strategically timed year-round in conjunction with conditions of supply in target markets. It can be tailored to the needs of smaller markets which do not exist for the wild fishery. Furthermore, production can be staggered to avoid market gluts, or concentrated to coincide with periods of anticipated demand - for instance during national holidays like Easter or the Labour Day weekend. Consequently, control over supply can be seen to be another means by which increased control over the production process in aquaculture serves to maximize capital's realization of product value.

¹⁷³ See Canadian Aquaculture. January 1988, p.61; and J. Douglas MacDonald and P. Leitz, in J. Pritchard, Proceedings of the National Aquaculture Conference. 1984 p. 115

¹⁷⁴ These new markets for fresh salmon will likely be at the expense of the market for frozen wild salmon.

II. The Development of Capitalist Salmon Aquaculture Production in British Columbia: The Role of The State.

In this second part of chapter five, I give an account of how salmon aquaculture came to be developed in British Columbia in the 1980s. I argue that the Canadian state at both federal and provincial levels, played the pivotal role in fostering and promoting the capitalist domination of aquaculture development through the following actions: 1) underwriting research and infrastructural services oriented toward making possible the initial development of forces of production which were biased towards the needs of capital, 2) securing the conditions for Norwegian and other types of large-scale capitalist investment through the rejection of state controls on aquaculture development and emphasizing infrastructural support through existing agencies, 3) rejecting the need to provide adequate support in overcoming barriers to the participation of aboriginal and small-scale producers in the industry and 4) attempting to mediate and contain the struggles of various social forces opposed to the unregulated expansion of capitalist control over productive resources represented by aquaculture development.

A. Technical Development

In section one, I explain how the research activities and infrastructural support of the Canadian federal government were central to the initial emergence of B.C. salmon aquaculture in the late 1970s as a technically viable form of

production. I establish that while the technical viability of B.C. aquaculture emerged in the late 1970s, its successful commercial development did not occur until about 1984 because of the high costs of production and a lack of investment capital.

While the technology for aquaculture has been around for many years, it was not applied to the commercial production of salmon until very recently. Fresh-water aquaculture has been practiced in China for over 4000 years and various forms of sea-based aquaculture have been carried out in Japan, Taiwan, Israel and Scandinavian countries for over 40 years.

Internationally, the first intensive research efforts into ocean-based salmon aquaculture occurred during the 1960s and early 1970s. Many fish-producing nations were beginning to look for alternatives to sea-based wild fisheries as a consequence of mounting industrial conflicts over usage of fish producing environments (North Sea oil, for example), environmental degradation in their domestic waters and the implementation of International Law of the Sea 200-mile maritime economic zones by countries in whose waters these nations had formerly fished. While aquaculture was not seen as an immediate solution to these problems, its potential as a efficient and profitable form of industrial fish production quickly became evident.

Norway, in particular, has emerged as a world leader in fish farming technologies. Building on knowledge already

derived from an intensive freshwater trout farming industry and employing a heavily state-regulated and state-funded model of development, Norwegian salmon aquaculture became a profitable enterprise during the late 1960's. In 1975, Norway had 66 farms and was already exporting 691 metric tonnes in saltwater aquaculture products. By 1985 Norway had 560 farms and nearly 30,000 tonnes in exports. It is predicted to produce over 100,000 tonnes of salmon for export by 1990¹⁷⁵. Other nations developing industrial salmon farming capacities -- Scotland, Iceland, New Zealand, Chile Canada and United States -- have followed Norway's lead.

In Canada, salmon aquaculture development has fallen under a bewildering mesh of overlapping jurisdictions administered by various ministries in both federal and provincial governments. While the federal department fisheries has had jurisdiction over the transportation, management and cultivation of salmon as an ocean-based resource, the provincial government has had jurisdiction over the foreshores upon which all salmon farms are located and the fresh water resources needed for hatcheries. As a consequence both levels of government have been intricately involved throughout aquaculture's development in British Columbia. In the initial stages, however, the research and development initiatives have been carried out wholly by the federal Department of Fisheries and Oceans.

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¹⁷⁵ See Bjorndal and Schwindt, 1987. p.9. Also see Canadian Aquaculture, May/June 1989 for revised predictions of 130,000 tonnes.

While sea-based salmon aquaculture technology and expertise is by and large new to British Columbia, the component technologies have existed and operated in British Columbia as far back as the 1890's when the federal government began operation of salmon hatcheries and artificial spawning channels. From the 1920's on, the operation of these facilities became a key part of the federal government's strategy to augment wild salmon stocks and support the B.C. salmon industry. Canadian federal fisheries programs for the artificial enhancement of wild salmon runs funded during the 1950's and 1960's were instrumental in providing a foundation of knowledge and expertise for current commercial aquaculture endeavors in British Columbia: in fact, they were the basis for the development of European salmon aquaculture technology.

During the late 1970's and 1980's, the federal government further developed and applied this expertise through an expensive and large scale program of hatchery development for the wild fishery -- the Salmon Enhancement Program¹⁷⁶. This latter program --representing expenditures of more than 250 million dollars over 9 years for the state-- resulted in the further refinement of the technologies which permitted the

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¹⁷⁶ It is worthy to note here that although 85% of the federal enhancement programs' efforts were directed toward the enhancement of traditionally net-caught species, it was only the traditional troll-caught species --chinook and coho-- which were selected for research into aquaculture production.

breeding, hatching and smolting¹⁷⁷ of Pacific salmon under artificial conditions.

Most of the initial efforts specifically aimed at developing salmon aquaculture in the marine grow-out stage after being raised in hatcheries, were carried out and funded by the Canadian federal government throughout the 1970s and early 1980s. While experience in the wild fishery had made Canadian expertise one of the world's most advanced at hatching and raising salmon prior to smolting, particular attention was still needed for the refinement of the technologies, foods and methods for smolting and raising salmon to maturity in the ocean.

The federal government issued its first salmon farming licence in 1971 and sponsored its own first experimental salmon farm in British Columbia a year later. While no real clear state policy or priority for aquaculture development yet existed by the late 1970s, aquaculture research became somewhat more systematically funded by the federal government and to a certain extent by the provincial government, with the great majority of funds being supplied by the federal Department of Fisheries and Oceans. Other state agencies providing funding were the Science Council of Canada, the National Research Council, the Science Council of B.C., the Marine Resources Branch of the B.C. Ministry of Fisheries and

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¹⁷⁷ Smolting is the process by which baby salmon are transferred from the fresh water habitat in which they were hatched to the salt water marine setting where they will mature.

Agriculture, B.C. Ministry of the Environment and the British Columbia Development Corporation.

Between 1978 and 1984, the federal and B.C. provincial governments increased their direct funding of salmon aquaculture, above and beyond the occasional project grant and the allocation of wild salmon enhancement monies, to an annual average of 1.5 million dollars specifically directed toward salmon aquaculture research¹⁷⁸. The state funded several experimental salmon farms and projects on nutrition, disease control and increasing production yields.

However, the most crucial area of state support for commercial aquaculture development was the supply and subsidy of broodstock, eggs and salmon smolts to the small number of private experimental and semi-commercial private farming operations which first emerged along the British Columbia coast during the late 1970s and early 1980s. It is illegal for anyone but the state to remove, disturb or transport from the wild, the live salmon or eggs upon which farms and hatcheries were wholly dependent. Without the state's generous supply of reproductive materials, the commercial domestication of salmon in British Columbia could have never even begun. Between 1981 and 1986, 95% of the eggs needed by the salmon aquaculture industry were supplied by the DFO's Salmon Enhancement Program¹⁷⁹.

¹⁷⁸ See Science Council of British Columbia, 1984:p.203-204.

¹⁷⁹ In fact, it has only been since 1985 that such private hatcheries have not had to depend completely upon wild eggs supplied and subsidized by the federal DFO. Since then,

By 1982, the number of licences issued by the B.C. Ministry of Environment for salmon farming operations increased to 15¹⁸⁰. Of the 15 farm licences issued in 1982, 8 were state-run experimental operations, 5 were to active "commercial" operations and 2 were to commercial but non-productive operations. Between 1982 and 1983, the overall number of commercial salmon farming operations in British Columbia increased only marginally to 10, with 8 active.

While all but one of these commercial salmon farms were small facilities, operated by families¹⁸¹, it is doubtful that many of these first few farms were independently viable as family units. In addition to the state-sponsored supply of eggs, their operations were in general, overwhelmingly dependent upon the receipt of technical, financial and infrastructural support from the state and large commercial enterprises interested in the future possibilities of fish farming¹⁸².

That is, for operating capital, these first operations were largely dependent on the receipt of research funds from a mixture of state and private sources. Limited short-term

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Europe (Atlantic salmon eggs) and growing numbers of private broodstock developed by commercial hatcheries in B.C. have begun to complement the DFO supply of eggs.

¹⁸⁰ Licences are issued by the province to every fish farm, laboratory or experimental facility which holds live salmon.

¹⁸¹ The only operation of any scale (comprising 90.4% of the province's total sales) among the 5 active private salmon farm operations in 1982 --Apex Bio-Resources-- ceased operations that year because of an inability to generate revenue in step with its expansion efforts and because of the pullout of its principal financial backer, Union Carbide.

