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Title: FOREIGN AND DOMESTIC TRADE IN CANNED SALMON OF THE U.S. AND CANADA: THE EFFECT ON THE DERIVED DEMAND OF THE FISHERMEN

Abstract approved: Richard S. Johnston

The principal objective of the study was first to present a historical discussion of foreign and domestic trade in canned salmon in the United States and Canada, and secondly, to estimate the ex-vessel derived demand characteristics for red and pink salmon facing the fishermen in both countries. Secondary sources were used to satisfy the first objective. With respect to the second objective, the least squares method was employed in the estimation of the coefficients of the various linear equations.

With these coefficients from the demand equations, price flexibilities were computed at the mean values of the ex-vessel price and quantity (landings) figures (1956 to 1970 (U.S.) and 1947 to 1970(Canada)). The statistical results indicated that prices are rather inflexible relative to landings. The price flexibility in the U.S. and Canada is

almost the same. In each case, a ten percent increase in landings would tend to depress the ex-vessel prices of red and pink salmon by a smaller percentage.

The impact of institutional change on the demand for canned salmon was investigated. Britain in 1958 relaxed its restrictive policy on imports of salmon. It was discovered that such an institutional change had a significant effect on the demand analysis of red salmon in the U.S. and Canada; however, the effect on the demand analysis of pink salmon in both countries was inconclusive.

Foreign and Domestic Trade in Canned Salmon of the U.S. and Canada: the Effect on the Derived Demand of the Fisherman

by

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INTRODUCTION

Statement of the Problem

Review of published articles and previous studies on demand analysis for salmon reveals that there is available only scanty reliable, quantitative information about the factors that influence salmon prices at the wholesale and ex-vessel levels. Until recently, the extent of research with regards to the prices of, and demand for, fishery products was rather meagre as compared to that of the agricultural commodities. Yet, these two industries are very nearly related in the market as pointed out by Fredrick V. Waugh and Virgil J. Norton (25, p. 9).

There is not much dispute as to the benefits to be derived from a better knowledge of the demand characteristics of salmon at the various levels of marketing. Policies designed to improve revenues from salmon fishery stand a better chance of success if accurate understanding of the relationship between price and quantity is known. For instance, measures designed to limit entry into the salmon fishing industry, may or may not increase revenues from salmon fishing industry, depending on the salmon demand and supply relation-

ships.

If a new salmon fishery hatchery program is to be developed, it would be very useful, to the industry in particular, to know the effects, desirable and undesirable, the introduction of the new resource (salmon) would have. Where large quantities of the new resource are brought into the market, what implications would that have on its price or on the price of other related fishery products? Without adequate knowledge of these relevant facts, funds may be invested in some fishery programs and/or salmon fishery with the least pay-off to the society in general and the salmon industry in particular.

This study is concerned with the demand for red and pink salmon at the ex-vessel market level, in the U.S. and Canada. It is hoped that the results of the analysis would be valuable to the salmon industry, the National Marine Fisheries Service and the fishery conservationists in formulating their policies and programs.

Goal of the Study

The basic objective of the study has been to estimate the parameters of the ex-vessel demand function for red and pink salmon in Canada and in the United States. In fulfilling this objective, it was decided to take the following steps: (1) develop a model which would identify those forces that tend to influence the supply and demand for red and pink salmon at the ex-vessel market level, (2) estimate the

parameters of the hypothesized relationships, and (3) calculate the price flexibilities of red and pink salmon in the U.S. and Canada.

Historical Review of Canada's Salmon Industry

Most of the historical backround was drawn from Lyons (1969) and DeLoach (1939). Salmon dominates the fisheries of Canada's Pacific coast province of British Columbia, accounting for over two thirds of the total fisheries revenue to the total community. Early in the history of the fishing industry of Canada, the Sockeye or red salmon was the predominant single species. It is still the most important of the species caught off the coast of British Columbia (B.C.). The Fraser River system is an important salmon nursery, and it is very well known for its abundant Sockeye salmon runs, made possible in part, by the conservation practices of the International Pacific Salmon Fisheries Commission.

The canning process was introduced in North America in 1819, by an English immigrant named Thomas Kinsett. The first commercial cannery was started in 1839 at St. Johns, in New Brunswick, a province in Canada, by Tristram Halliday. The food canned at the time included the Atlantic salmon and lobster.

Around 1864, the first commercial canning of the pacific salmon started in Washington, California, on the Sacramento River, through the efforts of W^{m} Hume, George W. Hume and Andrew S. Hapgood. In 1866, this company moved northwards and estab-

lished the first Columbia River cannery at Eaglecliff, Washington. The first commercial canning of salmon was started in British Columbia in 1870 under the leadership of Alexander Ewen. Puget Sound had its first salmon cannery in 1877 and a year later, the first Alaskan cannery was established.

Some of the Early Problems of the Salmon Canning Industry

The salmon canning industry in British Columbia started before Canada's confederation. Consequently, the pioneer canners had to seek outlets for their canned salmon outside of B.C. The poeple of B.C. were accustomed to consuming salmon in some forms other than canned. This suggested that there was no domestic market for the canned salmon, and at the time there was no direct transportation system to the more populated areas of Eastern Canada.

The canners soon realized the marketing problems facing them. However, they were able to export some portion of their pack to Britain after a short period of negotiation. For many years the B.C. canners marketed their canned salmon products through commission merchants, shipping and insurance agents. In most instances, these agents were firms engaged in import and export trades, and sometimes may have provided funds to establish canneries. Packaging posed some problems at the early stages of production until 1876 when a 48 pounds pack was introduced in B.C. This is presently one of the standard forms of packaging.

1906 was not a happy season for the B.C. canners because of some unexpected events. The season started with a large carry-over from the previous season. Some of the packs were already being disposed of in the export markets when a news story from Continental North America spread in Europe. The story, generally referred to as the "Canned Beef Scandal" (17, p. 262), was concerned with the unhygenic meat packaging conditions in Chicago. As a result of this, canned salmon sales in the U.K. market dropped to zero for a while. At the same time, the B.C. canners were accused of dyeing the salmon so that the canned salmon would look more attractive. The charge was seriously denied by the B.C. canners, but had devastating effects on sales abroad.

The same year, 1906, was also the year of the San Francisco earthquake which, besides resulting in the loss of many lives, led to the destruction by fire of a large quantity of canned salmon cases. Health officials seized and destroyed two carloads of canned salmon that the B.C. canners had sent up to Seattle to be reconditioned for sale.

The fishing industry of B.C. was directly affected by the outbreak of the first world war in 1914. Production costs rose, exports to Britain and other countries became very difficult. Prior to the outbreak of the war, B.C. exported about 72.8 percent of her annual canned salmon pack (17, p. 303). Canned salmon packs were stocked up in warehouses waiting indefinitely to be exported. Packers had to incur insurance and storage costs.

Canada sided with Britain against Germany during the war. Many young men were enlisted, some volunteered and were sent to England for training and combat duty. The government needed money to finance the war effort and had to impose new taxes in 1915. The government issued an order banning the exportation of various commodities anywhere, excluding United Kingdom, British Protectorates and Possessions. Specifically, fish of various kinds was explicitly not to be exported to many European countries formerly regarded as neutral.

The United Kingdom in 1926 passed "The Merchandise Markets Act", which stipulated that the exporting countries should identify their products by printing the name of the country on each can. Of course, Canada was pleased by the Act since she had always wanted to maintain the identity of her products so that the Alaskan or Siberian canned salmon would not be mistaken for the Canadian product. From then on all canned salmon cans were boldly marked with the word 'Canada'.

The Impact of the Second World War

Canada lost some of its world markets during this period. The Canadian government, starting in 1939, began gradually taking over the control of the fish packing industry. The take over was the result of wartime controls of the time.

In 1941, the government allotted almost 70 percent of the B.C. canned pack of salmon to Great Britain. Between 1941

and 1946, the government alone was the one responsible for the disposition of the B.C canned salmon packs. About two thirds of the season's pack in 1941 was financed by the government on behalf of the British Ministry of Food based on the estimated quantity of canned salmon that would be shipped to Britain.

Various measures were undertaken by the government during the war years to guarantee raw fish to the Canadian packers. Exports of raw salmon, excluding the red spring salmon, were not permitted in B.C. Some of the restrictions were relaxed in 1947 making it possible to export coho salmon in fresh or frozen state. This line of action was more favorable to the U.S. processors because, at the time, there existed a strong demand for canned salmon in the U.S. markets. Consequently, the U.S. processors were willing to offer higher prices for the available coho salmon. Large quantities of coho salmon started flowing into Seattle for canning. In fact, so much entered the U.S. that this species was not available in Canada for canning. Barely two months after softening the restrictions, the government once more prohibited export of coho salmon. A similar effect resulted when the export embargo on pink and chum salmon was removed, so that the government had to reverse its decision in each case.

During the Geneva Conference in 1947, agreement was reached between the eighteen participating countries, which included the United States, Britain, Canada, Australia,

Belgium-Netherlands-Luxemburg Customs Union and others, to reduce tariffs based on a commodity-by-commodity criteria. The U.S. tariff on canned salmon at the time was 25 percent ad valorem. The Canadian government had anticipated a curtailment of this tariff. The optimism soon faded away when the U.S. instead chose to reduce the duty on fresh and frozen salmon by as much as 50 percent. This meant that it would be cheaper to export salmon to the U.S. in fresh or frozen form rather than in canned state. The reduction of the duty also increased the difference in duty between the fresh-frozen salmon and the canned salmon products.

In the interest of the Canadian fishing industry, the government banned the exportation of raw sockeye, pink and chum salmon. This ban proved inefficient since it failed to include the exports of these species in frozen form. However, the situation was immediately corrected when this defect was detected. Thus, it became illegal to export sockeye and pink salmon in the frozen state in 1948, but frozen chum salmon and some other species could be exported at various specified periods.

Shortly after the commencement of hostilities during the second world war, Britain had bought the B.C. canned salmon packs in bulk. This practice was terminated with the 1954 salmon season. Since then import licenses were issued to private importers in Britain and in a number of other Commonwealth countries. But in September of 1958, import of salmon was freed from exchange permits and restrictions. Thus, large

quantities of salmon were imported into Britain after the policy change.

The Salmon Species and Their Basic Characteristics

Biologically, thereis a limited amount of salmon that can be caught in any one salmon season. The raw salmon, unlike other inputs, cannot be bought on a day to day basis in some central market. It is, in economic context, a flow resource; that is, different units become available at each point in time. The salmon harvest season is of short duration. Furthermore, the quantity landed of each species varies from season to season and within the season.

Salmon Species: There are five main species of the Pacific coast salmon.

> Sockeye: The importance of this species is embedded in the color of its flesh (deep red), its texture and its oil content. These characteristics have given this species its commercial importance. The sockeye averages about six pounds and it is the second smallest of the species. Its life cycle is, in most instances, four years. Very little sockeye is traded either in the fresh or frozen form; that is to say, almost all the catch is canned.

Pink: This is the smallest of the species with lower oil content as compared with sockeye. The pink salmon averages about five pounds. It has a pale, pink flesh and is used primarily for canning.

Table 1. Salmon Composition [a/]

	(PER POUND OF EDIBLE MATERIAL)			
	CALORIES	PROTEINS (grams)	FATS (grams)	CALCIUM (milligrams)
SALMON, CANNED	766	94.0	44.0	304
SALMON, FRESH	990	79.0	75.0	59

	PHOSPHEROUS (milligrams)	IRON (milligrams)	Vitamins
CANNED	1298	5.9	A,B,C,D
FRESH	990	4.5	A,B,C,D

Table 1a. Composition of Canned Salmon [b/]

Species Pacific Salmon:	% TOTAL SOLIDS	% FAT	%PROTEIN	%ASH	CALORIES PER LB.
SOCKEYE	35.22	11.22	20.80	1.23	860
CHINOOK	36.83	15.72	17.67	1.22	991
COHO	32.51	8.49	21.08	1.21	750
PINK	30.20	6.99	21.40	.76	696
CHUM	29.96	6.69	20.67	1.02	514

Source: a/ National Fisheries Institute, Inc., Yearbook 1948, p. 81

b/ The Salmon Canning Industry, 1939 Daniel B. De Loach, Ph.D. Oregon State College, Corvallis, Oregon. p. 21.

Chum: This species is considered less valuable for canning because it tends to bleach its color after cooking. It weighs on the average about ten pounds and its color varies from a light pink to a white. The Chum salmon is canned and it is also traded in the fresh and frozen state.

Spring or Chinook Salmon: Chinook salmon is the first recorded canned salmon but because of the heavy demand for it in frozen and smoked form, little of it is presently included in the canned salmon pack. It is the largest of the salmon species weighing about twenty four pounds. Its color varies from deep red to pale pink or white. Considered on a pound basis, it is the most valuable. Its life cycle is between four and six years. It possesses the highest fat content.

Coho: This is traded mostly in fresh and frozen form but a little quantity of it is also canned. Its life cycle is about three years, and its weight averages about nine pounds.

Foreign Trade in Canada's Canned Salmon

The entire output of canned salmon in the U.S. and Canada comes from Alaska and the Pacific Northwest. Thus, it seems reasonable that the national trade data of the U.S. and Canada can be used as a measure of the foreign trade situation

of the Pacific Salmon fisheries.

Canned salmon is exported to various countries of the world. It enjoys a world-wide recognition because of its nutritional value. Salmon is principally traded in the canned form. The remainder can be marketed in various other forms; for example, in the fresh or frozen state. Foreign demand for the Canadian canned salmon is largely among the higher income groups in the U.S., British Commonwealth and in other European countries.

There is a substantial instability in the price behavior of canned salmon in comparison with other commodities. Some of the reasons can be explained by: (a) Variation in salmon runs, (b) Production lags to changes in demand results in wide fluctuations in wholesale prices (13, p. 155), (c) Fresh and frozen salmon are mainly consumed in North America, and in this instance, the U.S. is the leading consumer. Consequently prices of these forms of commodities in Canada are greatly influenced by the prevailing prices in the U.S., (d) Prices of individual species tend to fluctuate more than the prices of all the species taken together. Consequently, the demand for individual species may probably be relatively elastic if it is easier to substitute other species.

Canada, unlike the U.S., depends heavily on overseas markets for its canned salmon. Depending on the number of buyers and sellers, export markets may be more competitive than the domestic markets. The U.S. population is by far greater than that of Canada. Thus the Canadian packers have

been forced to seek external outlets for their products. Export trade generally fluctuates with major depressions and wars, turning upwards during recovery and after major wars. Export trade expansion has played a larger role in Canada than in the U.S. However, canned salmon trade in both countries is small in terms of the overall foreign trade. The United Kingdom is the major consumer of canned salmon, mostly red salmon, from Canada, Japan, the Soviet Union and the U.S. Great Britain, besides being the principal consumer of canned salmon, is also a distributing center. That is, some of the British imports of canned salmon are further re-exported to other Commonwealth countries, British colonies and protectorates in Africa and other areas.

Marketing

Canned Salmon: As was earlier mentioned, the British Columbian canners are heavily dependent on foreign markets for the disposition of their products. The Commonwealth and other European countries absorb a large percentage of the exports, with the United Kingdom taking the greater share. Each of the export markets has its own taste in terms of the species demanded. The U.K. for example favors mostly Sockeye or red salmon species. France and Italy demand pink salmon. Australia and New Zealand usually purchase coho salmon while other less developed Commonwealth countries demand greater quantities of chum salmon. It is not certain whether these different demands in each market are influenced by the parti-

cular characteristics of the salmon species or by the price of each species. Probably, both factors may be responsible. A detailed analysis of the various demands in each market may be necessary in order to determine which factor is more important. Further research in regards to this is suggested.