¹⁸² See Science Council of British Columbia, 1983, p. 19.

financial assistance was also available through the provincial Agriculture Credit Act in the form of grants and tax breaks for research and interest free loans up to \$300,000 which could be applied toward hatchery operations. The state offered free veterinary and diagnostic services in its research labs in Vancouver and Nanaimo and provided these farms with the benefits of on-going state aquaculture research by supplying literature and consultation on husbandry methods, market and product promotion, disease control and environmental monitoring.

Support from private companies and the state was provided with the understanding that these first aquaculture operations were performing a ground-breaking (or guinea-pig) role for the industry that was to come. There was still no clear state policy of commitment to aquaculture development from either federal or provincial governments. As evidenced by a 1984 report of the Science Council of B.C., salmon aquaculture at the time, was considered to be in a developmental stage where research and "small-scale commercial projects [were] needed to solve technical problems and develop management skills" still required to make the industry commercially viable¹⁸³. The report concluded that "there is a general agreement that the difficulties in raising fish in captivity are limiting aquaculture now, and that production systems are too costly to remain competitive with other food sources¹⁸⁴."

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¹⁸³ Ibid, p. 235.

¹⁸⁴ Ibid, p. 137.

Until 1984, there were two major problems still inhibiting the development of a commercially successful salmon farming industry in British Columbia. The first major problem was the various technical obstacles to its economic viability. The Science Council of B.C. identified the main areas of aquaculture research at the time as being (1) disease and mortality control (2) feed cost reduction and (3) development of labour-saving technologies. Technology and experience were still needed to reduce risks, overcome high production costs and overcome marketing problems resulting from poor product quality^{185 186}.

Exacerbating the first problem was a second: banks and other private investors were extremely reluctant to invest or loan capital to aquaculture enterprises and the state was unwilling to provide sufficient financial support to overcome

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¹⁸⁵ At the time, high costs and risks exacerbated problems with product quality because farms were forced to sell before their fish were properly matured. Farmers were unwilling to trade-off extra growing time for higher feed and labour costs when this also meant significantly increasing the risk of stock mortality.

¹⁸⁶ In more detail, the technical obstacles to commercial viability in 1984 were as follows: (1) A widely varying incidence of stock mortality from disease, predators and unexpected environmental conditions meant that production risks were unacceptably high. These made salmon aquaculture not only a financially risky operation, but also affected the willingness of salmon farmers to let salmon grow beyond "pan-size" for fear of losing their stock before harvest. (2) Fish feeds appropriate to the needs of young salmon during different stages of growth were still very expensive and contributed up to 70% of the costs of raising salmon. Consequently farmed-raised salmon were very expensive. (3) The inability to produce a product larger than "pan-size" meant "poor quality." This, coupled with high costs created marketing problems for farmed salmon. See Science Council of British Columbia, 1983:p. vi,19-26.

this obstacle. This problem was particularly serious given the two to three years needed by an aquaculture operation to achieve production and up to five years needed to achieve commercially viable production¹⁸⁷.

Thus, although in the early 1980s state-sponsored research and infrastructural support had established the technical viability of fish farm production, salmon farms in British Columbia remained of marginal economic viability and consequently, few in number through until 1984.

B. Capitalist Development

In section two, I explain that the commercial development of B.C. salmon aquaculture by capital was set in motion in 1984 by a major infusion of investment by Norwegian aquaculture capital. I show how at the time, Norwegian capital was looking for new overseas investment markets to escape Norwegian state controls on capitalist development and was attracted to British Columbia mainly because of Canadian state policies which rejected such controls. I argue that the Norwegian investment these policies attracted, and subsequent increases in state research and infrastructural support for the industry, served to consolidate the economic viability of the industry and in turn, fueled a dramatic boom of capitalist investment which has continued until the end of 1988.

¹⁸⁷ Saxby, David., Aquaculture --" A Monetary Black Hole?", p.123-131. In G.I. Pritchard [ed.] Proceedings of the National Aquaculture Conference --strategies for aquaculture development in Canada. Department of Fisheries and Oceans, Ottawa, 1984.

1. Norwegian Aquaculture Capital Investment

Norway's first successful commercial salmon farms were established in the late 1960's. Through a program of extensive state support, by the 1980s Norway had established a highly successful commercial industry. In 1984, the Norwegian salmon farming industry produced over 22,000 metric tonnes of high quality salmon compared to British Columbia's 107 tonnes. About the same time, Norwegian aquaculture capital began to seek new investment opportunities overseas because of state-imposed restrictions on the expansion of capitalist aquaculture production in Norway.

In Norway since 1973, farming operations had been limited to a maximum volume of 8,000 cubic meters, aquaculture licences were required to have majority ownership by local capital (as opposed to large industrial concerns), aquaculture companies were limited to ownership of one farm-site at a time and the number of farm licences were limited. These restrictions were imposed by the Norwegian government to stimulate regional development through promoting small-scale, locally-controlled industry and to avoid the crises caused by over-rapid expansion of production such as has recently occurred in British Columbia.

While initially most large Norwegian aquaculture capital was not particularly concerned about these restrictions¹⁸⁸, as

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¹⁸⁸ Most of the large capitalist firms had established their operations before the restrictions were implemented and they were able to get around the limits on horizontal multiple

salmon farming became increasingly profitable in the 1980s, these enterprises, backed by Norwegian banks, began to seek investment opportunities abroad as means of escaping the limitations on their expansion in Norway. Furthermore, for Norwegian firms that were vertically-integrated with equipment manufacturers, investment abroad offered the possibility of expanded factor markets¹⁸⁹.

Why did Norwegian aquaculture capital choose to invest in British Columbia? There were a number of features which made British Columbia an attractive location.

First, there was British Columbia's geographic location. British Columbia is endowed with an ideal climate and coastline for salmon aquaculture farm-sites, this includes a pollution-free marine environment, mild winters, long protected inlets with tidal flushing and plenty of fresh water sources for hatcheries. Additionally, investment in British Columbia would offer significant new competitive advantages for Norwegian capital. It provided substantially cheaper access to the critical U.S. and Japanese salmon markets and served as a pre-emptive move against the possibility of North American competitors¹⁹⁰.

Second, and perhaps most importantly, there were the policies of the Canadian state toward development. In

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farm-site integration by integrating vertically with hatcheries, feed and equipment supply companies.

¹⁸⁹ See Bjorndal & Schwindt, 1987, p.5.

¹⁹⁰ See Bjorndal and Schwindt, 1987, p.28.; Also Report of the Standing Committee on Fisheries and Oceans, 1988, p.5.

contrast with Norway, the Canadian state, at both federal and provincial levels, had rejected the implementation of restrictions on foreign investment, location, ownership, number and size of aquaculture operations. Furthermore there were few environment controls, few restrictions on foreign egg imports, few controls on fish feed additives or pharmaceuticals, little or no production inspection, and no tariffs on equipment imports from Norway¹⁹¹. There was no obligation for aquaculture companies to provide information to the state on their production, or for foreign companies, to provide information on the amount of their investment (Investment Canada only required reporting on foreign investments of over 500 million dollars). Salmon aquaculture development in British Columbia was essentially unregulated, with none of the restrictions on capitalist development which were found in Norway.

This state policy of non-intervention was clearly intended as an incentive to capitalist investment in Canadian aquaculture. This rationale is explicit in the following statement of the Director General of the Federal Department of Fisheries and Oceans, Strategic Policy and Planning Directorate¹⁹². Explaining state promotion of salmon aquaculture to a parliamentary committee he made it clear

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¹⁹¹ The possibility of egg imports meant faster start-up time for new farms and that Norwegian firms could work with Atlantic salmon with which they were familiar and did not have to adapt their technologies to Pacific salmon. See Standing Committee on Fisheries and Oceans, July 1988, p. 19-21.

¹⁹² Standing Committee on Fisheries and Oceans, No. 21, p.33.

that, "what we as a department have been trying to do is make it easier for the private sector to come in and invest."

As stated by the majority report of the Parliamentary Committee on Fisheries and Oceans with regard to aquaculture:

Incentives...leave the industry relatively free to develop as it wants; this is especially valuable during the take-off state of an industry. It is important that the industry be able to operate without unnecessary restrictions which could either impede financing or prevent the industry from reaching optimal economies of scale.

Complementing the advantages of a relaxed investment climate, was the reluctance of the Canadian state to provide adequate financial backing or loan guarantees to banks for new aquaculture enterprises. This tightfistedness by the state created an "opportunity" for Norwegian investment to fill the vacuum. While Canadian banks were reluctant to loan money the new industry without such state support, loan guarantees from the state were limited to \$100,000¹⁹³. The inadequacy of this amount is evident in the face of the one million dollars minimum necessary to start a farming operation. According to the vice-president of a major Norwegian bank¹⁹⁴, "because Canadian banks have been hesitant to finance salmon farms, Norwegian banks are moving in to fill the gap."

As a consequence of the advantages, "incentives" and "opportunities" to be found in British Columbia, Norwegian

¹⁹³ This compares poorly with the 50% state financing available in Norway. See Campbell River Courier, July 19, 1986, p.16.

¹⁹⁴ Ibid, July 19, 1986, p.16.

aquaculture capital invested an estimated 50 to 100 million dollars in salmon farms, hatcheries and feed production between 1984 and 1986¹⁹⁵. By 1986, Norwegian investment controlled up to 60% of the total capital investment in B.C. farming operations, 50% of feed supply production and over 40% of non-integrated hatchery operations¹⁹⁶.