During the two world wars, most of the traditional export markets were not accessible. As a result, the B.C. canners directed their attentions to the domestic markets and undertook an extensive and aggressive campaign. This move or strategy helped to reduce the large inventory of canned salmon packs thereby minimizing the storage and insurance costs.

Scarcity of the dollar soon after the war hindered the resumption of the export trade. The Canadian government in cooperation with the fishing industry tried in every respect to, at least, retain the traditional U.K. market. Delegates were dispatched to Britain for trade negotiations and in return the fishing industry purchased various British-made machinery. As the economic and financial situation improved, the U.K.,as well as other countries, tended to resume purchases.

Fresh, Frozen and Other Markets for Salmon

Fresh and frozen salmon are generally marketed domestically and in the United States. Modern technology has helped in expanding salmon trade in this form. Frozen fillets, that is, pieces of salmon with skin including bones and other waste

materials have been processed and marketed. Prior to 1945, this processing was not too significant. Modern technology also has made it possible to process those salmon pieces formerly regarded as waste products. These include offal meal and oil, and Roe. Each of these products has been marketed in the domestic and foreign markets.

The United States is the principal market for fresh, frozen and mild-cured salmon of British Columbia. The entire U.S. market does not belong to B.C. alone. There are other producers from Washington, Alaska and Oregon. Iceland is also a giant producer of frozen fish. The B.C. canners have to compete with these other producers for the consumers' dollar.

Export Expansion Programs

The Canadian Department of Commerce has a foreign subsidiary designated the "Trade Commissioner Service" operating in about forty five foreign countries (10, p. 67). There are about 172 Trade Commissioners with approximately 65 offices. The main responsibility of these Commissioners in general, is to promote the Canadian trade interests abroad. They also provide liaison with governments and business sectors in various countries whose markets are important outlets for the products of the Canadian fishing industry. The Commissioners very often undertake surveys of the fishing industry of those countries who are potential competitors. Prices and imports of fishery products from other competitive sources are also recorded, mainly in those countries that import mostly from

Canada. There are also Commodity Officers in the Fisheries division of Canada, who provide various information on trade and export opportunity. The International Trade Relations Branch handles the Canadian trade development and relations with various foreign countries, such as trade and tariff arrangements. The basic objective is an attempt to gain entry and provide better terms of access to foreign markets.

The Exports Credits Insurance Corporation, in conjunction with the Department of Trade and Commerce, provides Credits and Insurance to the Canadian exporters.

Canadian Trade Flows-Canned Salmon 1947-1970

Foreign trade in canned salmon has been going on since the 19th century. Several factors have in the past interrupted this trade: for example, the two world wars. The author has chosen to survey the trade flows from 1947 to 1970. Economic and financial difficulties have plagued various countries at one time or another and within the period under consideration. Therefore, it will be noted at the onset that foreign trade in canned salmon has fluctuated in response to the above mentioned economic and financial problems in both the importing and the exporting countries. It will also be mentioned that it may not be possible to account for all factors that have affected foreign trade in canned salmon during the entire period under study. However, every effort will be made to identify some important factors that have tended to foster or prohibit trade in canned salmon. Based on

the expected findings, it may be possible to predict the future direction of trade in canned salmon of Canada.

Prior to world war II the United Kingdom had been the primary importer of the British Columbian canned salmon, mostly the Sockeye species. During the war years Britain lost most of its other sources of supply. Consequently, B.C. was exporting almost all her canned salmon to Britain and the domestic market was not given much attention. Between 1948 and 1950, British imports of canned salmon from Canada and the U.S. was comparatively small. In 1948, for example, Britain failed to issue import licenses with the result that there was practically no import of canned salmon in that year (20, 47(2):137). This contrasts with the situation in 1942, when the entire B.C. pack went to foreign markets with little or nothing left for domestic consumption. Exports to Britain, for several salmon seasons prior to the 1946 season were heavy because of the strong demand. Sales in the domestic markets were rather meagre due in part to lower prices as compared to the prices offered by the U.K. Ministry of Food.

The period of 1948-50 posed several marketing problems for the B.C. canners. Total imports (canned salmon) of Australia and New Zealand were usually smaller than the U.K. total imports. Australia and New Zealand, in 1948, decided not to buy canned salmon from hard currency countries, for example Canada, as a result of the shortage of dollars. The U.S. at the time had a stiff ad valorem duty of 25 percent

on canned salmon. On account of the above problems, the B.C. domestic market for the first time since the war, was given serious consideration.

External trade difficulties during the early fifties, portrayed the adverse economic effects that might result from the loss of overseas markets. For the B.C. canners, it was a good experience in that they were induced or rather forced to take precautionary measures. One of these was a new marketing strategy involving an extensive and aggressive advertising campaign aimed at developing the domestic market. Their efforts proved successful and since then, they have tended to intensify their advertising campaigns whenever exports declined.

Canada's dependence on overseas markets has some direct effects on production costs and the fishermen. The 1952 season was a case in point. That year, the canners lost most of their foreign markets because of the prevailing conditions; the B.C. fishermen failed to accept the lower prices offered by the processors for their catch. The processors themselves were facing rising costs. The outcome of the disagreement culminated in a prolonged strike by the fishermen. The canned pink salmon market in the U.S. improved moderately for Canadian exporters. This was the aftermath of the reduction in the import duty on canned salmon from 25 to 15 percent in 1952 (20, 51(2):141).

The continued shrinkage of the overseas markets during the 1950's led the B.C. processors to send a delegation to

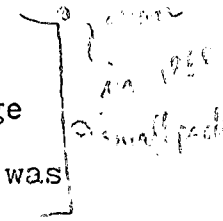
Britain in 1953, in an attempt to revive the dwindling U.K. market. There was no indication that Britain increased her purchases during that season however.

About 65 percent of the total B.C. canned salmon packs went to the overseas market prior to WWII, 50 percent of the 65 percent or 32 percent of the pack went to the Commonwealth countries. The British share increased tremendously during the war (20, 53(2):157). Trading in canned salmon declined greatly after the war. It was not until 1954, that the British imports of Canadian salmon were revived, perhaps because of the 1953 Canadian Trade Mission to Britain.

The salmon run during the 1954-55 season was not very large. The B.C. packers, afraid of losing the U.K. market to Japan, bought thousands of cases of salmon packs from Puget Sound. In 1956, the B.C. packers imported a substantial quantity of canned salmon from Japan-mainly pink, red and coho. Sales to Britain were mostly from the B.C. packs. The imports from Japan were considered necessary because the packers could no longer neglect the domestic market-remembering what had happened a few years back. The most likely explanation of the actions of the B.C. packers, could be an attempt to build and strengthen their position in the U.K. market for future years. Furthermore, the competitive pressure from Japan was causing some concern among the B.C. and the U.S. canned salmon producers. The B.C. packers were willing to take any measure that could lessen the competitive pressure from the Japanese canned

salmon products.

Imports of canned red salmon became necessary again in 1957 to meet domestic demand because home packs were rather small. The canners were not happy to import from Japan nor did they want to leave domestic consumers without supplies. Japan also was gaining ground in overseas markets and this development was something to reckon with, more so because Japan was offering lower prices for its products. While B.C. enjoyed preferential tariff treatment within the Commonwealth and had established a quality 'reputation', it was feared that the cheaper Japanese packs could some day out-weigh these advantages. As was formerly discussed (see p. 8), when in 1958, Britain removed the canned salmon exchange permit restrictions, a large quantity of canned salmon was imported from Japan.



New Developments-Foreign Trade in Canned Salmon

The relaxation of the U.K. trade restrictions in 1958 had an encouraging impact in the canned salmon market. This policy change portrayed what seemed to be the new trend of events: that is, a world-wide tendency towards reopening trade channels that had been clogged up due to dollar shortages, high tariffs, import quotas and various other trade barriers. Furthermore, the Canadian domestic market showed signs of dependability since the previous advertising campaign.

Whenever there is a light salmon run, salmon packs

are generally in short supply. 1960 was a bad season comparatively. The pack was estimated to be the lowest in forty years (20, 60(2):159). This was not a welcome event for the B.C. packers, especially at a time when import restrictions in Britain had been removed.

In 1960, Britain was comtemplating joining the European Economic Community (EEC). The B.C. exporters were afraid of losing the Commonwealth tariff preferences. If Britain were to join the EEC, Canada would be facing high external tariff applicable to non-members.

About two thirds of the total B.C. salmon pack in 1962 consisted of pinks, which did not sell as easily as the sockeye in the U.K. market. Consequently, a central marketing pool comprising most of the major packers was formed, with the primary objective of disposing of the surplus canned, pink salmon in the overseas markets. The selling agency also hoped to explore the possibility of establishing a foothold in the EEC.

B.C. canned salmon is exported to all the members of the EEC-Belgium-Luxemburg, France, Germany, Netherlands and Italy. On account of this, whether or not Canada or other canned salmon producers will be given any preferential tariff treatment, is yet to be known. However, this may be possible only if some or all the members of the EEC can agree that canned salmon does not compete with other fishery products in Europe.

Policy changes in importing countries are particularly important to the B.C. packers. Canadian representatives were sent to Australia in 1964, to plead their cause when the Australian government planned to increase the import duty on canned salmon in the interest of the domestic tuna industry.

There were some unhappy developments in the overseas market in 1967. The British devaluation of the pound sterling was one factor. In France, the internal taxes and import tariff were increasing. Similar developments were taking place in other countries. The B.C. packers once more resorted to an advertising campaign around Canada, very similar to that of 1945 (see p. 18).

Sales to the U.K. from the 1968 salmon pack were, in some instances, at a price below the cost of production, but the B.C. packers were willing to incur that loss for fear of losing their traditional market to Japan. The significance of the British currency devaluation in 1967 was that canned salmon would cost more in the U.K. irrespective of the country of origin. The B.C. packers may have chosen to accept lower prices primarily to retain the traditional British market for the future years. The U.K. market is the major export market for the B.C. canned salmon and canned salmon from other major producing countries.

Future Marketing and Demand for Canned Salmon

From the way things are going, the author is of the opinion that the B.C. packers will probably face a stiffer

competition in the export markets in the near future than has been the case in the past.

About 50 years back, not many Japanese fishing fleets were operating outside the coastal waters of Japan. Technological innovation in the early 20th century ushered in many changes that sent the Japanese trawlers to distant waters. In 1913, the first radio station was installed in a Japanese owned boat; in 1919, diesel engines and direction detectors came into being; in 1928, an echo finder was introduced, followed by installation of a refrigerator in a diesel trawler. The second world war disrupted the on going developments; at the same time Japan lost most of its large fishing vessels. Not long after the war, the Japanese government urgently reorganized and reconstructed the fishing fleets so fast that by the end of 1947, Japan had once more attained its prewar level in fishing fleets, numbering approximately 88,301 powered boats of about 570,000 gross tonnage (10, p. 39). Some of the Japanese motherships are equipped with every aspect of modern fishing and processing techniques. Japanese fishing vessels have been operating in various regions of the world. Japan also has been penetrating into many foreign markets.

Canned salmon from the Soviet Union has been exported to those countries which traditionally imported from Canada. This was made possible because of some relaxations in political restrictions and economic expansion on the part of the

Soviet Union.

The implication therefore, is that more and more canned salmon producing countries will share the available world market. What these shares will be is, of course, yet to be determined. However, it is likely that whichever country produces at the lowest cost per unit of output will have some advantages, if we should disregard trade barriers such as tariffs, quotas and trade embargoes. Both the Canadian and the U.S. processors often complain that Japan and to some extent Russia enjoy lower production costs because of low-cost labour. If so, the Canadian packers have to produce salmon packs that will not be priced out of the world market. Canada, as well as other producers, are optimistic that with the increasing population trend, higher standard of living, and a continued need for animal protein food, canned salmon will probably maintain its strong demand in the world market (9, p. 48).

Other fish is canned in Canada, but salmon canning dominates the industry. Processors have all along tried to maintain the qualities of the canned salmon established several years ago, to a greater extent than has been true of any other fishery product of the Canadian fishing industry. Development of the domestic market through aggressive advertising and other promotional activities has led to the increase in domestic consumption of canned salmon, although the total fish consumption in Canada by 1960 was considered

low due inpart to large supplies of agricultural products.

Government controls in whatever form on imports in most foreign countries will affect the demand for canned salmon in the overseas markets. For example, in the U.S. a 15 percent ad valorem tariff is imposed on Canadian canned salmon. In 1964, for instance, a Canadian delegation was sent to Australia when the Australian government planned on increasing the import duty on canned salmon (see p. 22). Canada has been able to retain its foreign markets with its high priced canned sockeye salmon primarily for the long established quality of this species. Besides its attractive red color, whether or not it tastes different from that of the relatively lower-priced canned pink and chum salmon is a question of personal opinion. But in view of the lower-priced canned red salmon from Japan, this factor may affect the Canadian exports in future.

Current marketing and economic situations in the Continental North America and Western Europe may have contributed to the recent policy change in Canada. The Canadian government in 1970, decided to lift the long-time embargo on export of fresh and frozen sockeye salmon. This action, some observers believe, was an attempt by the Canadian government to liberalize marketing of this species and to offer it for sale in whatever form that promises the best possible price. More importantly, is the fact that the government wanted both the fishermen, and the processors and exporters of Canada to par-

ticipate in the emerging European market for the sockeye salmon. The emerging market, it is feared, may be monopolized by other countries-Japan, the U.S. and the U.S.S.R. It will be recalled in the first instance, that the Canadian embargo on export of fresh or frozen sockeye or red salmon was aimed at limiting the exportation of the species to the U.S. The sockeye salmon is generally canned and it is the most favored species in the U.K. The U.K. is a traditional market for the Canadian canned salmon and, in particular, for canned sockeye.

The Canadian Fisheries Regulations have been moderated to allow the exportation of frozen sockeye salmon. So far trade in this much valued sockeye salmon has shown promising prospects in the Continental European market. Nevertheless, the greater portion of the Canadian sockeye catch is still canned in British Columbia.

These developments tend to suggest that marketing and the demand for canned salmon are changing. The Canadian government is taking measures to meet these changing marketing and demand conditions. The Central Marketing agency mentioned earlier, hoped to explore the possibility and the feasibility of establishing a strong foothold in the EEC member countries. That agency might have discovered the growing market for fresh and frozen salmon in Continental Europe. If so, the agency might have suggested to the Canadian government to lift the embargo on export of fresh and frozen sockeye so

that the Canadian salmon fishing industry might benefit from this new trend of events.

Vessel License Control Program in British Columbia

Fisheries authorities in Canada have come to the conclusion that the viability of the salmon industry of British Columbia is at stake because of the continued increase in the size of the salmon fishing fleet-Table 2 (p. 28), shows the relative changes in the salmon fishing fleet in Canada from 1956 to 1967. It is believed that the current level of investment and production of salmon can no longer guarantee a desirable return to labour and capital (1). It is argued that the common property characteristic of fishery resources leads to the dissipation of economic rent which would accrue to the owner of the fishing resource were it possible to place it under private ownership. On the other hand, the Canadian government bears the conservation costs. On the basis of this argument, Mr. Jack Davis[1/], the Canadian Minister of Fisheries and Forestry, introduced a bill in September 1968, aimed at discouraging over-capitalization and reduction in the size of the salmon fishing fleet.

1/ A detailed account of this program is contained in the article "Problems of Over-Expansion in the Salmon fleet in British Columbia", by Blake A. Campell, Chief, Economic Branch Fisheries Service, Pacific Region, Department of Fisheries and Forestry. It can also be found in Western Fisheries Magazine, October and November 1970 and January 1971.

The bill has been enacted and has become law.

It was also expected that those connected with the salmon industry would derive more reasonable incomes when and if production costs would be reduced, product price and production increased. It was anticipated that some fishermen would not continue to fish under this policy: the marginal ones would eventually leave the industry.

Table 2. Fishing Fleet in British Columbia 1956-1967

Year	Purse Seine	Drag Seines	Gill Nets	Troll Lines
1956	499	6	7,014	13,984
1957	503	8	7,416	14,018
1958	518	5	7,562	13,646
1959	516	16	7,436	13,100
1960	509	13	8,022	13,429
1961	500	8	8,010	13,451
1962	499	8	9,652	12,732
1963	475	9	9,392	13,493
1964	514	10	9,923	14,069
1965	524	10	10,007	13,893
1966	511	7	9,843	14,939
1967	516	9	10,151	15,953

Source: Philip B. Schary, Robert E. Shirley and B. Linn Soule Analysis of the Distribution System for Northwest Originated Fresh Salmon. p. 111-119.

Three main vessels types comprise the salmon fishing fleet in British Columbia, namely seines, gill-nets and trolls. The last ten years has witnessed a remarkable increase in trolling-combines, highly equipped with modern electronic

components. Consequently, troll-caught salmon has continued to increase while the aggregate harvestable salmon stock by all gear declined. Composition of the troll-catches has also changed, with a moderate increase in percentage of sockeye and pink salmon relative to coho and spring salmon. Troll-caught salmon are generally marketed in either fresh or frozen form, although this may not be true of red and pink salmon. Demand for salmon in these forms has been on the increase in the overseas markets. It is no surprise that prices of troll-caught salmon over the past few years have increased more than the prices of seine and gillnet-caught salmon. However, it is hard to say whether the upward trend in prices of troll-caught salmon will continue (see Table 3a, p. 30).

Seine-caught salmon are mainly canned so that the demand for canned salmon at home and abroad will be one of the determining factors in the probable future condition with regards to the salmon seine fishery.

Gillnet vessels have also shown a significant increase Table 2,(p. 28), and are becoming more diversified. One aspect of diversification is that some gillnetters of recent are dressing their salmon aboard their vessels. In so doing, they hope to improve their gross annual returns, considering the costly investment in boats and gear, and also the short operating fishing season-from July to September. However, the future trend in the prices of their dressed salmon will

Table 3a. Average Landed Prices for Troll Caught Salmon by Species-Five Year Periods

	Cents Per Pound			
	Coho	Springs	Pinks	Sockeye
1951-1955	16.4	20.5	8.9	23.3
1966-1969	33.4	47.9	15.7	37.0

Table 3b. Average Unit[a] Landed Price of Seine Caught Salmon by Species

	Cents Per Pound		
	1951-1955	1966-1969	Change %
Sockeye	23.3	37.5	+61
Coho	15.2	28.8	+89
Pink	8.3	14.1	+70
Chum	7.8	14.1	+81
Springs	27.4	34.0	+24

Table 3 c. Average Annual Troll Caught Salmon 1951-1969

	Millions of Pounds			
	Springs	Coho	Pinks	Sockeye
1951-1955	9.16	15.12	.83	.06
1964-1969(4 years)	10.90	18.44	6.38	1.09
% Increase 1966-1969 vs. 1951-1955	20	22	668	1,716

Source: Campbell, Blake A. Problems of Over-Expansion in the Salmon Fleet in British Columbia. 1971. pp. 2,6.

[a] 'Unit price' implies either the yearly negotiated minimum price between fishing companies and the fishermen or on an adjusted price changed during the fishing season.

determine how far they can go.

Fisheries authorities in Canada have also observed that, the fishermen more often than not neglect to include depreciation allowance when calculating their costs. The fishermen have been encouraged to take depreciation allowance into account so that they will be better informed when calculating the expected returns on the contemplated investment.

The vessel license program started in 1968. The expected reduction in the size of the salmon fishing fleet is yet to be seen. The Fisheries authorities expect a gradual decline in the size of the salmon fishing fleet in the next five to ten years. Further regulations with regards to improved standards for fishing vessels are expected in the future. When those regulations are implemented, it is most likely that the marginal producers with inefficient and ill-equipped fishing vessels will exit.

Prior to 1968, entry into the salmon industry was not regulated; only nominal license fees were required. Presently the license fees are higher as a result of the Salmon License Control Program. In contrast to the situation prior to 1968, it is more difficult to acquire a new vessel. Whether or not many people will be discouraged from entry into the salmon industry is still to be shown.

A Brief Survey of Salmon Canning Industry in the U.S.:

The commercial importance of the salmon fisheries can best be associated with the early adventures of the Hudson Bay

Company and the Northwest Company (6, p. 9). These two companies, although mainly concerned with fur-trading, decided to process salmon and market it in conjunction with the furs. The North American Indians sold salmon to these people in smoked and dried form. The purchased salmon was used as food. The companies processed the salmon with the crude preserving techniques available, at the time, such as smoking, salting and pickling. Like any other new product, it was not easy for the Companies to dispose of their new processed salmon in the foreign market.

The first commercial canning of the Pacific salmon was started by William and George W. Hume, and Andrew S. Hapgood under the name of Hapgood, Hume Company in 1864, at Washington California, on the Sacramento River (6, p. 11). This company was confronted with various problems early in the period. Inadequate supply of fish was one of the many problems. Eventually, the company decided to move northwards. This move brought them to Eagle Cliff, Washington. Thus, The first Columbian River cannery came into being.

Practically speaking, consumers are often reluctant to try a new product. It takes time and great effort to do the work of convincing consumers to accept a new product. Canned salmon initially encountered this problem. Sellers (wholesaler or retailer) hesitate to make large purchases when, at least, the confidence of the consumers is still at stake. Britain has been a major consumer of canned salmon from the North American

continent. It took a while before a strong market for canned salmon could be developed in Britain. In the course of that market development, the canned salmon product has undergone extensive changes and standardization.

Primary markets for canned salmon developed in Seattle, Vancouver, British Columbia and Portland in the Pacific Northwest as the canning industry moved northwards from California. Prior to that, San Francisco was the main outlet for canned and fresh salmon (6, p. 13).

The salmon canning industry has been plagued with over-investment that generally results in poor rates of returns (13, p. 89). In the early periods, canneries were rather small in size and many were owned individually or by partnership. Of course, there were no restrictions to entry into the salmon canning industry. There are often the possibilities that the pioneers in one industry or another may earn pure economic profits. Uncontrolled entry into the salmon canning industry led to over supply of canned salmon and declining prices. This led to liquidation of several canneries and those that survived decided to consolidate. The fact that there exists pure economic rent within an industry can lure more people into the industry and very soon it will be a struggle for survival.[2/]

[2/] A detailed account of concentration in the Alaska salmon canning industry can be found in 'The History of Concentration in the Canned Salmon Industry of the U.S.' by Mark Rubinstein, Bachelor's thesis. Harvard College, 1966. 126 numb. leaves.

Over-expansion of the salmon industry in the 19th Century was accompanied by many undesirable effects. Many plants were abandoned, a number of the establishments went bankrupt, prices of canned red and pink salmon in the domestic and foreign markets declined. One immediate outcome at the time was the combination movement in the salmon canning industry. Combinations in most instances involved merging of plants and equipment, and managing under one central unified body: for example, the Alaska Packing Association, Columbia River Packers Association and British Columbia Packers Association (13, p. 95). The degree of success among these vertical and horizontal combinations varied. Large size operation has some desirable effects, non-the-less, disadvantages still abound. Salmon canning involves employment of some specialized resources or machinery. Salmon runs, it will be recalled vary from season to season and within seasons. In bad years when the run is light, there may not be enough raw fish (salmon) to keep those machinery units busy as long as the season lasts. For this specialized machinery to lie idle involves a large amount of overhead costs.

Early Marketing of Canned Salmon

During the early periods of the salmon canning industry, marketing of the product was a problem to contend with. Over-expansion of the salmon industry prior to World War I, resulted in combinations or mergers of those canneries that survived the wave of bankruptcies which engulfed the salmon canning

industry. These mergers were more or less aimed at re-organizing production management while a lot remained to be done with regards to marketing. The product to a certain degree is homogeneous and standardized but varies in terms of grade and quality. These variations in turn depend on the species of the canned salmon products. For instance, canned sockeye is different from canned pink or chum. The pink has a very pale pink colour and possesses a lower oil content. The chum tends to bleach its colour after cooking and varies from a light to a white. The sockeye has a deep red colour and very rich oil content (9, p. 21).

Unlike some other food products, canned salmon is non-perishable and tends to suffer fewer of the transportation and refrigeration problems of the product in its more perishable form (for example, fresh fish). The packing process however, is concentrated within a very short period during each season, thus reinforcing the need for seasonal storage of the canned salmon product in large quantities.

Consumption of the salmon, unlike its production, is very widely dispersed all over the United States and foreign countries. The U.S. consumes more canned salmon in total, than does Canada, where the larger percentage of the canned salmon is marketed overseas (see Table 5, p. 37).

The demand for the canned salmon product in different areas in the U.S. and other foreign countries is closely associated with the level of income and the consumer prefer-

ence, for certain species. High quality grades-red, chinook, coho and some better grades of pink salmon are marketed in high income areas of the U.S., while the demand for low quality grade, such as chum is predominantly strong among low income groups.

Table 4. Exports of Canned Salmon by Countries of Origin (1953-1970)

	Thousand Metric Tons			
	Canada	United States	Japan	USSR
1953	22.5	1.0	1.8	-
1954	31.9	3.3	7.9	-
1955	20.7	4.7	12.7	3.1
1956	14.6	2.4	42.3	4.0
1957	10.9	3.0	31.3	3.6
1958	27.8	4.1	56.1	2.5
1959	15.5	6.3	62.2	4.6
1960	7.1	5.4	37.5	2.4
1961	8.4	3.3	26.7	3.7
1962	10.7	4.1	55.2	4.2
1963	15.3	4.6	29.8	4.1
1964	18.0	9.5	28.1	3.2
1965	12.0	11.3	37.7	3.6
1966	11.6	9.3	22.9	3.6
1967	19.8	9.3	27.5	2.7
1968	18.1	2.6	38.1	4.6
1969	15.9	7.0	22.3	3.7
1970	7.0	7.6	24.0	4.7

Source: F.A.O. Fisheries Statistics, Philip B. Schary, Robert E. Shirley and Linn Soule. Analysis of the Distribution System for Northwest Originated Fresh Salmon. p. 2-22.

Table 5 Canned Salmon Consumption by Country (1956-1966)

	Thousands of Pounds			
	U.S.	Canada	U.K.	France
1956	191,447	28,362	48,502	1,543
1957	171,261	46,711	46,077	441
1958	198,779	31,846	128,530	---
1959	135,158	17,487	109,790	2,646
1960	142,936	15,962	67,461	1,102
1961	176,492	49,984	49,163	2,205
1962	180,017	64,229	121,916	1,984
1963	148,807	25,534	73,855	5,071
1964	159,602	20,731	82,012	3,527
1965	49,434	18,917	94,358	3,307
1966	189,128	63,894	62,611	3,086

Source: see Table 4, p. 36.

The importance of San Francisco as the early main terminal market for canned salmon has declined considerably. When the salmon canning industry moved northwards from California early in the period, terminal markets were subsequently developed in some of the Northern cities. The cities of Seattle, Bellingham, Portland, and San Francisco-to a lesser degree-now constitute the terminal markets in the U.S. for the eventual disposition of canned salmon, for domestic and foreign consumption. At the end of the canning season, the season's packs are transported to these terminals for storage and distribution. Some canneries however store their packs in their warehouses and sales are made from there: for instance,

the Puget Sound and Columbia River canneries (13, p. 129). Depending on the location and size of the concern, usually the small canneries have to ship their packs to one or the other big trading centers for marketing. The port of Seattle has been expanded and equipped to handle large shipments of canned salmon. In some instances, sales are made even before the canning season goes into full operation. The big trading centers receive shipments of canned salmon packs after the close of the canning season, but shipments to the several buyers in the secondary markets continue through the entire year.

The Process of Distribution

A more efficient distribution mechanism of canned salmon product did not evolve until the cannery industry attained a stronger financial position. Earlier in the period of salmon canning, packers relied solely on the distribution services provided by wholesale grocers and eastern broker firms. Some of these distributors also provided the packers with some financial assistance. The salmon canning industry continued to grow and expand as companies merged and consolidated. These developments ushered in a remarkable change that led to the establishment of a new marketing organization. Production and sales departments were integrated via chain store marketing systems, processors of general food, and sales organizations; all were connected in different degrees with the salmon canneries (13, p. 131). The earlier marketing

structure involved arrangements between the packer and the selling agents. Some of the selling agents became interested in the salmon packing enterprise and decided to finance one or more packers. DeLoach (6, p. 71) writing in 1939, gave instances of large salmon broker firm's ownership or complete control of one or more salmon canning firms. The brokers through financing and other marketing arrangements did in fact control the output of many canning firms. Selling agents, by owning stock or advancing loans to small canners could exert very much influence over these small firms. Canned salmon export sales were made through the marketing services provided by some selling agents and brokers. The packers, selling agents and brokers, usually entered into agreements or contracts before or after salmon packs had been shipped to the primary terminal markets. The selling agents, while attempting to establish a strong demand for canned salmon products associated with their brand names, also strove to secure for themselves enough supply of better quality salmon products. These factors might offer one explanation why these agents have tended to finance and directly control some of the salmon canning companies.

The emergence of chain stores later in the period, provided new marketing channels for the canned salmon products. Some packers may have been pleased with this development, but for the selling agents, this represented more competition.

Foreign marketing of canned salmon has been subject to

various international trade barriers, including tariffs, quotas and all sorts of restrictions on canned products in each individual foreign country. Selling agents in the primary markets usually negotiated with foreign export brokers who had foreign subsidiaries that handled sales in their country. Import restrictions of canned salmon or any other canned products in some countries are often justified by various governments on the grounds that the consumers are being protected. Some governments may require limited use of food preservatives or may object to the use of artificial food colouring, for example, Britain. The canned salmon exports to Germany must satisfy the German pure food and drugs laws (6, p. 65).

Selling agents and other distributors make use of the mass media for advertising campaigns and sales promotion of canned salmon: for example, radio, magazines, newspapers and outdoor advertising. On the wholesale and retail levels, window and newspaper advertising were often utilized. Cooperative advertising by the salmon canning industry has also been resorted to, especially when there is a large supply. Such a massive advertising campaign device was attempted in Canada when the international economic and financial conditions prohibited the exportation of the British Columbian canned salmon. Cooperative advertising in the U.S. and Canada in the early 1930's proved very successful (6, p. 96).