Most of this Norwegian investment was in the form of equity financing, whereby joint ventures are formed with new or existing Canadian firms, rather than through takeovers or creation of subsidiaries. At least six million dollars was in the form of loans to 5 companies from the Norwegian state "Industrial Fund", which supports the expansion of Norwegian industry abroad.

The condition of Norwegian financial backing was generally that the Norwegian parent company retained operational control of the business and that the farming operation purchased Norwegian equipment and technologies. Norwegian firms supplied larger-scale production technologies, labour-saving technologies and expertise on farm management and marketing strategies. Consequently, not only did the Norwegian investment provide a needed infusion of capital, but it also supplied, albeit at a premium, Norwegian technology and expertise to the B.C. industry.

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¹⁹⁵ Rick Deegan, February 1988, Pers. comm.

¹⁹⁶ See DPA, 1986, Section 4, p. 19-21.; Also Bjorndal & Schwindt, 1987, p.27.; Also Canadian Banker. Vol. 95 No. 6 November-December 1988, p.8.

2. Increased State Support

A second key factor in the transition of aquaculture to a commercially successful capitalist industry was the provincial and federal governments' intensification of research and infrastructural support activities, while continuing their shared policy of minimal direct funding and a "hands-off" approach to regulation.

In 1983, 1984 and 1985, in response to the perceived success of the Norwegian salmon farming industry, various agencies of the state sponsored conferences and assembled task forces to make proposals concerning the establishment of a Canadian aquaculture industry¹⁹⁷. These agencies proposed the state at both provincial and federal levels recognize aquaculture as a high-priority opportunity, and that it establish a national aquaculture policy and designate lead agencies to coordinate aquaculture development¹⁹⁸. In 1985, a National Aquaculture Coordinating Committee was created to settle and administer jurisdictional and administrative disputes regarding aquaculture development between the provinces and the federal government. In British Columbia, the Ministry of Fisheries and Agriculture was designated an aquaculture development lead agency and within it the Aquaculture and Commercial Fisheries Branch was set up.

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¹⁹⁷ See Science Council of Canada, 1984, 1985; Science Council of B.C., 1984

¹⁹⁸ Science Council of Canada, 1985, p.23.

By 1985, following the first Norwegian investment, the federal and B.C. provincial governments moved aquaculture into a considerably more prominent position on their research and development agenda. That year, combined average annual provincial and federal state spending directed specifically toward aquaculture research rose from 1.5 million per annum to over 4 million dollars¹⁹⁹. Expenditures on infrastructural support also increased, especially with respect to skills training programs and the supply and subsidy of salmon eggs by the state to private hatcheries through the provincial salmon farmers business association, the British Columbia Salmon Farming Association (BCSFA)²⁰⁰. The number of eggs supplied by the federal Department of Fisheries and Oceans (DFO) increased significantly in 1985 and 1986 (see Table 8). In 1986, DFO sold chinook, coho and steelhead eggs to the BCSFA at a subsidized price of 1 cent each; the BCSFA sold the eggs to its members at between 7 and 12 cents each depending on the species of egg. The number of eggs supplied by DFO to private industry declined again after 1987 partly due to chinook egg

¹⁹⁹ Standing Committee on Fisheries and Oceans, House of Commons, June 2-4, 1987:13; Bill Harrower, B.C. Ministry of Agriculture and Fisheries. April 1988, Pers. comm. Key areas of this new state research were 1) mortality reduction, especially breeding, disease control and environmental monitoring, 2) growth enhancement, involving experiments with genetics, hormones, sexual modification, nutrition and the application of various husbandry methods to different growth phases, 3) husbandry technology: generally pharmaceuticals, breeding, fish transport and labour-saving devices for feeding, harvesting and general farm management and 4) product and market research.

²⁰⁰ Standing Committee on Fisheries and Oceans, House of Commons, June 18, 1987, p.8.; Also Standing Committee on Fisheries and Oceans, House of Commons, June 2-4, 1987, p.13.

shortages and to the growing self-sufficiency of private hatcheries.

TABLE 8: DFO Egg Supply to the B.C. Salmon Aquaculture Industry, 1980-1986²⁰¹.

<u>Year</u>	<u>No. of Eggs</u>
1981	3,556,000
1982	3,012,000
1983	2,611,000
1984	3,137,000
1985	12,000,000
1986	37,000,000
1987	16,000,000

In addition to research efforts, beginning in 1984, the state increased its financial assistance programs for aquaculture development. In 1984, the federal and provincial governments designated 9 million dollars over five years in grant monies to salmon aquaculture to be distributed in sums not exceeding \$100,000²⁰². The federal and provincial governments also provided financial assistance in the form of a jointly-supported interest-free loan program designed specifically for salmon aquaculture (Aquaculture Incentive

²⁰¹ Ministry of Agriculture and Fisheries, Aquaculture Information Bulletin, No. 23. 1988: p.7.; The Fisherman, February 13, 1987 and May 21, 1986; Westcoast Fisherman, December 1987, p.4.

²⁰² Standing Committee on Fisheries and Oceans, House of Commons, June 2-4, 1987, p.13.

Program) and introduced tax and import duty credits and job development programs to subsidize labour costs²⁰³.

As a consequence of (1) the compelling evidence of the success of salmon aquaculture in Norway, (2) the state's rejection of controls on aquaculture development, (3) the impetus provided by the investment and technical expertise of Norwegian capital and (4) increased federal and provincial support, salmon aquaculture in British Columbia experienced a tremendous surge of capitalist investment and growth after 1984.

While it took 12 years from 1972 to 1984 for the first 10 commercial salmon farms to emerge in British Columbia, it took only 4 years after 1984 for the number of these operations to increase to over 200 (See Table 9). Over the same time period, the scale of production also increased markedly. The average size of farm operations between 1986 and 1988 increased from 6,725 cubic meters to 30,000 cubic meters. This is equivalent to an average production capacity of nearly 240 tonnes per farm. Also during this period, the first commercially successful private salmon hatcheries emerged. The number of such hatcheries increased from 0 in 1984 to 47 in 1988²⁰⁴. In 1988, commercial production of salmon smolts

²⁰³ See Steele, B.J. Financing and Incentives for Aquaculture Production in British Columbia. 1986 p.15.; Also MacLeans, November 8, 1985, p. 60.; Also Victoria-Times Colonist, March 11, 1985, p.28.

²⁰⁴ Geoff Meggs, The Fisherman Newspaper. December, 1988. Pers. comm.

by private hatcheries almost completely replaced industry dependence on state production.

TABLE 9: Salmon Aquaculture Growth in British Columbia,
1979 - 1989²⁰⁵

	Number of Licenced Sites	Production Volume
1979	N/A	41
1980	N/A	157
1981	4	176
1982	5	273
1983	8	128
1984	10	107
1985	36	120
1986	82	397
1987	153	1,200
1988	207	6,500

According to the B.C. Salmon Farmers Association, between April 1986 and December 1988 Norwegian investment had dropped from 40% of total investment to no more than 25%. The reason for this drop is that investment from domestic sources had increased significantly relative to Norwegian investment²⁰⁶. Given that this increase in the proportion of domestic investment has accompanied a tripling in the size of the

²⁰⁵ Sources: Price-Waterhouse, 1989, p.12.; B.C. Ministry of Agriculture and Fisheries, Aquaculture Information Bulletin, No. 3-1. 1987; Rick Deegan, B.C. Ministry of Agriculture and Fisheries, Pers. comm.

²⁰⁶ See Library of Parliament, 1989. p.1.

industry, the rate of domestic capital investment since 1986 has to have been phenomenal.

Between 1984 and 1988, salmon aquaculture established itself in British Columbia, unequivocally, as a large-scale capitalist-dominated industry. This industry at the end of 1988 was estimated to represent an investment of half a billion dollars in capital value, and annual expenditures of another 400 million in operating capital²⁰⁷.

In the next section, I show that while provincial and federal governments have promoted the development of large-scale capitalist production, they have simultaneously acted in a manner which has served to guarantee the exclusion of aboriginal and small-scale producers from the salmon aquaculture industry.

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²⁰⁷ These figures are based upon a conservative figure of \$200 million invested in fish farming equipment (from Rick Deegan, B.C. Ministry of Fisheries and Agriculture, Pers. comm. and Author Unknown, Salmon Farming In British Columbia: An Economic Impact Study.) and 300 million dollars in capital stock (meaning live inventory --- fish) (See Library of Parliament, Briefing Notes: The Fish Farming Industry in British Columbia. January 1989, p.1-2.). Based on information that annual operating capital is assumed to be twice fixed capital (depending on scale of production), I calculated annual operating capital of the industry to be 200% of fixed capital. See Aquaculture in British Columbia by the investment firm Deacon, Morgan, McEwan, Eason Limited. p.11; Also Salmon Farming: A Profile. B.C. Ministry of Economic Development. p.1-2 and Aquaculture in B.C.:Getting Started, Ministry of Agriculture and Fisheries. June, 1987, p.7.; Also Salmon Aquaculture "CASA Report probes aquaculture supply side", March/April 1989, p.24-25.