Canned Salmon Prices

The salmon canning industry has undergone various changes in processing, marketing and pricing. In the early periods of the canned salmon industry, opening prices on all species of canned salmon were usually quoted at the end of the canning season. Future contracts between the processors and the distributors were based on the quoted opening prices. Price quotation may directly affect sales, that is, when buyers consider the quoted price too high, they would tend to purchase fewer canned salmon. Price leadership in the salmon industry is common. For example, large canners often announce their opening prices before the small canners announce their prices (6, p. 100). Opening prices are still announced at the end of each year led by the big canning companies.

Various factors tend to affect prices of different grades of canned salmon products. Salmon competes with other foods and meat products in its retail market. The quantity demanded at any one time will be determined by, among other things, its competitive price position. In some instances, fluctuations in runs of a particular species cause price to vary more than does the supply of the competing species. Consumer's demand and purchasing power, available supply of the canned salmon product, price of substitute goods, for example, canned tuna, and the available number of substitutes, can all, in one way or another, exert some influence on the prices of canned salmon products. A more detailed understanding of the

price behavior at the retail level needs a complete analysis of the forces of demand and supply which this study did not undertake.

Salmon Prices- Ex-vessel

Salmon prices as of now depend on the outcome of the negotiated settlement between the fishermen's union representatives on the one hand and the Processors Association on the other. Price negotiations may take place prior to the opening of the season or before the fishing vessels take off on a fishing trip. In some instances, prices may be negotiated for a specified period of time or on a day-to-day basis. There are also some fishermen operating independently. They can either sell at the negotiated prices industry-wide or at whatever price is prevailing in the market. Some fishermen have Cooperatives. The members of the Cooperatives are paid a prearranged price. This price is usually below the price that buyers may offer. The net difference is shared among members after each season with some amount set aside to defray the operating cost of the Cooperative.

Price negotiations involving Cooperatives and Processors differ from those involving non-members and usually lead to higher prices. The fishermen have the option of either becoming a member of a Cooperative or joining one of the Fishermen's Unions. Canning companies provide union fishermen with food, gear and accommodation; in turn union members are obligated to hand over all fish caught to the canning companies. Members

of the Cooperatives use their own gear, provide their own food and accommodation, and negotiate with the canning companies for their catch. As of now, ex-vessel prices are negotiated before the opening of the fishing season between the fishermen's and the processor's representative unions. Negotiated ex-vessel prices may differ depending on the applicable coastal areas.

In British Columbia for example, the fishermen and shoreworkers union negotiate with the strong Processors Association. Both unions determine and agree on the landed minimum prices for various salmon species caught with the gillnet and seine. They also negotiate for the wage-rates of those employees who work on shore and on boats owned by packers. Troll-caught salmon are often excluded from price negotiation since catches are generally dressed and sold in the fresh market (19, p. 51). Besides, the species caught are not generally those used in canning. More recently, fishermen have been converting trollers and equipping them to such a degree that their catch of these species mainly canned (sockeye and pink salmon) have increased. The Canadian Fisheries authorities have tried to check this trend. Conversions have involved rebuilding, re-engining and increased utilization of electronic equipment. Thus, the average size and efficiency of larger trollers have tended to increase.

Early Foreign Trade in Canned Salmon

It is rather difficult to keep track of exports of canned salmon according to various species. Usually what one finds are the statistics of exports of all canned salmon collectively. A lot of canned salmon of the U.S. has been going to the British market. In other words, the United Kingdom is the primary importer of the U.S. canned salmon. The U.S. also exports to France, Germany, Belgium, Holland and to a number of South American countries. The amount exported to each country depends in part, on the nature of import controls peculiar to each country. France for instance, is noted for its high internal taxes and quota system and there is not much the American exporters can do other than to abide by the regulations. Exports to South American countries have been usurped by the Japanese following her recovery from the Pacific wars. Canned salmon imports in the 1930's, both in the U.S. and Canada, were rather small. The U.S. imports came mostly from Canada and Japan, with Canada exporting more than Japan. Later, however, the Japanese exports increased. In total, U.S. exports of canned salmon are far smaller than the Canadian exports (see Table 4, p. 36). One explanation for this is the difference in population between the two countries. Exports fluctuated with major depressions and wars. The U.S. exports declined during WWII and shortly afterwards increased tremendously. This export boom did not last long because of the economic slump, the outcome of the

war (13, p. 167). The great depression of 1929-33 adversely affected salmon trade, exports decreased as trade channels were blocked by tariffs, quotas and lack of expendable income of the consumers. There was a significant improvement in trade flows soon afterwards. The U.S. canners directed their attention to home markets after the 1930's trade fluctuation, whereas in Canada exploration and expansion of the foreign markets became more important. It was not until the early 1950's that the Canadian canners attempted to explore the domestic market when exports to the U.K. and other countries were declining as a result of the financial difficulties in the importing countries. For instance, shortage of dollars prevented some countries like Australia and New Zealand from importing canned salmon from hard currency countries like Canada, in 1948.

British imports of canned salmon from the U.S. and Canada decreased by about 4.7 and 2.3 percent respectively between 1931 and 1937, while imports from Japan and Siberia increased by about 7 percent during the same period (13, p. 169).

Current Trends in Canned Salmon Trade

Canada, U.S., Japan and Russia are presently producers and exporters of canned salmon. Production of canned salmon does not seem to have changed significantly over time. However, the correct catch fluctuation have to be known be-

fore a strong statement could be made in this regard. The recent U.S. import and export statistics show that the U.S. exports of canned salmon have increased significantly relative to imports (see Table 6, p. 46).

Table 6. U.S. Canned Salmon Imports and Exports 1956-1968

Year	Thousands of Pounds Exports	Imports
1956	5,213	28,802
1957	6,688	24,401
1958	9,277	29,226
1959	13,826	31,154
1960	11,924	19,113
1961	7,786	7,167
1962	8,978	6,843
1963	10,228	1,249
1964	20,924	236
1965	24,892	101
1966	20,484	589
1967	20,543	121
1968	5,726	4,955

Source: Philip B. Schary, Robert E. Shirley and Linn Soule. Analysis of the Distribution System for Northwest Originated Fresh Salmon. p. II-10.

Consumption of canned salmon in the U.S. has been declining when compared with the quantity consumed in the 1920's and 1930's. Consumption patterns have also changed in favor of fresh and frozen salmon. While a marked decline in the consumption of canned salmon is evident, there has been a significant corresponding increase in the consumption of canned

tuna. Canned tuna therefore can be assumed to be a close substitute of canned salmon among other fish products. In some other major consuming countries, for example the United Kingdon and France, consumption of canned salmon has not increased significantly. Only Canada, a large producer, has increased her domestic consumption of canned salmon (24, p. II-11). The declining consumption of canned salmon in the U.S. may have contributed to the subsequent increase in the U.S. exports of canned salmon in recent years. The U.S. imports canned salmon from Canada, but not on a large scale, and usually during light salmon runs and small pack in the U.S. Similarly, Canada imports from the U.S. on a small scale.

Most of the U.S. exports of canned salmon go to Britain. The volume of trade is very small in terms of the overall foreign trade. Furthermore, the U.S. share of the British market is the smallest when compared with that of Canada or Japan. The major exporters of the Pacific canned salmon-Japan, Canada, U.S. and Russia-compete with each other in the British and other foreign markets. It is true that the U.S. exports of canned salmon increased in the past few years, but whether or not this will continue in the near future is a matter of great concern not only to the U.S. but also to Canada, Japan or Russia. Perhaps the relevant facts will not be known until the United Kingdom has been fully admitted into the European Economic Community (EEC). British entry

into the EEC has various implications for all those countries who export canned salmon to Britain. It is estimated that with the British entry into the EEC the canned salmon price will be roughly 25 percent more than the present price because of the external tariff and internal taxes of the member countries, for instance France (21, p. 26). With such an increase in price, sales will probably decline and canned salmon will flood the U.S. domestic market. The same could be said of the other exporting countries. Not only will the U.S. domestic market have to accommodate the surplus salmon, but Canada, Japan and perhaps the Soviet Union will be interested in the U.S. domestic market. A further influx of canned salmon products would further reduce domestic prices. In view of the above developments, the author is predicting that the U.S. producers might decide to explore other foreign outlets. However, other concerned countries will probably do the same. Or should the salmon producers in the U.S. ask Congress to increase tariffs, impose quotas, such a request may not find favor with many. For one thing, exports of canned salmon in terms of the aggregate U.S. exports are very insignificant. Again, it will not be in the interest of the U.S. in particular and the world in general to start once again building trade barriers instead of opening channels that have been long clogged up.

The Canned Salmon Institute (C.S.I.) (21, p. 25), a non-profit organization, comprising the Alaska, Puget Sound and the

Columbia River salmon packers, has been engaged in advertising activities aimed at encouraging the U.S. consumers to increase their purchase and consumption of canned salmon. The C.S.I. has utilized most of the available mass media and communications in its efforts to reach the consumers, including negotiations with other food manufacturers and lobbying at the highest government levels. The C.S.I. spearheaded small changes in can size, that is, to half-pound and one quarter pound salmon can packs which seemed to have met the desire of some consumers. The organizers anticipate carrying their campaigns to other foreign countries; in so doing, it will attempt to include other salmon producers, namely Canada and Japan. The C.S.I. would like in the near future to work jointly with these other countries because the future marketing problems are expected to intensify. The members of the C.S.I. anticipate that one day the Organization will be known as 'The International Canned Salmon Institute', that is, getting together the major canned salmon producers to work more closely (21, p. 27).

Internationally, attempts have been made by some importers in the Common Market countries, to convince other EEC members to exclude salmon from import duties on grounds that salmon fishery is not competing with other fisheries in Europe. However that appeal has not been successful.

Based on these facts, it can be predicted that the salmon industry in the U.S. and Canada may be adversely affected by

U.K. entry into the EEC, more so when it is remembered that the industry in both countries is already over-capitalized.

Exploration of other foreign markets will be attempted, but some of these countries-especially the developing ones-may not be able to purchase high priced canned salmon products from the U.S. and Canada. Japan might alleviate her own problems by concentrating on domestic sales to her ever increasing population. Britain can get into the EEC, and may not be able to protect the interests of the exporting countries in general and the British consumers in particular. The reactions of this latter group may create undue political and economic problems for Britain.

PART TWO: STATISTICAL ANALYSIS

SECTION A: Introduction and General Assumptions

The foregoing discussions dealt with the foreign and domestic trade in canned salmon in Canada and the United States. The Canadian canned salmon producers,as has been mentioned on several occasions, depend more on foreign markets for the disposition of their products whereas the U.S. producers rely more on the domestic markets. However, in the course of the discussions, it was discovered that the U.S. exports of canned salmon have tended to increase in recent years (see Table 6, p. 46).

A better understanding of the demand structure of salmon at the various levels of marketing would be valuable to

the salmon fishing industry. The second objective of this study, as pointed out in the introduction, was to estimate the ex-vessel derived demand characteristics for red and pink salmon facing the fishermen in the U.S. and Canada. It was for this reason that an econometric analysis of the ex-vessel derived demand was undertaken. Furthermore, it was intended also to compare the statistical results of the ex-vessel derived demand analysis in both countries; and possibly to see if the effects of demand and supply factors in the foreign markets which are more relevant to the Canadian salmon fishing industry, differ significantly from those of the domestic markets in the U.S. Price flexibilities-ex-vessel price with respect to landings of red and pink salmon in both countries-were calculated and compared.

Most of the data used in this analysis were obtained from secondary sources such as: FAO Fisheries Statistics, Bureau of Commercial Fisheries, Bureau of Labour Statistics, Pacific Fisherman Yearbook[3/], Fishery Statistics of Canada and Ontario Statistical Review.

3/ The Pacific Fisherman was combined with other publications in 1967 and from hence was called The National Fisherman.

Some assumptions are made which will be helpful in this derived demand analysis:

1. The variations in the ex-vessel price of red or pink salmon in the U.S. are largely determined by the domestic demand and supply conditions, whereas in Canada the ex-vessel price variations are greatly influenced by the external demand and supply factors.
2. Landings of red and pink salmon in the current year are not the sole determinants of the ex-vessel price of red and pink salmon. The level of pack (red and pink salmon), in the preceding year is expected to have a significant bearing on the ex-vessel price. In the U.S., other important factors are prices and quantities of other competing commodities, for instance meat, poultry and canned tuna, all of which compete with canned red and pink salmon at the consumer level. Canned tuna is chosen as the closest substitute in the U.S. model. Substitutes are not treated explicitly in the Canadian model, as a result of the assumption no. 1 above, although the Japanese or the American canned salmon can be substituted.
3. Ex-vessel prices fluctuate from year to year and somehow respond to variations in supply and wholesale prices of canned salmon. The wholesale prices tend to decline in the U.S. around July-August months when new packs from current season start coming into the

market . The external demand conditions and the level of inventory held by the importers have a significant effect on the wholesale export price in Canada. That is, an increase in demand in the foreign markets relative to supply of canned salmon would tend to increase the wholesale export price.

4. Changes in import policies in Britain which is the primary importer of canned salmon, will affect the salmon fishery in Canada, especially on the prices of red salmon since Britain imports this species from Canada in large quantity.

Section B-Statistical Analysis:Canada

The disposition of the canned salmon products in Canada is very much dependent on the world market, as discussed earlier in the historical review of the salmon industry in Canada.

In this section, a model of the derived demand for two species of salmon-red and pink-facing the Canadian fishermen is treated.

In a statistical analysis of economic time-series, it is often not possible to include all the variables that influence prices. However, in this model these demand variables were considered to have a significant bearing on the ex-vessel price of the red and pink salmon: landings, inventory and wholesale export price.

On the supply side, the quantity of red or pink salmon supplied by the fishermen can be regarded as dependent upon

such factors as the cost of production-labour, type of fishing gear, transportation and storage, and the biological factors- for example, the magnitude of the salmon run in a particular fishing season.

The derived demand equations for the red and pink salmon are expressed in the following linear form indicating the functional relationship between the ex-vessel price and other predetermined variables:

$$Pr^{ex-v} = a_o + a_1 L_r + a_2 K_{t-1} + a_3 P_r^{exp} + e_1 \quad (1)$$

$$P_p^{ex-v} = b_o + b_1 L_p + b_2 K_{t-1} + b_3 P_p^{exp} + e_2 \quad (2)$$

where

Dependent Variables

P_r^{ex-v}, P_p^{ex-v} = Annual average ex-vessel price of red and pink salmon (cents per pound)

Independent or Exogeneous Variables

L_r, L_p = Landings of fresh red and pink salmon (millions of pounds). It is assumed that biological factors rather than the current price are by far the major determinants of the value of the landings variable.

K = Red and Pink salmon pack (millions of pounds of processed red and pink salmon). This variable is used as a proxy for inventory in the above model. It does not include imports of processed red or pink salmon, but it is directly related to the domestic landings of the relevant species.

P_r^{exp}, P_p^{exp} = Annual average export wholesale price of canned red and pink salmon (dollars per standard case). A standard case consists of 48 one-pound cans of canned salmon.

a_o , b_o = Constant terms in the system of equations.

$a_1 \cdots a_3$, $b_1 \cdots b_3$ = Coefficients of the independent variables for the system.

e_1 , e_2 = Random error terms for equations 1 and 2.

The present time period is t and the preceding period is identified by the subscript $t-1$. The period of analysis is from 1947 to 1970.

Explanations of Economic Relationships of the Variables

A. The main objective here is to estimate the parameters of these variables included in the model. The effects of these variables are assumed to have an important bearing on the ex-vessel price of the two salmon species-red and pink. About 82 percent of the salmon landings each fishing year is canned (26, p. 26). The remaining 18 percent may be marketed in the fresh, frozen or other markets. Thus, it can be hypothesized that the quantity canned of either red or pink salmon has a direct relationship to the landed quantity. In the discussion of prices earlier, it was noted that the ex-vessel price-the price paid to the fishermen-is negotiated between the processors' and the fishermen's unions. In the course of the negotiation, the annual projected magnitude of the run (red or pink), is taken into consideration. However, the ex-vessel price of red or pink salmon may tend to decline if the quantity landed increases. Therefore, the estimated coefficient on the landings variable is expected to have a negative sign. Of course

it is the actual price that is treated in the demand analysis.

B. The amount of inventory in the hands of the processors is considered to influence the price of red or pink salmon the processors are willing to pay for a given quantity. Data limitations resulting from the unavailability of the appropriate data must be recognized in this study. For example, the actual inventory was not available for the entire period of the analysis, 1947 to 1970. Consequently, the pack of red and pink salmon in the preceding year was used in equations 1 and 2 respectively as a measure of inventory. The inventory variable is expected to be inversely related to the ex-vessel price of red and pink salmon.

C. The export wholesale price of canned red and pink salmon was included in the applicable equations. This was the price paid to the processors. Variation in the export wholesale price is dependent on the demand and supply factors at home and abroad. Canada is only one seller in the world market, consequently the export wholesale price was treated as an exogenous variable. The estimated coefficient on the export wholesale price of canned red or pink salmon is expected to be positive. In other words, if the export wholesale price increases, the ex-vessel price will tend to rise.

Statistical Results of the Estimates

Equations 1 and 2 are the basic demand equations for individual species-red and pink salmon. In the first estimation, all prices were in current dollars. The parameters of equations 1 and 2 were estimated by the ordinary least squares method. The results are presented below:

$$P_r^{ex\text{-}v} = -9.566911 + \underset{(2.385)}{0.077688}\, L_r + \underset{(0.505)}{0.022617}\, K_{t-1}^r + \underset{(16.878)}{0.9324396}\, P_r^{exp} \quad ; \quad R^2 = .93 \qquad (1)$$

$$P_p^{ex\text{-}v} = 0.158231 + \underset{(0.463)}{0.0036519}\, L_p + \underset{(0.897)}{0.01062129}\, K_{t-1}^p + \underset{(17.678)}{0.423473}\, P_p^{exp} \quad ; \quad R^2 = .94 \qquad (2)$$

The ex-vessel price is measured in cents per pound. Landings are measured in millions of pounds. Pack in the preceding year is measured in millions of pounds. Annual average wholesale export price of canned red and pink salmon is measured in dollars per standard case. A standard case consists of 48 one-pound cans of canned salmon.

The correlation coefficients R^2 in the above two equations were large and almost the same for the red and pink salmon. With the exception of the export wholesale price, the estimated coefficients of other predetermined variables did not have the expected signs. The t-values for landings (red), canned red and pink export wholesale price variables were

statistically significant at the ten percent level. The t-values are given in the parenthesis below the coefficients of the independent variables.

Since some of the estimated coefficients did not have the expected signs, it was decided to deflate all prices. The wholesale price index for food would have been appropriate as a deflator, but unfortunately such an index was not available. A consumer price index for food was available but since this study is concerned with the demand at the ex-vessel or primary market level, it was decided to use the general wholesale price index as a proxy for a measure of wholesale food prices. Equations 1 and 2 were used in this second stage, the only difference being that all prices were deflated. The number of observations was the same (from 1947 to 1970). The results of the regression are as follows:

$$P_r^{ex\text{-}v} = -0.059153 + \underset{(2.336)}{0.0004128}\, L_r + \underset{(0.683)}{0.0001540}\, K_{t-1}^r + \underset{(8.278)}{1.019302}\, P_r^{exp} \quad ; \quad R^2 = .781 \qquad (1a)$$

$$P_p^{ex\text{-}v} = 0.002078 + \underset{(0.461)}{0.0000169}\, L_p + \underset{(0.974)}{0.0000535}\, K_{t-1}^p + \underset{(9.480)}{0.405283}\, P_p^{exp} \quad ; \quad R^2 = .822$$

When all prices were deflated, the estimated coefficients on the landings and proxy for inventory retained their positive signs. These variables were expected to be negatively related to the ex-vessel price of the red and the pink salmon. The value of the estimated coefficient on the canned red wholesale export price increased from 0.93 to 1.02, although the t- value for the same variable declined from 16.878 to 8.278. There was no change in the estimated coefficient on the canned pink wholesale export price variable, except that the t-value decreased from 17.678 to 9.480. The t-values for the coefficient on the variable representing the export price of canned red and pink salmon and the landings of red salmon were statistically significant at the ten percent level. These t-values for the wholesale export price of canned red and pink were large, suggestive that these variables are significantly associated with the ex-vessel price of the red and pink salmon. The correlation coefficients R^2 were not as large as when prices were undeflated. The wholesale export price of canned red and pink predetermined variables explained 72 and 81 percent of the variations in the ex-vessel price of these species respectively.

As discussed earlier, a major institutional change took place in Britain in 1958[4/]. This policy change was expected

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4/ The mentioned institutional change is the removal of import restrictions on canned salmon in Britain which resulted in large imports.(Pacific Fisherman Yearbook 1959. p. 157).

to have a recognizable effect on demand for canned salmon in Britain. Britain, it will be recalled, is the major export outlet of the Canadian canned salmon, particularly the canned red salmon . Britain tends to maintain its established tradition and has been importing canned salmon from Canada and from other producing countries. To account for this change, a dummy variable was included in the model as a demand shifter. The dummy values from 1947 to 1957 were 0, and 1 from 1958 to 1970. It is hypothesized that if price and other variables are held constant, a major institutional change-for instance, a reduction in tariff or removal of other import restrictions-will shift the demand curve to the right. Therefore, the inclusion of the dummy variable will be a test of the hypothesis.

Once more using the equations 1 and 2, the ex-vessel price of red and pink salmon was regressed against the predetermined variables with the following specified equations:

$$P_r^{ex\text{-}v} = (a_o + a_1 L_r + a_2 K_{t-1}^r + a_3 P_r^{exp} + a_4 D_1) \quad (3)$$

$$P_p^{ex\text{-}v} = (b_o + b_1 L_p + b_2 K_{t-1}^p + b_3 P_p^{exp} + b_4 D_2) \quad (4)$$

The variables-dependent and predetermined-remain as previously defined. D in each case denotes dummy variable. All prices were deflated by the general wholesale price index.

The estimated results are presented below:

$$P_r^{ex\text{-}v} = 0.056065 - \underset{\substack{(-0.377)\\ -0.0161^*}}{0.0000742\ L_r} - \underset{(-0.311)}{0.0000589\ K_{t-1}^r} \qquad (3)$$

$$+\underset{(1.625)}{0.347136\ P_r^{exp}} + \underset{(3.541)}{0.025299\ D_1} \quad ; R^2 = .87$$

$$P_p^{ex\text{-}v} = 0.009039 + \underset{(0.154)}{0.0000575\ L_p} + \underset{(0.551)}{0.0000589\ K_{t-1}^p} \qquad (4)$$

$$+\underset{(4.338)}{0.326004\ P_p^{exp}} + \underset{(1.274)}{0.0029912\ D_2} \quad ; R^2 = .84$$

This later results indicated that the estimated coefficients on landings and proxy for inventory were inversely related to the ex-vessel price of red salmon. This relationship was expected. The estimated coefficients of these same variables have positive signs in the pink demand equation contrary to expectation. The t-values (in parenthesis) for the export wholesale price and the dummy variables were statistically significant at the ten percent level. The t-value for the wholesale export price of canned red salmon was rather low. It was discovered that the inclusion of the dummy variable had two effects in the red salmon equation. First, the estimated

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Note: * This denotes price flexibility calculated at the mean values of landings and ex-vessel price of red salmon.

coefficients on landings and proxy for inventory changed signs. Secondly, the t-value for the wholesale export price of canned red decreased from 6.230 to 1.625. This suggests that the dummy variable may have "picked up" some of the explanation of the variations in the ex-vessel price of red salmon formerly explained by the wholesale export price of canned red salmon. One further implication of this result could be that a major institutional change may have a significant effect on the demand for canned salmon, which was the hypothesized relationship.

The t-values for the wholesale export price of canned pink and the dummy variables were statistically significant in the pink equation. That for the dummy variable was low. The correlation coefficients R^2 were fairly close in both equations, 87 and 84 percent for the red and the pink salmon equations respectively.

On account of these statistical results, it can be tentatively concluded that the salmon industry in Canada would be directly affected if there is to be a significant institutional change in Britain with regards to the imports of canned salmon. It should be noted that Britain is the major importer of the Canadian canned salmon.

Section C-Statistical Analysis: U.S.

The discussions in this section will be concerned with first building up an economic model of the derived demand for red and pink salmon facing the U.S. fishermen and, secondly, with estimating the parameters of the ex-vessel demand function for red and pink salmon. This ex-vessel demand function is actually the processor's demand for salmon to be canned. It is the relative demand facing the salmon fishermen in the U.S. Since, as was earlier discussed, large quantities of canned salmon are marketed domestically, it can be assumed that the processor's or wholesaler's demand is derived from the retailer through the U.S. consumer's demand. Consequently, such factors as per capita disposable income, population, wholesale price, price of competing commodities and inventory in the hands of the retailers, have an important effect on the derived demand of the processors. These variables are those which are relevant in the demand functions of the consumers and the retailers.

The system of demand and supply equations is specified below: Demand for Canned Salmon

$$Q^c = f(P^{ret}, (Y/N), N, P_i^{ret} T) \quad \text{(by consumer)} \qquad \text{(I)}$$

$$Q^r = g(P^w, P_i^w P^{ret}, I^r, M) \quad \text{(by retailer)} \qquad \text{(II)}$$

$$P^{ex-v} = h(Q^p, P^w, I^p, V^p) \quad \text{(by processor)} \qquad \text{(III)}$$

Supply of Salmon:

$$S^f = j(L, P^{ex-v}, P_i^{ex-v}, B, V^f) \quad \text{(by fisherman)} \quad \text{(IV)}$$

$$S^p = k(P^{ex-v}, P^w, I, V^p) \quad \text{(by processor)} \quad \text{(V)}$$

$$S^r = l(P^{ret}, P^w, I, V^r) \quad \text{(by retailer)} \quad \text{(VI)}$$

where

Endogenous Variables

P^{ex-v} = Ex-vessel price of red and pink salmon

Q = Quantity demanded

S = Quantity supplied

P^{ret} = Retail price of canned salmon

P^w = Wholesale price of canned salmon

Exogenous Variables

Y = Disposable income

N = U.S. population

T = Price of competing commodity (canned tuna)

I = Beginning inventory

M = Marketing costs

V = Production costs

B = Biological factors

L = Landings of salmon

whereas the subscript "i" refers to 'pink' salmon in the red salmon equation, it refers to "red salmon" in the pink salmon equations.

The above system of equations was specified for the identification of economic relationships between the dependent variables and the predetermined or exogenous variables. The processor's demand equation (III) will be used in estimating the ex-vessel demand characteristics, that is, the derived

demand facing the fishermen. It is the equation of primary interest in this study.

The basic approach in this estimation will be in three stages:

a. The wholesale price of canned red and pink salmon will be predicted using the following equation:

$$P_r^w = \alpha_o + \alpha_1 L_r + \alpha_2 (Y/N) + \alpha_3 N + \alpha_4 T + \alpha_5 P_p^{ex\text{-}v} + \alpha_6 K_{t-1}^r + \alpha_7 P_p^w + \alpha_8 P_p^{ret} + U \qquad (1A)$$

$$P_p^w = \beta_o + \beta_1 L_p + \beta_2 (Y/N) + \beta_3 N + \beta_4 T + \beta_5 P_r^{ex\text{-}v} + \beta_6 P_r^w + \beta_7 K_{t-1}^p + \beta_8 P_r^{ret} + V \qquad (2A)$$

where

Endogenous Variables

P_r^w , P_p^w = Annual average wholesale price of canned red and pink salmon (dollars per standard case: 48 one-pound cans) The "annual average" refers to the calender year January to December.

Exogenous Variables

α_o , β_o = Constant terms in the system of equations.

$\alpha_1 \cdots \alpha_8$; $\beta_1 \cdots \beta_8$ = Coefficients of the parameters for the system.

L = Landings of fresh salmon (thousand metric tons). One metric ton is approximately 2,204.623 pounds.

Y/N = Per capita disposable income of the U.S. in dollars.

N = U.S. population including armed forces abroad in millions.

T = Annual average retail price of canned tuna (cents per can-6½ ounces light chunk tuna).

P_p^{ex-v}, P_r^{ex-v} = Annual average ex-vessel price of red and pink salmon (cents per pound).

K_{t-1} = Pack of canned red, pink salmon (millions of pounds). This variable is used as a proxy for inventory of canned red and pink salmon.

U, V = Random error terms

the current period is t, and the preceding period is t-1. There were fifteen sample observations, from 1956 to 1970.

This study has to accommodate the difficulties imposed by data limitations; the effects of which may inject some bias into the statistical results of the analysis. Two major limitations in the U.S. model include the annual retail prices of canned tuna which were recorded by the Bureau of Labor Statistics as far back as 1953. The figures from 1953 to 1955 were not consistent with those from 1956 to 1970. The difference was caused by a change in specification from solid pack (7,6-6½) oz. can, to 6½ oz. light chunk canned tuna. On account of this, the number of sample observations was reduced from 24 to 15 (1956 to 1970).

Besides those predetermined variables included in the above equations, there may be other variables that influence the wholesale price of canned red or pink salmon. Since it is not always possible to include all the relevant variables, it is anticipated that these variables included would help to

account for the variation in the wholesale price of canned red and pink salmon. All prices in the first stage of the prediction were in current dollars. It will be noted that the system of demand and supply equations (p. 63) consists of <u>two</u> models; one for red salmon and one for pink salmon. Equation 1A is an "enlarged reduced form" equation because it includes three variables (P_p^{ex-v} , P_p^{w} , P_p^{ret}) extracted from the "pink" model. Similarly, equation 2A includes three variables (P_r^{ex-v}, P_r^{w} , P_r^{ret}) that were borrowed from the "red" model. These "borrowed" variables are actually "endogenous" in the models from which they were borrowed. The variables M, V, B, P_r^{ret} and P_p^{ret} in the system of equations (p. 63) were not included in the "reduced form" equation as a result of data limitations.

The second stage is to predict the current pack of red and pink salmon. Since the actual inventory data were not available for the entire period of analysis, the pack in the preceding year will be used later in the analysis as a measure for inventory in the hands of the processors. The predicted equations are specified below:

$$^{*}K_t^r = a_o^1 + a_1^1 L_r + a_2^1 (Y/N) + a_3^1 N + a_4^1 T$$

$$a_5^1 P_p^{ex-v} + a_6^{1**} P_r^{w} + a_7^1 P_p^{w} + U^1 \qquad (3A)$$

Note: $^{*}K_{t-1}$ was included in the pack of red salmon prediction equation but the variable did not add much to the statistical results.