C. Developmental Constraints on Aboriginal and Small-Scale Aquaculture Production

David Harvey states that with regard to the development of new forces of production under capitalism "certain technologies are chosen rather than others; certain mental conceptions of the world take precedence over others²⁰⁸." Likewise, I argue that salmon aquaculture, as developed and advanced by the Canadian state, is not a neutral technology. Although touted in some quarters as a new "hi-tech cottage industry" for small "ma and pa" producers, and "one of the greatest single opportunities for native people on the coast of B.C.", salmon aquaculture is in fact biased toward larger-scale capitalist development and thus entails significant barriers to aboriginal and small-scale production. I argue that the federal and provincial government's rejection of adequate state support programs to overcome such barriers has served to guarantee the exclusion of aboriginal peoples and small-scale producers from the B.C. salmon aquaculture industry.

1. Size of Viable Operation

The main barrier to aboriginal and petty commodity production in salmon aquaculture is the high capital cost entailed in the scale of production currently required to

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²⁰⁸ Harvey, 1982, p.102

ensure commercial viability²⁰⁹. A report by Price Waterhouse and Entech in 1988 stated that at present:

A starting crop of 50,000 smolts is a minimum for an economical operation, with crop sizes of 100,000 smolts and up having the potential to produce attractive net returns on investment.

What this has meant for new entrants to the industry is a farming operation of 100 to 200 tonnes per year representing a minimum investment of 1-2 million dollars²¹⁰. At least 70% to 80% of this investment must be in the form of operating capital -- mostly for feed -- spread over the minimum two years needed before revenues are produced²¹¹. The *minimum*

²⁰⁹ A 1984 study for the Science Council of British Columbia found that the four most critical factors for the viability of salmon aquaculture are, in order of significance:

1. The ability to produce and sell large volumes of product, 100-200 tonnes per farm per annum.
2. Provision of a quality product which can sell for \$7.00 kg. (that is, which can compete internationally).
3. Availability of sufficient credit.
4. Maximum efficiency in use of labour and feed.

Italics added. See Science Council of British Columbia, 1984, p.19-20

²¹⁰ Most of the estimates of the minimum costs of entry to the salmon farming business derive from studies and estimates made in 1986. Since then, overall cost of entry may have increased. See British Columbia Ministry of the Food and Agriculture, Financing and Incentives for Aquaculture Production in British Columbia, March 1986, p.3.; The B.C. Ministry of Economic Development, Salmon Farming: A Profile, 1986, p.1-2.; DPA Group, Industrial Organization of the B.C. Salmon Aquaculture Industry, 1986, Sect. 3, p.18.; Science Council of British Columbia Report, 1984, p.19.; The B.C. Salmon Farmers Association, Fact Sheet: Salmon Farming - The Story, 1988, p.2.; Researchers at both DFO and the B.C. Ministry of Aquaculture and Fisheries have used this latter figure of one million dollars to start a 100 tonnes salmon farming operation since about 1986.

²¹¹ See Deacon, Morgan, McEwen, Easson Limited. Investment Research. Aquaculture in British Columbia. January 25, 1988. p.11.; Also Ministry of Agriculture and Fisheries. Aquaculture in B.C.: Getting Started. 1987, p.3.

number of workers needed was generally thought to be about 4 to 5, in addition to various "technical experts" (biologists, veterinarians, accountants, divers, engineering and mechanics etc.) which are typically employed by farms on a contractual basis. The high costs -- especially the operating costs -- required to put salmon aquaculture production into operation, significantly limit the possibility of petty production or initiatives by native people.

2. Financing

Complementing and compounding the barrier of cost for these producers is the problem of financing. The financing constraints on the participation of small producers in aquaculture arise as a consequence of several factors related to the nature of aquaculture production: 1) the reservation with which traditional sources of capital like banks view new, high-risk ventures like aquaculture, 2) the 2 to 3 year wait a salmon farm endures before the fish are large enough to sell and the first revenue is produced, 3) the unusually high ratio of operating expenses to fixed capital (collateral) incurred in aquaculture operations.

Each of these factors serve to inflate the amount of equity capital required by banks in order to obtain financing. Consequently, the amount of equity capital needed for entry into salmon aquaculture is commonly 80% and higher. For a small entry-level salmon farming operation 80% equity trans-

lates into \$800,000. This is clearly beyond the means of small producers and most native people. Furthermore, an option open to larger capitalist enterprise, raising capital on the stock exchange, is not really open to smaller producers²¹².

Although after 1984 the state made financial support for aquaculture more widely available, the monies have not generally been in quantities sufficient for non-capitalist producers to enter new salmon aquaculture operations. The limits on individual amounts for farming operations have not increased above \$100,000 and these amounts are designated for capital costs and not operating capital which constitutes the largest and most difficult portion of financing to obtain²¹³. While the provincial Agricultural Credit Act makes amounts of up to \$300,000 available for loans for hatcheries, this type of operation is not usually the type of endeavour which would be pursued by small non-capitalist producers.

The shortcoming of the Canadian state in this area of financing contrasts notably with the efforts of the Norwegian state to encourage and financially support small producers during the infancy of Norway's aquaculture industry. In Norway, generous state financial support via grants and loan guarantees have made available up to 90% of capital

²¹² In 1988, there were 20 B.C. salmon aquaculture firms trading on the Vancouver Stock Exchange. See Globe and Mail, September 20, 1988, p. B6.

²¹³ See Report of the Standing Committee on Fisheries and Oceans, July 1988, p.22.

requirements for producers. This has meant that for Norwegian producers, equity requirements for bank loans have been radically lower than in Canada, around 10%²¹⁴. The lack of state support in this area in British Columbia has meant that equity requirements for entry into aquaculture have remained prohibitively high for small producers. Consequently, nearly all participants in the industry have been large financially-secure capitalist enterprises or those which have entered into franchise agreements with such large enterprises.

3. Economies of Scale

Since salmon farming competes in an international market, the conditions of competitiveness are determined internationally. Salmon farms in British Columbia must be able to provide their products at prices equivalent to those of other countries competing in the same market. The technology-intensive nature of salmon farming means that maximization of economies of scale is a particularly important factor in determining a firm's viability and ability to compete²¹⁵.

According to a Science Council of Canada report in 1984, the benefits of economies of scale in salmon farming are

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²¹⁴ Ibid, p.95-96.

²¹⁵ Numerous industry analysts have reached this conclusion, among them: Science Council of British Columbia, 1984; The Standing Committee on Fisheries and Oceans, 1988; The DPA Group Inc., 1986, p.17.; Bjorndal and Schwindt, 1987; Science Council of Canada, 1983; and Price Waterhouse - Entech, Aquaculture in British Columbia: An Overview. 1988 p.8. This also seems to be a conclusion shared by the larger established salmon farming companies as the trend among these large firms is towards larger farms and multiple farm-sites.

such that, companies producing less than 50 tonnes per year have a productivity of 5 to 20 tonnes per worker while, companies producing 100 to 200 tonnes per year have a productivity of 10 to 30 tonnes per worker²¹⁶.

A major way in which capitalist firms can increase economies of scale is through vertical and horizontal integration. The vertical integration of firms with smolt suppliers, feed manufacturers and with marketing and processing infrastructures can significantly reduce the costs of inputs and the effectiveness of distribution. With horizontal integration, the costs of operation are reduced further, not only through volume purchases of inputs, but also through the diversification of risk among production units.

The increasing international competitiveness of the salmon aquaculture industry both fuels and is fueled by increasing economies of scale in production. To compete effectively, new entrants to the industry must attempt to achieve scales of operation which are comparable to that of existing enterprises. British Columbia, in contrast with Norway, has rejected state legislation or infrastructures to help smaller producers overcome these barriers to participation.

Norway has protected small producers from the competitive advantages wielded by large capital by imposing limits on the scale of farming operations and banning horizontal integration

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²¹⁶ See Science Council of Canada, 1984 p.10.

in the grow-out sector of the industry. It has given smaller farmers the competitive advantage of economies of scale in distribution and marketing by supporting the creation of a cooperatively run national marketing association, the Fish Farmers Sales Organization (FFSO) which has a monopoly on all aquaculture marketing in Norway. The FFSSO also carries out market and production research on behalf of its member producers with funds generated by a 1.5% commission paid by sellers and buyers.

The failure of the Canadian state to consider similar measures has meant that the barriers confronting petty commodity production in the B.C. salmon aquaculture industry and biases toward larger-scale producers are further reinforced. Smaller producers in the B.C. salmon farming industry have been unable to compete effectively in a field where aquaculture capital, internationally and within British Columbia are employing increasing economies of scale. Consequently, all such producers that existed in the earlier stages of the industry have been taken over by larger companies or put out of business. This trend is likely to continue with the eventual elimination of smaller capital in the industry, with only large-scale capitalist operations remaining.

4. Other Barriers to Aboriginal Peoples

Despite the compatibility of salmon aquaculture with the isolation of coastal native Indian communities and the native

way of life, native people face a number of exceptional barriers to participation, in addition to the ones mentioned above. These barriers include the effects of their heavier reliance on non-income generating activities and lack of access to capital on their ability to finance entry; their specialized needs for training and skills acquisition; and the opposition of the non-aboriginal aquaculture industry to "special treatment" of Indian businesses²¹⁷. Additionally, the failure of the provincial government to control the "gold rush" of hundreds of farm licences and investigative permits for foreshore tenure until 1988, has meant that many of the best farm-sites near native communities have already been allocated to other interests.