**See note on following page.

$$K_t^p = \beta_o^1 + \beta_1^1 L_p + \beta_2^1 (Y/N) + \beta_3^1 N + \beta_4^1 P_r^w$$

$$+ \beta_5^1 P_r^{ex-v} + \beta_6^1 T + \beta_7^1 P_p^{***w} + V^1 \qquad (4A)$$

All the variables in the above equations remain as previously defined in 1A and 2A. These are actually "reduced form" equations that will be helpful in the "two-stage least squares" procedure for estimating the parameters in equation III (p. 63). This procedure was followed in an attempt to minimize identification problems. In so doing, reduced form equations will be derived whereby the explanatory variables are represented by the predetermined variables of the system.

The third stage of the estimation is to specify a demand equation. The ex-vessel price of red salmon will be specified as depending upon its canned wholesale price, (predicted), the current pack (predicted) and the limited beginning actual inventory available. The same specification will be used in the pink equation. There are seven observations (1964 to 1970) for red and six for pink (1965 to 1970).

Note: $^{**}P_r^w$, $^{***}P_p^w$ - it is inappropriate to include P_r^w, P_p^w variables in the red salmon equation and the pink salmon equation respectively. However, these variables did not contribute much to the explanation.

$$P_r^{ex\text{-}v} = f(\bar{P}_r^w , \bar{K}_t^r , I^r) \qquad (5A)$$

$$P_p^{ex\text{-}v} = g(\bar{P}_p^w , \bar{K}_t^p , I^p) \qquad (6A)$$

where

Endogenous Variables

$P_r^{ex\text{-}v}$, $P_p^{ex\text{-}v}$ = Ex-vessel price of red and pink salmon.

Exogenous or Predetermined Variables

$\bar{P}_r^w$, $\bar{P}_p^w$ = Predicted wholesale price of canned red and pink salmon.

$\bar{K}_t^r$, $\bar{K}_t^p$ = Predicted pack of red and pink salmon. The "pack" denotes salmon in processed or canned form.

I^r , I^p = Actual beginning inventory of canned red and pink salmon in the hands of the processors.

It is hypothesized that the effects of the predetermined variables in the equations 5A and 6A have a significant bearing on the ex-vessel price of red and pink salmon in the applicable equation. The estimated coefficients on the beginning inventory (I) and the predicted pack ($\bar{K}_t$) are expected to be inversely related to the ex-vessel price in each case. That is, increases in quantities of these variables, holding the other variables constant, will tend to depress the ex-vessel price. The canned wholesale price, on the other hand, is expected to be positively related to the ex-vessel price. It is assumed that if the wholesale price of canned red or pink in-

creases, processors may demand more red or pink salmon for processing. If so, the ex-vessel price will tend to rise.

Later on in the analysis, landings of fresh salmon, red and pink, will be substituted in place of the predicted pack, in each applicable equation. This step was taken so that price flexibilities could be calculated from the estimated coefficients of the Canadian and the U.S. demand equations. Discussion of price flexibility will be undertaken when the computed values are compared between the two countries. The pack of red and pink salmon in the preceding period will be used as a proxy for inventory, as was done in the Canadian model.

The Regression Results for Equations 1A through 6A

1A: (i) $$P_r^w = 4.042724 + \underset{(0.743)}{0.012401}\ L_r + \underset{(1.448)}{0.005315}\ Y/N + \underset{(1.374)}{0.105132}\ N + \underset{(0.005)}{0.001146}\ T + \underset{(1.161)}{0.172911}\ P_p^{ex\text{-}v} - \underset{(-4.559)}{0.063356}\ K_{t-1}^r + \underset{(0.858)}{0.110969}\ P_p^w \quad ; R^2 = .962$$

(ii) $$P_r^w = 0.221213 + \underset{(1.978)}{0.000295}\ I_r + \underset{(0.882)}{0.0000289}\ Y/N + \underset{(2.229)}{0.001552}\ N + \underset{(1.373)}{0.189404}\ P_p^{ex\text{-}v} + \underset{(0.309)}{0.037770}\ P_p^w - \underset{(-4.145)}{0.006818}\ T - \underset{(-3.350)}{0.000444}\ K_{t-1}^{r\,*} \qquad R^2 = .940$$

* Indicates all prices were deflated by the wholesale price index for food.

2A:

$$P_p^w = -0.221507 \underset{(-0.112)}{-0.0000243\ L_p} \underset{(-1.372)}{-0.0000836\ Y/N}$$

$$\underset{(2.770)}{+0.004124\ N} + \underset{(0.155)}{0.052886\ P_r^w} \underset{(-3.032)}{-0.777955\ P_r^{ex-v}}$$

$$\underset{(-4.013)}{-0.000559\ K_{t-1}^p} + \underset{(0.579)}{0.0018164\ T} \quad ; \quad R^2 = .912$$

3A:

(i) $$K_t^r = 12.875 + \underset{(32.947)}{1.408\ L^r} \underset{(-1.062)}{-0.010\ Y/N} + \underset{(2.895)}{0.582\ N}$$

$$\underset{(-2.356)}{-1.316\ T} - \underset{(-0.451)}{0.168\ P_p^{ex-v}} - \underset{(-3.114)}{1.493\ P_r^w} + \underset{(0.159)}{0.051\ P_p^w}$$

$$R^2 = .994$$

(ii) $$K_t^r = 37.304 + \underset{(21.695)}{1.421\ L_r} \underset{(-1.208)}{-0.016\ Y/N} + \underset{(1.719)}{0.545\ N}$$

$$\underset{(-1.124)}{-0.010\ P_r^w} - \underset{(-0.002)}{0.128\ P_p^{ex-v}} \underset{(-2.391)}{-2.226\ T} + \underset{(0.508)}{23.444\ P_p^{w*}}$$

$$R^2 = .988$$

Note: the t-values are in the parentheses beneath the estimated coefficient of the variables.

*Indicates all prices were deflated by the wholesale price index for food.

4A (i) $K_t^p = -21.585 + \underset{(26.267)}{1.195}\ L_p \quad \underset{(-1.561)}{-0.020}\ Y/N \quad \underset{(2.089)}{+0.732}\ N$

$$\underset{(-3.798)}{-2.227}\ P_r^w \quad \underset{(1.348)}{+0.927}\ P_r^{ex-v} \quad \underset{(-0.662)}{-0.491}\ T \quad \underset{(0.946)}{+0.420}\ P_p^w$$

$$R^2 = .995$$

(ii) $K_t^p = 31.237 + \underset{(25.553)}{1.228}\ L_p \quad \underset{(0.015)}{-0.009}\ Y/N \quad \underset{(0.349)}{+0.136}\ N$

$$\underset{(2.112)}{-159.220}\ P_r^w \quad \underset{(2.692)}{+194.025}\ P_r^{ex-v} \quad \underset{(2.350)}{+115.439}\ P_p^w$$

$$\underset{(-1.818)}{-1.385}\ T^* \quad ; \quad R^2 = .994$$

The final demand equation for the red salmon with prices deflated in (i) of 5A is presented below:

5A: (i) $P_r^{ex-v} = 0.325222 \quad \underset{(-0.508)}{-0.266277}\ \bar{P}_r^w \quad \underset{(0.409)}{+0.000103}\ \bar{K}_t^r$

$$\underset{(-0.856)}{-0.0000305}\ I^{r\,*} \quad ; \quad R^2 = .404$$

(ii) $P_r^{ex-v} = 14.722663 + \underset{(0.419)}{0.010836}\ \bar{P}_r^w + \underset{(0.655)}{0.199051}\ \bar{K}_t^r$

$$\underset{(0.244)}{-0.000734}\ I^r \quad ; \quad R^2 = .318$$

The above statistical results indicated that when prices were deflated, the estimated coefficients on the predicted pack and the wholesale price have wrong signs. With undeflated prices, the estimated coefficient on the predicted

wholesale price of canned red salmon has a positive sign as expected, while the predicted pack maintained its previous positive sign, contrary to expectation. None of the t-values in the parentheses were statistically significant at the ten percent level. The limited number of observations may have been responsible for the poor results. The correlation coefficients R^2 were low in both equations.

In the demand equation 6A for the pink salmon there were only six observations of actual inventory available. A negative relationship is expected between the ex-vessel price of the pink salmon and (1) the predicted pack and (2) the inventory-(predetermined variables). The predicted wholesale price of canned pink salmon is expected to be directly related to the dependent variable-ex-vessel price of the pink salmon. The following results were obtained:

$$6A \qquad P_p^{ex\text{-}v} = 0.012874 + \underset{(0.055)}{0.035152}\ \bar{P}_p^w + \underset{(0.938)}{0.000923}\ \bar{K}_t^p + \underset{(1.040)}{0.000136}\ I^{p^*} \qquad ; \qquad R^2 = .356$$

The regression results were similar to those of the red demand equation. The expected negative signs on the coefficients of the predicted pack of pink and the beginning inventory variables were not realized. Only the estimated coefficient on the predicted wholesale price of canned pink salmon had the expected (positive) sign. The t-values for all the variables were not large enough to permit rejection

of the hypothesis that the estimated coefficients were different from zero.

SECTION D

Comparison and the Implications of the Derived Demand Facing the U.S. and the Canadian Fishermen

Besides estimating the parameters of the derived demand functions for red and pink salmon at the ex-vessel or primary market level in the U.S. and Canada , this study was also intended to compare the estimated results. It is hoped that the results would aid fisheries authorities in decision-making with respect to the salmon fishing industry in both countries. If the two demand characteristics differ significantly, this would suggest that a unilateral program-for example, measures to limit entry into the salmon fishing industry in both countries-may not achieve a uniform objective. Price flexibility-a measure of the percentage change in price of a commodity relative to a given percentage increase in the quantity demanded of that commodity holding other things constant, was calculated from the estimated coefficients of the demand equations for the two countries. The price flexibility was computed at the mean values of the quantity landed-red and pink salmon- and of the ex-vessel price of the two species. Price flexibility is only one measure of relative changes in quantity landed

with respect to changes in the ex-vessel price. Price elasticity is another. The inverse of the price flexibility figure is the lower bound of the price elasticity in absolute terms as was pointed out by Houck (14, p. 790).

It will be recalled that earlier, the dummy variable was added in the Canadian demand equation to account for the institutional change which took place in Britain in 1958. Britain imports canned salmon from the U.S. Therefore, it was hypothesized that the dummy variable might have some effect on the U.S. demand equation. Its effect on the Canadian demand equation has been discussed in part two of this study.

The following demand equations are specified for the two species, of red and pink, salmon in Canada and the U.S.:

$$P_r^{ex\text{-}v} = f(L_r , K_{t-1}^r , P_r^{exp} , D_1) \quad \text{(Red)} \quad (1.1)$$

$$P_p^{ex\text{-}v} = g(L_p , K_{t-1}^p , P_p^{exp} , D_2) \quad \text{(Pink)} \quad (1,2)$$

The endogenous and the predetermined variables in the above equations remain as previously defined. Negative signs are expected in the coefficient of L_r, L_p, K_{t-1}^r , K_{t-1}^p predetermined variables. The remaining exogenous variables- D's, P_r^{exp}, and P_p^{exp} - are expected to have positive estimated coefficients.

U.S. :

$$P_r^{ex-v} = h(\bar{P}_r^w \ , \ K_{t-1}^r \ , \ \bar{K}_t \ , \ D_1) \quad \text{(red)} \quad (1.3)$$

$$P_r^{ex-v} = j(\bar{P}_r^w \ , \ L_r \ , \ K_{t-1}^r \ , \ D_2) \quad \text{(red)} \quad (1.4)$$

$$P_p^{ex-v} = k(\bar{P}_p^w \ , \ L_p \ , \ K_{t-1}^p \ , \ D_3) \quad \text{(pink)} \quad (1.5)$$

The dependent and independent or predetermined variables retain their earlier definitions. D's in each equation denotes the dummy variable. The estimated coefficients on K_{t-1}^r , $\bar{K}t$, L_r , L_p and K_{t-1}^p are expected to have negative signs. Those on $\bar{P}_r^w$, $\bar{P}_p^w$, and D's are expected to have positive signs.

The variable K_{t-1} -pack of red and pink salmon in the preceding year-was used as proxy for inventory of canned red and pink salmon. The actual inventory (I) data was only available as far back as 1964, that is, seven years sample observations, 1964-1970. Really, the available data had been included earlier in the red and pink salmon demand equations (5A and 6A), however, the regression results were not satisfactory. Consequently, it was decided to use the pack data in the previous year in place of the actual inventory data.

The addition of the dummy variable in these later U.S. equations means that the dummy variable should also be included in the "reduced form" equations (1A through 4A). However, all the exogenous variables would show up as independent variables in those equations. To add the dummy variable

in those "reduced form" equations, might improve the statistical results. The values of the dummy variable from 1956 to 1957 were 0, and from 1958 to 1970 were 1. 1958 was the year that Britain removed import restrictions on salmon. There were fifteen sample observations, 1956 to 1970. The annual average retail price of canned tuna was not available for the entire period of analysis 1947 to 1970.

The estimated results are presented as follows:

Canada:

(Red) (1.6)
$$P_r^{ex\text{-}v} = 0.056065 \underset{(-0.377)}{-0.0000742} L_r \underset{(-0.311)}{-0.0000589} K_{t-1}^r$$
$$-0.0161^{**}$$
$$\underset{(1.625)}{+ 0.347136} P_r^{exp} \underset{(3.541)}{+ 0.025299} D_1^* \; ; \; R^2=.868$$

(Pink) (1.7)
$$P_p^{ex\text{-}v} = 0.009039 \underset{(0.154)}{+ 0.00000575} L_p \underset{(0.551)}{+ 0.0000313} K_{t-1}^p$$
$$\underset{(4.338)}{+0.326002} P_p^{exp} \underset{(1.274)}{+0.002991} D_2^* \; ; \; R^2=.836$$

U.S.:

(Red) (1.8)
$$P_r^{ex\text{-}v} = 0.146663 \underset{(0.422)}{+ 0.099044} \bar{P}_r^w \underset{(-0.322)}{-0.0000764} K_{t-1}^r$$
$$\underset{(-0.328)}{-0.0000665} \bar{K}_t^r \underset{(3.263)}{+ 0.043294} D_1^* \; ; \; R^2=.648$$

Note: * Implies that all prices were deflated.
** Indicates the calculated price flexibilities at the mean values of landed quantity and the ex-vessel price of the applicable salmon species.
The t-values are in the parentheses.