While the desirability of aboriginal participation in aquaculture development has been identified in several state sponsored task forces, and enabling programs have been proposed by various native peoples institutions (such as the Indian Aquaculture Task Force and the Aboriginal People's Fisheries Commission²¹⁸), as of 1988, there were still no state programs of financing or training directed specifically at overcoming these barriers to aboriginal participation in salmon aquaculture^{219 220 221}.

²¹⁷ See Submission of the Aboriginal People Fisheries Commission, Gillespie Inquiry, Public Report, Appendix I, December 1986, p.71

²¹⁸ Ibid, p.72.

²¹⁹ See Report of the Standing Committee on Fisheries and Oceans, July 1988, p.13. While it is reported that several Indian band corporations have apparently come up with proposals for salmon farms, to date there has been seemingly little movement on these proposals.

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Referring to aquaculture variously as a "pioneer industry", "a hi-tech cottage industry" or "ma and pa" type of operation, various representatives and agencies of the state, especially the B.C. provincial government, have until recently, promoted aquaculture as a new entrepreneurial opportunity for small business and native people²²². Some publications have gone as far as to suggest aquaculture as a sideline or alternative future for producers in the wild fishery, evoking utopian Marxist images of a fisher in the morning and farmer in the afternoon²²³. The high operating costs, economies of scale and highly specialized, capital-intensive nature of salmon aquaculture, however, have dictated that it would be more suited to large-scale enterprise. Without specific measures to promote native or small-scale aquaculture production, it is unlikely there would be any. No such measures have been forthcoming. The state has abstained from developing any policies of support which would assist

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²²⁰ The federal government, as part of its privatization scheme for fish hatcheries has leased out and funded the development of fish hatcheries to native corporations. Some of these hatcheries have apparently sold eggs to the aquaculture industry. Albeit run by native people this type of development would likely qualify as capitalist production. See Vancouver Sun, "Indian bands help salmon's future." February 2, 1988, p.B1.

²²¹ The only state programs concerning aboriginal participation in salmon farming are those which provide tax credits and wage assistance to companies locating on Indian reserves.

²²² Ministry of Agriculture and Fisheries, Aquaculture in B.C., Getting Started, June, 1987, p.2.; Science Council of Canada, 1984, p.21.

²²³ See Standing Committee on Fisheries and Oceans, July 1988, p.13.; Science Council of Canada, 1985, p.14-15.

native communities or small entrepreneurs in getting around the inherent barriers they face in a capital-intensive enterprise. Small-scale, native and other non-capitalist forms of production have not developed as a result, and without changes in state policies, they are unlikely to appear²²⁴.

D. The Role of Struggle

In section four, I discuss the role of popular struggle in the development of B.C. salmon aquaculture. I argue that the struggles of wild fishers to obtain increased controls on aquaculture development have been limited in success. I show that while these struggles, led by producers in United Fishermen and Allied Workers Union (UFAWU), have led to certain minor concessions and a public inquiry, the state ultimately succeeded in its efforts to mediate and contain popular opposition to aquaculture.

1. State Defiance of Struggle

Throughout the 1980s, producers in the wild fishery, led by the UFAWU, have fought to protect their interests against the development of salmon aquaculture in British Columbia. They have lobbied the federal and provincial governments on a

²²⁴ Even in the unlikely event that, as the federal government has recently suggested (See Standing Committee on Fisheries and Oceans, July 1988, p.13.), barriers to small-scale development will erode as the industry matures, the uncontrolled and explosive nature of its development has meant that most of the prime sites for salmon farms have been taken up by large, often foreign-controlled interests. Latecomers to the industry will have to spend more to go farther afield and accept "seconds" on the sites they choose from.

range of concerns regarding the impacts of unregulated aquaculture development on the wild fishery and wild fish stocks. Their chief demand has been a moratorium on aquaculture development until impacts could be ascertained and regulations necessary to protect the environment and existing industries could be introduced.

Aquaculture developers, represented politically by the B.C. Salmon Farmers' Association (BCSFA), have found a ready political ally in the Canadian state. The provincial and federal governments have first attempted to mediate the struggles of producers in the wild fishery ideologically, i.e., promoting aquaculture development as part of the "national interest" and by using the language of opportunity to promote it as serving the interests of the "common man." Here the state justified the continued unregulated development of aquaculture as a means of attracting investment to the industry necessary for "the nation" to "catch up" competitively with other nations further advanced in their development of fish farming production. Buzzwords like "cutting-edge", "world class" and "excellence" were to be found in pronouncements on aquaculture by the various agencies of both federal and provincial governments. The provincial government in particular emphasized aquaculture a new "hi-tech" industry and as an "entrepreneurial opportunity" for fishers and small business. These promotions of aquaculture as opportunity by the provincial government appeared regularly in state-sponsored television advertisements, news shows and

in glossy government publications like the Discovery Foundation's "BC R&D" whose cover boldly stated, "Our Mandate is New Technology Enterprise in British Columbia."

Politically, state agencies have sided with fish farming developers by resisting pressures to regulate and by rejecting as unfounded or exaggerated concerns of wild fishers and other popular groups in the following areas. With regard to concerns about the biological impacts of salmon farming on wild stocks and environment, and inadequacy of state controls, the state has downplayed and denied the possibility of salmon aquaculture impacts on the wild fishery. The first state-sponsored studies on such issues are finally being proposed in 1989, five years after intensive commercial aquaculture development began. Provincial and federal government responses to public pressure for state regulation of antibiotics, hormones, dyes and other chemical control substances used in farming (including the algaecide, tributyltin oxide²²⁵), have been delayed, inadequate and suffer from a lack of enforcement²²⁶. Lobbying by native people, fishers, and other groups for controls and opportunities for public input on the location of farms near parks, estuaries and aboriginal claims had little effect through

²²⁵ This chemical considered dangerous at levels measured in parts per billion, has been used against seaweed growth on fish pen netting on at least 35 B.C. fish farms. It has been banned for use in the United States and Britain and has been called one of the most toxic substances known to science.

²²⁶ See The Fisherman, April 21, 1989, p.13; also Rankin and Brown, 1988.

until 1987 after over 150 farm leases and over 300 investigative permits had already been granted.

Furthermore, any statistical information on aquaculture development has been difficult to come by: there is no obligation for foreign investors to provide the state with information on investment, and until recently, no obligation of farming operations to provide statistics on production, and no coordination or centralized collection of statistics between different departments of the provincial and federal governments.

The only issue upon which the federal and provincial government has been responsive from the start, was salmon ranching²²⁷. The federal government has banned salmon ranching, stating that political opposition from the wild fishery made this an undesirable option. This ban was implemented, despite the recommendations of the Pearce report of 1982 and Science Council of Canada report of 1985, which favoured the establishment of private salmon ranching.

2. Containment and Mediation

As salmon aquaculture development in British Columbia began to accelerate in 1985 and 1986, it gained salience in

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²²⁷ There are however, signs that the federal government is considering making exceptions to this ban in the case of native people. DFO has recently indicated that the leasing of the Qualicum River salmon hatchery to a native corporation may include the right of the corporation to harvest some of the returning fish for commercial sale.

the media and the struggles against it intensified. Mounting opposition by fishers was augmented by that of environmental groups, native people, and increasing numbers of property owners who found their waterfront occupied by salmon farming operations. By the summer of 1986 there was consistent and widespread media coverage of a wide variety of concerns regarding the potential impacts of salmon aquaculture.

In October of 1986, pressure from the UFAWU (United Fishermen and Allied Workers Union) during a provincial election campaign, succeeded in getting the provincial Social Credit government to initiate a month-long public inquiry into salmon aquaculture development and place a moratorium on the granting of salmon farming licences. The government appointed a lawyer with strong Socred ties, David Gillespie, to conduct the inquiry on the following aspects of salmon aquaculture:

- (a) Impact on commercial fishery operations, markets and localized production facilities.
- (b) Potential environmental impacts and effect on wild fish stocks.
- (c) Impact and involvement of local government and interest groups.
- (d) Government approval and monitoring procedures.

Through the Gillespie Inquiry the UFAWU did succeed in obtaining some increased regulation of the industry. Following the inquiry's recommendations, the provincial government has (1) instituted a ban on imported eggs, (2) implemented farm-siting restrictions with regard to native Indian reserves, (3) designated environmentally sensitive

areas and parks, (4) improved consultative and conflict-resolution mechanisms with regard to the allocation of these farm-sites, (5) funded studies on the effects of various chemical control substances used in farming, (6) introduced mandatory production reportage and environmental monitoring by farms, (7) funded a product inspection program to be administered by the B.C. Salmon Farmers Association (BCSFA) and (8) initiated an Aquaculture Advisory Council with representatives from the fishing industry.

While these actions appeared to be a step ahead from the perspective of the UFAWU, much was also to be desired in these and other areas of the inquiry's recommendations. With regard to many of the new controls introduced, the main emphasis of the provincial governments efforts has been industry "self-regulation" and unenforced "guidelines", rather than state controls which would have been significantly more meaningful. While consultative-mechanisms have been implemented with regard to farm siting, they have been criticized as ineffective in practice, by the provincial Ombudsman²²⁸. The Aquaculture Advisory Council, which in appearance seems a desirable consultative-mechanism, contained only three members of fifteen from the wild fishery and two of these represented the processing sector. Furthermore, the entirety of the union's concerns with regard to the impacts of aquaculture development on the wild fishery and wild fish markets, foreign

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²²⁸ See Owen, Stephen, Office of the Provincial Ombudsman, December 1988, p. 35., 96-101.

investment, and its argument for the necessity of a moratorium on farm development and controls on investment and ownership, were rejected or overlooked²²⁹.

In effect, while the Gillespie Inquiry provided a forum for popular concerns and, as such, might have appeared a victory for popular struggle, it was in a larger way a means of managing opposition to aquaculture development. The inquiry ultimately served the needs of capitalist development by deflecting public concern and focusing on ways in which the development of the industry could be made more orderly for the larger benefit of capital, rather than that of the workers, fishers and the general public. The provincial inquiry was ultimately applauded by the B.C. Salmon Farmers' Association, "for trying to defuse the fish farm controversy."²³⁰ From the perspective of capital, the inquiry was seen as a means of increasing investor confidence in salmon farming²³¹. According to the Canadian Aquaculture, the industry trade journal²³²:

B.C. salmon farmers generally agreed that the inquiry had been good for the industry. [I]t legitimized salmon farming and publicly clarified many of the misunderstandings and half-truths belaboured by opponents of the industry.

Since the report of the Gillespie Inquiry was issued in early 1987, the UFAWU and other interest groups have continued

²²⁹ See Gillespie Inquiry, Report and Recommendations, 1986. p.21.

²³⁰ See Vancouver Sun. February 4, 1987, p.B1

²³¹ See Victoria Times-Colonist, December 12, 1986, p.11

²³² See Canadian Aquaculture, Winter, 1986, p.4.

to force aquaculture issues onto the provincial and federal government's agenda. However, as some say, "the horse is already out of the gate", and, except for continuing issues of unionizing farm workers, monitoring and regulating existing industry, the development has already occurred.

Much of the industry regulation that has actually been implemented has come only recently, and at the behest of the fish farming industry itself. Consequently this regulation has been more concerned with orderly development and industry standards than the protection of the interests of other public resource user-groups. These new concerns, such as product inspection, and the regulation of the use of pharmaceuticals and toxicants in farm operations, have emerged because "the industry urgently needs to protect its reputation in the market place²³³" and not as a consequence of popular struggle against aquaculture.

E. Summary

With regard to its particular role in the introduction of aquaculture, the state has presented itself to be simply that of a neutral handmaiden of economic development, objective in its task of making available to society the new fruits of scientific and technological progress. This account of the state's role in aquaculture development refuted in this section. It is evident that through (1) the promotion of large-scale, knowledge-intensive technology (2) policies and

²³³ See Canadian Aquaculture. March/April, 1989, p.7.

interventions promoting capitalist investment (3) lack of commitment to protecting or fostering other non-capitalist forms of production, and (4) efforts to mediate and contain struggles against aquaculture development, the state has unequivocally promoted the interests of capital over those of others.

III. Concerns Affecting State Involvement in Aquaculture Development.

The previous section demonstrates that state intervention at both federal and provincial levels of government, has been instrumental to the introduction of salmon aquaculture during the 1980s and the facilitation of its development by capital. State involvement in the development of aquaculture has consistently been patterned around (1) the need to secure capitalist investment through an emphasis on deregulation and the provision of infrastructural support (2) a rejection of any extensive program of direct financial support and (3) the promotion of salmon aquaculture as a "hi-tech opportunity" for the nation. This section attempts to explain why the state has intervened in such a manner to promote capitalist aquaculture development in the 1980s.

As specified in the theoretical chapter of this thesis, state intervention under capitalism is delimited by a number of institutionally-derived concerns. These dictate that the state must intervene to counteract threats to capitalist accumulation and to reproduce bourgeois hegemony as a means of

guaranteeing its complementary interests with capital in continued capital accumulation and as a means of ensuring its own institutional continuity. In this section, I argue that the state, at both federal and provincial levels, acted to facilitate the capitalist development of salmon aquaculture in British Columbia because it promised to be a means of addressing various concerns of the state regarding barriers to accumulation in the salmon industry and the B.C. economy in the late 1970s and early 1980s. Furthermore, I argue that the key reason the state has succeeded in its promotion of capitalist aquaculture development has been the compromising effect of political and ideological divisions within the wild fishery on the ability of producers to defend their interests effectively. As a consequence of this division, capitalist development of aquaculture has been able to continue relatively unencumbered throughout the 1980s.

A. Threats to Capital Accumulation

The main concerns affecting the state's promotion of capitalist aquaculture development in British Columbia during the 1980s have been barriers to capitalist accumulation in the British Columbia wild fishery and overall economy resulting from (1) overcapitalization and industrial overcapacity in the B.C. wild fishery, (2) increasing competition in international salmon markets from Norway and Alaska, (3) severely depleted stocks of wild salmon and (4) the economic and political

impacts of the worldwide recession in 1981 and 1982 on the provincial economy.

1. Overcapacity in the Wild Fishery

The first concern that fuelled the state's promotion of aquaculture was a serious production overcapacity affecting B.C.'s salmon fishery. While overcapacity in the fishery has been a concern of the state for many decades, it became salient again in the 1970s and 1980s. This overcapacity was a consequence of (1) the investment boom in the fishery in the 1970s, and (2) state policies emerging from the federal government's Davis Plan of 1968, which significantly expanded the super-efficient industrial seine sector of the salmon fleet without sufficiently removing production capacity in less efficient sectors of the industry²³⁴.

The wave of investment which swept through the industry during the 1970's exacerbated an already existing problem with excessive harvest capacity in the fishing fleet. Between 1969 and 1982, despite a reduction in the numbers of vessels fishing, the capital value of the salmon fleet escalated from 91 million to 432 million dollars, almost 500%²³⁵. Overcapacity in the salmon fishery has become so excessive that, as stated in the Report of the Standing Senate Committee on the Fisheries²³⁶, "Estimates are that the total harvest on the West Coast could be taken with about one-half of the

²³⁴ See Pearse, 1982, p.99

²³⁵ See McMullan, 1984, p.79.

²³⁶ See December 1987, p.57

present fleet."²³⁷ The federal department of Fisheries and Oceans has in fact stated that overcapacity is so great that hypothetically the entire 1984 salmon catch could have been harvested in four hours.

While for capital, the overcapacity in the B.C. salmon fishery represents a serious barrier to accumulation, for the state, the overcapacity of the salmon fleet represents reduced tax revenues, increased management costs and increased political vulnerability.

Tax revenues are reduced as a consequence of lower profits and lower incomes among fishers as a result of too many producers chasing too few fish. Costs of management increase because overcapacity means a greater need for the state to enhance and protect dwindling salmon stocks, less room for mistakes in managing and allocating shares of the total catch, increased numbers of mobile and dispersed fishers to monitor and more regulations to enforce. In 1986, the costs of managing the Pacific fishery was over \$100 million dollars²³⁸. As stated in a section of the report of the Auditor-General²³⁹ in 1986, entitled "The Pacific Fishery: Low Returns High Costs:"

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²³⁷ The federal Department of Fisheries and Oceans has stated that, if deployed all at once, the west coast fishing fleet at present has a harvesting capacity of 250,000 metric tonnes per day. Meanwhile, in the last three decades, the total salmon harvest for the year has rarely exceeded 100 thousand metric tonnes. See Wayne Shinnars, Director-General, DFO Pacific Region, October 1984.

²³⁸ See Auditor General, 1986, para.10.26.

²³⁹ Ibid., para.10.30.

[The] total processing and harvesting costs (boats, fuel, employees, plants and equipment) and the government costs of the fishery are approximately equal to the value that the fishery produces. Thus, under the current management and regulatory framework, the average fisherman, the government and the taxpayer are barely breaking even with this valuable resource.

This echoes another study which concluded that the total Canadian fishery in 1978 had a net economic contribution to the Canadian economy of zero, and that if one adds the cost of regulation, the net economic benefit for the fishery is minus \$325 million²⁴⁰.

Overcapacity can also incur a political cost to the state. State regulation and allocation of catches in the wild fishery are highly visible forms of intervention. The increased regulatory intervention necessary in a situation of overcapacity, often involves the restriction of one group and the perceived appeasement of another. Since overcapacity increases the competitive tensions among groups of fishers, the general level of dissatisfaction with regard to state regulation is often exacerbated. The state is increasingly subject to group lobbying efforts and becomes a focus for political discontent²⁴¹. This increases the political vulnerability of the state and makes its legitimacy as a neutral arbiter subject to question.

²⁴⁰ See Neher, as discussed in Saxby, David., *Aquaculture -- "A Monetary Black Hole?"*, p.123-131. In G.I. Pritchard [ed.] Proceedings of the National Aquaculture Conference -- strategies for aquaculture development in Canada. Department of Fisheries and Oceans, Ottawa, 1984.
²⁴¹ See also Rueschemeyer and Evans, in Evans, Rueschemeyer and Skocpol, 1985, p.69.