U.S.:

(Red) (1.9)
$$P_r^{ex\text{-}v} = 0.146123 + \underset{(0.418)}{0.099560}\ \bar{P}_r^w \underset{(-0.302)}{-0.0000829}\ L_r - 0.0147^{**} \underset{(-0.325)}{-0.0000771}\ K_{t-1}^r \underset{(3.248)}{+0.043283}\ D_2^*\ ;\ R^2=.648$$

(Pink) (1.10)
$$P_p^{ex\text{-}v} = 0.047125 + \underset{(0.879)}{0.208778}\ \bar{P}_p^w \underset{(-0.315)}{-0.0000974}\ L_p - 0.0426^{**} + \underset{(0.795)}{0.0001953}\ K_{t-1}^p \underset{(0.377)}{+0.006226}\ D_3^*\ ;\ R^2=.134$$

Price flexibility, by definition, is the percentage change in price of a commodity relative to a given percent increase in the quantity demanded of that commodity or a related variable while every other thing remains constant. For instance, the expression $-\frac{dP}{dQ} \cdot (\frac{\bar{Q}}{\bar{P}})$ defines price flexibility while $\frac{dQ}{dP} \cdot (\frac{P}{Q})$ defines price elasticity. The price flexibility, with the ex-vessel price of red salmon as the dependent variable was calculated from the U.S. and Canadian results. Landings of red salmon represent the quantity in both cases, for comparative purposes. (It will be noted that the coefficients on $\bar{K}_t$ in 1.8 and L_r in 1.9 are very close.). Price flexibility U.S. red:

$$P = \frac{dP}{dQ} \cdot (\frac{\bar{Q}}{\bar{P}}) = -.0000829 \left(\frac{37.660}{.213}\right) = -0.0147$$

Price flexibility Canada Red:

$$P = \frac{\partial P}{\partial Q} \cdot \left(\frac{\bar{Q}}{\bar{P}} \right) = -.0000742 \left(\frac{26.892}{.124} \right) = -0.0161$$

The price flexibilities in both the U.S. and Canada associated with quantities landed are by far less than 1.0. The estimated inflexibility of the ex-vessel price of red salmon in Canada is a little bit greater than that of the U.S. (-.0161 and -.0147 respectively). That is, if the quantity of red salmon landed in a given salmon season were one percent greater than in the salmon season the year previous, assuming other things remain constant, the ex-vessel price of red salmon would decline by about .0161 and .0147 percent in Canada and the U.S. respectively.

The implication of the statistical results as suggested by Waugh and Norton, is that incomes from fisheries including salmon fishery would tend to decline if some policies geared towards reducing outpmt were implemented as compared to farm commodities (25, p. 52).

The quantity of raw salmon landed is to some extent dependent upon biological factors. It is often assumed that quantity landed is given, at least during one fishing season so that there is not much the fishermen can do to influence the ex-vessel price by deliberately varying the quantity landed, of raw salmon. This study has treated landings as exogenous for the U.S. red salmon, but quantity demanded for packing is endogenous. The results are very similar. That is, the coefficient on quantity demanded was approximately the

same no matter which variable was used. The simple correlation coefficients indicate a strong determining influence on ex-vessel price of red salmon by landing quantity during the period of analysis. The simple correlation coefficients were -.15039 and -.008053 for Canada and the U.S. respectively.

Although the dummy variable was introduced in the equation for the ex-vessel price of pink salmon (Canada and the U.S.), the results of the regression analysis were rather inconclusive. The landings variable in the Canadian case has a positive sign contrary to the expectation. The correlation coefficient R^2 was fairly high, 84 percent (Canadian equation) but was low in the U.S. equation, 13 percent. None of the t-values for the variables in the U.S. equation was statistically significant. The wholesale export price and the dummy variables in the Canadian equation have t-values that were statistically significant at the ten percent level.

The price flexibility was calculated for the ex-vessel price of the pink salmon from the U.S. regression results. Such calculation was not computed for the landings and the ex-vessel price of pink salmon from the Canadian equation because of the unexpected positive sign of the landings variable. Price flexibility U.S. pink salmon:

$$P = \frac{dp}{dQ} \cdot \left(\frac{\bar{Q}}{\bar{p}}\right) = -.0000974 \left(\frac{49.880}{.114}\right) = -.0426$$

This result indicates however that with a one percent increase in quantity landed of pink salmon during a given

salmon season, relative to the year before, other things being equal, the ex-vessel price of pink salmon would drop by 0.0426 percent.

One significant effect of including the dummy variable in both the U.S. and Canadian red salmon equations was that the estimated coefficients on all the predetermined variables had the expected signs. Landings and the preceding year's pack variables were inversely related to the ex-vessel price of red salmon. This is an indication that increases in quantity of either of the variable would tend to depress the ex-vessel price of red salmon. The correlation coefficient R^2 for the U.S. demand equation improved from 40 to 65 percent. The dummy variable in both countries' equations, and the wholesale export price variables in the Canadian equation have t-values that are statistically significant at the ten percent level. There was no significant difference in the statistical results of the U.S. red demand equations when landings of red salmon was substituted in place of the predicted pack of red salmon. Although no statistical test of the hypothesis that they are identical was performed. Landings of red salmon however, was included as one of the predetermined variables in the demand equations of both countries so that both regression results could be compared. There were some discrepancies between the estimated regression results for the pink salmon in both countries. The estimated coefficients on the landings

and the proxy for inventory were positive in the Canadian demand equation. That was not expected. The estimated coefficients on the wholesale export price and the dummy variables have the expected signs.

From the U.S. pink salmon demand equation, it was observed that the estimated coefficient on the landings variable has the expected negative sign, but that of the proxy for inventory was positive. The latter was not expected. The t-values for the coefficients of the wholesale export price of canned pink salmon and the dummy variables indicate that these coefficients were statistically significant at the ten percent level in the Canadian pink salmon demand equation. None of the estimated coefficient in the U.S. pink demand equation was statistically different from zero. The correlation coefficients were high in the Canadian equation and low in the U.S. equation. Data limitations could have been responsible for these different results. The regression results showed that the estimated coefficients on the dummy variable in the U.S. and Canadian red salmon equations have almost the same t-values, 3.541 (Canada) and 3.248 (U.S.). The export wholesale price variable in the Canadian pink demand equation has the largest t-value (4.385) among all other predetermined variables. The simple correlation coefficients for the canned pink wholesale export price and the dummy variables with the pink ex-vessel price were 0.81 and 0.90 respectively. This suggests that the two variables - wholesale export price of

canned pink and the dummy, are highly interrelated. Thus it is hard to identify the separate effects of each.

The following Canadian demand equations were specified excluding the dummy variable as one of the predetermined variables:

$$P_r^{ex\text{-}v} = 0.059153 + \underset{(2.334)}{0.0004128}\, L_r + \underset{(0.683)}{0.00015398}\, K_{t-1}^r + \underset{(8.278)}{1.019302}\, P_r^{exp^*} \quad ; \quad R^2=.781 \qquad (1.11)$$

$$P_p^{ex\text{-}v} = 0.0020785 + \underset{(0.461)}{0.0000169}\, L_p + \underset{(0.974)}{0.00005347}\, K_{t-1}^p + \underset{(9.840)}{0.405283}\, P_p^{exp^*} \quad ; \quad R^2=.822 \qquad (1.12)$$

Comparing these with the results obtained from the equations 1.6 and 1.7, it will be noted that only the estimated coefficients on the wholesale export price of canned red and pink salmon have the expected positive signs. There were some slight changes in the values of the correlation coefficients, R^2. The t-values for the estimated coefficients on the wholesale export price were larger in these later equations.

Based on the statistical results of the demand equations 1.6 through 1.12, it seemed that the demand characteristics for the red salmon at the primary market level in the U.S. and Canada were fairly similar. But the demand characteristics

for the pink salmon at the same market level in both countries and within countries were different. For example, the landings of pink salmon variable had the expected sign in the U.S. demand equation but not in the Canadian equation. Further investigation is recommended in regards to this.

It has been earlier discussed in part one of this study that the U.K. market is the major export market for the U.S. canned salmon. This market is also shared by the other major canned salmon producers namely, Canada, Japan and lately the Soviet Union. It was not possible to obtain export data on canned salmon by species. This study had to accept and recognize the difficulties imposed by data limitations. However, the export data on all canned salmon by countries are presented in Table 5, p. 37.

In general, the U.S. exports of canned salmon to Britain is small when compared with that of Canada or Japan. Producers in the U.S., unlike those in Canada, depend more on the domestic market, for the disposition of their canned salmon products, although there are indications that the U.S. exports have increased in recent years. Canada and Japan also export canned salmon to the U.S. The combined imports from Canada and Japan could have been included in the U.S. equations instead of the dummy variable but it was not possible to do this because of the limited number of data. The FAO Fishery Statistics stopped publishing the Japanese export data of canned red salmon in 1960. Instead export data for all canned

salmon were lumped together. Thus, it became very difficult to extract the data for each separate species.

The dummy variable did, in fact, "explain" a large percentage of the variations in the ex-vessel price of red salmon in both countries and the pink salmon in Canada. This suggests that an institutional change, for example, the removal of import restrictions on salmon fishery in the U.K. in 1958, may have an important bearing on the ex-vessel price of red salmon in both countries. Analysis of the effects on the ex-vessel price of pink in both countries was inconclusive.

Perhaps it would be interesting to include another dummy variable to account for another possible demand shift in response to Britain's contemplation of joining the European Economic Community. That would show further, the effects if any, of yet another institutional change with respect to the ex-vessel price of the red and the pink salmon.

The following percentage figures indicate the amount of variations in the ex-vessel price of the relevant salmon species explained by the dummy variable:

Canada: 80 percent (Red)
81 percent (Pink)

U.S.: 63 percent (Red)
10 per cent (Pink)

The above percentage figures were drawn from the regression results of the demand equations 1.6 through 1.10.

One further implication of these statistical results concerns the probable adverse effect that might result from changes in trade policies in the importing countries; in those exporting countries heavily dependent on those foreign markets, and where such trade policy changes tend to contract rather than expand trade. For example, if Britain had in 1958 tigthened its policy with regards to the import of salmon, either by higher tariffs or a more stringent exchange control on imports of salmon, such prohibitive measures might have shifted the demand curve to the left. With reference to Canada the salmon industry would be very adversely affected. Furthermore the effects would eventually permeate into other segments of the entire economy. The a priori assumption here is that Canada is dependent on the overseas markets to a large extent for the disposition of the canned salmon products.

Since the US. exports of canned salmon to Britain in recent years have tended to increase, it could be assumed that restrictive import policy with respect to canned salmon would have some undesirable effects on the salmon fishing industry in the U.S. For example, the U.S. producers of canned salmon are skeptical of the probable impact on marketing of their canned salmon products when Britain gains full entry into the EEC.Because of the high external taxes of the EEC member countries,it is feared that the exporters of canned salmon to Britain - Canada, Japan, and Russia, may turn their attention to the U.S. domestic markets. If that happens, the influx of canned salmon into the U.S. domestic markets

would further depress the domestic price of canned salmon. This study, it will be recalled, encountered some limitations for instance, certain desirable data - inventory data on canned red and pink salmon in the hands of the canners and im porters (U.K.), were not readily available. The U.S. exports of canned salmon are not broken down according to salmon species by the FAO Fisheries Statistics thus, it was not very easy to extract the exact export figures of either the canned red or pink salmon. Were all these data to be available, perhaps the statistical results could have been better especially with respect to the pink salmon.

SUMMARY AND CONCLUSIONS

The extent to which this study has accomplished the objectives as were stated in the introductory part will be discussed here. Some difficulties, involving scarcity of reliable quantitative data were encountered at various stages of this study. However, every effort was made to discover those factors that have affected the salmon canning industry in the U.S. and Canada, in reviewing the industry in both countries. One obvious fact as far as marketing of canned salmnon is concerned is that, the foreign markets are becoming more competitive. The UK. market which absorbs large amount of canned salmon from Canada, Japan and, to some degree, from Russia, is no longer dominated by any single canned salmon producing country, for example, Canada.

Canada is taking every measure in all directions to meet the changing market and demand conditions at home and abroad. For instance, some long-time regulations are being relaxed or modified to suit the changing conditions: for example, removing the long-time embargo on export of fresh and frozen sockeye or red salmon. There are indications that the consumption of canned salmon has not been increasing as compared with the consumption of the product in forms other than canned, for example, fresh and frozen.

If the U.K. eventually joins the EEC, exports of canned salmon from Canada and the U.S. , as well as other canned

salmon producers will be adversely affected by the external tariffs of the EEC members countries. This factor is causing some concern among the canned salmon producing countries - especially those that depend heavily on foreign markets, Canada being one of them. U.S. producers are as much worried as are the Canadian producers. The exports of U.S. canned salmon have been increasing in the past few years. The per capita consumption of the canned salmon in the U.S. in the last ten years on average is approximately 0.8 pounds of edible meat, a decrease of 0.37 pounds in the last twenty years (22, p.11). This suggests that the U.S. producers may have to seek other outlets for canned salmon products in the near future. The U.S. producers are also worried because should Britain gain full entry into the EEC, Canada, Japan and Russia may turn their attention to the U.S. domestic market. If so there will be an influx of canned salmon and probably this will have a depressing effect on prices of canned salmon in the U.S. domestic markets.

In general the future marketing and demand condition for canned salmon is not very bright. This factor may lead to various controls against entry into the salmon canning industry in one or more producing countries. Canada for example, in 1968, instituted a program designed to discourage entry into the salmon fishing industry in that country: the Salmon License Control Program.

The analysis of the derived demand facing the fishermen

in the U.S. and Canada showed a close similarity in the demand characteristics of red salmon in both countries. However, there were significant differences between the demand characteristics of pink and red salmon in both countries.

The price flexibility, -0.0147, -0.0161 for the U.S. and Canadian red salmon demand equations respectively, calculated at the mean values of the ex-vessel price and landings of red salmon in the U.S. and Canada were fairly close as between the two countries. It was not possible to make conclusive statements with regards to the demand structure for pink salmon in both countries. Further research is suggested to that effect.

The results of the statistical analysis indicate that ex-vessel price of red salmon in the U.S. and Canada is relatively inflexible with respect to landings. As Waugh and Norton suggested (25, p. 52) policies that will improve revenues from agricultural commodities may not be beneficial as far as fishery products are concerned.

It was also discovered that, in some instances, institutional change may have a strong influence on the demand for canned salmon. This was the situation in Britain in 1958 when restrictions on imports of salmon were removed. When the dummy variable was included as a demand shifter in the demand equations for red and pink salmon in the U.S. and Canada, this variable was statistically significant in the red salmon demand equations but was not statistically signi-

ficant in the U.S. pink salmon demand equation. This may be one indication of the differences in the demand structures of the red and pink salmon in both countries. These differences could have arisen because of the British taste for red salmon as opposed to pink salmon (18, 51(13):51).

The estimated coefficients on landings and pack of red and pink salmon in the preceding year, were not statistically significant in the red and pink demand equations. This was the case in both the Canadian and the U.S. models. Similarly, the estimated coefficients on the wholesale export price of canned red and pink salmon variable were statistically significant in the Canadian red and pink demand equations while the estimated coefficients on the wholesale price (predicted) of canned red and pink salmon were not statistically significant in the U.S. red and pink demand equations. The statistical significance of the estimated coefficients on the whdesale export price variable in the Canadian red and pink salmon demand equations could be a reflection of differences in the market structure-Canada being only one seller in the world market and the U.S. being the primary seller in the U.S. domestic market for canned red and pink salmon.

It was also observed that the estimated coefficients on the landings variables in all the demand equations of both countries were not statistically different from zero. The t-values for the same landings variables were very low. Consequently, one may not actually reject the hypothesis that the estimated coefficients on the quantity (landings) variables are zero, in which case the price flexibility is also zero that is, the demand curves in the U.S. and Canada are perfect elastic. On the basis of these statistical results, one could question as to whether some salmon fishery programs for example, the License Control Program in Canada or attempts to limit entry into the salmon fishing industry will infact improve the aggregate income of the fishermen.

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APPENDICES

APPENDIX A

Data Pertinent to the Ex-vessel Derived Demand of the U.S. and Canadian Fishermen

Appendix A Table 1. Factors that are instrumental in the supply-demand model:U.S.