From the perspective of both the state and capital the problem of overcapacity continues largely because of the persistence of "inefficient" petty commodity producers in the troll and combination fleets which comprise 75% of the total fishing fleet. While these producers formerly had a monopoly on fresh/frozen salmon production, new advances in technology mean that capitalist-controlled seine fleet could produce the same fish for capital at a much lower cost. Capital however has been unable to gain complete control over the fresh/frozen production because petty producers have been able to protect their share of the salmon catch by employing the convention of fisheries as a common property resource. As a consequence of the political strength of these producers, the state has been reluctant to reduce their catch allocation or to pursue the option of fleet rationalization as means of eliminating them.

For the federal government, capitalist development of aquaculture promised an attractive means of overcoming the problem of overcapacity because it allowed for an alternative means of capitalist production of fresh/frozen salmon that avoids (1) the high management costs of the wild fishery and (2) the political costs of rationalizing the wild fishery.

2. Competition on International Salmon Markets

For the state, the second concern aquaculture was intended to address was the erosion of Canadian processing capital's share of fresh/frozen salmon markets in Europe, United States and Japan due to the adoption of salmon

aquaculture technologies in Norway and Alaska in the 1970s. Fresh/frozen salmon production comprises the most valuable export commodity of the B.C. salmon industry.

Between 1971 and 1985, as a result of the introduction of salmon aquaculture, Norwegian fresh/frozen salmon production increased from practically nothing to nearly 30,000 tonnes, double that of the existing B.C. fishery. The superior quality of Norwegian farmed salmon resulted in its dominance over Canadian fish in European and U.S. fresh/frozen salmon markets and its increasing dominance in Japan²⁴². Currently, Norwegian farmed production is nearly ten times that of B.C. while the share of the European market held by Pacific salmon has declined to about 50% of what it was two years ago.

Between 1976 and 1985, as a consequence of supplementary production from state hatcheries and salmon ranching, the production of Alaskan salmon increased phenomenally from 85,000 tonnes to 285,000 tonnes²⁴³. The cost advantages afforded by the large volumes of Alaskan harvest allowed Alaskan capital to erode further the share of the salmon market enjoyed by Canadian processors. The advent of salmon farming in Scotland and Chile during the early 1980s further threatened the competitive position of capital in the B.C. salmon industry.

²⁴² See B.C. Ministry of Agriculture and Fisheries, The Market for Farmed Salmon: An Overview, 1986 p.16-21; See Pacific Fishing, August, 1989 p.11.

²⁴³ See Standing Senate Committee on Fisheries, December 1987, p.43.

With the advent of world farmed salmon production, the federal and provincial government's faced the prospect of fishing capital in British Columbia losing its ability to compete on fresh/frozen salmon markets²⁴⁴. This new threat to jobs and revenue in the provincial economy served to influence the state's support of capitalist aquaculture development in Canada.

3. Depletion of Wild Chinook and Coho Stocks

A third concern of the Canadian state affecting the promotion of aquaculture has been the recent depletion of Canadian wild chinook and coho stocks traditionally targeted by petty producers in the troll and combination fleets for fresh/frozen production. This depletion poses a potential obstacle to capital accumulation in two ways. First, state restrictions to protect these species threatens capital with a diminishing supply of raw materials. Second, because of the increasing scarcity of their traditional species, the fishing efforts of petty producers are being increasingly displaced onto the salmon species (sockeye, pink and chum salmon) traditionally harvested by the capitalist-controlled seine and gillnet sectors of the salmon fleet (see Table 10). This represents an increased cost for capital because it must pay higher prices for troll and combination-caught fish and catches fewer fish with its own boats.

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²⁴⁴ See Science Council of Canada, 1983, 1984. Also Science Council of British Columbia, 1984.

TABLE 10: Composition of Troll Fleet Salmon Catch, 1972-1985²⁴⁵

Year	% Traditional Net Species (Sockeye/Pink/Chum)	% Traditional Troll Species (Chinook/Coho)
1972	10%	90%
1973	19%	80%
1974	23%	77%
1975	19%	81%
1976	11%	89%
1977	37%	63%
1978	26%	74%
1979	44%	56%
1980	19%	81%
1981	49%	51%
1982	40%	60%
1983	34%	66%
1984	20%	80%
1985	54%	46%

The additional costs of protecting and enhancing these species to maintain the fishery is an added burden on the state, which is in the precarious position of balancing the economic needs of a commercial fishery with the conservation needs of the fish. Since salmon aquaculture was developed in British Columbia as a means of raising coho and chinook, it offers the state a means of relieving pressure on depleted stocks while at the same time maintaining capital's supply of these raw materials. A Science Council of Canada report in 1984 states, "Aquaculture production can also directly assist in the proper management of wild stocks by reducing the exploitative pressures on these stocks while maintaining economic activity in the production and sale of that species."

²⁴⁵ Source: B.C. Ministry of Environment and Parks, Fisheries Production Statistics of British Columbia 1985, 1986; B.C. Ministry of Environment, Fisheries Production Statistics of British Columbia 1981, 1982.

The subtext of this statement is simply, "even with reductions in the production of wild fishers, aquaculture will allow capital accumulation to continue."

4. Effects of the 1981 - 1982 Recession

A fourth and major area of concern affecting the involvement of the Canadian state in aquaculture development was the effects of the worldwide 1981 - 1982 recession on the B.C. economy. The high interest rates and depressed commodity prices resulting from this crisis of accumulation affected the British Columbia economy by raising unemployment to levels unprecedented since the 1930s, reducing levels of capital investment and increasing federal and provincial deficits.

Unemployment rates rose in British Columbia from between 6.7% and 7.7% from 1979 to 1981, to between 12% and 15% from 1982 to 1987. During this period the unemployment rate for Canada as a whole, rose too, although those of British Columbia has been consistently between 1 and 4 points more severe.

Between 1979 and 1981, before the recession, capital investment in British Columbia had increased at rates of between 20% and 28%, significantly faster than the Canadian average, of rates between 13% and 18%. After the recession however, capital investment in the province declined significantly, at a rate of between 6% and 15% per year, until 1987 when it began to increase again. The provincial decline

in capital investment superceded that of the country as a whole, which was between 3% and 5%, and lasted only until 1984²⁴⁶.

As a consequence of these economic difficulties, federal and provincial tax revenues decreased while social spending increased. Consequently, both the provincial and federal governments were faced with unusually large deficits, the federal deficit being significantly more severe than that of the province.

The promotion of capitalist aquaculture development was a means by which the federal and provincial governments addressed the crisis of accumulation represented by the 1982 recession. The neo-conservative agenda of the federal and provincial governments emphasized (1) the need to attract new capital investment²⁴⁷, (2) public sector fiscal restraint to reduce the deficit²⁴⁸ and (3) the widespread use of the language of "hi-tech" opportunity to counter the increasing disaffection of the provincial electorate during a time of significant economic upheaval in the overall B.C. economy²⁴⁹. Capitalist aquaculture development fit in well with all these

²⁴⁶ See Ministry of Finance and Corporate Relations, Province of British Columbia, 1988, p.7. Also 1982, p.3.

²⁴⁷ Allen and Rosenbluth, 1986, p.297. The provincial government even went as far as to propose the development of Special Enterprise, or Free Trade Zones in British Columbia as a means of attracting capital investment.

²⁴⁸ Ibid., 119.

²⁴⁹ This disaffection was largely related to high unemployment and provincial government restraint policies aimed at restructuring the economy. See Palmer, Brian. "The Rise and Fall of British Columbia's Solidarity" in Palmer, 1986; Also Magnusson et. al., 1984.

concerns. It (1) attracted a major infusion of direct investment by Norwegian aquaculture capital, (2) required relatively little state expenditure other than through existing infrastructure like the Salmon Enhancement Program and (3) in the early 1980s during its experimental stage, appeared compatible with the rhetoric of "hi-tech" opportunity for jobs and the small family entrepreneur.

B. Barriers to Effective Struggle Among Wild Fishers

Resistance from producers in the wild fishery or the absence of it, has played an important role in determining the development of salmon farming in various countries. In Alaska, the powerful resistance of producers in the wild fishery to aquaculture development has resulted in a moratorium on salmon farming until 1995²⁵⁰. In Norway, on the other hand, the decline of the wild fishery due to environmental destruction has served to expedite aquaculture development²⁵¹.

Why in British Columbia, where there is a large, vigorous and organized wild fishery, has the state been able to largely ignore the struggles of fishers in its promotion of unregulated aquaculture development; especially when there is such ample

²⁵⁰ See Owen, Stephen, Office of the Provincial Ombudsman, December 1988, p. 58-59. The moratorium was introduced so that the state could determine aquaculture's impacts on wild fishery and consider beforehand, the laws which should govern its introduction.

²⁵¹ Norway's commercial salmon industry (only 1,500 - 2000 tonnes) was eliminated and the catch allocated to the sports fishery in 1988. See Standing Committee on Fisheries December 2, 1987.

evidence that such development will have a negative impact on the wild fishery?

It appears that the main reason the state overcame the resistance of wild producers was the inability of wild producers to organize a strong cohesive opposition to salmon farming. As discussed elsewhere, the wild fishery suffers from deep political and ideological divisions. The most organized, informed and vocal producer group on the issue of salmon aquaculture has been the west coast fisher's union the United Fishermen and Allied Workers (UFAWU). However, while the UFAWU has taken a vocal stand opposing aquaculture, the same cannot be said for the Pacific Trollers Association (PTA) and the Native Brotherhood of British Columbia (NBBC), the Pacific Gillnetters Association (PGA), Pacific Seiners Association (PSA) and the Prince Rupert Fishermen's Co-operative (PRFC), the five other major industry organizations representing the 18,000 producers in the salmon fishery. The absence of the vocal support and involvement of these organizations in the UFAWU campaign against aquaculture development reveals the lack of unity in the fishery over the issue of aquaculture. This lack of unity contributed fundamentally to the ease with which the state has been able to facilitate aquaculture development.

The PGA and PSA did not make submissions to the Gillespie Inquiry and have not generally made themselves publicly heard on the aquaculture issue. The Prince Rupert Fishermen's

Cooperative has come out actively supporting salmon aquaculture development, and initially was involved in efforts to establish an operation itself. The lack of involvement from these organizations generally can be said to reflect the lack of a direct threat from salmon farming among their members. These organizations are dominated by small business or capitalist boat-owners who are often in conflict with the UFAWU. They use industrial methods to fish predominantly for the non-farmed species of salmon and the canned industry. They are consequently, less threatened by the prospect of fresh/frozen farmed production and in a better position to compete with aquaculture if it became necessary.

The most conspicuous silence on salmon farming comes from the PTA and the NBBC. These organizations represent the bulk of producers which stand to lose the most from salmon aquaculture development: small-scale native fishers, combination boats and trollers.

The Pacific Trollers Association has expressed occasional concerns, but in general, has distanced itself from UFAWU positions by asserting its confidence in the justice of market forces. For example, in its submission to the Gillespie Inquiry on salmon farming, the PTA stated²⁵²:

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²⁵² Submission of the Pacific Trollers Association, Gillespie Inquiry, Public Record, Appendix II, Written Submissions. December 12, 1986. p.2

Market forces will determine the outcome of the expected clash between wild and farmed production salmon production from B.C. The PTA is confident that the troll caught product produced by its members can compete head to head with net pen fish for the premium market.

The Native Brotherhood of B.C. has remained silent on the issue of salmon farming, with no submission to the Gillespie Inquiry and no publicly stated position on the issue. Why is it that those sectors of the fishing fleet most threatened by aquaculture have not been actively involved with the UFAWU in campaigning against its introduction?

First, the PTA, the main political representative of the troll sector, historically has tended to take the ideological positions of small business, opposing labour, aspiring to larger means of production, celebrating a faith in market forces, and organizing around the issue of "freedom to compete." Producers belonging to the PTA are generally most active on issues regarding the state's regulation of their ability to catch fish, like gear, area and species restrictions, licencing regulations, insisting on the right to unfettered competition and trusting in the market to deliver on issues of prices. This ideological position is consistent with the class position of the PTA membership, small boat owner-operators who, compared to other fishers, exercise a relatively high level of economic independence from capital and a high degree of control over their labour process.

The ideological position of the PTA members would tend to make them, at best, uneasy with state regulation and restriction of capitalist aquaculture development. While the PTA has expressed concerns regarding the environmental impacts of aquaculture on the wild fishery, it has remained faithful to the justice of the market and has generally stayed back of the fray over aquaculture. Consistent with its faith in its ability to compete, the one major issue regarding aquaculture production on which the PTA has focussed has been the separate labelling of wild and fresh fish. This request has been rejected by the federal government and processors as too awkward to implement.

As there has been a number of Native peoples organizations actively involved in opposing various aspects of aquaculture development, the absence of vocal opposition from the Native Brotherhood is conspicuous. The explanation for the NBBC's silence on salmon aquaculture development could very well stem from the privileged class position of its leadership relative to its membership.

The Native Brotherhood is organized around ethnicity and represents native people in the fishing industry. While the NBBC represents native fishers in price bargaining, it does not, as does the UFAWU, distinguish class position as a basis for membership. Consequently, while much of the NBBC's rank and file are small fishers, crew workers and rental-boat workers who very much still identify with the interests of

labour, the leadership is generally thought to be controlled by a class of large boat owners, who identify with the interests of capital²⁵³. This was evidenced in the NBBC leadership's frequent breaks with the UFAWU over strike action and its endorsement of the 1982 Pearse Commission Report which proposed further privatization of the B.C. fishery and a bidding system for removing 50% of the fishing fleet. That this system of rationalization could severely penalize small boat-owners and lower income producers did not appear to faze the NBBC leadership.

Consequently, the reluctance of the NBBC to state a position on aquaculture development despite the potential impact on its membership, could stem from the class differences between its membership and its leadership, large boat-owners who may be prone to assessing aquaculture as more of an opportunity than a threat.

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²⁵³ See Marchak, Guppy and McMullan, 1987, p.262-265.

CHAPTER 6: CONCLUSION

In this thesis I have examined the development of the salmon aquaculture industry in British Columbia during the 1980s. I ask first, what effect has the emergence of salmon aquaculture had on relations of production in the B.C. salmon industry. I show that although aquaculture was initially promoted as an opportunity for small-scale family businesses, it has developed into an industry overwhelmingly dominated by large-scale capital. On the grow-out or marine-farm level of production, the industry is characterized by extensive horizontal integration. Seventy percent of all operations are controlled by companies which own multiple farm-sites, while 50% of the industry's production and 70% of "reproductive capacity" in hatcheries was controlled by four companies in 1988. The industry is also characterized by extensive vertical integration with foreign aquaculture capital and large domestic capitalist fish processing and marketing interests. This horizontal and vertical integration is increasing in the form of mergers and takeovers as economies of scale increase and the industry grows and consolidates itself.

With regard to the wild fishery, I argue that salmon aquaculture threatens the eventual elimination of petty commodity production in the wild salmon fishery. I show that the persistence of petty production has largely been due to the specialized market niche these producers have established in fresh/frozen production. The advent of aquaculture as a capitalist form of fresh/frozen production threatens to

displace these producers. This threat of displacement comes directly, through market competition and also indirectly, through the possibility of disease transference to wild stocks, the weakening of state guarantees on petty production and the privatization of control over salmon reproductive materials. Additionally, I argue the aquaculture threatens the existence of small capitalist processors in the wild fishery because these processors depend on the supply of fish from petty producers.

The second question I address is that of why aquaculture production emerged as a capitalist form of production in B.C. in the 1980s? First I explain that aquaculture offered capital significant advantages over the wild fishery. These advantages are shown to be in the areas of (1) control over reproductive materials (2) decreased labour and production costs (3) the elimination of supply competition and (4) increased control over the production process.

Second, I show how the interventions of the Canadian state -- at various both federal and provincial levels -- played a central role in the development of aquaculture as a capitalist form of production in British Columbia. I argue that the state encouraged the capitalist development of aquaculture through (1) carrying out basic research toward the development of a technology which was clearly more suited to the needs of capital than those of other producers (2) encouraging capitalist investment through deregulation and the

provision of basic infrastructural services (3) rejecting the need for extensive direct funding programs to assist small producers and native people in overcoming barriers to their involvement and (4) resisting and mediating the struggles of wild producers to protect their interests from aquaculture development.

Finally, I attempt to explain the concerns which shaped the actions of the state in the first place. Why did the state act in this way at this particular time? I argue that the state acted to promote the capitalist development of aquaculture in the 1980's because (1) aquaculture served as a means of addressing the state's concerns with recently occurring barriers to capital accumulation and (2) political disunity thwarted the efforts of producers in the wild fishery to resist the state effectively²⁵⁴.

While the account of state intervention presented here is one which highlights the consistency and commonality of direction between federal and provincial agencies, I by no means wish to imply that the state is always necessarily a unitary or cohesive body. In fact, the state, at its different levels, is often more accurately seen as an ensemble of apparatuses with great potential for internal conflict. Ongoing conflict between different jurisdictions of state and

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²⁵⁴ While it was beyond the scope of this paper to address the specific political and ideological issues affecting state involvement in aquaculture development, I hope that my discussion has at least provided an account of the broader social and material factors which delimited the possibilities of state action in this instance.

different branches of the same level of the state may be expected because of the articulation of these bureaucracies with different and competing constituencies and the "empire-building"²⁵⁵ that can happen in institutions where people must live off of politics. While agendas are not always necessarily shared uniformly by all branches of the state,²⁵⁶ in the case of B.C. salmon aquaculture, it appears that various shared and overriding institutional concerns have resulted in a certain amount of coherency of state action at federal and provincial levels. In this instance, the effects of incongruities within the state appeared to be relatively marginal to the broader pattern of state action and, as such, were beyond the scope of this project to address.

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²⁵⁵ By "empire-building" I mean the internal struggles over power and resources which can often occur within state bureaucracies. Some sources have indicated that this type of internal struggle was a major factor in the diminishment of the DFO salmon enhancement program in its second phase in 1987.

²⁵⁶ For example, some branches of the Department of Indian Affairs and Northern Development appear to have lobbied unsuccessfully for more support in the funding of native Indian involvement in aquaculture, and various coastal municipalities have continued to protest the lack of regulation and controls governing aquaculture development in their jurisdictions.

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