	Per Capita Disposable Income (Defl. by CPI)	Aggregate Disposable Income (Defl. by CPI)	U.S. Population	CPI (1957 - 1959 base)	
				Food	All
	Dollars	Billion Dollars	(Millions)	Index	
1947	1506	217.9	144.7	81.3	77.8
1948	1521	223.9	147.2	88.2	83.8
1949	1514	226.7	149.8	84.7	83.0
1950	1621	246.9	152.3	85.8	83.8
1951	1613	249.8	154.9	95.4	90.5
1952	1625	256.1	157.6	97.1	92.5
1953	1676	268.5	160.2	95.6	93.5
1954	1668	271.9	163.0	95.4	93.6
1955	1779	295.1	165.9	94.0	93.3
1956	1816	306.8	168.9	94.7	94.7
1957	1827	314.2	172.0	97.8	98.0
1958	1805	315.7	174.9	101.9	100.7
1959	1868	332.1	177.8	100.3	101.5
1960	1879	339.5	180.7	101.4	103.1
1961	1904	349.7	183.7	102.6	104.2
1962	1960	365.6	186.5	103.6	105.4
1963	2004	379.2	189.2	105.1	106.7
1964	2113	405.3	191.8	106.4	108.1
1965	2217	430.6	194.2	108.8	109.9
1966	2303	452.6	196.5	114.2	113.1
1967	2365	469.7	198.6	115.2	116.3
1968	2432	487.8	200.6	119.3	121.2
1969	2441	494.6	202.6	125.5	127.7
1970	2471	506.1	204.8	132.4	135.3

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Appendix A Table 1 Continued

	Ex-vessel Price of:		Wholesale Price of Canned:	
	Red (P_r^{ex-v})	Pink (P_p^{ex-v})	Red (P_r^w)	Pink (P_p^w)
	Cents Per Pound		Dollars Per Case	
1947	5.4	6.9	25.14	17.39
1948	7.6	6.3	26.42	22.08
1949	9.1	8.8	25.65	19.98
1950	10.1	7.9	28.65	18.25
1951	14.0	12.4	30.92	21.00
1952	13.1	9.4	30.20	20.25
1953	14.0	9.5	27.69	19.25
1954	18.6	8.9	27.39	19.39
1955	14.8	10.3	30.15	21.90
1956	16.2	9.1	33.28	23.06
1957	18.2	11.7	33.57	23.36
1958	23.0	9.2	33.63	22.48
1959	21.4	11.4	35.17	23.04
1960	21.4	13.0	36.66	25.13
1961	19.6	10.1	35.48	27.97
1962	22.1	14.2	35.05	27.38
1963	23.8	11.7	36.05	24.04
1964	23.5	10.6	38.90	22.03
1965	22.2	10.4	38.65	23.40
1966	22.5	13.6	36.20	28.33
1967	22.6	12.1	40.31	28.92
1968	22.6[a]	9.2[a]	40.31	31.99
1969	22.6[a]	16.0[a]	42.64	31.28
1970	25.7[b]	13.2[b]	43.18	32.65

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Note: a/ Preliminary; b/ Computed.

Source: Bureau of Labor Statistics, Bureau of Commercial Fisheries, National Fisherman.

Appendix
Table 2. Factors that are Instrumental in the Supply-Demand Model: U.S.

Year	Landings (L)		Pack (K_t)		Annual Average Retail Price of Tuna (T)
	Red	Pink	Red	Pink	
	(Thousand Metric Tons)		(Million Pounds)		($6\frac{1}{2}$ oz.) (cents/can)
1947	71.2	86.8	91.7	113.4	na
1948	56.5	51.4	83.2	62.8	na
1949	35.4	123.9	51.6	155.3	na
1950	41.5	38.9	61.9	52.7	na
1951	30.0	67.0	44.9	96.1	na
1952	50.0	36.0	67.9	56.4	na
1953	37.8	44.1	55.8	67.0	38.2
1954	41.6	40.2	63.5	55.3	39.1
1955	26.1	58.1	36.0	80.7	(1)
1956	42.8	46.3	56.8	54.2	32.7
1957	30.6	32.5	46.3	45.3	32.1
1958	30.8	54.8	45.6	74.4	33.1
1959	24.4	28.0	35.4	39.4	33.1
1960	43.2	23.9	63.3	35.3	32.5
1961	47.1	49.2	69.2	65.4	32.4
1962	26.3	65.0	40.4	93.6	34.7
1963	19.0	68.7	28.9	93.9	33.6
1964	26.0	73.6	37.3	93.1	32.0
1965	67.2	36.1	98.5	48.0	32.0
1966	46.3	74.0	66.4	99.0	35.4
1967	29.9	23.5	41.5	29.6	34.9
1968	24.5	67.4	34.3	85.0	34.5
1969	36.9	50.9	43.3	62.4	35.7
1970	69.9	54.3	88.7	64.6	39.4

Note: na =not available; (1) prices not comparable all year

Source: FAO Fisheries Statistics, National Fisherman, Bureau of Labor Statistics

Appendix Table 3. U.S. Actual and Predicted Ex-vessel Price of Red and Pink Salmon 1956 - 1970

Year	Actual	Predicted	Difference (Red Salmon)
	cents per pound, defl. by w.p.i. (food)		
1956	.160	.173	-.013
1957	.186	.173	.013
1958	.222	.216	.006
1959	.217	.218	-.001
1960	.212	.219	-.007
1961	.195	.216	-.021
1962	.218	.216	.002
1963	.238	.221	.017
1964	.234	.223	.011
1965	.233	.221	.012
1966	.221	.214	.007
1967	.206	.219	-.013
1968	.218	.223	-.005
1969	.206	.223	-.017
1970	.227	.218	.009

Continued on Next Page

Appendix Table 3 cont. (Pink Salmon)

Year	Actual	Predicted	Difference
	cents per pound, defl. by w.p.i. (food)		
1956	.090	.106	-.016
1957	.120	.104	.016
1958	.089	.104	-.015
1959	.116	.112	.004
1960	.129	.112	.017
1961	.101	.114	-.013
1962	.140	.113	.027
1963	.117	.113	.004
1964	.105	.114	-.009
1965	.109	.118	-.009
1966	.134	.114	.020
1967	.111	.126	-.015
1968	.089	.115	-.026
1969	.146	.125	.021
1970	.116	.122	-.006

Appendix Table 4 U.S. Actual and Predicted Wholesale Price of Canned Red and Pink Salmon 1956 -1970

Year	Actual	Predicted	Difference (Red Salmon)
	dollars per case, defl. by w.p.i. (food)		
1956	.330	.339	-.529
1957	.343	.333	.301
1958	.325	.336	.034
1959	.356	.346	.527
1960	.366	.364	.266
1961	.353	.350	.480
1962	.346	.355	-.493
1963	.360	.370	-.941
1964	.387	.382	.656
1965	.405	.391	-.495
1966	.356	.368	-.611
1967	.368	.390	1.312
1968	.389	.410	-.603
1969	.388	.429	-.240
1970	.381	.428	.398

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Appendix Table 4 cont.

Year	Actual	Predicted	Difference (Pink Salmon)
	dollars per case, defl. by w.p.i. (food-)		
1956	.228	.229	-.001
1957	.239	.236	.003
1958	.217	.227	-.010
1959	.233	.223	.010
1960	.249	.257	-.008
1961	.279	.282	-.003
1962	.270	.257	.013
1963	.240	.232	.008
1964	.219	.235	-.016
1965	.245	.239	.006
1966	.279	.279	.000
1967	.264	.266	-.002
1968	.308	.298	.010
1969	.285	.286	-.001
1970	.288	.295	-.007

Appendix A Table 5. Factors that are instrumental in the supply-demand model: Canada

	Landings red (L)	Pack of red (K_t^r-1)	Wholesale Export Price of Canned red (Deflated by General W.P.I.) (P_r^{exp})	Ex-vessel Price of red (P_r^{ex-v})	General W.P.I. (1935-1939 base)
	(Millions of Pounds)		Dollars Per Case	Cents Per Pound	Index
1947	21.6	26.07	.144	.094	163.3
1948	19.7	13.73	.147	.106	193.4
1949	19.0	12.53	.159	.090	198.3
1950	29.3	12.48	.149	.095	211.2
1951	29.8	19.58	.150	.104	240.2
1952	30.9	20.54	.139	.111	226.0
1953	35.4	21.55	.129	.100	220.7
1954	47.0	24.48	.138	.102	217.0
1955	16.6	32.69	.162	.110	218.9
1956	21.5	11.76	.171	.122	225.6
1957	15.7	19.39	.169	.124	227.4
1958	74.0	10.94	.156	.123	227.8
1959	18.1	51.79	.173	.135	230.6
1960	15.5	12.29	.191	.153	230.9
1961	26.6	10.90	.180	.143	233.3
1962	20.1	19.10	.194	.139	240.0
1963	11.9	14.30	.192	.138	244.6
1964	23.0	7.58	.192	.147	245.4
1965	16.2	16.46	.188	.148	250.4
1966	25.7	11.81	.173	.143	259.5
1967	37.1	19.58	.170	.142	264.1
1968	41.4	26.83	.169	.140	269.9
1969	24.1	29.33	.186	.137	282.4
1970	25.2	17.28	.168	.138	286.5

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Appendix A Table 5 Continued

	Landings Pink (L_p)	Pack of Pink (K^p_{t-1})	Wholesale Export Price of Canned Pink (P^{exp}_p) (Deflated by General W.P.I.)	Ex-vessel Price of Pink (P^{ex-v}_p)
	(Millions of Pounds)		Dollars/Case	Cents/Pound
1947	50.7	5.60	.077	.028
1948	26.7	28.85	.085	.038
1949	55.8	15.46	.083	.033
1950	40.3	34.08	.083	.034
1951	60.0	21.46	.079	.040
1952	51.2	35.33	.066	.035
1953	61.5	36.29	.068	.033
1954	25.7	38.16	.074	.036
1955	63.1	16.13	.082	.041
1956	28.9	39.89	.093	.040
1957	57.0	17.47	.092	.041
1958	33.6	27.46	.088	.041
1959	35.0	21.89	.095	.047
1960	17.0	22.03	.108	.051
1961	50.1	10.56	.107	.049
1962	93.6	31.97	.100	.049
1963	60.6	57.07	.090	.041
1964	36.8	36.34	.102	.045
1965	22.9	22.27	.112	.046
1966	73.5	13.82	.108	.045
1967	51.6	45.70	.110	.049
1968	55.6	31.20	.111	.047
1969	13.8	32.11	.127	.057
1970	53.0	7.39	.119	.053

Source: FAO Fisheries Statistics, Canadian Fisheries Annual, Fisheries Statistics of Canada, National Fisherman, Ontario Statistical Review.

Appendix Table 6 Canada Actual and Predicted Ex-vessel Price of Red Salmon 1947 - 1970

Year	Actual	Predicted	Difference
	cents per pound, defl. by gen.w.p.i.		
1947	.094	.103	-.00891
1948	.106	.105	.00118
1949	.090	.109	-.01911
1950	.095	.105	-.00960
1951	.104	.105	-.00077
1952	.111	.101	.01019
1953	.100	.097	.00305
1954	.102	.099	.00296
1955	.110	.109	.00086
1956	.122	.113	.00886
1957	.124	.112	.01158
1958	.123	.129	-.00638
1959	.135	.137	-.00203
1960	.153	.146	.00721
1961	.143	.141	.00177
1962	.139	.146	-.00709
1963	.138	.146	-.00829
1964	.147	.146	.00114
1965	.148	.144	.00355
1966	.143	.139	.00418
1967	.142	.136	.00553
1968	.140	.135	.00462
1969	.137	.142	-.00542
1970	.138	.137	.00121

Appendix Table 7 Canada: Actual and Predicted Ex-vessel Price of Pink Salmon 1947-1970

Year	Actual	Predicted	Difference
	cents per pound, defl. by gen. w.p.i.		
1947	.028	.035	-.00661
1948	.038	.038	.00019
1949	.033	.037	-.00390
1950	.034	.037	-.00340
1951	.040	.036	.00419
1952	.035	.032	.00304
1953	.033	.033	.00030
1954	.036	.035	.00149
1955	.041	.037	.00436
1956	.040	.041	-.00077
1957	.041	.040	.00109
1958	.041	.042	-.00077
1959	.047	.044	.00311
1960	.051	.048	.00297
1961	.049	.048	.00147
1962	.049	.046	.00283
1963	.041	.044	-.00251
1964	.045	.047	-.00163
1965	.046	.049	-.00337
1966	.045	.048	-.00309
1967	.049	.050	-.00062
1968	.047	.050	-.00251
1969	.057	.055	.00248
1970	.053	.051	.00164

APPENDIX B

The Correlation Matrices of the Derived Demand Equations for Red and Pink Salmon (U.S. and Canada)

Table 1. The correlation between the variables of the demand equation 1.6

	Landings of Red Salmon (L_r)	Pack of Red (K^r_{t-1})	Wholesale Export Price of Canned Red (P^{exp}_r)	Dummy (D)	Ex-vessel Price of Red (P^{ex-v}_r)
L_r	1.000	-0.095	-0.428	0.060	-0.150
K^r_{t-1}	---	1.000	-0.132	-0.023	-0.082
P^{exp}_r	---	---	1.000	0.764	0.849
D	---	---	---	1.000	0.895
P^{ex-v}_r	---	---	---	---	1.000

The above is the upper portion of the correlation matrix between the variables in the demand equation.

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Table 1 cont. (equation 1.7)

	Landings of Pink Salmon	Pack of Pink	Dummy	Wholesale Export Price of Canned Pink	Ex-vessel Price of Pink
	(L_p)	(K^p_{t-1})	(D)	(P^{exp}_p)	(P^{ex-v}_p)
L_p	1.000	-0.111	-0.038	-0.185	-0.136
K^p_{t-1}	---	1.000	0.058	-0.129	-0.030
D	---	---	1.000	0.802	0.809
P^{exp}_p	---	---	---	1.000	0.901
P^{ex-v}_p	---	---	---	---	1.000

The above is the upper portion of the correlation matrix between the variables in the demand equation.

Table 2. The correlation between the variables of the demand equation 1.9

	Predicted Wholesale Price of Canned Red Salmon ($\bar{P}^{w}_{r}$)	Landings of Red Salmon (L_r)	Pack of Red Salmon (K^{r}_{t-1})	Dummy (D)	Ex-vessel Price of Red Salmon (P^{ex-v}_{r})
$\bar{P}^{w}_{r}$	1.000	0.324	-0.346	0.488	0.477
L_r	---	0.1000	0.008	0.026	-0.008
K^{r}_{t-1}	---	---	1.000	0.068	-0.056
D	---	---	---	1.000	0.793
P^{ex-v}_{r}	---	---	---	---	1.000

The above is the upper portion of the correlation matrix between the variables in the demand equation.

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Table 2 cont. (equation 1.10)

	Predicted Wholesale Price of Canned Red Salmon ($\tilde{P}^w_p$)	Landings of Pink Salmon (L_p)	Pack of Pink Salmon (K^p_{t-1})	Dummy (D)	Ex-vessel Price of Pink Salmon (P^{ex-v}_p)
$\tilde{P}^w_p$	1.000	0.228	-0.403	0.361	0.227
L_p	---	1.000	-0.095	0.239	-0.022
K^p_{t-1}	---	---	1.000	-0.014	0.142
D	---	---	---	1.000	0.207
P^{ex-v}_p	---	---	---	---	1.000

The above is the upper portion of the correlation matrix between the variables in the demand equation.